



Final

**Remedial Action Completion Report
Installation Restoration Program
Sites 2 and 17**

**FORMER MARINE CORPS AIR STATION
EL TORO, CALIFORNIA**

March 2009

Prepared for:

**Base Realignment and Closure
Program Management Office West
San Diego, California**

Prepared under:

**Naval Facilities Engineering Command
Contract Number No. N62742-03-D-1837
Contract Task Order 0025
DCN: ET- 1837-0025-0012**



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Prepared by:

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ACRONYMS AND ABBREVIATIONS

µg/kg	micrograms per kilogram
µg/L	micrograms per liter
APHO	Aerial Photograph Anomaly
APWA	American Public Works Association
ARICs	areas requiring institutional controls
ASTM	American Society of Testing and Materials
BCT	BRAC cleanup team
BEC	BRAC Environmental Coordinator
BO	Biological Opinion
BRAC	Base Realignment and Closure
CAA	Clean Air Act
Caltrans	California Department of Transportation
CCR	California Code of Regulations
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
C.F.R.	Code of Federal Regulations
cis-1,2-DCE	cis-1,2-dichloroethene
CIWMB	California Integrated Waste Management Board
CLSM	controlled low strength material
cm/s	centimeters per second
CO	Contracting Officer
COPCs	chemicals of potential concern
cpm	counts per minute
CQC	construction quality control
CSS	coastal sage scrub
CTO	contract task order
cy	cubic yard
DFOW	definable feature of work
DHS	Department of Health Services, California
DO	dissolved oxygen
DON	Department of the Navy
DTSC	Department of Toxic Substances Control, California
DWR	Department of Water Resources
ERRG	Engineering/Remediation Resources Group
ESD	Explanation of Significant Differences
ET	evapotranspiration
FAA	Federal Aviation Administration
FFA	Federal Facility Agreement
FS	feasibility study
HDPE	high-density polyethylene
HRA	Historical Radiological Assessment
HSO	Health and Safety Officer
IRP	Installation Restoration Program
kg/yr	kilograms per year
lbs/acre	pounds per acre
LEA	Local Enforcement Agency
LFG	landfill gas
LIFO	Lease In Furtherance of Conveyance
LUC	Land-use control
MCAS	Marine Corps Air Station
MCLs	maximum contaminant levels

mg/kg	milligrams per kilogram
Mg/yr	megagrams per year
msl	mean sea level
MOA	memorandum of agreement
MOU	memorandum of understanding
NAVFAC SW	Naval Facilities Engineering Command Southwest
NCP	National Oil and Hazardous Substances Pollution Contingency Plan
NMOCs	non-methane organic compounds
OCHCA	Orange County Health Care Agency
O&M	operation and maintenance
PCBs	polychlorinated biphenyls
PCC	Portland cement concrete
PCE	tetrachloroethene
PID	photo-ionization detector
PM	Project Manager
PMO	Program Management Office
ppmv	per million by volume
PRGs	preliminary remedial goals
PVC	polyvinyl-chloride
QA	quality assurance
QAO	quality assurance officer
QC	quality control
RAB	Restoration Advisory Board
RAC	remedial action
RAO	remedial action objective
RCP	reinforced concrete pipes
RI	remedial investigation
RIP	remedy-in-place
ROD	Record of Decision
ROICC	Resident Officer in Charge of Construction
RPM	Remedial Project Manager
RVR	Remedial Verification Report
RWQCB	California Regional Water Quality Control Point, Santa Ana Region
STLC	soluble threshold limit concentration
SVOCs	semivolatile organic compounds
SCAQMD	South Coast Air Quality Management District
SHSP	Site Health and Safety Plan
TCE	trichloroethene
TCLP	toxicity characteristic leaching procedure
USA	Underground Service Alert
U.S. EPA	United States Environmental Protection Agency
VOCs	volatile organic compounds
WET	Waste Extraction Test

1. OVERVIEW

This report has been prepared for Installation Restoration Program (IRP) Site 2 (Magazine Road Landfill) and Site 17 (Communication Station Landfill) at former Marine Corps Air Station (MCAS) El Toro, California to formally document the following:

- The construction activities are complete and landfill remedies are in place at both sites.
- The landfill remedies achieve the remedial action objectives (RAOs) specified in the Final Interim Record of Decision (ROD) (DON 2000) for IRP Site 17 and vadose zone of IRP Sites 2.
- The final inspections of the constructed remedies were conducted by the Department of the Navy (DON) and the Remedial Design/Oversight Contractor in February 2008 (IRP Site 2) and July 2008 (IRP Site 17).
- The landfill remedies at both sites are protective of human health and the environment.

The remedial action for IRP Site 17 and the vadose zone of IRP Site 2 consisted of implementation of the selected remedy documented in the Final Interim ROD (DON 2000). The remedial action implementation was in general accordance with the following documents:

- *Final Design Submittal, Remedial Action, Operable Unit 2B, Landfill Sites 2 and 17, Former Marine Corps Air Station, El Toro, California.* (Earth Tech 2005a) (hereinafter referred to as *Remedial Design Submittal*).
- *Remedial Action Work Plan, Operable Unit-2B, Sites 2 and 17, Former Marine Corps Air Station El Toro, California* (ERRG 2005, 2008a) (hereinafter referred to as *Remedial Action Work Plan*)

The remedial action construction at IRP Sites 2 and 17 was conducted by Engineering/Remediation Resources Group (ERRG) on behalf of the Base Realignment and Closure (BRAC) Program Management Office (PMO) West and Naval Facilities Engineering Command Southwest (NAVFAC SW) pursuant to the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) and its implementing regulations at the National Oil and Hazardous Substances Pollution Contingency Plan (NCP) (Title 40 of the Code of Federal Regulations [C.F.R.] Part 300) under the contract numbers N68711-01-D-6016 and N62473-07-C-3006. Following completion of remedial actions, ERRG prepared two separate Remediation Verification Reports (RVRs) for IRP Sites 2 and 17 (ERRG 2009a and ERRG 2009b) (hereinafter referred to as IRP Site 2 RVR and IRP Site 17 RVR). These RVRs describe the remedial action construction activities at IRP Sites 2 and 17 and document that construction conforms to the intent of the plans and specifications presented in the Remedial Design Submittal (Earth Tech 2005a).

This report was prepared in accordance with the *Department of Defense and Environmental Protection Agency Joint Guidance, Recommended Streamlined Site Closeout and NPL Deletion Process for DoD Facilities* (DoD and U.S. EPA 2005). This RACR also serves to document the closure certification requirements in accordance with Title 27 California Code of Regulations (CCR) Section 21880.

This document has been prepared by Earth Tech for the BRAC PMO West and the NAVFAC SW as authorized by the United States Navy, NAVFAC Pacific under contract number N62742-03-D-1837, Contract Task Order (CTO)-0025. A draft version of this document was issued to the regulatory agencies (United States Environmental Protection Agency [U.S. EPA], Region IX; California Department of Toxic Substances Control [DTSC]; and California Regional Water Quality Control

Board, Santa Ana Region [RWQCB]) for review in October 2008. The U.S. EPA, Region IX; DTSC; and RWQCB did not have any comment on the draft RACR (see Appendix A).

This RACR may also be used by the DON to make a determination that landfill capping remedies at IRP Sites 2 and 17 are operating properly and successfully (OPS) (also referred to as “OPS determination”) in consultation with other Federal Facility Agreement (FFA) signatories.

1.1 SITE LOCATION AND DESCRIPTION

Former MCAS El Toro is situated in south central Orange County, California, approximately 8 miles southeast of Santa Ana and 12 miles northeast of Laguna Beach. Former MCAS El Toro covers approximately 4,738 acres (Figure 1-1).

IRP Site 2, Magazine Road Landfill, is located in the eastern portion of former MCAS El Toro (Figure 1-2). IRP Site 2 consists of the Magazine Road Landfill (comprised of Areas A and B) and Areas C1, C2, and D2, which contain surficial waste from unauthorized dumping. Solid waste generated at former MCAS El Toro and some solid waste from former MCAS Tustin was disposed at IRP Site 2 from the late 1950s until about 1980.

IRP Site 17, Communication Station Landfill, is also located in the eastern portion of former MCAS El Toro (Figure 1-3). IRP Site 17 consists of the Communication Station Landfill and Areas B and C, which consist of surface accumulation of construction debris from former Marine Corps activities. The IRP Site 17 landfill served as a disposal facility for basewide activities from 1981 to 1983. However, aerial photographs indicate landfilling possibly began in 1970 and continued through 1986.

1.2 SITE BACKGROUND

1.2.1 CERCLA Remedial Action Evaluation Process Summary

1.2.1.1 STATIONWIDE BACKGROUND

Initial work conducted by the DON at former MCAS El Toro included an Initial Assessment Study during 1985 and a Site Inspection Plan of Action during 1987 and 1988 (JMM 1998).

Former MCAS El Toro was added to the Superfund Program National Priorities List on February 15, 1990, due to volatile organic compound (VOC) contamination at the former MCAS boundary and in agricultural wells west of former MCAS El Toro. A FFA was signed by the Marine Corps/DON in October 1990 with the U.S. EPA Region IX, the California Department of Health Services (DHS) (part of which is currently the DTSC), and the RWQCB.

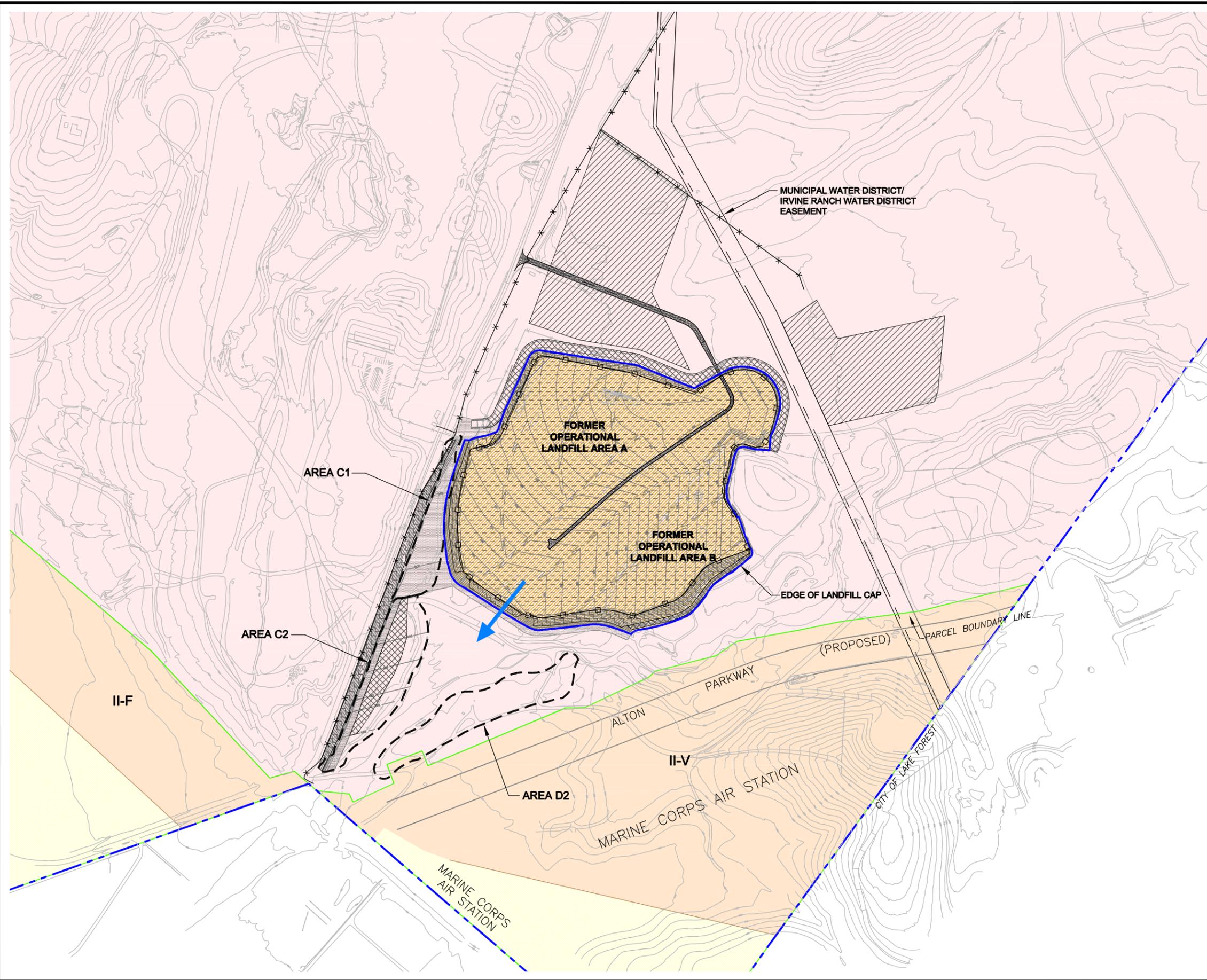
In March 1993, former MCAS El Toro was placed on the list of military facilities scheduled for closure under the BRAC Act. A BRAC cleanup team (BCT) was formed to oversee implementation of the FFA.

1.2.1.2 SITE-SPECIFIC BACKGROUND

Subsequent work at former MCAS El Toro to implement the IRP included the following investigations and studies at IRP Sites 2 and 17:

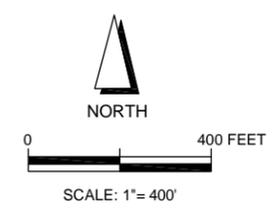
- An air quality solid waste assessment test (Strata 1991) ,
- Phase I RI (JEG 1993),

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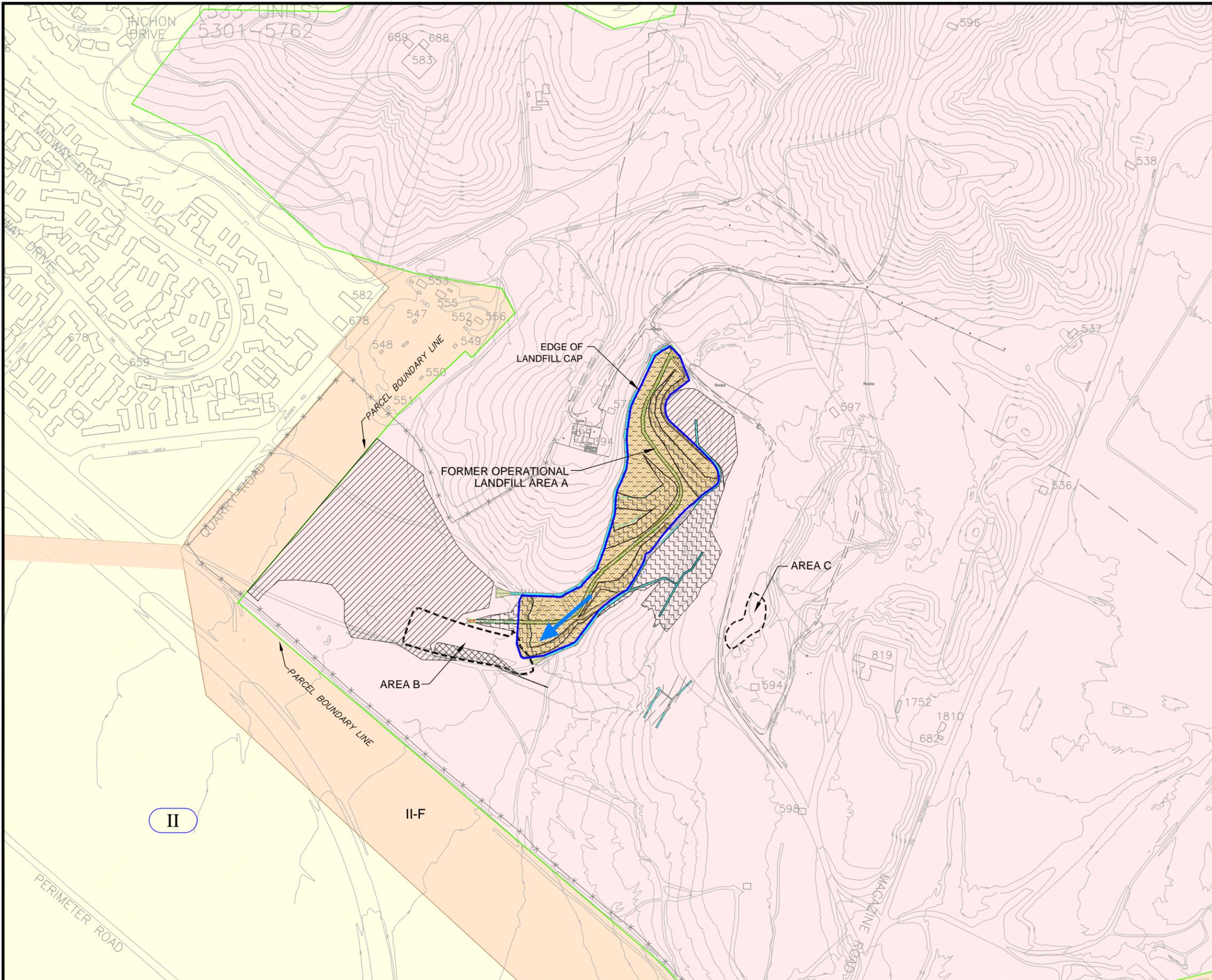
LEGEND

- DON OWNED
- FAA OWNED
- TRANSFERRED AREA
- NAVY SALE PARCEL BOUNDARY
- FORMER MCAS EL TORO BOUNDARY
- II-F** CARVE-OUT NUMBER
- III** NAVY SALE PARCEL NUMBER
- APPROXIMATE EXTENT OF FINAL LANDFILL COVER AREA
- APPROXIMATE LIMIT OF FORMER UNCONTROLLED DISPOSAL
- MULEFAT RESTORATION AREA
- NATIVE GRASSLAND / COASTAL SAGE SCRUB RESTORATION AREA
- ON LANDFILL COASTAL SAGE SCRUB RESTORATION AREA
- OFF LANDFILL COASTAL SAGE SCRUB RESTORATION AREA
- ACCESS ROAD
- EXISTING RIPRAP
- FENCE LINE
- 3-STRAND WIRE FENCE
- EXISTING BUILDING
- GROUNDWATER FLOW DIRECTION



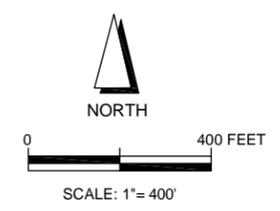
Remedial Action Completion Report		Final
IRP Site 2 Plan		
Landfill Sites 2 and 17		
Date: 03-09	Former MCAS El Toro	
Project No. 95653	EARTH TECH AECOM	Figure 1-2

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LEGEND

- DON OWNED
- FAA OWNED
- TRANSFERRED AREA
- NAVY SALE PARCEL BOUNDARY
- FORMER MCAS EL TORO BOUNDARY
- II-F** CARVE-OUT NUMBER
- III** NAVY SALE PARCEL NUMBER
- APPROXIMATE EXTENT OF FINAL LANDFILL COVER AREA
- APPROXIMATE LIMIT OF FORMER UNCONTROLLED DISPOSAL
- MULEFAT RESTORATION AREA
- NATIVE GRASSLAND / COASTAL SAGE SCRUB RESTORATION AREA
- ON LANDFILL COASTAL SAGE SCRUB RESTORATION AREA
- OFF LANDFILL COASTAL SAGE SCRUB RESTORATION AREA
- FENCE LINE
- RIPRAP ENERGY DISSIPATOR
- BUILDING
- VEGETATION
- GROUNDWATER FLOW DIRECTION



Remedial Action Completion Report		Final
IRP Site 17 Plan		
Landfill Sites 2 and 17		
Date: 03-09	Former MCAS El Toro	Figure
Project No. 95653	EARTH TECH AECOM	1-3

- Phase II RI (BNI 1996a and BNI 1996b),
- Feasibility Study (FS) (BNI 1997),
- Proposed Plan (DON 1998),
- Final Interim ROD (DON 2000),
- Final Design Submittal (Earth Tech 2005a)
- Draft Final FS Addendum (Earth Tech 2005b),
- Draft Proposed Plan (DON 2005),
- Final Technical Memorandum, Aquifer Test (Earth Tech 2006a)
- Final Technical Memorandum, Evaluation of the Selected Remedy With Respect to Radionuclides (Earth Tech 2006b)

Time-critical removal actions were performed in 1996 and 1997 at both sites following RI preparation, as interim measures to reduce the possibility of waste erosion until implementation of the final remedies.

Following regulatory and public acceptance of the Proposed Plan, the Final Interim ROD (DON 2000) was approved on 12 July 2000. The ROD addressed the groundwater and vadose zone at IRP Site 17 and the vadose zone at IRP Site 2. The final groundwater remedy at IRP Site 2 will be documented at a later date in a separate ROD in conjunction with the remedy for IRP Site 1 groundwater.

In October 2008, the Navy issued a Draft Explanation of Significant Differences (DON 2008) that documents that the Final Interim ROD for IRP Sites 2 and 17 will serve as the final ROD for IRP Site 17 and vadose zone of IRP Site 2. In addition, the ESD documents significant and non-significant changes in certain components of the selected remedies for IRP Sites 2 and 17 presented in the Final Interim ROD. These components include land-use restrictions, post-closure monitoring plan, and remedial action selection strategy for IRP Site 2 groundwater. Following regulatory agency review, this ESD will be made available to the public for review. A notice of availability of the ESD will be published in a major newspaper.

2. REMEDIAL ACTION OBJECTIVES

During the preparation of the Phase II Feasibility Study Report (BNI 1997), the following RAOs were developed for IRP Sites 2 and 17:

- Prevent direct contact with the landfill wastes;
- Control run-on, run-off, and erosion;
- Monitor landfill gas (LFG) migration;
- Minimize infiltration and potential contaminant leaching to groundwater;
- Prevent surface water in washes from contacting the landfill;
- Prevent contaminated sediments from entering the washes and being carried off-site;
- Reduce risk to sensitive habitats that support special-status species of plants and wildlife; and
- Prevent domestic use of groundwater containing VOCs above MCLs (IRP Site 2).

3. REMEDIAL ACTION CONSTRUCTION ROLES AND RESPONSIBILITIES

The construction of the landfill cover systems at Sites 2 and 17 included representatives from the Department of Navy, FFA signatories, the remedial action contractor (RAC) and the remedial design/oversight contractor. The responsibilities of key personnel within each of these organizations are discussed below.

3.1 OWNER AND PROJECT MANAGER

The Owner is defined as the BRAC PMO acting on behalf of the U.S Marine Corps. The positions and responsibilities of BRAC PMO and NAVFAC personnel are described below:

- **Contracting Officer (CO)** – The CO is responsible for the negotiation and execution of the construction contract. The CO is responsible for providing technical direction to the construction contractor;
- **Remedial Project Manager/Resident Officer in Charge of Construction (RPM/ROICC)**
The RPM/ROICC is responsible for coordination of all work performed by the environmental contractors, former MCAS El Toro and other Marine Corps representatives, and regulatory agencies, including the BRAC PMO management team. The RPM/ROICC has authority to stop work if quality standards are not maintained;
- **Quality Assurance Officer (QAO)** – The QAO is responsible for government oversight of the Quality Assurance (QA) program and provides quality-related direction for the project. The QAO has the authority to suspend affected project or site activities if NAVFAC-approved quality requirements are not adequately followed.

3.2 BRAC CLOSURE TEAM

The BRAC closure team is defined as the members of the BCT. The positions and responsibilities of BCT personnel are as follows:

- **BRAC Environmental Coordinator (BEC)** – The BEC is the BRAC PMO representative who chairs the BCT and is responsible for coordinating environmental restoration and compliance programs and updating the BRAC Cleanup Plan at former MCAS El Toro; and
- **U.S. EPA RPM, Cal-EPA/DTSC RPM, and RWQCB, Santa Ana Region RPM** – These agency RPMs are responsible for overseeing and monitoring the progress of remedial design, implementation of the RA, and conformance of these activities with the requirements of the FFA and ROD.

3.3 REMEDIAL ACTION CONTRACTOR (RAC)

The position and responsibilities of key RAC team members are as follows:

- **Program Manager** – The program manager is responsible for all aspects of the RA construction program;
- **Project Manager (PM)** – The PM has overall responsibility for all construction work performed during implementation of the RA. Responsibilities include project planning, scheduling, staffing, execution of tasks and subcontracts, and managing deliverables;
- **QC Manager** – The QC manager is responsible for developing the QC process and supervising audits of projects within the RAC program for compliance with program and project-specific procedures and specifications. The QC manager is a registered civil engineer in the State of California and is responsible for certifying construction submittals

- **Health and Safety Manager** – The health and safety manager is responsible for development and implementation of the program health and safety plan and project-specific modifications and amendments;
- **Contracts/Procurement Manager** – The contracts manager is responsible for solicitation, selection, and management of subcontracts for RA construction services and materials required for the project;
- **Project Health and Safety Officer (HSO)** – The HSO is responsible for establishing and maintaining communications with all site personnel concerning the project-specific health and safety plan, verifying adherence to site safety requirements, organizing and conducting safety meetings (tailgate meetings) and recording and documenting safety incidents on site; and
- **Project QC Engineer** – The project QC engineer is responsible for ensuring that subcontractors and vendors comply with project requirements and contractual obligations and that all field activities are performed as required by the project design. The QC engineer is a qualified and trained person who reports to the QC manager on quality matters.

3.4 REMEDIAL DESIGN/OVERSIGHT CONTRACTOR

The remedial design/oversight contractor is responsible for the preparation of the remedial design and supports the Navy in overseeing implementation of the RA. The position and responsibilities of key remedial design team members are as follows:

- **Project Manager (PM)** – The PM has overall responsibility for all work performed for the RA design and oversight support. Responsibilities include supporting the Navy staff in reviewing RA construction submittals for conformance with project requirements. The PM is responsible for reviewing the QC and QA performed by the RAC QC Manager and for the subsequent certification of the landfill closure as required by the California Code of Regulations Title 27;
- **Project Engineer** – The project engineer supports the project manager in reviewing RAC contractor submittal, periodically participating in construction meetings and inspections. Responding to the RAC contractor enquires.

4. REMEDIAL ACTION ACTIVITIES

The selected remedy for vadose zones of IRP Sites 2 and 17 as documented in the Final Interim ROD (DON 2000) included below-mentioned components. Each component below applies to both IRP Sites 2 and 17 unless otherwise noted.

- A single-layer, minimum 4-foot-thick monolithic soil cap to prevent contact with landfill materials and to reduce infiltration into landfill contents.
- On-site waste consolidation prior to capping.
- Erosion control features to control surface water flow and protect the integrity of the cap.
- Fencing, signs, and gates with locks to restrict access to the sites.
- Land use restrictions to protect the integrity of the landfill cap, restrict irrigation, prevent use of groundwater at IRP Site 2, assure that contact with landfill materials does not occur, and allow DON, Federal Facility Agreement signatories, and California Integrated Waste Management Board (CIWMB) and/or its Local Enforcement Agency (LEA) access to the sites for the purpose of conducting or overseeing monitoring and maintenance;
- Natural resource/habitat mitigation measures will be coordinated with the United States Fish and Wildlife Service;
- Monitoring of soil gas and soil moisture to detect any migration of contaminants from the landfills;
- Groundwater monitoring to detect any releases of contaminants from the landfills. Monitoring wells will be secured to prevent damage.
- The cap, drainage features, settlement monuments, and security features will be inspected and maintenance will be performed as necessary to assure the integrity of the landfill cap and prevent unauthorized access.
- Periodic reviews (every 5 years) to evaluate the monitoring results and verify that the action remains protective of human health and the environment.

The above remedial action components may be divided into two parts: landfill cover construction and implementation of ICs. The implementation of each of these components is discussed in detail in Sections 4.1 and 4.2. Section 4.1 provides a step-by-step summary of the pre-construction and construction activities performed as part of landfill cap construction at IRP Sites 2 and 17. Section 4.2 discusses implementation of ICs.

A summary of major events associated with the IRP Sites 2 and 17 cover construction, starting with ROD signature, is presented in Table 4-1.

Table 4-1: Chronology of Events - Remedial Action at IRP Sites 2 and 17

Event	Date
IRP Site 2	
<i>Remedial Action Selection and Planning</i>	
Record of Decision for IRP Site 2 signed by the Navy	April 2000
Remedial Design Work Plan (Earth Tech 2005a) finalized	November 2005
Remedial Action Work Plan (ERRG 2005) finalized	December 2005
<i>Pre-Construction Activities</i>	
ET Cover Soil Testing and Procurement	June 2003 through August 2005
Well Destruction/Abandonment	September 2003
Equipment Mobilization and Material Staging	September 2005
Pre-Construction Site Survey	December 2005
<i>Cover Construction Activities</i>	
Waste Consolidation	October 2005 through February 2006
Subgrade and Foundation Layer Placement	October 2005 through March 2006
Installation of Monitoring Wells	July 2006
Final ET Cover Placement	October 2005 through May 2007
Top Soil Placement	March through June 2007
Final Survey and Certification of Landfill Surface	May 2007
Installation of Security Fence, Gates, and Locks	July to November 2007
Revegetation and Site Restoration	March 2007 through February 2008
Decontamination and Demobilization	July 2007 through January 2008
Final Inspection	February 2008
IRP Site 17	
<i>Remedial Action Selection and Planning</i>	
Record of Decision for IRP Site 2 signed by the Navy	April 2000
Remedial Design Work Plan (Earth Tech 2005a) finalized	November 2005
Remedial Action Work Plan (ERRG 2005, 2008a) finalized	December 2005
<i>Pre-Construction Activities</i>	
ET Cover Soil Testing and Procurement	June 2003 through August 2005
Equipment Mobilization and Material Staging	November 2007
Pre-Construction Site Survey	November 2007
<i>Cover Construction Activities</i>	
Waste Consolidation	November 2007 through January 2008
Subgrade and Foundation Layer Placement	November 2007 through March 2008
Installation of Monitoring Wells	May 2008
Completion of Final ET Cover Placement	July 2008
Top Soil Placement	May through June 2008
Final Survey and Certification of Landfill Surface	July 2008
Installation of Security Fence, Gates, and Locks	March 2008
Revegetation and Site Restoration	Initiated July 2008
Decontamination and Demobilization	June through July 2008
Final Inspection	July 2008

4.1 LANDFILL CAP CONSTRUCTION

4.1.1 Pre-Construction Activities

Prior to construction of the cover system at IRP Sites 2 and 17, several pre-construction activities consisting of administrative and site preparation activities were conducted, including:

- ET Cover Soil Testing and Procurement
- Permitting
- Preliminary Site Survey
- Equipment Mobilization and Material Staging
- Underground Utility Clearance
- Removal of Scrap Metal Debris (Marsten Matting) (IRP Site 2 only)
- Abandonment of an Inactive Waterline (IRP Site 2 only)
- Well Abandonment (IRP Site 2 only)
- Vegetation Clearing, Chipping, Stockpiling, and Off-Site Recycling
- Coastal Sage Scrub (CSS) Seed Collection and Container Plant Cultivation

4.1.1.1 ET COVER SOIL TESTING AND PROCUREMENT

ET cover soil materials used to construct landfill covers were procured, blended, and tested prior to the start of construction activities. From June 2003 to August 2005, several sources of ET cover soil material were sampled and tested to determine if the material would meet the geotechnical specifications presented in the 90 Percent Design and Final Remedial Design Submittal (Earth Tech, 2003 and 2005a). During this period, numerous blends of sand and clay materials at varying mix ratios were evaluated for potential use.

In May 2005, the *Landfill Test Fill Construction and Borrow Source Evaluation Report, Operable Unit 2B, IRP Sites 2 and 17* (Earth Tech 2005d) was prepared. The conclusions of this report recommended the appropriate mix design and geotechnical parameters of the ET soil cover. In addition, the report provided placement and compaction specifications necessary to meet the minimum hydraulic conductivity requirement for the ET cover specified in the ROD. The report recommended using a blend of 50 percent clay and 50 percent sand from El Toro Materials located 8.3 miles from the site in Lake Forest, California. The report also recommended relative compaction of placed material to 90 percent of maximum dry density to meet the required minimum hydraulic conductivity of 2×10^{-5} centimeters per second (cm/s) stipulated in the ROD (DON 2000).

The imported soil was blended and tested at El Toro Materials prior to delivery to the project site to ensure that it met the minimum project specifications for moisture retention, hydraulic conductivity, and grain size. The details of this testing are presented in Section 4.1.2.6.

The imported soil was hauled to the site where it was initially stockpiled and managed in the laydown area. Further discussion of in-situ testing and placement of ET cover is presented in Section 4.1.2.6.

4.1.1.2 PERMITTING

CERCLA response actions are exempt from permit requirements under Section 121(e) of CERCLA. Therefore, the remedial actions performed at IRP Sites 2 and 17 (pursuant to CERCLA) were exempt from administrative permit requirements such as permit fees. However, the DON complied with substantive requirements of the following permits:

- Well abandonment permits for IRP Site 2, Orange County Health Care Agency (OCHCA): Permit numbers 03-08-38 (issued 26 August 2003) and 05-11-36 (issued 23 November 2005)
- Well installation permits, OCHCA: Permit number 06-07-02 (issued 3 July 2006 for IRP Site 2) and Permit number 08-05-09 (issued 9 May 2008 for IRP Site 17)
- Former MCAS El Toro Environmental Contractor Utility Clearance Request (submitted November 7, 2007)

Copies of the well permits are included Appendix B of IRP Site 2 RVR (ERRG 2009a) and Appendix B of IRP Site 17 RVR (ERRG 2009b). A discussion of the well abandonment activities and well installation activities are provided in Sections 4.1.1.8 and 4.1.2.8, respectively.

4.1.1.3 PRELIMINARY SITE SURVEY

Pre-construction site surveys were conducted at IRP Sites 2 and 17 in December 2005 and November 2007, respectively. During these surveys, pre-construction site grades and surface conditions were surveyed. Additional surveying was conducted upon the start of grading operations at both sites and is discussed in Section 4.1.2.3. Figures 4-1 and 4-2 show pre-construction maps of IRP Sites 2 and 17 respectively.

4.1.1.4 EQUIPMENT MOBILIZATION AND MATERIAL STAGING

The construction material lay down and equipment storage areas were established at IRP Sites 2 and 17 in September 2005 and November 2007, respectively, at locations designated by licensed biologist monitoring the project (Lincer and Associates). These areas are shown on Figures 4-1 and 4-2 and were located beyond the coastal California gnatcatcher habitat.

The following mobilization activities were performed during the first two weeks of September 2005 and November 2007 at IRP Sites 2 and 17, respectively:

- Delivery of earthwork equipment to the site laydown area.
- Delivery and setup of a fueling cell within the laydown and equipment staging area.
- Placement of a storage container unit at the west end of the lay down area.
- Correction of flow-meter to a fire hydrant adjacent to the Navy property.
- Grading of access roads leading eastward from Magazine Road to the proposed landfill construction location areas.
- Erection of a water supply storage tower adjacent to the office trailer on Magazine Road.
- Posting of environmental hazard notification signs leading to the landfill construction areas.

4.1.1.5 UTILITY CLEARANCE

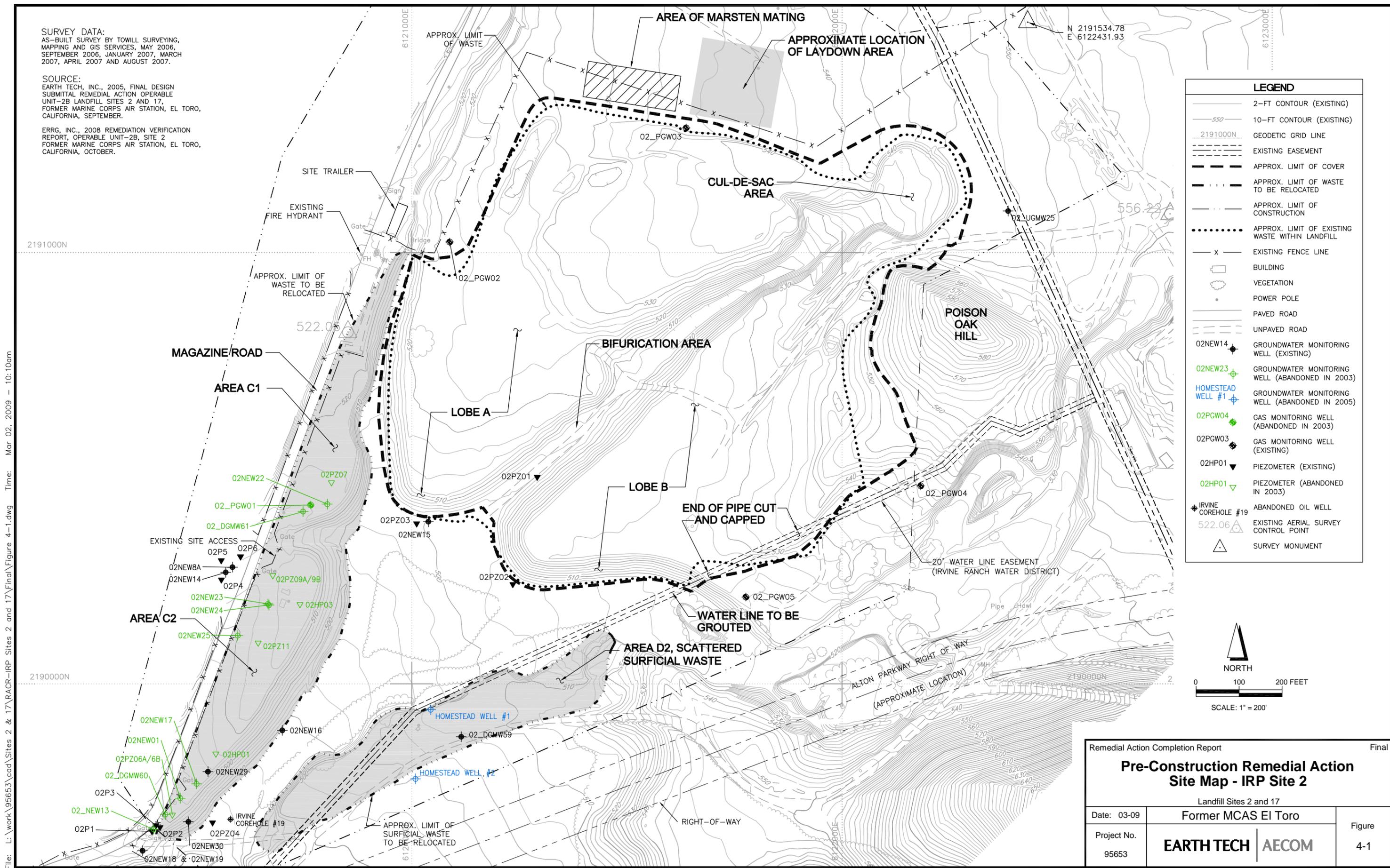
The appropriate agencies were notified of the forthcoming excavation activities via DigAlert, also known as Underground Service Alert (USA). Additionally, for IRP Site 2, a third-party utility line locator was contracted to locate and mark utilities in accordance with the American Public Works Association (APWA) standards.

SURVEY DATA:
 AS-BUILT SURVEY BY TOWILL SURVEYING,
 MAPPING AND GIS SERVICES, MAY 2006,
 SEPTEMBER 2006, JANUARY 2007, MARCH
 2007, APRIL 2007 AND AUGUST 2007.

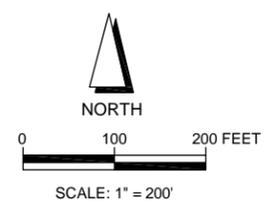
SOURCE:
 EARTH TECH, INC., 2005, FINAL DESIGN
 SUBMITTAL REMEDIAL ACTION OPERABLE
 UNIT-2B LANDFILL SITES 2 AND 17,
 FORMER MARINE CORPS AIR STATION, EL TORO,
 CALIFORNIA, SEPTEMBER.

**ERRG, INC., 2008 REMEDIATION VERIFICATION
 REPORT, OPERABLE UNIT-2B, SITE 2
 FORMER MARINE CORPS AIR STATION, EL TORO,
 CALIFORNIA, OCTOBER.**

N 2191534.78
 E 6122431.93



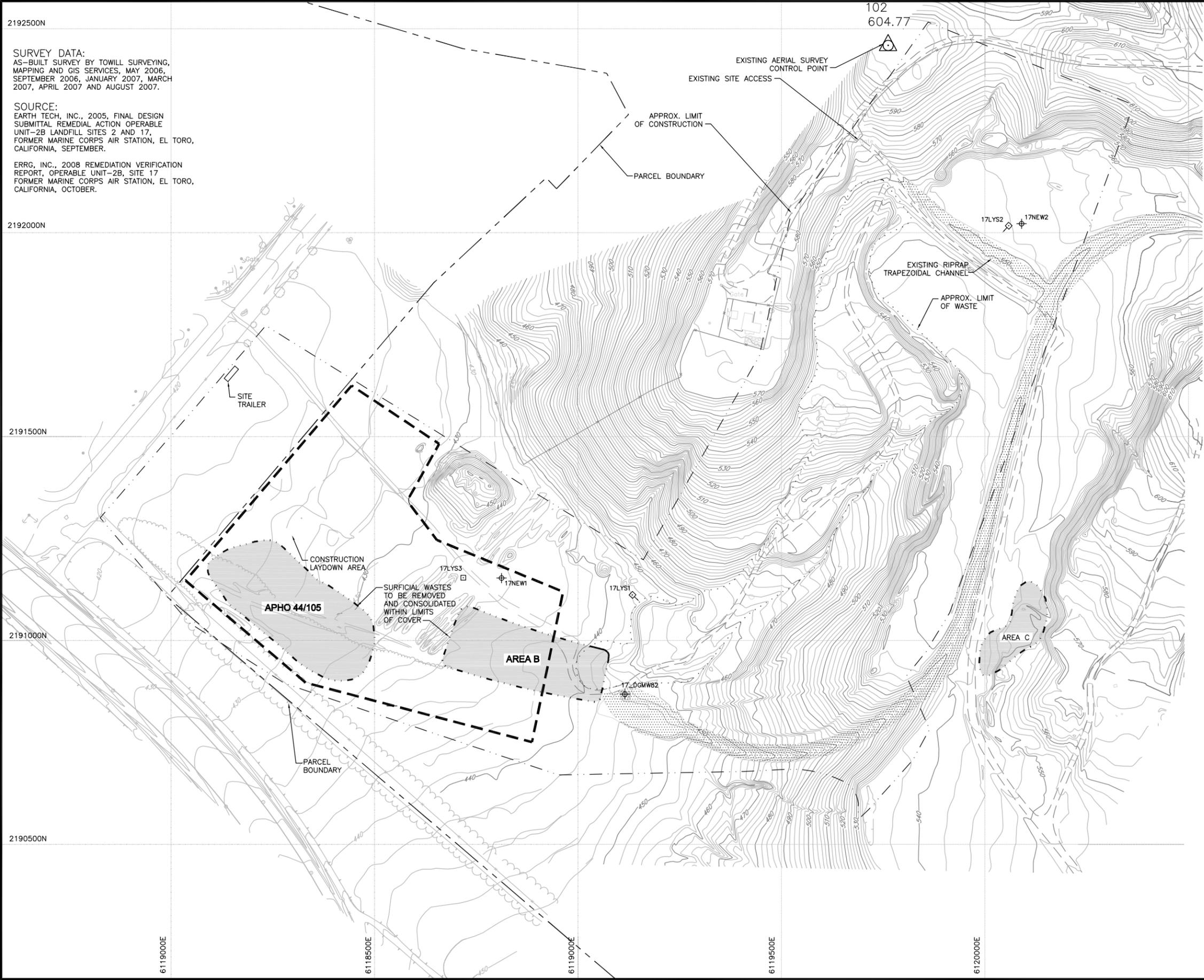
LEGEND	
	2-FT CONTOUR (EXISTING)
	10-FT CONTOUR (EXISTING)
	GEODETIC GRID LINE
	EXISTING EASEMENT
	APPROX. LIMIT OF COVER
	APPROX. LIMIT OF WASTE TO BE RELOCATED
	APPROX. LIMIT OF CONSTRUCTION
	APPROX. LIMIT OF EXISTING WASTE WITHIN LANDFILL
	EXISTING FENCE LINE
	BUILDING
	VEGETATION
	POWER POLE
	PAVED ROAD
	UNPAVED ROAD
	02NEW14 GROUNDWATER MONITORING WELL (EXISTING)
	02NEW23 GROUNDWATER MONITORING WELL (ABANDONED IN 2003)
	HOMESTEAD WELL #1 GROUNDWATER MONITORING WELL (ABANDONED IN 2005)
	02PGW04 GAS MONITORING WELL (ABANDONED IN 2003)
	02PGW03 GAS MONITORING WELL (EXISTING)
	02HP01 PIEZOMETER (EXISTING)
	02HP03 PIEZOMETER (ABANDONED IN 2003)
	IRVINE COREHOLE #19 ABANDONED OIL WELL
	522.06 EXISTING AERIAL SURVEY CONTROL POINT
	SURVEY MONUMENT



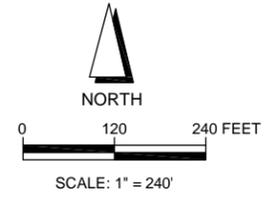
Remedial Action Completion Report		Final
Pre-Construction Remedial Action Site Map - IRP Site 2		
Landfill Sites 2 and 17		
Date: 03-09	Former MCAS El Toro	
Project No. 95653	EARTH TECH AECOM	Figure 4-1

File: L:\work\95653\cad\Sites 2 & 17\RACR-IRP_Sites 2 and 17\Final\Figure 4-1.dwg Time: Mar 02, 2009 10:10am

File: L:\work\95653\cad\Sites 2 & 17\RACR-IRP_Sites 2 and 17\Final\Figure 4-2.dwg Time: Mar 02, 2009 - 10:10am



LEGEND	
	2-FT CONTOUR (EXISTING)
	10-FT CONTOUR (EXISTING)
	GEODETIC GRID LINE
	APPROX. LIMIT OF SURFICIAL WASTE TO BE RELOCATED
	APPROX. LIMIT OF CONSTRUCTION
	APPROX. LIMIT OF EXISTING WASTE
	EXISTING FENCE LINE
	BUILDING
	VEGETATION
	POWER POLE
	UNPAVED ROAD
	EXISTING RIPRAP
	EXISTING GROUNDWATER MONITORING WELL
	EXISTING LYSIMETER (VERTICAL)
	EXISTING LYSIMETER DRILLED AT 30° ANGLE (SHOWS ANGLE DIRECTION)
	EXISTING AERIAL SURVEY CONTROL POINT
	CONSTRUCTION LAYDOWN AREA



Remedial Action Completion Report		Final
Pre-Construction Remedial Action Site Map - IRP Site 17		
Landfill Sites 2 and 17		
Date: 03-09	Former MCAS EI Toro	
Project No. 95653	EARTH TECH AECOM	Figure 4-2

The following areas were cleared in advance of field construction activities for IRP Site 2:

- Monitoring well installation locations
- Areas outside of the final cover areas to be cleared and grubbed, graded and backfilled
- Access roads
- Waste excavation areas C1/C2, and D2
- Grading and backfilling outside the final cover areas.

For IRP Site 17, no utilities were marked within the construction boundaries. DigAlert was also notified prior to installation of the perimeter fence at IRP Site 17. A water line and an abandoned gas line were located in the vicinity of the perimeter fence line.

4.1.1.6 REMOVAL OF SCRAP METAL DEBRIS (MARSTEN MATTING) AT IRP SITE 2

In conjunction with clearing and grubbing activities at IRP Site 2, a large stockpile of scrap metal debris was removed by American Wrecking, Inc. of South El Monte, California. This material, often referred to as Marsten matting, is a perforated steel decking material which had previously been spread over the laydown area adjacent to the IRP Site 2 landfill. In 2003, this material was removed from the laydown area and stockpiled for future removal and recycling.

In September 2005, an excavator with shear attachment was used to separate and cut the scrap metal into appropriately-sized pieces. These pieces were loaded into a high-side end-dump trailer for transport to an off-site recycling facility. During the cutting and separating operation, the shear attachment was used to shake loose other debris and/or soil intermingled within the scrap metal stockpile. A water truck was used for dust control and abatement. The soil and debris was placed in the depression between the two landfill lobes known as the landfill bifurcation area with other waste being consolidated from Areas C1 and C2.

The loads of steel were tracked individually and load/weight tickets were provided by the steel recycler for each load of steel removed from the site. A total of seven truck loads or approximately 210 cubic yards (equating to approximately 60 tons) were removed from the jobsite and recycled at Star Metals located in Santa Ana, California. After the scrap metal was processed and loaded out, the area was graded and the resulting debris or soil was placed in the bifurcation area. Photographs of the scrap metal removal are presented in Appendix D of IRP Site 2 RVR (ERRG 2009a).

4.1.1.7 ABANDONMENT OF INACTIVE WATERLINE AT IRP SITE 2

An inactive 14-inch diameter steel waterline crossing the southeast section of the eastern lobe of the landfill known as Lobe B, as shown on Figure 4-1, was abandoned at the beginning of construction activities at IRP Site 2. The project specifications required that only the section of piping beneath the landfill cover required abandonment; therefore, the pipeline section to be grouted was located by potholing at the northern and southern ends.

The excavations were sloped to allow for safe entry into the excavation by personnel. Two 4-foot wide and 4-foot deep, temporary plywood forms were constructed around the upslope and downslope ends of the pipeline in order to ensure a sufficient sized concrete plug.

A two-sack, sand-cement slurry was delivered to the site in 10 cubic yard (cy) concrete trucks and transferred into the pipe using a concrete pump with flexible hoses with cam lock fittings. As the slurry was injected into the pipe and traveled downslope in the piping, the hose was slowly

withdrawn in sections. The concrete filled the void of the pipe with the assistance of a concrete vibrator. Appendix D of IRP Site 2 RVR (ERRG 2009a) presents photographs of the pumping activities.

After the slurry set, the plywood forms at the upgradient and downgradient ends of the pipeline were filled to the top of pipe with concrete. After the concrete had set, the forms were stripped and disposed of as construction debris. The excavations at each end of the pipeline were backfilled and compacted as part of the subgrade preparation activities.

4.1.1.8 WELL ABANDONMENT AT IRP SITE 2

One perimeter gas monitoring well and three groundwater monitoring wells in Area C1 and 14 groundwater monitoring wells in Area C2 were abandoned at IRP Site 2 in September 2003. The locations of the abandoned wells are presented on Figure 4-1. All well abandonments were performed pursuant to OCHCA well abandonment permit #03-08-38, by pressure grouting and over-drilling techniques. Two additional water wells known as “Homestead Well #1 (HS-1) and “Homestead Well #2” (HS-2) formerly located in the D2 area were abandoned by pressure grouting and over-drilling techniques on July 17 and 18, 2006 pursuant to OCHCA well abandonment permit #05-11-36. The 2003 and 2006 well abandonment procedures are described in detail in *Well Destruction Report – Permit #03-08-38, Former MCAS El Toro, Site 2* (Shaw, 2003) and *Well Destruction Report – Permit #05-11-36, Former MCAS El Toro, IRP Site 2 Landfill* (Shaw, 2006a), which are included in Appendix B of IRP Site 2 RVR (ERRG 2009a).

4.1.1.9 VEGETATION CLEARING AND OFF-SITE RECYCLING

IRP Site 2

The vegetation within the limits of the landfill cap at IRP Site 2 was removed as part of the pre-construction activities in accordance with the Remedial Design Submittal (Earth Tech 2005a), Remedial Action Work Plan (ERRG 2005, 2008a) and the *Biological Opinion for Remedial Action at Sites 2 and 17, Former Marine Corps Air Station El Toro, Orange County, California* (1-6-F-02-1202) (BO) (USFWS 2002). Debris generated from the clearing and grubbing was placed in the bifurcation area between the two landfill lobes (Lobe A and Lobe B). A tree removal specialist was subcontracted to remove a large sycamore tree on the west side of the landfill. The waste generated as part of tree removal was transported from the site by a licensed waste transporter. The remaining tree stump was ground, mulched, and placed in the bifurcation area.

IRP Site 17

Most of the construction area at IRP Site 17 was burned during the Santiago fire that began on 21 October 2007, leaving the remaining site vegetation unusable for mulch or soil amendments. Thus prior to beginning fieldwork, the remaining charred vegetation within the limits of the landfill cover was removed in accordance with the Remedial Design Submittal (Earth Tech 2005a), Remedial Action Work Plan (ERRG 2005, 2008a) and the BO (USFWS 2002) and shipped off-site for disposal. Debris generated from the clearing and grubbing was placed in the waste consolidation area within the laydown and equipment staging area. Ten truckloads of waste were transported from the site by a licensed waste transporter.

4.1.1.10 COASTAL SAGE SCRUB SEED COLLECTION AND CONTAINER STOCK CULTIVATION

As required in the *Final Coastal Sage Scrub Restoration Plan* (Helix 2005) included as part of the Remedial Design Submittal (Earth Tech 2005a), on-site seed collection for the CSS and mulefat scrub was conducted prior to mobilization in the field. Seed was collected within the landfill

restoration area and in areas surrounding IRP Site 2 by S and S Seeds and Mockingbird Nursery. The CSS seed stock was collected in September 2005 at the beginning of the landfill construction activities.

Cuttings were also collected to support container plant growth. Container stock was grown at Mockingbird Nursery and inspected at the nursery by the restoration specialist, LSA Associates, and the Navy's wildlife biologist prior to delivery. As specified in the Restoration Plan, the container plants were relocated to the site to be hardened off prior to planting in the field.

4.1.2 Construction Activities

In accordance with the Remedial Action Work Plan (ERRG 2005, 2008a), the following construction activities were performed as part of remedial action implementation at IRP Sites 2 and 17:

- Biological Monitoring
- South Coast Air Quality Management District (SCAQMD) Fugitive Dust Monitoring
- Land Surveying
- Waste Consolidation
- Subgrade and Foundation Layer Preparation
- ET Cover Installation
- Construction of Drainage and Riprap Energy Dissipater Features
- Well Installation
- Settlement Monument Installation
- Site Access Road Construction
- Trapezoidal Channel Crossing Installation (IRP Site 2 only)
- Security Fence and Signage Installation
- Erosion Control and Site Restoration
- Demobilization

4.1.2.1 BIOLOGICAL MONITORING

Field activities at IRP Sites 2 and 17 were conducted in accordance with the BO and BO Amendment (USFWS 2002 and USFWS 2004), which identifies threatened or endangered species at the sites and prescribes activities required to protect those species. The focus of the IRP Sites 2 and 17 BO is twofold: (1) protection of the coastal California gnatcatcher (*Polioptila californica*), a federally threatened species, and (2) replacement and protection of the CSS critical habitat throughout IRP Sites 2 and 17 associated with the gnatcatcher. The BO amendment modified the acreage for CSS restoration on and off the landfill cap while keeping the total CSS restoration area to be the same. In addition, the BO amendment modified the mulefat scrub restoration area, included requirements for seeding portions of landfill caps and adjacent areas with slopes that are 3:1 or steeper with grassland/CSS mix, and stipulated conditions under which CSS that may possibly grow on the stockpiles used in cap repair activities, can be impacted without additional offsetting measures.

The BO describes restrictions and mitigation activities necessary to protect breeding and foraging habitat during construction of the cover. These restrictions include:

- Restricting the clearing and grubbing activities to before or after the gnatcatcher breeding season of February 15th to August 30th
- Clearly marking the limits of the landfill construction boundaries
- Conducting gnatcatcher monitoring during construction
- Implementing a construction crew education program regarding the presence of CSS and gnatcatchers
- Maintaining dust control to reduce the deleterious effects of dust on CSS.

Additionally, for construction activities conducted during the breeding season at IRP Site 2, a series of contingency measures were proposed and, when applicable, were implemented. Those measures included focused gnatcatcher nesting surveys to determine the presence of gnatcatchers within 500 feet of the project footprint, and postponing work within 300 or 500 feet (depending upon the activity) of an active gnatcatcher nest.

Dr. Jeff Lincer, or an associate of Lincer and Associates under his direction, performed the necessary monitoring and surveys to ensure that the work was performed in accordance with the BO. Dr. Lincer holds a valid Section 10(A)(1)(a) nest monitoring permit which is required to perform the surveys. Lincer and Associates also marked the construction boundaries as described in the BO, and conducted the construction crew education program classes.

During construction of the landfill cover at IRP Site 2, two observations of nesting pairs of gnatcatchers were identified. During the 2006 breeding season (February 15 through August 30), four gnatcatcher breeding pairs produced six nests within the IRP Site 2 survey area. In 2007, six gnatcatcher breeding pairs produced 10 nests within the IRP Site 2 survey area. In several instances, buffer areas were created around nesting areas adjacent to the construction as directed by Dr. Lincer. No construction activities were allowed within the buffer area until the young fledged or the nest was determined to have failed.

During construction of the landfill cover at IRP Site 17, no observations of nesting pairs of gnatcatchers were identified. The gnatcatchers were displaced during the Santiago wildfire that burned IRP Site 17 and the surrounding areas in October 2007. No additional contingency measures were implemented for the gnatcatchers. Construction activities at IRP Site 17 were allowed to occur, with Dr. Lincer monitoring the site on an established biweekly interval. Appendix E of IRP Site 2 RVR (ERRG 2009a) and Appendix C of IRP Site 17 RVR (ERRG 2009b) presents the annual summary reports from the gnatcatcher surveys and construction monitoring efforts at IRP Sites 2 and 17, respectively.

4.1.2.2 SOUTH COAST AIR QUALITY MANAGEMENT DISTRICT FUGITIVE DUST MONITORING

Fugitive dust monitoring was conducted in accordance with SCAQMD Rule 403 Fugitive Dust throughout the duration of on-site construction activities. The monitoring involved daily observation of dust emissions and documenting that the best available control measures were consistently applied. The project was completed without any observations of visible dust as result of the construction operations, beyond the property boundary.

4.1.2.3 LAND SURVEYING

Land surveying was performed by a third party entity, under the direction of a California Licensed Professional Surveyor during construction of the landfill covers to establish, document, and certify elevations for each grading phase. Following the completion of the earthwork, drawings were

prepared and approved by a California Licensed Professional Surveyor, documenting elevations of the completed subgrades and foundation layers, and the placement to the ET covers at IRP Sites 2 and 17. The survey data verified that a minimum of 4 feet of ET cover was placed over waste. As-built survey drawings of the subgrade and final grade for IRP Sites 2 and 17 are presented in Appendix C of IRP Site 2 RVR (ERRG 2009a) and Appendix I of IRP Site 17 RVR (ERRG 2009b), respectively.

IRP Site 2

At IRP Site 2, Towill Inc. was subcontracted to provide an independent third party surveying services. The chronology of surveying events at IRP Site 2 are provided below:

- September through January 2006 — Established subgrade elevations and delineated waste excavation boundaries.
- February through March 2006 — Resurveyed and restaked the foundation elevations in weather damaged portions of the slopes and the landfill deck in Lobes “A” and “B”
- March 2006 — Surveys to certify portions of the final foundation layer grade.
- April 2006 — Surveyed and staked the final redesigned foundation layer elevations throughout the landfill cap, waste excavation areas, and slope modifications.
- April 2006 to February 2007 — Surveyed intermediate ET cover lift thicknesses and final cover elevations.
- February 2007 — Surveyed the “cul-de-sac” and identified locations with insufficient ET cover thickness in Area “B”. Surveyed completed landfill surfaces in the southern two-thirds of Areas “A” and “B” and the bifurcation area for final grade certification.
- April 2007 — Surveyed the ET cover redesign final grades in the northernmost portions of Areas “A” and “B” and the “cul-de-sac.”
- May 2007 — Completed final survey and certification of landfill surface.

Following the completion of the earthwork, drawings were prepared by Towill, Inc. and approved by a California Licensed Professional Surveyor, documenting elevations of the completed subgrade and foundation layer and the placement of the ET cover.

IRP Site 17

At IRP Site 17, Case Land Surveying Inc. was subcontracted to provide an independent third party surveying services. The chronology of surveying events at IRP Site 17 are provided below:

- November 2007 — Established the perimeter of the clearing and grubbing limits and targets from the pre-construction aerial survey that was conducted on 20 November 2007.
- November through December 2007 — Surveyed and staked the preliminary subgrade elevations to establish cut and fill areas within the limits of the landfill.
- January 2008 — Surveyed and staked the subgrade layer throughout the landfill prior to placement of 1 foot of foundation material.
- March 2008 — Surveyed and staked final elevation of the foundation layer throughout the landfill.
- March 2008 — Completed final survey and certification of the foundation layer

- April 2008 — Surveyed and staked the entire landfill to provide preliminary elevations associated with placement of the ET cover.
- May 2008 — Surveyed and staked the final ET cover elevations throughout the landfill.
- June through July 2008 — Resurveyed and staked final ET cover elevations that were modified after the initial survey that was conducted in May 2008.
- June 2008 — Surveyed the new gas wells that were installed in May 2008
- June 2008 — Reestablished targets for the post-construction aerial survey that was conducted on June 27, 2008.
- July 2008 — Completed final survey and certification of the ET cover surface.

Following the completion of the earthwork, drawings were prepared by Case Land Surveying Inc. and approved by a California Licensed Professional Surveyor, documenting elevations of the completed subgrade and foundation layer and the placement of the ET cover.

4.1.2.4 WASTE CONSOLIDATION

IRP Site 2

Waste consolidation at IRP Site 2 consisted of three phases:

- Consolidating the waste within the proposed boundaries of the landfill
- Collecting confirmation samples from excavated areas
- Restoring the surface of waste excavation areas

Photographs of the waste consolidation efforts are provided in Appendix D of IRP Site 2 RVR (ERRG 2009a). Each of these phases is discussed further in the following sections.

Areas C1, C2, and D2 Waste Consolidation: Prior to excavation of waste material, the limits of the waste removal excavations were surveyed and staked by the surveyor in accordance with the Remedial Design Submittal (Earth Tech 2005a). Between September 2005 and November 2005, rip-rap, geotextile and bedding material overlying the C1/C2 area was removed. The rip-rap, ¾-inch rock, and bedding material were segregated from the geotextile and hauled to the lay down area where it was stockpiled, screened and cleaned for subsequent use. The geotextile material was hauled to the landfill and incorporated within the landfill consolidation areas.

Approximately 109,320 cy of waste were removed from the Areas C1/C2 and D2 from October 2005 through February 2006. The waste material was excavated from the Area C1/C2 using excavators, loaded into 20-yard end dump trucks using CAT 966 loaders, and hauled to the landfill area where it was screened for the presence of radionuclides prior to placement in Lobe “B” and the bifurcation. In accordance with the design specifications, relocated waste was commingled and surrounded with soil to minimize void spaces prior to compaction. Soil commingled with relocated waste was placed in 2-foot thick lifts and compacted by wheel-rolling a minimum of four passes with a steel-wheeled landfill compactor weighing more than 31,000 pounds. Solid waste larger than 12-inch maximum dimension was not placed in the upper 3 feet of the consolidated waste.

Radionuclide screening was performed during waste excavation within Areas C1/C2. Radionuclide screening with a sodium iodide detector was performed to assess if readings are above 17,500 counts per minute (cpm) (background of 12,303 cpm plus 3 times the standard deviation of 1,727 cpm) or

the action level of 53,000 cpm established in the Site Health and Safety Plan (ERRG 2008a). The radiological screening data is provided in Appendix F of IRP Site 2 RVR (ERRG 2009a).

Two locations in C1 and C2 had measured levels greater than 17,500 cpm but below the action level of 53,000 cpm. On 6 January, 2006, a pile of concrete and rock was excavated that recorded levels between 18,000 cpm to 21,000 cpm. Since the levels were below the action levels established in the Site Health and Safety Plan, the material was labeled as naturally occurring by the Radiological Controls Technician and the waste was transferred into the southeastern edge of the “cul-de-sac” area for disposal within the landfill. On 9 January 2006, screened rock from C1/C2 recorded readings of 9,800 cpm to 20,000 cpm. This rock was also transferred into the southeastern edge of the “cul-de-sac” area for disposal.

Five drums were unearthed during the C1/C2 excavation activities. One sample was collected for each drum and analyzed for TPH, VOCs, SVOCs, pesticides, polychlorinated biphenyls (PCBs), and metals. Samples with metals concentrations exceeding 10 times their soluble threshold limit concentrations (STLCS) were analyzed by Waste Extraction Test (WET). Samples with metal concentrations exceeding 20 times the toxicity characteristic leaching procedure (TCLP) value were analyzed by TCLP test. The laboratory analytical results were used to complete the waste profile. Based on the concentrations of metals including antimony and zinc, the waste in the drums was classified as California-regulated, non-RCRA hazardous waste. Therefore, the drums were shipped off-site by Belshire Environmental Services, Inc. of Lake Forest, California as non-RCRA hazardous waste. The wastes were shipped under a uniform hazardous waste manifest to the Clean Harbors Landfill in Buttonwillow, California. The Clean Harbors Buttonwillow facility is approved to receive CERCLA wastes. The waste profiling analytical results and the waste manifest are presented in Appendix G and Appendix H of IRP Site 2 RVR (ERRG 2009a), respectively.

Trucks transporting soil from the excavation operations during waste consolidation were decontaminated by pressure washing visible dirt from the tires and undercarriages of the vehicles. Rinsate water from the decontamination station was collected in drums or large-volume tanks. The collected rinsate water was applied to the waste consolidation and ET cover areas to control dust. Personnel working in contact with contaminated soil while in the exclusion zone followed personnel decontamination procedures in accordance with the Site Health and Safety Plan (ERRG 2008a).

Confirmation Sampling of Areas C1 and C2: Confirmation sampling was performed on six separate occasions (January 12, 17 and 20; February 2 and 6; and March 17, 2006) following excavation of the wastes within Areas C1 and C2 at Site 2. Figure 4-3 presents the confirmation sample locations. As described in the Sampling and Analysis Plan included as part of the Remedial Action Work Plan, the samples were collected to verify that constituents of concern were adequately removed from the waste excavation areas.

Visible waste was removed from the excavation areas prior to field screening for VOCs with a photo-ionization detector (PID). As specified in the Sampling and Analysis Plan, if PID readings exceeded 50 parts per million by volume (ppmv) or staining was observed on either the excavation side walls or excavation bottoms, further excavation and removal of material was performed. Once PID readings were below the threshold and visible staining was removed, confirmation samples were collected.

A total of 97 confirmation soil samples were collected from the sidewalls and bottoms of excavations. These included samples collected in the immediate vicinity of where five drums were recovered from Area C1/C2 during waste consolidation. One confirmation sample was collected

from each 50-foot by 50-foot grid cell in the excavated area shown on Figure 4-3 and was analyzed for the following constituents:

- Total petroleum hydrocarbons and VOCs by U.S. EPA 8015 and 8260B, respectively
- Metals by U.S. EPA 6010/6020
- SVOCs by U.S. EPA 8270C
- PCBs and pesticides by EPA 8081A

The metals analyzed included, aluminum, antimony, arsenic, barium, beryllium, cadmium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, selenium, silver, sodium, thallium, vanadium, and zinc.

The laboratory results of these analyses are included in Appendix G of IRP Site 2 RVR (ERRG 2009a).

The results for the confirmation samples were compared against known background concentrations or the residential preliminary remedial goals (PRGs) published by U.S. EPA Region 9. Three samples collected from the initial round of confirmation samples indicated that concentrations of selected constituents of concern were detected above screening values in Area C1 (see Table 4-2).

Table 4-2: Summary of Confirmation Sampling Results

Constituent	Comparison Criteria (U.S. EPA Region 9 Residential PRG)	Analytical Result	Analytical Result after Hot-Spot Removal
<i>Grid Cell A2 – Sample 844760-30/Re-sample 844760-105</i>			
4,4'-DDE	1.7 mg/kg	4.2 mg/kg	< 0.0013 mg/kg
4,4'-DDT	2.7 mg/kg	2.7 mg/kg	<0.0013 mg/kg
<i>Grid Cell A21 – Sample 844760-46/Re-sample 844760-106</i>			
1,2,3-Trichloropropane	5 µg/kg	6.3 µg/kg	4.4 mg/kg (estimated)
Benzo(a)pyrene	62 µg/kg	270 µg/kg	< 11 µg/kg
Sodium	856 mg/kg	405 mg/kg	316 mg/kg
<i>Grid Cell A26 – Sample 844760-51/Re-sample 844760-107</i>			
Benzo(a)pyrene	62 µg/kg	230 µg/kg	< 10 µg/kg

The concentrations of arsenic (6.94 mg/kg), cadmium (3.87 mg/kg and 3 mg/kg), magnesium (8,410 mg/kg), and sodium (434 mg/kg) were reported above their respective Station background values; however, the calculated 95 percent upper confidence limit of the mean of the overall data set for each of these constituents was below their respective Station background value. Magnesium and sodium are also considered essential nutrients.

Based on these analytical results, “hot spot” removals were performed on March 16, 2006 to remove an additional 80 cy from the west sidewall and slope of Area C1. After completion of the hot spot removal on March 17, 2006, three additional confirmation soil samples were collected and analyzed on March 20, 2006. The analytical results demonstrated that no constituents of concern were present above the background concentrations and PRGs (see Table 4-2).

Restoration of Waste Excavation Areas: Clean soil generated in 2003 from blended sand and clay from El Toro Materials was placed in the Area C1/C2 waste removal excavations to the planned design grade during the period from March 10 through March 27, 2006. The imported soil was placed in 8-inch thick compacted lifts in accordance with the Remedial Design Submittal (Earth Tech 2005a). The compaction was performed using a steel-wheeled CAT 815 compactor and moisture conditioned as necessary with a water truck.

The C1/C2 area restoration was performed in accordance with the Final Design as modified through the request for information approval process. The work involved lining the foundation layer with a seamed geotextile fabric, placing sand bedding material over the geotextile fabric, and covering the area with riprap. In addition, an erosion control blanket was placed on the side slopes of C1/C2 area.

IRP Site 17

On-site waste consolidation into the IRP Site 17 landfill footprint entailed relocation of surface waste and excavation of soil and debris from Aerial Photograph Anomaly (APHO) 44/105, Area B, Area C, and additional areas identified on Figure 4-2. APHO 44/105 was an aerial photograph anomaly identified on an aerial photograph dated 9 December 1974 (NAVFAC SW 2000). Visual and geophysical surveys were conducted at APHO 44/105 from May through October 2000. These investigations identified construction debris on the ground surface within APHO 44/105. It was recommended that the surface debris within the APHO 44/105 be managed during the planned consolidation activities at IRP Site 17 (NAVFAC SW 2000 and Earth Tech 2005a). Photographs of waste consolidation activities are provided in Appendix E of IRP Site 17 RVR (ERRG 2009b).

Prior to excavation of waste material, the limits of the waste were marked by the surveyor and bounded by definable features located at IRP Site 17. During the 2-month period from November 28 through January 16, 2008, material was relocated to the landfill, consolidated into the waste layer, and compacted in accordance with the Remedial Design Submittal (Earth Tech 2005a).

An excavator was used to load the material directly into articulated dump trucks, which were used to haul the debris to the landfill area for placement. During these waste consolidation activities, material was screened for the presence of radionuclides prior to being hauled to the landfill. Radionuclide screening with a sodium iodide detector was performed to assess if reading above 17,500 counts per minute (cpm) (background of 12,303 cpm plus three times the standard deviation of 1,727 cpm) or the action level of 53,000 cpm established in the Site Health and Safety Plan (ERRG 2008a). All locations were below the action level of 53,000 cpm. The radiological confirmation screening data are provided in Appendix F of IRP Site 17 RVR (ERRG 2009b).

In accordance with the design specifications, relocated waste was commingled and surrounded with soil to minimize void spaces prior to compaction. Soil commingled with relocated waste was placed in 2-foot thick lifts and compacted by rolling a minimum of four passes with a steel-wheeled landfill compactor weighing more than 31,000 pounds. Solid waste larger than 12 inches in diameter was not placed in the upper 3 feet of consolidated waste.

Visible waste was removed from the excavation areas in conjunction with field screening for volatile organic compounds (VOCs) with a PID. Excavations were visually checked for staining and presence of debris to verify that the waste was completely removed. Confirmation sampling at IRP Site 17 was not required in accordance with the Remedial Design Submittal (Earth Tech 2005a) since consolidation of only near surface and construction-related debris was conducted. Areas not connected to the landfill footprint were graded to match surrounding surfaces.

4.1.2.5 SUBGRADE AND FOUNDATION LAYER PREPARATION

IRP Site 2

In accordance with the subgrade design drawings, the toe of the slopes of the landfill and portions of the C1/C2 cut areas were reinforced with riprap. The riprap was placed over geotextile and geomembrane materials on the portions of the 3:1 slopes of the landfill as shown on the design drawings. The installed riprap, geotextile, and geomembrane met the design specifications presented in the Remedial Design Submittal (Earth Tech 2005a) Specifications, Sections 02380, 02373 and 02372, respectively.

Concurrent with the waste excavation activities approximately 190,320 cy of the Area C1/C2 excavated wastes were consolidated into the subgrade layer and compacted as part of the subgrade construction. The subgrade was constructed in accordance with the approved subgrade grading plan prepared by the Navy's design engineer, except for design modifications to address the increased fill in Lobe A and bifurcation area. Earthwork to construct the subgrade design modifications in the Lobe A and bifurcation areas, and land surveying to document the subgrade design modifications, were performed from 11 April through 14 April 2006. The foundation layer consists of existing onsite soils mixed with borrow material imported from El Toro. The foundation layer material was compacted to a minimum of 90 percent maximum dry density at a moisture content within 2 percent of the optimum moisture content as determined by test method ASTM D1557-02e1. The final subgrade certification reports, based on third party surveying data, and approved by the California Registered Professional Engineer were submitted to the Navy prior to placement of the ET cover and are included in Appendix A of IRP Site 2 RVR (ERRG 2009a). The subgrade as-built drawings are presented in Appendix C of IRP Site 2 RVR (ERRG 2009a).

IRP Site 17

In accordance with the Remedial Design Submittal (Earth Tech 2005a) specifications, Section 02315, the waste was consolidated within the footprint of the landfill prior to placement of subgrade cover soil. Common fill material used to build up the landfill subgrade was generated from an on-site stockpile and material excavated from the excess cut areas outside the landfill footprint. Approximately 40,940 cy of screened soil was incorporated into the subgrade and foundation layer. The subgrade as-built drawings are presented in Appendix I of IRP Site 17 RVR (ERRG 2009b). Compaction tests were performed on common fill 1 to 2 feet below the final subgrade elevation. The areas of common fill were placed in loose 8-inch lifts. Common fill was compacted to 90 percent compaction within 3 percent of optimum moisture by test method ASTM D1557-02e1 (ASTM 2002).

Areas were screened for the presence of radionuclides during intrusive work deeper than 18 inches. The screening subcontractor did not record any levels during monitoring activities that would trigger a response. The radiological confirmation screening data are provided in Appendix F of the IRP Site 17 RVR (ERRG 2009b).

A 1-foot foundation layer was placed over the prepared subgrade using soil generated from the identified cut areas outside of the landfill footprint and screened to meet the projected specifications. Construction of the foundation layer occurred between February through March 2008. The foundation layer material was compacted to a minimum of 90 percent maximum dry density with moisture content within 2 percent of the optimum moisture content, as determined by test method ASTM D1557-02e1 (ASTM, 2002). The final subgrade certification report was provided to the Navy prior to placement of the ET cover and is included in Appendix A of IRP Site 17 RVR (ERRG 2009b).

Approximately 41,000 cy of screened soil was incorporated into the subgrade and foundation layer. The subgrade contours are shown in Appendix I of IRP Site 17 RVR (ERRG 2009b).

4.1.2.6 ET COVER INSTALLATION

The installation of landfill cover consisted of off-site processing and importing of the ET cover soil, placement of the ET cover, placement of topsoil, geotechnical testing of the imported ET cover materials, and final land survey certification of the final grade. Each of these phases is discussed in further detail in the following sections.

Off-Site Processing and Importing of ET Cover Soil

ET cover soil from El Toro Materials was delivered to the site and either stockpiled in the lay down area for later use or placed directly on landfill surfaces from 17 October 2005 through 7 December 2006. Off-site processing and sampling of the soil to be imported was performed at El Toro Materials to demonstrate that each shipment of soil was suitable for placement in the landfill by meeting or exceeding the testing requirements of construction specification Section 02315. Off-site soil processing included blending soil types, screening the soils to remove any harmful materials, and conditioning the soil to the correct moisture content and grain-size ratio before delivery to the site.

Per the specifications, one sample was collected from each 5,000 cy-stockpile of ET cover soil and submitted to a third-party geotechnical testing laboratory for analysis. Analyses performed included Atterberg limits (ASTM D4318), particle-size distribution (ASTM D422), modified Proctor compaction (ASTM D1557), saturated hydraulic conductivity (ASTM methods D5084, D2216, and D2937), and soil classification (ASTM D2487). The data from each sample was reviewed by the Construction Quality Control (CQC) manager to certify that the remedial design specifications (Section 2315) had been met. In addition, the remedial design and oversight contractor also reviewed the results for conformance with project requirements. The geotechnical reports are included in Appendix J of IRP Site 2 RVR (ERRG 2009a) and Appendix A of IRP Site 17 RVR (ERRG 2009b).

Placement of ET Cover

A 4-foot thick ET soil cover was placed over the entire landfill at both IRP Sites 2 and 17. The Final Design estimated that approximately 196,500 cy of imported ET cover soil would be needed to construct the landfill cap at IRP Site 2; however, approximately 220,000 cy of ET cover soil were imported to complete the landfill cap. The additional 24,500 cy of ET cover was required due to differences in conversion from cubic yards to tons, modifications to the original landfill design to accommodate construction of diversion berms on the cap, and slope repairs caused by precipitation. The final grades, configurations and slopes were redesigned to account for the final grades in the northernmost portion of the bifurcation and the cul-de-sac area. Finish grading of the ET cover at IRP Site 2 was completed on May 21, 2007

At IRP Site 17, the Final Design estimated that approximately 56,246 cy of imported material would be required to construct the foundation layer and ET cover. However, approximately 64,500 cy of ET cover soils was imported and used to complete the cover. Additionally, approximately 10,000 cy of ET cover soil was imported to the site and consolidated within the maintenance stockpile. The maintenance stockpile is located at the toe of the landfill and will be used for future repairs to the landfill cover.

At both Sites 2 and 17, the ET cover moisture content was adjusted to within 3 percent of the optimum moisture content and compacted to a minimum of 90 percent of the corresponding maximum dry density as determined by test method ASTM D1557-02e1. Geotechnical testing is discussed further in subsection “Geotechnical Testing of In-Place ET Cover” below and Appendix A of IRP Sites 2 and 17 RVRs (ERRG 2009a and ERRG 2009b). Moisture content was adjusted by disking the on-site stockpile to aerate and dry prior to placement. Management of the imported soil stockpile within the laydown area was necessary because of the high moisture content within the stockpile.

Most of the ET cover soil was imported from El Toro Materials in 20-yard bottom-dump and end-dump trucks and placed directly on the landfill in loose lifts not exceeding 8 inches and compacted to approximately 6-inches with a compactor, as specified in the specifications. A registered land surveyor surveyed and created as-built drawings of the finish grading of the ET covers at both Sites 2 and 17. The final ET cover as-built drawings for IRP Sites 2 and 17 are provided in Appendix C of IRP Site 2 RVR (ERRG 2009a) and Appendix I of IRP Site 17 RVR (ERRG 2009b), respectively.

Placement of Top Soil

The topsoil for IRP Site 2 was generated from the nearby Irvine Community Development Center property and the topsoil for IRP Site 17 was salvaged from the excess cut area outside the footprint of the landfill. The topsoil for both IRP Site 2 and IRP Site 17 was in accordance with the specifications provided in the *Final Coastal Sage Scrub Restoration Plan* (Helix 2005) included as part of the Remedial Design Submittal (Earth Tech 2005a).

For IRP Site 2, following final grade surveying for certification of the southern two-thirds of the landfill on 26 February 2007, a registered land surveyor surveyed, marked, and staked the top of topsoil grade across the completed landfill surface in the southern two-thirds of Lobes A and B, and the bifurcation area. The material was imported to the site in 20-yard bottom-dump or end-dump trucks from 5 March 2007 through 9 April 2007. A 6-inch thick layer of top soil was placed over the southern two-thirds of Lobes A and B, and the bifurcation area; and scarified or ripped into the ET cover surface. The remaining top soil layer was later installed on the “Cul-de-Sac” area starting 21 May 2007 and continuing through 1 June 2007.

For IRP Site 17, ERRG marked and staked the top of topsoil grade across the landfill areas identified outside of the footprint of the landfill that were disturbed during construction activities. A 6-inch-thick layer of topsoil was then placed over the identified areas and ripped into the underlying surface. Top soil placement at IRP Site 17 began on 12 May 2008 and continued through 2 June 2008.

Geotechnical Testing of Imported ET Cover Materials

In general for both IRP Sites 2 and 17, a minimum of one soil density and moisture test was conducted by nuclear density gauge (ASTM methods D2922 and D3017, respectively) for each 250 cy of soil placed as common fill, subgrade, foundation, or ET cover. Additionally, a minimum of 1 sand cone test (ASTM method D1556) was performed for every 20 tests conducted by nuclear density and moisture gauge. Hydraulic conductivity testing was also performed for both IRP Sites 2 and 17 throughout the landfill cap construction. The specifics of geotechnical testing are provided below.

IRP Site 2: A grid system was developed to track the number and geographical distribution of the soil density tests at IRP Site 2. Each square of the grid system was 115 feet long per side, for a total area of 241 cy of soil per 6-inch compacted lift. The locations of the soil density and moisture content tests for the placement of the ET cover were plotted on a site drawing, which were included

as an attachment to the ET cover certification provided in Appendix A of IRP Site 2 RVR (ERRG 2009a). The geotechnical testing results were summarized for the ET cover and the finish grades of different surface features including the road base, earthen trapezoidal channel, or v-ditch. These results are presented in Appendix A of IRP Site 2 RVR (ERRG 2009a).

A total of 42 BAT™ tests were performed during installation of the ET cover in accordance with the specifications and under the supervision of professional engineer. In addition, 4 laboratory hydraulic conductivity tests were completed to verify the accuracy of the BAT™ tests. Three of the 43 tests initially failed and were retested. All of the final results were less than the acceptable threshold of 2×10^{-7} cm/sec. The BAT™ results and test locations are described in further detail in the ET cover certification reports provided in Appendix A of IRP Site 2 RVR (ERRG 2009a).

IRP Site 17: Similar to IRP Site 2, a grid system was developed to track the number and geographical distribution of the soil density tests at IRP Site 17. Each square of the grid system was 100 feet long per side, for a total area of 185 cy of soil per 6-inch compacted lift. The locations of the soil density and moisture content tests for the placement of the ET cover were plotted on a site drawing, which were included as an attachment to the ET cover certification provided in Appendix A of IRP Site 17 RVR (ERRG 2009b). The geotechnical testing results were summarized for the ET cover and the finish grades of different surface features including the road base, earthen trapezoidal channel, or v-ditch. These results are presented in Appendix A of IRP Site 17 RVR (ERRG 2009b).

A total of 13 BAT™ tests were performed during installation of the ET cover installation in accordance with the specifications. In addition, 4 laboratory hydraulic conductivity tests were completed to verify the accuracy of the BAT™ tests. Four of the 13 tests initially failed and were retested. All of the final results were less than the acceptable threshold of 2×10^{-7} cm/sec. The BAT™ results and test locations are described in further detail in the ET cover certification reports provided in Appendix A of IRP Site 17 RVR (ERRG 2009b).

Land Survey Certification of the Final Grade

At both IRP Sites 2 and 17, the third party surveying subcontractor under the supervision of the State of California-registered land surveyor, surveyed the various phases of ET cover construction to document and certify that final elevations and slopes for each grading phase of the landfill construction were within specification. Survey stakes were set for pre-grade, common fill grade, final subgrade, final foundation layer grade, and the final ET cover grade. The post-construction surveys for IRP Sites 2 and 17 are presented on Figures 4-4 and 4-5, respectively. The cross-sectional views of the landfill covers at IRP Sites 2 and 17 are presented on Figure 5 of IRP Site 2 RVR (ERRG 2009a) and Figure 4 of IRP Site 17 RVR (ERRG 2009b), respectively. Upon of the foundation layer grade and the final ET cover grade, the surveyor prepared contour maps for inclusion with the subgrade certification and final ET cover certification provided in Appendix A of both IRP Site 2 RVR (ERRG 2009a) and IRP Site 17 RVR (ERRG 2009b).

Survey elevations of the interim grading redesign showed that the final grade in some areas were thicker (i.e. exceeded the prescribed 4 feet) and therefore did not meet the requirements listed in *Technical Specification Section 02315, Part 3.11.1, Finish Operations, Grading* which required 4 feet plus or minus 0.10 feet. The increased thickness was constructed to facilitate surface drainage. The 4 feet thickness over the subgrade was a minimum requirement for ensuring the provisions of the ROD were complied by. Therefore, having areas with thicknesses greater than 4 feet was acceptable as long as it still promoted efficient drainage across the cover and off the landfill. A comparison of the as-built subgrade surface with the as-built final ET cover grade surface indicated

that the Remedial Design Submittal (Earth Tech 2005a) specifications and drainage requirements were met.

Final survey data provided by the surveyor also included:

- coordinates, surface elevation, and depth to subgrade at 43 BAT™ test locations for IRP Site 2 and 8 of the 13 BAT™ test locations for IRP Site 17
- elevations and coordinates for the top of rim, top of casing, and top of concrete monument for the new and/or modified monitoring wells at IRP Site 2 (02NEW29, 02NEW30, 02PGW01A/B, 02PGW03, and 02PZ01 through 02PZ03) and IRP Site 17 (17PGW01, 17PGW03, and 17PGW04) as discussed in Sections 4.1.2.8 and 4.1.2.9
- settlement monuments at IRP Sites 2 and 17
- coordinates for the new fence that runs parallel to Irvine Boulevard.

The survey data and contour maps provided by the surveyor for IRP Sites 2 and 17 are provided in Appendix I of IRP Site 2 RVR (ERRG 2009a) and Appendix D of IRP Site 17 RVR (ERRG 2009b), respectively.

4.1.2.7 CONSTRUCTION OF DRAINAGE AND RIPRAP ENERGY DISSIPATER FEATURES

IRP Site 2

The permanent cover drainage structures consist of:

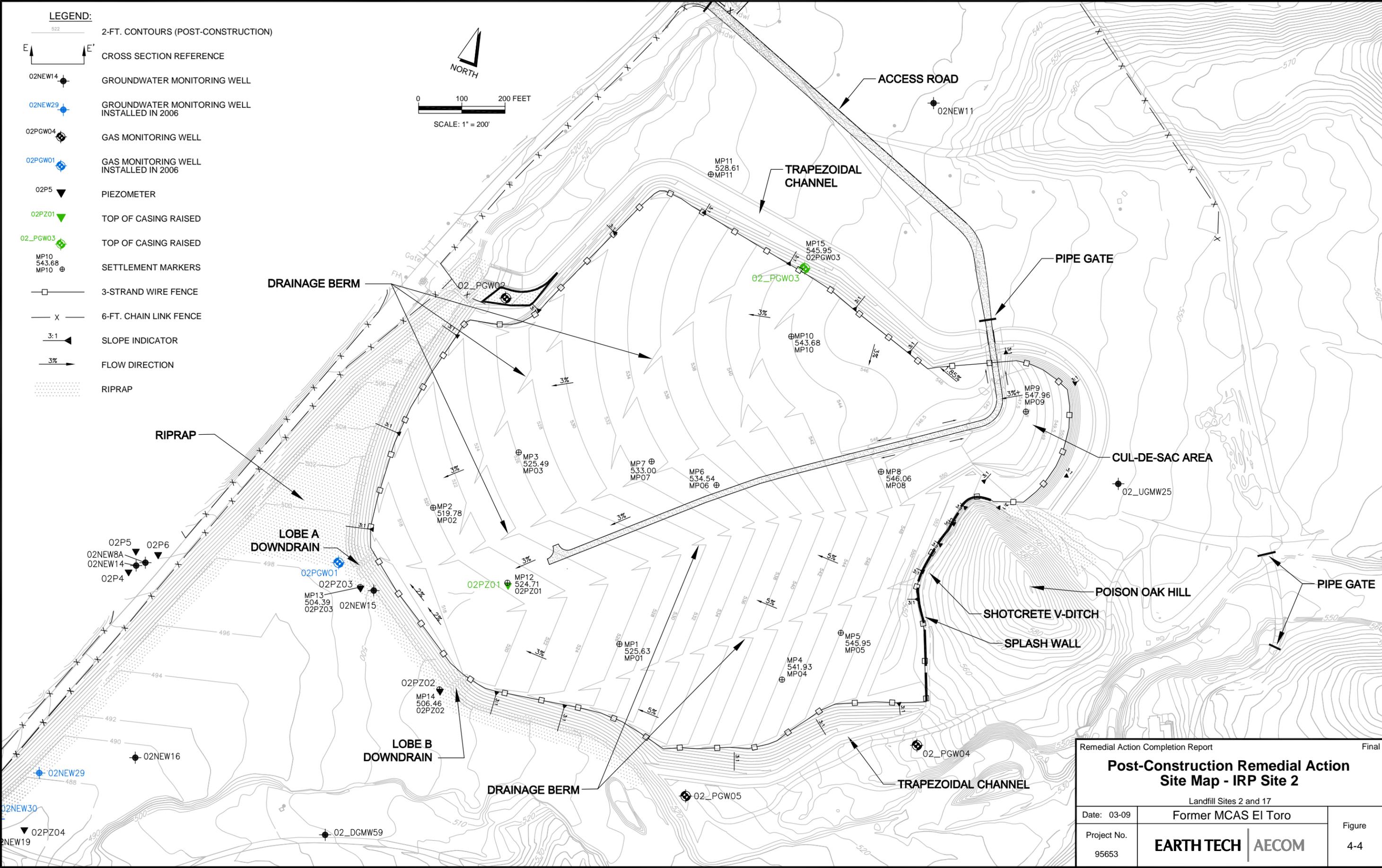
- Drainage berms
- Lobe A and Lobe B downdrains: The downdrains comprised of gabion baskets filled with polished “river rock”
- Trapezoidal channels
- Riprap
- Shotcrete V-ditch

The earthen trapezoidal channel and the riprap revetments were built during the landfill cap construction. The grading of the earthen dissipater berm, gabion downdrain and gabion basket installation, and the concrete lined V-ditch construction commenced after completion of the final landfill cover. These drainage devices were constructed in accordance with specification Sections 02315, 02371, 02372, 02380, and 03371.

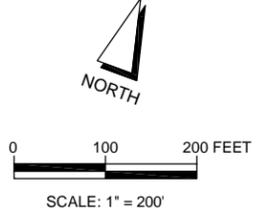
On the southern side of the landfill, an 80-mil high-density polyethylene (HDPE) liner was placed beneath the riprap at the base of the sideslopes. The liner was installed in accordance with the Final Remedial Design requirements; quality control documentation regarding the liner installation is provided in Appendix K of IRP Site 2 RVR (ERRG 2009a).

The two gabion downdrains located at the south ends of Lobes A and B shown on Figure 4-4 were modified to accommodate the change in the bifurcation design. The entrance areas funneling the surface flow to the downdrains was expanded. The perimeter of the landfill crown was raised slightly to slope surface runoff inward and toward the downdrains.

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- LEGEND:**
-  2-FT. CONTOURS (POST-CONSTRUCTION)
 -  CROSS SECTION REFERENCE
 -  GROUNDWATER MONITORING WELL
 -  GROUNDWATER MONITORING WELL INSTALLED IN 2006
 -  GAS MONITORING WELL
 -  GAS MONITORING WELL INSTALLED IN 2006
 -  PIEZOMETER
 -  TOP OF CASING RAISED
 -  TOP OF CASING RAISED
 -  SETTLEMENT MARKERS
 -  3-STRAND WIRE FENCE
 -  6-FT. CHAIN LINK FENCE
 -  $3:1$ SLOPE INDICATOR
 -  3% FLOW DIRECTION
 -  RIPRAP



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Post-Construction Remedial Action Site Map - IRP Site 2		
Landfill Sites 2 and 17		
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After a heavy storm that occurred in late December 2007, the Lobe A downdrain sustained some damage. The rip rap and gabion baskets area was immediately covered with plastic and the entrance to the downdrain was widened to prevent any further degradation of the downdrain before the next rain event. The temporary repair withstood several rain events over the forthcoming months until the Lobe A downdrain underwent repair in early March 2008. As part of the repair, the downdrain entrance was lowered and the apron leading into the downdrain was widened. Also, the entire downdrain was lined with 80-mil HDPE in lieu of requiring 4-feet of ET cover over the waste material beneath the downdrain.

IRP Site 17

The permanent cover drainage structures at IRP Site 17 consist of:

- Earthen dissipater berms (at various locations on the landfill cover)
- Earthen V-ditches
- Concrete-lined trapezoidal channels
- Concrete-lined V-ditches
- Two riprap energy dissipaters

The earthen V-ditches, concrete-lined trapezoidal channels, concrete-lined v-ditches, and energy dissipaters were built during the construction of the ET cover. These drainage features, shown on Figure 4-5, were constructed in accordance with specification Sections 02315, 02373, 02380, and 03371.

4.1.2.8 WELL INSTALLATION

IRP Site 2

Well installation permit #06-07-02 was acquired from the OCHCA on 3 July 2006, for the installation of groundwater monitoring wells 02NEW29 and 02NEW30 and the landfill perimeter gas well 02PGW01. Prior to well installation in the restored Area C2, all appropriate agencies were notified via USA regarding utility clearance at each well installation site. The monitoring wells were installed, completed, and developed during the period from 13 July through 21 July 2006. The wells were constructed and developed in accordance with all applicable project design drawings and specifications, which include:

- Section 02525 of the RD
- California Department of Water Resources (DWR) *California Well Standards, Bulletins 74-81 and 74-90* (DWR, 1981 and 1991, respectively)
- OCHCA permit #06-07-02

Groundwater monitoring wells 02NEW29 and 02NEW30 were installed in the Borrego Wash in the restored C2 Area and a dual nested landfill gas well, 02PGW01A/B, was installed south of the 3:1 slope of the Lobe A portion of the landfill, near the gabion basket drain. These wells are shown on Figure 4-4. Drill cutting and groundwater generated through the well development were sampled for waste profiling purposes. One sample each from soil cuttings and well development water was collected and analyzed for the following constituents:

- Total petroleum hydrocarbons EPA Method 8015

- VOCs by EPA Method 8260B
- Metals by EPA Method 6010/6020

Laboratory analytical data are included in Appendix G of IRP Site 2 RVR (ERRG 2009a). Based on these results, the drill cuttings were disposed of on-site in the cul-de-sac area and the development water was used for dust suppression in the same area.

Three-foot wide by 10-foot long steel reinforced concrete monuments were constructed around each of these wells to protect them from potential flooding, erosion, and earth movement. A CAT 237 excavator was used to remove riprap, provide access, and construct drilling pads in the Borrego wash. Following construction of each monument the drilling pads were removed and riprap was replaced as detailed in the design specifications and drawings.

Detailed descriptions of the individual well installations, including boring logs, and a copy of well installation permit #06-07-02 are presented in *Well Installation Report – Permit 06-07-02, Former MCAS El Toro, Site 2* (Shaw, 2006b), which are included in Appendix B of IRP Site 2 RVR (ERRG 2009a).

IRP Site 17

Well installation permit #08-05-09 was acquired from the OCHCA on 9 May 2008, for the installation of landfill perimeter gas wells 17PGW01, 17PGW03, and 17PGW04, and the lysimeter 17LYS4. Prior to well installation at IRP Site 17, all appropriate agencies were notified via USA regarding utility clearance at each well installation site. The landfill perimeter gas wells were installed during the period from 19 May through 30 May 2008. The lysimeter well was not installed because groundwater was encountered during the installation process. In consultation with regulatory agencies, the lysimeter borehole was abandoned and removed from the project scope of work.

The landfill perimeter gas wells were constructed in accordance with all applicable project design drawings and specifications discussed in the above subsection and OCHCA permit 08-05-09 (Appendix B of IRP Site 17 RVR).

Landfill perimeter gas wells 17PGW01, 17PGW03, and 17PGW04 were installed near the proposed locations identified in the Remedial Design Submittal (Earth Tech 2005a), as shown on Figure 4-5. A 12-inch protective galvanized steel casing with three pipe bollards was constructed around each landfill perimeter well to protect them from potential damage. A 3-foot by 3-foot by 6-inch reinforcement concrete pad was installed around each well. Detailed descriptions of the individual well installations, including boring logs, abandonment activities, and a copy of wells installation permit #08-05-09 are presented in *Well Installation Report - Permit 08-05-09, Former MCAS El Toro, Site 17* (ERRG 2008b), which are included in Appendix B of IRP Site 17 RVR (ERRG 2009b).

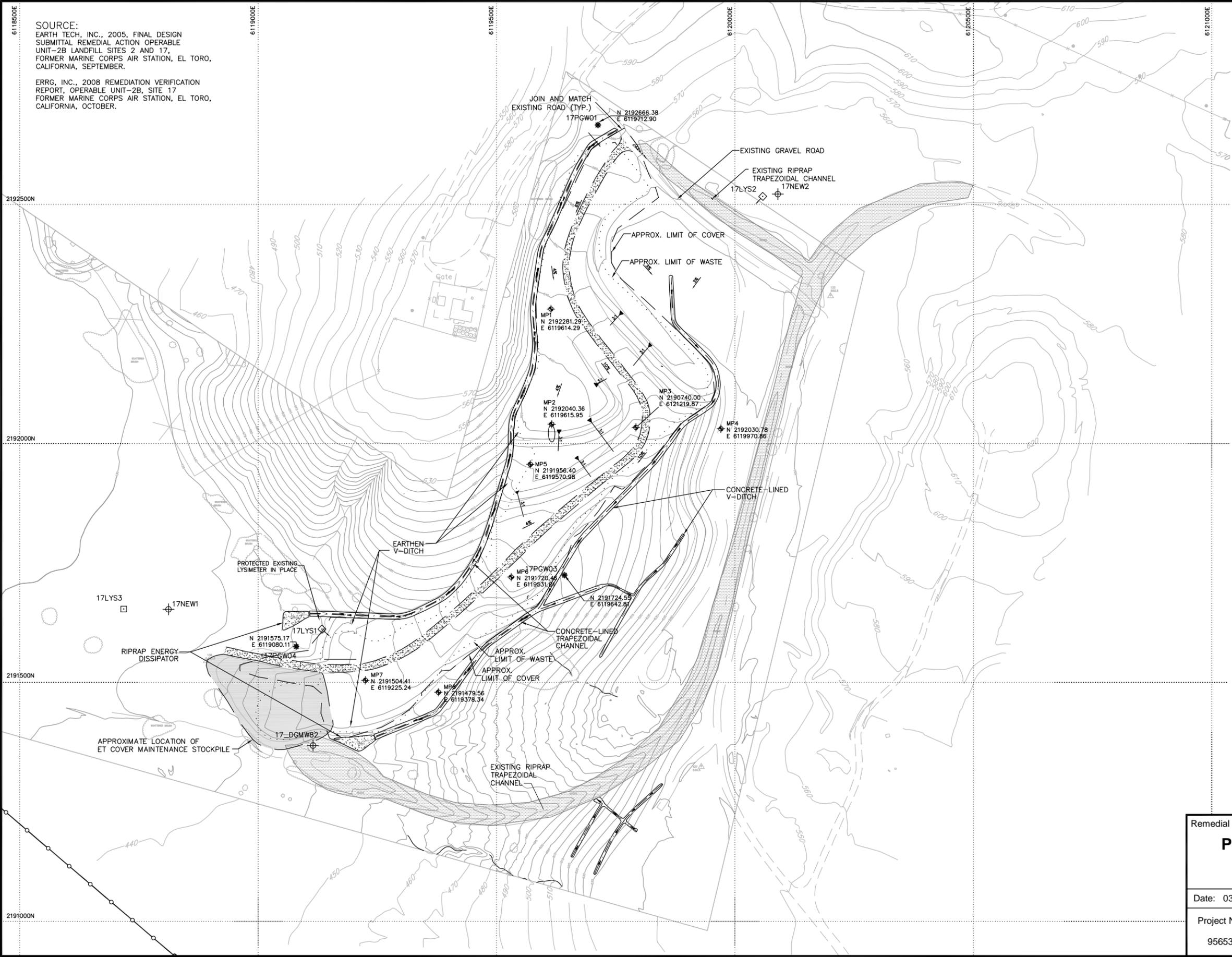
Drill cutting generated during well installation were sampled for waste profiling purposes. Samples were collected from 17 drums containing the drill cuttings and analyzed for the following constituents:

- Total petroleum hydrocarbons and VOCs by EPA Methods 8015 and 8260B, respectively
- Semivolatile organic compounds by EPA Method 8270C
- Polychlorinated biphenyls and pesticides by EPA Method 8081A
- Inorganic constituents by EPA Method 6010/6020

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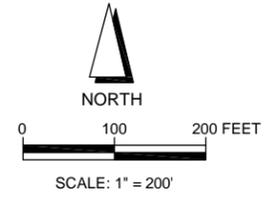
SOURCE:
 EARTH TECH, INC., 2005, FINAL DESIGN
 SUBMITTAL REMEDIAL ACTION OPERABLE
 UNIT-2B LANDFILL SITES 2 AND 17,
 FORMER MARINE CORPS AIR STATION, EL TORO,
 CALIFORNIA, SEPTEMBER.

ERRG, INC., 2008 REMEDIATION VERIFICATION
 REPORT, OPERABLE UNIT-2B, SITE 17
 FORMER MARINE CORPS AIR STATION, EL TORO,
 CALIFORNIA, OCTOBER.



LEGEND	
	2-FT CONTOUR (FINAL GRADE)
	10-FT CONTOUR (FINAL GRADE)
	2192000N GEODETIC GRID LINE
	APPROX. LIMIT OF COVER
	GRADE BREAK
	SHOTCRETE V-DITCH
	TRAPEZOIDAL CHANNEL
	EXISTING RIPRAP
	ACCESS ROAD
	SETTLEMENT MONUMENT
	FENCE LINE
	EXISTING FENCE LINE
	EXISTING BUILDING
	VEGETATION
	POWER POLE
	SLOPE (HORIZONTAL TO VERTICAL)
	3:1
	3% SLOPE AND FLOW DIRECTION
	17NEW2 EXISTING GROUNDWATER MONITORING WELL
	17LYS2 EXISTING LYSIMETER DRILLED AT 30° ANGLE (SHOWS ANGLE DIRECTION)
	17PGW01 GAS MONITORING PROBE

NOTES:
 1. FINAL CONTOURS SHOWN ARE ELEVATIONS AFTER PLACEMENT OF FOUNDATION LAYER AND EVAPOTRANSPIRATION SOIL COVER OVER PREPARED SUBGRADE.



Remedial Action Completion Report		Final
Post-Construction Remedial Action Site Map - IRP Site 17		
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The laboratory analytical data are included in Appendix G of IRP Site 17 RVR (ERRG 2009b). Based on the analytical results, the drill cuttings were classified and shipped under a nonhazardous waste manifest to Clean Harbors Landfill located in Buttonwillow, California. The waste profile and manifest are provided in Appendix H of IRP Site 17 RVR (ERRG 2009b).

4.1.2.9 WELL MODIFICATION – IRP SITE 2

Two wells, 02PZ01 and 02PGW03, are in areas where the surface elevation was raised as a consequence of landfill construction activities. The changes in elevation are shown in the Table 4-3.

Table 4-3: Well Modification Summary

Well ID	Original Top of Casing (feet msl)	Final Top of Casing (feet msl)	Change in Elevation (feet msl)
02PZ01	504.23	524.21	19.98
02PGW03	536.39	545.88	9.49

Each well was extended to its current elevation by extending the existing polyvinyl-chloride (PVC) casings with new PVC casing, providing a 6 inch diameter steel protective casing, encasing the PVC and steel casing within a circular concrete form that was subsequently filled with concrete. The new PVC casing extensions were protected as the landfill was brought up to final grade. On 10 January 2007, after the final grade at each well location was certified, the wells were surface completed per the applicable design drawings and project specifications for monitoring well installation. Well construction logs detailing the change in well construction are included in Appendix B of IRP Site 2 RVR (ERRG 2009a).

4.1.2.10 SETTLEMENT MONUMENT INSTALLATION

A total of 12 settlement monuments were installed at IRP Site 2 and 8 settlement monuments were installed at IRP Site 17. All settlement monuments were installed in accordance with the approved design drawings, details, and specifications. Each settlement monument was located in areas identified to provide representative settlement data. The settlement monument locations for IRP Sites 2 and 17 are shown on Figures 4-4 and 4-5, respectively.

4.1.2.11 SITE ACCESS ROAD CONSTRUCTION

Dimensions and Alignment

To facilitate landfill operations and maintenance, access roads were constructed at both IRP Sites 2 and 17 in accordance with the design plans and specifications outlined in Section 02721 (see Figures 4-4 and 4-5, respectively). The landfill access road at IRP Site 2 is 1,800-foot-long by 12-foot-wide and at IRP Site 17 it is 1,700-foot-long by 12-foot-wide. Both the access roads were designed for low-traffic volume with the potential for heavy construction equipment entering the site periodically for maintenance purposes.

The access roadway alignment at IRP Site 2 runs eastward approximately 800 feet from Magazine Road to a concrete box culvert constructed in the earthen trapezoidal channel as shown on Figure 4-4. The road extends onto the landfill cap, turns southward, and continues for approximately 1,000 feet to a turn around at the roadway’s south end. The 800-foot stretch of the roadway starting at Magazine Road is referred to as the “Off-cap” portion of the access roadway and the 1,000-foot stretch of the roadway beginning at the concrete road crossing is known as the “On-cap” portion of

the access roadway. The geotechnical testing results for the finish grade of the access roadway at IRP Site 2 are presented in Appendix J of IRP Site 2 RVR (ERRG 2009a).

At IRP Site 17, the new access roadway ties into the existing roadway at the top of the landfill and ends at the bottom of the access road ramp as shown on Figure 4-5. The geotechnical testing results for the finish grade of the access road are presented in Appendix A of IRP Site 17 RVR (ERRG 2009b).

Construction

At IRP Site 2, the access road consisted of scarified and compacted ET cover material overlain by 12 ounces per square yard of nonwoven geotextile, 10 inches of compacted subgrade material, and 6 inches of compacted aggregate course road base. The road base was comprised of “Eagle Valley 19.0 mm (3/4”) maximum Class 2 Crushed Aggregate Base” from Hanson Aggregates located in Eagle Valley, California approximately 40 miles from the site.

At IRP Site 17, the access road consisted of scarified and compacted ET cover material overlain by 12 ounces per square yard of nonwoven geotextile and 6 inches of compacted aggregate course road base. Approximately, 1,090 tons of road base material was provided by West Coast Sand & Gravel located in Buena Park, California. The material was generated from a location in Corona, California, approximately 24 miles from the site.

The imported aggregate base for both IRP Site 2 and 17 conforms to the requirements of California Department of Transportation (Caltrans) Standard Specifications Section 26 (Caltrans 1996) and meets or exceeds the sand equivalency, R-value, durability index and gradation specified in Remedial Design Submittal (Earth Tech 2005a) specifications Section 02721.

The roadway subgrade and/or base materials were (1) fine graded using a CAT 14H grader, (2) moisture conditioned to near optimum moisture content, and (3) compacted to a minimum of 95 percent of the corresponding maximum dry density as determined by test method ASTM D1557-02e1 using a CAT vibratory smooth drummed roller.

4.1.2.12 SECURITY FENCE AND SIGNAGE INSTALLATION

IRP Site 2

Upon completion of landfill construction and demobilization activities at IRP Site 2 in early July 2007, the installation of permanent security fence, gates, locks, and signage was conducted. In late November 2007, a remaining section of fencing was constructed along the west side of Magazine Road from the location of the office trailer south to the main IRP Site 2 access gate. In addition, four-strand wire fencing was installed around the perimeter of the landfill and three pipe gates limiting vehicular access to the landfill cap were constructed as shown on Figure 4-4. The four-strand wire landfill perimeter fencing at the top of the landfill was constructed in place of the chain-link fence proposed in the Final Design.

IRP Site 17

The installation of a permanent security fence at IRP Site 17 was conducted in March 2008. In addition to fence installation, repairs were made to a section of fence along the west side of Magazine Road. The repaired section of fence extended southward from the Federal Bureau of Investigation shooting range to the main gate of IRP Site 2. Signs were placed on the three access gates to IRP Site 17. The three access gate locations are at the Federal Aviation Administration receiver facility, Magazine Road, and Quarry Road. In addition, signs were also placed every 500

feet along the new security fence and at the top and bottom of the site access road traversing the landfill cover.

4.1.2.13 TRAPEZOIDAL CHANNEL CROSSING AT IRP SITE 2

A trapezoidal earthen channel was constructed around the northwestern perimeter of the site to facilitate drainage around the perimeter of the landfill. In order to allow vehicle access to the landfill, a road crossing over the earthen trapezoidal crossing was constructed. All work was completed according to the design specifications and drawings provided in the Remedial Design Submittal (Earth Tech 2005a).

The soil beneath the crossing, including the footings, was scarified and recompacted. Proctor curves and density tests were performed on the compacted soil to confirm that the subgrade was adequately compacted to 95 percent of the corresponding maximum dry density as determined by test method ASTM D1557-02e1.

The trapezoidal channel crossing consisted of two cast-in-place concrete reinforced walls and footings placed perpendicular to the channel 15 feet apart. The footings and walls were reinforced with #3, #4, and #6 rebar. The walls were formed to allow four 30-inch inside diameter reinforced concrete pipes (RCP) to pass through. Both walls were poured on between 19 March and 23 March 2007. The concrete was inspected for mix consistency and tested for temperature and slump.

The RCP met the specification of "Class II Wall B per ASTM C76", as shown on design drawing. The 4 pipes were bedded in slurry (controlled low strength material, CLSM). The slurry was placed in two lifts, first to the spring line and the second to subgrade. A Portland cement concrete (PCC) paved surface was placed across the crossing. Pavement was reinforced top and bottom with #4 and #5 rebar. A 2 percent grade from center line to the curb sides was obtained. The curbs on both sides of the pavement surface were part of the formed-in-place concrete walls and have #3 rebar pinning/anchoring the walls and pavement surface together. Type II rip-rap aprons were installed upgradient and downgradient of the crossing.

4.1.2.14 EROSION CONTROL AND SITE RESTORATION

Erosion control and site restoration for IRP Site 2 and 17 landfills consisted of (1) revegetation of the restored surfaces to prevent erosion of the topsoil and ET cover, (2) installation of geotextile, geomembranes, erosion control blankets, jute netting, fiber rolls, and stone revetments, (3) application of hydroseeding on the 3:1 side slope surfaces, and (4) incorporation of mulch within the identified laydown area. The erosion control methods implemented are discussed further in the following sections.

Revegetation and Site Restoration

Elements of the *Final Coastal Sage Scrub Restoration Plan (Landfill Sites 2 and 17), Former Marine Corps Air Station, El Toro, California* (Helix 2005) were used during restoration activities at IRP Sites 2 and 17. In general, the revegetation at IRP Sites 2 and 17 comprised of the following steps prescribed in the Final Coastal Sage Scrub Restoration Plan:

1. Collecting seeds, planting container stock, and routinely inspecting plants at the nursery (as discussed in Section 4.1.1.10)
2. Construction of an irrigation system.
3. Hardening off of container stock germinated from CSS seeds and grown in pots.

4. Conducting grow/kill cycles in the off-cap areas, which involved (1) installation of a temporary irrigation system to stimulate weed germination and growth, (2) treating weeds with herbicide one week following germination, and (3) repeating this process until weed germination is minimal as determined by the restoration specialist.
5. Scarifying the top 8 inches of ET cover soil placed in Lobes A and B of the landfill in March 2007. Six inches of topsoil was placed over the scarified soil, ripped and commingled with the ET cover soil
6. Planting container stock.
7. Applying hydroseeding throughout the restoration areas with specifically-designed seed stock.
8. On-going weeding and maintenance of the revegetated areas.

IRP Site 2: Revegetation of the Site 2 landfill finish grade surface was initiated with the scarification of the top 8 inches of ET cover soil placed in Lobes A and B of the landfill in March 2007. Six inches of topsoil was placed over the scarified soil, ripped and commingled with the ET cover soil. The ground surface of the landfill was then planted and seeded with CSS stock. The CSS seed stock was collected in September 2005 at the beginning of the landfill construction activities. In August 2007, these seeds along with plants germinated from these seeds grown in pots were planted in the topsoil covered landfill surface. Additionally, hydroseed specifically designed for this restoration effort was applied during late November 2007 through February 2008. Per the requirements of BO and BO Amendment (USFWS 2002 and USFWS 2004), restoration of mulefat scrub was also performed in off-cover landfill areas. Figure 4-6 presents an overview of the revegetation at the site. The selected plant species are drought resistant, requiring minimal moisture to become established; however, temporary irrigation systems were installed on the landfill and in off-site areas located north of the landfill to establish the initial coverage of vegetation necessary to restore the CSS habitat.

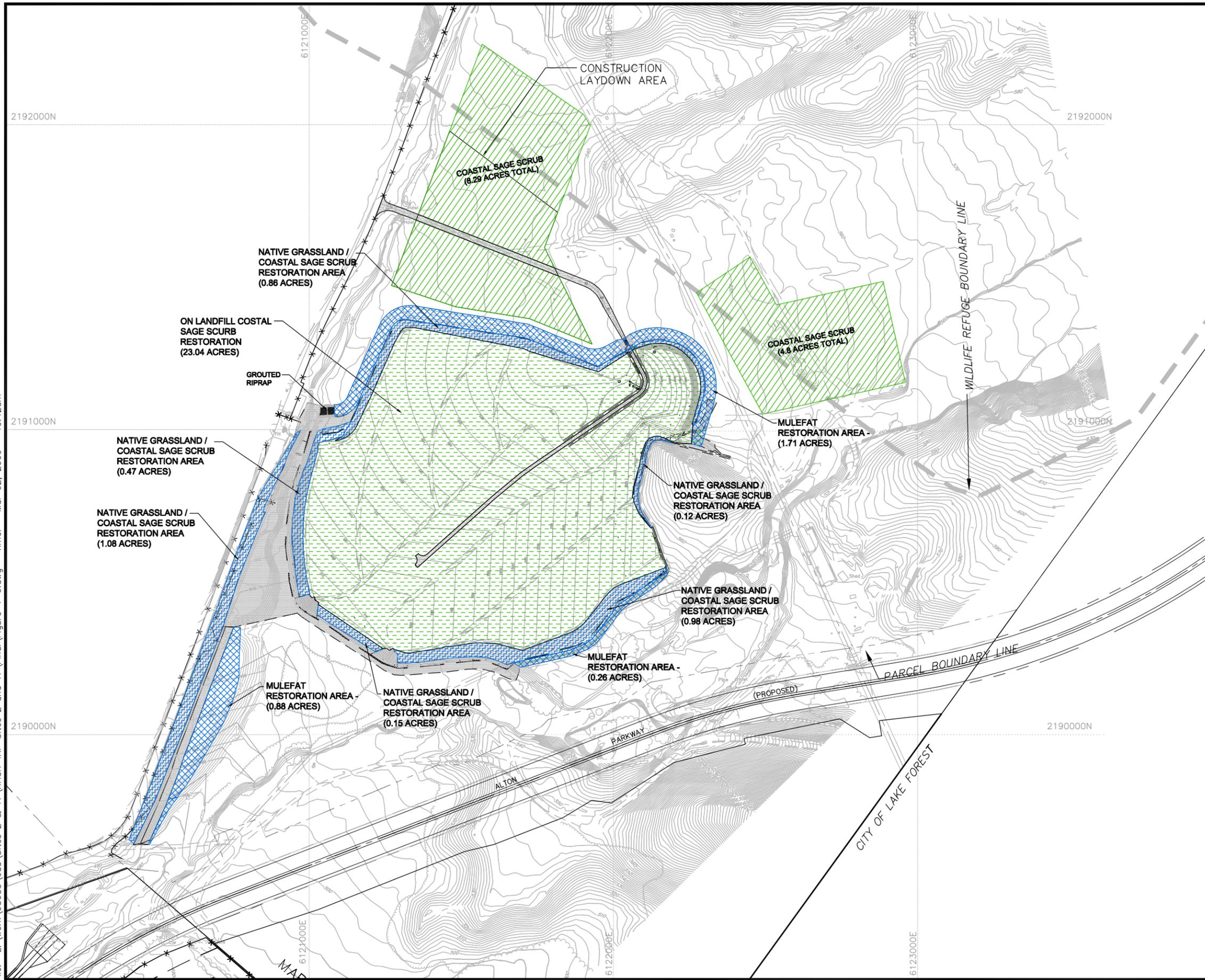
The revegetation was performed by Native Landscape, Inc. in accordance with the *Final CSS Restoration Plan* (Helix 2005). LSA Associates of Irvine, California was retained to monitor Native Landscape, Inc. during construction to ensure compliance with the restoration plan and measure the success of the restoration. Final acceptance of the revegetation and the beginning of the 120-day establishment period was initiated on 25 February 2008.

IRP Site 17: Revegetation of IRP Site 17 included placement of 6 inches of topsoil that was ripped and commingled with the underlying soil in both on-cover and off-cover landfill areas. In addition, the ground surface of the landfill side slope and 3:1 slopes outside the landfill were hydroseeded with seed stock provided by Stover Seed Company to establish a temporary vegetative cover. Hydroseed specifically designed to complement the CSS restoration effort while also providing erosion control was applied in early July 2008 instead of an erosion control blanket (i.e. jute net).

Hydroseeding was performed by Quality Hydroseeding. The hydroseed consisted of:

- Earthguard at 8 gallons per acre
- Eco Fiber at 2,000 pounds per acre (lbs/acre)
- Seed for small six-weeks grass (*Vulpia microstachys*) (2 lbs/acre)
- Purple needlegrass (*Nassella pulchra*) (1 lb/acre)
- Fascicled tarweed (*Deinandra fasciculata*) (2 lbs/acre)
- Coast golden brush (*Isocoma menziesii*) (0.5 lbs/acre)

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LEGEND

- MULEFAT RESTORATION AREA - 2.85 ACRES TOTAL
- NATIVE GRASSLAND / COASTAL SAGE SCRUB RESTORATION AREA - 3.66 ACRES TOTAL
- ON LANDFILL COASTAL SAGE SCRUB RESTORATION AREA - 23.04 ACRES TOTAL
- OFF LANDFILL COASTAL SAGE SCRUB RESTORATION AREA - 13.09 ACRES TOTAL
- 2-FT CONTOUR (FINISH GRADE)
- 10-FT CONTOUR (FINISH GRADE)
- 2192000N GEODETIC GRID LINE
- ACCESS ROAD
- SETTLEMENT MONUMENT
- FENCE LINE
- EXISTING BUILDING
- VEGETATION
- CONSTRUCTION LAYDOWN AREA
- WILDLIFE REFUGE BOUNDARY

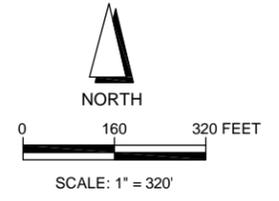
CSS ACREAGE

CSS On Landfill Acres	CSS Off Landfill Acres
23.04	13.09

SURVEY DATA:
 AS-BUILT SURVEY BY TOWILL SURVEYING, MAPPING AND GIS SERVICES, MAY 2006, SEPTEMBER 2006, JANUARY 2007, MARCH 2007, APRIL 2007 AND AUGUST 2007.

SOURCE:
 EARTH TECH, INC., 2005, FINAL DESIGN SUBMITTAL REMEDIAL ACTION OPERABLE UNIT-2B LANDFILL SITES 2 AND 17, FORMER MARINE CORPS AIR STATION, EL TORO, CALIFORNIA, SEPTEMBER.

ERRG, INC., 2008 REMEDIATION VERIFICATION REPORT, OPERABLE UNIT-2B, SITE 2 FORMER MARINE CORPS AIR STATION, EL TORO, CALIFORNIA, OCTOBER.



Remedial Action Completion Report		Final
Revegetation Map - IRP Site 2		
Landfill Sites 2 and 17		
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Figure 4-7 presents an overview of the revegetation at the site. The revegetation included restoration of CSS and mulefat in both on-cover and off-cover landfill areas per the requirements of BO and BO Amendment (USFWS 2002 and USFWS 2004).

Asphalt, concrete, metal (mostly rusty buckets), hardened tar and expansion joint material, and soft tar were unearthed during ripping activities within the laydown off-cover restoration area. The asphalt and concrete was hauled to El Toro Materials for future processing and recycling of materials. The remainder of the debris was placed in a bin and shipped off site as nonhazardous waste. The bin was removed from IRP Site 17 and disposed at Frank R. Bowerman Landfill, a Class III Landfill located in Irvine, California.

Erosion Control

IRP Site 2: Erosion control measures were constructed in accordance with the Remedial Design Submittal (Earth Tech 2005a) as detailed in specifications 02370, 02371, 02372, 02373, 02380 and the Final CSS Restoration Plan (Helix 2005). Surface erosion control blankets and jute netting were anchored in trenches and stapled to the completed landfill 3:1 peripheral slope surfaces to minimize the potential for soil loss in the present and over the long term. The restored Area C1/C2 was protected against potential soil loss using a combination of geomembrane liner, geotextile liners, and lined and bedded stone riprap revetments as discussed under subsection "Restoration of Waste Excavation Areas" in Section 4.1.2.4. Erosion control on the shallow slopes that were not covered by riprap consisted of erosion control blankets stapled in place on the slopes in combination with hydroseeding in accordance with the project specifications and applicable design drawings. Site 2 slopes immediately adjacent to the Borrego Canyon Wash and within the restored Areas C1/C2 were covered with geomembrane, geotextile, and riprap.

The Santiago Canyon Fire that occurred on 21 October 2007 destroyed the jute net and erosion control blankets established in the trapezoidal channels surrounding the perimeter of IRP Site 2 as well as burned some of the irrigation piping. The jute net and erosion control blanket were re-installed and portions of the irrigation system were replaced between December 2006 and February 2007. After the fire occurred, the C350 turf reinforcement mat was replaced with EXCEL CC-4, an ultraviolet stabilized and biodegradable material that is more conducive to vegetation growth within the trapezoidal channel.

Long-term erosion control of the surface soil is provided by establishing at least a 20-percent vegetative cover within the first year, continuing throughout the post-closure period. If post-closure inspections indicate that the vegetation is less than the desired amount, bare areas will be reseeded as necessary. Riprap on the side slopes exposed to the Borrego Canyon Wash and adjacent to the down drains and gabion baskets will be inspected after any inclement weather and repaired as stipulated in the Operation and Maintenance Plan.

IRP Site 17: A surface erosion control blanket was installed in the earthen v-ditches located throughout the landfill footprint. The 3:1 peripheral slope surfaces were hydroseeded after fiber rolls were installed in accordance with California Stormwater Handbook guidelines, instead of installing an erosion control blanket. The substitution of hydroseed and fiber rolls for erosion control blankets was initiated to promote future vegetative growth on the identified slope area while minimizing the potential for soil loss. EXCEL CC-4 erosion control blanket was installed in the earthen v-ditches and stapled into the surrounding soil in accordance with the manufacturer's installation specifications.

4.1.2.15 DECONTAMINATION AND DEMOBILIZATION

The majority of the earthwork equipment was demobilized from IRP Site 2 in early July 2007 and from IRP Site 17 in June and July 2008. The equipment was decontaminated by scraping and pressure washing as needed to remove visible soil and debris from earthwork equipment tires, tracks and undercarriages. Dry brushing or wiping was used whenever possible, to minimize the volume of water requiring treatment/disposal. Decontamination was continued until all attached soil was removed from each piece of earthwork equipment.

The office trailer was demobilized from IRP Site 2 in January 2008 and from IRP Site 17 in June 2008 upon completion of construction activities.

4.2 IMPLEMENTATION OF ICS

4.2.1 Land-Use Restrictions

In accordance with Section 9.2 of the Final Interim ROD, ICs are required at IRP Sites 2 and 17 to:

- maintain the integrity of the landfill caps by preventing excavations;
- minimize infiltration of surface waters;
- prevent land use that presents unacceptable risk to human health and the environment due to residual contamination;
- protect groundwater monitoring equipment; and
- preserve access to the sites and associated monitoring equipment for the DON and the FFA signatories.

A land-use control (LUC) plan has been prepared that presents description, implementation, maintenance, and enforcement procedures for ICs for the vadose zone of IRP Site 2, and the vadose zone and groundwater of IRP Site 17. This LUC plan is included as an attachment to the Final O&M Plan for IRP Sites 2 and 17 (Earth Tech 2009). The land-use restrictions listed in the LUC plan prohibit the following in the areas requiring institutional controls (ARICs) at IRP Sites 2 and 17:

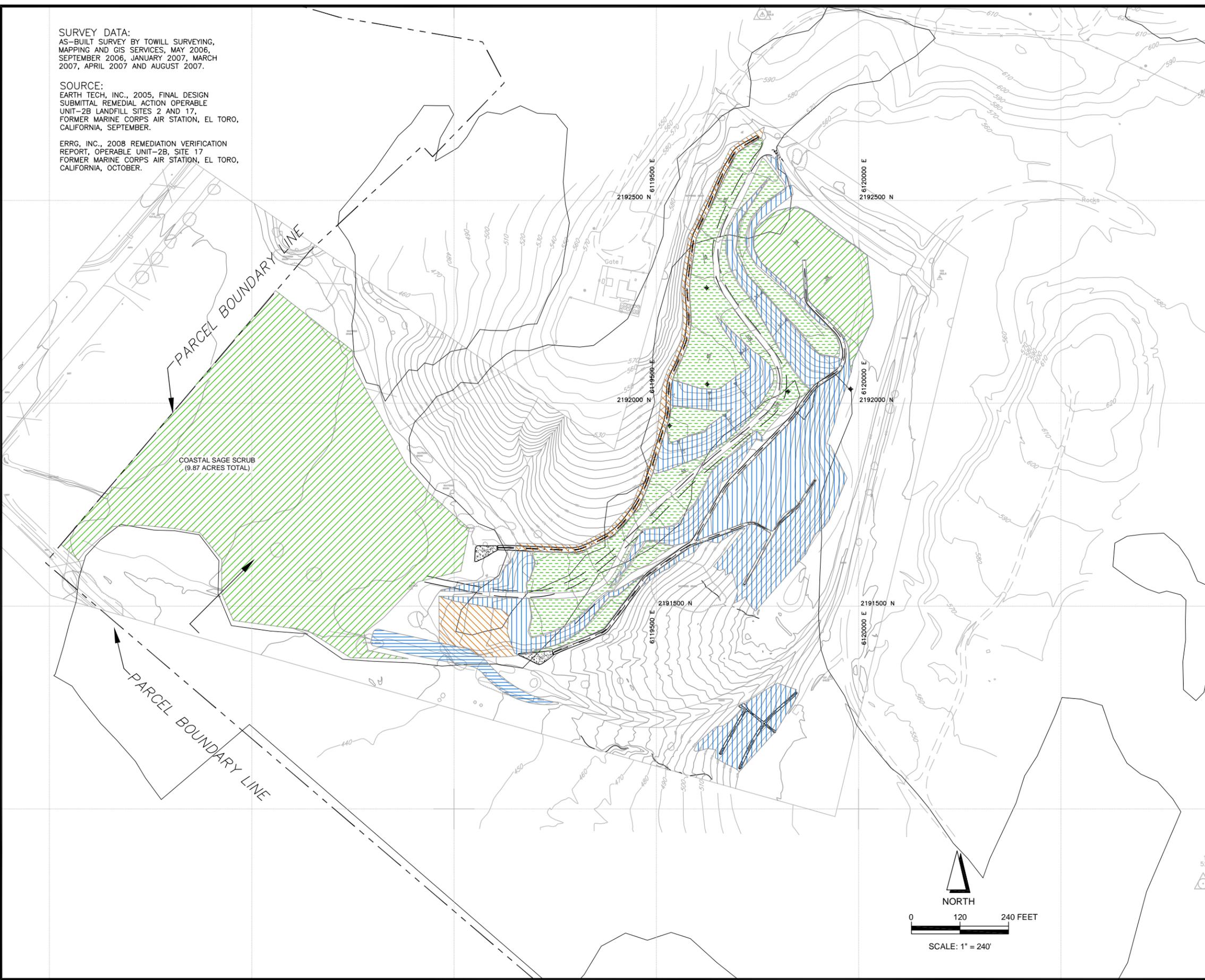
- residential use of the sites and construction of hospitals for humans, schools or persons under 21 years of age, day care centers for children, or any permanently occupied human habitation on the sites;
- construction of facilities, structures, or appurtenances; excavation; or any other land disturbing activity into or on the surface of the landfills that may affect the drainage or increase erosion or infiltration unless prior approval is obtained from the Department of the Navy (DON) and the FFA signatories;
- construction of structures within 1,000 feet of the edge of the landfill without prior approval of the DON and FFA signatories;
- planting deep-rooted plants that could threaten the integrity of the landfill cap;
- irrigating the surface of the landfill except when it is used for establishment, repair, and maintenance of vegetation cover required for effective performance of the cap;

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SURVEY DATA:
 AS-BUILT SURVEY BY TOWILL SURVEYING,
 MAPPING AND GIS SERVICES, MAY 2006,
 SEPTEMBER 2006, JANUARY 2007, MARCH
 2007, APRIL 2007 AND AUGUST 2007.

SOURCE:
 EARTH TECH, INC., 2005, FINAL DESIGN
 SUBMITTAL REMEDIAL ACTION OPERABLE
 UNIT-2B LANDFILL SITES 2 AND 17,
 FORMER MARINE CORPS AIR STATION, EL TORO,
 CALIFORNIA, SEPTEMBER.

ERRG, INC., 2008 REMEDIATION VERIFICATION
 REPORT, OPERABLE UNIT-2B, SITE 17
 FORMER MARINE CORPS AIR STATION, EL TORO,
 CALIFORNIA, OCTOBER.

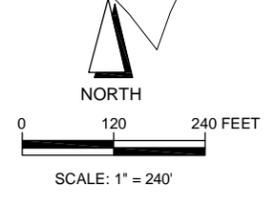


LEGEND

- MULEFAT RESTORATION AREA - 0.37 ACRES TOTAL
- NATIVE GRASSLAND / COASTAL SAGE SCRUB RESTORATION AREA - 5.34 ACRES TOTAL
- ON LANDFILL COASTAL SAGE SCRUB RESTORATION AREA - 3.76 ACRES TOTAL
- OFF LANDFILL COASTAL SAGE SCRUB RESTORATION AREA - 11.19 ACRES TOTAL
- HYDROSEED FOR EROSION CONTROL ONLY
- 2-FT CONTOUR (EXISTING/SUBGRADE)
- 10-FT CONTOUR (EXISTING/SUBGRADE)
- 2-FT CONTOUR (FINAL GRADE)
- 10-FT CONTOUR (FINAL GRADE)
- GEODETIC GRID LINE
- ACCESS ROAD
- SHOTCRETE V-DITCH
- TRAPEZOIDAL CHANNEL
- EXISTING RIPRAP
- SETTLEMENT MONUMENT
- FENCE LINE
- EXISTING FENCE LINE
- EXISTING BUILDING
- VEGETATION
- POWER POLE
- SLOPE (HORIZONTAL TO VERTICAL)
- SLOPE AND FLOW DIRECTION
- EXISTING GROUNDWATER MONITORING WELL
- EXISTING LYSIMETER DRILLED AT 30° ANGLE (SHOWS ANGLE DIRECTION)
- CONSTRUCTION LAYDOWN AREA

CSS ACREAGE

CSS On Landfill Acres	CSS Off Landfill Acres
3.76	11.19



Remedial Action Completion Report		Final
Revegetation Map - IRP Site 17		
Landfill Sites 2 and 17		
Date: 03-09	Former MCAS El Toro	
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- land-disturbing activity on lands adjacent to the landfill and currently or formerly owned by DON that may cause adverse effects upon the landfill through erosion of the surface or diversion of off-site surface water runoff onto the landfill, are prohibited unless the land owner of the adjacent property provides for mitigation of such adverse effects (e.g. through structural drainage and erosion control measures such as diversion channels, riprap) and obtains the prior approval of DON, U.S. EPA Region 9, Department of Toxic Substances Control (DTSC), and RWQCB;
- the removal of or damage to security features (e.g., locks on monitoring wells) or to monitoring equipment and associated pipelines and appurtenances.

In addition to above prohibitions, the DON, FFA signatories, and their authorized agents, employees, contractors, and subcontractors shall have the right to enter and inspect the property located in the ARICs at IRP Sites 2 and 17, perform monitoring activities, ensure the viability of land-use controls, and perform any additional response actions.

4.2.2 Legal Mechanisms for ICs Implementation

In addition to land-use restrictions, the LUC plan also discusses legal mechanisms for the implementation of ICs. The major portion of the areas requiring ICs (ARICs) at IRP Sites 2 and 17 have been transferred to the Federal Aviation Administration (FAA). The DON currently has a Memorandum of Understanding (MOU) with the FAA that documents the land use restrictions. This MOU is being used as a mechanism for the implementation of ICs by the DON for the areas owned by the FAA.

Portions of ARICs at IRP Sites 2 and 17 lie within Carve-outs II-V and II-F (see Figures 1-2 and 1-3), which were leased in 2005 to Heritage Fields, LLC (Orange County Great Park Corporation and Lennar Corporation), a private developer. These areas will be leased until the time FFA signatories concur that the landfill capping remedies at IRP Sites 2 and 17 are OPS. Following concurrence of the FFA signatories, Carve-outs II-V and II-F will be transferred to a non-Federal entity. It should be noted that this RACR may be used by the DON to make “OPS determination” in concurrence with other FFA signatories.

The interim land-use restrictions are being administratively handled through a Lease In Furtherance of Conveyance (LIFOC), until the time portions of ARICs at IRP Sites 2 and 17 currently leased to a private developer are conveyed by deed to the Lessee. The LIFOC for Parcel II at former MCAS El Toro is currently in place and includes the interim land use restrictions. The interim land use restrictions in the LIFOC meet the objectives of the ICs presented in Section 4.2.1 since they restrict activities that may adversely affect the integrity of the landfill cap and present unacceptable risk to human health due to potential exposure to residual contamination. In addition the land use restrictions prevent removal or damage to remedy components including monitoring equipment and preserve access to the sites by the DON and FFA signatories.

In the event of the transfer of whole or part of IRP Sites 2 and 17 ARICs (including but not limited to the portions of Carve-outs II-V and II-F within the ARICs) to a non-Federal entity, the DON will use proprietary ICs in the form of environmental restrictive covenants as provided in the Memorandum of Agreement (MOA) between the DON and the DTSC and attached covenant models (DON and DTSC 2000). More specifically, land use restrictions will be incorporated into and implemented through two separate legal instruments as provided in the DON/DTSC MOA: (1) Restrictive covenants included in one or more “Covenant to Restrict Use of Property” entered into by the DON and DTSC as provided in the DON/DTSC MOA and consistent with the substantive provisions of Title 22 California Code of Regulations §67391.1, and (2) Restrictive covenants included in one or more Quitclaim Deeds from the DON to the property recipient. The “Covenant to Restrict Use of

Property” will incorporate the land use restrictions stipulated in Section 4.2.1 into environmental restrictive covenants that run with the land and that will be enforceable by the DTSC against future transferees. The Quitclaim Deeds will include the identical land use restrictions as provided in environmental restrictive covenants that run with the land and that will be enforceable by the DON against future transferees. In essence, the DON and DTSC will each have the legal authority to enforce the land use restrictions and will share responsibility for their enforcement.

A detailed discussion of future implementation mechanisms for ICs in case of transfer of whole or part of IRP Sites 2 and 17 ARICs to a non-federal entity are discussed in detail in the LUC Plan (Earth Tech 2009).

5. DEMONSTRATION OF ATTAINMENT OF REMEDIAL OBJECTIVES

Section 2 presents the RAOs developed for IRP Sites 2 and 17. The last RAO pertaining to restriction of domestic use of VOC-impacted groundwater was developed for IRP Site 2 groundwater. The groundwater use at IRP Site 2 is presently restricted through restrictions placed on the transferred and leased portion of the IRP Site 2 property. These restrictions are specified in the MOU with FAA, and LIFO (see Section 4.2.2 for details). In addition, the remedial action for VOCs in IRP Site 2 groundwater will be addressed in a separate ROD. If any groundwater use restrictions are required as part of the selected remedy for IRP Site 2, these restrictions will be included in that separate ROD. A Draft ESD documenting this change in the selected remedy presented in the Final Interim ROD was issued by the DON in October 2008 (DON 2008). Therefore, the RAO pertaining to IRP Site 2 groundwater is not part of the selected remedy for the vadose zone and the discussion of attainment/non-attainment of this RAO is not appropriate for this RACR. The discussion of attainment of the remaining RAOs for IRP Sites 2 and 17 is presented in Table 5-1.

Table 5-1: Demonstration of Attainment of RAOs

RAO	Demonstration of Attainment
Prevent direct contact with the landfill waste	At both IRP Sites 2 and 17, surficial waste has been consolidated from the nearby areas into the main footprint of the landfills and ET covers have been constructed over the waste (see Sections 4.1.2.4, 4.1.2.5, and 4.1.2.6 for details). The construction of the ET cover and implementation of land-use restrictions that prohibit activities that may have adverse impact on the cap will prevent direct contact with the landfill waste.
Control run-on, run-off, and erosion	At both IRP Sites 2 and 17 cover drainage structures and erosion control features have been constructed including earthen berms, V-ditches, trapezoidal channels, riprap revetments, geotextiles, geomembranes, and erosion control blankets (see Sections 4.1.2.7 and 4.1.2.14 for details). These features will control run-on, run-off and erosion at IRP Sites 2 and 17 landfills.
Monitoring of the LFG migration	The landfill perimeter gas wells installed as part of remedial investigations and remedial actions at IRP Sites 2 and 17 will be used for monitoring landfill gas migration (see Section 4.1.2.8 for details).
Minimize infiltration and potential contaminant leaching to groundwater	The constructed ET covers at IRP Sites 2 and 17 landfills meet the design specifications presented in the Remedial Design Submittal (Earth Tech 2005a) and will minimize infiltration and potential contaminant leaching to groundwater (See Sections 4.1.2.5 and 4.1.2.6). The UNSAT-H modeling conducted as part of the remedial design showed that the ET covers constructed at IRP Sites 2 and 17 will be as effective in reducing infiltration as the state-prescriptive cover for the landfills.
Prevent surface water in washes from contacting the landfill	Several drainage features have been constructed as part of landfill caps at IRP Sites 2 and 17 per the design specifications presented in the Remedial Design Submittal (Earth Tech 2005a) (see Section 4.1.2.7). These drainage features include earthen and concrete-lined trapezoidal channels and V-ditches, and riprap energy dissipaters and will prevent surface water in washes from contacting the landfill.
Prevent contaminated sediments from entering the washes and being carried off-site	The waste and contaminated sediments at IRP Sites 2 and 17 have been capped with ET cover per the design specifications presented in the Remedial Design Submittal (Earth Tech 2005a) (see Sections 4.1.2.5 and 4.1.2.6). The ET cover has isolated the waste and contaminated sediments, and will prevent contaminated soils/wastes from entering the washes and being carried off-site.

RAO	Demonstration of Attainment
Reduce risk to sensitive habitats that support special-status species of plants and wildlife	<p>ET covers have been constructed at IRP Sites 2 and 17 per the design specifications presented in the Remedial Design Submittal (Earth Tech 2005a) (see Sections 4.1.2.5 and 4.1.2.6). These covers isolate the waste and contaminated soils, and reduce risk to sensitive habitats that support special-status species of plants and wildlife.</p> <p>During the remedial action, field activities at IRP Sites 2 and 17 were conducted in accordance with the BO (USFWS 2002). The focus of the BO was to protect coastal California gnatcatcher, a federal threatened species, and replacement and protection of CSS critical habitat throughout IRP Sites 2 and 17 associated with the gnatcatcher.</p>

6. CONSTRUCTION QUALITY ASSURANCE/CONSTRUCTION QUALITY CONTROL PROCEDURES

CQC procedures during remedial action implementation at IRP Site 2 and 17 were in accordance with the CQC Plan (ERRG and Shaw Environmental, Inc. 2005, 2008) provided as Appendix I of the Remedial Action Work Plan (ERRG 2005, 2008a). As described in the CQC Plan, the work was divided into the following definable features of work (DFOWs):

- Import Soil Confirmation
- Mobilize and Utilities
- Clear and Grub
- Landfill Subgrade Preparation
- Temporary Drainage and Erosion Control
- Waste Consolidation
- Place ET Cover
- Slope Fill Thickness
- Control Emission of Fugitive Dust
- Blend, Haul, and Stockpile Soil
- ET Cover Fill
- Erosion Control Blankets
- Chain-link Fences
- Install Lysimeter Wells
- Install Gas Monitoring Wells
- Concrete and Shotcrete
- Aerial and Land Survey
- Demobilize

QC testing was performed in accordance with the project specifications. Documentation of the QC measures was included on Daily Contractor QC Reports. During periods of active construction, CQC meetings were conducted on a weekly basis. The CQC meeting were attended by the Navy ROICC and RPM, periodically by representatives from the RWQCB – Santa Ana and County of Orange Health Care Agency, the RAC Construction and QA/QC staff and representatives from the remedial design/oversight contractor. Following most CQC meetings, construction observations/inspections were conducted. In addition, some or all of organizations listed above reviewed preparatory inspection checklists and participated in preparatory, initial or follow-up inspections. The Daily Contractor QC Reports included all geotechnical test results (i.e. compaction testing); preparatory, initial, and follow-up inspection checklists; daily tailgate safety meeting minutes; and photo documentation. As requested, copies of the daily construction reports were provided to representatives of the RWQCB. Scanned copies of these reports for both IRP Sites 2 and 17 are included in Appendix L of IRP Site 2 RVR (ERRG 2009a) and Appendix J of IRP Site 17 RVR (ERRG 2009b).

The following independent third party subcontractors performed CQC testing and provided certifications by California registered professionals attesting compliance with the project specifications:

- Surveying subcontractors to document and certify elevations and slopes meet project specifications
- Geotechnical laboratory to test the blended ET cover soil meets project specifications
- Geotechnical subcontractor to monitor and test soil compaction
- Geotechnical subcontractor to perform in-situ hydraulic conductivity tests using the BAT™ System
- Concrete placement subcontractor to monitor and test concrete placement.

As required, following review by RAC CQC staff, reports from these third party subcontractors along with shop drawings, equipment data, material samples, and manufacturer's certifications of compliance were submitted with Form 4025 and signed by the CQC Manager. All of the transmittals for IRP Sites 2 and 17 are documented on the submittal register and are included in Appendix L of IRP Site 2 RVR (ERRG 2009a) and Appendix J of IRP Site 17 RVR (ERRG 2009b).

In addition, RFIs generated during the construction process at IRP Sites 2 and 17 are also included in Appendix A of IRP Site 2 RVR (ERRG 2009a) and Appendix J of IRP Site 17 RVR (ERRG 2009b).

As shown in the certification reports provided in Appendix A of IRP Sites 2 and 17 RVRs (ERRG 2009a and ERRG 2009b) and the data provided in Appendix J of these RVRs, the construction of the landfill closure cover systems at IRP Sites 2 and 17 meets the QC requirements specified in the remedial design and CQC Plan and conforms to the intent of the RD as modified by the RFIs.

The remedial design and oversight support contractor participated in periodic construction inspections and also provided independent review of the construction submittals. Based on a the review of the data provided, certifications provided by the independent third party subcontractor and the RAC CQC manager, the oversight contractor has provided in Appendix B of this RACR a closure certification per CCR Title 27.

7. ONGOING ACTIVITIES

As specified in the Final Interim ROD (DON 2000) and consistent with Title 27 CCR §21180 and §20950, IRP Sites 2 and 17 landfills will be maintained and monitored for a period of not less than 30 years after completion of the closure construction or as long as waste poses a threat to water quality. The purpose of post-construction long-term monitoring and maintenance is to monitor the effectiveness of the landfill cap, drainage structures, groundwater monitoring systems, site security features and documenting that the constructed remedial system for consolidated waste containment perform as designed to protect human health and the environment.

As described in the Operation and Maintenance Plan for IRP Sites 2 and 17 (Earth Tech 2009), the long-term monitoring and maintenance at the sites will consist of the following:

- Cover Inspections and Maintenance
- Groundwater Monitoring
- Landfill Gas Monitoring
- Implementation of ICs
- Five-year Reviews

7.1 COVER INSPECTIONS AND MAINTENANCE

The following components of the landfill cover system at IRP Site 2 and 17 will be inspected and maintained as part of long-term monitoring and maintenance:

- Coastal Sage Scrub and Mulefat
- Settlement Monuments
- Erosion Control Features
- Drainage System
- Landfill Gas Monitoring Probes and Groundwater Monitoring Wells
- Site Security Features
- Access Roads

The detailed schedule for inspection activities and procedure for inspection of each of the above-mentioned components are presented in the O&M Plan (Earth Tech 2009).

7.2 GROUNDWATER MONITORING

Groundwater monitoring will be conducted at IRP Sites 2 and 17 consistent with the detection monitoring program in Titles 22 and 27 CCR. Groundwater monitoring objectives include:

- Assess the performance of the landfill cover system and ICs,
- Evaluate if contaminants are migrating beyond compliance monitoring locations,
- Monitor contaminants exceeding standards,
- Provide data to optimize monitoring requirements during the 30-year post-closure compliance period,

- Appraise compliance with the RAOs, and
- Satisfy regulatory requirements for landfill closure.

The specifics of the groundwater monitoring program including well locations, frequencies, and analytes are presented in the O&M Plan (Earth Tech 2009).

7.3 UNSATURATED ZONE MONITORING

Since lysimeters were not installed at IRP Site 2 due to relatively small separation between the waste and groundwater, the unsaturated zone monitoring will only be conducted at IRP Site 17. The unsaturated zone monitoring objectives include:

- to evaluate the performance of the remedy, and
- to act as the first line of defense when landfill wastes potentially leach to groundwater during the post-closure monitoring period of the landfills.

The specifics of unsaturated zone monitoring program including lysimeter locations, frequencies and analytes are presented in the O&M Plan (Earth Tech 2009).

7.4 LANDFILL GAS MONITORING

The objective of long-term monitoring of landfill gas is to monitor for the migration of landfill gas to the perimeter of the landfill boundaries at IRP Sites 2 and 17. The specifics of landfill gas monitoring program including landfill gas monitoring network, frequencies, and analytes are presented in the O&M Plan (Earth Tech 2009).

7.5 FIVE-YEAR REVIEWS

Since the selected remedies at IRP Sites 2 and 17 results in contaminants remaining on-site above levels that would allow for unlimited land use or unrestricted exposure, a review is required by the Navy no less often than every five years after initiation of the selected remedial actions. Five-year reviews are intended to evaluate whether the remedy remains protective of public health and the environment, is functioning as designed, and necessary monitoring and maintenance is being performed. Five-year reviews generally include document reviews, reviews of cleanup standards, interviews, inspections, technology reviews, and preparation of a report summarizing the findings and recommendations.

8. COMMUNITY RELATIONS

This section briefly summarizes the community outreach activities conducted during the remedy selection process for IRP Site 17 and the vadose zone of IRP Site 2. A Community Relations Plan (BNI 2005) was prepared to document the comprehensive community relations program being conducted by the DON in conjunction with the IRP investigation and environmental cleanup activities at former MCAS El Toro. The initial plan was prepared in 1991, and updated in 1993, 1996, and 2005. The updates incorporated the most recent assessment of community issues, concerns, information needs related to the ongoing environmental investigation and remediation program at former MCAS El Toro, and a determination of the best methods for conducting and enhancing communication between the DON and local community.

In 1994, the Restoration Advisory Board (RAB) was established through which individuals from the local community play a significant role in the environmental restoration process. RAB meetings occur every 2 months, are open to the public, and include interested representatives from the community, DON, city and county offices, and regulatory agencies. The OU-2B Sites 2 and 17 have been a key topic at numerous RAB meetings from July 1995 until the present day.

The draft final RI and FS Reports for IRP Sites 2 and 17 were released to the public in September 1997. The Proposed Plan for IRP Site 2 was issued in May 1998. This Proposed Plan also addressed OU-2C Sites 3 and 5. These documents were made available to the public at the information repository maintained at the Heritage Park Regional Library in Irvine, California. The notice of availability for these documents was published in the Orange County Register and the Los Angeles Times (Orange County Edition) approximately 1 week before the start of the public comment period on the Proposed Plan. The notices also announced the availability of the Administrative Record file for review. Complete Administrative Record files are available at the Navy office located at 937 N. Harbor Drive, San Diego, California 92132, and at former MCAS El Toro. A partial record file is available for review at the information repository. The information repository also contains a complete index of the Administrative Record file along with information about how to access the complete file. The Proposed Plan was also distributed to the former MCAS El Toro mailing list.

A public comment period was held for the Proposed Plan for OU-2B and OU-2C from 15 May to 13 July 1998. In addition, a public meeting was held on 18 June 1998. This meeting was announced in the Orange County Register and Los Angeles Times (Orange County Edition) on 11 June 1998. Media alerts issued by the BRAC Public Affairs Officer were also used to notify the reporters that the public was invited to the meeting and to encourage the reporters to attend and publicize the event. The BRAC Public Affairs Officer also met the reporters to brief them on the Proposed Plan. Subsequently, the Orange County Register and the Los Angeles Times published articles on the landfills, the FSs, and the Proposed Plan. These articles also announced the date, time, and location of the public meeting. At the public meeting, representatives from the DON, former MCAS El Toro, and environmental regulatory agencies answered questions about site conditions and the remedial alternatives under consideration and a court reporter recorded public comments. A response to the comments received regarding IRP Sites 2 and 17 during this period was included in the Responsiveness Summary, which was included in the Final Interim ROD (DON 2000).

Following the signing of the Final Interim ROD for IRP Site 2 and 17, the Navy has conducted six RAB/Community site tours on the following dates: May 2003, April 2005, June 2005, May 2006, June 2006 and August 2008. During each tour members of the community and RAB were briefed on the progress of the remedial design and remedial action construction at Site 2 and 17. In addition, in September 2005, the Navy issued a Fact Sheet regarding the implementation of the remedial actions at both sites to individuals listed in the community relations plan.

In October 2008, the Navy issued a Draft ESD (DON 2008) that documents that the Final Interim ROD for IRP Sites 2 and 17 will serve as the final ROD for IRP Site 17 and vadose zone of IRP Site 2. In addition, the ESD documents significant and non-significant changes in certain components of the selected remedies for IRP Sites 2 and 17 presented in the Final Interim ROD. These components include land-use restrictions, post-closure monitoring plan, and remedial action selection strategy for IRP Site 2 groundwater. Following regulatory agency review, this ESD will be made available to the public for review. A notice of availability of the ESD will be published in a major newspaper.

9. CERTIFICATION STATEMENT

I certify that this Remedial Action Completion Report memorializes the completion of the remedial action construction and achievement of the remedial action objectives at the IRP Sites 2 and 17, former MCAS El Toro, California. The remedial action construction at IRP Sites 2 and 17 was implemented pursuant to CERCLA, and as documented in the ROD (DON 2000). The operation and maintenance activities including cover inspections and maintenance; groundwater, unsaturated zone, and landfill gas monitoring; and implementation of ICs are currently under progress at IRP Sites 2 and 17 as part of the selected remedies at these sites in accordance with the ROD and the O&M Plan (Earth Tech 2009). Since the selected remedies at IRP Sites 2 and 17 result in contaminants remaining on-site above levels that would allow for unlimited land use or unrestricted exposure, the Navy will conduct 5-year reviews as mandated by CERCLA to evaluate the protectiveness of the remedies.

Signature: _____



Anthony Megliola
Base Realignment and Closure,
Base Closure Manager Former Marine Corps Air Station El Toro

Date: 3/2/09

10. REFERENCES

- American Society of Testing and Materials (ASTM). 2002. *ASTM Standard D 1557, "Standard Test Methods for Laboratory Compaction Characteristics of Soil using Modified Effort (56,000 ft-lbf/ft³ [2,700 kN-m/m³])."* ASTM International, West Conshohocken, PA.
- . 2004a. ASTM Standard D 2922, "Standard Test Methods for Density of Soil and Soil Aggregates in Place by Nuclear Methods (Shallow Depth)." ASTM International, West Conshohocken, PA.
- . 2004b. ASTM Standard D 3017, "Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth)." ASTM International, West Conshohocken, PA.
- . 2007. ASTM Standard D 1556, "Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method." ASTM International, West Conshohocken, PA.
- Bechtel National, Inc. (BNI). 1996a. *Draft Phase II Remedial Investigation Report Operable Unit 2B-Site 2, Marine Corps Air Station, El Toro, California.* San Diego. March.
- . 1996b. *Draft Final Phase II Remedial Investigation Report Operable Unit 2B-Site 17, Marine Corps Air Station, El Toro, California.* San Diego. September.
- . 1996c. *Technical Memorandum, Background and Reference Levels, Remedial Investigations, Marine Corps Air Station, El Toro, California.* San Diego. June.
- . 1997. *Draft Final Phase II Feasibility Study Report-Site 2, Marine Corps Air Station El Toro, California.* San Diego, California. March.
- . 1999a. *Draft Final CERCLA Groundwater Monitoring Plan, Marine Corps Air Station El Toro, California.* June.
- . 1999b. *Draft Evaluation of Perchlorate in Groundwater.* San Diego, CA.
- . 2005. *Final Updated Community Relations Plan, Marine Corps Air Station El Toro, California.* September.
- California Department of Transportation (Caltrans). 1996. *Manual of Traffic Control for Construction and Maintenance Work Zones.* December.
- Department of Defense and U. S. Environmental Protection Agency (DoD and U.S. EPA). 2005. *Department of Defense and Environmental Protection Agency Joint Guidance, Recommended Streamlined Site Closeout and NPL deletion Process for DoD Facilities.*
- Department of Navy (DON). 1998. *Proposed Plan for Closure of Inactive Landfills at Marine Corps Air Station El Toro.* May.
- . 2000. *Final Interim Record of Decision, Operable Unit 2B, Landfill Sites 2 and 17, Marine Corps Air Station El Toro, California.* San Diego, CA. April.
- . 2005. *Draft Proposed Plan, Final Remedy for Operable Unit 2B, Landfill Sites 2 and 17 at Former Marine Corps Air Station El Toro, California.* December.

- _____. 2008. *Draft Explanation of Significant Differences, Operable Unit 2B, Installation Restoration Program Sites 2 And 17, Finalizing the Interim Final Record Of Decision, Former Marine Corps Air Station El Toro, California*. October.
- Earth Tech, Inc. (Earth Tech). 2000. *Technical Memorandum, Evaluation of Radionuclides in Groundwater, Marine Corps Air Station, El Toro, California. Draft*. Honolulu. HI. March.
- _____. 2001. *Technical Memorandum, Phase II Evaluation of Radionuclides in Groundwater at Former Landfill Sites and the EOD Range, Marine Corps Air Station, El Toro, California*. Honolulu, HI. December.
- _____. 2005a. *Final Design Submittal, Remedial Action, Operable Unit 2B, Landfill Sites 2 and 17, Former Marine Corps Air Station, El Toro, California*. San Diego, CA. November.
- _____. 2005b. *Draft Final Feasibility Study Addendum, Operable Unit 2B, IRP Site 2 Groundwater, Former Marine Corps Air Station, El Toro, California*. Honolulu: PACNAVFACENGCOM. December.
- _____. 2005c. *Draft Proposed Plan, Operable Unit 2B, IRP Sites 2 and 17, Former Marine Corps Air Station, El Toro, California*. Honolulu: PACNAVFACENGCOM. December.
- _____. 2005d. *Landfill Test Fill Construction Report and Borrow Source Evaluation Report, Operable Unit 2B, IRP Sites 2 and 17, Marine Corps Air Station El Toro, California*. May.
- _____. 2006a. *Final Technical Memorandum, Aquifer Test, IRP Site 2, Former Marine Corps Air Station, El Toro, California*. Honolulu, HI. February.
- _____. 2006b. *Final Technical Memorandum Evaluation of the Selected Remedy With Respect To Radionuclides, Operable Unit 2B, IRP Sites 2 and 17, Former Marine Corps Air Station El Toro, California*. May.
- _____. 2009. *Final Operation and Maintenance Plan, IRP Sites 2 and 17, Former Marine Corps Air Station El Toro, California*. San Diego, CA. February.
- Engineering/Remediation Resources Group, Inc. (ERRG). 2005. *Remedial Action Work Plan, Operable Unit-2B, Sites 2 and 17, Former Marine Corps Air Station El Toro, California*. December.
- _____. 2008a. *Remedial Action Work Plan, Operable Unit-2B, Sites 2 and 17, Former Marine Corps Air Station El Toro, California*. April.
- _____. 2008b. *Well Installation Report - Permit 08-05-09, Former MCAS El Toro, Site 17*.
- _____. 2009a. *Final Remediation Verification Report, Operable Unit-2B, Site 2, Former Marine Corps Air Station El Toro, California*. February.
- _____. 2009b. *Final Remediation Verification Report, Operable Unit-2B, Site 17, Former Marine Corps Air Station El Toro, California*. February.
- Engineering/Remediation Resources Group, Inc. and Shaw Environmental, Inc. (ERRG and Shaw). 2008. *Construction Quality Control Plan Addendum, Operable Unit 2B, Sites 2 and 17, Former Marine Corps Air Station El Toro, California*. January.

- Enviro Compliance Solutions (ECS). 2006. *Draft Aquifer Characterization and Bench-Scale Treatability Testing, Installation Restoration Program Site 1, Former Marine Corps Air Station El Toro, Irvine, California*. Tustin, CA. May.
- Helix Environmental Planning, Inc. (Helix) 2005. *Final Coastal Sage Scrub Restoration Plan (Landfill Sites 2 and 17) Former Marine Corps Air Station El Toro, California*. September.
- Jacobs Engineering Group Inc. (JEG). 1993. *Draft Phase I Remedial Investigation Technical Memorandum*. Irvine, California.
- James M. Montgomery Engineers Inc. (JMM). 1998. *MCAS El Toro and Tustin Site Inspection Plan of Action*.
- Shaw Group (Shaw). 2003. *Well Destruction Report – Permit 03-08-38, Former MCAS El Toro, IRP Site 2 Landfill*.
- . 2006a. *Well Destruction Report – Permit 05-11-36, Former MCAS El Toro, IRP Site 2 Landfill*.
- . 2006b. *Well Installation Report – Permit 06-07-02, Former MCAS El Toro, IRP Site 2 Landfill*.
- Southwest Division, Naval Facilities Engineering Command (NAVFAC SW). 2000. *Summary Report, Aerial Photograph Anomaly 44, Aerial Photograph Anomaly Program, Marine Corps Air Station, El Toro, California*. November.
- Strata Technologies, Inc. 1991. *Solid Waste Air Quality Assessment Test Reports for MCAS El Toro*.
- U. S. Environmental Protection Agency (U.S. EPA). 2000. *Closeout Procedures for National Priorities List Sites*. EPA 540-R-98-016; OSWER Directive 9320.2-09A-P.
- U. S. Fish and Wildlife Service. (USFWS). 2002. *Biological Opinion for Remedial Action at Sites 2 and 17, Former Marine Corps Air Station El Toro, Orange County, California (1-6-F-02-1202)*. October 31.
- Weston Solutions, Inc. (Weston). 2000. *MCAS El Toro Final Historical Radiological Assessment*. May.
- . 2004. *Radiological Release Report, IRP Sites 2 and 17, Former Marine Corps Air Station, El Toro, California*. July.

Appendix A
No Comment/Concurrence Letters from Regulatory Agencies

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION IX
75 Hawthorne Street
San Francisco, CA 94105

15 December 2008

Marine Corps Air Station El Toro
Base Realignment and Closure
Attn: Ms. Debra Theroux
Deputy BRAC Environmental Coordinator
7040 Trabuco Road
Irvine, California 92618

Subject: Draft Remedial Action Completion Report (RACR), Installation
Restoration Program (IRP) Sites 2 and 17
Former Marine Corps Air Station, El Toro, California

Dear Ms. Theroux:

The U.S. Environmental Protection Agency (EPA) has reviewed the subject draft RACR dated October 2008. EPA has found the RACR to be well documented and well written. We have no comments and concur with the document as presented.

If you should have any questions/concerns, please contact me at 415-972-3349.

Sincerely,

Rich Moya

cc. Content Arnold, NFEC SW SDIEGO
Marc Smits, NFEC SW SDIEGO
Quang Than, DTSC
John Broderick, RWQCB
Bob Woodings, RAB Co-Chair
Marcia Rudolph, RAB Sub-Committee



Department of Toxic Substances Control



Linda S. Adams
Secretary for
Environmental Protection

Maureen F. Gorsen, Director
5796 Corporate Avenue
Cypress, California 90630



Arnold Schwarzenegger
Governor

February 3, 2009

Marine Corps Air Station El Toro
Base Realignment and Closure
Attn: Ms. Debra Theroux
Deputy Base Closure Manager
7040 Trabuco Road
Irvine, California 92618

DRAFT REMEDIAL ACTION COMPLETION REPORT (RACR), INSTALLATION
RESTORATION PROGRAM (IRP) SITES 2 & 17, FORMER MARINE CORPS AIR
STATION (MCAS) EL TORO, IRVINE, CALIFORNIA

Dear Ms. Theroux:

The California Department of Toxic Substances Control (DTSC) has reviewed the subject RACR for IRP Sites 2&17, dated October 2008. Situated in the eastern part of the former MCAS El Toro, Sites 2 and 17 are the former Magazine Road Landfill and former Communication Station Landfill, respectively. The remedies at these former landfills include an evapotranspirative cover, institutional controls, and monitoring. The RACR documents that (a) the construction activities are complete and the remedies are in place, (b) the remedies achieve the remedial action objectives specified in the 2000 Final Interim Record of Decision, and (c) the remedies are protective of human health and the environment.

DTSC has no comments on the subject RACR. Thanks for the opportunity to review the report. If you have any questions about this letter, please contact me at (714) 484-5352 or qthan@dtsc.ca.gov.

Sincerely,

Quang Than
Remedial Project Manager
Brownfields and Environmental Restoration Program

2009 FEB - 9 A 9:05

PRAC OFFICE

Ms. Debra Theroux
February 3, 2009
Page 2 of 2

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Marcia Rudolph
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Lake Forest, California 92630

Richard Muza
U.S. Environmental Protection Agency Region IX
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San Francisco, California 94105-3901

John Broderick
California Regional Water Quality Control Board
3737 Main Street, Suite 500
Riverside, California 92501-3339

Manny Alonzo
Department of Toxic Substances Control
5796 Corporate Avenue
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California Regional Water Quality Control Board

Santa Ana Region



Linda S. Adams
Secretary for
Environmental Protection

3737 Main Street, Suite 500, Riverside, California 92501-3348
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www.waterboards.ca.gov/santaana

Arnold Schwarzenegger
Governor

December 3, 2008

Base Realignment and Closure
Attn: Ms. Debra Theroux (debra.theroux@navy.mil)
Deputy Base Closure Manager
7040 Trabuco Road
Irvine, California 92618

**COMMENTS ON DRAFT REMEDIAL ACTION COMPLETION REPORT,
INSTALLATION RESTORATION PROGRAM SITES 2 AND 17, FORMER MARINE
CORPS AIR STATION, EL TORO
GeoTracker No. DOD100131200 & DOD100139500**

Dear Ms. Theroux:

We have reviewed the above-referenced document, dated October 2008, which we received on October 27, 2008:

This report includes: 1) an overview; 2) the remedial action objectives; 3) construction roles and responsibilities during the remedial action; 4) activities completed during the remedial action; 5) a demonstration of the attainment of the remedial objectives; 6) construction quality assurance/construction quality control procedures; 7) the ongoing activities; 8) a summary of community relations activities; 9) a certification statement; and 10) references.

We have no comments on this report.

For any questions, please call me at (951) 782-4494, or send email to jbroderick@waterboards.ca.gov.

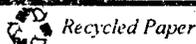
Sincerely,

John Broderick
Site Cleanup/DoD Section

cc:

Richard Muza, U.S. EPA, Region 9 - muza.richard@epa.gov
Quang Than, Department of Toxic Substances - qthan@dtsc.ca.gov
Marc Smits, BRAC PMO West - marc.smits@navy.mil

California Environmental Protection Agency



Appendix B
Closure Certification – IRP Sites 2 and 17

Closure Certification per CCR Title 27 21880 (b)

Closure of the former landfills at IRP Sites 2 and 17 was conducted by ERRG under contract to the Department of Navy. Earth Tech Inc, as the remedial design and oversight contractor provided periodic construction surveillance and reviewed construction QA/QC submittals and certifications provided by the remedial action contractor, ERRG and their independent third party QC subcontractors. Based on the review QA/QC documentation, and certifications provided by California licensed professionals, closure of former landfills at IRP Sites 2 and 17 has been constructed in accordance with Final Remedial Design.



Crispin G. Wanyoike P.E C049847

Date: 03/02/2009