Rate Review Committee
January 13, 2026
5:30pm
Newberg Public Safety Building 401 E. Third Street
Denise Bacon Community Room
Online: https://us06web.zoom.us/j/89536547180
Public Comment Registration:
https://www.newbergoregon.gov/government/departments/public_comment_registration.php

1. **Call to Order**
2. **Roll Call**
3. **Pledge of Allegiance**
4. **Public Comments**
5. **Election of Chair and Vice Chair***
6. **Reports and Presentations**
    a. Wastewater CIP Presentation
    b. Wastewater Financial Presentation
    c. Additional Information*
        i. CIP Process*
        ii. Eagle Elsner RFP*
        iii. Keller GES Report*
7. **Next Meeting – January 27th**
8. **Adjournment**

ADA Statement: Contact the City Recorder's Office for physical or language accommodation at least 2 business days before the meeting. Call (503) 537-1283 or email cityrecorder@newbergoregon.gov. For TTY services please dial 711.

*Indicates supplementary item

Newberg Rates CIP Review

Wastewater Projects

If only I knew in 2021 what I know now…

In the last three years I have finished my second master's degree and taken over a direct leadership role in engineering – I have learned a lot. As you will see the city now has an enviable record of completing CIP projects on time and under budget.

In the last set of rate review meetings, we were challenged to re-do the rates model from scratch and that is exactly what we have done.

Everything in the model needs to be done in the near to medium future, there are no wish list projects. With that said the nation and region is still seeing high inflation and it was especially high just a few years ago.

To answer the challenge, you set me last time I built a new CIP choosing process and a new TUF roads selection process from scratch. I have included these documents in your packet.

Wastewater Capital Improvement Projects

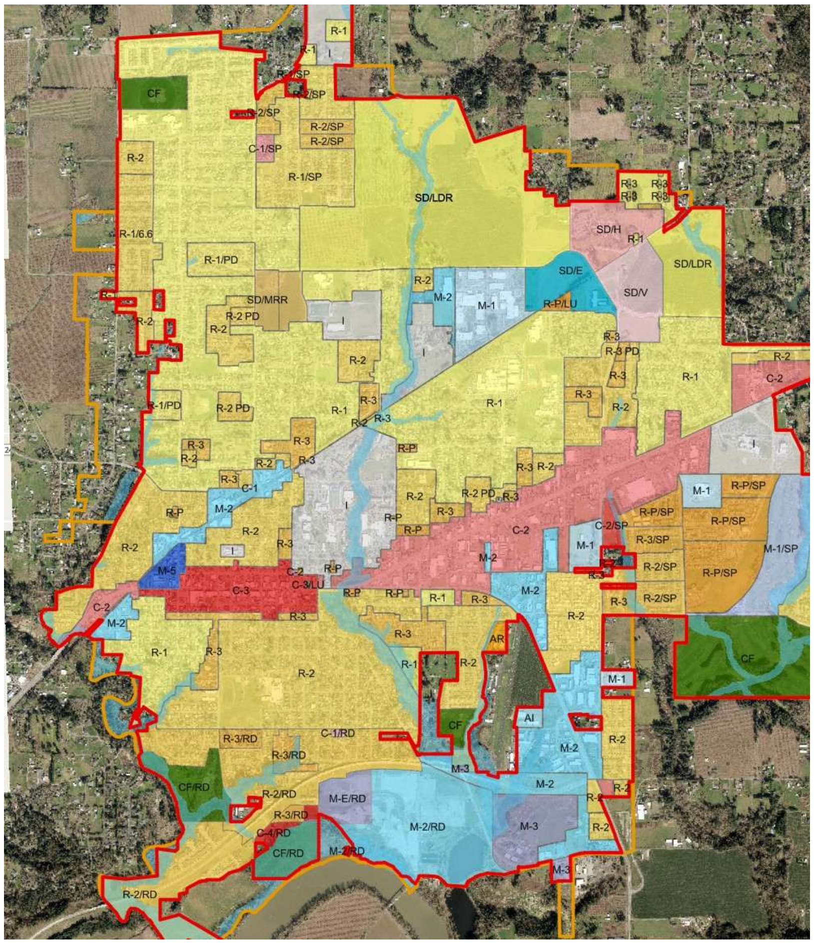
If only I knew in 2021 what I know now…

One difference from this model and the last is that we have not cited specific projects beyond the first five years, (except the needed water plant) but have added a placeholder for expenditures that we surely know will come. This is a more intelligent and flexible approach that lets the city tackle things as they come up in the priority set by the bi-annual CIP process.

No more adding projects that we may never need for a given decade!

Another key point is that the city continues to work on debt reduction. If we can get rid of our current debt (that heavily burdens the wastewater rates) and if we can avoid adding more debt, then the city can pay for infrastructure projects without interest – it's a no brainer.

Lastly, we have never been more effective, but I need some more staff this go around. We have been holding the line for four years (except for the sidewalk crew) and the city has grown by thousands of people in that time (from 25K to over 26K). Status quo on staffing is not sustainable.



2024 – 2026
Completed Projects

Project Title: Programmable Logic Controllers (PLC) for the Waste Water Plant

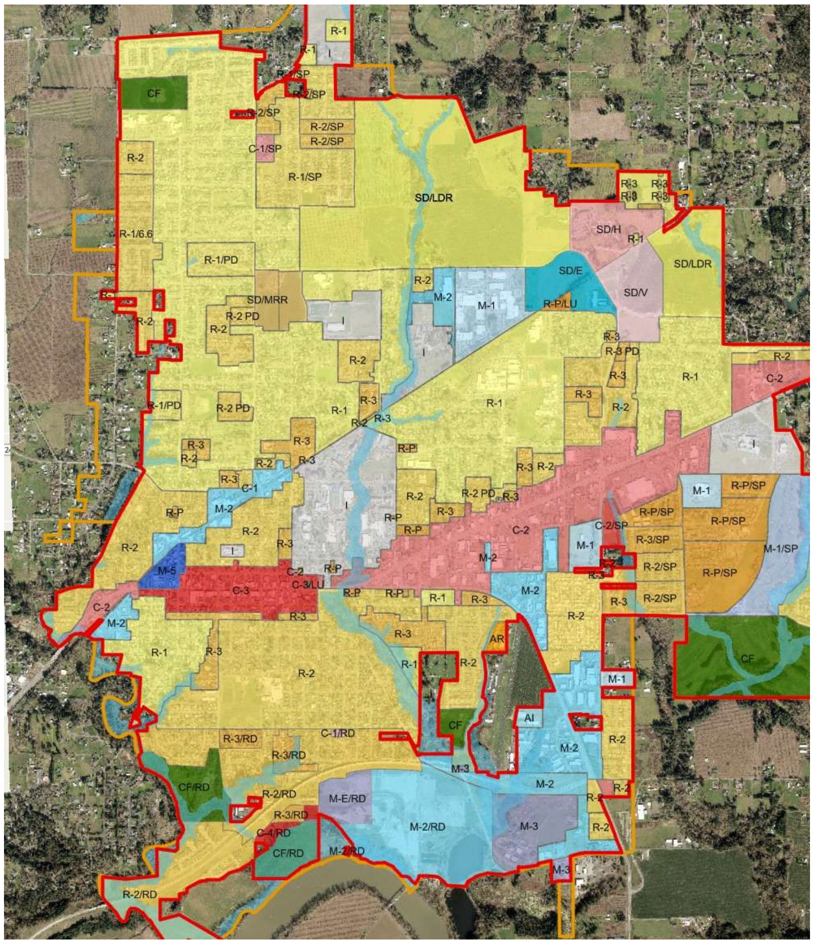
Expense total for BY 25-27: $1,079,474.25
SDC eligibility %: Nil

Description & Purpose:

The PLC project in Newberg, Oregon, involved upgrading the system at the Wastewater Treatment Plant (WWTP) for better control, security, and efficiency, a long-planned effort funded partly by grant funds and focused on replacing aging equipment with modern, redundant systems for smooth operation. This also enhanced our remote capabilities.

This budget overrun ($80K) was not acceptable (as could and should) have been predicted and estimated correctly. The staff member responsible is no longer with the city.

Wastewater Capital Improvement Projects



2025 – 2026
Finishing soon

Wastewater Capital Improvement Projects

Project Title: I & I study and report.

Estimated expense total for BY 25-27: $340,000

SDC eligibility %: Nil

Description & Purpose:

The "Newberg I & I Study" refers to the city's Inflow and Infiltration (I&I) Study, a crucial project to identify and fix leaks (I&I) in its sewer system, reducing stormwater overflow and protecting public hygiene.

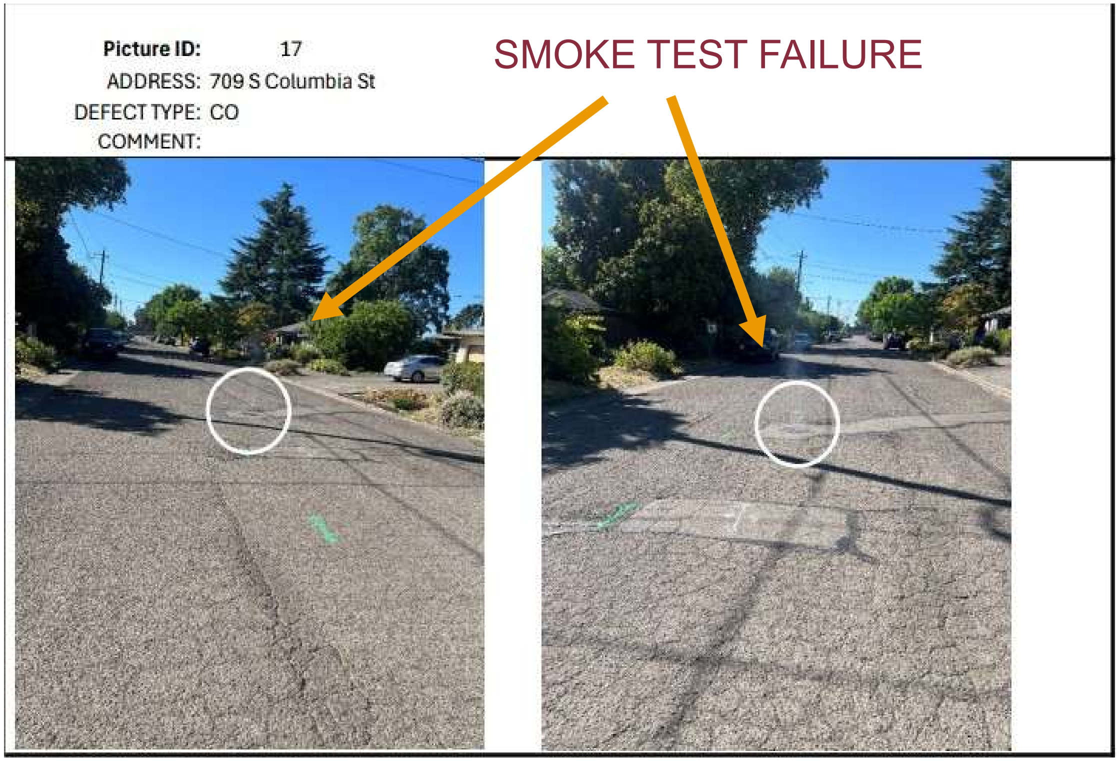
Wastewater Capital Improvement Projects

Project Title: I & I study and report

Estimated expense total for BY 25-27: <u>$340,000</u>

SDC eligibility %: Nil

Description & Purpose:
Recent phases including the council authorization for Keller Associates to conduct integrating data gathering from wet weather flows and smoke testing for repairs.



Things like the I & I study, and the Storm Water Master Plan produce hit lists of future CIP tasks for the next five years and beyond.

Project Title:
General wastewater pipe replacement fund

Estimated expense total for
BY 25-27: $300,000

SDC eligibility %: Nil

Description & Purpose:
We have not yet had to use this fund but may use it to take some strain off the Fernwood lift station at the end of the BY.

This is a contingency fund to combat unexpected below grade discoveries.

Project Title: Top Hats (The I & I Repair Project for BY 25-27)

Estimated expense total for BY 25-27: <u>$894,500</u>

SDC eligibility %: Nil used.

Description & Purpose:

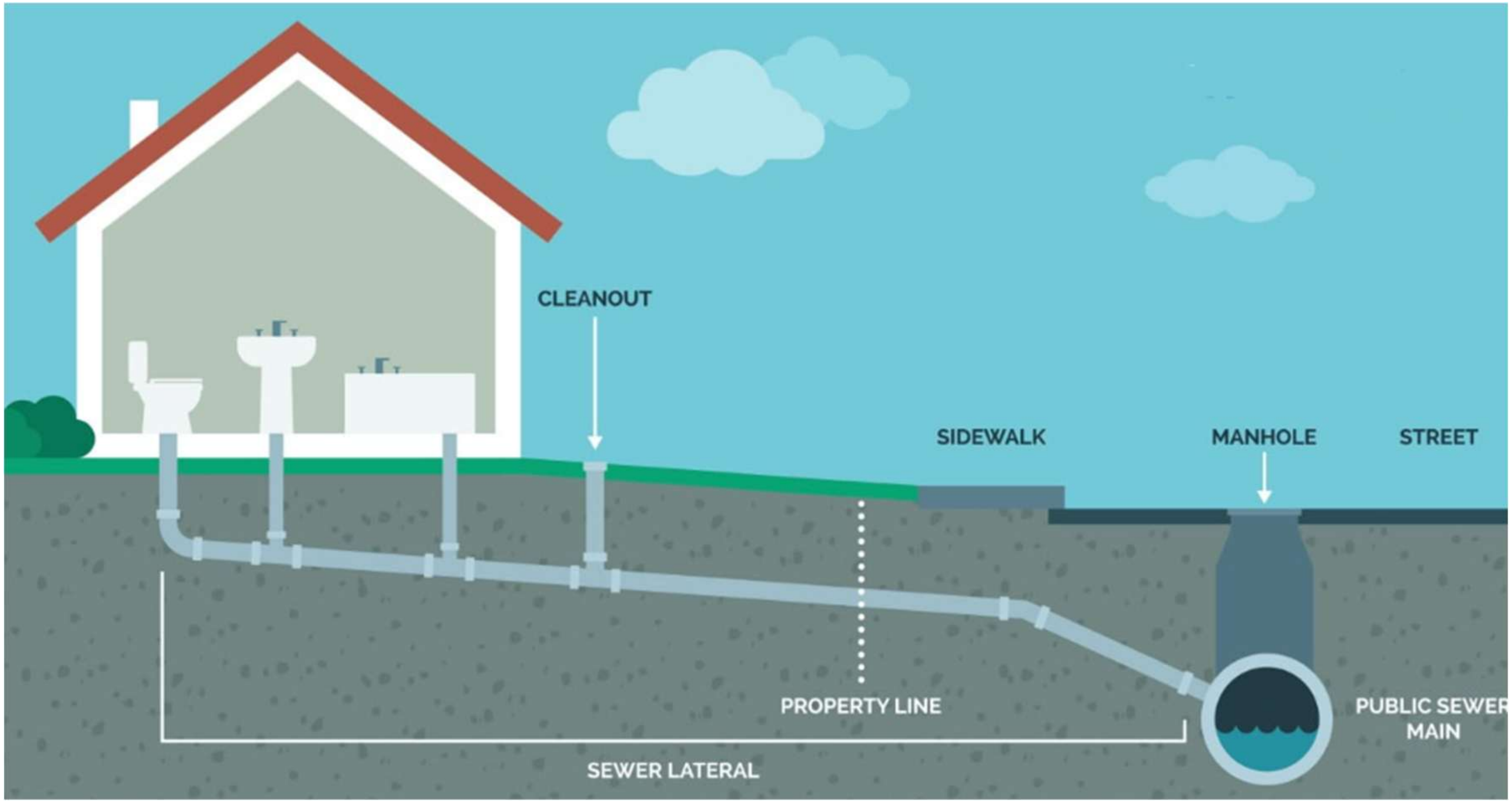
The main task a "Top hats" lateral sealing project – $894,500, is underway now and looking to be $15,000 under budget if all goes well based upon the bid price.

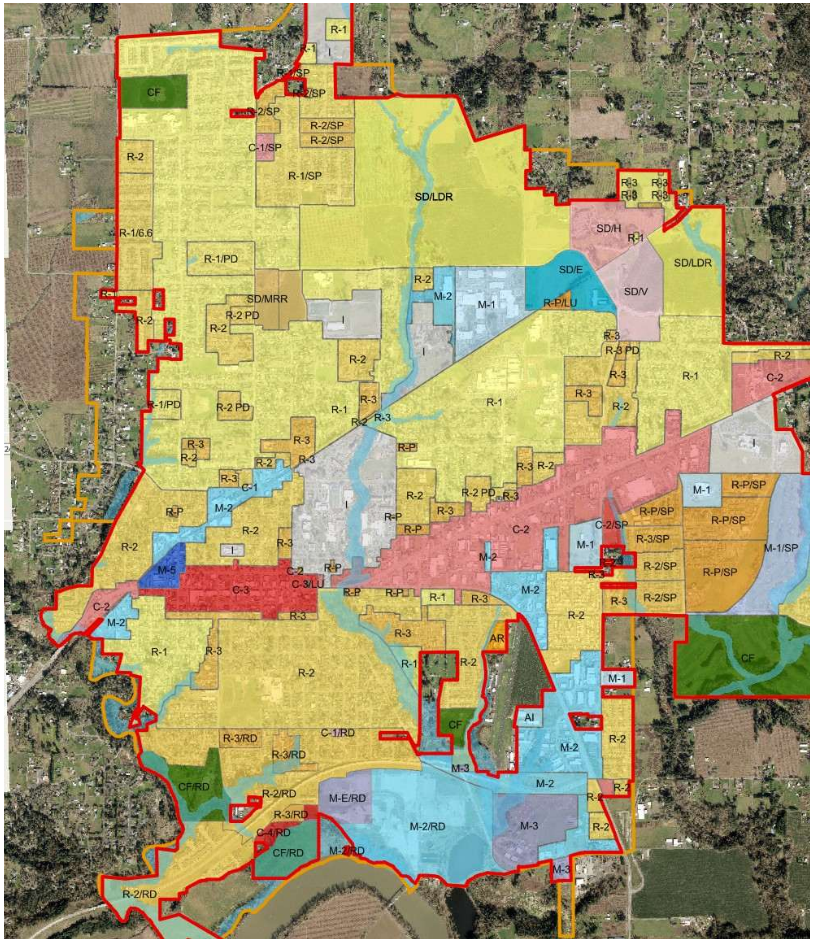
We hope this will stop sewage overflows from the Springbrook sewer line as has occurred twice before.

Rain / Sewage mix running down the side of Springbrook, Dec 2025 – 4" rain event.

DEC - 4" RAIN SPRINGBROOK SEWER OVER CAPACITY!

Project Title: I & I Repair Project → fixing 90+ laterals.



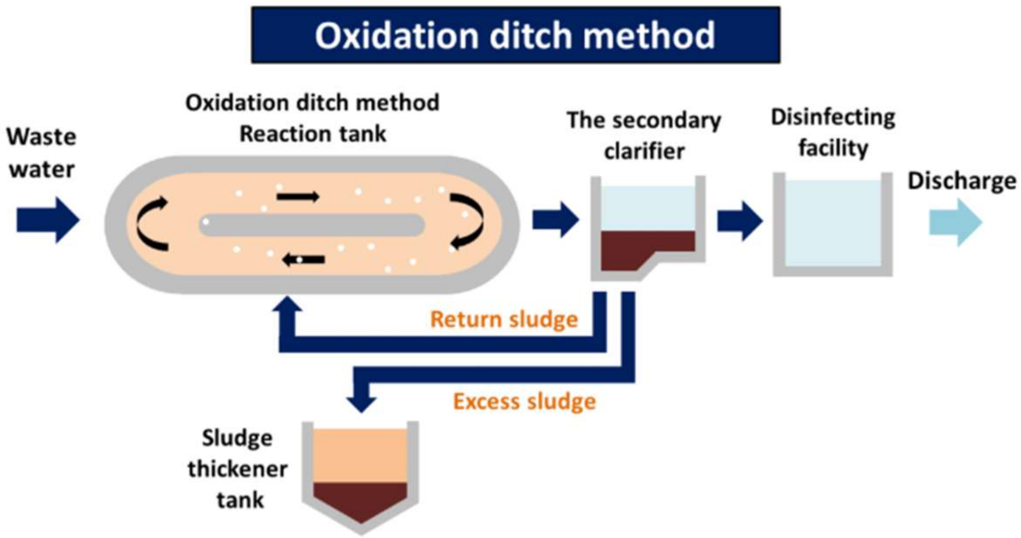


2024 – 2026 Ongoing & Future Projects

Project Title: Oxidation Ditch #3 & WWTP Upgrade

Estimated expense total for
BY 25-27 and BY 27 – 29: $25M - $30M*

SDC eligibility %:
Varies by element > 50%



Description & Purpose:

Oxidation Ditch #3 and plant expansion.
This is the biggest project that we faced over the next four years, and it will cost in the region of $25 to $30M. Several studies and stress tests have completed, and this will be going out to bid for design work in the near future.

* A DEQ decision on secondary clarifiers will set the final number.

Project Title: Oxidation Ditch #3 & WWTP Upgrade

Estimated expense total for
BY 25-27 and BY 27 – 29:
$25M - $30M *

SDC eligibility %:
Varies by element > 50%

Description & Purpose:
Key milestones – because we did not trust DEQs estimation of our capacity we already did our own capacity study to assure ourselves that the work is needed to get us to the 2040s.
We already completed a solids handling and design alternatives study to dial in on the most cost-effective ways of upsizing our flows and solids handling.

FIGURE 2-1: NEWBERG TUNNEL COMPOSTING

FIGURE 2-2: EXISTING COMPOSTING SITE LAYOUT

* A DEQ decision on secondary clarifiers will set the final number.

Description & Purpose:

The project will ultimately build another massive 300 foot concreate oxidation mixing ditch, mixers, add another secondary clarifier, and build compost bays and convincing equipment for human waste.

Now thanks to the foresight of the committee in adding this to the funding model last time we actually have enough cash on hand to do this without adding to the city's debt.

If we had to debt fund this it would be 30% to 40% more expensive in the end.

With that said, this upgrade will create sufficient capacity in the wastewater system to see us through to the 2040s even if population continues to grow at the current + 1% per year.

So that's the end of our exploration of our wastewater projects both past and future.

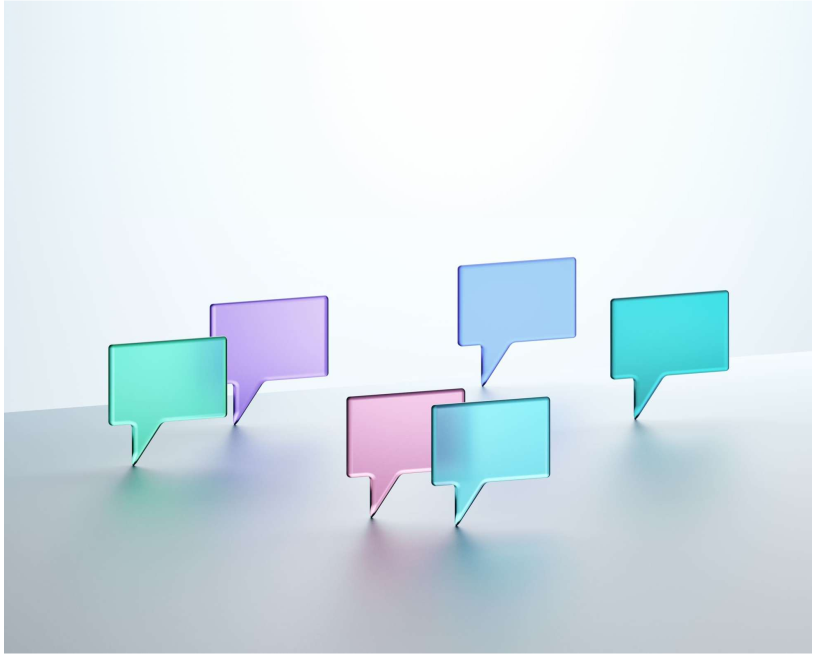
Questions?

2026 Rate Review

- Meeting #1: January 13, 2026

Discussion Topics

- Rate Review Process
- Background and Rate Trends
- Preliminary Sewer Financial Forecast Scenarios



RATE REVIEW PROCESS

Infrastructure Systems:

1. Sewer (wastewater)
2. Water
3. Stormwater
4. Transportation

Identify System Financial Needs

- Capital improvements
- Debt service
- Operation & maintenance
- Contingencies & reserves

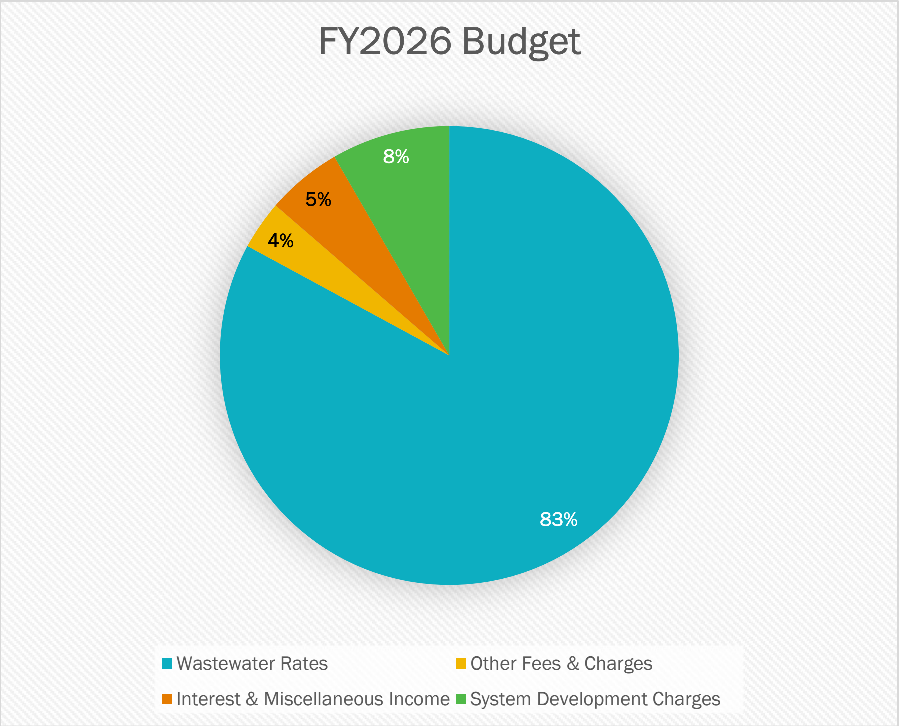
Evaluate Revenue Sources

- Revenue from rates
- Other fees and charges (e.g., system development charges)

Rate Recommendations

- Identify revenue increases by system
- Determine rate schedules

Rates are primary ongoing funding source



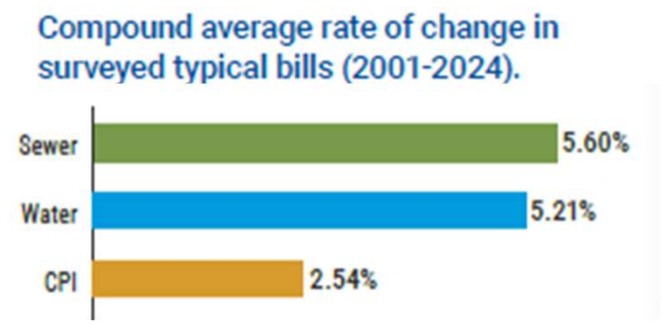
- System development charge revenues restricted to capital for growth
- Other fees & charges
  - Dumping/composting fees ($300K)
  - Development review ($125K)

Sewer Rate Increase History

City secures Clean Water loans for large portion of capital plan; large increases for water	Jan 1, 2013 – 0.00%
	Jan 1, 2014 – 3.00%
City proceeds with $25 million Wastewater Treatment Plant expansion and other capital projects	Jan 1, 2015 – 5.75%
	Jan 1, 2016 – 5.75%
City Council directs additional funding for infiltration & inflow projects	Jan 1, 2017 – 4.20%
	Jan 1, 2018 – 4.20%
Moderate capital spending; strong customer growth and SDC revenue; maintain cash reserves	Jan 1, 2019 – 3.50%
	Jan 1, 2020 – 3.50%
	Jan 1, 2021 – 3.50%
	Jan 1, 2022 – 3.50%
	Jan 1, 2023 – 3.50%
	Jan 1, 2024 – 3.50%
	Jan 1, 2025 – 3.50%
	Jan 1, 2026 – 3.50%

National Utility Rate Trends

- Recent National Survey Findings*
  - Combined water and sewer bill increases averaged about 24% between 2019-2024
  - Projected cumulative sewer rate increases between 2024-2029 = 31%
- Increase Factors: Inflation, operational costs, capital investment needs

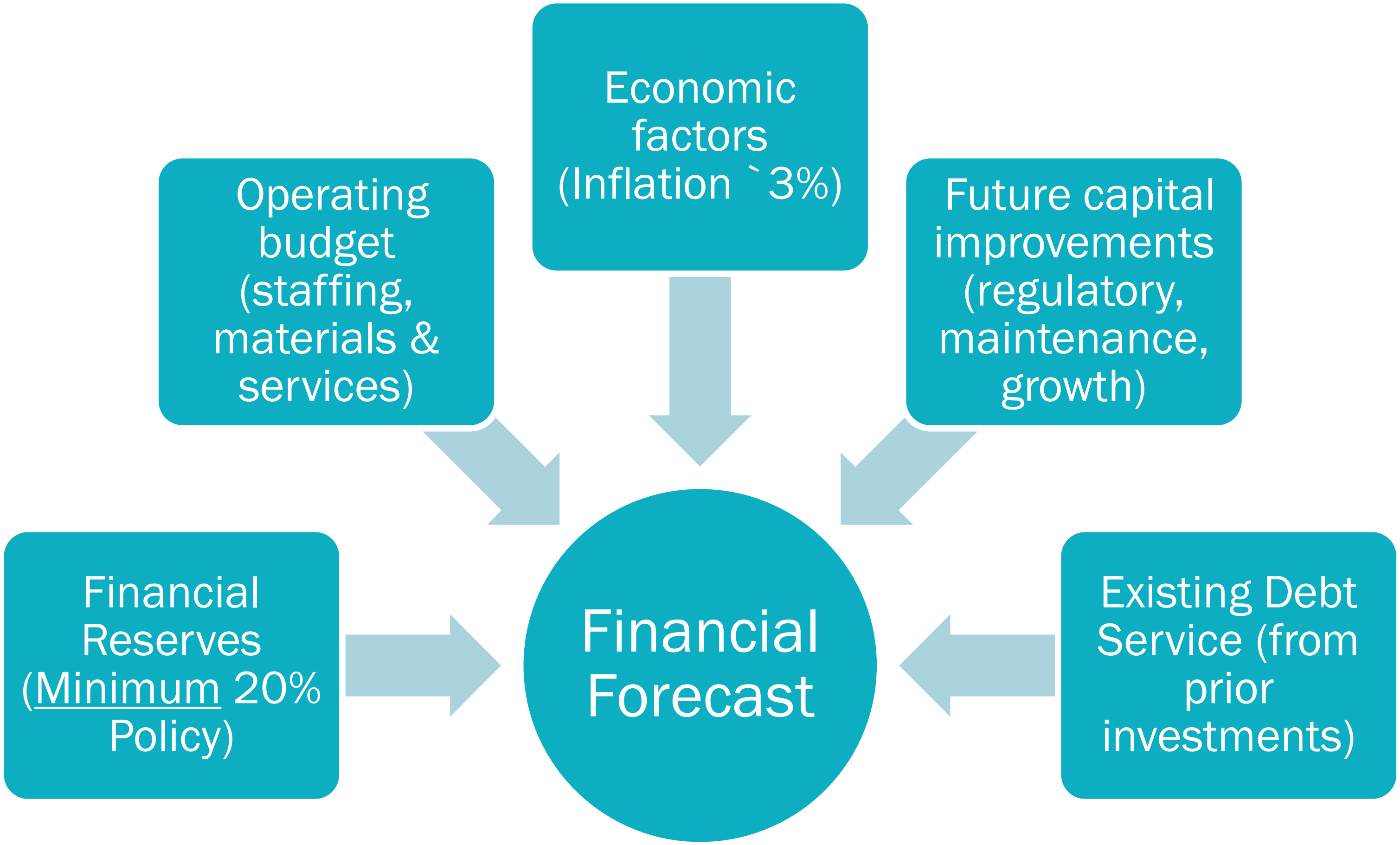


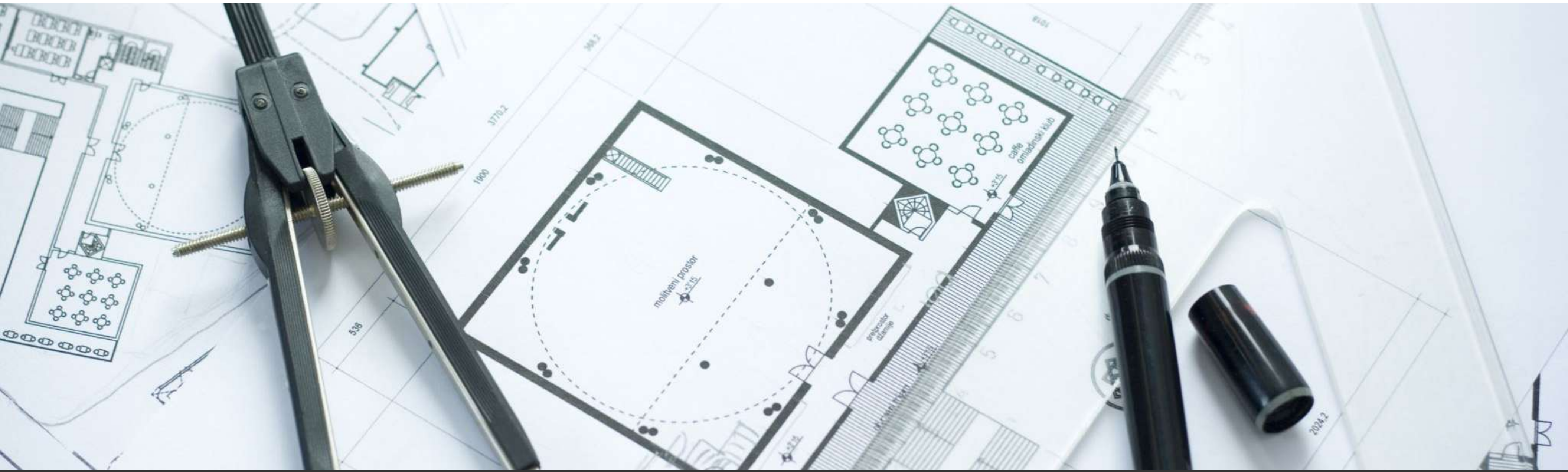
Source: Black & Veatch 2024 Rate Report

"...the CPI index maybe too broad to accurately reflect the variety of costs that impact utilities"

*Sources: *US Municipal Utility Water Rates Index 2024 (Bluefield Research); 2024 Cost of Clean Water Index (NACWA)*

Determining Financial Needs





Wastewater Financial Plan

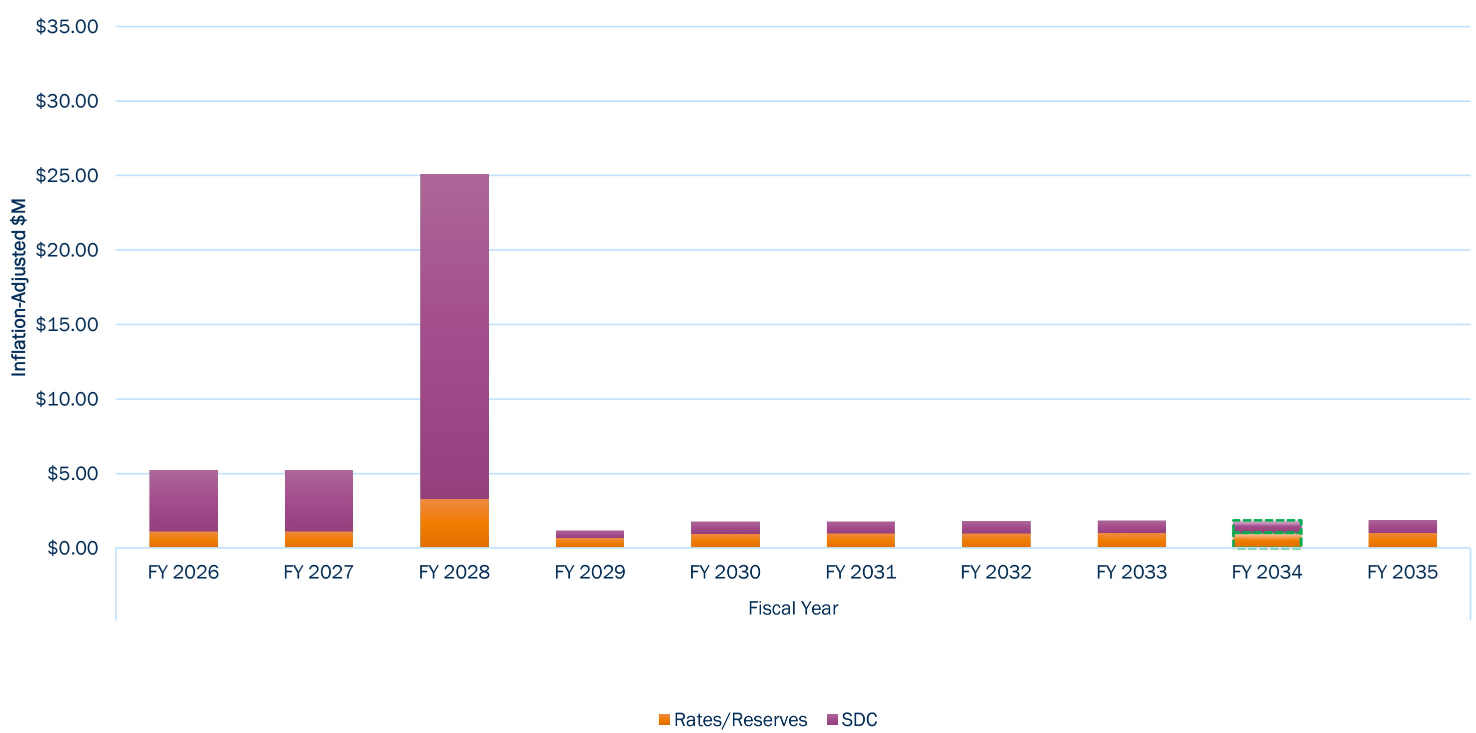
5-Year Capital Plan (Minimum I/I)

- Major investment front-loaded: Oxidation ditches (regulatory, growth-driven)
- Ongoing projects: Infiltration & inflow (I/I), pipe replacement, future project reserves
  - ***Policy question: funding I/I at $0.5 M or $1.0 M per year (Expanded I/I)***

	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030
CIP Expenditure	**$ 5,200,042**	**$ 5,205,292**	**$ 24,593,290**	**$ 666,308**	**$ 1,245,890**
Project Name					
Inflow & Infiltration (I&I) Projects	$500,000	$500,000	$500,000	$500,000	$500,000
Maintenance Yard	95,345	95,345	-	-	-
Pipe Replacement	150,000	155,250	160,684	166,308	172,128
Capital Project Reserve	-	-	-	-	573,762
I & I Report	171,000	171,000	-	-	-
Oxidation Ditches	4,283,697	4,283,697	23,932,606	-	-
	-	-	-	-	-

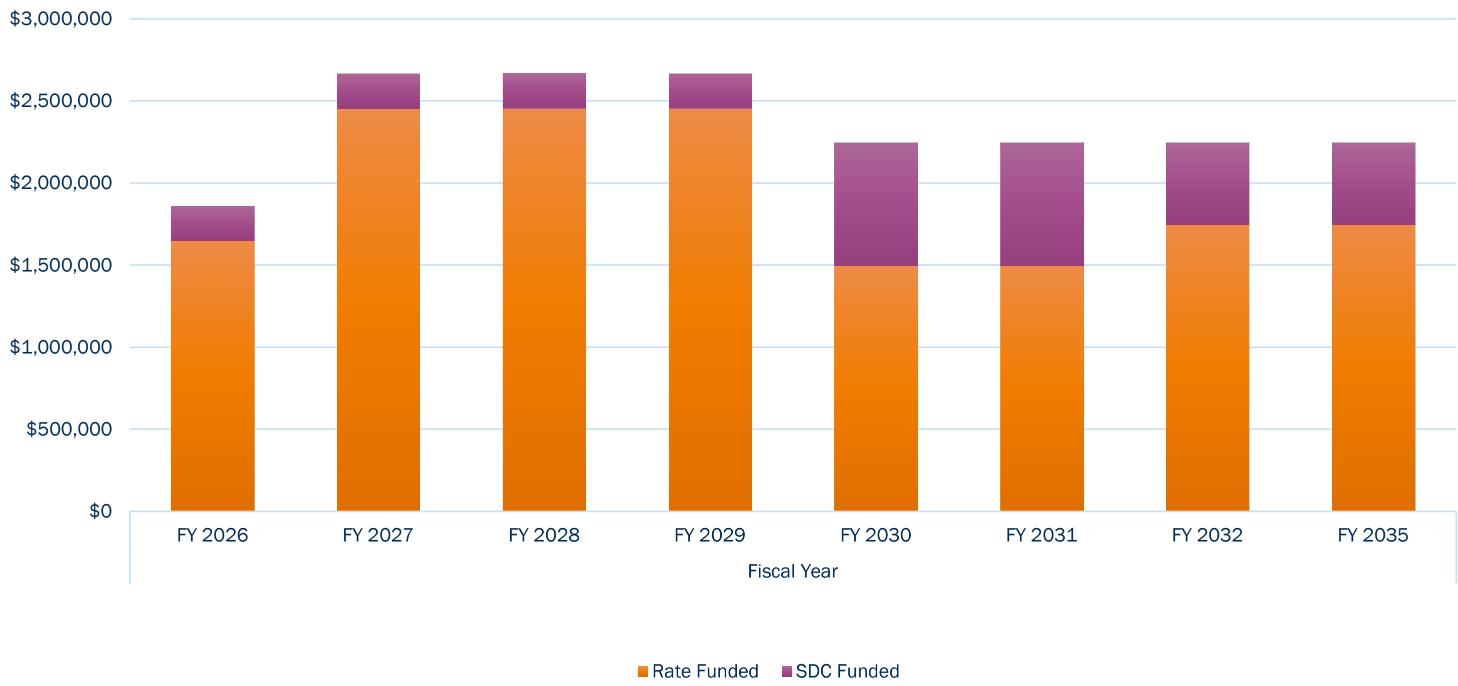
10-Year Capital Funding

- **Based on $6M loan from Water Fund and minimum ($0.5M/year) for Infiltration & Inflow projects**

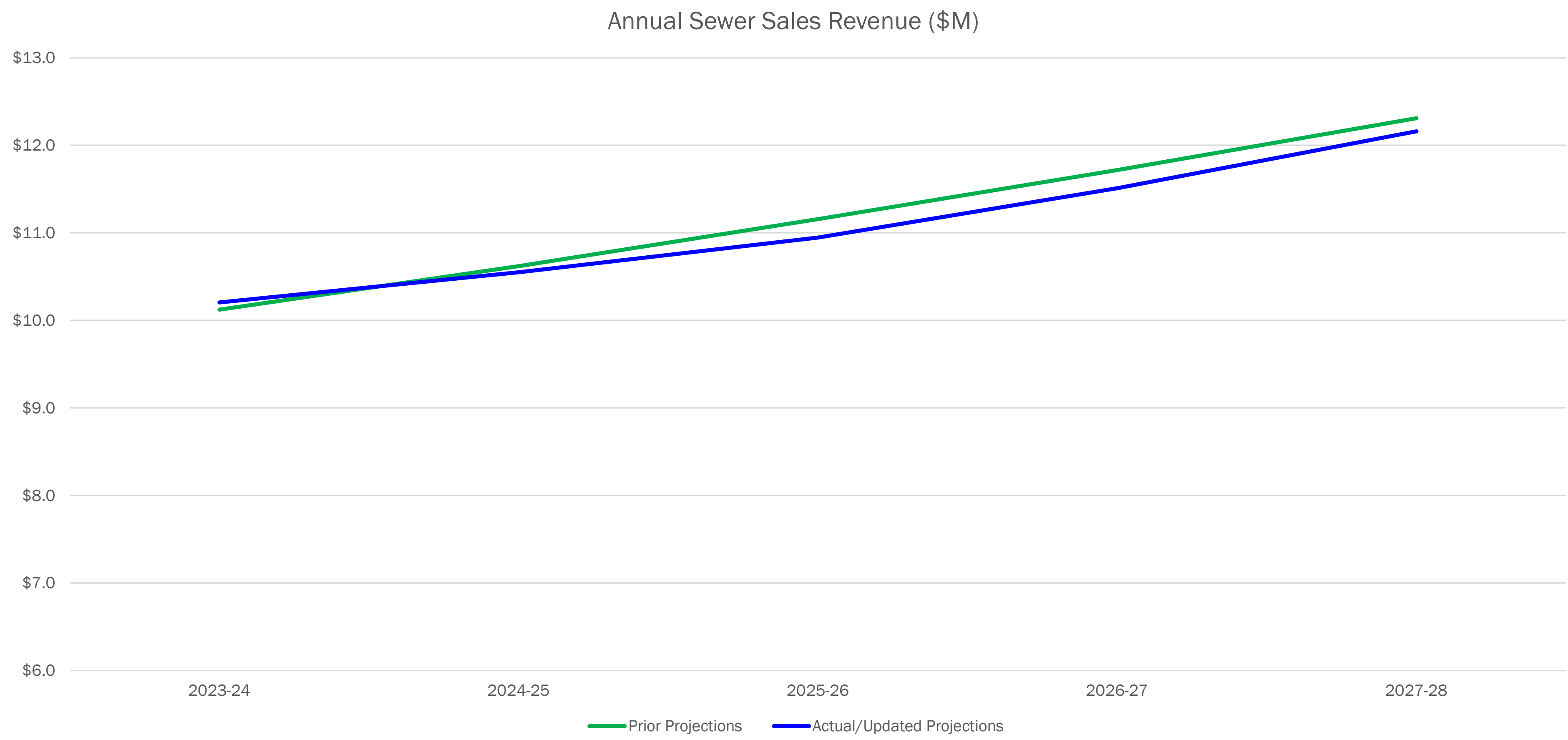


Projected Annual Debt Service

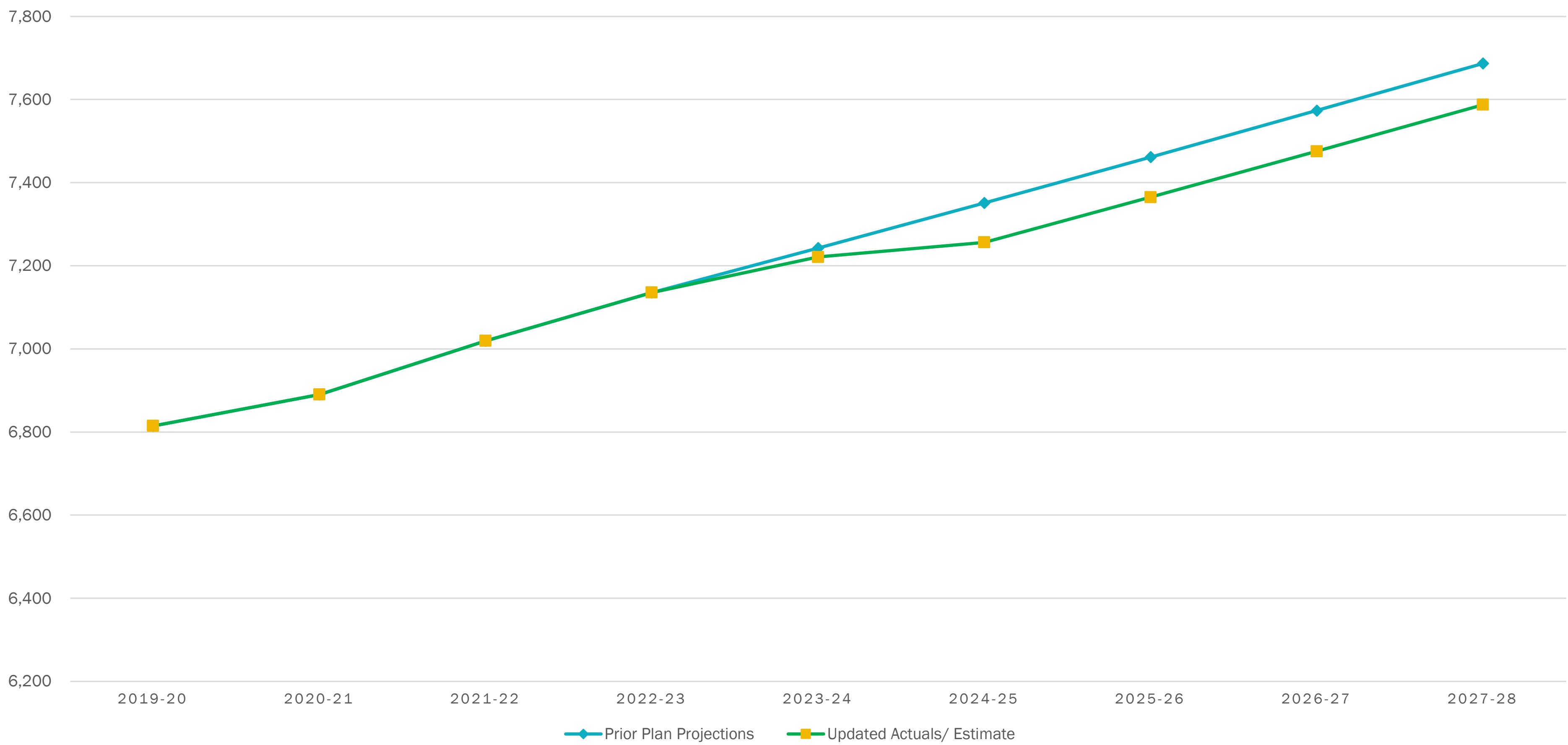
- Existing debt = effluent reuse loan (2029), wastewater treatment improvements (2036)
- New water loan 2027-2035



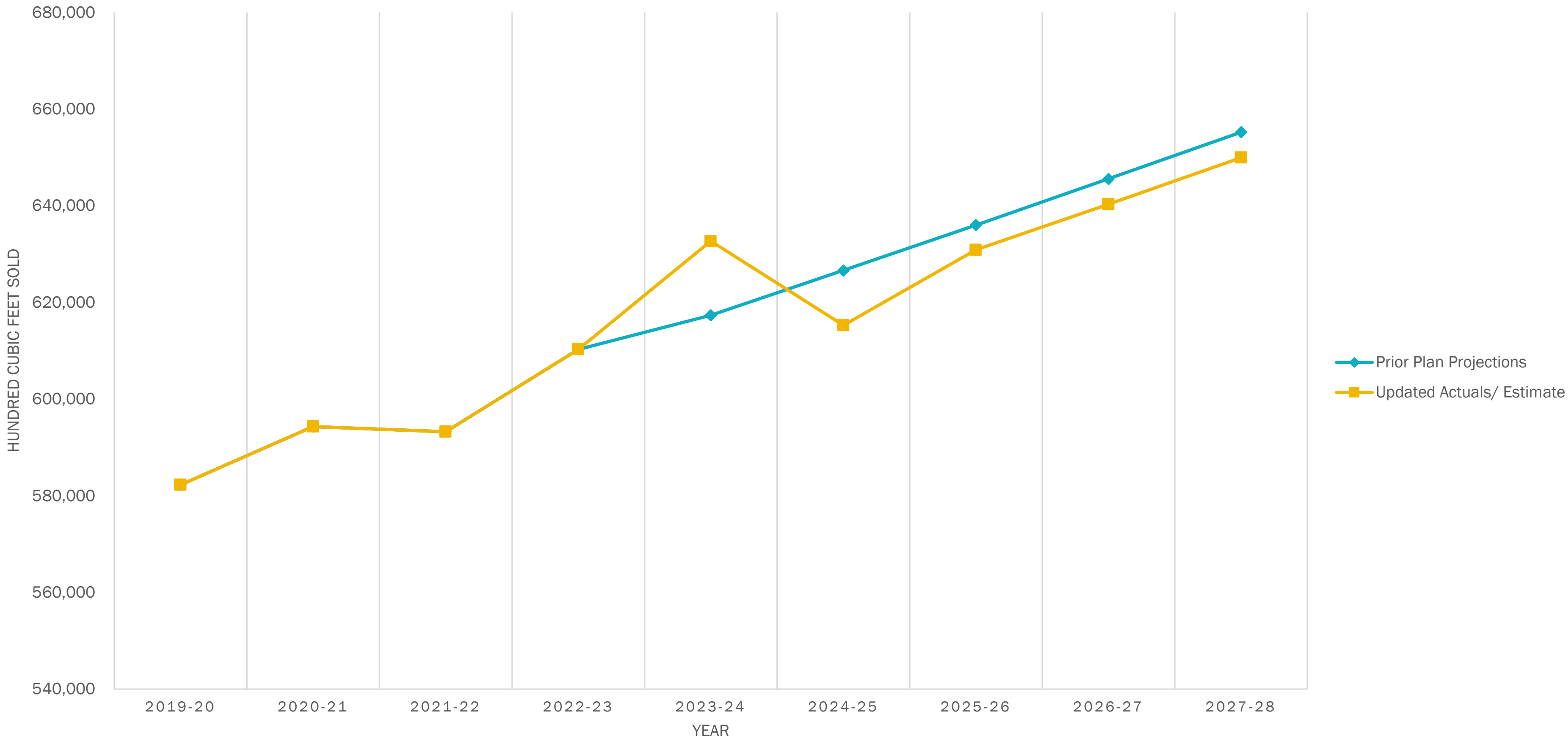
Projected vs Actual Revenue



Projected Sewer Account Growth



Projected Sales Volumes

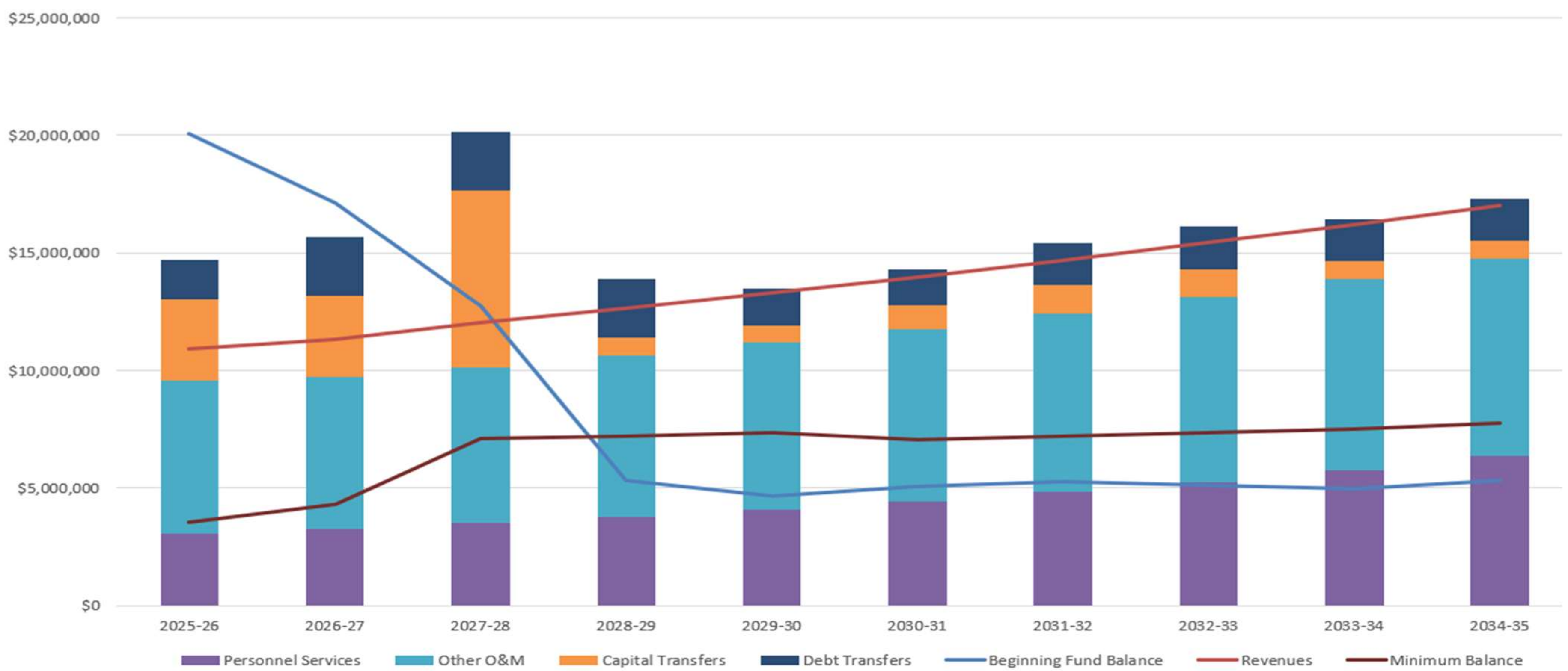


10-Year Projections: Minimum I/I

Revenue forecast assumes 3.5% rate increase per year

Minimum I/I Funding = $500K per year

Meets O&M and debt service reserve target; slightly lower than prior target (including rate stabilization and repair and replacement reserve)

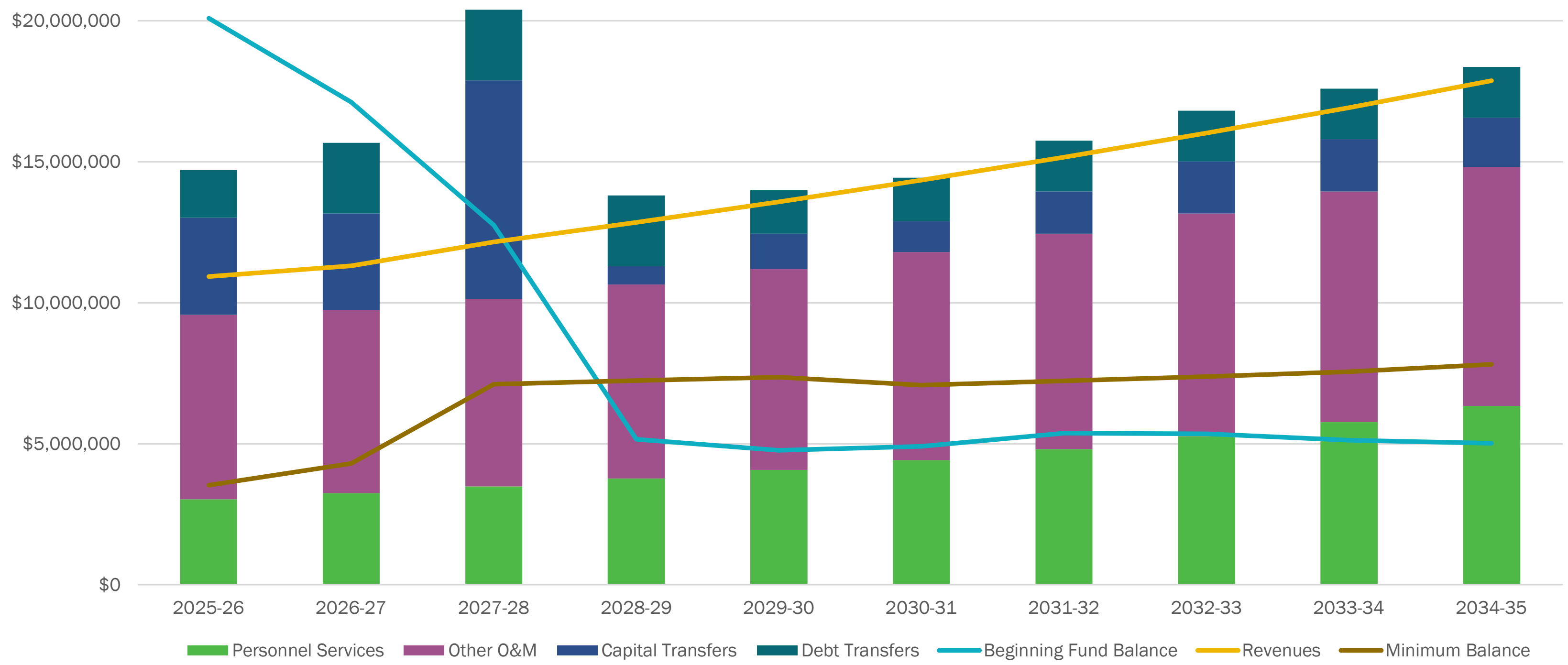


10-Year Projections: Expanded I/I

Revenue forecast assumes 4.1% rate increase per year

Expanded I/I Funding = $1 M per year

Meets O&M and debt service reserve target; slightly lower than prior target (including rate stabilization and repair and replacement reserve)



Current Sewer Rates

Customer Class	January 2026
Service Charge ($/Month)	
Billing Charge ($/Account)	$33.63
Infiltration & Inflow ($/Dwelling Unit)	$26.41
Volume Charge ($/ccf)	
Single Family	$10.95
Multifamily	$10.95
Commercial - 1	$10.95
Commercial - 2	$13.87
Commercial - 3	$22.54
Industrial	$13.87
Outside City	$10.95

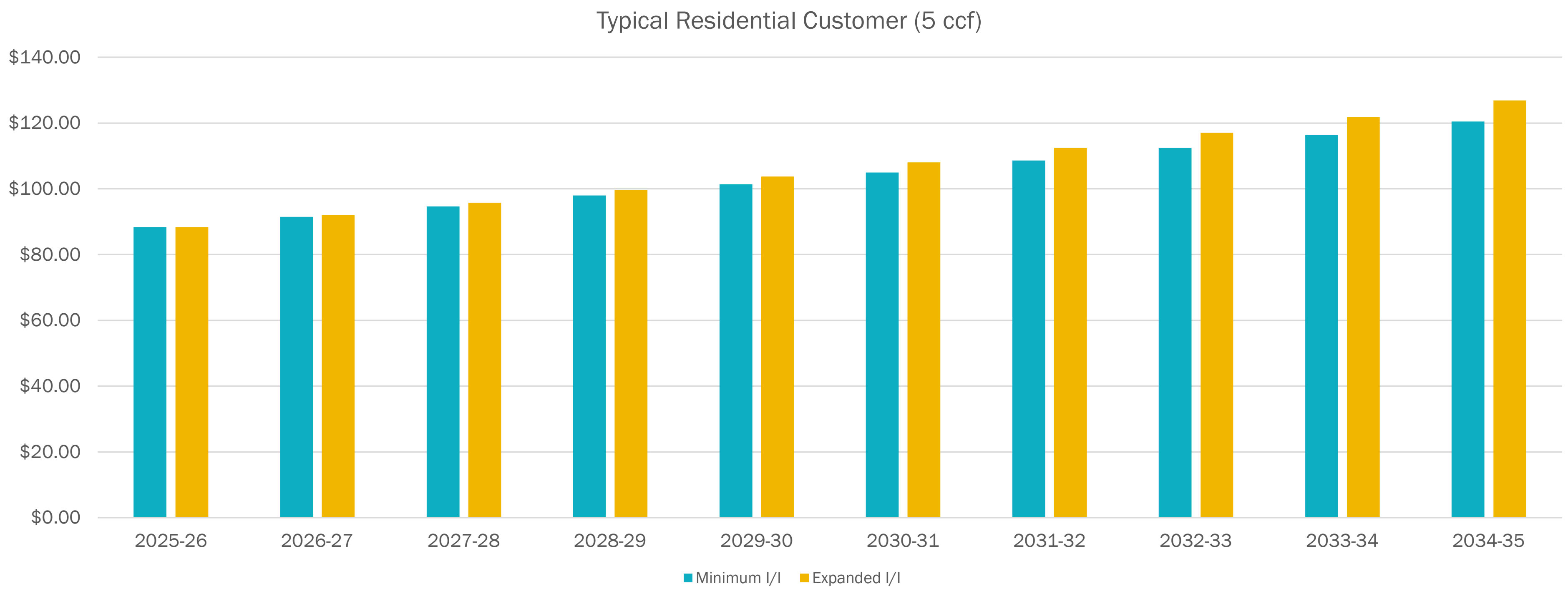
Note:

Commercial 1 includes general businessess, public agencies, and schools.

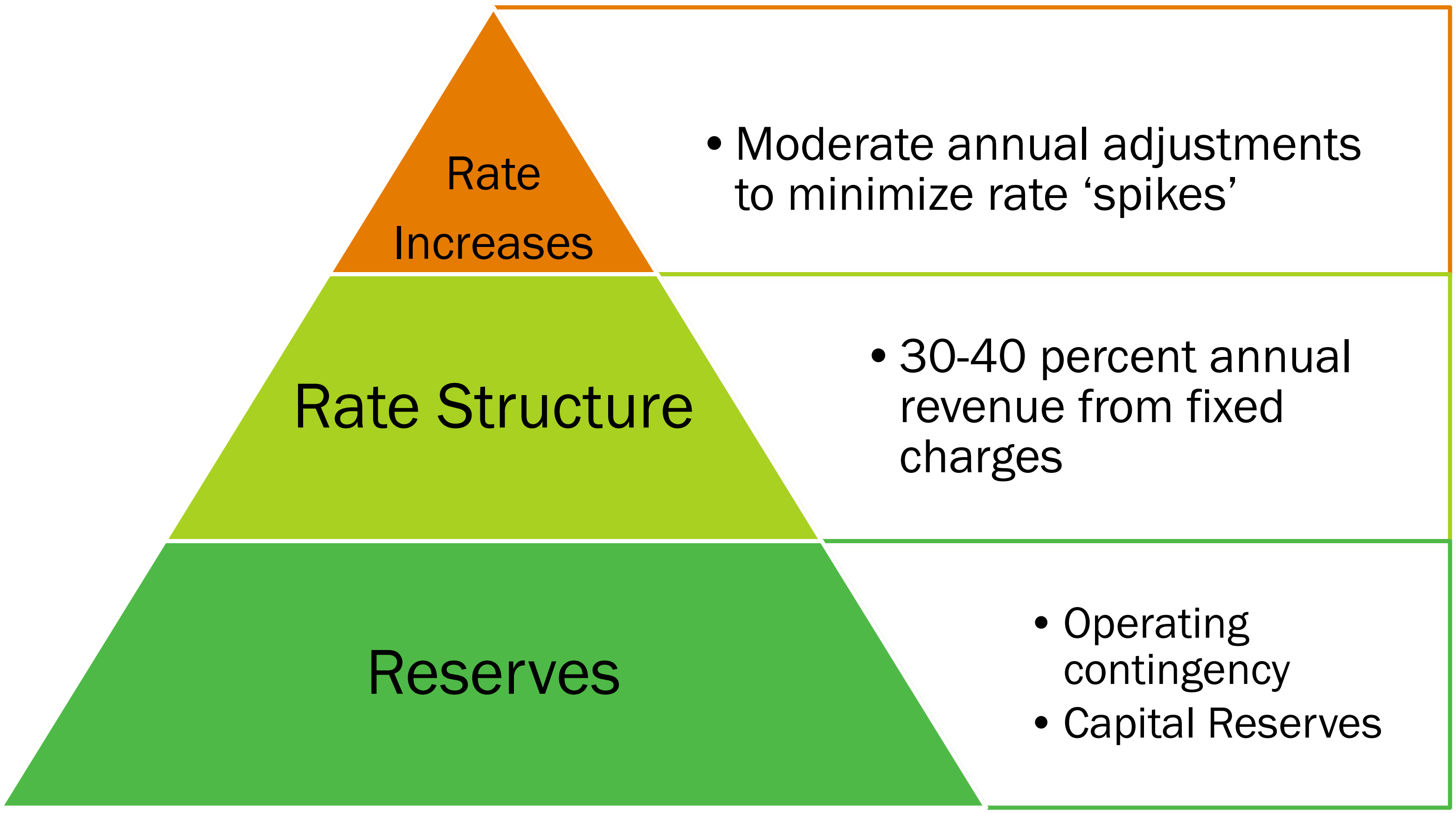
Commercial 2 includes mini-markets, car washes, mortuaries, industrial, and fast food/cafeterias.

Commercial 3 includes restaurants.

Expanded I/I adds $0.50-$0.60 per month per year



Foundation for financial resiliency



Future Rate Increase Factors

*Steady customer growth

*Portion of existing debt paid off in 2029

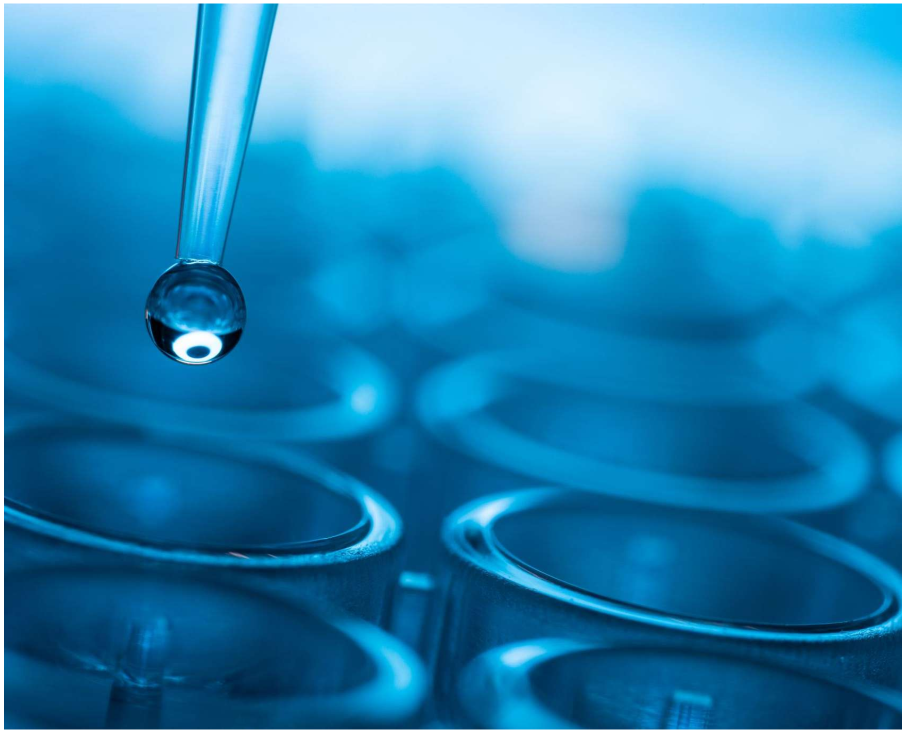
* Leverage existing reserves and Water Fund loan for short-term CIP

* Continued capital investment needs

* Inflation (construction and operating costs)

*Slowdown in customer growth or economic activity

Next Steps



- Water rate analysis
  - Review findings with CRRC January 27, 2026

Questions

CIP Process v4

Situation

Over many years, the city has witnessed substantial cost over runs for city Capital Improvement Program (CIP) projects. Part of these issues has resulted from a profound lack of coordination between the finance and engineering staff as well as a lack of:

- Shared nomenclature
- Effective tracking tools
- Effective, silo-free internal communications

Going forward, city CIP projects will be defined as physical assets with a minimum improvements value of $100,000, and a minimum useful lifespan of 10 ten years. The CIP planning period shall be in four-year increments with a re-calibration every two years. The projects that meet this definition may or may not be SDC eligible.

Mission

The objective of this process document is to ensure close cooperation between the administration, finance and engineering teams and break down a decade of ossification and information silos. The mission will be met by an ongoing act of city CIP co-production between the stakeholders.

Execution – Timeline of Events this occurs every other year.

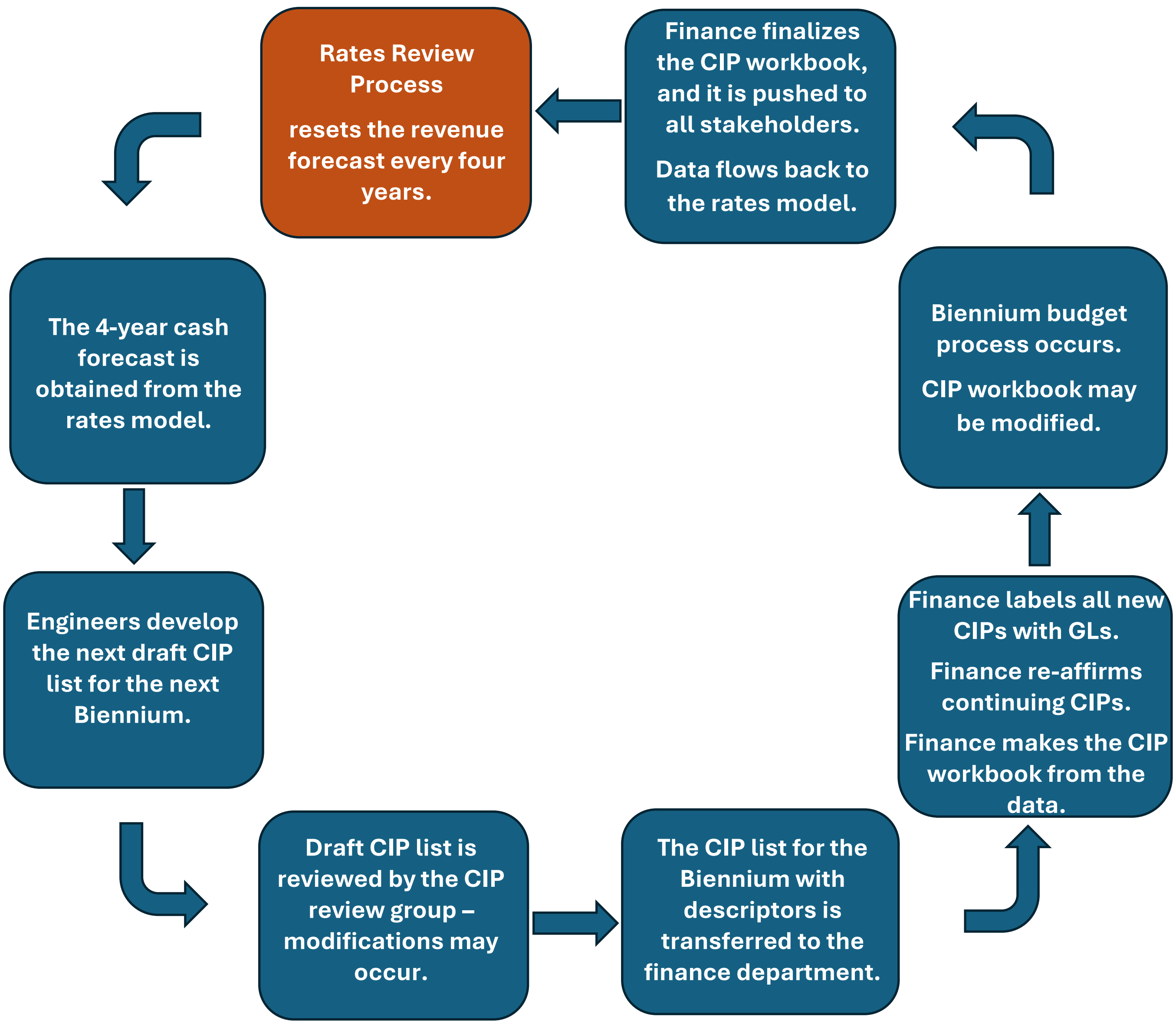
June:	Finance loads the city CIP projects from the previous cycle into our finance software.
June:	The cash forecast is obtained from the rates model for the next two fiscal periods. This data is transferred from Finance to the engineering work group.
July – August:	The City Engineer and Engineering work group build out a draft list of projects for the next Biennium within the revenue projection. Operations and Maintenance send in infrastructure alerts for poor condition based upon cartograph data and known failures by July. The list of previously suggested projects and the SDC Capital Improvement Project Lists are considered.

July – August:	The total available revenue is considered. This could result in a redistribution of the total cash flow projection between considered projects, The draft project list is generated with clear but minimal detail.
September:	The draft list of city CIP projects for the next Biennium is presented to the CIP review Group for comment and/or modification (see CIP review group participants on page 5 below). This step may take several meetings.
October:	The list of city CIP projects for the next Biennium with dollar amounts and more detail is transferred to the finance team. This list is labeled as either new projects OR continuing projects (ones that will roll over from one Biennium to another).
November:	Finance labels all new projects with a CIP GL number. Finance re-affirms continuing projects with their existing GL number. Finance creates the final CIP workbook (see administration and logistics below)
December - May:	The budget process occurs for the biennium. If changes occur to the relevant GL segments as the result of the budget process the CIP workbook is updated.
June:	After approval the CIP workbook is finalized and pushed out to all stakeholders. This sets the Public Works salary divisions for the biennium. This sets the PW labor split ratios for blended staff for the next biennium.

The process is iterative and begins again in the run up to the next Biennium. In other words, in July of the second year of the Biennium, it begins again.

Execution – Flow of events

The process is cyclical on a two-year cycle and iterative. The process obtains data from the rate review process but also feeds data back into that process.



Execution - Engineering Work Group Build Out

Currently, information on the city's infrastructure and its condition resides in three places:

1. Finance,
2. City public infrastructure Master Plans,
3. City Asset Management Program.

Finance has the infrastructure value for depreciation and other purposes.

- For water pipeline infrastructure the current qualitative assessment system is based on pipe material, pipe age and reported line breaks or repeated issues in one location to indicate areas of concern.
  - Project recommendations and prioritization criteria for water infrastructure is within the current Water Master Plan.
- Wastewater pipelines do have a qualitative score, and this is found in the Asset Management Program based upon the NASSCO system.
  - Project recommendations and prioritization criteria for wastewater infrastructure is within the current Wastewater Master Plan.
- Stormwater infrastructure has project prioritization criteria defined in Table 6-1 of the 2021 Stormwater Master Plan.
- Streets under city's jurisdiction also have a qualitative score based upon the street pavement condition index (PCI) data in our Asset Management Program.
  - Project recommendations and prioritization criteria for other transportation infrastructure is within the current Transportation System Plan.

Eventually, the city may need to develop updated prioritization criteria, using a scoring system or other process for establishing priorities for one or more of the public infrastructure systems of Transportation, Stormwater, Wastewater and Water.

The City Engineer and Engineering staff build out a draft list of city CIP projects for the next Biennium within the revenue projection. Prior to, or at the beginning of, this step the Community Development Department is to be consulted for:

1. Identification of any anticipated unfunded state mandates that could trigger the need for city CIP projects within the next two years.

2. Identification of any anticipated need for advancement of any projects from the Newberg Urban Renewal Agency project lists.
3. Identification of any anticipated private development projects that might be good candidates for partnering of needed public improvement infrastructure.

The draft city CIP project list is to include:

1. Continuing projects anticipated to flow into the next biennium.
2. Consideration of projects from the SDC Capital Improvement Project Lists within the current SDC Models for Transportation, Stormwater, Wastewater and Water infrastructure.
3. Consideration of projects from the Newberg Urban Renewal Agency project lists.
4. Consideration of a redistribution of the total cash flow projection between considered projects,
5. Consideration of high priority projects as defined in the city public infrastructure master plans for Transportation, Stormwater, Wastewater and Water.

Choices between high priority, or otherwise conflicting priority projects are to be made through a strategic comparison of priority projects against available resources. This includes consideration of cost saving opportunities that may be possible by combining projects ("digging once"), strategic financing[1], public-private partnerships, and alternative project delivery models[2], among others. Available resources include available budgets from the revenue projections for Transportation, Stormwater, Wastewater and Water funds and System Development Charges and availability of appropriate project staff and supporting consultants. A realistic balance of projects to available resources is to be created.

Execution – Draft CIP Review Group Process

After the engineering team has completed the task of choosing new projects from the potential list and / or affirming projects that need to roll over into a new biennium, a draft list of city CIP projects will be created. The city engineer will take this draft list and create a short, simple, in-house PowerPoint presentation on the projects. The list will be grouped by funding source in this order:

[1] This could include using revenue bonds when interest rates are low, and prioritizing projects where there is property owner support for local improvement districts. It could also include advance financing of infrastructure (Bancroft Bonding) when necessary for economic development or to meet an identified housing need.

[2] See https://www.pmi.org/learning/library/selecting-best-project-delivery-system-8910; https://www.oregon.gov/odot/business/pages/ads-cmgc.aspx; https://www.fhwa.dot.gov/construction/contracts/acm/cmgc.cfm

- Multi-funded
- Stormwater Projects
- Transportation Projects (to include TUF funded projects)
- Wastewater Projects
- Water Projects

A short series of meetings will be convened in September with the CIP review group. The group will contain the following staff members:

- The City Manager
- The Community Development Director or their designee
- The Finance Director or their designee
- The Public Works Director
- The City Engineer
- The engineering staff
- All PW superintendents

This group will take its time to thoughtfully review the list. This may take two or more sessions. The process requires discussions and consensus. It is not envisaged that there will be a requirement for a dispute resolution system or a prioritization ranking process. This can be re-visited if it proves not to be the case. Instead, the potential projects that we can afford will be reviewed and after sufficient discussions have occurred, a simple majority vote can be called if no consensus is reached on what project to keep or remove for fiscal reasons.

The final fruit of this step of the process will be a list of projects with approximate dollar values associated with each project. The projects will be sorted into funding class alphabetically and sub sorted into new or continuing projects (Stormwater, Transportation, Wastewater, Water).

Execution - Unexpected Events

In the event of an unexpected event such as:

- A sudden unfunded mandate
- An unexpected problematic below grade "discovery"
- A disaster

A meeting will be convened as soon as possible between senior engineering staff, the CM and the Finance Director. The meeting will rapidly determine the correct course of action to respond to the unexpected event. All options will be considered to include:

- Pausing CIP projects to free up funds to respond to the issue
- Cancelling CIP projects to free up funds to respond to the issue
- Adding new CIP projects to respond to the issue
- Changes to the current CIP ledger balances

If these sorts of changes need to occur, they will be communicated rapidly to the city council and as required a supplemental budget action will be initiated to ensure transparency and accurate ledger data.

Execution – Assignment of Project Managers

For every CIP project, (even those mostly connected to exterior engineering design contracts) there will be an assigned Project Manager (PM). At a minimum this individual will have the task of tracking payments and deliverables on behalf of the city so that each project stays on track and under budget. The CIP projects will be assigned to the relevant PM by the City Engineer and CM using the following matrix to inform their decision:

SINGLE SITE FOR CONSTRUCTION?	COULD BENEFIT FROM SPECIALIST TRADE SKILLS / CERTIFICATIONS*	INVOLVES MULTIPLE LAND USE DECISIONS OR COMPLEX PHASES	LIKELY PM ASSIGNED
Yes	No	No	PM from Capital Engineering team backed by the City Engineer.
Yes	Yes	No	PM is from Public Works generally the Director or a Superintendent depending on the relevant skills required.
No	No	Yes	PM is the Development Engineer in CDD.

* In addition to any P.E. requirements. For example, waste water certifications or construction skills.

Execution – Public Works Blended Staff Rate Setting

A useful side product of the CIP process will be the creation of blended funding source rate for Public Works staff who work across multiple funds. Basing the blended rates upon the CIP projected expenditures is a rational way to set the blended rates for downstream maintenance. Engineering work will logically follow from the construction of new infrastructure. In this context, CIP is being used as an overall barometer of general Public Works “activity”.

This will be accomplished in three steps:

1. The total likely expenditures for all city CIP projects will be totaled for the next two years.

2. The percentage of this total assigned to each of the funding classes will be calculated as a raw percentage of the total. For example, the water projects in the CIP list for the next two years might turn out to be 23.54% of the likely expenditure total.

3. The raw percentages will be rounded so that each is moved to the closest whole 5 percentage points. In the example above the water raw percentage would be shifted to 25%.

The product of this math will be transferred to finance to set the blended rates for the relevant staff for the next two years.

Administration

This process will broadly be under the control of the City Engineer; however, Community Development Director, Public Works Director, and City Manager will be kept informed about CIP list progress during each of the phases listed above.

City of Newberg, City Hall
Attention: Will Worthey, City Manager
Location: 414 E. First Street
Newberg, Oregon 97132

TO WHOM IT MAY CONCERN:

Please see our attached Proposal for the Newberg RFP with the performance period 2024-2027. Eagle-Elsner is prepared to submit this proposal with confidence in our pricing. We acknowledge that each individual street will have its own unique set of characteristics and challenges and feel confident with our field experience that we can provide a price to accommodate. Eagle-Elsner has worked on many projects over the years in the City of Newberg and the surrounding area. Eagle-Elsner Inc. has a vast amount of experience in the asphalt paving industry and a robust knowledge of the areas resources. With this Proposal, our goal is to provide the City of Newberg and its citizens with a functional and long-lasting product on time and on budget.

Eagle-Elsner Inc.
P.O. Box 23294
Tigard, OR 97281
Federal Tax Id: 93-0731670
Phone: 503-628-1137
Fax: 503-628-1138

PM/Estimator: Brent Williams
Email: brent@eagle-elsner.com
Office: 503-628-1137
Mobile: 503-999-0497

I am the authorized representative for this contract.

Respectfully,

EAGLE-ELSNER, INC.

Richard Eagle, Pres

Richard Eagle
President

2024

Small Jobs 0 - 10,000 square feet (about a block)

	Materials cost*	Other costs*	Total
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,334.00	$ 2,120.00	$ 3,454.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 5,279.00	$ 7,488.00	$ 12,767.00

* If your firm cannot do this sort of work please enter **NO BID**

Medium Jobs 10,000 - 30,000 square feet (several blocks)

	Materials cost*	Other costs*	Total
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,146.00	$ 1,279.00	$ 2,425.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 5,844.00	$ 5,223.00	$ 11,067.00

* If your firm cannot do this sort of work please enter **NO BID**

Small Jobs 30,000 - 50,000 square feet (a longer street section)

	Materials cost*	Other costs*	Total
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,148.00	$ 888.00	$ 2,036.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 7,276.00	$ 3,268.00	$ 10,544.00

* If your firm cannot do this sort of work please enter **NO BID**

2025

Small Jobs 0 - 10,000 square feet (about a block)	Materials cost*	Other costs*	Total
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,441.00	$ 2,290.00	$ 3,731.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 5,701.00	$ 8,087.00	$ 13,788.00

* If your firm cannot do this sort of work please enter **NO BID**

Medium Jobs 10,000 - 30,000 square feet (several blocks)	Materials cost*	Other costs*	Total
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,238.00	$ 1,382.00	$ 2,620.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 6,312.00	$ 5,641.00	$ 11,953.00

* If your firm cannot do this sort of work please enter **NO BID**

Small Jobs 30,000 - 50,000 square feet (a longer street section)	Materials cost*	Other costs*	Total
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,240.00	$ 960.00	$ 2,200.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 7,858.00	$ 3,530.00	$ 11,388.00

* If your firm cannot do this sort of work please enter **NO BID**

	2026		
Small Jobs 0 - 10,000 square feet (about a block)	**Materials cost***	**Other costs***	**Total**
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,556.00	$ 2,473.00	$ 4,029.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 6,157.00	$ 8,734.00	$ 14,891.00

* If your firm cannot do this sort of work please enter **NO BID**

Medium Jobs 10,000 - 30,000 square feet (several blocks)	**Materials cost***	**Other costs***	**Total**
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,337.00	$ 1,492.00	$ 2,829.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 6,816.00	$ 6,093.00	$ 12,909.00

* If your firm cannot do this sort of work please enter **NO BID**

Small Jobs 30,000 - 50,000 square feet (a longer street section)	**Materials cost***	**Other costs***	**Total**
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,339.00	$ 1,036.00	$ 2,375.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 8,487.00	$ 3,812.00	$ 12,299.00

* If your firm cannot do this sort of work please enter **NO BID**

		2027	
	Materials cost*	Other costs*	Total
Small Jobs 0 - 10,000 square feet (about a block)			
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,680.00	$ 2,671.00	$ 4,351.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 6,650.00	$ 9,433.00	$ 16,083.00

* If your firm cannot do this sort of work please enter **NO BID**

	Materials cost*	Other costs*	Total
Medium Jobs 10,000 - 30,000 square feet (several blocks)			
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,444.00	$ 1,611.00	$ 3,055.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 7,362.00	$ 6,580.00	$ 13,942.00

* If your firm cannot do this sort of work please enter **NO BID**

	Materials cost*	Other costs*	Total
Small Jobs 30,000 - 50,000 square feet (a longer street section)			
Price per 1000 square feet of crack sealing assume cracks covering 1/10th of the surface.			NO BID
Price per 1000 square feet of crack and slurry sealing.			NO BID
Price per 1000 square feet of crack, slurry sealing with chips.			NO BID
Price per 1000 square feet of Micro paving.			NO BID
Price per 1000 square feet of grind and inlay to a depth of 2".	$ 1,446.00	$ 1,119.00	$ 2,565.00
Price per 1000 square feet of complete structural rebuild to the full depth (see appendix A for complete re-build standard)	$ 9,166.00	$ 4,117.00	$ 13,283.00

* If your firm cannot do this sort of work please enter **NO BID**

	Five Year Applicable & Consecutive Experience Record	

FIVE YEAR APPLICABLE AND CONSECUTIVE EXPERIENCE RECORD

(Only include projects with a value of more than $100,000, recent projects first
Required to provide a minimum of 5 consecutive years' experience)

#1 (Project Name, Location)
MULINO PAVING PACKAGE

Project description PAVING, AGGREGATE SHOULDERS, PAVEMENT MARKINGS, AGGREGATE BASE

Project Cost (contract) 1,912,000 (actual) 1,828,512

Project completion date (contract) DEC. 31, 2023 (actual) OCT. 31, 2023

Contact name JON SPARKS Phone (503) 650-3235

Contact email JSPARKS@CLACKAMAS.US

#2 (Project Name, Location)
SOUTH HILLOCKBURN ROAD PAVING

Project description GRINDING, PAVING, AGGREGATE SHOULDERS, SUBGRADE STABILIZATION, GUARDRAIL MODS, STRIPING

Project Cost (contract) 655,000 (actual) 644,094

Project completion date (contract) DEC. 31, 2023 (actual) SEPT. 30, 2023

Contact name JON SPARKS Phone (503) 650-3235

Contact email JSPARKS@CLACKAMAS.US

Continued Next Page

#3 (Project Name, Location)
242ND AVE / BORGES

Project description RIPRAP, SUBGRADE STABILIZATION, MANHOLE ADJUSTMENTS, GRINDING, AGGREGATE BASE & SHOULDERS, PAVING, SIGNING

Project Cost: (contract) 254,025 (actual) 187,656

Project completion date: (contract) DEC. 31, 2023 (actual) OCT. 30, 2023

Contact name: MIKE WARD Phone (971) 352-2487

Contact email: MWARD@CLACKAMAS.US

#4 (Project Name, Location)
REEDVILLE TRAIL - BASELINE RD TO JOHNSON ST

Project description GRADING, DRAINAGE, PAVING, SIGNING, ELECTRICAL, STRIPING

Project Cost: (contract) 1,968,000 (actual) 1,742,595

Project completion date: (contract) FEB 29, 2024 (actual) FEB. 29, 2024

Contact name: RYAN KRUEGER Phone (971) 470-5333

Contact email: RYAN_KRUEGER@WASHINGTONCOUNTYOR.GOV

#5 (Project Name, Location)
GRAHAMS FERRY ROAD RECONSTRUCTION

Project description GRADING, EXCAVATION, GRINDING, CEMENT TREATMENT, PAVING, STRIPING

Project Cost: (contract) 349,000 (actual) 361,522

Project completion date: (contract) JUNE 30, 2023 (actual) JUNE 30, 2023

Contact name: MATT PARRISH Phone (503) 846-7643

Contact email: MATT_PARRISH@WASHINGTONCOUNTYOR.GOV

#6 (Project Name, Location)

CEDAR STREET DRAINAGE IMP.

Project description CONCRETE, UTILITIES, AGGREGATE BASE, PAVING

Project Cost: (contract) 606,606 (actual) 673,753

Project completion date: (contract) JUNE 30, 2023 (actual) JUNE 20, 2023

Contact name: DEREK ROBBINS Phone (503) 992-3228

Contact email: DJROBBINS@FORESTGROVE-OR.GOV

#7 (Project Name, Location)

NEWBERG 2022 PAVEMENT IMP.

Project description CONCRETE, UNDERGROUND UTILITIES, AGGREGATE BASE, TRAFFIC CONTROL

Project Cost: (contract) 1,295,295 (actual) 1,311,634

Project completion date: (contract) AUG 30, 2023 (actual) AUG 17, 2023

Contact name: PAUL CHIU Phone (503) 554-1751

Contact email: PAUL.CHIU@NEWBERGOREGON.GOV

Attach additional sheets if needed

Revised Report for Geotechnical Engineering Design Services

Newberg Water Treatment Plant
Newberg Dundee Bypass at Highway 219
Newberg, Oregon

CGS Project: Keller-15-01

Prepared For:

Keller Associates
100 E Bower Street, Suite 100
Meridan, Idaho 83642

SBA U.S. Small Business Administration
SERVICE-DISABLED VETERAN-OWNED CERTIFIED

Date: January 27, 2025
Revised February 21, 2025

CENTRAL
Geotechnical Services

7662 SW Mohawk Street
Tualatin, Oregon 97062
(503) 616-9419
www.centralgeotech.com

January 27, 2025
Revised February 21, 2025

Keller Associates
100 E Bower Street, Suite 100
Meridian, ID 83642

Attention: Larry Rupp (lrupp@kellerassociates.com)

Subject: Geotechnical Engineering Design Services
Newberg Water Treatment Plant
Newberg Dundee Bypass at Highway 219
Newberg, Oregon
CGS Project No. Keller-15-01

Central Geotechnical Services, LLC (CGS) is pleased to submit this revised report of geotechnical engineering services for the proposed Newberg Water Treatment Plant (WTP) in Newberg, Oregon. The site is an approximate 19.8-acre parcel south of the Newberg Dundee Bypass and approximately 150 feet west (of the northeast corner of the site) of Oregon Highway 219. The report was prepared for conformance with the executed subconsultant agreement dated October 28, 2024. Please feel free to call our office with questions about this report.

Respectfully,

Central Geotechnical Services, LLC

____
Julio Vela, Ph.D, P.E., G.E.
Principal Engineer

TABLE OF CONTENTS

LIST OF FIGURES

APPENDICES

1.0 INTRODUCTION

Central Geotechnical Services, LLC (CGS) is pleased to submit this geotechnical engineering report for the proposed Newberg Water Treatment Plant (WTP) in Newberg, Oregon. The site is an approximate 19.8-acre parcel south of the Newberg Dundee Bypass and approximately 150 feet west (of the northeast corner of the site) of Oregon Highway 219. The location of the site is shown in the Vicinity Map, Figure 1. The majority of the parcel appears to have been used for agricultural purposes with remnant farm structures on site and adjacent ot a solar array to the east.

Based on discussions with Keller Associates (Keller), site development will likely include an on-site shop facility, above-ground or partially buried storage/treatment tanks, parking areas, and associated roadways. The intent of explorations completed for this study and the recommendations included in this report are for geotechnical characterization of the overall site and geotechnical recommendations for development of the proposed improvements. At the time of this report, a specific site layout or project foundation loads were not provided. General areas were noted for proposed development as part of our site visit with the project team and provided on preliminary site development plans. Based on our experience with similar projects, we anticipate maximum column and wall loads less than 50 kips and 6 kips per foot, respectively, and floor slab loads to be less than 150 pounds per square foot (psf) for support structures. Based on topography, cuts, and fills are expected to be less than three feet each.

2.0 PURPOSE AND SCOPE OF WORK

The purpose of our services was to provide initial geotechnical engineering recommendations for use in design and construction of the proposed project. At this time, final project site layout within the nearly 20-acre parcel has not been determined for the project. Our geotechnical services provided as part of the scope below were intended to generally characterize the site for development of a WTP. Project-specific element locations may require updates to the project geotechnical report and possibly supplemental explorations. Our scope of services was provided in general accordance with our revised proposal dated September 10, 2024, which included the following:

1. Reviewed subsurface soil and groundwater conditions information in the site vicinity, including reports in our files, selected geologic maps, and other geotechnical engineering-related information.
2. Coordinated and managed the field investigation, including public and private utility notification and scheduling of subcontractors and CGS field staff.
3. Explored subsurface soil and groundwater conditions at the site by drilling eight drilled borings across the site to depths between 21.5 and 101.5 feet below ground surface (bgs).
4. Advanced two Cone Penetrometer Tests (CPT) to depths of approximately 100 feet bgs. Performed shear wave velocity testing in one of the CPTs, and pore water pressure dissipation in the CPTs.
5. Obtained samples at representative intervals from the explorations, observed groundwater conditions, and maintained detailed logs in general accordance with ASTM International (ASTM) Standard Practices Test Method D2488.
6. Performed laboratory tests on selected soil samples obtained from the explorations to evaluate pertinent engineering characteristics. Laboratory tests included:
    - Thirteen moisture content determination tests in general accordance with ASTM D2216
    - Six fines content analysis in general accordance with ASTM D1140.
    - Two Atterberg limits test in general accordance with ASTM D4318

7. Provided a geotechnical evaluation of the overall site and provide initial design recommendations in this geotechnical report that adresses the following geotechnical components:
    - A general description of site topography, geology, and subsurface conditions.
    - An opinion as to the adequacy of the proposed development from a geotechnical engineering standpoint.
    - Provide estimates of groundwater level and management recommendations.
    - Provided recommendations for site preparation, including grading and drainage, stripping depths, fill type for imported material, compaction criteria, trench excavation and backfill, use of on-site soil, and wet/dry weather earthwork.
    - Recommendations for shallow foundations to support the proposed structures, including minimum width and embedment, design soil bearing pressures, settlement estimates (total and differential), coefficient of friction, and passive earth pressures for sliding resistance.
    - Provide geotechnical engineering recommendations for use in designing below-grade walls, including backfill and drainage requirements and static and seismic lateral earth pressures, if necessary.
    - Recommendations for supporting floor slabs, subgrade preparation, and modulus of subgrade reaction.
    - Seismic design parameters, including soil site class evaluation in accordance with the current version of the International Building Code (IBC).
    - Recommendations for constructing asphaltic concrete (AC) pavements, including subgrade, drainage, base rock, and pavement section. Our recommendations will be based on proposed traffic loads or loads provided by the project civil engineer and on subsurface.

3.0 BACKGROUND

It is our understanding the proposed project site located south of the Newberg Dundee Bypass and approximately 150 feet west (of the northeast corner of the site) of Oregon Highway 219 is one option available to the City of Newberg for the proposed WTP. Keller provided us a geotechnical engineering report completed by others dated October 2023 completed for the existing Newberg Water Treatment Plant site located approximately 0.25-miles west of the intersection of Wynooski Road and NE Dog Ridge Road. It is our understanding that the report prepared by others concludes that that site has geologic hazard concerns such as lateral spreading, liquefaction, and slope instability, and that measures to mitigate those hazards (ground improvement) were recommended for site development. The City has selected the site that is the subject of this report as a potential alternative site for the proposed WTP.

4.0 SITE CONDITIONS

4.1 GEOLOGY

The project site is situated in the Willamette Valley, which extends from Cottage Grove in the south to the Portland Basin in the north (Burns, 1998; Orr and Orr, 1999). The Willamette Valley is part of the Puget-Willamette Trough physiographic province, a forearc basin associated with the tectonically active Cascadia convergent margin. The lowland is generally an elongate alluvial plain, bordered on the west by the Coast Ranges and on the east by the Cascade Mountains. A ridge of uplifted mountains underlain by Tertiary-age volcanic and sedimentary rocks (mainly Columbia River Balsalts) extends east from the Coast ranges, forming the Chehalem Mountains and Parrett Mountain, which form the boundary between the Willamette Valley and the Tualatin Valley to the north. Newberg is located on the southern flanks of the Chehalem Mountains where Chehalem Creek and several smaller streams drain from the mountains into the Willamette River.

Alluvial sediments have been accumulating in the Willamette Valley for at least 20 million years, transported by tributaries from the Coast and Cascade Ranges, foothills streams, and the upper Willamette River. In addition, the Willamette Valley was back-flooded by catastrophic floods that had traveled down the Columbia River, caused by the drainage of large glacial lakes in western Montana (Allen and others, 1986). Many dozens of these Missoula Floods occurred between 15,500 and 12,700 years ago. Flood waters rose to about 400 feet above mean sea level (msl) in the valley, and deposited silts and fine sands (the Willamette Silts) over the surfaces below that elevation. Since then, fluvial processes (stream erosion, avulsion, channel and floodplain deposition, reworking of older sediments, etc.) have created a complex series of terraces, dropping from the foothills down to the current Willamette River channel (about 60 feet msl at Newberg).

4.2 SURFACE CONDITIONS

The site is currently a vacant field with the exception of a solar field in a portion of the site on the east side. The project site is bounded by Highway 18 and ODOT right-of-way to the north, S Sandoz road to the east, industrial property to the south, and the existing Newberg Water Treatment plant to the west.

4.3 SUBSURFACE CONDITIONS

Subsurface conditions at the site were explored by drilling a total of eight geotechnical borings (B-1 through B-8). Explorations were completed to final depths between 21.5 and 101.5 feet bgs. Approximate locations of the explorations completed at the site are presented in Figure 2. Logs of our explorations and associated laboratory testing completed for this study are presented in Appendix A.

Our explorations encountered an approximate 3-inch-thick root zone at the surface of our explorations. Silt with varying amounts of sand, and sand with varying amounts of clay underlies the surficial materials at the site. Laboratory testing on select samples indicate moisture contents ranging from 33 to 45 percent at the time of our explorations and fines content of 88 to 99 percent. Atterberg limits test conducted on two select samples indicate a plasticity index of 8 and a liquid limit of 39, and a plasticity index of 5 and a liquid limit of 34.

4.3.1 Groundwater Conditions

Groundwater was measured during CPT advancement at approximately 11 and 14 feet bgs. The depth to groundwater may fluctuate in response to seasonal changes, prolonged rainfall, changes in surface topography, and other factors not observed in this study.

5.0 CONCLUSIONS

Based on our explorations, testing, and analyses, it is our opinion that the site is suitable for the proposed project from a geotechnical standpoint, provided the recommendations in this report are incorporated into the project design and implemented during construction. Based on comparison of geotechnical requirements between the two sites considered by the City, this site will require fewer mitigation strategies to develop the proposed project.

We offer the following conclusions regarding geotechnical engineering design and construction at the site.

- The near surface soil is sensitive to disturbance when at a moisture content that is above optimum. As discussed in the report, the subgrade should be protected from disturbance and damage by construction traffic. Proper subgrade protection during earthwork will be essential for the integrity of the turf field. Cement amendment of the subgrade should be considered.

- Prior site use included agricultural uses that likely disturbed upper site soils through tilling or other traffic of the site surface. After stripping of organics during site development, the remaining upper soils may require reworking and compacting or replacing in areas to receive structural fill or if prepared for structural subgrade.
- Columns with less than 50 kips and walls with loads up to 6 kips per foot can be supported by conventional spread footings bearing on 1-foot-thick gravel pads over firm, undisturbed native soil.
- Groundwater was encountered at depths between 10 and 14.5 feet bgs at the time of our explorations. Shallower groundwater is possible during the winter and spring months. Shallow depth to groundwater could impact site cuts for doundations and utilities.
- Subsurface conditions observed in our explorations across the site are generally consistent. It is our opinion that the recommendations in this report are generally applicable across the site. Depending on the final site configuration, additional field explorations may be required to confirm our recommendations or provide additional information.
- This report provides a general characterization of the site for the proposed development as generally described to us. If above ground tanks are determined to be part of the site development, CGS should be engaged to review the proposed site layout (including type and location of tanks), site grading, and structural elements. Depending on the results of our review, additional explorations and analyses may be required to provide specific foundation support design recommendation, to evaluate risk of settlement, and to confirm code design requirements.

  A site specific seismic hazard analysis including a ground motion response analysis may be required to meet OSSC guidelines depending on the tank configuration and risk category of facilities. As discussed with Keller, a site specific seismic hazard analysis, depending on results of the analyses, may provide information to reduce seismic design loads resulting in more efficient costs for structural ties required for above ground tanks.

6.0 DESIGN RECOMMENDATIONS

6.1 SHALLOW FOUNDATION SUPPORT RECOMMENDATIONS

Based on the results of our explorations, and assumed building loads, the proposed buildings can be supported on conventional shallow footings bearing on 1-foot-thick gravel pads placed over firm, undisturbed native soil, or on structural fill over firm native soils. Continuous wall and isolated spread footings should be at least 16 and 20 inches wide, respectively. The bottom of exterior column or continuous footings should be at least 18 inches below the adjacent exterior grade. The bottom of the interior footings should be established at least 12 inches below the base of the slab. Foundations should not be established on soft soil. Grading plans were not available at the time of this report.

Gravel pads should extend 6 inches beyond the margins of the foundations for every foot excavated below the foundations' base grade and should consist of imported granular material as described in the Imported Granular Fill section. The imported granular material should be compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557, or until well keyed, as determined by one of our geotechnical staff. It is also acceptable to use stabilization rock for gravel pads. We recommend that a member of our geotechnical staff observed the prepared footing subgrade before placing gravel pads as well.

6.1.1 Shallow Foundation Subgrade Preparation

Subgrades beneath proposed structural elements should be prepared as described below and in the “earthworks” section of this report. We recommend loose or disturbed soils resulting from prior site uses or from foundation excavation be removed before placing gravel pads. Foundation bearing surfaces should not be exposed to standing water. If water infiltrates and pools in the excavation, the water, along with any disturbed soil, should be removed before placing reinforcing steel and concrete.

We recommend CGS observe all foundation subgrades before placing concrete forms and reinforcing steel to determine that bearing surfaces have been adequately prepared and the soil conditions are consistent with those observed during our explorations.

6.1.2 Spread Footings

We recommend conventional footings be proportioned using a maximum allowable bearing pressure of 2,000 psf if supported on firm native soils or on structural fill placed over firm native soils. This bearing pressure applies to the total of dead and long-term live loads and may be increased by one-third when considering earthquake or wind loads. This is a net bearing pressure. The weight of the footing and overlying backfill can be ignored in calculating footing sizes.

6.1.3 Foundation Settlement

Foundations designed and constructed as recommended are expected to experience settlements of less than 1 inch. Differential settlements of up to one half of the total settlement magnitude can be expected between adjacent footings supporting comparable loads.

6.1.4 Shallow Foundation Lateral Resistance

Lateral loads can be resisted by a combination of friction between the footing and the supporting soil, and by the passive lateral resistance of the soil surrounding the embedded portions of the footings. A coefficient of friction between the concrete and gravel pad of 0.45 and a passive lateral resistance corresponding to an equivalent fluid density of 250 pcf may be used for design. These values are appropriate for foundation elements that are poured directly against the native soils or surrounded by compacted structural fill.

The passive earth pressure and friction components may be combined, provided the passive component does not exceed two-thirds of the total.

The passive earth pressure value is based on the assumptions that the adjacent grade is level and static groundwater remains below the base of the footing throughout the year. The top 1 foot of soil should be neglected when calculating passive lateral earth pressures unless the adjacent area is covered with pavement. The lateral resistance values do not include safety factors.

6.2 FLOOR SLABS

Satisfactory subgrade support for floor slabs on grade supporting the planned 150 psf floor loads can be obtained provided the floor slab subgrade is described in the “Earthwork Recommendations” section of this report, including re-working and compacting upper site soils disturbed as part of prior site use. Slabs should be reinforced according to their proposed use and per the structural engineer’s recommendations. Subgrade support for concrete slabs can be obtained from the firm native soils underlying the topsoil or on structural fill placed over firm native soils.

We recommend that on-grade slabs be underlain by a minimum 6-inch-thickness of aggregate base in order to provide the structural design support for subgrade reaction as described below and to act as a capillary break material to reduce the potential for moisture migration into the slab. The aggregate base section should be placed as recommended in the "Fill Placement and Compaction" section of this report.

If dry on grade slabs are required, for example at interior spaces where adhesives are used to anchor carpet or tile to the slab, a waterproof liner may be placed as a vapor barrier below the slab. The vapor barrier should be selected by the structural engineer and should be accounted for in the design floor section and mix design selection for the concrete, to accommodate the effect of the vapor barrier on concrete slab curing.

Load-bearing concrete slabs prepared as recommended should be designed assuming a modulus of subgrade reaction (k) of 150 psi per inch. This value is for a 1-foot by 1-foot square plate. The coefficient of subgrade reaction for a foundation varies based on its minimum width according to the following equation:

$$k_s = k_{s1}\left[\frac{B+1}{2B}\right]^2$$

Where k_s is the coefficient of subgrade reaction, k_{s1} is the coefficient of subgrade reaction for a 1-ft by 1-ft plate, and B is the minimum width or lateral dimension of the mat.

If dry on-grade slabs are required, for example at interior spaces where adhesives are used to anchor carpet or tile to the slab, a waterproof liner may be placed as a vapor barrier below the slab. The vapor retarder should be selected by the structural engineer and should be accounted for in the design floor section and mix design selection for the concrete, to accommodate the effect of the vapor barrier on concrete slab curing.

We estimate that concrete slabs constructed as recommended will settle less than ½ inch. Floor slab subgrades should be evaluated according to the "Subgrade Evaluation" section of this report.

6.3 SEISMIC DESIGN

Parameters provided on Table 1 are based on the conditions encountered during our subsurface exploration program and the procedure and requirements outlined in the 2021 IBC. Per American Society of Civil Engineers (ASCE) 7-22 Section 11.4.8, a site-specific response analysis is required for Site Class F sites, and a ground motion hazard analysis or site-specific response analysis is required to determine the design ground motions for structures on Site Class D and E sites with S_1 greater than or equal to 0.2g.

For this project, the site is classified as Site Class D; therefore, the provisions of 11.4.8 are applicable. Alternatively, the parameters listed in Table 5-1 may be used to determine the design ground motions if the exceptions provided in ASCE 7-16 Supplement 3 are met. The applicable exceptions are provided below.

From ASCE 7-16 Supplement 3

Exception: A ground motion hazard analysis not required:

1. Where the values of the parameter S_{M1} determined by Eq. (11.4-2) is increased by 50% for all applications of S_{M1} in the standard. And:
2. The resulting value of the parameter S_{D1} determined by Eq. (11.4-4) shall be used for all applications of S_{D1} in the standard.

Table 1. Mapped ASCE 7-16 Seismic design parameters

Parameter	Recommended Value[1,2]
Site Class	D
Mapped Spectral Response Acceleration at Short Period (S_S)	0.85 g
Mapped Spectral Response Acceleration at 1 Second Period (S_1)	0.41 g
Site Modified Peak Ground Acceleration (PGA_M)	0.473 g
Site Amplification Factor at 0.2 second period (F_a)	1.160
Site Amplification Factor at 1.0 second period (F_v)	1.89
Design Spectral Acceleration at 0.2 second period (S_{DS})	0.657 g
Design Spectral Acceleration at 1.0 second period (S_{D1})	0.517 g

Note:

[1] Parameters developed based on Latitude 45.287421° and Longitude -122.950411 °.

[2] These values are only valid if the structural engineer utilizes Exception 1 of ASCE 7-16 Supplement 3 Exception 1.

[3] Increased by a factor of 1.5 per ASCE 7-16 Supplement 3 Exception 1.

Seismic design parameters are applicable to site structures using the exception noted above (Supplement 3). The exception typically does not significantly impact small structures or structures with low fundamental structural periods. Studies noted in Section 11.4.8 of ASCE-7-22 as described above can provide significant reductions in design level requirement compared to design based on the exception of Supplement 3 for longer period structures and large footprint structures.

6.4 LIQUEFACTION POTENTIAL

Liquefaction is a phenomenon caused by a rapid increase in pore water pressure that reduces the effective stress between soil particles to near zero. The excessive buildup of pore water pressure results in the sudden loss of shear strength in a soil. Granular soil, which relies on interparticle friction for strength, is susceptible to liquefaction until the excess pore pressures can dissipate. Sand boils and flows observed at the ground surface after an earthquake are the result of excess pore pressures dissipating upwards, carrying soil particles with the draining water. In general, loose, saturated sand soil with low silt and clay contents is the most susceptible to liquefaction. Low plasticity, silty sand may be moderately susceptible to liquefaction under relatively higher levels of ground shaking.

Low plasiticity silt with varying amounts of sand and low plasticity silt may also be susceptible to seismic liquefaction-induced deformations during a seismic event under relatively higher levels of ground shaking. Magnitudes of settlement manifest at the ground surface is generally estimated to be significantly less than liquefaction-induced settlement of generally sandy or sand soils.

Based on subsurface conditions encountered in on-site explorations and laboratory testing results, it is our opinion that there is a low risk of seismic-induced liquefaction at the ground surface during the design-level earthquake. The site subsurface contains layers of relatively soft silt below groundwater that could strain soften and result in seismic settlement. We estimate that seismic settlement as a result of liquefaction in silt layers will be less than 1 inch manifest at the ground surface.

6.5 RETAINING WALLS

6.5.1 Assumptions

The following retaining wall design recommendations are based on the following assumptions: (1) walls consist of conventional, cantilevered retaining walls, (2) walls are less than 8 feet in height, (3) the backfill is drained and consists of imported granular materials, and (4) the backfill has a finish slope flatter than 4H:1V. Re-evaluation of our recommendations will be required if the retaining wall design criteria for the project varies from these assumptions.

6.5.2 Subgrade Preparation

Wall footings should bear on a minimum 12-inch-thick layer of imported granular material underlain by firm, undisturbed native soil and be prepared as listed in the “Site Subgrade Preparation and Evaluation” section of this report. The imported granular material should be fairly well graded between coarse and fine material, have less than 6 percent by dry weight passing the U.S. Standard 200 sieve, should have at least two mechanically fractured faces, and be compacted to 95% of maximum dry density as obtained from ASTM D1557.

6.5.3 Wall Design Parameters

Wall footings prepared as recommended above, including a one-foot thick granular pad, should be sized based on an allowable bearing pressure of 2,000 psf. The weight of the footing and overlying backfill can be ignored in calculating footing sizes.

For unrestrained retaining walls, an active equivalent fluid pressure of 35 pcf should be used for design. Where retaining walls are restrained from rotation (such as basement walls), an at-rest equivalent fluid pressure of 55 pcf should be used for design. A superimposed seismic lateral force should be calculated based on a dynamic force of 7H2 pounds per lineal foot of wall, where H is the height of the wall in feet, and applied as a distributed load with the centroid located at a distance of 0.6H from the base of the wall.

If surcharges (e.g., structure foundations, concrete slabs, vehicles, steep slopes, terraced walls, etc.) are located within a horizontal distance from the back of a wall equal to the height of the wall, additional pressures will need to be accounted for in the wall design. Our office should be contacted for appropriate wall surcharges based on the actual magnitude and configuration of the applied loads. The base of the wall footing should extend a minimum of 12 inches below the lowest adjacent finish grade.

Lateral loads on the proposed structures can be resisted by a combination of sliding resistance on the base of footings and passive earth pressure on the sides of footings. We recommend a coefficient of friction of 0.35 for footings bearing on undisturbed, native silt, and 0.45 for footings bearing on granular engineered structural fill.

Passive earth pressures on the sides of buried spread footings may be calculated using an equivalent fluid pressure of 300 pcf per foot of embedment. For this value, backfill against the footing should be compacted to at least 92% of the maximum dry density as obtained from ASTM D1557. The upper foot of embedment should be neglected unless protected by pavement or concrete slabs on grade.

6.5.4 Wall Drainage and Backfill

The above design parameters have been provided assuming back-of-wall drains will be installed to prevent buildup of hydrostatic pressures behind all walls. If a drainage system is not installed, CGS should be contacted for revised design forces.

Backfill material placed behind retaining walls and extending a minimum horizontal distance of H, where H is the height of the retaining wall, should consist of select granular wall backfill meeting the requirements described in the “Structural Fill and Backfill” section. All wall backfill should be compacted to at least 92% of the maximum dry density as obtained from ASTM D1557. Wall backfill in the top 2 feet should be compacted to at least 95% of the maximum dry density when under structural areas such as footings, concrete slabs, pavement.

Perforated collector pipes should be placed at the base of the granular backfill behind the walls. The pipe should be embedded in a minimum 1-foot-wide zone of angular drain rock and the drain rock should be wrapped in a drainage geotextile fabric. The collector pipes should discharge at an appropriate location away from the base of the wall. The discharge pipe should not be tied directly into stormwater drain systems, unless measures are taken to prevent backflow into the drainage system of the wall.

6.5.5 Settlement

Settlement of up to 1 percent of the wall height commonly occurs immediately adjacent to the wall as the wall rotates and develops active lateral earth pressures. Consequently, we recommend that construction of flatwork adjacent to retaining walls be postponed at least four weeks after backfilling of the wall, unless survey data indicates that settlement is complete prior to that time.

6.6 PAVEMENT

New pavement is proposed for an access road west of the baseball field. The pavement section may be either conventional (AC over Aggregate Base) or pervious asphalt pavement. Pavement sections should be installed on native subgrade or engineered fills prepared in conformance with the "Earthwork Recommendations" and "Structural Fill" sections. All thicknesses are intended to be the minimum acceptable. Design of the recommended pavement section assumes that construction will be completed during an extended period of dry weather. Wet weather construction could require an increased thickness of aggregate base.

Construction traffic should be limited to haul roads. Construction traffic should not be allowed on new pavement. If construction traffic is to be allowed on newly constructed pavement, an allowance for this additional traffic will need to be made in the design pavement section. The pavement thicknesses do not account for construction traffic, and haul roads and staging areas should be used.

Pavement material recommendations are provided in the "Structural Fill and Backfill" section of this report.

6.6.1 AC Pavement

The recommended pavement sections assume that final improvements surrounding the pavement will be designed and constructed such that stormwater or excess irrigation water from landscape areas does not infiltrate below the pavement section. Our pavement recommendations are based on the following assumptions:

- Resilient moduli of 4,500 psi and 20,000 psi were assumed for the subgrade and aggregate base, respectively.
- The design manual provided for the project specifies pavement recommendations based on a design life of 20 years.
- Initial and terminal serviceability indices of 4.2 and 2.5, respectively.
- Reliability of 85 percent and standard deviation of 0.45.
- Typical daily traffic consists of personal vehicles with occasional, small delivery trucks, and one to two garbage truck type vehicles per week. The section provided below is adequate for support of large fire truck equipment (non-routinely) in the event of emergency access being required.

We recommend the following conventional pavement section based on the above information. If traffic is to include larger, more frequent trucks, our recommendations should be revised.

Pavement Section (3 inches of AC over 8 inches of aggregate base)

- 3 inches of ½-inch, Level 2, dense ACP, PG 64-22 (surface course)

- 8.0 inches of aggregate base
- Subgrade stabilization (if required)
- Subgrade Geotextile

6.6.2 Cold Weather Paving Considerations

In general, AC paving is not recommended during cold weather (surface temperature less than 40 degrees Fahrenheit). Compacting under these conditions can result in low compaction and premature pavement distress.

Each AC Mix design has a recommended compaction temperature range that is specific for the particular AC binder used. In colder temperatures, it is more difficult to maintain the temperature of the AC mix as it can lose heat while stored in the delivery truck, as it is placed, and in the time between placement and compaction. In Oregon, the surface temperature during paving should be at least 40 degrees Fahrenheit for lift thickness greater than 2.5 inches and at least 50 degrees Fahrenheit for lift thicknesses between 2 and 2.5 inches.

If paving activities must take place during cold weather construction as defined above, the project team should be consulted and a site meeting should be held to discuss ways to lessen low compaction risks.

7.0 EARTHWORK RECOMMENDATIONS

7.1 SITE PREPARATIONS

In general, initial site preparation and primary earthwork operations will include stripping and grubbing of upper organics, areas of light logging, and brush clearing to create level working surfaces, excavating and filling for roads pavements, foundations, and utilities, demolition of existing structures, recompacting (dry weather) or replacing (wet weather) unsuitable soils in areas of the site that are to receive fill, fine-grading to establish final grades, or structural improvements.

All existing utilities in the proposed earthwork construction areas should be identified prior to excavation. Live utility lines beneath proposed structures should be completely removed or filled with grout to reduce potential settlement of new structures. Soft or loose soil encountered in utility line excavations should be removed and replaced with structural fill where it is located within structural areas.

Debris materials generated during demolition of existing improvements or relocation of utilities should be transported off site for disposal. Existing voids and new depressions created during site preparation, and resulting from removal of existing utilities, or other subsurface elements, should be cleaned of loose soil or debris down to firm soil and backfilled with compacted structural fill. Disturbance to a greater depth should be expected if site preparation and earthwork are conducted during a period of wet weather.

7.2 SITE SUBGRADE PREPARATION AND EVALUATION

Upon completion of site preparation activities, exposed subgrades should be proof-rolled with a fully loaded dump truck or similar heavy rubber-tired construction equipment where space allows to identify soft, loose or unsuitable areas. Probing may be used for evaluating smaller areas or where proof-rolling is not practical. Proof-rolling and probing should be conducted prior to placing fill and should be performed by a representative of CGS who will evaluate the suitability of the subgrade and identify areas of yielding that are indicative of soft or loose soil. We anticipate that there will be areas where disturbed soils from prior use, soft, or otherwise unsuitable soil is identified during subgrade evaluation. Unsuitable soil should be replaced by imported granular material. Soft or disturbed upper soils that can be improved should be scarifyied and compacted is weather and field conditions are suitable in accordance with the “Structural Fill and Backfill” section.

As discussed in the Subgrade Protection and Wet Weather Considerations of this report, the fine-grained soil at the surface can be sensitive to small changes in moisture content and will be difficult, or not possible, to compact adequately during wet weather. While tilling and compacting the subgrade is the economical method for subgrade improvement, it will likely only be possible during extended dry periods and following moisture-conditioning of the soil.

During wet weather, or when the exposed subgrade is wet or unsuitable for proof-rolling, the prepared subgrade should be evaluated by observing excavation activity and probing with a steel foundation probe. Observations, probing, and compaction testing should be performed by a member of our staff. Wet soil that has been disturbed due to site preparation activities or soft or loose zones identified during probing should be removed and replaced with compacted structural fill.

7.3 SUBGRADE PROTECTION AND WET WEATHER CONSIDERATIONS

Upper site soils are highly susceptible to moisture. If wet weather construction practices are necessary based on conditions observed at the time of construction, it may be necessary to use track-mounted equipment, load removed material into trucks supported on gravel haul roads, use gravel working pads, and employ other methods to reduce ground disturbance. The contractor should be responsible for protecting the subgrade during construction.

Earthwork planning should include considerations for minimizing subgrade disturbance. We provide the following recommendations if wet weather construction is considered:

- The ground surface in and around the work area should be sloped so that surface water is directed to a sump or discharge location. The ground surface should be graded such that areas of ponded water do not develop. Measures should be taken by the contractor to prevent surface water from collecting in excavations and trenches. Measures should be implemented to remove surface water from the work areas.
- Earthwork activities should not take place during periods of heavy precipitation.
- Slopes with exposed soils should be covered with plastic sheeting or similar means.
- Site soils should not be left in a disturbed or uncompacted state and exposed to moisture. Sealing surficial soils by rolling with a smooth-drum roller prior to periods of precipitation may reduce the extent to which these soils become wet or unstable.
- Construction activities should be scheduled so that the length of time that soil is left exposed to moisture is reduced to the extent practicable.
- Construction traffic should be restricted to specific areas of the site, preferably areas that are not susceptible to wet weather disturbance such as haul roads and areas that are adequately surfaced with working pad materials.
- When on-site, moisture sensitive soils are wet of optimum, they are easily disturbed and will not provide adequate support for construction traffic nor for the proposed development. The use of granular haul roads and staging areas will be necessary to support heavy construction traffic. Generally, a 12- to 16-inch-thick mat of Imported Granular Material (see reference in the "Structural Fill and Backfill" section of this report) should be sufficient for light staging areas for the building pad and light staging activities but is not expected to be adequate to support repeated heavy equipment or truck traffic. The thickness of the Imported Granular Material for haul roads and areas with repeated heavy construction traffic should be increased to between 18 and 24 inches. The actual thickness of haul roads and staging areas should be determined at the time of construction and based on the contractor's approach to site development and the amount and type of construction traffic.

- The Aggregate Base thicknesses described in the "Pavement Recommendations" sections of this report are intended to support post-construction design traffic loads. The design aggregate base thicknesses will likely not support repeated heavy construction traffic during site construction or during pavement construction. A thicker aggregate base section as described above for haul roads will likely be required to support construction traffic.
- During periods of wet weather, concrete should be placed as soon as practical after preparing foundation excavations. Foundation bearing surfaces should not be exposed to standing water. Should water infiltrate and pool in the excavation, the water should be removed, and the foundation subgrade should be re-evaluated before placing reinforcing steel or concrete. Foundation subgrade protection, such as a 3- to 4-inch thickness of aggregate base or lean concrete, may be necessary if footing excavations are exposed to extended wet weather conditions.

During wet weather, or when the exposed subgrade is wet or unsuitable for proof-rolling, the prepared subgrade should be evaluated by observing excavation activity and probing with a steel foundation probe. Observations and probing should be performed by a member of our staff. Wet soil that has been disturbed due to site preparation activities, or soft or loose zones identified during probing, should be removed, and replaced with Imported Granular Material.

7.4 DEWATERING

As discussed in the "Groundwater" section of this report, groundwater was encountered in our explorations. However, we do not expect groundwater to be a major factor during shallow excavations and earthwork, provided the contractor is aware of the potential for shallow water. Excavations that extend into saturated/wet soils, or excavations that extend into perched groundwater, should be dewatered. Sump pumps are expected to adequately address groundwater encountered in shallow excavations. In addition to groundwater seepage, surface water inflow to the excavations during the wet season can be problematic. Provisions for surface water control during earthwork and excavations should be included in the project plans and should be installed prior to commencing earthwork.

7.5 EXCAVATION

Excavations will be required for installation of new foundations, utilities, and other earthwork activities. Conventional earthmoving equipment in proper working conditions should generally be capable of making the necessary excavations. Excavations deeper than 4 feet bgs will likely require shoring or should be sloped.

Open excavation techniques may be used to excavate trenches to depths of 4 feet bgs, provided the walls of the excavation are cut at a slope of 1H:1V and groundwater seepage is not present. At this inclination, the slopes may ravel and require some ongoing repair. Excavations should be flattened if excessive sloughing or raveling occurs. In lieu of large and open cuts, approved temporary shoring may be used for excavation support. A wide variety of shoring and dewatering systems are available. Consequently, we recommend the contractor be responsible for selecting the appropriate shoring and dewatering systems.

If box shoring is used, it should be understood that box shoring is a safety feature used to protect workers and does not prevent caving. If excavations are left open for extended periods of time, caving of sidewalls will likely occur. The presence of caved material will limit the ability to properly backfill and compact the trenches. The contractor should be prepared to fill voids between the box shoring and the sidewalls of the trenches with sand or gravel before caving occurs.

If shoring is used, we recommend that the type and design of the shoring system be the responsibility of the contractor, who is in the best position to choose a system that fits the overall plan of operation.

7.6 DRAINAGE CONSIDERATIONS

7.6.1 Temporary

During earthwork at the site, the contractor should be responsible for the temporary drainage of surface water as necessary to prevent standing water and/or erosion at the working surface. During rough and finished grading of the site, the contractor should keep all pads and subgrade free of ponding water.

7.6.2 Surface

The ground surface around the finished building pads should be sloped away from the edge of the pad at a minimum 2 percent gradient for a distance of at least 5 feet. Downspouts or roof scuppers should discharge into a storm drain system that carries collected water to an appropriate stormwater system. Trapped planter areas should not be created adjacent to pavement and structures without providing means for positive drainage (e.g., swales or catch basins).

7.7 PERMANENT SLOPES

Permanent cut and fill slopes should not exceed 2H:1V. Slopes that will be maintained by mowing should be constructed no steeper than 3H:1V. Access roads and pavement should be located at least 5 feet away from the top of cut and fill slopes. The setback should be increased to 10 feet for buildings. The slopes should be planted with appropriate vegetation to provide protection against erosion as soon as possible after grading. Surface water runoff should be collected and directed away from slopes to prevent water from running down the face of the slope.

7.8 STRUCTURAL FILL AND BACKFILL

7.8.1 General

Structural areas include areas beneath foundations, floor slabs, pavements, and any other areas intended to support structures or within the influence zone of structures. Fill intended for use in structural areas should meet the criteria for structural fill presented below. All structural fill soils should be free of debris, clay balls, roots, organic matter, frozen soil, man-made contaminants, particles with greatest dimension exceeding 4 inches (3-inch-maximum particle size in building footprints) and other deleterious materials.

Recommendations for suitable fill material are provided in the following sections.

7.8.2 On-Site Soil

The on-site material should generally be suitable for use as general structural fill, provided it is properly moisture conditioned; free of debris, organic material, and particles over 6 inches in diameter; and meets the specifications provided in OSSC 00330.12 (Borrow Material). The suitability of soil for use as structural fill will depend on the gradation and moisture content of the soil. As the amount of fines in the soil matrix increases, the soil becomes increasingly sensitive to small changes in moisture content and achieving the required degree of compaction becomes more difficult or impossible.

When used as structural fill, native soil should be placed in lifts with a maximum uncompacted thickness of 6 to 8 inches and compacted to not less than 95 percent of the maximum dry density for granular soil, as determined by ASTM D1557.

If desired, an experienced geotechnical engineer from CGS can determine the suitability of on-site soil encountered during earthwork activities for use as structural fill.

7.8.3 Imported Granular Material

Imported granular material used as structural fill should be pit- or quarry-run rock, crushed rock, or crushed gravel and sand. The imported granular material should also be durable, angular, and fairly well graded between coarse and fine material; should have less than 5 percent passing the U.S. No. 200 sieve (3 percent for retaining walls) by dry weight; and should have at least two mechanically fractured faces. In addition, aggregate base shall have a minimum of 75 percent fractured particles according to AASHTO T-355 and a sand equivalent of not less than 30 percent based on AASHTO T-176.

7.8.4 Trench Backfill

Backfill for pipe bedding and in the pipe zone should consist of well-graded granular material with a maximum particle size of ¾ inch and less than 5 percent passing the U.S. No. 200 sieve. The material should be free of organic matter and other deleterious materials. Further, the backfill should meet the pipe manufacturer's recommendations. Above the pipe zone backfill, Imported Granular Material may be used as described above.

7.8.5 Aggregate Base

Imported granular material used as aggregate base for pavement and as referenced within this report, should consist of ¾- or 1 ½-inch-minus material an meet the general specifications listed in OSSC 00640 (Aggregate Base and Shoulders) In addition, the aggregate should have less than 5 percent fines by dry weight and have at least two mechanically fractured faces. The aggregate base should be compacted to not less than 95 percent of the maximum dry density, as determined by ASTM D1557.

7.8.6 Drain Rock Material

Drain rock should consist of angular, granular material with a maximum particle size of 2 inches. The material should be free of roots, organic material, and other unsuitable material; should have less than 2 percent by dry weight passing the U.S. Standard No. 200 sieve (washed analysis); and should have at least two mechanically fractured faces. Drain rock should be compacted to a well-keyed, firm condition.

7.8.7 Fill Placement and Compaction

Structural fill should be compacted at moisture contents that are within 3 percent of the optimum moisture content as determined by ASTM International (ASTM) Test Method D 1557 (Modified Proctor). The optimum moisture content varies with gradation and should be evaluated during construction. Fill material that is not near the optimum moisture content should be moisture conditioned prior to compaction.

Fill and backfill material should be placed in uniform, horizontal lifts and compacted with appropriate equipment. The appropriate lift thickness will vary depending on the material and compaction equipment used. Fill material should be compacted in accordance with Table 2. It is the contractor's responsibility to select appropriate compaction equipment and place the material in lifts that are thin enough to meet these criteria. However, in no case should the loose lift thickness exceed 18 inches. Initial lift thickness over pipe may need to be thicker than 18 inches to prevent damage to the pipe during the application of compactive effort.

A representative from CGS should evaluate the compaction of every two vertical feet (or less) and 500 cubic yards of fill material placed. Compaction should be evaluated by compaction testing unless other methods are proposed for oversized materials and are approved by CGS during construction. These other methods typically involve procedural placement and compaction specifications together with verification requirements such as proof-rolling.

Table 2. Compaction Criteria

Fill Type	Compaction Requirements		
	Percent Maximum Dry Density Determined by ASTM Test method D 1557 at ± 3% of Optimum Moisture		
	0 to 2 Feet Below Subgrade	➢ 2 Feet Below Subgrade	Pipe Zone
Fine-grained soils (non expansive)	92	92	-----
Imported Granular, maximum particle size < 1½ inch	95	92	-----
Imported Granular, maximum particle size 1½ inch to 6 inches (3-inch-maximum under building footprints)	n/a (proof-roll)	n/a (proof-roll)	-----
Retaining Wall Backfill*	95	92	-----
Nonstructural Zones	92	92	90
Trench Backfill	95	92	90

Note:

* Measures should be taken to prevent overcompaction of the backfill behind retaining walls. We recommend placing the zone of backfill located within 5 feet of the wall in lifts not exceeding about 6 inches in loose thickness and compacting this zone with hand-operated equipment such as a vibrating plate compactor or a jumping jack.

7.8.8 Soil Amendment with Cement

As an alternative to the use of imported granular material for wet weather structural fill, an experienced contractor should be able to amend the on-site soil with portland cement to obtain suitable support properties. Successful use of soil amendment depends on the use of correct mixing techniques, soil moisture content, and amendment quantities. The amount of cement used during amendment should be based on an assumed soil dry unit weight of 100 pcf.

In addition, the new Oregon Department of Environmental Quality requirements under 1200C permits include additional requirements and testing runoff from sites where cement amendment is used.

Specific recommendations based on exposed site conditions for soil amendment can be provided if necessary. However, for preliminary design purposes, we recommend a target strength for cement-amendment subgrade of 100 psi. The amount of cement used to achieve this target generally varies with moisture content and soil type. It is difficult to predict field performance of soil cement amendment due to variability in soil response, and we recommend laboratory testing to confirm expectations. In general, 6 percent cement by weight of dry soil can be used when the soil moisture content does not exceed approximately 25 percent. If the soil moisture content is in the range of 25 to 35 percent, 7 to 8 percent by weight of dry soil is recommended. The amount of cement added to the soil may be need to be adjusted based on field observations and performance.

Moreover, depending on the time of year and moisture content levels during amendment, water may need to be applied during tilling to appropriately condition the soil moisture content.

We recommend assuming a minimum cement ratio of 6 percent by dry weight if amendment is performed during the dry summer months. The cement should be increased to 7 to 8 percent if amendment occurs during any other time of the year.

We recommend cement amendment equipment be equipped with ballon tires to reduce rutting and disturbance of the fine-grained soil. A sheepsfoot or segmented pad roller with a minimum static weight of 40,000 pounds should be used for initial compaction of the fine-grained soil without the use of vibratory action. A smooth-drum roller with a minimum applied linear force of 700 pounds per inch should be used for final compaction. The amended soil should be compacted to at least 92 percent of the maximum dry density, as determined by ASTM D1557.

A minimum curing time of four days is required between amendment and construction traffic access. Construction traffic should not be allowed on unprotected, cement-amended subgrade. To protect the cement-amended surfaces from abrasion or damage, the finished surface should be covered with 4 to 6 inches of imported granular material.

Amendment depths for subgrade beneath buildings and pavement, haul roads, and staging areas are typically on the order of 12, 16, and 12 inches, respectively. The crushed rock typically becomes contaminated with soil during construction. Contaminated base rock should be removed and replaced with clean rock in pavement areas. The actual thickness of the amended material and imported granular material for haul roads and staging areas will depend on the anticipated traffic as well as the contractor’s means and methods and should be the contractor’s responsibility.

Cement amendment should not be attempted when the air temperature is below 40 degrees Fahrenheit or during moderate to heavy precipitation. Cement should not be placed when the ground surface is saturated or standing water exists.

Portland cement-amended soil is hard and has low-permeability. This soil does not drain well and is not suitable for planting. Future planted areas should not be cement amended, if practical, or accommodations should be made for drainage and planting. Moreover, cement amendment of soil within building areas must be done carefully to avoid trapping of water under floor slabs. We should be contacted if this approach is considered. Cement amendment should not be used if runoff during construction cannot be directed away from adjacent wetlands. In general, cement amendment is not recommended during cold weather or steady rainfall.

7.8.9 Asphalt Concrete Pavement (ACP)

The AC should be Level 2, ½ inch (or finer), dense ACP according to OSSC 00744 (Asphalt Concrete Pavement) and generally compacted to 92 percent of the theoretical maximum density of the mix, as determined by AASHTO T209. Minimum and maximum lift thicknesses are generally held to be 2 and 3.5 inches, respectively, for ½-inch ACP.

Asphalt binder should be performance graded and conform to PG 64-22. The binder grade may be adjusted depending on the aggregate gradation and amount of recycled asphalt pavement and/or recycled asphalt shingled in the contractor’s mix design controls.

7.8.10 Subgrade Geotextile

The subgrade geotextile should conform to OSSC 00350. The subgrade geotextile should conform to the minimum property values presented in ODOT spec Table 02320-4 – Subgrade Geotextile (Separation). A minimum initial aggregate base lift of 6 inches is required over geotextiles.

7.8.11 Drainage Geotextile

The subdrainage geotextile should conform to OSSC 00350. The drainage geotextile should conform to the minimum property values presented in ODOT spec Table 02320-1. A minimum initial drain/storage aggregate lift of 6 inches is required over geotextiles.

8.0 LIMITATIONS OF REPORT

We have prepared this report for the exclusive use of the City of Newberg, Keller Associates, and their authorized parties for the project specifically identified in this report only. The report should be provided in its entirety to prospective contractors for bidding and estimating purposes; however, the conclusions and interpretations presented should not be construed as a warranty of the subsurface conditions. Experience has shown that soil and groundwater conditions can vary significantly over small distances. Inconsistent conditions can occur between explorations that may not be detected by a geotechnical study. If, during future site operations, subsurface conditions are encountered which vary appreciably from those described herein, CGS should be notified for review of the recommendations of this report, and revision of such if necessary.

This report is not intended for use by others, and the information contained herein is not applicable to other sites. No other party may rely on the product of our services unless we agree in advance and in writing to such reliance.

We recommend that CGS be retained to review the plans and specifications and verify that our recommendations have been interpreted and implemented as intended. Sufficient geotechnical monitoring, testing and consultation should be provided during construction in order to maintain CGS as Geotechnical Engineer of Record (GER) for the project, and to confirm that the conditions encountered are consistent with those indicated by explorations. Recommendations for design changes will be provided should conditions revealed during construction differ from those anticipated.

Within the limitations of scope, schedule and budget, the analysis, conclusions, and recommendations presented in this report were prepared in accordance with generally accepted professional principles and practices in the fields of geotechnical engineering and engineering geology in this area at the time the report was prepared.

9.0 SIGNATURES

Thank you very much for the opportunity to work with you. If you feel obliged, we welcome referrals from our previous clients and would enjoy the opportunity to work with others in your professional and personal networks.

Central Geotechnical Services, LLC

Digitally signed by Julio Vela

REGISTERED PROFESSIONAL ENGINEER
60333
02/21/25
OREGON
FEBRUARY 08, 2000
JULIO C VELA
EXPIRES: 06/30/26

Julio Vela, Ph.D., PE, GE
Principal Engineer

Jessica Pence, PE
Project Engineer

REFERENCES

Allen, J.E., M. Burns, and S. Sargent, 1986, *Cataclysms on the Columbia*: Timber Press, Portland, Oregon; 211 p.

American Association of State Highway and Transportation Officials (AASHTO). 1993. Guide for Design of Pavement Structures.

Burns, Scott, 1998, Geologic and physiographic provinces of Oregon: p 3-14 *in* S. Burns, editor, *Environmental, Groundwater and Engineering Geology: Applications from Oregon*: Association of Engineering Geologists, Special Publication 11; Star Publishing Co., Belmont, California; 689 p.

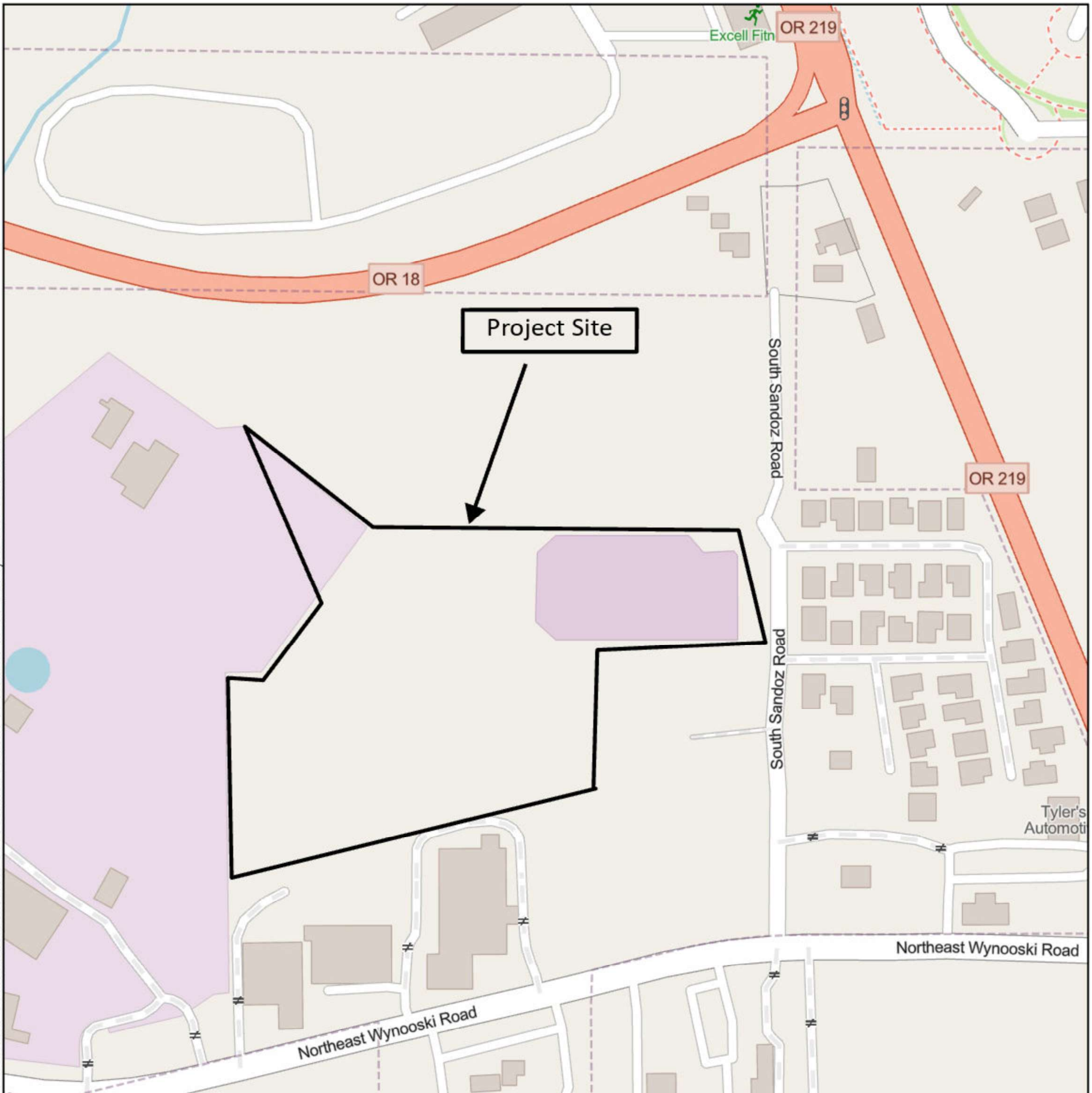
International Code Council. 2021. 2021 International Building Code.

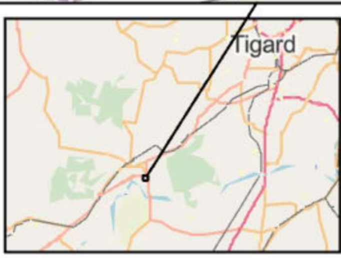
International Code Council. 2022. 2022 Oregon Structural Specialty Code.

Occupational Safety and Health Administration (OSHA). Technical Manual Section V: Chapter 2, Excavations: Hazard Recognition in Trenching and Shoring: http://www.osha.gov/dts/osta/otm/otm_v/otm_v_2.html.

Oregon Department of Transportation (ODOT). 2024. Oregon Standard Specifications for Construction, Oregon Department of Transportation.

Orr, E.L., W.N. Orr, 1999, *Geology of Oregon*. Kendall/Hunt Publishing Company, Dubuque, Iowa; 254 p.





N

0 350 700 Feet

Keller-15-01

Project Vicinity

CENTRAL GEOTECHNICAL SERVICES, LLC

Figure-1

Map data © OpenStreetMap contributors, Microsoft, Facebook, Inc. and its affiliates, Esri Community Maps contributors, Map layer by Esri

Default Folder: C:\Users\cgsuser.GIS-WORKSTATION\Central Geotechnical Services\A-H\Clutch\Clutch-11\Clutch-11-01\Analysis\GIS\Clutch-11-01

Legend

Approximate Location and Exploration Designation

- Borings
- CPTs

N

0 200 400 Feet

Keller-15-01
Site Plan
CENTRAL Geotechnical Services, LLC — Figure-2

Default Folder: C:\Users\cgsuser.GIS-WORKSTATION\Central Geotechnical Services\A-H\Clutch\Clutch-11\Clutch-11-01\Analysis\GIS\Clutch-11-01

APPENDIX A: FIELD EXPLORATIONS AND LABORATORY TESTING

APPENDIX A
FIELD EXPLORATIONS AND LABORATORY TESTING

FIELD EXPLORATIONS

Soil and groundwater conditions at the site were explored on December 2 through December 5, 2024, by drilling eight borings (B-1 through B-8) at the approximate locations shown on the Site Plan, Figure 2. The explorations were extended to final depths between 21.5 to 101.5 feet below ground surface. Drillings services were provided by Holt Services, Inc. of Milton, Washington, using mud rotary drilling techniques.

The explorations were continuously monitored by a qualified staff from our office who maintained detailed logs of subsurface explorations, visually classified the soil encountered and obtained representative soil samples from the explorations. Samples were collected from the borings using 1½-inch-inside-diameter, split-spoon SPT samplers in general accordance with ASTM D1586. The samplers were driven into the soil with a 140-pound automative trip hammer free-falling 30 inches. The samplers were driven a total distance of 18 inches. The number of blows required to drive the sampler the final 12 inches is recorded on the exploration logs, unless otherwise noted. The average efficiency of the automatic SPT hammer used by Holt Services, Inc. was 91.5 percent. The calibration testing results are presented at the end of this appendix.

Recovered soil samples from exploratory borings were visually classified in the field in general accordance with ASTM D 2488 and the classification chart listed in Key to Exploration Logs. Logs of the borings are presented in this Appendix. The logs are based on interpretation of the field and laboratory data and indicate the depth at which subsurface materials, or their characteristics change, although these changes may actually be gradual.

LABORATORY TESTING

Soil samples obtained from the explorations were visually classified in the field and in our laboratory using the USCS and ASTM classification methods. ASTM Test Method D2488 was used to visually classify the soil samples, while ASTM D2487 was used to classify the soils based on laboratory tests results.

Moisture Content

Moisture content determinations were performed in general accordance with ASTM D2216. Results of the moisture content testing are presented on the appropriate exploration logs at the respective sample depths.

Particle-size Analysis

Selected samples were "washed" through the U.S. No. 200 mesh sieve to estimate the relative percentages of coarse- and fine-grained particles in the soil. The percent passing value represents the percentage by weight of the sample finer than the U.S. No. 200 sieve. These tests were conducted to verify field descriptions and to estimate the fines content for analysis purposes. The tests were conducted in accordance with ASTM D1140 and/or C117, and the results are shown on the exploration logs in Appendix A at the respective sample depths.

Atterberg Limits Test

Atterberg limits (plastic and liquid limits) testing was performed on select soil samples in general accordance with ASTM D4318. The plastic limit is defined as the moisture content where the soil becomes brittle. The liquid limit is defined as the moisture content where the soil begins to act similar to a liquid. The plasticity index is the difference between the liquid and plastic limits. The test results are presented on the appropriate exploration log at the respective sample depth.

Exploration and Soil Classification Key

CENTRAL GEOTECHNICAL SERVICES

rev. 051624

Relative Density - Coarse-Grained Soil

Term	SPT (140-lb Hammer)*	D&M Sampler (140-lb Hammer)*	D&M Sampler (300-lb Hammer)*
Very-loose	0-4	0-11	0-4
Loose	4-10	11-26	4-10
Medium-dense	10-30	26-74	10-30
Dense	30-50	74-120	30-47
Very-dense	>50	>120	>47

Consistency - Fine-Grained Soil

Term	SPT (140-lb Hammer)*	Sampler (140-lb Hammer)*	Sampler (300-lb Hammer)*	Pocket Pen (tsf)	Torvane (tsf)
Very-soft	0-2	0-3	0-2	<0.25	<0.13
Soft	2-4	3-6	2-5	0.25-0.5	0.13-0.25
Medium-stiff	4-8	6-12	5-9	0.5-1	0.25-0.5
Stiff	8-15	12-25	9-19	1.0-2.0	0.5-1.0
Very-stiff	15-30	25-65	19-31	2.0-4.0	1.0-2.0
Hard	>30	>65	>31	>4.0	>2.0

SPT N-value correlation based off ASTM D1586

Unified Soil Classification System (USCS)

USCS Symbols	Graph	Typical Descriptions
GP		Poorly graded GRAVEL, <5% fines
GP-GM/GP-GC		Poorly graded GRAVEL w/ silt/clay, 5 to 12% fines
GM		silty GRAVEL, over 12% fines
GC		clayey GRAVEL, over 12% fines
GW		well graded GRAVEL, <5% fines
SP		poorly graded SAND, <5% fines
SP-SM/SP-SC		poorly graded SAND w/ silt/clay, 5 to 12% fines
SM		silty SAND, over 12% fines
SC		clayey SAND, over 12% fines
SW		well graded SAND, <5% fines
ML		SILT, low plasticity
MH		SILT, high plasticity
CL		CLAY, low plasticity
CH		CLAY, high plasticity
OL		ORGANIC SILT, low plasticity
OH		ORGANIC CLAY, medium to high plasticity
PT		PEAT

ADDITIONAL CONSTITUENTS

Silt/Clay in:			Sand/Gravel in:		
Percent*	Fine-Grained	Coarse-Grained	Percent*	Fine-Grained	Coarse-Grained
<5	trace	trace	<5	trace	trace
5-12	minor	with	5-15	minor	minor
>12	some	silty/clayey	15-30	with	with
			>30	sandy/gravelly	with

GEOTECHNICAL TESTING EXPLANATIONS

ATT	Atterberg Limits
CBR	California Bearing Ratio
CON	Consolidation
DD	Dry Density
DS	Direct Shear
HYD	Hydrometer Gradation
LL	Liquid Limit
PL	Plastic Limit
PI	Plasticity Index
MC	Moisture Content
MD	Moisture-Density
NP	Non-Plastic
OC	Organic Content
P	Pushed Sample
PP	Pocket Penetrometer
Passing No.200	Percent Passing U.S. Std. No.200 Sieve
RES	Resilient Modulus
SIEV	Sieve Gradation
TOR	Torvane
UC	Unconfined Compressive Strength
VS	Vane Shear

CONTACT LINES

———	Distinct contact between soil strata (approximate location)
– – – –	Approximate contact between soil strata

WATER LEVELS

	Water Level at Time of Drilling, or as labeled
	Water Level at End of Drilling, or as labeled
	Static Water Level, or as labeled

Moisture (ASTM D2488)

Dry	Very low moisture, dry to touch
Moist	Damp, without visible moisture
Wet	Visible free water, usually saturated

ADDITIONAL MATERIALS

AC		ASPHALT CONCRETE
CC		CEMENT CONCRETE
CR		CRUSHED ROCK
SOD		SOD/FOREST DUFF
FILL		FILL

SYMBOL	SAMPLER DESCRIPTIONS	SYMBOL	SAMPLER DESCRIPTIONS
	Location of grab sample (GS)		Location of sample collected using Standard Penetration Test with recovery (SS)
	No Recovery		Location of sample collected using Shelby tube/Geoprobe sample with recovery (ST)
	Location of rock coring interval (RC)		Location of sample collected using Dames & Moore sampler or pushed with recovery (D&M)

Key to Exploration Logs and Soil Classification

Figure A-1

CENTRAL Geotechnical Services
Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No: Keller-15-01

BORING LOG B-1

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/2/24
Date Completed: 12/2/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
0							
0–3		Medium-stiff, brown, SILT (ML), minor sand, trace organics, moist, sand is fine (3-inch-thick root zone)					
3–4.5			SS S-1	18		7	
5–6.5		Grades to Brown with orange and light-brown mottles, without organics at 5 feet bgs	SS S-2	18	39	6	
7.5–9		Grades to soft, trace sand at 7.5 feet bgs	SS S-	18		2	
9–11			ST S-	24			
11–12.5		Grades to brown with dark-brown streaks at 11 feet bgs	SS S-	18		3	
15–16.5		Grades to very-soft, brown with orange mottles, sandy, wet at 15 feet bgs	SS S-	18		1	
17–19			ST S-	24			
19–20.5		Grades to soft to medium-stiff, brown, minor sand at 19 feet bgs	SS S-	18		4	
25–26.5		Grades to medium-stiff, gray, trace sand at 25 feet bgs	SS S-	18		6	
30							

(Continued Next Page)

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL GEOTECHNICAL SERVICES
Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-1

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/2/24
Date Completed: 12/2/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
30							
31		Medium-stiff, brown, SILT (ML), minor sand, trace organics, moist, sand is fine (3-inch-thick root zone) *(continued)*	SS S-	18		15	
32		Grades to stiff, with pockets of gray sandy SILT at 30 feet bgs					
33							
34							
35							
36		Grades to medium-stiff, with pockets of gray SILT with sand at 35 feet bgs	SS S-	18		5	
37							
38							
39							
40							
41		Grades to stiff, without pockets at 40 feet bgs	SS S-	18		9	
41.5							

Exploration completed at 41.5 feet bgs.
Groundwater not observed due to drilling method.

Hammer efficiency is 91.5%.

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No: Keller-15-01

BORING LOG B-2

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/3/24
Date Completed: 12/3/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
0							
1		Medium-stiff, brown with orange mottles SILT (ML), minor sand, trace organics, moist, sand is fine (3-inch-thick root zone)					
2							
3			SS S-	18		5	
4							
5							
6		Grades to soft to medium-stiff, brown with light brown mottles, without organics at 5 feet bgs	SS S-	18		4	
7							
8			SS S-	18		3	
9							
10							
11		Grades to very-soft to soft, brown with dark-brown streaks, trace sand at 10 feet bgs	SS S-	18		2	
12							
13							
14							
15							
16		Grades to with sand at 15 feet bgs	SS S-	18	41	2	
17							
18							
19							
20							
21	21.5	Grades to soft to medium-stiff, brown at 20 feet bgs	SS S-	18		4	

Exploration completed at 21.5 feet bgs.
Groundwater not observed due to drilling method.

Hammer efficiency is 91.5%.

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

BORING TEMPLATE V05.07.24 - CGS BORING LOG.GDT - 1/17/25 19:03 - C:\USERS\CGSUSER\CENTRAL GEOTECHNICAL SERVICES\CGS - PROJECTS\I-Q\KELLER\KELLER-15\KELLER-15-01\FIELD EXPLORATION\2_FIELD AND DRAFT LOGS\KELLER-15-01 DRAFT LO

CENTRAL Geotechnical Services
Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-3

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/3/24
Date Completed: 12/3/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
0–2.5		Medium-stiff to stiff, brown with orange mottles SILT with sand (ML), trace organics, moist, sand is fine to medium grained, (3-inch-thick root zone)					
2.5–4			SS S-	18		8	
5–6.5		Grades to minor sand, without organics at 5 feet bgs	SS S-	18		6	
8–10		Grades to trace sand at 8 feet bgs	ST S-	24	36		Percent Passing No. 200: 96.3 LL: 39 PL: 31 PI: 8
10–11.5		Grades to soft to medium-stiff, brown with dark-brown streaks, minor sand at 10 feet bgs	SS S-	18	41	4	Percent Passing No. 200: 94.3
13–15			ST S-	24			
15–16.5		Grades to with approximately 2-inch-thick pockets of brown sand with silt at 15 feet bgs	SS S-	18		4	
20–21.5		Grades to gray, trace sand, with pockets of gray sandy silt at 20 feet bgs	SS S-	18		4	
25–26.5		Grades to sandy, wet at 25 feet bgs	SS S-	18		3	
27–29			ST S-	24			
29–30		Grades to stiff at 29 feet bgs	SS	18		9	

(Continued Next Page)

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL GEOTECHNICAL SERVICES
Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No: Keller-15-01

BORING LOG B-3

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/3/24
Date Completed: 12/3/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
30–35		Medium-stiff to stiff, brown with orange mottles SILT with sand (ML), trace organics, moist, sand is fine to medium grained, (3-inch-thick root zone) *(continued)*	S-				
35		Grades to soft to medium-stiff, minor sand, with pockets of gray sandy silt at 35 feet bgs	SS S-	18		4	
40		Grades to medium-stiff to stiff, trace sand, moist, without pockets at 40 feet bgs	SS S-	18		8	
45		Grades to soft to medium-stiff at 45 feet bgs	SS S-	3		4	
50.0		Very-stiff, gray with orange mottles CLAY (CL), minor sand, moist, sand is fine to medium	SS S-	18		22	
55.0		Medium-dense, brown with orange mottles, clayey SAND (SC), moist, sand is fine to medium, with pockets of gray clay	SS S-	18	45	13	Percent Passing No. 200: 44.2
60.0							

(Continued Next Page)

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-3

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/3/24
Date Completed: 12/3/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
60							
61		Very-stiff, brown with orange and black mottles sandy CLAY (CL), moist, sand is fine to medium	SS S-	18		16	
62–69							
70							
71		Grades to stiff, light-brown with orange mottles at 70 feet bgs Grades to trace sand at 71 feet bgs	SS S-	18		13	
72–79							
80							
81		Grades to medium-stiff at 80 feet bgs	SS S-	18		6	
82–90							

(Continued Next Page)

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL Geotechnical Services
Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-3

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/3/24
Date Completed: 12/3/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
90							
91		Very-stiff, brown with orange and black mottles sandy CLAY (CL), moist, sand is fine to medium *(continued)*	SS S-	18		20	
92		Grades to very-stiff red-brown with gray mottles at 90 feet bgs					
93							
94							
95							
96							
97							
98							
99							
100							
101		Grades to gray with orange mottles, minor sand at 100 feet bgs	SS S-	18		16	
	101.5						

Exploration completed at 101.5 feet bgs.
Groundwater not observed due to drilling method.

Hammer efficiency is 91.5%.

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-4

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/4/24
Date Completed: 12/4/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
0–3	Medium-stiff, brown with light-brown mottles SILT (ML), minor sand, trace organics, moist, sand is fine (3-inch-thick root zone)					
3–4.5		SS S-	18	33	7	
5.5–7	Grades to without organics at 5 feet bgs	SS S-	18		5	
8–9.5	Grades to soft to medium-stiff, with sand at 7.5 feet bgs	SS S-	18		4	
10.5–12	Grades to soft, brown with dark-brown streaks, minor sand at 10 feet bgs	SS S-	18		3	
15.5–17	Grades to with approximately 6-inch-thick lense of silty sand at 15 feet bgs	SS S-	18		3	
20.5–22	Grades to soft to medium-stiff, with approximately 2- to 3-inch-thick pockets of brown sandy silt at 20 feet bgs	SS S-	18		4	
25.5–27	Grades to soft, gray, with sand at 25 feet bgs	SS S-	18	39	3	
30						

(Continued Next Page)

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL
Geotechnical Services

Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-4

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/4/24
Date Completed: 12/4/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
30							
31		Medium-stiff, brown with light-brown mottles SILT (ML), minor sand, trace organics, moist, sand is fine (3-inch-thick root zone) *(continued)*	SS S-	18		5	
32		Grades to medium-stiff at 30 feet bgs					
33							
34							
35							
36		Grades to stiff, trace sand at 35 feet bgs	SS S-	18		10	
37							
38							
39							
40							
41	41.5	Grades to medium-stiff, without pockets of sandy silt at 40 feet bgs	SS S-	18		7	

Exploration completed at 41.5 feet bgs.
Groundwater not observed due to drilling method.

Hammer efficiency is 91.5%.

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL Geotechnical Services
Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No: Keller-15-01

BORING LOG B-5

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/4/24
Date Completed: 12/4/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
0	Medium-stiff, brown, SILT (ML), trace sand and organics, moist, sand is fine to medium (3-inch-thick root zone)					
2.5		SS S-	15		6	
5	Grades to brown with light-brown mottles, minor sand, without organics at 5 feet bgs	SS S-	18		7	
7.5	Grades to brown with dark-brown streaks at 7.5 feet bgs	SS S-	18		5	
10	Grades to soft at 10 feet bgs	SS S-	18		3	
15	Grades to wet, with approximately 2-inch-thick pockets of brown sandy silt at 15 feet bgs	SS S-	18		3	
20	Grades to soft to medium-stiff, brown at 20 feet bgs	SS S-	18	40	4	Percent Passing No. 200: 88.6
25	Grades to soft, gray at 25 feet bgs	SS S-	18		2	

(Continued Next Page)

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL Geotechnical Services
Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-5

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/4/24
Date Completed: 12/4/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
30							
31		Medium-stiff, brown, SILT (ML), trace sand and organics, moist, sand is fine to medium (3-inch-thick root zone) *(continued)*	SS S-	18	37	6	Percent Passing No. 200: 93.6
32		Grades to medium-stiff, trace organics (wood fibers) at 30 feet bgs					
33							
34							
35							
36		Grades to trace sand, no organics at 35 feet bgs	SS S-	18		7	
37							
38							
39							
40							
41		Grades to medium-stiff to stiff, without pockets at 40 feet bgs	SS S-	18		8	
	41.5						

Exploration completed at 41.5 feet bgs.
Groundwater not observed due to drilling method.

Hammer efficiency is 91.5%.

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL Geotechnical Services

Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-6

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/4/24
Date Completed: 12/4/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
0							
1		Medium-stiff, brown, SILT (ML), minor sand, trace organics, moist, sand is fine (3-inch-thick root zone)					
2							
3			SS S-	15		7	
4							
5							
6		Grades to without organics at 5 feet bgs	SS S-	18	36	6	
7							
8		Grades to soft to medium-stiff, brown with light-brown mottles, with sand at 7.5 feet bgs	SS S-	18		4	
9							
10							
11		Grades to soft, minor sand at 10 feet bgs	SS S-	18		3	
12							
13							
14							
15							
16		Grades to very-soft to soft, with approximately 4- to 6-inch-thick pockets of brown sandy silt at 15 feet bgs	SS S-	18		2	
17							
18							
19							
20							
21	21.5	Grades to stiff, brown with orange mottles at 20 feet bgs	SS S-	18		9	

Exploration completed at 21.5 feet bgs.
Groundwater not observed due to drilling method.

Hammer efficiency is 91.5%.

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL Geotechnical Services

Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-7

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/4/24
Date Completed: 12/4/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
0–3		Medium-stiff to stiff, brown, SILT (ML), minor sand, trace organics, moist, sand is fine (3-inch-thick root zone)					
3–4.5			SS S-	18		8	
5–6.5		Grades to medium-stiff, brown with light-brown mottles, without organics at 5 feet bgs	SS S-	18		7	
7.5–9		Grades to soft-medium-stiff, brown with dark-brown streaks, with sand at 7.5 feet bgs	SS S-	18		4	
10–11.5		Grades to soft, trace sand at 10 feet bgs	SS S-	18		3	
15–16.5		Grades to very-soft, sandy, wet at 15 feet bgs	SS S-	18	40	1	
20–21.5		Grades to medium-stiff, trace sand at 20 feet bgs	SS S-	18		5	
21.5							

Exploration completed at 21.5 feet bgs.
Groundwater not observed due to drilling method.

Hammer efficiency is 91.5%.

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL Geotechnical Services
Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No:
Keller-15-01

BORING LOG B-8

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/5/24
Date Completed: 12/5/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
0		Medium-stiff to stiff, brown with orange and light-brown mottles SILT with sand (ML), trace organics, moist, sand is fine to medium (3-inch-thick root zone)					
2.5			SS S-	15		8	
5		Grades to medium-stiff, without organics at 5 feet bgs	SS S-	18		5	
7.5		Grades to brown with dark-brown streaks, minor sand at 7.5 bgs	SS S-	18	38	5	LL: 34 PL: 29 PI: 5
10		Grades to soft at 10 feet bgs	SS S-	18		3	
15		Grades to medium-stiff, trace sand, wet, with approximately 1- to 2-inch-thick pockets of brown silty sand at 15 feet bgs	SS S-	18		6	
20		Grades to very-soft, brown, sandy at 20 feet bgs	SS S-	18		1	
25		Grades to soft, gray, trace sand, with approximately 4-inch-thick pockets of silty sand at 25 feet bgs	SS S-	18	37	3	Percent Passing No. 200: 99.4
30							

(Continued Next Page)

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:

CENTRAL GEOTECHNICAL SERVICES
Central Geotechnical Services
7662 SW Mohawk Street
Tualatin, OR 97062
Telephone: (503) 616-9419

Project No: **Keller-15-01**

BORING LOG B-8

Project: Newberg Wastewater Treatment Plant
Location: Newberg Dundee Bypass at Highway 219
Client: Keller Associates

Date Started: 12/5/24
Date Completed: 12/5/24

Approximate Ground Elevation:
Groundwater first observed: ---
Groundwater at end of drilling: ---

DEPTH (ft)	GRAPHIC LOG	MATERIAL DESCRIPTION	SAMPLE TYPE NUMBER	RECOVERY (in.)	MOISTURE (%)	N-Value	LAB RESULTS/ REMARKS
30							
31		Medium-stiff to stiff, brown with orange and light-brown mottles SILT with sand (ML), trace organics, moist, sand is fine to medium (3-inch-thick root zone) *(continued)*	SS S-	18		19	
32		Grades to very-stiff, with approximately 2-inch-thick pockets of sandy silt at 30 feet bgs					
33							
34							
35							
36		Grades to stiff, moist, without sandy silt pockets at 35 feet bgs	SS S-	18		12	
37							
38							
39	39.0						
40		Medium-dense, green-gray with orange mottles silty SAND (SM), moist, sand is fine to medium, weak cementation					
41	41.5		SS S-	18		27	

Exploration completed at 41.5 feet bgs.
Groundwater not observed due to drilling method.

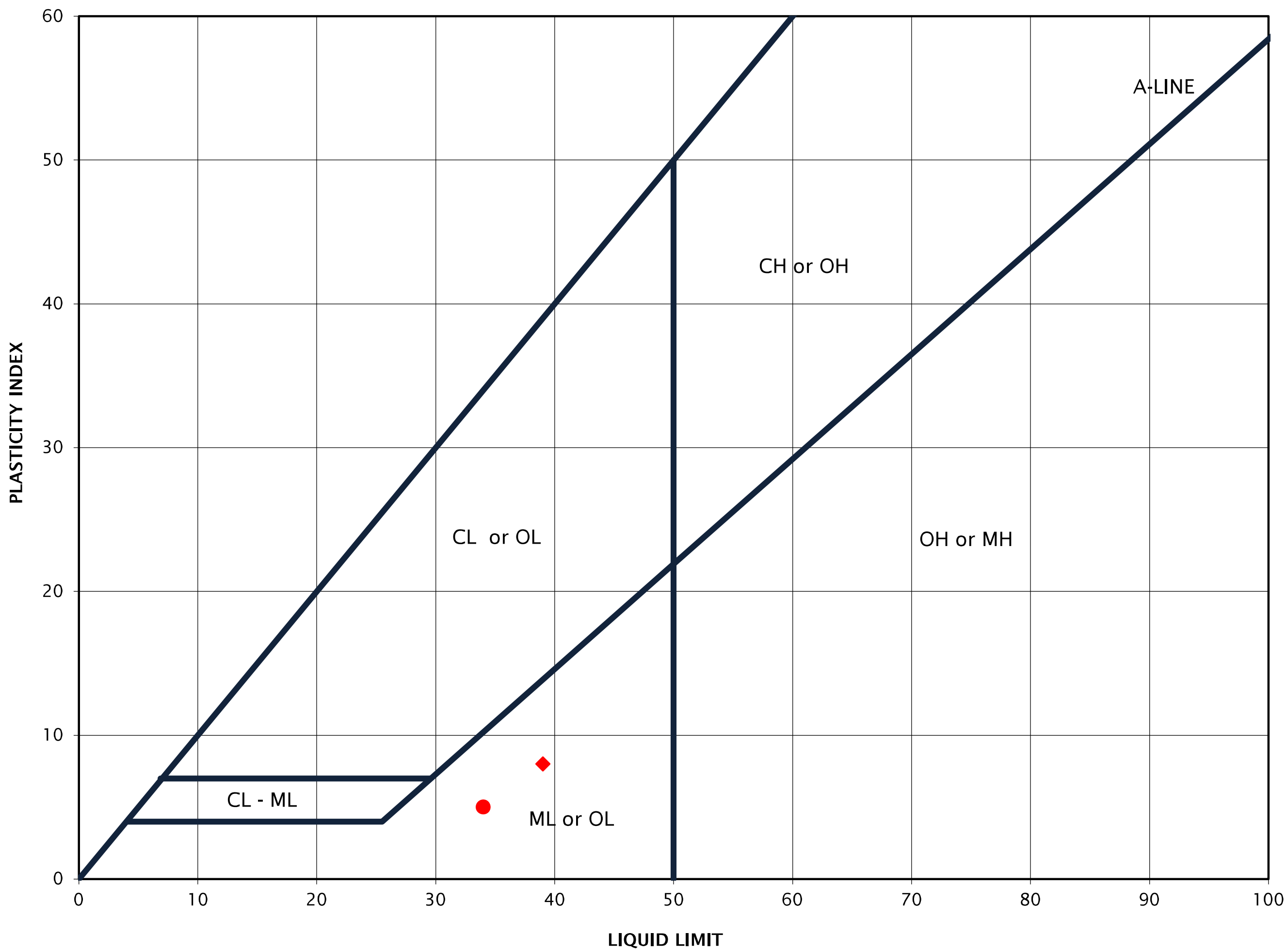
Hammer efficiency is 91.5%.

Operator: AEC Drilling
Equipment:
Rig Number:
Drilling Method: 3 7/8" Mud Rotary

Logged By: Heather H.
Checked By: Jessica P.

Approximate Location Coordinates:
Lat: Long:

Remarks:



Key	Exploration Number	Sample Depth (Feet)	Moisture Content (Percent)	Liquid Limit	Plastic Limit	Plasticity Index
◆	B-3	8	36.4	39	31	8
●	B-8	8	37.4	34	29	5

CENTRAL GEOTECHNICAL SERVICES

Atterberg Limits Test Results	
Keller-15-01	January 2025
Newberg Wastewater Treatment Plant	Figure A-10

Case Method & iCAP® Results

rig 13 mobile B-57 - 30
OP: EFD

holt yard test hole 1
Date: 08-December-2023

BL#	Depth ft	BLC bl/ft	BPM bpm	FMX kips	VMX f/s	EFV ft-lb	ETR (%)
419	40.27	185	48.3	44	15.2	320.7	91.6
420	40.27	185	47.8	42	15.5	320.6	91.6
421	40.28	185	48.2	43	15.3	318.6	91.0
422	40.28	185	48.1	42	15.3	317.1	90.6
423	40.29	185	48.3	43	15.3	318.2	90.9
		Average	46.9	40	15.4	320.3	91.5

Total number of blows analyzed: 423

BL# Sensors

1-423 F1: [706NWJ2] 223.2 (1.00); F4: [706NWJ1] 223.9 (1.00); A2: [K13450] 391.2 (1.00); A3: [K13449] 392.6 (1.00)

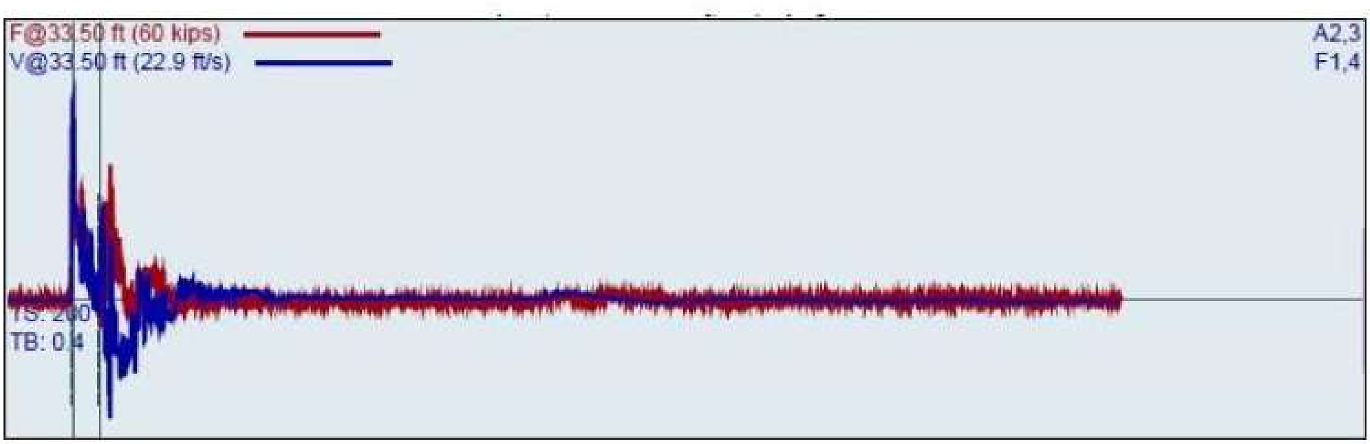
BL# Comments

84 34-50/4.5
85 LE = 38.50 ft; WC = 16,739.1 f/s
207 26-49-50/3.5
208 LE = 40.50 ft; WC = 16,805.0 f/s
289 33-50/5.5
290 LE = 43.50 ft; WC = 16,795.4 f/s
373 34-50/4.5
374 LE = 45.50 ft; WC = 16,789.7 f/s
423 50/3.5

Time Summary

Drive 1 minute 44 seconds 9:09 AM - 9:10 AM (12/8/2023) BN 1 - 84
Stop 18 minutes 52 seconds 9:10 AM - 9:29 AM
Drive 2 minutes 34 seconds 9:29 AM - 9:32 AM BN 85 - 207
Stop 20 minutes 0 second 9:32 AM - 9:52 AM
Drive 1 minute 42 seconds 9:52 AM - 9:54 AM BN 208 - 289
Stop 18 minutes 19 seconds 9:54 AM - 10:12 AM
Drive 1 minute 45 seconds 10:12 AM - 10:14 AM BN 290 - 373
Stop 16 minutes 7 seconds 10:14 AM - 10:30 AM
Drive 1 minute 11 seconds 10:30 AM - 10:31 AM BN 374 - 423

Total time [01:22:18] = (Driving [00:08:58] + Stop [01:13:20])



APPENDIX B: CONE PENETRATION TESTING

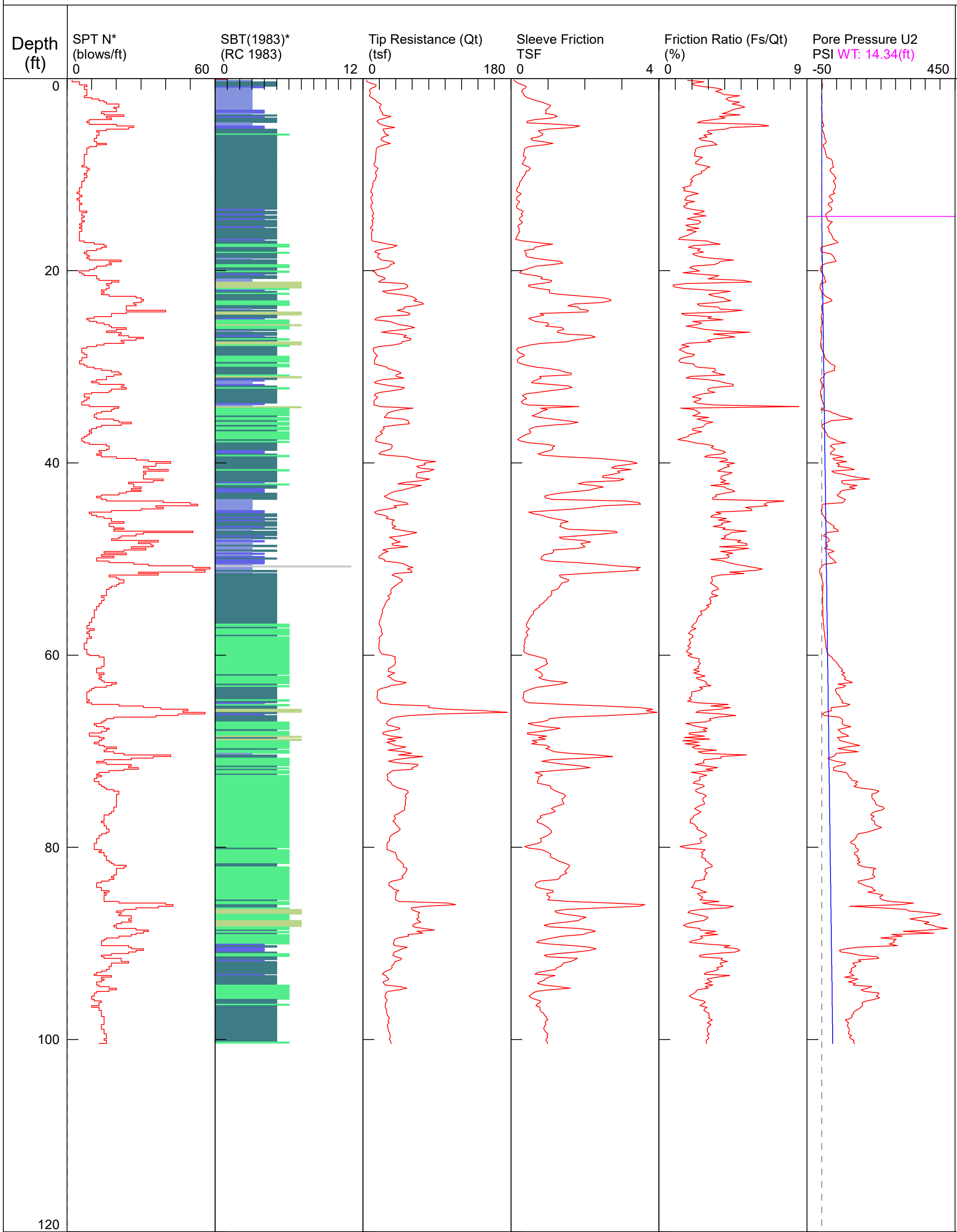
APPENDIX B
CONE PENETRATION TESTING

Our subsurface exploration program included two CPT probes (CPT-1 and CPT-2) advanced to depths of approximately 101.4 feet bgs. The approximate locations of the CPTs are shown on Figure 2. The CPT was conducted in general accordance with ASTM D5578 by Oregon Geotechnical Explorations of Keizer, Oregon. The results of the CPT are presented in this appendix.

The CPT is an in-situ test that characterizes subsurface stratigraphy. The testing includes advancing a 35.6-millimeter diameter cone equipped with a load cell and a friction sleeve through the soil profile. The cone is advanced at a rate of approximately 2 centimeters per second. Tip resistance, sleeve friction, and pore pressure are typically recorded at 0.1-meter intervals. At select depths, the CPT advancement was suspended and pore water dissipation rates measured. The shear wave velocity of the subsurface soil was measured at 2-meter increments.

Central Geotech / CPT-1 / 1591 S Sandoz Rd Newberg

OPERATOR: OGE DMM
TEST DATE: 11/18/2024 8:27:17 AM
CONE ID: DDG1661
TOTAL DEPTH: 100.394 ft
HOLE NUMBER: CPT-1



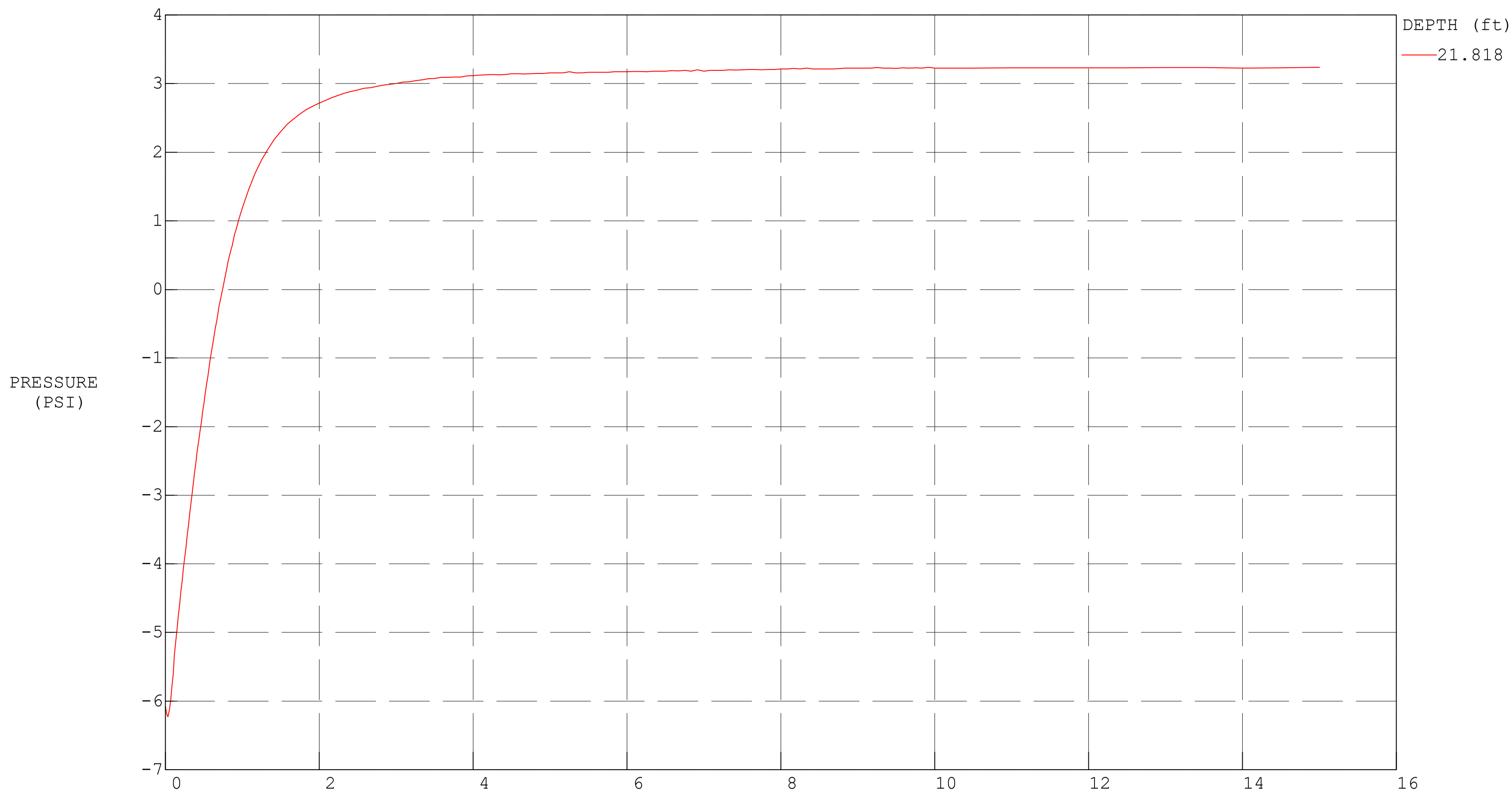
REMARKS

1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: Central Geotech / CPT-1 / 1591 S Sandoz Rd Newberg

OPERATOR: OGE DMM
CONE ID: DDG1661
TEST DATE: 11/18/2024 8:27:17 AM



MAXIMUM PRESSURE = 3.238 (PSI)
HYDROSTATIC PRESSURE = 3.24 (PSI), WATER TABLE: 14.34 ft

Central Geotech / CPT-1 / 1591 S Sandoz Rd Newberg

OPERATOR: OGE DMM
TEST DATE: 11/18/2024 8:27:17 AM
CONE ID: DDG1661
TOTAL DEPTH: 100.394 ft
HOLE NUMBER: CPT-1

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
0.164	4.42	0.0768	1.738	0.050	2	1	sensitive fine grained
0.328	4.72	0.1286	2.728	0.587	5	3	clay
0.492	9.79	0.2001	2.046	1.208	5	5	clayey silt to silty clay
0.656	16.05	0.3349	2.087	2.950	8	5	clayey silt to silty clay
0.820	15.32	0.4091	2.671	2.260	7	5	clayey silt to silty clay
0.984	10.93	0.3843	3.516	1.160	7	4	silty clay to clay
1.148	8.25	0.3166	3.837	0.539	8	3	clay
1.312	8.31	0.2871	3.456	0.276	8	3	clay
1.476	8.86	0.3340	3.770	0.209	8	3	clay
1.640	8.64	0.3369	3.900	-0.709	8	3	clay
1.804	7.48	0.3663	4.899	-0.801	7	3	clay
1.969	10.30	0.4336	4.210	-0.666	10	3	clay
2.133	13.57	0.5538	4.082	0.041	13	3	clay
2.297	16.13	0.6864	4.256	0.652	15	3	clay
2.461	17.06	0.8350	4.897	0.472	16	3	clay
2.625	21.68	0.9647	4.451	0.779	21	3	clay
2.789	21.83	1.0709	4.907	0.041	21	3	clay
2.953	19.91	1.0399	5.224	-0.321	19	3	clay
3.117	20.94	1.0006	4.779	-0.669	20	3	clay
3.281	21.12	0.9353	4.431	-0.197	20	3	clay
3.445	22.43	0.9496	4.235	0.388	14	4	silty clay to clay
3.609	24.19	0.9316	3.852	0.913	15	4	silty clay to clay
3.773	23.52	1.1609	4.936	1.038	23	3	clay
3.937	34.20	1.2525	3.664	2.219	16	5	clayey silt to silty clay
4.101	27.52	1.1073	4.025	1.249	18	4	silty clay to clay
4.265	19.49	0.6430	3.299	1.172	9	5	clayey silt to silty clay
4.429	17.00	0.4359	2.565	2.169	8	5	clayey silt to silty clay
4.593	18.56	0.4313	2.325	3.751	9	5	clayey silt to silty clay
4.757	21.27	1.2900	6.066	5.072	20	3	clay
4.921	27.92	1.8609	6.666	7.150	27	3	clay
5.085	38.58	1.6705	4.331	0.805	25	4	silty clay to clay
5.249	24.37	0.9856	4.045	0.930	16	4	silty clay to clay
5.413	24.96	0.7377	2.957	3.018	12	5	clayey silt to silty clay
5.577	26.25	0.7790	2.969	5.582	13	5	clayey silt to silty clay
5.741	26.92	0.8674	3.223	7.454	13	5	clayey silt to silty clay
5.906	31.17	0.8469	2.717	9.280	12	6	sandy silt to clayey silt
6.070	24.37	0.7136	2.929	8.406	12	5	clayey silt to silty clay
6.234	21.95	0.5367	2.445	10.582	11	5	clayey silt to silty clay
6.398	22.10	0.5744	2.600	12.428	11	5	clayey silt to silty clay
6.562	25.75	0.8289	3.220	15.208	12	5	clayey silt to silty clay
6.726	33.38	1.1380	3.410	13.046	16	5	clayey silt to silty clay
6.890	25.82	0.9121	3.533	4.796	12	5	clayey silt to silty clay
7.054	19.16	0.5013	2.617	5.611	9	5	clayey silt to silty clay
7.218	16.92	0.3923	2.320	7.723	8	5	clayey silt to silty clay
7.382	16.10	0.3574	2.221	10.743	8	5	clayey silt to silty clay
7.546	16.08	0.3583	2.229	11.840	8	5	clayey silt to silty clay
7.710	15.75	0.3415	2.169	12.679	8	5	clayey silt to silty clay
7.874	15.55	0.3413	2.196	14.033	7	5	clayey silt to silty clay
8.038	15.35	0.3298	2.150	15.771	7	5	clayey silt to silty clay
8.202	15.15	0.4015	2.650	17.358	7	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
8.366	15.46	0.3790	2.452	31.130	7	5	clayey silt to silty clay
8.530	14.75	0.3502	2.376	34.740	7	5	clayey silt to silty clay
8.694	14.73	0.3290	2.235	36.599	7	5	clayey silt to silty clay
8.858	13.59	0.3035	2.233	35.552	7	5	clayey silt to silty clay
9.022	13.42	0.3622	2.699	38.021	6	5	clayey silt to silty clay
9.186	15.67	0.4864	3.105	40.648	8	5	clayey silt to silty clay
9.350	18.24	0.5242	2.875	31.767	9	5	clayey silt to silty clay
9.514	17.35	0.4864	2.804	27.276	8	5	clayey silt to silty clay
9.678	15.73	0.4033	2.564	28.748	8	5	clayey silt to silty clay
9.843	15.03	0.3919	2.608	34.895	7	5	clayey silt to silty clay
10.007	16.35	0.3737	2.286	41.156	8	5	clayey silt to silty clay
10.171	16.22	0.3378	2.083	42.553	8	5	clayey silt to silty clay
10.335	15.27	0.3106	2.035	48.083	7	5	clayey silt to silty clay
10.499	15.47	0.2971	1.920	44.806	7	5	clayey silt to silty clay
10.663	12.78	0.2625	2.054	38.078	6	5	clayey silt to silty clay
10.827	12.09	0.2304	1.906	42.723	6	5	clayey silt to silty clay
10.991	11.87	0.2321	1.956	44.492	6	5	clayey silt to silty clay
11.155	11.82	0.2246	1.901	46.896	6	5	clayey silt to silty clay
11.319	11.36	0.1636	1.440	46.048	5	5	clayey silt to silty clay
11.483	10.32	0.1638	1.587	44.535	5	5	clayey silt to silty clay
11.647	9.74	0.1472	1.511	39.842	5	5	clayey silt to silty clay
11.811	9.34	0.1868	2.000	38.416	4	5	clayey silt to silty clay
11.975	11.39	0.2715	2.383	43.982	5	5	clayey silt to silty clay
12.139	11.87	0.2300	1.938	27.540	6	5	clayey silt to silty clay
12.303	9.93	0.1657	1.668	24.989	5	5	clayey silt to silty clay
12.467	9.30	0.1538	1.655	31.307	4	5	clayey silt to silty clay
12.631	10.39	0.1615	1.555	35.535	5	5	clayey silt to silty clay
12.795	10.90	0.2361	2.168	36.722	5	5	clayey silt to silty clay
12.959	11.74	0.1926	1.641	23.350	6	5	clayey silt to silty clay
13.123	10.05	0.1731	1.723	21.303	5	5	clayey silt to silty clay
13.287	9.57	0.1430	1.495	27.626	5	5	clayey silt to silty clay
13.451	9.90	0.1605	1.622	33.071	5	5	clayey silt to silty clay
13.615	11.27	0.2322	2.061	33.680	5	5	clayey silt to silty clay
13.780	11.80	0.3261	2.764	26.964	8	4	silty clay to clay
13.944	12.27	0.3082	2.513	18.750	6	5	clayey silt to silty clay
14.108	13.10	0.2749	2.098	14.228	6	5	clayey silt to silty clay
14.272	10.94	0.3133	2.864	13.175	7	4	silty clay to clay
14.436	12.13	0.2444	2.016	17.312	6	5	clayey silt to silty clay
14.600	13.28	0.2274	1.713	18.290	6	5	clayey silt to silty clay
14.764	10.60	0.2549	2.404	20.641	7	4	silty clay to clay
14.928	12.13	0.3078	2.537	36.099	6	5	clayey silt to silty clay
15.092	11.35	0.2742	2.417	27.293	5	5	clayey silt to silty clay
15.256	11.96	0.1946	1.627	26.403	6	5	clayey silt to silty clay
15.420	9.90	0.1869	1.888	18.511	5	5	clayey silt to silty clay
15.584	9.04	0.2195	2.429	23.606	6	4	silty clay to clay
15.748	12.48	0.2126	1.705	25.236	6	5	clayey silt to silty clay
15.912	10.51	0.2377	2.261	24.124	5	5	clayey silt to silty clay
16.076	10.43	0.2110	2.023	28.628	5	5	clayey silt to silty clay
16.240	10.26	0.1893	1.845	33.038	5	5	clayey silt to silty clay
16.404	10.49	0.1594	1.520	35.797	5	5	clayey silt to silty clay
16.568	10.47	0.1332	1.272	37.088	5	5	clayey silt to silty clay
16.732	10.57	0.1271	1.203	40.588	5	5	clayey silt to silty clay
16.896	11.24	0.3302	2.938	49.957	7	4	silty clay to clay
17.060	22.02	0.7084	3.218	54.178	11	5	clayey silt to silty clay
17.224	30.43	1.1312	3.718	35.152	15	5	clayey silt to silty clay
17.388	41.29	0.8744	2.118	17.315	16	6	sandy silt to clayey silt
17.552	36.12	0.6477	1.794	-1.992	14	6	sandy silt to clayey silt
17.717	25.21	0.6303	2.501	-3.104	12	5	clayey silt to silty clay
17.881	15.80	0.3691	2.337	-2.788	8	5	clayey silt to silty clay
18.045	14.01	0.3791	2.708	-0.362	7	5	clayey silt to silty clay
18.209	20.52	0.4209	2.052	29.649	8	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
18.373	18.42	0.3960	2.150	34.950	9	5	clayey silt to silty clay
18.537	17.66	0.4475	2.534	40.422	8	5	clayey silt to silty clay
18.701	19.72	0.6341	3.217	42.004	9	5	clayey silt to silty clay
18.865	22.53	1.0193	4.526	46.935	22	3	clay
19.029	36.01	1.3402	3.723	48.296	17	5	clayey silt to silty clay
19.193	38.63	1.3978	3.620	17.538	18	5	clayey silt to silty clay
19.357	33.27	1.1233	3.377	5.812	16	5	clayey silt to silty clay
19.521	32.58	0.6738	2.069	-0.971	12	6	sandy silt to clayey silt
19.685	29.16	0.5467	1.875	-4.317	11	6	sandy silt to clayey silt
19.849	17.86	0.3949	2.212	-4.489	9	5	clayey silt to silty clay
20.013	11.41	0.2822	2.475	-3.281	5	5	clayey silt to silty clay
20.177	15.83	0.2300	1.453	0.161	6	6	sandy silt to clayey silt
20.341	15.55	0.3744	2.408	3.562	7	5	clayey silt to silty clay
20.505	18.28	0.6650	3.638	6.594	12	4	silty clay to clay
20.669	25.25	0.8424	3.337	9.530	12	5	clayey silt to silty clay
20.833	27.13	0.8112	2.991	9.949	13	5	clayey silt to silty clay
20.997	21.42	1.1039	5.154	11.483	21	3	clay
21.161	19.05	1.0723	5.631	14.803	18	3	clay
21.325	49.92	0.7966	1.596	-3.229	16	7	silty sand to sandy silt
21.490	54.27	0.4634	0.854	-4.882	17	7	silty sand to sandy silt
21.654	54.46	0.5001	0.919	-5.680	17	7	silty sand to sandy silt
21.818	51.30	0.7397	1.442	-6.095	16	7	silty sand to sandy silt
21.982	36.94	1.0438	2.826	-1.455	14	6	sandy silt to clayey silt
22.146	23.72	1.0280	4.335	-1.433	15	4	silty clay to clay
22.310	29.12	1.0534	3.618	2.711	14	5	clayey silt to silty clay
22.474	44.67	1.3470	3.016	6.965	17	6	sandy silt to clayey silt
22.638	58.58	1.9630	3.352	12.018	28	5	clayey silt to silty clay
22.802	63.10	2.4957	3.956	22.446	30	5	clayey silt to silty clay
22.966	65.20	2.6820	4.114	32.616	31	5	clayey silt to silty clay
23.130	61.83	2.7032	4.373	34.378	30	5	clayey silt to silty clay
23.294	71.66	2.4154	3.371	17.801	27	6	sandy silt to clayey silt
23.458	73.45	1.7096	2.328	3.080	28	6	sandy silt to clayey silt
23.622	62.17	1.5413	2.480	-1.318	24	6	sandy silt to clayey silt
23.786	49.94	1.8135	3.632	-1.309	24	5	clayey silt to silty clay
23.950	50.01	1.8526	3.705	1.443	24	5	clayey silt to silty clay
24.114	41.39	2.0913	5.054	1.867	40	3	clay
24.278	50.74	2.0700	4.081	3.662	24	5	clayey silt to silty clay
24.442	57.11	0.7790	1.365	1.186	18	7	silty sand to sandy silt
24.606	55.58	0.8831	1.589	-1.263	18	7	silty sand to sandy silt
24.770	21.98	0.7025	3.197	-1.941	11	5	clayey silt to silty clay
24.934	16.14	0.4801	2.975	-1.508	8	5	clayey silt to silty clay
25.098	14.31	0.5570	3.893	-0.304	9	4	silty clay to clay
25.262	31.97	0.6498	2.033	2.234	12	6	sandy silt to clayey silt
25.427	38.48	0.9991	2.597	1.757	15	6	sandy silt to clayey silt
25.591	43.66	1.0255	2.349	0.105	17	6	sandy silt to clayey silt
25.755	56.75	0.9408	1.658	-1.095	18	7	silty sand to sandy silt
25.919	62.79	1.3764	2.193	-2.339	24	6	sandy silt to clayey silt
26.083	51.54	1.4295	2.774	-2.749	20	6	sandy silt to clayey silt
26.247	33.25	1.2593	3.788	-3.281	16	5	clayey silt to silty clay
26.411	22.57	1.2509	5.545	-2.752	22	3	clay
26.575	44.79	1.4864	3.320	0.125	21	5	clayey silt to silty clay
26.739	52.80	2.1532	4.079	0.355	25	5	clayey silt to silty clay
26.903	49.29	2.2732	4.613	-0.067	31	4	silty clay to clay
27.067	58.01	2.0202	3.483	-0.784	28	5	clayey silt to silty clay
27.231	57.69	1.6947	2.938	-2.351	22	6	sandy silt to clayey silt
27.395	47.36	1.5038	3.176	-3.034	23	5	clayey silt to silty clay
27.559	46.73	0.8169	1.748	-3.888	15	7	silty sand to sandy silt
27.723	37.21	0.5215	1.402	-4.386	12	7	silty sand to sandy silt
27.887	19.64	0.3593	1.830	-4.520	8	6	sandy silt to clayey silt
28.051	12.27	0.1686	1.375	-1.783	6	5	clayey silt to silty clay
28.215	12.31	0.1515	1.231	0.681	6	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
28.379	12.76	0.1870	1.466	2.886	6	5	clayey silt to silty clay
28.543	13.96	0.2281	1.634	5.796	7	5	clayey silt to silty clay
28.707	16.13	0.3482	2.160	7.945	8	5	clayey silt to silty clay
28.871	17.60	0.3573	2.030	9.331	8	5	clayey silt to silty clay
29.035	14.92	0.2244	1.504	10.862	6	6	sandy silt to clayey silt
29.199	14.85	0.1906	1.284	14.400	6	6	sandy silt to clayey silt
29.364	13.74	0.1635	1.190	19.858	5	6	sandy silt to clayey silt
29.528	13.92	0.1850	1.329	26.327	5	6	sandy silt to clayey silt
29.692	14.12	0.2965	2.100	32.139	7	5	clayey silt to silty clay
29.856	21.72	0.4687	2.158	43.931	8	6	sandy silt to clayey silt
30.020	29.26	0.6810	2.328	45.082	11	6	sandy silt to clayey silt
30.184	30.13	1.0202	3.387	41.606	14	5	clayey silt to silty clay
30.348	38.22	1.3141	3.439	43.862	18	5	clayey silt to silty clay
30.512	44.23	1.4392	3.255	23.012	21	5	clayey silt to silty clay
30.676	46.16	1.6374	3.548	13.166	22	5	clayey silt to silty clay
30.840	40.20	1.6162	4.021	7.723	19	5	clayey silt to silty clay
31.004	40.67	0.7724	1.900	7.737	16	6	sandy silt to clayey silt
31.168	49.49	0.8204	1.658	-0.801	16	7	silty sand to sandy silt
31.332	24.08	0.7092	2.945	-4.420	12	5	clayey silt to silty clay
31.496	16.23	0.5919	3.648	-3.883	10	4	silty clay to clay
31.660	13.83	0.5506	3.981	-1.239	13	3	clay
31.824	23.50	1.0593	4.509	3.540	23	3	clay
31.988	34.59	1.5597	4.510	4.197	22	4	silty clay to clay
32.152	50.59	1.6571	3.277	4.091	24	5	clayey silt to silty clay
32.316	47.56	1.4163	2.979	-1.920	18	6	sandy silt to clayey silt
32.480	35.60	1.0603	2.979	-3.833	17	5	clayey silt to silty clay
32.644	21.61	0.7377	3.414	-4.683	10	5	clayey silt to silty clay
32.808	14.93	0.3937	2.639	-4.336	7	5	clayey silt to silty clay
32.972	13.71	0.3106	2.267	-3.236	7	5	clayey silt to silty clay
33.136	17.83	0.3647	2.046	-1.548	9	5	clayey silt to silty clay
33.301	16.46	0.4222	2.565	-0.578	8	5	clayey silt to silty clay
33.465	13.65	0.3303	2.420	0.736	7	5	clayey silt to silty clay
33.629	13.29	0.2824	2.125	2.641	6	5	clayey silt to silty clay
33.793	13.35	0.3170	2.376	4.846	6	5	clayey silt to silty clay
33.957	13.42	0.4577	3.412	7.107	9	4	silty clay to clay
34.121	21.50	1.8301	8.515	10.117	21	3	clay
34.285	60.54	0.8038	1.328	5.621	19	7	silty sand to sandy silt
34.449	46.57	0.9849	2.115	-3.756	18	6	sandy silt to clayey silt
34.613	35.56	0.8340	2.346	27.309	14	6	sandy silt to clayey silt
34.777	30.17	0.7537	2.499	35.557	12	6	sandy silt to clayey silt
34.941	29.25	0.6824	2.334	52.160	11	6	sandy silt to clayey silt
35.105	28.06	0.5748	2.049	61.625	11	6	sandy silt to clayey silt
35.269	25.60	0.7751	3.029	85.557	12	5	clayey silt to silty clay
35.433	48.48	1.1169	2.305	103.955	19	6	sandy silt to clayey silt
35.597	55.06	1.4667	2.665	32.290	21	6	sandy silt to clayey silt
35.761	55.27	1.8077	3.272	21.780	26	5	clayey silt to silty clay
35.925	56.52	1.6133	2.855	8.032	22	6	sandy silt to clayey silt
36.089	37.16	1.0269	2.764	0.096	14	6	sandy silt to clayey silt
36.253	24.25	0.6472	2.669	1.062	12	5	clayey silt to silty clay
36.417	26.01	0.5328	2.049	5.709	10	6	sandy silt to clayey silt
36.581	23.85	0.4861	2.039	8.734	9	6	sandy silt to clayey silt
36.745	20.73	0.5372	2.592	12.490	10	5	clayey silt to silty clay
36.909	23.71	0.5164	2.178	17.336	9	6	sandy silt to clayey silt
37.073	21.01	0.3838	1.827	18.091	8	6	sandy silt to clayey silt
37.238	17.29	0.3067	1.775	21.864	7	6	sandy silt to clayey silt
37.402	15.81	0.2282	1.444	30.039	6	6	sandy silt to clayey silt
37.566	15.89	0.1817	1.144	45.259	6	6	sandy silt to clayey silt
37.730	15.25	0.2767	1.815	52.198	7	5	clayey silt to silty clay
37.894	22.88	0.4960	2.169	80.711	9	6	sandy silt to clayey silt
38.058	33.88	0.9851	2.908	37.839	16	5	clayey silt to silty clay
38.222	35.51	1.1790	3.321	28.841	17	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
38.386	35.18	1.1193	3.183	35.634	17	5	clayey silt to silty clay
38.550	33.31	1.1310	3.396	44.746	16	5	clayey silt to silty clay
38.714	28.03	1.0568	3.771	39.910	13	5	clayey silt to silty clay
38.878	21.98	0.8905	4.052	32.511	14	4	silty clay to clay
39.042	19.15	0.7321	3.824	28.683	12	4	silty clay to clay
39.206	28.93	0.8569	2.963	48.322	14	5	clayey silt to silty clay
39.370	53.30	1.4825	2.782	72.142	20	6	sandy silt to clayey silt
39.534	58.95	2.3841	4.045	37.843	28	5	clayey silt to silty clay
39.698	68.81	2.8712	4.174	43.457	33	5	clayey silt to silty clay
39.862	88.52	3.2558	3.679	83.685	42	5	clayey silt to silty clay
40.026	74.18	3.4101	4.598	49.281	36	5	clayey silt to silty clay
40.190	75.51	3.1135	4.124	59.880	36	5	clayey silt to silty clay
40.354	65.21	2.7936	4.285	54.604	31	5	clayey silt to silty clay
40.518	68.43	2.7199	3.976	93.085	33	5	clayey silt to silty clay
40.682	86.29	3.2472	3.764	109.643	41	5	clayey silt to silty clay
40.846	81.00	2.8813	3.558	34.140	31	6	sandy silt to clayey silt
41.011	66.10	2.9422	4.452	41.559	32	5	clayey silt to silty clay
41.175	65.29	2.7555	4.222	73.110	31	5	clayey silt to silty clay
41.339	64.62	2.4813	3.841	93.100	31	5	clayey silt to silty clay
41.503	65.71	2.4708	3.761	122.696	31	5	clayey silt to silty clay
41.667	81.02	3.0518	3.768	162.270	39	5	clayey silt to silty clay
41.831	72.13	2.9322	4.066	68.070	35	5	clayey silt to silty clay
41.995	52.27	1.9648	3.760	67.111	25	5	clayey silt to silty clay
42.159	42.54	1.8209	4.281	74.045	27	4	silty clay to clay
42.323	70.64	2.2359	3.166	118.870	27	6	sandy silt to clayey silt
42.487	62.52	2.4927	3.988	92.968	30	5	clayey silt to silty clay
42.651	54.52	2.2512	4.130	112.761	26	5	clayey silt to silty clay
42.815	47.50	2.1279	4.481	73.870	30	4	silty clay to clay
42.979	37.82	1.7446	4.615	61.560	24	4	silty clay to clay
43.143	33.25	1.3354	4.017	62.888	21	4	silty clay to clay
43.307	29.67	1.0224	3.446	51.989	14	5	clayey silt to silty clay
43.471	25.97	0.9086	3.500	55.705	12	5	clayey silt to silty clay
43.635	28.94	0.9422	3.257	67.226	14	5	clayey silt to silty clay
43.799	33.99	1.1145	3.280	79.064	16	5	clayey silt to silty clay
43.963	40.97	3.1130	7.600	76.353	39	3	clay
44.127	52.45	3.4513	6.581	70.114	50	3	clay
44.291	54.88	3.5059	6.390	2.313	53	3	clay
44.455	37.51	2.4733	6.596	0.388	36	3	clay
44.619	40.94	2.1492	5.250	2.495	39	3	clay
44.783	30.90	1.7309	5.603	-0.980	30	3	clay
44.948	18.69	1.0579	5.661	-1.505	18	3	clay
45.112	13.98	0.4822	3.451	-0.664	9	4	silty clay to clay
45.276	15.84	0.5984	3.778	1.361	10	4	silty clay to clay
45.440	25.93	0.8451	3.259	4.475	12	5	clayey silt to silty clay
45.604	30.53	0.9609	3.148	8.760	15	5	clayey silt to silty clay
45.768	28.14	1.1507	4.091	10.014	18	4	silty clay to clay
45.932	38.05	1.3776	3.621	14.930	18	5	clayey silt to silty clay
46.096	35.44	1.5479	4.369	18.089	23	4	silty clay to clay
46.260	35.46	1.3476	3.801	25.567	17	5	clayey silt to silty clay
46.424	35.26	1.3557	3.846	33.615	17	5	clayey silt to silty clay
46.588	39.99	1.3183	3.297	42.767	19	5	clayey silt to silty clay
46.752	35.56	1.4326	4.030	39.404	23	4	silty clay to clay
46.916	40.18	1.5603	3.884	51.263	19	5	clayey silt to silty clay
47.080	53.08	2.8187	5.312	56.282	51	3	clay
47.244	65.27	2.8730	4.403	18.180	31	5	clayey silt to silty clay
47.408	57.60	2.4733	4.295	11.838	28	5	clayey silt to silty clay
47.572	45.22	1.7932	3.967	5.362	22	5	clayey silt to silty clay
47.736	32.14	1.3050	4.062	18.767	21	4	silty clay to clay
47.900	36.63	1.3886	3.792	22.266	18	5	clayey silt to silty clay
48.064	39.12	1.9443	4.972	26.993	37	3	clay
48.228	45.14	2.1532	4.771	19.673	29	4	silty clay to clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
48.392	35.33	1.8872	5.343	13.041	34	3	clay
48.556	36.09	1.9373	5.369	18.633	35	3	clay
48.720	54.55	2.0031	3.673	17.717	26	5	clayey silt to silty clay
48.885	33.07	1.8036	5.455	9.292	32	3	clay
49.049	24.17	1.1344	4.695	30.030	23	3	clay
49.213	30.59	1.1504	3.761	41.458	15	5	clayey silt to silty clay
49.377	24.94	1.1162	4.476	21.617	24	3	clay
49.541	21.93	0.8960	4.087	22.712	14	4	silty clay to clay
49.705	19.67	0.8415	4.278	25.598	19	3	clay
49.869	19.21	0.8062	4.197	30.382	12	4	silty clay to clay
50.033	25.84	0.8141	3.152	39.665	12	5	clayey silt to silty clay
50.197	26.12	1.0249	3.925	42.822	17	4	silty clay to clay
50.361	42.77	1.7977	4.204	48.342	27	4	silty clay to clay
50.525	51.12	2.3852	4.668	9.719	33	4	silty clay to clay
50.689	53.77	2.8095	5.226	0.666	51	3	clay
50.853	60.68	3.4922	5.756	-1.817	58	11	very stiff fine grained (*)
51.017	53.93	3.3857	6.280	-6.172	52	3	clay
51.181	58.06	3.4371	5.922	-6.711	56	3	clay
51.345	59.88	2.5793	4.309	-7.190	29	5	clayey silt to silty clay
51.509	38.74	1.9985	5.160	-6.052	37	3	clay
51.673	35.34	1.3071	3.700	-3.300	17	5	clayey silt to silty clay
51.837	41.53	1.3269	3.196	-1.074	20	5	clayey silt to silty clay
52.001	44.79	1.4338	3.202	-0.520	21	5	clayey silt to silty clay
52.165	47.94	1.5570	3.249	0.623	23	5	clayey silt to silty clay
52.329	47.54	1.5385	3.237	2.469	23	5	clayey silt to silty clay
52.493	43.78	1.3731	3.138	3.288	21	5	clayey silt to silty clay
52.657	41.39	1.3528	3.269	4.238	20	5	clayey silt to silty clay
52.822	38.09	1.3064	3.430	3.516	18	5	clayey silt to silty clay
52.986	36.25	1.2962	3.577	3.176	17	5	clayey silt to silty clay
53.150	34.23	1.2385	3.619	3.250	16	5	clayey silt to silty clay
53.314	33.65	1.0955	3.256	2.694	16	5	clayey silt to silty clay
53.478	34.46	1.1025	3.200	3.202	16	5	clayey silt to silty clay
53.642	33.70	1.0892	3.233	1.668	16	5	clayey silt to silty clay
53.806	30.17	1.0804	3.582	2.207	14	5	clayey silt to silty clay
53.970	32.15	1.0047	3.126	2.931	15	5	clayey silt to silty clay
54.134	32.02	0.9806	3.064	2.323	15	5	clayey silt to silty clay
54.298	29.33	0.9344	3.187	2.519	14	5	clayey silt to silty clay
54.462	28.61	0.8897	3.110	2.531	14	5	clayey silt to silty clay
54.626	27.05	0.8529	3.153	2.229	13	5	clayey silt to silty clay
54.790	26.57	0.7650	2.880	2.704	13	5	clayey silt to silty clay
54.954	25.55	0.7789	3.049	3.092	12	5	clayey silt to silty clay
55.118	24.60	0.7105	2.889	3.058	12	5	clayey silt to silty clay
55.282	23.43	0.6574	2.807	3.356	11	5	clayey silt to silty clay
55.446	23.77	0.6010	2.529	3.468	11	5	clayey silt to silty clay
55.610	23.73	0.6120	2.580	3.801	11	5	clayey silt to silty clay
55.774	22.45	0.5864	2.613	3.751	11	5	clayey silt to silty clay
55.938	22.29	0.5395	2.421	4.084	11	5	clayey silt to silty clay
56.102	21.89	0.5163	2.359	4.276	10	5	clayey silt to silty clay
56.266	20.85	0.4825	2.314	4.590	10	5	clayey silt to silty clay
56.430	20.22	0.4679	2.315	5.062	10	5	clayey silt to silty clay
56.594	19.78	0.4428	2.239	5.251	9	5	clayey silt to silty clay
56.759	19.62	0.4139	2.110	5.616	9	5	clayey silt to silty clay
56.923	20.45	0.4148	2.029	6.232	8	6	sandy silt to clayey silt
57.087	21.59	0.4274	1.980	6.927	8	6	sandy silt to clayey silt
57.251	21.96	0.4915	2.238	7.272	11	5	clayey silt to silty clay
57.415	22.93	0.4533	1.977	7.310	9	6	sandy silt to clayey silt
57.579	22.16	0.4170	1.883	8.775	8	6	sandy silt to clayey silt
57.743	23.54	0.4210	1.789	10.165	9	6	sandy silt to clayey silt
57.907	22.70	0.4616	2.034	10.335	9	6	sandy silt to clayey silt
58.071	20.47	0.4257	2.080	9.630	10	5	clayey silt to silty clay
58.235	19.76	0.3853	1.950	11.071	8	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
58.399	19.82	0.3627	1.831	11.572	8	6	sandy silt to clayey silt
58.563	20.05	0.3787	1.889	12.046	8	6	sandy silt to clayey silt
58.727	19.37	0.3735	1.929	12.916	7	6	sandy silt to clayey silt
58.891	19.26	0.3560	1.849	13.578	7	6	sandy silt to clayey silt
59.055	19.57	0.3418	1.747	14.412	7	6	sandy silt to clayey silt
59.219	19.32	0.3688	1.909	14.733	7	6	sandy silt to clayey silt
59.383	19.76	0.3547	1.795	16.047	8	6	sandy silt to clayey silt
59.547	20.74	0.3457	1.667	17.655	8	6	sandy silt to clayey silt
59.711	20.96	0.3615	1.725	18.132	8	6	sandy silt to clayey silt
59.875	23.66	0.4729	1.999	20.977	9	6	sandy silt to clayey silt
60.039	34.37	0.6068	1.766	25.838	13	6	sandy silt to clayey silt
60.203	39.55	0.7726	1.954	34.315	15	6	sandy silt to clayey silt
60.367	38.50	0.9478	2.462	38.028	15	6	sandy silt to clayey silt
60.532	39.08	0.9565	2.448	41.060	15	6	sandy silt to clayey silt
60.696	39.53	0.9506	2.405	48.766	15	6	sandy silt to clayey silt
60.860	39.20	0.9865	2.517	51.704	15	6	sandy silt to clayey silt
61.024	38.06	0.9297	2.443	57.095	15	6	sandy silt to clayey silt
61.188	35.51	0.8352	2.352	58.032	14	6	sandy silt to clayey silt
61.352	31.40	0.7586	2.417	66.145	12	6	sandy silt to clayey silt
61.516	30.79	0.6497	2.110	70.443	12	6	sandy silt to clayey silt
61.680	30.59	0.7494	2.450	66.706	12	6	sandy silt to clayey silt
61.844	38.64	0.8144	2.108	78.160	15	6	sandy silt to clayey silt
62.008	34.35	0.8435	2.456	68.269	13	6	sandy silt to clayey silt
62.172	30.15	0.8451	2.804	75.646	14	5	clayey silt to silty clay
62.336	33.30	0.7535	2.264	80.303	13	6	sandy silt to clayey silt
62.500	35.68	0.8520	2.389	76.322	14	6	sandy silt to clayey silt
62.664	39.12	1.0732	2.744	89.318	15	6	sandy silt to clayey silt
62.828	52.34	1.5191	2.903	104.152	20	6	sandy silt to clayey silt
62.992	47.43	1.3546	2.857	54.638	18	6	sandy silt to clayey silt
63.156	33.48	1.0558	3.155	80.564	16	5	clayey silt to silty clay
63.320	29.26	0.7176	2.453	73.503	11	6	sandy silt to clayey silt
63.484	21.90	0.5798	2.648	48.608	10	5	clayey silt to silty clay
63.648	18.15	0.4487	2.472	45.520	9	5	clayey silt to silty clay
63.812	17.31	0.3447	1.992	49.063	8	5	clayey silt to silty clay
63.976	17.52	0.3513	2.006	50.666	8	5	clayey silt to silty clay
64.140	17.10	0.3386	1.981	58.070	8	5	clayey silt to silty clay
64.304	17.04	0.3357	1.970	60.594	8	5	clayey silt to silty clay
64.469	17.13	0.3165	1.849	61.519	8	5	clayey silt to silty clay
64.633	17.80	0.3502	1.968	66.049	9	5	clayey silt to silty clay
64.797	20.90	0.3633	1.739	70.797	8	6	sandy silt to clayey silt
64.961	21.06	0.4990	2.370	67.667	10	5	clayey silt to silty clay
65.125	33.68	1.4202	4.218	95.058	21	4	silty clay to clay
65.289	80.33	2.5394	3.162	83.165	31	6	sandy silt to clayey silt
65.453	79.74	3.4519	4.330	32.340	38	5	clayey silt to silty clay
65.617	101.37	3.8369	3.786	31.257	49	5	clayey silt to silty clay
65.781	147.79	3.6568	2.475	32.635	47	7	silty sand to sandy silt
65.945	175.61	3.9477	2.249	10.254	56	7	silty sand to sandy silt
66.109	93.07	3.4789	3.739	2.301	45	5	clayey silt to silty clay
66.273	56.27	2.6290	4.673	8.073	36	4	silty clay to clay
66.437	40.00	1.4421	3.606	56.745	19	5	clayey silt to silty clay
66.601	33.93	1.0408	3.068	67.427	16	5	clayey silt to silty clay
66.765	31.52	0.9943	3.155	71.303	15	5	clayey silt to silty clay
66.929	29.30	0.8314	2.838	69.412	14	5	clayey silt to silty clay
67.093	28.71	0.4688	1.633	68.290	11	6	sandy silt to clayey silt
67.257	30.18	0.6034	2.000	75.291	12	6	sandy silt to clayey silt
67.421	38.34	0.9000	2.348	98.598	15	6	sandy silt to clayey silt
67.585	45.00	1.3269	2.949	75.124	17	6	sandy silt to clayey silt
67.749	42.81	1.1457	2.677	54.458	16	6	sandy silt to clayey silt
67.913	28.38	0.8199	2.889	62.238	14	5	clayey silt to silty clay
68.077	23.72	0.4340	1.830	67.281	9	6	sandy silt to clayey silt
68.241	24.78	0.4608	1.860	79.263	9	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
68.406	34.57	0.9593	2.776	91.391	13	6	sandy silt to clayey silt
68.570	47.55	0.7420	1.561	53.253	15	7	silty sand to sandy silt
68.734	30.07	0.9298	3.092	58.746	14	5	clayey silt to silty clay
68.898	39.85	0.5757	1.445	61.308	13	7	silty sand to sandy silt
69.062	28.93	0.7056	2.439	83.584	11	6	sandy silt to clayey silt
69.226	34.70	0.5505	1.587	104.257	13	6	sandy silt to clayey silt
69.390	39.18	0.9720	2.481	127.899	15	6	sandy silt to clayey silt
69.554	51.70	1.0435	2.019	83.239	20	6	sandy silt to clayey silt
69.718	42.96	0.9463	2.203	54.429	16	6	sandy silt to clayey silt
69.882	30.43	1.0667	3.506	87.455	15	5	clayey silt to silty clay
70.046	49.16	1.1722	2.385	123.259	19	6	sandy silt to clayey silt
70.210	59.37	1.5867	2.673	47.404	23	6	sandy silt to clayey silt
70.374	43.43	2.3061	5.311	46.731	42	3	clay
70.538	72.77	2.7443	3.772	39.747	35	5	clayey silt to silty clay
70.702	54.39	2.0603	3.789	20.699	26	5	clayey silt to silty clay
70.866	39.09	1.0793	2.762	29.114	15	6	sandy silt to clayey silt
71.030	30.70	0.8281	2.698	48.229	12	6	sandy silt to clayey silt
71.194	41.98	1.1493	2.738	80.286	16	6	sandy silt to clayey silt
71.358	66.79	1.4665	2.196	77.652	26	6	sandy silt to clayey silt
71.522	65.97	1.9055	2.889	53.885	25	6	sandy silt to clayey silt
71.686	59.94	2.1379	3.568	39.061	29	5	clayey silt to silty clay
71.850	60.25	1.7228	2.860	40.027	23	6	sandy silt to clayey silt
72.014	36.13	1.1811	3.270	40.636	17	5	clayey silt to silty clay
72.178	33.16	0.6502	1.961	81.101	13	6	sandy silt to clayey silt
72.343	30.24	0.7779	2.574	87.228	12	6	sandy silt to clayey silt
72.507	29.34	0.8527	2.907	89.790	14	5	clayey silt to silty clay
72.671	30.06	0.7485	2.491	91.935	12	6	sandy silt to clayey silt
72.835	30.01	0.7425	2.475	99.787	11	6	sandy silt to clayey silt
72.999	29.50	0.7372	2.499	101.189	11	6	sandy silt to clayey silt
73.163	32.85	0.7078	2.156	121.253	13	6	sandy silt to clayey silt
73.327	34.62	0.7229	2.089	113.588	13	6	sandy silt to clayey silt
73.491	35.45	0.9457	2.669	117.754	14	6	sandy silt to clayey silt
73.655	39.05	1.0779	2.761	108.411	15	6	sandy silt to clayey silt
73.819	42.96	1.0667	2.483	130.251	16	6	sandy silt to clayey silt
73.983	50.64	1.1384	2.248	175.184	19	6	sandy silt to clayey silt
74.147	54.63	1.2150	2.225	192.767	21	6	sandy silt to clayey silt
74.311	54.88	1.3254	2.416	185.380	21	6	sandy silt to clayey silt
74.475	52.26	1.4427	2.761	168.928	20	6	sandy silt to clayey silt
74.639	51.22	1.4704	2.872	170.177	20	6	sandy silt to clayey silt
74.803	52.59	1.4350	2.730	169.098	20	6	sandy silt to clayey silt
74.967	52.14	1.3823	2.652	172.806	20	6	sandy silt to clayey silt
75.131	51.82	1.3903	2.684	178.470	20	6	sandy silt to clayey silt
75.295	51.36	1.4108	2.748	180.287	20	6	sandy silt to clayey silt
75.459	51.68	1.4335	2.775	181.909	20	6	sandy silt to clayey silt
75.623	51.37	1.2956	2.523	188.642	20	6	sandy silt to clayey silt
75.787	50.41	1.1740	2.330	207.165	19	6	sandy silt to clayey silt
75.951	50.64	1.0914	2.156	210.532	19	6	sandy silt to clayey silt
76.115	49.95	1.1620	2.327	202.014	19	6	sandy silt to clayey silt
76.280	46.89	1.1958	2.551	179.378	18	6	sandy silt to clayey silt
76.444	43.60	1.0559	2.422	169.424	17	6	sandy silt to clayey silt
76.608	38.82	0.8561	2.206	165.628	15	6	sandy silt to clayey silt
76.772	37.97	0.7891	2.079	176.620	15	6	sandy silt to clayey silt
76.936	39.35	0.8142	2.070	169.328	15	6	sandy silt to clayey silt
77.100	38.99	0.7400	1.898	167.909	15	6	sandy silt to clayey silt
77.264	36.39	0.7029	1.932	178.199	14	6	sandy silt to clayey silt
77.428	38.93	0.7299	1.876	179.870	15	6	sandy silt to clayey silt
77.592	39.94	0.8621	2.159	178.815	15	6	sandy silt to clayey silt
77.756	41.69	0.9224	2.213	187.913	16	6	sandy silt to clayey silt
77.920	42.85	1.0034	2.342	202.062	16	6	sandy silt to clayey silt
78.084	45.14	1.0377	2.299	188.640	17	6	sandy silt to clayey silt
78.248	43.99	1.0910	2.481	169.690	17	6	sandy silt to clayey silt

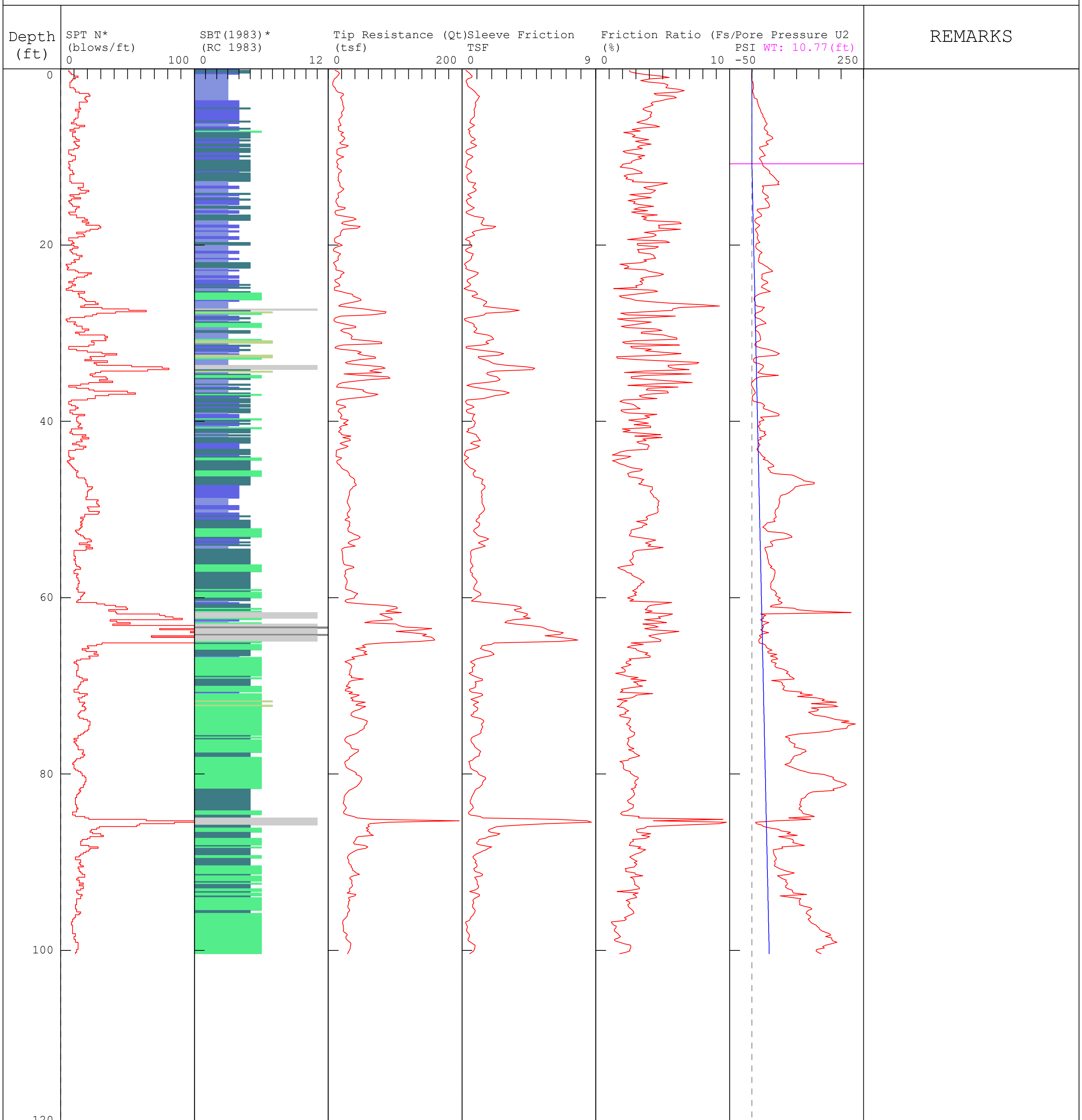
Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
78.412	40.77	1.0956	2.688	154.176	16	6	sandy silt to clayey silt
78.576	37.12	1.0585	2.852	123.705	14	6	sandy silt to clayey silt
78.740	34.43	0.9928	2.884	119.139	13	6	sandy silt to clayey silt
78.904	32.79	0.9059	2.764	117.337	13	6	sandy silt to clayey silt
79.068	32.11	0.7987	2.488	113.701	12	6	sandy silt to clayey silt
79.232	32.43	0.8166	2.518	108.164	12	6	sandy silt to clayey silt
79.396	31.48	0.8162	2.594	98.392	12	6	sandy silt to clayey silt
79.560	29.28	0.7354	2.513	98.318	11	6	sandy silt to clayey silt
79.724	29.26	0.5546	1.896	112.401	11	6	sandy silt to clayey silt
79.888	29.38	0.3750	1.277	113.859	11	6	sandy silt to clayey silt
80.052	29.20	0.4729	1.620	116.596	11	6	sandy silt to clayey silt
80.217	29.41	0.8242	2.804	124.215	14	5	clayey silt to silty clay
80.381	34.60	0.9312	2.692	122.792	13	6	sandy silt to clayey silt
80.545	39.37	1.0134	2.575	111.088	15	6	sandy silt to clayey silt
80.709	40.16	1.0743	2.676	109.935	15	6	sandy silt to clayey silt
80.873	40.79	1.0643	2.610	121.298	16	6	sandy silt to clayey silt
81.037	41.34	1.0718	2.593	119.208	16	6	sandy silt to clayey silt
81.201	41.59	1.1855	2.851	128.046	16	6	sandy silt to clayey silt
81.365	44.27	1.2467	2.817	120.623	17	6	sandy silt to clayey silt
81.529	46.18	1.3715	2.971	130.852	18	6	sandy silt to clayey silt
81.693	48.54	1.4871	3.065	120.759	19	6	sandy silt to clayey silt
81.857	49.10	1.5825	3.224	126.478	24	5	clayey silt to silty clay
82.021	48.81	1.5732	3.224	142.520	23	5	clayey silt to silty clay
82.185	53.24	1.5257	2.866	182.393	20	6	sandy silt to clayey silt
82.349	53.16	1.4907	2.805	173.108	20	6	sandy silt to clayey silt
82.513	52.01	1.4521	2.793	174.541	20	6	sandy silt to clayey silt
82.677	51.22	1.5082	2.945	174.254	20	6	sandy silt to clayey silt
82.841	49.33	1.3943	2.827	171.857	19	6	sandy silt to clayey silt
83.005	47.30	1.3227	2.797	179.989	18	6	sandy silt to clayey silt
83.169	48.72	1.3242	2.719	174.364	19	6	sandy silt to clayey silt
83.333	44.94	1.2546	2.793	153.291	17	6	sandy silt to clayey silt
83.497	35.77	0.7866	2.200	123.254	14	6	sandy silt to clayey silt
83.661	31.77	0.6902	2.173	123.110	12	6	sandy silt to clayey silt
83.825	31.37	0.6662	2.124	136.837	12	6	sandy silt to clayey silt
83.990	31.76	0.6582	2.073	147.994	12	6	sandy silt to clayey silt
84.154	35.46	0.7015	1.979	170.131	14	6	sandy silt to clayey silt
84.318	36.91	0.9023	2.445	173.621	14	6	sandy silt to clayey silt
84.482	43.65	1.1338	2.598	181.116	17	6	sandy silt to clayey silt
84.646	39.29	1.1384	2.898	155.698	15	6	sandy silt to clayey silt
84.810	40.88	0.9641	2.359	182.655	16	6	sandy silt to clayey silt
84.974	39.94	0.9741	2.439	207.021	15	6	sandy silt to clayey silt
85.138	39.80	1.0539	2.649	196.168	15	6	sandy silt to clayey silt
85.302	39.24	1.0297	2.624	198.014	15	6	sandy silt to clayey silt
85.466	39.91	0.9958	2.496	204.974	15	6	sandy silt to clayey silt
85.630	43.24	1.5733	3.640	233.544	21	5	clayey silt to silty clay
85.794	103.14	2.7091	2.627	310.357	40	6	sandy silt to clayey silt
85.958	113.03	3.6187	3.202	268.415	43	6	sandy silt to clayey silt
86.122	76.55	3.4693	4.533	94.500	37	5	clayey silt to silty clay
86.286	58.90	2.4602	4.178	196.460	28	5	clayey silt to silty clay
86.450	59.17	1.4911	2.521	283.786	23	6	sandy silt to clayey silt
86.614	63.35	1.1890	1.878	293.661	20	7	silty sand to sandy silt
86.778	69.20	1.2262	1.772	358.476	22	7	silty sand to sandy silt
86.942	67.23	1.4528	2.161	402.235	21	7	silty sand to sandy silt
87.106	66.88	1.7783	2.660	385.217	26	6	sandy silt to clayey silt
87.270	68.23	2.0340	2.982	333.954	26	6	sandy silt to clayey silt
87.434	65.33	1.8861	2.888	298.925	25	6	sandy silt to clayey silt
87.598	67.03	1.8263	2.725	329.091	26	6	sandy silt to clayey silt
87.762	70.28	1.4775	2.103	362.565	22	7	silty sand to sandy silt
87.927	62.83	1.0853	1.728	347.034	20	7	silty sand to sandy silt
88.091	60.29	0.8978	1.489	375.050	19	7	silty sand to sandy silt
88.255	61.18	1.0374	1.696	389.007	20	7	silty sand to sandy silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
88.419	73.48	1.8230	2.482	424.640	28	6	sandy silt to clayey silt
88.583	86.82	2.1700	2.500	360.990	33	6	sandy silt to clayey silt
88.747	65.73	2.2801	3.470	275.793	31	5	clayey silt to silty clay
88.911	72.93	2.0312	2.786	378.717	28	6	sandy silt to clayey silt
89.075	54.56	1.9516	3.578	236.974	26	5	clayey silt to silty clay
89.239	55.61	1.4061	2.529	271.145	21	6	sandy silt to clayey silt
89.403	42.19	1.1197	2.655	200.310	16	6	sandy silt to clayey silt
89.567	38.76	0.9544	2.463	252.196	15	6	sandy silt to clayey silt
89.731	37.63	0.7481	1.988	242.789	14	6	sandy silt to clayey silt
89.895	37.55	0.6970	1.857	244.943	14	6	sandy silt to clayey silt
90.059	36.43	1.0563	2.900	227.669	14	6	sandy silt to clayey silt
90.223	38.94	1.6764	4.306	255.482	25	4	silty clay to clay
90.387	53.95	2.1318	3.952	122.082	26	5	clayey silt to silty clay
90.551	48.01	2.2932	4.777	79.289	31	4	silty clay to clay
90.715	43.24	2.1271	4.921	59.415	28	4	silty clay to clay
90.879	38.39	1.7842	4.648	64.920	25	4	silty clay to clay
91.043	37.41	1.2582	3.364	103.279	18	5	clayey silt to silty clay
91.207	36.30	0.9032	2.489	124.122	14	6	sandy silt to clayey silt
91.371	39.63	0.9786	2.470	185.603	15	6	sandy silt to clayey silt
91.535	46.77	1.7989	3.848	192.614	22	5	clayey silt to silty clay
91.699	45.50	1.7196	3.780	123.269	22	5	clayey silt to silty clay
91.864	38.97	1.6210	4.160	132.401	25	4	silty clay to clay
92.028	38.14	1.4119	3.703	104.868	18	5	clayey silt to silty clay
92.192	36.56	1.3836	3.786	109.626	18	5	clayey silt to silty clay
92.356	34.54	1.3450	3.895	115.781	17	5	clayey silt to silty clay
92.520	35.49	1.2474	3.516	103.480	17	5	clayey silt to silty clay
92.684	33.25	1.2006	3.612	98.473	16	5	clayey silt to silty clay
92.848	28.34	0.9475	3.344	101.357	14	5	clayey silt to silty clay
93.012	25.43	0.7397	2.910	92.915	12	5	clayey silt to silty clay
93.176	23.46	0.6424	2.738	101.961	11	5	clayey silt to silty clay
93.340	27.70	1.1874	4.288	108.502	18	4	silty clay to clay
93.504	28.88	1.0319	3.574	77.724	14	5	clayey silt to silty clay
93.668	31.34	0.9182	2.931	121.260	15	5	clayey silt to silty clay
93.832	29.70	0.8981	3.025	110.017	14	5	clayey silt to silty clay
93.996	24.26	0.7729	3.187	90.804	12	5	clayey silt to silty clay
94.160	25.47	0.7145	2.805	113.943	12	5	clayey silt to silty clay
94.324	27.24	0.8931	3.280	106.083	13	5	clayey silt to silty clay
94.488	45.33	1.2819	2.829	169.113	17	6	sandy silt to clayey silt
94.652	53.42	1.6005	2.997	155.163	20	6	sandy silt to clayey silt
94.816	44.20	1.0245	2.318	132.866	17	6	sandy silt to clayey silt
94.980	30.36	0.6873	2.264	144.296	12	6	sandy silt to clayey silt
95.144	27.63	0.5934	2.148	192.587	11	6	sandy silt to clayey silt
95.308	27.43	0.5457	1.990	191.614	11	6	sandy silt to clayey silt
95.472	26.47	0.4889	1.847	184.469	10	6	sandy silt to clayey silt
95.636	27.07	0.5483	2.026	195.840	10	6	sandy silt to clayey silt
95.801	29.19	0.6621	2.268	178.185	11	6	sandy silt to clayey silt
95.965	29.42	0.8023	2.728	152.771	14	5	clayey silt to silty clay
96.129	27.99	0.7870	2.812	135.603	13	5	clayey silt to silty clay
96.293	27.11	0.7131	2.631	137.245	13	5	clayey silt to silty clay
96.457	27.21	0.6748	2.480	137.496	10	6	sandy silt to clayey silt
96.621	26.93	0.7866	2.922	131.229	13	5	clayey silt to silty clay
96.785	28.06	0.7826	2.790	126.967	13	5	clayey silt to silty clay
96.949	28.92	0.7884	2.727	115.858	14	5	clayey silt to silty clay
97.113	28.74	0.8260	2.875	107.176	14	5	clayey silt to silty clay
97.277	29.02	0.8834	3.045	108.670	14	5	clayey silt to silty clay
97.441	29.69	0.9013	3.036	100.796	14	5	clayey silt to silty clay
97.605	30.67	0.9462	3.086	102.622	15	5	clayey silt to silty clay
97.769	31.97	0.9653	3.020	98.435	15	5	clayey silt to silty clay
97.933	30.70	0.9966	3.247	79.368	15	5	clayey silt to silty clay
98.097	30.61	0.9366	3.060	84.802	15	5	clayey silt to silty clay
98.261	31.37	0.9241	2.947	90.837	15	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
98.425	29.91	0.9471	3.167	87.503	14	5	clayey silt to silty clay
98.589	29.88	0.9125	3.055	86.489	14	5	clayey silt to silty clay
98.753	30.13	0.8912	2.959	90.787	14	5	clayey silt to silty clay
98.917	30.44	0.8908	2.927	93.397	15	5	clayey silt to silty clay
99.081	31.13	0.9171	2.947	92.956	15	5	clayey silt to silty clay
99.245	32.01	0.9524	2.976	89.838	15	5	clayey silt to silty clay
99.409	32.46	0.9951	3.066	90.856	16	5	clayey silt to silty clay
99.573	33.44	0.9754	2.918	101.132	16	5	clayey silt to silty clay
99.738	32.95	0.9944	3.018	93.282	16	5	clayey silt to silty clay
99.902	31.66	0.9518	3.007	97.496	15	5	clayey silt to silty clay
100.066	32.97	0.9466	2.872	109.039	16	5	clayey silt to silty clay
100.230	33.75	0.9700	2.875	106.654	16	5	clayey silt to silty clay
100.394	34.37	0.9900	2.881	110.391	13	6	sandy silt to clayey silt

Central Geotech / CPT-2 / 1591 S Sandoz Rd Newberg

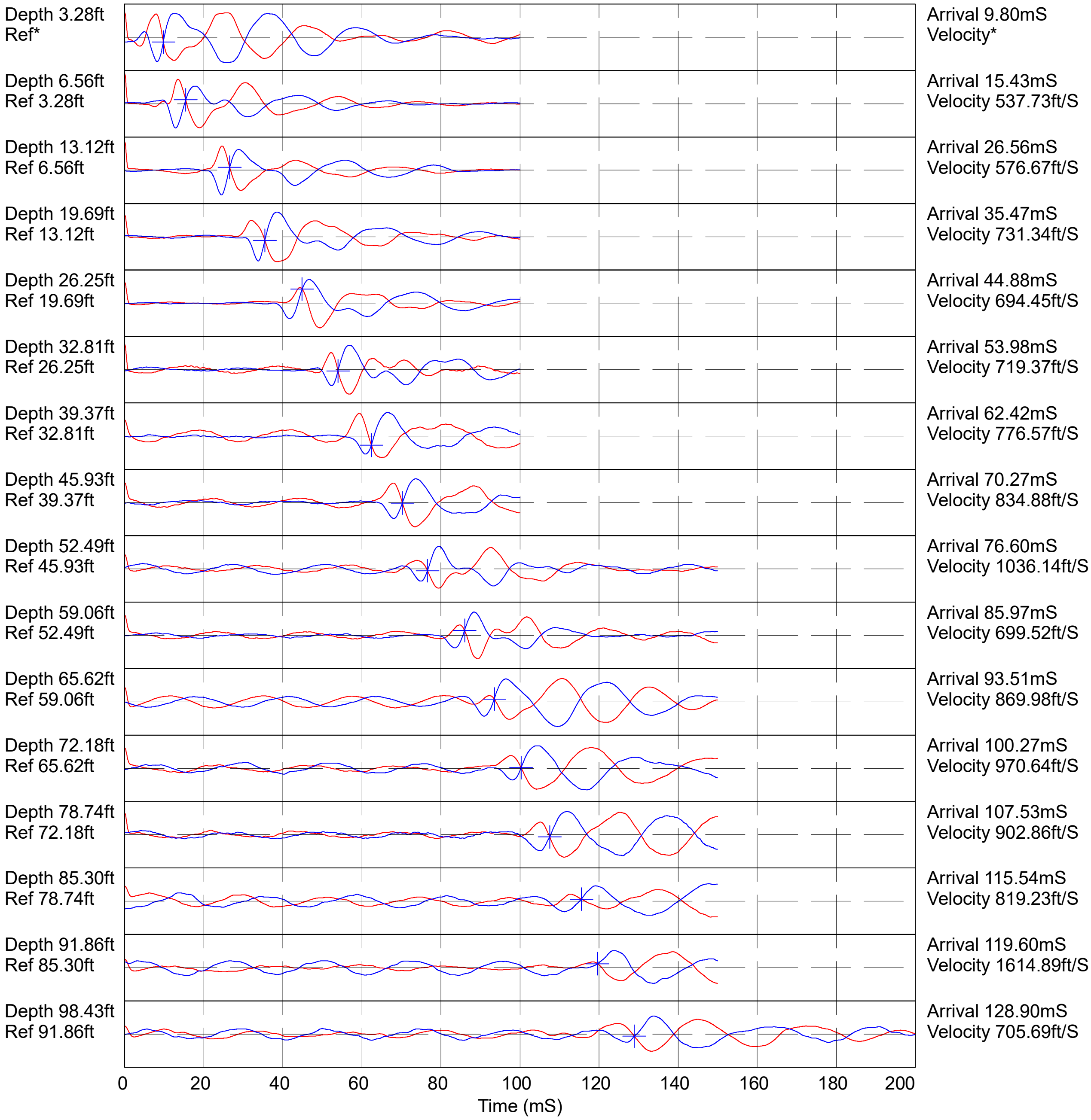
OPERATOR: OGE DMM
TEST DATE: 11/18/2024 9:42:32 AM
CONE ID: DDG1661
TOTAL DEPTH: 100.394 ft
HOLE NUMBER: CPT-2



1 sensitive fine grained
2 organic material
3 clay
4 silty clay to clay
5 clayey silt to silty clay
6 sandy silt to clayey silt
7 silty sand to sandy silt
8 sand to silty sand
9 sand
10 gravelly sand to sand
11 very stiff fine grained (*)
12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: Central Geotech / CPT-2 / 1591 S Sandoz Rd Newberg

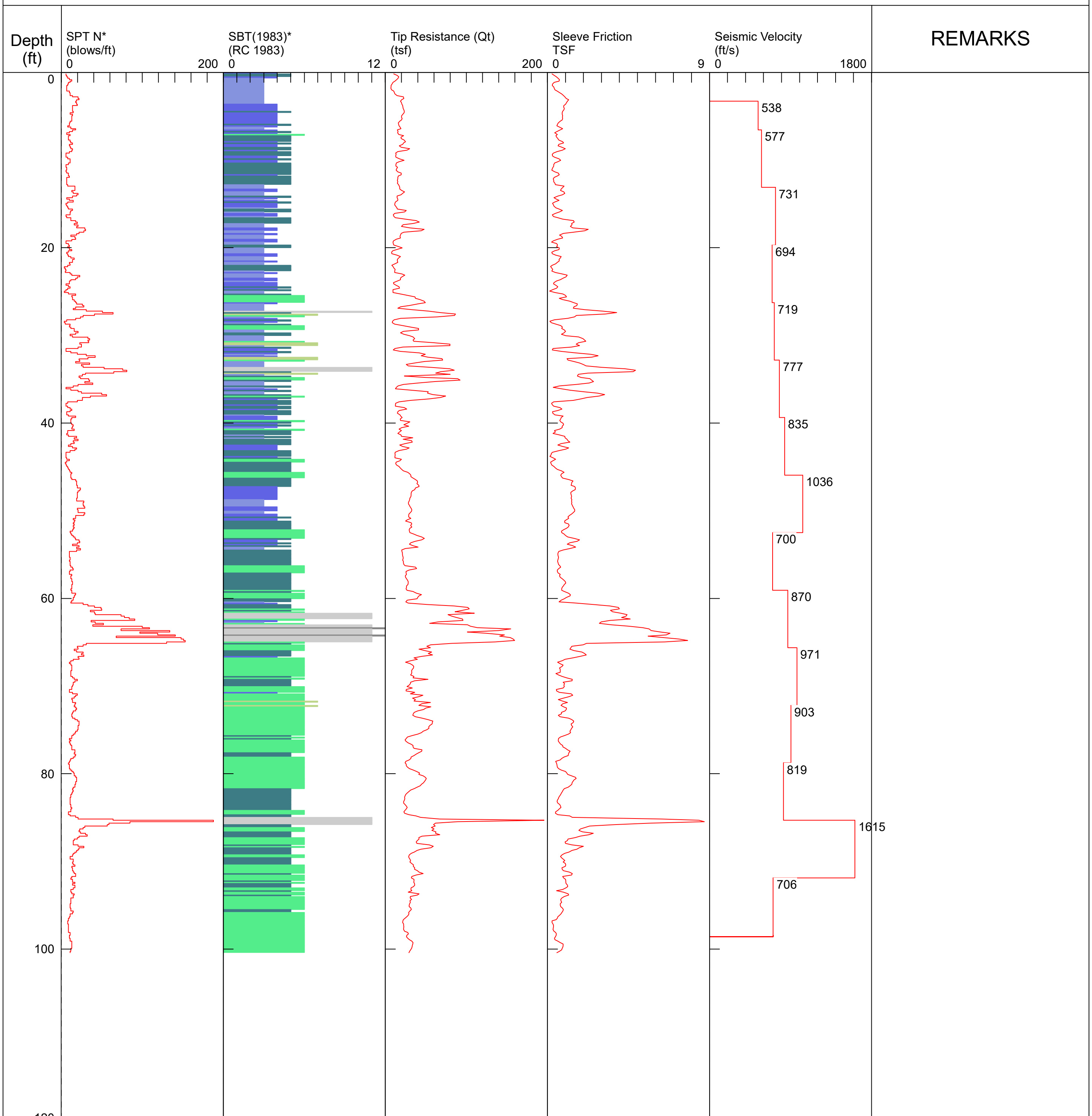


Hammer to Rod String Distance (ft): 1.97
* = Not Determined

COMMENT:

Central Geotech / CPT-2 / 1591 S Sandoz Rd Newberg

OPERATOR: OGE DMM
TEST DATE: 11/18/2024 9:42:32 AM
CONE ID: DDG1661
TOTAL DEPTH: 100.394 ft
HOLE NUMBER: CPT-2

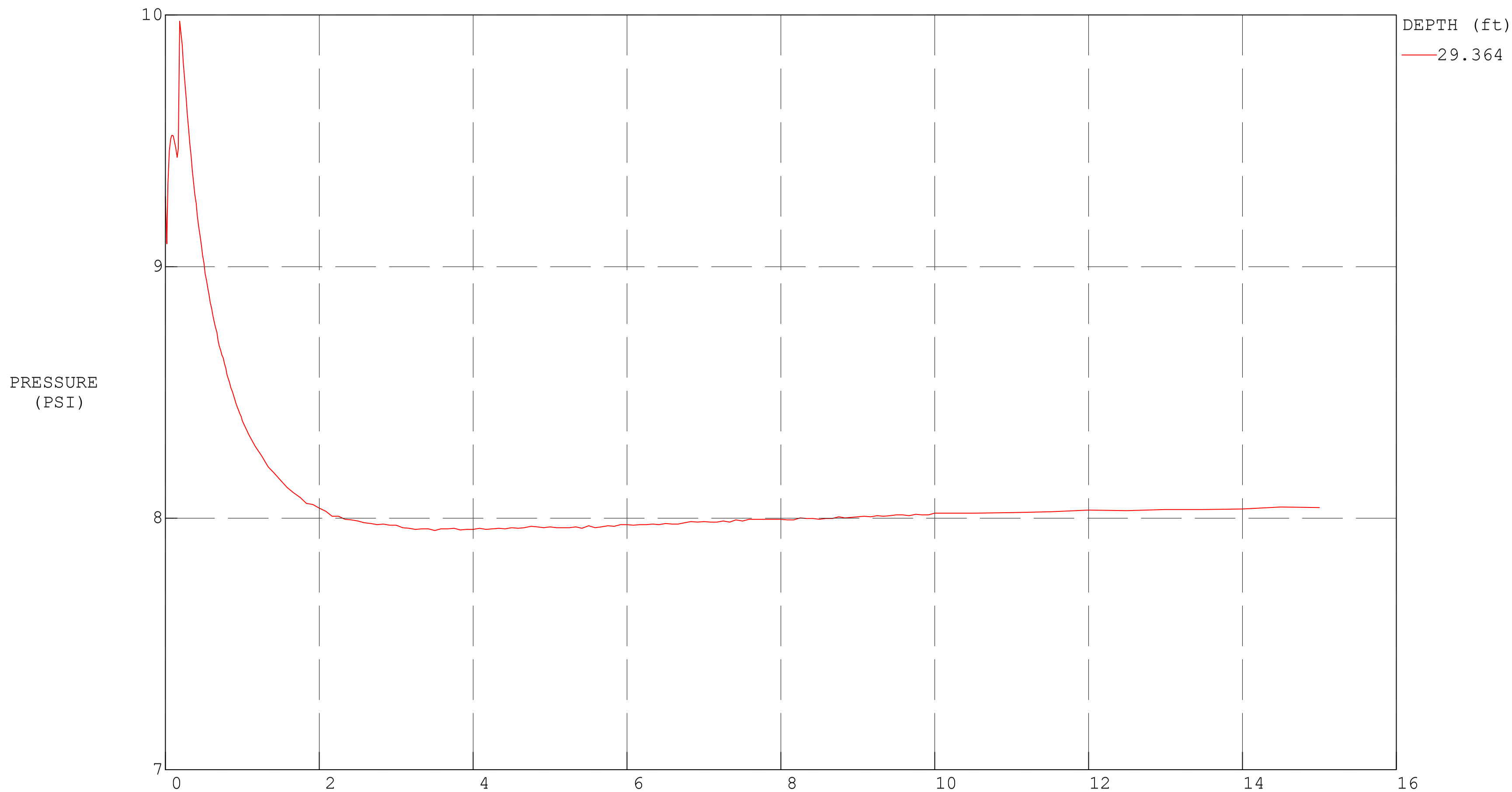


1 sensitive fine grained	4 silty clay to clay	7 silty sand to sandy silt	10 gravelly sand to sand
2 organic material	5 clayey silt to silty clay	8 sand to silty sand	11 very stiff fine grained (*)
3 clay	6 sandy silt to clayey silt	9 sand	12 sand to clayey sand (*)

*SBT/SPT CORRELATION: UBC-1983

COMMENT: Central Geotech / CPT-2 / 1591 S Sandoz Rd Newberg

OPERATOR: OGE DMM
CONE ID: DDG1661
TEST DATE: 11/18/2024 9:42:32 AM



MAXIMUM PRESSURE = 9.976 (PSI)
HYDROSTATIC PRESSURE = 8.061 (PSI), WATER TABLE: 10.76 ft

Central Geotech / CPT-2 / 1591 S Sandoz Rd Newberg

OPERATOR: OGE DMM
TEST DATE: 11/18/2024 9:42:32 AM
CONE ID: DDG1661
TOTAL DEPTH: 100.394 ft
HOLE NUMBER: CPT-2

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
0.164	10.14	0.2552	2.517	0.666	6	4	silty clay to clay
0.328	14.51	0.3692	2.545	0.463	7	5	clayey silt to silty clay
0.492	16.61	0.4980	2.999	-0.709	8	5	clayey silt to silty clay
0.656	15.73	0.5881	3.740	-0.762	10	4	silty clay to clay
0.820	14.04	0.6759	4.816	-0.784	13	3	clay
0.984	11.87	0.6499	5.476	-0.949	11	3	clay
1.148	9.38	0.3796	4.048	-0.959	9	3	clay
1.312	8.24	0.2766	3.355	-0.441	8	3	clay
1.476	6.93	0.2717	3.920	2.136	7	3	clay
1.640	6.89	0.3515	5.101	2.708	7	3	clay
1.804	6.86	0.3696	5.393	2.955	7	3	clay
1.969	7.73	0.4115	5.324	3.082	7	3	clay
2.133	10.18	0.5325	5.233	3.281	10	3	clay
2.297	11.19	0.6839	6.114	2.644	11	3	clay
2.461	11.88	0.7854	6.610	1.433	11	3	clay
2.625	14.50	0.8937	6.163	1.278	14	3	clay
2.789	22.14	0.9628	4.350	2.835	21	3	clay
2.953	22.94	1.0388	4.529	4.314	22	3	clay
3.117	20.11	1.1725	5.832	4.554	19	3	clay
3.281	18.61	1.1175	6.008	4.798	18	3	clay
3.445	19.94	1.0561	5.299	11.447	19	3	clay
3.609	20.50	1.0042	4.901	11.979	20	3	clay
3.773	21.45	0.9138	4.261	12.905	14	4	silty clay to clay
3.937	21.66	0.8915	4.117	13.453	14	4	silty clay to clay
4.101	21.92	0.9357	4.271	14.518	14	4	silty clay to clay
4.265	22.70	0.9109	4.014	15.651	14	4	silty clay to clay
4.429	23.43	0.8500	3.630	17.056	15	4	silty clay to clay
4.593	23.12	0.8131	3.519	18.767	11	5	clayey silt to silty clay
4.757	21.72	0.8192	3.772	19.934	14	4	silty clay to clay
4.921	20.13	0.8410	4.178	20.395	13	4	silty clay to clay
5.085	19.89	0.8258	4.152	23.110	13	4	silty clay to clay
5.249	20.78	0.8394	4.040	24.402	13	4	silty clay to clay
5.413	19.91	0.8230	4.135	24.587	13	4	silty clay to clay
5.577	17.84	0.7043	3.949	27.408	11	4	silty clay to clay
5.741	15.84	0.6042	3.816	28.561	10	4	silty clay to clay
5.906	16.43	0.5621	3.422	30.063	10	4	silty clay to clay
6.070	17.00	0.5200	3.060	31.667	8	5	clayey silt to silty clay
6.234	18.03	0.6599	3.660	34.356	12	4	silty clay to clay
6.398	19.16	0.8366	4.367	31.338	18	3	clay
6.562	14.79	0.7034	4.756	28.973	14	3	clay
6.726	15.76	0.5189	3.293	26.971	10	4	silty clay to clay
6.890	15.02	0.4075	2.714	29.184	7	5	clayey silt to silty clay
7.054	16.57	0.5497	3.319	33.359	11	4	silty clay to clay
7.218	22.59	0.4711	2.086	35.540	9	6	sandy silt to clayey silt
7.382	19.08	0.5143	2.696	33.426	9	5	clayey silt to silty clay
7.546	19.46	0.5707	2.933	40.084	9	5	clayey silt to silty clay
7.710	23.06	0.6300	2.732	44.605	11	5	clayey silt to silty clay
7.874	24.94	0.8440	3.385	47.193	12	5	clayey silt to silty clay
8.038	22.63	0.8931	3.947	42.206	14	4	silty clay to clay
8.202	21.37	0.6321	2.959	32.753	10	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
8.366	17.11	0.5904	3.450	31.494	11	4	silty clay to clay
8.530	19.47	0.8049	4.136	37.206	12	4	silty clay to clay
8.694	29.93	0.9911	3.313	30.710	14	5	clayey silt to silty clay
8.858	26.61	0.8239	3.097	17.427	13	5	clayey silt to silty clay
9.022	15.55	0.5408	3.478	16.826	10	4	silty clay to clay
9.186	12.65	0.3379	2.671	20.129	6	5	clayey silt to silty clay
9.350	13.23	0.2675	2.022	23.767	6	5	clayey silt to silty clay
9.514	12.65	0.2844	2.249	25.356	6	5	clayey silt to silty clay
9.678	13.07	0.3920	3.000	27.880	8	4	silty clay to clay
9.843	17.52	0.6415	3.663	30.001	11	4	silty clay to clay
10.007	23.18	0.7297	3.150	20.162	11	5	clayey silt to silty clay
10.171	17.03	0.5821	3.419	16.430	11	4	silty clay to clay
10.335	13.54	0.3987	2.946	19.026	9	4	silty clay to clay
10.499	12.84	0.3438	2.678	21.488	6	5	clayey silt to silty clay
10.663	12.99	0.3459	2.665	23.096	6	5	clayey silt to silty clay
10.827	15.02	0.3000	1.997	23.949	7	5	clayey silt to silty clay
10.991	13.83	0.2720	1.968	24.651	7	5	clayey silt to silty clay
11.155	13.13	0.2394	1.824	28.328	6	5	clayey silt to silty clay
11.319	15.37	0.4156	2.705	32.321	7	5	clayey silt to silty clay
11.483	19.55	0.5956	3.047	37.328	9	5	clayey silt to silty clay
11.647	19.48	0.6541	3.359	39.950	9	5	clayey silt to silty clay
11.811	15.94	0.5544	3.480	39.392	10	4	silty clay to clay
11.975	15.52	0.3699	2.384	43.385	7	5	clayey silt to silty clay
12.139	15.49	0.3264	2.108	47.797	7	5	clayey silt to silty clay
12.303	14.70	0.3477	2.366	50.146	7	5	clayey silt to silty clay
12.467	15.39	0.3445	2.239	53.461	7	5	clayey silt to silty clay
12.631	14.78	0.4174	2.825	54.962	7	5	clayey silt to silty clay
12.795	16.39	0.4472	2.729	60.242	8	5	clayey silt to silty clay
12.959	17.26	0.9244	5.358	57.677	17	3	clay
13.123	17.59	0.8521	4.845	60.954	17	3	clay
13.287	17.60	0.7574	4.305	22.724	17	3	clay
13.451	20.15	0.7222	3.586	26.382	13	4	silty clay to clay
13.615	23.67	0.9067	3.831	25.677	15	4	silty clay to clay
13.780	21.52	0.9615	4.470	24.122	21	3	clay
13.944	19.33	0.8338	4.316	23.489	19	3	clay
14.108	14.42	0.5913	4.102	25.931	14	3	clay
14.272	14.39	0.3655	2.541	30.255	7	5	clayey silt to silty clay
14.436	15.31	0.4951	3.234	35.466	10	4	silty clay to clay
14.600	15.40	0.6361	4.132	37.045	15	3	clay
14.764	12.47	0.3967	3.182	28.824	8	4	silty clay to clay
14.928	11.78	0.2826	2.400	32.050	6	5	clayey silt to silty clay
15.092	11.44	0.3360	2.938	34.660	7	4	silty clay to clay
15.256	12.67	0.3576	2.823	38.023	8	4	silty clay to clay
15.420	14.18	0.4707	3.321	38.507	9	4	silty clay to clay
15.584	14.82	0.6387	4.312	39.631	14	3	clay
15.748	25.64	0.8266	3.225	36.844	12	5	clayey silt to silty clay
15.912	23.81	0.6762	2.841	12.075	11	5	clayey silt to silty clay
16.076	11.39	0.4419	3.880	11.617	11	3	clay
16.240	9.78	0.2611	2.670	15.637	6	4	silty clay to clay
16.404	10.68	0.3402	3.185	18.619	7	4	silty clay to clay
16.568	12.52	0.5738	4.585	21.742	12	3	clay
16.732	24.92	0.8557	3.435	21.039	12	5	clayey silt to silty clay
16.896	38.05	1.4454	3.800	11.615	18	5	clayey silt to silty clay
17.060	41.87	1.4845	3.546	7.116	20	5	clayey silt to silty clay
17.224	34.22	1.3468	3.936	5.994	16	5	clayey silt to silty clay
17.388	21.91	1.3664	6.237	7.646	21	3	clay
17.552	19.89	1.2712	6.392	11.514	19	3	clay
17.717	29.99	1.3994	4.668	17.641	29	3	clay
17.881	47.71	2.2619	4.742	15.711	30	4	silty clay to clay
18.045	44.11	2.0703	4.694	11.114	28	4	silty clay to clay
18.209	22.82	1.4404	6.313	7.363	22	3	clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
18.373	19.51	0.8895	4.561	9.266	19	3	clay
18.537	18.72	0.6778	3.622	11.239	12	4	silty clay to clay
18.701	18.08	0.7900	4.371	13.044	17	3	clay
18.865	18.64	0.8407	4.510	13.966	18	3	clay
19.029	13.56	0.5726	4.225	12.150	13	3	clay
19.193	10.01	0.3245	3.244	11.833	6	4	silty clay to clay
19.357	9.39	0.2221	2.365	13.453	6	4	silty clay to clay
19.521	9.62	0.5020	5.220	14.947	9	3	clay
19.685	10.12	0.5583	5.517	17.962	10	3	clay
19.849	16.51	0.5100	3.089	9.844	8	5	clayey silt to silty clay
20.013	20.90	0.6545	3.132	9.017	10	5	clayey silt to silty clay
20.177	13.74	0.6431	4.682	8.514	13	3	clay
20.341	9.02	0.4001	4.435	9.700	9	3	clay
20.505	7.69	0.2388	3.107	13.501	7	3	clay
20.669	8.06	0.2603	3.230	17.679	8	3	clay
20.833	14.22	0.4529	3.186	22.767	9	4	silty clay to clay
20.997	18.63	0.7603	4.083	18.566	12	4	silty clay to clay
21.161	16.29	0.7073	4.343	16.502	16	3	clay
21.325	14.69	0.6383	4.346	16.946	14	3	clay
21.490	14.59	0.6529	4.476	14.676	14	3	clay
21.654	15.39	0.5524	3.591	15.361	10	4	silty clay to clay
21.818	11.95	0.4550	3.808	14.065	11	3	clay
21.982	7.94	0.2644	3.330	17.109	8	3	clay
22.146	9.37	0.1690	1.805	24.472	4	5	clayey silt to silty clay
22.310	10.59	0.2473	2.336	28.740	5	5	clayey silt to silty clay
22.474	12.02	0.2968	2.469	35.030	6	5	clayey silt to silty clay
22.638	11.41	0.2411	2.113	37.973	5	5	clayey silt to silty clay
22.802	11.58	0.4331	3.741	43.481	11	3	clay
22.966	20.53	0.8125	3.959	46.827	13	4	silty clay to clay
23.130	23.98	1.0982	4.580	31.981	23	3	clay
23.294	20.37	1.0316	5.066	22.451	20	3	clay
23.458	18.68	0.8858	4.742	22.696	18	3	clay
23.622	18.70	0.7026	3.758	23.156	12	4	silty clay to clay
23.786	15.00	0.5034	3.356	21.466	10	4	silty clay to clay
23.950	10.00	0.3580	3.579	25.442	10	3	clay
24.114	10.16	0.3358	3.307	33.630	6	4	silty clay to clay
24.278	13.34	0.4633	3.473	35.924	9	4	silty clay to clay
24.442	16.74	0.5785	3.457	28.340	11	4	silty clay to clay
24.606	17.32	0.5157	2.978	23.115	8	5	clayey silt to silty clay
24.770	9.53	0.2936	3.083	21.344	6	4	silty clay to clay
24.934	9.35	0.1248	1.336	28.266	4	5	clayey silt to silty clay
25.098	9.53	0.4144	4.349	34.160	9	3	clay
25.262	18.58	0.8571	4.614	41.448	18	3	clay
25.427	27.65	1.0019	3.625	22.621	13	5	clayey silt to silty clay
25.591	36.52	1.0528	2.884	14.822	14	6	sandy silt to clayey silt
25.755	37.18	0.6549	1.762	8.645	14	6	sandy silt to clayey silt
25.919	42.59	0.8312	1.952	5.316	16	6	sandy silt to clayey silt
26.083	47.82	1.2480	2.610	4.772	18	6	sandy silt to clayey silt
26.247	49.27	1.4551	2.954	5.105	19	6	sandy silt to clayey silt
26.411	40.48	1.6584	4.098	6.769	26	4	silty clay to clay
26.575	29.46	1.6313	5.538	7.102	28	3	clay
26.739	18.98	1.4786	7.792	7.466	18	3	clay
26.903	15.52	1.4343	9.242	11.169	15	3	clay
27.067	32.59	2.0595	6.320	28.491	31	3	clay
27.231	53.21	3.0581	5.749	24.258	51	3	clay
27.395	67.13	3.8476	5.733	23.113	64	11	very stiff fine grained (*)
27.559	86.45	3.2231	3.729	17.327	41	5	clayey silt to silty clay
27.723	85.53	1.5998	1.871	8.772	27	7	silty sand to sandy silt
27.887	63.81	1.5036	2.357	6.042	24	6	sandy silt to clayey silt
28.051	18.96	1.1257	5.940	6.220	18	3	clay
28.215	10.97	0.3860	3.521	9.312	7	4	silty clay to clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
28.379	8.73	0.1416	1.623	17.844	4	5	clayey silt to silty clay
28.543	8.51	0.2104	2.473	22.904	5	4	silty clay to clay
28.707	11.42	0.4746	4.156	28.616	11	3	clay
28.871	21.23	0.7380	3.478	31.427	10	5	clayey silt to silty clay
29.035	30.71	0.8288	2.699	17.684	12	6	sandy silt to clayey silt
29.199	40.96	0.7845	1.916	10.709	16	6	sandy silt to clayey silt
29.364	41.00	0.9372	2.286	9.278	16	6	sandy silt to clayey silt
29.528	22.31	1.0015	4.490	7.255	21	3	clay
29.692	18.63	0.9208	4.945	9.295	18	3	clay
29.856	22.82	0.7819	3.428	14.589	11	5	clayey silt to silty clay
30.020	30.03	1.0142	3.379	16.171	14	5	clayey silt to silty clay
30.184	34.16	1.7280	5.060	17.612	33	3	clay
30.348	36.13	1.9716	5.459	18.621	35	3	clay
30.512	34.14	2.0579	6.029	18.693	33	3	clay
30.676	35.07	2.1302	6.076	19.395	34	3	clay
30.840	59.86	1.7280	2.888	17.629	23	6	sandy silt to clayey silt
31.004	79.61	1.5955	2.005	10.194	25	7	silty sand to sandy silt
31.168	79.79	1.7820	2.234	7.210	25	7	silty sand to sandy silt
31.332	21.56	1.3463	6.247	6.150	21	3	clay
31.496	11.87	0.3087	2.601	10.107	6	5	clayey silt to silty clay
31.660	9.85	0.2676	2.716	19.862	6	4	silty clay to clay
31.824	18.77	0.7808	4.161	35.459	12	4	silty clay to clay
31.988	41.68	1.5406	3.698	46.000	20	5	clayey silt to silty clay
32.152	49.33	2.4187	4.904	54.087	31	4	silty clay to clay
32.316	44.16	2.8109	6.368	61.524	42	3	clay
32.480	52.47	2.4593	4.688	54.075	33	4	silty clay to clay
32.644	69.74	1.0810	1.551	15.129	22	7	silty sand to sandy silt
32.808	70.90	1.1407	1.609	5.064	23	7	silty sand to sandy silt
32.972	48.16	1.4717	3.057	3.519	18	6	sandy silt to clayey silt
33.136	36.32	1.7742	4.886	3.907	35	3	clay
33.301	25.80	1.9836	7.691	5.465	25	3	clay
33.465	28.34	2.1420	7.559	16.080	27	3	clay
33.629	55.74	3.0027	5.388	24.898	53	3	clay
33.793	79.52	4.3145	5.427	25.586	76	11	very stiff fine grained (*)
33.957	85.02	4.8845	5.747	23.427	81	11	very stiff fine grained (*)
34.121	68.33	4.7541	6.960	19.551	65	11	very stiff fine grained (*)
34.285	62.04	2.2372	3.607	17.492	30	5	clayey silt to silty clay
34.449	80.06	1.7158	2.144	12.981	26	7	silty sand to sandy silt
34.613	23.32	1.6603	7.122	23.788	22	3	clay
34.777	49.41	1.8659	3.777	59.182	24	5	clayey silt to silty clay
34.941	89.30	2.3610	2.644	18.403	34	6	sandy silt to clayey silt
35.105	92.36	2.4502	2.654	10.314	35	6	sandy silt to clayey silt
35.269	61.07	2.5614	4.195	5.755	29	5	clayey silt to silty clay
35.433	40.45	2.3203	5.738	2.615	39	3	clay
35.597	22.09	1.5935	7.217	-0.743	21	3	clay
35.761	15.62	0.6667	4.270	-1.345	15	3	clay
35.925	13.50	0.3213	2.380	-0.381	6	5	clayey silt to silty clay
36.089	12.53	0.7698	6.146	1.055	12	3	clay
36.253	32.75	1.2805	3.911	3.226	21	4	silty clay to clay
36.417	52.87	1.9881	3.762	4.453	25	5	clayey silt to silty clay
36.581	52.07	2.7780	5.337	6.455	50	3	clay
36.745	58.45	3.1722	5.429	7.886	56	3	clay
36.909	74.36	2.8628	3.851	5.268	36	5	clayey silt to silty clay
37.073	67.93	2.2038	3.245	1.438	26	6	sandy silt to clayey silt
37.238	53.56	1.8436	3.443	0.642	26	5	clayey silt to silty clay
37.402	31.30	1.4274	4.561	0.578	20	4	silty clay to clay
37.566	16.79	0.3469	2.066	1.656	8	5	clayey silt to silty clay
37.730	12.66	0.2271	1.794	4.796	6	5	clayey silt to silty clay
37.894	12.43	0.2716	2.185	20.162	6	5	clayey silt to silty clay
38.058	12.51	0.3466	2.772	25.497	8	4	silty clay to clay
38.222	23.41	0.6912	2.953	29.109	11	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
38.386	26.25	0.8060	3.071	24.941	13	5	clayey silt to silty clay
38.550	17.24	0.5705	3.310	26.454	11	4	silty clay to clay
38.714	15.22	0.2850	1.872	36.146	7	5	clayey silt to silty clay
38.878	14.75	0.2889	1.959	44.013	7	5	clayey silt to silty clay
39.042	17.98	0.4195	2.335	54.873	9	5	clayey silt to silty clay
39.206	18.99	0.8687	4.574	60.867	18	3	clay
39.370	20.76	0.7574	3.649	59.904	13	4	silty clay to clay
39.534	18.36	0.7380	4.021	18.923	12	4	silty clay to clay
39.698	18.76	0.6837	3.644	23.371	12	4	silty clay to clay
39.862	30.09	0.7395	2.458	27.226	12	6	sandy silt to clayey silt
40.026	26.74	0.8630	3.228	15.975	13	5	clayey silt to silty clay
40.190	22.73	0.8934	3.932	18.077	15	4	silty clay to clay
40.354	28.83	0.8197	2.844	18.870	14	5	clayey silt to silty clay
40.518	20.05	0.8187	4.084	13.763	13	4	silty clay to clay
40.682	16.80	0.6886	4.100	16.162	16	3	clay
40.846	19.72	0.3898	1.978	17.911	8	6	sandy silt to clayey silt
41.011	17.44	0.4469	2.563	17.387	8	5	clayey silt to silty clay
41.175	15.37	0.3123	2.032	29.824	7	5	clayey silt to silty clay
41.339	19.41	0.6613	3.408	27.285	9	5	clayey silt to silty clay
41.503	19.89	0.9669	4.863	31.799	19	3	clay
41.667	33.76	0.9831	2.913	26.674	16	5	clayey silt to silty clay
41.831	21.96	1.0898	4.964	17.171	21	3	clay
41.995	32.24	1.1338	3.518	21.562	15	5	clayey silt to silty clay
42.159	33.25	1.2494	3.759	13.597	16	5	clayey silt to silty clay
42.323	24.73	0.7605	3.077	13.751	12	5	clayey silt to silty clay
42.487	17.88	0.5780	3.234	14.942	9	5	clayey silt to silty clay
42.651	21.50	0.8350	3.884	18.031	14	4	silty clay to clay
42.815	29.45	1.1742	3.989	15.790	19	4	silty clay to clay
42.979	26.21	1.0197	3.891	13.417	17	4	silty clay to clay
43.143	16.88	0.6560	3.887	11.210	11	4	silty clay to clay
43.307	12.05	0.2854	2.369	12.813	6	5	clayey silt to silty clay
43.471	11.95	0.2118	1.773	16.320	6	5	clayey silt to silty clay
43.635	12.00	0.1940	1.616	19.088	6	5	clayey silt to silty clay
43.799	11.66	0.1422	1.220	21.488	6	5	clayey silt to silty clay
43.963	11.70	0.3058	2.615	24.457	7	4	silty clay to clay
44.127	19.84	0.4587	2.312	29.742	10	5	clayey silt to silty clay
44.291	17.95	0.3075	1.713	25.368	7	6	sandy silt to clayey silt
44.455	13.30	0.1655	1.245	35.032	5	6	sandy silt to clayey silt
44.619	12.71	0.1993	1.568	38.095	6	5	clayey silt to silty clay
44.783	14.00	0.2443	1.745	42.879	7	5	clayey silt to silty clay
44.948	16.91	0.3570	2.112	47.915	8	5	clayey silt to silty clay
45.112	18.54	0.4403	2.376	49.432	9	5	clayey silt to silty clay
45.276	20.05	0.5459	2.723	36.007	10	5	clayey silt to silty clay
45.440	22.39	0.7773	3.473	36.614	11	5	clayey silt to silty clay
45.604	27.69	0.9267	3.348	40.370	13	5	clayey silt to silty clay
45.768	30.06	0.7873	2.620	41.175	12	6	sandy silt to clayey silt
45.932	31.36	0.7419	2.367	50.638	12	6	sandy silt to clayey silt
46.096	31.48	0.7700	2.446	90.365	12	6	sandy silt to clayey silt
46.260	33.95	0.8410	2.478	99.614	13	6	sandy silt to clayey silt
46.424	37.21	1.1780	3.167	104.935	18	5	clayey silt to silty clay
46.588	39.62	1.4193	3.583	113.204	19	5	clayey silt to silty clay
46.752	39.72	1.3571	3.418	115.862	19	5	clayey silt to silty clay
46.916	38.78	1.3322	3.436	139.744	19	5	clayey silt to silty clay
47.080	41.37	1.3189	3.189	139.277	20	5	clayey silt to silty clay
47.244	41.70	1.5194	3.645	111.404	20	5	clayey silt to silty clay
47.408	36.91	1.5550	4.214	97.234	24	4	silty clay to clay
47.572	36.24	1.5349	4.236	95.044	23	4	silty clay to clay
47.736	33.26	1.4060	4.229	92.251	21	4	silty clay to clay
47.900	32.01	1.2987	4.059	87.103	20	4	silty clay to clay
48.064	31.77	1.3032	4.103	83.280	20	4	silty clay to clay
48.228	31.82	1.3309	4.184	77.055	20	4	silty clay to clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
48.392	31.42	1.3477	4.290	65.474	20	4	silty clay to clay
48.556	30.30	1.3111	4.327	62.941	19	4	silty clay to clay
48.720	30.03	1.3592	4.527	62.617	19	4	silty clay to clay
48.885	29.25	1.3382	4.576	60.474	28	3	clay
49.049	28.59	1.3532	4.735	62.454	27	3	clay
49.213	28.56	1.3316	4.664	61.905	27	3	clay
49.377	29.53	1.3764	4.662	61.351	28	3	clay
49.541	30.48	1.4259	4.679	59.779	29	3	clay
49.705	31.92	1.4606	4.577	59.130	20	4	silty clay to clay
49.869	32.71	1.5155	4.634	56.893	21	4	silty clay to clay
50.033	32.39	1.5058	4.650	52.833	21	4	silty clay to clay
50.197	30.71	1.4312	4.662	52.217	29	3	clay
50.361	29.05	1.3330	4.589	51.510	28	3	clay
50.525	28.61	1.2199	4.265	52.500	18	4	silty clay to clay
50.689	28.97	1.1353	3.920	53.586	18	4	silty clay to clay
50.853	31.51	1.1770	3.737	54.681	15	5	clayey silt to silty clay
51.017	27.02	1.0447	3.867	49.947	17	4	silty clay to clay
51.181	24.95	0.9502	3.809	48.936	16	4	silty clay to clay
51.345	31.69	0.9614	3.035	51.795	15	5	clayey silt to silty clay
51.509	32.65	1.1672	3.576	34.265	16	5	clayey silt to silty clay
51.673	31.32	1.2026	3.840	31.720	15	5	clayey silt to silty clay
51.837	32.66	1.1488	3.519	28.472	16	5	clayey silt to silty clay
52.001	30.41	1.0582	3.481	24.148	15	5	clayey silt to silty clay
52.165	29.28	0.8942	3.055	30.051	14	5	clayey silt to silty clay
52.329	29.60	0.7818	2.642	32.153	11	6	sandy silt to clayey silt
52.493	30.16	0.7884	2.615	35.550	12	6	sandy silt to clayey silt
52.657	35.16	0.9274	2.638	70.946	13	6	sandy silt to clayey silt
52.822	39.36	0.9982	2.537	81.554	15	6	sandy silt to clayey silt
52.986	44.89	1.1280	2.514	87.791	17	6	sandy silt to clayey silt
53.150	47.96	1.4846	3.096	89.878	18	6	sandy silt to clayey silt
53.314	44.97	1.7885	3.979	73.074	22	5	clayey silt to silty clay
53.478	36.72	1.6458	4.483	52.172	23	4	silty clay to clay
53.642	31.38	1.2471	3.976	41.822	20	4	silty clay to clay
53.806	29.68	1.1013	3.712	41.956	14	5	clayey silt to silty clay
53.970	33.91	1.3928	4.108	46.798	22	4	silty clay to clay
54.134	40.28	1.5650	3.887	45.894	19	5	clayey silt to silty clay
54.298	24.60	1.2386	5.036	29.337	24	3	clay
54.462	20.22	0.8687	4.297	29.443	19	3	clay
54.626	20.35	0.6252	3.073	30.749	10	5	clayey silt to silty clay
54.790	20.98	0.5910	2.818	31.935	10	5	clayey silt to silty clay
54.954	21.03	0.5757	2.738	33.263	10	5	clayey silt to silty clay
55.118	21.48	0.5887	2.741	34.346	10	5	clayey silt to silty clay
55.282	21.94	0.6180	2.817	34.555	11	5	clayey silt to silty clay
55.446	21.95	0.6098	2.778	34.886	11	5	clayey silt to silty clay
55.610	21.42	0.5811	2.714	35.950	10	5	clayey silt to silty clay
55.774	22.14	0.5616	2.538	37.014	11	5	clayey silt to silty clay
55.938	22.27	0.5846	2.626	37.199	11	5	clayey silt to silty clay
56.102	22.71	0.6164	2.715	37.966	11	5	clayey silt to silty clay
56.266	24.42	0.6892	2.823	39.770	12	5	clayey silt to silty clay
56.430	36.97	0.7342	1.986	44.993	14	6	sandy silt to clayey silt
56.594	38.41	0.6323	1.647	41.120	15	6	sandy silt to clayey silt
56.759	29.30	0.5447	1.859	48.519	11	6	sandy silt to clayey silt
56.923	25.60	0.5547	2.167	51.450	10	6	sandy silt to clayey silt
57.087	25.49	0.5861	2.300	51.915	10	6	sandy silt to clayey silt
57.251	26.14	0.7014	2.684	51.477	13	5	clayey silt to silty clay
57.415	24.75	0.6666	2.694	50.980	12	5	clayey silt to silty clay
57.579	24.75	0.7111	2.873	49.660	12	5	clayey silt to silty clay
57.743	26.22	0.8148	3.109	49.418	13	5	clayey silt to silty clay
57.907	27.46	0.9167	3.339	48.656	13	5	clayey silt to silty clay
58.071	28.34	0.9879	3.487	45.894	14	5	clayey silt to silty clay
58.235	28.22	1.0214	3.620	43.255	14	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
58.399	27.90	0.9360	3.356	42.290	13	5	clayey silt to silty clay
58.563	26.21	0.8802	3.360	42.699	13	5	clayey silt to silty clay
58.727	26.22	0.8205	3.129	41.654	13	5	clayey silt to silty clay
58.891	25.55	0.7950	3.113	42.071	12	5	clayey silt to silty clay
59.055	26.83	0.7923	2.954	43.862	13	5	clayey silt to silty clay
59.219	34.30	0.9427	2.749	51.093	13	6	sandy silt to clayey silt
59.383	38.29	1.1692	3.054	53.593	18	5	clayey silt to silty clay
59.547	44.36	1.2704	2.864	55.429	17	6	sandy silt to clayey silt
59.711	41.55	1.2549	3.021	52.620	16	6	sandy silt to clayey silt
59.875	39.83	1.0486	2.633	56.620	15	6	sandy silt to clayey silt
60.039	39.37	0.9360	2.378	63.573	15	6	sandy silt to clayey silt
60.203	26.93	0.7569	2.811	58.588	13	5	clayey silt to silty clay
60.367	25.03	0.6340	2.534	60.218	12	5	clayey silt to silty clay
60.532	28.15	1.5993	5.682	67.849	27	3	clay
60.696	51.79	2.5605	4.946	63.559	33	4	silty clay to clay
60.860	85.16	3.4710	4.077	44.574	41	5	clayey silt to silty clay
61.024	101.90	3.9333	3.861	41.082	49	5	clayey silt to silty clay
61.188	103.48	3.9937	3.860	96.050	50	5	clayey silt to silty clay
61.352	95.18	3.5017	3.680	100.724	36	6	sandy silt to clayey silt
61.516	85.93	3.6197	4.213	138.074	41	5	clayey silt to silty clay
61.680	109.67	4.0771	3.719	222.603	42	6	sandy silt to clayey silt
61.844	77.19	4.4192	5.727	19.805	74	11	very stiff fine grained (*)
62.008	81.73	4.3657	5.343	30.814	78	11	very stiff fine grained (*)
62.172	87.94	4.1166	4.682	24.965	84	11	very stiff fine grained (*)
62.336	95.13	4.6022	4.839	26.097	91	11	very stiff fine grained (*)
62.500	95.62	3.4702	3.630	19.007	37	6	sandy silt to clayey silt
62.664	65.10	2.9902	4.594	23.582	42	4	silty clay to clay
62.828	54.69	2.8865	5.279	38.086	52	3	clay
62.992	101.32	3.5535	3.508	28.546	39	6	sandy silt to clayey silt
63.156	104.90	4.5457	4.334	24.232	100	11	very stiff fine grained (*)
63.320	113.59	5.2869	4.656	26.008	109	11	very stiff fine grained (*)
63.484	154.58	5.6388	3.649	23.398	74	12	sand to clayey sand (*)
63.648	139.44	5.7597	4.132	19.424	134	11	very stiff fine grained (*)
63.812	101.22	6.2884	6.214	25.315	97	11	very stiff fine grained (*)
63.976	123.93	6.8104	5.497	37.297	119	11	very stiff fine grained (*)
64.140	147.02	6.5944	4.486	21.418	141	11	very stiff fine grained (*)
64.304	141.00	5.5828	3.960	16.349	68	12	sand to clayey sand (*)
64.469	154.22	6.4442	4.180	21.341	148	11	very stiff fine grained (*)
64.633	157.52	7.2958	4.633	17.689	151	11	very stiff fine grained (*)
64.797	159.55	7.7813	4.878	15.215	153	11	very stiff fine grained (*)
64.961	135.41	6.5172	4.814	15.124	130	11	very stiff fine grained (*)
65.125	81.79	2.1643	2.647	16.658	31	6	sandy silt to clayey silt
65.289	55.92	1.9854	3.552	28.407	27	5	clayey silt to silty clay
65.453	51.14	1.3573	2.655	31.684	20	6	sandy silt to clayey silt
65.617	55.50	1.2999	2.343	32.089	21	6	sandy silt to clayey silt
65.781	41.55	1.2449	2.997	36.954	16	6	sandy silt to clayey silt
65.945	48.60	1.4804	3.047	44.835	19	6	sandy silt to clayey silt
66.109	57.18	1.9196	3.358	35.034	27	5	clayey silt to silty clay
66.273	53.02	2.0649	3.895	36.532	25	5	clayey silt to silty clay
66.437	58.28	2.1526	3.695	55.582	28	5	clayey silt to silty clay
66.601	44.41	1.8063	4.068	41.216	21	5	clayey silt to silty clay
66.765	35.20	1.4236	4.045	52.788	22	4	silty clay to clay
66.929	39.40	0.9749	2.475	57.620	15	6	sandy silt to clayey silt
67.093	31.13	0.8205	2.636	43.996	12	6	sandy silt to clayey silt
67.257	24.84	0.5659	2.279	43.656	10	6	sandy silt to clayey silt
67.421	30.49	0.6920	2.270	54.530	12	6	sandy silt to clayey silt
67.585	33.46	0.8792	2.628	52.093	13	6	sandy silt to clayey silt
67.749	35.15	0.8178	2.327	51.366	13	6	sandy silt to clayey silt
67.913	34.74	0.6624	1.907	54.367	13	6	sandy silt to clayey silt
68.077	33.41	0.7041	2.108	68.597	13	6	sandy silt to clayey silt
68.241	32.26	0.7106	2.203	75.998	12	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
68.406	32.61	0.7081	2.172	81.183	12	6	sandy silt to clayey silt
68.570	32.26	0.4751	1.473	77.353	12	6	sandy silt to clayey silt
68.734	31.03	0.6185	1.994	83.352	12	6	sandy silt to clayey silt
68.898	35.36	0.8222	2.326	84.802	14	6	sandy silt to clayey silt
69.062	34.06	1.0735	3.152	91.300	16	5	clayey silt to silty clay
69.226	52.56	1.3726	2.612	95.041	20	6	sandy silt to clayey silt
69.390	36.21	1.3648	3.770	44.200	17	5	clayey silt to silty clay
69.554	31.16	0.8788	2.821	64.733	15	5	clayey silt to silty clay
69.718	30.74	0.9530	3.101	68.401	15	5	clayey silt to silty clay
69.882	29.26	0.9081	3.105	67.701	14	5	clayey silt to silty clay
70.046	26.66	0.9300	3.489	72.672	13	5	clayey silt to silty clay
70.210	33.19	0.8765	2.641	71.874	13	6	sandy silt to clayey silt
70.374	25.94	0.4964	1.914	68.997	10	6	sandy silt to clayey silt
70.538	25.41	0.5148	2.026	76.257	10	6	sandy silt to clayey silt
70.702	36.27	0.6558	1.809	112.174	14	6	sandy silt to clayey silt
70.866	30.93	1.3126	4.245	108.487	20	4	silty clay to clay
71.030	46.25	1.4063	3.041	135.492	18	6	sandy silt to clayey silt
71.194	41.18	1.1958	2.904	102.014	16	6	sandy silt to clayey silt
71.358	33.46	0.8827	2.639	145.233	13	6	sandy silt to clayey silt
71.522	37.09	0.6031	1.627	162.505	14	6	sandy silt to clayey silt
71.686	35.34	0.8278	2.343	157.155	14	6	sandy silt to clayey silt
71.850	55.47	1.1180	2.016	189.498	18	7	silty sand to sandy silt
72.014	45.09	0.8623	1.913	133.110	17	6	sandy silt to clayey silt
72.178	41.20	0.7558	1.835	181.181	16	6	sandy silt to clayey silt
72.343	56.16	0.8912	1.587	192.220	18	7	silty sand to sandy silt
72.507	49.99	1.0586	2.118	132.647	19	6	sandy silt to clayey silt
72.671	47.13	1.0521	2.233	149.559	18	6	sandy silt to clayey silt
72.835	39.76	0.9782	2.461	146.302	15	6	sandy silt to clayey silt
72.999	35.79	0.7807	2.182	126.929	14	6	sandy silt to clayey silt
73.163	34.35	0.7721	2.248	133.496	13	6	sandy silt to clayey silt
73.327	33.88	0.5957	1.759	139.663	13	6	sandy silt to clayey silt
73.491	37.22	0.6954	1.869	163.413	14	6	sandy silt to clayey silt
73.655	45.42	1.1706	2.578	177.844	17	6	sandy silt to clayey silt
73.819	52.58	1.3582	2.583	187.245	20	6	sandy silt to clayey silt
73.983	58.41	1.4615	2.503	217.481	22	6	sandy silt to clayey silt
74.147	57.82	1.4278	2.470	200.916	22	6	sandy silt to clayey silt
74.311	57.67	1.3132	2.278	232.082	22	6	sandy silt to clayey silt
74.475	54.84	1.3346	2.434	216.309	21	6	sandy silt to clayey silt
74.639	53.66	1.4036	2.617	213.686	21	6	sandy silt to clayey silt
74.803	53.70	1.3384	2.493	213.003	21	6	sandy silt to clayey silt
74.967	50.96	1.2971	2.546	183.769	20	6	sandy silt to clayey silt
75.131	46.76	1.2441	2.661	175.131	18	6	sandy silt to clayey silt
75.295	44.48	1.2916	2.904	143.014	17	6	sandy silt to clayey silt
75.459	40.20	1.1648	2.899	103.358	15	6	sandy silt to clayey silt
75.623	33.21	0.9488	2.858	84.119	13	6	sandy silt to clayey silt
75.787	27.44	0.7265	2.648	74.922	13	5	clayey silt to silty clay
75.951	25.77	0.6120	2.375	84.423	10	6	sandy silt to clayey silt
76.115	24.37	0.6017	2.470	82.479	12	5	clayey silt to silty clay
76.280	25.17	0.6091	2.421	84.764	10	6	sandy silt to clayey silt
76.444	27.83	0.6624	2.381	88.704	11	6	sandy silt to clayey silt
76.608	31.81	0.7429	2.336	96.743	12	6	sandy silt to clayey silt
76.772	33.99	0.8397	2.471	95.389	13	6	sandy silt to clayey silt
76.936	33.98	0.8599	2.531	94.154	13	6	sandy silt to clayey silt
77.100	35.22	1.0037	2.850	108.161	13	6	sandy silt to clayey silt
77.264	45.34	1.1117	2.452	119.168	17	6	sandy silt to clayey silt
77.428	44.96	1.2580	2.799	121.315	17	6	sandy silt to clayey silt
77.592	41.28	1.1923	2.889	112.354	16	6	sandy silt to clayey silt
77.756	37.93	1.1607	3.061	109.590	18	5	clayey silt to silty clay
77.920	35.25	1.1546	3.276	96.532	17	5	clayey silt to silty clay
78.084	31.71	0.9250	2.918	91.969	15	5	clayey silt to silty clay
78.248	31.57	0.7890	2.500	92.189	12	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
78.412	29.27	0.7145	2.442	88.100	11	6	sandy silt to clayey silt
78.576	25.14	0.4504	1.792	88.083	10	6	sandy silt to clayey silt
78.740	24.39	0.4937	2.025	84.433	9	6	sandy silt to clayey silt
78.904	25.69	0.5204	2.026	73.892	10	6	sandy silt to clayey silt
79.068	25.94	0.5396	2.081	80.969	10	6	sandy silt to clayey silt
79.232	27.15	0.5547	2.043	89.859	10	6	sandy silt to clayey silt
79.396	29.80	0.6142	2.061	97.838	11	6	sandy silt to clayey silt
79.560	34.46	0.7595	2.205	106.798	13	6	sandy silt to clayey silt
79.724	38.75	1.0025	2.587	119.398	15	6	sandy silt to clayey silt
79.888	42.04	1.0802	2.570	129.472	16	6	sandy silt to clayey silt
80.052	41.19	1.1253	2.732	161.285	16	6	sandy silt to clayey silt
80.217	46.78	1.3396	2.864	170.838	18	6	sandy silt to clayey silt
80.381	49.28	1.5542	3.154	182.568	19	6	sandy silt to clayey silt
80.545	50.34	1.5890	3.157	181.401	19	6	sandy silt to clayey silt
80.709	49.54	1.4659	2.960	187.182	19	6	sandy silt to clayey silt
80.873	47.97	1.4028	2.925	197.307	18	6	sandy silt to clayey silt
81.037	46.99	1.3642	2.904	208.624	18	6	sandy silt to clayey silt
81.201	44.50	1.3551	3.046	211.774	17	6	sandy silt to clayey silt
81.365	43.12	1.2587	2.920	205.465	17	6	sandy silt to clayey silt
81.529	39.21	1.1584	2.955	196.075	15	6	sandy silt to clayey silt
81.693	35.69	0.9432	2.644	181.818	14	6	sandy silt to clayey silt
81.857	30.99	0.8748	2.824	184.325	15	5	clayey silt to silty clay
82.021	29.19	0.8236	2.822	135.993	14	5	clayey silt to silty clay
82.185	27.04	0.7835	2.899	127.288	13	5	clayey silt to silty clay
82.349	25.30	0.7324	2.895	123.415	12	5	clayey silt to silty clay
82.513	24.47	0.6832	2.792	121.198	12	5	clayey silt to silty clay
82.677	23.69	0.6305	2.662	118.588	11	5	clayey silt to silty clay
82.841	23.94	0.6100	2.549	109.926	11	5	clayey silt to silty clay
83.005	23.43	0.5550	2.370	111.117	11	5	clayey silt to silty clay
83.169	22.63	0.5419	2.395	107.975	11	5	clayey silt to silty clay
83.333	22.54	0.5691	2.525	108.495	11	5	clayey silt to silty clay
83.497	24.23	0.6825	2.817	106.774	12	5	clayey silt to silty clay
83.661	25.79	0.7205	2.794	110.894	12	5	clayey silt to silty clay
83.825	27.07	0.7514	2.777	105.978	13	5	clayey silt to silty clay
83.990	25.87	0.6613	2.557	105.165	12	5	clayey silt to silty clay
84.154	24.14	0.5716	2.368	111.289	12	5	clayey silt to silty clay
84.318	22.98	0.4503	1.960	112.318	9	6	sandy silt to clayey silt
84.482	23.74	0.4382	1.846	115.359	9	6	sandy silt to clayey silt
84.646	29.02	0.5790	1.996	130.032	11	6	sandy silt to clayey silt
84.810	37.85	1.2289	3.247	139.661	18	5	clayey silt to silty clay
84.974	43.46	1.3825	3.182	82.321	21	5	clayey silt to silty clay
85.138	66.91	6.3598	9.507	131.502	64	11	very stiff fine grained (*)
85.302	195.88	8.4119	4.295	54.262	188	11	very stiff fine grained (*)
85.466	89.14	8.7040	9.767	7.866	85	11	very stiff fine grained (*)
85.630	61.96	5.7150	9.227	10.390	59	11	very stiff fine grained (*)
85.794	59.38	3.7931	6.389	21.813	57	11	very stiff fine grained (*)
85.958	61.53	2.3467	3.815	26.195	29	5	clayey silt to silty clay
86.122	56.74	2.0928	3.690	40.583	27	5	clayey silt to silty clay
86.286	60.11	1.8351	3.054	60.429	23	6	sandy silt to clayey silt
86.450	57.43	1.7476	3.044	64.697	22	6	sandy silt to clayey silt
86.614	62.31	1.9358	3.107	86.588	24	6	sandy silt to clayey silt
86.778	61.90	2.5455	4.113	78.973	30	5	clayey silt to silty clay
86.942	67.30	2.3039	3.424	101.609	32	5	clayey silt to silty clay
87.106	45.02	1.8066	4.014	60.060	22	5	clayey silt to silty clay
87.270	41.23	1.5449	3.748	80.727	20	5	clayey silt to silty clay
87.434	41.55	1.1397	2.744	91.714	16	6	sandy silt to clayey silt
87.598	39.43	1.1113	2.819	92.896	15	6	sandy silt to clayey silt
87.762	37.97	0.9751	2.569	91.348	15	6	sandy silt to clayey silt
87.927	38.97	0.9978	2.561	103.747	15	6	sandy silt to clayey silt
88.091	53.98	1.3500	2.501	117.962	21	6	sandy silt to clayey silt
88.255	59.19	1.9978	3.376	66.967	28	5	clayey silt to silty clay

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
88.419	56.17	1.7655	3.144	68.861	22	6	sandy silt to clayey silt
88.583	43.97	1.6381	3.727	48.126	21	5	clayey silt to silty clay
88.747	39.35	1.3645	3.468	47.483	19	5	clayey silt to silty clay
88.911	35.54	1.1942	3.361	48.430	17	5	clayey silt to silty clay
89.075	32.11	0.9583	2.985	49.132	15	5	clayey silt to silty clay
89.239	29.82	0.8230	2.761	50.700	14	5	clayey silt to silty clay
89.403	28.68	0.7229	2.521	53.044	11	6	sandy silt to clayey silt
89.567	29.03	0.7771	2.677	54.518	11	6	sandy silt to clayey silt
89.731	30.29	0.8668	2.862	53.811	15	5	clayey silt to silty clay
89.895	31.02	0.9583	3.090	50.376	15	5	clayey silt to silty clay
90.059	30.27	0.8680	2.868	52.174	14	5	clayey silt to silty clay
90.223	32.20	0.9884	3.070	52.016	15	5	clayey silt to silty clay
90.387	34.73	1.0181	2.932	50.139	17	5	clayey silt to silty clay
90.551	34.31	0.9876	2.880	54.801	13	6	sandy silt to clayey silt
90.715	36.40	0.7958	2.187	61.951	14	6	sandy silt to clayey silt
90.879	35.98	0.8148	2.265	70.558	14	6	sandy silt to clayey silt
91.043	39.50	0.8834	2.237	80.425	15	6	sandy silt to clayey silt
91.207	41.69	1.2161	2.918	94.703	16	6	sandy silt to clayey silt
91.371	46.57	1.3785	2.961	82.007	18	6	sandy silt to clayey silt
91.535	38.02	1.3375	3.519	57.076	18	5	clayey silt to silty clay
91.699	32.72	0.8455	2.585	63.293	13	6	sandy silt to clayey silt
91.864	32.07	0.9003	2.808	68.707	12	6	sandy silt to clayey silt
92.028	35.38	1.0080	2.850	77.166	14	6	sandy silt to clayey silt
92.192	35.28	1.0140	2.875	75.639	14	6	sandy silt to clayey silt
92.356	34.96	1.0205	2.920	79.110	17	5	clayey silt to silty clay
92.520	35.80	1.0337	2.888	79.289	14	6	sandy silt to clayey silt
92.684	36.31	1.1151	3.072	75.306	17	5	clayey silt to silty clay
92.848	34.72	1.1202	3.227	75.243	17	5	clayey silt to silty clay
93.012	31.64	1.0347	3.271	80.509	15	5	clayey silt to silty clay
93.176	31.50	0.8414	2.672	90.768	12	6	sandy silt to clayey silt
93.340	32.59	0.5140	1.578	91.237	12	6	sandy silt to clayey silt
93.504	28.19	0.8883	3.152	93.387	13	5	clayey silt to silty clay
93.668	41.48	1.1538	2.783	122.727	16	6	sandy silt to clayey silt
93.832	39.49	1.1759	2.978	63.003	15	6	sandy silt to clayey silt
93.996	30.89	0.9432	3.054	89.912	15	5	clayey silt to silty clay
94.160	30.68	0.8067	2.631	109.794	12	6	sandy silt to clayey silt
94.324	32.33	0.7314	2.263	105.908	12	6	sandy silt to clayey silt
94.488	30.20	0.7474	2.476	105.849	12	6	sandy silt to clayey silt
94.652	30.83	0.7859	2.550	107.627	12	6	sandy silt to clayey silt
94.816	29.92	0.7123	2.381	106.568	11	6	sandy silt to clayey silt
94.980	29.40	0.7128	2.425	116.184	11	6	sandy silt to clayey silt
95.144	29.45	0.7328	2.489	130.548	11	6	sandy silt to clayey silt
95.308	31.48	0.8289	2.634	134.205	12	6	sandy silt to clayey silt
95.472	32.10	0.8825	2.750	126.008	12	6	sandy silt to clayey silt
95.636	30.33	0.8595	2.834	122.713	15	5	clayey silt to silty clay
95.801	28.70	0.8119	2.830	121.411	14	5	clayey silt to silty clay
95.965	28.98	0.7560	2.609	125.824	11	6	sandy silt to clayey silt
96.129	28.28	0.6689	2.366	131.195	11	6	sandy silt to clayey silt
96.293	26.46	0.5671	2.144	131.176	10	6	sandy silt to clayey silt
96.457	24.30	0.5535	2.278	125.812	9	6	sandy silt to clayey silt
96.621	22.24	0.4793	2.156	128.417	9	6	sandy silt to clayey silt
96.785	21.72	0.2500	1.151	131.149	8	6	sandy silt to clayey silt
96.949	21.47	0.2596	1.209	135.212	8	6	sandy silt to clayey silt
97.113	22.51	0.3006	1.336	143.594	9	6	sandy silt to clayey silt
97.277	22.47	0.3428	1.526	145.602	9	6	sandy silt to clayey silt
97.441	22.92	0.3413	1.490	150.276	9	6	sandy silt to clayey silt
97.605	22.57	0.3158	1.400	150.933	9	6	sandy silt to clayey silt
97.769	22.54	0.3087	1.370	156.268	9	6	sandy silt to clayey silt
97.933	23.76	0.3603	1.517	164.540	9	6	sandy silt to clayey silt
98.097	27.54	0.4558	1.655	173.441	11	6	sandy silt to clayey silt
98.261	28.48	0.4940	1.735	176.773	11	6	sandy silt to clayey silt

Depth ft	Tip (Qt) (tsf)	Sleeve (Fs) TSF	Fr (Fs/Qt) (%)	Pressure (U2) PSI	SPT N* (blows/ft)	Zone	Soil Behavior Type UBC-1983
98.425	26.32	0.4879	1.855	164.796	10	6	sandy silt to clayey silt
98.589	26.23	0.4453	1.698	178.793	10	6	sandy silt to clayey silt
98.753	27.57	0.3832	1.391	179.175	11	6	sandy silt to clayey silt
98.917	29.48	0.4173	1.416	181.169	11	6	sandy silt to clayey silt
99.081	32.68	0.5827	1.784	190.835	13	6	sandy silt to clayey silt
99.245	33.98	0.7130	2.099	179.016	13	6	sandy silt to clayey silt
99.409	33.70	0.8735	2.593	166.263	13	6	sandy silt to clayey silt
99.573	33.07	0.8676	2.624	158.353	13	6	sandy silt to clayey silt
99.738	32.94	0.8552	2.597	162.306	13	6	sandy silt to clayey silt
99.902	32.41	0.8172	2.522	145.097	12	6	sandy silt to clayey silt
100.066	31.14	0.7951	2.554	143.759	12	6	sandy silt to clayey silt
100.230	29.88	0.6700	2.243	147.755	11	6	sandy silt to clayey silt
100.394	29.10	0.5200	1.788	154.681	11	6	sandy silt to clayey silt