5. Water Monitoring Programs

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Lawrence Livermore National Laboratory (LLNL) monitors water systems including wastewaters, storm water, and groundwater, as well as rainfall and local surface water. Water systems at the two LLNL sites (the Livermore Site and Site 300) operate differently. For example, the Livermore Site is serviced by a publicly owned treatment works (POTW) but Site 300 is not, resulting in different methods of treating and disposing of sanitary wastewater at the two sites. Many drivers determine the appropriate methods and locations of the various water monitoring programs, as described below.

In general, water samples are collected according to written, standardized procedures appropriate for the medium (LLNL's *Environmental Monitoring Plan*, Brunckhorst 2019). Sampling plans are prepared by the LLNL network analysts who are responsible for developing and implementing monitoring programs or networks. Network analysts decide which analytes are sampled and at what frequency, incorporating any permit-specified requirements. Except for analyses of certain sanitary sewer and retention tank analytes, analyses are usually performed by off-site, California-certified contract analytical laboratories.

5.1 Sanitary Sewer Effluent Monitoring

In 2021, the Livermore Site discharged an average of 968,695 L/d (255,930 gal/d) of wastewater to the City of Livermore sewer system or 4.7% of the total flow into the City's system. This volume includes wastewater generated by Sandia National Laboratories/California (SNL) and a very small quantity from Site 300. In 2021, SNL generated approximately 6.3% of the total effluent discharged from the Livermore outfall. Wastewater from SNL and Site 300 is discharged to the LLNL collection system and combined with LLNL sewage before it is released at a single point to the municipal collection system.

LLNL's effluent contains both domestic waste and process wastewater and is discharged in accordance with Wastewater Discharge Permit (Permit #1250) requirements administered by the Water Resources Division (WRD) of the City of Livermore, and the City of Livermore Municipal Code, as discussed below. Most of the process wastewater generated at the Livermore Site is collected in retention tanks and discharged to LLNL's collection system following characterization and approval from LLNL's Environmental Functional Area (EFA) Water Team Staff Wastewater Discharge Authorization Record (WDAR) approval process.

5.1.1 Livermore Site Sanitary Sewer Monitoring Complex

Permit #1250 requires continuous monitoring of the effluent flow rate and pH. Samplers at the Sewer Monitoring Station (SMS) collect flow-proportional composite samples and instantaneous grab samples that are analyzed for metals, radioactivity, total toxic organics, and other water-quality parameters.

5.1.1.1 Radiological Monitoring Results

Department of Energy (DOE) orders and federal regulations establish the standards of operation at LLNL (see **Chapter 2**), including the standards for sanitary sewer discharges. Primarily the standards for radioactive material releases are contained in sections of DOE Order 458.1.

For sanitary sewer discharges, DOE Order 458.1 provides the criteria DOE has established for the application of best available technology to protect public health and minimize degradation of the environment. The Derived Concentration Standards (DCS), which complement DOE Order 458.1, limit the concentration of each radionuclide discharged to publicly owned treatment works. If the measured monthly average concentration of a radioisotope exceeds its concentration limit, LLNL is required to improve discharge control measures until concentrations are again below the DOE limits.

The DOE Order 458.1 sanitary sewer discharge numerical limits include the following annual discharge limits for radioactivity: tritium, 185 GBq (5 Ci); carbon-14, 37 GBq (1 Ci); and all other radionuclides combined, 37 GBq (1 Ci). The radioisotopes with the potential to be found in sanitary sewer effluent at LLNL and their discharge limits are discussed below. All analytical results are provided in **Appendix A**, **Section A.3**.

LLNL determines the total radioactivity contributed by tritium, gross alpha emitters, and gross beta emitters from the measured radioactivity in the monthly effluent samples. As shown in **Table 5-1**, the 2021 combined release of alpha and beta sources was 0.140 GBq (0.004 Ci), which is 0.38% of the corresponding DOE Order 458.1 limit (37 GBq [1.0 Ci]). The tritium total was 3.671 GBq (0.099 Ci), which is 1.99% of the DOE Order 458.1 limit (185 GBq [5 Ci]).

Table 5-1. Estimated total radioactivity in LLNL sanitary sewer effluent, 2021.

Radioactivity	Estimate based on effluent activity (GBq)	MDC[(a)] (GBq)
Tritium	3.671	0.624
Gross alpha	0.020	0.069
Gross beta	0.120	0.054

(a) Minimum detectable concentration.

Discharge limits and a summary of the measurements of tritium in the sanitary sewer effluent from LLNL and the Livermore Water Reclamation Plant (LWRP) are reported in LLNL monthly reports. The maximum daily concentration for tritium was 0.09 Bq/mL (2.32 pCi/mL).

Calendar year 2021 data for measured concentrations of cesium-137 and plutonium-239 in the sanitary sewer effluent from LLNL and the LWRP, and plutonium-239 in LWRP sludge are reported in the LLNL January and February 2022 Reports (Rosene 2022b; 2022c). Cesium and plutonium results are from monthly composite samples of LLNL and LWRP effluent and from quarterly composites of LWRP sludge. For 2021, the annual total discharges of cesium-137 and plutonium-239 were far below the DOE DCSs. Plutonium discharged in LLNL effluent is ultimately concentrated in LWRP sludge. The highest plutonium concentration observed in 2021 sludge was 0.123 mBq/g (0.0035 pCi/g), which is many times lower than the National Council on Radiation Protection and Measurements (NCRP) recommended soil screening limit of 470 mBq/g (12.7 pCi/g) for commercial or industrial property.

LLNL also compares annual discharges with historical values to evaluate the effectiveness of ongoing discharge control programs. **Table 5-2** summarizes the radioactivity in sanitary sewer effluent over the past 10 years. During 2021, a total of 3.67 GBq (0.099 Ci) of tritium was discharged to the sanitary sewer. This amount is in a similar range to historical values, well within regulatory limits, and fully protective of the environment.

Table 5-2. Historical radioactive liquid effluent releases from the Livermore Site, 2011–2021.

Year	Tritium (GBq)	Plutonium-239+240 (GBq)
2011	1.37	2.00×10^{-6}
2012	1.57	7.00×10^{-6}
2013	1.94	5.91×10^{-5}
2014	1.54	3.21×10^{-5}
2015	2.21	1.10×10^{-5}
2016	0.64	$9.38 \text{ x } 10^{-6}$
2017	4.50	1.44×10^{-5}
2018	5.46	$8.7 \text{ x } 10^{-6}$
2019	5.54	$2.01 \text{ x } 10^{-5}$
2020	8.01	$7.99 \text{ x } 10^{-6}$
2021	3.67	$2.27 \text{ x } 10^{-5}$

5.1.1.2 Nonradiological Monitoring Results

LLNL monitors sanitary sewer effluent for chemical and physical parameters at different frequencies depending on the intended use of the result. Permit #1250 requires LLNL to collect grab samples once per month, 24-hour flow-proportional composite samples once per week, weekly composite samples collected over a 7-day period, and daily flow-proportional composite samples collected over a 24-hour period. All samples are collected continuously throughout the year.

A summary of the analytical results from the permit-specified weekly composite sampling program is presented in **Table 5-3**. The permit also requires that grab samples of effluent be collected on a monthly and quarterly basis and analyzed for total toxic organic (TTO) compounds. Samples for cyanide and metals are collected quarterly. Results from LLNL's 2021 sanitary sewer effluent monitoring program are provided in **Appendix A**, **Section A.3**.

Table 5-3. Summary of analytical results for permit-specified 24-hour composite sampling of the LLNL sanitary sewer effluent, 2021.

Parameter (mg/L)	Detection frequency[a]	Minimum	Maximum	Median
Biochemical oxygen demand (BOD)	52 of 52[b]	17	150	30
Total dissolved solids (TDS)	12 of 12[b]	230	1,100	305
Total suspended solids (TSS)	52 of 52[b]	5	170	13

(a) The number of times an analyte was positively identified, followed by the number of samples that were analyzed.

(b) BOD and TSS samples are taken once per week, TDS is sampled once per month.

As previously noted, grab samples of LLNL's sanitary sewer effluent are collected monthly for TTO analysis (permit limit = 1.0 mg/L) and quarterly for cyanide and metals analysis. In 2021, LLNL did not exceed any of these discharge limits. Results from the monthly TTO analyses for 2021 show that no priority pollutants, listed by the U.S. Environmental Protection Agency (EPA) as toxic organics, were identified in LLNL effluent above the 10 µg/L permit-specified reporting limit. As shown in **Appendix A**, **Section A.3**, one non-regulated organic compound, acetone, was identified in monthly grab samples at concentrations above the 10 µg/L permit-specified reporting limit.

5.1.2 Categorical Processes

The EPA has established pretreatment standards for categories of industrial processes that they have determined are major contributors to point-source water pollution. These federal standards include prescribed sampling, self-monitoring, reporting, and numerical limits for the discharge of category-specific pollutants. At LLNL, the categorical pretreatment standards are incorporated into Permit #1250.

The processes at LLNL that are determined to be regulated under the Categorical Standards may change as programmatic requirements dictate. Categorical processes identified at LLNL (from both the Metal-Finishing Category, 40 CFR 433, and the Electrical and Electronic Components Category, 40 CFR 469) are listed in Permit #1250.

Only processes that discharge to the sanitary sewer require semiannual sampling, inspection, and reporting. During 2021, two processes discharged wastewater to the sanitary sewer: semiconductor processes located in the Building 153 (microfabrication facility), and the abrasive jet machining located in Building 161. In 2021, LLNL analyzed compliance samples for all regulated parameters from both processes and demonstrated compliance with all federal categorical and local discharge limits. As a further environmental safeguard, LLNL sampled the wastewater in each Building 153 wastewater tank designated as receiving regulated waste, prior to each discharge to the sanitary sewer. These monitoring data were reported to the WRD in July

2021 and January 2022 Semiannual Wastewater Point-Source Monitoring Reports (Rosene 2021; 2022a).

In addition, WRD source control staff performed their required annual inspection and sampling of the two discharging categorical processes in October 2021. The compliance samples were analyzed for all regulated parameters, and the results demonstrated compliance with all federal and local pretreatment limits.

If any of the non-discharging regulated processes were to discharge process wastewater to the sanitary sewer, they would be regulated under 40 CFR Part 433 and reported in the Semiannual Wastewater Point-Source Monitoring Report. Currently, wastewater from these processes is either recycled on-site or contained for eventual removal and appropriate disposal by LLNL's Radioactive and Hazardous Waste Management (RHWM).

5.1.3 Discharges of Treated Groundwater

LLNL's groundwater discharge permit (1510G, 2021–2025) allows treated groundwater from the Livermore Site Ground Water Project (GWP) to be discharged in the City of Livermore sanitary sewer system (see **Chapter 7** for more information on the GWP). During 2021, there were no discharges (from on-site or off-site locations) to the sanitary sewer from the Environmental Restoration Department GWP activities. When such discharges occur, permit compliance is maintained by Treatment Facility Operators through the systematic use of engineering and administrative controls, including WDARs generated for each discharge. This information is reported to the City of Livermore.

5.1.4 Environmental Impact of Sanitary Sewer Effluent

During 2021, no discharges exceeded any discharge limits for either radioactive or nonradioactive materials to the sanitary sewer. The data are comparable to the lowest historical LLNL values. All the values reported for radiological releases are a fraction of their corresponding limits.

The data demonstrate that LLNL continues to have excellent control of both radiological and nonradiological discharges to the sanitary sewer. Monitoring results for 2021 reflect an effective year for LLNL's wastewater discharge control program and indicate no adverse impact to the LWRP or the environment from LLNL sanitary sewer discharges.

5.2 Site 300 Sewage Ponds and Site 300 Waste Discharge Requirements

Wastewater grab samples were collected for Waste Discharge Requirements (WDR) Order No. R5-2008-0148. This network includes the sewage evaporation and percolation ponds, mechanical equipment discharges to percolation pits, cooling tower discharges to percolation pits, and septic systems as shown in **Figure 5-1**.

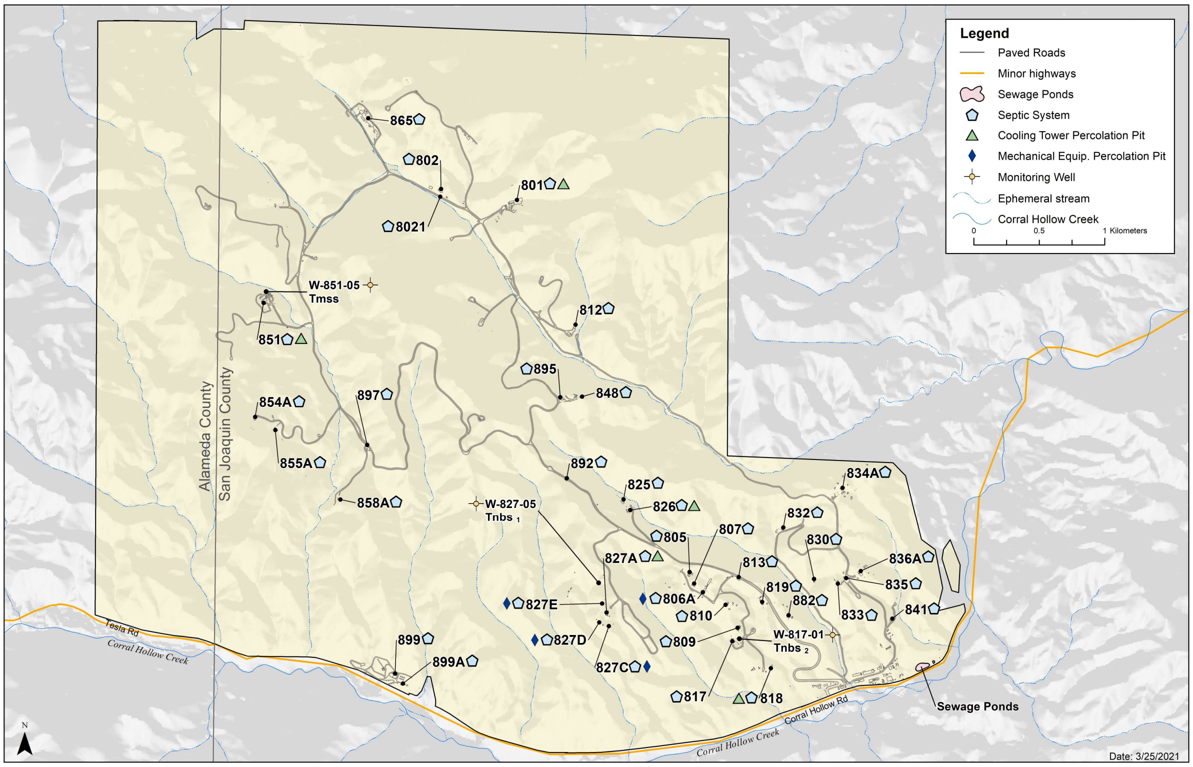

Figure 5-1. WDR-R5-2008-0148 monitoring network, 2021.

The Site 300 sewage evaporation pond is sampled semiannually at two locations—within the evaporation pond, and at the effluent from the evaporation pond prior to flow to the sewage percolation pond. All samples were collected in accordance with the standardized procedures summarized in Brunckhorst (2019).

5.2.1 Sewage Evaporation and Percolation Ponds

Sanitary effluent (nonhazardous wastewater) generated at buildings in the General Services Area (GSA) at Site 300 is managed in an evaporation pond lined with catalytically-blown asphalt. Occasionally, during winter rains when the minimum 12 inches of freeboard depth cannot be maintained, treated wastewater from the sewage evaporation pond may be released into an unlined percolation pond to the east where it enters the ground and the shallow groundwater. Although this potential exists, it did not occur during 2021.

In September 2008, the Central Valley Regional Water Quality Control Board (CVRWQCB) replaced WDR 96-248 with WDR R5-2008-0148. Under the terms of the Monitoring and Reporting Program (MRP) No. R5-2008-0148, LLNL submits semiannual and annual monitoring reports detailing Site 300 discharges of domestic and wastewater effluent to sewage evaporation and percolation ponds in the GSA, mechanical equipment discharges to percolation pits, cooling tower discharges to percolation pits, septic system discharges, and other low-threat discharges to ground.

The monitoring data collected for the 2021 semiannual and annual reports complied with all MRP conditions and permit requirements (Chan & Will 2022). Compliance certification accompanied this report, as required by federal and state regulations.

5.2.2 Environmental Impact of Sewage Ponds

There were no discharges from the Site 300 sewage evaporation pond to the percolation pond. Groundwater monitoring related to this area indicated there were no measurable impacts to the groundwater from the sewage pond operations (Chan & Will 2022).

5.3 Storm Water Compliance and Surveillance Monitoring

The current Storm Water Industrial General Permit (IGP) (2014-0057-DWQ), issued by the State Water Resources Control Board (SWRCB), took effect July 1, 2015. LLNL modified the storm water monitoring plan for both sites to achieve compliance with this permit. Storm water monitoring at both sites also follows the requirements in the U.S. DOE handbook *Environmental Radiological Effluent Monitoring and Environmental Surveillance* (U.S. DOE 2015) and meets the applicable requirements of DOE Order 458.1. See **Figures 5-2** and **5-3** for storm water sampling locations for the Livermore Site and Site 300, respectively.

For construction projects that disturb one acre of land or more, LLNL also meets storm water compliance monitoring requirements of the California National Pollutant Discharge Elimination System (NPDES) General Permit for Storm Water Discharges Associated with Construction Activity (Order Number 2009-0009-DWQ) (SWRCB, 2009). The Energy Independence and Security Act, Section 438 specifically calls for federal development that has a footprint that exceeds 5,000 square feet to maintain or restore predevelopment hydrology.

Under the IGP, LLNL is required to collect and analyze samples at specified locations two times during the period from July 1 to December 31 and two times during the period from January 1 to June 30, if specific criteria are met and the sampling window coincides with regular working hours. The State storm water reporting period is offset from the reporting period in this *Environmental Report*. Runoff samples were collected for one storm event from all five required storm water locations at the Livermore Site, and Building 883 at Site 300 on December 13, 2021. All other precipitation events at the Livermore Site and Site 300 during 2021 were not qualifying and could not be sampled in compliance with the IGP. LLNL is required to visually inspect the storm drainage system during up to four qualifying storm events to observe runoff quality and once each month during dry periods to identify any dry weather flows. Annual facility inspections are performed to ensure that the Best Management Practices (BMPs) for controlling storm water pollution are implemented and adequate.

The CVRWQCB issued a Water Code Section (WCO) 13267 Order for *Submittal of Technical and Monitoring Reports for The Active Building 851 Firing Table, Lawrence Livermore National Laboratory Site 300, San Joaquin County*, requesting a sediment and storm water runoff monitoring program during the Building 851 Firing Table operational period at Site 300.

Under the WCO, LLNL is required to collect a storm water runoff sample and a sediment sample annually, analyze samples for constituents of concern, and report the sampling results to the CVRWQCB. Only a sediment sample was collected from Building 851, on May 26, 2021. No runoff producing storm events occurred after the CVRWQCB Work Plan concurrence on May 6, 2021. See **Figure 5-3** for storm water and sediment sampling location for the Building 851 sample location.

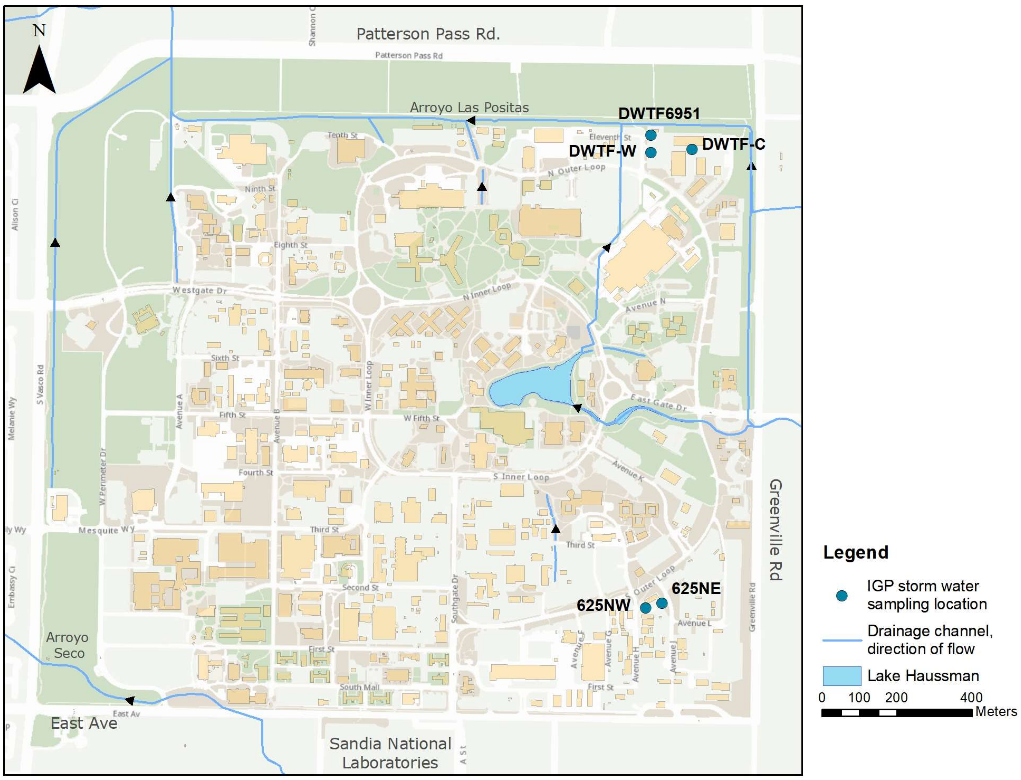

Figure 5-2. Storm water sampling locations, Livermore Site, 2021.

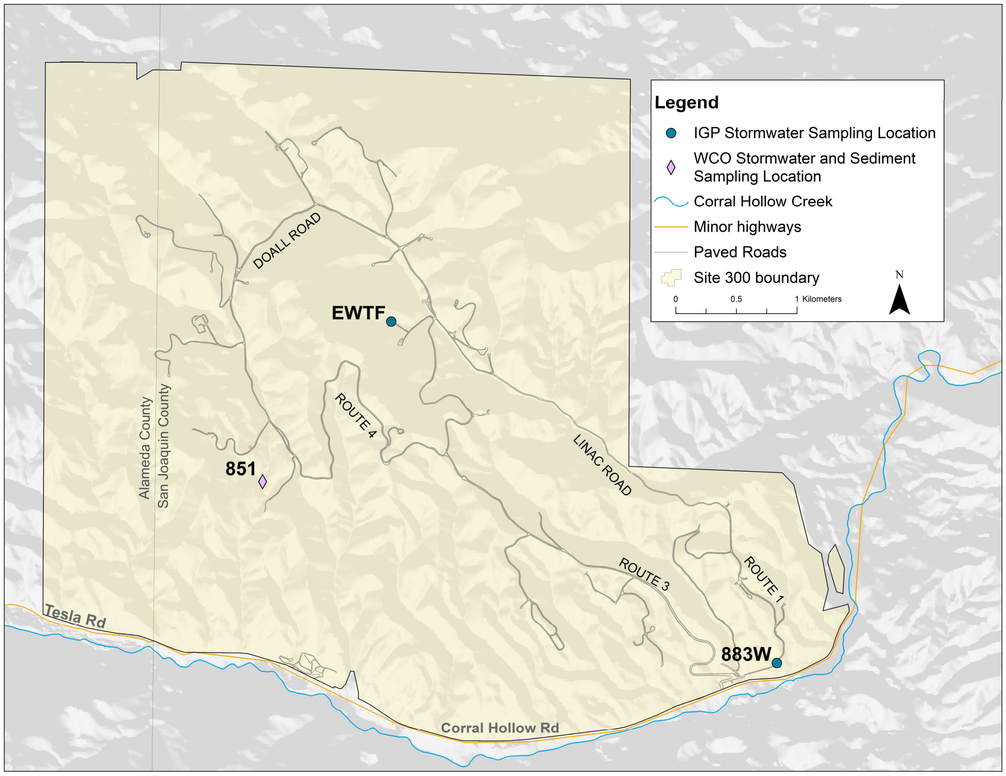

Figure 5-3. Storm water sampling locations, Site 300, 2021.

5.3.1 Storm Water Inspections

Each principal directorate at LLNL conducts an annual inspection of its facilities to verify implementation of BMPs and to ensure that those measures are adequate. LLNL's principal associate directors identified some corrections to the BMPs and certified in 2020 that their facilities complied with the provisions of LLNL's Storm Water Pollution Prevention Plans (SWPPPs). LLNL submits storm water analytical results to the San Francisco Bay Regional Water Quality Control Board (SFBRWQCB) and to the CVRWQCB through an online database called the Storm Water Multiple Application and Report Tracking System (SMARTS) for each Qualifying Storm Event (QSE).

For each construction project permitted by Order Number 2009-0009-DWQ, LLNL or designated subcontractors conduct visual monitoring of construction sites before, during, and after storms to assess the effectiveness of the BMPs. Annual compliance certifications, if necessary, summarize the inspections.

5.3.2 Storm Water Compliance

LLNL is required to meet the requirements of the IGP, which identifies two types of Numeric Action Levels (NALs).

Annual NAL exceedance – occurs when the average of all the analytical results for a parameter from samples taken within a reporting year exceeds an annual NAL value for that parameter.

Instantaneous maximum NAL exceedance – occurs when two or more analytical results for TSS, Oil and Grease (O&G), or pH from samples taken within a reporting year exceed the instantaneous maximum NAL value (or are outside the NAL pH range).

An NAL exceedance is determined as follows:

a. For annual NALs, an exceedance occurs when the average of all analytical results from all samples taken at a facility during a reporting year for a given parameter exceeds an annual NAL value listed in Table 2 of the General Permit; or

b. For instantaneous maximum NALs, an exceedance occurs when two or more analytical results from samples taken for any parameter within a reporting year exceed the instantaneous maximum NAL value (for TSS and O&G), or are outside of the instantaneous maximum NAL range (for pH) listed in Table 2 of the General Permit.

Please refer to **Appendix A, Tables A.4.1** to **A.4.5**. for storm water sample analytical results. Both the Livermore Site and Site 300 remain at Exceedance Response Action Level 2 for magnesium. LLNL has provided data and analysis that show the exceedance of magnesium is due to aerial deposition from natural sources, not industrial activities at LLNL.

Storm water visual observations and BMP inspections indicated that LLNL's storm water program continues to protect water quality.

A full report of storm water runoff samples for January 1, 2021 to June 30, 2021 is available in the 2021 Annual Storm Water Reports for the Livermore Site and Site 300 in SMARTS. A report of storm water compliance for the Livermore Site and Site 300 from July 1, 2021 to December 31, 2021 will be available in SMARTS after July 15, 2022.

Please refer to **Appendix A, Tables A.4.1** to **A.4.5**. for sediment sample analytical results.

A full report of sediment sampling for 2021 is available in the Building 851 Firing Table Sediment Monitoring Report in GeoTracker.[1] A report of sediment compliance for Building 851 Firing Table will be available in GeoTracker after July 15, 2021.

5.4 Groundwater

LLNL conducts surveillance monitoring of groundwater in the Livermore Valley and at Site 300 through networks of wells and springs that include off-site private wells and on-site Comprehensive Environmental Response, Compensation and Liability Act (CERCLA) wells. To meet the goal of maintaining a comprehensive, cost-effective monitoring program, LLNL determines the number and locations of surveillance wells, the analytes to be monitored, the frequency of sampling, and the analytical methods to be used. A wide range of analytes is

1 GeoTracker is the SWRCB's data management system for sites that impact, or have the potential to impact, water quality in California, with emphasis on groundwater. https://geotracker.waterboards.ca.gov/

monitored to assess the impact, if any, of current LLNL operations on local groundwater resources. Because surveillance monitoring is geared to detect substances at very low concentrations in groundwater, contamination can be detected before it significantly impacts groundwater resources. Groundwater monitoring wells at the Livermore Site, in the Livermore Valley, and at Site 300 are included in LLNL's *Environmental Monitoring Plan* (Brunckhorst 2019).

In 2009, LLNL implemented a CERCLA comprehensive compliance monitoring plan at Site 300 (Dibley et al. 2009) to fulfill the DOE and regulatory requirements for on-site groundwater surveillance. LLNL also monitors two surveillance networks to supplement the CERCLA compliance monitoring and provide additional data to characterize potential impacts of LLNL operations. LLNL monitoring related to CERCLA activities is described in **Chapter 7**. Additional monitoring programs at Site 300 comply with numerous federal and state controls such as state-issued permits associated with closed landfills containing solid wastes and with continuing discharges of liquid waste to sewage ponds and percolation pits; the latter are discussed in **Section 5.2.1**. Compliance monitoring is specified in WDRs issued by the CVRWQCB and in landfill closure and post-closure monitoring plans. (See **Chapter 2**, **Table 2-2** for a summary of LLNL permits.)

The WDRs and post-closure plans specify wells and discharges to be monitored, constituents of concern (COCs) and parameters, frequency of measurement, inspections, and reporting requirements. These monitoring programs include quarterly, semiannual, and annual monitoring of groundwater, monitoring of various influent waste streams, and visual inspections. LLNL performs the maintenance necessary to ensure the physical integrity of closed facilities, such as those that have undergone CERCLA or Resource Conservation and Recovery Act (RCRA) closure, and their monitoring networks.

During 2021, representative samples of groundwater were obtained from monitoring wells in accordance with the *LLNL Livermore Site and Site 300 Environmental Restoration Project Standard Operating Procedures* (Goodrich and Lorega 2016). The procedures cover sampling techniques and information about groundwater monitoring parameters. Different sampling techniques were employed at different wells depending on whether they were fitted with submersible pumps or had to be bailed. All the chemical and radioactivity analyses of groundwater samples were performed by California-certified analytical laboratories. For comparison purposes only, some of the results were compared with drinking water limits (maximum contaminant levels [MCLs]).

5.4.1 Livermore Site and Environs

5.4.1.1 Livermore Valley

LLNL has monitored tritium in water hydrologically downgradient of the Livermore Site since 1988. HTO (tritiated water) is potentially the most mobile groundwater contaminant from LLNL operations. Groundwater samples were obtained during 2021 from 13 of 15 wells in the Livermore Valley (see **Figure 5-4**) and measured for tritium concentration. Wells 11B1 and 12G1 were not sampled in 2021 because they were offline at the time of sampling. Since well 16B1 is out of service and well 7P3 was decommissioned, both wells have been removed from the monitoring plan.

Tritium measurements of Livermore Valley groundwater are provided in **Appendix A**, **Section A.5**. The measurements continue to show very low activities compared with the 740 Bq/L (20,000 pCi/L) MCL established for drinking water in California. The maximum tritium concentration estimated off-site was in the groundwater at well 17D12, located approximately 15.0 km (9.3 mi) west of LLNL (see **Figure 5-4**). The estimated activity at well 17D12 was 1.2 ± 3.4 Bq/L (32.4pCi/L) in 2021 which is less than 0.2% of the MCL.

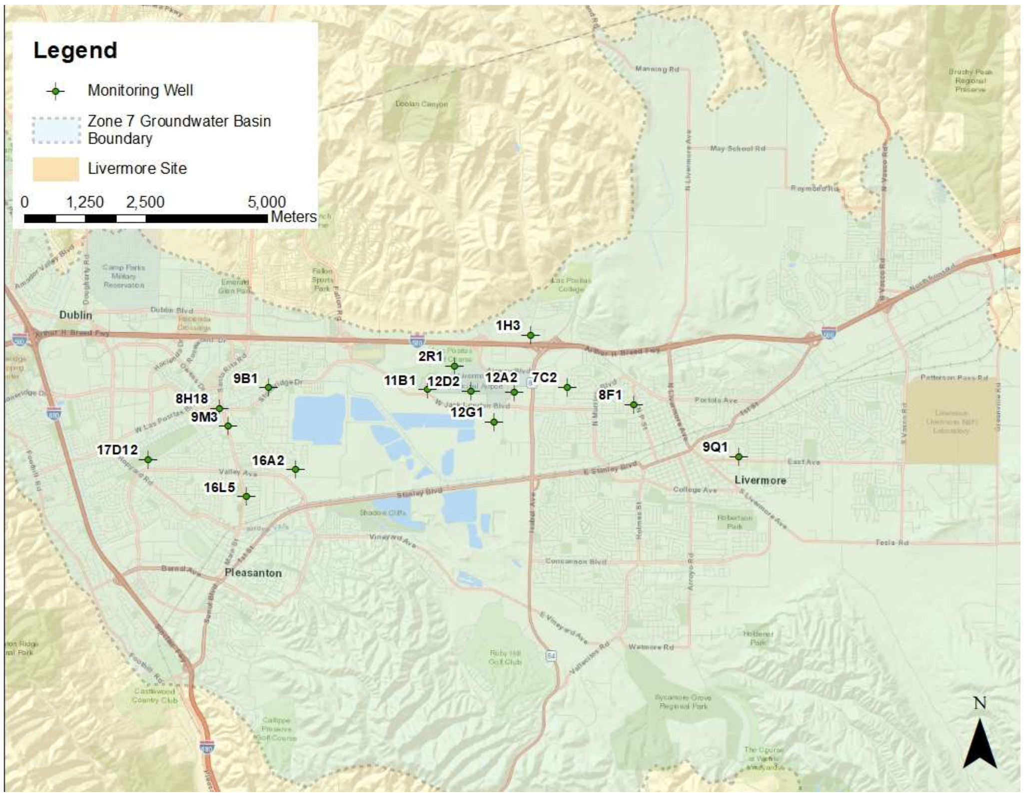

Figure 5-4. Off-site tritium monitoring wells in the Livermore Valley, 2021.

5.4.1.2 Livermore Site Perimeter

LLNL's groundwater surveillance monitoring program was designed to complement the Livermore Site GWP (see **Chapter 7**). The intent of the program is to monitor for potential groundwater contamination from LLNL operations. The perimeter portion of the surveillance groundwater monitoring network consists of three upgradient (background) monitoring wells (wells W-008, W-221, and W-017) near the eastern boundary of the site and seven downgradient monitoring wells located near the western boundary (wells 14B1, W-121, W-151, W-1012, W-571, W-556, and W-373) (see **Figure 5-5**). As discussed in **Chapter 7**, the alluvial sediments have been divided into nine hydrostratigraphic units (HSUs), which are water bearing zones that exhibit similar hydraulic and geochemical properties. The nine HSUs dip gently westward. Screened intervals (depth range from which groundwater is drawn) for these monitoring wells range from the shallow HSU-1B to the deeper HSU-5. Two of the background wells, W-008 and W-221, are screened partially in HSU-3A; well W-017 is considered a background well for the deeper HSU-5. To detect contaminants as quickly as possible, the seven western downgradient wells (except well 14B1, screened over a depth range that includes HSU-2, HSU-3A, and HSU-3B) were screened in shallower HSU-1B and HSU-2, the uppermost water-bearing HSUs at the western perimeter. These perimeter wells were sampled and analyzed at least once during 2021 for general minerals (including nitrate) and for certain radioactive constituents (gross alpha, gross beta, and tritium). Analytical results for the Livermore Site perimeter wells are provided in **Appendix A**, **Section A.5**. Although there have been variations in these concentrations since regular surveillance monitoring began in 1996, the concentrations detected in the 2021 groundwater samples from the upgradient wells represent current background values.

Historically, hexavalent chromium has been detected above the MCL (50 µg/L) in groundwater samples from western perimeter well W-373. However, concentrations of this analyte started dropping below the MCL in 2002. Except for 2006, hexavalent chromium levels at well W-373 have been below the MCL from 2002–2021. The 2021 sample from this location had a concentration of 27 µg/L, which is consistent with the range of hexavalent chromium concentrations (5 µg/L to 52 µg/L) detected at well W-373 since 2002. Groundwater samples collected in 2021 from the nearby wells W-556 and W-1012, also along the western perimeter of the Livermore Site, showed hexavalent chromium concentrations of 20 µg/L and 8 µg/L, respectively.

From 1996 through 2004, concentrations of nitrate detected in groundwater samples from downgradient well W-1012 were greater than the MCL of 45 mg/L. The nitrate concentration detected in the 2021 sample from this well (21 mg/L) was again, as in the past 17 years, below the MCL. During 2021, the concentration of nitrate in the on-site shallow background well W-221 was 42 mg/L, which is down from levels in 2018 and 2019. Detected concentrations of nitrate in western perimeter wells ranged from 16 mg/L (in well W-373) to 46 mg/L (in well W-151), a range consistent with results reported in previous years.

During 2021, gross alpha, gross beta, and tritium results for the Livermore Site's perimeter wells were consistent with the results from past years. The concentrations continue to remain below drinking water MCLs.

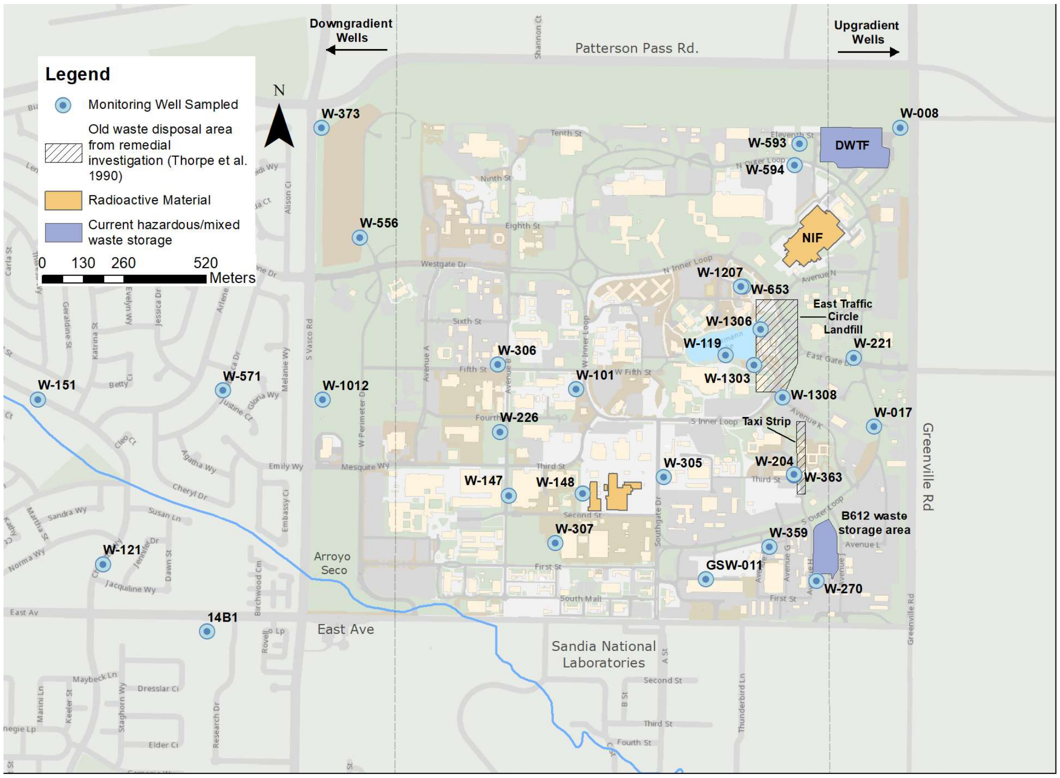

Figure 5-5. Routine surveillance groundwater monitoring wells at the Livermore Site, 2021.

5.4.1.3 Livermore Site

Groundwater sampling locations within the Livermore Site include areas where releases to the ground may have occurred in the recent past, where previously detected COCs have low concentrations that do not require CERCLA remedial action, and where baseline information needs to be gathered for the area near a new facility or operation. Wells selected for monitoring are screened in the uppermost aquifers and are downgradient from and as near as possible to the potential release locations. Well locations are shown in **Figure 5-5**. All analytical results are provided in **Appendix A**, **Section A.5**.

The Taxi Strip and East Traffic Circle Landfill areas (see **Figure 5-5**) are two potential sources of historical groundwater contamination. Samples from monitoring wells screened in HSU-2 (W-204) and HSU-3A (W-363) downgradient from the Taxi Strip area are analyzed for copper, lead, zinc, and tritium. Samples from monitoring wells screened at least partially in HSU-2 (W-119, W-1207, W-1303, W-1306, and W-1308) within and downgradient from the East Traffic Circle Landfill are analyzed for the same elements as the Taxi Strip area wells. All wells were sampled in 2021. Tritium concentrations remained well below the drinking water MCLs at all seven locations that were sampled. In 2019 and 2020, zinc was the only metal detected at these wells. No metals were detected at these monitoring wells in 2021.

Near the National Ignition Facility (NIF), LLNL measures pH, conductivity, and tritium concentration of nearby groundwater to establish a baseline. Downgradient of NIF, groundwater samples are collected from wells W-653 and W-1207 (screened in HSU-3A and HSU-2, respectively). Downgradient from the Decontamination and Waste Treatment Facility (DWTF), wells W-593 and W-594 (screened in HSU-3A and HSU-2, respectively) are sampled and analyzed annually for tritium. Tritium monitoring results from the wells near NIF and DWTF were well below the drinking water MCL.

The former storage area around Building 514 and the hazardous waste/mixed waste storage facilities around Building 612 are also potential sources of contamination. The area and facilities are monitored by wells W-270 and W-359 (both screened in HSU-5), and well GSW-011 (screened in HSU-3A). These wells were sampled and analyzed for gross alpha, gross beta, and tritium. No significant contamination was detected in the groundwater samples collected downgradient from these areas in 2021.

Groundwater samples are obtained annually from monitoring well W-307 (screened in HSU-1B), downgradient from Building 322. Soil samples previously obtained from this area showed concentrations elevated above the Livermore Site's background levels for total chromium, copper, lead, nickel, zinc, and occasionally other metals. LLNL removed contaminated soils near Building 322 in 1999 and replaced them with clean fill. The area was then paved over, making it less likely that metals would migrate from the site. In 2021, concentration of metals at well W-307 were within typical concentrations reported in recent years. The concentration of hexavalent chromium at well W-307 increased from 2020 (13 µg/L) to 2021 (17 µg/L). The concentration of manganese, which had shown some fluctuations in 2012 and 2013, remained below the analytical reporting limit in 2021. LLNL will continue to track these results as additional data become available.

Groundwater samples were obtained downgradient from a location where sediments containing metals (including cadmium, chromium, copper, lead, mercury, and zinc) had accumulated in a storm water catch basin near Building 253. Wells W-226 and W-306 (screened in HSU-1B and HSU-2, respectively) are sampled annually for metals. In 2021, the chromium concentration at well W-226 (14 µg/L) was again above the analytical reporting limit. The concentration of chromium at well W-306 was below the analytical reporting limit of 1 µg/L for the first time since sampling began in 1997. Additionally, well W-226 contained hexavalent chromium above the analytical reporting limit. However, the concentration remained low and was consistent with past monitoring results.

Additional surveillance groundwater sampling locations, established in 1999, are in areas surrounding the Plutonium Facility and Tritium Facility. Potential contaminants include plutonium and tritium from these facilities, respectively. Plutonium is much more likely to bind to the soil than migrate into the groundwater. Tritium, as HTO, can migrate into groundwater if spilled in sufficient quantities. Upgradient of these facilities, well W-305 is screened in HSU-2. Downgradient wells W-101, W-147, and W-148 are screened in HSU-1B. As in 2012 through 2020, well W-101 was dry and could not be sampled in 2021. In August 2000, elevated tritium was detected in the groundwater sampled at well W-148 (115 ± 5.0 Bq/L [3,100 ± 135 pCi/L]). The activity was most likely related to local infiltration of storm water containing elevated tritium. Tritium concentrations in groundwater in this area had remained at or near the same level through 2005, but samples collected from well W-148 in 2006 through 2021 have shown significantly lower values—a downward trend ranging from approximately one-fifth to one-half of the August 2000 value due to the natural decay and dispersion of tritium. Well W-147 tritium results for 2021 were also consistent with past years. LLNL continues to collect groundwater samples from these wells periodically for surveillance purposes, primarily to demonstrate that tritium concentrations remain below MCLs.

5.4.2 Site 300 and Environs

For surveillance and compliance groundwater monitoring at Site 300, LLNL uses CERCLA wells and springs on-site and private wells and springs off-site. Representative groundwater samples are obtained at least once per year at every monitoring location; they are routinely measured for various inorganic constituents (primarily metals), a wide range of organic compounds, general radioactivity (gross alpha and gross beta), uranium, and tritium. Groundwater from the shallowest water-bearing zone is the target of most of the monitoring because it would be the first to show contamination from LLNL operations at Site 300.

Brief descriptions of the Site 300 groundwater monitoring networks that are reported in this chapter are given below. (All analytical data from 2021 are included in **Appendix A**, **Section A.6**.)

5.4.2.1 Elk Ravine Drainage Area

The Elk Ravine drainage area, a tributary to the Corral Hollow Creek drainage system, includes most of northern Site 300 (see **Figure 5-6**). Storm water runoff in the Elk Ravine drainage area collects in arroyos and generally quickly infiltrates into the ground. Groundwater from wells in the Elk Ravine drainage area is monitored for COCs to determine the impact of current LLNL operations on the water-bearing zones in the area. Elk Ravine and the immediate area contain eight closed landfills, Pits 1 through 5 and 7 through 9, and the firing tables where explosives tests were or are conducted. None of these closed landfills have a liner, which is consistent with the disposal practices when the landfills were constructed. The following descriptions of monitoring networks within Elk Ravine begin with the headwaters area and proceed downstream. (See **Chapter 7** for a review of groundwater monitoring in this drainage area conducted under CERCLA.)

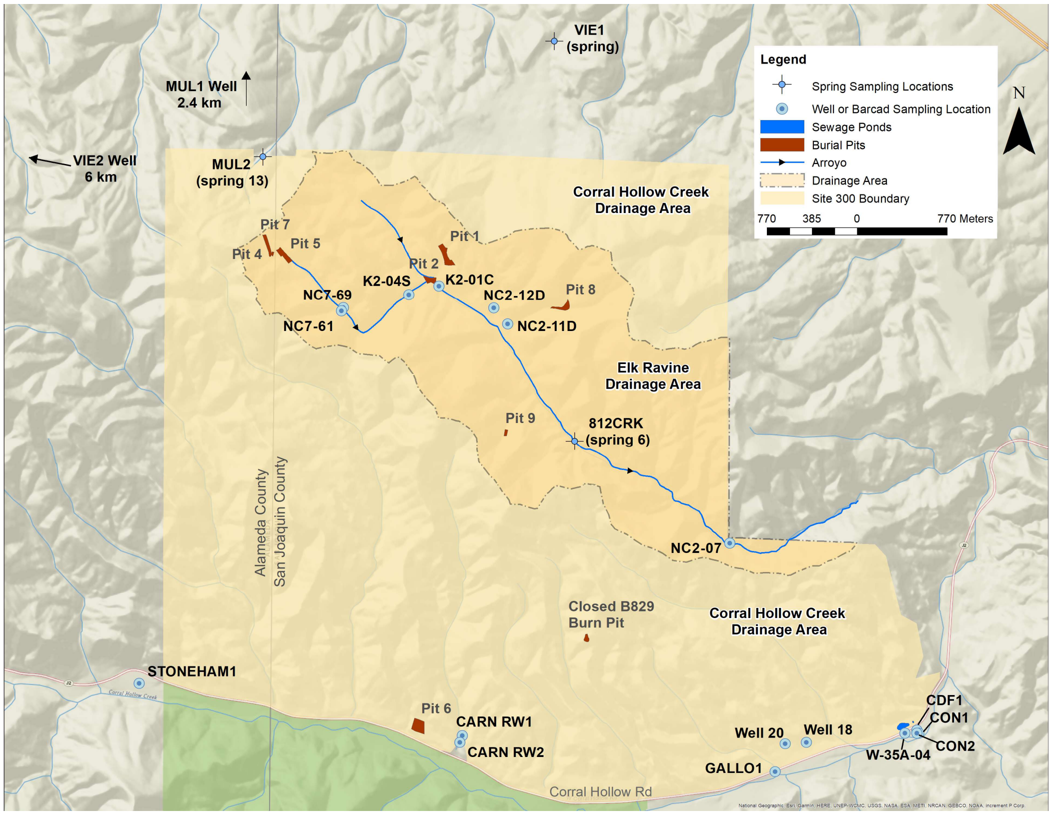

Figure 5-6. Surveillance groundwater wells and springs at Site 300, 2021.

Pit 7 Complex. The Pit 7 landfill was closed in 1992 in accordance with U.S. EPA and California Department of Health Services (now Department of Toxic Substances Control, or DTSC) approved RCRA Closure and Post-Closure Plans using the LLNL CERCLA Federal Facility Agreement (FFA) process. From 1993 until 2009, monitoring requirements were specified in WDR 93-100, administered by the CVRWQCB (1993, 1998), and in *LLNL Site 300 RCRA Closure and Post-Closure Plans—Landfill Pits 1 and 7* (Rogers/Pacific Corporation 1990). An Amendment to the Interim Record of Decision (ROD) for the Pit 7 Complex (Site 300 U.S. DOE, 2007) was signed in 2007 under CERCLA. The remedial actions specified in the Interim ROD, including a hydraulic drainage diversion system, extraction and treatment of groundwater, and Monitored Natural Attenuation for tritium in groundwater were implemented in 2008. In 2010, detection monitoring and reporting for the Pit 7 complex were transferred to CERCLA. Analytes and frequencies of sampling are documented in the CERCLA Compliance Monitoring Plan and Contingency Plan for Site 300 (Dibley et al. 2009). The objective of this monitoring continues to be the early detection of any new release of COCs from Pit 7 to groundwater.

For compliance purposes, during 2021 LLNL obtained annual or more frequent groundwater samples from the Pit 7 detection monitoring well network. Samples were analyzed for tritium, volatile organic compounds (VOCs), fluoride, high explosive compounds (HMX and RDX), nitrate, perchlorate, uranium (isotopes or total), metals, lithium, and polychlorinated biphenyls (PCBs). A detailed account of Pit 7 compliance monitoring conducted during 2020, including a summary of data analysis, well locations, maps of the distribution of COCs in groundwater, and analytical data tables is presented in the CERCLA 2021 Site 300 Annual Compliance Monitoring Report (CMR), that was submitted to the regulatory agencies by the LLNL Environmental Restoration Department (Buscheck et al., 2022).

Elk Ravine. Groundwater samples were obtained on various dates in 2021 from the widespread Elk Ravine surveillance monitoring network shown in **Figure 5-6** (NC2-07, NC2-11D, NC2-12D, NC7-61, NC7-69, 812CRK [SPRING6], K2-04S, K2-01C). Monitoring at well K2-04D ceased in 2014 due to a pump becoming stuck in the well, and the well was decommissioned in July 2020. Samples from NC2-07 were analyzed for inorganic constituents (mostly metals), general radioactivity (gross alpha and gross beta), tritium and uranium activity, and explosive compounds (HMX and RDX). Samples from 812CRK were analyzed for inorganic constituents (mostly metals), VOCs (EPA Method 624), general radioactivity (gross alpha and gross beta), and tritium and uranium activity. Wells NC7-61, K2-04S, K2-01C, NC2-12D, NC2-11D, and 812CRK were sampled for nitrate. Wells NC7-61, NC7-69, K2-01C, and NC2-07 were sampled for explosive compounds (HMX and RDX). All wells were sampled for general radioactivity (gross alpha and gross beta) and tritium and uranium activity.

No new release of COCs from LLNL operations in Elk Ravine to groundwater is indicated by the chemical and radioactivity data obtained during 2021. The major source of contaminated groundwater beneath Elk Ravine is from historical operations in the Building 850 firing table area (Webster-Scholten 1994; Taffet et al. 1996).

The 2021 tritium concentrations for well NC7-61 were 370 ± 73 Bq/L in May, and 400 ± 77 Bq/L in October. These concentrations were similar to the tritium measured in 2020 (400 ± 78 Bq/L). This tritium activity remains elevated with respect to the background concentration. Tritium, as HTO, has been released in the past in the vicinity of Building 850. Most of the Elk Ravine surveillance-network tritium measurements made during 2021 support earlier CERCLA studies showing that the tritium in the plume is diminishing over time because of natural decay and dispersion (Ziagos and Reber-Cox 1998). CERCLA modeling studies indicate that the tritium will decay to background levels before it can reach a site boundary.

Groundwater surveillance measurements of gross alpha, gross beta, and uranium activity in Elk Ravine are low and are indistinguishable from background levels. (Note that gross beta measurements do not detect the low-energy beta emission from tritium decay.) Additional detections of nonradioactive elements including arsenic, barium, chromium, selenium, and vanadium are all within the natural ranges of concentrations typical of groundwater elsewhere in the Altamont Hills.

Pit 1. The Pit 1 landfill was closed in 1993 in accordance with a DTSC approved RCRA Closure and Post-Closure Plan using the LLNL CERCLA FFA process. Monitoring requirements are specified in WDR 93-100 (CVRWQCB; 1993, 1998, and 2010) and in Rogers/Pacific Corporation (1990). In 2020, the CVRWQCB issued a letter rescinding the Pit 1 monitoring under WDR 93-100 and transferring the monitoring to CERCLA (CVRWQCB, 2020). The main objective of this detection monitoring is the early identification of any release of constituents from Pit 1 to groundwater. LLNL obtained groundwater samples quarterly during 2021 from the Pit 1 monitoring well network. Samples were analyzed for inorganic constituents (mostly metals), general radioactivity (gross alpha and gross beta), activity of certain radioisotopes (tritium, radium, uranium, and thorium), explosive compounds (HMX and RDX), and VOCs. Compliance monitoring showed no new releases of any constituents from Pit 1 in 2021; a detailed summary of Pit 1 detection monitoring conducted during 2021, including well locations, data analysis, and tables of analytical data, can be found in the 2021 annual CMR (Buscheck et al., 2022).

5.4.2.2 Corral Hollow Creek Drainage Area

Pit 6. Compliance monitoring requirements for the closed Pit 6 landfill in the Corral Hollow Creek drainage area are specified in Dibley et al. (2009) and MacQueen et al. (2013). Two Pit 6 groundwater monitoring programs, which operate under CERCLA, ensure compliance with all regulations. They are (1) the Detection Monitoring Plan (DMP), designed to detect any new release of COCs to groundwater from wastes buried in the Pit 6 landfill, and (2) the Corrective Action Monitoring Plan (CAMP), which monitors the movement and fate of historically released COCs. To comply with monitoring requirements, LLNL collected groundwater samples monthly, quarterly, semiannually, and annually during 2021 from specified Pit 6 monitoring wells. These samples were analyzed for VOCs, tritium, beryllium, mercury, total uranium, gross alpha/beta radioactivity, perchlorate, and nitrate.

During 2021, no new contaminant releases from Pit 6 were detected. A detailed account of Pit 6 compliance monitoring, including well locations, tables of groundwater analytical data, and maps showing the distribution of COCs, is summarized in the 2021 Site 300 Annual CMR (Buscheck et al., 2022).

Building 829 Closed High Explosives Burn Facility. Compliance monitoring requirements for the closed burn pits in the Corral Hollow Creek drainage area are specified in DTSC (2017). As planned for compliance purposes, LLNL obtained groundwater samples during 2021 from the three wells in the Building 829 monitoring network. Groundwater samples from these wells, screened in the deep regional aquifer, were analyzed for inorganic constituents (mostly metals), turbidity, explosive compounds (HMX, RDX, and TNT), VOCs (EPA Method 624.1), extractable organics (EPA Method 625), and general radioactivity (gross alpha and gross beta).

During 2021, the concentration for several metal constituents slightly exceeded their statistical limits (SLs). In the routine second quarter 2021 samples, barium exceeded its SL at wells W-829-22 and W-829-1938; manganese exceeded its SL at wells W-829-15 and W-829-22; and zinc exceeded its SL at well W-829-22. LLNL notified DTSC of these initial SL exceedances in emails dated July 21, 2021 and July 27, 2021. In accordance with CCR Section 66264.97(e)(8)(E), LLNL collected two discrete retest samples from each well and samples were analyzed using the same analytical method. All resample results were below their respective SLs and there were no validated SL exceedances.

In 2019, there was a confirmed manganese SL exceedance at well W-829-15. In 2020, manganese was not detected at well W-829-15 above the reporting limit. The 2021 manganese concentration at well W-829-15 initially exceeded the SL, but this result was invalidated after conducting two independent retests. The 2020 and 2021 monitoring results at well W-829-15 support LLNL's claim that the slight exceedance of manganese above the SL in 2019 was likely a result of desorption and dissolution of naturally occurring manganese-bearing minerals in the aquifer. Manganese had not previously been detected at well W-829-15 until 2019 and the manganese concentrations in 2020 and 2021 are consistent with sampling history.

In 2018 and 2019, there were confirmed manganese SL exceedances at well W-829-22. In 2020, manganese was not detected at W-829-22 above the RL. The 2021 manganese concentration at well W-829-22 initially exceeded the SL, but this result was invalidated after conducting two independent retests. As LLNL has concluded in the past, the 2018 and 2019 validated manganese detections at W-829-22 were likely the result of local background variability and not an actual manganese release from the B829 burn pit. LLNL will continue to monitor manganese concentrations annually.

In 2019, there was a confirmed barium SL exceedance at well W-829-1938. The 2020 and 2021 barium results at well W-829-1938 were lower than the SL. These results support LLNL's conclusion that the past exceedance did not indicate an actual barium release from the B829 burn pit and that barium concentrations are within the range of local background variability. LLNL will continue to monitor barium annually.

In 2020, LLNL missed a chromium SL exceedance at W-829-22. The routine second quarter 2020 chromium result was 1.7 µg/L, which slightly exceeded the SL of 1.5 µg/L. LLNL records indicate that chromium has only been detected four times at W-829-22 since monitoring began in 1999. The only other chromium SL exceedance at W-829-22 occurred in 2003 (2.0 µg/L). In 2021, chromium at well W-829-22 was <1 µg/L, which supports LLNL's prior claim that the 2020 chromium SL exceedance was likely the result of local background variability and not an actual chromium release from the B829 burn pit.

There were no organic or explosive COCs detected above reporting limits in any samples. All results for the radioactive COCs (gross alpha and gross beta) were below their SL values. For a detailed account of compliance monitoring of the closed burn pit during 2021, including well locations and tables and graphs of groundwater COC analytical data, see Will (2022).

Water Supply Well. Well 20 is a drinking water supply well located in the southeastern part of Site 300 (**Figure 5-6**). It is a deep, high production well screened in the Neroly lower sandstone aquifer ($Tnbs_1$) and can produce up to 1,500 L/min (396 gal/min) of potable water. For surveillance purposes, prior to 2019, LLNL obtained groundwater samples quarterly from Well 20 and analyzed samples for inorganic COCs (mostly metals), VOCs, general radioactivity (gross alpha and gross beta), and tritium. In 2019, LLNL determined that surveillance monitoring for Well 20 was no longer necessary because the well is sampled and analyzed for COCs under the monitoring program defined in Domestic Water Supply Permit Amendment No. 01-10-16PA-

003. In March 2020, Site 300's primary water supply changed from Well 20 to Hetch Hetchy surface water purchased from the San Francisco Public Utilities Commission (SFPUC). LLNL still uses Well 20 water when Hetch Hetchy water is unavailable. Results for 2021 surveillance measurements of groundwater from Well 20 do not differ significantly from previous years. As in past years, Well 20 showed no evidence of contamination. In 2021, Well 20 was sampled for nitrate, HMX, and RDX, and all results were non-detect.

5.4.2.3 Off-site Surveillance Wells and Springs

For surveillance purposes, LLNL obtains groundwater samples from three off-site springs (MUL1, MUL2, and VIE1) and nine off-site wells (VIE2, CARNRW1, CARNRW2, CDF1, CON1, CON2, GALLO1, STONEHAM1, and W-35A-04) **(Figure 5-6)**. In 2021, MUL1, MUL2, VIE1, and VIE2 were not sampled due to limited personnel availability during the COVID-19 pandemic. All other off-site surveillance wells were sampled in 2021. All off-site monitoring locations are near Site 300, except for VIE2 which is located at a private residence 6 km west of the site. VIE2 represents a typical potable water supply well in the Altamont Hills.

Samples from CARNRW2 and GALLO1 are typically analyzed at least quarterly for inorganic constituents (metals, nitrate, and perchlorate), general radioactivity (gross alpha and gross beta), and tritium. CARNRW2 is also analyzed for explosive compounds (HMX and RDX) and uranium. CARNRW1 samples are analyzed monthly for VOCs (EPA Method 624), perchlorate, and tritium.

Groundwater samples were obtained at least annually during 2021 from the following off-site surveillance monitoring locations: STONEHAM1, CON1, W-35A-04, and CDF1 (south of Site 300). Samples were analyzed for inorganic constituents, general radioactivity (gross alpha and gross beta), tritium and uranium, and explosive compounds (HMX and RDX).

Generally, no constituents attributable to LLNL operations at Site 300 were detected in the off-site groundwater samples. However, in 2021 perchlorate was detected at STONEHAM1 for the first time since monitoring began in 2001. LLNL will continue to track perchlorate concentrations and monitor trends at STONEHAM1. Radioactivity measurements in samples collected from off-site groundwater wells are generally indistinguishable from naturally occurring activities.

5.5 Other Monitoring Programs

5.5.1 Rainwater

Air moisture containing HTO is rapidly entrained and washed out locally during rain events. Rain gauge sampling is not required by DOE Order 458.1, or any other federal, state, or local regulation or permit; however, LLNL collects rainwater in rain gauges at fixed locations at both the Livermore Site and Site 300 to supplement information for storm events sampled for runoff. The collected rainwater is analyzed for tritium activity by EPA Method 906.0, a liquid scintillation counting method, and the analytical results are compared to the EPA drinking water MCL of 740 Bq/L (20,000 pCi/L) for tritium.

In calendar year 2021, the rain gauges were placed at the sample locations SALV, MET, DWTF, and SECO at the Livermore Site as shown in **Figure 5-7**. Site 300 rain gauges were located at ECP, PSTL, and GOLF as shown **Figure 5-8**. The samples for calendar year 2021 were collected at both sites after the December 14 qualifying storm. All sample locations at both the Livermore Site and Site 300 were non-detections for tritium with analytical error applied. All analytical results are provided in **Appendix A, Section A.7.**

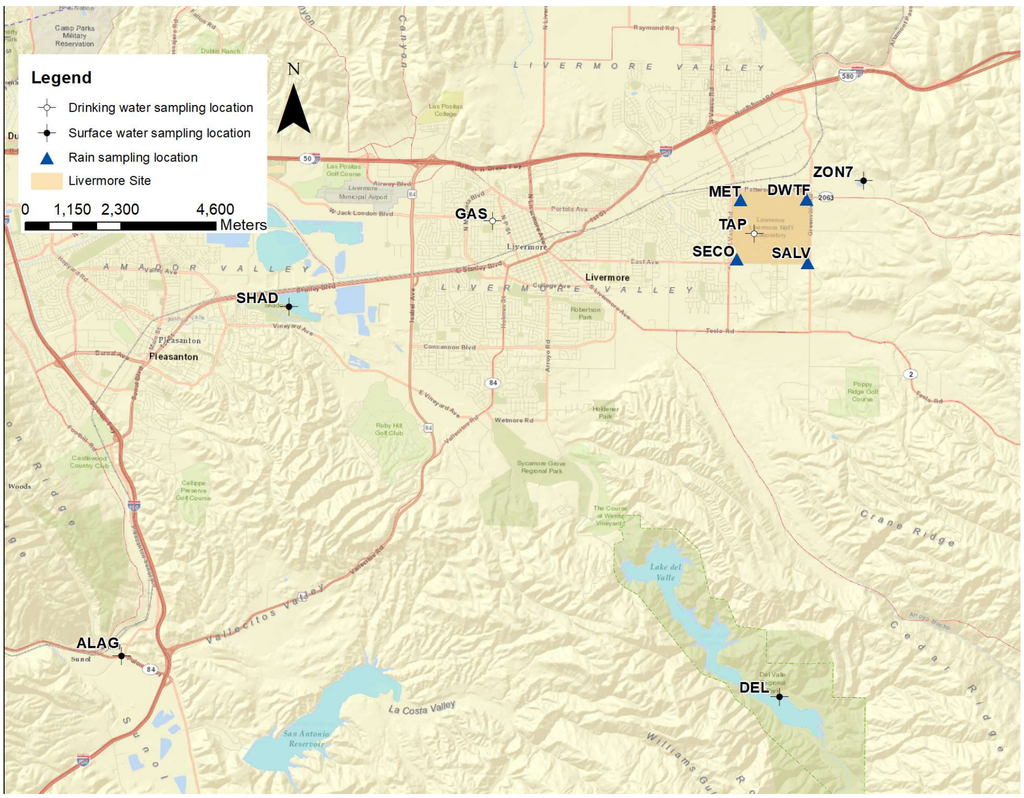

Figure 5-7. Livermore Site and Livermore Valley sampling locations for rain, surface water, and drinking water, 2021.

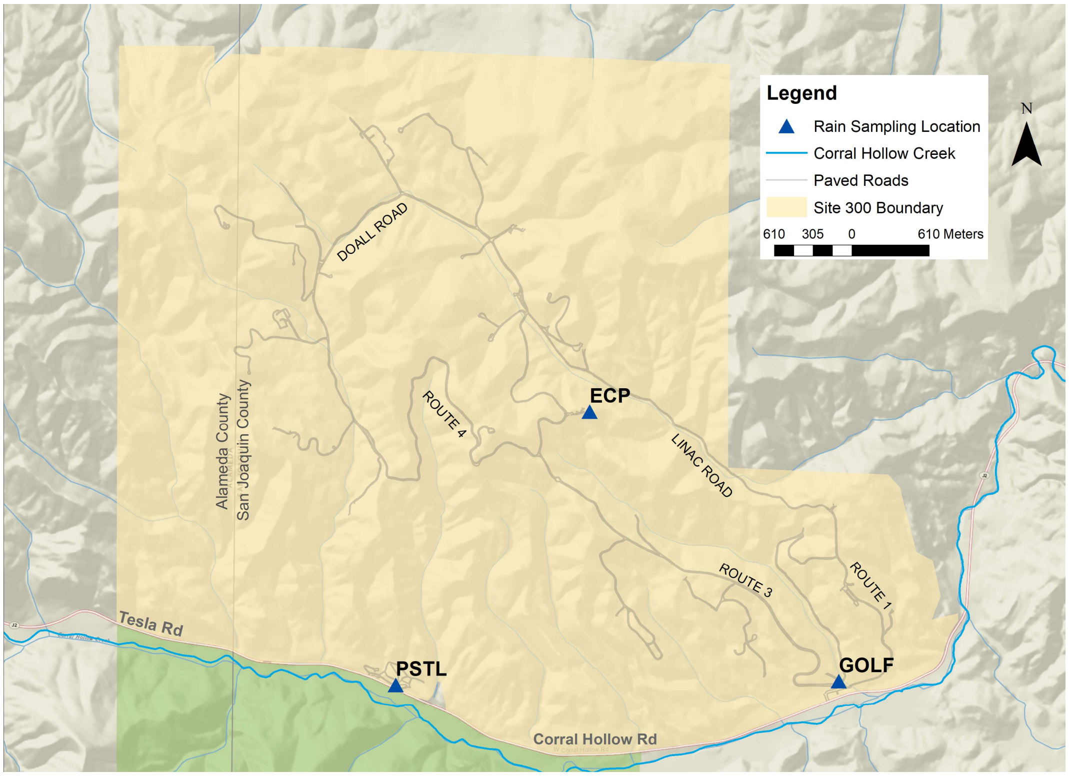

Figure 5-8. Rainwater sampling locations at Site 300, 2021.

5.5.2 Livermore Valley Surface Waters

LLNL conducts additional surface water surveillance monitoring in support of DOE Order 458.1. Surface and drinking water near the Livermore Site and in the Livermore Valley were sampled at the locations shown in **Figure 5-7** in 2021. Off-site sampling locations DEL, ALAG, SHAD, and ZON7 are surface water bodies; of these, DEL and ZON7 are also drinking water sources. The Springtown Pond (DUCK) is an artificial duck pond that was removed by the City of Livermore in 2018 and therefore the location was removed from the surface water sampling plan. GAS and TAP are drinking water outlets; radioactivity data from these two sources are used to calculate drinking water statistics (see **Table 5-4**).

Samples are analyzed according to standardized procedures summarized in Brunckhorst (2019). In 2021, LLNL sampled GAS and TAP semiannually, and ALAG, DEL, SHAD, and ZON7 annually. All locations were sampled for tritium, gross alpha, and gross beta. All analytical results are provided in **Appendix A**, **Section A.7.**

The median tritium concentration in all water location samples was estimated to be below the analytical laboratory's minimum detectable activities, or minimum quantifiable activities. The maximum tritium concentration detected in any sample collected in 2021 was 2.76 Bq/L (74.6 pCi/L), which is less than 1% of the drinking water MCL. Gross alpha results were all less than the drinking water MCL. Historically, concentrations of gross alpha and gross beta radiation in drinking water sources have fluctuated around the Laboratory's minimum detectable activities. At these very low levels, the counting error associated with the measurements is nearly equal to, or in many cases greater than, the calculated values so that no trends are apparent in the data. The maximum activities detected for gross alpha and gross beta occurred in samples collected at GAS (gross alpha at 0.0888 Bq/L [2.40pCi/L]) and ALAG (gross beta at 0.3320 Bq/L [8.97 pCi/L]). These maximum values were less than 16% and 18% of their respective gross alpha and gross beta drinking water MCLs (see **Table 5-4**).

Table 5-4. Radioactivity in surface and drinking waters in the Livermore Valley, 2021.

Location	Metric	Tritium (Bq/L)[(a)]	Gross alpha (Bq/L)[(a)]	Gross beta (Bq/L)[(a)]
All locations	Median	0.26	0.0422	0.1185
	Minimum	-0.64	-0.0050	0.0091
	Maximum	2.76	0.0888	0.3320
	Interquartile range	1.37	0.0283	0.1311
Drinking water outlet locations	Median	0.02	0.0314	0.0370
	Minimum	-0.52	-0.0050	0.0091
	Maximum	2.34	0.0888	0.2790
	Drinking water MCL	740	0.555	1.85

(a) A negative number means the sample radioactivity was less than the background radioactivity

5.5.3 Site 300 Drinking Water System Discharges

In 2021, LLNL maintained coverage under General Order R5-2016-0076-025, NPDES Permit No. CAG995002 for occasional large volume discharges from the Site 300 drinking water system that may reach surface water drainage courses. The monitoring and reporting program that LLNL developed for these discharges was approved by the CVRWQCB. Discharges with the potential to reach surface waters that are subject to these sampling and monitoring requirements are:

- Drinking water storage tank discharges
- System-flush and line-dewatering discharges
- Dead-end flush discharges

Complete monitoring results from 2021 are detailed in the quarterly self-monitoring reports to the CVRWQCB. All 2021 releases from the Site 300 drinking water system percolated into the drainage ditches or dry streambeds and did not reach Corral Hollow Creek, the potential receiving water.