

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD  
SAN DIEGO REGION

DRAFT INFORMATION SHEET  
FOR  
TENTATIVE WASTE DISCHARGE REQUIREMENTS  
ORDER NO. R9-2010-0004  
UNITED STATES MARINE CORPS  
MARINE CORPS BASE CAMP PENDLETON  
LAS PULGAS LANDFILL  
SAN DIEGO COUNTY

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## INTRODUCTION

The purpose of this Information Sheet is to summarize the information and technical analyses relied upon by the California Regional Water Quality Control Board, San Diego Region (San Diego Water Board) in developing the findings and discharge specifications in Tentative Order No. R9-2010-0004, *Waste Discharger Requirements for the Las Pulgas Landfill, United States Marine Corps, Marine Corps Base Camp Pendleton, San Diego County*.

This information sheet contains background information regarding significant changes to existing waste discharge requirements (WDRs), including construction requirements, slope stability, and corrective action. The Information Sheet also provides the justification for the enhancement of monitoring specifications to comply with corrective action and detection monitoring requirements in both State and federal regulations. The information in this document is too lengthy to reasonably present in the WDRs and the monitoring and reporting program (M&RP).

## BACKGROUND

The Las Pulgas Landfill is a municipal solid waste (MSW) landfill (Class III waste management unit). The facility is subject to both State and federal requirements regulating municipal solid waste (MSW) landfills.<sup>1</sup> The State Water Resources Control Board (State Water Board) adopted Resolution No. 93-62 in 1993, which requires waste discharge requirements (WDRs) for discharges at MSW landfills to apply both the California Code of Regulations (CCR) Chapter 15 (now CCR Title 27) and those applicable provisions of the federal MSW regulations that are necessary to protect water quality. As the agency responsible for implementing State Water Board Resolution 93-62, San Diego Water Board incorporates the existing State and federal requirements into new WDRs to ensure compliance with all applicable regulations.

On May 10, 2000 the San Diego Water Board adopted Order No. 2000-54, *Waste Discharge Requirements for the United States Marine Corps, Marine Corps Base Camp Pendleton, Las Pulgas Landfill, San Diego County*." Order No. 2000-54 incorporated both State and federal regulations and approved a 49.3-acre lateral expansion of the Landfill footprint. After failure of the existing composite liner system in the Phase 1 Unit, the Order was amended to revise composite liner and construction quality assurance (CQA) requirements (Addendum No. 1) on May 9, 2007.

The Basin Plan has established the following beneficial uses for groundwater and surface water in the San Onofre Hydrologic Area in which the Landfill is located:

<b>Beneficial Uses</b>	<b>Groundwater (Las Pulgas HAS)</b>	<b>Surface Water (Las Flores Creek)</b>
Municipal and Domestic Supply	X	
Agricultural Supply	X	X

<sup>1</sup> MSW Landfills in California are subject to State regulations under California Code of Regulations (CCR) Title 27, and federal regulations under Code of Federal Regulations (CFR) Title 40.

Contact Water Recreation		X
Non-contact Water Recreation		X
Warm Freshwater Habitat		X
Cold Freshwater Habitat		X
Wildlife Habitat		X
Rare, Threatened, or Endangered Species		X

Past discharges of solid wastes into the unlined portion of the Las Pulgas Landfill have resulted in the release of waste constituents from the Landfill, creating a condition of pollution in groundwater resources located within the San Onofre Hydrologic subarea. The U.S. Marine Corps (USMC) reported that groundwater resources underlying the Las Pulgas Landfill contain the following categories of waste constituents: a total of 20 volatile organic constituents (VOCs), 12 semi-volatile organic constituents, 3 total petroleum hydrocarbons, 1 pesticide, and 24 inorganic compounds (24 metals and cyanide). The nature and extent of groundwater pollution is documented in the USMC's Remedial Investigation and Feasibility Study (RI/FS) report for Operable Unit No. 2 (dated September 23, 1996). The RI/FS further reports the following constituents were detected at concentrations exceeding applicable groundwater quality objectives:

Constituent of Concern	Water Quality Objectives ( $\mu\text{g/l}$ )
1,2 Dichloroethane	0.5
1,2 Dichloroethene	0.5
Benzene <sup>1</sup>	1
Carbon Tetrachloride	0.5
Vinyl Chloride <sup>1</sup>	0.5
Methylene Chloride	76
Tetrachloroethene	5
1,4 Dichlorobenzene	5

<sup>1</sup> the U.S. Environmental Protection Agency (USEPA) classifies benzene and vinyl chloride as known human carcinogens.

Twelve of the 25 inorganic constituents detected in groundwater monitoring samples from the Las Pulgas Landfill were determined to contain concentrations that were evaluated to be statistically elevated compared to background concentrations. The inorganic constituents with elevated concentrations included: aluminum, arsenic, beryllium, cadmium, chromium, copper, cyanide, mercury, molybdenum, silver, thallium, and zinc.

Based upon groundwater monitoring results reported to the San Diego Water Board in 2009, concentrations of VOCs and certain inorganic constituents in groundwater continue to exceed applicable water quality objectives in some downgradient monitoring wells:

<b>Constituent of Concern</b>	<b>Monitoring Well Number</b>
1,4-Dichlorobenzene	8W-14B, 8W-17A
Total Dissolved Solids (TDS)	8W-06A, 8W-14B
Sulfate	8W-14B, 8W-17A, MW-2
Chloride	8W-17A

Concentrations of VOCs in groundwater exceed the water quality objectives needed to support the beneficial uses of groundwater in the San Onofre Hydrologic subarea. To date, there is no indication that surface waters within the vicinity of the Landfill have been adversely impacted by the unauthorized release of waste constituents to groundwater.

Tentative Order No. R9-2010-0004 contains both State and federal MSW landfill requirements. If adopted, tentative Order No. R9-2010-0004 will supersede Order No. 2000-54 and revise waste discharge requirements for the Las Pulgas Landfill.

1. **LANDFILL EXPANSION (see Finding Nos. 10 and 11, Landfill Construction Specifications E.6, and Reporting Requirements H.3).** In 1998 the USMC proposed a 49.3 acre lateral expansion of the Las Pulgas Landfill, to be completed in six phases. Phase I of the expansion was completed in 1999 and constructed with an engineered alternative liner design. Due to problems associated with the construction of Phase I (see Enforcement Actions below), WDR Order No. R9-2010-0004 requires the remaining phases to be constructed with a prescriptive liner design.

Order No. R9-2010-0004 establishes construction and design requirements that are specific to Phase II of the expansion project. For each new proposed phase of expansion, the USMC is required to provide the San Diego Water Board with a preliminary design report which provides the engineering design plan and specifications for the new phase. If the proposed design for a new phase differs from the specifications found acceptable for Phase II, then Order No. R9-2010-0004 will be modified to incorporate the changes.

2. **ENFORCEMENT ACTIONS (see Finding No. 21).** Since the adoption of waste discharge requirements (WDRs) Order No. 2000-54 in May 2000, the USMC has disposed of municipal solid waste into a lined expansion area (Phase 1) of the Las Pulgas Landfill. Phase 1 of the expansion project was completed in 1999 and constructed with an engineered alternative to the prescriptive standards for liner design. In April 2003, the San Diego Water Board observed conditions within the Phase 1 expansion area that indicated a problem with the liner system. Further site investigations conducted by the USMC confirmed defects in the composite liner system and faulty construction, and the USMC voluntarily shut down operations within Phase 1 in July 2003.

The San Diego Water Board issued Cleanup and Abatement Order No. R9-2006-0016, in January 2006, to the USMC for the development of a Corrective Action Plan for the Phase 1 expansion area. In March 2008 the San Diego Water Board concurred with the proposed Corrective Action Plan which includes the removal of waste from Phase 1, the destruction of the side-slope liner system, and an evaluation of the basal liner system to determine whether it is salvageable or needs to be replaced. As part of the Corrective Action Plan, the San Diego Water Board agreed that the USMC could delay the implementation of the Corrective Action Plan until the Phase 2 expansion area had been constructed. Thus, upon completion of Phase 2 construction activities, the USMC will implement the Corrective Action Plan for Phase 1.

Problems associated with the liner construction also resulted in the San Diego Water Board amending WDR Order No. 2000-54 to require that all subsequent phases of expansion be constructed using the prescriptive liner design outlined in CCR Title 27, or a design that demonstrates it is more conservative than the prescriptive design. The December 2008 JTD provided an update of site conditions, and the design plan for the Phase 2 expansion area. The Phase II excavation area will cover approximately 17.6 acres, of which 12.3 acres will be lined. The Phase 2 liner design meets the performance standards of CCR Title 27 for a prescriptive design. Each subsequent expansion area, including the re-construction of Phase 1, will require an update to the JTD and a design report specific to that expansion area.

3. **CALIFORNIA ENVIRONMENTAL QUALITY ACT (see Finding No. 22).** In December 1997 Marine Corps Base Camp Pendleton prepared an Environmental Assessment (EA) pursuant to the requirements of the National Environmental Policy Act (42 U.S.C. section 4321 *et seq.*). The EA and Finding of No Significant Impact (FONSI) were submitted to the State Clearinghouse and Planning Unit of the Governor's Office of Planning and Research in accordance with California Environmental Quality Act (CEQA) guidelines. The EA and FONSI were not challenged during the public review period by the San Diego Water Board, the public or other interested parties, prior to the adoption of Order No. 2000-54 on May 10, 2000.
4. **LANDFILL GASES (see Landfill Operation Specifications D.1).** The Las Pulgas Landfill does not currently have a landfill gas extraction system. However, in accordance with CCR Title 27, sections 20917 through 20939, the USMC is required to construct a series of landfill gas monitoring probes at 1,000 foot intervals around the perimeter of the Las Pulgas Landfill footprint during the construction of the Phase II expansion area of the Landfill.

Surface emission monitoring at the Landfill has been performed since October 1998. Consistent with CCR Title 27, sections 20919 and 20919.5, methane monitoring at the perimeter boundary, within facility structures, and on the

surface of the Landfill is conducted quarterly and reported to the San Diego County Local Enforcement Agency (LEA).

CCR Title 27 was revised to include landfill gas monitoring and control regulations for active landfills [CCR Title 27, section 20917-20939] in September 2007. As part of the new regulations, dischargers are required to submit a Landfill Gas Program Plan, demonstrating compliance with the new monitoring criteria, to be approved by the California Department of Resources Recycling and Recovery<sup>2</sup> (CalRecycle).

The USMC submitted a report to the LEA entitled, "Final Work Plan: Methane Perimeter Monitoring Network at Las Pulgas Landfill" on June 3, 2009. This report describes the proposed activities for design, construction, and monitoring of ten new perimeter landfill gas probes at the Las Pulgas Landfill. On June 30, 2009 the LEA approved the plan and subsequently submitted its recommendations to the CalRecycle for concurrence. By letter dated July 14, 2009 the CalRecycle concurred with the LEA's approval of the plan, allowing the USMC to move forward with implementation of the work plan and the installation of the landfill gas monitoring network. The LEA will provide oversight of the landfill gas monitoring program at the Landfill as required by CCR Title 27.

5. **SLOPE STABILITY (see Construction Specification E.4).** CCR Title 27, section 21750(f)(5) requires dischargers who are proposing to construct a lined landfill to complete a slope stability analysis to ensure the integrity of the landfill, including the foundation, final slopes, and containment structures under both static and seismic (earthquake) conditions, for the life of the landfill. The analysis must include the strength parameters used in the analysis, a discussion of the method of analysis for calculating the factor of safety (1.5 or greater), the expected peak ground acceleration associated with the maximum credible earthquake (MCE) or maximum probable earthquake (MPE) (for the active fault in closest proximity to the facility), and a description of the assumptions used in the analysis (i.e., height of fill, slope-and-bench configuration, etc). The analysis must identify the critical slope, anticipated and critical failure surfaces, the calculations used to identify the critical slope and failure surface, and how the strength parameters used in the analysis were derived (i.e., published data, or field or lab testing of site-specific samples).

A slope stability analysis takes into account site-specific characteristics and conditions, and incorporates that information into a computer model which predicts the shaking and ground movement expected to occur at the facility during an MCE or MPE. The model is chosen based upon site conditions and characteristics, and runs a series of calculations to produce a factor of safety based on the ratio of the driving forces to the resisting forces on a slope subject to seismic loading. CCR Title 27, section 21750(f)(5)(C) requires the slopes to

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<sup>2</sup> Previously known as the California Integrated Waste Management Board

meet a factor of safety of at least 1.5 under seismic conditions. If a dynamic factor of safety of 1.5 cannot be achieved, the USMC can utilize a more rigorous analysis which calculates the permanent displacement, or movement that would be associated with an MCE or MPE on the nearest active fault. The standard of practice for the State of California is that the permanent displacement for a liner system cannot exceed six inches.

The San Diego Water Board typically requires an analysis using the most conservative parameters available. In this case, the USMC was required to complete the analysis using parameters that include a cohesion value of zero for the side slopes, the yield (residual) acceleration,<sup>3</sup> and saturated conditions.

As part of the Joint Technical Document (JTD), the USMC submitted a report entitled "*Las Pulgas Landfill, Phase II Composite Liner System Design Report.*" This report contains information specific to the development of Phase II, including erosion and drainage controls, liner and leachate collection system designs, subdrain design, and a geotechnical analysis evaluating the stability of temporary and final slope designs under both static and seismic loading conditions. The strength parameters and peak acceleration used in the analysis are provided in **Attachment No. 1** to this Information Sheet.

The static factor of safety was calculated using Spencer's limit equilibrium method, a method considered appropriate by both the San Diego Water Board and the consultants at KLM (Certified Engineering Geologists) performing the analysis, and acceptable for the conditions at the Las Pulgas Landfill. This analysis takes into account the various orientations of potential failure surfaces occurring in non-homogeneous materials. This analysis yielded factors of safety along critical cross sections of 3.165 and higher.

For the seismic stability analysis, a seismic coefficient for an MPE event was calculated for the Holocene age Newport-Inglewood Offshore Fault, the closest active fault in proximity to the Las Pulgas Landfill. The analysis was performed for critical cross sections of cut slopes that will be temporarily exposed prior to placement of waste, as well as for slopes temporarily exposed during the placement of waste. For this analysis the USMC performed an analysis consistent with the Division of Mines and Geology (DMG) Special Publication 117 (2002), "Guidelines For Analyzing and Mitigating Landslide Hazards in California." A site-specific seismic coefficient was calculated based upon the Guidelines, which is an estimation of the yield (residual) acceleration expected to conservatively result in a given displacement of 6 inches, when the factor of safety is 1.5. The analysis completed for the Las Pulgas Landfill achieved a factor of safety of at least 1.5 for each cross section and thus, a permanent deformation/displacement analysis was not required.

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<sup>3</sup> The yield (residual) acceleration is the minimum seismic acceleration needed to produce instability within the soil mass or liner system under specific conditions.

6. **Justification for Corrective Action Monitoring.** CCR Title 27, section 20385 requires dischargers to institute an evaluation monitoring program in accordance with the requirements set forth in CCR Title 27, section 20425, whenever there is measurably significant evidence that a release has occurred at a site. When this Site was regulated under the Installation Restoration (IR) Program (1980s and 1990s), the USMC completed a series of investigations specific to the release from the Landfill. These investigations included a delineation of the nature and extent of the release, both vertically and horizontally, completion of a Feasibility Study, and the proposal of several corrective action measures for the Landfill. Prior to corrective actions being initiated at the Site, the Las Pulgas Landfill was removed from the IR Program and from then on has been regulated under the solid waste regulations found in Title 27. After a thorough review of the investigations and studies completed under the IR program, the San Diego Water Board found that the steps taken during the investigation closely paralleled the steps required under Title 27, and thus, the USMC had satisfied the requirements for an Evaluation Monitoring Program.

CCR Title 27, section 20385(a)(4) requires a discharger to implement a corrective action monitoring program in accordance with the requirements set forth in CCR Title 27, section 20430, once the San Diego Water Board determines that an assessment of the nature and extent of the release and the design of a Corrective Action Program have been satisfied. In 1987 and 1989 the USMC conducted a Solid Waste Assessment Test (SWAT) investigation which indicated that waste constituents were present in the alluvial and bedrock aquifers beneath the Las Pulgas Landfill. The presence of these constituents in groundwater established the need for the USMC to complete the requirements for an Evaluation Monitoring Program [CCR Title 27, section 20385(a)(4)] and subsequently to implement the requirements of a Corrective Action Monitoring Program [CCR Title 27, section 20430]. Based on the information provided in previous reports (see Basis for Finding No. 5 below), the USMC has satisfied the requirements of CCR Title 27, section 20385(a)(4) by delineating the nature and extent of the release, completing a feasibility study, and proposing corrective action alternatives for the Las Pulgas Landfill.

Similar to the requirements in CCR Title 27, the federal regulation in 40 CFR Part 258.55 requires the discharger to delineate the nature and extent of the release and propose corrective action measures to remediate groundwater contamination at the Site. The presence of waste constituents in groundwater established the need for the USMC to complete the requirements for an Assessment Monitoring Program (40 CFR, Part 258.55) including the assessment of corrective action measures and the selection of a remedy.

During a site investigation conducted between 1987 and 1989, contaminants were discovered in both the alluvial and bedrock aquifer downgradient of the Landfill. Investigations of conditions at the Las Pulgas Landfill were conducted

under the Installation Restoration Program, following procedures required by the Comprehensive Environmental Responses, Compensation and Liability Act (CERCLA), between 1989 and 1996. In response to the release, the USMC conducted a Remedial Investigation (RI)<sup>4</sup> in three phases to evaluate the extent of groundwater contamination. As a result of the investigation, the USMC implemented a Corrective Action Monitoring Program and implemented the preferred corrective action alternative of monitored natural attenuation.<sup>5</sup>

Between 1992 and 1995 the USMC conducted a Remedial Investigation in three-phases to determine the nature and extent of groundwater contamination downgradient of the Landfill. During these investigations, additional groundwater wells were installed and sampled to verify the vertical and lateral extent of contamination. The results of these investigations were presented with a Feasibility Study, presenting potential corrective action measures for the remediation of contaminated groundwater at the Las Pulgas Landfill.

In 1996 the Federal Facilities Agreement (FFA) Team<sup>6</sup> determined that regulating an active landfill facility under the CERCLA program was inappropriate. The Las Pulgas Landfill was removed from the CERCLA program in 1997, and placed into the Land Disposal Program where it is regulated by the San Diego Water Board and CalRecycle.

Although the investigation and delineation of the release, and development of corrective measures/remedial actions occurred while the Las Pulgas Landfill was regulated under the CERCLA program; the investigation progress and evaluation of corrective action measures parallel the steps required by CCR Title 27, section 20425 and 40 CFR Part 258.55.

The USMC proposed monitored natural attenuation as the preferred corrective action measure for the Las Pulgas Landfill and implemented a Corrective Action Monitoring Program in 1997. The USMC has been monitoring waste constituents and their attenuation through natural processes since 1996. VOCs continue to be detected in groundwater samples collected from several downgradient groundwater monitoring wells. Concentrations of the detected VOCs are generally stable to decreasing, indicating that monitored natural attenuation is effective.

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<sup>4</sup> IT Corporation, 1996, "Marine Corps Base Camp Pendleton, Remedial Investigation and Feasibility Study for Operable Unit 2: Site 8 and 22/23 Area Sites." Dated September 23, 1996.

<sup>5</sup> Camp Pendleton Marine Corps Base, EPA ID: CA2170023533, "Record of Decision, Operable Unit 02, Camp Pendleton, CA", dated September 30, 1997.

<sup>6</sup> The Federal Facilities Agreement (FFA) Team consists of representatives of the USMC, Naval Facilities Engineering Command, US Environmental Protection Agency, Department of Toxic Substances Control and San Diego Water Board, who jointly oversee all environmental activities conducted under the Installation Restoration Program at Camp Pendleton.

7. **Justification for Intrawell Analysis:** The M&RP implements the provisions for statistical analysis of groundwater monitoring data found in CCR Title 27, sections 20415(e)(7) through 20415(e)(12), and section 20420(f); and 40 CFR, Parts 258.53 and 258.54. This finding is also based on literature provided to the San Diego Water Board by the State Water Board on intra-well groundwater monitoring statistics (Horsey, Carosone-Link, Sullivan and Loftis, Intelligent Decision Technologies).<sup>7</sup>

Groundwater concentrations for a given constituent may vary greatly from one well to another, but may not be indicative of a release at the Site. Under such conditions, when data from background wells are used for comparison against downgradient well data, this (1) increases the chance that Detection Mode monitoring will fail to recognize an actual release of waste constituents from the Landfill, and (2) increases the rate at which false-positive indications of a release may occur. In order to distinguish between spatial/temporal variability in water quality and an actual release from the Site, and to eliminate any adverse effects of geographic variation, the intra-well analysis must be used at all background and monitoring points to analyze each of the monitoring parameters listed in the Order. The intra-well analysis must be used to compare the results of the current monitoring data of a given monitoring parameter, with the results of at least the previous 16 sampling events (*i.e.*, 8 years at a semi-annual monitoring frequency), for the specific monitoring parameter in the affected well. Using this approach allows the USMC to establish site-specific background concentration levels, and allows the San Diego Water Board to determine whether a measurably significant increase in the concentration of a particular constituent has occurred in a given well.

The application of intra-well statistical methods for detection monitoring and corrective action monitoring have been adopted and successfully implemented in other monitoring and reporting programs for landfills within the San Diego Region, as well as other Regions within the State.

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<sup>7</sup> Horsey, Carosone-Link, Sullivan and Loftis, Intelligent Decision Technologies, 1996. "The effectiveness of intrawell groundwater monitoring statistics at older Subtitle D facilities", Waste Age Journal, Volume 27, Journal Issue 3.