DEPARTMENT OF THE NAVY
BASE REALIGNMENT AND CLOSURE
PROGRAM MANAGEMENT OFFICE WEST
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September 28, 2016

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Mr. James Fyfe (3 copies)
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700 Heinz Avenue, Suite 200
Berkeley, CA 94710

Ms. Yemia Hashimoto
Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, Ca 94612

Dear Ms. Tran, Mr. Fyfe, and Ms. Hashimoto:

SUBJECT: FINAL FIVE YEAR REVIEW, ALAMEDA POINT AND FLEET AND INDUSTRIAL SUPPLY CENTER OAKLAND, ALAMEDA FACILITY/ALAMEDA ANNEX, ALAMEDA, CALIFORNIA

I am pleased to submit to you the *Final Five Year Review, Alameda Point and Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex, Alameda, California, September 2016*. The Navy appreciates your input and effort in the progress of this site.

If you have any questions, please call Ms. Tahirih Linz, the Project Manager, at 619-524-5866, or me at (619) 524-4569.

Sincerely,

Cecily Sabedra

CECILY SABEDRA
BRAC Environmental Coordinator
By direction of the Director

Enclosure: 1. Final Five Year Review, Alameda Point and Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex, Alameda, California, September 2016

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Final

Five-Year Review

Alameda Point and Fleet and Industrial Supply Center Oakland, Alameda Facility /Alameda Annex, Alameda, California

September 2016

Prepared for:

United States Department of the Navy
Base Realignment and Closure
Program Management Office West

Contract No. N62473-15-C-3215
DCN: STS-3215-15-0028

Prepared by:
Sealaska Technical Services, LLC
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Final

Five-Year Review

Alameda Point and Fleet and Industrial Supply Center Oakland, Alameda Facility /Alameda Annex, Alameda, California

September 2016

Contract No. N62473-15-C-3215
DCN: STS-3215-15-0028

Prepared for:

United States Department of the Navy
Base Realignment and Closure PMO West
33000 Nixie Way, Building 50
San Diego, CA 92147

Prepared by:

SEALASKA TECHNICAL

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REVIEW AND APPROVAL

Approved by: Cecily Sabedra Date: September 28, 2016
Cecily Sabedra
Base Realignment and Closure, Environmental Coordinator

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EXECUTIVE SUMMARY

The United States Department of the Navy (DON) has completed a Five-Year Review of remedial actions (RA) at the former Naval Air Station Alameda (Alameda Point) and the Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex (FISCA), in Alameda, California. The remedies at each site are described and published in site-specific documents such as the (1) Record of Decision (ROD), (2) Remedial Action Work Plan (RAWP), (3) Remedial Action Completion Reports (RACR), and (4) Land-Use Control (LUC) Remedial Design (RD).

Alameda Point contractor Sealaska Technical Services, LLC (STS), conducted this Five-Year Review and prepared this report for the DON. The Five-Year Review is required under the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA). This Five-Year Review covers the period between September 28, 2011, and September 28, 2016, and was conducted in accordance with (1) the United States Environmental Protection Agency (USEPA) Office of Solid Waste and Emergency Response Directive 9355.7-03B-P, *"Comprehensive Five-Year Review Guidance"* (USEPA 2001); (2) the USEPA *"Recommended Evaluation of Institutional Controls: Supplement to the 'Comprehensive Five-Year Review Guidance'"* (USEPA 2011); (3) the DON *"Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews"* (DON 2004); and (4) the Naval Facilities Engineering Command (NAVFAC) *"Toolkit for Preparing Five-Year Reviews"* (DON 2013). STS worked with the DON and followed the approach described in the *"Toolkit for Preparing Five-Year Reviews"* (DON 2013) to prepare this Five-Year Review Report.

Fifteen Alameda Point Installation Restoration (IR) sites are evaluated for this review period in eight operable units (OU): OU-1 (IR Sites 6 and 16 and IR Site 14), OU-2A (IR Sites 9, 13, and 19), OU-2B (IR Sites 3 and 4), OU-3 (IR Site 1), OU-4A (IR Site 2), OU-4B (IR Site 17), OU-5 (IR Site 25), and OU-6 (IR Site 26, IR Site 27, and IR Site 28). In addition, FISCA IR Site 02 Soil and the Marsh Crust are evaluated. For the purposes of this document, the "Marsh Crust" refers to the FISCA Marsh Crust as well as the Marsh Crust at Alameda Point. The OUs are at various stages in the CERCLA process, ranging from RA implementation to long-term monitoring.

This is the first Five-Year Review for Alameda Point IR Sites 1, 2, 3, 4, 9, 13, 17, and 19; the second for Alameda Point IR Sites 6, 14, 16, 25, 26, 27, and 28; and the third for FISCA IR Site 02 Soil and the Marsh Crust. Table ES-1 summarizes the status of each IR Site at Alameda Point and FISCA.

TABLE ES-1: SUMMARY OF CURRENT STATUS OF IR SITES AT ALAMEDA POINT AND FISCA

OU	Site ID	Site Description	ROD	Status	CERCLA Phase
3	IR Site 1	1943-1956 Disposal Area (soil)	2009 / 2013 Am	Initial Five-Year Review (this report), RIP/RA-O	Phase 6
3	IR Site 1	1943-1956 Disposal Area (groundwater)	2009	Initial Five-Year Review (this report), RA-O	Phase 6
4A	IR Site 2	West Beach Landfill and Associated Wetlands	2010	Initial Five-Year Review (this report), RIP/RA-O	Phase 6
2B	IR Site 3	Abandoned Fuel Storage Area	2015	Initial Five-Year Review (this report), RC / LTM	Phase 7
2B	IR Site 4	Building 360 (Aircraft Engine Facility) (Groundwater)	2015	RD	Phase 3
2B	IR Site 4	Building 360 (Aircraft Engine Facility) (soil)	2015	RC / LTM	Phase 7
2C	IR Site 5	Building 5/5A (Aircraft Rework Facility)	2014	RD / RA	Phases 3 and 4
2C	IR Site 5	Building 5/5A (Aircraft Rework Facility) Exterior Drain Lines	TBD	For drain lines outside building, ROD	Phases 2

TABLE ES-1: SUMMARY OF CURRENT STATUS OF IR SITES AT ALAMEDA POINT AND FISCA

OU	Site ID	Site Description	ROD	Status	CERCLA Phase
1	IR Site 6	Building 41 (Aircraft Intermediate Maintenance Facility)	2007	Second Five-Year Review (this report), RA-O	Phase 6
1	IR Site 7	Building 410 (Paint Stripping Facility)	2007 / 2013	NFA	None
1	IR Site 8	Abandoned Fuel Storage Area	2007	NFA	None
2A	IR Site 9	Building 410 (Paint Stripping Facility)	2012	Initial Five-Year Review (this report), RC / LTM	Phase 7
2C	IR Site 10	Building 400 (Missle Rework Facility)	2014	RD / RA	Phases 3 and 4
2C	IR Site 10	Building 400 (Missle Rework Facility) Drain Lines Outside Building	TBD	ROD For drain lines outside of building.	Phase 2
2B	IR Site 11	Building 14 (Engine Test Cell)	2015	RD for groundwater	Phase 3
2C	IR Site 12	Building 10 (Power Plant)	2014	No Action required; site closed	None
2A	IR Site 13	Former Oil Refinery (Excluding South RA-O Area)	2012	Initial Five-Year Review (this report), RIP / RC / LTM	Phases 7
2A	IR Site 13	Former Oil Refinery (South RA-O Area)	2012	Initial Five-Year Review (this report), RC / LTM and RA-O	Phases 6 and 7
1	IR Site 14	Former Fire Training Area	2007	Second Five-Year Review (this report), RAP / RA-O	Phase 6
1	IR Site 15	Buildings 301 and 389 (Former Transformer Storage Area)	2006	NFA	None
1	IR Site 16	C-2 CANS Area (Shipping Container Storage)	2012 Soil / 2015 Ground water ESD	Second Five-Year Review (this report), RC / LTM	Phase 7
4B	IR Site 17	Seaplane Lagoon	2006 / 2016	Initial Five-Year Review (this report), RC / LTM	Phase 7
NA	IR Site 18	Drain Lines	NA	No longer an IR Site; realigned	None
2A	IR Site 19	Yard D-13 (Hazardous Waste Storage)	2012	Initial Five-Year Review (this report), RC / LTM	Phase 7
4C	IR Site 20	Oakland Inner Harbor	2008	NFA	None
2B	IR Site 21	Building 162 (Ship Fitting and Engine Repair)	2015	RD for groundwater	Phase 3
2A	IR Site 22	Building 547 (Former Service Station)	2012	NFA	None
2A	IR Site 23	Building 530 (Missile Rework Operations)	2012	NFA	None
4B	IR Site 24	Pier 1 and 2 Sediments	2010	NFA	None
5	IR Site 25	Estuary Park and the Coast Guard Housing (soil only)	2007	Second Five-Year Review (this report), RC / LTM	Phase 7
6	IR Site 26	Western Hangar Zone	2006	Second Five-Year Review (this report), RIP / RA-O	Phase 6
6	IR Site 27	Dock Zone	2008	Second Five-Year Review (this report), RIP / RA-O	Phase 6
6	IR Site 28	Todd Shipyard	2007	Second Five-Year Review (this report), RIP / RA-O	Phase 6
4C	IR Site 29	Skeet Range	2005	NFA	None
5	IR Site 30	Miller School (soil only)	2009	NFA	None
5	IR Site 31	Marina Village (soil only)	2008	NFA	None
5	IR Site 32	Northeastern Ordnance Storage Areas	TBD	Remedy not selected, RI / FS	Phase 2

TABLE ES-1: SUMMARY OF CURRENT STATUS OF IR SITES AT ALAMEDA POINT AND FISCA

OU	Site ID	Site Description	ROD	Status	CERCLA Phase
NA	IR Site 33	South Tarmac and Runway Wetlands	2012 (Action Memo)	NFA	None
NA	IR Site 34	Former Northwest Shop Area	2011	NFA	None
NA	IR Site 35	West Housing Area	2010	NFA	None
NA	FISCA IR Site 02 Soil	FISCA	2001	Third Five-Year Review (this report), RIP / LTM	Phase 7
None	None	Marsh Crust	2001	Third Five-Year Review (this report), RIP / LTM	Phase 7

Notes:
Am = Amendment
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
FISCA = Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex
ID = Identification
IR = Installation Restoration
LTM = Long-Term Management (Phase 7)
NFA = No Further Action
OU = Operable Unit
RA = Remedial Action (Phase 4)
RA-O = Remedial Action Operation (Phase 6)
RAP = Remedial Action Plan
RD = Remedial Design (Phase 3)
RI/FS = Remedial Investigation/Feasibility Study (Phase 2)
RIP = Remedy in Place
ROD = Record of Decision
SC = Site Closure
TBD = To be determined

This Five-Year Review was completed in order to accomplish the following:

- Determine whether the remedies currently operating at Alameda Point and FISCA are protective of human health and the environment
- Document the methods, findings, and conclusions of the review in a report
- Identify issues found during the review, and make recommendations to address these issues

This Five-Year Review includes available finalized data (such as data presented in final documents) and was conducted in accordance with regulatory guidance as of April 1, 2016; new and revised data and regulatory guidance that became available after this date are not included in this Five-Year Review. The Five-Year Review process consists of document review; interviews with Alameda Point personnel, contractors, and community members; site inspections; and review of the human health risk assessment (HHRA) and ecological risk assessment (ERA). Information from these processes was used to answer the three technical assessment questions presented below from the USEPA *"Comprehensive Five-Year Review Guidance."*

A. Is the remedy functioning as intended by the decision documents?

B. Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAO) used at the time of the remedy selection still valid?

C. Has any other information come to light that could call into question the protectiveness of the remedy?

Protectiveness statements were assigned to each site included in this Five-Year Review in accordance with the USEPA guidance for "*Clarifying the Use of Protectiveness Determinations for CERCLA Five-Year Reviews*" (USEPA 2012). As required by the USEPA guidance, based on the answers to these questions, the protectiveness of each site was determined as one of the following:

- Protective
- Protective in the short term

- Will be protective once remedy is complete
- Protectiveness cannot be determined until additional information is obtained
- Not protective

All sites were determined to be protective, and protectiveness statements identified during this Five-Year Review are summarized below as well as issues and recommendations for specific sites identified during this Five-Year Review. Issues and recommendations for specific sites identified during the 2011 Five-Year Review have been addressed and status updates are provided in the "2011 Five-Year Review Recommendations Status Table" included in Appendix E of this 2016 Five-Year Review.

Protectiveness Statements

Based on the technical assessments, the remedies at IR Sites 1, 2, 3, 4, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, and 28; FISCA IR Site 02 Soil; and the Marsh Crust are protective of human health and the environment. Table ES-2 summarizes the protectiveness determinations.

TABLE ES-2: SUMMARY OF PROTECTIVENESS DETERMINATION FOR IR SITES AT ALAMEDA POINT AND FISCA

OU	Site ID	Current Management Stage	Protectiveness Determination
3	IR Site 1 Soil	RIP / RA-O	Protective
3	IR Site 1 Groundwater	RA-O	[1]Protective
4A	IR Site 2	RIP / RA-O	Protective
2B	IR Site 3	RC / LTM	Protective
2B	IR Site 4	RC / LTM	Protective
1	IR Site 6	RA-O	Protective
2A	IR Site 9	RC / LTM	Protective
2A	IR Site 13 (Excluding South RA-O Area)	RIP / RC / LTM	Protective
2A	IR Site 13 (South RA-O Area)	RC / LTM / RA-O	Protective
1	IR Site 14	RAP / RA-O	Protective
1	IR Site 16	RC / LTM	Protective
4B	IR Site 17	RC / LTM	Protective
2A	IR Site 19	RC / LTM	Protective
5	IR Site 25	RC / LTM	Protective
6	IR Site 26	RIP / RA-O	Protective
6	IR Site 27	RIP / RA-O	Protective
6	IR Site 28	RIP / RA-O	[2]Protective
None	FISCA IR Site 02 Soil	RIP / LTM	Protective
None	Marsh Crust	RIP / LTM	Protective

[1] The remedy for OU-3, IR Site 1 Groundwater is pending completion, ICs are protective of human health in the short-term and protectiveness of ecological receptors is deferred.

[2] The remedy for OU-6, IR Site 28 is considered protective for human health and terrestrial receptors and protective in the short term for aquatic receptors.

Notes:
FISCA = Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex
IR = Installation Restoration
ID = Identification
LTM = Long-Term Management
NFA = No Further Action
OU = Operable Unit
RA-O = Remedial Action Operation
RAP = Remedial Action Plan
RC = Response Complete
RIP = Remedy in Place
SC = Site closure

The Five-Year Review Summary Forms are presented below.

SUMMARY FORMS - FIVE-YEAR REVIEW

SITE IDENTIFICATION		
Site Name: Former Naval Air Station Alameda (Alameda Point), Installation Restoration (IR) Sites 1, 2, 3, 4, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, 28, and the Marsh Crust		
EPA ID: CA6170023236		
Region: 9	**State:** CA	**City/County:** Alameda, Alameda
SITE STATUS		
NPL Status: Yes, 1999		
Multiple OUs? Yes	**Has the site achieved construction completion?** Various; see Table ES-1	
REVIEW STATUS		
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** United States Department of the Navy (DON)		
Author name (Federal or State Project Manager): DON, Base Realignment and Closure (BRAC) Program Management Office (PMO) West		
Author affiliation: DON		
Review period: September 28, 2011, through September 28, 2016		
Date of site inspection: November 12, 2015		
Type of review: Statutory		
Review number: First for IR Sites 1, 2, 3, 4, 9, 13, 17, and 19; second for IR Sites, 6, 14, 16, 25, 26, 27, 28; third for Marsh Crust		
Triggering action date: September 28, 2011 (Previous Five-Year Review)		
Due date *(five years after triggering action date)*: September 28, 2016		

Issues and Recommendations

OU-1, IR Site 6 – No issues have been identified that would currently or in the future prevent the respective remedies at this site from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

OU-1, IR Site 16 – No issues have been identified that would currently or in the future prevent the respective remedies at this site from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

OU-1, IR Site 14 – No issues have been identified that would currently or in the future prevent the respective remedy at this site from being protective of human health and the environment; however, the DON will increase groundwater monitoring to quarterly and continue reporting VC concentrations in groundwater under the BGMP**.**

OU-2A, IR Sites 9, 13 and 19 – No issues have been identified that would currently or in the future prevent the respective remedies at these sites from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

OU-2B, IR Sites 3 and 4 – No issues have been identified that would currently or in the future prevent the respective remedies at these sites from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

OU-3, IR Site 1 Soil – Issues of sparse vegetation and invasive weeds on the soil cover have been identified. Recommendation and follow-up actions include reseeding the soil cover.

OU-3, IR Site 1 Groundwater – The issue identified includes destruction of a groundwater monitoring well network during the RA for soil. The recommendation and follow-up action includes reinstallation of the groundwater monitoring well network as required by the selected remedy.

OU-4A, IR Site 2 – Issues include subsurface methane detected above the lower explosive limit (LEL) in three soil gas probes during annual sampling. The recommendation and follow-up action includes the collection of surface and subsurface methane data on a quarterly basis and presented in the 2017 BGMP report.

OU-4B, IR Site 17 – No issues have been identified that would currently or in the future prevent the respective remedies at this site from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

OU-5, IR Site 25 – No issues have been identified that would currently or in the future prevent the respective remedies at this site from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

OU-6, IR Site 26 – No issues have been identified that would currently or in the future prevent the respective remedies at this site from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

OU-6, IR Site 27 – No issues have been identified that would currently or in the future prevent the respective remedies at this site from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

OU-6, IR Site 28 – The issue is well 28SW02 consistently remains above RGs; therefore, the impact to ecological receptors is unknown. The recommendation from the 2011 Five

Year Review to continue monitoring and evaluation of trends at IR Site 28 until 2021 remains appropriate. The recommendation and follow-up action for the 2016 Five-Year Review is to increase the BGMP monitoring frequency to quarterly at the low-low tide as well as conduction of a tidal study to better understand the potential impacts of tidal influence on copper concentrations in groundwater Evaluation and recommendations of the additional data collected will be presented in the 2017 BGMP report.

Marsh Crust – No issues have been identified that would currently or in the future prevent the respective remedies at this site from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

Protectiveness Statements:

OU-1, IR Site 6 – **The remedial action (RA) performed at IR Site 6 is considered protective of human health and the environment.** The extent of contamination has been defined, and institutional controls (IC) are in place to prevent exposure to contaminated groundwater. ICs and land-use controls (LUC) are assessed annually. The selected remedy will continue to be protective.

OU-1, IR Site 16 – **The RA performed at IR Site 16 is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated groundwater. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

OU-1, IR Site 14 – **The RA performed at IR Site 14 is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated groundwater. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

OU-2A, IR Sites 9, 13, and 19 – **The RAs performed at IR Sites 9, 13 and 19 are considered protective of human health and the environment.** The extent of contamination is defined, and ICs are in place to prevent exposure to contaminated groundwater. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

OU-2B, IR Sites 3 and 4 – **The RAs performed at IR Sites 3 and 4 are considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated soil. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

OU-3, IR Site 1 – **The soil RA performed at IR Site 1 is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated soil. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

OU-3, IR Site 1 – **The groundwater RA performed at IR Site 1 is pending completion and current ICs are considered protective of human health in the short term; however, protectiveness of ecological receptors is deferred.**

OU-4A, IR Site 2 – **The RA performed at IR Site 2 is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to soil beneath the landfill surface cover. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

OU-4B, IR Site 17 – **The RA performed at IR Site 17 is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated sediment. ICs and LUCs are

assessed annually. The selected remedy will continue to be protective.

OU-5, IR Site 25 – **The RA performed at IR Site 25 is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated soil. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

OU-6, IR Site 26 – **The RA performed at IR Site 26 is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated groundwater. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

OU-6, IR Site 27 – **The RA performed at IR Site 27 is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated groundwater. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

OU-6, IR Site 28 – **The RA performed at IR Site 28 is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated groundwater. ICs and LUCs are assessed annually. The selected remedy will continue to be protective of human health and terrestrial receptors; however, protectiveness of aquatic receptors is considered short term.

Marsh Crust – **The RA for the Marsh Crust is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated soil. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

SUMMARY FORMS – FIVE-YEAR REVIEW (CONTINUED)

SITE IDENTIFICATION		
Site Name: Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex (FISCA) IR Site 02 Soil, and the Marsh Crust (FISCA Marsh Crust and Former Subtidal Area at Alameda Point)		
EPA ID: CA1170090012		
Region: 9	**State:** CA	**City/County:** Alameda, Alameda

SITE STATUS	
NPL Status: Not NPL	
Multiple OUs? NO	**Has the site achieved construction completion?** Yes, 2001

REVIEW STATUS
Lead agency: Other Federal Agency **If "Other Federal Agency" was selected above, enter Agency name:** United States Department of the Navy (DON)
Author name (Federal or State Project Manager): DON, Base Realignment and Closure (BRAC) Program Management Office (PMO) West
Author affiliation: DON
Review period: September 28, 2011, through September 28, 2016
Date of site inspection: November 12, 2015
Type of review: Statutory
Review number: 3
Triggering action date: September 28, 2011 (Previous Five-Year Review)
Due date *(five years after triggering action date)*: September 28, 2016

Issues and Recommendations

FISCA IR Site 02 Soil – No issues have been identified that would currently or in the future prevent the selected remedy at this site from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

Marsh Crust – No issues have been identified that would currently or in the future prevent the selected remedy at this site from being protective of human health and the environment. No recommendations or follow-up actions have been identified.

Protectiveness Statements:

FISCA IR Site 02 Soil – **The remedial action (RA) performed at FISCA IR Site 02 Soil is considered protective of human health and the environment.** The extent of contamination has been defined, and institutional controls (IC) are in place to prevent exposure to contaminated groundwater. ICs and land-use controls (LUC) are assessed annually. The selected remedy will continue to be protective.

Marsh Crust – **The RA for the Marsh Crust is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated soil. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

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ABBREVIATIONS AND ACRONYMS

§	Section
µg/L	Microgram per liter
$\mu g/m^3$	microgram per cubic meter
$(\mu g/m^3)^{-1}$	per microgram per cubic meter
ACDEH	Alameda County Department of Environmental Health
Alameda Point	Former Naval Air Station Alameda
AMEC	AMEC Environment & Infrastructure, Inc.
AOC	Area of concern
ARAR	Applicable or relevant and appropriate requirement
Arcadis	U.S., Inc.
ARIC	Area Requiring Institutional Controls
AST	Aboveground storage tank
BCT	BRAC Cleanup Team
BEI	Bechtel Environmental, Inc.
BGMP	Basewide Groundwater Monitoring Program
bgs	Below ground surface
B(a)P	Benzo(a)pyrene
BRAC	Base Realignment and Closure
BSU	Bay Sediment Unit
BV	Background value
CAA	Corrective Action Area
CANS	Shipping containers
CDM	CDM Federal Programs Corporation
CDPH	California Department of Public Health
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	*Code of Federal Regulations*
CGC	Cape and Geosyntec Consultants
cpm	Count per minute
COPEC	Chemical of potential ecological concern
COC	Contaminant of concern
CSO	Caretaker Site Officer
CTE	Central tendency exposure
CTR	California Toxics Rule
CWMP	Compensatory Wetlands Mitigation Plan
DCA	Dichloroethane
DCB	Dichlorobenzene
DCE	Dichloroethene
DDD	Dichlorodiphenyldichloroethane
DDE	Dichlorodiphenyldichloroethene
DDT	Dichlorodiphenyltrichloroethane
DO	Dissolved oxygen
DON	United States Department of the Navy

ABBREVIATIONS AND ACRONYMS (CONTINUED)

DPT	Direct-push technology
DRMO	Defense Reutilization and Marketing Office
DTSC	California Department of Toxic Substances Control
EBS	Environmental Baseline Survey
ELCR	Excess lifetime cancer risk
ERA	Ecological risk assessment
ESD	Explanation of Significant Difference
ESS	Explosive Safety Submission
FFA	Federal Facility Agreement
FISCA	Fleet and Industrial Supply Center Oakland, Alameda Facility / Alameda Annex
FS	Feasibility Study
FWBZ	First water-bearing zone
GAP	Generator Accumulation Point
GPS	Global positioning system
HHRA	Human health risk assessment
HI	Hazard index
HQ	Hazard quotient
IC	Institutional control
ICTC	Institutional control termination criteria
ILCR	Incremental lifetime cancer risk
IR	Installation Restoration
ISB	*In situ* bioremediation
ISCO	*In situ* chemical oxidation
IT	International Technology Corporation
ITSI	Innovative Technical Solutions, Inc.
IWTP	Industrial Waste Treatment Plant
KCH	CH2M Hill and Kleinfelder Joint Venture
LEL	Lower explosive level
LIF	Laser-Inducted Fluorescence
LIFOC	Lease in Furtherance of Conveyance
LTM	Long-Term Management
LTMP	Long-Term Monitoring Plan
LUC	Land-use control
Marsh Crust	FISCA Marsh Crust and the Marsh Crust and Former Subtidal Area at Alameda Point
MCL	Maximum cleanup level
MEC	Munitions and explosives of concern
mg/kg	Milligram per kilogram
$(mg/kg\text{-}day)^{-1}$	Per milligram per kilogram-day
MIC	Metals immobilizing compound
MIP	Membrane interface probe
MMEC	Multimedia Environmental Compliance Group
MNA	Monitored natural attenuation

ABBREVIATIONS AND ACRONYMS (CONTINUED)

MOA	Memorandum of Agreement
MOU	Memorandum of Understanding
MPPEH	Munitions potentially presenting an explosive hazard
MRC	Metals remediation compound
mrem/yr	Millirem per year
MTBE	Methyl tert-butyl ether
MUD	Municipal Utilities District
NAS	Naval Air Station
NAVFAC	Naval Facilities Engineering Command
NAVFAC SW	Naval Facilities Engineering Command Southwest
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NFA	No further action
Neptune	Neptune and Company, Inc.
NPL	National Priorities List
NOSSA	Naval Ordnance Safety and Security Activity
NTR	National Toxics Rule
O&M	Operation and maintenance
OEW	Ordnance and explosives waste
OTIE	Oneida Total Integrated Enterprises, LLC
OU	Operable unit
OWS	Oil-water separator
PAH	Polycyclic aromatic hydrocarbon
PCB	Polychlorinated biphenyl
PCDD	Polychlorinated dibenzodioxin
PCDF	Polychlorinated dibenzofuran
PCE	Tetrachloroethene
pCi/g	Picocurie per gram
PCOMMP	Post-Construction Operation, Maintenance, and Monitoring Plan
PFC	Perfluorinated chemical
pH	Potential of Hydrogen
PM	Project Manager
PMO	Program Management Office
POE	Point of Exposure
PP	Proposed Plan
ppbv	Part per billion by volume
ppm	Part per million
PRC	PRC Environmental Management, Inc.
PRG	Preliminary remediation goal
RA	Remedial action
RA-O	Remedial action operation
RAB	Restoration Advisory Board
RACR	Remedial Action Completion Report

ABBREVIATIONS AND ACRONYMS (CONTINUED)

RAO	Remedial action objective
RAP	Remedial Action Plan
RAWP	Remedial Action Work Plan
RBA	Richard Brady & Associates
RCRA	Resource Conservation and Recovery Act
RD	Remedial design
RG	Remediation goal
RI	Remedial Investigation
RME	Reasonable maximum exposure
ROD	Record of Decision
RPM	Remedial Project Manager
RSL	Regional screening level
Regional Water Board	San Francisco Regional Water Quality Control Board
SARA	Superfund Amendments and Reauthorization Act
SCAPS	Site Characterization and Analysis Penetrometer System
SES	Sealaska Environmental Services, LLC
SMP	Site Management Plan
STS	Sealaska Technical Services, LLC
SulTech	Sullivan Environmental Services, LLC, and Tetra Tech, EC, Inc., A Joint Venture
SVE	Soil vapor extraction
SVOC	Semivolatile organic compound
SWBZ	Second water-bearing zone
SWMU	Solid waste management unit
SWPPP	Storm Water Pollution Prevention Plan
SWRCB	California State Water Resources Control Board
TBC	To be considered
TCE	Trichloroethene
TCP	Trichloropropane
TCRA	Time-critical removal action
TDS	Total dissolved solids
TEF	Toxicity equivalence factors
TPH	Total petroleum hydrocarbons
TPH-d	Total petroleum hydrocarbons, diesel range
TRW	Tarry refinery waste
TtEC	Tetra Tech EC, Inc.
TtEMI	Tetra Tech EM Inc.
UCL	Upper confidence limit
URS	URS Group, Inc.
USC	*United States Code*
USCG	United States Coast Guard
USEPA	United States Environmental Protection Agency
UST	Underground storage tank

ABBREVIATIONS AND ACRONYMS (CONTINUED)

VA	Veterans Affairs
VC	Vinyl chloride
VOC	Volatile organic compound
WD	Wash down area
WBZ	Water-bearing zone
WIB	Waste isolation bulkhead
yd^3	Cubic yard

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1 INTRODUCTION

This report presents the results of a Five-Year Review of remedies that have been implemented at Installation Restoration (IR) sites at the former Naval Air Station (NAS) Alameda (Alameda Point), and the Fleet Industrial Supply Center Oakland, Alameda Facility/Alameda Annex (FISCA), in Alameda, California. Fifteen Alameda Point IR sites were subject to active Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) remedies during this review period in eight operable units (OU): OU-1 (IR Sites 6 and 16 and IR Site 14), OU-2A (IR Sites 9, 13, and 19), OU-2B (IR Sites 3 and 4), OU-3 (IR Site 1), OU-4A (IR Site 2), OU-4B (IR Site 17), OU-5 (IR Site 25), OU-6 (IR Site 26, IR Site 27, and IR Site 28). In addition, FISCA IR Site 02 Soil and the Marsh Crust were evaluated. (For the purposes of this document, the "Marsh Crust" refers to the FISCA Marsh Crust and the Marsh Crust and Former Subtidal Area at Alameda Point.) The OUs are at various stages in the CERCLA process ranging from remedial action (RA) implementation to long-term monitoring.

IR Sites 9, 13, and 19 are grouped together because this group of IR sites are included in OU-2A and are, therefore, addressed under a single Record of Decision (ROD). The same approach is followed for IR Sites 3 and 4, which are included in OU-2B and addressed under a single ROD. The next Five-Year Review will be prepared 5 years from the completion of this Five-Year Review report. Alameda Point contractor Sealaska Technical Services, LLC (STS), conducted this Five-Year Review and prepared this report for the United States Department of the Navy (DON), Base Realignment and Closure (BRAC), Program Management Office (PMO) West, and the Naval Facilities Engineering Command Southwest (NAVFAC SW). This work was authorized by NAVFAC SW under the 8(a) Sole Source Contract No. N62473-15-C-3215.

This Five-Year Review covers the period between September 28, 2011, and September 28, 2016, and was conducted in accordance with (1) the United States Environmental Protection Agency (USEPA) Office of Solid Waste and Emergency Response Directive 9355.7-03B-P, *"Comprehensive Five-Year Review Guidance"* (USEPA 2001); (2) the USEPA *"Recommended Evaluation of Institutional Controls: Supplement to the 'Comprehensive Five-Year Review Guidance'"* (USEPA 2011a); (3) the DON *"Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews"* (DON 2004); and (4) the Naval Facilities Engineering Command (NAVFAC) *"Toolkit for Preparing Five-Year Reviews"* (DON 2013b).

The following sections discuss the purpose of the review, site description and background, and the Five-Year review authority and general approach.

1.1 PURPOSE OF REVIEW

The CERCLA, Title 42 of the *United States Code* (USC), Section (§) 9601, et seq., and the National Oil and Hazardous Substances Pollution Contingency Plan (NCP), Title 40 of the *Code of Federal Regulations* (CFR), § 300, call for Five-Year Reviews of certain CERCLA RAs. USEPA also conducts Five-Year Reviews of RAs in some other cases as a matter of policy. The statutory requirement to conduct a Five-Year Review was added to CERCLA as part of the Superfund Amendments and Reauthorization Act (SARA), Public Law 99-499. The USEPA classifies each Five-Year Review as either "statutory" or "policy," depending on whether it is required by statute or is conducted as a matter of policy. The Five-Year Review for Alameda Point and FISCA is a statutory review.

CERCLA applies to sites where a hazardous substance, pollutant, or contaminant is known or suspected to have been released to the environment. The corrective action requirements of the Resource Conservation and Recovery Act (RCRA) of 1976 apply to solid waste management units (SWMU) at RCRA- and non-RCRA-permitted facilities. CERCLA and RCRA corrective action requirements address the investigation and cleanup of contaminated property through slightly different but functionally

equivalent processes. This functional equivalence means that when CERCLA investigation requirements are met, the RCRA requirements for the SWMUs also are fulfilled.

As specified by CERCLA and the NCP, statutory reviews are required for sites where, after RAs are complete, hazardous substances, pollutants, or contaminants remain on site at levels that will not allow for unrestricted use or unrestricted exposure. Statutory reviews are required at such sites if the ROD was signed on or after the effective date of SARA. CERCLA §121(c), as amended, 42 USC § 9621(c), states the following:

> *"If the President selects a remedial action that results in any hazardous substances, pollutants, or contaminants remaining at the site, the President shall review such remedial action no less often than each 5 years after the initiation of such remedial action to assure that human health and the environment are being protected by the remedial action being implemented."*

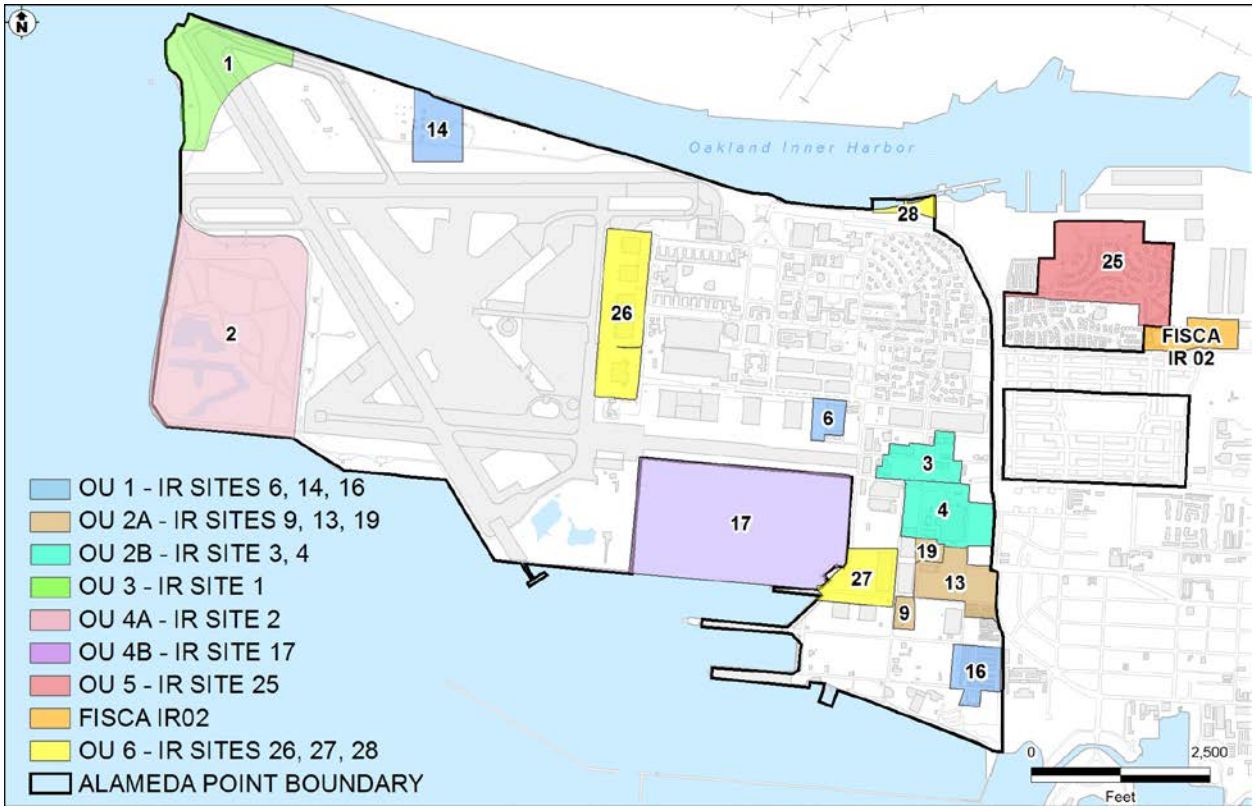
Additionally, the NCP, Title 40 of CFR 300.430(f) (4) (ii) states the following:

> *"If a remedial action is selected that results in hazardous substances, pollutants, or contaminants remaining at the site above levels that allow for unlimited use and unrestricted exposure, the lead agency shall review such action no less often than every five years after the initiation of the selected remedial action."*

1.2 SITE DESCRIPTION AND BACKGROUND

Alameda Point and FISCA are located on the western tip of Alameda Island in the City of Alameda, California, as shown on Figure 1-1.

FIGURE 1-1: ALAMEDA POINT AND FISCA, SITE LOCATION MAP



Alameda Island formerly consisted of tidelands, marshlands, and sloughs and is located adjacent to the historical San Antonio Channel, now known as the Oakland Inner Harbor, on the eastern side of San Francisco Bay. Filling activities conducted from the late 1800s to the 1960s of subtidal areas, natural tidelands, marshlands, and sloughs with dredge spoils from the surrounding San Francisco Bay, Seaplane Lagoon, and Oakland Inner Harbor created most of the land that is now Alameda Point and FISCA.

Table 1-1 summarizes the IR Sites at Alameda Point and FISCA included in this report, including media of concern and contaminants of concern (COC).

TABLE 1-1: SUMMARY OF IR SITES AT ALAMEDA POINT AND FISCA INCLUDED WITHIN THIS FIVE-YEAR REVIEW

OU	Site ID	Current Management Stage	Document Source	Media of Concern and COCs
3	IR Site 1	RIP / RA-O	ROD (DON 2009) and ROD Amendment (AMEC 2013)	Soil-PAHs, PCBs, metals, pesticides, radionuclides
3	IR Site 1	RA-O	ROD (DON 2009)	Groundwater – VC Surface Water – VOCs, SVOCs, arsenic
4A	IR Site 2	RIP / RA-O	ROD (DON 2010)	Groundwater –Pesticides, SVOCs, diethylhexyl phthalate, metals Soil – Benzo(a)pyrene, PCBs, radionuclides, DDx, metals
2B	IR Site 3	RC / LTM	ROD (DON 2015a)	Soil – Cobalt, lead
2B	IR Site 4	RC / LTM	ROD (DON 2015a)	Soil – Hexavalent chromium, PCBs, pesticides
1	IR Site 6	RA-O	ROD (DON 2007c)	Groundwater – cis-1,2-DCE; PCE; TCE; VC
2A	IR Site 9	RC / LTM	ROD (DON 2012)	Groundwater – cis-1,2-DCE; 1,1-DCE; benzene; MTBE; 1,2,3-TCP; 1,1-DCA; VC
2A	IR Site 13 (Excluding South RA-O Area)	RIP / RC / LTM	ROD (DON 2012)	Groundwater – Benzene, ethylbenzene
2A	IR Site 13 (South RA-O Area)	RC / LTM / RA-O	ROD (DON 2012)	Groundwater – Benzene, ethylbenzene
1	IR Site 14	RAP / RA-O	ROD (DON 2007a)	Groundwater – VC
1	IR Site 16	RC / LTM	ROD (DON 2007c) ROD (DON 2012) ESD (DON 2015c)	Groundwater – 1,3-DCB; 1,4-DCB; cis-1,2-DCE; PCE; TCE; VC
4B	IR Site 17	RC / LTM	ROD (DON 2006a) ESD (DON 2016a)	Sediment – PCBs, cadmium, pesticides
2A	IR Site 19	RC / LTM	ROD (DON 2012)	Groundwater – PCE, TCE, VC
5	IR Site 25	RC / LTM	ROD (DON 2007b)	Soil – PAHs
6	IR Site 26	RIP / RA-O	ROD (DON 2006b)	Groundwater – cis-1,2-DCE; TCE; VC
6	IR Site 27	RIP / RA-O	ROD (DON 2008)	Groundwater – cis-1,2-DCE, 1,1-DCA; trans-1,2-DCE; PCE; TCE; and VC
6	IR Site 28	RIP / RA-O	ROD (DON 2007c)	Groundwater – Copper Soil – Arsenic, lead, PAHs
5	FISCA IR Site 02 Soil	RIP / LTM	RAP / ROD (DON 2001)	Soil – Cadmium, PCBs
None	Marsh Crust	RIP / LTM	RAP / ROD (DON 2001)	Soil – PAHs

TABLE 1-1: SUMMARY OF IR SITES AT ALAMEDA POINT AND FISCA INCLUDED WITHIN THIS FIVE-YEAR REVIEW

Notes:
AMEC = AMEC Environment & Infrastructure, Inc.
COC = Contaminant of concern
DCA = Dichloroethane
DCB = Dichlorobenzene
DCE = Dichloroethene
DDD = Dichlorodiphenyldichloroethane
DDE = 1,1-Dichloro-2,2-bis(p-chlorophenyl) ethylene
DDT = Dichlorodiphenyltrichloroethane
DDx = Total DDD, DDE, DDT
DON = United States Department of the Navy
FISCA = Fleet Industrial Supply Center Oakland, Alameda Facility/Alameda Annex
ID = Identification
IR = Installation Restoration
KCH = CH2MHill and Kleinfelder Joint Venture
LTM = Long Term Management
MTBE = Methyl tert butyl ether
OU = Operable unit
PCB = Polychlorinated biphenyl
PCE = Tetrachloroethene
RA = Remedial action
RA-C = Remedial action construction per ROD
RA-O = Remedial Action Operation
RAP = Remedial Action Plan
RC = Remedy Complete
RIP = Remedy in Place
ROD = Record of Decision
SC = Site Closure
SVOC = Semivolatile organic compound
TCE = Trichloroethene
TCP = Trichloropropane
VC = Vinyl chloride
VOC = Volatile organic compound

The following sections discuss Alameda Point, FISCA, the Marsh Crust, hydrogeology, and the Five-Year Review status update.

1.2.1 Alameda Point

Alameda Point consists of 2,675 acres of land (1,560 acres of uplands and 1,115 submerged acres) from adjacent land acquired by the DON and from the filling of additional subtidal areas, natural tidelands, marshlands, and sloughs. Alameda Point is bordered on the north by the Oakland Inner Harbor or Estuary, on the west and south by San Francisco Bay, and the east by the portion of the City of Alameda exclusive of former Alameda Point property, including FISCA.

Alameda Point was commissioned in 1940 as the Alameda Naval Air Station and supported the DON's defense mission until its operational closure in 1997, when the name Naval Air Station Alameda was changed to Alameda Point. DON conducted a variety of on-site operations, including aircraft, engine, gun, and avionics maintenance; engine overhaul and repair; fueling activities; and plating, stripping, and painting activities.

Alameda Point was added to the National Priorities List (NPL) in July 1999 under CERCLA. When Alameda Point was listed for closure, responsibility for managing the environmental cleanup program at Alameda Point passed to the BRAC Cleanup Team (BCT). The BCT at Alameda Point is made up of representatives from the DON, USEPA, California Department of Toxic Substances Control (DTSC), and the San Francisco Regional Water Quality Control Board (Regional Water Board). The DON and USEPA negotiated and signed the Federal Facility Agreement (FFA) in 2001, and DTSC and the Regional Water Board signed the FFA in 2005.

1.2.2 FISCA

FISCA covers approximately 143 acres east of Alameda Point. Until the 1920s, FISCA and the surrounding area existed as undeveloped marshlands and tidal flats along the fringe of San Francisco Bay. The area south of FISCA consisted primarily of residential properties. Before 1930, at least two large industrial sites (an oil refinery and a borax processing plant) were located on the historical western tip of Alameda Island adjacent to IR Site 13. Several industries were located on the northern side of Oakland Inner Harbor, including two manufactured gas plants. Land use has been industrial since the land was created using imported fill between 1887 and 1939.

FISCA and surrounding areas were used as a commercial airport from 1920 to 1941. In 1941, the United States government purchased the land, and the United States Army used the property as a supply depot. The DON obtained the southern portion of the area in 1946 and the northern portion in 1966. The property was used as a main supply center supporting the operation of military fleets and shore activities in the Pacific Basin. In 1996, FISCA was designated for closure under the BRAC Act of 1990. FISCA was formally closed in September 1998. FISCA is not on the NPL, but eight IR Sites and shallow groundwater at FISCA were identified as potentially contaminated. Figure 1-1 shows IR Site 02 located within the FISCA boundary.

1.2.3 Marsh Crust

The Marsh Crust is a layer of sediment contaminated with semi-volatile organic compounds (SVOC) that was deposited across FISCA and the western coastal area of Alameda Island (current eastern portion of Alameda Point) from the late 1800s until the 1920s. The Marsh Crust also extends westward beneath Alameda Point. Historical industrial operations in the vicinity of Alameda Point are the likely sources of petroleum hydrocarbons released to the environment. From the late 1800s until 1920s, two manufactured gas plants and an oil refinery were located near the present locations of FISCA and Alameda Point. During their operation, these facilities discharged petroleum products and wastes, including PAHs to adjacent marshlands. The waste was deposited over the historical surface of the surrounding marsh and tidal flats, leaving a layer of contaminated sediment under the 143-acre area that is now FISCA and 2,675-acres of the eastern portion of Alameda Point (KCH 2011). The Marsh Crust is not on the NPL.

On February 13, 2001, the DON, USEPA, Regional Water Board, and DTSC approved the Remedial Action Plan (RAP)/ROD for the Marsh Crust at the FISCA and for the Marsh Crust and Former Subtidal Area at Alameda Point. On April 28, 2006, the DON issued the first Five-Year Review report for (1) IR Site 02 shallow soil at FISCA, (2) the Marsh Crust at FISCA, and (3) the Marsh Crust and Former Subtidal Area at Alameda Point. Appendix E provides Marsh Crust Ordinance No. 2824.

1.2.4 Hydrogeology

Groundwater is present at Alameda Point at approximately 1 to 8 feet below ground surface (bgs) in the artificial fill. From top to bottom, the following five distinct hydro-stratigraphic zones have been identified at Alameda Point (though not all occur at all locations):

- First water-bearing zone (FWBZ) (Artificial Fill)
- Semi-confining aquitard (Bay Sediment Unit [BSU]/Young Bay Mud)
- Second water-bearing zone (SWBZ) (Posey, Merritt Sand, and upper San Antonio Members)
- Yerba Buena Mud Aquitard, a regional aquitard
- Alameda Aquifer

All units are members of the Alameda Formation except for the artificial fill.

The BSU, where present, acts as an aquitard between the FWBZ and the SWBZ and is approximately 12 to 35 feet thick, although the BSU pinches out to the southeast at the edge of the historical Alameda Island. The semi-confined SWBZ is composed of the lower portion of the Posey Member, the Merritt Sand Member, and the upper portion of the San Antonio Member and has a maximum thickness of 88 feet. The Yerba Buena Mud Aquitard acts as the regional aquitard (Innovative Technical Solutions, Inc. [ITSI]) 2009; DON 2012). In the southeastern part of Alameda Point (OU-2A [IR Sites 9, 13, and 19], OU-2B [IR Sites 3, 4, 11, and 21], and OU-6 [IR Site 27]), the BSU is not present due to the past depositional environment. Therefore, the artificial fill and the Posey, Merritt Sand, and the upper portion of the San Antonio Members together make up the unconfined aquifer.

For the purposes of this Five-Year Review, in the areas where the BSU is present, the aquifers are referred to as the FWBZ and SWBZ. In areas where the BSU is absent or not laterally continuous, the unconfined aquifer is referred to as the Shallow WBZ (approximately equivalent to the FWBZ) and the Deep WBZ (approximately equivalent to the SWBZ).

Groundwater underlying Alameda Point and FISCA typically is known for high levels of total dissolved solids (TDS) and low sustained hydraulic well yield. Water is supplied to Alameda Point and FISCA by the Alameda Facility/Alameda Annex through the East Bay Municipal Utilities District (MUD).

The Regional Water Board has de-designated groundwater as a drinking water source at Alameda Point beneath the entire western portion and beneath part of the central portion (west of Saratoga Street) due to the factors discussed above and in accordance with tidal influence studies conducted for (1) the *"East Bay Plain Groundwater Basin Beneficial Use Evaluation Report"* (Regional Water Board 1999); (2) the *"Proposed Groundwater Amendments to the Water Quality Control Plan"* (Regional Water Board 2000a); and (3) *"Board Resolution 00-024"* (Regional Water Board 2000b). Additionally, the DON has obtained documentation that shallow groundwater in the southeastern portions of Alameda Point is unsuitable for municipal and domestic supply (DON 2012); consequently, Regional Water Board and USEPA concurred that shallow groundwater meets State Water Board Resolution 88-63 and Regional Water Board Resolution No. 89-39 "Sources of Drinking Water", exception criteria (a) and (c), and, therefore, does not meet requirements for a potable water source; accordingly, drinking water standards do not apply to groundwater in this area (Regional Water Board 2012). Both documents are presented in Appendix E of this Five-Year Review. Groundwater de-designation letters issued by the Regional Water Board and USEPA for Alameda Point are included in Appendix E of this report (See Figure 2 of Regional Water Board letter dated September 13, 2012). Groundwater at Alameda Point generally flows from the middle of Alameda Point toward San Francisco Bay, the Oakland Inner Harbor, and Seaplane Lagoon. Groundwater flow directions may vary throughout the year due to seasonal changes in precipitation and tidal changes (ITSI 2009).

1.2.5 Five-Year Review IR Status Update

This Five-Year Review addresses Alameda Point IR Sites 1, 2, 3, 4, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, and 28; FISCA IR Site 02 Soil; and the Marsh Crust. Table 1-2 provides a brief synopsis of the status of the IR sites at Alameda Point and FISCA that are addressed in this Five-Year Review report. IR sites not included in this Five-Year Review report are briefly discussed in the paragraph after Table 1-2 and are included in the table.

TABLE 1-2: FIVE-YEAR REVIEW STATUS OF IR SITES AT ALAMEDA POINT AND FISCA

OU	Site ID	Site Description	ROD	Status	CERCLA Phase
3	IR Site 1	1943-1956 Disposal Area	2009 / 2013 Am	Initial Five-Year Review (this report), RIP / RA-O for soil	Phase 6
3	IR Site 1	1943-1956 Disposal Area	2009	Initial Five-Year Review (this report), RA-O for groundwater	Phase 6
4A	IR Site 2	West Beach Landfill and Associated Wetlands	2010	Initial Five-Year Review (this report), RIP / RA-O	Phase 6
2B	IR Site 3	Abandoned Fuel Storage Area	2015	Initial Five-Year Review (this report), RC / LTM	Phase 7
2B	IR Site 4	Aircraft Engine Facility	2015	Initial Five-Year Review (this report), RIP / LTM	Phase 7
2B	IR Site 4	Building 360 (Aircraft Engine Facility)	2015	RD for groundwater	Phase 3
2C	IR Site 5	Building 5/5A (Aircraft Rework Facility)	2014	RD / RA	Phases 3 and 4

TABLE 1-2: FIVE-YEAR REVIEW STATUS OF IR SITES AT ALAMEDA POINT AND FISCA

OU	Site ID	Site Description	ROD	Status	CERCLA Phase
2C	IR Site 5	Building 5/5A (Aircraft Rework Facility) Exterior Drain Lines	TBD	ROD For drain lines outside building.	Phase 2
1	IR Site 6	Building 41 (Aircraft Intermediate Maintenance Facility)	2007	Second Five-Year Review (this report), RIP soil	Phase 7
1	IR Site 6	Building 41 (Aircraft Intermediate Maintenance Facility)	2007	Second Five-Year Review (this report), RA-O groundwater	Phase 6
1	IR Site 7	Building 410 (Paint Stripping Facility)	2007 / 2013	NFA	None
1	IR Site 8	Abandoned Fuel Storage Area	2007	NFA	None
2A	IR Site 9	Building 410 (Paint Stripping Facility)	2012	Initial Five-Year Review (this report), RC / LTM	Phase 7
2C	IR Site 10	Building 400 (Missle Rework Facility)	2014	RD/RA	Phases 3 and 4
2C	IR Site 10	Building 400 (Missle Rework Facility) Drain Lines Outside Building	TBD	ROD For drain lines outside building	Phases 2
2B	IR Site 11	Building 14 (Engine Test Cell)	2015	RD for groundwater	Phase 3
2C	IR Site 12	Building 10 (Power Plant)	2014	No Action required; site closed	None
2A	IR Site 13	Former Oil Refinery (Excluding South RA-O Area)	2012	Initial Five-Year Review (this report), RIP / RC / LTM	Phases 6 and 7
2A	IR Site 13	Former Oil Refinery (South RA-O Area)	2012	Initial Five-Year Review (this report), RC / LTM / RA-O	Phases 6 and 7
1	IR Site 14	Former Fire Training Area	2007	Second Five-Year Review (this report), RAP / RA-O	Phase 6
1	IR Site 15	Buildings 301 and 389 (Former Transformer Storage Area)	2006	NFA	None
1	IR Site 16	C-2 CANS Area (Shipping Container Storage)	2007, 2012 Soil / 2015 Groundwater ESD	Second Five-Year Review (this report), RC / LTM	Phase 7
4B	IR Site 17	Seaplane Lagoon	2006 / 2016	Initial Five-Year Review (this report),RC / LTM	Phase 7
NA	IR Site 18	Storm Sewer System Drain Lines	NA	No longer an IR Site; realigned	None
2A	IR Site 19	Yard D-13 (Hazardous Waste Storage)	2012	Initial Five-Year Review (this report), RC / LTM	Phase 7
4C	IR Site 20	Oakland Inner Harbor	2008	NFA	None
2B	IR Site 21	Building 162 (Ship Fitting and Engine Repair)	2015	RD for groundwater	Phase 3
2A	IR Site 22	Building 547 (Former Service Station)	2012	NFA	None
2A	IR Site 23	Building 530 (Missile Rework Ops)	2012	NFA	None
4B	IR Site 24	Pier 1 and 2 Sediments	2010	NFA	None
5	IR Site 25	Estuary Park and the Coast Guard Housing	2007	Second Five-Year Review (this report), RC / LTM	Phase 7
6	IR Site 26	Western Hangar Zone	2006	Second Five-Year Review (this report), RIP / RA-O	Phase 6
6	IR Site 27	Dock Zone	2008	Second Five-Year Review (this report), RIP / RA-O	Phase 6
6	IR Site 28	Todd Shipyard	2007	Second Five-Year Review (this report), RIP / RA-O	Phase 6
4C	IR Site 29	Skeet Range	2005	NFA	None

TABLE 1-2: FIVE-YEAR REVIEW STATUS OF IR SITES AT ALAMEDA POINT AND FISCA

OU	Site ID	Site Description	ROD	Status	CERCLA Phase
5	IR Site 30	Miller School	2009	NFA	None
5	IR Site 31	Marina Village	2008	NFA	None
5	IR Site 32	Northeastern Ordnance Storage Areas	TBD	Remedy not selected, RI / FS	Phase 2
NA	IR Site 33	South Tarmac and Runway Wetlands	2012 (Action Memo)	NFA	None
NA	IR Site 34	Former Northwest Shop Area	2011	NFA	None
NA	IR Site 35	West Housing Area	2010	NFA	None
NA	FISCA IR Site 02 Soil	FISCA	2001	Third Five-Year Review (this report), RIP / LTM	Phase 7
None	None	Marsh Crust	2001	Third Five-Year Review (this report), RIP / LTM	Phase 7

Notes:
Am = Amendment
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
FISCA = Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex
ID = Identification
IR = Installation Restoration
LTM = Long-Term Management (Phase 7)
NFA = No Further Action
OU = Operable Unit
RA = Remedial Action (Phase 4)
RA-O = Remedial Action Operation (Phase 6)
RAP = Remedial Action Plan
RC = Remediation Complete
RI/FS = Remedial Investigation / Feasibility Study (Phase 2)
RD = Remedial design (Phase 3)
RIP = Remedy in Place
ROD = Record of Decision
SC = Site Closure
TBD = To be determined

The following IR Sites, 7, 8, 16, and OU-5/FISCA IR Site 02 Groundwater, although included in the previous Five-Year Review, have since achieved no further action (NFA) status and; therefore, will not be evaluated in this, or future, Five-Year Reviews.

Since the 2011 Five-Year Review, the extent of soil excavation at IR Sites 7 and 8 was based on previous investigations and confirmed with post-excavation confirmation samples. In accordance with the ROD (DON 2007c), the approved RD Report (URS 2010a), and Remedial Action Work Plan (RAWP) (URS 2010b), the RA removed soil impacted with arsenic, cadmium and lead at concentrations above RGs at IR Site 7, as well as removed soil impacted with lead, dieldrin and polychlorinated biphenyls (PCB) at IR Site 8. The RACRs for IR Site 7 (DON 2013a) and IR Site 8 (URS 2012a) document the RA for soil and achievement of the RAOs. Soil at IR Sites 7 and 8 was reclassified for unrestricted use in June 2013.

IR Site 16, as documented in a RACR (URS 2012b) and ESD ROD (DON 2012b) for NFA and unrestricted use of soil at IR Site 16, is further discussed in Section 2.2.2.2 along with Site 16 groundwater.

The 2011 Five-Year Review Report (KCH 2011) discusses implementation of the original OU-5/FISCA IR Site 02 Groundwater remedy from the 2007 ROD (DON 2007b). The groundwater remedy included installation of treatment systems, biosparging, and groundwater monitoring. Sampling showed decreased concentrations of benzene and naphthalene in groundwater. Additionally, sub-slab soil gas, indoor air, and outdoor air sampling indicated no indoor air contamination due to the volatilization of groundwater contaminants to the indoor air exposure pathway.

The ROD Amendment (DON 2015b) documented NFA is required for OU-5/FISCA IR 02 Groundwater because the shallow groundwater does not pose an unacceptable risk to human health or the environment. There is no unacceptable risk for the hypothetical drinking water pathway from shallow groundwater. Water for all uses within the area is supplied by the East Bay MUD. Additionally, City of Alameda

regulations, Alameda County regulations, and State of California regulations prohibit intrusive activities and specifically prohibit well installation in shallow FWBZ groundwater. Nonetheless, one more round of groundwater sampling at OU-5/FISCA IR-02 will be completed under the Basewide Groundwater Monitoring Program, and the results will be included in the next Five-Year Review report.

1.3 FIVE-YEAR REVIEW AUTHORITY AND GENERAL APPROACH

The DON has prepared this Five-Year Review pursuant to CERCLA § 121(c) and the NCP. The following documents were extensively used to prepared this report: (1) USEPA Office of Solid Waste and Emergency Response Directive 9355.7-03B-P, *"Comprehensive Five-Year Review Guidance"* (USEPA 2001); (2) the DON *"Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews"* (DON 2004); (3) USEPA's *"Recommended Evaluation of Institutional Controls: Supplement to the 'Comprehensive Five-Year Review Guidance'"* (USEPA 2011a); (4) USEPA's *"Five-Year Review Recommended Template, OLEM 9200.089"* (USEPA 2011b); and (5) USEPA's *"Clarifying the Use of Protectiveness Determinations for Comprehensive Environmental Response, Compensation, and Liability Act Five-Year Reviews"* (USEPA 2012).

Pursuant to CERCLA § 121(c) and the NCP, this Five-Year Review has been conducted at Alameda Point IR Sites 1, 2, 3, 4, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, and 28; FISCA IR Site 02 Soil; and the Marsh Crust. The Five-Year Review was conducted to determine if remedies currently operating at Alameda Point and FISCA are or will be protective of human health and the environment. In accordance with the DON *"Navy/Marine Corps Policy for Conducting Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) Statutory Five-Year Reviews"* (DON 2004), the first site at an installation that requires a Five-Year Review triggers the Five-Year Review clock for the entire installation. As documented in the Remedial Action Plan/ROD for the Marsh Crust (DON 2001), the beginning of the implementation of institutional controls (IC) through a three-tiered land-use control (LUC) system at Alameda Point for the Marsh Crust in March 2001 triggered the first Five-Year Review for Alameda Point. To streamline and synchronize the Five-Year Reviews, other sites were evaluated because the response action for the Marsh Crust is ongoing, including Alameda Point IR Sites 1, 2, 3, 4, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, and 28; and FISCA IR Site 02 Soil. This approach is consistent with § 27.3 of the FFA and USEPA's *"Comprehensive Five-Year Review Guidance"* (USEPA 2001).

The following sections discuss community notification and involvement, document review, data review, ICs, site inspections, and interviews.

1.3.1 Community Notification and Involvement

The DON has continued to notify and involve the community of Alameda Point of all RAs related to Alameda Point and FISCA. Public meetings have been held for the residents of Alameda Point to discuss and comment on Proposed Plans (PP) and RODs before the finalization of these documents. The DON encourages residents of Alameda Point to participate in Restoration Advisory Board (RAB) and BCT meetings to evaluate selected remedies and address issues related to IR Sites at Alameda Point and FISCA. Public notices announcing the initiation and completion of each Five-Year Review will be issued to the community of Alameda Point indefinitely, as they were issued for the two preceding Five-Year Reviews at Alameda Point and FISCA. The DON informs the public to review reports related to investigations of Alameda Point and FISCA at the Alameda Public Library as well as on the Envirostor website provided by the DTSC.

1.3.2 Document Review

As part of this Five-Year Review, documents related to remedy implementation for each IR Site were reviewed. These reviews primarily focused on documents that provide information on the technical and regulatory considerations that led to remedy selection and implementation.

The types of documents reviewed included the following:

- Documents containing the basis for the response action, including remedy decision documents such as RODs and ESDs, Remedial Investigation (RI)/Feasibility Study (FS) reports, toxicological and chemical characteristics databases, and federal and state statutory and regulatory requirements identified as applicable or relevant and appropriate requirements (ARAR) in remedy decision documents
- Documents containing information about the design and implementation of remedies, including remedial design (RD)/RA work plans, RACRs, and as-built drawings
- Operational summaries

The References section lists all documents referenced in this Five-Year Review report.

1.3.3 Data Review

As part of this Five-Year Review, data related to remedy implementation for each IR Site were reviewed. These reviews primarily focused on documents that provide information on the technical and regulatory considerations that led to remedy selection and implementation. These documents contain site-specific data that also were reviewed as part of this task.

The types of information reviewed can be found in the reference section of this report, which included the following:

- Documents presenting monitoring data and information that can be used to assess whether the RA continues to operate and function as designed, including RD/RAWPs, routine monitoring reports and technical memoranda (LUC RDs for applicable sites).
- Updated EPA guidance documents including OSWER Directive 9200.1-120 Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors (USEPA 2014) which supplements EPA's Risk Assessment Guidance Superfund, Part A through E, and supersedes and replaces certain portions of OSWER Directive 9285.6-03 (USEPA 1989); and Frequently Asked Questions (FAQs) About Update of Standard Default Exposure Factors (USEPA 2015)."
- Site-specific Human Health Risk Assessment Reviews.

1.3.4 Institutional Controls

ICs require annual physical inspections of an IR site to confirm continued compliance with all IC performance objectives and land-use restrictions in place. These annual inspections are documented in an annual IC Compliance Monitoring Report and IC Compliance Certificate that address whether the use restrictions and controls were communicated in the deed(s), whether the owners and state and local agencies were notified of the use restrictions and controls affecting the property, whether use of the property has conformed with such restrictions and controls, and to evaluate the status of the ICs. If any deficiencies are found during the annual inspection, corrective action is taken to correct these deficiencies.

1.3.5 Site Inspections

Site inspections were conducted for Five-Year Review IR Sites at Alameda Point and FISCA to provide information about the status of these sites and to allow visual confirmation and documentation of the conditions of the remedies, sites, and surrounding areas. The inspection event was conducted on November 12, 2015. The inspection events were conducted by a team consisting of a representative from the DON and the Five-Year Review contractor.

Table 1-3 presents the list of participants for each IR Site. During the inspection, representative features of the implemented remedy or IC at each IR Site were inspected. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs.

TABLE 1-3: DETAILS OF ALAMEDA POINT AND FISCA SITE INSPECTIONS

OU	IR Site	Inspection Date	Inspection Participants
OU-3	IR Site 1	November 12, 2015	DON Douglas Delong, DON CSO Environmental Compliance DON Five-Year Review Contractor Jeremiah Santini, PM, STS IR Site 2: Scott Thompson (OTIE) IR Site 6: Noy Chau (AMEC-FW) Jacob Joab (AMEC-FW)
OU-4A	IR Site 2	November 12, 2015	
OU-2B	IR Site 3	November 12, 2015	
OU-1	IR Site 6	November 12, 2015	
OU-2A	IR Site 9	November 12, 2015	
OU-2A	IR Site 13	November 12, 2015	
OU-1	IR Site 14	November 12, 2015	
OU-1	IR Site 16	November 12, 2015	
OU-3	IR Site 17	November 12, 2015	
OU-2A	IR Site 19	November 12, 2015	
OU-5	IR Site 25	November 12, 2015	
OU-6	IR Site 26	November 12, 2015	
OU-6	IR Site 27	November 12, 2015	
OU-6	IR Site 28	November 12, 2015	
FISCA	FISCA IR Site 02 Soil	November 12, 2015	
*Marsh Crust	Marsh Crust	November 12, 2015	

*Site Inspection not conducted as this discontinuous layer is located below ground surface.

Notes:
AMEC-FW = AMEC Environment & Infrastructure, Inc. – Foster Wheeler
DON = United States Department of the Navy
CSO = Caretaker Site Officer
FISCA = Fleet Industrial Supply Center Oakland, Alameda Facility/Alameda Annex
IR = Installation Restoration
OTIE = Oneida Total Integrated Enterprises
OU = Operable unit
PM = Project manager
STS = Sealaska Technical Services, LLC

1.3.6 Interviews

As part of the Five-Year Review, interviews were conducted with various stakeholders to provide additional information about the status of IR Sites at Alameda Point and FISCA. Table 1-4 lists the interviewees.

TABLE 1-4: LIST OF INTERVIEWEES – ALAMEDA POINT AND FISCA

Interviewee Name	Title	Affiliation	OU and IR Site
DON			
Douglas Delong	CSO, Environmental Compliance	BRAC PMO West	All
RAB			
George Humphries	RAB Member	RAB	All
Susan Galleymore	RAB Member	RAB	All
Regulatory Agencies			
Xuan-Mai Tran	RPM	USEPA	All
Yemia Hashimoto	RPM	Regional Water Board	All
Henry Wong	RPM	DTSC	All
James Fyfe	Hazardous Substances Engineer	DTSC	All
Contractors			
Dr. Peter Russell	President	Russell Resources	All
Kevin Olness	PM	AMEC Foster Wheeler	Basewide Groundwater
Curtis Moss	PM	AMEC Foster Wheeler	OU-1, IR Site 16
Philip Stearns	Senior PM	AMEC Foster Wheeler	OU-3, IR Site 1
Lucas Goldstein	PM	Arcadis	OU-2B, IR Site 3
Ray Seamons	PM	Tetra Tech EC, Inc.	OU-4A, IR Site 2
Suman Sharma	Senior PM	OTIE, Inc.	OU-3, IR Site 1 and OU-4A, IR Site 2

Notes:
Arcadis = Arcadis U.S., Inc.
BRAC = Base Realignment and Closure
CSO = Caretaker Site Officer
DON = United States Department of the Navy
DTSC = California Department of Toxic Substances and Control
IR = Installation Restoration
OTIE = Oneida Total Integrated Enterprises
OU = Operable unit
PM = Project manager
PMO = Project Management Office
RAB = Restoration Advisory Board
RPM = Remedial Project Manager
STS = Sealaska Technical Services, LLC
USEPA = United States Environmental Protection Agency
Regional Water Board = San Francisco Regional Water Quality Control Board

Appendix C provides detailed interview documentation associated with this Five-Year Review. The documentation includes a list of interviewees; the date and time of each interview; contact information; and responses to interview questions. No major regulatory or community concerns related to the protectiveness of the remedies were identified during the interviews.

2 OPERABLE UNIT-SPECIFIC FIVE-YEAR REVIEWS

This section discusses the OU-specific Five-Year Reviews for each IR Site at Alameda Point and FISCA. For each IR site, the following topics are addressed:

- Site description and background, including land and resource use, current and potential groundwater uses, site history and chronology, initial response, and the basis for taking action
- RA, including remedy selection and remedy implementation
- Progress since the last Five-Year Review
- Five-Year Review process, including site inspection and interviews
- Technical assessment, including the answers to the following questions that appear in USEPA's "*Comprehensive Five-Year Review Guidance*" (USEPA 2001):
  - Question A: Is the remedy functioning as intended by the decision documents?
  - Question B: Are the exposure assumptions, toxicity data, cleanup levels, and RAOs used at the time of the remedy selection still valid?
  - Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
- Issues associated with each IR site
- Recommendations and follow-up actions
- Protectiveness statement

2.1 OU-1, IR SITE 6

2.1.1 Site Description and Background, Alameda Point, OU-1, IR Site 6

OU-1, IR Site 6 covers approximately 5.6 acres and is also known as Building 41, Aircraft Intermediate Maintenance Facility. IR Site 6 is located on the north side of Seaplane Lagoon (IR Site 17), as shown in Figure 1-1. Site features include Buildings 41 and 273; asphalt and concrete paved parking lots; sanitary sewer and storm drain lines; and oil-water separator (OWS) 041. Former features at IR Site 6 included portable avionics laboratories; a solvent dip tank; fuel lines; washdown areas (WD 040 and WD 041A, listed as SWMUs); two OWSs (OWS 040A and OWS 040B); and NAS Generator Accumulation Point (GAP) 25. Site activities included maintenance of aircraft and storage of chemicals at Building 41; paint stripping, rinsing, and draining operations conducted at WD 041A, the solvent dip tank, and associated OWS 041; aircraft maintenance, repair, and cleaning activities conducted at WD 040 and associated OWS 040A and OWS 040B; storage of waste at NAS GAP 25; activities at the fuel lines and fuel pits associated with Corrective Action Area (CAA) B; storage of chemicals at Building 273; and activities associated with the sewage pumping station at Building 501.

2.1.1.1 Land and Resource Use

According to the "*NAS Alameda Community Reuse Plan*" (EDAW 1996), the planned future use for IR Site 6 is as the Waterfront Town Center. The Waterfront Town Center will consist of mixed retail, residential, commercial, and office uses.

2.1.1.2 Current and Potential Groundwater Uses

Groundwater beneath Alameda Point at IR Site 6 is not used for drinking water, irrigation, or industrial supply purposes. Drinking water is supplied to Alameda Point by the East Bay MUD. Groundwater beneath IR Site 6 has been classified by the USEPA as a Class II aquifer; however, it is typically known for high TDS and low sustained hydraulic well yield.

2.1.1.3 Chronology and Initial Response

Table 2.1-1 summarizes major investigations and actions taken at IR Site 6.

TABLE 2.1-1: CHRONOLOGY OF SITE EVENTS – OU-1, IR SITE 6

Date	Event	Comments
1994	RCRA EBS	The EBS evaluated additional SWMUs at IR Site 6 and identified four SWMUs in addition to those identified during the RCRA facility assessment.
1997 - 1998	Storm Sewer Removal Action	The objectives of the removal action were to reduce the potential for sediments and debris in the storm sewer system (Subsystem G), which contained elevated concentrations of heavy metals, VOCs, SVOCs, pesticides, and fuel-related hydrocarbons in catch basins, storm sewer system lines an associated man-holes, and ensure protection of human health and the environment. The removal action resulted in no further action after it was determined that the lines were virtually sediment free.
2001	Supplemental RI data gaps sampling	The purpose of this investigation was to delineate chlorinated VOC plumes in groundwater, investigate storm sewer pathways at IR Site 6, and collect soil gas samples to support vapor intrusion modeling in the baseline HHRA. Groundwater samples were analyzed for VOCs and TPH. The delineation of VOC plumes addressed chlorinated VOCs west of Building 41 at IR Site 6.
November 2004	RI	The RI Report recommended further evaluation of soil at IR Sites 6, 7, 8, and 16 and groundwater at IR Sites 6 and 16. The RI also addressed risks identified during the baseline HHRA and the ERA.
July 2005	FS	The FS Report presented RAOs and remedial alternatives for each site, and evaluated the alternatives against the NCP criteria.
April 2006	PP	The PP recommended (1) RA for soil at IR Sites 6, 7, 8, and 16, and (2) RA for groundwater at IR Sites 6 and 16.
September 2007	ROD	The ROD was issued for OU-1 IR Sites 6, 7, 8, and 16 at Alameda Point.
October 2009-March 2010	Remedial action	At IR Site 6, the remedial action included removal of OWS 040A.
March 2010	RD	The RD presented details of the engineering design for the soil and groundwater remedies intended to fulfill the objectives of the ROD for IR Sites 6, 7, 8, and 16 within OU-1.
March 2010	RAWP	The RAWP presented the field implementation procedures, sequencing, and schedule for the soil and groundwater remedies intended to fulfill the objectives of the ROD for OU-1, IR Sites 6, 7, 8, and 16.
May 2010	Implementation of ISCO RA	The remedy at IR Site 6 included full-scale application of ISCO for treatment of VOCs in groundwater. The ISCO RA utilized sodium persulfate and ferrous sulfate injection treatment among 175 injection points at IR Site 6. ISCO treated an area of 67,200 square feet of contaminated groundwater. All RA field activities were conducted in accordance with the RAWP.
June 2010	ISCO RA Completion	ISCO RA field activities at IR Site 6 completed
September 2011	Five-Year Review	The first Five-Year Review for IR Site 6 was conducted to assess if the selected remedy remains protective of human health and the environment. The Five-Year Review report confirmed that the selected remedy and short-term ICs are protective of human health and the environment.

TABLE 2.1-1: CHRONOLOGY OF SITE EVENTS – OU-1, IR SITE 6

Date	Event	Comments
June 2014	Accelerated ISB Work Plan	The Work Plan outlined the approach for implementation of the enhanced ISB groundwater treatment to sufficiently degrade COCs to either meet RGs or transition to MNA, in accordance with the OU-1 ROD.
August 2014	Accelerated ISB RA Implementation	Accelerated ISB implemented at IR Site 6 as the next phase of the selected remedy. The enhanced ISB utilized a network of 66 injection wells and 27 extraction wells. The goal of ISB is to treat and degrade remaining COCs in groundwater and either meet RGs, or transition to MNA in accordance with the ROD.
September 2015	ISB RA Completion	Enhanced ISB RA field activities completed. Continued groundwater monitoring planned for IR Site 6 to further evaluate ISB implementation.
September 2015	Optimization Implementation Plan for ISB	The Optimization Implementation Plan for ISB describes the approach to optimizing ISB groundwater treatment at IR Site 6.

Notes:
BCT = BRAC Cleanup Team
COC = Contaminant of concern
EBS = Environmental Baseline Survey
ERA = Ecological risk assessment
FS = Feasibility Study
HHRA = Human health risk assessment
IR = Installation Restoration
ISB = In situ bioremediation
ISCO = In situ chemical oxidation
MNA = Monitored Natural Attenuation
LUC = Land-use control
NCP = National Oil and Hazardous Substances Pollution Contingency Plan
OU = Operable unit
OWS = Oil-water separator
PP = Proposed Plan
RAO = Remedial action objective
RAWP = Remedial Action Work Plan
RCRA = Resource Conservation and Recovery Act
RD = Remedial design
RG = Remediation goal
RI = Remedial Investigation
ROD = Record of Decision
SWMU = Solid waste management unit
TPH = Total petroleum hydrocarbon
UST = Underground storage tank
VOC = Volatile organic compound

2.1.1.4 Basis for Taking Action

Results of the human health risk assessment (HHRA) for IR Site 6 indicated that COCs in groundwater posed a risk to human health through vapor intrusion to indoor air and domestic use of groundwater based on current and reasonably anticipated future land use (TtEMI 2004).

The RI Report (TtEMI 2004) concluded that soil at IR Site 6 did not require remediation. However, the USEPA and DTSC subsequently requested, and the DON agreed, further sampling during the remedial design phase to evaluate the nature and extent of potential soil and groundwater contamination beneath and adjacent to OWSs 040A and 040B. The following RAO was developed for any potential COCs that may be identified for IR Site 6 soil:

- Minimize the potential risk of exposure (through ingestion or dermal contact) of a commercial worker to unacceptable levels of COCs in Site 6 soil and either prevent exposure (through ingestion or dermal contact) of future residents to unacceptable levels of COCs in soil or prohibit residential use of the property.

The following COCs were identified as posing risk to human health:

- Tetrachloroethene (PCE); trichloroethene (TCE); cis-1,2-dichloroethene (DCE); and vinyl chloride (VC)
- The total reasonable maximum exposure (RME) cancer risk (including background) was 5×10^{-4}, which is above the risk management range (USEPA 1991).

2.1.2 Remedial Action, Alameda Point, OU-1, IR Site 6

2.1.2.1 Remedy Selection (Record of Decision)

The RAOs for IR Site 6 groundwater are to protect the beneficial use of the aquifer from COCs and to minimize the potential risk of exposure to unacceptable levels of COCs in groundwater through inhalation by a residential receptor.

Based on information presented in the RI report (Tetra Tech EM, Inc. [TtEMI 2004]) and on the applicable or relevant and appropriate requirements (ARAR), RAOs, and RA, goals were developed during preparation of the FS Report and then later refined during preparation of the ROD and RD Report.

The ROD (DON 2007) states the following RAs for IR Site 6:

- Soil – Sampling, excavation, and off-site disposal
- Groundwater – Well installation, *in situ* chemical oxidation (ISCO), *in situ* bioremediation (ISB), monitored natural attenuation (MNA), and ICs

Data available at the time of the ROD indicated that soil at IR Site 6 did not pose a significant risk to human health or the environment. The subsequent pre-design data gaps study (TtEC 2008) confirmed the findings in the ROD. During the pre-design data gaps sampling events, soil samples were collected from areas at and around IR Site 6 OWSs 040A, 040B, and 041, and WDs 040 and 041A, and soil results were below applicable preliminary remediation goals (PRGs) and/or background levels. To address the presence of low levels of groundwater contaminants in FWBZ groundwater in the immediate vicinity of OWS 040A, the OWS structure was removed along with a limited amount of soil surrounding the structure during the Site 6 remedial action. The ultimate depth of removal was approximately 7 ft bgs (i.e., approximately 2 ft to 3 ft below the groundwater table). During backfill of the excavation, activated persulfate was added to the backfill area to address the low levels of groundwater contaminants. OWS removal will be discussed in the IR Site 6 RACR.

The ROD-selected remedy for groundwater at IR Site 6 to reduce the mobility, toxicity, and volume of volatile organic compounds (VOC) in groundwater, has high implementability, is protective of human health and the environment, and complies with all environmental regulations and laws. Monitoring wells have been installed and sampled to further refine the plume boundary. ISCO and accelerated bioremediation treatment reduced the concentrations of chlorinated VOCs in the groundwater plume and continue to degrade remaining chemical COCs. MNA was conducted at select wells at IR Site 6 as part of the initial groundwater remedy until concentrations met the remediation goals (RG). ICs restrict property use until groundwater concentrations meet the RGs.

TABLE 2.1-2: RGS FOR COCS IN GROUNDWATER, OU-1, IR SITE 6

COC	RGs for Groundwater, IC Termination Criteria
cis-1,2-DCE	6 µg/L
PCE	5 µg/L
TCE	5 µg/L
VC	0.5 µg/L

Source: RD/RAWP (URS 2010a, 2010b)

Notes:
µg/L = Microgram per liter
BGMP = Basewide Groundwater Monitoring Program
COC = Contaminant of concern
DCE = Dichloroethene
IC = Institutional control
PCE = Tetrachloroethene
TCE = Trichloroethene
RG = Remediation goal
VC = Vinyl chloride

2.1.2.2 Remedy Implementation

IR Site 6, Soil – Excavation and Off-Site Disposal at OWS 040A

Although the ROD does not identify any COCs for IR Site 6 Soil, it was determined that removing OWS 040A and surrounding impacted soil would be protective of human health and the environment. The OWS removal at IR Site 6 was completed between October 2009 and March 2010 (URS 2012).

Groundwater ISCO

As discussed in the RAWP (URS 2010b), the remedial strategy for groundwater at IR Site 6 consisted of implementing ISCO with sodium persulfate and ferrous sulfate, followed, if necessary, by ISB, MNA, or other approaches.

ISCO Performance Monitoring

Based on post-ISCO performance monitoring at IR Site 6, the DON has transitioned to ISB at IR Site 6, in accordance with the decision logic presented in the RAWP for OU-1.

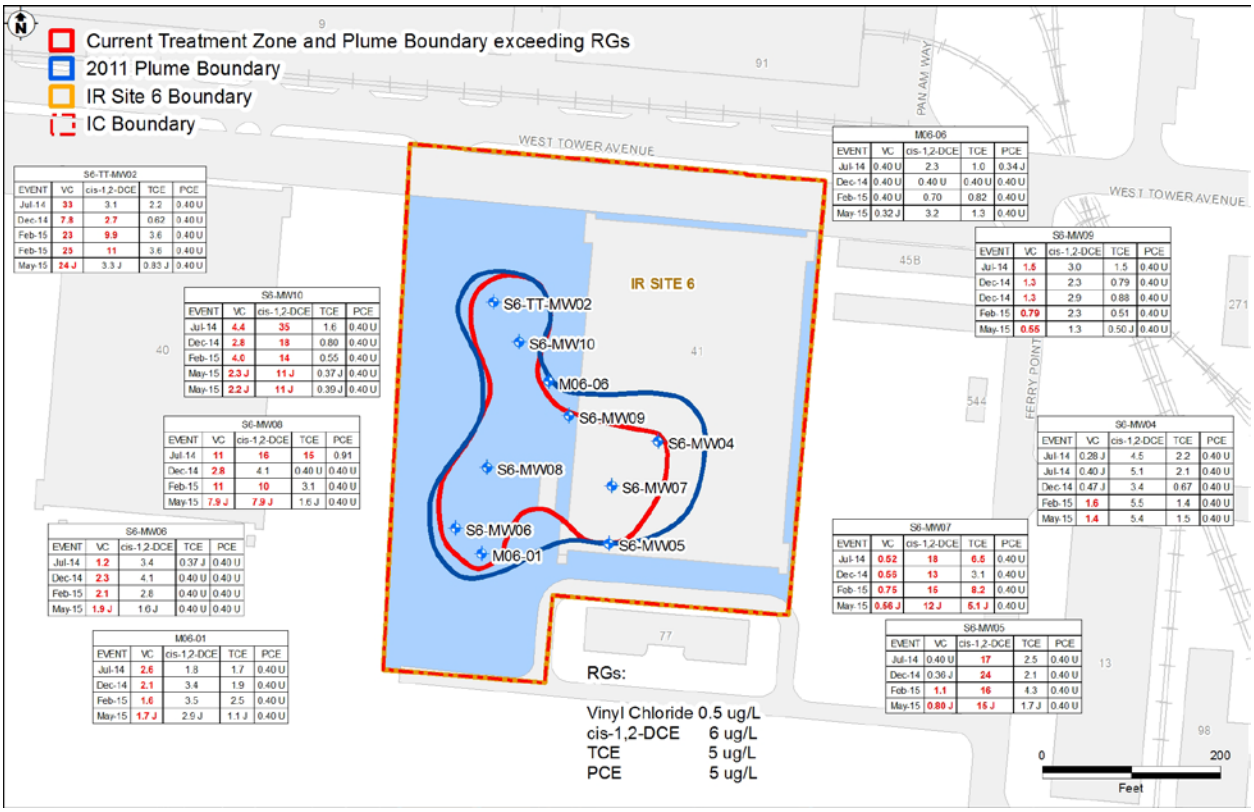
ISB

The decision to transition from ISCO to ISB follows the decision logic for implementing the selected remedy in the final ROD (DON 2007) and the Final RAWP (URS 2010b). Specifically, the RAWP stipulates that if RGs are not attained within 2 years after implementation of ISCO, an alternate treatment approach using the next treatment process as presented in the Decision Trees in the 2010 ROD.

Groundwater monitoring was conducted at IR Site 6 in July (baseline), September, December 2014; February, May, September, and December 2015; and March 2016.Three additional post-optimization sampling events will be completed in 2016 followed by preparation of a Technical Memorandum, or an interim RACR, documenting all field activities, data collected and evaluated, and the analysis of the ISB treatment. Figure 2.1-1 shows the ISB target zone at IR Site 6.

The ISB Work Plan (MMEC 2014) describes enhanced ISB groundwater treatment, the potential transition to MNA (if necessary), and ICs to be implemented to achieve the RAOs.

FIGURE 2.1-1: GROUNDWATER COCS, ISB TARGET ZONE, OU-1, IR SITE 6



Source: ISB Work Plan (MMEC 2014)

ICs

The ICs at IR Site 6 consist of the following:

Prohibition against:

- A residence, including any mobile home or factory-built housing constructed or installed for use as residential human habitation
- A hospital for humans
- A school for persons under 21 years of age
- A day care facility for children
- The installation of new groundwater wells of any type is prohibited without prior review and written approval of the DON and FFA signatories until cleanup objectives have been achieved.
- The alteration, disturbance, or removal of groundwater monitoring wells, groundwater extraction wells, treatment facilities, and associated equipment is prohibited without prior review and written approval from the DON and FFA signatories.
- Removal of or damage to security features (such as locks on monitoring wells, site fencing, and signs) or to survey monuments, monitoring equipment, piping, and other appurtenances is prohibited without prior written approval from the DON and FFA signatories.

Since the RA for IR Site 6 is on-going, annual IC compliance inspections are planned for January of the calendar year following RA completion.

2.1.3 Progress Since the Last Five-Year Review, Alameda Point, OU-1, IR Site 6

The protectiveness statement in the previous Five-Year Review stated: "Remedial actions (RAs) performed at IR Site 6 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place to prevent exposure to contaminated groundwater at IR Site 6. ICs and land-use controls are assessed annually. The selected remedy will continue to be protective if the recommendations and follow-up items identified in this Five-Year Review are addressed."

In 2014, the groundwater remedy at IR Site 6 transitioned from ISCO to ISB and is on-going. Routine IC compliance monitoring is ongoing at IR Site 6.

A recommendation was made in the 2011 Five-Year Review report (KCH 2011) to continue tracking the progress of the remedy per the approved ROD and to review and evaluate finalized post-remedy data to assess the effectiveness of the remedy (Appendix E, Table E-2). As a result of data evaluation and in accordance with approved work plans, additional remedial action using ISB was implemented at IR Site 6.

2.1.4 Five-Year Review Process, Alameda Point, OU-1, IR Site 6

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 6. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.1.4.1 Site Inspection

The site inspection confirmed that the selected remedy of ISB for IR Site 6 is ongoing and that groundwater monitoring wells are in good condition. Perimeter fencing around the site is in good condition with restricted access to IR Site 6 by a locked gate Appendix A presents checklists that document the results of the site inspection, and Appendix B provides the site inspection photographs. ICs are operating as intended by the ROD and are protective of human health and the environment. Table 1-3 lists participants involved in the site inspection conducted for IR Site 6.

2.1.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 6. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response: "The Regulatory Agencies were not given an opportunity to review an optimization plan for groundwater treatment before it was implemented. It is expected that before transition to MNA, the multiple lines of evidence outlined in Section 6 of the Final Work Plan for Enhanced In-situ Biodegradation would be demonstrated successfully."

DTSC Response: No comments.

Regional Water Board Response: No comments.

Community Interview Response: "Sampling of groundwater concentrations at IR Sites with remediated groundwater plumes [IR Sites 1, 6, 7, 26, (OU-2B), OU-5, IR Site 25] should occur immediately after a

significant earthquake (eg; Napa or larger) to assure [sic] that deeper contaminants at IR Site 25, and OU-2B have not migrated upward." George Humphreys, RAB Member.

2.1.5 Technical Assessment, Alameda Point, OU-1, IR Sites 6

The RAOs for IR Site 6 groundwater are being met by minimizing the potential risk of exposure of the residential receptors to inhalation of indoor air vapors. The RA of ISB has been implemented at IR Site 6 which will further reduce the groundwater contamination plume size. ICs will continue to assist in protecting human health and in meeting the RAOs.

Historical use of IR Site 6 (aircraft intermediate maintenance facility) indicates the potential for release of compounds known to contain Perfluorinated chemicals (PFCs). The DON is closely monitoring regulatory and technical developments related to PFCs and proactively evaluating an appropriate approach for PFCs at IR Site 6. Pending developments, further status may be reported in the next Five-Year Review (2021) and/or a separate report (e.g. site-specific evaluation, BGMP Report).

TABLE 2.1-3: TECHNICAL ASSESSMENT SUMMARY, OU-1, IR SITE 6

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 6	Soil – Excavation and off-site disposal	Yes	Yes	No	Protective	2021
	Groundwater - ISCO, ISB, MNA, and ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification
IR = Installation Restoration
ISB = *In situ* bioremediation
ISCO = *In situ* chemical oxidation
MNA = Monitored natural attenuation
OU = Operable unit

2.1.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedy is functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remedy implemented for groundwater at IR Site 6 is working as intended by the ROD. The documents that detail the remedial decisions for IR Site 6 are the ROD (DON 2007), RD Report (URS 2010a), RAWP (URS 2010b) and the ISB Work Plan (MMEC 2014). ISB is nearing completion at IR Site 6 and is anticipated to further degrade COCs in groundwater. At present, performance monitoring is on-going. Following eight quarters of performance monitoring, the RACR or iRACR will evaluate site conditions and recommend closure or long-term MNA sampling under the BGMP, as appropriate.

ICs are currently in place at IR Site 6, and Annual Compliance and Inspection Reports ensure protection of human health and the environment. ICs will remain in place until the RAO termination criterion has been achieved. The ROD (DON 2007) stated that the selected remedy would treat contaminated groundwater at IR Site 6 within three years of remedy implementation for a projected goal of 2013, to meet RGs. ICs will remain in place until RGs have been achieved,

System Operations and Operation and Maintenance (O&M)

O&M of the ISB treatment is conducted quarterly. The ISB remedy is described in the ISB Work Plan (MMEC 2014).

Opportunities for Optimization

ISB processes at IR Site 6 were optimized in 2014 (Optimization Implementation Plan [MMEC 2015]), by amending groundwater with a soluble carbon substrate (e.g. lactate) injected into the subsurface to address selected areas of the target treatment zone where COCs remain above RGs. The carbon substrate is intended to support further degradation of the COCs in groundwater by maintaining reducing conditions in the groundwater and bolstering the previously performed bioaugmentation to drive reductive dechlorination.

2.1.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 6 is in place and there are no reported changes to the remedy that would affect its protectiveness. The RGs for cis-1,2-DCE, PCE, TCE, and VC are based on federal and California MCLs, which continue to be protective of the future land uses at IR Site 6. The MCLs are protective of commercial indoor air (Vapor Intrusion Screening Level Calculator, USEPA 2015a).

The potential RME cancer risk for IR Site 6 soil (including background) is 2×10^{-6} for the commercial/industrial scenario and 1×10^{-6} for the recreational scenario, both of which are at the lower end of the risk management range of 10^{-6} to 10^{-4}. The RME cancer risk for the construction worker scenario is 2×10^{-7} (both surface and subsurface soil), which is below the risk management range. The RME hazard index (HI) (including background) is 0.03 (surface soil) for the construction worker scenario, 0.02 for the recreational scenario, and 0.009 for the commercial/industrial worker, all of which are less than the noncancer threshold of 1. Since groundwater is generally 5 feet below ground surface (bgs), deeper than the construction worker scenario depth, only surface soil was evaluated.

For the residential scenario, soil data were evaluated at depth intervals of 0 to 2 feet bgs (surface soil) and 0 to 8 feet bgs (subsurface soil). For surface soil, the total RME cancer risk (including background) was 1×10^{-5}, which is within the risk management range. The RME HI for a child (including background) was 0.2, which is less than the noncancer threshold of 1. For subsurface soil, the total RME cancer risk (including background) was 1×10^{-5}, which is within the risk management range. The RME HI for a child (including background) was 0.1, which is less than 1. Risks from soil were attributed primarily to arsenic; however, arsenic was found to be within background levels. Polycyclic aromatic hydrocarbons (PAHs) and SVOCs were not identified as risk drivers at IR Site 6.

Lead was not selected as a chemical of potential concern for soil because concentrations of lead were statistically similar to background; therefore, risk from exposure to lead was not evaluated.

Changes in Exposure Assumptions and Toxicity Data

No changes in exposure assumptions or land use have occurred since the refined HHRA and ecological risk assessment (ERA) were conducted.

For groundwater, the primary risk drivers were cis-1,2-DCE, PCE, TCE, and VC in the IR Site 6 HHRA. The toxicity values used for these chemicals of concern were primarily obtained from USEPA's IRIS database dated 2003 and updated toxicity values were identified during the 2011 Five-Year Review. Since the 2011 review, the oral slope factor for TCE was updated to 0.046 (per milligram per kilogram –day $[mg/kg\text{-}day]^{-1}$) (USEPA IRIS) compared to the previous oral cancer slope factor (CSF) of 0.0013 $(mg/kg\text{-}day)^{-1}$. The inhalation unit risk (UR_i) for TCE was also updated [0.0000041 $(mg/m^3)^{-1}$,] as well

as the oral reference dose (0.0005 mg/kg-day) and reference concentration (0.002 mg/m3) (USEPA IRIS). In 2012, the oral CSF for PCE was updated to 0.54 $(mg/kg\text{-}day)^{-1}$ compared to the previous oral CSF of 0.052 $(mg/kg\text{-}day)^{-1}$ (California Office of Environmental Health Hazard Assessment [OEHHA]). The UR_i for PCE was updated [5.9E-06 $(\mu g/m^3)^{-1}$] as well as the reference dose (0.006 mg/kg-day) and reference concentration (0.04 mg/m^3) (USEPA IRIS). These updated values in the IRIS and the (OEHHA) databases are more conservative than what was used in the 2004 HHRA, but because the RGs are based on MCLs, the changes will not affect the current remedy at IR Site 6. Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

The HHRA for IR Site 6 primarily used the default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's most recent update (USEPA 2014) include: skin surface area, adult body weight, resident exposure duration and exposure time, and worker soil adherence factor. Some of these factors are less conservative and some are more conservative so overall, the changes do not significantly impact the risk results for IR Site 6.

The methods and assumptions used in the HHRA to evaluate health risks for groundwater vapor intrusion to indoor air do not reflect current standards of practice (DTSC 2011; Interstate Technology & Regulatory Council [ITRC] 2007; and USEPA 2015b). In particular, soil and building property assumptions used in the HHRA differ significantly from current DTSC (2011) recommended values. In all cases, the DTSC recommended values are more conservative than those used in the HHRA. However, these changes do not impact the current remedy at IR Site 6 which is currently based on MCLs and these MCLs are protective of commercial indoor air (*Vapor Intrusion Screening Level Calculator*, EPA 2015a).

No additional exposure pathways have been identified since land uses, zoning, and receptors at the IR site have not changed since the previous 5-Year Review.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Sites 6 included identification and evaluation of changes in the ROD-specified ARARs and criteria To Be Considered (TBC) to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.1.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

2.1.6 Issues, Alameda Point, OU-1, IR Site 6

No issues have been identified at IR Site 6 that would currently or in the future prevent the respective remedies at these sites from being protective of human health and the environment.

2.1.7 Recommendations and Follow-up Actions, Alameda Point, OU-1, IR Site 6

No recommendations or follow-up actions have been identified for IR Site 6.

2.1.8 Protectiveness Statement, Alameda Point, OU-1, IR Site 6

The RAs performed at IR Site 6 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposures to contaminated groundwater. IR Site 6 is currently in the remedial action operation stage of the CERCLA process. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

2.2 OU-1, IR SITE 16

2.2.1 Site Description and Background, Alameda Point, OU-1, IR Site 16

OU-1, IR Site 16 (also known as the shipping container storage area) covers approximately 11.1 acres. IR Site 16 is located 390 feet east of San Francisco Bay as shown in Figure 1-1. IR Site 16 is mostly covered by asphalt, concrete roads, parking lots, and buildings, and has some unpaved open areas. IR Site 16 contains the following SWMUs: Aboveground Storage Tank (AST) 338-A1, AST 338-D4, AST 608, Underground Storage Tank (UST) (R)-18/NAS GAP 17, OWS 608A, OWS 608B, and WD 608. Before 1968, IR Site 16 was used to park aircraft and store chemicals. In 1961, eight shipping containers were placed in the eastern portion of the site and used to store avionic parts and to test equipment, chemicals, and aircraft fabrication equipment. In 1980, an auto-repair facility (Building 608) was constructed in the southern portion of IR Site 16. IR Site 16 also includes converted shipping container storage sheds, including the original eight containers mentioned above, in an area known as the CANS area.

2.2.1.1 Land and Resource Use

Also included in the *"NAS Alameda Community Reuse Plan"* (EDAW 1996), IR Site 16 will serve as a future commercial business and industry zone, bordered by the Enterprise Park, in southeast Alameda Point. The Enterprise Park will provide a gathering and commercial/visitor serving area connected to the Enterprise employment center.

2.2.1.2 Current and Potential Groundwater Uses

Groundwater beneath Alameda Point at IR Site 16 is not used for drinking water, irrigation, or industrial supply purposes. Drinking water is supplied to Alameda Point by the East Bay MUD. Groundwater beneath IR Sites 16 has been classified by the USEPA as a Class II aquifer; however, it is typically known for high TDS and low sustained hydraulic well yield.

Regional Water Board and USEPA concurred that shallow groundwater underlying IR Site 16 meets State Water Board Resolution 88-63 and Regional Water Board Resolution No. 89-39 "Sources of Drinking Water", exception criteria (a) and (c) and therefore does not meet requirements for a potable water source; accordingly, drinking water standards do not apply to groundwater in this area. Groundwater de-designation letters issued by the Regional Water Board and USEPA for shallow groundwater in the southeastern part of Alameda Point, including OU-1, IR Site 16 are included in Appendix E of this report (also Figure 2 - Extent of Former Alameda Island Circa 1859).

2.2.1.3 Site Chronology and Initial Response

Table 2.2-1 summarizes major investigations and actions taken at IR Site 16.

TABLE 2.2-1: CHRONOLOGY OF SITE EVENTS – OU-1, IR SITE 16

Date	Event	Comments
1983	Initial Assessment Survey	Assessment of visual contamination upon surfaces of asphalt, concrete, inside and outside of buildings and structures at Alameda Point, including OU-1, IR Site 16. The assessment also involved removal of equipment no longer in use, cleaning of all equipment remaining in place and pressure washing of the interior of select buildings.
1995 - 1997	UST 608-1 removal and investigation	UST 608-1 was removed, and the surrounding area was designated CAA 9B at IR Site 16.
1997	Soil removal action	Approximately 3,000 yd^3 of surface soil contaminated with PCBs and lead was removed from IR Site 16. The interim action goals for PCBs and lead were 1 and 300 mg/kg, respectively. Analytical results for confirmation samples collected from the excavation indicated that the interim action levels for PCBs and lead had been achieved.
1997 - 1998	Storm Sewer Removal Action	The objectives of the removal action were to reduce the potential for sediments and debris in the storm sewer system (Subsystem Q), which contained elevated concentrations of heavy metals, VOCs, SVOCs, pesticides, and fuel-related hydrocarbons in catch basins, storm sewer system lines an associated man-holes. Only a portion of Subsystem Q was cleaned out during the removal action, as a portion of the line was replaced in 1991.
2001	NFA	Results of the 1994 storm water corridor study at IR Site 16 indicated chemical concentrations below 1996 PRGs, background metals concentrations, and petroleum risk-based screening criteria. As a result, no further investigation of storm sewers was recommended at IR Site 16.
2001	Supplemental RI data gaps sampling	In support of the RI/FS, the objectives of this investigation at IR Site 16 were to (1) delineate the VOC groundwater plumes near Building 608 and in the open space west of the CANS area, (2) assess chlordane contamination near the former location of UST 608-01, (3) assess storm sewer exposure pathways, and (4) collect soil gas samples to further assess risk to human health and the environment. Measurable concentrations of VOCs were detected in soil vapor above the contaminant plume in groundwater.
2002 - 2006	BGMP sampling	Selected wells at IR Site 16 were identified for quarterly or semiannual long-term monitoring.
November 2003	Removal action for ISCO	The removal action consisted of full-scale application of ISCO for the mass removal of VOCs in soil and groundwater at IR Site 16. The application of ISCO focused on two areas at IR Site 16 designated as “IR Site 16 South” and “IR Site 16 North.”
November 2004	RI	The RI Report recommended further evaluation of soil at IR Sites 6, 7, 8, and 16 and groundwater at IR Sites 6 and 16. The RI also addressed risks identified during the baseline HHRA and the ERA.
July 2005	FS	The FS Report presented RAOs and remedial alternatives for each site, and evaluated the alternatives against the NCP criteria.
April 2006	PP	The PP recommended (1) RA for soil at IR Sites 6, 7, 8, and 16, and (2) RA for groundwater at IR Sites 6 and 16.
September 2007	ROD	The ROD was issued for OU-1 IR Sites 6, 7, 8, and 16 at Alameda Point.
October 2009- March 2010	Remedial action	At IR Site 16, the remedial action included soil excavation, removal of OWS 608A and OWS 608B, and ISCO.
March 2010	RD	The RD presented details of the engineering design for the soil and groundwater remedies intended to fulfill the objectives of the ROD for IR Sites 6, 7, 8, and 16 within OU-1.
March	RAWP	The RAWP presented the field implementation procedures, sequencing, and

TABLE 2.2-1: CHRONOLOGY OF SITE EVENTS – OU-1, IR SITE 16

Date	Event	Comments
2010		schedule for the soil and groundwater remedies intended to fulfill the objectives of the ROD for IR Sites 6, 7, 8, and 16 OU-1.
May -2010	Implementation of ISCO RA	The remedy at IR Site 16 included full-scale application of ISCO for treatment of VOCs in groundwater at IR Site 16. The RA of ISCO utilized sodium persulfate and ferrous sulfate injection treatment among 51 injection points at IR Site 16 North, and 22 injection points at IR Site 16 South. The implementation of ISCO treated areas of 24,800 and 11,200 square feet of contaminated groundwater at IR Site 16 North and IR Site 16 South, respectively. All RA field activities were conducted in accordance with the RAWP.
June 2010	ISCO RA Completed	RA of ISCO at IR Site 16 North and South completed. Groundwater monitoring of both IR Site 16 North and South continued as part of the BGMP.
September 2011	Five-Year Review	The first Five-Year Review for IR Site 16 was conducted to assess if the selected remedy remains protective of human health and the environment. The Five-Year Review report confirmed that the selected remedy is protective of human health and the environment.
April 2012	ESD (Soil)	The ESD for IR Site 16 modified the point-by-point confirmation sample evaluation protocol (from the ROD) to an EPC evaluation basis. The ESD was approved by the BCT.
July 2012	RACR	The IR Site 16 Soil RACR recommended NFA for soil at IR Site 16. A small volume of contaminated soil was left in place beneath Building 608. The ESD presented the results of a statistical analysis and an HHRA prepared for IR Site 16 EPC data. The soil RACR was approved by the BCT.
September 2015	ESD (Groundwater)	The ESD for IR Site 16 groundwater modified the MNA and IC portions of the IR Site 16 remedy and extension of the 5-Year Review requirements. The ESD resulted in permanent ICs and defined IC implementation areas at IR Site 16 overlying the groundwater COCs that exceed human health risk criteria for residential land use. The ESD was approved by the BCT.
February 2016	LUC RD	The IR Site 16 LUC RD addressed the ICs required by the ROD and ESD for IR Site 16 and applies specifically to shallow unconfined groundwater at IR Site 16.
March 2016	IC Compliance Monitoring Report and Annual IC Compliance Certificate issued	The report certified that ICs for IR Site 16 are in compliance with the requirements specified in the ROD.

Notes:
BCT = BRAC Cleanup Team
BGMP = Basewide Groundwater Monitoring Program
COC = Contaminant of concern
EPC = Exposure point concentration
ERA = Ecological risk assessment
ESD = Explanation of Significant Difference
FS = Feasibility Study
HHRA = Human health risk assessment
IC = Institutional control
IR = Installation Restoration
ISCO = In situ chemical oxidation
mg/kg = Milligram per kilogram
MNA = Monitored Natural Attenuation
LUC = Land-use control
NCP = National Oil and Hazardous Substances Pollution Contingency Plan
NFA = No further action
OU = Operable unit
OWS = Oil-water separator
PCB = Polychlorinated biphenyl
PP = Proposed Plan
PRG = Preliminary remediation goal
RA = Remedial action
RACR = Remedial action completion report
RCRA = Resource Conservation and Recovery Act
RAO = Remedial action objective
RAWP = Remedial Action Work Plan
RACR = Remedial Action Completion Report
RD = Remedial design
RI = Remedial Investigation
ROD = Record of Decision
UST = Underground storage tank
VOC = Volatile organic compound
yd3 = Cubic yard

2.2.1.4 Basis for Taking Action

Results of the HHRA for IR Site 16 indicated that COCs in groundwater at the sites posed a potential risk to human health through vapor intrusion to indoor air and domestic use of groundwater based on current and reasonably anticipated future land use (TtEMI 2004).

The ROD (DON 2007) concluded that soil at IR Site 16 require sampling, excavation, and off-site disposal. The following RAO was developed for any potential COCs that may be identified for IR Site 16 soil:

- Minimize the potential risk of exposure (through ingestion or dermal contact) of a commercial worker to unacceptable levels of COCs in Site 16 soil and either prevent exposure (through ingestion or dermal contact) of future residents to unacceptable levels of COCs in soil or prohibit residential use of the property.

The following COCs were identified as posing risk to human health:

- cis-1,4-dichlorobenzene (DCB); cis-1,3-DCB; cis-1,2-DCB; cis-1,2-DCE; chlorobenzene; chlordane; TCE; PCE; and VC
- The total RME cancer risk (including background) was 7×10^{-4}, which exceeds the risk management range (USEPA 1991).

2.2.2 Remedial Action, Alameda Point, OU-1, IR Site 16

2.2.2.1 Remedy Selection (Record of Decision)

The RAOs for IR Site 16 soil are to minimize the potential risk for exposure (through ingestion, inhalation of particulates, or dermal contact) of site workers and to either prevent exposure (through ingestion, inhalation of particulates, or dermal contact) of future residents to unacceptable levels of COCs in soil or to prohibit residential use of the property.

The RAOs for IR Site 16 groundwater are to protect the beneficial use of the aquifer from COCs and to minimize the potential risk of exposure to unacceptable levels of COCs in groundwater through inhalation by a commercial worker.

Based on information presented in the RI report (Tetra Tech EM, Inc. [TtEMI 2004]) and on the ARARs, RAOs, and RA, goals were developed during preparation of the FS Report and then later refined during preparation of the ROD and RD Report.

The ROD (DON 2007) states the following RAs for IR Site 16:

- Soil – Sampling, excavation, and off-site disposal
- Groundwater – Well installation, ISCO, ISB, MNA, and ICs

The ESD (DON 2012) to the original ROD states no further action for soil at IR Site 16. This is the last Five-Year Review for IR Site 16 soil.

The ROD states that the selected remedy for groundwater at IR Site 16 reduces the mobility, toxicity, and volume of VOC in groundwater, has high implementability, is protective of human health and the environment, and complies with all environmental regulations and laws. Monitoring wells were installed and sampled to further refine the plume boundary. ISCO groundwater treatment reduced the concentrations of chlorinated VOCs in the groundwater plume and continue to degrade remaining chemical COCs. MNA was conducted at select wells at IR Site 16 to assure RGs are being achieved. The 2015 GW ESD removed MNA and made the groundwater ICs for vapor intrusion permanent. ICs

restricting property use until groundwater concentrations meet the RGs is on-going at IR Site 16 in accordance with the LUC RD (Multimedia Environmental Compliance Group [MMEC] 2016).

TABLE 2.2-2: RGS FOR COCS IN GROUNDWATER, OU-1, IR SITE 16

COC	RGs for Groundwater, IC Termination Criteria
cis-1,2-DCE	6 µg/L
PCE	5 µg/L
TCE	5 µg/L
VC	0.5 µg/L
chlorobenzene	70 µg/L
1,2-DCB	600 µg/L
1,3-DCB	5.5[(1)] µg/L
1,4-DCB	5 µg/L

Source: BGMP report (SES 2015)

[1]No MCL is established for 1,3-DCB risk-based value per 2007 ROD.

Notes:

µg/L = Microgram per liter
BGMP = Basewide Groundwater Monitoring Program
COC = Contaminant of concern
DCB = Dichlorobenzene
DCE = Dichloroethene
IC = Institutional control
PCE = Tetrachloroethene
TCE = Trichloroethene
RG = Remediation goal
VC = Vinyl chloride

2.2.2.2 Remedy Implementation

Soil – Excavation and Off-Site Disposal

In accordance with the ROD (DON 2007), the approved RD Report (URS 2010a), and Remedial Action Work Plan (RAWP) (URS 2010b), the RA removed soil impacted with lead, chlordane, dieldrin, heptachlor, and heptachlor epoxide at concentrations above RGs. The RACR documents the RA for soil and achievement of the RAOs (URS 2012).

The extent of soil excavation at IR Site 16 was based on previous investigations and confirmed with post-excavation confirmation samples. Although a small section of soil with COCs exceeding RGs could not be removed without the demolition of a functional building, the ESD described further sampling and subsequent risk evaluation that determined the remaining site soils meet the remedial action objectives and that the remedial action completed is protective of human health and the environment. Soil at IR Site 16 requires NFA.

Groundwater ISCO

As discussed in the RAWP (URS 2010b), the remedial strategy for groundwater at IR Site 16 consisted of implementing ISCO with sodium persulfate and ferrous sulfate, followed, if necessary, by ISB, MNA, or other approaches.

ISCO Performance Monitoring

Post-ISCO performance monitoring was used to evaluate IR Site 16 and prepare an ESD to the original ROD (DON 2015) for groundwater, which documents RA completion. A LUC RD (MMEC 2016a) for IR Site 16 was prepared to provide IC restrictions at the site.

ICs

The ICs at IR Site 16 were developed and presented in the ROD (DON 2007) and modified in the ESD (DON 2015). The LUC RD presents the following IC performance objectives:

- Prohibition of domestic use of shallow groundwater
- Prohibition of drilling wells of any kind (other than remedy-related monitoring wells)
- A requirement for engineered vapor intrusion mitigation systems that meet indoor air risk criteria, and are acceptable to the FFA signatories or their successors for all residential buildings constructed above the IC implementation areas until COC concentrations in groundwater meet IC termination criteria
- Prohibition of disturbing/removing/altering components of the remedy, including monitoring wells and warning signs
- Prohibition of construction of the following types of buildings: schools, child care facilities, hospitals, and senior care facilities, overlying the IC implementation areas until IC termination criteria are achieved, unless approved by FFA signatories or their successors
- Annual IC Compliance inspections

Based on requirements of the LUC RD groundwater monitoring at IR Site 16 has been redesigned to take place every five years which will inform the Five-Year Reviews and determine when IC termination criteria (ICTC) are met. The DON will work with the BCT to schedule the groundwater sampling with enough lead time to inform the 2021 Five-Year Review. For each five-year sampling event, the six wells illustrated on Figure 2.2-1 will be sampled and analyzed for VOCs using USEPA Method 8260C (or current equivalent); only site COCs will be evaluated and reported. Routine IC compliance monitoring is ongoing at IR Site 16.

2.2.3 Progress Since the Last Five-Year Review, Alameda Point, OU-1, IR Site 16

The protectiveness statement in the previous Five-Year Review stated: "Remedial actions (RAs) performed at IR Site 16 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place to prevent exposure to contaminated groundwater at IR Site 16. ICs and land-use controls are assessed annually. The selected remedy will continue to be protective if the recommendations and follow-up items identified in this Five-Year Review are addressed."

The 2011 Five-Year Review report (KCH 2011) recommended continued tracking of the remedy at IR Site 16 per the approved ROD and to review and evaluate finalized post-remedy data to assess the effectiveness of the remedy (Appendix E, Table E-2).

Since 2011, validated post-remedy data have been reviewed and evaluated for IR Site 16. Based on the data evaluation and concurrence on a change in groundwater exception to drinking water policy in September 2012, an ESD was prepared in 2015 (DON 2015).

2.2.4 Five-Year Review Process, Alameda Point, OU-1, IR Site 16

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 16. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

Figure 2.2-1 shows the IC implementation areas for vapor intrusion at IR Site 16 north and south.

2.2.4.1 Site Inspection

Groundwater monitoring wells and perimeter fencing at IR Site 16 are in good condition. IR Site 16 is divided into two properties/businesses, both with coded access to each property. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. ICs are operating as intended by the ROD and are protective of human health and the environment. Table 1-3 lists participants involved in the site inspection conducted for IR Site 16.

2.2.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 16. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response:

"As long as the future use remains commercial/industrial, recreational, and open space, I don't have any concerns about this site."

DTSC Response: No comments.

Regional Water Board Response:

"The role of two ARARs have changed as documented in ESDs to the Site 16 ROD. In the Site 16 ESD to the ROD, two chemical-specific ARARs do not apply as remedial goals but serve as termination criteria for the permanent ICs. The two chemical-specific ARARs that will apply as IC termination criteria are:

Federal-Safe Drinking Water Act (42 United States Code [USC], Chapter 6A, Sections 300[f]–300[j]-26)b – National primary drinking water standards are health-based standards for public water systems (MCLs) 40 CFR Section 141.61(a); and

Cal/EPA Department of Toxic Substances Control-California Code Regulations Title 22 Section 64444 (state MCL list for sources of drinking water)."

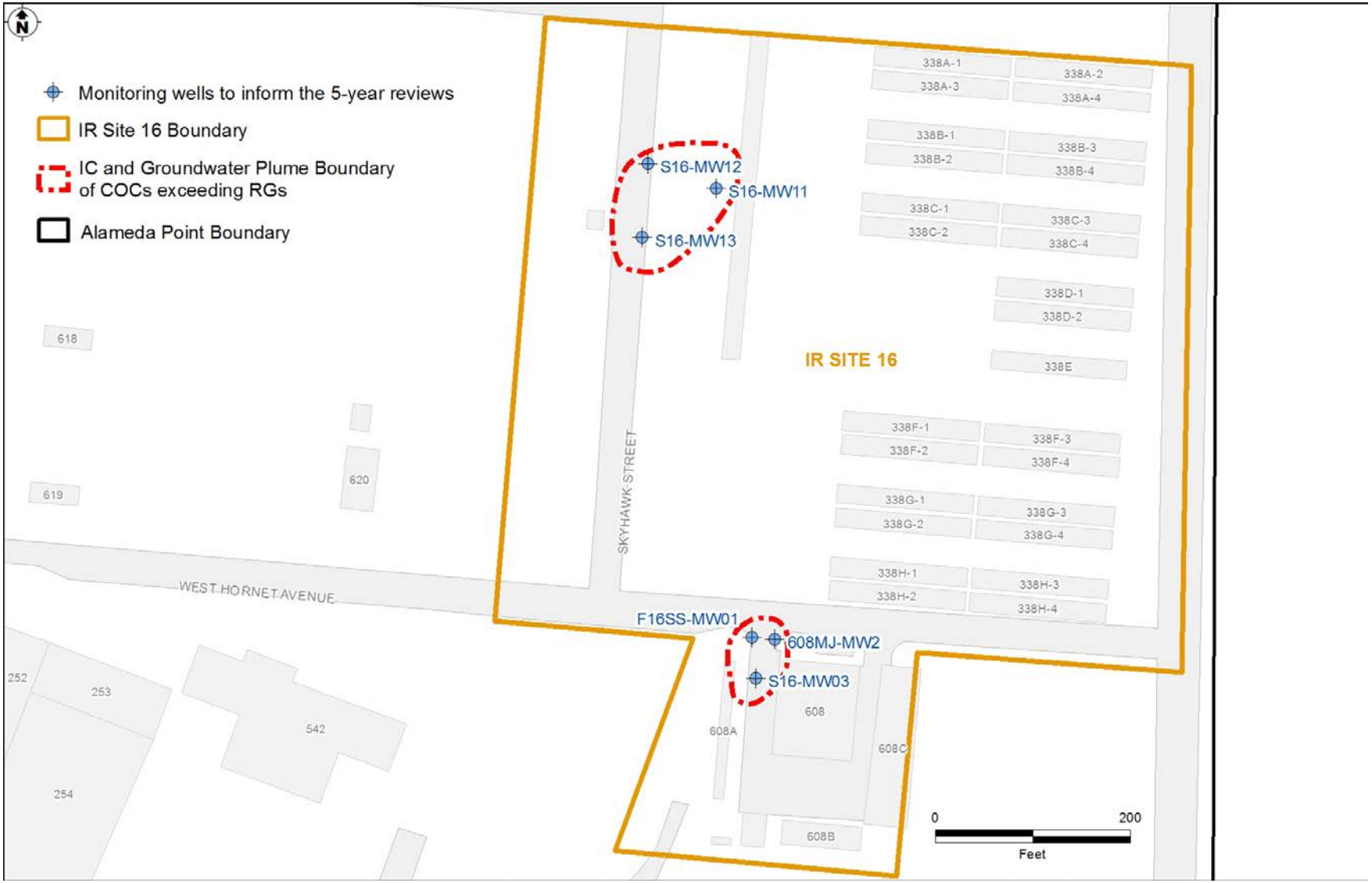
Community Interview Response: No comments.

Contractor Interview Response:

"Yes. The ARARs related to Site 16 groundwater being used as drinking water source, and all other human domestic residential uses have been removed per the Exception to Drinking Water Policy."

"Since the site is safe for current use and planned future use (i.e. commercial use), groundwater monitoring should be minimized, and at the discretion of the Navy whether to be conducted, to reduce the cost to tax payers. At most, sampling should occur once every five years to inform the five year review." Curtis Moss, AMEC Foster Wheeler.

FIGURE 2.2-1: IC IMPLEMENTATION AREAS, OU-1, IR SITE 16



Source: LUC RD (DON 2016)

2.2.5 Technical Assessment, Alameda Point, OU-1, IR Site 16

The RAOs for soil have been met by the implementation of the RA. Potential risk of exposure of the site worker and future residential receptor was determined to be on the low end of the risk management range for soil and an ESD (DON 2012) for NFA for soil was issued.

The RAOs for IR Site 16 groundwater are being met by minimizing the potential risk of exposure to the residential receptors. An ESD (DON 2015) to the original ROD was issued for shallow groundwater, which outlines vapor risk below the residential use criteria. ICs stated in the LUC RD (MMEC 2016a) restrict residential use of the IR Site 16, the residential receptor is protected and RAOs are achieved.

TABLE 2.2-3: TECHNICAL ASSESSMENT SUMMARY, OU-1, IR SITE 16

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 16	Soil - Excavation and off-site disposal	Yes	Yes	No	Protective	NA
	Groundwater - ISCO, ISB, MNA, ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification
IR = Installation Restoration
ISB = *In situ* bioremediation
ISCO = *In situ* chemical oxidation
MNA = Monitored natural attenuation
NA = Not applicable
OU = Operable unit

2.2.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedy is functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remedy implemented for groundwater at IR Site 16 is working as intended by the ROD. The documents that detail the remedial decisions for IR Site 16 are the ROD (DON 2007), RD Report (URS 2010a), RAWP (URS 2010b), RACR for IR Site 16 Soil (URS 2012), ESD for IR Site 16 soil (DON 2012), and the ESD for IR Site 16 groundwater (DON 2015).

ICs are currently in place at IR Site 16, and Annual Compliance and Inspection Reports ensure protection of human health and the environment. ICs will remain in place until the RAO termination criterion has been achieved. The ROD (DON 2007) stated that the selected remedy would treat contaminated groundwater at IR Site 16 within three years of remedy implementation for a projected goal of 2013, to meet RGs. ICs will remain in place until RGs have been achieved.

System Operations and O&M

Not applicable for IR Site 16.

Performance of Groundwater Remedy

Groundwater monitoring data for IR Site 16 in Fall 2014 and Spring 2015 indicate the presence of COCs above RGs in 11 of the 16 wells monitored as reported in the Preliminary Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016b). The maximum reported concentrations of COCs exceeding respective RGs including 1,3-DCB (58 µg/L), 1,4-DCB (230 µg/L), cis-1,2-DCE (36 µg/L),

PCE (15 µg/L), TCE (17 µg/L), and VC (0.9J 17 µg/L). Groundwater monitoring will occur every 5 years at IR Site 16 in accordance with the LUC RD (DON 2016).

2.2.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 16 is in place and there are no reported changes to the remedy that would affect its protectiveness.

For the commercial/industrial scenario, the total potential RME cancer risk (including background) for soil is 7×10^{-6}, which is within the risk management range. The RME HI (including background) is 0.1, which is less than the noncancer threshold of 1.

For the residential scenario, soil data were evaluated in depth intervals of 0 to 2 feet below ground surface (surface soil) and 0 to 8 feet below ground surface (surface soil and subsurface soil; herein called subsurface soil). For surface soil, the total RME cancer risk (including background) is 7×10^{-5} at IR Site 16, which is within the risk management range. The total RME HI for a child (including background) from surface soil is 1. For subsurface soil, the total RME cancer risk (including background) is 6×10^{-5}, which is within the risk management range. The total RME HI for a child (including background) from subsurface soil is 1.

The future land uses at IR Site 16 are recreational and commercial/industrial; therefore, the exposure assessment in the IR Site 16 HHRA (TtEC 2004) is reasonable and no additional exposure pathways need to be evaluated. Groundwater exposure pathways for the recreational and construction worker receptors were not considered complete at IR Site 16; therefore, groundwater was not evaluated for these receptors. Only inhalation of vapors from groundwater to indoor air was a potentially complete exposure pathway for the residential and commercial/industrial scenarios. For the commercial/industrial scenario, the total RME cancer risk is 9.6×10^{-6}, which is within the risk management range. The total RME HI of 0.04 is less than 1.

Changes in Exposure Assumptions and Toxicity Data

No changes in exposure assumptions or land use have occurred since the refined HHRA and ERA were conducted.

The toxicity values used for the COCs in the IR Site 16 HHRA (TtEC 2004) were primarily obtained from USEPA's IRIS database dated 2003. The toxicity values for COCs in soil and groundwater are current and no changes are needed except for TCE and PCE, that is only COCs in groundwater. In September 2011, the oral CSF for TCE was updated to 0.046 $(mg/kg\text{-}day)^{-1}$ (IRIS) compared to the previous CSF of 0.0013 $(mg/kg\text{-}day)^{-1}$. The UR_i for TCE was also updated (0.0000041 milligram per cubic meter $[mg/m^3]^{-1}$) as well as the oral reference dose (0.0005 mg/kg-day) and reference concentration (mg/m^3) (IRIS). In 2012, the oral CSF for PCE was updated to 0.54 $(mg/kg\text{-}day)^{-1}$ compared to the previous oral CSF of 0.052 $(mg/kg\text{-}day)^{-1}$ from the 2016 California OEHHA. The UR_i for PCE was updated (5.9E-06 $[\mu g/m^3]^{-1}$) as well as the reference dose (0.006 mg/kg-day) and reference concentration (0.04 mg/m^3) (IRIS). These updated toxicity values are more conservative than what was used in the HHRA and would result in higher indoor air concentration in DTSC's vapor intrusion. However, using 5 µg/L (MCLs) for TCE and PCE in DTSC's groundwater vapor intrusion model and conservative inputs, the risk results for TCE and PCE would be 2×10^{-7} and 3.5×10^{-7}, respectively, for the commercial worker. Therefore, the updated toxicity values for TCE and PCE do not affect the current remedy at IR Site 16. Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

The HHRA for IR Site 16 primarily used the default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's 2014 update (USEPA 2014) include: skin surface area, adult body weight, and resident exposure duration and exposure time, and worker adherence factor. Some of these factors are less conservative or more conservative so overall, the impact of these changes to the HHRA results does not affect the current remedy at IR Site 16.

Furthermore, the methods and assumptions used in the HHRA (TtEC 2004) to evaluate health risks for groundwater vapor intrusion to indoor air do not reflect current standards of practice (DTSC 2011; ITRC 2007; and USEPA 2015). In particular, soil and building property assumptions used in the HHRA differ significantly from current DTSC (2011) recommended values. In all cases, the DTSC (2011) recommended values are more conservative than those used in the HHRA. However, these changes do not impact the remedy at IR Site 16 that is currently based on regulatory values. No additional exposure pathways have been identified since land uses, zoning, and receptors at the IR site have not changed since the previous 5-Year Review.

The future land uses at IR Site 16 are recreational and commercial/industrial; therefore, the exposure assessment in the IR Site 16 HHRA (TtEC 2004) is reasonable and no additional exposure pathways need to be evaluated.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Site 16 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.2.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

2.2.6 Issues, Alameda Point, OU-1, IR Site 16

No issues have been identified at IR Site 16 that would currently or in the future prevent the respective remedies at this site from being protective of human health and the environment.

2.2.7 Recommendations and Follow-up Actions, Alameda Point, OU-1, IR Site 16

No recommendations or follow-up actions have been identified for IR Site 16.

2.2.8 Protectiveness Statement, Alameda Point, OU-1, IR Site 16

IR Site 16 is currently in the long term management stage of the CERCLA process. The remedy at IR Site 16 is protective of human health and the environment and is being implemented in accordance with the ROD (DON 2007) and ESD for groundwater (DON 2015).

2.3 OU-1, IR SITE 14

2.3.1 Site Description and Background, OU-1, IR Site 14

OU-1, IR Site 14 covers approximately 14.4 acres and is located on the northwestern edge of Alameda Point just south of Oakland Inner Harbor as shown in Figure 1-1. IR Site 14 is partially paved and was historically used for training firefighters, parking equipment, storing miscellaneous items, defueling planes, cleaning machinery, storing ordnance, maintaining vehicles, and storing fuel and used solvents. The site topography is relatively flat. IR Site 14 was designated as part of OU-1 because it is relatively small, with low levels of contamination related to historical use. IR Site 14 currently includes five buildings (Buildings 26, 120, 121, 122, and 388), open space, two closed ASTs (AST 96A and AST 96B) that stored non-potable water and petroleum, CAA-2, and several storm and sanitary sewer lines.

2.3.1.1 Land and Resource Use

The buildings at IR Site 14 are currently vacant and access to IR Site 14 is restricted. The *"Draft Master Infrastructure Plan, Alameda Point, Alameda, California"* (Carlson, Barbee & Gibson, Inc. 2013) designates long-term use of IR Site 14 as an open space preserve, with surrounding use as associated recreational and public access facilities such as trails and parks. Included in the proposed Northwest Territories plan is a Veterans Affairs (VA) Outpatient Clinic and National Cemetery, as described in *The Town Center and Waterfront Precise Plan* (City of Alameda 2014), proposed for construction on the southern portion of IR Site 14.

2.3.1.2 Current and Potential Groundwater Uses

Groundwater beneath IR Site 14 is not used for drinking water, irrigation, or industrial supply and meets the California State Water Resources Control Board (SWRCB) exemption criteria to de-designate the municipal supply beneficial use for portions of Alameda Point (Regional Water Board 2003). Lines of evidence for groundwater de-designation include proximity to San Francisco Bay and potential for salt-water intrusion, high salinity, current county restrictions on well installation in shallow groundwater, and the potential for surface runoff to contaminate groundwater.

A beneficial use evaluation conducted for the purposes of CERCLA cleanup decisions determined that groundwater in the western region of Alameda Point is unlikely to be used as a potential drinking water source, or for watering livestock, based on proposed land uses (TtEC 2000). High concentrations of TDS in groundwater (or the likelihood of saltwater intrusion if any significant pumping takes place) would require pretreatment, which would not be economical.

The USEPA stated that it is unlikely that groundwater in this area will be a potential source of drinking water in the future (USEPA 2000). This statement was based on the shallow depth of the aquifer in this area, the likelihood of saltwater intrusion if any significant pumping takes place, and the fact that no wells currently exist within or close to this area.

2.3.1.3 Site Chronology and Initial Response

On June 6, 1988, the DON received an RA Order from the California Department of Health Services (now DTSC) that identified IR Site 14 as requiring an RI and FS in conformance with the requirements of CERCLA. Table 2.3-1 summarizes major investigations and actions taken at IR Site 14.

TABLE 2.3-1: CHRONOLOGY OF SITE EVENTS – OU-1, IR SITE 14

Date	Event	Comments
1992	RCRA facility assessment	Identified and collected preliminary information on SWMUs and AOCs. Six SWMUs were identified at IR Site 14: GAP 9, GAP 11, WD 528, AOC 357, AST-174, and AST-528.
1998	Data Gaps Investigation	Data collected to (1) evaluate the nature and extent of the chlorinated VOC and TPH plume in groundwater, (2) support an HHRA for the site, and (3) characterize potential source of contamination at Site 14. Depth-specific groundwater samples were collected to evaluate the nature and extent of groundwater contamination. Soil samples were collected at GAP 9. Additional data collection was recommended.
2001	EBS	Identified management activities for both solid and hazardous wastes, including those present in soil, groundwater, surface water, and air. This review indicated that storage and treatment of hazardous wastes were regulated through two operating permits issued by the DTSC.
2001	Supplemental RI data gaps sampling	Investigation characterized the lateral and vertical extent of VOCs and TPH in groundwater, assessed the extent of dioxins in soil and the potential for migration of dioxin-contaminated soil, obtained additional PAH data to conduct the HHRA, collected additional information for the HHRA, and assessed possible preferential pathways associated with storm sewer lines. In 2001 and 2002, the extent of VOCs and TPH in groundwater was delineated, and the extent of dioxins was further delineated as part of the removal action for dioxin-contaminated soil. Storm sewers were determined not to be a pathway.
2001 - 2002	Removal action	1,400 yd^3 of dioxin-contaminated soil was removed from six areas. Remaining concentrations were below the ecologically based screening level and the human health-based cleanup goal.
2002 - present	BGMP sampling	IR Site 14 was incorporated into the BGMP to track MNA for select COCs stated in the ROD after ISCO.
June 2003	RI	Included the HHRA and ERA.
2003	FS	Determined that no further CERCLA action is necessary for soil at IR Site 14. Levels of contamination are low and do not pose an unacceptable risk to human health or the environment for current or future uses of IR Site 14.
August 2005	Supplemental FS	The DON re-evaluated the potential for human exposures through domestic use of groundwater under a hypothetical residential reuse risk scenario and concluded that there is an incomplete pathway for such exposures.
January 2007	ROD	Established an ITCT of 15 µg/L for VC in groundwater, with ISCO, monitoring, and ICs as the selected RA. After this cleanup goal is met, ICs can be terminated.
2007	Data gaps investigation	Provided additional vertical and horizontal lithologic and groundwater chemical data showing slight expansion of the VC contaminant plume since the delineation of the plume during the RI from 1998 to 2001.
December 2008	RD/RAWP	Provided detail on the implementation of the RA.
September 16, 2008	Implementation of ISCO RA	The RA of ISCO at IR Site 14 involved installation of 119 injection wells and 297 extraction wells. The ISCO treatment utilized a recirculation approach of iron-activated sodium persulfate. The 100,000 square foot target treatment area was divided into 17 areas, or "modules". Each module consisted of 22 extraction wells and seven injection wells. All RA field activities were conducted in accordance with the RD/RAWP.
August 27, 2009	ISCO RA Completion	The RA of ISCO was completed. IR Site 14 groundwater monitoring continued as part of the BGMP.
September 2010	Transition Technical Memorandum	Summarized unpublished results for ISCO, which decreased VC concentrations but did not achieve the IC termination criterion. The memorandum recommends MNA transition.
March 2011	MNA Work Plan	Outlined the rationale and decision to transition into MNA in accordance with the ROD to document the reduction in COC concentrations and verify the stability of any residual concentrations.
September 2011	Five-Year Review	The first Five-Year Review for IR Site 14 was conducted to assess if the selected remedy remains protective of human health and the environment.

TABLE 2.3-1: CHRONOLOGY OF SITE EVENTS – OU-1, IR SITE 14

Date	Event	Comments
		The Five-Year Review report confirms that the selected remedy is protective of human health and the environment.
March 2016	IR Site 14 IC Compliance Monitoring Report and Annual IC Compliance Certificate	The report certified that IR Site 14 is in compliance with the ICs and/or LUC requirements specified in the ROD.

Notes:
µg/L = Microgram per liter
AOC = Area of concern
AST = Aboveground storage tank
BGMP = Basewide Groundwater Monitoring Program
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
COC = Contaminant of concern
DON = United States Department of the Navy
DTSC = California Department of Toxic Substances Control
EBS = Environmental Baseline Survey
ERA = Ecological risk assessment
FS = Feasibility Study
GAP = General Accumulation Point
HHRA = Human health risk assessment
IC = Institutional control
ICTC = Institutional Control Termination Criteria
IR = Installation Restoration
ISCO = In situ chemical oxidation
MNA = Monitored natural attenuation
OU = Operable unit
PAH = Polycyclic aromatic hydrocarbon
RA = Remedial action
RAWP = Remedial Action Work Plan
RCRA = Resource Conservation and Recovery Act
RD = Remedial design
RG = Remediation goal
RI = Remedial Investigation
ROD = Record of Decision
SWMU = Solid waste management unit
TPH = Total petroleum hydrocarbon
VC = Vinyl chloride
VOC = Volatile organic compound
WD = Washdown
yd3 = Cubic yard

2.3.1.4 Basis for Taking Action

The basis for taking action at IR Site 14 was risk to residential receptors for inhalation of VC vapors from groundwater to indoor air. The total RME cancer risk (including background) at the ICTC would correspond to a potential cancer risk of 10^{-6}, which is within the risk management range (USEPA 1991).

2.3.2 Remedial Action, OU-1, IR Site 14

2.3.2.1 Remedy Selection (Record of Decision)

The RAO for groundwater at IR Site 14 is to protect future unrestricted recreational receptors.

Selection of the remedy was based on the findings of the RI report (TtEMI 2003b), the FS report (TtEMI 2003a), and the supplemental FS report (Sullivan Environmental Services, LLC, and Tetra Tech EC, Inc., a Joint Venture [SulTech] 2005); information provided in the administrative record for IR Site 14 presented in the ROD; and an evaluation of all comments on the PP (DON 2006) submitted by interested parties during the public comment period.

The IR Site 14 ROD dated January 31, 2007 (DON 2007), describes the selected remedy for groundwater at IR Site 14 as ISCO, monitoring, and temporary ICs. Temporary ICs are currently implemented and will remain in place until the concentrations of VC are at levels permissible for unrestricted use and exposure at the site.

TABLE 2.3-2: SHORT-TERM ICTC FOR GROUNDWATER, OU-1, IR SITE 14

COC	Short-term ICTC for Groundwater
VC	15 µg/L

Source: ROD (DON 2007)

Notes:
µg/L = Microgram per liter
COC = Contaminant of concern
ICTC = IC termination criteria
VC = Vinyl chloride

The *"Final Addendum 1 to the Final Sampling and Analysis Plan"* (SulTech 2010) recommended pursuing MNA as the RA strategy at IR Site 14. IR Site 14 currently is included in the BGMP until RAOs are achieved and the short-term ICs can be removed for unrestricted use.

2.3.2.2 Remedy Implementation

ISCO

A pilot test was conducted in October 2007 to assess the effectiveness of the ISCO process to reduce the contaminant mass in subsurface groundwater at IR Site 14 and to evaluate the effective radius of influence of the injected reagent. Full-scale implementation of ISCO was performed between September 2008 and August 2009 using a recirculation approach to deliver iron-activated sodium persulfate.

Groundwater Monitoring

IR Site 14 was included in the BGMP beginning in 2002. The site was transitioned to MNA as recommended in the draft Technical Transition Technical Memorandum (Battelle 2010) and outlined in the MNA Work Plan (Battelle 2011). The Preliminary Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016) recommends optimization at IR Site 14 by reducing the number of monitored wells by three wells. This recommendation to optimize the BGMP well network for the site was based on concentrations of VC below the ICTC of 15 µg/L (see Table 2.3-2). Select wells with concentrations of VC historically below reporting limits were decommissioned in spring 2015. The existing well network included in the BGMP will continue to be sampled quarterly until the RAO for VC is achieved.

Area Requiring Institutional Controls (ARIC)

The area requiring ICs encompasses the northern two-thirds of IR Site 14 (approximately 10 acres), with the area of concern being the plume with VC concentrations greater than 15 µg/L.

IC Performance Objectives

IC performance objectives are presented in the ROD (DON 2007) and the RD/RAWP (DON 2008) and are intended to maintain the integrity of the remedy until the cleanup levels are met. The IC performance objectives are implemented through land use restrictions for IR Site 14 as summarized below.

1. IR Site 14 areas subject to ICs shall not be used for the following purposes unless otherwise approved by the DON and FFA signatories:
    - A residence, including any mobile home or factory-built housing constructed or installed for use as residential human habitation
    - A hospital for humans
    - A school for persons under 21 years of age
    - A day care facility for children

- A playground
- Any permanently occupied human habitation other than those used for commercial or industrial purposes

2. The installation of new groundwater wells of any type is prohibited without prior review and written approval of the DON and FFA signatories until cleanup objectives have been achieved.
3. The alteration, disturbance, or removal of groundwater monitoring wells, groundwater extraction wells, treatment facilities, and associated equipment is prohibited without prior review and written approval from the DON and FFA signatories.
4. Removal of or damage to security features (such as locks on monitoring wells, site fencing, and signs) or to survey monuments, monitoring equipment, piping, and other appurtenances is prohibited without prior written approval from the DON and FFA signatories.

2.3.3 Progress Since the Last Five-Year Review, OU-1, IR Site 14

The protectiveness statement in the previous Five-Year Review stated: "RAs performed at IR Site 14 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place on base to prevent exposures to contaminated groundwater. ICs and land use controls (LUCs) are assessed annually. The selected remedy will continue to be protective."

A recommendation was made in the 2011 Five-Year Review report (KCH 2011) to continue monitoring and evaluating VC concentrations at IR Site 14 in accordance with the approved RD/RAWP (DON 2008), to ensure that the ICTC of 15 µg/L for VC in groundwater would be met within the DON's expected time frame of 3 years from the date of the last Five Year Review, or 2014. See Table E-2: Status of Issues and Recommendations Identified in the Alameda 2011 Five-Year Review in Appendix E.

Since 2011, VC concentrations continue to be monitored, evaluated, and reported in the BGMP report. The Preliminary Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016) states that there is some fluctuation in VC concentrations; however, values do not exceed historical maximums. Low concentrations of dissolved ethane and ethane suggest that ethanogenesis likely is contributing to natural attenuation. Since the inception of monitoring (2008), the occurrence of VC concentrations exceeding the ICTC in wells has declined from eight to five wells; the general areal footprint of the plume has declined; and downgradient migration has stabilized. The most recent exceedance of the ICTC occurred in monitoring well M14-15, with a concentration of 26 µg/L in Spring 2015. Monitoring well M14-06 has shown a decline from 73 µg/L in Fall 2014 to 7.3 µg/L in Spring 2015.

Select wells with concentrations of VC consistently below reporting limits were decommissioned in Spring 2015 bringing the monitoring well network at Site 14 to eight wells.

2.3.4 Five-Year Review Process, OU-1, IR Site 14

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 14. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.3.4.1 Site Inspection

The site inspection confirmed that wells within the MNA network are in good condition and that the ICs are implemented as intended by the ROD and are protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B

provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Site 14.

2.3.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 14. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response:

"Although there are no changes in site conditions, conditions have not been improved and concentrations of contaminants have not been reduced at some well locations as expected within the estimated time frame stated in the ROD. An evaluation will be needed to re-assess the current remedy for Site 14."

DTSC Response: No comments.

Regional Water Board Response: No comments.

Community Interview Response: No comments

2.3.5 Technical Assessment, OU-1, IR Site 14

RAOs stated in the ROD continue to be met for IR Site 14 groundwater. VC concentrations in monitored wells at IR Site 14 exceeding the ICTC (15 µg/L) only exist in one remaining well (M14-15), indicating VC plume area reduction. The site is located in an area of Alameda Point currently restricted by fencing. After removal of the security fence, the ICs will remain protective because the planned use is open space preserve, with surrounding use as associated recreational and public access facilities such as trails and parks place. The VA Outpatient Clinic and National Cemetery proposed for construction on the southern portion of IR Site 14 will be outside of the IC boundary; however, design parameters for the VA development will consider the ICs and current site status. Annual inspections also demonstrate that no unauthorized activities have occurred at IR Site 14 over this 5-Year Review period. Table 2.3-3 provides the technical assessment summary for IR Site 14.

PFCs have been identified as an emerging contaminant in drinking water. Historical use of IR Site 14 as a fire fighting training area indicates the potential for release of compounds known to contain PFCs. The beneficial use designation for groundwater at IR Site 14 does not include use for drinking water; however, the DON is closely monitoring regulatory and technical developments related to PFCs and proactively evaluating an appropriate approach for PFCs at IR Site 14. Pending developments, further status may be reported in the next Five-Year Review (2021) and/or a separate report (e.g. site-specific evaluation, BGMP Report).

TABLE 2.3-3: TECHNICAL ASSESSMENT SUMMARY, OU-1, IR SITE 14

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 14	Groundwater - ISCO, MNA, and ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification
IR = Installation Restoration
ISCO = In situ chemical oxidation
MNA = Monitored natural attenuation
OU = Operable unit

2.3.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedy is functioning as intended by the decision documents and is in compliance with the LUC RD as indicated by review of documents, data collected within this Five-Year Review period, site inspections, and interviews. The documents that detail the remedial decisions for IR Site 14 are the ROD (DON 2007), RD/RAWP (DON 2008), and the draft Technical Transition Technical Memorandum (Battelle 2010).

ICs currently in place and Annual Compliance and Inspection Reports ensure protection of human health and the environment. ICs will remain in place until the RAO termination criterion (15 µg/L for VC) has been achieved. The ROD (DON 2007) stated that the selected remedy would treat contaminated groundwater at IR Site 14 within three years of remedy implementation for a projected goal of 2013, to meet RGs. ICs remain in place until RAOs are achieved.

Opportunities for Optimization

The Preliminary Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016) recommended optimization of the BGMP by reducing the number of wells monitored in the BGMP from nine wells to six wells. This recommendation to optimize the BGMP well network for the site is based on concentrations of VC historically declining to below the ICTC of 15 µg/L. Select wells with concentrations of VC historically below reporting limits were decommissioned in Spring 2015. The existing well network included in the BGMP will continue to be sampled semi-annually until the RAO for VC is achieved.

Performance of Groundwater Remedy

Since 2008, VC concentration trends in the eight wells currently monitored at IR Site 14 have declined (six wells) or are, on average stable, (two wells: M14-06 and M14-15). As shown in Figure 2.3-1, VC concentrations have declined to concentrations below the ICTC for VC in all wells monitored except one, M14-15 (26 µg/L in Spring 2015). Well M14-06 has exhibited an average flat trend with no apparent seasonal pattern, although the degree of variance in VC concentrations since 2009 ranges from 6 µg/L (discounting the anomalous Fall 2010 0.5U µg/L) to 120 µg/L. The reduced concentrations and subsequent rebound observed for VC at well M14-06 in Fall 2010 was a two order-of-magnitude change (from less than 100 µg/L to less than 1.0 µg/L and back to near 100 µg/L), not unlike similar drop-and-rebound changes observed at wells M14-15, M14-09D, M14-20D at various times. The VC concentration in monitoring well M14-15 was 26 µg/L in Spring 2015. VC concentration trends for all wells monitored are declining or stable. The Spring 2015 monitoring data in the Preliminary Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016) indicates that there is some fluctuation in VC concentrations; however, no values exceed historical maximums. Additionally, four wells exhibited historical low VC concentrations during the 2014-2015 monitoring period and the low concentrations of dissolved ethane and ethene suggesting that ethanogenesis likely is contributing to natural attenuation (MMEC 2016).

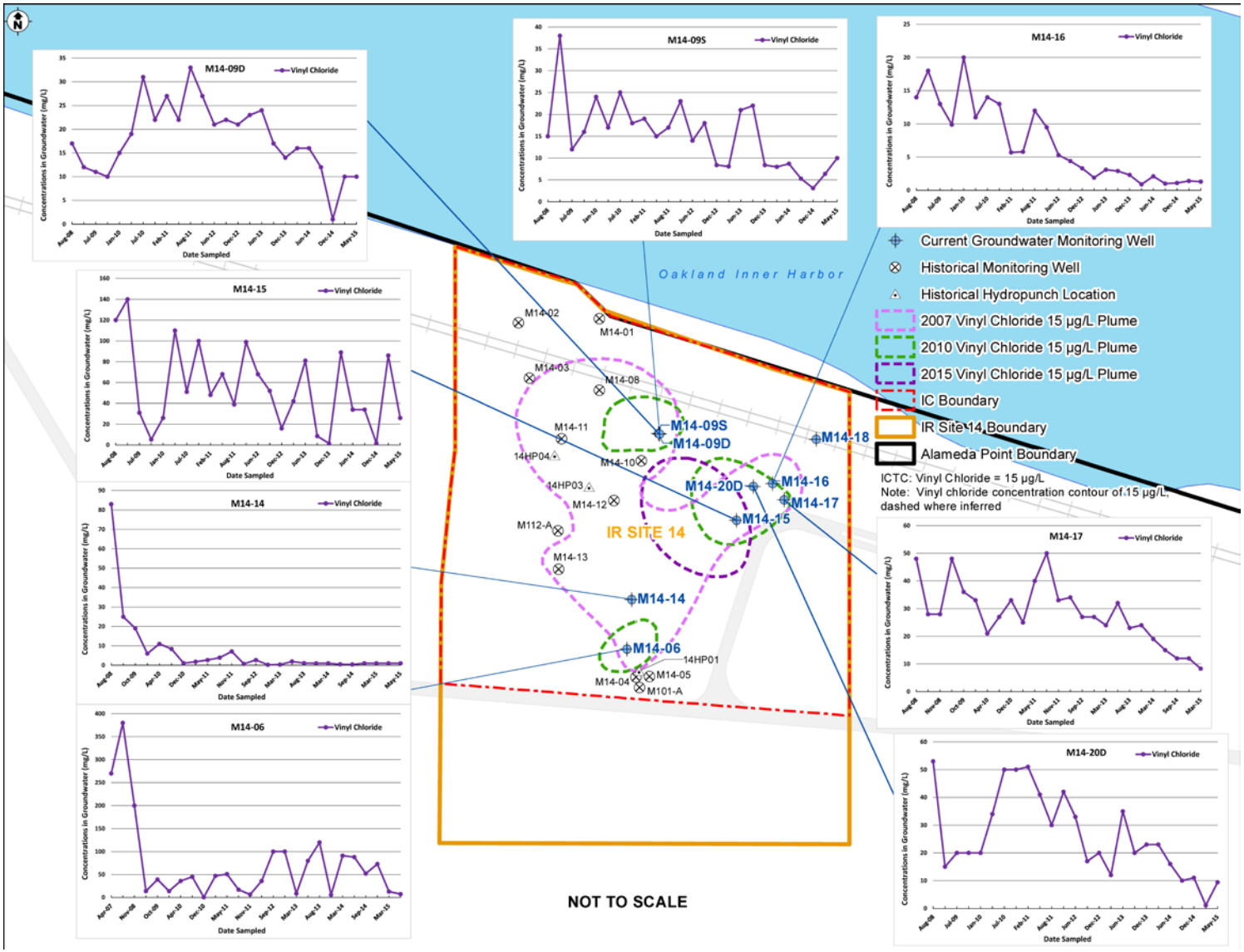
Although wells exhibiting average stable trends (M14-06 and M14-15) have not attained consistent VC concentrations below ICTC within five years of ISCO implementation, the plume area has reduced in surface area. Between 2011 and 2016, the plume area concentrations exceeding the ICTC decreased from approximately 136,000 square feet to 28,900 square feet, a reduction in size of approximately 79% further

indicating a reduction in mass. With continued plume collapse from the edges inward, the elevated core concentrations will remain recalcitrant until on-going natural attenuation mitigates the remaining lateral contaminant mass. The flat trends of the core wells, M14-06 and M14-15, do not currently predict when that may occur.

2.3.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 14 is in place and there are no reported changes to the remedy that would affect its protectiveness.

FIGURE 2.3-1: VC CONCENTRATION TRENDS IN THE FWBZ, OU-1, IR SITE 14



Source: BGMP Report (MMEC 2016)

Based on all exposure pathways for IR Site 14, total cancer risks—which include risk from background metals—calculated for recreational users and occupational and construction workers are on the lower end of USEPA risk management range of 10^{-6} to 10^{-4} and the noncancer HIs are less than 1. For the residential scenario at IR Site 14, risks were within the risk management range.

The indoor air risk estimate for residential receptors was within the risk management range. The RME cancer risk is 5×10^{-5}, and the revised RME noncancer HI is 0.2. The primary groundwater risk driver was VC for the vapor intrusion pathway.

Changes in Exposure Assumptions and Toxicity Data

No changes in exposure pathways, toxicity, or land use have occurred since the HHRA and ERA were conducted.

The UR_i factor for VC used in the Johnson & Ettinger model was 7.8×10^{-5} micrograms per cubic meter (µg/m^3) and the reference concentration was 1×10^{-1} µg/m^3. Upon review of the OEHHA database and USEPA's IRIS, these toxicity values are current. The VC UR_i factor provided in USEPA's IRIS of 4.4×10^{-6} µg/m^3 is slightly less health protective than the unit risk factor used in the HHRA from the OEHHA database. Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

The HHRA for IR Site 14 primarily used the default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's 2014 update include: skin surface area, adult body weight, and resident exposure duration and exposure time, and worker adherence factor. Some of these factors are slightly less conservative and more conservative; so overall, the impact of these changes to the HHRA results does not affect the current remedy at IR Site 14.

The methods and assumptions used in the HHRA to evaluate health risks for groundwater vapor intrusion to indoor air do not reflect current standards of practice (DTSC 2011; ITRC 2007; and USEPA 2015). In particular, the site-specific soil and building property assumptions used in the HHRA differ significantly from current DTSC (2011) recommended values. In general, the DTSC (2011) recommended default values are more conservative than those used in the HHRA. In 2014, USEPA Region 9 also released the indoor air action level for TCE of 2 µg/m^3 for pregnant women in their first trimester.

However, because the calculated RAO for VC for a hypothetical future resident from inhalation of indoor air is based on the more conservative residential scenario, it is assumed that the RAO continues to be protective of the future occupational and recreational receptors, in addition to potential patients that visit the proposed VA Clinic and Columbarium at IR Site 14. The calculations were performed using the most conservative toxicity values (OEHHA) that are current and valid. No additional exposure pathways have been identified since land uses, zoning, and receptors at the IR site have not changed since the previous 5-Year Review. The conclusions of the HHRA are currently valid and continue to be protective of human health.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Site 14 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific,

and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.3.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

2.3.6 Issues, OU-1, IR Site 14

No issues have been identified at IR Site 14 that would currently or in the future prevent the respective remedy at this site from being protective of human health and the environment. VA redevelopment and design will have impacts even if the outpatient clinic is outside of the IC boundary; however, design parameters for the VA development will consider the ICs and current site status.

2.3.7 Recommendations and Follow-up Actions, OU-1, IR Site 14

The DON will increase groundwater monitoring to quarterly and continue reporting VC concentrations in groundwater under the BGMP. Protectiveness Statement, OU-1, IR Site 14

The RAs performed at IR Site 14 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposures to contaminated groundwater. ICs and LUCs are assessed annually. IR Site 14 is currently in the remedial action operations stage of the CERCLA process. The selected remedy will continue to be protective.

2.4 OU-2A, IR SITES 9, 13, AND 19

2.4.1 Site Description and Background, OU-2A, IR Sites 9, 13, and 19

OU-2A consists of IR Site 9, IR Site 13, IR Site 19, IR Site 22, and IR Site 23. This section discusses the protectiveness of each selected remedy for IR Sites 9, 13, and 19. The ROD (DON 2012a) for OU-2A states “No Action” as the selected remedy for IR Sites 22 and 23 soil and groundwater. Therefore, these two sites will not be discussed further. Figure 1-1 shows the locations of IR Sites 9, 13, and 19.

IR Site 9 covers approximately 2.9 acres in the southeastern area of Alameda Point. The site contains two buildings, building 410, constructed in 1958 and used as an aircraft paint stripping facility, has been used for storage since the early 1990s and building 351 which served as a support building for Building 410 housing lunch and locker rooms. The Industrial Waste Treatment Plant (IWTP) 410 in Structure 588 east of Building 351 was used to treat paint stripping wastes and was closed as required by a RCRA permit. In 1988, the DTSC certified closure of the IWTP.

IR Site 13 covers 17.5 acres northeast of IR Site 9 along the east-central border of Alameda Point. IR Site 13 includes Building 397, which was constructed in 1958 and used as an aircraft overhaul plant and engine test facility. Most of the remaining portions of the site are either paved or open space. IR Site 13 formerly contained Buildings 298 and 401, Structure 258, and underground fuel lines from Building 397 to Building 372. The Pacific Coast Oil Works Company petroleum refinery operated at the site from 1879 until 1903; however, no refinery structures remain at IR Site 13. It is assumed that refinery wastes and asphaltic residues were disposed of at IR Site 13 and surrounding tidal lands and those wastes are referred to as tarry refinery waste (TRW). The RA area for IR Site 13 consists of the area south of West Oriskany Avenue; the area north of West Oriskany Avenue was transferred to the City of Alameda in 2013 with legal limitations and restrictions on future land use.

IR Site 19 covers approximately 2.3 acres north of IR Site 9 and west of IR Site 13 in east-central Alameda Point. IR Site 19 currently contains two structures, building 616 built in 1982 for office and storage space, and Yard D-13, a RCRA-permitted hazardous waste storage area prior to 1996. DTSC certified closure of Yard D-13 in 1999. Building 609, demolished in 1991, was constructed in 1975 and used for building and storing engines. Two on-site USTs designated for spill control were never used and were closed in place.

2.4.1.1 Land and Resource Use

Current land use at IR Sites 9, 13, and 19 includes parking of boats and recreational vehicles and storage facilities, as well as activities related to general maintenance and security. Future land use for IR Sites 9, 13, and 19 is commercial mixed use, including office space, research and development, warehousing, light industrial use, maritime industrial use, manufacturing, service and commercial use, retail space, and residential housing, where appropriate. Because the reuse plans include components of residential reuse, the risk assessments evaluated both residential and commercial exposure scenarios, with residential use representing the greatest potential exposure to contamination.

2.4.1.2 Current and Potential Groundwater Uses

The DON and the regulatory agencies have evaluated the potential use of shallow groundwater adjacent to and beneath OU-2A as a future drinking water source. The DON submitted a letter to the Regional Water Board, dated August 6, 2012 (DON 2012b), which requested an exception for shallow groundwater use. The lines of evidence included proximity to San Francisco Bay and potential for salt-water intrusion, high salinity, current county restrictions on well installation in shallow groundwater, and off-site groundwater plume migration. The Regional Water Board concurred with the DON's exception request for groundwater beneath IR Sites 9, 13, and 19 in a letter dated, September 13, 2012 (Regional Water Board 2012) included in Appendix E (also Figure 2 – Extent of Former Alameda Island Circa 1859).

2.4.1.3 Site Chronology and Initial Response

Table 2.4-1 summarizes major investigations and actions taken at IR Sites 9, 13, and 19. These investigations are described in detail in the ROD (DON 2012a).

TABLE 2.4-1: CHRONOLOGY OF SITE EVENTS – OU-2A, IR SITES 9, 13, AND 19

Date	Event	Comments
1940	TRW removal action	Involved a 30- by 30-foot excavation to the depth of the TRW at IR Site 13. TRW was removed from the excavation and replaced with a concrete slab. The excavation was backfilled with the excavated material. The removal action was conducted to mitigate previous subsurface gas pressure build-up and surface rupture in the area.
March 1993	Removal action	Conducted at IR Site 13 at five areas around Building 397 because of a JP-5 fuel leak inside the building. Fuel entered the storm drain system and leaked into surrounding soil. Free product recovery wells were installed in two excavation areas.
2002	Supplemental RI data gaps sampling	Additional sampling was performed to fill data gaps from previous investigations. Data collected allowed further assessment of the conceptual site model.
2003	TRW delineation investigation	Involved terrain conductivity mapping to delineate the subsurface location of the TRW in surrounding soil.
2005	RI	Presented the HHRA and ERA and discussed the nature and extent of contamination, conceptual site model, and other studies based on findings of previous investigations conducted at OU-2A, IR Sites 9, 13, 19, 22, and 23.

TABLE 2.4-1: CHRONOLOGY OF SITE EVENTS – OU-2A, IR SITES 9, 13, AND 19

Date	Event	Comments
2005 - 2006	Removal action	Separate ISCO injections were conducted at IR Site 9 to target high concentrations of cis-1,2-DCE and VC in groundwater.
2008	TRW investigation	During this follow-on investigation, SCAPS and LIF were used to assess the horizontal and vertical extent, concentration, and types of contaminants in TRW at IR Site 13.
2009 - 2010	Data gaps sampling IR Sites 9, 13, and 19	Additional sampling was conducted as recommended in the RI Report.
January 2011	Work Plan	Presented the design and implementation of DVE and free product recovery at IR Site 9. This portion of the response action is under the Alameda Point Petroleum Program.
June 2011	FS	Presented the updated conceptual site model based on the data gaps investigations and the development and evaluation of remedial alternatives to address risks to human-health and the environment. In addition, the report presents the results of the updated HHRA for IR Sites 9, 13, 19, 22, and 23 conducted in consultation with the regulatory agencies.
August 2011	PP	Outlined the proposed remedial alternative of MNA and ICs for IR Sites 9 and 19, and ISB, MNA, and ICs for IR Site 13. A Public Meeting was held August 31, 2011, with a Public Comment Period from August 24 through September 24, 2011. Based on the HHRA, NFA was proposed for soil.
September 2012	ROD	Outlined the selected remedial alternative of MNA and ICs for IR Sites 9 and 19, and ISB, MNA, and ICs for IR Site 13. Based on the HHRA, NFA was required for soil.
December 2012	Technical Memorandum for TRW	Presented historical information on the origin of TRW, which was created by the Pacific Coast Oil Works Refinery from 1879 to 1903.
March 2014	LTMP	Described the approach to monitor groundwater at IR Site 13. The LTMP also discussed the purpose and objectives, groundwater sample collection methods, analytical laboratory requirements, and frequency for groundwater monitoring.
April 2014	RD/RAWP issued	Discussed activities undertaken to implement the selected remedies for groundwater stated in the ROD for IR Sites 9, 13, and 19.
June 30, 2014	RA Implementation of at IR Site 13	The RA for IR Site 13 began with the installation of 69 soil borings (first phase) in support of the RA. Follow on phases included in the RA were the installation of 54 biovents and DPT injections (three separate DPT injection events). All RA field activities were conducted in accordance with the RD/RAWP.
March 23, 2015	RA Completion at IR Site 13	The RA for IR Site 13 was completed. Groundwater monitoring in accordance with the LTMP continued for further evaluation of the ISB RA.
December 2015	Annual Remedial Action Operations and Monitoring Report	Describes the activities undertaken to implement the groundwater remedies selected in the ROD and monitoring results for OU-2A, IR Site 13.
March 2016	IC Compliance Monitoring Report and Annual IC Compliance Certificate	Certified that ICs for IR Sites 9, 13, and 19 are in compliance with the requirements specified in the ROD.

Notes:
DCE = Dichloroethene
DVE = Dual-phase vapor extraction
ERA = Ecological risk assessment
FS = Feasibility Study
HHRA = Human health risk assessment
IC = Institutional control
IR = Installation Restoration
ISB = In situ bioremediation
ISCO = In situ chemical oxidation
LIF = Laser-Induced Fluorescence
LTMP = Long-term Monitoring Plan
MNA = Monitored natural attenuation
NFA = No further action
OU = Operable unit
PP = Proposed plan
RAWP = Remedial Action Work Plan
RD = Remedial design
RI = Remedial Investigation
ROD = Record of Decision
SCAPS = Site Characterization and Analysis Penetrometer System
TRW = Tarry refinery waste
VC = Vinyl chloride

2.4.1.4 Basis for Taking Action

The identification of groundwater COCs at IR Sites 9, 13, and 19 was based on human health risk considerations and potential ARARs. Prior to groundwater beneficial use evaluation, MCLs were ARARs; however, MCLs are no longer applicable. The total cancer risk was within the risk management range of 10^{-4} to 10^{-6}. Based on groundwater evaluation at OU-2A, groundwater at IR Sites 9, 13, and 19 does not meet the drinking water standard. Soil at OU-2A is NFA based on conclusions in the ROD (DON 2012a) and is not further evaluated.

IR Site 9

Residual concentrations of contaminants at IR Site 9 are above drinking water MCLs: therefore, prior to the beneficial use evaluation, the ROD established ICs to restrict the domestic use of groundwater at IR Site 9. The vapor intrusion pathway was evaluated as within the risk management range for residential reuse with VC as the primary risk driver. In the ROD, the no action alternative was selected and deemed protective for vapor intrusion.

IR Site 13

Human health risks for residential reuse from vapor intrusion, primarily from benzene in groundwater, were identified at IR Site 13 (DON 2012b) south of West Oriskany Ave; therefore, a response action was necessary to protect human health from actual or potential releases.

IR Site 19

Residual concentrations of contaminants at IR Site 19 are above drinking water MCLs: therefore, prior to the beneficial use evaluation, the ROD established ICs to restrict the domestic use of groundwater at IR Site 19. The vapor intrusion pathway was evaluated as within the risk management range for residential reuse with PCE, TCE, and VC as the primary risk drivers. In the ROD, the no action alternative was selected and deemed protective for vapor intrusion.

2.4.2 Remedial Action, OU-2A, IR Sites 9, 13, and 19

2.4.2.1 Remedy Selection (Record of Decision)

The following are the RAOs for IR Sites 9, 13, and 19:

- Minimize the potential for domestic use of groundwater at IR Sites 9, 13, and 19 containing COCs at concentrations exceeding the established target RGs
- Minimize the potential for exposure of on-site receptors to COC vapors from groundwater at concentrations exceeding the established RGs

IR Sites 9 and 19

The selected remedy for IR Sites 9 and 19 consists of ICs to prohibit the municipal and domestic use of groundwater. Because the beneficial use evaluation for groundwater at IR Sites 9 and 19 was changed to indicate that groundwater does not meet the criteria for a potential drinking water source, MNA was removed as a component of the selected remedy. The RAO stated in the ROD (DON 2012a) is ICs only. The remedy includes CERCLA Five-Year Reviews, annual inspections, and reporting for IC compliance.

IR Site 13

The selected remedy for IR Site 13 consists of ISB, MNA, and ICs. ISB was implemented to treat COCs present in groundwater south of West Oriskany Avenue at IR Site 13. Performance monitoring was conducted periodically during implementation of bioremediation to assess the concentrations of remaining COCs in the subsurface and MNA will continue until RGs are met. The remedy also includes CERCLA Five-Year Reviews, annual inspections, and reporting for IC compliance (Cape and Geosyntec Consultants [CGC] 2014b).

TABLE 2.4-2: RGS FOR GROUNDWATER, OU-2A, IR SITE 13

COC	Residential RG for LUC Termination	Commercial RG RA Termination Criteria
Benzene	11.26 µg/L	37.84 µg/L
Ethylbenzene	31.46 µg/L	105.69 µg/L

Source: ROD (DON 2012)

Notes:
µg/L = Microgram per liter
LUC = Land-use control
RA = Remedial action
RG = Remediation goal

Figure 2.4-1 shows IC boundaries for IR Sites 9 and 19 as well as the RA area, select groundwater results, and the vapor intrusion IC boundary for IR Site 13.

2.4.2.2 Remedy Implementation

IR Sites 9 and 19

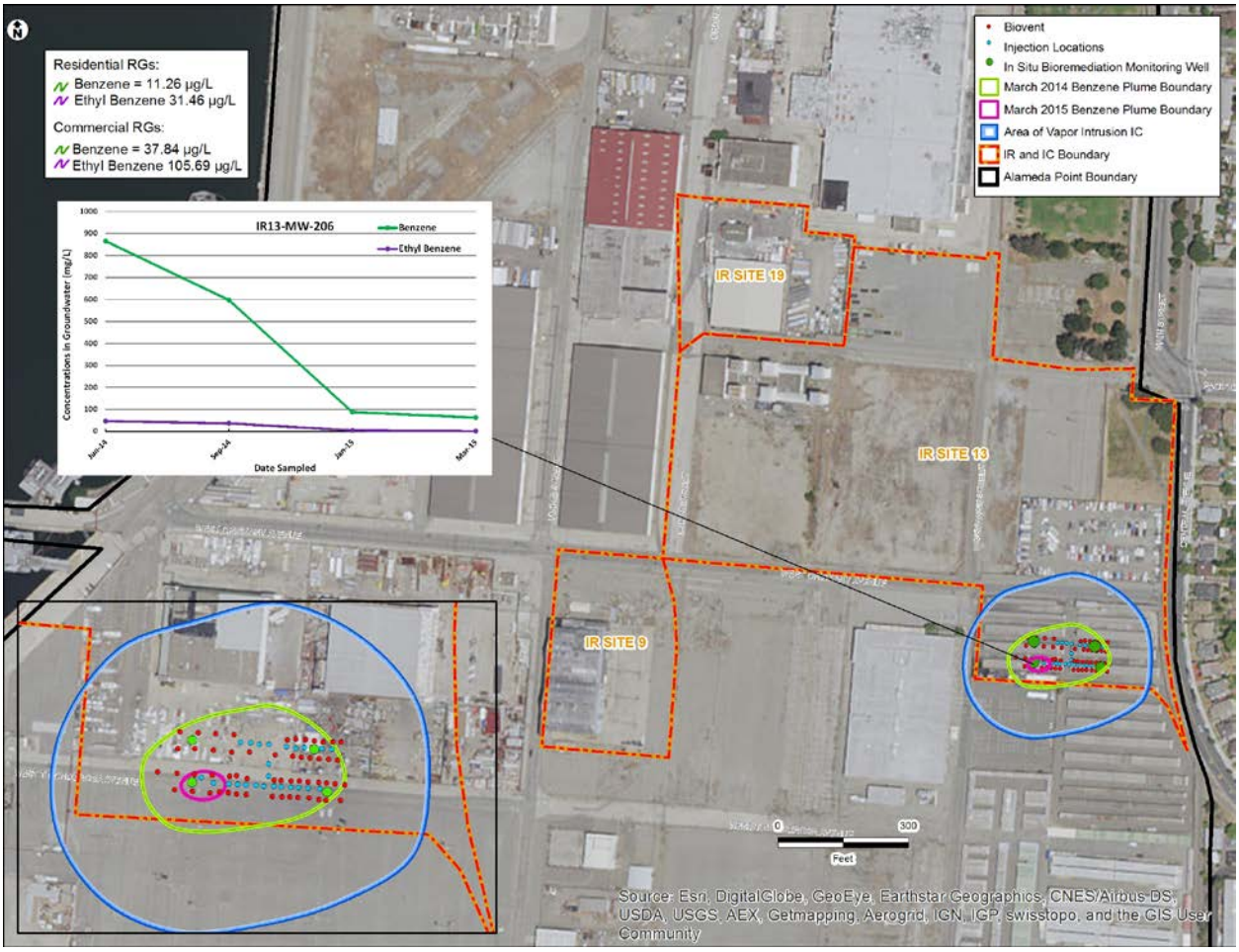
As stated in the RD/RAWP (CGC 2014b), LUCs in the form of ICs were implemented until IR Sites 9 and 19 are safe for unrestricted use.

IR Site 13 ISB

The remedial action consists of three primary elements: implementation of auger borings, installation of bioventing wells, and direct-push ISCO injections. Overall, these elements provide oxygen (from the atmosphere and decomposition of calcium peroxide) to the target zone, as well as increase soil permeability, partially oxidize hydrocarbons (Klozur®CR) to stimulate biological activity, and buffer groundwater potential of hydrogen (pH) (using limestone backfill and calcium peroxide).

O&M activities were performed on a monthly basis after completion of the remedial actions, beginning in September 2014.

FIGURE 2.4-1: IC BOUNDARIES AND ISB TREATMENT AREA, OU-2A, IR SITES 9, 13, AND 19



Source: RD/RAWP (CGC 2014b)

In accordance with the RD/RAWP (CGC 2014b) and the Long-Term Monitoring Plan (LTMP) (CGC 2014a), the first year of groundwater monitoring was conducted during four events from June to March 2015. An additional year of performance groundwater monitoring is planned for IR Site 13 (CGC 2014a). Figure 2.4-1 shows results for post-ISB performance groundwater monitoring.

According to the Remedial Action Operations and Monitoring Report (Geosyntec 2015), the implementation of ISB has been successful; benzene and ethylbenzene concentrations across the site have decreased by more than 90 percent on average. Concentrations of both COCs are below residential RGs in three out of four wells (IR13-MW-204, IR13-MW-205 and IR13-MW-207). Concentrations of benzene (62.9 µg/L) in monitoring well IR13-MW-206 continue to exceed the residential RG; however, concentrations of COCs in this well are 78 percent below historical maximums. Figure 2.4-1 depicts two graphs illustrating decreasing COC trends in select wells (IR13-MW-205 and IR-MW-206) at IR Site 13.

IC Performance Objectives

IC performance objectives are presented in the ROD (DON 2012a) and the RD/RAWP (CGC 2014b) and are intended to maintain the integrity of the remedy until the cleanup levels are met. The IC performance objectives to be implemented through land-use restrictions for IR Sites 9, 13, and 19 are summarized below.

- Installation of new groundwater wells of any type is prohibited without prior review and written approval of the FFA signatories until RGs have been achieved.
- Alteration, disturbance, or removal of groundwater monitoring wells, groundwater remediation wells, treatment facilities, and associated equipment is prohibited without prior review and written approval from the FFA signatories.
- Removal of or damage to security features (such as locks on monitoring wells, site fencing or signs) or to survey monuments, monitoring equipment, piping or other appurtenances is prohibited without prior written approval from the DON.
- IR Site 13 only - Construction of any new residential building that does not include the installation of an approved vapor control system until vapor intrusion RGs are met is prohibited in the areas of IR Site 13 subject to vapor intrusion ICs.

2.4.3 Progress Since the Last Five-Year Review, OU-2A, IR Sites 9, 13, and 19

This is the first Five-Year Review for IR Sites 9, 13, and 19.

2.4.4 Five-Year Review Process, OU-2A, IR Sites 9, 13, and 19

This section discusses activities performed during the Five-Year Review process for IR Sites 9, 13, and 19. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.4.4.1 Site Inspection

The site inspection confirmed that the monitoring well network for performance monitoring at IR Site 13 is in good condition. All three sites contain boundary fencing and posted signage, which are all in good condition. ICs outlined in the ROD (DON 2012a) are operating as intended and are protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Sites 9, 13, and 19.

2.4.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Sites 9, 13, and 19. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response:

"Site 13: The dissolved oxygen (DO) concentration at IR13-MW-206 is quite low while the benzene and ethylbenzene concentrations remain above commercial cleanup levels. In addition, the powered fans have

not operated continuously, so air is not being injected to increase the DO levels. Since DO is required for effective biodegradation of benzene and ethylbenzene, it may take additional time before this area is ready to transition to MNA, particularly give the likely water table rise during the El Nino storms expected in late winter and spring. In addition, the potential for rebound should be considered – long-term monitoring will be necessary to ensure that rebound does not occur."

DTSC Response: No comments.

Regional Water Board Response:

"IR Site 13 contains a site with an historical refinery waste management unit of tarry refinery waste (TRW). It was closed under CERCLA based on the petroleum being co-located with some CERCLA contamination. Based on our recent review, the HHRA conducted for IR Site 13 did not specifically address risks associated with waste management unit of TRW. Instead, a HHRA for IR Site 13 averaged the data for TRW area across the 17.5 acres of IR Site 13."

"The IR Site 13 ROD and FOST specified that after transfer to the City of Alameda, that the Water Board reserved its right to continue regulating the site. Since the site transferred, Water Board staff have been working with the City of Alameda to investigate paths forward to ensure that the nuisance associate with TRW is safely managed into the future. However, at this time, it appears that the risk assessment completed may not have been appropriate for a waste management unit and there may be risk, as well as nuisance, associated with the waste. In addition, it appears that the impacts to groundwater from the TRW may not have been effectively evaluated."

"As we move forward with additional site evaluation, we may uncover additional information. At this time, the parcels containing TRW are open cases being regulated by the Water board."

Community Interview Response: No comments.

2.4.5 Technical Assessment, OU-2A, IR Sites 9, 13, and 19

The RAOs stated in the ROD (DON 2012a) are being met by implementation of ICs at IR Sites 9 and 19 that prohibit the use of groundwater. The recent RA of ISB at IR Site 13 has shown significant reductions in COC concentrations in groundwater. ICs and LUC restrictions continue to ensure protection of human health at IR Site 13.

TABLE 2.4-3: TECHNICAL ASSESSMENT SUMMARY, OU-2A, IR SITES 9, 13, AND 19

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Sites 9 and 19	Groundwater - ICs	Yes	Yes	No	Protective	2021
IR Site 13	Groundwater – ISB, MNA, and ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification
IR = Installation Restoration
ISB = In situ bioremediation
MNA = Monitored natural attenuation
OU = Operable unit

2.4.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedies are functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remedy implemented for IR Sites 9, 13, and 19 are working as intended by the ROD (DON 2012a). ICs continue to be implemented as intended by the ROD for IR Sites 9, 13, and 19. ISB has been implemented at IR Site 13 and performance groundwater monitoring is ongoing. Upon completion of performance groundwater monitoring, transition to the MNA component of the selected remedy will be evaluated based on decision criteria. Once COCs satisfy MNA termination criteria, ICs will remain in place at IR Site 13 to continue protecting human health and environment. The ROD (DON 2012a) stated that the selected remedy would treat contaminated groundwater at IR Site 13 within five years of remedy implementation for a projected goal of 2019, to meet RGs. ICs remain in place until RAOs are achieved.

System Operations and O&M

System Operations and O&M are not applicable for IR Sites 9 and 19. A full description and results of the most recent system O&M activities for IR Site 13 are available in the Remedial Action Operations and Monitoring Report (Geosyntec 2015).

Cost of System Operations and O&M

The monthly O&M cost for IR Site 13 is approximately $8,201, and the approximate cost for quarterly groundwater monitoring is $8,990.

Opportunities for Optimization

The Remedial Action Operations and Monitoring Report (Geosyntec 2015) discusses the details summarized below regarding optimization of the treatment area at IR Site 13.

After review of data from the first DPT injection event and the first performance groundwater monitoring event, the second DPT injection locations were focused in areas containing high concentrations of benzene and ethylbenzene (IR13-MW-206).

The layout of the second and third DPT injection events optimized the delivery of the reagent doses (calcium peroxide and Klozur® CR, respectively) based on the performance monitoring data. Groundwater monitoring and biovent monitoring data were used to select the layouts and dose of reagent across the site.

The second and third DPT injection events used two optimized injection intervals: 8 to 12 feet bgs and 10 to 14 feet bgs, respectively. The adjustments to the depth intervals were based on updates to the conceptual site model (groundwater elevation data and MIP investigation results) within the area where the third DPT injection was focused.

Lastly, the biovent fans were optimized to accommodate observed fluctuations in the groundwater table related to seasonal factors including response to rain events and winter tides. Wind-driven biovent fans were in service throughout the operational period. Powered air injection fans were operated when the biovent well screens were not submerged.

Performance of Groundwater Remedy

ISB currently is in the performance groundwater monitoring phase, and the next phase is transition to the MNA component of the remedy. It is anticipated that the plume will continue to reduce in size and

concentration, leading to additional opportunities for optimization such as reduction of the groundwater monitoring network, sampled analytes, or sampling frequency.

2.4.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedies for IR Sites 9, 13, and 19 are in place and there are no reported changes to these remedies that would affect their protectiveness.

The total lifetime cancer risks for residential scenarios are within the USEPA cancer risk management range of 1×10^{-6} to 1×10^{-4} when USEPA toxicity values are used in the risk calculations. Using the OEHHA toxicity values, the total lifetime cancer risks of the resident exposed to surface soil are within the USEPA cancer risk management range, but the cancer risk of the resident exposed to surface/subsurface soil exceeds the risk management range. However, if background constituents are excluded, the lifetime cancer risks for this receptor equal the upper limit of the lifetime cancer risk management range when OEHHA toxicity values are used. The lifetime cancer risks for the commercial worker, using USEPA toxicity values, are less than the risk management range, which indicates negligible risk equal to the lower end of the cancer risk management range.

The HI of 3 for the resident exposed under the surface soil scenario exceeded the target HI value of 1. However, if the contribution of background is excluded, the HI does not exceed a value of 1. The resident exposed under the surface/subsurface soil scenario had an HI of 6 at Site 9 and 3 at Sites 13 and 19, which also exceeded the target HI value. The commercial worker HI value of 0.08 at Site 9 and 0.04 at Sites 13 and 19 is less than the target HI value of 1.

Changes in Exposure Assumptions and Toxicity Data

No changes in exposure assumptions or land use have occurred since the HHRA and ERA were conducted.

The HHRAs for IR Site 9, Site 13 and Site 19 primarily used the default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's 2014 update include: skin surface area, adult body weight, and resident exposure duration and exposure time, and worker adherence factor. Some of these factors are less conservative and some are more conservative than the 2014 default values (USEPA 2014); the overall the impact of these changes on the risk calculations would be minimal or negligible.

Toxicity criteria were selected for the HHRAs per USEPA (2003) guidance which recommends the following hierarchy for human health toxicity values: (1) USEPA's Integrated Risk Information System; (2) USEPA's (Office of Research and Development, National Center for Environmental Assessment, Superfund Health Risk Technical Support Center) Provisional Peer Reviewed Toxicity Values; and (3) other sources of information such as the DTSC's toxicity values and the Agency for Toxic Substances Disease Registry minimal risk levels for non-carcinogenic compounds. The USEPA toxicity values used in the IR Site 9, Site 13 and Site 19 HHRA were primarily from USEPA's IRIS database that were current at the time of the HHRA preparation for the risk drivers are current, except for PCE at Site 19, which was based on the groundwater-to-indoor air pathway via vapor intrusion. The current cancer unit risk of 2.6×10^{-7} per microgram per cubic meter [$(\mu g/m^3)^{-1}$] per day is over 20 times less stringent than the unit risk of 5.9×10^{-6} $(\mu g/m^3)^{-1}$.

The OEHHA toxicity values used in the HHRAs are still current except for PCE at Site 19 (as previously discussed). However, DTSC cancer toxicity values are now listed for chromium. This finding does not impact the HHRA for Site 9 because this document determined that chromium

concentrations were consistent with background; therefore, no remedial action was recommended for this metal. Thus, the toxicity values used in the HHRAs for Site 9, Site 13 and Site 19 for the risk drivers are still protective.

DTSC recently revised their recommended benzo(a)pyrene [B(a)P] relative potency factors in 2015 as cited in their *Preliminary Endangerment Assessment Guidance Manual* (DTSC 2015). These updated values, which are the same values used by USEPA, would produce slightly higher B(a)P equivalent concentrations than those reported in the HHRA for Site 19.

The toxic effects of lead are incorporated into the DTSC LeadSpread blood lead model. The target blood lead concentration used in the LeadSpread 7 model has been revised to a more stringent blood-lead level in the current LeadSpread 8 model (DTSC 2011a). Regardless of the model used, lead is not a concern because lead concentrations in soil were attributable to background.

Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

The RGs and residential LUC termination criteria for IR Site 13 groundwater are based on the groundwater-to-indoor air model for protection of receptors from exposure to this COC in ambient air. The only vapor intrusion risk drivers at Site 13, benzene and ethylbenzene, were re-evaluated for vapor intrusion risk using the current DTSC modified version of the groundwater-to-indoor air vapor intrusion model (DTSC 2014). The cancer risk associated with each value was near the lower end of USEPA risk management range. Therefore, the RGs and the residential LUC termination criteria are protective.

The methods and assumptions used in the HHRAs to evaluate health risks for groundwater vapor intrusion to indoor air do not reflect current standards of practice (DTSC 2011b; ITRC 2007; and EPA 2015). In particular, the site-specific soil and building property assumptions used in the HHRA differ significantly from current DTSC (2011b) recommended values. The DTSC (2011b) recommended default values are more conservative than those used in the Site 9 HHRA. The only vapor intrusion risk driver at Site 19, PCE, was re-evaluated for vapor intrusion risk using the current DTSC modified version of the groundwater-to-indoor air vapor intrusion model (DTSC 2014). The lifetime cancer risks for the resident exposed to PCE in groundwater underlying IR Site 19 was calculated using this model as less than the USEPA cancer risk management range of 1×10^{-6} to 1×10^{-4}. In summary, the various exposure receptors, pathways, and assumptions used in the Site 19 HHRA are appropriate, given the planned future land use and the implementation of the selected remedy and the IC remedy at Site 9 is protective of the groundwater-to-indoor air pathway.

No additional exposure pathways have been identified since land uses, zoning, and receptors at these IR sites have not changed since the previous 5-Year Review. The FS HHRAs used appropriate receptors, pathways, assumptions, and parameter values. The toxicity values used in the FS HHRA of the COCs are still current. The protocol for selecting toxicity values is also still current. Although the vapor intrusion model has been revised since the FS HHRAs, the remedy is still protective for the groundwater-to-indoor air pathway and, for IR Site 13, the remedy and the associated RGs and residential LUC termination criteria are current. For IR Site 19, the revised model results for PCE under residential use showed the lifetime cancer risks were less the than the cancer risk management range; therefore, the IC action for groundwater is still protective, and no additional ICs are required to address groundwater to indoor air vapor intrusion concerns.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Sites 9, 13, and 19 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.4.5.3 Question C – Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy. The ARARs for IR Sites 9, 13, and 19 remain unchanged and are still valid. Risks to human health and the environment remain unchanged.

2.4.6 Issues, OU-2A, IR Sites 9, 13, and 19

No issues have been identified at IR Sites 9, 13, and 19 that would currently or in the future prevent the respective remedies at these sites from being protective of human health and the environment.

2.4.7 Recommendations and Follow-up Actions, OU-2A, IR Sites 9, 13, and 19

No recommendations or follow-up actions have been identified for IR Sites 9, 13, and 19.

2.4.8 Protectiveness Statement, OU-2A, IR Sites 9, 13, and 19

The remedy at IR Sites 9, 13, and 19 is protective of human health and environment, and the remedy is being implemented in accordance with the ROD (DON 2007). IR Sites 9 and 19 and the northern portion of IR Site 13 are currently in the long term management stage of the CERCLA process. The southern portion of IR Site 13 is currently in the remedial action operation stage of the CERCLA process. The DON will continue groundwater monitoring at IR Site 13 and the implementation of LUCs at IR Sites 9, 13, and 19.

2.5 OU-2B, IR SITES 3 AND 4

2.5.1 Site Description and Background, OU-2B, IR Sites 3 and 4

OU-2B consists of IR Sites 3, 4, 11, and 21. This section discusses the protectiveness of the selected remedies for soil at IR Sites 3 and 4. The ROD (DON 2015) for OU-2B states "No Action" as the selected remedy for soil at IR Sites 11 and 21 soil. The selected remedy for OU-2B shallow groundwater applies to portions of IR Sites 4, 11, and 21 and is not yet implemented. Therefore, only the soil remedies for IR Sites 3 and 4 are included in this report.

IR Site 3 at OU-2B covers about 13 acres near the eastern boundary of Alameda Point as shown in Figure 1-1. IR Site 3 is known as the Abandoned Fuel Storage Area. Approximately 80 percent of IR Site 3 is covered by asphalt or concrete in the form of approximately nine buildings, roads, curbs, sidewalks, and an LTV A-7E Corsair II airplane monument tribute.

IR Site 4 at OU-2B comprises approximately 22 acres in the eastern portion of Alameda Point as shown in Figure 1-1. The site is also known as Building 360, the Aircraft Engine Facility, which contained multiple process shops including a blast shop, cleaning shop, paint shop, welding shop, plating shop, various aircraft component repair rooms, and non-destructive testing facilities. About 65 percent of IR Site 4 is covered with asphalt and concrete in the form of buildings, roads, and parking lots.

2.5.1.1 Land and Resource Use

Current land use at IR Site 3 includes vehicle parking, storage facilities, and commercial/light industrial use. The "*NAS Alameda Community Reuse Plan*" (EDAW 1996) and OU-2B RI Report document that IR Site 3 is located in the Civic Core except for a portion of the site on the west that is located in the Marina District. The Civic Core area would be developed as a mixed use area, which is planned to include residential, recreational, administrative, and industrial uses. The Marina District would be developed as a mixed use area, which is planned to include residential, recreational, and civic uses such as office space, a cultural arts center, and theater (EDAW 1996).

Current land use at IR Site 4 includes vehicle parking, storage facilities, and a large landscaped sports field along the eastern border. The "*NAS Alameda Community Reuse Plan*" (EDAW 1996) and OU-2B RI Report document that IR Site 4 is located in the Inner Harbor area except for a small portion of the site on the north that is located in the Civic Core. The Inner Harbor area would be developed as a mixed use area, which is planned to include a combination of light industrial/research and development use and commercial/retail and recreational community support uses, including a regional park. The Civic Core area would be developed as a mixed use area, which is planned to include residential, recreational, administrative, and industrial uses (EDAW 1996).

2.5.1.2 Current and Potential Groundwater Uses

The DON and the regulatory agencies have evaluated the potential use of shallow groundwater adjacent to and beneath OU-2B as a future drinking water source. The DON submitted a letter to the Regional Water Board, dated August 6, 2012 (DON 2012), which requested an exception for shallow groundwater use. The lines of evidence included proximity to San Francisco Bay and potential for salt-water intrusion, high salinity, current county restrictions on well installation in shallow groundwater, and off-site groundwater plume migration. The Regional Water Board concurred with the DON's exception request for groundwater beneath IR Sites 3, 4, 11, and 21 in a letter dated, September 13, 2012 (Regional Water Board 2012) included in Appendix E (also Figure 2 – Extent of Former Alameda Island Circa 1859). Section 1.2.4 of this report discusses future beneficial use of groundwater at Alameda Point.

2.5.1.3 Site Chronology and Initial Response

Table 2.5-1 summarizes major investigations and actions taken at IR Sites 3 and 4. These investigations are described in detail in the FS Report (OTIE 2011), and the ROD (DON 2015).

TABLE 2.5-1: CHRONOLOGY OF SITE EVENTS – OU-2B, IR SITES 3 AND 4

Date	Event	Comments
1983	Initial Assessment Study	Documented petroleum contamination in groundwater at IR Site 3 and soil contamination by chemicals at IR Site 4 Building 360. Recommended further evaluation.
2001	Supplemental RI data gaps sampling	Additional sampling conducted to fill data gaps from previous investigations (i.e., EBS). Data collected allowed further assessment of the conceptual site model.
2002	BGMP sampling	IR Sites 3 and 4 were first included in the BGMP.
July 2005	RI	Summarized soil and groundwater sampling results collected from IR Sites 3, 4, 11, and 21. The report includes the initial HHRA and ERA.
October 2005	FS	Summarized soil and groundwater sampling results collected from IR Sites 3, 4, 11, and 21. The report includes the initial conceptual site model, HHRA, ERA, and remedial alternatives.
2008 - 2009	Data Gaps Investigation	Investigation conducted to develop and refine the conceptual site model through collection of soil and groundwater sample data at OU-2B.

TABLE 2.5-1: CHRONOLOGY OF SITE EVENTS – OU-2B, IR SITES 3 AND 4

Date	Event	Comments
2009 - 2010	Supplemental data gaps investigation	Conducted to fill data gaps after the RI and FS.
2009 - 2013	Zero-Valent Iron, ISTT and Bioremediation Treatability Studies	A treatability study was conducted at OU-2B between August 2009 and February 2010 to assess the viability of ZVI injection as a treatment technology to accomplish the degradation of dissolved contaminants, particularly TCE in groundwater.
December 2011	FS	Presented an updated conceptual site model, an updated HHRA, and development and evaluation of remedial alternatives based on the RI and data gaps investigations.
2012	FS Addendum	Provided a comparison of 2009 tap water regional screening levels (RSLs) to the updated November 2011 United States Environmental Protection Agency (USEPA) tap water RSLs and impacts to the OU-2B FS groundwater COC selection and response action alternatives. Also provided an additional FS evaluation for potential drinking water reuse scenario restricted to commercial use only.
April 2013	PP	Proposed the selected remedy for soil impacted by lead and cobalt at IR Site 3, as wells as the proposed selected remedy for soil impacted by PCBs, pesticides and hexavalent chromium at IR Site 4. The PP was announced to the public for comments and a public meeting.
April 2014	Draft Final ROD	Described selected remedies at OU-2B IR Sites 3, 4, 11, and 21. Issued following comment resolution with the BCT, who concurred on the soil remedies for IR Sites 3 and 4. The selected remedial alternative for IR Site 3 is removal of lead in soil and ICs for the area impacted by cobalt contamination in soil. The selected remedial alternative for IR Site 4 soil is removal of PCBs and pesticides in soil and ICs for the area impacted by hexavalent chromium contamination in soil.
July 2014	Soil RAWP	Described the technical approach for implementing remedial activities for lead-impacted soil at IR Site 3 as well as PCB-impacted soil at IR Site 4.
August 2014	RA Implementation	Excavation began at IR Site 3 for lead-impacted soil.
September 2014	RA Implementation	Excavation began at IR Site 4 for PCBs and pesticide-impacted soil.
October 2014	RA Completion	Demobilization at IR Site 3 for lead-impacted soil and IR Site 4 for PCBs and pesticide-impacted soil.
March 2015	Final ROD	Provided the decision summary for selected remedies at IR Sites 3, 4, 11, and 21. The selected remedial alternative for IR Site 3 is removal of lead in soil and ICs for the area impacted by cobalt contamination in soil. The selected remedial alternative for IR Site 4 is removal of PCBs and pesticides in soil and ICs for the area impacted by hexavalent chromium contamination in soil. The remedy for OU-2B groundwater is ISB, monitoring, and ICs. Although there is no groundwater contamination in IR Site 3, the selected remedy for OU-2B groundwater includes a 100-foot buffer zone with ICs that extends into a small portion of the southern area of IR Site 3. Groundwater ICs apply to the majority of IR Site 4 and portions of IR Sites 11 and 21. The RGs for OU-2B groundwater were changed from commercial RGs in the Draft and Draft Final RODs to residential RGs in the Final ROD.
November 2015	RACR	Documented remedy completion for lead impacted soil at IR Site 3 and PCB and pesticide impacted soil at IR Site 4.
December 2015	LUC RD	Outlined the ICs and land-use restrictions for soil and groundwater at IR Sites 3, 4, 11, and 21.
March 2016	IC Compliance Monitoring Report and Annual IC Compliance Certificate	Certified that ICs for IR Sites 3 and 4 are in compliance with the requirements specified in the ROD.

TABLE 2.5-1: CHRONOLOGY OF SITE EVENTS – OU-2B, IR SITES 3 AND 4

Notes:
BGMP = Basewide Groundwater Monitoring Program
ERA = Ecological risk assessment
FS = Feasibility Study
HHRA = Human health risk assessment
IC = Institutional control
IR = Installation Restoration
ISTT = In-situ thermal treatment
LUC = Land-use control
OU = Operable unit
PCB = Polychlorinated biphenyl
PP = Proposed Plan
RACR – Remedial Action Completion Report
RAWP = Remedial Action Work Plan
RD = Remedial design
RI = Remedial Investigation
ROD = Record of Decision
ZVI = Zero-Valent Iron

2.5.1.4 Basis for Taking Action

The RI Report (SulTech 2005) concluded that potentially unacceptable human health risks included a variety of soil exposure pathways: ingestion of soil, ingestion of homegrown produce, dermal contact with soil, and inhalation of vapors in indoor air from soil. The FS Report (OTIE 2011) provides further analysis of the RI results. The basis for taking action for soil at IR Sites 3 and 4 was due to unacceptable risk through soil exposure pathways for lead and cobalt at IR Site 3 and for PCBs, pesticides and hexavalent chromium at IR Site 4.

The ROD documented that there is no unacceptable risk for IR Site 3 groundwater, however, since IR Site 4 is within the OU-2B plume, there is unacceptable risk for IR Site 4 groundwater. The groundwater remedy at OU-2B is the remedial design phase and remedial action construction has not yet begun; therefore, groundwater was not evaluated for IR Site 4 in this Five-Year Review.

IR Sites 3 and 4 Soil

Lead and cobalt comprise the two COCs in soil identified at IR Site 3, with cobalt primarily located beneath Building 398. Concentrations of lead-impacted soil at Site 3 exceeded the RG of 208 mg/kg (DON 2015) in previous investigations. A post-FS site boundary change at Site 21 resulted in the relocation of the area containing elevated cobalt concentrations from IR Site 21 to IR Site 3, establishing cobalt as a Site 3 COC. Cobalt was reported at concentrations exceeding the RG of 300 mg/kg in 10 of 72 site samples in the RI (SulTech 2005). At IR Site 4, concentrations of PCBs (Aroclor 1254), pesticides (aldrin, dieldrin, and heptachlor epoxide) and hexavalent chromium were detected in soil above RGs during previous investigations (DON 2015). Table 2.5-2 lists the OU-2B soil COCs and RGs that are protective of the current and future land use for IR Sites 3 and 4.

2.5.2 Remedial Action, OU-2B, IR Sites 3 and 4

2.5.2.1 Remedy Selection (Record of Decision)

As stated in the ROD for OU-2B (DON 2015), the following RAO was developed for lead and cobalt impacted soil at IR Site 3, as wells as PCBs, pesticides, and hexavalent chromium impacted soil at IR Site 4:

- Reduce the potential for exposure to COC-impacted soil that would result in unacceptable risks to future receptors

The remedy for lead-impacted soil at IR Site 3 and PCBs, pesticides-impacted soil was excavation with off-site disposal of the contaminated soil. The remedy for cobalt-impacted soil at IR Site 3 and hexavalent chromium-impacted soil at IR Site 4 are ICs to restrict residential use as stated in the LUC RD (Arcadis 2015b). In addition to restricting residential use, ICs for hexavalent chromium-impacted soil beneath Building 360 at IR Site 4 will prohibit intrusive activities without prior approval by the agencies

or their successors. Table 2.5-2 lists the RGs for COCs in soil at IR Sites 3 and 4. Figure 2.5-1 presents RA and IC areas for soil at IR Sites 3 and 4.

TABLE 2.5-2: RGS FOR COCS IN SOIL, OU-2B, IR SITES 3 AND 4

COC	RGs for IR Site 3	RGs for IR Site 4
Lead	208 mg/kg	--
Cobalt	300 mg/kg	--
Aroclor 1254	--	0.22 mg/kg
Hexavalent Chromium	--	5.6 mg/kg
Aldrin	--	0.029 mg/kg
Dieldrin	--	0.03 mg/kg
Heptachlor Epoxide	--	0.053 mg/kg

Source: ROD (DON 2015)

Notes:
COC = Contaminant of concern
IR = Installation Restoration
mg/kg = Milligram per kilogram
RG = Remediation goal

Figure 2.5-1 shows the locations of completed soil removal and IC areas at OU-2B, IR Sites 3 and 4.

2.5.2.2 Remedy Implementation

Figure 2.5-1 shows the locations of completed soil removal and IC areas at OU-2B, IR Sites 3 and 4.

FIGURE 2.5-1: REMEDIAL ACTION AND IC AREAS, OU-2B, IR SITES 3 AND 4

Source: RACR (Arcadis 2015a) and LUC RD (Arcadis 2015b)

Soil Removal Action and Excavation

The remedial action for lead-impacted soil and PCB and pesticide-impacted soil at IR Site 4 included the following components in accordance with the RAWP (Arcadis 2014):

- Excavation of lead-impacted soil at IR Site 3
- Chemical profiling and disposal of the excavated soil at IR Site 4
- Soil sample collection from the excavated areas to confirm that the RAO was met for each area at IR Sites 3 and 4
- Backfilling the excavation areas with fill acceptable for reuse IR Sites 3 and 4
- Resurfacing the excavated areas to match existing grade IR Sites 3 and 4

The remedial action was successfully completed, removing unacceptable risk to human health from lead-impacted soil and PCB and pesticide-impacted soil at IR Site 4. A RACR (Arcadis 2015a) was issued in November 2015, which certified that the remedial action for lead impacted soil was complete at IR Site 3 and PCB and pesticide-impacted soil at IR Site 4. Figure 2.5-1 shows the RA areas for IR Sites 3 and 4.

Groundwater

For the groundwater remedy at OU-2B, the remedial design is in development and remedial action construction has not begun. No groundwater evaluation is presented for IR Sites 3 or 4 in this Five-Year Review.

ICs

The ICs will protect human health by imposing restrictions on activities that may result in exposure to cobalt-impacted soil at IR Site 3 and hexavalent chromium-impacted soil at IR Site 4. ICs have been implemented to prohibit residential use at IR Site 3 in the area of cobalt-impacted soil and at IR Site 4 in the area of hexavalent chromium-impacted soil as stated in the LUC RD (Arcadis 2015b). Because the RGs for commercial use are exceeded in the hexavalent chromium-impacted soil beneath Building 360, the ICs for hexavalent chromium-impacted soil at IR Site 4 also prohibit intrusive activities without prior approval by the agencies approving or concurring on the OU-2B ROD, or their successors. Intrusive activities include any activity that disturbs the surface of the soil beneath the building. Figure 2.5-1 shows the IC area for cobalt-impacted soil at IR Site 3 and hexavalent chromium-impacted soil at IR Site 4.

Five-Year Reviews will be conducted in accordance with the ROD.

2.5.3 Progress Since the Last Five-Year Review, OU-2B, IR Sites 3 and 4

This is the first Five-Year Review for IR Sites 3 and 4.

2.5.4 Five-Year Review Process, OU-2B, IR Sites 3 and 4

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Sites 3 and 4. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.5.4.1 Site Inspection

During the site inspection, it was observed that approximately 80 percent of IR Site 3 is paved or covered by buildings. Removal action areas appear to be in good condition (through backfill and restoration). ICs outlined in the ROD and implemented in the LUC RD are operating as intended and are protective of human health and the environment. Although a site inspection at IR Site 4 was not conducted as part of this Five-Year Review, the Annual IC Compliance Site Inspection conducted in January 2016 documented compliance with the LUC RD requirements; the remedy for IR Site 4 soil is in place and protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Site 3.

2.5.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 3. No interviews conducted for IR Site 4. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response:

"A soil remedial action was completed at Site 3 to remove the two lead impacted soil. However, an IC is being implemented to prevent any exposures to a cobalt impacted soil underneath a building at Site 3."

DTSC Response: No Comments.

Regional Water Board Response: No Comments.

Community Interview Response:

"There is cobalt contamination left under a building where the main street (Appezzato Blvd) will be constructed. ICs should require excavation and removal of this cobalt contamination." George Humphreys, RAB Member.

Contractor Interview Response: No Comments.

2.5.5 Technical Assessment, OU-2B, IR Sites 3 and 4

The RAO for former areas impacted by lead at IR Site 3 and PCBs and pesticides at IR Site 4 were achieved during the RA in October 2014. The DON issued a RACR (Arcadis 2015a) for soil impacted with lead, PCBs and pesticides. The RAO for the cobalt-impacted soil area is being met through ICs that restrict residential use. The RAO for the hexavalent chromium-impacted soil at IR Site 4 is being met through ICs that restrict residential use and intrusive activities, unless authorized by the DON, BCT and or successors.

PFCs have been identified as an emerging contaminant in drinking water. Historical use of IR Site 4 (aircraft engine facility) indicates the potential for release of compounds known to contain PFCs. The beneficial use designation for groundwater at IR Site 4 does not include use for drinking water; however, the DON is closely monitoring regulatory and technical developments related to PFCs and proactively evaluating an appropriate approach for PFCs at IR Site 4. Pending developments, further status may be reported in the next Five-Year Review (2021) and/or a separate report (e.g. a Site 4 site-specific evaluation, a BGMP Report).

TABLE 2.5-3: TECHNICAL ASSESSMENT SUMMARY, OU-2B, IR SITES 3 AND 4

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 3	Soil – excavation, off-site disposal, clean imported backfill, and ICs	Yes	Yes	No	Protective	2021
IR Site 4	Soil – excavation, off-site disposal, clean imported backfill, and ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification
IR = Installation Restoration
OU = Operable unit

2.5.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the soil remedy is functioning as intended by the decision documents for IR Sites 3 and 4. Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remedy implemented for IR Sites 3 and 4 soil is working as intended by the ROD. The documents that detail the remedial decisions for IR Sites 3 and 4 are the ROD (DON 2015), RACR (Arcadis 2015a), and the LUC RD (Arcadis 2015b).

System Operations and O&M

Not applicable for IR Sites 3 and 4.

Performance of Soil Remedy

The selected remedies were implemented between July and October 2014 at IR Site 3 and between September and October 2014 at IR Site 4. The RAO was implemented in response to unacceptable risk to human health and the environment from lead-impacted soil at IR Site 3 and PCB and pesticide-impacted soil at IR Site 4. ICs under Alternative S-2 are effective in minimizing risk and maximizing reuse of the areas impacted with cobalt-contaminated soil (IR Site 3) and hexavalent chromium-impacted soil (IR Site 4).

2.5.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedies for soil at IR Sites 3 and 4 are in place and there are no reported changes to the remedies that would affect its protectiveness.

Site 3

The cancer risks for the resident exceed the USEPA cancer risk management range of 1×10^{-6} to 1×10^{-4} whether USEPA or OEHHA toxicity values are used in the risk calculations but it was determined (OTIE 2011) that 90% of the risk was due to PAHs in soil and should not be identified as COCs; therefore, the Alameda Point B(a)P equivalent screening level of 0.62 mg/kg was agreed upon, for which cancer risk is within the USEPA risk management range and below the DTSC risk management range. The cancer risk based on commercial use was within the USEPA risk management range if USEPA

toxicity values were used, but exceeded this range if OEHHA toxicity values were used. The risk drivers were the same as for residential exposure. The cancer risks for the construction worker were within the risk management range, using either USEPA or OEHHA toxicity values. Thus, no COCs for these receptors were identified in the RI (SulTech 2005) based on cancer risks.

The HI of 7 for the resident exceeded the target HI value of 1. Over 40 percent of this HI, excluding the area of cobalt-contaminated soil that was part of IR Site 21 in the FS, is associated with VOCs (i.e., benzene, toluene, and xylenes) that are being addressed under the petroleum program. Therefore, these VOCs were excluded in the FS as being identified as COCs. Most of the remainder of this HI is associated with metals that have been identified as associated with background (OTIE 2011). The commercial worker HI of 3 for this same area (i.e., excluding the cobalt-contaminated area) exceeded a value of 1; the risk drivers were the same as for the resident. The construction worker HI for this area did not exceed a value of 1.

The HI for the resident at the cobalt-contaminated area exceeded the target value of 1. The HI values for the commercial worker and construction worker were both less than 1.

Site 4

The cancer risks associated with soil from a depth interval of 0 to 2 feet for the resident exceeds the USEPA cancer risk management range of 1×10^{-6} to 1×10^{-4} if USEPA toxicity values (USEPA 2014) are used in the risk calculations, but are within the risk management range if OEHHA toxicity values are used. The noncancer HI associated with soil from a depth interval of 0 to 2 feet for the resident was 9 in the HHRA.

The cancer risks associated with soil from a depth interval of 0 to 4.5 feet for the resident exceed the USEPA cancer risk management range of 1×10^{-6} to 1×10^{-4} whether USEPA or OEHHA toxicity values are used in the risk calculations. The noncancer HI associated with soil from a depth interval of 0 to 4.5 feet for the resident was 306 in the HHRA.

The cancer risk based on commercial use was within the USEPA risk management range if either the USEPA toxicity values or the OEHHA toxicity values were used. The total HI of 4 for the commercial worker exceeded the target HI value of 1.

The construction worker cancer risk is within the risk management range, whether USEPA or OEHHA toxicity values were used. The HI for this area did not exceed a value of 1.

Changes in Exposure Assumptions and Toxicity Data

The toxicity values used in the HHRAs for Sites 3 and 4 were compiled from USEPA RSLs (USEPA 2011), and were confirmed using the IRIS data base. The toxicity selection criteria used to compile toxicity information in the RSL table is consistent with the current USEPA (2003) hierarchy for selection of toxicity values used in HHRAs.

CSFs developed by DTSC were also used in the HHRA. The DTSC CSFs for carcinogens are listed in the OEHHA toxicity database. Use of OEHHA values in addition to USEPA CSFs results in the creation of separate risk assessment results for carcinogens.

The only COCs for IR Site 3 are cadmium and lead. USEPA toxicity values used in the HHRA are accurate and current. No DTSC CSF values were listed in the HHRA for cadmium; this is consistent with the current OEHHA database. The toxic effects of lead are assessed using the DTSC LeadSpread blood lead model. As discussed above, the target blood lead concentration used in the LeadSpread 7 model has

been revised to be more stringent in the current LeadSpread 8 model. This revision is based on a re-evaluation of the adverse health effects of lead as they correlate to blood lead concentrations.

EPA toxicity values used in the IR Site 4 HHRA are accurate and current. No California USEPA oral CSF values were listed in the FS HHRA for hexavalent chromium; currently the OEHHA database lists a value of 0.5 $(mg/kg\text{-}day)^{-1}$ for hexavalent chromium, which is the same as the USEPA value. The current California EPA CSF value for Aroclor 1254 of 0.5 $(mg/kg\text{-}day)^{-1}$ is less conservative than that used in the HHRA; the current Aroclor 1254 value listed in the OEHHA database is the same as the USEPA value. There were no DTSC UR_i values listed for Aroclor 1254 or heptachlor epoxide; the OEHHA database currently lists the inhalation unit risk values for these two analytes that are the same as the USEPA values. Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

The HHRAs for IR Sites 3 and 4 used default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's 2014 update include: skin surface area, adult body weight, and resident exposure duration and exposure time, and worker adherence factor. Additionally, the groundwater-to-indoor air vapor intrusion pathway was excluded because the IR Site 3 boundary was revised subsequent to the HHRA to exclude the groundwater plume. Some of these factors are less conservative and some are more conservative than the 2014 default values; the overall the impact of these changes on the risk calculations would be minimal or negligible.

The various exposure receptors, pathways, and assumptions used in the HHRAs for IR Sites 3 and 4 are appropriate, given the planned future land use and the implementation of the selected remedy.

No additional exposure pathways have been identified since land uses, zoning, and receptors at these IR sites have not changed since the previous 5-Year Review.

The RGs continue to be appropriately protective, as they are based on appropriate receptors, pathways, assumptions, and parameter values. The toxicity values of the COCs that were used in the HHRAs are still current or, for IR Site 4, are more protective than current values.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of these remedies.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. This first Five-Year Review evaluating the soil remedies for IR Sites 3 and 4 includes identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.5.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No information has come to light that could call into question the protectiveness of the soil remedies for IR Sites 3 and 4. Lead (IR Site 3) and PCB and pesticides (IR Site 4) contaminated soil has been removed during RA implementation as stated in the ROD (Alternative S-3a). ICs for cobalt-impacted soil and hexavalent chromium-impacted soil are operating as intended by the ROD, are implemented and enforced by the LUC RD, and are protective of human health and the environment.

2.5.6 Issues, OU-2B, IR Sites 3 and 4

No issues have been identified at this time that would affect the protectiveness of the selected remedy.

2.5.7 Recommendations and Follow-up Actions, OU-2B, IR Sites 3 and 4

No recommendations or follow-up actions have been identified at this time.

2.5.8 Protectiveness Statement, OU-2B, IR Sites 3 and 4

The soil RAs performed at IR Sites 3 and 4 are considered protective of human health and the environment. The extent of contamination is defined, and ICs are in place at Alameda Point to prevent exposures to contaminated soil. ICs and LUCs are assessed annually. The selected remedies for soil at IR Sites 3 and 4 will continue to be protective.

2.6 OU-3, IR SITE 1

2.6.1 Site Description and Background, OU-3, IR Site 1

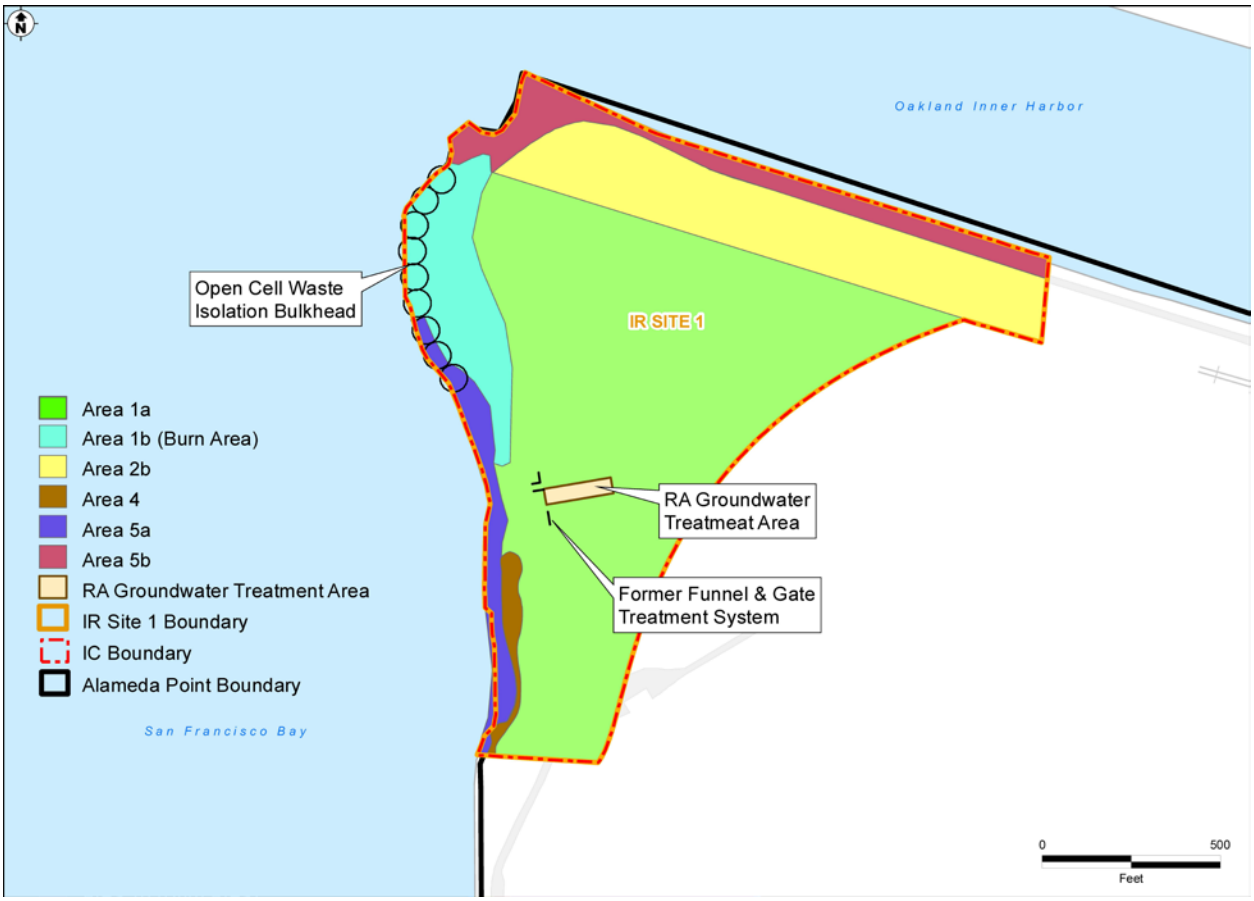
IR Site 1 at OU-3 covers approximately 37 acres and is located within the boundary of Alameda Point, as shown in Figure 1-1. IR Site 1 is located at the northwestern tip of Alameda Island, where the Oakland Inner Harbor joins San Francisco Bay. The site topography is generally flat, with slight depressions in the surface that promote seasonal wetlands.

Historically, IR Site 1 was used to dispose of waste, aircraft parts, and petroleum and as a pistol and skeet range. The selected remedial actions at IR Site 1 were subdivided into the six areas depicted in Figure 2.6-1.

2.6.1.1 Land and Resource Use

Currently, the federal government owns IR Site 1 under the jurisdiction of the DON. According to the "*Alameda Community Reuse Plan*" (EDAW 1996), IR Site 1 is located within the future Northwest Territories. These lands are suitable for passive and active recreation and gathering facilities along the Oakland Estuary waterfront, which could include trails, picnic areas, viewing areas, wetlands, and parking lots. The future land uses for IR Site 1 in the ROD (DON 2009) are occupational and recreational.

FIGURE 2.6-1: SOIL CONTAMINATION AREAS AND SITE FEATURES, OU-3, IR SITE 1



Source: RD/RAWP (AMEC 2014a)

2.6.1.2 Current and Potential Groundwater Uses

As outlined in the FS Report (Bechtel Environmental, Inc. [BEI] 2006), groundwater beneath the western portion of Alameda Point (including IR Site 1) currently is not used for drinking water, irrigation, or industrial supply purposes and meets the SWRCB exemption criteria. In addition, according to the USEPA, it seems unlikely that groundwater in this area will be a potential source of drinking water based on the shallow depth of the aquifer in this area, the likelihood of saltwater intrusion (based on groundwater flow directions) if significant pumping takes place, and the fact that no wells currently exist within or close to this area. As a result, the USEPA concurs with the cleanup level for IR Site 1 because threats posed by exposure such as inhalation, dermal contact, and irrigation use are eliminated, and any significant ongoing degradation of the groundwater from contamination is prevented (USEPA 2000).

2.6.1.3 Site Chronology and Initial Response

Previous investigations identified the following in soil at IR Site 1: metals, VOCs, SVOCs, PAH, pesticides, PCBs, total petroleum hydrocarbons (TPH), munitions potentially presenting an explosive hazard (MPPEH), dioxins, furans, strontium-90, and radium. Additionally, previous investigations identified a VOC groundwater plume in the FWBZ in the west-central portion of IR Site 1 with metals, SVOCs, and TPH detected in groundwater in this area. The chemicals at IR Site 1 generally are not mobile except for VOCs in the VOC plume (DON 2009). Table 2.6-1 summarizes major investigations and actions taken at IR Site 1.

TABLE 2.6-1: CHRONOLOGY OF SITE EVENTS – OU-3, IR SITE 1

Date	Event	Event Comments
1983	Initial Assessment Study	Characterization of Site 1 was recommended by installing three groundwater monitoring wells along the shoreline of the site. Water level measurements and groundwater samples were collected and analyzed for inorganic chemicals, organic chemicals, radionuclides, and pH
1995 and 1998	Area 4 - Pistol Range investigation	Conducted to determine the extent of lead contamination in soil and groundwater from previous activities. Lead was detected at the highest levels in soil in the target trench. The investigation found what risk from lead in soil could pose unacceptable risk to human health and the environment (aquatic organisms) if leachate from lead-impacted soil reaches groundwater.
1996 - 1999	Pilot-scale *in situ* Funnel and Gate Remediation Demonstration	This demonstration involved the Implementation of a permeable reactive barrier treatment system for aerobic biodegradation by biosparging chlorinated solvents and petroleum hydrocarbons. The pilot-scale project was successful and suggested that the source of VOC contamination was relatively shallow and that natural attenuation of chlorinated VOCs was occurring.
December 1998	Emergency removal action	During this removal action, 8 acres of IR Site 1 at Areas 1a, 1b, and 4 were screened and cleared of surface MPPEH consisting of 20-millimeter high explosive projectiles. The removal action was implemented to protect human health and the environment and to prepare IR Site 1 for a radiological soil screening investigation.
1999	RI	Presented soil and groundwater data and includes an HHRA and ERA. The RI Report recommends further investigation and an FS for IR Site 1.
2005	Radiological Survey Characterization Report	Documented field activities necessary to establish the vertical and horizontal extent of radiological contamination at IR Site 1.
2005	Field sampling	Soil samples were collected from the former burn area and the proposed public beach. Analytical results for these soil samples contained unacceptable levels of PCDDs and PCDFs for the former burn area and unacceptable levels of metals and PAHs for the proposed public beach.
2006	FS	Presented a comparative analysis of remedial alternatives for IR Site 1 and includes an updated HHRA and ERA.
September 2006	PP	Presented DON's preferred remedial alternatives for soil and groundwater at IR Site 1, also known as the "1943-1956 Disposal Area."
2006 to 2014	BGMP Report	Presented data and discusses trends for VOCs and radionuclide contamination at IR Site 1.
2007	Action Memorandum	Documented the decision to undertake the TCRA at IR Sites 1, 2, and 32.
2008	TCRA	The primary goal of the TCRA was to mitigate potential risk posed by MPPEH at the former Firing-Range Berm, and Debris Pit; remove the Disposal Trench; remove previously identified radiological anomalies at IR Sites 1, 2, and 32; and prevent the release of hazardous substances to the environment.
September 2009	Post-TCRA Summary Report	Described TCRA activities at IR Sites 1, 2, and 32.
November 2009	ROD	Presented selected remedies for soil and groundwater at IR Site 1.
2010 to 2012	Pre-design data gaps investigation	Conducted to support the RD for the Burn Area (Area 1b).
December 2011	RD/RAWP for ISCO	Described the approach, performance objectives, RD, and RA for groundwater remedy Alternative GW-3. Appendix H of the RD/RAWP includes the LUC RD for both the soil and groundwater.
February 2012	Implementation of ISCO RA for Groundwater at IR Site 1	The RA of ISCO was implemented at IR Site 1 to target COCs stated in the ROD and in accordance with the RD/RAWP for ISCO.
February 2013	Burn Area Focused FS	Developed and evaluates an amended RA alternative for the former Burn Area (Area 1b) to replace the original remedial alternative selected in the 2009 ROD. The post-ROD data gaps investigation revealed that the vertical and horizontal extent of the former Burn Area was significantly different than originally characterized in the ROD.

TABLE 2.6-1: CHRONOLOGY OF SITE EVENTS – OU-3, IR SITE 1

Date	Event	Event Comments
March 2013	PP for Burn Area	Presented the DON's preferred remedial alternatives for soil and groundwater at IR Site 1, Burn Area (Area 1b).
February 2013	Burn Area Focused FS	Developed and evaluates an amended RA alternative for the former Burn Area (Area 1b) to replace the original remedial alternative selected in the 2009 ROD. The post-ROD data gaps investigation revealed that the vertical and horizontal extent of the former Burn Area was significantly different than originally characterized in the ROD.
April 2013	ESD to the original ROD	Explained a post-ROD change in the thickness of the soil cover over areas of IR Site 1.
September 2013	ROD Amendment for Area 1 Burn Area	This amendment to the original ROD of 2009 selected an amended remedy to remediate soil at the former Burn Area (Area 1b).
July 2014	RD/RAWP for soil	Provided information on the approach and guidance for activities conducted to support the soil RD and RA implementation.
July 2014	RA Implementation for Soil	The RA field activities at IR Site 1 involved clearing, grubbing and demolition of all existing structures within the RA area. The RA included installation of a WIB, soil cover, wetland replacement, shoreline rip-rap, wetland vegetation and vegetative cover. All RA field activities were conducted in accordance with the RD/RAWP.
March 2016	IC Compliance Monitoring Report and Annual IC Compliance Certificate	Certified that ICs for IR Site 1 are in compliance with the requirements specified in the ROD.

Notes:
BGMP = Basewide Groundwater Monitoring Program
DON = United States Department of the Navy
ERA = Ecological risk assessment
ESD = Explanation of significant differences
FS = Feasibility Study
HHRA = Human health risk assessment
ISCO = In situ chemical oxidation
IR = Installation Restoration
LUC = Land-use control
MPPEH = Munitions potentially presenting an explosive hazard
OU = Operable unit
PAH = Polycyclic aromatic hydrocarbons
PCDD = Polychlorinated dibenzodioxin
PCDF = Polychlorinated dibenzofuran
PP = Proposed Plan
RAWP = Remedial Action Work Plan
RD = Remedial design
RI = Remedial Investigation
ROD = Record of Decision
TCRA = Time-critical removal action
VOC = Volatile organic compound

2.6.1.4 Basis for Taking Action

The basis for taking action at IR Site 1 was unacceptable risk due to COCs in soil and groundwater exposure pathways.

The types of COCs in soil identified as posing risk to human health within occupational and/or recreational scenarios include: PAHs, PCBs, and radionuclides, with PCDDs, PCDFs, and metals identified posing ecological risk.

Additionally, VOCs were identified as posing risk to human health within occupational and/or recreational scenarios in groundwater at IR Site 1.

2.6.2 Remedial Action, OU-3, IR Site 1

2.6.2.1 Remedy Selection (Record of Decision)

The ROD (DON 2009) states that the RAOs for soil were developed to protect human health for future recreational visitors (or occupational workers) and terrestrial ecological receptors. These RAOs reflect

the current and planned future use of IR Site 1 for recreational purposes. The RAOs for chemical contamination in soil are as follows:

- Protect future recreational visitors from exposure to hexavalent chromium, PAHs, and PCBs at concentrations above human health RGs
- Protect terrestrial ecological receptors from exposure to cadmium; lead; zinc; 4,4'-DDD; and 4,4'- DDT at concentrations above ecological RGs

The DON calculated a risk-based concentration for VC in groundwater that would protect human receptors from the inhalation of VOCs in outdoor air (BEI 2006). The calculated risk-based concentration for VC in groundwater is 6,011 µg/L. The volatilization of VOCs from groundwater to outdoor air will be addressed by meeting the risk-based RG. The RAOs for groundwater are as follows:

- Prevent human exposure to VOCs in outdoor air by reducing VOC concentrations in groundwater to risk-based RGs
- Prevent ingestion of VOCs and SVOCs by people who fish recreationally (ingesting the organism only) by ensuring that groundwater discharges to surface water do not cause concentrations in the surface water to exceed California Toxics Rule (CTR) and National Toxics Rule (NTR) criteria for surface water
- Prevent ingestion of arsenic by aquatic receptors by ensuring that groundwater discharges to surface water do not cause concentrations in the surface water above the CTR, NTR, and Basin Plan criteria for the aquatic life RG for surface water

The RAO for radiological contamination in soil is as follows:

- Prevent exposure to radionuclides of concern (radium-226, cesium-137, strontium-90, depleted uranium, uranium oxide, thorium-232, and cobalt-60) that exceed RGs

TABLE 2.6-2: RGS FOR COCS IN SOIL, GROUNDWATER, AND SURFACE WATER, OU-3, IR SITE 1

COC	Receptor	RG
SOIL		
Metals		
Hexavalent chromium	Human	3.1 mg/kg
Cadmium	Ecological	1.5 mg/kg
Lead	Ecological	88.32 mg/kg
Zinc	Ecological	300 mg/kg
PAHs		
Benzo(a)anthracene	Human	16.4 mg/kg
Benzo(b)fluoranthene	Human	16.4 mg/kg
Benzo(a)pyrene	Human	1.6 mg/kg
Indeno(1,2,3-cd)pyrene	Human	16.4 mg/kg
Dibenzo(a,h)anthracene	Human	2.7 mg/kg
PCBs		
Aroclor-1254	Human	0.38 mg/kg
Aroclor-1260	Human	0.38 mg/kg
Pesticides		
4,4'-DDD	Ecological	1.2 mg/kg
4,4'-DDT	Ecological	1.2 mg/kg
Radionuclides [a]		
Cesium-137+D	Human	0.113 pCi/g [b]
Cobalt-60	Human	0.0361 pCi/g [b]
Radium-226	Human	1.0+ pCi/g [c,d]
Strontium-90	Human	0.331 pCi/g [b]

TABLE 2.6-2: RGS FOR COCS IN SOIL, GROUNDWATER, AND SURFACE WATER, OU-3, IR SITE 1

COC	Receptor	RG
SOIL		
Radionuclides [a]		
Thorium-232	Human	1.69 pCi/g [b]
Uranium-238+D (used for depleted uranium and uranium oxide)	Human	0.742 pCi/g [d]
GROUNDWATER		
VOCs		
VC	Human	6,011 µg/L
Surface Water		
VOCs		
1,1-DCE	Human	3.2 µg/L
Benzene	Human	71 µg/L
TCE	Human	81 µg/L
VC	Human	525 µg/L
SVOCs		
Bis(2-chloroethyl)ether	Human	1.4 µg/L
Bis(2-ethylhexyl)phthalate	Human	5.9 µg/L
2,4-Dimethylphenol	Human	2,300 µg/L
Metals		
Arsenic	Ecological	36 µg/L

Source: ROD/RD/RAWPs (DON 2009, AMEC 2011a, and 2014a)

Notes:
µg/L = Microgram per liter
+D = Plus daughter product(s)
AMEC = AMEC Environment & Infrastructure, Inc.
COC = Contaminant of concern
DDE = Dichlorodiphenyldichloroethene
DDT = Dichlorodiphenyltrichloroethane
DON = United States Department of the Navy
HHRA = Human health risk assessment
Notes (continued):
IC = Institutional control
IR = Installation Restoration
mg/kg = Milligram per kilogram
mrem/yr = Millirem per year
OU = Operable unit
PAH = Polycyclic aromatic hydrocarbon
PCB = Polychlorinated biphenyl
PCE = Tetrachloroethene
pCi/g = Picocurie per gram
RAWP = Remedial Action Work Plan
Notes (continued):
RD = Remedial design
RG = Remediation goal
SVOC = Semivolatile organic compound
TCE = Trichloroethene
USEPA = United States Environmental Protection Agency
VC = Vinyl chloride
VOC = Volatile organic compound

a The RGs for radionuclides meet or are more protective than the 12-mrem/yr residual dose level consistent with the 1997 USEPA OSWER Directive 9200.4-18. Residential use of radiologically-impacted areas will be prohibited based on ICs. Radionuclides were identified based on the findings of the HHRA (Weston Solutions, Inc. 2007).
b Source: DON. 2006. *"Final Basewide Radiological Removal Action Memorandum, Revision 2006, Hunters Point Shipyard, San Francisco, California."* April 21.
c The RG is 1 pCi/g above the background count in agreement with the USEPA.
d Source: USEPA. 2009. *"Preliminary Remediation Goals for Radionuclides."* http://epa-prgs.ornl.gov/radionuclides/

The text below lists each soil and groundwater remedial alternative.

Soil

- Soil Area 1a (former main disposal area), Excavation and Off-Site Disposal of Soil, Soil Cover, Radiological Screening and MPPEH Sweep, Wetlands Mitigation Plan, and ICs
- Soil Area 1b (former Burn Area): Stabilization and Containment of Burn Waste with Open Cell Steel Sheet Pile Waste Isolation Bulkhead (WIB), Select Excavation, Soil Cover, and ICs
- Soil Area 2b: Soil Cover and ICs
- Soil Area 4: Removal, Screening, and Off-Site Disposal of Soil, and ICs

- Soil Areas 5a and 5b: Confirmation Sampling, Hot Spot Relocation, Placement of Riprap Cover, and ICs
- Site-Wide Radiologically-Impacted Soil: Removal of Radiologically-Impacted Waste at IR Site 1 and Cover or Cap Remaining Radiologically-Impacted Waste in IR Site 1

Groundwater

- ISCO, MNA, Groundwater Monitoring, and ICs

2.6.2.2 Remedy Implementation

The overall approach, performance objectives, and summary of the RD are presented in the RD/RAWP (AMEC Environment & Infrastructure, Inc. [AMEC] 2014a) for soil and the RD/RAWP for ISCO (AMEC 2011a).

Select Excavation

- The upper 5 to 8 feet of overburden was excavated to expose the surface of the burn residues.
- Removed overburden was relocated to inland portions of Area 1a and reused as the foundation layer for the soil cover.
- Burn residues were excavated and relocated above the thicker portions of the burn layer, stabilized, and contained by the WIB (see Figure 2.6-1).
- Destruction of groundwater monitoring wells.
- Excavations were backfilled with clean imported fill material.

Soil Cover

- A 3-foot-thick, seismically stable soil cover was installed extending into other areas of IR Site 1 in accordance with the RD/RAWP (AMEC 2014a) and the ESD to the original ROD (AMEC 2013).
- The surface of the soil cover was seeded with indigenous plant species as an erosion control measure.

Radiological Screening (before Soil Cover Placement)

Field work was conducted in accordance with the RD/RAWP (AMEC 2014a) and the Radiological Work Plan (AMEC 2014c). Radiological screening activities are summarized below.

- Hot spots were identified at areas with greater than twice the gamma background count rates.
- Radiological scanning and sampling of the foundation layer surface below the WIB were conducted in support of final dose and risk modeling determinations.
- Surface contaminants were removed from hot spots with greater than twice the gamma background count rates.

MPPEH Sweep

MPPEH surface sweeps using a magnetic locator (Schonstedt magnetometer) were conducted before all investigation or excavation activities. Surface and subsurface anomalies of potential MPPEH were flagged and relocated to a safe distance until identification and disposal of the MPPEH.

Wetlands Mitigation Plan

Fieldwork was conducted in accordance with the Compensatory Wetlands Mitigation Plan in Appendix B of the RD/RAWP (AMEC 2014a). Wetlands disturbed during installation of the soil cover were replaced in accordance with the Compensatory Wetlands Mitigation Plan (CWMP).

Open Cell Steel Sheet Pile Installation

- An open-cell steel sheet pile WIB was installed along the thickest portions of the burn layer and impacted materials adjacent to the IR Site 1 shoreline (see Figure 2.6-1).
- Clean imported backfill was placed in the WIB.

Soil Area 2b, Alternative S2-3, Soil Cover and ICs

- Removal of pavement to accommodate soil cover seismic design requirements.
- Destruction of groundwater monitoring wells.
- Installation of a 3-foot-thick, seismically stable soil cover, in accordance with the RD/RAWP (AMEC 2014a) and the ESD to the original ROD (AMEC 2013).
- Surface of soil cover seeded with indigenous plant species as an erosion control measure.

Groundwater ISCO

- Treatment Zone Delineation
- Active ISCO treatment to decrease target VOC mass and concentrations.

Groundwater RA implementation at IR Site 1 began in Spring 2012. The first phase of the RA for groundwater at IR Site 1 was ISCO treatment with the ultimate goal of decreasing groundwater VC concentrations to or below the RG for human receptors as well as decreasing groundwater concentrations of TCE; 1,1-DCE; and benzene. Performance monitoring results summarized in the Draft BGMP Report indicated that post-ISCO VOC concentrations have varied (SES 2015).

MNA and Groundwater Monitoring

MNA is an anticipated future component of the groundwater remedy; however, it is premature to determine the path forward until after the monitoring well network is replaced and sampled. The monitoring well network was destroyed in accordance with guidelines and procedures stated in the RD/RAWPs (AMEC 2011a and 2014a) during implementation of the RA for soil. Reinstallation of the monitoring network is planned for September 2016. These wells will be installed in accordance with the RD/RAWP and the Post-Closure Monitoring and Maintenance Plan (AMEC 2016).

ICs for Soil

As stated in the ROD, IR Site 1 shall be restricted to open space and recreational uses. In addition, the following land uses specifically are prohibited within the boundaries of the IR Site 1 ARIC:

- A residence, including any mobile home or factory-built housing constructed or installed for use as residential human habitation
- A hospital for humans
- A school for persons under 21 years of age

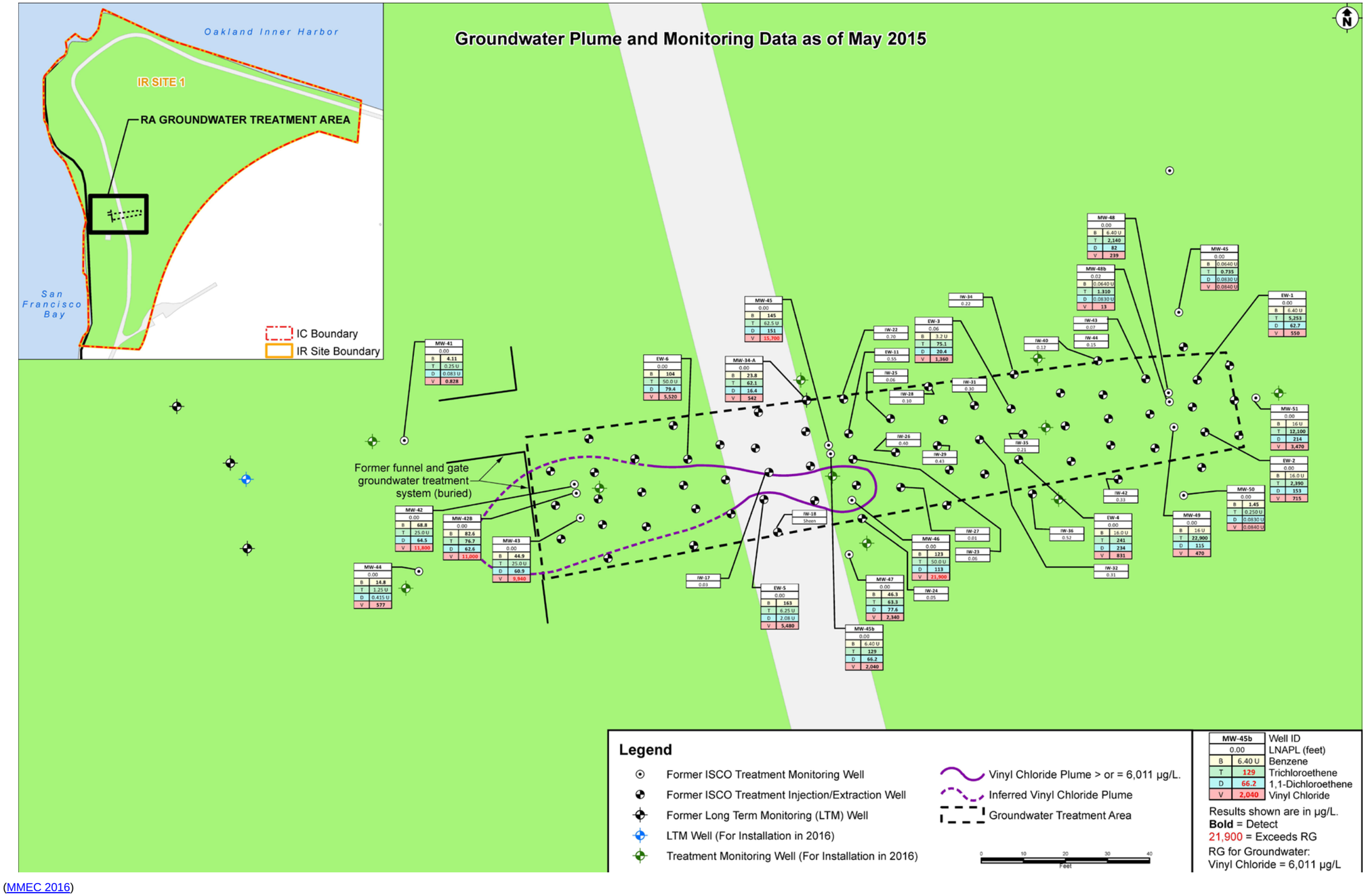
- A day care facility for children
- Any permanently occupied human habitation other than those used for commercial or industrial purposes

In addition, the activities summarized below are prohibited.

- Land-disturbing activity unless conducted pursuant to an approved soil management plan, including, but not limited to, (1) excavation of soil and disturbance of the soil cover; (2) construction of roads, utilities, permanently occupied buildings, facilities, structures, and appurtenances of any kind; (3) demolition or removal of paved areas; (4) actions that may impair the soil cover or other exposure prevention barriers; (5) excavation and/or disturbance of soil or riprap areas; and (6) any other activity that involves movement of soil to the surface from below the surface of the land
- Alteration, disturbance, or removal of any component of a response or cleanup action
- Extraction of groundwater and installation of new groundwater wells
- Removal of or damage to security features (such as locks on monitoring wells, site fencing, and signs) or to survey monuments, monitoring equipment, piping, and other appurtenances prohibited without prior written approval from the DON and FFA signatories

Figure 2.6-2 shows the most recent data from former monitoring wells at IR Site 1 (SES 2015).

FIGURE 2.6-2: VOCS IN GROUNDWATER FWBZ, OU-3, IR SITE 1



Source: BGMP (MMEC 2016)

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Additional Land-Use Restrictions for Radionuclides at IR Site 1

Excavation within the IR Site 1 ARIC is strictly prohibited unless approved in writing by the FFA signatories and the California Department of Public Health (CDPH). Any proposed excavation below a depth of 2 feet is required to be described in a soil management plan that will include, but not be limited to, a radiological work plan, the identification of a radiological safety specialist, soil sampling and analysis requirements, and a plan for off-site disposal of any excavated radionuclides by the transferee in accordance with federal and state law.

ICs for Groundwater

ICs for groundwater are being implemented in accordance with the procedures and requirements outlined in the ROD (DON 2009) and the LUC RD (AMEC 2011b). Based on the groundwater contamination at IR Site 1, the following activities are prohibited:

- Any surface or subsurface activity that causes or could cause the preferential movement of contaminated groundwater
- Extraction of groundwater, and installation of new groundwater wells
- Alteration, disturbance, or removal of any component of the groundwater response or cleanup action, including groundwater monitoring wells, groundwater extraction wells, treatment facilities, and associated equipment
- Removal of or damage to security features (such as locks on monitoring wells, survey monuments, fencing, signs, or monitoring equipment and associated pipelines and appurtenances)
- Construction of buildings above the VOC plume or for any purpose
- ICs for groundwater to be maintained until the concentrations of hazardous substances in groundwater are at levels that allow unrestricted use and exposure

O&M

O&M is required at IR Site 1 in accordance with the Draft-Final Post-Construction Operation, Maintenance, and Monitoring Plan (PCOMMP) (AMEC 2016). IR Site 1 will be inspected quarterly and after abnormal events and repairs or maintenance will be performed as necessary. Abnormal events may include any rain event with 0.5 inch of rain occurring in a 24-hour period, seismic events with a measured peak ground acceleration at the Yerba Buena Island Ground Response System ground-shaking Station No. 58163 exceeding a gravitation force of 0.10 g, tidal or ocean surges, wildfire or failure of surface water management systems. A brief outline of O&M components is provided in the following text.

WIB

- Visual Inspection
- Maintenance and Repair

Groundwater Monitoring and Soil Gas Probe

- Groundwater Monitoring and Monitoring Well inspection
- Soil Gas Monitoring and Soil Gas Probe inspection (TBD)

Inspection of Site Structures

- Waste Isolation Cover (WIC), Vegetation Cover, Differential Settlement & Geonet Animal Intrusion Barrier
- Compensatory Mitigation Wetlands
- Access Roads (annually)
- Signage (semi-annually)
- Wildlife (compensatory mitigation wetland habitat observations)
- Land Survey of WIC (annually)

A Storm Water Pollution Prevention Plan (SWPPP) was designed for IR Site 1 to comply with California's General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Permit) Order No. 2009-0009-DWQ as amended by Order No. 2010-0014-DWQ (NPDES No. CAS000002) issued by the SWRCB (AMEC 2014b). O&M supporting the SWPPP was implemented during all construction field activities.

Ongoing O&M is required for the soil cover (including minor brush and grass clearing) in accordance with the ROD (DON 2009), LUC RD (AMEC 2011b), and PCOMMP (AMEC 2016).

2.6.3 Progress Since the Last Five-Year Review, OU-3, IR Site 1

This is the first Five-Year Review for IR Site 1.

2.6.4 Five-Year Review Process, OU-3, IR Site 1

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 1. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.6.4.1 Site Inspection

Because IR Site 1 soil cover was recently seeded, a perimeter site inspection was conducted for this Five-Year Review. The landfill cap and perimeter fencing appear to be in good condition. ICs outlined in the ROD and ROD Amendment are operating as intended and are protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Site 1.

2.6.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 1. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response:

"Additional burned materials were encountered during pre-design investigation which led to Focused Feasibility Study for the Burn Area. The ROD Amendment was prepared to document the remedy

change from the original ROD. The extent to which VOCs were treated in the plume area is unknown as the wells were removed to install the soil cover. Additional in-situ chemical oxidation (ISCO) may be needed. Also, additional wells are needed to monitor whether contaminated groundwater moves around the waste isolation barrier (WIB)."

DTSC Response: No Comments.

Regional Water Board Response:

"During a Site 1 inspection on March 13, 2015, Water Board staff noted three site conditions that were out of compliance for storm water requirements. These issues were addressed quickly and the site documented as having complied by April 2015. I am unaware of any additional incidents during the time I have been the caseworker (November 2014 to present). The community (via RAB meetings) voiced concerns regarding the re-vegetation of IR Sites 1 and 2 and the Tarry Refinery Waste (TRW) remaining at IR Site 13."

Community Interview Response:

"Inadequate protection against burrowing animals. Closure of IR Sites 1, and 2 does not meet current state standards for landfills." George Humphreys, RAB Member.

"I suspect that, over time, Sites 1 & 2 will be impacted by sea level rise at which time the ground will be far more wet or inundated. The WIB is expensive and is probably vulnerable to certain types of earthquakes. If it is damaged in a quake or even by a combo or quake and water action, how will 'damage' be evaluated before the WIB is restored? (It is 'holding back' an enormous amount of contamination and it is unlikely that a structure in its particular situation will last 'forever'." Susan Galleymore, RAB Member

Contractor Interview Response:

"I continue to believe that the remedy selected was the best one and that it has been implemented correctly. I have no additional suggestions." Philip Stearns, AMEC Foster Wheeler.

2.6.5 Technical Assessment, OU-3, IR Site 1

The RAOs for soil are being met by eliminating exposure to buried waste at IR Site 1 through a soil cover. Ongoing O&M will ensure the integrity of the soil cover and WIB along with enforcement of ICs to maintain the integrity of the implemented remedy. The remedy will protect future recreational visitors and terrestrial ecological receptors from exposure to buried waste. and prevent human exposure to VOCs in outdoor air.

TABLE 2.6-3: TECHNICAL ASSESSMENT SUMMARY, OU-3, IR SITE 1

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 1	Soil – Excavation, Disposal, Import Fill, Soil Cover, and ICs	Yes	Yes	No	Protective	2021
	Groundwater – ISCO, MNA, and ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ISCO = In situ chemical oxidation
ID = Identification
IR = Installation Restoration
MNA = Monitored natural attenuation
OU = Operable unit

2.6.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Soil Remedy

Yes, the soil remedy is functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remedy implemented is working as intended by the ROD. The documents that detail the remedial decisions for IR Site 1 are the ROD (DON 2009), ESD to the original ROD (AMEC 2013), RD/RAWP for groundwater (AMEC 2011a), RD/RAWP for soil (AMEC 2014a), and LUC RD (AMEC 2011b).

Groundwater Remedy

The remedy for groundwater at IR Site 1 is pending completion; therefore, concentration trends will not be evaluated in this Five-Year Report. It is premature to determine the efficacy of the groundwater remedy as remedy implementation is ongoing. The path forward will be determined after the monitoring well network is replaced and sampled. The ROD (DON 2009) stated that once remediation goals are met, the DON will continue corrective groundwater monitoring for one year. Thereafter, the DON will implement a detection monitoring program to demonstrate continued compliance with the remediation goals.

System Operations and O&M

O&M requirements are briefly discussed in Section 2.6.2.2.

Cost of System Operations and O&M

The estimated annual cost of O&M at IR Site 1 over the first five years is $341,148 in 2015 dollars.

Opportunities for Optimization

Soil Remedy

No opportunities for soil remedy optimization have been identified at this time.

Groundwater Remedy

The effectiveness of on-going groundwater remedy implementation at IR Site 1 is under evaluation. It is premature to determine the path forward until after the monitoring well network is replaced and sampled.

Performance of Remedies

As discussed in Section 2.6.2.2, the selected remedy consists of multiple, area-specific components at IR Site 1. Other than Area 4 remedy which was implemented in 2008, and well installation which has yet to be implemented, the remainder of the selected remedy was implemented between 2014 and 2015. The soil and groundwater remedies are functioning as intended, as evidence by results of groundwater data, document reviews, interviews, and ongoing O&M activities. IC performance was evaluated by conducting site inspections and interviews with stakeholders. The data review, site inspection and interviews revealed no evidence of any activities that were inconsistent with the land use restrictions specified in the LUC RD (AMEC 2011b).

Soil Remedy Performance

The soil remedy is functioning as intended, as evidenced by document reviews, interviews, and ongoing O&M activities.

Groundwater Remedy Performance

An evaluation of the performance of the groundwater remedy implemented to date at IR Site 1 is deferred until after the monitoring well network is replaced and sampled.

2.6.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 1 is in place and there are no reported changes to the remedy that would affect its protectiveness.

For the recreational scenario, the total potential RME incremental lifetime cancer risk (ILCR) is 1×10^{-4} which is within the cancer risk management range. This includes an ILCR of 4.4×10^{-5} for chemicals in soil, an ILCR of 4.0×10^{-5} for chemicals in groundwater (via inhalation of volatiles), and an ILCR of 2.0×10^{-5} for radiological constituents in soil. The noncancer HI for the recreational receptor, including all media and exposure pathways, were 0.1, which is less than the target HI of 1; therefore, adverse noncancer health effects were regarded as unlikely and no COCs were identified based on noncancer effects.

The total potential RME ILCR under the occupational scenario is 1×10^{-4}, which equals the recreational ILCR and is within the cancer risk management range. This includes an ILCR of 2.6×10^{-5} for chemicals in soil, an ILCR of 4.0×10^{-5} for chemicals in groundwater (via inhalation of volatiles), and an ILCR of 3.6×10^{-5} for radiological constituents in soil. The noncancer HI for the occupational receptor, including all media and exposure pathways was 0.09 which is less than the target HI of 1.

Changes in Exposure Assumptions and Toxicity Data

The IR Site 1 HHRA predates the current USEPA hierarchy used for toxicity values in human health risk assessments (USEPA 2003). The toxicity values used in the IR Site 1 HHRA were primarily from USEPA's IRIS database as of 1998, which is defined by the current USEPA hierarchy as the preferred Tier 1 source. For soil, the primary human health risk drivers were several carcinogenic PAHs, PCBs, and chromium VI. For groundwater-to-ambient air the only COC identified was VC. The toxicity values used in the HHRA for the COCs are from Integrated Risk Information System. Each of these values is still current and correct, with the exceptions of the CSF_i used for Aroclor 1254 and Aroclor 1260 and the CSF_i used for VC. A CSF_i of 0.4 $(mg/kg\text{-}day)^{-1}$ was used in the HHRA for each Aroclor. In more recent years, USEPA has used an UR_i rather than a CSF_i. A CSF_i of 0.4 $(mg/kg\text{-}day)^{-1}$ converts to a UR_i of 1.1×10^{-4} $(\mu g/m^3)^{-1}$. This value is less than the current UR_i of 5.7×10^{-4} $(\mu g/m^3)^{-1}$, meaning that current value is less conservative and that the value used in the HHRA was more protective. Because the inhalation pathway for PCBs contributed negligibly to the ILCR in the HHRA (4×10^{-10}), protectiveness is unaffected by the difference in inhalation toxicity values. Thus, the toxicity values used in the HHRA for soil COCs are still regarded as protective. A CSF_i of 0.3 $(mg/kg\text{-}day)^{-1}$ was used in the HHRA for VC in groundwater. A CSF_i of 0.3 $(mg/kg\text{-}day)^{-1}$ converts to a UR_i of 8.6×10^{-5} $(\mu g/m^3)^{-1}$. This value is approximately 20 times the current UR_i of 4.4×10^{-6} $(\mu g/m^3)^{-1}$, meaning that the current value is less conservative and that the value used in the HHRA was more protective.

Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

More recently, HHRAs conducted for the Alameda Point facility have also included a separate evaluation that uses OEHHA values as a point of reference. This evaluation was not conducted in the HHRA for IR Site 1. The current OEHHA values for B(a)P and total PCBs are the same as the current USEPA values for the COCs. For chromium, OEHHA has identified an oral cancer slope factor (CSF_o) of 0.5 $(mg/kg\text{-}day)^{-1}$. A CSF_o has not been identified from an USEPA source, although the current RSL table (USEPA 2015) lists a Tier 3 CSF_o (cited therein as being from the State of New Jersey) that equals the OEHHA value. The OEHHA CSF_i of 1.5×10^{-1} $(\mu g/m^3)^{-1}$ is an order of magnitude higher than the current USEPA CSF_i of 1.2×10^{-2} $(\mu g/m^3)^{-1}$. Because the contamination is in disposal areas and a burn area, chemical contaminants at IR Site 1 generally co-occur with other contaminants, including the COCs. Currently, the COCs are covered with a 3-foot-thick soil cover that was installed as part of the remedy. This cover prevents any human exposure, especially as ICs that prohibit cover disturbance are also part of the remedy. Therefore, exposure to both COCs and non-COC chemicals is eliminated.

With respect to the radionuclide COC, radium-226 (including daughter products), the HHRA used an external CSF value of 6.74×10^{-6} (risk/year)/(picocurie per gram [pCi/g]). This value is similar to the current RPRG (USEPA 2014) external CSF value for radium-226 of 8.37×10^{-6} (risk/year)/(pCi/g), which is approximately 25 percent higher. Therefore, the radiological cancer risks calculated in the HHRA are approximately 25 percent less than what would be calculated using the current external CSF for radium-226 and daughter products.

Because surface water RGs are based on regulatory values, any changes to toxicity values do not affect the protectiveness of the remedy.

Potential redevelopment of IR Site 1 is split between recreation and public open space. The majority of IR Site 1 is considered public trust land. Public trust land is subject to the use restrictions identified in the State Tideland Trust and can be used only for activities related to commerce, fisheries, navigation, ecological reservation, and recreation. IR Site 1 is bayfront; the practice in other bayfront areas has been to leave the land in a mostly natural vegetative state, with unpaved walking and bicycle paths. Based on the future land uses at IR Site 1, the exposure assessment receptors and pathways evaluated in the HHRA for IR Site 1 are reasonable and protective for the current remedy.

No additional exposure pathways have been identified since land uses, zoning, and receptors at this IR site have not changed since the previous 5-Year Review. There are uncertainties concerning some of the assumptions used to evaluate risks associated with soil in the HHRA for the recreational receptor. These assumptions were used in the derivation of the RGs, and they may affect the interpretation of protectiveness for PAHs. The HHRA found that the risks to the occupational receptor and recreational receptor were very comparable. It is our experience that worker scenarios generally have greater risks than recreational scenarios, especially for low-intensity exposure land uses such as walking and biking trails. Therefore, industrial soil RSLs should be protective of both occupational and recreational land use. The RGs for chromium and the Aroclors are less than the industrial RSLs, indicating that the RGs for these COCs are adequately protective. For PAHs, the RGs are several times greater than the industrial RSLs. However, the areas of contamination have been remediated and are covered with a 3-foot-thick soil cover, and ICs are in place to prevent contact. Therefore, the remedy is protective even if the RGs for PAHs may not be as protective as the other RGs.

Each of the RGs for the radionuclide COCs are protective under industrial land use, except the RG for cesium-137+D (0.113 pCi/g), which only slightly exceeds the industrial land use RPRG (0.092 pCi/g). However, given that the HHRA showed the radiological exposure/risks under the occupational scenario to be more than double those under the recreational scenario, the RG for cesium 137+D is regarded as protective for recreational land use. In general, the radiological RGs are highly conservative as most of them are based on residential use. The toxicity values of the COCs that were used in the HHRA are still current. All RGs for groundwater and surface water are regarded as protective.

Changes in Cleanup Levels

The preliminary remediation goals (PRG) value used to evaluate the risk associated with Radium-226 has been revised slightly. This would result in a minimally higher cancer estimate with respect to Radium-226; the current cleanup level would still be protective with respect to human health risks.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Site 1 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.6.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy. COCs in soil have been delineated, and the impacted soil has been removed (where applicable) or covered during RA implementation in accordance with the ROD and ROD Amendment for Area 1a (see Section 2.6.2.2). The VC groundwater contamination plume has been delineated, and the groundwater RA was implemented in Spring 2012. ICs for soil and groundwater are operating as intended by the ROD and ROD Amendment and are protective of human health and the environment.

2.6.6 Issues, OU-3, IR Site 1

The IR Site 1 soil cover is sparsely vegetated with mostly noxious weeds. Additionally, the groundwater monitoring well network was destroyed as part of the RA for soil.

2.6.7 Recommendations and Follow-up Actions, OU-3, IR Site 1

The DON will reseed the soil cover, in accordance with the PCOMMP (AMEC 2016), to establish native vegetation and reinstall the groundwater monitoring well network as stated in the ROD (DON 2009).

2.6.8 Protectiveness Statement, OU-3, IR Site 1

The soil RAs performed at IR Site 1 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at IR Site 1 to prevent human and ecological exposures to COCs in soil. ICs and LUCs are assessed annually. The selected remedy will continue to be protective in the long term.

The protectiveness of the groundwater RA at IR Site 1 cannot be evaluated until after installation of the planned monitoring well network; therefore, protectiveness is deferred. Groundwater ICs included in the selected remedy at IR Site 1, and stated in the ROD and LUC RD, are considered protective of human health in the short term.

2.7 OU-4A, IR SITE 2

2.7.1 Site Description and Background, OU-4A, IR Site 2

IR Site 2 at OU-4A covers approximately 110 acres at the southwestern tip of Alameda Point, which is on the eastern side of San Francisco Bay and south of Oakland, California, as shown in Figure 1-1. IR Site 2

consists of a landfill occupying approximately 77 acres and wetlands occupying approximately 33 acres. The topography at IR Site 2 gently slopes overall from the north and east to the south and west toward San Francisco Bay.

The site originally was constructed in a shallow open water and intertidal environment through dredging and filling. Beginning around 1956, IR Site 2 was used as the principal disposal location for wastes generated at Alameda Point. Waste disposal activities at IR Site 2 reportedly terminated in early 1978. Over the course of its operation as a landfill, IR Site 2 reportedly received up to 1.6 million tons of general base waste as well as specific and potentially hazardous industrial or process waste streams, including, but not limited to, asbestos, solvents, waste oils, pesticides, and sandblasting grit. Disposal primarily occurred in the landfill portion of the site, although historical information suggests that a minor amount of disposal could have occurred in limited portions of the wetlands. Historical information also suggests that dredged San Francisco Bay sediment from other sites at Alameda Point was placed in the wetland area at IR Site 2. After the cessation of landfill activities at IR Site 2, landfill closure activities were initiated; however, these closure activities were not comprehensively completed (Battelle 2006).

2.7.1.1 Land and Resource Use

Currently, the federal government owns IR Site 2 under the jurisdiction of the United States VA. In 2014, the DON and VA entered into a Memorandum of Understanding (MOU), indicating the DON will continue all real property accountability for VA Property (including IR Site 2) until the VA assumes such responsibility, as defined in the MOU, and continues to carry out its responsibilities under the FFA amendment.

The site can be divided into the following general areas: the upland area consisting predominantly of the former landfill; the wetland area south and west of the former landfill, which contains the wetland ponds (the North Pond and South Pond); the coastal margin composed of the perimeter rock sea wall and berm along the western and southern boundaries of the site; and the interior margin consisting of the berm north and east of the landfill, and all areas north and east of the berm.

According to the "*Alameda Community Reuse Plan*" (EDAW 1996), IR Site 2 is located in the future Nature Reserve; therefore, per the ROD (DON 2010), future land use for IR Site 2 is recreational. The proposed Nature Reserve is planned to provide long-term protection of habitat primarily for the federally-endangered California least tern but also for other wildlife. The VA's management of the California least tern Colony is under a Management Plan approved by the United States Fish and Wildlife Service.

2.7.1.2 Current and Potential Groundwater Uses

No above- or belowground utilities exist at IR Site 2. Because the site originated as an area of shallow open water as part of East San Francisco Bay and currently is a closed Class II landfill, groundwater beneath IR Site 2 is currently not used for drinking water and is not considered a potential drinking water source because of its poor quality for use as a drinking water, irrigation, industrial, and municipal source. Groundwater underlying Alameda Point typically is known for high levels of TDS and low sustained hydraulic well yield. As stated in the ROD (DON 2010), the Regional Water Board and USEPA have concurred with this position. Because groundwater is not a potential drinking water source, numeric standards associated with such uses (such as MCLs for drinking water) do not directly apply to groundwater at IR Site 2.

2.7.1.3 Site Chronology and Initial Response

Table 2.7-1 summarizes major investigations and actions taken at IR Site 2. These site activities are described in detail in the RI Report (Battelle 2006).

TABLE 2.7-1: CHRONOLOGY OF SITE EVENTS – OU-4A, IR SITE 2

Date	Event	Comments
1983	Initial Assessment Study	Documented historical disposal of waste items associated with former landfill operations. IR Site 2 was formerly the main disposal location for Alameda Point. Recommended further evaluation.
August 1998	IR Sites 1 and 2 radiological survey	According to the Radiological Survey Report, the area north and east of the berm was surveyed at IR Site 2 and found to occupy approximately 17.2 acres.
August 1999	IR Sites 1, 2, 5, and 10 radiological removal action	According to the Action Memorandum/Final Interim Remedial Action Plan, eight anomalies were found in the Radiological Shack area during a survey of the jogging trail at IR Site 2. Seventeen sources were recovered and removed.
September 1999	Removal action	During the removal action, hand digging was performed at 50 locations. Soil samples were collected, and removal continued until no levels of radium-226 exceeded 20,000 cpm and all soil sample results were below 5 pCi/g. Eight drums of material were removed from the Radiological Shack area, including soil, rock, and concrete.
October 1999	Walkover grid survey of entire site	According to the Field Summary Report, the survey identified an AOC at IR Site 2 of approximately 2.25 acres used as an OEW disposal area.
January 2004	OEW and geotechnical characterization	Documented an upland area surface sweep for OEW in the bermed landfill. The characterization included determining liquefaction potential, seismic slope instability hazards, and geotechnical improvements needed.
March 2004	Geotechnical FS	Soil-cement gravity wall and stone columns were determined to be the most feasible remedial option.
February 2005	Tidal study for IR Sties 1 and 2	Concluded that groundwater monitoring wells near San Francisco Bay are moderately to strongly influenced by tidal fluctuations in San Francisco Bay.
August 2005	Radiological characterization	Twenty-three areas were identified at IR Site 2 with radiological counts above two times background. Areas with elevated readings generally were located in the northern and eastern portions of IR Site 2 around the former weapons storage magazines. Four of the five soil samples contained radium-226 at concentrations exceeding background. The maximum concentration was 0.397 pCi/g, compared to 0.365 pCi/g background.
2006 to 2014	Annual BGMP sampling	Presented groundwater and soil gas data from the Alameda Point BGMP.
June 2006	RI	Determined that the primary human health and ecological risk drivers in soil at IR Site 2 included PCBs, some metals, PAHs, pesticides, radionuclides, and polychlorinated dibenzodioxins/dibenzofurans.
September 2007	Radiological characterization, IR Sites 1, 2, and 32	Revealed three areas of elevated radiological counts during the scan survey of the former Radiological Shack area. No elevated readings were detected in the shoreline areas of IR Site 2.
October 2008	FS	The preferred remedy for soil is a multilayer soil cover, engineering controls, ICs, and monitoring. The preferred alternative for groundwater is MNA, engineering controls, and ICs.
February 2009	Data gaps investigation	Indicated that seven soil gas samples were collected and analyzed in the field. Methane concentrations in all samples were 0.0 to 0.1 percent by volume.
August 2009	PP	Presented the proposed remedy for IR Site 2 based on previous investigations, including the RI and FS.
September 2009	TCRA	TCRA activities focused on confirming elevated areas identified in 2004 and 2006 and removing discrete items outside the bermed area. Ten discrete items were recovered from IR Site 2, one along the shoreline and the others from the area north of the berm. A surface survey for gamma-emitting radionuclides was conducted after the removal activities along the shoreline area and north of the bermed landfill.
August 2010	ROD	Documented the selected remedies for soil in the upland area and groundwater at IR Site 2. A multilayer soil cover is selected for installation upon the former landfill surface to isolate buried waste. Implementation of engineering controls, ICs, and monitored natural attenuation (MNA) will all contribute toward the protection of human health and the environment.
April 2013	LUC RD	The LUC RD Report documented LUCs for the upland and wetland areas at IR Site 2 in accordance with the ROD.

TABLE 2.7-1: CHRONOLOGY OF SITE EVENTS – OU-4A, IR SITE 2

Date	Event	Comments
February 2013	RA Implementation	The RA began with clearing, grubbing and demolition of existing structures within the RA area. The components of the RA involved installation of an animal intrusion barrier, general soil layer, vegetative soil cover, monitoring wells, soil gas probes, drainage culverts, hydro-seed, perimeter fencing, signage and 8,500 feet of linear gravel road. All RA field activities were conducted in accordance with the RAWP.
November 2013	RAWP	The RAWP described the planned RA activities and procedures necessary for implementing the RA for soil and groundwater at IR Site 2.
January 2015	Draft Remedial Action Completion Report	Outlining remedy completion at IR Site 2.
December 2015	Post-closure field activities	An Annual Report documented the post-closure field activities and O&M activities from October 2014 through October 2015 at IR Site 2.
March 2016	IC Compliance Monitoring Report and Annual IC Compliance Certificate	Certified that ICs for IR Site 2 are in compliance with the requirements specified in the ROD.

Notes:
AOC = Area of concern
BGMP = Basewide Groundwater Monitoring Program
cpm = Count per minute
FS = Feasibility Study
IC = Institutional control
IR = Installation Restoration
LUC = Land-use control
MNA = Monitored natural attenuation
O&M = Operation and maintenance
OEW = Ordnance and explosives waste
OU = Operable unit
PAH = Polycyclic aromatic hydrocarbon
PCB = Polychlorinated biphenyl
pCi/g = Picocurie per gram
PP = Proposed Plan
RA = Remedial action
RAWP = Remedial Action Work Plan
RD = Remedial design
RI = Remedial Investigation
ROD = Record of Decision
TCRA = Time-critical removal action

2.7.1.4 Basis for Taking Action

The basis for taking action at IR Site 2 was unacceptable risk from COCs in soil and groundwater exposure pathways. Remedial action is warranted to protect future recreational or occupational receptors as well as ecological receptors from potential risks posed by COCs in soil and groundwater (DON 2010).

The following types of COCs in soil were identified as posing risk to human health and the environment: PCDDs, PCDFs, PAHs, PCBs, Pesticides, Metals and Radionuclides.

For shallow (i.e., FWBZ) groundwater at IR Site 2, risk assessments concluded that total COCs represent contributors to potentially unacceptable risk to human receptors through the direct contact pathway.

The following types of COCs in groundwater were identified as posing risk to human health and the environment: SVOCs/PAHs, pesticides and metals.

2.7.2 Remedial Action, OU-4A, IR Site 2

2.7.2.1 Remedy Selection (Record of Decision)

As stated in the ROD (DON 2010), RAOs were established based on data available for the site and the results of the risk assessments conducted during the RI. Surface soil and FWBZ groundwater were determined to be the media of interest for developing an appropriate risk management strategy at IR Site 2. RAOs were developed to provide protection against the risks identified in these media. Based on the findings from the RI Report and the summary of human health and ecological risk drivers, the RAOs for IR Site 2 as follows:

- Protect sensitive human receptors, avian species, and mammal species from exposure to COCs in surface soil in the landfill and wetland portions of the site

- Protect the viable wetland area in the southwest portion of the site from impacts associated with the landfill
- Protect sensitive human receptors from exposure through external radiation from surface soil in the landfill and wetland portions of the site
- Protect beneficial uses of surface water in San Francisco Bay from the potential for discharge of site groundwater containing COCs

The selected remedy for soil and groundwater stated in the ROD (DON 2010) includes the components listed below.

Soil Alternative 2:

- Installation of a multilayer soil cover to isolate buried waste and soil contaminants and to prevent animal burrowing
- Before placement of the multilayer soil cover, scanning of the subgrade surface and removal of radiological hot-spot material to prevent the spread of potential contamination and ensure worker health and safety
- Radiological surface scan using field instruments to identify hot spots as material exhibiting gamma radiation readings approximately two times background (while recognizing that background radiation readings typically vary depending on whether the source material is soil, gravel, or concrete, all of which are present at IR Site 2)
- Implementation of ICs for IR Site 2 soil

Groundwater Alternative 2:

- Long term MNA for groundwater in the FWBZ
- Implementation of ICs for IR Site 2 groundwater

TABLE 2.7-2: RGS FOR COCS IN SOIL AND GROUNDWATER, OU-4A, IR SITE 2

COC	Receptor	RG
Soil in Upland Area (Former Landfill)		
Benzo(a)pyrene and PCBs		
Benzo(a)pyrene	Recreational Human	0.24 mg/kg
Total PCBs	Recreational Human	0.87 mg/kg
Radionuclides [a]		
Cesium-137+D	Recreational Human	0.113 pCi/g [b]
Cobalt-60	Recreational Human	0.0361 pCi/g [b]
Radium-226	Recreational Human	1.0 + pCi/g [c,d]
Strontium-90	Recreational Human	0.331 pCi/g [b]
Thorium-232	Recreational Human	1.69 pCi/g [b]
Uranium-238+D (used for depleted uranium and uranium oxide)	Recreational Human	0.742 pCi/g [d]
Metals		
Cadmium	Ecological	6.5 mg/kg
Chromium	Ecological	48.5 mg/kg
Lead	Ecological	-- [e]
Zinc	Ecological	263 mg/kg
Molybdenum	Ecological	1.9 mg/kg
PCBs and DDx		
Total PCBs	Ecological	1.4 mg/kg
Total DDx	Ecological	0.027 mg/kg

TABLE 2.7-2: RGS FOR COCS IN SOIL AND GROUNDWATER, OU-4A, IR SITE 2

COC	Receptor	RG
Groundwater (Shoreline FWBZ Groundwater Monitoring Well)		
Metals		
Arsenic	Aquatic Life	122 µg/L
Copper	Aquatic Life	31 µg/L
Nickel	Aquatic Life	25 µg/L
Pesticides		
Aldrin	Recreational Fisherman	0.01 µg/L
Alpha Chlordane	Recreational Fisherman	0.02 µg/L
a-HCH	Recreational Fisherman	0.02 µg/L
b-HCH	Recreational Fisherman	0.16 µg/L
4,4'-DDE	Recreational Fisherman	0.05 µg/L
4,4-DDT	Recreational Fisherman	0.03 µg/L
Dieldrin	Recreational Fisherman	8.5 µg/L
Endrin	Recreational Fisherman	0.06 µg/L
Gamma Chlordane	Recreational Fisherman	2.6 µg/L
Heptachlor	Recreational Fisherman	0.02 µg/L
Heptachlor Epoxide	Recreational Fisherman	0.02 µg/L
SVOC/PAHs		
Diethylhexyl Phthalate	Recreational Fisherman	18 µg/L

Source: ROD (DON 2010)
Notes:
µg/L = Microgram per liter
+D = Plus daughter product(s)
a-HCH = alpha-Hexachlorocyclohexane
b-HCH = beta-Hexachlorocyclohexane
COC = Contaminant of concern
DDE = Dichlorodiphenyldichloroethene
DDD = Dichlorodiphenyldichlorethane
DDT = Dichlorodiphenyltrichloroethane
DDx = Sum of DDT, DDD, and DDE
DON = United States Department of the Navy
FWBZ = First water-bearing zone
HHRA = Human health risk assessment
IC = Institutional control
IR = Installation Restoration
mg/kg = Milligram per kilogram
mrem/yr = Millirem per year
OU = Operable unit
PAH = Polycyclic aromatic hydrocarbon
PCB = Polychlorinated biphenyl
pCi/g = Picocurie per gram
RG = Remediation goal
ROD = Record of Decision
SVOC = Semivolatile organic compound
USEPA = United States Environmental Protection Agency

a The RGs for radionuclides meet or are more protective than the 12-mrem/yr residual dose level consistent with 1997 USEPA OSWER Directive 9200.4-18. Residential use of radiologically-impacted areas will be prohibited based on ICs. Radionuclides were identified based on the findings of the HHRA (Battelle 2006).
b Source: DON. 2006. *"Final Basewide Radiological Removal Action Memorandum, Revision 2006, Hunter Point Shipyard, San Francisco, California."* April 21.
c The RG is 1 pCi/g above the background count in agreement with the USEPA.
d Source: USEPA. 2009. *"Preliminary Remediation Goals for Radionuclides."* http://epa-prgs.ornl.gov/radionuclides/
e No soil RG for lead is presented because of uncertainties associated with the bioavailability and toxicity of lead to avian receptors. In addition, the remediation footprint identified to address soil COCs other than lead will address potentially unacceptable risks to ecological receptors associated with lead in surface soil.

2.7.2.2 Remedy Implementation

The RA at IR Site 2 for soil and groundwater was implemented between 2013 and 2014. The RA consisted of the following field activities in accordance with the ROD (DON 2010) and RAWP, Revision 1 (TtEC 2013c):

- Destruction of selected existing groundwater and soil gas monitoring wells by pressure grouting per California Well Standards Bulletin 74-90
- Site grading to subgrade elevation, and radiological surface scan of the subgrade surface
- Installation of an animal intrusion barrier consisting of a high-density polyethylene geonet

- Placement of a minimum of 1.5 feet of soil above the geonet to provide adequate holding capacity for soil moisture
- Placement of a 6-inch-thick layer of soil, compacted to 85% relative compaction, to help establish vegetation
- Radiological scan of the finished cover to document the effective remedy
- Hydroseeding to help establish native vegetation
- Construction of two earthen swales with turf reinforcement mats for surface water management
- Installation of landfill groundwater monitoring wells and soil gas monitoring probes
- Installation of access roads

Production of a RACR to document the implementation of the RA is expected in 2016.

LUCs, general activity restrictions, and restrictions related to radionuclides at IR Site 2 are discussed below.

LUCs

The following LUCs are presented in the LUC RD Report (Attachment 12 of the RAWP [TtEC 2013b]):

- A residence, including any mobile home or factory-built housing constructed or installed for use as residential human habitation
- A hospital for humans
- A school for persons under 21 years of age
- A day care facility for children
- Any permanently occupied human habitation other than those used for commercial or industrial purposes

General Activity Restrictions

The general activity restrictions summarized below apply to IR Site 2.

- Land-disturbing activity is prohibited unless conducted pursuant to an approved soil management plan.
- Alteration, disturbance, or removal of any component of a response or cleanup action is prohibited, including, but not limited to, soil cover and containment systems; groundwater extraction, injection, and monitoring wells and associated piping and equipment; and associated utilities.
- Extraction of groundwater and installation of new groundwater wells are prohibited.
- Removal of or damage to security features is prohibited (such as locks on monitoring wells, survey monuments, signs, and monitoring equipment and associated pipelines and appurtenances).

Restrictions Related to Radionuclides

The restrictions related to radionuclides summarized below apply to IR Site 2.

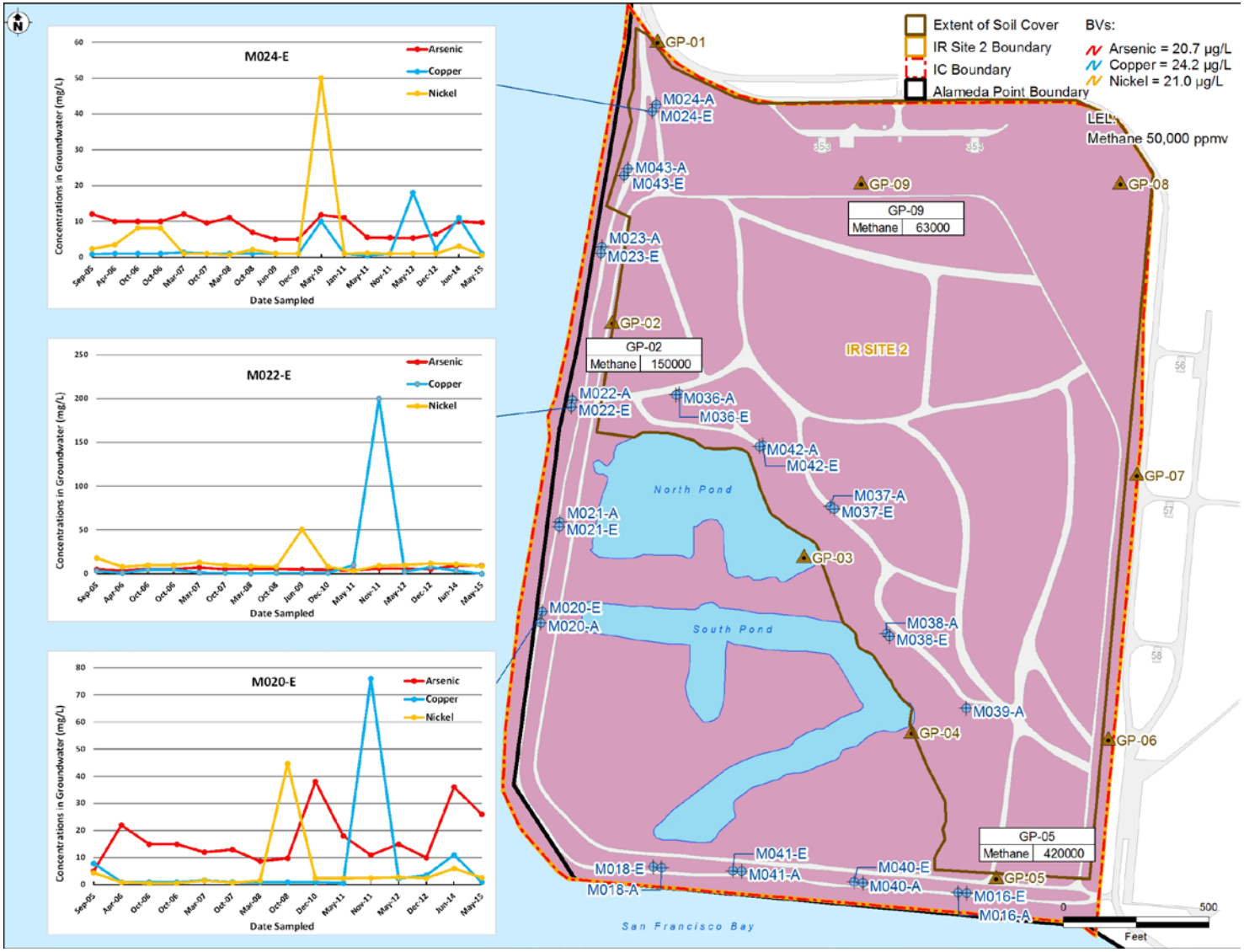
- Excavation within the IR Site 2 ARIC below a depth 1.9 feet is strictly prohibited unless approved in writing by the FFA signatories and the CDPH. Any proposed excavation below a depth of 1.9 feet is required to be described in a soil management plan that will include, but not be limited to, a radiological work plan, the identification of a radiological safety specialist, soil sampling and

analysis requirements, and a plan for off-site disposal of any excavated radionuclides by the transferee in accordance with federal and state law.

- The integrity of the soil cover must be restored upon completion of any excavation as provided in the IR Site 2 O&M Plan, LUC RD, or similar document.

Figure 2.7-1 presents the IR Site 2 IC Boundary as well as recent dissolved metals in select groundwater monitoring wells and landfill methane gas concentrations.

FIGURE 2.7-1: DISSOLVED METALS IN GROUNDWATER, LANDFILL METHANE GAS AND IC BOUNDARY MAP, OU-4A, IR SITE 2



Source: LUC RD Report (TtEC 2013b) and BGMP (MMEC 2016)

O&M

The post-closure O&M consists of multiple components for IR Site 2 as stated in the Post-Closure Operations, Maintenance, and Monitoring Plan (Attachment 11 of the RAWP, Revision 1 [TtEC 2013b]). IR Site 2 will be inspected quarterly and after major weather events (any rain event with 0.5 inch or more of rain in a 24-hour period) and seismic events (Modified Mercalli Intensity V) for damage, and maintenance will be performed as necessary. A brief outline of O&M components is provided below.

Groundwater and Methane Soil Gas Monitoring

- Groundwater monitoring and monitoring well inspection
- Soil gas monitoring for methane and soil gas probe inspection

Inspection of Site Structures

- Landfill cover surface water management system
- Wetlands culvert
- Passive landfill gas collection system
- Settlement monuments (semi-annual inspection and annual topographic survey)
- Access roads
- Signage (semi-annually)
- Differential settlement and geonet animal intrusion barrier
- Soil cover vegetation
- Wildlife (migratory bird counts)

A SWPPP was designed for IR Site 2 to comply with California's General Permit for Storm Water Discharges Associated with Construction and Land Disturbance Activities (General Permit) Order No. 2009-0009-DWQ issued by the SWRCB (TtEC 2013a). O&M supporting the SWPPP was implemented during all construction field activities.

2.7.3 Progress Since the Last Five-Year Review, OU-4A, IR Site 2

This is the first Five-Year Review for IR Site 2.

2.7.4 Five-Year Review Process, OU-4A, IR Site 2

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 2. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.7.4.1 Site Inspection

Because IR Site 2 was recently seeded, a perimeter site inspection was conducted for this Five-Year Review. The landfill soil cover, wetlands (North and South Pond), and perimeter fencing appear to be in good condition. ICs outlined in the ROD and LUC RD are operating as intended and are protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Site 2.

2.7.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 2. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response:

"The soil cover depression collected rainwater in a pond and the vegetative layer needed to be reseeded. The Navy proposed and implemented a soil cover repair and re-seeding the vegetative layer. However, since a limited amount of soil was imported to regrade the depression and the depression remains, it is uncertain if the repair was sufficient. The depression must fully drain such that no ponded water remains behind; if it does not, additional soil and grading will be needed. USEPA is aware that the community is also concerned that sea level rise will affect the remedies at both Sites 1 and 2. Sea-level rise has been considered in the remedial designs for both Sites 1 and 2, and it is part of the long term maintenance of the coastal margin."

DTSC Response:

"The revegetation for IR Site 2 did not go according to the Remedial Design/Remedial Action Work Plan. The Restoration Advisory Board (RAB) expressed concern that the invasive plants that were covering the site would get established and revegetation with the appropriate native species would not occur. The DON is working to remove the invasive species and plans to try to revegetate with native species."

Regional Water Board Response:

"The community (via RAB meetings) voiced concerns regarding the re-vegetation of IR Sites 1 and 2 and the Tarry Refinery Waste (TRW) remaining at IR Site 13."

Community Interview Response:

"IR Site 2 – erosion of landfill slopes that occurred under last year's meager rainfall (i.e., drought). Closure of IR Sites 1, and 2 does not meet current state standards for landfills. The roadbase for the original road on the landfill berm was sandblasting grit that contained excessive levels of tributyl tin, that was used to protect ships from barnacles."

"I suspect that, over time, Sites 1 & 2 will be impacted by sea level rise at which time the ground will be far more wet or inundated." Susan Galleymore, RAB Member.

Contractor Interview Response:

"In my opinion the Navy and regulatory agencies have selected a remedy that addresses all human health and environmental risks." Ray Seamons, Tetra Tech, EC, Inc.

2.7.5 Technical Assessment, OU-4A, IR Site 2

RAOs are being met by isolating buried waste in the former landfill through a soil cover. Vegetative cover conditions and storm water drainage have been addressed and improved over the last year under the PCOMMP and will be documented in the 2016 Annual O&M Report for Site 2. The RA for soil will protect human and ecological receptors from exposure to COCs in the former landfill. The wetland will

remain in long-term management to protect ecological receptors from exposure to COCs from the former landfill. The RAO for groundwater is being met through MNA, which is protective of beneficial uses of surface water in San Francisco Bay from potential discharge of contaminated groundwater from IR Site 2.

Groundwater MNA and landfill soil gas monitoring are currently being conducted under the Alameda Point BGMP. The Preliminary Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016) presents annual results for groundwater and soil gas monitoring at IR Site 2 as well as other IR sites included in the Alameda Point BGMP.

Soil gas samples from three of the nine sampling locations (GP-02, GP-05 and GP-09) contained methane at concentrations above the lower explosive level (LEL) (5%) at 15%, 42% and 6.3%, respectively. Figure 2.7-1 shows the most recent soil gas data available for IR Site 2.

Groundwater contamination concentration trends in the FWBZ were evaluated for dissolved metals (arsenic, copper, and nickel) at IR Site 2 and the VA Federal parcel because concentrations of these metals have historically exceeded their background values (BV). Arsenic, copper, and nickel concentrations in groundwater in the FWBZ were consistent with previous periodic findings as shown on Figure 2.7-1. During the spring 2015 monitoring event, arsenic was detected in three wells at concentrations exceeding its BV of 20.7 µg/L (up to 33 µg/L in well MW018-E in the FWBZ). Copper and nickel concentrations did not exceed their respective BVs during this monitoring period. Pesticides and SVOCs are also included as COCs for analysis under the BGMP and have been detected at concentrations below RGs. Figure 2.7-1 shows dissolved metals trends in select groundwater monitoring wells and landfill methane concentrations at IR Site 2.

TABLE 2.7-3: TECHNICAL ASSESSMENT SUMMARY, OU-4A, IR SITE 2

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 2	Soil – Radiological Screening, Geonet Installation, Soil Cover, and ICs	Yes	Yes	No	Protective	2021
	Groundwater – MNA and ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification
IR = Installation Restoration
OU = Operable unit
MNA = Monitored natural attenuation

2.7.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

No, the remedy may not yet be functioning as intended by the decision documents; however, it is still protective of human health and the environment. Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remedy implemented is working as intended by the ROD. The documents that detail the remedial decisions for IR Site 2 are the ROD (DON 2010), RAWP (TtEC 2013c), and the LUC RD (TtEC 2013b).

System Operations and O&M

Section 2.7.2.2 provides a brief outline of post-closure O&M requirements for IR Site 2. Post-closure O&M is on-going and in compliance with the ROD (DON 2010), LUC RD (TtEC 2013b) and the Post-Closure Operations, Maintenance, and Monitoring Plan (Attachment 11 of the RAWP, Revision 1 [TtEC 2013b]).

Cost of System Operations and O&M

According to the Post-Closure Operations, Maintenance, and Monitoring Plan (Attachment 11 of the RAWP, Revision 1 [TtEC 2013b]), the estimated annual cost for O&M is $101,715 in 2012 dollars.

Opportunities for Optimization

No opportunities for optimization have been identified at this time.

Performance of Soil and Groundwater Remedies

Soil Alternative 2 was implemented at IR Site 2 and includes a subgrade surface radiological scan, installation of geonet, soil cover, and ICs for soil. Groundwater Alternative 2 includes MNA and ICs. ICs under each selected remedial alternative prohibit use of the property for residential use, hospitals for humans, schools for persons under 21 years of age, day care centers for children, and any permanent human habitation other than for industrial purposes. The selected remedy of MNA for groundwater allows COCs to degrade, adsorb, dilute, or transform according to natural, unaided environmental processes. ICs prohibit any use of groundwater at IR Site 2 as intended in the LUC RD. ICs are effective in minimizing risk to human health from soil in the Upland Area (former landfill) and protecting potential receptors in surface water of San Francisco Bay as well as onsite tidal wetlands. Monitoring groundwater conditions along the shoreline of IR Site 2 will continue to confirm that COC concentrations are remaining stable or decreasing over time and no longer posing risk to the environment.

2.7.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 2 is in place and there are no reported changes to the remedy that would affect its protectiveness.

In the former landfill area, the total cancer risks associated with exposure to soil for the three future recreational scenarios ranged from 7.1×10^{-6} to 2.8×10^{-5}; these values are within the cancer risk management range. The ILCR for the construction worker of 1.4×10^{-5} was also within the cancer risk management range. The noncancer HI for the recreational receptors ranged from 0.5 to 1.9; only the HI for the Park Ranger/Restoration Habitat Supervisor exceeded the threshold value of 1. The HI for the construction worker in the HHRA was 14; however, the FS identified the construction worker as unrealistic and unreasonable.

A vapor intrusion screening was performed as part the HHRA, conservatively assuming an indoor commercial worker. Based on the results of this evaluation, the HHRA concluded that vapor intrusion from groundwater is not likely to pose unacceptable risks and hazards to an indoor commercial receptor at the site. Given that the property is used recreationally, actual risks and hazards associated with the vapor intrusion pathway are likely to be much less than those estimated in the HHRA.

In the Wetland area the total cancer risks associated with exposure to soil for the three future recreational scenarios ranged from 7.8×10^{-6} to 1.2×10^{-5}; these values are within the cancer risk management range. The ILCR for the construction worker of 2.4×10^{-5} was also within the cancer risk management range. The noncancer HI for the recreational receptors ranged from 0.5 to 3.0; only the HI for the Park Ranger/Restoration Habitat Supervisor exceeded the threshold value of 1. The HI for the construction worker in the HHRA was 26, however, the FS identified the construction worker as unrealistic and unreasonable.

Changes in Exposure Assumptions and Toxicity Data

Toxicity criteria were selected for the HHRA per USEPA (2003) guidance which recommends the following hierarchy for human health toxicity values: (1) USEPA's IRIS; (2) USEPA's (Office of Research and Development, National Center for Environmental Assessment, Superfund Health Risk Technical Support Center) Provisional Peer Reviewed Toxicity Values; and (3) other sources of information such as the DTSC's toxicity values and the Agency for Toxic Substances Disease Registry minimal risk levels for non-carcinogenic compounds. The toxicity values used in the IR Site 2 HHRA were primarily from USEPA's IRIS database as of 2004. For soil, the primary site-related human health risk drivers were B(a)P and total PCBs. For groundwater, the only risk driver was total PCBs. The toxicity values used in the HHRA for the COCs are current and correct. Thus, the toxicity values used in the HHRA for the COCs are still protective.

Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

More recently, HHRAs conducted for the Alameda Point facility have also included a separate evaluation that uses DTSC OEHHA values as a point of reference. This evaluation was not conducted in the HHRA for IR Site 2. However, the current DTSC OEHHA values for B(a)P and total PCBs are the same as the current USEPA values for the COCs.

With respect to the radionuclide COC, radium-226, the HHRA used a CSF value of 8.49×10^{-6} (risk/year)/(pCi/g). This value is virtually the same as the current RPRG value for radium-226 (including daughter products) of 8.37×10^{-6} (risk/year)/(pCi/g). Therefore, the radiological CSF used in the HHRA is protective.

The current and planned future use of IR Site 2 is recreational, as it is within a nature reserve and it includes a walking path. Future recreational uses considered in the HHRA included this use and potential guided wildlife tours and wildlife-related educational outreach (Battelle 2008). The receptors evaluated in the HHRA are appropriate, with the exception of the construction worker. As stated in the FS (Battelle 2008), this receptor is regarded as unrealistic and unreasonable, given the future recreational land use. Accordingly, the RGs are based on protection under recreational use, rather than future construction use.

The exposure parameter values used in the HHRA are reasonable, defensible, and appropriately protective. They include protection of long-term site recreation workers (e.g., 250 days per year for 25 years for Future Park Ranger/Tour Guide) as well as the protection of visitor children.

In summary, the various exposure receptors, pathways, and assumptions used in the HHRA for the recreational receptors are protective, given the planned future land use and the ROD remedy (Navy 2010). No additional exposure pathways have been identified since land uses, zoning, and receptors at this IR site have not changed since the previous 5-Year Review. The RGs continue to be appropriately protective, as they are based on appropriate receptors, pathways, assumptions, and parameter values. In the case of radiological constituents, the RGs are highly conservative as most of them are based on residential use. The toxicity values of the COCs that were used in the HHRA are still current.

Changes in Cleanup Levels

The PRG value used to evaluate the cancer risk associated with Radium-226 has been revised slightly from 15 millirem per year (mrem/yr) to 12 mrem/yr (USEPA 2014). This would result in a minimally lower cancer estimate with respect to Radium-226 and would only minimally affect the risk estimate. The cleanup value for Radium-226 would still be protective.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Site 2 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.7.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy. COCs in soil have been delineated and covered in place during RA implementation as stated in the RAWP, Revision 1 (TtEC 2013c). COCs in groundwater are currently monitored in the BGMP. ICs for soil and groundwater are operating as intended by the ROD (DON 2010), are implemented and enforced by the LUC RD and are protective of human health and the environment.

2.7.6 Issues, OU-4A, IR Site 2

Annual sampling of subsurface methane was detected above the lower explosive limit (LEL) in three soil gas probes at IR Site 2. The impact on the effectiveness of the remedy is unknown as soil gas sampling data is limited.

2.7.7 Recommendations and Follow-up Actions, OU-4A, IR Site 2

Additional data regarding methane in ambient air and in the subsurface will be collected on a quarterly basis to further evaluate the effectiveness of the remedy at IR Site 2. Soil gas data will be presented in the 2017 Annual BGMP report.

2.7.8 Protectiveness Statement, OU-4A, IR Site 2

The RAs performed at IR Site 2 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposures to contaminated soil and groundwater. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

2.8 OU-4B, IR SITE 17

2.8.1 Site Description and Background, OU-4B, IR Site 17

IR Site 17 at OU-4B is located at the south-central boundary of Alameda Point, which opens to San Francisco Bay, as shown in Figure 1-1. IR Site 17 is a partially enclosed lagoon constructed in the 1930s by dredging a former tidal flat. Its entrance is an 800-foot opening in the seawall along the southern perimeter. During construction, seawalls were built along the eastern, western, and southern boundaries, and a bulkhead wall was constructed on the northern side (DON 2006).

From the 1940s to 1975, industrial wastewater and stormwater generated at Alameda Point was discharged directly into a network of storm drains and carried, in part, into IR Site 17 through stormwater sewer outfalls. During this period, approximately 300 million gallons of untreated industrial wastewater and stormwater that reportedly contained heavy metals, solvents, paints, detergents, acids, caustics, mercury, oil and grease, and pesticides and PCBs were discharged into the lagoon. Radioluminescent paint containing radium was included in the discharging to the lagoon during this period. The outfalls located in the northeast and northwest corners of IR Site 17 were the primary sources of contamination.

In 1975, the direct discharge of industrial wastewater through the storm sewer network was terminated, and since then, a stormwater pollution prevention program has been in place at Alameda Point to ensure that only surface runoff is carried into the lagoon.

2.8.1.1 Land and Resource Use

The lagoon is not currently being used. According to the *"Alameda Community Reuse Plan"* (EDAW 1996), IR Site 17 will serve as the center piece of the future Town Center Development, which includes the Seaplane Lagoon Promenade. The Seaplane Lagoon Promenade will border IR Site 17, creating an active and interesting waterfront promenade or waterfront park that includes visitor services, waterfront-related uses such as concessions related to maritime activities, boat rentals, hotels, and restaurants. Parts of the promenade may also include more passive waterfront uses. The future use of the lagoon itself will be related strictly to maritime development as a marina and ferry terminal.

2.8.1.2 Current and Potential Groundwater Uses

IR Site 17 is a partially enclosed salt water lagoon, which is not anticipated to provide potential groundwater use based on future planned use by the City of Alameda (City of Alameda 2013).

2.8.1.3 Site Chronology and Initial Response

Table 2.8-1 summarizes major investigations and actions at IR Site 17. These site activities are described in detail in the ROD (DON 2006).

TABLE 2.8-1: CHRONOLOGY OF SITE EVENTS – OU-4B, IR SITE 17

Date	Event	Comments
1983	Initial Assessment Study	IR Site 17 was the focus of several investigations due to elevated levels of contaminants in the Seaplane Lagoon sediment.
1993 to 2002	Investigations supporting the RI	These investigations defined the horizontal and vertical extent of contamination in support of the ERA. Investigations identified elevated levels of metals, pesticides, radionuclides, and total PCBs in the northwest and northeast corners of IR Site 17. The University of California Berkeley conducted bioaccumulation sampling for PCBs to evaluate risks to fish and the species that consume them.
2004	RI	Defined the nature and extent of contamination and presents the HHRA and ERA.
July 2005	FS	The purposes of the FS were to (1) summarize conditions at IR Site 17 as they relate to the presence of contamination in offshore sediments and (2) assemble, screen, and thoroughly evaluate remedial alternatives to address this contamination.
February 2006	PP	Proposed a remedial alternative of dredging contaminated sediments from the northeast and northwest corners of IR Site 17.
October 2006	ROD	Selected dredging, dewatering, and off-site upland disposal as the remedy for IR Site 17.

TABLE 2.8-1: CHRONOLOGY OF SITE EVENTS – OU-4B, IR SITE 17

Date	Event	Comments
December 2010 to January 2011	Construction debris piles TCRA	During the TCRA, three soil and debris piles contaminated with heavy metals, pesticides, and PCBs were removed.
January 2011	RAWP	Described methods and field activities for implementing the RA at IR Site 17 northeast and northwest locations, due to unacceptable risk to ecological health.
January 22, 2011	Implementation of RA for Northeast IR Site 17	Dredging RA field activities began within the northeast area of IR Site 17, to mitigate contaminated sediment stated in the ROD and in accordance with the RAWP.
May 7, 2011	Completion of RA for Northeast IR Site 17	Dredging RA field activities completed within the northeast area of IR Site 17.
January 16, 2012	Implementation of RA for Northwest IR Site 17	Dredging RA field activities began within the northwest area of IR Site 17, to mitigate contaminated sediment stated in the ROD and in accordance with the RAWP.
April 11, 2012	Completion of RA for Northwest IR Site 17	Dredging RA field activities completed within the northwest area of IR Site 17.
September 2014	RACR	Documented the completion of the remedial action, in accordance with the ROD and RAWP.
February 2016	ESD	Documents addition of an IC for future dredging / sediment removal.
February 2016	LUC RD	Documents restrictions related to future dredging.

Notes:
ERA = Ecological risk assessment
FS = Feasibility Study
HHRA =- Human health risk assessment
IR = Installation Restoration
OU = Operable unit
PCB = Polychlorinated biphenyl
PP = Proposed Plan
RACR = Remedial Action Completion Report
RAWP = Remedial Action Work Plan
RI = Remedial Investigation
ROD = Record of Decision
TCRA = Time-critical removal action

2.8.1.4 Basis for Taking Action

Previous investigations (RI 2004, Battelle 2005) focused on ecological risk as the key consideration for remedial decisions at IR Site 17 because the site allows limited human access. Sediments at IR Site 17 contained metals, total DDx (the sum of the organochlorine pesticides dichlorodiphenyltrichloroethane [DDT], dichlorodiphenyldichlorethane [DDD], and dichlorodiphenyldichloroethene [DDE]), and PCBs. Based on the results of the RI and FS, the northwest and northeast areas at IR Site 17 posed an unacceptable risk to human health and the environment.

The following types of COCs were identified by the RI as posing ecological risk from sediment at IR Site 17: PCBs, Pesticides and Metals.

The basis for taking action at IR Site 17 was unacceptable risk from COCs for sediment. (DON 2006).

2.8.2 Remedial Action, OU-4B, IR Site 17

2.8.2.1 Remedy Selection (Record of Decision)

The RAOs for sediment at IR Site 17 consist of the following components.

- Protection of fish-eating birds from exposure to cadmium, Total PCBs, Total DDx, lead, and chromium through the consumption of contaminated prey

- Protection of fish from exposure to cadmium in sediments
- Reduction of potential biomagnification of total PCBs in organisms higher in the food chain to reduce potential human health risks from the consumption of fish

The selected remedy outlined in the FS Report (Battelle 2005) and stated in the ROD (DON 2006) for impacted sediment in select areas of IR Site 17 includes the components listed below.

Alternative 5: Dredging, Dewatering, and Upland Disposal at Permitted Off-Site Waste Disposal Facility

- Dredging – Northeast and Northwest corners of IR Site 17 are to be dredged to a uniform depth of 4 feet bgs. Approximately 63,000 cubic yards (yd^3) of contaminated sediment are to be removed.
- Dewatering – Dredged sediment from IR Site 17 will be dewatered on site in temporary drying beds, with each bed container lined with impermeable material (visqueen plastic sheeting) to prevent spills or leaks.
- Confirmation Sediment Sampling – Quality control confirmation sampling and analytical testing for COCs in sediment will be conducted upon completion of the dredging depth stated in the ROD and the RAWP.
- Disposal – Dredged and dewatered sediment will be transported to a permitted off-site waste disposal facility.

TABLE 2.8-2: RGS FOR COCS IN SEDIMENT, OU-4B, IR SITES 17

COC	Ecological Sediment RG
Cadmium	24.4 mg/kg
Total PCBs	1.13 mg/kg
Pesticides [Total DDx]	0.13 mg/kg

Notes:
COC = Contaminant of concern
DDx = Sum of DDD, DDE, and DDT
DDD = Dichlorodiphenyldichloroethane
DDT = Dichlorodiphenyltrichloroethane
mg/kg = Milligram per kilogram
PCB = Polychlorinated biphenyl
RG = Remediation goal
DDE = 1,1-Dichloro-2,2-bis (p-chlorophenyl) ethylene

2.8.2.2 Remedy Implementation

The removal of three construction debris piles, as well as other source removal action were conducted prior to the IR Site 17 remediation.

The selected remedy for IR Site 17 was implemented during the two separate field events, as described below. Following the remediation, the ESD added an IC for future dredging.

Northeast Area Dredging Completed in May 2011

Dredging of the northeast area of IR Site 17 began in January 2011 and was completed in May 2011. Dredging activities were completed in accordance with the ROD (DON 2006) and RAWP (Battelle and TtEC 2011). The dredge bucket was controlled using a global positioning system (GPS) and high-resolution bathymetry surveying data to ensure that the lateral and vertical extent of sediment removal was achieved. The RAWP called for a uniform dredging depth of 5 feet below the existing sediment surface.

From May 17 through 21, 2011, confirmation sediment cores were collected from the dredge area floor and sidewalls. Post-dredging RA completion criteria were determined using an upper confidence limit (UCL) standard for samples containing COCs with and without RGs. If the 95 percent UCLs or

maximum detected concentrations were lower than the 95 percent UCLs (that is, COCs are less than the RGs, including COCs without RGs), then it was determined that the RA successfully achieved the RGs and that the RA was complete.

The northeast remediation area post-dredge confirmation sampling achieved 95 percent UCLs calculated for the project COCs with RGs and without RGs, indicating that the dredging remedy for the northeast remediation area was successful. Based on the evaluation of post-dredging analytical data, the RAOs were achieved and no further dredging is required in the northeast area of IR Site 17 (TtEC 2014).

Northwest Area Dredging Completed in March 2012

Dredging of the northwest area of IR Site 17 began in January 2012 and was completed in early April 2012, prior to the arrival of the federally-endangered California least terns at Alameda Point. Dredging activities were completed in accordance with the ROD (DON 2006) and RAWP (Battelle and TtEC 2011). The dredge was operated as discussed above for the May 2011 dredging of the northeast area. The RAWP calls for a uniform dredging depth of 5 feet below the existing sediment surface, with one area (Area A) to be dredged to 6 feet and another area (Area B) to be dredged to 7 feet.

From February through April 2012, confirmation sediment cores were collected from the dredge area floor and sidewalls. Validated post-dredging analytical sediment sampling data demonstrated that the RAOs were achieved and that no further dredging is required in the northwest area of IR Site 17 (TtEC 2014).

Based on the successful RA implementation activities discussed above, a RACR is expected to be issued for IR Site 17 in 2016.

ICs

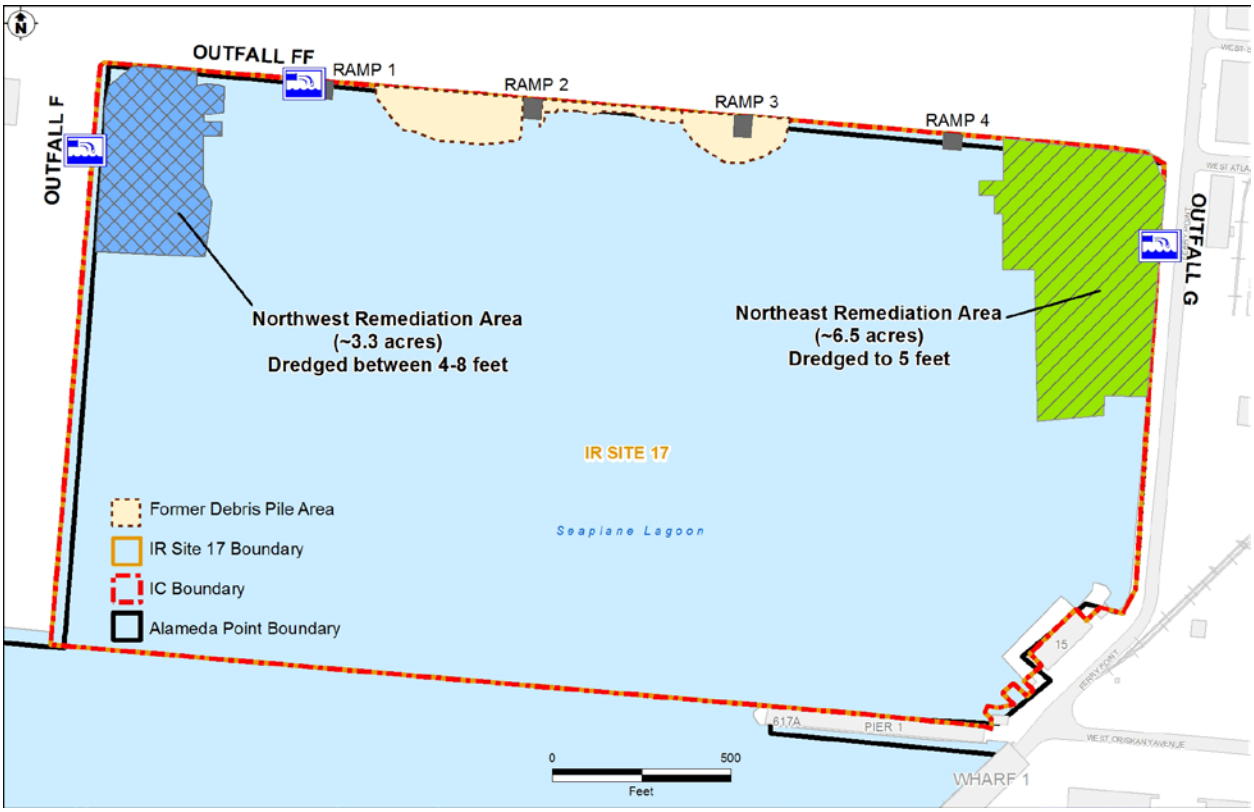
The ESD for IR Site 17 documents the addition of an IC for future dredging / sediment removal (DON 2016a). The LUC RD presents the restrictions associated with future dredging / sediment removal (DON 2016b).

O&M

O&M is not required in support of the selected remedy.

Figure 2.7-1 presents completed RA areas previously described for IR Site 17.

FIGURE 2.8-1: COMPLETED REMEDIAL ACTION AREAS, OU-4B, IR SITE 17



Source: RACR (TtEC 2014)

2.8.3 Progress Since the Last Five-Year Review, OU-4B, IR Site 17

This is the first Five-Year Review for IR Site 17.

2.8.4 Five-Year Review Process, OU-4B, IR Site 17

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 17. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.8.4.1 Site Inspection

Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Site 17.

2.8.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 17. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response:

"Although the remedial action for Site 17 was conducted according to the original ROD (2006), the Navy has acknowledged there are potential discrete radiological items might be encountered during the future dredging. An ESD and a LUC RD are being prepared to place an IC on future dredging to protect human health and the environment."

DTSC Response:

"While dredging portions of Seaplane Lagoon during remediation of IR Site 17, some discrete radioactively contaminated devices were discovered in the dredged sediments. Similar devices are thought to be scattered throughout the lagoon in as-yet un-dredged area of the lagoon. While not a significant health risk when left in place, their disturbance during future dredging operations may cause difficulty in disposing of the dredge spoils. As a result, a ROD ESD is being prepared to address that issue."

Regional Water Board Response: No Comments.

Community Interview Response:

"The only suggestion I have concerns IR Site 17. The draft ESD and Land-Use Control Remedial Design (LUC RD) require annual inspections of the site. However, the remedy – that future dredging be conducted pursuant to a Sediment Management Plan that is acceptable to the Navy and the regulatory agencies – will not benefit from annual inspections. Inspections would be useful only if they discovered unexpected dredging activities. This is highly unlikely to be the case." Dr. Peter Russell, Russell Resources.

A "Site Occupancy Factor" of 1/10, was used for Least Terns. This permits concentration levels 10 times higher. This says levels this high are okay anywhere and everywhere in the world, where wildlife will be. If this 1/10 factor had not been used, essentially the whole Seaplane Lagoon would have had to be cleaned up. This approach of dilution is what got us into trouble with dichlorodiphenyltrichloroethane (DDT), and polychlorinated biphenyls (PCBs)." George Humphreys, RAB Member.

2.8.5 Technical Assessment, OU-4B, IR Site 17

The RAOs for sediment at IR Site 17 were achieved with the implementation of the RA. Sediment impacted with COCs stated in the ROD was removed from IR Site 17, which is now protective of human health and the environment. The ESD and LUC RD issued in early 2016 provided further protection for future dredging / sediment removal.

TABLE 2.8-3: TECHNICAL ASSESSMENT SUMMARY, OU-4B, IR SITE 17

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 17	Sediment – Dredging, Dewatering, and Off-Site Upland Disposal	Yes	Yes	No	Protective	2021

Notes:
ID = Identification
IR = Installation Restoration
OU = Operable unit

2.8.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedy is functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review, site inspections, and interviews indicate that the remedy implemented for sediment at IR Site 17 is working as intended by the ROD. The documents that detail the remedial decisions for IR Site 17 are the ROD (DON 2006), the RACR (TtEC 2014), the ESD (DON 2016a) and the LUC RD (DON 2016b).

System Operations and O&M

Not applicable for IR Site 17.

Performance of Remedy

The selected remedy (Alternative 5) consisted of dredging, dewatering, confirmation sediment sampling and testing, and upland disposal at an approved off-site landfill at IR Site 17. The selected remedy was implemented between 2011 and 2012. The IC in the 2016 ESD is implemented per the LUC RD and provides protectiveness by restricting activities related to future dredging / sediment removal.

2.8.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 17 is in place and there are no reported changes to the remedy that would affect its protectiveness.

The HHRA evaluated exposure pathways associated with chemicals in Seaplane Lagoon sediment. The only receptor evaluated were individuals engaged in the collection of fish and shellfish from the lagoon, and subsequent ingestion, as well as incidental contact with sediment.

Risks and hazards were calculated and presented in the HHRA as two sets of results: the first used only USEPA toxicity values, and the second used either the respective USEPA or DTSC toxicity values, whichever was more conservative. Additionally, each set of results included separate RME assumption and a central tendency exposure (CTE) assumption results to present a range of potential risks and hazards for these two types of exposure scenarios.

The total cancer risks for the Seaplane Lagoon are summarized as follows:

- Using USEPA toxicity values: 6×10^{-5} (CTE) to 3×10^{-3} (RME)
- Using DTSC/EPA toxicity values: 1×10^{-4} (CTE) to 5×10^{-3} (RME)

The CTE values were within the risk management range; the RME cancer risk values exceeded the risk management range. Sediment, fish tissue, and shellfish samples were also collected from reference (background) stations. The total cancer risks associated with the reference stations were reported in the HHRA as follows:

- Using USEPA toxicity values: 5×10^{-5} (CTE) to 2×10^{-3} (RME)
- Using DTSC/EPA toxicity values: 6×10^{-5} (CTE) to 3×10^{-3} (RME)

Noncancer HI values were also evaluated in the HHRA, but the USEPA and DTSC toxicity values were identical. The HI values ranged from 5 (CTE) to 60 (RME). The HI values from the reference stations range from 2 to 29. Each of these values exceeded the target HI value of 1.

Changes in Exposure Assumptions and Toxicity Data

Two sets of toxicity values were used in the HHRA: USEPA and DTSC toxicity values. The IR Site 17 HHRA predates the current USEPA hierarchy used for toxicity values in human health risk assessments. USEPA toxicity values used in the HHRA were obtained from the USEPA Region 9 preliminary remediation goal table (USEPA 2002a) and were confirmed by the IRIS database (USEPA 2002b). IRIS is the preferred Tier 1 source for USEPA toxicity values under the current USEPA hierarchy protocol. The DTSC toxicity values were developed by the DTSC Office of Environmental Health Hazard Assessment. They were applied in the HHRA to evaluate the impact of using California-based toxicity values versus USEPA-approved toxicity values.

Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

The only chemical identified as a COC based on human health effects was total PCBs. The USEPA cancer and noncancer toxicity values used in the HHRA for total PCBs are current and still correct. Thus, the USEPA toxicity values used in the HHRA for the COCs are still protective.

The DTSC CSF used in the HHRA for total PCBs (5 $[mg/kg\text{-}day]^{-1}$) was more conservative than the USEPA CSF (2 $[mg/kg\text{-}day]^{-1}$) used in the HHRA by a factor of 2.5. However, the current DTSC, OEHHA CSF (2 $[mg/kg\text{-}day]^{-1}$) for total PCBs is the same as the current USEPA value. Therefore, the DTSC slope factor used for total PCBs in the HHRA is not only still protective, it is overly conservative by a factor of 2.5.

The HHRA used radionuclide CSF values from the USEPA (2002c) radiation webpage that were current at the time of HHRA preparation. In general, the values used in the HHRA are slightly more conservative than current radiological values from the USEPA Radionuclide Preliminary Remediation Goals table (USEPA 2014a). Therefore, the radiological CSFs used in the HHRA are protective.

The HHRA for IR Site 17 used some general default exposure factors from the 1991 guidance. The exposure factors used in the HHRA that changed in the USEPA (2014b) update include: skin surface area, adult body weight, and exposure duration. Some of these factors are less conservative and some are more conservative; the overall the impact of these changes would be minor and would likely result in a slightly less conservative risk result for the IR Site 17 HHRA. Therefore, the exposure scenario used in the HHRA is still appropriately protective.

No additional exposure pathways have been identified since land uses, zoning, and receptors at this IR site have not changed since the previous 5-Year Review. The HHRA exposure assessment is still reasonable and appropriate given current and planned future use of the Seaplane Lagoon. The EPA toxicity assessment values for total PCBs, the only COC, are current. Even though the RG is not based on human health risks, the post-remediation fish tissue concentrations (estimated from post-remediation sediment concentrations and site-specific bioaccumulation factor) appear to result in fish PCB concentrations that are within the range of reference station concentrations. This indicates that the RG is still protective of human health with respect to site-related contamination.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Site 17 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if

such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.8.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No information has come to light that could call into question the protectiveness of the remedy. RAOs for impacted sediment areas at IR Site 17 have been achieved (northeast area and northwest area) through RA implementation as documented in the RACR (TtEC 2014) and IC in the 2016 LUC RD (DON 2016b). The successful completion of the RA will continue to be protective of human health and the environment.

2.8.6 Issues, OU-4B, IR Site 17

No issues have been identified at this time that would affect the protectiveness of the selected remedy.

2.8.7 Recommendations and Follow-up Actions, OU-4B, IR Site 17

No recommendations or follow-up actions have been identified at this time.

2.8.8 Protectiveness Statement, OU-4B, IR Site 17

The RAs performed at IR Site 17 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to dredging and sediment removal within the lagoon. IR Site 17 is currently in the long term management stage of the CERCLA process. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

2.9 OU-5, IR SITE 25

2.9.1 Site Description and Background, OU-5, IR Site 25

IR Site 25 at OU-5 is located in the northeastern portion of Alameda Point, Alameda, California, as shown in Figure 1-1. IR Site 25 is located in an area of Alameda Point known as FISCA, which comprises approximately 42 acres with a relatively flat topography. IR Site 25 contains no areas of undisturbed land because dredging, construction, and other man-made disturbances have altered most of the area.

Between 1947 and 1966, IR Site 25 was used for residential purposes and contained naval barracks. These buildings were reportedly demolished sometime between 1966 and 1970. Fifty-one residential buildings were constructed in 1969, and nine open-space areas were built within the IR Site 25 United States Coast Guard (USCG) North Village Housing Area. Estuary Park is part of IR Site 25 and is located north of the residential housing area. A housing office (Building 534) was constructed sometime between 1990 and 1992 in the southernmost portion of Estuary Park. Estuary Park contains baseball and soccer fields, a sand volleyball court, a playground, and a physical fitness course.

2.9.1.1 Land and Resource Use

The historical land and resource use for IR Site 25 was residential housing. Under the *Alameda Point General Development Plan* (City of Alameda 2014), the proposed land use for the IR Site 25 area includes residential land use. Future land usage is expected to remain residential and open space for park and recreation.

2.9.1.2 Current and Potential Groundwater Uses

Shallow groundwater beneath IR Site 25, is designated as OU-5/FISCA IR Site 02 Groundwater, which is currently not used for drinking water, irrigation, agriculture, or industrial supply purposes. The ROD Amendment (DON 2015) for OU-5/FISCA IR Site 02 Groundwater states that the hypothetical use of groundwater from the FWBZ as a drinking water source is not feasible. Multiple lines of evidence collected during previous investigations include unacceptable levels of TDS, sulfates, iron, and alkalinity. For these reasons, naturally occurring shallow groundwater beneath IR Site 25 has been deemed unusable for potable water and unsuitable for any use. NFA is required for groundwater.

2.9.1.3 Site Chronology and Initial Response

Table 2.9-1 summarizes major investigations and actions at IR Site 25. These site activities are described in detail in the ROD (DON 2007).

TABLE 2.9-1: CHRONOLOGY OF SITE EVENTS – OU-5, IR SITE 25

Date	Event	Comments
1994 -1995	EBS	During the EBS, soil and soil gas samples were collected from IR Site 25. Additional soil and groundwater sampling was recommended based on elevated concentrations of PAHs detected along the northern boundary. Elevated PAH concentrations were detected in one soil sample during the Phase 2A EBS sampling and in soil samples from the Phase 2B investigation to a depth of over 8 feet bgs.
October 2000	TCRA for Clover Park Play Area	Conducted to address health risk to children in the play area from PAH-impacted soil. The upper 4 feet of soil was removed and replaced with clean fill material.
March 2002	TCRA for USCG North Village Housing Area and Estuary Park	Conducted from December 4, 2001, to September 5, 2002. Activities included demolition and removal of asphalt and concrete pavements; excavation, transportation, and off-site disposal of contaminated soil and demolition waste material; soil sampling and analysis; backfilling of the excavated areas; and site restoration, including reconstruction of the asphalt and concrete pavement areas and installation of an irrigation system for Estuary Park.
December 2002	RI	Summarized findings of previous soil investigations at IR Site 25 between 1994 and 2001. These investigations confirmed the presence of PAHs in soil and formed the basis for delineation of the extent of contamination defined as the IR Site 25 TCRA area.
January 2003	Permanganate Treatability Study	The treatability study indicated that treatment of shallow soils with potassium permanganate at IR Site 25 was not effective. No significant oxidation of the PAH contamination was observed.
March 2005	FS	Evaluated post-TCRA risk and develops and compares remedial alternatives for PAH-impacted soil compatible with the site reuse plan.
August 2006	PP	Described proposed RA alternatives for soil at IR Site 25.
September 2007	ROD	The ROD for IR Site 25 soil described the remedy of ICs for soil below 4 feet bgs across the site.
October 2009	LUC RD	Addressed the ICs and land-use restrictions required by CERCLA and the ROD. ICs and land-use restrictions apply throughout IR Site 25 soil and will be maintained indefinitely unless the PAH concentrations in soil are reduced or subsequently determined to not exceed levels that allow unrestricted site use and exposure.
September 2010 - 2014	Soil Annual IC Compliance Monitoring Report and Annual IC Compliance Certificate issued	These documented certify that the site is in compliance with requirements specified in the LUC RD for IR Site 25 Soil.

TABLE 2.9-1: CHRONOLOGY OF SITE EVENTS – OU-5, IR SITE 25

Date	Event	Comments
September 2011	Five-Year Review	Conducted to evaluate the IR Site 25 remedy and determine if the selected remedy remains protective of human health and the environment. The Five-Year Review confirms that the selected remedy is protective of human health and the environment.
2015	ROD Amendment	Provided multiple lines of evidence in support of NFA for groundwater at OU-5/FISCA IR Site 02 (beneath IR Site 25).
March 2016	IC Compliance Monitoring Report and Annual IC Compliance Certificate	Certified that ICs for IR Site 25 are in compliance with the requirements specified in the ROD.

Notes:
bgs = Below ground surface
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
DON = United States Department of the Navy
DTSC = California Department of Toxic Substances Control
EBS = Environmental baseline survey
FISCA = Fleet Industrial Supply Center Oakland, Alameda
FS = Feasibility Study
LUC = Land-use control
IC = Institutional control
IR = Installation Restoration
OU = Operable unit
PAH = Polycyclic aromatic hydrocarbon
PP = Proposed Plan
RA = Remedial action
RD = Remedial design
RI = Remedial Investigation
ROD = Record of Decision
TCRA = Time-critical removal action
USCG = United States Coast Guard
USEPA = United States Environmental Protection Agency

The EBS for OU-5, IR Site 25 was conducted between 1994 and 1995. Soil and soil gas samples were collected, and additional soil and groundwater sampling was recommended based on elevated concentrations of PAHs detected along the northern boundary. Based on the EBS findings, in October 2001, the USCG conducted a TCRA at IR Site 25 at the Clover Park play area for soil with elevated levels of PAHs.

2.9.1.4 Basis for Taking Action

The HHRA in the RI (Neptune and Company, Inc. [Neptune], International Technology Corporation [IT], and ENVIRON 2002) led to the basis for taking action. The TCRA removed hotspots in areas of elevated concentrations of PAHs to a depth of 4 feet bgs. The TCRA did not address soil impacts below buildings or hardscape. Soil below buildings and hardscape may contain concentrations not acceptable for unrestricted use. Under current and proposed land uses, risks to residents were evaluated and determined to be within the NCP Risk Management Range for soils within 4 feet of ground surface. All applicable exposure scenarios through direct contact with soil at IR Site 25 from were considered (ingestion, dust inhalation, and dermal absorption for all receptors; assumed all of the site is unpaved, and inhalation of vapors from soil gas).

The COCs identified by the RI (Neptune, IT, and ENVIRON 2002) as posing potential human health risk exposure through direct contact with soil greater than 4 feet bgs at IR Site 25 include PAHs.

The basis for taking action (ICs) at IR Site 25 was unacceptable human health risk to residential receptors from PAHs in soil.

The FS Report (CDM Federal Programs Corporation [CDM] 2005) includes a post-TCRA HHRA for IR Site 25 to evaluate potential risks to human health posed by chemical substances remaining in soil at the site. This HHRA was based on soil data. However, soil gas and groundwater risks were incorporated into the exposure assessments. The objective of the HHRA was to estimate risks to human and ecological receptors from exposure to chemicals in groundwater and soil gas at the site. PAHs were determined to be the only carcinogenic risk drivers for the residential scenario and are the only COCs at IR Site 25.

Results of the post-TCRA HHRA indicate that risks associated with IR Site 25 soil within 4 feet of ground surface are within the NCP Risk Management Range. At depths below 4 feet bgs, estimated HI were slightly above 1 and ILCR for soil were greater than the NCP Risk Management Range.

2.9.2 Remedial Action, OU-5, IR Site 25

2.9.2.1 Remedy Selection (Record of Decision)

The ROD (DON 2007) states that the RAO for soil at IR Site 25 is to prevent human exposure for residents to soil containing PAHs at concentrations that represent a lifetime cancer risk exceeding the risk management range or that represent a non-cancer HI exceeding 1.0. Additional protectiveness is achieved by reducing exposure through ongoing IC implementation.

The remedy selection processes for the response actions at IR Site 25 are presented in the following documents:

- PP issued by the DON in August 2006 (DON 2006)
- ROD signed by the DON in October 2007 (DON 2007)
- OU-5 ROD Amendment (DON 2015)

The ROD documents the selected remedy of ICs designed to protect human health and the environment from PAH contamination in soil at the site. The EBS Report (IT 2001), RI Report (Neptune, IT, and ENVIRON 2002), and FS Report (CDM 2005) identify the need for a remedy.

This alternative was selected because it has high short-term effectiveness, moderate long-term effectiveness, high implementability, and a relatively low cost while fully protecting human health and the environment and complying with all environmental regulations and laws.

2.9.2.2 Remedy Implementation

As described in the ROD (DON 2007), the selected remedy, ICs, are implemented at IR Site 25. The ICs require that future landowners obtain written approval from the regulatory agencies and the DON and comply with a soil management plan for excavation of soil from depths below 4 feet bgs and for major site work where prior soil removal actions were not feasible. ICs are necessary to manage long-term risks by minimizing exposure to impacted soil below 4 feet bgs that contains unacceptable levels of chemicals in undeveloped areas and potentially beneath buildings and hardscape.

ICs include annual physical inspections of IR Site 25 to confirm continued compliance with all IC performance objectives and land-use restrictions in place. If any deficiencies are found during the annual inspection, corrective action is taken to correct these deficiencies. These and other IC details are described in the LUC RD for IR Site 25 soil issued by the DON in 2009 (DON 2009).

2.9.2.3 Operations and Maintenance

O&M is not required in support of the selected remedy.

2.9.3 Progress Since the Last Five-Year Review, OU-5, IR Site 25

This is the second Five-Year Review for IR Site 25. The recommendation in the 2011 Five-Year Review Report (KCH 2011) related to lead was erroneously included for IR Site 25. Lead is not a COC in the 2007 ROD for IR Site 25; therefore, this recommendation is not applicable. See Appendix E, Table E-2.

The protectiveness statement in the previous Five-Year Review stated: “The remedy in place at IR Site 25 is considered protective of human health and the environment. The ICs prevent exposure to soil

contaminants at depth and beneath the hardscape. Continued monitoring of the ICs as part of the RA will ensure that the selected remedy continues to be protective."

2.9.4 Five-Year Review Process, OU-5, IR Site 25

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 25. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.9.4.1 Site Inspection

The site inspection confirmed that ICs are operating as intended by the ROD and are protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Site 25.

2.9.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 25. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response:

"Although not expected, vapor intrusion could be an issue for redevelopment at IR Site 25 if benzene and naphthalene concentrations increase in shallow groundwater. In addition, site conditions at IR Site 25 will change once the hardscape and the housing are removed, since the previous excavations only removed contaminated soil in the areas that were not covered by hardscape. The reassessment of the protectiveness of the remedy will be needed once the hardscape is removed. This reassessment is not the Navy's responsibility but will be undertaken by a third party in conjunction with the DTSC and USEPA."

DTSC Response: No Comments.

Regional Water Board Response: No Comments.

Community Interview Response:

"IR Site 25 should have IC requiring testing of soil under and around building, trees and under roads. Contaminated soil should be excavated and disposed of properly at an offsite location. Previously remediated areas should have prohibition against digging deeper than 4 feet (2 feet replaced + 2 feet averaged). This is in addition to the Marsh Crust Ordinance."

"Sampling of groundwater concentrations at IR Sites with remediated groundwater plumes [eg; IR Sites 1, 6, 7, 26, (OU-2B), OU-5, IR Site 25] should occur immediately after a significant earthquake (eg; Napa or larger) to assure that deeper contaminants at IR Site 25, and OU-2B have not migrated upward." George Humphreys, RAB Member

2.9.5 Technical Assessment, OU-5, IR Site 25

The RAO for soil at IR Site 25 is being met by preventing human exposure to soil containing PAHs through the ICs indicated in the LUC RD (DON 2009).

TABLE 2.9-2: TECHNICAL ASSESSMENT SUMMARY, OU-5, IR SITE 25

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 25	Soil –ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification
IR = Installation Restoration
OU = Operable unit

2.9.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedy is functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review, site inspection, and interview results indicate that the remedy for IR Site 25 is functioning as intended by the decision documents. The documents that detail the remedial decisions for IR Site 25 are the ROD (DON 2007) and LUC RD (DON 2009).

System Operations and O&M

Not applicable for IR Site 25.

Performance of LUC Remedy

LUCs are in place that restrict excavations on land within the boundaries of IR Site 25, in accordance with the LUC RD. Covenants and deed restrictions are in place that reinforce and monitor implementation of the LUCs. The remedy has been implemented and is functioning as intended.

2.9.5.1 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 25 is in place and there are no reported changes to the remedy that would affect its protectiveness.

Post-Time Critical Removal Action results of the HHRA indicated that IR Site 25 soils within 4 feet of ground surface are within the NCP risk management range of 1×10^{-6} to 1×10^{-4} for residential use and with noncancer hazard below the threshold of 1. IR Site 25 soil within 8 feet of ground surface is generally within the NCP risk management range, with the exception of the northern portion of IR Site 25 (Decision Area 7 [DA7] and Parcels 182/183). At depths greater than 4 feet bgs at DA7, the estimated HI (2) was above 1 and potential cancer risks for soil was 1×10^{-3}, which exceeds the NCP Risk Management Range. At depths greater than 4 feet bgs at Parcels 182/183, the estimated HI was 1 and potential cancer risk was 8×10^{-4}. PAHs were determined to be the only chemicals of concern for the onsite residential scenario.

Because the estimated HIs and cancer risks for soil were slightly above 1 and greater than the NCP risk management range, respectively, at depths greater than 4 feet bgs, the final ROD (DON 2007) required ICs for soil below 4 feet across the site. Since cancer risks and HIs were within the cancer risk management range and below the noncancer target level, respectively, for soil between 0 and 4 feet bgs, ICs are not required for surface soil.

Changes in Exposure Assumptions and Toxicity Data

In the feasibility study HHRA for IR Site 25 soil, there was a dual-calculation of risk based on USEPA and DTSC toxicity values. The California OEHHA toxicity values were only used in the DTSC cancer risk calculations. Naphthalene was later added as a carcinogen in the revised DTSC risk calculations. The toxicity factors for the carcinogenic PAHs (excluding naphthalene) are based on the toxicity of B(a)P. B(a)P has CSFs published by both USEPA and OEHHA. USEPA and DTSC also publish lists of toxicity equivalence factors (TEF). These TEFs are then applied to the exposure point concentration for each PAH. The concentrations of the carcinogenic PAHs are then added together to make a B(a)P-equivalent concentration. Current methodology would apply the TEFs to each sample concentration, instead of the exposure point concentration. Depending on the distribution of individual carcinogenic PAH concentrations, the risks could be higher or lower than what was originally calculated.

The DTSC recently revised their recommended B(a)P relative potency factors (DTSC 2015). The toxicity of B(a)P is currently being reassessed by USEPA as of April 2015; consequently, if the toxicity values are updated, future Five-Year Reviews should re-evaluate the action level for PAHs to ensure that it is protective.

Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

The HHRA for IR Site 25 primarily used the default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's 2014 update include: skin surface area, adult body weight, and resident exposure duration and exposure time, and worker adherence factor. Some of these factors are less conservative and some are more conservative so overall, the impact of these changes to the HHRA results does not affect the current remedy at IR Site 25.

No additional exposure pathways have been identified since land uses, zoning, and receptors at this IR site have not changed since the previous 5-Year Review. The toxicity and exposure assessments performed in the most recent HHRA evaluations are current and continue to be protective of human health. In 2014, EPA released updated default exposure factors; however, the new exposure factors do not affect the current remedy which is ICs to restrict human contact with soil at IR Site 25 that contains PAHs which may be harmful to human health.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Site 25 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.9.5.2 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy. No new or previously unidentified human health or ecological risks have been identified at IR Site 25.

2.9.6 Issues, OU-5, IR Site 25

No issues have been identified at this time that would affect the protectiveness of the selected remedy.

2.9.7 Recommendations and Follow-up Actions, OU-5, IR Site 25

No recommendations or follow-up actions have been identified at this time.

2.9.8 Protectiveness Statement, OU-5, IR Site 25

The RAs performed at IR Site 25 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposures to contaminated soil. IR Site 25 is currently in the long term management stage of the CERCLA process. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

2.10 OU-6, IR SITE 26

2.10.1 Site Description and Background, OU-6, IR Site 26

IR Site 26 at OU-6 occupies about 32 acres in the central portion of Alameda Point, Alameda, California, as shown in Figure 1-1. IR Site 26 is immediately east of the former airfield runway area and rectangular, with a north/south orientation. IR Site 26 is covered by concrete and asphalt pavement, four former aircraft hangars (Buildings 20 through 23), a building that formerly housed paint and finishing operations (Building 24), and several ancillary buildings. The unpaved areas account for less than 1 acre and generally are landscaped strips along the east sides of buildings. The four former aircraft hangars are included in the Alameda Point Historic District and are occupied by businesses that are tenants of the City of Alameda. No naturally occurring surface streams or ponds are located at the site.

Historical use of IR Site 26 included aircraft parking, maneuvering, WDs (southeast of Building 20 and north of Building 23), fueling, and maintenance as well as support activities, including paint and primer spraying; mixing; and storage and use of solvents, adhesives, detergents, alcohol, and sealers. IR Site 26 contains SWMUs, fuel lines, and storm sewer lines. SWMUs include seven ASTs, four GAPs, two WD areas, and an OWS. The areas southeast of Building 20 and north of Building 23 historically were used for aircraft WD and an OWS was associated with the WD area near Building 20. Historically, underground fuel lines connected each of the four hangars to the fueling manifold system, which was connected to the fuel-loading station located immediately north of IR Site 26. Groundwater southeast of Building 20 contains the VOCs DCE, TCE, and VC. Groundwater also contains fuel-related hydrocarbons that are being addressed under the Alameda Point Petroleum Program.

2.10.1.1 Land and Resource Use

IR Site 26 was included in the transfer of property to the City of Alameda in 2013 based on USEPA's determination that the remedy is Operating Properly and Successfully. Portions of IR Site 26 are currently leased for industrial purposes by the City of Alameda. As of January 2016, the following tenants are subleasing portions of IR Site 26:

- Building 20 – Edge Innovations (animatronics company) and Ocean Systems (ocean technology company)
- Building 21 – St. George Spirits, Inc. (spirit production), and Delphi (motion picture productions)
- Building 22 – Faction Brewing (beer production) and Hangar 1 Vodka (spirit production)
- Building 23 – West Coast Novelties (wholesale distributor) and Matson (freight hauler)
- Building 24 – Rock Wall Wine Company (wine tasting and wine distributor) and Complete Coach Works (private bus transit company)

All structures located within IR Site 26 have been recognized as a part of the NAS Alameda Historic District and are subject to City of Alameda's "*State Historical Building Code, Community Development,*

Planning & Building, Alameda, California" (City of Alameda 2014), Preservation of Historical Monuments.

The "*Alameda Community Reuse Plan"* (EDAW 1996) states that IR Site 26 is situated in the Adaptive Reuse Area of Alameda Point. The area will continue to house existing light manufacturing, distillery and food-related business, office, warehousing, institutional, and commercial and recreational uses. Future uses may include additional food and beverage manufacturing, maritime wholesaling, concessions related to maritime activities, printing and publishing, research and development, educational, and institutional uses and residential use limited to the former residential buildings.

2.10.1.2 Current and Potential Groundwater Uses

The ROD (DON 2006) states that groundwater beneath the central portions of Alameda Point (including IR Site 26) is currently not used for drinking water, irrigation, or industrial supply purposes and meets SWRCB exemption criteria for beneficial use as a municipal supply (Regional Water Board 2003). Drinking water is supplied to Alameda Point by the East Bay MUD. In addition, USEPA stated that, based on the shallow depth of the aquifer in this area, the likelihood of saltwater intrusion with any significant groundwater pumping, and the lack of exist wells within or close to this area, it seems unlikely that groundwater in this area will be a potential source of drinking water in the future. Section 1.2.4 of this report discusses future beneficial use of groundwater at Alameda Point.

2.10.1.3 Site Chronology and Initial Response

Table 2.10-1 summarizes major investigations and actions taken at IR Site 26. These site events are described in detail in the RI Report (BEI 2003).

TABLE 2.10-1: CHRONOLOGY OF SITE EVENTS – OU-6, IR SITE 26

Date	Event	Comments
1997	TCRA for storm sewer	Implemented to prevent residual contamination in storm drain lines from flowing into nearby surface water bodies. Residual contamination was removed from storm sewer lines and sediments in catch basins.
1999	RCRA facility investigation	Two SWMUs (OWS 020 and WD 020) were recommended for further action and later determined that contaminated groundwater from these OWS would be handled under CERCLA.
1999	Non-TCRA for storm sewer	Performed to address radiological contamination in a storm sewer line segment oriented east/west between Building 5 and IR Site 26.
2002	Data gaps sampling	Performed on surrounding material at select storm drain lines to determine preferential pathways for contaminant migration.
November 2003	RI	Documented the collection of soil, soil gas, and groundwater samples and aquifer testing to refine the characterization of contamination at IR Site 26 and provide data for the HHRA and ERA.
2002 - present	BGMP sampling	Groundwater monitoring was conducted at IR Site 26 under the BGMP. Samples were analyzed for the VOCs (1,2-DCE; TCE; and VC) as well as MNA parameters.
April 2005	FS	Presented a comparative analysis of remedial alternatives for groundwater at IR Site 26.
October 2005	PP	Announced the proposed remedial alternative for groundwater at IR Site 26.
August 2006	ROD	Stated the selected remedy for groundwater at IR Site 26, which consists of ISCO, ISB, MNA, and ICs.
July 2007	Data gaps sampling	Additional sampling was conducted to provide data to support the RD.
October 2008	RD/RAWP	Presented the technical justification and basis of design for the proposed approach and describes steps that will be taken during implementation.
July 2008 and February 2009	ISCO RA Implementation	The RA began with the full-scale ISCO application consisting of two phases: a peroxide phase and a persulfate phase. All RA field activities were conducted in accordance with the RD/RAWP

TABLE 2.10-1: CHRONOLOGY OF SITE EVENTS – OU-6, IR SITE 26

Date	Event	Comments
February 2009	ISCO RA Completion	The RA of full scale ISCO was completed. Due to diminished reduction of COCs in groundwater, ISB was selected as the next phase of the selected remedy.
October 2010	Enhanced ISB RA Implementation	The RA of enhanced ISB was implemented due to limited progress from ISCO. The enhanced ISB utilized 45 injection well points and 20 extraction well points. All RA field activities were conducted in accordance with the RD/RAWP.
November 2010	Enhanced ISB RA Completion	The second round of ISB was completed, which was successful in further reduction of COCs in groundwater.
April 4, 2011	Completion of the RA	The second round of ISB was completed, which was successful in further reduction of COCs in groundwater.
September 2011	Five-Year Review	The first Five-Year Review was conducted to assess if the selected remedy remains protective of human health and the environment. Confirmed that the selected remedy is protective of human health and the environment.
2011 - 2015	IC Annual Compliance Report issued	Documented annual inspections to monitor the effectiveness of the ICs and evaluate if they are performing as designed.
May 2013	Less Than Significant Change to the ROD Memorandum	Announced a reduction in the ARICs at IR Site 26. The document was approved by the DTSC.
March 2016	IC Compliance Monitoring Report and Annual IC Compliance Certificate	Certified that ICs for IR Site 26 are in compliance with the requirements specified in the ROD.

Notes:
ARIC = Area Requiring Institutional Controls
BGMP = Basewide Groundwater Monitoring Program
DCE = Dichloroethene
DTSC = California Department of Toxic Substances Control
ERA = Ecological risk assessment
FS = Feasibility Study
HHRA = Human health risk assessment
IC = Institutional controls
ISB = *In situ* bioremediation
ISCO = *In situ* chemical oxidation
IR = Installation Restoration
MNA = Monitored natural attenuation
OU = Operable unit
OWS = Oil-water separator
PP = Proposed Plan
RAWP = Remedial Action Work Plan
RCRA = Resource Conservation and Recovery Act
RD = Remedial design
RI = Remedial Investigation
ROD = Record of Decision
SWMU = Solid waste management unit
TCE = Trichloroethene
TCRA = Time-critical removal action
VC = Vinyl chloride
VOC = Volatile organic compound
WD = Washdown area

2.10.1.4 Basis for Taking Action

The DON determined that groundwater southeast of Building 20 at IR Site 26 poses a risk to potential residents based on inhalation of vapors migrating from VOCs in shallow groundwater to indoor air (BEI 2003). Although the current and planned future use is commercial/industrial, the DON has selected an alternative that provides for unrestricted use.

The basis for taking action at IR Site 26 was unacceptable human health risk due to vapor intrusion from VOCs in groundwater, specifically cis-1,2-DCE, TCE, and VC.

2.10.2 Remedial Action, OU-6, IR Site 26

2.10.2.1 Remedy Selection (Record of Decision)

The RAO for groundwater at IR Site 26 is to protect human health by preventing exposure of potential residents and occupational workers to VOCs in indoor air that have migrated from groundwater. The DON will continue to implement ICs at IR Site 26 until the RGs are met.

TABLE 2.10-2: RGS FOR COCS IN GROUNDWATER, OU-6, IR SITE 26

COC	RG for Groundwater, Short-Term IC Termination Criteria
cis-1,2-DCE	6 µg/L
TCE	5 µg/L
VC	0.5 µg/L

Source: ROD (DON 2006)

Notes:
µg/L = Microgram per liter
COC = Contaminant of concern
DCE = Dichloroethene
IC = Institutional control
RG = Remediation goal
VC = Vinyl chloride

2.10.2.2 Remedy Implementation

RAOs for IR Site 26 were developed to guide the development and evaluation of remedial alternatives for VOCs in groundwater near Building 20.

According to the ROD (DON 2006), the selected alternative for groundwater at IR Site 26 consists of *in situ* chemical oxidation, *in situ* bioremediation, MNA, and ICs to reduce the mobility, toxicity, and volume of VOCs in groundwater. The remedy provides the short-term ICs and has a low relative cost and moderate implementability while fully protecting human health and the environment and complying with all environmental regulations and laws.

The components listed below comprise the selected remedy for groundwater at IR Site 26 in accordance with the ROD (DON 2006).

Groundwater

- Installation of groundwater monitoring wells: Install a network of groundwater monitoring wells to delineate the horizontal and vertical extent of the groundwater plume, monitor flow conditions, track plume movement, establish a baseline (pre-ISCO), conduct ISCO performance monitoring, provide RD parameters, and allow additional sampling.
- ISCO: Conduct injections, including a pilot test with three injections, to verify the effectiveness for this aggressive approach to reduce chemical concentrations.
- ISB: If post-ISCO confirmation sampling results indicate that COCs remain in groundwater, implement ISB.
- MNA: Conduct routine groundwater monitoring to assess the natural breakdown of the COCs stated in the ROD.
- Short Term ICs: Rely on proprietary controls in the form of lease restrictions contained in the LIFOC between the DON and Alameda Reuse and Redevelopment Authority. These controls will continue until the property containing IR Site 26 is conveyed with environmental restriction covenants as provided in the Memorandum of Agreement (MOA) between the DON and DTSC and attached covenant models.

After the ROD (DON 2006) was issued in 2006, the remedial activities implemented included a site data gap sampling investigation, the ISCO pilot test, RD and preparation of the RD/RAWP (Battelle 2008), full-scale ISCO implementation, groundwater remediation performance monitoring, and implementation of ICs. All remedy implementation activities were conducted in accordance with the ROD and the RD/RAWP.

Implementation of each component of the selected remedy as stated in the ROD (DON 2006) for groundwater at IR Site 26 is summarized below, followed by a discussion of LUC inspections.

Installation of Groundwater Monitoring Wells

During the post-ROD data gaps investigation, five direct-push borings were advanced, multiple discrete-depth grab groundwater samples were collected, seven groundwater monitoring wells were installed, three piezometers were installed, aquifer testing was conducted, and one round of initial baseline groundwater sampling was conducted.

ISCO

The RD phase work included the installation of four additional monitoring wells; conducting the ISCO pilot test between November 26, 2007, and January 7, 2008; and assessing pilot-test information to modify or adjust the design. Full-scale ISCO treatment was designed and implemented between July 2008 and February 2009 and was performed in two phases. Phase 1 included the injection of modified Fenton-based reagent (consisting of hydrogen peroxide and citric acid) in two rounds between July and August 2008. Phase 2 included the injection of iron-activated sodium persulfate using a recirculation approach between February 12 and 19, 2009. Three rounds of post-Phase 2 groundwater sampling were performed between April 2009 and July 2010. Performance monitoring was used to evaluate ISCO performance and consisted of a baseline sampling event and six post-ISCO sampling events.

Technology Transition to ISB

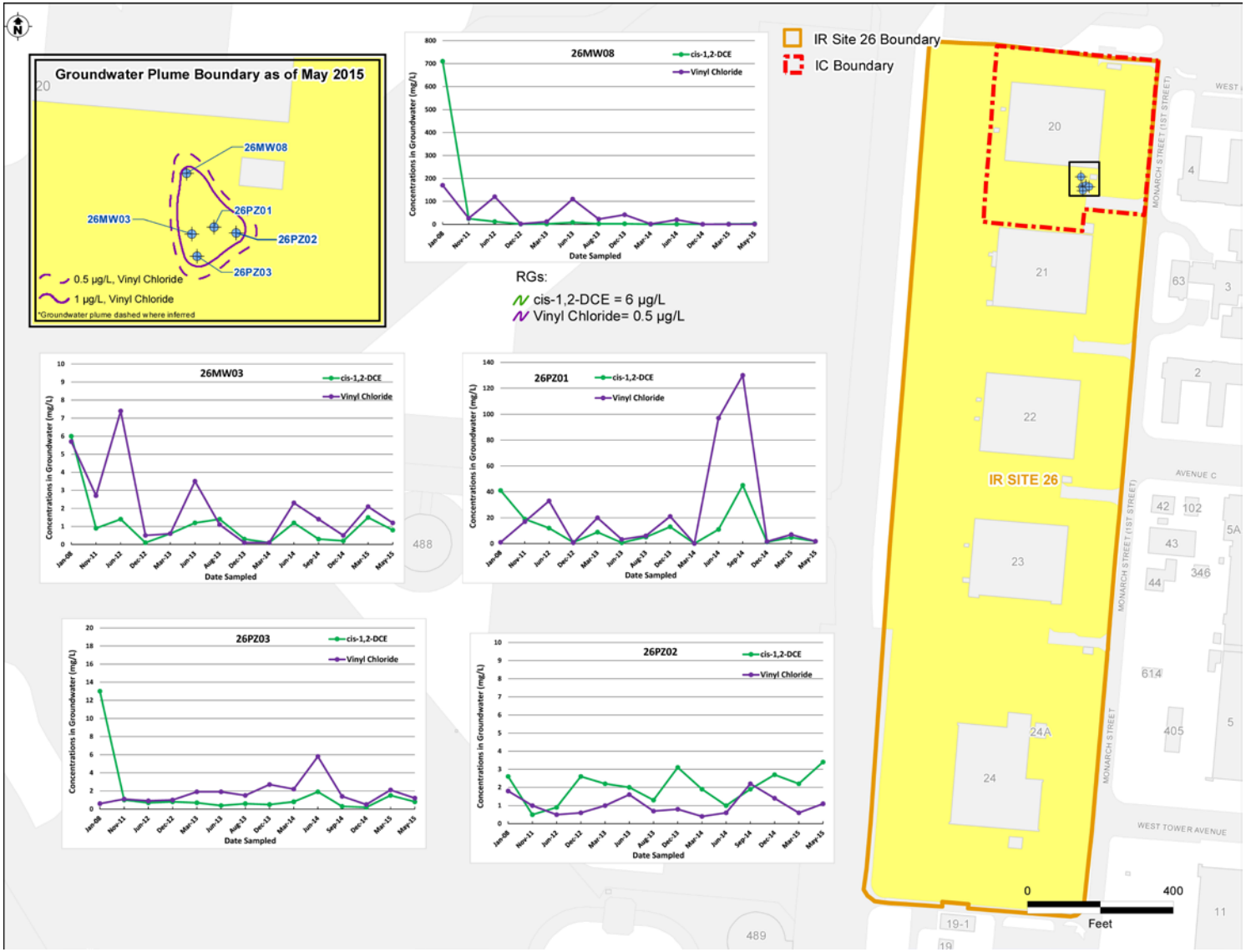
Based on the performance monitoring data, the ISCO applications achieved significant reduction in concentrations of the principal COCs, but COC concentrations continued to exceed the RGs specified in the ROD (DON 2006). Enhanced ISB injections were implemented from July 2010 through April 2011 (Battelle 2011). The enhanced ISB included the introduction of emulsified vegetable oil for bioaugmentation consistent with the ROD and RD/RAWP (Battelle 2008). Implementation of ISB at IR Site 26 has successfully achieved the appropriate aquifer conditions to enhance degradation of the COCs, and the remedy is expected to facilitate further COC degradation to achieve the RGs (Battelle 2011). The 2011 Technical Memorandum presented the results, conclusions, and a proposed remedial exit strategy (Battelle 2011).

Figure 2.10-1 shows the short-term IC boundaries, as well as the most recent trends of VOCs in groundwater at IR Site 26 (MMEC 2016).

MNA

IR Site 26 was incorporated into the BGMP in 2002. Although MNA parameters in groundwater indicate low dissolved oxygen and moderate reducing conditions (MMEC 2016), marginally low average DOC/TOC concentrations and relatively high sulfate concentrations suggest subsurface conditions are not favorable for continued optimal anaerobic VOC degradation at IR Site 26. However, VC concentrations generally exceed cis-1,2-DCE indicating, along with the presence of Dehalococcoides ethenogenes (DHE), TCE reductase, and VC reductase (at modest concentrations [MMEC 2016]), that reductive dechlorination is occurring; therefore, it is anticipated that biodegradation will continue at IR Site 26 to achieve IC termination criteria.

FIGURE 2.10-1: SHORT-TERM ARICS AND VOC TRENDS IN GROUNDWATER, OU-6, IR SITE 26



Source: ROD (DON 2006) and BGMP (MMEC 2016)

Short-Term ICs

The ARICs at IR Site 26 encompass all of Building 20, including a portion of surrounding paved areas. The area of primary concern is the VOC plume immediately south of Building 20, which is approximately 4.6 acres in area. IC termination criteria will be achieved when COC concentrations in groundwater decline to below the RGs stated in the ROD (Table 2.10-2). The ARICs will reduce in size and area as COC concentrations in groundwater decline below their respective RGs.

The DON currently uses ICs at IR Site 26 in the form of deed restrictions that contain provisions that prevent changes in land use and include restrictions against including excavation, drilling, construction, alteration, or repairs. The property owner and lease are prohibited from conducting operations that interfere with environmental restoration activities. The land-use restrictions summarized below are presented in the deed and covenant to restrict use of property and will remain in force until COC concentrations in groundwater decline below their respective RGs and the deed and covenant restrictions are released by the DON and FFA signatories. Deed restrictions run with the land.

1. IR Site 26 areas subject to ICs shall not be used for the following purposes unless otherwise approved by the DON and FFA signatories:

- A residence, including any mobile home or factory-built housing constructed or installed for use as residential human habitation
- A hospital for humans
- A school for persons under 21 years of age
- A day care facility for children
- Any permanently occupied human habitation other than those used for commercial or industrial purposes

2. The installation of new groundwater wells of any type is prohibited without prior review and written approval of the DON and FFA signatories until cleanup objectives have been achieved.
3. The alteration, disturbance, or removal of groundwater monitoring wells, groundwater extraction wells, treatment facilities, and associated equipment is prohibited without prior review and written approval from the DON and FFA signatories.
4. Removal of or damage to security features (such as locks on monitoring wells, site fencing, and signs) or to survey monuments, monitoring equipment, piping, and other appurtenances is prohibited without prior written approval from the DON and FFA signatories.

LUC Inspections

The DON will conduct annual LUC inspections to confirm compliance with all IC performance objectives and LUCs throughout the LIFOC. The annual inspections will be conducted in accordance with the RD Annual Inspection Checklist to identify compliance or non-compliance with the LUCs (DON 2016).

O&M

O&M is not required during this phase of the selected remedy at IR Site 26. The first Five-Year Review (KCH 2011) for IR Site 26 contains a detailed summary of the full-scale ISCO implementation, which was completed in 2009.

2.10.3 Progress Since the Last Five-Year Review, OU-6, IR Site 26

The protectiveness statement in the previous Five-Year Review stated: "RAs performed at IR Site 26 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposures to contaminated groundwater. ICs and land-use controls are assessed annually. The selected remedy will continue to be protective."

Issues stated in the 2011 Five-Year Review Report (KCH 2011) included the following: (1) the short period of observation for ISB did not allow sufficient time to assess the effect of ISB, and (2) the presence of disinfectant byproducts such as trihalomethanes. Recommendations made in the 2011 Five-Year Review Report included (1) continued monitoring and evaluation of TCE, DCE, and VC concentrations at IR Site 26 in accordance with the approved RD/RAWP (Battelle 2008) to ensure that the ISB was continuing to be effective at reducing COCs, and (2) the continued monitoring of disinfectant byproduct concentrations to ensure that they return to pre-ISCO concentrations by 2015 (Appendix E, Table E-2).

Since 2011, TCE, DCE, and VC concentrations at IR Site 26 continue to be monitored, evaluated, and reported in the BGMP Reports. The Preliminary Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016) indicates that TCE concentrations have remained below the RG of 5 µg/L. There is some fluctuation in 1,2-DCE concentrations; however, 1,2-DCE concentration trends are declining overall. VC concentration trends since 2011 have been variable with concentrations declining in some wells while increasing in others, which is expected with reductive dechlorination. VC concentrations exceeded the VC RG (0.5 µg/L) in five wells in 2015.

Disinfectant byproduct concentrations were last sampled in 2013 after having declined to pre-ISCO concentrations and then to non-detectable concentrations. The Technical Memorandum (Battelle 2011) states that trihalomethanes were not detected in any downgradient monitoring wells and that decreasing trends are consistent with typical post-ISCO sites.

2.10.4 Five-Year Review Process, OU-6, IR Site 26

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 26. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.10.4.1 Site Inspection

The site inspection indicates that monitoring wells are in good condition with most located in a secured fenced area. The site inspection confirms that the ICs are operating as intended by the ROD and are protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Site 26.

2.10.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 26. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response:

"Sites 26 and 27: I think these sites are going well. I don't have any concerns about these sites."

DTSC Response: No Comments.

Regional Water Board Response: No Comments.

Community Interview Response:

"Sampling of groundwater concentrations at IR Sites with remediated groundwater plumes [eg; IR Sites 1, 6, 7, 26, (OU-2B), OU-5, IR Site 25] should occur immediately after a significant earthquake (eg; Napa or larger) to assure that deeper contaminants at IR Site 25, and OU-2B have not migrated upward." George Humphreys, RAB Member.

2.10.5 Technical Assessment, OU-6, IR Site 26

The RAOs for groundwater at IR Site 26 are being met by preventing the exposure of occupational workers to potential VOCs in indoor air that have migrated from groundwater. Continued post-ISCO natural attenuation of COCs in groundwater has led to a reduction in size of the ARICs. ICs provide continued protectiveness to human health since stable concentrations of VC in groundwater still exceed its RG in all five groundwater monitoring wells (MMEC 2016).

PFCs have been identified as an emerging contaminant in drinking water. Historical use of IR Site 26 (western aircraft hangar zone) indicates the potential for release of compounds known to contain PFCs. The beneficial use designation for groundwater at IR Site 26 does not include use for drinking water; however, the DON is closely monitoring regulatory and technical developments related to PFCs and proactively evaluating an appropriate approach for PFCs at IR Site 26. Pending developments, further status may be reported in the next Five-Year Review (2021) and/or a separate report (e.g. a Site 26 site-specific evaluation, a BGMP Report).

TABLE 2.10-3: TECHNICAL ASSESSMENT SUMMARY, OU-6, IR SITE 26

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 26	Groundwater – ISCO, ISB, MNA, and Short-Term ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification
IR = Installation Restoration
ISB = *In situ* bioremediation
ISCO = *In situ* chemical oxidation
MNA = Monitored natural attenuation
OU = Operable unit

2.10.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedy is functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review period, site inspection, and interview results indicate that the remedy for IR Site 26 is functioning as intended by the decision documents. The documents that detail the remedial decisions for IR Site 26 are the ROD (DON 2006), and the RD/RAWP (Battelle 2008).

Opportunities for Optimization

No opportunities for optimization have been identified at this time. Significant reduction of the VOC plume at IR Site 26 has allowed a reduction in the ARICs as agreed upon by the DON and BCT (DON 2013). Continued MNA through the BGMP will allow potential optimization of the well network (reduction in sampling frequency or well decommissioning) as RGs are achieved for each COC stated in the ROD.

Performance of Groundwater Remedy

ISCO and ISB have resulted in significant decreases in concentrations of TCE; cis-1,2-DCE; and VC in groundwater. Concentrations of TCE have declined to below detection limits in most groundwater monitoring wells across IR Site 26. Concentrations of cis-1,2-DCE in well 26PZ02 have shown seasonal variation over the past five years. Though the average concentration of cis-1,2-DCE has recently increased in well 26PZ02, the current concentration of 3.4 µg/L (Spring 2015) is below the RG of 6 µg/L. The recent increase in cis-1,2-DCE is likely attributed to lateral dispersion from well 26PZ01, which is upgradient of well 26PZ02. Recent elevated concentrations of cis-1,2-DCE (8.5 µg/L [Spring 2013] and 45 µg/L, [Summer 2014]) have been detected in well 26PZ01, which is the likely source of increasing trends in well 26PZ02. The remedy at IR Site 26 is functioning and performing as intended, and the increase in well 26PZ02 is likely the localized dispersion of cis-1,2-DCE from 26PZ01.

The ROD (DON 2006) stated that the selected remedy would treat contaminated groundwater at IR Site 26 within three years of remedy implementation for a projected goal of 2013 to meet RGs. ICs will remain in place until RAOs have been achieved.

2.10.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 26 is in place and there are no reported changes to the remedy that would affect its protectiveness.

In the 2003 HHRA, the total cancer risks calculated for occupational and construction workers at IR Site 26 (Building 20 and 23 exposure units), which include risk from background metals, are equal to or below a cancer risk of 10^{-6}, and the noncancer HIs are less than 1. Potential residential cancer risks for Buildings 20 and 23 exposure pathways are 5×10^{-6} and 8×10^{-6} and the noncancer HIs are 1 and 2, respectively.

For the hypothetical resident, the cancer risk for indoor air inhalation based on groundwater data is at the low end of the risk management range of 10^{-6} to 10^{-4} (3×10^{-6} using USEPA assumptions and 4×10^{-6} using DTSC assumptions), with hazard quotients less than 1. Industrial risk associated with indoor air inhalation based on groundwater data was calculated for the two residential cancer risk drivers (TCE and VC). For the industrial receptor, calculated risks for TCE and VC were less than 10^{-6}, with hazard quotients less than 1.

Changes in Exposure Assumptions and Toxicity Data

Although property ownership has changed to the City of Alameda, who in turn lease the site to various tenants, the exposure pathways remain unchanged. The toxicity values that were used in the IR Site 26 HHRA were obtained from both USEPA's IRIS and DTSC's OEHHA databases. The primary risk drivers in the HHRA were cis-1,2-DCE, VC, and TCE.

During the previous Five-Year Review (KCH 2011), the toxicity values for cis-1,2-DCEe were updated in the IRIS database. The revised reference dose is 0.002 mg/kg-day and is less conservative than when the risk assessment was conducted so the hazards were overestimated. Based on a current review, no further

changes are needed. It was also noted that the VC slope factors in the IRIS database are more health protective than those used in the HHRA from the OEHHA database. The oral CSF in IRIS is 0.72 $(mg/kg\text{-}day)^{-1}$ and the UR_i is 4.4E-06 $\mu g/m^3$. Based on a current review, no further changes are needed. Also, it was noted in the 2011 review that the oral CSF for TCE was updated to 5.9×10^{-3} mg/kg-day. The changes to the TCE toxicity values are less conservative than when the risk assessment was conducted; therefore, the risks and hazards were overestimated.

Based on a current review of TCE toxicity values, the oral slope factor for TCE was updated to 0.046 $(mg/kg\text{-}day)^{-1}$ in September 2011. Also, the UR_i for TCE was also updated (0.0000041 $[\text{milligrams per cubic meter}]^{-1}$), as well as the reference dose (0.0005 mg/kg-day) and reference concentration (milligrams per cubic meter). These changes are more conservative than what was previously used in the HHRA. However, the current RAOs are based on California MCLs which are more are protective of the vapor intrusion pathway for commercial receptors so these changes do not impact the selected remedy.

The RAO values for cis-1,2-DCE, TCE, and VC are conservative values because the domestic use of groundwater as drinking water is unlikely at IR Site 26. The evaluation of a hypothetical future resident in the HHRA provides a conservative approach that is protective of current and future industrial workers at IR Site 26. Toxicity values for TCE and VC have been updated since the HHRA was conducted and are more conservative than what was previously used. However, since the remedial goals are based on MCLs, these changes do not impact the selected remedy as MCLs are protective of commercial indoor air (USEPA 2015).

Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

No additional exposure pathways have been identified since land uses, zoning, and receptors at this IR site have not changed since the previous 5-Year Review.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Site 26 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.10.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

2.10.6 Issues, OU-6, IR Site 26

No issues have been identified at this time that would affect the protectiveness of the selected remedy.

2.10.7 Recommendations and Follow-up Actions, OU-6, IR Site 26

No recommendations or follow-up actions have been identified at this time.

2.10.8 Protectiveness Statement, OU-6, IR Site 26

The RAs performed at IR Site 26 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposures to contaminated groundwater. IR Site 26 is currently in the remedial action operation stage of the CERCLA process. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

2.11 OU-6, IR SITE 27

2.11.1 Site Description and Background, OU-6, IR Site 27

IR Site 27 at OU-6 covers approximately 15.8 acres in the southeastern portion of Alameda Point, Alameda, California, as shown in Figure 1-1. IR Site 27 is mostly paved or covered by buildings. The major features of the site are Buildings 68, 168, 555, and 601; Ferry Point Road and West Oriskany Avenue; inactive railroad tracks and sidings; and fenced open space between Building 168 and Ferry Point Road. Beneath the site along Ferry Point Road, there is a sheet pile bulkhead installed as part of the construction of Seaplane Lagoon and the hydraulic filling of the area that is now IR Site 27. Seaplane Lagoon (IR Site 17) is located west of and adjacent to IR Site 27.

The ROD for IR Site 27 (DON 2008) states that during the operational period of Alameda Point, the area east of Seaplane Lagoon was designated as the Dock Zone, the Dock Support Services Zone, and the Engine Testing Zone. Reportedly, historical activities in the western portion of IR Site 27 included ship docking, ship repair, and marine painting activities. Building 601 was constructed in 1980 to house an OWS, which later was removed. Historical activities in the eastern portion of IR Site 27 included materials storage and equipment and vehicle parking in open space areas; warehouse operations in Building 168; and waterfront services, including welding, in Building 68. Historically, the open space served as an aircraft parking area. The southern portion of a former fuel farm area is located in the northwestern portion of IR Site 27. Building 555 was used as an electrical substation.

2.11.1.1 Land and Resource Use

IR Site 27 historically was used for ship docking, repair, and painting; equipment and materials staging and storage; vehicle WD; and chemical storage and handling in Building 168. Current operations by tenants leasing the space at the site are generally similar to the historical activities.

IR Site 27 was included in the transfer of property to the City of Alameda in 2013 based on USEPA's determination that the remedy is Operating Properly and Successfully. According to the *"Alameda Point Town Center and Waterfront Precise Plan"* (City of Alameda 2014), areas south of Pacific Avenue and along the eastern edge of Seaplane Lagoon will transition to a maritime and industrial mix of uses similar to those that currently operate there. Current uses will continue and expand into restored and new infill buildings, such as the Maritime Administration fleet, maritime contractors, and the future Water Emergency Transportation Authority Central Bay Area Maintenance Facility.

2.11.1.2 Current and Potential Groundwater Uses

The Regional Water Board concurred with the DON's exception request for groundwater beneath IR Site 27 in a letter dated September 13, 2012 (Regional Water Board 2012) included in Appendix E (also Figure 2 – Extent of Former Alameda Island Circa 1859). Drinking water is supplied to Alameda Point by the East Bay MUD. The SWRCB currently classifies groundwater beneath Alameda Point as potentially suitable for municipal or domestic water supply, irrigation or agricultural supply, and industrial supply (DON 2008). Because of the potential for saltwater intrusion resulting in high TDS, high alkalinity, and other factors, it is

unlikely that groundwater at IR Site 27 will be used as a drinking water source. Section 1.2.4 of this report discusses future beneficial use of groundwater at Alameda Point.

2.11.1.3 Site Chronology and Initial Response

Table 2.11-1 summarizes major investigations and actions taken at IR Site 27. These site events are described in detail in the ROD (DON 2008).

TABLE 2.11-1: CHRONOLOGY OF SITE EVENTS – OU-6, IR SITE 27

Date	Event	Comments
1994, 1995, and 1996	Storm drain investigations	Storm drain water sampling was conducted in 1996 in support of a basewide SWPPP. According to the ROD, water quality issues were not observed.
2000, 2001, and 2002	Data gaps investigation	Groundwater samples were collected from existing monitoring wells, and VOCs were detected. Water samples collected in 2001 from storm drain line man-holes contained multiple chlorinated solvents. The 2002 investigation was conducted to determine if the storm drain line bedding material was more permeable than native fill material and confirmed that neither material was acting as preferred conduits for the transport of chemicals in nearby soil or groundwater (KCH 2011).
2002	Site inspection	Eight direct-push soil samples were collected that contained low levels of PAHs.
August 2005	RI	Performed to characterize the nature and extent of soil and groundwater contamination, assess health risks to human and ecological receptors, and collect information to support a recommendation of either no action or NFA. The RI Report concludes that there are no threats to human health or the environment from soil and an FS should be completed to address chlorinated VOCs in groundwater.
April 2006	FS	Developed and evaluated remedial action alternatives to address human health risks from groundwater underlying IR Site 27 containing chlorinated VOCs at concentrations above applicable regulatory comparison criteria.
November 2006	PP	Summarizes information detailed in the RI and FS Report and other previous supporting documents. The PP encourages public comment for the proposed remedial alternative of full-scale ISCO and groundwater confirmation sampling.
February 2008	ROD	States the selected remedial alternative (6B) of ISCO, ICs, and groundwater sampling for MNA parameters.
November 2008	Data gaps sampling	Combined CERCLA and RCRA confirmation groundwater sampling was conducted to determine if WD-166 and associated OWS-166A/OWS-166B can be recommended for NFA and closure.
June 2009	RD/RAWP	Provided the field implementation procedures, sequencing, schedule, and engineering design for the groundwater remedy that will be undertaken to fulfill the objectives of the ROD at IR Site 27.
July 2009	ISCO RA Implementation	RA begins with the installation of the ISCO 110 extraction well points and 35 injection well points. IR Site 27 was divided into five areas or "modules" with 22 extraction well points and seven injection well points comprising each module. All RA field activities were conducted in accordance with the RD/RAWP.
2010	ISCO RA Completion	The ISCO extraction and injection well network is decommissioned.
October 2010	Technology Transition Technical Memorandum	Documented that the remedy component of ISCO has achieved RAOs for groundwater. A shift to MNA is recommended based on declining concentrations of the COCs stated in the ROD.
September 2011	Five-Year Review	The first Five-Year Review was conducted for IR Site 27 to assess if the selected remedy remains protective of human health and the environment. It confirmed that the selected remedy is protective of human health and the environment.

TABLE 2.11-1: CHRONOLOGY OF SITE EVENTS – OU-6, IR SITE 27

Date	Event	Comments
May 2013	Less Than Significant Change to the ROD Memorandum	Announced a reduction in the ARICs at IR Site 27. The document was approved by the DTSC.
March 2016	IC Compliance Monitoring Report and Annual IC Compliance Certificate	Certified that ICs for IR Site 27 are in compliance with the requirements specified in the ROD.

Notes:
ARIC = Area Requiring Institutional Controls
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
COC = Contaminant of concern
DTSC = California Department of Toxic Substances Control
FS = Feasibility Study
IC = Institutional controls
ISCO = In situ chemical oxidation
IR = Installation Restoration
KCH = CH2M Hill and Kleinfelder Joint Venture
MNA = Monitored natural attenuation
NFA = No further action
OU = Operable unit
OWS = Oil-water separator
PAH = Polycyclic aromatic hydrocarbon
PP = Proposed Plan
RAO = Remedial action objective
RAWP = Remedial Action Work Plan
RCRA = Resource Conservation and Recovery Act
RD = Remedial design
RI = Remedial Investigation
ROD = Record of Decision
SWPPP = Storm Water Pollution Prevention Plan
VOC = Volatile organic compound
WD = Washdown area

2.11.1.4 Basis for Taking Action

The basis for taking action at IR Site 27 was unacceptable human health risk to residential receptors from VOCs in groundwater (KCH 2011). The COCs identified (KCH 2011) as posing potential human health risk from groundwater at IR Site 27 include: 1,1-DCA; cis-1,2-DCE; trans-1,2-DCE; PCE; TCE; and VC.

2.11.2 Remedial Action, OU-6, IR Site 27

2.11.2.1 Remedy Selection (Record of Decision)

The RAOs for groundwater stated in the ROD (DON 2008) were developed to protect human health and include the following components:

- Protect beneficial uses of groundwater underlying the site
- Protect beneficial uses of surface water adjacent to the site
- Protect human health by prohibiting domestic use of groundwater that has been impacted by COCs until the DON and regulatory agencies concur that there is no longer an unacceptable risk from such exposure

TABLE 2.11-2: RGS FOR COCS IN GROUNDWATER, OU-6, IR SITE 27

COC	RG for Groundwater, Short-Term IC Termination Criteria
1,1-DCA	5 µg/L
cis-1,2-DCE	6 µg/L
trans-1,2-DCE	10 µg/L
PCE	5 µg/L
TCE	5 µg/L
VC	0.5 µg/L

Source: ROD (DON 2008)

Notes:
µg/L = Microgram per liter
COC = Contaminant of concern
DCA = Dichloroethane
DCE = Dichloroethene
DCE = Dichloroethene
IC = Institutional control
PCE = Tetrachloroethene
TCE = Trichloroethene
RG = Remediation goal
VC = Vinyl chloride

The DON has selected a remedial alternative that provides for unrestricted use. The preferred alternative for groundwater at IR Site 27 consists of ISCO, short-term ICs, and groundwater monitoring for MNA parameters. The selected remedy components will reduce the mobility, toxicity, and volume of VOCs in the groundwater, has a low relative cost, and has moderate implementability while fully protecting human health and the environment and complying with all environmental regulations and laws.

The components listed below comprise the selected remedy for groundwater at IR Site 27 in accordance with the ROD (DON 2008).

Groundwater

- ISCO: Conduct injections, including a pilot test with three injections, to verify the effectiveness for this aggressive approach to reduce chemical concentrations.
- MNA: Conduct routine groundwater monitoring to assess the natural breakdown of the COCs stated in the ROD.
- ICs: Rely on proprietary controls in the form of deed and covenant restrictions.

2.11.2.2 Remedy Implementation

After the ROD (DON 2008) was issued in 2008, the remedial activities implemented included a data gaps sampling investigation, installation of 20 new groundwater monitoring wells, preparation of an RD/RAWP (Battelle 2009), full-scale ISCO implementation, groundwater remediation performance monitoring, and implementation of ICs. All remedy implementation activities were conducted in accordance with the ROD and the RD/RAWP.

Implementation of each component of the selected remedy as stated in the ROD (DON 2008) for groundwater at IR Site 27 is summarized below followed by a discussion of LUC inspections.

ISCO

The first component of the selected remedy consists of ISCO, which included baseline groundwater sampling of 20 newly installed monitoring wells in July 2009. Baseline sampling performed in July 2009 indicated that concentrations of PCE, TCE, trans-1,2-DCE, and 1,1-DCA in groundwater were below RGs in all 27 wells sampled with only cis-1,2-DCE and VC present at concentrations exceeding RGs. The new groundwater monitoring wells were designed to be used as extraction wells during ISCO and as monitoring wells after ISCO. Full-scale ISCO treatment was designed and implemented between

September 2009 and June 2010. ISCO treatment consisted of sodium persulfate injection performed in three phases with groundwater monitoring following each round of ISCO treatment.

ISCO implementation decreased all COCs concentrations, including those already lower than RGs, in all except three wells. Diminishing post-Phase 3 injection monitoring results suggest that it is unlikely that continued injections of sodium persulfate will cost-effectively reduce the concentrations of COCs, principally cis-1,2-DCE and VC, further at IR Site 27 (Battelle 2010). The RD/RAWP (Battelle 2009) outlines the detailed approach and procedures for ISCO implementation at IR Site 27.

Technology Transition to Groundwater Sampling for MNA Parameters

A preliminary evaluation of MNA was conducted before ISCO during baseline sampling and indicated that natural attenuation likely was occurring at IR Site 27 (Battelle 2009). Reductions in total chlorinated VOC concentrations ranged between 63% and 100% from July 2002 to March 2008 (Battelle 2010). The maximum VOC concentration (15MW-03) declined from 122 µg/L in December 2003 to 39 µg/L in July 2009.

MNA

IR Site 27 was incorporated into the BGMP after the last phase of ISCO treatment in 2010; however, groundwater monitoring at the site dates back to the early 2000s. MNA of groundwater has been useful in tracking the progress of ISCO treatments at IR Site 27. Natural attenuation can attain the RGs for COCs that remain above RGs (cis-1,2-DCE and VC) through biodegradation since cis-1,2-DCE and VC degrade under anaerobic conditions (Battelle 2010). It is anticipated that biodegradation will continue at IR Site 27 to the point where ICTC are achieved (the RGs) at which point groundwater monitoring can be discontinued; however, if site conditions revert to pre-treatment aerobic conditions, degradation of cis-1,2-DCE will be unfavorable and difficult to achieve.

Short-Term ICs

The ARICs at IR Site 27 encompass all of Buildings 68, 168, 555, and 601; Ferry Point Road and West Oriskany Avenue; inactive railroad tracks and sidings; and fenced open space between Building 168 and Ferry Point Road. The area of primary concern is the VOC plume west of Building 168, which is approximately 3 acres in area. IC termination criteria will be achieved when COC concentrations in groundwater decline to below the RGs stated in the ROD (Table 2.11-2).

The DON currently uses ICs at IR Site 27 in the form of deed restrictions that contain provisions to prevent changes in land use and include prohibitions against excavation, drilling, construction, alteration, or repairs. The property owner and lease are prohibited from conducting operations that interfere with environmental restoration activities. The land-use restrictions summarized below are presented in the deed and will remain in force until COC concentrations in groundwater decline below their respective RGs and the deed and covenant restrictions are released by the DON and FFA signatories. Deed restrictions run with the land.

1. IR Site 27 areas subject to ICs shall not be used for the following purposes unless otherwise approved by the DON and FFA signatories:
    - A residence, including any mobile home or factory-built housing constructed or installed for use as residential human habitation
    - A hospital for humans
    - A school for persons under 21 years of age
    - A day care facility for children

- A playground
- Any permanently occupied human habitation other than those used for commercial or industrial purposes

2. The installation of new groundwater wells of any type is prohibited without prior review and written approval of the DON and FFA signatories until cleanup objectives have been achieved.
3. The alteration, disturbance, or removal of groundwater monitoring wells, groundwater extraction wells, treatment facilities, and associated equipment is prohibited without prior review and written approval from the DON and FFA signatories.
4. Removal of or damage to security features (such as locks on monitoring wells, site fencing, and signs) or to survey monuments, monitoring equipment, piping, and other appurtenances is prohibited without prior written approval from the DON and FFA signatories.

Figure 2.10-1 shows the IC boundaries at IR Site 27 and the VOC trends in groundwater which illustrates COC levels in wells at the upper and lower plume boundaries showing stable or declining COC trends.

LUC Inspections

The DON conducts annual LUC inspections to confirm compliance with all IC performance objectives and LUCs throughout the LIFOC. The annual inspections are in accordance with the RD Annual Inspection Checklist to identify compliance or non-compliance with the LUCs (DON 2016).

2.11.3 Progress Since the Last Five-Year Review, OU-6, IR Site 27

The protectiveness statement in the previous Five-Year Review stated: "RAs performed at IR Site 27 are considered protective of human health and the environment. The extent of contamination is defined, and ICs are in place on IR Site 27 to prevent exposures to contaminated groundwater. ICs and LUCs are assessed annually. The selected remedy will continue to be protective if the actions outlined in the RD/RAW are performed."

This is the second Five-Year Review for IR Site 27. MNA has been ongoing at IR Site 27 under the BGMP. Data collected for the BGMP have demonstrated significant reductions in the chlorinated hydrocarbon VOC plume at IR Site 27, which has allowed a reduction of the ARICs agreed upon by the DON and BCT (DON 2013).

The 2011 Five-Year Review Report (KCH 2011) stated an issue of possible rebound in COCs due to insufficient ISCO compounds in groundwater. The 2011 Five-Year Review Report recommended that the DON continue to monitor and evaluate COCs at IR Site 27 under the BGMP to ensure that the COC concentrations continue to decrease and are below RGs within the expected timeframe.

Since 2011, COC concentrations at IR Site 27 continue to be monitored, evaluated, and reported in the BGMP. Based on the Preliminary Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016), concentrations of only two (1,2-DCE and VC) of the six original COCs remain above RGs, and their general concentration trends have declined or remained stable (Figure 2.11-1). COC concentrations will continue to be monitored.

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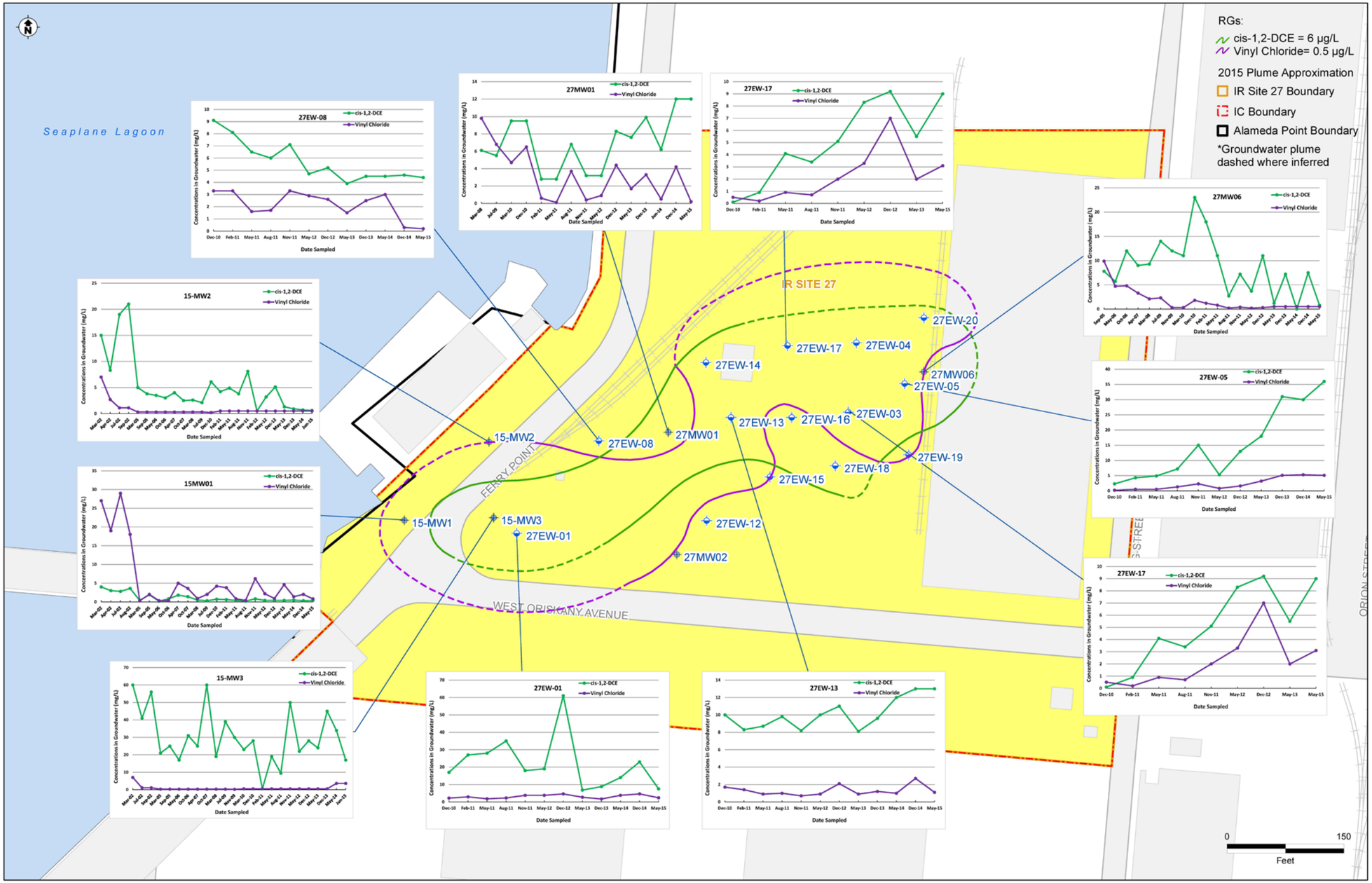
FIGURE 2.11-1: IC BOUNDARY MAP AND VOC TRENDS IN GROUNDWATER, OU-6, IR SITE 27



Source: BGMP Report (MMEC 2016)

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2.11.4 Five-Year Review Process, OU-6, IR Site 27

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 27. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.11.4.1 Site Inspection

The site inspection indicates the former ISCO treatment area is located in a secured fenced area operated by a private company. Monitoring wells appear to be in good condition with most located within the secured fenced area. The site inspection confirms that ICs are operating as intended by the ROD and are protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Site 27.

2.11.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 27. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response: "Sites 26 and 27: I think these sites are going well. I don't have any concerns about these sites."

DTSC Response: No Comments.

Regional Water Board Response: No Comments.

Community Interview Response: No Comments.

2.11.5 Technical Assessment, OU-6, IR Site 27

The RAOs for groundwater at IR Site 27 are being met. The continued RA of MNA is ongoing and ICs ensure protection of human health from contaminated groundwater. The DON will keep ICs in place until COC concentrations fall below the RGs and allow for unrestricted land use.

TABLE 2.11-3: TECHNICAL ASSESSMENT SUMMARY, OU-6, IR SITE 27

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 27	Groundwater – ISCO, Groundwater Sampling for MNA Parameters, and ICs	Yes	Yes	No	Protective	2021

Notes
IC = Institutional control
ID = Identification
IR = Installation Restoration
ISCO = In situ chemical oxidation
MNA = Monitored natural attenuation

2.11.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedy is functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remedy implemented for groundwater at IR Site 27 is working as intended by the ROD. The documents that detail the remedial decisions for IR Site 27 are the ROD (DON 2008), RD/RAWP (Battelle 2009), and the Technology Transition Technical Memorandum (Battelle 2010).

Opportunities for Optimization

No opportunities for optimization have been identified at this time. Significant reduction of the VOC plume at IR Site 27 has allowed a reduction in the ARICs as agreed upon by the DON and DTSC (DON 2013).

Performance of Groundwater Remedy

ISCO has significantly decreased concentrations of 1,1-DCA; cis-1,2-DCE; trans-1,-DCE; PCE; TCE; and VC in groundwater. Concentrations of 1,1-DCA; PCE; and TCE have declined to below detection limits in all groundwater monitoring wells across IR Site 27. It is anticipated that cis-1,2-DCE; trans-1,2-DCE; and VC will continue to biodegrade through natural attenuation as intended by the selected remedy stated in the ROD. Although, cis-1,2-DCE concentration trends are increasing in five of the 18 wells for which concentrations are tracked. VC concentration trends are increasing in three of the same wells in which cis-1,2-DCE concentrations are rising. These wells are near or immediately down gradient from the apparent source and may represent continuing degradation of COCs in the source area. They are near or surrounded by wells that indicate stable or declining cis-1,2-DCE and VC trends; therefore, the data are interpreted to represent local variations in plume dynamics rather than indicate a faltering remedy and the remedy appears to be functioning as intended.

The ROD (DON 2008) stated that the selected remedy would permanently treat VOC-affected groundwater at IR Site 27 within three years of remedy implementation for a projected goal of 2013 to meet RGs. IR Site 27 is progressing towards meeting the RAOs and ICs will remain in place until they have been achieved.

2.11.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 27 is in place and there are no reported changes to the remedy that would affect its protectiveness.

For the occupational and construction scenarios, the cancer risk and noncancer HIs are within the National Contingency Plan risk management range or less than the noncancer threshold of 1 for all exposure pathways. For the hypothetical future resident, RME risk values exceed the risk management range for two exposure pathways (assuming domestic use of onsite groundwater): ingestion and dermal contact while showering. The selected remedy included institutional controls to restrict human exposures to groundwater in addition to in situ chemical oxidation treatment to reduce volatile organic compound concentrations in groundwater.

Concentrations of chemicals in soil do not pose an unacceptable risk to human health for current conditions and planned future site uses (including residential use). Therefore, no action is required for soil.

Changes in Exposure Assumptions and Toxicity Data

Although the property was transferred outside of DON control, exposure assumptions are expected to remain unchanged. The toxicity values used in the IR Site 27 HHRA were obtained from the preliminary remediation goal table published by USEPA Region 9 and then confirmed by a review of USEPA's IRIS and Health Effects Assessment Summary Tables databases. Toxicity values from OEHHA were also used in the HHRA as a point of reference. In the last five-year review (KCH 2011), toxicity values for the COCs were found to be current and correct except for updates to TCE and VC.

The toxicity values for TCE and PCE have been updated since the 2011 review. In September 2011, the oral slope factor for TCE was updated to 0.046 $(mg/kg\text{-}day)^{-1}$ (USEPA IRIS) compared to the previous oral CSF of 0.0013 $(mg/kg\text{-}day)^{-1}$. The UR_i for TCE was also updated [0.0000041 $(mg/m^3)^{-1}$] as well as the oral reference dose (0.0005 mg/kg-day) and reference concentration (mg/m^3) (IRIS). In 2012, the oral CSF for PCE was updated to 0.54 $(mg/kg\text{-}day)^{-1}$ (OEHHA), the UR_i for PCE was updated [5.9E-06 $(\mu g/m^3)^{-1}$] as well as the reference dose (0.006 mg/kg-day) and reference concentration (0.04 mg/m^3) (IRIS). These updated values in the IRIS and OEHHA databases are more conservative than what was used in the 2004 HHRA and would result in higher TCE and PCE concentrations in indoor air.

Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

The HHRA for IR Site 27 primarily used the default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's 2014 update include: skin surface area, adult body weight, and resident exposure duration and exposure time, and worker adherence factor. Some of these factors are less conservative or more conservative so overall, the impact of these changes to the HHRA results does not affect the current remedy at IR Site 27.

The methods and assumptions used in the HHRA to evaluate health risks for groundwater vapor intrusion in indoor air do not reflect current standards of practice (DTSC 2011; ITRC 2007; and USEPA 2015b). In particular, soil and building property assumptions used in the HHRA differ significantly from current DTSC (2011) recommended values. In general, the DTSC (2011) recommended values are more conservative than those used in the HHRA.

Based on the future mixed land uses (industrial and maritime uses) at IR Site 27, the evaluation of the residential, occupational worker and construction worker exposure scenarios are current and reasonable. In 2014, EPA updated their recommended default exposure parameters which are slightly less or more conservative compared to what was used in the HHRA. Also, the evaluation of the vapor intrusion pathway does not apply the most current DTSC guidance (2011). Additionally, the updated toxicity values for TCE and PCE are more conservative than when the risk assessment was conducted. Overall, these changes do not impact the current remedy which is based on regulatory values. The MCLs are also protective of commercial indoor air (USEPA 2015a).

No additional exposure pathways have been identified since land uses, zoning, and receptors at this IR site have not changed since the previous 5-Year Review.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Site 27 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.11.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

2.11.6 Issues, OU-6, IR Site 27

No issues have been identified at this time that would affect the protectiveness of the selected remedy.

2.11.7 Recommendations and Follow-up Actions, OU-6, IR Site 27

No recommendations or follow-up actions have been identified at this time.

2.11.8 Protectiveness Statement, OU-6, IR Site 27

The RAs performed at IR Site 27 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposures to contaminated groundwater. IR Site 27 is currently in the remedial action operation stage of the CERCLA process. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

2.12 OU-6, IR SITE 28

2.12.1 Site Description and Background, Alameda Point, OU-6, IR Site 28

IR Site 28 at OU-6 covers 2.9 acres in the northeastern portion of Alameda Point as shown in Figure 1-1. The site is 900 feet long from east to west and is wedge-shaped with a width of 35 feet at the western boundary to 300 feet at the eastern boundary. IR Site 28 is bordered to the north by the Oakland Inner Harbor.

Historical use of IR Site 28 included the following activities by Todd Shipyards Corporation: ship building, repair and maintenance of commercial and military marine vessels, and storage and staging of equipment. Railroad causeways, railroad tracks, and spurs were present at IR Site 28 from 1883 to the mid-1960s. Approximately 12,000 square feet of Building 63, a 40,000-square-foot building likely used for storage related to shipbuilding and maintenance, was located within the east boundary of IR Site 28. Building 63 was constructed in 1947 and demolished in 1988.

2.12.1.1 Land and Resource Use

The City of Alameda owned the property that is now IR Site 28 until 1930 when it was acquired by the United States Army and then by the DON in 1936. The land remained DON property until 1970 when it was acquired by Todd Shipyards Corporation as part of a land purchase that included the privately owned, non-DON-leased property adjacent to IR Site 28. In 1995, ownership of the land comprising IR Site 28 reverted to the DON because of a property title dispute. IR Site 28 was included in the transfer of property to the City of Alameda in 2013 based on USEPA's determination that the remedy is Operating Properly and Successfully.

IR Site 28 is currently a dog park in the south portion, a partially paved parking lot in the east portion, and a shore park with a paved recreational use trail adjacent to the Oakland Inner Harbor in the north portion. The *"Alameda Community Reuse Plan"* (EDAW 1996) indicates that the future use of IR Site 28 will be consistent with current use. The Bay Trail will extend through IR Site 28 and to the west as a pedestrian and bike use path. The existing Main Street Ferry Terminal also is planned for continued future use.

2.12.1.2 Current and Potential Groundwater Uses

Based on criteria contained in SWRCB Resolution 88-63, the DON, with concurrence from the Regional Water Board, has determined that because of the poor quality of groundwater in the FWBZ, groundwater within 200 feet of the shoreline is not a likely source of drinking water (Regional Water Board 2003). In addition, the Water Board concurred with the DON in a letter dated October 23, 2006 (Regional Water Board 2006), that groundwater in the FWBZ beneath IR Site 28 is not a likely source of drinking water because of the potential for salt-water intrusion, the absence of conduits to the Alameda Aquifer, the absence of nearby supply wells, and ICs restrict extraction of the groundwater. Water is supplied to IR Site 28 by East Bay MUD. Section 1.2.4 of this report discusses future beneficial use of groundwater at Alameda Point.

2.12.1.3 Site Chronology and Initial Response

The DON received a remedial action order for IR Site 28 in June 1988. IR Site 28 was designated as a CERCLA IR Site in August 2000 (DON 2007). A number of investigations have been conducted at IR Site 28 to evaluate the nature and extent of contamination and potential impacts to human health and the environment. Table 2.12-1 summarizes major investigations and actions at IR Site 28. These site events are described in detail in the ROD (DON 2007).

TABLE 2.12-1: CHRONOLOGY OF SITE EVENTS – ALAMEDA POINT, OU-6, IR SITE 28

Date	Event	Comments
August 2001	Follow-on investigation in support of EBS Phase 2C	Further examined the environmental condition of Alameda Point property through the collection and analysis of soil and groundwater samples from 21 locations.
2004 - present	BGMP sampling	Groundwater monitoring is conducted at IR Site 28 under the BGMP. Samples are analyzed for metals and TDS.
September 2004	RI	Discussed the history and setting of IR Site 28, summarizes previous investigations conducted at the site, summarizes the nature and extent of contamination, and includes both an HHRA and an ERA. The RI Report recommended further evaluation of soil and groundwater at IR Site 28 to address risks identified in the HHRA and ERA.
June 2005	FS	Summarized the results of the IR Site 28 RI Report, develops RAOs, RGs, and RAs, and evaluates the remedial alternatives against the NCP criteria.
March 2006	PP	The PP included recommendations by the DON for remediating soil and groundwater, summarizes the site history, and notifies the community of the public meeting and public comment period.
January 2007	Technical Memorandum	Described the resolution of issues identified by the regulatory agencies during review of the RI Report, FS Report, and PP. It also develops a groundwater modeling conceptual approach, presents updated analytical data for arsenic in groundwater compared to the PRG based on the California Toxics Rule criterion for the shoreline wells, and concludes that neither storm sewer at IR Site 28 is likely to act as a preferential migration pathway for COCs.
September 2007	ROD	Presented the selected remedies for soil and groundwater at IR Site 28. The selected remedy consists of excavation and off-site disposal, clean soil import fill placement; MIC Injection; installation of groundwater monitoring wells, long-term monitoring; and ICs

TABLE 2.12-1: CHRONOLOGY OF SITE EVENTS – ALAMEDA POINT, OU-6, IR SITE 28

Date	Event	Comments
November 2008	IR Site 28 pilot test	Evaluated methods for remediating copper in groundwater for incorporation into the design and implementation methods for the groundwater remedy.
April 2010	RD/RAWP	The RD/RAWP presented the technical justification and basis of the design for the overall IR Site 28 remedial approach.
May-July 2010	RA Implementation	The RA included excavation, transport, and disposal of contaminated soil at an approved off-site facility; backfilling of the excavated area with clean soil to prevent exposure; use of MRC® to immobilize contaminants in soil. All RA field activities were conducted in accordance with RD/RAWP.
July 2010	RA Completion	The RA was completed, which consisted of excavation, off-site disposal, import backfill and MRC® applications was completed.
September 2011	Five-Year Review	The first Five-Year Review was conducted for IR Site 28 to assess if the selected remedy remains protective of human health and the environment. The Five-Year Review confirmed that the selected remedy is protective of human health and the environment.
January 2012 - 2015	Annual Inspection and Compliance Report	Certified that the site is in compliance with ROD requirements.
July 2012	Interim RACR	Interim RACR that discusses results for the implemented remedy.
March 2016	IC Compliance Monitoring Report and Annual IC Compliance Certificate	Certified that ICs for IR Site 28 are in compliance with the requirements specified in the ROD.

Notes:
BGMP = Basewide Groundwater Monitoring Program
COC = Contaminant of concern
DON = United States Department of the Navy
EBS = Environmental Baseline Survey
ERA = Ecological risk assessment
FS = Feasibility Study
HHRA = Human health risk assessment
IC = Institutional controls
IR = Installation Restoration
MIC = Metals immobilization compound
NCP = National Oil and Hazardous Substances Pollution Contingency Plan
OU = Operable unit
PP = Proposed Plan
PRG = Preliminary remediation goal
RA = Remedial action
RACR = Remedial Action Completion Report
RAO = Remedial action objective
RAWP = Remedial Action Work Plan
RG = Remediation goal
RI = Remedial Investigation
ROD = Record of Decision
TDS = Total dissolved solids

2.12.1.4 Basis for Taking Action

The basis for taking action is to reduce human health risk from the soil COCs of PAHs, arsenic, and lead and ecological risk from the surface water COC of copper for aquatic receptors.

Cancer and non-cancer causing COCs were identified for IR Site 28 based on planned future reuse. The cancer-causing COCs for the occupational and recreational receptors included arsenic and PAHs in soil through ingestion and dermal contact pathways. In addition, lead is a non-cancer causing COC for soil for the occupational and recreational scenarios and copper in shallow groundwater could pose an unacceptable ecological risk to aquatic life from exposure to surface water at the point of exposure (POE).

2.12.2 Remedial Action, Alameda Point, OU-6, IR Site 28

2.12.2.1 Remedy Selection (Record of Decision)

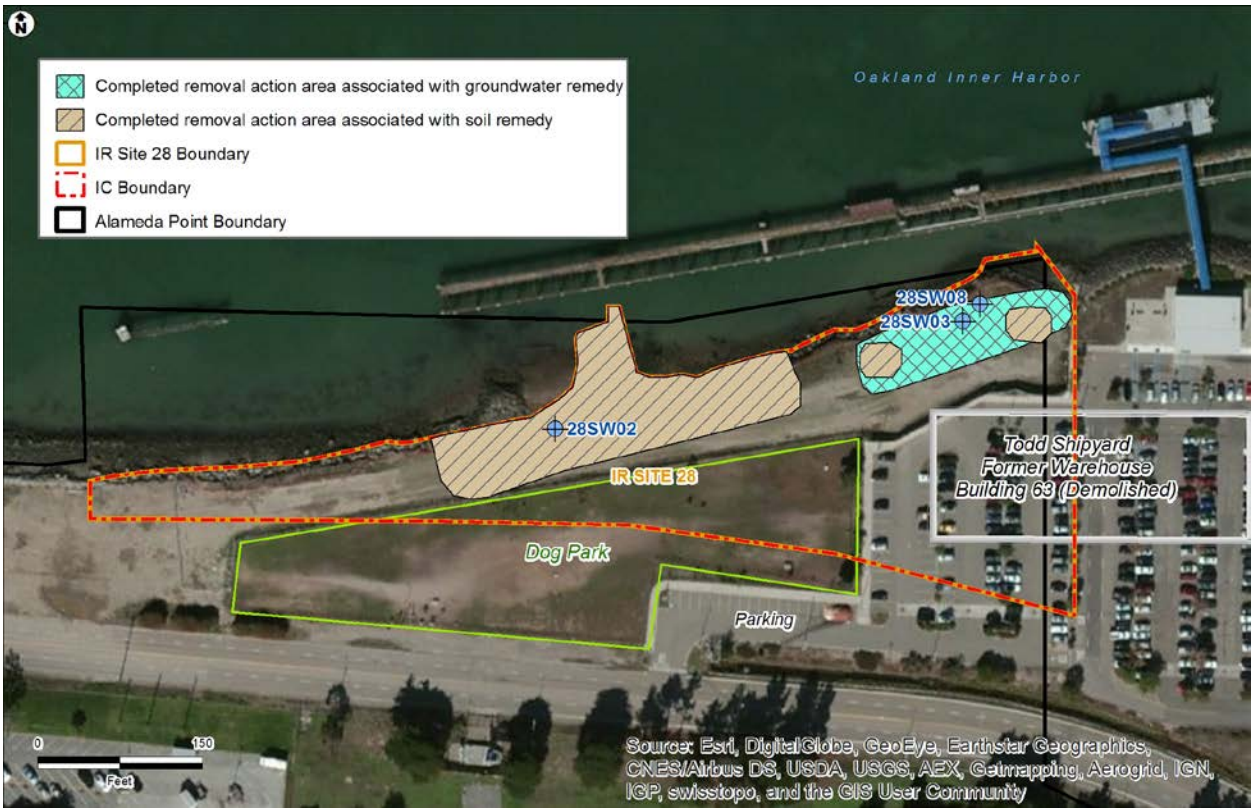
The RAOs for soil and groundwater at IR Site 28 include the following components:

- Minimize the potential risk of exposure (through ingestion or dermal contact) of a recreational visitor or occupational worker to unacceptable levels of arsenic, lead, and PAHs in soil
- Either prevent exposure (through ingestion or dermal contact) of future residents to unacceptable levels of arsenic, lead, and PAHs in soil or prohibit residential use of the property
- Prevent potential exposure of aquatic offshore receptors (in the Oakland Inner Harbor) to copper in surface water at the POE exceeding the CTR continuous concentration criterion of 3.1 µg/L

According to the ROD (DON 2007), the purpose of remediation at IR Site 28 is to restore soil and shallow groundwater water quality to the pre-contamination conditions by reducing COC concentrations to levels that no longer pose a threat to the environment or human health based on recreational reuse. Figure 2.12-1 shows completed remedial action areas (excavation locations) associated with the soil and groundwater remedies.

The selected remedy for soil and groundwater at IR Site 28 is discussed below in accordance with the ROD (DON 2007).

FIGURE 2.12-1: COMPLETED REMEDIAL ACTION AREAS FOR SOIL AND GROUNDWATER, OU-6, IR SITE 28



Source: Pilot Test Report (ITSI 2009)

Soil

This alternative was selected because it substantially eliminates potential exposure pathways as presented in the RI Report (BEI 2004), is protective of human health and the environment, complies with environmental regulations and laws, and has a relatively moderate cost and implementability.

The remedy selected for IR Site 28 soil to protect human health consists of the following components:

- Removal of soil contaminated by metals or PAHs to a maximum depth of 2 feet below ground surface (bgs) in designated shoreline areas where concentrations exceed the remediation goal for arsenic (9.1 milligrams per kilogram [mg/kg]), lead (800 mg/kg), or PAHs (2.1 mg/kg).
- Backfill the excavations with clean soil to prevent exposure to the underlying contaminated soil remaining after the excavation. Seed the area with selected indigenous plant species for erosion protection.
- ICs to restrict land use by prohibiting new construction for hospital, school, daycare center, and residential human habitation purposes. In addition, ICs will restrict subsurface activities below 2 feet below ground surface at Site 28, and the offsite reuse of excavated soil.

TABLE 2.12-2: RGS FOR SOIL, OU-6, IR SITE 28

COC	RG for Soil (shoreline area)
Arsenic	9.1 mg/kg
PAH	2.1 mg/kg B(a)P equivalent
Lead	800 mg/kg
Copper	1,500 mg/kg

Source: ROD (DON 2007)

Notes:
B(a)P = Benzo(a)pyrene
COC = Contaminant of concern
IC = Institutional control
mg/kg = milligram per kilogram
PAH = Polycyclic aromatic hydrocarbons
RG = Remediation goal

Groundwater

The groundwater remedy was selected because it reduces the mobility, toxicity, and volume of copper in groundwater by using an expedient treatment strategy; has a moderate relative cost and implementability; protects the environment; and complies with environmental regulations and laws. The remedy selected for IR Site 28 groundwater to protect human health and the environment consists of the following components:

- Injection of the metals remediation compound ([MRC®] product of Regenesis, Inc.), a metals immobilization compound (MIC), into direct-push borings in the subsurface to immobilize copper detected in groundwater
- Direct application of MRC™ into the open excavation associated with groundwater remediation before backfilling
- Installation of groundwater monitoring wells, and additional groundwater monitoring for IC termination criteria
- ICs to restrict access to and use of groundwater

TABLE 2.12-3: RG FOR COPPER, OU-6, IR SITE 28

COC	RG for Surface Water at Point of Exposure, Short-Term IC Termination Criteria
Copper	3.1 µg/L

Source: BGMP Report (SES 2015)

Notes:
µg/L = Microgram per liter
COC = Contaminant of concern
IC = Institutional control
RG = Remediation goal

2.12.2.2 Remedy Implementation

From May through November 2010, the selected remedies for soil and groundwater were implemented at IR Site 28 in accordance with the RD/RAWP (Battelle 2010) after successful implementation of the pilot test (ITSI 2009). Activities associated with remedy implementation are discussed below.

Remedial Activities

The excavation RA involved the removal of shallow soil, limited to the top 2 feet of soil (approximately 1,900 yd^3), containing arsenic, lead, or PAHs at concentrations exceeding their respective RGs. In addition, soil was excavated from an area where copper was a potential source of contamination to the groundwater. This excavation extended to the water table. The excavated areas then were backfilled with clean soil to match the pre-existing grade, compacted, scarified, and seeded with grassy vegetation.

MRC™ was injected into the subsurface through direct-push borings to immobilize the copper detected in groundwater. Additionally, MRC™ was added directly to the open excavation associated with the area of elevated copper before backfilling.

According to the Interim RACR for IR Site 28, the remaining sections of perimeter fence associated with the RD/RA implementation were removed in November 2010 (Battelle 2012).

Post-Remedial Activities

Semi-annual groundwater monitoring under the BGMP will continue until the RAOs are achieved.

ICs

ICs are included as deed restrictions and Annual Inspection and Compliance Reports are submitted to ensure that the remedy continues to be protective of human health and the aquatic environment. Deed restrictions run with the land until ICTC are met.

IR Site 28 shall not be used for any of the following purposes:

- A residence, including any mobile home or factory-built housing constructed or installed for use as residential human habitation
- A hospital for humans
- A school for persons under 21 years of age
- A day care facility for children
- A playground

In addition, the activities summarized below are prohibited.

- Installation of new groundwater wells of any type without prior written approval by the DON and FFA signatories
- Alteration, disturbance, or removal of groundwater monitoring wells, groundwater extraction wells, treatment facilities, and associated equipment without prior written approval by the DON and FFA signatories.
- Subsurface activities that involve excavation of soil from deeper than 2 feet bgs without prior approval by the DON and FFA signatories

Reuse of soil excavated from 0 to 2 feet bgs during subsurface activities at IR Site 28 will be limited to sites designated for commercial/industrial or recreational uses. Residential reuse of soil excavated from 0 to 2 feet bgs will be prohibited. Soil may not be removed from IR Site 28 without prior written approval by the DON and FFA signatories (except for appropriate landfill disposal).

Annual inspection and reporting requirements, effects of future land-use plans on ICs, and plans for changes to the site contamination status are discussed below.

Effects of Future Land Use Plans on ICs: No effects of future land use on ICs were identified during this Five-Year Review.

Plans for Changes to Site Contamination Status: No changes to site contaminant status are anticipated in the near future. Interim ICs will remain in place until the RGs have been achieved.

2.12.3 Progress Since the Last Five-Year Review, Alameda Point, OU-6, IR Site 28

The protectiveness statement in the previous Five-Year Review stated: "The remedy in place at IR Site 28 is considered protective of human health and the environment. The RAs planned for IR Site 28 are considered protective of human health and the environment in the short term. The extent of contamination is defined and remedies have been implemented to eliminate the risk of exposure to site occupants and limit the toxicity, volume, and mobility of the COCs. Regularly assessed ICs are in place to prevent exposure to contaminated subsurface soil. The selected remedy for both groundwater and soil will continue to be protective of human health and the environment."

This is the second Five-Year Review for IR Site 28. ICs are enforced by the ROD to restrict land and groundwater use, off-site reuse of excavated soil, construction of specific structures for human occupancy, and access to groundwater. Groundwater monitoring continues under the BGMP for IR Site 28.

The 2011 Five-Year Review Report (KCH 2011) identified the issue of post-injection copper rebound, suggesting sufficient reducing conditions may not have been achieved (Appendix E, Table E-2). The 2011 Five-Year Review Report recommends that the DON continue to monitor and evaluate COCs at IR Site 28 in accordance with the approved RD/RAWP (Battelle 2010) for the next 10 years until 2021 to ensure that COC concentrations are/remain below the trigger level for copper.

Since 2011, copper concentrations at IR Site 28 continue to be monitored, evaluated, and reported in the BGMP. The Preliminary Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016) indicates that, since the Fall 2014 sampling event, only one well (28SW02) consistently exceeds the trigger level of 40 µg/L with concentrations ranging from 63 to 120 µg/L. COC concentrations will continue to be monitored. During that same time period, the two remaining wells at Site 28 demonstrated fluctuating concentrations ranging from 34 to 80 µg/L. These concentrations are below the historical site maximum concentration which was 325 µg/L.

Select wells with concentrations of copper continuously below reporting limits were decommissioned in Spring 2015 effectively reducing the number of wells monitored in the BGMP from five to three.

2.12.4 Five-Year Review Process, Alameda Point, OU-6, IR Site 28

This section discusses activities performed during the Five-Year Review process for Alameda Point IR Site 28. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.12.4.1 Site Inspection

The site inspection confirms that wells within the BGMP network are in good condition. ICs are operating as intended by the ROD and are protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for IR Site 28.

2.12.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 28. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response: "For this site, the copper concentrations in well 28SW02 remain high, at nearly 40 times the RG. (RG=3.1 µg/L, Spring 2013 concentration was 120 µg/L)."

DTSC Response: No Comments.

Regional Water Board Response: No Comments.

Community Interview Response: No Comments.

2.12.5 Technical Assessment, OU-6, IR Site 28

RAOs for soil at IR Site 28 have been met by excavation and off-site disposal of soil impacted by arsenic, lead, and PAHs, ensuring protection of human health and the environment. RAOs for groundwater have not been achieved and groundwater monitoring will continue. Copper groundwater concentrations are below historical maximums. The ERA using the most conservative assumptions, including historical maximum concentrations, resulted in hazard quotients for aquatic exposures greater than one for some metals, including copper. Refined estimates in the ERA using reasonable maximum assumptions, including 95 percent upper confident limit exposure point concentrations, resulted in no groundwater COCs having hazard quotients greater than one.

TABLE 2.12-4: TECHNICAL ASSESSMENT SUMMARY, OU-6, IR SITE 28

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
IR Site 28	Excavation, Disposal, and Clean Soil Backfill; MIC Injection; Long-Term Groundwater Monitoring; and ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification
IR = Installation Restoration
MIC = Metals immobilization compound
OU = Operable unit

2.12.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Although copper concentrations have rebounded in the remaining wells, only one well remains consistently above the trigger level. The effectiveness of the remedy appears to have plateaued, possibly due to temporary environmental conditions; therefore, the remedy function will continue to be evaluated through increased monitoring. Review of documents, collected data within this Five-Year Review period, site inspections, and interviews indicate that the remedy implemented for groundwater at IR Site 28 is working as intended by the ROD. The documents that detail the remedial decisions for IR Site 28 are the ROD (DON 2007), RD/RAWP (Battelle 2010), and the 2007 Draft Technical Memorandum (SulTech 2007).

Opportunities for Optimization

Six groundwater monitoring wells at IR Site 28, two of which were being monitored within the BGMP, were decommissioned in April 2015. The following groundwater monitoring wells were decommissioned: 28SW01, 28SW04, 28SW05 along with three unmarked monitoring wells.

Performance of Groundwater Remedy

Copper concentrations in groundwater continue to fluctuate and, at times, exceed (however inconsistently) the RG trigger level of 40 µg/L in monitoring wells 28SW02, 28SW03, and 28SW08 at Site 28 (MMEC 2016). Figure 2.11-2 shows the historical trends for copper in the SWBZ for these groundwater monitoring wells.

The ROD (DON 2007) stated that the selected remedy would treat contaminated groundwater at IR Site 28 within 10 years for a projected goal of 2020 to meet RGs. Groundwater monitoring would be conducted following remedy implementation to verify treatment effectiveness for a goal of achieving RAOs. ICs will remain in place until RAOs have been achieved.

2.12.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for IR Site 28 is in place and there are no reported changes to the remedy that would affect its protectiveness.

The total cancer risks for the occupational worker and recreational user were within USEPA risk management range (BEI 2004). For construction workers at IR Site 28, total cancer risks were also within the risk management range. The noncancer HI for the occupational worker was less than the threshold of

one; the noncancer HI for the recreational user does not exceed one; and the construction worker noncancer HI was two, which slightly exceeds the noncancer threshold.

A conservative cancer risk estimate was calculated for a resident and included the exposure pathways of ingestion of homegrown produce and the domestic use of groundwater. The total cancer risk calculated for a resident exceeded the risk management range and the noncancer HI was above one. Most of the residential risk is based on the ingestion of homegrown produce and domestic use of groundwater pathways. Although these pathways were evaluated in the HHRA and presented in the Remedial Investigation, there is a high level of uncertainty associated with the homegrown produce pathway, and the residential use of groundwater is hypothetical and unlikely to occur in the future.

Changes in Exposure Assumptions and Toxicity Data

Toxicity values used in the IR Site 28 HHRA were obtained from USEPA Region 9 PRGs and were confirmed by USEPA's IRIS and Health Effects Assessment Summary Tables. DTSC's OEHHA toxicity values were also applied to the HHRA as a point of reference.

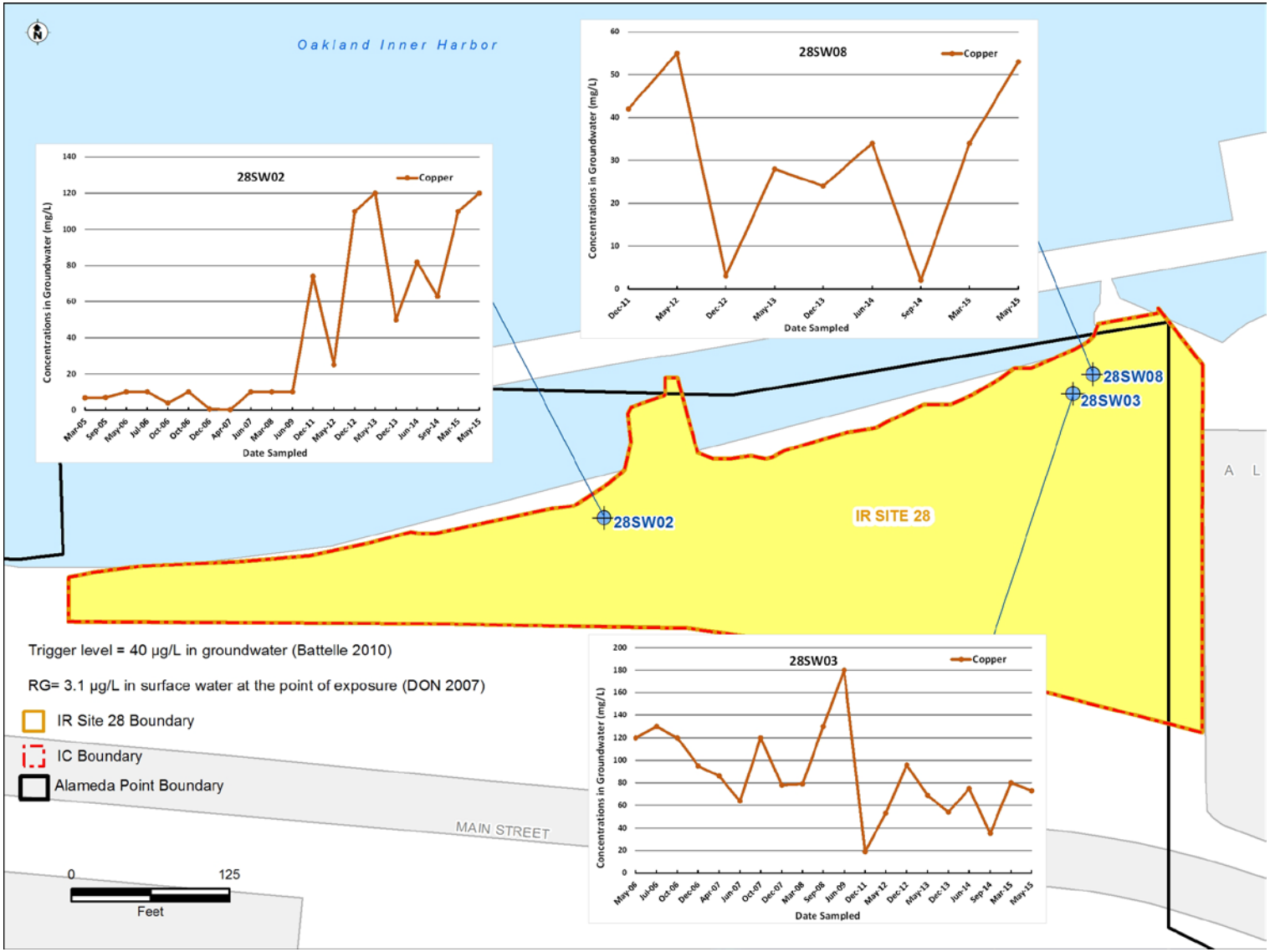
Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

Since the 2011 Five-Year Review, the toxicity values for B(a)P have not changed. However, the updated toxicity of B(a)P is currently posted as a Peer Review Draft in April 2015 (IRIS); therefore, no change is currently needed. DTSC recently revised their recommended B(a)P relative potency factors (DTSC 2015). These updates would produce higher B(a)P equivalence concentrations which would be more conservative than what was is in the previous HHRA.

The HHRA for IR Site 28 primarily used the default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's 2014 update include: skin surface area, adult body weight, and resident exposure duration and exposure time, and worker adherence factor. Some of these factors are less conservative and some are more conservative; so overall, the impact of these changes to the HHRA results does not affect the current remedy at IR Site 28.

No additional exposure pathways have been identified since land uses, zoning, and receptors at this IR site have not changed since the previous 5-Year Review. The RAO values for arsenic, lead, and PAHs from exposures to soil at IR Site 28 are protective. In 2011 DTSC updated the residential benchmark value for lead to 80 mg/kg which is less than and more conservative than what was previously used in the HHRA. However, the current remedial goal for lead is based on the recreational scenario due to the future land use at IR Site 28 which is a dog park and biking trails.

FIGURE 2.12-2: COPPER TRENDS IN GROUNDWATER SWBZ, OU-6, IR SITE 28



Source: BGMP Report (MMEC 2016)

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for IR Site 28 included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.12.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

2.12.6 Issues, Alameda Point, OU-6, IR Site 28

One well, 28SW02, consistently remains above RGs; therefore, the impact to ecological receptors is unknown.

2.12.7 Recommendations and Follow-up Actions, Alameda Point, OU-6, IR Site 28

The recommendation from the 2011 Five Year Review to continue to monitor and evaluate trends at IR Site 28 until 2021 remains appropriate; however, the BGMP monitoring frequency will be increased to quarterly and each quarterly sampling event will occur at the low-low tide. Sampling will include measurement of water quality parameters including field measurements of DO, ORP, conductivity, and pH, and analysis for salinity. Additionally, to better understand the potential impacts of tidal influence on groundwater at IR Site 28, data loggers will be used in existing wells during both the wet and dry seasons to document the potential influences of weather and tidal cycles on copper concentrations. Evaluation of the data and recommendations based on the additional data collected will be presented in the 2017 BGMP report.

2.12.8 Protectiveness Statement, Alameda Point, OU-6, IR Site 28

The RAs performed at IR Site 28 are considered protective of human health and terrestrial receptors. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposures to contaminated soil and groundwater. The RAs performed at IR Site 28 have reduced the risk to aquatic receptors and are considered protective in the short term. Groundwater concentrations of copper continue to be monitored. IR Site 28 is currently in the remedial action operation stage of the CERCLA process. ICs and LUCs are assessed annually.

2.13 FISCA IR SITE 02 SOIL

2.13.1 Site Description and Background, FISCA IR Site 02 Soil

FISCA IR Site 02 Soil is located in the south-central portion of the FISCA as shown in Figure 1-1. The site is less than 1 mile east of Alameda Point along the southern shore of the Oakland Inner Harbor in Alameda, California. Soil COCs identified at IR Site 02 fall into five categories: PCBs, metals, VOCs, SVOCs, and TPH. The HHRA indicates that the principal risks to human health under future industrial and residential land-use scenarios come from dermal contact with soil as well as inhalation and ingestion of soil. These risks as associated with two COCs: PCBs and cadmium. Figure 2.13-1 shows a layout of FISCA IR Site 02 Soil, including previous RA areas.

A RAP/ROD (DON 2001) was prepared and implemented to address shallow soil at IR Site 02 impacted with PCBs and cadmium. Pursuant to the RAP/ROD, soil that exceeded cleanup levels for PCBs and cadmium was identified and removed to allow residential use of the western one-third of IR Site 02 and industrial use of the eastern two-thirds of IR Site 02. Excavated areas were backfilled with clean fill, and contaminated soil was transported to an off-site authorized landfill for disposal. The RAP/ROD also required the implementation of LUCs to prevent future residential redevelopment of the industrial use portion of IR Site 02 as long as PCB and cadmium concentrations in shallow soil remain above residential use cleanup levels.

This is the third Five-Year Review for FISCA IR Site 02 Soil.

2.13.1.1 Land and Resource Use

The Defense Logistics Agency Defense Reutilization and Marketing Office (DRMO) operated a material screening lot and scrap yard at IR Site 02 until 1998. The western portion of IR Site 02 was used as a screening lot and for temporary equipment storage. This facility was responsible for the sorting, resale, and proper disposal of property declared to be excess by the DON. Surplus equipment transferred to IR Site 02 for processing may have contained fuel, oil, coolants, and other liquids. The eastern portion of IR Site 02 was used as a scrap yard and for temporary storage of discarded automobiles, stockpiled scrap metal, and surplus equipment.

FIGURE 2.13-1: SITE LAYOUT AND REMEDIAL ACTION AREAS, FISCA IR SITE 02 SOIL

Source: RAP/ROD (DON 2001)

IR Site 02 was transferred to the City of Alameda in July 2000, with planned residential reuse in the western one-third of the site and mixed commercial use in the eastern two-thirds of the site. The eastern portion of IR Site 02 is currently undergoing construction in accordance with the RAP/ROD (DON 2001)

and the LUC RD (BEI 2008). Shinsei Gardens, a multi-family residential housing structure was recently constructed on the western one-third of IR Site 02.

2.13.1.2 Current and Potential Groundwater Uses

Shallow groundwater beneath FISCA IR Site 02 is currently not used for drinking water, irrigation, agriculture, or industrial supply purposes. The ROD Amendment (DON 2015) for OU-5/FISCA IR Site 02 Groundwater states that the hypothetical use of groundwater from the FWBZ as a drinking water source is not feasible. Multiple lines of evidence collected during previous investigations include unacceptable levels of TDS, sulfates, iron, and alkalinity. For these reasons, naturally occurring shallow groundwater at OU-5/FISCA IR Site 02 Groundwater has been deemed unusable for potable water and unsuitable for any use.

2.13.1.3 Site Chronology and Initial Response

Table 2.13-1 summarizes major investigations and actions for soil at FISCA IR Site 02.

TABLE 2.13-1: CHRONOLOGY OF SITE EVENTS – FISCA IR SITE 02 SOIL

Date	Event	Comments
December 1992	RFA	The DTSC conducted an RFA at FISCA. The RFA identified four SWMUs. The screening lot and scrap yard area used by DRMO was designated as SWMU 1 (today known as IR Site 02) and was recommended for additional investigation.
January 1996	RI	Indicated that site use related to soil contamination generally was limited to the upper 1 foot of soil and designates three areas within SWMU 1 (IR Site 02) as candidates for interim RA. Screening lot and scrap yard activities apparently contaminated shallow soil within SWMU 1 with PCBs and cadmium.
January 1999	FS	Developed, screened, and evaluated potential RAs for IR Site 02 to reduce human health risks that may be posed by the COCs identified during the RI for IR Site 02 shallow soil.
January 1999	RD	Presented the design basis for the RA and alternative methods for defining the limits of contaminated shallow soil that exceeds the cleanup goals and therefore would be removed under the RA.
July 2000	Environmental restrictions in place	The DON and the City of Alameda executed a "Quitclaim Deed and Environmental Restrictions Pursuant to California Civil Code Section 1471 for FISCA" wherein the DON transferred the FISCA (including IR Site 02) to the City of Alameda.
April 2001	PP	Presented six potential RA alternatives and identifies the preferred remedy as Alternative 4 – Excavation and Off-site Disposal and LUCs.
May 2001	RD	Presented the design for removing PCB- and cadmium-impacted shallow soil at IR Site 02 based on the conclusions of the design basis report.
June 2001	RAP/ROD	Stated that consistent with and supported by the FS Report dated January 1999 for IR Site 02 soil, the DON and the State of California have selected excavation of IR Site 02 shallow soil containing PCBs and cadmium at concentrations exceeding cleanup goals and disposal of the excavated soil in a permitted off-site landfill.
July 5, 2001	RA Initiation	Initiation of excavation fieldwork as part of the RA for FISCA IR Site 02 Soil.
November 8, 2001	RA Completion	Backfilling and site restoration completed as part of the RA for FISCA IR Site 02 Soil.
December 2001	Close-out Report	Documented closeout for the completed RA of excavation of contaminated soil with off-site disposal.
April 2002	Soil Management Plan	Provided guidelines and the means for redevelopment of IR Site 02 in a manner protective of the health and safety of site workers, future site residents, nearby residents, and the environment. The DTSC and the City of Alameda provide regulatory oversight for implementing this plan.

TABLE 2.13-1: CHRONOLOGY OF SITE EVENTS – FISCA IR SITE 02 SOIL

Date	Event	Comments
2006	Five-Year Review	The first Five-Year Review of FISCA IR Site 02 Soil was conducted to assess if the selected remedy remains protective of human health and the environment. The Five-Year Review confirmed that the selected remedy is protective of human health and the environment.
April 2008	Draft LUC RD	Identified and described the ICs in effect at FISCA IR Site 02 Soil and the responsibilities of stakeholders (the DON, the City of Alameda, regulatory agencies, developers, and ultimately the transferees) for LUC implementation actions such as enforcement, inspections, and reporting.
September 2011	Five-Year Review	The Second Five-Year Review was of FISCA IR Site 02 Soil was conducted to assess if the selected remedy remains protective of human health and the environment. The Five-Year Review confirmed that the selected remedy is protective of human health and the environment.

Notes:
DON = United States Department of the Navy
DRMO = Defense Reutilization and Marketing Office
DTSC = California Department of Toxic Substances Control
FISCA = Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex
FS = Feasibility Study
IC = Institutional controls
IR = Installation Restoration
LUC = Land-use control
OU = Operable unit
PCB = Polychlorinated biphenyl
PP = Proposed Plan
RA = Remedial action
RAP = Remedial Action Plan
RCRA = Resource Conservation and Recovery Act
RD = Remedial design
RFA = RCRA facility assessment
RI = Remedial Investigation
ROD = Record of Decision
SWMU = Solid waste management unit

2.13.1.4 Basis for Taking Action

The HHRA exposure assessment in the RI (PRC 1996) identified pathways by which contaminants could be released from the site into the environment. The following exposure pathways were evaluated for soil at FISCA IR Site 02: inhalation of dust and volatilized contaminants, soil ingestion, dermal contact with contaminated soil, and ingestion of produce grown in contaminated soil.

An updated risk assessment was conducted in January 1999 as part of the FS for FISCA IR Site 02 that addressed changes in established toxicity values and exposure parameters since the initial HHRA documented in the RI Report (PRC 1996).

The final soil COCs identified as posing potential human health risk from shallow soil at FISCA IR Site 2 consisted of metals (cadmium) and PCBs (Aroclor 1016, Aroclor 1254 and Aroclor 1260).

The updated risk assessment provided the basis for action and identified the COCs and exposure pathways that should be addressed by the RA. The basis of taking action identified in the FISCA IR Site 02 RAP/ROD (DON 2001) is elevated cadmium and PCBs in shallow soil.

Removal of PCB- and cadmium-impacted shallow soil and off-site disposal would protect public health, public welfare, and the environment from actual or threatened releases of PCBs and cadmium reported in IR Site 02 shallow soils.

2.13.2 Remedial Action, FISCA IR Site 02 Soil

2.13.2.1 Remedy Selection (Record of Decision)

The RAOs presented in the RAP/ROD (DON 2001) consisted of the following components:

The RAOs for contaminated shallow soil at IR Site 02 include the following components:

- Prevention of ingestion, direct contact with, or inhalation of PCBs in contaminated soil from 0 to 1 foot bgs at concentrations that result in an excess lifetime cancer risk (ELCR) exceeding 1×10^{-4} for residents
- Prevention of ingestion, direct contact with, or inhalation of PCBs in contaminated soil from 0 to 1 foot bgs at concentrations that result in an ELCR exceeding 1×10^{-4} for workers now and in the future
- Prevention of ingestion or direct contact with cadmium-contaminated soil from 0 to 1 foot bgs at concentrations that result in an HQ exceeding 1 for future residents

Remedy Selection Based on RAP/ROD

The RAP/ROD requires that the RAOs identify and remove shallow soil exceeding cleanup levels for PCBs and cadmium to allow residential use of the western one-third of IR Site 02 and industrial use of the eastern two-thirds of IR Site 02. The RAP/ROD also requires that the DON implement LUCs to prevent future redevelopment of the industrial use portion of IR Site 02 for residential use for as long as PCB and cadmium concentrations in shallow soil at IR Site 02 remain above residential use cleanup levels.

In the planned residential area, soil contaminated with PCBs and cadmium at concentrations exceeding residential cleanup standards (the residential RGs) would be excavated. In the planned industrial area, soil contaminated with PCBs and cadmium at concentrations exceeding the industrial cleanup standards (industrial RGs) would be excavated. Under both scenarios, excavated areas would be backfilled with clean fill. Contaminated soil would be disposed of at permitted off-site Class I, II, or III landfills, depending on the concentrations of PCBs and cadmium detected during profiling. Erosion and runoff controls would be implemented to prevent migration of excavated soil from the staging areas. Confirmation samples would be collected after completion of soil excavation and before backfilling of the excavated areas.

RGs

RGs were established to address potential future unacceptable risk scenarios. In the planned residential area, the soil RGs were 1 mg/kg for PCBs and 12 mg/kg for cadmium. In the planned industrial area, the soil RGs were 12 mg/kg for PCBs and 450 mg/kg for cadmium.

2.13.2.2 Remedy Implementation

Remedial soil excavation began on July 5, 2001. The removal of PCB- and cadmium-impacted soil from IR Site 02 was completed the week of November 5, 2001. After soil removal activities were completed, IR Site 02 was returned to nearly its original grade through the placement of about 14,230 tons of clean backfill soil. The backfilling of excavated areas was completed on November 6, 2001. Previous investigations and events carried out during RA are documented in the Closeout Report for IR Site 02 (BEI 2001).

ICs stated in the ROD/RAP (DON 2001) apply to the eastern two-thirds of the site. These ICs restrict residential use. The western one-third of IR Site 02 has been reclassified for unrestricted use for soil. Unrestricted use for soil at IR Site 02 must comply with the standards stated in Marsh Crust Ordinance No. 2824 (Appendix H) in any case. The ROD/RAP states that construction activities at IR Site 02 shall not begin until (1) the DON and DTSC have determined that soil containing PCBs and cadmium concentrations at unacceptable risk levels has been properly remediated and (2) the DON has recorded a release terminating the restrictions.

The RA is complete for IR Site 02 and documented in the Closeout Report (BEI 2001). Construction activities have been ongoing at IR Site 02 in accordance with the RAP/ROD, LUC RD and Soil Management Plan. The Shinsei Gardens multi-family housing complex was constructed in the western

portion of the site prior to the last Five-Year Review and has a vapor mitigation system in place due to the OU-5/FISCA IR-02 Groundwater restrictions.

O&M is not required for FISCA IR Site 02 Soil.

2.13.3 Progress Since the Last Five-Year Review, FISCA IR Site 02 Soil

The protectiveness statement in the previous Five-Year Review stated: "The remedy in place at IR Site 02 for soil is considered protective of human health and the environment. The RAs completed for IR Site 02 soil are considered protective of human health and the environment. The extent of contamination is defined and remedies have been implemented to eliminate the risk of exposure to site occupants and limit the toxicity, volume, and mobility of the COCs. Regularly assessed ICs are in place to prevent exposure to contaminated subsurface soil. The selected remedy for soil will continue to be protective of human health and the environment."

This is the third Five-Year Review for FISCA IR Site 02 Soil. The 2011 Five-Year Review Report (KCH 2011) noted that cadmium toxicity criteria changes (Appendix E, Table E-1) were pending. The DON recommended that potential updates to the cadmium toxicity criteria would be tracked.

The ROD/RAP (DON 2001) cadmium cleanup levels for soil are 12 parts per million (ppm) for the residential scenario and 450 ppm for the industrial scenarios. The cadmium residential soil regional screening level (RSL) (70 mg/kg) did not change. In 2014, the cadmium industrial soil RSL (800 mg/kg in 2011) increased to 980 mg/kg. FISCA IR Site 02 Soil has long-term ICs and is subject to additional Five-Year Reviews.

The development contractor worked with local agencies (the Regional Water Board and City of Alameda) to reach an exemption to the RAP/ROD (DON 2001) and LUC RD (BEI 2008), which originally placed use restrictions on the eastern portion of IR Site 02. In 2012, construction began for Alameda Landing, a mixed use commercial/residential development. The City of Alameda and its developer installed passive remediation beneath the central portion of the site before importing clean backfill material. With the implementation of the passive remediation beneath the clean backfill material, Alameda Landing was deemed suitable for commercial mixed use. The change in land use was initially mentioned in the second Five-Year Review Report of 2011 (KCH 2011).

During grading activities of FISCA IR Site 02 Soil in January 2014, the developer Catellus discovered two single-walled steel USTs of approximately 2,500 and 3,000 gallons. Catellus removed the USTs pursuant to the Alameda County Department of Environmental Health's (ACDEH) permit number SR0024324. A total of approximately 5,400 gallons of non-hazardous waste liquid was transported under Non-Hazardous Waste Manifests for off-site management. Catellus removed the USTs, excavated adjacent soil for off-site disposal, and backfilled the area under the Regional Water Board, ACDEH, and DTSC oversight.

Confirmation soil analytical results for soil in the UST excavation areas were below hazardous waste levels, USEPA RSLs, and Regional Water Quality Control Board environmental screening levels for all chemicals except some PAHs, which were detected within historical ranges in commercial areas of the Alameda Landing Redevelopment Project. Consequently, the Regional Water Quality Control Board issued an NFA letter on May 29, 2014, for the UST removal activity at FISCA IR Site 02 Soil.

2.13.4 Five-Year Review Process, FISCA IR Site 02 Soil

This section discusses activities performed during the Five-Year Review process for Alameda Point IR FISCA IR Site 02 Soil. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.13.4.1 Site Inspection

The site inspection confirms that ICs are operating as intended by the RAP/ROD and LUC RD and are protective of human health and the environment. Appendix A presents checklists that document the results of the site inspections, and Appendix B provides the site inspection photographs. Table 1-3 lists participants involved in the site inspection conducted for FISCA IR Site 02 Soil.

2.13.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of FISCA IR Site 02 Soil. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response: No Comments.

DTSC Response:

"During grading activities of FISCA IR Site 02 Soil in January 2014, the developer Catellus discovered two single-walled steel underground storage tanks (UST) of approximately 2,500 gallons and 3,000 gallons presumably containing petroleum fuel. Catellus removed the USTs pursuant to the Alameda County Department of Environmental Health's permit number SR0024324. A total of approximately 5,400 gallons of non-hazardous waste liquid was transported under Non-Hazardous Waste Manifests for off-site management. Catellus removed the USTs, excavated adjacent soil for offsite disposal, and backfilled the area under the Regional Water Quality Control Board's (RWQCB), ACDEH's, and DTSC's oversight."

"Confirmation soil analytical results were below hazardous waste levels, USEPA's RSLs, and RWQCB's ESLs for all chemicals with the exception of select polycyclic aromatic hydrocarbons, which were detected within historical ranges in commercial areas of the Alameda Landing Redevelopment Project. Consequently, RWQCB issued a No Further Action letter on May 29, 2014 for the UST removal activity at FISCA IR Site 02."

Regional Water Board Response: No Comments.

Community Interview Response: No Comments.

2.13.5 Technical Assessment, FISCA IR Site 02 Soil

The RAOs for FISCA IR Site 02 Soil continue to be met. The land area of FISCA IR Site 02 has been transferred to the City of Alameda, along with the responsibility to uphold IC the restrictions stated in the LUC RD (BEI 2008).

TABLE 2.13-2: TECHNICAL ASSESSMENT SUMMARY, FISCA IR SITE 02 SOIL

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
FISCA IR Site 02 Soil	Excavation, Off-Site Disposal, Clean Soil Backfill, and ICs	Yes	Yes	No	Protective	2021

Notes:
FISCA = Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex
ID = Identification
IR = Installation Restoration
IC = Institutional control

2.13.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedy is functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review, site inspections, and interviews indicate that the remedy implemented for PCB- and cadmium-impacted shallow soil at IR Site 02 is working as intended by the RAP/ROD (DON 2001). The documents that detail the remedial decisions for FISCA IR Site 02 Soil are the RAP/ROD (DON 2001) and the LUC RD (BEI 2008).

System Operations and O&M

Not applicable for FISCA IR Site 02 Soil.

Performance of Soil Remedy

Shallow soil exceeding cleanup levels for PCB and cadmium in both the planned residential-use area (western one-third of IR Site 02) and planned industrial-use area (eastern two-thirds of IR Site 02) has been removed and disposed of off site, and the RAOs stated in the approved ROD/RAP were achieved. LUCs are in effect prohibiting residential development in the eastern two-thirds of IR Site 02 with respect to PCB- and cadmium-impacted shallow soil. The existing ICs in the eastern two-thirds of IR Site 02 are stated a Quitclaim Deed. These documents state that the industrial-use portion of IR Site 02 shall not be used for residential purposes and that construction activities shall not be undertaken until (1) the DON and DTSC have determined that PCB and cadmium concentrations in shallow soil do not pose unacceptable risks to human health and the environment and (2) the DON has recorded a release terminating these interim restrictions. These documents also include prohibitions on the alteration, disturbance, or removal of surface or subsurface PCB- and cadmium-impacted shallow soil in the industrial-use portion of IR Site 02. No LUCs exist on the western one-third of IR Site 02 which is acceptable for unrestricted use, including for residential use with respect to the remediated PCB- and cadmium-impacted shallow soil.

2.13.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for FISCA IR Site 02 Soil is in place and there are no reported changes to the remedy that would affect its protectiveness.

The results for the future residential scenario for cadmium exceed the noncancer threshold of 1. For the current worker scenario, the risk (3×10^{-3}) exceeded the risk management range. For the worker scenario, the HIs were all below the target level.

Changes in Exposure Assumptions and Toxicity Data

In the IR Site 02 soil HHRA, the PCB congeners that are chemicals of concern were Aroclor 1016, Aroclor 1254, and Aroclor 1260. The CSF_os that were used in the HHRA for Aroclor 1016, 1254, and 1260 are 7×10^{-2} (mg/kg-day)$^{-1}$, 2 (mg/kg-day)$^{-1}$, and 2 (mg/kg-day)$^{-1}$, respectively. For cadmium, the oral reference dose used in the HHRA was 1×10^{-3} mg/kg-day to account for both soil and garden produce ingestion.

Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

The toxicity values used in the HHRA for the primary risk drivers are current and correct based on a review of USEPA's IRIS and DTSC's OEHHA databases. Cadmium residential soil RSL, 70 mg/kg, did not change; however, in 2014, the industrial soil RSL (800 mg/kg) increased to 980 mg/kg. Since the updated industrial soil RSL is less conservative than the previous RSL, the selected remedy remains protective of human health and the environment.

The HHRAs for IR Site 02 soil primarily used the default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's 2014 update include: skin surface area, adult body weight, and resident exposure duration and exposure time, and worker adherence factor. Some of these factors are less conservative and some are more conservative so overall, the changes do not significantly impact the risk results for IR Site 02 soil.

No additional exposure pathways have been identified. The RAO values and toxicity values for the primary risk drivers, PCBs and cadmium for soil, are current and correct for IR Site 02 Soil. Based on the current and future land uses, the evaluation of the residential and industrial worker exposure scenarios remain applicable and reasonable. EPA also updated their recommended default exposure parameters in 2014. However, OEHHA toxicity values were not applied in the baseline HHRA which may potentially change the primary risk drivers and chemicals of concern at IR Site 02. However, as COPCs are expected to be collocated in soil at the site, the remedy likely addressed other potential risk drivers based on OEHHA toxicity values.

Changes in Cleanup Levels

No new cleanup levels have been identified since the last Five-Year Review that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for FISCA IR Site 02 Soil included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.13.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy.

2.13.6 Issues, FISCA IR Site 02 Soil

No issues have been identified at this time that would affect the protectiveness of the selected remedy.

2.13.7 Recommendations and Follow-up Actions, FISCA IR Site 02 Soil

FISCA IR Site 02 Soil has long-term ICs and is subject to additional Five-Year Reviews.

2.13.8 Protectiveness Statement, FISCA IR Site 02 Soil

The RAs performed at FISCA IR Site 02 Soil are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposures to contaminated soil. FISCA IR Site 02 Soil currently has the remedy in place and is in the long-term management stage of the CERCLA process. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

2.14 MARSH CRUST

2.14.1 Site Description and Background, Marsh Crust

The Marsh Crust is an approximately 2- to 6-inch-thick layer of sediment contaminated with SVOCs, including PAHs, which were deposited across FISCA and Alameda Point from the late 1800s until the 1920s. The contamination is believed to have resulted from discharges of petroleum products and wastes from former manufactured gas plants and oil refineries to the marshlands and the tidal flats of Alameda Point. Subsurface investigations conducted at these properties for various environmental assessments have encountered the Marsh Crust over a large areal extent at depths ranging from 10 to 20 feet bgs at FISCA and from 4 to 10 feet bgs at Alameda Point. The Marsh Crust is believed to exist throughout these properties in a somewhat predictable, planar zone but may not exist as a continuous layer because of the presence of tidal channels and other features affecting their original deposition.

2.14.1.1 Land and Resource Use

Land use at Alameda Point and FISCA has been industrial since the land was created from fill between 1887 and 1939. Before 1930, at least two large industrial sites (an oil refinery and a borax processing plant) were located on the western tip of Alameda Island. Several industries were located on the northern side of Oakland Inner Harbor, including two manufactured gas plants. The two manufactured gas plants and the oil refinery were located near the present locations of FISCA and Alameda Point. During their operation, these facilities discharged petroleum products and wastes, including PAHs, to adjacent marshlands. The waste was deposited over the historical surface of the surrounding marsh and tidal flats, leaving a discontinuous layer of contaminated sediment under the 143-acre area that is now FISCA and 2,675 acres of the eastern portion of Alameda Point.

Further west beneath Alameda Point, Marsh Crust waste has been deposited on the tidal flats, now known as the Former Subtidal Area. Sediments dredged from the Oakland Inner Harbor and surrounding San Francisco Bay have been placed as fill on the Marsh Crust from as early as 1887 to as late as 1975, covering the Marsh Crust and Former Subtidal Area.

2.14.1.2 Site Chronology and Initial Response

Table 2.14-1 summarizes major investigations and actions taken with regards to the Marsh Crust.

TABLE 2.14-1: CHRONOLOGY OF SITE EVENTS – MARSH CRUST

Date	Event	Comments
1999	RI	RI Reports were issued for Alameda Point OU-1, OU-2, and OU-3, which overly the Marsh Crust.
February 15, 2000	Marsh Crust Ordinance No. 2824	The City of Alameda issued its Marsh Crust Ordinance No. 2824, providing standards and procedures to be followed for excavation and pile driving in the Marsh Crust area (Appendix E).
March 31, 2000	FS	The FS Report for the "Marsh Crust at Alameda Annex and Alameda Point" was issued. The FS Report developed, screened, and evaluated potential RAs for the Marsh Crust to reduce human health risks that may be posed by the COCs identified during the RIs.
May 25, 2000	RAWP	DTSC approved this RAWP for the Marsh Crust at the East Housing Area.
June 1, 2000	PP	Stated that the preferred remedial alternative is LUCs that would require proper procedures to excavate soil that would reach the underlying Marsh Crust. The PP also states that the DON would conduct a review after 5 years of implementing this remedy to ensure (1) compliance with the LUCs as required by CERCLA and (2) that the land underlain by the Marsh Crust could be available for residential or industrial use after the remedy is implemented.
February 2, 2001	RAP/ROD	The DON and the State of California signed the RAP/ROD for the Marsh Crust and Former Subtidal Area. The RAP/ROD stated that based on the RI results, the DON and DTSC, with the concurrence of USEPA and Regional Water Board, have selected LUCs for the Marsh Crust.
January 1, 2005	SMP	Stated that the remedy is LUCs, including environmental deed restrictions and Marsh Crust Ordinance No. 2824 that require excavation permits and soil management plans for excavations to depths beyond the threshold depths identified in the ordinance.
2006	Five-Year Review	The first Five-Year Review of the Marsh Crust was conducted to assess if the selected remedy remained protective of human health and the environment. The Five-Year Review confirmed that the selected remedy was protective of human health and the environment.
September 2011	Five-Year Review	The second Five-Year Review of the Marsh Crust was conducted to assess if the selected remedy remained protective of human health and the environment. The Five-Year Review confirmed that the selected remedy was protective of human health and the environment.

Notes:
CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act
DON = United States Department of the Navy
DTSC = California Department of Toxic Substances Control
FISCA = Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex
FS = Feasibility Study
LUC = Land-use control
OU = Operable unit
PP = Proposed Plan
RAP = Remedial Action Plan
RAWP = Remedial Action Work Plan
RI = Remedial Investigation
ROD = Record of Decision
SMP = Site Management Plan
USEPA = United State Environmental Protection Agency
Regional Water Board = San Francisco Regional Water Quality Control Board

2.14.1.3 Basis for Taking Action

The HHRA (PRC 1996) led to the basis for taking action, which concluded that an exposure pathway to soil contaminated with PAHs could exist for workers exposed to the former subtidal area and Marsh Crust during construction of building foundations and underground utility work at depths of 4 to 10 feet bgs. In addition, if the contaminated soil were ever brought to the surface or disposed of in an uncontrolled manner, workers or residents could be exposed.

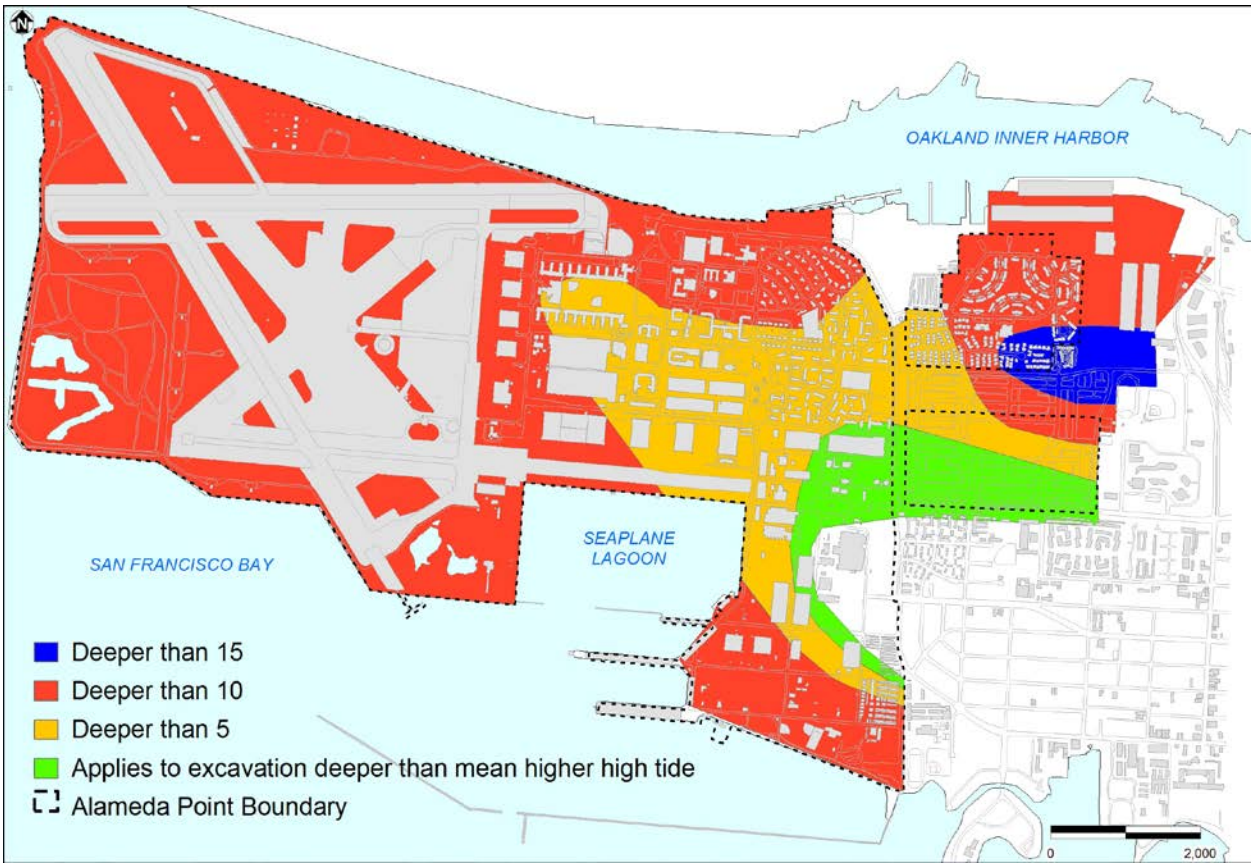
The HHRA conducted as part of the RIs for the Marsh Crust and the Former Subtidal Area materials concluded that at the current depths of the Marsh Crust beneath the FISCA, the materials do not pose a risk to human health. No COCs were identified in the HHRA for the Marsh Crust because no complete exposure pathways were deemed to exist.

The Marsh Crust is located at varying depths, depending on geographic location at Alameda Point and FISCA.

Several ERAs were conducted to evaluate whether chemical compounds reported in the Marsh Crust underlying the FISCA and Alameda Point would potentially cause adverse ecological impacts to the environment. The terrestrial ERA found no potential risks to terrestrial receptors because FISCA has (1) limited and unsuitable habitat; (2) no endangered species that feed or nest on the facility; (3) a scarcity of mammalian receptors; and (4) the Marsh Crust material is below the existing ground surface, with limited potential for adverse effects to terrestrial biota.

Figure 2.14-1 shows the threshold depths requiring an excavation permit in the Marsh Crust area.

FIGURE 2.14-1: THRESHOLD DEPTHS REQUIRING EXCAVATION PERMIT, MARSH CRUST



Source: RAP/ROD (DON 2001)

2.14.2 Remedial Action, Marsh Crust

2.14.2.1 Remedy Selection (Record of Decision)

The RAO identified in the RAP/ROD (DON 2001) is to prevent future uncontrolled excavation and placement of Marsh Crust materials on the surface, where they may pose unacceptable risk to human health and the environment. The RAP/ROD was written in accordance with the regulations stated in Marsh Crust Ordinance No. 2824 (Appendix E).

2.14.2.2 Remedy Implementation

No active engineering or construction is required to implement this remedy. ICs are applied for land use restrictions, which consist of excavation restrictions and permitting requirements. ICs are the remedy for Marsh Crust consistent with the intended land use, and no further CERCLA response action is required. These restrictions are contained in environmental restrictions in deeds, covenants, and Marsh Crust Ordinance No. 2824. The SMP prepared by the City of Alameda for intrusive activities at Alameda Point and FISCA properties continues to serve as an implementation tool for the remedy.

O&M is not required for the selected remedy at the Marsh Crust.

2.14.3 Progress Since the Last Five-Year Review, Marsh Crust

The protectiveness statement in the previous Five-Year Review stated: "The remedy in place at the Marsh Crust (i.e., the FISCA Marsh Crust and Marsh Curst and Former Subtidal Area at Alameda Point) is considered protective of human health and the environment. The RAs completed for these areas are considered protective of human health and the environment. The extent of contamination is defined and remedies have been implemented to eliminate the risk of exposure to site occupants and limit the toxicity of the COCs. Regularly assessed ICs are in place to prevent exposure to contaminated subsurface. The selected remedy for soil will continue to be protective of human health and the environment."

This is the third Five-Year Review for the Marsh Crust. All RAs outlined in the RAP/ROD were implemented before the first Five-Year Review period. ICs currently are implemented through the RAP/ROD, Marsh Crust Ordinance No. 2824, and the City's SMP. Annual Inspection and Compliance Reports are filed by the City of Alameda.

2.14.4 Five-Year Review Process, Marsh Crust

This section discusses activities performed during the Five-Year Review process for the Marsh Crust. Section 1.3 outlines the general Five-Year Review Process, which was applied to each IR Site involved in this Five-Year Review.

2.14.4.1 Site Inspection

Since the Marsh Crust is a contaminated layer beneath the surface of Alameda Point and FISCA, a site inspection of the contaminated layer is not possible. There were no reports of excavation permit violations of Marsh Crust Ordinance No. 2824 (Appendix E) or the City's SMP during this Five-Year Review period.

2.14.4.2 Interviews

Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of the Marsh Crust. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms. The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections.

USEPA Interview Response: No Comments.

DTSC Response:

"Marsh crust threshold depths vary from approximately 18 feet to 2 feet, or shallower at certain areas, below the existing ground surface. The Ordinance 2824 map defines areas with shallow threshold depths as "applies to excavation deeper than mean higher high tide." This description is not readily comprehensible to the general public. DTSC is concerned that implementation of the institutional control remedy for marsh crust and former subtidal area would be ineffective at areas with shallow threshold depths because the requirements are unclear."

Regional Water Board Response: No Comments.

Community Interview Response: No Comments.

2.14.5 Technical Assessment, Marsh Crust

The RAOs identified in the RAP/ROD (DON 2001) continue to be met. There have been no unauthorized excavation activities within the footprint of the Marsh Crust. ICs and the Marsh Crust Ordinance continue to satisfy RAOs and ensure protection of human health and the environment.

TABLE 2.14-2: TECHNICAL ASSESSMENT SUMMARY, MARSH CRUST

Site ID	Remedy Description	Technical Assessment Question Answers			Protectiveness	Next Five-Year Review
		Question A	Question B	Question C		
Marsh Crust	ICs	Yes	Yes	No	Protective	2021

Notes:
IC = Institutional control
ID = Identification

2.14.5.1 Question A - Is the Remedy Functioning as Intended by the Decision Documents?

Yes, the remedy is functioning as intended by the decision document, the RAP/ROD (DON 2001). Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remedy for the Marsh Crust is functioning as intended by the RAP/ROD.

System Operations and O&M

Not applicable for the Marsh Crust.

Performance of LUC Remedy

ICs are in place to restrict excavation of these materials and enforced through deed restrictions and covenants. The SMP Update prepared by the City of Alameda for the FISCA and Alameda Point properties further confirms the effective implementation of this remedy.

2.14.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?

Yes, the assumptions made at the time of remedy selection have not changed. The selected remedy for the Marsh Crust is in place and there are no reported changes to the remedy that would affect its protectiveness.

There are currently no complete exposure pathways to humans for the primary COCs, PAHs, in the Marsh Crust because of its depth. The Marsh Crust is presently at an average depth of 10 to 20 feet below ground surface below the fill placed on the marsh to create Alameda Point, which is well below likely construction depths.

Changes in Exposure Assumptions and Toxicity Data

No changes in exposure assumptions, toxicity data, or land use have occurred since the HHRA and ERA were conducted. Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.

No additional exposure pathways have been identified since land uses, zoning, and receptors at this IR site have not changed since the 2011 5-Year Review.

Changes in Cleanup Levels

No new cleanup levels have been identified that would impact the effectiveness of this remedy.

Changes to RAOs and ARARs

No changes to RAOs and ARARs have been identified. The Five-Year Review for the Marsh Crust included identification and evaluation of changes in the ROD-specified ARARs and criteria TBC to determine if such changes may affect the protectiveness of the selected remedy. Chemical-specific, location-specific, and action-specific ARARs were reviewed and determined to still be applicable or relevant and appropriate or TBC as presented in Appendix D.

2.14.5.3 Question C - Has Any Other Information Come to Light that Could Call into Question the Protectiveness of the Remedy?

No other information has come to light that could call into question the protectiveness of the remedy. The HHRA and ERA have identified limited to no risk to human health and the environment from the Marsh Crust when the ICs are adhered to.

2.14.6 Issues, Marsh Crust

No issues have been identified at this time that would affect the protectiveness of the selected remedy.

2.14.7 Recommendations and Follow-up Actions, Marsh Crust

No recommendations or follow-up actions have been identified at this time.

2.14.8 Protectiveness Statement, Marsh Crust

The remedy for the Marsh Crust is protective of human health and environment. The RAs performed for the Marsh Crust are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at Alameda Point to prevent exposure to contaminated soil. The Marsh Crust is currently in the long term management stage of the CERCLA process. ICs and LUCs are assessed annually. The selected remedy will continue to be protective.

3 NEXT REVIEW

The next Five-Year Review for Alameda Point and FISCA is required 5 years from the date of this Five-Year Review report.

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Marsh Crust

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Appendix A
Site Inspection Checklists

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I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-1, Installation Restoration (IR) Site 6	**Date of inspection:** 11/12/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 61 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☒ Installation of Groundwater Monitoring Wells and Additional Sampling
- ☐ Access Controls
- ☒ Groundwater In-Situ Chemical Oxidation (ISCO)
- ☒ Accelerated Bioremediation
- ☒ Monitored natural attenuation (MNA) ☒ Institutional Controls (IC)
- ☒ Other: Excavation, Off-site Disposal and Clean Soil Replacement Backfill Material.

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Active ISB currently ongoing at the site. _____ (Name) (Title) (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒Readily available ☐Up to date ☐N/A
   ☐Contingency plan/emergency response plan ☒Readily available ☐Up to date ☐N/A
   Remarks_____

3.	**O&M and OSHA Training Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
	☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
	☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
5.	**Gas Generation Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☒Readily available	☐Up to date	☐N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	☐Readily available	☐Up to date	☒N/A
	Remarks: No security logs available at the site. The site is a gated area and key access is required in order to enter the remediation area. Building 41 and the sheds at IR Site 6 are presently vacant.			

IV. O&M COSTS

1. **O&M Organization**

☐State in-house ☐Contractor for State
☐PRP in-house ☐Contractor for PRP
☐Federal Facility in-house ☒Contractor for Federal Facility
☐Other _____

2. **O&M Cost Records -Not available at the site.**

☐Readily available ☐Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: None.

V. ACCESS AND ICs ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☒Gates secured ☐N/A

Remarks: The remediation area is fenced and in good condition. Gates and locked doors prevent pedestrian and vehicular traffic from accessing the remediation area.

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A

Remarks: Signs are posted at the gates, along the fences and in good condition. No daily security logs are kept for the site. Signs note contact information and some note restrictions and/or presence of contamination. Site overseen by private security company, 24/7.

C. ICs

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) DON
Frequency Annually
Responsible party/agency DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☐ Yes ☐No ☒N/A

Specific requirements in deed or decision documents have been met ☐Yes ☐No ☒N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks

2. **Land use changes on site** ☒N/A
Remarks No

3. **Land use changes off site** ☒N/A
Remarks No

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A
Remarks

B. Other Site Conditions

Remarks:

No issues noted for each phase of ISB.

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines	☐ Applicable	☒ N/A
B. Surface Water Collection Structures, Pumps, and Pipelines	☐ Applicable	☒ N/A
C. Treatment System	☐ Applicable	☒ N/A
D. Monitoring Data		
1. Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality		
2. Monitoring data suggests: ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining		
E. Monitored Natural Attenuation		
1. **Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks Remedy transition to MNA will occur (if necessary) upon successful demonstration of transition criteria as discussed in the ISB Work Plan.		
X. OTHER REMEDIES		
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.		
XI. OVERALL OBSERVATIONS		
A. Implementation of the Remedy		
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Remedy included excavation, off-site disposal of contaminated soil and clean import fill previously conducted for soil. Groundwater wells were previously installed an ISCO implemented. Accelerated ISB began in early Summer 2014 And was complete in late Summer 2015. Remedy transition to MNA will occur (if necessary) upon successful demonstration of transition criteria as discussed in the ISB Work Plan.		
B. Adequacy of O&M		
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Quarterly O&M required for the accelerated ISB.		
C. Early Indicators of Potential Remedy Problems		
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.		
D. Opportunities for Optimization		

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time, pending results of accelerated ISB.

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-1, Installation Restoration (IR) Site 16	**Date of inspection:** 11/11/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 63 degrees Fahrenheit
Remedy Includes: (Check all that apply) ☒ Installation of Groundwater Monitoring Wells and Additional Sampling ☐ Access Controls ☒ Groundwater In-Situ Chemical Oxidation (ISCO) ☒ Groundwater Accelerated Bioremediation ☒ Monitored Natural Attenuation ☒ ICs ☒ Other: Excavation, Off-site Disposal and Clean Soil Replacement Backfill Material. MNA every five years to inform the Five-Year Review Report.	
Attachments: ☐ Inspection team roster attached ☒ Site map attached	

II. INTERVIEWS (Check all that apply)			
1. **O&M site manager**	Douglas Delong Name	Environmental Compliance Title	11/12/15 Date
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713 Problems, suggestions; ☐ Report attached _____			
2. **O&M staff** N/A			
3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.			
4. **Other interviews** (optional) ☐Report attached.			

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1. **O&M Documents**			
☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A
Remarks_____			

2.	**Site-Specific Health and Safety Plan**	☒Readily available	☐Up to date	☐N/A
	☐Contingency plan/emergency response plan	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
3.	**O&M and OSHA Training Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
	☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
	☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
5.	**Gas Generation Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☒Readily available	☐Up to date	☐N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	☒Readily available	☒Up to date	☐N/A
	Remarks: Security logs available at the site. The site is a gated area and occupied by a commercial storage company (north side), and an auto repair company (south side). Key access is required to enter the site. The site is leased and operated by a two privately operated companies, as previously stated. Alameda Point is patrolled by a private security company, 24/7.			
	IV. O&M COSTS			
1.	**O&M Organization**			
	☐State in-house	☐Contractor for State		
	☐PRP in-house	☐Contractor for PRP		
	☐Federal Facility in-house	☒Contractor for Federal Facility		
	☐Other: _____			
2.	**O&M Cost Records** N/A			
3.	**Unanticipated or Unusually High O&M Costs During Review Period**			
	Describe costs and reasons: None at this time.			
	V. ACCESS AND ICs ☒Applicable ☐N/A			
A. Fencing				
1.	**Fencing damaged**	☐Location shown on site map	☒Gates secured	☐N/A
	Remarks: IR Site 16 is securely fenced and operated by a private commercial storage company (north side), and an auto repair company (south side).			

B. Other Access Restrictions	
1.	**Signs and other security measures** ☐Location shown on site map ☐N/A Remarks: Signs are posted at the gates, along the fences; but no security logs kept for the site. Signs appeared in good condition. Signs note contact information and some note restrictions and/or presence of contamination. Alameda Point is patrolled by a private security company 24/7.
C. ICs	
2.	**Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A Remarks_____
D. General	
1.	**Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident Remarks_____
2.	**Land use changes on site** ☒N/A Remarks: None
3.	**Land use changes off site** ☒N/A Remarks: None
VI. GENERAL SITE CONDITIONS	
A. Roads ☒Applicable ☐N/A	
1.	**Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A Remarks:
B. Other Site Conditions Remarks:	
VII. LANDFILL COVERS ☐Applicable ☒N/A	
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining
E. Monitored Natural Attenuation	

1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: The ROD ESD issued in 2015 states that groundwater monitoring will occur at IR Site 16 at a frequency of every five years to inform the Five-Year Review in regards to concentrations of COCs. This approach is in accordance with the LUC RD.
	X. OTHER REMEDIES
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
	XI. OVERALL OBSERVATIONS
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Remedy included excavation, off-site disposal of contaminated soil and clean import fill previously conducted for soil. Groundwater wells were previously installed an ISCO implemented in May and June 2010. Groundwater monitoring will occur once every five years to inform each Five-Year Review until Remedial Goals (RG) are achieved. ICs will remain in place until RG are achieved for contaminants of concern (COC) outlined in the Record of Decision (ROD) and the Land Use Control Remedial Design (LUC RD).
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. N/A
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-1, Installation Restoration (IR) Site 14	**Date of inspection:** 11/12/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the five-year review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 63 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☒ Installation of Groundwater Monitoring Wells and Additional Sampling
- ☒ Groundwater In-Situ Chemical Oxidation (ISCO)
- ☐ Access Controls
- ☒ Temporary Institutional controls (IC)
- ☐ Other: _____

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** N/A. No active remediation currently occurring at the site.
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒Readily available ☐Up to date ☐N/A
   ☐Contingency plan/emergency response plan ☐Readily available ☐Up to date ☒N/A
   Remarks_____

3. **O&M and OSHA Training Records** ☐Readily available ☐Up to date ☒N/A
   Remarks_____

4. **Permits and Service Agreements**

	☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
	☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
	☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
5.	**Gas Generation Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☒Readily available	☐Up to date	☐N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	☐Readily available	☐Up to date	☒N/A
	Remarks __No security logs were available at the site. IR Site 14 is located within the former airfield, which is fenced and secured by a locked gate.			
	IV. O&M COSTS			
1.	**O&M Organization**			
	☐State in-house	☐Contractor for State		
	☐PRP in-house	☐Contractor for PRP		
	☐Federal Facility in-house	☒Contractor for Federal Facility		
	☐Other: _____			
2.	**O&M Cost Records -N/A**			
	☐Readily available ☐Up to date			
	☐Funding mechanism/agreement in place			
	Original O&M cost estimate_____ ☐Breakdown attached			
3.	**Unanticipated or Unusually High O&M Costs During Review Period**			
	Describe costs and reasons: None.			
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒Applicable ☐N/A			
A. Fencing				
1.	**Fencing damaged** ☐Location shown on site map ☒Gates secured ☐N/A			
	Remarks: The airfield area is fenced. Fences appeared to be in good condition. Gates prevent pedestrian and vehicle traffic access.			
B. Other Access Restrictions				
1.	**Signs and other security measures** ☐Location shown on site map ☐N/A			
	Remarks: Signs are posted at the gates, along the fences; but no security logs kept for the site. Signs appeared in good condition.			
C. ICs				

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Physical Inspection
Frequency Annually
Responsible party/agency DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☒ Yes ☐No ☐N/A

Specific requirements in deed or decision documents have been met ☒Yes ☐No ☐N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks: IC controls prevent the use of groundwater and the construction of structures designed for human occupancy, as described in the Record of Decision (ROD).

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks

2. **Land use changes on-site** ☐N/A
Remarks: None

3. **Land use changes off-site** ☐N/A
Remarks: None

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A
Remarks

B. Other Site Conditions

Remarks: None

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data

1. Monitoring Data
☒ Is routinely submitted on time ☒ Is of acceptable quality

2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
E. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☒ N/A Remarks: IR Site 14 has been transitioned to MNA for groundwater.
X. OTHER REMEDIES	
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Groundwater monitoring wells were previously installed and ISCO conducted between 2008 and 2009. MNA evaluation will continue to predict the time to reach Remedial Goals (RG). Annual inspections will continue for IR Site 14 to ensure ICs are in compliance with the remedy stated in the ROD.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. N/A
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-2A, Installation Restoration (IR) Site 9	**Date of inspection:** 11/11/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 61 degrees Fahrenheit

Remedy Includes: (Check all that apply)
- ☐ Groundwater Monitoring
- ☐ Access Controls
- ☐ Monitored Natural Attenuation
- ☒ Institutional Controls (IC)
- ☐ Groundwater In-Situ Chemical Oxidation
- ☐ Other:_____

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** N/A _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒Readily available ☐Up to date ☐N/A
   ☐Contingency plan/emergency response plan ☐Readily available ☐Up to date ☒N/A
   Remarks_____

3.	**O&M and OSHA Training Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
	☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
	☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
5.	**Gas Generation Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☒Readily available	☐Up to date	☐N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	☐Readily available	☐Up to date	☒N/A
	Remarks: No security logs available at the site. Building 351 and Building 410 are both secured by locks. Alameda Point is patrolled 24/7 by a private security company.			

IV. O&M COSTS

1. **O&M Organization**
☐State in-house ☐Contractor for State
☐PRP in-house ☐Contractor for PRP
☐Federal Facility in-house ☒Contractor for Federal Facility
☐Other _____

2. **O&M Cost Records -** N/A
☐Readily available ☐Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: N/A

V. ACCESS AND ICs ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☒Gates secured ☐N/A
Remarks: Perimeter fence in good condition.

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks: Signs are posted and in good condition. IR Site 9 is secured by a perimeter fence, which is secured by a lock. Building 351 and Building 410 are also secured by lock. Alameda Point is patrolled by private security 24/7.

C. ICs

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Physical
Frequency Annually
Responsible party/agency DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☐ Yes ☐No ☒N/A

Specific requirements in deed or decision documents have been met ☐Yes ☐No ☒N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks

2. **Land use changes on site** ☐N/A
Remarks Groundwater is no longer considered a potential drinking water source, or beneficial use. ICs prevent extraction or use of contaminated groundwater at IR Site 9.

3. **Land use changes off site** ☒N/A
Remarks No

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A
Remarks

B. Other Site Conditions

Remarks: None at this time.

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES		☒ Applicable	☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines		☐ Applicable	☒ N/A
B. Surface Water Collection Structures, Pumps, and Pipelines		☐ Applicable	☒ N/A
C. Treatment System		☐ Applicable	☒ N/A
D. Monitoring Data			
1.	Monitoring Data ☐ Is routinely submitted on time ☐ Is of acceptable quality N/A		
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining		
E. Monitored Natural Attenuation			
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks		
X. OTHER REMEDIES			
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.		
XI. OVERALL OBSERVATIONS			
A.	**Implementation of the Remedy**		
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). ICs stated in the Record of Decision (ROD) prevent extraction or use of contaminated groundwater. The IC is effective and operating as intended by the ROD, which is protective of human health.		
B.	**Adequacy of O&M**		
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M not required at IR Site 9.		
C.	**Early Indicators of Potential Remedy Problems**		
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.		
D.	**Opportunities for Optimization**		
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.		

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-2A, Installation Restoration (IR) Site 13	**Date of inspection:** 11/11/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 63 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☒ Groundwater Monitoring
- ☐ Access controls
- ☒ Institutional Controls
- ☐ Groundwater In-Situ Chemical Oxidation
- ☐ Other:
- ☒ Monitored Natural Attenuation
- ☒ Groundwater In-situ Bioremediation

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** N/A _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☒Readily available	☒Up to date	☐N/A
☐As-built drawings	☒Readily available	☒Up to date	☐N/A
☐Maintenance logs	☒Readily available	☒Up to date	☐N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒Readily available ☒Up to date ☐N/A
   ☐Contingency plan/emergency response plan ☒Readily available ☒Up to date ☐N/A
   Remarks_____

3.	**O&M and OSHA Training Records**	☒Readily available	☐Up to date	☒N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
	☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
	☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
5.	**Gas Generation Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☒Readily available	☐Up to date	☐N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	☒Readily available	☒Up to date	☐N/A
	Remarks: Daily access logs are maintained by a private commercial storage company. Alameda Point is patrolled 24/7 by a private security company.			

IV. O&M COSTS

1. **O&M Organization**

☐State in-house ☐Contractor for State
☐PRP in-house ☐Contractor for PRP
☐Federal Facility in-house ☒Contractor for Federal Facility
☐Other _____

2. **O&M Cost Records -**

☒Readily available ☒Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From: June 2014 To:_April 2016 _____$93,367___ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: N/A

V. ACCESS AND ICs ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☒Gates secured ☐N/A
Remarks

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks: The western portion of IR Site 13, which surrounds Building 397 is secured by a fence with a locked gate. The former Oil Refinery, Building 397 is secured by locks. The northern portion of IR Site 13 (north of W Pacific Ave) is secured by a fence and locked gate. The eastern portion of IR Site 13 (east of Skyhawk St.) is paved open space. The southeastern portion of IR Site 13 is operated by a private commercial storage company, which is secured by secured by code access rolling gate. Alameda Point is patrolled by private security 24/7.

C. ICs

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Physical/DON
Frequency Annually
Responsible party/agency DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☐ Yes ☐No ☒N/A

Specific requirements in deed or decision documents have been met ☐Yes ☐No ☒N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks

2. **Land use changes on site** ☒N/A
Remarks No

3. **Land use changes off site** ☒N/A
Remarks No

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A
Remarks

B. Other Site Conditions

Remarks: None at this time.

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines	☐ Applicable	☒ N/A
B. Surface Water Collection Structures, Pumps, and Pipelines	☐ Applicable	☒ N/A
C. Treatment System	☒ Applicable	☐ N/A
D. Monitoring Data		
1. Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality		
2. Monitoring data suggests: ☒ Groundwater plume is effectively contained ☒ Contaminant concentrations are declining		
E. Monitored Natural Attenuation		
1. **Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: Groundwater monitoring is in the ISB performance monitoring phase, with an anticipated transition to MNA.		
X. OTHER REMEDIES		
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.		
XI. OVERALL OBSERVATIONS		
A. Implementation of the Remedy		
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). ISB, MNA and ICs were included in the remedial actions of the Record of Decision (ROD). ISB was implemented in 2014, with Post ISB performance groundwater monitoring and possible transition to MNA as the follow-on remedial action. Post ISB performance groundwater monitoring has shown COCs have fallen in concentrations to levels at or below RGs. ICs are an on-going component of the remedial action, which prevents the domestic use of groundwater. The IC is effective and operating as intended by the ROD, which is protective of human health.		
B. Adequacy of O&M		
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Monthly O&M required at this phase of the remedial action for IR Site 13.		
C. Early Indicators of Potential Remedy Problems		
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.		
D. Opportunities for Optimization		

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. Direct push technology (DPT) ISB injection events and biovent fans were optimized, as described in Section 2.4.5.1 of the 2016 Five-Year Review. Additional opportunities for optimization may be possible through reduced sample frequency, reduced sample analytes and groundwater monitoring well network.

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-2A, Installation Restoration (IR) Site 19	**Date of inspection:** 11/12/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 60 degrees Fahrenheit
Remedy Includes: (Check all that apply) ☐ Groundwater Monitoring ☐ Monitored Natural Attenuation ☐ Access controls ☒ Institutional Controls (IC) ☐ Groundwater In-Situ Chemical Oxidation (ISCO) ☐ Other: _____	
Attachments: ☐ Inspection team roster attached ☒ Site map attached	
II. INTERVIEWS (Check all that apply)	
1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date) Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713 Problems, suggestions; ☐ Report attached _____	
2. **O&M staff** N/A (Name) _____ (Title) _____ (Date) Interviewed ☐ at site ☐ at office ☐ by phone phone no. _____ Problems, suggestions; ☐ Report attached _____	
3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.	
4. **Other interviews** (optional) ☐Report attached.	
III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)	

1.	**O&M Documents**			
	☐O&M manual	☐Readily available	☐Up to date	☒N/A
	☐As-built drawings	☐Readily available	☐Up to date	☒N/A
	☐Maintenance logs	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
2.	**Site-Specific Health and Safety Plan**	☐Readily available	☐Up to date	☒N/A
	☐Contingency plan/emergency response plan	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
3.	**O&M and OSHA Training Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
	☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
	☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
5.	**Gas Generation Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	☒Readily available	☒Up to date	☐N/A
	Remarks: Daily access logs available at the site through the private commercial company. Building 616 and the former Hazardous Waste Storage Yard D-13 is secured by code access rolling gate. Alameda Point is patrolled 24/7 by a private security company and tenant security.			

IV. O&M COSTS

1. **O&M Organization**

☐State in-house ☐Contractor for State
☐PRP in-house ☐Contractor for PRP
☐Federal Facility in-house ☒Contractor for Federal Facility
☐Other _____

2. **O&M Cost Records -N/A**

☐Readily available ☐Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: N/A

V. ACCESS AND ICs ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☒Gates secured ☐N/A

Remarks: No issues noted.

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A

Remarks: Building 616 and the former Hazardous Waste Storage Yard D-13 are secured by code access rolling gate. Alameda Point is patrolled 24/7 by a private security company and tenant security.

C. ICs

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Observations
Frequency Annually
Responsible party/agency DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☐ Yes ☐No ☒N/A

Specific requirements in deed or decision documents have been met ☐Yes ☐No ☒N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks

2. **Land use changes on site** ☒N/A
Remarks ICs prevent extraction or use of contaminated groundwater at IR Site 19.

3. **Land use changes off site** ☒N/A
Remarks No

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☒Location shown on site map ☒Roads adequate ☐N/A
Remarks -

B. Other Site Conditions

Remarks:

Private remediation company uses IR Site 19 as a storage facility for their vehicle fleet and equipment.

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES	☒ Applicable	☐ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines	☐ Applicable	☒ N/A
B. Surface Water Collection Structures, Pumps, and Pipelines	☐ Applicable	☒ N/A
C. Treatment System	☐ Applicable	☒ N/A
D. Monitoring Data		
1. Monitoring Data ☐ Is routinely submitted on time ☐ Is of acceptable quality N/A		
2. Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining		
E. Monitored Natural Attenuation		
1. **Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks:_____		
X. OTHER REMEDIES		
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.		
XI. OVERALL OBSERVATIONS		
A. Implementation of the Remedy		
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). ICs stated in the Record of Decision (ROD) prevent extraction or use of contaminated groundwater at IR Site 19. The IC is effective and operating as intended by the ROD, which is protective of human health.		
B. Adequacy of O&M		
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. None at this time.		
C. Early Indicators of Potential Remedy Problems		
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.		
D. Opportunities for Optimization		
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.		

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-2B, Installation Restoration (IR) Site 3	**Date of inspection:** 11/12/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 63 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☐ Groundwater Monitoring
- ☐ Monitored Natural Attenuation
- ☐ Access controls
- ☒ Institutional Controls (IC)
- ☐ Groundwater In-Situ Chemical Oxidation (ISCO)
- ☒ Other: Excavation, disposal and backfill with clean fill material

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** N/A no active remediation currently ongoing at the site _____
   Name Title Date
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☐Readily available ☐Up to date ☒N/A
   ☐Contingency plan/emergency response plan ☐Readily available ☐Up to date ☒N/A
   Remarks_____
   _____

3.	**O&M and OSHA Training Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
	☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
	☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
5.	**Gas Generation Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	☐Readily available	☐Up to date	☒N/A
	Remarks: No security logs available at the site. All buildings within the IR Site 3 boundary are secured by locks. Alameda Point is patrolled by a private security company, 24/7.			

IV. O&M COSTS

1. **O&M Organization**

☐State in-house ☐Contractor for State
☐PRP in-house ☐Contractor for PRP
☐Federal Facility in-house ☒Contractor for Federal Facility
☐Other _____

2. **O&M Cost Records -N/A**

☐Readily available ☐Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**

Describe costs and reasons: N/A

V. ACCESS AND ICs ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☐Gates secured ☒N/A
Remarks:

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks: LUC RD prevents access to Building 398 at IR Site 3, unless authorized by the DON.

C. ICs

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Physical
Frequency Annually
Responsible party/agency DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☐ Yes ☐No ☒N/A

Specific requirements in deed or decision documents have been met ☐Yes ☐No ☒N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks

2. **Land use changes on site** ☒N/A
Remarks No

3. **Land use changes off site** ☒N/A
Remarks No

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A
Remarks

B. Other Site Conditions

Remarks: None at this time.

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines	☐ Applicable	☒ N/A
B. Surface Water Collection Structures, Pumps, and Pipelines	☐ Applicable	☒ N/A
C. Treatment System	☐ Applicable	☒ N/A
D. Monitoring Data		
1. Monitoring Data ☐ Is routinely submitted on time ☐ Is of acceptable quality		
2. Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining		
E. Monitored Natural Attenuation		
1. **Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks		
X. OTHER REMEDIES		
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.		
XI. OVERALL OBSERVATIONS		
A. Implementation of the Remedy		
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The time critical removal action (TCRA) accomplished removal of lead impacted soil, with replacement of clean soil fill material in those hotspot areas. ICs have been implemented to restrict residential use of IR Site 3 in areas impacted by cobalt soil contamination. The IC appears to be operating effectively, as intended by the Record of Decision (ROD).		
B. Adequacy of O&M		
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. N/A		
C. Early Indicators of Potential Remedy Problems		
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.		
D. Opportunities for Optimization		
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.		

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-3, Installation Restoration (IR) Site 1	**Date of inspection**: 11/12/2015
Location and Region: Alameda, California	**EPA ID**: CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature**: Sunny, 63 degrees Fahrenheit

Remedy Includes: (Check all that apply)

☒ Groundwater Monitoring ☒ Monitored Natural Attenuation
☐ Access controls
☒ Institutional Controls (IC)
☒ Groundwater In-Situ Chemical Oxidation (ISCO)
☒ Other: Excavation, Off-Site Soil Disposal, Installation of Soil Cover, Radiological Screening, Munitions of Explosive Concern Sweep, Placement of Riprap Cover, Wetlands Mitigation Plan, and maintain the Storm Water Pollution Prevention Plan (SWPPP).

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
Problems, suggestions; ☐ Report attached_____

2. **O&M staff** Not available for interview

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☒ O&M manual	☒ Readily available	☒ Up to date	☐ N/A
☒ As-built drawings	☒ Readily available	☒ Up to date	☐ N/A
☒ Maintenance logs	☒ Readily available	☒ Up to date	☐ N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A
☒ Contingency plan/emergency response plan ☒ Readily available ☐ Up to date ☐ N/A
Remarks_____

3. **O&M and OSHA Training Records** ☒Readily available ☐Up to date ☒N/A

Remarks_____

4. Permits and Service Agreements

☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
☒Effluent discharge	☒Readily available	☐Up to date	☒N/A
☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
☐Other permits_____	☐Readily available	☐Up to date	☒N/A

Remarks_____

5. **Groundwater Monitoring Records** ☒Readily available ☐Up to date ☐N/A

Remarks_____

6. Discharge Compliance Records

☐Air	☐Readily available	☐Up to date	☒N/A
☒Water (effluent)	☒Readily available	☐Up to date	☐N/A

Remarks_____

7. **Daily Access/Security Logs** ☐Readily available ☐Up to date ☒N/A

Remarks: No access logs available at the site. IR Site 1 is secured by a fence within the former airfield. IR Site 1 is secured from unauthorized visitors.

8. **Groundwater Monitoring Records** ☒Readily available ☐Up to date ☐N/A

Remarks_____

9. **Gas Generation Records** ☒Readily available ☐Up to date ☐N/A

Remarks_____

10. **Settlement Monument Records** ☒Readily available ☒Up to date ☐N/A

Remarks_____

11. **Leachate Extraction Records** ☐Readily available ☐Up to date ☒N/A

Remarks_____

IV. O&M COSTS ☒Applicable ☐N/A

2. **O&M Cost Records - Available**
☐Readily available ☐Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate $341,148 over first five years (beginning in late 2015)
☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

V. ACCESS AND INSTITUTIONAL CONTROLS ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☒Gates secured ☐N/A
Remarks: The former airfield is secured by a fence and locked gate. Pedestrians and vehicular traffic are not permitted within the former airfield area, where IR Site 1 is located. All fencing is in good condition.

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks: Signs are posted and in good condition.

C. ICs

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by): Physical Inspection
Frequency Annually
Responsible party/agency: DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West

Contact: __ Doug DeLong Environmental Compliance (415) 743-4713
Name Title Phone no.

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☒ Yes ☐No ☐N/A

Specific requirements in deed or decision documents have been met ☒Yes ☐No ☐N/A
Violations have been reported ☐Yes ☐No ☒N/A

	Other problems or suggestions: ☐ Report attached
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks: The IC to restrict residential use of IR Site 1 is operating as intended by the Record of Decision (ROD).
D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks_____
2.	**Land use changes on site** ☒ N/A Remarks_____
3.	**Land use changes off site** ☒ N/A Remarks_____
VI. GENERAL SITE CONDITIONS	
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks_____
B. Other Site Conditions	
	Remarks: None_____
VII. LANDFILL COVERS ☒ Applicable ☐ N/A	
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER / SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1.	Monitoring Data ☐ Is routinely submitted on time ☒ Is of acceptable quality Remarks: Groundwater data is available for IR Site 1 from 2011 through Spring 2014.
2.	Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
E. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☐ N/A Remarks The monitoring well network will be reinstalled in 2016. All monitoring wells were destroyed in accordance with the RAWP during the implementation of the soil remedy.
X. OTHER REMEDIES	

If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The selected remedy was designed to isolate buried waste at IR Site 1. The remedy included Excavation, Off-Site Soil Disposal, Installation of Soil Cover, Radiological Screening, Munitions of Explosive Concern Sweep, Placement of Riprap Cover, Wetlands Mitigation Plan, maintaining the SWPPP and an IC that prevents residential use of IR Site 1, which may damage or otherwise reduce the effectiveness of the soil cover.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M is being conducted in accordance with the Post Construction Operation Maintenance and Monitoring Plan (PCOMMP. The soil cover has recently been seeded in 2015.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None issues at this time.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-4A, Installation Restoration (IR) Site 2	**Date of inspection**: 11/11/2015
Location and Region: Alameda, California	**EPA ID**: CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature**: Sunny, 63 degrees Fahrenheit

Remedy Includes: (Check all that apply)

☒ Groundwater Monitoring ☒ Monitored Natural Attenuation
☐ Access controls
☒ Institutional Controls (IC)
☒ Other: Installation of Soil Cover, Soil Gas Monitoring

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
Problems, suggestions; ☐ Report attached_____

2. **O&M staff** On-site

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐ Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. O&M Documents

☒ O&M manual	☐ Readily available	☐ Up to date	☐ N/A
☒ As-built drawings	☐ Readily available	☐ Up to date	☐ N/A
☒ Maintenance logs	☐ Readily available	☐ Up to date	☐ N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒ Readily available ☐ Up to date ☐ N/A
☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A
Remarks_____

3. **O&M and OSHA Training Records** ☒Readily available ☐Up to date ☐N/A

Remarks_____

4. Permits and Service Agreements

☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
☐Other permits_____	☐Readily available	☐Up to date	☒N/A

Remarks_____

5. **Groundwater Monitoring Records** ☒Readily available ☒Up to date ☐N/A

Remarks_____

6. **Gas Generation Records** ☒Readily available ☒Up to date ☐N/A

Remarks_____

7. **Settlement Monument Records** ☒Readily available ☒Up to date ☐N/A

Remarks_____

8. **Leachate Extraction Records** ☐Readily available ☐Up to date ☒N/A

Remarks_____

9. Discharge Compliance Records

☐Air	☐Readily available	☐Up to date	☒N/A
☒Water (effluent)	☐Readily available	☐Up to date	☐N/A

Remarks_____

10. **Daily Access/Security Logs** ☐Readily available ☐Up to date ☒N/A

Remarks: No access logs available at the site. IR Site 2 is secured by a fence within the former airfield. IR Site 2 is secured from unauthorized pedestrians and vehicular traffic.

IV. O&M COSTS ☒Applicable ☐N/A

2. **O&M Cost Records - Available**
☐Readily available ☐Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From___2013__ To__2015____ ____$305,145_____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

V. ACCESS AND INSTITUTIONAL CONTROLS ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☒Gates secured ☐N/A
Remarks: The former airfield is secured by a fence and locked gate. Pedestrians and vehicular traffic are not permitted within the former airfield area, where IR Site 2 is located. All fencing is in good condition.

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks_ Access restriction signs are posted on the perimeter of the former landfill and in good condition.

C. ICs

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by): Physical Inspection_____
Frequency Annually_____
Responsible party/agency: DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact: __Doug DeLong Environmental Compliance (415) 743-4713
Name Title Phone no.

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☒ Yes ☐No ☐N/A

Specific requirements in deed or decision documents have been met ☒Yes ☐No ☐N/A
Violations have been reported ☐Yes ☐No ☒N/A

	Other problems or suggestions: ☐ Report attached
2.	**Adequacy** ☒ ICs are adequate ☐ ICs are inadequate ☐ N/A Remarks: The ICs for IR Site 2 outlined in the Record of Decision (ROD) is for a landfill soil cover to isolate buried waste and implement engineering controls, which are protective of human health and the environment..
D. General	
1.	**Vandalism/trespassing** ☐ Location shown on site map ☒ No vandalism evident Remarks_____
2.	**Land use changes on site** ☒ N/A Remarks_____
3.	**Land use changes off site** ☒ N/A Remarks_____
VI. GENERAL SITE CONDITIONS	
A. Roads ☒ Applicable ☐ N/A	
1.	**Roads damaged** ☐ Location shown on site map ☒ Roads adequate ☐ N/A Remarks_____
B. Other Site Conditions	
	Remarks: The original seeding of the IR Site 2 soil cover did not take and therefore was reseeded. A depression in the central portion of the former landfill was repaired in 2015 to ensure proper rain-water run-off drainage in accordance with the Storm Water Pollution and Prevention Plan (SWPPP) and the Post Construction Maintenance and Monitoring Plan (PCMMP).
VII. LANDFILL COVERS ☒ Applicable ☐ N/A	
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A	
IX. GROUNDWATER / SURFACE WATER REMEDIES ☒ Applicable ☐ N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A	
B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A	
C. Treatment System ☐ Applicable ☒ N/A	
D. Monitoring Data	
1.	Monitoring Data ☒ Is routinely submitted on time ☒ Is of acceptable quality
2.	Monitoring data suggests: ☒ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining
E. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A

	Remarks
	X. OTHER REMEDIES
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
	XI. OVERALL OBSERVATIONS
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The remedy included ICs, installation of a soil cover, soil gas monitoring, wetland mitigation and groundwater MNA. The selected remedy is currently operating as intended by the ROD.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M is being conducted in accordance with the PCMMP.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-4B, Installation Restoration (IR) Site 17, Seaplane Lagoon	**Date of inspection:** 11/11/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 60 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☐ Groundwater Monitoring
- ☐ Monitored Natural Attenuation
- ☐ Access controls
- ☒ Institutional Controls (IC)
- ☐ Groundwater In-Situ Chemical Oxidation
- ☒ Other: Dredging, Dewatering and Off-site Disposal of contaminated sediment.

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** N/A _____ (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☐Readily available ☐Up to date ☒N/A
   ☐Contingency plan/emergency response plan ☐Readily available ☐Up to date ☒N/A
   Remarks_____

3.	**O&M and OSHA Training Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
	☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
	☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
5.	**Gas Generation Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	☐Readily available	☐Up to date	☒N/A
	Remarks: No security logs available at the site. Alameda Point is patrolled 24/7 by a private security company.			

IV. O&M COSTS

1. **O&M Organization**
☐State in-house ☐Contractor for State
☐PRP in-house ☐Contractor for PRP
☐Federal Facility in-house ☒Contractor for Federal Facility
☐Other _____
_____

2. **O&M Cost Records -N/A**
☐Readily available ☐Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: N/A

V. ACCESS AND ICs ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☐Gates secured ☒N/A
Remarks:

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks: Signs posted around IR Site 17, Seaplane Lagoon, as disturbance of sediments in the lagoon is restricted. Alameda Point is patrolled by private security 24/7.

C. ICs

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) Observations
Frequency Annually
Responsible party/agency DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☐ Yes ☐No ☒N/A

Specific requirements in deed or decision documents have been met ☐Yes ☐No ☒N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☒N/A
Remarks: ICs restrict any disturbance of sediments located within IR Site 17, Seaplane Lagoon, without approval from the Navy. Dredging and dropping of anchor by any maritime vessel is strictly prohibited.

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks

2. **Land use changes on site** ☒N/A
Remarks No

3. **Land use changes off site** ☒N/A
Remarks No

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A
Remarks Roads are adequate. Road access exists along the west, north and east perimeter of IR Site 17, Seaplane Lagoon.

B. Other Site Conditions

Remarks: None at this time.

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS	☐ Applicable ☒ N/A
IX. GROUNDWATER/SURFACE WATER REMEDIES	☐ Applicable ☒ N/A
A. Groundwater Extraction Wells, Pumps, and Pipelines	☐ Applicable ☒ N/A
B. Surface Water Collection Structures, Pumps, and Pipelines	☐ Applicable ☒ N/A
C. Treatment System	☐ Applicable ☒ N/A
D. Monitoring Data	
1. Monitoring Data ☐ Is routinely submitted on time ☐ Is of acceptable quality N/A	
2. Monitoring data suggests: ☐ Groundwater plume is effectively contained ☐ Contaminant concentrations are declining	
E. Monitored Natural Attenuation	
1. **Monitoring Wells** (natural attenuation remedy) ☐ Properly secured/locked ☐ Functioning ☐ Routinely sampled ☐ Good condition ☐ All required wells located ☐ Needs Maintenance ☒ N/A Remarks	
X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The remedy outlined in the Record of Decision (ROD) was to dredge impacted sediment from specific locations within IR Site 17, Seaplane Lagoon, conduct remedial action sampling, sediment dewatering, and off-site disposal of dewatered sediment dredge material. Dredged material was dewatered, remedial action sampling conducted, and disposed of in an off-site approved landfill. The ROD restricts any disturbance of sediment within IR Site 17, Seaplane Lagoon.	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. No O&M is required at IR Site 17.	

C.	Early Indicators of Potential Remedy Problems
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-5, Installation Restoration (IR) Site 25	**Date of inspection**: 11/12/2015
Location and Region: Alameda, California	**EPA ID**: CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature**: Sunny, 60 degrees Fahrenheit
Remedy Includes: (Check all that apply) ☐ Access controls ☒ Institutional controls ☐ Other:_____	
Attachments: ☐ Inspection team roster attached ☐ Site map attached	
II. INTERVIEWS (Check all that apply)	
1. **O&M site manager** Douglas Delong Environmental Compliance 11/12/15 Name Title Date Interviewed ☒ at site ☐ at office ☐ by phone Phone no. 415-743-4713 Problems, suggestions; ☐ Report attached _____	
2. **O&M staff** Not applicable	
3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply. No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.	
4. **Other interviews** (optional) ☐ Report attached.	
Other interviews are included in Appendix C of the 2016 Alameda Point and Fleet and Industrial Supply Center Oakland, Alameda Facility / Alameda Annex (FISCA) Five Year Review Report.	
III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)	
1. O&M Documents ☐ O&M manual ☐ Readily available ☐ Up to date ☒ N/A ☐ As-built drawings ☐ Readily available ☐ Up to date ☒ N/A ☐ Maintenance logs ☐ Readily available ☐ Up to date ☒ N/A Remarks_____	
2. **Site-Specific Health and Safety Plan** ☐ Readily available ☐ Up to date ☒ N/A ☐ Contingency plan/emergency response plan ☐ Readily available ☐ Up to date ☒ N/A Remarks_____	

3. **O&M and OSHA Training Records** ☐Readily available ☐Up to date ☒N/A

Remarks_____

4. Permits and Service Agreements

☐Air discharge permit ☐Readily available ☐Up to date ☒N/A

☐Effluent discharge ☐Readily available ☐Up to date ☒N/A

☐Waste disposal, POTW ☐Readily available ☐Up to date ☒N/A

☐Other permits_____ ☐Readily available ☐Up to date ☒N/A

Remarks_____

5. **Groundwater Monitoring Records** ☐Readily available ☐Up to date ☒N/A

Remarks_____

6. Discharge Compliance Records

☐Air ☐Readily available ☐Up to date ☒N/A

☐Water (effluent) ☐Readily available ☐Up to date ☒N/A

Remarks_____

7. **Daily Access/Security Logs** ☐Readily available ☐Up to date ☒N/A

Remarks_____

IV. O&M COSTS ☐Applicable ☒N/A

V. ACCESS AND INSTITUTIONAL CONTROLS ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☐Gates secured ☒N/A

Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A

Remarks__Access to IR Site 25 is limited by fences along the perimeter and traffic barricades along Mosley and Singleton Ave.

C. ICs

1. **Implementation and enforcement**

Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A

Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by): Physical Inspection_____

Frequency Annually_____

Responsible party/agency: DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West

Contact: __Douglas DeLong__ Environmental Compliance (415) 743-4713

Name Title Phone no.

	Reporting is up-to-date ☒Yes ☐No ☐N/A Reports are verified by the lead agency ☒ Yes ☐No ☐N/A Specific requirements in deed or decision documents have been met ☒Yes ☐No ☐N/A Violations have been reported ☐Yes ☐No ☒N/A Other problems or suggestions: ☐Report attached
2.	**Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A Remarks_____
D. General	
1.	**Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident Remarks_____
2.	**Land use changes on site** ☒N/A Remarks_____
3.	**Land use changes off site** ☒N/A Remarks_____
VI. GENERAL SITE CONDITIONS	
A. Roads	☒Applicable ☐N/A
1.	**Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A Remarks_____
B. Other Site Conditions	
	Remarks: None_____
VII. LANDFILL COVERS ☐Applicable ☒N/A	
VIII. VERTICAL BARRIER WALLS ☐Applicable ☒N/A	
IX. GROUNDWATER / SURFACE WATER REMEDIES ☐Applicable ☒N/A	
X. OTHER REMEDIES	
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Remedy included previous soil excavation and institutional controls. The IC restricts excavations of any kind without a permit from the City of Alameda, in reference to the Marsh Crust Ordinance, No. 2824.

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M is not a requirement of the remedy.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-6, Installation Restoration (IR) Site 26	**Date of inspection:** 11/12/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 60 degrees Fahrenheit

Remedy Includes: (Check all that apply)

☐ Access controls
☒ Groundwater In-Situ Bioremediation Treatment
☒ Institutional controls (IC) (short term)
☒ Monitored Natural Attenuation
☒ Groundwater Monitoring well installation and sampling
☒ Groundwater In-Situ Chemical Oxidation
☐ Other: _____

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** N/A no active remediation currently ongoing at the site

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒Readily available ☐Up to date ☐N/A
   ☐Contingency plan/emergency response plan ☐Readily available ☐Up to date ☒N/A
   Remarks_____

3. **O&M and OSHA Training Records** ☒Readily available ☐Up to date ☐N/A
   Remarks_____

4. **Permits and Service Agreements**

☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A

	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
5.	**Gas Generation Records** Remarks_____	☐Readily available	☐Up to date	☒N/A
6.	**Settlement Monument Records** Remarks_____	☐Readily available	☐Up to date	☒N/A
7.	**Groundwater Monitoring Records** Remarks_____	☒Readily available	☒Up to date	☐N/A
8.	**Leachate Extraction Records** Remarks_____	☐Readily available	☐Up to date	☒N/A
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs** Remarks: No security logs available at the site. The site is a gated area and key access is required. Alameda Point is patrolled by a private security company 24/7.	☐Readily available	☐Up to date	☒N/A

IV. O&M COSTS

1. **O&M Organization**
   ☐State in-house ☐Contractor for State
   ☐PRP in-house ☐Contractor for PRP
   ☐Federal Facility in-house ☒Contractor for Federal Facility?
   ☐Other _____

2. **O&M Cost Records** → N/A.
   ☐Readily available ☐Up to date
   ☐Funding mechanism/agreement in place
   Original O&M cost estimate_____ ☐Breakdown attached

   Total annual cost by year for review period if available

   From_____ To_____ _____ ☐Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ ☐Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ ☐Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ ☐Breakdown attached
   Date Date Total cost
   From_____ To_____ _____ ☐Breakdown attached
   Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
   Describe costs and reasons:

V. ACCESS AND INSTITUTIONAL CONTROLS ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☒Gates secured ☐N/A
   Remarks: Fences appeared to be in good condition and gates were locked. Fences prevent general unauthorized access to the areas.

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks: Signs are posted at the gates along the fences, but no security logs are kept for the site. Signs appeared to be in good condition. Site overseen by private security company, 24/7 and the current tenants.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by): Physical Inspection
Frequency: Annually
Responsible party/agency: DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West

Contact	Douglas DeLong	Environmental Compliance	(415) 743-4713
	Name	Title	Phone no.

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☒ Yes ☐No ☐N/A
Specific requirements in deed or decision documents have been met ☒Yes ☐No ☐N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident

2. **Land use changes on site** ☒N/A
Remarks None

3. **Land use changes off site** ☒N/A
Remarks None

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A
Remarks None

B. Other Site Conditions

Remarks None

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS ☐Applicable ☒N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒ Applicable ☐ N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System ☐ Applicable ☒ N/A

D. Monitoring Data	
Monitoring Data ☒Is routinely submitted on time	☒Is of acceptable quality
Monitoring data suggests: ☒Groundwater plume is effectively contained	☒ Contaminant concentrations are declining
E. Monitored Natural Attenuation	
1. **Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: Project completed the ISB phase. Technology Transition has taken place and MNA currently being implemented.	
X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). The selected remedy was designed to reduce and eliminate the chlorinated solvent plume in groundwater located within the Hangar Zone, or IR Site 26. The remedy included installation of groundwater monitoring wells. ISCO was conducted in 2008, followed by groundwater monitoring and ISB. The IC component of the remedy involves restrictions against any excavation, drilling, or interference with environmental restoration activities without written consent from the DON.	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. Post-ISCO and ISB groundwater monitoring continues to show decreases in the chlorinated solvent plume located in the northeast portion of the site. ICs continue to be protective of human health and the environment, with future reuse of the site planned for commercial.	
C. Early Indicators of Potential Remedy Problems	
Describe issues and observations, such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, which suggest that the protectiveness of the remedy may be compromised in the future. None at this time.	
D. Opportunities for Optimization	
Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.	

I. SITE INFORMATION	
Site name: Alameda Point, Operable Unit (OU)-6, Installation Restoration (IR) Site 27	**Date of inspection:** 11/11/2015
Location and Region: Alameda, California	**USEPA ID:** CA2170023236
Agency, office, or company leading the five-year review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 60 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☒ Monitored natural attenuation (MNA)
- ☐ Access controls
- ☒ Institutional controls (IC)
- ☒ In-Situ Chemical Oxidation
- ☒ Groundwater sampling
- ☐ Other: _____

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff:** None.
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ONSITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒Readily available ☐Up to date ☐N/A
   ☐Contingency plan/emergency response plan ☐Readily available ☐Up to date ☒N/A
   Remarks_____

3. **O&M and OSHA Training Records** ☐Readily available ☐Up to date ☒N/A

Remarks_____

4. **Permits and Service Agreements**

☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
☐Other permits_____	☐Readily available	☐Up to date	☒N/A

Remarks_____

5. **Gas Generation Records** ☐Readily available ☐Up to date ☒N/A
Remarks_____

6. **Settlement Monument Records** ☐Readily available ☐Up to date ☒N/A
Remarks_____

7. **Groundwater Monitoring Records** ☒Readily available ☐Up to date ☐N/A
Remarks_____

8. **Leachate Extraction Records** ☐Readily available ☐Up to date ☒N/A
Remarks_____

9. **Discharge Compliance Records**

☐Air	☐Readily available	☐Up to date	☒N/A
☐Water (effluent)	☐Readily available	☐Up to date	☒N/A

Remarks_____

10. **Daily Access/Security Logs** ☒Readily available ☒Up to date ☐N/A
Remarks: Security logs available at the site through the current commercial tenant. The site is a gated area and key access is required to enter the site. Current tenant on site (NRC Environmental) has the site fenced, with an access code rolling gate. Alameda Point is patrolled by a private security company 24/7.

IV. O&M COSTS

1. **O&M Organization**

☐State in-house	☐Contractor for State
☐PRP in-house	☐Contractor for PRP
☐Federal Facility in-house	☒Contractor for Federal Facility

☐Other_____

2. **O&M Cost Records**
N/A
☐Readily available ☐Up to date
☐Funding mechanism/agreement in place

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons:

V. ACCESS AND INSTITUTIONAL CONTROLS ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☒Gates secured ☐N/A
Remark Fences appeared to be in good condition and the gates are locked. Fences prevent pedestrian and vehicle traffic from accessing the remediation area. Permanent perimeter fencing surrounds NRC's compound/yard.

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks: Signs are posted at the gates and along fences. Signs appeared to be in good condition. Signs note contact information and some note restrictions and/or presence of contamination. Signs noting requirements for authorized personnel (NRC employees) are present at the gates. Guests must sign in with the receptionist across the site from the remediation area. The site is overseen by 24-hour site-wide security service.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐Yes ☒No ☐N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐N/A

Type of monitoring (*e.g.*, self-reporting, drive by): Physical Inspection
Frequency: Annually
Responsible party/agency: DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☒ Yes ☐No ☐N/A
Specific requirements in decision documents have been met ☒Yes ☐No ☐N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks

2. **Land use changes on site** ☒N/A
Remarks No

3. **Land use changes off site** ☒N/A
Remarks No

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A
Remarks:

B. Other Site Conditions

Remarks None

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS ☐Applicable ☒N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒Applicable ☐N/A

A. Groundwater Extraction Wells, Pumps, and Pipelines	☐ Applicable ☒ N/A
B. Surface Water Collection Structures, Pumps, and Pipelines	☐ Applicable ☒ N/A
C. Treatment System	☐ Applicable ☒ N/A
D. Monitoring Data	
1. Monitoring Data ☒Is routinely submitted on time ☒Is of acceptable quality Remarks: MNA groundwater monitoring under the Base-wide Groundwater Monitoring Program (BGMP), is on-going.	
2. Monitoring data suggests: ☒Groundwater plume is effectively contained ☐ Contaminant concentrations are declining Remarks:	
E. Monitored Natural Attenuation	
1. **Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks: The MNA remedy has been implemented as the next phase in the remedial action.	
X. OTHER REMEDIES	
If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.	
XI. OVERALL OBSERVATIONS	
A. Implementation of the Remedy	
Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). ISCO using sodium persulfate has been effective at reducing concentrations of chlorinated solvent chemicals of concern (COC) in groundwater at IR Site 27. MNA is on-going under the BGMP. The IC component of the remedy places restrictions on the use of groundwater at IR Site 27 to protect human health, as well as to maintain integrity of the remedial action until remediation goals (RG) are met. MNA is on-going until RGs are met.	
B. Adequacy of O&M	
Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. O&M no longer required in this phase of the remedial action for IR Site 27.	
C. Early Indicators of Potential Remedy Problems	
Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future. Concentrations of COCs outlined in the Record of Decision (ROD) remain above respected RGs in select monitoring wells, following three phases of ISCO injection.	

D.	Opportunities for Optimization
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

I. SITE INFORMATION	
Site name: – Alameda Point, Operable Unit (OU)-6, Installation Restoration (IR) Site 28	**Date of inspection:** 11/12/2015
Location and Region: Alameda, California	**EPA ID:** CA2170023236
Agency, office, or company leading the five-year review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 63 degrees Fahrenheit

Remedy Includes: (Check all that apply)

☒ Soil removal and disposal
☐ Access controls
☒ Institutional controls (IC)
☐ Other: _____
☒ Monitored Natural Attenuation
☒ Groundwater pilot study
☒ Groundwater Metals Reducing Compound™ addition

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1 **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
Interviewed ☒ at site ☐ at office ☐ by phone Phone no. 415-743-4713
Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Not applicable. (Name) _____ (Title) _____ (Date)
Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☒Readily available ☐Up to date ☐N/A
☐Contingency plan/emergency response plan ☐Readily available ☐Up to date ☒N/A
Remarks_____

3. **O&M and OSHA Training Records** ☐Readily available ☐Up to date ☒N/A
Remarks_____

4. **Permits and Service Agreements**

☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
☐Waste disposal, POTW	☐Readily available	☐Up to date	☐N/A
☐Other permits_____	☐Readily available	☐Up to date	☒N/A

Remarks_____

5. **Groundwater Monitoring Records** ☒Readily available ☒Up to date ☐N/A
Remarks

6. **Discharge Compliance Records**

☐Air	☐Readily available	☐Up to date	☒N/A
☐Water (effluent)	☐Readily available	☐Up to date	☒N/A

Remarks_____

7. **Daily Access/Security Logs** ☐Readily available ☐Up to date ☒N/A
Remarks___No security logs available at the site. The site is currently located adjacent to the San Francisco/Alameda Ferry Terminal and dog park managed by the City of Alameda._____

IV. O&M COSTS

1. **O&M Organization**

☐State in-house	☐Contractor for State
☐PRP in-house	☐Contractor for PRP
☐Federal Facility in-house	☒Contractor for Federal Facility

☐Other_____
_____

2. **O&M Cost Records**
☐Readily available ☐Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate_____N/A_____ ☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: N/A_____

V. ACCESS AND INSTITUTIONAL CONTROLS ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☐Gates secured ☒N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks: IR Site 28 is currently used as a bike path / shoreline park and dog park. A ferry terminal servicing Alameda Point and San Francisco is located on the north edge of the site. A private security company provides 24/7 patrols of Alameda Point and IR Site 28.

C. Institutional Controls (ICs)

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by) : Physical Inspections
Frequency: Annually
Responsible party/agency: DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)
Reporting is up-to-date ☒ Yes ☐No ☐N/A
Reports are verified by the lead agency ☒ Yes ☐No ☐N/A

Specific requirements in deed or decision documents have been met ☒Yes ☐No ☐N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached
N/A

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks: IC controls prevent the use of groundwater and the construction of structures designed for human occupancy, as described in the Record of Decision (ROD).

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks

2. **Land use changes on site** ☒N/A
Remarks

3. **Land use changes off site** ☒N/A
Remarks

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1. **Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A
Remarks

B. Other Site Conditions

Remarks: None

VII. LANDFILL COVERS ☐Applicable ☒N/A

VIII. VERTICAL BARRIER WALLS ☐Applicable ☒N/A

IX. GROUNDWATER/SURFACE WATER REMEDIES ☒Applicable ☐N/A

A. Groundwater Extraction Wells, Pumps and Pipelines ☐ Applicable ☒ N/A

B. Surface Water Collection Structures, Pumps, and Pipelines ☐ Applicable ☒ N/A

C. Treatment System	☐ Applicable ☒ N/A
D. Monitoring Data	
1.	Monitoring Data ☒Is routinely submitted on time ☒Is of acceptable quality Remarks:
2.	Monitoring data suggests: ☒Groundwater plume is effectively contained ☐ Contaminant concentrations are declining Remarks:
E. Monitored Natural Attenuation	
1.	**Monitoring Wells** (natural attenuation remedy) ☒ Properly secured/locked ☒ Functioning ☒ Routinely sampled ☒ Good condition ☒ All required wells located ☐ Needs Maintenance ☐ N/A Remarks:
X. OTHER REMEDIES	
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.
XI. OVERALL OBSERVATIONS	
A.	**Implementation of the Remedy**
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Time critical removal action (TCRA) and addition of Metals Reducing Compound (MRC™) implemented in 2010. Long term groundwater monitoring for metals currently on-going. IC to prevent the use of groundwater, and restrict the construction of structures designed for human occupancy has been effective and operating as design by the ROD.
B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. None at this time.
C.	**Early Indicators of Potential Remedy Problems**
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

I. SITE INFORMATION	
Site name: Fleet and Industrial Supply Center Oakland, Alameda Facility / Alameda Annex (FISCA), Installation Restoration (IR) Site 02 Soil	**Date of inspection:** 11/12/2015
Location and Region: Alameda, California	**EPA ID:** CA1170090012
Agency, office, or company leading the Five-Year Review: U.S. Department of the Navy (DON)	**Weather/temperature:** Sunny, 64 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☐ Monitored Natural Attenuation (MNA)
- ☐ Access controls
- ☒ Institutional controls (IC)
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☒ Other: Excavation, Off-site Disposal, Back-fill of Clean Soil Fill Material.

Attachments: ☐ Inspection team roster attached ☒ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Not applicable (Name) _____ (Title) _____ (Date)
   Interviewed ☐ at site ☐ at office ☐ by phone Phone no. _____
   Problems, suggestions; ☐ Report attached _____

3. **Local regulatory authorities and response agencies** (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.

   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☐Readily available ☐Up to date ☒N/A
   ☐Contingency plan/emergency response plan ☐Readily available ☐Up to date ☒N/A
   Remarks_____

3.	**O&M and OSHA Training Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
4.	**Permits and Service Agreements**			
	☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
	☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
	☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
	☐Other permits_____	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
5.	**Gas Generation Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
6.	**Settlement Monument Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
7.	**Groundwater Monitoring Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
8.	**Leachate Extraction Records**	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
9.	**Discharge Compliance Records**			
	☐Air	☐Readily available	☐Up to date	☒N/A
	☐Water (effluent)	☐Readily available	☐Up to date	☒N/A
	Remarks_____			
10.	**Daily Access/Security Logs**	☒Readily available	☒Up to date	☐N/A
	Remarks____ Daily security logs managed by Catellus, the City of Alameda construction contractor.			
	IV. O&M COSTS ☐Applicable ☒N/A			
	V. ACCESS AND INSTITUTIONAL CONTROLS ☒Applicable ☐N/A			
A. Fencing				
1.	**Fencing damaged**	☐Location shown on site map	☒Gates secured	☐N/A
	Remarks_____			
B. Other Access Restrictions				
1.	**Signs and other security measures**	☐Location shown on site map	☐N/A	
	Remarks: FISCA/IR Site 02 is currently being developed for mixed residential and commercial use. The site boundary is secured by a fence and locked gates.			
C. Institutional Controls (ICs)				
1.	**Implementation and enforcement**			
	Site conditions imply ICs not properly implemented	☐Yes	☒No	☐ N/A
	Site conditions imply ICs not being fully enforced	☐Yes	☒No	☐ N/A
	Type of monitoring (*e.g.*, self-reporting, drive by) Not applicable. Property transferred to the City of Alameda. Current land use is mixed commercial/residential.			
	Frequency N/A_____			
	Responsible party/agency N/A_____			
	Contact N/A _____ _____ _____ _____			
	Name Title Date Phone no.			
	Reporting is up-to-date	☐Yes	☐No	☒N/A

	Reports are verified by the lead agency	☐ Yes ☐No	☒N/A
	Specific requirements in deed or decision documents have been met	☐Yes ☐No	☒N/A
	Violations have been reported	☐Yes ☐No	☒N/A
	Other problems or suggestions: ☐Report attached		
2.	**Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A Remarks: Property has been transferred to the City of Alameda.		
D. General			
1.	**Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident Remarks_____		
2.	**Land use changes on site** ☐N/A Remarks: The City of Alameda currently uses the land as mixed commercial and residential. The City of Alameda worked with the developer to install a passive remediation system, which protects human health and the environment from exposure to PCB and cadmium impacted soil. The eastern two thirds of the site are currently under construction for mixed commercial and residential use. The western portion of the site has been developed into multi-family residential housing, with unrestricted use.		
3.	**Land use changes off site** ☒N/A Remarks_____		
VI. GENERAL SITE CONDITIONS			
A. Roads ☒Applicable ☐N/A			
1.	**Roads damaged** ☐Location shown on site map ☒Roads adequate ☐N/A Remarks_____		
B. Other Site Conditions			
	Remarks None_____		
VII. LANDFILL COVERS ☐Applicable ☒N/A			
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A			
IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A			
X. OTHER REMEDIES			
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction.		
XI. OVERALL OBSERVATIONS			
A.	**Implementation of the Remedy**		
	Describe issues and observations relating to whether the remedy is effective and functioning as designed. Begin with a brief statement of what the remedy is to accomplish (i.e., to contain contaminant plume, minimize infiltration and gas emission, etc.). Soil remedy is complete and the site is currently being redeveloped for commercial mixed use. ICs remain protective of human health and the environment, which are operating as intended by the Record of Decision (ROD).		

B.	**Adequacy of O&M**
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. None at this time.
C.	**Early Indicators of Potential Remedy Problems** None at this time.
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.
D.	**Opportunities for Optimization**
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.

I. SITE INFORMATION	
Site name: Marsh Crust	**Date of inspection:** 11/12/2015
Location and Region: Alameda, California	**EPA ID:** CA1170090012
Agency, office, or company leading the Five-Year Review: United States Department of the Navy (DON)	**Weather/temperature:** Sunny, 61 degrees Fahrenheit

Remedy Includes: (Check all that apply)

- ☐ Landfill cover/containment
- ☐ Access controls
- ☒ Institutional controls
- ☐ Groundwater pump and treatment
- ☐ Surface water collection and treatment
- ☐ Other: Soil and groundwater_____
- ☐ Monitored natural attenuation
- ☐ Groundwater containment
- ☐ Vertical barrier walls

Attachments: ☐ Inspection team roster attached ☐ Site map attached

II. INTERVIEWS (Check all that apply)

1. **O&M site manager** Douglas Delong (Name) Environmental Compliance (Title) 11/12/15 (Date)
   Interviewed ☒ at site ☐ at office ☐ by phone Phone no. (415) 743-4713
   Problems, suggestions; ☐ Report attached _____

2. **O&M staff** Not applicable

3. **Local regulatory authorities and response** agencies (i.e., State and Tribal offices, emergency response office, police department, office of public health or environmental health, zoning office, recorder of deeds, or other city and county offices, etc.) Fill in all that apply.
   No local regulatory authorities and response agencies were interviewed as part of the site inspection. See Appendix C – Technical interviews, for specific comments made by local regulatory authorities and response agencies related to the site.

4. **Other interviews** (optional) ☐Report attached.

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)

1. **O&M Documents**

☐O&M manual	☐Readily available	☐Up to date	☒N/A
☐As-built drawings	☐Readily available	☐Up to date	☒N/A
☐Maintenance logs	☐Readily available	☐Up to date	☒N/A

Remarks_____

2. **Site-Specific Health and Safety Plan** ☐Readily available ☐Up to date ☒N/A
   ☐Contingency /emergency response plan ☐Readily available ☐Up to date ☒N/A
   Remarks_____

3. **O&M and OSHA Training Records** ☐Readily available ☐Up to date ☒N/A
   Remarks_____

4. **Permits and Service Agreements**

☐Air discharge permit	☐Readily available	☐Up to date	☒N/A
☐Effluent discharge	☐Readily available	☐Up to date	☒N/A
☐Waste disposal, POTW	☐Readily available	☐Up to date	☒N/A
☐Other permits_____	☐Readily available	☐Up to date	☒N/A

Remarks_____

5. **Gas Generation Records** ☐Readily available ☐Up to date ☒N/A
Remarks_____

6. **Settlement Monument Records** ☐Readily available ☐Up to date ☒N/A
Remarks_____

7. **Groundwater Monitoring Records** ☐Readily available ☐Up to date ☒N/A
Remarks_____

8. **Leachate Extraction Records** ☐Readily available ☐Up to date ☒N/A
Remarks_____

9. **Discharge Compliance Records**

☐Air	☐Readily available	☐Up to date	☒N/A
☐Water (effluent)	☐Readily available	☐Up to date	☒N/A

Remarks_____

10. **Daily Access/Security Logs** ☐Readily available ☐Up to date ☒N/A
Remarks: Since the Marsh Crust is a discontinuous subsurface layer of contaminated soil, no daily access logs exist other than excavation permits (Marsh Crust Ordinance No. 2824) submitted through the City of Alameda.

IV. O&M COSTS

1. **O&M Organization**

☐State in-house	☐Contractor for State
☐PRP in-house	☐Contractor for PRP
☐Federal Facility in-house	☒Contractor for Federal Facility

☐Other _____

2. **O&M Cost Records**
☐Readily available ☐Up to date
☐Funding mechanism/agreement in place
Original O&M cost estimate_____ ☐Breakdown attached

Total annual cost by year for review period if available

From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost
From_____ To_____ _____ ☐Breakdown attached
Date Date Total cost

3. **Unanticipated or Unusually High O&M Costs During Review Period**
Describe costs and reasons: N/A

V. ACCESS AND INSTITUTIONAL CONTROLS ☒Applicable ☐N/A

A. Fencing

1. **Fencing damaged** ☐Location shown on site map ☐Gates secured ☒N/A
Remarks_____

B. Other Access Restrictions

1. **Signs and other security measures** ☐Location shown on site map ☐N/A
Remarks: The Marsh Crust Ordinance 2824 provides access restrictions for excavations, unless access is granted through the City of Alameda excavation permitting process.

C. ICs

1. **Implementation and enforcement**
Site conditions imply ICs not properly implemented ☐Yes ☒No ☐ N/A
Site conditions imply ICs not being fully enforced ☐Yes ☒No ☐ N/A

Type of monitoring (*e.g.*, self-reporting, drive by): Drive by, unauthorized excavation alert notifications by the City of Alameda or local agencies
Frequency: Annually
Responsible party/agency: DON Base Realignment and Closure (BRAC) Project Management Office (PMO) - West
Contact Douglas DeLong (Name) Environmental Compliance (Title) (415) 743-4713 (Phone no.)

Reporting is up-to-date ☒Yes ☐No ☐N/A
Reports are verified by the lead agency ☒ Yes ☐No ☐N/A

Specific requirements in deed or decision documents have been met ☒Yes ☐No ☐N/A
Violations have been reported ☐Yes ☐No ☒N/A
Other problems or suggestions: ☐Report attached

2. **Adequacy** ☒ICs are adequate ☐ICs are inadequate ☐N/A
Remarks: The Marsh Crust Ordinance No. 2824 prevents engaging in any excavation below specified threshold depths, without an excavation permit from the City of Alameda.

D. General

1. **Vandalism/trespassing** ☐Location shown on site map ☒No vandalism evident
Remarks_____

2. **Land use changes on site** ☒N/A
Remarks_____

3. **Land use changes off site** ☒N/A
Remarks_____

VI. GENERAL SITE CONDITIONS

A. Roads ☒Applicable ☐N/A

1.	**Roads damaged**	☐Location shown on site map	☒Roads adequate	☐N/A
	Remarks_____			
B. Other Site Conditions				
	Remarks _None_____			
VII. LANDFILL COVERS ☐Applicable ☒N/A				
VIII. VERTICAL BARRIER WALLS ☐ Applicable ☒ N/A				
IX. GROUNDWATER/SURFACE WATER REMEDIES ☐ Applicable ☒ N/A				
X. OTHER REMEDIES				
	If there are remedies applied at the site which are not covered above, attach an inspection sheet describing the physical nature and condition of any facility associated with the remedy. An example would be soil vapor extraction. N/A			
XI. OVERALL OBSERVATIONS				
A.	**Implementation of the Remedy**			
B.	**Adequacy of O&M**			
	Describe issues and observations related to the implementation and scope of O&M procedures. In particular, discuss their relationship to the current and long-term protectiveness of the remedy. N/A			
C.	**Early Indicators of Potential Remedy Problems**			
	Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs that suggest that the protectiveness of the remedy may be compromised in the future. None at this time.			
D.	**Opportunities for Optimization**			
	Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy. None at this time.			

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Appendix B
Site Inspection Photographs

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Site Inspection Photographs Log		
Alameda Point		
Operable Unit (OU)	Installation Restoration (IR) Site	Page
1	6	2
1	16	3-4
1	14	4-5
2A	9	5-6
2A	13	6-7
2A	19	8
2B	3	9
3	1	10-11
4A	2	12-13
4B	17	14
5	25	15
6	26	16
6	27	17
6	28	18
Fleet and Industrial Supply Center Oakland, Alameda Facility / Alameda Annex (FISCA)		
NA	02 Soil	19

OU-1, IR SITE 6

Photograph 1: Building 41, In-Situ Bioremediation (ISB) Remedial Action Area, looking southeast (11/12/15).

OU-1, IR SITE 6

Photograph 2: Building 41, ISB Remedial Action Area, looking northwest (11/12/15).

OU-1, IR SITE 16

Photograph 3: North Institutional Control (IC) Implementation Area (4/21/2016)

OU-1, IR SITE 16

Photograph 4: North IC Implementation Area (4/21/2016)

OU-1, IR SITE 16

Photograph 5: South IC Implementation Area (4/21/2016)

OU-1, IR SITE 14

Photograph 6: Southeast perimeter, looking northwest (11/12/15)

OU-1, IR SITE 14

Photograph 7: Former In-situ Chemical Oxidation (ISCO) Remedial Action Area, looking east (11/12/15)

OU-2A, IR SITE 9

Photograph 8: Looking south, perimeter fence with Building 410 on the right (11/12/15)

OU-2A, IR SITE 9

Photograph 9: Looking north, perimeter fence with Building 410 on the left (11/12/15)

OU-2A, IR SITE 13

Photograph 10: West Oriskany Ave. and Building 397, looking northeast (11/12/15).

OU-2A, IR SITE 13

Photograph 11: West Pacific Ave., looking south (11/12/15).

OU-2A, IR SITE 13

Photograph 12: Active Groundwater Remedial Action Area, looking west (4/21/16)

OU-2A, IR SITE 19

Photograph 13: West Pacific Ave., and Orion St., Yard D-13, looking northeast (11/12/15)

OU-2A, IR SITE 19

Photograph 14: Northeast perimeter fence and Yard D-13, looking southwest (11/12/15)

OU-2B, IR SITE 3

Photograph 15: Southeast perimeter, looking northwest (11/12/15)

OU-2B, IR SITE 3

Photograph 16: Former Soil Remedial Action Area, Trident Ave, looking southeast (4/21/16).

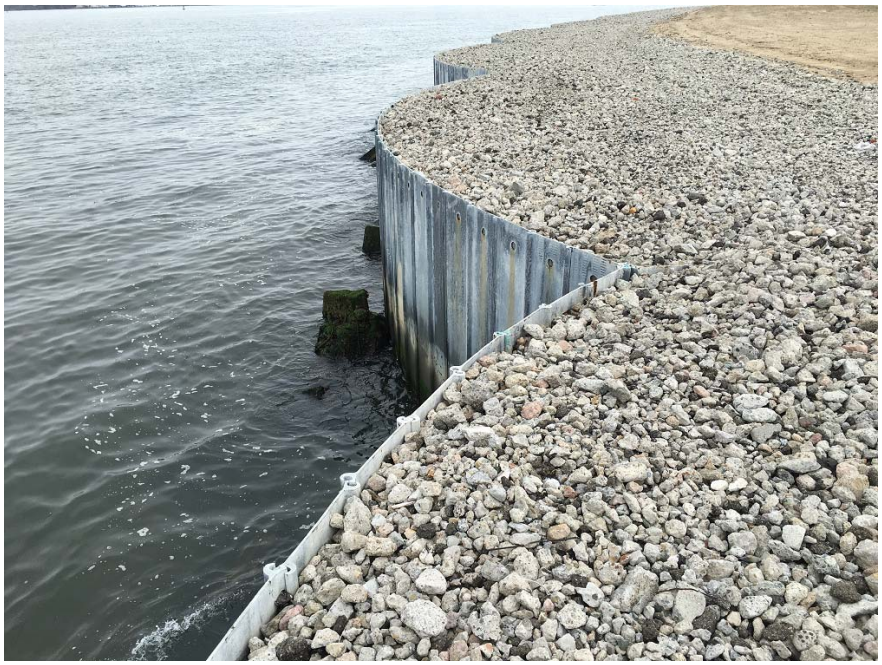
OU-3, IR SITE 1

Photograph 17: Landfill cover edge, looking south (4/21/16)

OU-3, IR SITE 1

Photograph 18: Landfill cover surface, looking north (4/21/16)

OU-3, IR SITE 1



Photograph 19: Waste Isolation Bulkhead, looking north (4/21/16)

OU-3, IR SITE 1

Photograph 20: Compensatory Wetlands, looking northeast (4/21/16)

OU-4A, IR SITE 2

Photograph 21: Landfill cover surface, looking north (4/21/16)

OU-4A, IR SITE 2

Photograph 22: Landfill cover surface and vegetation, looking east (4/21/16)

OU-4A, IR SITE 2

Photograph 23: North Pond, looking southeast (4/21/16)

OU-4A, IR SITE 2

Photograph 24: South Pond, looking southeast (4/21/16)

OU-4B, IR SITE 17

Photograph 25: Northeast perimeter fence, looking west (11/12/15)

Photograph 26: Southwest perimeter, looking east (11/12/15).

OU-5, IR SITE 25

Photograph 27: Estuary Park, looking northwest (4/21/16)

OU-5, IR SITE 25

Photograph 22: Clover Park (in the distance), looking northeast (11/12/15).

OU-6, IR SITE 26

Photograph 23: Former ISCO Remedial Action Area, looking northwest (11/12/15)

OU-6, IR SITE 26

Photograph 24: Hangar 20, Area Requiring Institutional Controls, looking west (4/21/16).

OU-6, IR SITE 27

Photograph 25: Former ISCO Remedial Action Area, looking northeast (4/21/16)

OU-6, IR SITE 27

Photograph 26: Former ISCO Remedial Action Area looking north (4/21/16)

OU-6, IR SITE 28

Photograph 27: Northeast perimeter, looking west (11/12/15)

OU-6, IR SITE 28

Photograph 28: Northwest perimeter, looking east (11/12/15)

FISCA, IR SITE 02 SOIL

Photograph 29: East of Shinsei Gardens Housing at Willie Stargell Ave., looking east (11/12/15)

FISCA, IR SITE 02 SOIL

Photograph 30: Southwest perimeter at Willie Stargell Ave., looking north toward Shinsei Gardens Housing (11/12/15)

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Appendix C
Interview Record and Interview Documentation Forms

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INTERVIEW DOCUMENTATION FORM			
The following is a list of individuals interviewed for this five-year review. See the attached contact record(s) for a detailed summary of the interviews.			
Name	Title/Position	Organization	Date
Doug DeLong	Environmental Compliance	Base Realignment and Closure (BRAC) Project Management Office (PMO) West	October 22, 2015
Xuan-Mai Tran	Project Manager (PM)	United States Environmental Protection Agency (USEPA)	January 8, 2016
James Fyfe	Hazardous Substances Engineer	Department of Toxic Substances and Control (DTSC)	December 15, 2015
Henry Wong	Remedial Project Manager (RPM)	DTSC	December 29, 2015
Dr. Peter Russell	Principal	Russell Resources, Inc.	January 12, 2016
George Humphreys	Remedial Advisory Board (RAB) Member	Alameda Point RAB	December 28, 2015
Susan Galleymore	RAB Member	Alameda Point RAB	January 6, 2016
Yemia Hashimoto	PM	San Francisco Regional Water Quality Control Board	December 8, 2015
Kevin Olness	PM	AMEC Foster Wheeler, Inc.	October 22, 2015
Philip Stearns	Senior PM	AMEC Foster Wheeler, Inc.	October 22, 2015
Curtis Moss	PM	AMEC Foster Wheeler, Inc.	January 13, 2016
Suman Sharma	PM	Oneida Total Integrated Enterprises	January 14, 2016
Ray Seamons	PM	Tetra Tech EC, Inc.	December 8, 2015
Lucas Goldstein	PM	Arcadis	December 8, 2015

INTERVIEW RECORD
Alameda Point Installation Restoration (IR) Sites 1, 2, 3, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, 28, Former Subtidal Area, and Fleet and Industrial Supply Center Oakland Alameda Facility Annex (FISCA), IR Site 02 Soil, and the Marsh Crust at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** Not Applicable (NA)	**Date:** January 8, 2016
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:		
Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)

Individual Contacted:		
Name: Xuan-Mai Tran	**Title:** Remedial Project Manager (RPM)	**Organization:** United States Environmental Protection Agency (USEPA)
Phone No: 415-972-3002 **Fax No:** None **E-mail Address:** tran.xuan-mai@epa.gov	**Street Address:** 75 Hawthorne Street **City, State, Zip:** San Francisco, CA 94105-3901	

Summary Of Conversation

Do you feel well informed about site activities at Alameda Point and FISCA sites named above?

Response: Yes, in general EPA feels well informed about site activities at Alameda Point and FISCA sites named above. If there are any concerns or issues, they are usually discussed and resolved at monthly BCT meetings or subsequent conference calls. For FISCA, although EPA does not have a specific role in that site, the Navy keeps EPA informed including decision making if any issues may impact the Alameda Point.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for Alameda Point and FISCA sites named above? Have there been any changes to the Applicable or Relevant and Appropriate Requirements (ARARs) upon which the remedy decisions were based?

Response: OU-2A ROD was signed in September 2012. WB has concurred on the groundwater use exception in September 2012 for the southeast portion of the Alameda which led to remedy decisions in the OU-2A ROD.

Vapor intrusion issue that has shaped the OU-2B ROD as well as the decision made in ROD Amendment for FISCA sites.

Although not expected, vapor intrusion could be an issue for redevelopment at IR Site 25 if benzene and naphthalene concentrations increase in shallow groundwater. In addition, site conditions at IR Site 25 will change once the hardscape and the housing are removed, since the previous excavations only removed contaminated soil in the areas that were not covered by hardscape. The reassessment of the protectiveness of the remedy will be needed once the hardscape is removed. This reassessment is not the Navy's responsibility but will be undertaken by a third party in conjunction with the DTSC and EPA.

Indoor air pathway risk should be updated with new toxicity information regarding TCE, particularly the risk to the fetus in the first trimester.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the Record of Decisions (RODs) for each of Alameda Point and FISCA sites named above?

Response: Site 1: Additional burned materials were encountered during pre-design investigation which led to Focused Feasibility Study for the Burn Area. The ROD Amendment was prepared to document the remedy change from the original ROD. The extent to which VOCs were treated in the plume area is unknown as the wells were removed to install the soil cover. Additional in-situ chemical oxidation (ISCO) may be needed. Also, additional wells are needed to monitor whether contaminated groundwater moves around the waste isolation barrier (WIB).

Site 2: The soil cover depression collected rainwater in a pond and the vegetative layer needed to be reseeded. The Navy proposed and implemented a soil cover repair and re-seeding the vegetative layer. However, since a limited amount of soil was imported to regrade the depression and the depression remains, it is uncertain if the repair was sufficient. The depression must fully drain such that no ponded water remains behind; if it does not, additional soil and grading will be needed.

Site 3: A soil remedial action was completed at Site 3 to remove the two lead impacted soil. However, an IC is being implemented to prevent any exposures to a cobalt impacted soil underneath a building at Site 3.

Site 6: The Regulatory Agencies were not given an opportunity to review an optimization plan for groundwater treatment before it was implemented. It is expected that before transition to MNA, the multiple lines of evidence outlined in Section 6 of the Final Work Plan for Enhanced In-situ Biodegradation would be demonstrated successfully.

Site 13: The dissolved oxygen (DO) concentration at IR13-MW-206 is quite low while the benzene and ethylbenzene concentrations remain above commercial cleanup levels. In addition, the powered fans have not operated continuously, so air is not being injected to increase the DO levels. Since DO is required for effective biodegradation of benzene and ethylbenzene, it may take additional time before this area is ready to transition to MNA, particularly give the likely water table rise during the El Nino storms expected in late winter and spring. In addition, the potential for rebound should be considered – long-term monitoring will be necessary to ensure that rebound does not occur.

Site 14: Although there are no changes in site conditions, conditions have not been improved and concentrations of contaminants have not been reduced at some well locations as expected within the estimated time frame stated in the ROD. An evaluation will be needed to re-assess the current remedy for Site 14.

Site 16: As long as the future use remains commercial/industrial, recreational, and open space, I don't have any concerns about this site.

Site 17: Although the remedial action for Site 17 was conducted according to the original ROD (2006), the Navy has acknowledged there are potential discrete radiological items might be encountered during the future dredging. An ESD and a LUC RD are being prepared to place an IC on future dredging to protect human health and the environment.

Sites 26 and 27: I think these sites are going well. I don't have any concerns about these sites.

Site 28: For this site, the copper concentrations in well 28SW02 remain high, at nearly 40 times the RG. (RG=3.1 ug/L, Spring 2013 concentration was 120 ug/L).

Since April 2011, have there been any complaints, violations, or other incidents related to Alameda Point and FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: As far as EPA is aware, there have not been any complaints, violations, or other incident related to Alameda Point and FISCA sits named above that required a response by EPA.

Are you aware of any community concerns regarding implementation of the remedies at Alameda Point and FISCA sites named above? If so, please give details.

Response: The community had concerns at IR Site 2 regarding the vegetation cover. Monitoring and prompt removal of undesirable plants, particularly Tobacco trees, should be conducted.

EPA is aware that the community is also concerned that sea level rise will affect the remedies at both Sites 1 and 2. Sea-level rise has been considered in the remedial designs for both Sites 1 and 2, and it is part of the long term maintenance of the coastal margin.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at Alameda Point and FISCA sites named above? If so, please give details.

Response: Site 1: Groundwater monitoring in the ISCO treatment area will determine whether additional ISCO is necessary.

Site 2: Monitoring the depression area is needed after significant rain storms to determine if ponding has occurred. Additional soil and grading may be necessary.

Site 6 groundwater remedy: The BCT was not given the opportunity to review the optimization plan before it was implemented. The BCT should be involved prior to any further decisions about Site 6.

Site 14: Groundwater remedy needs to be evaluated because injections were insufficient to lower concentrations to the levels required before initiation of MNA. The Navy proceeded to MNA, but concentrations did not decrease within the expected timeframe at some locations. However, this is not remedy failure, but failure to properly implement the remedy. Note that the injection wells were removed without BCT approval and that the BCT recommended that additional injections be done in areas where concentrations remain elevated, but this was not done.

Do you have any suggestions for changes in how monitoring of the remedies at Alameda Point and FISCA sites named above are being conducted?

Response: Long-term monitoring is needed at several sites to evaluate whether rebound occurs. In addition, the frequency of monitoring should be reviewed by the Regulatory Agencies before it is implemented. Changes to the Basewide Groundwater Monitoring Plan should be submitted to the Regulatory Agencies with sufficient time for review, comment, and responses prior to implementation of any changes.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at Alameda Point and FISCA sites named above?

Response: No.

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INTERVIEW RECORD
Alameda Point IR Sites 1, 2, 3, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, 28, FISCA, IR Site 02 Soil, and the Marsh Crust at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** October 22, 2015
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)

Individual Contacted:

Name: Doug DeLong	**Title:** Environmental Compliance	**Organization**: United States Navy Base Realignment and Closure (BRAC) Project Management Office (PMO)-West
Phone No: 415-743-4713 **Fax No:** 415-743-4700 **E-mail Address:** douglas.delong@nav.mil	**Street Address:** 1 Ave of the Palms, Suite-161 **City, State, Zip:** San Francisco, CA 94130	

Summary Of Conversation

Do you feel well informed about site activities at Alameda Point and FISCA sites named above?

Response: Yes, fully aware.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for Alameda Point and FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: No. No changes that I'm aware to the ARAR's.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the RODs for each of Alameda Point and FISCA sites named above?

Response: No.

Since April 2011, have there been any complaints, violations, or other incidents related to Alameda Point and FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: No.

Are you aware of any community concerns regarding implementation of the remedies at Alameda Point and FISCA sites named above? If so, please give details.

Response: No.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at Alameda Point and FISCA sites named above? If so, please give details.

Response: No, all seem to be working correctly.

Do you have any suggestions for changes in how monitoring of the remedies at Alameda Point and FISCA sites named above are being conducted?

Response: None.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at Alameda Point and FISCA sites named above?

Response: No.

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INTERVIEW RECORD
Alameda Point IR Sites 1, 2, 3, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, 28, FISCA, IR Site 02 Soil, and the Marsh Crust at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** December 15, 2015
Type: ☐ Telephone ☒ E-mail **Location of Visit:** NA	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)

Individual Contacted:

Name: James Fyfe	**Title:** Hazardous Substances Engineer	**Organization:** DSTC
Phone No: 510-540-3850 **Fax No:** 510-540-3819 **E-mail Address:** jfyfe@dtsc.ca.gov	**Street Address:** 700 Heinz Avenue **City, State, Zip:** Berkeley, CA 95710	

Summary Of Conversation

Do you feel well informed about site activities at Alameda Point and FISCA sites named above?

Response: Overall, I feel adequately informed about the listed sites. I feel better informed about the sites where active remediation has been completed only recently, is currently being completed, or if the sites have other issues. For sites with ongoing passive remediation, i.e., monitored natural attenuation (MNA) that has been determined to be "operating properly and successfully" (OPS), I typically receive updates whenever significant changes at the site occur. I also get annual reports on groundwater monitoring (via Annual Groundwater Monitoring Reports) and compliance with Institutional Controls (ICs).

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for Alameda Point and FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: To the best of my knowledge, there have been no new scientific findings related to potential risks that might call into question the protectiveness of the remedies for Alameda Point. There have been no changes to ARARs.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the RODs for each of Alameda Point and FISCA sites named above?

Response: While dredging portions of Seaplane Lagoon during remediation of IR Site 17, some discrete radioactively contaminated devices were discovered in the dredged sediments. Similar devices are thought to be scattered throughout the lagoon in as-yet un-dredged area of the lagoon. While not a significant health risk when left in place, their disturbance during future dredging operations may cause difficulty in disposing of the dredge spoils. As a result, a ROD ESD is being prepared to address that issue.

Since April 2011, have there been any complaints, violations, or other incidents related to Alameda Point and FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: There were no complaints, violations, or other incidents related to the subject sites requiring a response by DTSC.

Are you aware of any community concerns regarding implementation of the remedies at Alameda Point and FISCA sites named above? If so, please give details.

Response: The revegetation for IR Site 2 did not go according to the Remedial Design/Remedial Action Work Plan. The Restoration Advisory Board (RAB) expressed concern that the invasive plants that were covering the site would get established and revegetation with the appropriate native species would not occur. The DON is working to remove the invasive species and plans to try to revegetate with native species. The RAB continues to be skeptical.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at Alameda Point and FISCA sites named above? If so, please give details.

Response: I have no suggestions at this time.

Do you have any suggestions for changes in how monitoring of the remedies at Alameda Point and FISCA sites named above are being conducted?

Response: I have no suggestions at this time.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at Alameda Point and FISCA sites named above?

Response: I have no additional comments, concerns, or suggestions at this time.

INTERVIEW RECORD
Alameda Point IR Sites 1, 2, 3, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, 28, FISCA, IR Site 02 Soil, and the Marsh Crust at Alameda Point, Alameda, California

Subject: Five-Year Review Interview	**Time:** NA	**Date:** January 12, 2016
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)

Individual Contacted:

Name: Dr. Peter Russell, Ph.D., P.E.	**Title:** Principal	**Organization**: Russell Resources, Inc. / Alameda Re-Use and Redevelopment Authority
Phone No: 415-902-3123 **Fax No:** 815-572-8600 **E-mail Address:** peter@russellresources.com	**Street Address:** 440 Nova Albion Way **City, State, Zip:** San Rafael, CA 94903	

Summary Of Conversation

Do you feel well informed about site activities at Alameda Point and FISCA sites named above?

Response: Yes, in general. The BCT copies me on most of the documents and correspondence. I am included in many of the CERCLA-related discussions, at BCT meeting, RAB meetings, and ad hoc.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for Alameda Point and FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: No.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the RODs for each of Alameda Point and FISCA sites named above?

Response: Site 17: During the remedial action for Seaplane Lagoon, in the dredged sediment the Navy's contractor discovered 51 small, discrete items that had traces of radioluminescent

paint. The occurrence of these items is a changed condition that is not explicitly included in the conceptual site model for the IR Site 17. The BCT is currently preparing an Explanation of Significant (ESD) differences to expand the CERCLA decision to accommodate potential risks posed by these items.

All of the other listed sites: I am aware of no such changed conditions.

Since April 2011, have there been any complaints, violations, or other incidents related to Alameda Point and FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: None of which I am aware.

Are you aware of any community concerns regarding implementation of the remedies at Alameda Point and FISCA sites named above? If so, please give details.

Response: Community concerns, in general, revolve around removing contaminant residues to pre-Navy levels, revegetating remedial action areas with native plants exclusively, adequately considering the potential impact of seismic events on remedies, and adequately considering the potential impact of sea-level rise on remedies. In general, the Navy and the other BCT members suitably weigh these community concerns in CERCLA decision making.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at Alameda Point and FISCA sites named above? If so, please give details.

Response: I already share any such suggestions I have with the Navy and the other BCT members. For details, review the administrative record, especially BCT meeting minutes.

Do you have any suggestions for changes in how monitoring of the remedies at Alameda Point and FISCA sites named above are being conducted?

Response: The only suggestion I have concerns IR Site 17. The draft ESD and Land-Use Control Remedial Design (LUC RD) require annual inspections of the site. However, the remedy – that future dredging be conducted pursuant to a Sediment Management Plan that is acceptable to the Navy and the regulatory agencies – will not benefit from annual inspections. Inspections would be useful only if they discovered unexpected dredging activities. This is highly unlikely to be the case. Such inspections would be a wasteful expenditure of time and effort for the following reasons:

Dredging operations are not casual efforts, which might be undertaken without significant governmental notice and interaction. All dredging projects will be conducted only with City of Alameda permission and with permitting and oversight by the DMMO, the Corps of Engineers, the Water Board, and myriad other agencies. Thus, all dredging will be well-known to the City and the BCT before it occurs

Inspections would uncover no useful information, unless they happened to occur while an unpermitted dredging operation is in progress, a highly unlikely occurrence.

Seaplane Lagoon will be transferred to the City of Alameda, which is well aware of the applicable ICs, via the deed and otherwise, and will ensure that all dredging projects are

conducted in compliance with the LUC RD's IC. Thus, inspection by the City of its own property (Seaplane Lagoon) for prohibited activities (dredging), which only the City could conduct is unnecessary.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at Alameda Point and FISCA sites named above?

Response: No.

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INTERVIEW RECORD
Alameda Point IR Sites 1, 2, 3, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, 28, FISCA, IR Site 02 Soil, and the Marsh Crust at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** December 28, 2015
Type: ☐ Telephone ☒ U.S. Mail **Location of Visit:** NA	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)

Individual Contacted:

Name: George Humphreys	**Title:** Restoration Advisory Board (RAB) Member	**Organization:** Alameda Point RAB
Phone No: 510-521-2380 **Fax No:** None **E-mail Address:** None	**Street Address:** 25 Captains Drive **City, State, Zip:** Alameda, CA 94502	

Summary Of Conversation

Do you feel well informed about site activities at Alameda Point and FISCA sites named above?

Response: Alameda Point – reasonably well informed. FISCA – except for IFSCA/OU-5, RAB has not been kept up to date, although NAS Alameda RAB was supposed to have taken over duties of FISCA RAB. Jim Sweeney is only person who was on both RABs.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for Alameda Point and FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: No, but RAB is not kept advised of ARARs or Records of Decisions (RODs). Closure of IR Sites 1, and 2 does not meet current state standards for landfills.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the RODs for each of Alameda Point and FISCA sites named above?

Response: IR Site 2 – erosion of landfill slopes that occurred under last year's meager rainfall (i.e., drought).

Since April 2011, have there been any complaints, violations, or other incidents related to Alameda Point and FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: Newspaper articles imply that IR Site 25 will be transferred without restrictions other than Marsh Crust Ordinance. At both IR Sites 25, and portion of 35, occupied by housing collaborative, soil around and under houses, around trees, under roads was never tested for polycyclic aromatic hydrocarbons (PAHs). Even though other soil in area had to be excavated, RAB was previously told there would be institutional controls (ICs), note this is not Marsh Crust Ordinanace, which is at greater depth.

Are you aware of any community concerns regarding implementation of the remedies at Alameda Point and FISCA sites named above? If so, please give details.

Response: The community, as a whole, is blissfully unaware of cleanup. They are relying on regulators, the City, and the Navy to protect them.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at Alameda Point and FISCA sites named above? If so, please give details.

Response: See comment 4.
IR Site 25 should have IC requiring testing of soil under and around building, trees and under roads. Comtaminated soil should be excavated and disposed of properly at an offsite location. Previously remediated areas should have prohibition against digging deeper than 4 feet (2 feet replaced + 2 feet averaged). This is in addition to the Marsh Crust Ordinance.

Do you have any suggestions for changes in how monitoring of the remedies at Alameda Point and FISCA sites named above are being conducted?

Response: Sampling of groundwater concentrations at IR Sites with remediated groundwater plumes [eg; IR Sites 1, 6, 7, 26, (OU-2B), OU-5, IR Site 25] whould occur immediately after a significant earthquake (eg; Napa or larger) to assure that deeper contaminants at IR Site 25, and OU-2B have not migrated upward. Note that IR Site 25 and OU-2B have not been and will not be treated for deeper contamination. Testing should not be a year later.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at Alameda Point and FISCA sites named above?

Response: In general, the Navy and regulators have relied too much on dilution to solve contamination problems. Dilution may be either actual or by calculation. Examples of actual dilution would be solvent plumes at IR Sites 1, 2, and OU-2B, where plumes were allowed to flow unabated for up to 15 years into the Bay. Sampling was avoided a the point of entry into the Bay at IR Site 1. The plum was originally flowing around a sheet pile barrier in a boomerang shape. Later, just before treatment, the plume shape narrowed to an arrow directed at the "Gate" in the Funnel and Gate. This incicates the gate was opend to direct the plume into the Bay.

Another problem is that of background levels. Cleanup is to a certain concentration above "background", in the case of radium and arsenic, contamination is so wide-spread that "background" is somewhat elevated.

Specific Problems

<u>IR Site 1</u>

Inadequate protection against burrowing animals. The cover is 3 feet thick, but cracks 18 inches deep can open due to liquefaction.
There is no rodent barrier as at IR Site 2
The 3 feet cover is inadequate because squirrels dig "several" feet (i.e., 2 to 3 feet)
Gophers dig food chambers and nest as deep as 6 feet. Other animals such as skunks and rabbits can burrow deeper than 3 feet.
Most of the waste cells tested by trenching had radioactivity.
Observers will have to test materials brought to the surface for radioactive and other contaminants.
Rodenticides will poison raptors, other wildlife and endanger children and pets.
Waste Isolation Bulkhead (WIB) must be kept in pure tension. The asymmetry of seismic impingement will put bending or torsion into portions of the barrier, as seismic waves hit the wall at different times. Note the WIB is curved, not straight.
Offshore lead (IR Site 29) may be ground up and carried ashore by storm waves.

<u>IR Site 2</u>

The roadbase for the original road on the landfill berm was sandblasting grit that contained excessive levels of tributyl tin, that was used to protect ships from barnacles. Sampling showed no benthic invertebrates in sediments in the north and south ponds. This could have been caused by tributyl tin. Construction to reduce the slope of the landfill bulldozed tributyl tin contamination along the slopes, making it difficult or impossible to remediate.

<u>IR Site 3</u>

There is cobalt contamination left under a building where the main street (Appezzato Blvd) will be constructed. ICs should require excavation and removal of this cobalt contamination.

<u>IR Site 14</u>

Calculational dilution was used by averaging contamination over a larger area of the site.

IR Site 17

A "Site Occupancy Factor" of 1/10, was used for Least Terns. This permits concentration levels 10 times higher. This says levels this high are okay anywhere and everywhere in the world, where wildlife will be. The same approach was used elsewhere at near shore NAS sites, where Least Terns feed (e.g; IR Sites 1, 2, 14, 15, 20, 24, and 33). If this 1/10 factor had not been used, essentially the whole Seaplane Lagoon would have had to be cleaned up. This approach of dilution is what got us into trouble with dichlorodiphenyltrichloroethane (DDT), and polychlorinated biphenyls (PCBs).

IR Site 25

The hot spot near the college of Alameda and homes near 3rd Street and Tinker was not cleaned up. The hotspot was said to have "disappeared", or was an "anomaly". There was a nearby large excavation for a storm water pumping station. Records of groundwater sampling from the pit under a National Pollution Discharge and Elimination System (NPDES) permit were lost when the Water Board transferred from hard copies to digital records.

Higher precipitation years (el nino) may bring contamination nearer the surface. Cleanup of the benzene/naphthalene was done during drought years of extremely low groundwater. Some RAB members are aware that contractors hauled away contaminated soil from a former FISCA warehouse along the Stargell Avenue alignment, but were not told what the contamination was or where it went. Also, burning of the former hospital on FISCA, near where "Target" was constructed, left asbestos, lead and other contamination, no information on the cleanup was given to RAB. New construction of "Target", stores and apartmens was supposed to have vapor barriers and ventilation like that at Shinsei Gardens. Again, RAB has had no confirmation that this was done.

INTERVIEW RECORD
Alameda Point IR Sites 1, 2, 3, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, 28, FISCA, IR Site 02 Soil, and the Marsh Crust at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** December 8, 2015
Type: ☐ Telephone ☒ E-mail **Location of Visit:** NA	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)

Individual Contacted:

Name: Yemia Hashimoto	**Title:** Project Manager	**Organization**: San Francisco Regional Water Quality Control Board (Water Board)
Phone No: 510-622-2756 **Fax No:** **E-mail Address:** yemia.hashimoto@waterboards.ca.gov	**Street Address:** 1515 Clay Street **City, State, Zip:** Oakland, CA 94612	

Summary Of Conversation

Do you feel well informed about site activities at Alameda Point and FISCA sites named above?

Response: Yes, I am well informed. There are monthly BCT meetings and opportunities between meetings to correspond with BRAC team members.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for Alameda Point and FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: Yes. IR Site 13 contains a site with an historical refinery waste management unit of tarry refinery waste (TRW). It was closed under CERCLA based on the petroleum being co-located with some CERCLA contamination. Based on our recent review, the HHRA conducted for IR Site 13 did not specifically address risks associated with waste management unit of TRW. Instead, a HHRA for IR Site 13 averaged the data for TRW area across the 17.5 acres of IR Site 13.

The IR Site 13 ROD and FOST specified that after transfer to the City of Alameda, that the Water Board reserved its right to continue regulating the site. Since the site transferred, Water Board staff have been working with the City of Alameda to investigate paths forward to ensure that the nuisance associate with TRW is safely managed into the future. However, at this time, it appears that the risk assessment completed may not have been appropriate for a waste management unit and there may be risk, as well as nuisance, associated with the waste. In addition, it appears that the impacts to groundwater from the TRW may not have been effectively evaluated.

As we move forward with additional site evaluation, we may uncover additional information. At this time, the parcels containing TRW are open cases being regulated by the Water board.

Yes, the role of two ARARs have changed as documented in ESDs to the Site 16 ROD. In the Site 16 ESD to the ROD, two chemical-specific ARARs do not apply as remedial goals but serve as termination criteria for the permanent ICs. The two chemical-specific ARARs that will apply as IC termination criteria are:

Federal-Safe Drinking Water Act (42 United States Code [USC], Chapter 6A, Sections 300[f]–300[j]-26)b – National primary drinking water standards are health-based standards for public water systems (MCLs) 40 CFR Section 141.61(a); and
Cal/EPA Department of Toxic Substances Control-California Code Regulations Title 22 Section 64444 (state MCL list for sources of drinking water).

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the RODs for each of Alameda Point and FISCA sites named above?

Response: To my knowledge there have not been any impacts to the protectiveness of the remedies selected in the RODs. I have been the Water Board caseworker for Alameda Point NAS since November 2014.

Since April 2011, have there been any complaints, violations, or other incidents related to Alameda Point and FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: During a Site 1 inspection on March 13, 2015, Water Board staff noted three site conditions that were out of compliance for storm water requirements. These issues were addressed quickly and the site documented as having complied by April 2015. I am unaware of any additional incidents during the time I have been the caseworker (November 2014 to present).

Are you aware of any community concerns regarding implementation of the remedies at Alameda Point and FISCA sites named above? If so, please give details.

Response: The community (via RAB meetings) voiced concerns regarding the re-vegetation of IR Sites 1 and 2 and the Tarry Refinery Waste (TRW) remaining at IR Site 13.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at Alameda Point and FISCA sites named above? If so, please give details.

Response: No.

Do you have any suggestions for changes in how monitoring of the remedies at Alameda Point and FISCA sites named above are being conducted?

Response: No.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at Alameda Point and FISCA sites named above?

Response: Aside from the concerns regarding the Tarry Refinery Waste, per item 2 above, there are no additional comments at this time.

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INTERVIEW RECORD
Alameda Point IR Sites 1, 2, 3, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, 28, FISCA, IR Site 02 Soil, and the Marsh Crust at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** December 29, 2015
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)

Individual Contacted:

Name: Henry Wong	**Title:** RPM	**Organization:** DTSC
Phone No: 510-540-3770 **Fax No:** **E-mail Address:** hwong@dtsc.ca.gov	**Street Address:** 700 Heinz Avenue **City, State, Zip:** Berkeley, CA 94710	

Summary Of Conversation

Do you feel well informed about site activities at the former FISCA sites named above?

Response: DTSC was well informed about the site activities at the subject FISCA sites.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for the former FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: Except for the institutional control remedy for marsh crust as discussed below, there was no scientific finding that relate to potential site risks and that might call into question the protectiveness of the remedies for the subject FISCA sites. There was no change to ARARs upon which the FISCA remedy decisions were based.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the Remedial Action Plan (RAP) for each of the FISCA sites named above?

Response: There was no change in site condition that may negatively impact the protectiveness of the remedies in the decision documents for the subject FISCA sites.

Since April 2011, have there been any complaints, violations, or other incidents related to the FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: There was no complaint and violation related to the subject FISCA site.

During grading activities of FISCA IR Site 02 Soil in January 2014, the developer Catellus discovered two single-walled steel underground storage tanks (UST) of approximately 2,500 gallons and 3,000 gallons presumably containing petroleum fuel. Catellus removed the USTs pursuant to the Alameda County Department of Environmental Health's permit number SR0024324. A total of approximately 5,400 gallons of non-hazardous waste liquid was transported under Non-Hazardous Waste Manifests for off-site management. Catellus removed the USTs, excavated adjacent soil for offsite disposal, and backfilled the area under the Regional Water Quality Control Board's (RWQCB), ACDEH's, and DTSC's oversight.

Confirmation soil analytical results were below hazardous waste levels, U.S. EPA's RSLs, and RWQCB's ESLs for all chemicals with the exception of select polycyclic aromatic hydrocarbons, which were detected within historical ranges in commercial areas of the Alameda Landing Redevelopment Project. Consequently, RWQCB issued a No Further Action letter on May 29, 2014 for the UST removal activity at FISCA IR Site 02.

Are you aware of any community concerns regarding implementation of the remedies at the FISCA sites named above? If so, please give details.

Response: DTSC is not aware of any community concerns regarding implementation of the remedies at the subject FISCA sites.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at the FISCA sites named above? If so, please give details.

Response: In February 2001, the Navy, U.S EPA, RQWCB, and DTSC approved the Remedial Action Plan/Record of Decision for the Marsh Crust at the Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex and for the Marsh Crust and Former Subtidal Area at Alameda Point. This decision document selected a 3-tier institutional control remedy for marsh crust and former subtidal area consisting of (a) the 2/15/00 Marsh Crust Ordinance 2824 enacted by the City of Alameda, (b) the 7/17/00 Covenant to Restrict Use of Property between DTSC and the City of Alameda, and (c) the 7/17/00 Environmental Restrictions in Deed with the City of Alameda. Compliance of the Marsh Crust Ordinance 2824 is location specific based on threshold depths as depicted in the marsh crust map available in the City of Alameda's website.

Marsh crust threshold depths vary from approximately 18 feet to 2 feet, or shallower at certain areas, below the existing ground surface. The Ordinance 2824 map defines areas with shallow threshold depths as "applies to excavation deeper than mean higher high tide." This description is not readily comprehensible to the general public. DTSC is concerned that implementation of the institutional control remedy for marsh crust and former subtidal area would be ineffective at areas with shallow threshold depths because the requirements are unclear.

Do you have any suggestions for changes in how monitoring of the remedies at the FISCA sites named above are being conducted?

Response: To ensure implementation of the institutional control remedy, DTSC suggests preparation of maps showing marsh crust threshold depths that are easy to understand. DTSC requests maps showing marsh crust threshold depths with contour lines based on feet below current ground surface. Since ground surface elevations may change as needed, maps showing marsh crust threshold elevations with contour lines relative to the Alameda Datum are also necessary.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at the FISCA sites named above?

Response: DTSC has contracted with a vendor for notification of planned activities that may involve restricted ground intrusion activities. Often time property owners were planning to conduct utility maintenance, tree planting, swimming pool construction, etc., without first checking with the City of Alameda on whether Ordinance 2824 is applicable. The effectiveness of the institutional control remedy is questionable because property owners may neither be aware of the marsh crust excavation permit requirements nor cognizant of the marsh crust threshold depths at the job sites.

To ensure that the land use restrictions and Ordinance 2824 requirements are being clearly communicated, DTSC suggests mailing a fact sheet to all property owners, homeowner associations, and occupants at the marsh crust and former subtidal areas informing the institutional control remedy, marsh crust threshold depths, and Ordinance 2824 permit requirements.

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INTERVIEW RECORD Base-wide Groundwater at Alameda Point, Alameda, California		
Subject: Five Year Review Interview	**Time:** NA	**Date:** October 22, 2015
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	
Contact Made By:		
Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)
Individual Contacted:		
Name: Kevin Olness	**Title:** Project Manager	**Organization:** AMEC Foster Wheeler, Inc.
Phone No: 412-446-3171 **Fax No:** **E-mail Address:** kevin.olness@amecfw.com	**Street Address:** 9210 Sky Park Court **City, State, Zip:** San Diego, CA, 92123	

Summary Of Conversation

Do you feel well informed about site activities at the former FISCA sites named above?

Response: Yes.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for the former FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: No. No changes in ARARs that I'm aware of.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the Remedial Action Plan (RAP) for each of the FISCA sites named above?

Response: No.

Since April 2011, have there been any complaints, violations, or other incidents related to the FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: No.

Are you aware of any community concerns regarding implementation of the remedies at the FISCA sites named above? If so, please give details.

Response: No.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at the FISCA sites named above? If so, please give details.

Response: Not at this time.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at the FISCA sites named above?

Response: No.

INTERVIEW RECORD
IR Site 1 at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** October 22, 2015
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	
Contact Made By:		
Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)
Individual Contacted:		
Name: Philip Stearns	**Title:** Senior Project Manager	**Organization:** AMEC Foster Wheeler, Inc.
Phone No: 724-504-1732 **Fax No:** **E-mail Address:** philip.stearns@amecfw.com	**Street Address:** 800 North Bell Ave. **City, State, Zip:** Carnegie, PA 15106	

Summary Of Conversation

Do you feel well informed about site activities at the former FISCA sites named above?

Response:

Yes. As the Project Manager, I was involved in every discussion regarding the AmecFW efforts and I was physically on site throughout the RA implementation, so I interfaced with Navy and city personnel routinely.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for the former FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response:

No. I still fully agree that the remedy recently implemented remains protective. There have been no changes to the ARARs upon which the remedy decisions were made.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the Remedial Action Plan (RAP) for each of the FISCA sites named above?

Response: No. There have been no changes to the site conditions that would impact the protectiveness of the remedy selected and revised in the ROD, ROD Amendment, and ESD.

Since April 2011, have there been any complaints, violations, or other incidents related to the FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: No. There have been no complaints, violations or other incidents.

Are you aware of any community concerns regarding implementation of the remedies at the FISCA sites named above? If so, please give details.

Response: No. There have been no community concerns that were brought to my attention.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at the FISCA sites named above? If so, please give details.

Response: No. I continue to believe that the remedy selected was the best one and that it has been implemented correctly. I have no additional suggestions.

Do you have any suggestions for changes in how monitoring of the remedies at the FISCA sites named above are being conducted?

Response: Amec Foster Wheeler is preparing the Draft Final Operations Maintenance and Monitoring Plan at present that details our recommended suggestions for monitoring of the remedy. It will be issued in the coming months.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at the FISCA sites named above?

Response: No.

INTERVIEW RECORD
IR Sites 1 & 2 at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** January 14, 2016
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	
Contact Made By:		
Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)
Individual Contacted:		
Name: Suman Sharma	**Title:** Project Manager	**Organization:** Oneida Total Integrated Enterprises
Phone No: 510-260-6463 **Fax No:** **E-mail Address:** ssharma@otie.com	**Street Address:** 1777 N. California Blvd., Suite 310 **City, State, Zip:** Walnut Creek, CA 94596	

Summary Of Conversation

Do you feel well informed about site activities at the former FISCA sites named above?

Response: Yes, I'm well informed about IR Sites 1 and 2, Operation and Maintenance.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for the former FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: Sanberg-OTIE team has been managing O&M activities at Site 2 landfill since October 2014. OTIE received Site 1 landfill O&M contact in September 2015, and has been preparing planning documents. OTIE team is not aware of new scientific findings related to potential site risks that can impact protectiveness of the remedies at Site 2 landfill. OTIE is not in a position to answer technical questions on Site 1 landfill.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the Remedial Action Plan (RAP) for each of the FISCA sites named above?

Response: OTIE team is not aware of any site conditions that may impact protectiveness of the selected remedies in the ROD for Site 2. OTIE is not in a position to answer technical questions on Site 1 landfill.

Since April 2011, have there been any complaints, violations, or other incidents related to the FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: OTIE team is not aware of any complaints, violations, or other incidents for Site 2 since September 2014. OTIE is not in a position to answer above question for Site 1 landfill.

Are you aware of any community concerns regarding implementation of the remedies at the FISCA sites named above? If so, please give details.

Response: OTIE team is not aware of any community concerns regarding implementation of the remedies at Site 2 since September 2014. OTIE is not in a position to answer above question for Site 1 landfill.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at the FISCA sites named above? If so, please give details.

Response: O&M per approved plans.

Do you have any suggestions for changes in how monitoring of the remedies at the FISCA sites named above are being conducted?

Response: O&M per approved plans.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at the FISCA sites named above?

Response: None.

INTERVIEW RECORD
IR Site 2 at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** December 8, 2015
Type: ☐ Telephone ☒ E-mail **Location of Visit:** NA	☐ Incoming ☒ Outgoing	

Contact Made By:

Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)

Individual Contacted:

Name: Ray Seamons	**Title:** Project Manager	**Organization:** Tetra Tech EC, Inc.
Phone No: 510-523-1582 **Fax No:** **E-mail Address:** ray.seamons@tetratech.com	**Street Address:** 399 West Seaplane Lagoon **City, State, Zip:** Alameda, CA 94501	

Summary Of Conversation

Do you feel well informed about site activities at the former FISCA sites named above?

Response: Not well informed but somewhat informed.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for the former FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: Not to my knowledge.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the Remedial Action Plan (RAP) for each of the FISCA sites named above?

Response: No. If anything actions are being taken to strengthen the protectiveness.

Since April 2011, have there been any complaints, violations, or other incidents related to the FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: None.

Are you aware of any community concerns regarding implementation of the remedies at the FISCA sites named above? If so, please give details.

Response: I am not aware of any community concerns regarding implementation of the remedy at IR Site 2.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at the FISCA sites named above? If so, please give details.

Response: In my opinion the Navy and regulatory agencies have selected a remedy that addresses all human health and environmental risks.

Do you have any suggestions for changes in how monitoring of the remedies at the FISCA sites named above are being conducted?

Response: I believe the monitoring plan currently in place is sufficient.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at the FISCA sites named above?

Response: None.

INTERVIEW RECORD
IR Site 3 at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** December 8, 2015
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	
Contact Made By:		
Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)
Individual Contacted:		
Name: Lucas Goldstein	**Title:** Project Manager	**Organization:** Arcadis
Phone No: 510-596-9535 **Fax No:** **E-mail Address:** lucas.goldstein@arcadis.com	**Street Address:** **City, State, Zip:**	

Summary Of Conversation

Do you feel well informed about site activities at the former FISCA sites named above?

Response: Yes.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for the former FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: No.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the Remedial Action Plan (RAP) for each of the FISCA sites named above?

Response: No.

Since April 2011, have there been any complaints, violations, or other incidents related to the FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: No.

Are you aware of any community concerns regarding implementation of the remedies at the FISCA sites named above? If so, please give details.

Response: No.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at the FISCA sites named above? If so, please give details.

Response: No.

Do you have any suggestions for changes in how monitoring of the remedies at the FISCA sites named above are being conducted?

Response: No.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at the FISCA sites named above?

Response: No.

INTERVIEW RECORD
IR Site 16 at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** January 13, 2016
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	
Contact Made By:		
Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)
Individual Contacted:		
Name: Curtis Moss	**Title:** Project Manager	**Organization:** AMEC Foster Wheeler
Phone No: 858-869-7548 **Fax No:** **E-mail Address:** curtis.moss@amecfw.com	**Street Address:** 9177 Sky Park Ct **City, State, Zip:** San Diego, CA 92123	

Summary Of Conversation

Do you feel well informed about site activities at the former FISCA sites named above?

Response: Yes.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for the former FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: No new scientific findings.

Yes. The ARARs related to Site 16 groundwater being used as drinking water source, and all other human domestic residential uses have been removed per the Exception to Drinking Water Policy.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the Remedial Action Plan (RAP) for each of the FISCA sites named above?

Response: No.

Since April 2011, have there been any complaints, violations, or other incidents related to the FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response: No.

Are you aware of any community concerns regarding implementation of the remedies at the FISCA sites named above? If so, please give details.

Response: No.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at the FISCA sites named above? If so, please give details.

Response: No. The ROD ESD is nearly final, which selects long term ICs prohibiting residential use as the remaining existing remedy. A draft LUC RD is being developed to document the change in nature of the ICs form short-term (interim) to long term ICs.

Do you have any suggestions for changes in how monitoring of the remedies at the FISCA sites named above are being conducted?

Response: Since the site is safe for current use and planned future use (i.e. commercial use), groundwater monitoring should be minimized, and at the discretion of the Navy whether to be conducted, to reduce the cost to tax payers. At most, sampling should occur once every five years to inform the five year review.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at the FISCA sites named above?

Response: I commend the Navy for reassessing the site post-ROD after the changes in groundwater designation and reassessing site risk to ensure the site is protective, while not spending funds needlessly.

INTERVIEW RECORD
Alameda Point IR Sites 1, 2, 3, 6, 9, 13, 14, 16, 17, 19, 25, 26, 27, 28, FISCA, IR Site 02 Soil, and the Marsh Crust at Alameda Point, Alameda, California

Subject: Five Year Review Interview	**Time:** NA	**Date:** January 6, 2016
Type: ☐ Telephone ☒ E-mail **Location of Visit:**	☐ Incoming ☒ Outgoing	
Contact Made By:		
Name: Jeremiah Santini	**Title:** Project Manager	**Organization:** Sealaska Technical Services, LLC. (STS)
Individual Contacted:		
Name: Susan Galleymore	**Title:** Restoration Advisory Board (RAB) Member	**Organization**: Alameda Point RAB
Phone No: 210-752-7994 **Fax No:** **E-mail Address:** sgalleymore@hotmail.com	**Street Address:** **City, State, Zip:**	

Summary Of Conversation

Do you feel well informed about site activities at Alameda Point and FISCA sites named above?

Response: Along with the rest of the RAB, I try to stay well informed. Since the meetings were changed from monthly to every 2 or 3 months, it has become more difficult to stay current.

To the best of your knowledge, since April 2011, have there been any new scientific findings that relate to potential site risks and that might call into question the protectiveness of the remedies for Alameda Point and FISCA sites named above? Have there been any changes to the ARARs upon which the remedy decisions were based?

Response: No findings that I know of (also not my area of expertise). RAB is not advised on ARARs. I understand though, that closure of Sites 1 & 2 does not meet current CA state standards for landfills.

Are you aware of any changes in site conditions that you feel may impact the protectiveness of the remedies selected in the RODs for each of Alameda Point and FISCA sites named above?

Response: It will be interesting to see how recent (and ongoing?) severe drought conditions and now, current El Nino rainfall will impact outer west sites (1 & 2 along with WIB). A non-natural / built environment is likely to undergo more stress than a natural environment. Additionally, I suspect that,

over time, Sites 1 & 2 will be impacted by sea level rise at which time the ground will be far more wet or inundated. I suspect that contaminants currently covered over might migrate into the bay. I understand the need to balance current technology with current finances, but...(why do today what you can put off until tomorrow when it will be someone else's problem?)

Since April 2011, have there been any complaints, violations, or other incidents related to Alameda Point and FISCA sites named above that required a response by your office? If so, please provide details of the events and results of the responses.

Response:

Why is the City of Alameda acting as if the contaminants in the OU 2 region are minor and that the most important thing is to get residences and businesses built before there's even a complete ROD? Other than Marsh Crust ordinance, what other restrictions will be transferred? , e.g. what of Sites 25 and 35?
There must be strict transparency regarding ICs and these should also be released to developers, realtors, and any potential residents who request them.

Are you aware of any community concerns regarding implementation of the remedies at Alameda Point and FISCA sites named above? If so, please give details.

Response: The community seems to have the idea that "the Navy know best" and that "the Navy wouldn't do anything out of the ordinary." The RAB and other community action groups have held public meetings to disseminate info but... ,for the most part, only the whacky community members attend, and monopolize the conversation while the rest stay home and watch TV.

Do you have any suggestions regarding implementation of the remedies (including institutional controls) at Alameda Point and FISCA sites named above? If so, please give details.

Response: Educate, educate, educate. It is tough to know how to educate but, since those coming to live and work on Al. Point will, for the most part, NOT be Alameda residents, there needs to be, as stated above, strict transparency regarding ICs that must also be released to developers, realtors, and any potential residents who request them.

Do you have any suggestions for changes in how monitoring of the remedies at Alameda Point and FISCA sites named above are being conducted?

Response: No comment.

Do you have any other comments, concerns, or suggestions regarding the effectiveness of the cleanup measures implemented so far in protecting human health and the environment at Alameda Point and FISCA sites named above?

Response: The WIB is expensive and is probably vulnerable to certain types of earthquakes. If it is damaged in a quake or even by a combo or quake and water action, how will 'damage' be evaluated before the WIB is restored? (It is 'holding back' an enormous amount of contamination and it is unlikely that a structure in its particular situation will last 'forever'.

I"m concerned, too, that the ICs are insufficiently strong -- particularly given that the city's response to the Point is, "hand it over, the sooner the better, "we" want it 'Now", even if ICs are not fully implement.

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Appendix D
Review of ARARS

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OPERABLE UNIT 1, INSTALLATION RESTORATION SITES 6 AND 16
ARARS IDENTIFIED IN 2007 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
GROUNDWATER - FEDERAL			
Safe Drinking Water Act (42 U.S.C., chapter 6A, § 300[f]–300[j]-26)			
National primary drinking water standards are health-based standards for public water systems.	40 CFR § 141.61(a)	The DON has identified the federal MCLs for PCE and TCE as ARARs for groundwater in the first water bearing zone at IR Sites 6 and 16.	No substantive changes identified that could affect protectiveness of human health and the environment. The federal MCLs for the COCs have not changed.
Resource Conservation and Recovery Act (42 U.S.C. chapter 82 §§ 6901 – 6991[i])			
Groundwater protection standards: ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed the concentration limits for chemicals of concern in the uppermost aquifer underlying the waste management area of concern at the point of compliance.	Cal. Code Regs. tit. 22, § 66264.94, except 66264.94(a)(2) and 66264.94(b)	The DON has determined that a concentration limit greater than background, but not greater than MCLs, is the relevant and appropriate standard.	No substantive changes identified that could affect protectiveness of human health and the environment.
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Authorizes the SWRCB and the Water Board to establish beneficial uses and numerical and narrative standards to protect the beneficial uses. Authorizes Water Board to issue permits for discharges that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, Division. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter- Cologne Water Quality Control Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Describes the water basins in the San Francisco Bay Region; establishes beneficial uses of groundwater and surface water; establishes water quality objectives, including narrative and numerical standards; and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin, Chapters 2 and 3 (Cal. Water Code §13240)	The DON accepted the substantive requirements pertaining to beneficial uses and water quality objectives as state ARARs for groundwater at IR Sites 6 and 16. The DON identified MCLs as chemical-specific ARARs for IR Sites 6 and 16. The DON determined that state MCLs for cis-1,2-DCE and vinyl chloride are more stringent than the federal MCLs for cis-1,2-DCE and vinyl chloride. Therefore, the DON identified the state MCLs for these chemicals. In addition, no federal MCL is available for 1,4- DCB, so the DON has also identified the state MCL for 1,4-DCB.	No substantive changes identified that could affect protectiveness of human health and the environment.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids is greater than 3,000 parts per million, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonable be treated for domestic use using either best management practices or best economically achievable treatment practices.	SWRCB Res. 88- 63	The DON is protecting and restoring groundwater in the FWBZ at IR Sites 6 and 16 as potential drinking water sources and so has identified federal and state MCLs as chemical-specific ARARs for IR Sites 6 and 16. The DON may revise this determination should additional information about the unsuitability of the groundwater for use as a drinking water source be obtained.	No substantive changes identified that could affect protectiveness of human health and the environment.
Cal/EPA Department of Toxic Substances Control			
State MCL list	Cal. Code Regs. tit. 22 § 64444	The DON identified MCLs as chemical-specific ARARs for IR Sites 6 and 16. The DON determined that state MCLs for cis-1,2-DCE and vinyl chloride are more stringent than the federal MCLs for cis-1,2-DCE and vinyl chloride. Therefore, the DON identified the state MCLs for these chemicals. In addition, no federal MCL is available for 1,4- DCB, so the DON has also identified the state MCL for 1,4-DCB.	No substantive changes identified that could affect protectiveness of human health and the environment. The state MCLs for the COCs have not changed.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
National Historic Preservation Act of 1966, as Amended (54 U.S.C. §§ 300101-307108)			
Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	54 U.S.C §§ 3001-307108 36 CFR part 800	The DON has determined that Building 41 at IR Site 6 and Building 114 at IR Site 8 are eligible for inclusion on the National Register of Historic Places as part of the Alameda Point historic district. The selected soil and groundwater remedial actions for IR Sites 6 and 16 will not adversely affect these buildings.	In December 2014, the National Historic Preservation Act of 1966 (previously located at 16 U.S.C. §§ 470-470x)) was moved to title 54 of the U.S.C. The Act was moved almost in its entirety, with only non-substantive changes; the requirements and the programs remained the same. Therefore, no substantive changes identified that could affect protectiveness of human health and the environment.
Coastal Zone Management Act (16 U.S.C. §§ 1451 – 1465)			
Conduct activities in a manner consistent with approved state management programs.	16 U.S.C § 1456(c) 15 CFR § 930	The DON is complying with the state coastal zone management program ARARs identified below.	No substantive changes identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated “take,” which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point. The DON evaluated the habitat at these OU-1 sites and determined that there is no habitat suitable for migratory birds. Therefore, the DON has complied with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
LOCATION-SPECIFIC ARARs			
STATE			
McAteer-Petris Act (California Government Code §§66600 through 66661)			
Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	McAteer-Petris Act at Government Code §§ 66650-66661 San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	The remedial actions selected in this ROD are in compliance with the substantive purposes of the San Francisco Bay Plan.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Groundwater – Operation of ISCO and Accelerated Bioremediation Treatment Systems			
FEDERAL			
Safe Drinking Water Act (42 U.S.C., ch. 6A, § 300[f]–300[j]-26)			
The Underground Injection Control program prohibits injection activities that allow movement of chemicals into underground sources of drinking water that may result in violations of MCLs or adversely affect human health.	40 CFR § 144.12, excluding the reporting requirements in § 144.12(b) and 144.12(c)(1)	The remedy included constructing injection wells for the ISCO and accelerated bioremediation treatment systems. These wells are considered Class V wells under these regulations. The injection of treatment chemicals will not cause the groundwater in the FWBZ to at IR Sites 6 and 16 to violate MCLs or adversely affect human health.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes were identified that could affect protectiveness of human health and the environment.
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, Sections 6901-6991[i])[a]			
Waste containers handling, storing, and disposing of hazardous waste.	Cal. Code Regs. tit. 22, § 66264.171, 66264.172, 66264.173, 66264.174 66264.175(a) and (b) 66264.178	The DON generated waste in construction of the ISCO and/or accelerated bioremediation components of the groundwater remedy. If additional waste is generated, the DON will place this waste in containers and characterize it for proper off-site disposal.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Groundwater – Monitoring			
FEDERAL			
These regulations require the identification of constituents of concern expected to be in the groundwater and monitoring points for each regulated unit, and contain general water quality monitoring requirements.	Cal. Code Regs. tit. 22, § 66264.93 Cal. Code Regs. tit. 22, § 66264.95(a) and (b) Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (b)(1)(B), (b)(1)(C), (b)(1)(D)(1), (b)(1)(D)(2), (b)(2), (b)(4) through (b)(7), (e)(6), (e)(12)(A), (e)(12)(B), (e)(13), and (e)(15)	These sections are ARARs for groundwater monitoring.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Groundwater – Monitoring			
FEDERAL			
These regulations contain requirements for detection monitoring, evaluation monitoring, and corrective action monitoring.	Cal. Code Regs. tit. 22, § 66264.98 (e)(1) through (5), (i), (j), (k)(1) through (3), (k)(4)(A), (k)(4)(D), (k)(5), (k)(7)(C), (k)(7)(D), (n)(1), (n)(2)(B), and (n)(2)(C) Cal. Code Regs. tit. 22, § 66264.99(e)(1) through (6), (f)(3), and (g) Cal. Code Regs. tit. 22, § 66264.100(d)	These sections are ARARs for groundwater monitoring.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Groundwater – Monitoring			
STATE			
For compliance demonstration, each COC "(1) must have remained at or below its respective concentration limit during a proof period of at least one year...and (2) the individual sampling events for each Monitoring Point must have been evenly distributed throughout the proof period and have consisted of no less than eight sampling events per year per Monitoring Point."	Cal. Code Regs. tit. 27, §20430(g)(2)	The substantive requirements in this state ARAR are relevant and appropriate to determining when corrective action monitoring is no longer required.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, including a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at Cal. Health and Safety Code § 25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to temporarily restrict the uses of IR Sites 6 and 16. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
Prohibits certain uses of land containing hazardous substances without a specific variance.	Cal. Health and Safety Code § 25232(b)(1)(A) through (E)	Cal. Health and Safety Code § 25232(b) contained actual land use prohibitions for certain uses (i.e., residences, hospitals for humans, schools, and daycare centers).	Cal. Health and Safety Code § 25232(b)(1)(A) through (E) was repealed in 2012. This does not affect the protectiveness of human health and the environment because the DON has restrictions in the LIFOC and will place appropriate land use restrictions in the transfer documents if necessary.
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223 (formerly codified at Cal. Health and Safety Code § 25233)	Cal. Health and Safety Code § 25223 contained criteria for obtaining variances from uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.	Cal. Health and Safety Code § 25233 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25223. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224 (formerly codified at Cal. Health and Safety Code § 25234)	Cal. Health and Safety Code § 25224 sets forth the relevant and appropriate substantive criteria for the removal of a land-use restriction on the grounds that "… the waste creates a significant existing or potential hazard to present or future public health or safety."	Cal. Health and Safety Code § 25234 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25224. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment

Requirement	Citation	Comments	Current Status
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will include a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.
Institutional Controls			
STATE			
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
Cal.	California
Cal. Code Regs.	California Code of Regulations
CFR	Code of Federal Regulations
COC	Chemical of concern
DCB	Dichlorobenzene
DCE	Dichloroethene
DON	U.S. Department of the Navy
DTSC	California Department of Toxic Substances Control
IC	Institutional control
IR	Installation Restoration
ISCO	In situ chemical oxidation
LIFOC	Lease in Furtherance of Conveyance
MCL	Maximum contaminant level
NPDES	National pollutant discharge elimination system
OU	Operable unit
PCE	Tetracholoroethene
RCRA	Resource Conservation and Recovery Act
Res.	Resolution
ROD	Record of Decision
SWRCB	State Water Resources Control Board
TCE	Trichloroethene
U.S.C.	United States Code

OPERABLE UNIT 1, INSTALLATION RESTORATION SITE 14
ARARS IDENTIFIED IN 2007 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
GROUNDWATER - FEDERAL			
Resource Conservation and Recovery Act (42 U.S.C. chapter 82 §§ 6901 – 6991[i])			
Groundwater protection standards: ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed the concentration limits for chemicals of concern in the uppermost aquifer underlying the waste management area of concern at the point of compliance.	Cal. Code Regs. tit. 22, §66264.94, except 66264.94(a)(2) and 66264.94(b)	The DON has determined that a concentration limit greater than background based on potential vapor intrusion risk is the relevant and appropriate standard.	No substantive changes identified that could affect protectiveness of human health and the environment.
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Authorizes the SWRCB and the Water Board to establish in water quality control plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes Water Board to issue permits for discharges to land or surface or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, Division. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Water Quality Control Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.
Describes the water basins in the San Francisco Bay Region; establishes beneficial uses of groundwater and surface water; establishes water quality objectives, including narrative and numerical standards; and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin, Chapters 2 and 3 (Cal. Water Code §13240)	The DON accepted the substantive requirements pertaining to beneficial uses (except the domestic and municipal supply beneficial use designation) and water quality objectives as state ARARs for groundwater at IR Site 14.	No substantive changes identified that could affect protectiveness of human health and the environment.
CHEMICAL-SPECIFIC ARARS			

Requirement	Citation	Comments	Current Status
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids is greater than 3,000 parts per million, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonable be treated for domestic use using either best management practices or best economically achievable treatment practices.	SWRCB Res. 88- 63	The DON and the Water Board have concluded that the groundwater at IR Site 14 is not a current or potential source of drinking water.	No substantive changes identified that could affect protectiveness of human health and the environment.
LOCATION-SPECIFIC ARARs			
FEDERAL			
Coastal Zone Management Act (16 U.S.C. §§ 1451 – 1465)			
Conduct activities in a manner consistent with approved state management programs.	16 U.S.C § 1456(c) 15 CFR § 930	The DON is complying with the state coastal zone management program ARARs identified below.	No substantive changes identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated “take,” which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point. The DON evaluated the habitat at IR Site 14 and determined that there is no habitat suitable for migratory birds. In addition, migratory birds will not be exposed to contaminated groundwater and the ongoing remediation will not affect them. Therefore, the DON has complied with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
LOCATION-SPECIFIC ARARs			
STATE			

Requirement	Citation	Comments	Current Status
McAteer-Petris Act (California Government Code §§66600 through 66661)			
Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	The remedial actions selected in this ROD are in compliance with the substantive purposes of the San Francisco Bay Plan.	No substantive changes identified that could affect protectiveness of human health and the environment.
ACTION-SPECIFIC ARARs			
Groundwater – Construction and Operation of ISCO Treatment Systems			
FEDERAL			
Safe Drinking Water Act (42 U.S.C., chapter 6A, § 300[f]–300[j]-26)			
The Underground Injection Control program prohibits injection activities that allow movement of chemicals into underground sources of drinking water that may result in violations of MCLs or adversely affect human health.	40 CFR § 144.12, excluding the reporting requirements in § 144.12(b) and 144.12(c)(1)	The injection well (or wells) for this alternative are considered a Class V well under these regulations. Groundwater at IR Site 14 is not a current or potential source of drinking water. Therefore, the injection of treatment chemicals will not cause the groundwater at IR Site 14 to violate MCLs or adversely affect human health. In addition, the injection of treatment chemicals will not cause groundwater that is a potential source of drinking water to violate MCLs.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes were identified that could affect protectiveness of human health and the environment.
Resource Conservation and Recovery Act (42 U.S.C., chapter 82, Sections 6901-6991[i])[a]			
Person who generates waste shall determine if the waste is a RCRA hazardous waste.	California Code Regs., tit. 22, §§ 66262.10(a), 66262.11	This requirement is applicable for any operation that generates waste. Construction of the ISCO treatment system will generate waste. The DON will characterize this waste in compliance with these regulations for proper off-site disposal.	Groundwater remediation is ongoing therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Groundwater – Construction and Operation of ISCO Treatment Systems			
FEDERAL			
Requirement for analyzing waste to determine whether waste is hazardous.	California Code Regs., tit. 22, § 66264.13(a) and (b)	This requirement is applicable for any operation that generates waste. Construction of the ISCO treatment system will generate waste. The DON will characterize this waste in compliance with these regulations for proper off-site disposal.	Groundwater remediation is ongoing therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	California Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	The DON will determine if the waste generated in construction of the ISCO treatment system meets the definition of a RCRA hazardous waste.	Groundwater remediation is ongoing therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
On-site hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers or tanks, on drip pads, inside buildings, is labeled and dated, etc.	California Code Regs., tit. 22, § 66262.34	If the DON determines that the waste generated in construction of the ISCO treatment system is RCRA hazardous waste, the DON will comply with this requirement and dispose of the RCRA waste off site prior to 90 days.	Groundwater remediation is ongoing therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Waste containers for handling, storing, and disposing hazardous waste.	Cal. Code Regs. tit. 22, § 66264.171, 66264.172, 66264.173, 66264.174 66264.175(a) and (b) 66264.178	The DON generated waste in construction of the ISCO and/or accelerated bioremediation components of the groundwater remedy. If additional waste is generated, the DON will place this waste in containers and characterize it for proper off-site disposal.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Groundwater – Monitoring			
FEDERAL			
These regulations require the identification of constituents of concern expected to be in the groundwater and monitoring points for each regulated unit, and contain general water quality monitoring requirements.	Cal. Code Regs. tit. 22, § 66264.93 Cal. Code Regs. tit. 22, § 66264.95(a) and (b) Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (b)(1)(B), (b)(1)(C), (b)(1)(D)(1), (b)(1)(D)(2), (b)(2), (b)(4) through (b)(7), (e)(6), (e)(12)(A), (e)(12)(B), (e)(13), and (e)(15)	These sections are ARARs for groundwater monitoring.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
These regulations contain requirements for detection monitoring, evaluation monitoring, and corrective action monitoring.	Cal. Code Regs. tit. 22, § 66264.98 (e)(1) through (5), (i), (j), (k)(1) through (3), (k)(4)(A), (k)(4)(D), (k)(5), (k)(7)(C), (k)(7)(D), (n)(1), (n)(2)(B), and (n)(2)(C) Cal. Code Regs. tit. 22, § 66264.99(e)(1) through (6), (f)(3), and (g) Cal. Code Regs. tit. 22, § 66264.100(d) and (g)(1)	These sections are ARARs for groundwater monitoring.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs In the transfer documents, including a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at §25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to temporarily restrict the uses of IR Site 14. No substantive changes identified that could affect protectiveness of human health and the environment
Prohibits certain uses of land containing hazardous substances without a specific variance.	Cal. Health and Safety Code § 25232(b)(1)(A) through (E)	Cal. Health and Safety Code § 25232(b) contained actual land use prohibitions for certain uses (i.e., residences, hospitals for humans, schools, and daycare centers).	Cal. Health and Safety Code § 25232(b)(1)(A) through (E) was repealed in 2012. This does not affect the protectiveness of human health and the environment because the DON has ICs in the LIFOC that control site uses and will place appropriate land use restrictions in the transfer documents if necessary.
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223 (formerly codified at Cal. Health and Safety Code § 25233)	Cal. Health and Safety Code § 25223 contained criteria for obtaining variances from uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.	Cal. Health and Safety Code § 25233 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25223. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224 (formerly codified at Cal. Health and Safety Code § 25234)	Cal. Health and Safety Code § 25224 sets forth the relevant and appropriate substantive criteria for the removal of a land-use restriction on the grounds that "… the waste creates a significant existing or potential hazard to present or future public health or safety."	Cal. Health and Safety Code § 25234 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25224. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will include a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section	IR	Installation Restoration
§§	Sections	ISCO	In situ chemical oxidation
ARAR	Applicable or relevant and appropriate requirement	LIFOC	Lease in Furtherance of Conveyance
Cal.	California	NPDES	National pollutant discharge elimination system
Cal. Code Regs.	California Code of Regulations	RCRA	Resource Conservation and Recovery Act
CFR	Code of Federal Regulations	Res.	Resolution
DON	U.S. Department of the Navy	ROD	Record of Decision
DTSC	California Department of Toxic Substances Control	SWRCB	State Water Resources Control Board
IC	Institutional control	U.S.C.	United States Code

OPERABLE UNIT 2A, INSTALLATION RESTORATION SITES 9, 13, AND 19
ARARS IDENTIFIED IN 2012 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
GROUNDWATER - FEDERAL			
Resource Conservation and Recovery Act (42 U.S.C. chapter 82 §§ 6901 – 6991[i])			
Groundwater protection standards: ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed the concentration limits for chemicals of concern in the uppermost aquifer underlying the waste management area of concern at the point of compliance.	Cal. Code Regs. tit. 22, § 66264.94, except 66264.94(a)(2) and 66264.94(b)	The DON has determined that a concentration limit greater than background, but not greater than MCLs, is the relevant and appropriate standard for IR Site 13 groundwater.	No substantive changes identified that could affect protectiveness of human health and the environment.
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Authorizes the SWRCB and the Water Board to establish beneficial uses and numerical and narrative standards to protect the beneficial uses. Authorizes Water Board to issue permits for discharges that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, Division. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter- Cologne Water Quality Control Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Describes the water basins in the San Francisco Bay Region; establishes beneficial uses of groundwater and surface water; establishes water quality objectives, including narrative and numerical standards; and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin	The DON accepted the substantive requirements pertaining to beneficial uses (except as the MUN beneficial use) and water quality objectives (except as applied to the MUN beneficial use designation) as state ARARs for groundwater at OU-2A.	No substantive changes identified that could affect protectiveness of human health and the environment.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids is greater than 3,000 parts per million, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonable be treated for domestic use using either best management practices or best economically achievable treatment practices.	SWRCB Res. 88- 63	The DON and the Water Board have determined that the groundwater at OU-2A is not a current or potential source of drinking water.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
National Historic Preservation Act of 1966, as Amended (54 U.S.C. §§ 300101-307108)			
Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	54 U.S.C §§ 3001-307108 36 CFR part 800	The Navy has concluded that none of the buildings in this OU are included as part of the historic district. Therefore, the remedial action is in compliance with this ARAR.	In December 2014, the National Historic Preservation Act of 1966 (previously located at 16 U.S.C. §§ 470-470x)) was moved to title 54 of the U.S.C. The Act was moved almost in its entirety, with only non-substantive changes; the requirements and the programs remained the same. Therefore, no substantive changes identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point. The DON evaluated the habitat at OU-2A and determined it has limited habitat for ecological receptors is barren, or urban, habitat and offers little value to ecological receptors. The DON concluded that there were no potential risks to ecological receptors that required further evaluation or mitigation.	No substantive changes identified that could affect protectiveness of human health and the environment.
ACTION-SPECIFIC ARARs			
Groundwater –ISB/MNA/ICs			
FEDERAL			
Requires continued monitoring until the regulated unit has been in compliance with the water quality protection standard for a period of 3 consecutive years and all waste, waste residues, contaminated subsoils, and other contaminated geologic materials are removed or decontaminated at closure.	California Code Regs. tit. 22, § 66264.90(c)	This section is ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore this ARAR was reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
This regulation requires a monitoring and response program for waste disposal units.	Cal. Code Regs. tit. 22, § 66264.91(a)(4) and (c)	This section is an ARAR for groundwater monitoring.	Groundwater monitoring is ongoing; therefore this ARARs was reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
These regulations require the identification of constituents of concern expected to be in the groundwater and contain general water quality monitoring requirements.	Cal. Code Regs. tit. 22, § 66264.93 Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (b)(1)(D)(1) and (2), (b)(4) through (b)(7), (e)(6), (e)(12)(A), (e)(12)(B), (e)(13), and (e)(15)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
These regulations contain requirements for detection monitoring	Cal. Code Regs. tit. 22, § 66264.98 (e)(1) through (5), (i), (j), (k)(1) through (3), (k)(4)(A), (k)(4)(D), (k)(5), (k)(7)(C), (k)(7)(D), (n)(1), (n)(2)(B), and (n)(2)(C)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
These regulations require corrective action monitoring to determine the effectiveness of corrective action measures.	Cal. Code Regs. tit. 22, § 66264.100(a), (d), and (g)(1)	These sections are ARARs for groundwater monitoring	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has entered into a covenant to restrict the use of property with DTSC that has been recorded in the title record for Alameda County. The DON will included the same provisions in the quitclaim deed when it transfers the property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has entered into a covenant to restrict the use of property with DTSC that has been recorded in the title record for Alameda County. The DON will included the same provisions in the quitclaim deed when it transfers the property.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at Cal. Health and Safety Code § 25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has entered into a covenant to restrict the use of property with DTSC that has been recorded in the title record for Alameda County. The DON will included the same provisions in the quitclaim deed when it transfers the property.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to temporarily restrict land and resource uses of IR Sites 9, 13, and 19. No substantive changes identified that could affect protectiveness of human health and the environment.
Prohibits certain uses of land containing hazardous substances without a specific variance.	Cal. Health and Safety Code § 25232(b)(1)(A) through (E)	Cal. Health and Safety Code § 25232(b) contained actual land use prohibitions for certain uses (i.e., residences, hospitals for humans, schools, and daycare centers).	Cal. Health and Safety Code § 25232(b)(1)(A) through (E) was repealed in 2012. This does not affect the protectiveness of human health and the environment because the DON has appropriate restrictions in the covenant to restrict the use of property and will place appropriate restrictions in the quitclaim deed.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223 (formerly codified at Cal. Health and Safety Code § 25233)	Cal. Health and Safety Code § 25223 contained criteria for obtaining variances from uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.	Cal. Health and Safety Code § 25233 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25223. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224 (formerly codified at Cal. Health and Safety Code § 25234)	Cal. Health and Safety Code § 25224 sets forth the relevant and appropriate substantive criteria for the removal of a land-use restriction on the grounds that "… the waste creates a significant existing or potential hazard to present or future public health or safety."	Cal. Health and Safety Code § 25234 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25224. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will include a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1(a), (d), and (e)(1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section	IC	Institutional control
§§	Sections	IR	Installation Restoration
ARAR	Applicable or relevant and appropriate requirement	NPDES	National pollutant discharge elimination system
Cal.	California	OU	Operable unit
Cal. Code Regs.	California Code of Regulations	RCRA	Resource Conservation and Recovery Act
CFR	Code of Federal Regulations	SWRCB	State Water Resources Control Board
DON	U.S. Department of the Navy	Res.	Resolution
DTSC	California Department of Toxic Substances Control	ROD	Record of Decision

OPERABLE UNIT 2B, INSTALLATION RESTORATION SITE 3
ARARS IDENTIFIED IN 2015 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
National Historic Preservation Act of 1966, as Amended (54 U.S.C. § 300101-307108)			
Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	54 U.S.C. §§ 300101-307108 36 CFR part 800	. The Navy has concluded that none of the buildings in this OU are included as part of the historic district. Therefore, the remedial action is in compliance with this ARAR.	In December 2014, the National Historic Preservation Act of 1966 (previously located at 16 U.S.C. 470-470x) was moved to title 54 of the U.S.C. The Act was moved almost in its entirety, with only non-substantive changes; the requirements and the programs remained the same. Therefore, no substantive changes were identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point that are present or potentially present at OU-2B (which includes IR Site 3). The DON evaluated the habitat at OU-2B and concluded that there is limited habitat suitable for migratory birds and the remedial action did not affect them. Therefore, the DON has complied with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
Coastal Zone Management Act (16 U.S.C. §§ 1451 – 1465)			
Conduct activities in a manner consistent with approved state management programs.	16 U.S.C § 1456(c) 15 CFR § 930	The eastern portion of IR Site 3, where the ICs were placed for cobalt, is within approximately 500 feet of the Seaplane Lagoon. The placement of the ICs did not include any excavation, construction, or development in the coastal zone. The portions of IR Site 3 that were excavated for lead are outside the coastal zone.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
STATE			
McAteer-Petris Act (California Government Code §§66600 through 66661)			
Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	The San Francisco Bay Plan was not specifically identified in the ROD for OU-2B; however, the state coastal zone management program was discussed with the federal Coastal Zone Management Act (which requires compliance with an approved state coastal zone management program). Therefore, the San Francisco Bay Plan was reviewed. The remedial actions are in compliance with the substantive provisions of the San Francisco Bay Plan.	No substantive changes identified that could affect protectiveness of human health and the environment.
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. The DON will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
Institutional Controls			
STATE			
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. The DON will include appropriate ICs in the transfer	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
		documents, including a covenant to restrict the use of property.	
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure before the property transfers. The DON will include appropriate ICs in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure before the property transfers. The DON will include appropriate variance provisions in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure before the property transfers. The DON will include appropriate removal requirements in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure before the property transfers. The DON will include appropriate ICs in the transfer documents, which will include a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.
Institutional Controls			
STATE			
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to	Cal. Code Regs., tit. 22, § 67391.1(a) and (e)(1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure before the property transfers. The DON will include appropriate ICs in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.			

Notes:

§	Section	DTSC	California Department of Toxic Substances Control
§§	Sections	IC	Institutional control
ARAR	Applicable or relevant and appropriate requirement	IR	Installation Restoration
Cal.	California	LIFOC	Lease in Furtherance of Conveyance
Cal. Code Regs.	California Code of Regulations	OU	Operable unit
CFR	Code of Federal Regulations	ROD	Record of Decision
DON	U.S. Department of the Navy	U.S.C.	United States Code

OPERABLE UNIT 2B, INSTALLATION RESTORATION SITE 4
ARARS IDENTIFIED IN 2015 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
National Historic Preservation Act of 1966, as Amended (54 U.S.C. § 300101-307108)			
Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	54 U.S.C. §§ 300101-307108 36 CFR part 800	The Navy has concluded that none of the buildings in this OU are included as part of the historic district. Therefore, the remedial action is in compliance with this ARAR.	In December 2014, the National Historic Preservation Act of 1966 (previously located at 16 U.S.C. 470-470x) was moved to title 54 of the U.S.C. The Act was moved almost in its entirety, with only non-substantive changes; the requirements and the programs remained the same. Therefore, no substantive changes were identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point that are present or potentially present at OU-2B (which includes Site 4). The Navy evaluated the habitat at OU-2B and concluded that there is limited habitat suitable for migratory birds and the remedial action did not affect them. Therefore, the Navy has complied with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
Coastal Zone Management Act (16 U.S.C. §§ 1451 – 1465)			
Conduct activities in a manner consistent with approved state management programs.	16 U.S.C § 1456(c) 15 CFR § 930	Site 4 is not within the coastal zone. Therefore, the remedial action is in compliance with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The Navy accepted the substantive provisions as state ARARs for implementing the ICs. The Navy has ICs in the LIFOC as an interim measure before the property transfers. At the time of transfer, the Navy will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The Navy accepted the substantive provisions as state ARARs for implementing the ICs. The Navy has ICs in the LIFOC as an interim measure before the property transfers. At the time of transfer, the Navy will include appropriate ICs in the transfer documents, including a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223	The Navy accepted the substantive provisions as state ARARs for implementing the ICs. The Navy has ICs in the LIFOC as an interim measure before the property transfers. At the time of transfer, the Navy will include appropriate variance provisions in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224	The Navy accepted the substantive provisions as state ARARs for implementing the ICs. The Navy has ICs in the LIFOC as an interim measure before the property transfers. At the time of transfer, the Navy will include appropriate removal requirements in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The Navy accepted the substantive provisions as state ARARs for implementing the ICs. The Navy has ICs in the LIFOC as an interim measure before the property transfers. At the time of transfer, the Navy will include appropriate ICs in the transfer documents, which will include a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the Navy and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1(a) and (e)(1)	The Navy accepted the substantive provisions as state ARARs for implementing the ICs. The Navy has ICs in the LIFOC as an interim measure before the property transfers. At the time of transfer, the Navy will include appropriate ICs in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
Cal.	California
Cal. Code Regs.	California Code of Regulations
CFR	Code of Federal Regulations
DTSC	California Department of Toxic Substances Control
IC	Institutional control
LIFOC	Lease in Furtherance of Conveyance
OU	Operable unit
ROD	Record of Decision
U.S.C.	United States Code

OPERABLE UNIT 3, INSTALLATION RESTORATION SITE 1
ARARS IDENTIFIED IN 2009 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
SOIL - FEDERAL			
Toxic Substances Control Act (15 U.S.C., chapter 53, §§ 2601-2692)			
Regulates storage and disposal of PCB remediation waste. Any person wishing to sample, cleanup, or dispose of PCB remediation waste in a manner other than prescribed in 761.61(a) or (b) may apply for a risk-based disposal method.	40 CFR § 761.61(c)	The DON identified risk based PCB remediation goals protective of human health and the environment. Any PCBs remaining at IR Site 1 are under the soil cover.	No substantive changes identified that could affect protectiveness of human health and the environment.
GROUNDWATER - FEDERAL			
Resource Conservation and Recovery Act (42 U.S.C. chapter 82 §§ 6901 – 6991[i])			
Groundwater protection standards: ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed the concentration limits for chemicals of concern in the uppermost aquifer underlying the waste management area of concern at the point of compliance.	Cal. Code Regs. tit. 22, § 66264.94, except 66264.94(a)(2)	The DON has determined that a concentration limit greater than background based on protection of human health exposure to outdoor air and ecological receptors in San Francisco Bay is the relevant and appropriate standard.	No substantive changes identified that could affect protectiveness of human health and the environment.
Defines RCRA hazardous waste.	Cal. Code Regs. tit. 22, §§ 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	These sections are ARARs for characterizing waste.	Groundwater remediation is ongoing and additional waste may be generated. Therefore, these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARs			
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Authorizes the SWRCB and the Water Board to establish beneficial uses and numerical and narrative standards to protect the beneficial uses. Authorizes Water Board to issue permits for discharges that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, Division. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter- Cologne Water Quality Control Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.
Describes the water basins in the San Francisco Bay Region; establishes beneficial uses of groundwater and surface water; establishes water quality objectives, including narrative and numerical standards; and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin, Chapters 2 and 3 (Cal. Water Code §13240)	The DON accepted the substantive requirements pertaining to beneficial uses (except the municipal and domestic supply designation) and water quality objectives (except as apply to the municipal and domestic supply beneficial use) as state ARARs for groundwater at IR Site 1.	No substantive changes identified that could affect protectiveness of human health and the environment.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids is greater than 3,000 parts per million, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonable be treated for domestic use using either best management practices or best economically achievable treatment practices.	SWRCB Res. 88- 63	The DON and the Water Board have determined that the groundwater at IR Site 1 is not a current or potential future source of drinking water.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARs			
GROUNDWATER – STATE			
Defines designated waste, nonhazardous waste, and inert waste.	Cal. Code Regs. tit. 27, §§ 20210, 20220, and 20230	These sections are ARARs for characterizing waste.	Groundwater remediation is ongoing and additional waste may be generated. Therefore, these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
California Department of Toxic Substances Control			
Defines non-RCRA, state regulated hazardous waste.	Cal. Code Regs. tit. 22, § 66261.3(a)(2)(C) or (a)(2)(F), 66261.22(a)(3) and (4), 66261.24(a)(2) through (a)(8), 66261.101(a)(1) and (2)	These sections are ARARs for characterizing waste.	Groundwater remediation is ongoing and additional waste may be generated. Therefore, these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
CHEMICAL-SPECIFIC ARARs			
RADIOLOGICAL - FEDERAL			
Uranium Mill Tailings Radiation Control Act (42 U.S.C., chapter 23 enacting §§ 2022 and 2114 and amending §§ 2014, 2021, 2111, 2201 and 42 U.S.C. enacting chapter 88, §§ 7901-7942)			
In any occupied or habitable building, the objective of the remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 working level. In any case, the radon decay product concentration (including background) shall not exceed 0.03 working level. Provisions applicable to radon-222 shall also apply to radon-220.	40 CFR §§ 192.12(b)(1) and 192.41(b)	There are no buildings on IR Site 1 and no buildings are planned in the future. However, because the ICs do not prohibit the construction of all new buildings, these requirements are necessary. If buildings are constructed in the future, the transferee will address these requirements in documents provided to the DON, USEPA, and the State.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARs			
RADIOLOGICAL - FEDERAL			
Concentration limits for cleanup of gamma radiation in occupied or habitable buildings shall not exceed the background level by more than 20 microentgens per hour.	40 CFR § 192.12(b)(2)	There are no buildings on IR Site 1 and no buildings are planned in the future. However, because the ICs do not prohibit the construction of all new buildings, these requirements are necessary. If buildings are constructed in the future, the transferee will address these requirements in documents provided to the DON, USEPA, and the State.	No substantive changes identified that could affect protectiveness of human health and the environment.
Atomic Energy Act of 1954 (42 U.S.C. chapter 23 §§ 2011-2297h-13)			
Performance objectives for the land disposal of low level radioactive waste. Concentrations of radioactive material that may be released to the general environment must not result in an annual dose exceed 25 millirems to the body or any organ of a member of the general public.	10 CFR § 61.41	Radiological contamination may remain on IR Site 1 under the soil cover. However, after placement of cover and implementation of radiological remedy, concentrations of released radiological material will be less than an annual dose of 25 millirems to the body or any organ of a member of the general public.	No substantive changes identified that could affect protectiveness of human health and the environment.
Each licensee shall conduct operations so that: (1) the total effective dose equivalent to members of the public from the operation does not exceed .01 rem in a year; (2) the dose in any unrestricted area from external sources does not exceed 0.002 rem in any one hour.	10 CFR § 20.1301	Radiological contamination may remain on IR Site 1 under the multilayer soil cover. However, after placement of the cover and implementation of the radiological remedy, concentrations will be less than these dose limits.	No substantive changes identified that could affect protectiveness of human health and the environment.
CHEMICAL-SPECIFIC ARARs			
SURFACE WATER - FEDERAL			
Clean Water Act of 1977, as amended (33 U.S.C., chapter 26, §§ 1251-1387)			
Water quality standards in the California Toxics Rule	40 CFR §131.38	The DON identified surface water standards as ARARs for the discharge of contaminated groundwater to surface water. These ARARs will be met in the surface water at the interface of the groundwater and surface water.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARs			
SURFACE WATER - FEDERAL			
Water quality standards in the National Toxics Rule	40 CFR § 131.36(b)	The DON identified surface water standards as ARARs for the discharge of contaminated groundwater to surface water. These ARARs will be met in the surface water at the interface of the groundwater and surface water.	No substantive changes identified that could affect protectiveness of human health and the environment.
CHEMICAL-SPECIFIC ARARs			
SURFACE WATER – STATE			
State and Regional Water Quality Control Boards			
Authorized the SWRCB and RWQCB to establish in water quality control plans, beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes regional water boards to issue permits for discharges to land or surface water or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, division 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.
Describes the water basins in the San Francisco Bay Region, establishes beneficial uses of groundwater and surface water, establishes water quality objectives, including narrative and numerical standards, and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) chapter 2 and 3 (Cal. Water Code § 13240)	The DON accepted the numeric standard for arsenic in Table 3-3 of the Basin Plan for the surface water in the San Francisco Bay.	No substantive changes identified that could affect protectiveness of human health and the environment.
Requires analysis for each priority pollutant to determine if water-quality based effluent limitation is required. Provides effluent limitation development methodology.	Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Inland Surface Waters Plan SWRCB 2000a), §§ 1.3 and 1.4.	The DON accepted this policy for implementing the CTR and NTR surface water standards.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
National Historic Preservation Act of 1966, as Amended (54 U.S.C. §§ 300101-307108)			
Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	54 U.S.C §§ 3001-307108 36 CFR part 800	The DON has determined that portions of the historic Alameda Training Wall that runs along the entire northern side of IR Site 1 is eligible for inclusion on the National Register of Historic Places. The selected remedy for IR Site 1 will not adversely affect these buildings.	In December 2014, the National Historic Preservation Act of 1966 (previously located at 16 U.S.C. §§ 470-470x)) was moved to title 54 of the U.S.C. The Act was moved almost in its entirety, with only non-substantive changes; the requirements and the programs remained the same. Therefore, no substantive changes identified that could affect protectiveness of human health and the environment.
Executive Order No. 11990, Protection of Wetlands			
Federal agencies must minimize the destruction, loss, or degradation of wetlands.	Executive Order 11990 (formerly promulgated at 40 CFR § 6.302[a])	There are wetlands within and adjacent to IR Site 1. Approximately 2.1 acres of wetlands were disturbed by the remedial action. These will be replaced with high-quality wetlands outside of the cover. See also Clean Water Act location- and action-specific ARARs for wetlands.	No substantive changes identified in the executive order that could affect protectiveness of human health and the environment. The requirements pertaining to federal actions in wetlands promulgated in 40 CFR § 6.302(a) were repealed in 2007. This does not affect the protectiveness of the remedy because this regulatory provision did not contain any additional or different requirements than contained in the federal executive order or the location- and action-specific Clean Water Act wetland ARARs. So, compliance with the federal executive order and the location- and action-specific Clean Water Act ARARs results in compliance with this former regulatory provision.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
Clean Water Act of 1977, as amended (33 U.S.C. chapter 26, §§ 1251-1387)			
The discharge of dredged and fill material without a permit is prohibited.	33 U.S.C. § 1344 (§ 404)	There are wetlands within and adjacent to IR Site 1. Approximately 2.1 acres of wetlands were disturbed by the remedial action. These will be replaced with high-quality wetlands outside the cover. CERCLA § 121(e) exempts remedial actions conducted on-site from the requirement to obtain permits. Because the discharge into the wetlands occurred within a CERCLA site, the DON did not obtain a permit.	No substantive changes identified that could affect protectiveness of human health and the environment.
Coastal Zone Management Act (16 U.S.C. §§ 1451 – 1465)			
Conduct activities in a manner consistent with approved state management programs.	16 U.S.C § 1456(c) 15 CFR § 930	The DON is complying with the state coastal zone management program ARARs identified below.	No substantive changes identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated “take,” which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point and migratory birds could use the wetlands at IR Site 1 for nesting and foraging. The DON has complied with this ARAR during the remedial action.	No substantive changes identified that could affect protectiveness of human health and the environment.
Endangered Species Act of 1973 (16 U.S.C. §§ 1531-1543)			
Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat.	16 U.S.C. §§ 1536(a) and (h)(1)(B) and 1538(a)(1)(B) and (G)	The California clapper rail, a federal endangered species, is present or potentially present at IR Site 1. The remedial action will prevent exposure of listed species to contamination and the remedy was completed in a manner that did not result in a taking of any listed species and did not cause adverse modification of habitat.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
STATE			
McAteer-Petris Act (California Government Code §§66600 through 66661)			
Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	The remedial actions selected in this ROD are in compliance with the substantive purposes of the San Francisco Bay Plan.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Endangered Species Act (California Fish and Game Code §§ 2050-2116)			
No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof.	Cal. Fish and Game Code § 2080	The California black rail, a state threatened species, is present or potentially present at IR Site 1. The remedial action will prevent exposure of listed species to contamination and the remedy was completed in a manner that did not result in a taking of any listed species and did not cause adverse modification of habitat.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Fish and Game Code			
It is unlawful to take or possess fully protected birds.	Cal. Fish and Game Code § 3511	The California clapper rail, the California black rail, and the American peregrine falcon, state fully protected birds, are present or potentially present at IR Site 1. The remedial action will prevent exposure of fully protected birds to contamination and the remedy was completed in a manner that did not result in a taking of any fully protected bird or its habitat.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Landfill– Maintain Landfill and Soil Cover			
FEDERAL			
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, Sections 6901-6991[i])[a]			
Maintain the integrity and effectiveness of the final cover including making repairs to the cap as necessary to correct the effects of settling, subsidence, erosion, or other events throughout the postclosure period.	Cal. Code Regs. tit. 22, § 66264.310(b)(1)	This section is an ARAR for maintaining the soil cover.	No substantive changes identified that could affect protectiveness of human health and the environment.
Prevent the unknowing entry, and minimize the possibility for the unauthorized entry of persons or livestock onto the active portion of the facility.	Cal. Code Regs. tit. 22, § 66264.14(a)	The DON identified this as an ARAR for maintaining the landfill and the soil cover.	Maintenance of the cover is ongoing; therefore, this ARAR was reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Landfill– Maintain Landfill and Soil Cover			
STATE			
California Integrated Waste Management Board			
The operator shall ensure that landfill gases generated at a disposal IR Site are controlled. Methane must not exceed 1.25 percent by volume in air within on-site structures and concentrations of methane gas migrating from the disposal site must not exceed 5 percent by volume in air at the property boundary. Trace gases shall be controlled to prevent adverse acute and chronic exposure to toxic and/or carcinogenic compounds.	Cal. Code Regs. tit. 27 § 20921(a)(1), (2), and (3)	The DON identified this as an ARAR for maintaining the landfill and the soil cover.	Monitoring for landfill gas is ongoing; therefore these ARARs were reviewed to identify changes to could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Landfill– Maintain Landfill and Soil Cover			
STATE			
Diversion and drainage facilities shall be maintained to accommodate the anticipated volume of precipitation and peak flows. Collection and holding facilities associated with precipitation and drainage control systems shall be emptied immediately or otherwise managed to maintain system design capacity.	Cal. Code Regs. tit. 27, §§ 20365(c) and (d), 21090(c)(4), 21150	The DON identified this as an ARAR for maintaining the landfill and the soil cover.	Maintenance of the landfill is ongoing; therefore this ARAR was reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Landfill - Wetland Mitigation Plan			
FEDERAL			
Clean Water Act of 1977, as amended (33 U.S.C. chapter 26, §§ 1251-1387)			
The discharge of dredged and fill material without a permit is prohibited.	33 CFR § 320.4 and 40 CFR §§ 230.10, 230.11, 230.20-230.25, 230.31, 230.32, 230.41, 230.42, and 230.53	There are wetlands within and adjacent to IR Site 1. Approximately 2.1 acres of wetlands were disturbed by the remedial action. This loss will be mitigated by replacing the wetlands with high-quality wetlands outside the cover. CERCLA § 121(e) exempts remedial actions conducted on-site from the requirement to obtain permits. Because the discharge into the wetlands occurred within a CERCLA site, the DON did not obtain a permit.	No substantive changes identified that could affect protectiveness of human health and the environment.
Groundwater – Monitoring			
FEDERAL			
Person who generates waste shall determine if the waste is a RCRA hazardous waste.	California Code Regs., tit. 22, §§ 66262.10(a), 66262.11	This requirement is applicable for any operation that generates waste. Construction of the treatment system will generate waste. The DON will characterize this waste in compliance with these regulations for proper off-site disposal.	Groundwater remediation is ongoing and additional waste may be generated. Therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Groundwater – Monitoring			
FEDERAL			
Requirement for analyzing waste to determine whether waste is hazardous.	California Code Regs., tit. 22, § 66264.13(a) and (b)	This requirement is applicable for any operation that generates waste. Construction of the treatment system will generate waste. The DON will characterize this waste in compliance with these regulations for proper off-site disposal.	Groundwater remediation is ongoing and additional waste may be generated. Therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Waste containers for handling, storing, and disposing of hazardous waste.	Cal. Code Regs. tit. 22, § 66264.171, 66264.172, 66264.173, 66264.174 66264.175(a) and (b) 66264.178	The DON generated waste in construction of the ISCO treatment system. If additional waste is generated, the DON will place this waste in containers and characterize it for proper off-site disposal.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Requires continued monitoring until the regulated unit has been in compliance with the water quality protection standard for a period of three consecutive years and all waste, waste residues, contaminated subsoil, and all other contaminated geologic materials are removed or decontaminated at closure.	Cal. Code Regs. tit. 22, § 66264.90(c)(1) and (c)(2)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
These regulations require the identification of constituents of concern expected to be in the groundwater and contain general water quality monitoring requirements.	Cal. Code Regs. tit. 22, § 66264.93 Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (b)(1)(B), (b)(1)(C), (b)(1)(D)(1), (b)(1)(D)(2), (b)(2), (b)(4) through (b)(7), (e)(6), (e)(12)(A), (e)(12)(B), (e)(13), and (e)(15)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Groundwater – Monitoring			
FEDERAL			
These regulations contain requirements for detection monitoring, evaluation monitoring, and corrective action monitoring.	Cal. Code Regs. tit. 22, § 66264.98 (e)(1) through (5), (i), (j), (k)(1) through (3), (k)(4)(A), (k)(4)(D), (k)(5), (k)(7)(C), (k)(7)(D), (n)(1), (n)(2)(B), and (n)(2)(C) Cal. Code Regs. tit. 22, § 66264.99(b), (e)(1) through (6), (f)(3), and (g) Cal. Code Regs. tit. 22, § 66264.100(d) and (g)(1)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
At final closure, the groundwater monitoring system must be monitored and maintained.	Cal. Code Regs. tit. 22, § 66264.310(b)(3)	This section is an ARAR for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Groundwater – Monitoring			
STATE			
For compliance demonstration, each COC "(1) must have remained at or below its respective concentration limit during a proof period of at least one year...and (2) the individual sampling events for each Monitoring Point must have been evenly distributed throughout the proof period and have consisted of no less than eight sampling events per year per Monitoring Point."	Cal. Code Regs. tit. 27, §20430(g)(1)	The substantive requirements in this state ARAR are relevant and appropriate to determining when corrective action monitoring is no longer required.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure before the property transfers. At the time of transfer, the DON will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure before the property transfers. At the time of transfer, the DON will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at §25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. At the time of transfer, the DON will include appropriate ICs in a covenant to restrict the use of property.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to restrict the uses of IR Site 1.

Requirement	Citation	Comments	Current Status
			No substantive changes identified that could affect protectiveness of human health and the environment
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
Prohibits certain uses of land containing hazardous substances without a specific variance.	Cal. Health and Safety Code § 25232(b)(1)(A) through (E)	Cal. Health and Safety Code § 25232(b) contained actual land use prohibitions for certain uses (i.e., residences, hospitals for humans, schools, and daycare centers).	Cal. Health and Safety Code § 25232(b)(1)(A) through (E) was repealed in 2012. This does not affect the protectiveness of human health and the environment because the DON has restrictions in the LIFOC and will place appropriate land use restrictions in the quitclaim deed and covenant to restrict the use of property.
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223 (formerly codified at Cal. Health and Safety Code § 25233)	Cal. Health and Safety Code § 25223 contained criteria for obtaining variances from uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.	Cal. Health and Safety Code § 25233 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25223. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224 (formerly codified at Cal. Health and Safety Code § 25234)	Cal. Health and Safety Code § 25224 sets forth the relevant and appropriate substantive criteria for the removal of a land-use restriction on the grounds that "… the waste creates a significant existing or potential hazard to present or future public health or safety."	Cal. Health and Safety Code § 25234 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25224. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. The DON will include appropriate ICs in the covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs the LIFOC as an interim measure while remediation is ongoing and before the property transfers. The DON will include appropriate ICs in the quitclaim deed and covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
Cal.	California
Cal. Code Regs.	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
COC	Chemical of concern
DON	U.S. Department of the Navy
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
IC	Institutional controls
IR	Installation Restoration
LIFOC	Lease in Furtherance of Conveyance
NPDES	National pollutant discharge elimination system
PCB	Polychlorinated biphenyls
RCRA	Resource Conservation and Recovery Act
Res.	Resolution
ROD	Record of Decision
SWRCB	State Water Resources Control Board
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency

OPERABLE UNIT 4A, INSTALLATION RESTORATION SITE 2
ARARS IDENTIFIED IN 2010 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
GROUNDWATER - FEDERAL			
Resource Conservation and Recovery Act (42 U.S.C. chapter 82 §§ 6901 – 6991[i])			
Groundwater protection standards: ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed the concentration limits for chemicals of concern in the uppermost aquifer underlying the waste management area of concern at the point of compliance.	Cal. Code Regs. tit. 22, § 66264.94, except 66264.94(a)(2) and 66264.94(b)	The DON has determined that a concentration limit greater than background based on protection of ecological receptors in San Francisco Bay is the relevant and appropriate standard.	No substantive changes identified that could affect protectiveness of human health and the environment.
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Authorizes the SWRCB and the Water Board to establish beneficial uses and numerical and narrative standards to protect the beneficial uses. Authorizes Water Board to issue permits for discharges that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, Division. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter- Cologne Water Quality Control Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.
Describes the water basins in the San Francisco Bay Region; establishes beneficial uses of groundwater and surface water; establishes water quality objectives, including narrative and numerical standards; and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin, Chapters 2 and 3 (Cal. Water Code §13240)	The DON accepted the substantive requirements pertaining to beneficial uses (except the municipal and domestic supply designation) and water quality objectives (except as apply to the municipal and domestic supply beneficial use) as state ARARs for groundwater at IR Site 2.	No substantive changes identified that could affect protectiveness of human health and the environment.
CHEMICAL-SPECIFIC ARARS			

Requirement	Citation	Comments	Current Status
GROUNDWATER - STATE			
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids is greater than 3,000 parts per million, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonable be treated for domestic use using either best management practices or best economically achievable treatment practices.	SWRCB Res. 88- 63	The DON and the Water Board have determined that the groundwater at IR Site 2 is not a current or potential future source of drinking water.	No substantive changes identified that could affect protectiveness of human health and the environment.
CHEMICAL-SPECIFIC ARARs			
RADIOLOGICAL - FEDERAL			
Uranium Mill Tailings Radiation Control Act (42 U.S.C., chapter 23 enacting §§ 2022 and 2114 and amending §§ 2014, 2021, 2111, 2201 and 42 U.S.C. enacting chapter 88, §§ 7901-7942)			
In any occupied or habitable building, the objective of the remedial action shall be, and reasonable effort shall be made to achieve, an annual average (or equivalent) radon decay product concentration (including background) not to exceed 0.02 working level. In any case, the radon decay product concentration (including background) shall not exceed 0.03 working level. Provisions applicable to radon-222 shall also apply to radon-220.	40 CFR §§ 192.12(b)(1) and 192.41(b)	There are no buildings on IR Site 2 and no buildings are planned in the future. However, because the ICs do not prohibit the construction of all new buildings, these requirements are necessary. If buildings are constructed in the future, the transferee will address these requirements in documents provided to the DON, USEPA, and the State.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARs			
RADIOLOGICAL - FEDERAL			
Concentration limits for cleanup of gamma radiation in occupied or habitable buildings shall not exceed the background level by more than 20 microentgens per hour.	40 CFR § 192.12(b)(2)	There are no buildings on IR Site 2 and no buildings are planned in the future. However, because the ICs do not prohibit the construction of all new buildings, these requirements are necessary. If buildings are constructed in the future, the transferee will address these requirements in documents provided to the DON, USEPA, and the State.	No substantive changes identified that could affect protectiveness of human health and the environment.
Atomic Energy Act of 1954 (42 U.S.C. chapter 23 §§ 2011-2297h-13)			
Performance objectives for the land disposal of low level radioactive waste. Concentrations of radioactive material that may be released to the general environment must not result in an annual dose exceed 25 millirems to the body or any organ of a member of the general public.	10 CFR § 61.41	Radiological contamination may remain on IR Site 2 under the multilayer soil cover. However, after placement of cover and implementation of radiological remedy, concentrations of released radiological material will be less than an annual dose of 25 millirems to the body or any organ of a member of the general public.	No substantive changes identified that could affect protectiveness of human health and the environment.
Each licensee shall conduct operations so that: (1) the total effective dose equivalent to members of the public from the operation does not exceed .01 rem in a year; (2) the dose in any unrestricted area from external sources does not exceed 0.002 rem in any one hour.	10 CFR § 20.1301	Radiological contamination may remain on IR Site 2 under the multilayer soil cover. However, after placement of the cover and implementation of the radiological remedy, concentrations will be less than these dose limits.	No substantive changes identified that could affect protectiveness of human health and the environment.
CHEMICAL-SPECIFIC ARARs			
SURFACE WATER - FEDERAL			
Clean Water Act of 1977, as amended (33 U.S.C., chapter 26, §§ 1251-1387)			
Water quality standards in the California Toxics Rule	40 CFR §131.38	The DON identified surface water standards as ARARs for the discharge of contaminated groundwater to surface water. These ARARs will be met in the surface water at the interface of the groundwater and surface water.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARs			
SURFACE WATER - FEDERAL			
Water quality standards in the National Toxics Rule	40 CFR § 131.36(b)	The DON identified surface water standards as ARARs for the discharge of contaminated groundwater to surface water. These ARARs will be met in the surface water at the interface of the groundwater and surface water.	No substantive changes identified that could affect protectiveness of human health and the environment.
CHEMICAL-SPECIFIC ARARs			
SURFACE WATER – STATE			
State and Regional Water Quality Control Boards			
Authorized the SWRCB and RWQCB to establish in water quality control plans, beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes regional water boards to issue permits for discharges to land or surface water or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, division 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.
Describes the water basins in the San Francisco Bay Region, establishes beneficial uses of groundwater and surface water, establishes water quality objectives, including narrative and numerical standards, and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin (Basin Plan) chapter 2 and 3 (Cal. Water Code § 13240)	The DON accepted the substantive provision of chapters 2 and 3 for the surface water in the San Francisco Bay.	No substantive changes identified that could affect protectiveness of human health and the environment.
Requires analysis for each priority pollutant to determine if water-quality based effluent limitation is required. Provides effluent limitation development methodology.	Policy for Implementation of Toxic Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Inland Surface Waters Plan SWRCB 2000a), §§ 1.3 and 1.4.	The DON accepted this policy for implementing the CTR and NTR surface water standards.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
Executive Order No. 11990, Protection of Wetlands			
Federal agencies must minimize the destruction, loss, or degradation of wetlands.	Executive Order 11990 (formerly promulgated at 40 CFR § 6.302[a])	There are wetlands within IR Site 2. Approximately 3 acres of wetlands were disturbed by the remedial action. These were replaced with high-quality wetlands outside of the cover. See also Clean Water Act location- and action-specific ARARs for wetlands.	No substantive changes identified in the executive order that could affect protectiveness of human health and the environment. The requirements pertaining to federal actions in wetlands promulgated in 40 CFR § 6.302(a) were repealed in 2007. This does not affect the protectiveness of the remedy because this regulatory provision did not contain any additional or different requirements than contained in the federal executive order or the location- and action-specific Clean Water Act wetland ARARs. So, compliance with the federal executive order and the location- and action-specific Clean Water Act ARARs results in compliance with this former regulatory provision.
Clean Water Act of 1977, as amended (33 U.S.C. chapter 26, §§ 1251-1387)			
The discharge of dredged and fill material without a permit is prohibited.	33 U.S.C. § 1344 (§ 404)	There are wetlands within IR Site 2. Approximately 3 acres of wetlands were disturbed by the remedial action. These were replaced with high-quality wetlands outside the cover. CERCLA § 121(e) exempts remedial actions conducted on-site from the requirement to obtain permits. Because the discharge into the wetlands occurred within a CERCLA site, the DON did not obtain a permit.	No substantive changes identified that could affect protectiveness of human health and the environment.
Coastal Zone Management Act (16 U.S.C. §§ 1451 – 1465)			
Conduct activities in a manner consistent with approved state management programs.	16 U.S.C § 1456(c) 15 CFR § 930	The DON is complying with the state coastal zone management program ARARs identified below.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point and migratory birds could use the wetlands at IR Site 2 for nesting and foraging. The DON has complied with this ARAR during the remedial action.	No substantive changes identified that could affect protectiveness of human health and the environment.
Endangered Species Act of 1973 (16 U.S.C. §§ 1531-1543)			
Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat.	16 U.S.C. §§ 1536(a) and (h)(1)(B) and 1538(a)(1)(B) and (G)	The wetlands at IR Site 2 could be used by bird species that are listed as threatened or endangered. The remedial action will prevent exposure of listed species to contamination and the remedy was completed in a manner that did not result in a taking of any listed species and did not cause adverse modification of habitat.	No substantive changes identified that could affect protectiveness of human health and the environment.
LOCATION-SPECIFIC ARARs			
STATE			
McAteer-Petris Act (California Government Code §§66600 through 66661)			
Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	The remedial actions selected in this ROD are in compliance with the substantive purposes of the San Francisco Bay Plan.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Endangered Species Act (California Fish and Game Code §§ 2050-2116)			
No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof.	Cal. Fish and Game Code § 2080	Species listed as state threatened or endangered species may use the wetlands at IR Site 2. The remedial action will prevent exposure of state listed species to contamination and the remedy was completed in a manner that did not result in a taking of any state listed species or their habitat.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
STATE			
The department may authorize the take of a state listed or special status species if is incidental to otherwise lawful activity, the impacts are minimized and mitigated, the permit is consistent with other regulations; and there is adequate funding to implement the mitigation measures.	Cal. Fish and Game Code § 2081(b)	The remedial action did not include the intentional taking of a state listed species and was completed in a manner that did not result in a taking of any state listed species or their habitat.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Fish and Game Code			
It is unlawful to take or possess fully protected birds.	Cal. Fish and Game Code § 3511	The DON accepted the substantive provisions of Cal. Fish and Game Code § 3511 for the Savannah Sparrow. However, the Savannah Sparrow is not a state fully protected bird. The Savannah Sparrow is a state listed endangered bird and is protected under Cal. Fish and Game Code § 2080 (listed above).	No substantive changes identified that could affect protectiveness of human health and the environment.
ACTION-SPECIFIC ARARs			
Landfill– Maintain Landfill and Multilayer Soil Cover			
FEDERAL			
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, Sections 6901-6991[i])[a]			
Prevent the unknowing entry, and minimize the possibility for the unauthorized entry of persons or livestock onto the active portion of the facility.	Cal. Code Regs. tit. 22, § 66264.14(a)	The DON identified this as an ARAR for maintaining the landfill and the multilayer soil cover.	Maintenance of the cover is ongoing; therefore, this ARAR was reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Landfill– Maintain Multilayer Soil Cover			
STATE			
California Integrated Waste Management Board			
The operator shall ensure that landfill gases generated at a disposal site are controlled. Methane must not exceed 1.25 percent by volume in air within on-site structures and concentrations of methane gas migrating from the disposal site must not exceed 5 percent by volume in air at the property boundary. Trace gases shall be controlled to prevent adverse acute and chronic exposure to toxic and/or carcinogenic compounds.	Cal. Code Regs. tit. 27 § 20921(a)(1), (2), and (3)	The DON identified this as an ARAR for maintaining the landfill and the multilayer soil cover.	Monitoring for landfill gas is ongoing; therefore these ARARs were reviewed to identify changes to could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Landfill - Wetland Mitigation Plan			
FEDERAL			
Clean Water Act of 1977, as amended (33 U.S.C. chapter 26, §§ 1251-1387)			
The discharge of dredged and fill material without a permit is prohibited.	33 CFR § 320.4 and 40 CFR §§ 230.10, 230.11, 230.20-230.25, 230.31, 230.32, 230.41, 230.42, and 230.53	There are wetlands within IR Site 2. Approximately 3 acres of wetlands were disturbed by the remedial action. This loss was mitigated by replacing the wetlands with high-quality wetlands outside the cover. CERCLA § 121(e) exempts remedial actions conducted on-site from the requirement to obtain permits. Because the discharge into the wetlands occurred within a CERCLA site, the DON did not obtain a permit.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Groundwater – Monitoring			
FEDERAL			
Requires continued monitoring until the regulated unit has been in compliance with the water quality protection standard for a period of three consecutive years and all waste, waste residues, contaminated subsoil, and all other contaminated geologic materials are removed or decontaminated at closure.	Cal. Code Regs. tit. 22, § 66264.90(c)(1) and (c)(2)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
These regulations require the identification of constituents of concern expected to be in the groundwater and contain general water quality monitoring requirements.	Cal. Code Regs. tit. 22, § 66264.93 Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (b)(1)(B), (b)(1)(C), (b)(1)(D)(1), (b)(1)(D)(2), (b)(2), (b)(4) through (b)(7), (e)(6), (e)(12)(A), (e)(12)(B), (e)(13), and (e)(15)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
These regulations contain requirements for detection monitoring, evaluation monitoring, and corrective action monitoring.	Cal. Code Regs. tit. 22, § 66264.98 (e)(1) through (5), (i), (j), (k)(1) through (3), (k)(4)(A), (k)(4)(D), (k)(5), (k)(7)(C), (k)(7)(D), (n)(1), (n)(2)(B), and (n)(2)(C) Cal. Code Regs. tit. 22, § 66264.99(b), (e)(1) through (6), (f)(3), and (g) Cal. Code Regs. tit. 22, § 66264.100(d) and (g)(1)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
At final closure, the groundwater monitoring system must be monitored and maintained.	Cal. Code Regs. tit. 22, § 66264.310(b)(3)	This section is an ARAR for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Groundwater – Monitoring			
STATE			
For compliance demonstration, each COC "(1) must have remained at or below its respective concentration limit during a proof period of at least one year...and (2) the individual sampling events for each Monitoring Point must have been evenly distributed throughout the proof period and have consisted of no less than eight sampling events per year per Monitoring Point."	Cal. Code Regs. tit. 27, §20430(g)(1)	The substantive requirements in this state ARAR are relevant and appropriate to determining when corrective action monitoring is no longer required.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section	DTSC	California Department of Toxic Substances Control
§§	Sections	EPA	United States Environmental Protection Agency
ARAR	Applicable or relevant and appropriate requirement	IR	Installation Restoration
Cal.	California	NPDES	National pollutant discharge elimination system
Cal. Code Regs.	California Code of Regulations	RCRA	Resource Conservation and Recovery Act
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act	SWRCB	State Water Resources Control Board
		Res.	Resolution
CFR	Code of Federal Regulations	ROD	Record of Decision
COC	Chemical of concern	USEPA	United States Environmental Protection Agency
DON	U.S. Department of the Navy		

OPERABLE UNIT 4B, INSTALLATION RESTORATION SITE 17
ARARS IDENTIFIED IN 2006 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
Coastal Zone Management Act (16 U.S.C. §§ 1451 – 1465)			
Conduct activities in a manner consistent with approved state management programs.	16 U.S.C § 1456(c) 15 CFR § 930	The DON is complying with the state coastal zone management program ARARs identified below.	No substantive changes identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point and near IR Site 17. The dredging activities were conducted in a manner consistent with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
Endangered Species Act of 1973 (16 U.S.C. §§ 1531-1543)			
Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat.	16 U.S.C. §§ 1536(a) and (h)(1)(B), and 1538(a)	Federal threatened and endangered species are present in areas around IR Site 17. The dredging activities were conducted in a manner consistent with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
Fish and Wildlife Coordination Act (16 U.S.C. §§ 661-666c)			
Diversion, channeling, or other activity that modifies a stream or other water body should protect fish and wildlife.	16 U.S.C. § 662	The dredging activities were conducted in a manner consistent with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
Rivers and Harbors Act of 1899 (33 U.S.C. 401-413)			
It is unlawful to excavate or fill, or in any manner alter or modify the course, location, condition, or capacity of any harbor or channel of any navigable water of the U.S. unless authorized.	33 U.S.C. § 403	The dredging activities were conducted in a manner consistent with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
Marine Mammal Protection Act (16 U.S.C. §§ 1361-1421h)			

Requirement	Citation	Comments	Current Status
Marine mammals may not be taken except as provided by international treaties.	16 U.S.C. § 1372(a)(2)	Marine mammals are known to be present near IR Site 17. The dredging activities were conducted in a manner consistent with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
LOCATION-SPECIFIC ARARs			
STATE			
California Coastal Act of 1976			
Regulates activities associated with development to control direct significant impacts on coastal waters and to protect State and national interests in California coastal resources.	California Public Resources Code §§ 30000-30900 Cal. Code Regs. tit. 14, §§ 13001-13666.4	These statutory and regulatory provisions were identified as the approved state coastal zone management. However, the McAteer-Petris Act and the San Francisco Bay Plan are the approved state coastal zone management programs for the San Francisco Bay. The California Coast Commission does not have jurisdiction over the San Francisco Bay. The dredging activities were conducted in a manner consistent with the Coastal Zone Management Act and the San Francisco Bay Plan.	The response action is complete and was conducted in compliance with the substantive provisions of the San Francisco Bay Plan. Future dredging activities at the site are subject to compliance with ICs
California Fish and Game Code			
It is unlawful to take birds and mammals with any net, pound, cage, trap, set line or wire, or poisonous substance, or to possess birds or mammals so taken.	Cal. Fish and Game Code § 3005(a)	Birds and mammals are present near IR Site 17. The dredging activities were conducted in a manner consistent with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
Prohibits the deposition of specifically identified substances or materials where such materials can pass into waters of the State deleterious to fish, plant life, or birds.	Cal. Fish and Game Code §§ 5650(a) and (f) and 5651.	The DON accepted these statutory provisions as ARARs for potential discharges during dredging. The dredging activities were conducted in a manner consistent with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
California Civil Code			

Requirement	Citation	Comments	Current Status
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs through the ESD. The property has transferred and the DON has included appropriate restrictions in the transfer documents, which have been recorded and will apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs through the ESD. The property has transferred and the DON has included appropriate restrictions in the transfer documents, which have been recorded.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at §25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs through the ESD. The property has transferred and the DON has included appropriate restrictions in the transfer documents, which have been recorded.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to restrict the uses of IR Site 28. No substantive changes identified that could affect protectiveness of human health and the environment
Institutional Controls			
STATE			

Requirement	Citation	Comments	Current Status
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223 (formerly codified at Cal. Health and Safety Code § 25233)	Cal. Health and Safety Code § 25223 contained criteria for obtaining variances from uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria. The DON accepted the substantive provisions as state ARARs for implementing the ICs through the ESD. The property has transferred and the DON has included appropriate restrictions in the transfer documents, which have been recorded.	Cal. Health and Safety Code § 25233 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25223. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224 (formerly codified at Cal. Health and Safety Code § 25234)	Cal. Health and Safety Code § 25224 sets forth the relevant and appropriate substantive criteria for the removal of a land-use restriction on the grounds that "… the waste creates a significant existing or potential hazard to present or future public health or safety." The DON accepted the substantive provisions as state ARARs for implementing the ICs through the ESD. The property has transferred and the DON has included appropriate restrictions in the transfer documents, which have been recorded.	Cal. Health and Safety Code § 25234 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25224. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs through the ESD. The property has transferred and the DON has included appropriate restrictions in the transfer documents, which have been recorded.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1(a) and (e)(1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs through the ESD. The property has transferred and the DON has included appropriate restrictions in the transfer documents, which have been recorded.	No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
BAAQMD	Bay Area Air Quality Management District
Cal.	California
Cal. Code Regs.	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFR	Code of Federal Regulations
CTR	California Toxics Rule
DON	U.S. Department of the Navy
DTSC	California Department of Toxic Substances Control
EPA	United States Environmental Protection Agency
IC	Institutional controls
IR	Installation Restoration
kg	kilograms
NTR	National Toxics Rule
RCRA	Resource Conservation and Recovery Act
Res.	Resolution
ROD	Record of Decision
SWRCB	State Water Resources Control Board
U.S.C.	United States Code
USEPA	United States Environmental Protection Agency

OPERABLE UNIT 5, INSTALLATION RESTORATION SITE 25
ARARS IDENTIFIED IN 2007 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has completed an LUC RD and is currently performing annual inspections of IR Site 25 until the property transfers. When the property transfers, the DON will include appropriate ICs in the transfer documents that will be recorded and will apply to successive owners.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has completed an LUC RD and is currently performing annual inspections of IR Site 25 until the property transfers. When the property transfers, the DON will include appropriate ICs in the transfer documents, including a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at § 25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has completed an LUC RD and is currently performing annual inspections of IR Site 25 until the property transfers. When the property transfers, the DON will include appropriate ICs in the transfer documents, including a covenant to restrict the use of property.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to restrict the uses of IR Site 25. No substantive changes identified that could affect protectiveness of human health and the environment

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224 (formerly codified at Cal. Health and Safety Code § 25234)	Cal. Health and Safety Code § 25224 sets forth the relevant and appropriate substantive criteria for the removal of a land-use restriction on the grounds that "… the waste creates a significant existing or potential hazard to present or future public health or safety."	Cal. Health and Safety Code § 25234 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25224. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has completed an LUC RD and is currently performing annual inspections of IR Site 25 until the property transfers. When the property transfers, the DON will include appropriate ICs in the transfer documents, including a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of	Cal. Code Regs., tit. 22, § 67391.1	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has completed an LUC RD and is currently performing annual inspections of IR Site 25 until the property transfers. When the property transfers, the DON will include appropriate ICs in the transfer documents, including a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.			

Notes:

§	Section	IC	Institutional control
§§	Sections	IR	Installation Restoration
ARAR	Applicable or relevant and appropriate requirement	ISCO	In situ chemical oxidation
Cal.	California	NPDES	National pollutant discharge elimination system
Cal. Code Regs.	California Code of Regulations	RCRA	Resource Conservation and Recovery Act
CFR	Code of Federal Regulations	SWRCB	State Water Resources Control Board
DON	U.S. Department of the Navy	Res.	Resolution
DTSC	California Department of Toxic Substances Control	ROD	Record of Decision

OPERABLE UNIT 6, INSTALLATION RESTORATION SITE 26
ARARS IDENTIFIED IN 2006 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
GROUNDWATER - FEDERAL			
Resource Conservation and Recovery Act (42 U.S.C. chapter 82 §§ 6901 – 6991[i])			
Groundwater protection standards: ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed the concentration limits for chemicals of concern in the uppermost aquifer underlying the waste management area of concern at the point of compliance.	Cal. Code Regs. tit. 22, § 66264.94, except 66264.94(a)(2)	The DON has determined that a concentration limit greater than background, but not greater than MCLs, is the relevant and appropriate standard. The DON and the Water Board have determined that the groundwater is not a current or potential future source of drinking water. The cis-1,2-DCE, TCE, and vinyl chloride in the groundwater present a potential vapor intrusion risk. Remediation goals for cis-1,2-DCE, TCE, and vinyl chloride were set in the ROD protective of potential vapor intrusion risk. These goals were set at levels equal to the MCL.	No substantive changes identified that could affect protectiveness of human health and the environment.
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the TCLP, if the waste exceeds the TCLP maximum concentrations.	California Code Regs. tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	Applicable for determining whether waste is hazardous.	Groundwater remediation is ongoing and additional waste may be generated. So these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Authorizes the SWRCB and the Water Board to establish beneficial uses and numerical and narrative standards to protect the beneficial uses. Authorizes Water Board to issue permits for discharges that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, Division. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter-Cologne Water Quality Control Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Describes the water basins in the San Francisco Bay Region; establishes beneficial uses of groundwater and surface water; establishes water quality objectives, including narrative and numerical standards; and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin, Chapters 2 and 3 (Cal. Water Code §13240)	The DON accepted the substantive requirements pertaining to beneficial uses, except the MUN designation, and water quality objectives, except as apply to the MUN designation, as state ARARs for groundwater at IR Site 26.	No substantive changes identified that could affect protectiveness of human health and the environment.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids is greater than 3,000 parts per million, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonable be treated for domestic use using either best management practices or best economically achievable treatment practices.	SWRCB Res. 88- 63	The DON and the Water Board have determined that the groundwater at IR Site 26 is not a current or potential future source of drinking water.	No substantive changes identified that could affect protectiveness of human health and the environment.
LOCATION-SPECIFIC ARARs			
FEDERAL			
National Historic Preservation Act of 1966, as Amended (54 U.S.C. § 300101-307108)			
Action to preserve historic properties; planning of action to minimize harm to properties listed on or eligible for listing on the National Register of Historic Places.	54 U.S.C. §§ 300101-307108 36 CFR part 800	There are no buildings on or adjacent to IR Site 26 listed on the National Register of Historic Places. However, four buildings at IR Site 26 (Buildings 20, 21, 22, and 23) are included in the Alameda Point Historic District. Remedial activities did not affect any of these buildings; therefore, the DON is in compliance with these ARARs.	In December 2014, the National Historic Preservation Act of 1966 (previously located at 16 U.S.C. 470-470x) was moved to title 54 of the U.S.C. The Act was moved almost in its entirety, with only non-substantive changes; the requirements and the programs remained the same. Therefore, no substantive changes were identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC ARARs			
FEDERAL			
Historic Sites Act of 1935 (54 U.S.C. §§ 102303, 102304, 309101, 320101, 320106)			
Avoid impacts on artifacts and landmarks	54 U.S.C. §§ 102303, 102304, 309101, 320101-320106	There are no designated historical sites at IR Site 26. However, four buildings at IR Site 26 (Buildings 20, 21, 22, and 23) are included in the Alameda Point Historic District. Remedial activities did not affect any of these buildings; therefore, the DON is in compliance with this ARAR.	In December 2014, the Historic Sites Act of 1935 (previously located at 16 U.S.C. §§ 461-467) was moved to title 54 of the U.S.C. The Act was moved almost in its entirety, with only non-substantive changes; the requirements and programs remained the same. Therefore, no substantive changes were identified that could affect protectiveness of human health and the environment.
Endangered Species Act of 1973 (16 U.S.C. Sections 1531–1543)			
Federal agencies may not jeopardize the continued existence of any listed species or cause the destruction or adverse modification of critical habitat. The Endangered Species Committee may grant an exemption for agency action if reasonable mitigation and enhancement measures such as propagation, transplantation, and habitat acquisition and improvement are implemented.	16 U.S.C. § 1536(a), (h)(1)(B)	The California least tern is known to exist at Alameda Point. However, IR Site 26 remedial activities should not affect any areas that support the California least tern or its habitat. Consultation regulations at 50 CFR § 402 are administrative in nature and, therefore, not ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated “take,” which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point. The DON evaluated the habitat at IR Site 26 and determined that there is no habitat suitable for migratory birds. In addition, migratory birds will not be exposed to contaminated groundwater and the ongoing remediation will not affect them. Therefore, the DON has complied with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
LOCATION-SPECIFIC			
STATE			
California Endangered Species Act (Cal. Fish and Game Code §§ 20050-2116)			
No person shall import, export, take, possess, or sell any endangered or threatened species or part or product thereof.	California Fish and Game Code § 2080	Several endangered species are known to exist at Alameda Point. However, IR Site 26 remedial activities will not affect any areas that support special-status species or habitat.	No substantive changes identified that could affect protectiveness of human health and the environment.
ACTION-SPECIFIC ARARs			
Groundwater – Operation of ISCO and In-Situ Bioremediation Treatment Systems			
FEDERAL			
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, Sections 6901-6991[i])[a]			
Person who generates waste shall determine if the waste is a hazardous waste.	California Code Regs., tit. 22, §§ 66262.10(a), 66262.11	The DON generated waste in construction of the ISCO and in-situ bioremediation systems. Groundwater remediation is ongoing and additional waste may be generated.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Requirement for analyzing waste to determine whether waste is hazardous.	California Code Regs, tit. 22, § 66264.13(a) and (b)	The DON generated waste in construction of the ISCO and in-situ bioremediation systems. Groundwater remediation is ongoing and additional waste may be generated.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
On-site hazardous waste accumulation is allowed for up to 90 days as long as the waste is stored in containers or tanks, on drip pads, inside buildings, is labeled and dated, etc.	California Code Regs, tit. 22, § 66262.34	The DON generated waste in construction of the ISCO and in-situ bioremediation systems. Groundwater remediation is ongoing and additional waste may be generated.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Groundwater – Operation of ISCO and In-Situ Bioremediation Treatment Systems			
FEDERAL			
Waste containers for handling, storing, and disposing of hazardous waste.	Cal. Code Regs. tit. 22, § 66264.171, 66264.172, 66264.173, 66264.174 66264.175(a) and (b) 66264.178	The DON generated waste in construction of the ISCO and in-situ bioremediation systems. Groundwater remediation is ongoing and additional waste may be generated.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Groundwater – Monitoring			
FEDERAL			
These regulations require the identification of constituents of concern expected to be in the groundwater.	Cal. Code Regs. tit. 22, § 66264.93	This is an ARAR for the groundwater monitoring performed in conjunction with the ISCO and in-situ bioremediation. Groundwater remediation, including groundwater monitoring, is ongoing.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, including a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at Cal. Health and Safety Code § 25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to temporarily restrict the uses of IR Site 26. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223 (formerly codified at Cal. Health and Safety Code § 25233)	Cal. Health and Safety Code § 25223 contained criteria for obtaining variances from uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.	Cal. Health and Safety Code § 25233 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25223. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224 (formerly codified at Cal. Health and Safety Code § 25234)	Cal. Health and Safety Code § 25224 sets forth the relevant and appropriate substantive criteria for the removal of a land-use restriction on the grounds that "… the waste creates a significant existing or potential hazard to present or future public health or safety."	Cal. Health and Safety Code § 25234 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25224. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will include a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section	ISCO	In situ chemical oxidation
§§	Sections	LIFOC	Lease in Furtherance of Conveyance
ARAR	Applicable or relevant and appropriate requirement	MCL	Maximum contaminant level
Cal.	California	MUN	Domestic and municipal supply
Cal. Code Regs.	California Code of Regulations	NPDES	National pollutant discharge elimination system
CFR	Code of Federal Regulations	OU	Operable unit
COC	Chemical of concern	RCRA	Resource Conservation and Recovery Act
DCE	Dichloroethene	Res.	Resolution
DON	U.S. Department of the Navy	ROD	Record of Decision
DTSC	California Department of Toxic Substances Control	SWRCB	State Water Resources Control Board
IC	Institutional control	TCE	Trichloroethene
IR	Installation Restoration		

OPERABLE UNIT 6, INSTALLATION RESTORATION SITE 27
ARARS IDENTIFIED IN 2008 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
GROUNDWATER - FEDERAL			
Safe Drinking Water Act (42 U.S.C., chapter 6A, § 300[f]–300[j]-26)			
National primary drinking water standards are health-based standards for public water systems.	40 CFR § 141.61(a)	The DON has identified the federal MCLs for PCE and TCE as ARARs for groundwater in the first water bearing zone at IR Site 27.	No substantive changes identified that could affect protectiveness of human health and the environment. The federal MCLs for the COCs have not changed.
MCLGs pertain to known or anticipated adverse health effects (also known as recommended MCLs)	40 CFR § 141.50-141.51	Non-zero MCLGs may be relevant and appropriate ARARs for groundwater. MCLGs were identified as chemical-specific ARARs in the 2008 ROD for IR Site 27; however, no MCLGs were used to develop remediation goals. The federal primary MCL was identified as the remediation goals for TCE and PCE (both of which have an MCLG set at zero). The state MCLs were identified as the remediation goals for 1,1-DCA, cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride (state MCL concentrations were lower than the MCLGs for cis-1,2-DCE and trans-1,2-DCE; there is no MCLG for 1,1-DCA; and vinyl chloride has an MCLG set at zero).	MCLGs were not reviewed for substantive changes that could affect protectiveness of human health and the environment because MCLGs were not used in the ROD and were not used to set remediation goals.
Resource Conservation and Recovery Act (42 U.S.C. chapter 82 §§ 6901 – 6991[i])			
Groundwater protection standards: ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed the concentration limits for chemicals of concern in the uppermost aquifer underlying the waste management area of concern at the point of compliance.	Cal. Code Regs. tit. 22, § 66264.94, except 66264.94(a)(2) and 66264.94(b)	The DON has determined that a concentration limit greater than background, but not greater than MCLs, is the relevant and appropriate standard.	No substantive changes identified that could affect protectiveness of human health and the environment.
CHEMICAL-SPECIFIC ARARS			

Requirement	Citation	Comments	Current Status
GROUNDWATER - FEDERAL			
Clean Water Act of 1977, as Amended (33 U.S.C., ch. 26, §§ 1251–1387)			
Water quality standards. National Toxics Rule and California Toxics Rule.	40 .FR § 131.36(b) and 131.38	These regulations were identified as chemical-specific ARARs in the 2008 ROD. However, the discharge of groundwater to Seaplane Lagoon or San Francisco Bay was found not to present a potential risk to ecological or human health receptors in either surface water body. Therefore, no action was necessary or taken based on the discharge of groundwater to surface water. In addition, the remedial action did not include a discharge to either surface water body	These regulations were not reviewed for substantive changes that could affect protectiveness of human health and the environment because no action was necessary for the discharge of groundwater to surface water and the selected remedy did not include a discharge to surface water.
Effluent limitations that meet technology-based requirements, including BCPCT and BAT to the extent economically achievable.	33 U.S.C., ch. 26, § 1311(b)(2) (CWA Section 301[b])	These regulations were identified as chemical-specific ARARs in the 2008 ROD. However, the remedial action did not include a point source discharge to surface water.	These regulations were not reviewed for substantive changes that could affect protectiveness of human health and the environment because the remedial action did not include a point source discharge to surface water.
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Authorizes the SWRCB and the Water Board to establish beneficial uses and numerical and narrative standards to protect the beneficial uses. Authorizes Water Board to issue permits for discharges that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, Division. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter- Cologne Water Quality Control Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Describes the water basins in the San Francisco Bay Region; establishes beneficial uses of groundwater and surface water; establishes water quality objectives, including narrative and numerical standards; and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin, Chapters 2 and 3 (Cal. Water Code §13240)	The DON accepted the substantive requirements pertaining to beneficial uses and water quality objectives as state ARARs for groundwater at IR Site 27. The DON identified MCLs as chemical-specific ARARs for IR Site 27. The DON determined that state MCLs for cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride are more stringent than the federal MCLs. Therefore, the DON identified the state MCLs for these chemicals. In addition, no federal MCL is available for 1,1-DCA, so the DON has also identified the state MCL for 1,1-DCA	No substantive changes identified that could affect protectiveness of human health and the environment.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids is greater than 3,000 parts per million, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonable be treated for domestic use using either best management practices or best economically achievable treatment practices.	SWRCB Res. 88- 63	The DON is protecting and restoring groundwater at IR Site 27 as potential drinking water sources and so has identified federal and state MCLs as chemical-specific ARARs. The DON may revise this determination should additional information about the unsuitability of the groundwater for use as a drinking water source be obtained.	No substantive changes identified that could affect protectiveness of human health and the environment.
Cal/EPA Department of Toxic Substances Control			
State MCL list	Cal. Code Regs. tit. 22 § 64444	The DON identified MCLs as chemical-specific ARARs for IR Site 27. The DON determined that state MCLs for cis-1,2-DCE, trans-1,2-DCE, and vinyl chloride are more stringent than the federal MCLs. Therefore, the DON identified the state MCLs for these chemicals. In addition, no federal MCL is available for 1,1-DCA, so the DON has also identified the state MCL for 1,1-DCA.	No substantive changes identified that could affect protectiveness of human health and the environment. The state MCLs for the COCs have not changed.

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARS			
SURFACE WATER – STATE			
Requires analysis for each priority pollutant to determine if water-quality-based effluent limitation is required. Provides effluent limitation development methodology.	Policy for Implementation of Toxics Standards for Inland Surface Waters, Enclosed Bays, and Estuaries of California (Toxics Standards SIP) (SWRCB 2000), § 1.3 and 1.4	This was identified as a chemical-specific ARAR in the 2008 ROD. However, the remedial action did not include a point source discharge to surface water.	These regulations were not reviewed for substantive changes that could affect protectiveness of human health and the environment because the remedial action did not include a point source discharge to surface water.
LOCATION-SPECIFIC ARARs			
FEDERAL			
Coastal Zone Management Act (16 U.S.C. §§ 1451 – 1465)			
Conduct activities in a manner consistent with approved state management programs.	16 U.S.C § 1456(c) 15 CFR § 930	The DON is complying with the state coastal zone management program ARARs identified below.	No substantive changes identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated “take,” which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point. The DON evaluated the habitat at IR Site 27 and determined that IR Site 27 is barren, or urban, habitat and offers little value to ecological receptors. Therefore, the DON has complied with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
LOCATION-SPECIFIC ARARs			
STATE			
McAteer-Petris Act (California Government Code §§66600 through 66661)			
Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	The remedial actions selected in this ROD are in compliance with the substantive purposes of the San Francisco Bay Plan.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Groundwater –ISCO/MNA/Groundwater Monitoring			
FEDERAL			
These regulations require corrective action monitoring to determine the effectiveness of corrective action measures.	Cal. Code Regs. tit. 22, § 66264.100(d) and (g)(1)	These sections are ARARs for groundwater monitoring	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Requires continued monitoring until the regulated unit has been in compliance with the water quality protection standard for a period of 3 consecutive years and all waste, waste residues, contaminated subsoils, and other contaminated geologic materials are removed or decontaminated at closure.	California Code Regs. tit. 22, § 66264.90(c)(1) and (c)(2)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
These regulations require the identification of constituents of concern expected to be in the groundwater and contain general water quality monitoring requirements.	Cal. Code Regs. tit. 22, § 66264.93 Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (b)(1)(D)(1) and (2), (b)(4) through (b)(7), (e)(6), (e)(12)(A), (e)(12)(B), (e)(13), and (e)(15)	These sections are ARARs for groundwater monitoring.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Groundwater –ISCO/MNA/Groundwater Monitoring			
STATE			
For compliance demonstration, each COC "(1) must have remained at or below its respective concentration limit during a proof period of at least one year...and (2) the individual sampling events for each Monitoring Point must have been evenly distributed throughout the proof period and have consisted of no less than eight sampling events per year per Monitoring Point."	Cal. Code Regs. tit. 27, §20430(g)(1) and (2)	The substantive requirements in this state ARAR are relevant and appropriate to determining when corrective action monitoring is no longer required.	Groundwater monitoring is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, including a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at Cal. Health and Safety Code § 25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to temporarily restrict the uses of IR Site 27. No substantive changes identified that could affect protectiveness of human health and the environment.
Prohibits certain uses of land containing hazardous substances without a specific variance.	Cal. Health and Safety Code § 25232(b)(1)(A) through (E)	Cal. Health and Safety Code § 25232(b) contained actual land use prohibitions for certain uses (i.e., residences, hospitals for humans, schools, and daycare centers).	Cal. Health and Safety Code § 25232(b)(1)(A) through (E) was repealed in 2012. This does not affect the protectiveness of human health and the environment because the DON has restrictions in the LIFOC and will place appropriate land use restrictions in the transfer documents if necessary.
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223 (formerly codified at Cal. Health and Safety Code § 25233)	Cal. Health and Safety Code § 25223 contained criteria for obtaining variances from uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.	Cal. Health and Safety Code § 25233 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25223. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224 (formerly codified at Cal. Health and Safety Code § 25234)	Cal. Health and Safety Code § 25224 sets forth the relevant and appropriate substantive criteria for the removal of a land-use restriction on the grounds that "… the waste creates a significant existing or potential hazard to present or future public health or safety."	Cal. Health and Safety Code § 25234 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25224. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Institutional Controls			
STATE			
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will include a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section	IR	Installation Restoration
§§	Sections	ISCO	In situ chemical oxidation
DCB	Dichlorobenzene	LIFOC	Lease in Furtherance of Conveyance
DCE	Dichloroethene	MCL	Maximum contaminant level
ARAR	Applicable or relevant and appropriate requirement	NPDES	National pollutant discharge elimination system
Cal.	California	OU	Operable unit
Cal. Code Regs.	California Code of Regulations	RCRA	Resource Conservation and Recovery Act
CFR	Code of Federal Regulations	SWRCB	State Water Resources Control Board
COC	Chemical of concern	PCE	Tetrachloroethene
DON	U.S. Department of the Navy	Res.	Resolution
DTSC	California Department of Toxic Substances Control	ROD	Record of Decision
IC	Institutional control	TCE	Trichloroethene

OPERABLE UNIT 6, INSTALLATION RESTORATION SITE 28
ARARS IDENTIFIED IN 2007 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARs			
GROUNDWATER - FEDERAL			
Resource Conservation and Recovery Act (42 U.S.C. chapter 82 §§ 6901 – 6991[i])			
Groundwater protection standards: ensure that hazardous chemicals entering groundwater from a regulated unit do not exceed the concentration limits for chemicals of concern in the uppermost aquifer underlying the waste management area of concern at the point of compliance.	Cal. Code Regs. tit. 22, §66264.94, except 66264.94(a)(2) and 66264.94(b)	The DON has determined that a concentration limit greater than background based on potential risk to ecological receptors in surface water (Oakland Inner Harbor) is the relevant and appropriate standard.	No substantive changes identified that could affect protectiveness of human health and the environment.
Defines RCRA hazardous waste. A solid waste is characterized as toxic, based on the toxicity characteristic leaching procedure (TCLP), if the waste exceeds the TCLP maximum concentrations	California Code Regs. Tit. 22, § 66261.21, 66261.22(a)(1), 66261.23, 66261.24(a)(1), and 66261.100	These ARARs are applicable for determining whether waste is hazardous	Groundwater remediation is ongoing and additional waste may be generated. Therefore, these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment
CHEMICAL-SPECIFIC ARARs			
GROUNDWATER – STATE			
State and Regional Water Quality Control Boards			
Authorizes the SWRCB and the Water Board to establish in water quality control plans beneficial uses and numerical and narrative standards to protect both surface water and groundwater quality. Authorizes Water Board to issue permits for discharges to land or surface or groundwater that could affect water quality, including NPDES permits, and to take enforcement action to protect water quality.	Cal. Water Code, Division. 7, §§ 13241, 13243, 13263(a), 13269, and 13360 (Porter- Cologne Water Quality Control Act)	The DON accepted the substantive provisions of §§ 13241, 13243, 13263(a), 13269, and 13360 of the Porter-Cologne Act enabling legislation, as implemented through the beneficial uses, water quality objectives, waste discharge requirements, and promulgated policies of the Basin Plan as ARARs.	Groundwater remediation is ongoing and additional waste may be generated. Therefore, these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment
CHEMICAL-SPECIFIC ARARs			

Requirement	Citation	Comments	Current Status
GROUNDWATER – STATE			
Describes the water basins in the San Francisco Bay Region; establishes beneficial uses of groundwater and surface water; establishes water quality objectives, including narrative and numerical standards; and incorporates statewide water quality control plans and policies.	Water Quality Control Plan for the San Francisco Bay Basin, Chapters 2 and 3 (Cal. Water Code §13240)	The DON accepted the substantive requirements pertaining to beneficial uses (except the domestic and municipal supply beneficial use designation) and water quality objectives as state ARARs for groundwater at IR Site 28.	No substantive changes identified that could affect protectiveness of human health and the environment.
Incorporated into all regional board basin plans. Designates all groundwater and surface waters of the state as drinking water except where the total dissolved solids is greater than 3,000 parts per million, the well yield is less than 200 gallons per day from a single well, the water is a geothermal resource or in a water conveyance facility, or the water cannot reasonable be treated for domestic use using either best management practices or best economically achievable treatment practices.	SWRCB Res. 88- 63	The DON and the Water Board have concluded that the groundwater at IR Site 28 is not a current or potential source of drinking water.	No substantive changes identified that could affect protectiveness of human health and the environment.
Definitions of designated waste, nonhazardous solid waste, and inert waste	California Code Regs. Tit. 27 §§ 20210, 20220, and 20230	Applicable for determining whether waste is designated, nonhazardous solid, or inert	Groundwater remediation is ongoing and additional waste may be generated. Therefore, these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment
Department of Toxic Substances Control (DTSC)			
Definition of “non-RCRA hazardous waste”	California Code Regs. tit. 22, § 66261.22(a)(3) and (4), § 66261.24(a)(2)–(a)(8), § 66261.101, § 66261.3(a)(2)(C) or § 66261.3(a)(2)(F)	Applicable for determining whether a waste is a non-RCRA state regulated hazardous waste	Groundwater remediation is ongoing and additional waste may be generated. Therefore, these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment
CHEMICAL-SPECIFIC ARARs			

Requirement	Citation	Comments	Current Status
SURFACE WATER - FEDERAL			
Surface water quality standards	40 CFR § 131.38	Applicable to surface water in Oakland Inner Harbor. The groundwater remedy will comply with this ARAR in surface water at the POE.	No substantive changes identified that could affect protectiveness of human health and the environment
LOCATION-SPECIFIC ARARs			
FEDERAL			
Coastal Zone Management Act (16 U.S.C. §§ 1451 – 1465)			
Conduct activities in a manner consistent with approved state management programs.	16 U.S.C § 1456(c) 15 CFR § 930	The DON is complying with the state coastal zone management program ARARs identified below.	No substantive changes identified that could affect protectiveness of human health and the environment.
Migratory Bird Treaty Act (16 U.S.C. §§ 703 – 712)			
Protects almost all species of native migratory birds in the U.S. from unregulated "take," which can include poisoning at hazardous waste sites.	16 U.S.C. § 703	There are migratory birds on Alameda Point. The DON evaluated the habitat at IR Site 28 and determined that there is no habitat suitable for migratory birds. In addition, migratory birds will not be exposed to contaminated groundwater and the ongoing remediation will not affect them. Therefore, the DON has complied with this ARAR.	No substantive changes identified that could affect protectiveness of human health and the environment.
LOCATION-SPECIFIC ARARs			
STATE			
McAteer-Petris Act (California Government Code §§66600 through 66661)			
Reduce fill and disposal of dredged material in San Francisco Bay, maintain marshes and mudflats to the fullest extent possible to conserve wildlife, abate pollution, and protect the beneficial uses of the bay.	San Francisco Bay Plan at Cal. Code Regs. tit. 14, §§ 10110 through 11990	The remedial actions selected in this ROD are in compliance with the substantive purposes of the San Francisco Bay Plan.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Groundwater –Construction and Operation of MRC™ Treatment Systems			
FEDERAL			
Safe Drinking Water Act (42 U.S.C., ch. 6A, § 300[f]–300[j]-26)			
The Underground Injection Control program prohibits injection activities that allow movement of chemicals into underground sources of drinking water that may result in violations of MCLs or adversely affect human health.	40 CFR § 144.12, excluding the reporting requirements in § 144.12(b) and 144.12(c)(1)	The injection well (or wells) for this alternative are considered a Class V well under these regulations. Groundwater at IR Site 28 is not a current or potential future source of drinking water. So, the injection of treatment chemicals will not cause the groundwater at IR Site 28 to violate MCLs or adversely affect human health. In addition, the injection of treatment chemicals will not cause groundwater that is a potential future source of drinking water to violate MCLs or adversely affect human health.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes were identified that could affect protectiveness of human health and the environment.
Resource Conservation and Recovery Act (42 U.S.C., Chapter 82, Sections 6901-6991[i])[a]			
Person who generates waste shall determine if the waste is a RCRA hazardous waste.	California Code Regs., tit. 22, §§ 66262.10(a), 66262.11	This requirement is applicable for any operation that generates waste. Construction of the MRC™ treatment system will generate waste. The DON will characterize this waste in compliance with these regulations for proper off-site disposal.	Groundwater remediation is ongoing and additional waste may be generated. Therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Requirement for analyzing waste to determine whether waste is hazardous.	California Code Regs., tit. 22, § 66264.13(a) and (b)	This requirement is applicable for any operation that generates waste. Construction of the MRC™ treatment system will generate waste. The DON will characterize this waste in compliance with these regulations for proper off-site disposal.	Groundwater remediation is ongoing and additional waste may be generated. Therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Groundwater –Construction and Operation of MRC™ Treatment Systems			
FEDERAL			
Waste containers for handling, storing, and disposing of hazardous waste.	Cal. Code Regs. tit. 22, § 66264.171, 66264.172, 66264.173, 66264.174 66264.175(a) and (b) 66264.178	The DON generated waste in construction of the MRC treatment system components of the groundwater remedy. If additional waste is generated, the DON will place this waste in containers and characterize it for proper off-site disposal.	Groundwater remediation is ongoing and additional waste may be generated; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Groundwater – Monitoring			
FEDERAL			
These regulations require the identification of constituents of concern expected to be in the groundwater and contain general water quality monitoring requirements.	Cal. Code Regs. tit. 22, § 66264.93 Cal. Code Regs. tit. 22, § 66264.97(b)(1)(A), (b)(1)(B), (b)(1)(C), (b)(4) through (b)(7), (e)(6), (e)(12)(A), (e)(12)(B), (e)(13), and (e)(15)	These sections are ARARs for groundwater monitoring.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
These regulations contain requirements for detection monitoring, evaluation monitoring, and corrective action monitoring.	Cal. Code Regs. tit. 22, § 66264.98 (e)(1) through (5), (k)(1) through (3), (k)(4)(A), (k)(4)(D), (k)(5), (k)(7)(C), (k)(7)(D), (n)(1), (n)(2)(B), and (n)(2)(C) Cal. Code Regs. tit. 22, § 66264.99(b), (e)(1) through (6), (f)(3), and (g) Cal. Code Regs. tit. 22, § 66264.100(d)	These sections are ARARs for groundwater monitoring.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Groundwater – Monitoring			
FEDERAL			
Requires continued monitoring until the regulated unit has been in compliance with the water quality protection standard for a period of three consecutive years and all waste, waste residues, contaminated subsoil and all other contaminated geologic materials are removed or decontaminated at closure.	California Code Regs., Tit. 22, § 66264.90(c)(1) and (c)(2)	These sections are ARARs for groundwater monitoring.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Groundwater – Monitoring			
STATE			
After suspending corrective action measures, the discharger shall implement the remaining portions of the corrective action program until an approved detection monitoring program is approved and until the discharger demonstrates that the water standard has been met. This demonstration is based on concentrations of COCs remaining at or below their respective concentration limits and the individual sampling events have been evenly distributed throughout the proof period and consisted of not less than eight sampling events per year per monitoring point.	Cal. Code Regs. tit. 27, § 20430(g)(1)	This section is an ARAR for groundwater monitoring.	Groundwater remediation is ongoing; therefore these ARARs were reviewed to identify changes that could affect protectiveness of human health and the environment. No substantive changes identified that could affect protectiveness of human health and the environment.
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure before the property transfers. If necessary, at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure before the property transfers. If necessary, at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will be recorded and apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at §25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while groundwater remediation is ongoing and before the property transfers. If necessary, at the time of transfer the DON will include appropriate ICs in the transfer documents.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to restrict the uses of IR Site 28. No substantive changes identified that could affect protectiveness of human health and the environment

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
Prohibits certain uses of land containing hazardous substances without a specific variance.	Cal. Health and Safety Code § 25232(b)(1)(A) through (E)	Cal. Health and Safety Code § 25232(b) contained actual land use prohibitions for certain uses (i.e., residences, hospitals for humans, schools, and daycare centers).	This regulation was not included in the ARAR tables of the 2007 ROD. However, this regulation was identified in the text of the 2007 ROD and the land use restrictions included in this regulation were identified in the 2007 ROD. As a result, this regulation was included in the 5-year review. Cal. Health and Safety Code § 25232(b)(1)(A) through (E) was repealed in 2012. This does not affect the protectiveness of human health and the environment because the DON has restrictions in the LIFOC and will place appropriate land use restrictions in the transfer documents if necessary.
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223 (formerly codified at Cal. Health and Safety Code § 25233)	Cal. Health and Safety Code § 25223 contained criteria for obtaining variances from uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.	Cal. Health and Safety Code § 25233 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25223. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
Provides a process by which DTSC can remove land use restrictions	Cal. Health and Safety Code § 25224 (formerly codified at Cal. Health and Safety Code § 25234)	Cal. Health and Safety Code § 25224 sets forth the relevant and appropriate substantive criteria for the removal of a land-use restriction on the grounds that "… the waste creates a significant existing or potential hazard to present or future public health or safety."	Cal. Health and Safety Code § 25234 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25224. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment

Requirement	Citation	Comments	Current Status
Institutional Controls			
STATE			
Authorizes DTSC to enter into an enforceable agreement that imposes restrictions on present or future uses of the property.	Cal. Health and Safety Code § 25355.5(a)(1)(C)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents, which will include a covenant to restrict the use of property.	No substantive changes identified that could affect protectiveness of human health and the environment.
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The DON has ICs in the LIFOC as an interim measure while remediation is ongoing and before the property transfers. If remediation goals are not met at the time of transfer, the DON will include appropriate ICs in the transfer documents.	No substantive changes identified that could affect protectiveness of human health and the environment.

Notes:

§	Section	IR	Installation Restoration
§§	Sections	LIFOC	Lease in Furtherance of Conveyance
ARAR	Applicable or relevant and appropriate requirement	MCL	Maximum contaminant level
Cal.	California	MRC	Metals Remediation Compound
Cal. Code Regs.	California Code of Regulations	POE	Point of entry
CFR	Code of Federal Regulations	RCRA	Resource Conservation and Recovery Act
COC	Chemical of concern	Res.	Resolution
DON	U.S. Department of the Navy	ROD	Record of Decision
DTSC	California Department of Toxic Substances Control	SWRCB	State Water Resources Control Board
IC	Institutional control	U.S.C.	United States Code

FLEET AND INDUSTRIAL SUPPLY CENTER OAKLAND, ALAMEDA FACILITY/ALAMEDA ANNEX, INSTALLATION RESTORATION SITE 02 SOIL ARARS IDENTIFIED IN 2001 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
CHEMICAL-SPECIFIC ARARs			
SOIL - FEDERAL			
Toxic Substances Control Act (15 U.S.C. chapter 53 §§ 2601 – 2692)			
Regulates storage and disposal of PCB remediation waste. The cleanup level for bulk PCB remediation waste in high occupancy areas is ≤ 1 mg/kg without further conditions or > 1 mg/kg and ≤ 10 mg/kg if covered by a cap. The cleanup level for low occupancy areas is ≤ 25k mg/kg. Any person wishing to sample, cleanup, or dispose of PCB remediation waste in a manner other than prescribed in 761.61(a) or (b) may apply for a risk-based disposal method.	40 CFR § 761.61(a)(4)(i)(A) and (B) and 761.61(c)	The DON identified the high occupancy cleanup level of 1 mg/kg as the residential remediation goal. The DON identified 10 mg/kg as the industrial remediation goal.	No substantive changes identified that could affect protectiveness of human health and the environment.
ACTION-SPECIFIC ARARs – Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The property has transferred and the DON has included appropriate restrictions in the transfer documents, which have been recorded and will apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Health and Safety Code			

Requirement	Citation	Comments	Current Status
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The property has transferred and the DON has entered an interim covenant to restrict the use of property with DTSC.	No substantive changes identified that could affect protectiveness of human health and the environment.
ACTION-SPECIFIC ARARs – Institutional Controls			
STATE			
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at §25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The property has transferred and the DON has entered an interim covenant to restrict the use of property with DTSC.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to restrict the uses of FISCA IR Site 02 soil. No substantive changes identified that could affect protectiveness of human health and the environment
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.	Cal. Code Regs., tit. 22, § 67391.1	This regulation was promulgated in March 2003 and made effective April 2003; after finalizing the ROD for FISCA Site 02 soil. It was not identified as an ARAR in the ROD.	The FISCA IR Site 02 soil property has transferred. The DON has placed appropriate restrictions in the quitclaim deed transferring the property and has entered into an interim covenant to restrict the use of property with DTSC. These actions are consistent with the requirements of Cal. Code Regs. tit. 22, § 67391.1. Cal. Code Regs. tit. 22, § 67391.1 does not present any additional or different requirements for placing and implementing the ICs. Therefore, the promulgation of this requirement after finalizing the ROD does not affect the protectiveness of the ICs or the remedy's protectiveness of human health and the environment.

Notes:

§	Section
§§	Sections
ARAR	Applicable or relevant and appropriate requirement
Cal.	California
Cal. Code Regs.	California Code of Regulations
CFR	Code of Federal Regulations
IR	Installation Restoration
mg/kg	Milligrams per kilogram
ROD	Record of Decision
U.S.C.	United States Code
DON	U.S. Department of the Navy
DTSC	Department of Toxic Substances Control
FISCA	Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex
IC	Institutional control

MARSH CRUST
ARARS IDENTIFIED IN 2001 ROD FOR REMEDIAL ACTIONS ONGOING AT THE 5-YEAR REVIEW

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
California Civil Code			
Provides conditions under which land-use restrictions will apply to successive owners of land	Cal. Civil Code § 1471	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The property has transferred and the DON has included appropriate restrictions in the transfer documents, which have been recorded and will apply to successive owners of the land.	No substantive changes identified that could affect protectiveness of human health and the environment.
California Health and Safety Code			
Allows DTSC to enter into an agreement with the owner of a hazardous waste facility to restrict present and future land uses.	Cal. Health and Safety Code § 25202.5	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The property has transferred and the DON has entered a covenant to restrict the use of property with DTSC.	No substantive changes identified that could affect protectiveness of human health and the environment.
Provides a streamlined process to be used to enter into an agreement to restrict specific use of property in order to implement the substantive use restrictions.	Cal. Health and Safety Code § 25221 (formerly codified at § 25222.1)	The DON accepted the substantive provisions as state ARARs for implementing the ICs. The property has transferred and the DON has entered a covenant to restrict the use of property with DTSC.	Cal. Health and Safety Code § 25222.1 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25221. In the reenactment, subpart (b) was removed. Subpart (b) allowed the department to retain authority to designate hazardous waste or border zone property. The removal of this section does not affect the protectiveness of human health and the environment because it pertained to powers retained by DTSC and does not affect the DON's authority to enter into an agreement with DTSC to restrict the uses of the Marsh Crust. No substantive changes identified that could affect protectiveness of human health and the environment

Requirement	Citation	Comments	Current Status
ACTION-SPECIFIC ARARs			
Institutional Controls			
STATE			
Hazardous waste property or border zone property shall have a written instrument which imposes an easement, covenant, restriction, or servitude, or combination thereof, as appropriate, to accompany all purchase, lease, or rental agreements to protect the public health and safety.	California Health & Safety Code § 25230	The DON accepted the substantive provisions as state ARARs for implementing ICs. The property has transferred and the DON has entered a covenant to restrict the use of property with DTSC.	Cal. Health and Safety Code § 25230 was repealed in 2012. Repealing this statutory provision does not affect the protectiveness of human health and the environment because the property has already transferred and the DON has included appropriate land use restrictions in the quitclaim deed and the covenant to restrict the use of property between the DON and DTSC.
Prohibits certain uses of land containing hazardous substances without a specific variance.	Cal. Health and Safety Code § 25232	The DON accepted the substantive provisions as state ARARs for implementing ICs. The property has transferred and the DON has entered a covenant to restrict the use of property with DTSC.	Cal. Health and Safety Code § 25232 was repealed in 2012. This does not affect the protectiveness of human health and the environment because the DON has included appropriate land use restrictions and provisions to modify the land use restrictions in the quitclaim deed and the covenant to restrict the use of property between the DON and DTSC.
Provides a process for obtaining a written variance from a land-use restriction.	Cal. Health and Safety Code § 25223 (formerly codified at Cal. Health and Safety Code § 25233)	Cal. Health and Safety Code § 25223 contained criteria for obtaining variances from uses prohibited in § 25232(b)(1)(A)-(E) based on specific environmental and health criteria.	Cal. Health and Safety Code § 25233 was repealed in 2012 and reenacted in Cal. Health and Safety Code § 25223. The substantive provisions of the statute remained essentially the same, with only minor wording changes. The repeal and reenactment of this section does not affect the protectiveness of human health and the environment because it did not change the substantive requirements. No substantive changes identified that could affect protectiveness of human health and the environment
A land use covenant imposing appropriate limitations on land use shall be executed and recorded when facility closure, corrective action, remedial or removal action, or other response actions are undertaken and hazardous materials, hazardous wastes or constituents, or hazardous substances will remain at the property at levels that are not suitable for unrestricted use of the land. If it is not feasible to execute and record a limitation on land use, the DON and DTSC shall use other mechanisms, such as	Cal. Code Regs., tit. 22, § 67391.1	This regulation was promulgated in March 2003 and made effective April 2003; after finalizing the ROD for the Marsh Crust. It was not identified as an ARAR in the ROD.	The Marsh Crust property has transferred. The DON has placed appropriate restrictions in the quitclaim deed transferring the property and has entered into a covenant to restrict the use of property with DTSC. These actions are consistent with the requirements of Cal. Code Regs. tit. 22, § 67391.1. Cal. Code Regs. tit. 22, § 67391.1 does not present any additional or different requirements for placing and implementing the ICs. Therefore, the promulgation of this requirement after finalizing the ROD does not affect the protectiveness of the ICs or the

Requirement	Citation	Comments	Current Status
agreements, to ensure future land use will be compatible with the levels of hazardous material, hazardous wastes or constituents, or hazardous substances that remain on the site.			remedy's protectiveness of human health and the environment.

Notes:

§	Section	DON	U.S. Department of the Navy
§§	Sections	DTSC	Department of Toxic Substances Control
ARAR	Applicable or relevant and appropriate requirement	IC	Institutional control
Cal.	California	ROD	Record of Decision
Cal. Code Regs.	California Code of Regulations		

Appendix E
Supporting Documents

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Table E-1 - Toxicity Value Changes Noted in Alameda Point 2016 Five-Year Human Health Reviews

Chemical of Concern (COC)	IR Sites	External Slope Factor (risk/year) (pCi/gram)	Oral Cancer Slope Factor $(mg/kg\text{-}day)^{-1}$	Inhalation Unit Risk Factor $(\mu g/m^3)^{-1}$	Oral Reference Dose (mg/kg-day)	Reference Concentration (mg/m^3)
		Revised Toxicity Values				
Trichloroethylene (TCE)	IR6, IR16, IR26, IR27	--	0.046 (I)	4.1E-6 (I)	0.0005 (I)	0.002 (I)
Tetrachloroethylene (PCE)	IR6, IR16, IR27, IR19	--	0.54 (Cal/EPA)	5.9E-6 (Cal/EPA)	0.006 (I)	0.04 (I)
Vinyl Chloride	IR14, IR26, IR01	No Cal/EPA toxicity value changes were identified for vinyl chloride; however, current EPA IRIS values were found to be slightly less health protective than the CalEPA values that were used in the IR14 and IR26 HHRAs. Since submission of the IR01 HHRA, EPA guidance has been revised so that inhalation unit risk factors (URi) are used instead of SFi values. For IR01, A CSFi of 0.3 $(mg/kg\text{-}day)^{-1}$ was used in the HHRA for vinyl chloride in groundwater. A CSFi of 0.3 (mg/kg-day)-1 converts to a URi of 8.6×10^{-5} $(\mu g/m^3)^{-1}$. This value is approximately 20 times the current URi of 4.4×10^{-6} $(\mu g/m^3)^{-1}$. The current value is less conservative than the value used in the HHRA.				
Aroclors/total PCBs	IR01, IR17	--	2 (Cal/EPA)	5.7E-4 (Cal/EPA)	--	--
	Inhalation toxicity was evaluated for PCBs in the IR01 HHRA using an inhalation slope factor (SF_i) of 0.4 $(mg/kg\text{-}day)^{-1}$. Since submission of the IR01 HHRA, EPA guidance has been revised so that inhalation unit risk factors (URi) are used instead of SFi values. A CSFi of 0.4 (mg/kg-day)-1 converts to a URi of 1.1×10^{-4} per microgram per cubic meter $(\mu g/m3)^{-1}$. This value is less than the current URi of $5.7 \times 10^{-4}(\mu g/m3)^{-1}$, meaning that the current URi value is less conservative and that the value used in the HHRA was more protective. The IR17 HHRA was conducted using a Cal/EPA oral slope factor [5 $(mg/kg\text{-}day)^{-1}$] that was higher than the current value [2 $(mg/kg\text{-}day)^{-1}$] and is thus more protective than the current Cal/EPA oral slope factor.					
Chromium	IR01	--	0.5 (Cal/EPA)	0.15 (Cal/EPA)	--	--
Cadmium	FISCA IR02 Soil, IR03	--	--	1.8E-3 (I)	1.0E-3 (I)	1.0E-5 (A)
	The oral reference dose of 1.0E-3 was correctly used in both the FISCA IR02 soil and IR03 HHRAs.					
Radium-226	IR01, IR02	8.37E-6 (PRG)	--	--	--	--

NOTES:

Toxicity values were accessed from EPA Region 9's RSL table (November 2015), EPA's IRIS database (2016), and the OEHHA Toxicity Criteria Database (2016).

RAD-226 toxicity values accessed from EPA's Radionuclide Preliminary Remediation Goals table (2014)

A = ATSDR (Agency for Toxic Substances and Disease Registry)

I = EPA's IRIS database

Cal/EPA = OEHHA Toxicity Criteria Database

PRG = EPA's Radionuclide Preliminary Remediation Goals table

Table E-2
Status of Issues and Recommendations Identified in the Alameda 2011 Five-Year Review
June 15, 2015

Sites 7, 8, 25, and 28	**Issue:** The Office of Environmental Health Hazard Assessment (OEHHA) has revised the human exposure to lead benchmark to 80 parts per million for residential land use; this new benchmark is lower than the previous benchmark on which the remedy decisions were based. The DTSC, however, officially adopted the new OEHHA lead benchmark in June 2011, which was after the cutoff date (April 1, 2011) for new information to be included in the 2011 Five-Year Review. Since this new benchmark has just been promulgated, the Navy has not yet adopted the new lead benchmark.			
	Recommendation: Navy to evaluate whether OEHHA's revised lead benchmark for residential land use would impact protectiveness of the remedies for these sites.			
	Status: Complete. EPA has been reviewing the lead benchmark but no changes to the Federal criteria have been made. November 2014 EPA RSL User Guide discusses Lead as a special case. The November 2014 EPA RSL User Guide continues to use the 10 ug/dl threshold for blood lead level. The November 2014 RSL table lists Lead at 400 mg/kg residential soil and 800 mg/kg industrial soil. Individual Site evaluations in relation to OEHHA's revised lead benchmark for residential land use. - Site 7: No impact. Post remedy exposure point concentration (EPC) for lead at Site 7 is 70.8 mg/kg which is below the derived concentration from OEHHA's revised benchmark. The Remedial Action Completion Report (RACR) documents that remedial action objectives have been met. Post the 2011 5-Yr Review, EPA concurred on the Site 7 RACR 04/2013 confirming site closure with unrestricted use/unrestricted exposure (UU/UE). - Site 8: No impact. Post remedy maximum confirmation sample result is 100 mg/kg, with second highest 47 mg/kg. Site wide lead is below the derived concentration from OEHHA's revised benchmark. Post the 2011 5-Yr Review, EPA concurred on the Site 8 RACR 07/2012 confirming site closure with UU/UE. - Site 25: Not applicable, this site should not be included in this recommendation. Lead was not carried forward in the ROD as a contaminant of concern and therefore the ROD has no RG for Lead. The ROD paragraph 5.3.2 states that metals are consistent with background levels. - Site 28: No impact, cleanup levels established for recreational / occupational land use, not residential. Remedy includes institutional controls restricting residential land use.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Navy	EPA, DTSC, Water Board	2015

Sites 6, 7, 8, 16, 28, and OU-5 FISCA IR Site 02 Groundwater	**Issue:** At the time of this Five-Year Review, post-remedy implementation monitoring data for these Sites had not been validated; therefore the data are not available for review and inclusion in this report to assess the effectiveness of the remedy.			
	Recommendation: Navy to continue tracking the progress of the remedies at these sites per the approved RODs and review and evaluate finalized post-remedy data to assess effectiveness of the remedies.			
	Status: Complete (Sites 6, 7, 8, and 16); On-going (Site OU-5/FISCA IR Site 2). The Navy continues to track progress of remedies at the listed sites in site specific documents and/or the Annual Base-wide Groundwater Monitoring Report. Site specific comments follow. - Site 6 – Validated post-remedy data specified in the 2011 5-Yr Review has been reviewed and evaluated. As a result of data evaluation and in accordance with approved work plans, additional remedial action using in-situ bioremediation implemented 2014. - Site 7 – Validated post-remedy data specified in the 2011 5-Yr Review has been reviewed and evaluated. Data evaluation was incorporated into a Site 7 RACR. EPA concurred on the Site 7 RACR 04/2013 confirming site closure with UU/UE. - Site 8 – Validated post-remedy data specified in the 2011 5-Yr Review has been reviewed and evaluated. Data evaluation was incorporated into a Site 8 RACR. EPA concurred on the Site 8 RACR 07/2012 confirming site closure with UU/UE. - Site 16 – Validated post remedy data specified in the 2011 5-Yr Review has been reviewed and evaluated. Data evaluation was incorporated into a Technical Memorandum. Based on the data evaluation and concurrence on a change in groundwater designation/exception to drinking water policy in September 2012, an Explanation of Significant Difference is in process. - Site 28 – Validated post-remedy data specified in the 2011 5-Yr Review has been reviewed and evaluated. Groundwater monitoring and reporting continues in the Base-wide Groundwater Monitoring Program. - Site OU-5/FISCA IR Site 02 Groundwater – Validated post remedy data specified in the 2011 5-Yr Review has been reviewed and evaluated. Based on the data evaluation and additional data collection since the 2011 5-Yr Review, a ROD amendment is in process to document No Further Action based on current site conditions.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Navy	EPA, DTSC, Water Board	2016 (Site OU-5/FISCA IR Site 2 Groundwater)

Site 7	**Issue:** Updates to the cadmium toxicity criteria are pending. Changes in the toxicity criteria may have implications to the human health risk assessment for IR Site 7.			
	Recommendation: Navy to track the potential updates to the cadmium toxicity criteria, and evaluate potential impacts to the human health risk assessment when these updates have become final.			
	Status: On-going, address in next Five-Year Review. Potential updates to the cadmium toxicity criteria did not change the cadmium EPA RSL of 70 mg/kg, for residential soil. Site 7 residual cadmium levels are well below the remedial goal of 37 mg/kg. A Site 7 RACR was completed. EPA concurred on the Site 7 RACR 04/2013 confirming site closure with UU/U.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Navy	EPA, DTSC, Water Board	2016
Site 14	**Issue**: Rebound of vinyl chloride (VC) in groundwater may be an indicator that MNA may not meet the ICs' termination criterion of 15 micrograms per liter (Bg/L) within the Navy's expected time frame of three years.			
	Recommendation: Navy to continue monitoring and evaluating VC concentrations at IR Site 14 per the approved RAW to ensure that the ICs' termination criterion of 15 Bg/L in groundwater will be met within the Navy's expected time frame of three years (2014) as listed in the approved RAW.			
	Status: Continue monitoring and address in next Five-Year Review VC concentrations continue to be monitored evaluated and reported in the Base-wide Groundwater Monitoring Program. Final 2013 Base-wide Groundwater Monitoring Program report states that there is some fluctuation in VC concentrations but no values exceed historical maximums. Report also states that low concentrations of dissolved ethane and ethene suggests that ethanogenesis is likely contributing to natural attenuation.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Navy	EPA, DTSC, Water Board	2016

Site 26	**Issue: (1)** After several ISCO applications, trichloroethene (TCE), dichloroethene (DCE), and VC all continued to exceed the remedial goals (RGs) as specified in the ROD. Transition to in-situ bioremediation (ISB) was initiated in October 1, 2010. Given that ISB was implemented within the past year, not enough data have been collected to assess its effectiveness at reducing TCE, DCE, and VC concentrations below RGs. **(2)** The unexpected formation of disinfectant byproducts (such as trihalomethanes [THMs]) was noted during post-ISCO application monitoring; however, the data indicate that levels appear to be decreasing and that the THMs and their reductive daughter products such as methylene chloride or chloromethane do not appear to be migrating from the Site.			
	Recommendation: (1) Navy to continue monitoring the TCE, DCE, and VC concentrations in groundwater per the approved RAW to ensure that the ISB is continuing to be effective at reducing these COCs to levels below the RGs listed in the ROD within the expected time frame of three years after completion of the ISB (2014). **(2)** Navy to continue monitoring disinfectant byproduct concentrations in groundwater to ensure that concentrations continue to decrease over time and return to pre-ISCO concentrations by 2015.			
	Status: (1) Continue monitoring and address in next Five-Year Review. TCE, DCE, and VC concentrations continue to be monitored in the Base-wide Groundwater Monitoring Program. The 2013 Base-wide Groundwater Monitoring Report documents TCE below RG (5 ug/L) in all wells and cis 1,2-DCE and VC concentrations generally declining. The 2013 Report evaluates natural attenuation parameters and states that sulfate reduction and microbial reductive dechlorination is occurring. **(2)** Complete The Enhanced In-Situ Bioremediation Application Technical Memorandum IR Site 26 (July 2011) reports additional disinfectant byproduct groundwater sampling results. This report states that "THMs were not detected in any of the down gradient monitoring wells" and decreasing trends are consistent with typical post-ISCO sites "with steady declines in concentrations as the aquifer re-equilibrates and THMs/daughter products degrade." April 2011 results are mostly non-detect with one low detection of chloroform in one well and one low detection of methylene chloride in another well.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Navy	EPA, DTSC, Water Board	**(1)** 2016 **(2)** 2015

Site 27	**Issue**: There is possible rebound of chemical of concern (COC) because of insufficient residual ISCO compounds (sodium persulfate) in groundwater.			
	Recommendation: Navy to continue monitoring and evaluating COC concentrations at IR Site 27 under the Base-wide Groundwater Monitoring Program to ensure that concentrations of COCs continue to decrease and are below RGs within the Navy's expected time frame of three years (2014).			
	Status: Continue monitoring and address in next Five-Year Review COC concentrations continue to be monitored in the Base-wide Groundwater Monitoring Program. The 2013 Base-wide Groundwater Monitoring Report documented that cis-1,2 DCE and VC are the remaining two of six COCs that have concentrations above RGs. These COCs are latter stage degradation products of the parent COCs; PCE and TCE. Natural attenuation conditions vary across the site but "In areas with strongly reducing conditions, sulfate and methane levels indicate that sulfate reduction and methanogenesis are the primary degradation mechanisms.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Navy	EPA, DTSC, Water Board	2016
Site 28	**Issue:** Rebound of copper in some of the monitoring locations during the eight-week post-injection monitoring event may suggest sufficient reducing conditions were not achieved.			
	Recommendation: Navy to continue monitoring and evaluating copper concentrations at IR Site 28 per the approved RAW for the next 10 years (until 2021) to ensure that concentrations in groundwater are/remain below the trigger level for copper.			
	Status: Continue monitoring and address in next Five-Year Review. Copper concentrations continue to be monitored in the Base-wide Groundwater Monitoring Program. The 2013 Base-wide Groundwater Monitoring Report documented that two wells are slightly above the copper trigger level of 40 ug/L.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Navy	EPA, DTSC, Water Board	2016

FISCA IR Site 02	**Issue:** Updates to the cadmium toxicity criteria are pending. Changes in the toxicity criteria may have implications to the human health risk assessment for FISCA IR Site 02 Soil.			
	Recommendation: Navy to continue to track the potential updates to the cadmium toxicity criteria, and to evaluate potential impacts to the human health risk assessment when these updates have become final.			
	Status: On-going, address in next Five Year Review. Record of Decision cadmium clean up levels are 12 ppm residential and 450 ppm (mg/kg) industrial. Cadmium residential soil RSL, 70 mg/kg, did not change. Cadmium industrial soil 2011 RSL 800 mg/kg increased to 2014 RSL 980 mg/kg. Site has long-term ICs and is subject to additional 5-Year reviews.			
Affect Current Protectiveness	**Affect Future Protectiveness**	**Implementing Party**	**Oversight Party**	**Milestone Date**
No	No	Navy	EPA, DTSC, Water Board	2016

SAN FRANCISCO REGIONAL WATER QUALITY CONTROL BOARD RESOLUTION 89-39

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CHAPTER 2: BENEFICIAL USES

State policy for water quality control in California is directed toward achieving the highest water quality consistent with maximum benefit to the people of the state. Aquatic ecosystems and underground aquifers provide many different benefits to the people of the state. The beneficial uses described in detail in this chapter define the resources, services, and qualities of these aquatic systems that are the ultimate goals of protecting and achieving high water quality. The Water Board is charged with protecting all these uses from pollution and nuisance that may occur as a result of waste discharges in the region. Beneficial uses of surface waters, groundwaters, marshes, and wetlands presented here serve as a basis for establishing water quality objectives and discharge prohibitions to attain these goals.

Beneficial use designations for any given water body do not rule out the possibility that other beneficial uses exist or have the potential to exist. Existing beneficial uses that have not been formally designated in this Basin Plan are protected whether or not they are identified. While the tables in this Chapter list a large, representative portion of the water bodies in our region, it is not practical to list each and every water body.

2.1 DEFINITIONS OF BENEFICIAL USES

The following definitions (in italic) for beneficial uses are applicable throughout the entire state. A brief description of the most important water quality requirements for each beneficial use follows each definition (in alphabetical order by abbreviation).

2.1.1 AGRICULTURAL SUPPLY (AGR)

Uses of water for farming, horticulture, or ranching, including, but not limited to, irrigation, stock watering, or support of vegetation for range grazing.

The criteria discussed under municipal and domestic water supply (MUN) also effectively protect farmstead uses. To establish water quality criteria for livestock water supply, the Water Board must consider the relationship of water to the total diet, including water freely drunk, moisture content of feed, and interactions between irrigation water quality and feed quality. The University of California Cooperative Extension has developed threshold and limiting concentrations for livestock and irrigation water. Continued irrigation often leads to one or more of four types of hazards related to water quality and the nature of soils and crops. These hazards are (1) soluble salt accumulations, (2) chemical changes in the soil, (3) toxicity to crops, and (4) potential disease transmission to humans through reclaimed water use. Irrigation water classification systems, arable soil classification systems, and public health criteria related to reuse of wastewater have been developed with consideration given to these hazards.

2.1.2 AREAS OF SPECIAL BIOLOGICAL SIGNIFICANCE (ASBS)

Areas designated by the State Water Board.

These include marine life refuges, ecological reserves, and designated areas where the preservation and enhancement of natural resources requires special protection. In these areas, alteration of natural water quality is undesirable. The areas that have been designated as ASBS in this Region are Bird Rock, Point Reyes Headland Reserve and Extension, Double Point, Duxbury Reef Reserve and Extension, Farallon Islands, and James V. Fitzgerald Marine Reserve, depicted in Figure 2-1. The California Ocean Plan prohibits waste discharges into, and requires wastes to be discharged at a sufficient distance from, these areas to assure maintenance of natural water quality conditions. These areas have been designated as a subset of State Water Quality Protection Areas as per the Public Resources Code.

2.1.3 COLD FRESHWATER HABITAT (COLD)

Uses of water that support cold water ecosystems, including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

Cold freshwater habitats generally support trout and may support anadromous salmon and steelhead fisheries as well. Cold water habitats are commonly well-oxygenated. Life within these waters is relatively intolerant to environmental stresses. Often, soft waters feed cold water habitats. These waters render fish more susceptible to toxic metals, such as copper, because of their lower buffering capacity.

2.1.4 COMMERCIAL, AND SPORT FISHING (COMM)

Uses of water for commercial or recreational collection of fish, shellfish, or other organisms, including, but not limited to, uses involving organisms intended for human consumption or bait purposes.

To maintain fishing, the aquatic life habitats where fish reproduce and seek their food must be protected. Habitat protection is under descriptions of other beneficial uses.

2.1.5 ESTUARINE HABITAT (EST)

Uses of water that support estuarine ecosystems, including, but not limited to, preservation or enhancement of estuarine habitats, vegetation, fish, shellfish, or wildlife (e.g., estuarine mammals, waterfowl, shorebirds), and the propagation, sustenance, and migration of estuarine organisms.

Estuarine habitat provides an essential and unique habitat that serves to acclimate anadromous fishes (e.g., salmon, striped bass) migrating into fresh or marine water conditions. The protection of estuarine habitat is contingent upon (1) the

maintenance of adequate Delta outflow to provide mixing and salinity control; and (2) provisions to protect wildlife habitat associated with marshlands and the Bay periphery (i.e., prevention of fill activities). Estuarine habitat is generally associated with moderate seasonal fluctuations in dissolved oxygen, pH, and temperature and with a wide range in turbidity.

2.1.6 FRESHWATER REPLENISHMENT (FRSH)

Uses of water for natural or artificial maintenance of surface water quantity or quality.

2.1.7 GROUNDWATER RECHARGE (GWR)

Uses of water for natural or artificial recharge of groundwater for purposes of future extraction, maintenance of water quality, or halting saltwater intrusion into freshwater aquifers.

The requirements for groundwater recharge operations generally reflect the future use to be made of the water stored underground. In some cases, recharge operations may be conducted to prevent seawater intrusion. In these cases, the quality of recharged waters may not directly affect quality at the wellfield being protected. Recharge operations are often limited by excessive suspended sediment or turbidity that can clog the surface of recharge pits, basins, or wells.

Under the state Antidegradation Policy, the quality of some of the waters of the state is higher than established by adopted policies. It is the intent of this policy to maintain that existing higher water quality to the maximum extent possible.

Requirements for groundwater recharge, therefore, shall impose the Best Available Technology (BAT) or Best Management Practices (BMPs) for control of the discharge as necessary to assure the highest quality consistent with maximum benefit to the people of the state. Additionally, it must be recognized that groundwater recharge occurs naturally in many areas from streams and reservoirs. This recharge may have little impact on the quality of groundwaters under normal circumstances, but it may act to transport pollutants from the recharging water body to the groundwater. Therefore, groundwater recharge must be considered when requirements are established.

2.1.8 INDUSTRIAL SERVICE SUPPLY (IND)

Uses of water for industrial activities that do not depend primarily on water quality, including, but not limited to, mining, cooling water supply, hydraulic conveyance, gravel washing, fire protection, and oil well repressurization.

Most industrial service supplies have essentially no water quality limitations except for gross constraints, such as freedom from unusual debris.

2.1.9 MARINE HABITAT (MAR)

Uses of water that support marine ecosystems, including, but not limited to, preservation or enhancement of marine habitats, vegetation such as kelp, fish, shellfish, or wildlife (e.g., marine mammals, shorebirds).

In many cases, the protection of marine habitat will be accomplished by measures that protect wildlife habitat generally, but more stringent criteria may be necessary for waterfowl marshes and other habitats, such as those for shellfish and marine fishes. Some marine habitats, such as important intertidal zones and kelp beds, may require special protection.

2.1.10 FISH MIGRATION (MIGR)

Uses of water that support habitats necessary for migration, acclimatization between fresh water and salt water, and protection of aquatic organisms that are temporary inhabitants of waters within the region.

The water quality provisions acceptable to cold water fish generally protect anadromous fish as well. However, particular attention must be paid to maintaining zones of passage. Any barrier to migration or free movement of migratory fish is harmful. Natural tidal movement in estuaries and unimpeded river flows are necessary to sustain migratory fish and their offspring. A water quality barrier, whether thermal, physical, or chemical, can destroy the integrity of the migration route and lead to the rapid decline of dependent fisheries.

Water quality may vary through a zone of passage as a result of natural or human-induced activities. Fresh water entering estuaries may float on the surface of the denser salt water or hug one shore as a result of density differences related to water temperature, salinity, or suspended matter.

2.1.11 MUNICIPAL AND DOMESTIC SUPPLY (MUN)

Uses of water for community, military, or individual water supply systems, including, but not limited to, drinking water supply.

The principal issues involving municipal water supply quality are (1) protection of public health; (2) aesthetic acceptability of the water; and (3) the economic impacts associated with treatment- or quality-related damages.

The health aspects broadly relate to: direct disease transmission, such as the possibility of contracting typhoid fever or cholera from contaminated water; toxic effects, such as links between nitrate and methemoglobinemia (blue babies); and increased susceptibility to disease, such as links between halogenated organic compounds and cancer.

Aesthetic acceptance varies widely depending on the nature of the supply source to which people have become accustomed. However, the parameters of general concern are excessive hardness, unpleasant odor or taste, turbidity, and color. In

each case, treatment can improve acceptability although its cost may not be economically justified when alternative water supply sources of suitable quality are available.

Published water quality objectives give limits for known health-related constituents and most properties affecting public acceptance. These objectives for drinking water include the U.S. Environmental Protection Agency Drinking Water Standards and the California State Department of Health Services criteria.

2.1.12 NAVIGATION (NAV)

Uses of water for shipping, travel, or other transportation by private, military, or commercial vessels.

2.1.13 INDUSTRIAL PROCESS SUPPLY (PRO)

Uses of water for industrial activities that depend primarily on water quality.

Water quality requirements differ widely for the many industrial processes in use today. So many specific industrial processes exist with differing water quality requirements that no meaningful criteria can be established generally for quality of raw water supplies. Fortunately, this is not a serious shortcoming, since current water treatment technology can create desired product waters tailored for specific uses.

2.1.14 PRESERVATION OF RARE AND ENDANGERED SPECIES (RARE)

Uses of waters that support habitats necessary for the survival and successful maintenance of plant or animal species established under state and/or federal law as rare, threatened, or endangered.

The water quality criteria to be achieved that would encourage development and protection of rare and endangered species should be the same as those for protection of fish and wildlife habitats generally. However, where rare or endangered species exist, special control requirements may be necessary to assure attainment and maintenance of particular quality criteria, which may vary slightly with the environmental needs of each particular species. Criteria for species using areas of special biological significance should likewise be derived from the general criteria for the habitat types involved, with special management diligence given where required.

2.1.15 WATER CONTACT RECREATION (REC1)

Uses of water for recreational activities involving body contact with water where ingestion of water is reasonably possible. These uses include, but are not limited to, swimming, wading, water-skiing, skin and scuba diving, surfing, whitewater activities, fishing, and uses of natural hot springs.

Water contact implies a risk of waterborne disease transmission and involves human health; accordingly, criteria required to protect this use are more stringent than those for more casual water-oriented recreation.

Excessive algal growth has reduced the value of shoreline recreation areas in some cases, particularly for swimming. Where algal growths exist in nuisance proportions, particularly bluegreen algae, all recreational water uses, including fishing, tend to suffer.

One criterion to protect the aesthetic quality of waters used for recreation from excessive algal growth is based on chlorophyll a.

Public access to drinking water reservoirs is limited or prohibited by reservoir owner/operators for purposes of protecting drinking water quality and public health. In some cases, access to reservoir tributaries is also prohibited. For these water bodies, REC-1 is designated as E*, for the purpose of protecting water quality. No right to public access is intended by this designation.

2.1.16 NONCONTACT WATER RECREATION (REC2)

Uses of water for recreational activities involving proximity to water, but not normally involving contact with water where water ingestion is reasonably possible. These uses include, but are not limited to, picnicking, sunbathing, hiking, beachcombing, camping, boating, tide pool and marine life study, hunting, sightseeing, or aesthetic enjoyment in conjunction with the above activities.

Water quality considerations relevant to noncontact water recreation, such as hiking, camping, or boating, and those activities related to tide pool or other nature studies require protection of habitats and aesthetic features. In some cases, preservation of a natural wilderness condition is justified, particularly when nature study is a major dedicated use.

One criterion to protect the aesthetic quality of waters used for recreation from excessive algal growth is based on chlorophyll a.

2.1.17 SHELLFISH HARVESTING (SHELL)

Uses of water that support habitats suitable for the collection of crustaceans and filter-feeding shellfish (e.g., clams, oysters, and mussels) for human consumption, commercial, or sport purposes.

Shellfish harvesting areas require protection and management to preserve the resource and protect public health. The potential for disease transmission and direct poisoning of humans is of considerable concern in shellfish regulation. The bacteriological criteria for the open ocean, bays, and estuarine waters where shellfish cultivation and harvesting occur should conform with the standards described in the National Shellfish Sanitation Program, Manual of Operation.

Toxic metals can accumulate in shellfish. Mercury and cadmium are two metals known to have caused extremely disabling effects in humans who consumed shellfish that concentrated these elements from industrial waste discharges. Other elements, radioactive isotopes, and certain toxins produced by particular plankton species also concentrate in shellfish tissue. Documented cases of paralytic shellfish poisoning are not uncommon in California.

2.1.18 FISH SPAWNING (SPWN)

Uses of water that support high quality aquatic habitats suitable for reproduction and early development of fish.

Dissolved oxygen levels in spawning areas should ideally approach saturation levels. Free movement of water is essential to maintain well-oxygenated conditions around eggs deposited in sediments. Water temperature, size distribution and organic content of sediments, water depth, and current velocity are also important determinants of spawning area adequacy.

2.1.19 WARM FRESHWATER HABITAT (WARM)

Uses of water that support warm water ecosystems including, but not limited to, preservation or enhancement of aquatic habitats, vegetation, fish, or wildlife, including invertebrates.

The warm freshwater habitats supporting bass, bluegill, perch, and other fish are generally lakes and reservoirs, although some minor streams will serve this purpose where stream flow is sufficient to sustain the fishery. The habitat is also important to a variety of nonfish species, such as frogs, crayfish, and insects, which provide food for fish and small mammals. This habitat is less sensitive to environmental changes, but more diverse than the cold freshwater habitat, and natural fluctuations in temperature, dissolved oxygen, pH, and turbidity are usually greater.

2.1.20 WILDLIFE HABITAT (WILD)

Uses of waters that support wildlife habitats, including, but not limited to, the preservation and enhancement of vegetation and prey species used by wildlife, such as waterfowl.

The two most important types of wildlife habitat are riparian and wetland habitats. These habitats can be threatened by development, erosion, andsedimentation, as well as by poor water quality.

The water quality requirements of wildlife pertain to the water directly ingested, the aquatic habitat itself, and the effect of water quality on the production of food materials. Waterfowl habitat is particularly sensitive to changes in water quality. Dissolved oxygen, pH, alkalinity, salinity, turbidity, settleable matter, oil, toxicants, and specific disease organisms are water quality characteristics particularly important to waterfowl habitat. Dissolved oxygen is needed in

waterfowl habitats to suppress development of botulism organisms; botulism has killed millions of waterfowl. It is particularly important to maintain adequate circulation and aerobic conditions in shallow fringe areas of ponds or reservoirs where botulism has caused problems.

2.2 EXISTING AND POTENTIAL BENEFICIAL USES

2.2.1 SURFACE WATERS

Surface waters in the Region consist of non-tidal wetlands, rivers, streams, and lakes (collectively described as inland surface waters), estuarine wetlands known as baylands, estuarine waters, and coastal waters. In this Region, estuarine waters consist of the Bay system including intertidal, tidal, and subtidal habitats from the Golden Gate to the Region's boundary near Pittsburg and the lower portions of streams that are affected by tidal hydrology, such as the Napa and Petaluma rivers in the north and Coyote and San Francisquito creeks in the south.

Inland surface waters support or could support most of the beneficial uses described above. The specific beneficial uses for inland streams include municipal and domestic supply (MUN), agricultural supply (AGR),commercial and sport fishing (COMM), freshwater replenishment (FRESH), industrial process supply (PRO), groundwater recharge (GWR), preservation of rare and endangered species (RARE), water contact recreation (REC1), noncontact water recreation (REC2), wildlife habitat (WILD), cold freshwater habitat (COLD), warm freshwater habitat (WARM), fish migration (MIGR), and fish spawning (SPWN). The San Francisco Bay Estuary supports estuarine habitat (EST), industrial service supply (IND), and navigation (NAV) in addition to COMM, RARE, REC1, REC2, WILD, MIGR, and SPWN.

Coastal waters' beneficial uses include water contact recreation (REC1); noncontact water recreation (REC2); industrial service supply (IND); navigation (NAV); marine habitat (MAR); shellfish harvesting (SHELL); commercial and sport fishing (COMM); wildlife habitat (WILD), fish migration (MIGR), fish spawning (SPWN), and preservation of rare and endangered species (RARE). In addition, the California coastline within the Region is endowed with exceptional scenic beauty.

The beneficial uses of any specifically identified water body generally apply to all its tributaries. In some cases a beneficial use may not be applicable to the entire body of water, such as navigation in Richardson Bay or shellfish harvesting in the Pacific Ocean. In these cases, the Water Board’s judgment regarding water quality control measures necessary to protect beneficial uses will be applied.

Beneficial uses of streams that have intermittent flows, as is typical of many streams in the region, must be protected throughout the year and are designated as “existing.”

Beneficial uses of each significant water body have been identified and are organized according to the seven major Hydrologic Planning Areas within the

Region (Figure 2-2). The maps locating each water body (Figures 2-3 through 2-9) were produced using a geographical information system (GIS) at the Water Board. The maps use the hydrologic basin information compiled by the California Interagency Watershed map, with supplemental information from the Oakland Museum of California Creek and Watershed Map series, the Contra Costa County Watershed Atlas, and the San Francisco Estuary Institute EcoAtlas. More detailed representations of each location can be created using this GIS version.

Table 2-1 contains the beneficial uses for many surface water bodies in the Region, organized geographically by the Region's seven Hydrologic Planning Areas. Within each Hydrologic Planning Area, water bodies are listed geographically, with tributaries indented below their receiving water body. In cases where a water body shares the same name with another water body (e.g., Redwood Creek), the location of the water body (county and/or other identifier) is given in parentheses. An alternative name for a water body, where known, is also shown in parentheses. In Table 2-1, beneficial uses are indicated as follows:

E – indicates the beneficial use exists in the water body.

E* – indicates public access to the water body is limited or prohibited for purposes of protecting drinking water quality and public health. REC-1 is designated as E* for the purpose of protecting water quality. No right to public access is intended by this designation.

P – indicates the water body could potentially support the beneficial use.

2.2.2 GROUNDWATER

Groundwater is defined as subsurface water that occurs beneath the water table in soils and geologic formations that are fully saturated. Where groundwater occurs in a saturated geologic unit that contains sufficient permeable thickness to yield significant quantities of water to wells and springs, it can be defined as an aquifer. A groundwater basin is defined as a hydrogeologic unit containing one large aquifer or several connected and interrelated aquifers.

Water-bearing geologic units occur within groundwater basins in the Region that do not meet the definition of an aquifer. For instance, there are shallow, low permeability zones throughout the Region that have extremely low water yields. Groundwater may also occur outside of currently identified basins. Therefore, for basin planning purposes, the term "groundwater" includes all subsurface waters, whether or not these waters meet the classic definition of an aquifer or occur within identified groundwater basins.

The California Department of Water Resources (DWR) evaluated the characteristics of groundwater basins in the Region and throughout the state and summarized the results in California's Groundwater, Bulletin 118 (2003). Of special importance to the Region are the 28 groundwater basins and seven sub-basins classified by DWR that produce, or potentially could produce, significant amounts of groundwater (Figures 2-10 and 2-10A-D). The Water Board maintains a GIS for all water bodies in the Region and has the capacity to present

information on each basin at a much higher level of resolution than is depicted in Figures 2-10A-D.

Existing and potential beneficial uses applicable to groundwater in the Region include municipal and domestic water supply (MUN), industrial water supply (IND), industrial process supply (PRO), agricultural water supply (AGR), groundwater recharge (GWR), and freshwater replenishment to surface waters (FRESH). Table 2-2 lists the 28 identified groundwater basins and seven sub-basins located in the Region and their existing and potential beneficial uses.

Unless otherwise designated by the Water Board, all groundwater is considered suitable, or potentially suitable, for municipal or domestic water supply (MUN). In making any exceptions, the Water Board will consider the criteria referenced in State Water Board Resolution No. 88-63 and Water Board Resolution No. 89-39, "Sources of Drinking Water," where:

- The total dissolved solids exceed 3,000 milligrams per liter (mg/L) (5,000 microSiemens per centimeter, µS/cm, electrical conductivity), and it is not reasonably expected by the Water Board that the groundwater could supply a public water system; or
- There is contamination, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices (BMPs) or best economically achievable treatment practices; or
- The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day; or
- The aquifer is regulated as a geothermal energy-producing source or has been exempted administratively pursuant to 40 Code of Federal Regulations (CFR) Part 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR Part 261.3.

2.2.3 WETLANDS

Federal administrative law (e.g., 40 CFR Part 122.2, revised December 22, 1993) defines wetlands as waters of the United States. National waters include waters of the State of California, defined by the Porter-Cologne Act as "any water, surface or underground, including saline waters, within the boundaries of the State" (California Water Code §13050[e]). Wetland water quality control is therefore clearly within the jurisdiction of the State Water Board and Regional Water Boards.

Wetlands are further defined in 40 CFR 122.2 as "those areas that are inundated or saturated by surface or groundwater at a frequency and duration sufficient to support, and that under normal circumstances do support, a prevalence of vegetation typically adapted for life in saturated soil conditions. Wetlands generally include swamps, marshes, bogs, and similar areas."

The Water Board recognizes that wetlands frequently include areas commonly referred to as saltwater marshes, freshwater marshes, open or closed brackish water marshes, mudflats, sandflats, unvegetated seasonally ponded areas, vegetated shallows, sloughs, wet meadows, playa lakes, natural ponds, vernal pools, diked baylands, seasonal wetlands, floodplains, and riparian woodlands.

Mudflats make up one of the largest and most important habitat types in the Estuary. Snails, clams, worms, and other animals convert the rich organic matter in the mud bottom to food for fish, crabs, and birds.

Mudflats generally support a variety of edible shellfish, and many species of fish rely heavily on the mudflats during at least a part of their life cycle. Additionally, San Francisco Bay mudflats are one of the most important habitats on the coast of California for millions of migrating shorebirds.

Another important characteristic of the Estuary is the fresh, brackish, and salt water marshes around the Bay's margins. These highly complex communities are recognized as vital components of the Bay system's ecology. Most marshes around the Bay have been destroyed through filling and development. The protection, preservation, and restoration of the remaining marsh communities are essential for maintaining the ecological integrity of the Estuary.

Identifying wetlands may be complicated by such factors as the seasonality of rainfall in the Region. Therefore, in identifying wetlands considered waters of the United States, the Water Board will consider such indicators as hydrology, hydrophytic plants, and/or hydric soils for the purpose of mapping and inventorying wetlands. The Water Board will, in general, rely on the federal manual for wetland delineation in the Region when issuing Clean Water Act Section 401 water quality certifications (U.S. Army Corps of Engineers (Corps) Wetlands Delineation Manual, 1987). In the rare cases where the U.S. EPA and Corps guidelines disagree on the boundaries for federal jurisdictional wetlands, the Water Board will rely on the wetlands delineation made by the U.S. EPA or the California Department of Fish and Game (CDFG). For the purpose of mapping and inventorying wetlands, the Water Board will rely on the protocols and naming conventions of the National Wetlands Inventory (NWI) prepared by the U.S. Fish and Wildlife Service (USFWS).

Many individual wetlands provide multiple benefits depending on the wetland type and location. There are many potential beneficial uses of wetlands, including Wildlife Habitat (WILD); Preservation of Rare and Endangered Species (RARE); Shellfish Harvesting (SHELL); Water Contact Recreation (REC1); Noncontact Water Recreation (REC2); Commercial, and Sport Fishing (COMM); Marine Habitat (MAR); Fish Migration (MIGR); Fish Spawning (SPAWN); and Estuarine Habitat (EST). Some of these general beneficial uses can be further described in terms of their component wetland function. For example, many wetlands that provide groundwater recharge (GWR) also provide flood control, pollution control, erosion control, and stream baseflow.

Table 2-3 shows how beneficial uses are associated with different wetland types. Table 2-4 lists and specifies beneficial uses for 34 significant wetland areas within

the Region; generalized locations of these wetlands are shown in Figure 2-11. It should be noted that most of the wetlands listed in Table 2-4 are saltwater marshes, and that the list is not comprehensive.

The Water Board has participated in completing the Baylands Ecosystem Habitat Goals Report (1999) and the Baylands Ecosystem Species and Community Profiles (2000), which were written by scientists and managers in the Region in order to recommend sound wetland restoration strategies. Other efforts around the Bay to locate wetland sites include San Francisco Estuary Institute's (SFEI) EcoAtlas Baylands Maps (Baylands Maps) and Bay Area Wetlands Project Tracker (Wetlands Tracker), and the Wetland Tracker managed by the San Francisco Bay Joint Venture. Because of the large number of small and non-contiguous wetlands, it is not practical to delineate and specify beneficial uses of every wetland area. Therefore, beneficial uses may be determined site specifically, as needed. Chapter 4 of this Plan contains additional information on the process used to determine beneficial uses for specific wetland sites.

FIGURES

Figure 2-1: Areas of Special Biological Significance

Figure 2-2: Hydrologic Planning Areas

Legend for Figures 2-3 through 2-9b

Figures 2-3 through 2-3b: Marin Coastal Basin (legend)

Figures 2-4 through 2-4b: San Mateo Coastal Basin (legend)

Figure 2-5: Central Basin (legend)

Figures 2-6 through 2-6b: South Bay Basin (legend)

Figures 2-7 through 2-7b: Santa Clara Basin (legend)

Figures 2-8 through 2-8b: San Pablo Basin (legend)

Figures 2-9 through 2-9b: Suisun Basin (legend)

Figure 2-10: Significant Groundwater Basins

Figure 2-10A: Groundwater Basins: Marin / Sonoma / Napa

Figure 2-10B: Groundwater Basins: Napa / Solano

Figure 2-10C: Groundwater Basins: San Francisco

Figure 2-10D: Groundwater Basins: East and South Bay

Figure 2-11: General Locations of Wetland Areas

TABLES

Table 2-1: Existing and Potential Beneficial Uses of Water Bodies in the San Francisco Bay Region

Table 2-2: Existing and Potential Beneficial Uses of Groundwater in Identified Basins

Table 2-3: Examples of Existing and Potential Beneficial Uses of Selected Wetlands

Table 2-4: Beneficial Uses of Wetland Areas

<<< Previous - Ch.1: Introduction

Next - Ch.3: Water Quality Objectives >>>

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California Regional Water Quality Control Board
San Francisco Bay Region

Winston H. Hickox
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Gray Davis
Governor

N00236.000890
ALAMEDA POINT
SSIC. NO. 5090.3

Date: JUL 2 1 2003
File No. 2199.9285 (JCH)

Ms. Glenna M. Clark
Remedial Project Manager
Department of the Navy
Southwest Division
Naval Facilities Engineering Command
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San Diego, California 92101-8517

SUBJECT: CONCURRENCE THAT GROUNDWATER MEETS THE EXEMPTION CRITERIA IN THE STATE WATER RESOURCES CONTROL BOARD SOURCE OF DRINKING WATER POLICY RESOLUTION 88-63, AND SAN FRANCISCO BAY REGIONAL WATER QUALITY CONTROL BOARD RESOLUTION 89-39 FOR GROUNDWATER WEST OF SARATOGA STREET AT ALAMEDA POINT, CITY OF ALAMEDA, ALAMEDA COUNTY

Dear Ms. Clark:

This is in response to the U.S. Navy's July 10, 2003, request for an exemption from the municipal and domestic water supply designation in accordance to San Francisco Bay Regional Water Quality Control Board (Regional Board) Resolution 89-39 and State Water Resources Control Board (State Board) Source of Drinking Water Policy, Resolution 88-63.

Staff has reviewed the accompany report titled "Determination of The Beneficial Uses of Groundwater, Alameda Point, Alameda, California" (Report) dated July 2000, and finds that the quality and nature of the groundwater in the first and second water bearing zones beneath Alameda Point west of Saratoga Street are such that these waters are not potential sources of drinking water pursuant to State Board Resolution No. 88-63 and Regional Board Resolution 89-39. Furthermore, as the U.S. Navy demonstrated in the Report, the artificial land surface west of Saratoga Avenue lies entirely within what was the San Francisco Bay prior to the early 1900's.

Staff concurs with the U.S. Navy that the groundwater in the first and second water bearing zones west of Saratoga Avenue are not potential sources of drinking water, based on the high total dissolved solids (TDS) data. However, the U.S. Navy must consider all other potential beneficial uses of the groundwater west of Saratoga Avenue as outlined in the 1995 Water Quality Control Plan, San Francisco Bay Regional Board.

Hydrogeology of the Subsurface at Alameda Point west of Saratoga Avenue

There are two water-bearing zones at Alameda Point west of Saratoga Avenue. The first is an unconfined aquifer composed of artificial fill material from just below ground surface to the top of the Bay Sediment Unit. The natural groundwater gradient for the shallow fill slopes toward the Bay. The Bay Sediment Unit west of Saratoga Avenue is about 10 to 110 feet thick. The second water-bearing zone is a semi-confined aquifer composed of the lower portion of the Bay Sediment Unit, the Merrit Sand Formation (where present), and the upper unit of the San Antonio Formation. Beneath the second water bearing zone is the Alameda Formation.

Total Dissolved Solids Levels in the Shallow Fill Aquifer at Alameda Point west of Saratoga Avenue

The TDS exemption criteria in the State Board's Sources of Drinking Water Policy, Resolution No. 88-63, states that all groundwater in California are considered a potential drinking water source unless the TDS levels exceed 3,000 mg/L, and it is not reasonably expected by the Board that the groundwater could supply a public water system. The first and second water bearing zones at Alameda Point west of Saratoga Avenue contain water with high TDS contents due to naturally occurring saltwater intrusion. Information submitted by the U.S. Navy indicates that the maximum TDS concentrations in the first water bearing zone range from 80 – 52,000 mg/L and the maximum TDS concentrations in the second water bearing zone range from 1,600 – 78,600 mg/L.

Additional Issues

While the U.S. Navy has adequately demonstrated that the groundwater in the first and second water bearing zones are brackish and their TDS concentrations exceed the State Board's Sources of Drinking Water Policy exemption criteria, there are several other issues that must still be addressed. Other potential groundwater beneficial uses as outlined in the 1995 Basin Plan (Table 2-9), still apply to Alameda Point west of Saratoga Avenue (i.e. agricultural supply, industrial process supply, and industrial service supply).

Pursuant to State Board Resolution 92-49, the U.S. Navy must still demonstrate that 1) adequate source removal has occurred, 2) the plume or plumes have been adequately defined both laterally and vertically, and 3) a long-term monitoring program is established to verify that the plume or plumes are stable and will not impact ecological receptors or human health (e.g. from volatilization into trenches and buildings).

Please contact me at (510) 622-2363 or email jch@rb2.swrcb.ca.gov if you have any questions.

Very Truly Yours,

Judy C. Huang, P.E.
Associate Water Resource Control Engineer
Groundwater Protection and Waste Containment Division

cc:

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SENSITIVE RECORD

PORTIONS OF THIS RECORD ARE CONSIDERED SENSITIVE AND ARE NOT FOR PUBLIC VIEWING

PRIVATE CITIZEN'S HOME ADDRESS HAS BEEN REDACTED IN ACCORDANCE WITH THE PRIVACY ACT

QUESTIONS MAY BE DIRECTED TO:

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AUG 6 2012

Mr. John West
San Francisco Bay Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

SUBJECT: REQUEST FOR GROUNDWATER USE EXCEPTION FROM CONSIDERATION AS A MUNICIPAL OR DOMESTIC WATER SUPPLY IN THE SOUTHEAST PORTION OF THE FORMER NAVAL AIR STATION ALAMEDA POINT, ALAMEDA, CALIFORNIA - DOCUMENT CONTROL NUMBER (DCN): CH2M-1000-FZN0-0010

Dear Mr. West,

This letter presents data which supports that the shallow groundwater (i.e., groundwater above the Yerba Buena Mud) in the southeast portion of Alameda Point is not of sufficient quality to be considered a future potential municipal or domestic water source pursuant to State Water Resources Control Board Resolution No. 88-63 and State Water Board Resolution No. 89-39, "Sources of Drinking Water". The Department of the Navy (Navy) requests the San Francisco Bay Regional Water Quality Control Board's (Water Board) concurrence that groundwater does not meet municipal and domestic supply (MUN) criteria for the southeast portion of the former Naval Air Station Alameda Point (Alameda Point), Alameda, California. The southeast portion includes the following areas: operable units (OU)-2A (Installation Restoration Program (IR) Sites 9, 13, 19, 22, 23), OU-2B (IR Sites 3, 4, 11, and 21), OU-1 (IR Site 16), OU-6 (IR Site 27), and Transfer Parcels Economic Development Conveyance (EDC)-12 and EDC-17 (Figure 1).

The Navy is requesting this MUN use exception because the shallow groundwater beneath the southeast portion of Alameda Point does not meet the State's requirements to be considered as a future MUN water source. The Navy understands that shallow groundwater is in hydraulic communication with San Francisco Bay, and the Navy is committed to its protection. Risks to ecological receptors have been evaluated in each sites' appropriate CERCLA documentation, and have been found to either be an incomplete exposure pathway, or below screening levels. Risks due to vapor intrusion into indoor air were also evaluated as a potential exposure pathway. If the drinking water exposure pathway is no longer applicable, vapor intrusion risk would drive the cleanup goals for any CERCLA sites requiring a response action.

The Navy understands that the Water Board may identify exceptions to beneficial uses based on the following exceptions criteria stated in State Water Board Resolution No. 88-63 and State Water Board Resolution No. 89-39, "Sources of Drinking Water":

(a) Total dissolved solids (TDS) exceed 3,000 milligrams per liter (mg/L) (5,000 microSiemens per centimeter [µS/cm], electrical conductivity), and it is not reasonably expected by the Water Board that the groundwater could supply a public water system.

(b) There is contamination, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices (BMPs) or best economically achievable treatment practices.

(c) The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.

(d) The aquifer is regulated as a geothermal energy-producing source or has been exempted administratively pursuant to 40 Code of Federal Regulations (CFR) Part 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR Part 261.3.

In addition to the exceptions criteria above, the Navy also considered the following in evaluating the shallow groundwater's potential future MUN use:

- The southeast region's proximity to San Francisco Bay and its formerly submerged setting.
- The lack of an effective confining layer present with sufficient thickness and lateral extent to create two separate and distinct water-bearing zones.
- State of California production well construction requirements regarding the length of the sanitary seal for municipal, industrial, and domestic production wells.
- The current and anticipated future MUN water supply to Alameda Point.

The following discussion describes the groundwater conditions at Alameda Point and the factors the Navy believes preclude the use of the shallow groundwater in the southeastern portion of Alameda Point

as a suitable or potentially suitable municipal or domestic water supply.

SOUTHEASTERN AREA GEOLOGY

Three members of the Alameda Formation are present in the southeast portion of Alameda Point. A thin layer of artificial fill overlies the Alameda Formation. Members from top to bottom are the Bay Sediment Unit (BSU), formerly referred to as Young Bay Mud, the Posey/Merritt/San Antonio Members (a sequence of alluvial fan deposits), and the Yerba Buena Mud, also referred to as Old Bay Mud.

The BSU, where present, is composed of sands, silty sands, clay lenses, and clayey sand lenses with shells. The BSU is not present throughout the southeastern portion of the site because of its former depositional setting. The former shoreline exists in the Southeast region; as a result, the BSU is only present in the former off-shore area as shown on Figure 2). Geologic cross sections were developed for the southeastern area, see Figures 3 and 4. As shown in Figure 4, a small BSU lens exists in the central portion of the southeastern area and extends minimally into OU-2A and EDC-12.

The Merritt Sand is described as well-sorted aeolian sand deposited contemporaneously with the Posey and Upper San Antonio Members (Rogers and Figuers, 1991); however, a strictly sand unit was not encountered in borings in the southeast region of Alameda Point. Instead, the alluvial fan deposits between the Young Bay Mud and the Old Bay Mud are inter-fingered and differentiation among them is difficult. The Posey/Merritt/San Antonio Members are composed of clayey sand, silty sand, and clay with sand (TTEC, 2009).

The Yerba Buena Mud is described as a black, organic clay layer that averages 25 to 50 feet thick with a gravel/sand/shell layer commonly in the middle of the unit. The Yerba Buena Mud is a regional aquitard underlying the Upper Unit of the San Antonio member at approximately 70 to 100 feet below ground surface (bgs) at OU-2A and OU-2B within the southeast region (Figures 3 and 4).

SOUTHEASTERN AREA HYDROGEOLOGY

The hydrogeologic unit present in the southeast portion of the site is a shallow unconfined water-bearing zone from the water table at approximately 3 to 6 feet bgs to the top of the Yerba Buena Mud at approximately 70 to 79 feet bgs. This zone includes artificial fill, where present, the BSU where present, the Posey/Merritt/San Antonio Members. In the southeast area, the clay within the BSU was not deposited in sufficient thickness or lateral continuity to create two

separate and distinct water-bearing zones (Figures 4 and 5). This is the critical difference between the central region's hydrostratigraphy and the southeast region described in the Determination of the Beneficial Uses of Groundwater Report (TTEMi, 2000). In the central region of Alameda Point the BSU is present as a laterally continuous clay confining layer which separates two water-bearing zones. In the southeast region, the BSU, where present, contains a higher percentage of sand and lacks a continuous clay layer. Clay is present only occasionally as narrow lenses of limited lateral extent. As a result, the BSU is an ineffective aquitard in the southeastern region resulting in density stratified freshwater in physical contact with saline water (Figure 5). Therefore, it is appropriate that the evaluations used to determine future potential beneficial uses (e.g., total dissolved solids (TDS) measurements) should be made throughout the shallow water-bearing zone in the southeast region.

GROUNDWATER QUALITY: TDS DISTRIBUTION

The Navy has compiled TDS data from eleven IR Sites (3, 4, 9, 11, 13, 16, 19, 21, 22, 23, and 27) in addition to Parcel EDC-12 and EDC-17. TDS from 157 groundwater monitoring wells and 26 hydropunch/Geoprobe wells were used to support the beneficial use exception request. The sample locations and all TDS data in the southeast area are shown in Figure 6. Figures 7 through 9 show TDS concentration contours for shallow (0 to 20 feet bgs), intermediate (20 to 50 feet bgs), and deep (50 feet bgs and greater) depth intervals. TDS data are listed in Table 1.

Based on historical groundwater data (February 1994 through July 20, 2012), TDS values range from 135 mg/L to 62,600 mg/L with an average TDS of approximately 15,274 mg/L. A TDS weighted average with equal distribution of measurements taken from the shallow interval (well screen depths less than 20 feet bgs), mid-interval (well screen depths between 20 and 50 feet bgs) and deep interval (well screen depths greater than 50 feet bgs) was calculated. The average TDS weighted proportionally for measurements taken from the three intervals is 15,274 mg/L. These averages include monitoring well and Hydropunch data. Hydropunch TDS data are as accurate as monitoring well data because the EPA Method (160.1) and Standard Method (2540C) filter the sample in the lab to ensure an accurate dissolved measurement.

In July 2012, the Navy collected seven hydropunch samples (AP12TDS-DP01 through AP12TDS-DP03; AP17TDS-DP01 and AP17TDS-DP02; APIR16TDS-DP01; APIR27TDS-DP01) within EDC-12, EDC-17, IR Site 16, and IR Site 27 to enhance the TDS data set for these areas (Table 1).

The hydropunch samples included one sample (AP17TDS-DP01) from 49 feet bgs and the remaining six hydropunch samples were collected at 50 feet bgs (see Figure 6 and 9). Analytical results for these new TDS samples are listed in Table 1 and the soil boring logs are attached.

The average TDS value and weighted average TDS value exceeds both the Water Board (3,000 mg/L) and U.S. EPA (10,000 mg/L) potential beneficial use standards. Most of the southeast area of Alameda Point is reclaimed tideland or bay, and the high TDS values are representative of historical infilling of the San Francisco Bay.

WELL CONSTRUCTION REQUIREMENTS

The California Department of Water Resources (DWR) has developed standard well construction requirements to prevent contamination of water supply wells by chemicals and biologic hazards related to point and nonpoint sources (DWR, "California Well Standards, 1991" Bulletin 74-90). The California standards require that annular sanitary seals must extend at least 50 feet bgs for community and industrial water supply wells and at least 20 feet bgs for domestic, agricultural, and other types of water supply wells. These well construction requirements would result in screened intervals in saline water that would neither be suitable for domestic, agricultural, industrial, nor municipal beneficial uses.

SALINE WATER INTRUSION

Additional site-specific factors that have also been considered are the proximity to the San Francisco Bay and potential for additional saline water intrusion.

Alameda Point is surrounded by the San Francisco Bay and Oakland Inner Harbor. Before the creation of land at Alameda Point, the majority of the southeastern area of the site was submerged. The Merritt Sand aquifer (occurring east of Alameda Point) is a hydraulically isolated aquifer with limited recharge resulting from a paved urban landscape. This condition increases the likelihood of saline water intrusion from pumping shallow groundwater in contact with San Francisco Bay. As shown in Figure 5, density stratification is occurring creating a narrow band of fresh water in physical contact with saline water. Pumping of shallow groundwater would create additional saline water intrusion farther inland, as has been observed in the past at Alameda Point and adjacent East Bay Plain shallow aquifers (RWQCB, 1999).

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POTENTIAL FOR OFF-SITE PLUME MIGRATION

One of the major concerns for making the unconfined groundwater a potential drinking water source in the 1999 Beneficial Use document was the potential for off-site (eastward) plume migration resulting from backyard wells used for irrigation in times of drought (TTEMi, 2000). The Navy and the regulatory agencies have evaluated twelve years of groundwater monitoring results and it is evident all plumes are being transported via regional groundwater flow to San Francisco Bay. No plume has ever been observed to migrate upgradient off-site. Further, contaminant source reduction is a component of all groundwater remedial actions, where applicable.

CONCLUSIONS AND RECOMMENDATIONS

The data presented in this letter support the conclusion that shallow groundwater located within the southeastern portion of Alameda Point meets the MUN beneficial use exception criteria. The groundwater in these areas exceeds 3,000 mg/L of TDS on average (exception criteria [a]), and the thin freshwater lens present in the southeastern area of the site is in direct contact with saline water from San Francisco Bay and any pumping would result in additional saline water intrusion. Therefore, the Navy requests that the Water Board concur with the request to except the shallow groundwater in the southeastern portion of Alameda Point from municipal and domestic supply from the water table to top of the Yerba Buena Mud aquitard for the purposes of assessing risk and establishing cleanup goals for CERCLA actions.

If you have any questions or comments, please call me at (619) 532-0951 or the Remedial Project Manager, Ms. Cecily Sabedra at (619) 532-0972.

Sincerely,

DEREK J. ROBINSON
BRAC Environmental Coordinator
By direction of the Director

Enclosures: 1. Figures 1 - 9
2. Table 1 Groundwater TDS Concentrations
3. Soil Boring Logs

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References: a. California Regional Water Quality Control Board, San Francisco Bay Region, 1999. *East Bay Plain Groundwater Basin Beneficial Use Evaluation Report, Alameda and Contra Costa Counties*. California, June.
b. Tetra Tech EMI. 2000. *Final Determination of Beneficial Uses of Groundwater Alameda Point, Alameda, California*. July.
c. Tetra Tech EC, Inc. 2009. Final *Technical Memorandum for Data Gap Sampling at Operable Units 2A and 2B*. Alameda Point, Alameda, California. July.

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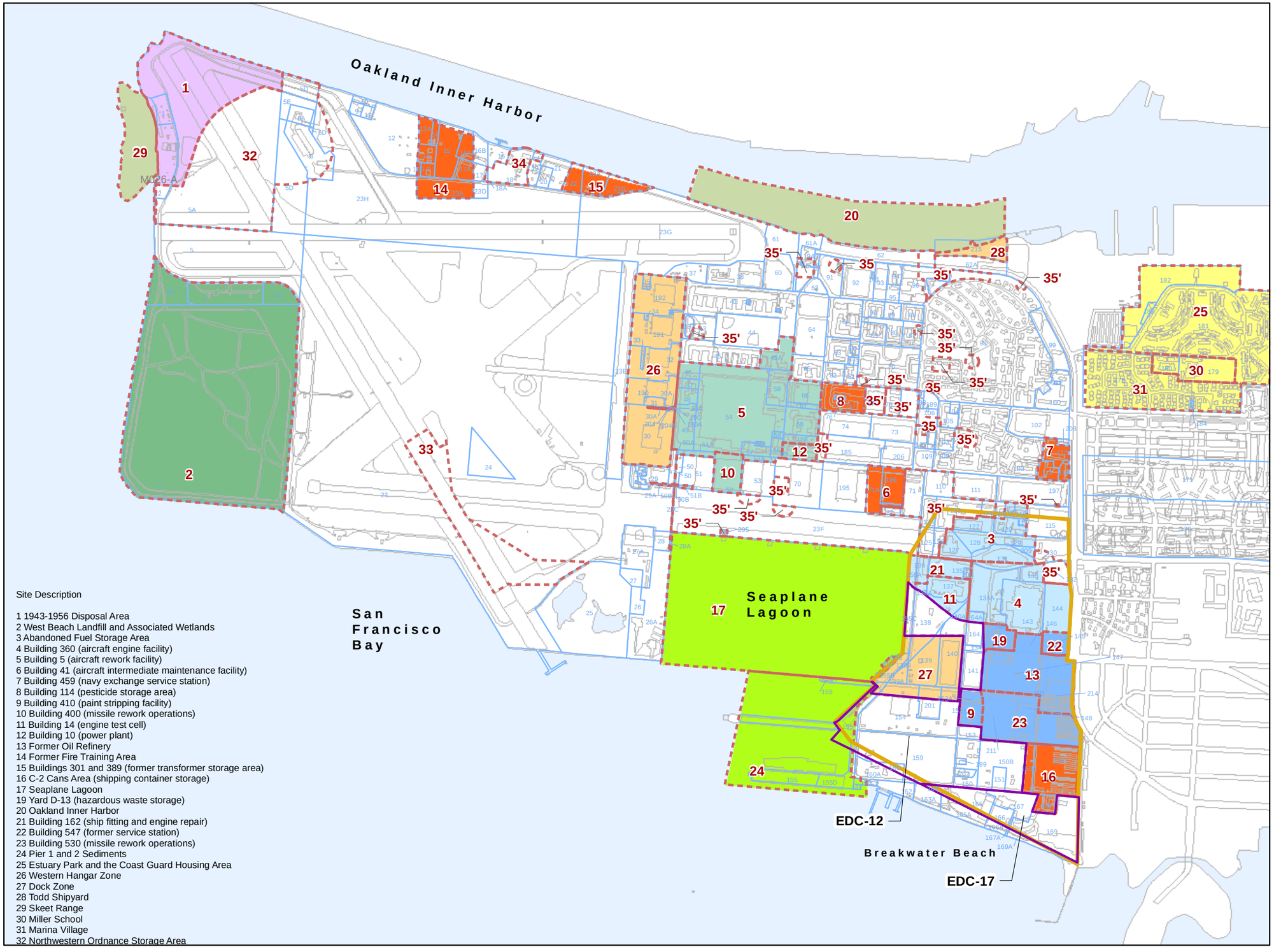

Site Description

1 1943-1956 Disposal Area
2 West Beach Landfill and Associated Wetlands
3 Abandoned Fuel Storage Area
4 Building 360 (aircraft engine facility)
5 Building 5 (aircraft rework facility)
6 Building 41 (aircraft intermediate maintenance facility)
7 Building 459 (navy exchange service station)
8 Building 114 (pesticide storage area)
9 Building 410 (paint stripping facility)
10 Building 400 (missile rework operations)
11 Building 14 (engine test cell)
12 Building 10 (power plant)
13 Former Oil Refinery
14 Former Fire Training Area
15 Buildings 301 and 389 (former transformer storage area)
16 C-2 Cans Area (shipping container storage)
17 Seaplane Lagoon
19 Yard D-13 (hazardous waste storage)
20 Oakland Inner Harbor
21 Building 162 (ship fitting and engine repair)
22 Building 547 (former service station)
23 Building 530 (missile rework operations)
24 Pier 1 and 2 Sediments
25 Estuary Park and the Coast Guard Housing Area
26 Western Hangar Zone
27 Dock Zone
28 Todd Shipyard
29 Skeet Range
30 Miller School
31 Marina Village
32 Northwestern Ordnance Storage Area

LEGEND
- Cercla Site
- Environmental Baseline Survey (EBS) Parcel
- Southeastern Region - Proposed Groundwater Exemption Area
- Transfer Parcel Boundaries
- OU-1
- OU-2A
- OU-2B
- OU-2c
- OU-3
- OU-4a
- OU-4b
- OU-4c
- OU-5
- OU-6
- Road/Runway/Building
- Water

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

OU - Operable Unit

N

0 600 1,200
Feet

FIGURE 1
OPERABLE UNITS AND CERCLA SITES
Alameda Point, Alameda, California

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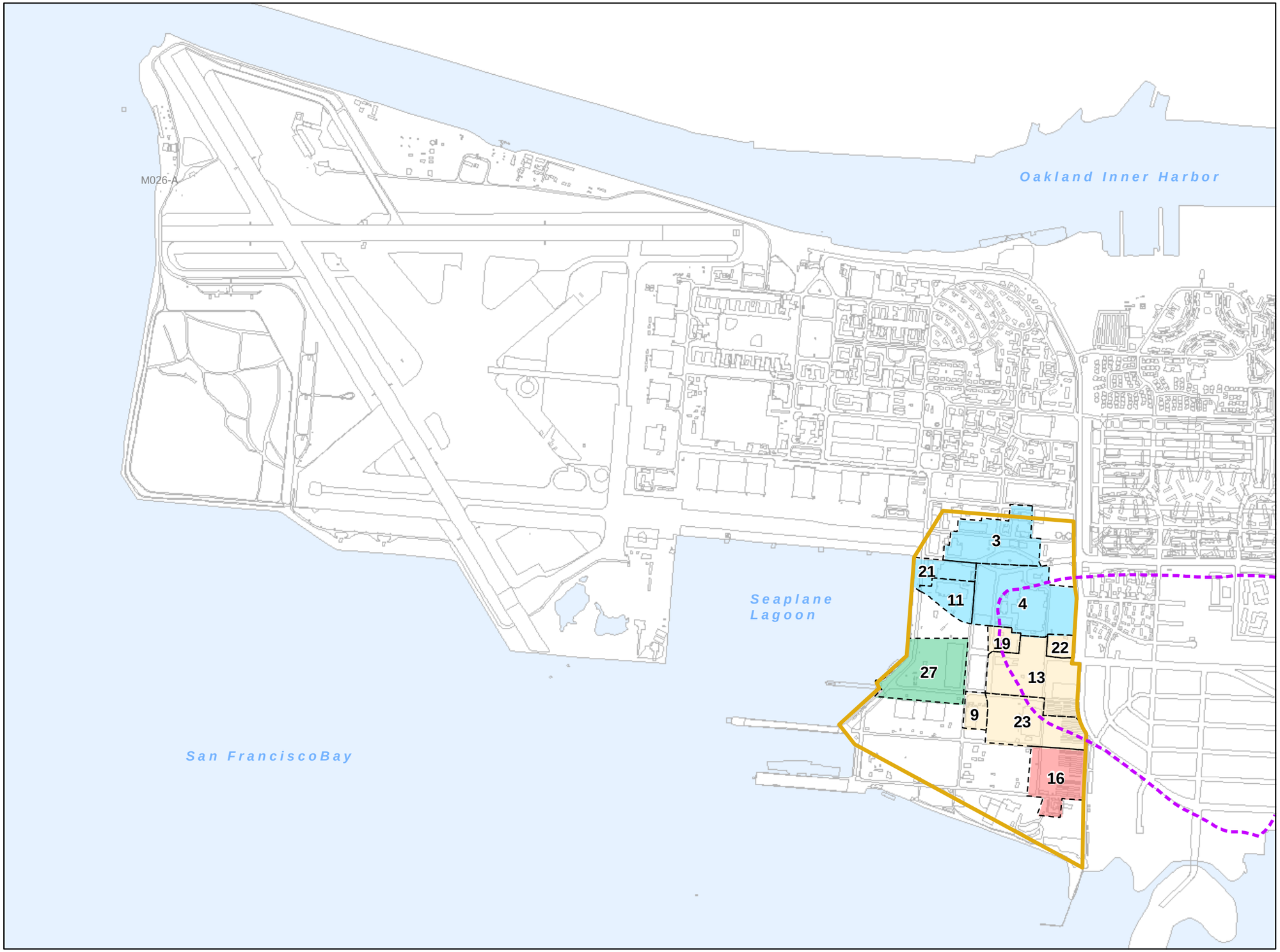

LEGEND

- Approximate Extent of Former Alameda Island Circa 1859 (United States Coast Survey, 1877)
- Proposed Groundwater Exemption Area
- Site and Site Number
- OU-1
- OU-2A
- OU-2B
- OU-6
- Road/Runway/Building
- Water

Notes:

OU - Operable Unit

N

0 600 1,200
Feet

FIGURE 2
EXTENT OF FORMER ALAMEDA ISLAND CIRCA 1859
Alameda Point, Alameda, California

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LEGEND

A——A' CROSS SECTION LOCATION

REGION DIVISION LINE

WESTERN REGION IR SITE BOUNDARY

CENTRAL REGION IR SITE BOUNDARY

SOUTHEASTERN REGION IR SITE BOUNDARY

PROPOSED GROUNDWATER EXEMPTION AREA

750' 0 750' 1500'

SCALE: 1" = 1500'

FIGURE 3
Subregions and Cross Section Locations
Alameda Point
Alameda, CA

Note: Figure from Tetra Tech EM Inc., Revised Draft Determination of Beneficial Uses of Groundwater, Alameda Point Alameda, California. November 1999.

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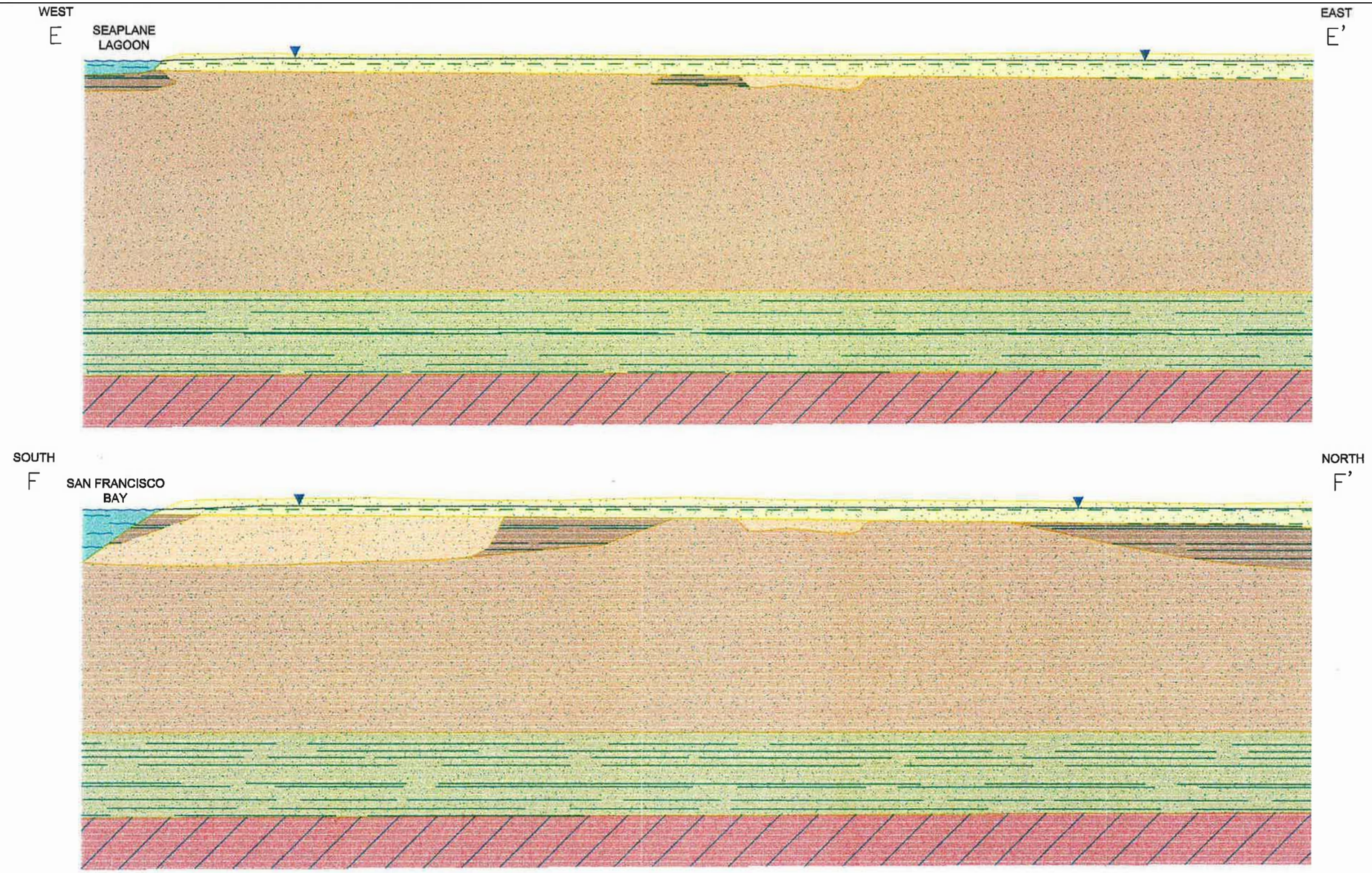

LEGEND

- WATER BODIES
- FILL
- BAY SEDIMENTS CLAY
- BAY SEDIMENTS SAND
- MERRITT SAND
- SAN ANTONIO INTERBEDDED SAND AND CLAY
- YERBA BUENA MUD
- CONTACT OF LITHOLOGIC UNITS
- CONTACT OF FINE AND COARSE MATERIAL WITHIN BAY SEDIMENTS
- FIRST WATER-BEARING ZONE WATER TABLE

NOT TO SCALE

FIGURE 4
Conceptual Geology – Southeastern Region
Cross Section E-E' and F-F'
Alameda Point
Alameda, CA

Note: Figure from Tetra Tech EM Inc., Revised Draft Determination of Beneficial Uses of Groundwater, Alameda Point Alameda, California. November 1999. Not Independently verified by CH2M HILL, Inc.

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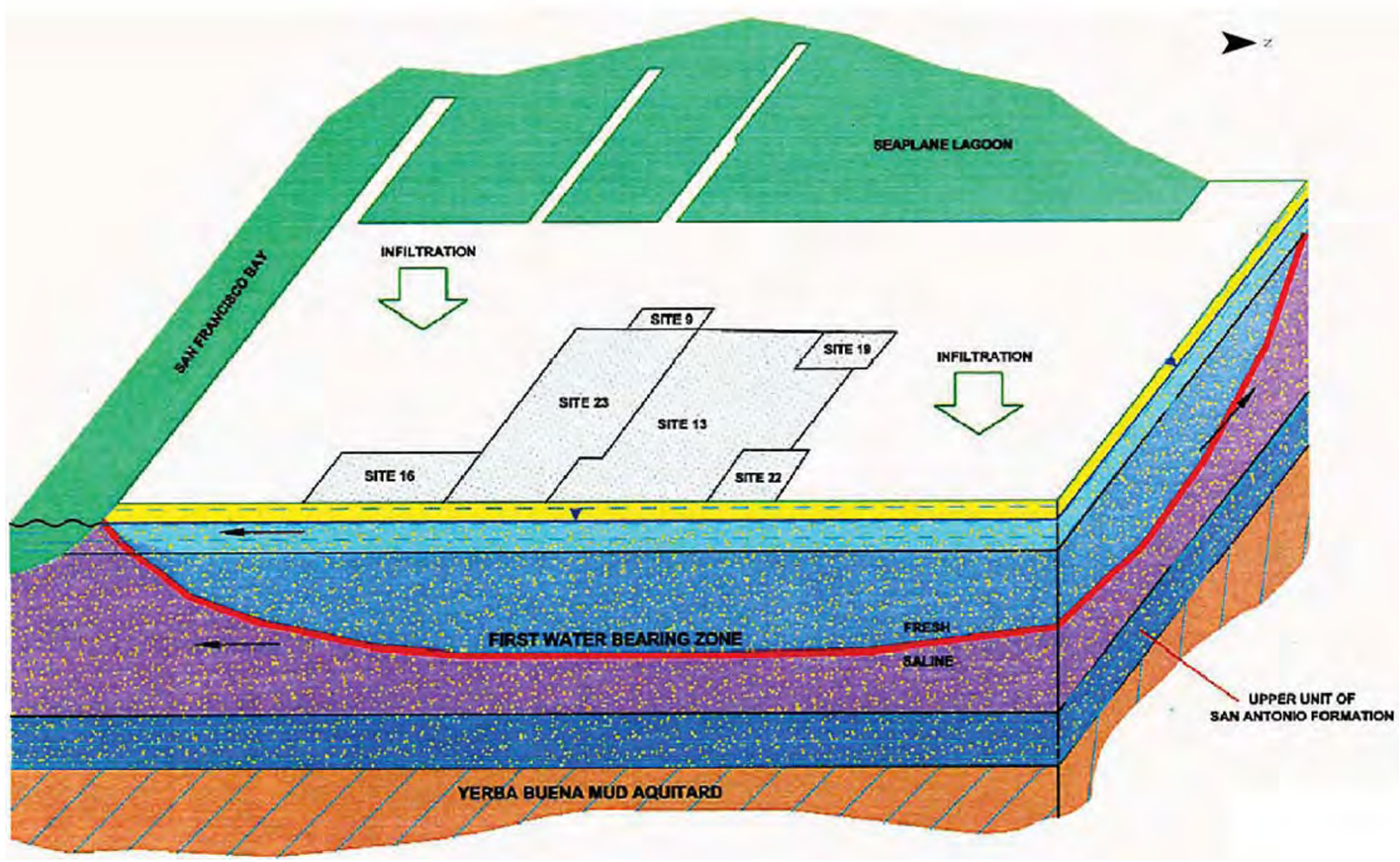

Source: SulTech 2005b

NOT TO SCALE

LEGEND

- INSTALLATION RESTORATION SITE
- SEAWATER
- ARTIFICIAL FILL WITH FRESH WATER
- MERRITT SAND WITH FRESH WATER
- MERRITT SAND WITH SALINE WATER
- UPPER UNIT OF SAN ANTONIO FORMATION WITH SALINE WATER
- YERBA BUENA MUD AQUITARD
- CONTACT OF LITHOLOGIC UNITS
- FIRST WATER-BEARING ZONE WATER TABLE
- GROUNDWATER FLOW DIRECTION
- FRESHWATER/SALTWATER INTERFACE (TOTAL DISSOLVED SOLIDS [TDS] >10,000 MILLIGRAMS PER LITER [mg\L])

FIGURE 5
Conceptual Hydrogeologic Model
for the Southeastern Region
Alameda Point
Alameda, CA

Note: Figure from Tetra Tech EM Inc., Revised Draft Determination of Beneficial Uses of Groundwater, Alameda Point Alameda, California. November 1999. Not Independently verified by CH2M HILL, Inc.

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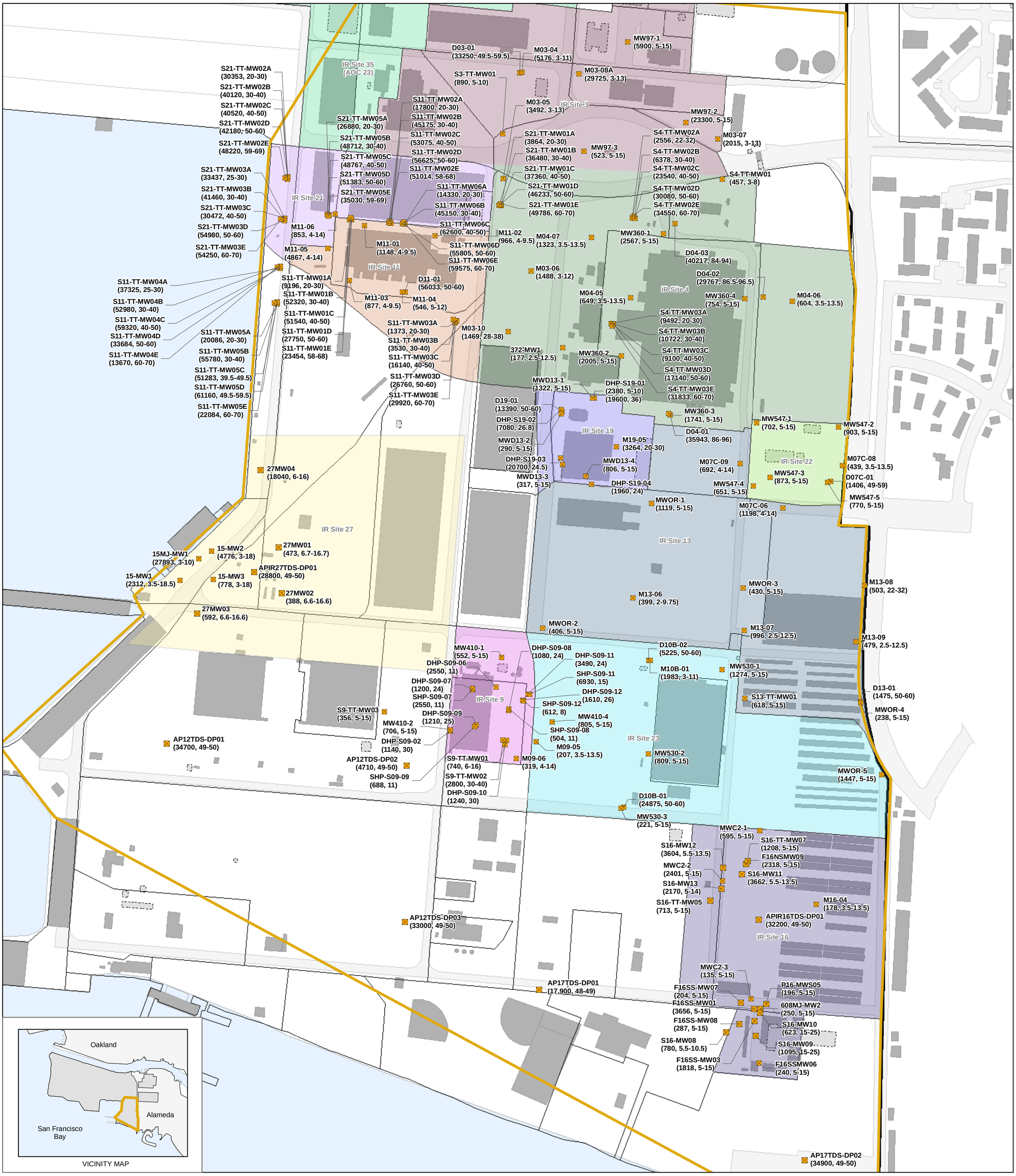

LEGEND

- Groundwater TDS Sample Locations
- Proposed Groundwater Exemption Area
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)

Notes:

MWC2-3 (135, 5-15) — Well ID (Concentration in mg/L, well screen interval in feet)

mg/L = milligrams per liter
TDS = Total Dissolved Solids

Groundwater samples were collected from monitoring wells and hydropunch locations

N

0 200 400
Feet

FIGURE 6
TDS SAMPLE VALUES
Alameda Point, Alameda, California

CH2MHILL

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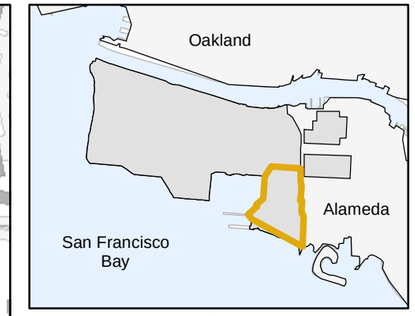

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 225 450
Feet

FIGURE 7
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS BETWEEN 0-20 FEET

Alameda Point, Alameda, California

CH2MHILL

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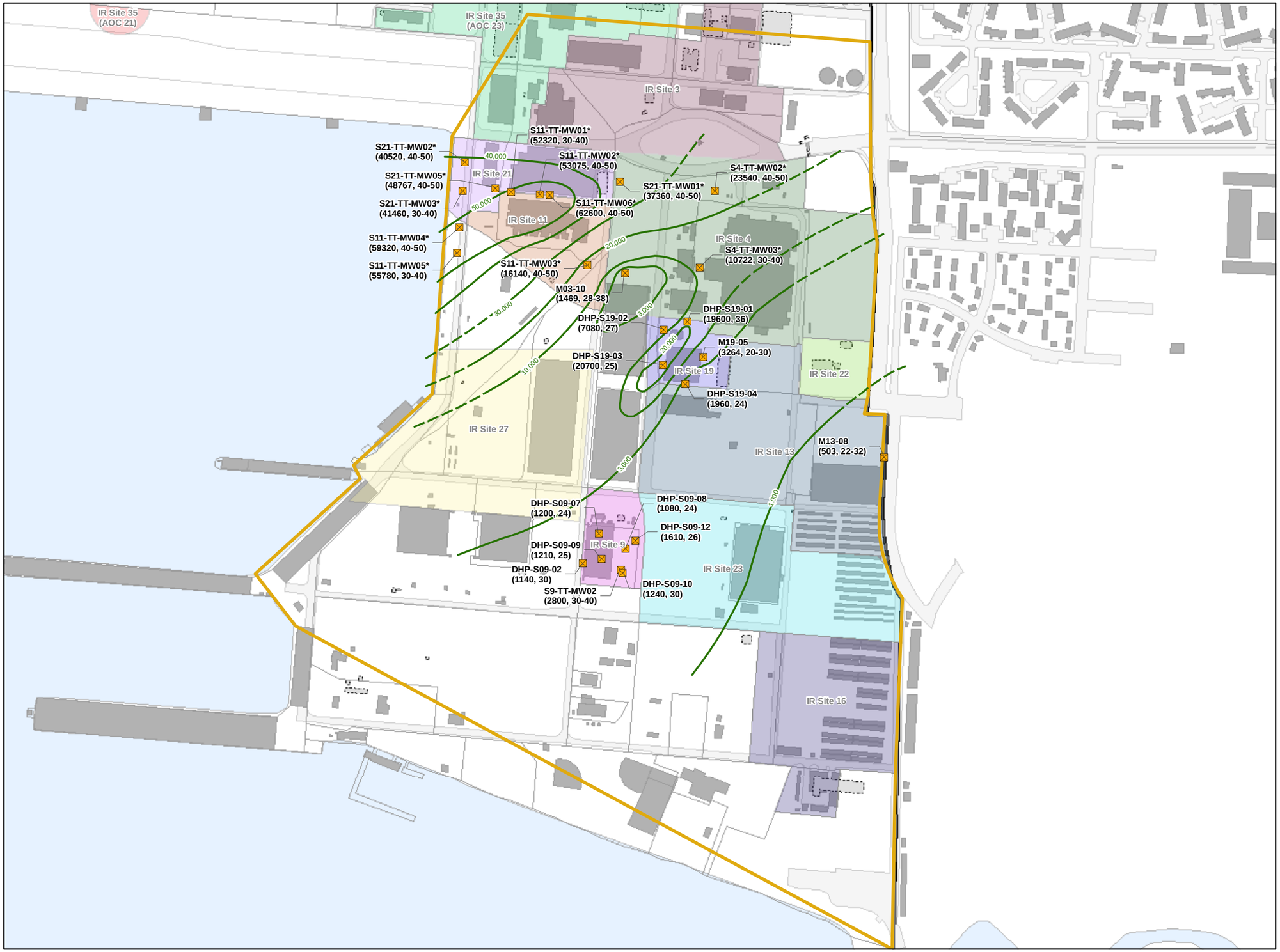

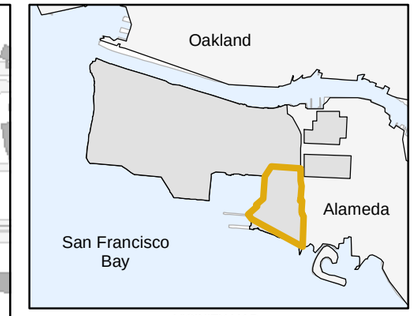

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids
* = TDS values for wells 20 feet from one another have maximum average TDS concentrations listed for contouring purposes.

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 300 600
Feet

FIGURE 8
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS BETWEEN 20-50 FEET
Alameda Point, Alameda, California

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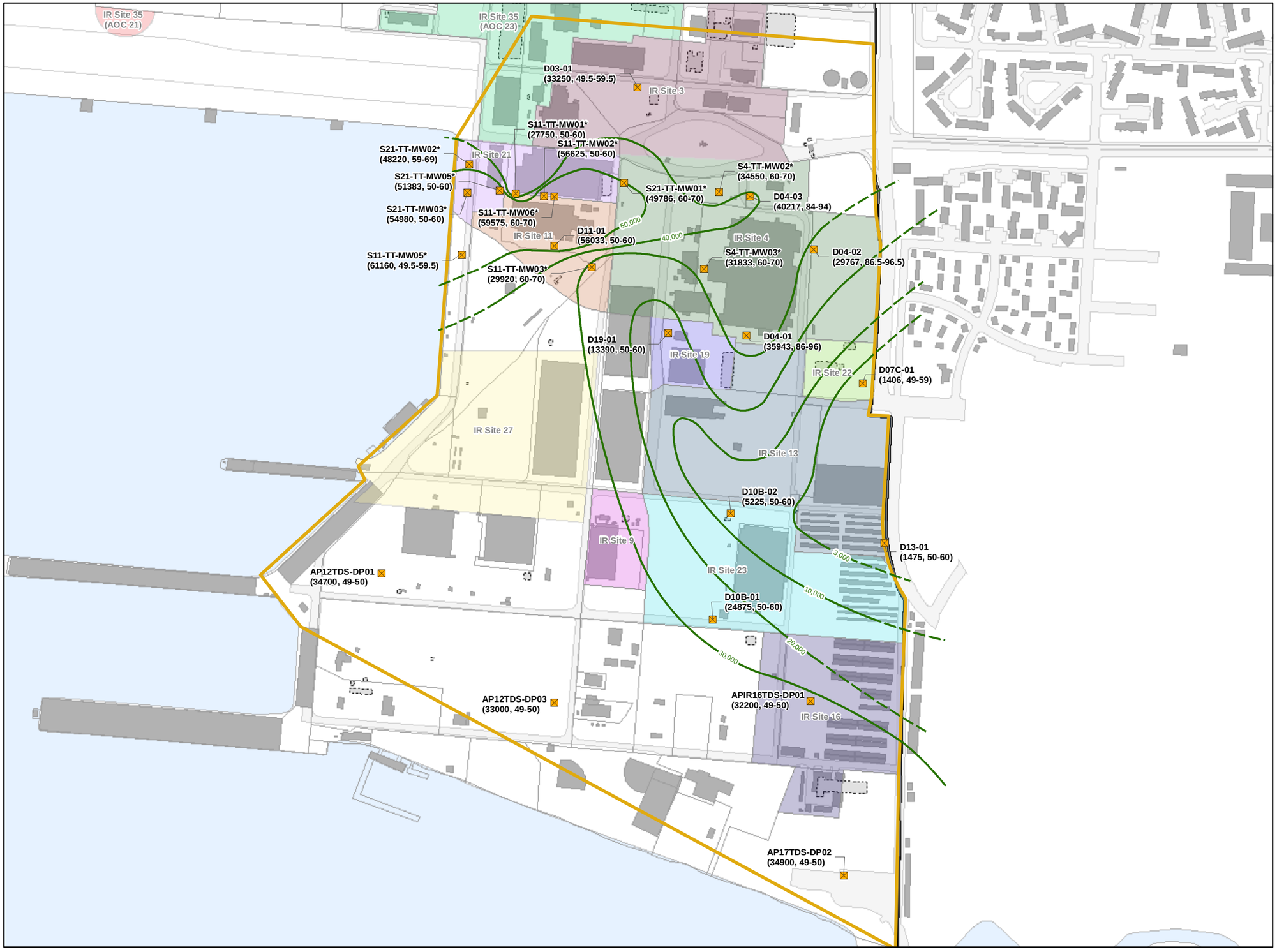

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids
* = TDS values for wells 20 feet from one another have maximum average TDS concentrations listed for contouring purposes.

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 300 600
Feet

FIGURE 9
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS 50 FEET AND GREATER
Alameda Point, Alameda, California

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TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00003	M03-04	5176	3 to 11	Monitoring well	15-Dec-94	04-Aug-98	8
IR 00003	M03-07	2015	3 to 13	Monitoring well	15-Dec-94	04-Aug-98	8
IR 00003	M03-08A	29725	3 to 13	Monitoring well	09-Dec-94	04-Aug-95	4
IR 00003	MW97-1	5900	5 to 15	Monitoring well	14-Oct-94	31-Jul-95	5
IR 00003	MW97-2	23300	5 to 15	Monitoring well	18-Oct-94	01-Aug-95	4
IR 00003	MW97-3	523	5 to 15	Monitoring well	14-Oct-94	02-Aug-95	5
IR 00003	S3-TT-MW01	890	5 to 10	Monitoring well	09-Jun-10	12-May-11	5
IR 00004	372-MW1	177	2.5 to 12.5	Monitoring well	14-Oct-08	10-May-11	14
IR 00004	M03-05	3492	3 to 13	Monitoring well	08-Dec-94	04-Aug-98	9
IR 00004	M03-06	1488	3 to 12	Monitoring well	08-Dec-94	02-Aug-95	4
IR 00004	M04-05	649	3.5 to 13.5	Monitoring well	05-Jul-94	04-Aug-98	9
IR 00004	M04-06	604	3.5 to 13.5	Monitoring well	30-Jun-94	04-Aug-98	8
IR 00004	M04-07	1323	3.5 to 13.5	Monitoring well	06-Jul-94	04-Aug-98	8
IR 00004	MW360-1	2567	5 to 15	Monitoring well	06-Jul-94	04-Aug-98	9
IR 00004	MW360-2	2005	5 to 15	Monitoring well	05-Jul-94	30-Aug-06	11
IR 00004	MW360-3	1741	5 to 15	Monitoring well	01-Jul-94	05-Aug-98	9
IR 00004	MW360-4	754	5 to 15	Monitoring well	01-Jul-94	05-Aug-98	8
IR 00004	S4-TT-MW01	457	3 to 8	Monitoring well	08-Jun-10	10-May-11	7
IR 00009	M09-06	319	4 to 14	Monitoring well	30-Nov-94	07-Aug-98	8
IR 00009	MW410-1	552	5 to 15	Monitoring well	18-Oct-94	08-Aug-95	4
IR 00009	MW410-2	706	5 to 15	Monitoring well	18-Oct-94	04-Aug-95	4
IR 00009	S9-TT-MW01	740	6 to 16	Monitoring well	10-Jun-10	16-May-11	6
IR 00009	S9-TT-MW03	356	5 to 15	Monitoring well	10-Jun-10	13-May-11	5
IR 00009	SHP-S09-07	2550	11	Hydropunch	07-Sep-94	07-Sep-94	1
IR 00011	M11-01	1148	4 to 9.5	Monitoring well	26-Oct-94	07-Aug-98	8
IR 00011	M11-02	966	4 to 9.5	Monitoring well	26-Oct-94	07-Aug-98	9
IR 00011	M11-03	877	4 to 9.5	Monitoring well	01-Nov-94	28-Aug-95	4
IR 00011	M11-04	546	5 to 12	Monitoring well	04-Nov-94	25-Aug-95	4
IR 00011	M11-05	4867	4 to 14	Monitoring well	26-Oct-94	07-Aug-98	9
IR 00013	M07C-06	1198	4 to 14	Monitoring well	10-Nov-94	31-Aug-95	5
IR 00013	M07C-09	692	4 to 14	Monitoring well	10-Nov-94	30-Aug-95	4
IR 00013	M13-06	399	2 to 9.75	Monitoring well	21-Oct-94	07-Aug-98	9
IR 00013	M13-07	996	2.5 to 12.5	Monitoring well	01-Nov-94	16-Aug-95	4

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00013	M13-09	479	2.5 to 12.5	Monitoring well	09-Dec-94	07-Aug-98	8
IR 00013	MWOR-1	1119	5 to 15	Monitoring well	20-Oct-94	09-Aug-95	5
IR 00013	MWOR-2	406	5 to 15	Monitoring well	20-Oct-94	09-Aug-95	4
IR 00013	MWOR-3	430	5 to 15	Monitoring well	20-Oct-94	10-Aug-95	5
IR 00013	MWOR-4	238	5 to 15	Monitoring well	20-Oct-94	17-Aug-95	4
IR 00013	S13-TT-MW01	618	5 to 15	Monitoring well	10-Jun-10	12-May-11	5
IR 00016	608MJ-MW2	250	5 to 15	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	F16NSMW09	2318	5 to 15	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	F16SS-MW01	3656	5 to 15	Monitoring well	30-Apr-10	20-May-11	5
IR 00016	F16SS-MW03	1818	5 to 15	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	F16SSMW06	240	5 to 15	Monitoring well	02-May-06	02-May-06	1
IR 00016	F16SS-MW07	204	5 to 15	Monitoring well	30-Apr-10	19-May-11	5
IR 00016	F16SS-MW08	287	5 to 15	Monitoring well	30-Apr-10	19-May-11	5
IR 00016	M16-04	178	3.5 to 13.5	Monitoring well	01-Dec-94	06-Feb-98	7
IR 00016	MWC2-1	595	5 to 15	Monitoring well	21-Oct-94	17-Aug-95	5
IR 00016	MWC2-2	2401	5 to 15	Monitoring well	24-Oct-94	20-May-11	9
IR 00016	MWC2-3	135	5 to 15	Monitoring well	24-Oct-94	18-Aug-95	4
IR 00016	P-16-MWS05	196	5 to 15	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	S16-MW08	780	5.5 to 10.5	Monitoring well	28-Apr-10	28-Apr-10	1
IR 00016	S16-MW09	1095	15 to 25	Monitoring well	28-Apr-10	19-May-11	4
IR 00016	S16-MW10	623	15 to 25	Monitoring well	28-Apr-10	19-May-11	4
IR 00016	S16-MW11	3662	5.5 to 13.5	Monitoring well	30-Apr-10	17-May-11	5
IR 00016	S16-MW12	3604	5.5 to 13.5	Monitoring well	30-Apr-10	20-May-11	5
IR 00016	S16-MW13	2170	5 to 14	Monitoring well	29-Apr-10	19-May-11	5
IR 00016	S16-TT-MW05	713	5 to 15	Monitoring well	28-Apr-10	18-May-11	4
IR 00016	S16-TT-MW07	1208	5 to 15	Monitoring well	28-Apr-10	18-May-11	4
IR 00019	MWD13-1	1322	5 to 15	Monitoring well	25-Oct-94	18-Aug-95	5
IR 00019	MWD13-2	290	5 to 15	Monitoring well	24-Oct-94	10-Aug-98	6
IR 00019	MWD13-3	317	5 to 15	Monitoring well	25-Oct-94	11-Aug-98	8
IR 00019	MWD13-4	806	5 to 15	Monitoring well	25-Oct-94	21-Aug-95	4
IR 00019	DHP-S19-01	2380	5 to 10	Hydropunch	01-Aug-94	01-Aug-94	1
IR 00021	M11-06	853	4 to 14	Monitoring well	29-Nov-94	07-Aug-98	8
IR 00022	M07C-08	439	3.5 to 13.5	Monitoring well	07-Nov-94	11-Aug-98	8

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00022	MW547-1	702	5 to 15	Monitoring well	08-Nov-94	31-Aug-95	4
IR 00022	MW547-2	903	5 to 15	Monitoring well	08-Nov-94	29-Aug-95	4
IR 00022	MW547-3	873	5 to 15	Monitoring well	07-Nov-94	31-Aug-95	4
IR 00022	MW547-4	651	5 to 15	Monitoring well	07-Nov-94	11-Aug-98	9
IR 00022	MW547-5	770	5 to 15	Monitoring well	10-Nov-94	29-Aug-95	4
IR 00009	DHP-S09-06	2550	11	Hydropunch	08-Sep-94	08-Sep-94	1
IR 00009	SHP-S09-08	504	11	Hydropunch	09-Sep-94	09-Sep-94	1
IR 00009	SHP-S09-09	688	11	Hydropunch	08-Sep-94	08-Sep-94	1
IR 00009	SHP-S09-11	6930	15	Hydropunch	25-Aug-94	25-Aug-94	1
IR 00009	SHP-S09-12	612	8	Hydropunch	24-Aug-94	24-Aug-94	1
IR 00023	M09-05	207	3.5 to 13.5	Monitoring well	30-Nov-94	07-Aug-95	5
IR 00023	M10B-01	1983	3 to 11	Monitoring well	01-Dec-94	09-Aug-95	4
IR 00023	MW410-4	805	5 to 15	Monitoring well	19-Oct-94	07-Aug-95	4
IR 00023	MW530-1	1274	5 to 15	Monitoring well	19-Oct-94	09-Aug-95	5
IR 00023	MW530-2	809	5 to 15	Monitoring well	19-Oct-94	10-Aug-98	8
IR 00023	MW530-3	221	5 to 15	Monitoring well	19-Oct-94	09-Aug-95	4
IR 00023	MWOR-5	1447	5 to 15	Monitoring well	21-Oct-94	07-Aug-98	8
IR 00027	15MJ-MW1	27893	3 to 10	Monitoring well	19-Mar-02	10-Jul-02	3
IR 00027	15-MW1	2312	3.5 to 18.5	Monitoring well	20-Mar-02	09-Jul-02	5
IR 00027	15-MW2	4776	3 to 18	Monitoring well	19-Mar-02	02-Jul-02	5
IR 00027	15-MW3	778	3 to 18	Monitoring well	14-Mar-02	01-Jul-02	4
IR 00027	27MW01	473	6.7 to 16.7	Monitoring well	09-Jul-02	06-Mar-08	7
IR 00027	27MW02	388	6.6 to 16.6	Monitoring well	08-Jul-02	06-Mar-08	8
IR 00027	27MW03	592	6.6 to 16.6	Monitoring well	10-Jul-02	06-Mar-08	5
IR 00027	27MW04	18040	6 to 16	Monitoring well	05-Aug-03	06-Mar-08	3
IR 00004	S4-TT-MW02A	2556	22 to 32	Monitoring well	15-Jun-09	10-May-11	9
IR 00004	S4-TT-MW02B	6378	30 to 40	Monitoring well	12-Jun-08	10-May-11	12
IR 00004	S4-TT-MW02C	23540	40 to 50	Monitoring well	12-Jun-08	10-May-11	15
IR 00004	S4-TT-MW03A	9492	20 to 30	Monitoring well	18-Jun-09	10-May-11	10
IR 00004	S4-TT-MW03B	10722	30 to 40	Monitoring well	18-Jun-09	10-May-11	10
IR 00004	S4-TT-MW03C	9100	40 to 50	Monitoring well	08-Jun-10	10-May-11	5
IR 00004	M03-10	1469	28 to 38	Monitoring well	12-Jun-08	10-May-11	13
IR 00009	DHP-S09-02	1140	30	Hydropunch	28-Jul-94	28-Jul-94	1

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00009	DHP-S09-07	1200	24	Hydropunch	07-Sep-94	07-Sep-94	1
IR 00009	DHP-S09-08	1080	24	Hydropunch	06-Sep-94	06-Sep-94	1
IR 00009	DHP-S09-09	1210	25	Hydropunch	12-Sep-94	12-Sep-94	1
IR 00009	DHP-S09-10	1240	30	Hydropunch	09-Sep-94	09-Sep-94	1
IR 00009	DHP-S09-11	3490	24	Hydropunch	25-Aug-94	25-Aug-94	1
IR 00009	DHP-S09-12	1610	26	Hydropunch	25-Aug-94	25-Aug-94	1
IR 00009	S9-TT-MW02	2800	30 to 40	Monitoring well	10-Jun-10	16-May-11	5
IR 00011	S11-TT-MW01A	9196	20 to 30	Monitoring well	08-Jun-10	09-May-11	7
IR 00011	S11-TT-MW01B	52320	30 to 40	Monitoring well	10-Jun-10	09-May-11	5
IR 00011	S11-TT-MW01C	51540	40 to 50	Monitoring well	08-Jun-10	09-May-11	5
IR 00011	S11-TT-MW02A	17800	20 to 30	Monitoring well	08-Jun-10	18-Feb-11	4
IR 00011	S11-TT-MW02B	45175	30 to 40	Monitoring well	09-Jun-10	22-Feb-11	4
IR 00011	S11-TT-MW02C	53075	40 to 50	Monitoring well	10-Jun-10	22-Feb-11	4
IR 00011	S11-TT-MW03A	1373	20 to 30	Monitoring well	08-Jun-10	09-May-11	7
IR 00011	S11-TT-MW03B	3530	30 to 40	Monitoring well	08-Jun-10	09-May-11	5
IR 00011	S11-TT-MW03C	16140	40 to 50	Monitoring well	09-Jun-10	09-May-11	6
IR 00011	S11-TT-MW04A	37325	25 to 30	Monitoring well	16-Jun-08	11-May-11	12
IR 00011	S11-TT-MW04B	52980	30 to 40	Monitoring well	08-Jun-10	12-May-11	5
IR 00011	S11-TT-MW04C	59320	40 to 50	Monitoring well	09-Jun-10	11-May-11	5
IR 00011	S11-TT-MW05A	20086	20 to 30	Monitoring well	10-Jun-10	11-May-11	7
IR 00011	S11-TT-MW05B	55780	30 to 40	Monitoring well	10-Jun-10	11-May-11	5
IR 00011	S11-TT-MW05C	51283	39.5 to 49.5	Monitoring well	10-Jun-10	11-May-11	6
IR 00011	S11-TT-MW06A	14330	20 to 30	Monitoring well	09-Jun-10	15-Feb-11	4
IR 00011	S11-TT-MW06B	45150	30 to 40	Monitoring well	16-Jun-08	14-Feb-11	12
IR 00011	S11-TT-MW06C	62600	40 to 50	Monitoring well	16-Jun-08	14-Feb-11	11
IR 00013	M13-08	503	22 to 32	Monitoring well	14-Dec-94	16-Aug-95	5
IR 00019	DHP-S19-01	19600	36	Hydropunch	27-Jul-94	27-Jul-94	1
IR 00019	DHP-S19-02	7080	26.8	Hydropunch	01-Aug-94	01-Aug-94	2
IR 00019	DHP-S19-03	20700	24.5	Hydropunch	01-Sep-94	01-Sep-94	1
IR 00019	DHP-S19-04	1960	24	Hydropunch	18-Aug-94	18-Aug-94	1
IR 00019	M19-05	3264	20 to 30	Monitoring well	13-Dec-94	21-Aug-95	5
IR 00021	S21-TT-MW01A	3864	20 to 30	Monitoring well	10-Jun-10	09-May-11	5
IR 00021	S21-TT-MW01B	36480	30 to 40	Monitoring well	10-Jun-10	09-May-11	5

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00021	S21-TT-MW01C	37360	40 to 50	Monitoring well	10-Jun-10	09-May-11	5
IR 00021	S21-TT-MW02A	30353	20 to 30	Monitoring well	11-Jun-08	11-May-11	15
IR 00021	S21-TT-MW02B	40120	30 to 40	Monitoring well	09-Jun-10	11-May-11	5
IR 00021	S21-TT-MW02C	40520	40 to 50	Monitoring well	09-Jun-10	12-May-11	5
IR 00021	S21-TT-MW03A	33437	25 to 30	Monitoring well	09-Jun-10	12-May-11	6
IR 00021	S21-TT-MW03B	41460	30 to 40	Monitoring well	09-Jun-10	11-May-11	5
IR 00021	S21-TT-MW03C	30472	40 to 50	Monitoring well	09-Jun-10	12-May-11	5
IR 00021	S21-TT-MW05A	26880	20 to 30	Monitoring well	09-Jun-10	09-May-11	5
IR 00021	S21-TT-MW05B	48713	30 to 40	Monitoring well	16-Jun-08	09-May-11	16
IR 00021	S21-TT-MW05C	48767	40 to 50	Monitoring well	11-Jun-08	09-May-11	12
EDC 17	AP17TDS-DP01	17900	48 to 49	Hydropunch	19-Jul-12	19-Jul-12	1
IR 00003	D03-01	33250	49.5 to 59.5	Monitoring well	14-Dec-94	04-Aug-95	4
IR 00004	D04-01	35943	86 to 96	Monitoring well	01-Jul-94	05-Aug-98	7
IR 00004	D04-02	29767	86.5 to 96.5	Monitoring well	09-Mar-95	05-Aug-98	6
IR 00004	D04-03	40217	84 to 94	Monitoring well	09-Mar-95	05-Aug-98	6
IR 00004	S4-TT-MW02D	30080	50 to 60	Monitoring well	08-Jun-10	09-May-11	5
IR 00004	S4-TT-MW02E	34550	60 to 70	Monitoring well	08-Jun-10	09-May-11	6
IR 00004	S4-TT-MW03D	17140	50 to 60	Monitoring well	08-Jun-10	10-May-11	5
IR 00004	S4-TT-MW03E	31833	60 to 70	Monitoring well	08-Jun-10	10-May-11	6
IR 00011	D11-01	56033	50 to 60	Monitoring well	08-Mar-95	19-Sep-95	3
IR 00011	S11-TT-MW01D	27750	50 to 60	Monitoring well	10-Jun-10	09-May-11	6
IR 00011	S11-TT-MW01E	23454	58 to 68	Monitoring well	10-Jun-10	09-May-11	5
IR 00011	S11-TT-MW02D	56625	50 to 60	Monitoring well	09-Jun-10	22-Feb-11	4
IR 00011	S11-TT-MW02E	51014	58 to 68	Monitoring well	10-Jun-10	22-Feb-11	5
IR 00011	S11-TT-MW03D	26760	50 to 60	Monitoring well	08-Jun-10	09-May-11	5
IR 00011	S11-TT-MW03E	29920	60 to 70	Monitoring well	08-Jun-10	09-May-11	5
IR 00011	S11-TT-MW04D	33684	50 to 60	Monitoring well	09-Jun-10	12-May-11	5
IR 00011	S11-TT-MW04E	13670	60 to 70	Monitoring well	09-Jun-10	11-May-11	5
IR 00011	S11-TT-MW05D	61160	49.5 to 59.5	Monitoring well	10-Jun-10	11-May-11	5
IR 00011	S11-TT-MW05E	22084	60 to 70	Monitoring well	10-Jun-10	11-May-11	5
IR 00011	S11-TT-MW06D	55805	50 to 60	Monitoring well	16-Jun-08	14-Feb-11	11
IR 00011	S11-TT-MW06E	59575	60 to 70	Monitoring well	09-Jun-10	25-Feb-11	4
IR 00013	D13-01	1475	50 to 60	Monitoring well	16-Dec-94	19-Sep-95	4

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
IR 00019	D19-01	13390	50 to 60	Monitoring well	16-Dec-94	06-Aug-98	6
IR 00021	S21-TT-MW01D	46233	50 to 60	Monitoring well	10-Jun-10	09-May-11	6
IR 00021	S21-TT-MW01E	49786	60 to 70	Monitoring well	10-Jun-10	09-May-11	7
IR 00021	S21-TT-MW02D	42180	50 to 60	Monitoring well	09-Jun-10	12-May-11	5
IR 00021	S21-TT-MW02E	48220	59 to 69	Monitoring well	09-Jun-10	11-May-11	5
IR 00021	S21-TT-MW03D	54980	50 to 60	Monitoring well	09-Jun-10	11-May-11	5
IR 00021	S21-TT-MW03E	54250	60 to 70	Monitoring well	09-Jun-10	11-May-11	6
IR 00021	S21-TT-MW05D	51383	50 to 60	Monitoring well	16-Jun-08	09-May-11	12
IR 00021	S21-TT-MW05E	35030	59 to 69	Monitoring well	10-Jun-10	09-May-11	5
IR 00022	D07C-01	1406	49 to 59	Hydropunch	16-Dec-94	07-Aug-98	8
IR 00023	D10B-01	24875	50 to 60	Monitoring well	15-Dec-94	14-Sep-95	4
IR 00023	D10B-02	5225	50 to 60	Monitoring well	15-Dec-94	07-Aug-98	8
EDC 12	AP12TDS-DP01	34700	49 to 50	Hydropunch	20-Jul-12	20-Jul-12	1
EDC 12	AP12TDS-DP02	4710	49 to 50	Hydropunch	18-Jul-12	18-Jul-12	1
EDC 12	AP12TDS-DP03	33000	49 to 50	Hydropunch	19-Jul-12	19-Jul-12	1
EDC 17	AP17TDS-DP02	34900	49 to 50	Hydropunch	20-Jul-12	20-Jul-12	1
IR 00016	APIR16TDS-DP01	32200	49 to 50	Hydropunch	19-Jul-12	19-Jul-12	1
IR 00027	APIR27TDS-DP01	28800	49 to 50	Hydropunch	18-Jul-12	18-Jul-12	1
Maximum Average Historical TDS value		62600					
Average Historical TDS value		15274					
Average Historical TDS value (Rounded)		15300					
Average (wells with screen interval < or = 20 feet bgs):		2337					
Number of wells with screen interval < or = 20 feet bgs:		91					
Average (wells with screen interval between 20 and 50 feet bgs):		23374					
Number of wells with screen interval between 20 and 50 feet bgs:		52					
Average (wells with screen interval > or = 50 feet bgs):		34176					
Number of wells with screen interval > or = 50 feet bgs:		40					

TABLE 1

Historical Average Total Dissolved Solids Concentrations in Groundwater

Alameda Point Southeast Region

IR Site or Parcel	Location	Historical Average TDS[a] (mg/L)	Screen Interval (feet)	Type of Data	First Sample Collected	Last Sample Collected	Total Number of Samples used to develop Historical Average
Weighted Average		15274					
Rounded Weighted Average		15300					

Note:

[a] TDS data collected from February 1994 through July 2012. For monitoring wells with multiple TDS results, the average TDS value is provided.

Double line denotes the boundary between wells with screen interval less than or equal to 20 feet bgs, 20-50 feet bgs, and greater than 50 feet bgs.

< equals less than

> equals greater than

Historical data excluded if screen interval is not available.

Average = Sum of TDS/Total No. of samples

Weighted Average = [(Avg x No. of samples)shallow + (Avg x No.of samples)intermediate + (Avg x No.of samples)deep]/(Total No.of samples)

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PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP01	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109374.667, E 6041627.97 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 07:35 | END : 7/20/12 09:15 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
						ASPHALT CONCRETE PAVEMENT 0.4' thick.	Core pavement; hand auger to 5'
						AGGREGATE BASE / BROKEN CONCRETE 0.6' thick.	
		100	HA			**POORLY GRADED SAND (SP)** brown (10YR 5/3), damp, fine to medium grained, poorly graded, broken shell fragments.	
5	5.0			PID = 0		**POORLY GRADED SAND (SP)** brown (10YR 5/3), as above, without shell fragments after ~7 ft.	
		80	DP				Wet at ~8'
10	10.0			PID = 0		**POORLY GRADED SAND (SP)** brown (10YR 5/3), wet, fine grained, poorly graded, 95% sand, 5% fines.	
						CLAYEY SAND (SC) dark greenish gray (10Y 4/1), wet, fine grained, poorly graded, soft, 70% sand, 30% fines.	
		100	DP			**POORLY GRADED SAND (SP)** dark grayish brown (2.5Y 4/2), wet, fine grained, poorly graded, 95% sand, 5% fines.	
15	15.0					**FAT CLAY (CH)** dark greenish gray (10Y 4/1), wet, high plasticity, very soft, 90% fines, 10% fine sand.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP01	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109374.667, E 6041627.97 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 07:35 | END : 7/20/12 09:15 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**POORLY GRADED SAND (SP)** very dark greenish gray (10Y 3/1), wet, medium grained, poorly graded, with 2- to 3-mm diameter bivalve shells.	
						POORLY GRADED SAND (SP) dark greenish gray (10Y 4/1), wet, fine grained, poorly graded, 95% sand, 5% fines.	
20	20.0	100	DP	PID = 0		**SILTY SAND (SM)** brown (10YR 4/3), wet, fine grained, poorly graded, 75% to 85% sand, 15% to 25% fines (variable).	
	22.5	100	DP				
25	25.0	100	DP	PID = 0		**CLAYEY SAND (SC)** strong brown (7.5YR 5/6), wet, fine grained, poorly graded, soft, 85% sand, 15% fines.	
						POORLY GRADED SAND (SP) brown (10YR 4/3), wet, fine grained, poorly graded, 95% sand, 5% fines.	
	27.5	100	DP			**SILTY SAND (SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 75% sand, 25% fines.	
30	30.0					**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, medium grained, poorly graded.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP01	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109374.667, E 6041627.97 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 07:35 | END : 7/20/12 09:15 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
	32.5					**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 95% sand, 5% fines.	
		0	DP			**NO RECOVERY** very liquid, material flowed out of liner during retrieval.	
35	35.0						
		100	DP	PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
	37.5						
		100	DP				
40	40.0						
		100	DP	PID = 0		**CLAYEY SAND (SC)** yellowish brown (10YR 5/4), wet, fine grained, poorly graded, soft, 80% sand, 20% fines.	
	42.5						
		100	DP			**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
45	45.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP01	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109374.667, E 6041627.97 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 07:35 | END : 7/20/12 09:15 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
		100	DP	PID = 0		**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
	47.5	100	DP			**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 95% sand, 5% fines.	
50	50.0	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
				PID = 0		Boring terminated at 50 ft bgs.	
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP02	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2109298.979, E 6042451.45
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 5.3 ft bgs
START : 7/18/12 09:00
END : 7/18/12 10:50
LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
						CONCRETE 0.6' thick.	Core concrete; hand auger to 5.5'
						SILTY SAND (SM) olive (5Y 4/3), moist, fine to medium grained, very loose, predominately quartz with felsic minerals.	
				PID = 0		**SILTY SAND (SM)** olive (5Y 4/3), wet at 4.5'; saturated at 5.3'.	
		100	HA				
5							Wet at 5.3'
	5.5						
		60	DP				
10	10.0						
		50	DP				
						SANDY SILT (ML) very dark gray (5Y 3/1), wet, fine grained, very soft, with trace bivalve shells to 2mm diameter.	
15	15.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP02	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109298.979, E 6042451.45 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.3 ft bgs | START : 7/18/12 09:00 | END : 7/18/12 10:50 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		50	DP			**SANDY SILT (ML)** very dark gray (5Y 3/1), wet, fine grained, very soft, with trace bivalve shells to 2mm diameter.	
20	20.0					**CLAYEY SAND (SC)** very dark greenish gray (10GY 3/1), wet, fine to medium grained, loose to medium density, intermittent 0.5 layers of bivalve shells.	
		100	DP			**SILTY SAND (SM)** olive (5Y 4/3), wet, fine to medium grained, with felsic minerals.	
	22.5						
		100	DP				
25	25.0						
		100	DP				
	27.5						
		100	DP				
30	30.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP02	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109298.979, E 6042451.45 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.3 ft bgs | START : 7/18/12 09:00 | END : 7/18/12 10:50 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP			**SILTY SAND (SM)** olive (5Y 4/3), wet, fine to medium grained, with felsic minerals.	
	32.5	100	DP				
35	35.0	100	DP				
	37.5	100	DP				
40	40.0	100	DP				
	42.5	100	DP			**SANDY FAT CLAY (CH)** olive brown (2.5Y 4/4), wet, stiff, high plasticity.	
45	45.0					**SILTY SAND (SM)** olive (5Y 4/3), wet, fine to medium grained, with felsic minerals.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP02	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109298.979, E 6042451.45 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.3 ft bgs | START : 7/18/12 09:00 | END : 7/18/12 10:50 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP			**SILTY SAND (SM)** olive (5Y 4/3), wet, fine to medium grained, with felsic minerals.	
	47.5						
		100	DP				
50	50.0					Boring terminated at 50 ft bgs.	
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP03	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108763.113, E 6042445.39 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/19/12 10:30 | END : 7/19/12 12:50 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
						ASPHALT CONCRETE PAVEMENT 0.4' thick.	Core pavement; hand auger to 5'
		100	HA			**POORLY GRADED SAND (SP)** light olive brown (2.5Y 5/3), dry to damp, fine to medium grained, poorly graded, very loose.	
5	5.0			PID = 0		**NO RECOVERY**.	
		30	DP			**POORLY GRADED SAND (SP)** olive brown (2.5Y 4/3), wet, medium grained, poorly graded, loose, with shell fragments.	Wet at ~8'
10	10.0			PID = 0		**POORLY GRADED SAND (SP)** very dark greenish gray (10Y 3/1), wet, fine grained, poorly graded, loose, some shell fragments.	
		80	DP			**SANDY FAT CLAY (CH)** very dark greenish gray (10Y 3/1), wet, high plasticity, very soft, 60% fines, 40% fine sand.	
15	15.0					**POORLY GRADED SAND (SP)** very dark greenish gray (10Y 3/1), wet, fine to medium grained, poorly graded, loose, with shell fragments and 1- to 2-mm diameter bivalve shells.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP03	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108763.113, E 6042445.39 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/19/12 10:30 | END : 7/19/12 12:50 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		60	DP	PID = 0		**POORLY GRADED SAND (SP)** very dark greenish gray (10Y 3/1), wet, fine to medium grained, poorly graded, loose, with shell fragments and 1- to 2-mm diameter bivalve shells.	
20	20.0	100	DP	PID = 0		**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, loose, 95% sand, 5% fines.	
	22.5	100	DP			**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, loose, 90% sand, 10% fines.	
25	25.0	100	DP	PID = 0		**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, loose, 95% sand, 5% fines.	
	27.5	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, soft, 70% sand, 30% fines.	
30	30.0					**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP03	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2108763.113, E 6042445.39
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 8.0 ft bgs
START : 7/19/12 10:30
END : 7/19/12 12:50
LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
		100	DP	PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
	32.5	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, soft, 70% sand, 30% fines.	
35	35.0	100	DP	PID = 0		**SILTY SAND (SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 70% sand, 30% fines.	
	37.5	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 75% sand, 25% fines.	
40	40.0	100	DP	PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
	42.5	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, 70% sand, 30% fines.	
45	45.0	100	DP			**SILTY SAND (SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
						POORLY GRADED SAND WITH SILT (SP-SM) dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP12TDS-DP03	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108763.113, E 6042445.39 DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs START : 7/19/12 10:30 END : 7/19/12 12:50 LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/6), wet, fine grained, poorly graded, 70% sand, 30% fines.	
	47.5	100	DP				
						SILTY SAND (SM) dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
50	50.0			PID = 0		Boring terminated at 50 ft bgs.	
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR16TDS-DP01	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2108771.058, E 6043658.88
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 10.0 ft bgs
START : 7/19/12 08:10
END : 7/19/12 10:00
LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION (SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY)	COMMENTS (DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION)
						ASPHALT CONCRETE PAVEMENT 1' thick.	Core pavement; hand auger to 5'
		100	HA			**POORLY GRADED SAND (SP)** light olive brown (2.5Y 5/4), damp, fine to medium grained, very loose, 95% sand, 5% fines.	
						FAT CLAY (CH) dark greenish gray (10Y 4/1), damp, high plasticity, soft, 95% fines, 5% sand.	
						POORLY GRADED SAND (SP) light olive brown (2.5Y 5/4), damp, fine to medium grained, very loose, 95% sand, 5% fines.	
5	5.0			PID = 0		**POORLY GRADED SAND (SP)** dark greenish gray (10Y 4/1), damp, fine to medium grained, poorly graded, very loose, 95% sand, 5% fines, shell fragments, some thin 2" lenses of FAT CLAY (CH) of same color, occasional gravel to 0.5, wet at 10'.	
		90	DP				
10	10.0			PID = 0			Wet at ~10'
		90	DP				
						FAT CLAY (CH) dark greenish gray (10Y 4/1), wet, high plasticity, very soft.	
15	15.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR16TDS-DP01	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108771.058, E 6043658.88 DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 10.0 ft bgs START : 7/19/12 08:10 END : 7/19/12 10:00 LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
				PID = 0		**POORLY GRADED SAND (SP)** dark greenish gray (10Y 4/1), wet, fine to medium grained, poorly graded, very loose, 95% sand, 5% fines, shell fragments.	
	17.5	100	DP			**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines, color change to strong brown (7.5YR 5/6) at 22.5'.	
20	20.0	100	DP	PID = 0			
	22.5	100	DP				
25	25.0	100	DP	PID = 0		**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, slightly stiff, 95% sand, 5% fines.	
	27.5	100	DP				
30	30.0	100	DP				

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR16TDS-DP01	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108771.058, E 6043658.88 DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 10.0 ft bgs START : 7/19/12 08:10 END : 7/19/12 10:00 LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, slightly stiff, 95% sand, 5% fines.	
	32.5					**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
		100	DP			**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 95% sand, 5% fines.	
35	35.0			PID = 0			
		100	DP			**POORLY GRADED SAND (SP)** brown (10YR 5/3), wet, fine grained, poorly graded, 95% sand, 5% fines.	
	37.5						
		100	DP				
40	40.0			PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
		100	DP			**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 95% sand, 5% fines, fine to medium grained beginning at 43'.	Flowing fine sand
	42.5						
		100	DP				
45	45.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR16TDS-DP01	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108771.058, E 6043658.88 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 10.0 ft bgs | START : 7/19/12 08:10 | END : 7/19/12 10:00 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** grayish brown (10YR 5/2), wet, fine to medium grained, poorly graded, soft, 80% sand, 20% fines.	
	47.5	100	DP				
						SILTY SAND (SM) brown (10YR 5/3), wet, fine to medium grained, poorly graded, soft, 80% sand, 20% fines.	
50	50.0			PID = 0		Boring terminated at 50 ft bgs.	
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP01	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108529.996, E 6042905.57
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs
START : 7/19/12 13:15 END : 7/19/12 15:30 LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
						ASPHALT CONCRETE PAVEMENT 0.5' thick.	Core pavement; hand auger to 5'
						POORLY GRADED SAND (SP) brown (10YR 5/3), damp, fine to medium grained, poorly graded, very loose, moist at 5', wet at 8', trace shell fragments at 5', many shell fragments at 8'.	
		100	HA				
5	5.0			PID = 0			
		70	DP				Wet at ~8'
10	10.0			PID = 0			
		60	DP				
						POORLY GRADED SAND (SP) dark greenish gray (10Y 4/1), wet, fine to medium grained, poorly graded, loose.	
15	15.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP01	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2108529.996, E 6042905.57
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 8.0 ft bgs
START : 7/19/12 13:15
END : 7/19/12 15:30
LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
				PID = 0		**POORLY GRADED SAND (SP)** dark greenish gray (10Y 4/1), wet, fine to medium grained, poorly graded, loose.	
				PID = 0.2		**SANDY FAT CLAY (CH)** dark greenish gray (10Y 4/1), wet, high plasticity, very soft, 70% fines, 30% sand.	Broken liner; partial recovery
		60	DP				
						POORLY GRADED SAND (SP) dark greenish gray (10Y 4/1), wet, medium grained, poorly graded.	
						SILTY SAND (SM) dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 80% sand, 20% fines.	
20	20.0			PID = 0			
		100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 70% sand, 30% fines.	
	22.5					**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
		100	DP				
25	25.0			PID = 0			
		100	DP			**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
	27.5					**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
		100	DP				
30	30.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP01	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108529.996, E 6042905.57 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/19/12 13:15 | END : 7/19/12 15:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**POORLY GRADED SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
	32.5					**CLAYEY SAND (SC)** brown (10YR 5/3), wet, fine to medium grained, poorly graded, soft, 80% sand, 20% fines.	
		100	DP			**POORLY GRADED SAND WITH SILT (SP-SM)** brown (10YR 5/3), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
35	35.0			PID = 0			
		100	DP				
	37.5						
		100	DP			**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 90% sand, 10% fines.	
						POORLY GRADED SAND (SP) brown (10YR 5/3), wet, fine to medium grained, poorly graded, 95% sand, 5% fines.	
40	40.0			PID = 0			
		100	DP				
	42.5						
		0	DP			**NO RECOVERY**.	
45	45.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP01	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2108529.996, E 6042905.57 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/19/12 13:15 | END : 7/19/12 15:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		0	DP	PID = 0		**NO RECOVERY**.	Broken liner stuck at 47.5'; no recovery
	47.5					Boring terminated at 47.5 ft bgs.	
50							
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP02	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2107945.691, E 6043816.85 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 10:20 | END : 7/20/12 12:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
						ASPHALT CONCRETE PAVEMENT 0.3' thick.	Core pavement; hand auger to 5'
		100	HA			**POORLY GRADED SAND (SP)** brown (10YR 4/3), damp to moist, fine to medium grained, poorly graded, 80% sand, 20% broken shell fragments.	
5	5.0			PID = 0		**FAT CLAY (CH)** dark greenish gray (10Y 4/1), moist to wet, high plasticity, soft, 90% fines, 10% fine sand.	
		85	DP			**POORLY GRADED SAND (SP)** dark grayish brown (10YR 4/2), moist to wet, fine grained, poorly graded, 95% sand, 5% fines.	Wet at ~8'
10	10.0			PID = 0			
		100	DP			**CLAYEY SAND (SC)** very dark greenish gray (10Y 3/1), wet, fine grained, poorly graded, 70% sand, 30% fines.	
15	15.0					**POORLY GRADED SAND WITH SILT (SP-SM)** very dark greenish gray (10Y 3/1), wet, medium grained, poorly graded, 90% sand, 10% fines.	3-inch lens colored black (PID = 0.0 ppm)

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP02	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2107945.691, E 6043816.85
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 8.0 ft bgs
START : 7/20/12 10:20
END : 7/20/12 12:30
LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**FAT CLAY WITH SAND (CH)** dark greenish gray (10Y 4/1), wet, high plasticity, very soft, 75% fines, 25% fine sand.	
20	20.0	100	DP	PID = 0		**CLAYEY SAND (SC)** dark greenish gray (10Y 4/1), wet, fine grained, poorly graded, 85% sand, 15% fines.	
	22.5	100	DP			**POORLY GRADED SAND WITH SILT (SP-SM)** dark grayish brown (10YR 4/2), wet, fine grained, poorly graded, 90% sand, 10% fines.	
25	25.0	100	DP	PID = 0		**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 75% to 85% sand, 15% to 25% fines (variable).	
	27.5	100	DP				
30	30.0	100	DP				

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP02	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2107945.691, E 6043816.85 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 10:20 | END : 7/20/12 12:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 75% to 85% sand, 15% to 25% fines (variable).	
	32.5	100	DP			**POORLY GRADED SAND (SP)** dark yellowish brown (10YR 4/4), wet, fine to medium grained, poorly graded, 95% sand, 5% fines.	
35	35.0	100	DP			**CLAYEY SAND (SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 80% sand, 20% fines.	
	37.5	100	DP	PID = 0		**POORLY GRADED SAND WITH CLAY (SP-SC)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
40	40.0	100	DP	PID = 0		**POORLY GRADED, SAND WITH SILT (SP-SM)** dark yellowish brown (10YR 4/4), wet, fine grained, poorly graded, 90% sand, 10% fines.	
	42.5	100	DP			**CLAYEY SAND (SC)** dark grayish brown (10YR 4/2), wet, fine grained, poorly graded, 80% sand, 20% fines, at 47.5' color change to very dark greenish gray (5GY 3/1) with 25% fines.	
45	45.0	100	DP				

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: AP17TDS-DP02	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2107945.691, E 6043816.85 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 8.0 ft bgs | START : 7/20/12 10:20 | END : 7/20/12 12:30 | LOGGER : J. Sterling

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP	PID = 0		**CLAYEY SAND (SC)** dark grayish brown (10YR 4/2), wet, fine grained, poorly graded, 80% sand, 20% fines, at 47.5' color change to very dark greenish gray (5GY 3/1) with 25% fines.	
	47.5	100	DP				
50	50.0			PID = 0		Boring terminated at 50 ft bgs.	
55							
60							

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR27TDS-DP01	SHEET 1 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum)
LOCATION : Alameda Point, Alameda, CA
ELEVATION : Not Measured
DRILLING CONTRACTOR : Penecore Drilling
COORDINATES : N 2109962.000, E 6041927.69
DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT
WATER LEVELS : 5.0 ft bgs
START : 7/18/12 13:00
END : 7/18/12 14:35
LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
						CONCRETE 0.6' thick.	Core concrete; hand auger to 5'
		100	HA			**POORLY GRADED SAND (SP)** olive brown (2.5Y 4/4), moist to wet, loose to very loose, with felsic minerals, wet at 5'.	
5	5.0						Wet at ~5'
		60	DP			**POORLY GRADED SAND (SP)** greenish black (5GY 3/1), wet, loose to very loose, with felsic minerals.	
10	10.0						
		60	DP	PID = 0			
15	15.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR27TDS-DP01	SHEET 2 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109962.000, E 6041927.69 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.0 ft bgs | START : 7/18/12 13:00 | END : 7/18/12 14:35 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP			**CLAYEY SAND (SC)** very dark greenish gray (10GY 3/1), wet, fine to medium grained, medium density, trace bivalve shells.	
	17.5					**SILTY SAND (SM)** very dark greenish gray (10GY 3/1), wet, fine to medium grained, medium density, trace shell fragments up to 0.5 diameter.	
		100	DP			**SILTY SAND (SM)** olive brown (2.5Y 4/3), wet, fine to medium grained, medium density.	
20	20.0						
		100	DP				
	22.5						
		100	DP				
25	25.0						
		100	DP				
	27.5						
		100	DP	PID = 0			
30	30.0						

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR27TDS-DP01	SHEET 3 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109962.000, E 6041927.69 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.0 ft bgs | START : 7/18/12 13:00 | END : 7/18/12 14:35 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
	32.5	100	DP			**SILTY SAND (SM)** olive brown (2.5Y 4/3), wet, fine to medium grained, medium density.	
	35.0	100	DP			**CLAYEY SAND (SC)** olive brown (2.5Y 4/4), wet, medium density, felsic minerals.	
35	37.5	100	DP				
	40.0	100	DP				
40	42.5	100	DP				
	45.0	100	DP			**SILTY SAND (SM)** olive brown (2.5Y 4/4), wet, medium density, felsic minerals.	
45							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

PROJECT NUMBER: 383512.FI.FS	BORING NUMBER: APIR27TDS-DP01	SHEET 4 OF 4

SOIL BORING LOG

PROJECT : ESI Transfer Parcels EDC-12, EDC-17, IR-16, IR-27 (TDS Addendum) | LOCATION : Alameda Point, Alameda, CA

ELEVATION : Not Measured | DRILLING CONTRACTOR : Penecore Drilling

COORDINATES : N 2109962.000, E 6041927.69 | DRILLING METHOD AND EQUIPMENT : Geoprobe, DPT

WATER LEVELS : 5.0 ft bgs | START : 7/18/12 13:00 | END : 7/18/12 14:35 | LOGGER : L. Mancuso

DEPTH BELOW GROUND SURFACE (ft)	INTERVAL (ft)	RECOVERY (%)	#TYPE	ENVIRONMENTAL DATA	GRAPHIC LOG	SOIL DESCRIPTION: SOIL NAME, USCS GROUP SYMBOL, COLOR, MOISTURE CONTENT, RELATIVE DENSITY OR CONSISTENCY, SOIL STRUCTURE, MINERALOGY	COMMENTS: DEPTH OF CASING, DRILLING RATE, DRILLING FLUID LOSS, TESTS, & INSTRUMENTATION
		100	DP			**SILTY SAND (SM)** olive brown (2.5Y 4/4), wet, medium density, felsic minerals.	
	47.5						
		100	DP				
50	50.0					Boring terminated at 50 ft bgs.	
55							
60							

PROFESSIONAL GEOLOGIST STEPHEN B. QUAYLE No. 7800 Exp. 5-31-14 STATE OF CALIFORNIA

SOIL BORING LOG 383512.FI.FS - NO SAMPLE, EDC-12.GPJ, CH2M GEOTECH_06_REVISED_383512.GLB, 8/2/12

City of Alameda • California

January 23, 2012

Mr. Derek Robinson
BRAC Environmental Coordinator
Department of the Navy
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

Ms. Xuan-Mai Tran
US EPA, Region 9
75 Hawthorne Street
San Francisco, CA 94105-3901

Mr. Pankaj Arora
US EPA, Region 9
75 Hawthorne Street (SFD 8-3)
San Francisco, CA 94105-3901

Mr. James Fyfe
Department of Toxic Substances Control
700 Heinz Avenue, Suite 200
Berkeley, CA 94710

Mr. John West
San Francisco Regional Water Quality Control Board
1515 Clay Street, Suite 1400
Oakland, CA 94612

Re: Beneficial Use of Shallow Groundwater in Southeast Portion of Alameda Point

Dear Mr. Robinson, Mr. Arora, Mr. Fyfe, and Mr. West:

The Alameda Reuse and Redevelopment Authority (ARRA) appreciates the importance of remediating groundwater at Alameda Point so that its current and potential beneficial uses are preserved, thereby protecting human health and the environment. Current discussions among the environmental regulatory agencies and the Navy include whether shallow groundwater in the southeast portion of Alameda Point should be remediated according to standards applicable to potential drinking-water supplies.

Economic Development Department
2263 Santa Clara Avenue, Room 120
Alameda, California 94501-4477
510.747.6890 • Fax 510.523.1081 • TDD 510.522.7538

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Furthermore, these issues were discussed with the ARRA governing board in November 2011.

The City of Alameda does not foresee ever using shallow groundwater at Alameda Point for a drinking-water supply. East Bay Municipal Utilities District supplies Alameda's potable water and is expected to continue to do so. Shallow groundwater at Alameda Point is undesirable as a municipal water supply for at least three reasons. First, shallow groundwater is prone to episodic and chronic contamination from overlying activities, such as, spills and leaks, excessive application of gardening chemicals, percolation of precipitation that has picked up contaminants on the ground surface, etc. Water-supply-well construction standards require well casings to exclude shallow groundwater for this reason. Second, most shallow groundwater at Alameda Point is too salty for domestic use. Although, limited areas of less salty shallow groundwater are present in some places, their small volumes preclude them from being reliable water supplies. Finally, except for seasonal precipitation and leakage from sewers and water mains, no freshwater sources of groundwater recharge are present at Alameda Point. Material groundwater pumping would induce saltwater intrusion from San Francisco Bay, Seaplane Lagoon, and Oakland Inner Harbor, quickly making shallow groundwater at Alameda Point even saltier.

The ARRA is vitally interested in remediation of Alameda Point to support its reuse in a manner that is protective of human health and the environment. However, funding for environmental clean-up activities is not limitless. Please direct remediation efforts to remediating contamination that significantly impacts reuse and redevelopment of the former base, rather than toward cleaning shallow groundwater in the southeast portion of Alameda Point to meet maximum contaminant levels for drinking-water supplies. Cleaning groundwater to protect ecological receptors and avoid vapor intrusion into buildings would be a much worthier effort.

Thank you for considering the ARRA's views in this matter.

Sincerely,

Jennifer Ott
Chief Operating Officer - Alameda Point

JO:rv

cc: Peter Russell, PhD, PE

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

September 28, 2012

Mr. Derek Robinson
Code BPMOW.DR
Department of the Navy
Base Realignment and Closure
Program Management Office West
1455 Frazee Road, Suite 900
San Diego, CA 92108-4310

Re: Navy's Request for Groundwater Use Exception from Consideration as a Municipal or Domestic Water Supply in the Southeast Portion of the Former Naval Air Station Alameda Point, Alameda, California, August 2012

Dear Mr. Robinson:

The U.S. Environmental Protection Agency (EPA) Region 9 has received a copy of the Navy's request for Groundwater Use Exception from Consideration as a Municipal or Domestic Water Supply in the Southeast Portion of the Former Naval Air Station Alameda Point, Alameda, California, dated August 6, 2012. The requested groundwater use exception area includes Operable Units (OU)-2A (IR Sites 9, 13, 19, 22 and 23), OU-2B (IR Sites 3, 4, 11 and 21), OU-1 (IR Site 16), OU-6 (IR Site 27) and Transfer Parcels Economic Development Conveyance (EDC)-12 and EDC-17.

Based on the information provided in your request letter and the concurrence letter from the San Francisco Bay Regional Water Quality Control Board dated September 13, 2012, EPA concurs that the shallow groundwater in the southeast portion of Alameda Point does not meet the State or Federal criteria for municipal or domestic water supply. In addition, the City of Alameda has made the declaration in its January 23, 2012 letter to the Navy that the shallow groundwater at Alameda Point will not be used for drinking water supply. The drinking water supply at Alameda Point is being provided by the East Bay Municipal Utilities District.

If there are any questions concerning this matter, please contact Xuan-Mai Tran of my staff at (415) 972-3002.

Sincerely,

John Chesnutt

John D. Chesnutt
Chief, DoD and Pacific Islands Section
Superfund Division

cc: James Fyfe, DTSC
John West, SFRWQCB
Jennifer Ott, City of Alameda

CALIFORNIA
Water Boards

EDMUND G. BROWN JR.
GOVERNOR

MATTHEW RODRIQUEZ
SECRETARY FOR
ENVIRONMENTAL PROTECTION

San Francisco Bay Regional Water Quality Control Board

September 13, 2012
ECM File No: 2199.9285 (JRW)

Department of the Navy
Base Realignment and Closure Program
Management Office West
Attn. Mr. Derek Robinson
1455 Frazee Road, Suite 900
San Diego, CA 92108
Via email: derek.j.robinson1@navy.mill

SUBJECT: Concurrence with Request for Beneficial Use Exception for Shallow Groundwater at Southeast Portion of the Former Naval Air Station, Alameda Point, Alameda County

Dear Mr. Robinson:

At the request of the Navy, Water Board staff reviewed groundwater and lithologic information, submitted in the Navy's February, August, and July, 2012, beneficial use exception request packages[1] to assess the potability and beneficial use of groundwater in the water-bearing zones from the surface to the Yerba Buena Mud Aquitard in the Southeast Portion at the former Alameda Naval Air Station. The Southeast Portion includes the following areas: operable units (OU) -2A (Installation Restoration Program (IR) Sites 9, 13, 19, 22, 23), OU-2B (IR Sites 3, 4, 11, and 21), OU-1 (IR Site 16), OU-6 (IR Site 27), and Transfer Parcels Economic Development Conveyance (EDC) -12 and EDC-17 (Figure 1). Based on the information for the southeast portion and adjacent areas provided by the Navy, including lithology, well location and screen interval, and total dissolved solids concentrations, Water Board staff believe groundwater in the

[1] Department of the Navy, Request for Groundwater Use Exception from Consideration as a Municipal or Domestic Water Supply in the Southeast Portion of the Former Naval Air Station Alameda Point, Alameda, California – Document Control Number (DCN): CH2M-1000-FZN0-0010, February 6, 2012.

Department of the Navy, Addendum to Expanded Site Inspection for Transfer Parcels EDC-12, EDC-17, FED-1A, FED-2B, and FED-2C, Alameda Point, Alameda, California, prepared by CH2MHill of Oakland, California, July 12, 2012

Department of the Navy, Request for Groundwater Use Exception from Consideration as a Municipal or Domestic Water Supply in the Southeast Portion of the Former Naval Air Station Alameda Point, Alameda, California – Document Control Number (DCN): CH2M-1000-FZN0-0010, August 6, 2012.

water bearing zones between the surface and the Yerba Buena Mud Aquitard within the Southeast Portion meets beneficial use exception (a) outlined below. Therefore, Water Board staff concur with the Navy's beneficial use exception request for the Southeast Portion.

BASIS FOR CONCURRENCE

Beneficial uses for groundwater and surface water are defined in the San Francisco Bay Basin (Region 2) Water Quality Control Plan (Basin Plan)[2]. The Basin Plan states that all groundwater is considered suitable, or potentially suitable, for municipal or domestic water supply and that, in making any exceptions, the Water Board will consider the criteria referenced in State Water Resource Control Board Resolution No. 88-63 and Regional Water Board Resolution No. 89-39, "Sources of Drinking Water," where the exceptions include:

a) The total dissolved solids (TDS) exceed 3,000 milligrams per liter (mg/L); 5,000 micro Siemens per centimeter electrical conductivity, and it is not reasonably expected by the Water Board that the groundwater could supply a public water system; or

b) There is contamination, either by natural processes or human activity (unrelated to the specific pollution incident), that cannot reasonably be treated for domestic use using best management practices or best economically achievable treatment practices; or

c) The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day; or

d) The aquifer is regulated as a geothermal energy-producing source or has been exempted administratively pursuant to 40 Code of Federal Regulations (CFR) Part 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR part 261.3.

In addition to the exceptions criteria above, the Navy also considered the following in evaluating the shallow groundwater's potential future Municipal and Domestic Supply (MUN) use:

a) The Southeast Portion's proximity to the saline San Francisco Bay would make the occurrence of elevated TDS in groundwater likely;

b) Most of the Southeast Portion of Alameda Point is reclaimed tideland or bay, and the high TDS values are likely representative of historical infilling of the San Francisco Bay.

c) The lack of an effective confining layer present with sufficient thickness and lateral extent to create two separate and distinct water-bearing zones was adequately characterized from the compilation of numerous investigation soil borings;

[2] California Regional Water Quality Control Board, San Francisco Bay Region, 2011, San Francisco Bay Basin (Region 2), Water Quality Control Plan (Basin Plan), December 31, 2011.

d) State of California production well construction requirements regarding the length of the sanitary seal for municipal, industrial, and domestic production wells would seal off any existing useable shallow groundwater; and

e) The current and anticipated future water supply to Alameda Point will be provided to the City from East Bay Municipal Utility District and there are no known plans to extract groundwater from the Southeast Portion.

SOUTHEAST PORTION AREA HYDROGEOLOGY

The hydrogeologic unit present in the Southeast Portion is a shallow unconfined water-bearing zone from the water table at approximately 3 to 6 feet bgs to the top of the Yerba Buena Mud at approximately 70 to 79 feet below ground surface (bgs). This zone includes artificial fill, where present, the Bay Sediment Unit (BSU) where present, and the Posey/Merritt/San Antonio Members. In the Southeast Portion, the clay within the BSU was not deposited in sufficient thickness or lateral continuity to create two separate and distinct water-bearing zones. This is the critical difference between the Alameda Point central region's hydrostratigraphy and the Southeast Portion and is described in the Determination of the Beneficial Uses of Groundwater Report[3]. In the central region of Alameda Point the BSU is present as a laterally continuous clay confining layer which separates two water-bearing zones. In the Southeast Portion, the BSU, where present, contains a higher percentage of sand and is not continuous. Clay is present only occasionally as narrow lenses of limited lateral extent. As a result, the BSU is an ineffective aquitard in the Southeast Portion resulting in density stratified freshwater in physical contact with saline water. Therefore, it is appropriate that the evaluations used to determine future potential beneficial uses (e.g., total dissolved solids (TDS) measurements) should be made throughout the shallow water-bearing zone in the Southeast Portion because the shallow non-saline groundwater would be rapidly depleted during extraction and subsequently the deeper saline groundwater would enter the groundwater extraction well.

SITE-SPECIFIC DATA

In support of its request, the Navy provided data focusing on TDS and/or electrical conductivity concentrations in groundwater samples from eleven IR Sites (3, 4, 9, 11, 13, 16, 19, 21, 22, 23, and 27) in addition to Parcel EDC-12 and EDC-17. In addition, TDS from 157 groundwater monitoring wells and 26 hydropunch/Geoprobe wells were used to support the beneficial use exception request. Figures 1 and 2 (Attachment A) show: Alameda Point, Operable CERCLA units; and the Southern Portion. Figures 5 and 6 show: the Conceptual Hydrogeological Model; Sample Locations and the TDS data in the Southeast Portion. Figures 7, 8, and 9 show the TDS

[3] Department of the Navy, Final Determination of the Beneficial Uses of Groundwater Alameda Point, prepared by Tetra Tech, EMI, July 2000,

concentration contours for shallow (0 to 20 feet bgs), intermediate (20 to 50 feet bgs), and deep (50 feet bgs to the Yerba Buena Mud Aquitard) depth intervals.

Based on historical groundwater data (February 1994 through July 20, 2012), TDS values of the Southeast Portion range from 135 mg/L to 62,600 mg/L with an average TDS concentration of approximately 15,274 mg/L. The average TDS sample concentrations taken from: 1) 77 samples in the shallow interval (well screen depths less than 20 feet bgs) were 2,527 mg/L; 2) 52 samples in the mid-interval (well screen depths between 20 and 50 feet bgs) were 23,146 mg/L; and 3) 34 samples in the deep interval (well screen depths greater than 50 feet bgs) were calculated at 35,257 mg/L. The average TDS weighted proportionally for measurements taken from the three intervals is 15,274 mg/L. These averages include monitoring well and Hydropunch data. Hydropunch TDS data are as accurate as monitoring well data because the EPA Method (160.1) and Standard Method (2540C) require filtration of the sample in the laboratory to ensure an accurate dissolved TDS measurement.

Water Board staff initially reviewed the Navy's February 6, 2012 Beneficial Use Exception request report and determined that the existing TDS data set was not sufficient to define the lateral extent of elevated TDS groundwater. Therefore, the Navy returned to the field and advanced seven additional borings to the Yerba Buena Mud Aquitard. The data from this sampling effort supported that elevated TDS groundwater exists at depth throughout the Southeast Portion. Specifically, in July 2012, the Navy collected seven additional hydropunch samples (AP12TDS-DP01 through AP12TDS-DP03; AP17TDS-DP01 and AP17TDS-DP02; APIR16TDS-DP01; APIR27TDS-DP01) within EDC-12, EDC-17, IR Site 16, and IR Site 27 to enhance the TDS data set for these areas. The hydropunch samples included one sample (AP17TDS-DP01) from 49 feet bgs and the remaining six hydropunch samples were collected at 50 feet bgs (see Figure 6 and 9).

The number of samples exceeding TDS criteria of 3,000 mg/l and 10,000 mg/l are tabulated and presented below, including the percentage that exceeded each criteria:

Water Bearing Depth	**# MWs/CPTs sampled**	**# MWs/CPTs with Average[1] [TDS] Exceeding:**	
		3,000 mg/l	**10,000 mg/l**
Shallow (<20 ft bgs)	91	13 (14%)	4 (4%)
Intermediate (~20-50 ft bgs)	52	40 (81%)	31 (60%)
Deep (>50ft bgs)	40	38 (95%)	36 (90%)

[1] Average TDS concentration is based on no fewer than one groundwater samples (and up to 15) for each location collected from MWs and Hydropunch/Geoprobe borings from 1994 to 2012.

Water Board staff also note that we have previously concurred with similar requests for water-bearing zones at Alameda Point in 1999 at Alameda ANNEX, and again in July of 2003 for Alameda Point areas west of Saratoga Road. In addition to elevated TDS, those prior concurrences have considered the low likelihood that groundwater within the fill could realistically serve as a future source of drinking water.

CLOSING

Based on the information presented above, Water Board staff concur that shallow groundwater in the Southeast Portion exceeds 3,000 mg/L on average and meets exception (a) outlined in Resolution Nos. 88-63 and 89-39. Therefore, Water Board staff concur with the Navy's request to provide a beneficial use exception for MUN at the Southeast Portion.

A beneficial use exception is not intended to allow for any ongoing groundwater degradation. Therefore, please note that State Water Resources Control Board (SWRCB) Resolution No. 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California," requires attainment of background levels of water quality, or the highest level of water quality that is reasonable achievable if background levels cannot be restored. Furthermore, SWRCB Resolution No. 92-49, "Policies and Procedures for Investigation and Cleanup and Abatement of Dischargers Under Water Code Section 13304," states that cleanup levels other than background must be consistent with the maximum benefit to the people of the State, not unreasonably affect present and anticipated beneficial uses of such water, and not result in water quality less than that prescribed in the Water Quality Control Plans and Policies adopted by the State and Regional Water Boards. Where it is not possible to achieve background water quality, SWRCB Resolution No. 92-49 requires cleanup to the best level of water quality that is technologically and economically feasible.

If you have any questions, please contact John West of my staff at (510) 622-2438 or email at jwest@waterboards.ca.gov.

Sincerely,

Terry Seward

Digitally signed by Terry Seward
Date: 2012.09.13 13:24:01 -07'00'

Terry Seward, PE
Chief, Groundwater
Protection and Waste Containment
Division

E-Attachment A: Figures 1, 2, 5, 6, 7, 8, & 9
cc (via email)

Mr. William McGinnis, Department of the Navy, BRAC PMO West, william.mcginnis1@navy.mil
Mr. Cecily Sabedra, Department of the Navy, BRAC PMO West, cecily.sabedra@navy.mil
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Mr. Peter Russell, Russell Resources, Inc. for the City of Alameda, peter@russellresources.com

Attachment A: Figures 1, 2, 5, 6, 7, 8, & 9

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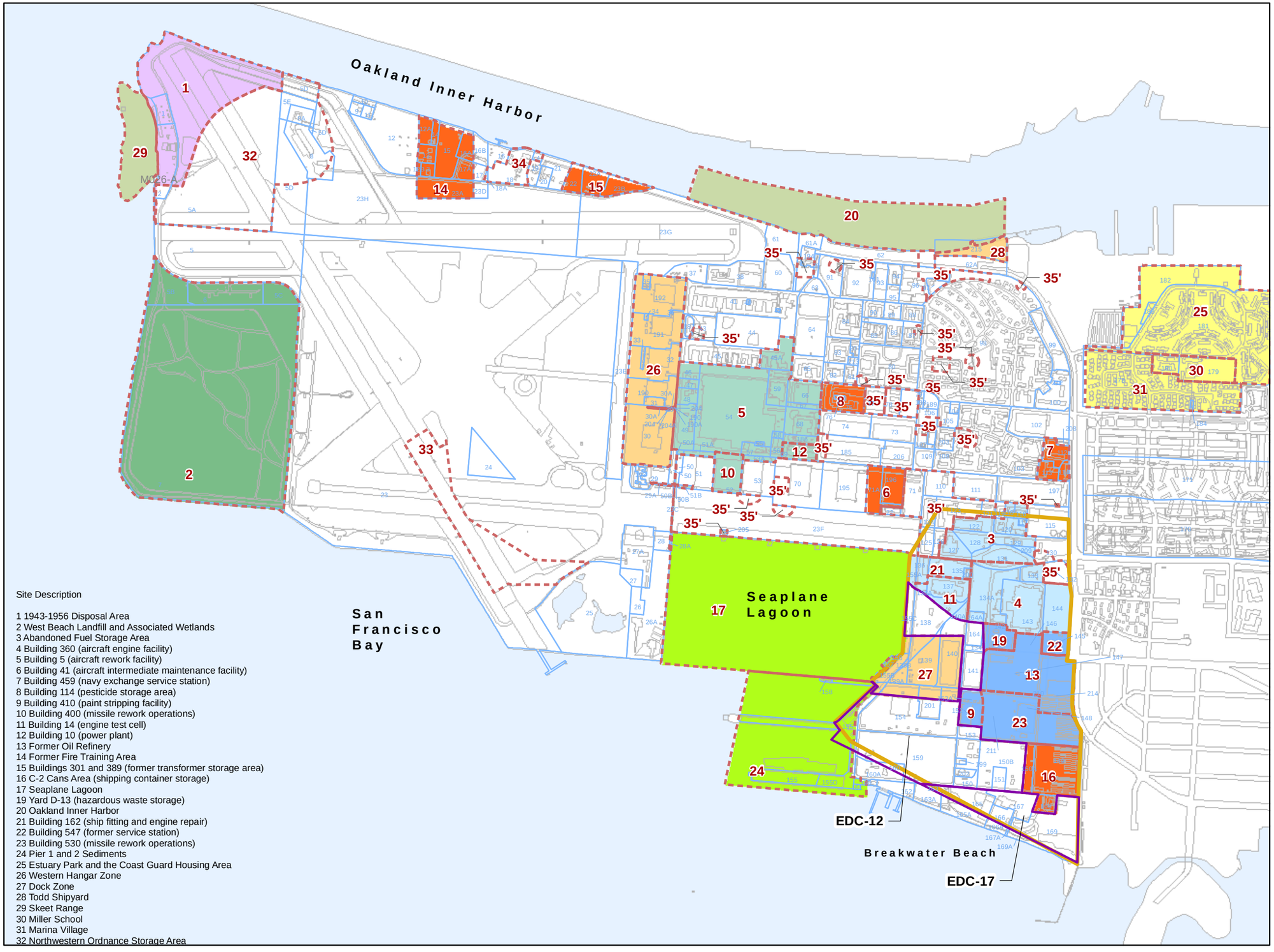

Site Description

1 1943-1956 Disposal Area
2 West Beach Landfill and Associated Wetlands
3 Abandoned Fuel Storage Area
4 Building 360 (aircraft engine facility)
5 Building 5 (aircraft rework facility)
6 Building 41 (aircraft intermediate maintenance facility)
7 Building 459 (navy exchange service station)
8 Building 114 (pesticide storage area)
9 Building 410 (paint stripping facility)
10 Building 400 (missile rework operations)
11 Building 14 (engine test cell)
12 Building 10 (power plant)
13 Former Oil Refinery
14 Former Fire Training Area
15 Buildings 301 and 389 (former transformer storage area)
16 C-2 Cans Area (shipping container storage)
17 Seaplane Lagoon
19 Yard D-13 (hazardous waste storage)
20 Oakland Inner Harbor
21 Building 162 (ship fitting and engine repair)
22 Building 547 (former service station)
23 Building 530 (missile rework operations)
24 Pier 1 and 2 Sediments
25 Estuary Park and the Coast Guard Housing Area
26 Western Hangar Zone
27 Dock Zone
28 Todd Shipyard
29 Skeet Range
30 Miller School
31 Marina Village
32 Northwestern Ordnance Storage Area

LEGEND
- Cercla Site
- Environmental Baseline Survey (EBS) Parcel
- Southeastern Region - Proposed Groundwater Exemption Area
- Transfer Parcel Boundaries
- OU-1
- OU-2A
- OU-2B
- OU-2c
- OU-3
- OU-4a
- OU-4b
- OU-4c
- OU-5
- OU-6
- Road/Runway/Building
- Water

Notes:

CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act of 1980

OU - Operable Unit

N

0 600 1,200
Feet

FIGURE 1
OPERABLE UNITS AND CERCLA SITES
Alameda Point, Alameda, California

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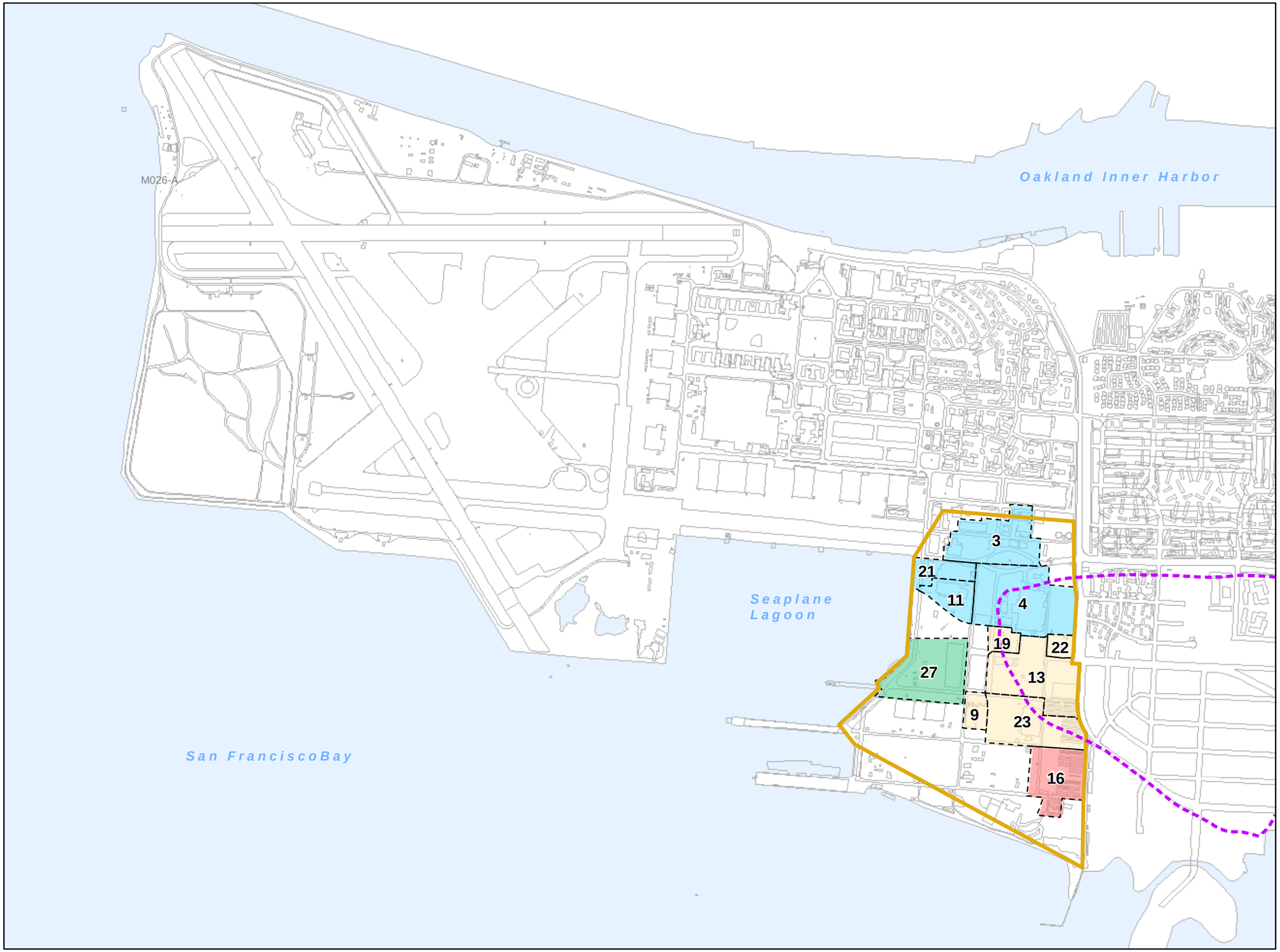

LEGEND

- Approximate Extent of Former Alameda Island Circa 1859 (United States Coast Survey, 1877)
- Proposed Groundwater Exemption Area
- Site and Site Number
- OU-1
- OU-2A
- OU-2B
- OU-6
- Road/Runway/Building
- Water

Notes:

OU - Operable Unit

N

0 600 1,200
Feet

FIGURE 2
EXTENT OF FORMER ALAMEDA ISLAND CIRCA 1859
Alameda Point, Alameda, California

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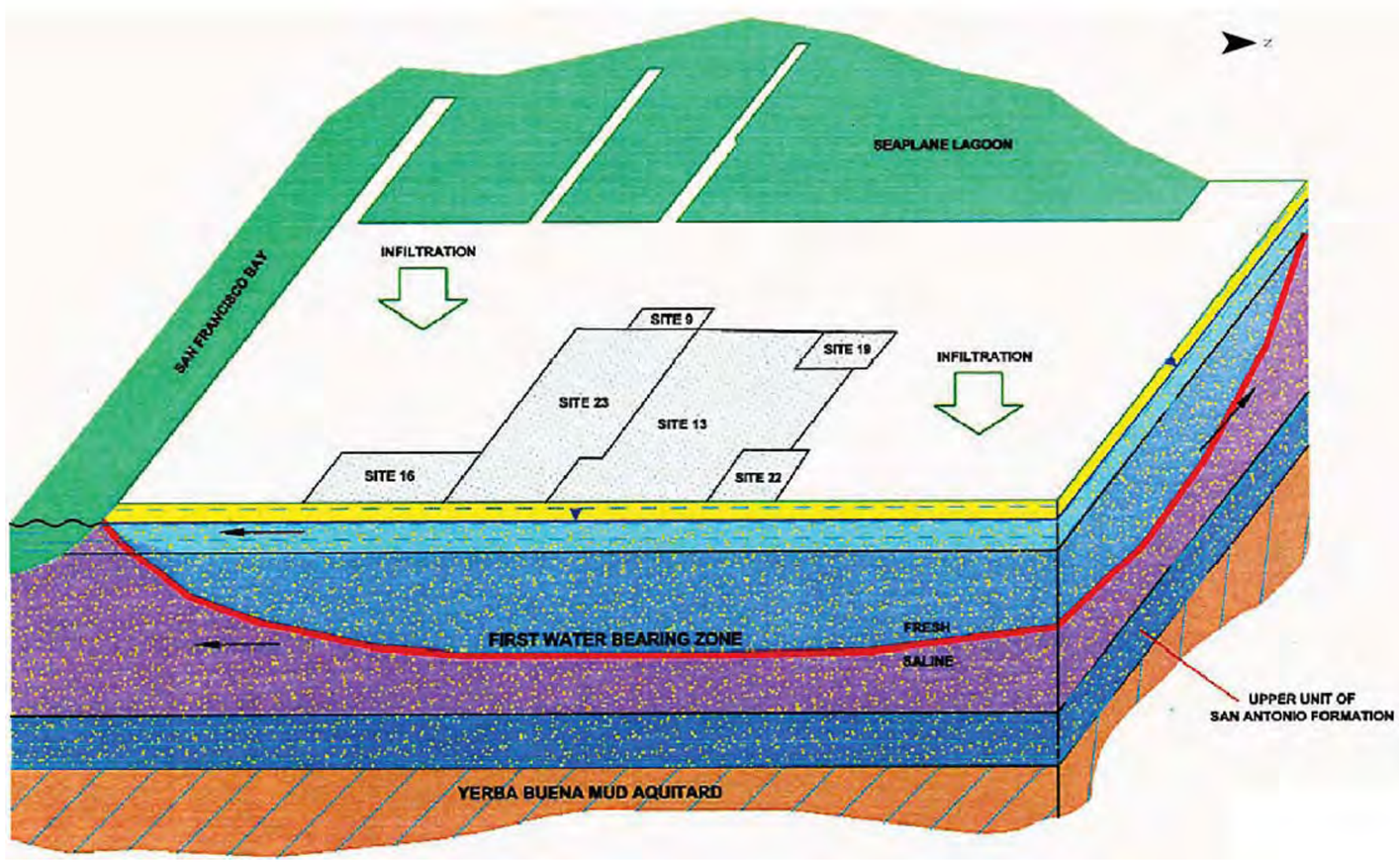

Source: SulTech 2005b

NOT TO SCALE

LEGEND

- INSTALLATION RESTORATION SITE
- SEAWATER
- ARTIFICIAL FILL WITH FRESH WATER
- MERRITT SAND WITH FRESH WATER
- MERRITT SAND WITH SALINE WATER
- UPPER UNIT OF SAN ANTONIO FORMATION WITH SALINE WATER
- YERBA BUENA MUD AQUITARD
- CONTACT OF LITHOLOGIC UNITS
- FIRST WATER-BEARING ZONE WATER TABLE
- GROUNDWATER FLOW DIRECTION
- FRESHWATER/SALTWATER INTERFACE (TOTAL DISSOLVED SOLIDS [TDS] >10,000 MILLIGRAMS PER LITER [mg\L])

FIGURE 5
Conceptual Hydrogeologic Model
for the Southeastern Region
Alameda Point
Alameda, CA

Note: Figure from Tetra Tech EM Inc., Revised Draft Determination of Beneficial Uses of Groundwater, Alameda Point Alameda, California. November 1999. Not Independently verified by CH2M HILL, Inc.

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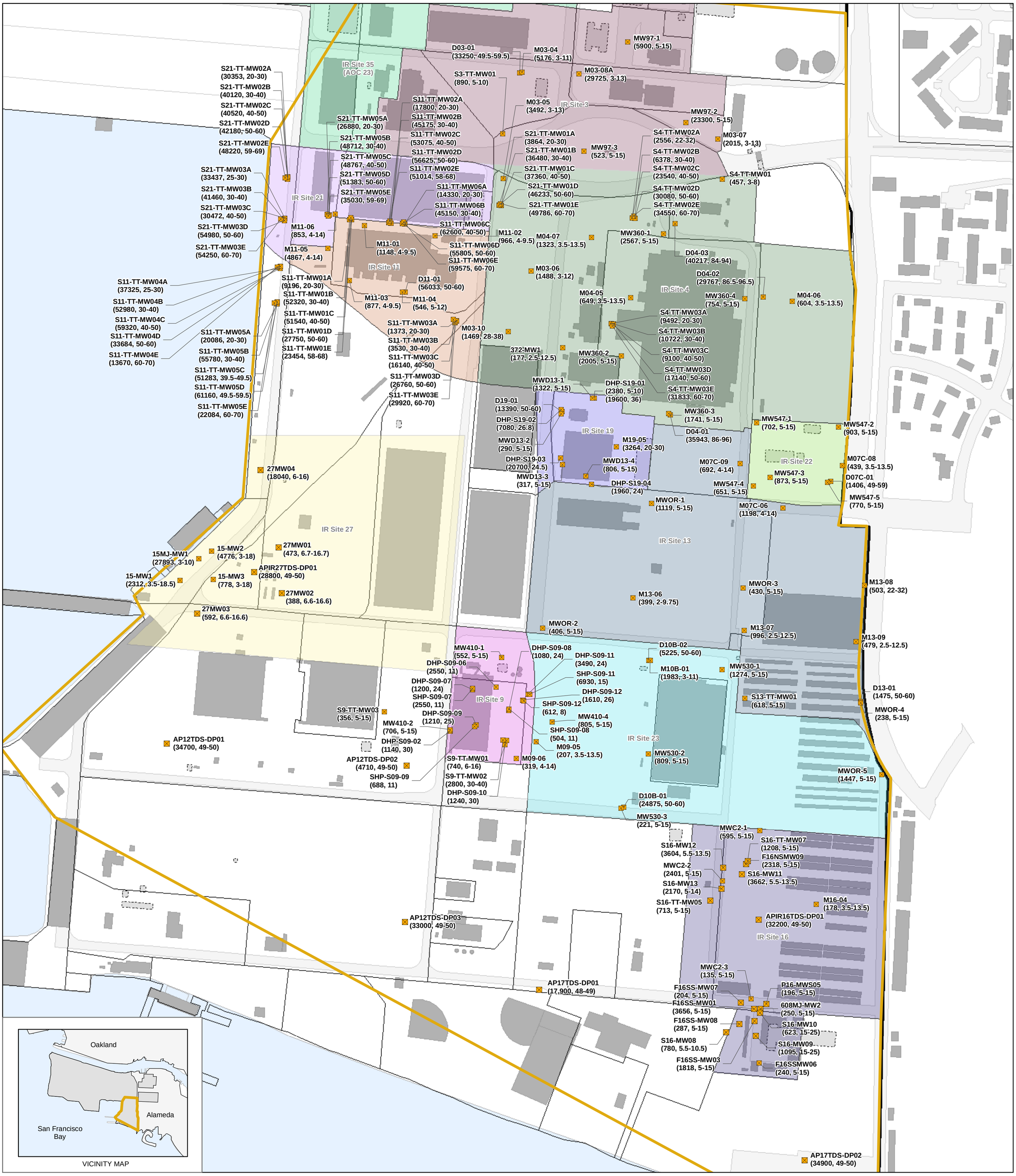

LEGEND

- Groundwater TDS Sample Locations
- Proposed Groundwater Exemption Area
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)

Notes:

MWC2-3 (135, 5-15) — Well ID (Concentration in mg/L, well screen interval in feet)

mg/L = milligrams per liter
TDS = Total Dissolved Solids

Groundwater samples were collected from monitoring wells and hydropunch locations

N

0 200 400
Feet

FIGURE 6
TDS SAMPLE VALUES
Alameda Point, Alameda, California

CH2MHILL

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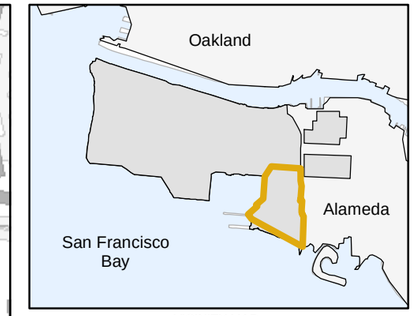

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 225 450
Feet

FIGURE 7
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS BETWEEN 0-20 FEET

Alameda Point, Alameda, California

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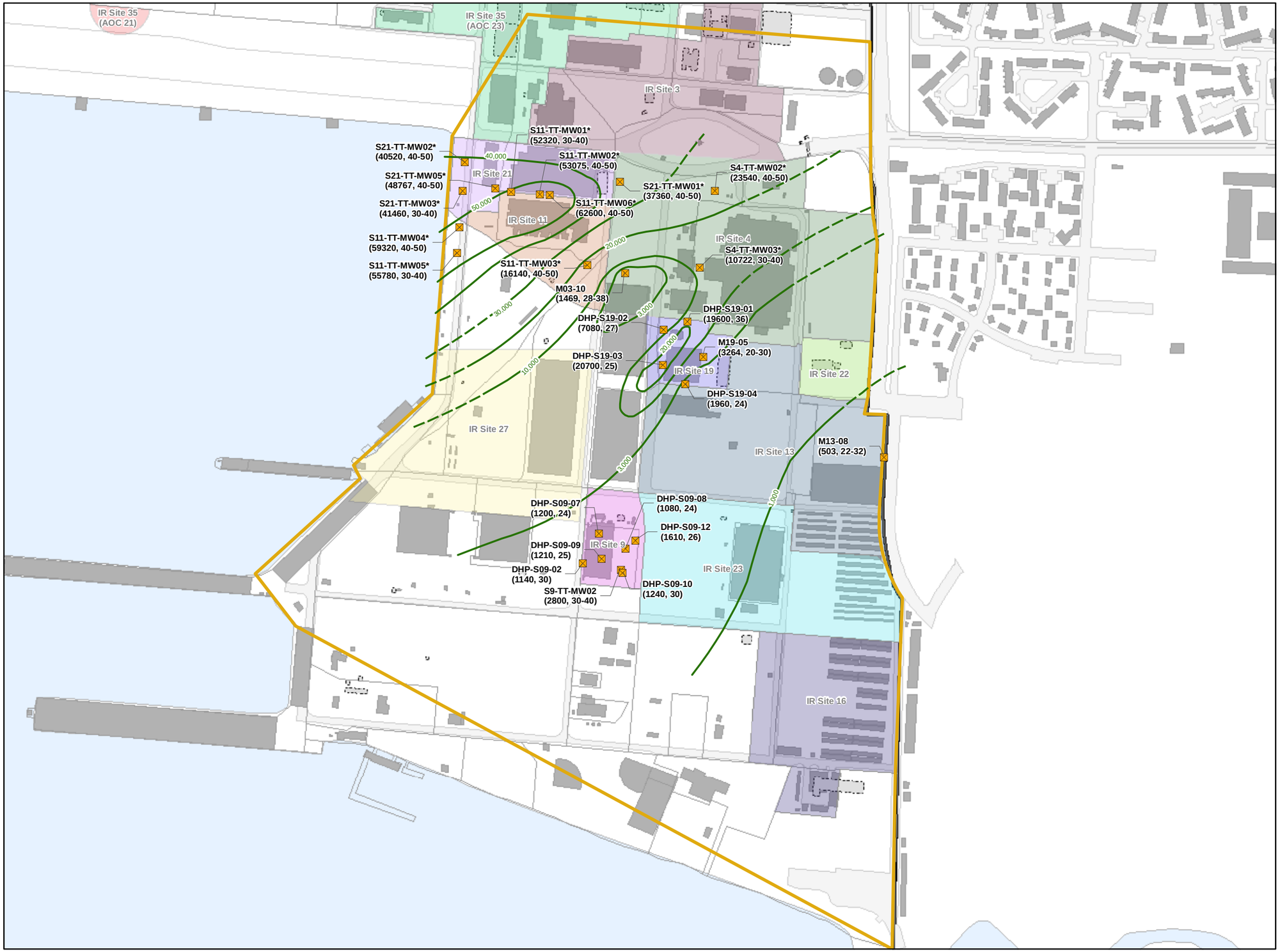

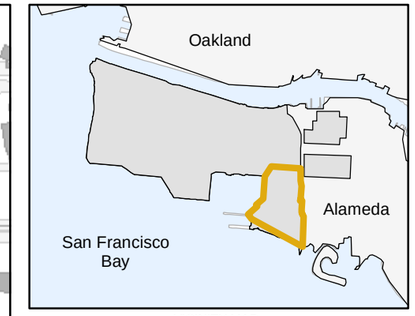

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids
* = TDS values for wells 20 feet from one another have maximum average TDS concentrations listed for contouring purposes.

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 300 600
Feet

FIGURE 8
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS BETWEEN 20-50 FEET
Alameda Point, Alameda, California

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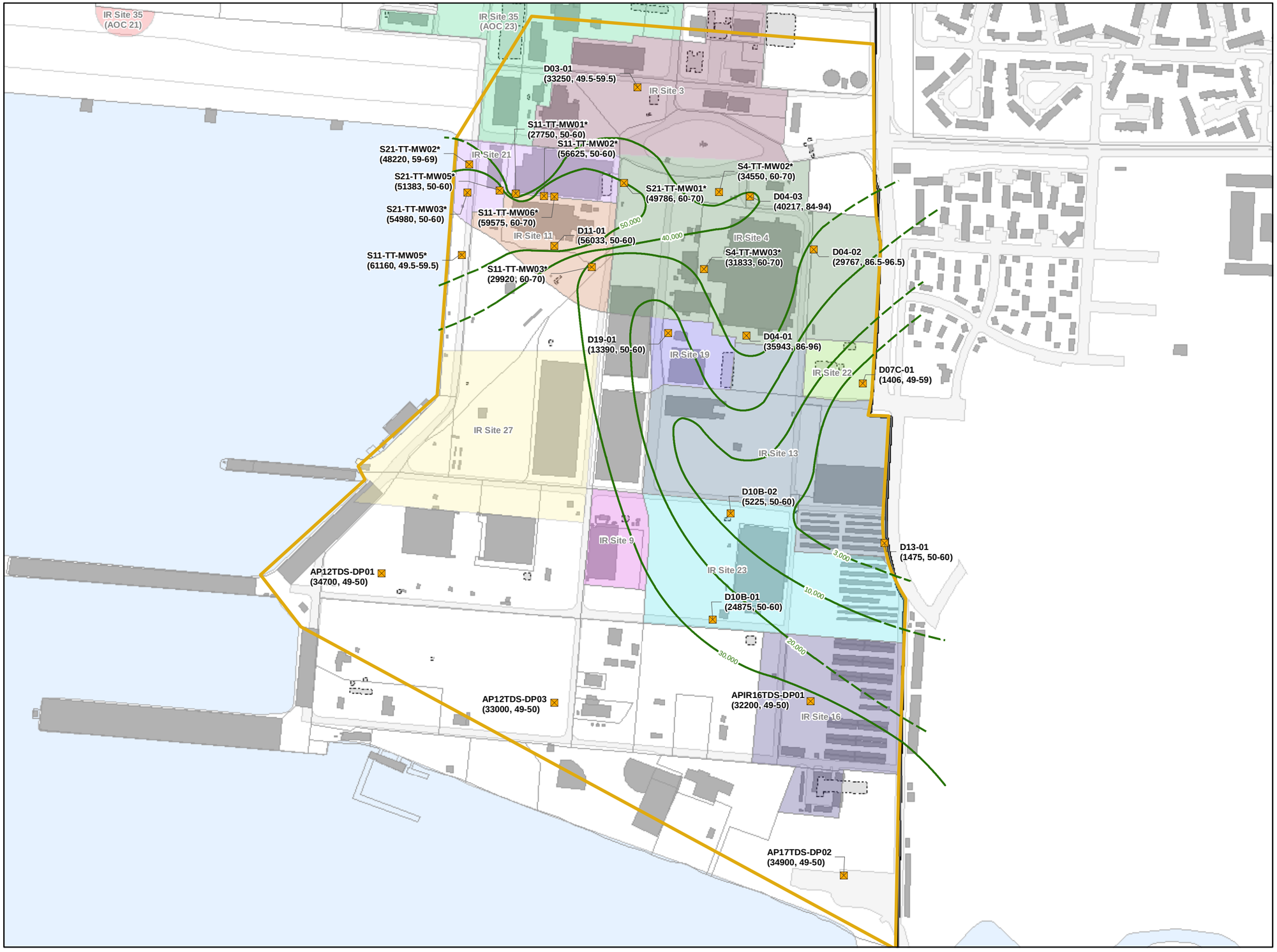

VICINITY MAP

LEGEND

- Groundwater TDS Sample Locations
- IR Site 11
- IR Site 13
- IR Site 16
- IR Site 19
- IR Site 21
- IR Site 22
- IR Site 23
- IR Site 27
- IR Site 3
- IR Site 35 (AOC 21)
- IR Site 35 (AOC 23)
- IR Site 4
- IR Site 9
- Proposed Groundwater Exemption Area
- Parcel Boundary
- Alameda Point NAS Property Boundary
- Building or Structure (Present)
- Building or Structure (Removed)
- Line of TDS Concentration in milligrams per liter (mg/L); dashed where inferred or uncertain

Notes:

MWC2-3 (135, 5-15) — Well ID (Average Concentration in mg/L, well screen interval in feet below ground surface)

mg/L = milligrams per liter
TDS = Total Dissolved Solids
* = TDS values for wells 20 feet from one another have maximum average TDS concentrations listed for contouring purposes.

Groundwater samples were collected from monitoring wells and hydropunch locations.

N

0 300 600
Feet

FIGURE 9
GROUNDWATER AVERAGE TDS SAMPLE VALUES AT WELL SCREEN INTERVALS 50 FEET AND GREATER
Alameda Point, Alameda, California

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STATE WATER RESOURCES CONTROL BOARD
RESOLUTION NO. 88-63
(as revised by Resolution No. 2006-0008)

ADOPTION OF POLICY ENTITLED
"SOURCES OF DRINKING WATER"

WHEREAS

1 California Water Code section 13140 provides that the State Board shall formulate and adopt State Policy for Water Quality Control; and,

2. California Water Code section 13240 provides that Water Quality Plans "shall conform" to any State Policy for Water Quality Control; and,

3. The Regional Boards can conform the Water Quality Control Plans to this policy by amending the plans to incorporate the policy; and,

4. The State Board must approve any conforming amendments pursuant to Water Code section 13245; and,

5. "Sources of drinking water" shall be defined in the Water Quality Control Plans as those water bodies with beneficial uses designated as suitable, or potentially suitable, for municipal or domestic water supply (MUN); and,

6. The Water Quality Control Plans do not provide sufficient detail in the description of water bodies designated MUN to judge clearly what is, or is not, a source of drinking water for various purposes.

7. On February 1, 2006, the State Board adopted Resolution No. 2006-0008, which amended this policy to establish a site-specific exception for Old Alamo Creek.

THEREFORE BE IT RESOLVED:

All surface and ground waters of the State are considered to be suitable, or potentially suitable, for municipal or domestic water supply and should be so designated by the Regional Boards[1] with the exception[2] of:

---

[1] This policy does not affect any determination of what is a potential source of drinking water for the limited purposes of maintaining a surface impoundment after June 30, 1988, pursuant to Section 25208.4 of the Health and Safety Code.

[2] This policy contains general categories for exceptions from the policy. On February 1, 2006, the State Board adopted Resolution No. 2006-0008, which established a site-specific exception from the policy for Old Alamo Creek. The rationale for the site-specific exception is contained in the resolution and in State Board Order WQO 2002-0015, II.A.2.d.

1. Surface and ground waters where:

    a. The total dissolved solids (TDS) exceed 3,000 mg/L (5,000 uS/cm, electrical conductivity) and it is not reasonably expected by Regional Boards to supply a public water system, or

    b. There is contamination, either by natural processes or by human activity (unrelated to the specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or best economically achievable treatment practices, or

    c. The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day.

2 Surface Waters Where:

    a. The water is in systems designed or modified to collect or treat municipal or industrial wastewaters, process waters, mining wastewaters, or storm water runoff, provided that the discharge from such systems is monitored to assure compliance with all relevant water quality objectives as required by the Regional Boards; or,

    b. The water is in systems designed or modified for the primary purpose of conveying or holding agricultural drainage waters, provided that the discharge from such systems is monitored to assure compliance with all relevant water quality objectives as required by the Regional Boards.

3. Ground water where:

The aquifer is regulated as a geothermal energy producing source or has been exempted administratively pursuant to 40 Code of Federal Regulations, section 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR, section 261.3.

4. Regional Board Authority to Amend Use Designations:

Any body of water which has a current specific designation previously assigned to it by a Regional Board in Water Quality Control Plans may retain that designation at the Regional Board's discretion. Where a body of water is not currently designated as MUN but, in the opinion of a Regional Board, is presently or potentially suitable for MUN, the Regional Board shall include MUN in the beneficial use designation.

The Regional Boards shall also assure that the beneficial uses of municipal and domestic supply are designated for protection wherever those uses are presently being attained, and assure that any changes in beneficial use designations for waters of the State are

consistent with all applicable regulations adopted by the Environmental Protection Agency.

The Regional Boards shall review and revise the Water Quality Control Plans to incorporate this policy.

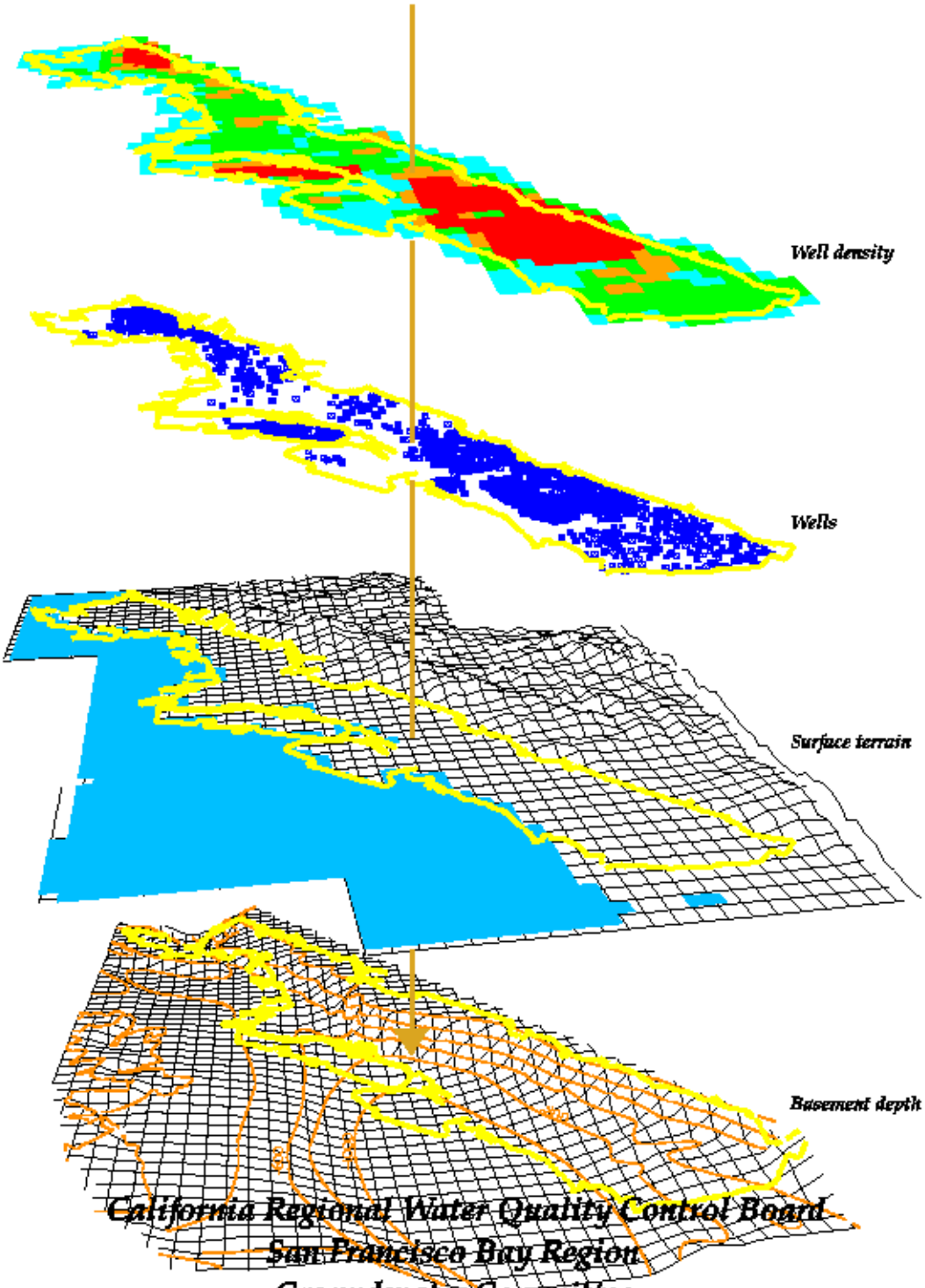
CERTIFICATION

The undersigned, Acting Clerk to the Board, does hereby certify that the foregoing is a full, true, and correct copy of a policy duly and regularly adopted at a meeting of the State Water Resources Control Board held on May 19, 1988, and amended on February 1, 2006.

Selica Potter
Acting Clerk to the Board

East Bay Plain Groundwater Basin Beneficial Use Evaluation Report

Alameda and Contra Costa Counties, CA



California Regional Water Quality Control Board
San Francisco Bay Region
Groundwater Committee

June 1999

Contributors

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Acknowledgements

Steve Wolmer from the East Bay Municipal Utility District and Jeff Kapellas, Nancy Katyl and Susannah Belding of the San Francisco Bay Regional Water Quality Control Board provided valuable assistance on the geographic information system portion of this project. Sands Figuers, of Norfleet Consultants, supplied key technical information for our beneficial use evaluation. Alameda County consultant Kenneth Muir provided valuable comments on early drafts of the report. The Committee sought out and incorporated comments from the following peer reviewers: David Abbott, John Fio, Seena Hoose, Richard Makdisi, and Bill Rudolph.

EXECUTIVE SUMMARY

All regulatory agencies rely on the groundwater beneficial use designations for establishing soil and groundwater cleanup levels at individual contaminated sites. The San Francisco Bay Basin Water Quality Control Plan (Basin Plan), adopted through a public hearing process in 1992, includes alternatives for improving beneficial use designations. Since 1992, The San Francisco Bay Regional Water Quality Control Board's (Regional Board) Groundwater Committee (Committee) has undertaken regional groundwater basin projects to better understand and improve beneficial use designations. This report presents a comprehensive evaluation of the beneficial uses of groundwater in the East Bay Plain Groundwater Basin (East Bay Plain). The purpose of this project is to better define current and future East Bay Plain beneficial uses. This project, when combined with a California Environmental Quality Act (CEQA) analysis, will be the technical basis for a future amendment to the Basin Plan. For agencies, consultants, businesses, and the public, the project provides a broader context in which to evaluate site-specific cleanup issues within the East Bay Plain.

STUDY AREA and PROJECT DESIGN

Located on the eastern shore of San Francisco Bay, the Basin is long (25 miles), narrow (2 to 7 miles) and includes all or portions of the cities of Richmond, San Pablo, El Cerrito, Albany, Berkeley, Emeryville, Piedmont, Alameda, Oakland, San Leandro, San Lorenzo and Hayward. Over 900,000 people live in the East Bay Plain. There are approximately 1300 leaking underground fuel sites and 130 non-fuel sites with identified pollution. While most of this pollution is limited in extent, there are 13 groundwater pollution plumes over 1,000 feet long.

The East Bay Plain project was conducted by the Committee, which was originally established by the Board's Executive Officer in 1990. For this project, its membership was expanded to include staff from the Alameda County Flood Control and Water Conservation District (ACFCWCD), East Bay Municipal Utility District (EBMUD), the Port of Oakland, the U.S. Navy and the cities of Oakland and San Leandro. The Committee initiated the study in 1996 to answer the following six key questions:

1. What are the current and planned future groundwater beneficial uses of the East Bay Plain?
2. Can the East Bay Plain be subdivided into Sub-Areas based on hydrogeology?
3. Where is the use of the East Bay Plain limited?
4. Can the shallow and deeper zones have different designations?
5. Should any current beneficial use designations change?
6. Are there areas requiring special protection programs?

Current, published reports were not detailed enough to answer the key questions. This is due, in part, to the population's reliance on surface water. However, pre-1930's data was available. At that time, groundwater supplied a significant portion of the water demand. In recognition of this, the Committee sought out a comprehensive review of historical groundwater use. The Friends of the San Francisco Estuary, in cooperation with the Regional Board, retained a consultant to complete a report on the historic groundwater use and current hydrogeologic framework of the East

Bay Plain (Figuers, 1998). Building upon this report, Committee members have compiled the best available information on beneficial uses, analyzed the information, developed a conceptual groundwater framework, and recommended revisions for beneficial use designations.

FINDINGS

Based on the key questions posed, the following findings were made:

1. Approximately 3,400 acre-feet of groundwater is extracted annually, based on 1995 estimates. Although safe yield estimates are somewhat crude, this volume is about 40% of the available yield. With a current demand of over 162,000 acre-feet/year, groundwater supplies about 2% of the total water used within the East Bay Plain.

2. There are approximately 4,700 existing wells in the East Bay Plain used for agricultural, industrial and municipal use, based on the records of ACFCWCD and EBMUD. Many of these wells are inactive. Well permit applications for Alameda County indicate that nearly all of the wells are used for "backyard" or commercial irrigation (91%) with less utilization for industrial process water (8.6%) and municipal drinking water supply (0.4%). Current uses of groundwater, by beneficial use designation category are:

   - Municipal and Domestic Water Supply: There are 6 permitted small water system wells that serve, collectively, over 200 individual users, primarily for backyard irrigation. Hayward also has 5 stand-by wells planned in the event of an emergency. Individual domestic drinking water wells are more difficult to account for due to gaps in databases in the permitting agencies. However, it is believed that there are very few wells used for domestic drinking water. Of the 1422 wells permitted since July 17, 1973 by ACFCWCD, 1417 (99.6%) are for non-drinking water purposes, primarily backyard irrigation. While these backyard irrigation wells are primarily intended for landscape and garden irrigation, incidental ingestion can occur. Therefore, backyard wells are considered a Municipal and Domestic Supply Beneficial Use.
   - Industrial/Process Water Supply: There are 10 active permitted industrial wells that service food processing and product manufacturing operations.
   - Agricultural Water Supply: Groundwater is used at two golf courses, three cemeteries and by several high schools, colleges, parks, and nurseries.

3. In addition to these designated categories, there are over 60 groundwater extraction systems at contaminated sites that collectively are pumping about 800 acre-feet per year.

4. Water service in the East Bay Plain is provided by the City of Hayward and EBMUD in the remaining area (San Lorenzo north to Richmond). Future potential beneficial uses include the use of the Basin's aquifers for storage of imported surface water by EBMUD. This storage is intended for use during a drought or an earthquake. Additional potential uses by EBMUD include municipal extraction wells and non-potable irrigation wells. Based on the Committee's review of general plans for the cities and at a workshop attended by most cities, no groundwater wells are planned for future emergency use other than by Hayward and EBMUD.

5. The East Bay Plain can be subdivided into seven Sub-Areas based on previously defined boundaries and geologic factors. Distinct characteristics are the potential for vertical contaminant migration and the potential for water supply development.

6. Groundwater use is limited in the East Bay Plain by several factors, including a) readily available high quality imported surface water, b) existing high salts in shallow bay margin groundwater, c) the potential for saltwater intrusion, and d) contamination in shallow aquifers. In particular, shallow groundwater use is limited in artificial fill and shallow bay-margin deposits in Richmond and Oakland because these units are largely saturated by brackish Bay water. In San Leandro, shallow groundwater use is limited by extensive shallow groundwater pollution by industrial solvents.

7. At this time, it does not appear prudent to change designations for most of the shallow water bearing units. The geologic relationships between deeper, potentially productive aquifers and shallow water bearing units are not defined well enough to change subregional designations. Furthermore, there were over 15,000 historical groundwater wells that were never appropriately decommissioned. These wells are potential pathways of shallow pollution to deeper aquifers. It is estimated that 8% of these wells are deeper than 200 feet. However, localized changes in some designations are feasible.

RECOMMENDATIONS

As a result of the findings of the regional analysis, the Committee has made specific recommendations to direct better decision-making at polluted sites. Also, the need for groundwater protection and monitoring measures to prevent further pollution is recommended. Some of the recommendations call for specific actions by the Regional Board or its staff, while others require the cooperation of other agencies.

Recommendations requiring action by the Regional Board or its staff:

- The Regional Board should amend the Basin Plan to include the East Bay Plain Basin Sub-Areas.

- The East Bay Plain should be subdivided into three management zones to prioritize groundwater remediation and dedesignate beneficial uses (see Figure 19). Subdivisions were developed by utilizing information on water quality, historic, existing and probable-future beneficial uses, and hydrogeology. The subdivisions are:

  Zone A - Significant drinking water resource. - Groundwater in these areas is an existing or probable drinking water resource. The basin is deep, with depths ranging from 500 to over 1000 feet. Well yields are generally sufficient for municipal supply. Cleanup strategies should be focused on actively maintaining or restoring groundwater quality to drinking water standards. Cleanup, spill prevention and education efforts within the source water protection zones of existing municipal wells should be the top priority of local and state programs.

Also areas with a high density of potential conduit wells and/or shallow backyard wells may need to receive higher priority and be subject to more detailed investigations than other areas.

Zone B - Groundwater that is unlikely to be used as a drinking water resource. In this area the basin is shallow, with depths generally less than 300 feet. Well yields are generally not sufficient for municipal supply. There are no current or planned uses of groundwater as a drinking water source. However, groundwater in these areas is used for backyard irrigation, industrial supply and commercial irrigation. Therefore, dedesignating beneficial uses in this area is not recommended. Remedial strategies should reflect the low probability that groundwater in this zone will be used as a public water supply in the foreseeable future. However, other beneficial uses/exposure pathways exist and should be actively protected. These include domestic irrigation, industrial process supply, human health, and ecological receptors. The potential for exposure via incidental ingestion from back yard wells should be evaluated.

Zone C - Shallow, nonpotable groundwater proposed for dedesignation of the Municipal Supply Beneficial Use. The Regional Board should locally dedesignate the municipal beneficial use for brackish, shallow groundwater in Bay-front artificial fill, young bay mud and the San Antonio Formation/Merritt Sand. This groundwater meets the exemption criteria of the State Water Resources Control Board's (SWRCB's) Sources of Drinking Water Policy because the groundwater could not reasonably be expected to serve a public water supply and exceeds the 3000 mg/L total dissolved solids criteria. Cleanup should be protective of ecological receptors and human health. Pursuant to SWRCB Resolution 92-49, pollution sites will continue to be required to demonstrate 1) that reasonably adequate source removal has occurred, 2) the plume has been reasonably defined both laterally and vertically and 3) a long-term monitoring program is established to verify that the plume is stable and will not impact ecological receptors or human health

- Within the East Bay Plain, there are groundwater pollution plumes that may warrant less aggressive remediation on a case-by-case basis. In certain cases, aggressive cleanup may not be warranted when the plume is shallow, concentrations are declining and no beneficial uses are threatened. The requirement for aggressive cleanup can pose a serious obstacle to redevelopment of blighted urban areas in the East Bay. This report outlines “basin specific” situations where less aggressive remediation may be warranted. Ultimately, the remedial options that would be part of a less aggressive strategy depend on site specific conditions. However, likely options would include restricting groundwater remediation to the source area only, allowing monitored natural attenuation, or implementing pump-and-treat solely to limit plume migration.

- Regional Board staff should encourage the use of aquifers in the East Bay Plain for groundwater storage. If groundwater from existing sources or surface water is stored in these aquifers (either from surface water sources in wet years or from treated wastewater), demand on limited surface water resources can be reduced.
- The methods required for conducting a Vertical Conduit Study and Well Search in the East Bay Plain should be formalized by Regional Board staff.
- Regional Board staff should encourage the establishment of a basin-wide groundwater management program.
- The GIS coverages displayed in this report should be updated regularly and placed on the Internet.

Recommendations requiring follow-up in cooperation with other agencies:

- The five agencies that maintain well databases within the East Bay Plain should make the data accessible to the public at a single agency.
- The existing ACFCWCD regional groundwater monitoring network should be expanded to include more wells, sampled more frequently, and monitored for a larger list of chemicals of concern. A similar network is also needed in the Contra Costa County portion of the East Bay Plain.
- Regulatory agencies should request that both ACFCWCD and EBMUD well databases are searched for current well locations as part of groundwater pollution site investigations.
- Well abandonment programs should be undertaken by appropriate Alameda and Contra Costa agencies in areas where groundwater resources are at risk.
- Together with ACFCWCD and EBMUD, the Regional Board staff should encourage the establishment of a basin-wide groundwater management program.

EAST BAY PLAIN GROUNDWATER BASIN
BENEFICIAL USE EVALUATION REPORT

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1.0 INTRODUCTION

The in-house Groundwater Committee (Committee) for the San Francisco Bay Regional Water Quality Control Board (Regional Board), and other State and local agencies completed the *San Francisco and Northern San Mateo County Pilot Beneficial Use Designation Project* in April 1996. The 1996 project evaluated alternatives to the current framework of groundwater beneficial use designation. As a result of this project, the Regional Board staff recommended that the preferred alternative, the Hydrogeologic Framework, should be tested in other groundwater basins. The East Bay Plain Groundwater Basin (East Bay Plain) was highlighted as a good test candidate. The goal of this project is to better define groundwater beneficial uses in the East Bay Plain. Located between San Francisco Bay and the East Bay Hills, the East Bay Plain is a highly urbanized groundwater basin (Figure 1).

1.1 About This Report

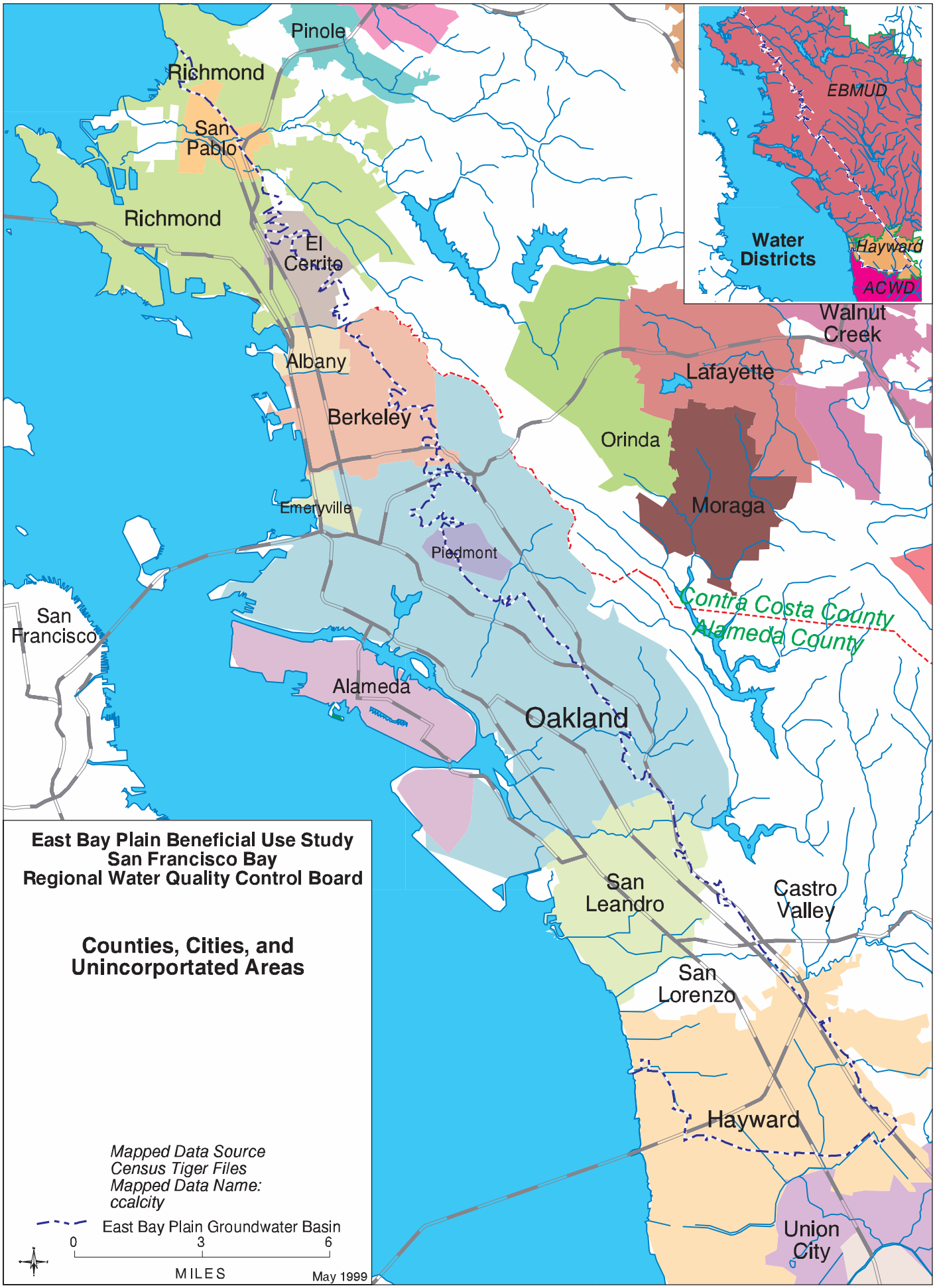
This report leads the reader through the steps that were followed to complete the beneficial use project. Sections 1-5 provide the background and context of the project. Sections 6-13 cover the physical and chemical characteristics of the East Bay Plain. Historic and current groundwater beneficial uses are analyzed in sections 12-13. Section 14 highlights local redevelopment and regulatory initiatives in Oakland, Berkeley, Emeryville and Richmond. The key findings and recommendations are presented in Sections 15-17. The proposed revisions and an accompanying CEQA analysis will be brought before the Regional Board for consideration of a Water Quality Control Plan (Basin Plan) Amendment.

1.2 Background

The urbanized East Bay Plain includes 12 cities, the five largest being Oakland, Berkeley, Hayward, Richmond and San Leandro. The total population within the Plain is over 900,000. From the 1860's to the 1930's, all water supplies to the East Bay Plain area were provided by groundwater, springs, and local reservoirs (Figures 2 and 3). As a result of the development of various Sierra Nevada water supplies in the 1920's and 1930's, all local East Bay Plain municipal water supplies were abandoned. Since then, the East Bay Plain has not been a regional source of water. However, the East Bay Plain is used locally for irrigation, industrial and emergency water supply purposes and as a limited drinking water supply.

There are areas of the East Bay Plain where beneficial use is limited due to brackish water quality, low sustainable yields, or the presence of pollution. This project seeks to balance the need to protect existing and potential future groundwater resources with the need to develop realistic cleanup goals for polluted groundwater in areas of limited beneficial use. To achieve this balance we framed the following key questions:

- What are the current and planned future groundwater beneficial uses of the East Bay Plain?
- Can the East Bay Plain be subdivided into Sub-Areas based on hydrogeology?
- Where is the use of the East Bay Plain limited?
- Can the shallow and deeper zones have different designations?


Pinole
Richmond
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Emeryville
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San Francisco
Alameda
Oakland
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Lafayette
Orinda
Moraga
Contra Costa County
Alameda County
San Leandro
Castro Valley
San Lorenzo
Hayward
Union City
EBMUD
Water Districts
Hayward
ACWD
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Counties, Cities, and Unincorporated Areas
Mapped Data Source
Census Tiger Files
Mapped Data Name:
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East Bay Plain Groundwater Basin
0
3
6
MILES
May 1999

Figure 1

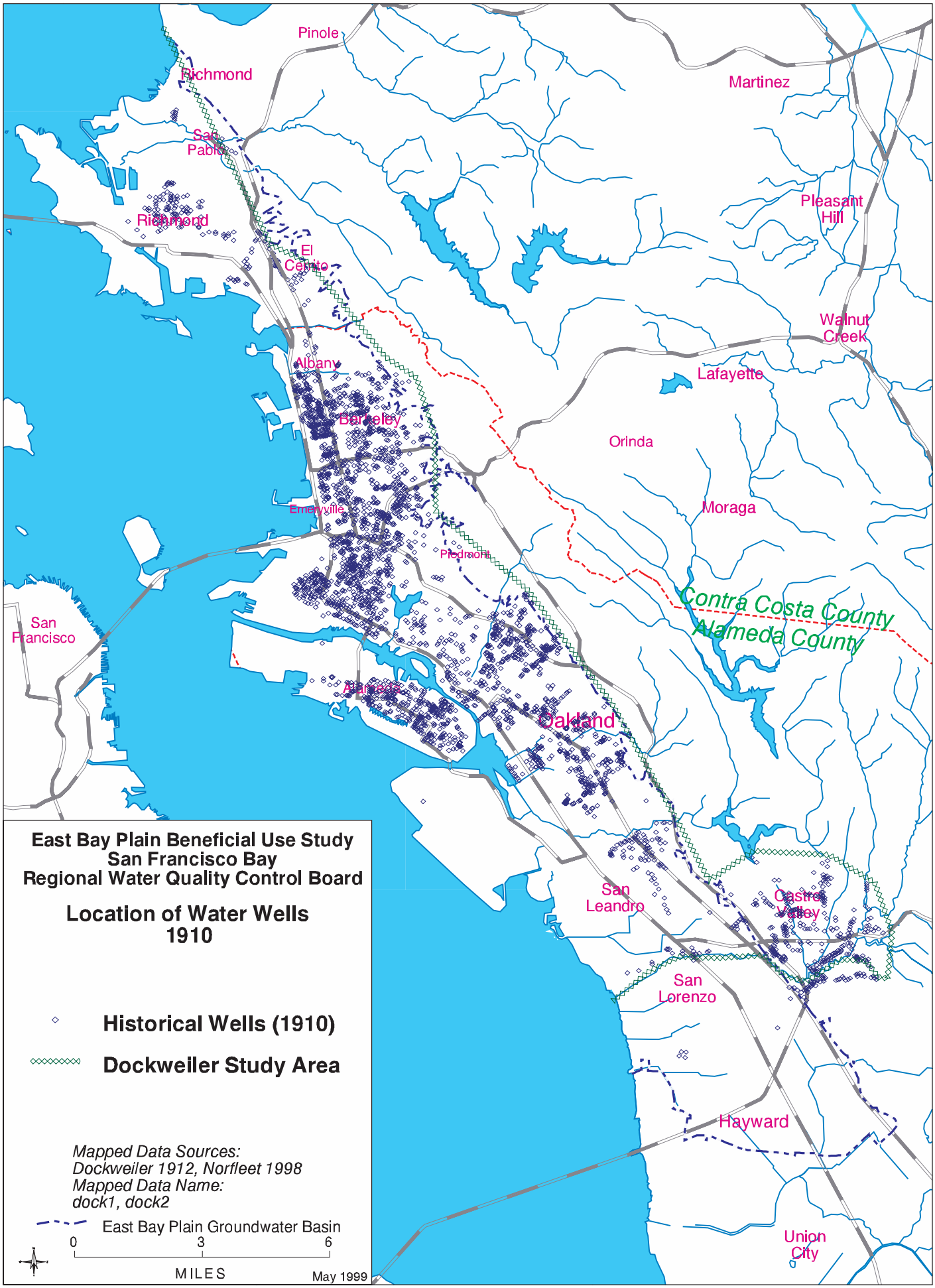

Pinole
Richmond
Martinez
San Pablo
Richmond
Pleasant Hill
El Cerrito
Walnut Creek
Albany
Lafayette
Berkeley
Orinda
Emeryville
Moraga
Piedmont
Contra Costa County
Alameda County
San Francisco
Alameda
Oakland
San Leandro
Castro Valley
San Lorenzo
Hayward
Union City
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Location of Water Wells
1910
Historical Wells (1910)
Dockweiler Study Area
Mapped Data Sources:
Dockweiler 1912, Norfleet 1998
Mapped Data Name:
dock1, dock2
East Bay Plain Groundwater Basin
0
3
6
MILES
May 1999

Figure 2

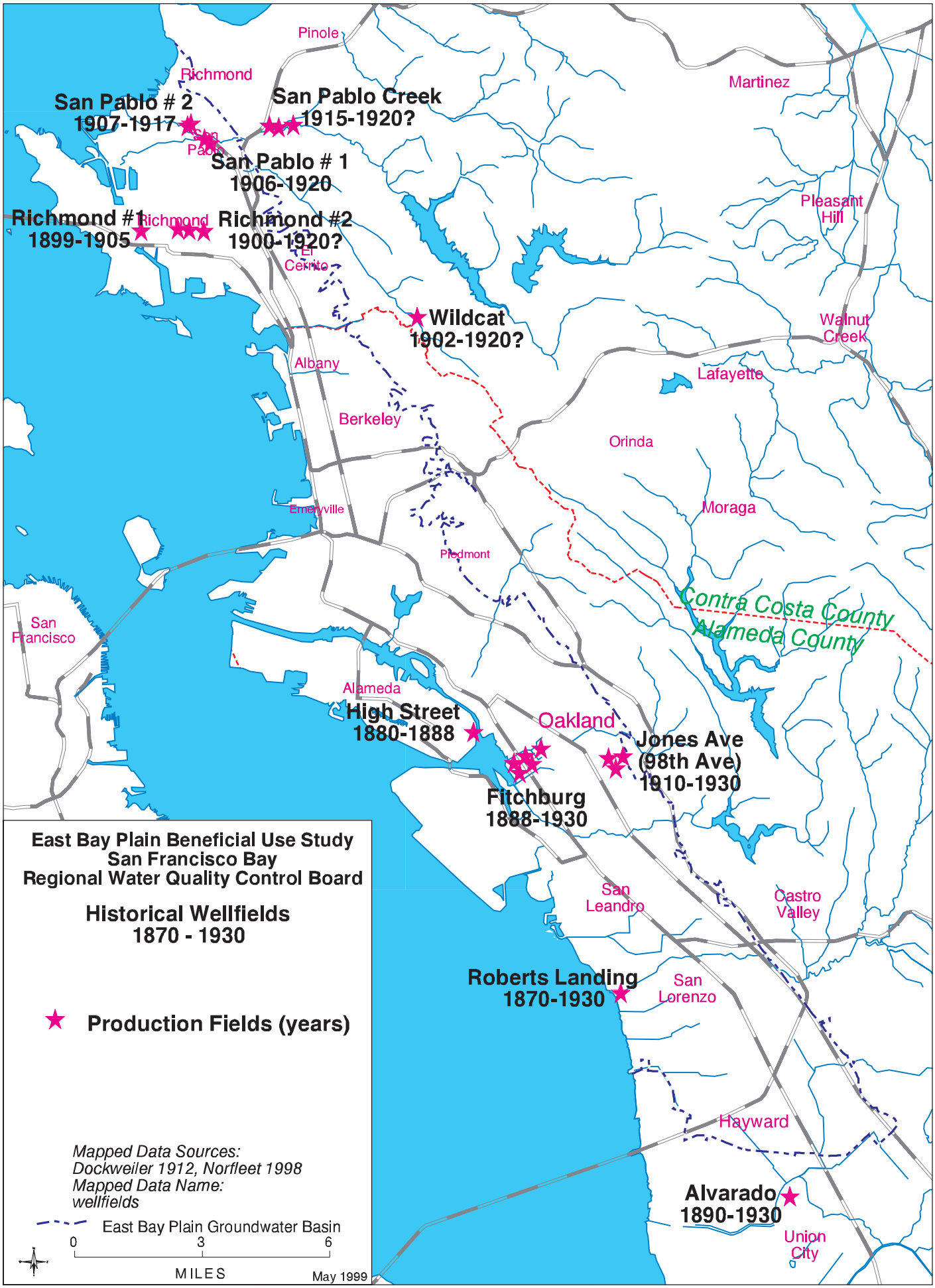

East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Historical Wellfields
1870 - 1930
Production Fields (years)
Mapped Data Sources:
Dockweiler 1912, Norfleet 1998
Mapped Data Name:
wellfields
East Bay Plain Groundwater Basin
0
3
6
MILES
May 1999
Pinole
Richmond
Martinez
San Pablo # 2
1907-1917
San Pablo Creek
1915-1920?
San Pablo
San Pablo # 1
1906-1920
Richmond #1
1899-1905
Richmond
Richmond #2
1900-1920?
El Cerrito
Pleasant Hill
Wildcat
1902-1920?
Walnut Creek
Albany
Lafayette
Berkeley
Orinda
Emeryville
Moraga
Piedmont
Contra Costa County
Alameda County
San Francisco
Alameda
High Street
1880-1888
Oakland
Jones Ave
(98th Ave)
1910-1930
Fitchburg
1888-1930
San Leandro
Castro Valley
Roberts Landing
1870-1930
San Lorenzo
Hayward
Alvarado
1890-1930
Union City

Figure 3

- Should any current beneficial use designations change?
- Are there areas requiring special protection programs?

1.3 Selection of East Bay Plain as Study Area

The Plain offers an excellent opportunity to conduct a groundwater beneficial use evaluation as a follow up to the Regional Board's San Francisco/ Northern San Mateo County Project (Regional Board, 1996). Information is available on current beneficial uses of groundwater, and largely forgotten historical information has been brought to light. The East Bay Plain includes areas that currently provide drinking water and areas that are unlikely to. U.S. EPA's Brownfields Programs are being studied for Emeryville, Oakland and Richmond, which could potentially benefit from this project. Simultaneously, the East Bay Municipal Utility District (EBMUD) is studying the feasibility of using the East Bay Plain for conjunctive use. EBMUD's study of using Aquifer Storage Recovery technology to inject imported surface water into the East Bay Plain raises important questions about its future beneficial uses (see Section 13.5).

Lastly, given the large number of groundwater pollution sites, a better definition of beneficial uses could focus expenditure of public and private resources on groundwater remediation on areas that are either existing or probable future drinking water sources. Correspondingly, in areas where no groundwater use exists and its future use is unlikely, remediation could be driven by human health and environmental risks associated with non-potable users.

1.4 Groundwater Committee

The Committee recommends policy on groundwater issues, conveys and shares new information and events related to groundwater pollution cleanup, and fosters internal consistency on groundwater policy implementation. The Committee normally consists of Regional Board line staff, supervisors, and managers from all five staff divisions.

The Committee's first major project was the groundwater Basin Plan Amendment adopted by the Board in 1992. Significant portions of this amendment have been used by the State and other regional boards in their Basin Plan updates. It highlights the Board's experience with groundwater cleanup since the early 1980's and includes a recommendation to evaluate the Board's existing approach to managing site cleanups. This includes a review of the beneficial use designations for each of the Region's groundwater basins.

In 1994, the Committee conducted a survey among its members and other interested Board staff to identify the primary unresolved issues in dealing with groundwater pollution cleanup within the Region. The results of the survey identified inconsistencies in applying the State Board's "Sources of Drinking Water" Policy (Sources Policy) to groundwater pollution cleanup and the corresponding need for refinement of beneficial use designations. This was similar to the Basin Plan's recommendation to streamline Board programs by developing "cleanup levels and policies for individual groundwater basins or Sub-Areas based on designated beneficial uses."

The Committee then embarked on its first pilot beneficial use project, which was San

Francisco and Northern San Mateo County. Between 1994 and 1996, the Committee designed and completed a comprehensive evaluation of hydrogeology, future groundwater uses, and alternatives for revised beneficial use designations. At the April 16, 1996, Regional Board meeting, staff presented the project summary report titled, "The San Francisco and Northern San Mateo County Pilot Beneficial Use Designation Project." The draft staff report provided the following recommendations:

- Three different methods for defining beneficial uses were evaluated. For groundwater basins in the study area, the Hydrogeologic Framework is the preferred alternative.
- Portions of the seven groundwater basins within the study area should retain their existing designations.
- Beneficial uses should be changed for the Downtown San Francisco Basin and portions of other basins composed of Franciscan Bedrock, artificial fill or bay mud.
- Corrective action strategies should match revised beneficial use designations. These strategies include aggressive cleanup to drinking water standards, passive cleanup with drinking water standards achieved as a long-term goal, and cleanup and management to goals defined by risk analysis.

After this pilot project was completed, the Committee decided to test the Hydrogeologic Framework in other basins. In late 1996, a second pilot project was initiated in the East Bay Plain.

2.0 STAKEHOLDER PARTICIPATION

On January 29, 1997, the Committee held a workshop for all potential agency stakeholders in the East Bay Plain Region. Included were municipal and county elected officials, water agencies, flood control districts, planning agencies, health and regulatory agencies, and city managers, as well as the East Bay Regional Park District, the Port of Oakland, U.S. Geological Survey, U.S. EPA, U.S. Navy; dischargers, and state agencies: Department of Water Resources, CALTRANS, Department of Toxic Substances Control, State Water Resources Control Board, and Department of Health Services. Stakeholders were invited to participate in the pilot project to update the beneficial use designation of groundwater in the East Bay Plain. Fifty-six individuals representing thirty-one agencies attended this workshop. The attendees are listed in Appendix C.

Participants were asked to give their input in the initial planning phases of the project and to share any information regarding their current or planned use of groundwater in the project area. The Committee also asked to review any evaluations of groundwater supplies that stakeholders might have. Input was also requested about how best to clean up and manage polluted groundwater.

The Committee felt that it was very important to include all of the agency stakeholders in the preliminary stage of this pilot project. After the initial workshops, agency representatives from EBMUD, Port of Oakland, DTSC, US Navy, the Alameda County Flood Control and Water Conservation District, the City of Oakland, and the City of San Leandro became active participants with Regional Board staff on the Committee.

3.0 METHODS

The methods used for this Pilot Project (Figure 4) were similar to those used in the San Francisco/San Mateo Beneficial Use Study (Regional Board, 1996). First, the best information available was compiled on beneficial uses and existing water quality. This information was compiled and analyzed on an ArcView GIS database. Second, a conceptual groundwater framework was developed that identified major aquifers and aquicludes, recharge areas, discharge areas, storage, potential for vertical migration, groundwater flow direction, etc. Third, findings were made regarding the overall condition of the East Bay Plain and its ability to meet all of the beneficial uses documented in the Basin Plan (RWQCB, 1995).

3.1 Investigation by Norfleet Consultants

One of the key resources that the Committee used for the beneficial use analysis was a comprehensive study on the area prepared by Sandy Figuers, Ph.D. (1998). This study provides a geologic, hydrologic and historical framework of the East Bay Plain.

The report, titled "Groundwater Study and Water Supply History of the East Bay Plain, Alameda and Contra Costa Counties, CA.," built upon the previous work by Dr. Figuers (Rogers and Figuers, 1991). Figuers' work included an in-depth search for and review of documents held in 12 libraries that yielded over 250 contemporary and historical references. In addition, he evaluated the subsurface geology, created the first basin-wide subsurface bedrock map, delineated areas of historical groundwater use, and proposed subdividing the basin into Sub-Areas.

Figuers' work expands on the efforts by previous workers including notably Muir (1993, 1996, 1997), Maslonkowski (1988) and the California Department of Water Resources (1963, 1994) to create the principal reference on East Bay Plain geology, hydrogeology and groundwater history.

3.2 Geographic Information System (GIS) Analysis

The GIS analysis in this report was performed by the staff of EBMUD and the Regional Board using Arc/INFO 7.2.1 and ArcView 3.0a software. Coverages were collected and compiled from a variety of sources and agencies, including the Regional Board, EBMUD, U.S. Geological Survey, U.S. Navy, Association of Bay Area Governments, Division of Toxic Substances Control, Norfleet Consultants and the County of Alameda. Where necessary, coverages were modified in consultation with one-meter resolution digital orthophotographs to enable proper overlay and display. SLIC and LUST data were geocoded by the Regional Board based on 1993 TIGER street data. The minimum coverage scale is 1:100000.

The proximity analysis of the well and toxic site data was performed at distances of 660 feet (approximately 1/8 mile), 1000 feet and 2000 feet. The lowest number was assumed to be the minimum possible distance for which accurate results could be obtained as the wells in the Alameda County Well Database are referenced by Township-Range quartersection coordinate, whose diagonal distance is 660 feet. Since the 660-foot distance is also approximately the same length as the average city block, it is assumed that the distance also provides sufficient flexibility to account

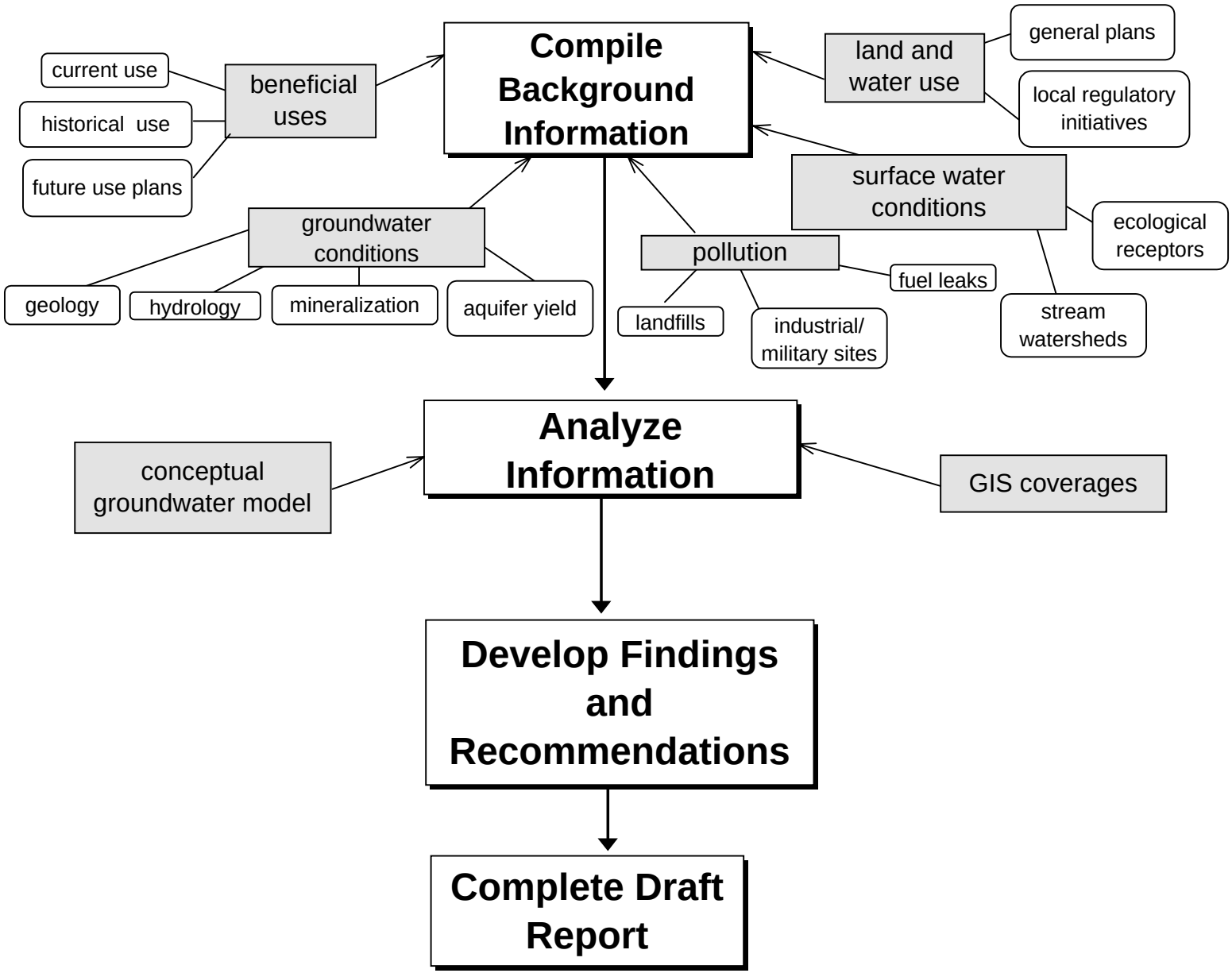


Figure 4. Methods for the East Bay Plain Groundwater Beneficial Use Evaluation

for most variation in accuracy.

4.0 CURRENT STATE WATER RESOURCES CONTROL BOARD POLICIES FOR GROUNDWATER

4.1 Resolution 68-16, "Statement of Policy with Respect to Maintaining High Quality of Waters in California"

Adopted in 1968, the Policy requires that where water quality objectives are set by Basin Plans or the Porter Cologne Act, existing water quality must be maintained. The resolution says:

> "1. Whenever the existing quality of water is better than the quality established in policies as of the date on which such policies become effective, such existing high quality will be maintained until it has been demonstrated to the State that any change will be consistent with maximum benefit to the people of the State, will not unreasonably affect present and anticipated beneficial use of such water and will not result in water quality less than that prescribed in the policies.
>
> 2. Any activity which produces or may produce a waste or increased volume or concentration of waste and which discharges or proposes to discharge to existing high quality waters will be required to meet waste discharge requirements which will result in the best practicable treatment or control of the discharge necessary to assure that (a) a pollution or nuisance will not occur and (b) the highest water quality consistent with maximum benefit to the people of the state will be maintained.
>
> 3. In implementing this policy, the Secretary of the Interior will be kept advised and will be provided with such information as he will need to discharge his responsibilities under the Federal Water Pollution Control Act."

This implies cleanup must be made to non-detect or background levels. Background is the lowest concentration limit required for groundwater protection. Chemical specific objectives for bacteria, organic and inorganic constituents, radioactivity, and taste and odor define the upper limit that is protective of beneficial uses. These objectives are based on Federal and State published standards and guidelines. Other site-specific limits are risk-based. The Policy does provide conditions under which a change in water quality is allowable. A change must:

- Be consistent with maximum benefit to the people of the state;
- Not unreasonably affect present and anticipated beneficial uses of water; and
- Not result in water quality less than that prescribed in the water quality policies.

4.2 Resolution 88-63, Sources of Drinking Water Policy (Sources Policy)

The Sources Policy was adopted by the State Board in 1988, following the passage of Proposition 65, which required public notification when specific cancer-causing chemicals were discharged into "sources of drinking water." The Sources Policy was incorporated into the Basin Plan in 1989 (Regional Board Order No. 89-39). The Sources Policy assigns municipal and domestic supply designations to all waters of the state with certain exceptions. The Sources Policy specifies that "any body of water that is not currently designated as MUN (municipal and domestic supply) but, in the opinion of the Regional Board, is presently or potentially suitable for MUN and domestic water, the Regional Board shall include MUN in the beneficial use designation." The Sources Policy allows for exceptions if the Regional Board has previously assigned specific designations or if specific exemption criteria are met. These exemption criteria are as follows:

- The total dissolved solids (TDS) exceed 3,000 mg/l (5,000 uS/cm, electrical conductivity) and it is not reasonably expected by the Regional Board that the groundwater could supply a public water system; *or*,

- There is contamination, either by natural processes or by human activity (unrelated to a specific pollution incident), that cannot reasonably be treated for domestic use using either Best Management Practices or best economically achievable treatment practices; *or*,

- The water source does not provide sufficient water to supply a single well capable of producing an average, sustained yield of 200 gallons per day; *or*,

- The aquifer is regulated as a geothermal energy producing source or has been exempted administratively pursuant to 40 CFR Section 146.4 for the purpose of underground injection of fluids associated with the production of hydrocarbon or geothermal energy, provided that these fluids do not constitute a hazardous waste under 40 CFR Section 261.3.

Basin Plan Table 2-9 (Appendix A), applies the beneficial use designations to groundwaters. In this table, each of the Region's groundwater basins is identified, and their existing and potential beneficial uses are designated. Identification of the groundwater basins is based on the Department of Water Resources (DWR) Bulletin 118-80. In addition to these designations, the Basin Plan further states that all subsurface waters are considered suitable, or potentially suitable, for municipal or domestic supply. Therefore, groundwater that falls outside of the identified basins was included within this designation.

4.3 Resolution 92-49, Policies and Procedures for Investigation and Cleanup and Abatement of Discharges under Water Code, Section 13304.

This Resolution was enacted in June 1992, amended in April 1994 and again in October 1996. Resolution 92-49 establishes policies and procedures for the oversight of investigations and cleanup and abatement activities resulting from discharges of hazardous substances. It requires regional boards to meet the highest levels reasonably attainable where, at a minimum, water quality objectives, established in the Basin Plans, must be met. If it is not reasonable to restore water quality to background levels, case by case cleanup levels may be specified, depending on the water quality provisions of a regional board's Basin Plan, beneficial uses of the waters, and maximum benefit to the people of the state.

4.4 Resolution 96-79, Adoption of Containment Zone Policy

Adopted October 2, 1996, Resolution 96-79 amends Resolution No. 92-49 to include the Containment Zone Policy. In recent years, the State Board and the regional boards have found that, in some circumstances, compliance with water quality objectives for groundwater as part of cleanup actions cannot be reasonably achieved. Since there were no procedures to address the inability of meeting Basin Plan objectives, Resolution 92-49 was further amended to include the Containment Zone Policy. This Policy establishes conditions under which a regional board may establish containment zones. That is, specific portions of groundwater-bearing units where water quality objectives cannot be reasonably achieved. The amendment therefore recognizes that some pollutants will remain within the containment zone for a period of time.

Since there is a potential for the migration of polluted water into uncontaminated waters, the amendment requires the discharger to contain pollutants within the area of the containment zone. The containment zone designation will be revoked if chemicals migrate outside of that area.

The amendment also includes an environmental document, the Functional Equivalent Document (FED). The FED is intended to be "functionally equivalent" to the CEQA process, therefore fulfilling the requirement for preparing Environmental Impact Reports, Negative Declarations, and Initial Studies.

5.0 GROUNDWATER REGULATORY AGENCIES

5.1 Federal

5.1.1 U.S. Environmental Protection Agency (EPA)

EPA has the regulatory lead for the National Priorities List (NPL) Superfund sites. They also provide grant funding for other regulatory programs.

5.1.2 U.S. EPA's Groundwater Classification Guidelines

Under State Water Board Resolution 88-63 (see Section 4.2), all state waters are considered to be potential drinking water unless either the total dissolved solids (TDS) exceeds 3000 mg/l and the Regional Water Board makes a determination that the water is not reasonably expected to supply a public water system, or the yield is less than 200 gal/day. However, EPA's Groundwater Classification Guidelines use a stricter standard of 10,000 mg/l TDS or less and a yield of 150 gal/day to define a potential drinking water source. The National Contingency Plan (NCP) Preamble directs EPA to use the Guidelines when determining the appropriate remediation for contaminated groundwater at CERCLA (Superfund) sites and EPA's OSWER Directive #9283.1-09 directs EPA to defer to the NCP Preamble and the Guidelines when a state does not have an EPA endorsed Comprehensive State Groundwater Protection Program (CSGWPP). EPA's definition is based on the importance of maintaining broad protections of potential drinking water sources in light of the growing demands on drinking water supplies. Since California does not have a CSGWPP, the federal definition of potential drinking water (10,000 ppm TDS or less and a yield of 150 gal/day) has recently been required by USEPA at CERCLA sites. Of the 1430 groundwater contamination sites in the East Bay Plain, CERCLA sites accounted for 3% by number and roughly 10% by area. These CERCLA sites consist primarily of closing Navy bases that are undergoing investigation and remediation as part of base reuse.

5.2 State of California

The major California laws regulating cleanup of pollution sites are contained in the Health and Safety Code and the Water Code. The nature of these chemicals and their effects on human health and the environment has long involved multi-agency oversight for the cleanup of these sites. In addition to the state agencies, several county and city agencies participate in regulatory activities. The state agencies usually have the lead in overseeing the cleanup of these sites.

5.2.1 Regional Water Quality Control Board (Regional Board)

The mission of the Regional Board is to protect the beneficial uses of the Region's surface and groundwater. Beneficial uses are the resources, services, and qualities of aquatic ecosystems that are the ultimate goals of protecting and achieving water quality. The Board works with local public entities and industry to ensure that they comply with the policies and objectives of the Water Quality Control Plan (Basin Plan) which is intended to guide local officials. The Regional Board will consider any proposed alternative actions that are consistent with the Basin Plan. The Regional Board oversees many programs with and without local program participation.

5.2.1.1 The "Spills, Leaks, Investigation and Cleanup" (SLIC) Program

SLIC is the program term used by the State Water Resources Control Board and Regional Boards to define those sites with groundwater polluted by chemicals other than total petroleum hydrocarbon (TPHs) that are used as fuels. These chemicals include, but are not limited to, polyaromatic hydrocarbons (PAHs), volatile organic chemicals (VOCs), PCBs, metals and

pesticides. Most of the 32 SLIC sites in the study area are located on the western side in old industrial areas.

Because of the nature of these chemicals and their effects on human health and the environment, a group of agencies has long been involved in overseeing the cleanup of these sites. In addition to state agencies, several county and city agencies have had a significant role in the process. Usually, a state agency has the lead for overseeing the cleanup of SLIC and other toxic sites, but because of local agencies participating actively in determining cleanup levels and time frames, the role of the lead agency becomes less distinct. One reason is that SLIC sites do not have a Local Oversight Program like the leaking underground storage tank sites (LUSTs) program (see below).

5.2.1.2 Non-SLIC Regional Board-lead groundwater cleanup sites

This class of sites includes the Unocal Oil Terminal in Richmond and the PG&E facility in Oakland that use aboveground tanks for storing petroleum hydrocarbons; and the groundwater cleanup under the Chevron refinery in Richmond (the only refinery located on the Plain). Although the Regional Board is the lead agency for these sites, the corresponding County Health Departments are consulted on soil cleanup issues.

Although the Regional Board has the authority to protect groundwater quality, the non-distinguishable relationships between human health, the environment, land-use, and economic considerations have complicated the regulatory roles of all agencies involved in site cleanup. Occasional inconsistencies in cleanup requirements, and the lack of coordination and information sharing between these agencies, have resulted in regulatory oversight that is not as efficient as it could be. Table 1 provides a breakdown of the number and types of cases each agency regulates. This “multi-agency” approach to regulating groundwater pollution presents both advantages and disadvantages. The advantage is that it allows each agency to use the unique skills and legal tools that it possesses and it makes the best use of limited resources to provide oversight of the thousands of sites in the East Bay Plain. The main disadvantage is the lack of a coordinated “watershed” approach to prioritizing sites, compiling data, and sharing information. For example, in San Leandro four agencies need to be contacted to get information on groundwater pollution sites. The East Bay Plain is essentially a large unmanaged basin with pollution sites regulated by any of eight different environmental agencies.

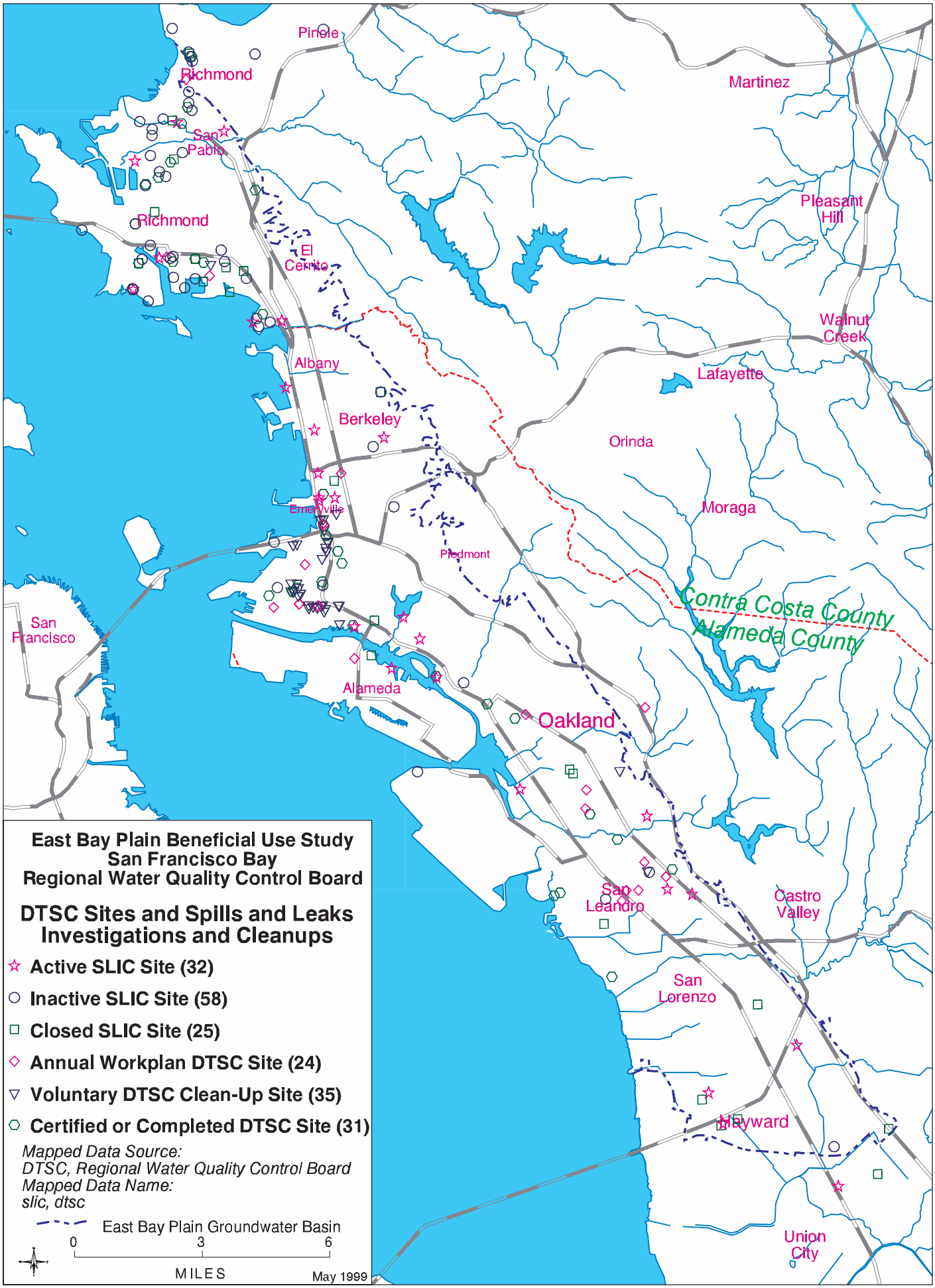
Table 1. Summary of Groundwater Cleanup Regulatory Agencies in the East Bay Plain

Agency	Types of Groundwater Pollution Cases Regulated	Number of active cases in East Bay Plain except where noted otherwise [1]	Comments
U.S. EPA	Superfund Sites, DoD Sites/Emergency Response	52 Fuel Sites 19 VOC Sites	Oversight of cleanup at closing military bases and DC Metals
CA Department of Toxic Substances Control	VOCs, metals, RCRA, state lead for DoD Sites	90	From Calsites Database
CA Regional Water Quality Control Board	VOCs, Metals, coordinates LUFT Program, Landfills, Refineries, consults on DoD Sites	Active LUFT: 1310 [2] Nonfuel/SLIC: 32 Landfills: (1 active and 10 closed)	
Alameda County Environmental Health Services	Local Oversight Program for Fuels, also active in SLIC Sites	1235	
Contra Costa County Department of Environ. Health	Non-Local Oversight Program for Fuels	686 within entire county	RWQCB is lead for all sites.
City of Berkeley, Planning and Development Department, Toxics Management Division	Non-Local Oversight Program for Fuels	194	
San Leandro Fire Department	Non-Local Oversight Program for Fuels	121	
Hayward Fire Department	Non-Local Oversight Program for Fuels	256	

1Total number of sites as of January 1998.
2 LUFT total includes fuel sites regulated by other agencies.

5.2.2 Department of Toxic Substances Control (DTSC) protects public health and the environment from the effects of hazardous substances as required by Chapter 6.8 of the California Health and Safety Code. They are required to ensure that contaminated sites are cleaned up in accordance with state and federal laws and they regulate the generation, storage, treatment, transportation, handling, and disposal of hazardous wastes. DTSC is organized into two separate programs, Site Mitigation and Hazardous Waste Management Program (Figure 5).

5.2.2.1 Site Mitigation Program oversees the investigation and remediation of hazardous substance release sites, including military facilities as well as private party sites. According to the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Orinda
Emeryville
Moraga
Piedmont
Contra Costa County
Alameda County
San Francisco
Alameda
Oakland
San Leandro
Castro Valley
San Lorenzo
Hayward
Union City
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
DTSC Sites and Spills and Leaks Investigations and Cleanups
Active SLIC Site (32)
Inactive SLIC Site (58)
Closed SLIC Site (25)
Annual Workplan DTSC Site (24)
Voluntary DTSC Clean-Up Site (35)
Certified or Completed DTSC Site (31)
Mapped Data Source:
DTSC, Regional Water Quality Control Board
Mapped Data Name:
slic, dtsc
East Bay Plain Groundwater Basin
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May 1999

Figure 5

"CALSITES LIST" database, DTSC currently oversees the investigation and cleanup of 90 sites in the East Bay Plain. Responsibility includes the oversight of remediation of both soil and groundwater contamination. Larger projects include the DWA Plume (San Leandro), Barbary Coast (Emeryville), Cypress Freeway Reconstruction Projects (Oakland), and the Liquid Gold Site (Richmond).

5.2.2.2 Hazardous Waste Management Program is responsible for permitting corrective action, and enforcement for sites that handle hazardous wastes. This includes generators, transporters, as well as those who accept offsite waste for treatment or disposal.

5.2.3 Landfills

Landfills are regulated by the Regional Board in coordination with the California Integrated Waste Management Board and the Local Oversight Agency (Alameda County and Contra Costa County Health Departments). Of the eleven regulated landfills in the East Bay Plain, only one (West Contra Costa Landfill) is still open and accepting waste. See Section 9.4 and Table 3B for more information on landfills.

5.2.4 Department of Health Services

The Drinking Water Source Assessment and Protection (DWSAP) Program was prepared in response to 1996 amendments to the federal Safe Drinking Water Act (SDWA). These amendments included requirements for states to develop a program to assess sources of drinking water and encourage states to establish drinking water protection programs. The Department of Health Services (DHS) Division of Drinking Water and Environmental Management is the lead agency for development and implementation of the DWSAP Program.

The drinking water source assessment is the first step in developing a complete drinking water source protection program. The assessments enable determinations to be made as to whether a drinking water source may be vulnerable to contamination. Assessments are to be completed between November 1999 and May 2003.

California's DWSAP Program addresses both groundwater and surface water sources, and draws upon EPA guidance, DHS' experience from related programs and advice from advisory committees and the public. The groundwater portion of the DWSAP will serve as the State's wellhead protection program. The surface water components of the DWSAP will be developed using DHS' experience with other activities such as watershed sanitary surveys.

Although DHS is responsible for performing the assessments, some public water systems may wish to perform their own. In such cases, the assessments must be conducted in conformance with DHS procedures.

A copy of the DWSAP can be found on the internet at http://www.dhs.cahwnet.gov.

5.3 Local Agencies (Counties, Cities and Special Districts)

Local oversight differs from county to county and city to city:

(a) Contra Costa County and Cities - sites within the Study Area are overseen by the Regional Board or DTSC, with some assistance from the County Health Services Department.

(b) Alameda County and Cities - involvement varies from city to city.

San Leandro - DTSC, the Alameda County Health Services Department (ACHSD), the Regional Board and the City of San Leandro all assume lead roles for various sites in San Leandro.

Hayward - the Regional Board is usually the lead agency with ACHSD taking the lead on some pesticide-polluted sites. The City of Hayward is the lead agency for most fuel sites in Hayward.

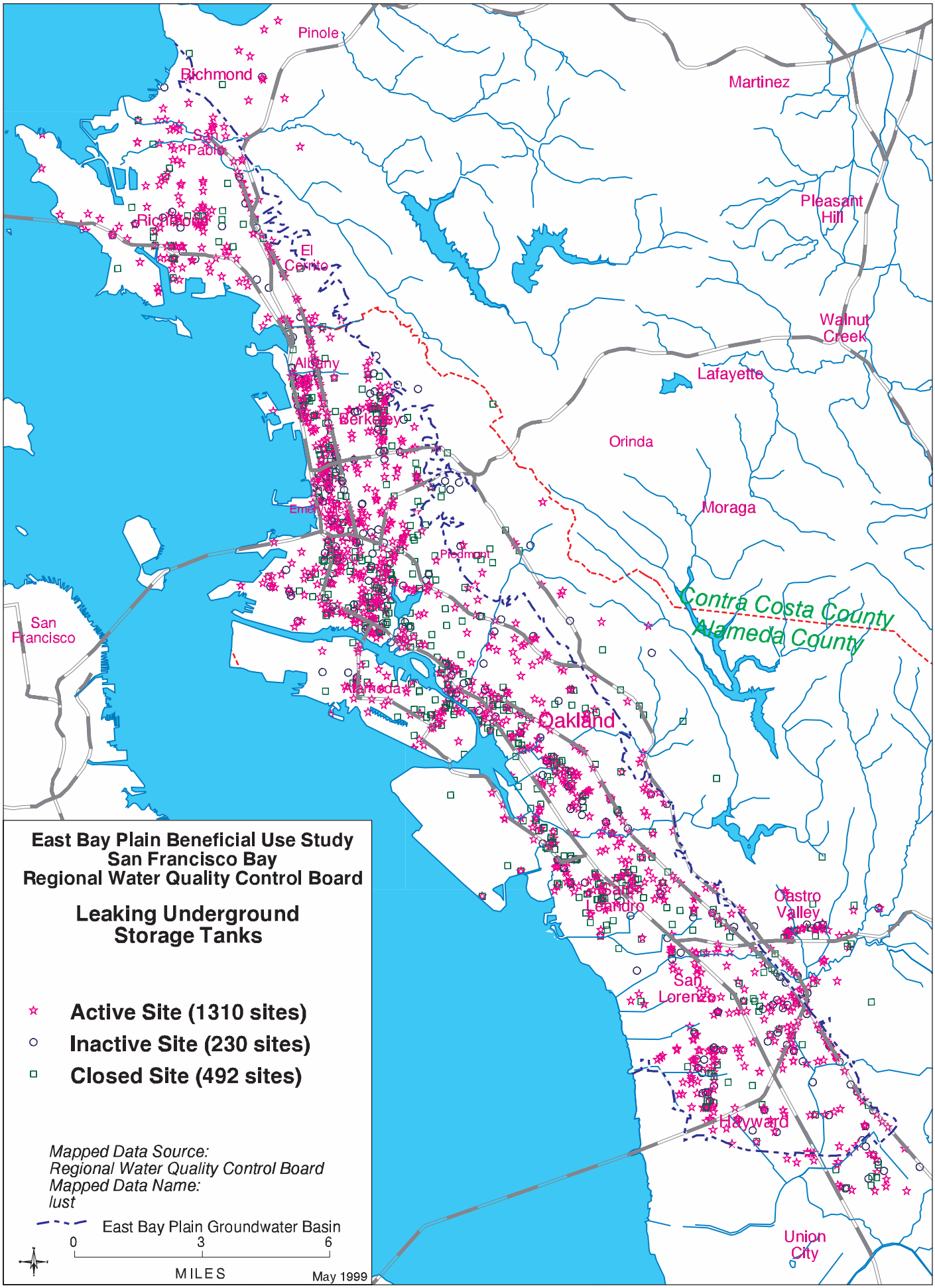
Emeryville and Oakland - the lead is usually a joint effort between the Regional Board and ACHSD, with DTSC taking the lead in several large pollution sites, such as the Cypress Freeway Project.

Berkeley - the City of Berkeley, Planning and Development Department, Toxics Management Division (TMD), oversees the cleanup of pollution sites; the Regional Board provides technical and regulatory support for the agency.

5.3.1 Local Oversight Program (LOP) for Leaking Underground Fuel Tank Sites

The Local Oversight Program (LOP) and the Local Implementing Agencies (LIAs, see below) were formed to oversee the closing of Leaking Underground Fuel Tanks (LUFTs) in the State. As of January 1998, the Regional Board had 1310 sites (see Table 1 and Figure 6). Developed in the late 1980's as a pilot program the LOP was codified in 1990 in Section 25297.1 of Chapter 6.7 of the Health and Safety Code. Under Section 25283 of this Code ("Underground Storage of Hazardous Substances"), counties or local agencies are required to implement the conditions of the chapter as they relate to permitting, inspection, and monitoring of Underground Storage Tanks (USTs). Under the LOP program, the State Water Resources Control Board (SWRCB) contracted with local agencies, including Alameda County, that agreed to oversee the remediation of unauthorized releases of fuels from USTs. The agreement focuses only on fuel USTs, specifically exempting solvent cases, because of Federal and State funding restrictions. The primary source of funding for the program comes from the Federal LUST Grant and the State's UST Cleanup Fund (USTCF). Most costs to a responsible party are reimbursable by the UST Cleanup Fund if the responsible party remains in compliance. USTCF is funded by a 1.2-cent tax per gallon of gasoline sold.

The LOP provides a framework to implement the cleanup of LUFTs and requires that work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Berkeley
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Emeryville
Piedmont
Contra Costa County
Alameda County
San Francisco
Alameda
Oakland
San Leandro
Castro Valley
San Lorenzo
Hayward
Union City
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Leaking Underground Storage Tanks
Active Site (1310 sites)
Inactive Site (230 sites)
Closed Site (492 sites)
Mapped Data Source:
Regional Water Quality Control Board
Mapped Data Name:
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East Bay Plain Groundwater Basin
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MILES
May 1999

Figure 6

performed under the agreement be consistent with cleanup standards specified by the State and Regional Boards. The Local Agency is encouraged to do its own enforcement. Appeals arising from disputes between the LOP agency and the responsible party are heard by petition at the SWRCB, although some technical disputes may be handled informally by Regional Board staff. Unless a case has been assigned to the Regional Board, the LOP agencies oversee day to day cleanup activities and prepare final closure packages for Regional Board review and concurrence.

Alameda County Environmental Health Services is the only LOP within the East Bay Plain and has jurisdiction over all of Alameda County, except for the areas covered by the three non-LOP agencies described below. In January 1998, the County had 1235 sites.

5.3.2 LIA Programs – Cities of San Leandro, Berkeley, Hayward, and Contra Costa County

Some local agencies chose not to participate in the LOP program and elected instead to implement cleanup oversight authority themselves. These agencies are known as Local Implementing Agencies (LIAs). There are four LIAs in the East Bay Plain: the Cities of Berkeley, Hayward and San Leandro, and Contra Costa County. These agencies do not have enforcement authority, rather the agency or County District Attorney refers cases to the Regional Board. The agency submits its recommendation for closure to the Regional Board (the only agency that can officially close a case) along with a summary checklist. Regional Board staff provides technical guidance, general support, and enforcement, as required. Staff maintains case files, reviews closure recommendations and prepares the final closure letter and transmittal packages.

Berkeley (Toxics Division) currently has 194 cases. Funding sources include hourly fee schedules, permit fees, and work plan review fees.

Hayward (Hayward Fire Department) covers the incorporated part of Hayward and has 256 cases. Alameda County handles cases located in unincorporated areas. Funding sources are the annual permit fees for hazardous materials storage and cost recovery.

San Leandro (Hazardous Materials Division) has 121 cases and is the lead agency for all but one. The Regional Board is the lead agency for the other case. The funding source is reimbursement for direct oversight.

Contra Costa County (Department of Health Services) has 686 LUST cases, which are under the lead of the Regional Board. The funding source is UST Permit Fees and cost recovery in special cases.

5.3.3 Alameda County Flood Control and Water Conservation District (ACFCWCD) was formed in 1949 to address the flood control and water supply problems of the rapidly developing southern and eastern portions of the County. Within its boundaries, ACFCWCD has monitored and protected groundwater since 1955. This includes a continuous program of well measurements and water quality sampling. These boundaries are exclusive of the Alameda County Water District, which is a separate agency.

ACFCWCD collects information on water levels and water quality from 50 private wells in the Alameda County portion of the East Bay Plain (30 for water levels, 20 for quality). Water levels are measured semi-annually, quality biannually, and half of the wells are sampled every other year. The Department of Water Resources (DWR) analyzes the samples for inorganic compounds. The monitoring program does not analyze for synthetic organic chemicals such as solvents or fuel compounds.

The present network (Figure 7) was established by DWR in the 1950's and 1960's to study saltwater intrusion. The data is kept on file with ACFCWCD in both hard copy and computerized form.

On July 17,1973, Alameda County enacted a groundwater protection ordinance, No. 73-68, to regulate the construction of water wells. Permits for well construction or destruction are obtained from the county at no cost. The purpose of the ordinance was to protect the quality of the groundwater from contamination either from surface pollutants or from groundwater sources of lesser quality. The ordinance is administered and enforced by ACFCWCD in the unincorporated areas of the County and in the Cities of Alameda, Albany, Hayward, Oakland, Piedmont, Emeryville, and San Leandro. ACFCWCD has information on over 10,000 wells. These "driller logs" are filed by State well numbers, which are stored on a computer data base (dBASE) linked to a mapping software (MapInfo).

6.0 GEOLOGIC SETTING

The study area has a Mediterranean climate. Most rainfall occurs between November and March. The average annual rainfall across the entire area is 23 inches. The upland watershed area for the East Bay Plain is over 100 square miles along the western slope of the Coast Ranges. The major drainages in the watershed are San Pablo Creek, Wildcat Creek, San Leandro Creek, and San Lorenzo Creek (see Figure 8). In addition, there are thirteen minor creeks within the watershed. This study does not include groundwater in the upland watersheds.

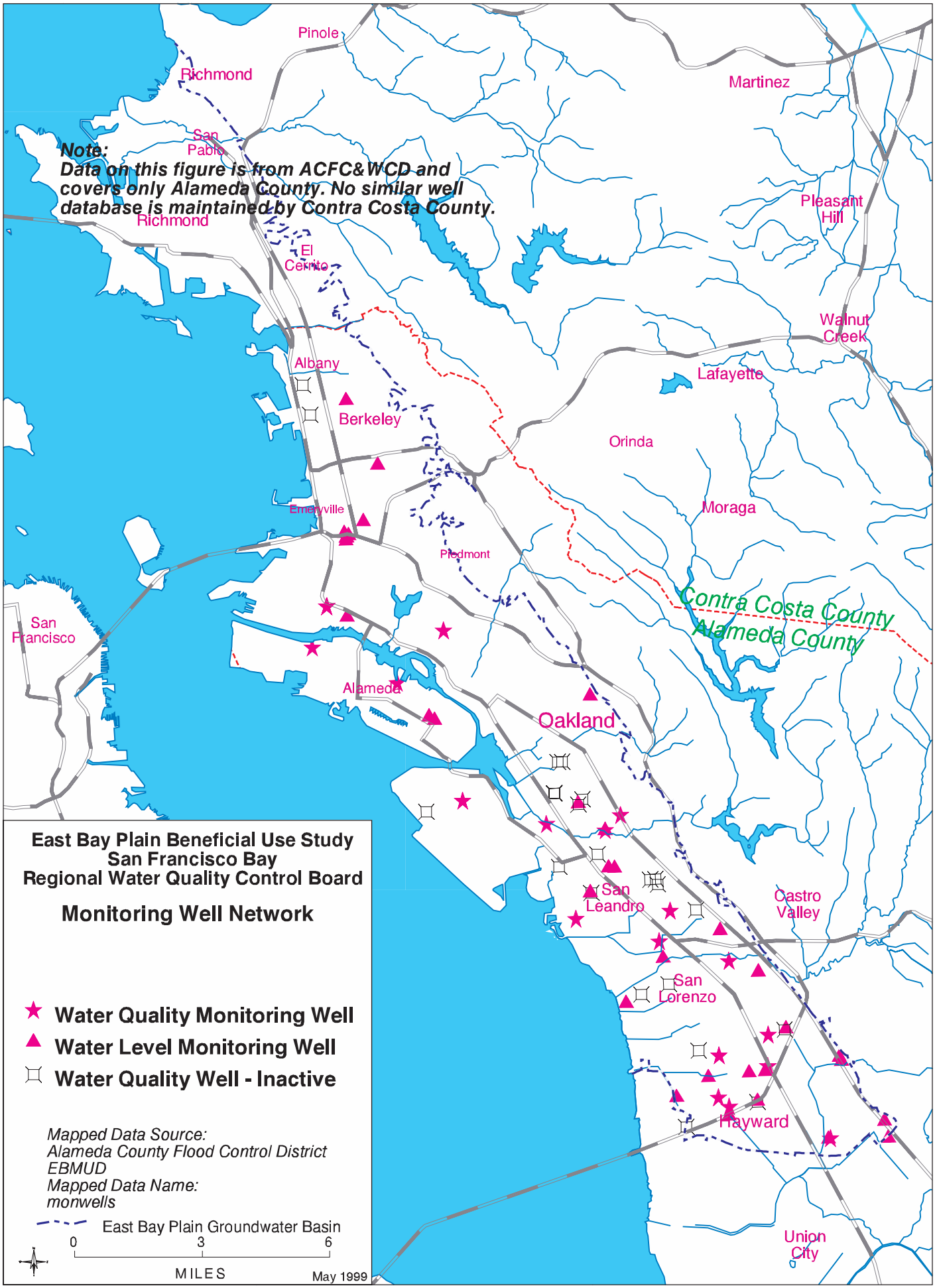
This section describes the geologic setting including structural features and stratigraphic units within the East Bay Plain.

6.1 Previous Investigations

Several reports and investigations exist detailing the stratigraphy and structure of the East Bay Plain. They are the product of extensive field investigations, including geotechnical borings, well borings, and field mapping. Recently other authors have compiled, summarized, and synthesized previous investigations. Muir (1993, 1997) and Figuers (1998) were the primary reports used in the compilation of this section.

6.2 Structural Geology

The East Bay Plain overlies a flank of a broad Franciscan bedrock depression, the core of which is roughly centered under San Francisco Bay (Figuers, 1998). The Hayward Fault and the


Note:
Data on this figure is from ACFC&WCD and covers only Alameda County. No similar well database is maintained by Contra Costa County.
Pinole
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El Cerrito
Walnut Creek
Albany
Lafayette
Berkeley
Orinda
Emeryville
Moraga
Piedmont
Contra Costa County
Alameda County
San Francisco
Alameda
Oakland
San Leandro
Castro Valley
San Lorenzo
Hayward
Union City
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Monitoring Well Network
Water Quality Monitoring Well
Water Level Monitoring Well
Water Quality Well - Inactive
Mapped Data Source:
Alameda County Flood Control District
EBMUD
Mapped Data Name:
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East Bay Plain Groundwater Basin
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May 1999

Figure 7

East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Significant Hydrology
Sub-Watersheds
Significant Waters
Mapped Data Sources
USGS & RWQCB
Mapped Data Name:
sigwats, subwats
East Bay Plain Groundwater Basin
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Rodeo Creek
Richmond
Pinole Creek
Pinole Creek
Martinez
San Pablo
Wildcat Creek
San Pablo Creek
Wildcat Creek
Richmond
Wildcat Creek
El Cerrito
Briones Reservoir
Pleasant Hill
Suisun Bay
Walnut Creek
Walnut Creek
San Pablo Reservoir
Lake Anza
Albany
Lafayette
Lafayette Lake
Las Trampas Creek
Tice Creek
Berkeley
Orinda
Moraga Valley Creek
Moraga Valley Creek
Moraga
Emeryville
San Leandro Creek
Piedmont
Redwood Creek
San Leandro Reservoir
Kaiser Creek
San Francisco
Alameda
Oakland
Cull Canyon Reservoir
San Leandro Creek
Lake Chabot
San Leandro Creek
San Leandro Creek
Crow Creek
Crow Creek
San Leandro
Castro Valley
San Lorenzo Creek
San Lorenzo Creek
San Lorenzo
Alameda Creek
Hayward
Alameda Creek
Union City

Figure 8

San Andreas Fault form the eastern and western boundaries of the depression. The Hayward Fault is the dominant structural feature in the Plain, trending parallel to the long axis of the East Bay Plain in a northwest direction.

Within the East Bay Plain, Figuers (1998) finds that there are two, separate basins based on the presence of two structural depressions (Figure 10). The San Francisco Basin extends north from the Dumbarton Bridge to the shoreline south of Richmond. There is a well-defined bedrock ridge separating the San Francisco Basin from the San Pablo Basin. The San Pablo Basin extends from Richmond north to the Petaluma area. The Hayward-Rogers Creek fault system crosses the basin, but it is unknown how this fault system has affected the sediments or groundwater flow patterns within the Basin. Figure 11 illustrates the structural contours for the bedrock, and clearly indicates the two basins.

6.3 Major Stratigraphic Units

The geologic units can be divided into two groups: 1) consolidated bedrock of Jurassic, Cretaceous, and Tertiary age and 2) unconsolidated sediments of Pleistocene and Holocene age (Muir, 1993). Recently, the U.S. Geological Survey compiled a surficial geological map of Alameda and Contra Costa Counties (USGS, 1999) (See Figure 9).

Bedrock forms the bottom and eastern boundary of the Basin. The bedrock is structurally complex and includes the Franciscan Complex (melanges, serpentines, and ultramafic rocks) and the Great Valley Sequence (shale, sandstone, and conglomerate). The unconsolidated sediments have a variable thickness, but are up to 1000 feet thick in their deepest areas. The nomenclature applied to the unconsolidated sediments has varied over time. For the purposes of this report, we use the nomenclature from Figuers (1998). From oldest to youngest, the unconsolidated sediments are 1) Santa Clara Formation 2) the Alameda Formation (including Yerba Buena Mud, San Antonio, Merritt, and Young Bay Mud Members 3) Temescal and 4) Artificial Fill (Figure 12).

For discussion purposes, shallow groundwater-bearing units are defined as the units above the Yerba Buena Mud (Artificial Fill, San Antonio/Merritt/Posey Member, and Temescal Formation). Deeper groundwater-bearing units are defined as the units below the Yerba Buena Mud (Unnamed member of the Alameda Formation and Santa Clara Formation).

6.3.1 Santa Clara Formation

This formation name has not been consistently applied to the deep units north of the Santa Clara Valley. This early Pleistocene formation is continental in origin and includes alluvial fans deposits interfingered with lake, swamp, river channel, and flood plain deposits. The formation is between 300 to 600 feet thick. Overall, this formation is very poorly understood. Figuers (1998) reports that this section has only been sampled within the past year or so by Caltrans borings along the San Mateo and Bay Bridges. Historically, municipal well fields were completed in this formation. Its thickness is up to 600 feet. This formation is of interest to EBMUD for their aquifer storage program, so additional stratigraphic information may be forthcoming.

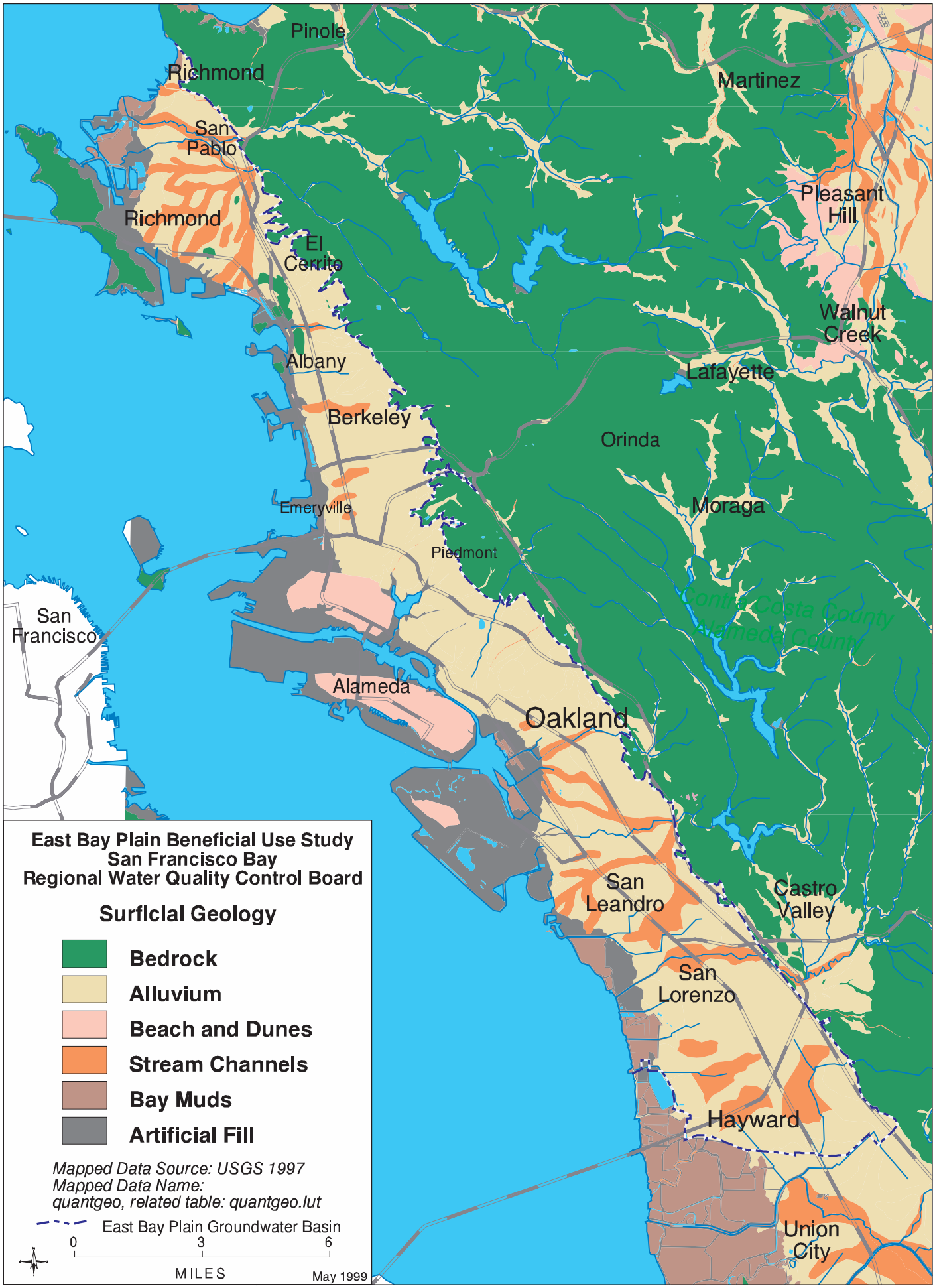
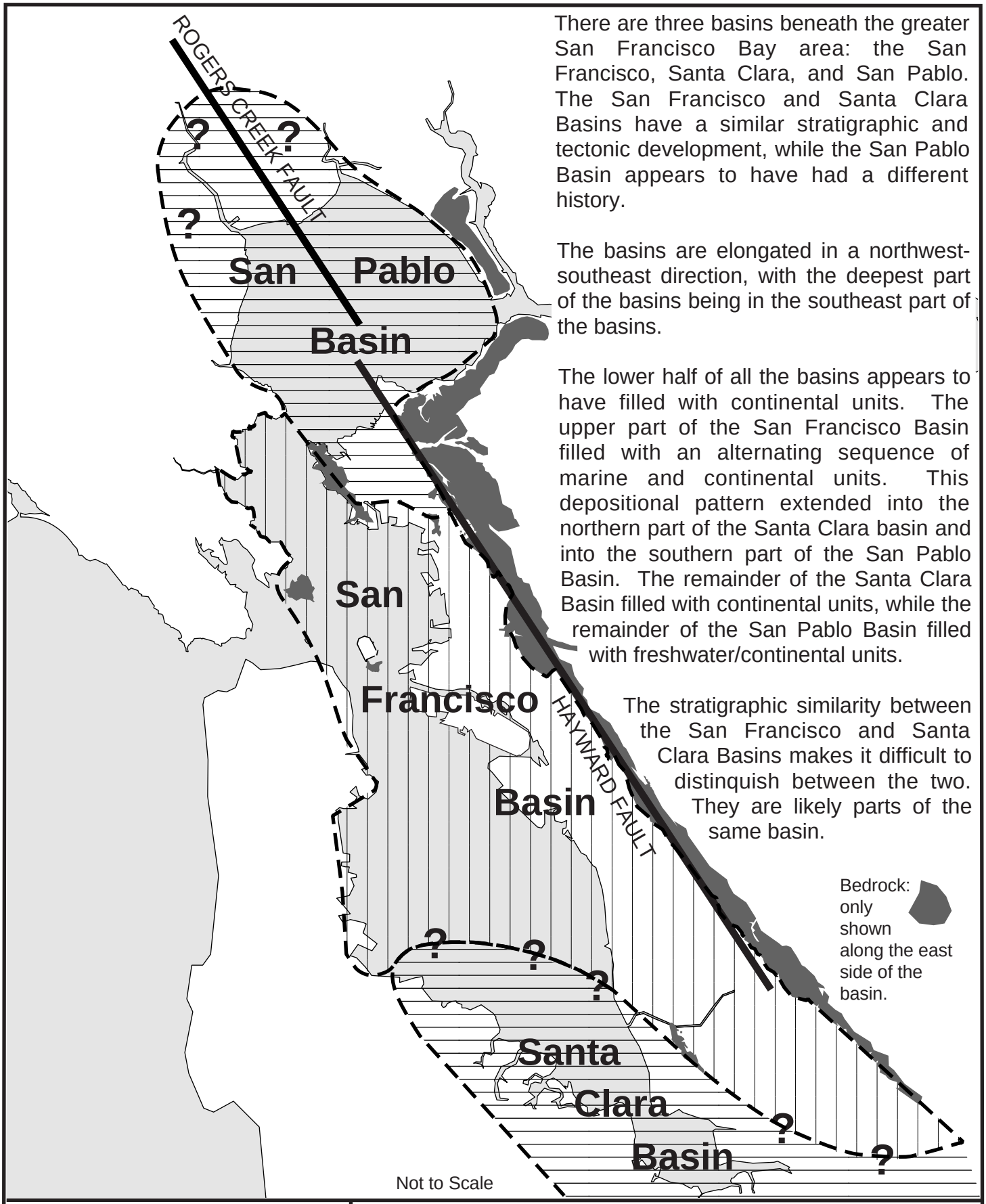

Pinole
Richmond
Martinez
San Pablo
Pleasant Hill
Richmond
El Cerrito
Walnut Creek
Albany
Lafayette
Berkeley
Orinda
Emeryville
Moraga
Piedmont
Contra Costa County
Alameda County
San Francisco
Alameda
Oakland
San Leandro
Castro Valley
San Lorenzo
Hayward
Union City
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Surficial Geology
Bedrock
Alluvium
Beach and Dunes
Stream Channels
Bay Muds
Artificial Fill
Mapped Data Source: USGS 1997
Mapped Data Name:
quantgeo, related table: quantgeo.lut
East Bay Plain Groundwater Basin
0
3
6
MILES
May 1999

Figure 9



There are three basins beneath the greater San Francisco Bay area: the San Francisco, Santa Clara, and San Pablo. The San Francisco and Santa Clara Basins have a similar stratigraphic and tectonic development, while the San Pablo Basin appears to have had a different history.

The basins are elongated in a northwest-southeast direction, with the deepest part of the basins being in the southeast part of the basins.

The lower half of all the basins appears to have filled with continental units. The upper part of the San Francisco Basin filled with an alternating sequence of marine and continental units. This depositional pattern extended into the northern part of the Santa Clara basin and into the southern part of the San Pablo Basin. The remainder of the Santa Clara Basin filled with continental units, while the remainder of the San Pablo Basin filled with freshwater/continental units.

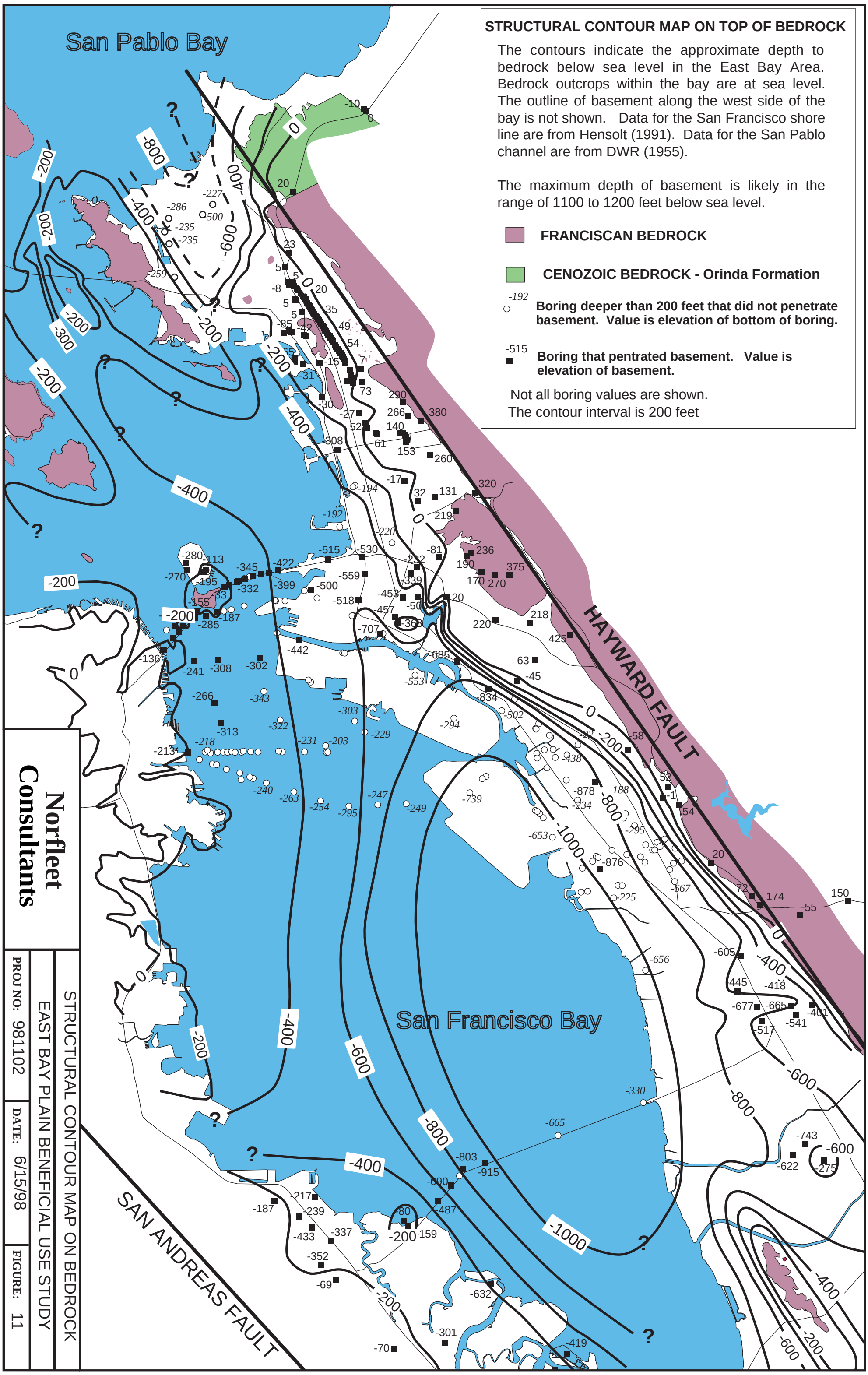
The stratigraphic similarity between the San Francisco and Santa Clara Basins makes it difficult to distinquish between the two. They are likely parts of the same basin.

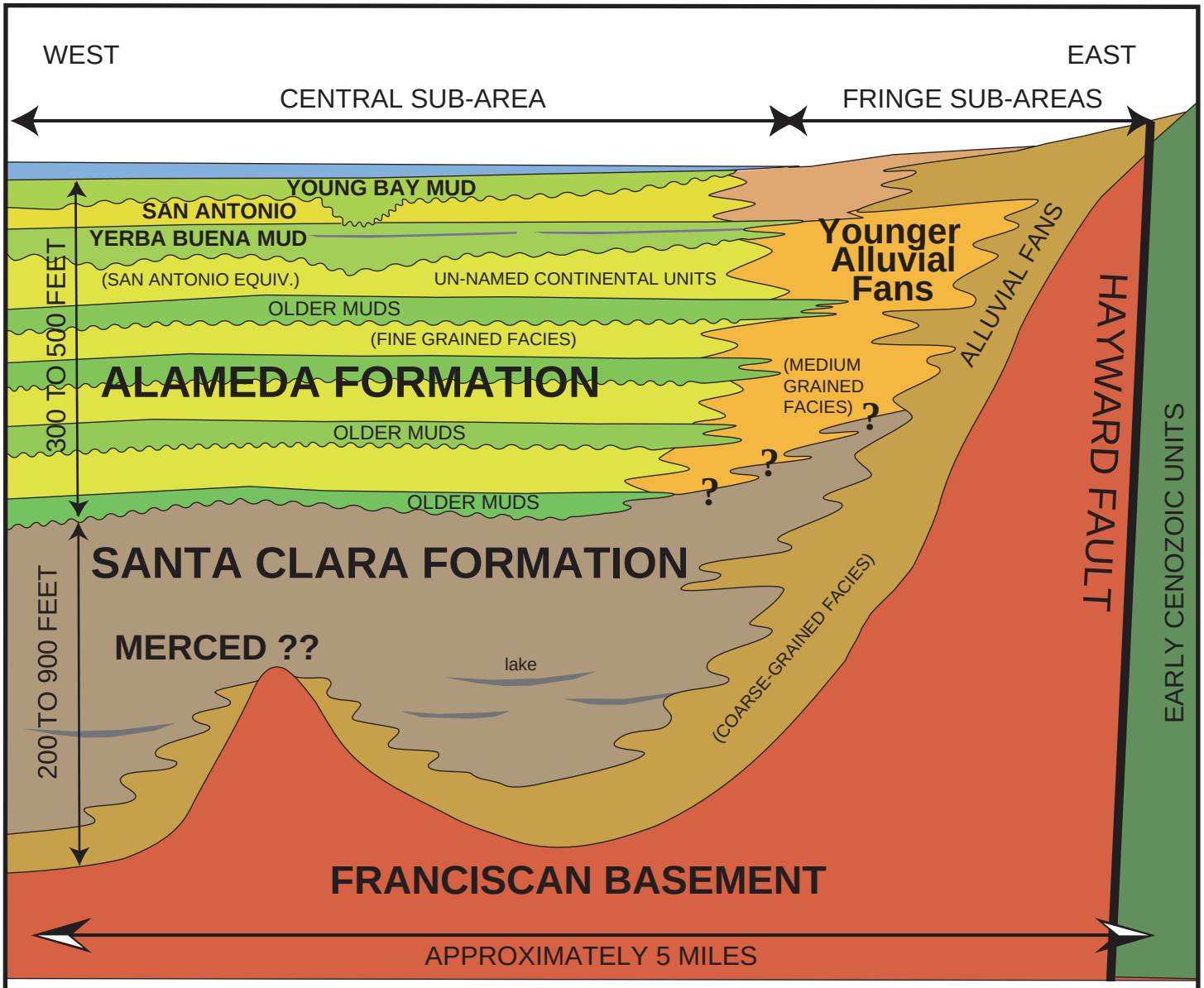
Norfleet Consultants

OUTLINE OF MAIN BASINS

EAST BAY PLAIN BENEFICIAL USE STUDY

PROJ NO: 981102	DATE: 6/15/98	FIGURE: 10


San Pablo Bay
San Francisco Bay
HAYWARD FAULT
SAN ANDREAS FAULT
STRUCTURAL CONTOUR MAP ON TOP OF BEDROCK
The contours indicate the approximate depth to bedrock below sea level in the East Bay Area. Bedrock outcrops within the bay are at sea level. The outline of basement along the west side of the bay is not shown. Data for the San Francisco shore line are from Hensolt (1991). Data for the San Pablo channel are from DWR (1955).
The maximum depth of basement is likely in the range of 1100 to 1200 feet below sea level.
FRANCISCAN BEDROCK
CENOZOIC BEDROCK - Orinda Formation
-192
Boring deeper than 200 feet that did not penetrate basement. Value is elevation of bottom of boring.
-515
Boring that pentrated basement. Value is elevation of basement.
Not all boring values are shown.
The contour interval is 200 feet
Norfleet Consultants
STRUCTURAL CONTOUR MAP ON BEDROCK
EAST BAY PLAIN BENEFICIAL USE STUDY
PROJ NO: 981102
DATE: 6/15/98
FIGURE: 11



Schematic cross-section of stratigraphic relationships along the east side of the San Francisco Basin (15-20:1 vertical exaggeration). The Alameda Formation is restricted to the marine transgression(s) (including the current transgression), and local names (San Antonio, Yerba Buena Mud, etc.) are members within the Alameda Formation. There were six to eight transgressions of the late Pleistocene seas within the Alameda Formation. The upper two are well defined, but little is known about the earlier transgressions.

The units below the Alameda are likely Santa Clara and possibly Merced formation. The units on the side of the basin are Holocene and late Pleistocene alluvial fans and related deposits. The location of the boundary between the Santa Clara and the Younger fans is unknown.

Basement knobs (hills) are scattered throughout the Basin. Some are exposed (e.g. Yerba Buena Island), but the majority are buried. All basement knobs affected sedimentation patterns laterally and vertically. Basement topography is self replicating through time. The current shape of the bay and the location of the major streams and embayments mimic basement topography.

Norfleet Consultants	SCHEMATIC STRATIGRAPHIC SECTION		
	EAST BAY PLAIN BENEFICIAL USE STUDY		
	PROJ NO: 981102	DATE: 6/15/98	FIGURE: 12

6.3.2 Alameda Formation

This formation is differentiated from the underlying Santa Clara Formation by nature of its estuarine origins. The members of this formation include:

Yerba Buena Mud Member: This member, originally named Old Bay Mud, has subsequently been renamed. The black, organic clay averages 25 to 50 feet thick with a gravel/sand/shell layer commonly in the middle of the unit.

San Antonio/Merritt/Posey Member: This 0 to 120 foot thick member contains a sequence of alluvial fan deposits between the Young Bay Mud and the Yerba Buena Mud. Given a discontinuous nature and the wide array of materials found in this member (sands, gravels, and silts) the units are difficult to correlate. A distinctive facies within this member is the Merritt Sand. Found on Alameda Island and western Oakland, this facies is fine grained, well sorted, aeolian sand. It ranges between 0 to 60 feet thick. Figuers (1998) reports that it was deposited at the same time as the upper San Antonio/Posey.

Young Bay Mud: Ranging in thickness from less than 1 foot to 75 feet, this member is a black, organic-rich clay being deposited today in the San Francisco Bay. It contains occasional gravel and sand layer, shell fragments/layers, peat, and organic debris.

6.3.3 Temescal Formation

The Temescal is an early Holocene alluvial deposit that varies from 1 to 50 feet thick, thinning toward the bay. It consists primarily of silts and clays, but near Alameda, the base of the unit is a layer of gravel with cobbles up to 8 inches thick.

6.3.4 Artificial Fill

The fill varies from 1 to 50 feet in thickness and generally thickens toward the Bay. Most of the fill was placed in the bay front and wetland areas. Much of the Oakland and Alameda fill is derived from sediment dredged during the completion of Oakland Inner Harbor. Other common sources of artificial fill include rock from the Leona Heights Quarry, construction and demolition debris, and municipal waste.

7.0 HYDROGEOLOGY

This section describes what is known about the East Bay Plain's hydrogeology including the storage, recharge, and yield amounts.

7.1 East Bay Plain Boundaries

The East Bay Plain is an elongated, northwest trending flat alluvial plain encompassing about 115 square miles (Figure 9). The East Bay Plain, as defined by DWR (1980), is bounded on the west by San Francisco Bay, by San Pablo Bay to the north, and by the Hayward Fault to the east.

The southern boundary is defined as the northern boundary of the Alameda County Water District. Figuers (1998) suggests that the eastern boundary is better defined by the contact with the Franciscan bedrock. He also suggests that the basin extends under San Francisco Bay (Figure 10).

7.2 East Bay Plain Depth

The base of the East Bay Plain is defined at the contact between unconsolidated materials and bedrock. As illustrated on Figure 11 (Depth to Bedrock), this surface is variable across the study area. As described above, Figuers (1998) identifies two main basins, the San Pablo and the San Francisco (Figure 10). There is not as much geologic information to define the depth of San Pablo Basin. Water well depths suggest that the basin is 600 feet or more below ground surface. Moving southerly from Richmond into the San Francisco Basin, the unconsolidated materials thicken to greater than 1,000 feet. The deepest sections of the East Bay Plain are underneath San Francisco Bay. To the east, the East Bay Plain thins out rapidly.

7.3 Sub-Area Hydrogeology

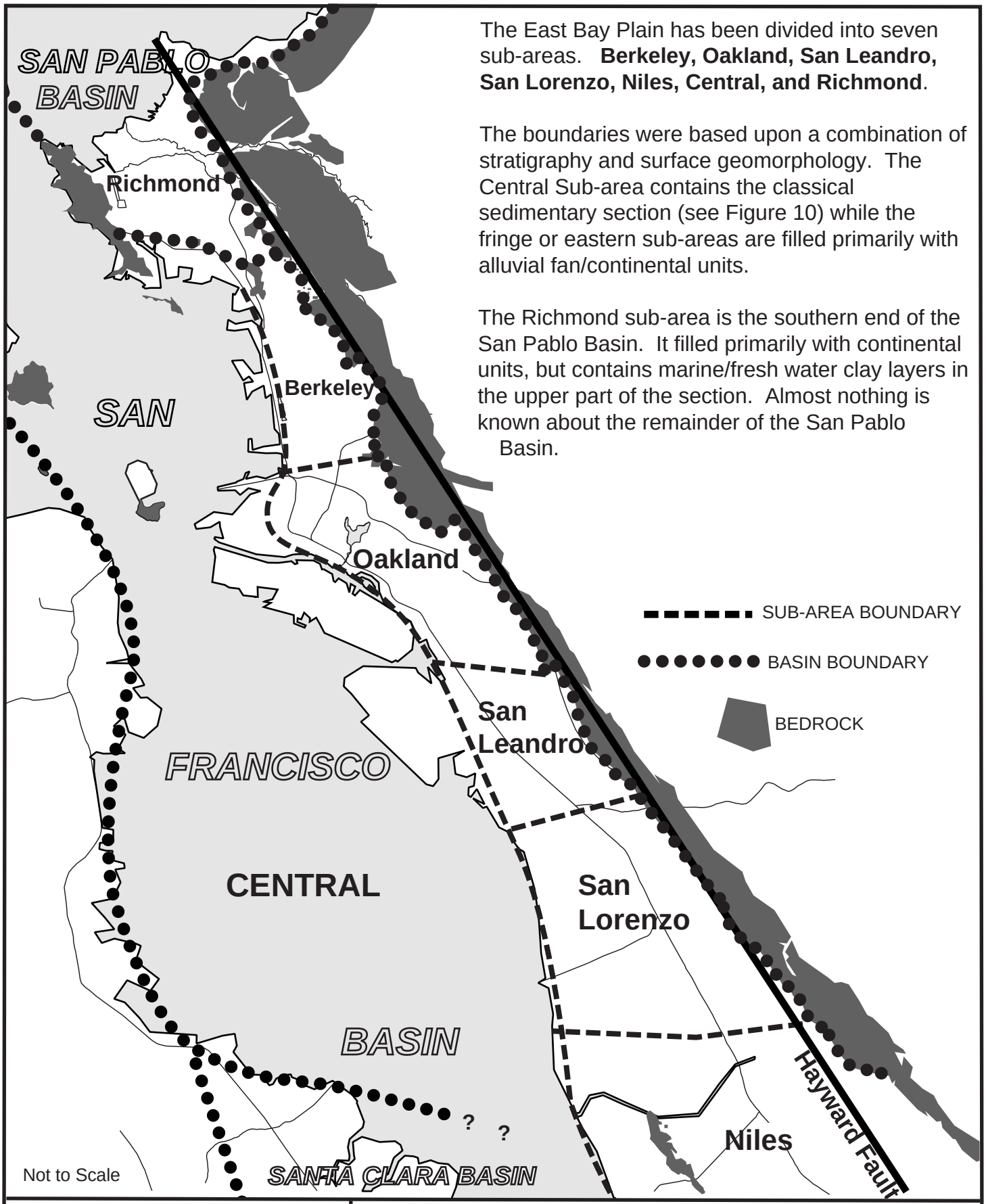
The East Bay Plain is regionally subdivided into two major basins, the San Pablo and the San Francisco Basins. Further subdivisions have been previously reported by Muir (1993). Refinements were recently made by Figuers (1998). Figure 13 illustrates the seven Sub-Areas. Because of the East Bay's reliance of surface water supplies, little data is available to characterize the hydrogeologic characteristics of the Sub-Areas. In recognition of this, the Committee commissioned a comprehensive review of historical groundwater use. The results of this review are reported in Figuers (1998). Sub-Areas have been defined based on geologic, geomorphic and geographic factors. The hydrogeologic characteristics of each Sub-Area can be summarized below.

7.3.1 Richmond Sub-Area is located at the southern end of the San Pablo Basin. It is estimated to contain at least 600 feet of unconsolidated deposits. The deposits are primarily alluvial materials, but there is evidence of estuarine clays between 60 to 125 feet below sea level. These clays and the younger bay muds may be limited in extent. Given what appears to be a lack of widespread clay layers, regionally the shallow and deep water bearing layers can be considered to be interconnected. Historically, there were well fields in this Sub-Area that likely tapped significant gravel deposits that occur 100 to 150 feet below ground surface. The historical wells were only operated for 12 to 16 years before they were shut down due to saltwater intrusion.

7.3.2 Berkeley Sub-Area contains a series of alluvial fans deposited on a west sloping bedrock surface. The alluvial deposits range from 10 to 300 feet deep, averaging 100 to 200 feet deep. There is no historical evidence that groundwater supplies are sufficient for municipal use, primarily due to low recharge rates.

There are no reported clay units that function as major aquitards. However, in the Berkeley Sub-Area the first encountered groundwater is frequently semi-confined, particularly in West Berkeley.

7.3.3 Oakland Sub-Area is similar to the Berkeley Sub-Area in that it contains a sequence of alluvial fans. However, the basement is deeper and the alluvial fill is thicker (300 to



The East Bay Plain has been divided into seven sub-areas. **Berkeley, Oakland, San Leandro, San Lorenzo, Niles, Central, and Richmond**.

The boundaries were based upon a combination of stratigraphy and surface geomorphology. The Central Sub-area contains the classical sedimentary section (see Figure 10) while the fringe or eastern sub-areas are filled primarily with alluvial fan/continental units.

The Richmond sub-area is the southern end of the San Pablo Basin. It filled primarily with continental units, but contains marine/fresh water clay layers in the upper part of the section. Almost nothing is known about the remainder of the San Pablo Basin.

Norfleet Consultants	SUB-AREAS		
	EAST BAY PLAIN BENEFICIAL USE STUDY		
	PROJ NO: 981102	DATE: 6/15/98	FIGURE: 13

700 feet). There are no well-defined aquitards such as the estuarine muds. The largest and deepest wells in this Sub-Area historically pumped 1 to 2 million gallons per day at a depth greater than 200 feet. Upland areas historically had shown little groundwater potential beyond single family use. Overall, sustainable yields are low due to low recharge potential. The Merritt Sand outcrop in west Oakland was an important part of the early water supply for Oakland. It is shallow (up to 60 feet) and before the turn of the century, septic systems contaminated the water supply wells. Other high production wells were located from the southwestern side of Alameda to the Oakland Coliseum. The wells tapped gravels below the Yerba Buena Mud. EBMUD has drilled a test well near San Leandro Bay in the Oakland Sub-Area to explore the potential for aquifer storage of injected surface water.

7.3.4 San Lorenzo and San Leandro Sub-Areas are very similar in hydrogeologic characteristics, but can be separated based the surface trace of the junction between the San Leandro and San Lorenzo alluvial fans. The Sub-Areas are primarily filled with alluvial fans, but unlike the Sub-Areas to the north, the Yerba Buena Mud extends west into the San Lorenzo and San Leandro Sub-Areas. It has been proposed that a clay layer forms an extensive east-west aquitard across this basin. Historically there were municipal supply wells in these Sub-Areas that produced from upper Alameda gravels. These Sub-Areas were distinct from the Niles Cone basin to the south, in that the alluvial fans are finer-grained and produce less groundwater. The City of Hayward has emergency supply wells in the San Lorenzo Sub-Area. Also, EBMUD has drilled test wells in the San Lorenzo Sub-Area to explore the potential for aquifer storage of injected surface water.

7.3.5 Central Sub-Area extends beneath San Francisco Bay. The boundaries of the Sub-Area are based on the Young Bay Mud. The Young Bay Mud has a sharp “edge” in some areas, and in other areas, the boundary is less well-defined. Alameda and Bay Farm Islands are located along the northeastern edge of the Sub-Area. Historically there were artesian wells in the Sub-Area that produced from gravels below the Yerba Buena Mud, but saltwater intrusion shut down these wells. Single family residences historically relied on the Merritt Sand for water supply. However, contamination from septic systems and some saltwater intrusion resulted in localized contamination. More recently, deep wells (700 to 1000 feet deep) were drilled at the Alameda City Golf Course. Production rates were lower than expected but this is believed due to drilling problems. Water quality was satisfactory for irrigation.

7.4 Groundwater Flow Direction

Throughout most of the Alameda County portion of the East Bay Plain, Hayward north to Albany, water level contours show that the direction of groundwater flow is east to west, or from the Hayward Fault to San Francisco Bay. Groundwater flow direction generally correlates to topography. Flow direction and velocity are also influenced by buried stream channels that typically are oriented in an east-west direction. In the very southern end of the study area, in the San Lorenzo Sub-Area, the direction of flow may not be this simple. The small set of water level measurements available seem to show that the groundwater in the upper aquifers may be flowing south, with the deeper aquifers, the Alameda Formation, moving north (Muir, 1996).

In the northern portion of the Richmond Sub-Area, investigations showed flow in the San Antonio Aquifer to be toward San Pablo Bay. In the southern portion of the Richmond Basin, groundwater flows south between both the Hayward and San Pablo Faults to San Francisco Bay (EBMUD, 1986). In the Richmond Sub-Area, the EBMUD report used an average field measured transmissivity value at Richmond UC Field Station wells of about 4000 gallons per day per foot, and a hydraulic gradient of 0.003 to calculate a volume flow rate south to San Francisco Bay on the order of 135 acre-feet per year.

7.5 Groundwater Storage

DWR (1994) examined over 350 wells in Alameda County to evaluate the storage capacity in the Alameda County portion of the East Bay Plain. The study area consisted of the area north of Hayward, (about 114 square miles). DWR estimates: 1) total groundwater storage capacity of the East Bay Plain, 2) amount of storage in the East Bay Plain, and 3) usable storage in the East Bay Plain. Potential storage beneath San Francisco Bay was not considered.

DWR examined the thickness and equivalent specific yield of the various sediment types within 50-foot horizontal sections of the study area to approximate the three above properties. The estimated storage capacity of the study area is approximately 2,670,000 acre-feet. Of this amount, roughly 2,560,000 acre-feet of groundwater is currently stored. This is the total current storage in the Plain, as not all of the aquifers are 100 % saturated.

The storage for the Richmond sub-basin has not been quantitatively evaluated, but is assumed to be much lower than the storage for Alameda County, given the much smaller area and thinner section of unconsolidated sediments (EBMUD, 1986).

7.6 Recharge and Discharge Estimates

Muir (1993) summarized the different types and overall amounts of recharge for the Alameda County portion of the East Bay Plain. The study area comprised approximately 114 square miles between Albany and Hayward, and the Bay and the Hayward Fault. Sources of recharge were: rainfall infiltration, stream seepage, pipe leakage, agriculture return water, and subsurface inflow. Rainfall infiltration was defined as the rainfall left over after surface runoff and evapotranspiration that percolates through the soil strata and recharges the groundwater reservoir. The report evaluated the recharge potential of various sub-basins, rainfall data, and evapotranspiration data to determine the amount of rainfall that recharges groundwater. It looked at the unlined length of streams, the streambed recharge potential, stream gradients, and stream area to determine the potential seepage rates for each stream in cubic feet per day. These rates were multiplied by the average time per year in which there would be flow and summed to total the amount of stream seepage. Muir then analyzed EBMUD's water meter readings to determine the annual water loss from water supply lines in the area. For loss from sewer pipes, he used discharge records of four sewer treatment plants that serve the East Bay, and the records of potable water usage for the same study area. Agricultural return runoff and subsurface inflow were assumed to be small.

Based on the above considerations, Muir broke down recharge accordingly:

Table 2. Groundwater Recharge in the East Bay Plain (Alameda County Portion Only)

Recharge Sources	Recharge (Acre-feet per Year)
Rainfall Infiltration	3,700
Stream Seepage	6,200
Sewer Pipe Leakage	4,500
Water Pipe Leakage	5,400
Agriculture Return Water	200
Subsurface Inflow	200
Total	20,200

The Richmond Sub-Area recharge was assumed to be much lower than the above figure, due to dense urbanization in Richmond and San Pablo (EBMUD, 1986).

In another Muir study, "Groundwater Discharge in the East Bay Plain Area, Alameda County" (July, 1996), he approximated the outflow, or discharge, in the study area. This was the same area used to calculate recharge. Muir identified evapotranspiration and subsurface discharge as the two natural forms of discharge and pumpage as the means of artificial discharge. The report determined evapotranspiration by using long term climatic data from the East Bay Plain and correlating this data with evapotranspiration studies made in comparable areas of California and calculated a total of 25,780 acre-feet for 1995. This is equivalent to about 8 inches a year, or about 38 percent of the annual rainfall of the area. Evapotranspiration, although an important discharge element in the overall hydrologic budget, does not remove groundwater from aquifer storage. In other words, this is rainfall that evapotranspires before it enters the subsurface aquifer. The report next assumed that most of the subsurface discharge occurred at the Bay margins. To determine subsurface discharge, Muir examined the thickness of unconsolidated deposits at the Bay margins for various sub basins, the width of the sub basins, and the amount of saturation. Muir concluded a subsurface discharge of 13,500 acre-feet for 1995. Finally, the report determined groundwater pumpage for agricultural, domestic and industrial uses. The total for 1995 was approximately 3,350 acre-feet per year.

7.7 Groundwater Basin Yield

The yield of the East Bay Plain is the rate at which water can be withdrawn annually, without decreasing groundwater in storage to the point where the intrusion of saltwater from San Francisco Bay would occur. It is related to the groundwater storage of the East Bay Plain. Storage can be depleted by pumping until water levels near the Bay are drawn down to near sea level. When this occurs, the average annual pumpage should not exceed a quantity equal to the long-term average inflow to the reservoir minus the quantity of subsurface discharge that must flow to the Bay annually to maintain a barrier against saltwater intrusion. This would be the groundwater yield of the East Bay Plain Area (Muir, 1993). Muir (1996) estimated that the groundwater safe yield for the Alameda County portion of the East Bay Plain at 10,000 acre-feet/year based on 1965 to 1995 data

for rainfall from Niles and Berkeley, hydrographs of selected wells, and the historical water use..

8.0 GROUNDWATER QUALITY

This Section summarizes the findings presented in the Alameda County Flood Control and Water Conservation District report titled "Groundwater Quality of the East Bay Plain, Alameda County California" authored by Kenneth Muir in December 1997, and presents a survey of Total Dissolved Solids (TDS) concentration data collected from 15 sites along the East Bay Plain shoreline.

The Committee recognizes that a complete groundwater quality assessment of the East Bay Plain would identify and evaluate the past and present groundwater chemistry facies specific to each groundwater aquifer. From a regulatory perspective, the single most important groundwater quality parameter directly influencing a beneficial use determination is the TDS concentration. Resolution 89-39, Sources of Drinking Water, exempts the Municipal and Domestic Supply Beneficial Use designation for groundwaters with TDS concentrations greater than 3,000 mg/l and are not reasonably expected by the Regional Board to supply a public water system (note that USEPA uses the 10,000 mg/l TDS value in determining potential drinking water sources). This section includes a review of the available inorganic data and an evaluation of TDS groundwater values along the East Bay shoreline.

8.1 East Bay Plain Inorganic Groundwater Quality

Muir (1997) prepared a study of inorganic groundwater quality of the East Bay Plain. His study area extents from Albany in the north to Hayward in the south and is bounded by the Hayward Fault in the east and the bay shoreline in the west. He identified seven Sub-Areas within the East Bay Plain but limited his study to five Sub-Areas: the Berkeley Alluvial Plain, the Merritt Sand Outcrop, the Oakland Upland and alluvial Plain, the San Leandro Cone, and the San Lorenzo Cone. He divided the aquifer system into two depth zones: Shallow Zone aquifers (0 to 200 feet) and Deep Zone aquifers (200 to 1,000 feet). The inorganic water quality data was collected from 16 shallow zone wells and 13 deep zone wells.

The Shallow Zone groundwater is generally a calcium-bicarbonate type of water. TDS concentrations in the 16 wells assessed by Muir ranged from 364 to 1,020 mg/l. Along the Oakland Inner Harbor and adjacent to the Bay, Shallow Zone deposits appear to be in contact with saltwater, as indicated by the magnesium-sodium-chloride type waters found in these areas.

The Deep Zone groundwater is generally a sodium-bicarbonate type water. TDS concentrations in 13 Deep Zone wells ranged from 313 to 1,420 mg/l. Water from two Deep Zone wells in the Oakland alluvial plain were classified as sodium-chloride type water. Water in the northern part of the San Leandro Cone was the only water in those areas studied with a calcium-chloride type water. Water from this area also had the highest TDS, with values exceeding 1,300 mg/l in the three wells studied. TDS concentrations exceeded the secondary Maximum Contaminant Level (MCL) of 500 mg/l in 15 of the 29 wells.

Based on historic data (1940-1970), nitrate concentrations have exceeded the MCL of 45 mg/l in many Shallow Zone wells, though few currently exceed the standard. Nitrate concentrations in deep wells historically have been low.

Historically, saltwater intrusion has occurred in portions of deeper aquifers as a result of large scale historic pumping prior to 1930 (Figuers, 1998). Saltwater intrusion occurred at the High Street Well Field in Alameda, San Pablo Well Fields No. 1 and No. 2 in Richmond and the Fitchburg Well Field in Oakland.

8.2 East Bay Plain Shoreline Total Dissolved Solids Concentrations

The Committee surveyed 15 facilities along the East Bay Plain shoreline for shallow groundwater chemistry data. Appendix E provides a groundwater chemistry data summary table for each site surveyed. A total of 399 data points are reported, where the concentrations of TDS ranged from 24 to 55,333 mg/l. TDS values were both measured analytically and calculated from conductivity measurements. All groundwater data was collected from groundwater monitoring wells screened in the shallow units, primarily from 10 to 60 feet below ground surface.

Several other studies have been performed to determine tidal influence. Work at Oakland Army Base (Draft Base-wide Hydrogeologic Study, 1998) showed that the effects of San Francisco Bay on facility groundwater were seen up to 600 feet from the Bay margins. The study focused on the artificial fill and Merritt Sand aquifers. Hydrogeologic studies at Alameda Point indicate that tidal influence is up to 1500 feet inland and that saltwater intrusion has occurred up to 250 feet inland within the artificial fill and 1500 feet inland within the unconfined Merritt Sand. In their groundwater storage feasibility study in the Roberts Landing area of Hayward, EBMUD observed a pressure variation in their wells due to tidal influence. This included wells screened in the deeper Alameda Formation.

The landward extent of saltwater intrusion in shallow aquifers along the East Bay Plain appears related to the anthropogenic deposition of the overlying sediment, the connectivity of an aquifer to the San Francisco Bay, the amount of fresh water recharge, the hydraulic isolation of the aquifer, and any active landward pumping of groundwater. Existing saltwater intrusion is limited and correlates with shallow aquifers contained in artificial fill and hydraulically isolated aquifers (e.g., Merritt Sand) in direct contact with the Bay. In the north, the deeper fresh water aquifer systems (e.g., Alameda Formation) appear to be hydraulically isolated from the shallow aquifer systems along the East Bay Plain margin by the Yerba Buena Mud. However, in the southern portion, the water quality values in the San Leandro and San Lorenzo Sub-Areas indicate probable vertical migration from the Shallow Zone to the Deep Zone aquifer (Muir, 1997).

9.0 GROUNDWATER CONTAMINATION

9.1 Fuels and Solvents

Some shallow groundwater has been impacted by historical and current releases of fuels and solvents. A review of case files from the Regional Board, Department of Toxic Substances Control, Alameda County, City of Berkeley, and City of San Leandro reveal that, as of January 1998, there were a total of 1310 active leaking underground fuel tanks and 130 non-fuel cases (typically solvents) in the East Bay Plain. These totals do not include the numerous groundwater pollution sites at former DoD facilities in the East Bay Plain.

A map showing the location of groundwater plumes longer than 1000 feet is shown on Figure 14 and the following table summarizes information about each plume.

Table 3A. Major Areas of Existing Groundwater Pollution in the East Bay Plain

Site Name	Location	Chemicals	Boundary	Date	Lead Agency
Thermofustion	Hayward	VOCs	10 ppb	6/6/97	RWQCB
CHEMCentral	Hayward	VOCs	100 ppb	12/19/96	RWQCB
DWA Plume	San Leandro	VOCs	Above MCL's	Dec-95	DTSC
Caterpillar Facility	San Leandro	PCE/TCE	5 ppb	Feb-97	DTSC
Kaiser Aerotech	San Leandro	1,2-DCE	100 ppb	Nov-96	San Leandro
1964 Williams St.	San Leandro	TCE	10 ppb	11/7/96	RWQCB
Site 4, Alameda Point Navy Base	City of Alameda	TCE	1 ppb	1998	DTSC
Site 5, Alameda Point Navy Base	City of Alameda	TCE	1 ppb	1998	DTSC
Lawrence Berkeley	Berkeley	Diesel, Tritium	Detection Limit	1997	DTSC
WRE/ColorTech	Berkeley	Chromium	Detection Limit	1998	TMD
GE site	Oakland	TCE	10 ppb	1998	DTSC
Santa Fe Railway	Richmond	Petroleum Hydrocarbons	Detection Limit	1993	RWQCB
Chevron Refinery	Richmond	Petroleum Hydrocarbons	Detection Limit	1997	RWQCB

Ambient monitoring data on common organic pollutants within the deeper groundwater (i.e., deeper than about 100 feet) is very limited. Based on this limited data, the overall water quality of the deeper in the East Bay Plain is good. Much more data is available on the water quality of shallow groundwater (i.e., less than about 100 feet). Some shallow groundwater has been impacted by historical and current releases of fuels and solvents.

Groundwater pollution in the East Bay Plain appears to generally be restricted to portions of the shallow aquifers. Typically, site investigations require that groundwater plumes be defined in both the lateral and vertical dimension. In almost all cases, groundwater pollution appears limited to less than 50 feet below the ground surface.

However, recently one of EBMUD's aquifer storage test wells detected contamination at a depth of over 200 feet below ground surface. Volatile organic compounds were detected in a test well located west of Interstate 880 about one mile north of the Oakland Coliseum. TCE was

detected in the test well at 50-70 ppb that was screened between 260 and 350 feet below ground surface. Prior to this detection, no pollution had ever been detected above trace levels at depths greater than 140 feet. The source and migration pathway for the TCE contamination is currently under investigation by DTSC.

Although the source of the deep groundwater contamination has not been defined, it may illustrate the potential for connection between the shallow deposits and deeper aquifers. Moreover, given that there are very few existing wells pumping from the deeper aquifer, and the numerous historical wells in the East Bay Plain that could be vertical conduits, if the number of wells pumping from the deeper aquifer increases, there is a potential that shallow pollution could be drawn down into the deeper aquifers.

Water quality testing data for common organic pollutants in the East Bay Plain is very limited. In October 1997, eight water supply wells were sampled and tested for volatile organic compounds, metals and inorganic parameters in a joint project between ACFCWCD, EBMUD and the Regional Board. Two of the wells showed trace levels of carbon tetrachloride, chloroform, methylene chloride, naphthalene, and trichloroethene. However, the results are considered suspect because these two wells were not fully functional when the water samples were taken. Confirmation sampling is recommended when these wells are repaired. The contaminants may be related to residual chemicals used to lubricate the pumps in the wells. No volatile organic compounds were detected in the other six wells (see Appendix E).

Nearly all of the 32 active Regional Board SLIC Sites have volatile organic compounds (VOCs) in groundwater. Generally, VOC groundwater pollution has been regulated less aggressively in the East Bay Plain because the basin is not used as a current municipal source of drinking water. At a minimum, source control, plume delineation and long-term monitoring is typically required. A number of sites have also implemented soil vapor extraction and groundwater pump-and-treat systems.

9.2 Fuel Pipelines

Potential impacts to groundwater resources from leaking or ruptured fuel pipelines are recognized as significant areas of concern, especially in the seismically active East Bay Plain. Development of a GIS pipeline database is being performed by the State Fire Marshal's Office. This information, when completed, should be made available to stakeholders in the East Bay Plain.

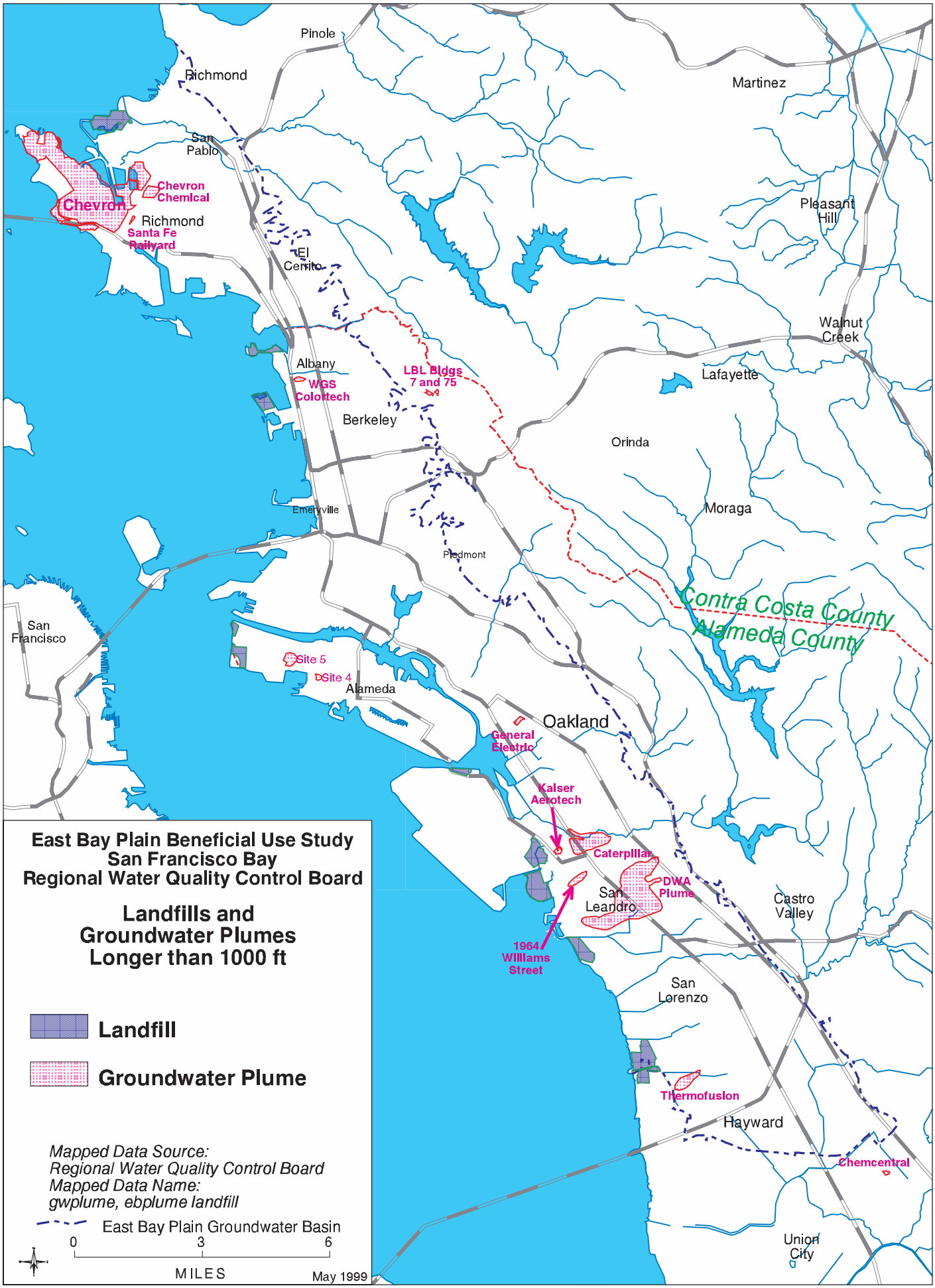

East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Landfills and
Groundwater Plumes
Longer than 1000 ft
Landfill
Groundwater Plume
Mapped Data Source:
Regional Water Quality Control Board
Mapped Data Name:
gwplume, ebplume landfill
East Bay Plain Groundwater Basin
0
3
6
MILES
May 1999
Pinole
Richmond
Martinez
San Pablo
Chevron
Chevron Chemical
Richmond Santa Fe Railyard
El Cerrito
Pleasant Hill
Walnut Creek
Albany
WGS Colortech
LBL Bldgs 7 and 75
Lafayette
Berkeley
Orinda
Emeryville
Moraga
Piedmont
Contra Costa County
Alameda County
San Francisco
Site 5
Site 4
Alameda
Oakland
General Electric
Kaiser Aerotech
Caterpillar
DWA Plume
San Leandro
Castro Valley
1964 Williams Street
San Lorenzo
Thermofusion
Hayward
Chemcentral
Union City

Figure 14

9.3 Vertical Conduits

Improperly abandoned wells (vertical conduits) are included in this section on Groundwater Pollution Sources. While vertical conduits are not "pollution sources" in the conventional sense, they can provide a potential pathway for contamination to migrate from shallow to deeper aquifers.

In the East Bay Plain, it is likely that numerous historical wells drilled prior to the importing of Sierra water are potential vertical conduits. J.H. Dockweiler (1912) provided a detailed snapshot of water supply and usage in the East Bay area in the fall of 1911 and identified a total of 3,573 wells. Of these wells, only 1,930 had data on well depth. In the study area overall, about 8% of the wells with depth data had a total depth of 200 feet or deeper. About 30% of the wells with depth data were 100 feet deep or more (see Section 12.1 for additional discussion)

The Yerba Buena Mud forms a major aquitard between the shallow and deep aquifers throughout much of the southwest portion of the East Bay Plain. However, the integrity of the aquitard may be locally compromised due to the drilling of wells in the 1890-1930 time frame. In Oakland, it is estimated that there are over 200 wells that penetrated the Yerba Buena Mud. It is surmised that virtually none of these wells was properly destroyed. In the remaining portions of the East Bay Plain, the Yerba Buena Mud is not present and no other major aquitards separate the shallow and deep aquifers.

One exception is the area along the extreme western East Bay Plain shoreline, south of the Bay Bridge, where artificial fill was placed after 1930. In this area, the Yerba Buena Mud is considered continuous and should form a natural barrier to minimize the downward spread of pollution.

9.4 Landfills

A total of about 1150 acres of bay-front wetlands were used for municipal waste disposal (see Figure 14). The landfills were constructed using earthen levees and filling the interiors with waste. Fill elevations range from approximately 20 to 150 feet above sea level. Most of the landfills are unlined and were built directly over Young Bay Mud. Typically, groundwater gradients are upward into the waste fill due to the weight of the overlying waste pile. The most significant water quality issue at these landfills is seepage of leachate from the base of the fill directly into San Francisco Bay. Minor low level VOC groundwater pollution is present at most of the landfills. Nearly all of the landfills are closed and capped and several have leachate extraction systems in place. The following table summarizes landfill data in the East Bay Plain.

Table 3B. Summary of Regulated Landfills in the East Bay Plain Groundwater Basin

Landfill Name and Regional Board Order No.	City	Years Operated	Acres	Water Quality Issues
Alameda Naval Air Station Landfill No. 93-129	Alameda	30-40 years until 4/93	Two landfills (12 and 110 acres respectively)	Primarily surface water issues.
Alameda City Doolittle Landfill No. 95-189	Alameda	1953-1985	40	No leachate detected below or off-site.
Albany Landfill	Albany	1963-83	75	Primarily surface water issue.
Berkeley Landfill No. 86-041	Berkeley	Approx. 1900-1985	90	Low levels of metals in groundwater and leachate within landfill footprint.
Oyster Bay/Davis Street Landfill	San Leandro	1942-1980	247	Shallow groundwater pollution. Leachate extraction planned to contain seeps.
Galbraith Landfill No. 94-187	Oakland	1930's-1960's	110	Fuels in shallow groundwater. Perimeter slurry wall installed. Currently used for dredged sediment disposal by Port of Oakland.
Oakland Scavenger Construction Debris Landfill, North Field, Oakland Airport	Oakland	1957-1960	21	
Tony Lema No. 95-129	San Leandro	1958-1977		Landfill gas found in groundwater wells in 1993.
West Contra Costa Landfill No. 96-079	Richmond	1953 – 1999	188	Fuels and VOCs in shallow groundwater. Slurry wall and leachate extraction system in place.
Winton Avenue Landfill	Hayward		approx. 200	Primarily surface water issues.
West Winton Landfill No. 95-088	Hayward	1938-1974	57	Seepage to surface water controlled by leachate extraction.

In addition to the regulated landfills discussed above, about 17,000 acres (26 sq. mi.) of bay-front wetlands and mudflats along the western edge of the East Bay Plain were filled with dredged material, construction debris, rock from various quarries, and other unknown sources. These fills were not previously regulated, but are now becoming an issue for regulatory review as the land use changes (e.g., Alameda Naval Air Station, the East Bay Shoreline State Park, and the Port of Oakland).

9.5 Department of Defense Sites

This subsection provides a summary of activities and releases to groundwater at four DoD facilities in the East Bay Plain: Naval Fuel Depot Point Molate, Fleet Industrial Supply Center Oakland (FISCO), Alameda Annex, and Alameda Point.

9.5.1 Naval Fuel Depot Point Molate

Naval Fuel Depot (NFD) Point Molate is located in the Potrero Hills along the northeastern shore of San Francisco Bay on the San Pablo Peninsula. Bulk fuel storage was provided at NFD Point Molate from 1943 until fuel transfer and storage ceased in May 1995. Several different fuels and wastewater have been stored in the 24 fuel tanks at the facility including Navy special fuel oil, marine diesel fuel, jet propellant (JP)-5, motor gasoline, mixed fuels, oil reclamation, lube and turbine oil, JP-8, ballast, wastewater, and sludge. Currently, four active Investigation Remediation (IR) sites are located at NFD Point Molate with three sites releasing contaminants to groundwater. Releases to groundwater include (1) oil, fuel, and sludge from leaking tanks, pipelines, and valve boxes, and (2) contaminated fuels, tank bottom sludges, and Bunker fuel from a former sump pond. Total petroleum hydrocarbons (primarily JP-5), PAHs, BTEX, and VOCs were the most commonly detected contaminants in groundwater. Five fuel-related and three chlorinated VOC-related plumes exist at NFD Point Molate. The fuel-related plumes range from approximately 50 feet in width by 75 feet in length up to 440 feet in width by 1750 feet in length and extend to the bottom of the artificial fill, approximately 22 feet below ground surface. The chlorinated VOC-related plumes range from approximately 50 feet by 50 feet up to 50 feet in width by 125 feet in length and also extend to the bottom of the artificial fill.

The Navy will be investigating the soil and groundwater around the large Underground Storage Tanks (USTs) and underground fuel pipelines in future investigations. There is the potential that other fuel plumes occur in the hillsides or near the shoreline due to previous spills from the USTs and fuel pipelines. The Navy is investigating approximately 20 two-million gallon USTs and approximately 20 miles of underground fuel pipeline, analyzing the soil and groundwater for TPH, VOCs, and SVOCs. Groundwater flow in the vicinity of NFD Point Molate is west to southwest, generally toward San Francisco Bay. The majority of the shallow groundwater at NFD Point Molate contains concentrations of total dissolved solids (TDS) below 3,000 mg/l. (Draft Final Evaluation of Beneficial Uses for Groundwater for NFD Point Molate, June 26, 1998, Table 1) The only portion of the facility that has shallow groundwater with a high TDS (up to 27,000 mg/l) is a portion of the shoreline. While the shallow aquifers are generally capable of maintaining a sustained yield of 200 gallons per day near the bay margin, pumping induced intrusion of saltwater would further degrade water quality. An extraction trench has been installed along the shoreline to capture floating fuel and remove contaminated groundwater for treatment.

9.5.2 Fleet Industrial Supply Center Oakland

Fleet Industrial Supply Center Oakland (FISCO) is located in Oakland just south of the San Francisco-Oakland Bay Bridge, and within the Port of Oakland. FISCO was commissioned in 1941 as the principal supply facility supporting DoD activities in the Pacific Basin and was the Navy's largest west coast supply point. Currently, ten active Investigation Remediation sites are located at FISCO with eight sites releasing contaminants to groundwater. Releases to groundwater include (1) leaking fluids from a scrapyard and storage area, (2) disposal of waste materials (lubricants, solvents, paints), (3) leaking sumps and waste oil USTs, (4) spills from redrumming and overpacking operations, (5) discharges from a wash rack, and (6) spills due to poor drum handling and slow leaks from older drums. Chlorinated VOCs, BTEX, SVOCs, and TPH were the most

commonly detected contaminants in groundwater. No fuel-related plumes exist at FISCO. One chlorinated VOC-related plume exists at FISCO and is approximately 350 feet long and 260 feet wide and extends to 12 feet bgs. The VOC contaminant plume is located within the artificial fill hydrostratigraphic unit. Groundwater flow in the vicinity of FISCO is west to southwest, generally toward San Francisco Bay. The groundwater typically contains moderate to high concentrations of total dissolved solids (405 to 36,000 mg/l) as a result of saltwater intrusion from San Francisco Bay. Lenses of fresh water exist near the ground surface as a result of leaking water supply distribution pipes and rainwater infiltration. While the shallow aquifers are generally capable of maintaining a sustained yield of 200 gallons per day near the bay margin, pumping induced intrusion of saltwater would further degrade water quality.

Regional Board staff have recently reviewed and commented on the Navy's groundwater beneficial use evaluation at FISCO (see Appendix G). As part of the review, staff found that the brackish quality of the shallow groundwater beneath FISCO is such that the water is not a potential source of drinking water pursuant to SWRCB Resolution 88-63 (Sources of Drinking Water Policy).

9.5.3 Alameda Annex

The Fleet and Industrial Supply Center, Oakland, Alameda Facility/Alameda Annex (hereafter referred to as the Annex) is located along the southern shore of the Oakland Inner Harbor in Alameda, California. It is situated about 1 mile southeast of the FISCO main base and less than ½ mile east of Alameda Point. Currently, seven active Investigation Remediation sites are located at the Annex with four sites releasing contaminants to groundwater. Releases to groundwater include (1) leaking fluids from a screening lot and scrapyard, (2) a diesel fuel spill, and (3) paint and solvent spills at a paint spray booth. Chlorinated VOCs, SVOCs, and TPH were the most commonly detected contaminants in groundwater. Five fuel-related plumes also exist at the Annex. The fuel-related plumes range from approximately 400 feet to 2000 feet long by 300 to 1000 feet wide and extend to the bottom of the artificial fill, approximately 10 to 12 feet bgs. All contaminant plumes are located within the artificial fill hydrostratigraphic units. Groundwater flow in the vicinity of the Annex is north to northwest toward the Oakland Inner Harbor. The groundwater typically contains moderate to high concentrations of total dissolved solids (500 to 36,000 mg/l) as a result of saltwater intrusion from the San Francisco Bay. Small lenses of fresh water exist near the ground surface as a result of leaking water supply distribution pipes and rainwater infiltration. While the shallow aquifers are generally capable of maintaining a sustained yield of 200 gallons per day near the bay margin, pumping induced intrusion of saltwater would further degrade water quality.

9.5.4 Alameda Point

Alameda Point (formerly Naval Air Station Alameda) is located on the western end of Alameda Island. Alameda Point was a major active naval base between 1936 and 1997. The installation and its tenants supported several activities that generated wastes including, but not limited to, industrial solvents, acids, paint strippers, degreasers, caustic cleaners, metal plating wastes, used oil, fuel, and asbestos. Other installation activities that generated hazardous wastes in the past include (1) repair of aircraft components for transient and tenant aircraft which may have

produced contamination from fuel products and cleaning solvents; (2) air operations related fuel spills and fuel dumps; (3) waste oils stored in underground tanks from automotive service stations; (4) wastes related to receiving, issuing, storing, and shipping ammunition, ammunition components, and explosives; and (5) fueling support service activities.

Currently, twenty-five active Investigation Remediation sites are located at Alameda Point with seventeen sites releasing contaminants to groundwater. Releases to groundwater include (1) leachate from a 12 acre and a 110 acre landfill, (2) jet fuel from a former fuel storage area, solvents and heavy metals from paint stripping and plating operations, (3) solvents from parts cleaning, operations and equipment washing, (4) spills or leaks associated with underground storage tanks, fuel pipelines, and fuel pump islands, (5) spills and releases of petroleum products related to the former refinery, and (6) spills or leaks from hazardous waste container storage area. Chlorinated VOCs, BTEX, SVOCs, TPH, PAH, and heavy metals were the most commonly detected contaminants in groundwater. At least seventeen fuel-related and fourteen chlorinated VOC-related plumes exist at Alameda Point. The fuel-related plumes range from approximately 125 to 1,100 feet long by 125 to 600 feet wide and extend up to at least 27 feet bgs. The chlorinated VOC-related plumes range from approximately 125 to 1,800 feet long by 190 to 1,800 feet wide and extend up to at least 27 feet bgs. All contaminant plumes are located within the artificial fill and Merritt Sand hydrostratigraphic units, which comprise the first and second water bearing zones at Alameda Point. Generally, groundwater flow in the vicinity of Alameda Point is radial from the center of the facility toward the San Francisco Bay, Oakland Inner Harbor, and the Seaplane Lagoon. The first water bearing zone (fill aquifer) along the shoreline contains concentrations of total dissolved solids greater than 3000 mg/l, as a result of saltwater intrusion. However, the first water bearing zone in the central and southeastern portions of Alameda Point is primarily fresh water (<3000 mg/l TDS) and is recharged by rainwater infiltration and leaking water supply distribution pipes. The second water bearing zone (Merritt Sand) contains total dissolved solids greater than 3000 mg/l, except in the southeastern portion of Alameda Point. The southeastern portion of Alameda Point is distinctive due to the absence of a bay mud aquitard. The single water bearing zone (fill + Merritt Sand) contains mainly fresh (<3000 mg/l TDS) that is recharged by rainwater infiltration and groundwater flowing from eastern, upgradient portions of the Merritt Sand aquifer.

The size of fresh groundwater lenses may change during future property development at Alameda Point. On the one hand, the size of the fresh groundwater lenses may increase when the paved surfaces are removed. On the other hand, the size of the fresh groundwater lenses may decrease because redevelopment will include replacement of the leaking water supply and sanitary sewer pipelines, which currently are believed to provide the majority of fresh water recharge. The current safe yields for aquifer development exceed 200 gallons per day in the western, central and southeastern areas of Alameda Point. In the southeastern portion of Alameda Point, the current safe yield exceeds 8,000 gallons per day.

9.5.5 Oakland Army Base

Oakland Army Base (OARB) is a former active U.S. Army installation located in an industrialized area of Oakland. The installation was constructed on fill in a shallow tideland water area on the eastern shore of San Francisco Bay. OARB sits adjacent to the toll plaza of the San Francisco-Oakland Bay Bridge, and is surrounded by the Fleet Industrial Supply Center Oakland, the Port of Oakland, and the Southern Pacific Rail Terminal. It was constructed and began performing its duties as a military transportation port and distribution terminal in the early 1940s. Most of the site is approximately 10 feet above sea level. Seven operable units for investigation and remediation have been identified at OARB. They are all currently being investigated. These operable units include a railroad roundhouse site, a chlorinated solvent release site, and a housing area containing some petroleum tank sites. Chlorinated VOCs, SVOCs, and TPH were the most commonly detected contaminants in groundwater. The contamination has affected the artificial aquifer, and additional work is being conducted to investigate the potential that shallow contamination has migrated into the deeper Merritt Sand aquifer.

The natural groundwater gradient for the artificial fill is west toward San Francisco Bay. The total dissolved solids (TDS) of the artificial fill groundwater is high (up to 25,000 mg/l) in background borings that are in paved areas. The TDS of the shallow aquifer is below 3,000 mg/l in much of the unpaved, grassy areas of OARB. However, geochemical studies conducted by the Army have pointed to the source of the relatively fresh water as lawn watering, and leaking pipes at the base. The shallow artificial fill aquifer generally can sustain pumping rates of at least 200 gallons per day. Deeper groundwater studies and the potential for shallow groundwater contamination to migrate vertically to the Merritt Sand are being investigated, on a site-by-site basis, in the seven designated operable units.

9.6 Davis-Washington-Alvarado (DWA) Plume

The largest groundwater plume in the East Bay Plain is the Davis-Washington-Alvarado (DWA) Plume in San Leandro (Figure 14). The VOC plume (primarily TCE and PCE) is 2 miles long and over 1 mile wide. Since 1993, DTSC has been conducting soil and groundwater investigations to determine the extent of the plume and possible sources. DTSC has determined that the groundwater pollution could not be attributable to any one site but is coming from multiple sources. The extent of the groundwater plume has been defined and soil remediation has been conducted at several sites.

Many San Leandro residents use private wells in the vicinity of the plume for landscape and garden irrigation. DTSC has conducted a risk assessment and determined that shallow groundwater in the plume can be safely used for irrigation and other outside uses, but should not be used in the home for domestic purposes such as drinking, cooking, showering or bathing. An intensive public education campaign was conducted in the early 1990's to warn residents of the risks associated with drinking the shallow groundwater and to encourage and facilitate residents that were using shallow wells for domestic purposes to connect to the EBMUD water system. Currently, DTSC is investigating eight potential sources of pollution within the DWA plume and developing a coordinated plan for long-term management of the plume.

9.7 Chevron Richmond Refinery

The Chevron Richmond Refinery is located on the peninsula of the Potrero-San Pablo Ridge in northwestern Richmond. It consists of a large refining complex and appurtenant tank fields and manufactures and stores approximately 12 primary refined petroleum products including propane, gasoline, jet fuel, fuel oils, diesel, lube oil, solvents and other byproducts.

The refinery was built at the turn of the century. There are four geologic zones: Alluvial, Flats (marsh covered by fill), Ridge (deformed Franciscan Complex), and Transition Zone (between Flats and Ridge) on more than 2,900 acres. The City of Richmond lies south and east of the facility, where there are industrial, residential, commercial and agricultural land use operations. It is classified as an integrated refinery as defined by the U.S. Environmental Protection Agency in 40 CFR 419.50. Remediation of the site is regulated by the Regional Board under Order No. 93-109. Groundwater pollution at the refinery is prevented from migrating off site by a four-mile long slurry wall/groundwater interceptor trench. Within the refinery property, groundwater and soil contaminated sites are being remediated. However, restoration of groundwater beneath the entire refinery is not a requirement due to the infeasibility of remediating significant pollution related to nearly 100 years of operation and the absence of any historical, existing or planned municipal beneficial use.

9.8 Port of Oakland

The Port of Oakland is a semi-autonomous department of the City of Oakland that is responsible for the management of the Marine Terminals, Oakland International Airport, and commercial real estate. The Port has jurisdiction over the Port Area, defined as extending immediately south of the Bay Bridge to the City of San Leandro northern boundary and including approximately 23 miles of shoreline. Geographically the Port is situated at the boundary between the East Bay Plain and San Francisco Bay.

Prior to the arrival, in the mid-1800's, of the transcontinental railroad, the Oakland shoreline was relatively unaltered. Subsequently, deep water shipping channels were dredged and the intertidal and shallow near-shore Bay waters were filled with dredged materials, some refuse materials, and imported soils. The new land was mostly utilized for both marine and heavy industrial activities. Typical industrial usages included railyards, shipbuilding, gas and electric generation, lumber yards, grain milling and storage, petroleum tank farms, and a number of smaller industries. With the arrival of World War II, the US military filled additional Port Baylands to create large installations to support the war effort. Beginning in the 1960's, the conversion of the ocean-going shipping industry from break-bulk to containerization resulted in wholesale changes in the Marine Terminals landscape. Timber wharves and finger piers, transit sheds, and near shore industries were replaced by marginal concrete wharves, container cranes, and large paved container storage yards.

The industrial legacy has left a mark upon the soils and shallow groundwater under the Port Area. Past industrial releases have typically and locally impacted some sites with petroleum hydrocarbons, i.e. gasoline and diesel fuels derived from underground and above ground storage

tanks, and atypically, polynuclear aromatic hydrocarbons associated with residues from gas and power generation plants. The most significant sites at the Port include a former wood treatment plant at Embarcadero Cove (State Superfund Site), fuel pollution at Berth 24, and a former Coal Gasification Plant. There are 12 leaking underground storage tank sites at the Port; six have been remediated and are closed, five are on quarterly monitoring and one site is undergoing active remediation.

The Port recently conducted a hydrogeologic investigation of the Marine Terminals area. The purpose of the study was to assess the potential for saltwater intrusion from San Francisco Bay as a result of a proposed deepening of the shipping channels. The study concluded that the proposed deepening would have minimal impact on the Alameda Formation aquifer. However, the study demonstrated that shallower water-bearing units, the Merritt Sand and saturated fill soils, have already been invaded by salty Bay water.

9.9 Oakland Central District Redevelopment Area

The Oakland Central District Redevelopment Area, often referred to as the Uptown Theater District, encompasses Oakland's historic downtown. This area, which is anchored by the historic Fox Theater, was almost completely abandoned by business over the last three decades. Significant groundwater contamination has been identified in large portions of the area and must be addressed prior to redevelopment.

9.10 Bacteriological Contamination

Leaking sewer pipes are estimated to account for 20% of the groundwater recharge in the East Bay Plain. Shallow groundwater frequently contains elevated levels of fecal coliform. Both of these findings are typical for highly urbanized areas. California State Well Standards require a minimum 50-foot deep well seal for drinking water wells to guard against exposure to such contamination.

10.0 ECOLOGICAL IMPACTS

In the East Bay Plain, groundwater may discharge directly to the Bay or to freshwater features such as lakes, creeks, or manmade culverts or channels, which in turn discharge to the Bay. Over the last hundred or more years, a great deal of industrial activity has occurred along the Bay margin, and has resulted in many instances of groundwater contamination. This section looks at sites where groundwater contamination exists near a surface water body where there is the potential for impacts to aquatic receptors. To summarize the findings of the section, there are a number of sites where concentrations of chemicals in groundwater exceed numerical water quality objectives for individual constituents or levels of mixtures shown to have impacts in aquatic receptor tests. At the present time, while the potential for impact exists, studies to establish a link between these sites and impacts to aquatic receptors have not been completed or performed.

10.1 Ecological Impacts from Petroleum Hydrocarbons

In the East Bay Plain, most documented releases of contaminants to the subsurface that have resulted or could result in degradation of groundwater quality are associated with underground fuel storage tanks. A preliminary assessment of the potential for such sites to reach surface water was conducted using the information presented in Figure 6. To make this assessment, the number of sites located within about 250 feet of a surface water body was estimated. Surface water bodies included the Bay, surface water drainages shown on Figure 6, and wetlands (the latter primarily in the most southerly and northerly portions of the East Bay Plain). The distance of 250 feet was selected for fuel sites based on the Lawrence Livermore National Laboratory (LLNL) finding that 90% of groundwater plumes at fuel sites stabilize within about 250 feet of the source of the release. Thus, the class of sites more than 250 feet from surface water bodies are judged to have a small potential for impacts to ecological receptors via a groundwater pathway. About 40 sites were identified within 250 feet of the Bay or wetlands adjacent to the Bay. About 60 sites were identified within 250 feet of surface water drainages.

An example of a site where discharge of petroleum hydrocarbons to surface water has been documented is located at 1138 Glascock Street on the Oakland side of the Oakland-Alameda estuary. A 20,000-gallon diesel tank and a 4,000-gallon diesel tank were removed from the property in 1993. Samples collected in the last 12 months from a well located adjacent to the estuary have shown concentrations of TPH-diesel and TPH-motor oil ranging from 1 to 10 mg/l and 1 to 8 mg/l, respectively.

The Chevron refinery in Richmond is another facility in the East Bay Plain where petroleum hydrocarbons in groundwater have discharged to the surface waters of San Francisco Bay. An assessment of ecological impacts associated with releases from the refinery and associated activities to surface water and sediment of the Bay is in the planning stages.

At sites where groundwater containing petroleum hydrocarbons is discharging to surface water, the potential for impacts to aquatic receptors exists. While the nature and degree of any such impacts is not well characterized at this time, studies conducted at other Bay margin sites indicate that water with TPH concentrations in the range of 100-1,000 ug/L can result in significant effects on test organisms.

10.2 Ecological Impacts from Chlorinated Solvent Plumes

There are an estimated 90 sites in the East Bay Plain where chlorinated solvents have been identified in groundwater. Of these sites, about 19 are located within 1000 feet of the Bay or a surface water feature. Major plumes in the East Bay Plain are shown on Figure 14. In general, the major solvent plumes do not extend to the Bay or discharge to surface water. The potential for impacts to ecological receptors from chlorinated solvents would appear to be limited.

10.3 Ecological Impacts from Pesticides

There appears to be little evidence of discharge of pesticides to surface water via a groundwater pathway. As an example, at the United Heckathorn site on the Lauritzen Canal, Richmond, crystalline DDT (100% DDT) was observed in shallow soils while concentrations in sediments ranged to 633 mg/kg. Groundwater investigations revealed little in the way of dissolved pesticides. This observation is consistent with the generally strong sorption characteristics of many pesticides. Direct discharge or transport of pesticides with suspended sediment in surface water appears to be much more significant migration pathways to aquatic ecological receptors than migration as a dissolved phase in groundwater.

10.4 Ecological Impacts from Metals

This section illustrates the potential impact to aquatic receptors via elevated metals concentrations in groundwater through brief discussions of two sites: the Volvo-GM site in Oakland and the Zeneca Ag Products site in Richmond.

The Volvo-GM site is located at 5050, 5051, and 5200 Coliseum Way, Oakland. The site was formerly a paint manufacturing facility. Several metals including arsenic, cadmium, cobalt, copper, lead, nickel, and zinc are contaminants of concern. The site is bordered on the west by subsurface culverts and a stormwater drainage channel. Groundwater elevation contours and contaminant distribution maps indicate groundwater discharges to the culverts or channel. The channel discharges to San Leandro Bay. Groundwater contaminant concentrations of zinc have exceeded Basin Plan water quality objectives by factors of up to 20,000. Concentrations of cadmium, copper, and nickel have exceeded objectives by factors of 100 to 1,000. Storm sewer samples have shown elevated nickel and zinc concentrations. An ecological risk assessment is planned at this site.

The Stege Marsh site (owned by Zeneca Ag Products) is located at 1415 South 47th Street, Richmond. The site occupies about 75 acres and is bordered to the south by a tidal basin connected to San Francisco Bay. A variety of chemicals has been manufactured at the facility. Chemicals associated with plant activities have been identified in Quaternary Alluvium to depths up to 20 feet below Mean Sea Level, and include arsenic, cadmium, copper, lead, zinc, and several chlorinated volatile organics. Maximum measured metals concentrations in wells adjacent to the tidal basin exceed Basin Plan water quality objectives by factors of up to about 500. An ecological risk assessment is planned for this site, although groundwater discharge is not considered to be the most important route of exposure to aquatic receptors.

11.0 REGULATORY ISSUES

11.1 Lawrence Livermore National Laboratory LUFT Report

In October 1995, Lawrence Livermore National Laboratory (LLNL), under contract to and at the request of the State Board, submitted written recommendations to the State Board for improving the cleanup process for California's leaking underground fuel storage tanks (LUFTs) for fuels without MTBE or other oxygenates. The recommendations were the result of an 18-month review of the regulatory framework and cleanup procedures currently applied to LUFTs. Under current regulation, the minimum cleanup standards for cases affecting groundwater are the maximum contaminant levels (MCLs) for drinking water. Numeric cleanup standards are not established for residual fuel hydrocarbons (FHC) in soil.

The main findings of the LLNL study were: 1) if an FHC source is removed, passive bioremediation processes act to naturally reduce the mass of dissolved constituents in groundwater, and to eventually complete the FHC cleanup, 2) dissolved benzene plumes in groundwater tend to stabilize at relatively short distances from the FHC release site, 3) in 90% of the cases, benzene concentrations greater than 10 ppb extended no more than about 250 feet from release sites, and 4) a review of the state's database of over 28,000 cases showed that 136 sites (0.5%) reportedly have affected drinking water wells.

The LLNL study also found that remediation alternatives that use pump and treat technologies were ineffective at reaching MCL groundwater cleanup standards for FHC constituents in many geologic settings. Although contaminated groundwater can be removed, contaminants sorbed to soil particles act as a continuing source to groundwater, making it difficult to reach MCLs. The LUFT historical case study conducted by LLNL, as well as other historical case studies, found that once an FHC source is removed, the time for passive bioremediation to reduce a dissolved FHC plume by a factor of 10 is about 1 to 3 years. LLNL recommended that passive bioremediation be used as a remediation alternative for LUFTs whenever possible; pump and treat remediation should not be used unless its effectiveness can be demonstrated.

From a regulatory perspective, the LLNL study concluded that the current LUFT decision-making process does not result in cost-effective site closures. As an alternative, a Risk-Based Corrective Action (RBCA) approach to LUFT cleanups was recommended to provide guidance to reasonably manage risks to human health, ecosystems, and groundwater beneficial uses, while considering technical and economic feasibility.

The RBCA approach is tiered. Lower tiers use conservative assumptions and historical or screening level data to make decisions. Tier 1 evaluations rely on a generic approach and are applicable to most LUFT cases and sites. Higher tier evaluations require more intensive, site-specific data as a trade-off for the conservative Tier 1 assumptions. By using a modified American Society of Testing and Materials (ASTM) RBCA approach, LUFT cases can be evaluated on the basis of exposure pathways, (e.g., proximity of drinking water wells and depth to groundwater). A modified Tier 1 approach could encompass a majority of California's LUFT cases, and encourage the use of passive remediation. LLNL recommends that a modified ASTM RBCA framework be

applied to cases where FHCs have affected soil but do not threaten groundwater, and that SWRCB policies be modified to allow the consideration of risk-based cleanup goals higher than MCLs. The Regional Board concurs with the submitted recommendations, and implements them for LUFT cases on a case-by-case basis.

11.2 Methyl-tert-butyl-ether (MTBE)

Methyl-tert-butyl-ether (MTBE) is an oxygenate additive to gasoline intended to reduce combustion emissions. MTBE is more soluble, less volatile, less well adsorbed, and apparently significantly less biodegradable than gasoline mixtures or benzene. As a consequence, releases of gasoline to the subsurface have resulted in MTBE migration in groundwater that is much more extensive than the migration of the gasoline or other constituents of concern in gasoline. In addition, MTBE imparts an unpleasant taste and odor to water at very low concentrations. Given its migration characteristics and its low taste and odor threshold, the potential for impacts to water supply wells is higher for MTBE than for gasoline or BTEX constituents. The concern would be greatest for wells completed in shallow aquifers, as is the case for some domestic wells included in the ACFCWCD or EBMUD well database.

The Department of Health Services has proposed a taste and odor secondary MCL of 5 ppb for MTBE. The Office of Environmental Health Hazards Assessment proposed a Public Health Goal of 14 ppb in August 1998. The primary MCL for MTBE must be adopted by DHS by July 1, 1999, and could be as low as 14 ppb.

The use of MTBE in reformulated gasoline to satisfy the federal Clean Air Act has sparked considerable controversy in California and elsewhere. On November 12, in conformance with SB 521, the University of California (UC) issued a report to the Governor, “Health and Environmental Assessment of Methyl Tertiary-Butyl Ether (MTBE)”, which found that the air quality benefits of reformulated gasoline containing MTBE were not significant on exhaust emissions from advanced technology vehicles. However UC did find that there are significant risks and costs associated with water contamination due to the use of MTBE. The UC report recommends a gradual phase out of MTBE over several years as well as other strategies to minimize the risks associated with MTBE. On March 25, 1999, after peer review and public hearings, in accordance with SB 521, the Governor issued Executive Order D-5-99 that mandated the California Air Resources Board develop a timetable by July 1, 1999 for the removal of MTBE from reformulated gasoline at the earliest possible date, but no later than December 31, 2002.

12.0 HISTORICAL GROUNDWATER BENEFICIAL USES

Groundwater was a major part of the water supply for the East Bay during the period from 1860 to 1930, before Sierra water was imported to the area. Groundwater may have supplied up to 15,000,000 gallons of water per day for short periods, and was the sole supply for months on end during times of drought. Approximately half of the groundwater was pumped from the study area (Figuers, 1998). Most of this was produced from a band of well fields stretching from the southeastern end of Alameda Island to 98th Street in Oakland. Groundwater was used widely for municipal supply. It is estimated that 15,000 wells were drilled in the Basin between 1860 and 1950 (Figuers, 1998). Most of these wells were less than 50 feet deep, but many were 200 to 500 feet

deep, with some extending as deep as 1000 feet below ground surface (see Figures 2 and 3).

While the development of local groundwater supplies was instrumental in the early development of the East Bay Plain, by the late 1920's the supply was too small to meet the growing population. In addition, wells often became contaminated by seepage or saltwater intrusion. Thus faced with an increasingly degraded and insufficient water supply, East Bay civic leaders turned to imported supplies to meet the growing demand for water. Early alternatives for such a supply included a joint effort in developing the Hetch Hetchy Reservoir with the City of San Francisco, pumping surface water from the Sacramento Delta and developing its own Sierran supply. Ultimately the decision was made to develop a Sierran supply by building Pardee Reservoir. For a detailed and colorful account of the East Bay Plain water supply history, see Figuers (1998).

In addition to using the East Bay Plain for a source of drinking water, it was used for agricultural and industrial supply. An estimated 15,000 acres of land were in agricultural production in 1963 (Muir, 1994). If all of this acreage was irrigated with an average of 3 acre-feet/year, agricultural usage would have been an estimated 45,000 acre-feet in 1963. It is not known what portion of historical agricultural usage may have been supplied by groundwater. Groundwater has also been used for industrial processes, though no estimates of historical usage were obtained for this report.

12.1 Dockweiler Report

J.H. Dockweiler (1912) provided a detailed snapshot of water supply and usage in the East Bay area in the fall of 1911. During the period August to October 1911, Dockweiler hired a corps of canvassers to identify all wells in the territory between Richmond and Hayward. Canvassers went house to house and recorded the address, use and number of people served, depth to water and depth of water in the well. Dockweiler estimates that 80% of the wells were recorded, the remainder being small wells with hand pumps.

Excluding those in Castro Valley, a total of 3,573 wells were identified (see Figures 2 and 3). Of these wells, only 1,930 had data on depth to water or height of water in well. It is assumed that the depth to water in the well plus the height of water in the well would be equal to the total depth of the well. The data was put into a spreadsheet to examine statistics on the number of deep wells in each city area. Table 4 summarizes the results of this analysis. In the study area overall, about 8% of the wells with depth data had a total depth of 200 feet or deeper. About 30% of the wells with depth data were 100 feet deep or more.

Looking at each city area individually and estimating the area of the city canvassed, an approximate deep well density for 1911 can be calculated. This calculation shows the highest density of wells 200 feet deep or more to be in the areas of Alameda and Oakland, with densities of 6 to 10 deep wells per square mile. These cities were fairly densely developed, so these numbers may accurately reflect the density of the time. In Alameda, there are reports of saltwater intrusion of the shallow groundwater, so the density of deeper wells may be due to pursuit of clean, deeper aquifers. Other developed areas were Berkeley and Emeryville, where the deep well density was fairly low, around 1 deep well per square mile. This low density reflects the shallow bedrock in this

area. Any deep wells were likely installed close to the Bay shore.

Richmond was partially developed and the San Leandro/San Lorenzo and Hayward areas were rural (undeveloped) in 1911. These areas had low deep well densities (zero deep wells in the hamlet of Hayward and about 1 deep well per 2 square miles in Richmond and San Leandro/San Lorenzo). The low deep well density in Richmond even with the partial development at the time may reflect the successful service of the water companies there and their wellfields in Richmond and San Pablo. The deep well densities in all those areas are likely to have increased due to development between 1911 and the early 1930s when EBMUD began supplying imported surface water to the region.

Table 4. Summary of Well Data Recorded in the Dockweiler Report

Area	Total Wells Reported	Wells deeper than 199 ft	Wells deeper than 99 ft	Approximate Area Canvassed (sq. mi.)	Ratio Wells > 199 ft Deep wells per Sq. Mile
Alameda	362	16%	55%	6	10.2
Berkeley	642	1%	9%	12	0.6
Emeryville	77	3%	5%	2	1.2
Hayward	55	0%	2%	1	0.0
Oakland	1762	12%	36%	35	6.0
Richmond	238	5%	51%	26	0.5
San Leandro/ San Lorenzo	437	2%	13%	16	0.5
Overall	3573	8%	30%		

Note: Well canvassing took place in 1911. Canvassers recorded depth to water and height of water in well for 1,930 of the 3,573 wells recorded (percentage of wells are based on these 1,930 records). "Depth to water" and "feet of water in well" were added to calculate the well depth and this data was analyzed for wells depth statistics. The approximate area canvassed was measured roughly off the map on page 141 from the Dockweiler report.

13.0 CURRENT GROUNDWATER BENEFICIAL USES

13.1 Industrial Use

Using a variety of sources, Muir (1996) compiled information on groundwater use in the Alameda County portions of the basin, including the amount of groundwater pumped by industrial concerns and remediation projects. EBMUD, DTSC, the Environmental Compliance Department of the San Leandro Water Pollution Control District, and the Hayward Sewage Treatment Plant supplied data that were critical to determine this pumpage. He also used a county list of industrial wells and contacted individual industrial concerns to determine if they used groundwater.

Muir found that only ten industrial concerns used groundwater. They pumped a total of 1015 acre-feet in 1995, which came from wells deeper than 200 feet. This was used mainly in food processing and product manufacturing. He estimated that there were about 60 remediation projects in operation in the East Bay Plain in any one year, pumping about 800 acre-feet, generally from wells less than 100 feet deep. Thus, estimated total industrial use in 1995 was 1815 acre-feet.

13.2 Agricultural Use

Muir (1996) compiled information on agricultural groundwater use in the Alameda County portion of the East Bay Plain as follows:

In 1995, five elements were considered: golf courses, cemeteries, schools and colleges, parks, and crops. Data from DWR Bulletins No. 113-3 (DWR, 1975) and No. 113-4 (DWR, 1986) and Sunset (1961) were used to estimate agricultural pumpage.

Golf Courses – Only two golf courses used wells for irrigation; all others used either reclaimed sewage water or water stored in lakes from captured rainfall runoff. It was estimated that the two golf courses pumped 390 acre-feet of groundwater.

Cemeteries – Three cemeteries used approximately 450 acre-feet of well water for irrigation.

Schools and Colleges – Several high schools and colleges use well water to irrigate athletic fields. Their total pumpage for 1995 was estimated to be only 20 acre-feet.

Parks – A number of parks in the East Bay Plain have wells for irrigation purposes, but a total of only 25 acre-feet were used.

Crops – There were only 14 acres of row crops and several hot houses in the area; their estimated pumpage totaled 25 acre-feet.

Table 5. Groundwater Pumpage for Agricultural Use in the East Bay Plain, 1995

Use	Acre-Feet
Golf Courses	390
Cemeteries	450
Schools and Colleges	20
Parks	25
Crops	25
Total Agricultural Usage	910

13.3 Domestic Use

13.3.1 EBMUD Survey

EBMUD staff conducted an agency survey to identify small drinking water systems (2 or more connections) in the East Bay Plain (excluding Castro Valley):

- Alameda County Department of Environmental Health oversees water systems of 2 to 14 connections (Personal communication, Ron Torres).
- California DHS Division of Drinking Water and Environmental Management oversees water systems of 15 and higher connections in Alameda County (John Andrew at 510-540-3227).

- Contra Costa County DEH oversees water systems of 2 to 199 connections (William Alejandro at 925-646-5225 x212).

Although other systems may exist, agency files only indicate several small drinking water systems in Alameda County that rely on groundwater. There are no known small water systems in Contra Costa County. The water systems are grouped below by oversight agency.

Alameda County DEH records indicate two small water systems that rely on groundwater for drinking water:

- The Venice Court Housing Group, located on Venice Court off Dutton in the northern part of San Leandro. One well serves 7 houses. Well depth is unknown.

- 24180 Saklan, off Winton Avenue on the outskirts of Hayward. One well serves 4 or 5 units. The well was deepened in 1989, although well construction details are not known.

DHS ODW records indicate several groundwater-based water systems with 15 or more connections (see Figure 15):

- 2399 East 14th Street, San Leandro. The Trailer Haven trailer park has a 290-foot deep well. Although the site is located near the source of the DWA Plume, solvents have not been detected in water from the well (per Karen Toth, DTSC).

- 28111 Harvey Street in Hayward. One well serves 6 units. Well construction details are not known.

- 6901 Sobrante Road, Oakland, off Skyline. One well serves 4 homes and is pumped at 40 gpm. The well is 275 feet deep. This system is not in the East Bay Plain.

- The Mohrland Mutual Water Company in Mt. Eden, an unincorporated area near Hayward. It serves about 180 connections with one well that is approximately 800 feet deep.

The City of Hayward has installed 4 emergency supply water wells with one more planned. The 5 wells are expected to supply 10,000 gpm for use over 7 days should an earthquake damage the San Francisco Water Department's Hetch Hetchy aqueduct, which is the main drinking water source for the city. The wells range in depth from 464 to 600 feet.

In addition, there may be households with a single well connection using groundwater for drinking water. The following agencies were contacted to identify single connection domestic-use wells:

- Alameda County Flood Control and Water Conservation District (ACFCWCD) issues well permits for much of Alameda County except Berkeley and the areas covered by Zone 7 and the

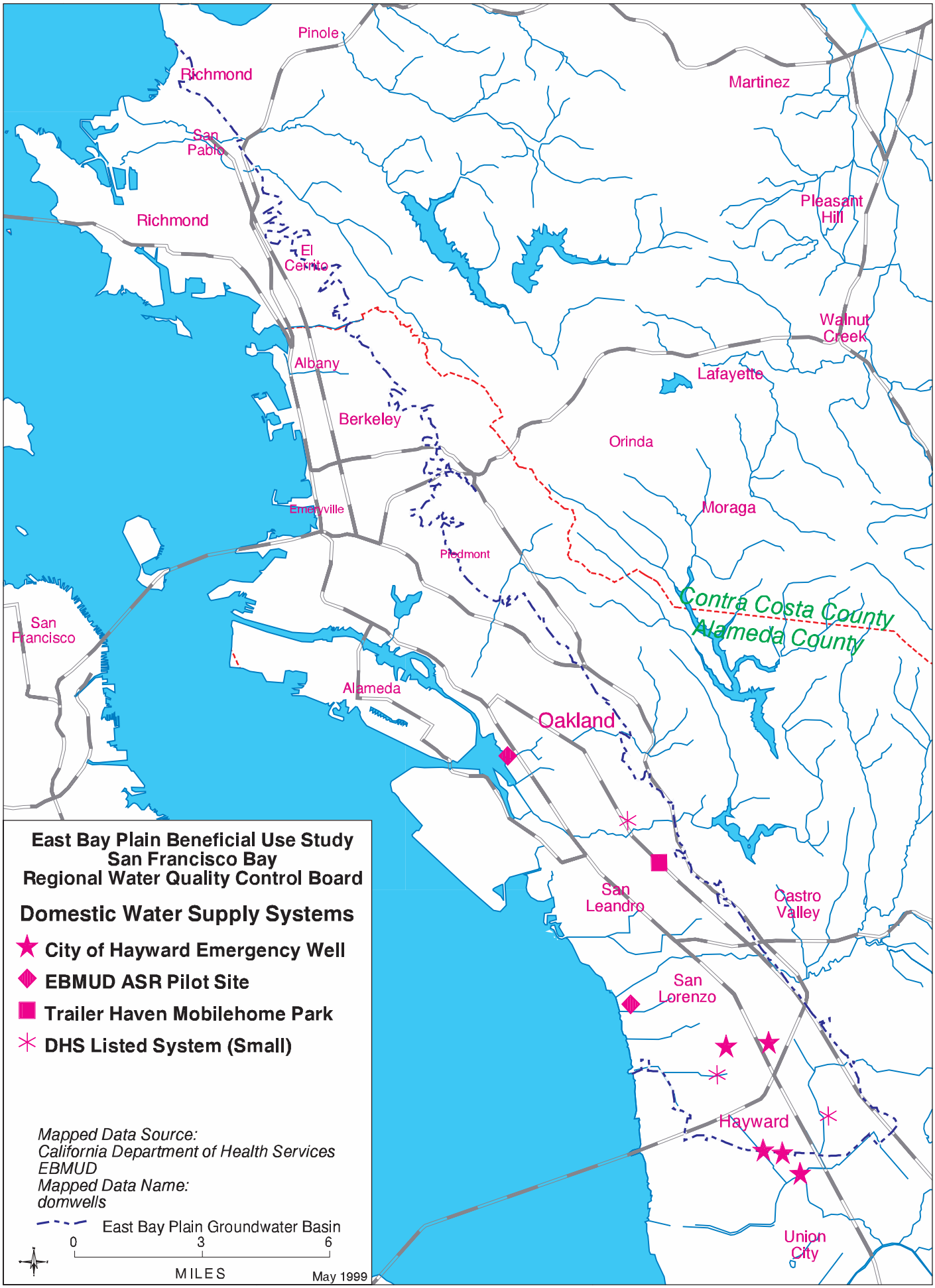

Pinole
Richmond
Martinez
San Pablo
Richmond
Pleasant Hill
El Cerrito
Walnut Creek
Albany
Lafayette
Berkeley
Orinda
Emeryville
Moraga
Piedmont
Contra Costa County
Alameda County
San Francisco
Alameda
Oakland
San Leandro
Castro Valley
San Lorenzo
Hayward
Union City
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Domestic Water Supply Systems
City of Hayward Emergency Well
EBMUD ASR Pilot Site
Trailer Haven Mobilehome Park
DHS Listed System (Small)
Mapped Data Source:
California Department of Health Services
EBMUD
Mapped Data Name:
domwells
East Bay Plain Groundwater Basin
0
3
6
MILES
May 1999

Figure 15

Alameda County Water District (contact: Andreas Godfrey at 510-670-5575).

- City of Berkeley Department of Public Works Permit Service Center 510-883-6555 and City of Berkeley Planning Department Toxics Division (contact: Nabil Al-Hadithy at 510-705-8155).

- Contra Costa County DEH issues well permits for Contra Costa County (contact: William Alejandro at 925-646-5225 x212).

- EBMUD maintains a database of well owners for their Backflow Prevention Program.

EBMUD obtained a copy of ACFCWCD's well database as of January 1, 1997. This compilation of wells is incomplete and may include wells abandoned or destroyed. The well database includes wells permitted by the agency and installed in the Alameda County portion of the Plain (excluding Berkeley) starting in July 17, 1973, with sporadic records of wells installed prior to that. For wells destroyed or abandoned, it is difficult to cross-check installation with destruction records.

As part of the evaluation of beneficial uses in the East Bay Plain, the ACFCWCD data for all wells coded as Domestic, Municipal, Irrigation, and Industrial was analyzed (see Figures 16 and 17). ACFCWCD codes wells as Domestic, Irrigation, Municipal, and Industrial. Of the 1421 wells permitted since July 17, 1973 by ACFCWCD, 1417 (99.6%) are for non-drinking water purposes. A summary of the number of wells in each category is shown below:

Table 6. Number of Permitted ACFCWCD Wells Classified as Domestic, Irrigation, Municipal or Industrial

Use Code and Description	Total Number of wells <100 ft. deep	Total Number of wells >100 ft. deep	Sub Total
Domestic – Small scale irrigation well (e.g. private backyard irrigation well)	331	61	392
[1] Municipal – Large scale drinking water well	2	11	13
Irrigation – Large scale irrigation well	730	169	899
Industrial – Industrial process supply well	38	79	117
TOTAL	1101	320	1421

[1] Of these 13 wells, only 7 are known to be for drinking water supply. These 7 wells consist of 3 owned by the Mohrland Mutual Water Company in Hayward (one of which is active), 2 owned by EBMUD, and 2 owned by the City of Hayward. The remaining 6 wells are not believed to be used for drinking water purposes.

For the following cities, the number of wells indicated as "domestic use" (defined as small scale irrigation wells, e.g. private backyard irrigation wells) or "municipal use" (defined as large scale drinking water wells) are as follows:

- Alameda: 2 wells, 60 and 325 feet deep
- Albany: 0 wells
- Berkeley (although ACFCWCD does not issue permits for Berkeley): 2 wells, 180 and 204 feet deep
- Emeryville: 0 wells

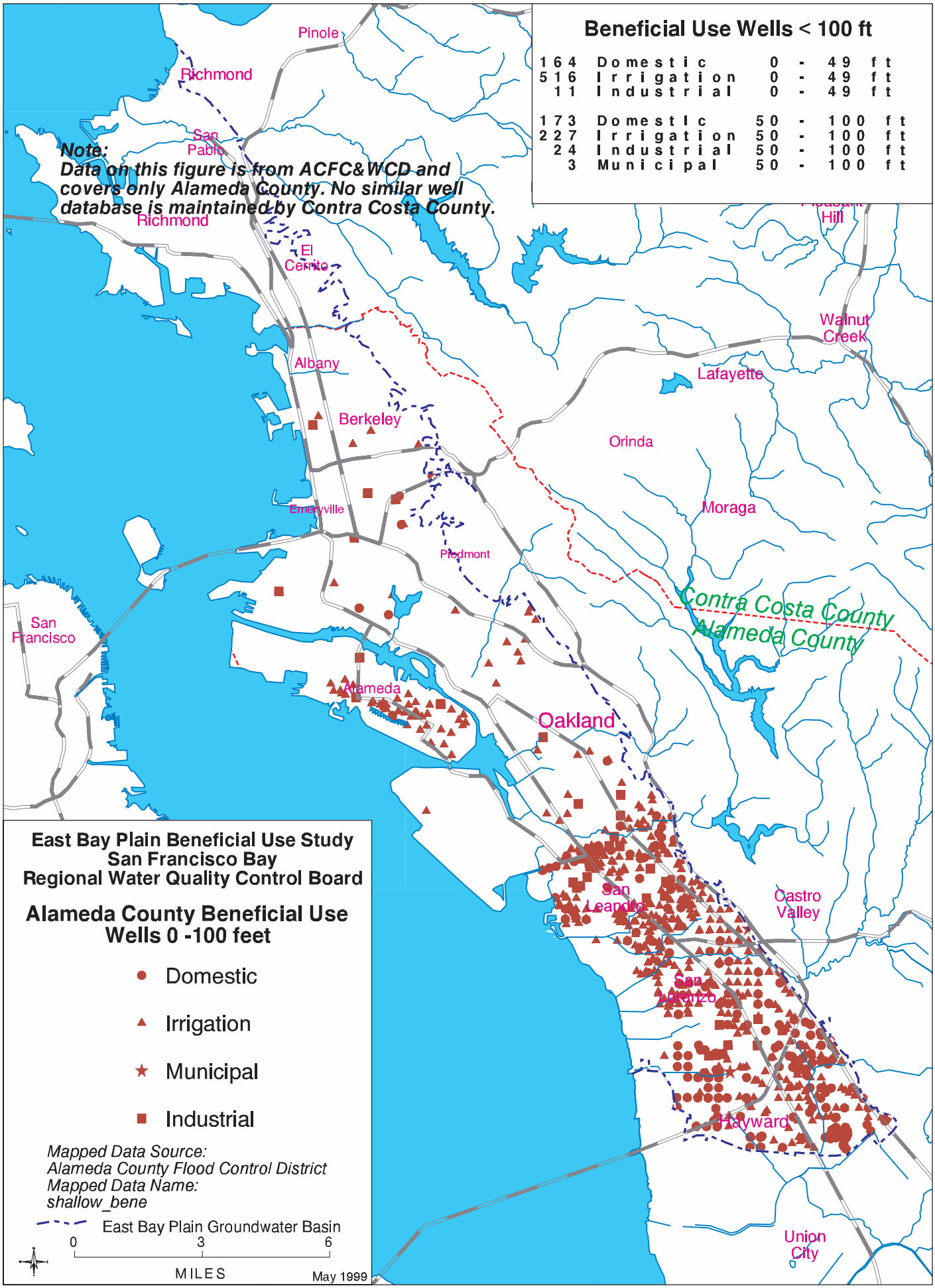

Beneficial Use Wells < 100 ft
164 Domestic 0 - 49 ft
516 Irrigation 0 - 49 ft
11 Industrial 0 - 49 ft
173 Domestic 50 - 100 ft
227 Irrigation 50 - 100 ft
24 Industrial 50 - 100 ft
3 Municipal 50 - 100 ft
Note:
Data on this figure is from ACFC&WCD and covers only Alameda County. No similar well database is maintained by Contra Costa County.
Pinole
Richmond
San Pablo
Richmond
El Cerrito
Albany
Berkeley
Emeryville
Piedmont
San Francisco
Alameda
Oakland
Hill
Walnut Creek
Lafayette
Orinda
Moraga
Contra Costa County
Alameda County
San Leandro
Castro Valley
San Lorenzo
Hayward
Union City
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Alameda County Beneficial Use Wells 0 -100 feet
Domestic
Irrigation
Municipal
Industrial
Mapped Data Source:
Alameda County Flood Control District
Mapped Data Name:
shallow_bene
East Bay Plain Groundwater Basin
0
3
6
MILES
May 1999

Figure 16

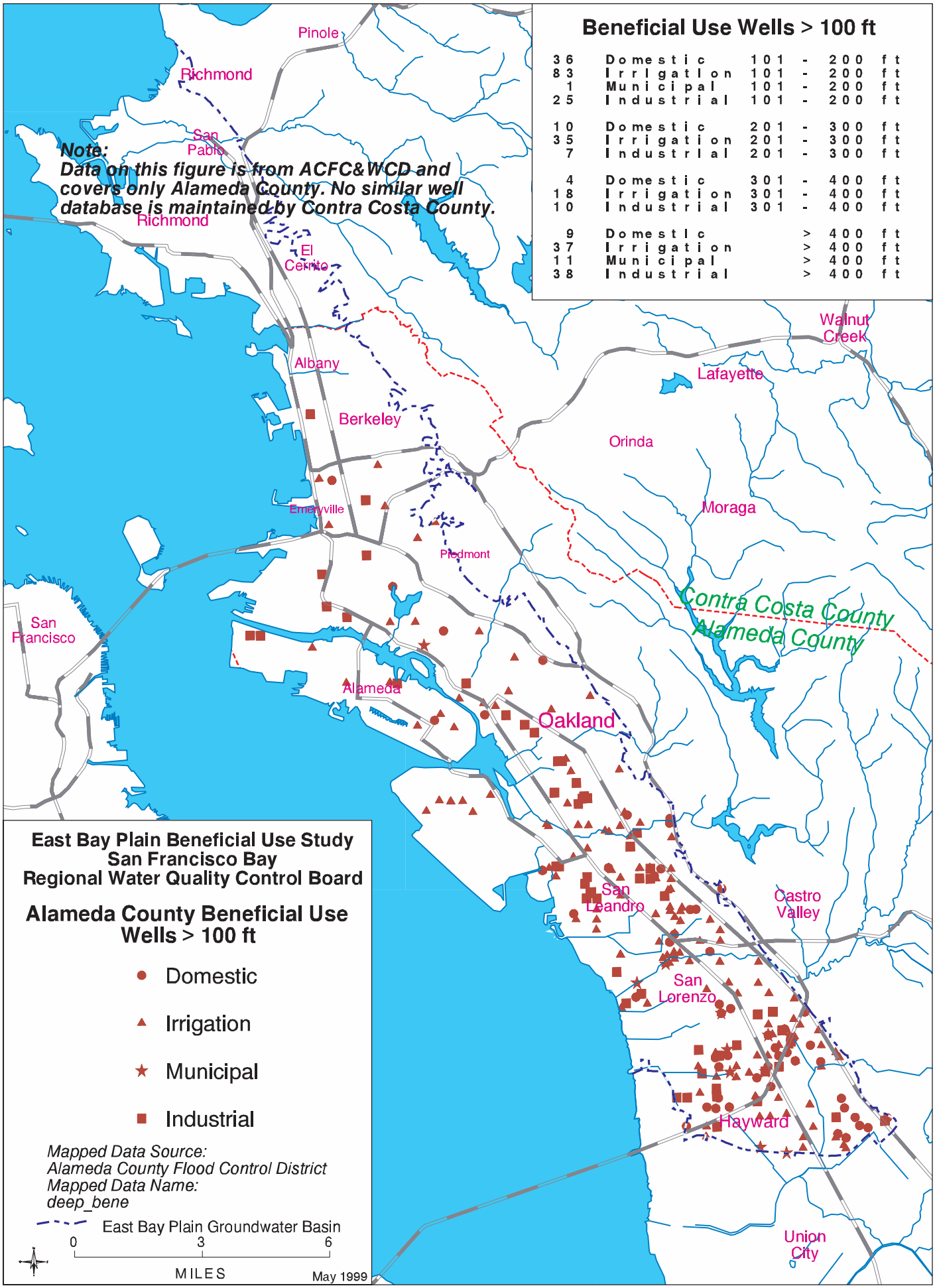

Beneficial Use Wells > 100 ft
36 Domestic 101 - 200 ft
83 Irrigation 101 - 200 ft
1 Municipal 101 - 200 ft
25 Industrial 101 - 200 ft
10 Domestic 201 - 300 ft
35 Irrigation 201 - 300 ft
7 Industrial 201 - 300 ft
4 Domestic 301 - 400 ft
18 Irrigation 301 - 400 ft
10 Industrial 301 - 400 ft
9 Domestic > 400 ft
37 Irrigation > 400 ft
11 Municipal > 400 ft
38 Industrial > 400 ft
Note:
Data on this figure is from ACFC&WCD and covers only Alameda County. No similar well database is maintained by Contra Costa County.
Pinole
Richmond
San Pablo
Richmond
El Cerrito
Albany
Berkeley
Emeryville
Piedmont
San Francisco
Alameda
Oakland
Walnut Creek
Lafayette
Orinda
Moraga
Contra Costa County
Alameda County
San Leandro
Castro Valley
San Lorenzo
Hayward
Union City
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Alameda County Beneficial Use Wells > 100 ft
Domestic
Irrigation
Municipal
Industrial
Mapped Data Source:
Alameda County Flood Control District
Mapped Data Name:
deep_bene
East Bay Plain Groundwater Basin
0
3
6
MILES
May 1999

Figure 17

- Hayward: 357 wells, depths range from 18 to 763 feet
- Oakland: 32 wells, depths range from 33 to 533 feet
- Piedmont: 24 wells, depths range from 83 to 300 feet
- San Leandro: 76 wells, depths range from 12 to 596 feet
- San Lorenzo: 14 wells, depths range from 30 to 834 feet.

Note that the total wells listed above are greater than shown in Table 6. This is because some wells located in the above cities are outside (i.e., east) of the East Bay Plain basin boundary.

The City of Berkeley issues permits for monitoring wells through its Toxics Division but does not maintain a publicly accessible well database. It is possible that several units near San Pablo Ave. in Berkeley use groundwater for drinking water (per Nabil Al-Hadithy, City of Berkeley). Before approximately 1993, the City of Emeryville issued well permits; now they are issued by ACFCWCD.

Contra Costa County DEH has recorded permitted wells in their database since 1992. However, at the time that this report was prepared, Contra Costa County DEH was not able to provide information from their well database.

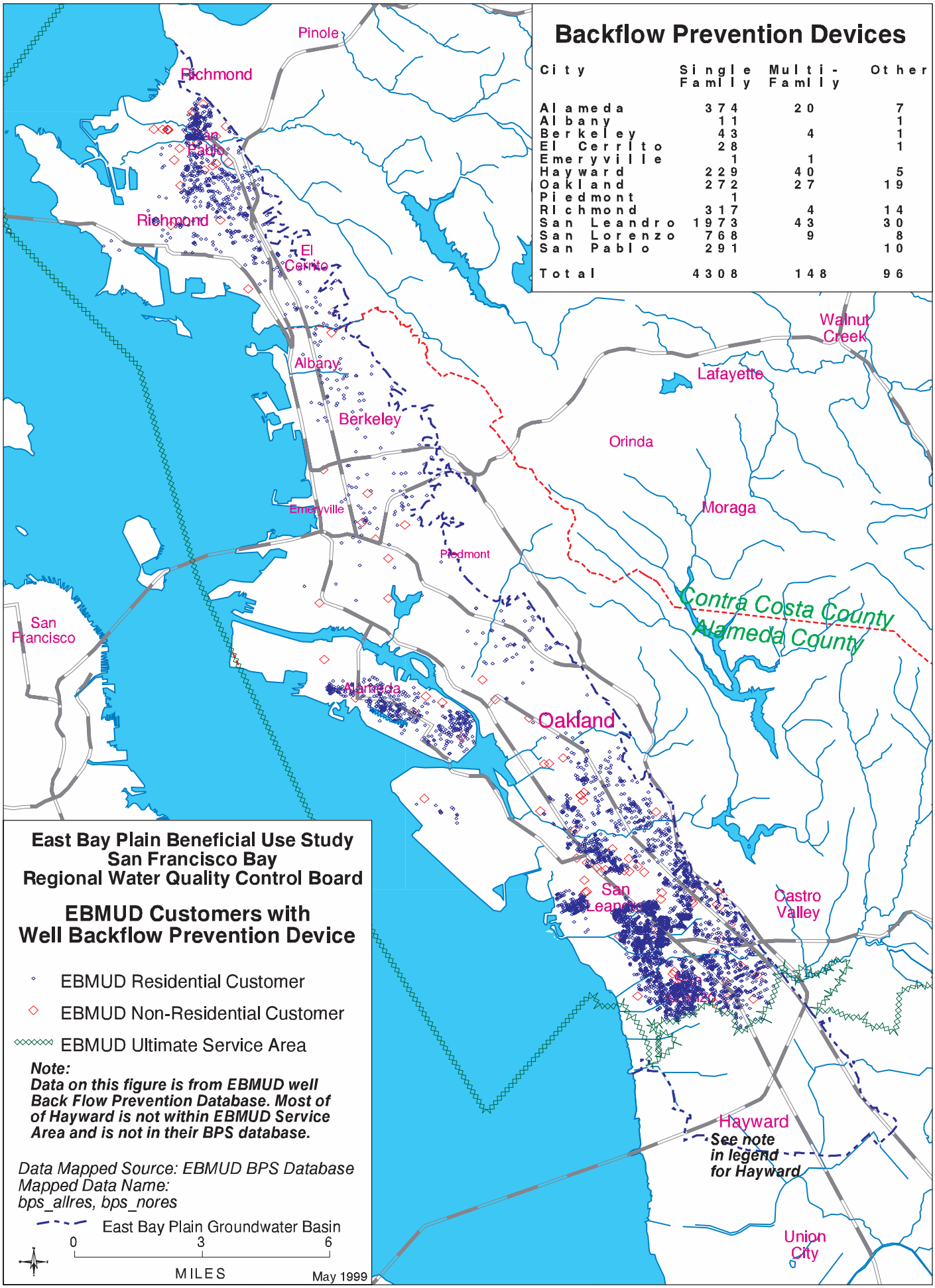
EBMUD has a database of well owners in its area for their Backflow Prevention Program. In about 1990, EBMUD used mailings with utility bills to ask customers with wells to contact EBMUD. Backflow devices are installed at houses with a well, regardless of whether the well is in use or tied into the customer's water system. Although no data are collected on the well, customer type is known. The table below shows numbers of wells in the backflow database for each city for several customer classifications.

A map of the location of well owners with backflow prevention devices is shown on Figure 18.

Table 7. EBMUD Customers with Backflow Prevention Devices

City	Single Family	Multi-Family	Other
Alameda	374	20	7
Albany	11	0	1
Berkeley	43	4	1
El Cerrito	28	0	1
Emeryville	1	1	0
Hayward	229	40	5
Oakland	272	27	19
Piedmont	1	0	0
Richmond	317	4	14
San Leandro	1973	43	30
San Lorenzo	768	9	8
San Pablo	291	0	10
Total	4308	148	96

Note: Data in this table is from EBMUD well Backflow Prevention Database. Most of Hayward is not within EBMUD Service Area and is not in EBMUD's BPS database.



Backflow Prevention Devices

City	Single Family	Multi-Family	Other
Alameda	374	20	7
Albany	11		1
Berkeley	43	4	1
El Cerrito	28		1
Emeryville	1	1	
Hayward	229	40	5
Oakland	272	27	19
Piedmont	1		
Richmond	317	4	14
San Leandro	1973	43	30
San Lorenzo	768	9	8
San Pablo	291		10
Total	4308	148	96

Figure 18

13.3.2 City of San Leandro

In 1994, the City set out to determine if any properties in San Leandro were being serviced by domestic wells. First, the City used existing sources, such as DTSC, to identify all known domestic wells. The City also asked EBMUD to identify all lots in San Leandro that were not being billed. Each of these lots was checked to verify that it was being supplied by EBMUD. Most of the lots were industrial double lots or were an entry error.

After several weeks of investigation, the City was satisfied that all existing residences with no domestic water service other than groundwater had been identified. A total of ten residences were identified. All were offered City assistance to obtain an EBMUD hookup, including homes outside of the known plume areas. By 1995, all but four of the homes were hooked up to EBMUD or had been demolished. In 1998, one of the four homes was additionally connected to EBMUD using private party funds.

The only three potential remaining domestic wells in San Leandro are all outside of the known plume areas.

13.3.3 City of Hayward

ACFCWCD records show there are several “islands” of unincorporated land within the City of Hayward. Over the years, the size and quantity of these “islands” has decreased. As land is incorporated into the City of Hayward, infrastructure is added, including imported water supplied by Hayward. These remaining “islands” represent areas where groundwater is currently being used (i.e. Mohrland Mutual Water Company) or areas with a high probability of use.

13.4 Municipal Use

13.4.1 Hayward emergency wells

The City of Hayward depends on the San Francisco Water Department’s Hetch Hetchy aqueduct for its municipal water supply. Since a major earthquake could disrupt this supply for periods of days, Hayward has installed an emergency water supply well system. To date, 4 wells have been installed of a planned 5-well, 10,000-gpm system. In the event of an earthquake, the wells are expected to be in use for no more than 7 days.

Hayward overlies the San Lorenzo Cone, which contains an upper and a lower aquifer. The emergency water supply well screens are generally perforated across several intervals in the Lower Hayward Aquifer, between 350 and 550 feet below grade. The wells are 18 inches in diameter and were installed using reverse rotary drilling equipment. Although manganese concentrations are above the secondary maximum concentration level (MCL), DHS has given the City approval to use the wells in an emergency. Well water is chlorinated at each wellhead with sodium hypochlorite.

Hayward selected well sites that were generally on City property and adjacent to water transmission pipelines of 12-inch diameter or larger. The City historically operated a wellfield near

Hesperian and Industrial Boulevards; it was phased out of service starting in 1962, when Hetch Hetchy water became available. Only Well No. 9 remains operable (but inactive). Two of the four emergency wells installed to date (Wells B and C) are located near this former wellfield. The fifth well will replace Well No. 9.

13.4.2 East Bay Municipal Utility District (EBMUD)

Background: EBMUD was created in 1923 to provide a public water supply to East Bay communities. By 1929, EBMUD was providing imported water to the East Bay from Pardee Reservoir on the Mokelumne River in the Sierra Nevada Mountains. The reservoir provided a high-quality, reliable supply that soon eliminated the need for local groundwater wells. The District has expanded its boundaries as development has occurred, with demands increasing as agricultural areas with wells were converted into residential communities relying upon EBMUD for water.

EBMUD currently provides water to approximately 1.2 million customers in Alameda and Contra Costa Counties, including all of the East Bay Plain, except for portions of the City of Hayward, which receive water from the City of San Francisco's Hetch Hetchy Project. Average District-wide water consumption is approximately 200 million gallons per day (MGD). Of this, approximately 70-75% is delivered to customers in areas tributary to the East Bay Plain.

Pardee Reservoir provides 95% of EBMUD's water supply, with a small amount of water also contributed by local runoff collected in Briones, San Pablo, and Upper San Leandro Reservoirs in the East Bay hills. Lafayette and Chabot Reservoirs are available for emergency use only.

Normalized current EBMUD demand is expected to rebound to 220 MGD. Gross demand of 277 MGD is projected for the year 2020, much of which will be offset by aggressive conservation and reclamation programs. Supply from Pardee Reservoir is projected as 228 MGD in 2020.

Previous Investigations: For nearly seventy years, EBMUD has benefited from a reliable, high-quality water supply. Therefore, the District did not actively pursue local groundwater as a supplemental supply. In recent years, however, as more demands have been placed on Pardee Reservoir by senior water rights holders and environmental needs, it has become apparent that EBMUD must develop storage to meet customer demands during drought periods. The East Bay Plain Groundwater Basin is currently being considered by EBMUD as a water storage alternative.

In 1986 and again in 1993, the District performed reconnaissance level studies of groundwater resources within its East Bay service area. The study results indicated that at the time, other, higher quality resources might be available. The 1986 study compiled existing water quality information and aquifer characteristics and concluded that the southern part of the East Bay Plain and the San Ramon Valley were most promising for municipal use. In 1993, the District developed a Water Supply Management Program, which included a brief evaluation of local groundwater resources. The study concluded that total yield from local groundwater resources was not likely to meet the District's need for drought water supplies.

In 1997, based on improvements in dual purpose injection/extraction well technology, the District decided to evaluate whether the East Bay Plain could serve as storage for at least a part of the District's dry year supply.

Aquifer Storage and Recovery Pilot Project/Potential Future Beneficial Use: In 1997, EBMUD started a pilot project to evaluate the use of dual-purpose injection/extraction wells in the East Bay Plain. The technology, also known as aquifer storage recovery (ASR), may enable the District to store excess high-quality Sierra water supply underground for future use during a drought or earthquake. By using the same well for both injection and extraction, the District plans to extract virtually the same high quality water supply as was injected.

Exploratory borings were installed at the first project site in western San Lorenzo in the Fall of 1997. The borings indicated the presence of a significant aquifer zone at a depth of 550 to 660 feet below the ground surface. The borings were converted into monitoring wells, which were used to perform preliminary aquifer tests and water quality analyses. The results of these tests indicate that the aquifer appears to be suitable for ASR. Therefore, a more detailed pilot project is being undertaken with a larger well. The well will be tested by alternating cycles of injection and extraction to determine whether ASR may be feasible for EBMUD. In addition, a second pilot test is being initiated at EBMUD's Oakport property across Highway 880 from the Oakland Coliseum. The pilot project reports will be complete in the Spring of 1999 and will present an assessment of the feasibility of using ASR wells in the Plain for emergency water supply purposes.

The results of the pilot projects, along with an assessment of local groundwater resources, will be used to determine EBMUD's future plans for beneficial use of the Plain. Potential beneficial uses by EBMUD include ASR wells, municipal extraction wells, and non-potable irrigation wells. The actual locations of these facilities are not known, but may include any part of the East Bay Plain within the EBMUD service area where high potential for extraction or storage is available.

13.5 East Bay Plain City General Plans for Groundwater Use

In 1996, Regional Board Staff reviewed the General Plans for the East Bay Plain Cities of Alameda, Albany, El Cerrito, Berkeley, Emeryville, Hayward, Oakland, Piedmont, Richmond, and San Leandro, along with the Alameda County Resource Conservation District, the ACFCWCD, the North Richmond Shoreline, and Alameda County (see Appendix F). None of these cities had any plans to develop local groundwater resources for drinking water purposes, because of existing or potential saltwater intrusion, contamination, or poor or limited quantity. Only the City of Hayward is currently developing groundwater as an emergency drinking water supply. General plans for Richmond and El Cerrito acknowledge the potential for groundwater use in an emergency. However, both plans lack any specific details on such use.

However, the lack of interest by East Bay cities to install emergency groundwater wells may actually reflect confidence in EBMUD's role as water supplier rather than general disinterest.

13.6 Freshwater Replenishment

The ultimate points of discharge of groundwater in the East Bay Plain are surface water bodies including streams, lakes and San Francisco Bay. Freshwater bodies and the Bay support a range of aquatic life. Groundwater in the East Bay Plain retains the beneficial use of freshwater replenishment because groundwater discharge helps maintain surface water quantity and quality.

14.0 LOCAL REGULATORY INITIATIVES

14.1 City of Oakland Urban Land Redevelopment (ULR) Program

The ULR is a program designed to facilitate the cleanup and redevelopment of contaminated properties by clarifying investigation requirements, standardizing the regulatory process and establishing pre-approved cleanup standards for qualifying sites based on physical and chemical characteristics, land and water use, and potential for contaminant migration. The program is based on the premise that contaminated properties in Oakland pose not only a public health threat, but also affect the social and economic health of communities. Frequently, contaminated sites remain vacant, unremediated, and undeveloped because remediation and redevelopment efforts are stunted by liability issues, a confusing regulatory framework, and uncertainty surrounding cleanup costs.

Members of the ULR Oversight Committee include representatives from: EPA Region 9, State Board, Regional Board, DTSC, Alameda County EHD, and the City of Oakland. In addition, volunteers from consulting firms participate as non-voting members.

The ULR Program employs a tiered decision-making approach for evaluating sites that contain, or are suspected to contain, soil or groundwater contamination. The first tier consists of comparing site concentrations of chemicals of concern with a Tier 1 look-up table containing cleanup levels applicable at all Oakland sites. The second tier involves characterizing site geology and consists of comparing site concentrations of chemicals of concern with one of three Tier 2 look-up tables that contain cleanup levels based on geological setting. The Tier 2 process takes into account potential for contaminant retardation and migration in three different Oakland soil types: Merritt Sands, sandy silts and clayey silts. The Tier 3 process involves an extensive, site-specific analysis.

In Tiers 1 and 2, the property owner/developer has three options:

1. Clean up to the concentrations in the applicable look-up table.
2. Implement engineering controls that eliminate or sufficiently reduce exposure via pathways of concern
3. Undertake more site-specific analysis in a higher tier.

Cleanup levels for contaminated groundwater are partially dependent on the potential beneficial uses of the groundwater basin. Most groundwater in Oakland is currently designated as a potential source of drinking water, requiring the highest levels of protection. This has a direct impact on the determination of groundwater cleanup levels and, therefore, on development costs and the prospects

for economic revitalization in the Downtown and other commercial/industrial areas of the city.

In developing the ULR Program, a Community Review Panel was formed consisting of individuals who constituted a representative cross-section of the Oakland community. The ULR Program Community Review Panel Report indicates that Oakland's shallow groundwater is not currently, nor is it expected to be, utilized as a source of drinking water in Oakland. Further, it acknowledges that, due to historic contamination and alternative sources, groundwater in much of Oakland is neither a healthy nor a cost-effective source of drinking water. With this in mind, the Community Review Panel supports the Regional Board's study and a possible redesignation of the beneficial uses of some portions of Oakland's groundwater on the condition that the following recommendations are implemented:

- Ensure that the redesignation is based on sound hydrogeologic data;
- Show that it will have a positive impact;
- Demonstrate that it will have an equitable impact on the various socio-economic and ethnic groups within Oakland;
- Ensure that a viable plan exists for providing drinking water to Oakland residents in the case of any foreseeable emergency;
- Demonstrate an openness to innovative technologies for providing clean, fresh water;
- Undertake a public education campaign to inform Oakland residents of the potential health hazards associated with the use of groundwater from private wells;
- Increase the minimum well sanitary seal depth required to obtain a well construction permit;
- Ensure that standards for future polluting activities will not be relaxed based on the redesignation of the beneficial uses.

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14.2 Berkeley City Council Actions

In March, 1996, the Berkeley City Council responded to what they perceived as a weakening of the State Board Resolution 92-49 in State Board's Executive Officer Walt Pettit's proposed amendment to the resolution and in the recommendations found in the LLNL Report. Berkeley took the position that Resolution 92-49 gave Regional Boards authority to suspend remediation requirements on a case-by-case basis and suggested that any further loosening of these requirements not be adopted. Berkeley felt that "the initial intent of a containment zone policy was to provide a process for the closure of sites that had undergone remediation but for technological and financial considerations were unable to achieve drinking water standards but would still protect human health and the environment. The containment zone policy as currently proposed does not reflect this goal. Therefore, the City of Berkeley will not adopt these policies, as currently proposed."

Existing Toxics Management Division (TMD) policy is to preserve the water resource, where technologically and financially feasible, and this is consistent with existing State policy and with Berkeley policy set by Council in 1996. In the City's position (discussed in Council in 1996), the resource is identified first and if found to not be of quality, then a lower level of clean up is required. Berkeley's policy has several significant benefits, it reduces dependence on EBMUD water, less water is diverted from Sierra and Delta regions and provides an emergency resource if needed in the future. TMD proposes taking it further by actually correctly identifying and encouraging the use of groundwater for irrigation or industry, where possible. This indicates a commitment of maintaining high environmental and health standards.

14.3 U.S. EPA Brownfields Projects

A "brownfield" is a property, or portion thereof, that has actual or perceived contamination and an active potential for redevelopment or reuse. EPA's Brownfields Economic Redevelopment Initiative is designed to allow states, communities and other stakeholders in economic redevelopment to work together in a timely manner to prevent, assess, safely clean up, and sustainably reuse brownfields. Between 1995 and 1996, EPA funded 76 National and Regional Brownfields Assessment Pilots, at up to $200,000 each, to support creative two-year explorations and demonstrations of brownfields solutions. The pilots are intended to provide EPA, States, Tribes, municipalities, and communities with useful information and strategies as they continue to seek new methods to promote a unified approach to site assessment, environmental cleanup, and redevelopment. EPA has designated three municipalities within the Plain (Emeryville, Oakland and Richmond) as pilot project cities.

14.3.1 Emeryville

Background

Historically, heavy industry was the predominant land use in Emeryville, but the majority of these companies left the area in the 1970s. Currently, 234 acres are vacant or under-used, and 213 acres are known to have soil and groundwater contamination. Nearly half of the City's citizens are low-income, and more than half are minorities. Most of the City's poor live in neighborhoods bordered by brownfields. Although there is demand for residential and commercial development, the cost and risk associated with brownfields have impeded their redevelopment. The result for the City over the past five years has been a loss of $13.3 million in tax revenues and about 450 jobs.

Objectives

The aim of Emeryville's Brownfields effort is to encourage residential and commercial development by building stakeholder confidence in a risk management-based model for brownfields redevelopment. The model will incorporate an emerging State of California regulatory policy based on using an area-wide rather than a parcel-by-parcel approach to environmental cleanups.

Accomplishments and Activities

The Emeryville Pilot has:

- Selected ten brownfields sites for potential redevelopment. Collectively, these sites cover approximately 180 acres;
- Compiled hydrogeologic, soil, and groundwater information from available sources to develop geographical information system (GIS) and developed a Conceptual Groundwater Model (Geomatrix, 1998);
- Achieved a 50% completion milestone in development of a GIS model that incorporates environmental, economic, land use, and zoning information
- Convened a broad-based Community Task Force to serve as a forum for community participation in decision making related to brownfields redevelopment;
- Drafted a regulatory framework for a Mitigation and Risk Management Plan to incorporate a City-wide approach to groundwater cleanup.

Experience with the Emeryville Pilot has been a catalyst for related activities including the following:

- The Chiron Corporation, the second largest biotechnology firm in the country, will redevelop an unused research facility. Chiron will construct 12 new buildings over the span of 20 years to house their biotech firm, creating more than 3,000 jobs during this time.
- Catellus Development Corporation will construct 200 units of mixed income housing on a four-acre Brownfields site, considerably decreasing the City's housing shortage.

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14.3.2 Oakland

Background

Oakland selected two catalyst sites for redevelopment projects in its commercial and industrial centers: the 2-acre Central District Redevelopment Area and a 17-acre portion of the Coliseum Redevelopment Area of East Oakland.

The Central District Redevelopment Area, often referred to as the Uptown Theater District, encompasses Oakland's historic downtown. This area, which is anchored by the historic Fox Theater, was almost completely abandoned by business over the last three decades. Significant groundwater contamination has been identified in large portions of the area and must be addressed prior to redevelopment.

During the past two decades over 20,000 manufacturing jobs have been lost in the Coliseum Area due to plant closure and relocation. Over 600 acres in the Coliseum Area were vacated or are

under-used, and over 700 sites were identified as having known or suspected hazardous or toxic contamination. Most of the Coliseum Area is within a federally-designated Enhanced Enterprise Community.

In April 1997, an additional $100,000 was added to the Pilot grant, and is being used to encourage Brownfields redevelopment of the Fruitvale Bay Area Rapid Transit (BART) area's Transit Village project. This large-scale redevelopment project is designed to revitalize the neighborhood with shops, offices, and housing in a pedestrian-oriented setting. This is a local, community-driven project for which EPA is working in partnership with the Department of Housing and Urban Development (HUD), the Department of Health and Human Services (HHS), and the Department of Transportation (DOT) and private entities.

Objectives

The Oakland Pilot is seeking to revitalize the contaminated properties in the Central District and Coliseum Redevelopment Areas as well as the Fruitvale BART Station area. The major focus of the Pilot will be on completing Phase II site assessments and remediation planning. This information will assist Oakland's Redevelopment Agency in developing a strategy for redevelopment of the sites.

Accomplishments and Activities

The Oakland Pilot is:

- Reviewing existing data on two sites and completing site assessments;
- Completing health and safety plans, site surveys, and risk assessments, and preparing summary reports of the findings and recommendations; and
- Developing remedial plans and cost estimates.

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14.3.3 Richmond

Background

The project area is the 900-acre North Richmond Shoreline, which contains a variety of brownfields in a relatively compact area. Aging heavy industry, low-income housing, idle and vacant properties, and waste disposal facilities are concentrated in an area that borders a distressed neighborhood and an estuarine ecosystem known to support two endangered species. At least 36 properties (90 percent of the City's developable area) are contaminated with volatile organic compounds, polychlorinated biphenyls, and metals. The sector has a mix of thriving large businesses and struggling smaller ones. The presence of hazardous materials on the latter's property, combined with their shaky financial condition, has stymied growth in that sector.

Objectives

The focus of Richmond's brownfields effort is to stimulate economic growth and improve public health and the environmental quality of the Bay. To do this, the project is building on the intensive planning and cooperative partnerships that have evolved over the last five years. Richmond included a green component in its planning that will provide public recreation, open the shoreline for public use, and establish zoning standards to limit industrial activities that may endanger human health and the environment. Richmond is working to increase public awareness of contaminated sites and involve the community in remedial planning and redevelopment activities.

Accomplishments and Activities

Completed Activities:

- Created a computerized inventory of all properties within the project area. The listing includes assessor parcel number, site names, jurisdiction, address, property owner, and other site related information. A site inventory was distributed to interested parties;
- Developed site selection criteria and identified potential sites for matching funds from among the inventoried sites; and
- Held meetings with the North Richmond Industrial and Agricultural Association, the Municipal Advisory Committee, neighborhood councils, the League of Women Voters, and West County Toxics.

Current Activities:

- Completing preliminary site assessments of two to five sites within the North Richmond Shoreline;
- Developing financing mechanisms specifically to promote the City's brownfields process;
- Working to clarify jurisdictional authorities to promote coordination among the City, County, and State;
- Streamlining the regulatory process through cooperative partnerships with State and Federal authorities; and implementing community education and outreach programs to promote full stakeholder participation.

Related Activities:

- Several property owners, representing a number of large properties in the Pilot Project Area, are working together to explore issues of mutual concern such as regulatory cleanup processes and site assessments.
- The Pilot is working with Contra Costa College's Center for Science Excellence to develop information on the environmental status of each property in the inventory.

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14.3.4 Base Reuse Authority

There are a number of closing military facilities in the East Bay Plain. These include the Oakland Army Base, Alameda Naval Air Station, Fleet Industrial Supply Center Oakland, Oak Knoll Naval Hospital, and the Navy's Point Molate Fuel Depot. The facilities will be or have been taken out of military service and are intended for beneficial reuse. As part of the process leading to reuse, the facilities are being investigated and remediated to reduce impacts to human health and the environment to acceptable levels.

15.0 FINDINGS

This section summarizes the six key findings of the report.

15.1 Portions of the East Bay Plain currently support all of the groundwater beneficial uses listed in the Basin Plan.

Until the 1930s, the East Bay Plain Groundwater Basin historically was extensively used for drinking water, industrial, and agricultural supply. However, because of the lack of an adequate and dependable supply for a growing population, the East Bay now relies on imported surface water to satisfy nearly all drinking water and industrial demands. By far the most frequent current use of groundwater is for irrigation from "backyard" private shallow wells. It is estimated that East Bay Plain groundwater is used by over 4000 homeowners for irrigation. Groundwater is also still used by 10 businesses for industrial purposes and by several users to irrigate a few parks, golf courses, cemeteries and schools.

Groundwater is still used as source of drinking water by several small systems in the cities of Hayward, San Leandro and Oakland. A total of five permitted water systems (three in Hayward and two in San Leandro) are known to serve between 4 and 180 households each. The only known permitted system in Oakland is located in the Oakland Hills above the East Bay Plain Groundwater Basin. There are no permitted water supply systems north of Oakland.

In addition, according to Alameda County Flood Control & Water Conservation District's (ACFCWCD's) records, there are 507 wells that are classified as municipal or domestic wells. Nearly all of these wells are believed to be used for residential irrigation. However, there are still some individual private wells being used for drinking water.

The following table shows the existing and potential beneficial uses as determined by this evaluation for the Sub-Areas proposed by Figuers (1998).

Table 8. Existing and Potential Beneficial Uses in Sub-Areas of the East Bay Plain

Sub-Area	MUN – Municipal And Domestic Water Supply	AGR – Agricultural Water Supply	IND –Industrial Service Water Supply and PROC Industrial Process Supply
Richmond	E[1]	E	E
Berkeley	E[1]	E	E
Oakland	E[1]	E	E
San Leandro	E	E	E
San Lorenzo	E	E	E
Central	E[1,2]	E	E

P-Potential E-Existing

[1] No known existing drinking water wells, existing MUN designation based on backyard irrigation use.

[2] EBMUD has installed a pilot aquifer storage well in the Central Sub-Area, which, if successful, would result in an existing beneficial use.

15.2 A review of historical groundwater beneficial uses provides insight into future probable uses.

All water supplies in the East Bay were derived from wells and local runoff until the import of Sierra water into the area in 1930. Figuers (1998) searched for historical private and municipal wells as part of a comprehensive evaluation of groundwater conditions in the East Bay Plain for the Regional Board. In addition to municipal well fields, thousands of private wells supplied water to homes and businesses. In 1911, there was an extensive survey of all private and public wells in the East Bay area, locating and mapping more than 3400 active wells serving a population of about 232,150 (1910 census). Norfleet estimates that in the range of 15,000 wells were drilled in the East Bay Plain between 1860 and 1950. The majority of the wells were less than 50 feet deep, but many were 200 to 500 feet deep, with the deepest reaching 1000 feet below the ground surface. A few are still in use today, but most were abandoned and forgotten. Virtually none of these wells was properly destroyed.

Table 9. Summary of East Bay Plain Groundwater Basin Sub-Areas

Sub-Area	Approximate Basin Depth	Historic Municipal Groundwater Well Fields (circa 1890-1930)	Are Significant Aquitards Present?
Richmond	>600 ft.	Yes, San Pablo and Richmond Well Fields	No
Central	>1000 ft	Yes, High Street Well Field	Yes
Berkeley	< 300 ft.	No, but suitable for limited single family/industrial users. No historical evidence that groundwater supplies are sufficient for municipal use	No
Oakland	< 700 ft.	Yes, Fitchburg Well Field	Yes, along western portion
San Leandro	700-1100 ft.	No, however, area was primarily rural prior to 1930.	Yes, along western portion
San Lorenzo	700-1100 ft.	Yes, Roberts Well Field	Yes, along western portion

15.3 Shallow groundwater has been degraded locally in much of the East Bay Plain and regionally in the Cities of Emeryville and San Leandro. Deeper groundwater supplies are at risk given the number of abandoned wells.

Ambient monitoring data on common organic pollutants within the deeper groundwater (i.e., deeper than about 100 feet) is very limited. Based on this limited data, the overall water quality of deep groundwater in the East Bay Plain is good. Much more data is available on the water quality of shallow groundwater (i.e., less than about 100 feet). Some shallow groundwater has been impacted by historical and current releases of fuels and solvents. See Section 8.0 and 9.0 for a more detailed discussion on water quality.

Groundwater pollution in the East Bay Plain appears to generally be restricted to portions of the shallow aquifers. Typically, site investigations require that groundwater plumes be defined in both the lateral and vertical dimension. In almost all cases, groundwater pollution appears limited to less than 50 feet below the ground surface.

However, recently one of EBMUD's aquifer storage test wells detected contamination at a depth of over 200 feet below ground surface. Volatile organic compounds were detected in a test well located west of Interstate 880 about one mile north of the Oakland Coliseum. TCE was detected in the test well at 50-70 ppb that was screened between 260 and 350 feet below ground surface. Prior to this detection, no pollution had ever been detected above trace levels at depths greater than 140 feet. The source and migration pathway for the TCE contamination is currently under investigation by DTSC.

Although the source of the above deep groundwater contamination has not been defined, it may illustrate the potential for connection between the shallow deposits and deeper aquifers. Moreover, given that there are very few existing wells pumping from the deeper aquifer, and the numerous historical wells in the East Bay Plain that could be vertical conduits, if the number of wells pumping from the deeper aquifer increases, there is a potential that shallow pollution could be drawn down into the deeper aquifers.

15.4 Innovative remedial approaches are being developed to manage East Bay land that often contains soil and groundwater pollution.

Several significant land development and redevelopment initiatives may be affected by the regulatory recommendations resulting from this beneficial use evaluation. The initiatives are as follows:

- Closing Military Bases and Conversion to Civilian Uses;
- City of Oakland Urban Land Redevelopment Program; and

- US EPA's Brownfields Economic Redevelopment Initiative for Emeryville, Oakland, and Richmond.

These initiatives have a common interest in remediating and redeveloping East Bay land that often contains soil and groundwater pollution.

A legacy of intense urban and industrial development has contaminated some soil and portions of the shallow East Bay Plain aquifers. In general, addressing soil contamination issues is relatively straightforward compared to groundwater. For soil cleanup, most projects utilize a risk-based approach to establish cleanup levels. Then, based upon redevelopment, technical, and economic factors, the soil is either excavated to remove chemicals above a prescribed level or remediated in-situ. Groundwater cleanup, on the other hand, poses a much more difficult dilemma. First, groundwater contamination is usually much larger in areal extent than soil contamination and may underlie many other properties besides the source property. Second, since all groundwater is essentially currently designated with a municipal beneficial use, the groundwater cleanup objectives are set no greater than drinking water standards. Given the technical difficulty of restoring contaminated aquifers, most groundwater cleanup involves significant expenditures in the range of $100,000 - $1,000,000+, and time frames measured in decades (for VOCs). Compared to soil cleanups, costs for groundwater cleanups are much more difficult to forecast. The staggering costs and potential liability associated with cleaning up this contamination severely impacts local redevelopment efforts.

The uncertainty in projecting cost and cleanup time has resulted in financial institutions being unwilling or very risk-adverse when considering whether to invest in groundwater contaminated areas of the East Bay Plain. In addition, the uncertainty breeds delays in converting closing military bases to civilian uses including expanding the Port of Oakland's maritime facilities. Moreover, most groundwater contamination is located in shallow groundwater zones that are unlikely to ever be used as a source of drinking water and are often isolated from deeper or regional aquifers. The viewpoint of many of the parties involved in groundwater remediation is that society is essentially spending enormous amounts of money to remediate contaminated shallow groundwater even though it will take decades to restore, is unlikely to be used, is usually isolated from deeper and regional aquifers, and if used, will likely still need treatment to meet use requirements.

Additionally, several other essentially local programs and initiatives may have an impact upon groundwater cleanup: US EPA's Underground Injection Control program, wellhead protection programs, and source water protection programs under the amended Safe Drinking Water Act. At this time, none of these programs have been developed enough to indicate their impacts on redesignating beneficial uses.

15.5 East Bay Municipal Utilities District is considering using portions of the East Bay Plain for conjunctive use.

In 1997, EBMUD started a pilot project to evaluate the use of dual-purpose injection/extraction wells in the East Bay Plain. The technology, also known as aquifer storage

recovery (ASR) may enable the District to store excess high-quality Sierra water supply underground for future use during a drought or earthquake. By using the same well for both injection and extraction, the District plans to extract virtually the same high quality water supply as was injected. The results of the pilot projects, along with an assessment of local groundwater resources, will be used to determine EBMUD's future plans for beneficial use of the Plain. Potential beneficial uses by EBMUD include ASR wells, municipal extraction wells, and non-potable irrigation wells. The potential locations of these facilities are not known, but may include nearly any part of the East Bay Plain within the EBMUD service area. Aquifers likely to be used would be below the Yerba Buena Mud.

15.6 EBMUD's Backflow Prevention Database can be used to supplement ACFCWCD well searches.

Two public databases that contain information on existing wells in the East Bay Plain yield notably different estimates. The ACFCWCD database covers the Alameda County portion of the East Bay Plain. EBMUD maintains a database of addresses where they have installed backflow prevention devices at residential or commercial properties that have volunteered that they have wells. EBMUD's database covers the entire East Bay Plain with the exception of Hayward, which is outside their service area. Comparisons between the two databases yield notably different estimates regarding the number of wells in different communities. The following table provides an example of the differences between the databases in the number of wells in selected cities.

Table 10. Comparison of EBMUD and ACFCWCD Well Databases

City	[1]EBMUD Backflow Prevention Database	[2]ACFCWCD Well Permit Database
Alameda	400	2
Oakland	400	32
San Leandro	1958	76
San Lorenzo	756	14

Note:
[1] EBMUD database only includes wells owned by property owners that voluntarily agreed to participate in its backflow prevention program.
[2] ACFCWCD database only includes wells drilled after 7/17/73 and wells documented by DWR for the groundwater investigation in Alameda County in the 1960's.
Above statistics are for all domestic, municipal, industrial and agricultural wells.

Currently, environmental consultants use the ACFCWCD database to search for active wells in the vicinity of groundwater pollution sites. Since the EBMUD backflow database has a greater number of wells, consultants should also search this database although there may be privacy issues to be resolved.

16.0 ANSWERS TO KEY QUESTIONS

At the outset of this beneficial use evaluation, the committee posed six key questions:

Question No. 1. What are the current and planned future groundwater beneficial uses of the East Bay Plain?

Answer: All groundwater beneficial uses currently exist in the East Bay Plain. However, the existing uses are relatively limited in certain Sub-Areas. The only firm plans for future use are by the City of Hayward for Emergency Supply (see Section 13.4.1). In addition, EBMUD is evaluating the potential for use of the East Bay Plain for storage of imported surface water and/or use of native groundwater (see Section 13.4.2).

Background: Groundwater was the major source of drinking water in the East Bay prior to the development and import of a Sierra water supply in the 1930s to serve a growing population and to solve water supply reliability problems. Since that time, groundwater has served only a minor role in water supply, primarily for industrial or irrigation purposes. However, following 60 years of near obscurity, there has been a recent resurgence in interest in using groundwater as a supplemental water supply (e.g., Hayward's emergency groundwater municipal supply system) and some others are being seriously considered (EBMUD's groundwater storage and retrieval project). A new test well was drilled by EBMUD in the San Lorenzo area during 1998. The 660-feet deep well was constructed to evaluate the potential for using the East Bay Plain aquifer to store imported surface water. The water would be used in the event of a drought or after a major earthquake. EBMUD is evaluating another well site near the Oakland Coliseum and may consider other sites within the East Bay Plain. Such storage is attractive because it would provide a reliable, although limited, emergency supply west of the Hayward Fault. The City of Hayward has in the past few years installed four wells as part of a five well project to provide a 7-day emergency municipal water supply in the event of an emergency (e.g., earthquake).

Question No. 2. Can the East Bay Plain be subdivided into Sub-Areas based on hydrogeology?

Answer: Yes, and it should be. The East Bay Plain has been subdivided by several previous investigators (Todd, 1986; Muir, 1988; Maslonkowski, 1988; Figuers 1998). Figuers' subdivision is a refinement and expansion of Muir and Maslonkowski's work. For this beneficial use evaluation, it is recommended that the Basin Plan be revised to incorporate the groundwater basin subdivisions of Figuers (1998).

Background:
The East Bay Plain can be subdivided into six Sub-Areas (Figuers, 1998), (Figure 13). The Sub-Areas laterally merge into one another, and there are few distinct subdivisions based upon depositional source. No distinct flow boundaries/barriers, topographic, or geologic features provide easily recognizable boundaries. The Sub-Areas were based on a combination of previously defined boundaries and a specific analysis requested by the Regional Board of Figuers of geologic, hydrogeologic, and geomorphic factors available from historical and contemporary data.

Question No. 3. Where is the use of the East Bay Plain limited?

Answer: Groundwater uses in portions of the East Bay Plain Sub-Areas are limited by several factors: 1) existing high TDS levels in shallow Bay Front aquifers, 2) the existing high TDS levels in artificial fills, 3) the potential for saltwater intrusion, 4) volatile organic compound groundwater contamination in portions of the shallow aquifers, 5) lack of significant water quantities and/or storage, and 6) shallow non-point source groundwater contamination from leaking sewer lines, septic systems and applied fertilizers.

Background:
Based upon an analysis of the available data, some limitations on the use of the Sub-Areas are as follows:

Table 11. Municipal Beneficial Use Limiting Factors in the East Bay Plain

Sub-Areas	Extensive Shallow VOC Groundwater Pollution	Existing High TDS Levels in Artificial Fill	Existing High TDS Level in Shallow Bay Front Aquifers
Richmond		√	√
Berkeley			
Oakland		√	√
San Leandro	√		
San Lorenzo			
Central		√	√

Question No. 4. Can the shallow and deep zones have different designations?

Answer: The question is applicable because most groundwater pollution in the Bay Area is shallow (i.e., less than 50 feet below the ground surface) and most use, other than for backyard irrigation, is from deeper aquifers, typically greater than 200 feet below ground surface. Based primarily upon available data, at this time it appears that the shallow and deep aquifers cannot have different designations in most of the East Bay Plain. However, there are localized situations where such differentiation can be made.

Background:
The Yerba Buena Mud forms a major aquitard between the shallow and deep aquifers throughout much of the southwest portion of the East Bay Plain. However, the integrity of the aquitard probably is compromised due to the drilling of wells in the 1890-1930 time frame. In Oakland, it is estimated that there are over 200 wells that penetrated the Yerba Buena Mud. Virtually none of these wells were properly destroyed. In the remaining portions of the East Bay Plain, the Yerba Buena Mud is not present and thus no natural aquitard separates the shallow and deep aquifers.

One exception is the area along the extreme western East Bay Plain Shoreline where artificial fill was placed after 1930. In this area the Yerba Buena Mud is continuous and should form a natural barrier to minimize the downward spread of pollution.

From a hydrogeologic standpoint, no aquitard is impermeable. However, for significant downward

migration to occur several factors need to be present. First, a pollution source must be present with high enough residual concentrations to be detectable if it migrates from the shallow to the deeper aquifers. Second, there must be a pathway for the pollutants to migrate from the shallow to the deep aquifers. This pathway may be a man-made conduit such as an improperly installed or abandoned well, or natural discontinuities in the aquitard itself. Lastly, a gradient must be present that drives the contaminants downward. This can be due to hydraulic gradient downward caused by pumping from the lower aquifer, or a density gradient caused by the presence of dense non-aqueous phase liquids such as free phase solvents or PCBs.

In the Santa Clara Valley, shallow groundwater contamination has rarely migrated through the regional aquitard and effected the deeper aquifers. However, of the several sites with pollution below the regional aquitard, nearly all are believed to be due to vertical migration along abandoned or poorly destroyed wells.

Question No. 5. Should any current beneficial use designations change?

Answer: Groundwater beneficial uses should be changed in the vicinity of the Port of Oakland Alameda Point and the Chevron Refinery in Richmond for artificial fill. Such changes are described in Section 17.9.

Background:
The current Basin Plan designates all groundwater beneficial uses as "existing." While this designation is appropriate for the East Bay Plain as a whole, the designations do not apply when the basin is appropriately divided into Sub-Areas.

As outlined in the discussion of Question 3, municipal and domestic supply beneficial use is limited in several areas of the East Bay Plain. Most notably, the shallow artificial fill along the Bay-front is unlikely to be used as a source of drinking water due to the existing high TDS, potential for saltwater intrusion, and relatively low yield.

Question No. 6. Are there any areas requiring special protection programs?

Answer: Several areas should receive additional focus. First, the deeper portions of the basin in the San Lorenzo, San Leandro, Southern Oakland and Richmond Sub-Areas appear to be the most likely areas for future potential MUN beneficial use. Monitoring the deeper aquifers for organic pollutants is necessary. Second, a well destruction program should be initiated to locate and seal abandoned wells in the East Bay Plain. Former wells located near emergency water supply wells, and aquifer storage and recovery wells would be primary candidates for determining their location and destruction. Third, the existing water supply systems listed in Section 13.3 should be subject to a source water protection program.

17.0 RECOMMENDATIONS

Based on the analysis and findings of this report, the following recommendations are made:

17.1 The Regional Board should amend the Basin Plan to recognize the East Bay Plain Basin Sub-Areas. (As shown on Figure 13).

17.2 The existing ACFCWCD regional groundwater monitoring network should be expanded to include more wells, monitored more frequently, and for a larger list of chemicals of concern. A similar network is also needed in the Contra Costa County portion of the East Bay Plain.

Such a network could be modeled after the proposed monitoring program developed as part of a USEPA grant application (City of Emeryville, 1998). The grant was not funded, but the cooperating agencies are interested in the network. The grant sought to create the "East Bay Groundwater Awareness and Information Network" (GAIN). The objective of GAIN are (1) to design a community based, time relevant groundwater monitoring program network, (2) cultivate public interest in obtaining and using information, (3) complete a time relevant groundwater monitoring network, and (4) manage, process, and deliver groundwater monitoring data to the public. GAIN is designed to provide East Bay residents with the ability to gauge for themselves the overall "health" of their deep groundwater resources. GAIN also targets localized areas where groundwater is contaminated and residents have requested monitoring data to guide decisions affecting economic revitalization.

17.3 Agencies within the East Bay Plain should make their well databases more accessible to the public.

A well search is typically required as a part of a groundwater contamination investigation that involves a plume that has migrated offsite and beneath adjacent properties. The purpose is to determine if any groundwater wells could be impacted by the plume, and to notify the well owner if necessary. A well search may include a database review, door-to-door surveys and/or targeted mailings.

Five agencies maintain well databases in the East Bay Plain. ACFCWCD is the primary well permitting agency in the Alameda County Portion of the basin, and well searches can be requested by contacting Andreas Godfrey at 510-670-5575. EBMUD has a database of well owners in its area for their Backflow Prevention Program (see Figure 18). The Regional Board has a database of historic wells that are shown in Figure 2 of this report. Contra Costa County and the City of Berkeley both permit well installations in their respective jurisdictions, but, well searches are not currently publicly available. Both Contra Costa County and the City of Berkeley have plans to make their well databases more accessible in the future.

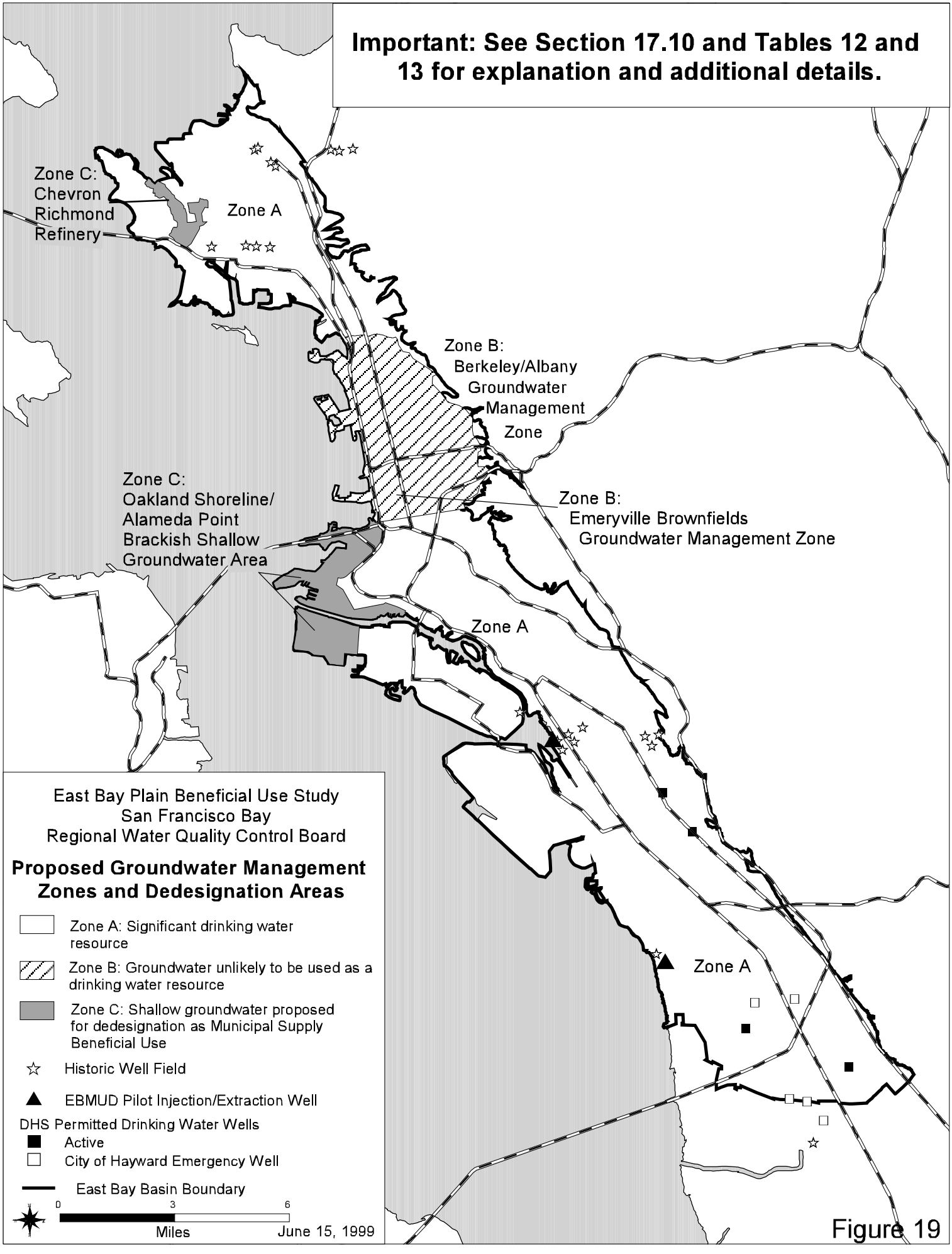
Important: See Section 17.10 and Tables 12 and 13 for explanation and additional details.
Zone C: Chevron Richmond Refinery
Zone A
Zone B: Berkeley/Albany Groundwater Management Zone
Zone C: Oakland Shoreline/ Alameda Point Brackish Shallow Groundwater Area
Zone B: Emeryville Brownfields Groundwater Management Zone
Zone A
Zone A
East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Proposed Groundwater Management Zones and Dedesignation Areas
Zone A: Significant drinking water resource
Zone B: Groundwater unlikely to be used as a drinking water resource
Zone C: Shallow groundwater proposed for dedesignation as Municipal Supply Beneficial Use
Historic Well Field
EBMUD Pilot Injection/Extraction Well
DHS Permitted Drinking Water Wells
Active
City of Hayward Emergency Well
East Bay Basin Boundary
0
3
6
Miles
June 15, 1999

Figure 19

Plans are under way to coordinate EBMUD's backflow database and the historic well locations contained in Figuers (1998) with ACFCWCD's database and make all three databases available at one agency.

17.4 The Regional Board Staff should encourage the use of aquifers in the East Bay Plain for groundwater storage.

An increase in local storage capacity would be a small but significant step towards implementing the recommendations of the Comprehensive Conservation and Management Plan (CCMP) prepared by the San Francisco Estuary Project. The CCMP encourages the use of groundwater basins with the capacity to store additional water to be used as "water banks." Freshwater inflow is a major factor that determines environmental conditions in the Estuary. The volume and timing of freshwater inflow affects the Estuary's circulation and water quality, conditions for wildlife and the survival of aquatic species. If groundwater from existing sources or surface water is stored in these aquifers (either from surface water sources in wet years or from treated wastewater), demand on limited surface water resources can be reduced.

17.5 The Regional Board staff should encourage the establishment of a basin-wide groundwater management program.

This could take the form of a formal AB 3030 Groundwater Management Plan with a Wellhead Protection Plan included, a stand-alone Wellhead Protection Plan, or a regional plan that addresses issues specific to the East Bay Plain.

Currently, much historical and geological information is available on the past use of groundwater, water availability and quality, as well as problems encountered by past use. EBMUD is currently evaluating the potential of using the East Bay Plain for conjunctive use and has drilled two deep wells in the study area. At a minimum, it would be useful for both planning purposes and water quality protection to develop some type of plan that would address the specific issues within the potential capture zones of the new wells.

Elements of the management plan could address: saltwater intrusion, overdraft, delineation of the aquifer and its recharge areas, location of potential sources of contamination (e.g., a source water protection plan), a plan to decommission old wells, conjunctive use, proper well construction, coordination with local, state and federal agencies, and review of land use planning activities that might create a risk to groundwater.

If EBMUD's pilot groundwater storage project is successful, then they would be the obvious local agency to assume a management role in the East Bay Plain. In addition, the ACFCWCD charter provides the county with some groundwater management authority. By monitoring both groundwater levels and quality, ACFCWCD is practicing the first level of groundwater management.

17.6 The methods required for conducting a Vertical Conduit Study and Well Search in the East Bay Plain should be formalized by the Regional Board.

There is no formal guidance that describes the necessary tasks for conducting Vertical Conduit Studies or Well Searches in the East Bay Plain. Given the importance of such studies as part of groundwater contamination investigations, it is recommended that the information collected in this report as well as other references on the subject be compiled into a single document.

Cities within the East Bay Plain and Alameda and Contra Costa Counties should consider implementing a well abandonment program similar to the one developed by the Alameda County Water District. Such a program would require developers to destroy any abandoned wells prior to redevelopment.

17.7 The Regional Board should encourage the establishment of a vertical conduit location and abandonment program.

It is estimated that there are 15,000 historical wells in the East Bay Plain that were drilled between 1860 and 1950. Most of these wells have been abandoned but not properly destroyed. Some of these wells may pose a current threat to the East Bay Plain because they provide a potential vertical pathway for shallow contamination to migrate into the deeper zones. The program could be implemented by Contra Costa and Alameda counties.

17.8 The GIS coverages that were developed as part of this Beneficial Use Evaluation should be updated regularly and made accessible to the public on the Internet.

The databases include location information on groundwater pollution sites and historical and modern well locations. A dedicated funding source for maintaining these coverages will need to be located. The GIS analysis conducted for this project identifies areas where their efforts can be targeted.

17.9 Proposed Groundwater Management Zones and Dedesignation Areas

The East Bay Plain can be subdivided into three management zones for purposes of prioritizing groundwater remediation and dedesignating beneficial uses. Subdivisions were developed by utilizing the information presented in this report on water quality, historic, existing and probable-future beneficial uses, and hydrogeology.

The following subdivisions are proposed for preserving and restoring groundwater beneficial uses in the East Bay Plain. A description of each subdivision is included below, summarized on Tables 12 and 13 and shown graphically on Figure 19.

Zone A - Significant drinking water resource. Remedial strategies should be focused on actively maintaining or restoring groundwater quality to drinking water quality objectives. These areas historically supported a municipal beneficial use prior to the 1930's and likely

could, with proper management, be used as a limited municipal source of drinking water in the future. In Hayward and San Leandro, there are five permitted small water system wells that serve, collectively, over 200 individual users. However, relatively low recharge rates limit the sustained yields. Cleanup, spill prevention and education efforts within the source water protection zones of existing municipal wells should be the top priority of local and state programs.

Portions of Zone A may warrant higher concern. For example, areas within Zone A with a high density of potential conduit wells and/or shallow backyard wells may need to receive higher priority and be subject to more detailed investigations than other areas. An example of delineating such areas is shown on Figure B-3 in Appendix B.

From a beneficial use perspective, these areas are of higher concern because 1) historic wells may act as vertical conduits and allow shallow contamination to migrate into deeper aquifers, 2) current backyard irrigation wells may represent an incidental drinking water exposure pathway to groundwater contamination as well as a non-drinking water pathway (e.g., volatilization or irrigation of fruits and vegetables), and 3) contamination sites within source water protection zones may impact existing or planned drinking water wells.

Investigation and remediation of groundwater contamination sites within areas of higher concern should be tailored to address the potential for beneficial uses to be impaired due to any of the three above issues. Depending on the site-specific circumstances, this may include a more in-depth investigation (to identify the location of historic or current wells) or more aggressive remediation (to protect current or planned drinking water wells). Groundwater contamination sites within source water protection zones should be the top priority of local and state programs.

Within Zone A, there are also areas that may warrant less aggressive remediation on a case-by-case basis. As a mechanism to both recognize that the shallow groundwater is unlikely to be used for drinking water, but still safe guard the deeper aquifers for future drinking water supply uses, a less aggressive remediation strategy is recommended. Criteria for allowing less aggressive remediation in Zone A areas is discussed in Recommendation 17.10.

Zone B - Groundwater that is unlikely to be used as a drinking water resource. While these areas meet the broad "sources of drinking water" criteria, limiting factors related to yield and water quality restrict practical uses. Remedial strategies should reflect the low probability that groundwater in this zone will be used as a source of drinking water in the foreseeable future. However, other beneficial uses/exposure pathways exist and should be protected. These include domestic irrigation, industrial process supply, human health, and ecological receptors. The potential for exposure via incidental ingestion from back yard wells should be evaluated. Appendix B highlights areas within Zone B that have the highest density of backyard wells. Zone B areas should utilize risk based corrective action in establishing groundwater cleanup standards. Passive remediation to restore MUN beneficial uses as a long-term goal is recommended.

Important Note - This report is not recommending beneficial use dedesignation for Zone B areas. Furthermore, these recommendations should not be considered as advocating a "No Action" approach to groundwater pollution. Rather, Zone B is an area where other, non-drinking water, exposure pathways are more likely to "drive" remediation.

Within the Easy Bay Plain, areas proposed for Zone B management are:

Berkeley Sub-Area Groundwater Management Zone: Groundwater extraction for municipal drinking water supply is unlikely in the Berkeley Sub-Area due to the relatively thin aquifer (ranging from 10 to 300 feet thick, and averaging 100-200 feet thick) and limited groundwater recharge (Figuers, 1998). Accordingly, remedial strategies should be focused on actively protecting existing domestic irrigation and industrial uses and potential aquatic receptors rather than as a municipal drinking water supply. Achievement of drinking water objectives within a reasonable time period is an appropriate long-term goal. At a minimum, groundwater pollutant sites would be regulated pursuant to SWRCB Resolution 92-49, and need to demonstrate 1) that reasonably adequate source removal has occurred, 2) the plume has been reasonably defined both laterally and vertically and 3) a long-term monitoring program is established to verify that the plume is stable and will not impact ecological receptors or human health (e.g., from volatilization into trenches and buildings).

Emeryville Brownfields Groundwater Management Zone: Groundwater is not currently used for any municipal, domestic, industrial, or agricultural purpose in Emeryville. No extractive beneficial uses are planned in the future. Remedial strategies should focus on protecting potential aquatic receptors and potential future irrigation or industrial uses. Achievement of drinking water objectives within a reasonable time period is an appropriate long term goal. Emeryville has developed a sub-regional groundwater monitoring plan that will provide information on both the shallow and deeper aquifer water quality. In addition, Emeryville has developed a detailed GIS system for tracking contaminated properties that will help to prevent inappropriate land uses. Lastly, Emeryville may consider assuming some of the liability for the groundwater pollution as well as overseeing smaller cleanups under an agreement with DTSC and the Regional Board.

Zone C - Shallow, nonpotable groundwater proposed for dedesignation of the Municipal Supply Beneficial Use. The Regional Board should locally dedesignate the municipal beneficial use for brackish, shallow groundwater in Bay-front artificial fill, young bay mud and the San Antonio Formation/Merritt Sand. This groundwater meets the exemption criteria of the State Water Resources Control Board's (SWRCB's) Sources of Drinking Water Policy because the groundwater could not reasonably be expected to serve as a public water supply and exceeds the 3000 mg/L total dissolved solids criteria. Cleanup should be protective of ecological receptors and human health. In addition, pollution sites will continue to be required to demonstrate 1) that reasonably adequate source removal has

occurred, 2) the plume has been reasonably defined both laterally and vertically and 3) a long-term monitoring program is established to verify that the plume is stable and will not impact ecological receptors or human health (Pursuant to SWRCB Resolution 92-49. Remedial strategies should focus on other exposure pathways such as human health and ecological receptors.

In addition, for Zone C areas overlying more productive, although currently unused deeper aquifers, potential vertical conduits should be located and properly destroyed. Contamination in deep zones underlying Zone C would be subject to the requirements of Zone A.

Two shallow groundwater areas in the East Bay Plain are recommended for dedesignation. Any deep aquifers in these areas would continue to be designated as MUN.

Oakland Shoreline/Alameda Point Brackish Shallow Groundwater Zone: In this zone, shallow bay-front groundwater in the artificial fill, Young Bay Mud and San Antonio/Merritt Formations generally exceeds the 3000 mg/l TDS criteria (SWRCB Resolution No. 88-63). Dedesignation of the municipal beneficial use in this area is therefore warranted. While some artificial fill has TDS below 3000 mg/l (due to recharge from rainfall, landscape irrigation and leaking water pipes), most groundwater to a depth of 100 feet below ground surface is not a Resolution No. 89-39 source of drinking water. An evaluation of TDS data in the vicinity of the FISCO Navy Base, Port of Oakland and Alameda Point is included in Appendix G. A review of groundwater TDS data from other portions of the Port of Oakland High TDS Zone (i.e., Port of Oakland, Alameda Point, Oakland Army Base) shows similar results.

Chevron Richmond Refinery: This is a large refining complex and tankfield. Over 300 different refined petroleum products are manufactured and stored at the refinery. The refinery was built at the turn of the century. The 2900-acre refinery lies along the southern shore of San Pablo Bay in Contra Costa County. Portions of the property were created from bay fill.

Groundwater pollution at the refinery is prevented from migrating off site by a four-mile long slurry wall/ groundwater interceptor trench, known as the Groundwater Protection System (GPS). Groundwater extraction through the trenches and/or wells establishes and maintains a contiguous capture zone, which prevents migration of potentially contaminated shallow groundwater past the GPS alignment. A low permeability Bay Mud “floor” inhibits vertical transport of shallow contaminants to the underlying deeper aquifers (see Appendix D for more detail). Since 1988, Chevron has spent approximately $100 million on groundwater remediation at the Richmond Refinery.

Dedesignation of the municipal beneficial use of the shallow groundwater (to approximately 100 feet) is proposed beneath the “Flats Zone” which comprises the

flatland marsh area bounded by San Pablo Bay to the north and extending south along the northeast side of Potrero-San Pablo Ridge. The Regional Board has previously found that the GPS is a satisfactory corrective action measure and protects beneficial uses of San Francisco Bay and underlying deeper aquifers.

17.10 Less Aggressive Remediation Approach

Within the East Bay Plain, there are groundwater pollution plumes that may warrant less aggressive remediation on a case-by-case basis. In general aggressive cleanup may not be warranted when the plume is shallow, concentrations are declining and no beneficial uses are threatened. The requirement for aggressive cleanup can possess a serious obstacle to redevelopment of blighted brownfields. The goal of the proposed Less Aggressive Remediation Approach is to outline "basin specific" situations where less aggressive remediation may be acceptable.

One example is pollution in shallow deposits above the Yerba Buena Mud. Groundwater in these shallow deposits is unlikely to be used as a source of drinking water (due to low yield, elevated levels of coliform from leaking sewer pipes, and requirement for a 50-foot well seal for new municipal wells). However, deeper aquifers beneath the Yerba Buena Mud do have a high potential for municipal development. Therefore, it is important that existing pollution in the shallow deposits is prevented from migrating into the deeper aquifers below the Yerba Buena Mud. As a mechanism to both recognize that the shallow groundwater is unlikely to be used for drinking water, and to safe guard the deeper aquifers for future drinking water supply uses, the following approach is recommended.

Ultimately, the remedial options that would be part of less aggressive strategy are dependent on site specific conditions. However, likely options could include restricting groundwater remediation to the source area only, allowing monitored natural attenuation, or implementing pump-and-treat solely to limit plume migration.

Less Aggressive Remediation Approach Criteria: The Regional Board should consider allowing less aggressive remediation within Zone A, on a case-by-case basis, provided that the responsible party demonstrates to the satisfaction of the Board, at a public meeting, that the following criteria are addressed:

1) the pollution is pre-existing and has not occurred subsequent to this policy;
2) pollutants are reasonably characterized both laterally and vertically;
3) the source is reasonably removed or remediated;
4) pollutant concentrations are stable or declining, and the requisite concentration levels will be attained within a reasonably defined time period;
5) the shallow aquifer is separated from the deeper aquifer by a continuous confining layer (the Yerba Buena Mud or its lateral equivalent aquitard);
6) potential vertical conduits are properly destroyed;
7) existing groundwater and surface water beneficial uses are not impacted by the pollutants;
8) the proposal is consistent with any local groundwater management plans and well head

protection areas (current or future).

The Regional Board should provide a 30-day public notice to all known, interested parties when considering taking such an action.

Comparison of "Less Aggressive Remediation Approach" to "Containment Zone Policy": Both the Containment Zone Policy and the proposed Less Aggressive Remediation Approach specify criteria to address existing pollution plumes. The following discussion provides a brief summary of the Containment Zone Policy and then contrasts key differences.

The Containment Zone Policy (SWRCB Order No. 92-49) provides a mechanism for regulating groundwater pollution where "attainment of applicable water quality objectives cannot reasonably be achieved," and is defined as a specific portion of a water bearing unit where the Regional Board finds that it is unreasonable to remediate to the levels that achieve water quality objectives.

The Containment Zone Policy establishes a number of conditions that must be satisfied before a containment zone may be adopted by a Regional Board. For instance, a containment zone applicant must "take all actions necessary to prevent the migration of pollutants beyond the boundaries of the containment zone in concentrations which exceed water quality objectives." Additionally, the applicant "must verify containment with an approved monitoring program and must provide reasonable mitigation measures to compensate for any significant adverse environmental impacts attributable to the discharge." Most significantly perhaps, the applicant "must propose and agree to implement a management plan to assess, cleanup, abate, manage, monitor, and mitigate the remaining significant human health, water quality, and environmental impacts to the satisfaction of the Regional Water Board."

There are two key differences between the Less Aggressive Remediation Approach and the Containment Zone Policy. The Less Aggressive Remediation Approach is a "basin-specific" approach that allows for management of plumes where requisite concentration levels will be attained within a reasonably defined time period. In contrast, the Containment Zone Policy is a statewide policy and addresses groundwater pollution where attainment of applicable water quality objectives cannot reasonably be achieved. Thus the Less Aggressive Remediation Approach differs because it based on local conditions and aimed at sites that will eventually meet applicable water quality objectives.

Table 12. Summary of Proposed East Bay Plain Groundwater Management Zones

Zone		Historical Public Water Supply	Historical Domestic Water Supply	Existing, Probable or Potential Drinking Water Source	Remediation Strategy	Location
A – Areas of Basin that have moderate to significant deep drinking watert resource	Shallow	Yes, but limited	Yes	Potential	For shallow pollution, goal is to maintain and restore drinking water quailty and actively prevent migration into deeper zones. Target areas of Special Concern shown on Table 13.	All of San Leandro and San Lorenzo Subareas; Bulk of Cen Oakland and Richmond Sub A
	Deep	Yes	Yes	Existing or Probable	For deeper aquifers require active remediation and hydraulic control to maintain and restore drinking water quality.	
B – Areas of basin that are unlikely to be used as a drinking water resource		No	Yes	Potential	Passive Remediation to restore drinking water quality as a long-term strategy while actively protecting private irrigation wells, human health and ecological receptors. Utilize risk based corrective action in establishing groundwater cleanup standards.	Berkeley Sub Area and Emery
C - Not a drinking water resource		No	No	Neither Existing, Probable or Potential	Protect human health and ecological receptors. Dedesignate MUN in Zone C. Utilize risk based corrective action in establishing groundwater cleanup standards. Locate and seal vertical conduits that extend into deeper portions of Zone B.	Shallow high TDS aquifers alo Oakland and Alameda Shorelin and at Chevron Refinery.

MUN - Municipal and Domestic Supply Beneficial Use
Shallow Zone - Groundwater within shallow deposits above the Yerba Buena Mud or its lateral equivalent.
Deep Zone - Groundwater below the Yerba Buena Mud or its lateral equivalent within the Alameda Formation or Santa Clara Formation as defined by Figuers (1998) .

Table 13. Proposed Strategy by Sub-Area for Addressing Groundwater Contamination in the East Bay Plain

Sub-Area	Vertical Subdivisions	Areas of special concern	Areas proposed for less aggressive or passive remediation.	Areas proposed for dedesignation
RICHMOND	*None*	Areas with a have high density of back yard irrigation wells in east central Richmond and western San Pablo (See Figure 17). North-central portion is deepest and potentially most productive (See Figure 10).	None defined, however, portions of Richmond Inner Harbor / South Shore Area may qualify. Bedrock is less than 200 feet deep in this area (See Figure 10).	Chevron Richmond Refinery
CENTRAL	*Shallow*	Area on Alameda Island with a high density of existing back yard irrigation wells pumping from Merritt Formation (See Figure 17). Bay front groundwater with potential to impact San Francisco Bay.	Shallow brackish artificial fill areas on a case-by-case basis (See Figure 17).	Portion of Alameda Point and Oakland Shorline
	Deep	Area south of the Bay Bridge where basin is deepest and potentially most productive (See Figure 10). High density of deep historic wells in City of Alameda (See Fig. 2 and Table 4).	None	None
BERKELEY	*None*	Areas with moderate density of back yard irrigation wells (see Figure 17).	Berkeley/ Albany Groundwater Management Zone. Emeryville Brownfields Groundwater Management Zone (see Figure 19).	None
OAKLAND	*Shallow*	Areas with moderate density of back yard irrigation wells (See Figure 17).	Regional Board will consider applicability of City of Oakland's Urban Land Redevelopment Protocol once it is finalized (see Section 14.1).	None
	Deep	Area south of Lake Merritt is deepest and historically most productive portion of the Oakland Sub-Area (See Figure 3). SWPZ for EBMUD aquifer storage and recovery test well near Oakland Coliseum (See Figure 14). High density of deep historic wells in City of Oakland (See Fig. 2 and Table 4).	None	None
SAN LEANDRO	*Shallow*	Areas with a high density of back yard irrigation wells (See Figure 17).	Shallow groundwater pollution sites that meet remediation and investigation criteria on a case-by-case basis (See Section 17.11).	None
	Deep	SWPZ for 2 small DHS Permitted Drinking Water Systems (See Figure 14).	None	None
SAN LORENZO	*Shallow*	Areas with a high density of back yard irrigation wells (Figure 17).	Shallow groundwater pollution sites that meet remediation and investigation criteria on a case-by-case basis (See Section 17.11).	None
	Deep	SWPZ for 2 small DHS Permitted Drinking Water Systems, 5 City of Hayward Emergency Supply Wells, and EBMUD aquifer storage and recovery test well near Ora Loma Waste Water Treatment Plant.	None	None

SWPZ – Source Water Protection Zone

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Appendix A: Basin Plan -- Table 2-9

GROUNDWATER BASIN	COUNTY	DWR BASIN NO.	MUN[1]	PROC[2]	IND[3]	AGR[4]	FRESH[5]
Alameda Creek (Niles Cone)	Alameda	2 - 9.01	E[6]	E	E	E	
Castro Valley	Alameda	2 - 8	P[7]	P	P	P	
East Bay Plain	Alameda	2 - 9.01	E	E	E	E	
Livermore Valley	Alameda	2 - 10	E	E	E	E	
Sunol Valley	Alameda	2 - 11	E	E	E	E	
Arroyo Del Hambre Valley	Contra Costa	2 - 31	P	P	P	P	
Clayton Valley	Contra Costa	2 - 5	E	P	P	P	
Pittsburg Plain	Contra Costa	2 - 4	P	P	P	P	
San Ramon Valley	Contra Costa	2 - 7	E	P	P	E	
Ygnacio Valley	Contra Costa	2 - 6	P	P	P	P	
Novato Valley	Marin	2 - 30	P	P	P	P	
Sand Point Area	Marin	2 - 27	E	P	P	P	
San Rafael	Marin	2 - 29	P	P	P	P	
Ross Valley	Marin	2 - 28	E	P	P	E	
Napa Valley	Napa	2.2 & 2 - 2.01	E	E	E	E	
Islais Valley	San Francisco	2 - 33	P	E	E	P	
Merced Valley (North)	San Francisco	2 - 35	P	P	P	E	
San Francisco Sands	San Francisco	2 - 34	E	P	P	E	
Visitation Valley	San Francisco	2 - 32	P	E	E	P	
Half Moon Bay Terrace	San Mateo	2 - 22	E	P	P	E	
Merced Valley (South)	San Mateo	2 - 35A	E	P	P	E	
Pescadero Valley	San Mateo	2 - 26	E	P	P	E	
San Gregorio Valley	San Mateo	2 - 24	E	P	P	E	
San Mateo Plain	San Mateo	2 - 9A	E	E	E	P	
San Pedro Valley	San Mateo	2 - 36	P	P	P	P	
Santa Clara Valley (& Coyote)	Santa Clara	2 - 9B	E	E	E	E	
Suisun/Fairfield Valley	Solano	2 - 3	E	E	E	E	
Kenwood Valley	Sonoma	2 - 19	E	P	P	E	
Petaluma Valley	Sonoma	2 - 1	E	P	P	E	
Sebastopol-Merced Fm. Highlands	Sonoma	2 - 25	E	P	P	E	
Sonoma Valley	Sonoma	2 - 2.022	E	P	P	E	

NOTES:
(1) MUN = Municipal and domestic water supply.
(2) PROC = Industrial process water supply.
(3) IND = Industrial service water supply.
(4) AGR = Agricultural water supply.
(5) FRESH = Freshwater replenishment to surface water. (Designation will be determined at a later date; for the interim, a site-by-site determination will be made).
(6) E = Existing beneficial use; based on available information (see references listed in Table 2-8).
(7) P = Potential beneficial use; based on available information. There is no known use of the basin for this category; however, the basin could be used for this purpose (see references listed in Table 2-8).

Appendix B

Well Density Maps

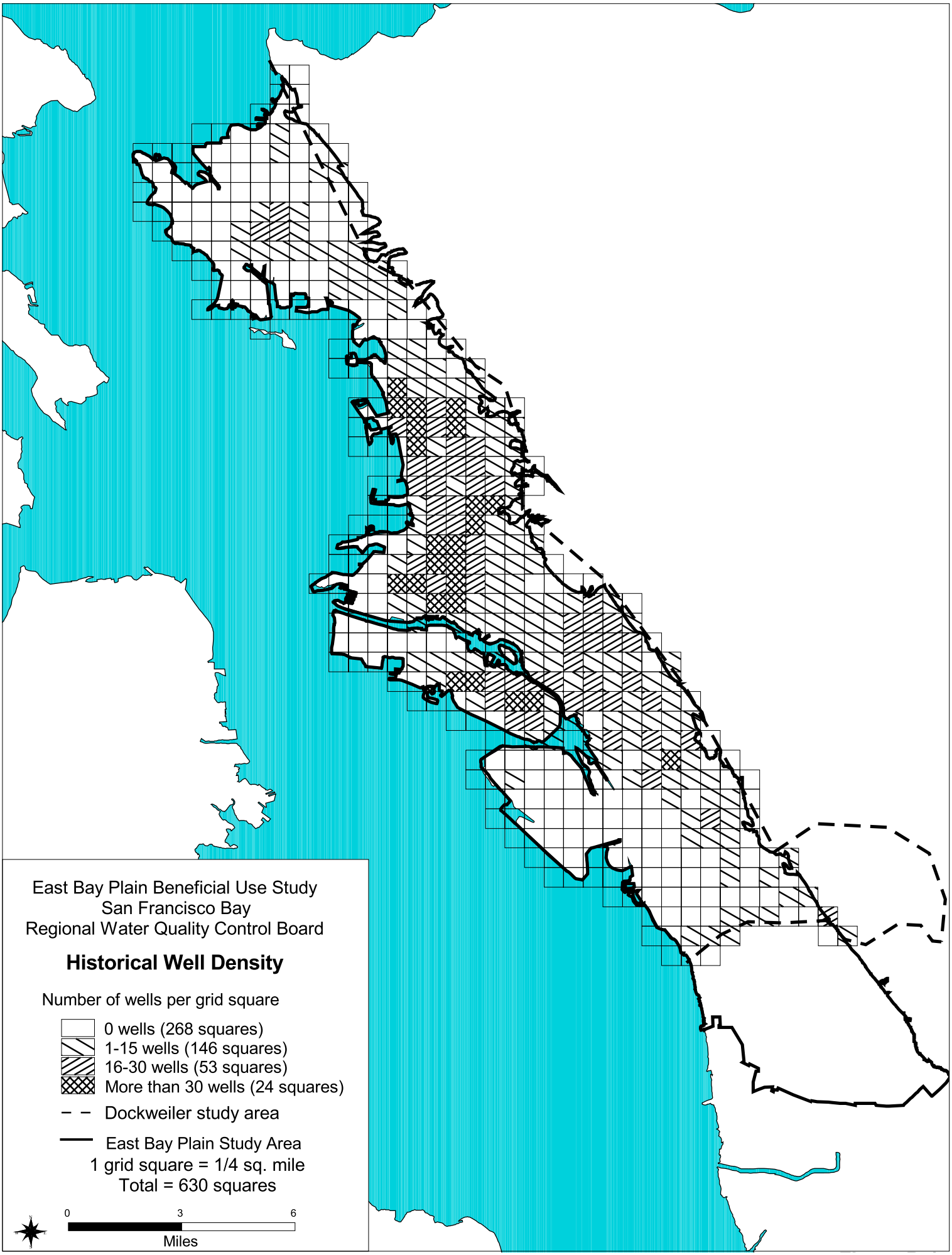
This section provides background on the GIS analysis of the density of historic and current wells in the East Bay Plain. Point locations for the historic and current wells used in the analysis are as shown on Figures 2, 15, 16 and 17 of this report. The density of the data points was computed on a ¼ square mile grid. The results are shown on Figures B-1 and B-2.

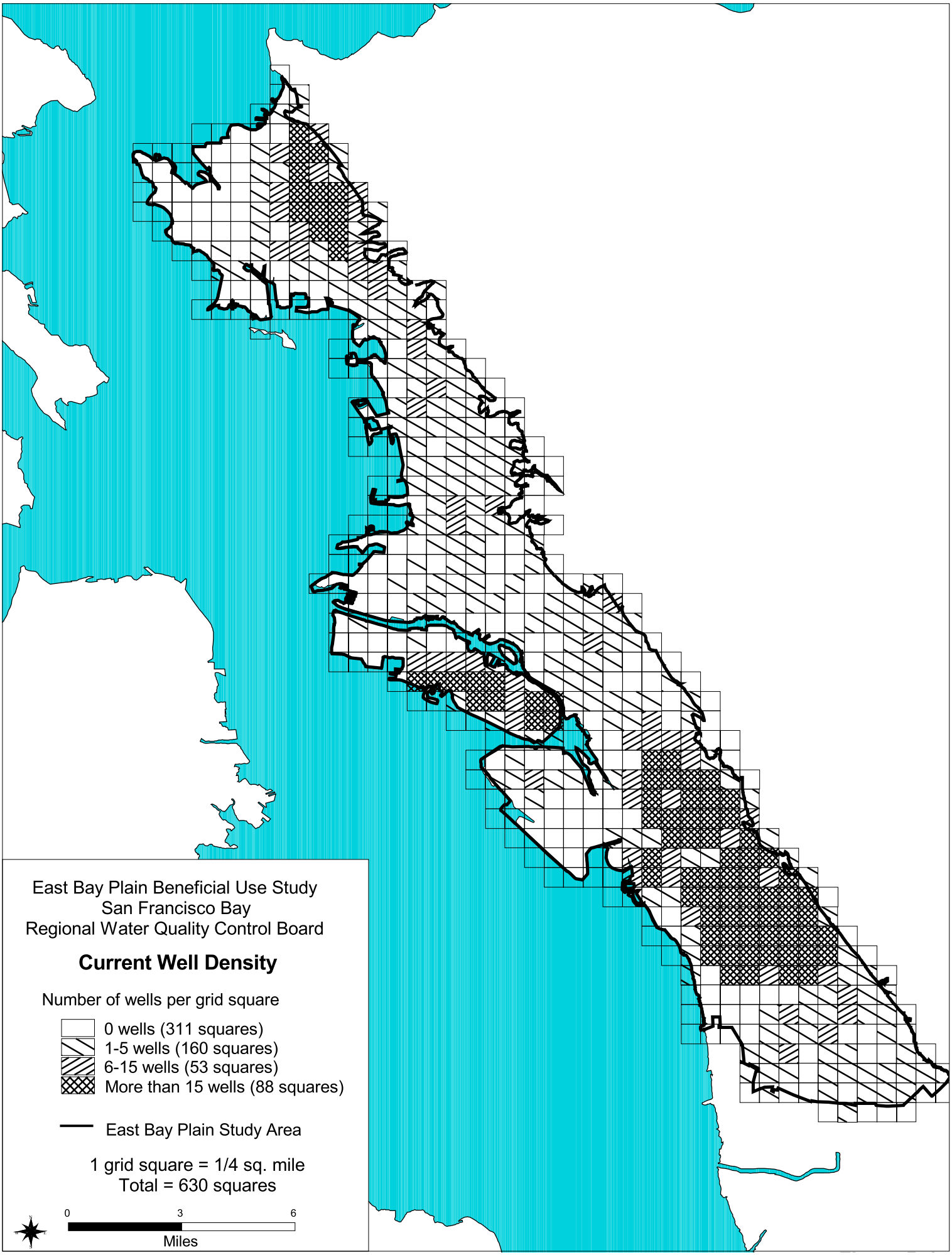
Historic Well Density: Wells used in this analysis are from the Dockweiler (1912) study discussed in Section 12.1 of the report. A total of 3,573 wells were identified (See Figure 2). In the study area overall, about 8% of the wells with depth data had a total depth of 200 feet or deeper. About 30% of the wells with depth data were 100 feet deep or more. The highest density of wells are in the cities of Oakland, Berkeley and Alameda (Figure B-1).

Current Well Density: Within the East Bay Plain, most current wells are used for residential irrigation. A smaller number of wells are used for commercial irrigation and industrial use. Only four wells are permitted for drinking water use (See Figures 14-17). Wells used in this analysis are a combination of coverages from the databases of ACFCWCD and EBMUD. EBMUD's database was used for the area between Richmond and San Leandro because it has a larger number of wells (See Section 13.3). ACFCWCD's was used for the area south of San Leandro, primarily within the City of Hayward, since EBMUD's jurisdiction does not cover this area. The highest density of current wells are in Richmond, Alameda, San Lorenzo, San Leandro, and Hayward (Figure B-2).

As an example of the utility of the well density maps discussed above, a composite map was generated that shows areas that have densities above the 80th percentile for each data set. For current wells, the 80th percentile equates to a density of 5 or greater wells per ¼ square mile. For historic wells, the 80th percentile equates to a density of 15 or greater wells per ¼ square mile. Figure B-3 delineates both of these areas. In addition, conceptual well head protection zones are shown.

From a beneficial use perspective, these areas are of higher concern because 1) historic wells may act as vertical conduits and allow shallow contamination to migrate into deeper aquifers, 2) current backyard irrigation wells may represent a non-drinking water exposure pathway to groundwater contamination (e.g., volatilization or irrigation of fruits and vegetables), and 3) contamination sites within well head protection zones may impact existing or planned drinking water wells.


East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Historical Well Density
Number of wells per grid square
0 wells (268 squares)
1-15 wells (146 squares)
16-30 wells (53 squares)
More than 30 wells (24 squares)
Dockweiler study area
East Bay Plain Study Area
1 grid square = 1/4 sq. mile
Total = 630 squares
0
3
6
Miles


East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Current Well Density
Number of wells per grid square
0 wells (311 squares)
1-5 wells (160 squares)
6-15 wells (53 squares)
More than 15 wells (88 squares)
East Bay Plain Study Area
1 grid square = 1/4 sq. mile
Total = 630 squares
0
3
6
Miles

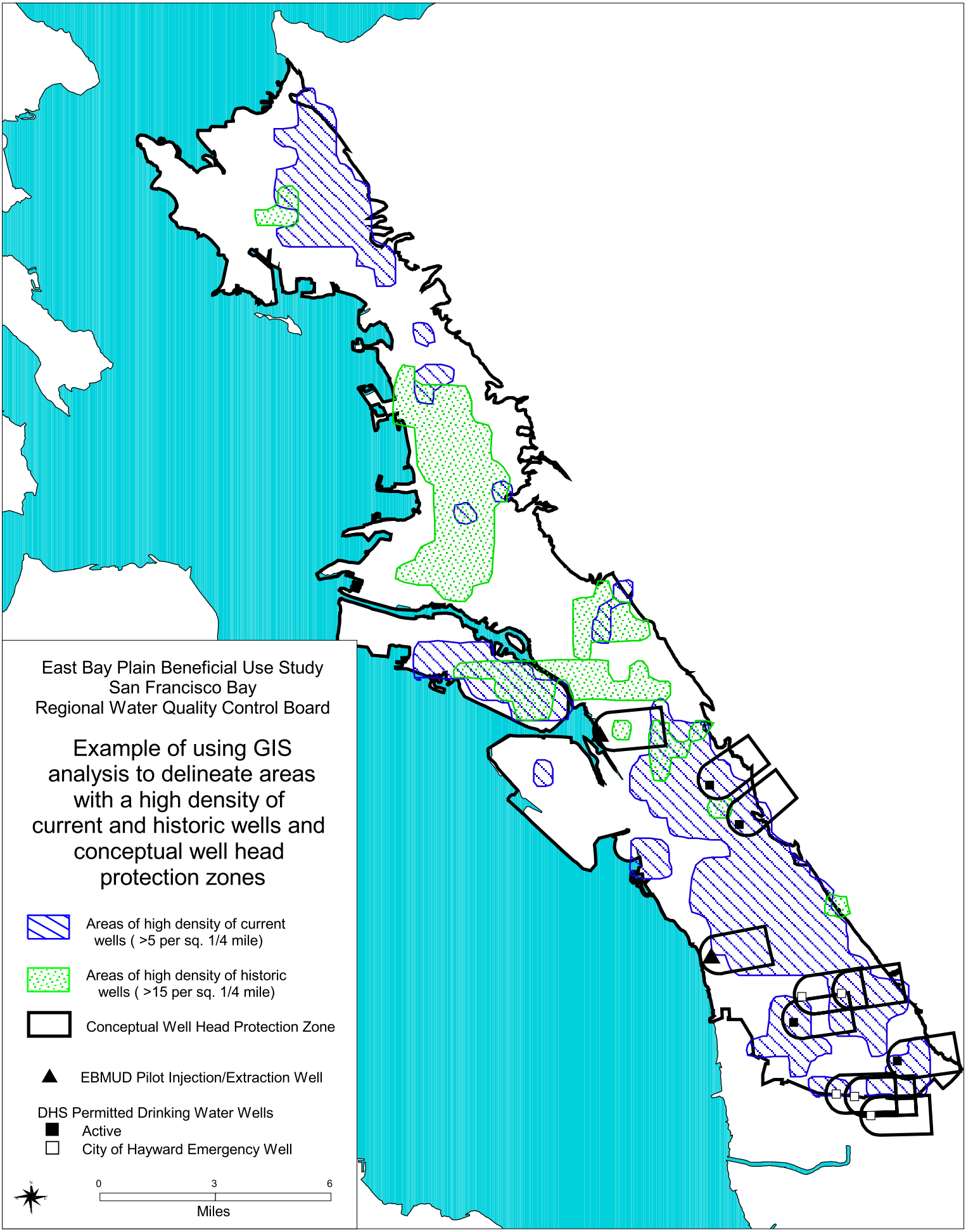

East Bay Plain Beneficial Use Study
San Francisco Bay
Regional Water Quality Control Board
Example of using GIS analysis to delineate areas with a high density of current and historic wells and conceptual well head protection zones
Areas of high density of current wells (>5 per sq. 1/4 mile)
Areas of high density of historic wells (>15 per sq. 1/4 mile)
Conceptual Well Head Protection Zone
EBMUD Pilot Injection/Extraction Well
DHS Permitted Drinking Water Wells
Active
City of Hayward Emergency Well
0
3
6
Miles

Figure B-3

I, the undersigned, hereby certify that the foregoing Ordinance was duly and regularly adopted and passed by the Council of the City of Alameda in regular meeting assembled on the 15th day of February, 2000, by the following vote to wit:

AYES:	Councilmembers Daysog, DeWitt, Johnson, Kerr and Mayor Appezzato - 5.
NOES:	None.
ABSENT:	None.
ABSTENTIONS:	None.

IN WITNESS, WHEREOF, I have hereunto set my hand and affixed the official seal of said City this 16th day of February, 2000.

Diane B Felsch

Diane Felsch, City Clerk
City of Alameda

Marsh Crust
Ordinance

file

NOTICE OF EXEMPTION

To: __ Office of Planning and Research
1400 Tenth Street, Room 121
Sacramento, CA 95814

or _x_ County Clerk
County of Alameda
1225 Fallon Street
Oakland, CA 94612

From: City of Alameda
Planning Department
City Hall, Room 120
2263 Santa Clara Avenue
Alameda, CA 94501

RECEIVED
MAR 08 2000
CITY OF ALAMEDA

Project Title: Marsh Crust Excavation Ordinance No. 2824

Project Location - City: Alameda **Project Location - County:** Alameda

Description of Project: City Council adoption of Ordinance No. 2824 on February 16, 2000, providing environmental protection during excavation of potentially hazardous soils in the shoreline Marsh Crust area of Alameda along Oakland/Alameda Estuary. Project does not include individual construction activities within the Marsh Crust; projects will receive individual review under CEQA Guidelines.

Name of Public Agency Approving Project: Alameda City Council

Name of Person or Agency Carrying Out Project: Alameda City Public Works Department

Exempt Status: (check one)
__Ministerial (Sec. 15268)
__Declared Emergency (Sec. 15269(a))
__Emergency Project (Sec. 15269(b)(c))
__Categorical Exemption. State type & section number.
_XX_ Statutory Exemptions. State code number: S. 15308 ; also S. 15061(b)(3)

Reasons why project is exempt: The Ordinance is an "action by a regulatory agency for protection of the environment," a Class 8 exemption under Section 15308 of CEQA Guidelines, "to assure the maintenance, restoration, enhancement or protection of the environment." The Ordinance establishes standards for control of subsurface hydrocarbon and other deposits during future construction processes. Individual construction projects are to be evaluated by subsequent CEQA review, under standards of the Ordinance. In addition, Section 15061(b)(3) of the CEQA Guidelines provide, where it can be seen with certainty that a program will not involve activities which may have a significant effect on the environment, the project is exempt. Adoption of an Ordinance causes no physical activities and enhances regulation.

Lead Agency Contact Person: David Valeska, Planner III
Area Code/Telephone: (510) 748-4554

If filed by applicant:
1. Attach certified document of exemption finding.
2. Has a notice of exemption been filed by the public agency approving the project: __ Yes __ No

Signature: _____

Title: Development Review Manager

Date Received for Filing: _____
Date Posted: _____
Date Removed: _____

g:\envirrev\exempts\marshctx 3/1/00

SUPPLEMENT TO NOTICE OF EXEMPTION, MARSH CRUST EXCAVATION ORDINANCE

BACKGROUND

The City of Alameda borders the Oakland/Alameda Estuary, a waterway connecting to San Francisco Bay. The Estuary shoreline was at a lower elevation in the early 20th Century, when shipping and manufacturing left hydrocarbon deposits on these marsh areas. Later in the 20th Century, landfill raised the elevation of these shoreline areas above the tidal action line, covering the hydrocarbon-impacted tidal marshes. This process resulted in a buried layer of hydrocarbon-saturated soils known as Marsh Crust. Exposure of the Marsh Crust may result in hazardous conditions.

In recent years, construction along the north Alameda shoreline has involved excavation and installation of pilings to create foundations for new structures. Excavation below the surface of such properties may result in exposure of the Marsh Crust to the public.

Mitigated Negative Declarations adopted by the City in recent years for this area have included mitigations and conditions addressing excavation and pile driving in the Marsh Crust. The City has identified a need for establishment of standards for Marsh Crust excavation and pile driving, which resulted in adoption of the attached Ordinance.

ORDINANCE

The Ordinance provides for standards and procedures to be followed regarding excavation and pile driving in the Marsh Crust area. These regulations will minimize the risk of exposure of the public to subsurface hydrocarbon or other chemical deposits which have entered the Marsh Crust due to past chemical leakages. The regulations will protect Estuary wildlife by minimizing the risk of chemical spills into Estuary waters.

The Ordinance does not approve any individual construction projects. Each excavation or pile driving activity in the Marsh Crust will separately be evaluated under the California Environmental Quality Act as either requiring a Mitigated Negative Declaration, Categorical Exemption or other procedure.

CONCLUSION

The Ordinance is Categorically Exempt under Section 15308 of the CEQA Guidelines because it establishes regulatory standards for protection of the environment without approving any individual construction projects.

March 1, 2000 dv

NOTICE OF EXEMPTION

Appendix E

To: ☐ Office of Planning and Research
1400 Tenth Street, Room 121
Sacramento, CA 95814

☒ County Clerk
County of Alameda
1225 Fallon Street
Oakland, CA 94612

From: City of Alameda
Public Works Department
2263 Santa Clara Avenue
Alameda, CA 94501

Project Title: Excavation Ordinance

Project Location - Specific: Former Alameda Naval Air Station and Fleet Industrial Supply Center, Alameda Annex and Facility

Project Location - City: Alameda

Project Location - County: Alameda

Project Description: Adoption of an excavation ordinance to regulate excavation into the Marsh Crust at Fleet Industrial Supply Center and Alameda Naval Air Station, Alameda. The excavation ordinance will require testing and proper handling of soils which may be hazardous, protecting health and human safety.

Name of Public Agency Approving Project: City of Alameda

Name of Person or Agency Carrying Out Project:

Exempt Status: (check one)

- ☐ Ministerial (Sec. 21080(b)(1); 15268);
- ☐ Declared Emergency (Sec. 21080(b)(3); 15269(a));
- ☐ Emergency Project (Sec. 21080(b)(4); 15269(b)(c));
- ☒ Categorical Exemption. State type and section Number: 15061(b)(3)
- ☐ Statutory Exemptions. State code number:

Reasons why project is exempt: The project involves adoption of an excavation ordinance. There is no possibility that the adoption of this ordinance will have a significant impact on the environment. (See attachment)

Lead Agency Contact Person: Dina Tasini **Area Code/Telephone/Extension:** 510/749-5922

If filed by applicant:

1. Attach certified document of exemption finding.
2. Has a Notice of Exemption been filed by the public agency approving the project? ☐ Yes ☐ No

Signature: [signature] Date: 2/18/10 Title: Environmental Policy Manager

☐ Signed by Lead Agency Date received for filing at OPR:

☐ Signed by Applicant

CITY OF ALAMEDA ORDINANCE NO. 2824
New Series

AMENDING THE ALAMEDA MUNICIPAL CODE BY AMENDING CHAPTER XIII (BUILDING AND HOUSING) BY ADDING A NEW SECTION 13-56 (EXCAVATION INTO THE MARSH CRUST/SUBTIDAL ZONE AT THE FORMER NAVAL AIR STATION ALAMEDA AND FLEET INDUSTRIAL SUPPLY CENTER, ALAMEDA ANNEX AND FACILITY) TO ARTICLE XVII (PITS, WELLS AND EXCAVATIONS)

WHEREAS, the marshlands and near shore areas once located adjacent to the island of Alameda were filled with dredge material between approximately 1900 and 1940; and

WHEREAS, the marsh crust, and the subtidal zone extending from it, is a horizon that is identifiable in the subsurface (the interface at the bottom of the fill material) which contains remnants of grasses and other intertidal and subtidal features; and

WHEREAS, the marsh crust/subtidal zone also contains, at least locally, elevated levels of petroleum-related substances, such as semi-volatile organic compounds, which substances may pose an unacceptable risk to human health and the environment if excavated in marsh crust/subtidal zone materials, brought to the ground surface and handled in an uncontrolled manner; and

WHEREAS, proper handling, storage and disposal of materials excavated from the marsh crust/subtidal zone, pursuant to state and federal hazardous materials laws, will help eliminate unacceptable exposures and risks to human health and the environment; and

WHEREAS, the Draft Base-wide Focused Feasibility Study for the Former Subtidal Area and Marsh Crust and Ground Water (U.S. Navy, February 20, 1999) recommends implementation by the City of an institutional control, such as an excavation ordinance, as a remedial action related to the cleanup by the United States Navy of Naval Air Station Alameda and the Fleet Industrial Supply Center, Alameda Annex and Facility, which closed military installations are anticipated to be transferred to the City; and

WHEREAS, it can be seen with a certainty that adoption of a permitting program by the City that requires proper handling, storage and disposal, pursuant to existing state and federal hazardous materials laws, of materials excavated from the marsh crust/subtidal zone will not involve or require any physical activities other than optional testing of excavated materials and, therefore, is exempt from the California Environmental Quality Act pursuant to California Code of Regulations, title 14, section 15061(b)(3) because there is no possibility that the enactment of the ordinance may have a significant effect on the environment.

CITY ATTORNEY

NOW, THEREFORE, BE IT ORDAINED by the Council of the City of Alameda that:

Section 1. The Alameda Municipal Code is hereby amended by adding a new Section 13-56 (Excavation Into the Marsh Crust/Subtidal Zone at the Former Naval Air Station Alameda and Fleet Industrial Supply Center) to Article XVII (Pits, Wells and Excavations) of Chapter XIII (Building and Housing) thereof to read:

13-56 EXCAVATION INTO THE MARSH CRUST/SUBTIDAL ZONE AT THE FORMER NAVAL AIR STATION ALAMEDA AND FLEET INDUSTRIAL SUPPLY CENTER, ALAMEDA ANNEX AND FACILITY.

13-56.1 DEFINITIONS.

For purposes of this Section 13-56 the following definitions shall apply:

Bay shall mean San Francisco Bay, including the Oakland Estuary and the Oakland Inner Harbor.

DTSC shall mean the California Environmental Protection Agency, Department of Toxic Substances Control.

Earth material shall mean any rock, natural soil or fill or any combination thereof.

Excavation shall mean the mechanical removal of earth material.

Hazardous materials, as defined in California Health and Safety Code sections 25260(d) and 25501(k), shall mean any material that, because of its quantity, concentration, or physical or chemical characteristics, poses a significant or potential hazard to human health and safety, or to the environment. Hazardous materials include, but are not limited to, hazardous substances, hazardous waste and any material which a handler or the administering agency has reasonable basis for believing would be injurious to the health and safety of persons or harmful to the environment if released into the workplace or the environment.

Marsh crust shall mean the underground layer that is the remnant of the tidal marsh that existed along the shoreline of Alameda Island before filling to create additional dry land. In many places, this layer contains substances from former industrial discharges that were retained in the historic marsh before filling.

Subtidal zone shall mean the underground layer that is the pre-filling Bay floor extension of the historic marsh. Together, the marsh crust and the subtidal zone constitute a single, continuous, underground layer that extends Bayward of the original mean higher high tide line of Alameda Island, before filling, throughout the area that was filled.

Threshold depth shall mean the depth below which a permit is required by this Section 13-56. The threshold depth is conservatively identified with the elevation above which there is little likelihood that substances from the historic marsh or Bay floor would have mixed during filling, including a margin of safety above the elevation of the historic marsh surface or subtidal zone. In no event will the threshold depth be above mean higher high water.

13-56.2 Permit Required.

a. It shall be unlawful for any person, including utility companies and their employees and contractors, to excavate below a threshold depth above the marsh crust/subtidal zone within the area of the former Naval Air Station Alameda and Fleet and Industrial Supply Center, Alameda Annex and Facility, as depicted in Exhibit A, hereto, without first obtaining a permit in writing from the Chief Building Official.

b. All excavation below the threshold depth in the area subject to this Section 13-56 shall be performed solely in accordance with the permit as approved and issued by the City.

13-56.3 Depth of Excavation Subject to Permit Requirement.

The Chief Building Official shall establish a threshold depth, consistent with DTSC's remedial decision documents pertaining to the marsh crust/subtidal zone, below which a permit shall be required for excavation pursuant to this Section 13-56. The threshold depth may vary by location. The Chief Building Official shall publish a map depicting the parcels and threshold depths for which a permit is required under this Section 13-56. The Chief Building Official may update the map, consistent with DTSC's remedial decision documents pertaining to the marsh crust/subtidal zone, as necessary to incorporate any new information concerning the depth of the marsh crust/subtidal zone received by the City since the preparation of the initial map or last update.

13-56.4 Exception to Permit Requirement.

a. No permit shall be required under this Section 13-56 for pile driving or other penetration of the marsh crust/subtidal zone that involves neither (i) bringing materials from below the threshold depth to above the threshold depth; nor (ii) exposure of construction workers to soil excavated from below the threshold depth.

b. No permit shall be required under this Section 13-56 for excavation associated with emergency repair of public infrastructure facilities; provided, however, that soil excavated from below the threshold depth in the area of the marsh crust/subtidal zone, as depicted on Exhibit A, must be managed as though it were hazardous in accordance with Subsection 13-56.8b.

13-56.5 Permit Application.

Application for a permit shall be made in writing on forms available in or from the Building Services Office and shall be filed in the Building Services Office. Subsection 13-1.2 of Article I of Chapter XXIII regarding Appeals (Section 105.1), Appeal Fee (Section 105.2), Expiration (Section 106.4.4), Permit Fees (Section 107.2) and Plan Review Fees (Section 107.3) shall apply to all permits issued pursuant to this Section 13-56. The information required to be provided on the application shall be determined by the Chief Building Official and shall include at a minimum:

a. A description and map of the property that is to be excavated sufficient to locate the area of proposed excavation on Exhibit A.

b Detailed plans, prepared by a registered civil engineer licensed in the State of California, of the excavation work to be done, including a drawing with dimensions to scale of all proposed excavation activity.

c. A statement of the maximum depth of excavation.

d. All elevations in plans and application materials submitted to the City shall be referenced to City Datum and shall show depth below ground surface.

e. A cost estimate for purposes of determining the amount of the bond required to be obtained pursuant to Subsection 13-56.11.

13-56.6 Certifications and Acknowledgments.

a. The following certifications shall be required as part of the permit application:

1. The applicant shall sign a certification prepared by the Chief Building Official acknowledging receipt of notice that the property to be excavated may be in the area of the marsh crust/subtidal zone, and that hazardous materials may be encountered during excavation.

2. The applicant shall sign a certification prepared by the Chief Building Official acknowledging that federal and state hazardous materials laws and regulations will apply to storage, transportation and disposal of any materials excavated from the marsh crust/subtidal zone that are hazardous materials.

3. The applicant shall sign a certification prepared by the Chief Building Official acknowledging liability for disturbing and removing all materials from the marsh crust/subtidal zone in accordance with this Section 13-56 and the permit.

b. All building and excavation permits issued for construction or excavation within the area subject to this SubSection 13-56 shall contain the following written warning:

"Pursuant to Section 13-56 of Article XVII of Chapter XIII of the Alameda Municipal Code, excavation work in the area of the marsh crust/subtidal zone within the area of the former Naval Air Station Alameda and Fleet and Industrial Supply Center, Alameda Annex and Facility, as depicted in Exhibit A to Section 13-56 of Article XVII of Chapter XIII of the Alameda Municipal Code, may be subject to special materials handling requirements. The permittee acknowledges that he or she has been informed of the special materials handling requirements of Section 13-56 of Article XVII of Chapter XIII of the Alameda Municipal Code and that hazardous materials may be encountered during excavation."

13-56.7 Notification Prior to Start of Excavation.

a. After receipt of a permit and no less than two (2) business days (forty-eight (48) hours minimum) before commencement of any excavation activity in the area subject to this Section 13-56, the permittee shall notify the Chief Building Official of the planned start of excavation. Said notification shall include a schedule for any excavation work that will last for more than one day.

b. The permittee shall give adequate notice to Underground Service Alert prior to commencing any excavation activity subject to this Section 13-56.

13-56.8 Materials Handling.

The permittee shall elect to follow one or more of the courses of action set forth below before beginning any excavation activities in the area subject to this Section 13-56. Unless otherwise demonstrated by the permittee by means of reconnaissance investigation pursuant to Subsection 13-56.8a, or unless the permittee prepares site management plans pursuant to Subsection 13-56.8c, soil below the threshold depth in the area of the marsh crust/subtidal zone, as depicted on Exhibit A, must be managed as though it were hazardous pursuant to Subsection 13-56.8b. The permittee may elect to follow Subsection 13-56.8a, but must comply with Subsection 13-56.8b or 13-56.8c if testing demonstrates that the materials below the threshold depth are hazardous materials. Copies of all reconnaissance testing results and/or existing information used to satisfy the reconnaissance investigation requirements of Subsection 13-56.8a shall be reported to and filed with the City. All observations or encounters with the marsh crust/subtidal zone during excavation shall be reported to the City.

a. Reconnaissance Investigation to Rule Out the Presence of Hazardous Materials Below the Threshold Depth.

The permittee may elect to use reconnaissance borings, pursuant to a plan prepared by a qualified registered engineer or registered geologist, licensed in the State of California, to rule out, to the satisfaction of the Chief Building Official, the presence of hazardous materials below the threshold depth in the area to be excavated. As part or all of the reconnaissance plan, the permittee may make use of existing information, where appropriate, if the existing information is directly relevant to the location and depth to be excavated and contains observations or results of analyses that assist in concluding whether hazardous materials are present. The reconnaissance report shall include a description of all observations from below the threshold depth evidencing the presence or absence of the marsh crust/subtidal zone.

1. If hazardous materials are found below the threshold depth within the area to be excavated at any time (during reconnaissance or during excavation), the permittee shall comply with either Subsection 13-56.8b or Subsection 13-56.8c, at his or her election.

2. If hazardous materials are not found below the threshold depth within the area to be excavated, no additional materials controls, except as otherwise may be required under applicable federal, state or local law, are required under this Section 13-56.

b. Handling Materials Excavated From Below the Threshold Depth as Hazardous Materials.

If the permittee has not ruled out the presence of hazardous materials pursuant to Subsection 13-56.8a, or elects not to prepare a site management plan and materials testing program pursuant to Subsection 13-56.8c, the permittee shall presume that materials excavated from below the threshold depth must be disposed at an appropriately permitted disposal facility. In addition, no excavated materials from below the threshold depth may be stockpiled prior to disposal or returned to the excavation.

c. Preparation of Construction Site Management Plan for Handling Materials Excavated From Below the Threshold Depth.

1. In lieu of handling materials excavated from below the threshold depth pursuant to the restrictions in Subsection 13-56.8b, the permittee may elect to hire a qualified registered engineer or registered geologist, licensed in the State of California, to develop a site-specific construction site management plan, including a materials testing program, to the satisfaction of the Chief Building Official. The construction site management plan shall include, at a minimum, provisions governing control of precipitation run on and run off from stockpiled soils, soil segregation, securing of stockpiled soils, duration of stockpiling, and contingency plans for handling materials excavated from below the threshold depth that prove to be hazardous materials.

2. The permittee shall hire a qualified registered engineer or registered geologist, licensed in the State of California, to oversee compliance with the approved construction site management plan, and shall transmit to the Chief Building Official upon completion of the project written certification of compliance with the construction site management plan. The certification report shall include a description of all observations from below the threshold depth evidencing the presence or absence of the marsh crust/subtidal zone.

13-56.9 Health and Safety Plan.

The applicant shall cause to be prepared by a certified industrial hygienist, and keep on the construction site at all times, a health and safety plan to protect workers at the excavation site and the general public to the satisfaction of the Chief Building Official. The Chief Building Official may prepare and provide to applicants a model health and safety plan which, if used by the applicant, shall be modified by the applicant's certified industrial hygienist to suit the specific requirements of the applicant's project.

13-56.10 Excavation Site Best Management Practices.

All excavation and materials handling activities permitted under this Section 13-56 shall be conducted in accordance with applicable Alameda Countywide Clean Water Program Best Management Practices and City of Alameda Storm Water Management and Discharge Control Program Ordinance requirements.

13-56.11 Bonds.

Upon a finding by the Chief Building Official that a permit should issue for excavation pursuant to this Section 13-56, a surety or performance bond conditioned upon the faithful performance and completion of the permitted excavation activity shall be filed with the City. Such bond shall be executed in favor of the City and shall be maintained in such form and amounts prescribed by the Risk Manager sufficient to ensure that the work, if not completed in accordance with the approved plans and specifications, will be corrected to eliminate hazardous conditions.

13-56.12 Nonassumption of Liability.

In undertaking to require applicants for certain excavation permits to comply with the requirements of this Section 13-56, the City of Alameda is assuming an undertaking only to promote the general welfare. The City is not assuming, nor is it imposing on itself or on its officers and employees, an obligation for breach of which it is liable in money damages to any person who claims that such breach proximately caused injury.

13-56.13 Construction on City Property.

a. The Chief Building Official shall prepare standard work procedures that comply with all the requirements of this Section 13-56 for all City

construction or improvement activities involving excavation below the threshold depth in the area subject to this Section 13-56. All departments, boards, commissions, bureaus and agencies of the City of Alameda that conduct construction or improvements on land under their jurisdiction involving excavation below the threshold depth in the area subject to this Section 13-56 shall follow such standard work procedures.

b. The City shall include in all contracts involving excavation below the threshold depth in the area subject to this Section 13-56 a provision requiring City contractors to comply with all the requirements of this Section 13-56. All contracts entered into by departments, boards, commissions, bureaus and agencies of the City of Alameda that authorize construction or improvements on land under their jurisdiction involving excavation below the threshold depth in the area subject to this Section 13-56 also shall contain such standard contract provision.

13-56.14 Severability.

If any section, subsection, subdivision, paragraph, sentence, clause or phrase of this Section 13-56 or any part thereof is for any reason held to be unconstitutional or invalid or ineffective by any court of competent jurisdiction, such decision shall not affect the validity or effectiveness of the remaining portions of this Section 13-56 or any part thereof. The City Council hereby declares that it would have passed each section, subsection, subdivision, paragraph, sentence, clause or phrase of this Section 13-56 irrespective of the fact that one or more sections, subsections, subdivisions, paragraphs, sentences, clauses or phrases be declared unconstitutional or invalid or effective.

13-56.15 Permit Fee.

No permits for excavation in the marsh crust/subtidal zone shall be issued unless a fee has been paid. The fee shall be set by City Council resolution.

13-56.16 Penalties.

a. Any person, including utility companies and their employees and contractors, violating any of the provisions of this Section 13-56 shall be deemed guilty of a misdemeanor, and each person shall be deemed guilty of a separate offense for each and every day or portion thereof during which any violation of any of the provisions of this Section 13-56 is committed, continued or permitted, and such violation may be prosecuted and punished as an infraction or misdemeanor pursuant to the provisions of Section 1-5.1 of the Alameda Municipal Code .

b. Any person, including utility companies and their employees and contractors, that commences any excavation without first obtaining the necessary permits therefor shall, if subsequently allowed to obtain a permit, pay an amount, in

addition to the ordinary permit fee required, quadruple the permit fee otherwise required.

13-56.17 Retention and Availability of Permit Files

The City shall maintain files pertaining to all permits issued under this Section 13-56, and shall make such files available to DTSC for inspection upon request during normal business hours.

13-56.18 Amendment of Section 13-56

This Section 13-56 shall not be repealed or amended without thirty (30) days prior written notice to the DTSC Deputy Director for Site Mitigation.

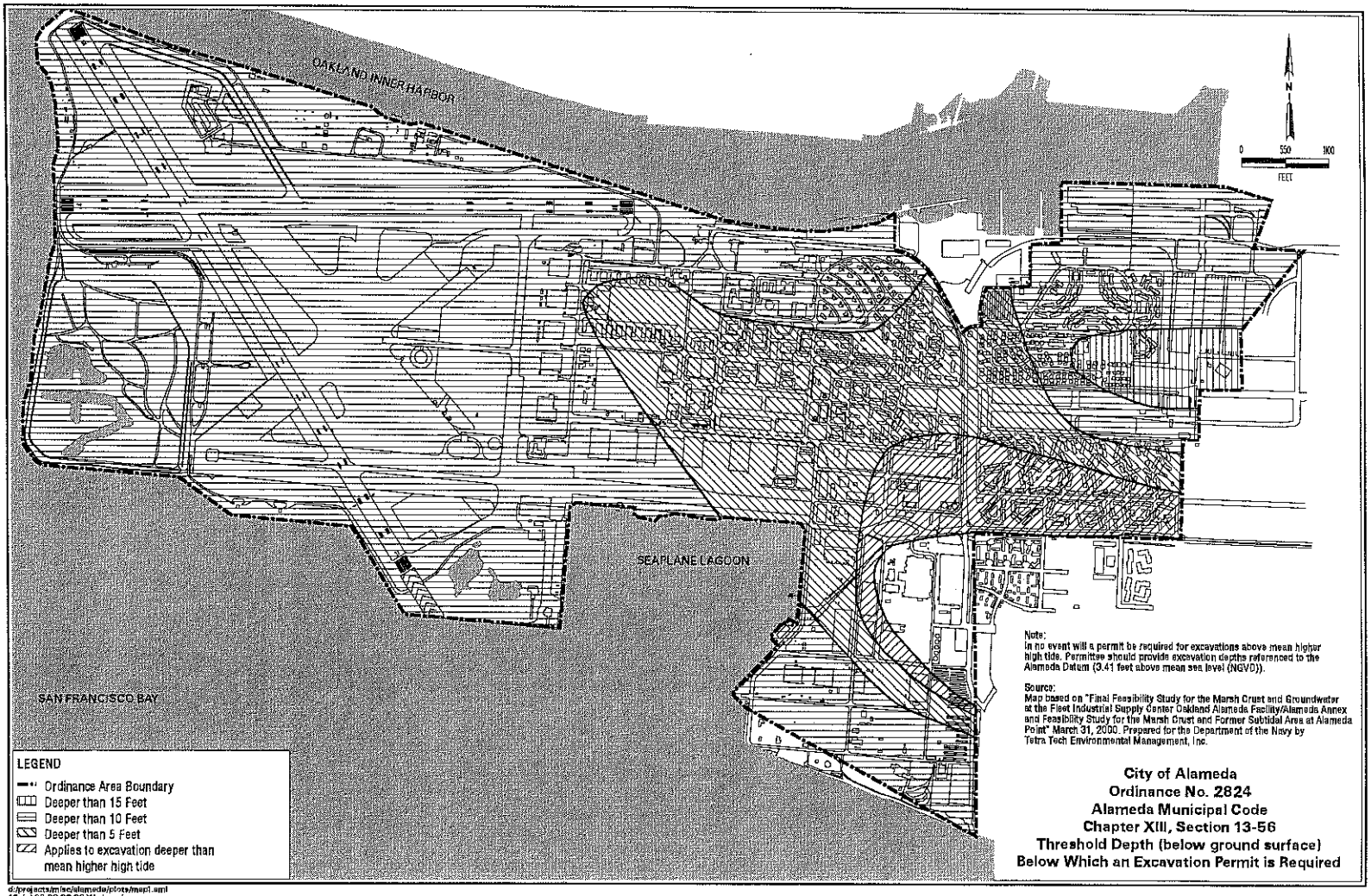
Section 2. This Ordinance shall be in full force and effect from and after the expiration of thirty (30) days from the date of its final passage.

Presiding Officer of the City Council

Attest:

City Clerk

* * * * * *



Note:
In no event will a permit be required for excavations above mean higher high tide. Permittee should provide excavation depths referenced to the Alameda Datum (3.41 feet above mean sea level (NGVD)).

Source:
Map based on "Final Feasibility Study for the Marsh Crust and Groundwater at the Fleet Industrial Supply Center Oakland Alameda Facility/Alameda Annex and Feasibility Study for the Marsh Crust and Former Subtidal Area at Alameda Point" March 31, 2000. Prepared for the Department of the Navy by Tetra Tech Environmental Management, Inc.

City of Alameda
Ordinance No. 2824
Alameda Municipal Code
Chapter XIII, Section 13-56
Threshold Depth (below ground surface)
Below Which an Excavation Permit is Required

d:/projects/mise/alameda/plots/map1.aml
12 Jul 00 08:32:36 Wednesday

LIZ DODGE - rmap1_L.pdf
Page 1

Appendix F
Regulatory Concurrence and Responses to Comments

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RESPONSE TO COMMENTS ON THE DRAFT FIVE-YEAR REVIEW REPORT
ALAMEDA POINT AND FLEET AND INDUSTRIAL SUPPLY CENTER
OAKLAND, ALAMEDA FACILITY / ALAMEDA ANNEX
FORMER NAVAL AIR STATION ALAMEDA, CALIFORNIA
DCN: STS-3215-15-0021

Comments from:

Xuan-Mai Tran, Remedial Project Manager

United States (US) Environmental Protection Agency (EPA)

Comments Dated: June 22, 2016

GENERAL COMMENTS

No.	Comment	Response
1.	The Draft Five-Year Review, Alameda Point and Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex, Alameda, California (the FYR) does not include all of the content outlined in Exhibit 3-3 of the *Comprehensive Five-Year Review Guidance* (the FYR Guidance), dated June 2001. The following contents are not included in the FYR: • The summary forms do not include issues and recommendations. If a given site has no applicable issues or recommendations, then this should be stated within the issues and recommendations portion of the summary forms; • The site background discussions for each site do not include subsections for the history of contamination or the initial response; • The progress since the last five year review discussions for each site do not include the protectiveness statements from the last review (applicable to sites if this is the second or third FYR); • The Question A discussion for each site does not include the remedial action performance and monitoring results, early indicators of potential remedy problems, or implementation of institutional controls and other	**Bullet Point 1, Summary Forms:** Summary forms have been revised for sites with no applicable issues or recommendations to include this information within the issues and recommendations section. **Bullet Point 2, Site Background:** The 2016 FYR includes discussions for history of contamination and initial response under sections titled "Site Chronology and Initial Response" and "Basis for Taking Action". Based on this comment response, no revisions have been applied to the FYR. **Bullet Point 3, Progress Since Last Five-Year Review:** Each site has been revised to include a discussion of the progress since the last five-year review and the protectiveness statement for applicable sites. **Bullet Point 4, Question A:** Question A for each site review has been revised to include remedial action performance and monitoring results, early indicators of potential remedy problems (if applicable), or implementation of institutional controls and other measures. Data will be provided to support conclusions that the remedy is or is not performing as designed / intended. Figures have been revised to

	measures. While some sites include discussion of remedy performance, there are no data provided to support the conclusions that remedies are performing as designed/intended. In addition, it should be noted that some figures in the FYR include trend graphs for select contaminants of concern (COCs) and sampling locations; however, the monitoring results for each COC and sampling location should be summarized for each site where monitoring is part of the remedy; • The Question A discussion only includes the costs of the system operations/O&M for some sites. If the costs are not applicable, then this should be stated, but costs associated with maintenance and monitoring of groundwater monitoring networks should be included and even when they are applicable to multiple sites; and • The technical assessment discussions do not include a summary of findings and conclusions. Please revise the FYR to include all applicable content outlined in Exhibit 3-3 of the FYR Guidance.	include groundwater plumes (where applicable), including as much monitoring results for each COC, as is feasible. **Bullet Point 5, Question A, Costs:** Question A has been revised to state system operations / O&M costs are not applicable if it doesn't apply to the site being reviewed. The site-specific costs of O&M associated with the BGMP cannot be assessed, as all sites included in the BGMP are not priced out separately. **Bullet Point 6, Technical Assessment:** The technical assessment discussions have been revised to include a summary of findings and conclusions for each site reviewed.
2.	Installation Restoration (IR) Sites 4, 7, and 8 were omitted from the FYR. Although the groundwater remedy for IR Site 4 is still in the remedial design (RD) phase, the soil remedy is complete and this portion of IR Site 4 should be included in the FYR. Excavation and disposal was the selected remedy for IR Sites 7 and 8 and the Remedial Action Completion Reports (RACRs) for IR Sites 7 and 8 were completed in 2013 and 2012, respectively. Since this occurred after the date of the previous FYR, these sites also need to be included in the FYR;	**Section 1.2.5, Five-Year Review IR Status Update, Paragraph following Table 1-2.** The text has been revised to include a brief discussion of IR Sites 7, 8 and OU-5/FISCA IR Site 02 Groundwater as follows: "The following IR Sites, 7, 8, 16, *and OU-5/FISCA IR Site 02 Groundwater*, although included in the previous Five-Year Review, ~~will not be included in future Five-Year Reviews because remedial action objectives (RAO) have been achieved: IR Sites 7,~~

	however, IR Sites 7 and 8 do not need to be included in the next FYR. Please revise the FYR to include IR Sites 4, 7, and 8.	~~8, and 16. IR Site 16, as documented in a RACR (URS 2012b) and ESD ROD (DON 2012b) for NFA and unrestricted use of soil at IR Site 16, is further discussed in Section 2.2.2.2 along with Site 16 groundwater.~~ *have since achieved no further action (NFA) status and; therefore, will not be evaluated in this, or future, Five-Year Reviews.* ~~IR Sites 7 and 8 soil are briefly described in the following paragraph, but were not evaluated further.~~ *Since the 2011 Five-Year Review*, the extent of soil excavation at IR Sites 7 and 8 was based on previous investigations and confirmed with post-excavation confirmation samples. In accordance with the ROD (DON *2007b*~~c~~), the approved RD Report (URS 2010a), and Remedial Action Work Plan (RAWP) (URS 2010b), the RA removed soil impacted with arsenic, cadmium and lead at concentrations above RGs at IR Site 7, as well as removed soil impacted with lead, dieldrin and polychlorinated biphenyls (PCB) at IR Site 8. The RACRs for IR Site 7 (DON *2013d*~~a~~) and IR Site 8 (URS 2012*a*) document the RA for soil and achievement of the RAOs. Soil at IR Sites 7 and 8 was reclassified for unrestricted use in June 2013. IR Site 16, as documented in a RACR (URS 2012b) and ESD ROD (DON 2012b) for NFA and unrestricted use of soil at IR Site 16, is further discussed in Section 2.2.2.2 along with Site 16 groundwater. ~~along with Site 16 groundwater.~~ *The 2011 Five-Year Review Report (KCH 2011) discusses implementation of the original OU-5/FISCA IR Site 02 Groundwater remedy from the 2007 ROD (DON 2007b). The*

		groundwater remedy included installation of treatment systems, biosparging, and groundwater monitoring. Sampling showed decreased concentrations of benzene and naphthalene in groundwater. Additionally, sub-slab soil gas, indoor air, and outdoor air sampling indicated no indoor air contamination due to the volatilization of groundwater contaminants to the indoor air exposure pathway. *The ROD Amendment (DON 2015b) documented NFA is required for OU-5/FISCA IR 02 Groundwater because the shallow groundwater does not pose an unacceptable risk to human health or the environment. There is no unacceptable risk for the hypothetical drinking water pathway from shallow groundwater. Water for all uses within the area is supplied by the East Bay MUD. Additionally, City of Alameda regulations, Alameda County regulations, and State of California regulations prohibit intrusive activities and specifically prohibit well installation in shallow FWBZ groundwater. Nonetheless, one more round of groundwater sampling at OU-5/FISCA IR-02 will be completed under the Basewide Groundwater Monitoring Program, and the results will be included in the next Five-Year Review report."* The review for IR Site 4 has been included in the Executive Summary, Section 1 and Section 2.5, OU-2B, IR Site 3 *and 4.*

3.	The figures included in the FYR do not provide sufficient information about the extent of remaining contamination and the extent of institutional control (IC) boundaries. For example, Figure 2.1-1 shows the extent of plume boundaries at IR Site 6, but does not depict the extent of IC boundaries. Similarly, Figure 2.2-1 shows the extent of IC boundaries at IR Site 16, but does not depict the extent of contaminants that remain above remediation goals (RGs). Section 3.5 of the memorandum *Recommended Evaluation of Institutional Controls: Supplement to the Comprehensive Five-Year Review Guidance* (the Supplemental IC Evaluation), dated September 2011, recommends including "Maps that illustrate the areas of remaining contamination (e.g., contaminated ground water plume), parcel boundaries, and an overlay of any ICs that may be in place." Please revise the FYR to ensure site figures depict both the extent of contamination above RGs and the extent of IC boundaries.	Figures presenting IR and IC boundaries have been revised to clearly present both boundaries. Sites with a groundwater remedy component include a plume map, which presents the extent of contamination of the main COCs above RGs. Figure 2.2-1, IR Site 16: The IC boundary corresponds to the plume boundary and will change if the plume boundary changes. Figure 2.6-1: Soil Contamination Areas and Site Features, OU-3, IR Site 1. The following text on the figure has been revised to read as follows: "~~Former~~ *RA* Groundwater Treatment Area" Figure 2.6-2: VOCs in Groundwater FWBZ, OU-3, IR Site 1. The figure has been revised to present the plume boundary for vinyl chloride. Figure 2.10-1: Short Term ARICS and VOC Trends in Groundwater, OU-6, IR Site 26. The figure has been revised to show the current plume boundary for vinyl chloride. Figure 2.11-1: IC Boundary Map and VOC Trends in Groundwater, OU-6, IR Site 27. The figure has been revised to define the northern and southern extents of the plume boundary for vinyl chloride. Figure 2.12-2: Copper Trends in Groundwater SWBZ, OU-6, IR Site 28. There are only three wells currently at IR Site 28 within a spread

		out line, adjacent to the shoreline. Based on this configuration, plume boundaries cannot be accurately defined. Figure 2.13-1: Site Location Map, OU-5/FISCA IR Site 02 Groundwater will not include a plume boundary as this site is NFA, per the 2015 ROD Amendment.
4.	The FYR includes two summary forms and two sites (Operable Unit [OU]-5/Fleet and Industrial Supply Center Oakland, Alameda Facility/Alameda Annex [FISCA] IR Site 02 Groundwater and the Marsh Crust) are included on both summary forms. One summary form should be included for the Alameda Point sites and another for the FISCA sites, and the March Crust is the only site that should be included on both summary forms. In addition, the second summary from indicates that this is the third review; however, this is the third review for two of the three sites listed (FISCA IR Site 02 Soil and the Marsh Crust) and the second review for the remaining site (FISCA IR Site 02 Groundwater). Please revise the FYR to ensure one summary form is provided for Alameda Point and another for the FISCA. Please also revise the second summary form to ensure the correct review number is provided for each of the three sites.	The FISCA FYR Summary Form has been revised to remove OU-5/FISCA IR Site 02 Groundwater. The FISCA FYR Summary Form has been revised to state this is the third review for FISCA IR Site 02 Soil and the Marsh Crust.

5.	There are several issues related to the summary form: • According to the summary form all sites have received construction complete status, but some sites have not received this status (e.g., IR Site 1, IR Site 2, etc.); • The summary form includes a protectiveness statement for IR Site 1, but there are no monitoring wells currently installed, so the protectiveness cannot be determined. In addition, the extent of contamination in the vicinity of the volatile organic compound (VOC) plume needs to be redefined because capping may have change the extent of the VOC plume; • There are issues with groundwater remediation at IR Sites 1, 14, and 28, but no issues or recommendations are included for these sites. Also, the vegetative cover at IR Site 2 has not been established (second year) and noxious invasive vegetation remains, which should be identified as an issue; Please revise the summary form to include these issues and to provide recommendations.	**Bullet Point 1:** Because the Summary Form presented in the Executive Summary, page ES-4, covers many IR sites at various stages of construction completion, the Summary Form "Has the site achieved construction completion?" cell has been revised from "~~Yes~~" to "*Various; see Table ES-1*". **Bullet Point 2:** The summary form for IR Site 1 has been revised to read as follows. **OU-3, IR Site 1– The RA performed at IR Site 1 *soil*, is considered protective of human health and the environment.** The extent of contamination has been defined, and ICs are in place to prevent exposure to contaminated soil~~ and groundwater~~. ICs and LUCs are assessed annually. The selected remedy will continue to be protective. *The RA at IR Site 1 groundwater is pending completion and current ICs are considered protective of human health in the short term; however, since implementation of the RA at IR Site 1 groundwater is pending completion, protectiveness of ecological receptors is deferred.* **Bullet Point 3:** If issues and recommendations for specific sites were modified in Section 3, those issues and recommendations will be carried through to the summary forms.
6.	The information presented in Table 1-1 is not consistent with the information provided in Tables ES-1 and ES-2. Examples include, but are not limited to: • Table 1-1 includes a single entry for IR Site 13 while Table ES-2 includes two separate entries for this site. In addition, the management stages listed in Table 1-1 for IR Site 13 differ from those in Table ES-2. Table 1-1 lists Remedy in Place (RIP)/Remedy Complete	The management stages presented in Table 1-1 have been revised to match the management stages presented in Tables ES-1 and ES-2.

	(RC)/Remedial Action Operation (RA-O), while Table ES-2 lists RIP/RC/Long-Term Management (LTM) for IR Site 13 Excluding South RA-O Area and RC/LTM/RA-O for IR Site 13 South RA-O Area; • Table 1-1 lists management stages RC/LTM/RA-O for IR Site 14 and RIP/RA-O for IR Site 16, while Table ES-2 lists RIP/RA-O for IR Site 14 and RC/LTM for IR Site 16; • Table ES-1 lists two Record of Decisions (RODs) for IR Site 16 (2012 for soil and 2015 for groundwater) and a 2016 Explanation of Significant Differences (ESD), while Table 1-1 lists a 2007 ROD and a 2015 ESD; • Table ES-1 lists 2007 and 2016 RODs for IR Site 17, but Table 1-1 lists a 2006 ROD; • Table 1-1 lists management stages RC/LTM for IR Site 26, while Table ES-2 lists RIP/RA-O for IR Site 26; and • Table 1-1 lists management stages RIP/RA-O for FISCA IR Site 02 Groundwater, Site Closure (SC) for FISCA IR Site 02 Soil, and RIP for Marsh Crust, while Table ES-2 lists SC for FISCA IR Site 02 Groundwater, RIP for FISCA IR Site 02 Soil, and RIP/LTM for Marsh Crust. Please revise the FYR to resolve these discrepancies.	

7.	The FYR Report does not discuss the source(s) of the exposure factors used in the original human health risk assessment (HHRA). As such it is unclear whether any of the risk and hazard estimates warrant revision. It is noted that since September 28, 2011, EPA has published several resources with more current exposure factors, including the *Exposure Factors Handbook: 2011 Edition*, dated September 2011; and OSWER Directive 9200.1-120 (*Update of Standard Default Exposure Parameters*), dated February 6, 2014. EPA has also promulgated a document to supplement aspects of the 2014 Update of Standard Default Exposure Parameters. This supplementary document, OSWER Directive 9285.6-03, originally dated February 6, 2014, was updated September 14, 2015 and is titled *Frequently Asked Questions (FAQs) About Update of Standard Default Exposure Factors* (EPA, 2015). The FYR should clarify if any of the exposure factors used in the original HHRA have changed since that time, and if so, if the changes are deemed substantive and necessitate re-calculations of risk and hazard. In evaluating exposure assumptions, EPA's FYR Guidance also states that the FYR should evaluate "whether there are changed or new land uses, including zoning changes, changed or new routes of exposure or receptors, changed physical site conditions that may affect the protectiveness of the remedy, new contaminants, or a new understanding of geological conditions." Please revise the FYR to include an in-depth evaluation of changes in exposure factors and exposure assumptions, including exposure pathways and receptors, and clarify if any of these changes affect the protectiveness of the remedy.	**Section 1.3.3, Data Review,** has been revised to read as follows. "The types of ~~documents~~ *information* reviewed *can be found in the reference section of this report, which* included the following:" The following generic text has been inserted as second and third bullet points in **Section 1.3.3, Data Review.** "• *Updated EPA guidance documents including* OSWER Directive 9200.1-120 Human Health Evaluation Manual, Supplemental Guidance: Update of Standard Default Exposure Factors (EPA, 2014) *which supplements EPA's Risk Assessment Guidance Superfund, Part A through E, and supersedes and replaces certain portions of OSWER Directive 9285.6-03 (EPA, 1989); and* Frequently Asked Questions (FAQs) About Update of Standard Default Exposure Factors *(EPA, 2015)."* "• *Site-specific Human Health Risk Assessment Reviews."* Revised comment #7 via email on 7/15/16. For the source(s) of the exposure factors used in the original HHRA, the reader will be referred back to the original HHRA, for example, each site-specific RI report. Specific text has been added to individual IR Site Sections 2.X.5.2, Question B, <u>Changes in Exposure Assumptions and Toxicity Data,</u> in review of site-specific risk and hazard and to address changes, if any, in exposure factors and assumptions. As an example, the following

	Revised comment #7 via email on 7/15/16: The FYR Report does not discuss the source(s) of the exposure factors used in the original human health risk assessment (HHRA). As such it is unclear whether any of the risk and hazard estimates warrant revision. It is noted that since September 28, 2011, EPA has published several resources with more current exposure factors, including the Exposure Factors Handbook: 2011 Edition, dated September 2011; and OSWER Directive 9200.1-120 (Update of Standard Default Exposure Parameters), dated February 6, 2014. EPA has also promulgated a document to supplement aspects of the 2014 Update of Standard Default Exposure Parameters. This supplementary document, OSWER Directive 9285.6-03, originally dated February 6, 2014, was updated September 14, 2015 and is titled Frequently Asked Questions (FAQs) About Update of Standard Default Exposure Factors (EPA, 2015). The FYR should clarify if any of the exposure factors used in the original HHRA have changed since that time, and if so, if the changes are deemed substantive and necessitate re-calculations of risk and hazard. In evaluating exposure assumptions, EPA's FYR Guidance also states that the FYR should evaluate "whether there are changed or new land uses, including zoning changes, changed or new routes of exposure or receptors, changed physical site conditions that may affect the protectiveness of the remedy, new contaminants, or a new understanding of geological conditions." Please revise the FYR to include an in-depth evaluation of changes in exposure factors and exposure assumptions, including exposure pathways and receptors, and clarify if any of these changes affect the protectiveness of the remedy.	specific discussion has been inserted into the text of Section 2.1.5.2, Question B, for IR Site 6: *"The potential RME cancer risk for IR Site 6 soil (including background) is 2 x 10^{-6} for the commercial/industrial scenario and 1 x 10^{-6} for the recreational scenario, both of which are at the lower end of the risk management range of 10^{-6} to 10^{-4}. The RME cancer risk for the construction worker scenario is 2 x 10^{-7} (both surface and subsurface soil), which is below the risk management range. The RME hazard index (HI) (including background) is 0.03 (surface soil) for the construction worker scenario, 0.02 for the recreational scenario, and 0.009 for the commercial/industrial worker, all of which are less than the noncancer threshold of 1. Since groundwater is generally 5 feet below ground surface (bgs), deeper than the construction worker scenario depth, only surface soil was evaluated.* *"For the residential scenario, soil data were evaluated at depth intervals of 0 to 2 feet bgs (surface soil) and 0 to 8 feet bgs (subsurface soil). For surface soil, the total RME cancer risk (including background) was 1 x 10^{-5}, which is within the risk management range. The RME HI for a child (including background) was 0.2, which is less than the noncancer threshold of 1. For subsurface soil, the total RME cancer risk (including background) was 1 x 10^{-5}, which is within the risk management range. The RME HI for a child (including background) was 0.1, which is less than 1. Risks from soil were attributed primarily to arsenic; however, arsenic was found to*

		be within background levels. Polycyclic aromatic hydrocarbons and semivolatile organic compounds were not identified as risk drivers at IR Site 6. *Lead was not selected as a chemical of potential concern for soil because concentrations of lead were statistically similar to background; therefore, risk from exposure to lead was not evaluated.* <u>Changes in Exposure Assumptions and Toxicity Data</u> No changes in exposure assumptions or land use have occurred since the refined HHRA and ecological risk assessment (ERA) were conducted. ~~Changes in the human toxicity values for TCE and PCE were evaluated. USEPA and DTSC cancer slope factors and inhalation unit risks were revised for both compounds. Also, the USEPA reference doses and reference concentrations were revised since the HHRA was conducted in 2004. Each of these revised values is more conservative than the corresponding value that was used in the HHRA. Because the cleanup levels for TCE and PCE in IR Site 6 groundwater are based on Federal maximum clean-up level (MCL), which are ARARs, revisions to the toxicity values would not affect the protectiveness of the cleanup levels. No changes in ecological exposure pathways or toxicity values have occurred since submittal of the ERA.~~ *"For groundwater, the primary risk drivers were cis-1,2-DCE, PCE, TCE, and VC in the IR Site 6 HHRA. The toxicity values used for these chemicals of concern were primarily obtained from the USEPA's IRIS database dated 2003 and updated toxicity values were identified during the 2011 Five-Year Review. Since the 2011 review, the oral slope factor for TCE*

		*was updated to 0.046 (*per milligram per kilogram –day *[mg/kg-day]$^{-1}$) (USEPA IRIS) compared to the previous oral cancer slope factor (CSF) of 0.0013 (mg/kg-day)$^{-1}$. The inhalation unit risk (URi) for TCE was also updated [0.0000041 (mg/m^3)$^{-1}$,] as well as the oral reference dose (0.0005 mg/kg-day) and reference concentration (0.002 mg/m^3) (USEPA IRIS). In 2012, the oral CSF for PCE was updated to 0.54 (mg/kg-day)$^{-1}$ compared to the previous oral CSF of 0.052 (mg/kg-day)$^{-1}$ (California Office of Environmental Health Hazard Assessment [OEHHA]). The URi for PCE was updated [5.9E-06 (µg/m^3)$^{-1}$] as well as the reference dose (0.006 mg/kg-day) and reference concentration (0.04 mg/m^3) (USEPA IRIS). These updated values in the IRIS and the (OEHHA) databases are more conservative than what was used in the 2004 HHRA, but because the RGs are based on MCLs, the changes will not affect the current remedy at IR Site 6. Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review.* *The HHRA for IR Site 6 primarily used the default exposure factors from the 1991 guidance. The exposure factors that changed in USEPA's most recent update (USEPA 2014)~~s~~ include: skin surface area, adult body weight, resident exposure duration and exposure time, and worker soil adherence factor. Some of these factors are less conservative and some are more conservative so overall, the changes do not significantly impact the risk results for IR Site 6.* [Note: this last sentence changes with each IR Site.]

		The methods and assumptions used in the HHRA to evaluate health risks for groundwater vapor intrusion to indoor air do not reflect current standards of practice (DTSC, 2011; Interstate Technology & Regulatory Council [ITRC], 2007; and USEPA, 2015b). In particular, soil and building property assumptions used in the HHRA differ significantly from current DTSC (2011) recommended values. In all cases, the DTSC recommended values are more conservative than those used in the HHRA. However, these changes do not impact the current remedy at IR Site 6 which is currently based on MCLs and these MCLs are protective of commercial indoor air (Vapor Intrusion Screening Level Calculator, EPA, 2015a)." *No additional exposure pathways have been identified since land uses, zoning, and receptors at the IR site have not changed since the previous 5-Year Review."* The FYR text has been revised to discuss whether the changes in exposure factors are deemed substantive and necessitate re-calculation of risk and hazard. The text has also been revised to include a current assessment of vapor intrusion risk and hazard for applicable sites.

8.	The FYR does not include sufficient comparisons of the toxicity criteria employed in the original HHRA to current toxicity criteria for each COC at each site. As such, it is unclear whether any of the risk and hazard estimates warrant revision. For example, the toxicity criteria for trichloroethene were updated in November 2011 and it was also reclassified as a mutagen. Similarly, toxicity criteria for tetrachloroethene; methylene chloride; and 2,3,7,8-tetrachlorodibenzopdixoin (TCDD) were updated in May 2012. Finally, toxicity criteria for cadmium were updated in May 2013. Note that this list of examples may not be exhaustive. Please revise the FYR to provide a comparison of the toxicity criteria used in the original HHRA to current toxicity criteria for each COC. Please also clarify if any re-calculations of risk and hazard are necessary to demonstrate continued protectiveness of the remedy and/or if cleanup goals should be revised on the basis that improved approaches are available for calculating new/current cleanup standards. Revised Comment #8 via Email on 7/18/2016: The FYR does not include sufficient comparisons of the toxicity criteria employed in the original HHRA to current toxicity criteria for each COC at each site. As such, it is unclear whether any of the risk and hazard estimates warrant revision. While Table E-1, Toxicity Value Changes Noted in Alameda Point 2016 Five-Year Human Health Reviews, presents current toxicity criteria for select chemicals, it is unclear whether any of the risk and hazard estimates associated with these chemicals were revised based on the new toxicity criteria, or whether they warrant revision. Please revise the FYR to provide a comparison of the toxicity criteria used in the original HHRA to current toxicity	See General Comment Response 7. **Section 2.X.5.2, Question B – Are the Exposure Assumption, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?**, will include the following text: *"Table E-1 included in Appendix E provides a summary of revisions to toxicity values for IR sites included in this Five-Year Review."* The FYR text has been revised to provide updated estimates of risk and hazard based on current toxicity criteria to demonstrate that cleanup goals do not warrant revision and to demonstrate continued protectiveness of the remedy. Specific text has been added to individual IR Site Sections 2.X.5.2, Question B, <u>Changes in Exposure Assumptions and Toxicity Data,</u> in review of site-specific risk and hazard and to address changes, if any, in exposure factors and assumptions. As an example, the following specific discussion has been inserted into the text of Section 2.3.5.2, Question B, for IR Site 14: "*However, because the calculated RAO for VC for a hypothetical future resident from inhalation of indoor air is based on the more conservative residential scenario, it is assumed that the RAO continues to be protective of the future occupational and recreational receptors, in addition to potential patients that visit the proposed VA Clinic and Columbarium at IR Site 14. The calculations were performed using the most conservative toxicity values (OEHHA) that are current and valid. No additional*

	criteria for each COC. Please also clarify if any re-calculations of risk and hazard are necessary to demonstrate continued protectiveness of the remedy and/or if cleanup goals should be revised on the basis that improved approaches are available for calculating new/current cleanup standards.	*exposure pathways have been identified since land uses, zoning, and receptors at the IR site have not changed since the previous 5-Year Review. The conclusions of the HHRA are currently valid and continue to be protective of human health.*"
9.	Some of the site chronology tables do not include dates of major events. For example, Section 2.1.2.2 indicates that "Under the BGMP [Basewide Groundwater Monitoring Program], groundwater monitoring was conducted at IR Site 6 in August 2012, October 2012, March 2013, May 2013, and December 2013," but monitoring under the BGMP was not included in Table 2.1-1. This information should be included in the site chronology because monitored natural attenuation (MNA) is part of the selected remedy for IR Site 6. Another example is found in Section 2.4.2.1, which indicates that in situ bioremediation (ISB) and MNA are part of the remedies for IR Site 13, but Table 2.4-1 does not include dates for ISB or monitoring events associated with MNA. In addition, the dates of landfill cap construction for IR Sites 1 and 2 are not provided and the dates of dredging are not provided for IR Site 17. In general, the chronology tables appear to be missing the dates of remedy implementation. Per Exhibit 3-3 of the FYR Guidance, site chronology should include "decision and enforcement documents, start and completion of remedial and removal actions, construction completion, and prior five-year reviews." Please ensure the site chronology tables include	The site chronology for each IR Site included in the FYR has been revised to include more specific events such as the remedial action start and finish (i.e. ISCO implementation, cover construction, etc.). Additionally, the *1983 IAS Report* has been added to the Site Chronology for IR Sites 1, 2, 4, 16 and 17.

	dates for all major events related to remedy documentation and implementation.	
10.	Some of the trend diagrams included in the FYR show increasing concentration trends; however, the FYR does not discuss how increasing concentration trends relate to remedy performance (i.e., is the remedy functioning as intended if concentrations are increasing). For example, Figure 2.6-2 shows that trichloroethene (TCE) and vinyl chloride (VC) concentrations are increasing in well M034-A. Since ISCO is being conducted, it is unclear why VC and TCE concentrations are increasing; this should be discussed in the text. Another example is found on Figure 2.10-1, where cis-1,2-dichloroethene (cis-1,2-DCE) concentrations appear to be increasing in well 26PZ02 (note that while the trend is variable, the peak concentrations have increased each time). A third example is depicted on Figure 2.12-2, which shows increasing copper concentrations in well 28SW02. It should be noted that trend diagrams have only been provided for select COCs and sampling locations, so additional COCs and/or sampling locations may exhibit increasing trends. Please revise the FYR to discuss how increasing concentration trends relate to remedy performance (i.e., whether the remedy is functioning as intended if concentrations are increasing).	For illustration, the following example of text changes have been applied to Section 2.10.5.1, Question A, in the FYR. In addition to IR Sites 1, 26, and 28, illustrated here, similar changes have been applied to the review for IR site 27 (Section 2.11.5.1, p. 2-145) where increasing trends are apparent. **Section 2.10.5.1, Question A, Is the Remedy Functioning as Intended by the Decision Documents? Performance of Groundwater Remedy**, has been revised to include ~~the following~~ discussion of increasing trends in relation to remedy performance. "ISCO and ISB have resulted in significant decreases in concentrations of TCE; cis-1,2-DCE; and VC in groundwater. Concentrations of TCE have declined to below detection limits in most groundwater monitoring wells across IR Site 26. *"Concentrations of cis-1,2-DCE in well 26PZ02 have shown seasonal variation over the past five years. Though the average concentration of cis-1,2-DCE has recently increased in well 26PZ02, the current concentration of 3.4 µg/L (Spring 2015) is below the RG of 6 µg/L. The recent increase in cis-1,2-DCE is likely attributed to lateral dispersion from well 26PZ01, which is*

		upgradient of well 26PZ02. Recent elevated concentrations of cis-1,2-DCE (8.5 µg/L [Spring 2013] and 45 µg/L, [Summer 2014]) have been detected in well 26PZ01, which is the likely source of increasing trends in well 26PZ02. The remedy at IR Site 26 is functioning and performing as intended, and the increase in well 26PZ02 is likely the localized dispersion of cis-1,2-DCE from 26PZ01." **Site 1: Section 2.6.5.1, Question A, Is the Remedy Functioning as Intended by the Decision Documents?** The following text has been added to this section. *"The remedy for groundwater at IR Site 1 is pending completion; therefore, concentration trends will not be evaluated in this Five-Year Report. It is premature to determine the efficacy of the groundwater remedy as remedy implementation is ongoing. The path forward will be determined after the monitoring well network is replaced and sampled."* **Site 28: Section 2.12.3, Progress Since the Last Five-Year Review:** The EPA states that "copper is being discharged to the Oakland Inner Harbor at levels in excess of the RGs" but this fact is not known. The observed copper concentrations in the wells do exceed the 40 µg/L trigger level but are declining in well 28SW03 and have exceeded it only three times in well 28SW08. The copper concentrations, if any, that may be entering the surface water of the harbor are unknown. Secondly, the increase in observed copper concentrations in the monitoring wells may not be indicative that the metals immobilizing

		compound (MIC) is no longer effective. Review of copper concentration trends indicates that the well (28SW03) with the greatest historical copper concentrations continues to decline and the trends in the wells with increasing copper concentrations (28SW02 and 28SW08) only began to show increases in 2012, which correlates with the beginning of the ongoing drought. Rising electrical conductivity in the well farthest inland from the tidal influence (28SW03), now at a historical high, suggests saltwater intrusion and decreased offshore flow of groundwater to Oakland Inner Harbor. If the historically wetter annual weather cycle returns, copper concentrations may return to expected trends.
11.	The FYR should discuss the time estimated in the ROD to reach RGs for all sites with MNA as the ongoing remedy and whether RGs will be achieved within that time period. If the estimated time has already passed without levels decreasing to concentrations below RGs, then the FYR should explain why and provide a new estimate. For example, the text describing the remedy for IR Site 14 should include this information. Please revise the FYR to discuss the time estimated in the ROD to reach RGs for all sites with MNA as the ongoing remedy and whether RGs will be achieved within that time period. If the estimated time has already passed without levels decreasing to concentrations below RGs, please revise the FYR to explain why and provide a new estimate of time to reach RGs.	The FYR will include the original dates estimated in the ROD; however, revised remedy complete dates will not be provided. The FYR will include a milestone date for Site 28 which will be evaluated after an additional year of quarterly monitoring. Section 2.1.5, 2nd paragraph (p. 2-8); Section 2.2.5.1, 2nd paragraph (p. 2-19); Section 2.3.5, 2nd paragraph (p. 2-28); Section 2.4.5.1, 1st paragraph (p. 2-39); Section 2.5.5, 2nd paragraph (p. 2-48); Section 2.6.5.1, Groundwater Remedy subsection, 2nd paragraph (p. 2-66); Section 2.10.5 2nd paragraph (p. 2-107); Section 2.11.5.1, Performance of Groundwater Remedy, 2nd paragraph (p. 2-118); Section 2.12.5.1, Performance of Groundwater Remedy, 3rd paragraph (p. 2-128); and Section 2.13.5.1, Performance of Groundwater Remedy, 1st paragraph (p. 2-138), Question A, have been revised for each IR site that requires long-term groundwater monitoring, as part of the selected remedy, to include the estimated timeframe for remediation as presented in the RODs.

12.	There are several inconsistencies regarding the site inspection checklists in Appendix A of the FYR. Examples include, but are not limited to: • Section IV, O&M [Operations and Maintenance] Costs – Some checklists are marked "Other" and input "N/A" or have no entries for Item 1, O&M Organization; however, several sites have monitoring well networks associated with the remedy so there are O&M associated with maintaining the monitoring well networks and conducting sampling; • Section V, Access and ICs – Checklists for some sites mark Item 1, "Signs and other security measures" as "NA" under Part B, Other Access Restrictions, but then go on to discuss the signage in the remarks; • Section V, Access and ICs – Checklists for some sites have the answer to "Violations have been reported" under Item 1 of Part C, ICs, marked as "N/A" (no violations occurred), while checklists for other sites have this answer marked as "No" (assumed to mean that no violations occurred, rather than violations occurred but were not reported). The checklists should be completed as consistently as possible to ensure clarity regarding the inspection findings; • Section VI, General Site Conditions – Several of the inspection checklists mark Part A, Roads, as "N/A" but then mark Item 1 as "Roads adequate;" • Section IX, Groundwater/Surface Water Remedies – Several of the inspection checklists mark this section as "N/A" but then include answers for all the parts and items under Section IX. In addition, the majority of the sites	**Bullet Point 1:** Section IV, O&M Costs have been revised to show "*Contractor for Federal Facility*" for each Site Inspection Checklist. **Bullet Point 2:** Each IR site has been revised to include a short summary of access and security measures. **Bullet Point 3:** Section V, Access and ICs "Violations have been reported" have been revised to read "*N/A*" for all IR Site Inspection Checklists. **Bullet Point 4:** Section VI, General Site Conditions, Part A, Roads, have been revised to read "*Applicable*" and Item 1, have been revised to read "*Roads Adequate*", where applicable. **Bullet Point 5:** Section IX, Groundwater/Surface Water Remedies have been revised to read "*Applicable*" for those sites with a groundwater remedy component. **Bullet Point 6:** Section IX, Groundwater/Surface Water Remedies have been revised to read "*All wells were located*" and "*Functioning*", under Item 1 of Part E, where applicable. **Bullet Point 7:** IR Site 16, Section III, Item 10, Daily Access/Security Logs has been revised to read "*Readily Available*". **Bullet Point 8:** IR Site 14, Section III, Item 7, Groundwater Monitoring Records, has been revised to read "*Readily Available*". This revision was carried through other applicable IR Sites where groundwater monitoring is occurring.

	evaluated in the FYR have some sort of groundwater remedy component (e.g., ISB, MNA, ICs, etc.), so Section IX should be marked as "Applicable" for all sites with a groundwater remedy component; • Section IX, Groundwater/Surface Water Remedies – The inspection checklists for sites with MNA do not indicate whether "All required wells [were] located" or whether all wells were "Functioning" under Item 1 of Part E, Monitored Natural Attenuation; • IR Site 16 Checklist – The "Daily Access/Security Logs" is marked as "N/A" under Item 10 of Section III, On-Site Documents & Records Verified, but the remarks indicate that "Security logs available at the site;" • IR Site 14 Checklist – Item 7 under Section III, On-Site Documents & Records Verified, has been left blank, but groundwater monitoring is occurring; • IR Site 17 Checklist – ICs are marked for the remedy, but "Other" should also be marked because dredging was also a component of the remedy for this site; Please revise the FYR to clarify the inconsistencies regarding the site inspection checklists in Appendix A.	**Bullet Point 9:** IR Site 17 Checklist – ICs has been revised to show "*Other*" and now reads "*Dredging, Dewatering and Off-site Disposal of contaminated sediment.*"
13.	There are concerns identified in the interview records in Appendix C of the FYR that are not discussed in the main text of the FYR. The main text of the FYR should acknowledge the concerns expressed in the interviews and discuss whether these concerns impact protectiveness or require recommendations for follow-up. Examples include, but are not limited to:	The following example for Section 2.6.4.2, Interviews, for OU-3, IR Site 1 has been applied to all other interview section reviews included in the Five-Year Review Report. **Section 2.6.4.2, Interviews**, has been revised as follows:

	• Ms. Xuan-Mai Tran expressed several concerns related to site conditions that may impact protectiveness. She indicates that at IR Site 1 "The extent to which VOCs [volatile organic compounds] were treated in the plume area is unknown as the wells were removed to install the soil cover." At IR Site 2 "The soil cover depression collected rainwater in a pond and the vegetative layer needed to be reseeded." At IR Site 6 "The Regulatory Agencies were not given an opportunity to review an optimization plan for groundwater treatment before it was implemented." At IR Site 13 "powered fans have not operated continuously, so air is not being injected to increase the DO [dissolved oxygen] levels" and "the potential for rebound should be considered – long-term monitoring will be necessary to ensure that rebound does not occur." At IR Site 14 "conditions have not been improved and concentrations of contaminants have not been reduced at some well locations as expected within the estimated time frame stated in the ROD." At IR Site 28 "the copper concentrations in well 28SW02 remain high, at nearly 40 times the RG. (RG=3.1 ug/L [micrograms per liter], Spring 2013 concentration was 120 ug/L)." • Mr. Jeremiah Santini expressed concerns related to erosion of landfill slopes at IR Site 2, which was concerning to him given the below	"Interviews were conducted with various stakeholders as part of the Five-Year Review to provide additional information about the status of IR Site 1. Table 1-4 lists the interviewees and Appendix C provides the interview documentation and record forms." *"The respondents reported being informed overall regarding environmental actions on Alameda Point and were unaware of any changes in site conditions or in ARARs that could impact remedy protectiveness. Highlights of the interview responses related to remedy protectiveness are summarized in the following subsections."* *USEPA Interview Response:* *"Additional burned materials were encountered during pre-design investigation which led to Focused Feasibility Study for the Burn Area. The ROD Amendment was prepared to document the remedy change from the original ROD. The extent to which VOCs were treated in the plume area is unknown as the wells were removed to install the soil cover. Additional in-situ chemical oxidation (ISCO) may be needed. Also, additional wells are needed to monitor whether contaminated groundwater moves around the waste isolation barrier (WIB)."* *DTSC Response: No comments.* *Regional Water Board Response:* *"During a Site 1 inspection on March 13, 2015, Water Board staff noted three site conditions that were out of compliance for storm water requirements. These issues were addressed quickly and the site documented as having complied by April 2015. I am*

	average rainfall. Mr. Santini also expressed concerns regarding the potential transfer of IR Site 25 "without restrictions other than Marsh Crust Ordinance." • Ms. Susan Galleymore expressed concerns related to migration of contaminants into the bay at IR Sites 1 and 2 given increased rainfall (there had been drought conditions for many years prior) and potential rising sea levels. Please revise the main text of the FYR to acknowledge the concerns expressed in the interviews and to discuss whether these concerns impact protectiveness or require recommendations for follow-up.	*unaware of any additional incidents during the time I have been the caseworker (November 2014 to present). The community (via RAB meetings) voiced concerns regarding the re-vegetation of IR Sites 1 and 2 and the Tarry Refinery Waste (TRW) remaining at IR Site 13."* *Community Interview Response:* *"Inadequate protection against burrowing animals. Closure of IR Sites 1, and 2 does not meet current state standards for landfills."* George Humphreys, RAB Member. *"I suspect that, over time, Sites 1 & 2 will be impacted by sea level rise at which time the ground will be far more wet or inundated. The WIB is expensive and is probably vulnerable to certain types of earthquakes. If it is damaged in a quake or even by a combo or quake and water action, how will 'damage' be evaluated before the WIB is restored? (It is 'holding back' an enormous amount of contamination and it is unlikely that a structure in its particular situation will last 'forever'." Susan Galleymore, RAB Member* The Interview responses are intended to present concerns from the BCT, the community and contractors. Concerns raised during the interviews are acknowledged by highlighting direct quotes in the site-specific text; however, a discussion of the concerns is not required. Decisions regarding issues and recommendations for each site are made by gathering data from all the components of the Five-Year Review: interviews, site inspections, previous documents, and evaluation of data trends.
SPECIFIC COMMENTS		

1.	**Table ES-1, Summary of Current Status of IR Sites at Alameda Point and FISCA, Pages ES-1 through ES-3 and Table 1-2, Five-Year Review Status of IR Sites and Alameda Point and FISCA, Pages 1-6 and 1-7:** Tables ES-1 and 1-2 include a column with phase numbers, but the phase numbers are not defined. Please revise Tables ES-1 and 1-2 to define the phase numbers or remove the phase numbers from these tables.	**Table ES-1, Summary of Current Status of IR Sites at Alameda Point and FISCA, Pages ES-1 through ES-3 and Table 1-2, Five-Year Review Status of IR Sites and Alameda Point and FISCA:** Tables ES-1 and 1-2 have been revised to include a definition of phase numbers used in each table.
2.	**Tables ES-1, Summary of Current Status of IR Sites at Alameda Point and FISCA, Pages ES-1 through ES-3; Table ES-2, Summary of Protectiveness Determination for IR Sites at Alameda Point and FISCA, Page ES-4; and Table 1-1, Summary of IR Sites at Alameda Point and FISCA, Page 1-3:** The remedy is not complete ("RC") for IR Site 1 nor is the remedy in place ("RIP") for groundwater, but Tables ES-2 and 1-1 list IR Site 1 as RC and RIP. In addition, IR Site 1 is not in long-term management ("LTM"), because the monitoring wells have to be re-installed for both the landfill detection monitoring and monitoring of the VOC plume; however, Tables ES-1, ES-2, and 1-1 all list IR Site 1 as LTM. Delineation of the current extent of the VOC plume at IR Site 1 (i.e., additional monitoring wells may be necessary) should be acknowledged in the text because capping activities may have spread contamination. Also, additional in-situ injections may be required for the VOC plume as the injections have not reduced concentrations to below the RGs. Please revise Tables ES-1, ES-2, and 1-1 to remove the designations "RC," "RIP," and "LTM" for IR Site 1.	Tables ES-1, ES-2, and 1-1 have been revised to state "RA-O" for Site 1.

3.	**Protectiveness Statements, Page ES-9:** The protective statement for Marsh Crust is misleading. The text states "The RA performed for the Marsh Crust is considered protective of human health and the environment." Please remove the word "performed".	**Protectiveness Statements:** The following text has been revised to read as: "The RA ~~performed~~ for the Marsh Crust is considered protective of human health and the environment."
4.	**Section 1.1, Purpose of Review, Page 1-1:** The second paragraph of this section states "The corrective action requirements of the Resource Conservation and Recovery Act (RCRA) of 1976 apply to solid waste management units (SWMU) at RCRA-permitted facilities." Please note that these corrective action requirements also apply to non RCRA-permitted facilities.	**Section 1.1, Purpose of Review**: The second sentence of the second paragraph has been revised as follows: "The corrective action requirements of the Resource Conservation and Recovery Act (RCRA) of 1976 apply to solid waste management units (SWMU) at RCRA- *and non-RCRA*-permitted facilities."
5.	**Figure 1-1, Alameda Point and FISCA, OU and IR Site Location Map, Page 1-2 and Section 1.2.2, FISCA, Page 1-4:** Figure 1-1 shows the location of FISCA IR Site 02, but does not distinguish between the soil and groundwater portions of this site. Also, Section 1.2.2 states "Figure 1-1 shows the OUs and IR Sites located within the FISCA boundaries," but this figure does not depict all of the eight IR sites associated with the FISCA. Please revise Figure 1-1 to distinguish between the soil and groundwater portions of FISCA IR Site 02. Please also revise Figure 1-1 to depict all of the eight IR sites associated with the FISCA.	**Figure 1-1, Alameda Point and FISCA, OU and IR Site Location Map, and Section 1.2.2, FISCA:** The title of Figure 1-1 has been revised to read as follows: "Figure 1-1, Alameda Point and FISCA, ~~OU and IR~~ Site Location Map". In addition to this revision, Figure 1-1 is intended to present Alameda Point and FISCA IR Sites included in the 2016 FYR. Since FISCA IR Site 02 Soil is the only IR Site included in the FYR, the other seven FISCA sites are not presented in Figure 1-1. Also, Figure 1-1 has been revised to present IR Site 4. For consistency, **Section 1.2.2, FISCA, Second Paragraph, Last Sentence**, has been revised to read as follows. Figure 1-1 shows FISCA IR Site 02 Soil located within the FISCA boundaries.

		"Figure 1-1 shows ~~the OUs and IR Sites~~ *IR Site 02* located within the FISCA boundary~~ies~~."
6.	**Table 1-1, Summary of IR Sites at Alameda Point and FISCA, Page 1-3:** According to Table 1-1 RODs, ROD Amendments, ESDs, and previous FYRs were reviewed, but it is unclear why RD/remedial action work plans (RAWPs) and RACRs were not reviewed. In addition, applicable monitoring reports, such as groundwater monitoring reports, should have also been reviewed. Please revise Table 1-1 to list all documents reviewed in support of the FYR, including RA/RAWP, RACRs, and monitoring reports.	**Table 1-1, Summary of IR Sites at Alameda Point and FISCA:** Table 1-1 column titled "Document Reviewed" has been revised to read "*Document Source*". The table column header "Document Sources" is meant to indicate from which source the site-specific COCs and RGs used in this Five-Year Review were taken. For a comprehensive list of all documents reviewed for this report, please see the References section.
7.	**Section 1.2.1, Alameda Point, Page 1-4 and Section 1.2.2, FISCA, Page 1-4:** Section 1.2.2 states "Before 1930, at least two large industrial sites (an oil refinery and a borax processing plant) were located on the western tip of Alameda Island adjacent to IR Site 13," the western portion of Alameda Island is not located at FISCA, so this information should be discussed in Section 1.2.1 instead of Section 1.2.2. Please revise the text to move the discussion of the western tip of Alameda Island to Section 1.2.1.	**Section 1.2.1, Alameda Point, Page 1-4 and Section 1.2.2, FISCA:** Figure 3 of the RAP/ROD for the Marsh Crust shows the previous shoreline of Alameda Island. The two large industrial sites were located on the former western edge of Alameda Island, prior to westward land expansion. The text has been revised to read as follows: "Before 1930, at least two large industrial sites (an oil refinery and a borax processing plant) were located on the *historical* western tip of Alameda Island adjacent to IR Site 13."
8.	**Section 1.2.3, March Crust, Page 1-4:** Section 1.2.3 states "The primary source of contamination is a manufactured gas plant [MGP] active from approximately 1903 through 1930 located across the Oakland Inner Harbor from Alameda Point;"	**Section 1.2.3, Marsh Crust:** The following statement has been deleted: "~~The primary source of contamination is a manufactured gas plant [MGP] active from approximately 1903 through 1930~~

	however, this statement is incorrect. MGP byproduct releases are dense non-aqueous phase liquids (DNAPLs), which are heavier than water. In addition, because San Antonio Creek had an incised channel (i.e., it cut into the sediment/soil beneath the estuary that was located between Oakland and Alameda Point) and the Oakland Inner Harbor was dredged even more deeply so that large ships could be unloaded in Oakland, it is not possible that the DNAPL flowed down into the San Antonio Creek Channel/Oakland Inner Harbor, then flowed across and up into the marshes that were originally present at Alameda Point. It is much more likely that the source of the Marsh Crust was the refinery that was present at IR Site 13. Please revise Section 1.2.3 to remove the statement that the MGP is the primary source of contamination.	~~located across the Oakland Inner Harbor from Alameda Point; Releases of oil and by-products associated with manufacturing operations and incomplete combustion are believed to have resulted in widespread contamination of the former Oakland Inner Harbor shoreline, tidal channels, and tidally influenced marshlands along the southwestern shoreline of Alameda Island."~~ The following text has been inserted in place of the deleted text: "*From the late 1800s until 1920s, two manufactured gas plants and an oil refinery were located near the present locations of FISCA and Alameda Point. During their operation, these facilities discharged petroleum products and wastes, including PAHs to adjacent marshlands. The waste was deposited over the historical surface of the surrounding marsh and tidal flats, leaving a layer of contaminated sediment under the 143-acre area that is now FISCA and 2,675-acres of the eastern portion of Alameda Point (KCH 2011).*"
9.	**Section 1.2.4, Hydrogeology, Pages 1-5 and 1-6:** The FYR does not include a figure that depicts the areas where groundwater was de-designated as drinking water in relation to the IR sites at Alameda Point. A figure depicting area de-designated as drinking water should be provided to accompany the discussion of this topic in Section 1.2.4. Please revise the FYR to include a figure that depicts the areas where groundwater was de-designated as drinking water in relation to the IR sites at Alameda Point.	**Section 1.2.4, Hydrogeology:** The Supporting Documents included in Appendix E of the 2016 FYR provide groundwater de-designation exception letters and corresponding figures. The following sections of the FYR have been revised to refer the reader to specific sections of Appendix E for groundwater dedesignation areas at Alameda Point: **OU-1, IR Site 16, Section 2.2.1.2 Current and Potential Groundwater Uses**, second paragraph, last sentence. Page 2-11.

		OU-2A, IR Sites 9, 13, and 19, Section 2.4.1.2 Current and Potential Groundwater Uses, last sentence. Page 2-33. **OU-2B, IR Sites 3 and 4, Section 2.5.1.2 Current and Potential Groundwater Uses**, last sentence. Page 2-44. **OU-6, IR Site 27, Section 2.11.1.2 Current and Potential Groundwater Uses**, first sentence. Page 2-112.
10.	**Table 1-2, Five-Year Review Status of IR Sites and Alameda Point and FISCA, Page 1-6 and Section 1.2.5, Five-Year Review IR Status Update, Page 1-7:** It appears there should be two entries for IR Site 6, one for soil (remediation complete) and one for groundwater (remediation ongoing), in Table 1-2. The last paragraph on page 1-7 states that the RA for soil at IR Site 6 has been completed; however, the groundwater portion is still in progress. Please revise Table 1-2 to include two entries for IR Site 6, one for soil and one for groundwater.	**Table 1-2, Five-Year Review Status of IR Sites and Alameda Point and FISCA.** Table 1-2 has been revised to include two entries for IR Site 6, one for soil (remediation in-place) and one for groundwater (remediation on-going). **Section 1.2.5, Five-Year Review IR Status Update:** See Response to General Comment #2
11.	**Section 1.2.5, Five-Year Review IR Status Update, Pages 1-7 and 1-8:** Section 1.2.5 discusses two RACRs that are not yet final, one for IR Site 6 and one for IR Site 2. The text should not discuss a Final RACR before it has been issued, particularly in the case of IR Site 2, which still has outstanding issues. The vegetation at IR Site 2 has not been established on the landfill cap, and vegetation is unlikely to become established because	**Section 1.2.5, Five-Year Review IR Status Update:** See response to General Comment #2

	the landfill cap was not covered with topsoil. There is insufficient organic material in the clayey soils used to cover the site to support vegetation growth, but this has not been considered. Please revise Section 1.2.5 to remove the discussion of Final RACRs that have not been issued.	
12.	**Section 1.2.5, Five-Year Review IR Status Update, Page 1-7:** The status of some IR sites is unclear. According to the last paragraph of Section 1.2.5, "Several IR sites included in previous Five-Year Reviews have dropped out of the review process because remedial action objectives (RAO) were achieved;" however, the text then goes on to discuss several sites that are included in the FYR, such as IR Site 6, IR Site 16, IR Site 2, and OU-5/FISCA IR Site 02 Groundwater. To be dropped from the FYRs, sites have to be cleaned up to levels for unlimited use/unrestricted exposure (UU/UE), so sites such as IR Site 2 (landfill) will never be UU/UE and will require FYRs in perpetuity (i.e., the site should be removed from the discussion in Section 1.2.5). In addition, even if a site achieves UU/UE, the site should be included in the FYR if the RACR was not final prior to the previous FYR. For example, the RACR for soil at IR Site 6 will not be finalized until 2017, which is after the current FYR will be finalized, so the soil portion of IR Site 6 will still need to be included in the next FYR. The FYR should clearly list any sites that will not be included in future FYRs. Please revise the FYR to clarify which sites will not be included in future FYRs and to remove sites for which the RACR has not been finalized.	**Section 1.2.5, Five-Year Review IR Status Update:** See response to General Comment #2

13.	**Section 1.3.3, Data Review, Page 1-9:** Section 1.3.3 indicates that "routine monitoring reports and technical memoranda" were reviewed to "assess whether the RA continues to operate and function as designed;" however, there are several other document types that should have been reviewed to assess whether the RAs continue to operate and function as designed (e.g., RD/RAWP documents, LUC RDs, etc.). Please revise Section 1.3.3 to identify other document types that should have been reviewed to assess whether the RAs continue to operate and function as designed.	**Section 1.3.3, Data Review:** This section has been revised to read as follows: "The types of documents reviewed *can be found in the reference section of this report, which* included the following: • Documents presenting monitoring data and information that can be used to assess whether the RA continues to operate and function as designed, including *RD/RAWPs*, routine monitoring reports and technical memoranda *(LUC RDs for applicable sites)."*
14.	**Section 1.3.5, Site Inspections, Pages 1-9 and 1-10:** It does not appear that the Regulatory Agencies were invited to attend the FYR inspections. Per Section 3.5.3 of the FYR Guidance, "At Federal facility sites, a State and/or EPA representative may wish to be present and/or participate in conducting site inspections," so the Regulatory Agencies should be invited to attend FYR inspections. Please ensure that the Regulatory Agencies are invited to attend future FYR inspections.	Comment noted.
15.	**Table 1-3, Details of Alameda Point and FISCA Site Inspections, Page 1-10 and Appendix A, Site Inspection Checklists:** Table 1-3 does not list the Marsh Crust, but a checklist is included for this site in Appendix A. Please revise Table 1-3 to include the Marsh Crust.	**Table 1-3, Details of Alameda Point and FISCA Site Inspections.** Table 1-3 has been revised to include the Marsh Crust.
16.	**Table 1-4, List of Interviewees – Alameda Point and FISCA, Pages 1-10 and 1-11 and Appendix C, Interview Documentation Form and Interview Records:** Table 1-4 indicates that contractors were only interviewed about specific IR sites; however, contractors should be interviewed about all	The Department of the Navy conducted interviews with contractors for IR sites for which a remediation contract was in place. Titles as presented in the text were those provided in interview responses.

	the sites included in the FYR. In addition, Table 1-4 and the Interview Documentation Form at the beginning of Appendix C state that James Fyfe is the "Hazardous Substances Engineer," but Mr. Fyfe is the DTSC RPM for Alameda Point. Henry Wong is the DTSC RPM for the FISCA. Please clarify why contractors were only interviewed about specific IR sites and ensure contractors are interviewed about all applicable IR site during future FYRs. Please also revise Table 1-4 and the Interview Documentation Form to clarify that Mr. Fyfe is the DTSC RPM for Alameda Point and Mr. Wong is the DTSC RPM for the FISCA.	
17.	**Section 2.1.1.2, Current and Potential Groundwater Uses, Page 2-2:** According to the second paragraph of Section 2.1.1.2, "regulatory agencies concurred with the Navy's assessment that groundwater in the southeast portion of the base, including IR Site 16 is unsuitable for municipal and domestic supply," but this sentence should not be included in Section 2.1.1.2 since it is applicable to IR Site 16 and not to IR Site 6. IR Site 6 is not included in the Water Board de-designation concurrence letter dated September 13, 2012. Please revise Section 2.1.1.2 to remove the sentence regarding the de-designation of groundwater at IR Site 16 as drinking water from the IR Site 6 discussion.	**Section 2.1.1.2, Current and Potential Groundwater Uses:** The second paragraph has been deleted from the FYR: "~~In 2012, the Water Board regulatory agencies concurred with the Navy's assessment that groundwater in the southeast portion of the base, including IR Site 16 is unsuitable for municipal and domestic supply (Water Board 2012). Regional Water Board and U.S. EPA concurred that shallow groundwater underlying IR Site 16 meets State Water Board Resolution 88-63 and Regional Water Board Resolution No. 89-39 "Sources of Drinking Water", exception criteria (a) and (c) and therefore does not meet requirements for a potable water source; accordingly, drinking water standards do not apply to groundwater in this area.~~"
18.	**Section 2.1.2.1, Remedy Selection (Record of Decision), Page 2-4 and Section 2.1.2.2, Remedy Implementation, Page 2-5:** RGs are provided for IR Site 6 groundwater, but not	**Section 2.1.2.1, Remedy Selection (Record of Decision).** Table 2.1-3: Residential PRGs for COCs in Soil, OU-1, IR Site 6, has been added to this section. The remedial action for soil at IR Site 6 was

	for soil. The text should state that the ROD required soil cleanup to residential PRGs (the ROD is pre-RSLs) and should discuss whether these were achieved for contaminants that were detected in soil during the pre-design investigation. The RACR was not final until 2012, which was after the previous FYR, so the details of the soil RA need to be summarized in these sections. Please revise Sections 2.1.2.1 and 2.1.2.2 to include discussion of the soil RA for IR Site 6.	guided by the residential PRGs presented in Table 2.1-3. The text has been revised to include the following discussion: "*Data available at the time of the ROD indicated that soil at IR Site 6 did not pose a significant risk to human health or the environment. The subsequent pre-design data gaps study (TtEC, 2008) confirmed the findings in the ROD. During the pre-design data gaps sampling events, soil samples were collected from areas at and around IR Site 6 OWSs 040A, 040B, and 041, and WDs 040 and 041A, and soil results were below applicable preliminary remediation goals (PRGs) and/or background levels. To address the presence of low levels of groundwater contaminants in FWBZ groundwater in the immediate vicinity of OWS 040A, the OWS structure was removed along with a limited amount of soil surrounding the structure during the Site 6 remedial action. The ultimate depth of removal was approximately 7 ft bgs (i.e., approximately 2 ft to 3 ft below the groundwater table). During backfill of the excavation, activated persulfate was added to the backfill area to address the low levels of groundwater contaminants. OWS removal will be discussed in the IR Site 6 RACR."* **Section 2.1.2.2, Remedy Implementation.** There is no RACR for IR Site 6 Soil and this comment is not applicable to this section.
19.	**Section 2.1.2.2, Remedy Implementation, Page 2-5:** The text states that an ESD was completed and monitoring data is no longer needed for IR Site 6, but groundwater monitoring is necessary until RGs have been met. The text should state that groundwater monitoring is being conducted by the remedial	**Section 2.1.2.2, Remedy Implementation, 3rd Subheading, Basewide Groundwater Monitoring Program (BGMP):** The entirety of the text under the 3rd subheader has been deleted because the paragraph pertained to IR Site 16. No ESD has been prepared for IR Site 6 and ISB is ongoing.

	action contractor and state when groundwater monitoring will be resumed under the BGMP. Please make this change.	
20.	**Section 2.1.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-8:** Section 2.1.5.1 does not mention the need for long-term monitoring of groundwater to ensure rebound does not occur. Rebound could occur once the injected substrate is consumed. Please revise Section 2.1.5.1 to acknowledge that long-term monitoring of groundwater at IR Site 6 will be necessary to ensure rebound does not occur.	**Section 2.1.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?** The text has been revised to include the following discussion: "*At present, performance monitoring is on-going. Following eight quarters of performance monitoring, the RACR or iRACR will evaluate site conditions and recommend closure or long-term MNA sampling under the BGMP, as appropriate.*"
21.	**Section 2.1.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?, Page 2-8:** Section 2.1.5.2 does not discuss whether the change in toxicity criteria impact the cleanup level for TCE is groundwater. Specifically, Section 2.1.5.1 should evaluate whether 5 ug/L is still protective of vapor intrusion (VI). Please revise Section 2.1.5.1 to discuss whether the change in toxicity criteria impact the cleanup level for TCE is groundwater and whether 5 ug/L is still protective.	**Section 2.1.5.2 Question B - Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?:** The text has been revised to include the following text: "*The RGs for cis-1,2-DCE, PCE, TCE, and VC are based on federal and California MCLs, which continue to be protective of the future land uses at IR Site 6. The MCLs are protective of commercial indoor air (Vapor Intrusion Screening Level Calculator, USEPA 2015a).*"
22.	**Table 2.2-2: RGs for COCs in Groundwater, OU-1, IR Site 16, Page 2-13:** Please include chlorobenzene and 1,2-dichlorobenzene in Table 2.2-2. Those are the groundwater COCs identified post-ROD and documented in the September 2015 Final ESD for Groundwater at OU-1, IR Site 16.	**Table 2.2-2: RGs for COCs in Groundwater, OU-1, IR Site 16:** Table 2.2-2 has been revised to include COCs stated in the September 2015 ESD for Groundwater at OU-1, IR Site 16, which include chlorobenzene and 1,2-dichlorobenzene.
23.	**Section 2.2.2.2, Remedy Implementation, Page 2-13:** In the second paragraph of the soil section, please revise the sentence	**Section 2.2.2.2, Remedy Implementation:** The second paragraph has been revised to read as follows:

	"The Site 16 ROD ESD justified leaving soil in place with concentrations of COCs exceeding RGs." to reference the correct decision document.	"The extent of soil excavation at IR Site 16 was based on previous investigations and confirmed with post-excavation confirmation samples. *Although a small section of soil with COCs exceeding RGs could not be removed without the demolition of a functional building, the ESD described further sampling and subsequent risk evaluation that determined the remaining site soils meet the remedial action objectives and that the remedial action completed is protective of human health and the environment.* ~~The Site 16 ROD ESD justified leaving soil in place with concentrations of COCs exceeding RGs.~~ Soil at IR Site 16 requires NFA."
24.	**Section 2.2.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-16 and Section 2.2.8, Protectiveness Statement, Alameda Point, OU-1, IR Site 16, Page 2-17:** Section 2.2.5.1 does not indicate whether the current concentrations of COCs in groundwater (i.e., TCE at 17 ug/L, tetrachloroethene at 15 ug/L, cis-1,2-DCE 36 ug/L, 1,4-dichlorobenzene [1,4-DCB] at 230 ug/L, and 1,3-DCB at 45 ug/L, all in shallow groundwater) at IR Site 16 are protective of the VI pathway. Please revise Section 2.2.5.1 to discuss whether the current concentrations of COCs in groundwater at IR Site 16 are protective of the VI pathway and modify the protectiveness statement in Section 2.2.8 as needed.	No modification to the protectiveness statement in Section 2.2.8 is needed. IR Site 16 is protective because there are no current buildings over the plume, and ICs are in place to prevent construction of residential structures and other specified structures over the plume, as stated in the LUC RD. The remedy is functioning as intended. The protectiveness in 2.2.8 is separate. The site is protective due to ICs. Furthermore, the LUC RD states that the updated evaluation of VI risk using post-RA groundwater monitoring data concluded that the remaining chemical of concern (COC) concentrations in groundwater do not present unacceptable risk to current receptors (i.e., commercial/industrial) at IR Site 16.
25.	**Section 2.3.1.2, Current and Potential Groundwater Uses, Page 2-18:** Although groundwater at IR Site 14 may meet the criteria for de-designation as a drinking water source, the	**Section 2.3.1.2, Current and Potential Groundwater Uses:** The text has been revised to read as follows:

	groundwater for this site has not been de-designated by the Water Board. The text should be modified to clarify this. Please revise Section 2.3.1.2 to clarify that although groundwater at IR Site 14 may meet the criteria for de-designation, the groundwater for this site has not been de-designated as a drinking water source by the Water Board.	*"A beneficial use evaluation conducted for the purposes of CERCLA cleanup decisions determined that groundwater in the western region of Alameda Point is unlikely to be used as a potential drinking water source, or for watering livestock, based on proposed land uses (Tetra Tech 2000). High concentrations of TDS in groundwater (or the likelihood of saltwater intrusion if any significant pumping takes place) would require pretreatment, which would not be economical.* *The USEPA stated that it is unlikely that groundwater in this area will be a potential source of drinking water in the future (USEPA 2000). This statement was based on the shallow depth of the aquifer in this area, the likelihood of saltwater intrusion if any significant pumping takes place, and the fact that no wells currently exist within or close to this area."*
26.	**Section 2.3.1.3, Site Chronology and Initial Response, Page 2-18:** In the first paragraph, please clarify whether the date of June 6, 1988 for "RA Order from the California Department of Health Services (now DTSC) that identified IR Site 14 as requiring an RI and FS in conformance with the requirements of CERCLA." is correct since the RA Order is a lot earlier than any of the events in Table 2.3-1.	**Section 2.3.1.3, Site Chronology and Initial Response:** Section 2.2.1, second paragraph of the ROD for IR Site 14 states the following: "On June 6, 1988, the Navy received a Remedial Action Order from the California Department of Health Services (now DTSC) that identified Site 14 as requiring a remedial investigation (RI) and feasibility study (FS), in conformance with the requirements of CERCLA."
27.	**Table 2.3-1, Chronology of Site Events – OU-1, IR site 14, Pages 2-18 and 2-19:** Table 2.3-1 is missing the 1998 Data Gaps Investigation that evaluated the horizontal and vertical extent of groundwater contamination and the annual IC	**Table 2.3-1, Chronology of Site Events – OU-1, IR site 14:** Table 2.3-1 has been revised to include the *1998 Data Gaps Investigation.*

	Compliance Reports. Please revise Table 2.3-1 to include the 1998 Data Gaps Investigation as well as the annual IC Compliance Reports.	The 2016 IC Compliance Report is included in Table 2.3-1 and the reference section.
28.	**Section 2.3.3, Progress Since the Last Five-Year Review, OU-1, IR Site 14, Pages 2-21 and 2-22:** Historically, VC concentrations in well 14-06 have dropped below the ICTC, but rebounded; however, this is not discussed in Section 2.3.3. In addition, the yearly maximum concentration has occurred either in spring, summer, or fall for most wells, so it is critical that the samples be collected during these periods. Please revise Section 2.3.3 to discuss the rebound of VC concentrations in well 14-06. Please also revise the FYR to recommend that groundwater monitoring at IR Site 14 occur during spring, summer, or fall as these are typically the period where maximum concentrations occur.	**Section 2.3.3, Progress Since the Last Five-Year Review, OU-1, IR Site 14.** Discussion of historic VC concentrations and trends is included within the Response to Specific Comment 29. **Section 2.3.7, Recommendations and Follow-up Actions, OU-1, IR Site 14.** The text has been changed: *"The DON will increase groundwater monitoring to quarterly and continue reporting VC concentrations in groundwater under the BGMP."* ~~No recommendations or follow-up actions were identified for IR Site 14.~~
29.	**Section 2.3.5, Technical Assessment, OU-1, IR Site 14, Page 2-22 and Section 2.3.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-23:** Sections 2.3.5 and 2.3.5.1 do not adequately discuss the performance of the remedy based on monitoring data. Historically, COC concentrations in several wells have dropped below the ICTC, but subsequently rebounded. In addition, there was excessive rain in December 2014, so the spring 2015 results may not be representative and monitoring should continue, even in wells where concentrations appear to have dropped below the ICTC. Further, it should be noted that the winter 2014 concentration in well M14-15 was 86 ug/L, so the spring 2015 concentration may be an anomaly based on the	**Section 2.3.5, Technical Assessment, OU-1, IR Site 14, Page 2-28 and Section 2.3.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?:** Further discussion within Subsection 2.3.5.1 Question A, under the <u>Performance of Groundwater Remedy</u> subheading, will be expanded as follows: *"Since 2008, VC concentration trends in the eight wells currently monitored at IR Site 14 have declined (six wells) or are, on average stable, (two wells: M14-06 and M14-15).* As shown in Figure 2.3-1, VC concentrations have declined to below the ICTC in all wells except M14-15 (26 µg/L in Spring 2015). *Well M14-06 has exhibited an average flat trend with no apparent seasonal pattern, although the degree of variance in VC*

	large decrease over such a short period of time. Lastly, the trend graph for well 14-09S indicates that the concentrations of VC are increasing, but this is not discussed in the text. The implications for the remedy should also be discussed, since RGs were not achieved 5 years after the transition to MNA. Please revise Sections 2.3.5 and 2.3.5.1 to discuss the likelihood of rebound based on historical monitoring data, the impacts of above average rainfall during the winter 2014, the large decrease in VC concentrations in well M14-15 between winter 2014 and spring 2015 sampling events, and the increasing trend for VC in well 14-09S. Also, please discuss the implementations of the elevated concentrations for remedy completion, since MNA did not achieve RGs in 5 years.	*concentrations since 2009 ranges from 6 ug/L (discounting the anomalous Fall 2010 0.5U ug/L) to 120 ug/L. The reduced concentrations and subsequent rebound observed for VC at well M14-06 in Fall 2010 was a two order-of-magnitude change (from less than 100 ug/L to less than 1.0 ug/L and back to near 100 ug/L), not unlike similar drop-and-rebound changes observed at wells M14-15, M14-09D, M14-20D at various times.* The Spring 2015 monitoring data in the Draft 2015 Annual Groundwater Monitoring Report (MMEC 2016) indicate fluctuation in VC concentrations; however, values do not exceed historical maximums. *Additionally, four wells exhibited historical low VC concentration during the 2014-2015 monitoring period and* low reported concentrations of dissolved ethane and ethene suggest ethanogenesis likely is contributing to *continuing* natural attenuation (MMEC 2016)." "*Although wells exhibiting average stable trends (M14-06 and M14-15) have not attained consistent VC concentrations below ICTC within five years of ISCO implementation, the plume area has reduced in surface area. Between 2011 and 2016, the plume area concentrations exceeding the ICTC decreased from approximately 136,000 square feet to 28,900 square feet, a reduction in size of approximately 79% further indicating a reduction in mass. With continued plume collapse from the edges inward, the elevated core concentrations will remain recalcitrant until on-going natural attenuation mitigates the remaining lateral contaminant mass. The flat trends of the core wells, M14-06 and M14-15, do not currently predict when that may occur."* The effect of heavy rain during the winter of 2014 produced no clear, attributable change in VC concentrations in either winter 2014 or

		spring 2015 sampling results. Most wells exhibited predictable results falling within expected trends and concentration ranges with a few exceptions: VC concentrations were slightly low in well M14-06 for winter and spring and anomalously low in M14-20D during the winter event; however, VC concentrations rose above their respective trend averages in wells M14-09S and M14-14. The "large decrease in VC concentrations in well M14-15 between winter 2014 and spring 2015" sampling events actually occurred during the fall of 2014 before the rain event. Therefore, the results are mixed and no clear effect of the heavy rains during December 2014 can be ascertained from the sampling data. The VC concentration trend for well M14-09S has declined from an average concentration of approximately 25 ug/L in summer 2008 to less than 10 ug/L in spring 2015 and has been below the ICTC since fall 2013.
30.	**Section 2.4.2.1, Remedy Implementation, Page 2-30:** Conclusions discussed in Section 2.4.2.1 were based on the Remedial Action Operations and Monitoring Report (Geosyntec 2015), but it does not appear that this report was submitted to the Regulatory Agencies for review. The FYR should not base conclusions on documents that have not been submitted to the Regulatory Agencies. Please clarify whether the Remedial Action Operations and Monitoring Report (Geosyntec 2015) was submitted to the Regulatory Agencies or revise Section 2.4.2.1 to remove the conclusions made based on this document.	**Section 2.4.2.1, Remedy Implementation.** The Remedial Action Operations and Monitoring Report (Geosyntec 2015) was submitted to the BCT via email on December 11, 2015. Based on this comment response, no revision has been applied to the FYR

31.	**Section 2.5.1, Site Description and Background, OU-2B, IR Site 3, Page 2-34 and Table 2.5-1, Chronology of Site Events – OU-2B, IR Site 3, Page 2-35:** The first paragraph of Section 2.5.1 states that IR Site 3 is the only site from OU-2B that needs to be included in the FYR, but this statement is inconsistent with Table 2.5-1, which indicates that the November 2015 RACR documented remedy completion for polychlorinated biphenyl (PCB) and pesticide impacted soil at IR Site 4. Since IR Site 4 must be included, a figure depicting the soil remediation areas and the groundwater plume, with buffer zones should be included. Please revise Section 2.5.1 to remove the statement that IR Site 3 is the only site from OU-2B that needs to be included in the FYR. Please also ensure that IR Site 4 is discussed in the FYR.	**Section 2.5.1, Site Description and Background, OU-2B, IR Site 3 *and 4*.** The first paragraph has been revised to read as follows: "OU-2B consists of IR Sites 3, 4, 11, and 21. This section discusses the protectiveness of the selected remedy for IR Sites 3 *and 4* ~~soil~~. The ROD (DON 2015) for OU-2B states "No Action" as the selected remedy for *soil at* IR Sites 11 and 21 soil. The selected remedy for *OU-2B* shallow groundwater *applies to portions of*~~under~~ IR Sites 4, 11, and 21 *and is not yet implemented.* ~~is ISB, which has yet to be implemented.~~ Therefore, only *the soil remedies for* IR Sites 3 *and 4 soil are* ~~is~~ included in this report." **Table 2.5-1, Chronology of Site Events – OU-2B, IR Site 3 *and 4*:** Table 2.5.1 is correct. Figure 2.5-1 has been revised to include soil remediation areas, the groundwater contamination plume and associated buffer zones at IR Site 4.
32.	**Section 2.6.1.2, Current and Potential Groundwater Uses, Page 2-41:** The cited document for de-designation of the aquifer as a drinking water source, SWRCB 2009, is a reference to a National Pollutant Discharges Elimination System (NPDES) discharge permit. The IR Site 1 area has not been de-designated as a drinking water source and text discussing the de-designation should be deleted. Please revise Section 2.6.1.2 to remove the text discussing the de-designation of the aquifer as a drinking water source**.**	**Section 2.6.1.2, Current and Potential Groundwater Uses.** The first sentence text has been revised to read as follows: "As outlined in the FS Report (Bechtel Environmental, Inc. [BEI] 2006), groundwater beneath the western portion of Alameda Point (including IR Site 1) currently is not used for drinking water, irrigation, or industrial supply purposes and meets the SWRCB exemption criteria ~~to de-designation the aquifer beneath portions of Alameda Point as having potential beneficial uses as a municipal supply (SWRCB 2009)~~."

33.	**Section 2.6.2.2, Remedy Implementation, Page 2-45:** The second paragraph states that the "remedy was implemented between 2014 and 2015," but the remedy for groundwater has not been fully implemented at IR Site 1. The groundwater monitoring network needs to be re-installed and evaluation of the need for additional ISCO injections must be based on current contaminant concentrations. Please revise Section 2.6.2.2 to remove the statement that the remedy for IR Site 1 has been implemented.	**Section 2.6.2.2, Remedy Implementation, Second Paragraph.** The following text will be deleted from the FYR: ~~"The remedy was implemented between 2014 and 2015 in accordance with the RD/RAWP (AMEC 2014a) and consisted of the components discussed below."~~
34.	**Section 2.6.2.2, Remedy Implementation, Page 2-47:** The Groundwater ISCO discussion indicates that VOC concentrations were reduced to below RGs, but this is not the case based on previous monitoring data and transition to MNA is not expected by the Regulatory Agencies. ISCO reagents appear to have been consumed by light aqueous phase liquid (LNAPL) that entered several wells and was ignored when detected during the pre-design investigation; additional treatment of this area will be needed. Also, additional delineation of the extent of contamination will likely be needed because capping activities may have changed the extent of the VOC plume. Lastly, high concentrations of TCE are present (up to 22,900 ug/L – a concentration indicative of DNAPL presence). TCE will continue to degrade to VC (due in part to the presence of LNAPL). The statements regarding the transition to MNA and MNA monitoring should be deleted. Instead, Section 2.6.2.2 should be revised to state that the path forward will be determined after the monitoring well network is replaced and sampled. It should be noted that persulfate is a sterilizing agent and an oxidizer, so it is likely that the microbial population (Dehalococcoides [DHC]), which	**Section 2.6.2.2, Remedy Implementation:** The statement, as written, is meant to convey that the goal of ISCO treatment is to reach RGs, not that ISCO attained RGs. To mitigate ambiguity in the statement, the text has been changed as follows: "The first phase of the RA for groundwater at IR Site 1 was ISCO treatment, *with the ultimate goal of* ~~to~~ decrease*ing* groundwater *VC* concentrations to~~,~~ or below the RG for human receptors as well as decrease*ing* ~~the~~ groundwater concentrations of TCE; 1,1-DCE; and benzene~~ to or below their respective surface water RGs~~." The second paragraph of the Groundwater ISCO subheading of Section 2.6.2.2 discusses MNA and groundwater monitoring under the heading of Groundwater ISCO. While ISCO, MNA, groundwater monitoring, and groundwater ICs are all components of the groundwater remedy, MNA and groundwater monitoring are not part of the ISCO implementation and have been placed under their correct subheading, MNA and Groundwater Monitoring. The discussion of MNA is as a future component of the groundwater remedy and is not meant to convey that the remedy has transitioned to MNA, stating that it is *anticipated*. To mitigate ambiguity in the statement, the

	requires anaerobic conditions, has been killed or severely impacted. MNA of TCE and its daughter products requires DHC, so the impacts to the DHC population and a return to anaerobic conditions will need to be resolved before MNA can be effective. Please revise Section 2.6.2.2 to remove the statement that VOC concentrations were reduced to below RGs. Please also revise Section 2.6.2.2 to remove the statements regarding the transition to MNA and revise Section 2.6.2.2 to state that the path forward will be determined after the monitoring well network is replaced and sampled.	text of the first sentence of the second paragraph (now the first paragraph of the new MNA subheading) has been changed as follows: *"MNA and Groundwater Monitoring* ~~"Transition to MNA as part of the BGMP is anticipated until concentrations of COCs decrease to at or below the RGs stated in the ROD for both groundwater and surface water, and until the remedial goal is achieved.~~ *MNA is an anticipated future component of the groundwater remedy; however, it is premature to determine the path forward until after the monitoring well network is replaced and sampled. The monitoring well network was destroyed in accordance with guidelines and procedures stated in the RD/RAWPs (AMEC 2011a and 2014a) during implementation of the RA for soil. Reinstallation of the monitoring network is planned* ~~to allow continued long-term monitoring of the soil remedy and the groundwater treatment area MNA as part of the BGMP for the COCs stated in the ROD. A replacement monitoring well network is scoped~~ for ~~installation between~~*September 2016 and* ~~2017 to allow continued long-term MNA~~. *These wells will be installed in accordance with the RD/RAWP and the Post-Closure Monitoring and Maintenance Plan (AMEC 2016).*~~"~~
35.	**Section 2.6.2.2, Remedy Implementation, Page 2-47 and Section 2.6.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-51:** Section 2.6.5.1 states that the groundwater remedy for IR Site 1 was determined to be functioning as intended; however, the remedy does not appear to be functioning as intended. Section 2.6.2.2 indicates that the monitoring well network for IR Site 1 was	**Section 2.6.2.2, Remedy Implementation, Page 2-60 and Section 2.6.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?:** To address soil and groundwater remedies separately, Section 2.6.5.1 Question A has been reorganized to separate soil and groundwater discussion. Section 2.6.5.1 Question A – Is the Remedy Functioning

	destroyed in accordance with guidelines and procedures stated in the RD/RAWPs during the implementation of the RA for soil and installation of a replacement monitoring network is planned between 2016 and 2017. Given the lack of monitoring data, it is unclear how Section 2.6.2.2 [2.6.5.1] can conclude that the groundwater remedy for IR Site 1 is "functioning as intended." In addition, ISCO injections appear to have been consumed by LNAPL that was ignored when detected during the pre-design investigation; additional treatment of this area will be needed because high concentrations of COCs are still present. Please revise Section 2.6.5.1 to remove the statement that the groundwater remedy for IR Site 1 was determined to be functioning as intended.	as Intended by the Decision Documents?, Page 2-68, has been revised as follows: "*Soil Remedy* Yes, the *soil* remedy is functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remedy implemented for soil at IR Site 1 is working as intended by the ROD. The documents that detail-.-. ." "*Groundwater Remedy* *The remedy for groundwater at IR Site 1 is pending completion; therefore, concentration trends will not be evaluated in this Five-Year Report. It is premature to determine the efficacy of the groundwater remedy as remedy implementation is ongoing. The path forward will be determined after the monitoring well network is replaced and sampled. The ROD (DON 2009) stated that once remediation goals are met, the DON will continue corrective groundwater monitoring for one year. Thereafter, the DON will implement a detection monitoring program to demonstrate continued compliance with the remediation goals.*"
36.	**Section 2.6.2.2, Remedy Implementation, Page 2-48 and Section 2.6.8, Protectiveness Statement, OU-3, IR Site 1, Page 2-52:** The ICs for Groundwater discussion in Section 2.6.2.2 states that "ICs for groundwater will be implemented in accordance with the procedures and requirements outlined for soil;" however, Section 2.6.8 states that "ICs are in place at Alameda Point to prevent exposures to contaminated soil and groundwater." If ICs for groundwater are not yet in place, then the remedy is not currently protective, but will be protective	**Section 2.6.2.2, Remedy Implementation:** The statement in Section 2.6.2.2 that groundwater ICs "will be implemented" is ambiguous, incorrectly implying that they do not yet exist or apply. The first sentence of the first paragraph of the ICs for Groundwater subsection has been clarified as follows: "ICs for groundwater ~~will be~~ *are being* implemented in accordance with the procedures and requirements outlined ~~for soil~~ *in the ROD (DON 2009) and the LUC RD (AMEC 2011b)*.

	when fully implemented. In addition, RGs were established to protect aquatic receptors and the RGs have not been met in the ISCO area, so the remedy is not protective of ecological receptors. ICs do not protect ecological receptors, so the protectiveness statement should acknowledge that the IR Site 1 remedy is not currently protective for ecological receptors (e.g., aquatic receptors). Please revise the FYR to clarify the status of ICs for groundwater at IR Site 1. If ICs for groundwater at IR Site 1 are not currently in place, then please also revise the protectiveness statement to indicate that the remedy will be protective of human receptors when fully implemented. Please also revise the FYR to acknowledge that the remedy for IR Site 1 is not currently protective of ecological receptors.	**Section 2.6.8, Protectiveness Statement, OU-3, IR Site 1:** The text will be revised to discuss protectiveness of soil and groundwater for OU-3, IR Site 1 as follows: "The *soil* RAs performed at IR Site 1 are considered protective of human health and the environment. The extent of contamination is defined and ICs are in place at *IR Site 1*~~Alameda Point~~ to prevent *human and* ecological exposure to *COCs in the soil*. ICs and LUCs are assessed annually. The selected remedy will continue to be protective *in the long term.*~~, and in order to remain protective in the long-term, a monitoring well network will be restored."~~ "*The protectiveness of the groundwater RA at IR Site 1 cannot be evaluated until after installation of the planned monitoring well network; therefore, protectiveness is deferred. Groundwater ICs included in the selected remedy* ~~*for groundwater*~~ *at IR Site 1, and stated in the ROD and LUC RD, are considered protective of human health in the short term.* ~~*"The groundwater RA at IR Site 1 cannot be evaluated until groundwater data is collected after installation of the planned monitoring well network; therefore protectiveness is deferred."*~~
37.	**Section 2.6.4.1, Site Inspection, Page 2-50 and Appendix B, Site Inspection Photographs, Pages 10 and 11:** Based on the photographs in Appendix B, the vegetation is very sparse and has not been sufficiently established at IR Site 1. This needs to be acknowledged in Section 2.6.4.1. In addition, the lack of sufficient vegetation should be listed as an issue in Section 2.6.6 and addressed with a recommendation in Section 2.6.7.	Section 2.6.6, Issues, OU-3, IR Site 1. The text will be revised to read as follows. "*The IR Site 1 soil cover is sparsely vegetated with mostly noxious weeds. Additionally, the groundwater monitoring well network was destroyed as part of the RA for soil.* ~~No issues have been~~

	Please revise Section 2.6.4.1 to acknowledge the lack of sufficient vegetation at IR Site 1. Please also list the lack of sufficient vegetation as an issue in Section 2.6.6 and include a recommendation to address this issue in Section 2.6.7.	~~identified at this time that would affect the protectiveness of the selected remedy.~~*"* Section 2.6.7, Recommendations, OU-3, IR Site 1. The text will be revised to read as follows. *" The DON will reseed the soil cover, in accordance with the PCOMMP (AMEC 2016) to establish native vegetation, and reinstall the groundwater monitoring well network as stated in the ROD (DON 2009).* ~~No recommendations have been identified at this time that would affect the protectiveness of the selected remedy.~~*"* The objective of the vegetative cover is to manage erosion of the waste isolation cover (WIC) and success in establishing the vegetative cover is currently inspected and managed in accordance with the Post-Construction, Operations, Maintenance and Monitoring Plan (PCOMMP). The Navy will continue to work toward establishing the vegetative cover and strive to demonstrate success criteria in the compensatory wetland stated in the Table 4-1 of the PCOMMP.
38.	**Section 2.6.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-51:** The Opportunities for Optimization discussion should discuss the ISCO area and how the LNAPL at IR Site 1 will be treated. It is unclear whether persulfate is the best choice or if another ISCO technology, like ozone sparging, would be more effective to address the LNAPL, since it appears that the LNAPL must be addressed in order to address the target COCs. Please revise the Opportunities for Optimization discussion of	**Section 2.6.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?:** To address soil and groundwater remedies separately, Section 2.6.5.1 Question A has been reorganized to separate soil and groundwater discussion. Section 2.6.5.1 Question A, subheading Opportunities for Optimization, Page 2-68, has been revised as follows: "Opportunities for Optimization • *Soil Remedy*

	Section 2.6.5.1 to discuss the ISCO area and how the LNAPL at IR Site 1 will be treated.	No opportunities for *soil remedy* optimization have been identified at this time. • *Groundwater Remedy* *The effectiveness of on-going groundwater remedy implementation at IR Site 1 is under evaluation. It is premature to determine the path forward until after the monitoring well network is replaced and sampled."*
39.	**Section 2.6.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-51:** The last paragraph of Section 2.6.5.1 states that "The soil and groundwater remedies are functioning as intended, as evidenced by results of groundwater data, document reviews, interviews, and ongoing O&M activities;" however, this statement is contradicted by the post-ISCO VOC concentrations presented on Figure 6-1 of the Alameda Point IR Site 1 Operations Maintenance and Monitoring Plan. Figure 6-1 indicates that VC and TCE concentrations remain above 1,000 ug/L in multiple wells, so the ISCO treatment has not sufficiently decreased VOC concentrations are IR Site 1. Please revise Section 2.6.5.1 to remove the statement that the groundwater remedy is functioning as intended.	**Section 2.6.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?:** To address soil and groundwater remedies separately, Section 2.6.5.1 Question A has been reorganized to separate soil and groundwater discussion. Section 2.6.5.1 Question A, subheading Performance of Soil and Groundwater Remedies, Pages 2-68 and 2-69, has been revised to Performance of Remedies and the discussion separated as follows: "*Performance of Remedies* As discussed in Section 2.6.2.2, the selected remedy consists of multiple, area-specific components at IR Site 1. Other than Area 4 remedy which was implemented in 2008, and well installation which has yet to be implemented, the remainder of the selected remedy was implemented between 2014 and 2015. IC performance was evaluated by conducting site inspections and interviews with stakeholders. The data review, site inspection and interviews revealed no evidence of any activities that were inconsistent with the land use restrictions specified in the LUC RD (AMEC 2011b). • *Soil Remedy Performance*

		"The soil remedy is functioning as intended, as evidenced by document reviews, interviews, and ongoing O&M activities. • *Groundwater Remedy Performance* *An evaluation of the performance of the groundwater remedy implemented to date at IR Site 1 is deferred until after the monitoring well network is replaced and sampled."*
40.	**Section 2.7.2.2, Remedy Implementation, Page 2-57:** The IR Site 2 remedy called for placement of a 6-inch thick layer of soil to help establish vegetation, but this was not done and the lack of vegetation has not been acknowledged in Section 2.7.2.2. Please revise Section 2.7.2.2 to indicate that the vegetation at IR Site 2 is sparse due to the lack of soil.	**Section 2.7.2.2, Remedy Implementation:** Although there was no difference in source material for the import soil applied to Site 2, all 2' of import soil met the qualifications of the 100% RD requirements for the site including the need for "topsoil". The only difference between the top 6" of the cover material and the rest of the import fill was the percent compaction applied, which also met the requirements of the 100% RD. The fifth bullet of Section 2.7.2.2 Remedy Implementation has been revised to read as follows: • Placement of a 6-inch-thick layer of soil, *compacted to 85% relative compaction*, to help establish vegetation. Additionally, Section 2.7.5 Technical Assessment, OU-4A, IR Site 2, first paragraph has been revised as follows: "RAOs are being met by isolating buried waste in the former landfill through a soil cover. *Vegetative cover conditions and stormwater drainage have been addressed and improved over the last year under the PCOMMP and will be documented in the 2016 Annual O&M Report for Site 2.* The RA for soil . . ."

41.	**Section 2.7.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-62 and Section 2.7.6, Issues, OU-4A, IR Site 2, Page 2-63:** The detection of methane above the lower explosive limit (LEL) in three locations should be discussed as an issue in Section 2.7.6. Also, the problems establishing vegetation and the presence of noxious weeds in the northern portion of the landfill should also be acknowledged as issues in Section 2.7.6. These weeds were not eradicated during the first attempt, and seeds for establishment of vegetation did not take well after the second seeding. Further, due to subsidence during cap construction, there is a large depression at the designed high-point of the landfill. Although a small amount of soil was added in an attempt to grade the soil cover for drainage, it is unclear if this will be effective in the long term (e.g., if subsidence continues, the area will not drain and water will pool). Lastly, based on these issues it appears that the remedy is not yet functioning as intended, so the statement in Section 2.7.5.1 should be removed. Please revise Section 2.7.6 to discuss the detections of methane above the LEL, the problems establishing vegetation, and the potential drainage concerns related to subsidence. Please also revise Section 2.7.5.1 to remove the statement that the remedy is functioning as intended.	**Section 2.7.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?:** The first two sentences of the first paragraph of Section 2.7.5.1, Question A, have been revised as follows: *No*, ~~Yes,~~ the remedy *may not yet be* ~~is~~ functioning as intended by the decision documents; ~~*but*~~ *however, it is still protective of human health and the environment.* **Section 2.7.6, Issues, OU-4A, IR Site 2, Page 2-85:** The statement has been revised as follows: ~~"No issues have been identified at this time that would affect the protectiveness of the selected remedy."~~ *"Annual sampling of subsurface methane was detected above the lower explosive limit (LEL) in three soil gas probes at IR Site 2. The impact on the effectiveness of the remedy is unknown as soil gas sampling data is limited."* **Section 2.7.7, Recommendations and Follow-up Actions, OU-4A, IR Site 2, OU-4A, IR Site 2, Page 2-85:** The statement has been revised as follows: ~~"No recommendations have been identified at this time."~~ *"Additional data regarding methane in ambient air and in the subsurface will be collected on a quarterly basis to further evaluate the effectiveness of the remedy at IR Site 2. Soil gas data will be presented in the 2017 Annual BGMP report."*

		Section 2.7.5 Technical Assessment, OU-4A, IR Site 2, first paragraph has been revised as follows: "RAOs are being met by isolating buried waste in the former landfill through a soil cover. *Vegetative cover conditions and storm water drainage have been addressed and improved over the last year under the PCOMMP and will be documented in the 2016 Annual O&M Report for Site 2.* The RA for soil . . ."
42.	**Table 2.9-1, Chronology of Site Events – OU-5, IR Site 25, Pages 2-70 and 2-71:** Table 2.9-1 does not include the permanganate treatability study that was conducted to evaluate whether soil could be treated in-situ to decrease PAH concentrations. Please revise Table 2.9-1 to include the permanganate treatability study that was conducted at IR Site 25.	The permanganate treatability study has been added to Table 2.9-1.
43.	**Section 2.9.3, Progress Since the Last Five-Year Review, OU-5, IR Site 25, Pages 2-73:** Section 2.9.3 indicates that "This is the third Five-Year Review for IR Site 25," but this is only the second FYR for this site. In addition, Section 2.9.3 states, "The recommendation in the 2011 Five-Year Review Report (KCH 2011) related to lead was erroneously included for IR Site 25;" however, additional information should be provided in the text, including the recommendation and why it is not applicable to IR Site 25. Please revise Section 2.9.3 to indicate that this is the second FYR for IR Site 25. Please also revise Section 2.9.3 to include and discuss the erroneous recommendation and explain why this recommendation is not applicable to IR Site 25.	**Section 2.9.3, Progress Since the Last Five-Year Review, OU-5, IR Site 25.** The first-paragraph will be revised to read as follows: "This is the *second* ~~third~~ Five-Year Review for IR Site 25. The recommendation in the 2011 Five-Year Review Report (KCH 2011) related to lead was erroneously included for IR Site 25. *Lead is not a COC in the 2007 ROD for IR Site 25; therefore, this recommendation is not applicable.* See *Appendix* E, Table E-2)." ~~"Lead is not a COC in the 2007 ROD for IR Site 25; therefore, this recommendation is not applicable to IR Site 25. "~~

44.	**Section 2.10.2.2, Remedy Implementation, Page 2-79:** The MNA discussion should discuss whether there is enough dissolved organic carbon (DOC) to sustain reductive dechlorination at IR Site 26 and if not, to propose a solution. Please revise the MNA discussion under Section 2.10.2.2 to discuss whether there is enough DOC to sustain reductive dechlorination. If there is not, then a solution should be proposed to provide DOC at IR Site 26 and the solution should be included as a recommendation in Section 2.10.7.	Per Interstate Technology and Regulatory Council (2008) guidance, >20-50 mg/L TOC/DOC are desired in the anaerobic treatment zone. TOC/DOC levels <20 mg/L in conjunction with elevated VOCs indicate additional substrate is required. The average DOC/TOC concentrations for all wells sampled at IR Site 26 for the annual sampling period 2013/2014 were 9.05/7.11 mg/L. During the 2014/2015 annual sampling period, the average DOC/TOC concentrations for all wells sampled at IR Site 26 were 12.35/13.53 mg/L. Additionally, the occurrence of relatively high concentrations of sulfate compared to the relatively depleted DOC/TOC is also indicative that addition of EVO substrate would be beneficial for optimizing stalling ISB. Regardless of whether TOC/DOC availability is marginally low, the fact that DHE and TCE reductase, and VC reductase are present is evidence that biodegradation is ongoing. Given that the residual COC load is low in groundwater at IR Site 26 (generally at single digit concentrations), the organic carbon demand would be low and biodegradation could function on marginal conditions. The MNA discussion of Section 2.10.2.2, Remedy Implementation, will be revised as follows: "IR Site 26 was incorporated into the BGMP in 2002. *Although* MNA parameters in groundwater ~~including~~*indicate* low dissolved oxygen and moderate reducing conditions (MMEC 2016), *marginally low average DOC/TOC concentrations and relatively high sulfate concentrations* suggest subsurface conditions are *not* favorable for continued *optimal anaerobic* VOC degradation at IR Site 26. However, VC concentrations

		generally exceed cis-1,2-DCE *indicating, along with the presence of Dehalococcoides ethenogenes (DHE), TCE reductase, and VC reductase* (*at modest concentrations [MMEC 2016]), that reductive dechlorination is occurring*; therefore, it is anticipated that biodegradation will continue at IR Site 26 to *achieve* ~~the point where~~IC termination criteria ~~are achieved, at which point groundwater monitoring can be discontinued~~."
45.	**Section 2.10.3, Progress Since the Last Five-Year Review, OU-6, IR Site 26, Page 2-82:** Section 2.10.3 states that "Disinfectant byproduct concentrations have declined to pre-ISCO concentrations," but the text does not specify when disinfectant byproducts were last sampled at IR Site 26. Please revise Section 2.10.3 to specify when disinfectant byproducts were last sampled at IR Site 26.	**Section 2.10.3, Progress Since the Last Five-Year Review, OU-6, IR Site 26:** "Disinfectant byproduct" concentrations continue to be analyzed at IR Site 26 as part of the full USEPA Method 8260B and are presented in the laboratory reports in Appendix B of the annual BGMP reports. THM and the daughter products, chloroform and methylene chloride, continued to decline after the post-ISCO sampling reported in the Technical Memorandum (Battelle 2011) until 2013, when they were no longer present at concentrations greater than the RLs. The sentence will be revised as follows: "Disinfectant byproduct concentrations ~~*continue to be*~~*were last sampled in 2013* ~~*as part of the BGMP*~~, ~~have~~*after having* declined to pre-ISCO concentrations *and* ~~*attained*~~ *then to non-detectable concentrations."*
46.	**Section 2.11.2.2, Remedy Implementation, Page 2-88 and Section 2.11.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?, Pages 2-91 and 2-92:** The MNA discussion in Section 2.11.2.2 should discuss whether there is enough dissolved organic carbon (DOC) to sustain reductive dechlorination. For several wells (EW03, EW04, EW05, EW13, EW14, EW17, EW18), it appears that	Current site conditions indicate that while some wells remain aerobic, the majority of the wells reflect anaerobic conditions at least some of the time. Due to the aerobic subsurface environment at IR Site 27, the remedy utilized sodium persulfate injection to implement ISCO; however, DOC/TOC is not an appropriate predictor of residual persulfate or aerobic biodegradation. Of the parameters analyzed, only sulfate might be indicative of persulfate activity;

	cis-1,2-DCE concentrations are increasing, which may indicate either a stall in reductive dechlorination or that there is insufficient total organic carbon (TOC)/DOC. Also, this has bearing on whether the remedy is functioning as intended as increasing concentrations are not expected if the remedy is functioning properly. Further, Section 2.11.5.1 indicates that potential optimization may include well decommissioning, but the number of monitoring wells should not be reduced until it is clear that rebound is not occurring throughout the plume. Please revise the MNA discussion under Section 2.11.2.2 to discuss whether there is enough TOC/DOC to sustain reductive dechlorination. If there is not, then a solution should be proposed to provide TOC/DOC at IR Site 27 and the solution should be included as a recommendation in Section 2.10.7. Please also revise Section 2.11.5.1 to clarify that the number of monitoring wells will not be reduced until it is clear that rebound is not occurring throughout the plume.	however, the location of the site contiguous with Seaplane Lagoon suggests that sulfate in seawater is or could influence any signature of sulfate from residual persulfate substrate. Cis-1,2-DCE concentration trends are increasing in three of the 18 wells for which concentrations are tracked (MMEC 2016). These three wells are near or immediately down gradient from the apparent source and are near or surrounded by wells that indicate stable or declining cis-1,2-DCE trends and, therefore, are interpreted to represent local variations in plume dynamics rather than be indicative of a faltering remedy. The trends will continue to be monitored and evaluated. The last sentence of the paragraph under the subheader, MNA, of **Section 2.11.2.2, Remedy Implementation,** will be revised to acknowledge the potential effect of the subsurface environment returning to post-treatment aerobic conditions as follows: "It is anticipated that biodegradation will continue at IR Site 27 to the point where ICTC are achieved (the RGs) at which point groundwater monitoring can be discontinued; *however, if site conditions revert to pre-treatment aerobic conditions, degradation of cis-1,2-DCE will be unfavorable and difficult to achieve*." Section 2.11.5.1, 1ST SubHeader, Opportunities for Optimization: the last sentence will be deleted: "~~Continued MNA through the BGMP will allow potential optimization of the well network (reduction in sampling frequency or well decommissioning) as RGs are achieved for each COC stated in the ROD~~"

47.	**Section 2.12.3, Progress Since the Last Five-Year Review, Alameda Point, OU-6, IR Site 28, Page 2-99:** There is no evidence that the metals immobilizing compound (MIC) injected at IR Site 28 is still effective. Concentrations in the three wells dropped, but have increased again to levels equal to or higher than the initial concentrations (e.g., in SW-02 and SW-08). Copper is being discharged to the Oakland Inner Harbor at levels in excess of the RGs (i.e., 10 to 40 times the RG), so additional injections should be considered. Please revise the FYR to recommend evaluation of additional injections of MIC at IR Site 28 to address the elevated copper levels.	**Section 2.12.3, Progress Since the Last Five-Year Review, Alameda Point, OU-6, IR Site 28:** The EPA states that "copper is being discharged to the Oakland Inner Harbor at levels in excess of the RGs" but this fact is not known. The observed copper concentrations in the wells do exceed the 40 µg/L trigger level but are declining in well 28SW03 and have exceeded it only three times in well 28SW08. The copper concentrations, if any, that may be entering the surface water of the harbor are unknown. Secondly, the increase in observed copper concentrations in the monitoring wells may not be indicative that the metals immobilizing compound (MIC) is no longer effective. Review of copper concentration trends indicates that the well (28SW03) with the greatest historical copper concentrations continues to decline and the trends in the wells with increasing copper concentrations (28SW02 and 28SW08) only began to show increases in 2012, which correlates with the beginning of the ongoing drought. Rising electrical conductivity in the well farthest inland from the tidal influence (28SW03), now at a historical high, suggests saltwater intrusion and decreased off-shore flow of groundwater to Oakland Inner Harbor. If the historically wetter annual weather cycle returns, copper concentrations may return to expected trends. **Section 2.12.6 Issues, Alameda Point, OU-1, IR Site 28** The following text has been revised to read as follows:~~.~~ ~~"No issues have been identified at this time that would affect the protectiveness of the selected remedy."~~ *"One well, 28SW02, consistently remains above RGs; therefore, the impact to ecological receptors is unknown."*

		Section 2.12.7 Recommendations and Follow-up Actions, Alameda Point, OU-6, IR Site 28 The following text has been revised to read as follows:~~:~~ ~~"No new recommendations or follow-up actions have been identified at this time. Groundwater monitoring will continue through 2021, as recommended in the 2011 Five Year Review."~~ *"The recommendation from the 2011 Five Year Review to continue to monitor and evaluate trends at IR Site 28 until 2021 remains appropriate; however, the BGMP monitoring frequency will be increased to quarterly and each quarterly sampling event will occur at the low-low tide. Sampling will include measurement of water quality parameters including field measurements of DO, ORP, conductivity, and pH, and analysis for salinity. Additionally, to better understand the potential impacts of tidal influence on groundwater at IR Site 28, data loggers will be used in existing wells during both the wet and dry seasons to document the potential influences of weather and tidal cycles on copper concentrations. Evaluation of the data and recommendations based on the additional data collected will be presented in the 2017 BGMP report."*
48.	**Section 2.12.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-100:** Section 2.12.5.1 states that the remedy is functioning as intended, but it does not appear that the IR Site 28 remedy is functioning as intended given the rebound in copper concentrations. Please revise Section 2.12.5.1 to remove the	**Section 2.12.5.1, Question A - Is the Remedy Functioning as Intended by the Decision Documents?:** Section 2.12.5.1, Question A, will be revised to correct the statement that the remedy at IR Site 28 is functioning as intended, as follows: "~~Yes,~~ Although copper concentrations have rebounded in the remaining wells, only one well remains consistently above the trigger level. *The effectiveness of the remedy appears to have*

	statement that the remedy at IR Site 28 is functioning as intended.	*plateaued, possibly due to temporary environmental conditions;* therefore, the remedy function will continue to be evaluated through increased monitoring ~~the remedy is functioning as intended by the decision documents~~."
49.	**Section 2.13.2.2, Remedy Implementation, Page 2-106; Section 2.13.3, Progress Since the Last Five-Year Review, OU-5/FISCA IR Site 02 Groundwater, Page 2-107; and Section 2.13.8, Protectiveness Statement, OU-5/FISCA IR Site 02 Groundwater, Page 2-109:** The ROD Amendment required sampling of groundwater to ensure that concentrations of benzene and naphthalene have not rebounded to concentrations that pose a VI risk, but data is not included in the FYR. Per Section 2.7 of the ROD Amendment, "No land-use restrictions, environmental monitoring, RCRA corrective actions, or other actions are required for groundwater at this site. Nonetheless, one more round of groundwater sampling at OU-5/FISCA IR-02 will be completed under the Basewide Groundwater Monitoring Program, and the results will be included in the next Basewide Five-Year Review report." Without this data, protectiveness cannot be assessed and must be deferred. Please revise the FYR to include and discuss the required groundwater data or to defer the protectiveness determination until the final groundwater sampling round is completed for OU-5/FISCA IR-02.	See response to General Comment #2. A Five-Year Review is not required for OU-5/FISCA IR Site 02 Groundwater.
50.	**Section 2.14.2.1, Remedy Selection (Record of Decision), Page 2-112:** The second paragraph goes into a lot detail on what an RAO is and it is not consistent with the format of other sections. Please make it consistent with other sections.	**Section 2.14.2.1, Remedy Selection (Record of Decision):** The second paragraph has been revised as follows to be more consistent with other Remedy Selection (Record of Decision) sections:

		"~~RAOs specify (1) each COC, (2) the exposure route and each receptor, and (3) an acceptable contaminant concentration or range of concentrations for each exposure pathway and medium. As part of the RI (PRC 1996), the HHRA results showed that the principal threats to human health under future industrial and residential land-use scenarios come from the pathways for dermal contact with soil as well as inhalation and ingestion of soil containing PCBs and cadmium.~~ *The* RAOs for contaminated shallow soil at IR Site 02 ~~are to prevent~~ *include* the following *components*: • *Prevention of* ingestion ~~of~~, direct contact with, or inhalation of PCBs in contaminated soil from 0 to 1 foot bgs at concentrations that result in an excess lifetime cancer risk (ELCR) exceeding 1×10^{-4} for residents • *Prevention of* ingestion ~~of~~, direct contact with, or inhalation of PCBs in contaminated soil from 0 to 1 foot bgs at concentrations that result in an ELCR exceeding 1×10^{-4} for workers now and in the future • *Prevention of* ingestion ~~of~~ or direct contact with cadmium-contaminated soil from 0 to 1 foot bgs at concentrations that result in an HQ exceeding 1 for future residents"
51.	**Section 2.14.3, Progress Since the Last Five-Year Review, FISCA IR Site 02 Soil, Page 2-113 and Section 2.14.5.2, Question B – Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?, Page 2-115:** Section 2.14.3 states that the 2011 FYR "noted that cadmium toxicity criteria changes were pending," but Section 2.14.5.2 states that no	**Section 2.14.5.2, Question B – Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid?** will be revised as follows: "~~No changes in exposure pathways, toxicity, or land use have occurred since the HHRA and ERA were conducted.~~ …

	changes have occurred. Please revise Section 2.1.4.5.2 to discuss the toxicity changes for cadmium that have occurred since the last FYR.	*"…Cadmium residential soil RSL, 70 mg/kg, did not change; however, in 2014, the industrial soil RSL (800 mg/kg) increased to 980 mg/kg." Since the updated industrial soil RSL is less conservative than the previous RSL, the selected remedy remains protective of human health and the environment…"*
MINOR COMMENTS		
1.	**Section 2.1.3, Progress Since the Last Five-Year Review, Alameda Point, OU-1, IR Site 6, Page 2-7:** Please remove the underline from "transitioned_from".	**Section 2.1.3, Progress Since the Last Five-Year Review, Alameda Point, OU-1, IR Site 6, Page 2-7:** In the first sentence of the second paragraph, the underline has been removed between "transitioned" and "from".
2.	**Section 2.1.4.1, Site Inspection, Page 2-7:** Please remove the quotation mark at the end of the paragraph.	**Section 2.1.4.1, Site Inspection, Page 2-7:** The quotation mark at the end of the paragraph has been removed.
3.	**Section 2.2.1.2, Current and Potential Groundwater Uses, Page 2-10:** Please delete "Site" at the end of the section and add a period.	**Section 2.2.1.2, Current and Potential Groundwater Uses, Page 2-11:** The word "Site" has been removed from the end of last sentence in the last paragraph of the section and a period has been added.
4.	**Section 2.2.1.4, Basis for Taking Action, Page 2-11:** Please remove the extra space after "sampling" on the first line of the second paragraph.	**Section 2.2.1.4, Basis for Taking Action, Page 2-14:** In the first sentence of the second paragraph, the extra space has been removed after "sampling".
5.	**Section 2.2.1.4, Basis for Taking Action, Page 2-12:** Please change "10-4" to "10^{-4}".	**Section 2.2.1.4, Basis for Taking Action, Page 2-14:** Second bullet point, the number, "7 X 10-4", has been corrected to proper scientific notation, "7 X 10^{-4}".
6.	**Section 2.2.2.1, Remedy Selection (Record of Decision), Page 2-12:** Please change "RG" to "RGs" on the sixth line of the last paragraph.	**Section 2.2.2.1, Remedy Selection (Record of Decision), Page 2-14:** In the <u>fourth</u> sentence of the last paragraph, the acronym "RG" has been changed to "RGs".

7.	**Section 2.2.2.2, Remedy Implementation, Page 2-13:** Please change "remove" to "removed" on the second line of the first paragraph under the soil section.	**Section 2.2.2.2, Remedy Implementation, Page 2-15:** The first sentence of the first paragraph under the soil section was changed as follows: ". . . the RA remove*d* soil impacted with lead, . . ."
8.	**Section 2.2.2.2, Remedy Implementation, Page 2-14:** In the last paragraph of Section 2.2.2.2, please change "… analyzed for VOCs by U.S. EPA Method 8260C" to "… analyzed for VOCs using U.S. EPA Method 8260C".	**Section 2.2.2.2, Remedy Implementation, Page 2-16:** In the third sentence of the last paragraph, the word "by" has been replaced with the word "using", to read as follows: " . . . analyzed for VOCs ~~by~~ *using* U.S. EPA Method 8260C . . ."
9.	**Section 2.2.4.1, Site Inspection, Page 2-14:** Please remove the quotation mark at the end of the paragraph.	**Section 2.2.4.1, Site Inspection, Page 2-17:** The quotation mark at the end of the paragraph has been removed.
10.	**Section 2.2.6, Issues, Alameda Point, OU-1, IR Site 16, Page 2-17:** Please change "these sites" to "this site".	**Section 2.2.6, Issues, Alameda Point, OU-1, IR Site 16, Page 2-21:** The sentence has been changed as follows: "No issues have been identified at IR Site 16 that would currently or in the future prevent the respective remedies at ~~these sites~~*this site* from being protective of human health and the environment."
11.	**Section 2.3.1.4, Basis for Taking Action, Page 2-20:** Please remove "scenario" after "residential receptors".	**Section 2.3.1.4, Basis for Taking Action, Page 2-24:** The first sentence of the paragraph has been changed as follows: "The basis for taking action at IR Site 14 was risk to residential receptors ~~scenario~~ for inhalation of VC vapors from groundwater to indoor air."
12.	**Section 2.3.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-23:** Please add the word "is" in between "and" and "in compliance" on the first line of the first paragraph.	**Section 2.3.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-28:** The first sentence of the first paragraph has been changed as follows:

		"Yes, the remedy is functioning as intended by the decision documents and *is* in compliance with the LUC RD as indicated by review of documents, ..."
13.	**Section 2.4.2.1, Remedy Selection (Record of Decision), Page 2-29:** In the IR Site 13 section, please change "… MNA will continue until RGs met." to "… MNA will continue until RGs are met."	**Section 2.4.2.1, Remedy Selection (Record of Decision), Page 2-36:** The second sentence of the IR Site 13 subsection will be changed as follows: "Performance monitoring was conducted periodically during implementation of bioremediation to assess the concentrations of remaining COCs in the subsurface and MNA will continue until RGs *are* met."
14.	**Section 2.4.2.1, Remedy Implementation, Page 2-29:** In the IR Site 13 ISB section, please replace the semi colon with a colon after "three primary elements".	**Section 2.4.2.*2*, Remedy Implementation, Page 2-36:** The semi colon in the first sentence of the IR Site 13 ISB section has been replaced with a colon. Additionally, this section has been renumbered to 2.4.2.2, as Section 2.4.2.1 already exits.
15.	**Section 2.4.2.1, Remedy Implementation, Page 2-30:** In the last paragraph, please remove the extra period after "… and IR13-MW-207)."	**Section 2.4.2.*2*, Remedy Implementation, Page 2-36:** The extra period in the second sentence of the last paragraph has been removed. Additionally, this section has been renumbered to 2.4.2.2, as Section 2.4.2.1 already exits.
16.	**Section 2.4.4, Five-Year Review Process, OU-2A, IR Sites 9, 13, and 19, Page 2-31:** Please remove "Alameda Point" on the first line.	**Section 2.4.4, Five-Year Review Process, OU-2A, IR Sites 9, 13, and 19, Page 2-38:** The first sentence in the paragraph has been changed as follows: "This section discusses activities performed during the Five-Year Review process for ~~Alameda Point~~ IR Sites 9, 13, and 19."
17.	**Section 2.4.4.1, Site Inspection, Page 2-31:** Please remove "and" after "(DON 2012a)".	**Section 2.4.4.1, Site Inspection, Page 2-38:** The third sentence in the paragraph has been changed as follows:

		"ICs outlined in the ROD (DON 2012a) ~~and~~ are operating as intended and are protective of human health and the environment."
18.	**Section 2.4.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-32:** Please change "the remedy is" to "the remedies are" at the beginning of the first paragraph.	**Section 2.4.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents?, Page 2-40:** The first sentence of the paragraph has been changed to read as follows: "Yes, the remed*ies are* ~~is~~ functioning as intended by the decision documents. Review of documents, data collected within this Five-Year Review period, site inspections, and interviews indicate that the remed*ies* implemented for IR Sites 9, 13, and 19 ~~is~~ *are* working as intended by the ROD (DON 2012a). ICs continue to be implemented as intended by the ROD ~~and~~ for IR Sites 9, 13, and 19. ISB has been implemented at IR Site 13 and performance groundwater monitoring is ongoing. Upon completion of performance groundwater monitoring, transition to the MNA component of the selected remedy will be evaluated based on decision criteria. Once COCs satisfy MNA termination criteria, ICs will remain in place at IR Site 13 to continue protecting human health and environment."
19.	**Section 2.4.7, Recommendations and Follow-up Actions, OU-2A, IR Sites 9, 13, and 19, Page 2-34:** The text is conflict with the title of the section. The title of the section is for IR Sites 9, 13, and 19; however, the text is talking about IR Site 16.	**Section 2.4.7, Recommendations and Follow-up Actions, OU-2A, IR Sites 9, 13, and 19, Page 2-43:** The text of the sentence has been changed as follows: "No recommendations or follow-up actions have been identified for IR Sites *9, 13, and 1*~~6~~*9*."
20.	**Section 2.4.8, Protectiveness Statement, OU-2A, IR Sites 9, 13, and 19, Page 2-34:** Please change "16" to "19" at the end of the section.	**Section 2.4.8, Protectiveness Statement, OU-2A, IR Sites 9, 13, and 19, Page 2-43:** The last sentence of the paragraph has been changed as follows:

		"The DON will continue groundwater monitoring at IR Site 13 and the implementation of LUCs at IR Sites 9, 13, and 1~~6~~*9*."
21.	**Section 2.6.2.2, Remedy Implementation, O&M, Page 2-49:** The second sentence in the first paragraph is too long and confusing. Please break it up into two sentences.	**Section 2.6.2.2, Remedy Implementation, O&M, Page 2-65:** The second sentence in the first paragraph has been rewritten as follows: "IR Site 1 will be inspected quarterly and *after abnormal events repair or maintenance will be performed as necessary*. *Abnormal events may include* ~~major weather (~~any rain event with 0.5 inch of rain occurring in a 24-hour period~~)~~, seismic events ~~(~~with a measured peak ground acceleration at the Yerba Buena Island Ground Response System Ground-shaking Station No. 58163 exceeding a gravitation force of 0.10 g~~)~~, tidal ~~events~~ or ocean surges, wildfire, or failure of surface water management systems~~ and repair/maintenance will be performed as necessary~~."
22.	**Section 2.8.5.2, Question B – Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid, Page 2-69:** Please change "And" to "and" in the first paragraph.	**Section 2.8.5.2, Question B – Are the Exposure Assumptions, Toxicity Data, Cleanup Levels, and RAOs Used at the Time of Remedy Selection Still Valid, Page 2-92**, 1st paragraph**:** The word "And" in the first paragraph has been changed to "and".
23.	**Section 2.14.1.4, Basis for Taking Action, Page 2-112:** Please remove the colon at the end of the third paragraph.	**Section 2.13.1.4, Basis for Taking Action, Page 2-138:** The colon at the end of the third paragraph has been removed. Note: Section 2.14 was revised to become Section 2.13.
24.	**Section 2.14.1.4, Basis for Taking Action, Page 2-112:** Please remove the unnecessary comma after "off-site disposal".	**Section 2.13.1.4, Basis for Taking Action, Page 2-138:** The comma after "off-site disposal" has been removed. Note: Section 2.14 was revised to become Section 2.13.

25.	**Appendix C, Interview Documentation Form and Interview Records, Page 2:** Please correct the interview date for Mr. Doug Delong. It should be October 22, 2015 instead of October 22, 2016.	**Appendix C, Interview Documentation Form and Interview Records, Page 1:** The interview date for Mr. Doug Delong has been corrected from October 22, 2016 to October 22, 2015.

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OAKLAND, ALAMEDA FACILITY / ALAMEDA ANNEX
FORMER NAVAL AIR STATION ALAMEDA, CALIFORNIA
DCN: STS-3215-15-0024

Comments from:

Yemia Hashimoto, PG, CHG, Engineering Geologist

San Francisco Regional Water Quality Control Board (Regional Water Board)

Comments Dated: June 15, 2016

COMMENTS

No.	Comment	Response
1.	In the Executive Summary, page ES-1, second paragraph, the last sentence states that the report will be prepared in a "streamlined format." Based on the Toolkit for Preparing Five Year Reviews, a "streamlined format" is not synonymous with data exclusion. Instead, the report should align with EPA's Comprehensive Five-Year Review Guidance and include visualization tools, but exclude extraneous information. The EPA's first General Comment gives numerous examples of Information that was excluded from the Five-Year Review. **Action requested**: Remove the words "streamlined format," or explain how the Five-Year Review is streamlined.	Executive Summary, page ES-1. The text has been revised to read as follows. "STS worked with the DON and followed the approach described in the "*Toolkit for Preparing Five-Year Reviews"* (DON 2013) to prepare this Five-Year Review Report. ~~in a streamlined format.~~"
2.	In the list of Acronyms and Abbreviations, page xii, the Regional Water Quality Control Board, San Francisco Bay Region, is incorrectly abbreviated as "Water Board." **Action requested**: Globally, please revise the text, changing "Water Board" to "Regional Water Board." Also revise "San Francisco Regional Water Quality Control Board" to "Regional Water Quality Control Board, San Francisco Bay Region."	The abbreviation for the "Water Board" has been globally revised to read "*Regional* Water Board". Acronyms and Abbreviations text has been revised to include the following. *San Francisco Regional Water Quality Control Board* (*Regional Water Board*)

3.	In Section 2.3.7 Recommendations and Follow-up Actions, OU-1 IR Site 14, no recommendations or follow-up actions are proposed for IR Site 14 to address the increasing concentration trend in well M14-09S and the elevated levels of vinyl chloride in well M14-15 shown on Figure 2.3-1. In the Monitored Natural Attenuation Work Plan for IR Site 14, Figure 1, Vinyl Chloride Concentration in Groundwater at IR Site 14, isoconcentration lines delineate large areas west of both wells M14-09S and M14-15 that contain vinyl chloride at concentrations greater than 15 micrograms per liter (µg/L). Those areas are not monitored in the Five-Year Review. A hot spot including former sampling location 14HP04 is also excluded. **Action requested**: To evaluate the protectiveness of the remedy, revise Section 2.3.7, Recommendations and Follow-up Actions, OU-1, IR Site 14, to include the installation of monitoring wells to evaluate the western extent of the hot spots that include existing locations M14-09S and M14-15, and former location 14HP04.	The VC isoconcentration contours illustrated in Figure 1 of Monitored Natural Attenuation Work Plan, IR Site 14 (DON 2011) presented the interpretation of the July 2010 VC distribution in groundwater at that time. Based on those sampling results, it was proposed to integrate the IR Site 14 monitoring requirements into the BGMP and the wells to be sampled were presented in Table 1 of the MNA WP. These wells were located with the areas of greatest VC impact and are the same wells currently sampled at IR Site 14 under the BGMP. Wells M14-09S and M14-09D were chosen to monitor the northwestern area of VC concentrations greater than ICTC and wells M14-15, M14-16, M14-17, and M14-20D were chosen to monitor the northeastern area of VC concentrations greater than ICTC. Since 2010, VC concentrations have declined to concentrations below the ICTC for VC in all wells monitored except M14-15 and VC concentration trends for all wells monitored are declining or stable. The VC concentration in monitoring well M14-15 was 26 µg/L in Spring 2015. Since these wells are located within the areas of greatest former VC impact and are today below ICTC or declining, no further assessment of areas of lesser former impact is warranted. Although the interpretation that the trend graph for well 14-09S indicates “increasing concentrations of VC” for the most recent sampling events, is not supported by Figure 2.3-1 which illustrates an average trend that is declining. The VC concentration trend for well M14-09S has declined from an average concentration of approximately 25 ug/L in summer 2008 to less than 10 ug/L in spring 2015 and has been below the ICTC since fall 2013 and

		continues to be monitored under the BGMP. Additionally, the former 2007 14HP04 "hot spot" (53 ug/L VC) was identified based on a grab sample (Hydropunch) from groundwater. Subsequently, a monitoring well (M14-11) was installed near the former 14HP04 location. Monitoring of M14-11 from 2008 to July 2010 indicated declining VC concentrations to below the ICTC by 2009 (Figure 22, Technology Transition Technical Memorandum [TTTM], DON 2010). In 2010, the VC concentration in well MW14-11 had declined to 10 ug/L and sampling of M14-11 was terminated. The question of whether 14HP04 was adequately addressed by the treatment area and appropriately monitored post-treatment by groundwater wells was confused by basemap discrepancies between figures in the above-referenced TTTM. Figure 2.3-1 has been revised to further clarify the relationship between former hydropunch hot spots and both existing and historical monitoring wells. No need to sample the former 14HP04 "hot spot" is apparent. Section 2.3.7 Recommendations and Follow-up Actions, OU-1 IR Site 14 has been revised to state the following: ~~No recommendations and follow-up actions were identified for Site 14.~~ *The DON will increase groundwater monitoring to quarterly and continue reporting VC concentrations in groundwater under the BGMP*.

4.	Section 2.12.3 Progress Since the Last Five-Year Review, Alameda Point, OU-6, RI Site 28, states that monitoring wells demonstrate fluctuating concentrations of copper, ranging from greater than to less than the remedial action objective of 40 µg/L. The three site monitoring wells are located within 25 feet of Oakland Inner Harbor, but tidal influences on groundwater levels and copper concentrations have not been evaluated. **Action requested**: Revise Section 2.12.7 Recommendations and Follow-up Actions, Alameda Point, OU-6, IR Site 28, to include an evaluation of tidal influences on the site monitoring wells during the quarterly monitoring events. The evaluation should include, at a minimum, measurement of water levels and changes in pH, ORP, and salinity/conductivity to assess if the tidal influence is solely pressure or if there is an exchange of water. Samples should be collected for copper and salinity analysis at a minimum of the four tidal changes per day (high, highest high, low, lowest low tides) to determine the effect on copper concentrations and salinity.	**Section 2.12.7 Recommendations and Follow-up Actions, Alameda Point, OU-6, IR Site 28** The following text has been revised to read as follows. ~~No new recommendations or follow-up actions have been identified at this time. Groundwater monitoring will continue through 2021, as recommended in the 2011 Five Year Review.~~ *"The recommendation from the 2011 Five Year Review to continue to monitor and evaluate trends at IR Site 28 until 2021 remains appropriate; however, the BGMP monitoring frequency will be increased to quarterly and each quarterly sampling event will occur at the low-low tide. Sampling will include measurement of water quality parameters including field measurements of DO, ORP, conductivity, and pH, and analysis for salinity. Additionally, to better understand the potential impacts of tidal influence on groundwater at IR Site 28, data logging will be performed in existing wells during both the wet and dry seasons to document the potential influences of weather and tidal cycles on copper concentrations. The evaluation of tidal influences on site monitoring wells will also involve the collection of groundwater samples for chemical analysis of salinity and copper during four tidal cycles (highest high, high, low, lowest low) as part of each quarterly sampling event for one year. Evaluation of the data and recommendations based on the additional data collected will be presented in the 2017 BGMP report."*

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DCN: STS-3215-15-0025

Comments from:

James Fyfe, PE, Project Manager, Hazardous Substances Engineer, Cleanup Program, Berkeley Office

Michelle Dalrymple, PG 6339, Engineering Geologist, Geological Services Unit, Geological Services Branch

Bryan Lewis, PG 4287, CEG 1414, CHG 136, Senior Engineering Geologist, Unit Chief, Geological Services Unit, Geological Services Branch

Brownfields and Environmental Restoration Program

Department of Toxic Substances Control (DTSC)

Comments Dated: July 21, 2016

COMMENTS

No.	Comment	Response
1.	<u>Section 2.3, OU-1, IR Site 14.</u> a. It is unclear why the five wells shown on Figure 2.3-1 were selected for presentation. A more comprehensive map should be included, such as Figure 3.1-2 from the Draft 2015 Annual Groundwater Monitoring Report (Draft 2015 GMR) for the Basewide Groundwater Monitoring Program (BGMP) b. In looking at the comprehensive data set, it appears that a few wells are not exhibiting reductions in concentrations of vinyl chloride – in particular, well M14-15. These trends bring into question the statement that the monitored natural attenuation (MNA) remedy is functioning as intended. Further evaluation of long-term trends should be used to support the conclusion that MNA will meet the remedial goals (RGs) within a reasonable timeframe and that the remedy is functioning as intended.	a. Trend diagrams for all monitored wells at Site 14 will be added to Figure 2.3-1 with the exception of M14-18, which is the downgradient compliance well outside the plume area with historically very low or non-detectable VC concentrations. Additionally, to depict current VC distribution at IR Site 14, Figure 2.3-1 has been revised to include a plume boundary for exceedances of the institutional control termination criteria (ICTC) of 15 µg/L. b. Please refer to USEPA RTC table Specific Comment Response 29. c. The wells that are currently monitored under the BGMP, and their data thus reported in this Five Year Review, are the same wells presented in Table 1 of the 2011 Monitored Natural Attenuation Work Plan for IR Site 14. This well list was based on VC distribution in groundwater in July 2010 and MNA wells were

	c. There are currently no monitoring wells to monitor the western extent of contamination (i.e., west of M14-09S and M14-09D). Additional wells are needed to monitor this portion of the plume until such time that RGs are met throughout the plume. Consider installing additional wells in the western lobe of the vinyl chloride plume and including these new wells in the BGMP.	located in areas of greatest VC impact. Since 2010, VC concentrations have declined and stabilized at concentrations below the ICTC in all wells monitored except M14-15 (26 µg/L in Spring 2015); therefore, further assessment of areas of lesser former impact is not warranted.
2.	<u>Section 2.10, OU-6, IR Site 26.</u> It is unclear why the three wells shown on Figure 2.10-1 were selected for presentation. A more comprehensive map should be included, such as Figure 3.10-2 from the Draft 2015 Annual GMR.	Figure 2.10-1 has been revised to include wells 26PZ01 and 26PZ03.
3.	<u>Section 2.11, OU-6, IR Site 27.</u> a. It is unclear why the three wells shown on Figure 2.11-1 were selected for presentation. A more comprehensive map should be included, such as Figure 3.11-2 from the Draft GMR. b. In looking at the comprehensive data set, it appears that several wells are not exhibiting reductions in concentrations of cis-1,2-dichloroethene and vinyl chloride, and that one or both of these compounds remain at levels above RGs in most wells. In a few wells, increasing trends are observed. These concentrations/trends bring into question the statement that the remedy is functioning as intended. Further	a. Figure 2.11-1 has been revised to include current plume boundary limits of COCs exceeding RGs along with analytical groundwater data trends for all wells sampled under the BGMP. b. **Section 2.11.5.1, Question A – Is the Remedy Functioning as Intended by the Decision Documents**, has been revised to include the following text. *"Although, cis-1,2-DCE concentration trends are increasing in three of the 18 wells for which concentrations are tracked, these three wells are near or immediately down gradient from the apparent source and are near or surrounded by wells that indicate*

	evaluation of long-term trends should be used to support broad statements such as: "It is anticipated that biodegradation will continue at IR Site 27 to the point where the ICTC are achieved (the RGs) at which point groundwater monitoring can be discontinued" and "the remedy is functioning as intended."	*stable or declining cis-1,2-DCE trends; therefore, the data are interpreted to represent local variations in plume dynamics rather than indicate a faltering remedy and the remedy appears to be functioning as intended."*
4.	<u>Section 2.12, OU-6, IR Site 28.</u> Copper exceeds the RG in all three wells that are monitored, and an increasing trend is observed at well 28SW02. These concentrations and trends bring into question the statement that the remedy is functioning as intended. In the near future, further evaluation of long-term trends should be performed and monitoring frequency should be increased. A comprehensive study on the influence of tidal fluctuations on copper concentrations near the shoreline should be conducted. Additional monitoring wells and follow-up actions may be needed. The results of these activities and recommendations for follow-up actions should be provided in the next BGMP following completion of the activities or sooner, as necessary.	As stated in the USEPA RTC table Specific Comment Response 47, the text of **Section 2.12.7 Recommendations and Follow-up Actions, Alameda Point, OU-6, IR Site 28** has been revised as follow: ~~No new recommendations or follow-up actions have been identified at this time. Groundwater monitoring will continue through 2021, as recommended in the 2011 Five Year Review.~~ *"The recommendation from the 2011 Five Year Review to continue to monitor and evaluate trends at IR Site 28 until 2021 remains appropriate; however, the BGMP monitoring frequency will be increased to quarterly and each quarterly sampling event will occur at the low-low tide. Sampling will include measurement of water quality parameters including field measurements of DO, ORP, conductivity, and pH, and analysis for salinity. Additionally, to better understand the potential impacts of tidal influence on groundwater at IR Site 28, data loggers will be used in existing wells during both the wet and dry seasons to document the potential influences of weather and tidal cycles on copper concentrations. Evaluation of the data and recommendations based on the additional data collected will be presented in the 2017 BGMP report."*

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