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

STAFF REPORT FOR REGULAR MEETING OF FEBRUARY 6, 2004

Prepared January 7, 2004

ITEM: 11

SUBJECT: Post-Earthquake Status of Wastewater Facilities, Landfills, and Power Plants

SUMMARY

A magnitude 6.5 earthquake shook San Luis Obispo County and the surrounding area at 11:15 a.m. on December 22, 2003. The epicenter was on the Oceanic Fault, approximately 6 miles northeast of San Simeon. Intense shaking occurred throughout San Luis Obispo County, and was felt as far away as Los Angeles and San Francisco. Ground accelerations were greatest to the east-southeast of the epicenter, in the Paso Robles area. Several structures in downtown Paso Robles, mostly unreinforced masonry buildings, were severely damaged or destroyed, and two people were killed. Power was temporarily lost in several communities.
In the days after the earthquake, staff inspected and contacted several wastewater facilities, landfills, and power plants that may have been affected. Fortunately, most facilities had very little or no damage. The following discussion details their status as of January 7, 2004.

DISCUSSION

Wastewater Facilities

Collection systems (sewers), sewage pump stations, and wastewater treatment facilities are especially vulnerable to power loss and ground movement. Fortunately, very little damage occurred at most of wastewater facilities affected by the earthquake. The **City of Atascadero, Avila Beach, California Men's Colony, City of Gonzales, City of Greenfield, King City, Pfeiffer Big Sur State Park, Ragged Point Inn, City of San Luis Obispo, San Miguel, San Miguelito (Avila)**, **City of Santa Maria, City of Soledad**, and **Templeton** wastewater facilities had little or no problems.

Significant damage and/or problems occurred at the following wastewater facilities. They're listed in order of severity of damage.

South [San Luis Obispo] County Sanitation District – A levee that prevents Arroyo Grande Creek from flooding the treatment plant reportedly is damaged and in danger of breaching. San Luis Obispo County Department of Public Works is assessing the damage and is responsible for repair. If the levee breaks, the treatment plant's influent pumps, which are below grade, could be flooded. In anticipation of this possibility, South County Sanitation District rented a large portable pump capable of pumping 10 million gallons per day and placed the intake in the influent channel. Because the portable pump is above grade, the portable pump should be able to move influent through the treatment process (all other unit processes are elevated above a probable flood level) if the influent pumps are flooded. The portable pump will be kept onsite at least until the wet season is over. Operators intend to request their district board purchase such a pump for the future.

Liquefaction caused subsidence and a small sinkhole near the influent pump station. The sinkhole has been filled. Operation at the facility was not unaffected by this problem.

In one of the primary clarifiers and the secondary clarifier, sloshing caused all fiberglass panels on the internal baffles to break away from their steel frame and sink to the bottom. Operators were concerned the panels would jam the rake arm and clog the sludge intake; so specialized divers were deployed in the secondary clarifier to fish them

out. The divers were scheduled back to the facility the week of January 5th to install stronger PVC panels. The treatment plant has a redundant primary clarifier, so the damaged one was drained and the baffle repaired.

Several vertical struts in the walls of the trickling filter are cracked at the base. Fortunately, the trickling filter does not contain standing water, so stress on the trickling filter walls is minimal. A structural engineer has been contacted to assess the severity of damage to the trickling filter and recommend repair.

San Simeon WWTP – Electrical power to San Simeon was lost, and the wastewater treatment facility does not have a backup power generator. In the absence of power, the treatment process shut down and the facilities' equalization basin began to fill. The facility did not have power for approximately four hours until contract operators Bill Callihan and Chris Nally of Fluid Resource Management brought in a portable generator from Templeton. Mr. Callihan and Mr. Nally deserve commendation for quickly restoring power and preventing the equalization basin from overflowing (which surely would have affected the ocean and beach nearby). When main power was restored in the area, a surge destroyed the facility's electrical panel. As of January 2nd, the electrical panel was still awaiting repair, and the treatment facility was still running on power from the portable generator. On January 2, 2003, staff sent a letter to San Simeon Community Services District, requesting they install a permanent emergency generator as soon as possible.

Paso Robles WWTP – Although several buildings in the City of Paso Robles were severely damaged, the City's wastewater facilities were only slightly damaged. Overhead power lines collapsed into the wastewater disposal ponds, causing a power failure. Backup power generators supplied power to the facility for 17 hours until main power was restored. Sloshing in one of the primary clarifiers caused the fiberglass panels of the internal baffle to rip off their steel frames and sink (this same problem occurred at South County Sanitation District). Operators have since drained the clarifier and replaced the panels. Effluent quality reportedly was unaffected and the wastewater facility is now operating normally.

In downtown Paso Robles, a new mineral spring appeared. The suspected culprit is an old artesian well that may have ruptured. The pressurized water burst through the City Library parking lot and created a 40 to 50-foot wide pool. Hot mineral water overflowed from the pool at 500 to 1,000 gallons per minute to the street and storm drain system, eventually discharging to the Salinas River. Hydrogen sulfide in the mineral water caused a rotten-egg odor throughout the downtown. On December 31st, City officials began pumping the mineral water into the sanitary sewer to dewater the pool and plug the well. Staff is concerned the mineral water will upset the biological treatment process at the treatment facility. We have notified City personnel of our concerns, and we will be tracking plant performance and effluent quality closely.

City of Morro Bay/Cayucos Sanitary District WWTP – A primary clarifier at the Morro Bay wastewater treatment facility was damaged. A 12" diameter pipe that distributes wastewater to the middle of the primary clarifier sheared at the flange connection to the inside of the clarifier wall. Operators immediately diverted all wastewater flow through a redundant clarifier. The damaged clarifier was drained and the pipeline repaired. The clarifier was brought back into service on December 24th, only two days after the earthquake occurred. Effluent quality was unaffected.

Power was lost to all major sewage pump stations in Cayucos. Emergency generators at the pump stations did not automatically start as they were designed, but were manually started by maintenance personnel shortly thereafter. Periodic aftershocks caused sloshing in one pump station, which caused the pump to shut off. Maintenance personnel were on standby to restart the pump. Nevertheless, no sewage spills occurred at any of these pump stations as a result of the earthquake.

City of Pismo Beach WWTP – On the afternoon of December 30th, water was discovered coming out of the ground just north of Oceano Airport, near the South County Sanitation District treatment plant. The water was determined to be coming from a break in the pipeline that transports

treated wastewater from the City of Pismo Beach WWTP to the South County Sanitation District's ocean outfall.

That same day (night), City of Pismo Beach crews initiated emergency repair procedures by diverting treated wastewater at the City's treatment plant (upstream of the pipeline break) with a fleet of 5 large pumper trucks (some were borrowed from the City of San Luis Obispo). The wastewater was hauled to South County Sanitation District's treatment plant for disposal. The broken pipeline was excavated, repaired, and resumed normal operation by 2:30 a.m on December 31st (next day). City staff deserve commendation for their extraordinary efforts to prevent discharge to Pismo Creek during the pipeline repair.

Cambria WWTP – Electrical power to several pump stations was lost temporarily, but emergency generators operated effectively, and no sewage spills occurred. Flow into the wastewater treatment facility is normal, suggesting no sewer lines are broken. The treatment facility and disposal ponds were inspected and no damage was found.

Guadalupe WWTP – The Guadalupe WWTP apparently survived the earthquake with little or no damage, however the City has reason to believe there may be problems in parts of the collection system (e.g. old brick manhole wells) and the City is investigating its system.

Wineries – Several wineries in the Paso Robles area, including Wild Horse, Turley, and Justin, had stacks of barrels collapse and wine bottles break. Most of the spilled wine likely drained to the wineries' wastewater treatment and disposal system. Some wine was likely released directly to the surrounding environment, but the impact to water quality is considered negligible.

Landfills

At landfills, the integrity of waste containment and monitoring systems are the areas of greatest concern to water quality. After a significant earthquake, the Discharger is expected to inspect, where feasible, landfill liners and cover systems, leachate collection and removal systems, groundwater monitoring wells (by measuring water depth), and gas collection systems.

Those landfills most likely affected by the earthquake include: Chicago Grade, Cold Canyon, Los Osos (Closed), Paso Robles, Jolon Road (Inactive), and Santa Maria. Following is their status as of January 2, 2004:

Chicago Grade Landfill – No apparent problems are reported at Chicago Grade Landfill. Staff requested that groundwater levels be measured to determine whether the liner system was affected. Any significant changes in leachate flow volume would indicate damage to the liner system. Staff will continue to track leachate flow volumes closely to assure the liner system was not damaged.

Cold Canyon Landfill – The landfill surface areas were checked during the quarterly surface emission sweep and monthly landfill integrity check. There was no evidence of unusual settlement, surface cracking, slope failures or subsurface fires. The landfill gas collection system had minor damage and will be repaired. The groundwater monitoring wells were briefly inspected and appeared undamaged. Cold Canyon Landfill staff will continue to monitor the landfill as part of regularly scheduled inspections.

Los Osos (Closed) Landfill – San Luis Obispo County staff inspected the Los Osos Landfill the day after the earthquake. The landfill gas system, final cover and drainage systems did not appear to be affected. Landfill gas collection system oxygen levels are 0%, indicating little or no damage to the collection equipment. Subsequent rains have not shown any areas of ponding, indicating little damage to the final cover. San Luis Obispo County staff will continue to monitor the landfill as part of regularly scheduled inspections.

Paso Robles Landfill – Landfill operator, PWS Engineering, reported no problems at the Paso Robles Landfill. Their Monitoring and Reporting program calls for them to measure water levels in the landfill's groundwater monitoring wells. Staff will continue to track leachate flow volumes over time to assure the liner system was not damaged.

Jolon Road (Inactive) Landfill – The Salinas Valley Solid Waste Authority reports no problems

with the leachate collection and recovery systems, groundwater levels and interim cover systems (this landfill does not have a gas system). Staff will continue to track leachate flow volumes closely to assure the liner system was not damaged.

Santa Maria Landfill – Shortly after the earthquake, City of Santa Maria staff visually inspected and tested: the functionality of the landfill liner and associated leachate collection system and storage tanks; landfill closure cap and slope stability for the closed and active areas of the landfill; the Santa Maria River levee system adjacent to the landfill; landfill gas extraction, collection and flare system; groundwater monitoring wells and subsurface gas monitoring probes; landfill access roads; landfill buildings; and lined drainage facilities. No damage was observed.

Power Plants

Morro Bay Power Plant – At the time of the earthquake the power plant was not operating. Duke Energy staff reported that the cooling water pumps and tunnels were not damaged. All hazardous materials in use or in storage were unaffected. The surface waste impoundments and oil/water separator were not damaged. Duke Energy has not been able to determine with certainty if any of the poert-generating systems were damaged. Since then, plant personnel have begun to systematically check the power-generating systems for damage.

A fire water supply main ruptured, causing water to flow over a newly resurfaced parking lot and into a storm drain. Consequently, a minor oil sheen occurred where the storm drain discharges to Morro Bay. Duke Energy personnel shut off the valve to that particular storm drain until they could repair the water main.

Diablo Canyon Nuclear Power Plant – Within an hour of the earthquake, plant operators and Nuclear Regulatory Commission inspectors searched for broken, shifted or leaking pipes and their support braces; displaced equipment; cracks in cement walls and the plant's foundation. They reported no damage. Nuclear Regulatory Commission inspectors with expertise in structural engineering conducted further inspections the week of December 29th and found no structural damage.

Moss Landing Power Plant – Duke Energy reported no damage at Moss Landing Power Plant. Units 1 & 2 were operating, and there was no interruption of power. The surface waste impoundments were inspected and no damage was found.

CONCLUSION

Considering damage incurred to other man-made structures in the area, wastewater facilities, landfills, and power plants fared well. The absence of damage at most facilities is the result of sound engineering and construction. This earthquake proved that the redundancy and contingency measures the Regional Board requires are worthwhile and necessary.

One major lesson learned is that siting greatly determines whether an earthquake damages a facility. South County Sanitation District's treatment plant is located in an area that is prone to liquefaction (sandy soil and shallow groundwater). Although the components of the facility were designed to withstand such earthquakes, the facility had greater damage than several facilities much closer to the epicenter.

Lastly, the earthquake proved the importance of good facility operators. Had it not been for the extraordinary effort of a few good people, this earthquake could have resulted in significant impacts to water quality.

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