September 6, 2024
File: TF24135E

Bob Beer
Twin Falls County
630 Addison Avenue West
Twin Falls, ID 83301
Phone: 208-358-1150

RE: **Geotechnical Engineering Evaluation**
Twin Falls County Jail Modernization & Addition
2515 Wright Avenue
Twin Falls, Idaho 83301

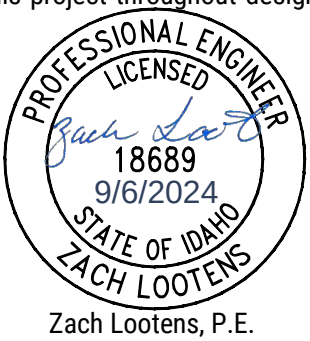
Dear Mr. Beer,

STRATA is pleased to present our authorized Geotechnical Engineering Evaluation (GEE) Report for the planned Twin Falls County Jail addition in Twin Falls, Idaho. The purpose of our GEE was to assess the subsurface conditions at the project site and provide geotechnical engineering recommendations for planning, design, and construction of the proposed facility. The attached report summarizes our field exploration and laboratory testing and presents our geotechnical engineering opinions and recommendations.

Our services were accomplished referencing conversations with you and our subconsultant agreement executed April 18, 2022. Portions of this report cannot be relied upon individually without the supporting text of remaining sections, appendices, and/or plates. When providing this report to designers, estimators, contractors, etc., the report including all appendices, plates and attachments must be provided in its entirety.

We appreciate the opportunity to work with Twin Falls County and your design team and look forward to our continued involvement with this project throughout design and construction. Please contact us if you have any questions or comments.

Sincerely,
STRATA



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STRATA

Geotechnical Engineering Evaluation

Twin Falls County Jail Modernization & Addition
Twin Falls, Idaho

September 6, 2024

Prepared for:
Bob Beer
Twin Falls County
360 Addison Avenue West
Twin Falls, ID 83301

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Geotechnical Engineering Evaluation Report
Twin Falls County Jail Modernization & Addition
2515 Wright Avenue
Twin Falls, Idaho 83301

INTRODUCTION

STRATA is pleased to present our Geotechnical Engineering Evaluation Report for the proposed Twin Falls County Jail addition at 2515 Wright Avenue in Twin Falls, Idaho. The purpose of our evaluation was to evaluate the subsurface soil, rock and groundwater conditions and to provide geotechnical engineering opinions and recommendations to assist project planning, design, and construction. We accomplished our geotechnical services referencing our subconsultant agreement dated April 18, 2022.

PROJECT UNDERSTANDING

Existing Site Conditions

The area of the site is situated northeast of the Wright Avenue cul-de-sac, at the existing juvenile center, with a single-story building and paved parking lot. The ground slopes down from west to east at the site, with up to 10 feet of elevation change. The Perrine Coulee flows from south to north on the east perimeter of the site.

Proposed Development

We understand the proposed construction will include a remodeling/modernization of the existing building, a one-story addition (Part A) of approximately 5,128 square feet to the east of the existing building, and an attached two-story addition (Part B) of approximately 44,342 square feet to the north. New pavement for service trucks and inmate busses is proposed to extend from the existing parking lot. New stormwater infiltration facilities are proposed to accept runoff from the building and asphalt pavements areas. The proposed structures are outlined on Plate 1.

Based on information provided, Part A building will be constructed of CMU masonry and will have wall loading ranging from 2.8 to 3.5 kips/ft with isolated column loading from 25 to 35 kips. Part B structure will be constructed of precast concrete double tee and CMU masonry and have 20 kips/ft wall loading and up to 250-kip column loads. Both buildings will have conventional slab-on-grade construction. Up to 5 feet of fill is expected for the Part A structure and a mechanically stabilized earth (MSE) retaining wall will provide grade separation between the edge of pavement and the Perrine Coulee. The MSE wall will have a free height up to 5 feet and a length of approximately 200 feet. A grading plan for the Part B structure has not been finalized at this time but we anticipated to have less than 3 feet of cuts or fills.

Flood elevations for the Perrine Coulee are approximately 3791 feet for the 100-year flood and 3792 feet for the 500-year flood.

FIELD EXPLORATION

Subsurface Exploration

STRATA observed the excavation of six test pits throughout the project site on July 19, 2024. The test pits extended between 10 to 15 feet below the ground surface (BGS). All depths are in reference to the existing ground surface elevation at the test pit locations. Latitude and longitude were established using a handheld Global Positioning System (GPS) device accurate to within 10 feet, using the WGS 84 datum. The test pit locations are illustrated on Plate 1, *Exploration Location Plan*.

Test Pit Excavation

The test pits for our exploration were completed by Twin Falls County using a 420E excavator, with a target excavation depth of 15 feet below the existing ground surface; however, most of the test pits were terminated at practical refusal on basalt or caliche before reaching the target depth. We obtained soil samples in each stratum encountered in the test pits. At the conclusion of our subsurface exploration, the test pits were backfilled with the excavation spoils and compacted by tamping with the bucket.

Infiltration Testing

Infiltration testing was performed in test pits 24-STR-TP4 and -TP6 at approximately 4 feet in the native loess silt. The infiltration test was performed in general accordance with the procedure for the In-Situ Large-Scale Pilot Infiltration Test (PIT) Method, per Ada County Highway District Stormwater Design Manual – Appendix C. The test pits had a cross-sectional area of approximately 8 square feet. The test was saturated a minimum of 1 hour with a 10 to 12-inch head. The falling head infiltration rate was then measured over a 2-hour period following saturation at 15-minute intervals.

SUBSURFACE CONDITIONS

The subsurface conditions across the site can generally be described as windblown loess overlying basalt. A general description of each unit's stratigraphic location and properties is provided below:

Loess – Native (wind-blown loess) stiff to hard Silt (ML) was observed in all test pits from the surface to approximately 13-foot deep at this site. The loess generally exhibited no cementation with strong hydrochloric (HCl) reaction, indicating the presence of calcium carbonate. A pinhole structure was observed in all of the explorations – generally within the non-cemented to moderately cemented layers.

Cemented Loess – Strongly cemented Sandy Silt (ML) loess (also known as caliche) was encountered in 24-STR-TP1 and -TP2 at a depth of approximately 13 to 14 feet BGS. The strongly cemented layer was hard and exhibited strong HCl reaction.

Basalt Rock – Basalt rock was encountered in test pits -TP3 to -TP6 at variable depths ranging from 10 feet to up to 14 feet BGS. The basalt was dark gray in color.

Groundwater

Groundwater was encountered in test pit 24-STR-TP3 at a depth of approximately 12 feet BGS at the time of exploration. It should be noted that groundwater levels can fluctuate seasonally and in response to water levels in the Perrine Coulee, precipitation events, and irrigation. Perched groundwater may exist at the loess-basalt interface, or above cemented soils, following periods of extended precipitation.

LABORATORY TESTING

Soil samples collected from the explorations were returned to our laboratory for further classification and testing. Laboratory testing was accomplished in general accordance with ASTM International (ASTM) and other procedures. ("General accordance" means that certain local and common descriptive practices and methodologies have been followed.) Our laboratory testing program included:

- Moisture Content (ASTM D2216)
- Atterberg Limits (ASTM D4318)
- Percent Passing the No. 200 Sieve (ASTM D1140)
- Consolidation or Collapse Consolidation (ASTM D2435 or D4546)

Laboratory test results are included on the exploration logs in Appendix A and summarized in Appendix B.

GEOTECHNICAL OPINIONS AND RECOMMENDATIONS

The following geotechnical engineering recommendations were developed to support design and construction of the proposed structure. Our recommendations and opinions are based on the results of our field evaluation, laboratory testing, our experience with similar soil conditions, and our understanding of the proposed construction.

Geotechnical Constraints

Collapsible Silt/Sand (Loess)

Loess is a windblown soil deposit, which often exhibits a high void ratio (often distinguished by pinhole sized voids in the soil structure) and variable cemented structure due to leached minerals (such as calcium carbonate) that form along shallow soil wetting fronts in Idaho's arid climate. The cemented soil structure will support moderate imposed loads until the soil is inundated/saturated, then the minerals dissolve and the soil collapses. Based on laboratory testing performed on a sample obtained from the project site, the weakly cemented (silt) loess layer

collapsed approximately 3.3 percent under a load of 2,000 psf. Unacceptable large settlements may occur post-construction if relatively thick layers of collapsible silt below structures are allowed to become saturated.

Due to the proximity of flood waters from the Perrine Coulee to structures for this project, we recommend placing a cut-off trench between the structures and the Perrine Coulee, and infiltration ponds/seepage beds to mitigate the potential for saturation of native loess below structures. Recommendations for the cut-off trench are provided in the *MSE Wall Recommendations.*

To mitigate the potential for settlement beneath the structures, we are recommending over excavation and backfill soil improvements. Our design assumes a potential wetting front up to 5 feet in depth below the surface from irrigation and stormwater infiltration. If saturation of native loess below a depth of 5 feet or below the depth of soil improvements were to occur due to unforeseen water infiltration (possible pipe leaks or defect in the cut off trench) then additional collapse settlement can occur which could cause distress to the overlying improvements. The ownership team understands and accepts this risk of possible future settlement.

Earthwork

Excavation Characteristics

Based on our exploration, the soil at the project site may be excavated with conventional earthwork equipment. Slower rates of excavation should be expected in strongly cemented silt/sand (caliche). Where basalt rock is encountered, excavation methods may need to include heavy equipment with ripper teeth, pneumatic hammers, or drill and blast methods to remove rock. In general, ripping and chipping the basalt is not typically performed by contractors in this area to significant depths due to its hardness. Excavations may cave and slough and are to be sloped in accordance with Occupational Health and Safety Act (OSHA) guidelines. The on-site, non-cemented to weakly cemented loess will correspond to Class B soil. Excavations in Class B soils should be temporarily sloped no steeper than 1H:1V (horizontal to vertical) for excavations deeper than 4 feet. Excavations in Stable Rock can be temporarily sloped up to vertical based on field evaluation by a Competent Person as defined by OSHA. Surcharges must not be allowed within a horizontal distance equal to one-half the excavation depth. Construction vibrations can cause excavations to slough or cave. Ultimately, the contractor is solely responsible for site safety and excavation configurations. We recommend earthwork contractors evaluate each excavation configuration specific to OSHA guidelines and that they seek appropriate professional guidance to ensure excavation safety and stability.

Site Stripping

Prior to any earthwork, we recommend stripping the upper topsoil/organics below the footprint of all structures. Based on our explorations, we estimate a stripping depth ranging from 6 to 12 inches. If organic material and

topsoil is not removed beneath structures, there is a risk that decay of organics could lead to settlement and that could negatively impact its performance. To help maintain uniform support conditions, it will be necessary to remove all organic-laden topsoil and replace topsoil inorganic structural fill. Stripping shall extend laterally at least 5 feet outside of the planned structure footprints. Soil containing vegetation and organics shall be disposed of off-site or may be stockpiled for reuse as landscaping. Topsoil is not suitable for use as structural fill.

Proof Compaction

Proof compaction (or proof rolling) is typically used on subgrade, in lieu of density testing, to create a stable platform to place structural fill. Where specified in this report, proof compaction shall consist of moisture conditioning followed by compacting with a minimum of 5 passes of a 5-ton static drum weight vibratory roller, or other heavier equipment. STRATA should observe the proof compaction to see if any pumping or weaving of the subgrade is observed. If pumping or weaving occurs, the subgrade in question should be undercut in accordance with *Section 202, Part 3.7 Excavation of Unsuitable Material* of the ISPWC and replaced with Granular Structural Fill, as defined in the following section. Where proof compaction with large compaction equipment is not possible (footing trenches), the exposed subgrade should be moisture conditioned and proof compacted with a vibratory hoe pack. A steel probe and/or pocket penetrometer shall be used to identify potential areas with unsuitable subgrade, where removal and replacement is required.

Subgrade Preparation

Soil improvements will be required to limit potential settlement to tolerable levels. We recommend improving soil below the foundations and the MSE wall (and reinforced soil zone) using the removal of loess and replacement with structural fill. Table 1 summarizes the required depths of removal and replacement material for this project.

Table 1. Soil Improvements

Structure	Depth of Soil Improvements (ft)	Replacement Material
MSE Wall and Reinforced Soil Zone	3	General or Granular Structural Fill
Part A Footings	3	General or Granular Structural Fill
Part B Footings	5	Granular Structural Fill

The depth of soil improvements in Table 1 are in reference to the bottom of footing elevation or bottom of MSE reinforced zone. Onsite loess may be re-used as General Structural Fill and replaced to the bottom of Part A footings and the MSE wall. All over-excavations should extend 1 foot laterally beyond the improvement area for every 2 feet of excavation depth.

In floor slab on grade and pavement areas, the subgrade should be proof-rolled and any soft or loose areas removed and replaced with Granular Structural Fill. STRATA should be retained to perform field inspections during removal and replacement operations.

Structural Fill

The on-site loess is moisture susceptible and can be difficult to use during inclement weather, but may be used as General Structural Fill, provided it is moisture conditioned and compacted in accordance with the *Compaction* section of this report. In general, the structural fill requirements described in Table 2 correlate to material specifications in the *Idaho Standards for Public Works Construction* (ISPWC).

The following soils are considered unsatisfactory for use in structural applications:

- Soil classified as CL, CH, MH, OH, OL or PT.
- Soil with a moisture content greater than 3% of optimum moisture.
- Any soil containing more than 3% organics by weight or other deleterious substances (wood, metal, plastic, waste, etc.).

Table 2. Structural Fill Specifications

Structural Fill Material • Allowable Use	Material Specifications
General Structural Fill • General site grading	• Soil classified as GW, GP, GP-GM, GM, GC, SW, SP, SP-SM, SM, SC, or ML according to the USCS. • Maximum particle size must be less than 6 inches. • Soil consisting of inert earth materials with less than 3% organics or other deleterious substances (wood, metal, plastic, waste, etc.).
Granular Structural Fill • Soft spot subgrade replacement • Soil improvements • Pavement subbase	• Soil classified as GW, GP, GP-GM, SP or SP-SM according to the USCS, with no particles greater than 6 inches in size. *Or* • Soil meeting requirements stated in the latest edition of the *ISPWC, Section 801 – Uncrushed Aggregates (6 inches).*
Aggregate Base Course • Slab or foundation support • Gravel base course	• Soil meeting requirements stated in the latest edition of the *ISPWC, Section 802 – Crushed Aggregate Base Type I.*
Utility Trench Bedding • Utility trench construction	• Soil meeting requirements stated in the latest edition of the *ISPWC, Section 305 – Pipe Bedding.*
Drainage Aggregate • MSE face drain	• AASHTO #57 Stone

Compaction

All structural fill should be compacted to a minimum of 95 percent below buildings and walls and 90 percent below pavement of the maximum dry density of the soil as determined by ASTM D1557 (Modified Proctor). Structural fill must be moisture-conditioned to near optimum moisture content, placed in maximum 8-inch-thick loose lifts for fine grain cohesive soils, and 12 inches thick loose lifts for granular soils, then compacted using appropriate compaction equipment. If smaller or lighter compaction equipment is used, the lift thickness should be reduced to meet the compaction requirements.

Testing of structural fill shall consist of a minimum of one modified proctor, particle size distribution, and Atterberg limit (as needed) per 5,000 cubic yards. Density testing shall be accomplished with a nuclear density meter at a minimum frequency of one test per lift per 2500 square feet in the building area, one test per lift for spot footings, one test per 50 linear feet for strip footings, and one test per lift per 5000 square feet in pavement areas.

Wet Weather/Wet Soil Construction

We recommend earthwork be performed during dry weather conditions. Fine-grained, silty soils are susceptible to pumping and/or rutting when the soil is above optimum moisture content and is subjected to heavy loads, such as rubber-tired equipment or vehicles. Earthwork should not be performed immediately after precipitation events until the soil has dried sufficiently to support construction traffic without disturbing the subgrade. The contractor shall take precautions to protect the subgrade from becoming saturated and/or disturbed. Use of tracked mount equipment can limit the disturbance of moisture sensitive soil. We recommend the contractor limit construction traffic on the prepared subgrade and reduce exposure of the subgrade to precipitation and water. Specifically, the contractor should:

- Slope subgrades to direct surface water away from construction areas.
- Remove subgrade soil that has become soft and/or pumping and replace it with properly compacted structural fill, as described in the Structural Fill subsection above.
- Not place structural fill during or immediately following a significant precipitation event.
- Not place structural fill on frozen or saturated subgrades.

Use of on-site silty soil as structural fill may be impractical during periods of inclement weather. Therefore, we recommend construction contingencies include removal and replacement of wet soil with Granular Structural Fill.

Seismic Design Criteria

Based on our subsurface test pit, geologic data, the project location, and ASCE 7 (ASCE, 2016), we recommend Seismic Site Class D be utilized for the seismic design of the project, provided the soil improvements outlined in the Subgrade Preparation Section are accomplished beneath the shallow foundations. Seismic response criteria are presented in Table 3.

Table 3. Seismic Response Criteria

Period (seconds)	Mapped Acceleration Coefficients (g)	Site Factor for Site Class D	Modified Acceleration Coefficient for Site Class D (g)
Peak	PGA = 0.086	F_{PGA} = 1.6	PGA_M = 0.137
0.2 (Short)	S_S = 0.194	F_a = 1.6	S_{DS} = 0.207
1.0	S_1 = 0.082	F_v = 1.5	S_{D1} = 0.132

1. Values for location Latitude 42.5437°N and Longitude 114.4328°W

Conditions required for liquefaction to occur include relatively loose, fine granular soil, shallow groundwater, and strong earthquake ground motions. Due to the absence of these conditions at this site and the low seismic hazard, it is our opinion that the liquefaction and lateral spreading are unlikely to occur.

Foundation Design Recommendations

Shallow foundations may be utilized for this project, provided that the required subgrade improvements in the *Subgrade Preparation* section are performed. We recommend a 24-inch frost depth for this site.

Shallow Foundations

Shallow foundations must be structurally designed to conform to the latest edition of the International Building Code (IBC). Provided the soil improvements outlined in the *Subgrade Preparation Section* are accomplished, an allowable bearing capacity of 3,000 psf may be used for footings for building Part A and an allowable bearing capacity of 4,000 psf may be used for footings supported on Granular Structural fill for building Part B.

A friction coefficient of 0.35 can be used for concrete placed on General Structural Fill and 0.55 for concrete placed on Granular Structural Fill or Aggregate Base Course. The bearing capacity may be increased 30 percent to account for transitory live loads such as seismic and wind.

The allowable bearing capacity provided assumes that structures can tolerate up to 1-inch of total settlement and differential settlement less than 0.002L where L is the span distance. We recommend STRATA be retained to observe the foundation installation; including subgrade preparation and structural fill placement and compaction, prior to placing concrete forms or concrete. Observing the subgrade soil improvement process and foundation bearing surfaces allows us to confirm our allowable bearing pressure recommendations and settlement estimates and is an important part of the geotechnical engineering design process.

Concrete Slab-on-Grade Floors

Concrete slab-on-grade floors can be supported directly on the prepared subgrade, as described in the Subgrade Preparation section above. The thickness of the Aggregate Base shall be at least 6 inches below slabs. Floor slabs may be designed for the anticipated use and equipment or storage loading conditions considering a preliminary unit modulus of subgrade reaction “k” value of 175 psi/in (12-inch plate equivalent).

Interior floor slabs may be susceptible to moisture migration caused by capillary action and vapor pressure. If floor coverings such as tile, vinyl, or other “impervious coatings” are planned, a vapor retarder should be used. Where utilized, vapor retarders must consist of a 15-mil, puncture-resistant sheeting, consistent with American Concrete Institute (ACI) Section 302.2R-06 specifications. An example of a common vapor retarder is Stego Wrap™.

The specific location of vapor retarders has been widely discussed in the architectural, structural, construction and geotechnical engineering communities, and differing opinions exist. However, the ACI recommends placement of a vapor retarder directly below the concrete slab. Ultimately, the location of the vapor retarder (if a vapor retarder is specified) should be carefully considered by the owner and architect. Studies have shown that decreased

concrete water-cement ratios, higher strength concrete, and good construction finishing practices significantly decrease any negative impacts associated with placement of the vapor retarder immediately below the concrete slab.

Form stakes or other sub-slab penetrations must not be allowed to puncture the vapor retarder. Manufacturer recommendations for proper sealing of slab-to-wall connections, plumbing, or other penetrations must be followed. Water vapor migration through the concrete floor slab is still possible. Floor covering must be selected accordingly and manufacturer's recommendations followed.

Exterior slabs are susceptible to frost action, which can generate substantial frost heave at certain times of the year. The potential for frost heave may not be acceptable in areas adjacent to the structures that will be exposed to weather. One approach to provide partial frost protection requires removing 60-65 percent of material within the frost depth and replacing it with non-frost susceptible aggregate. Partial frost protection typically allows for up to 1 inch of frost heave. If this method is employed, we recommend placing Granular Structural Fill or Aggregate Base Course below the slabs so that the combined slab and aggregate thickness is 15 inches or greater. Alternatively, if partial frost protection is unacceptable, over-excavation and Granular Structural Fill/Aggregate Subbase Course replacement must be accomplished to the anticipated frost depth (24 inches).

MSE Wall Recommendations

We understand the proposed MSE wall will have Eco Block facing with geotextile reinforcement. We have performed stability analysis on the wall to calculate the minimum tensile strength and length of the reinforcements. Drainage recommendations are also included in this section. The retaining wall was designed assuming a 250 psf traffic surcharge load with wall dimensions provided by Civil Science.

Backfill

The MSE reinforced zone should be backfilled with Aggregate Base Course, with exception of the face drain discussed further in the *Drainage* subsection. Heavy compaction equipment or other construction loads must not to be allowed within 3 feet of the wall face. Hand-operated or lightweight compaction equipment such as vibrating plate compactors and loose lift thicknesses reduced to a maximum of 6 inches must be utilized within 3 feet of the structure.

Reinforcement

We recommend using a woven geotextile with a minimum long term tensile strength of 2000 lbs./ft. The minimum reinforcement length should be 6 feet and placed between blocks at a vertical spacing of 2 feet.

Lateral Earth Pressures

Assuming General Structural Fill as described in this report will be placed behind the retaining walls, we recommend using the following parameters for estimating lateral forces.

- Active earth pressure (wall free to move away from backfill): 37 pounds per square foot per foot of depth (psf/ft).
- At-rest earth pressure: 62 psf/ft.
- Passive earth pressure: 300 psf/ft.
- Coefficient of sliding friction: 0.55.

The values indicated above do not include safety factors. Appropriate safety factors should be included when designing retaining walls to resist lateral earth forces.

Cut-off Barrier

We recommend placing a cut-off barrier along the eastern perimeter of the site as illustrated on Plate 1. The cut-off barrier will extend up to the 100-year floodplain Elevation 3791 feet and down 5 feet below existing grade. Details for the cut-off barrier are presented in Apprendix C. The barrier will be placed behind the reinforced zone of the MSE wall and transition to a 24-inch-wide trench to the north and south of the wall. The cut-off trench sections should be backfilled with native excavated soils re-compacted as General Structural Fill. We recommend using a 30-mil thick PVC or HDPE membrane.

Drainage

Both internal and external drainage measures are recommended for the MSE wall. A surface swale should be constructed at the edge of pavement to mitigate stormwater from sheet flowing over the wall face. The surface swale should have a minimum depth of 4 inches and connect with the stormwater retention ponds/seepage beds. We recommend placing 12 inches of Drainage Aggregate behind the wall face from the top of the wall down to the finished grade below wall to allow water to seep through the block facing.

Pavement Design

We have provided a flexible pavement section for parking lots and drive aisles. The native silt subgrade soil is frost susceptible and pavement sections were designed to provide a minimum 60 percent frost protection. Pavement subgrades should be approved by grading to the finished subgrade elevation and proof compacting the subgrade.

Flexible Pavement

We performed flexible pavement section analyses for the pavement section utilizing the ITD Gravel Equivalency (GE) design method. Based on our understanding of the anticipated traffic, the recommended flexible hot-mix asphalt (HMA) pavement section for the development is presented in Table 4 and will provide a 20-year design for a traffic index of 6.5 or approximately 65,000 ESALS.

Table 4. Flexible Pavement Design Recommendations

HMA (inches)	Aggregate Base (inches)	Granular Subbase[1] (inches)
3	4	8

1. Aggregate Base can be substituted for Granular Subbase to place in fewer lifts.

We recommend Superpave HMA Class SP-2 or SP-3 with PG 64-28 and 1/2-inch nominal aggregate. We also recommend crack maintenance and seal coating be accomplished on all pavement surfaces every 3 to 5 years to reduce the potential for surface water infiltration into the underlying pavement subgrade. Surface and subgrade drainage are extremely important to the performance of the pavement section. Therefore, we recommend the subgrade, base, and asphalt surfaces slope at no less than 2 percent to an appropriate stormwater disposal system or other appropriate location that does not impact adjacent buildings or properties. The pavement's lifespan is dependent on achieving adequate drainage throughout the section, especially at the subgrade elevation. Ponding water at the pavement subgrade surface can induce heaving during the freeze-thaw process.

Utility Trench Backfill

Trenches for utilities should conform to the specifications of the Idaho Standards for Public Works Construction (ISPWC) Section 305 and 306 (ISPWC 2017). Trench backfills below the building foundation should be imported trench backfill, per Section 306.2.3, and compacted to Type A-1 compaction. Loose soil must be removed from the base of trenches prior to placing utility trench bedding. In addition, if water is encountered, it must be removed from the base of the trench before placing bedding.

Site Drainage

We recommend that finished grades be sloped at a minimum of 2 percent away from the proposed structures for a minimum distance of 10-ft and directed to an acceptable collection area/facility. We recommend a minimum buffer of 30 feet from the building perimeter to the infiltration facilities. Infiltration test results are presented in Table 5. We recommend a safety factor of 2 for the field infiltration rate.

Table 5. Infiltration Testing

Location (Depth)	Stratum	Measured Infiltration (in/hr)	Recommended Safety Factor	Design Infiltration (in/hr)
24-STR-TP4 (4')	Silt (ML)	1	2	0.5
24-STR-TP6 (4')	Silt (ML)	1	2	0.5

GEOTECHNICAL DESIGN CONTINUITY

Geotechnical design continuity will be an important aspect of this project's successful completion. In our opinion, geotechnical continuity can occur in the planning, design, and construction project aspects. Specifically, we recommend STRATA maintain the geotechnical design continuity in the following aspects:

Plan and Specification Review

Once project drawings have been produced, STRATA should be notified in order to review the site plan layout and grading plans for the Twin Falls County Jail Modernization and Addition. We recommend STRATA be retained to review final design, construction plans, and specifications to verify our geotechnical recommendations are incorporated into project bidding and construction documents, as well as to provide additional recommendations based on the final design concepts. These efforts can help provide document continuity across the engineering disciplines and reduce the potential for errors as the project concepts evolve.

Geotechnical Design Confirmation

We recommend STRATA be retained to provide geotechnical engineering oversight during site grading, foundation installation, soil improvements, cut-off drain installation, wall construction, and excavation to observe the potential variability in the soil conditions and provide consultation regarding potential impacts on foundation construction.

Construction Observation and Testing

We recommend STRATA be retained to observe foundation soil improvement, excavation, grading, and concrete placement operations for floor slab preparation and shallow foundations. Having STRATA provide inspection and oversight during this process will reduce the potential for any unforeseen construction errors, which may ultimately impact the project. STRATA can also provide construction material testing and special inspections for concrete, masonry, reinforcement, steel/welding, and asphalt. If we are not retained to perform the recommended services, we cannot be responsible for related construction errors or omissions.

EVALUATION LIMITATIONS

This geotechnical engineering evaluation report was prepared to assist in the design, planning, and construction of the proposed Twin Falls County Jail addition at 2515 Wright Avenue in Twin Falls, Idaho. Our services and this report are not applicable to other sites. Our services consist of professional opinions and recommendations made in accordance with generally accepted geotechnical engineering principles and practices as they exist in southern Idaho at the time of this report. This report has been prepared under the premise that STRATA will review the geotechnical aspects of the plans and specifications and will provide geotechnical observation and design verification during construction.

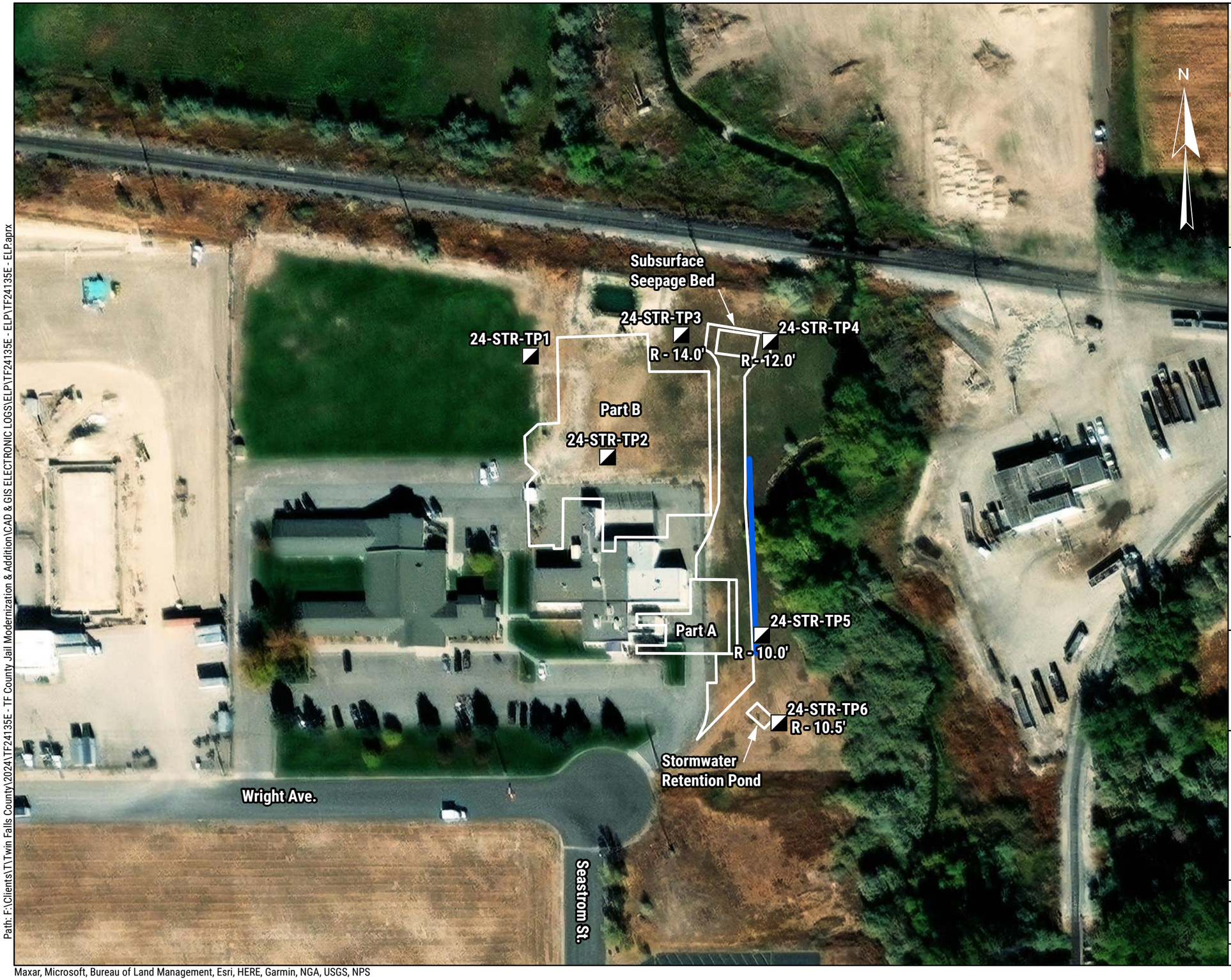
Soil and geologic materials, including groundwater, are variable in nature and conditions can change between exploration locations. These changes can impact construction timing and costs. STRATA's exploration identified the conditions at the time of our site reconnaissance and subsurface evaluation and in the discrete locations explored. This acknowledgment is in lieu of all warranties either express or implied.

This report has been prepared specifically for Twin Falls County and their design team. STRATA cannot be held responsible for unauthorized duplication or reliance upon this report or its contents without written authorization.

REFERENCES

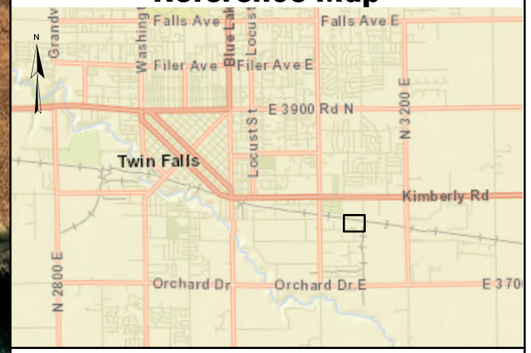
ASCE. (2016). Minimum Design Loads for Buildings and Other Structures. ASCE/SEI Standard 7-16.

ISPWC. (2020). "IDAHO STANDARDS for PUBLIC WORKS CONSTRUCTION, 2020 Edition". Local Highway Technical Assistance Council (LHTAC), Boise, Idaho



Maxar, Microsoft, Bureau of Land Management, Esri, HERE, Garmin, NGA, USGS, NPS

Reference Map



Legend

24-STR-TP1 — Approximate location of test pit observed by STRATA on July 19, 2024

R — Depth to Rock in feet

Retaining Wall

0 50 100 200 Feet

Scale: 1" = 100'

STRATA

EXPLORATION LOCATION PLAN

Twin Falls County Jail
Modernization & Addition
Twin Falls, Idaho

Client: Twin Falls County	
Client File No.: N/A	File No.: TF24135E
Drawn By: G. Morlan	Checked By: C. Medina
Date: 8/1/2024	Plate 1

Path: F:\Clients\T\Twin Falls County\2024\TF24135E - TF County Jail Modernization & Addition\CAD & GIS ELECTRONIC LOGS\ELP\TF24135E - ELP\TF24135E - ELP.aprx

Appendix A
Exploratory Test Pit Logs

UNIFIED SOIL CLASSIFICATION SYSTEM

MAJOR DIVISIONS			GRAPH SYMBOL	LETTER SYMBOL	TYPICAL NAMES
COURSE GRAINED SOIL MORE THAN 50% RETAINED ON NO. 200 SIEVE	GRAVELS >50% COARSE FRACTION RETAINED #4 SIEVE	CLEAN GRAVELS WITH LITTLE OR NO FINES		GW	WELL GRADED GRAVELS, GRAVEL-SAND MIXTURES
				GP	POORLY GRADED GRAVELS, GRAVEL-SAND MIXTURES
		GRAVELS WITH >12% FINES		GM	SILTY GRAVELS, GRAVEL-SAND-SILT MIXTURES
				GC	CLAYEY GRAVELS, GRAVEL-SAND-SILT MIXTURES
	SANDS >50% COARSE FRACTION PASSES #4 SIEVE	CLEAN SANDS WITH LITTLE OR NO FINES		SW	WELL-GRADED SANDS, GRAVELY SANDS
				SP	POORLY-GRADED SANDS, GRAVELY SANDS
		SANDS WITH >12% FINES		SM	SILTY SANDS, SAND-SILT MIXTURES
				SC	CLAYEY SANDS, SAND CLAY MIXTURES
FINE GRAINED SOIL MORE THAN 50% PASSING NO. 200 SIEVE	SILTS AND CLAYS LIQUID LIMIT LESS THAN 50	INORGANIC		ML	INORGANIC SILTS, SANDY OR CLAYEY SILTS
				CL	INORGANIC CLAYS OF LOW TO MEDIUM PLASTICITY, SANDY OR SILTY CLAYS
		ORGANIC		OL	ORGANIC SILTS AND CLAYS OF LOW PLASTICITY
	SILTS AND CLAYS LIQUID LIMIT 50 OR MORE	INORGANIC		MH	INORGANIC SILTS, MICACEOUS SILTS, PLASTIC SILTS
				CH	INORGANIC CLAYS OF HIGH PLASTICITY, FAT CLAYS
		ORGANIC		OH	ORGANIC CLAYS OF MEDIUM TO HIGH PLASTICITY
HIGHLY ORGANIC SOILS				PT	PEAT, MUCK AND OTHER HIGHLY ORGANIC SOIL

SHORTHAND NOTATION

SPT - STANDARD PENETRATION TEST
PL - PLASTIC LIMIT
LL - LIQUID LIMIT
PI - PLASTICITY INDEX
MC - MOISTURE CONTENT
DD - DRY DENSITY
WD - WET DENSITY
UC - UNCONFINED COMPRESSION
OC - ORGANIC CONTENT
BGS - BELOW GROUND SURFACE
N.E. - NOT ENCOUNTERED

MATERIAL DESCRIPTION CONTACT

——— DISTINCT SOIL LAYER CONTACT WITHIN SOIL PROFILE

- - - - - - APPROXIMATE SOIL LAYER CONTACT WITHIN SOIL PROFILE

NOTES

1. MIXED UNIFIED SOIL CLASSIFICATION SYSTEM SYMBOLS ARE USED TO INDICATE DUAL SOIL CLASSIFICATIONS.
2. THE SPT N-VALUE, REPORTED IN BLOWS PER FOOT, IS THE SUM OF THE NUMBER OF BLOWS REQUIRED TO DRIVE THE STANDARD SPLIT SPOON SAMPLER A DISTANCE OF 12-INCHES AFTER AN INITIAL 6-INCHES OF PENETRATION. IF A TOTAL OF 50 BLOWS ARE INSUFFICIENT TO ADVANCE ANY OF THE THREE 6-INCH INTERVALS, THE PENETRATION DEPTH AFTER 50 BLOWS IS ALSO REPORTED.

BORING LOG SYMBOLS

GRAPH SYMBOL	DESCRIPTION
	STANDARD 2-INCH OUTSIDE DIAMETER SPLIT SPOON SAMPLER
	MODIFIED CALIFORNIA 3-INCH OUTSIDE DIAMETER SAMPLER
	ROCK CORE
	SHELBY TUBE 3-INCH OUTSIDE DIAMETER SAMPLER

ADDITIONAL MATERIAL SYMBOLS

GRAPH SYMBOL	LETTER SYMBOL	TYPICAL NAMES
	AC	ASPHALT CONCRETE
	CC	CEMENT CONCRETE
	TS	TOPSOIL
	FL	FILL

TEST PIT LOG SYMBOLS

GRAPH SYMBOL	DESCRIPTION
BG	BAGGIE SAMPLE
	BULK SAMPLE
RG	RING SAMPLE

GROUNDWATER SYMBOLS

GRAPH SYMBOL	DESCRIPTION
	GROUNDWATER LEVEL AT TIME OF DRILLING
	GROUNDWATER LEVEL AT END OF DRILLING
	GROUNDWATER LEVEL 24 HOURS AFTER DRILLING COMPLETION
04-10-18	DATE OF GROUNDWATER READING

EXPLORATION LOG KEY - SOIL

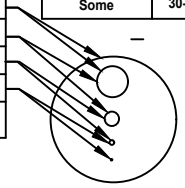
STRATA

GRAIN SIZE

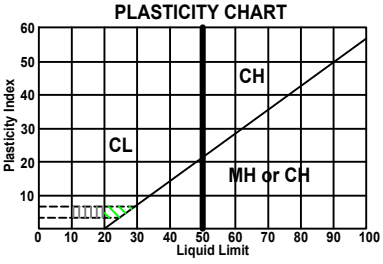
DESCRIPTION		SIEVE SIZE	GRAIN SIZE	APPROXIMATE SIZE
Boulders		>12"	>12"	Larger than basketball-size.
Cobbles		3" - 12"	3" - 12"	Fist-size to basketball-size.
Gravel	coarse	3/4" - 3"	3/4" - 3"	Thumb-sized to fist sized.
	fine	#4 - 3/4"	0.19 - 0.75"	Pea-sized to thumb-sized.
Sand	coarse	#10 - #4	0.079 - 0.19"	Rock salt-sized to pea-sized.
	medium	#40 - #10	0.017 - 0.079"	Sugar-sized to rock salt-sized.
	fine	#200 - #40	0.0029 - 0.017"	Flour-sized to sugar-sized.
Fines		Passing #200	<0.0029"	Flour-sized and smaller.

MODIFIERS

DESCRIPTION	%
Trace	<5
Few	5-10
Little	15-25
Some	30-45



PLASTICITY CHART



STRATIFICATION

DESCRIPTION	THICKNESS
Parting	1/16 - 1/4"
Lense	1/4 - 4"
Layer	4 - 12"

DESCRIPTION	THICKNESS
Occasional	One or less per foot of thickness.
Frequent	More than one per foot of thickness.

MOISTURE CONTENT

DESCRIPTION	FIELD TEST
Dry	Absence of moisture, dusty, dry to touch.
Moist	Slightly damp, some apparent moisture.
Wet	Saturated, visible free water, soil is below water table.

APPARENT RELATIVE DENSITY OF COARSE-GRAINED SOIL

APPARENT DENSITY	SPT blows/ft	CALIFORNIA SAMPLER blows/ft	D & M SAMPLER blows/ft	RELATIVE DENSITY (%)	FIELD TEST
Very Loose	0-4	<4	<5	0-15	Easily penetrated with 1/2" reinforcing rod pushed by hand.
Loose	5-10	5-12	5-15	15-35	Difficult to penetrate with 1/2" reinforcing rod pushed by hand.
Medium Dense	11-30	12-35	15-40	35-65	Easily penetrated a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Dense	31-50	35-60	40-70	65-85	Difficult to penetrate a foot with 1/2" reinforcing rod driven with 5-lb hammer.
Very Dense	>50	>60	>70	85-100	Penetrated only a few inches with 1/2" reinforcing rod driven with 5-lb hammer.

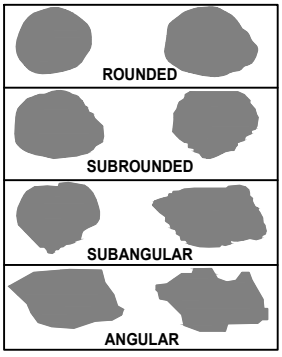
CONSISTENCY FINE-GRAINED SOIL

		TORVANE	POCKET PENETROMETER	
CONSISTENCY	SPT blows/ft	UNDRAINED SHEAR STRENGTH (tsf)	UNCONFINED COMPRESSIVE STRENGTH (tsf)	FIELD TEST
Very Soft	<2	<0.125	<0.25	Easily penetrated several inches by thumb. Extrudes between thumb and finger when squeezed in hand.
Soft	2-3	0.125-0.25	0.25-0.5	Penetrated about 1/4 inch by thumb with moderate effort. Molded by strong finger pressure.
Firm	4-7	0.25-0.5	0.5-1.0	Penetrated about 1/4 inch by thumb with moderate effort. Molded by strong finger pressure.
Stiff	8-14	0.5-1.0	1.0-2.0	Indented about 1/2 inch by thumb only with great effort.
Very Stiff	15-30	1.0-2.0	2.0-4.0	Readily indented with difficulty by thumbnail.
Hard	>30	>2.0	>4.0	Indented with difficulty by thumbnail.

REACTION WITH HCl

None	No visible reaction.
Weak	Some reaction, with bubbles forming slowly.
Strong	Violent reaction, with bubbles forming immediately.

PARTICLE SHAPE



CEMENTATION

Weak	Crumbles or breaks with handling or little finger pressure.
Moderate	Crumbles or breaks with considerable finger pressure.
Strong	Will not crumble or break with finger pressure.

STRUCTURE

Stratified	Alternating layers of varying material or color with layers at least 1/4" thick; note thickness.
Laminated	Alternating layers of varying material or color with layers at least 1/2" thick; note thickness.
Fissured	Breaks along definite planes of fracture with little resistance to fracturing.
Slickensided	Fracture planes appear polished or glossy, sometimes striated.
Blocky	Cohesive soil that can be broken down into small macular lumps which resist further breakdown.
Lensed	Inclusion of small pockets of different soil, such as small lenses or sand scattered through a mass of clay; note thickness.
Homogeneous	Same color and thickness throughout.

EXPLORATION LOG KEY - SOIL

STRATA

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: N.E.

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP1

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3796.0	**Silt (ML)**, Tan to medium brown, moist, stiff to very stiff, HCl reaction: strong	ML	BG			2.0 2.0 1.5 2.0						Organics in upper 8 inches
2.5													
5.0													
7.5													
10.0													
12.5													
	3782.5	**Sandy Silt (ML)**, Tan, moist, hard, HCl reaction: strong, strong cementation, fine-grained sand (caliche)	ML										
15.0	3781.0	Terminated at 15.0 Feet.											

Latitude: 42.5443
Longitude: -114.43314

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: N.E.

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP2

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3795.0	**Silt (ML)**, Brown, dry to moist, very stiff to hard, HCl reaction: strong, pinholes present					2.5						Organics in upper 16 inches to 4 feet (big root)
							4.5+						
2.5				■			3.5	8.2		88			
							2.0						
5.0			ML										
7.5													
10.0													Basalt fragments
12.5													
	3781.5												
	3781.0	**Sandy Silt (ML)**, Tan, dry to moist, hard, HCl reaction: strong, strong cementation, fine-grained sand (caliche)	ML										
		Terminated at 14.0 Feet.											

Latitude: 42.54401
Longitude: -114.43285

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls | **Equipment:** 420E

Date Excavated: 07-19-2024 | **Bucket Width:** 24"

Depth to Groundwater: 12' | **Logged By:** C. Medina

STRATA

Test Pit:

24-STR-TP3

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks
0.0	3792.0	**Silt (ML)**, Brown, dry to wet, very stiff to hard, HCl reaction: strong, pinholes present					4.5+						Organics in upper 18 inches.
							3.5						
2.5								18.6		91			
							2.5						
							2.5						
5.0													
7.5			ML	BG				27.3		98	25	3	
10.0													
12.5													
	3778.0												Terminated at 14 feet BGS due to basalt.

Terminated at 14.0 Feet.

Latitude: 42.45506
Longitude: -114.4328

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: N.E.

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP4

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3790.0	**Silt (ML)**, Brown, dry to moist, stiff to very stiff, HCl reaction: strong, pinholes present	ML				3.0 2.5 1.0 1.0						Organics in upper 6 inches. Field Infiltration Rate = 1 in/hr
2.5													
5.0													
7.5													
10.0	3778.0												Terminated at 12 feet BGS due to basalt

Terminated at 12.0 Feet.

Latitude: 42.54433
Longitude: -114.43222

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: N.E.

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP5

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3793.0	**Silt (ML)**, Brown, dry to moist, very stiff to hard, HCl reaction: strong, pinholes present	ML				4.0 4.5+ 3.0 2.0						Organics in upper 12 inches.
2.5													
5.0													
7.5													
10.0	3783.0	Terminated at 10.0 Feet.											Terminated at 10 feet BGS due to basalt

Latitude: 42.5435
Longitude: -114.43227

TEST PIT - STRATA PROJECT.GDT - 8/15/24 12:35 - F:\CLIENTS\TWIN FALLS COUNTY\2024\TF24135E - TF COUNTY JAIL MODERNIZATION & ADDITION\CAD & GIS ELECTRONIC LOGS\BORING-TEST PIT LOGS\TF24135E LOGS.GPJ

Project: Twin Falls County Jail Addition (TF24135E)

Client: City of Twin Falls

Equipment: 420E

Date Excavated: 07-19-2024

Bucket Width: 24"

Depth to Groundwater: N.E.

Logged By: C. Medina

STRATA

Test Pit:

24-STR-TP6

Depth (ft)	Elevation	USCS Description	Symbol	Sample Type	DCP Blows	DCP Value	Pocket Pen (TSF)	Moisture Content (%)	Dry Density (pcf)	Percent Passing the No. 200 Sieve	Liquid Limit	Plasticity Index	Remarks Note: BGS = Below Ground Surface
0.0	3793.0	**Silt (ML)**, Brown, dry to moist, very stiff to hard, HCl reaction: strong, pinholes present	ML	BG			3.0 4.0 4.5+ 2.0	8.9		96			Organics in upper 16 inches Field Infiltration Rate = 1 in/hr
2.5													
5.0													
7.5													
10.0	3782.5												Terminated at 10.5 feet BGS due to basalt

Terminated at 10.5 Feet.

Latitude: 42.54325
Longitude: -114.43221

Appendix B
Laboratory Test Results

STRATA

Summary of Laboratory Test Results

Project: Twin Falls County Jail Modernization & Addition
Client: Twin Falls County

Project Number: TF24135E
Date: 7/31/2024

Boring	Depth, feet	Soil Classification (USCS)	In Situ Moisture, %	Passing No. 200,%	Atterberg Limits LL	PL	PI	Fines Class.
24-STR-TP2	2.75-3.25	Silt (ML)	8.2	88	-	-	-	ML
24-STR-TP3	2.5-3.0	Silt (ML)	18.6	91	-	-	-	ML
24-STR-TP3	6.5-7.5	Silt (ML)	27.3	98	25	22	3	ML
24-STR-TP6	0.0-1.0	Silt (ML)	8.9	96	28	23	5	ML

Reviewed By:

Zach Lootens
Project Engineer

Boise
8653 W. Hackamore Dr
Boise, ID 83709
Phone: 208.376.8200

ASTM D2435

Report Date: 07/30/2024

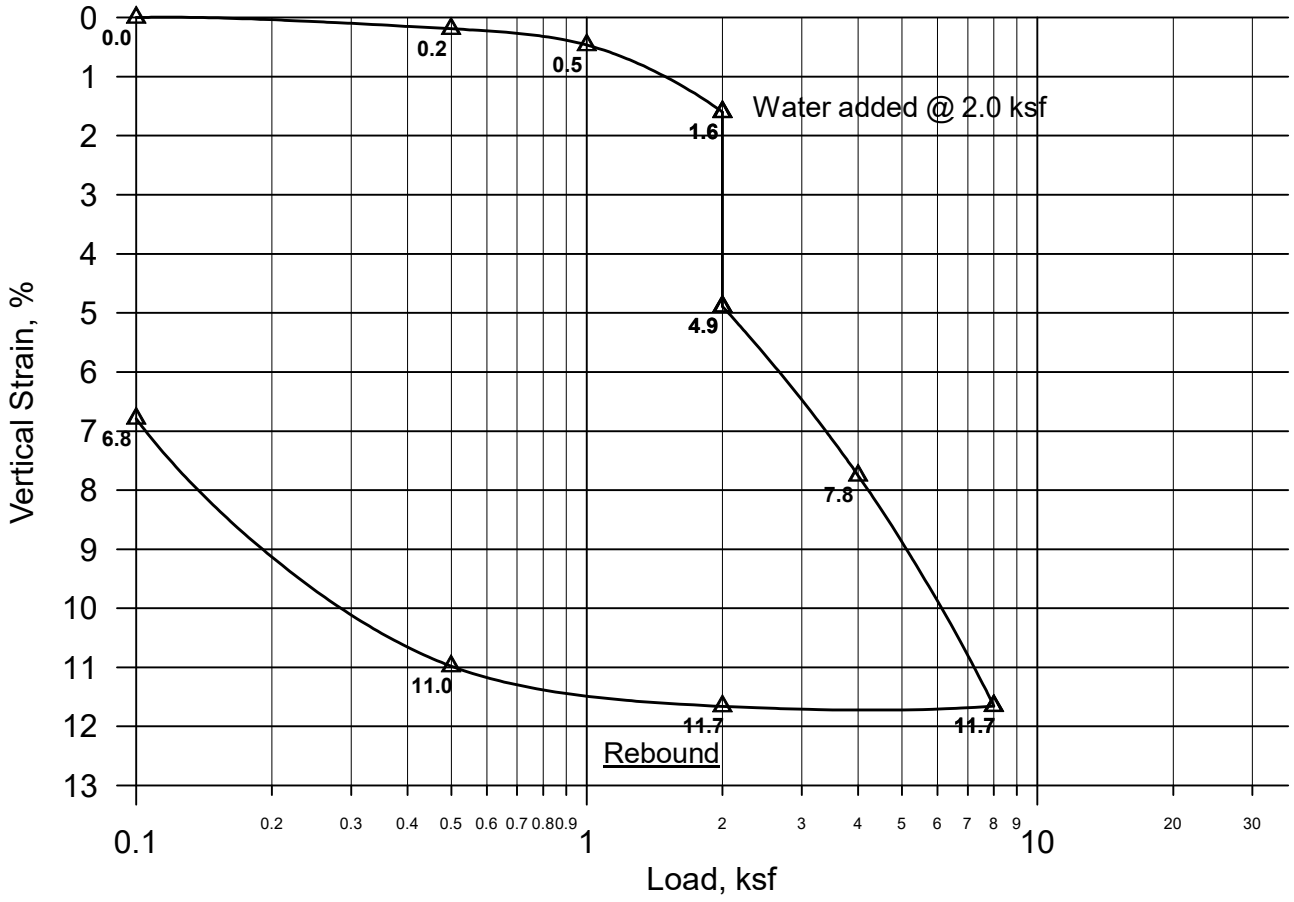
Client
Twin Falls County

Project
TF24135E
Twin Falls County Jail Modernization and Addition

SAMPLE INFORMATION

SAMPLE No.:	54145	**SAMPLE DATE:**	07/17/2024	**BORING No.:**	24-STR-TP3
SPECIMEN SIZE:	Shelby Tube	**TEST DATE:**	07/23/2024	**DEPTH (FT):**	2.5-3.0
USCS CLASSIFICATION:	[USCS Classification]	**SAMPLED BY:**	J. Marsh	**SAMPLE CONDITION:**	Good
		TESTED BY:	V. Barinaga		

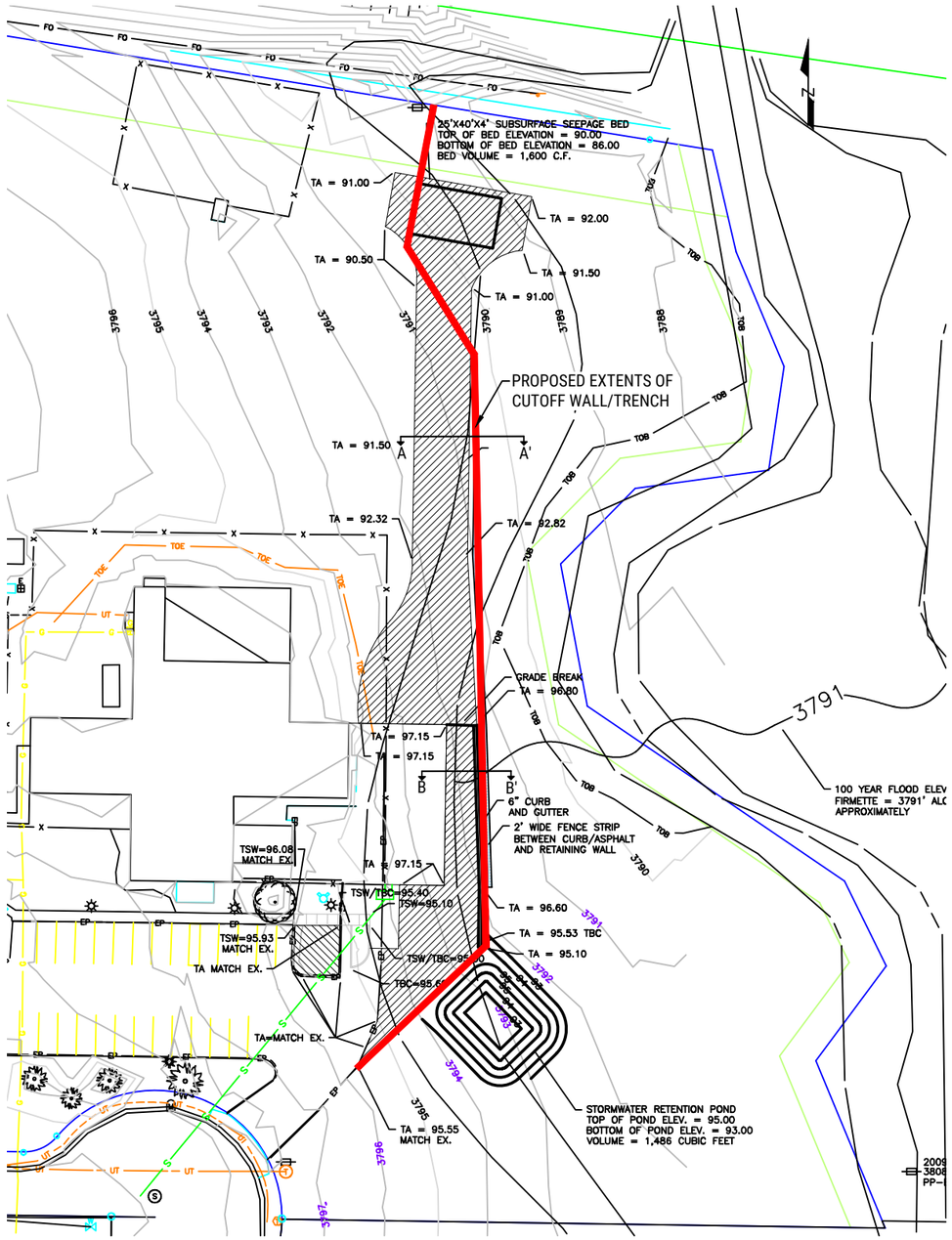
APPARATUS:	Humboldt Load Frame	**INITIAL MOISTURE CONTENT:**	18.6%
SAMPLE PREP:	Intact	**FINAL MOISTURE CONTENT:**	25.4%
TEST WATER:	Tap	**DRY UNIT WEIGHT:**	87.9 pcf



REMARKS:

Reviewed by Keith Wildman
Laboratory Services Coordinator

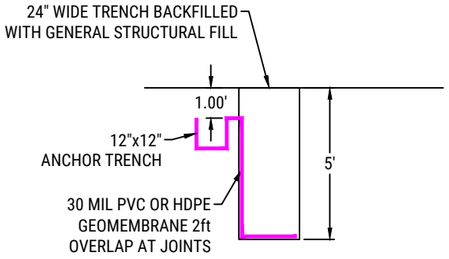
Appendix C
Cut-off Barrier and MSE Wall Detail



PLAN VIEW

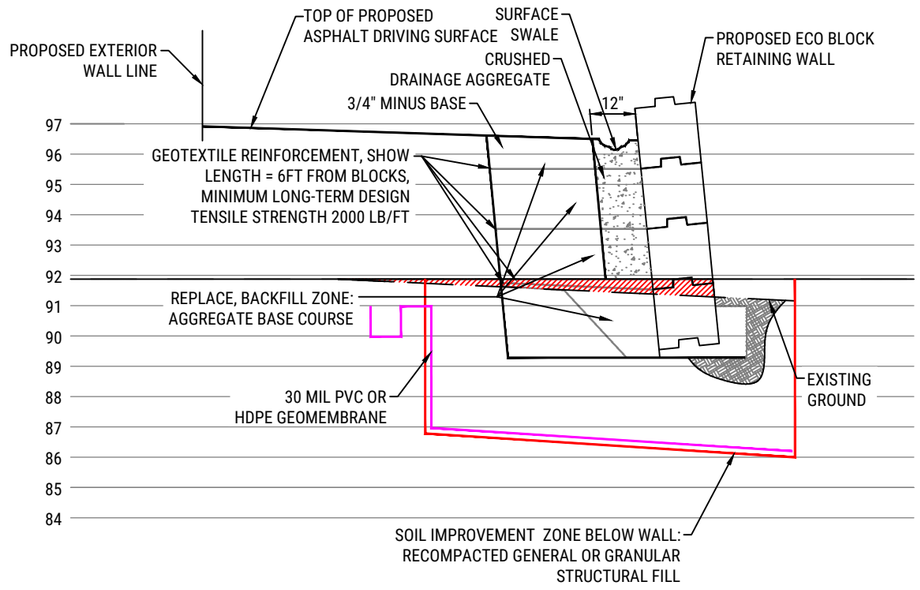
0' 70'

SCALE: 1" = 70'



CUTOFF TRENCH (A-A')

SCALE: 1" = 5'



RETAINING WALL CUTOFF DETAIL (B-B')

SCALE: 1" = 5'

CUT-OFF BARRIER AND MSE WALL DETAIL
TF COUNTY JAIL MODERNIZATION & ADDITION
TWIN FALLS, IDAHO

STRATA

Project No.: TF24135	Drawing By: G. MORLAN
Client: TWIN FALLS COUNTY	Checked By: Z. LOOTENS
Plate: APPENDIX C1	Date: 8/15/2024