

Coal Combustion Residual  
Groundwater Monitoring System Certification  
for the Limited Purpose Landfill at the  
Centralia Mine Site near  
Centralia, Washington

*Prepared for*

TransAlta Centralia Mining LLC

October 16, 2017



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**TransAlta Centralia Mining LLC**  
**Limited Purpose Landfill**  
**CCR Groundwater Monitoring Systems Certification**

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## Professional Engineer Certification

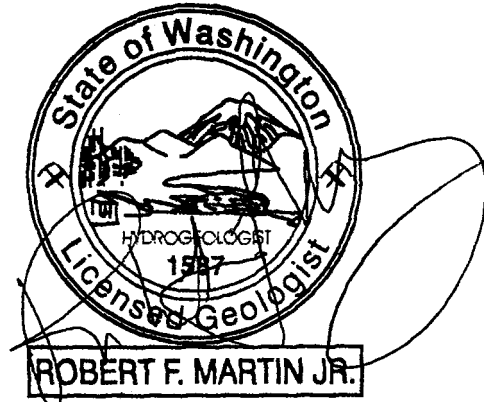
"I hereby certify that the **groundwater monitoring system** for the Limited Purpose Landfill at TransAlta Centralia Mining LLC located at 913 Big Hanaford Road, Centralia, Washington as described herein, has been designed and constructed to meet the requirements in the Coal Combustion Residual Rule, Title 40 Code of Federal Regulations § 257.91, *Groundwater Monitoring Systems*. I am a duly licensed Professional Engineer under the laws of the State of Washington."



Signed 10/16/17

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## 1.0 Introduction

On April 17, 2015, the U.S. Environmental Protection Agency (EPA) published the final rule for the regulation and management of Coal Combustion Residuals (CCR) under the Resource and Recovery Conservation Act (RCRA). The rule, which took effect October 19, 2015, applies to the Limited Purpose Landfill at the Centralia Mine site, operated and owned by TransAlta Centralia Mining LLC (TCM). In accordance with the updated Code of Federal Regulations (CFR), any facility that disposes of CCR waste after the October 19, 2015, cutoff date must implement groundwater detection monitoring in accordance with CCR Rule § 257.90. As part of the CCR requirements, the owner (that is, TCM) must initiate a detection groundwater monitoring program, and a qualified Professional Engineer (PE) must certify the groundwater monitoring system (that is, the well network and monitoring design) meets the CCR performance standards of CCR Rule § 257.91, *Groundwater Monitoring Systems*. This document has been prepared on behalf of TCM to provide documentation for public record that the groundwater monitoring network for the Limited Purpose Landfill at the TCM site meets the CCR performance standards for groundwater monitoring design.

TCM manages the Limited Purpose Landfill, which is approximately 7 miles east of Centralia, Washington (Figure 1). The Limited Purpose Landfill is north of Pit 7 in the Centralia Mine. The site is in the southern half of Section 33, Township 15N, Range 1W; Latitude 46-44-23 North, Longitude 122-49-55. The site address is 913 Big Hanaford Road, and the Property Tax Parcel (Account) Number is 023387001000. The permitted area encompassing the Limited Purpose Landfill is 57 acres, and the actual footprint of the waste disposal area is 18 acres (Figure 2). The Limited Purpose Landfill consists of the waste disposal area, and the surface impoundments immediately south of the waste disposal area to manage leachate generated at the disposal cell.

TransAlta Centralia Generation LLC (TCG) operates a coal-burning power plant, located adjacent to TCM, that generates residual ash waste, which is disposed of into the Limited Purpose Landfill. The construction of Stage 1 of the began during the summer of 2009, and the Lewis County Environmental Health Department (LCEHD) authorized TCM to begin waste disposal operations effective October 31, 2009. On December 21, 2009, the LCEHD amended the facility permit to approve the disposal of residual ash waste in Stage 1 Area A3a, in addition to Areas A1 and A2, which had been approved for disposal in the original permit. The Stage 2 Area of the Limited Purpose Landfill was constructed in three phases from 2011 through 2014 and was subsequently approved for the receipt of ash waste material.

## 2.0 Groundwater Conditions

The groundwater conditions near the Limited Purpose Landfill have been reviewed to demonstrate the designated CCR groundwater monitoring system meets the performance standards of CCR Rule § 257.91, *Groundwater Monitoring Systems*. The groundwater conditions have been characterized based on a review of the following existing site data, coupled with focused efforts to implement the CCR requirements:

- The hydrogeological conditions as documented in Section 2 of *TransAlta Centralia Mining LLC, Limited Purpose Landfill Solid Waste Permit Application*, dated October 2008 (CH2M, 2008).
- Detection groundwater monitoring data, collected and reported under Chapter 173-350-500, *Groundwater Monitoring* of the Washington Administrative Code (WAC) from 2007 to 2016; functional details of the existing WAC detection groundwater monitoring program are described in the *Groundwater Monitoring Plan for TransAlta Centralia Mining LLC Limited Purpose Landfill, Amendment 1, July 2011* (CH2M, 2011) as approved by the Washington State Department of Ecology (Ecology) and the (LCEHD). Since 2010, TCM has prepared quarterly and annual groundwater monitoring reports and submitted these to Ecology in accordance with Chapter 173-350[5] *Groundwater Monitoring – Data Analysis, Notification, and Reporting*.

- The site conditions and field observations of subsurface conditions (i.e., drilling, collection of soil samples, and installation of resource protection monitoring wells) from implementing the CCR detection monitoring well network, as presented in *Groundwater Monitoring Well Network Completion Data Report for the Limited Purpose Landfill at TransAlta Centralia Mine* (CH2M, 2016a).
- A review of the CCR background data collected from 2016 to 2017, as prescribed by *Groundwater Monitoring Sampling and Analysis Plan for the Limited Purpose Landfill at the TransAlta Centralia Mine* (CH2M, 2016b).

The following paragraphs summarize the stratigraphic sequence, uppermost aquifer, lower aquitard/confining unit, and groundwater flow characteristics to provide a context for the monitoring systems performance standards (summarized in Section 3).

**Stratigraphic Sequence.** The hydrogeological setting of the Limited Purpose Landfill is unique in that present day subsurface conditions were constructed such that surface overburden soils (mine spoils) were excavated during active mining operations to expose coal seams within the relatively fine-grained Skookumchuck formation. As part of reclamation efforts following coal mining activities, the mine spoils were backfilled into a pit that forms the current footprint of the Limited Purpose Landfill. The mine spoils are generally characterized as light tan to brown silty loam to silty clay with sand lenses; the underlying Skookumchuck is characterized as a sequence of siltstones, claystones, coal seams, and occasional carbonaceous shales. The stratigraphic sequence beneath the center of the LIMITED PURPOSE LANDFILL consists of approximately 80 feet of mine spoils, underlain by relatively thick sequence of Skookumchuck, estimated at over 500 feet thick in the area of the Limited Purpose Landfill.

**Uppermost Aquifer.** Saturated conditions forming the uppermost aquifer beneath the Limited Purpose Landfill occurs at the base of the mine spoils overlying the finer-grained Skookumchuck Formation.

**Lower Aquitard/Confining Unit.** The lower aquitard, which defines the base of the uppermost aquifer, is the relatively fine-grained Skookumchuck Formation. The depth to the top of Skookumchuck beneath the landfill ranges from approximately 40 to 80 feet below the bottom of landfill. The hydraulic conductivity of the Skookumchuck is relatively low, estimated in the range of at  $1.1 \times 10^{-5}$  to  $2.8 \times 10^{-9}$  centimeters per second (cm/sec) (CH2M 2008).

**Groundwater Flow Direction, Hydraulic Gradient, Hydraulic Conductivity, and Groundwater Seepage Velocity.** The groundwater flow direction for the uppermost aquifer (mine spoils) is to the southwest (Figure 3). A typical hydraulic gradient is from 0.058 to 0.063 feet per foot. The range of hydraulic conductivity for the mine spoils (uppermost aquifer) is  $1.2 \times 10^{-4}$  to  $7.1 \times 10^{-7}$  cm/sec with an average value of  $3.88 \times 10^{-5}$  cm/sec (CH2M 2008). The estimated groundwater seepage velocity is 9 feet per year assuming an average hydraulic conductivity of  $3.88 \times 10^{-5}$  cm/sec, estimated porosity of 0.05, and hydraulic gradient of 0.058 as calculated from the June 2017 groundwater elevations.

### 3.0 Groundwater Monitoring Systems Performance Standards

Figure 4 shows the designated CCR detection groundwater monitoring network for the Limited Purpose Landfill well network, which consists of five wells screened in the uppermost aquifer and located around the perimeter of the regulated waste unit. Table 1 provide details of the well locations/coordinates, reference point elevation (to obtain groundwater elevations), screen intervals, and the hydraulic designation. The groundwater monitoring well network meets the performance standards of monitoring the uppermost aquifer and the minimum requirements of one upgradient and three downgradient wells.

The performance standards and technical justification for CCR Rule § 257.91, *Groundwater Monitoring Systems* is summarized below.

Performance Standards of CCR Rule § 257.91, Groundwater Monitoring Systems	Technical Justification
Part (a)(1) Accurately represent the quality of background groundwater that has not been affected by leakage from a CCR unit.	Wells LPLF-5 and LPLF-1 are located upgradient and cross-gradient of the Limited Purpose Landfill, respectively and groundwater elevation data demonstrate a consistent groundwater flow direction to the southwest (Figure 3), which supports that these wells are not affected by the Limited Purpose Landfill.
Part (a)(2) Accurately represent the quality of groundwater passing the waste boundary of the CCR unit. The downgradient monitoring system must be installed at the waste boundary that ensures detection of groundwater contamination in the uppermost aquifer. All potential contamination pathways must be monitored.	Based on a review of site conditions and well logs, the wells shown on Figure 3 are screened in the uppermost aquifer, and support a consistent southwest flow direction. Given the southwest groundwater flow direction, the three downgradient wells (LPLF-2R, LPLF-8, and LPLF-7R) are placed at the immediate downgradient perimeter of waste boundary to detect potential groundwater contamination in the uppermost aquifer beneath the Limited Purpose Landfill.
SubPart (b)(1) The number, spacing, and depths of monitoring systems shall be determined based upon site-specific technical information that (part 1) must include thorough characterization of aquifer thickness, groundwater flow rate, groundwater flow direction including seasonal and temporal fluctuations in groundwater flow; and...	The well network design was determined using site-specific conditions relative of the overall size, geometry of the Limited Purpose Landfill (that is, relatively small waste unit with circular footprint), and considering that the groundwater generally flows southwest. The three downgradient wells are positioned in reasonably spaced locations to detect potential leakage to the uppermost aquifer.
SubPart (b)(2) .....must include thorough characterization of saturated and unsaturated geologic and fill materials overlying uppermost aquifer, materials comprising the uppermost aquifer, and materials comprising the confining unit defining the lower boundary of the uppermost aquifer, including, but not limited to, thickness, stratigraphy, lithology, hydraulic conductivities, porosities, and effective porosities.	The existing site data have been reviewed and provide a thorough characterization of both vadose zone and the saturated hydrostratigraphic units, including the identification of uppermost aquifer and confining unit (lower boundary of uppermost aquifer) beneath the Limited Purpose Landfill. Section 3 summarizes these characteristics, related to site stratigraphy, thickness of units, and groundwater flow characteristics.
Part (c) The groundwater monitoring system must contain minimum of 1 upgradient and 3 downgradient wells.	Based on the groundwater flow direction for the uppermost aquifer, Table 1 and Figure 4 show the designated CCR groundwater monitoring system, which includes one upgradient, one cross-gradient, and three downgradient wells, and thus meets the minimum CCR requirements.
Part (d) the owner or operator of multiple CCR units may install a multiunit groundwater monitoring system instead of a separate groundwater monitoring system for each CCR unit.	Item not applicable. The TCM site has only 1 CCR unit referred to as the 'Limited Purpose Landfill'.
Part (e) Monitoring wells must be cased in a manner that maintains the integrity of the monitoring well borehole.	The well log and well construction diagrams were reviewed for all the designated CCR wells (show on Figure 4) and found to meet the well construction standards of Chapter 173-160-420 of the WAC, <i>General Construction Requirements for Resource Protection Wells</i> .
SubPart (e)(1) The owner must document and include in the operating record the design, installation, development, and decommissioning of any monitoring wells, piezometers, and other measurement, sampling, and analytical devices.	This documentation was reviewed as provided in <i>Groundwater Monitoring Well Construction Data Report for Limited Purpose Landfill at the TransAlta Centralia Mining LLC Site</i> (CH2M, 2016a). The above documentation was placed in the operating record as required by 257.106(h)(2). The certifying PE was given access to the documentation when competing the certification as required by 257.91(e)(2).
SubPart (e)(2) The monitoring wells, piezometers, and other measurement, sampling and analytical devices must be operated and maintained so that	Following well installation and development in July 2016, the CCR wells were equipped with dedicated tubing and are sampled with a peristaltic pump, which is designed for 'low-flow' sampling to obtain

Performance Standards of CCR Rule § 257.91, <i>Groundwater Monitoring Systems</i>	Technical Justification
they perform to the design specifications throughout the life of the monitoring program.	representative samples as prescribed by <i>Groundwater Sampling and Analysis Requirements</i> in accordance with the <i>Groundwater Monitoring Sampling and Analysis Plan for the Limited Purpose Landfill at the TransAlta Centralia Mining LLC Site</i> (CH2M, 2016b). Each well has a steel protective stick-up monument with lockable lid; each well cap remains locked between sampling events, and TCM performs routine inspections.
Part (f) Minimum number of wells.	The designated well network design and construction satisfies the minimum number of wells; as the information in this table demonstrates, the selected number and spacing of wells is appropriate to detect potential leakage to the uppermost aquifer as noted in subpart (b)(1) and (2) above.

## 4.0 References

- CH2M Engineers, Inc. (CH2M). 20018. *TransAlta Centralia Mining LLC, Limited Purpose Landfill Solid Waste Permit Application*. Prepared for TransAlta Centralia Mining LLC. October.
- CH2M Engineers, Inc. (CH2M). 2011. *Groundwater Monitoring Plan for TransAlta Centralia Mining LLC Limited Purpose Landfill, Amendment 1, July 2011*. Prepared for TransAlta Centralia Mining LLC.
- CH2M Engineers, Inc. (CH2M). 2016a. *Groundwater Monitoring Well Construction Data Report for Limited Purpose Landfill at the TransAlta Centralia Mining LLC Site*. Prepared for TransAlta Centralia Mining LLC.
- CH2M Engineers, Inc. (CH2M). 2016b. *Groundwater Monitoring Sampling and Analysis Plan for the Limited Purpose Landfill at the TransAlta Centralia Mining LLC Site*. Prepared for TransAlta Centralia Mining LLC.
- U.S. Environmental Protection Agency (EPA). 2015. *Federal Register, 40 CFR § 257 and 261, Hazardous and Solid Waste Management System, Disposal of Coal Combustion Residuals from Electric Utilities, Final Rule, Vol. 80 No. 74, dated Friday, April 17, 2015*.
- Washington Administrative Code (WAC). Chapter 173-160-420, *General Construction Requirements for Resource Protection Wells*.
- Washington Administrative Code (WAC). Chapter 173-350, *Solid Waste Handling Standards*.

**Table 1. Groundwater Monitoring Well Network**

Coal Combustion Residuals Groundwater Monitoring System Certification  
 TransAlta Centralia Mining LLC - Limited Purpose Landfill - October 2017

Well	Installation Date	Coordinates in NAD27 <sup>1</sup>		Reference Point		Well Screen Elevation <sup>2</sup>		Sand Pack Elevation <sup>2</sup>		Well Depth <sup>3</sup>	Uppermost Aquifer Unit	Hydraulic Designation
		Northing	Easting	Top of Casing Elevation <sup>2</sup>	Top of Ground Elevation <sup>2</sup>	Top	Bottom	Top	Bottom			
LPLF-1	October 2007	520,881.45	1,420,272.06	347.80	344.58	305.58	285.58	309.58	282.58	59	Mine Spoils	Up or Cross-Gradient
LPLF-5	August 2008	521,931.70	1,419,921.73	359.90	357.88	349.88	344.88	351.38	343.38	13	Mine Spoils	Upgradient
LPLF-8	August 2008	521,235.37	1,419,233.53	298.75	296.93	279.93	274.93	282.93	273.93	22	Mine Spoils	Downgradient
LPLF-2R	July 2016	521,561.20	1,419,130.52	296.04	293.86	10.0	263.9	275.86	262.36	31	Mine Spoils	Downgradient
LPLF-7R	July 2016	521,180.82	1,419,531.95	299.00	297.04	279.7	269.7	282.04	269.04	28	Mine Spoils	Downgradient

**General Notes:**

1. Well LPLF-1 is low yield and sampled via bailer.

**Column Header Footnotes:**

<sup>1</sup>Washington State Plane Coordinates (NAD27).

<sup>2</sup>All elevations in feet above mean sea level (NGVD29)

<sup>3</sup>Well depth is feet below ground surface (rounded to nearest foot)



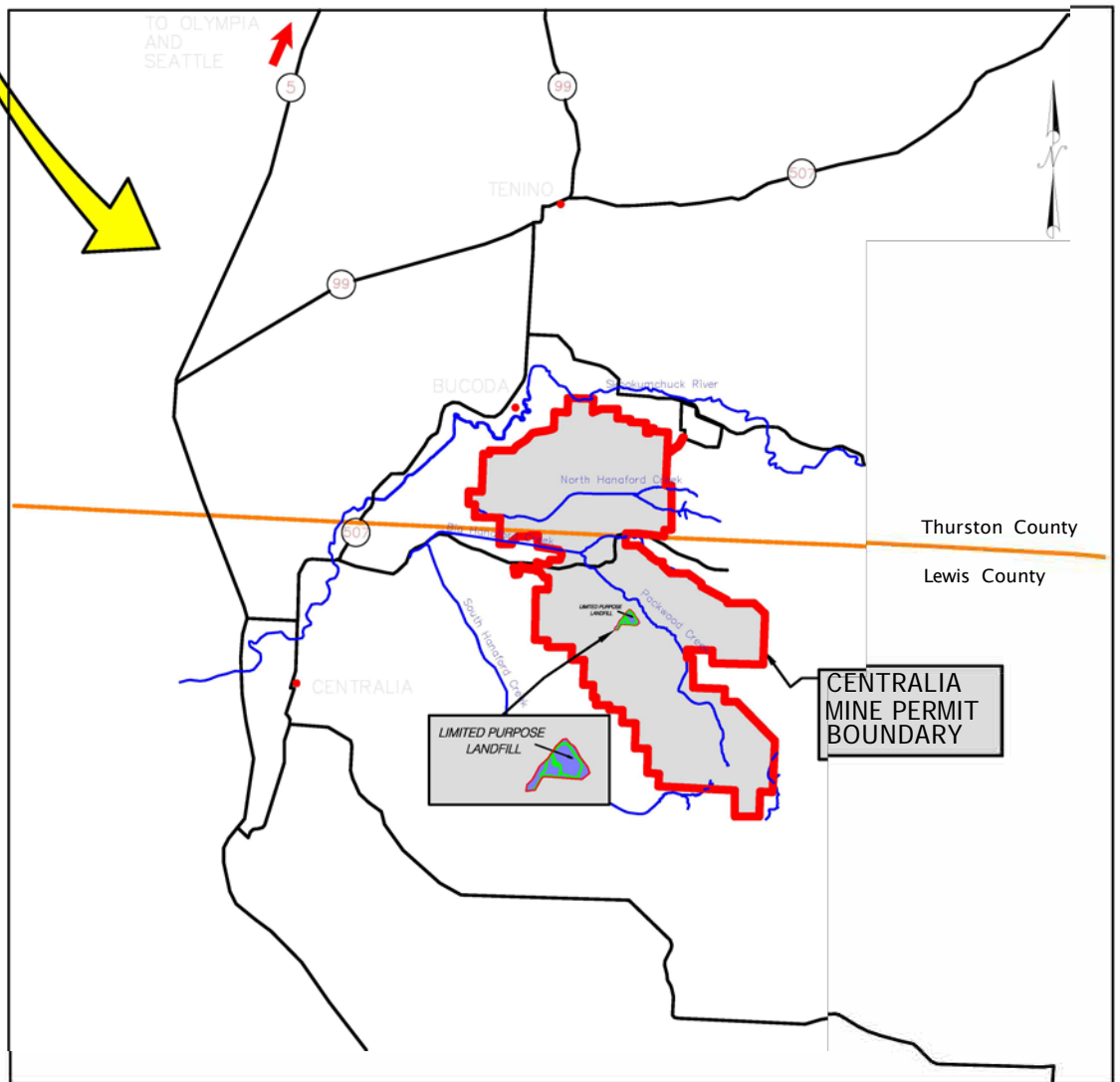
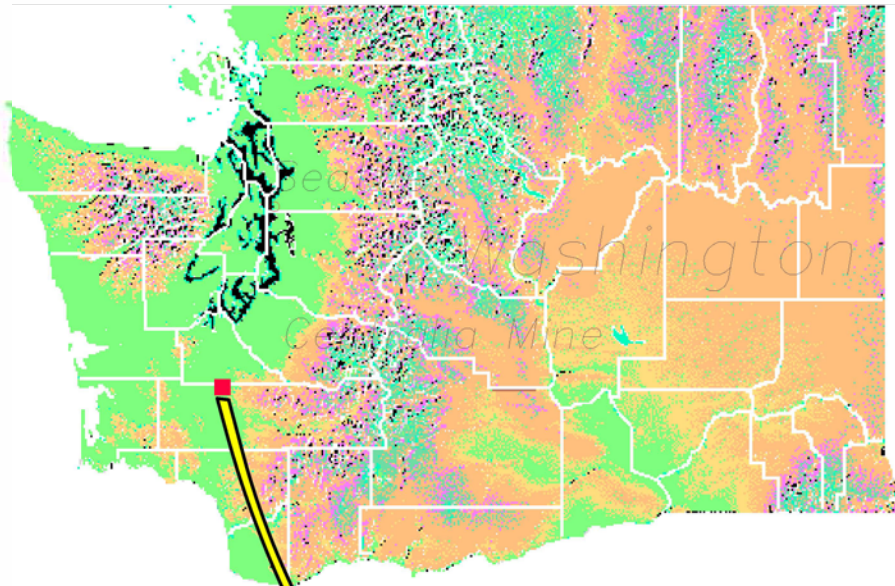
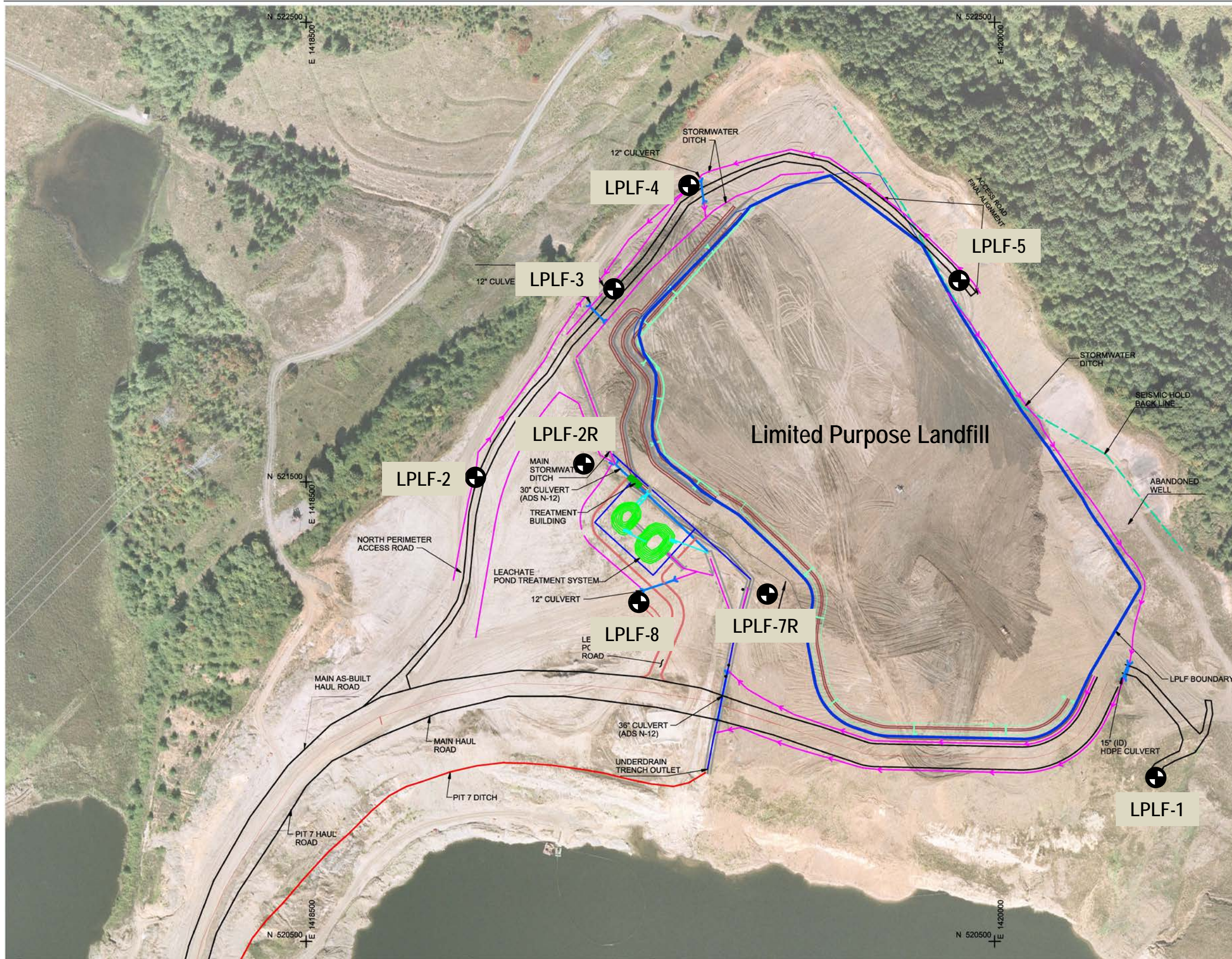


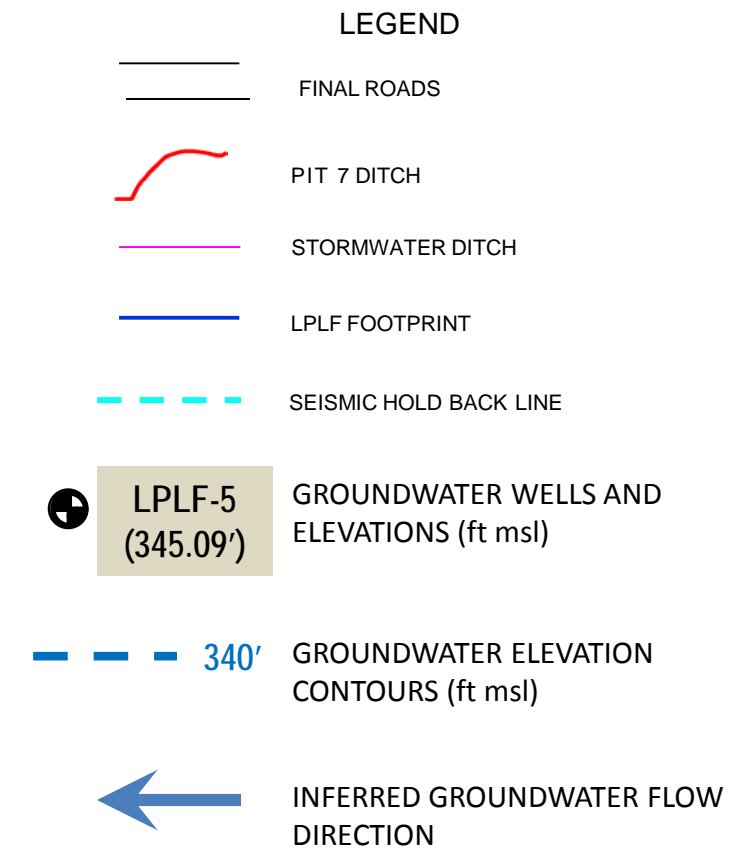
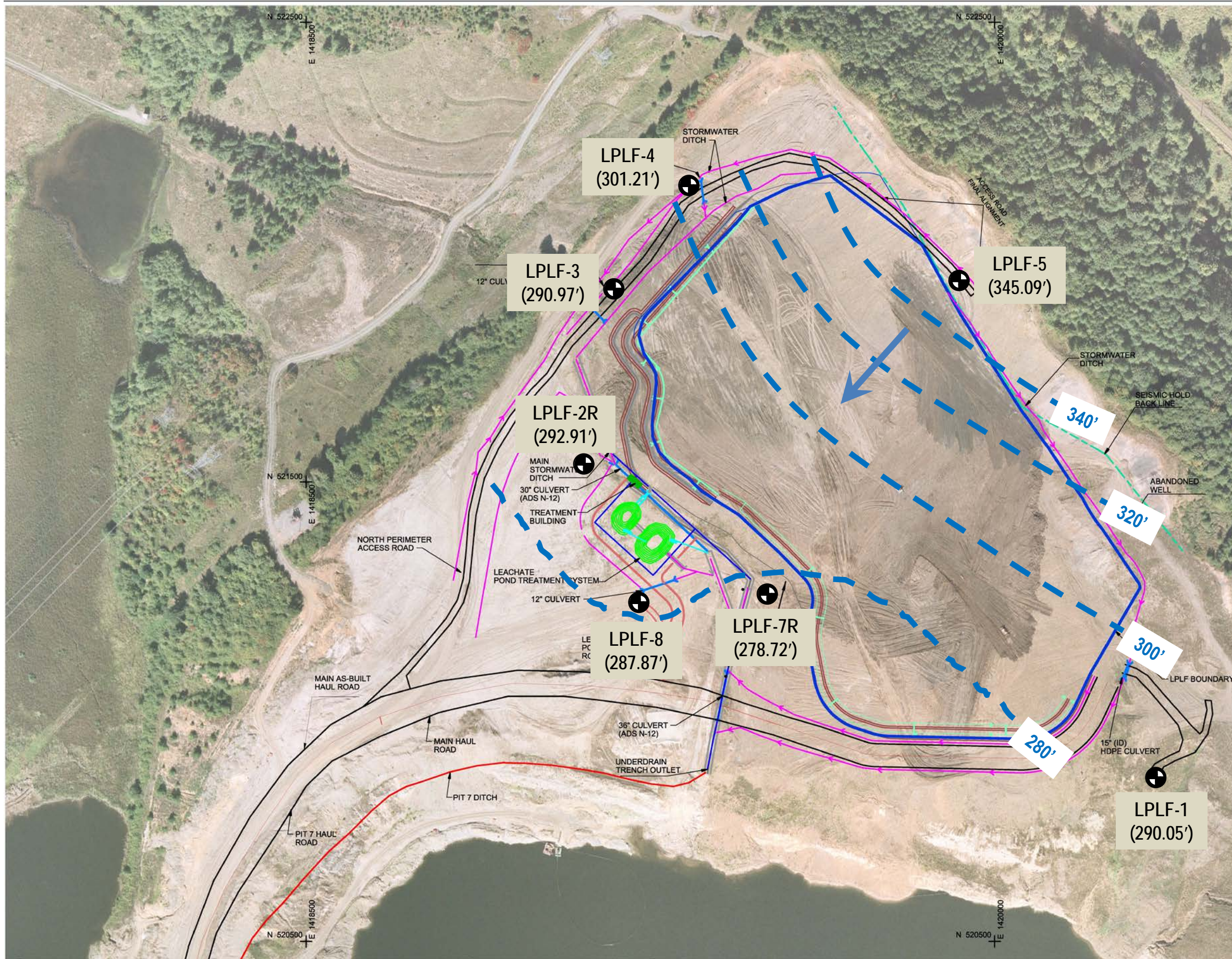
FIGURE 1  
 Vicinity Map  
 Groundwater Monitoring System Certification  
 Limited Purpose Landfill  
 October 2017





**Figure 2**  
**Site Features**  
 Groundwater Monitoring System Certification  
 Limited Purpose Landfill  
 October 2017



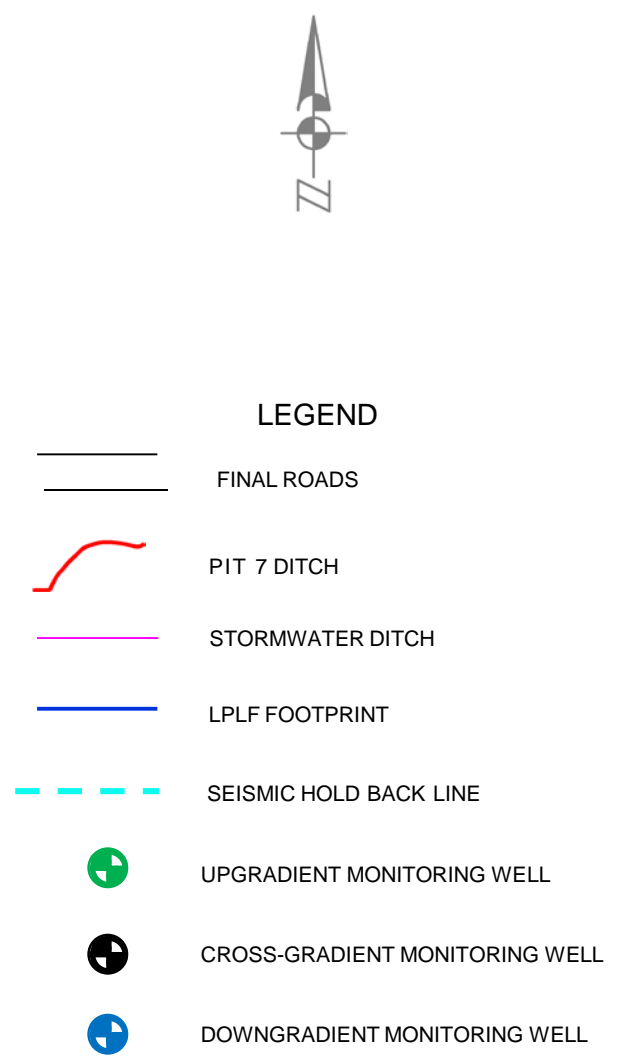
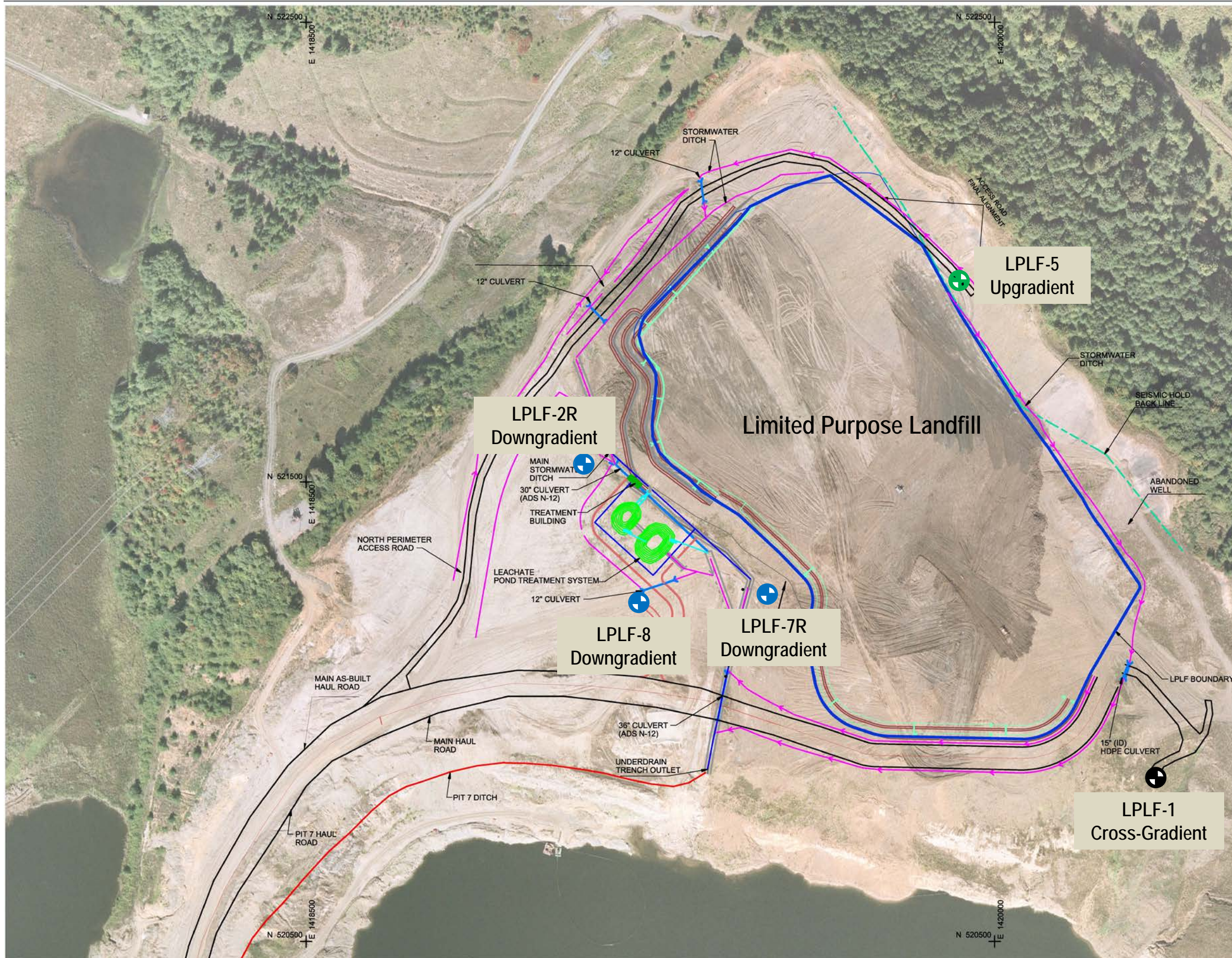


**NOTE:**  
 1. Groundwater levels measured June 26-27, 2017.



**Figure 3**  
**Groundwater Elevations and Flow Map**  
 Groundwater Monitoring System Certification  
 Limited Purpose Landfill  
 October 2017





**Figure 4**  
**Groundwater Monitoring System**  
 Groundwater Monitoring System Certification  
 Limited Purpose Landfill  
 October 2017