

**STATE OF CALIFORNIA
REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL COAST REGION**

STAFF REPORT FOR REGULAR MEETING OF DECEMBER 7, 2007

Prepared on November 14, 2007

ITEM NUMBER: 19

SUBJECT: Landfill Program Update

SUMMARY:

This status report provides a Land Disposal program update including a program overview, staffing, priorities, fiscal year 2006-2007 achievements, and brief summaries for selected landfills from throughout the region.

DISCUSSION:

Program Overview: Land Disposal Unit staff oversee approximately 100 landfills throughout the region, of which 58 are covered by either individual (35 sites) or general (23 sites) waste discharge requirements (WDRs). Of the 35 facilities covered under individual WDRs, there are 16 active landfill sites. These disposal sites range in size from active, hundred acre, multi-cell, state-of-the-art facilities (Monterey Peninsula and Cold Canyon) to small, unpermitted one- to two-acre closed sites (Creston and Van Gordon).

The overall trend in landfilling during the last fifteen years has been towards larger, regional facilities (Tajiguas, Monterey Peninsula, Johnson Canyon, Las Flores, etc.) and away from smaller landfills. As such, a number of smaller sites have moved through closure/final cover installation and are now in the post-closure, maintenance and monitoring phase. Examples of these smaller site closures include landfills at Foxen Canyon, New Cuyama, and Jolon Road.

This shift to larger regional sites reflects promulgation of revised regulations at the state (Chapter 15 of Title 23, pre-Title 27) and federal (Subtitle D) level in the early 1990s. New state and federal landfill regulations required low-permeability liner and leachate collection systems for all new landfill cells. These more protective landfill regulations were borne out of studies, including California's Solid Waste Assessment Test (SWAT) program, which indicated a very high correlation between unlined landfills and groundwater impacts. Greater than 90 percent of the unlined landfills in this region have impacted groundwater, and as a result are in some form of corrective action to address these discharges.

Program Staffing: Funding for program staff comes from two sources. Active landfills pay a portion of tipping fees into an account administered by the Integrated Waste Management Board. The State and Regional Board system receive a portion of these fees to oversee regulatory compliance at active landfill sites. Closed landfills pay fees annually, associated with their WDRs.

The State Water Board provides funding for approximately 2.6 staff to oversee the land disposal program in this region. In contrast, the State Water Board provided funding for approximately 5.0 staff for this region in 2000. This reduction in resources reflects declining tipping fees from active landfills, although this region received a disproportionately large reduction in personnel authority relative to other regions.

In 2001, we re-organized a land disposal unit within the office. Previously, landfill permitting work had been performed by area engineers in watershed-based groups within the office. The intent behind this reorganization was to create positions that allowed specialized staff to focus more exclusively on unique types of landfill issues (e.g., slope stability, liner design, waste acceptance, etc.). This re-organization also provided better consistency on technical issues for landfills in the region.

The Land Disposal unit consists of Dean Thomas and Martin Fletcher, who work exclusively on landfill issues, and Dan Niles who dedicates approximately 30 percent of his time to landfill sites. Burton Chadwick is transitioning into the Land Disposal program supervision responsibilities (accounting for about 30 percent of his time), assuming that role from John Robertson.

Program Priorities: Since reorganizing as the Land Disposal unit in 2001, we prioritized the sites posing the greatest threat to water quality. These threats generally take the form of landfill gas and leachate and are almost exclusively directed toward groundwater. The sites posing the greatest risk are older, unlined landfills with poor underlying geologic conditions. Since 2001, the Regional Water Board has required closure at two sites, Santa Maria (in 2002) and Crazy Horse (pending in 2009) through the adoption of revised WDRs. These are both large, predominantly unlined facilities sited over very permeable materials. In this sense closure means that these sites will no longer receive waste, and will construct a final cover system over the existing refuse. We will continue to direct facilities toward landfilling on liner systems appropriate for the geologic conditions beneath their sites.

Other program priorities include:

- Emphasis on a field inspection presence during liner and final cover construction projects at any facility in the region. These construction projects provide the means for containment of wastes, leachate, and landfill gas. We also evaluate liner design, liner component selections, slope stability, and construction specifications associated with each landfill expansion or final cover project – on average we receive about six joint technical documents with expansion/cover plans per year.
- Requirements that all bottom liner systems are designed to accommodate anticipated settlement and displacement in the subgrade. This is usually achieved through an engineered alternative design that includes a compacted clay component (typically one-foot thick or more).
- Wet weather preparedness for all sites in advance of each rainy season. Most landfill problems associated with water quality manifest during the rainy season (e.g., leachate generation, ponding on the cover, runoff, erosion, etc.). We send out an annual letter to all of our sites prior to the rainy season, addressing areas of concern we will focus on during ensuing pre-wet weather inspections.
- Groundwater trend evaluation for organic and inorganic compounds. We evaluate monitoring data to determine if impacts from lined or unlined landfill cells exist. Lately, we have been evaluating several more subtle impacts associated with inorganic discharges to groundwater (i.e., Santa Maria landfill and manganese). As we determine a facility has a discharge to groundwater, we initiate the evaluation and corrective action processes, consistent with Title 27 requirements.

Our work products far exceed this short list of priorities, and as such, we will continue to evaluate and redefine, as needed, the most important work we do in the Land Disposal unit.

Fiscal Year 2006-2007 Achievements: In the 2006-2007 fiscal year, the Landfill unit completed updates for four WDRs (Crazy Horse, Jolon Road, Los Osos, and Foxen Canyon). The Crazy Horse update requires closure of the facility no later than 2009. The Jolon Road and Foxen Canyon

updates specified final cover system and post-closure monitoring requirements for these newly closed facilities.

Consistent with the priorities listed above, during the preceding fiscal year, we monitored liner or final cover construction projects at Santa Maria, Jolon Road, Foxen Canyon, Tajiguas, John Smith Road, Monterey Peninsula, and Rancho Los Lobos. This field presence helps assure that construction adheres to design, waste discharge, and regulatory requirements.

Summaries for Selected Landfills:

City of Lompoc Landfill; Santa Barbara County

Acreage: 115
Life Span: 43 years
Corrective Actions: None

The City of Lompoc owns and operates a 115-acre facility, sited in 1961, and located in a canyon site on the south side of the Santa Ynez River valley, west of Lompoc. WDRs were last revised in 2003.

Waste disposal occurs over a 40-acre unlined area and the City of Lompoc Landfill has an estimated 43 years of remaining capacity. Although the landfill is unlined, the geologic characterization of underlying soil is more favorable than most landfill sites due to the amount of fine-grained silt and clay. The yearly wet weather intermediate cover also consists of the relatively low permeability soil found onsite, which is compacted and graded to promote runoff and reduce percolation of water into the landfill. City staff has prioritized operations and efforts to reduce the amount of water percolating into the landfill.

The City installed a landfill gas collection system in 1986; it was removed in 1992 due to a low volume of methane gas being collected, which may indicate that the waste mass is not generating significant amounts of leachate and/or landfill gas.

Santa Maria Landfill, City of Santa Maria, Santa Barbara County

Acreage: 290 acres
Life Span: 10 years with optional Cell No. 2; 6 years without
Corrective Actions: Enhanced landfill gas extraction; forced closure

The 290-acre site is located along the southern margin of the Santa Maria River, directly behind a Corps of Engineer-built levee that bounds the river's margin. The landfill is divided into three basic areas: the Inactive Area, Closed Active Area, and the Lined Area. The 68-acre Inactive Area was a burn dump until it was closed in the 1960s and currently has a soil cover ranging in thickness from 3 to 10 feet. The 118-acre Closed Active Area was landfilled using trench and fill followed by area fill methods. There is no bottom liner or leachate collection system between municipal solid waste (MSW) and underlying river sediments, resulting in the periodic contact between groundwater and waste during high groundwater elevations, which occur during wetter periods (last relatively high elevation occurred in 1998). The area received waste from the late 1960s until late 2002. Approximately 66 acres of the northwest portion of this area have received a final cover, with the remaining 52 acres awaiting foundation layer soil to bring the landfill slopes to final grade. Nonhazardous hydrocarbon impacted soils (NHIS) are used as foundation layer for the final cover, and are necessary to provide proper crowning and drainage. The Lined Area consists of two cells

totaling 61 acres. Cell No. 1 has been active since December 2002 and covers 36 acres; unconstructed Cell No. 2 covers 25 acres. The design of the cells in the Lined Area includes a double-liner system, complete with an under drain for shallow groundwater, a leak detection system, and geocomposite clay liner at the base of the leachate collection and removal system. The City plans to move MSW operations to a new location (the proposed Las Flores landfill) before capacity in Cell No. 1 is exhausted.

As discussed in the October 19, 2007 Water Board meeting, the Army Corps of Engineer's (COE) levee was designed to contain a 500-year flood event; however, in early 2007, the COE downgraded the protection provided by the levee to below 100-year flood event, causing the preliminary revised flood maps from the Federal Emergency Management Agency (FEMA) to place the landfill area within the 100-year flood zone. This potentially places the landfill in conflict with state and federal landfill regulations. By January 2008, the City is required to submit a report evaluating the susceptibility of the landfill to such a flood, along with proposed protection measures, if necessary. The City is actively working with COE to improve drainage in the river and stockpile rip rap in preparation for the 2007/2008 wet season.

Groundwater impacts are associated with the Closed Active Area, including low-level volatile organic compounds and inorganic constituents such as manganese. As part of the groundwater corrective action, the Water Board forced cessation of MSW disposal in the area in 2002, and the City implemented an incremental (rolling) cover program. The City also enhanced the landfill gas extraction system. These actions have been effective in reducing the VOC impacts to below Maximum Contaminant Levels (MCLs), although cleaning up the inorganic constituents is progressing more slowly. For this reason, staff added a provision in WDR Order No.R3-2007-0045 requiring the City to evaluate the source and fate and transport mechanisms for the inorganic constituents by early 2008. Staff may recommend additional remedial action, depending on the results of the evaluation. However, cursory analysis by staff indicates that the inorganic concentrations improve in monitoring wells adjacent to areas that have received the final cover. In 2006, the City covered a large portion of the Closed Active Area with the NHIS bottom liner system, resulting in all but 15% of the Closed Active Area being covered by final cover or bottom liner. Staff expects significant reductions in inorganic concentrations as a result.

Santa Ynez Airport Closed Landfill; Santa Barbara County
(Update as requested by the Board at the October 19, 2007 meeting)

Acreage: 1.6 (Disposal Trench Area)
Life Span: Closed (Open for 11 months from 1969-1970)
Corrective Actions: Landfill gas collection, vadose zone venting, intermediate cover.

The Santa Ynez Airport Closed Landfill was operated by Santa Barbara County Public Works Department (County) during an 11-month period from 1969 to 1970, and accepted municipal solid waste generated in the Santa Ynez Valley. The landfill is located approximately one mile southeast of the community of Santa Ynez within an approximately 125 acre parcel that also contains the Santa Ynez Airport, County of Santa Barbara Fire Department Station #32, and a building used by the United States Forest Service. The landfill site is comprised of three separate, waste-filled trenches with a combined area of approximately 1.6 acres, and is estimated to contain less than 55,000 cubic yards of waste material.

Since the Santa Ynez Airport Landfill was closed prior to November 27, 1984, it is defined by CCR Title 27 as a closed, abandoned, or inactive (CAI) Unit and is generally not subject to Title 27 requirements. However, pursuant to CCR Title 27, section 20080 (g) the persons responsible for the CAI Unit may be required to develop and implement a detection monitoring program, and if water

quality impairment is found, may be required to develop a corrective action program. The Santa Ynez Airport Closed Landfill is enrolled in the region's General Waste Discharge Requirements for Post-Closure Maintenance of Closed, Abandoned or Inactive Nonhazardous Waste Landfills within the Central Coast Region (Order No. R3-2004-0006).

The first encountered groundwater beneath the site is unconfined and varies from approximately 50 to 80 feet deep. Groundwater monitoring indicates a relatively consistent groundwater flow direction to the north to northwest. VOC impacts were first identified in 1998 and have been detected in downgradient and crossgradient wells ranging from trace to concentrations above established MCLs. The existing groundwater plume extends offsite to the neighboring property approximately 500 feet, but there are no known water supply or irrigation wells directly downgradient of the landfill. Existing groundwater impacts are attributed to landfill gas migration and/or the infiltration of leachate.

The County originally intended to clean-close the Landfill by removing the waste and preventing additional impacts to groundwater, but in 2004 efforts to clean-close the site were stopped due to local opposition. Water Board staff supported clean-closure as source removal is proven, effective strategy in groundwater remediation. As a result, the California Environmental Quality Act (CEQA) process associated with proposed clean-closure activities was also stopped. The nearby Foxen Canyon Landfill with more than 1.5 million cubic yards of waste in place had enough remaining capacity to accept the Santa Ynez Airport Landfill's 55,000 cubic yards of waste. Since the waste from the Santa Ynez Airport Landfill would have been a relatively small volume and on top of waste already in place at the Foxen Canyon Landfill, the depth to groundwater at Foxen Canyon Landfill is approximately 100 feet greater than the Santa Ynez Airport Landfill, and the waste at each site was similar, being municipal solid waste from the same community, the potential to further impact groundwater would have been greatly reduced.

In February 2005, the County submitted a groundwater remediation and capping proposal. The proposal included a phased approach. Phase I of the proposed remediation consisted of three tasks: Task 1- Installation of a landfill gas extraction system, Task 2- Installation of a vapor recovery system, and Task 3-Installation of an air sparging system. Task 3 would be conditional upon the monitoring results following Task 1 and 2. Phase II includes the installation of a final cover system. The County recommended delaying the construction of the final cover to consider the Santa Ynez Airport Authority's plans for expansion over the landfill area. This phased approach, including proposal to delay implementation of Phase II, was agreed to by the Executive Officer in an April 7, 2005 letter.

Recent groundwater monitoring indicates downward concentration trends for VOCs in almost all wells; however, it is too early to make a long-term conclusion on whether landfill gas extraction (alone) is sufficient to clean up groundwater. Installation of a final cover will yield additional improvement to groundwater quality, by reducing the generation of leachate and landfill gas, which are the primary mechanisms for impacts to groundwater. Since it has been more than two years since our approval to delay construction of a final cover, Water Board staff will be requesting that the County design and install a final cover for Executive Officer approval, and to evaluate the monitoring program to further delineate impacts to groundwater. Water Board staff believes the County should be able to design a final cover that is compatible with proposed expansion by the Santa Ynez Airport Authority.

Answers to Board member questions at the October 19th Board Meeting

1. What is the County going to do?

Before answering this question, here is a brief background on the CEQA process as it relates to the airport expansion project. CEQA was enacted by the state legislature in 1970 to ensure that the

environmental effects of public and private projects are adequately examined before a decision is made to approve a project. All new development projects must comply with CEQA. Based upon what is known about the project and the site, the Santa Barbara County Planning Department is the "Lead Agency" responsible for determining which type of environmental review is required under California law. Prior to the Lead Agency adopting any CEQA documents, including but not limited to a Negative Declaration, a mitigated Negative Declaration, or an Environmental Impact Report (EIR), the public and other agencies have the opportunity to comment on the proposed project including the adequacy of the CEQA documents themselves.

Based on a November 9, 2007 telephone conversation with John Karamitsos, Santa Barbara County Planning has received a complete development application from the Santa Ynez Airport Authority proposing an expansion of the airport, which includes an area involving the Santa Ynez Closed Landfill. Santa Barbara County Planning has completed an Initial Study with requirements and findings, which if incorporated would result in a draft Negative Declaration. Upon completion, the draft Negative Declaration would be distributed for public comment. To date, a draft Negative Declaration has not been completed and it is our understanding that the Santa Ynez Airport Authority may be revising their development application, which would result in the need for a new or modified Initial Study.

2. What is the Water Board's role in CEQA?

During the CEQA process involving a project such as this the Water Board is usually referred to as a "Responsible Agency," which is a public agency with discretionary approval authority over a portion of the project that is the subject of the CEQA analysis. As a Responsible Agency, the Water Board staff would review the CEQA documents and provide comments with respect to water quality issues including any permitting requirements. As such, we expect to review and comment on the expected airport expansion plans and associated CEQA documents when they are distributed. Although Water Board staff has not received any CEQA documents regarding proposed development of the site to date, we will be informing the County of Santa Barbara Public Works and Planning Departments and the Santa Ynez Airport Authority that airport expansion in the vicinity of the Santa Ynez Airport Closed Landfill must not compromise containment of waste, ongoing source control efforts, nor restrict current or potential future groundwater corrective action (if necessary).

Regarding the Santa Ynez Airport Closed Landfill, the site was operated and closed (in 1970) prior to current landfill regulatory requirements and before CEQA was enacted. Importantly, CCR Title 27 provides the Water Board authority to require monitoring of CAI (on or before November 27, 1984) landfills, and to require corrective actions if water quality impairment is detected.

3. Who decides when to do an EIR?

Based on the proposed project triggering CEQA, the Lead Agency decides what CEQA documents (such as a Negative Declaration or an EIR) are required. The Lead Agency for approving expansion of the Santa Ynez Airport is the Santa Barbara County Planning Department.

4. It appears the community wants to force the county to do an EIR, can we do that?

Based our review of CEQA, the Water Board can submit comments recommending that an EIR is more appropriate than a Negative Declaration, but currently CEQA documents regarding development of the site have not been released for comment. To be more proactive, we will be informing the County of Santa Barbara Public Works (responsible for the landfill) and Planning Departments (Lead Agency responsible for CEQA tasks) and the Santa Ynez Airport Authority that development in the vicinity of the Santa Ynez Airport Closed Landfill must not compromise the containment of waste, ongoing source control efforts, nor restrict groundwater corrective actions, as

necessary. Water Board staff also intend to review and comment on any CEQA documents regarding the proposed development and the Santa Ynez Airport Closed Landfill as they become available.

In general, minor development of the site that does not involve compromising containment of the waste or source control efforts would not be expected to create additional water quality issues that would trigger the need for an EIR. Furthermore, minor development would not inhibit the Board's ability to regulate the site as a CAI landfill under General Waste discharge Requirements Order No. R3-2004-0006. Based on our experience with unlined landfills, landfill gas extraction with a final cover is highly effective at preventing additional impacts and cleaning up groundwater.

Tajiguas Landfill; Santa Barbara County

Acreage: 78
Life Span: 13 years
Corrective Actions: Landfill gas collection, groundwater interceptor trench, groundwater management systems, leachate collection and removal from unlined area wells, and up-canyon groundwater extraction

Tajiguas Landfill is operated by the County of Santa Barbara and serves all of southern Santa Barbara County, and the Santa Ynez and Cuyama Valleys. The 78 acre facility was originally sited in 1967 and is located west of the City of Santa Barbara in a 450-acre coastal canyon watershed along the Gaviota Coast. WDRs were last revised in 2003.

Historically the landfill site was unlined; however, all current disposal occurs over a composite liner and in compliance with regulatory requirements. In November of 2007, Water Board staff reviewed and approved a Construction Quality Assurance Report regarding liner construction completed in October 2007. The County's recent projections indicate that capacity will be reached in 2020.

The County has monitored groundwater continuously since 1988. Historically, VOCs have been detected in several downgradient wells, with leachate being the likely source. Corrective action control measures include: landfill gas extraction, a groundwater interceptor trench, groundwater management, leachate collection and extraction from unlined area wells, and up-canyon groundwater extraction.

In response to corrective actions, total VOC concentrations and the number of specific compounds detected have declined. VOCs continue to be detected primarily in a single monitoring well, immediately downgradient of the landfill, but with declining trends and concentrations ranging between non-detectable to below maximum contaminant levels.

Camp Roberts Class III Landfill; San Luis Obispo County

Acreage: 14.3
Life Span: 38
Corrective Actions: Final covers over inactive preregulatory waste disposal units

Camp Roberts is a federal facility licensed to the State of California. The California Army National Guard operates the Camp Roberts Landfill, which consists of two separate unlined units covering 14.3 acres and referred to as the North Unit and South Unit. The North Unit reached capacity in 2003 and all nonhazardous solid waste generated at Camp Roberts is currently disposed offsite. Although the South Unit has significant airspace available for disposal, it is currently inactive while

the California Army National Guard proposes upgrades including a composite liner and a leachate collection and removal system. The Water Board staff will bring revised WDRs for the Camp Roberts Class III Landfill to the Board for consideration in 2008.

There are also six inactive waste disposal units which were used prior to federal, state, or local landfill regulations. The inactive waste disposal units consist of a South Landfill (4 acres) and five disposal trenches collectively referred to as the Closed Landfills (6.5 acres). Final covers were completed over the South Landfill and Closed Landfills in October 2006. Water Board staff expects to enroll the South Landfill and Closed Landfills in the General Waste Discharge Requirements for Post-Closure Maintenance of Closed, Abandoned or Inactive Nonhazardous Waste Landfills with the Central Coast Region, in conjunction with a revised WDRs for the active Camp Roberts Landfill.

Chicago Grade Landfill, Atascadero, San Luis Obispo County

Acreage: 188 acres
Life Span: 11 years as permitted; 36 years with approval of proposed expansion
Corrective Actions: Landfill gas extraction

The existing disposal area (Modules 1-5) occupies an area of about 38.6 acres within the 188-acre Waste Management Facility. Module 1 encompasses 24.5 acres and is the only unlined portion; however, approximately 2.5-acres of Module 1 adjacent to Module 2 were lined with a flexible membrane liner (over existing MSW) before expanding vertically in the area. The 3.5-acre Module 2 includes a Subtitle D bottom liner system. The remainder of the permitted area, located in the northeast corner of the Waste Management Facility, is a recycle area covering about four and one-half acres where 10-15 percent of incoming waste is recycled. The proposed expansion (Modules 6 and 7) would add about 38 acres to the disposal area. WDRs were last revised in 2004.

The Discharger employs 34 landfill gas extraction wells to control migration of landfill gas. In January 2007, the Discharger installed six new gas wells in a proactive measure to address low concentrations (less than 5 micrograms per liter [ug/L] of dichlorodifluoromethane detected in groundwater from one monitoring well, the only incidence of a groundwater impact. The Discharger upgraded the gas flare capacity from 200 cubic feet per minute (cfm) to 400 cfm in 2006 to handle additional expansion of the system.

Because of the steep slopes at the site, the landfill has had problems in the past with controlling leachate seeps. This year the Discharger has added soil over chronic leachate seep areas in preparation for the winter. In addition, management of storm water run-off and run-on is a challenge during wetter years. Pursuant to NPDES stormwater requirements, the Discharger continues to modify best management practices, including modifying sediment retention basins, to improve storm water effluent concentrations of inorganic constituents.

Cold Canyon Class III Landfill; San Luis Obispo County

Acreage: 121
Life Span: 3 years
Corrective Actions: Final covers over formally closed area, landfill gas collection

Waste Connections, Inc. owns Corral de Piedra Land Company, Inc. owner of the Cold Canyon Class III Landfill, a 121 acre site that includes a 14-acre unlined, closed landfill, and a 74 acre active landfill. WDRs were last revised in 2006.

The active area consists of both unlined and lined areas. The unlined areas are generally at final elevations and are considered part of the active area only because they have not been formally closed;. The current waste disposal areas of the active landfill consist of Modules 6, 7, 8, and 9. Modules 6 and 7 are at, and module 8 is being filled to, interim elevations. Module 9 will consist of the vertical expansion above modules 6, 7, and 8. Without further permitted expansion, capacity will be reached in 2010. Water Board staff expects to comment during the CEQA process on any proposed expansion of the Cold Canyon Landfill. Furthermore, if expansion is permitted at the local level, a revision of the WDRs will be necessary.

Groundwater monitoring has historically documented minor impacts to groundwater as a result of landfill gas, but review of recent results indicate several increasing trends for inorganic constituents, which may be due to a leachate release from the unlined areas. Water Board staff has recently requested that the landfill operator provide a proposed evaluation monitoring program and an engineering feasibility study to address the possible impacts to groundwater from leachate consistent with CCR Title 27. The proposed program and study are due to the Executive Officer in early 2008.

Los Osos Closed Landfill, Los Osos, San Luis Obispo County

Acreage: 25
Life Span: Closed (last received waste in 1988)
Corrective Actions: Landfill gas collection

The Los Osos Closed Landfill is located at 2285 Turri Road approximately 1.5 miles northeast of the community of Los Osos. The landfill is located above Warden Creek, a seasonally flowing creek that joins the Los Osos Creek half a mile downgradient of the landfill. The landfill last received waste on November 26, 1988 when the County of San Luis Obispo (County) closed the landfill with approximately 838,000 tons of waste in place. The County constructed the final cover for the landfill in 1990 that the Water Board approved in January 1991. Disposal operations began at the landfill in December 1958 and previous landfill operators placed waste as area fill on native silty clay, sandy clay, and sandy soil with no liner or leachate collection and removal system. WDRs were last revised in 2007.

The County identified VOC impacts to groundwater at the landfill after installation of monitoring wells in 1986. The County installed a landfill gas extraction system in 1998. As part of the corrective action program, the County also implemented enhancements to the landfill's final cover in 1998 to minimize the potential for leachate formation and gas production.

Since implementation of the landfill gas extraction system and final cover improvements, VOC concentrations downgradient of the landfill still exist. VOC impacts to groundwater extend approximately 200 feet from the toe of the landfill. The County is currently taking additional corrective action measures (besides landfill gas extraction and final cover improvements) to cleanup VOC pollution in groundwater downgradient of the landfill.

VOCs are the most commonly detected waste constituents in groundwater. However, groundwater samples collected from some wells along the toe of the landfill that have VOC impacts, also have elevated levels of nitrate and chloride. Elevated nitrate and chloride concentrations in wells at the toe of the landfill indicate groundwater impacts from landfill leachate.

The County has monitored VOCs and nitrate in groundwater and surface water since 1988. Currently, the County monitors VOCs, nitrates, and other inorganic constituents in surface water and groundwater on a semiannual basis. During the first quarter of 2007, the County reported nitrate (as

nitrate) concentrations in 7 out of 13 monitoring wells sampled at concentrations ranging from 0.75 to 40 micrograms per liter ($\mu\text{g/L}$). The nitrate concentrations have not fluctuated significantly in groundwater since the County first sampled the groundwater wells in 1988. The MCL for nitrate (as nitrate) in groundwater is 45 $\mu\text{g/L}$.

The County reported a nitrate (as nitrate) concentration in the upstream (from the landfill) surface water sample station for the first quarter of 2007 as 110 $\mu\text{g/L}$. Since the nitrate concentration in the upstream surface water sample is significantly higher than the nitrate concentrations in groundwater, a limited number of groundwater monitoring wells demonstrate elevated nitrate impacts, the landfill does not appear to be a significant source of nitrate to surface water in Warden Creek or to groundwater in this area.

Paso Robles Landfill, City of Paso Robles, San Luis Obispo County

Acreage: 80 acres
Life Span: 43 years assuming current waste disposal rates
Corrective Actions: Landfill gas extraction

The 80-acre municipal solid waste facility currently has a waste footprint of 31 acres, but is permitted for 65 acres at full build-out. Two portions of the landfill are unlined: the north existing refuse fill area (4.7 acres), and the south existing refuse fill area (14.8 acres) each with an interim cover. The south area has reached final grade but landfilling continues over the north area and in lined modules 1, 2A, 2B, and 3A (each 2.1 - 3.2-acres in size). WDRs were last updated in 2001. Staff plan to bring revised WDRs to the Board in 2008.

Historically, VOCs have been detected in vadose (unsaturated) zone monitoring probes (lysimeters) located in the southwest corner of the south existing refuse fill area. The City responded to these findings by enhancing landfill gas extraction in the area. This appears to be an effective remedy as the lysimeters have generally been dry, indicating that landfill gas extraction is drying out the vadose zone in this area. No consistent detections of VOCs have occurred in perched groundwater or underlying aquifer at the landfill.

In 2003, the landfill had an instance of excessive erosion and offsite discharge of sediment, resulting in an NOV. The City has since implemented storm water best management practices that appear to have solved the problem because no significant erosion has been observed since that time.

Crazy Horse Class III Sanitary Landfill, Prunedale, Monterey County

Acreage: 160 acres
Life Span: Less than one year
Corrective Actions: Groundwater pump and treat, enhanced bioremediation (southern area); landfill gas extraction (eastern area)

The landfill site is a 160-acre parcel, with 72 acres of the site permitted for Class III refuse disposal. The landfill began operation in 1934 and operated as a burn dump until 1966 in the old fill area now identified as Closed Module I. In 1966, the burn dump operations were changed to sanitary landfill operations. Disposal operations continued in the 6-acre Module I area until about 1972. The current active disposal area has been in operation since 1972 and covers approximately 66 acres. The active landfill is being developed in phases over 15 acres of lined and 51 acres of unlined area (pre-Subtitle D requiring bottom liner systems). The Salinas Valley Solid Waste Authority owns and operates the Crazy Horse landfill.

There are three groundwater plumes, one south, west, and east of the landfill. In 1988, a groundwater extraction and treatment system was installed and began operation to mitigate contamination from Module I (Module I plume, located south of the landfill). As a further remediation measure, in 1988 a final cover was installed on Module I. Based on the groundwater impacts from Module I, the U.S. Environmental Protection Agency placed Module I on the National Priorities List (NPL) and the landfill became a Superfund site in 1990. Total VOCs in the Module I plume interior have stabilized at a concentration of approximately 70 µg/L. However, trace concentrations of VOCs near the southern property boundary indicate that the plume may be expanding, although at a very slow rate. Very low groundwater extraction rates (less than 3 gallons per minute total for the system), along with possible plume expansion and lack of cleanup progress in the plume interior suggests that the groundwater corrective action program is not completely effective. The groundwater corrective action system was vandalized in June 2006 and has remained off-line since that time. The Discharger used the system shutdown as an opportunity to conduct a long-term VOC rebound test to evaluate the past effectiveness of the system. The results, reported in an Engineering Feasibility Study (EFS) to reevaluate the corrective action system performance, indicate that the Module I plume remains stable without operation of the groundwater extraction system. The EFS recommends in-situ bioremediation, possibly coupled with targeted groundwater extraction, as the preferred remedial alternative for the Module I plume. A pilot study is underway to evaluate the effectiveness of in-situ bioremediation.

The Discharger recently characterized the nature and extent of the eastern and western groundwater plumes; the Engineering Feasibility Study identifies enhanced landfill gas as the best remedial strategy for controlling these plumes. The Discharger is currently scoping necessary modifications to the landfill gas extraction system.

Recently revised Waste Discharge Requirements (WDR) Order R3-2007-0003 requires that the landfill close by April 2009. After closure, the Discharger plans to maintain a transfer station at Crazy Horse to divert MSW to the Johnson Canyon Landfill, located in Gonzales. The final cover system for the landfill will provide a critical component of the groundwater corrective action, because it will ultimately cut off percolation of water into the waste, the primary driving mechanism for forming landfill gas and leachate.

Johnson Canyon Landfill, Gonzales, Monterey County

Acreage: 163 acres
Life Span: 32 years, assuming proposed expansion is approved
Corrective Actions: Landfill gas extraction

The 163-acre landfill facility is currently permitted for a waste footprint of 80 acres; the Joint Technical Document (JTD) proposes an expansion of the footprint to 96.3 acres. Water Board staff is currently reviewing the JTD and updating the WDR order for this landfill, tentatively scheduled to be proposed for adoption at a Spring 2008 Water Board meeting. Upon closure of the Crazy Horse Landfill in late 2008, the Johnson Canyon Landfill will effectively serve a large portion of the northern half of the Salinas Valley (formerly also served by Lewis Road Landfill [closed in 2002], and Jolon Road Landfill [closed in 1997]). The fill sequencing of the landfill is based on 96 acres divided into one approximately 6.3-acre unlined module and nine lined (existing and proposed) modules based on 30-foot (ft) deep by approximately 1200-ft long by 200-ft wide sequential rectangular excavations. Modules II and III northwest, approximately 4.8 and 2.0-acres in size, respectively, are pre-Subtitle D but lined with one-foot of compacted clay and include leachate collection systems. The Salinas Valley Solid Waste Authority owns and operates the Johnson Canyon landfill.

VOC compounds are detected in point-of-compliance landfill monitoring wells at less than 5 ug/L, at approximately one-half of applicable MCLs. Based on the chemical signature of groundwater, and the fact that the VOCs are low in concentration and are relatively dispersed, the Discharger identified landfill gas as the source for the VOCs in groundwater. In 2000, the Discharger installed a landfill gas extraction system. This system was upgraded in 2005 to include six downgradient landfill gas extraction wells. Concentrations of VOCs have stabilized since that time.

All storm water from the site drains to a series of sediment retention basins. To date, no storm water has left the site boundary because of the large holding capacity of the basins and the fact that the Discharger uses the collected storm water for dust control at the landfill.

Monterey Peninsula Class III Landfill (also known as the "Marina Landfill"); Marina, Monterey County

Acreage: 475
Life Span: 100 years
Corrective Actions: Groundwater natural attenuation; liquids controls; landfill gas collection

The landfill comprises 475 acres with unlined and lined disposal areas. The landfill serves as a regional disposal facility operated by the Monterey Regional Waste Management District (District) and has an anticipated life of 100 years according to the District. Extensive materials recovery, recycling, and green waste programs are also operated by the District.

Of note was an ink spill in November 2006 that occurred from a temporary drying area on top of an active, lined disposal area called "Module 3." The District took immediate steps to cleanup the spill and notified Water Board staff as required by their WDRs. Cleanup involved excavation followed by sampling to ensure the spill had been completely removed. Water Board staff issued an NOV in response to the incident. To prevent future releases, the District reviewed and updated its operations plan and provided further staff training.

Reports of illicit waste disposal were also addressed by the District once it became known from the Monterey County District Attorney that a certain hauler was concealing such wastes. In response, the District reviewed and revised its load inspection program. Noteworthy is that no load inspection program will capture 100 percent of all wastes coming into the facility. Being a regional facility, the District has had, and continues to have, a rigorous load inspection program. Overall, the District has a positive compliance record and is proactive in implementing changes to ensure water quality protection.

Minor groundwater degradation was detected in an area where historic automotive operations occurred. Declining concentrations of low level VOCs in groundwater indicate cessation of such operations and natural attenuation has improved water quality. Groundwater monitoring indicates wastes are currently contained and landfill gas collection has provided effective controls.

City of Watsonville Class III Landfill; Santa Cruz County

Acreage: 103
Life Span: 23 years
Corrective Actions: Final covers over closed areas, leachate and landfill gas collection

The City of Watsonville owns and operates a 103 acre landfill site. The site consists of a 15.3-acre closed unlined landfill (Phase I/II), a currently active 11.6-acre lined landfill (Phase III), and two

additional future landfill modules of 6.9 acres (Phase IV) and 14.2 acres (Phase V). The sites capacity, assuming phase V build out, will be reached in 2030. WDRs were last revised in 2006.

Inorganic constituents and VOC impacts have been detected in the vicinity of the unlined Phase I/II landfill, which were closed in 1997 and include final cover. Additional corrective action efforts have documented significant amounts of leachate in phase I/II; as a result the City is pumping leachate and extracting gas from the closed landfill. The City has recently expanded leachate and gas extraction efforts and is evaluating further expansion, or possible alternatives to current methods, to accelerate the removal of leachate.

During 2006, the City determined the Phase III liner was leaking in or around its main collection sump. To minimize the production of leachate within Phase III, the City has installed a posi-shell intermediate wet weather cover on all surfaces of Phase III except on the active landfill face. Posi-shell is a spray-applied, thin layer of fibrous cement, which significantly promotes runoff and reduces the percolation of water into the waste. The City is also removing leachate from the Phase III leachate collection and removal system as quickly as possible and only applying leachate for dust control at minimum levels. Excess leachate is transported to the Watsonville Wastewater Treatment Plant for disposal rather than applied to the Phase III landfill. The City continues to remove leachate from the lysimeter located below the leachate sump and removal rates have dropped significantly since the leak was first detected. Due to the liner leak the City intends to propose an improved liner design for the future phase IV and V landfills.

Buena Vista Class III Landfill; Santa Cruz County

Acreage: 126
Life Span: 12 years
Corrective Actions: Final covers over closed areas, landfill gas collection

Santa Cruz County owns and operates the Buena Vista Landfill. The 126 acre site consists of a 31-acre landfill closed in 1986, a 15-acre landfill closed in 1995, and a 61-acre active lined landfill. WDRs were last revised in 2006.

The active landfill consists of seven modules, 1, 2, 3, 4A, 4B, 5, and 6. Modules 1, 2, 3, 4A, and 6 have been filled to interim elevations. The module 4B liner was approved by Water Board staff in June 2007 and is currently being filled to an interim elevation consistent with other modules. Prior to constructing module 5 the County will submit a proposed liner design report for approval. A construction quality assurance report for the constructed module 5 liner will also have to be approved prior to the module receiving waste. Upon filling module 5 to its interim elevation the County will reopen all modules and fill to final elevations with expected capacity reached in 2019.

Low level VOCs have been detected in groundwater near module 2. The County believes these groundwater impacts are caused by landfill gas, due to the lack of leachate indicators. To remove and prevent migration of landfill gas the County has added more than 33 gas extraction wells to modules 1, 2, and 3 since 1997. Monitoring indicates that landfill gas extraction is reducing landfill gas impacts to groundwater. Regarding the closed landfill areas, monitoring appears to indicate that the final covers and surface grading are preventing the formation and resulting migration of leachate and/or landfill gas to groundwater.

Santa Cruz Class III Landfill; Santa Cruz County

Acreage: 100
Life Span: 34 years
Corrective Actions: Leachate collection and disposal, expanding landfill gas collection system

The landfill comprises 40 acres of unlined disposal area, 6.0 acres of lined disposal area, 4.5 acres for disposal operations during the wet season; and 26.3 acres designated for future disposal over liners. The facility is owned and operated by the City of Santa Cruz (the City) and includes green waste operations, a recycling center, a "gas to energy" plant (through subcontract), and a hazardous materials collection program for temporary storage of waste destined for offsite disposal at a Class I landfill. WDRs were last updated in 2006.

A recent development includes the City delineating previous waste disposal in the unlined area to better define a small portion of the future construction boundary for Cell 3. Cell 3 will be the third in a series of expansions onto lined disposal units that will have leachate collection and removal systems. The City anticipates construction of Cell 3 will commence in 2008. A series of lined areas with leachate collection and removal systems will be constructed by the City during the active life of landfill. Landfill operations will continue within unlined and lined areas until the City meets its projected landfill capacity.

Similar to many active facilities, the City has expanded its landfill gas collection system to control gas migration and mitigate associated impacts of VOCs to groundwater. The City has good groundwater monitoring well network and data indicate the extent of groundwater impact has stabilized immediately adjacent to the southern landfill boundary. The City has an excellent compliance record and is proactive in identifying and taking corrective actions for groundwater, surface water, leachate collection and removal system appurtenances, and landfill gas controls.

John Smith Road Class I and Class III Landfill; City of Hollister, San Benito County

Acreage: 65.3
Life Span: 20 years
Corrective Actions: Groundwater pump and treat; landfill gas collection

There are two main components to the facility: the 8.3-acre Class I cell and the active 29-acre Class III area. The Class I cell is inactive and will not receive Class I wastes for the remaining life of the facility. The 29 acre Class III portion of the active facility is designated for municipal solid waste disposal and includes lined and unlined areas. The owner, San Benito County, estimates 20 years of remaining capacity. WDRs were last updated in 2002.

In October 2007, construction began on "Module 3," a 13-acre disposal area. The liner design was an approved alternative to the prescriptive standard for waste containment. Water Board staff believe the alternative design is equivalent to, and potentially more protective, than the minimum regulatory requirements for containment. The liner will underlie the waste and consists of (from bottom to top) prepared subgrade, one foot of low permeability clay, a geosynthetic clay liner, an 80-mil high density plastic liner, and a leachate collection and removal system. A protective "operations layer" consisting of soil will be placed over the liner system prior to waste disposal.

The unlined portion of the landfill continues to receive waste, and corrective actions to address groundwater degradation are on-going. Enhanced landfill gas collection and modifications to the groundwater pump and treat system have successfully reduced concentrations of VOCs in groundwater.