

TECHNICAL MEMORANDUM

To: Nevada Environmental Response Trust

Cc: Nevada Division of Environmental Protection
United States Environmental Protection Agency

From: Dana Grady

Date: August 1, 2023

Subject: Las Vegas Wash ZVI-Enhanced Bioremediation Treatability Study Monthly Progress Report

At the direction of the Nevada Environmental Response Trust (NERT or Trust), Tetra Tech, Inc. (Tetra Tech) has prepared this memorandum to summarize Tetra Tech's progress during June 2023 toward successfully implementing the Las Vegas Wash Zero-Valent Iron (ZVI)-Enhanced Bioremediation Treatability Study.

Task Progress Update: June 2023

Task M18 – Las Vegas Wash ZVI-Enhanced Bioremediation Treatability Study

- Current Status
 - The general treatability study layout, including locations of the continuous and discontinuous ZVI walls and associated monitoring well network, is presented on Figures 1, 2a, and 2b. Well construction details are provided in Table 1. The construction phase of the treatability study was completed on April 24, 2023. Details of the continuous and discontinuous ZVI wall installation, injection and monitoring well installation, and the one-time injection event of the perchlorate inoculum culture developed by SiREM and nutrients were provided in the March, April, and May 2023 monthly progress reports.
 - The Month 1 performance monitoring event was conducted from May 22 to May 30, 2023. Results from this sampling event will be summarized in future monthly progress reports once all laboratory data have been received.
 - The June monthly synoptic gauging event was performed June 19 to June 21, 2023.
 - A post-construction drone survey and aerial imaging was performed on June 27, 2023. Once the data are processed, the figures presented in future monthly progress reports will be updated to include the most recent post-construction aerial imagery. Additionally, aerial images from both pre- and post-construction will be included in the final treatability study results report.
- Schedule and Progress Updates
 - Groundwater levels will be measured on a monthly basis for the duration of the treatability study. The next monthly synoptic event is scheduled for July 24, 2023.

- Groundwater samples will be collected on a quarterly basis to generate time-series data to evaluate the treatment effectiveness of the ZVI installations with respect to the design performance criteria. The next quarterly groundwater sampling event will be performed in August 2023.
- Health and Safety
 - There were no health and safety incidents related to Task M18 during June 2023.

CERTIFICATION

Las Vegas Wash ZVI-Enhanced Bioremediation Treatability Study Monthly Progress Report

Nevada Environmental Response Trust Site
(Former Tronox LLC Site)
Henderson, Nevada

Nevada Environmental Response Trust (NERT) Representative Certification

I certify that this document and all attachments submitted to the Division were prepared at the request of, or under the direction or supervision of NERT. Based on my own involvement and/or my inquiry of the person or persons who manage the systems(s) or those directly responsible for gathering the information or preparing the document, or the immediate supervisor of such person(s), the information submitted and provided herein is, to the best of my knowledge and belief, true, accurate, and complete in all material respects.

Office of the Nevada Environmental Response Trust

Le Petomane XXVII, not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

*Not Individually, but Solely
as President of the Trustee*

Signature:  not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

Name: Jay A. Steinberg, not individually, but solely in his representative capacity as President of the Nevada Environmental Response Trust Trustee

Title: Solely as President and not individually

Company: Le Petomane XXVII, Inc., not individually, but solely in its representative capacity as the Nevada Environmental Response Trust Trustee

Date: August 1, 2023

CERTIFICATION

I hereby certify that I am responsible for the services described in this document and for the preparation of this document. The services described in this document have been prepared in a manner consistent with the current standards of the profession, and to the best of my knowledge, comply with all applicable federal, state, and local statutes, regulations, and ordinances. I hereby certify that all laboratory analytical data was generated by a laboratory certified by the NDEP for each constituent and media presented herein.

Description of Services Provided: Prepared Las Vegas Wash ZVI-Enhanced Bioremediation Treatability Study Monthly Progress

Report.



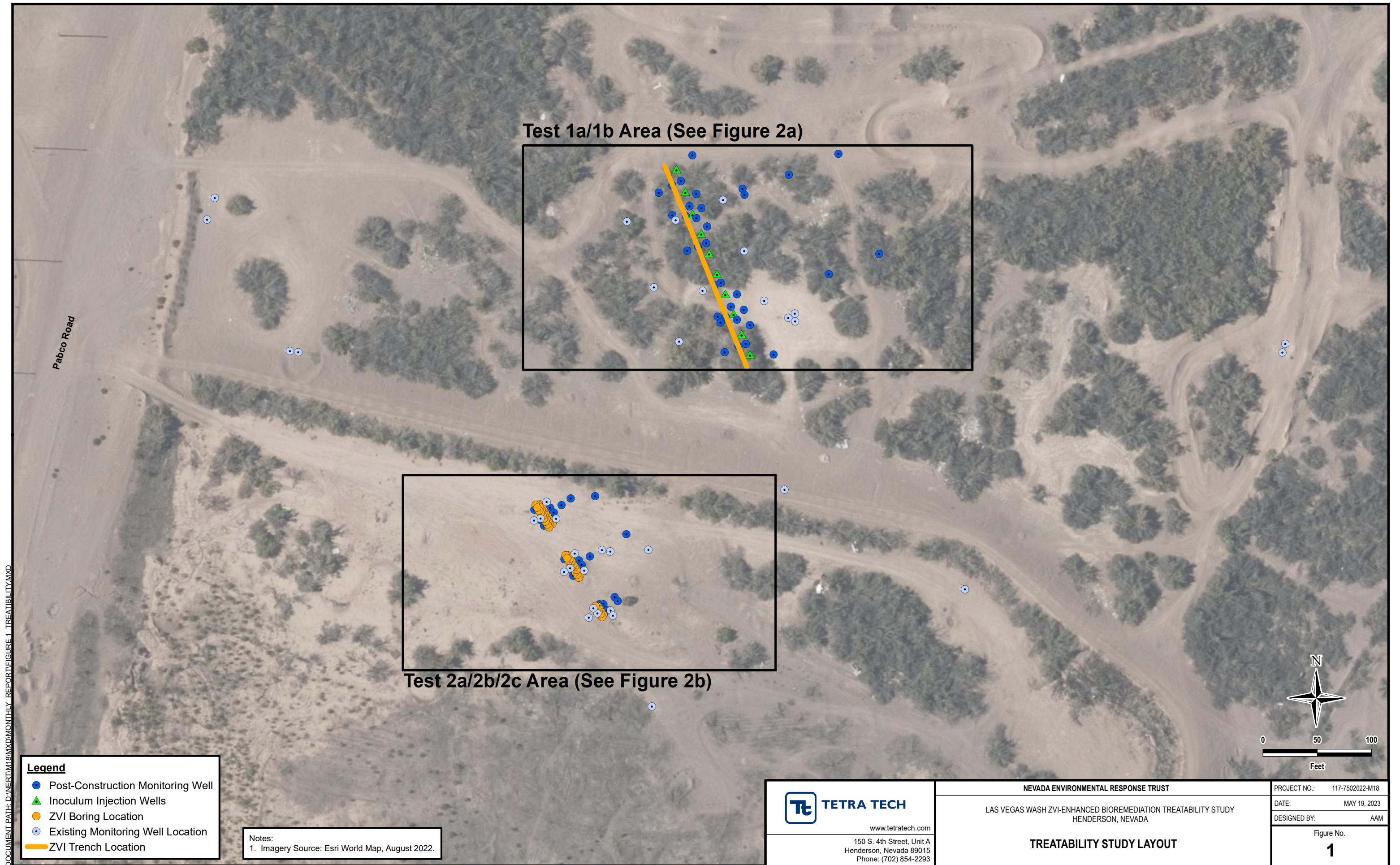
Christopher Hayes, CEM
Environmental Engineer
Tetra Tech, Inc.

August 1, 2023

Date

Nevada CEM Certificate Number: EM2499
Nevada CEM Expiration Date: December 15, 2024

Figures



Test 1a/1b Area (See Figure 2a)

Test 2a/2b/2c Area (See Figure 2b)

- Legend**
- Post-Construction Monitoring Well
 - ▲ Inoculum Injection Wells
 - ZVI Boring Location
 - Existing Monitoring Well Location
 - ZVI Trench Location

Notes:
 1. Imagery Source: Esri World Map, August 2022.



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NEVADA ENVIRONMENTAL RESPONSE TRUST

LAS VEGAS WASH ZVI-ENHANCED BIOREMEDIATION TREATABILITY STUDY
 HENDERSON, NEVADA

TREATABILITY STUDY LAYOUT

PROJECT NO.: 117-7502022-M18

DATE: MAY 19, 2023

DESIGNED BY: AAM

Figure No.

1

DOCUMENT PATH: D:\NERT\M18\MXD\MONTHLY REPORT\FIGURE 2A TEST AREA 1A 1B.MXD



Legend

- Post-Construction Monitoring Well
- ▲ Inoculum Injection Wells
- Existing Monitoring Well Location
- ZVI Trench Location

Notes:
 1. Imagery Source: Esri World Map, August 2022.

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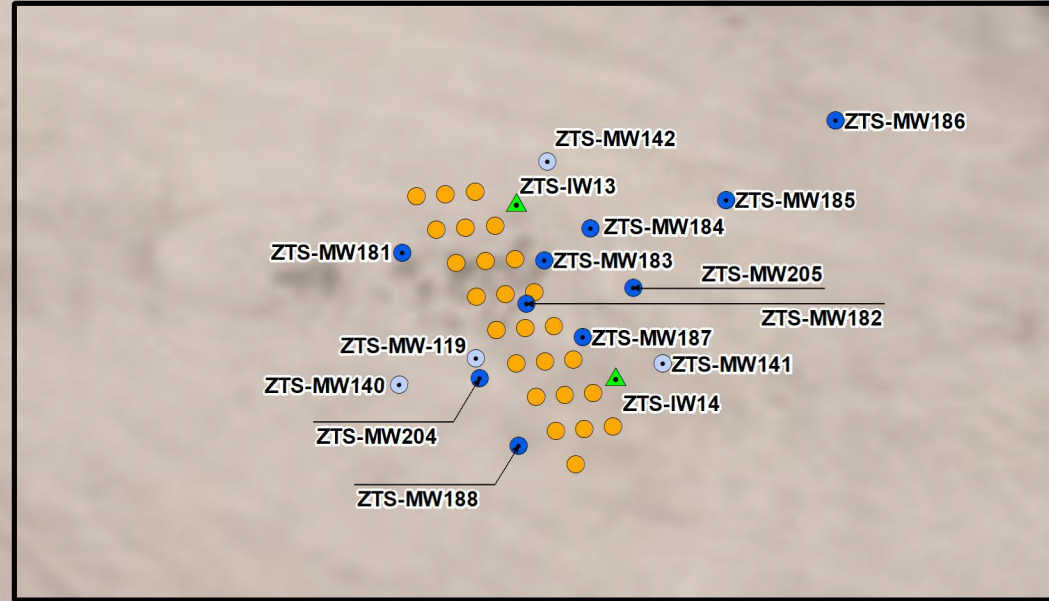
NEVADA ENVIRONMENTAL RESPONSE TRUST
 LAS VEGAS WASH ZVI-ENHANCED BIOREMEDIATION TREATABILITY STUDY
 HENDERSON, NEVADA

TEST AREA 1a/1b LAYOUT

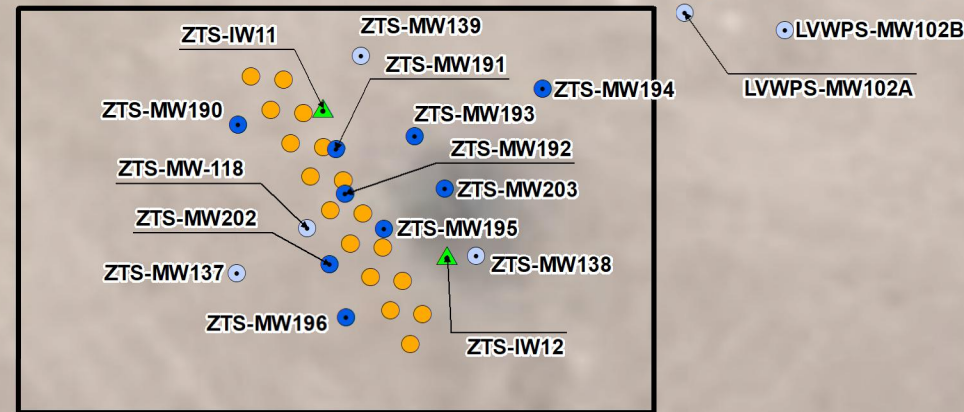
PROJECT NO.: 117-7502022-M18
 DATE: MAY 19, 2023
 DESIGNED BY: AAM

Figure No.
2a

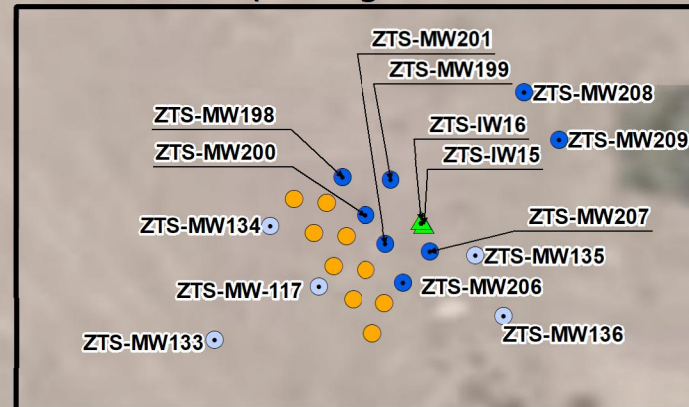
Test 2c Area (Borings ZTS-BH01 through ZTS-BH25)



Test 2a Area (Borings ZTS-BH26 through ZTS-BH42)



Test 2b Area (Borings ZTS-BH43 through ZTS-BH51)



Legend	
●	Post-Construction Monitoring Well
▲	Inoculum Injection Wells
●	ZVI Boring Location
○	Existing Monitoring Well Location

Notes:
1. Imagery Source: Esri World Map, August 2022.

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NEVADA ENVIRONMENTAL RESPONSE TRUST
LAS VEGAS WASH ZVI-ENHANCED BIOREMEDIATION TREATABILITY STUDY
HENDERSON, NEVADA
TEST AREA 2a/2b/2c LAYOUT

PROJECT NO.:	117-7502022-M18
DATE:	MAY 19, 2023
DESIGNED BY:	AAM
Figure No.	2b

DOCUMENT PATH: D:\NERT\M18\MXD\MONTHLY REPORT\FIGURE 2B TEST AREA 2A 2B 2C.MXD

Tables

Table 1
Phase 2 Post-Construction Well Construction Details
 Las Vegas Wash ZVI-Enhanced Bioremediation Treatability Study

Well ID	Screened Lithology	Northing	Easting	Ground Surface Elevation	Top of Casing Elevation	Depth to Water ¹	Groundwater Elevation	Casing Material	Slot Size	Filter Pack Gradation	Nominal Borehole Diameter	Borehole Total Depth	Well Diameter	Nominal Screen Length	Well Total Depth	Bottom of Screen	Top of Screen
				feet amsl	feet amsl	ft bTOC	amsl		inches		inches	feet bgs	inches	feet	feet bgs	feet bgs	feet bgs
ZTS-MW202	UMCf	26732585.08	832941.97	1547.83	1547.46	16.48	1530.98	Schedule 40 PVC	0.010	#2/16	6	40.0	2	10.0	39.0	38.5	28.8
ZTS-MW203	UMCf	26732590.95	832950.78	1547.77	1547.71	16.90	1530.81	Schedule 40 PVC	0.010	#2/16	6	45.0	2	10.0	38.5	38.0	28.3
ZTS-MW204	UMCf	26732632.00	832913.21	1547.40	1546.87	16.35	1530.52	Schedule 40 PVC	0.010	#2/16	6	42.5	2	10.0	40.5	40.0	30.3
ZTS-MW205	UMCf	26732638.98	832925.09	1547.61	1547.30	17.00	1530.30	Schedule 40 PVC	0.010	#2/16	6	42.5	2	10.0	40.5	40.0	30.3
ZTS-MW206	UMCf	26732546.67	832971.91	1547.58	1547.61	11.34	1536.27	Schedule 40 PVC	0.010	#2/16	6	70.0	2	15.0	65.5	65.0	50.1
ZTS-MW207	UMCf	26732549.09	832973.98	1547.48	1547.43	16.33	1531.10	Schedule 40 PVC	0.010	#2/16	6	48.0	2	20.0	46.5	46.0	26.1
ZTS-MW208	UMCf	26732561.34	832981.27	1547.35	1547.21	16.41	1530.80	Schedule 40 PVC	0.010	#2/16	6	48.0	2	20.0	46.5	46.0	26.1
ZTS-MW209	UMCf	26732557.71	832983.97	1547.62	1547.30	11.00	1536.30	Schedule 40 PVC	0.010	#2/16	6	69.0	2	15.0	66.0	65.5	50.6
ZTS-IW01	Alluvium	26732954.69	833038.19	1545.73	1545.62	NM	NM	Schedule 40 PVC	0.020	#3	6	40.0	2	15.0	36.0	35.5	20.8
ZTS-IW02	Alluvium	26732933.88	833046.37	1545.63	1545.70	NM	NM	Schedule 40 PVC	0.020	#3	6	37.5	2	15.0	35.5	35.0	20.3
ZTS-IW03	Alluvium	26732913.63	833053.06	1546.39	1546.35	NM	NM	Schedule 40 PVC	0.020	#3	6	40.0	2	15.0	36.0	35.5	20.8
ZTS-IW04	Alluvium	26732895.95	833061.35	1545.81	1545.64	NM	NM	Schedule 40 PVC	0.020	#3	6	38.0	2	15.0	36.0	35.5	20.8
ZTS-IW05	Alluvium	26732877.62	833068.66	1546.34	1546.32	NM	NM	Schedule 40 PVC	0.020	#3	6	37.5	2	15.0	36.0	35.5	20.8
ZTS-IW06	Alluvium	26732858.63	833075.96	1547.14	1546.96	NM	NM	Schedule 40 PVC	0.020	#3	6	35.0	2	15.0	35.0	34.5	19.8
ZTS-IW07	Alluvium	26732840.03	833083.70	1547.73	1547.48	NM	NM	Schedule 40 PVC	0.020	#3	6	30.0	2	5.0	27.5	27.0	22.3
ZTS-IW08	Alluvium	26732822.00	833091.44	1547.88	1547.75	NM	NM	Schedule 40 PVC	0.020	#3	6	31.0	2	5.0	27.5	27.0	22.3
ZTS-IW09	Alluvium	26732803.17	833098.78	1548.14	1548.30	NM	NM	Schedule 40 PVC	0.020	#3	6	27.0	2	5.0	26.5	26.0	21.3
ZTS-IW10	Alluvium	26732784.72	833106.32	1548.63	1548.48	NM	NM	Schedule 40 PVC	0.020	#3	6	25.0	2	5.0	25.0	24.5	19.8
ZTS-IW11	Alluvium	26732597.13	832941.47	1547.80	1547.86	NM	NM	Schedule 40 PVC	0.020	#3	6	25.0	2	5.0	23.5	23.0	18.3
ZTS-IW12	Alluvium	26732585.78	832951.00	1547.51	1547.54	NM	NM	Schedule 40 PVC	0.020	#3	6	26.0	2	5.0	25.0	24.5	19.8
ZTS-IW13	Alluvium	26732645.58	832916.08	1547.54	1547.64	NM	NM	Schedule 40 PVC	0.020	#3	6	30.0	2	10.0	29.5	29.0	19.3
ZTS-IW14	Alluvium	26732632.18	832923.75	1547.50	1547.55	NM	NM	Schedule 40 PVC	0.020	#3	6	30.0	2	10.0	27.3	26.8	17.1
ZTS-IW15	UMCf	26732551.24	832973.58	1547.33	1547.34	NM	NM	Schedule 40 PVC	0.010	#2/16	10	68.0	2	15.0	46.5	46.0	26.3
ZTS-IW16	UMCf	26732551.53	832973.34	1547.37	1547.44	NM	NM	Schedule 40 PVC	0.010	#2/16			2	20.0	67.5	67.0	52.3

Notes
 amsl - above mean sea level
 bgs - below ground surface
 bTOC - below top of casing
 PVC - polyvinyl chloride
 NM - not measured
 UMCf - Upper Muddy Creek formation
 1. Depth to water collected on May 16-17, 2023.