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GRACE ROBINSON HYDE
Chief Engineer and General Manager

April 30, 2014

Mr. Daniel K. Zogaib, Project Manager
Brownfields and Environmental Restoration Program
Department of Toxic Substances Control
5796 Corporate Avenue
Cypress, CA 90630

Dear Mr. Zogaib:

Workplan for the Second Five-Year Review of the Palos Verdes Landfill

Enclosed for your review, please find the *Workplan for the Second Five-Year Review of the Palos Verdes Landfill*. This workplan was prepared pursuant to the Operation and Maintenance Agreement dated December 23, 1998 between the County Sanitation Districts of Los Angeles County and the California Environmental Protection Agency, Department of Toxic Substances Control (DTSC).

This workplan has been prepared in accordance with the United States Environmental Protection Agency's (USEPA) Comprehensive Five-Year Review Guidance. If you have any questions regarding this transmittal, please contact the undersigned at (562) 908-4288, extension 2826.

Very truly yours,
Grace Robinson Hyde

Kristen M. Ruffell
Project Coordinator and Project Engineer
Technical Services Department

KMR:KYL:cv

Enclosure

cc: Mr. Emad Yemut, DTSC

DOC# 2861413

**Workplan for the Second Five-Year Review
of the Palos Verdes Landfill
Rolling Hills Estates, California**

April 2014

Prepared by:

County Sanitation Districts of Los Angeles County
1955 Workman Mill Road
Whittier, CA 90601

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1. INTRODUCTION

The Operation and Maintenance (O&M) Agreement (DTSC, 1998) between the County Sanitation Districts of Los Angeles County (Sanitation Districts) and the Department of Toxics Substances (DTSC) for the Palos Verdes Landfill (site, PVLf) requires the Sanitation Districts conduct a review and reevaluation of the remedial actions at the site every five years. The requirement is consistent with Section 121 of the Federal Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA), as amended by the Superfund Amendments and Reauthorization Act (SARA), which subject remedial actions that result in hazardous substances, pollutants, or contaminants remaining at a site to a Five-Year Review. DTSC is the primary regulatory agency overseeing the implementation and the performance review of these remedial activities at the PVLf.

While the PVLf is not regulated under CERCLA and is not a Superfund site, five-year reviews for the site are performed in general accordance with provisions of CERCLA and the National Contingency Plan (NCP) at the direction of the DTSC. The first Five-Year Review for the PVLf was completed and approved by DTSC on November 4, 2009 (DTSC, 2009). In 2014, the Sanitation Districts will perform a second Five-Year Review of the site. The review will be conducted based on the United States Environmental Protection Agency's (USEPA) Comprehensive Five-Year Review Guidance (USEPA, 2001).

In accordance with the review guidance, the purpose of the Five-Year Review is to evaluate the implementation and performance of remedial actions at the PVLf to determine if the implemented remedy continues to be protective of human health and the environment and whether remedial action objectives are being fulfilled.

2. FACILITY OVERVIEW

The PVLf is located at 25706 Hawthorne Boulevard, Rolling Hills Estates, Los Angeles County, California (Figure 1) and covers approximately 291 acres. About 83 acres of the site are operated by the County of Los Angeles Department of Parks and Recreation as the South Coast Botanic Garden; 35 acres are operated by the City of Rolling Hills Estates as Ernie Howlett Park; and the remaining 173 acres, referred to as the Main Site, are operated by the Sanitation Districts with limited access to the public (Figure 2).

From the early 1900s until the 1950s, much of the area covered by the PVLf was operated as a diatomite mine. In 1952, Ben K. Kazarian and Sons (BKK) began landfill operations in the area now developed into the South Coast Botanic Garden. In May 1957, the Sanitation Districts acquired the landfill from BKK and assumed landfill operations. The Sanitation Districts expanded the landfill and operated the facility until December 1980 when the landfill reached design capacity. A portion of the facility was permitted to receive hazardous waste and approximately 3 to 4 percent of the waste received at the landfill was considered hazardous. The types of hazardous waste accepted were primarily liquid wastes that included: acid wastes, solvents, alkaline wastes,

tetraethyl lead sludge, chemical toilet wastes, hazardous tank bottoms, contaminated soil and sand, brine, pesticides, and other hazardous wastes (primarily refinery, oil field, and oil terminal wastes) (Sanitation Districts, 1997).

The Sanitation Districts have been performing groundwater monitoring and reporting analytical results since 1964. Groundwater contamination was first discovered in the northern corner of the Main Site in 1984. A remedial investigation and feasibility study (Sanitation Districts, 1995a and 1995b, respectively) were performed and identified affected groundwater onsite and offsite along Hawthorne and Crenshaw Boulevards. The remedial investigation report concluded that the constituents of concern in groundwater were arsenic and landfill-related volatile organic compounds. In an effort to control groundwater contamination, the Sanitation Districts operate groundwater extraction wells and treatment systems to mitigate affected groundwater. Currently, a total of 18 extraction wells have been installed to pump affected groundwater (Figure 3) from the PVLf. Extraction wells E01 through E13, E17, and E18 are part of a subsurface cement-bentonite barrier system installed to control affected groundwater near Hawthorne Boulevard. Extraction wells E14, E15, and E16 were installed to control affected groundwater near Crenshaw Boulevard.

The first Five-Year Review of the remedial actions for the PVLf was completed and approved by DTSC on November 4, 2009. The review found the environmental control systems in place (landfill soil cover, gas collection/control system for surface air and subsurface gas, groundwater containment system, industrial wastewater, and stormwater, etc.) effective and that the site is safe and well maintained. As a result, no additional remedial measures were recommended.

3. FIVE-YEAR REVIEW PROCESS

The second Five-Year Review for the PVLf will be conducted based on the guidelines provided by the USEPA Comprehensive Five-Year Review Guidance, report number EPA 540-R-01-007. The Five-Year Review Inspection Checklist, Content Checklist, and Review Summary Form, as provided in the Comprehensive Five-Year Review Guidance and presented in Appendices A-C, will guide the review process to ensure that all pertinent information is gathered for evaluation.

In accordance with the guidelines, the purpose of this Five-Year Review is to evaluate the implementation and performance of remedial actions at the PVLf in order to determine if the implemented remedy is protective of human health and the environment and whether remedial action objectives are being fulfilled since the first Five-Year Review. This Five-Year Review will include the review of all relevant site O&M data and documents, interviews with site staff, and a thorough inspection of the environmental control systems. The findings and conclusions of the Five-Year Review, including recommendations, follow-up actions to address any issues identified, and protectiveness determinations, will be presented in a report with all data and information necessary to support the findings and conclusions. The draft report for the second Five-Year Review will be submitted to DTSC 90 days from workplan approval.

4. REFERENCE DOCUMENTS

Routine sampling and monitoring data for groundwater, surface air, subsurface gas, stormwater, and industrial wastewater will be compiled for review and reevaluation. These include: groundwater monitoring reports submitted to DTSC, routine reports for surface air and subsurface gas submitted to the South Coast Air Quality Management District; quarterly and annual site inspection reports performed in accordance with the site's Storm Water Pollution Prevention Plan; annual stormwater reports submitted to the Regional Water Quality Control Board; and industrial wastewater monitoring reports submitted in accordance with the Sanitation Districts' discharge requirements will be used to aid the Five-Year Review process by providing a basis for drawing conclusions about the success of the implemented remediation techniques. The Sanitation Districts have most sampling and monitoring data available in electronic format in a database. This database will be queried to extract the pertinent data for this review.

The first Five-Year Review for the PVLFF reviewed monitoring data through December 2006. This second Five-Year review will evaluate all relevant site operation and maintenance information including sampling and monitoring data collected since the last Five-Year review (between January 2007 and December 2013).

5. SUMMARY

The Sanitation Districts have prepared this workplan for the upcoming Five-Year Review that will review and reevaluate the implementation and performance of remedial actions at the PVLFF. Guidance provided by the USEPA in the Five-Year Review's Site Inspection Checklist (Appendix A), Content Checklist (Appendix B), and Review Summary (Appendix C) will be followed to complete the Five-Year Review. The Five-Year Review Report will be submitted to the DTSC 90 days from workplan approval.

6. REFERENCES

Department of Toxic Substances Control, 1998, Operation and Maintenance Agreement, Palos Verdes Landfill Main Site, Rolling Hills Estates, California, December (DTSC, 1998).

Department of Toxic Substances Control, 2009, Palos Verdes Landfill Five-Year Review, November (DTSC, 2009).

U.S. Environmental Protection Agency, 2001, Comprehensive Five-Year Review Guidance, June (USEPA, 2001)

County Sanitation Districts of Los Angeles County, 1997, Operation and Maintenance Plan for Remedial Action, Palos Verdes Landfill, April (Sanitation Districts, 1997).

County Sanitation Districts of Los Angeles County, 1995, Remedial Investigation Report for the Palos Verdes Landfill, June (Sanitation Districts, 1995a).

County Sanitation Districts of Los Angeles County, 1995, Feasibility Study Report for the Palos Verdes Landfill, June (Sanitation Districts, 1995b).

FIGURES



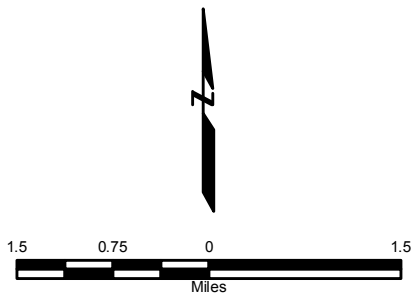
Note: Base map from ESRI Streetmap (2002).

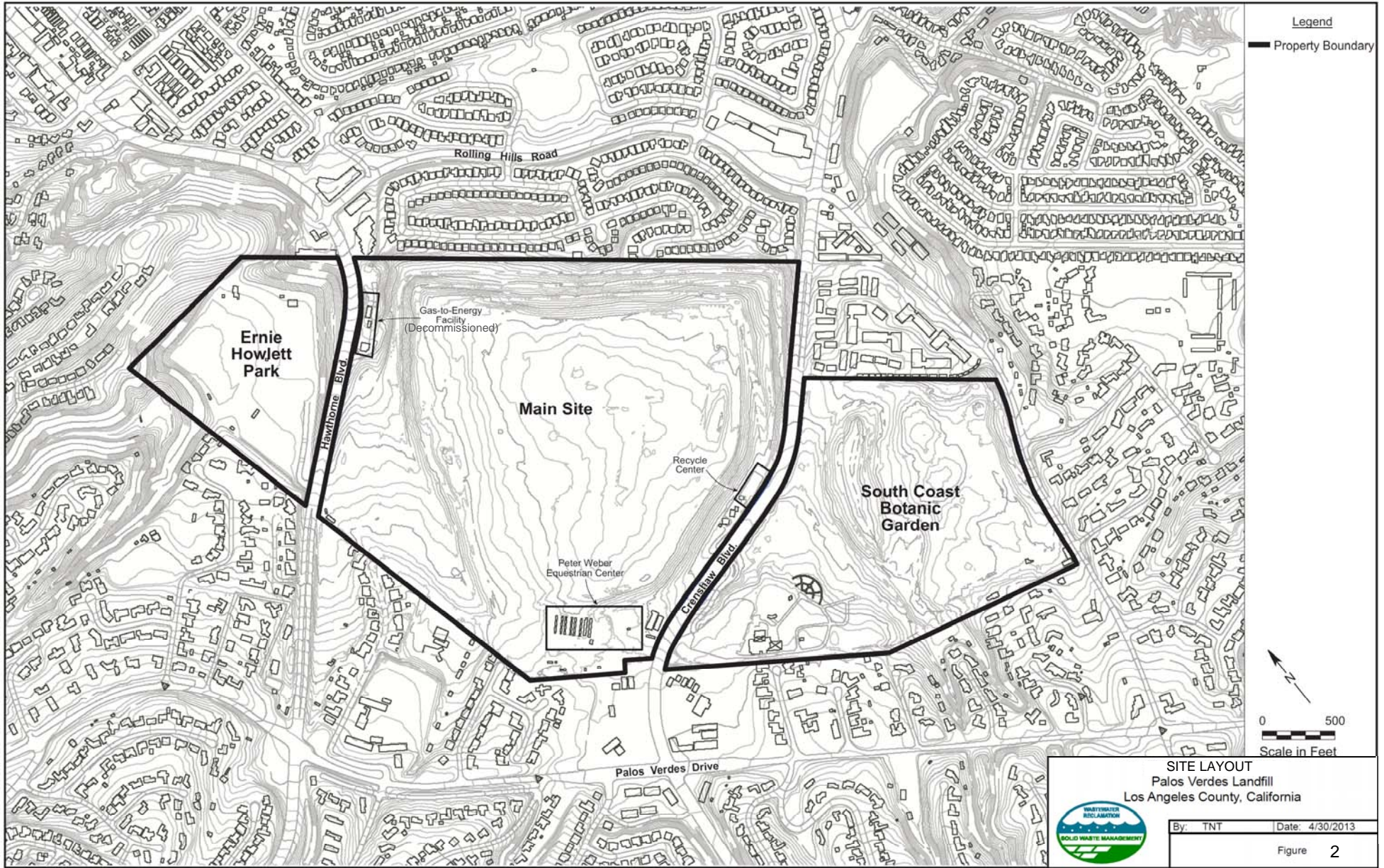
SITE LOCATION MAP
Palos Verdes Landfill
Los Angeles County, California

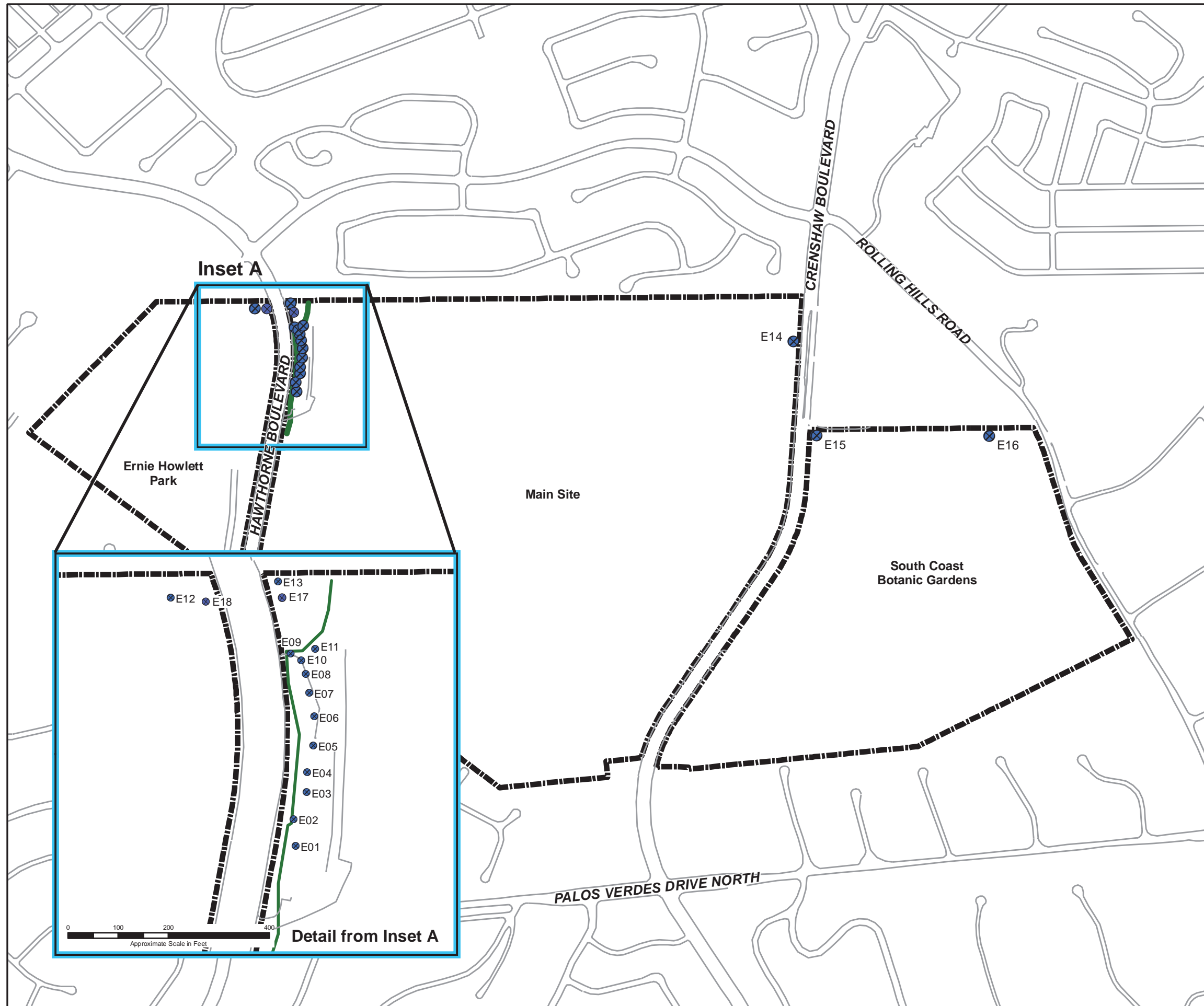


By: TNT	Date: 1/31/2014
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Figure **1**

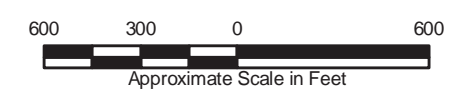






Explanation

-  Extraction well
-  Subsurface barrier
-  Property boundary



Base map provided by County Sanitation Districts of Los Angeles County (2pv100802.dgn).

**LOCATION OF GROUNDWATER EXTRACTION WELLS
Palos Verdes Landfill
Los Angeles County, California**



By: TNT Date: 1/31/2014

APPENDIX A
FIVE-YEAR REVIEW SITE INSPECTION CHECKLIST

Five-Year Review Site Inspection Checklist

Purpose of the Checklist

The site inspection checklist provides a useful method for collecting important information during the site inspection portion of the five-year review. The checklist serves as a reminder of what information should be gathered and provides the means of checking off information obtained and reviewed, or information not available or applicable. The checklist is divided into sections as follows:

- I. Site Information
- II. Interviews
- III. On-site Documents & Records Verified
- IV. O&M Costs
- V. Access and Institutional Controls
- VI. General Site Conditions
- VII. Landfill Covers
- VIII. Vertical Barrier Walls
- IX. Groundwater/Surface Water Remedies
- X. Other Remedies
- XI. Overall Observations

Some data and information identified in the checklist may or may not be available at the site depending on how the site is managed. Sampling results, costs, and maintenance reports may be kept on site or may be kept in the offices of the contractor or at State offices. In cases where the information is not kept at the site, the item should not be checked as “not applicable,” but rather it should be obtained from the office or agency where it is maintained. If this is known in advance, it may be possible to obtain the information before the site inspection.

This checklist was developed by EPA and the U.S. Army Corps of Engineers (USACE). It focuses on the two most common types of remedies that are subject to five-year reviews: landfill covers, and groundwater pump and treat remedies. Sections of the checklist are also provided for some other remedies. The sections on general site conditions would be applicable to a wider variety of remedies. The checklist should be modified to suit your needs when inspecting other types of remedies, as appropriate.

The checklist may be completed and attached to the Five-Year Review report to document site status. Please note that the checklist is not meant to be completely definitive or restrictive; additional information may be supplemented if the reviewer deems necessary. Also note that actual site conditions should be documented with photographs whenever possible.

Using the Checklist for Types of Remedies

The checklist has sections designed to capture information concerning the main types of remedies which are found at sites requiring five-year reviews. These remedies are landfill covers (Section VII of the checklist) and groundwater and surface water remedies (Section IX of the checklist). The primary elements and appurtenances for these remedies are listed in sections which can be checked off as the facility is inspected. The opportunity is also provided to note site conditions, write comments on the facilities, and attach any additional pertinent information. If a site includes remedies beyond these, such as soil vapor extraction or soil landfarming, the information should be gathered in a similar manner and attached to the checklist.

Considering Operation and Maintenance Costs

Unexpectedly widely varying or unexpectedly high O&M costs may be early indicators of remedy problems. For this reason, it is important to obtain a record of the original O&M cost estimate and of annual O&M costs during the years for which costs incurred are available. Section IV of the checklist provides a place for documenting annual costs and for commenting on unanticipated or unusually high O&M costs. A more detailed categorization of costs may be attached to the checklist if available. Examples of categories of O&M costs are listed below.

Operating Labor - This includes all wages, salaries, training, overhead, and fringe benefits associated with the labor needed for operation of the facilities and equipment associated with the remedial actions.

Maintenance Equipment and Materials - This includes the costs for equipment, parts, and other materials required to perform routine maintenance of facilities and equipment associated with a remedial action.

Maintenance Labor - This includes the costs for labor required to perform routine maintenance of facilities and for equipment associated with a remedial action.

Auxiliary Materials and Energy - This includes items such as chemicals and utilities which can include electricity, telephone, natural gas, water, and fuel. Auxiliary materials include other expendable materials such as chemicals used during plant operations.

Purchased Services - This includes items such as sampling costs, laboratory fees, and other professional services for which the need can be predicted.

Administrative Costs - This includes all costs associated with administration of O&M not included under other categories, such as labor overhead.

Insurance, Taxes and Licenses - This includes items such as liability and sudden and accidental insurance, real estate taxes on purchased land or right-of-way, licensing fees for certain technologies, and permit renewal and reporting costs.

Other Costs - This includes all other items which do not fit into any of the above categories.

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Please note that "O&M" is referred to throughout this checklist. At sites where Long-Term Response Actions are in progress, O&M activities may be referred to as "system operations" since these sites are not considered to be in the O&M phase while being remediated under the Superfund program.

Five-Year Review Site Inspection Checklist (Template)

(Working document for site inspection. Information may be completed by hand and attached to the Five-Year Review report as supporting documentation of site status. "N/A" refers to "not applicable.")

I. SITE INFORMATION			
Site name:	Date of inspection:		
Location and Region:	EPA ID:		
Agency, office, or company leading the five-year review:	Weather/temperature:		
Remedy Includes: (Check all that apply) <table style="width: 100%; border: none;"> <tr> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ _____ </td> <td style="width: 50%; vertical-align: top;"> <input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls </td> </tr> </table>		<input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ _____	<input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls
<input type="checkbox"/> Landfill cover/containment <input type="checkbox"/> Access controls <input type="checkbox"/> Institutional controls <input type="checkbox"/> Groundwater pump and treatment <input type="checkbox"/> Surface water collection and treatment <input type="checkbox"/> Other _____ _____	<input type="checkbox"/> Monitored natural attenuation <input type="checkbox"/> Groundwater containment <input type="checkbox"/> Vertical barrier walls		
Attachments: <input type="checkbox"/> Inspection team roster attached <input type="checkbox"/> Site map attached			
II. INTERVIEWS (Check all that apply)			
1. O&M site manager _____ _____ _____ <div style="display: flex; justify-content: space-between; width: 100%;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____ _____			
2. O&M staff _____ _____ _____ <div style="display: flex; justify-content: space-between; width: 100%;"> Name Title Date </div> Interviewed <input type="checkbox"/> at site <input type="checkbox"/> at office <input type="checkbox"/> by phone Phone no. _____ Problems, suggestions; <input type="checkbox"/> Report attached _____ _____			

III. ON-SITE DOCUMENTS & RECORDS VERIFIED (Check all that apply)			
1.	O&M Documents <input type="checkbox"/> O&M manual <input type="checkbox"/> As-built drawings <input type="checkbox"/> Maintenance logs Remarks _____ _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A
2.	Site-Specific Health and Safety Plan <input type="checkbox"/> Contingency plan/emergency response plan Remarks _____ _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> N/A
3.	O&M and OSHA Training Records Remarks _____ _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> N/A
4.	Permits and Service Agreements <input type="checkbox"/> Air discharge permit <input type="checkbox"/> Effluent discharge <input type="checkbox"/> Waste disposal, POTW <input type="checkbox"/> Other permits _____ Remarks _____ _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A <input type="checkbox"/> N/A
5.	Gas Generation Records Remarks _____ _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> N/A
6.	Settlement Monument Records Remarks _____ _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> N/A
7.	Groundwater Monitoring Records Remarks _____ _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> N/A
8.	Leachate Extraction Records Remarks _____ _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> N/A
9.	Discharge Compliance Records <input type="checkbox"/> Air <input type="checkbox"/> Water (effluent) Remarks _____ _____	<input type="checkbox"/> Readily available <input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> Up to date <input type="checkbox"/> N/A <input type="checkbox"/> N/A
10.	Daily Access/Security Logs Remarks _____ _____	<input type="checkbox"/> Readily available	<input type="checkbox"/> Up to date <input type="checkbox"/> N/A

IV. O&M COSTS

1. O&M Organization

- State in-house
- PRP in-house
- Federal Facility in-house
- Other _____
- Contractor for State
- Contractor for PRP
- Contractor for Federal Facility

2. O&M Cost Records

- Readily available
- Up to date
- Funding mechanism/agreement in place
- Original O&M cost estimate _____ Breakdown attached

Total annual cost by year for review period if available

From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	
From _____	To _____	_____	<input type="checkbox"/> Breakdown attached
Date	Date	Total cost	

3. Unanticipated or Unusually High O&M Costs During Review Period

Describe costs and reasons: _____

V. ACCESS AND INSTITUTIONAL CONTROLS Applicable N/A

A. Fencing

- 1. Fencing damaged** Location shown on site map Gates secured N/A
- Remarks _____

B. Other Access Restrictions

- 1. Signs and other security measures** Location shown on site map N/A
- Remarks _____

C. Institutional Controls (ICs)			
1.	Implementation and enforcement		
	Site conditions imply ICs not properly implemented	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Site conditions imply ICs not being fully enforced	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Type of monitoring (e.g., self-reporting, drive by) _____		
	Frequency _____		
	Responsible party/agency _____		
	Contact _____		
	Name	Title	Date
			Phone no.
	Reporting is up-to-date	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Reports are verified by the lead agency	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Specific requirements in deed or decision documents have been met	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Violations have been reported	<input type="checkbox"/> Yes	<input type="checkbox"/> No <input type="checkbox"/> N/A
	Other problems or suggestions: <input type="checkbox"/> Report attached		

2.	Adequacy	<input type="checkbox"/> ICs are adequate	<input type="checkbox"/> ICs are inadequate <input type="checkbox"/> N/A
	Remarks _____		

D. General			
1.	Vandalism/trespassing	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No vandalism evident
	Remarks _____		

2.	Land use changes on site	<input type="checkbox"/> N/A	
	Remarks _____		

3.	Land use changes off site	<input type="checkbox"/> N/A	
	Remarks _____		

VI. GENERAL SITE CONDITIONS			
A. Roads			
	<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A	
1.	Roads damaged	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Roads adequate <input type="checkbox"/> N/A
	Remarks _____		

B. Other Site Conditions

Remarks _____

VII. LANDFILL COVERS Applicable N/A

A. Landfill Surface

1. **Settlement** (Low spots) Location shown on site map Settlement not evident
 Areal extent _____ Depth _____
 Remarks _____

2. **Cracks** Location shown on site map Cracking not evident
 Lengths _____ Widths _____ Depths _____
 Remarks _____

3. **Erosion** Location shown on site map Erosion not evident
 Areal extent _____ Depth _____
 Remarks _____

4. **Holes** Location shown on site map Holes not evident
 Areal extent _____ Depth _____
 Remarks _____

5. **Vegetative Cover** Grass Cover properly established No signs of stress
 Trees/Shrubs (indicate size and locations on a diagram)
 Remarks _____

6. **Alternative Cover (armored rock, concrete, etc.)** N/A
 Remarks _____

7. **Bulges** Location shown on site map Bulges not evident
 Areal extent _____ Height _____
 Remarks _____

8.	Wet Areas/Water Damage <input type="checkbox"/> Wet areas <input type="checkbox"/> Ponding <input type="checkbox"/> Seeps <input type="checkbox"/> Soft subgrade Remarks _____ _____	<input type="checkbox"/> Wet areas/water damage not evident <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Location shown on site map Areal extent _____ <input type="checkbox"/> Location shown on site map Areal extent _____
9.	Slope Instability Areal extent _____ Remarks _____ _____	<input type="checkbox"/> Slides <input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of slope instability
B. Benches <input type="checkbox"/> Applicable <input type="checkbox"/> N/A (Horizontally constructed mounds of earth placed across a steep landfill side slope to interrupt the slope in order to slow down the velocity of surface runoff and intercept and convey the runoff to a lined channel.)		
1.	Flows Bypass Bench Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
2.	Bench Breached Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
3.	Bench Overtopped Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> N/A or okay
C. Letdown Channels <input type="checkbox"/> Applicable <input type="checkbox"/> N/A (Channel lined with erosion control mats, riprap, grout bags, or gabions that descend down the steep side slope of the cover and will allow the runoff water collected by the benches to move off of the landfill cover without creating erosion gullies.)		
1.	Settlement Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of settlement
2.	Material Degradation Material type _____ Areal extent _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of degradation
3.	Erosion Areal extent _____ Depth _____ Remarks _____ _____	<input type="checkbox"/> Location shown on site map <input type="checkbox"/> No evidence of erosion

4.	Undercutting	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> No evidence of undercutting
	Areal extent _____	Depth _____	
	Remarks _____ _____		
5.	Obstructions	Type _____	<input type="checkbox"/> No obstructions
	<input type="checkbox"/> Location shown on site map	Areal extent _____	
	Size _____		
	Remarks _____ _____		
6.	Excessive Vegetative Growth	Type _____	
	<input type="checkbox"/> No evidence of excessive growth		
	<input type="checkbox"/> Vegetation in channels does not obstruct flow		
	<input type="checkbox"/> Location shown on site map	Areal extent _____	
	Remarks _____ _____		
D. Cover Penetrations <input type="checkbox"/> Applicable <input type="checkbox"/> N/A			
1.	Gas Vents	<input type="checkbox"/> Active	<input type="checkbox"/> Passive
	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning	<input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance
	<input type="checkbox"/> N/A		
	Remarks _____ _____		
2.	Gas Monitoring Probes	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks _____ _____		
3.	Monitoring Wells (within surface area of landfill)	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks _____ _____		
4.	Leachate Extraction Wells	<input type="checkbox"/> Properly secured/locked	<input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition
	<input type="checkbox"/> Evidence of leakage at penetration		<input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A
	Remarks _____ _____		
5.	Settlement Monuments	<input type="checkbox"/> Located	<input type="checkbox"/> Routinely surveyed <input type="checkbox"/> N/A
	Remarks _____ _____		

E. Gas Collection and Treatment <input type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	Gas Treatment Facilities <input type="checkbox"/> Flaring <input type="checkbox"/> Thermal destruction <input type="checkbox"/> Collection for reuse <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____	
2.	Gas Collection Wells, Manifolds and Piping <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____	
3.	Gas Monitoring Facilities (<i>e.g.</i> , gas monitoring of adjacent homes or buildings) <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____	
F. Cover Drainage Layer <input type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	Outlet Pipes Inspected <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____ _____	
2.	Outlet Rock Inspected <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____ _____	
G. Detention/Sedimentation Ponds <input type="checkbox"/> Applicable <input type="checkbox"/> N/A		
1.	Siltation Areal extent _____ Depth _____ <input type="checkbox"/> N/A <input type="checkbox"/> Siltation not evident Remarks _____ _____	
2.	Erosion Areal extent _____ Depth _____ <input type="checkbox"/> Erosion not evident Remarks _____ _____	
3.	Outlet Works <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____ _____	
4.	Dam <input type="checkbox"/> Functioning <input type="checkbox"/> N/A Remarks _____ _____	

H. Retaining Walls		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Deformations	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Deformation not evident
	Horizontal displacement_____	Vertical displacement_____	
	Rotational displacement_____		
	Remarks_____		

2.	Degradation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Degradation not evident
	Remarks_____		

I. Perimeter Ditches/Off-Site Discharge		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Siltation	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Siltation not evident
	Areal extent_____	Depth_____	
	Remarks_____		

2.	Vegetative Growth	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> N/A
	<input type="checkbox"/> Vegetation does not impede flow		
	Areal extent_____	Type_____	
	Remarks_____		

3.	Erosion	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Erosion not evident
	Areal extent_____	Depth_____	
	Remarks_____		

4.	Discharge Structure	<input type="checkbox"/> Functioning	<input type="checkbox"/> N/A
	Remarks_____		

VIII. VERTICAL BARRIER WALLS		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Settlement	<input type="checkbox"/> Location shown on site map	<input type="checkbox"/> Settlement not evident
	Areal extent_____	Depth_____	
	Remarks_____		

2.	Performance Monitoring	Type of monitoring_____	
	<input type="checkbox"/> Performance not monitored		
	Frequency_____	<input type="checkbox"/> Evidence of breaching	
	Head differential_____		
	Remarks_____		

IX. GROUNDWATER/SURFACE WATER REMEDIES <input type="checkbox"/> Applicable <input type="checkbox"/> N/A	
A. Groundwater Extraction Wells, Pumps, and Pipelines <input type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Pumps, Wellhead Plumbing, and Electrical <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells properly operating <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____ _____
2.	Extraction System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks _____ _____
B. Surface Water Collection Structures, Pumps, and Pipelines <input type="checkbox"/> Applicable <input type="checkbox"/> N/A	
1.	Collection Structures, Pumps, and Electrical <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
2.	Surface Water Collection System Pipelines, Valves, Valve Boxes, and Other Appurtenances <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____
3.	Spare Parts and Equipment <input type="checkbox"/> Readily available <input type="checkbox"/> Good condition <input type="checkbox"/> Requires upgrade <input type="checkbox"/> Needs to be provided Remarks _____ _____

C. Treatment System		<input type="checkbox"/> Applicable	<input type="checkbox"/> N/A
1.	Treatment Train (Check components that apply) <input type="checkbox"/> Metals removal <input type="checkbox"/> Oil/water separation <input type="checkbox"/> Bioremediation <input type="checkbox"/> Air stripping <input type="checkbox"/> Carbon adsorbers <input type="checkbox"/> Filters _____ <input type="checkbox"/> Additive (e.g., chelation agent, flocculent) _____ <input type="checkbox"/> Others _____ <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> Sampling ports properly marked and functional <input type="checkbox"/> Sampling/maintenance log displayed and up to date <input type="checkbox"/> Equipment properly identified <input type="checkbox"/> Quantity of groundwater treated annually _____ <input type="checkbox"/> Quantity of surface water treated annually _____ Remarks _____ _____		
2.	Electrical Enclosures and Panels (properly rated and functional) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____		
3.	Tanks, Vaults, Storage Vessels <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Proper secondary containment <input type="checkbox"/> Needs Maintenance Remarks _____ _____		
4.	Discharge Structure and Appurtenances <input type="checkbox"/> N/A <input type="checkbox"/> Good condition <input type="checkbox"/> Needs Maintenance Remarks _____ _____		
5.	Treatment Building(s) <input type="checkbox"/> N/A <input type="checkbox"/> Good condition (esp. roof and doorways) <input type="checkbox"/> Needs repair <input type="checkbox"/> Chemicals and equipment properly stored Remarks _____ _____		
6.	Monitoring Wells (pump and treatment remedy) <input type="checkbox"/> Properly secured/locked <input type="checkbox"/> Functioning <input type="checkbox"/> Routinely sampled <input type="checkbox"/> Good condition <input type="checkbox"/> All required wells located <input type="checkbox"/> Needs Maintenance <input type="checkbox"/> N/A Remarks _____ _____		
D. Monitoring Data			
1.	Monitoring Data <input type="checkbox"/> Is routinely submitted on time <input type="checkbox"/> Is of acceptable quality		
2.	Monitoring data suggests: <input type="checkbox"/> Groundwater plume is effectively contained <input type="checkbox"/> Contaminant concentrations are declining		

C. Early Indicators of Potential Remedy Problems

Describe issues and observations such as unexpected changes in the cost or scope of O&M or a high frequency of unscheduled repairs, that suggest that the protectiveness of the remedy may be compromised in the future.

D. Opportunities for Optimization

Describe possible opportunities for optimization in monitoring tasks or the operation of the remedy.

APPENDIX B
FIVE-YEAR REVIEW REPORT CONTENT CHECKLIST

Content Checklist For Five-Year Review Reports

This checklist may be used by you, your managers, etc., to verify that you have included all of the appropriate information in your Five-Year Review report. Depending on site-specific circumstances, some items may not be applicable. For example, a report for a site just beginning construction will generally contain less data than for a site that has reached construction completion.

General Report Format

- Signed concurrence memorandum (as appropriate)
- Title page with signature and date
- Completed five-year review summary form (page E-15)
- List of documents reviewed
- Site maps (as appropriate)
- List of tables and figures
- Interview report (as appropriate)
- Site inspection checklist
- Photos documenting site conditions (as appropriate)

Introduction

- The purpose of the five-year review
- Authority for conducting the five-year review
- Who conducted the five-year review (lead agency) and when
 - Organizations providing analyses in support of the review (*e.g.*, the contractor supporting the lead agency)
 - Other review participants or support agencies
- Review number (*e.g.*, first, second)
- Trigger action and date
- Number, description, and status of all operable units at the site
- If review covers only part of a site, explain approach
 - Define which areas are covered in the five-year review
 - Summarize the status of other areas of the site that are not covered in the present five-year

Site Chronology

- List all important site events and relevant dates (*e.g.*, date of initial discovery of problem, dates of pre-NPL responses, date of NPL listing, etc.)

Background

- General site description (*e.g.*, size, topography, and geology)
- Former, current, and future land use(s) of the site and surrounding areas
- History of contamination
- Initial response (*e.g.*, removals)
- Basis for taking remedial action (*e.g.*, contaminants)

Remedial Actions

- Regulatory actions (*e.g.*, date and description of Records of Decision, Explanations of Significant Difference, Administrative Orders on Consent, Consent Decrees and Action Memorandum)
- Remedial action objectives
- Remedy description
- Remedy implementation (*e.g.*, status, history, enforcement actions, performance)
- Systems operations/Operations & Maintenance
 - Systems operations/O&M requirements
 - Systems operations/O&M operational summary (*e.g.*, history, modifications, problems, and successes)
 - Summary of costs of system operations/O&M effectiveness (*i.e.*, are requirements being met and are activities effective in maintaining the remedy?)

Progress Since Last Five-Year Review (if applicable)

- Protectiveness statements from last review
- Status of recommendations and follow-up actions from last review
- Results of implemented actions, including whether they achieved the intended effect
- Status of any other prior issues

Five-Year Review Process

- Administrative Components
 - Notification of potentially interested parties of initiation of review process
 - Identification of five-year review team members (as appropriate)
 - Outline of components and schedule of your five-year review
- Community Involvement
 - Community notification (prior and post review)
 - Other community involvement activities (*e.g.*, notices, fact sheets, etc., as appropriate)
- Document review
- Data review
- Site inspection
 - Inspection date
 - Inspection participants

Five-Year Review Process, cont'd.

- Site inspection scope and procedures
- Site inspection results, conclusions
- Inspection checklist
- Interviews
 - Interview date(s) and location(s)
 - Interview participants (name, title, etc.)
 - Interview documentation
 - Interview summary

Technical Assessment

- Answer Question A: Is the remedy functioning as intended by the decision documents?
 - remedial action performance (*i.e.*, is the remedy operating as designed?)
 - system operations/O&M
 - cost of system operations/O&M
 - opportunities for optimization
 - early indicators of potential issues
 - implementation of institutional controls and other measures

- Answer Question B: Are the exposure assumptions, toxicity data, cleanup levels, and remedial action objectives (RAOs) used at the time of the remedy selection still valid?
 - changes in standards, newly promulgated standards, TBCs
 - expected progress towards meeting RAOs
 - changes in exposure pathways
 - changes in land use
 - new contaminants and/or contaminant sources
 - remedy byproducts
 - changes in toxicity and other contaminant characteristics
 - risk recalculation/assessment (as applicable)

- Answer Question C: Has any other information come to light that could call into question the protectiveness of the remedy?
 - new or previously unidentified ecological risks
 - natural disaster impacts
 - any other information that could call into question the protectiveness of the remedy
- Technical Assessment Summary

Issues

- Issues identified during the technical assessment and other five-year review activities
- Determination of whether issues affect current or future protectiveness

Issues, cont'd.

- A discussion of unresolved issues raised by support agencies and the community (States, Tribes, other Federal agencies, local governments, citizens, PRPs, other interested parties), if applicable

Recommendations and Follow-up Actions

- Required/suggested improvements to identified issues or to current site operations
- Note parties responsible for actions
- Note agency with oversight authority
- Schedule for completion of actions related to resolution of issues

Protectiveness Statements

- Protective statement(s) for each OU (If the remedy is not protective of human health and/or the environment, have you provided supporting discussion and information in the report to make this determination, such as current threats or level of risk?)
- Comprehensive protectiveness statement covering all of the remedies at the site (if applicable)

Next Review

- Expected date of next review
- If five-year reviews will no longer be done, provide a summary of that portion of the technical analysis presented in the report that provides the rationale for discontinuation of five-year reviews

APPENDIX C
FIVE-YEAR REVIEW SUMMARY FORM

Five-Year Review Summary Form

SITE IDENTIFICATION

Site name (from WasteLAN): _____

EPA ID (from WasteLAN): _____

Region:

State:

City/County: _____

SITE STATUS

NPL status: Final Deleted Other (specify) _____

Remediation status (choose all that apply): Under Construction Operating Complete

Multiple OUs?* YES NO

Construction completion date: ___ / ___ / _____

Has site been put into reuse? YES NO

REVIEW STATUS

Lead agency: EPA State Tribe Other Federal Agency _____

Author name: _____

Author title: _____

Author affiliation: _____

Review period:** ___ / ___ / _____ to ___ / ___ / _____

Date(s) of site inspection: ___ / ___ / _____

Type of review:

- Post-SARA Pre-SARA NPL-Removal only
 Non-NPL Remedial Action Site NPL State/Tribe-lead
 Regional Discretion

Review number: 1 (first) 2 (second) 3 (third) Other (specify) _____

Triggering action:

- Actual RA Onsite Construction at OU # _____ Actual RA Start at OU# _____
 Construction Completion Previous Five-Year Review Report
 Other (specify) _____

Triggering action date (from WasteLAN): ___ / ___ / _____

Due date (five years after triggering action date): ___ / ___ / _____

* ["OU" refers to operable unit.]

** [Review period should correspond to the actual start and end dates of the Five-Year Review in WasteLAN.]

Five-Year Review Summary Form, cont'd.

Issues:

Summarize issues (see Chapter 3).

Recommendations and Follow-up Actions:

Summarize recommendations and follow-up actions (see Chapter 3).

Protectiveness Statement(s):

Include individual operable unit protectiveness statements. For sites that have reached construction completion and have more than one OU, include an additional and comprehensive protectiveness statement covering all of the remedies at the site (see Chapter 4).

Other Comments:

Make any other comments here.