CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

ORDER NO. R5-2008-0148

WASTE DISCHARGE REQUIREMENTS
ISSUED TO
LAWRENCE LIVERMORE NATIONAL SECURITY, LLC
AND
THE U.S. DEPARTMENT OF ENERGY
FOR
LAWRENCE LIVERMORE NATIONAL LABORATORY
EXPERIMENTAL TEST SITE (SITE 300)

SEWAGE EVAPORATION AND PERCOLATION PONDS
SEPTIC SYSTEMS
COOLING TOWER DISCHARGES
MECHANICAL EQUIPMENT WASTEWATER DISCHARGES
AND
OTHER LOW-THREAT DISCHARGES

ALAMEDA AND SAN JOAQUIN COUNTIES

The California Regional Water Quality Control Board, Central Valley Region, (hereafter Regional Water Board) finds that:

DESCRIPTION OF SITE

1. Lawrence Livermore National Laboratory Experimental Test Site (Site 300), occupies 10.4 square miles in the Altamont Hills of the Diablo Range, in T3S, R4E, MDB&M, most of which is in San Joaquin County. The western one-sixth of the site is in Alameda County. Site 300 is approximately 8.5 miles southwest of downtown Tracy and 17 miles southeast of Livermore, as shown on Attachment 1, a part of this Order.

2. Site 300 is owned by the United States Government and operated by Lawrence Livermore National Security, LLC, (hereafter jointly referred to as Discharger).

3. Site 300 was placed on the National Priorities List in 1990. Ongoing work to characterize and remediate contaminant release sites is conducted under the Comprehensive Environmental Response Compensation Liability Act (CERCLA) and a Federal Facilities Agreement. This work is supervised by Remedial Project Managers from the Regional Water Board, the California Department of Toxic Substances Control, the U.S. Environmental Protection Agency, and the U.S. Department of Energy. Discharges regulated by this

order may occur within areas under investigation or remediation by the CERCLA project.

4. The general layout of the site, including the locations of the discharges covered in this permit, is shown on Attachment 2, a part of this Order.

5. The hydrogeologic units first encountered under discharge areas and depths to these units vary across the site and are controlled by geologic structures, elevation and depositional environments. A simplified cross-section with the stratigraphy and hydrologic characteristics at Site 300 is shown on Attachment 3, a part of this Order. Depth to groundwater varies across the site and ranges below the discharge areas from approximately 10 feet to 230 feet below ground surface (bgs).

BACKGROUND

6. On 20 September 1996 the Regional Water Board adopted WDR Order No. 96-248 prescribing requirements for:

   a) The discharge of domestic and mechanical equipment wastewater to sewage evaporation and percolation ponds (hereafter collectively referred to as sewage ponds).
   b) The discharge of mechanical equipment wastewater to percolation pits.
   c) Discharges to Class II surface impoundments that were used for disposal of explosives processing wastewater and photographic rinse water.

7. In addition to the discharges to land, the Discharger had low threat discharges and discharges from cooling towers at Buildings 801, 836A and 865 to surface water. These discharges were permitted under NPDES Permit No. CA0081396, WDR Order No. 94-131. Discharge from the cooling tower at Building 865 was discontinued in 1995.

8. The Discharger installed new waste disposal systems to eliminate discharge to surface waters. The Discharger evaluated wastewater disposal systems for cooling towers and mechanical equipment and proposed and installed, with Regional Water Board concurrence, percolation pits to engineer discharges from mechanical equipment and cooling towers to the subsurface. Between 1991 and 2005, the Discharger eliminated and/or replaced water-based cooling tower systems with air-cooled systems, thereby eliminating nineteen cooling tower discharges.

9. In a letter dated 22 May 2000, the Discharger notified the Regional Water Board that it had determined that the discharges from the cooling towers at

801 and 836A and other low-threat discharges included in the NPDES permit, listed in Attachment 4, a part of this Order, percolate into the ground and do not reach surface water and therefore did not need to be included in the NPDES permit. Regional Water Board staff concurred with this determination. Discharge from the cooling tower at Building 836A has since been discontinued and discharge from the cooling tower at Building 801 is now directed to a percolation pit. On 4 August 2000, the Regional Water Board rescinded the Discharger's NPDES permit, Order No. 94-131.

10. Lawrence Livermore National Laboratory submitted a Report of Waste Discharge (RWD), dated 19 July 2000, to amend Order No. 96-248 to include:

    a) Discharges to sewage evaporation and percolation ponds.
    b) Mechanical equipment room wastewater discharges to percolation pits.
    c) Cooling tower blowdown and discharges associated with cooling tower maintenance to percolation pits.
    d) Septic system discharges to septic tanks, leach fields, and cesspools.
    e) Low threat discharges to ground: primarily low volumes of drinking water, condensates, and uncontaminated contained rainwater that are detailed in Attachment 4, which is attached hereto and made part of this Order.

11. This Order includes the discharges listed in Finding 10 and removes discharges to the Class II Surface Impoundments, which LLNL clean closed in compliance with Title 27 requirements. Closure was completed on 3 November 2005, and the final Clean Closure Report for the Class II Surface Impoundments was submitted on 22 February 2006.

12. On 28 January 2005, in response to a request from the Regional Water Board, the Discharger submitted a technical report containing the analytical results of:

    a) Representative samples of the wastewater discharges from cooling towers and mechanical equipment to septic systems, percolation pits, and sewage ponds.
    b) Samples from sewage pond influent and the sewage pond.
    c) Groundwater samples from monitoring wells upgradient and downgradient of the sewage ponds.

    The analytical results are included in Attachments 5, 6, 7, 9, 10, 11, 12, 13, 14, 18, 19 and 20, a part of this Order.

13. The report also contained descriptions of the percolation pits and the septic systems across the site, locations of monitoring wells with respect to septic

systems, and results of an analysis of threat to groundwater from septic systems and percolation pits discharges based on the designated level methodology. The Discharger conducted the designated level methodology analysis to evaluate the potential threat to beneficial uses of groundwater from constituents in mechanical equipment and cooling tower discharges. The Discharger applied an attenuation factor for all constituents likely to be discharged to percolation pits and septic systems, except trihalomethanes. The Regional Water Board has since determined that because salts (as represented by measured specific conductance values, and sulfate, total dissolved solids, sodium, chloride, and nitrate concentrations) do not fully attenuate as they move through the soils, the Discharger will need to re-evaluate the potential for discharges of these salts to degrade groundwater. Monitoring and Reporting Program (MRP) No. R5-2008-0148, included with this Order, requires the Discharger to conduct additional monitoring of wastewater effluent for salts and metals in cooling tower and mechanical equipment effluent.

14. This Order also requires the Discharger to conduct studies and modeling to determine appropriate attenuation factors for salts and re-evaluate whether the discharges of salts and metals are degrading or have the potential to degrade groundwater. If the studies or modeling identify any discharges with the potential to degrade groundwater, the Regional Water Board will require that the Discharger monitor the groundwater near those discharges, which may require the installation of new monitoring wells. If groundwater degradation is confirmed, the Regional Water Board will require the Discharger to evaluate and conduct source control, and if beneficial uses of groundwater have been degraded, to prepare a feasibility study proposing groundwater remediation.

PREVIOUS ANALYSIS OF GROUNDWATER IMPACTS

15. Site 300 conducts extensive monitoring of groundwater in connection with the CERCLA project. Some of the septic systems are within areas undergoing remedial investigation or areas where cleanup remedies have been selected and are being implemented.

16. CERCLA-conducted monitoring near septic systems at Buildings 812, 834, 850, and 899 have shown concentrations of nitrate above the maximum contaminant level (MCL). The septic systems at these four locations are within 30 feet of groundwater. In each of these areas nitrate is also a constituent of concern in the CERCLA investigation but, according to studies conducted by LLNL staff, the groundwater nitrate concentrations cannot be completely explained by CERLCA-related releases.

17. Nitrate is a groundwater constituent that may result from natural and anthropogenic sources. The CERCLA investigations have identified both natural and anthropogenic sources of nitrate at Site 300 including the geology, historic releases associated with explosive compounds, and septic systems. Multiple independent data sets, including nitrogen and oxygen isotopes of nitrate and excess dissolved nitrogen, indicate that nitrate is naturally denitrifying in the confined regions of the bedrock aquifers at Site 300.

18. CERCLA investigation and/or remediation occurring in areas where the Discharger has determined that septic systems may be impacting groundwater are:

    a) Building 812 – Remedial Investigation/Feasibility Study and pilot study for treatment of uranium, volatile organic compounds (VOCs), explosive compounds, nitrate and perchlorate.
    b) Building 834 – Active remediation for VOCs and diesel, treated nitrate-bearing groundwater is misted to the air.
    c) Building 850 – Pilot study targeting perchlorate remediation, which will denitrify nitrate as an added benefit.
    d) Building 899 – Monitored natural attenuation for TCE, perchlorate, tritium and nitrate. Nitrate concentrations above the MCL are limited to one well which is in the vicinity of the septic system leach field.

19. Site 300 operates a nontransient, noncommunity drinking water system under a permit issued by the California Department of Public Health. Groundwater is pumped from two-onsite supply wells (Well 20 [primary] and Well18 [backup]). Well 20 is screened between 425 and 475 feet bgs and Well 18 is screened between 387 and 517 feet bgs. Both are screened in the regional aquifer, the Tertiary Neroly Lower Blue Sandstone ($Tnbs_1$). The water is chlorinated in the distribution system and is monitored to assure that drinking water standards are met. Analyses of nitrate concentrations in the groundwater from these wells consistently have been below the detection limit for nitrate of 0.5 mg/L, indicating that natural and anthropogenic nitrate sources are not degrading the regional aquifer.

20. Regional Water Board staff concludes that some localized degradation of groundwater from the nitrate associated with domestic waste in septic system discharges has occurred in the past and may still be occurring. Issuance of this Order and the associated MRP provides a means to monitor the impacts that the septic systems may have caused to groundwater, and will help the Regional Water Board ascertain whether continued use of these systems will

not unreasonably affect beneficial uses, and will not result in water quality less than that described in the State Water Board's policies.

21. The Water Quality Control Plan, Central Valley Region, Fourth Edition (Basin Plan) designates the beneficial uses of groundwater underlying Site 300 as municipal and domestic, agricultural, and industrial supply. The property is not conducive to growing of crops. The most likely agricultural beneficial use would be livestock watering.

DESCRIPTION OF WASTES AND WASTE UNITS

Sewage Evaporation and Percolation Ponds - Domestic and Industrial Waste Ponds

22. The location of the sewage evaporation and percolation ponds is shown on Attachment 2. The sewage evaporation pond discharges to the percolation pond when the capacity of the sewage evaporation pond is exceeded.

23. The sewage evaporation pond receives domestic and mechanical equipment wastewater from Buildings 870, 871, 872, 873, 874, 875, 876, 877, 878, 879 and 880. Domestic wastewater generated at these Site 300 buildings includes discharges of sanitary wastes from restroom and shower facilities, washing machines, kitchens, and housekeeping activities. Mechanical equipment wastewater discharges generated at these facilities include discharges from boilers, vacuum pumps, pressure relief valves on hot water/steam equipment, humidifiers, filter drains, and water softeners, as well as condensate from air compressors, air conditioners, and refrigeration units. The Discharger sampled and analyzed wastewater discharges from mechanical equipment in the Buildings 806 and the 827 Complex. Because the sources of the wastewater at these buildings are similar to those which discharge to the sewage evaporation pond, the analytical results were determined to be representative of mechanical equipment discharges to the sewage evaporation pond. Attachments 5 and 6 show analytical results from the mechanical equipment discharges. The Discharger also analyzed washing machine effluent from Building 873. Attachment 7 shows the analytical results from the washing machine. The results on Attachments 5 and 6 show that the discharge to the sewage pond has the potential to degrade groundwater if overflow from the sewage evaporation pond to the sewage percolation pond occurs.

24. The sewage ponds are underlain by approximately 35 feet of Quaternary alluvium that consists of clay, silt, sand, and gravel lenses. The alluvium

overlies the regional aquifer, the $Tnbs_1$. The alluvium and $Tnbs_1$ are in hydraulic communication.

25. The seasonally highest groundwater level in the alluvium ranges from 10 feet below to even with the base of the sewage ponds. Groundwater flows generally in a northeasterly direction along alluvial paleochannels of Corral Hollow Creek and to the southeast in the $Tnbs_1$.

26. Land within 1,000 feet of the sewage ponds off Site 300 property is used primarily for livestock grazing. One residence is within 1,000 feet of the sewage ponds on the property previously operated as a fire station by the California Department of Forestry. Water supply for this residence is from wells completed in the $Tnbs_1$. Land within 1,000 feet of the sewage ponds within Site 300 is primarily open space, groundwater treatment facilities, and facility maintenance shops and offices.

27. The sewage evaporation pond is lined with catalytically-blown asphalt and is designed to overflow to the sewage percolation pond during periods of high rainfall. The surface area of the sewage evaporation pond is approximately one acre and the surface area of the percolation pond is approximately 0.33 acres. The sewage evaporation pond has a depth of 6.5 feet at the deepest point and four feet near the edges. The Discharger aerates the sewage evaporation pond for odor control as needed.

28. Design capacity of the sewage evaporation pond is 250 people per day at 30 gallons per day (gpd) per person. The sewage evaporation pond receives approximately 4,000 gpd of wastewater. Normal usage is lower than the design capacity. Due to the low flow (less than 10 gallons per minute during the work day), monitoring flow is not practical and no flow meter is installed.

29. The Discharger has only needed to remove sludge from the sewage ponds once since beginning operation. The Discharger sampled the sludge to characterize it for disposal. The sludge was determined to be non-hazardous and was disposed at the Class III BFI Landfill off Vasco Road in Livermore. Future sludge removal would be handled in the same manner. Four metals in the sludge, copper, mercury, silver and zinc, exceed Site 300 soil background levels for these metals. Annual groundwater sampling for metals is required in this Order.

30. The Discharger has registered the sewage percolation pond as a Class V Injection Well with the United States Environmental Protection Agency (US EPA).

31. In March 1997, the Discharger submitted a *100-year Storm Event Study for the Site 300 Sanitary Sewer Ponds* (1997 Study) evaluating the capacity of the system to contain the 100-year precipitation event. The 1997 Study evaluated the maximum flow into the sewage evaporation and percolation ponds, the 100-year precipitation, infiltration and exfiltration, and percolation and concluded that the sewage ponds can hold the maximum discharge and the influx from a 100-year storm event.

32. To augment the 1997 Study, in 2005 the Discharger submitted a water balance evaluation to account for the evaporation from the system. The 2005 evaluation concluded that the evaporation potential is greater than the amount of water entering the sewage evaporation pond; approximately 75% of the flow into the sewage evaporation pond is lost to evaporation annually. During the winter months of December through March, the evaporation decreases and flows to the percolation pond may occur

33. The Order preceding Order No. 96-248 did not have freeboard requirements. For 10 years prior to issuance of Order No. 96-248, the Discharger operated the sewage evaporation pond with one foot of freeboard without incident of structural problems or wave action washing over the berm. Since depth to groundwater varies between zero and 10 feet below the base of the sewage ponds, overflow to the percolation pond has the potential to degrade groundwater.

34. This Order requires the Discharger to maintain adequate freeboard in the sewage evaporation pond to prevent over-topping or erosion of the pond embankment which may threaten the integrity of the pond. The Discharger will maintain the minimum freeboard determined as adequate to reduce or eliminate the overflow frequency to the percolation pond during winter months. Removable boards control flow into the spillway to the percolation pond and maintain freeboard depth.

35. This Order requires the Discharger to monitor quarterly the wastewater entering the sewage evaporation pond for specific conductance (SC), pH and biochemical oxygen demand (BOD) and the wastewater in the sewage evaporation pond for pH, SC, dissolved oxygen (DO), (BOD), total and fecal coliform and metals. Any discharge from the sewage evaporation pond to the sewage percolation pond is sampled and analyzed for DO, BOD, SC, total and fecal coliform, pH and metals. The Discharger also monitors groundwater downgradient and upgradient of the sewage ponds semi-annually for pH, SC, fecal and total coliform, chloride, nitrate, sulfate, sodium, total dissolved solids (TDS), metals and groundwater elevation. Sewage pond and groundwater sampling locations are shown on Attachment 8, a part

of this Order. Results of routine monitoring of evaporation sewage pond influent and in-pond samples are show in Attachment 9, of percolation sewage pond influent are shown on Attachment 10, and for groundwater on Attachment 11. Attachments 12, 13, and 14 provide additional water quality monitoring results of sewage evaporation pond influent (cation/anion scan with ion balance, dissolved metals, and nutrients and coliform organisms) collected to support renewal of the WDRs.

36. This Order continues the existing groundwater monitoring program with the addition of two downgradient monitoring wells and analyses for chloride, sulfate, TDS, sodium and metals to the groundwater monitoring program for the sewage ponds. The added constituents were found to be elevated in mechanical equipment discharges and in sewage sludge.

37. During the summer, evaporation from the sewage evaporation pond exceeds the influent flow to the sewage evaporation pond. In order for the sewage evaporation pond to function properly, the Discharger supplements the influent with groundwater from the on-site supply Well 20, when necessary. Under the CERCLA project, in 2005 the Discharger achieved the groundwater cleanup standard for VOCs in the eastern General Services Area (EGSA) and subsequently shut down the groundwater treatment system. The Discharger is required to continue groundwater monitoring to determine if the VOC concentrations increase or “rebound”. Should rebound occur, additional treatment may be required under the CERCLA project. If additional groundwater treatment becomes necessary in the EGSA, the Discharger has the option of discharging a portion of the treated groundwater from the EGSA treatment facility to the sewage evaporation pond when water is needed to make up for excessive evaporative losses during the summer. Approximately 1,000 to 1,500 gpd of treated groundwater could be discharged into the sewage evaporation pond during the summer months.

Mechanical Equipment Wastewater Percolation Pits

38. The five mechanical equipment wastewater percolation pits receive mechanical equipment wastewater from Buildings 806A, 827A, 827C, 827D, and 827E, which are in the High Explosives Process Area and Chemistry Area in the southeast area of the site. The buildings that have mechanical equipment percolation pits are shown on Attachment 2. The percolation pits are approximately 50 to 200 feet from the buildings. Mechanical equipment wastewater includes discharges from boilers, vacuum pumps, pressure relief valves on hot water/steam equipment, humidifiers, filter drains, and water softeners, as well as condensates from air compressors, air conditioners, and refrigeration units. Maximum discharge to the mechanical equipment

wastewater percolation pits is 150 gpd each for Buildings 827A, C, D and E and 50 gpd for Building 806A.

39. The High Explosives Process Area and Chemistry Area are underlain by an unsaturated zone ranging from 50 to over 130 feet thick, which consists of interbedded claystone, siltstone and sandstone. Attachment 15, a part of this Order, provides a summary of the percolation pits, waste streams, up and down-gradient monitoring wells and depths to first water-bearing zones. Additional wells may be identified as up and downgradient monitoring wells after the required studies are completed, as described in Provision 5 and discussed in Finding 46.

40. The average hydraulic conductivity of the $Tnbs_2$ is 0.001 cm/sec and the hydraulic gradient is 0.05 to the south-southeast.

41. Land within 1,000 feet of Buildings 806 and 827 A through E is used by Site 300 as open space and for other buildings used for explosives formulation, processing, and storage.

42. The mechanical equipment wastewater percolation pits, constructed in 1995, are rectangular excavations (ranging from 4x3x3 to 7x6x6 feet) filled with drain rock over which is a geotextile filter fabric and a concrete cap. The design flow rate of each of the percolation pits at Buildings 827 A, C, D, and E is 150 gpd and at Building 806 is 50 gpd.

43. The Discharger has registered the mechanical equipment wastewater percolation pits as Class V Injection Wells with the US EPA.

44. At the request of the Regional Water Board, the Discharger submitted technical reports on the quality of the mechanical equipment wastewater in 1994 and in 2005. In 1994 and 2004, the Discharger analyzed the wastewater for analytes suspected to be in the wastewater. In 1994, the analyses included general minerals, VOCs, oil and grease, and metals. In 2004, the analyses included general minerals, oil and grease and metals, as shown on Attachments 5 and 6. VOCs were not analyzed in 2004 because they were not detected in 1994.

45. The Discharger used the Designated Level Methodology (DLM) to evaluate the potential for the mechanical equipment wastewater discharged to percolation pits to impact beneficial uses of underlying groundwater. The lowest appropriate water quality limits protective of beneficial uses of groundwater were selected for the model endpoints. By applying an attenuation factor of 100 for areas where groundwater is greater than

30 feet bgs, the Discharger determined that all constituents detected in the mechanical equipment discharges were lower than the DLM value, indicating the discharges are not predicted to negatively affect groundwater. However, the Regional Water Board has since concluded that salts do not attenuate; therefore, an attenuation factor of one (1) should be applied for salts. In response to this conclusion, the results of the Discharger's analyses reported in the 28 January 2005 report were revised to reflect an attenuation factor of 1 for salts as shown on Attachment 16, a part of this Order. Concentrations of conductivity (measured as SC), sulfate, sodium, and TDS in the mechanical equipment effluent exceed water quality goals. Concentrations of chloride were elevated as well and have the potential to exceed the water quality goal. Concentrations of these five constituents in groundwater vary throughout the site and vary in the different hydrostratigrahic units. Concentrations observed in existing monitor wells upgradient of the percolation pits range from just below to significantly above the water quality goals (see Attachment 17, a part of this Order).

46. For discharges of mechanical equipment effluent, this Order requires the Discharger to conduct a salinity evaluation and minimization plan; requires the Discharger to obtain additional effluent information; requires the Discharger to evaluate fate and transport of salt and metals to ground water; and requires the Discharger to develop additional information on salinity in the source water and receiving water. If any mechanical equipment discharges to percolation pits have degraded groundwater, the Discharger will be required to monitor groundwater up and downgradient of those discharges and submit a feasibility study proposing remedial alternatives to restore beneficial uses of groundwater if it is determined by the Regional Water Board that the groundwater has been unreasonably degraded. The Discharger must include a proposal for implementing a source control program and best practicable technology (BPT) to reduce pollutants in the discharge.

47. This Order also requires the Discharger to monitor semi-annually wastewater discharged to each mechanical equipment percolation pit as described in MRP No. R5-2008-0148.

Cooling Tower Percolation Pits

48. Nine non-contact cooling towers, one each at Buildings 801, 809, 812, 817A, 826, two at 827A, and two at 851, discharge blowdown to seven percolation pits, one at each building. Maximum design discharge to these percolation pits ranges from 300 to 1,200 gpd. Attachment 15 provides a summary of the location and design of the percolation pits, nearby wells, depth to groundwater and groundwater flow direction. Additional wells may be

identified as down and upgradient monitoring wells after the required studies are completed, as described in Provision 5 and discussed in Finding 56.

49. Occasionally these cooling towers may discharge onto the ground when the percolation pits undergo maintenance. These discharges are of short duration, usually no more than seven days, and the Discharger takes steps to minimize flow and prevent the blowdown from reaching surface water drainage courses.

50. All but three of the existing cooling tower percolation pits are in the High Explosives Process Area and Chemistry Area, described in Finding 39. The three cooling tower percolation pits outside these two areas receive blowdown from cooling towers at the Buildings 801 Complex, 812 Complex and 851 Complex. These buildings are used for testing of explosives. Building 801 and 812 are located in Elk Creek Ravine in the East Firing Area. Groundwater is approximately 50 feet bgs at Building 801 and about 30 feet bgs at Building 812. Building 851 is in the West Firing Area near the San Joaquin/Alameda County line. Groundwater below Building 851 is greater than 120 feet bgs. Land use within 1,000 feet of these building complexes is open space and explosive storage facilities. Locations of the buildings with percolation pits are shown on Attachment 2.

51. The cooling tower percolation pits are rectangular excavations (ranging from 6x6x3 to 18x18x5 feet) filled with drain rock covered by a concrete cap. These percolation pits were constructed in 1994. Because the cooling tower percolation pit at Building 827 had a recurring overflow problem, it was reconstructed in a new location in March 2001.

52. The Discharger has registered the cooling tower percolation pits as Class V Injection Wells with the U.S. Environmental Protection Agency.

53. Currently, NALCO TRASAR 23246 is added to the cooling towers for corrosion control. The MSDS sheet indicates that this substance contains carbon, nitrate and phosphorus.

54. The Discharger analyzed the blowdown from the cooling towers at Buildings 801, 827A and 836A for analytes suspected to be in the blowdown. (The cooling tower discharge at Building 836A was discontinued on 13 April 2005.) The analyses included volatile organic compounds (VOCs), general minerals, and metals, as shown in Attachments 18, 19 and 20 respectively. The VOCs detected are trihalomethanes resulting from the breakdown of the corrosion and microbiocide additives.

55. The Discharger used the DLM to evaluate the potential for constituents, except VOCs, in cooling tower effluent to impact beneficial uses of underlying groundwater. The lowest appropriate water quality limits protective of beneficial uses of groundwater were selected for the model endpoints. By applying an attenuation factor of 10 for areas where groundwater is less than or equal to 30 feet bgs and an attenuation factor of 100 for areas where groundwater is greater than 30 feet bgs, the Discharger determined that all constituents detected in the cooling tower blowdown were lower than the DLM value, indicating the discharges are not predicted to negatively affect groundwater. However, the Regional Water Board has since concluded that salts do not attenuate; therefore, an attenuation factor of one (1) should be applied for salts. In response to this conclusion, the results of the Discharger's analyses reported in the 28 January 2005 report were revised to reflect an attenuation factor of 1 for salts as shown on Attachments 16 and 21, parts of this Order. Concentrations of conductivity (measured as SC), sulfate, sodium, and TDS in the cooling tower effluent exceed water quality goals. Concentrations of chloride were elevated as well and have the potential to exceed the water quality goal. Background concentrations of these five constituents in groundwater vary throughout the site and vary in the different hydrostratigrahic units. Concentrations observed in existing monitor wells upgradient of the percolation pits range from just below to significantly above the water quality goals (see Attachment 17).

56. For discharges of cooling tower effluent, this Order requires the Discharger to conduct a salinity evaluation and minimization plan; requires the Discharger to obtain additional effluent information; requires the Discharger to evaluate fate and transport of salt to ground water; and requires the Discharger to develop additional information on salinity in the source water and receiving water. If any cooling tower discharges to percolation pits have degraded groundwater, the Discharger will be required to monitor groundwater up and downgradient of those discharges and submit a feasibility study proposing remedial alternatives to restore beneficial uses of groundwater if it is determined by the Regional Water Board that the groundwater has been unreasonably degraded. The Discharger must include a proposal for implementing a source control program and best practicable technology (BPT) to reduce pollutants in the discharge.

57. This Order also requires the Discharger to monitor semi-annually wastewater discharged to each cooling tower percolation pit as described in MRP No. R5-2008-0148.

Septic Systems

58. Thirty-three (33) facilities, which are remotely located throughout the site, have septic systems. These septic systems are located at Buildings 801, 802, 805, 806, 807, 809, 810, 812, 813, 817, 818, 819, 825, 826, 827, 830, 832, 833/835, 834, 836, 841, 848, 850, 851, 854, 855A, 858, 865, 882, 892, 895, 897, and 899 as shown on Attachment 2.

59. The geology and hydrogeology vary across the site and are described in the April 1994 *Final Site-Wide Remedial Investigation*. Land use within 1,000 feet of the septic systems is within Site 300 with two exceptions. Within Site 300 the land uses include open space and buildings used for offices, research, and explosives storage, processing and testing. The septic systems at Buildings 834 and 899 are within 1,000 feet of the site boundary. Offsite land uses within 1,000 feet of these two buildings include off-road vehicle recreation, park ranger housing and livestock grazing on neighboring properties.

60. Septic systems used at Site 300 have been constructed over the 52-year life of the facility and vary in design and capacity. Flows to the septic systems at Site 300 are estimated to range from under 10 to just over 300 gpd, which is lower than typical residential flows. Attachment 22, a part of this Order, provides a summary of the Site 300 septic systems design and waste streams.

61. The Discharger has registered all the septic systems to which mechanical equipment wastewater or cooling tower blowdown is discharged as Class V Injection Wells with the USEPA. None of the purely domestic waste septic systems at Site 300 serve more than 20 people so are not considered Class V Injection Wells.

62. Domestic waste is discharged to all of the septic systems. Domestic waste includes discharges of sanitary wastes from restroom and shower facilities, washing machines, kitchens, and housekeeping activities. Mechanical equipment and cooling tower wastewater is discharged to 12 septic systems at Buildings 801, 802, 805, 813, 819, 825, 826, 830, 833/835, 834A, 850, and 851. Mechanical equipment wastewater may include discharges from boilers, vacuum pumps, pressure relief valves on hot water/steam equipment, humidifiers, filter drains, and water softeners, as well as condensates from air compressors, air conditioners, and refrigeration units.

63. The Discharger analyzed mechanical equipment wastewater from the Building 827 Complex and Building 806, and cooling tower blowdown from

Buildings 801, 827A, and 836A. Although these specific sources are discharged to percolation pits, they were considered representative of the mechanical equipment and cooling tower discharges to septic systems at Site 300. (See Attachments 5, 6, 18, 19, and 20.).

64. The septic systems at Buildings 813 and 835 receive discharge from washing machines. Clothing from High Explosives Process Area workers is washed in the washing machine at Building 813. The Discharger analyzed the washing machine effluent at these buildings for general minerals, and at Building 813 only, for explosive compounds, as shown in Attachment 7 and Attachment 23, a part of this Order.

65. The Discharger evaluated threat to water quality from laundry water discharges using the DLM. By applying an attenuation factor of 100 for areas where groundwater is greater than 30 feet bgs, the Discharger determined that all constituents detected in the laundry effluent were lower than the DLM values, except for aluminum and iron. Wastewater from the Building 813 washing machine had detections of the high explosives RDX and HMX lower than the DLM value. The Regional Water Board has since concluded that salts do not attenuate so an attenuation factor of one (1) should be applied for salts. In response to this conclusion, the results of the Dischargers' analyses reported in the 28 January 2005 report were revised to reflect an attenuation factor of 1 for salts, as shown on Attachment 24, a part of this Order. Concentrations of conductivity (measured as SC), sodium, and TDS in the laundry effluent exceed water quality goals. The study discussed in Finding 69 will evaluate if any constituents in septic system effluent have the potential to degrade or have degraded groundwater.

66. The septic systems at Site 300 have limited flow, and some are used intermittently. Only six are within 30 feet of groundwater. The septic systems are in remote locations across the site. Connecting to treatment and sewer systems is not practicable. Allowing discharge to these septic systems without secondary treatment is practicable because the septic systems are in remote areas, they have limited use, groundwater is greater than 30 feet bgs at all but six of the septic systems, groundwater below the septic systems is not used for animal or human consumption, and in most cases has limited yield.

67. The groundwater underlying the septic systems is not used on site for livestock or human consumption. The regional aquifer is used for drinking water on site. This water is chlorinated to meet drinking water requirements and is tested regularly. Because San Joaquin County requires an annular seal to extend from ground surface to a depth of 50 feet for agricultural wells

and 100 feet for drinking water supply wells, groundwater within 50 feet of the septic systems is not available for agricultural, municipal, or domestic use.

68. The Discharger has not evaluated the potential for domestic wastewater discharges to the septic systems to impact beneficial uses of groundwater. Also, the Discharger does not monitor the groundwater specifically for impact of discharges from septic systems to groundwater; however, groundwater monitoring wells installed for the CERCLA investigations exist in the general vicinity of most of the septic systems. The Discharger monitors for a wide range of constituents associated with the CERCLA project. CERCLA investigations in the areas around Building 812, Building 834, Building 850, and Building 899, have determined that nitrate concentrations in groundwater exceed the drinking water MCL. Investigations in these areas have attributed the source of the nitrate at least in part to the septic systems. This Order requires the Discharger to monitor existing groundwater monitoring wells in the vicinity of these four septic systems as described in the MRP.

69. This Order requires the Discharger to evaluate if groundwater is impacted or may be impacted by the septic systems, as described below in Provision 8. If any septic systems have degraded groundwater, the Discharger will be required to monitor groundwater up and downgradient of those septic systems and to submit a feasibility study proposing remedial alternatives to restore beneficial uses of groundwater if it is determined by the Regional Water Board that the groundwater has been unreasonably degraded. The Discharger shall include a proposal for implementing a source control program and BPT to reduce pollutants in the discharge.

Low Threat Discharges

70. The Discharger conducts a variety of activities at Site 300 that may result in low volume and low-threat discharges. Consistent with the Storm Water Pollution Prevention Program, the discharger has implemented Best Management Practices (BMPs) to prevent these discharges from reaching surface water drainage courses, thus these discharges percolate into the ground. The discharges detailed in Attachment 4 are primarily composed of potable water, low conductivity water, condensate, and uncontaminated contained rainwater. These discharges may occur at any of the facilities and outdoor areas at Site 300.

71. The Discharger evaluated the low threat discharges in a technical report submitted in 1994. These discharges did not contain any constituents that would negatively affect groundwater and are discharged in low volumes,

ranging from drips of condensate to one time 5,000-gallon discharges of water that percolate into the ground. (see Attachment 4)

72. The Discharger has obtained coverage under the Central Valley General Order No. 5-00-175, NPDES Permit CAG995001 the *General Order for Dewatering and Other Low Threat Discharges to Surface Waters*, for large volume potable water discharges that have the potential to reach surface waters.

BASIN PLAN, BENEFICIAL USES, AND REGULATORY CONSIDERATIONS

73. The Water Quality Control Plan for the Sacramento River and San Joaquin River Basins, Fourth Edition, (hereafter Basin Plan) designates beneficial uses, establishes water quality objectives, contains implementation plans and policies for protecting waters of the basin, and incorporates by reference plans and policies adopted by the State Water Resources Control Board (State Water Board). Pursuant to Section 13263(a) of the California Water Code, waste discharge requirements must implement the Basin Plan.

74. The Basin Plan designates the beneficial uses of ground water underlying Site 300 as municipal and domestic, agricultural, and industrial supply.

75. The Basin Plan establishes numerical and narrative water quality objectives for surface and groundwater within the basin, and recognizes that water quality objectives are achieved primarily through the Regional Water Board’s adoption of waste discharge requirements and enforcement orders. Where numerical water quality objectives are listed, these are limits necessary for the reasonable protection of beneficial uses of the water. Where compliance with narrative water quality objectives is required, the Regional Water Board will, on a case-by-case basis, adopt numerical limitations in orders, which will implement the narrative objectives to protect beneficial uses of the waters of the state.

76. The Basin Plan identifies numerical water quality objectives for waters designated as municipal supply. These are the MCLs specified in the following provisions of Title 22, California Code of Regulations: Tables 64431-A (Inorganic Chemicals) and 64431-B (Fluoride) of Section 64431, Table 64444-A (Organic Chemicals) of Section 64444, and Table 64449-A (Secondary MCLs-Consumer Acceptance Limits) of Section 64449. The Basin Plan’s incorporation of these provisions by reference is prospective, and includes future changes to the incorporated provisions as the changes take effect. The Basin Plan recognizes that the Regional Water Board may

apply limits more stringent than MCLs to ensure that waters do not contain chemical constituents in concentrations that adversely affect beneficial uses.

77. The Basin Plan contains narrative water quality objectives for chemical constituents, tastes and odors, and toxicity. The toxicity objective requires that groundwater be maintained free of toxic substances in concentrations that produce detrimental physiological responses in humans, plants or animals. The chemical constituent objective requires that groundwater shall not contain chemical constituents in concentrations that adversely affect beneficial uses. The taste and odor objectives require that groundwater shall not contain tastes or odors producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

78. The Basin Plan establishes the control of salinity as a high priority. The Regional Water Board issued a memorandum on 26 April 2007 setting forth guidance for the consistent management of salinity and the need to immediately begin addressing salinity in existing discharges. The discharge of salts above background levels, when discharged to land or water, increases the inventory of salt in the Region, that is, it increases the total salt contained in surface water, groundwater, and soil. Crop productivity drops with increasing soil salinity until farming becomes infeasible. Some types of salt can result in significant human health risks. For example, nitrates are a component of salt and pose a significant human health risk. This Order complies with the 26 April 2007 guidance memorandum. Salinity is of concern in the existing discharges covered by this Order. However, sufficient information is not available at this time to establish effluent limits or interim effluent limits. This Order requires the Discharger to conduct a salinity evaluation and minimization plan; requires the Discharger to obtain additional effluent information; requires the Discharger to evaluate fate and transport of salt to ground water; and requires the Discharger to develop additional information on salinity in the source water and receiving water.

79. Section 13241 of the Water Code requires the Regional Water Board to consider various factors, including economic considerations, when adopting water quality objectives into its Basin Plan. Water Code Section 13263 requires the Regional Water Board to address the factors in Section 13241 in adopting waste discharge requirements. The State Water Board, however, has held that a regional water board need not specifically address the Section 13241 factors when implementing existing water quality objectives in waste discharge requirements because the factors were already considered in adopting water quality objectives. These waste discharge requirements implement adopted water quality objectives. Therefore, no additional analysis of Section 13241 factors is required.

80. The US EPA has promulgated biosolids reuse regulations in 40 CFR 503, Standard for the Use or Disposal of Sewage Sludge, which establishes management criteria for protection of ground and surface waters, sets application rates for heavy metals, and establishes stabilization and disinfection criteria.

81. The Regional Water Board is using the Standards in 40 CFR 503 as guidelines in establishing this Order, but the Regional Water Board is not the implementing agency for 40 CFR 503 regulations. The Discharger may have separate and/or additional compliance, reporting, and permitting responsibilities to the US EPA.

82. The action to revise the WDR for the sewage evaporation and percolation ponds, septic systems, low-threat discharges, mechanical equipment wastewater, and cooling tower discharges is exempt from provisions of the California Environmental Quality Act (Pub. Resources Code § 21000, et seq.) in accordance with CCR, Title 14, Section 15301 for existing facilities.

83. State Board Resolution No. 68-16 (Resolution 68-16) requires the Regional Water Board, in regulating the discharge of waste, to maintain high quality waters of the State until it is demonstrated that any change in water quality will be consistent with maximum benefit to the people of the State, will not unreasonably affect beneficial uses, and will not result in water quality less than that described in the State Water Board's policies (e.g., quality that exceeds water quality objectives). The Regional Water Board finds that the discharge, as allowed in these waste discharge requirements, is consistent with Resolution No. 68-16 since: (1) this Order requires use of best practicable treatment, including adequate monitoring and contingency plans to assure protection of water quality, and (2) this Order does not allow discharges of waste to degrade water quality below background levels, and, where background levels have already been degraded, this Order prohibits any further degradation. If the discharge causes or threatens to cause degradation of water quality to levels that exceed water quality objectives, then the Discharger will be required to cease the discharge, implement source control, change the method of disposal, or take other action. Some localized degradation of groundwater beneath septic systems is indicated in investigations of groundwater quality conducted as part of the CERCLA remedial investigations. Additional monitoring may be necessary to determine if degradation threatens beneficial uses. If beneficial uses are being impacted, the Discharger will need to implement source control for constituents that impact beneficial uses and may be required to undertake remedial actions.

84. Section 13267(b) of the California Water Code provides that: "In conducting an investigation specified in subdivision (a), the regional board may require that any person who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge waste within its region, or any citizen or domiciliary, or political agency or entity of this state who has discharged, discharges, or is suspected of having discharged or discharging, or who proposes to discharge, waste outside of its region that could affect the quality of waters within its region shall furnish, under penalty of perjury, technical or monitoring program reports which the regional board requires. The burden, including costs, of these reports shall bear a reasonable relationship to the need for the report and the benefits to be obtained from the reports. In requiring those reports, the regional board shall provide the person with a written explanation with regard to the need for the reports, and shall identify the evidence that supports requiring that person to provide the reports".

85. The technical reports required by this Order and by MRP No. R5-2008-0148 are necessary to assure compliance with these waste discharge requirements. The Discharger operates the facility that discharges the waste subject to this Order.

86. The California Department of Water Resources sets standards for the construction and destruction of groundwater wells (hereafter DWR Well Standards), as described in California Well Standards Bulletin 74-90 (June 1991) and Water Well Standards: State of California Bulletin 94-81 (December 1981). These standards, and any more stringent standards adopted by the State or county pursuant to CWC Section 13801, apply to all monitoring wells.

87. The discharges to ground and into the sewage ponds, septic systems, and percolation pits are exempt from the requirements of Title 27. The exemption is based on the following:

    a) The Regional Water Board is issuing waste discharge requirements,
    b) The discharge complies with the Basin Plan, and
    c) The wastewater does not need to be managed according to 22 CCR, Division 4, Chapter 30, as a hazardous waste.

88. State regulations that prescribe procedures for detecting and characterizing the impact of waste constituents from waste management units on groundwater are found in Title 27. While the wastewater treatment facility is exempt from Title 27, the data analysis methods of Title 27 are appropriate for

determining whether the discharge complies with the terms for protection of groundwater specified in this Order.

89. Pursuant to California Water Code Section 13263(g), discharge is a privilege, not a right, and adoption of this Order does not create a vested right to continue the discharge.

90. The Regional Water Board considered all the above and the supplemental information and details in the attached Information Sheet, a part of this Order, in establishing the following conditions of discharge.

91. The Regional Water Board has notified the Discharger and interested agencies and persons of its intention to revise the waste discharge requirements for this facility and has provided them with an opportunity for a public hearing and an opportunity to submit their written views and recommendations.

92. In a public hearing, the Regional Water Board heard and considered all comments pertaining to this facility and discharges that fall under these requirements.

IT IS HEREBY ORDERED that Order No. 96-248, is rescinded and Lawrence Livermore National Security, LLC, and the U.S. Department of Energy, their agents, successors, and assigns, in order to meet provisions of Division 7 of the Water Code and the regulations adopted thereunder, shall comply with the following:

[Note: Other prohibitions, conditions, definitions, and some methods of determining compliance are contained in the attached “Standard Provisions and Reporting Requirements for Waste Discharge Requirements” dated September 2003.

A. DISCHARGE PROHIBITIONS:

1. Discharge of waste to surface waters or to surface water drainage courses is prohibited.

2. The bypass or overflow of untreated or partially treated waste is prohibited except for the overflow from the sewage evaporation pond to the percolation pond during periods of heavy rainfall and occasional bypass of the percolation pits when they undergo maintenance.

3. Discharges not listed on Attachment 4 or in the Findings are prohibited unless the Regional Water Board has otherwise permitted or granted a waiver for the discharge.

4. Discharge of waste classified as hazardous, as defined in Sections 2521(a) of the California Code of Regulations (CCR), Title 23, Chapter 15 (hereafter Chapter 15), or designated, as defined in Section 13173 of the California Water Code (CWC), to the sewage ponds, percolation pits, septic systems, or ground, is prohibited.

5. Neither the treatment nor the discharges shall cause a pollution or nuisance as defined by the CWC, Section 13050.

6. The discharges shall not adversely impact the beneficial uses of groundwater.

B. DISCHARGE SPECIFICATIONS:

1. The discharges shall remain within the designated disposal areas at all times.

2. The sewage ponds shall be managed to prevent breeding of mosquitoes. In particular,

   a) An erosion control program must be implemented to assure that small coves and irregularities are not created around the perimeter of the water surface.

   b) Weeds shall be minimized through control of water depth, harvesting, or herbicides.

   c) Dead algae, vegetation, and debris shall not accumulate on the water surface.

3. Objectionable odors originating at the sewage ponds shall not be perceivable beyond the limits of the property owned by the Discharger.

4. As a means of discerning compliance with discharge specification No. 3, the dissolved oxygen content in the upper one-foot of the sewage evaporation pond shall not be less than 1.0 mg/L for 16 hours in any 24 hour period.

5. Public contact with wastewater shall be precluded through such means as fences, signs, and other acceptable alternatives.

6. The Discharger shall implement the BMPs for low threat discharges identified in Attachment 4.

7. Adequate freeboard must be maintained in the sewage evaporation pond to prevent over-topping or erosion of the pond embankment which may threaten the integrity of the pond.

8. When discharge to a percolation pit is diverted during maintenance activities, the Discharger shall prevent the discharge from entering any surface water drainage courses.

9. Discharges to the sewage ponds and the percolation pits shall not have a pH less than 5.0 or greater than 10.0.

C. SCREENINGS, SLUDGES, AND SOLIDS MANAGEMENT AT THE SEWAGE PONDS

1. Collected screenings, sludges, and other solids removed from liquid wastes shall be disposed of in a manner that is consistent with CCR Title 27, Division 2, Section 20220(c) and Title 23, Division 3, Chapter 15 and approved by the Executive Officer.

2. Any proposed change in sludge use or disposal practice from a previously approved practice shall be reported to the Executive Officer at least 90 days in advance of the change.

3. Use and disposal of sewage sludge shall comply with existing Federal and State laws and regulations, including permitting requirements and technical standards included in 40 CFR 503.

4. If the State Water Board and the Regional Water Boards are given the authority to implement regulations contained in 40 CFR 503, this Order may be reopened to incorporate appropriate time schedules and technical standards. The Discharger must comply with the standards and time schedules contained in 40 CFR 503 whether or not they have been incorporated into this Order.

5. The Discharger shall submit an annual report describing the quantity of sludge removed from wastewater management units and the manner and location of disposal. This report is not required in years when no screenings, sludge, or solids have been removed.

D. GROUND WATER LIMITATIONS

The discharge shall not cause underlying groundwater to:

1. Contain waste constituents in concentrations statistically greater than background water quality. If background quality has been degraded in the past, the discharges covered in this Order shall not further degrade groundwater. Groundwater background quality varies across the site and among the various stratigraphic units. The methods for determining background are described in the MRP

2. Contain chemicals, metals, or trace elements in concentrations that adversely affect beneficial uses or exceed MCLs specified in 22 CCR, Division 4, Chapter 15. If MCLs are exceeded due to natural background or degradation from past discharges, the discharges covered in this Order shall not further degrade groundwater.

3. Exceed a most probable number of fecal coliform organisms of 2.2/100 ml over two consecutive quarters.

4. Exceed concentrations of radionuclides specified in 22 CCR, Division 4, Chapter 15.

5. Contain taste or odor-producing substances in concentrations that cause nuisance or adversely affect beneficial uses.

6. Groundwater shall not be impacted with nitrate so that the concentrations are greater than the MCL or background water quality when background concentrations exceed the MCL. Where groundwater is already degraded with nitrate from past discharges, the discharges covered in this Order shall not further degrade groundwater.

E. PROVISIONS

1. The Discharger shall notify the Regional Board **30 days** prior to installing or enlarging septic systems or percolation pits to receive domestic wastewater, mechanical equipment wastewater, or cooling tower blowdown discharges. If the installation or enlargement of a septic system or percolation pit is to accommodate a new discharge location or a change in discharge water quality or quantity, the Discharger must submit a new report of waste discharge (RWD) which includes an evaluation of any potential impact to groundwater quality posed by the waste stream. The new discharge shall not occur until this Order is revised in response to the RWD.

2. The Discharger shall submit an RWD to the Regional Water Board in advance of discharging any new mechanical equipment waste stream or cooling tower waste stream to a septic system. The RWD shall include an evaluation of any potential impact to groundwater quality posed by the waste stream. The new discharge shall not occur until this Order is revised in response to the RWD.

3. By **1 March 2010** the Discharger shall prepare a final salinity evaluation and minimization plan to address the sources of salinity in cooling tower and mechanical equipment effluent. The evaluation and minimization plan shall include:
   a) Identification of the sources or potential sources of salinity in cooling tower and mechanical equipment effluent and an estimate of the contributions of salinity from these sources.
   b) An estimate of potential reductions that may be attained through controllable sources.
   c) A description of the tasks, costs and time required to investigate and to implement the source reduction elements of the minimization plan.
   d) An analysis, to the extent feasible, of any adverse environmental impacts, including the impact to water conservation, that may result from the implementation of the salinity minimization program.
   e) Progress to date in reducing the concentration and/or mass of salinity in the effluent.

4. The Discharger shall include progress reports on the salinity evaluation and minimization plan in the semi annual monitoring reports.

5. By **1 March 2009** the Discharger shall submit to the Regional Water Board for review and concurrence a work plan to sample effluent to the percolation pits and to model and otherwise evaluate the potential for salts in the mechanical equipment and cooling tower effluent to impact groundwater beneficial uses. In addition, the work plan will identify monitoring wells that can be used to determine background concentrations for salts in groundwater and monitoring wells that could be used to monitor groundwater downgradient of the percolation pits. The work plan shall include a schedule for completing the work and submitting the final evaluation, which shall become a part of this Order.
6. If it is determined through monitoring and modeling that the salts in the effluent from cooling towers and mechanical equipment have the potential to impact beneficial uses of groundwater, upon request of the Executive Officer the Discharger shall submit to the Regional Water Board for review and concurrence a work plan to install groundwater monitoring wells to determine if beneficial uses are being impacted. The work plan shall include a schedule

for completing the work, which shall become a part of this Order.

7. **One month after receiving the first four consecutive quarters of groundwater monitoring results,** the Discharger shall submit to the Regional Water Board an evaluation of the monitoring. If the monitoring shows that the beneficial uses of groundwater have been impacted by percolation pit discharges, upon request of the Executive Officer the Discharger must submit a feasibility study proposing remedial alternatives to restore beneficial uses to the groundwater. The feasibility study shall include a schedule for completing the work, which shall become a part of this Order. The Discharger must include a proposal for implementing a source control program and best practicable technology (BPT) to reduce pollutants in the discharge. The Regional Water Board may reopen this Order to include additional requirements resulting from the above submitted studies.

8. By **1 March 2009**, the Discharger shall submit to the Regional Water Board a work plan for review and concurrence to evaluate the impacts or potential impacts to groundwater by Site 300 septic systems. The evaluation shall be based on the location of each septic system discharge zone (e.g. leachfield), the use of the septic systems, depths to groundwater, geology below the systems, monitoring wells in the vicinity of the system including monitoring wells potentially upgradient and downgradient of the discharge zone, and any available data on groundwater and effluent quality. The evaluation shall summarize available data for nutrients, fecal and total coliform, trace organics, general minerals or other analyses such as isotopic signatures that may indicate a septic system impact on groundwater. The work plan shall include a schedule for completing the work and submitting the final evaluation, which shall become a part of this Order.

9. If the Regional Water Board determines from review of the evaluation report that the effluent from septic systems poses a threat to groundwater, upon request of the Executive Officer the Discharger shall submit a work plan to the Regional Water Board for review and concurrence to install groundwater monitoring wells to determine if beneficial uses are being impacted. The work plan shall include a schedule for completing the work, which shall become a part of this Order.

10. **One month after receiving the first four consecutive quarters of groundwater monitoring results,** the Discharger shall submit to the Regional Water Board an evaluation of the monitoring. If the monitoring shows that the beneficial uses of groundwater have been impacted by septic

system discharges, upon request of the Executive Officer the Discharger shall submit to the Regional Water Board for review and concurrence a feasibility study proposing remedial alternatives to restore beneficial uses to the groundwater. The feasibility study shall include a schedule for completing the work, which shall become a part of this Order. The Discharger shall include a proposal for implementing a source control program and BPT to reduce pollutants in the discharge. The Regional Water Board may reopen this Order to include additional requirements resulting from the above submitted studies.

11. If the State issues a general permit to control discharges from on-site wastewater treatment systems (e.g. septic systems), this Order may be reopened to incorporate appropriate provisions and technical standards to make the regulation of on-site wastewater treatment systems at Site 300 consistent with the State requirements.

12. The Discharger shall notify Regional Water Board staff at least 30 days in advance of changing chemical additives to cooling tower water used for corrosion and biological control to receive approval from Regional Water Board staff of the change. The notification shall include an evaluation of any potential impact to groundwater quality posed by the use of the new treatments.

13. The Discharger shall notify Regional Water Board staff at least 30 days in advance of any proposed changes to the processes or mechanical equipment which may affect mechanical equipment discharge quality. The notification shall include an evaluation of any potential impact to groundwater quality posed by the changes.

14. The Discharger shall notify the Regional Water Board of plans to close a waste management unit and submit a closure plan 45 days prior to closure. Field activities for closure shall not take place until the closure plan is approved by Regional Water Board staff.

15. The Discharger shall notify the Regional Water Board of any overflow from a mechanical equipment or cooling tower percolation pit within 2 days of the overflow. Notification shall include a description of the affected area, the cause of the overflow, containment methods and a plan to assure that overflow will not occur in the future.

16. The Discharger shall notify the Regional Water Board within 24-hours of any overflow from mechanical equipment or cooling tower percolation pits that reaches a surface water drainage course. Notification shall include a description of the affected area, the cause of the overflow, containment

methods and a plan to assure that overflow will not occur in the future.

17. The Discharger shall comply with Monitoring and Reporting Program No. R5-2008-0148, a part of this Order, and any revisions thereto as ordered by the Executive Officer.

18. The Discharger shall comply with the "Standard Provisions and Reporting Requirements for Waste Discharge Requirements", dated September 2003, a part of this Order. This attachment and its individual paragraphs are commonly referenced as "Standard Provision(s)".

19. In the event of any change in control or ownership of land or waste discharge facilities described herein, the Discharger shall notify the succeeding owner or operator of the existence of this Order by letter, a copy of which shall be immediately forwarded to the Regional Water Board.

20. The Discharger shall comply with all applicable provisions of Title 27 and 40 CFR Part 258 that are not specifically referenced in this Order.

21. The Regional Water Board will review this Order periodically and will revise requirements when necessary.

22. The Discharger shall maintain a copy of this Order at the facility and make it available at all times to facility operating personnel, who shall be familiar with its contents, and to regulatory agency personnel.

I, PAMELA C. CREEDON, Executive Officer, do hereby certify the foregoing is a full, true, and correct copy of an Order issued by the California Regional Water Quality Control Board, Central Valley Region, on 11 September 2008.

Original signed by

PAMELA C. CREEDON, Executive Officer

CALIFORNIA REGIONAL WATER QUALITY CONTROL BOARD
CENTRAL VALLEY REGION

MONITORING AND REPORTING PROGRAM NO. R5-2008-0148
ISSUED TO
LAWRENCE LIVERMORE NATIONAL SECURITY, LLC
AND
THE U.S. DEPARTMENT OF ENERGY
FOR
LAWRENCE LIVERMORE NATIONAL LABORATORY
EXPERIMENTAL TEST SITE (SITE 300)

SEWAGE EVAPORATION AND PERCOLATION PONDS
SEPTIC SYSTEMS
COOLING TOWER DISCHARGES
MECHANICAL EQUIPMENT WASTEWATER DISCHARGES
AND
OTHER LOW-THREAT DISCHARGES

ALAMEDA AND SAN JOAQUIN COUNTIES

Lawrence Livermore National Laboratory Site 300 discharges domestic and wastewater to sewage evaporation and percolation ponds in the General Services Area, septic systems located throughout the site, and mechanical equipment wastewater and cooling tower blowdown to percolation pits and septic systems located throughout the site. Other low threat discharges described in Attachment 4 of Waste Discharge Requirements Order No. R5-2008-0148 occur throughout the site.

This Monitoring and Reporting Program (MRP) is issued pursuant to Section 13267 of the California Water Code and is designed to determine if permitted wastewater discharges are impacting, or have the potential to impact, groundwater. The Discharger shall not implement any changes to this MRP unless and until a revised MRP is issued by the Executive Officer.

Prior to construction of any new groundwater monitoring wells, the Discharger shall submit plans and specifications to the Regional Water Board for review and approval. Once installed, all new wells shall be added to the monitoring program described below for the area in which they were installed.

SEWAGE EVAPORATION AND PERCOLATION PONDS

Effluent and Pond Monitoring

1. Effluent samples shall be collected just prior to discharge to the disposal facility (Location ISWP). The effluent waste stream shall be sampled and analyzed **semi-annually** for specific conductance (SC), pH, and biochemical oxygen demand (BOD).

Table 1 lists analytical methods and reporting limits.

2. The sewage evaporation pond (Location ESWP) shall be sampled and analyzed **semi-annually** for the all analytes listed on Table 1. Table 1 lists analytical methods and reporting limits.

3 The sewage evaporation pond shall be observed **monthly** for freeboard, color, odor, and levee condition.

4. When discharge to the percolation pond (Location DSWP) occurs, the discharge shall be sampled for the all analytes listed on Table 1. Table 1 lists analytical methods and reporting limits.

Table 1. Sewage ponds wastewater and effluent analytes, analytical methods and reporting limits

Analyte	EPA (E) or Standard Method (SM)[1]	Reporting limit	Units
Specific conductance	E120.1 or calibrated field meter	Not applicable	µmhos/cm
pH	E150.1 or calibrated field meter	± 0.1	unitless
Metals	E200.7 or E200.8	Variable	mg/L
Dissolved oxygen	E 360.1 or calibrated field meter	0.05	mg/L
Biochemical oxygen demand	SM 5210B	2	mg/L
Total coliform	SM 9211	2	MPN/100mL
Fecal coliform	SM 9211	2	MPN/100mL

[1] Or equivalent method as approved by the Regional Water Board.

Groundwater Monitoring

5. Groundwater near and below the sewage evaporation and percolation ponds shall be sampled and analyzed **semi-annually** from upgradient wells W-7ES and W-7PS, crossgradient monitoring well W-35A-04, and downgradient monitoring wells W-26R-01, W-26R-03, W-26R-05, W-26R-11, W-25N-20, W-25N-23 and W-7DS (wells are shown on Attachment 8 of Waste Discharge Requirements Order No. R5-2008-0148) for the analytes listed on Table 2. Table 2 lists analytical methods and reporting limits.

6. Semi-annual sample collection shall be separated by at least 3 months and collected during periods that represent seasonally high and seasonally low ground water elevations.

Table 2. Sewage ponds groundwater analytes, analytical methods and reporting limits

Analyte	EPA (E) or Standard Method (SM)[1]	Reporting limit	Units
Specific conductance	E120.1 or calibrated field meter	Not applicable	µmhos/cm
pH	E150.1 or calibrated field meter	± 0.1	Unitless
Total coliform	SM 9211	2	MPN/100mL
Fecal coliform	SM 9211	2	MPN/100mL
Chloride	E300.0	0.5	mg/L
Nitrate as NO_3	E300.0, E354.1, or E353.2	0.5	mg/L
Sulfate	E300.0	1	mg/L
Total Dissolved Solids (TDS)	E160.1	1	mg/L
Sodium	E200.7	11	mg/L
Metals	E200.7 or E200.8	Variable	mg/L
Ground water elevation	Field measurement	Not applicable	Feet or Meters

[1] Or equivalent method as approved by the Regional Water Board.

SEPTIC SYSTEMS GROUNDWATER MONITORING

7. Groundwater near or downgradient of the septic systems at Buildings 812, 834, 850, and 899 shall be sampled and analyzed **semi-annually** from the wells specified in **Table 3** for nitrate as NO_3, total and fecal coliform, and groundwater elevation. **Table 4** lists the analytes, analytical methods and reporting limits.

8. Semi-annual sample collection shall be separated by at least 3 months and collected during periods that represent seasonally high and seasonally low ground water elevations.

Table 3. Groundwater monitoring wells for Buildings 812, 834, 850 and 899 septic systems

Septic system	Downgradient monitoring wells	Upgradient monitoring well
Building 812	W-812-07 W-812-09	W-812-1929
Building 834	W-834-S1 W-834-S4	W-834-D17
Building 850	NC7-61 NC7-10	W-850-2416
Building 899	K6-23[1]	K6-17

[1] No monitoring wells exist directly downgradient of the septic system at B899. K6-23 is located within 50 feet of the septic system and has historically yielded samples with high nitrate concentrations.

Table 4. Buildings 812, 834, 850, and 899 septic system groundwater analytical methods and reporting limits

Analyte	EPA (E) or Standard Method (SM)[1]	Reporting limit	Units
Nitrate as NO_3	E300.0, E354.1, or E353.2	0.5	mg/L
Total coliform	SM 9211	2	MPN/100mL
Fecal coliform	SM 9211	2	MPN/100mL
Ground water elevation	Field measurement	Not Applicable	Feet or Meters

[1] Or equivalent method as approved by the Regional Water Board.

PERCOLATION PIT INSPECTIONS

9. The Discharger shall inspect **quarterly** the five mechanical equipment percolation pits located at Buildings 806A, 827 A, C, D, and E. If standing water is visible during the quarterly inspection, the Discharger shall increase the inspection frequency to **monthly** until no standing water is visible.

10. The Discharger shall inspect **quarterly** the seven cooling tower percolation pits located at Buildings 801, 809, 812, 817A, 826, 827A, and 851. If standing water is visible during the quarterly inspection the Discharger shall increase the inspection frequency to **monthly** until no standing water is visible. The more frequent inspections are required at percolation pits with standing water in order to prevent overflow of the percolation pits.

COOLING TOWER BLOWDOWN EFFLUENT MONITORING

11. The Discharger shall **semi-annually** collect representative grab samples of blowdown discharges from each active cooling tower for the analytes shown in **Table 5**. Active cooling towers which discharge to percolation pits are located at Buildings 801, 809, 812, 817A, 826, 827A, and 851. Cooling towers which discharge to septic systems are located at Buildings 802, 825, 830, 833, 835, 834A, and 850.

12. The Discharge shall also record the total flow monthly blowdown flow from the cooling towers.

MECHANICAL EQUIPMENT DISCHARGE EFFLUENT MONITORING

13. The Discharger shall **semi-annually** collect representative composite samples of mechanical equipment discharges at Buildings 827 A, C, D, E and 806A for the analytes shown in **Table 5**. Composite samples shall be representative of the combined discharge to the percolation pit during a day of operation at each specified facility.

Table 5. Cooling tower and mechanical equipment effluent, analytical methods and reporting limits

Analyte	EPA (E) or Standard Method (SM)	Reporting limit	Units
Aluminum	E200.7 or E200.8	0.05	mg/L
Arsenic	E200.8	0.002	mg/L
Barium	E200.7 or E200.8	0.025	mg/L
Boron	E200.7	0.05	mg/L
Cadmium	E213.2 or E200.8	0.05	mg/L
Calcium	E200.7	0.5	mg/L
Chloride	E300.0	0.5	mg/L
Chromium	E218.2 or E200.8	0.001	mg/L
Chromium (VI)	E218.2 or E200.8	0.001	mg/L
Copper	E220.2 or E200.8	0.001	mg/L
Fluoride	E340.2	0.05	mg/L
Iron	E200.7	0.1	mg//L
Lead	E239.2 or E200.8	0.005	mg/L
Magnesium	E200.7	0.5	mg/ L
Manganese	E200.7 or E200.8	0.03	mg/L
Molybdenum	E200.7 or E200.8	0.025	mg/L
Nickel	E249.2 or E200.8	0.002	mg/L
Nitrate (as NO_3)	E300.0, E354.1, or E353.2	0.5	mg/L
pH (pH units)	E150.1 or calibrated meter	± 0.1	Unitless
Potassium	E200.7	1	mg/L
Selenium	E270.2 or E270.3 or E200.8	0.002	mg/L
Sodium	E200.7	11	mg/L
Specific conductance	E120.1 or calibrated meter	na	µmhos/cm
Sulfate	E300.0	1	mg/L
Total alkalinity (as $CaCO_3$)	E310.1	1	mg/L
Total dissolved solids (TDS)	E160.1	1	mg/L
Total hardness (as $CaCO_3$)	SM2320B	1	mg/L
Total phosphorus (as PO_4)	SM 4500-P or E365.4	0.05	mg/L
Vanadium	E200.7 or E200.8	0.020	mg/L
Zinc	E200.7 or E200.8	0.02	mg/L

REPORTING

14. In reporting all monitoring data, the Discharger shall arrange the data in tabular form so that the sampling location, sample type (e.g. effluent, groundwater, etc.), date, constituents, concentrations and units are readily discernible. The data shall be

summarized in such a manner as to illustrate clearly the compliance with this Order. A short discussion of the monitoring results, including notations of any water quality violations, shall precede the tabular data.

15. As required by the California Business and Professions Code Sections 6735, 7835, and 7835.1, all water monitoring reports shall be prepared under the direct supervision of a California Registered Professional Engineer or Geologist and signed by the registered professional.

16. The results of any monitoring done more frequently than required at the locations specified in the MRP also shall be reported to the Regional Water Board.

Semi-Annual Monitoring Reports

17. The Discharger shall submit semi-annual electronic data reports, which conform to the requirements of the California Code of Regulations, Title 23, Division 3, Chapter 30. The semi-annual reports shall be submitted electronically over the internet to the State Water Board Geotracker database system by the **1st day of the third month following the second and fourth calendar quarter (i.e. by 1 March and 1 September)** until such time as the Executive Officer determines that the reports are no longer necessary.

18. In addition, hardcopies of the semi-annual monitoring reports shall be submitted to the Regional Water Board by the **1st day of the third month following the second and fourth calendar quarter (i.e. by 1 March and 1 September)** until such time as the Executive Officer determines that the reports are no longer necessary**.** Each semi-annual report shall include the following minimum information:

    a. A narrative description of all preparatory, monitoring, sampling and analytical testing activities, including trends in the concentrations of pollutants, if applicable, groundwater elevations in the wells, and how and when samples were collected.

    b. The narrative shall be supported by field logs for each groundwater monitoring well documenting depth to groundwater; measuring point elevation (e.g. top of casing elevation), parameters measured before, during, and after purging; method of purging; calculation of the casing volume; and total volume of water purged.

    c. Groundwater contour maps for all groundwater zones, if applicable.

    d. A table showing well construction details such as well number, groundwater zone being monitored, coordinates (longitude and latitude), ground surface elevation, reference elevation, elevation of screen, elevation of bentonite, elevation of filter pack, and elevation of well bottom.

e. A table showing historical lateral and vertical (if applicable) flow directions and gradients.

f. Cumulative data tables containing the water quality analytical results and depth to groundwater.

19. Copies of the laboratory analytical data reports shall be maintained by the Discharger and provided upon request to the Regional Water Board or its representatives.

Annual Monitoring Report

20. An annual report, which contains a summary of the data including tabular summaries of all monitoring data and graphical summaries of all groundwater monitoring data obtained during the previous year, shall be submitted to the Regional Water Board. The annual report may either be included in the submission of the second semi-annual report or as a separate report to be submitted to the Regional Water Board by **1 March of each year**. The report shall discuss the compliance record and corrective actions taken or planned which may be needed to bring the discharge into full compliance with the waste discharge requirements.

21. The Annual Report shall contain the following minimum information:

a. Tabular summaries of all data obtained during the year and graphical summaries of the last five years of data.

b. Groundwater elevation and chemical concentration contour maps.

c. An evaluation of the groundwater quality beneath and downgradient of each wastewater treatment facility.

d. An identification of any data gaps and potential deficiencies/redundancies in the monitoring system or reporting program.

e. If desired, a proposal and rationale for any revisions to the groundwater sampling plan frequency and/or list of analytes.

22. The Discharger shall implement the above monitoring program as of the date of the Order.

Ordered by: Original signed by

PAMELA C. CREEDON, Executive Officer

(Date)

INFORMATION SHEET

ORDER NO. R5-2008-0148
LAWRENCE LIVERMORE NATIONAL SECURITY, LLC AND
THE U.S. DEPARTMENT OF ENERGY FOR
LAWRENCE LIVERMORE NATIONAL LABORATORY SITE 300
SAN JOAQUIN AND ALAMEDA COUNTIES

Lawrence Livermore National Security, LLC, and the U.S. Department of Energy (hereafter jointly referred to as Discharger) operate a test facility known as the Lawrence Livermore National Laboratory Experimental Test Site (Site 300). Site 300 occupies 10.4 square miles in the Altamont Hills, approximately 6.5 miles southwest of downtown Tracy and 12 miles southeast of Livermore. The site consists of steep hills and narrow ravines with elevations that range from 500 to 1750 feet above mean sea level. The United States Government owns the property.

Waste Discharge Requirements (WDR) Order No. 96-248, adopted by the Regional Water Board on 20 September 1996, prescribed requirements for:

a. The discharge of domestic and mechanical equipment wastewater to sewage evaporation and percolation ponds (collectively referred to as sewage ponds).
b. The discharge of mechanical equipment wastewater to percolation pits.
c. Discharges to Class II surface impoundments that were used for disposal of explosives processing wastewater and photographic rinse water.

The Discharger submitted a Report of Waste Discharge (RWD), dated 19 July 2000, to amend WDR Order No. 96-248 to include:

a. Discharges to the sewage ponds.
b. Mechanical equipment wastewater to percolation pits.
c. Cooling tower blowdown and discharges associated with cooling tower maintenance to percolation pits.
d. Domestic and mechanical equipment wastewater discharges to septic tanks, leach fields, cesspools.
e. Low threat discharges to ground: primarily low volumes of drinking water, condensates and uncontaminated contained rainwater that are detailed in Attachment 4.

All of the discharges that will be regulated by the new order. Waste Discharge Requirements Order No. R5-2008-0148, are existing discharges that have been regulated in the past under other orders or waivers of Waste Discharge Requirements. Locations of the discharges are shown on Attachment 2. The issuance of this Order provides the Regional Water Board with a better tool to control the discharges and evaluate potential impacts to water quality.

Surface water drainage is to Corral Hollow Creek, an ephemeral stream that drains east toward the San Joaquin Basin. Surface water runoff at the site occurs only after heavy rains. None of the discharges covered by this Order enter surface water drainage courses.

Depth to groundwater varies across the site. Depth to groundwater below the sewage ponds ranges from 10 feet below to even with the base of the sewage ponds. Below the percolation pits groundwater is 30 to 130 feet below ground surface (bgs). Only the percolation pit at Building 812 overlies groundwater shallower than 65 feet bgs. Below the septic systems depth to groundwater ranges from less than 30 feet to 240 bgs.

Sewage Evaporation and Percolation Ponds

A lined sewage evaporation pond located on the southeast boundary of the site in the General Services Area receives sanitary and mechanical equipment wastewater. The evaporation pond discharges to a percolation pond during periods of heavy rainfall. The Discharger estimates that between 3.4 and 5.1 inches of rain over the rainy season is required to produce discharge to the percolation pond when operated with two feet of freeboard.

Because depth to groundwater ranges between zero and 10 feet below the sewage ponds, discharge to the percolation pond has the potential to contaminate groundwater. This Order removes the freeboard requirement for the sewage evaporation pond to allow the Discharger to better manage the evaporation pond to reduce the frequency of discharge into the percolation pond. Prior to discharging under WDR Order No. 96-248, the Discharger operated under WDR Order No. 85-188, which had no freeboard requirements. Prior to 1995, the Discharger maintained a one-foot freeboard without incidence of structural damage or wave action washing over the berm. When operated with one foot of freeboard, there was no discharge to the percolation pond. The Discharger designed the sewage evaporation and percolation ponds to hold the maximum potential discharge plus influx from a 100-year storm event.

This Order requires monitoring of the sewage ponds and groundwater as follows:

- The influent to the sewage ponds must be monitored semi-annually for specific conductance (SC), pH, and biochemical oxygen demand (BOD).

- The wastewater in the sewage pond must be monitored semi-annually for SC, pH, and dissolved oxygen and observed monthly for freeboard, color, odor, and levee condition.

- If the sewage evaporation pond discharges to the percolation pond, the discharge shall be sampled for BOD, SC, total and fecal coliform, and pH.

- The groundwater upgradient, crossgradient and downgradient of the sewage ponds must be monitored for SC, pH, nitrate, chloride, sulfate, sodium, total dissolved solids (TDS), total and fecal coliform, and ground water elevation.

Mechanical Equipment and Cooling Tower Discharge Percolation Pits

Five percolation pits receive mechanical equipment wastewater from Buildings 806A, 827A, 827C, 827D, and 827E, which are in the High Explosives Process Area in the southeast area of the site. Depth to groundwater varies from 70 to 130 feet bgs.

Seven percolation pits receive cooling tower effluent from blowdown and cooling tower maintenance discharges. Four percolation pits are in the High Explosives Process Area in the general area of the mechanical equipment wastewater percolation pits. The other three percolation pits are located at Buildings 801 and 812 along the Elk Creek Ravine, and Building 851 in the Western Firing Area. Groundwater is more than 120 feet bgs at Building 801 and Building 851 and about 30 feet bgs at Building 812.

Mechanical equipment and cooling tower discharges contain levels of some constituents in the wastewater that exceed water quality goals. The Discharger performed the Designated Level Methodology (DLM) analysis to evaluate the potential for the wastewater to impact groundwater beneficial uses. The evaluation showed that none of the constituents should impact beneficial uses of groundwater; however, an attenuation factor was applied to salts which the Regional Water Board has determined do not attenuate. The salts measured as specific conductance, chloride, sodium, sulfate and TDS are above water quality objectives in some of the cooling tower and mechanical equipment wastewater discharges

This Order requires the Discharger to submit a work plan to further characterize effluent to the percolation pits and to evaluate the potential for salts in the mechanical equipment and cooling tower effluent to degrade groundwater. If the Discharger determines that the salts in the effluent have the potential to degrade groundwater, the Discharger is required to submit a work plan to install groundwater monitoring wells to determine if groundwater quality is being negatively impacted. If groundwater monitoring confirms degradation of water quality by percolation pit discharges, the Discharger must submit a feasibility study proposing remedial alternatives to restore the groundwater quality. The Discharger must include a proposal for implementing a source control program and Best Practicable Technologies (BPT) to reduce pollutants in the discharge.

Septic Systems

Thirty-three (33) facilities, which are remotely located throughout the site, have septic systems. These septic systems are located at Buildings 801, 802, 805, 806, 807, 809, 810, 812, 813, 817, 818, 819, 825, 826, 827, 830, 832, 833/835, 834, 836, 841, 848, 850, 851, 854, 855, 858, 865, 882, 892, 895, 897, and 899.

Domestic waste is discharged to all of the septic systems. Domestic waste includes discharges of sanitary wastes from restroom and shower facilities, washing machines, kitchens, and housekeeping activities. Cooling tower and mechanical equipment wastewater is discharged to 12 septic systems at Buildings 801, 802, 805, 813, 819, 825, 826, 830, 833/835, 834A, 850, and 851. Mechanical equipment wastewater may include discharges from boilers, vacuum pumps, pressure relief valves on hot water/steam equipment, humidifiers, filter drains, and water softeners, as well as condensates from air compressors, air conditioners, and refrigeration units. Washing machines discharge to the septic systems at Buildings 813 and 835.

Mechanical equipment, cooling tower, and washing machine wastewater discharged to the septic systems contain levels of constituents in the wastewater that exceed water quality goals. The Discharger performed the Designated Level Methodology (DLM) analysis to evaluate the potential for these wastewaters to impact groundwater beneficial uses. The evaluation showed that none of the constituents associated with mechanical equipment or cooling towers should impact beneficial uses of groundwater. Since an attenuation factor was applied to salts and the Regional Water Board has determined that salts do not attenuate as they move through the soils, the Discharger must re-evaluate the potential for discharges of these salts to degrade groundwater. The salts measured as SC, chloride, sodium, sulfate and TDS are above water quality objectives in some of the cooling tower and mechanical equipment wastewater discharges. If the Discharger determines that salts are degrading or have the potential to degrade groundwater, the Regional Water Board will request that the Discharger propose BPT for reducing salt concentrations in discharges and if necessary propose remedial alternatives for restoring water quality.

The DLM analysis of washing machine, mechanical equipment and cooling tower wastewater shows that iron and aluminum from the washing machine at Building 835 have the potential to impact ground water. Only the washing machine at Building 813 washes High Explosives Process Area workers' clothes. The effluent from this washing machine contains the high explosives RDX above water quality objectives and HMX above the detection limit. No monitoring wells are downgradient of the septic systems which receive the washing machine discharge. Domestic wastewater discharged to septic systems has the potential to impact groundwater beneficial uses with fecal coliform and nitrate. This Order requires the Discharger to evaluate which septic systems have the potential to impact groundwater and to propose monitoring for those septic systems which have the potential to threaten beneficial uses of groundwater.

This Order requires the Discharger to monitor groundwater for nitrate as $NO_{3,}$ total and fecal coliform, and ground water elevation upgradient and downgradient of four septic systems which service Buildings 812, 834, 850, and 899.

Groundwater monitoring of wells near these septic systems has shown evidence of elevated nitrate concentrations that cannot be explained by CERCLA sources.

Low Threat Discharges

The discharger conducts a variety of activities at Site 300 that may result in low volume and low-threat discharges. Consistent with the Storm Water Pollution Prevention Program, the discharger has implemented Best Management Practices (BMPs) to prevent these discharges from reaching surface water drainage courses, thus these discharges percolate into the ground. The discharges detailed in Attachment 4 are primarily composed of potable water, low conductivity water, condensate, and uncontaminated contained rainwater. These discharges may occur at any of the facilities and outdoor areas at Site 300.

The Discharger evaluated the low threat discharges in a technical report submitted in 1994. These discharges did not contain any constituents that would negatively affect groundwater and are discharged in very low volumes. The discharge quality and quantity have not changed significantly since 1994 and therefore are continued to be considered as low threat.

Reporting Requirements

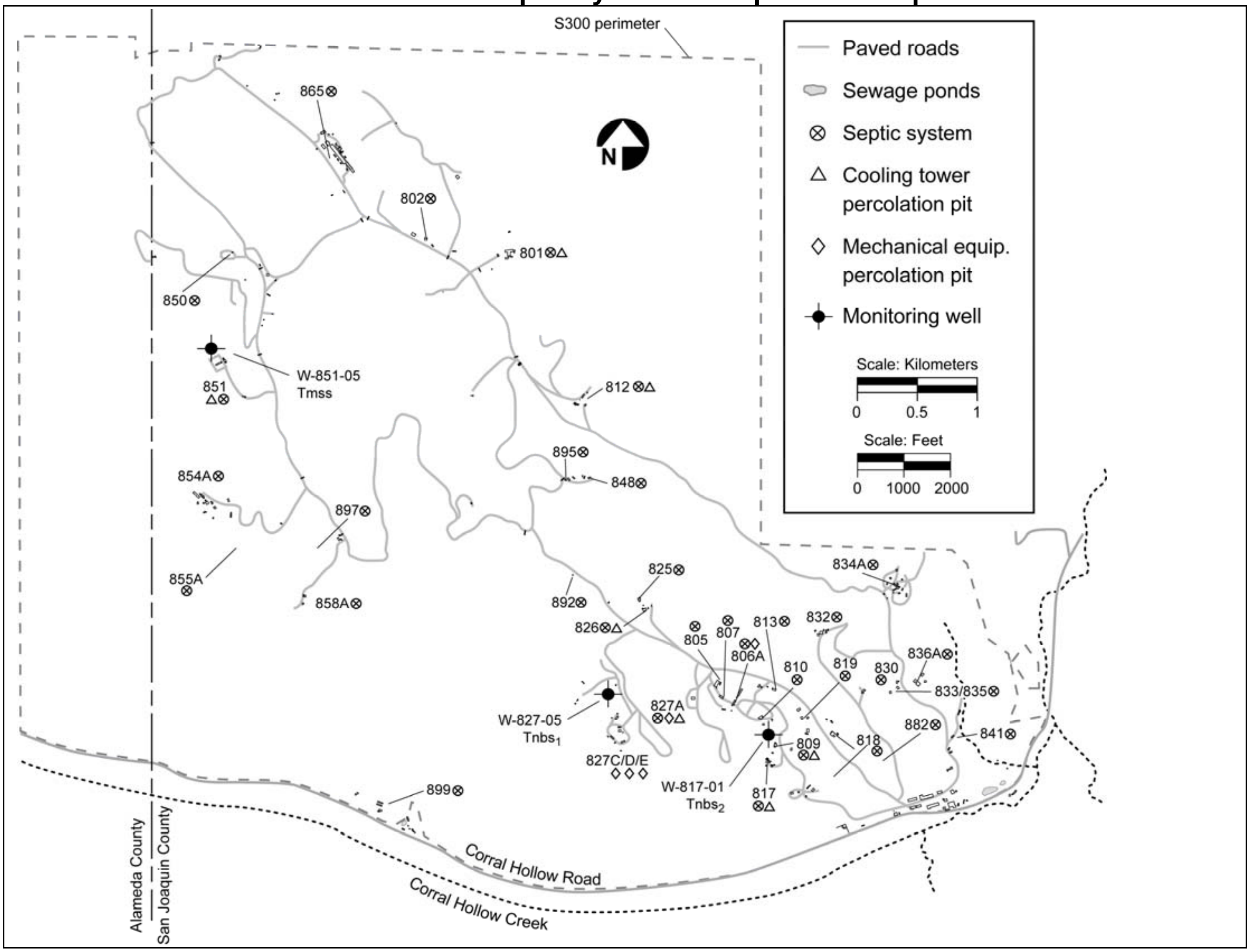
The Discharger is to submit to the Regional Water Board semi-annual and annual monitoring reports as required in MRP No. R5-2008-0148.

ATTACHMENT 1

Lawrence Livermore National Laboratory, Site 300, regional location map.

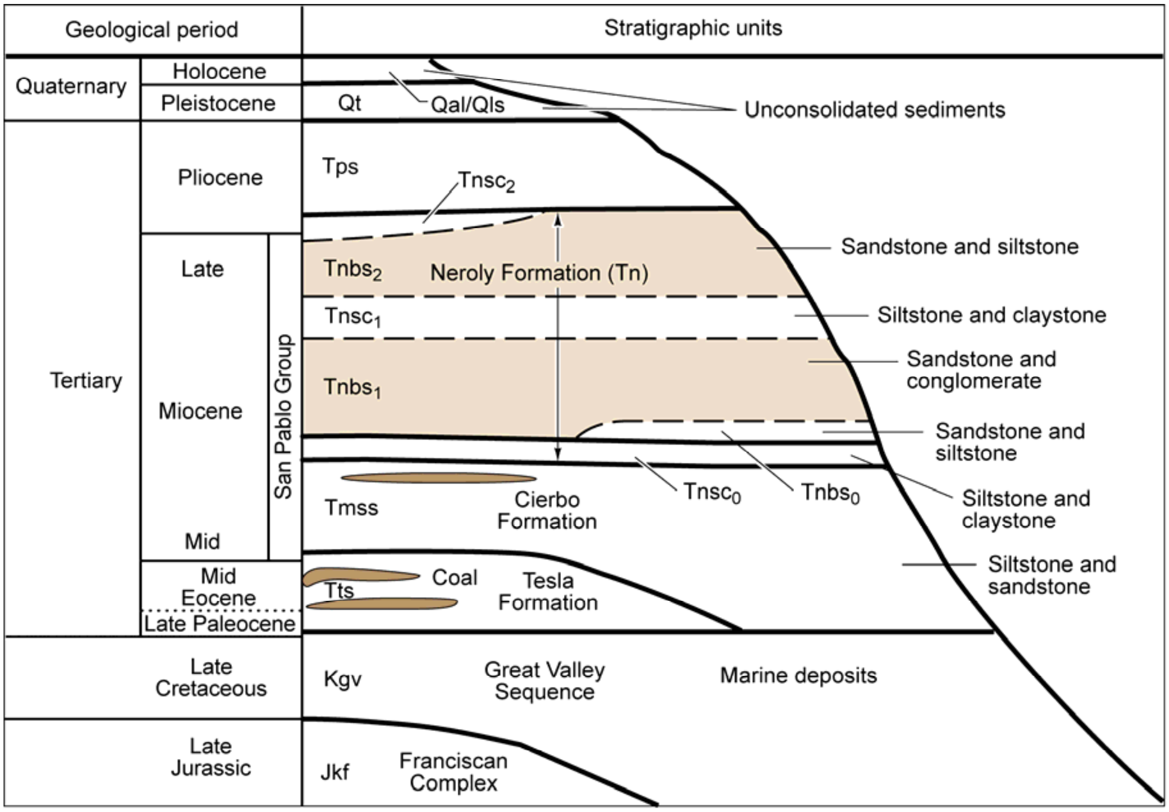
ATTACHMENT 2

Locations of Site 300 facilities with septic systems and percolation pits.



ATTACHMENT 3

Site 300 stratigraphy and hydrologic characteristics



Hydrologic characteristics of stratigraphic units

Quaternary alluvium and underlying decomposed bedrock (Qal/WBR): Occurs in ravines and valley bottoms throughout Site 300. It is perennially saturated beneath Corral Hollow Creek, in Doall Ravine, and in southern Elk Ravine in the vicinity of Building 812. Groundwater also occurs in Qal/WBR in the Pit 7 Complex during the winter rainy season or during extended periods of higher than normal rainfall. Groundwater in this unit is unconfined.

Quaternary landslide deposits (Qls): Thin zones of unconfined groundwater occur locally beneath the Building 851 and Building 854 areas.

Quaternary terrace alluvium (Qt): Present and saturated at Pit 6, the GSA, and the Building 832 Canyon area; some of the groundwater occurrences are ephemeral.

Pliocene non-marine sediments (Tps/Tpsg): Saturated in the Building 833 and 834 areas and the Explosives Process Area. This bedrock unit is generally present only on hilltops. Where present, groundwater is typically unconfined, perched, discontinuous, and ephemeral. The exception to this condition exists in the Explosives Process Area, where the extent of saturation is significant.

Neroly Formation (Tn): Most extensive and saturated bedrock strata beneath Site 300. Unconfined to artesian conditions may exist. The formation is subdivided into the following units:

- Upper claystone/siltstone unit ($Tnsc_2$): Absent beneath much of Site 300. Saturated beneath the Building 834 area.
- Upper blue sandstone unit ($Tnbs_2$): Absent beneath much of Site 300. Saturated beneath Explosives Process Area.
- Lower siltstone/claystone unit ($Tnsc_1$): Saturated beneath Explosives Process Area, and Building 832 Canyon.
- Lower blue sandstone unit of the Neroly Formation ($Tnbs_1$): Primary water-bearing strata within the Neroly Formation. Saturated throughout Site 300, except in northeast portion, where it is absent. Fine-grained siltstone and claystone interbeds act as aquitards, confining layers, or perching horizons.
- Basal sandstone unit ($Tnbs_0$): Saturated beneath the Pit 7 Complex, Pit 2, and Building 801/Pit 8 areas.
- Basal siltstone/claystone unit ($Tnsc_0$): Saturated beneath the Building 854 area, and Building 845/Pit 9.

Cierbo Formation (Tmss): Groundwater occurs beneath Doall Ravine, the Building 850, 851, and 854 areas and the East Firing Area. The continuity of saturation between the northwest and southeast areas of Site 300 is undetermined. Groundwater occurs under unconfined to artesian conditions. Where saturation does not occur, fine-grained siltstone and claystone interbeds may act as aquitards, confining layers, or perching horizons.

Tesla Formation (Tts): Only found to contain groundwater immediately south of the Site 300 Pit 6 area.

Great Valley Sequence (Kgv): Groundwater not found in the few wells at Site 300 that penetrate the upper portion of the Great Valley Sequence.

Franciscan Complex (Jkf): No wells at Site 300 penetrate the Franciscan Complex.

ATTACHMENT 4

Description of Site 300 low threat discharges to ground along with required Best Management Practices

Type of discharge (estimated volume)	Best management practices
Water (varies, one time discharges from a few gallons up to 5,000 gallons)	Minor discharges primarily associated with maintenance and operations of potable, deionized water or low-conductivity water systems. Large volume discharges reaching surface waters are permitted by NPDES permit CAG9950001. Small discharge volumes of potable, deionized water or low-conductivity water may be allowed to evaporate or percolate into the ground to prevent discharge directly into storm drain or surface water. Minimize erosion during discharge.
Air conditioner and compressor condensate (at most continuous drip)	Condensate must evaporate or percolate into the ground. Direct discharge to storm drain or surface waters is prohibited. No treatment chemicals are added. Units that discharge elevated metals as a result of corrosion in the system have condensate captured and characterized for proper disposal.
Landscape irrigation (varies from 10 to 300 gallons)	Excess runoff must evaporate or percolate into the ground to prevent discharge directly into storm drain or surface water. Minimize use of water to prevent excess runoff. Follow BMPs for pesticide and fertilizer application.
Pavement, building and window washing and equipment rinsing (varies from 10 to 300 gallons)	Excess water must evaporate or percolate into the ground to prevent discharge directly into storm drain or surface water. Use no soaps, detergents, or other cleaning chemicals. Use dry-cleaning methods for pavement cleaning when possible. Use water only when deemed necessary. Care is taken to ensure that water-washed areas have had no spills of toxic or hazardous materials, or that the spills were properly cleaned prior to any washing activity. Minimize water use.
Culvert flushing (varies from 100 to 5000 gallons)	Culverts are visually inspected annually and cleaned when needed. Cleaning involves removing accumulated sediments either with a backhoe or hand digging. Residual sediments may be flushed from the culvert with potable water. Removed sediments are used to reinforce channel banks or removed from the drainage channel for disposal or reuse elsewhere at Site 300.

Continued

ATTACHMENT 4 - CONTINUED

Description of Site 300 low threat discharges to ground along with required Best Management Practices

Type of discharge	Best management practices
Rainwater collected in secondary containment (varies based on size of berm and size of rain event, 60 gallons up to 5000 gallons)	Water collected in secondary containment berms must be evaluated prior to release to ensure the water is uncontaminated. Secondary containment maybe used for oil containing equipment, industrial wastewater retention systems, hazardous wastewater retention systems, hazardous waste accumulation areas (WAAs) and hazardous waste permitted facilities (TSDFs). These release evaluation protocols depend on the system containing the rainwater, and may include visual evaluation for sheens (at oil containing equipment), visual evaluation for contaminants (all systems), review of records to ensure no unexpected loss of liquid from the primary container, review of records to verify that any spills or releases have been cleaned up (all systems), sampling and analysis of the first rainwater of the season (industrial and hazardous wastewater retention systems, WAAs and TSDFs). Any water released to ground from berms must be released in a manner such that it evaporates or percolates into the ground to prevent discharge directly into storm drain or surface water.
Emergency eye wash and safety showers (30 gallons per unit tested)	Excess water from tests must evaporate or percolate into the ground to prevent discharge directly into storm drain or surface water. After use in an emergency, follow emergency response procedures to address any contamination that may need to be cleaned up.
Building fire sprinkler system tests (50 gallons per sprinkler system to several thousand gallons for deluge systems)	When no chemicals are added to the fire suppression system, water from tests may be allowed to evaporate or percolate into the ground to prevent discharge directly into storm drain or surface water. Measures are taken to ensure that no property damage, including erosion, results from the tests. When used in the event of an emergency, normal emergency response procedures are followed to address any contamination.
Fire hydrant testing (varies 750 to 1,500 gallons per hydrant)	When discharge will not reach surface waters, water may be discharged without dechlorination. If discharge may reach surface waters, follow requirements of WDR 5-00-175. Use erosion control measures during discharge to prevent soil erosion at the release site. Erosion prevention measures may include the use of a banana tube to direct flow away from erosion-prone areas and the use of hoses if necessary to direct the discharge to a suitable discharge location.

Continued

ATTACHMENT 4 - CONTINUED

Description of Site 300 low threat discharges to ground along with required Best Management Practices

Type of discharge	Best management practices
Wet hose drills and hose tests (hose tests, up to 3000 gallons annually; drills, vary depending on drill scenario)	Allow water from drills to evaporate or percolate into the ground to prevent discharge directly into storm drain or surface water. Implement erosion prevention measures.
Fire apparatus rinsing (up to 100 gallons per vehicle)	Rinse one to two times per week at the Fire House using a minimum amount of potable water and wipe down. Allow excess water to evaporate or percolate into the ground to prevent discharge directly into storm drain or surface water. No soaps, detergents, or chemical cleaners can be used. When a full cleaning is required, the equipment is taken to an approved wash facility.

ATTACHMENT 5

Mechanical equipment discharges; general minerals and oil and grease analytical results from samples collected at Buildings 806, 827A, 827C, 827D, and 827E.

Parameter		**B806**	**B827A**	**B827C**	**B827D**	**B827E**
General mineral		**10/7/04**	**10/7/04**	**10/7/04**	**10/7/04**	**10/7/04**
Aluminum	mg/L	<0.05	<0.05	<0.05	<0.05	<0.25
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	200	200	170	210	<10
Calcium	mg/L	7.5	11	6.8	3.9	8.5
Carbonate alkalinity (as $CaCO_3$)	mg/L	17	72	280	57	800
Chloride	mg/L	83	102	92	87	210
Copper	mg/L	0.17	0.028	2.4	0.25	0.35
Fluoride	mg/L	0.46	0.58	0.35	0.26	1.1
Hydroxide alkalinity (as $CaCO_3$)	mg/L	<5	<10	<10	<10	120
Iron	mg/L	<0.05	<0.05	2.3	1.5	<0.25
Magnesium	mg/L	<0.5	<0.5	1.4	<0.5	<0.5
Manganese	mg/L	<0.01	<0.01	0.16	0.018	<0.05
Nickel	mg/L	<0.05	<0.05	<0.05	<0.05	<0.05
Nitrate (as N)	mg/L	<0.1	<0.1	0.12	0.17	0.15
Nitrate plus Nitrite (as N)	mg/L	<0.1	<0.1	0.12	0.17	0.15
Nitrite (as N)	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Ortho-phosphate	mg/L	0.17	0.36	30	3.4	180
pH	units	8.28	8.67	9.64	8.71	11.3
Potassium	mg/L	8.9	10	78	15	280
Sodium	mg/L	210	250	320	240	740
Specific conductance	µmhos/cm	1,040	1,240	1,710	1,180	4,340
Sulfate	mg/L	194	227	301	206	885
Surfactants	mg/L	<0.5	<0.5	<0.5	<0.5	<0.5
Total alkalinity (as $CaCO_3$)	mg/L	220	280	440	260	920
Total dissolved solids	mg/L	727	915	1,220	835	3,300
Total hardness (as $CaCO_3$)	mg/L	20	23	23	11	22
Total phosphorus (as P)	mg/L	0.06	0.16	9.4	1.1	54
Zinc	mg/L	<0.05	<0.05	0.34	<0.05	<0.05
Oil and Grease	mg/L	<5	<5	<5	<5	<5

ATTACHMENT 6

Mechanical equipment discharges; dissolved metals analytical results from samples collected at Buildings 806, 827A, 827C, 827D, and 827E.

Parameter		**B806**	**B827**	**B827C**	**B827D**	**B827E**
Dissolved metals		**10/7/04**	**10/7/04**	**10/7/04**	**10/7/04**	**10/7/04**
Aluminum	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.25
Antimony	mg/L	< 0.005	< 0.005	< 0.005	< 0.005	< 0.005
Arsenic	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	0.0028
Barium	mg/L	< 0.025	< 0.025	< 0.025	< 0.025	< 0.2
Beryllium	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Boron	mg/L	0.9	1.1	0.79	0.91	2.2
Cadmium	mg/L	< 0.0005	< 0.0005	< 0.0005	< 0.0005	< 0.0005
Chromium	mg/L	< 0.001	< 0.001	0.0013	< 0.001	0.0072
Cobalt	mg/L	< 0.05	< 0.05	< 0.05	< 0.05	< 0.25
Copper	mg/L	0.13	0.023	1.8	0.19	0.28
Hexavalent chromium	mg/L	< 0.002	< 0.002	0.002	0.002	0.0066
Iron	mg/L	< 0.1	< 0.1	2.2	1.4	< 0.5
Lead	mg/L	< 0.005	< 0.005	0.0077	0.0053	< 0.005
Manganese	mg/L	< 0.03	< 0.03	0.16	< 0.03	< 0.2
Mercury	mg/L	< 0.0002	< 0.0002	< 0.0002	< 0.0002	< 0.0002
Molybdenum	mg/L	< 0.025	< 0.025	< 0.025	< 0.025	0.045
Nickel	mg/L	< 0.002	< 0.002	0.019	0.0036	< 0.002
Selenium	mg/L	< 0.002	< 0.002	< 0.002	< 0.002	0.0036
Silver	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Thallium	mg/L	< 0.001	< 0.001	< 0.001	< 0.001	< 0.001
Vanadium	mg/L	< 0.02	< 0.02	< 0.02	< 0.02	< 0.1
Zinc	mg/L	< 0.02	0.034	0.34	0.03	< 0.1

ATTACHMENT 7

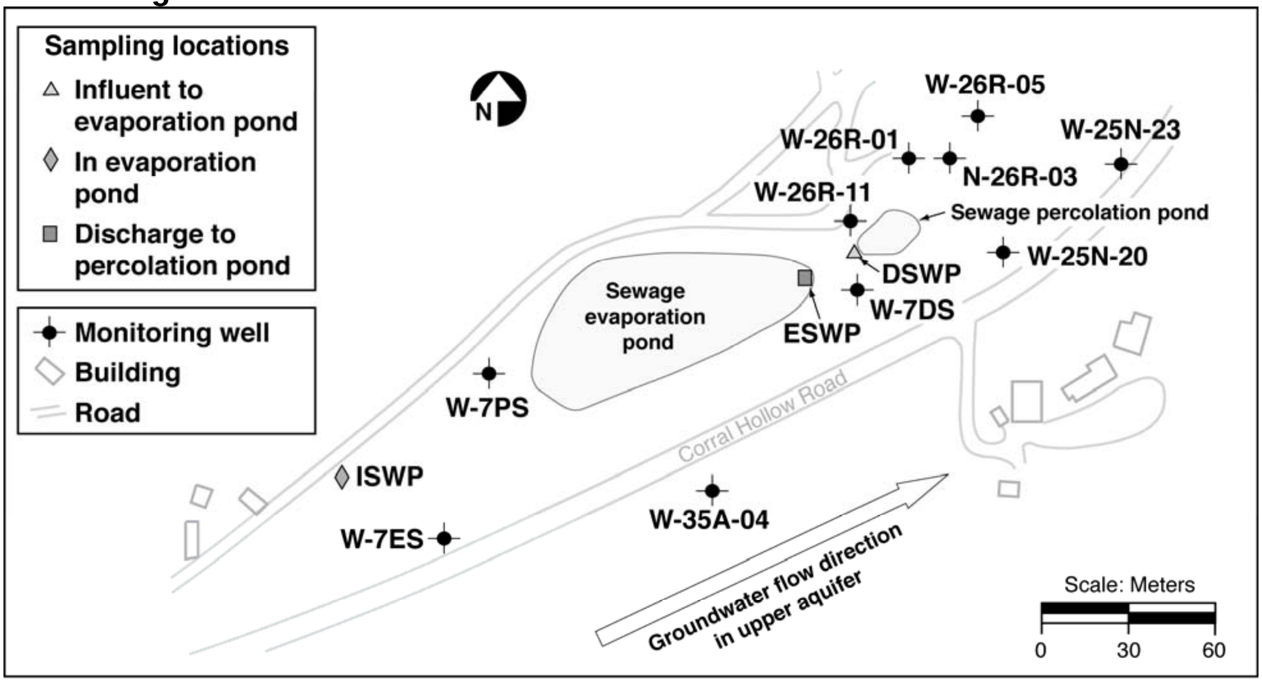
Washing machine discharges; general minerals and oil and grease analytical results from samples collected at Buildings 813, 835, and 873.

Parameter	Units	B813	B835	B873
General minerals		**9/22/04**	**10/14/04**	**9/20/04**
Aluminum	mg/L	0.66	150	0.85
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	210	250	220
Calcium	mg/L	7.2	73	3.7
Carbonate alkalinity (as $CaCO_3$)	mg/L	220	500	350
Chloride	mg/L	107	102	199
Copper	mg/L	0.13	0.57	0.16
Fluoride	mg/L	0.3	< 0.05	0.28
Hydroxide alkalinity (as $CaCO_3$)	mg/L	< 10	< 10	< 10
Iron	mg/L	0.2	90	0.56
Magnesium	mg/L	2.3	40	1.6
Manganese	mg/L	0.024	2.2	0.058
Nickel	mg/L	< 0.05	0.57	< 0.05
Nitrate (as N)	mg/L	< 0.5	0.59	0.36
Nitrate (as NO_3)	mg/L	0.63	2.6	1.6
Nitrite (as N)	mg/L	< 0.5	< 0.5	< 0.5
Ortho-phosphate	mg/L	0.8	0.84	1.2
pH	pH units	9.29	9.78	9.59
Potassium	mg/L	12	18	19
Sodium	mg/L	380	500	480
Specific conductance	µmhos/cm	1,580	2,000	2,070
Sulfate	mg/L	193	191	201
Surfactants	mg/L	< 250	< 500	< 250
Total Alkalinity (as $CaCO_3$)	mg/L	430	750	570
Total dissolved solids	mg/L	1,210	1,450	1,490
Total hardness (as $CaCO_3$)	mg/L	27	347	16
Total phosphorus (as P)	mg/L	0.37	0.58	0.71
Zinc	mg/L	0.14	1.3	0.31
Oil and grease	mg/L	NS[a]	46	81/99

[a]NS = Not sampled.

ATTACHMENT 8

Site 300 sewage evaporation and percolation ponds sampling locations and groundwater monitoring locations.



ATTACHMENT 9

Sewage evaporation pond influent and in pond samples; pH, specific conductance, and biochemical oxygen demand routine analytical results from samples collected at sampling locations ISWP and ESWP.

	ISWP			ESWP		
	pH (units)	**Specific conductance (µmhos/cm)**	**Biochemical oxygen demand (mg/L)**	**pH (units)**	**Specific conductance (µmhos/cm)**	**Dissolved oxygen (mg/L)**
2003						
1st quarter	8.67	1,600	800	9.93	7,600	18.5
2nd quarter	8.6	1,400	134	9.6	9,580	1.07[a]
3rd quarter	8.4	1,780	152	9.3	9,340	9.94
4th quarter	8.8	2,250	820	9.6	10,000	16.44
2004						
1st quarter	8.5	1,500	110	9.6	7,400	25
2nd quarter	8.0	1,300	110	9.9	8,600	28.5
3rd quarter	8.1	1,200	79	9.6	8,300	25.4
4th quarter	8.3	1,700	150	9.1	7,700	9.48
2005						
1st quarter	8.3	1,120	70	9.8	3,800	30.3
2nd quarter	8.1	1,620	310	10.3	4,050	30.5
3rd quarter	7.4	1,070	210	9.9	5,050	7.9
4th quarter	8.9	1,940	170	9.5	5,710	28.1
2006						
1st quarter	8.7	1,802	390	9.9	4,560	22.6
2nd quarter	8.5	1,420	180	9.6	4,850	5.89
Max	8.9	2,250	820	10.3	10,000	30.5
Min	7.4	1,070	70	9.1	3,800	1.07
Avg	8.4	1550	263	9.7	6896	18.5

[a]Sample analyzed within 24 hours, but beyond USEPA recommended hold time of 6 hours

ATTACHMENT 10

Sewage percolation pond influent; water quality parameters analyzed in samples of discharge to the sewage percolation pond, sampled at location DSWP.

Parameter	2/2/02	2/19/02	3/7/02	12/20/02	2/11/03
pH (units)	9.6	9.7	9.9	9.8	9.92
Specific conductance (μmhos/cm)	9,800	11,000	10,000	8,400	6,700
Biochemical oxygen demand (mg/L)	70	<39	54	31	86
Fecal coliform (MPN/100mL)[a]	1,400	1,100	4,300[b]	700	130
Total coliform (MPN/100mL)[a]	13,000	5,400	24,000	2,200	1,600
Nitrate as NO_3	<4.4	<4.4	<4.4	<0.5	<0.5
Nitrate as N	<1	<1	<1	<0.5	<0.5
Nitrate + nitrite as N	<1	<1	<1	<0.1	<0.1
Total Kjeldahl nitrogen	37	24	84	20	27
Ammonia as N	0.3	<0.5	<0.4	0.1	0.1
Nitrite as N	0.020	0.020	0.026	<0.5	<0.5
Nitrite as NO_2	0.066[c]	0.066[c]	0.087[c]	<0.5	<0.5
Parameter	**1/27/04**	**2/25/04**	**1/3/05**	**3/9/05**	**1/4/06**
pH (units)	9.6	9.7	9.0	9.8	9.4
Specific conductance (μmhos/cm)	7,100	6,800	7,360	3,770	4,620
Biochemical oxygen demand (mg/L)	48	130	51	38	45
Fecal coliform (MPN/100mL)[a]	1,600	1,600	700	90,000	30,000
Total coliform (MPN/100mL)[a]	1,600	1,600	16,000	>160,000	30,000
Nitrate as NO_3	<0.5	<2.2	0.65	-	<1.0
Nitrate as N	-	-	-	-	<0.4
Total Kjeldahl nitrogen	-	-	-	-	25
Ammonia as N	-	-	-	-	0.15
Nitrite as N	-	-	-	-	0.15
Nitrite as NO_2	-	-	-	-	<0.5

[a]MPN = Most probable number (of colony forming organisms).
[b]Result is considered an estimate because of analytical laboratory error.
[c]The result has an estimated value less than the normal reporting limit for nitrite as NO_2.

ATTACHMENT 11

Sewage evaporation ponds ground water monitoring; routine water quality parameters analyzed in samples of ground water, 2003 through 2006.

Parameter	Monitor Well	2003 1st Qtr	2003 3rd Qtr	2004 1st Qtr	2004 3rd Qtr	2005 1st Qtr	2005 3rd Qtr	2006 1st Qtr
pH (units)	W-7E	8.54	8.50	8.54	8.53	8.50	7.96	8.53
	W-7ES	7.83	7.68	7.65	7.75	7.77	8.47	7.86
	W-7PS	7.76	7.65	7.95	7.82	7.81	7.90	8.12
	W-35A-04	7.89	7.84	8.05	7.94	7.96	7.84	8.17
	W-25N-20	7.88	7.71	7.66	8.14	8.13	7.91	7.98
	W-26R-01	7.95	7.83	7.79	7.83	8.03	8.12	8.13
	W-26R-05	7.96	8.02	7.96	8.07	8.16	8.26	8.16
	W-26R-11	7.77	7.66	7.83	8.13	7.82	8.07	8.01
	W-7DS	7.86	7.78	7.66	7.99	7.80	7.96	8.04
Specific conductance (μmhos/cm)	W-7E	1440	1420	1480	1500	1530	1700	1500
	W-7ES	1790	1940	1900	1930	1940	1500	1800
	W-7PS	1500	1740	1470	1850	1450	1800	1600
	W-35A-04	1730	1890	1870	1880	1800	1600	1700
	W-25N-20	1740	1790	1920	1920	1840	1700	1700
	W-26R-01	1360	1310	1440	1320	1400	1400	1500
	W-26R-05	1180	1150	1130	1180	1080	1300	1100
	W-26R-11	1560	1710	1600	1840	1550	1700	1700
	W-7DS	1740	1780	1880	1890	1860	1700	1700
Nitrate (as NO_3) (mg/L)	W-7E	<0.44	<0.44	<0.44	<0.5	<0.44	11	<0.5
	W-7ES	12.7	10.5	10.6	<0.44	9.22	<0.5	10
	W-7PS	24.8	20.3	19.1	18.4	18.1	17	17
	W-35A-04	14.0	12.5	11.7	10.7	-	14	12
	W-25N-20	12.8	11.3	11.3	9.45	9.16	11	11
	W-26R-01	31.9	28.2	32.5	26	29.1	21	31
	W-26R-05	18.1	8.99	<0.44	3.6	0.48	21	0.73
	W-26R-11	18.6	14.4	14.1	13.7	14.2	13	13
	W-7DS	12.5	11.3	9.89	9.39	9.02	11	11

continued

Attachment 11 continued

Sewage evaporation ponds ground water monitoring; routine water quality parameters analyzed in samples of ground water, 2003 through 2006.

Parameter	Monitor Well	2003 1st Qtr	2003 3rd Qtr	2004 1st Qtr	2004 3rd Qtr	2005 1st Qtr	2005 3rd Qtr	2006 1st Qtr
Fecal coliform (MPN/100 mL)[a]	W-7E	<1.1	<1.1	<1.1	<1.1	<1.1	<2	<2
		-	-	-	-	<1.1	<2	-
	W-7ES	<1.1	<1.1	1.1	<1.1	<1.1	<2	<2
		-	-	-	-	<1.1	<2	-
	W-7PS	<1.1	<1.1	<1.1	<1.1	<1.1	<2	<2
		-	-	-	-	<1.1	-	-
	W-35A-04	<1.1	<1.1	<1.1	<1.1	5.1	<2	<2
		-	-	-	-	2.1	-	-
		-	-	-	-	<2	-	-
	W-25N-20	<1.1	<1.1	<1.1	<1.1	<1.1	<2	<2
		-	-	-	-	<1.1	<2	-
	W-26R-01	<1.1	<1.1	<1.1	<1.1	<1.1	<2	<2
	W-26R-05	<1.1	<1.1	<1.1	<1.1	<1.1	<2	<2
		-	-	-	-	<1.1	<2	-
	W-26R-11	<1.1	<1.1	<1.1	<1.1	<1.1	<2	<2
		-	-	-	-	23	-	-
	W-7DS	<1.1	<1.1	<1.1	<1.1	<1.1.	<2	<2
		-	-	-	-	<1.1.	<2	-
Total coliform (MPN/100 mL)[a]	W-7E	<1.1	<1.1	<1.1	<1.1	<1.1.	<2	<2
		-	-	-	-	<1.1.	<2	-
	W-7ES	<1.1	<1.1	1.1	<1.1	<1.1.	<2	<2
		-	-	-	-	<1.1.	<2	-
	W-7PS	<1.1	<1.1	<1.1	<1.1	<1.1.	<2	<2
		-	-	-	-	<1.1.	-	-
	W-35A-04	1.1	<1.1	6	<1.1	12	<2	<2
		-	-	-	-	1.1-	-	-
		-	-	-	-	2	-	-
	W-25N-20	<1.1	<1.1	1.1	<1.1	<1.1.	<2	<2
		-	-	-	-	<1.1.	-	-
	W-26R-01	<1.1	<1.1	<1.1	<1.1	<1.1.	<2	<2
	W-26R-05	1.1	<1.1	<1.1	<1.1	<1.1.	<2	<2
		-	-	-	-	<1.1.	<2	-
	W-26R-11	<1.1	<1.1	<1.1	<1.1	<1.1.	<2	<2
		-	-	-	-	23	-	-
	W-7DS	<1.1	<1.1	<1.1	<1.1	<1.1.	<2	<2
		-	-	-	-	<1.1.	<2	-

[a] MPN = Most probable number (of colony forming organisms).

ATTACHMENT 12

Sewage evaporation pond influent; cation/anion analytical results from samples collected at sampling location ISWP.

Parameter	**Units**	**ISWP**
Cations/Anions with balance		**9/20/04**
Anion-cation balance	% Error	2.4
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	330
Calcium	mg/L	12
Carbonate alkalinity (as $CaCO_3$)	mg/L	48
Chloride	mg/L	127
Hydroxide alkalinity (as $CaCO_3$)	mg/L	< < 3.3
Magnesium	mg/L	1.7
Nitrate (as N)	mg/L	< < 0.5
Nitrate (as NO_3)	mg/L	< < 0.5
pH	pH units	8.28
Potassium	mg/L	24
Sodium	mg/L	240
Specific conductance	µmhos/cm	1,440
Sulfate	mg/L	197
Total dissolved solids	mg/L	865
Total hardness (as $CaCO_3$)	mg/L	36

ATTACHMENT 13

Sewage evaporation pond influent; dissolved metals analytical results from samples collected at sampling location ISWP.

Parameter	Units	ISWP	Co-located sample
Aluminum	mg/L	< 0.05	< 0.05
Antimony	mg/L	< 0.005	< 0.005
Arsenic	mg/L	< 0.002	< 0.002
Barium	mg/L	0.031	0.044
Beryllium	mg/L	< 0.0005	< 0.0005
Boron	mg/L	1.1	1.1
Cadmium	mg/L	< 0.0005	< 0.0005
Chromium	mg/L	< 0.001	< 0.001
Cobalt	mg/L	< 0.05	< 0.05
Copper	mg/L	0.0083	0.0083
Hexavalent chromium	mg/L	< 0.002	< 0.002
Iron	mg/L	< 0.1	< 0.1
Lead	mg/L	< 0.005	< 0.005
Manganese	mg/L	< 0.03	< 0.03
Mercury	mg/L	< 0.0002	< 0.0002
Molybdenum	mg/L	< 0.025	< 0.025
Nickel	mg/L	0.0045	0.0046
Selenium	mg/L	< 0.002	< 0.002
Silver	mg/L	< 0.001	< 0.001
Thallium	mg/L	< 0.001	< 0.001
Vanadium	mg/L	< 0.02	< 0.02
Zinc	mg/L	0.031	0.04

ATTACHMENT 14

Sewage evaporation pond influent; nutrients and coliform organisms analytical results from samples collected at sampling location ISWP.

Parameter	**Units**	**ISWP**	**Coliform resample[a]**
Nutrients		**9/20/04**	**11/17/04**
Ammonia nitrogen (as N)	mg/L	33	
Nitrite (as N)	mg/L	< 0.5	
Nitrite (as NO_2)	mg/L	< 0.5	
Total Kjeldahl nitrogen	mg/L	69	
Coliform organisms			
Fecal coliform	MPN/100 mL	> 1,600	2,200,000
Total coliform	MPN/100 mL	> 1,600	16,000,000

[a]Coliform organisms resampled to use a higher maximum limit of detection more appropriate for sewage.

Attachment 15

Summary of Site 300 active percolation pits

Building	Waste stream	Percolation pit design (dimensions [ft] and design rate)	Wells Up gradient of percolation pit	Wells Down gradient of percolation pit	Direction of flow	Water bearing zone	Current depth to ground water (ft)	Distance of downgradient well from percolation pit (ft)
801	Cooling tower	12x12x7 860 gpd	NC2-11D	[a]	ESE	$Tnbs_1$/ $Tnbs_0$	50	[b]
806	Mechanical equipment	4x3x3 50 gpd	[a]	W-808-01 W-808-02 (both cross gradient)	SE	Tps $Tnsc_2$	50 Below 96	850 (from 806B percolation pit to W-808-01 & W-808-02)
809	Cooling tower	6x6x6 300 gpd	W-809-02	W-815-02 W-815-08	SE	$Tnbs_2$ $Tnbs_1$	104 127[c]	420 (from 809B cooling tower to W-815-02, & W-815-08)
812	Cooling tower	12x12x5 360 gpd	W-812-01 W-812-02	W-812-2009	SW	$Tnbs_1$/ $Tnbs_0$	47	120 (from 812E cooling tower to W-812-2009)
817A	Cooling tower	7x7x5 300 gpd	W-817-06A	W-817-04 W-817-01 (up gradient or cross-gradient)	SE	$Tnbs_2$	76	625 (from 817A cooling tower to W-817-04)

continued

Attachment 15 continued

Summary of Site 300 active percolation pits

Building	Waste stream	Percolation pit design (dimensions [ft] and design rate)	Upgradient well(s)	Downgradient well(s)	Direction of flow	Water bearing zone	Current depth to ground water (ft)	Distance of downgradient well from percolation pit (ft)
826	Cooling tower	6x6x5 300 gpd	a	a	b	b	b	b
827A	2 Cooling towers	18x18x5 1200 gpd	W-827-04 W-827-05	W-827-01 W-827-02 W-827-03	SE	$Tnbs_2$ $Tnsc_{1b}$ $Tnbs_1$	Below 48 50 194	300 (from 827C percolation pit to W-827-01, W-827 -02, &W-827-03)
827A, C, D, E	Mechanical equipment	827A – 5x4x4, 150 gpd 827C – 7x6x6 827D – 6x5x5 827E – 5x4x4 150 gpd (each)	W-827-04 W-827-05	W-827-01 W-827-02 W-827-03 (cross-gradient)	SE	$Tnbs_2$ $Tnsc_{1b}$ $Tnbs_1$	Below 48 50 194	750 (from 827E percolation pit to W-827-01, W-827-02, & W-827 -03)
851	2 Cooling towers	14x14x5 900 gpd	W-851-05	W-851-08 W-851-07	SE	Tmss Tmss	183 140	350 from 851 cooling tower to W-851-07, & W-851-08)

[a] No wells in vicinity.
[b] Information not available.
[c] Confined zone; depth refers to groundwater depth in well. Depth to HSU is much deeper.

ATTACHMENT 16

Evaluation of cooling tower and mechanical equipment discharges threat to groundwater quality using the designated level methodology (DLM); comparison of maximum value detected in samples with the DLM values for disposal units (percolation pits or septic systems) using attenuation factor of 100 for systems more than 30 feet above ground water.

Parameter	Units	Maximum value detected in effluent	Designated level methodology value	Corresponding water quality goal[a]	Source of water quality goal[a]
Aluminum	mg/L	0.25	100	1	CA primary MCL[b]
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	220	None	None	None
Boron	mg/L	2.2	140	1.4	IRIS[c]
Calcium	mg/L	22	None	None	None
Carbonate alkalinity (as $CaCO_3$)	mg/L	800	None	None	None
Chloride	mg/L	210	Not applicable	250	CA secondary MCL
Chromium (total)	mg/L	0.0072	5	0.05	CA primary MCL
Chromium (hexavalent)	mg/L	0.0067	2.1	0.021	IRIS
Copper	mg/L	2.4	130	1.3	CA primary MCL
Fluoride	mg/L	1.1	200	2	CA primary MCL
Hydroxide alkalinity (as $CaCO_3$)	mg/L	120	None	None	None
Iron	mg/L	2.3	30	0.3	CA secondary MCL
Lead	mg/L	0.0077	1.5	0.015	CA primary MCL
Magnesium	mg/L	1.4	None	None	None
Manganese	mg/L	0.2	5	0.05	CA secondary MCL
Molybdenum	mg/L	0.045	3.5	0.035	IRIS

continued

ATTACHMENT 16 - CONTINUED

Evaluation of cooling tower and mechanical equipment discharges on ground water quality using the designated level methodology (DLM); comparison of maximum value detected in samples with the DLM values for disposal units (percolation pits or septic systems) using attenuation factor of 100 for systems more than 30 feet above ground water.

Parameter	Units	Maximum value detected in effluent	Designated level methodology value	Corresponding water quality goal[a]	Source of water quality goal[a]
Nickel	mg/L	0.019	10	0.1	CA primary MCL
Nitrate (as N)	mg/L	0.4	Not applicable	10	CA primary MCL
Nitrate (as NO_3)	mg/L	1.8	Not applicable	45	CA primary MCL
Nitrate plus Nitrite (as N)	mg/L	0.17	Not applicable	10	CA primary MCL
Ortho-phosphate	mg/L	180	None	None	None
Potassium	mg/L	280	None	None	None
Selenium	mg/L	0.0036	5	0.05	CA primary MCL
Sodium	mg/L	740	Not applicable	30-60	Taste & odor
Specific conductance	µmhos/cm	4,340	Not applicable	900	CA secondary MCL
Sulfate	mg/L	885	Not applicable	250	CA secondary MCL
Total alkalinity (as $CaCO_3$)	mg/L	920	None	None	None
Total dissolved solids	mg/L	3,300	Not applicable	500	CA secondary MCL
Total hardness (as CaCO)	mg/L	58	None	None	None
Total phosphorus (as P)	mg/L	54	None	None	None
Total trihalomethanes	mg/L	0.011	Not applicable	0.08	CA primary MCL
Vanadium	mg/L	0.1	6.3	0.063	IRIS
Zinc	mg/L	0.34	500	5	CA secondary MCL

[a] From *A Compilation of Water Quality Goals* (Marshack August 2007).
[b] MCL – Maximum contaminant level.
[c] IRIS – USEPA Integrated Risk Information System reference dose for drinking water.

Attachment 17

Background Concentrations of Chloride, Sodium, Specific Conductance, Sulfate and TDS within the first Hydrostratigraphic Unit (HSU) beneath percolation pits at Buildings 801, 806, 809, 827, 817, and 851[1].

Background monitoring wells screened within the first HSU below each discharge	Number of Samples Evaluated Units	Chloride (mg/L)	Sodium (mg/L)	Specific conductance (µmhos/cm)	Sulfate (mg/L)	Total dissolved solids (TDS) (mg/L)
W-812-05 (HSU Tnbs1) Buildings 801 and 812	**5**	**78**	**86**	**780**	**95**[2]	**520**
W-827-05 (HSU Tnbs1) Building 827	**23**	**190**	**330**	**2200**	**860**[3]	**1900**[3]
W-817-01 (HSU Tnbs2) Buildings 806, 809 and 817	**46**	**200**[4]	**370**	**2270**[4]	**143**[4]	**1300**
W-851-05 (HSU Tmss) Building 851	**11**	**86**	**370**	**3500**	**2900**	**3200**
Water Quality Objectives		**250 secondary MCL**	**30-60 Taste and Odor Threshold**	**900 Secondary MCL**	**250 Secondary MCL**	**500 Secondary MCL**

[1] There are no existing monitoring wells near Building 826 cooling tower percolation pit.
[2] For sulfates, well NC2-11D was used (HSU Tnbs1).
[3] TDS and sulfate are based on 4 samples
[4] Chloride and sulfate are based on 86 samples and Specific conductance is based on 124 samples.

ATTACHMENT 18

Cooling tower blowdown; volatile organic compound analytical results from samples collected at Buildings 801, 827A, and 836A.

Parameter	**Units**	**B801**	**B827A**	**B836A**
Volatile organic compounds		**9/20/04**	**9/20/04**	**9/20/04**
1,1,1-Trichloroethane	µg/L	< 0.5	< 0.5	< 0.5
1,1,2,2-Tetrachloroethane	µg/L	< 0.5	< 0.5	< 0.5
1,1,2-Trichloroethane	µg/L	< 0.5	< 0.5	< 0.5
1,1-Dichloroethane	µg/L	< 0.5	< 0.5	< 0.5
1,1-Dichloroethene	µg/L	< 0.5	< 0.5	< 0.5
1,2-Dichlorobenzene	µg/L	< 0.5	< 0.5	< 0.5
1,2-Dichloroethane	µg/L	< 0.5	< 0.5	< 0.5
1,2-Dichloroethene (total)	µg/L	< 1	< 1	< 1
1,2-Dichloropropane	µg/L	< 0.5	< 0.5	< 0.5
1,3-Dichlorobenzene	µg/L	< 0.5	< 0.5	< 0.5
1,4-Dichlorobenzene	µg/L	< 0.5	< 0.5	< 0.5
2-Chloroethylvinylether	µg/L	< 10	< 10	< 10
Bromodichloromethane	µg/L	< 0.5	< 0.5	< 0.5
Bromoform	µg/L	10	9	< 0.5
Bromomethane	µg/L	< 1	< 1	< 1
Carbon tetrachloride	µg/L	< 0.5	< 0.5	< 0.5
Chlorobenzene	µg/L	< 0.5	< 0.5	< 0.5
Chloroethane	µg/L	< 0.5	< 0.5	< 0.5
Chloroform	µg/L	< 0.5	< 0.5	< 0.5
Chloromethane	µg/L	< 0.5	< 0.5	< 0.5
cis-1,2-Dichloroethene	µg/L	< 0.5	< 0.5	< 0.5
cis-1,3-Dichloropropene	µg/L	< 0.5	< 0.5	< 0.5
Dibromochloromethane	µg/L	0.88	< 0.5	< 0.5
Dichlorodifluoromethane	µg/L	< 0.5	< 0.5	< 0.5
Freon 113	µg/L	< 0.5	< 0.5	< 0.5
Methylene chloride	µg/L	< 1	< 1	< 1
Tetrachloroethene	µg/L	< 0.5	< 0.5	< 0.5
Total trihalomethanes	µg/L	11	9.5	< 2
trans-1,2-Dichloroethene	µg/L	< 0.5	< 0.5	< 0.5
trans-1,3-Dichloropropene	µg/L	< 0.5	< 0.5	< 0.5
Trichloroethene	µg/L	< 0.5	< 0.5	< 0.5
Trichlorofluoromethane	µg/L	< 0.5	< 0.5	< 0.5
Vinyl chloride	µg/L	< 0.5	< 0.5	< 0.5

ATTACHMENT 19

Cooling tower blowdown; general mineral analytical results from samples at Buildings 801, 827A, and 836A.

Parameter	Units	B801	B827A	B836A
General minerals		**9/20/04**	**9/20/04**	**9/20/04**
Aluminum	mg/L	< 0.05	< 0.05	< 0.05
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	220	160	220
Calcium	mg/L	21	13	22
Carbonate alkalinity (as $CaCO_3$)	mg/L	160	120	190
Chloride	mg/L	141	100	144
Copper	mg/L	< 0.01	< 0.01	< 0.01
Fluoride	mg/L	0.62	0.43	0.6
Hydroxide alkalinity (as $CaCO_3$)	mg/L	< 10	< 10	< 10
Iron	mg/L	< 0.05	< 0.05	0.055
Magnesium	mg/L	0.73	< 0.5	0.57
Manganese	mg/L	< 0.01	< 0.01	< 0.01
Nickel	mg/L	< 0.05	< 0.05	< 0.05
Nitrate (as N)	mg/L	0.11	< 0.1	0.4
Nitrate (as NO_3)	mg/L	0.49	< 0.44	1.8
Nitrite (as N)	mg/L	< 0.5	< 0.5	< 0.5
Ortho-phosphate	mg/L	0.52	0.41	0.25
pH	units	8.91	8.83	8.79
Potassium	mg/L	13	10	13
Sodium	mg/L	360	280	390
Specific conductance	µmhos/cm	1,640	1,270	1,760
Sulfate	mg/L	288	219	305
Surfactants	mg/L	< 0.5	< 0.5	< 0.5
Total alkalinity (as $CaCO_3$)	mg/L	380	290	410
Total dissolved solids	mg/L	1,160	885	1,220
Total hardness (as $CaCO_3$)	mg/L	56	34	58
Total phosphorus (as P)	mg/L	0.24	0.19	0.72
Zinc	mg/L	0.051	< 0.05	< 0.05

ATTACHMENT 20

Cooling tower blowdown; dissolved metals analytical results from samples collected at Buildings 801, 827A, and 836A.

Parameter	**Units**	**B801**	**B827A**	**B836A**
Dissolved metals		**9/20/04**	**9/20/04**	**9/20/04**
Aluminum	mg/L	< 0.05	< 0.05	< 0.05
Antimony	mg/L	< 0.005	< 0.005	< 0.005
Arsenic	mg/L	< 0.002	< 0.002	< 0.002
Barium	mg/L	0.025	< 0.025	< 0.025
Beryllium	mg/L	< 0.0005	< 0.0005	< 0.0005
Boron	mg/L	1.5	1.2	1.6
Cadmium	mg/L	< 0.0005	< 0.0005	< 0.0005
Chromium	mg/L	< 0.001	< 0.001	0.003
Cobalt	mg/L	< 0.05	< 0.05	< 0.05
Copper	mg/L	0.0072	0.0056	0.0083
Hexavalent chromium	mg/L	0.002	< 0.002	0.0067
Iron	mg/L	< 0.1	< 0.1	< 0.1
Lead	mg/L	< 0.005	< 0.005	< 0.005
Manganese	mg/L	< 0.03	< 0.03	< 0.03
Mercury	mg/L	< 0.0002	< 0.0002	< 0.0002
Molybdenum	mg/L	0.031	< 0.025	0.031
Nickel	mg/L	< 0.002	< 0.002	< 0.002
Selenium	mg/L	< 0.002	< 0.002	< 0.002
Silver	mg/L	< 0.001	< 0.001	< 0.001
Thallium	mg/L	< 0.001	< 0.001	< 0.001
Vanadium	mg/L	0.021	< 0.02	0.037
Zinc	mg/L	0.044	0.023	< 0.02

ATTACHMENT 21

Evaluation of cooling tower discharges on ground water quality using the designated level methodology (DLM); comparison of maximum value detected in samples with the DLM values for septic systems less than 30 feet above ground water using attenuation factor of 10.

Parameter	Units	Maximum value detected in effluent	Designated level methodology value (10 attenuation factor)	Corresponding water quality goal[a]	Source of water quality goal[a]
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	220	None	None	None
Boron	mg/L	1.5	14	1.4	IRIS[b]
Calcium	mg/L	22	None	None	None
Carbonate alkalinity (as $CaCO_3$)	mg/L	190	None	None	None
Chloride	mg/L	144	Not applicable	250	CA secondary MCL[c]
Chromium (total)	mg/L	0.003	0.5	0.05	CA primary MCL
Chromium (hexavalent)	mg/L	0.0067	0.21	0.021	IRIS
Copper	mg/L	0.0083	13	1.3	CA primary MCL
Fluoride	mg/L	0.62	20	2	CA primary MCL
Iron	mg/L	0.055	3	0.3	CA secondary MCL
Magnesium	mg/L	0.73	None	None	None
Molybdenum	mg/L	0.031	0.35	0.035	IRIS
Nitrate (as N)	mg/L	0.4	Not applicable	10	CA primary MCL
Nitrate (as NO_3)	mg/L	1.8	Not applicable	45	CA primary MCL

continued

ATTACHMENT 21 - CONTINUED

Evaluation of cooling tower discharges on ground water quality using the designated level methodology (DLM); comparison of maximum value detected in samples with the DLM values for septic systems less than 30 feet above ground water using attenuation factor of 10.

Parameter	Units	Maximum value detected in effluent	Designated level methodology value (10 attenuation factor)	Corresponding water quality goal[a]	Source of water quality goal[a]
Ortho-phosphate	mg/L	0.52	None	None	None
Potassium	mg/L	13	None	None	None
Sodium	mg/L	390	Not applicable	30-60	Taste & odor threshold
Specific conductance	µmhos/cm	1,760	Not applicable	900	CA secondary MCL
Sulfate	mg/L	305	Not applicable	250	CA secondary MCL
Total alkalinity (as $CaCO_3$)	mg/L	410	None	None	None
Total dissolved solids	mg/L	1,220	Not applicable	500	CA secondary MCL
Total hardness (as CaCO)	mg/L	58	None	None	None
Total phosphorus (as P)	mg/L	0.72	None	None	None
Total trihalomethanes	mg/L	0.011	Not applicable	0.08	CA primary MCL
Vanadium	mg/L	0.037	0.5	0.05	IRIS
Zinc	mg/L	0.051	50	5	CA secondary MCL

[a] From A Compilation of Water Quality Goals (Marshack August 2007).
[b] IRIS – USEPA Integrated Risk Information System reference dose for drinking water.
[c] MCL – Maximum contaminant level.

ATTACHMENT 22

Summary of Site 300 septic systems.

System location (Building)	Septic system type	Size[a]	Waste streams	Estimated design flow (gpm)[b]	Estimated daily flow (gpd)[c]	Depth to nearest water bearing zone/Regional ($Tnbs_1$) aquifer if different (ft)
801 A&D	Septic tank w/ Leach field	1000g (1) 125', (1) 100', (1) 75'	DW[d], ME[e]	48	312	100 ($Tnbs_1$/$Tnbs_0$)
802	Septic tank w/ 2 Leach fields	1000g 75'4"pipe	DW, CT[f], ME	30	45.8	50 ($Tnbs_1$)
805	2 Septic tanks w/ Cesspool	1200g and 350g 460 sq. ft., 141 sq. ft.	DW, ME	35	45.8	50 (Tps)/300 ($Tnbs_1$)
806 A	Septic tank w/ 2 Cesspools	1000g 115 sq. ft.	DW	27	72.8	50 (Tps)/300 ($Tnbs_1$)
807	Septic tank w/ 2 Leach fields	1000g 75' 4" pipe	DW	25	[g]	50 (Tps)/300 ($Tnbs_1$)
809	Septic tank w/ Cesspool	500g 315 sq. ft	DW	23	20.8	60 (Tps)/240 ($Tnbs_1$)
810	Septic tank w/ Leach field	500g 25'x4"	DW	27	104	60 (Tps)/240 ($Tnbs_1$)
812 A&B	Septic tank w/ 2 Leach fields	1000g 75'4" pipe	DW	32	[g]	40 ($Tnbs_1$/$Tnsc_0$)
813	Septic tank w/ 3 cesspools	1480g	DW, ME, LW[h]	45	183.2[i]	50 (Tps)/300 ($Tnbs_1$)
817	Septic tank w/ 4 Leach fields	1000g 55' pipe	DW	23	124.8	60 (Tps)/240 ($Tnbs_1$)

continued

ATTACHMENT 22 continued

Summary of Site 300 septic systems.

System location (Building)	Septic system type	Sizea	Waste streams	Estimated design flow (gpm)b	Estimated daily flow (gpd)c	Depth to nearest water bearing zone/Regional (Tnbs1) aquifer if different (ft)
818	Septic tank w/ 4 Leach fields	1000g 55' pipe	DW	32	104	100 ($Tnbs_2$)/220 ($Tnbs_1$), confined – top of HSU
819	Septic tank w/ Leach field	1000g 120'4" tile	ME	j	g	230 ($Tnsc_{1b}$)/270 ($Tnbs_1$), confined – top of HSU
825	Septic tank w/ Leach field	500g	DW, CT, ME	23	g	No information in this area
826	Septic tank w/ 2 Leach field	500g 75' 4" tile	DW, ME	30	22.9	No information in this area
827 A	Septic tank w/ 2 Leach fields	1000g 100'4" tile	DW	30	137.4	50 ($Tnsc_1$)/195 ($Tnbs_1$)
830	Septic tank w/ 2 Leach fields	1000g 100'4" tile	DW, CT	27	g	20 (Qal)/100 ($Tnbs_1$)
832	Septic tank w/ Cesspool	500g 25'x4'	DW	32	72.8	20 ($Tnsc_{1b}$)/125 ($Tnbs_1$)
833 & 835	Septic tank w/ 3 Leach fields	1000g 150'4" tile	DW, CT, LW,	32	31.2	40 (Tpsg)/280 ($Tnbs_1$)
834 A	Septic tank w/ 2 Leach fields	1000g 75'4" tile	DW, CT	28	72.8	25 (Tpsg)/300 ($Tnbs_1$)
836 A	Septic tank w/ Leach field	1000g 85'4" tile	DW	30	229	No information in this area

continued

ATTACHMENT 22 continued

Summary of Site 300 septic systems.

System location (Building)	Septic system type	Sizea	Waste streams	Estimated design flow (gpm)b	Estimated daily flow (gpd)c	Depth to nearest water bearing zone/Regional (Tnbs1) aquifer if different (ft)
841	Septic tank w/ 2 Leach fields	500g 75’4” tile	DW	23	g	No information in this area
848	Septic tank w/ Leach field	500g	DW	23	10.4	No information in this area
850	Septic tank w/ 2 Leach fields	1000g 75’4” pipe	DW, CT	35	68.7	30 (Qal/WBR)
851 A&B	Septic tank w/ 2 Leach fields	1000g 100’4” tile	DW, ME	40	274.8	140 (Tmss)
854 A	Septic tank w/ Leach field	1000g 75’4” pipe	DW	27	10.4	145 ($Tnbs_1$/$Tnsc_0$)
855 A	Septic tank w/ 2 Leach fields	1000g 75’4” pipe	DW	23	g	100 ($Tnbs_1$/$Tnsc_0$)
858 A	Septic tank w/ Cesspool	1200g. 10’x6’	DW	27	g	90 ($Tnbs_1$/$Tnsc_0$)
865	2 Septic tanks w/ Leach field	1500g each	DW	44	41.6	125 ($Tnbs_1$/$Tnbs_0$)
882	2 Septic tanks w/ Leach field	1000g each	DW	27	218.4	No information in this area
892	Septic tank w/ Seepage Pit	1000g	DW	23	10.4	No information in this area

continued

ATTACHMENT 22 continued

Summary of Site 300 septic systems.

System location (Building)	Septic system type	Size[a]	Waste streams	Estimated design flow (gpm)[b]	Estimated daily flow (gpd)[c]	Depth to nearest water bearing zone/Regional (Tnbs1) aquifer if different (ft)
895	Septic tank w/ 2 Leach fields	500g 75'4" tile	DW	23	[g]	No information in this area
897	Cesspool		DW	23	[g]	No information in this area
899	Septic tank w/ Leach field	1500g	DW	36	52	24 (Qt- $Tnbs_1$)/220 (deep $Tnbs_1$)

[a] Based on best available information and records.

[b] Estimated design flow was calculated based on the domestic waste fixture units for each type of plumbing fixture in the building in accordance with *Appendix A, Recommended Rules for Sizing The Water Supply System, of 1997 Uniform Plumbing Code*. The toilets and urinals predominantly use flushometer valves.

[c] Estimated daily flow was calculated based on the facility peak population using the following assumptions:

1. Each building occupant will use the restroom four times a day. Each use will consume 1.6 gallons of water per flush and 1.0 gallon of water for hand washing.
2. Each building occupant will take a 5-minute shower if there is shower facility in the building. The showerhead will deliver 2.0 gallons of water per minute.

[d] DW= domestic waste. [e] ME = mechanical equipment wastewaster. [f] CT = cooling tower blowdown.

[g] There are no assigned occupants in the building. Therefore domestic plumbing fixtures are used only by transient workers. Sewage flow is minimum.

[h] LW = laundry wastewater.

[i] This is the change house and shower facility for process area workers, therefore the daily flow is estimated on 8 persons using the facility daily rather than the peak facility population number.

[j] There are no domestic plumbing fixtures in the building, previously Building 820, which has been demolished, was connected to this septic system.

ATTACHMENT 23

Washing machine discharges; explosive compounds analytical results from a sample collected at Buildings 813.

Parameter	**Units**	**B813**
Explosive compounds		**9/22/04**
1,3,5-Trinitrobenzene	µg/L	< 5
1,3-Dinitrobenzene	µg/L	< 5
2,4-Dinitrotoluene	µg/L	< 5
2,6-Dinitrotoluene	µg/L	< 5
2-Amino-4,6-dinitrotoluene	µg/L	< 5
2-Nitrotoluene	µg/L	< 5
3-Nitrotoluene	µg/L	< 5
4-Amino-2,6-dinitrotoluene	µg/L	< 5
4-Nitrotoluene	µg/L	< 5
HMX	µg/L	230
Nitrobenzene	µg/L	< 5
RDX	µg/L	17
Tetryl	µg/L	< 5
TNT	µg/L	< 5

ATTACHMENT 24

Evaluation of laundry water discharges on ground water quality using the designated level methodology (DLM); comparison of maximum value detected in laundry water samples discharged to septic systems with the DLM for discharges more than 30 feet above ground water using an attenuation factor or 100.

Parameter	Units	Maximum value detected in effluent	Designated level methodology value	Corresponding water quality goal[a]	Source of water quality goal[a]
Aluminum	mg/L	150	100	1	CA primary MCL[b]
Bicarbonate alkalinity (as $CaCO_3$)	mg/L	250	None	None	None
Calcium	mg/L	73	None	None	None
Carbonate alkalinity (as $CaCO_3$)	mg/L	500	None	None	None
Chloride	mg/L	107	Not applicable	250	CA secondary MCL
Copper	mg/L	0.57	130	1.3	CA primary MCL
Fluoride	mg/L	0.3	200	2	CA primary MCL
HMX	mg/L	0.23	35	0.35	IRIS[c]
Iron	mg/L	90	30	0.3	CA secondary MCL
Magnesium	mg/L	40	None	None	None
Manganese	mg/L	2.2	5	0.05	CA secondary MCL
Nickel	mg/L	0.57	10	0.1	CA primary MCL
Nitrate (as N)	mg/L	0.59	Not applicable	10	CA primary MCL
Nitrate (as NO_3)	mg/L	2.6	Not applicable	45	CA primary MCL
Oil and grease	mg/L	46	None	None	None
Ortho-phosphate	mg/L	0.84	None	None	None
Potassium	mg/L	18	None	None	None

Continued

ATTACHMENT 24 - CONTINUED

Evaluation of laundry water discharges on ground water quality using the designated level methodology (DLM); comparison of maximum value detected in laundry water samples discharged to septic systems with the DLM for discharges more than 30 feet above ground water using an attenuation factor or 100.

Parameter	Units	Maximum value detected in effluent	Designated level methodology value	Corresponding water quality goal[a]	Source of water quality goal[a]
RDX	mg/L	0.017	0.21	0.0021	IRIS
Sodium	mg/L	500	Not applicable	30-60	Taste & odor threshold
Specific conductance	µmhos/cm	2,000	Not applicable	900	CA secondary MCL
Sulfate	mg/L	193	Not applicable	250	CA secondary MCL
Total alkalinity (as $CaCO_3$)	mg/L	750	None	None	None
Total dissolved solids	mg/L	1,450	Not applicable	500	CA secondary MCL
Total hardness (as CaCO)	mg/L	347	None	None	None
Total phosphorus (as P)	mg/L	0.58	None	None	None
Zinc	mg/L	1.3	500	5	CA secondary MCL

[a] From A Compilation of Water Quality Goals (Marshack August 2007).
[b] MCL – Maximum Contaminant Level
[c] IRIS – USEPA Integrated Risk Information System reference dose for drinking water.