160 Forest Drive, Frisco, CO 80443
Major Site Plan Application
Excavation Plan

February 14, 2024

Dear Town of Frisco Planning Commission,

The following letter details the excavation plans for 160 Forest Drive.

Methodology to be utilized:

- Alpine Specialty is expecting to use a Cat 349 excavator with an H180 hammer attachment to break apart and shape the bedrock. Alpine Specialty is also expecting to use a Hitachi 210 excavator to work in conjunction with the hammer machine to remove the broken waste material as it is being created. Alpine Specialty does not anticipate any issues removing and shaping using this technique.
- The excess spoil material will be hauled out by tandem axle ten yard dump trucks.
- Prior to finishing the building excavation, Alpine Specialty is expecting to shape and install the patios and boulder retaining walls on the west side of the structure, to the extent possible. At backfill, Alpine Specialty is expecting to install the remaining walls and patio prep from within the footprint of the structure.
- The geotechnical report indicates that the excavated rock will be stable. This will be confirmed via an onsite visit from the geotechnical engineer. If the excavated rock is determined to not be stable, gunite or another similar material/process will be used to shore up the walls.

Experience:

- Alpine Specialty Earthworks ("Alpine Specialty") has been a full service excavation contractor for approximately 30 years. Alpine Specialty is a Colorado based company providing excavation services primarily in the Summit County area and along the Front Range and the surrounding areas.
  - https://www.alpinespecialty.com/about

- Alpine Specialty are experts in the following areas:
  - Excavation
  - Rock Hammering
    - https://www.alpinespecialty.com/services/rockhammer
  - Retaining Walls
  - Snow removal
  - Winter Work
  - Utilities
  - Demolition

- Alpine Specialty has used the above described technique for breaking apart and shaping bedrock many times in similar conditions over the past 30 years with great success. The below photos show this technique being used in recent years on two separate job sites (2019 and 2022) at the top of the ridge in the Summerwood neighborhood above Lake Dillon. There are also additional photos captured on Alpine Specialty's website.

Regards,

Seth

Seth Francis
Managing Partner
Blue River Real Estate
PO Box 7035, Breckenridge, CO 80424
Cell: 347-834-1009
sfrancis1985@gmail.com

0303 High Meadow Drive (2022):


CAT
CAT

107 Torrey Lane (2019):


CAT
CAT
316E

160 Forest Drive, Frisco, CO 80443
Major Site Plan Application
Plan to Maintain Slope Disturbance Boundary

February 14, 2024

Dear Town of Frisco Planning Commission,

The following letter details the construction plans to maintain the slope disturbance boundaries of 160 Forest Drive.

General

A metal chain linked fence will be added on the slope disturbance boundary as per the site plan to demarcate the disturbance line.

West Side of Unit D

To the west of Unit D there appears to be a slope disturbance boundary that is two feet away from the Unit. However, this is a cantilevered bedroom on the third level of the home. As such there is sufficient room to construct this structure from below and a cherry picker can be used to install the siding of the west wall of the bedroom and to not impact the disturbance boundary.

North Side of Unit A and B

To the north of Unit A and Unit B there are some areas that have four feet between the edge of the Unit and the slope disturbance boundary. In order to not impact the disturbance boundary, the following steps will be taken:

- The foundation will be formed and poured from the interior.
- 4' is sufficient to remove the forms between the foundation wall and the excavated rock.
- Waterproofing and insulation will be sprayed using long spray poles.
- Backfilling will occur with a large excavator from the interior of the house. Fill will be gravel or a self-compacting fill.
- Most of framing will be completed from the interior of the house and 4' will be sufficient to install the sheathing.
- Pump-jacks will be used to install the exterior siding as these require less footprint and can fit in the 4' disturbance line.

Regards,

Seth

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Managing Partner
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SOILS AND FOUNDATION INVESTIGATION
PROPOSED TOWNHOMES
LOT 2
WEST FRISCO SUB #2
160 FOREST DRIVE
FRISCO, COLORADO

Prepared For:

Blue River Real Estate Fund III LLC.
PO Box 7035
Breckenridge, Colorado 80424

Attention: Seth Francis

Project No. SU02435.000-120

November 28, 2023

1790 Airport Road, Unit 2, PO Box 4928, Breckenridge, Colorado 80424
Telephone: 970-453-2047 www.ctlthompson.com

TABLE OF CONTENTS

SCOPE OF WORK

This report presents the results of our Soils and Foundation Investigation for the Proposed Townhomes on Lot 2, West Frisco Sub #2 in Frisco, Colorado. We conducted this investigation to evaluate subsurface conditions at the site and provide geotechnical engineering recommendations for the proposed townhomes. Our report was prepared from data developed during our field exploration, engineering analysis, and experience. This report includes a description of the subsurface conditions observed in four exploratory pits and presents geotechnical engineering recommendations for design and construction of the foundation, floor systems, and details influenced by the subsoils. The scope was described in a Service Agreement (SU-23-0127) dated September 12, 2023.

Recommendations contained in this report were developed based on our understanding of the planned construction. Once building plans are completed, we should review to determine whether our recommendations and design criteria are appropriate. A summary of our conclusions is presented below.

SUMMARY OF CONCLUSIONS

1. Subsurface conditions observed in the exploratory pits consisted of topsoil, existing fill soils, native gravel soils, and hard bedrock. The maximum depth explored was 9 feet. No groundwater was observed in the pits at the time of excavation.

2. Based on the proposed site plan and building locations, we anticipate that excavations for the new townhomes will result in hard bedrock being the predominant material at anticipated foundation elevations. The townhomes can be constructed on footing foundations supported by the undisturbed, hard bedrock. Should native gravel soils be encountered at footing subgrade elevation, we recommend extending the footings down to bear on hard bedrock to reduce the potential for differential settlement. All topsoil (surficial and buried) and existing fill soils must be removed entirely beneath footings and slabs. Design and con-

struction criteria are presented in the report. It is critical that we observe the excavation to check whether conditions are as anticipated, prior to placing footings.

3. Surface drainage should be designed to provide for rapid removal of surface water away from the townhomes.

4. The design and construction criteria for foundations and floor systems in this report were compiled with the expectation that all other recommendations presented related to surface and subsurface drainage, landscaping irrigation, backfill compaction, etc. will be incorporated into the project and that the owners will maintain the structure, use prudent irrigation practices, and maintain surface drainage. It is critical that all recommendations in this report are followed.

SITE CONDITIONS

The site is located on the west side of Forest Drive in Frisco, Colorado as shown on Figure 1. The property is bordered by single-family residences to the north and south, Forest Drive to the east, and Interstate 70 to the west. An outcrop of granitic gneiss dominates the site topography with a general slope of around 23 percent down to the southeast. Slopes of the granitic gneiss outcrop exceed 30 percent in some areas of the site. Vegetation consists of grass, aspens, and coniferous trees.

PROPOSED CONSTRUCTION

The proposed construction consists of one structure with four townhome units. The lower-level and garage floors will be slab-on-grade. Wood frame construction will be used above grade with cast-in-place concrete foundation walls below grade. Required excavations could be on the order of 15 feet or more, particularly for the west portion of the structure. Foundation loads are expected to be about 1 to 3 kips per linear foot of foundation wall, with maximum column loads of 50 kips or less.

SUBSURFACE CONDITIONS

Subsurface conditions were investigated by observing four exploratory pits excavated at the approximate locations shown on Figure 2. Subsurface conditions observed in the pits were logged by our representative who obtained samples of the soils during excavation. Graphic logs of the soils observed in the pits are shown on Figure 3 with associated legend on notes on Figure 4.

Subsurface conditions observed in TP-1 consisted of 18 inches of topsoil underlain by well-graded gravel with sand to the maximum depth explored of 9 feet below the existing ground surface. The gravel soils contained subrounded cobbles up to 10 inches in diameter. Subsurface conditions observed in TP-2 through TP-4 consisted of existing fill soils. The existing fill soils consisted of silty gravel with sand and contained some debris such as abandoned wires. The fill extended to a depth of 2 feet in TP-2, 4.5 feet in TP-3 and 2 feet in TP-4. Beneath the existing fill soils in TP-2, we encountered practical excavation refusal on hard granitic gneiss bedrock at a depth of 2 feet. Beneath the existing fill soils in TP-3, we encountered buried topsoil from 4.5 to 6.5 feet below the existing ground surface. Beneath the buried topsoil in TP-3, we encountered the native gravel soils from 6.5 feet to 7 feet. Practical excavation refusal on hard granitic gneiss bedrock occurred at depth of 7 feet in TP-3. Practical excavation refusal due to unmarked, live utilities occurred beneath the fill soils in TP-4. No groundwater was observed in the pits at the time of excavation. The pits were backfilled after excavation operations were completed.

Samples obtained in the field were returned to our laboratory where field classifications were checked and samples were selected for pertinent testing. Laboratory test results are summarized on Table I.

GEOLOGY

We reviewed the following geologic mapping showing the site.

1. Geologic Map of the Frisco Quadrangle, Summit County, Colorado, (Map MF-2340) by Karl S. Kellogg, Paul J Bartos and Cindy L. Williams with the U.S. Geologic Survey, 2002.

The site is mapped as granitic gneiss from the Lower Proterozoic and glacial till from the Pinedale Glaciation from the upper Pleistocene. Our field investigation and observations at the site support the mapping. We did not observe geologic constraints on this site that would inhibit the planned construction.

SITE EARTHWORK

Cuts on the order of 15 feet are anticipated along the western edge of the proposed townhomes. Based on our subsurface investigation, we anticipate that excavation in this area will consist of mostly hard granitic gneiss bedrock. Hard bedrock will likely be encountered in most areas of the foundation excavation. Difficult excavation at the site should be anticipated. A contractor with experience in hard rock excavation should be consulted for the project. Hard rock excavation methods, such as the use of a hydraulic hammer chisel, expansion grouting, or drilling and blasting (if permitted by Summit County) will be necessary.

We anticipate excavation of the existing fill soils and native soils can be accomplished using conventional, heavy duty excavating equipment. Hard cobbles should be expected. We did not encounter large boulders during our subsurface investigation, however, boulders encountered during foundation excavation could be large. A hydraulic hammer chisel (excavator attachment) or similar device may be required to split large boulders (if encountered).

Sides of excavations need to be sloped to meet local, state and federal safety regulations. We anticipate the on-site soils will likely classify as Type C soils based on OSHA standards governing excavations. Temporary slopes deeper than 4 feet that are not retained should be no steeper than 1.5 to 1 (horizontal to vertical) in Type C soils. The bedrock may classify as “stable rock” in some areas. Stable rock may be vertical. However, if joints or fractures dip into the excavation at a slope of 4H:1V or steeper, the bedrock should be classified as Type C. Some sloughing of the excavation face may occur as the soils dry out. Contractors are required to identify the soils encountered and ensure that applicable standards are met. Contractors are responsible for site safety and maintenance of the work site.

No groundwater or seepage was encountered in the exploratory pits at the time of excavation. Some seepage may occur during foundation excavation, particularly if it occurs during seasonal runoff. The footing areas should be protected from any seepage and precipitation through the use of shallow trenches and sumps. Excavations should be sloped to a gravity discharge or to a temporary sump where water can be removed by pumping, if necessary.

Slope Stability

We believe the existing hillside above the proposed structure is stable at this time. Based on our field exploration and experience, we believe that the proposed construction will not significantly increase the risk of slope instability. The factor of safety against slope instability will be lowest during construction when the cut slope is not retained. If the cut slope is not laid back, an earth retention system may be necessary for excavations in soil deeper than 4 feet below existing grade. Stable rock may be vertical. We can provide additional information regarding shoring systems upon request.

Structural Fill

We do not anticipate that structural fill will be needed below foundations. Structural fill may be necessary beneath the proposed slabs, following removal of topsoil and existing fill and gravel soils. The native gravel soils or excavated bedrock material, free of organic matter, debris and rocks larger than 6 inches in diameter, can be used as structural fill. Care should be taken during fill placement so the larger rocks do not become nested or grouped together. If required, import fill should consist of CDOT 5 or 6 aggregate base course or similar soil. Structural fill should have no rocks larger than 6 inches. We can evaluate potential fill materials upon request. Lean-mix concrete (flowable fill) can also be used to fill voids.

Prior to placing any structural fill, all topsoil (buried and surficial) and existing fill soils must be removed. The native gravel subgrade should be scarified, moisture conditioned and compacted with a vibratory padfoot or sheepsfoot roller. Structural fill should be benched into the existing hillside in flat and level lifts. Structural fill placed beneath floor slabs should be placed in thin loose lifts, moisture conditioned to within +/-2 percent of optimum moisture content and compacted to at least 98 percent of ASTM D 698 maximum dry density. Structural fill placed outside the building footprint should be placed in thin loose lifts, moisture conditioned to within +/-2 percent of optimum moisture content and compacted to at least 95 percent of ASTM D 698 maximum dry density. Moisture content and density of structural fill should be tested by a representative of our firm during placement.

FOUNDATIONS

The townhomes can be supported on footing foundations on the undisturbed, granitic gneiss bedrock. Placement of footings on soil and bedrock creates the potential for differential settlement and should be avoided. If necessary, footings should extend so that all footings bear on the bedrock. If bedrock is not encountered at a practical depth beneath the proposed footing subgrade elevation, we should be consulted to evaluate our recommendations. All topsoil (buried and surficial) and existing fill soils should be removed completely beneath proposed footing areas. Prior to concrete placement, the footing areas should be cut and cleaned to provide a flat and level subgrade. Loose soil or bedrock fragments should be removed. Our representative should observe conditions exposed in the completed foundation excavation to confirm whether the footing subgrade is as anticipated and suitable for support of the foundation.

1. Loose soil and bedrock fragments created during the forming process for the footings should be removed prior to placing concrete. Lean concrete may also be used to fill depressions resulting from the removal of over ripped bedrock.

2. Footings can be sized using a maximum allowable soil pressure of 5,000 psf. Settlement of footings on hard bedrock is expected to be negligible. Settlement of foundations that bear on both soil and hard bedrock could be differential and should be avoided.

3. To resist lateral loads, a coefficient of friction of 0.70 can be used for concrete in contact with dry, hard bedrock. Lateral loads can be resolved by evaluating passive resistance using a passive equivalent fluid density of 425 pcf for native gravel backfill that is compacted to the criteria in <u>Foundation Wall Backfill</u> and will not be removed. These values have not been factored. The magnitude of strain required to develop passive resistance must be considered. Appropriate factors of safety must be applied in design.

4. Continuous wall footings should have a minimum width of at least 16 inches. Foundations for isolated columns should have minimum dimensions of 24 inches by 24 inches. Larger sizes may be required, depending upon foundation loads.

5. Grade beams and foundation walls should be well reinforced, top and bottom, to span undisclosed loose or soft soil pockets and resist lateral earth pressures. We recommend reinforcement sufficient to span an unsupported distance of at least 10 feet. Reinforcement should be designed by the structural engineer.

6. The soils under exterior footings should be protected from freezing. We recommend the bottom of footings be constructed at a depth of at least 40 inches below finished exterior grade. Footings that bear on hard bedrock are not frost susceptible.

SLABS-ON-GRADE

Slab-on-grade lower-level and garage floors are desired. Based on our laboratory test data and experience, we judge slab-on-grade construction supported by the undisturbed, bedrock, native gravel soils, or properly placed granular structural fill will have a low risk of damaging differential movement. All topsoil (buried and surficial) and existing fill soils must be removed beneath slabs. Fill placed to attain subgrade elevations below floor slabs should be placed in accordance with the recommendations outlined in Structural Fill. We recommend the following precautions for slab-on-grade construction at this site. These precautions will not prevent movement from occurring; they tend to reduce damage if slab movement occurs.

1. Slabs should be separated from exterior walls and interior bearing members with slip joints that allow free vertical movement of the slabs.

2. Underslab plumbing should be pressure tested for leaks before the slabs are constructed. Plumbing and utilities that pass through slabs should be isolated from the slabs with sleeves and provided with flexible couplings.

3. Frequent control joints should be provided, in accordance with American Concrete Institute (ACI) recommendations, to reduce problems associated with shrinkage and curling.

4. We recommend a 4-inch layer of clean gravel be placed beneath the slabs to provide a flat, uniform subgrade. This material should consist of minus 2-inch aggregate with at least 50% retained on the No. 4 sieve and less than 2% passing the No. 200 sieve.

5. The 2018 International Residential Code (IRC R506) states that a 4-inch base course layer consisting of clean graded sand, gravel, crushed stone, or crushed blast furnace slag shall be placed beneath below grade floors (unless the underlying soils are free-draining), along with a vapor retarder.

   IRC states that the vapor retarder can be omitted where approved by the building official. The merits of installation of a vapor retarder below floor slabs depend on the sensitivity of floor coverings and building use to moisture. A properly installed vapor retarder is more beneficial below concrete slab-on-grade floors where floor coverings, painted floor surfaces, or products stored on the floor will be sensitive to moisture. The vapor retarder is most effective when concrete is placed directly on top of it, rather than placing a sand or gravel leveling course between the vapor retarder and the floor slab. Placement of concrete on the vapor retarder may increase the risk of shrinkage cracking and curling. Use of concrete with reduced shrinkage characteristics including minimized water content, maximized coarse aggregate content, and reasonably low slump will reduce the risk of shrinkage cracking and curling. Considerations and recommendations for the installation of vapor retarders below concrete slabs are outlined in Section 3.2.3 of the 2006 American Concrete Institute (ACI) Committee 302, "Guide for Concrete Floor and Slab Construction (ACI 302.R-96)".

FOUNDATION WALLS

Foundation walls that extend below-grade should be designed for lateral earth pressures where backfill is not present to about the same extent on both sides of the wall. Many factors affect the values of the design lateral earth pressure. These factors include, but are not limited to, the type, compaction, slope, and drainage of the backfill, and the rigidity of the wall against rotation and deflection. For a very rigid wall where negligible or very little deflection will occur, an "at-rest" lateral earth pressure should be used in design. For walls that can deflect or rotate 0.5 to 1 percent of wall height (depending upon the backfill types), lower "active" lateral earth pressures are appropriate. Our experience indicates typical below-grade walls in residences deflect or rotate slightly under normal design loads, and that this deflection results in satisfactory wall performance. Thus, the earth pressures on the walls will likely be between the "active" and "at-rest" conditions.

If native gravel soil or excavated bedrock aggregate are used as backfill and the backfill is not saturated, we recommend design of basement walls at this site using an equivalent fluid density of at least 50 pcf. This value assumes deflection; some minor cracking of walls may occur. If very little wall deflection is desired, a higher design value is appropriate. The structural engineer should also consider site-specific grade restrictions, the effects of large openings on the behavior of the walls, and the need for lateral bracing during backfill. Retaining walls that are free to rotate and allow the active earth pressure condition to develop can be designed using an equivalent fluid density of at least 40 pcf for native gravel soil or excavated bedrock aggregate backfill.

Foundation Wall Backfill

Proper placement and compaction of foundation backfill is important to reduce infiltration of surface water and settlement of backfill. The native gravel soils and excavated bedrock aggregate can be used as backfill, provided they are free of rocks larger than 6 inches in diameter, organics, and debris. Reuse of the existing fill soils for foundation wall backfill should be avoided. The upper 2 feet of fill should be a relatively impervious material to limit infiltration. Backfill that will support surface improvements (sidewalks, driveways, etc.) should be placed in thin loose lifts, moisture conditioned to within +/-2 percent of optimum moisture content, and compacted to at least 95 percent of ASTM D 698 maximum dry density. Backfill in landscape areas should be compacted to at least 90 percent of ASTM D 698 maximum dry density. Thickness of lifts will likely need to be reduced if there are small, confined areas of backfill, which limit the size and weight of compaction equipment. Some settlement of the backfill should be expected even if the material is placed and compacted properly. In our experience, settlement of properly compacted backfill could be on the order of 0.5 to 1 percent of backfill thickness. Increasing the minimum compaction level will reduce settlement potential. However, care should be taken not to over compact the backfill or use large equipment near the wall, since this could cause excessive lateral pressure and damage/cracking of the wall. Moisture content and density of the backfill should be tested during placement by a representative of our firm.

SUBSURFACE DRAINAGE

Water from snow melt, precipitation and surface irrigation of lawns and landscaping frequently flows through relatively permeable backfill placed adjacent to a structure, and collects on the surface of less permeable soils occurring at the bottom of foundation excavations. This process can cause wet or moist basement conditions after construction. To reduce the likelihood water pressure will develop outside foundation walls and the risk of accumulation of water at basement level, we recommend a foundation drain be installed. The drain should be installed along the entire basement perimeter. The foundation drain will not prevent moist conditions in the basement.

The drain should consist of a 4-inch diameter, perforated or slotted pipe encased in free-draining gravel, and a geocomposite drain board or clean gravel layer extending to within 2 feet of exterior grade, adjacent to the walls. The drain should lead to a positive gravity outlet or sump where water can be removed by pumping. Sump pumps and gravity outlet locations must be maintained by the owners. A typical foundation drain detail for basement construction is presented on Figure 6.

CONCRETE

Concrete in contact with soil can be subject to sulfate attack. We measured the water-soluble sulfate concentration in a sample taken from the site at less than 0.01 percent. For this level of sulfate concentration, ACI 332-08 *Code Requirements for Residential Concrete* indicates there are no special requirements for sulfate resistance.

Superficial damage may occur to the exposed surfaces of highly permeable concrete, even though sulfate levels are likely relatively low. To control this risk and to resist freeze-thaw deterioration, the water-to-cementitious materials ratio should not exceed 0.50 for concrete in contact with soils that are likely to stay moist due to surface drainage or high water tables. Concrete should have a total air content of 6 percent ± 1.5 percent.

SURFACE DRAINAGE

Surface drainage is critical to the performance of foundations, floor slabs and concrete flatwork. Recommendations in this report are based on effective drainage for the life of the structure and cannot be relied upon if effective drainage is not maintained. We recommend the following precautions be observed during construction and maintained at all times after construction is completed:

1. The ground surface surrounding the exterior of the building should be sloped to drain away from the building in all directions. We recommend providing a slope of at least 12 inches in the first 10 feet in landscape areas. There are instances where this slope cannot be achieved. A slope of 6 inches in the first 10 feet should be used as a minimum. We recommend a slope of at least 3 inches in the first 10 feet in paved areas. A swale should be provided around the uphill side of the building to divert surface runoff.

2. Backfill around the exterior of foundation walls should be placed as described in Foundation Wall Backfill. Increases in the moisture content of the backfill soils after placement often results in settlement. Settlement is most common adjacent to north facing walls. Re-establishing proper slopes (owners' maintenance) away from the building may be necessary.

3. Landscaping should be carefully designed to minimize irrigation. Plants used near foundation walls should be limited to those with low moisture requirements; irrigated grass should not be located within 5 feet of the foundation. Lawn sprinklers should not discharge within 5 feet of the foundation and should be directed away from the building. Low-volume emitters can be used within 5 feet of the foundation.

4. Impervious plastic membranes should not be used to cover the ground surface immediately surrounding the building. These membranes tend to trap moisture and prevent normal evaporation from occurring. Geotextile fabrics can be used to control weed growth and allow some evaporation to occur.

5. Roof downspouts and drains should discharge well beyond the limits of all backfill. Splash blocks and/or extensions should be provided at all downspouts so water discharges onto the ground beyond the backfill. We generally recommend against burial of downspout discharge. Where it is necessary to bury downspout discharge, solid, rigid pipe should be used, and it should slope to an open gravity outlet. Buried downspout discharge pipes should be heated (with thermostat) during winter months to prevent freezing. Downspout extensions, splash blocks and buried outlets must be maintained by the owners.

CONSTRUCTION OBSERVATIONS

We recommend that CTL|Thompson, Inc. provide construction observation services to allow us the opportunity to verify whether soil conditions are consistent with those found during this investigation. If others perform these observations, they must accept responsibility to judge whether the recommendations in this report remain appropriate.

GEOTECHNICAL RISK

The concept of risk is an important aspect with any geotechnical evaluation primarily because the methods used to develop geotechnical recommendations do not comprise an exact science. We never have complete knowledge of subsurface conditions. Our analysis must be tempered with engineering judgment and experience. Therefore, the recommendations presented in any geotechnical evaluation should not be considered risk-free. Our recommendations represent our judgment of those measures that are necessary to increase the chances that the structure will perform satisfactorily. It is critical that all recommendations in this report are followed during construction. The homeowner must assume responsibility for maintaining the structure and use appropriate practices regarding drainage and landscaping. Improvements performed by the owner after construction, such as finishing a basement or construction of additions, retaining walls, decks, patios, landscaping, and exterior flatwork, should be completed in accordance with recommendations in this report.

RADON

Radon is a gaseous, radioactive element that comes from the radioactive decay of uranium, which is commonly found in igneous rocks. The average indoor radon level in Summit County is approximately 7.7 pCi/L, which is above the recommended action level of 4 pCi/L as recommended by the Environmental Protection Agency. Testing for radon gas at the site is beyond the scope of this study. Due to the many factors that affect the radon levels in a specific building, accurate testing of radon levels is usually only possible after construction is complete. Typically, radon mitigation systems consist of ventilation systems installed beneath lower-level slabs and crawlspaces. The infrastructure for such a mitigation system can normally be installed during construction at a relatively low cost, which is recommended. The townhomes should be tested for radon once construction is complete. If test results indicate mitigation is required, the installed system can then be used for mitigation. We are not experts in radon testing or mitigation. If the client is concerned about radon, then a professional in this special field of practice should be consulted.

LIMITATIONS

This report has been prepared for the exclusive use of Blue River Real Estate Fund III LLC. and the design/construction team to provide geotechnical design and construction criteria for the proposed project. The information, conclusions, and recommendations presented herein are based upon consideration of many factors including, but not limited to, the type of structure proposed, the geologic setting, and the subsurface conditions encountered. The conclusions and recommendations contained in the report are not valid for use by others. Standards of practice evolve in the area of geotechnical engineering. The recommendations provided in this report are appropriate for about three years. If the proposed project is not constructed within about three years, we should be contacted to determine if we should update this report.

The exploratory pits were located to provide a reasonably accurate picture of subsurface conditions. Variations in the subsurface conditions not indicated by the pits will occur. A representative of our firm should observe placement of and test structural fill. We should observe the completed foundation excavation to confirm that the footing subgrade is suitable for support of the footings as designed. This investigation was conducted in a manner consistent with that level of care and skill ordinarily exercised by geotechnical engineers currently practicing under similar conditions. No warranty, express or implied, is made. If we can be of further service in discussing the contents of this report, please call.

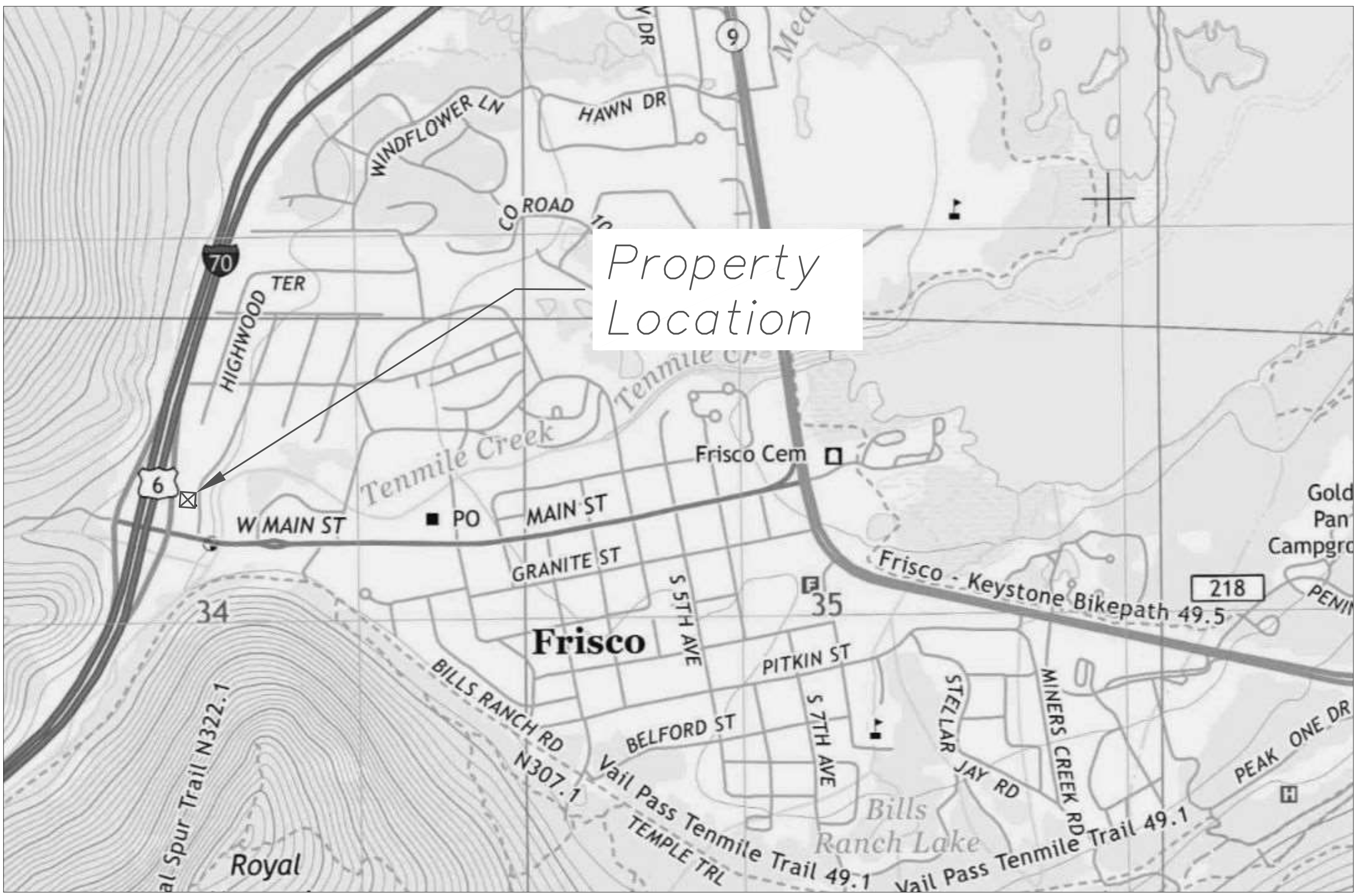
CTL | THOMPSON, INC.

Brittany Niggeler
Staff Engineer

Reviewed By:

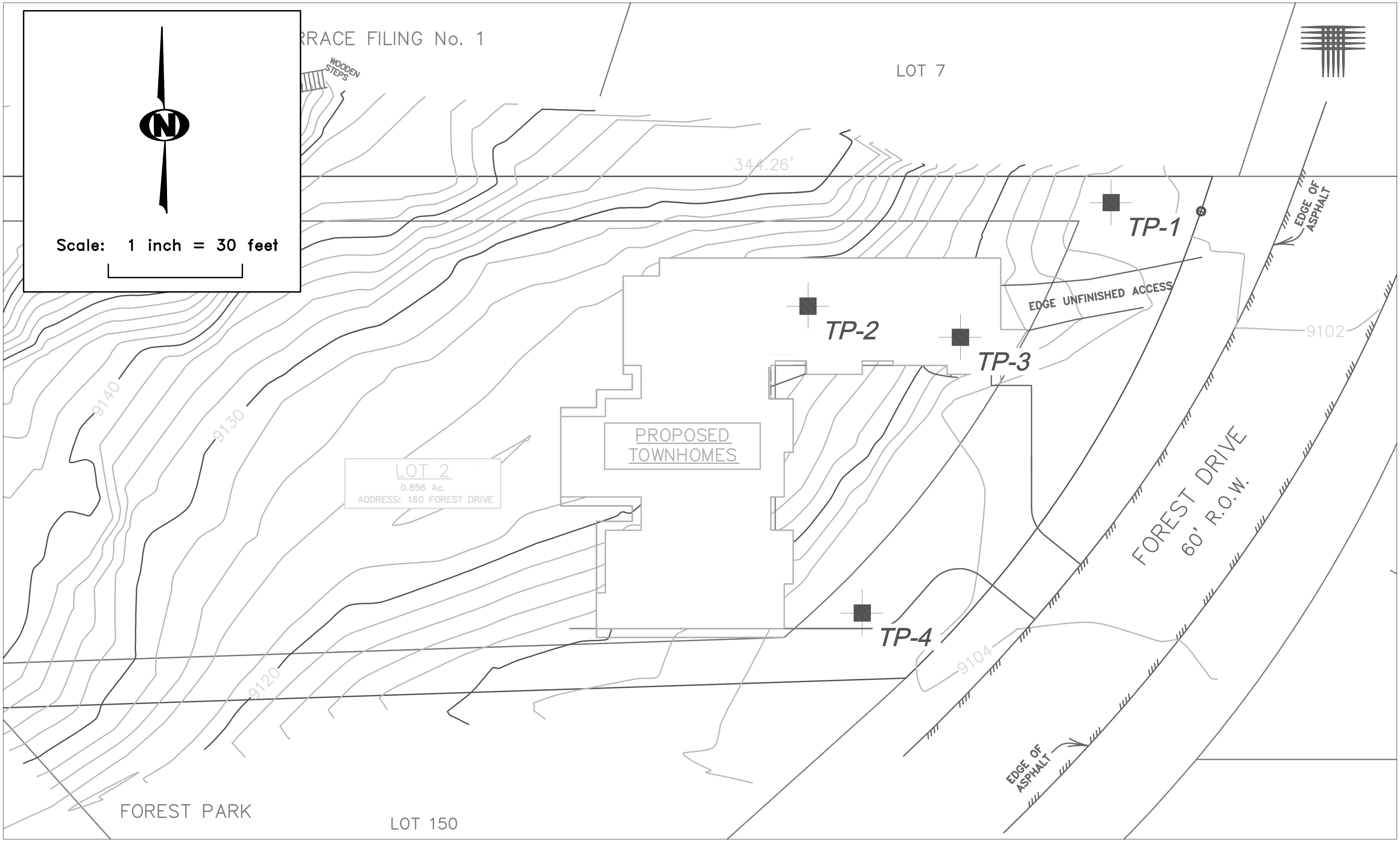
Greg Crum, P.E.
Principal Engineer
Division Manager, Summit County

cc: sefrancis@deloitte.com



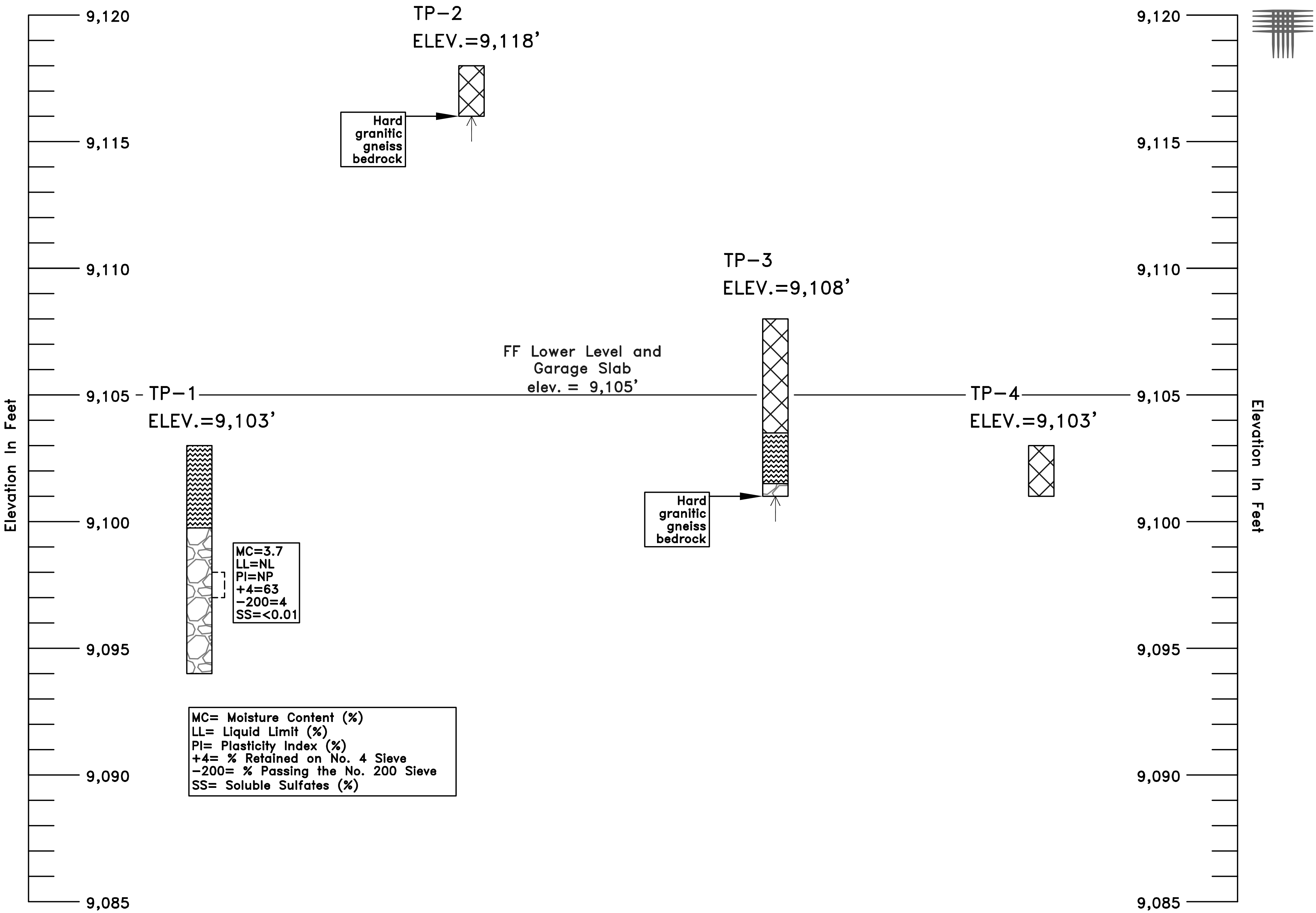
VICINITY MAP
Figure 1

CTL|T Project No. SU02435.000–120



LOCATIONS OF EXPLORATORY PITS
Figure 2

CTL|T Project No. SU02435.000-120



SUMMARY LOGS OF EXPLORATORY PITS
Figure 3

CTL|T Project No. SU02435.000-120

LEGEND:

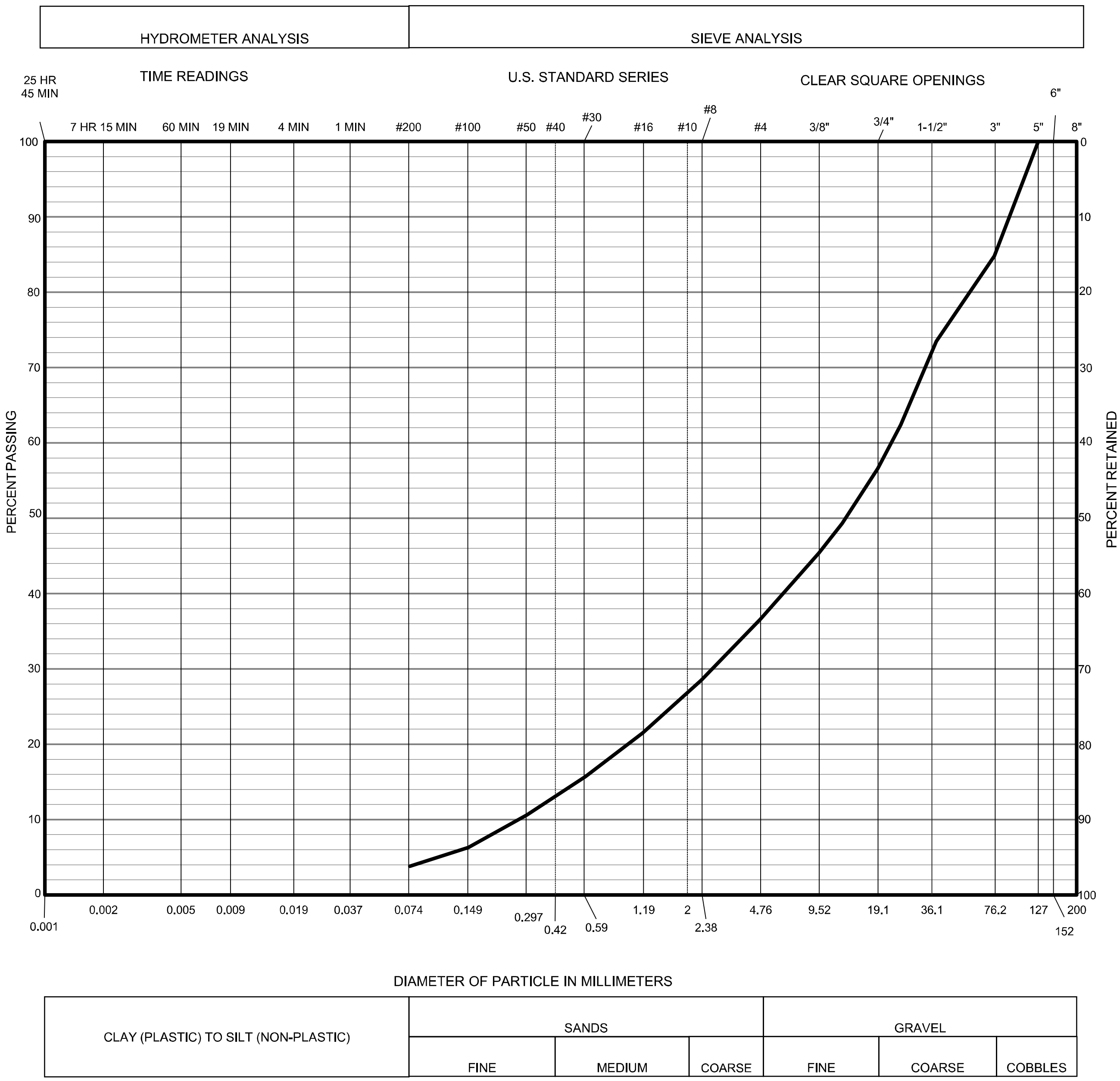
- TOPSOIL; clayey sand, with roots, slightly moist, dark brown.
- FILL; silty gravel with sand, with subangular cobbles and boulders up to 16 inches in diameter, with some debris such as abandoned wires, loose, moist, brown.
- GRAVEL; well-graded gravel with sand, with subrounded cobbles up to 10 inches, dense, moist to very moist, brown. (GW)
- Disturbed bulk sample.
- Practical excavation refusal encountered at depth indicated on hard bedrock.

NOTES:

1. The pits were excavated with a track-mounted mini excavator on 09/27/23.
2. No groundwater was observed in the pits at the time of excavation. Groundwater levels can fluctuate. The pits were backfilled.
3. Pit locations as shown on Figure 2 were measured from site features and should be considered approximate.
4. Pit elevations are estimated from topography shown on Figure 2 and should be considered approximate. Relative elevations were checked by hand level.
5. These exploratory pits are subject to the explanations, limitations and conclusions contained in this report.

CTL|T Project No. SU02435.000-120

LEGEND AND NOTES
Figure 4



SAMPLE OF: Well-graded Gravel with Sand (GW)

FROM: TP-1 at 5 feet

GRAVEL: 63% SAND: 33%

SILT & CLAY: 4% LIQUID LIMIT: NL

PLASTIC INDEX: NP

D_{10}: 0.279 D_{30}: 2.803 D_{60}: 22.517 C_U: 80.7 C_C: 1.2

Size (mm)	75.7	38.1	25.0	19.0	12.5	9.5	4.8	2.4	1.2	0.6	0.3	0.2	0.1	-	-	-	-	-	-
% Passing	84.8	73.5	62.4	56.6	49.3	45.4	36.6	28.5	21.5	15.7	10.6	6.3	3.8	-	-	-	-	-	-

Gradation Test Results

TABLE - I

SUMMARY OF LABORATORY TEST RESULTS

TEST PIT	DEPTH (ft)	MOISTURE CONTENT (%)	ATTERBERG LIMITS		SOLUBLE SULFATE CONTENT (%)	RETAINED NO. 4 SIEVE (%)	PASSING NO. 200 SIEVE (%)	SOIL TYPE
			LIQUID LIMIT	PLASTICITY INDEX				
1	5	3.7	NL	NP	<0.01	63	4	Well-Graded Gravel with Sand (GW)