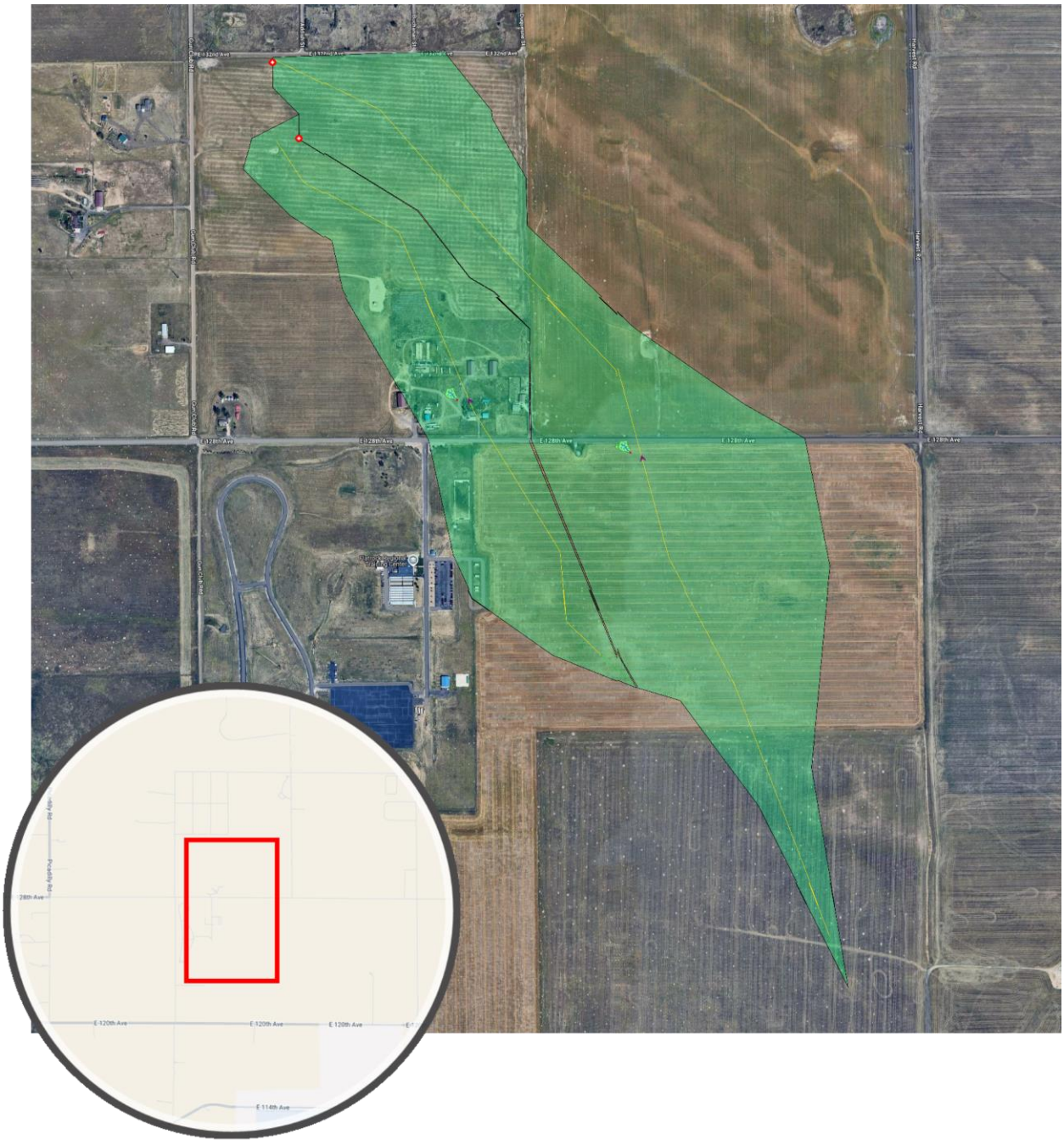
Project Description

The project is located in Adams County, Colorado



Purpose

The purpose of this hydrology study is to determine the peak runoff rates.

Methodology Used

The HEC-HMS version 4.5 computer software was used in this hydrology study. The **SCS Curve Number** infiltration (loss) method and **SCS Unit Hydrograph** runoff (transform) method was used for determining the stormwater runoff**.** Multiple routing method were used for routing the stormwater**.**

The following scenarios were analyzed in this hydrology study:

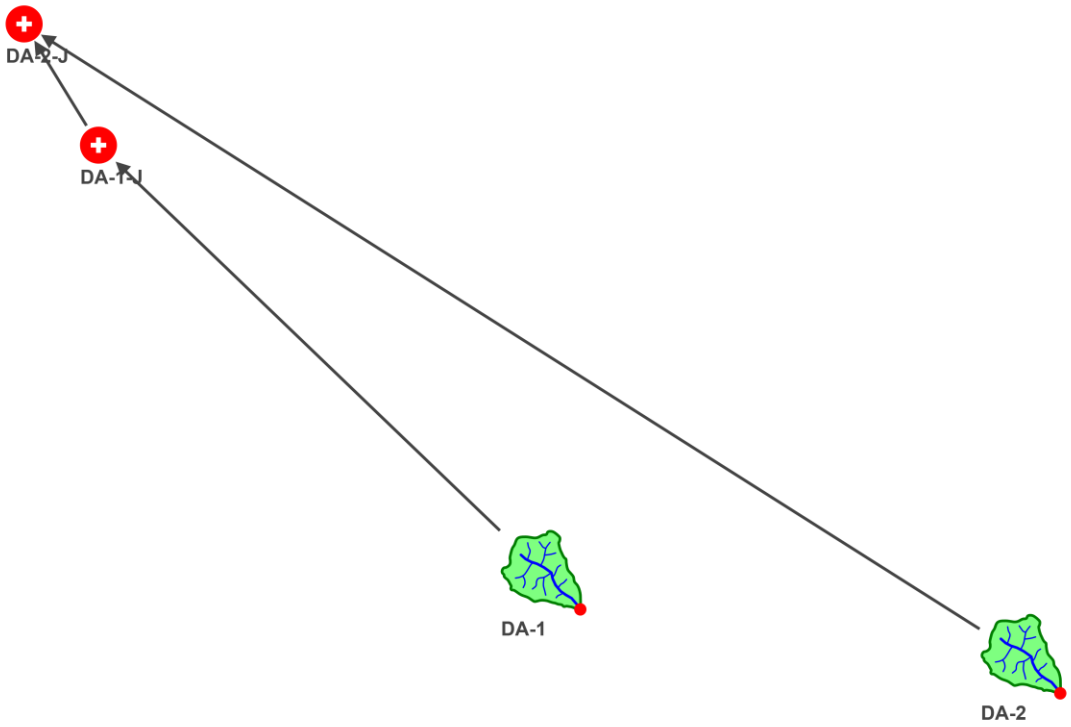
5yr

This scenario contains:

- 2 delineated subbasin areas and corresponding lag time flow paths.
- 2 connecting junctions.

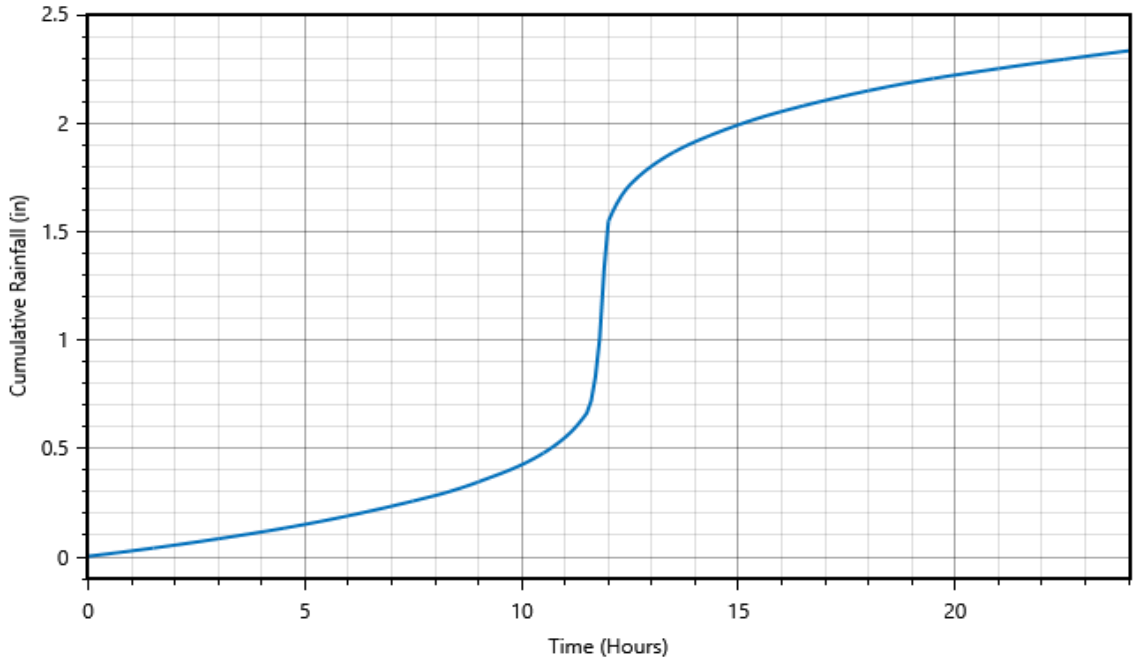
5yr

Watershed Routing Diagram



Design Storm

Precipitation type: SCS Storm
SCS storm distribution: Type II
Rainfall depth: 2.33 in



Watershed Summary

Subbasin ID	Drainage Area (acres)	Initial Abstraction (in)	Curve Number	Impervious Surface (%)	Lag Time (minutes)	Peak Discharge (cfs)
DA-1	67.740	N/A	81.10	25.00	67.97	25.94
DA-2	148.301	N/A	79.60	25.00	103.56	39.24

Subbasins

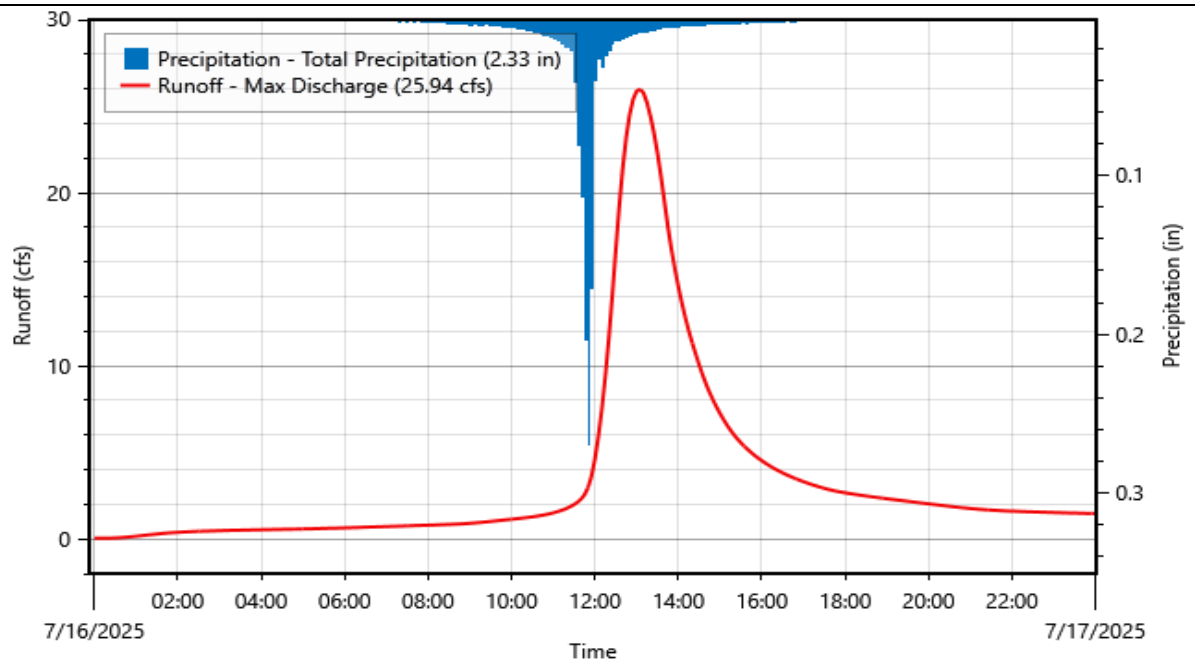
Subbasin ID:	**DA-1**			
Scenario:	**5yr**		**Depth**	**Volume**
Peak discharge:	25.94 cfs	**Time of peak:**	16 Jul 2025, 01:05	
Drainage area:	67.740 acres	**Total rainfall:**	2.33 in	13.153 ac-ft
Initial abstraction:	N/A	**Losses:**	1.13 in	6.358 ac-ft
Curve Number:	81.10	**Precip excess:**	1.20 in	6.795 ac-ft
Impervious surface:	25.00%	**Direct runoff:**	1.17 in	6.625 ac-ft
Peaking factor:	484	**Baseflow:**	0.00 in	0.000 ac-ft
Lag time:	67.97 minutes	**Total runoff:**	1.17 in	6.625 ac-ft

Weighted Curve Number Calculations

Soil Group	Land Use Description	Area (acres)	Area (%)	Composite CN
C	Developed, Low Density	0.266	0.39	83.00
C	Agricultural, Pasture/Hay	7.301	10.78	74.00
C	Developed, Medium Density	0.409	0.60	90.00
C	Agricultural, Cultivated Crops	45.376	66.99	85.00
C	Developed, Open Space	2.025	2.99	79.00
C	Undeveloped, Grassland	12.364	18.25	71.00
Weighted Average		**67.740**	**100.00**	**81.10**

Time of Concentration (TOC) / Lag time Calculations

TOC (min)	Length (ft)	Slope (ft/ft)	Velocity (ft/s)	Description
52.55	300.00	0.03838	0.0952	Sheet Flow
60.73	4,318.49	0.01734	1.1851	Shallow Concentrated Flow
113.28	**4,618.49**	**Total**	**Lag Time = 67.97 minutes**	



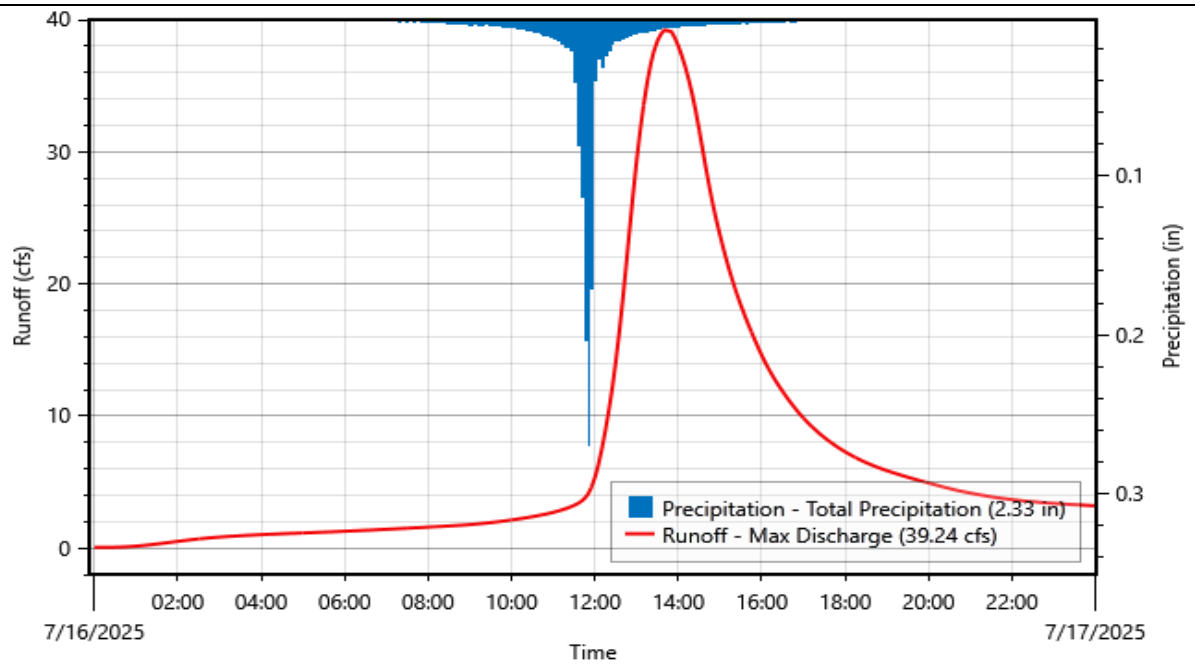
Subbasin ID:	**DA-2**			
Scenario:	**5yr**		**Depth**	**Volume**
Peak discharge:	39.24 cfs	**Time of peak:**	16 Jul 2025, 01:45	
Drainage area:	148.301 acres	**Total rainfall:**	2.33 in	28.795 ac-ft
Initial abstraction:	N/A	**Losses:**	1.18 in	14.607 ac-ft
Curve Number:	79.60	**Precip excess:**	1.15 in	14.188 ac-ft
Impervious surface:	25.00%	**Direct runoff:**	1.10 in	13.627 ac-ft
Peaking factor:	484	**Baseflow:**	0.00 in	0.000 ac-ft
Lag time:	103.56 minutes	**Total runoff:**	1.10 in	13.627 ac-ft

Weighted Curve Number Calculations

Soil Group	Land Use Description	Area (acres)	Area (%)	Composite CN
C	Agricultural, Pasture/Hay	31.579	21.29	74.00
C	Agricultural, Cultivated Crops	80.764	54.46	85.00
C	Developed, Open Space	6.318	4.26	79.00
C	Undeveloped, Grassland	29.640	19.99	71.00
Weighted Average		**148.301**	**100.00**	**79.60**

Time of Concentration (TOC) / Lag time Calculations

TOC (min)	Length (ft)	Slope (ft/ft)	Velocity (ft/s)	Description
67.98	300.00	0.02016	0.0735	Sheet Flow
104.62	7,339.78	0.01688	1.1693	Shallow Concentrated Flow
172.60	**7,639.78**	**Total**	**Lag Time = 103.56 minutes**	



Nodes

Element ID	Element Type	Peak Inflow (cfs)	Peak Outflow (cfs)	Peak Diverted Flow (cfs)
DA-1-J	Junction	25.94	25.94	
DA-2-J	Junction	60.97	60.97	

Results Summary

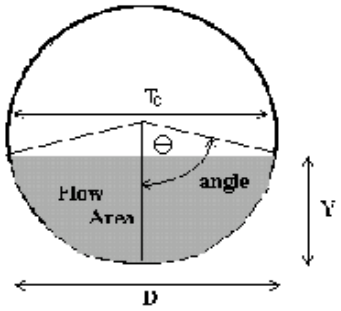
Hydrologic Element	Drainage Area (acres)	Maximum Outflow (cfs)	Time of Peak	Volume (ac-ft)
DA-1	67.740	25.94	16Jul2025, 13:05	6.625
DA-1-J	67.740	25.94	16Jul2025, 13:05	6.625
DA-2	148.301	39.24	16Jul2025, 13:45	13.627
DA-2-J	216.041	60.97	16Jul2025, 13:25	20.252

CIRCULAR CONDUIT FLOW (Normal & Critical Depth Computation)

MHFD-Culvert, Version 4.01 (April 2025)

Project: Stonehouse Substations

Pipe ID: C1 12 " RCP



100 year

Design Information (Input)			
Pipe Invert Slope	So =	0.4500	ft/ft
Pipe Manning's n-value	n =	0.0120	
Pipe Diameter	D =	12.00	inches
Design discharge	Q =	8.70	cfs

Full-Flow Capacity (Calculated)			
Full-flow area	Af =	0.79	sq ft
Full-flow wetted perimeter	Pf =	3.14	ft
Half Central Angle	Theta =	3.14	radians
Full-flow capacity	Qf =	25.96	cfs

Calculation of Normal Flow Condition			
Half Central Angle (0<Theta<3.14)	Theta =	1.37	radians
Flow area	An =	0.29	sq ft
Top width	Tn =	0.98	ft
Wetted perimeter	Pn =	1.37	ft
Flow depth	Yn =	0.40	ft
Flow velocity	Vn =	29.78	fps
Discharge	Qn =	8.70	cfs
Percent of Full Flow	Flow =	33.5%	of full flow
Normal Depth Froude Number	Fr_n =	9.61	supercritical

Calculation of Critical Flow Condition			
Half Central Angle (0<Theta-c<3.14)	Theta-c =	2.94	radians
Critical flow area	Ac =	0.78	sq ft
Critical top width	Tc =	0.20	ft
Critical flow depth	Yc =	0.99	ft
Critical flow velocity	Vc =	11.10	fps
Critical Depth Froude Number	Fr_c =	1.00	

Trickle Channel Check

Mannings Formula

$Q = a \times 1.486/n \times R^{2/3} \times S^{1/2}$

Input Data:			Results:		
Area =	2	ft^2	Hydraulic Radius =	0.4	ft
Mannings 'n' =	0.013		Flow Rate =	9.61	cfs
Wetted Perimeter =	5	ft	Velocity =	4.81	ft/s
Slope =	0.006	ft/ft			

At culvert exit for 100 year

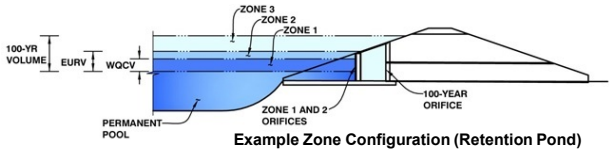
C1 Q = 8.7 CFS

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Project: Stonehouse Adams County Co

Basin ID: A



Example Zone Configuration (Retention Pond)

	Estimated Stage (ft)	Estimated Volume (ac-ft)	Outlet Type
Zone 1 (WQCV)	1.87	0.090	Orifice Plate
Zone 2 (EURV)	2.36	0.163	Orifice Plate
ne 3 (100-year)	2.76	0.265	Weir&Pipe (Restrict)
Total (all zones)		0.518	

User Input: Orifice at Underdrain Outlet (typically used to drain WQCV in a Filtration SCM)

Underdrain Orifice Invert Depth =	N/A	ft (distance below the filtration media surface)	Underdrain Orifice Area =	N/A	ft^2
Underdrain Orifice Diameter =	N/A	inches	Underdrain Orifice Centroid =	N/A	feet

Calculated Parameters for Underdrain

User Input: Orifice Plate with one or more orifices or Elliptical Slot Weir (typically used to drain WQCV and/or EURV in a sedimentation SCM)

Centroid of Lowest Orifice =	0.00	ft (relative to basin bottom at Stage = 0 ft)	WQ Orifice Area per Row =	N/A	ft^2
Depth at top of Zone using Orifice Plate =	2.36	ft (relative to basin bottom at Stage = 0 ft)	Elliptical Half-Width =	N/A	feet
Orifice Plate: Orifice Vertical Spacing =	N/A	inches	Elliptical Slot Centroid =	N/A	feet
Orifice Plate: Orifice Area per Row =	N/A	sq. inches	Elliptical Slot Area =	N/A	ft^2

Calculated Parameters for Plate

User Input: Stage and Total Area of Each Orifice Row (numbered from lowest to highest)

	Row 1 (required)	Row 2 (optional)	Row 3 (optional)	Row 4 (optional)	Row 5 (optional)	Row 6 (optional)	Row 7 (optional)	Row 8 (optional)
Stage of Orifice Centroid (ft)	0.00	0.81	1.42					
Orifice Area (sq. inches)	0.12	0.26	2.70					

	Row 9 (optional)	Row 10 (optional)	Row 11 (optional)	Row 12 (optional)	Row 13 (optional)	Row 14 (optional)	Row 15 (optional)	Row 16 (optional)
Stage of Orifice Centroid (ft)								
Orifice Area (sq. inches)								

User Input: Vertical Orifice (Circular or Rectangular)

	Not Selected	Not Selected			Not Selected	Not Selected	
Invert of Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Area =	N/A	N/A	ft^2
Depth at top of Zone using Vertical Orifice =	N/A	N/A	ft (relative to basin bottom at Stage = 0 ft)	Vertical Orifice Centroid =	N/A	N/A	feet
Vertical Orifice Diameter =	N/A	N/A	inches				

Calculated Parameters for Vertical Orifice

User Input: Overflow Weir (Dropbox with Flat or Sloped Grate and Outlet Pipe OR Rectangular/Trapezoidal Weir and No Outlet Pipe)

	Zone 3 Weir	Not Selected			Zone 3 Weir	Not Selected	
Overflow Weir Front Edge Height, Ho =	3.00	N/A	ft (relative to basin bottom at Stage = 0 ft)	Height of Grate Upper Edge, H_t =	4.25	N/A	feet
Overflow Weir Front Edge Length =	5.00	N/A	feet	Overflow Weir Slope Length =	5.15	N/A	feet
Overflow Weir Grate Slope =	4.00	N/A	H:V	Grate Open Area / 100-yr Orifice Area =	20.59	N/A	
Horiz. Length of Weir Sides =	5.00	N/A	feet	Overflow Grate Open Area w/o Debris =	17.94	N/A	ft^2
Overflow Grate Type =	Type C Grate	N/A		Overflow Grate Open Area w/ Debris =	17.94	N/A	ft^2
Debris Clogging % =	0%	N/A	%				

Calculated Parameters for Overflow Weir

User Input: Outlet Pipe w/ Flow Restriction Plate (Circular Orifice, Restrictor Plate, or Rectangular Orifice)

	Zone 3 Restrictor	Not Selected			Zone 3 Restrictor	Not Selected	
Depth to Invert of Outlet Pipe =	1.00	N/A	ft (distance below basin bottom at Stage = 0 ft)	Outlet Orifice Area =	0.87	N/A	ft^2
Outlet Pipe Diameter =	18.00	N/A	inches	Outlet Orifice Centroid =	0.43	N/A	feet
Restrictor Plate Height Above Pipe Invert =	8.90		inches	Half-Central Angle of Restrictor Plate on Pipe =	1.56	N/A	radians

Calculated Parameters for Outlet Pipe w/ Flow Restriction Plate

User Input: Emergency Spillway (Rectangular or Trapezoidal)

Spillway Invert Stage=	3.20	ft (relative to basin bottom at Stage = 0 ft)	Spillway Design Flow Depth=	0.70	feet
Spillway Crest Length =	4.00	feet	Stage at Top of Freeboard =	4.90	feet
Spillway End Slopes =	5.00	H:V	Basin Area at Top of Freeboard =	1.64	acres
Freeboard above Max Water Surface =	1.00	feet	Basin Volume at Top of Freeboard =	3.35	acre-ft

Calculated Parameters for Spillway

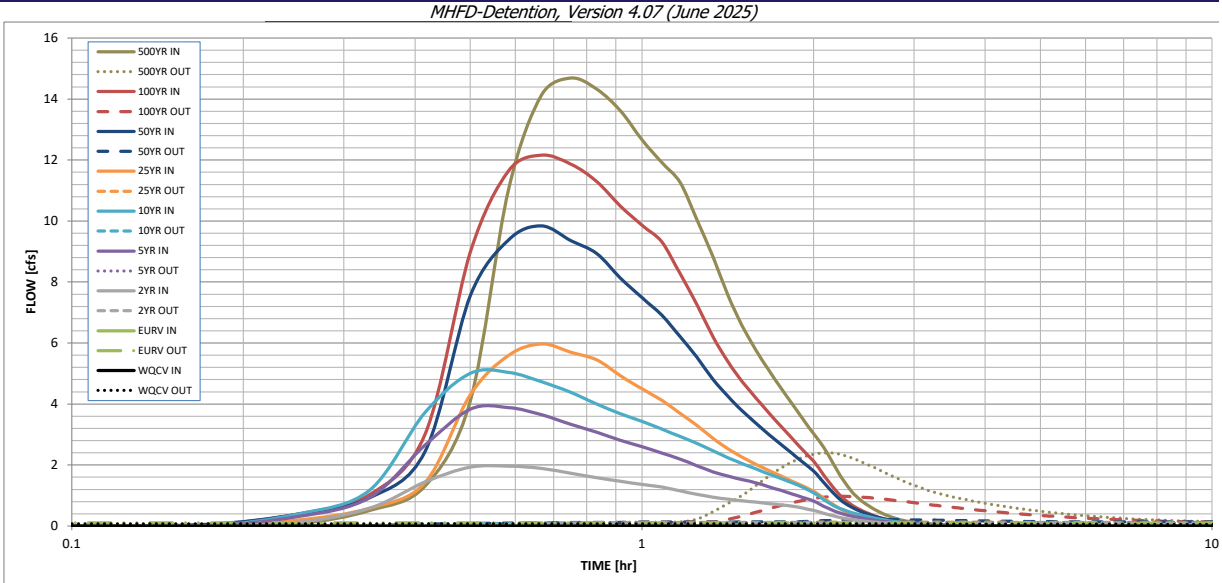
Routed Hydrograph Results

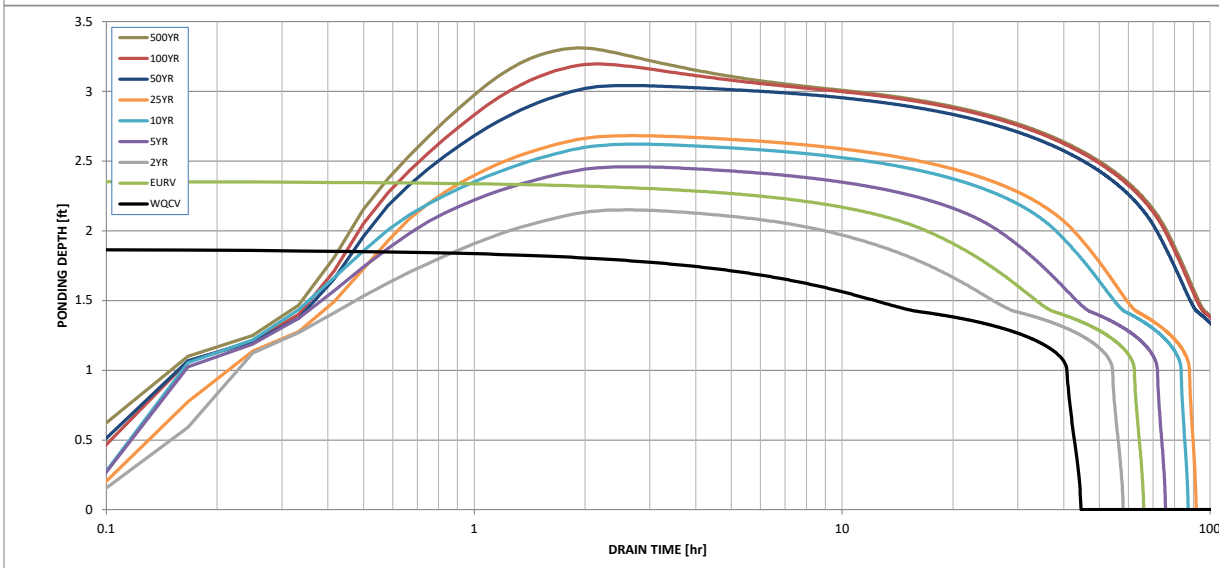
The user can override the default CUHP hydrographs and runoff volumes by entering new values in the Inflow Hydrographs table (Columns W through AF).

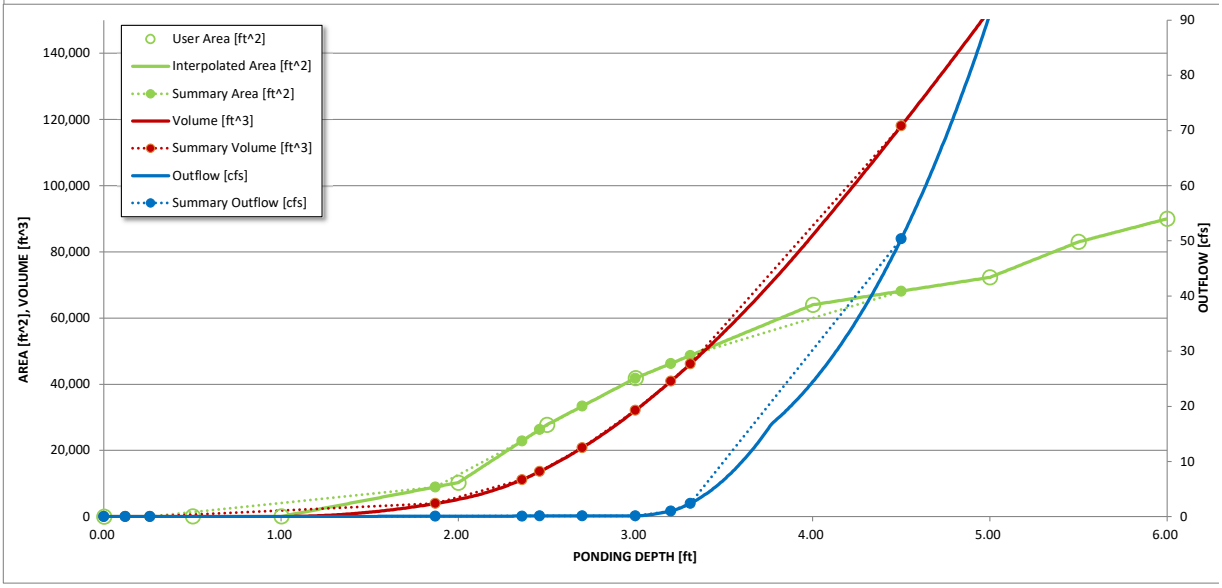
Design Storm Return Period =	WQCV	EURV	2 Year	5 Year	10 Year	25 Year	50 Year	100 Year	500 Year
One-Hour Rainfall Depth (in) =	N/A	N/A	1.00	1.42	1.68	1.69	2.35	2.71	3.14
CUHP Runoff Volume (acre-ft) =	0.090	0.253	0.181	0.334	0.443	0.487	0.808	1.015	1.236
Inflow Hydrograph Volume (acre-ft) =	N/A	N/A	0.181	0.334	0.443	0.487	0.808	1.015	1.236
CUHP Predevelopment Peak Q (cfs) =	N/A	N/A	0.2	1.2	2.0	2.8	5.4	7.1	8.9
OPTIONAL Override Predevelopment Peak Q (cfs) =	N/A	N/A							
Predevelopment Unit Peak Flow, q (cfs/acre) =	N/A	N/A	0.03	0.21	0.33	0.46	0.90	1.18	1.47
Peak Inflow Q (cfs) =	N/A	N/A	2.0	3.9	5.0	6.0	9.8	12.2	14.7
Peak Outflow Q (cfs) =	0.1	0.1	0.1	0.1	0.1	0.1	0.2	1.0	2.4
Ratio Peak Outflow to Predevelopment Q =	N/A	N/A	N/A	0.1	0.1	0.0	0.0	0.1	0.3
Structure Controlling Flow =	Plate	Plate	Plate	Plate	Plate	Plate	Overflow Weir 1	Spillway	Spillway
Max Velocity through Grate 1 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	0.0	0.0	0.1
Max Velocity through Grate 2 (fps) =	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A
Time to Drain 97% of Inflow Volume (hours) =	39	54	48	61	68	71	91	92	91
Time to Drain 99% of Inflow Volume (hours) =	**41**	60	53	69	79	83	108	109	108
Maximum Ponding Depth (ft) =	1.87	2.36	2.15	2.46	2.62	2.68	3.04	3.20	3.31
Area at Maximum Ponding Depth (acres) =	0.21	0.52	0.35	0.60	0.71	0.75	0.98	1.06	1.11
Maximum Volume Stored (acre-ft) =	0.091	0.256	0.160	0.307	0.419	0.463	0.776	0.929	1.048

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)







S-A-V-D Chart Axis Override	X-axis	Left Y-Axis	Right Y-Axis
minimum bound			
maximum bound			

DETENTION BASIN OUTLET STRUCTURE DESIGN

Outflow Hydrograph Workbook Filename:

Inflow Hydrographs

The user can override the calculated inflow hydrographs from this workbook with inflow hydrographs developed in a separate program.

ime Interval	SOURCE	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP	CUHP
	TIME	WQCV [cfs]	EURV [cfs]	2 Year [cfs]	5 Year [cfs]	10 Year [cfs]	25 Year [cfs]	50 Year [cfs]	100 Year [cfs]	500 Year [cfs]
5.00 min	0:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	0:10:00	0	0.00	0.00	0.00	0.00	0.00	0.04	0.03	0.08
	0:15:00	0	0.00	0.13	0.31	0.40	0.19	0.39	0.40	0.51
	0:20:00	0	0.00	0.59	0.94	1.18	0.59	0.93	1.03	1.31
	0:25:00	0	0.00	1.44	2.65	3.73	1.42	2.45	3.01	4.09
	0:30:00	0	0.00	1.93	3.83	5.01	4.30	7.54	8.97	11.04
	0:35:00	0	0.00	1.97	3.89	5.04	5.59	9.38	11.65	14.13
	0:40:00	0	0.00	1.89	3.65	4.73	5.97	9.84	12.16	14.68
	0:45:00	0	0.00	1.73	3.34	4.39	5.70	9.36	11.87	14.32
	0:50:00	0	0.00	1.58	3.07	3.99	5.45	8.93	11.29	13.62
	0:55:00	0	0.00	1.46	2.81	3.68	4.93	8.13	10.49	12.67
	1:00:00	0	0.00	1.37	2.60	3.42	4.49	7.49	9.86	11.92
	1:05:00	0	0.00	1.27	2.39	3.18	4.12	6.92	9.32	11.27
	1:10:00	0	0.00	1.15	2.20	2.93	3.70	6.21	8.27	10.03
	1:15:00	0	0.00	1.04	1.98	2.71	3.29	5.53	7.25	8.82
	1:20:00	0	0.00	0.94	1.78	2.46	2.87	4.80	6.20	7.55
	1:25:00	0	0.00	0.88	1.63	2.24	2.53	4.25	5.38	6.56
	1:30:00	0	0.00	0.83	1.52	2.05	2.25	3.77	4.74	5.78
	1:35:00	0	0.00	0.78	1.42	1.87	2.03	3.37	4.20	5.13
	1:40:00	0	0.00	0.74	1.29	1.71	1.83	3.01	3.72	4.54
	1:45:00	0	0.00	0.70	1.17	1.56	1.64	2.69	3.29	4.01
	1:50:00	0	0.00	0.65	1.05	1.42	1.47	2.38	2.88	3.50
	1:55:00	0	0.00	0.58	0.94	1.26	1.30	2.09	2.49	3.03
	2:00:00	0	0.00	0.51	0.82	1.09	1.14	1.80	2.12	2.59
	2:05:00	0	0.00	0.42	0.65	0.87	0.92	1.43	1.68	2.04
	2:10:00	0	0.00	0.33	0.51	0.67	0.70	1.08	1.26	1.53
	2:15:00	0	0.00	0.26	0.40	0.54	0.52	0.80	0.92	1.13
	2:20:00	0	0.00	0.22	0.33	0.44	0.39	0.61	0.70	0.86
	2:25:00	0	0.00	0.18	0.27	0.36	0.31	0.48	0.53	0.66
	2:30:00	0	0.00	0.15	0.22	0.30	0.24	0.38	0.40	0.50
	2:35:00	0	0.00	0.12	0.18	0.24	0.19	0.30	0.31	0.38
	2:40:00	0	0.00	0.10	0.15	0.20	0.15	0.23	0.23	0.28
	2:45:00	0	0.00	0.08	0.12	0.15	0.12	0.18	0.17	0.21
	2:50:00	0	0.00	0.07	0.09	0.12	0.09	0.14	0.13	0.16
	2:55:00	0	0.00	0.05	0.07	0.10	0.08	0.11	0.10	0.13
	3:00:00	0	0.00	0.04	0.06	0.08	0.06	0.09	0.08	0.10
	3:05:00	0	0.00	0.03	0.05	0.06	0.05	0.07	0.06	0.08
	3:10:00	0	0.00	0.03	0.03	0.05	0.04	0.05	0.05	0.06
	3:15:00	0	0.00	0.02	0.03	0.03	0.03	0.04	0.04	0.05
	3:20:00	0	0.00	0.01	0.02	0.02	0.02	0.03	0.03	0.03
	3:25:00	0	0.00	0.01	0.01	0.01	0.01	0.02	0.02	0.02
	3:30:00	0	0.00	0.01	0.01	0.01	0.01	0.01	0.01	0.01
	3:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.01
	3:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	3:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	4:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:05:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:10:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:15:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:20:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:25:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:30:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:35:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:40:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:45:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:50:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	5:55:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
	6:00:00	0	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00

DETENTION BASIN OUTLET STRUCTURE DESIGN

MHFD-Detention, Version 4.07 (June 2025)

Summary Stage-Area-Volume-Discharge Relationships

The user can create a summary S-A-V-D by entering the desired stage increments and the remainder of the table will populate automatically.
The user should graphically compare the summary S-A-V-D table to the full S-A-V-D table in the chart to confirm it captures all key transition points.

Stage - Storage Description	Stage [ft]	Elevation [ft]	Area [ft^2]	Area [acres]	Volume [ft^3]	Volume [ac-ft]	Total Outflow [cfs]
Micropool 5178.5	0.00		0	0.000	0	0.000	0.00
Orifice 1- 5178.62	0.12		13	0.000	1	0.000	0.00
Orifice 2- 5178.76	0.26		29	0.001	4	0.000	0.00
WQV 5180.5	1.87		8942	0.205	3955	0.091	0.07
EURV 5180.37	2.36		22856	0.525	11166	0.256	0.10
5 Year 5180.98	2.46		26352	0.605	13626	0.313	0.11
Orifice 3 5181.2	2.70		33387	0.766	20822	0.478	0.12
Spillway 5181.5	3.00		41842	0.961	32106	0.737	0.13
100 year 5181.7	3.20		46274	1.062	40918	0.939	1.00
500 year 5181.81	3.31		48711	1.118	46142	1.059	2.40
Top of berm 8183	4.50		68150	1.565	118065	2.710	50.36

For best results, include the stages of all grade slope changes (e.g. ISV and Floor) from the S-A-V table on Sheet 'Basin'.

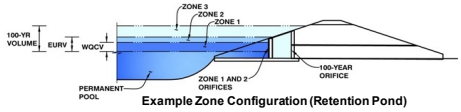
Also include the inverts of all outlets (e.g. vertical orifice, overflow grate, and spillway, where applicable).

DETENTION BASIN STAGE-STORAGE TABLE BUILDER

MHFD-Detention, Version 4.07 (June 2025)

Project: Stonehouse Adams County Co

Basin ID: A



Example Zone Configuration (Retention Pond)

Watershed Information

Selected SCM Type =	**EDB**	
Watershed Area =	6.02	acres
Watershed Length =	750	ft
Watershed Length to Centroid =	410	ft
Watershed Slope =	0.007	ft/ft
Watershed Imperviousness =	40.00%	percent
Percentage Hydrologic Soil Group A =	0.0%	percent
Percentage Hydrologic Soil Group B =	100.0%	percent
Percentage Hydrologic Soil Groups C/D =	0.0%	percent
Target WQCV Drain Time =	40.0	hours
Location for 1-hr Rainfall Depths =	User Input	

After providing required inputs above including 1-hour rainfall depths, click 'Run CUHP' to generate runoff hydrographs using the embedded Colorado Urban Hydrograph Procedure.

			Optional User Overrides	
Water Quality Capture Volume (WQCV) =	0.090	acre-feet		acre-feet
Excess Urban Runoff Volume (EURV) =	0.253	acre-feet		acre-feet
2-yr Runoff Volume (P1 = 1 in.) =	0.181	acre-feet	1.00	inches
5-yr Runoff Volume (P1 = 1.42 in.) =	0.334	acre-feet	1.42	inches
10-yr Runoff Volume (P1 = 1.68 in.) =	0.443	acre-feet	1.68	inches
25-yr Runoff Volume (P1 = 1.69 in.) =	0.487	acre-feet	1.69	inches
50-yr Runoff Volume (P1 = 2.35 in.) =	0.808	acre-feet	2.35	inches
100-yr Runoff Volume (P1 = 2.71 in.) =	1.015	acre-feet	2.71	inches
500-yr Runoff Volume (P1 = 3.14 in.) =	1.236	acre-feet	3.14	inches
Approximate 2-yr Detention Volume =	0.157	acre-feet		
Approximate 5-yr Detention Volume =	0.246	acre-feet		
Approximate 10-yr Detention Volume =	0.344	acre-feet		
Approximate 25-yr Detention Volume =	0.339	acre-feet		
Approximate 50-yr Detention Volume =	0.439	acre-feet		
Approximate 100-yr Detention Volume =	0.518	acre-feet		

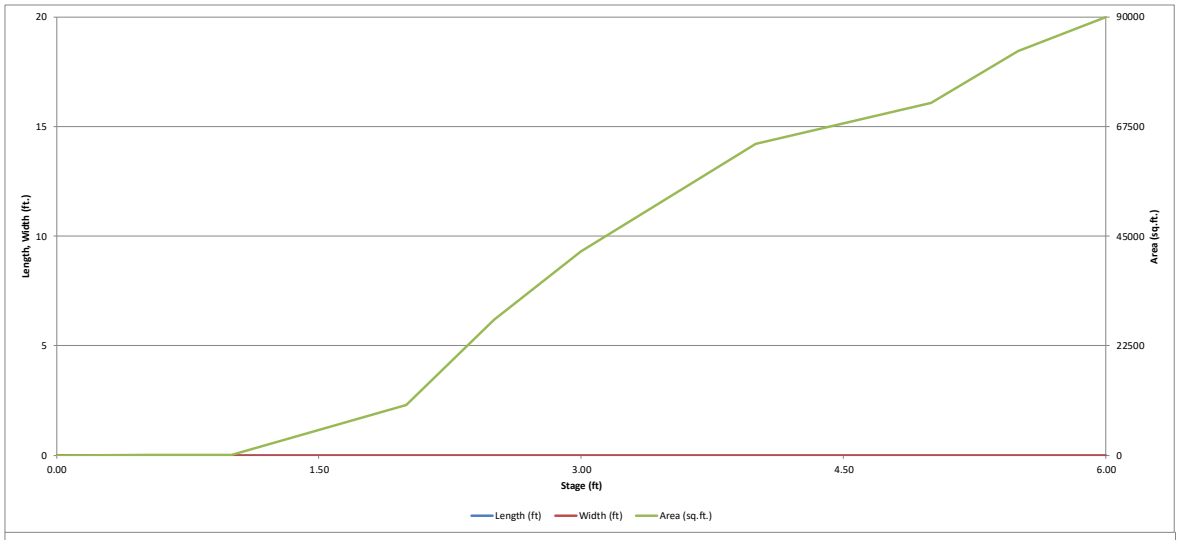
Define Zones and Basin Geometry

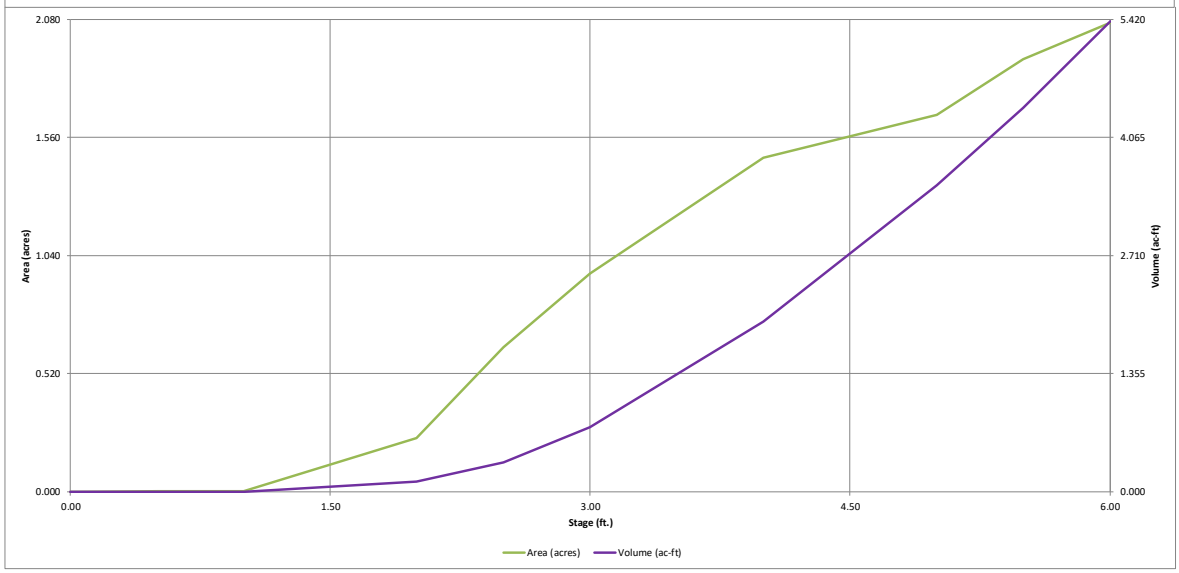
Zone 1 Volume (WQCV) =	0.090	acre-feet
Zone 2 Volume (EURV - Zone 1) =	0.163	acre-feet
Zone 3 Volume (100-year - Zones 1 & 2) =	0.265	acre-feet
Total Detention Basin Volume =	0.518	acre-feet
Initial Surcharge Volume (ISV) =	user	ft^3
Initial Surcharge Depth (ISD) =	user	ft
Total Available Detention Depth (H_{total}) =	user	ft
Depth of Trickle Channel (H_{TC}) =	user	ft
Slope of Trickle Channel (S_{TC}) =	user	ft/ft
Slopes of Main Basin Sides (S_{main}) =	user	H:V
Basin Length-to-Width Ratio ($R_{L/W}$) =	user	

Initial Surcharge Area (A_{ISV}) =	user	ft^2
Surcharge Volume Length (L_{ISV}) =	user	ft
Surcharge Volume Width (W_{ISV}) =	user	ft
Depth of Basin Floor (H_{FLOOR}) =	user	ft
Length of Basin Floor (L_{FLOOR}) =	user	ft
Width of Basin Floor (W_{FLOOR}) =	user	ft
Area of Basin Floor (A_{FLOOR}) =	user	ft^2
Volume of Basin Floor (V_{FLOOR}) =	user	ft^3
Depth of Main Basin (H_{MAIN}) =	user	ft
Length of Main Basin (L_{MAIN}) =	user	ft
Width of Main Basin (W_{MAIN}) =	user	ft
Area of Main Basin (A_{MAIN}) =	user	ft^2
Volume of Main Basin (V_{MAIN}) =	user	ft^3
Calculated Total Basin Volume (V_{total}) =	**user**	acre-feet

Depth Increment = 0.50 ft

Stage - Storage Description	Stage (ft)	Optional Override Stage (ft)	Length (ft)	Width (ft)	Area (ft^2)	Optional Override Area (ft^2)	Area (acre)	Volume (ft^3)	Volume (ac-ft)
Top of Micropool	--	0.00	--	--	--	0	0.000		
79	--	0.50	--	--	--	55	0.001	14	0.000
79.5	--	1.00	--	--	--	55	0.001	41	0.001
80	--	2.00	--	--	--	10,270	0.236	5,204	0.119
80.5	--	2.50	--	--	--	27,750	0.637	14,708	0.338
81	--	3.00	--	--	--	41,842	0.961	32,106	0.737
82	--	4.00	--	--	--	64,000	1.469	85,027	1.952
83	--	5.00	--	--	--	72,300	1.660	153,177	3.516
83.5	--	5.50	--	--	--	83,000	1.905	192,002	4.408
84	--	6.00	--	--	--	90,000	2.066	235,252	5.401


20
15
10
5
0
90000
67500
45000
22500
0
0.00
1.50
3.00
4.50
6.00
Length, Width (ft.)
Area (sq.ft.)
Stage (ft)
Length (ft)
Width (ft)
Area (sq.ft.)

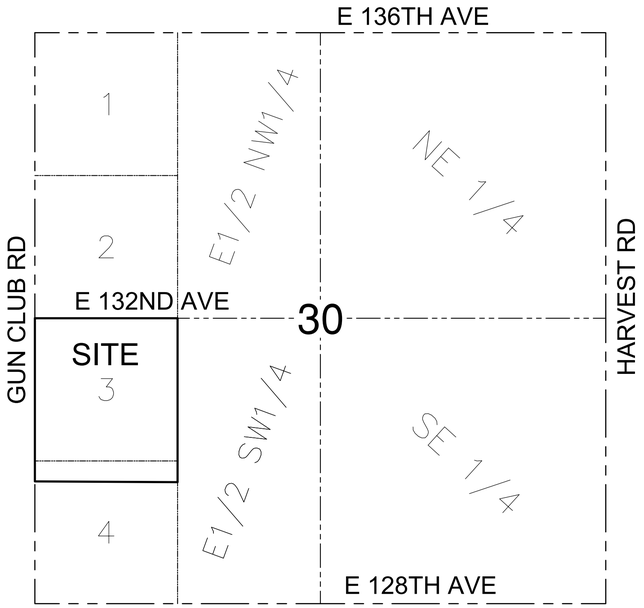

2.080
1.560
1.040
0.520
0.000
5.420
4.065
2.710
1.355
0.000
0.00
1.50
3.00
4.50
6.00
Area (acres)
Volume (ac-ft)
Stage (ft.)
Area (acres)
Volume (ac-ft)

APPENDIX E– Plans

CIVIL DESIGN PACKAGE

GRADING PLAN FOR
STONE HOUSE SUBSTATION
ADAMS COUNTY, STATE OF COLORADO

DRAWING INDEX	
REV	TITLE
0	GRADING DESIGN TITLE SHEET
0	SITE PLAN
0	GRADING AND EROSION CONTROL PLAN
0	GRADING SECTIONS
0	GRADING DETAILS 1
0	GRADING DETAILS 2



SECTION 30
TOWNSHIP 1 S., RANGE 65 W., 6TH P.M.

LOCATION

(NOT TO SCALE)

VICINITY MAP

(NOT TO SCALE)

THE SITE IS IN SOUTH PLATTE RIVER BASIN.
WATERSHED: MILE HIGH LAKES-BEEBE SEEP CANAL

ANTICIPATED START DATE	TBD
ANTICIPATED COMPLETION DATE	TBD
ANTICIPATED FINAL STABILIZATION DATE	TBD

ENGINEER'S STATEMENT
THIS GRADING PLAN WAS PREPARED UNDER MY DIRECTION AND SUPERVISION AND IS CORRECT TO THE BEST OF MY KNOWLEDGE AND BELIEF. IF SUCH WORK IS PERFORMED IN ACCORDANCE WITH THE GRADING PLAN, THE WORK WILL NOT BECOME A HAZARD TO LIFE AND LIMB, ENDANGER PROPERTY, OR ADVERSELY AFFECT THE SAFETY, USE, OR STABILITY OF A PUBLIC WAY, DRAINAGE CHANNEL, OR OTHER PROPERTY.

NAME: MARISOL E. VELILLA, CO. PE-C NO. 44702 3-25-2024
PHONE:651-415-6628
SEAL

ADAMS COUNTY APPROVAL BLOCK
REVIEW IS FOR GENERAL COMPLIANCE WITH COUNTY STANDARDS AND REGULATIONS. CONSTRUCTION MUST BE IN ACCORDANCE WITH APPLICABLE COUNTY STANDARDS. THE COUNTY'S ACCEPTANCE SHALL NOT RELIEVE THE DESIGN ENGINEER'S RESPONSIBILITY FOR ERRORS, OMISSIONS, OR DESIGN DEFICIENCIES FOR WHICH THE COUNTY IS HELD HARMLESS

COUNTY ENGINEER:_____

DATE:_____

PRELIMINARY
NOT FOR CONSTRUCTION

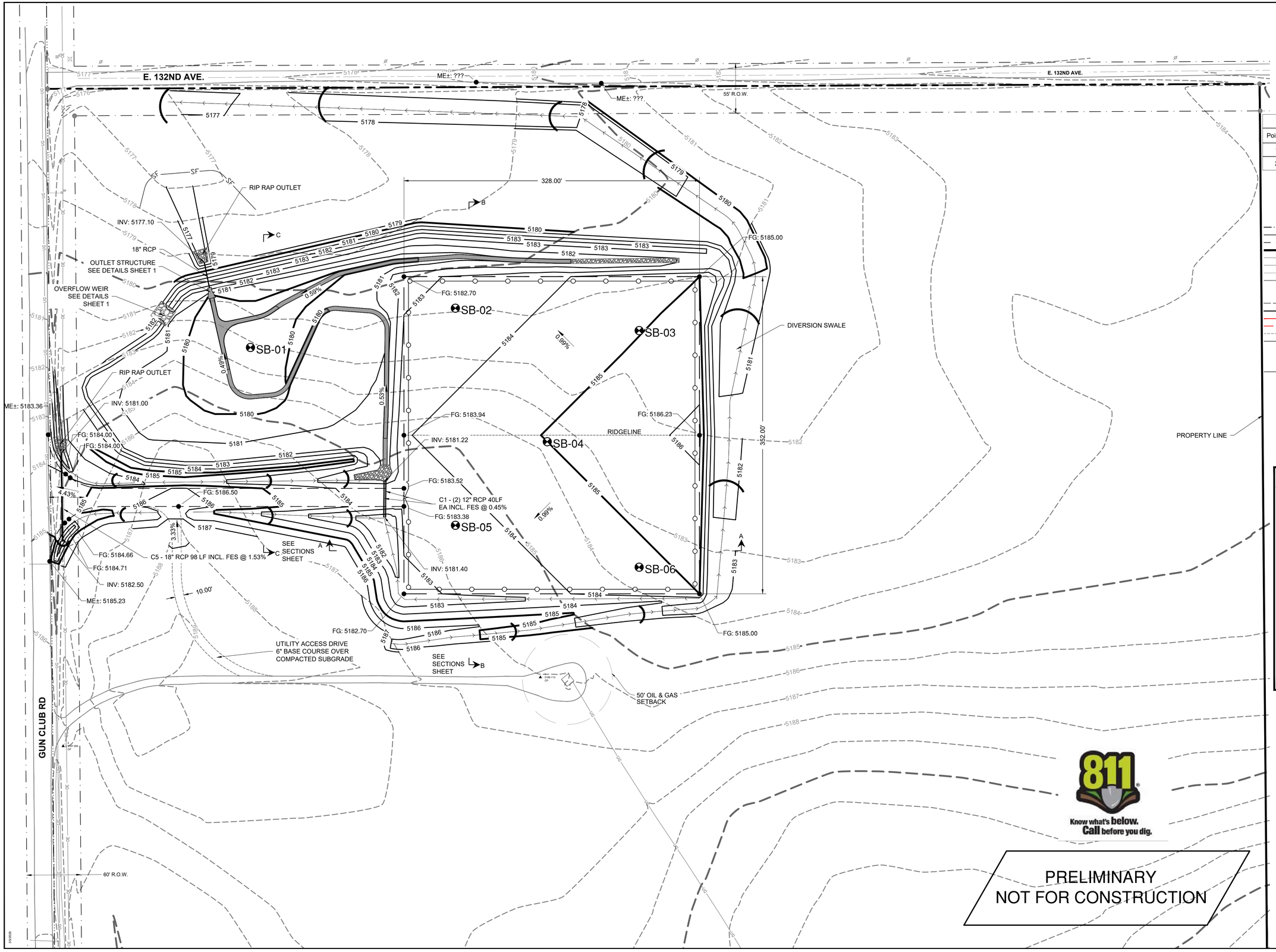
ULTEIG ENGINEERS

5575 DTC PARKWAY, STE. 200
GREENWOOD VILLAGE, CO. 80111
PROJECT MANAGER:
DEREK HOLSCHER

3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
{DRAWING PREPARED 03-09-2026}

STONEHOUSE SUBSTATION
GRADING DESIGN
TITLE SHEET



0 50 100
1"=50'-0"

Control Point Table				
Point #	Raw Description	Elevation	Northing	Easting
1	100	5186.113	1220230.5510	3221667.6400
2	100	5187.269	1220154.1870	3221138.0530

LEGEND:

- SECTION LINE
- SECTION QUARTER LINE
- R.O.W. LINE
- PROPERTY LINE
- OE — EX. OVERHEAD ELECTRIC
- UG — EX. UNDERGROUND GAS
- UT — EX. UNDERGROUND COMMUNICATION
- EX. GRAVEL EDGE
- CONTROL POINT
- SURVEY MONUMENT
- 5184 — EX. CONTOUR
- 5184 — PROPOSED CONTOUR
- PROPOSED SUBSTATION GRAVEL
- PROPOSED DRIVEWAY GRAVEL
- PROPOSED UTILITY DRIVEWAY
- PROPOSED FENCE
- PROPOSED BIOROLL
- SB-05 SOIL BORING
- SF — SF — SILT FENCE

FG: FINISHED GRADE ELEVATION
ME±: MATCH EXISTING ELEVATION
INV: PIPE INVERT ELEVATION

CONTROL:

HORIZONTAL DATUM:
NAD83 COLORADO STATE PLANES, NORTH ZONE, US FOOT

VERTICAL DATUM:
NAVD 88

COORDINATE SYSTEM CODE:
CO83-NF

UNITS:
US SURVEY FOOT

TRANSFORMATION:
GRID TO GROUND CSF - 1.00027313
GROUND TO GRID CSF - 0.99972694
SCALED ABOUT 0,0

LOCATION:
A PORTION OF THE SOUTHWEST QUARTER OF SECTION 30, TOWNSHIP 1 SOUTH, RANGE 65 WEST OF THE 6TH P.M. ADAMS COUNTY, STATE OF COLORADO

Know what's below. Call before you dig.

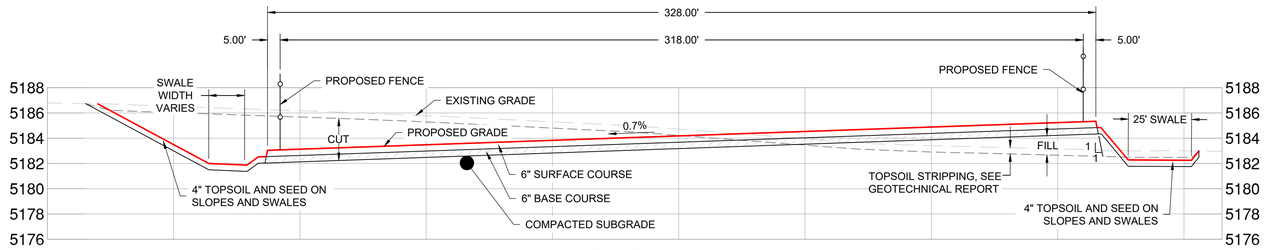
PRELIMINARY
NOT FOR CONSTRUCTION

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
{DRAWING PREPARED 03-09-2026}

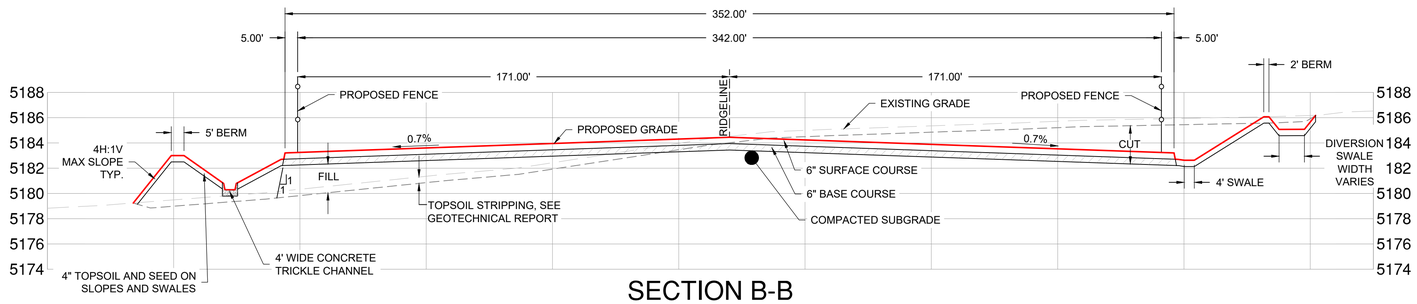
STONEHOUSE SUBSTATION PRELIMINARY GRADING & EROSION CONTROL PLAN

3/9/2026



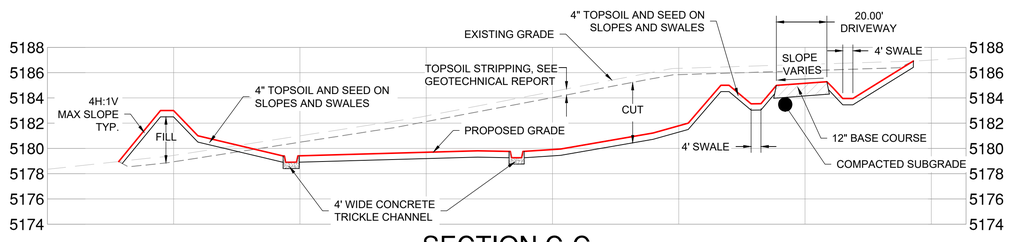
SECTION A-A

HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=6'



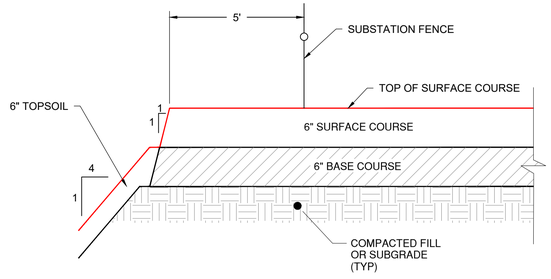
SECTION B-B

HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=3'



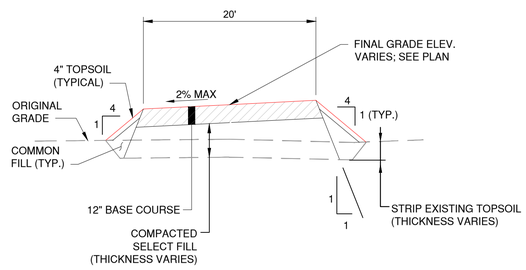
SECTION C-C

HORIZONTAL SCALE: 1"=30'
VERTICAL SCALE: 1"=3'



1 #### SUBSTATION EDGE SECTION

SCALE = NONE



2 #### TYPICAL DRIVEWAY SECTION

SCALE = NONE

CONSTRUCTION NOTES

1. FILLS AND EMBANKMENTS SHALL BE CONSTRUCTED IN UNIFORM LIFTS OR LAYERS NOT EXCEEDING 9 INCHES OF LOOSE FILL AND LAID PARALLEL TO THE FINISHED SURFACE .
2. COMPACT FILL MATERIAL IN LIFTS NOT EXCEEDING 9 INCHES UNCOMPACTED THICKNESS TO 95% OF STANDARD PROCTOR DENSITY (ASTM D698). MAINTAIN MOISTURE CONTENT WITHIN PLUS OR MINUS 2% OF THE OPTIMUM DETERMINED FOR MAXIMUM DENSITY OR AS RECOMMENDED BY GEOTECHNICAL ENGINEERING REPORT. DO NOT PLACE, SPREAD, OR COMPACT FILL MATERIAL DURING WET OR UNFAVORABLE WEATHER CONDITIONS. WET GRANULAR MATERIALS THOROUGHLY DURING OR IMMEDIATELY PRIOR TO COMPACTION.
3. FINISH ALL DISTURBED AREAS TO A NEAT APPEARANCE AND PROVIDE UNIFORM GRADE AND POSITIVE DRAINAGE AS OBTAINABLE WITH A BLADE GRADER.
4. SEE GEOTECHNICAL ENGINEERING REPORT, NAME, ADAMS COUNTY, COLORADO, DATED MONTH ##, 2025, BY GEOTECH NAME, PROJECT NO. ######### FOR SITE PREPARATION RECOMMENDATIONS.

BASE COURSE

1. SUBSTATION AGGREGATE SHALL CONFORM WITH SPECIFICATIONS SECTION #####

SURFACE COURSE

1. SUBSTATION AGGREGATE SHALL CONFORM WITH SPECIFICATIONS SECTION #####

COMMON FILL

1. ALL FILL MATERIALS AND ACTIVITIES SHALL FOLLOW ALL RECOMMENDATIONS PROVIDED IN THE LATEST GEOTECHNICAL REPORT AS REFERENCED ON THIS SHEET OR ONCOR SPECIFICATIONS WHICHEVER IS MORE STRINGENT.
2. COMMON FILL SHALL CONSIST OF LOW-PLASTICITY COHESIVE MATERIAL OR GRANULAR MATERIAL. LOW-PLASTICITY COHESIVE FILL SHALL HAVE A LIQUID LIMIT LESS THAN 30% AND A PLASTICITY INDEX BETWEEN 4%-15%.
3. COMMON FILL SHALL NOT CONTAIN FROZEN MATERIAL OR PARTICLES WITH MAXIMUM LENGTHS GREATER THAN 4".
4. COMMON FILL MATERIAL SHALL CONFORM TO RECOMMENDATIONS PRESENTED IN THE SOILS REPORT FOR THE PROJECT. THE ENGINEER MAY APPROVE VARIATIONS FROM THE PREVIOUS CONDITIONS IF REQUESTED IN WRITING.

GENERAL NOTES

1. STRIPPING MATERIAL TO BE USED FOR DRESSING OF SIDE SLOPES.
2. LOCATION AND STAKING OF THE SITE WITHIN THE PROPERTY LINES WILL BE THE RESPONSIBILITY OF THE CONTRACTOR.
3. ALL SLOPES 3:1 MAXIMUM UNLESS NOTED.
4. BASE ROCK AREA TO HAVE SOIL STERILANT APPLIED PRIOR TO PLACEMENT OF SURFACE COURSE .(NOT IN THIS CONTRACT)
5. EXCESS MATERIAL SHALL BE HAULED OFF AND DISPOSED OF OFF SITE OR SPREAD EVENLY IN AREAS AS AGREED BETWEEN CONTRACTOR AND OWNER.
6. ELEVATIONS INDICATED IN SWITCHYARD GRADED AREA ARE TOP OF SURFACE COURSE.
7. NO EQUIPMENT WILL BE ALLOWED TO CROSS RIVERS OR STREAM BEDS.

APPROXIMATE QUANTITIES

ASSUMED 12" OF TOP SOIL

CUT 12,000 CY (EV)

FILL 10,000 CY (CV)

EV = EXCAVATED VOLUME

CV = COMPACTED VOLUME

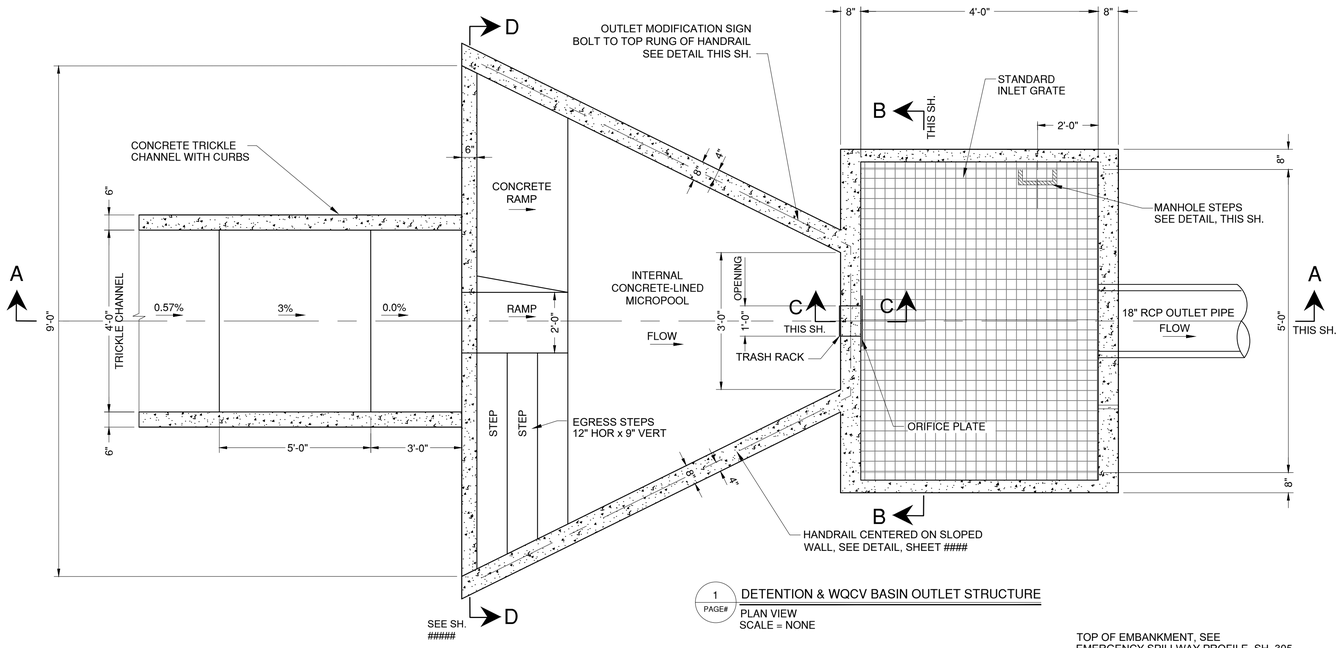
PRELIMINARY
NOT FOR CONSTRUCTION

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

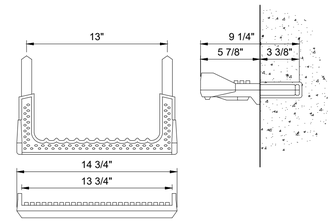
PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
{DRAWING PREPARED 03-09-2026}

STONEHOUSE SUBSTATION
PRELIMINARY SECTIONS

3/3/2026



1 PAGE# DETENTION & WQCV BASIN OUTLET STRUCTURE
PLAN VIEW
SCALE = NONE



5 PAGE# MANHOLE STEPS
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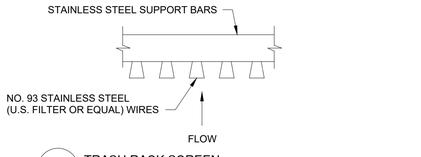

6 PAGE# TRASH RACK SCREEN
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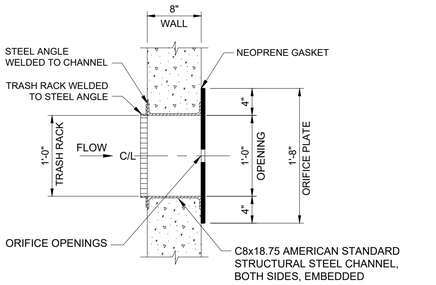
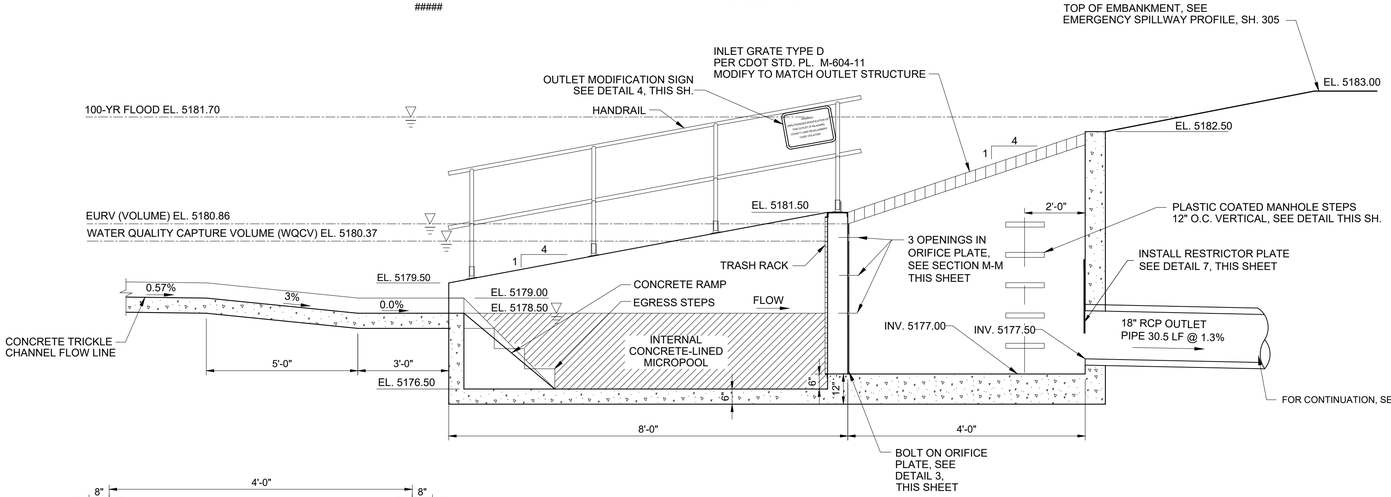
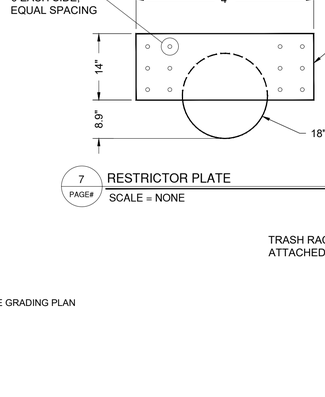


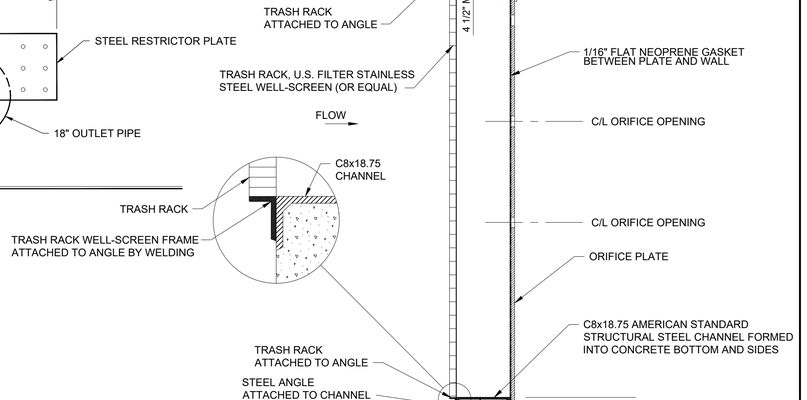
8 PAGE# ORIFICE PLATE - PLAN VIEW
SECTION G-G - THIS SH.
SCALE = NONE



2 PAGE# DETENTION & WQCV BASIN OUTLET STRUCTURE
SECTION VIEW A-A
SCALE = NONE



7 PAGE# RESTRICTOR PLATE
SCALE = NONE



9 PAGE# BASIN OUTLET STRUCTURE OPENING
SECTION C-C
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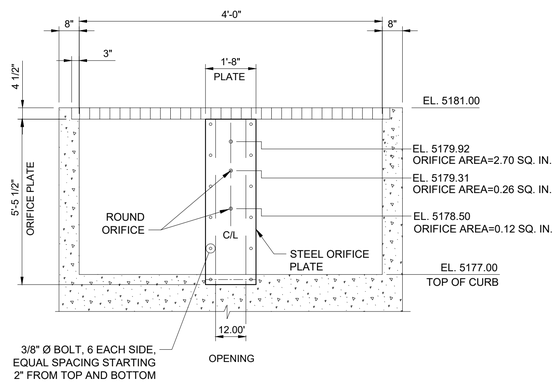
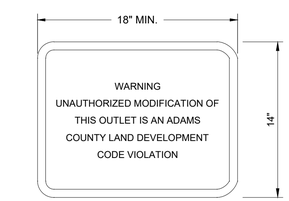
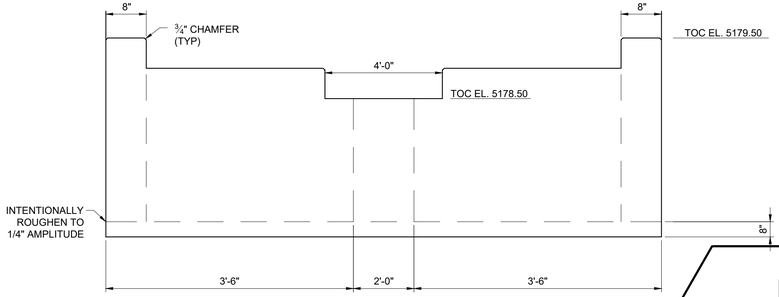


3 PAGE# OUTLET STRUCTURE ORIFICE PLATE
SECTION B-B
SCALE = NONE



1. WARNING SIGN TO BE BOLTED TO OUTLET STRUCTURE HANDRAIL.
2. SIGN WITH A MINIMUM AREA OF 1.75-SQUARE FEET, SHALL HAVE RED LETTERS ON A WHITE BACKGROUND.

4 PAGE# OUTLET MODIFICATION SIGN
SCALE = NONE



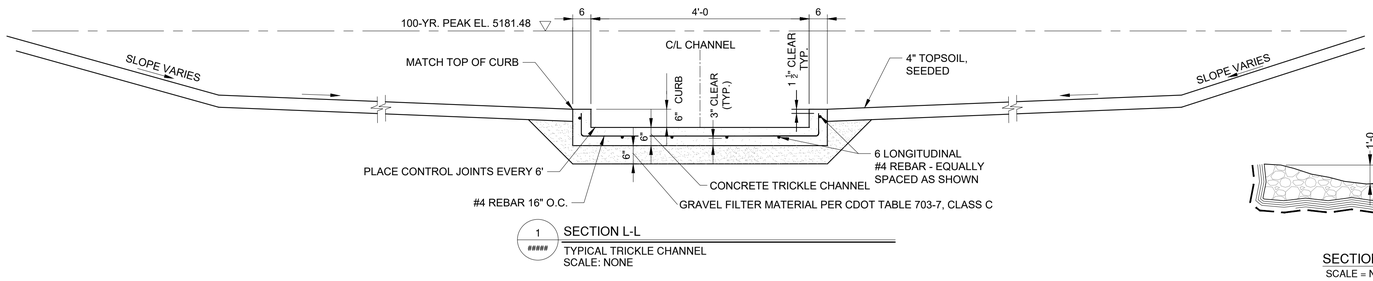
D PAGE # DETENTION & WQCV BASIN OUTLET STRUCTURE
SECTION D-D - SH. 304
SCALE = NONE

PRELIMINARY
NOT FOR CONSTRUCTION

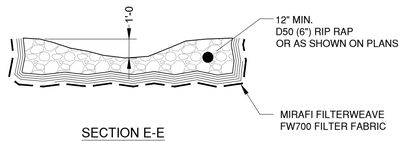
Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
{DRAWING PREPARED 03-09-2026}

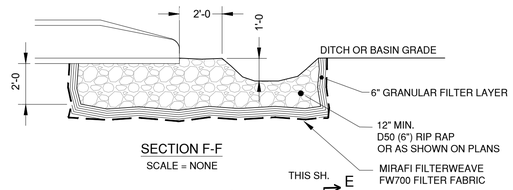
STONEHOUSE SUBSTATION
PRELIMINARY DETAILS 1



1 ##### SECTION L-L
TYPICAL TRICKLE CHANNEL
SCALE: NONE



SECTION E-E
SCALE = NONE



SECTION F-F
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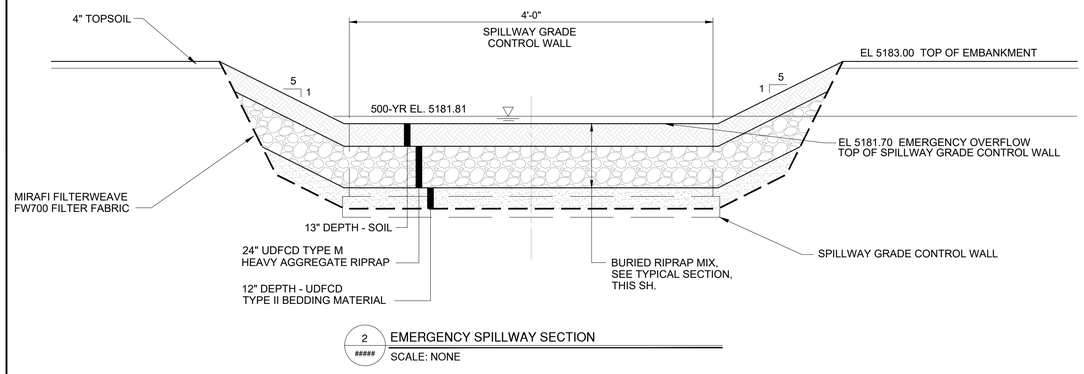
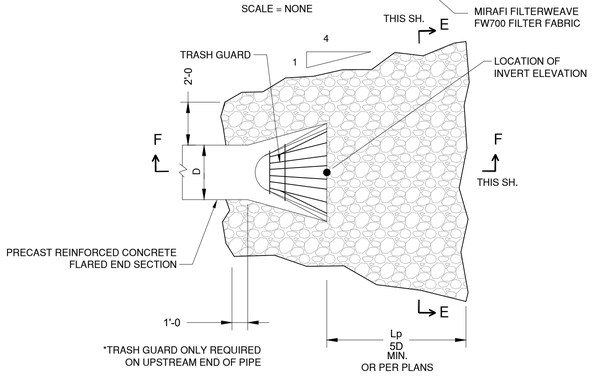
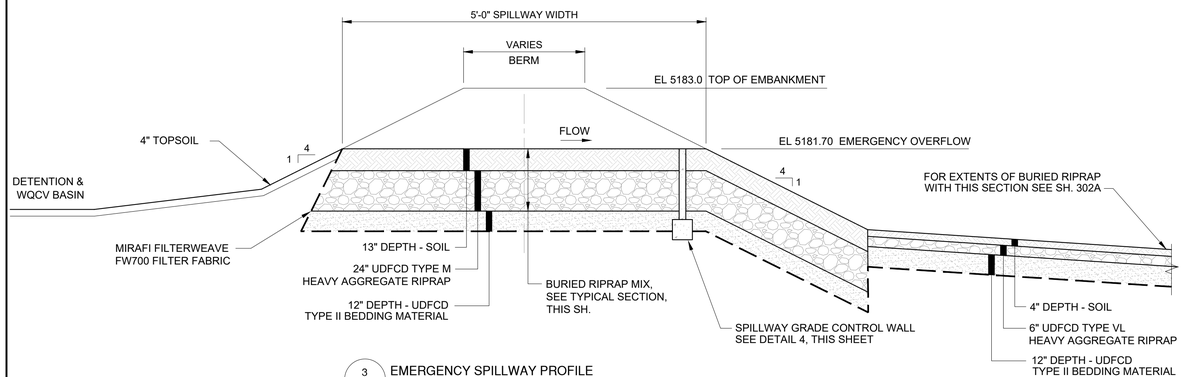


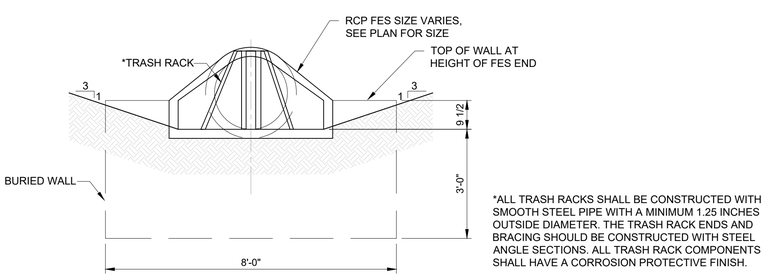
2 ##### EMERGENCY SPILLWAY SECTION
SCALE: NONE



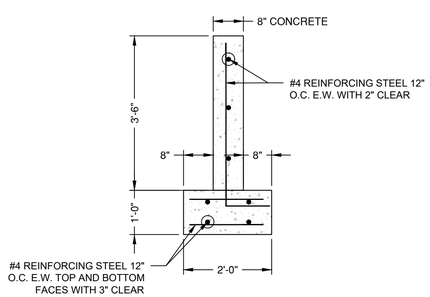
5 ##### RIP RAP OUTLET DETAIL
SCALE: NONE



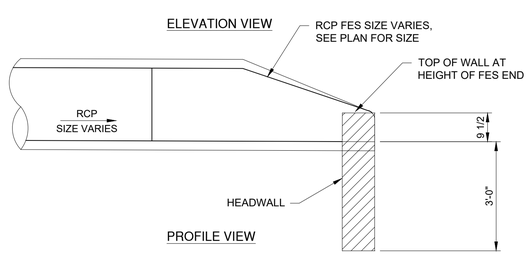
3 ##### EMERGENCY SPILLWAY PROFILE
SCALE: NONE



*ALL TRASH RACKS SHALL BE CONSTRUCTED WITH SMOOTH STEEL PIPE WITH A MINIMUM 1.25 INCHES OUTSIDE DIAMETER. THE TRASH RACK ENDS AND BRACING SHOULD BE CONSTRUCTED WITH STEEL ANGLE SECTIONS. ALL TRASH RACK COMPONENTS SHALL HAVE A CORROSION PROTECTIVE FINISH.



4 ##### SPILLWAY GRADE CONTROL WALL
SCALE: NONE



6 ##### FLARED END SECTION HEADWALL
SCALE: NONE

PRELIMINARY
NOT FOR CONSTRUCTION

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: 24.00441
DESIGN BY: UEI-MEV
DRAWN BY: UEI-CJK
APPROVED BY: UEI-MEV
{DRAWING PREPARED 03-09-2026}

STONEHOUSE SUBSTATION
PRELIMINARY DETAILS 2

APPENDIX F – Permits

April 15, 2025

Adams County Colorado
Attn: Community & Economic Development Department
4430 South Adams County Parkway
1st Floor, Suite W2000
Brighton, CO 80601

RE: United Power Stonehouse Substation Conditional Use Permit – Written Explanation

Dear Adams County Community & Economic Development Department:

Ulteig on behalf of United Power, Inc., is seeking approval from Adams County on a Conditional Use Permit for a proposed electrical substation and its associated transmission line tap identified as the Stonehouse Substation (Project). United Power is a member-owned distribution electric cooperative serving 900 square miles along the north-central Front Range in Colorado. Serving more than 112,000 meters across 900 square miles, their service territory, including portions of unincorporated Adams County, is broken into two noncontiguous areas - the plains northeast of Denver and two historic mountain canyons. The cooperative occupies the smallest geographic footprint of any Colorado cooperative, but also serves the second highest meter count and largest load.

Project Description:
The subject parcel for the Project (parcel # 0156730300001) does not currently have an address associated with it but is located at the southeast corner of 132nd Avenue and Gun Club Road. The subject parcel is a portion of SW1/4 of Section 30, Township 1 South, Range 65 West of the 6th Principal Meridian in unincorporated Adams County. The parcel has been used for agricultural purposes in the distant past but is currently vacant with no permanent or temporary structures. The Project will be constructed on a 46.766-acre parcel, zoned Agricultural 3 (A-3), and is owned by United Power. The footprint for the substation itself will be approximately 2.5 acres and utilize access to the site off of both Gun Club Road and 132nd Avenue; the remainder of the parcel will be left in its current condition. In order to provide power for the substation, a transmission line tap will be required, which will involve tapping the existing Public Service Company of Colorado (PSCo) Reunion-Barr Lake 230kV overhead transmission line. The PSCo transmission line is adjacent to the subject parcel and runs north-south along the west side of Gun Club Road. The Project site will be unmanned and will not require water/sewer services.

There is an existing “shut-in” well (Wenzel 13-30) near the center of the parcel that is operated by Extraction Oil & Gas Inc. In coordination with the Adams County Oil & Gas Liaison, Greg Dean, it was determined that Extraction has included the Wenzel 13-30 well on Adams County’s list to be plugged in 2025. Extraction is actively drilling at one of their wells just south of the subject parcel and once that has

been fracked, there will be no need for the Wenzel 13-30 well. With this in mind, United Power is showing the reverse setback for the Wenzel 13-30 well to be 50 feet. With the Project set for construction in 2028, the status of the Wenzel 13-30 well can be verified prior to pulling any construction-related permits.

The subject parcel is located within the DIA Aviation Overlay District, particularly within the Height and Noice Districts. Due to the equipment heights of the Project, there will be no impacts to everyday operations at DIA. Ulteig has contacted Air Traffic Technician, Steven Landy and discussed the proposed project and FAA Obstruction Evaluation process. Per our conversation, an FAA Obstruction Evaluation application will require plans showing final grade and equipment heights. Ulteig will submit an FAA Obstruction Evaluation application when the appropriate information is finalized. Any detailed comments from the airport can be addressed during the referral period.

The subject parcel is not within any water district and does not have a readily accessible source of water. Additionally, the electrical substation will be an unmanned facility and not require water or sewer services. Due to the lack of water availability at the proposed project site, United Power will pursue Administrative Relief from landscaping requirements of a type C Bufferyard. Please see attached Administrative Relief request. However, in order to provide screening of the substation, United Power is proposing to add vinyl slats to the chain link security fence that encompasses the substation equipment.

Purpose and Need:
In order to continue to provide adequate, reliable power, United Power must upgrade existing facilities and/or construct new facilities. The Project "load center" is the point where the transmission level power converts to the distribution level. The substation serves as the source of power for the distribution network in the vicinity of the Project. As residential and commercial growth occurs, the distribution systems in such an area become overloaded. In order to serve the increased electric consumer demand, United Power must add distribution substations located close to the growth areas. United Power is experiencing growth in the vicinity of the Project and the new substation is needed to allow United Power to provide adequate and reliable electric power to its customers in the area. The arrangement and capacity of the substation is planned to provide electric service to United Power's customers in the area with a level of capacity and reliability consistent with United Power's documented electric service standards. In summary, the Project is a result of the residential and commercial growth in the area. The Project will not only increase United Power's load serving capacity, but it will also provide additional reliability in this portion of their service territory by having an additional source of power in the event of outages/maintenance on other existing facilities in the area.

Construction and Operation:
Due to long lead times on certain materials, construction is tentatively scheduled for 2028. United Power estimates that construction will take 6 – 8 months depending on weather conditions.

United Power's electric facilities are designed, constructed, operated, and maintained to meet or exceed all applicable standards of design and performance set forth in the National Electrical Safety Code

(NESC). Construction, operation, and maintenance activities shall comply with all applicable federal, state, and local laws. In its contract with the construction contractor, United Power can specify that it will hold a required pre-construction meeting with the contractor to ensure all applicable laws and United Power's procedures will be followed.

During construction, enclosed containment would be provided for all trash. All construction waste, including trash and litter, garbage, other solid waste, petroleum products, and other potentially hazardous materials would be removed from the site and transported to a disposal facility authorized to accept such materials.

During construction, United Power and their contractors will utilize industry standard practices to control and mitigate nuisances from construction activities. Typical examples include, noise, dust, and visual light pollution. In order to prevent and mitigate these impacts the following will occur during construction: 1. Noise - construction will be limited to daytime work and follow all local ordinances regarding nighttime work should any need arise. 2. Dust - the site will follow all dust pollution conditions in the erosion and sediment control plans, to include minimizing and or eliminating high wind work during earth moving activities and the use of water trucks to control dust from leaving the site. 3. Visual light pollution - nighttime work is not expected and any work lighting will be cast down to ensure no visual impact towards the road or any structures. 4. Traffic - There will be no impacts to traffic associated with the Project, see enclosed Trip Generation Analysis.

Once construction is complete, traffic associated with the substation will be minimal and limited to periodic maintenance and inspection vehicles. There will not be any noise impacts with the operation of the Project; the noise produced will not exceed the levels spelled out in Title 25, Article 12 (25-12-103) of the Colorado Revised Statutes, Maximum Permissible Noise Levels (see Exhibit A).

Access to the substation will be regulated to United Power personnel and their subcontractors only. The substation will be enclosed with a 7-foot chain link fence with 3 strands of barbed wire on top and locked access gates. There will be downcast lighting installed within the substation; however, this lighting is only used in emergency situations after dark. Although the substation would be inspected annually, emergencies may occur. If there were an issue, appropriate field crews and engineering personnel would be notified by telephone or radio, and they would undertake the required procedures to correct the problem and restore facilities to normal operations.

United Power has retained Ulteig Operations LLC to assist with Land Use permitting. If you have any questions or require additional information, please contact Derek Holscher (720-973-5876 or derek.holscher@ulteig.com) or Liz Manassee (720-873-5714 or liz.manassee@ulteig.com).

Sincerely,

Derek Holscher

Derek Holscher – Project Manager, Ulteig

Reference Materials

These items were provided in previous submittal but are being included for reference with this resubmittal

1. Trip Generation Analysis
2. FAA Obstruction Evaluation Determination
3. Fence Details
4. Responses to Public Outreach Comments
5. Emergency Action Plan
6. Geotechnical Report

Trip Generation Analysis

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March 24, 2025

David DeBoskey, AICP
Planner II
Adams County
4430 South Adams County Pkwy, 1st Floor, Suite W2000A
Brighton, CO 80601

Re: United Power WO202001013 Stonehouse Substation – Trip Generation Analysis Memo

Dear Mr. DeBoskey:

The Stonehouse Substation project is located on the east side of Gun Club Road approximately 0.25 miles north of E. 128th Avenue. The site is in a low population density area within unincorporated Adams County. Currently, both Gun Club and E 132nd Avenue are a two-lane gravel roads. The site layout includes a 2.5 acre fenced gravel yard containing 3 transformers and a Power Control Assembly. The site will have two access points; one will access the site from Gun Club Road and the second access point will be from E. 132nd Ave.

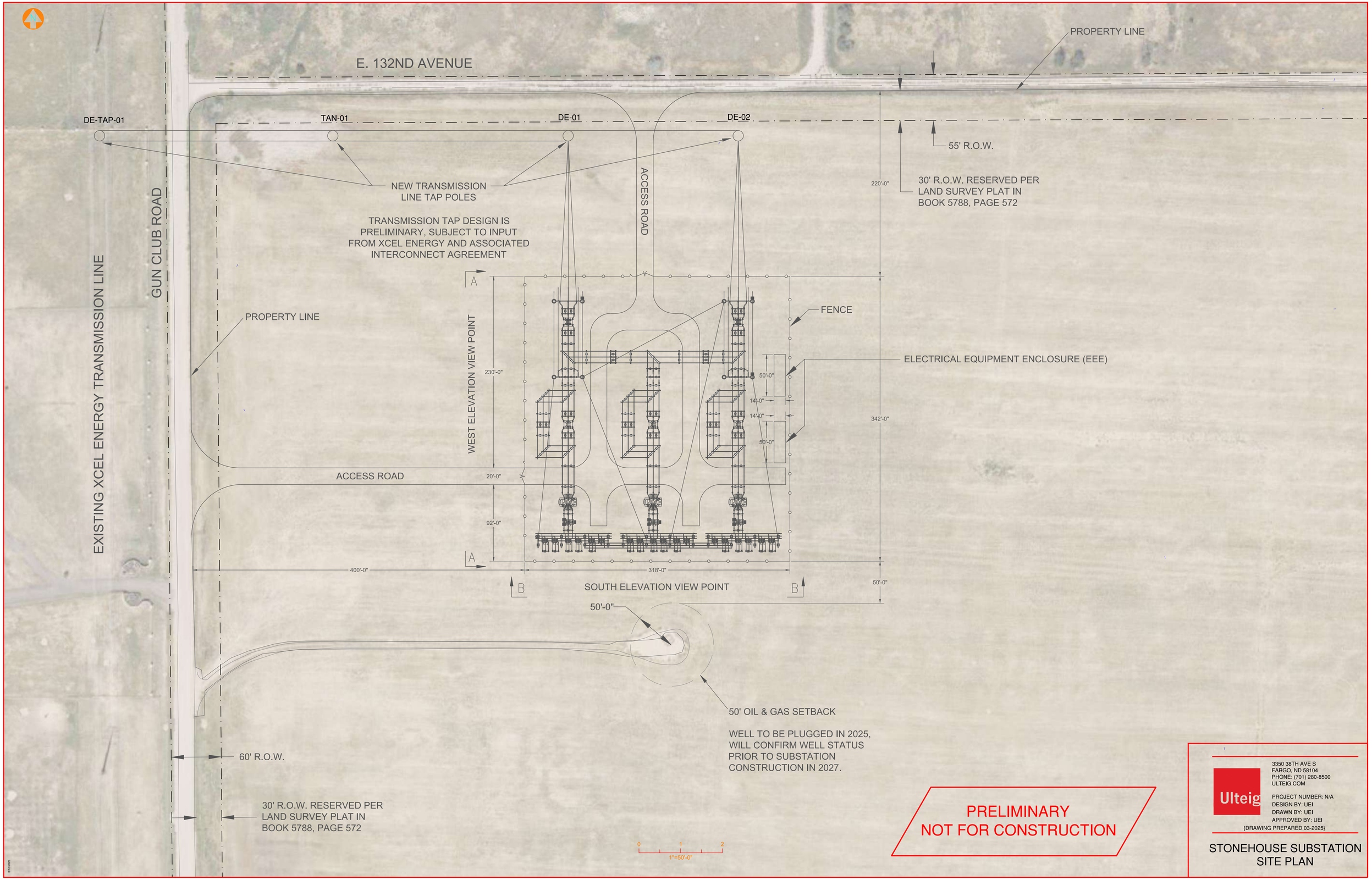
The proposed project closely matches the Institute of Traffic Engineers Trip Generation Manual Land Use Code – Industrial 170 for Utilities. For a typical weekday, the AM Peak Hour is estimated to have an average trip rate of 0.01 vehicles per gross floor area (GFA) and the PM Peak Hour is estimated to have an average trip rate of 0.04 vehicles per GFA.

The best estimation for trip generation to this site comes from United Power's previous substation sites. Post construction, the Stonehouse Substation will operate 24 hours a day as an unmanned facility. Anticipated traffic with this development is limited to periodic maintenance and inspection vehicles, which is estimated to be between 5 and 10 vehicles/maintenance trucks annually, with specialized equipment if needed for any major repairs. No impacts are expected to the operational efficiency or safety of the local roadway network around the development.

The construction of the substation could last up to 6 months and will involve mostly personal vehicle trips for construction workers of 10 to 12 trips per day. A staging area will be designated on site for truck traffic to deliver materials to the substation; these trips will be approximately 1 to 2 trips per week. To mitigate any potential impacts to local county roads, Traffic Control Plans will be prepared and followed during construction. Impacts to the public and traffic on county roads from construction vehicles and

equipment will be temporary and are not expected to negatively impact the operational efficiency or safety of the roadway network in the County.

Based on the Adams County Development Standards and Regulations, Chapter 8, a more detailed Level 2 or Level 3 traffic impact study is not required for this development. Attached to this memo is the preliminary site plan of the substation and the trip generation sheets from the Trip Generation manual. If you have any further questions regarding, feel free to reach out to Eric Milliken at eric.milliken@ulteig.com or by phone (720) 873-5879.



PRELIMINARY
NOT FOR CONSTRUCTION

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

PROJECT NUMBER: N/A
DESIGN BY: UEI
DRAWN BY: UEI
APPROVED BY: UEI
{DRAWING PREPARED 03-2025}

STONEHOUSE SUBSTATION SITE PLAN

Utility
(170)

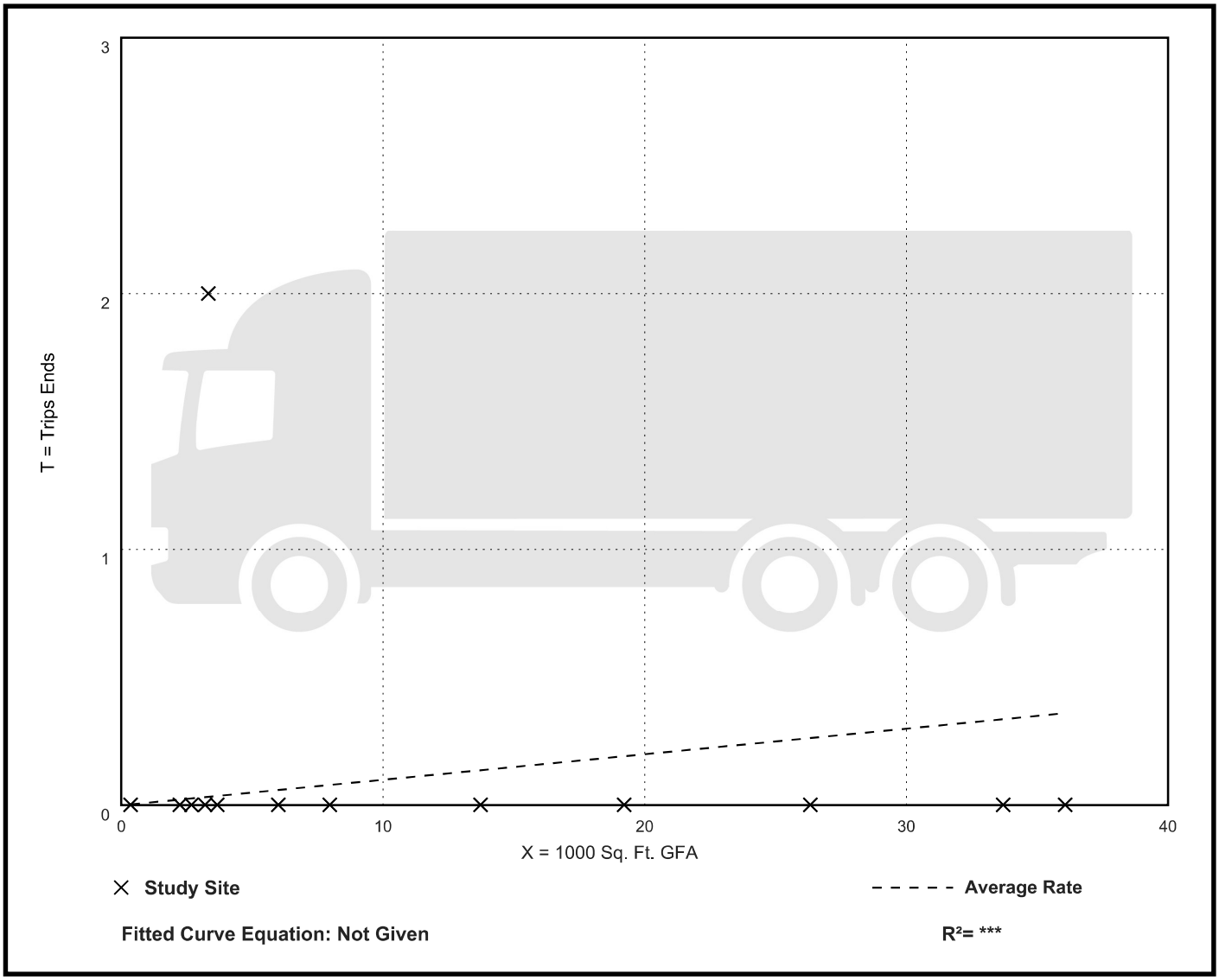
Truck Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday,
AM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 13
Avg. 1000 Sq. Ft. GFA: 12
Directional Distribution: 50% entering, 50% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.01	0.00 - 0.60	0.09

Data Plot and Equation



Utility
(170)

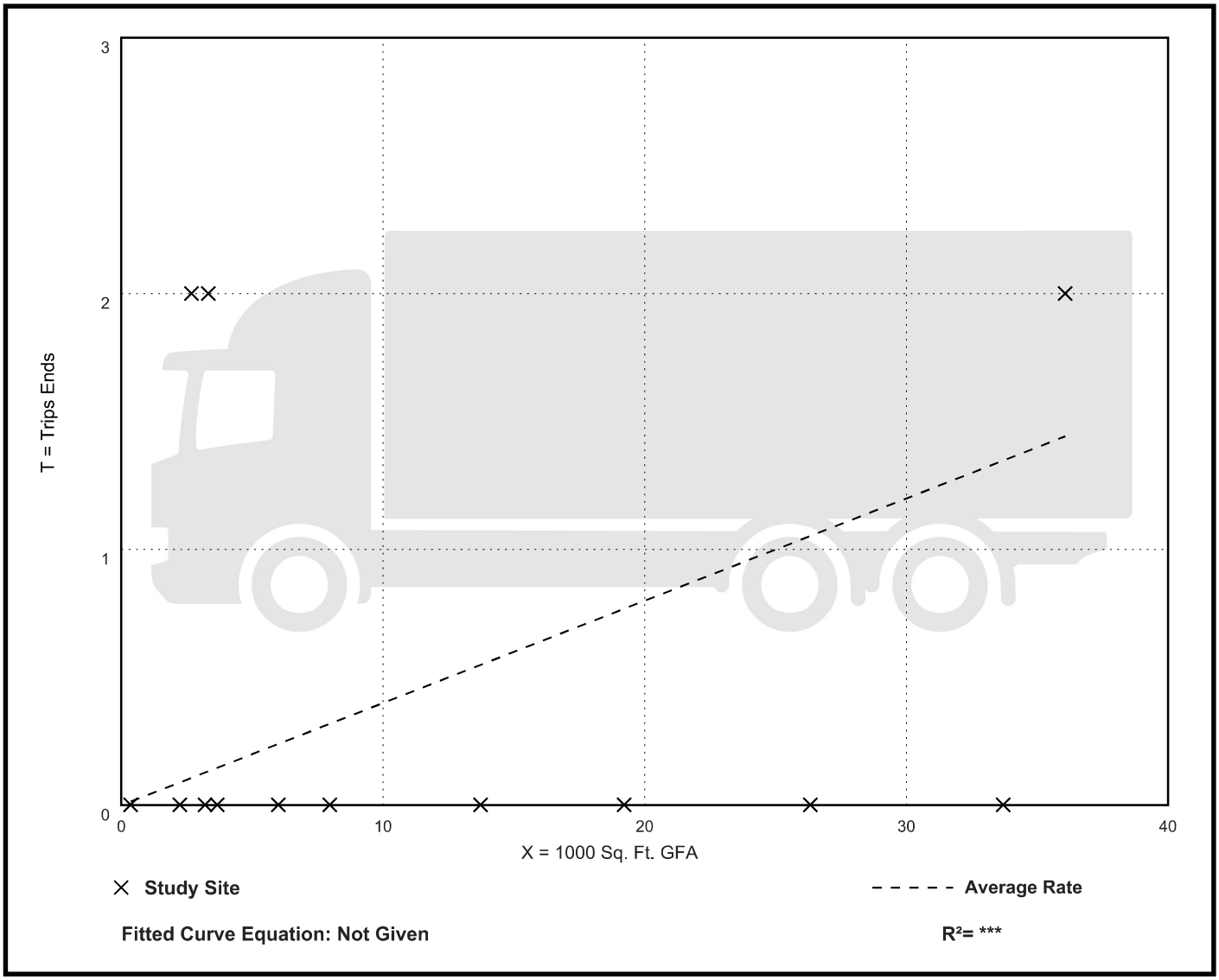
Truck Trip Ends vs: 1000 Sq. Ft. GFA
On a: Weekday,
PM Peak Hour of Generator

Setting/Location: General Urban/Suburban
Number of Studies: 13
Avg. 1000 Sq. Ft. GFA: 12
Directional Distribution: 50% entering, 50% exiting

Truck Trip Generation per 1000 Sq. Ft. GFA

Average Rate	Range of Rates	Standard Deviation
0.04	0.00 - 0.75	0.13

Data Plot and Equation



FAA Aeronautical Determination

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Mail Processing Center
Federal Aviation Administration
Southwest Regional Office
Obstruction Evaluation Group
10101 Hillwood Parkway
Fort Worth, TX 76177

Aeronautical Study No.
2025-ANM-5975-OE

Issued Date: 10/14/2025

UNITED POWER, INC.
MARISSA HILLJE
500 Cooperative Way
Brighton, CO 80603

**** DETERMINATION OF NO HAZARD TO AIR NAVIGATION ****

The Federal Aviation Administration has conducted an aeronautical study under the provisions of 49 U.S.C., Section 44718 and if applicable Title 14 of the Code of Federal Regulations, part 77, concerning:

Structure: Transmission Line Tower Stonehouse Substation and Transmission
County, State: Adams, Colorado

Collected Point(s):

Label	Latitude	Longitude	SE	DET AGL	AMSL
Stonehouse Substation	39-56-09.07N	104-42-50.40W	5177 Ft	58 Ft	5235 Ft

In accordance with the provisions of 49 U.S.C., Section 44718 and as applicable Title 10 of the Code of Federal Regulations, part 183a, this aeronautical study was sent to the Military Aviation and Installation Assurance Clearinghouse established by the Secretary of Defense for review. The results of that review resulted in a finding of no risk to national security.

This aeronautical study revealed that the structure does not exceed obstruction standards and would not be a hazard to air navigation provided the following condition(s), if any, is(are) met:

It is required that FAA Form 7460-2, Notice of Actual Construction or Alteration, be e-filed any time the project is abandoned or:

_____ At least 10 days prior to start of construction (7460-2, Part 1)
__X__ Within 5 days after the construction reaches its greatest height (7460-2, Part 2)

Based on this evaluation, marking and lighting are not necessary for aviation safety. However, if marking/ lighting are accomplished on a voluntary basis, we recommend it be installed in accordance with FAA Advisory circular 70/7460-1 M Change 1.

This determination expires on 04/14/2027 unless:

(a) the construction is started (not necessarily completed) and FAA Form 7460-2, Notice of Actual Construction or Alteration, is received by this office.
(b) extended, revised, or terminated by the issuing office.

(c) the construction is subject to the licensing authority of the Federal Communications Commission (FCC) and an application for a construction permit has been filed, as required by the FCC, within 6 months of the date of this determination. In such case, the determination expires on the date prescribed by the FCC for completion of construction, or the date the FCC denies the application.

NOTE: REQUEST FOR EXTENSION OF THE EFFECTIVE PERIOD OF THIS DETERMINATION MUST BE E-FILED AT LEAST 15 DAYS PRIOR TO THE EXPIRATION DATE. AFTER RE-EVALUATION OF CURRENT OPERATIONS IN THE AREA OF THE STRUCTURE TO DETERMINE THAT NO SIGNIFICANT AERONAUTICAL CHANGES HAVE OCCURRED, YOUR DETERMINATION MAY BE ELIGIBLE FOR ONE EXTENSION OF THE EFFECTIVE PERIOD.

This determination is based, in part, on the foregoing description which includes specific coordinates, heights, frequency(ies) and power. Any changes in coordinates, heights, and frequencies or use of greater power, except those frequencies specified in the Colo Void Clause Coalition; Antenna System Co-Location; Voluntary Best Practices, will void this determination. Any future construction or alteration, including increase to heights, power, or the addition of other transmitters, requires separate notice to the FAA.This determination includes all previously filed frequencies and power for this structure.

If construction or alteration is dismantled or destroyed, you must submit notice to the FAA within 5 days after the construction or alteration is dismantled or destroyed.

This determination does include temporary construction equipment such as cranes, derricks, etc., which may be used during actual construction of the structure. However, this equipment shall not exceed the overall heights as indicated above. Equipment which has a height greater than the studied structure requires separate notice to the FAA.

This determination concerns the effect of this structure on the safe and efficient use of navigable airspace by aircraft and does not relieve the sponsor of compliance responsibilities relating to any law, ordinance, or regulation of any Federal, State, or local government body.

A copy of this determination will be forwarded to the Federal Communications Commission (FCC) because the structure is subject to their licensing authority.

If we can be of further assistance, please contact steven.l-ctr.landry@faa.gov, at 1-404-305-6249, or Steven.L-ctr.Landry@faa.gov. On any future correspondence concerning this matter, please refer to Aeronautical Study Number 2025-ANM-5975-OE.

Signature Control No: 677475877-681712980 (DNE)
Julie A. Morgan
Manager, Obstruction Evaluation Group

Attachment(s)
Frequency Data
Map(s)

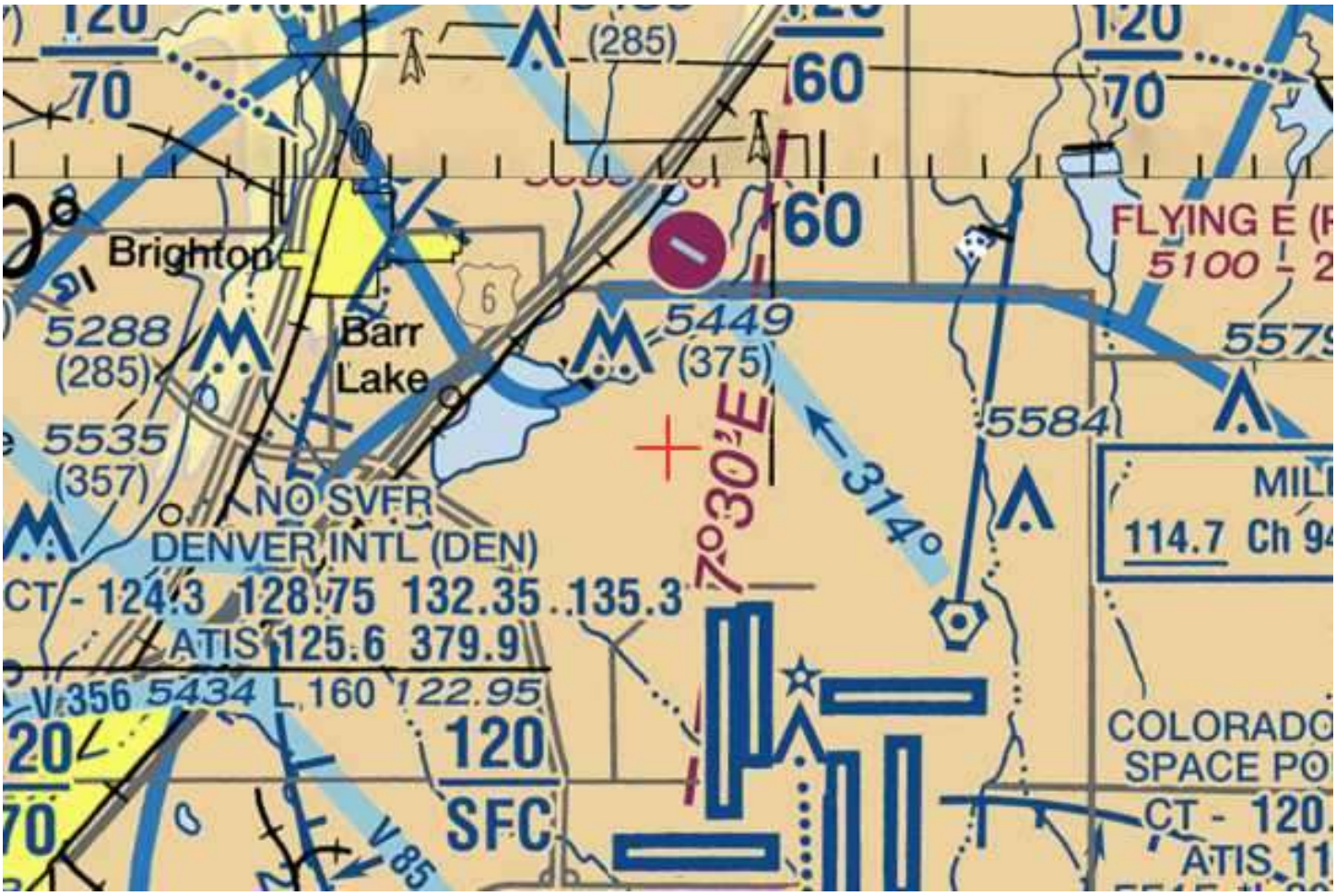
cc: FCC

Frequency Data for ASN 2025-ANM-5975-OE

LOW FREQUENCY	HIGH FREQUENCY	FREQUENCY UNIT	ERP	ERP UNIT
6	7	GHz	42	dBW

TOPO Map for ASN 2025-ANM-5975-OE

Sectional Map for ASN 2025-ANM-5975-OE



Fencing Details

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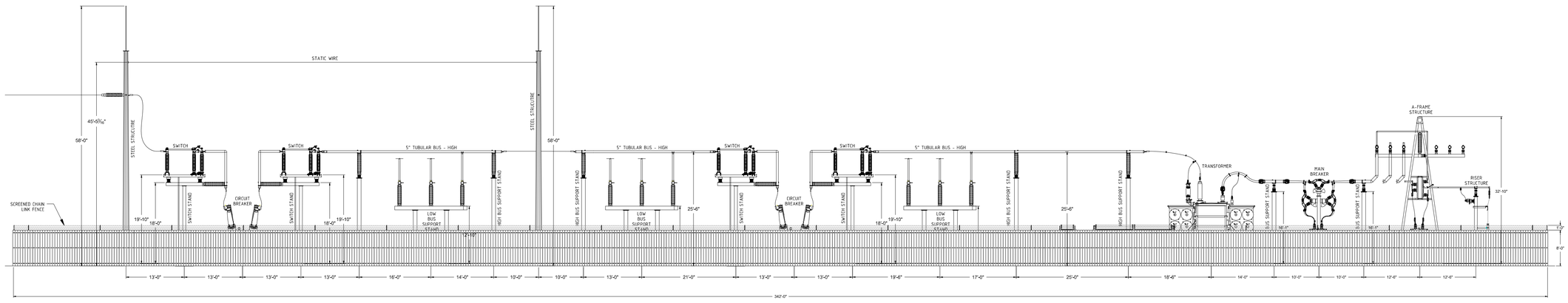
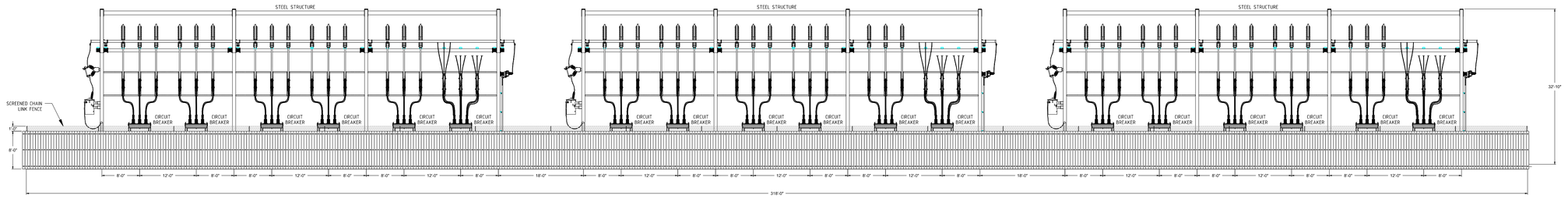


WEST ELEVATION
(LOOKING EAST TOWARDS
HARVEST ROAD)



SOUTH ELEVATION
(LOOKING NORTH TOWARDS
E. 132ND AVENUE)

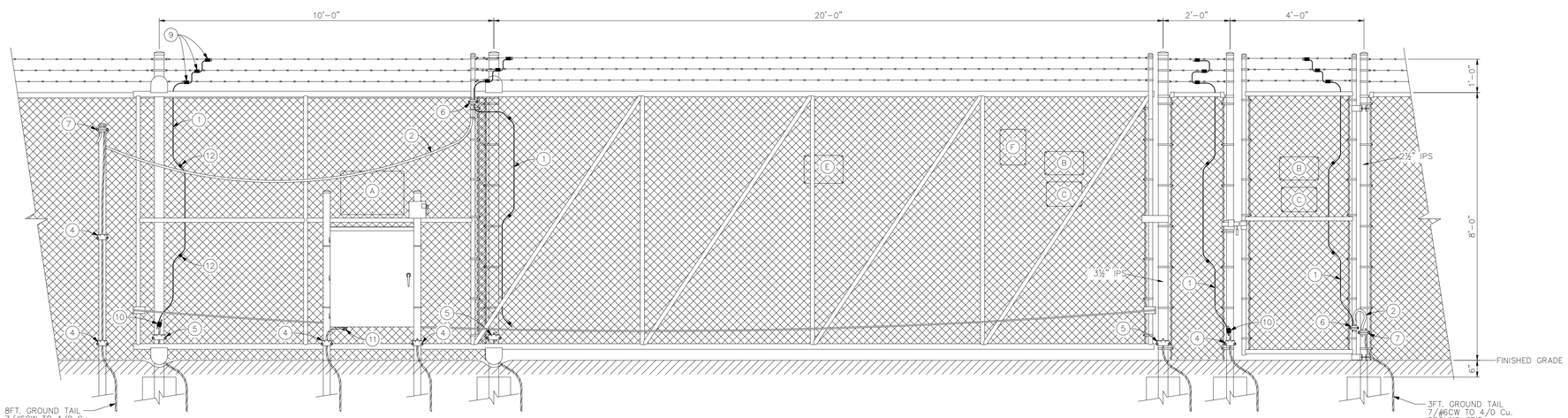
0 1 2
1"=150'-0"

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (701) 280-8500
ULTEIG.COM

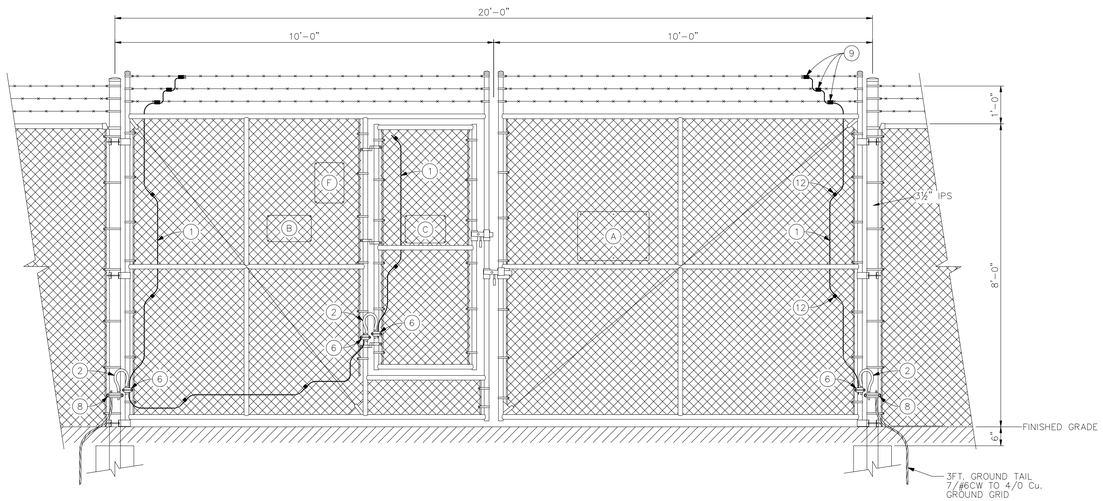
PROJECT NUMBER: N/A
DESIGN BY: UEI
DRAWN BY: UEI
APPROVED BY: UEI
{IF APPLICABLE IN STATE, ADD FIRM REG NO. HERE}

STONEHOUSE SUBSTATION FENCE ELEVATIONS

1/28/2025

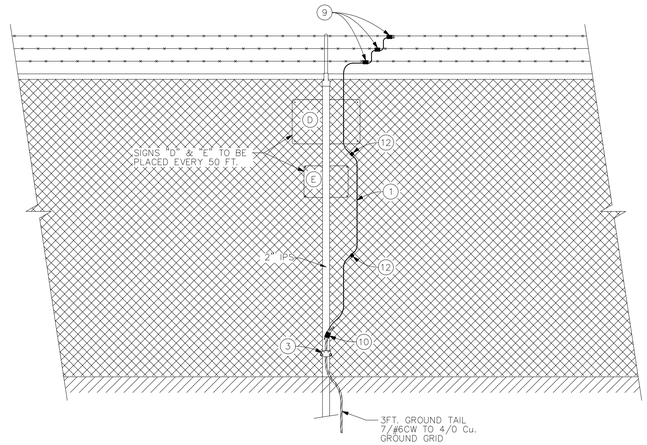


TYPICAL SLIDING GATE DETAIL

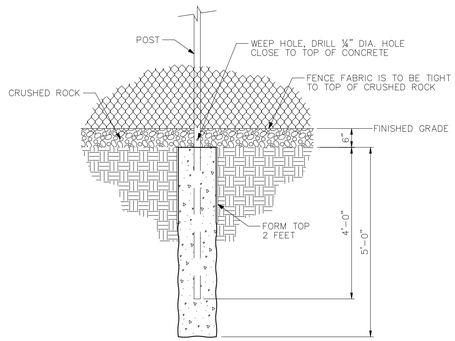


TYPICAL SWING GATE DETAIL

TYPICAL CORNER POST DETAIL



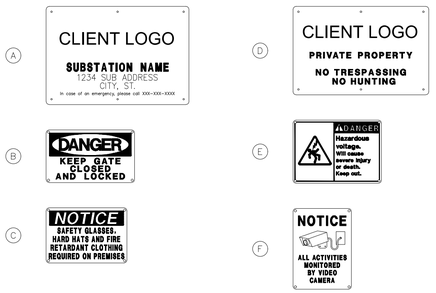
TYPICAL LINE POST DETAIL



TYPICAL FOUNDATION DETAIL

MATERIAL LIST		
DESCRIPTION	ITEM ID	QTY.
CONCRETE – 4000 PSI AT 28 DAYS	CONTRACTOR	0.15 CU.YD.
FORM, STOVE PIPE OR WAXED CARDBOARD TUBE, 12" DIA.	CONTRACTOR	2 FT.

MATERIAL LISTED IS FOR ONE FOUNDATION



TYPICAL SECURITY FENCE SIGNAGE

MATERIAL LIST			
ITEM NO.	DESCRIPTION	ITEM ID	QTY.
1	WIRE, TIE, 1/C, #4, ALUMINUM, SOLID, SOFT DRAWN, EC GRADE, UTILITY GRADE, 25LB BOX, APPROX. 651FT; DIRECT 4ASB CT 25	TBD	TBD
2	CABLE, GROUNDING, 1/C, 2/0, 3276 STRAND COPPER, 21kA MAX FAULT CURRENT, BLACK COLORED JACKET; HUBBELL S3712	TBD	TBD
3	CLAMP, GROUNDING, 2" IPS, BRONZE, 1–WIRE, FOR 1/0–4/0 STR COPPER, □" HOLE; HUBBELL GC–111–7C	TBD	TBD
4	CLAMP, GROUNDING, 2–1/2" IPS TO 2/0–250KCMIL CU, PIPE TO CABLE, BRONZE TWO PIECE CLAMP, BOTH PARTS OF CLAMP ARE ATTACHED TO THE U–BOLT; HUBBELL GC–111–8C	TBD	TBD
5	CLAMP, GROUNDING, 3–1/2" IPS TO 2/0–250KCMIL CU, PIPE TO CABLE, BRONZE TWO PIECE CLAMP, BOTH PARTS OF CLAMP ARE ATTACHED TO THE U–BOLT; HUBBELL GC–111–10C	TBD	TBD
6	CONNECTOR, GROUND CABLE, #4 SOL – 2/0 STR, BRONZE, ONE, TWO OR THREE CABLES TO 2" O.D. – 1–1/2" IPS ROD OR TUBE; HUBBEL GC11061C	TBD	TBD
7	CONNECTOR, GROUND CABLE, 2/0 SOL – 250 MCM, BRONZE, ONE, TWO OR THREE CABLES TO 3" O.D. – 2–1/2" IPS ROD OR TUBE; HUBBEL GC110102C	TBD	TBD
8	CONNECTOR, GROUND CABLE, 2/0 SOL – 250 MCM, BRONZE, ONE, TWO OR THREE CABLES TO 4" O.D. – 3–1/2" IPS ROD OR TUBE; HUBBEL GC110142C	TBD	TBD
9	CONNECTOR, COMPRESSION, H–TAP, #2–#6 ACSR, MAIN/TAP, TYPE O DIES; BLACKBURN WR159	TBD	TBD
10	CONNECTOR, COMPRESSION, H–TAP, 4/0 STR/6–2 STR, DIE D; BLACKBURN WR379	TBD	TBD
11	CLAMP, GROUND CABLE, #4 SOL – 300 MCM, 2–PC BRONZE, SINGLE CABLE TO FLAT, ½" SS BOLT; HUBBELL POWER SYSTEMS GC–141–A02	TBD	TBD
12	CONNECTOR, SPLIT BOLT, #4 SOL – 1/0 STR, Cu TIN PLATED, 2–WIRE CONDUCTOR CONNECTION, □" BOLT SIZE; HUBBELL SBS10	TBD	TBD

NOTES:

1. ALL 7/#6CW GROUND TAILS TO BE 3FT. ABOVE FINISHED GRADE UNLESS OTHERWISE NOTED.
2. ALL GROUNDING WIRE AND CONNECTIONS SHALL BE INSTALLED ON THE INSIDE OF FENCE.

Preliminary
08/14/2025 12:03:46 PM

Ulteig
3350 38TH AVE S
FARGO, ND 58104
PHONE: (888) 858-3441
ULTEIG.COM

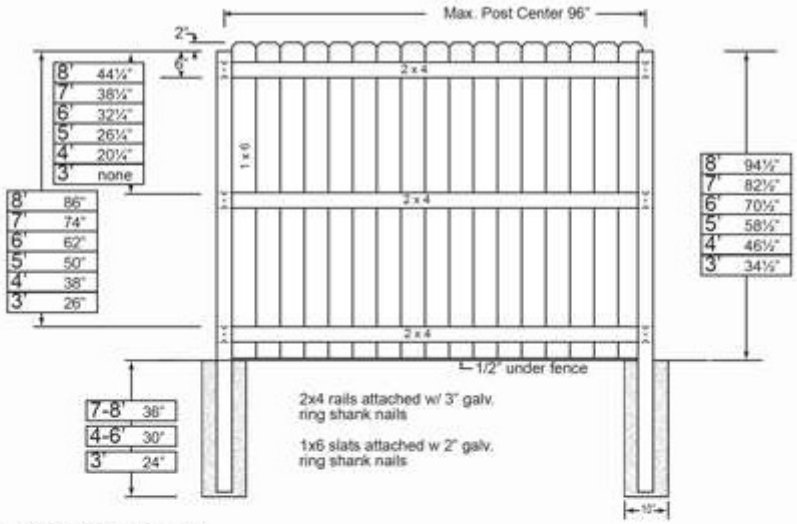
PROJECT NUMBER: N/A
DESIGN BY: N/A
DRAWN BY: N/A
APPROVED BY: N/A

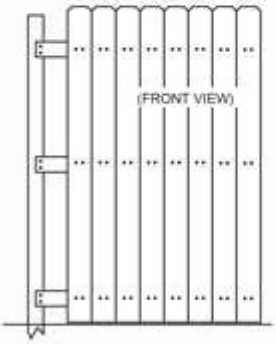
SECURITY FENCE DETAILS

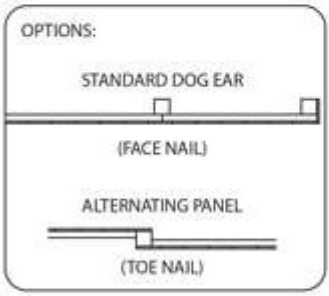
DRAWING NUMBER: N/A
REVISION: N/A

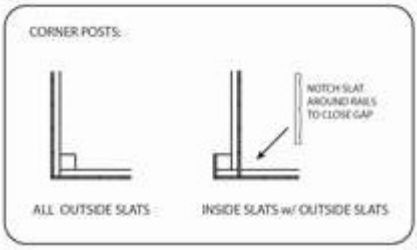
20250808.4

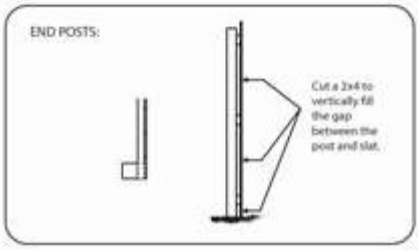
DOG EAR FENCE











Public Outreach - 2

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Landowner Responses & Additional Information

1. Is the project planned to support any proposed growth or development in the immediate area?
    a. Currently, United Power is not aware of any proposed developments in the immediate area. The purpose of this project is to increase load serving capacity and provide additional reliability in this portion of United Power's service territory.
2. Will private property be impacted by any additional powerlines or easement related to the project?
    a. The purpose of this project is to construct a new electric substation on property owned by United Power. To bring power to the proposed substation, United Power anticipates tapping into the existing Xcel Transmission line that runs north/south on the west side of Gun Club Road. In the future, there will be smaller electric distribution lines that will exit the substation to serve existing and future load growth. Easements may be needed in the future for the smaller electric distribution projects.
3. Will there be any negative impact to property values in the surrounding area?
    a. The project should not have a negative impact on surrounding property values. There have been previous studies completed on impacts to property values in relation to electric substations, which have been supported by comparable market analysis examining appreciation rates, paired sales analysis, statistical descriptive measures and statistical regression. The results indicate there is no measurable market impact on property values. A study on impacts to property values is not a requirement for the Adams County Conditional Use permit process. Therefore, United Power did not perform an independent study for this project.
4. We are concerned on a multitude of areas. We already are exposed to the fracking in our area, to the big power lines that run through our area, and now additional substation. This impacts our health, the value of our home, our water, land, and any hazard runoff comes downstream to our home. I'm in disagreement one other problem being added to our neighborhood.
    a. United Power is not associated with fracking or the electric transmission lines in your area. The facilities for the project will be designed, constructed, operated and maintained in compliance with the National Electric Safety Code. There will be no hazardous materials stored on the project site. Certain pieces of equipment such as back-up battery and transformers that have operational fluids are contained within the equipment and will have secondary containment designed to capture and contain if an equipment failure occurs. Next, the water table/aquifer system will not be impacted. The runoff from the project site will be minimal and ground under the substation will be pervious for drainage into the ground. Additional engineering studies will be performed and reviewed by Adams County to evaluate any additional storm system facilities that are needed to capture storm water runoff and release runoff into the Adams County drainage system.

5. We are concerned about EMF emitted and health risks associated with exposure.
    a. There have been previous studies performed by government and scientific institutions that indicate exposure to EMF does not cause disease. Per the Public Utilities Commission Rule (3206(e), proposed magnetic field levels of 150mG (milliGauss) and below are deemed reasonable by rule and do not require mitigation to a lower level. The magnetic fields generated by the substation do not exceed 150mG at the substation fence, where the public has unrestricted access. The nearest residence to the proposed substation is approximately 700 feet from the proposed substation fence. An EMF study is not a requirement for the Adams County Conditional Use permit process; therefore, United Power did not perform an independent study for this project.
6. Why does it need to be so close to homes?
    a. There are many factors that are considered when siting a new substation. Included in those factors are a willing landowner to sell the property, proximity to homes, proximity to existing developments, areas of projected growth (load center), proximity to existing transmission lines, and environmental concerns. It is difficult to adhere to all of these considerations; however, in this case, United Power was able to find a landowner willing to sell their property, which is located adjacent to an existing transmission line (along the west side of Gun Club Road) and within the load center. There are homes in the area, so the substation was placed further east of Gun Club Road on the United Power property to provide more of a buffer.
7. We are concerned about increased traffic on the road and deterioration of the dirt road.
    a. Construction of the project is not expected to cause significant local transportation effects, and any impacts will be temporary in nature during the construction process. Work crews will mobilize each day from an on-site laydown yard. Traffic to the site will be limited to supervisory vehicles transporting work crews, required construction equipment, and equipment delivery vehicles. Construction equipment or labor transportation are not anticipated to have a significant impact on traffic volumes or flow on local roadways. To mitigate any potential impacts to County roads, Traffic Control Plans will be prepared and followed during construction. Once the substation is built and operational, traffic will consist of 1-2 trucks, 2-4 times a month. No impacts or improvements to county roads are expected. A traffic study is not a requirement for the Adams County Conditional Use permit process. Therefore, United Power did not perform an independent study for this project.

Emergency Action Plan

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November 17, 2025

Facility Emergency Action Plan

Stonehouse Substation
(303) 637-1300

November 17, 2025

1. **Name:** United Power, Inc. Stonehouse Substation
2. **Location**: Southeast corner of the intersection E 132nd Ave & Gun Club Rd,
   LAT: 39-56-09.07N LONG: 104-42-50-.40W
3. **Emergency Telephone Numbers:** **24-Hour Phone #**

United Power Main Office:	303-659-0551 or 1-800-468-8809
Fire District	
Brighton Fire Rescue District	911
Ambulance Service Area	
American Medical Response (AMR)	911
Dispatch	
Adams County Regional Dispatch	911
Other	
Chemtrec (Chemical transportation Emergency Center)	800-424-9300

4. **Agency Notification Non-Emergency:** **Phone#**

Fire Department/District (Brighton Fire Rescue District)	303-659-4101
Ambulance Service Area (American Medical Response Dispatch)	303-308-4000
County Law Enforcement Agency (Adams County Sheriff Office)	303-654-1850
State Law Enforcement Agency (Colorado State Patrol, Troop 1D)	303-239-4501
Communication Center (Adams County Regional Dispatch)	303-288-1535
Office of Emergency Management (Adams County OEM)	720-523-2792

5. **Surrounding Occupancies & Land Use**

   Surrounding land use is primarily agricultural and grazing land with single-family residences. Some light industrial facilities may also be present as well.

6. **Personal Protective Equipment Required:** Boots, gloves, hard hats, and eye protection.
7. **Emergency Equipment & Supplies:** **Location and Phone#**

Spill Cleanup Kits	Brighton and Longmont Offices, 303-637-1300
Fire Extinguishers	Onsite Vehicles & Offices, 303-637-1300
Misc. Emergency Equipment	Onsite Vehicles & Offices, 303-637-1300
First-Aid Supplies	Onsite Vehicles & Offices, 303-637-1300

8. **Location & Types of Water Supplies:**

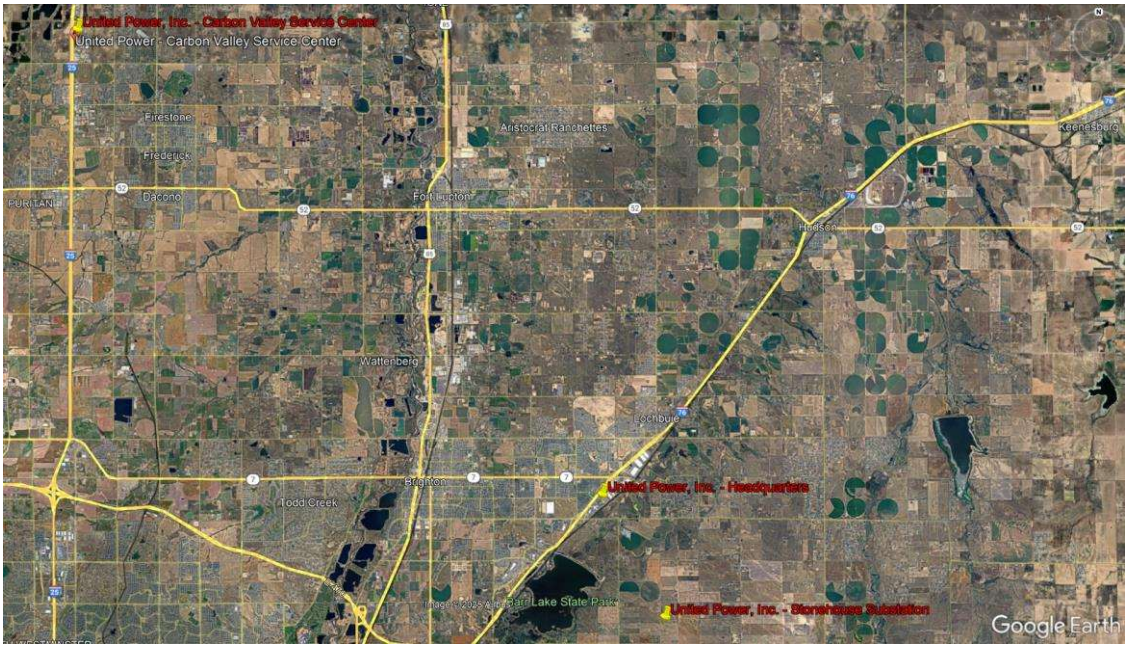
No permanent water supply is proposed. Bottled water would be provided during construction, and minimal quantities of water for construction and/or dust suppression would be brought in by a water truck if needed.

****Never attempt to fight a fire in any United Power, Inc. electrical facility with water without consent and instruction from United Power, Inc. Staff.****

9. **Transportation routes:**

The substation has yet to be fully designed. However, access to the substation will be via East 132nd Avenue and Gun Club Road. The route from United Power's Headquarters at 500 Cooperative Way, Brighton, CO 80603 will be: south 0.6 miles on E I-76 Frontage Road to E 152nd Avenue, then east 0.8 miles on E 152nd Avenue to Picadilly Road, then south 2.4 miles on Picadilly Road to E 128th Avenue, then 1.0 mile east on E 128th Avenue to Gun Club Road, then 0.5 miles north on Gun Club Road to the site entrance. The dedicated entrance(s) of the substation will likely be gated on the north and west sides of the substation accessed from the south side of East 132nd Avenue and from the east side of Gun Club Road. Do not try to access the substation without United Power, Inc. Staff approval or presence, as the site will be secured by chain link fence.

During construction, most materials will be delivered by United Power's selected contractors or in United Power, Inc. company vehicles. Following construction there will not be regular shipments of materials or chemicals to this facility as it is an unmanned electrical substation housing electrical equipment and batteries. Any deliveries will likely be electrical equipment including breakers, relays, transformers, batteries, etc. Chemicals of interest could be dielectric fluids such as mineral oil, SF6 gas for circuit breakers, and battery acid for battery banks as well as miscellaneous small quantities of chemicals necessary to perform work.



10. **Action Items and Response:**

****Never enter a substation in an unknown state of operation or energization****

If access to a facility is needed, United Power, Inc. staff must always be present and made aware of the request to ensure all parties safety and compliance to various standards. The dedicated entrance(s) of the substation will be a gate on the north and west sides of the substation accessed from the south side of East 132nd Avenue and east side of Gun Club Road. Do not try to access the substation without United Power, Inc., staff approval and presence.

Identified Emergency Response scenarios are as follows:

a. Electrical fire or dielectric fluid/gas release due to electrical equipment damage or malfunction. United Power's Substation Maintenance staff would respond to the emergency to de-energize the substation so that maintenance/fire/cleanup crews could make repairs, fight the fire, or clean up as necessary. **Never enter an energized facility or a facility in an unknown state of operation or energization**. United Power's Substation Maintenance Staff are available 24/7 to respond to emergencies upon request.

b. Battery bank failure causing a release of dilute sulfuric acid in the Power Control Assembly (PCA). United Power's Substation Maintenance Staff would respond to the emergency and provide cleanup services within their training. Outside cleanup contractors may also be utilized for larger releases.

c. Electrocution of personnel by energized equipment. United Power's staff would respond to the emergency by de-energizing equipment as necessary so that rescue crews could perform actions as necessary. Contractor or United Power personnel would call 911 for emergency medical and rescue services. United Power linemen and contractors are trained in rescue, first aid, and CPR.

d. Injury of personnel via impacts of falling or moving equipment, falls, slips, and trips. Contractor or United Power personnel would call 911 for emergency medical and rescue services, if necessary. United Power linemen and contractors are trained in rescue, first aid, and CPR.

11. **Wildland Fire Mitigation Measures for Construction and Maintenance**

a. United Power Inc. will require its employees and contractors to do everything reasonable and within their power or expertise, as allowed to protect human safety; to prevent and suppress fires resulting from construction or maintenance activities. Fires ignited by the contractor will be reported to the appropriate agency immediately.

b. Before each workday, a "tailgate" safety meeting will occur and include discussion of fire and other hazards.

c. All work areas will be mowed or plowed prior to construction to reduce the risk of grass fire ignition from vehicles.

d. Fuels and flammable materials may not be stored on the project site. They may be located in approved containers in a truck. For example, an approved diesel tank in the back of a truck, containing fuel for hand-held equipment. No fuel or flammable substance will be stored in any glass container.

e. Welding operations are subject to the following additional provisions:

1. There will be no welding when winds are over 15 miles per hour; and
2. Welding will occur only in areas cleared of all flammable vegetation and materials at a minimum radius of 35 feet from the welding operation.
3. Welding will not occur on days where a red flag warning has been issued for the location by the National weather service.

f. Exhaust systems of vehicles will have an acceptable muffler and will be in proper working condition. All motorized equipment and machinery will be equipped with spark arresters.

g. Type ABC rated fire extinguishers will be required and available during all operations.

12. **Coordination with First Responder Agencies:**

If requested, United Power's representative and first responders may meet to review this Emergency Action Plan and tour the site, since construction has not begun. The facility is not currently a Tier II facility, as it has not yet been constructed.

13. **Safety and Training Review:**

Job specific training will be performed on site prior to employees beginning work.

All United Power, Inc. electric facilities are designed, constructed, operated, and maintained to meet or exceed all applicable standards of design and performance set forth in the National Electrical Safety Code (NESC 2012).

Geotechnical Engineering Report

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United Power Stonehouse Substation

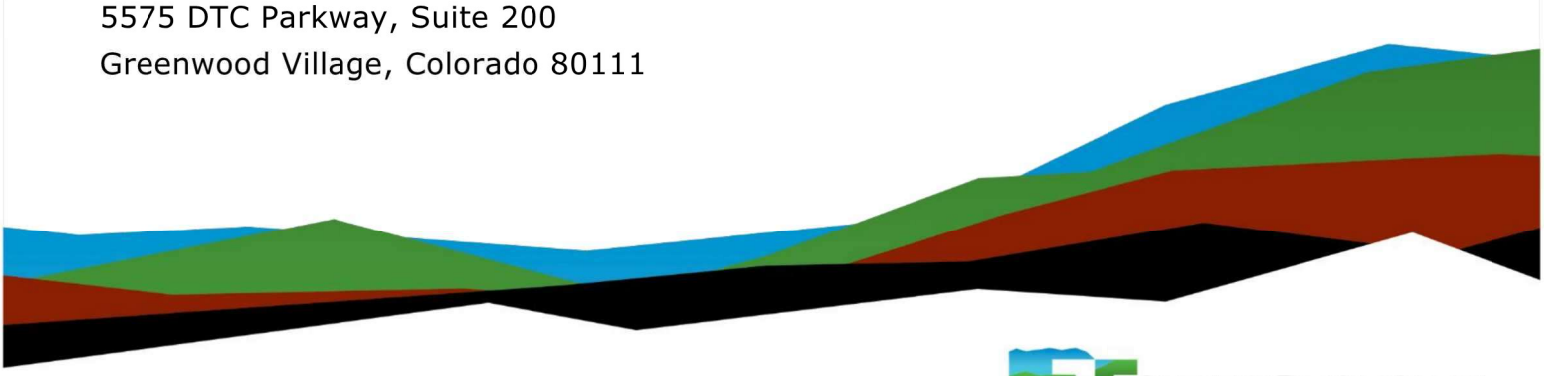
Geotechnical Engineering Report

Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado

October 7, 2025 | Terracon Project No. 25255177

Prepared for:

Ulteig Engineers, Inc.
5575 DTC Parkway, Suite 200
Greenwood Village, Colorado 80111



Terracon
Explore with us

Nationwide
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- Facilities
- Environmental
- Geotechnical
- Materials

10625 W. I-70 Frontage Rd N., Ste. 3
Wheat Ridge, Colorado 80033
P 303-423-3300
Terracon.com

October 7, 2025

Ulteig Engineers, Inc.
5575 DTC Parkway, Suite 200
Greenwood Village, Colorado 80111

Attn: Derek Holscher
P: (720) 837-4742
E: derek.holscher@ulteig.com

Re: Geotechnical Engineering Report
United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue
Adams County, Colorado
Terracon Project No. 25255177

Mr. Holscher:

We have completed the scope of Geotechnical Engineering services for the project referenced above in general accordance with Work Order No. 1 for Ulteig Project No. 24.00441. This report presents the findings of the subsurface exploration and provides geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have any questions concerning this report or if we may be of further service, please contact us.

Sincerely,

Terracon

Trevor Meinholz, E.I.T.
Staff Engineer

Scott B. Myers, P.E.
Regional Senior Consultant

Table of Contents

Figures

GeoModel

Attachments

Note: This report was originally delivered in a web-based format. **Blue Bold** text in the report indicates a referenced section heading. The PDF version also includes hyperlinks which direct the reader to that section and clicking on the terracon logo will bring you back to this page. For more interactive features, please view your project online at **client.terracon.com**. Refer to each individual Attachment for a listing of contents.

Report Summary

Topic [1]	Overview Statement [2]
Project Description	We understand the proposed project consists of the design and construction of a new substation southeast of Gun Club Road and East 132nd Avenue in Adams County. Based on email and phone conversations with Ulteig, we understand the substation equipment and structures will include the following: ■ 230 kV and 12.47 kV Transformers ■ 230 kV Circuit Breakers ■ 230 kV Dead end Tapered Tubular Structures ■ 230 kV and 12.47 kV Standard Steel Support Structures (bus supports, switches, etc.) We understand the substation development will include a detention pond to be located west of the proposed substation.
Geotechnical Characterization	Subsurface conditions encountered in the borings generally consisted of 6 to 32 inches of topsoil underlain by native sand with varying amounts of silt and clay and native lean clay with varying amounts of sand to depths of about 29 to 39 feet below the ground surface (bgs). Claystone and sandstone bedrock was encountered below the native soils to the maximum depths explored of about 40 feet bgs. Groundwater was not encountered in any of the borings at the time of our exploration to the maximum depths explored of about 40 feet.
Earthwork	The on-site native sand and clay soils can be reused as engineered fill for this project provided any deleterious materials are removed. It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.
Foundation Recommendations	The proposed breakers and transformers may be constructed on shallow mat foundations on properly prepared native soils or engineered fill. The proposed tapered tubular and steel support structures may be constructed on drilled pier foundations bottomed in native soils or claystone and sandstone bedrock.
General Comments	This section contains important information about the limitations of this geotechnical engineering report.

Topic [1]	Overview Statement [2]

1. If the reader is reviewing this report as a pdf, the topics above can be used to access the appropriate section of the report by simply clicking on the topic itself.
2. This summary is for convenience only. It should be used in conjunction with the entire report for design purposes.

Introduction

This report presents the results of our subsurface exploration and Geotechnical Engineering services performed for the proposed United Power Stonehouse Substation to be located southeast of Gun Club Road and East 132nd Avenue in Adams County, Colorado. The purpose of these services was to provide information and geotechnical engineering recommendations relative to:

- Subsurface soil conditions
- Groundwater conditions
- Seismic site classification per IBC
- Site preparation and earthwork
- Foundation design and construction

The geotechnical engineering Scope of Services for this project included the advancement of six (6) soil borings (designated as Boring Nos. SB-01 to SB-06) to depths of approximately 40 feet below existing site grades. In addition, field electrical resistivity testing was performed at the southwest portion of the project site.

Plans showing the site and boring locations are shown on the **Site Location** and **Exploration Plan**, respectively. The results of the laboratory testing performed on soil samples obtained from the site during our field exploration are included on the boring logs and as separate graphs in the **Exploration Results** section.

Project Description

Our initial understanding of the project was provided in our proposal and was discussed during project planning. A period of collaboration has transpired since the project was initiated, and our final understanding of the project conditions is as follows:

Item	Description
Information Provided	Our understanding of the project is based on the emails and documents provided by Ulteig Engineers, Inc., including the following file: ▪ Stone House - Soil Boring Sketch.pdf

Item	Description
Project Description	We understand the proposed project consists of the design and construction of a new substation southeast of Gun Club Road and East 132nd Avenue in Adams County. Based on email and phone conversations with Ulteig, we understand the substation equipment and structures will include the following: ■ 230 kV and 12.47 kV Transformers ■ 230 kV Circuit Breakers ■ 230 kV Tapered Tubular Structures ■ 230 kV and 12.47 kV Standard Steel Support Structures (bus supports, switches, etc.) We understand the transformers and breakers will be constructed on mat foundations, and the steel support and tapered tubular structures will be constructed on drilled pier foundations. We understand there will be no below grade areas constructed as a part of this development. We understand the substation development will include a detention pond to be located west of the proposed substation.
Maximum Loads (From Project Team)	**Transformers** ■ Bearing Pressure: 1.3 ksf **Circuit Breakers** ■ Bearing pressure: 0.8 psf **Tapered Tubular Structures** ■ Moment: 550 kip-ft ■ Shear: 13 kips ■ Axial: 17 kip **Standard Steel Support Structures** ■ Moment: 80 kip-ft ■ Shear: 4 kips ■ Axial: 2.5 kip
Grading/Slopes	Cut and fill, 3 feet (+/-) max
Excavation Depth	3 feet for frost-depth foundations
Below Grade Construction	Not anticipated
Pavement	Not anticipated

Terracon should be notified if any of the above information is inconsistent with the planned construction as revised and/or additional geotechnical recommendations may be required.

Site Conditions

The following description of site conditions is derived from our site visit in association with the field exploration.

Item	Description
Parcel Information	This project is located southeast of Gun Club Road and East 132nd Avenue in Adams County, Colorado. Approximate latitude/longitude: 39.9356° N, 104.7132° W See **Site Location**.
Existing Improvements	The site is currently undeveloped and is used as agricultural land.
Current Ground Cover	Ground cover on the subject site consists of the remnants of previously harvested crops.
Existing Topography	The site slopes down from south to north with an elevation difference of about 5 feet.

Geotechnical Characterization

We have developed a general characterization of the subsurface conditions based upon our review of the subsurface exploration, laboratory data, geologic setting and our understanding of the project. This characterization, termed GeoModel, forms the basis of our geotechnical calculations and evaluation of the site. Conditions observed at each exploration point are indicated on the individual logs. The individual logs can be found in the **Exploration Results** and the GeoModel can be found in the **Figures** attachment of this report. As noted in **General Comments**, the characterization is based upon widely spaced exploration points across the site, and variations are likely.

Subsurface Profile

As part of our analyses, we identified the following model layers within the subsurface profile. For a more detailed view of the model layer depths at each boring location, refer to the GeoModel.

Model Layer	Layer Name	General Description
1	Topsoil	Topsoil; about 6 inches
2	Native Sand	Native sand with varying amounts of silt and clay; very loose to medium dense
3	Native Clay	Native lean clay with varying amounts of sand; stiff to hard
4	Bedrock	Bedrock consisting of claystone and sandstone; firm to hard

Stratification boundaries on the boring logs represent the approximate location of changes in soil and material types; in situ, the transition between materials may be gradual. Further details of the borings can be found on the boring logs in the **Exploration Results**.

Based on the results of the laboratory testing and our experience in the area, the native sand and clay soils have nil to low expansive potential. Based on our experience in the area, the claystone bedrock has low to moderate expansive potential and the sandstone bedrock has nil to low expansive potential. A summary of laboratory test results is included in the **Exploration Results**.

Groundwater Conditions

The borings were observed while drilling and upon completion of drilling for the presence and level of groundwater. The water levels encountered in the boreholes can be found on the boring logs in **Exploration Results** and are summarized below.

Boring No.	Shallowest depth to groundwater encountered while or upon completion of drilling [1]
SB-01	Not encountered to the maximum depth explored of about 40 feet
SB-02	Not encountered to the maximum depth explored of about 40 feet
SB-03	Not encountered to the maximum depth explored of about 40 feet
SB-04	Not encountered to the maximum depth explored of about 40 feet
SB-05	Not encountered to the maximum depth explored of about 40 feet
SB-06	Not encountered to the maximum depth explored of about 40 feet

1. Borings were backfilled immediately after completion. Therefore, subsequent groundwater measurements were not obtained.

Groundwater level fluctuations occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were performed.

Groundwater levels during construction or at other times in the life of the structures may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

Field Electrical Resistivity Test Results

Field measurements of soil electrical resistivity were performed by Terracon on September 4, 2025. The Wenner arrangement (equal electrode spacing) was used with "a" spacings of 0.5, 1, 1.5, 2, 3, 5, 7, 10, 15, 20, 30, 45, 70, 100, 150, 200, 300, 400, and 500 feet at the test location (designated FER-1) at the southwest corner of the project site. The "a" spacing is generally considered to be the depth of influence of the test. The testing was performed in both a northwest-southeast and a northeast-southwest orientation. The approximate location of the center of the in-situ electrical resistivity lines are shown in the **Site Location and Exploration Plans**. Results of the soil electrical resistivity measurements are presented in the **Field Electrical Resistivity Test Results**.

It should be noted that the resistivity values measured in the field may vary by material type, moisture content, surface temperature, groundwater depth, and other climatic conditions. During testing, our field representative indicated the ground surface was dry. The weather conditions during the site visit are indicated on the field data sheets.

Corrosivity

The table below lists the results of laboratory soluble sulfate, chlorides, electrical resistivity, pH, Red-Ox, total salts, and sulfides. The values may be used to estimate potential corrosive characteristics of the on-site soils with respect to contact with the various underground materials which will be used for project construction.

Corrosivity Test Results Summary

Boring	Sample Depth (feet)	Soluble Sulfate (%)	Soluble Chloride (mg/kg)	Electrical Resistivity (Ω-cm)	pH	Red-Ox (mV)	Total Salts (mg/kg)	Sulfides
SB-04	0 – 5	<0.10	1	2,600	7.35	+372	513	Negative
SB-05	0 – 5	<0.10	2	2,800	7.33	+345	500	Negative

Results of water-soluble sulfate testing indicate that samples of the on-site soils have an exposure class of S0 when classified in accordance with the American Concrete Institute (ACI) Design Manual. The results of the testing indicate ASTM Type I portland cement is

suitable for project concrete in contact with on-site soils. However, if there is no (or minimal) cost differential, use of ASTM Type II portland cement is recommended for additional sulfate resistance of construction concrete. Concrete should be designed in accordance with the provisions of the ACI Design Manual.

Imported fill materials may have significantly different properties than the site materials noted above and should be evaluated if expected to be in contact with materials used for construction.

Geotechnical Overview

Based on subsurface conditions encountered in the borings, the site appears suitable for the proposed construction from a geotechnical point of view provided certain precautions and design and construction recommendations outlined in this report are followed. We have identified geotechnical conditions that could impact design and construction of the proposed substation.

Loose Soils

Test boring data indicate that loose soils may be locally present. Consequently, loose soils could be encountered below foundations or other improvements and these conditions will likely require some corrective work. Corrective work could involve removal and re-compaction or replacement, in-place soil densification, or deepening footings excavations to suitable bearing materials. In any event, Terracon should be contacted to observe foundation excavations to evaluate bearing conditions and to provide guidance concerning corrective work (if needed).

Earthwork

The following sections present recommendations for site preparation, excavation, subgrade preparation, and placement of engineered fills on the project. All earthwork on the project should be observed and evaluated by Terracon.

Site Preparation

Strip and remove existing vegetation, organics, and other deleterious materials from the proposed construction areas. All exposed surfaces should be free of mounds and depressions that could prevent uniform compaction.

Stripped materials consisting of vegetation, unsuitable fills, and organic materials should be wasted from the site or used to revegetate landscaped areas or exposed slopes after completion of grading operations.

Where possible, the site should be initially graded to create a relatively level surface to receive fill and to provide for a relatively uniform thickness of fill beneath the proposed improvement areas. All exposed areas that will receive fill, once properly cleared, should be scarified to a minimum depth of 12 inches, conditioned to near optimum moisture content, and compacted. It is imperative the moisture content of prepared materials be protected from moisture loss.

Although evidence of underground facilities such as utility vaults was not observed during our exploration, such features could be encountered during construction. If unexpected fills or underground facilities are encountered, such features should be removed, and the excavation thoroughly cleaned prior to backfill placement and/or construction.

It is anticipated that excavations for the proposed construction can be accomplished with conventional earthmoving equipment.

Depending upon seasonal conditions, surface water may infiltrate into the excavations on the site. Water seeping into excavations at this site could most likely be controlled by shallow trenches leading to a sump pit where the water could be removed by pumping.

The stability of subgrade soils may be affected by precipitation, repetitive construction traffic, or other factors. If unstable conditions are encountered or develop during construction, workability may be improved by overexcavation of wet zones and mixing these soils with crushed gravel. Use of geotextiles could also be considered as a stabilization technique. Lightweight excavation equipment may be required to reduce subgrade pumping.

Material Types

Fill for this project should consist of engineered fill. Engineered fill is fill that meets the criteria presented in this report and has been properly documented.

Engineered fill should meet the following material property requirements:

Fill Type [1,2]	USCS Classification	Acceptable location for placement
On-site sand soils	SC-SM, SC, SP	On-site sand soils are considered suitable for reuse as engineered fill below foundation areas and as general fill for this project.

Fill Type [1,2]	USCS Classification	Acceptable location for placement
On-site clay soils	CL	On-site clay soils are considered suitable for reuse as engineered fill below foundation areas and as general fill for this project.
Imported soils	Varies	Imported soils meeting the gradation outlined herein can be considered acceptable for use as engineered fill beneath foundation areas and as general fill for this project.

1. Engineered fill should consist of approved materials that are free of organic matter and debris. Frozen material should not be used, and fill should not be placed on a frozen subgrade. A sample of each material type should be submitted to the Geotechnical Engineer for evaluation.
2. Care should be taken during the fill placement process to avoid zones of dis-similar fill. Improvements constructed over varying fill types are at a higher risk of differential movement compared to improvements over a uniform fill zone.

Imported soils for engineered fill (if required) should meet the following material property requirements:

Gradation	Percent finer by weight (ASTM C136)
1”	100
No. 4 Sieve	30-100
No. 200 Sieve	>35

- Liquid Limit..... 30 (max)
- Plasticity Index..... 10 (max)
- Maximum Expansive Potential (%)..... 0.0*

  *Measured on a sample compacted to approximately 95 percent of the ASTM D698 maximum dry density at optimum water content. The sample is confined under a 200-psf surcharge and submerged.

Compaction Requirements

Engineered fill should be placed and compacted in horizontal lifts, using equipment and procedures that will produce recommended moisture contents and densities throughout the lift.

Item	Description
Fill lift thickness	8-inches or less in loose thickness when heavy, self-propelled compaction equipment is used 4 to 6-inches in loose thickness when hand-guided equipment (i.e. jumping jack, plate compactor) is used
Compaction requirements [1,2]	Minimum of 98% of the material's standard Proctor maximum dry density (ASTM D698) for sand soils, and minimum of 95% of the material's standard Proctor maximum dry density (ASTM D698) for clay soils
Moisture content cohesionless soils (sand soils)	-2 to +2% of the optimum moisture content
Moisture content cohesive soils (clay soils)	0 to +3% of the optimum moisture content

1. We recommend that engineered fill be tested for water content and compaction during placement. Should the results of the in-place density tests indicate the specified water or compaction limits have not been met, the area represented by the test should be reworked and retested as required until the specified water and compaction requirements are achieved.
2. Water levels should be maintained low enough to allow for satisfactory compaction to be achieved without the compacted fill material pumping when proofrolled.

Excavation

Excavations into the subsurface soils will encounter a variety of conditions. The individual contractor(s) is responsible for designing and constructing stable, temporary excavations as required to maintain stability of both the excavation sides and bottom. All excavations should be sloped or shored in the interest of safety following local and federal regulations, including current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards.

Soils penetrated by the proposed excavations may vary significantly across the site. The soil classifications are based solely on the materials encountered in the exploratory borings. The contractor should verify that similar conditions exist throughout the proposed area of excavation. If different subsurface conditions are encountered at the time of construction, the actual conditions should be evaluated to determine any excavation modifications necessary to maintain safe conditions.

Grading and Drainage

All grades must be adjusted to provide positive drainage away from the proposed structures during construction and maintained throughout the life of the proposed project. Infiltration of water into utility or foundation excavations must be prevented during construction. Landscaped irrigation adjacent to the foundation systems, if present, should be minimized or eliminated. Water permitted to pond near or adjacent to the perimeter of the structures (either during or post-construction) can result in higher soil movements than those discussed in this report. As a result, any estimations of potential movement described in this report cannot be relied upon if positive drainage is not obtained and maintained, and water is allowed to infiltrate the fill and/or subgrade.

Permanent grades of the subgrade soils below any surface gravel should be sloped at a minimum of 10 percent grade for at least 5 feet beyond the perimeter of the structures. Backfill against foundations and in utility trenches should be compacted in accordance with recommendations in this report and free of all construction debris to reduce the possibility of water infiltration. Prior to placing surface gravel, we recommend that verification of final grading be performed to document that positive drainage, as described above, has been achieved.

Earthwork Construction Considerations

The earthwork efforts should be monitored under the direction of the Geotechnical Engineer. Monitoring should include documentation of adequate removal of existing vegetation and topsoil, proofrolling, and mitigation of areas delineated by the proofroll to require mitigation.

Each lift of compacted fill should be tested, evaluated, and reworked, as necessary, until approved by the Geotechnical Engineer prior to placement of additional lifts. Each lift of fill should be tested for density and water content.

In areas of foundation excavations, the subgrade should be evaluated under the direction of the Geotechnical Engineer. If unanticipated conditions are encountered, the Geotechnical Engineer should prescribe mitigation options.

In addition to the documentation of the essential parameters necessary for construction, the continuation of the Geotechnical Engineer into the construction phase of the project provides the continuity to maintain the Geotechnical Engineer's evaluation of subsurface conditions, including assessing variations and associated design changes.

Foundation Recommendations

Based upon the results of the field exploration and laboratory testing program for this exploration, the following foundation systems were evaluated for the proposed equipment and support structures:

- Mat foundations on properly prepared native soils or new engineered fill.
- Drilled piers embedded in native soils or socketed into claystone and sandstone bedrock

Based on our engineering analysis, it is our opinion the proposed circuit breakers could be constructed on mat foundation systems bottomed on native soils or engineered fill.

The proposed tapered tubular structures, steel support structures, and transformers may be constructed on drilled piers installed into the native soils or socketed into claystone and sandstone bedrock.

The following sections present geotechnical recommendations for mat foundations and drilled pier foundation systems for the proposed substation.

Mat Foundation Recommendations

Design recommendations for mat foundation systems are presented in the following tables and paragraphs:

Description	Value
Foundation Subgrade Preparation	Soils at the base of all foundation excavations must be scarified to a minimum depth of 12 inches, moisture conditioned, and compacted prior to placement of new engineered fill.
Supporting Stratum	Properly prepared native soils or new engineered fill
Maximum Allowable Bearing Pressure (Mat Foundations) [1,2]	1,000 psf
Maximum Mat Size (assumed based on previous experience)	15 feet by 25 feet

Description	Value
Modulus of Subgrade Reaction	Square: $K_{(BXB)} = K_1\left(\frac{B+1}{2B}\right)^2$ Rectangle: $K_{(BXL)} = K_1\left(\frac{1+0.5B/L}{1.50}\right)$ K_1 = 36 pounds per square inch per inch (psi/in) Where: K_1 = modulus of subgrade reaction of a foundation measuring 1 ft x 1 ft $K_{(BXB)}$ = modulus of subgrade reaction for a foundation having a square dimension B $K_{(BXL)}$ = modulus of subgrade reaction for a foundation having dimensions of B by L
Allowable passive resistance [3]	250 psf/ft
Coefficient of Friction (Sliding)	0.3
Minimum Embedment Below Finished Grade	3 feet
Approximate Total Movement [4,5]	About 1 inch
Estimated Differential Movement [4,5,6]	About ½ to ¾ inch of total movement

1. The recommended bearing pressure assumes that any existing fill or lower strength soils, if encountered, will be excavated and replaced with engineered fill.
2. The maximum allowable soil bearing pressure can be increased by 1/3 for transient loading conditions.
3. Use of passive earth pressures require the sides of the excavation for the spread footing foundation to be nearly vertical and the concrete paced near against these vertical faces, or that the footing forms be removed and compacted engineered fill be placed against the vertical footing face. Assumes no hydrostatic pressure.
4. Foundation movement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footings, the thickness of engineered fill, and the quality of the earthwork operations and footing construction.
5. Footings should be proportioned on the basis of equal total dead load pressure to reduce differential movement between adjacent footings.
6. Differential movement is considered over a distance of about 40 feet.

Additional foundation movements could occur if water from any source infiltrates the foundation soils; therefore, proper drainage should be provided in the final design and during construction and throughout the life of the structures. Failure to maintain the

proper drainage as recommended in the **Grading and Drainage** section of **Earthwork** will nullify the movement estimates provided above.

The base of all foundation excavations should be free of water and loose soil prior to concrete placement. Concrete should be placed soon after excavating to reduce bearing soil disturbance. Should the soils at bearing level become excessively dry, disturbed or saturated, or frozen, the affected soil should be removed prior to placing concrete.

Foundations should be detailed and reinforced as necessary to reduce the potential for distress caused by differential foundation movement.

Drilled Pier Recommendations

We understand the dead end tapered tubular and steel support structures will be constructed on drilled piers. Drilled piers can also be considered for the construction of heavily loaded structures and equipment when socketed into the underlying claystone and sandstone bedrock. The following recommendations should be followed for drilled pier foundations:

Description	Value
Minimum Pier Diameter	18 inches
Minimum Pier Length	6 feet
Pier concrete slump (uncased piers)	5 to 7 inches
Pier concrete slump (cased piers)	7 to 9 inches
Approximate axial movement (bearing on overburden soils)	About 1 inch
Approximate axial movement (bearing in claystone and sandstone bedrock)	Less than ½ inch

Recommended soil stratigraphy and corresponding design parameters are presented in the **Drilled Pier Design Parameters** section of this report.

Side resistance should be applied to the surface area of the drilled pier for that given length interval below a depth of 3 feet to reduce the effect of frost. The skin friction value with a $^{2}/_{3}$ reduction should be used to determine the uplift capacity of the drilled piers. The contribution of soil resistance within the frost zone should be neglected in computations of vertical and lateral capacity.

For lateral load and overturning design, we have included LPILE© and MFAD© parameters in the **Drilled Pier Design Parameters** section of this report. Lateral load design parameters are valid for maximum soil strain of 1 percent for the native soils acting over a distance of one shaft diameter. The passive pressure, coefficient of horizontal

subgrade reaction, and LPILE© parameters are ultimate values; therefore, appropriate factors of safety should be applied in the pier design.

Piers should be considered to work in group action if the center-to-center horizontal spacing is less than three pier diameters. A minimum practical center-to-center horizontal spacing between piers of at least three diameters should be maintained, and adjacent piers should bottom at the same elevation. The capacity of individual piers must be reduced when considering the effects of group action. Capacity reduction is a function of pier spacing and the number of piers within a group. The following table presents capacity reductions for closely spaced piers.

Description	Value		
Drilled Pier Spacing (Center-to-Center)	>3 diameters	>2 to 3 diameters	1 to 2 diameters
Pier Capacity Reduction	None	30 percent	50 percent

1. End bearing values do not need to be reduced for closely spaced piers if bottom of piers are at the same elevation.

Lateral analysis should account for the center-to-center spacing and P-Y multiplier values per the following table:

Pier Center-to-Center Spacing (In Direction of Loading)	P-multiplier, P_M Row 1	P-multiplier, P_M Row 2	P-multiplier, P_M Row 3 and Higher
3 x diameter	0.8	0.4	0.3
5 x diameter	1.0	0.85	0.7

The structural engineer should determine the reinforcement necessary for the piers. At a minimum, all piers should be reinforced full depth for the applied axial, lateral, and uplift stresses imposed.

While not anticipated, pier casing may be required during the construction of the drilled piers if groundwater, loose soils, or caving soils are encountered. Casing should be withdrawn in a slow continuous manner maintaining a sufficient head of concrete to prevent infiltration of water or caving soils or the creation of voids in pier concrete. Pier concrete should have a relatively high fluidity when placed in cased pier holes or through a tremie. Pier concrete with slump in the range of 5 to 7 inches is recommended for uncased piers. For cased piers, a slump in the range of 7 to 9 inches is recommended.

Groundwater, if encountered, should be removed from each pier hole prior to concrete placement. Pier concrete should be placed immediately after completion of drilling and cleaning. If pier concrete cannot be placed in dry conditions, a tremie should be used for concrete placement. Free-fall concrete placement in piers will only be acceptable if

provisions are taken to avoid striking the concrete on the sides of the hole or reinforcing steel. The use of a bottom-dump hopper, or an elephant's trunk discharging near the bottom of the hole where concrete segregation will be reduced, is recommended.

Pier concrete must be poured the same day the pier hole is drilled.

Due to potential sloughing and raveling, foundation concrete quantities may exceed calculated geometric volumes. Pier-bearing surfaces must be cleaned prior to concrete placement. A Terracon representative should observe the bearing surface and shaft configuration.

The top of the piers should be cylindrical in shape. Forms may be necessary at the top of the piers in order to minimize the disturbance of the soils and to maintain a cylindrical shape. Failure to provide this shape (i.e., allowing mushrooming of pier tops) may result in additional uplift forces and unanticipated movement.

The drilled pier installation process should be performed under the observation of the Geotechnical Engineer. The Geotechnical Engineer should document the pier installation process including soil/rock and groundwater conditions observed, consistency with expected conditions, and details of the installed pier.

Seismic Considerations

The following table presents the seismic site classification based on the 2018 International Building Code (IBC), and the subsurface conditions encountered within the borings:

Code Used	Site Classification
2018 International Building Code (IBC) [1,2]	D

1. In general accordance with the 2018 International Building Code.
2. The 2018 International Building Code (IBC) requires a site subsurface profile determination extending a depth of 100 feet for seismic site classification. The current scope requested does not include the required 100-foot subsurface profile determination. The deepest borings of this exploration extended to a maximum depth of about 40 feet and this seismic site class definition considers that similar subsurface conditions exist below the maximum depth of the subsurface exploration.

General Comments

Our analysis and opinions are based upon our understanding of the project, the geotechnical conditions in the area, and the data obtained from our site exploration.

Variations will occur between exploration point locations or due to the modifying effects of construction or weather. The nature and extent of such variations may not become evident until during or after construction. Terracon should be retained as the Geotechnical Engineer, where noted in this report, to provide observation and testing services during pertinent construction phases. If variations appear, we can provide further evaluation and supplemental recommendations. If variations are noted in the absence of our observation and testing services on-site, we should be immediately notified so that we can provide evaluation and supplemental recommendations.

Our Scope of Services does not include either specifically or by implication any environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

Our services and any correspondence are intended for the sole benefit and exclusive use of our client for specific application to the project discussed and are accomplished in accordance with generally accepted geotechnical engineering practices with no third-party beneficiaries intended. Any third-party access to services or correspondence is solely for information purposes to support the services provided by Terracon to our client. Reliance upon the services and any work product is limited to our client and is not intended for third parties. Any use or reliance of the provided information by third parties is done solely at their own risk. No warranties, either express or implied, are intended or made.

Site characteristics as provided are for design purposes and not to estimate excavation cost. Any use of our report in that regard is done at the sole risk of the excavating cost estimator as there may be variations on the site that are not apparent in the data that could significantly affect excavation cost. Any parties charged with estimating excavation costs should seek their own site characterization for specific purposes to obtain the specific level of detail necessary for costing. Site safety and cost estimating including excavation support and dewatering requirements/design are the responsibility of others. Construction and site development have the potential to affect adjacent properties. Such impacts can include damages due to vibration, modification of groundwater/surface water flow during construction, foundation movement due to undermining or subsidence from excavation, as well as noise or air quality concerns. Evaluation of these items on nearby properties are commonly associated with contractor means and methods and are not addressed in this report. The owner and contractor should consider a preconstruction/precondition survey of surrounding development. If changes in the nature, design, or location of the project are planned, our conclusions and recommendations shall not be considered valid unless we review the changes and either verify or modify our conclusions in writing.

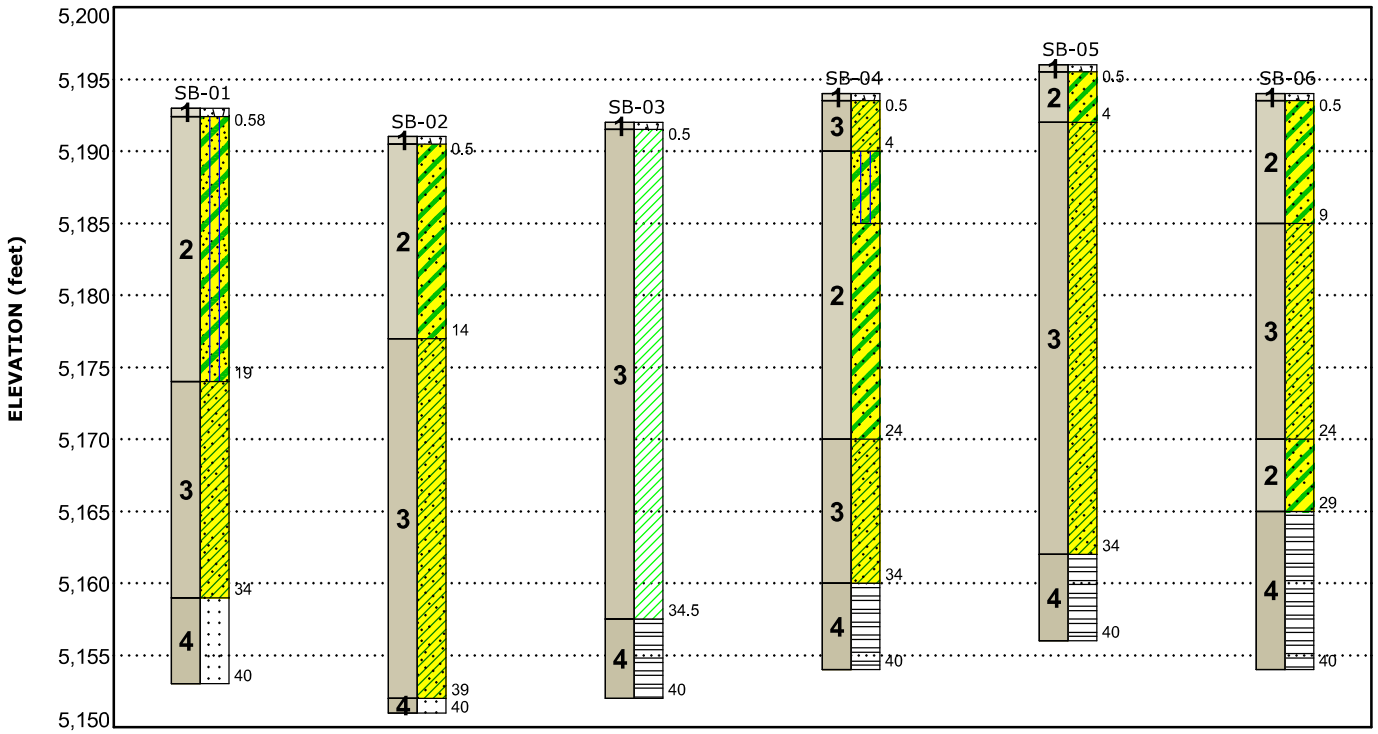
Figures

Contents:

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N
Ste 3
Wheat Ridge, CO

GeoModel



This is not a cross section. This is intended to display the Geotechnical Model only. See individual logs for more detailed conditions.

Model Layer	Layer Name	General Description
1	**Topsoil**	Topsoil; about 6 to 7 inches
2	**Native Sand**	Native sand with varying amounts of silt and clay; very loose to medium dense
3	**Native Clay**	Native lean clay with varying amounts of sand; stiff to hard
4	**Bedrock**	Bedrock consisting of claystone and sandstone; firm to hard

Legend

- Topsoil
- Silty Clayey Sand
- Sandy Lean Clay
- Sandstone
- Clayey Sand
- Lean Clay
- Claystone

NOTES:
Layering shown on this figure has been developed by the geotechnical engineer for purposes of modeling the subsurface conditions as required for the subsequent geotechnical engineering for this project.
Numbers adjacent to soil column indicate depth below ground surface.

Attachments

Exploration and Testing Procedures

Field Exploration

Boring Layout and Elevations: The locations of the borings are presented in the **Site Location and Exploration Plans**. Locations of the borings were obtained by using a handheld, recreational-grade GPS unit. The accuracy of the latitude and longitude values is typically about +/- 25 feet when obtaining the values using this method. Elevations at the boring locations were obtained using Google Earth. The accuracy of the boring locations and elevations should only be assumed to the level implied by the methods used.

Subsurface Exploration Procedures: The borings were drilled with a CME-55/300 track-mounted rotary drill rig and a Mobile B-57 truck-mounted rotary drill rig with solid-stem augers. During the drilling operations, lithologic logs of the borings were recorded by the field engineer. Relatively undisturbed samples were obtained at selected intervals utilizing a 2½-inch outside diameter modified California barrel sampler. Bulk samples were obtained from auger cuttings. Penetration resistance values were recorded in a manner similar to the standard penetration test (SPT), or in the same manner when split spoon samplers were used. This test consists of driving the sampler into the ground with a 140-pound hammer free falling through a distance of 30 inches. The number of blows required to advance the barrel sampler 12 inches (18 inches for standard split-spoon samplers, final 12 inches are recorded) or the interval indicated is recorded and can be correlated to the standard penetration resistance value (N-value). The blow count values are indicated on the boring logs at the respective sample depths, barrel sampler blow counts are not considered N-values.

An automatic hammer was used to advance the samplers in the borings performed on this site. A greater efficiency is typically achieved with the automatic hammer compared to the conventional safety hammer operated with a cathead and rope. Published correlations between the SPT values and soil properties are based on the lower efficiency cathead and rope method. This higher efficiency affects the standard penetration resistance blow count value by increasing the penetration per hammer blow over what would be obtained using the cathead and rope method. The effect of the automatic hammer's efficiency has been considered in the interpretation and analysis of the subsurface information for this report.

The standard penetration test provides a reasonable indication of the in-place density of sandy type materials, but only provides an indication of the relative stiffness of cohesive materials since the blow count in these soils may be affected by the soil moisture content. In addition, considerable care should be exercised in interpreting the N-values in gravelly soils, particularly where the size of the gravel particle exceeds the inside diameter of the sampler.

Groundwater measurements were obtained in the borings at the time of drilling. Due to safety concerns, the borings were backfilled with auger cuttings after drilling. Some settlement of the backfill may occur and should be repaired as soon as possible.

Laboratory Testing

Samples retrieved during the field exploration were returned to the laboratory for observation by the Geotechnical Engineer and were classified in general accordance with the Unified Soil Classification System presented in the **Supporting Information**.

At this time, an applicable laboratory-testing program was formulated to determine engineering properties of the subsurface materials. Following the completion of the laboratory testing, the field descriptions were confirmed or modified as necessary, and the boring logs were prepared. The boring logs are included in the **Exploration Results**.

Laboratory test results are included in the **Exploration Results**. These results were used for the geotechnical engineering analyses and the development of foundation and earthwork recommendations. All laboratory tests were performed in general accordance with the applicable local or other accepted standards.

Selected soil samples were tested for the following engineering properties:

- Water content
- Dry density
- Grain size distribution
- Atterberg limits
- Swell/consolidation
- Water-soluble sulfate
- Sulfide
- Chloride
- Red-Ox
- pH
- Electrical resistivity
- Total salts

Site Location and Exploration Plans

Contents:

Note: All attachments are one page unless noted above.

Site Location

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan with Aerial Image

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration Plan with Project Overlay

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Field Electrical Resistivity Testing Plan

DIAGRAM IS FOR GENERAL LOCATION ONLY, AND IS NOT INTENDED FOR CONSTRUCTION PURPOSES

MAP PROVIDED BY MICROSOFT BING MAPS

Exploration and Laboratory Results

Contents:

Note: All attachments are one page unless noted above.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-01

Location: See Exploration Plan

Latitude: 39.9353° Longitude: -104.7138°

Depth (Ft.) | Elevation: 5193 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Elevation	Material Description	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.6	5192.42	**TOPSOIL**, about 7 inches									
2		19.0	5174	**SILTY CLAYEY SAND (SC-SM)**, fine to coarse grained, brown, very loose to medium dense				2-3		6.5	101	21-16-5	43
								4-6	-2.4 @ 500 psf	5.9	94		
					5								
								8-7		10.2	118		
					10								
								7-12		12.6	117		
					15								
3		34.0	5159	**SANDY LEAN CLAY (CL)**, brown, very stiff to hard				11-17		14.4	118		
					20								
								12-25		13.9	116		
					25								
								10-13		13.5	117		
					30								
4		40.0	5153	**SANDSTONE**, fine to coarse grained, brown, hard, weak cementation				50/7"		10.5	106		
					35								
								50/8"		16.4	107		
				Bottom of Hole at 40 Feet	40								

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
Mobile B-57

Hammer Type
Automatic

Driller
Terracon

Logged by
KT

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-02

Location: See Exploration Plan

Latitude: 39.9354° Longitude: -104.7130°

Depth (Ft.) Elevation: 5191 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5 **TOPSOIL**, about 6 inches 5190.5								
2		**CLAYEY SAND (SC)**, fine to coarse grained, brown, loose to medium dense			4-6		8.5	102		
					3-12		7.0	114		
					7-11		9.8	116	28-14-14	39
		14.0 5177								
3		**SANDY LEAN CLAY (CL)**, brown, stiff to very stiff			11-12		14.8	115		
					11-14		13.6	119	32-16-16	61
					11-14		11.7	122		
					8-13		18.5	113		
					6-10		16.5	112		
		39.0 5152								
4		40.0 **SANDSTONE**, fine to coarse grained, brown, hard, moderate cementation 5151			50/9"		22.5	105		
		Bottom of Hole at 40 Feet								

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
Mobile B-57

Hammer Type
Automatic

Driller
Terracon

Logged by
KT

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-03

Location: See Exploration Plan

Latitude: 39.9354° Longitude: -104.7122°

Depth (Ft.) Elevation: 5192 (Ft.) +/-

Model Layer	Graphic Log	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5 **TOPSOIL**, about 6 inches 5191.5								
3		**LEAN CLAY (CL)**, with sand, brown, stiff to hard			6-7		11.3	90		
					8-9		10.3	111	34-13-21	76
					8-10		11.1	120		
					8-13		10.4	119		
					7-15		16.1	115		
					10-17		11.6	121		
					10-17		21.6	103		
		34.5 5157.5								
4		**CLAYSTONE**, gray to brown, medium hard			11-26		27.2	98		
		40.0 5152			50/10"		20.6	107		
		Bottom of Hole at 40 Feet								

5 10 15 20 25 30 35 40

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
Mobile B-57

Hammer Type
Automatic

Driller
Terracon

Logged by
KT

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-04

Location: See Exploration Plan

Latitude: 39.9350° Longitude: -104.7126°

Model Layer	Graphic Log	Depth (Ft.)	Elevation: 5194 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5	**TOPSOIL**, about 6 inches 5193.5									
3			**SANDY LEAN CLAY (CL)**, brown, stiff				5-7		9.8	118		
		4.0	5190									
2			**SILTY CLAYEY SAND (SC-SM)**, fine to coarse grained, brown, medium dense	5			7-8		5.7	108	20-14-6	27
		9.0	5185									
			CLAYEY SAND (SC), fine to coarse grained, brown, medium dense	10			8-12		9.7	123		
				15			10-18		12.5	121	34-17-17	48
				20			12-14		8.2	116		
3			**SANDY LEAN CLAY (CL)**, brown, very stiff	25			9-17		13.1	117		
				30			10-14		12.3	121		
		34.0	5160									
4			**CLAYSTONE**, gray, firm to medium hard	35			12-20		29.0	95		
		40.0	5154				16-23		29.2	94		
			Bottom of Hole at 40 Feet	40								

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
CME-55/300

Hammer Type
Automatic

Driller
Terracon

Logged by
PA

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

United Power Stonehouse Substation
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Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-05

Location: See Exploration Plan

Latitude: 39.9347° Longitude: -104.7129°

Model Layer	Graphic Log	Depth (Ft.)	Elevation: 5196 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5	**TOPSOIL**, about 6 inches 5195.5									
2			**CLAYEY SAND (SC)**, fine to coarse grained, brown, loose				5-8	-2.3 @ 500 psf	6.3	101		
		4.0	5192									
3			**SANDY LEAN CLAY (CL)**, brown, stiff to very stiff	5			5-7		6.1			
				10			5-7		12.0	104	32-13-19	62
				15			8-12		13.0	117		
				20			11-18		11.6	119		
				25			10-19		12.8	122		
				30			10-18		11.8	122		
		34.0	5162									
4			**CLAYSTONE**, gray, firm to medium hard	35			10-16		28.5	97		
		40.0	5156									
			Bottom of Hole at 40 Feet	40			15-28		27.7	97		

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
CME-55/300

Hammer Type
Automatic

Driller
Terracon

Logged by
PA

Boring Started
09-05-2025

Boring Completed
09-05-2025

Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

United Power Stonehouse Substation
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Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Boring Log No. SB-06

Location: See Exploration Plan

Latitude: 39.9346° Longitude: -104.7122°

Model Layer	Graphic Log	Depth (Ft.)	Elevation: 5194 (Ft.) +/-	Depth (Ft.)	Water Level Observations	Sample Type	Field Test Results	Swell (%)	Water Content (%)	Dry Unit Weight (pcf)	Atterberg Limits LL-PL-PI	Percent Fines
1		0.5	**TOPSOIL**, about 6 inches 5193.5									
2			**CLAYEY SAND (SC)**, fine to coarse grained, brown, very loose to loose				4-4	-1.1 @ 500 psf	9.5	109	23-15-8	47
				5			2-2		10.2			
		9.0	5185									
3			**SANDY LEAN CLAY (CL)**, brown, stiff to very stiff	10			10-11	+2.0 @ 500 psf	18.1	107		
				15			8-10		12.6	115	27-13-14	52
				20			12-15		12.4	122		
		24.0	5170									
2			**CLAYEY SAND (SC)**, fine to coarse grained, brown, medium dense	25			8-12		13.1	119		
		29.0	5165									
4			**CLAYSTONE**, gray, medium hard	30			15-24		22.2	106		
				35			16-30		25.3	98		
		40.0	5154									
			Bottom of Hole at 40 Feet	40			12-26		24.4	101		

See Exploration and Testing Procedures for a description of field and laboratory procedures used and additional data (If any).

See Supporting Information for explanation of symbols and abbreviations.

Elevation Reference: Approximate ground surface elevation obtained using Google Earth.

Water Level Observations
None encountered while drilling

Drill Rig
CME-55/300

Hammer Type
Automatic

Driller
Terracon

Logged by
PA

Boring Started
09-05-2025

Boring Completed
09-05-2025

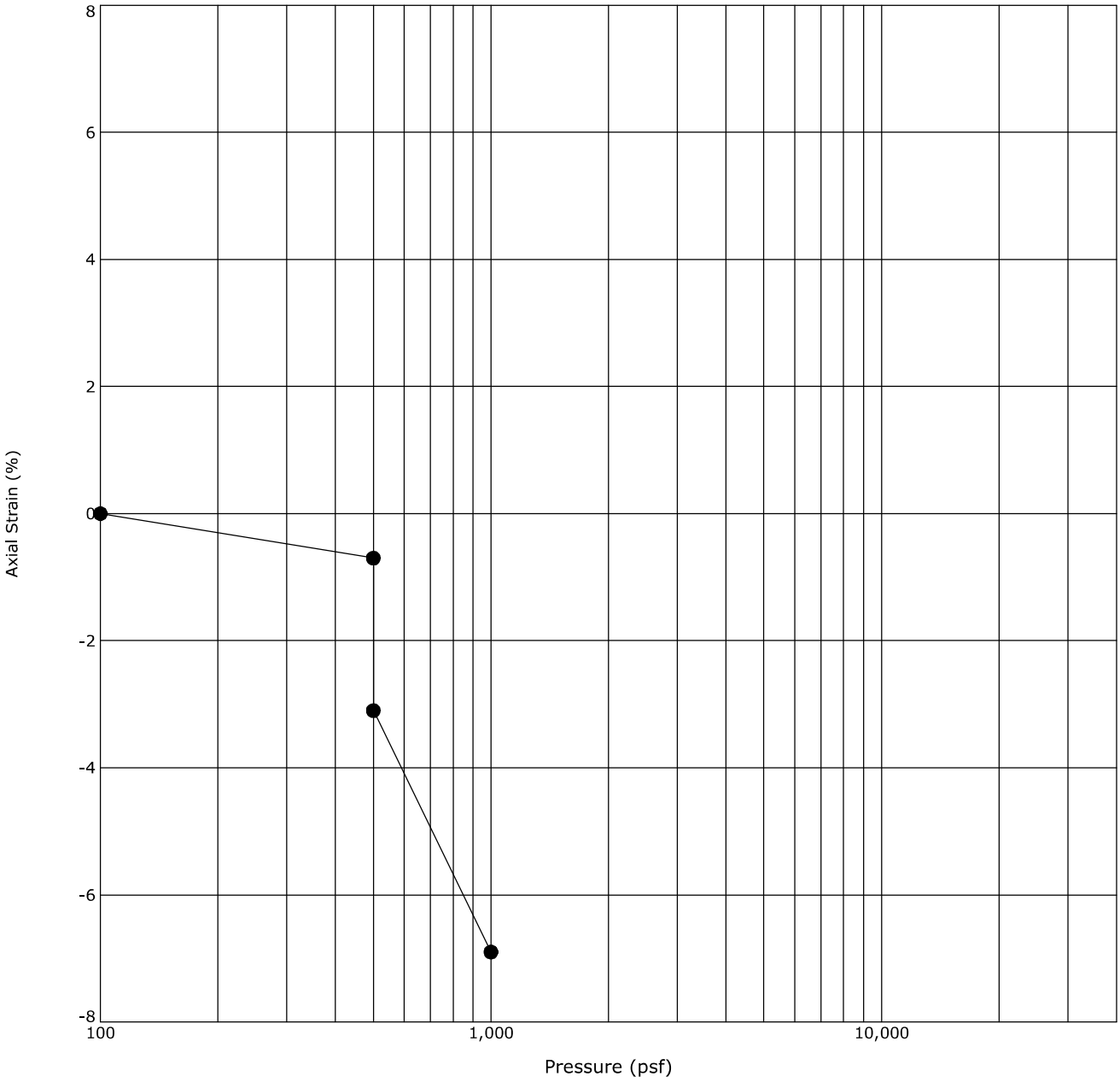
Notes
Modified California Ring Samples are 1.92 inches in diameter.

Advancement Method
4-inch diameter, solid-stem, continuous-flight power auger

Abandonment Method
Boring backfilled with auger cuttings upon completion.

10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

One-Dimensional Swell or Collapse

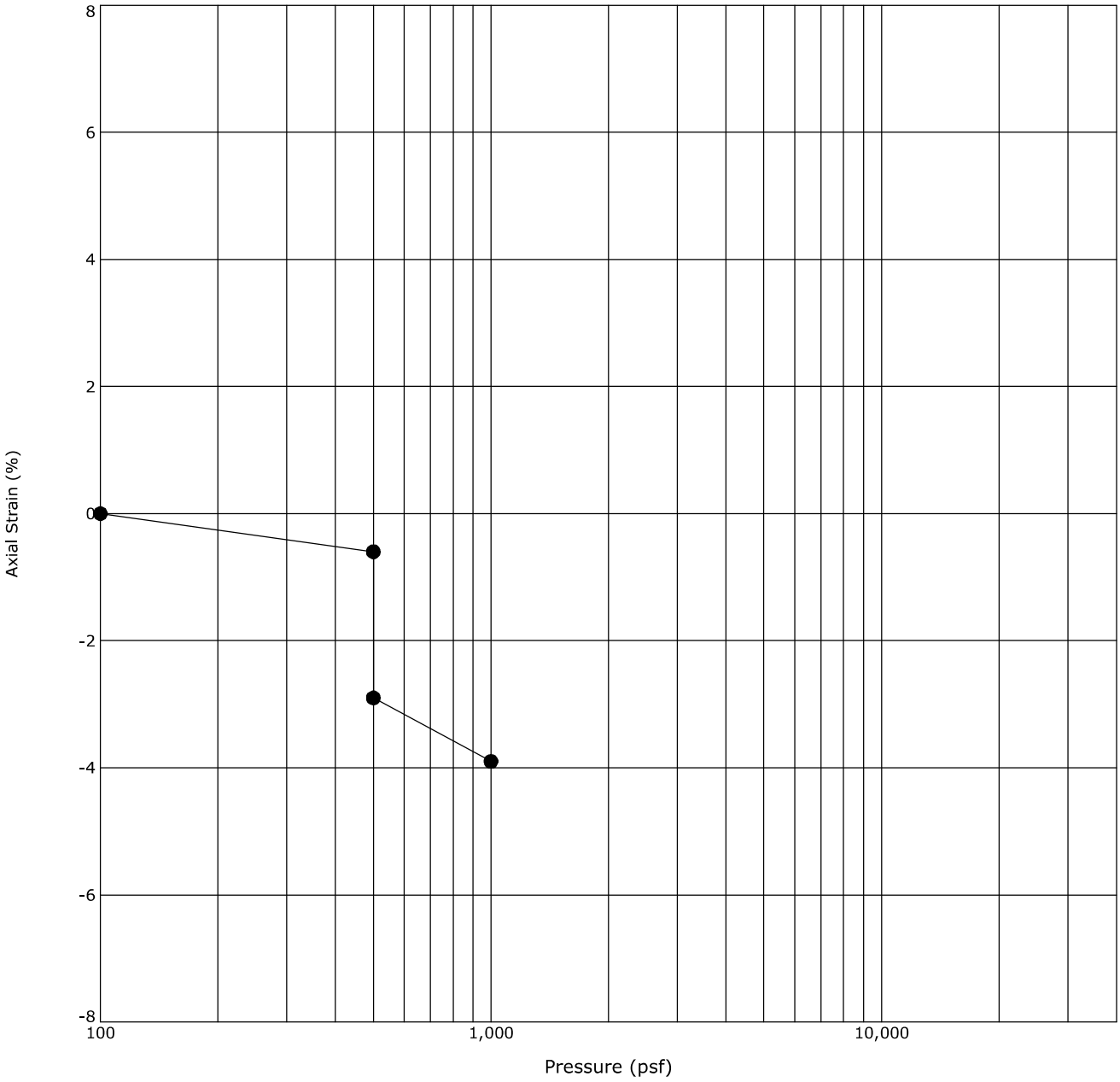


Boring ID		Depth (Ft)	Description	USCS	γ_d(pcf)	WC (%)
●	SB-01	4 - 5	SILTY CLAYEY SAND	SC-SM	94	5.9

Notes: Water was added at 500 psf. Sample disturbed.

10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

One-Dimensional Swell or Collapse

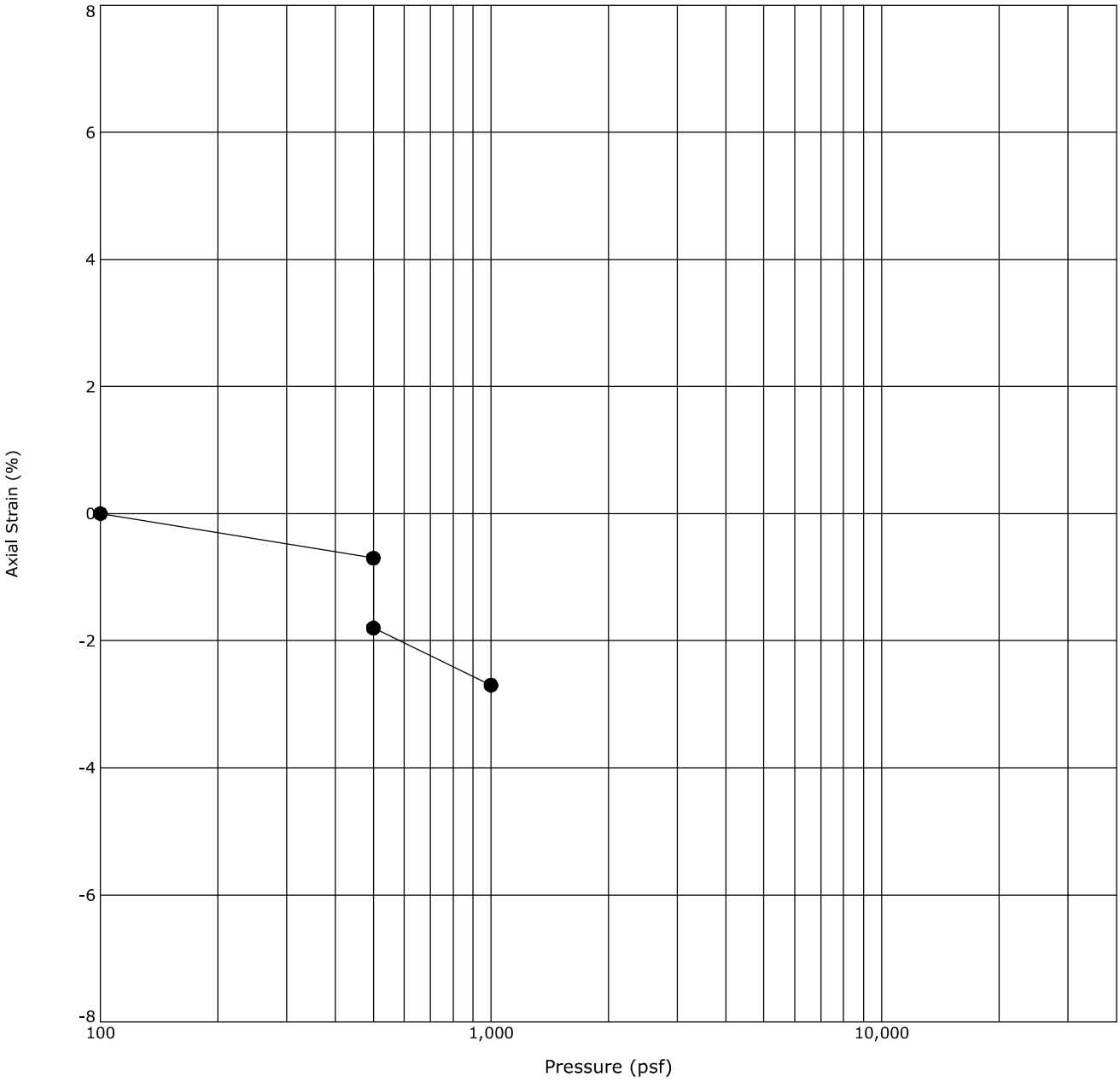


Boring ID		Depth (Ft)	Description	USCS	γ_d(pcf)	WC (%)
●	SB-05	2 - 3	CLAYEY SAND	SC	101	6.3

Notes: Water was added at 500 psf.

10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

One-Dimensional Swell or Collapse

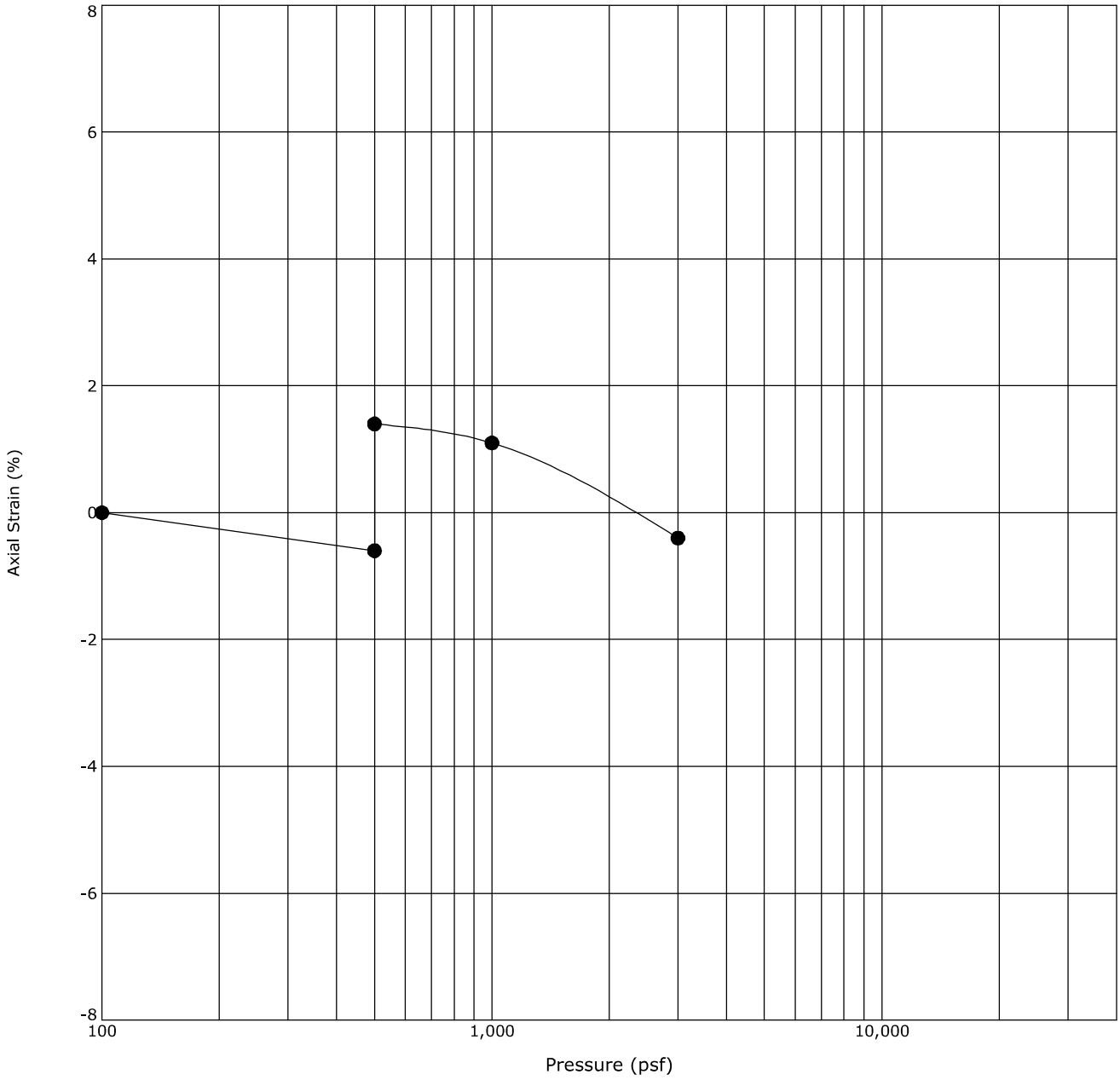


Boring ID		Depth (Ft)	Description	USCS	γ_d(pcf)	WC (%)
●	SB-06	2 - 3	CLAYEY SAND	SC	109	9.5

Notes: Water was added at 500 psf.

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

One-Dimensional Swell or Collapse



Boring ID		Depth (Ft)	Description	USCS	γ_d(pcf)	WC (%)
●	SB-06	9 - 10	SANDY LEAN CLAY	CL	107	18.1

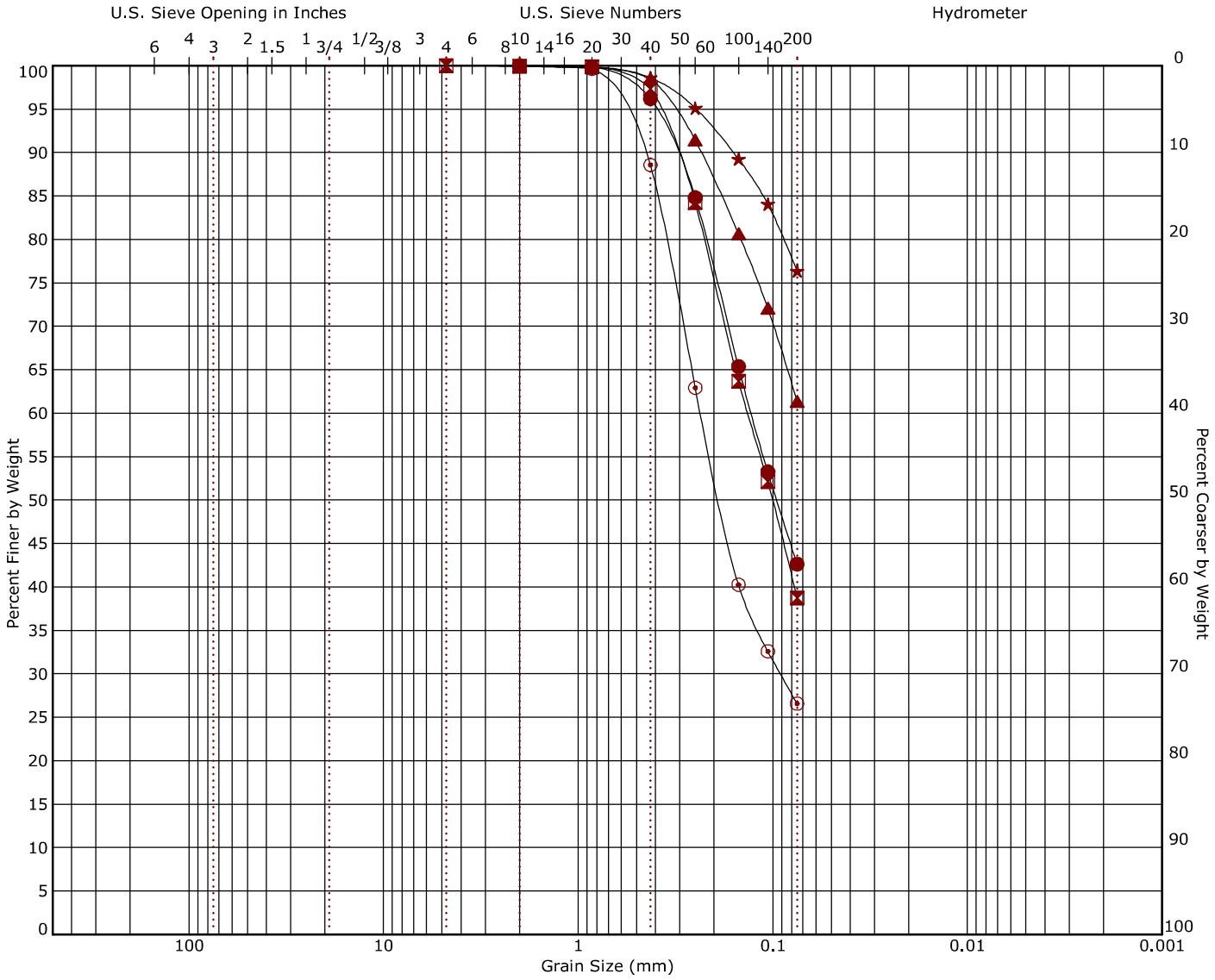
Notes: Water was added at 500 psf.

United Power Stonehouse Substation
Southeast of Gun Club Road and East 132nd Avenue | Adams County, Colorado
Terracon Project No. 25255177

Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	USCS	AASHTO	LL	PL	PI	Cc	Cu
●	SB-01	2 - 3	SILTY, CLAYEY SAND	SC-SM	A-4 (0)	21	16	5		
⊠	SB-02	9 - 10	CLAYEY SAND	SC	A-6 (2)	28	14	14		
▲	SB-02	19 - 20	SANDY LEAN CLAY	CL	A-6 (7)	32	16	16		
★	SB-03	4 - 5	LEAN CLAY with SAND	CL	A-6 (14)	34	13	21		
⊙	SB-04	4 - 5	SILTY, CLAYEY SAND	SC-SM	A-2-4 (0)	20	14	6		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	SB-01	2 - 3	2	0.129			0.0	0.0	57.4	42.6		
⊠	SB-02	9 - 10	4.75	0.134			0.0	0.0	61.3	38.7		
▲	SB-02	19 - 20	2				0.0	0.0	38.6	61.4		
★	SB-03	4 - 5	2				0.0	0.0	23.6	76.4		
⊙	SB-04	4 - 5	2	0.234	0.091		0.0	0.0	73.4	26.6		

United Power Stonehouse Substation
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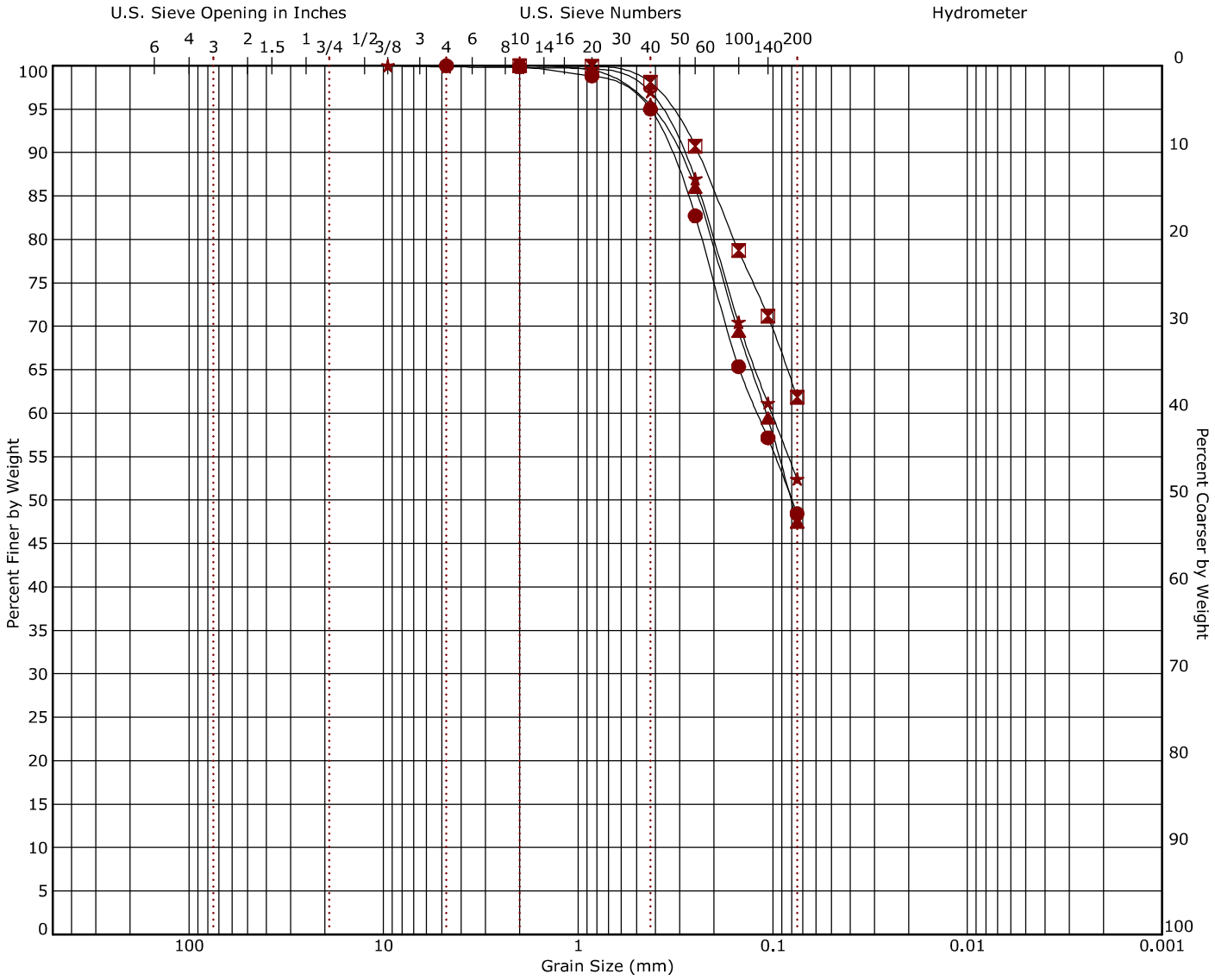
Terracon
10625 W I70 Frontage Rd N Ste 3
Wheat Ridge, CO

Grain Size Distribution

ASTM D422 / ASTM C136



Cobbles	Gravel		Sand			Silt or Clay
	coarse	fine	coarse	medium	fine	

Boring ID		Depth (Ft)	USCS Classification	USCS	AASHTO	LL	PL	PI	Cc	Cu
●	SB-04	14 - 15	CLAYEY SAND	SC	A-6 (5)	34	17	17		
⊠	SB-05	9 - 10	SANDY LEAN CLAY	CL	A-6 (9)	32	13	19		
▲	SB-06	2 - 3	CLAYEY SAND	SC	A-4 (1)	23	15	8		
★	SB-06	14 - 15	SANDY LEAN CLAY	CL	A-6 (4)	27	13	14		

Boring ID		Depth (Ft)	D_{100}	D_{60}	D_{30}	D_{10}	%Cobbles	%Gravel	%Sand	%Fines	%Silt	%Clay
●	SB-04	14 - 15	4.75	0.119			0.0	0.0	51.6	48.4		
⊠	SB-05	9 - 10	2				0.0	0.0	38.2	61.8		
▲	SB-06	2 - 3	2	0.108			0.0	0.0	52.6	47.4		
★	SB-06	14 - 15	9.5	0.101			0.0	0.1	47.4	52.4		

Client
Ulteig Engineers, Inc.

Project
United Power Stonehouse Substation
25255177

Results from Corrosion Testing

Sample Location	SB-04	SB-05
Sample Depth (ft.)	0 - 5	0 - 5
pH Analysis, ASTM D4972	7.35	7.33
Water Soluble Sulfate (SO4), AASHTO T290, (%)	<0.10	<0.10
Sulfides, ASTM A674 - X1.6, (Negative/Trace/ Present)	Negative	Negative
Chlorides, AASHTO T291, (mg/kg)	1	2
Red-Ox, ASTM G200, (mV)	+372	+345
Resistivity (Saturated), ASTM G57, (ohm-cm)	2600	2800
Total Salts (mg/Kg)	513	500

Analyzed By: Daryl Lee
Laboratory Supervisor

SUMMARY OF LABORATORY TEST RESULTS

United Power Stonehouse Substation - Adams County, Colorado
Terracon Project No. 25255177

Boring No.	Depth (ft)	USCS Class.	Initial Water Content (%)	Initial Dry Density (pcf)	Swell/Consolidation		Particle Size Distribution, Percent Passing by Weight					Atterberg Limits		Water Soluble Sulfates (%)	Chlorides (mg/kg)	pH	Sulfides (mg/kg)	Red-Ox (mV)	Resistivity (ohm-cm)	Total Salts (mg/kg)	Remarks
					Surcharge (ksf)	Swell (%)	3/4"	#4	#10	#40	#200	LL	PI								
SB-01	2	SC-SM	6.5	101			100	100	100	96	43	21	5								
SB-01	4	SC-SM	5.9	94	0.5	-2.4															3
SB-01	9	SC-SM	10.2	118																	
SB-01	14	SC-SM	12.6	117																	
SB-01	19	CL	14.4	118																	
SB-01	24	CL	13.9	116																	
SB-01	29	CL	13.5	117																	
SB-01	34		10.5	106																	
SB-01	39		16.4	107																	
SB-02	2	SC	8.5	102																	
SB-02	4	SC	7.0	114																	
SB-02	9	SC	9.8	116			100	100	100	97	39	28	14								
SB-02	14	CL	14.8	115																	
SB-02	19	CL	13.6	119			100	100	100	99	61	32	16								
SB-02	24	CL	11.7	122																	
SB-02	29	CL	18.5	113																	
SB-02	34	CL	16.5	112																	
SB-02	39		22.5	105																	
SB-03	2	CL	11.3	90																	
SB-03	4	CL	10.3	111			100	100	100	99	76	34	21								
SB-03	9	CL	11.1	120																	
SB-03	14	CL	10.4	119																	
SB-03	19	CL	16.1	115																	
SB-03	24	CL	11.6	121																	
SB-03	29	CL	21.6	103																	
SB-03	34	CL	27.2	98																	
SB-03	39		20.6	107																	
SB-04	0 - 5	CL												<0.10	1	7.35	Negative	+372	2600	513	
SB-04	2	CL	9.8	118																	
SB-04	4	SC-SM	5.7	108			100	100	100	89	27	20	6								
SB-04	9	SC	9.7	123																	
SB-04	14	SC	12.5	121			100	100	100	95	48	34	17								
SB-04	19	SC	8.2	116																	
SB-04	24	CL	13.1	117																	
SB-04	29	CL	12.3	121																	
SB-04	34		29.0	95																	
SB-04	39		29.2	94																	
SB-05	0 - 5	SC												<0.10	2	7.33	Negative	+345	2800	500	
SB-05	2	SC	6.3	101	0.5	-2.3															3

Notes:
Initial Dry Density and Initial Water Content are in-situ values unless otherwise notes
* – Partially disturbed sample
- – Compression/settlement
NV = no value
NP = non-plastic

Remarks:
1 Remolded Compacted density (about 95% of ASTM D698 maximum density near optimum moisture content)
2 Remolded Compacted density (about 95% of ASTM D1557 maximum density near optimum moisture content)
3 Water added to sample
4 Minus #200 Only
5 Moisture-Density Relationship Test Method ASTM D698/AASHTO T99
6 Moisture-Density Relationship Test Method ASTM D1557/AASHTO T180

Terracon
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SUMMARY OF LABORATORY TEST RESULTS

United Power Stonehouse Substation - Adams County, Colorado
Terracon Project No. 25255177

Boring No.	Depth (ft)	USCS Class.	Initial Water Content (%)	Initial Dry Density (pcf)	Swell/Consolidation		Particle Size Distribution, Percent Passing by Weight					Atterberg Limits		Water Soluble Sulfates (%)	Chlorides (mg/kg)	pH	Sulfides (mg/kg)	Red-Ox (mV)	Resistivity (ohm-cm)	Total Salts (mg/kg)	Remarks
					Surcharge (ksf)	Swell (%)	3/4"	#4	#10	#40	#200	LL	PI								
SB-05	4	CL	6.1																		
SB-05	9	CL	12.0	104			100	100	100	98	62	32	19								
SB-05	14	CL	13.0	117																	
SB-05	19	CL	11.6	119																	
SB-05	24	CL	12.8	122																	
SB-05	29	CL	11.8	122																	
SB-05	34		28.5	97																	
SB-05	39		27.7	97																	
SB-06	2	SC	9.5	109	0.5	-1.1	100	100	100	95	47	23	8								3
SB-06	4	SC	10.2																		
SB-06	9	CL	18.1	107	0.5	+2.0															3
SB-06	14	CL	12.6	115			100	100	100	97	52	27	14								
SB-06	19	CL	12.4	122																	
SB-06	24	SC	13.1	119																	
SB-06	29		22.2	106																	
SB-06	34		25.3	98																	
SB-06	39		24.4	101																	

Notes:
Initial Dry Density and Initial Water Content are in-situ values unless otherwise notes
* – Partially disturbed sample
- – Compression/settlement
NV = no value
NP = non-plastic

Remarks:
1 Remolded Compacted density (about 95% of ASTM D698 maximum density near optimum moisture content)
2 Remolded Compacted density (about 95% of ASTM D1557 maximum density near optimum moisture content)
3 Water added to sample
4 Minus #200 Only
5 Moisture-Density Relationship Test Method ASTM D698/AASHTO T99
6 Moisture-Density Relationship Test Method ASTM D1557/AASHTO T180

Terracon
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Field Electrical Resistivity Test Results

Contents:

Field Electrical Resistivity Test Data

Note: All attachments are one page unless noted above.

FIELD ELECTRICAL RESISTIVITY TEST DATA

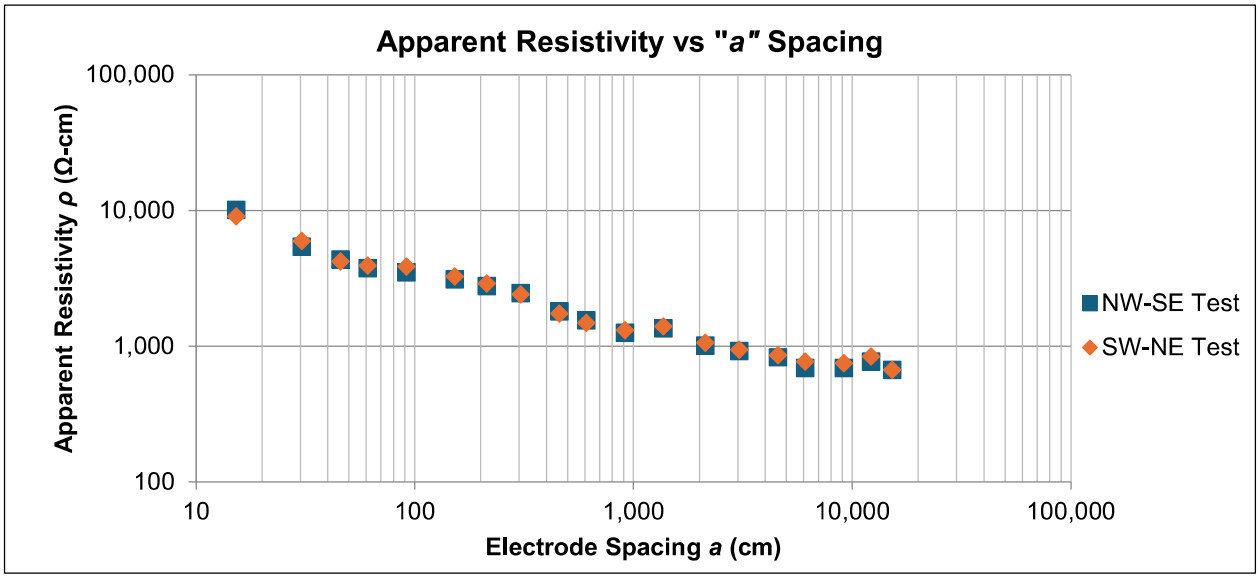
Stonehouse Substation ■ Adams County, Colorado
October 3, 2025 ■ Terracon Project No. 25255177

Array Loc.	FER-1 Center at 39.9348º, -104.7121º		
Instrument	L&R Mini Res	**Weather**	70ºF, Clear
Serial #	SN-375	**Ground Cond.**	Dry
Cal. Check	9/4/2025	**Tested By**	WRL & NC
Test Date	9/4/2025	**Method**	Wenner 4-pin (ASTM G57-06 (2020); IEEE 81-2012)
Notes & Conflicts			

Apparent resistivity ρ is calculated as :

$$\rho = \frac{4\pi a R}{1 + \frac{2a}{\sqrt{a^2 + 4b^2}} - \frac{a}{\sqrt{a^2 + b^2}}}$$

Electrode Spacing *a*		Electrode Depth *b*		NW-SE Test		SW-NE Test	
(feet)	(centimeters)	(inches)	(centimeters)	Measured Resistance *R*	Apparent Resistivity ρ	Measured Resistance *R*	Apparent Resistivity ρ
				Ω	(Ω-cm)	Ω	(Ω-cm)
0.5	15	6	15	62.8	10,080	56.5	9,070
1	30	6	15	21.6	5,410	23.8	5,970
1.5	46	6	15	13.111	4,370	12.622	4,210
2	61	6	15	8.904	3,740	9.355	3,930
3	91	6	15	5.846	3,510	6.426	3,860
5	152	6	15	3.192	3,110	3.359	3,270
7	213	6	15	2.047	2,770	2.141	2,890
10	305	12	30	1.270	2,470	1.233	2,400
15	457	12	30	0.622	1,800	0.601	1,740
20	610	12	30	0.403	1,550	0.388	1,490
30	914	12	30	0.217	1,250	0.228	1,310
45	1,372	12	30	0.157	1,350	0.162	1,400
70	2,134	12	30	0.075	1,010	0.079	1,060
100	3,048	12	30	0.048	920	0.049	940
150	4,572	12	30	0.029	830	0.030	860
200	6,096	12	30	0.018	690	0.020	770
300	9,144	12	30	0.012	690	0.013	750
400	12,192	12	30	0.010	770	0.011	840
500	15,240	12	30	0.007	670	0.007	670



Drilled Pier Design Parameters

Contents:

Drilled Pier Design Parameters

Note: All attachments are one page unless noted above.

United Power Stonehouse Substation
Recommended Soil Parameters for MFAD and LPile Analysis

Boring No.	Soil Type (p-y) Curve Model	Applicable Layer for Design Parameters (feet) [1]	Depth to Ground-water (feet)	Ultimate Soil Parameters (Lateral Loading)						Allowable Pressure for Vertical Loading	
				Effective Unit Weight (pcf)	Cohesion (psf)	Internal Friction Angle (deg.)	Modulus of Deformation (ksi)	Soil Modulus (pci)	e50	Skin Friction (psf) [3,4]	Maximum End Bearing (psf) [2,3]
SB-01 through SB-06	Sand (Reese)	0 to 3	Not Encountered	110	---	30	0.5	Allow L-Pile Program to choose values based on the other parameters in this table.		---	---
	Sand (Reese)	3 to 10		110	---	30	0.5			150	1,500
	Stiff Clay w/o Free Water	10 to 15		110	1,000	---	1.1			500	5,500
	Stiff Clay w/o Free Water	15 to 30		110	1,250	---	1.5			700	7,500
	Stiff Clay w/o Free Water	30 to 40		130	5,000	---	3.1			1,100	15,000

1. Depth below existing ground surface.
2. Applicable for a minimum two times the pier diameter socket into the bearing stratum and at least 3 feet below existing grade.
3. A factor of safety of 3 was used to determine the allowable bearing pressure, while a factor of safety of 2 was used to determine the allowable compressive skin friction.
4. Applicable for compressive loading only. Reduce 2/3 of value shown for uplift loading. Effective weight of shaft can be added to uplift load capacity.

Supporting Information

Contents:

Note: All attachments are one page unless noted above.

Terracon
10625 W I70 Frontage Rd N
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General Notes

Sampling

Water Level

Water Initially Encountered

Water Level After a Specified Period of Time

Water Level After a Specified Period of Time

Cave In Encountered

Water levels indicated on the soil boring logs are the levels measured in the borehole at the times indicated. Groundwater level variations will occur over time. In low permeability soils, accurate determination of groundwater levels is not possible with short term water level observations.

Field Tests

N	Standard Penetration Test Resistance (Blows/Ft.)
(HP)	Hand Penetrometer
(T)	Torvane
(DCP)	Dynamic Cone Penetrometer
UC	Unconfined Compressive Strength
(PID)	Photo-Ionization Detector
(OVA)	Organic Vapor Analyzer

Descriptive Soil Classification

Soil classification as noted on the soil boring logs is based Unified Soil Classification System. Where sufficient laboratory data exist to classify the soils consistent with ASTM D2487 "Classification of Soils for Engineering Purposes" this procedure is used. ASTM D2488 "Description and Identification of Soils (Visual-Manual Procedure)" is also used to classify the soils, particularly where insufficient laboratory data exist to classify the soils in accordance with ASTM D2487. In addition to USCS classification, coarse grained soils are classified on the basis of their in-place relative density, and fine-grained soils are classified on the basis of their consistency. See "Strength Terms" table below for details. The ASTM standards noted above are for reference to methodology in general. In some cases, variations to methods are applied as a result of local practice or professional judgment.

Location And Elevation Notes

Exploration point locations as shown on the Exploration Plan and as noted on the soil boring logs in the form of Latitude and Longitude are approximate. See Exploration and Testing Procedures in the report for the methods used to locate the exploration points for this project. Surface elevation data annotated with +/- indicates that no actual topographical survey was conducted to confirm the surface elevation. Instead, the surface elevation was approximately determined from topographic maps of the area.

Strength Terms

Relative Density of Coarse-Grained Soils
(More than 50% retained on No. 200 sieve.)
Density determined by Standard Penetration Resistance

Relative Density	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)
Very Loose	0 - 3	0 - 5
Loose	4 - 9	6 - 14
Medium Dense	10 - 29	15 - 46
Dense	30 - 50	47 - 79
Very Dense	> 50	≥ 80

Consistency of Fine-Grained Soils
(50% or more passing the No. 200 sieve.)
Consistency determined by laboratory shear strength testing, field visual-manual procedures or standard penetration resistance

Consistency	Unconfined Compressive Strength Qu (psf)	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)
Very Soft	less than 500	0 - 1	< 3
Soft	500 to 1,000	2 - 4	3 - 5
Medium Stiff	1,000 to 2,000	4 - 8	6- 10
Stiff	2,000 to 4,000	8 - 15	11 - 18
Very Stiff	4,000 to 8,000	15 - 30	19 - 36
Hard	> 8,000	> 30	> 36

Bedrock

Consistency	Standard Penetration or N-Value (Blows/Ft.)	Ring Sampler (Blows/Ft.)
Weathered	< 20	< 24
Firm	20 - 29	24 - 35
Medium Hard	30 - 49	36 - 60
Hard	50 - 79	61 - 96
Very Hard	>79	> 96

Relevance of Exploration and Laboratory Test Results

Exploration/field results and/or laboratory test data contained within this document are intended for application to the project as described in this document. Use of such exploration/field results and/or laboratory test data should not be used independently of this document.

Terracon
10625 W I70 Frontage Rd N
Ste 3
Wheat Ridge, CO

Unified Soil Classification System

Criteria for Assigning Group Symbols and Group Names Using Laboratory Tests [A]				Soil Classification	
				Group Symbol	Group Name [B]
Coarse-Grained Soils: More than 50% retained on No. 200 sieve	**Gravels:** More than 50% of coarse fraction retained on No. 4 sieve	**Clean Gravels:** Less than 5% fines [C]	Cu≥4 and 1≤Cc≤3 [E]	GW	Well-graded gravel [F]
			Cu<4 and/or [Cc<1 or Cc>3.0] [E]	GP	Poorly graded gravel [F]
		Gravels with Fines: More than 12% fines [C]	Fines classify as ML or MH	GM	Silty gravel [F, G, H]
			Fines classify as CL or CH	GC	Clayey gravel [F, G, H]
	Sands: 50% or more of coarse fraction passes No. 4 sieve	**Clean Sands:** Less than 5% fines [D]	Cu≥6 and 1≤Cc≤3 [E]	SW	Well-graded sand [I]
			Cu<6 and/or [Cc<1 or Cc>3.0] [E]	SP	Poorly graded sand [I]
		Sands with Fines: More than 12% fines [D]	Fines classify as ML or MH	SM	Silty sand [G, H, I]
			Fines classify as CL or CH	SC	Clayey sand [G, H, I]
Fine-Grained Soils: 50% or more passes the No. 200 sieve	**Silts and Clays:** Liquid limit less than 50	**Inorganic:**	PI > 7 and plots above "A" line [J]	CL	Lean clay [K, L, M]
			PI < 4 or plots below "A" line [J]	ML	Silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OL	Organic clay [K, L, M, N]
					Organic silt [K, L, M, O]
	Silts and Clays: Liquid limit 50 or more	**Inorganic:**	PI plots on or above "A" line	CH	Fat clay [K, L, M]
			PI plots below "A" line	MH	Elastic silt [K, L, M]
		Organic:	$\frac{LL\ oven\ dried}{LL\ not\ dried} < 0.75$	OH	Organic clay [K, L, M, P]
					Organic silt [K, L, M, Q]
Highly organic soils:	Primarily organic matter, dark in color, and organic odor			PT	Peat

[A] Based on the material passing the 3-inch (75-mm) sieve.
[B] If field sample contained cobbles or boulders, or both, add "with cobbles or boulders, or both" to group name.
[C] Gravels with 5 to 12% fines require dual symbols: GW-GM well-graded gravel with silt, GW-GC well-graded gravel with clay, GP-GM poorly graded gravel with silt, GP-GC poorly graded gravel with clay.
[D] Sands with 5 to 12% fines require dual symbols: SW-SM well-graded sand with silt, SW-SC well-graded sand with clay, SP-SM poorly graded sand with silt, SP-SC poorly graded sand with clay.
[E] $Cu = D_{60}/D_{10}$ $Cc = \frac{(D_{30})^2}{D_{10} \times D_{60}}$
[F] If soil contains ≥ 15% sand, add "with sand" to group name.
[G] If fines classify as CL-ML, use dual symbol GC-GM, or SC-SM.
[H] If fines are organic, add "with organic fines" to group name.
[I] If soil contains ≥ 15% gravel, add "with gravel" to group name.
[J] If Atterberg limits plot in shaded area, soil is a CL-ML, silty clay.
[K] If soil contains 15 to 29% plus No. 200, add "with sand" or "with gravel," whichever is predominant.
[L] If soil contains ≥ 30% plus No. 200 predominantly sand, add "sandy" to group name.
[M] If soil contains ≥ 30% plus No. 200, predominantly gravel, add "gravelly" to group name.
[N] PI ≥ 4 and plots on or above "A" line.
[O] PI < 4 or plots below "A" line.
[P] PI plots on or above "A" line.
[Q] PI plots below "A" line.