State-Licensed Disposal Area at West Valley: 2018 Annual Report

Final Report - March 2019

NYSERDA's Promise to New Yorkers:

NYSERDA provides resources, expertise, and objective information so New Yorkers can make confident, informed energy decisions.

Mission Statement:

Advance innovative energy solutions in ways that improve New York's economy and environment.

Vision Statement:

Serve as a catalyst – advancing energy innovation, technology, and investment; transforming New York's economy; and empowering people to choose clean and efficient energy as part of their everyday lives.

State-Licensed Disposal Area at West Valley:

2018 Final Report

Prepared by:

New York State Energy Research and Development Authority

West Valley, NY

March 2019

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Acronyms and Abbreviations

AMSL	Above Mean Sea Level
BGS	Below Ground Surface
BOD	Biological Oxygen Demand
COD	Chemical Oxygen Demand
Consent Order	Administrative Order on Consent
DEC	New York State Department of Environmental Conservation
EPA	United States Environmental Protection Agency
ft	Feet
GMP	Groundwater Monitoring Plan for the State-Licensed Disposal Area (SDA) at West Valley
LiDAR	Light Detection and Ranging
LMP	Leachate Monitoring Plan for the State-Licensed Disposal Area (SDA) at West Valley
MDC	Minimum Detectable Concentration
mg/L	Milligrams per Liter
mR/Qtr	Milliroentgens per Quarter
NAD	North American Datum
NAVD	North American Vertical Datum
NGVD	National Geodetic Vertical Datum
NDA	Nuclear Regulatory Commission-Licensed Disposal Area
NTU	Nephelometric Turbidity Unit
NYCRR	New York State Codes, Rules, and Regulations
NYSERDA	New York State Energy Research and Development Authority
pCi/L	Picocurie per liter
RCRA	Resource Conservation and Recovery Act
SDA	State-Licensed Radioactive Waste Disposal Area
SPDES	State Pollution Discharge Elimination System
TLD	Thermoluminescent Dosimeter
TSS	Total Suspended Solids
µmhos/cm	Micromhos per Centimeter
µrem/hr	Microrem per Hour
UPL	Upper Predictive Limits
UTL	Upper Tolerance Limits
VOC	Volatile Organic Compound
WP-91	Well Point 91
WNYNSC	Western New York Nuclear Service Center
WVDP	West Valley Demonstration Project
WVSMP	West Valley Site Management Program
XR-5	Ethylene Interpolymer Alloy Geomembrane

S-1 Executive Summary

2018 PERFORMANCE

The New York State Energy Research and Development Authority (NYSERDA) maintains and monitors the State-Licensed Radioactive Waste Disposal Area (SDA) to protect public health, safety, and the environment. This report summarizes the results of environmental monitoring, erosion monitoring, facility operations and maintenance, and waste management activities conducted during calendar year 2018 at the SDA, which is located at the Western New York Nuclear Service Center (WNYNSC).

In 2018, NYSERDA safely, successfully, and in full compliance with our permits and licenses, completed several field activities, including:

- Routine sampling was completed at 85 locations with 450 separate analyses.
- Leachate and groundwater levels were monitored with 546 separate elevation measurements.
- The trench cap and north slope elevations were measured at 141 survey points.
- Gamma radiation measurements were completed at 204 locations.
- Forty-two inspections were performed at the SDA including SDA buildings, waste, geomembrane cover, erosion monitoring, and workplace safety.
- Field work related to the 2017's geomembrane cover installation over Trenches 1-12 was completed, including replacement of the stormwater basin outlet piping and reshaping of the south detention basin.
- Obsolete equipment from the Trench 14 sump was removed to allow for leachate sampling at this location.
- The Trench 14 sump was reconfigured for accessibility and consistency with the other monitored trench sump locations.
- Leachate sampling activities for Trench 14, Borehole 14, and Piezometers 22 and 23 were completed. This provides NYSERDA with leachate sampling data for all current trench and surrounding locations.
- Eleven new piezometers north of Trench 14 were installed to obtain additional information concerning the source of groundwater infiltration into the trench.

The 2018 environmental monitoring data (from groundwater, surface water, stormwater, and gamma radiation measurements) indicate radioactive and/or chemical constituents in the SDA trenches are being effectively contained. In addition, inspections indicate that the SDA trench caps remain stable; in areas where ponding of water on the geomembrane cover has been observed, additional monitoring is being performed.

The subsurface barrier wall along the western side of the southern trenches and the geomembrane cover are effective at keeping water out of the SDA trenches, although the slight increase in the Trench 14 leachate continues to be evaluated. NYSERDA's monitoring data and the ongoing evaluations show that the current leachate levels in these trenches are not a public health and safety concern.

The erosion control measures are keeping the slopes surrounding the SDA stable, and the West Valley Site Management Program (WVSMP) operations and maintenance actions continue to keep the SDA systems functioning properly, and the grounds in good condition.

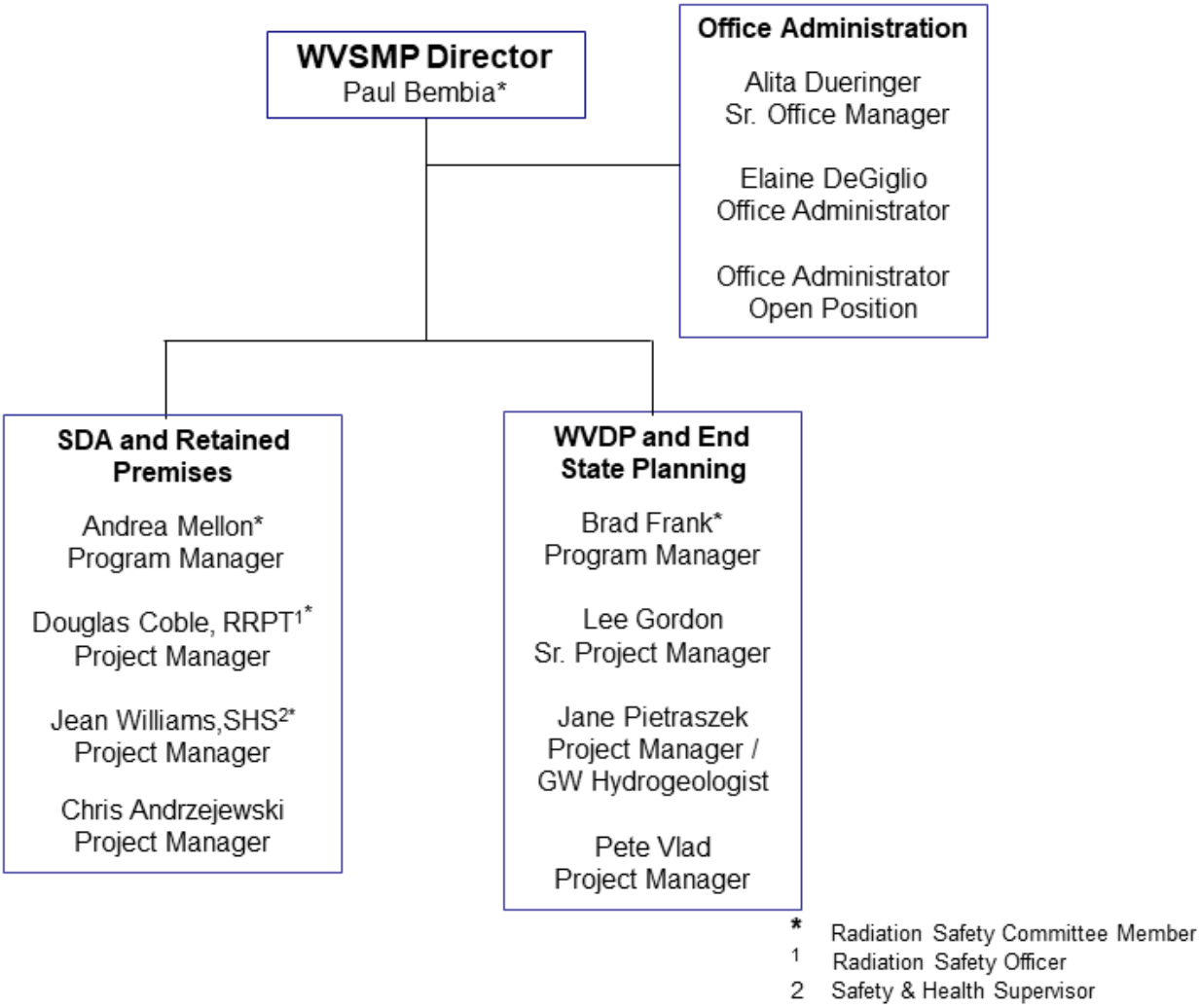
This report is prepared in accordance with the New York State Department of Environmental Conservation (DEC) radiation control regulations and the SDA radiation control program. Annual reporting requirements are specified in:

- Title 6 of the Official Compilation of Codes, Rules, and Regulations of the State of New York (6 NYCRR) Part 380, Rules and Regulations for the Prevention and Control of Environmental Pollution by Radioactive Materials, February 2, 2002
- NYSDEC RCP #137-6, Permit No. 9-0422-00011/00011, March 13, 2015

Part 380 Permit inspections were conducted on August 1, 2018, and on November 7, 2018. The inspections included records review, visual walkover inspection of the facility and surrounding slopes and streams, and surface water and soil sample collection. The inspector noted that NYSERDA operations at the SDA were in compliance with the Part 380 regulations and the conditions of the permit.

S.2 West Valley Site Management Program

NYSERDA's WVSMP is responsible for the monitoring and maintenance, and the protection of public health, safety, and the environment at the WNYNSC. The WVSMP is comprised of 11 professionals with diverse talents and expertise. The mission of the WVSMP is to be responsible stewards of the WNYNSC, including the SDA, by using objective analysis, and soliciting multiple perspectives to identify, assess, and implement effective, enduring approaches to protect the environment, and the well-being of our workers and neighbors.



1 SDA Description

The SDA occupies approximately 15 acres of the WNYNSC (Figure 1-1) immediately adjacent to the West Valley Demonstration Project (WVDP). The SDA consists of three filled lagoons and two sets of parallel trenches that contain radioactive waste: 1 through 7 in the northern area and 8 through 14 in the southern area (see Figure 1-2). The SDA is surrounded by an eight-foot-high, chain-link fence. NYSERDA controls access to the SDA by limiting the issuance of keys to the five, locked SDA gates. In addition, a contracted security service conducts routine patrols of the SDA's perimeter.

Between 1963 and 1975, Nuclear Fuel Services, Inc. (the SDA operator at that time), placed approximately 2.4 million cubic feet (ft) of radioactive waste in trenches constructed in the native silty-clay soil. These trenches are 450 to 650 ft in length and are approximately 20 ft deep. Trench cross-sections are trapezoidal in shape, with a top width of 35 ft and a bottom-floor width of 20 ft. During construction, the trench floors were sloped along their length to allow water to drain to a low point where a trench sump was located. A vertical pipe, which extends from above the trench cap to each sump, provides a way to routinely monitor trench water elevations. The sump pipe also serves as a conduit through which water can be sampled or removed from the trenches. Each trench is covered with an eight- to 10-ft-thick mounded cap of compacted clay, and a drainage swale is located between adjacent trenches to direct precipitation away from the trenches.

Differing in both physical form and construction from other trenches, Trenches 6 and 7 were built to hold high-activity wastes that required immediate shielding. Trench 6 is a series of individual holes in which waste was placed, while Trench 7 is a narrow, shallow trench where waste containers were placed and encased in concrete. A sump was not installed in either of these two trenches.

Efforts to minimize erosion of the clay caps and infiltration of water into the trenches began in the late 1970s and early 1980s. These efforts included rolling and reseeding the trench caps as well as several larger-scale regrading, recapping, and water infiltration controls projects. Rising water elevations in Trenches 13 and 14 led NYSERDA to investigate additional water management measures; and, in 1990, NYSERDA began implementing several projects aimed at reducing water accumulation in the SDA trenches.

Figure 1-1. Map of the Western New York Nuclear Service Center

Source: NYSERDA

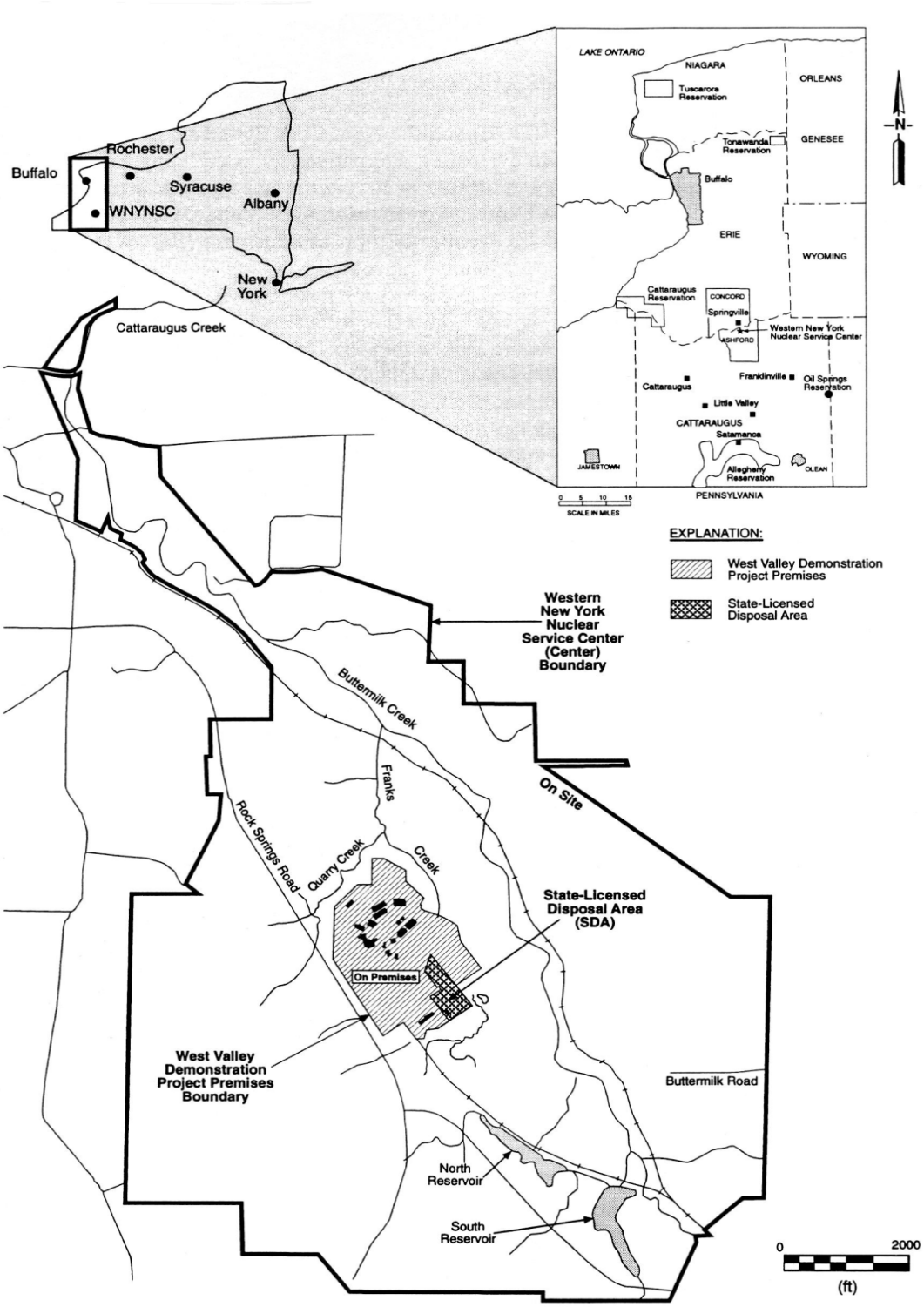


Figure 1-2. Aerial Photograph of the SDA

Source: NYSERDA

1.1 Leachate Management

Between 1990 and 1991, NYSERDA installed three tanks in two adjoining buildings at the SDA. In 1991, 8,000 gallons of leachate were pumped from Trench 14 into a 9,200-gallon fiberglass tank, located in the smaller of the two buildings. In 2009, the 8,000 gallons of leachate were removed from the fiberglass tank, placed in U.S. Department of Transportation-approved shipping containers, and shipped to a licensed and permitted treatment and disposal facility. The empty tank was removed in 2010 and shipped to a licensed facility for off-site disposal.

On December 29, 2011, NYSERDA received certification of clean closure from DEC when the portion of the Leachate Treatment Facility (SDA Solid Waste Management Unit No. 5) that stored mixed waste (i.e., leachate and Tank T-1) was removed, shipped, and treated, and the facility was sampled for confirmation that it was free of hazardous waste. Subsequently, on April 24, 2012, DEC approved NYSERDA's Protective Filer Certification for the unused portion of the Leachate Treatment Facility (two Frac tanks). NYSERDA has no further closure actions to complete with the combined clean-closure certification and approval of protective filing status, and is currently awaiting an amendment of the operational status of this unit to "no further action."

1.2 Trench Water Infiltration Controls

NYSERDA has completed five projects as interim measures under the Resource Conservation and Recovery act (RCRA) 3008(h) Administrative Order on Consent (Docket No. II RCRA-3008(h) 92-0202) (Consent Order). The Consent Order authorized the U. S. Environmental Protection Agency (EPA) and DEC to issue orders requiring corrective action or such other responses as necessary to protect human health or the environment. Specific interim measures include:

- In September 1992, NYSERDA installed a soil-bentonite subsurface barrier wall along the western side of Trench 14 to prevent groundwater flow toward the south trenches (eight through 14). In June 1993, the project was completed with the installation of a very low-density polyethylene geomembrane cover over the surface of the trenches, extending from the centerline of Trench 12; across Trenches 13, 14, and the barrier wall; and terminating in a stormwater drainage swale excavated just beyond the barrier wall. Slit-trench monitoring wells were also installed on either side of the barrier wall to monitor for possible groundwater mounding upgradient of the wall.
- In 1995, NYSERDA expanded the use of the geomembrane covers at the SDA with the installation of a reinforced, ethylene interpolymer alloy geomembrane (XR-5) cover over Trenches 1 through 8, and 10 through 12. As part of this project, NYSERDA installed a stormwater management system consisting of five, geomembrane-lined stormwater basins to

detain and release precipitation without increasing peak runoff from preproject conditions. In 1999, NYSERDA installed an XR-5 geomembrane cover on Trench 9, replacing the bioengineering management cover installed as a pilot project in 1993.

- In 2010, NYSERDA installed a new XR-5 geomembrane cover over the 1992 very low-density polyethylene geomembrane cover to ensure that water infiltration controls remained effective.
- In the summer and fall of 2017, NYSERDA installed an XR-5 geomembrane cover on Trenches 1 through 12, placing the new geomembrane over the existing covers, and included reconfiguration and elimination of one stormwater detention area (W03), reconfiguration of the hardstand barrier area, regrading of select areas, removal of obsolete pipe penetrations, and installation of weighted ballasts to limit potential damage from wind.

1.3 Corrective Measures Study

In addition to radionuclides, the SDA trenches are known to contain materials that are classified as hazardous constituents under RCRA. Because there is a possibility that these materials could be released from the trenches, NYSERDA is required to prepare a corrective measures study under the requirements of the Consent Order. On October 6, 2010, NYSERDA submitted the *Final Focused Corrective Measures Study for the State-Licensed Disposal Area at the Western New York Nuclear Service Center West Valley, New York.*[1] NYSERDA is required to submit a Final Corrective Measures Study at the time a decision is made on the ultimate disposition of the SDA.

1.4 Hazardous Waste Management Permit Application

In 2010, DEC requested that NYSERDA move from an interim status permit to a final status permit. In response, on January 6, 2011, NYSERDA submitted a draft 6 NYCRR Part 373 Hazardous Waste Management Permit Application (i.e., Corrective Action Permit Application). On February 10, 2011, DEC requested that the timeframe for review and processing of NYSERDA's Hazardous Waste Management Permit be suspended per 6 NYCRR Part 621 of the Uniform Procedures Act. NYSERDA agreed to suspend the timeframes for this application on February 23, 2011. NYSERDA met with DEC on July 18, 2012, to discuss a regulatory path forward, and on October 23, 2012, DEC informed NYSERDA that a new regulatory document (i.e., Corrective Action Only Order) for the WNYNSC would be developed when information from the Phase 1 Studies is available to better inform additional corrective action activities.

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[1] NYSERDA. 2010. "Final Focused Corrective Measures Study for the State-Licensed Disposal Area at the Western New York Nuclear Service Center West Valley, New York." Prepared by Ecology and Environment, Inc.

2 Environmental Monitoring

2.1 Trench Leachate Elevations

2.1.1 Leachate Elevation Monitoring

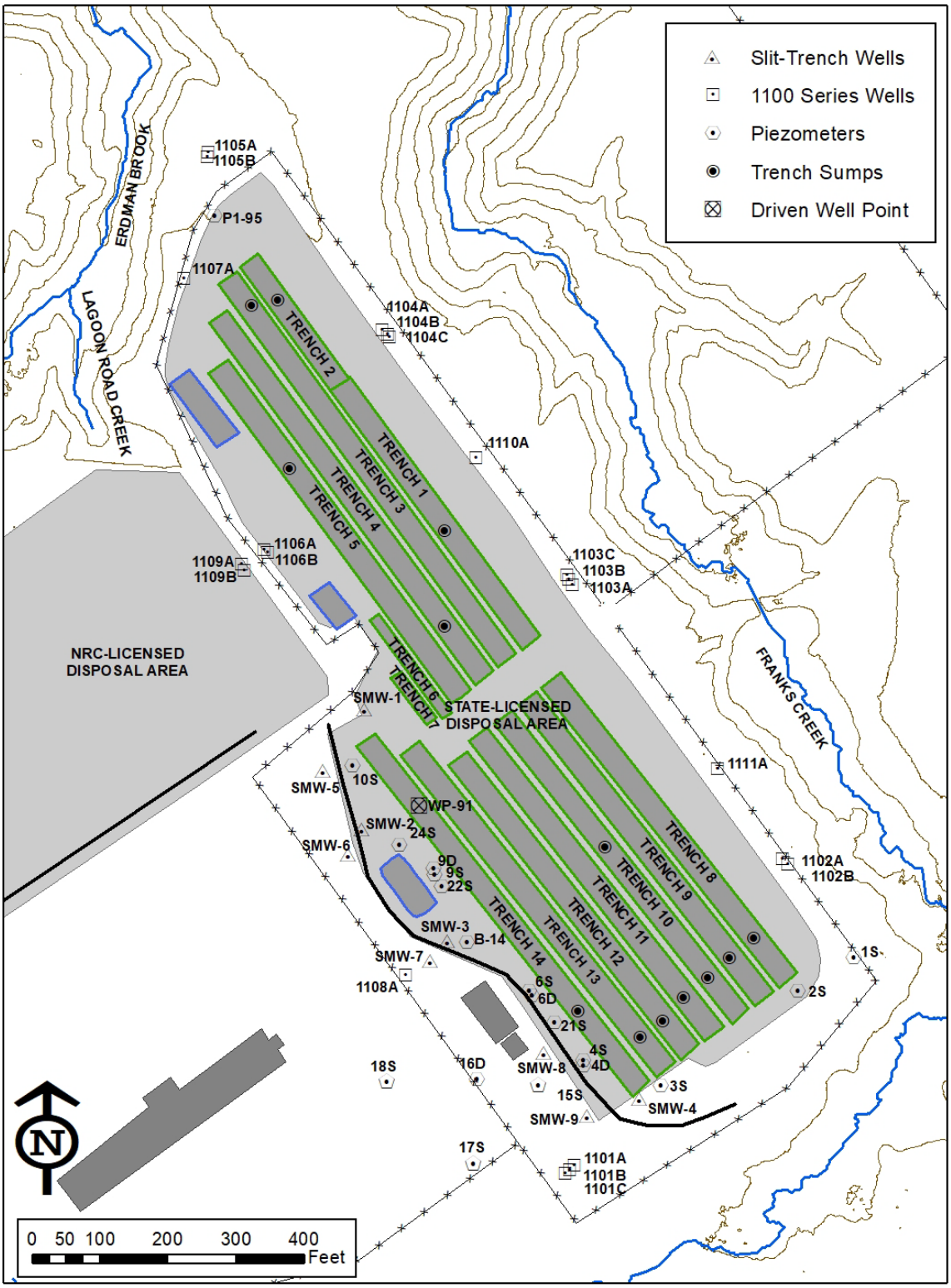
Because the SDA trenches are constructed in a highly impermeable clay, water that enters the trenches has a tendency to accumulate. As such, routine measurements of water in the trenches (called leachate) are conducted in each sump to monitor the leachate level in each trench. One SDA trench sump is located in each of Trenches 1 through 5, 8, 9, and 11 through 13. Two sumps, designated 10N and 10S, are located in Trench 10; and, two sumps designated Trench 14 and WP-91 (Well Point-91), are located in Trench 14 (see Figure 2-1).

Leachate elevations are measured in the 13 trench sumps at the SDA in accordance with the *Leachate Monitoring Plan for the State-Licensed Disposal Area at West Valley* (LMP^2). In addition to requiring the leachate elevation measurements, the LMP specifies data assessment, notification, and reporting requirements. Prior to this annual report, elevations at the SDA were reported in Plant 29 datum (based off of North American Datum [NAD] 27 and National Geodetic Vertical Datum [NGVD] 29). From this point forward, elevations at the SDA will be reported in NAD 83/North American Vertical Datum (NAVD) 88, which provides greater accuracy for the elevation data at the SDA. Table A-1 presents leachate elevation data for 2018. Graphical presentations of leachate elevations over the 10-year time period (2008 through 2018) are presented using regression lines (red) and prediction intervals (green) in Figures A-1 through A-15. In addition, the slope (rate of increase or decrease) and the R2 value (coefficient of determination) are shown on these figures. These plots will aid in the identification of leachate elevation trend changes in the trenches.

A regression analysis is a statistical process for estimating the relationship among dependent and independent “predictor” variables. It takes into account how the typical value of the dependent variable changes with a change in the independent variables, while other independent variables remain fixed. In this manner, the regression analysis can estimate a conditional expectation of the dependent variable (in this case, the leachate levels), with a change in the independent variable (time). The 95 percent prediction intervals presented on the graphs are an estimate of the interval in which future observations will occur, with a 95 percent probability, given what has already been observed at that particular location. The R2 value is a statistical ratio of how the data fit the regression line and how the data points within the data set vary around their mean. In general, the closer the value of R2 is to 1.0, the better the model fits the data.

Figure 2-1. Trench Sump and Groundwater Monitoring Locations

Source: NYSERDA



Leachate elevation measurements for 2018 were collected quarterly in March, June, September, and December (see Table A-1). Additional monthly leachate elevation measurements were taken in Trenches 13 and 14 (including WP-91) (see Section 2.1.2).

2.1.2 Leachate Elevation Trend Assessment

The LMP requires an annual assessment of long-term leachate elevation trends. The long-term statistical data assessment for 2018 (*Annual Statistical Assessment of SDA Water Elevations - Data Through 2018*[3]) indicates that from 2000 through 2018, most trenches show a decreasing long-term leachate elevation trend (Figure 2-2). Until 2017, Trench 1 was shown to be exhibiting an increasing long-term trend. However, Trench 1 was sampled in September 2017, and the leachate level decreased by approximately six inches and has not recovered through 2018 (see Figure A-1). Based on the regression analysis plotted in Figure A-1, Trench 1 is decreasing at a rate of approximately 0.07 inches per year. This potentially indicates that there is little water in this trench, or the sump is responding like a well in a lower-permeability material. NYSERDA will continue to monitor and evaluate the leachate elevation in Trench 1.

Up to and through 2018, Trench 13 has been shown to be exhibiting a decreasing long-term trend. Based on the regression analysis plotted in Figure A-12, Trench 13 is decreasing at a rate of approximately 0.77 inches per year. The elevations in Trench 13 are being monitored to aid in the investigation of increasing leachate in Trench 14.

As described below, an increase in the Trench 14 leachate elevation has been observed since 2011 following a period of consistent decrease (Figures 2-3 and A-13); but due to the long-term decreasing trend for Trench 14, this increase is not identified using the Mann-Kendall with Sen's method test. As such, NYSERDA instituted the regression analysis as another tool to evaluate leachate elevation changes. Based on the regression analysis plotted in Figures 2-4 and A-14, Trench 14 has been increasing at approximately 0.77 inches per year (since 2011). Monitoring of Location WP-91 began in 2013 to supplement data from Trench 14. Based on the regression analysis plotted in Figure A-15, Trench 14 at WP-91 has been increasing at approximately 0.25 inches per year.

Figure 2-2. SDA Water Elevation Trends

Source: NYSERDA

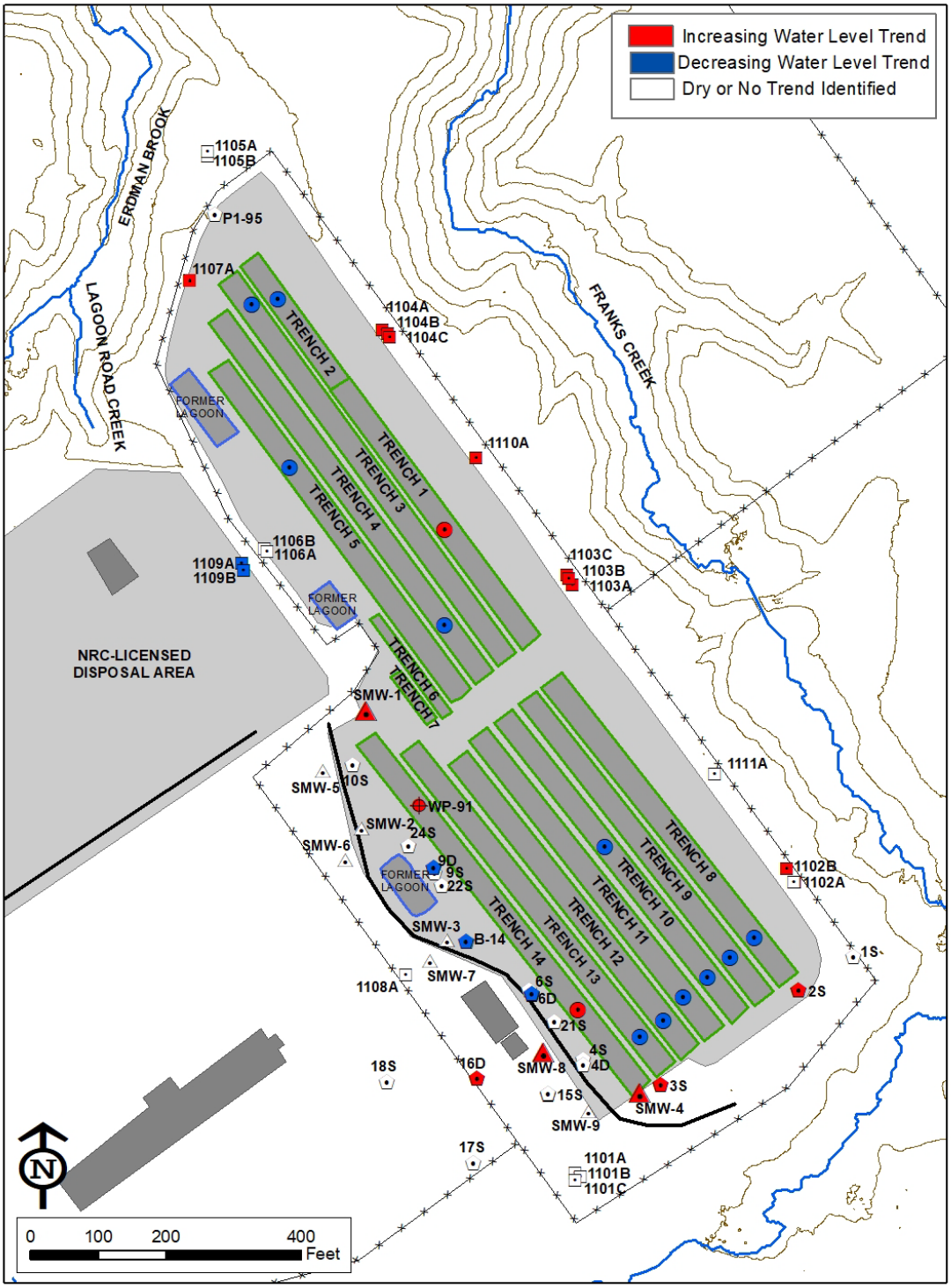
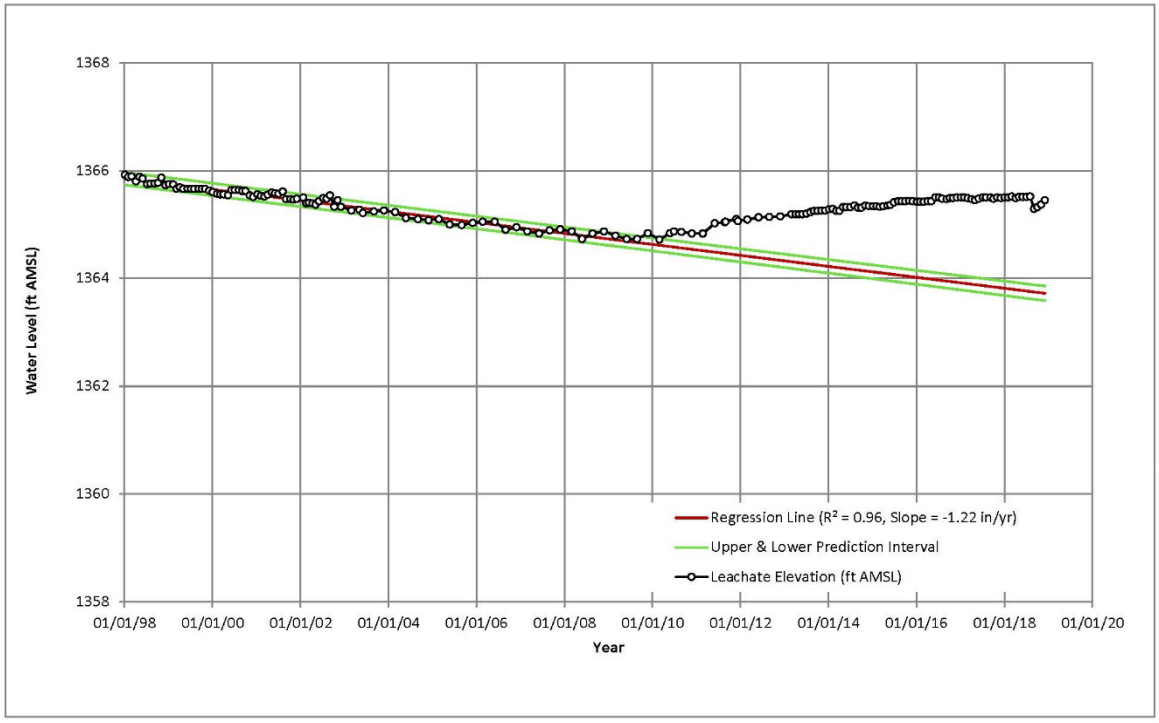


Figure 2-3. Trench 14 Leachate Elevations for the Period 1998 to 2018, Regression Analysis Shown for 1998 to 2008

Regression line shown in red. 95% Prediction intervals shown in green.

Source: NYSERDA



The current leachate levels do not represent a threat of release, or concern to health and safety to the public or the environment. NYSERDA will continue to review and evaluate leachate trends in the trenches using the regression analyses to identify changes in trends that may not be identified using the historical long-term statistical analysis.

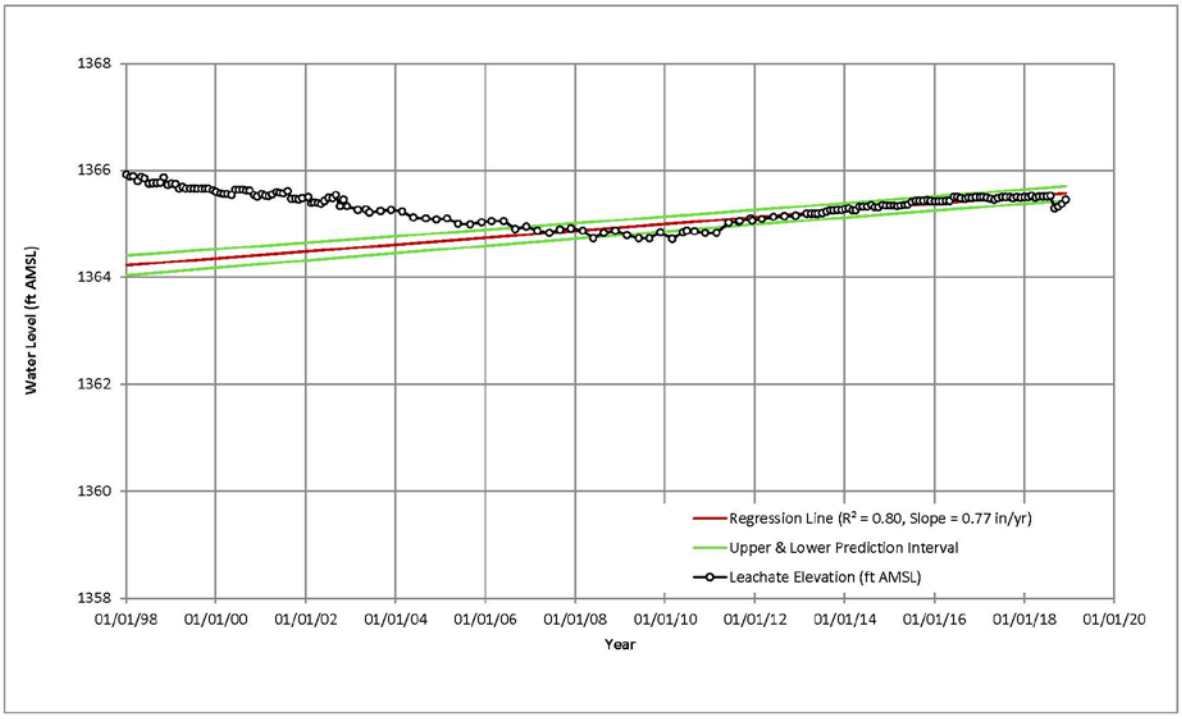
2.1.3 Trench 14 and Trench 1 Leachate Investigation

Following the installation of infiltration controls in the mid-1990s, the Trench 14 leachate elevation followed a consistent and generally predictable decreasing trend (Figures 2-3 and A-13). A noteworthy change in behavior of this trend occurred in approximately 2008 through 2011 when the decreasing trench leveled off, as shown in Figure 2-3.

Figure 2-4. Trench 14 Leachate Elevations for the Period 1998 to 2018, Regression Analysis Shown for 2011 to 2018

Regression line shown in red. 95% Prediction intervals shown in green.

Source: NYSERDA



Small increases and decreases have been observed since 2011; but overall, the Trench 14 leachate elevation continued to increase each year, although none of the increases were large enough to trigger regulatory reporting requirements.

In 2014, NYSERDA issued a contract with an independent consulting company to conduct a detailed evaluation of the leachate increases in Trenches 14 and 1 (to address a very slow increase in the leachate elevation that had been observed for several years within Trench 1). The purpose of this evaluation was to identify a cause or potential cause for the increase in the leachate elevation that has been observed for several years within both trenches, and to present findings and recommendations for mitigating the increases. This evaluation has included extensive geologic and hydrologic data evaluation, resulting in a preliminary Findings and Recommendations Report, which was submitted to DEC and EPA in 2015. A work plan to address the findings and recommendations presented in the 2015 report was finalized and submitted to DEC and EPA in 2016.

Field activities began during the second quarter 2016 (installation of 24 piezometers), continued into the fourth quarter of 2016 (sampling of 22 of the 24 piezometers installed in 2016), and concluded in the fourth quarter of 2018 (installation of 11 additional piezometers, with the development and sampling to be conducted in the first quarter of 2019) (see Figure 2-5). At this time, water levels are being collected from the 2016 and 2018 installed piezometers and select monitoring wells, and are being evaluated in regard to leachate elevation increases. A final Leachate Increase Investigation Findings and Recommendations Report is anticipated to be completed at the end of 2019.

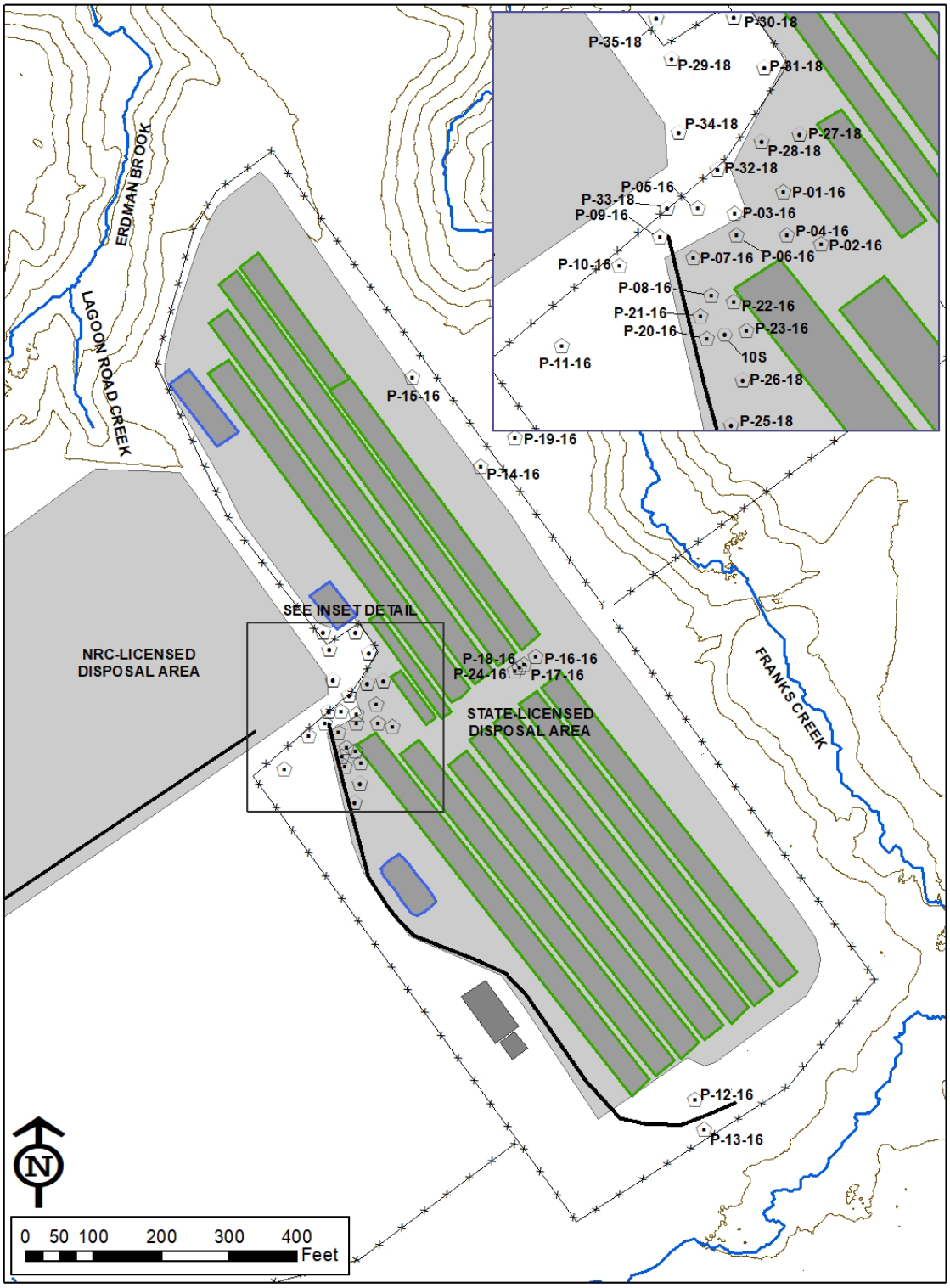
In August 2018, ancillary equipment (pump, piping, etc.) was removed from the Trench 14 sump in order for the sump to be sampled (sampling equipment could not fit down the sump pipe in its then-existing configuration). The Trench 14 sump cover was then reconfigured with a sump cap cover similar to other trenches to provide access. Leachate levels during the equipment removal process were monitored frequently to determine if removal of the equipment would influence the leachate level in the sump. The Trench 14 sump was then sampled in September 2018 as discussed in the following paragraphs. The leachate level in the sump did decrease immediately after equipment removal and leachate sampling, and appears to be increasing since that time; but has not yet recovered to the pre-equipment removal elevation.

Evaluation of the 2018 data sets shows that the leachate levels measured in WP-91, located on the north end of Trench 14, are increasing after a period of stabilization. During 2018, monthly leachate elevation measurements in WP-91 have intermittently increased or decreased by 0.01 to 0.06 ft, resulting in a net change of 0.10 ft (which is below reportable requirements). However, since June 2018, the leachate in WP-91 has been steadily increasing, with an overall increase during this period of 0.12 ft (which is below reportable requirements). Review of the precipitation data for 2018 (Appendix E) indicates that above average precipitation values may be contributing to this increase. The total precipitation from January through December 2018 at the SDA was 53.68 inches. By comparison, the average total precipitation for 2010 through 2017 was 45.61 inches. This is 8.07 inches above the seven-year average at the SDA. Further evaluation of the 2010 through 2017 precipitation data shows that on average, the precipitation between August and December each year at the SDA measures 19.44 inches. In 2018, 27.01 inches of precipitation fell between August and December, an increase of 7.57 inches. Leachate levels will continue to be collected at this location on a monthly basis.

The leachate elevation measured in the Trench 1 sump, which had been slowly increasing for several years, dropped 0.48 ft (approximately six inches) after the September 2017 sampling, and remained at that

Figure 2-5. 2016 and 2018 Piezometer Locations

Source: NYSERDA



approximate level from January through December 2018, with a net increase of 0.01 ft during that time. A review of the Trench 1 construction and disposal history determined that a large volume of backfill was added to the trench during disposal operations. In an effort to evaluate the leachate elevation in Trench 1 in the 1970s, Nuclear Fuel Services, Inc. installed multiple well points in the trench and concluded that due to the significant amount of backfill used during disposal operations, there was little leachate present. The decrease in leachate elevation in Trench 1 is consistent with the Nuclear Fuel Services' report that concluded there is limited leachate present within Trench 1. The leachate elevation in Trench 1 will continue to be measured and evaluated.

2.1.4 Leachate Sampling

NYSERDA began a leachate and groundwater sampling activity in 2017 and concluded it in September 2018. All leachate sumps, including WP-91 and excluding Trench 14 (which was inaccessible due to equipment obstructions within the sump pipe), were sampled in 2017. In September 2018, the Trench 14 sump was sampled after removal of the ancillary equipment; and locations B-14, P-22-16, and P-23-16 were resampled due to low sample volume collected in 2017. Samples were collected for analysis of radiological and chemical constituents.

Elevation measurements were collected immediately before and after sampling at Trench 14, and results indicated that the leachate levels at this location are representative of, and in communication with, the area of the trench in which they are located. The analytical data from the leachate and groundwater sampling event (both radiological and chemical) will be provided to DEC and EPA when it is received and validated.

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[2] Throughout this report, LMP refers to the Leachate Monitoring Plan: NYSERDA. 2014. "Leachate Monitoring Plan for the State-Licensed Disposal Area, ENV501.05."

[3] NYSERDA. 2019. "Annual Statistical Assessment of SDA Water Elevations – Data Through 2018." Prepared by AECOM.

2.2 Groundwater Monitoring

The SDA groundwater monitoring network consists of 21 groundwater monitoring wells (the 1100-series wells); 19 piezometers; and nine slit-trench wells. The location of each monitoring well is shown in Figure 2-1. The purpose of the groundwater monitoring program is twofold: (1) to provide data of sufficient quality and quantity to allow detection of the migration of radionuclides or volatile organic

compounds (VOCs) from the SDA via groundwater; and, (2) to provide information on hydrologic conditions near the disposal trenches. The Groundwater Monitoring Program is conducted in accordance with the *Groundwater Monitoring Plan for the State-Licensed Disposal Area at West Valley,* (GMP[4]). The 1100-series wells, piezometers, and slit-trench wells are inspected and maintained as described in the GMP.

2.2.1 Groundwater Elevation Monitoring

The GMP requires quarterly groundwater elevation measurements in the 1100-series wells, the piezometers, and the slit-trench wells. Prior to this annual report, elevations at the SDA were reported in Plant 29 datum (based off of NAD 27 and NGVD 29). From this point forward, elevations at the SDA will be reported in NAD 83/NAVD 88, which provides greater accuracy for the elevation data at the SDA. Well summary information for each type of well is presented in Tables B-1, B-3, and B-5. In 2018, measurements were taken in March, June, September, and December; and the results for each well are presented in Tables B-2, B-4, and B-6, respectively. In addition, monthly groundwater elevation measurements were taken at a number of locations in support of the Trench 14 leachate investigation (see Section 2.1.3). A tabulation of these supporting levels will be presented in the final Leachate Increase Investigation Findings and Recommendations Report, anticipated to be completed at the end of 2019.

Groundwater elevation data are used to construct quarterly groundwater elevation contour maps in NAD 83/NAVD 88 datum for the Weathered Lavery Till and the Kent Recessional Sequence (see Figures B-1 through B-8). The 2018 groundwater contour maps show the hydraulic gradient in the Weathered Lavery Till, in the vicinity of the disposal trenches, to be inward toward the trenches. The path of the groundwater movement in the Kent Recessional Sequence is northeasterly. These trends are consistent with historical data.

2.2.2 Groundwater Elevation Trend Assessment

An assessment of upward or downward trends in groundwater elevations was conducted for the data collected in 2018 (*Annual Statistical Assessment of State-Licensed Disposal Area Water Elevations – Data through 2018*[5]). The statistical assessment used groundwater elevation data from January 2000 through December 2018, and the results of the trend assessment show increasing long-term water elevation trends in: Wells 1102B, 1103A, 1103B, 1103C, 1104A, 1104B, 1104C, 1107A, and 1110A; Piezometers 2S, 3S, and 16D; and Slit-Trench Wells SMW-1, SMW-4, and SMW-8. A long-term decreasing water elevation trend was observed in: Wells 1109A, Well 1109B; and Piezometers 6D, 9D,

and B-14. Piezometers 4S and 9S; and Slit-Trench Wells SMW-2 and SMW-3 have been dry throughout the statistical assessment period. No upward or downward trends were found in the remaining groundwater wells at the SDA.

A short-term increasing elevation trend was identified at Piezometer 6D (2013 through 2016). Overall, a long-term decreasing water elevation trend is present at this location; but since 2013, this trend appeared to have reversed and become an increasing water elevation trend through 2016. However, the water elevations in 2018 indicate that the trend is now decreasing. Water levels will continue to be collected at 6D-91 as per the GMP to determine elevation trending at this location.

As Figure 2-2 shows, the majority of the wells located within the area covered by the geomembrane and immediately downgradient of the slurry wall are dry or exhibit no trend. Two wells located on the upgradient side of the slurry wall show an increasing trend. The distribution of groundwater elevations near the west side of Trench 14, and the decreasing long-term leachate elevation trends in all but two of the SDA trenches, reflect the continued effectiveness of the water infiltration controls system (i.e., subsurface barrier wall and geomembrane cover). The majority of the wells on the east side of the SDA show an increasing trend, potentially due to increased rates of precipitation.

2.2.3 Groundwater Parameter Monitoring

In accordance with the GMP, the 1100-series wells were sampled semiannually (June/July and November) during 2018. On June 26, 2018, NYSERDA received notification from our environmental monitoring contractor that an error in laboratory sample labeling had resulted in the inability to analyze the first semiannual 2018 radiological groundwater samples. This labeling error did not affect the VOC samples, but did impact the radiologic samples; therefore, groundwater resampling was necessary. This resampling was conducted between July 16 and July 23, 2018.

Analytical parameters monitored semiannually included gross alpha, gross beta, and tritium; and field water quality parameters (conductivity, pH, temperature, and turbidity). Analytical parameters monitored annually in 2018 included gamma-emitting radionuclides (by gamma spectroscopy); four beta-emitting radionuclides (carbon-14, iodine-129, strontium-90, and technetium-99); and VOCs. Checklists of the parameters sampled at each well are presented in Tables B-7 and B-8. Groundwater analytical results for all parameters, except VOCs, are presented in Tables B-9 and B-10.

2.2.3.1 Gross Alpha

For the July 2018 sampling event, the Upper Tolerance Limits (UTLs) or Upper Predictive Limits (UPLs) were exceeded for Wells 1103C and 1110A. Review of the historical data for these wells indicated that the results were consistent with historical data and resampling was not required. For the November sampling event, no UTLs or UPLs were exceeded.

Gross alpha results were assessed using the statistical intrawell comparison protocol described in the GMP. Results of gross alpha monitoring are consistent with historical results.

2.2.3.2 Gross Beta

In July and November 2018, no UTLs or UPLs were exceeded for any of the sampled wells.

Gross beta results were assessed using the statistical intrawell comparison protocol described in the GMP. Results of gross beta monitoring are consistent with historical results.

2.2.3.3 Tritium

In July and November 2018, no UTLs or UPLs were exceeded for any of the sampled wells.

Tritium results were assessed using the statistical intrawell comparison protocol described in the GMP. Results of tritium monitoring are consistent with historical results.

2.2.3.4 Gamma-Emitting Radionuclides

In July, gamma spectroscopy was performed for the 14 routinely reported radionuclides. The results were generally consistent with historical results. All results for actinium-228, cesium-134, cesium-137, cobalt-57, potassium-40, lead-212, radium-224, radium-226, and uranium-235 were below their minimum detectable concentrations (MDC) or 2-sigma uncertainties.

Bismuth-214, cobalt-60, lead-214, thallium-208, and thorium-234 all exceeded their MDC; and all are considered qualified data due to either an uncertainty greater than 50 percent, the absolute value of the negative result exceeding the uncertainty value, the absence of the parent radionuclide, or the nondetection of the parent radionuclide.

Calculation of statistics (mean, standard deviation, and control charting) for the 14 routinely reported gamma emitters was not required. Typically, five positive detections (as defined in the GMP) have to occur for any gamma-emitting radionuclide to require control charting. The lead-214 dataset for Well 1107A met the minimum requirement for creating a control chart in July 2018; however, the data were not suitable for creating a control chart because of the elapsed time between the positive detections. The July 2018 detect is the first detect since 1996. The objective of a control chart is to analyze trends, and the recent data from Well 1107A indicates that there is not a definable trend due to the number of nondetects. Therefore, a control chart would not be representative of current conditions at this location. A control chart will be created when regular occurrences of detected value are observed.

2.2.3.5 Beta-Emitting Radionuclides

Beta-emitting radionuclide sampling for carbon-14, iodine-129, strontium-90, and technicium-99 was performed in 2018.

Results for carbon-14 were consistent with historical results and below the MDC, which did not exceed the reporting criteria set forth in the GMP.

All July 2018 results for iodine-129 were below their MDC and the program detection limit of 1E+00 picocurie per liter (pCi/L), which is consistent with historical results. All the iodine-129 results were qualified due to associated laboratory control sample and matrix spike/matrix spike duplicate results exhibiting biased low recoveries.

The strontium-90 result for Well 1107A (6.12E+00±5.07E-01 pCi/L) exceeded the criteria in the GMP but was similar to historical results. After the fifth positive detection for strontium-90 in the well (2002) was reported, control charting was initiated. The current calculated mean and control limits are based upon the initial five positive detections. Based upon the control chart for strontium-90 in Well 1107A, no trends in the data have been identified.

All July 2018 results for technicium-99 were below their MDC and the program detection limit of 5E+00 pCi/L, which is consistent with historical results. One result was qualified due to the absolute value of the negative result exceeding the uncertainty.

The technicium-99 dataset for Well 1107A meets the minimum requirements for creating a control chart (i.e., five or more positive detects). This is the second positive detect in the last 10 years (and the only

detect in the last five years), which may suggest that there is not a definable trend; but small levels of variability in the measurement process. A control chart will be established, and the mean and standard deviation calculated after the fifth data point.

2.2.3.6 Volatile Organic Compounds

VOC results for samples collected in 2018 were not detected above the method detection limits or practical quantitation limits, which is consistent with historical results, except for low-level detections for acetone (below the practical quantitation limits of 10 micrograms per liter) for Wells 1101A (5.6 micrograms per liter), and 1102B (3.5 micrograms per liter). These results were qualified "J" based on a continuing calibration exceedance. Due to nondetection of the remainder of the VOCs tested in 2018 (with the exception of the two detections noted above), the VOC results are not presented with this report.

2.2.3.7 Field Water Quality Parameters

Conductivity, temperature, turbidity, and pH are measured in the field during groundwater sampling. The 2018 water quality measurements were generally consistent with historical results and are reported in Table B-10. New maximum temperatures were seen at Wells 1101B, 1101C, 1102A, and 1106A. New maximum pH values were seen at Wells 1103B and 1104B in July 2018. In November 2018, new minimum values for pH were recorded at Wells 1101B, 1101C, 1102A, 1104A, 1104B, 1105A, 1105B, 1108A, and 1109B. This decrease in pH is thought to be due to a potentially faulty pH probe. The pH probe will be replaced prior to the next groundwater sampling event.

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[4] Throughout this report, GMP refers to the Groundwater Monitoring Plan: NYSERDA, 2014. "Groundwater Monitoring Plan for the State-Licensed Disposal Area (SDA) at West Valley, ENV502.05."

[5] AECOM, pg. 14.

2.3 Surface Water Monitoring

During 2018, quarterly surface water samples for gross alpha, gross beta, and tritium analyses were collected at the four SDA monitoring locations (WNDCELD, WNFRC67, WNNDADR, and WNERB53). A background sampling location south (and upgradient) of the SDA on Buttermilk Creek (WFBCBKG) also collected quarterly, is used for data comparison. An annual sample was also collected at location WFBCANL in 2018, approximately 0.75 miles northeast (and downgradient) of the SDA on Buttermilk Creek.

As shown in Figure 2-6, WNNDADR, located in Lagoon Road Creek adjacent to both the SDA and the Nuclear Regulatory Commission-Licensed Disposal Area (NDA), (and within the WVDP premises), and WNERB53, located in Erdman Brook downstream of WNNDADR, monitor surface water runoff from the SDA, NDA, and portions of the WVDP Premises. WNDCELD, located in Franks Creek on the south side of the SDA, monitors surface water from areas adjacent to the WVDP Drum Cell upstream of the SDA. WNFRC67, located downstream on Franks Creek, monitors surface water on the eastern and southern portions of the SDA.

Figure 2-7 shows WFBCBKG, located upstream of the WNYNSC in Buttermilk Creek, which monitors background surface water conditions, and WFBCANL, also located in Buttermilk Creek, which monitors Buttermilk Creek just downstream of where the Kent Recessional unit groundwater is discharged to Buttermilk Creek via groundwater seeps.

Surface water monitoring data are presented in Tables C-1 through C-6. A statistical assessment of radiological constituents (gross alpha, gross beta, and tritium) for the SDA surface water was conducted using the data collected in 2018 (*Statistical Assessment of SDA Surface Water Constituents for 2018*[6]).

2.3.1 Radiological Parameters

2.3.1.1 Gross Alpha

The 2018 gross alpha results at all four surface water sampling locations (WNDCELD, WNFRC67, WNNDADR, and WNERB53) were statistically indistinguishable from background. These findings are consistent with previous annual statistical assessments. All results were below the 6 NYCRR 703.5 – Table 1 Water Quality Standards for Surface Water and Groundwater (6 NYCRR 703.5[7]) (15 pCi/L), which is used as a comparative value for gross alpha.

2.3.1.2 Gross Beta

The 2018 gross beta results for WNNDADR were statistically higher than the background locations, which is consistent with historical results, although levels at the WNNDADR have fallen since the NDA geomembrane cover and subsurface barrier wall were installed in 2008. Figure 2-8 shows the gross beta results for the WNNDADR location and the background location (WFBCBKG). Gross beta results for WNERB53 were statistically higher than background from 2012 through 2016, but in 2017 and 2018 were found to be statistically indistinguishable from background. The 2018 results for WNFRC67 and

Figure 2-6. Surface Water Monitoring Locations (WNDCELD, WNFRC67, WNNDADR, and WNERB53)

Source: NYSERDA

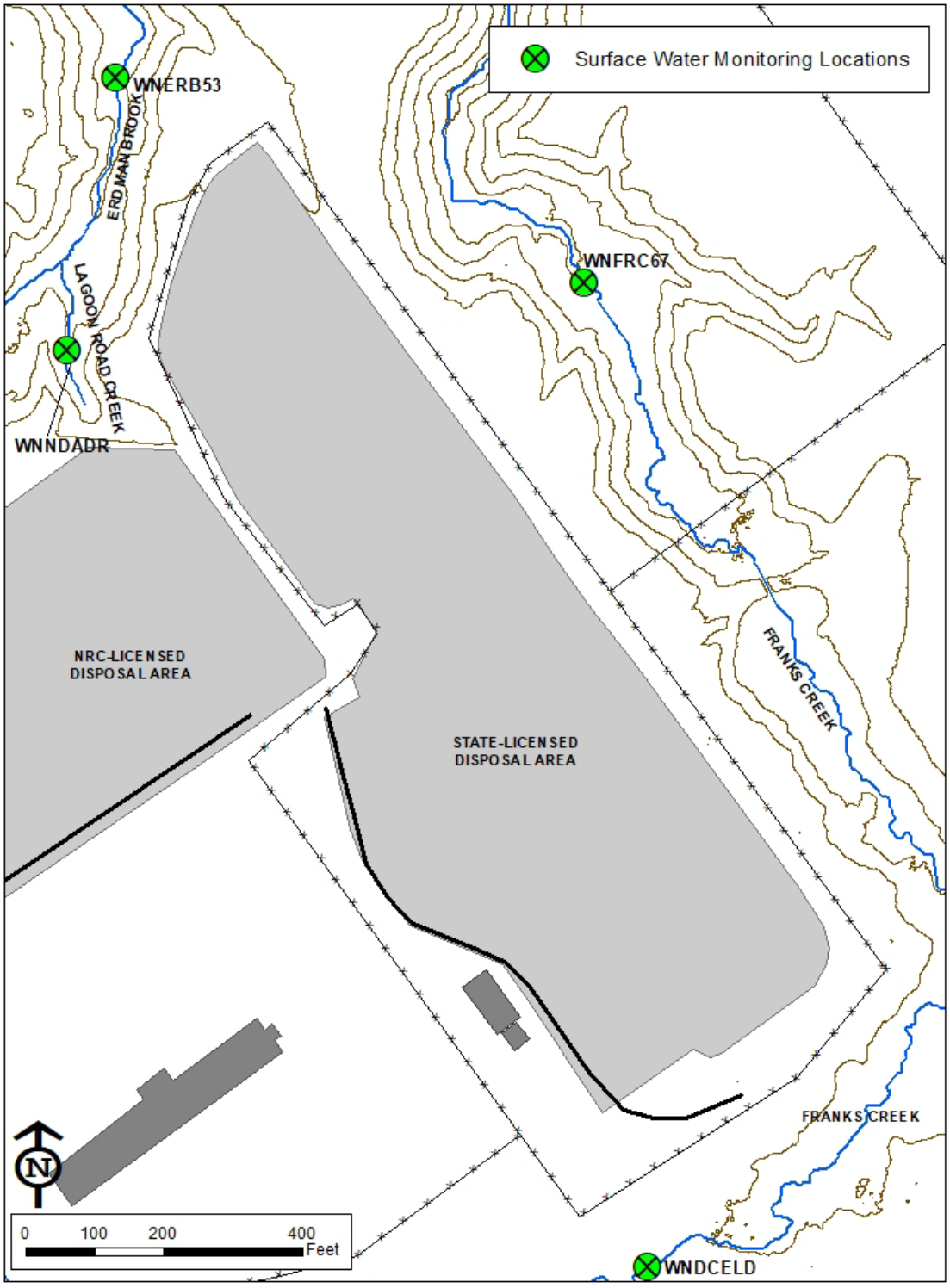
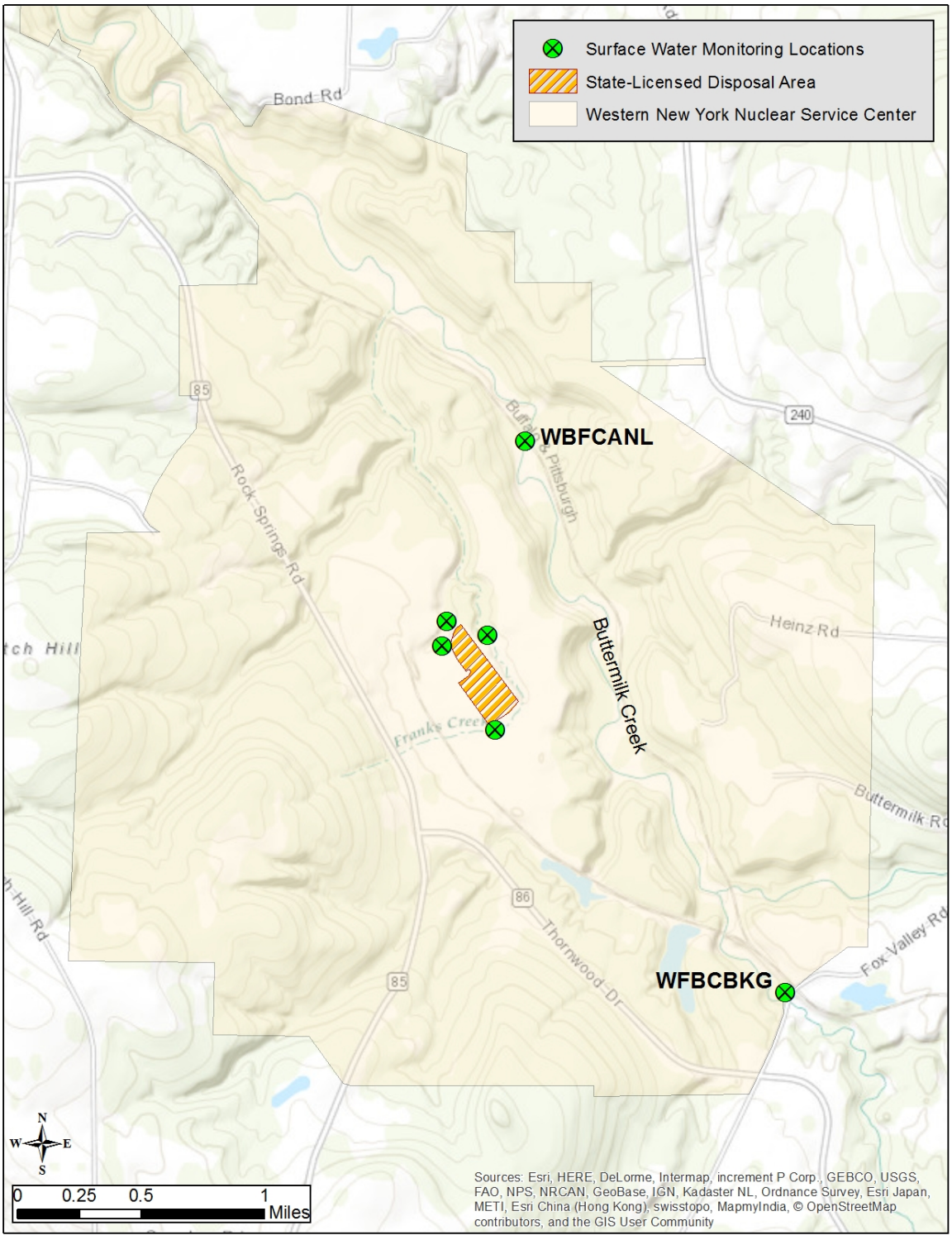


Figure 2-7. Surface Water Monitoring Locations (WFBCBKG and WFBCANL)

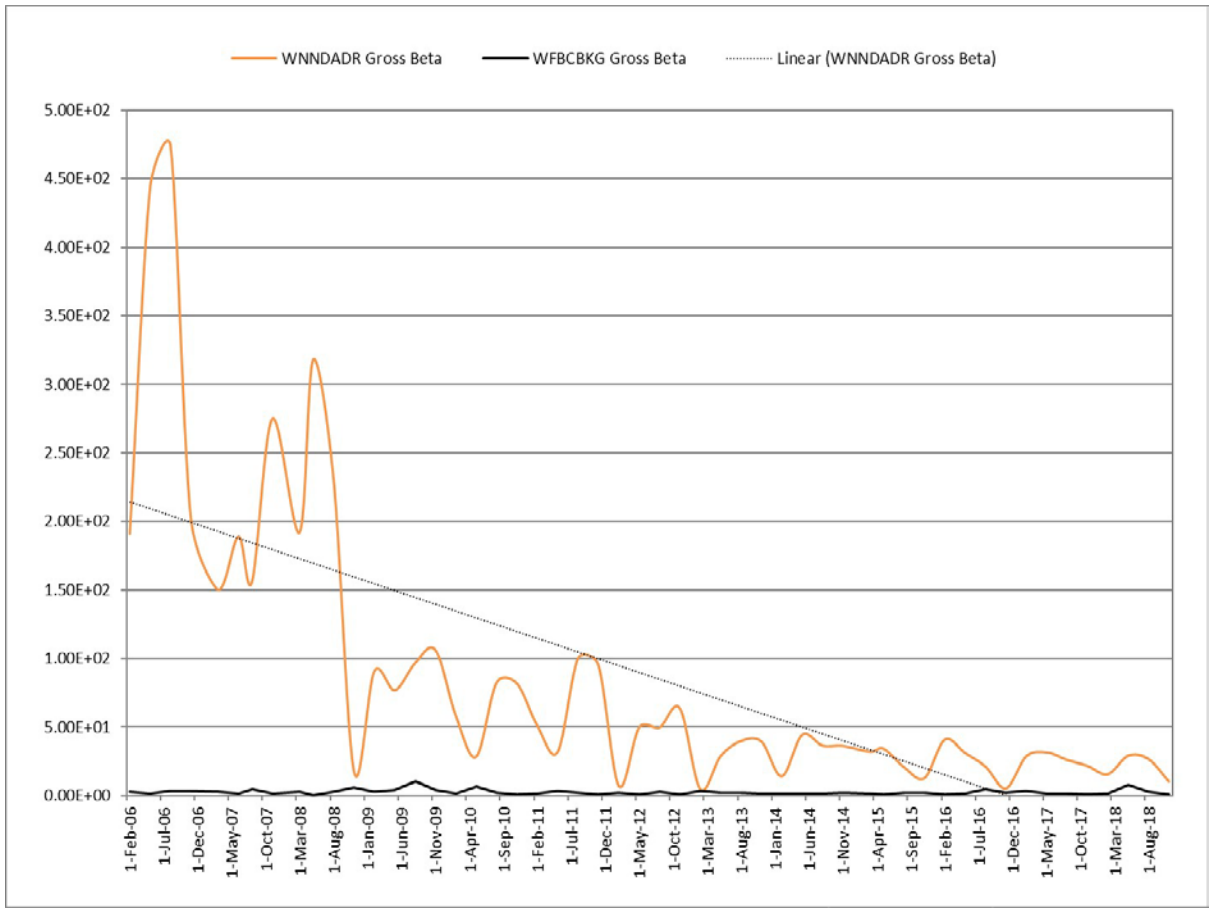
Source: NYSERDA



WNDCELD were statistically indistinguishable from background, which is consistent with previous annual assessments. However, the second quarter gross beta result for WNFRC67 was elevated above recent data; but the third and fourth quarter showed results consistent with historical data. NYSERDA will continue to monitor results for all locations. All gross beta results were below 6 NYCRR 703.5 (1.0E+3 pCi/L), which is used as a comparative value for gross beta.

Figure 2-8. Gross Beta Results for Surface Water Monitoring Location WNNDADR Compared to WFBCBKG

Source: NYSERDA



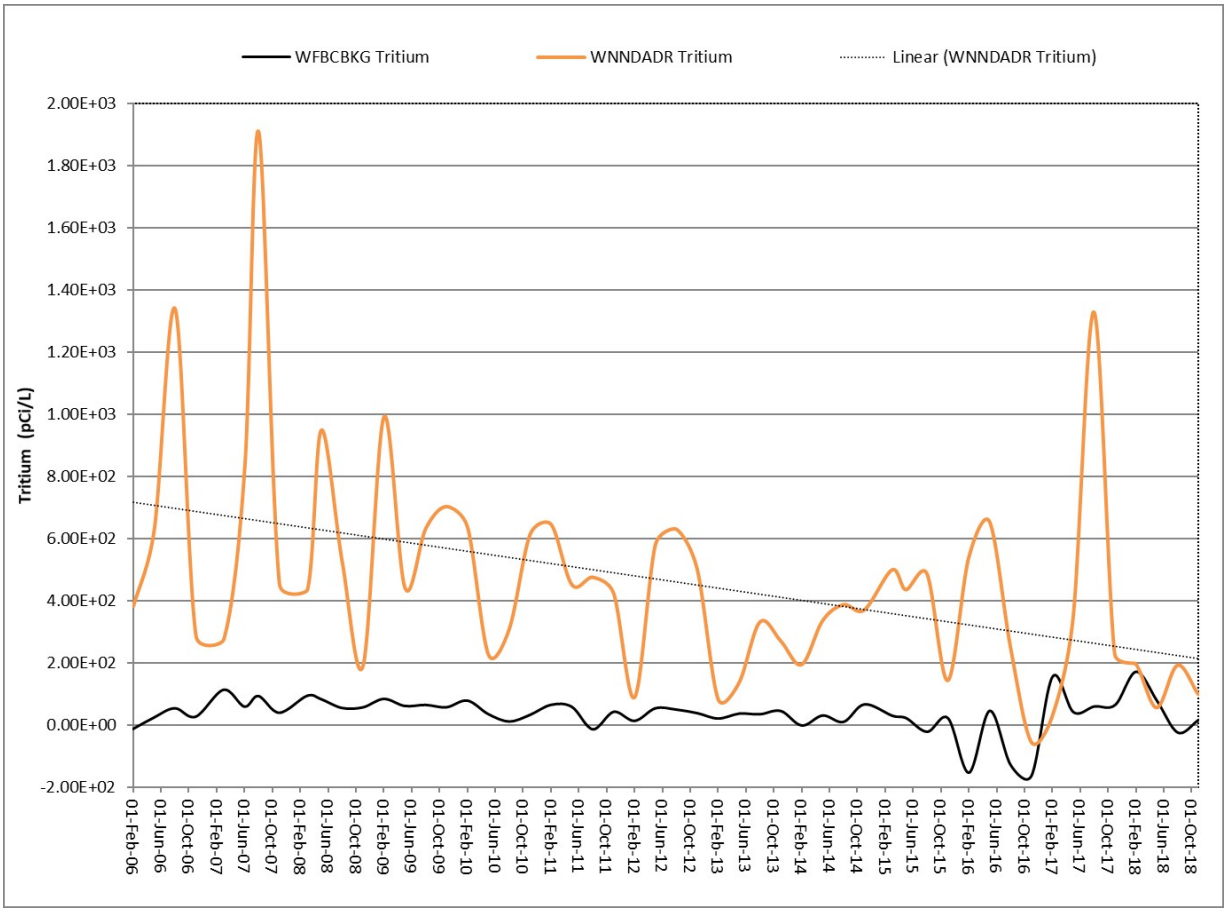
2.3.1.3 Tritium

Historically, the tritium result for WNNDADR has been statistically higher than background. Tritium levels have generally fallen since the NDA geomembrane cover and subsurface barrier wall were installed in 2008; and in 2018, this location was found to be statistically indistinguishable from background. Figure 2-9 shows an overall decreasing trend for tritium identified since 2008 for the WNNDADR location. The 2018 results for WNDCELD, WNFRC67, and WNERB53 were statistically indistinguishable from

background, which is consistent with historical assessments. All tritium results were below the 6 NYCRR 703.5 (2.0E+4 pCi/L), which is used as a comparative value for tritium.

Figure 2-9. Tritium Results for Surface Water Monitoring Location WNNDADR Compared to WFBCBKG

Source: NYSERDA



[6] NYSERDA. 2019. "Statistical Assessment of SDA Surface Water Constituents for 2018." Prepared by AECOM.

[7] Throughout this report, 6 NYCRR 703.5 refers to Table 1 Water Quality Standards for Surface Waters and Groundwater: DEC. 1998. "6 NYCRR 703.5 – Table 1 Water Quality Standards for Surface Waters and Groundwater."

2.4 Stormwater Monitoring

As required by the SDA State Pollution Discharge Elimination System (SPDES) Permit No. NY-026971, semiannual sampling is conducted at one of the four designated SDA stormwater outfalls (as shown in Figure 2-10). During 2018, semiannual stormwater samples were collected from Outfall W01 during nonqualifying storm events on April 3 and August 21.

Composite samples from both events were analyzed for biological oxygen demand (BOD), chemical oxygen demand (COD), total nitrate-nitrite and total Kjeldahl nitrogen, total phosphorus, total suspended solids (TSS), gross alpha, gross beta, tritium, and gamma spectroscopy. Grab samples from both events were analyzed for BOD, COD, total nitrate-nitrite and total Kjeldahl nitrogen, oil and grease, total phosphorus, TSS, pH, and temperature. Ambient rainfall samples from both events were analyzed for pH and temperature. Stormwater monitoring data for 2018 is provided in Tables C-7 and C-8, and is reported to DEC as required by the SPDES permit.

2.4.1 Radiological Parameters

2.4.1.1 Gross Alpha

Gross alpha results from the April and August 2018 sampling events were 7.42E-01 pCi/L and 0.0 pCi/L, respectively, and were qualified results. The April 2018 result was below the reported MDC value of 9.25E-01 pCi/L, and the August 2018 result was an estimated value equal to the MDC of 7.87E-01 pCi/L.

Both results were below the 6 NYCRR 703.5 (1.5E+01 pCi/L), which is used as a comparative value for gross alpha.

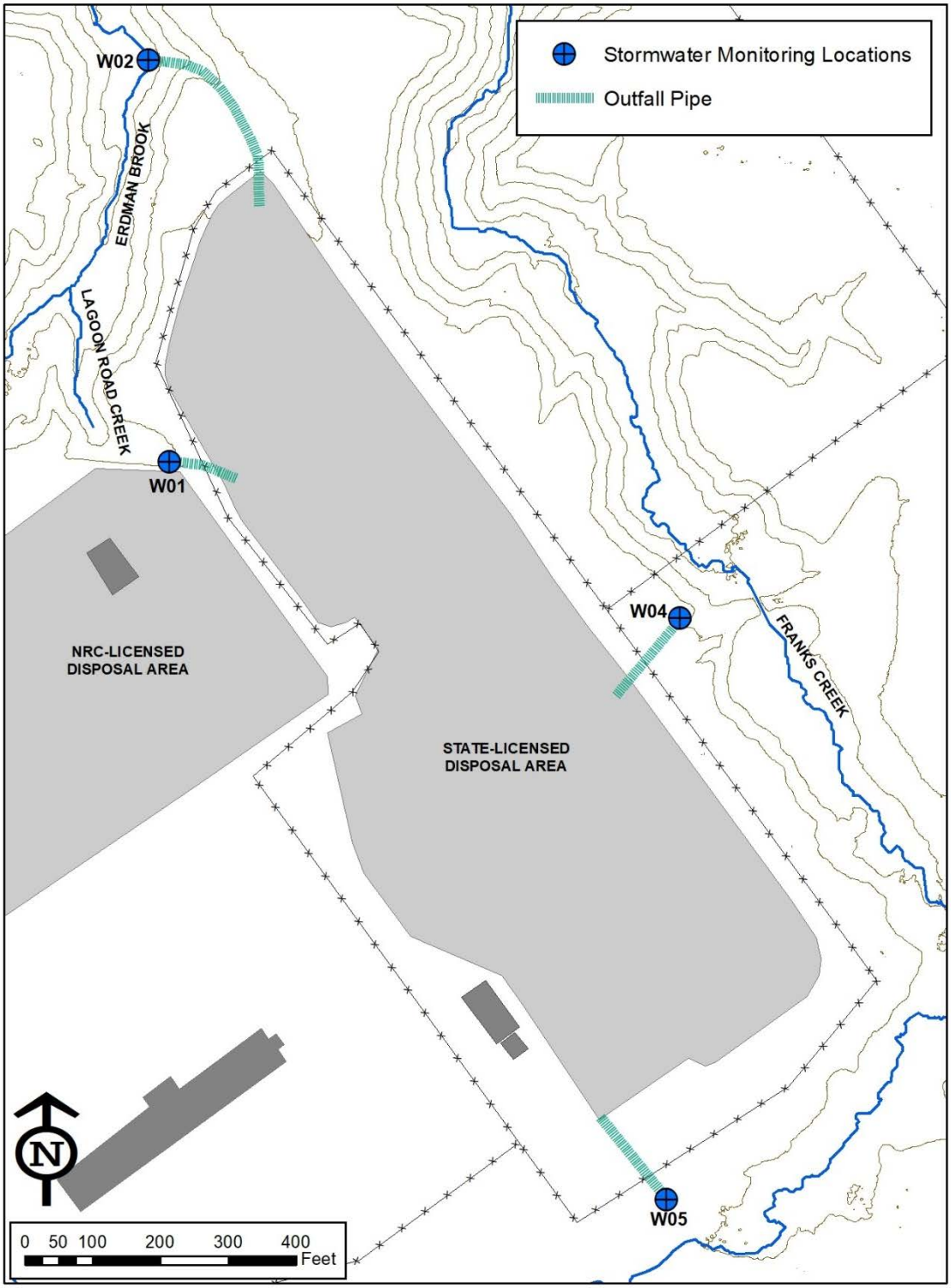
2.4.1.2 Gross Beta

The gross beta results for the April and August 2018 sampling events (2.28E-00 pCi/L and 1.24E-00 pCi/L) were both above the reported MDC values of 7.55E-01 pCi/L (for April) and 5.25E-01 pCi/L (for August). Since 2017, the gross beta results have been decreasing.

Both gross beta results were below the 6 NYCRR 703.5 (1.0E+03 pCi/L), which is used as a comparative value for gross beta.

Figure 2-10. Stormwater Monitoring Locations

Source: NYSERDA



2.4.1.3 Tritium

The tritium results for the April and August 2018 sampling events were 8.48E+01 pCi/L and 1.85E+01 pCi/L, respectively. Both results are below their reported MDC (1.71E+02 pCi/L for April) and (8.64E+01 pCi/L for August). Statistical trend analysis did not identify any significant trend for tritium.

Both tritium results were below the 6 NYCRR 703.5 (2.0E+04 pCi/L), which is used as a comparative value for tritium.

2.4.1.4 Gamma Spectroscopy

The results for three gamma emitters (cesium-137, cobalt-60, and potassium-40) are reported for each stormwater sampling event. In addition, gamma spectroscopy results were reviewed for an additional 145 gamma-emitting radionuclides.

Sample analysis from the April 2018 event showed Beryllium (Be-7) and Bismuth (Bi-214) to be reported above their MDC; all remaining gamma spectroscopy results were reported below their respective MDC. Be-7 has been reported historically and is a cosmogenic radionuclide that is removed from the atmosphere via precipitation; therefore, its presence in stormwater is not unexpected. The Be-7 results for the composite sample and field duplicate were below the MDC.

The Bi-214 result for the August composite sample is 2.97+01 pCi/L and was qualified during validation because the 2-sigma uncertainty was greater than 50 percent of the result. In addition, because the parent radionuclide (lead-214) is a nondetect, the result is considered uncertain. There have been four Bi-214 detects in stormwater samples since the second semiannual stormwater sampling event in 2016, which coincides with a change in the laboratory that performs the analysis. Similar results have been seen in SDA groundwater samples.

Sample analysis from the August 2018 event showed that cesium-137, cobalt-60, and potassium-40 results were below their respective MDC.

2.4.2 Chemical and Physical Parameters

Results for all chemical and physical parameters were below the SPDES permit limits. As required by the SPDES permit, chemical and physical results were reported to DEC's Division of Water in the Discharge Monitoring Report after each semiannual sampling event.

2.5 Gamma Radiation Monitoring

2.5.1 Overland Gamma Radiation Surveys

Gamma radiation surveys are performed semiannually at the SDA to maintain current data on gamma exposure levels and to monitor for changing conditions at the SDA.

As shown on Figure 2-11, radiation levels are measured at 51 fixed-survey locations in and around the SDA including:

- Thirty-two monument markers located on the north and south ends of each trench (designated as T1s, T1n, etc.), and the three filled lagoons (SDA2, SDA3, and SDA4) monitor the contribution of underground radioactive materials to the area radiation levels within the SDA.
- Sixteen SDA perimeter survey points (P-1 through P-16) marked on the chain-link fence surrounding the SDA monitor external radiation from all sources, including the WVDP.
- One survey point (T-1) inside the T-1 Building monitors external radiation. This location was previously used to track radiation levels from the stored Trench 14 leachate. Because the leachate was removed from the tank in 2009 and the tank was removed in 2010, this measurement is taken in the middle of the now-vacant concrete tank pad.
- Two survey points (DC-[G] and DC-dr) at the WVDP Drum Cell, located west of the SDA, provide information on the radiation levels near the Drum Cell. Historically, waste in the Drum Cell created elevated radiation levels at the nearby SDA monitoring points. Radiation levels have fallen since the waste was removed from the Drum Cell in 2007.

At each fixed survey point, radiation levels are measured at one meter and one centimeter above the ground, floor, or building surface.

Radiation detection instruments are also monitored continuously between fixed-survey locations to identify any anomalous reading(s) exceeding three times those of the nearby fixed-survey monitoring points; any such fluctuations are noted on the survey report form. Survey readings for the 2018 semiannual surveys (April and August) are provided in Table D-1.

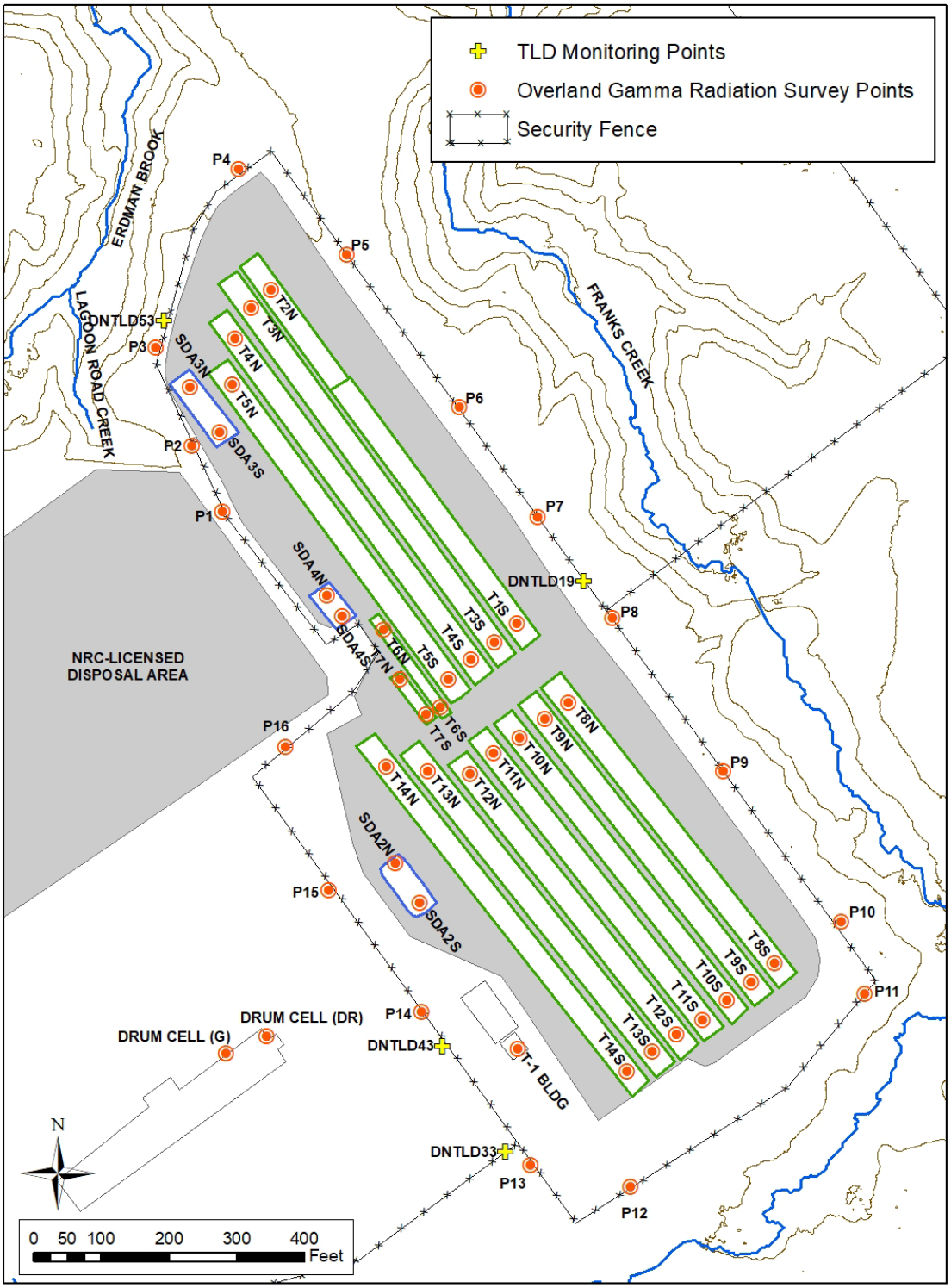
Gamma radiation levels observed during both semiannual surveys were consistent with historical data.

2.5.2 Thermoluminescent Dosimetry Monitoring

Each calendar quarter, four environmental thermoluminescent dosimeters (TLDs) placed around the SDA are processed to obtain the integrated gamma radiation exposure from each location (see Figure 2-11). Thermoluminescent dosimeter monitoring locations DNTLD43 and DNTLD33 are located north and south of the SDA Tank buildings, respectively, on the western SDA perimeter fence. DNTLD19 is

Figure 2-11. Gamma Radiation Monitoring Locations

Source: NYSERDA



located midway along the SDA east perimeter fence and is farthest from WVDP radiation sources. DNTLD53 monitors the northwestern corner of the SDA and is the closest to the WVDP and the NDA, which are potential sources of external radiation exposure. In addition to the on-site TLD locations, a background location, NYTLDBK, is located approximately 4.5 miles southwest of the SDA outside of the Ashford Office Complex. Environmental TLD monitoring results for 2018 are included in Table D-2.

The quarterly environmental TLD results for 2018 were reviewed for completeness and accuracy, and to determine if there were any outliers in the data set. Various outlier tests were performed for the 2018 results for each location, no outliers were confirmed; therefore, no results were removed from the 2018 data set.

The results of the statistical tests show that the 2018 ambient radiation exposures for all locations were consistent with background. This is generally consistent with historical results, except for DNTLD53. In recent years (2015 – 2017), DNTLD53 had been reported as significantly higher than background; however, beginning with 2018, the statistical test results show levels consistent with background.

2.6 Meteorological Monitoring

NYSERDA operates and maintains a suite of meteorological instruments at the SDA, including instruments to measure total precipitation (e.g., rain, snow, and sleet); temperature; relative humidity; barometric pressure; wind speed; and wind direction. The instruments are equipped with a battery-powered backup system to ensure data continuity during power outages. A quarterly summary of the daily precipitation at the SDA is provided in Tables E-1, E-2, E-3, and E-4. There were no interruptions in meteorological data collection in 2018.

3 Erosion Monitoring

In accordance with the requirements of the Part 380 Permit #9-0422-00011/00011, NYSERDA has established a comprehensive erosion monitoring program at the SDA, inclusive of the surrounding slopes and streams. The objective of the program is to monitor active erosion processes that could threaten the integrity of the SDA. The monitoring ensures that erosion features are clearly identified, inspected, quantified, and, if necessary, mitigated before erosion damage can occur at the SDA.

3.1 Visual Inspections

3.1.1 Visual Inspections of Surrounding Stream Channels

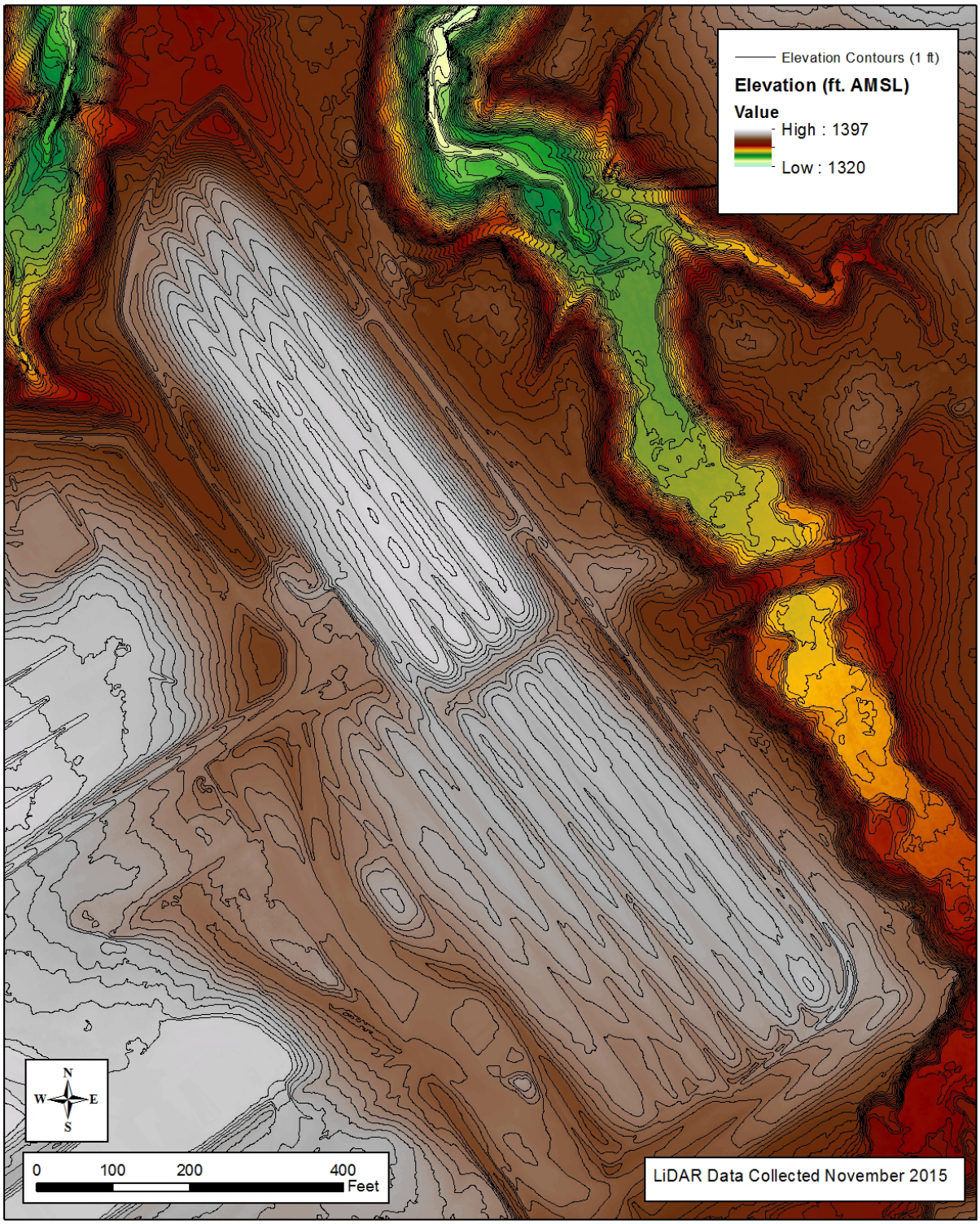
In 2018, NYSERDA conducted monthly visual inspections of the creeks that flow around three sides of the SDA (Erdman Brook, Franks Creek, and Lagoon Road Creek). Stream channel inspections included assessments of installed erosion control structures and the results are documented in NYSERDA's Erosion Monitoring Log per NYSERDA's *Erosion Monitoring Plan*.[8] Additional unscheduled inspections are conducted after abnormally large precipitation events (>2.5 inches/24 hours) to check for significant erosion or mass wasting. There were no unscheduled inspections required for 2018. Field observations are documented and follow-up actions, if necessary, are tracked using WVSMP's maintenance log database. As noted in the Erosion Monitoring Log updates for 2018, there remains an area of minor damage to erosion control structures on Erdman Brook west of the NDA, which initially occurred as a result of rainstorms in July 2015. Repairs to erosion controls in this section of Erdman Brook are scheduled for summer 2019.

3.1.2 LiDAR Mapping and Orthophotography

In 2010, NYSERDA conducted an aerial Light Detection and Ranging (LiDAR) mapping and orthoimagery project for the Buttermilk Creek watershed, covering both the WNYNSC and the SDA. This survey fulfills NYSERDA's requirement to complete comprehensive topographic mapping of the SDA and adjacent premises once every five years (per NYSERDA's *Erosion Monitoring Plan*[9]). A detailed topographic map of the SDA and adjacent premises was developed at a resolution of 0.5 meters. In 2015, NYSERDA conducted a new LiDAR survey of the area. Figure 3-1 is a high-quality topographic map of the SDA and the surrounding area that was derived from a subset of the 2015 LiDAR data. Having separate datasets collected at different times allows the data to be examined for changes to the land surface due to erosion, deposition, and/or subsidence. This examination revealed active erosion of streams and gullies in the watershed, as would be expected. There was no evident subsidence or erosion at the

Figure 3-1. LiDAR-Derived Topographic Map of the SDA and Surrounding Areas

Source: NYSERDA



SDA or in areas adjacent to the SDA. There were some topographic changes at points along Erdman Brook and Franks Creek, which were directly attributable to the construction of erosion controls at these locations. NYSERDA plans to update the LiDAR survey with a new data collection in November 2020.

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[8] NYSERDA. 2014. “Erosion Monitoring Plan, ENV509.01.”
[9] Ibid.

4 Facility Operations and Maintenance

NYSERDA is responsible for the safety, operations, and maintenance of the buildings and grounds at the SDA. Both routine and nonroutine facility inspections and maintenance activities are implemented to ensure that the facility is operating as designed. In 2018, facility operations and maintenance at the SDA included:

- inspections and testing
- maintenance

4.1 Inspections and Testing

NYSERDA actively maintains the facilities at the SDA through routine inspections and testing of all physical and mechanical systems, followed by prompt corrective actions, as needed. All inspections are documented on standard forms and maintained as WVSMP records. Any deficiencies noted during these inspections and tests are tracked in WVSMP's maintenance log database, scheduled for completion, and closed out in a timely manner.

In 2018, NYSERDA completed the following inspections and tests:

- monthly SDA Building inspections
- monthly and annual fire extinguisher inspections and testing
- five walkover inspections of the entire SDA, and surrounding slopes and streams, completed under NYSERDA's *Walkover Inspection of the SDA*[10] procedure
- annual geomembrane cover system inspection per NYSERDA's *Geomembrane Cover System Inspection*[11] procedure
- nonroutine inspections of the SDA after severe weather conditions (e.g., high winds, heavy precipitation, earthquakes, etc.)

All systems and operations at the SDA are performing as designed.

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10 NYSERDA. 2013. "Walkover Inspection of the SDA, OPS003.08"
11 NYSERDA. 2013. "Geomembrane Cover System Inspection, OPS007.04."

4.2 Operations and Maintenance

In 2018, NYSERDA completed the following routine and preventative maintenance at the SDA:

- snowplowing and vegetation control at the SDA and Bulk Storage Warehouse
- support tasks for the annual deer hunting program on the WNYNSC

NYSERDA completed the following nonroutine operations and maintenance activities at the SDA in 2018:

- repair of the SDA security light and vestibule space heater
- investigation of Trench 13 subsidence
- removal of the Trench 14 sump pump cover and ancillary equipment (e.g., electrical wiring, tubing, and pump), and installation of a new locking cap on the sump stand pipe (see Figure 4-1)
- installation of two new above-grade wind anchors along the south end of Trench 1 (see Figure 4-2) to add weight to the cover to prevent movement
- installation of a temporary stormwater flow meter in the W-05 stormwater chamber (see Figure 4-3)
- reconfiguration of the south detention basin (see Figures 4-4 and 4-5) to promote proper drainage

All nonroutine maintenance actions are tracked from start to finish in the WVSMP's maintenance log database.

Figure 4-1. Trench 14 ancillary equipment removal

Source: NYSERDA

Figure 4-2. Trench 1 above-grade wind anchors

Source: NYSERDA

Figure 4-3. W-05 Stormwater Flowmeter

Source: NYSERDA

Figure 4-4. South detention basin reconfiguration

Source: NYSERDA

Figure 4-5. South detention basin completed work

Source: NYSERDA

4.2.1 Quantitative Measurements

4.2.1.1 North Slope Survey

In accordance with the requirements of the Part 380 Permit #9-0422-00011/00011, NYSERDA conducts an annual survey of 47 monitoring points on the North Slope of the SDA to detect slope movement. Survey data for the North Slope was collected on August 29, 2018. Survey data contained herein is being reported in NAD 83 for horizontal positioning, and the NAVD 88 for vertical positioning or elevation. The survey and periodic field inspections of the North Slope area during 2018 confirmed no reportable horizontal or vertical movement (e.g., slumping).

The 2018 elevations of the North Slope monitoring points (see Figure 4-6) are provided in Table F-1. A comparison between the 2017 and 2018 data did not show any reportable changes (>0.5 ft) in the elevations of the monitoring points.

4.2.1.2 SDA Trench Cap Survey

NYSERDA also surveys the ground surface elevations along the SDA trench centerlines and monuments to monitor for trench cap settlement. NYSERDA has established fixed-trench cap elevation survey points that are easily surveyed from year to year. The annual results are compared to the previous year's data for indications of trench cap subsidence. A map identifying the location of the trench cap elevation survey points is shown in Figure 4-7 with the current survey data points presented in Table F-2.

Areas of settlement were observed on the southernmost 100-foot sections of Trenches 8 and 13 in 2013, the northern area of Trench 14, and recently observed along the centerline of Trench 12. Since 2014, NYSERDA has conducted a focused topographic survey in each of the areas identified above using a 10-foot grid pattern to monitor the rate of subsidence. To date, there has been less than one inch of subsidence per year.

In 2017, Trench 8 settlement was mitigated during the installation of the new geomembrane cover by installing lightweight geofoam blocks to raise the areas of settlement before covering with the new geomembrane cover. A settlement gauge was also installed to further monitor the trench cap surface of Trench 8 after the installation of the geofoam panels. The settlement gauge elevation measurements have decreased by 0.04 ft, which is within the survey measurement uncertainty. NYSERDA will continue to monitor this area of Trench 8.

Figure 4-6. North Slope Ground Surface Elevation Survey Points

Source: NYSERDA

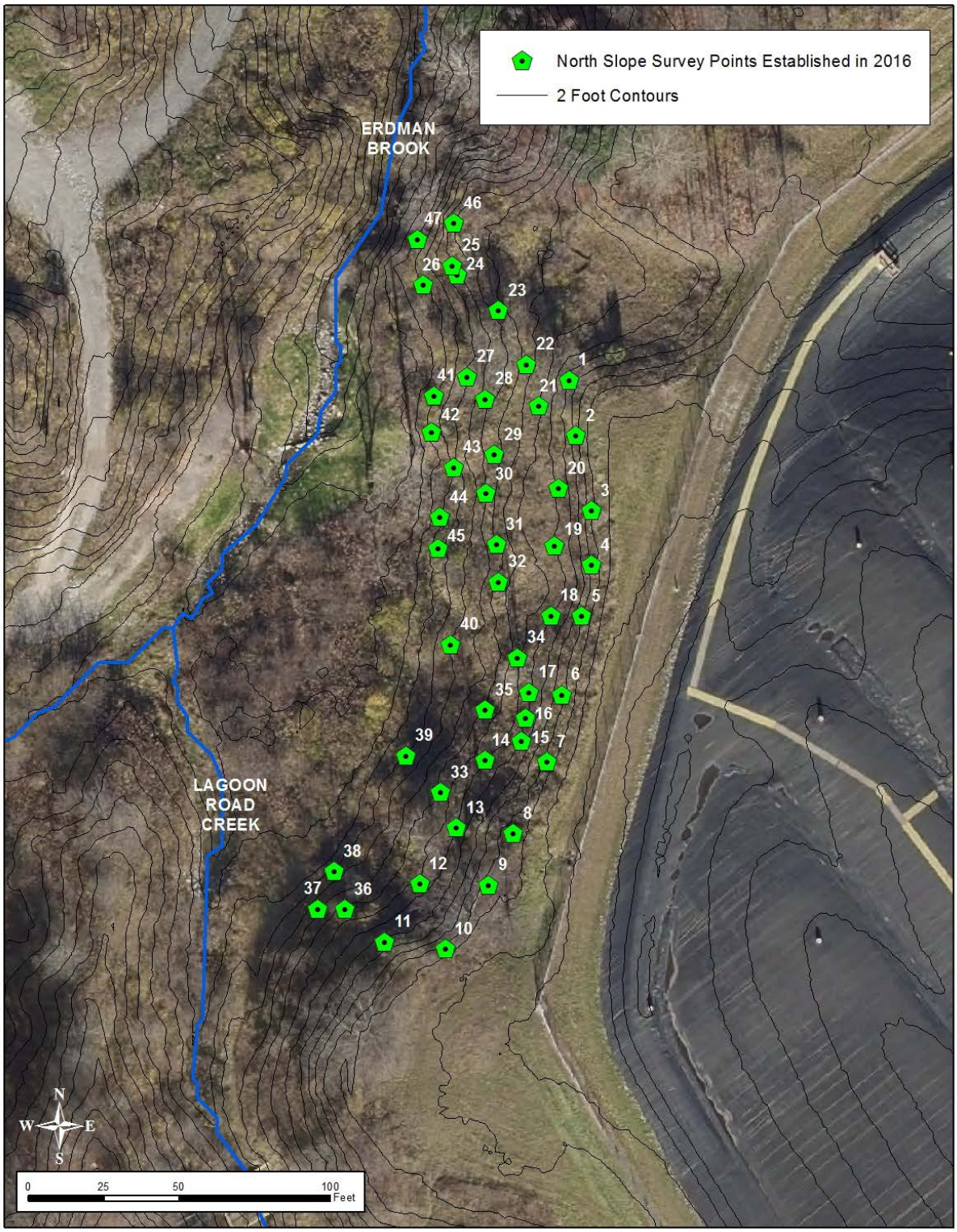
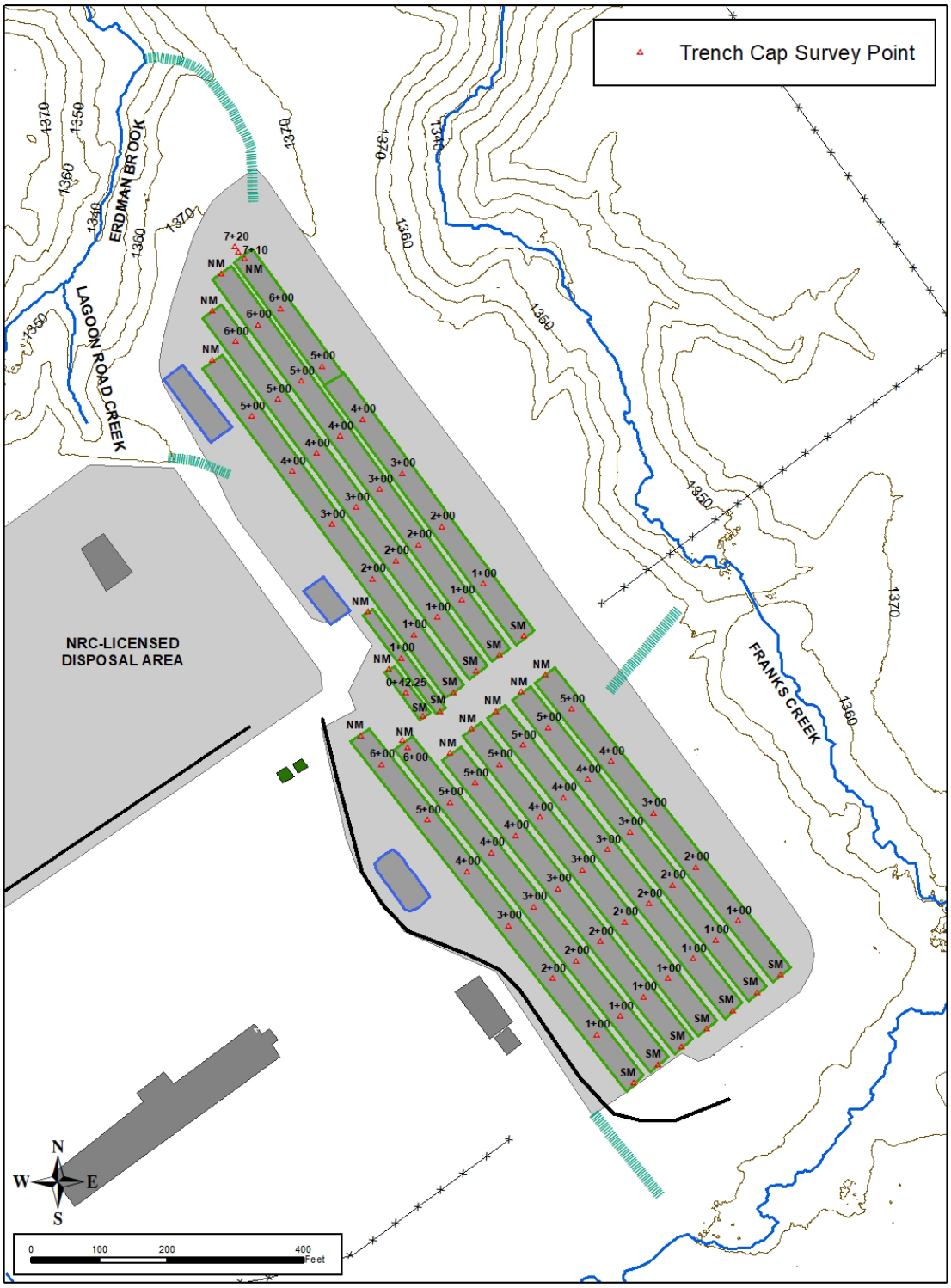


Figure 4-7. Trench Cap Ground Surface Elevation Survey Points

Source: NYSERDA



NYSERDA continues to monitor the area on Trenches 13 and 14 with focused topographic surveys in areas observed to be settling or subsiding. In addition to the focused topographic surveys, periodic visual inspections of the trench caps will be performed to provide a more immediate identification of cap subsidence. NYSERDA is evaluating mitigation alternatives for the subsidence on Trenches 13 and 14. NYSERDA will continue to monitor all locations where subsidence has been identified in accordance with our plans and procedures, and will report subsidence to DEC as identified in the plans and procedures.

4.3 Engineered Construction Projects

In 2017, NYSERDA completed installation of a new geomembrane cover over Trenches 1-12 and improved the stormwater collection system (including the removal of stormwater outfall location No. 3). All field work was completed, with the exception of reshaping and replacing the existing outlet pipe for the south detention basin (see Figure 4-4), which was completed during 2018. The 2018 field work provided additional stormwater capacity and replaced an uneven pipe that retained water. Upon completion of this work, the contractor welded a new piece of geomembrane cover over the existing cover and realigned the slope of the piping to eliminate ponding (see Figure 4-5).

5 Waste Management

NYSERDA has developed and implemented both systems and procedures to manage the SDA in a manner that minimizes the generation of radioactive or hazardous waste.

In 2018, waste management at the SDA included:

- inspections
- waste storage

5.1 Inspections

In 2018, NYSERDA completed four waste inspections. No deficiencies were noted during these inspections.

5.2 Waste Removal and Disposal

NYSERDA is not a routine generator of waste. In 2018, 0.84 m^3 of low-level radioactive waste was generated:

- equipment from the trenches
- used personal protective equipment

The total volume of waste currently in storage is 1.33 m^3. All waste currently in storage is low-level radioactive waste only.

Appendix A – Trench Leachate Elevation Data

Table A-1. 2018 Trench Leachate Elevation Data

Elevations are referenced to the NAVD of 1988.[a]

Source: NYSERDA

Trench	Jan 3	Feb 1	Mar 1	Apr 2	May 1	Jun 1
Trench 1			1364.77			1364.79
Trench 2			1360.30			1360.26
Trench 3			1358.91			1358.81
Trench 4			1361.90			1361.87
Trench 5			1362.14			1362.10
Trench 8			1360.32			1360.29
Trench 9			1359.41			1359.40
Trench 10n			1360.62			1360.52
Trench 10s			1359.79			1359.76
Trench 11			1359.44			1359.38
Trench 12			1360.14			1360.25
Trench 13	1362.69	1362.69	1362.67	1362.65	1362.66	1362.65
Trench 14	1365.50	1365.50	1365.52	1365.49	1365.51	1365.51
Wp-91	1365.39	1365.41	1365.39	1365.38	1365.37	1365.37

Table A-1 continued.

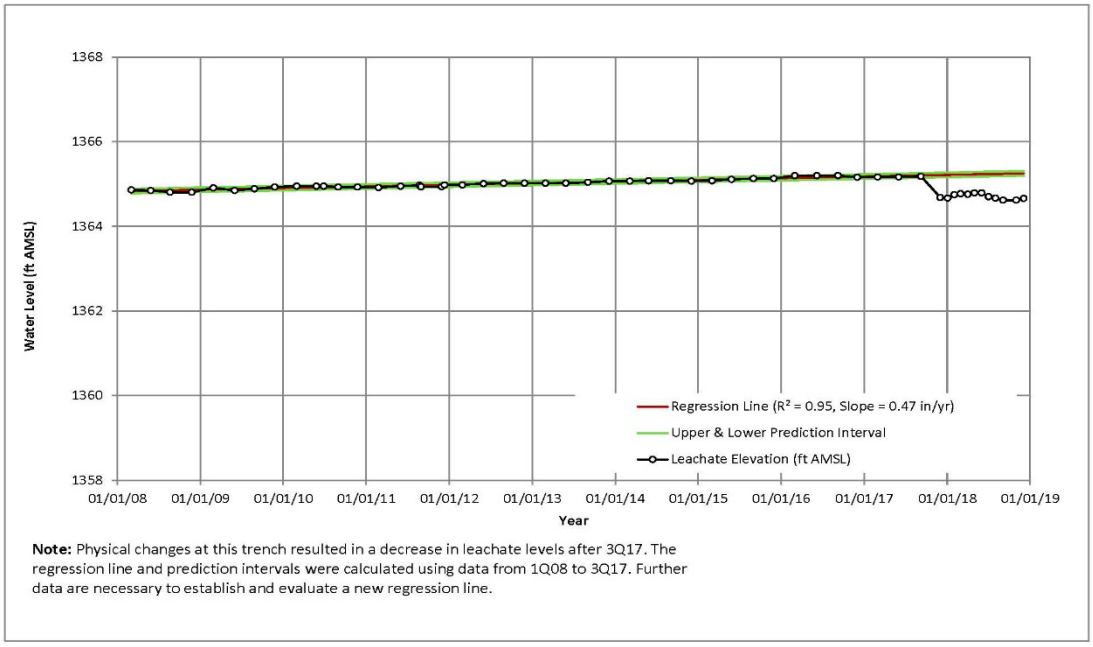
Trench	Jul 2[b]	Aug 1	Sep 4	Oct 1	Nov 1	Dec 3
Trench 1			1364.62			1364.66
Trench 2			1360.15			1360.15
Trench 3			1358.74			1358.66
Trench 4			1361.59			1361.57
Trench 5			1361.99			1362.02
Trench 8			1360.25			1360.26
Trench 9			1359.33			1359.29
Trench 10n			1360.41			1360.32
Trench 10s			1359.59			1359.54
Trench 11			1359.23			1359.20
Trench 12			1360.11			1360.15
Trench 13	1362.32	1362.32	1362.31	1362.29	1362.30	1362.28
Trench 14	1365.51	1365.52	1365.29	1365.32	1365.37	1365.45
Wp-91	1365.25	1365.26	1365.28	1365.28	1365.33	1365.35

[a] Prior to this annual report, elevation datum was reported in Plant 29. From 2019 going forward, elevation datum will be reported in NAVD 88.

[b] In June 2018, the trench sump reference elevation points were surveyed in NAVD 88. This is reflected in the July through December leachate elevations.

Figure A-1. 2008-2018 Leachate Elevations, Trench 1

Source: NYSERDA



Note: Physical changes at this trench resulted in a decrease in leachate levels after 3Q17. The regression line and prediction intervals were calculated using data from 1Q08 to 3Q17. Further data are necessary to establish and evaluate a new regression line.

Figure A-2. 2008-2018 Leachate Elevations, Trench 2

Source: NYSERDA

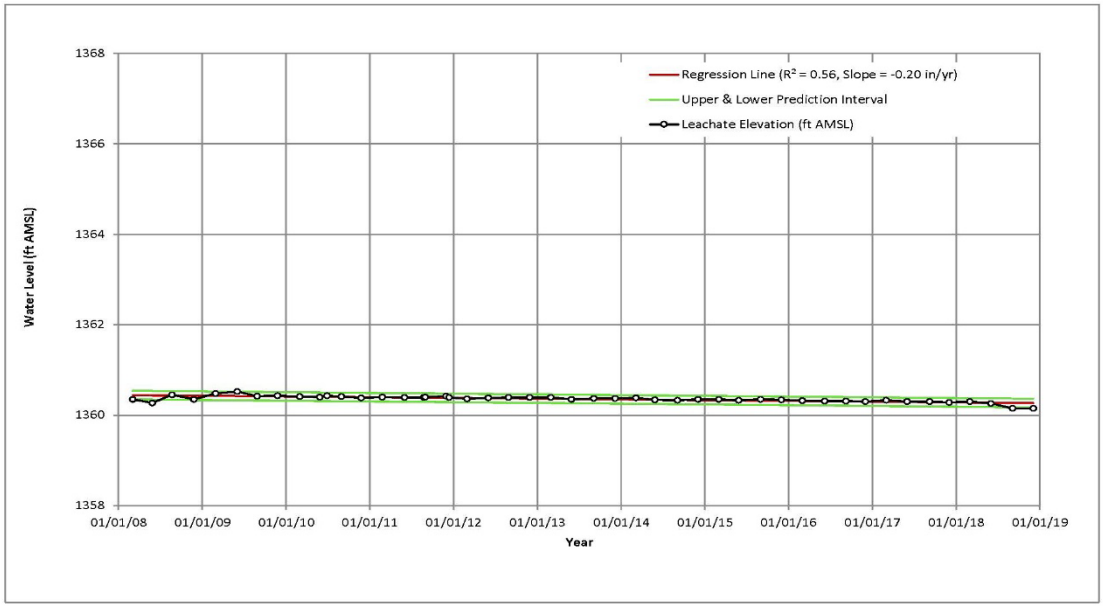


Figure A-3. 2008-2018 Leachate Elevations, Trench 3

Source: NYSERDA

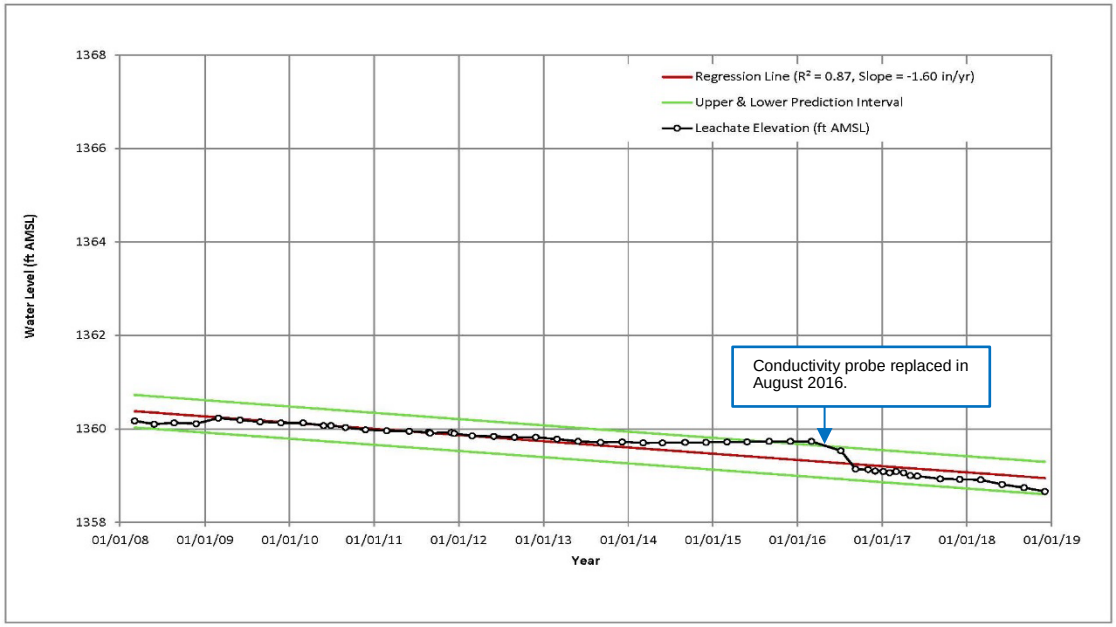


Figure A-4. 2008-2018 Leachate Elevations, Trench 4

Source: NYSERDA

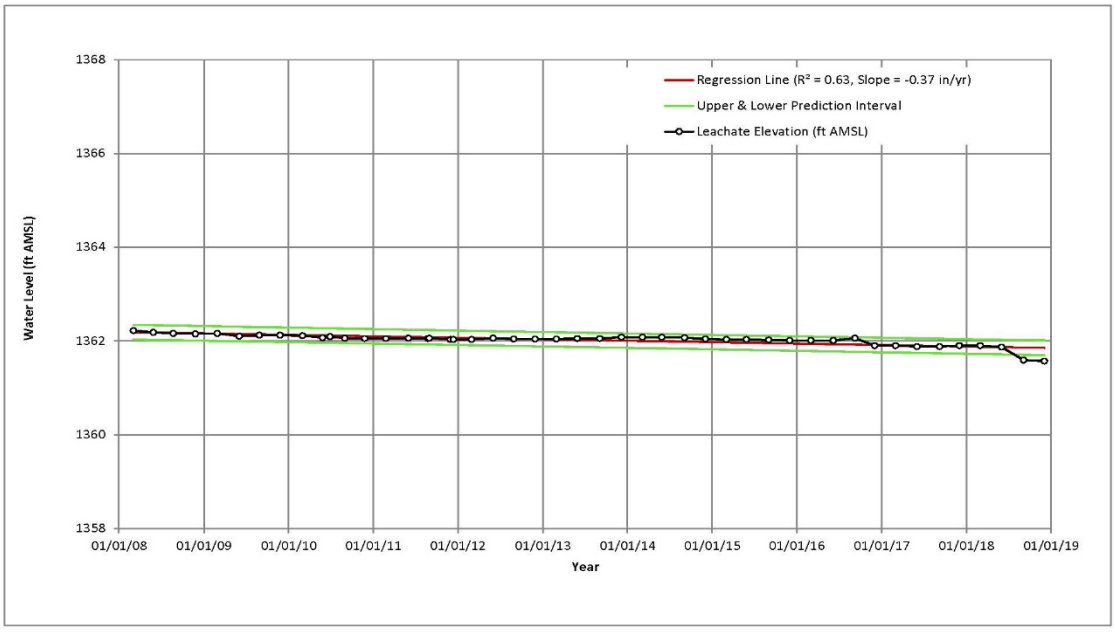


Figure A-5. 2008-2018 Leachate Elevations, Trench 5

Source: NYSERDA

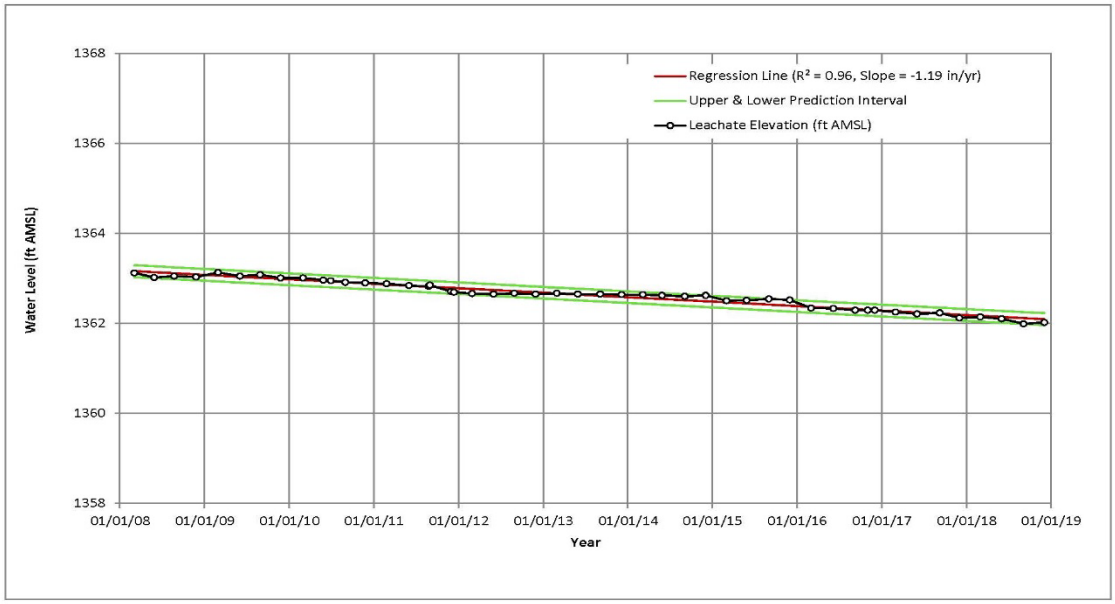


Figure A-6. 2008-2018 Leachate Elevations, Trench 8

Source: NYSERDA

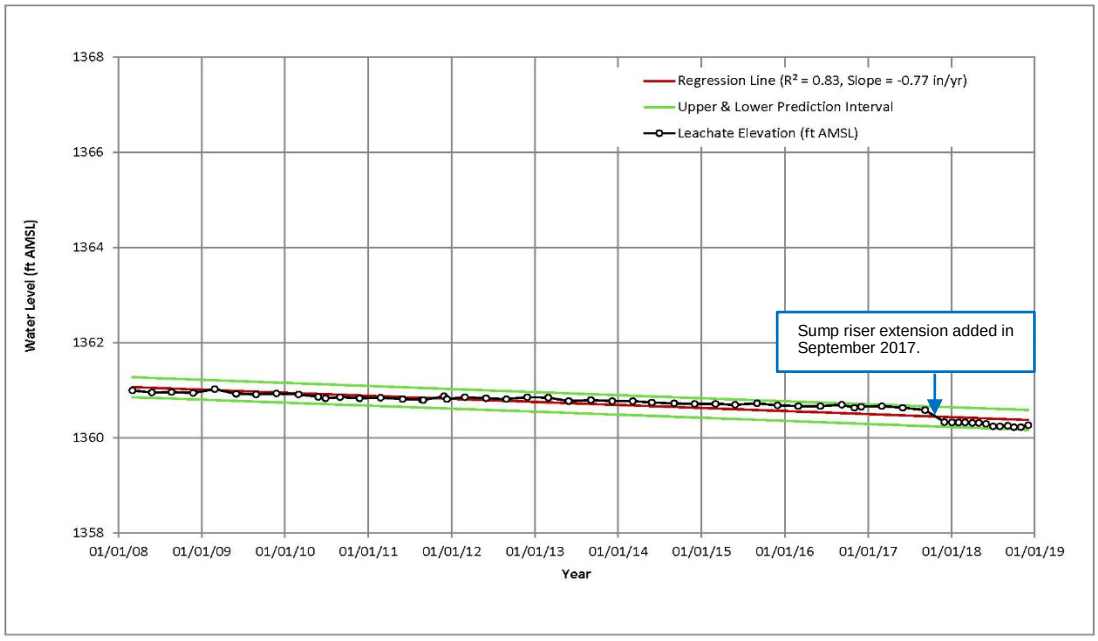


Figure A-7. 2008-2018 Leachate Elevations, Trench 9

Source: NYSERDA

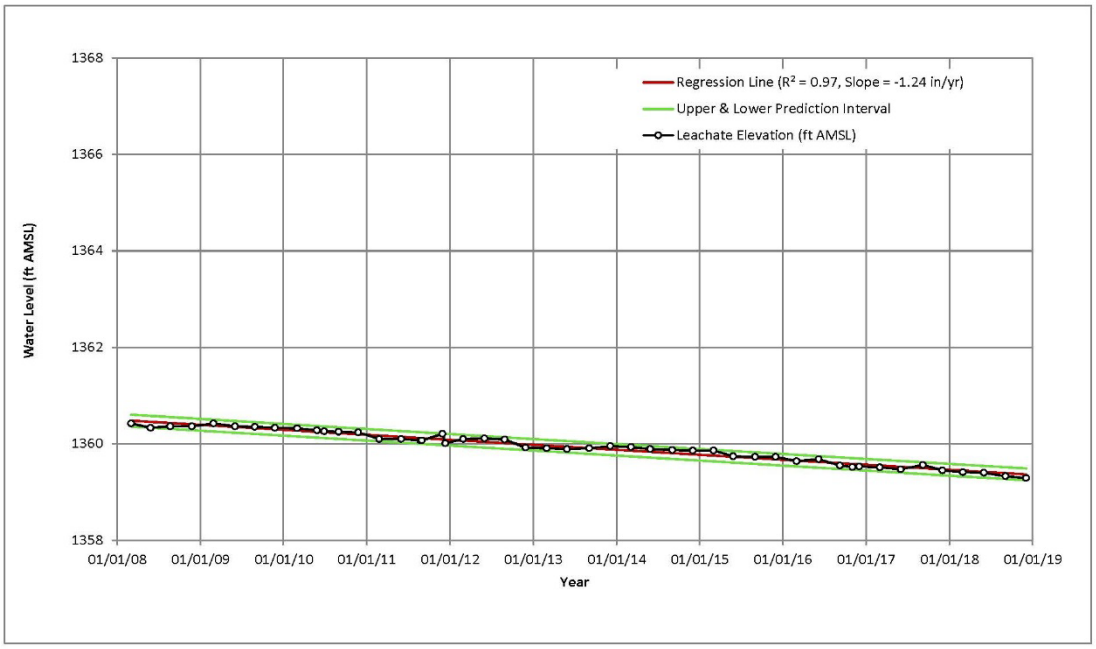


Figure A-8. 2008-2018 Leachate Elevations, Trench 10N

Source: NYSERDA

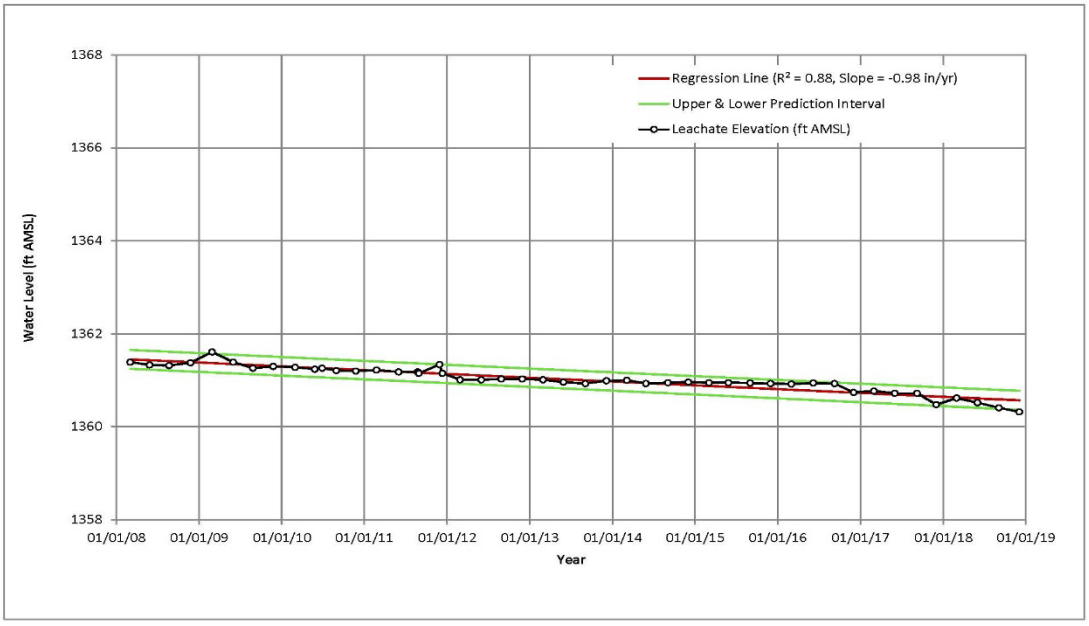


Figure A-9. 2008-2018 Leachate Elevations, Trench 10S

Source: NYSERDA

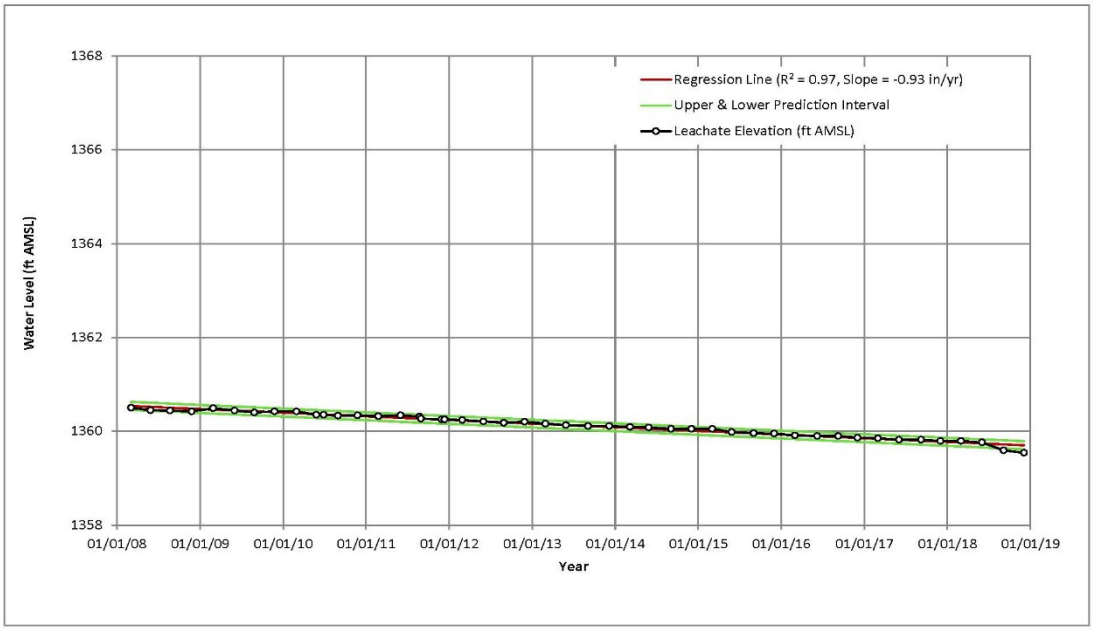


Figure A-10. 2008-2018 Leachate Elevations, Trench 11

Source: NYSERDA

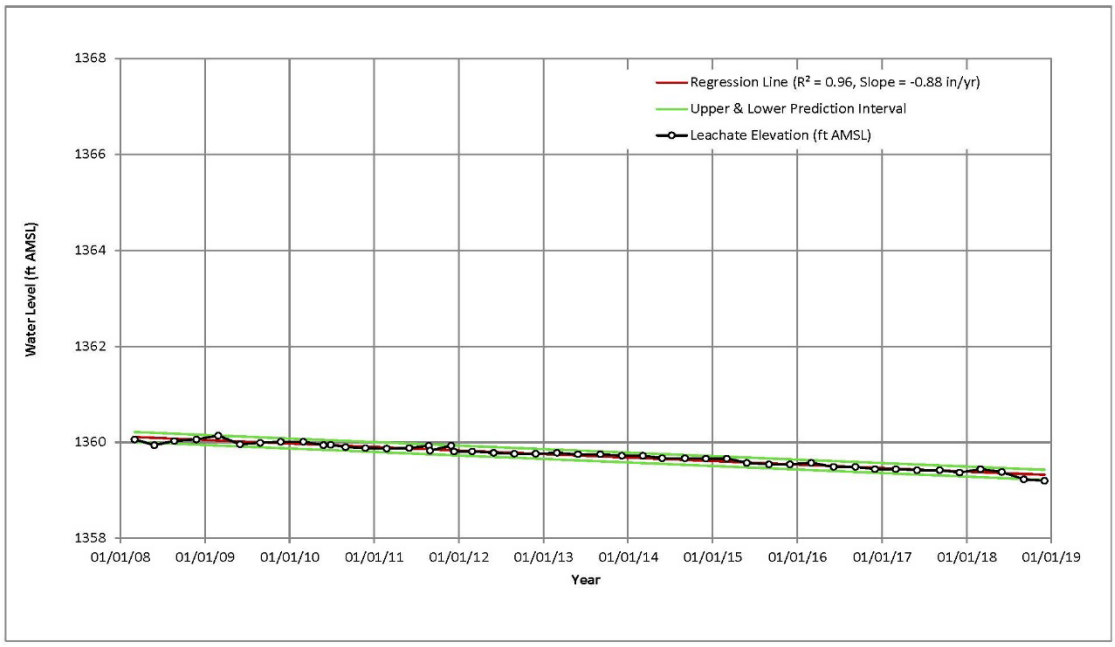


Figure A-11. 2008-2018 Leachate Elevations, Trench 12

Source: NYSERDA

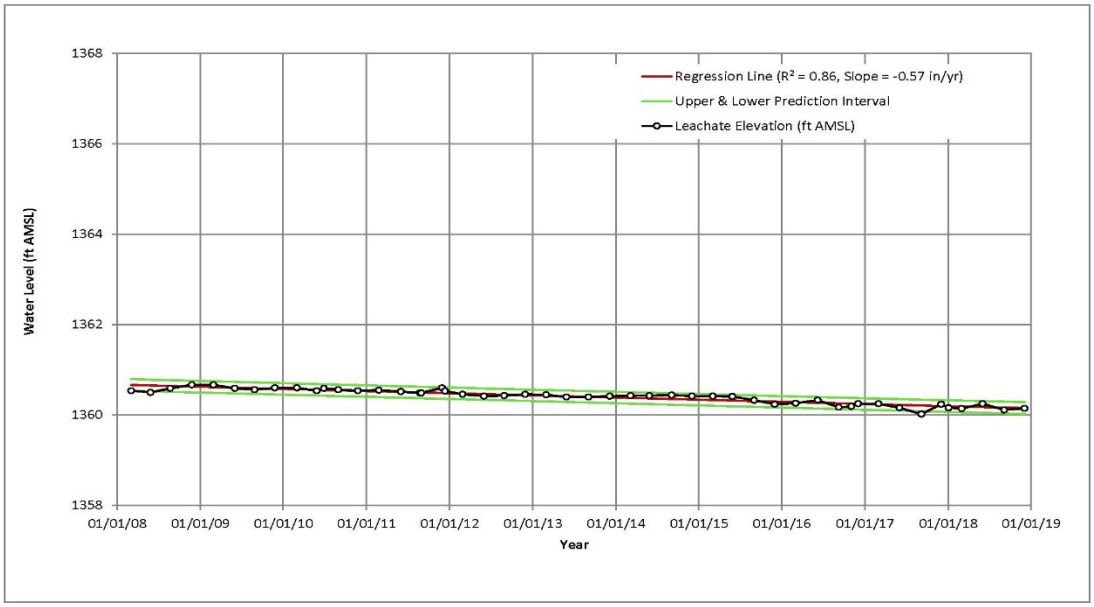
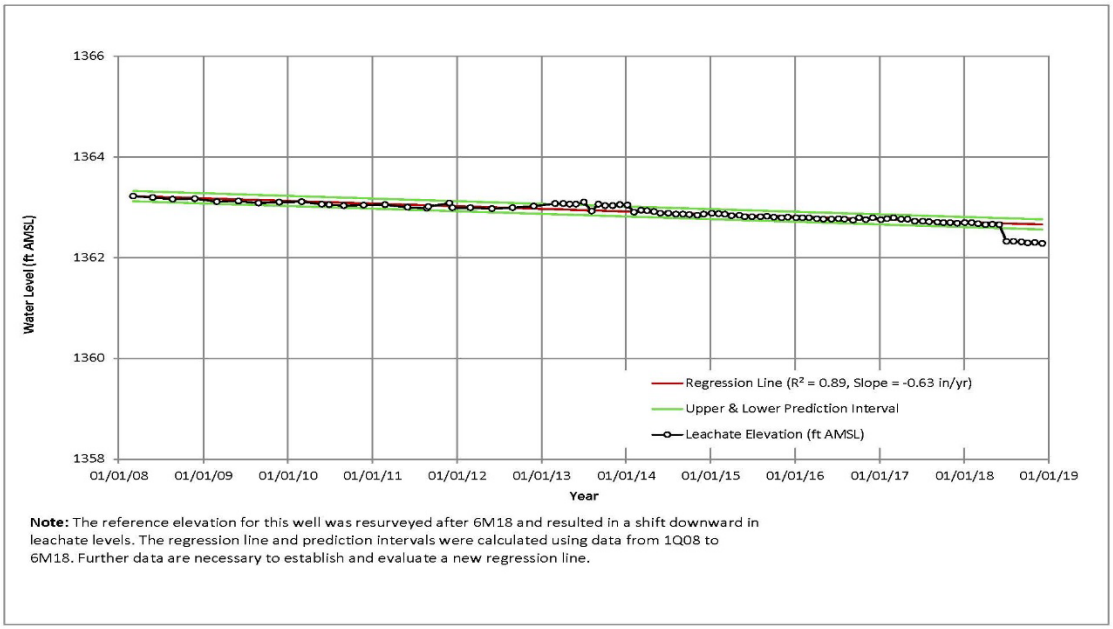


Figure A-12. 2008-2018 Leachate Elevations, Trench 13

Source: NYSERDA



Note: The reference elevation for this well was resurveyed after 6M18 and resulted in a shift downward in leachate levels. The regression line and prediction intervals were calculated using data from 1Q08 to 6M18. Further data are necessary to establish and evaluate a new regression line.

Figure A-13. Trench 14 Leachate Elevations for the Period 1998 to 2008

Source: NYSERDA

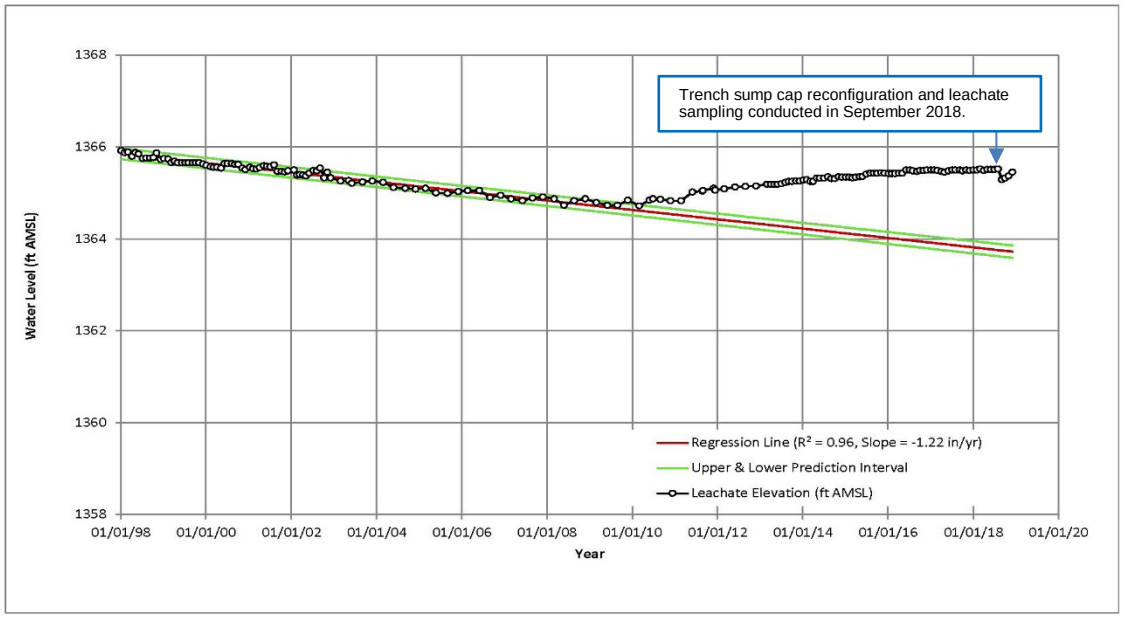


Figure A-14. Trench 14 Leachate Elevations for the Period 2011 to 2018

Source: NYSERDA

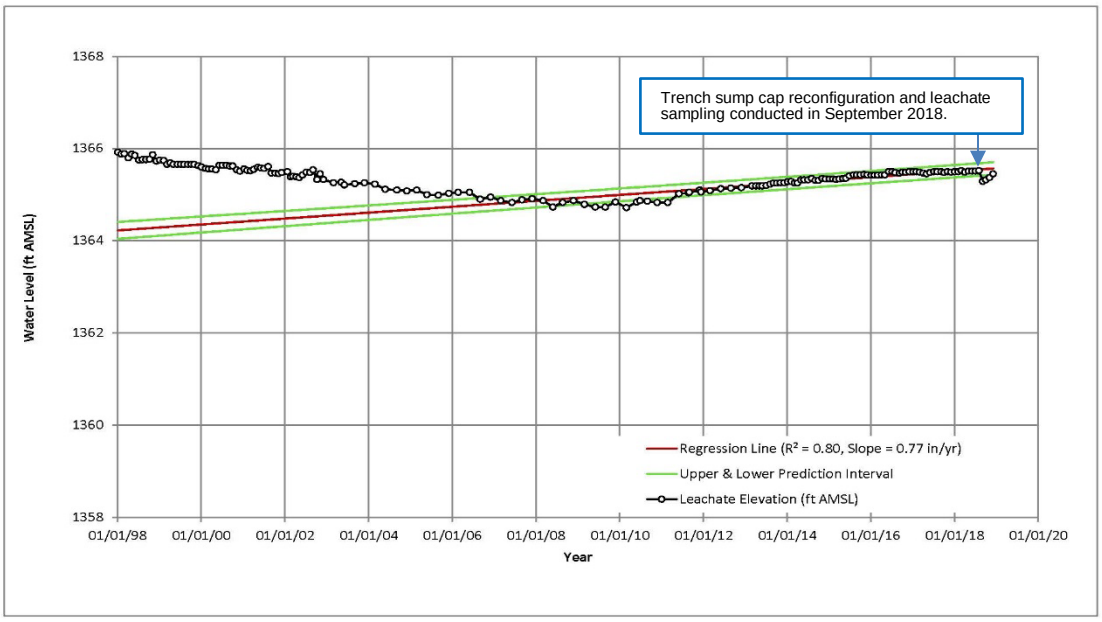
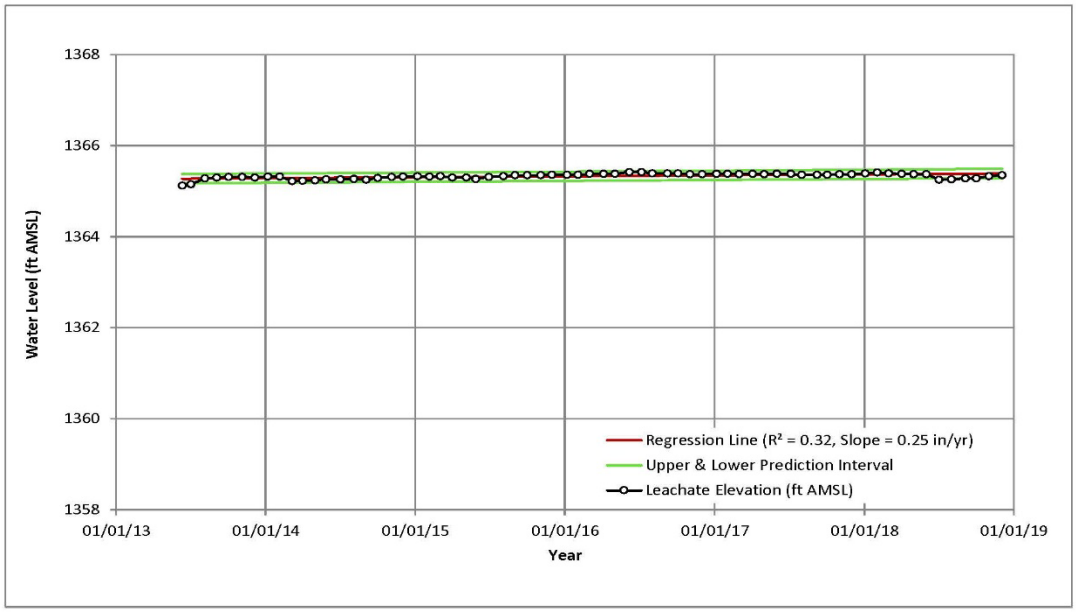


Figure A-15. 2013 to 2018 Leachate Elevations, WP-91

Source: NYSERDA



Appendix B – Groundwater Monitoring

Table B-1. Groundwater Monitoring Well Summary – SDA 1100-Series Wells

Well depths are rounded. Elevations are referenced to the NAVD of 1988 and based on well construction details.

Source: NYSERDA

Well	Well Depth (ft BGS)	Well Bottom Elevation (ft AMSL)	Screened Interval Elevations (ft AMSL)	Geologic Unit Screened
1101A	16	1362.78	1363.20 - 1373.20	W/U
1101B	30	1348.83	1349.25 - 1359.25	U
1101C	109	1269.54	1269.96 - 1284.96	L
1102A	17	1365.12	1365.54 - 1375.54	W/U
1102B	31	1351.00	1351.42 - 1361.42	U
1103A	16	1363.31	1363.73 - 1373.73	W/U
1103B	36	1343.24	1343.66 - 1358.66	U
1103C	121	1257.92	1258.34 - 1273.34	L/O
1104A	19	1356.53	1356.95 - 1371.95	W/U
1104B	36	1339.51	1339.93 - 1354.93	U
1104C	124	1251.37	1251.79 - 1261.79	L/O
1105A	21	1344.22	1344.64 - 1354.64	U
1105B	36	1329.85	1329.85 - 1344.85	U
1106A	16	1357.77	1358.19 - 1368.19	W/U
1106B	31	1343.03	1343.45 - 1353.45	U
1107A	19	1357.58	1358.00 - 1373.00	W/U
1108A	16	1364.34	1364.76 - 1374.76	W/U
1109A	16	1358.27	1358.69 - 1368.69	W/U
1109B	31	1342.43	1342.85 - 1357.85	U
1110A	20	1356.46	1356.88 - 1366.88	W/U
1111A	21	1358.63	1359.05 - 1369.05	U

Key:

L	Lacustrine Unit (Kent Recessional Sequence)
L/O	Lacustrine/Outwash - Kame Sand and Gravel (Kent Recessional Sequence)
U	Unweathered Till
W/U	Weathered/Unweathered Till

Table B-2. 2018 Groundwater Elevations – SDA 1100-Series Wells – (Ft AMSL)

Elevations are referenced to the NAVD of 1988.[c] Entries are blank for location/dates for which water elevation was not measured.

Source: NYSERDA

Well	Jan 3	Feb 1	Mar 1	Apr 2	May 1	Jun 1
1101A	1372.28	1376.59	1377.25	1377.52	1377.47	1377.35
1101B	1357.54	1356.60	1362.82	1363.18	1363.23	1363.21
1101C	1281.22	1281.48	1281.51	1281.36	1281.35	1281.62
1102A			1379.08			1378.96
1102B			1366.69			1366.59
1103A			1378.48			1378.28
1103B			1365.02			1364.77
1103C			1259.32			1259.42
1104A			1372.11			1372.56
1104B			1360.55			1360.90
1104C			1253.28			1253.33
1105A			1353.41			1355.31
1105B			1338.65			1340.54
1106A	1367.23	1370.43	1371.25	1371.53	1371.35	1370.87
1106B	N.M.[d]	1357.27	1356.96	1356.68	1356.52	1356.62
1107A			1369.17			1368.90
1108A	1370.21	1371.54	1372.51	1373.52	1374.15	1374.76
1109A	1361.32	1361.82	1361.82	1361.71	1361.63	1361.85
1109B	1361.64	1362.23	1361.96	1361.77	1361.72	1362.01
1110A			1359.66			1358.98
1111A			1376.71			1376.95

Table B-2 continued.

Well	Jul 2[e]	Aug 1	Sep 4	Oct 1	Nov 1	Dec 3
1101A	1370.45	1368.08	1374.75	1376.77	1377.72	1370.48
1101B	1354.44	1353.44	1357.49	1360.97	1363.78	1356.42
1101C	1281.33	1281.49	1281.31	1281.33	1281.60	1281.85
1102A			1375.85			1373.56
1102B			1366.56			1366.99
1103A			1377.09			1378.92
1103B			1364.37			1364.04
1103C			1259.40			1259.11
1104A			1368.80			1368.01
1104B			1354.92			1351.16
1104C			1253.17			1253.49
1105A			1349.84			1350.21
1105B			1334.35			1334.81
1106A	1365.60	1363.56	1367.74	1370.30	1371.23	1366.20
1106B	1352.73	1351.73	1357.40	1358.41	1358.96	1355.23
1107A			1369.23			1369.97
1108A	1369.42	1367.54	1370.59	1372.19	1373.34	1369.73
1109A	1359.78	1359.46	1362.17	1363.24	1363.56	1360.85
1109B	1359.81	1359.27	1362.54	1363.24	1363.56	1360.93
1110A			1359.24			1360.79
1111A			1375.75			1375.08

[c] Prior to this annual report, elevation datum was reported in Plant 29. From 2019 going forward, elevation datum will be reported in NAVD 88.

[d] N.M. – Not measured.

[e] In June 2018, the 1100-Series Well reference elevation points were surveyed in NAVD 88. This is reflected in the July through December groundwater elevations.

Table B-3. Groundwater Monitoring Well Summary – SDA Piezometers

Well depths are rounded. Elevations are referenced to the NAVD of 1988 and based on well construction details.

Source: NYSERDA

Piezometer	Well Depth (ft BGS)	Well Bottom Elevation (ft AMSL)	Screened Interval Elevations (ft AMSL)	Geologic Unit Screened
1S-91	14	1368.88	1368.88 - 1376.38	W/U
2S-91	16	1368.87	1368.87 - 1378.87	W/U
3S-91	13.5	1365.10	1365.10 - 1372.60	W/U
4S-91	11	1369.48	1369.48 - 1374.48	W/U
4D-91	29	1351.48	1351.48 - 1366.48	U
6S-91	11	1370.52	1370.52 - 1375.52	W/U
6D-91	25	1356.52	1356.52 - 1366.52	U
9S-91	9	1372.03	1372.03 - 1377.03	W/U
9D-91	25	1356.03	1356.03 - 1366.03	U
10S-91	12.4	1367.07	1367.07 - 1374.57	W/U
15S-91	13	1365.91	1365.91 - 1373.41	W/U
16D-91	25	1354.31	1354.31 - 1364.31	U
17S-91	11	1372.55	1372.55 - 1377.55	W/U
18S-91	14	1366.52	1366.52 - 1374.02	U
21S-91	16	1365.52	1365.52 - 1370.52	U
22S-91	21	1361.74	1361.74 - 1366.74	U
24S-91	18	1362.32	1362.32 - 1372.32	W/U
B-14	24	1355.89	1355.89 - 1365.89	U
P1-95[f]	7.7	1360.21	1360.21 - 1365.21	W

Key:

U	Unweathered Till
W	Weathered Till
W/U	Weathered/Unweathered Till

[f] P1-95 was installed using the direct push method.

Table B-4. Groundwater Elevations – SDA Piezometers – (Ft AMSL)

Elevations are referenced to the NAVD of 1988.[g] Entries are blank for location/dates for which water elevation was not measured.

Source: NYSERDA

Well/ Piezometer	Jan 3	Feb 1	Mar 1	Apr 2	May 1	Jun 1
1S			1380.35			1380.87
2S			1378.88			1380.48
3S	1373.95	1374.53	1375.22	1375.81	1376.08	1375.78
4S	dry	dry	dry	dry	dry	dry
4D	1357.01	1356.55	1356.00	1355.47	1355.27	1355.43
6S	dry	dry	dry	dry	dry	dry
6D	1361.99	1361.29	1360.82	1360.53	1360.34	1360.31
9S	dry	dry	dry	dry	dry	dry
9D	1357.87	1356.94	1356.91	1356.48	1356.48	1356.47
10S	1372.08	1371.47	1371.23	1371.43	1371.80	1373.32
15S	1377.90	1377.98	1378.01	1378.50	1378.41	1378.33
16D	1363.36	1363.16	1362.89	1362.65	1362.41	1362.25
17S	1382.07	1382.41	1381.47	1381.67	1382.50	1381.98
18S	1376.37	1377.00	1377.39	1378.13	1377.72	1377.94
21S	dry	dry	dry	dry	dry	dry
22S	dry	dry	dry	dry	dry	dry
24S	dry	dry	dry	dry	dry	dry
B-14	1359.48	1359.13	1358.56	1357.87	1357.60	1357.74
P1			1363.76			1363.87

Table B-4 continued.

Well/ Piezometer	Jul 2[h]	Aug 1	Sep 4	Oct 1	Nov 1	Dec 3
1S			1379.80			1380.02
2S			1379.67			1377.86
3S	1375.93	1375.82	1375.42	1375.00	1374.81	1374.90
4S	dry	dry	dry	dry	dry	dry
4D	1355.63	1356.25	1356.78	1357.33	1357.85	1357.84
6S	dry	dry	dry	dry	dry	dry
6D	1360.78	1361.64	1362.37	1362.91	1363.17	1362.59
9S	dry	dry	dry	dry	dry	dry
9D	1356.38	1356.33	1356.42	1356.41	1357.47	1357.48
10S	1375.32	1376.53	1376.54	1376.05	1374.91	1373.26
15S	1378.18	1378.01	1378.27	1377.98	1378.25	1378.15
16D	1362.28	1362.63	1363.08	1363.72	1364.49	1364.57
17S	1381.62	1380.91	1381.41	1381.50	1382.28	1382.71
18S	1377.43	1376.93	1376.22	1375.94	1375.46	1376.74
21S	dry	dry	dry	dry	dry	dry
22S	dry	dry	dry	dry	dry	dry
24S	dry	dry	dry	dry	dry	dry
B-14	1357.92	1358.51	1359.04	1359.40	1359.78	1359.89
P1			1363.11			1365.35

[g] Prior to this annual report, elevation datum was reported in Plant 29. From 2019 going forward, elevation datum will be reported in NAVD 88.

[h] In June 2018, the piezometer reference elevation points were surveyed in NAVD 88. This is reflected in the July through December 2018 groundwater elevations.

Table B-5. Groundwater Monitoring Well Summary – SDA Slit-Trench Wells

Well depths are rounded. Elevations are referenced to the NAVD of 1988 and based on well construction details.

Source: NYSERDA

Slit Trench Well	Well Depth (ft BGS)	Well Bottom Elevation (ft AMSL)	Screened Interval Elevations (ft AMSL)	Geologic Unit Screened
SMW-1	7	1373.09	1373.29 - 1375.49	W
SMW-2	6	1374.32	1374.52 - 1376.72	W
SMW-3	6	1373.76	1373.96 - 1376.16	W
SMW-4	11	1366.37	1366.57 - 1368.77	W/U
SMW-5	7	1370.97	1371.17 - 1373.17	W
SMW-6	7	1372.53	1372.73 - 1374.93	W
SMW-7	6.5	1372.73	1372.93 - 1375.13	W
SMW-8	7	1369.51	1369.71 - 1372.71	W
SMW-9	6	1369.98	1370.18 - 1372.38	W

Key:

W	Weathered Till
W/U	Weathered/Unweathered Till

Table B-6. 2018 Groundwater Elevations – SDA Slit-Trench Wells – (Ft AMSL)

Elevations are referenced to the NAVD of 1988.[i] Entries are blank for location/dates for which water elevation was not measured.

Source: NYSERDA

Well	Jan 3	Feb 1	Mar 1	Apr 2	May 1	Jun 1
SMW-1	1378.56	1379.07	1379.39	1379.23	1379.35	1380.20
SMW-2	dry	dry	dry	dry	dry	dry
SMW-3	N.M.[j]	dry	dry	dry	dry	dry
SMW-4	1371.34	1372.64	1373.74	1374.39	1374.98	1375.84
SMW-5	1375.92	1376.20	1376.33	1376.25	1376.39	1376.71
SMW-6	1379.65	1379.70	1379.53	1379.82	1379.33	1378.88
SMW-7	dry	1374.09	1374.29	1374.84	1375.10	1375.20
SMW-8	1373.54	1373.77	1373.89	1373.61	1374.06	1375.99
SMW-9	1376.44	1376.48	1376.62	1376.79	1376.59	1376.67

Well	Jul 2[k]	Aug 1	Sep 4	Oct 1	Nov 1	Dec 3
SMW-1	1379.74	1379.31	1378.95	1378.27	1378.07	1378.75
SMW-2	dry	dry	dry	dry	dry	dry
SMW-3	dry	dry	dry	dry	dry	dry
SMW-4	1375.62	1375.64	1374.70	1374.28	1373.65	1372.64
SMW-5	1376.25	1376.18	1376.17	1375.96	1375.88	1376.75
SMW-6	1378.96	1378.41	1378.50	1377.92	1380.39	1380.35
SMW-7	1375.13	1375.02	1374.80	1374.40	1374.30	1374.79
SMW-8	1376.85	1377.51	1377.16	1376.85	1375.87	1374.45
SMW-9	1376.02	1375.45	1374.76	1374.50	1374.94	1376.42

[i] Prior to this annual report, elevation datum was reported in Plant 29. From 2019 going forward, elevation data will be reported in NAVD 88.

[j] N.M. – Not measured.

[k] In June 2018, the Slit-Trench Well reference elevation points were surveyed in NAVD 88. This is reflected in the July through December 2018 groundwater elevations.

Figure B-1. First Quarter 2018 Weathered Lavery Till Groundwater Contour Map

Source: NYSERDA

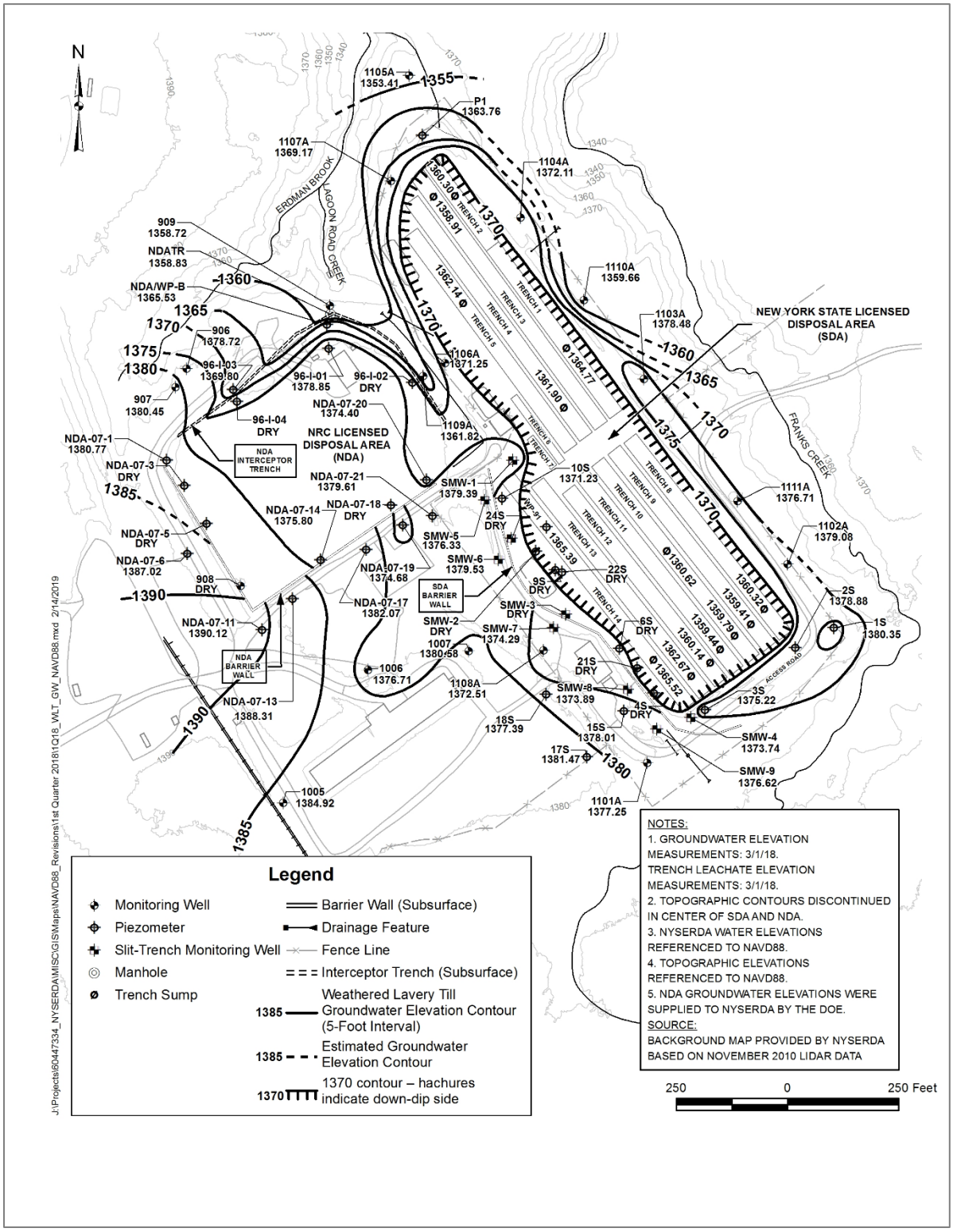


Figure B-2. First Quarter 2018 Kent Recessional Sequence Groundwater Contour Map

Source: NYSERDA

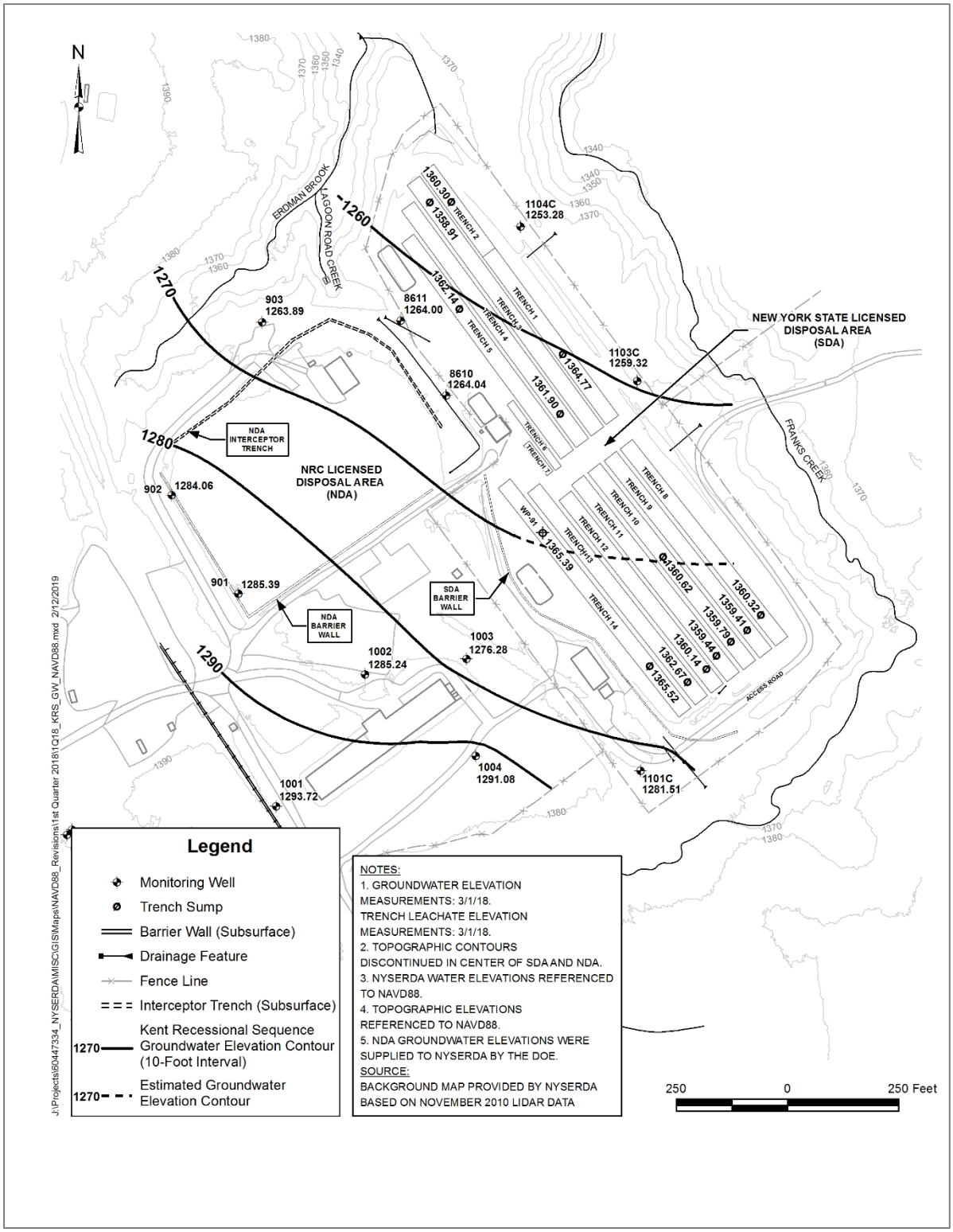


Figure B-3. Second Quarter 2018 Weathered Lavery Till Groundwater Contour Map

Source: NYSERDA

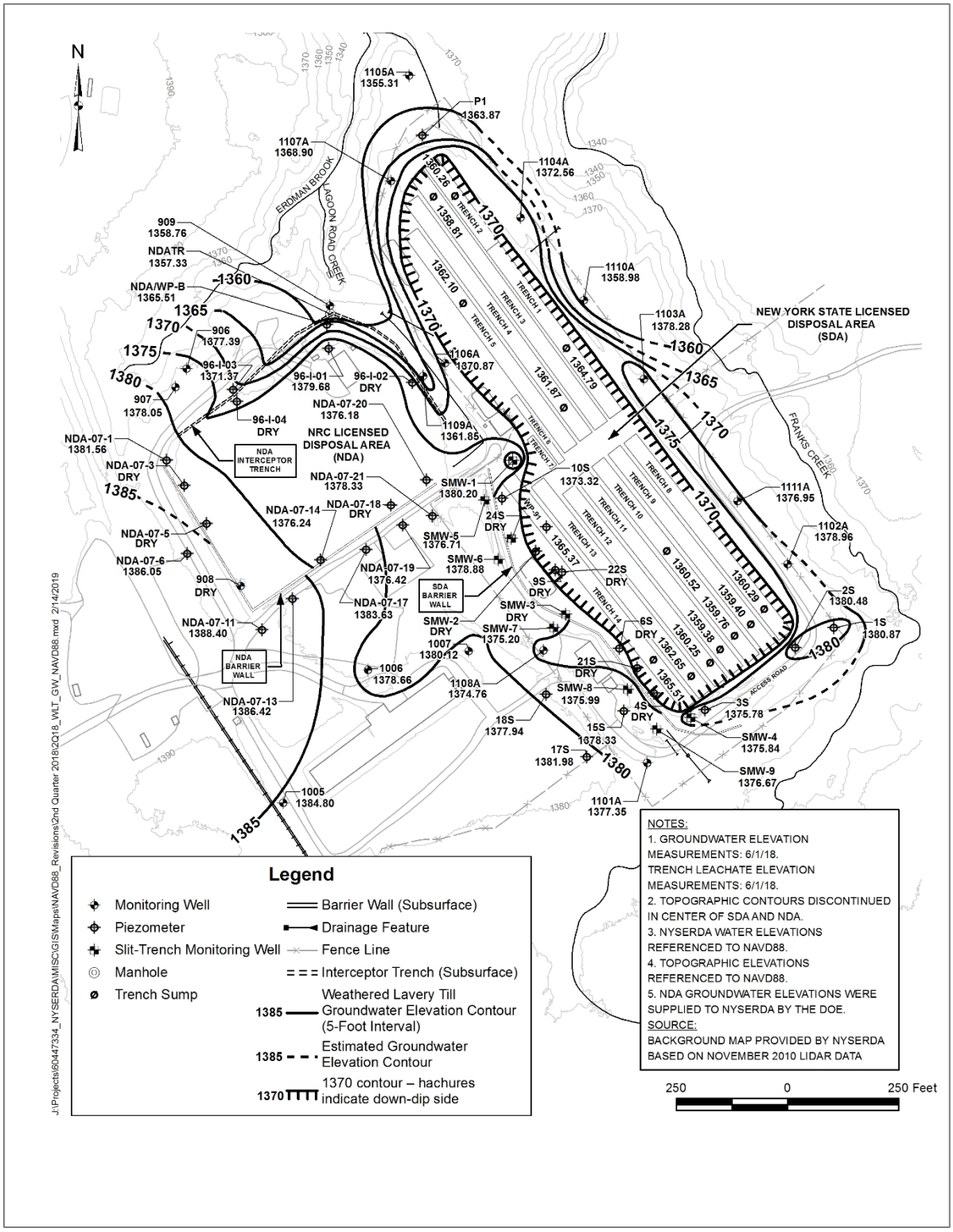


Figure B-4. Second Quarter 2018 Kent Recessional Sequence Groundwater Contour Map

Source: NYSERDA

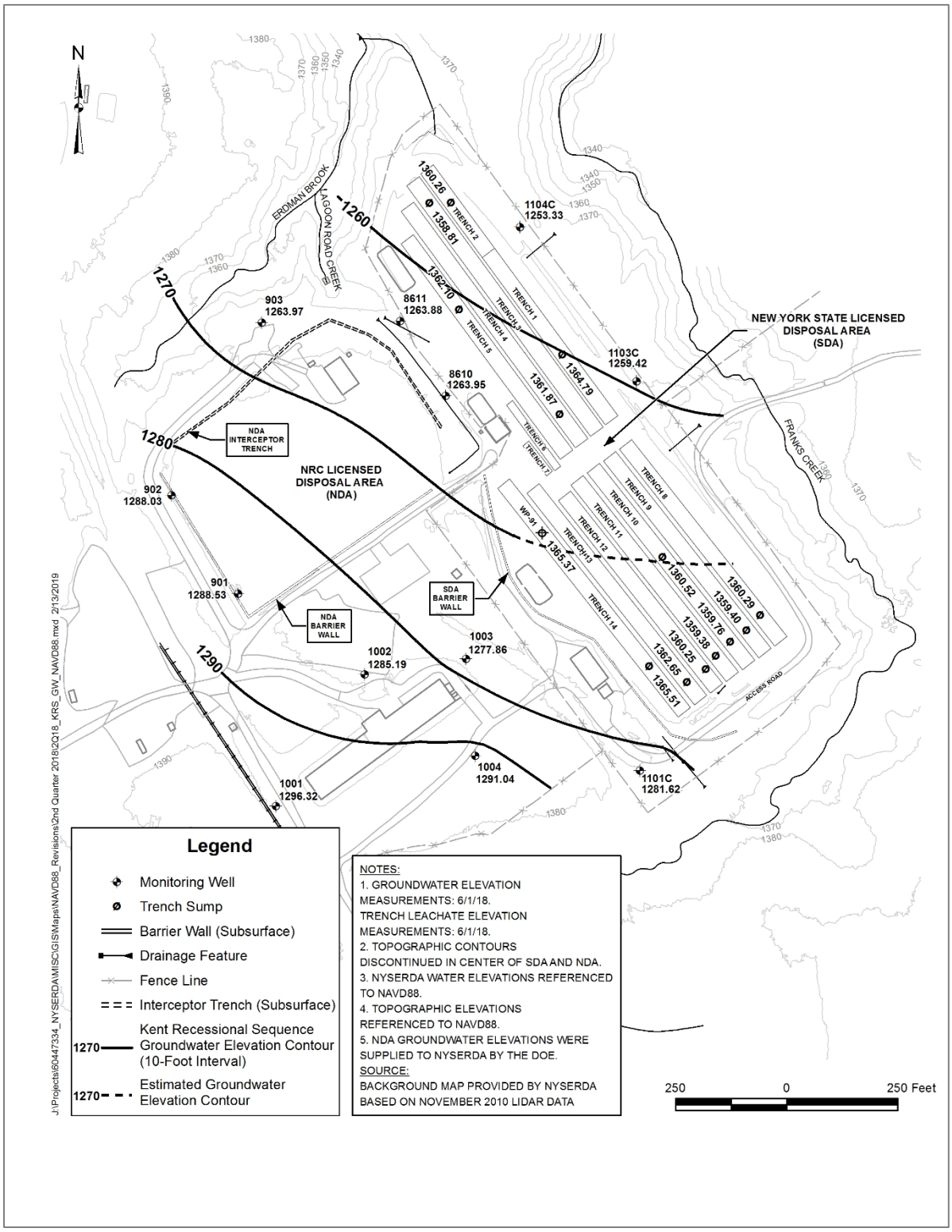


Figure B-5. Third Quarter 2018 Weathered Lavery Till Groundwater Contour Map

Source: NYSERDA

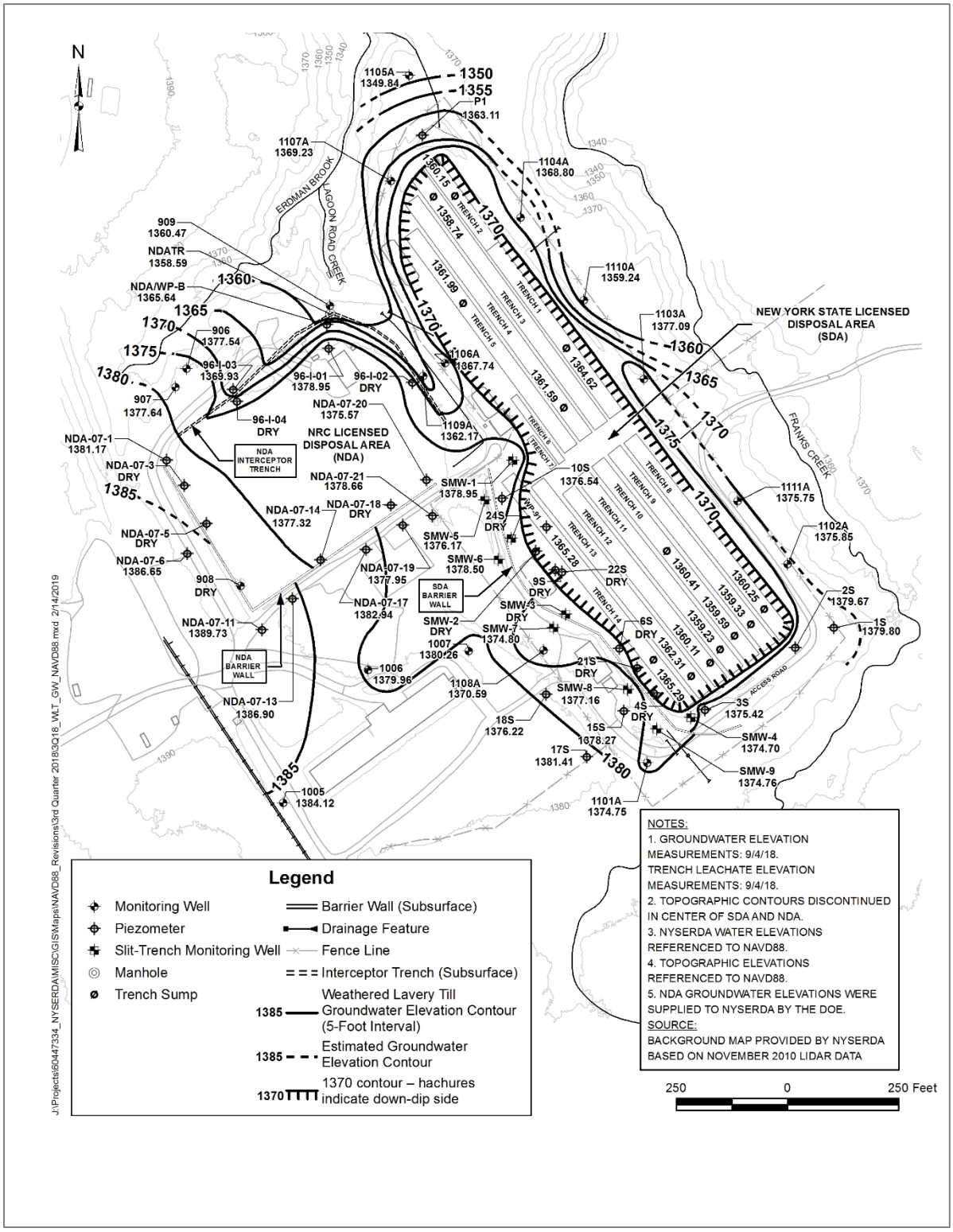


Figure B-6. Third Quarter 2018 Kent Recessional Sequence Groundwater Contour Map

Source: NYSERDA

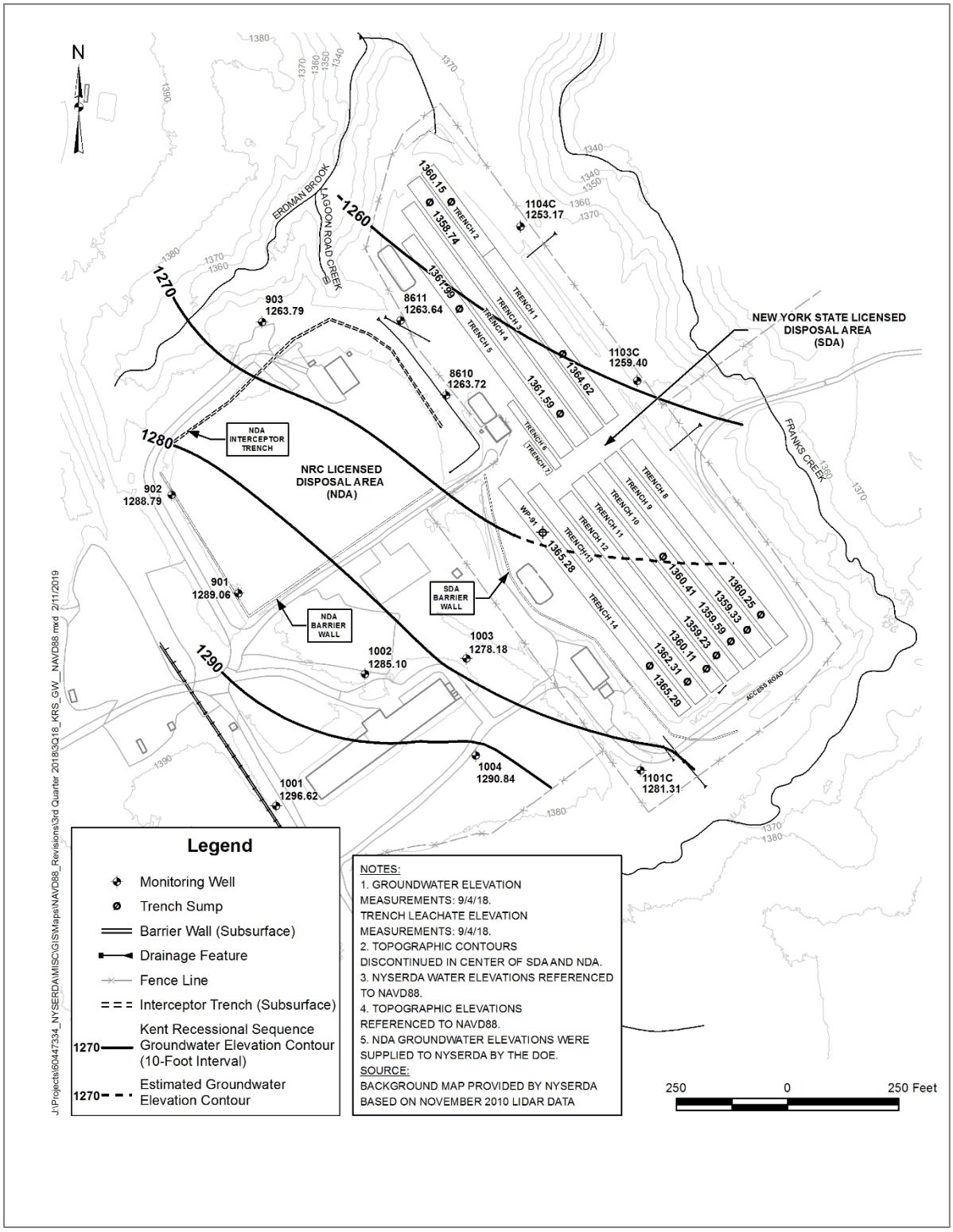


Figure B-7. Fourth Quarter 2018 Weathered Lavery Till Groundwater Contour Map

Source: NYSERDA

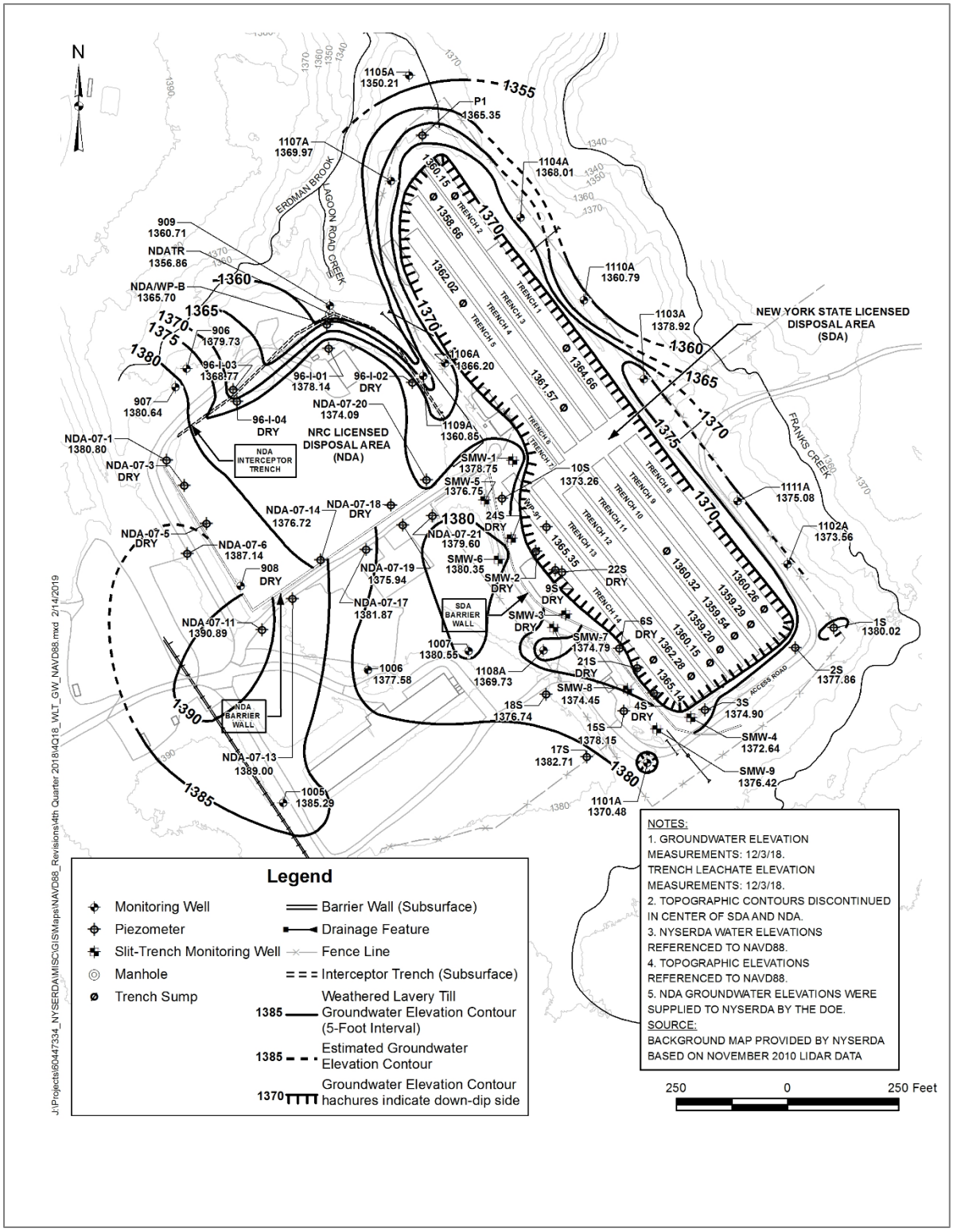


Figure B-8. Fourth Quarter 2018 Kent Recessional Sequence Groundwater Contour Map

Source: NYSERDA

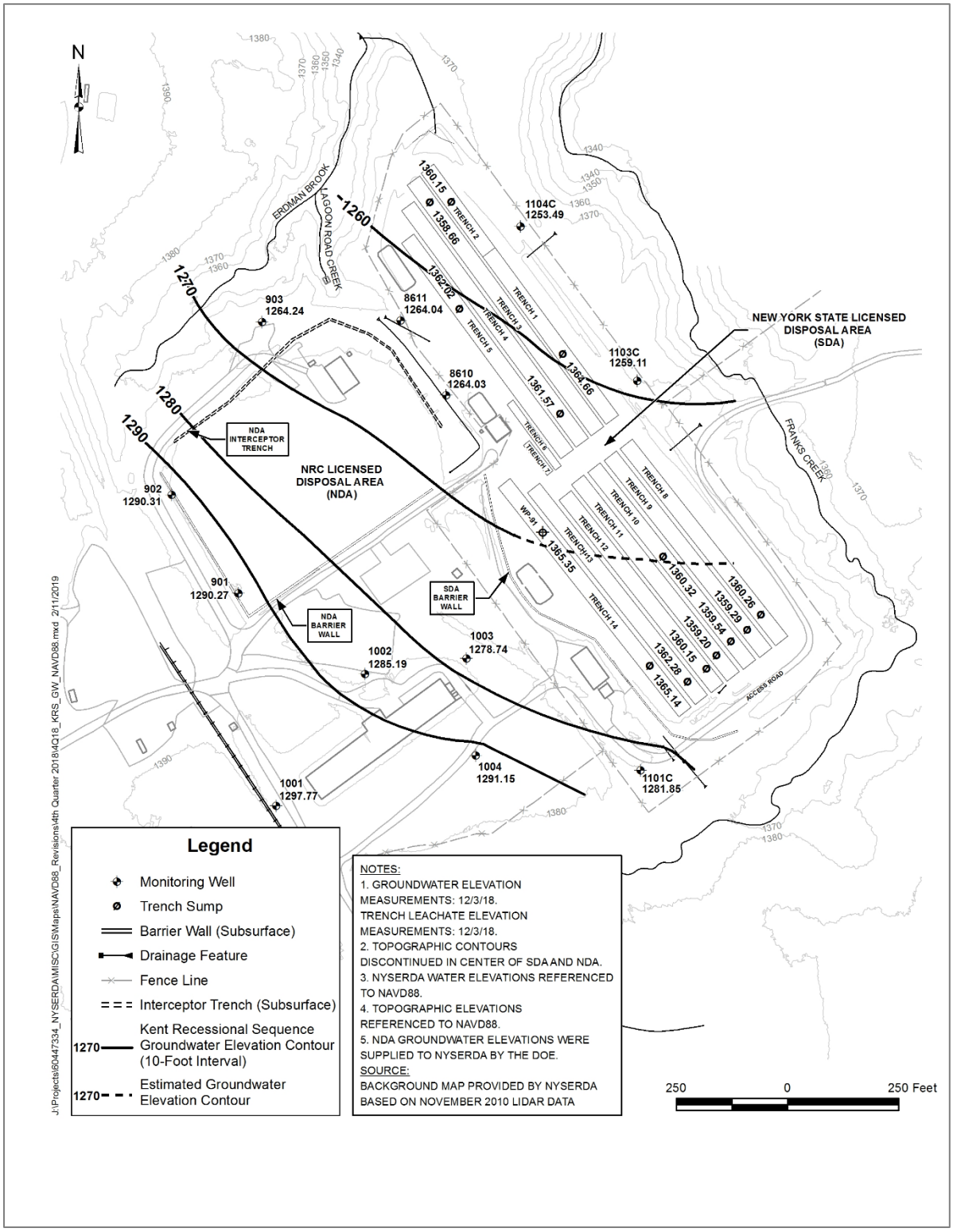


Table B-7. Semiannual Groundwater Sampling Performed in 2018

Source: NYSERDA

Well	Gross Alpha (July)	Gross Alpha (Nov)	Gross Beta (July)	Gross Beta (Nov)	Tritium (July)	Tritium (Nov)	Field Water Quality Parameters (July)	Field Water Quality Parameters (Nov)
1101A	✓	✓	✓	✓	✓	✓	✓	✓
1101B	✓	✓	✓	✓	✓	✓	✓	✓
1101C	✓	✓	✓	✓	✓	✓	✓	✓
1102A	✓	✓	✓	✓	✓	✓	✓	✓
1102B	✓	✓	✓	✓	✓	✓	✓	Insufficient Volume
1103A	✓	✓	✓	✓	✓	✓	✓	✓
1103B	✓	✓	✓	✓	✓	✓	✓	✓
1103C	✓	✓	✓	✓	✓	✓	Insufficient Volume	Insufficient Volume
1104A	✓	✓	✓	✓	✓	✓	✓	✓
1104B	✓	✓	✓	✓	✓	✓	✓	✓
1104C	✓	✓	✓	✓	✓	✓	Insufficient Volume	Insufficient Volume
1105A	✓	✓	✓	✓	✓	✓	✓	✓
1105B	✓	✓	✓	✓	✓	✓	✓	✓
1106A	✓	✓	✓	✓	✓	✓	✓	✓
1106B	✓	✓	✓	✓	✓	✓	✓	✓
1107A	✓	✓	✓	✓	✓	✓	✓	✓
1108A	✓	✓	✓	✓	✓	✓	✓	✓
1109A	✓	✓	✓	✓	✓	✓	Insufficient Volume	✓
1109B	✓	✓	✓	✓	✓	✓	✓	✓
1110A	✓	✓	✓	✓	✓	✓	✓	✓
1111A	✓	✓	✓	✓	✓	✓	✓	✓

Table B-8. Annual Groundwater Sampling Performed in 2018

Source: NYSERDA

Well	Gamma Emitters	Beta Emitters				VOCs
		C-14	I-129	Sr-90	Tc-99	
1101A	✓	✓	✓	✓	✓	✓
1101B	✓	✓	✓	✓	✓	✓
1101C	✓	✓	✓	✓	✓	✓
1102A	✓	✓	✓	✓	✓	✓
1102B	✓	✓	✓	✓	✓	✓
1103A	✓	✓	✓	✓	✓	✓
1103B	✓	✓	✓	✓	✓	✓
1103C	Insufficient Volume	✓	Insufficient Volume	Insufficient Volume	Insufficient Volume	✓
1104A	✓	✓	✓	✓	✓	✓
1104B	✓	✓	✓	✓	✓	✓
1104C	Insufficient Volume	Insufficient Volume	✓	✓	✓	✓
1105A	✓	✓	✓	✓	✓	✓
1105B	✓	✓	✓	✓	✓	✓
1106A	✓	✓	✓	✓	✓	✓
1106B	✓	✓	✓	✓	✓	✓
1107A	✓	✓	✓	✓	✓	✓
1108A	✓	✓	✓	✓	✓	✓
1109A	✓	✓	✓	✓	✓	✓
1109B	✓	✓	✓	✓	✓	✓
1110A	✓	✓	✓	✓	✓	✓
1111A	✓	✓	✓	✓	✓	✓

Table B-9. 2018 Groundwater Radiological Data – SDA 1100-Series Wells

Blank entries indicate a result was not obtained, typically due to insufficient sample volume. Duplicate samples on the same date indicate a field duplicate was collected and analyzed.

Source: NYSERDA

Sample Location	Sample Date	Gross Alpha (pCi/L)	Q	Gross Beta (pCi/L)	Q	Tritium (pCi/L)	Q
1101A	07/23/18	7.02E-02±3.26E+00	UJ	3.10E+00±2.00E+00	J	3.87E+01±5.20E+01	U
1101A	11/19/18	3.13E+00±2.39E+00	UJ	2.57E+00±9.74E-01		1.71E+01±5.16E+01	U
1101B	07/17/18	5.06E+00±2.78E+00	J	4.41E+00±1.82E+00		-4.95E+00±4.85E+01	U
1101B	11/19/18	1.47E+00±1.47E+00	U	1.27E+00±7.07E-01	J	-1.35E+01±4.93E+01	U
1101C	07/18/18	1.88E+00±1.67E+00	U	2.85E+00±1.06E+00		2.39E+01±4.97E+01	U
1101C	11/15/18	1.26E+00±1.28E+00	U	5.20E-01±6.02E-01	U	-2.43E+01±5.04E+01	U
1102A	07/23/18	3.44E+00±3.50E+00	UJ	4.75E+00±2.32E+00		7.79E+01±5.17E+01	U
1102A	11/15/18	1.95E+00±2.32E+00	UJ	3.57E+00±1.44E+00		6.67E+01±5.89E+01	U
1102B	07/23/18	1.36E+00±2.70E+00	UJ	-3.63E-01±1.52E+00	U	1.04E+01±4.94E+01	U
1102B	11/15/18	-3.17E-02±1.30E+00	U	1.71E+00±9.18E-01	J	-3.20E+01±5.08E+01	U
1103A	07/23/18	6.18E+00±6.42E+00	UJ	5.63E-01±3.04E+00	UJ	7.97E+01±5.17E+01	U
1103A	11/15/18	6.37E+00±4.01E+00	J	2.76E+00±1.96E+00	U	3.06E+01±5.23E+01	U
1103B	07/23/18	2.00E+00±2.46E+00	UJ	1.63E+00±1.53E+00	U	1.35E+01±5.01E+01	U
1103B	11/15/18	1.72E+00±1.94E+00	UJ	2.25E+00±1.11E+00		-3.74E+01±5.02E+01	U
1103C	07/16/18	4.69E+00±3.10E+00	J	4.30E+00±2.03E+00		-2.25E+01±4.87E+01	U
1103C	11/13/18	5.30E-02±1.16E+00	U	2.10E+00±7.20E-01		-2.25E+00±4.91E+01	U
1104A	07/17/18	2.19E+00±2.70E+00	UJ	2.43E+00±1.39E+00	J	5.99E+01±5.04E+01	U
1104A	11/14/18	2.70E+00±2.42E+00	UJ	2.71E+00±1.28E+00		6.31E+00±5.21E+01	U
1104B	07/18/18	2.53E+00±2.18E+00	UJ	9.96E-01±1.11E+00	U	1.94E+01±5.04E+01	U
1104B	11/14/18	1.77E+00±1.51E+00	U	1.04E+00±7.75E-01	U	-1.22E+01±4.99E+01	U
1104C	07/16/18	2.86E+00±1.02E+01	UJ	-3.17E+00±4.42E+00	UJ	4.50E-01±4.83E+01	U
1104C	11/13/18	7.85E+00±9.18E+00	UJ	2.05E+00±3.61E+00	UJ	-2.12E+01±4.80E+01	U
1105A	07/17/18	4.21E+00±2.50E+00	J	1.91E+00±1.16E+00	J	7.34E+01±5.24E+01	U
1105A	11/14/18	2.38E+00±1.88E+00	U	1.13E+00±9.14E-01	U	3.96E+01±5.30E+01	U
1105B	07/17/18	3.28E+00±2.29E+00	UJ	2.15E-01±9.50E-01	U	-4.59E+01±4.78E+01	U
1105B	11/14/18	8.84E-01±1.68E+00	U	1.54E+00±7.89E-01	J	-5.18E+01±4.91E+01	UJ
1106A	07/18/18	2.13E+00±2.33E+00	UJ	1.17E+00±1.45E+00	U	1.86E+02±5.40E+01	

Table B-9 continued.

Sample Location	Sample Date	Gross Alpha (pCi/L)	Q	Gross Beta (pCi/L)	Q	Tritium (pCi/L)	Q
1106A	11/14/18	3.46E+00±2.65E+00	UJ	1.55E+00±1.36E+00	U	1.79E+02±5.68E+01	
1106B	07/18/18	1.90E+00±2.55E+00	UJ	2.06E+00±1.49E+00	U	-2.57E+01±4.93E+01	U
1106B	11/14/18	2.16E+00±2.16E+00	UJ	7.51E-01±1.15E+00	U	-5.86E+01±4.95E+01	UJ
1106B	11/14/18	4.60E+00±2.70E+00	J	4.06E+00±1.30E+00		-2.43E+01±5.18E+01	U
1107A	07/18/18	0.00E+00±8.01E+00	UJ	4.00E+00±3.97E+00	UJ	2.86E+03±1.05E+02	
1107A	11/14/18	4.94E+00±6.64E+00	UJ	1.56E+01±4.34E+00	J	2.85E+03±1.04E+02	
1108A	07/18/18	5.13E+00±3.88E+00	UJ	2.62E+00±1.65E+00	J	4.55E+01±5.21E+01	U
1108A	11/14/18	4.64E+00±2.95E+00	J	2.02E+00±1.22E+00	J	-4.50E-01±5.11E+01	U
1109A	07/17/18	3.19E+00±3.31E+00	UJ	2.15E+00±1.77E+00	U	2.40E+02±5.65E+01	
1109A	11/14/18	-4.52E-01±1.93E+00	UJ	2.98E+00±1.52E+00	J	2.15E+02±5.78E+01	
1109B	07/18/18	2.16E+00±2.36E+00	UJ	1.46E+00±1.12E+00	U	1.68E+02±5.41E+01	
1109B	07/18/18	2.06E+00±2.34E+00	UJ	3.38E+00±1.52E+00		1.77E+02±5.41E+01	
1109B	11/14/18	1.02E+00±1.31E+00	U	6.38E-01±7.63E-01	U	1.66E+02±5.63E+01	
1110A	07/16/18	1.79E+01±8.53E+00	J	1.87E+00±3.59E+00	UJ	4.59E+01±5.06E+01	U
1110A	11/13/18	1.23E+01±6.51E+00	J	5.39E+00±2.97E+00	J	3.51E+01±5.37E+01	U
1111A	07/23/18	8.94E+00±5.75E+00	J	1.20E+00±2.81E+00	UJ	7.52E+01±5.19E+01	U
1111A	11/15/18	1.66E+00±3.50E+00	UJ	2.01E+00±1.68E+00	U	3.51E+01±5.27E+01	U

Table B-9 continued.

Sample Location	Sample Date	Actinium 228 (pCi/L)	Q	Bismuth-214 (pCi/L)	Q	Carbon-14 (pCi/L)	Q
1101A	07/23/18	2.16E+01±3.45E+01	U	6.15E+01±2.52E+01		2.28E+00±6.03E+00	U
1101B	07/17/18	3.42E+00±5.04E+00	U	8.25E+01±2.72E+01		1.68E+00±6.03E+00	U
1101C	07/18/18	2.28E+01±4.27E+01	U	5.15E+01±2.76E+01	J	6.00E-01±5.95E+00	U
1102A	07/23/18	1.29E+01±1.61E+01	U	3.37E+01±2.15E+01	J	1.74E+00±5.99E+00	U
1102B	07/23/18	5.99E+00±1.64E+01	U	9.74E+00±4.10E+01	U	1.56E+00±6.04E+00	U
1103A	07/23/18	1.92E+01±3.63E+01	U	-9.34E-01±3.89E+01	U	1.98E+00±6.03E+00	U
1103B	07/23/18	1.54E+01±2.33E+01	U	3.43E+01±2.20E+01	J	3.72E+00±6.10E+00	U
1103C	07/16/18					-6.00E-02±5.93E+00	U
1104A	07/17/18	2.64E+01±4.69E+01	U	-1.49E+01±3.37E+01	U	8.41E-01±5.96E+00	U
1104B	07/18/18	-4.26E+01±4.25E+01	UJ	6.14E+01±1.75E+01		1.32E+00±5.97E+00	U
1104C	07/16/18						
1105A	07/17/18	1.01E+01±2.87E+01	U	3.18E+01±1.67E+01	J	2.76E+00±6.03E+00	U
1105B	07/17/18	5.92E-01±1.41E+00	U	2.40E+01±1.58E+01	J	2.76E+00±6.04E+00	U
1106A	07/18/18	1.52E+01±3.69E+01	U	1.07E+00±9.55E-01	U	2.76E+00±6.03E+00	U
1106B	07/18/18	1.36E+01±3.49E+01	U	6.56E+01±2.20E+01		-6.00E-02±5.90E+00	U
1107A	07/18/18	1.12E+01±2.29E+01	U	-2.00E+00±9.02E+00	U	1.14E+00±5.96E+00	U
1108A	07/18/18	1.23E+01±2.93E+01	U	6.23E+01±2.28E+01		3.96E+00±6.09E+00	U
1109A	07/17/18	-1.59E+01±3.37E+01	U	7.52E+01±2.23E+01		2.76E+00±6.04E+00	U
1109B	07/18/18	1.41E+01±1.42E+01	U	-2.34E+01±1.38E+01	UJ	-1.44E+00±5.85E+00	U
1109B	07/18/18	1.77E+00±3.61E+01	U	1.03E+02±2.13E+01		1.32E+00±5.99E+00	U
1110A	07/16/18	-1.36E+00±2.55E+00	U	4.62E+01±2.07E+01		2.94E+00±6.03E+00	U
1111A	07/23/18	8.90E+00±1.78E+01	U	9.94E+00±8.36E+00	U	1.56E+00±6.01E+00	U

Table B-9 continued.

Sample Location	Sample Date	Cesium-134 (pCi/L)	Q	Cesium-137 (pCi/L)	Q	Cobalt-57 (pCi/L)	Q
1101A	07/23/18	8.32E+00±4.55E+00	U	-4.55E+00±1.38E+01	UJ	-2.52E+00±9.08E+00	U
1101B	07/17/18	5.53E+00±4.47E+00	U	-7.84E+00±1.38E+01	UJ	4.31E+00±7.31E+00	U
1101C	07/18/18	4.88E+00±8.28E+00	U	0.00E+00±5.90E+00	UJ	3.48E+00±5.91E+00	U
1102A	07/23/18	5.38E+00±4.23E+00	U	-2.41E+00±1.04E+01	U	0.00E+00±1.49E+00	UJ
1102B	07/23/18	1.07E+01±2.02E+01	U	3.71E+00±7.19E+00	U	1.07E+00±5.56E+00	U
1103A	07/23/18	3.29E+00±6.77E+00	U	6.54E+00±1.31E+01	UJ	0.00E+00±1.69E+00	UJ
1103B	07/23/18	7.56E+00±1.06E+01	U	-1.22E+01±1.40E+01	UJ	-4.85E+00±9.42E+00	U
1103C	07/16/18						
1104A	07/17/18	8.09E+00±1.49E+01	U	7.38E-01±1.15E+01	UJ	0.00E+00±3.20E+00	UJ
1104B	07/18/18	9.93E+00±1.39E+01	U	3.91E+00±1.19E+01	UJ	0.00E+00±1.18E+00	UJ
1104C	07/16/18						
1105A	07/17/18	-3.00E+00±5.29E+00	U	3.91E+00±1.07E+01	U	-2.31E+00±5.78E+00	U
1105B	07/17/18	4.92E+00±1.05E+01	U	0.00E+00±5.57E+00	UJ	2.70E+00±7.91E+00	U
1106A	07/18/18	-3.98E+00±7.10E+00	U	3.67E-01±1.10E+01	U	3.10E+00±7.68E+00	U
1106B	07/18/18	-5.01E+00±1.86E+01	U	-1.94E+00±1.55E+01	UJ	7.08E-01±5.58E+00	U
1107A	07/18/18	7.83E+00±5.67E+00	U	1.66E+00±8.08E+00	U	0.00E+00±2.62E+00	UJ
1108A	07/18/18	1.68E+00±2.25E+00	U	7.91E-01±1.07E+01	U	3.72E-01±5.52E+00	U
1109A	07/17/18	-9.87E-01±1.88E+00	U	2.14E+00±9.18E+00	U	2.46E+00±7.56E+00	U
1109B	07/18/18	2.63E+00±1.89E+00	U	-1.16E+00±1.04E+01	U	-3.07E+00±6.85E+00	U
1109B	07/18/18	7.56E-01±1.16E+00	U	-1.16E+00±1.27E+01	U	2.79E+00±7.48E+00	U
1110A	07/16/18	8.20E+00±1.21E+01	U	-4.55E+00±1.36E+01	UJ	0.00E+00±2.93E+00	UJ
1111A	07/23/18	8.62E-01±1.28E+01	U	-4.37E-01±8.87E+00	U	3.50E+00±7.85E+00	U

Table B-9 continued.

Sample Location	Sample Date	Cobalt-60 (pCi/L)	Q	Iodine-129 (pCi/L)	Q	Lead-212 (pCi/L)	Q
1101A	07/23/18	8.02E+00±6.29E+00	U	5.25E-01±3.54E-01	UJ	-1.87E+00±2.24E+01	U
1101B	07/17/18	2.32E-01±9.90E+00	U	5.85E-02±4.49E-01	UJ	-2.71E+00±1.57E+01	U
1101C	07/18/18	6.22E+00±3.32E+00	U	6.52E-02±3.06E-01	UJ	-1.34E+01±2.25E+01	U
1102A	07/23/18	2.52E+00±7.26E+00	U	2.74E-01±3.95E-01	UJ	-2.19E+00±1.61E+01	U
1102B	07/23/18	4.05E+00±3.00E+00	U	4.81E-01±3.69E-01	UJ	2.17E+00±1.38E+01	U
1103A	07/23/18	6.21E+00±4.39E+00	U	4.58E-01±4.11E-01	UJ	-1.87E+00±2.08E+01	U
1103B	07/23/18	7.46E+00±7.28E+00	U	2.47E-01±3.53E-01	UJ	2.59E+01±1.82E+01	U
1103C	07/16/18						
1104A	07/17/18	4.92E+00±3.11E+00	U	1.26E-01±3.92E-01	UJ	-2.80E+00±2.34E+01	U
1104B	07/18/18	8.89E+00±6.83E+00	J	1.99E-01±3.35E-01	UJ	-8.50E+00±1.99E+01	U
1104C	07/16/18			1.24E+00±1.29E+00	UJ		
1105A	07/17/18	-9.20E-01±1.83E+00	U	3.05E-01±5.73E-01	UJ	5.17E+00±1.50E+01	U
1105B	07/17/18	2.83E+00±2.38E+00	U	-5.40E-02±5.12E-01	UJ	-1.02E+01±1.58E+01	U
1106A	07/18/18	6.56E+00±5.99E+00	U	1.75E-01±3.12E-01	UJ	-2.25E+00±1.76E+01	U
1106B	07/18/18	3.46E+00±1.38E+01	U	5.99E-02±2.83E-01	UJ	-3.01E+00±1.96E+01	U
1107A	07/18/18	6.66E+00±3.56E+00	U	2.51E-01±3.53E-01	UJ	-4.00E+00±1.47E+01	U
1108A	07/18/18	6.07E+00±5.09E+00	U	1.24E-01±4.65E-01	UJ	-5.45E+00±1.86E+01	U
1109A	07/17/18	2.57E+00±4.71E+00	U	-4.14E-02±4.70E-01	UJ	9.92E+00±1.06E+01	U
1109B	07/18/18	2.44E-01±1.09E+01	U	9.42E-02±3.78E-01	UJ	-4.55E+00±1.61E+01	U
1109B	07/18/18	8.04E+00±4.85E+00	J	7.50E-02±3.11E-01	UJ	1.49E+01±1.28E+01	U
1110A	07/16/18	3.59E-01±1.41E+00	U	1.02E-02±3.11E-01	UJ	-2.07E+01±1.99E+01	UJ
1111A	07/23/18	8.04E+00±4.85E+00	J	2.19E-01±4.24E-01	UJ	-1.63E+01±1.28E+01	UJ

Table B-9 continued.

Sample Location	Sample Date	Lead-214 (pCi/L)	Q	Potassium-40 (pCi/L)	Q	Radium-224 (pCi/L)	Q
1101A	07/23/18	4.66E+01±1.69E+01		-1.64E+01±2.02E+02	U	-1.87E+00±2.24E+01	U
1101B	07/17/18	3.83E+01±1.80E+01		-1.70E+01±1.26E+02	U	-2.71E+00±1.57E+01	U
1101C	07/18/18	6.75E+01±2.03E+01		7.05E+01±9.97E+01	U	-1.34E+01±2.25E+01	U
1102A	07/23/18	4.10E+01±1.83E+01		-7.02E+01±1.30E+02	U	-2.19E+00±1.61E+01	U
1102B	07/23/18	4.71E+00±2.11E+01	U	-5.36E+01±2.04E+02	U	2.17E+00±1.38E+01	U
1103A	07/23/18	4.99E+01±2.06E+01		7.30E+00±2.05E+02	U	-1.87E+00±2.08E+01	U
1103B	07/23/18	2.63E+01±2.69E+01	U	-6.41E+01±1.55E+02	U	2.59E+01±1.82E+01	U
1103C	07/16/18						
1104A	07/17/18	5.17E+01±1.93E+01		-6.37E+01±2.01E+02	U	-2.80E+00±2.34E+01	U
1104B	07/18/18	-2.19E+00±4.51E+00	U	3.36E+01±1.03E+02	U	-8.50E+00±1.99E+01	U
1104C	07/16/18						
1105A	07/17/18	3.98E+00±9.86E+00	U	-4.56E+01±1.41E+02	U	5.17E+00±1.50E+01	U
1105B	07/17/18	-4.07E+00±1.68E+01	U	-5.46E+01±1.20E+02	U	-1.02E+01±1.58E+01	U
1106A	07/18/18	7.43E+00±2.13E+01	U	3.36E+01±1.03E+02	U	-2.25E+00±1.76E+01	U
1106B	07/18/18	3.25E+01±1.74E+01	U	-3.38E+01±1.58E+02	U	-3.01E+00±1.96E+01	U
1107A	07/18/18	3.59E+01±1.59E+01		1.06E+01±1.21E+02	U	-4.00E+00±1.47E+01	U
1108A	07/18/18	4.11E+01±1.48E+01		-2.64E+01±1.24E+02	U	-5.45E+00±1.86E+01	U
1109A	07/17/18	5.50E+01±1.78E+01		-5.37E+01±1.40E+02	U	9.92E+00±1.06E+01	U
1109B	07/18/18	-9.15E-01±1.73E+01	U	-4.56E+01±1.41E+02	U	-4.55E+00±1.61E+01	U
1109B	07/18/18	7.51E+01±2.21E+01		-5.37E+01±1.40E+02	U	1.49E+01±1.28E+01	U
1110A	07/16/18	4.55E+01±1.77E+01		-1.19E+02±1.64E+02	U	-2.07E+01±1.99E+01	UJ
1111A	07/23/18	2.31E+00±1.86E+01	U	-4.63E+01±1.41E+02	U	-1.63E+01±1.28E+01	UJ

Table B-9 continued.

Sample Location	Sample Date	Radium-226 (pCi/L)	Q	Strontium-90 (pCi/L)	Q	Technetium 99 (pCi/L)	Q
1101A	07/23/18	-5.91E+01±2.00E+02	U	-1.45E-01±1.25E-01	UJ	-1.98E-01±1.29E+00	U
1101B	07/17/18	7.93E+01±1.55E+02	U	2.68E-02±1.27E-01	U	-9.59E-01±1.03E+00	U
1101C	07/18/18	-1.30E+02±2.27E+02	U	9.00E-03±1.51E-01	U	-3.98E-01±1.22E+00	U
1102A	07/23/18	-6.03E+00±1.66E+02	U	1.38E-01±1.56E-01	U	-8.30E-01±1.19E+00	U
1102B	07/23/18	-1.57E+02±1.76E+02	U	1.62E-01±1.28E-01	U	-8.52E-01±1.18E+00	U
1103A	07/23/18	-2.71E+02±3.87E+02	U	8.73E-02±1.54E-01	U	-9.41E-03±1.17E+00	U
1103B	07/23/18	0.00E+00±3.50E+02	UJ	2.86E-02±1.29E-01	U	-7.61E-01±1.06E+00	U
1103C	07/16/18						
1104A	07/17/18	1.97E+02±1.79E+02	U	3.38E-02±1.46E-01	U	-1.02E+00±1.11E+00	U
1104B	07/18/18	-8.64E+01±2.12E+02	U	-3.03E-02±1.36E-01	U	-6.76E-01±1.08E+00	U
1104C	07/16/18			2.32E-01±3.29E-01	U	-6.21E-01±1.18E+00	U
1105A	07/17/18	6.64E+01±1.55E+02	U	1.12E-01±1.52E-01	U	1.08E-01±1.15E+00	U
1105B	07/17/18	6.63E+01±1.51E+02	U	-2.09E-02±1.20E-01	U	-7.63E-01±1.14E+00	U
1106A	07/18/18	-2.47E+02±3.01E+02	U	-5.06E-02±1.36E-01	U	-5.04E-01±1.13E+00	U
1106B	07/18/18	-1.57E+02±2.12E+02	U	4.59E-01±3.03E-01	U	-6.71E-01±1.20E+00	U
1107A	07/18/18	7.28E+01±1.71E+02	U	6.12E+00±5.17E-01		-1.35E+00±1.20E+00	UJ
1108A	07/18/18	-2.61E+01±1.77E+02	U	7.02E-02±1.50E-01	U	-6.35E-01±1.08E+00	U
1109A	07/17/18	2.15E-01±1.94E+02	U	8.49E-03±1.53E-01	U	-8.83E-01±1.11E+00	U
1109B	07/18/18	6.80E+01±1.63E+02	U	-2.81E-02±1.61E-01	U	-9.41E-01±1.10E+00	U
1109B	07/18/18	5.38E+01±1.85E+02	U	-3.08E-03±1.25E-01	U	-8.99E-01±1.28E+00	U
1110A	07/16/18	-4.83E+01±1.95E+02	U	6.65E-02±1.41E-01	U	-6.38E-01±1.16E+00	U
1111A	07/23/18	-1.76E+01±1.87E+02	U	6.58E-03±1.30E-01	U	-2.02E-01±1.08E+00	U

Table B-9 continued.

Sample Location	Sample Date	Thallium-208 (pCi/L)	Q	Thorium-234 (pCi/L)	Q	Uranium-235 (pCi/L)	Q
1101A	07/23/18	1.10E+01±5.48E+00		2.77E+02±1.36E+02		1.26E+01±3.25E+01	U
1101B	07/17/18	3.87E+00±5.92E+00	U	4.80E+01±7.13E+01	U	-6.77E+00±1.74E+01	U
1101C	07/18/18	1.59E+01±8.66E+00	J	3.23E+01±6.21E+01	U	-5.88E+00±6.45E+01	U
1102A	07/23/18	9.36E+00±6.16E+00	U	-8.07E+01±1.56E+02	U	-3.89E+00±6.64E+00	U
1102B	07/23/18	1.74E+00±3.45E+00	U	-2.57E+02±2.02E+02	UJ	-9.86E+00±1.85E+01	U
1103A	07/23/18	9.96E+00±1.28E+01	U	-1.04E+01±2.03E+02	U	2.15E+01±5.42E+01	U
1103B	07/23/18	7.79E+00±8.62E+00	U	1.44E+02±1.59E+02	U	3.33E+01±7.07E+01	U
1103C	07/16/18						
1104A	07/17/18	1.57E+01±1.37E+01	J	-1.85E+02±1.62E+02	UJ	3.36E+01±3.06E+01	U
1104B	07/18/18	-7.93E+00±8.70E+00	U	-1.24E+02±1.45E+02	U	-3.65E+00±6.84E+00	U
1104C	07/16/18						
1105A	07/17/18	-6.86E+00±8.89E+00	U	2.82E+01±1.20E+02	U	-8.56E+00±5.84E+01	U
1105B	07/17/18	3.87E+00±8.34E+00	U	1.10E+01±1.48E+02	U	1.38E+01±5.23E+01	U
1106A	07/18/18	-4.17E+00±1.21E+01	U	1.02E+02±1.55E+02	U	1.86E+01±6.75E+01	U
1106B	07/18/18	2.32E+00±5.23E+00	U	4.82E+01±1.61E+02	U	2.10E+01±5.36E+01	U
1107A	07/18/18	-4.73E+00±7.25E+00	U	2.13E+01±8.18E+01	U	3.29E+00±1.06E+01	U
1108A	07/18/18	2.30E+00±4.89E+00	U	6.67E+01±7.59E+01	U	-4.44E-01±3.80E+00	U
1109A	07/17/18	-1.99E+00±1.06E+01	U	2.63E+02±1.26E+02		-2.50E+01±6.51E+01	U
1109B	07/18/18	1.05E-01±2.48E-01	U	9.21E+01±1.70E+02	U	-3.88E+01±3.50E+01	UJ
1109B	07/18/18	-3.53E-01±1.39E+00	U	5.66E+01±8.55E+01	U	1.07E+01±4.60E+01	U
1110A	07/16/18	4.91E+00±1.32E+01	U	2.70E+02±1.87E+02	J	2.74E+01±5.39E+01	U
1111A	07/23/18	-6.91E-01±9.25E-01	U	3.03E+02±1.31E+02		6.04E+00±5.14E+01	U

Key for Qualifier Codes (Q):

J = Analyte identified. Associated result is considered estimated or uncertain.

U = Not detected above MDC and/or 2-sigma uncertainty.

UJ = Not detected above MDC and/or 2-sigma uncertainty, which may be considered estimated or uncertain.

Table B-10. 2018 Groundwater Field Parameter Data – SDA 1100-Series Wells

Blank entries indicate a result was not obtained, typically due to insufficient sample volume. Duplicate samples on the same date indicate a field duplicate was collected and analyzed.

Source: NYSERDA

Sample Location	Sample Date	Conductivity (µmhos/cm)	pH	Temperature (ºC)	Turbidity (NTU)
1101A	07/23/18	770	7.61	14.56	2.79
1101A	11/19/18	760	6.20	11.48	2.46
1101B	07/18/18	609	7.66	18.41	2.05
1101B	11/19/18	598	6.26	10.55	2.65
1101C	07/18/18	406	7.85	20.94	74.5
1101C	11/15/18	349	4.38	7.82	85.4
1102A	07/23/18	797	7.95	20.30	3.96
1102A	11/15/18	588	6.30	11.30	5.97
1102B	07/23/18	533	7.88	12.43	9.13
1102B	11/15/18				5.60
1103A	07/23/18	1187	7.29	14.20	12.8
1103A	11/15/18	1157	6.11	9.84	8.17
1103B	07/23/18	567	8.03	13.00	8.76
1103B	11/15/18	640	6.16	9.96	5.19
1104A	07/17/18	711	7.80	18.52	6.75
1104A	11/14/18	666	5.70	10.00	2.49
1104B	07/18/18	644	8.14	17.79	1.63
1104B	11/14/18	555	5.73	9.76	2.35
1105A	07/17/18	685	7.97	12.37	12.6
1105A	11/14/18	709	5.59	9.55	6.10
1105B	07/17/18	645	7.90	12.12	40.00
1105B	11/14/18	618	5.51	8.26	12.3
1106A	07/18/18	690	7.64	17.18	3.11
1106A	11/14/18	666	6.77	9.08	7.30
1106B	07/18/18	727	7.58	15.36	35.4

Table B-10 continued.

Sample Location	Sample Date	Conductivity (µmhos/cm)	pH	Temperature (ºC)	Turbidity (NTU)
1106B	11/14/18	696	6.77	9.03	9.95
1106B	11/14/18	696	6.77	9.03	9.95
1107A	07/18/18	1904	6.94	13.31	2.47
1107A	11/14/18	1952	5.10	8.98	1.42
1108A	07/18/18	820	7.37	15.10	40.5
1108A	11/14/18	812	5.62	9.74	107
1109A	11/14/18	765	6.12	7.29	7.54
1109B	07/18/18	484	7.39	13.90	13.30
1109B	07/18/18	484	7.39	13.90	13.30
1109B	11/14/18	510	6.72	9.28	2.95
1110A	07/16/18	1513	7.15	13.54	85
1110A	11/13/18	1472	6.53	10.54	
1111A	07/23/18	985	7.55	12.74	8.14
1111A	11/15/18	933	6.05	10.19	3.17

Appendix C – Surface and Stormwater Data

Table C-1. 2018 SDA Surface Water Data – Lagoon Road Creek (WNNDADR)

Source: NYSERDA

Sample Date	Gross Alpha (pCi/L)	Q	Gross Beta (pCi/L)	Q	Tritium (pCi/L)	Q
02/20/18	9.32E-01±8.14E-01	U	1.54E+01±3.70E+00		1.98E+02±1.24E+02	U
05/15/18	4.40E+00±1.23E+00	J	2.88E+01±6.79E+00		5.64E+01±1.08E+02	U
08/21/18	1.29E+00±7.07E-01	J	2.64E+01±1.62E+00		1.93E+02±5.65E+01	
11/14/18	4.09E-01±5.72E-01	U	9.98E+00±7.87E-01		9.91E+01±5.28E+01	J

Table C-2. 2018 SDA Surface Water Data – Erdman Brook (WNERB53)

Duplicate samples on the same date indicate a field duplicate was collected and analyzed.

Source: NYSERDA

Sample Date	Gross Alpha (pCi/L)	Q	Gross Beta (pCi/L)	Q	Tritium (pCi/L)	Q
02/20/18	1.05E+00±7.12E-01	U	2.62E+00±8.16E-01		9.43E+01±1.18E+02	U
05/15/18	3.12E-01±5.66E-01	U	3.58E+00±1.00E+00		2.59E+01±1.08E+02	U
08/21/18	9.39E-01±6.19E-01	J	4.54E+00±9.80E-01		3.11E+01±5.11E+01	U
08/21/18	1.47E+00±7.48E-01	J	5.05E+00±1.05E+00		1.08E+01±5.15E+01	U
11/14/18	1.60E-01±4.73E-01	U	1.91E+00±1.35E+00	UJ	2.48E+01±5.17E+01	U

Table C-3. 2018 SDA Surface Water Data – Franks Creek (WNFRC67)

Source: NYSERDA

Sample Date	Gross Alpha (pCi/L)	Q	Gross Beta (pCi/L)	Q	Tritium (pCi/L)	Q
02/20/18	-8.68E-01±5.33E-01	UJ	1.01E+00±5.22E-01	J	5.31E+01±1.15E+02	U
05/15/18	6.03E-01±6.63E-01	U	8.70E+01±2.04E+01		7.16E+01±1.09E+02	U
08/21/18	1.26E-01±6.57E-01	U	7.50E-01±3.45E-01		-3.87E+01±4.86E+01	U
11/14/18	6.52E-02±5.43E-01	U	1.14E+00±3.55E-01		2.39E+01±5.02E+01	U

Table C-4. 2018 SDA Surface Water Data – Franks Creek (WNDCELD)

Duplicate samples on the same date indicate a field duplicate was collected and analyzed.

Source: NYSERDA

Sample Date	Gross Alpha (pCi/L)	Q	Gross Beta (pCi/L)	Q	Tritium (pCi/L)	Q
02/20/18	4.48E-01±7.00E-01	U	1.04E+00±5.46E-01	J	1.07E+02±1.18E+02	U
02/20/18	-4.61E-01±5.90E-01	U	1.26E+00±5.67E-01		1.12E+02±1.19E+02	U
05/15/18	5.75E-01±6.62E-01	U	1.59E+00±6.09E-01		5.23E+01±1.09E+02	U
08/21/18	4.53E-01±6.71E-01	U	1.77E+00±4.46E-01		-4.05E+00±5.13E+01	U
11/14/18	-1.75E-01±4.15E-01	U	7.21E-01±3.29E-01		-8.11E+00±5.08E+01	U

Table C-5. 2018 SDA Surface Water Data – Buttermilk Creek: Upgradient of the SDA (WFBCBKG)

Source: NYSERDA

Sample Date	Gross Alpha (pCi/L)	Q	Gross Beta (pCi/L)	Q	Tritium (pCi/L)	Q
02/20/18	4.76E-01±7.26E-01	U	1.48E+00±6.11E-01		1.72E+02±1.22E+02	U
05/15/18	4.17E+00±1.44E+00	J	7.53E+00±1.90E+00		7.87E+01±1.09E+02	U
08/21/18	7.75E-01±5.85E-01	U	2.41E+00±4.94E-01		-2.34E+01±5.08E+01	U
11/14/18	2.87E-01±5.74E-01	U	1.03E+00±3.31E-01		1.76E+01±4.96E+01	U

Table C-6. 2018 SDA Surface Water Data - Buttermilk Creek: Downgradient of the SDA (WFBCANL)

Source: NYSERDA

Sample Date	Gross Alpha (pCi/L)	Q	Gross Beta (pCi/L)	Q	Tritium (pCi/L)	Q
05/15/18	3.37E+00±1.19E+00	J	1.04E+01±2.53E+00		1.50E+02±1.11E+02	U

Key for Qualifier Codes (Q):

J = Analyte identified. Associated result is considered estimated or uncertain.

U = Not detected above MDC and/or 2-sigma uncertainty.

UJ = Not detected above MDC and/or 2-sigma uncertainty, which may be considered estimated or uncertain.

Table C-7. 2018 SDA Stormwater Radiological Data – Outfall Location W01

Duplicate samples on the same date indicate a field duplicate was collected and analyzed.

Source: NYSERDA

Sample Date	Gross Alpha (pCi/L)	Q	Gross Beta (pCi/L)	Q	Tritium (pCi/L)	Q
04/03/18	7.42E-01±5.92E-01	U	2.28E+00±7.31E-01		8.48E+01±1.02E+02	U
08/21/18	0.00E+00±3.64E-01	UJ	1.24E+00±3.91E-01		1.85E+01±5.17E+01	U
08/21/18	8.69E-01±5.77E-01	J	7.71E-01±3.05E-01		-2.70E+00±5.04E+01	U

Sample Date	Beryllium-7 (pCi/L)	Q	Cesium-137 (pCi/L)	Q
04/03/18	3.69E+01±1.41E+01		2.13E-01±1.74E+00	U
08/21/18	-5.17E+01±1.08E+02	U	-9.06E+00±1.20E+01	UJ
08/21/18	-4.79E+01±9.27E+01	U	-4.67E+00±1.08E+01	UJ

Sample Date	Cobalt-60 (pCi/L)	Q	Potassium-40 (pCi/L)	Q
04/03/18	7.73E-01±1.60E+00	U	-5.49E+00±2.87E+01	U
08/21/18	5.93E+00±4.72E+00	U	-9.57E+01±1.23E+02	U
08/21/18	8.89E-01±5.34E+00	U	2.38E+01±8.20E+01	U

Key for Qualifier Codes (Q):

J = Analyte identified. Associated result is considered estimated or uncertain.

U = Not detected above MDC and/or 2-sigma uncertainty.

UJ = Not detected above MDC and/or 2-sigma uncertainty, which may be considered estimated or uncertain.

Table C-8. 2018 SDA Stormwater Chemical Physical Data – Outfall Location W01

Blank entries indicate a result was not obtained, typically because it was not required. Duplicate samples on the same date indicate a field duplicate was collected and analyzed. Data are reported herein relative to the laboratory practical quantitation limit.

Source: NYSERDA

Sample Date	Sample Type	BOD (mg/L)	Q	COD (mg/L)	Q	Nitrogen, Total (mg/L)	Q	Oil & Grease (mg/L)	Q
04/03/18	Grab	12.2	J	49.4		3.1	J	5.0	U
04/03/18	Composite	4.0	U	15.7		0.79			
04/03/18	Ambient Rain								
04/03/18	Grab	12.4	J	41.0		2.1	J	5.0	U
08/21/18	Grab	13.0		47.0		2.4		1.78	J
08/21/18	Composite	2.0	U	12.0		0.32	J		
08/21/18	Ambient Rain								
08/21/18	Composite	2.0	U	10.0	U	0.30	J		

Sample Date	Sample Type	Total Phosphorus (mg/L)	Q	TSS (mg/L)	Q	pH (SU)	Q	Temp (ºC)	Q
04/03/18	Grab	0.13		1.0	U	6.29		5.40	
04/03/18	Composite	0.050	U	1.0	U				
04/03/18	Ambient Rain					6.92		4.68	
04/03/18	Grab	0.12		1.0					
08/21/18	Grab	0.089		4.0	U	6.25		21.15	
08/21/18	Composite	0.40		4.0	U				
08/21/18	Ambient Rain					5.16		19.59	
08/21/18	Composite	0.050	U	4.0	U				

Key for Qualifier Codes (Q):

J = Analyte identified. Associated result is considered estimated or uncertain.

U = Not detected above associated value.

UJ = Not detected above associated value, which may be considered estimated or uncertain.

Appendix D – Overland Gamma Radiation Survey & Thermoluminescent Dosimeter Data

Table D-1. 2018 Overland Gamma Radiation Survey Results

Source: NYSERDA

	April 11 (µrem/hr)		August 29 (µrem/hr)	
Location[1]	**1m**	**1cm**	**1m**	**1cm**
P-1	7	5	8	7
P-2	6	5	7	9
P-3	6	8	11	7
P-4	7	8	8	15
P-5	6	7	7	10
P-6	7	7	11	11
P-7	6	6	6	5
P-8	6	5	7	7
P-9	8	6	5	7
P-10	5	6	6	8
P-11	6	7	8	6
P-12	5	5	6	6
P-13	8	6	9	10
P-14	5	6	9	7
P-15	5	5	8	9
P-16	6	7	7	7
SDA2n	7	6	10	9
SDA2s	5	6	8	5
SDA3n	6	5	6	8
SDA3s	7	6	11	12
SDA4n	6	7	10	7
SDA4s	5	7	7	7
T1s	6	5	8	10
T2n	8	5	9	6
T3n	8	7	11	7
T3s	7	10	8	11

Table D-1 continued.

	April 11 (μrem/hr)		August 29 (μrem/hr)	
Location[l]	1m	1cm	1m	1cm
T4n	7	10	7	7
T4s	7	6	12	12
T5n	7	8	8	8
T5s	8	7	10	11
T6n	8	9	7	7
T6s	10	11	10	10
T7n	7	8	8	10
T7s	5	6	9	9
T8n	9	7	8	8
T8s	6	6	12	8
T9n	10	12	10	13
T9s	8	6	7	9
T10n	10	6	12	7
T10s	5	8	8	8
T11n	6	5	8	8
T11s	6	7	7	6
T12n	7	8	9	9
T12s	7	9	8	7
T13n	9	9	6	6
T13s	5	5	6	9
T14n	6	6	12	10
T14s	5	7	7	9
Tank T-1	3	4	7	7
DC-(G)[m]	7	6	8	6
DC-dr[m]	5	5	5	4

[l] SDA perimeter locations (P-1 through P-16) are identified on Figure 2-11. Measurements were made at one meter (1 m) and one centimeter (1 cm) from the ground, tank, or building surface.

[m] DC-(G) and DC-dr are located (at the Drum Cell) on the WVDP Premises adjacent to the SDA. The Drum Cell was used to store low-level radioactive waste drums; however, the waste was removed and shipped for off-site disposal in 2007. The DC(G) and DC-dr measurements were made at locations on the north side and west roll-up door, respectively.

Table D-2. 2018 Thermoluminescent Dosimeter Data

Source: NYSERDA

Location	1st Qtr (mR/Qtr)	Q	2nd Qtr (mR/Qtr)	Q	3rd Qtr (mR/Qtr)	Q	4th Qtr (mR/Qtr)	Q
DNTLD19 (SDA E. Fence)	18.0±5.3		17.7±5.0		15.2±4.7		14.2±4.9	
DNTLD33 (SDA SW Corner)	18.0±5.3		18.8±5.1		15.2±4.7		15.3±5.0	
DNTLD43 (SDA West Gate)	19.1±5.5		14.5±4.5		13.1±4.4		11.1±4.4	
DNTLD53 (SDA West Gate)	21.3±5.9		20.9±5.5		21.4±5.7		21.6±6.0	
NYTLDBK (Background Location)	14.7±4.8		15.5±4.6		18.3±5.2		21.6±6.0	

Appendix E – Precipitation

Table E-1. First Quarter 2018 SDA Precipitation Data (Liquid Rainfall Equivalent)

Source: NYSERDA

January 2018	Precipitation (inches)	February 2018	Precipitation (inches)	March 2018	Precipitation (inches)
1/1/2018	0.04	2/1/2018	0.00	3/1/2018	0.81
1/2/2018	0.02	2/2/2018	0.02	3/2/2018	0.35
1/3/2018	0.00	2/3/2018	0.01	3/3/2018	0.00
1/4/2018	0.00	2/4/2018	0.09	3/4/2018	0.00
1/5/2018	0.02	2/5/2018	0.00	3/5/2018	0.00
1/6/2018	0.03	2/6/2018	0.08	3/6/2018	0.00
1/7/2018	0.00	2/7/2018	0.34	3/7/2018	0.05
1/8/2018	0.09	2/8/2018	0.00	3/8/2018	0.11
1/9/2018	0.00	2/9/2018	0.10	3/9/2018	0.30
1/10/2018	0.00	2/10/2018	0.20	3/10/2018	0.04
1/11/2018	0.65	2/11/2018	0.13	3/11/2018	0.00
1/12/2018	0.89	2/12/2018	0.00	3/12/2018	0.00
1/13/2018	0.15	2/13/2018	0.00	3/13/2018	0.05
1/14/2018	0.00	2/14/2018	0.00	3/14/2018	0.31
1/15/2018	0.02	2/15/2018	0.55	3/15/2018	0.04
1/16/2018	0.05	2/16/2018	0.11	3/16/2018	0.07
1/17/2018	0.00	2/17/2018	0.05	3/17/2018	0.00
1/18/2018	0.00	2/18/2018	0.00	3/18/2018	0.00
1/19/2018	0.00	2/19/2018	0.57	3/19/2018	0.00
1/20/2018	0.00	2/20/2018	0.18	3/20/2018	0.00
1/21/2018	0.04	2/21/2018	0.03	3/21/2018	0.00
1/22/2018	0.12	2/22/2018	0.31	3/22/2018	0.00
1/23/2018	0.64	2/23/2018	0.09	3/23/2018	0.00
1/24/2018	0.01	2/24/2018	0.00	3/24/2018	0.00
1/25/2018	0.14	2/25/2018	0.52	3/25/2018	0.00
1/26/2018	0.00	2/26/2018	0.00	3/26/2018	0.00
1/27/2018	0.24	2/27/2018	0.00	3/27/2018	0.14
1/28/2018	0.00	2/28/2018	0.02	3/28/2018	0.07
1/29/2018	0.04			3/29/2018	0.72
1/30/2018	0.11			3/30/2018	0.10
1/31/2018	0.00			3/31/2018	0.03
Total	**3.30**	**Total**	**3.40**	**Total**	**3.19**

Table E-2. Second Quarter 2018 SDA Precipitation Data (Liquid Rainfall Equivalent)

Source: NYSERDA

April 2018	Precipitation (inches)	May 2018	Precipitation (inches)	June 2018	Precipitation (inches)
4/1/2018	0.22	5/1/2018	0.00	6/1/2018	0.21
4/2/2018	0.00	5/2/2018	0.02	6/2/2018	0.02
4/3/2018	0.21	5/3/2018	0.20	6/3/2018	0.15
4/4/2018	0.73	5/4/2018	0.35	6/4/2018	0.10
4/5/2018	0.00	5/5/2018	0.00	6/5/2018	0.02
4/6/2018	0.18	5/6/2018	0.00	6/6/2018	0.00
4/7/2018	0.01	5/7/2018	0.00	6/7/2018	0.00
4/8/2018	0.01	5/8/2018	0.00	6/8/2018	0.00
4/9/2018	0.03	5/9/2018	0.00	6/9/2018	0.00
4/10/2018	0.02	5/10/2018	0.14	6/10/2018	0.06
4/11/2018	0.00	5/11/2018	0.05	6/11/2018	0.00
4/12/2018	0.16	5/12/2018	0.62	6/12/2018	0.00
4/13/2018	0.05	5/13/2018	0.00	6/13/2018	1.50
4/14/2018	0.00	5/14/2018	0.00	6/14/2018	0.00
4/15/2018	0.13	5/15/2018	0.80	6/15/2018	0.00
4/16/2018	1.29	5/16/2018	0.00	6/16/2018	0.06
4/17/2018	0.22	5/17/2018	0.00	6/17/2018	0.04
4/18/2018	0.01	5/18/2018	0.00	6/18/2018	0.36
4/19/2018	0.05	5/19/2018	0.21	6/19/2018	0.00
4/20/2018	0.00	5/20/2018	0.30	6/20/2018	0.09
4/21/2018	0.00	5/21/2018	0.00	6/21/2018	0.00
4/22/2018	0.00	5/22/2018	0.44	6/22/2018	0.13
4/23/2018	0.00	5/23/2018	0.01	6/23/2018	1.08
4/24/2018	0.09	5/24/2018	0.00	6/24/2018	0.41
4/25/2018	0.11	5/25/2018	0.00	6/25/2018	0.00
4/26/2018	0.00	5/26/2018	0.00	6/26/2018	0.00
4/27/2018	0.07	5/27/2018	0.20	6/27/2018	0.42
4/28/2018	0.36	5/28/2018	0.00	6/28/2018	0.37
4/29/2018	0.01	5/29/2018	0.00	6/29/2018	0.00
4/30/2018	0.00	5/30/2018	0.00	6/30/2018	0.00
		5/31/2018	0.01		
Total	**3.96**	**Total**	**3.35**	**Total**	**5.02**

Table E-3. Third Quarter 2018 SDA Precipitation Data (Liquid Rainfall Equivalent)

Source: NYSERDA

July 2018	Precipitation (inches)	August 2018	Precipitation (inches)	September 2018	Precipitation (inches)
7/1/2018	0.00	8/1/2018	0.01	9/1/2018	0.00
7/2/2018	0.38	8/2/2018	0.00	9/2/2018	0.24
7/3/2018	0.00	8/3/2018	0.00	9/3/2018	0.20
7/4/2018	0.00	8/4/2018	0.00	9/4/2018	0.00
7/5/2018	0.00	8/5/2018	0.00	9/5/2018	0.00
7/6/2018	0.01	8/6/2018	0.00	9/6/2018	0.00
7/7/2018	0.00	8/7/2018	0.72	9/7/2018	0.00
7/8/2018	0.00	8/8/2018	0.78	9/8/2018	0.00
7/9/2018	0.00	8/9/2018	0.01	9/9/2018	0.03
7/10/2018	0.00	8/10/2018	0.00	9/10/2018	1.81
7/11/2018	0.00	8/11/2018	0.09	9/11/2018	0.03
7/12/2018	0.00	8/12/2018	0.00	9/12/2018	0.00
7/13/2018	0.00	8/13/2018	0.07	9/13/2018	0.11
7/14/2018	0.12	8/14/2018	0.07	9/14/2018	0.00
7/15/2018	0.00	8/15/2018	0.00	9/15/2018	0.00
7/16/2018	0.44	8/16/2018	0.01	9/16/2018	0.00
7/17/2018	0.92	8/17/2018	0.99	9/17/2018	0.17
7/18/2018	0.00	8/18/2018	1.00	9/18/2018	0.00
7/19/2018	0.00	8/19/2018	0.00	9/19/2018	0.01
7/20/2018	0.00	8/20/2018	0.00	9/20/2018	0.05
7/21/2018	0.05	8/21/2018	0.76	9/21/2018	0.52
7/22/2018	0.91	8/22/2018	0.63	9/22/2018	0.00
7/23/2018	0.01	8/23/2018	0.00	9/23/2018	0.00
7/24/2018	0.03	8/24/2018	0.00	9/24/2018	0.00
7/25/2018	0.51	8/25/2018	0.00	9/25/2018	0.33
7/26/2018	0.03	8/26/2018	0.18	9/26/2018	0.57
7/27/2018	0.01	8/27/2018	0.05	9/27/2018	0.02
7/28/2018	0.00	8/28/2018	0.00	9/28/2018	0.00
7/29/2018	0.00	8/29/2018	0.75	9/29/2018	0.00
7/30/2018	0.46	8/30/2018	0.00	9/30/2018	0.17
7/31/2018	0.00	8/31/2018	0.00		
Total	**3.88**	**Total**	**6.12**	**Total**	**4.26**

Table E-4. Fourth Quarter 2018 SDA Precipitation Data (Liquid Rainfall Equivalent)

Source: NYSERDA

October 2018	Precipitation (inches)	November 2018	Precipitation (inches)	December 2018	Precipitation (inches)
10/1/2018	0.05	11/1/2018	0.91	12/1/2018	0.11
10/2/2018	1.66	11/2/2018	0.18	12/2/2018	0.20
10/3/2018	0.01	11/3/2018	0.22	12/3/2018	0.19
10/4/2018	0.82	11/4/2018	0.00	12/4/2018	0.01
10/5/2018	0.00	11/5/2018	0.01	12/5/2018	0.01
10/6/2018	1.02	11/6/2018	0.59	12/6/2018	0.16
10/7/2018	0.51	11/7/2018	0.01	12/7/2018	0.00
10/8/2018	0.00	11/8/2018	0.00	12/8/2018	0.05
10/9/2018	0.00	11/9/2018	0.27	12/9/2018	0.00
10/10/2018	0.02	11/10/2018	0.40	12/10/2018	0.00
10/11/2018	0.40	11/11/2018	0.03	12/11/2018	0.02
10/12/2018	0.11	11/12/2018	0.00	12/12/2018	0.00
10/13/2018	0.13	11/13/2018	0.22	12/13/2018	0.04
10/14/2018	0.00	11/14/2018	0.01	12/14/2018	0.00
10/15/2018	0.24	11/15/2018	0.41	12/15/2018	0.00
10/16/2018	0.00	11/16/2018	0.54	12/16/2018	0.19
10/17/2018	0.42	11/17/2018	0.01	12/17/2018	0.04
10/18/2018	0.02	11/18/2018	0.13	12/18/2018	0.00
10/19/2018	0.00	11/19/2018	0.01	12/19/2018	0.00
10/20/2018	0.87	11/20/2018	0.15	12/20/2018	0.32
10/21/2018	0.03	11/21/2018	0.20	12/21/2018	0.76
10/22/2018	0.03	11/22/2018	0.00	12/22/2018	0.02
10/23/2018	0.31	11/23/2018	0.00	12/23/2018	0.01
10/24/2018	0.00	11/24/2018	0.02	12/24/2018	0.16
10/25/2018	0.00	11/25/2018	0.00	12/25/2018	0.05
10/26/2018	0.02	11/26/2018	0.30	12/26/2018	0.05
10/27/2018	0.70	11/27/2018	0.64	12/27/2018	0.00
10/28/2018	0.29	11/28/2018	0.58	12/28/2018	0.22
10/29/2018	0.19	11/29/2018	0.02	12/29/2018	0.05
10/30/2018	0.00	11/30/2018	0.04	12/30/2018	0.04
10/31/2018	0.19			12/31/2018	0.56
Total	**8.04**	**Total**	**5.90**	**Total**	**3.26**

Appendix F – Ground Surface Elevation Data

Table F-1. 2017 and 2018 SDA North Slope Ground Surface Elevation Data

Source: NYSERDA

Location[n]	2017 Elevation[o]	Location[n]	2018 Elevation[o]
1	1367.53	1	1367.48
2	1371.08	2	1371.06
3	1372.91	3	1372.88
4	1371.86	4	1371.83
5	1370.58	5	1370.54
6	1370.32	6	1370.27
7	1371.44	7	1371.35
8	1370.94	8	1370.90
9	1370.96	9	1370.91
10	1371.20	10	1371.15
11	1364.97	11	1364.90
12	1361.34	12	1361.26
13	1363.21	13	1363.14
14	1362.51	14	1362.43
15	1365.63	15	1365.52
16	1364.87	16	1364.76
17	1364.60	17	1364.50
18	1364.77	18	1364.73
19	1364.66	19	1364.61
20	1365.19	20	1365.13
21	1362.86	21	1362.82
22	1359.24	22	1359.20
23	1357.83	23	1357.84
24	1353.57	24	1353.50
25	1353.78	25	1353.73
26	1348.78	26	1348.71
27	1352.44	27	1352.39
28	1355.56	28	1355.52

Table F-1 continued.

Location[n]	2017 Elevation[o]	Location[n]	2018 Elevation[o]
29	1357.57	29	1357.52
30	1357.24	30	1357.16
31	1358.67	31	1358.56
32	1359.64	32	1359.52
33	1359.66	33	1359.60
34	1362.28	34	1362.11
35	1359.44	35	1359.32
36	1358.46	36	1358.39
37	1356.61	37	1356.54
38	1353.35	38	1353.29
39	1352.80	39	1352.73
40	1354.42	40	1354.32
41	1348.69	41	1348.64
42	1349.49	42	1349.46
43	1352.35	43	1352.30
44	1350.43	44	1350.37
45	1351.68	45	1351.58
46	1356.27	46	1356.29
47	1351.59	47	1351.55
1004	1379.24	1004	1379.24
1005	1380.72	1005	1380.72
CP53	1374.92	CP53	1374.92

[n] NYSERDA established 47 new monitoring points on the north slope of the SDA in 2016 and had them surveyed on October 26, 2016, by Clear Creek Land Surveying, LLC. The new monitoring points were surveyed in the NAD 83/NAVD 88 coordinate system and should not be compared to survey location data prior to 2016. Control for the north slope survey relied on Control Points CP53, 1004, and 1005.

[o] Coordinate System: Horizontal datum in NAD 83, NY West Zone. Vertical datum is NAVD 88. Elevations were measured on October 10, 2017, and August 29, 2018, by Clear Creek Land Surveying, LLC.

Table F-2. 2018 SDA Trench Cap Ground Surface Elevation Data

Source: NYSERDA

Trench	Location[p]	Elevation[q]	Trench	Location[p]	Elevation[q]	Trench	Location[p]	Elevation[q]
1&2	S-M	1392.77	6	S-M	1385.84	11	S-M	1385.37
1&2	1+0	1391.89	6	1+0	1388.44	11	1+0	1384.42
1&2	2+0	1390.92	6	N-M	1390.63	11	2+0	1385.60
1&2	3+0	1390.55				11	3+0	1386.51
1&2	4+0	1390.00	7	S-M	1385.89	11	4+0	1386.92
1&2	5+0	1388.89	7	0+42.25	1384.99	11	5+0	1387.18
1&2	6+0	1386.10	7	N-M	1384.76	11	N-M	1388.67
1&2	N-M	1383.72						
1&2	7+10	1379.62	8	S-M	1390.23	12	S-M	1385.34
1&2	7+20	1377.41	8	1+0	1388.67	12	1+0	1383.71
			8	2+0	1387.87	12	2+0	1384.94
3	S-M	1392.89	8	3+0	1387.57	12	3+0	1386.02
3	1+0	1392.41	8	4+0	1387.43	12	4+0	1386.71
3	2+0	1392.33	8	5+0	1387.53	12	5+0	1386.63
3	3+0	1391.05	8	N-M	1389.06	12	N-M	1389.51
3	4+0	1390.63						
3	5+0	1389.11	9	S-M	1388.46	13	S-M	1385.21
3	6+0	1386.40	9	1+0	1386.35	13	1+0	1382.26
3	N-M	1384.20	9	2+0	1387.08	13	2+0	1384.55
			9	3+0	1387.48	13	3+0	1385.48
4	S-M	1393.30	9	4+0	1388.11	13	4+0	1386.13
4	1+0	1391.33	9	5+0	1388.45	13	5+0	1386.43
4	2+0	1392.15	9	N-M	1389.81	13	6+0	1385.18
4	3+0	1391.54				13	N-M	1387.92
4	4+0	1391.39	10	S-M	1386.59			
4	5+0	1389.47	10	1+0	1385.31	14	S-M	1385.29
4	6+0	1387.25	10	2+0	1386.47	14	1+0	1383.10
4	N-M	1387.16	10	3+0	1387.02	14	2+0	1383.79
			10	4+0	1387.61	14	3+0	1384.88
5	S-M	1393.84	10	5+0	1387.75	14	4+0	1385.35
5	1+0	1391.65	10	N-M	1389.46	14	5+0	1384.84
5	2+0	1390.96				14	6+0	1384.32
5	3+0	1390.19				14	N-M	1384.57
5	4+0	1389.54						
5	5+0	1389.62						
5	6+0	1386.68						
5	N-M	1388.36						

Table notes are on the next page

Table F-2 continued.

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[p] Location is given as X+Y where X is a trench length in 100-foot increments plus Y in ft (e.g., 7+10 = 710 ft). N-M is located on the centerline mark of the north monument plaque at each trench. S-M is located on the centerline mark of the south monument plaque at each trench.

[q] Coordinate System: Horizontal datum is NAD83, NY West Zone. Vertical datum is NAVD 88. Elevations were measured on September 19, 2018, by Clear Creek Land Surveying, LLC.

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