INL/EXT-18-45157

2017 Idaho National Laboratory Water Use Report and Comprehensive Well Inventory (Revision 26)

June 2018

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Idaho National Laboratory
Idaho Falls, Idaho 83415

http://www.inl.gov

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ABSTRACT

This *2017 Idaho National Laboratory Water Use Report and Comprehensive Well Inventory (Revision 26)* provides water use information for production and potable water wells at the Idaho National Laboratory (INL) Site for Calendar Year 2017. It also provides detailed information for new, modified, and decommissioned wells. Fourteen new wells were drilled and completed in Calendar Year 2017. No wells on the INL Site were decommissioned in Calendar Year 2017. However, an offsite area near Box Canyon that contained instrumented boreholes used for research was decommissioned. Detailed construction and decommissioning information and location maps for the wells are provided.

This report is being submitted in accordance with the Water Rights Agreement between the State of Idaho and the United States, for the United States Department of Energy (dated 1990), the subsequent Partial Decree for Water Right 34-10901 issued June 20, 2003, and the Final Unified Decree issued August 26, 2014.

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ACRONYMS

ATR Complex	Advanced Test Reactor Complex
bbc	below brass cap
bls	below land surface
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CFA	Central Facilities Area
CITRC	Critical Infrastructure Test Range Complex
CWI	Comprehensive Well Inventory
CY	calendar year
INL	Idaho National Laboratory
INTEC	Idaho Nuclear Technology and Engineering Center
MFC	Materials and Fuels Complex
NRF	Naval Reactors Facility
RWMC	Radioactive Waste Management Complex
RHLLW	Remote Handled Low Level Waste
TAN	Test Area North
USGS	United States Geological Survey

2017 Idaho National Laboratory Water Use Report and Comprehensive Well Inventory (Revision 26)

1. INTRODUCTION

This *2017 Idaho National Laboratory Water Use Report and Comprehensive Well Inventory, (Revision 26)* is being submitted in accordance with the "Water Rights Agreement between the State of Idaho and the United States, for the United States Department of Energy" (Department of Justice 1990), the subsequent Partial Decree for Water Right 34-10901 (District Court 2003) issued June 20, 2003, and the Final Unified Decree (District Court 2014) issued August 26, 2014. As previously agreed (Street 2001), the annual Water Use Report and Comprehensive Well Inventory are being combined and submitted as one report.

The Idaho National Laboratory (INL) Site water use reported is for Calendar Year (CY) 2017. Section 2 provides the annual volume of water diverted, maximum and average diversion rates, and "available" pumping levels (water depth) as required by Section 6.2.3 of the Water Rights Agreement for production and potable water wells at the INL Site. Section 2.1 provides total monthly volume, average monthly volume, total annual volume diverted, and water depths (as available) for each production or potable water well. Section 2.2 provides the total monthly volume of water diverted for each facility and the total annual volume for all INL Site production or potable water wells. Section 2.3 provides a summary of the annual water usage, including the total volume of water diverted, maximum diversion rate, and average monthly volume of water diverted for all production and potable wells.

Section 3 is the Comprehensive Well Inventory (CWI) for the INL Site as required by Section 6.2.2 of the Water Rights Agreement. Section 3.1 provides information for new wells. Fourteen new wells were constructed in CY 2017. Section 3.2 provides information for the decommissioning of instrumented boreholes at the Box Canyon Subsurface Applied Research site in CY 2017.

Appendix A provides location maps and diagrams containing detailed construction information for the newly constructed wells.

Appendix B provides a location map and decommissioning details for instrumented boreholes at the Box Canyon Subsurface Applied Research site.

2. 2017 WATER USE INFORMATION FOR THE IDAHO NATIONAL LABORATORY SITE

2.1 Water Volume for Individual Idaho National Laboratory Site Production or Potable Water Wells

Eight major facilities are located at the INL Site:

- Advanced Test Reactor Complex (ATR Complex)
- Central Facilities Area (CFA)
- Critical Infrastructure Test Range Complex (CITRC)
- Idaho Nuclear Technology and Engineering Center (INTEC)
- Materials and Fuels Complex (MFC)
- Naval Reactors Facility (NRF)
- Radioactive Waste Management Complex (RWMC)
- Test Area North (TAN).

Each major facility is serviced by one or more production and/or potable water wells. Tables 1 through 8 show the water information for production or potable wells at these facilities.

Seven wells are grouped under the CFA facility. Wells CFA-1 and CFA-2 serve the actual CFA facility. The other five wells (e.g., Badging Facility Well, EBR-1, Fire Station Well, Rifle Range Well, and Site-04 [Dairy Farm]) serve smaller facilities or processes. The Fire Station Well has occasionally been used for filling water trucks for construction purposes. However, for 2017, the Fire Station Well was not used because the pump remains inoperable. The Dairy Farm Well is used for irrigating various research projects. The wells identified at other INL Site facilities provide water primarily for that specific facility.

The U. S. Department of Energy (DOE) is working cooperatively with the Idaho Department of Water Resources (IDWR) under the 1990 Water Rights Agreement to provide assurance to IDWR regarding the accuracy of measurement data from DOE's groundwater diversions at the Idaho National Laboratory (INL) Site.

Total monthly volumes are recorded as close to the last day of the month as is reasonably possible. Each table provides the total monthly volume, average monthly volume, and total annual volume of water diverted from each production or potable well during CY 2017. The tables provide water depth as available. Many of the wells were not designed with an access line to measure the water depth. Each well is identified by its official well name, the most common alias name, and the well identification number. Footnotes are provided where applicable.

Section 5.3 of the Water Rights Agreement states, "The use of water for fire suppression benefits the public. Water diverted for fire suppression may be taken randomly, without a definition of the specific elements of a recordable water right, and if so diverted for fire suppression, existing water rights shall not be diminished." The volumes in the tables may include water used for fire suppression activities. However, there is no way to distinguish water used for fire suppression and water used for other activities.

Table 1. Advanced Test Reactor Complex water volume for 2017.

Volume in Gallons																
Well	Alias	INL Well ID	January	February	March	April	May	June	July	August	September	October	November	December	Total Annual Volume	Average Monthly Volume
TRA-01	NO. 1 DEEP WELL	356	33,894,000	5,677,000	22,151,000	1,477,000	21,657,000	16,000	23,000	29,000	3,000	2,000	31,000	12,813,000	97,773,000	8,147,750
TRA-03	NO. 3 DEEP WELL	358	1,794,000	315,000	4,329,000	987,000	724,000	976,000	3,000	2,883,000	1,128,000	58,000	2,000	836,000	14,035,000	1,169,583
TRA-04	NO. 4 DEEP WELL	359	1,071,000	26,376,000	3,647,000	23,391,000	8,564,000	36,230,000	28,972,000	26,212,000	26,478,000	36,378,000	36,372,000	13,465,000	267,156,000	22,263,000
TRA-1863		1863	3,365,000	3,073,000	3,512,000	3,379,000	3,704,000	3,445,000	3,561,000	3,895,000	3,841,000	3,910,000	4,000,000	3,736,000	43,421,000	3,618,417
Monthly total			40,124,000	35,441,000	33,639,000	29,234,000	34,649,000	40,667,000	32,559,000	33,019,000	31,450,000	40,348,000	40,405,000	30,850,000		
Total annual volume for ATR Complex: **422,385,000**																
Depth to water, static water level: Date: September 12, 2017 TRA-1863: 470.27 ft bls bls – below land surface																

Table 2. Central Facilities Area water volume for 2017.

Volume in Gallons																
Well	Alias	INL Well ID	January	February	March	April	May	June	July	August	September	October	November	December	Total Annual Volume	Average Monthly Volume
CFA-1	CFA-651	93	165,900	163,600	1,800	11,900	4,270,800	2,249,900	5,927,000	12,302,400	2,801,600	1,797,700	502,300	161,200	30,356,100	2,529,675
CFA-2	CFA-642	94	1,128,500	881,300	1,454,900	1,532,600	2,855,400	3,805,300	2,315,400	0	4,722,400	1,418,600	645,200	959,900	21,719,500	1,809,958
Badging Facility Well	B27-605 Main Gate	88	1,560	1,950	1,900	2,010	2,400	82,750	363,970	608,520	170,600	60,110	1,830	910	1,298,510	108,209
EBR-1	EBR 1	149	1,966	144	725	956	6,200	6,209	7,751	15,072	625	1,172	402	810	42,032	3,503
Rifle Range Well	B21-607 Gun Range	267	1,470	1,100	1,410	1,470	2,070	1,060	1,020	3,320	2,090	2,090	1,310	2,450	20,860	1,738
Site-04	B16-604 Dairy Farm	273	0	0	0	0	320	0	10	73,734	12,029	0	0	0	86,093	7,174
Fire Station Well[a]	Fire Station #2	158	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monthly total			1,299,396	1,048,094	1,460,735	1,548,936	7,137,190	6,145,219	8,615,151	13,003,046	7,709,344	3,279,672	1,151,042	1,125,270		
Total annual volume for CFA: **53,523,095**																
a. Pump for the Fire Station Well is inoperable. Pump has not been repaired or replaced.																

Table 3. Critical Infrastructure Test Range Complex water volume for 2017.

			Volume in Gallons													
Well	Alias	INL Well ID	January	February	March	April	May	June	July	August	September	October	November	December	Total Annual Volume	Average Monthly Volume
SPERT-1	PBF Deep Well No. 1	280	235,700	373,700	492,600	132,900	338,900	489,100	162,700	358,000	210,000	175,800	171,400	235,600	3,376,400	281,367
SPERT-2	PBF Deep Well No. 2	281	230,200	154,300	800	216,700	263,300	608,000	254,500	353,400	193,100	212,800	226,600	188,700	2,902,400	241,867
Monthly total			465,900	528,000	493,400	349,600	602,200	1,097,100	417,200	711,400	403,100	388,600	398,000	424,300		
Total annual volume for CITRC: **6,278,800**																

Table 4. Idaho Nuclear Technology and Engineering Center water volume for 2017.

			Volume in Gallons													
Well	Alias	INL Well ID	January	February	March	April	May	June	July	August	September	October	November	December	Total Annual Volume	Average Monthly Volume
CPP-01	F-UTI-670	98	11,777,000	7,965,000	9,073,000	10,723,000	11,841,000	8,784,000	8,546,000	9,758,000	9,608,000	7,779,000	8,506,000	6,928,000	111,288,000	9,274,000
CPP-02	F-UTI-671	99	7,275,000	7,215,000	9,806,000	10,224,000	10,804,000	7,738,000	8,979,000	11,196,000	8,878,000	7,868,000	7,933,000	6,379,000	104,295,000	8,691,250
CPP-04 [a]	CPP 04	101	226,076	177,470	242,269	169,900	156,409	227,150	185,351	211,270	188,091	228,150	182,754	222,785	2,417,675	201,473
ICPP-POT-A-012 [a]	F-UTI-699 or CPP-05	1186	226,077	177,470	242,269	169,899	156,409	227,151	185,351	211,270	188,090	228,149	182,754	222,786	2,417,675	201,473
Monthly total			19,504,153	15,534,940	19,363,538	21,286,799	22,957,818	16,976,301	17,895,702	21,376,540	18,862,181	16,103,299	16,804,508	13,752,571		
Total annual volume for INTEC: **220,418,350**																

a. One flow meter was used for potable wells CPP-04 and ICPP-POT-A-012. Operations switched between the wells weekly, so the totals are estimated to be 50% for each well.

Table 5. Materials and Fuels Complex water volume for 2017.

			Volume in Gallons													
Well	Alias	INL Well ID	January	February	March	April	May	June	July	August	September	October	November	December	Total Annual Volume	Average Monthly Volume
EBR-II #1[a]	EBR-II-1	150	1,004,521	740847.5	1025273.5	857,062.5	993,680.5	1,109,132.5	1,188,817	1409012.5	1,403,404	1,391,242	1,210,419	1,043,877	13,377,289	1,114,774
EBR-II #2[a]	EBR-II-2	151	1,004,521	740847.5	1025273.5	857,062.5	993,680.5	1,109,132.5	1,188,817	1409012.5	1,403,404	1,391,242	1,210,419	1,043,877	13,377,289	1,114,774
Monthly total			2,009,042	1,481,695	2,050,547	1,714,125	1,987,361	2,218,265	2,377,634	2,818,025	2,806,808	2,782,484	2,420,838	2,087,754		
Total annual volume for MFC: **26,754,578**																
a. The two wells share two flow meters. Operations switch between the wells, so the totals are estimated to be 50% for each well.																

Depth to water, static water level:

Date	EBR-II #1	EBR-II #2
May 2017	661.0 ft bbc	662.0 ft bbc
November 2017	661.3 ft bbc	661.6 ft bbc

bbc – below brass cap

Table 6. Naval Reactors Facility water volume for 2017.

			Volume in Gallons													
Well	Alias	INL Well ID	January	February	March	April	May	June	July	August	September	October	November	December	Total Annual Volume	Average Monthly Volume
NRF-1	NRF 1	240	480,000	260,000	138,000	74,000	0	8,000	12,000	12,000	22,000	0	81,740	360,000	1,447,740	120,645
NRF-2[a]	NRF 2	241	0	0	0	0	0	0	0	0	0	0	0	0	0	0
NRF-3[b]	NRF 3	242	145,778	69,310	71,786	73,875	64,611	67,560	121,296	155,924	128,700	108,813	85,367	72,263	1,165,283	97,107
NRF-4	NRF 4	869	991,000	727,000	805,000	1,320,000	1,190,000	1,680,000	4,769,000	2,845,000	990,000	600,000	774	1,746,948	17,664,722	1,472,060
NRF-14[b]		2204	658,322	382,941	409,615	381,171	449,138	667,895	677,992	651,623	500,558	376,034	300,319	204,346	5,659,954	471,663
Monthly total			2,275,100	1,439,251	1,424,401	1,849,046	1,703,749	2,423,455	5,580,288	3,664,547	1,641,258	1,084,847	468,200	2,383,557		
Total annual volume for NRF: **25,937,699**																
a. NRF-2 was removed from service in 2006. Future use will be determined. b. Wells NRF-3 and NRF-14 are used as potable water wells.																

Depth to water, static water level:

Date	NRF-3	NRF-14
May 2017	389.83 ft bls	389.37 ft bls
November 2017	389.06 ft bls	388.49 ft bls

bls – below land surface

Table 7. Radioactive Waste Management Complex water volume for 2017.

			Volume in Gallons													
Well	Alias	INL Well ID	January	February	March	April	May	June	July	August	September	October	November	December	Total Annual Volume	Average Monthly Volume
RWMC Production	RWMC-PROD	268	345,400	305,400	391,700	353,500	591,100	456,800	886,700	686,500	543,500	393,700	268,600	289,900	5,512,800	459,400
PIT 9 Production Well	Pit 9 Prod	2155	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Monthly total			345,400	305,400	391,700	353,500	591,100	456,800	886,700	686,500	543,500	393,700	268,600	289,900		
Total annual volume for RWMC: **5,512,800**																

Table 8. Test Area North water volume for 2017.

			Volume in Gallons													
Well	Alias	INL Well ID	January	February	March	April	May	June	July	August	September	October	November	December	Total Annual Volume	Average Monthly Volume
ANP-01[a]	TAN-612	69	0	0	0	0	0	0	0	0	0	0	0	0	0	0
ANP-02	TAN-613	70	154,200	117,200	167,700	132,700	223,400	173,800	165,000	256,000	213,800	98,400	190,800	123,600	2,016,600	168,050
FET-1	TAN-632	154	0	129,000	107,500	262,600	744,100	223,600	455,100	518,300	346,900	52,300	0	0	2,839,400	236,617
FET-2	TAN-639	155	530,800	350,200	467,400	269,700	204,400	341,900	416,300	717,500	789,600	610,900	596,700	997,500	6,292,900	524,408
Monthly total			685,000	596,400	742,600	665,000	1,171,900	739,300	1,036,400	1,491,800	1,350,300	761,600	787,500	1,121,100		
Total annual volume for TAN: **11,148,900**																
a. Well is maintained as a backup well for ANP-02.																

2.2 Combined Total Volume Diverted from All Production and Potable Water Wells

Table 9 provides the combined total volume from all production and potable water wells at the INL Site during CY 2017. Table 9 includes:

- Total monthly volume of water diverted for each major INL Site facility
- Combined total monthly volume diverted from all the major INL Site facilities
- Monthly average volume diverted for all wells combined
- Monthly maximum volume diverted for all wells combined
- Total annual volume diverted at the INL Site.

Table 9. Idaho National Laboratory Site water volume totals for 2017.

Volume in Gallons												
Facility	January	February	March	April	May	June	July	August	September	October	November	December
Advanced Test Reactor Complex	40,124,000	35,441,000	33,639,000	29,234,000	34,649,000	40,667,000	32,559,000	33,019,000	31,450,000	40,348,000	40,405,000	30,850,000
Central Facilities Area	1,299,396	1,048,094	1,460,735	1,548,936	7,137,190	6,145,219	8,615,151	13,003,046	7,709,344	3,279,672	1,151,042	1,125,270
Critical Infrastructure Test Range Complex	465,900	528,000	493,400	349,600	602,200	1,097,100	417,200	711,400	403,100	388,600	398,000	424,300
Idaho Nuclear Technology and Engineering Center	19,504,153	15,534,940	19,363,538	21,286,799	22,957,818	16,976,301	17,895,702	21,376,540	18,862,181	16,103,299	16,804,508	13,752,571
Materials and Fuels Complex	2,009,042	1,481,695	2,050,547	1,714,125	1,987,361	2,218,265	2,377,634	2,818,025	2,806,808	2,782,484	2,420,838	2,087,754
Naval Reactors Facility	2,275,100	1,439,251	1,424,401	1,849,046	1,703,749	2,423,455	5,580,288	3,664,547	1,641,258	1,084,847	468,200	2,383,557
Radioactive Waste Management Complex	345,400	305,400	391,700	353,500	591,100	456,800	886,700	686,500	543,500	393,700	268,600	289,900
Test Area North	685,000	596,400	742,600	665,000	1,171,900	739,300	1,036,400	1,491,800	1,350,300	761,600	787,500	1,121,100
Monthly Totals	**66,707,991**	**56,374,780**	**59,565,921**	**57,001,006**	**70,800,318**	**70,723,440**	**69,368,075**	**76,770,858**	**64,766,491**	**65,142,202**	**62,703,688**	**52,034,452**
Maximum monthly volume (gallons)	76,770,858 for August 2017											
Total average monthly volume (gallons)	64,329,935											
Annual total for 2017 (gallons)	**771,959,222**											

2.3 Water Use Summary

The INL Site's Federal Reserved Water Right is 35,000 acre-ft/yr (1.14×10^{10} gal/yr); not to exceed a maximum diversion rate of 80 ft^3/s (35,906 gpm). The total volume of water diverted at the INL Site for CY 2017 was approximately 7.72×10^8 gal (see Table 9) or approximately 6.77% of the annual water right. The maximum monthly volume of water diverted was 76,770,858 gal and the maximum diversion rate was 3.83 ft^3/s that occurred in August. The average monthly volume of water diverted for all INL Site production and potable wells was approximately 6.43×10^7 gal. The INL Site's water use remained well within the established water right.

3. COMPREHENSIVE WELL INVENTORY, REVISION 26

3.1 Idaho National Laboratory Site New and Modified Wells in Calendar Year 2017

Fourteen new monitoring wells were constructed at the INL Site in CY 2017 and are listed in Table 10. Two of the wells, United States Geological Survey (USGS)-146 and TAN-2312 are aquifer monitoring wells drilled by the USGS. The other 12 wells are located at INL's Remote-Handled Low Level Waste (RHLLW) disposal facility. No INL Site wells were modified in CY 2017.

Well USGS-146 was drilled approximately 5.5 miles southwest of the ATR Complex. In addition to improving the understanding of hydrogeology in this area, the well will also serve to fill a data gap within the USGS well monitoring network at INL. Well USGS-146 was drilled 800 ft below land surface (bls) and constructed approximately 95 ft into the regional Eastern Snake River Plain Aquifer. The well is open (not screened) between 591 and 800 ft bls; the carbon steel well casing (6-in.) extends 2 ft above ground to 591 ft bls. The well was equipped with a 1.25-in. stainless steel discharge line and 1-in. stainless steel water level access line set down to 780 and 735 ft bls, respectively; well USGS-146 pump inlet (5 hp Grundfos) was placed near 783 ft bls. The initial water level in well USGS-146 was measured at 706.16 ft bls, taken October 25, 2017. Groundwater and geologic data collected will be used to improve INL groundwater and stratigraphic framework models.

Well TAN-2312 is a Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) well drilled to support the OU 1-07B remediation project. The well will serve as a distal zone sampling location for the TAN groundwater plume. The well will be used to monitor plume expansion. The well was also drilled to provide groundwater and geologic data that will be used to improve the USGS INL groundwater and stratigraphic framework models and provide the USGS with an additional downgradient monitoring well at TAN. The well was cored to 568 ft bls. The well was completed by reaming the corehole to a 9.87 inch diameter to 522 ft bls. A 10-in. diameter carbon steel casing was set to 228 ft bls and a 1.5 hp pump was installed at 340 ft bls. The initial water level was measured at 244.4 ft bls, taken on September 27, 2017.

The RHLLW disposal facility has been constructed approximately 0.3 miles southwest of the ATR Complex and will receive RHLLW waste contained in steel waste containers from the ATR Complex, NRF, and MFC. The steel waste containers will then be placed in below-grade precast concrete vaults arranged in an array by container/cask type. A subsurface characterization and monitoring system was designed and installed to obtain data necessary to quantify hydraulic performance of the vault system and to enable early detection of potential radiologic releases from the facility (INL/EXT-17-43081). The system consists of clusters of instrumented tubes and boreholes (see Figure 3.1), and sedimentary interbed instrumented wells (see Figure 3.2). The instrumented tubes were not drilled, but were constructed in the excavated vault area as it was backfilled. The forty-five foot boreholes and interbed wells were drilled after the vaults were placed and the area backfilled. Instrument boxes are fixed to the top of each well to house the datalogger and battery. The usage of each is as follows:

- Instrumented tubes – collect hydraulic performance data at multiple elevations in the vault perimeter drainage material and drainage course material, and allow for the collection of water samples.
- Forty-five foot drilled boreholes – collect water samples and hydraulic performance data in the alluvium above the first basalt layer.
- Sedimentary interbed wells – collect water samples and hydraulic performance data in the sedimentary interbed located approximately 170 to 175 ft below the top of the vault plugs.

Table 10. Idaho National Laboratory Site new wells constructed in Calendar Year 2017.

Well Name	Type	Tube/Borehole/ Well Depth (ft bls)	Casing Diameter (Inner)	Construction Material	Status	Location	Driller/License #
USGS-146	Monitoring	800	10 inch from -1 to 3 ft 6 inch from -2 to 591 ft	Carbon Steel Carbon Steel	Active	T3N, R28E, Sec 25, NE ¼, NW ¼, NW ¼	USGS
TAN-2312	Monitoring	568	16 inch from -3 to 37 ft 10 inch from -2 to 228 ft	Carbon Steel Carbon Steel	Active	T6N, R31E, Sec24, SE ¼, SE ¼, SW ¼	USGS
RHLLW-2278	Scientific Instrumentation	43 29 29	5 inch from -2 to 8 ft 10 inch from -2 to 8 ft 10 inch from -2 to 8 ft	PVC	Active	T3N, R29E, Sec 23, NE ¼, NW ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2279	Scientific Instrumentation	40 29	5 inch from -2 to 8 ft 10 inch from -2 to 8 ft	PVC	Active	T3N, R29E, Sec 23, NE ¼, NW ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2280	Scientific Instrumentation	176.6	5.5 inch from -2 to 173 ft	Carbon Steel	Active	T3N, R29E, Sec 23, NW ¼, NE ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2281	Scientific Instrumentation	43.8 26	5 inch from -2 to 8 ft 10 inch from -2 to 8 ft	PVC	Active	T3N, R29E, Sec 23, NW ¼, NE ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2282	Scientific Instrumentation	41.75 26	5 inch from -2 to 8 ft 10 inch from -2 to 8 ft	PVC	Active	T3N, R29E, Sec 23, NW ¼, NE ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2283	Scientific Instrumentation	42.5 26	5 inch from -2 to 8 ft 10 inch from -2 to 8 ft	PVC	Active	T3N, R29E, Sec 23, NE ¼, NW ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2284	Scientific Instrumentation	172	5.5 inch from -2 to 168 ft	Carbon Steel	Active	T3N, R29E, Sec 23, NW ¼, NE ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2285	Scientific Instrumentation	41 26	5 inch from -2 to 8 ft 10 inch from -2 to 8 ft	PVC	Active	T3N, R29E, Sec 23, NE ¼, NW ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2286	Scientific Instrumentation	42 26	5 inch from -2 to 8 ft 10 inch from -2 to 8 ft	PVC	Active	T3N, R29E, Sec 23, NW ¼, NE ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2287	Scientific Instrumentation	173	5.5 inch from -2 to 168 ft	Carbon Steel	Active	T3N, R29E, Sec 23, NE ¼, NW ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2288	Scientific Instrumentation	41.75 26	5 inch from -2 to 8 ft 10 inch from -2 to 8 ft	PVC	Active	T3N, R29E, Sec 23, NW ¼, NE ¼, NW ¼	Thomas Well Drilling, #390
RHLLW-2289	Scientific Instrumentation	43.75 26	5 inch from -2 to 8 ft 10 inch from -2 to 8 ft	PVC	Active	T3N, R29E, Sec 23, NW ¼, NE ¼, NW ¼	Thomas Well Drilling, #390

Figure 3-1. Cluster of instrumented tubes and boreholes at RHLLW facility.

Figure 3-2. Instrumented sedimentary interbed well at RHLLW facility.

Maps and detailed construction diagrams of all the new wells can be found in Appendix A. The CWI database maintains detailed well information that can be provided electronically to the State upon request.

3.2 Idaho National Laboratory Site Wells Decommissioned in Calendar Year 2017

No wells were decommissioned at the INL Site in 2017. However, an old research site, Box Canyon Subsurface Applied Research Site (see Figure 3-3), located on Bureau of Land Management property, was decommissioned. This site served as a collaborative effort from several institutions to perform environmental investigations on detailed geological, lithological, and hydrogeological conditions in the mid to late 1990's. Instrumented boreholes, both vertical and slanted, were equipped with hundreds of sensors used to perform infiltration tests, underground grouting tests, vadose zone monitoring and characterization methods, and evaluations of fractured rocks.

Figure 3-3. Box Canyon Subsurface Applied Research Site before decommissioning activities.

Decommissioning work began on July 27, 2017, and was completed on August 7, 2017. The casings were pulled or broken off below grade. Instruments were removed if possible, or the wiring was cut off below grade. The concrete wall used to contain water for infiltration tests was removed. The holes were filled with bentonite pellets to within 3 inches of existing grade and soaked with water, then covered with native soil and rock restoring the area to its natural habitat (see Figure 3-4). Table B-1 provides decommissioning details for these instrumented boreholes.

Figure 3-4. Box Canyon Subsurface Applied Research Site after decommissioning activities were completed.

The CWI database maintains detailed well information that can be provided electronically to the state upon request.

4. REFERENCES

Department of Justice, Environment and Natural Resources Division, 1990, "Water Rights Agreement between the State of Idaho and the United States, for the United States Department of Energy," CCN 23795.

District Court-SRBA, Fifth Judicial District, Twin Falls County, Idaho, Order of Partial Decree for Water Right 34-10901 (United States Department of Energy, Idaho National Engineering and Environmental Laboratory), Case No. 39576, June 20, 2003, CCN 23795.

District Court-SRBA, Fifth Judicial District, Twin Falls County, Idaho, Final Unified Decree, Case No. 39576, August 25, 2014.

INL/EXT-17-43081, "As-Built Characterization and Monitoring System for the RH-LLW Disposal Facility," September, 2017.

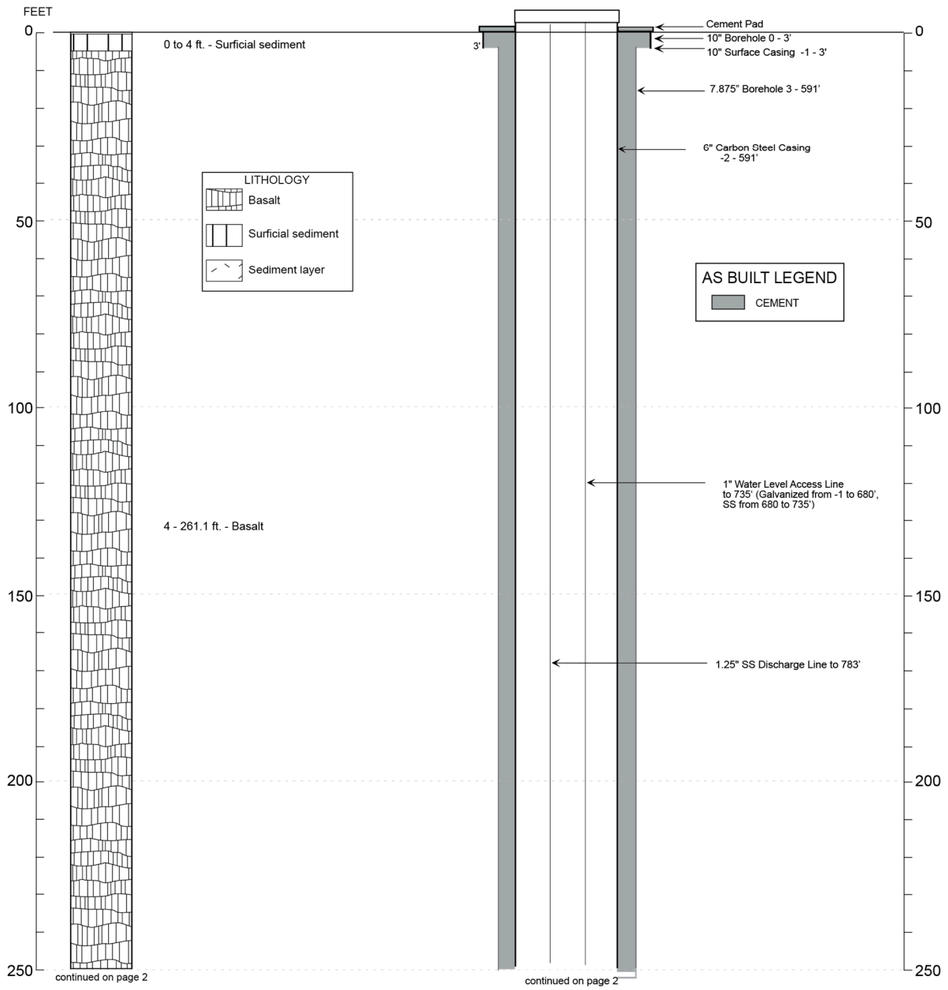
Street, L. V., INEEL, to D. Dunn, IDWR, September 4, 2001, "INEEL Comprehensive Well Surveys and Annual Water Use Reports," CCN 25370.

Appendix A
–
Maps and Construction Diagrams for New Wells Completed in CY 2017

Figure A-1. Map showing location of new well USGS-146.

WELL NAME: **USGS-146**
WELL ID: **2314**
Facility: INL (near MFC)
Well Type: Monitoring
Well Status Active
Year Drilled: 2017
Total Depth 800'
Drilling Start Date 4/06/2017 Drilling End Date 6/06/2017
Completion Depth: 800'

Driller: USGS
Geologist: M Hodges
Drill Method: Air/Foam Rotary
Drill Fluid: Air/Foam
Land Surface: 5131.31 (29) B.C.
5134.82 (88) B.C.
Water Level: 708 ft bls
Water Level/ Date: 5/17/2017
Water Level Access: Hole



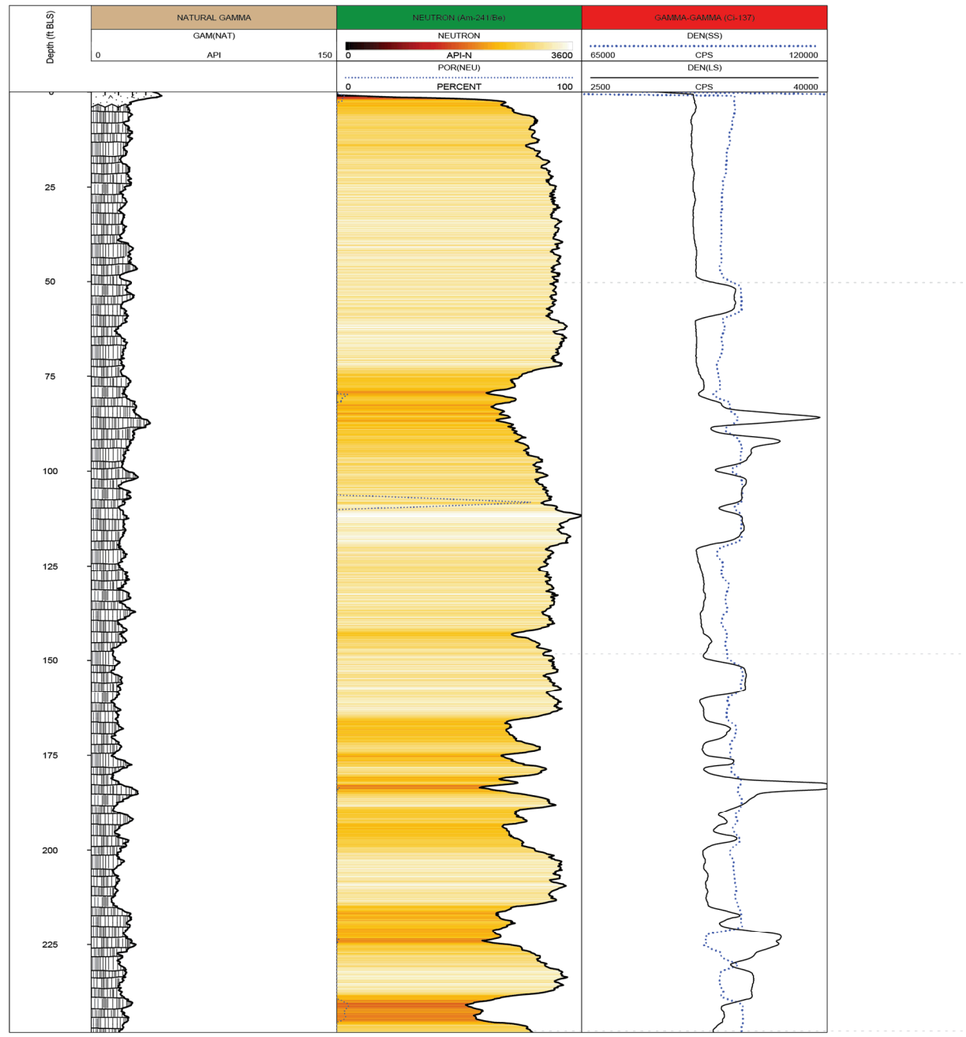
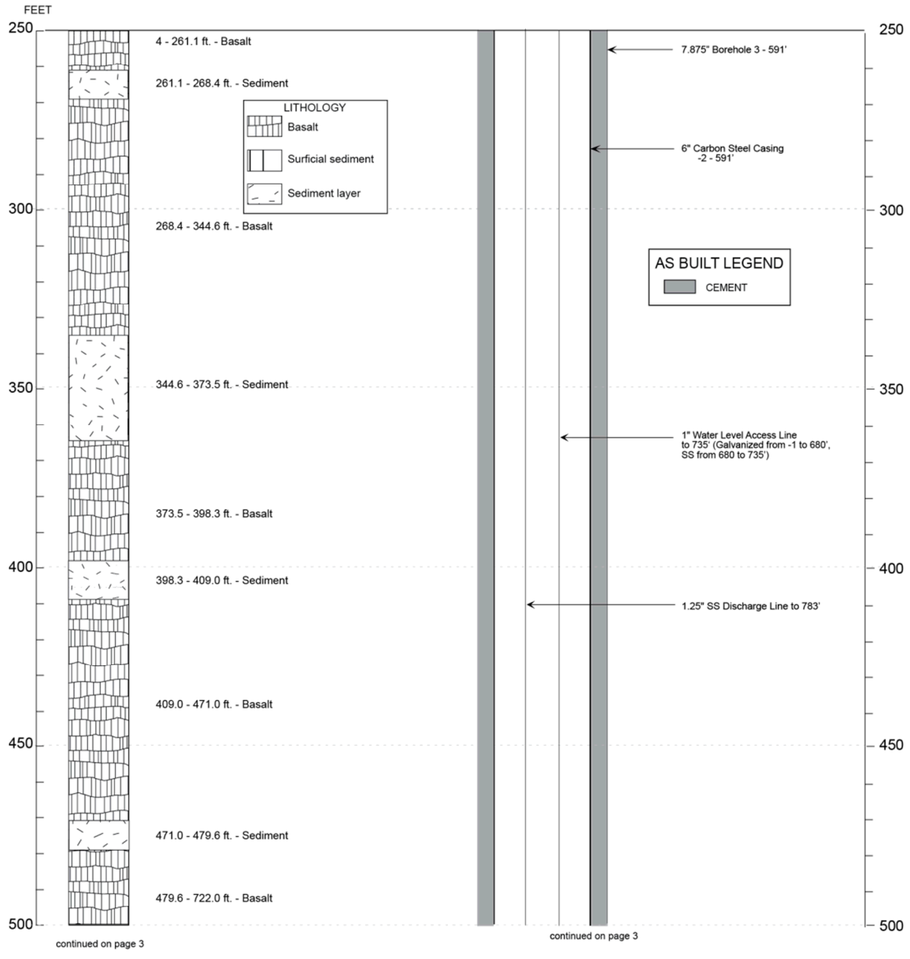


Figure A-2. Construction diagram for new well USGS-146.

WELL NAME: **USGS-146**



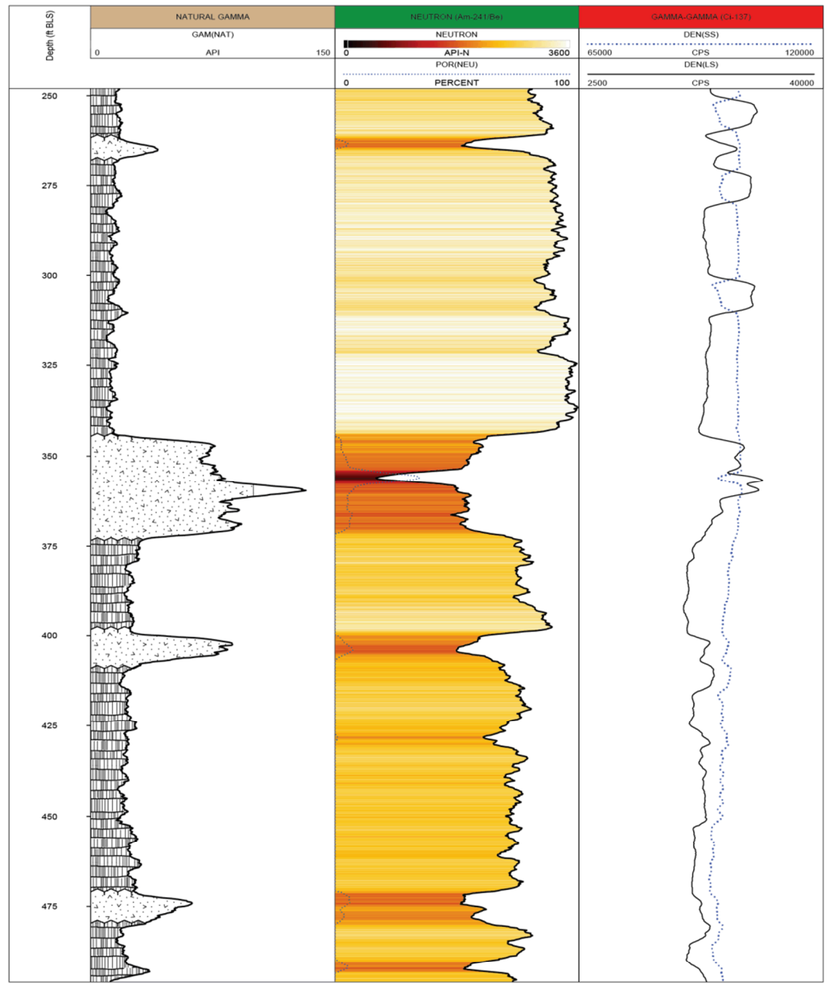
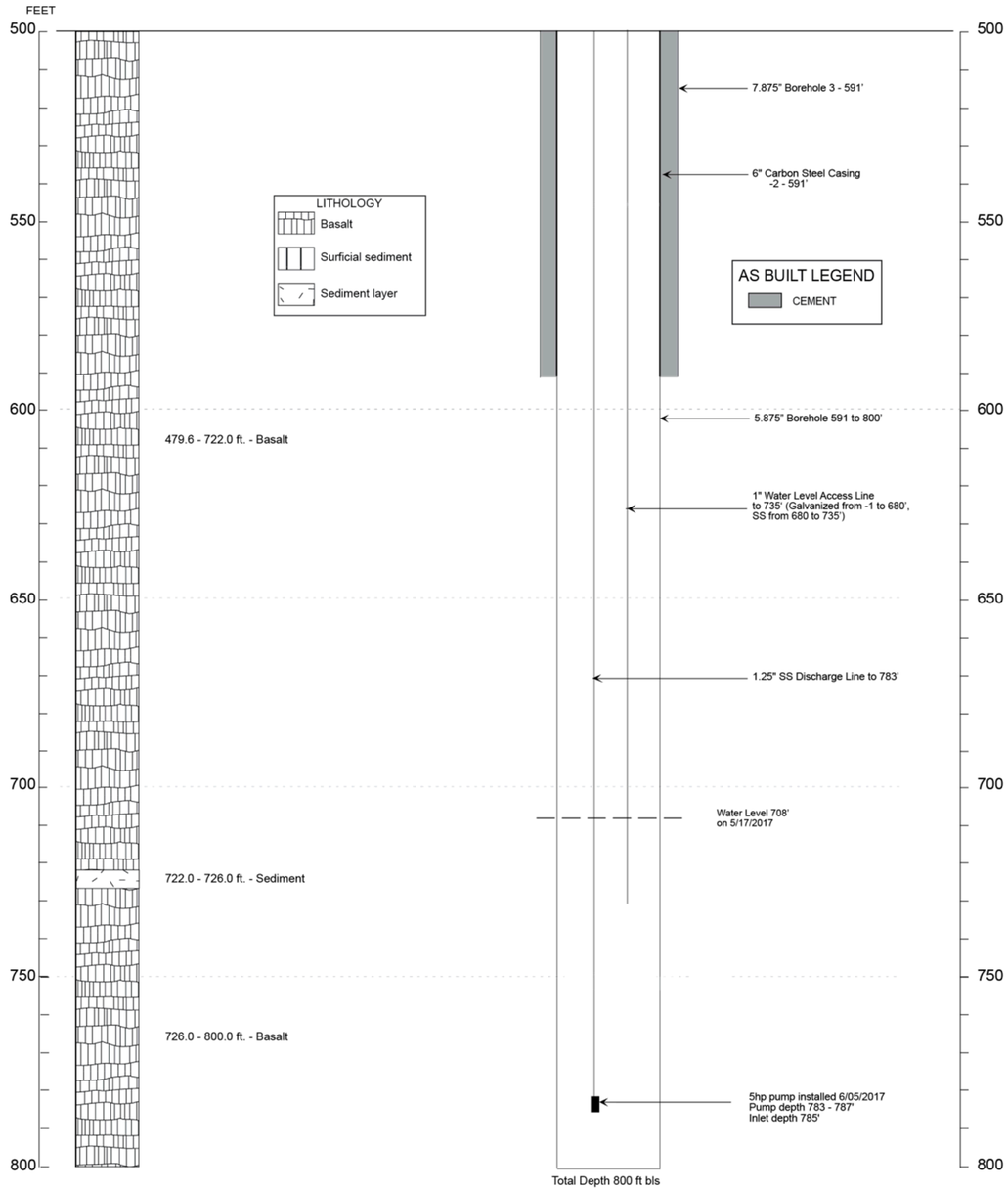


Figure A-2 (cont.).

WELL NAME: **USGS-146**



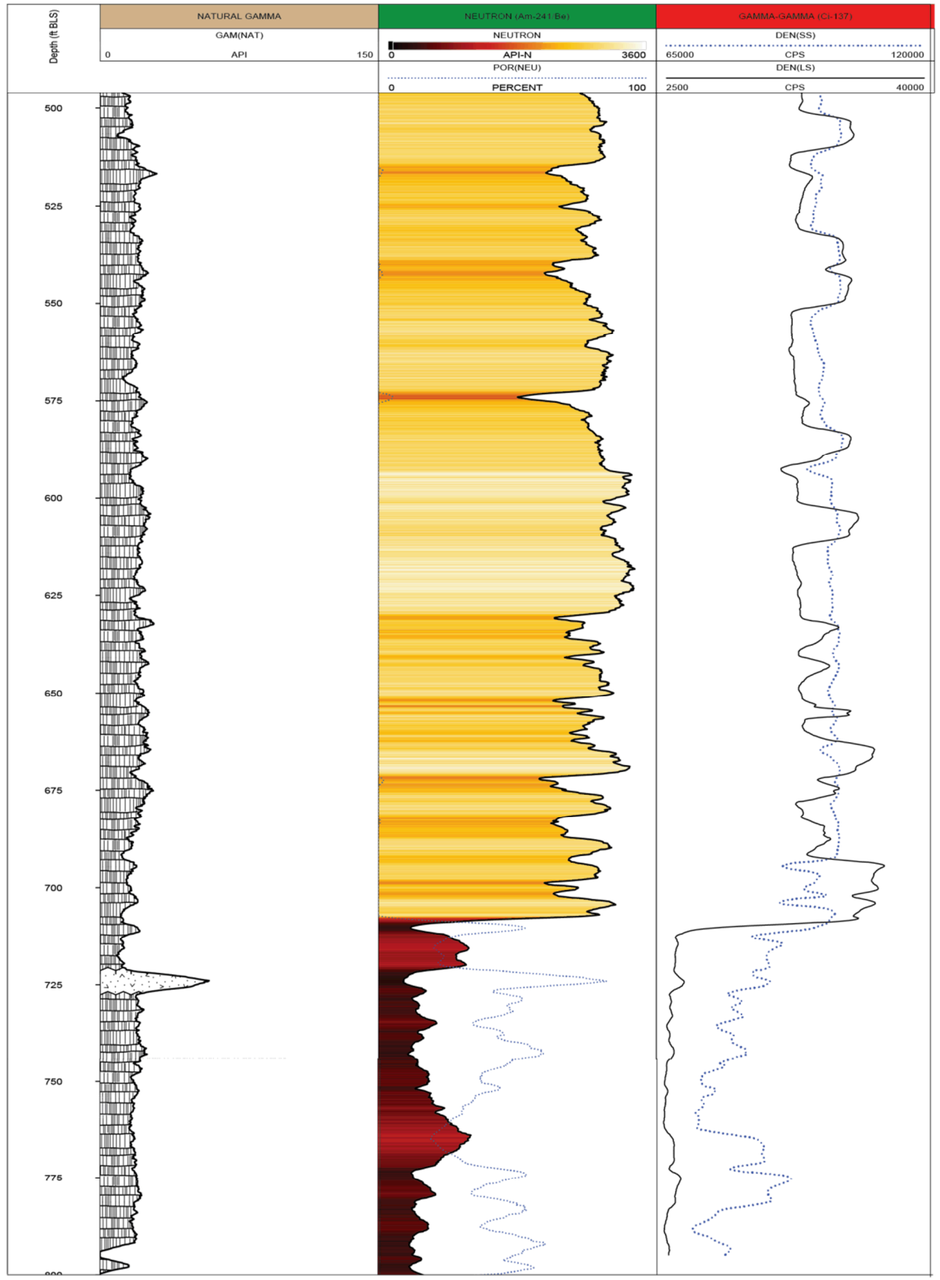


Figure A-2 (cont.).

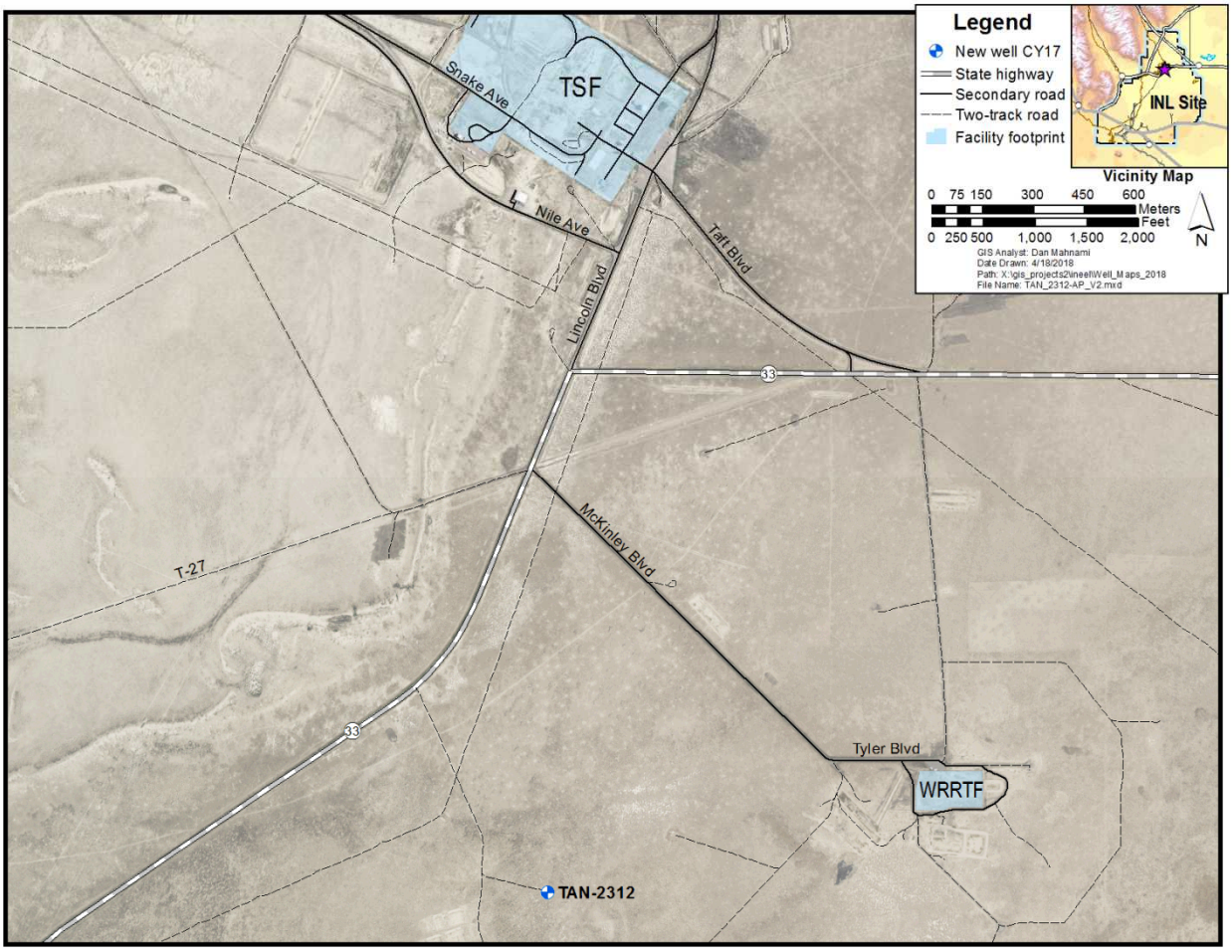


Figure A-3. Map showing location of new well TAN-2312.

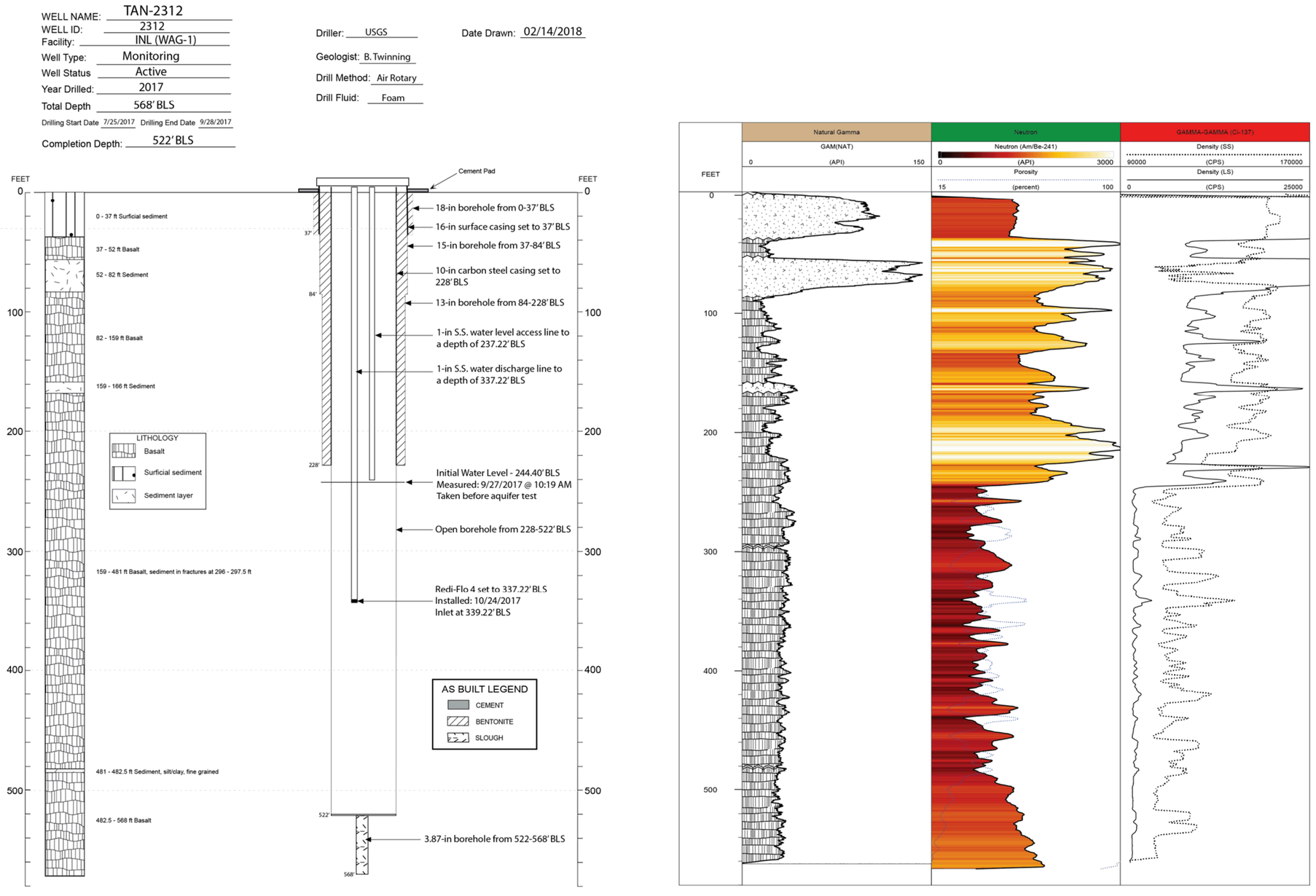


Figure A-4. Construction diagram for new well TAN-2312.

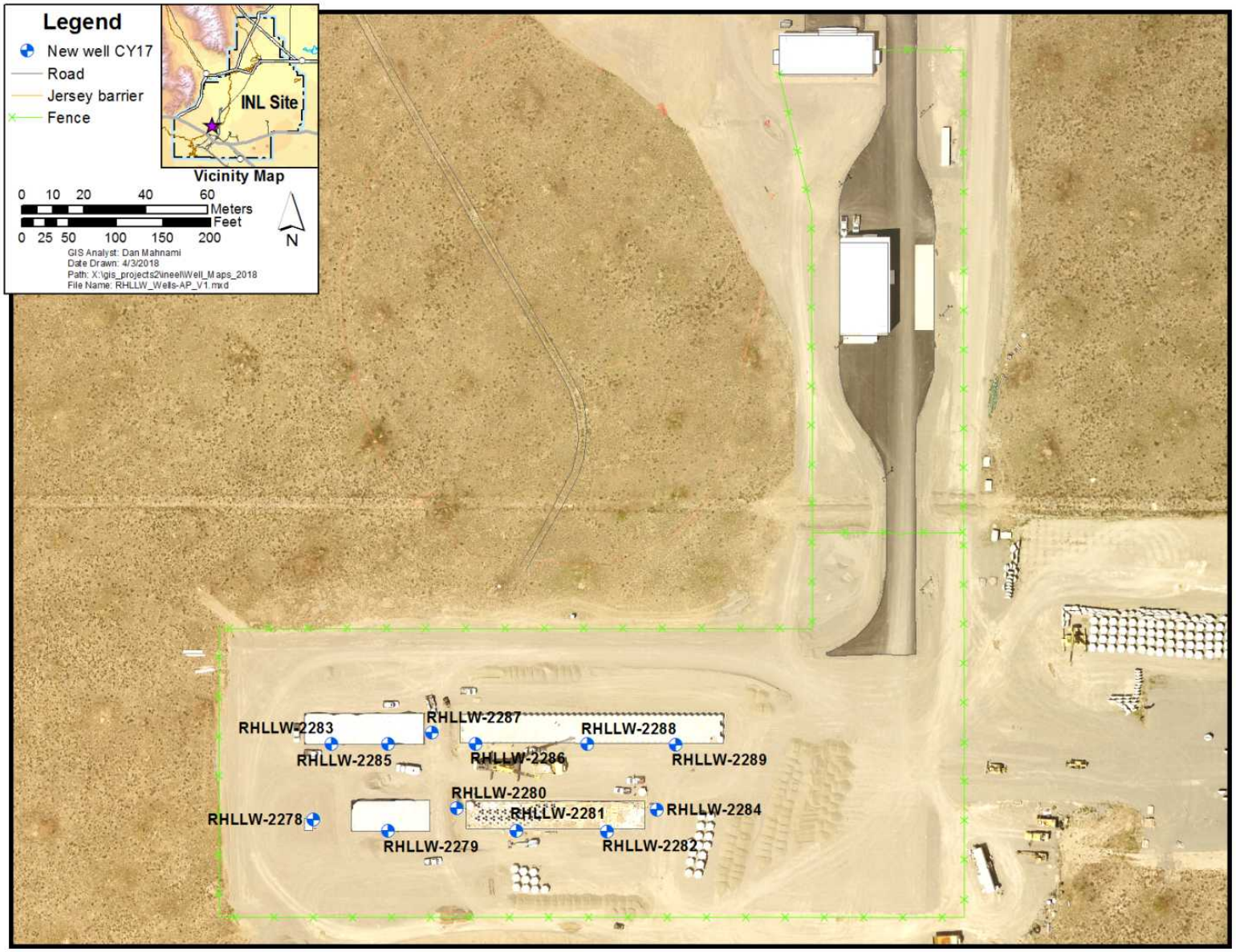


Figure A-5. Map showing location of new wells at the Remote Handled Low Level Waste Facility.

WELL NAME: RHLLW-2278
WELL ID: 2278
Facility: RHLLW
Well Type: Scientific Instrumentation
Well Status Active
Year Drilled: 2017

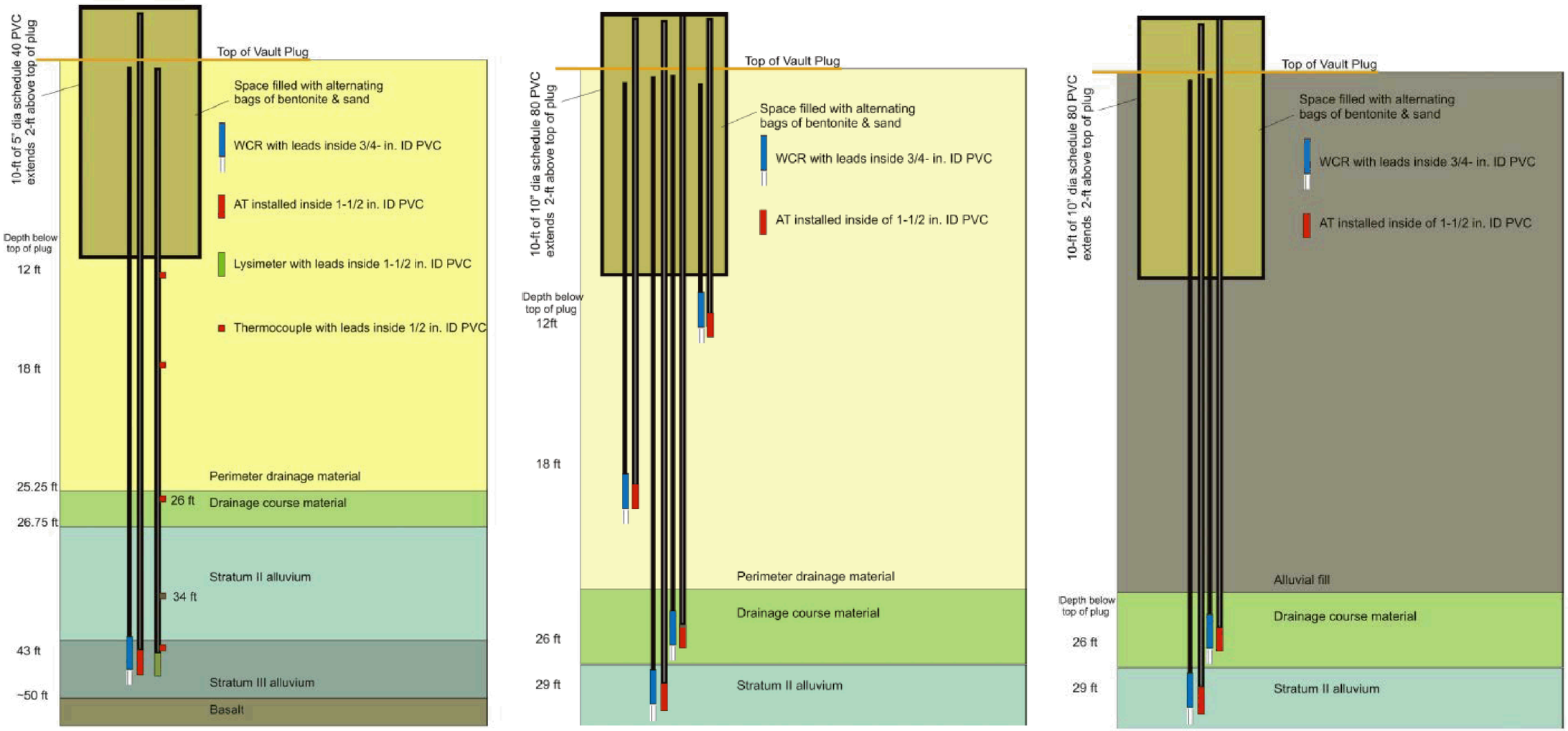


Figure A-6. Construction diagram for new well cluster RHLLW-2278.

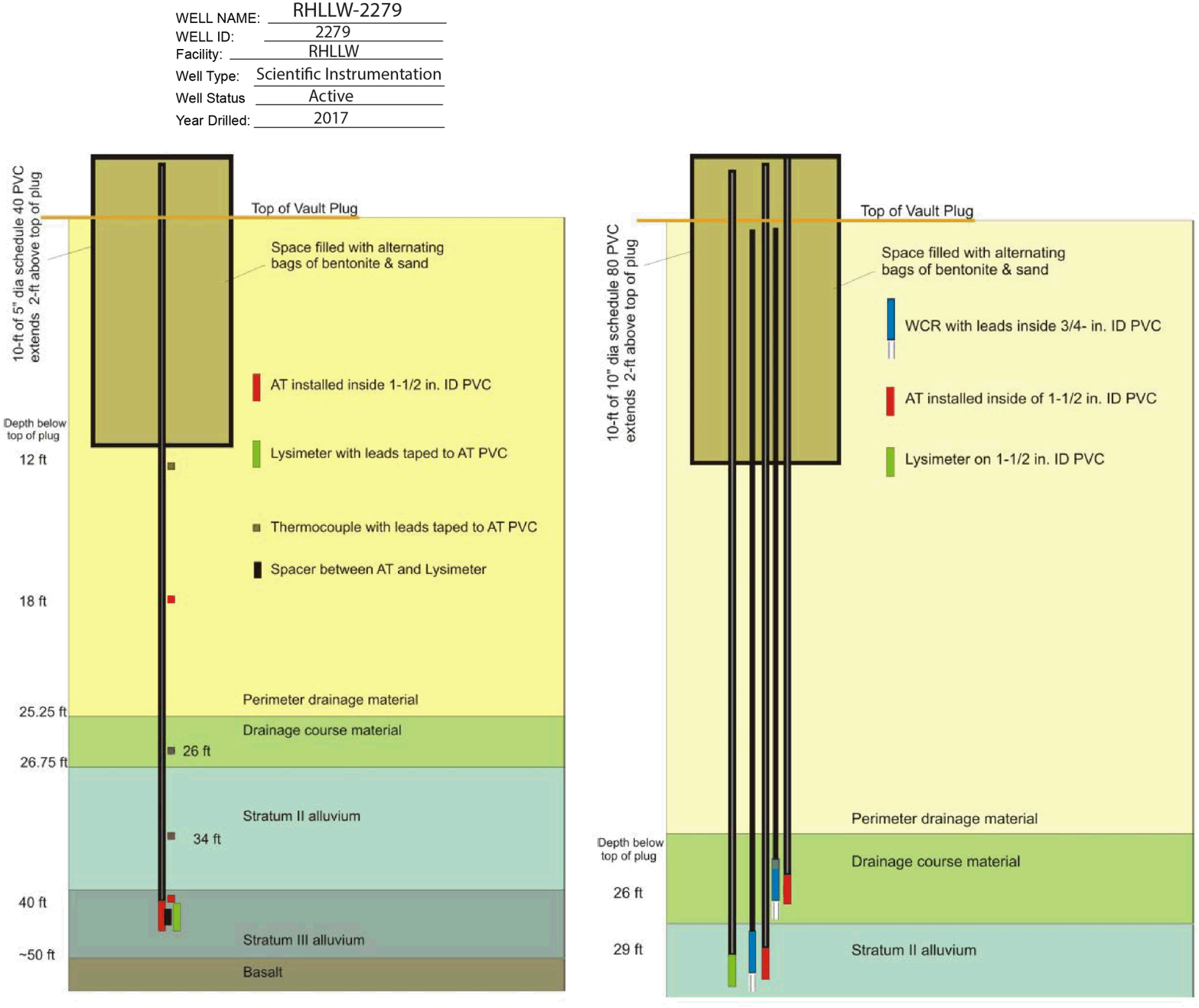


Figure A-7. Construction diagram for new well cluster RHLLW-2279.

WELL NAME: RHLLW-2280
WELL ID: 2280
Facility: RHLLW
Well Type: Scientific Instrumentation
Well Status Active
Year Drilled: 2017

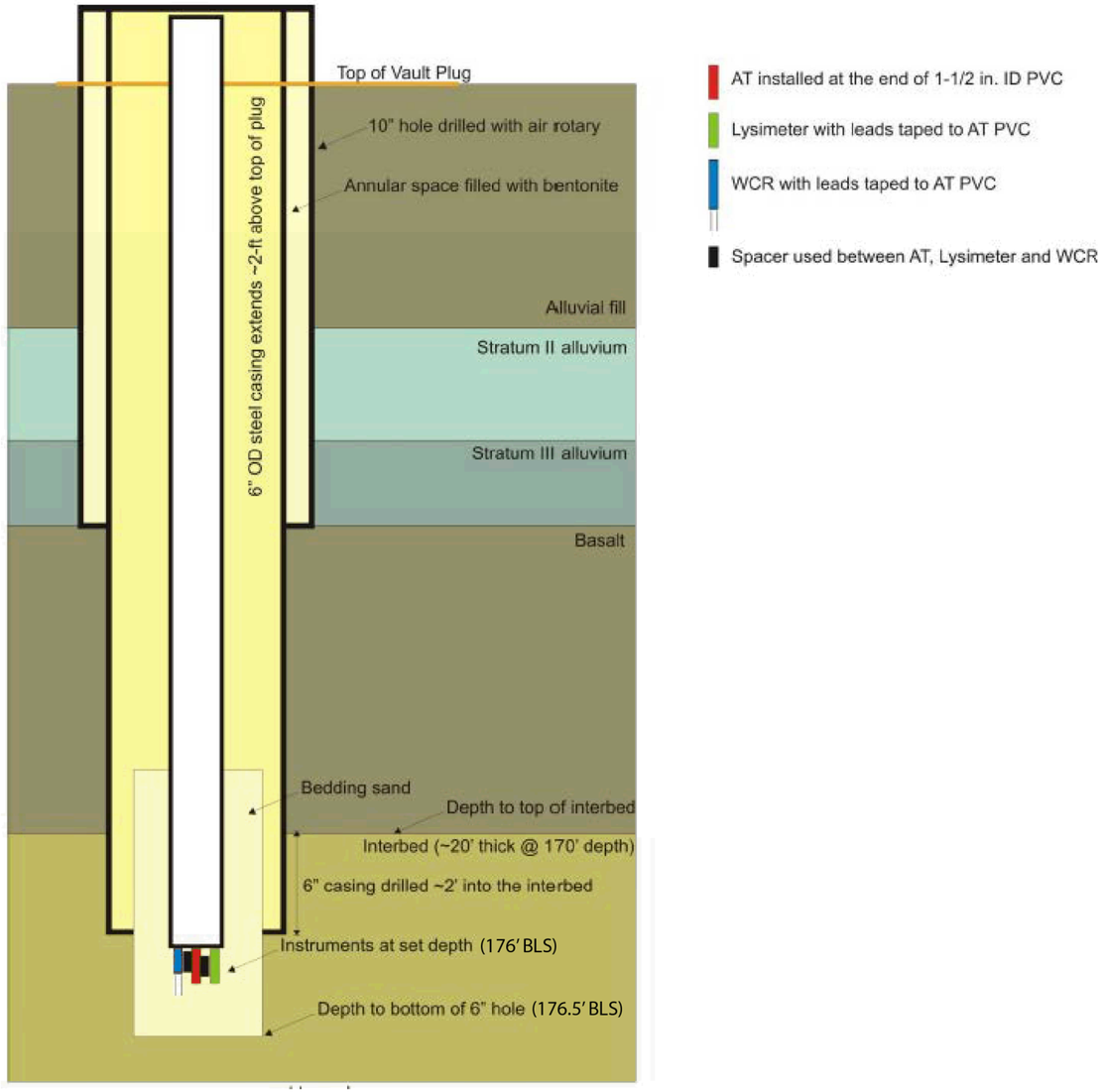
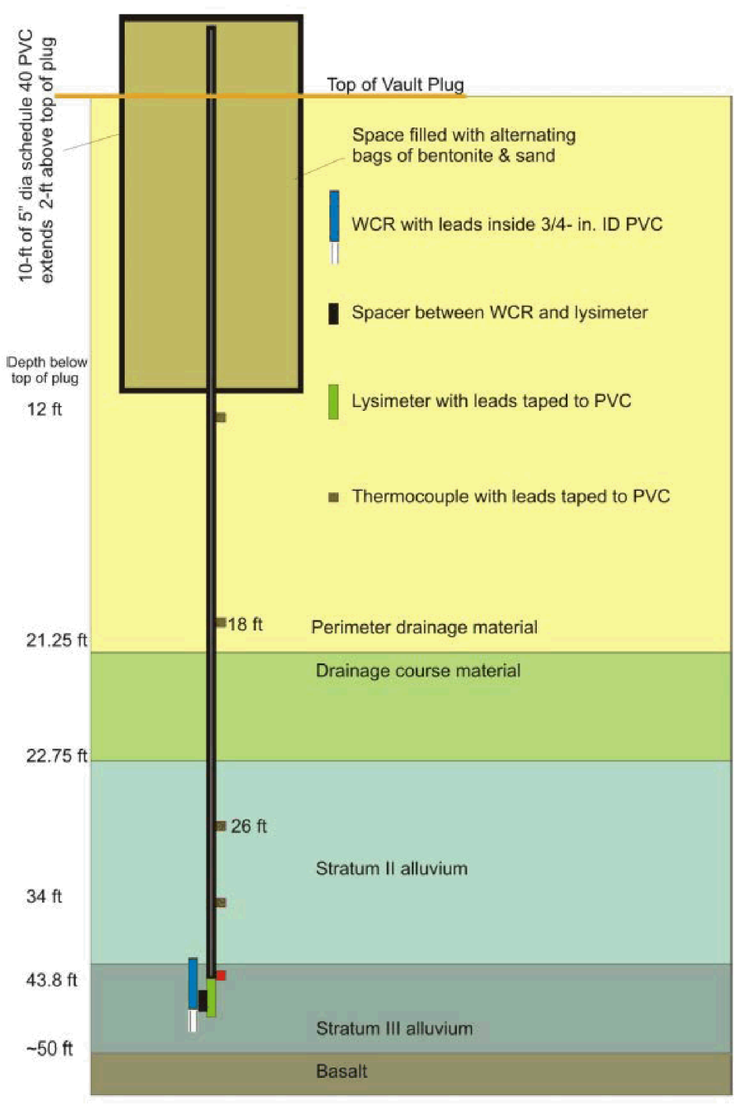


Figure A-8. Construction diagram for new sedimentary interbed well RHLLW-2280. Interbed depth shown is approximate.

WELL NAME: RHLLW-2281
WELL ID: 2281
Facility: RHLLW
Well Type: Scientific Instrumentation
Well Status Active
Year Drilled: 2017



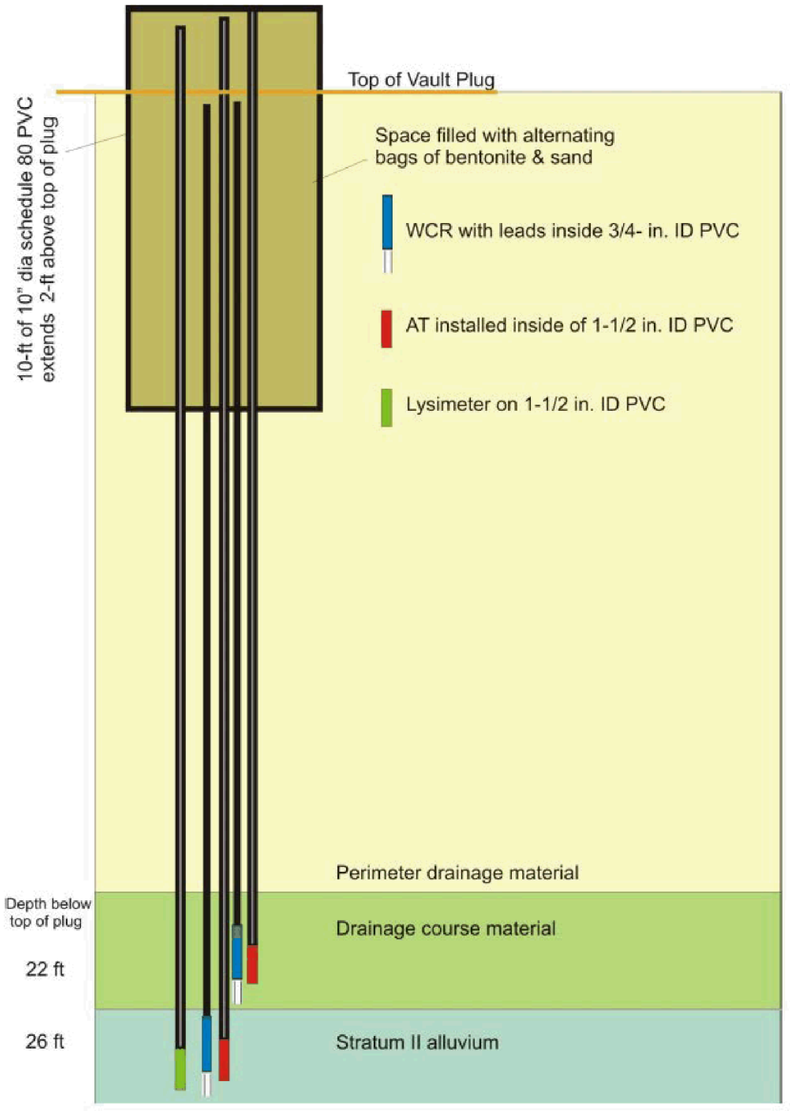


Figure A-9. Construction diagram for new well cluster RHLLW-2281.

WELL NAME: RHLLW-2282
WELL ID: 2282
Facility: RHLLW
Well Type: Scientific Instrumentation
Well Status Active
Year Drilled: 2017

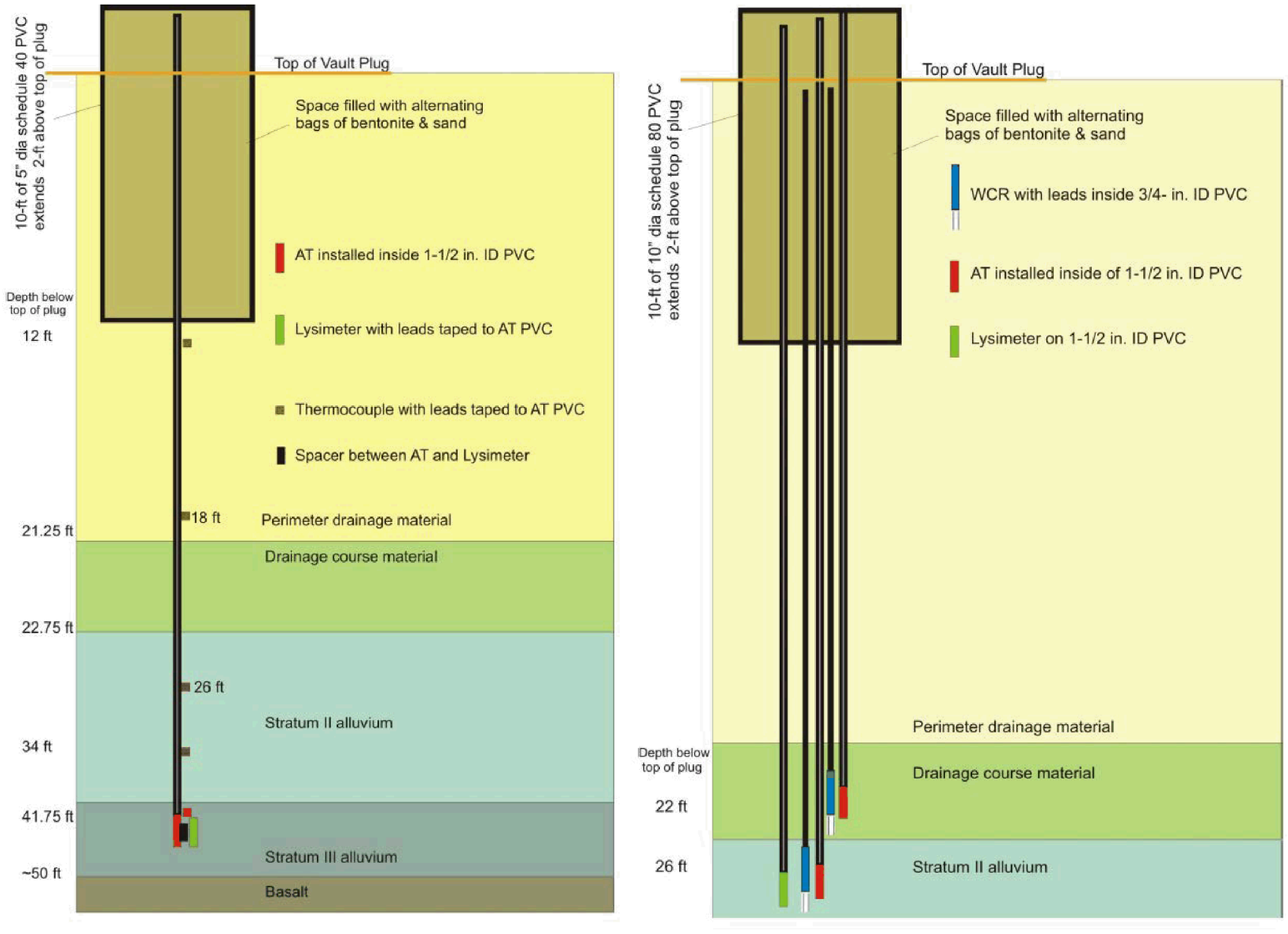


Figure A-10. Construction diagram for new well cluster RHLLW-2282.

WELL NAME: RHLLW-2283
WELL ID: 2283
Facility: RHLLW
Well Type: Scientific Instrumentation
Well Status Active
Year Drilled: 2017

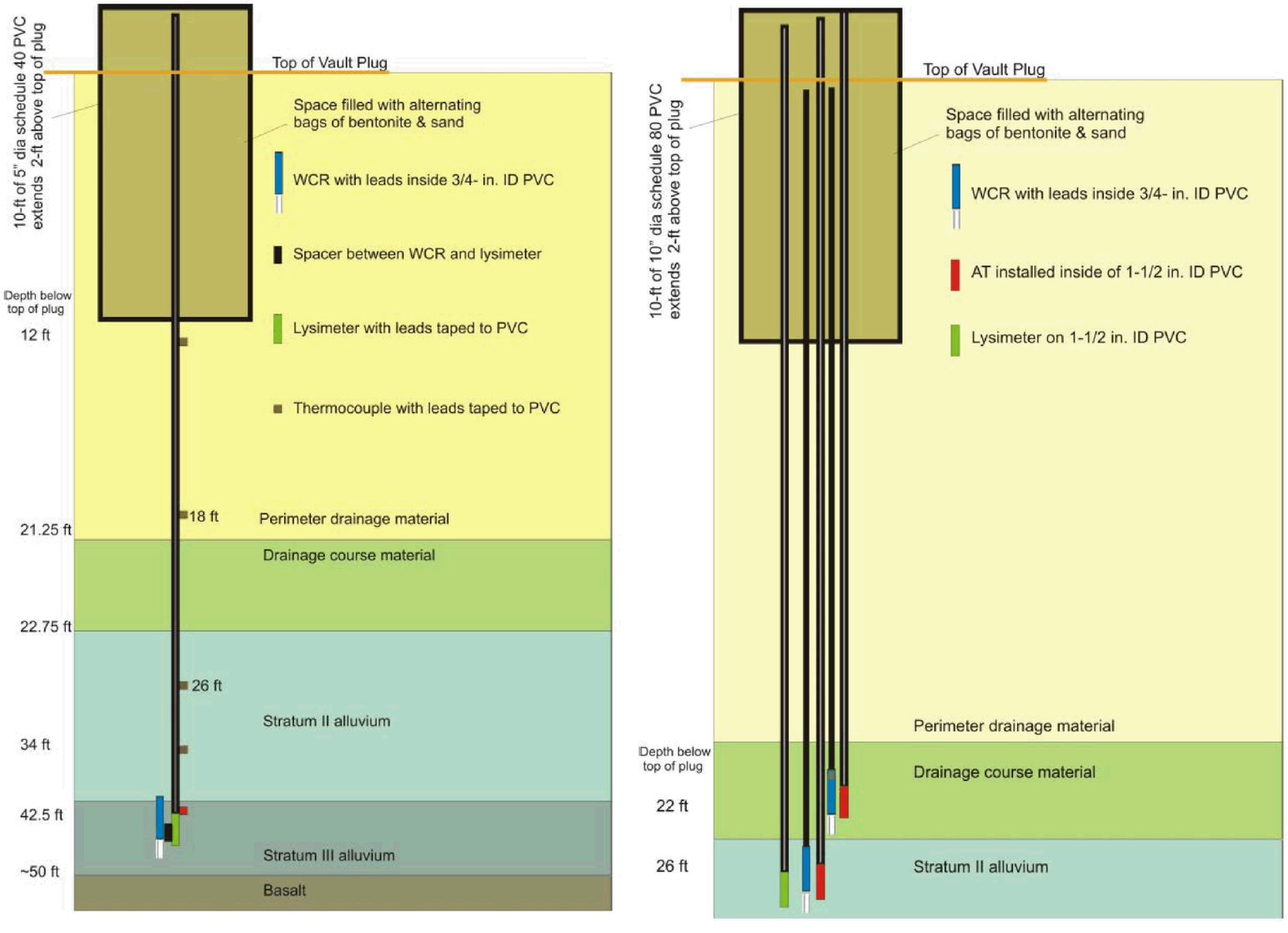


Figure A-11. Construction diagram for new well cluster RHLLW-2283.

WELL NAME: RHLLW-2284
WELL ID: 2284
Facility: RHLLW
Well Type: Scientific Instrumentation
Well Status Active
Year Drilled: 2017

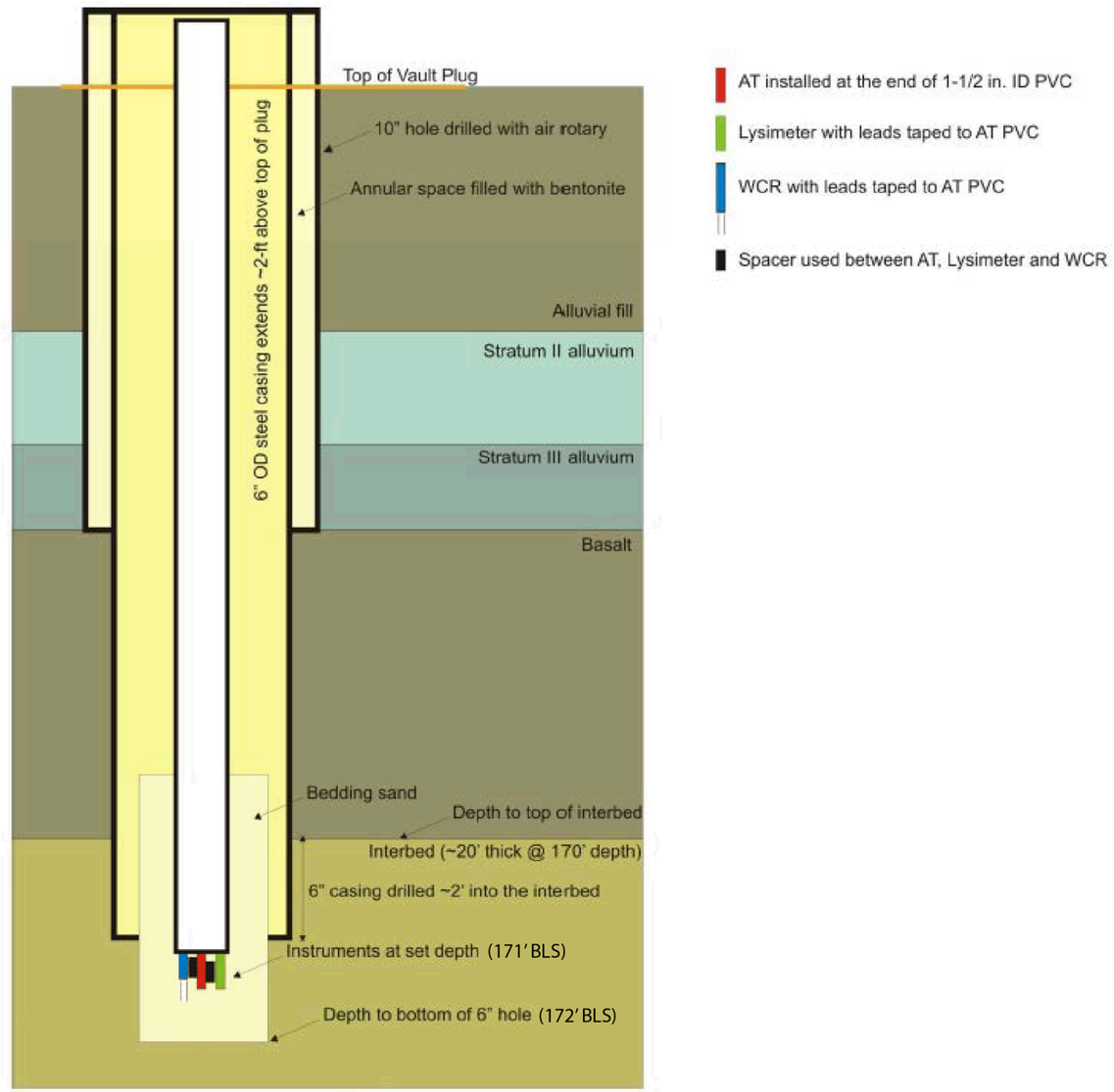


Figure A-12. Construction diagram for new sedimentary interbed well RHLLW-2284. Interbed depth shown is approximate.

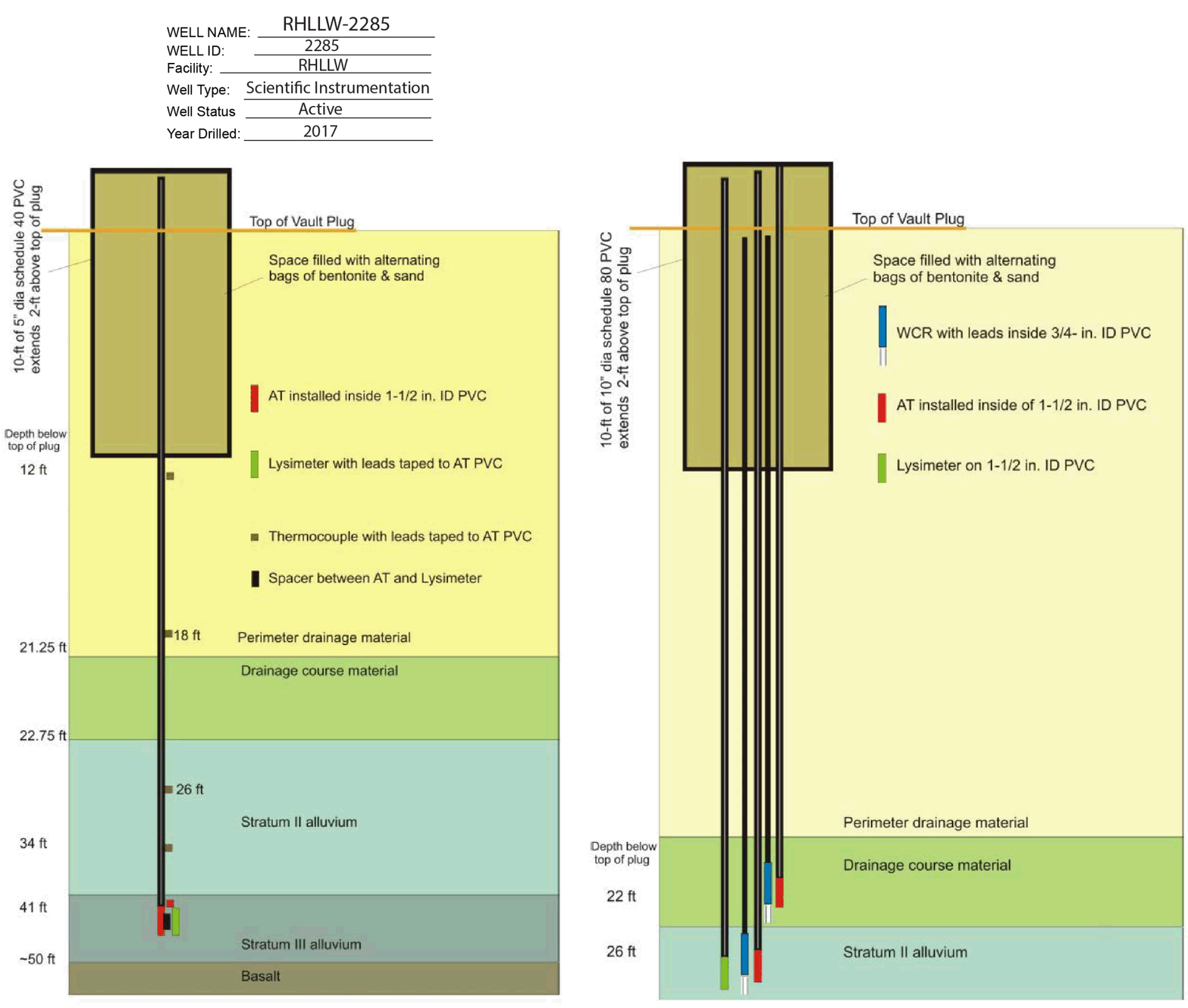


Figure A-13. Construction diagram for new well cluster RHLLW-2285.

WELL NAME: RHLLW-2286
WELL ID: 2286
Facility: RHLLW
Well Type: Scientific Instrumentation
Well Status Active
Year Drilled: 2017

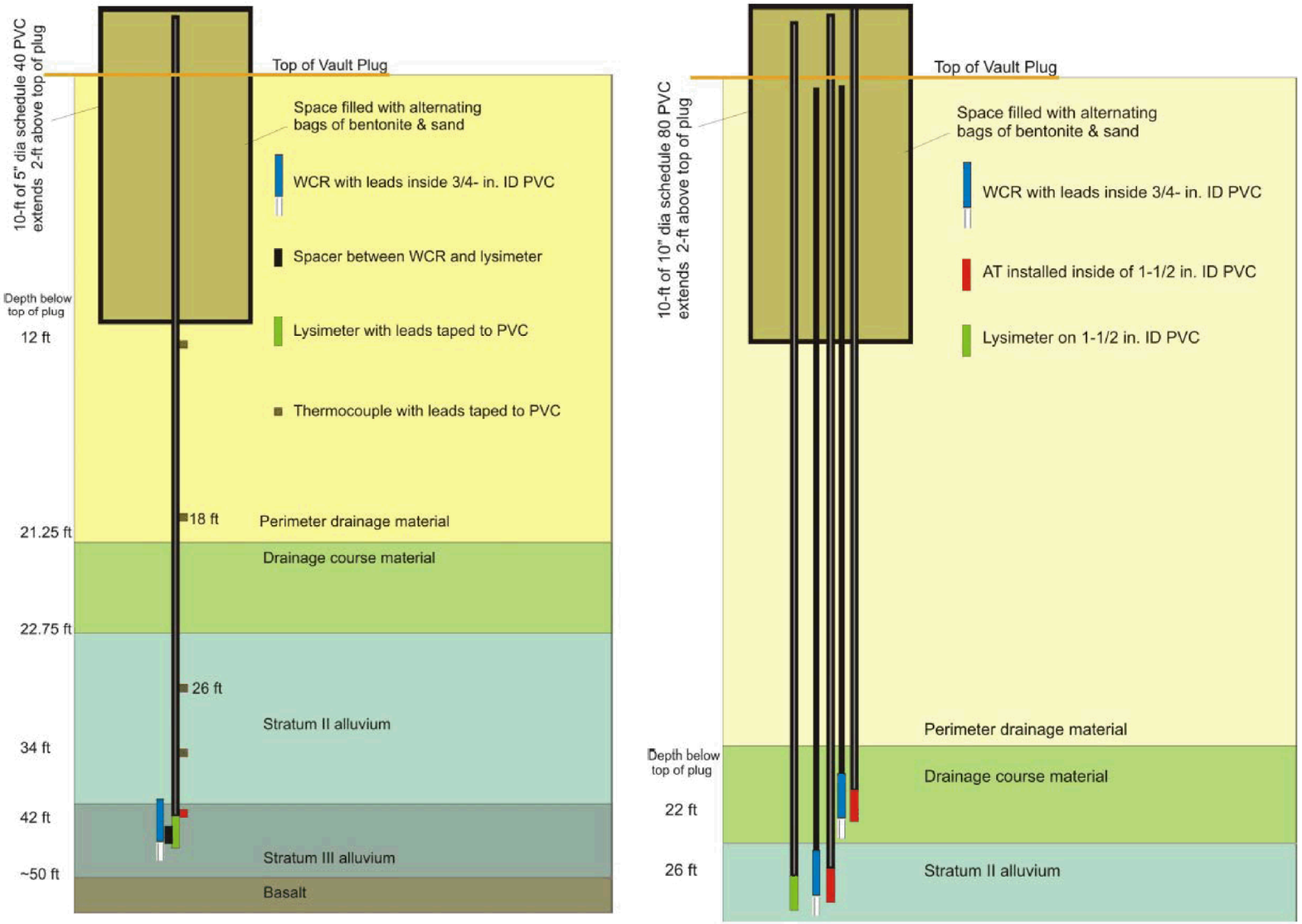


Figure A-14. Construction diagram for new well cluster RHLLW-2286.

WELL NAME: RHLLW-2287
WELL ID: 2287
Facility: RHLLW
Well Type: Scientific Instrumentation
Well Status Active
Year Drilled: 2017

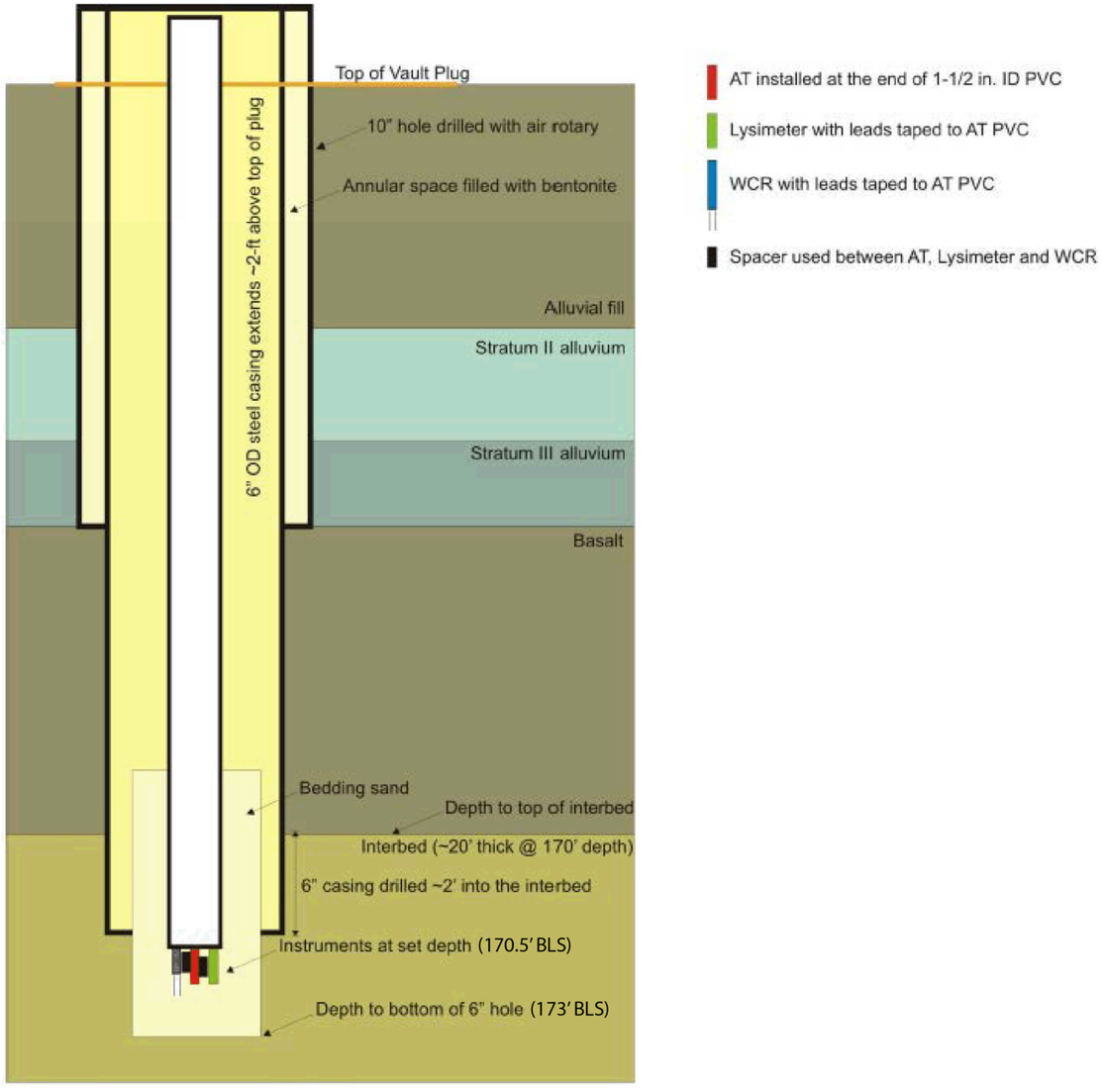


Figure A-15. Construction diagram for new sedimentary interbed well RHLLW-2287. Interbed depth shown is approximate.

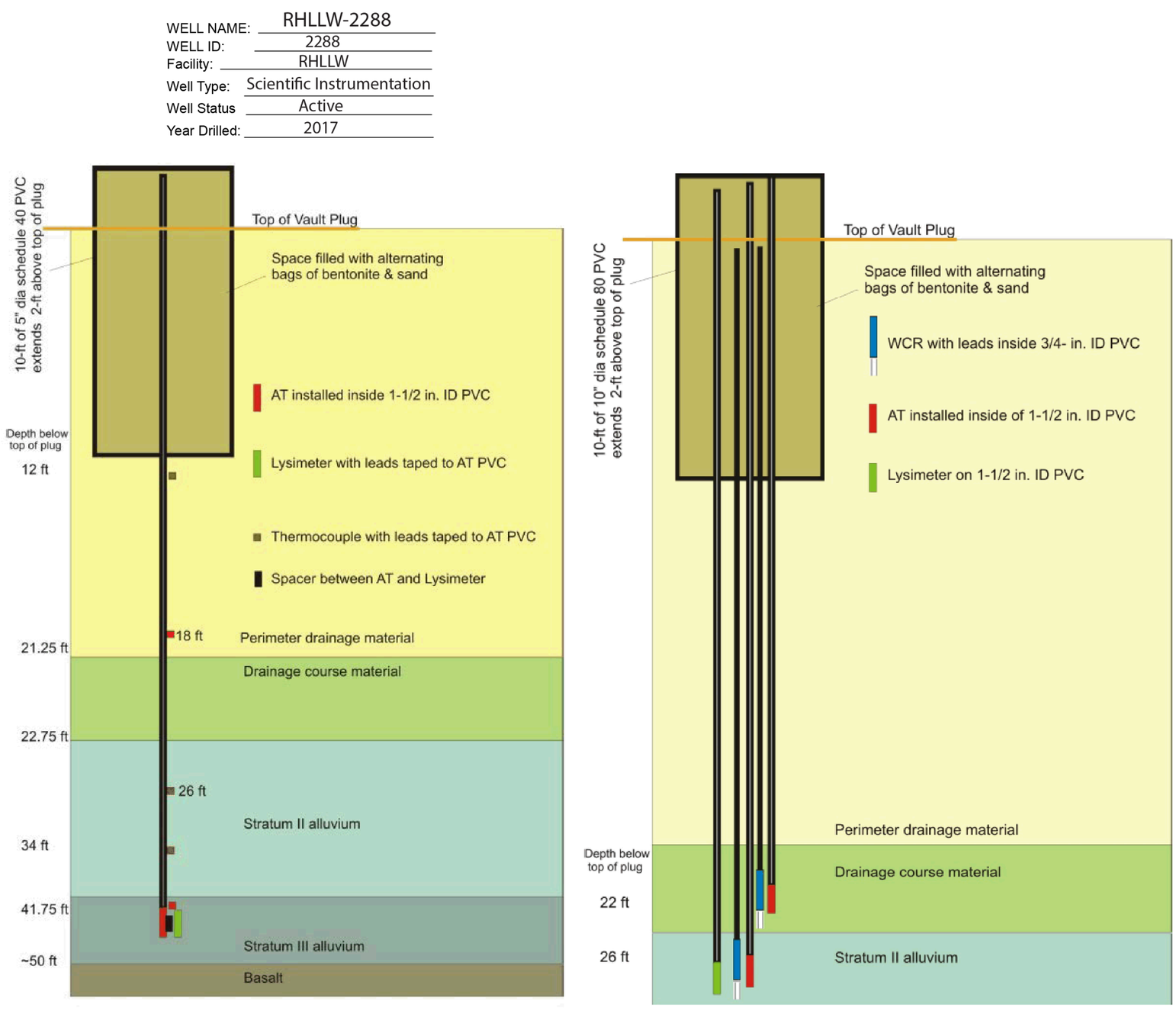


Figure A-16. Construction diagram for new well cluster RHLLW-2288.

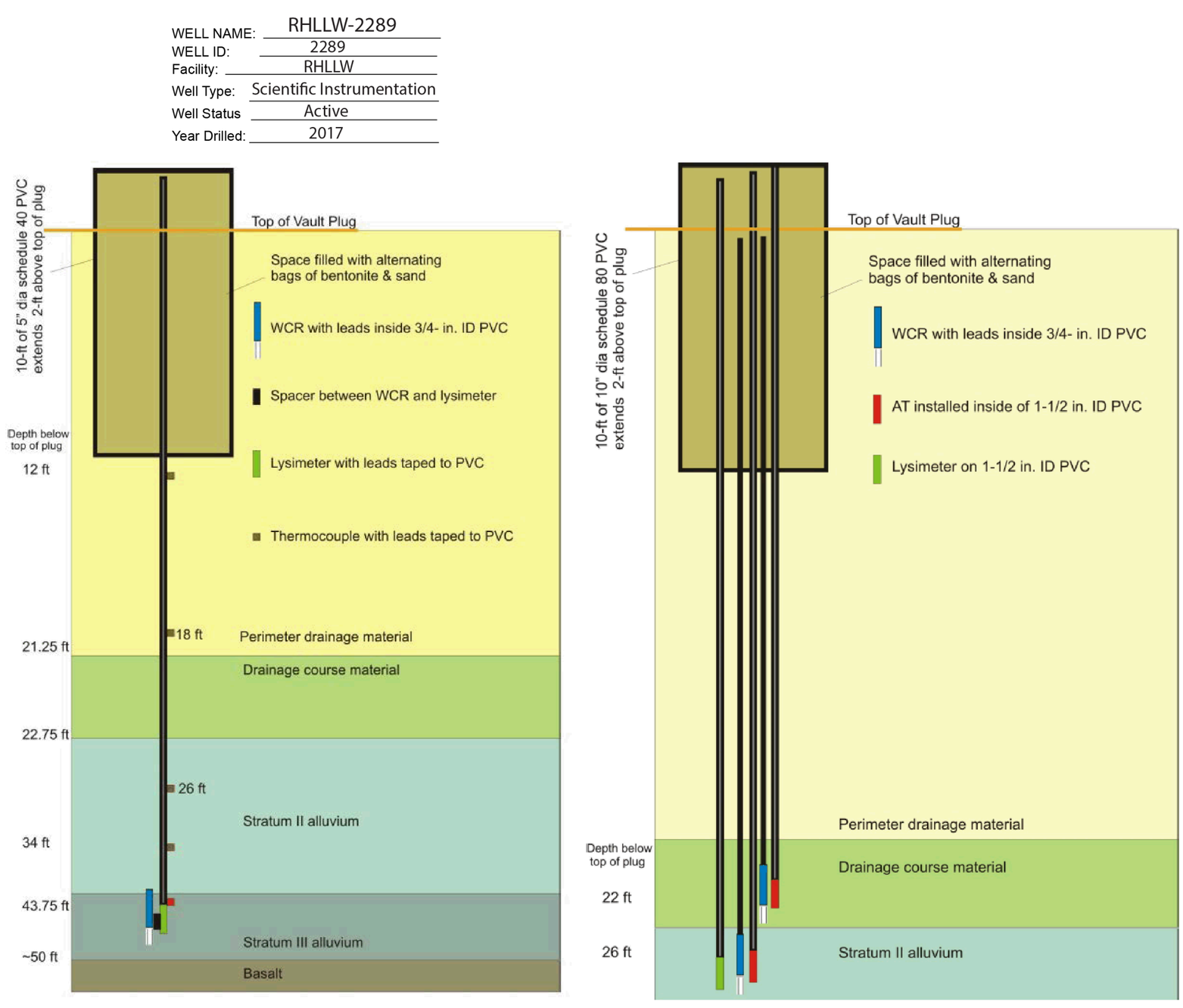


Figure A-17. Construction diagram for new well cluster RHLLW-2289.

Appendix B
–
Decommissioning Details at Box Canyon Subsurface Applied Research Site CY 2017

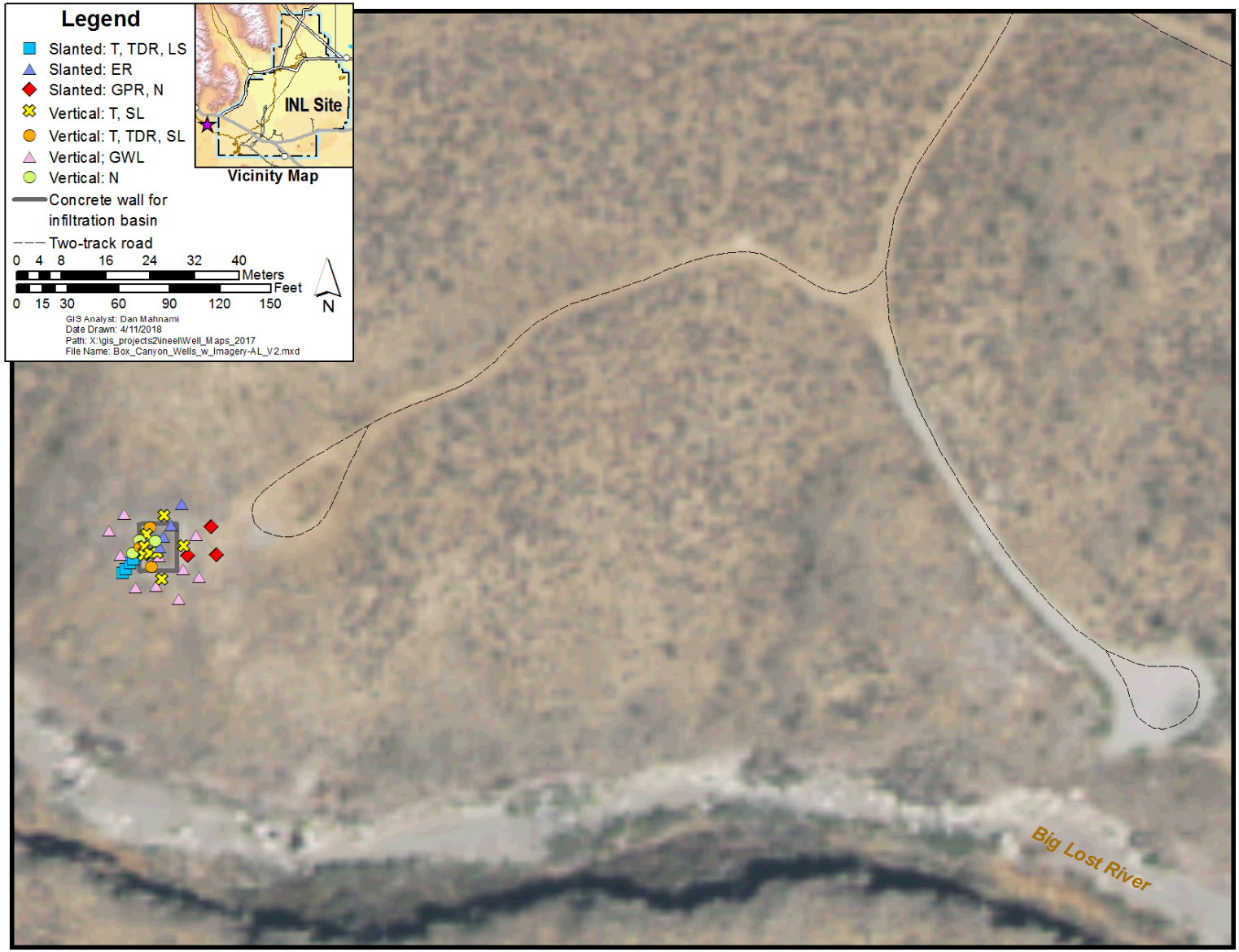


Figure B-1. Map showing location of Box Canyon Subsurface Applied Research Site.

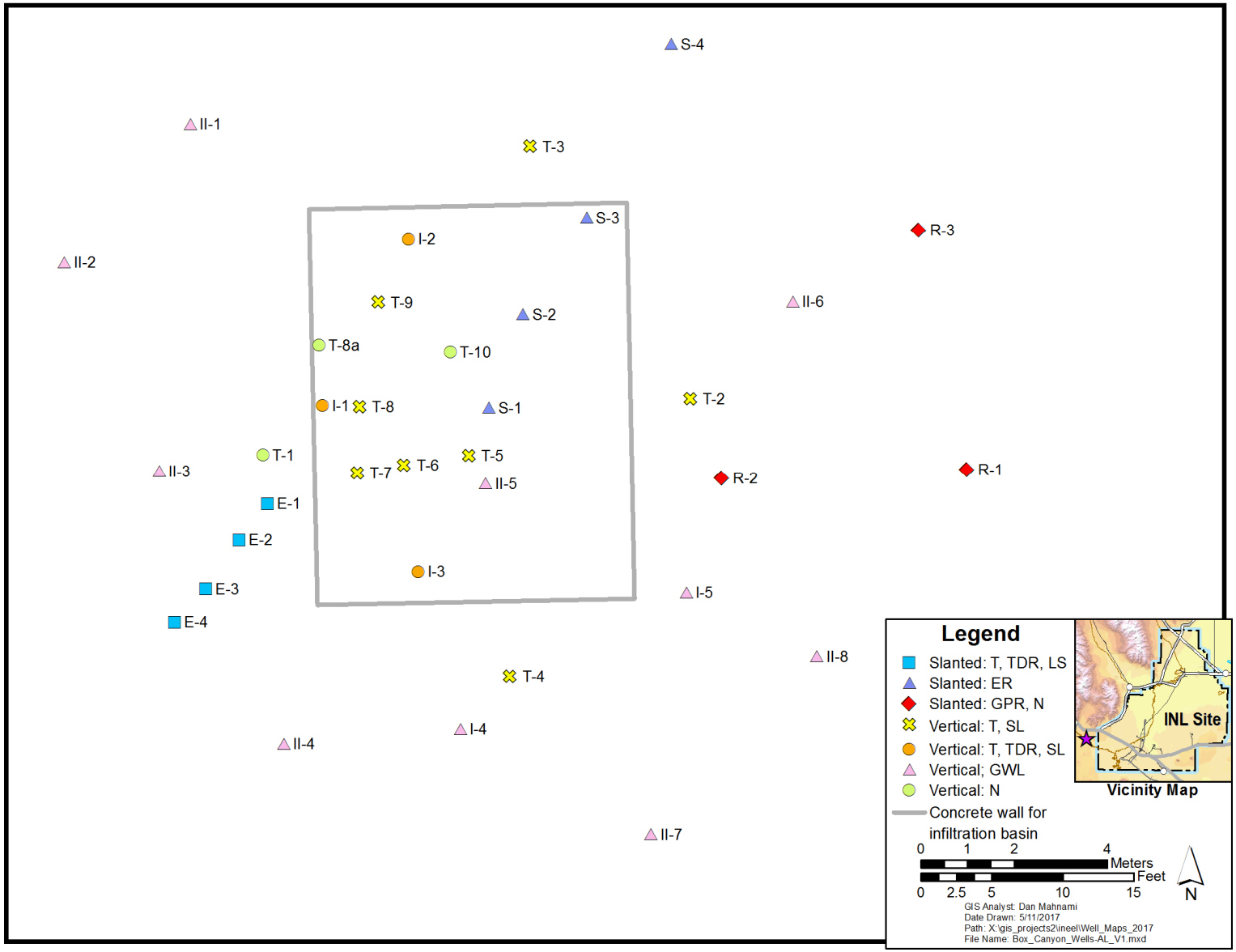


Figure B-2. Map showing instrumented boreholes at the Box Canyon Subsurface Applied Research Site.

Table B-1. Decommissioning details of instrumented boreholes at Box Canyon Subsurface Applied Research Site.

Box Canyon Instrumented Boreholes Decommissioning						
Well Name	**Type of Instrumentation Installed and Measurements Taken[a]**	**Inside/Outside Pond**	**General Location**	**Casing Diameter/Type**	**Original Well Depths[b]**	**Decommissioning Activities**
II-1	Vertical GWL	Outside	NE corner	8" ID carbon steel	Series II wells were drilled to depths of 60 to 73.8 feet.	Pulled Casing. Filled with 1/4" bentonite pellets to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.
II-2	Vertical GWL	Outside	West	8" ID carbon steel	Series II wells were drilled to depths of 60 to 73.8 feet.	Pulled Casing. Filled with 1/4" bentonite pellets to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.
II-3	Vertical GWL	Outside	West/SW	8" ID carbon steel	Series II wells were drilled to depths of 60 to 73.8 feet.	Pulled Casing. Filled with 1/4" bentonite pellets to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.
II-4	Vertical GWL	Outside	SW corner	8" ID carbon steel	Series II wells were drilled to depths of 60 to 73.8 feet.	Pulled Casing. Filled with 1/4" bentonite pellets to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.
II-5	Vertical GWL	Inside	SE corner	2" PVC inside 8" ID carbon steel	Series II wells were drilled to depths of 60 to 73.8 feet.	Pulled Casing. 2" PVC was removed to the extent possible. Filled with 1/4" bentonite pellets to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.
II-6	Vertical GWL	Outside	East	Casing had been pulled	Series II wells were drilled to depths of 60 to 73.8 feet.	Filled with 1/4" bentonite pellets to the extent possible to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.
II-7[c]	Vertical GWL	Outside	S/SE	8" ID carbon steel	Series II wells were drilled to depths of 60 to 73.8 feet.	Pulled Casing. Filled with 1/4" bentonite pellets to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.

Box Canyon Instrumented Boreholes Decommissioning						
Well Name	**Type of Instrumentation Installed and Measurements Taken[a]**	**Inside/Outside Pond**	**General Location**	**Casing Diameter/Type**	**Original Well Depths[b]**	**Decommissioning Activities**
II-8	Vertical GWL	Outside	SE corner	8" ID carbon steel	Series II wells were drilled to depths of 60 to 73.8 feet.	Pulled Casing. Filled with 1/4" bentonite pellets to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.
I-4	Vertical GWL	Outside	South	8" ID carbon steel	Series I wells were drilled to depths of 39.4 feet.	Pulled Casing. Filled with 1/4" bentonite pellets to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.
I-5	Vertical GWL	Outside	E/SE	8" ID carbon steel	Series I wells were drilled to depths of 39.4 feet.	Pulled Casing. Filled with 1/4" bentonite pellets to within 3" of existing grade. Pellets were soaked with water. Covered with native soil and rock.
T-1	Vertical N	Outside	West	No casing, just cable sticking out	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. Filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
T-8a	Vertical N	Inside	NW corner	2" Lexan	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. Lexan cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
T-10	Vertical N	Inside	Middle	2" Lexan	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. Lexan cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
T-2	Vertical T, SL	Outside	East	2" PVC	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
T-3	Vertical T, SL	Outside	N/NE	2" PVC	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.

Box Canyon Instrumented Boreholes Decommissioning						
Well Name	**Type of Instrumentation Installed and Measurements Taken[a]**	**Inside/Outside Pond**	**General Location**	**Casing Diameter/Type**	**Original Well Depths[b]**	**Decommissioning Activities**
T-4	Vertical T, SL	Outside	South	2" PVC	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
T-5	Vertical T, SL	Inside	SE corner	2" PVC	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
T-6	Vertical T, SL	Inside	SW corner	2" PVC	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
T-7	Vertical T, SL	Inside	SW corner	2" PVC	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
T-8	Vertical T, SL	Inside	SW corner	2" PVC	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
T-9	Vertical T, SL	Inside	NW corner	2" PVC	Series T wells were drilled to depths of 9.8 to 22 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
I-1	Vertical T, TDR, SL	Inside	SW corner	2" PVC inside 8" carbon steel	Series I wells were drilled to depths of 39.4 feet.	Dug out to the extent possible. 8" CS casing cut below grade. PVC pipe in casing was removed to the extent possible. Filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.

Box Canyon Instrumented Boreholes Decommissioning						
Well Name	**Type of Instrumentation Installed and Measurements Taken[a]**	**Inside/Outside Pond**	**General Location**	**Casing Diameter/Type**	**Original Well Depths[b]**	**Decommissioning Activities**
I-2	Vertical T, TDR, SL	Inside	North center	2" PVC inside 8" carbon steel	Series I wells were drilled to depths of 39.4 feet.	Dug out to the extent possible. 8" CS casing cut below grade. PVC pipe in casing was removed to the extent possible. Filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
I-3	Vertical T, TDR, SL	Inside	South center	2" PVC inside 8" carbon steel	Series I wells were drilled to depths of 39.4 feet.	Dug out to the extent possible. 8" CS casing cut below grade. PVC pipe in casing was removed to the extent possible. Filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
E-1	Slanted T, TDR, SL	Outside	SW corner	2" PVC	Series E and R wells were drilled to depths of 60 to 75 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
E-2	Slanted T, TDR, SL	Outside	SW corner	2" PVC inside 6" carbon steel	Series E and R wells were drilled to depths of 60 to 75 feet.	Pulled casing. PVC pipe in casing was removed to the extent possible. Filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
E-3	Slanted T, TDR, SL	Outside	SW corner	2" PVC	Series E and R wells were drilled to depths of 60 to 75 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
E-4	Slanted T, TDR, SL	Outside	SW corner	2" PVC	Series E and R wells were drilled to depths of 60 to 75 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
S-1	Slanted ER	Inside	Middle	Previously grouted with wire sticking out	Series S wells were drilled to depths of 16.1 to 69.6 feet.	Cut wire off flush with grout. Covered with native soil and rock.

Box Canyon Instrumented Boreholes Decommissioning						
Well Name	**Type of Instrumentation Installed and Measurements Taken[a]**	**Inside/Outside Pond**	**General Location**	**Casing Diameter/Type**	**Original Well Depths[b]**	**Decommissioning Activities**
S-2	Slanted ER	Inside	NE corner	2" PVC	Series S wells were drilled to depths of 16.1 to 69.6 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
S-3	Slanted ER	Inside	NE corner	2" PVC	Series S wells were drilled to depths of 16.1 to 69.6 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
S-4	Slanted ER	Outside	NE corner	2" PVC	Series S wells were drilled to depths of 16.1 to 69.6 feet.	Dug out to the extent possible. PVC cut below grade and filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
R-1	Slanted GPR, N	Outside	East/SE	2" PVC inside 4" carbon steel	Series E and R wells were drilled to depths of 60 to 75 feet.	Pulled casing. PVC pipe in casing was removed to the extent possible. Filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
R-2	Slanted GPR, N	Outside	East	2" PVC inside 4" carbon steel	Series E and R wells were drilled to depths of 60 to 75 feet.	Pulled casing. PVC pipe in casing was removed to the extent possible. Filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
R-3	Slanted GPR, N	Outside	East/NE	2" PVC inside 4" carbon steel	Series E and R wells were drilled to depths of 60 to 75 feet.	Pulled casing. PVC pipe in casing was removed to the extent possible. Filled with Bentonite Pellets and soaked with water. Covered with native soil and rock.
R-4	Slanted GPR, N	Outside	NE	Not found	Series E and R wells were drilled to depths of 60 to 75 feet.	Appears to have been previously decommissioned.

a. Tensionmeter (T), Suction Lysymeter (SL), Electrical Resistivity (ER), Time Domain Reflectometry (TDR), Ground Penetrating Radar (GPR), Ground Water Level (GWL), and Neutron Logging (N).
b. Faybishenko, et al, Conceptual Model of the Geometry and Physics of Water Flow in a Fractured Basalt Vadose Zone, March 1999.
Closure Note: After the wells were closed native rock and soil was spread over the site to leave it in a more natural condition.