NorthWest Colorado Consultants, Inc.

Geotechnical / Environmental Engineering • Materials Testing

February 12, 2016

Routt County Road and Bridge Department
P.O. Box 773598
Steamboat Springs, CO 80477

Attn: Janet Hruby

Job Number: 16-10301

Subject: Subsoil and Foundation Investigation, Proposed Routt County Road and Bridge (RCRB) Oak Creek Shop Addition, 24500 County Road 27, Oak Creek, Colorado.

Dear Janet,

This report presents the results of the Subsoil and Foundation Investigation for the proposed RCRB Oak Creek Shop Addition to be constructed at 24500 County Road 27 in Oak Creek, Colorado. The approximate location of the project site is shown in Figure #1.

NWCC, Inc. (NWCC) scope of our work included obtaining data from cursory observations made at the site, the logging of two test holes, the sampling of the probable foundation soils and the laboratory testing of the samples obtained. This report presents recommendations for economically feasible and safe type foundations, as well as allowable soil pressures and other design and construction considerations that are advisable, but not necessarily routine to quality design and building practices.

Proposed Construction: NWCC understands an approximately 75 feet by 80 feet addition will be constructed to the north of the existing shop building. NWCC has assumed the proposed addition will consist of a one-story metal building with a concrete slab-on-grade floor system constructed near or above the existing ground surface.

For design purposes, we have assumed that the building loads will be light to moderate typical of this type of construction. If loadings or conditions are significantly different from those above, we should be notified to reevaluate the recommendations in this report.

Site Conditions: The existing shop is located north of County Road 27 in Oak Creek, Colorado. The site was vacant and covered with 1 to 4 inches of snow at the time of our investigation. The proposed building site is located within the existing driveway.

The topography of the site is relatively flat, and generally slopes very gently to the north-northeast on the order of 0 to 1 percent. It appears that an elevation difference of 1 foot exists across the proposed building site.

Subsurface Conditions: To investigate the subsurface conditions at the site, two test holes were advanced on February 4, 2016 with a truck-mounted drill rig utilizing 4-inch diameter continuous flight power augers. The approximate test hole locations are shown in Figure #2.

The subsurface conditions encountered were variable and generally consisted of various layers of fill materials overlying natural clays, gravels and shale bedrock to the maximum depth investigated, 30 feet below the existing ground surface (bgs). Graphic logs of the exploratory test holes, along with the associated Legend and Notes, are presented in Figure #3.

A layer of road base sand and gravel fill materials was encountered at the ground surface in both test holes and was approximately 2 to 2½ feet in thickness. Coal fill materials were encountered below the road base sands and gravels and extended to depths of 5½ and 3 feet bgs. Sand and clay fill materials were encountered below the coal fill materials in test hole 2 at a depth of 3 feet bgs. The sand and clay fill materials extended to a depth of 5½ feet bgs. The sand and clay fill materials were fine to medium grained with sandstone and shale fragments, low to moderately plastic, loose to medium dense, slightly moist to moist and brown to dark brown in color. A sample of the fill materials classified as an SC-GC soil in accordance with the Unified Soil Classification System (USCS). Natural clays were encountered below the fill materials in both of the test holes and extended to a depth of 21 feet bgs in each test hole. The natural clays were very sandy to sandy, silty, fine-grained with occasional gravels, low plastic, soft to very soft, wet and brown to gray in color. Samples of the natural clays classified as CL soils in accordance with USCS.

Natural gravels were encountered below the natural clays in both test holes and extended to a depth of 23 feet bgs in each test hole. The gravels were clayey to sandy, fine to coarse grained with occasional cobbles, low to non-plastic, medium dense, wet and brown to gray in color. Shale bedrock was encountered below the natural gravels in both test holes at a depth 23 feet bgs. The shale bedrock materials extended to the maximum depth investigated in each of the test holes. The shale bedrock materials were slightly sandy to sandy with sandstone interbeds, fine to medium grained, low plastic, weathered to very hard, moist and brown to gray in color. A sample of the shale bedrock classified as a CL soil in accordance with USCS.

Swell-consolidation tests conducted on samples of the natural clays and fill materials indicate the materials tested exhibited a moderate to high degree of consolidation under low initial loading, 500 psf. The natural clays and fill materials also exhibited a very low to low swell potential when wetted under a constant load, 500 psf. The swell-consolidation test results are presented in Figures #4 and #5, and all of the other laboratory test results are summarized in the attached Table 1.

Groundwater was encountered at a depth of 5½ feet bgs in each of the test holes at the time of drilling and when measured 1 day after drilling. It should be noted that the groundwater conditions at the site can be expected to fluctuate with changes in precipitation and runoff.

Foundation Recommendations: Based on the subsurface conditions encountered in the test holes, the results of the field and laboratory investigations and our understanding of the proposed construction and assumed footing grades, we believe an economically feasible and safe type of foundation system for the proposed structures is straight-shaft helical screw piles or skin friction/end bearing piers drilled into the underlying shale bedrock materials. The helical screw pile or drilled pier foundations will place the bottom of the foundation in a zone of competent bearing and relatively stable moisture content to prevent consolidation of the existing fill materials and natural soils and resist the uplift caused by the expansive materials if they become wetted.

Utilizing this type of foundation, each column is supported on a single or group of screw piles or drilled piers and the structures are founded on grade beams or pier caps that are supported by a series of piers/piles. Load applied to the piers/piles is transmitted to the bedrock partially through the peripheral shear stresses (skin-friction) which develop on the sides of the drilled pier and through the end bearing pressure at the bottom of the drilled pier or the helices of the screw pile.

Foundation movement should be less than ½-inch if the following design and construction conditions are observed.

Helical Screw Piles: The helical screw pile foundation system should be designed by a qualified engineer, using industry standards and be installed by a licensed/certified installer. If pile groups are required, we recommend a minimum pile spacing of 3 times the largest helix to achieve the maximum capacity of each individual pile. Lateral loads should be resisted by the use of battered piles or tiebacks or through passive soil pressures against foundation walls or grade beams.

We strongly recommend that at least two test piles be advanced at the site so that the torque versus depth relationships can be established and the proper shaft and helix size and type can be determined. In addition, load testing of the helical screw piles is strongly recommended to verify the design capacity of the piles, as well as evaluate the slenderness buckling potential due to lack of lateral support of the soft natural clays. A representative of this office should observe the test piles/load test and helical screw pile installations.

NWCC also recommends the following:

- Use of a single helix lead pier section;
- Minimum bedrock penetration of 2 feet;
- Minimum installation torque of 4,000 ft-lbs;
- Full-time installation observation by a qualified special inspector;
- Review of the Contractor's quality control plan regarding instrumentation calibration and testing, materials QC, and pier installation procedures.

Drilled Piers: An alternative deep foundation system to the helical screw pile foundation system is a drilled pier foundation system. The design and construction details presented below should be observed for a drilled pier foundation system. It should be noted, that due to the presence of groundwater and soft/loose soils, that casing of the drilled piers will likely be required and will increase the costs associated with this type of foundation system.

1) A minimum pier diameter of 12 inches, a minimum bedrock penetration of 6 feet and a minimum pier length of 20 feet are recommended. Drilled piers should be spaced center to center at a minimum of 3 pier diameters. Piers closer than 3 pier diameters should be designed as a group. In addition, special installation techniques will be required for piers spaced closer than 3 pier diameters. A maximum pier length to diameter ratio of 25 should be used in the pier design.

2) Drilled piers should be designed using an allowable skin friction value of 3,000 psf for the portion of the pier advanced in the shale bedrock materials. A drill rig of sufficient size and type should be used so that the piers can be cased and cleaned out properly and minimum length and bedrock penetration requirements can be met. Properly cleaned and approved piers by NWCC, can be designed using an allowable end bearing pressure of 30,000 psf may be used in the design. Uplift on the piers should be limited to 50 percent of the allowable skin friction values.

3) Piers should also be designed to resist lateral loads assuming a modulus of horizontal subgrade reaction of 300 tcf in the bedrock materials. These modulus values are given for a 1-foot wide pier and must be corrected for pier size. The portion of the pier in the existing fill materials and overburden soils should be neglected in the lateral load calculations.

4) Piers should be reinforced their full length with at least one #5 reinforcing rod for each 16 inches of pier perimeter.

5) Piers should be properly cleaned and dewatered prior to steel and concrete placement.

6) A 4-inch void should be provided beneath grade beams to prevent the swelling soils from exerting uplift forces on the grade beams and to concentrate pier loadings. A void should also be provided beneath necessary pier caps.

7) Due to the presence of soft/loose clays, gravels and groundwater, casing and dewatering equipment will likely be required to reduce water infiltration and caving in the piers. The concrete should not be placed in more than 3 inches of water unless the tremie of pump method are used.

8) A representative of NWCC should observe the pier drilling operations, concrete and reinforcing steel placement on a full-time basis.

Alternate Foundation Recommendations: If the owner is aware of the risks associated with placing shallow foundations on moisture sensitive soils and can tolerate and/or design for the differential movements, which could result if the underlying natural clays consolidate or swell, then the structure may be supported by spread footings founded on properly compacted structural fill materials placed over the natural clays. The design and construction details presented below should be observed if a shallow foundation system is opted for. The precautions and recommendations itemized below will not prevent the movement of the foundations if the underlying natural clays consolidate or swell; however, they should reduce the amount of differential movement beneath the foundation system. Differential movements on the order of 1 to 2 inches could still occur if the clay materials undergo moisture changes.

1) The footings placed on a minimum of 2 feet of properly compacted structural fill materials, after all the existing fill materials are removed, should be designed using a maximum allowable soil bearing pressure of 1,500 psf. The footings should also be designed using a minimum dead load pressure of at least 500 psf.

2) The footings or pad sizes should be computed using the above soil pressures and placed on a minimum of 2 feet of properly compacted structural fill materials placed over the natural clays found beneath the existing fill materials. If footings are used, they may have to be narrow or interrupted to maintain the minimum load. The foundation should be closely checked to assure that it distributes the loads per the allowable pressures given. In order not to exceed the maximum allowable load while maintaining the minimum dead loads, the difference between the live load and dead load conditions should be minimized. Increasing the dead load with heavy construction materials or reducing the live load with well-pitched metal roof can accomplish this.

3) Any existing fill materials, as well as any loose or soft pockets of soil found beneath or within the footings when the excavations are opened should be removed and the footings should be extended down to more competent natural clays prior to fill placement. The structural fill materials placed beneath the footings and over the natural clays should consist of a non-expansive granular soil approved by this office. Based on the groundwater conditions encountered, we recommend that the structural fill materials consist of either washed or screened gravels having less than 3 percent passing the No. 200 sieve. The structural fill materials should be placed in 6 to 12 inch loose lifts and be compacted to at least 80 percent of the maximum relative density or 100 percent of the maximum standard Proctor density.

4) The foundation walls should be designed and reinforced to span an unsupported distance of 10 feet or the length between pads, whichever is greater.

5) The footing or pads should be placed well enough below final backfill grades to protect them from frost heave. Forty-eight (48) inches is typical for this location considering normal snow cover and other winter factors.

6) Care should be taken when excavating the foundations to avoid disturbing the supporting materials. Hand excavation or careful backhoe soil removal may be required in excavating the last few inches. Dewatering of the foundation excavations should also be anticipated.

7) Based on experience, we estimate total settlement for footings and pads designed and constructed as discussed in this section will be approximately 1 inch.

8) An engineer from this office should be called to the site when the foundation excavations are near completion to identify the bearing soils and confirm the recommendations in this report. In addition, the structural fill materials placed beneath the footings should be tested for compaction by this office as they are placed.

Floor Slabs: NWCC has assumed the structure will likely be constructed utilizing a concrete slab-on-grade floor system. Based on the presence of existing fill materials and soft natural soils, total differential slab movements on the order of 1 to 2 inches should be anticipated. If floor slabs are considered the following items should be considered and observed during design and construction to reduce the risk of floor slab movements.

Floor slabs present a very difficult problem where existing fill materials and moisture sensitive soils are present near floor slab elevation because sufficient dead load cannot be imposed on them to resist uplift pressure generated when expansive soils are wetted and expand in addition to the settlement of the deeper soft soils. Based on the moisture-volume change characteristics of the fill materials and natural clays encountered at this site, we believe slab-on-grade construction may be used, provided the risk of distress resulting from slab movement is recognized and special design precautions are followed.

The following measures must be taken to reduce damage that could result from slab movement should the underslab soils be subjected to moisture changes.

1) Floor slabs must be separated from all bearing walls, columns and their foundation supports with a positive slip joint. NWCC recommends the use of ½-inch thick cellotex or impregnated felt.

2) Interior non-bearing partition walls resting on floor slabs must be provided with a slip joint, preferably at the bottom, so that in the event the floor slab moves, this movement is not transmitted to the upper structure. This detail is also important for wallboard and doorframes and is shown in Figure #6.

3) A minimum 6-inch gravel layer must be provided beneath all floor slabs to act as a capillary break and to help distribute pressures. Prior to placing the gravel, the excavations should be shaped so that if water does get under the slab, it will flow to the low point of the excavation.

4) All existing fill materials should be removed prior to placement of the underslab gravels or new fill materials.

5) A minimum slab thickness of 6 inches is recommended for areas subjected to truck traffic or heavy storage areas. Concrete in these areas should also be reinforced with No.4 bars at 18-inches on center each way. Floor slabs must be provided with control joints placed a maximum of 12 feet on center in each direction to help control shrinkage cracking. Joints locations should be carefully checked to assure natural, unavoidable cracking will be controlled. The depth of the control joints should be a minimum of ¼ of the thickness of the slab.

6) Underslab soils must be kept as close as possible to their in-situ moisture content. Excessive wetting or drying of these materials prior to placement of the floor slab could result in differential movement after slabs are constructed.

7) Slabs must be placed on a minimum of 2 feet of approved nonexpansive, granular soils to reduce swelling soil effects. Granular fill materials should be uniformly placed and compacted in 6 to 8 inch loose lifts to at least 95% of the maximum standard Proctor density within 2% of optimum moisture content as determined by ASTM D-698. Prior to the placement of the granular soils, the upper 1 foot of the exposed clays should be overexcavated, moistened to within +1 to +4 percent of the optimum moisture content and then be recompacted to between 92 and 96 percent of the maximum standard Proctor density.

The above precautions and recommendations will not prevent floor slab movement in the event the fill materials or clays beneath floor slabs undergo moisture changes or consolidate. However, they should reduce the degree of damage if such movement occurs. The only way to eliminate the risk of all floor slab movement is to construct a structural floor system over a crawl space or other void materials.

Perimeter Drainage System: To enhance site drainage and improve foundation and interior slab-on-grade performance, NWCC recommends a perimeter drainage system be installed around the building perimeter. Localized perched water or runoff can infiltrate the structure at the foundation level. This water can be one of the primary causes of differential foundation and slab movement.

The drainage system should be located around the entire building perimeter and be placed and at least 12 inches below interior building grades and a minimum of 24 inches below final grades to provide frost protection. Ideally, the drainage system should be centered along roof drip-line locations. In locations where roof drip-lines are not present, the drainage system may be located within 24 inches of foundation walls. Drains should be insulated using 2-inches of rigid polystyrene insulation board in locations higher than 48 inches below final grade to provide protection against freezing.

Perimeter drainage system piping should be constructed using perforated PVC pipe that meets or exceeds ASTM D-3034/SDR 35 requirements to provide satisfactory long-term function and rapid runoff of water. The holes in the drainpipes should be oriented down between 4 o'clock and 8 o'clock to promote rapid

runoff of the water. The drainpipes should be covered with at least 12 inches of free draining gravel and be protected from contamination by a geotextile filter fabric covering of Mirafi 140N subsurface drainage fabric or an equivalent product. The drainpipes should have a minimum slope of 1 percent and be daylighted at positive outfalls that are protected from freezing. If the drainpipes cannot be daylighted, the drains should be led to sumps where the water can be pumped. Multiple daylights or sumps are recommended for the proposed structures. A typical perimeter/underdrain detail is shown in Figure #7.

Caution should be taken when backfilling so as not to damage or disturb the installed drains. NWCC recommends the drainage piping include cleanouts provided at minimum 100-foot intervals, be protected against intrusion by animals at the outfalls and be tested prior to backfilling. NWCC should be retained to provide periodic observations of underdrain construction to verify installation has been accomplished in general accordance with these recommendations. Flow testing of the system is recommended.

Foundation Walls and Retaining Structures: Foundation walls and retaining structures, which are laterally supported and can be expected to undergo only a moderate amount of deflection, may be designed for a lateral earth pressure computed on the basis of an equivalent fluid unit weight of 45 pcf for imported, free draining granular backfill and 55 pcf for the on-site soils.

Cantilevered retaining structures on the site can be expected to deflect sufficiently to mobilize the full active earth pressure condition. Therefore, cantilevered structures may be designed for a lateral earth pressure computed on the basis of an equivalent fluid unit weight of 35 pcf for imported, free draining granular backfill and 45 pcf for the on-site soils.

Foundation walls and retaining structures should be designed for appropriate hydrostatic and surcharge pressures such as adjacent buildings, traffic and construction materials. An upward sloping backfill and/or natural slope will also significantly increase the earth pressures on foundation walls and retaining structures and the structural engineer should carefully evaluate these additional lateral loads when designing the foundation and retaining walls.

Lateral resistance of retaining wall foundations placed on undisturbed natural soils at the site will be a combination of the sliding resistance of the footings on the foundation materials and the passive pressure against the sides of the footings. Sliding friction can be taken as 0.4 times the vertical dead load. Passive pressure against the sides of the footing can be calculated using an equivalent fluid pressure of 250 pcf. The fill placed against the sides of the footings to resist lateral loads should be compacted to at least 100% of the maximum standard Proctor density and near the optimum moisture content.

We recommend imported granular soils for backfilling foundation walls and retaining structures because their use results in lower lateral earth pressures. The imported granular materials should be placed to within 2 to 3 feet of the ground surface. Imported granular soils should be free draining and have less than 7 percent passing the No. 200 sieve. The granular soils behind foundation and retaining walls should be sloped from the base of the wall at an angle of at least 45 degrees from the vertical. The upper 2 to 3 feet of fill should be a relatively impervious soil or pavement structure to prevent surface water infiltration into the backfill.

The wall backfill should be carefully placed in uniform lifts and compacted to at least 95 percent of the maximum standard Proctor density and near the optimum moisture content. Care should be taken not to overcompact the backfill since this could cause excessive lateral pressure on the walls. Some settlement of deep foundation wall backfill materials will occur even if the material is placed correctly.

Surface Drainage: Proper surface drainage at this site is of paramount importance for minimizing the infiltration of surface drainage into the wall backfill and bearing soils, which could result in increased wall pressures, differential foundation and slab movement. The following drainage precautions should be observed during construction and at all times after the structure has been completed:

1) The ground surface surrounding the structure should be sloped (minimum of 1.0 inch per foot) to drain away from the structure in all directions to a minimum of 10 feet. Ponding must be avoided. If necessary, raising the top of foundation walls to achieve a better surface grade is advisable.

2) Non-structural backfill placed around the structure should be compacted to at least 95% of the maximum standard Proctor density at or near the optimum moisture content in order to minimize future settlement of the fill. The backfill should be placed immediately after the braced foundation walls are able to structurally support the fill. Puddling or sluicing must be avoided.

3) The top 2 to 3 feet of soil placed within 10 feet of the foundation should be impervious in nature to minimize infiltration of surface water into the wall backfill.

4) Roof downspouts and drains should discharge well beyond the limits of all backfill. Roof overhangs, which project two to three feet beyond the foundation, should be considered if gutters are not used.

5) Landscaping, which requires excessive watering and lawn sprinkler heads, should be located a minimum of 10 feet from the foundation walls of the structure.

6) Plastic membranes should not be used to cover the ground surface adjacent to foundation walls.

Site Grading Recommendations: Site grading should be carefully planned to provide positive surface drainage away from all of the buildings and parking areas. The buildings and parking areas should be placed on the site so that positive drainage away from these structures can be provided. Surface diversion features should be provided around parking areas to prevent surface runoff from flowing across the pavement surfaces.

In our opinion, the excavation of the on-site soils at the site should be feasible with heavy-duty conventional excavation equipment. We recommend that unretained cuts in the natural soils not exceed a 3(H) to 1(V) slope configuration. It should be noted that flatter slopes than those outlined above are often desirable to promote revegetation.

Where fills are required, we recommend that the fill slopes not exceed a 3 (H) to 1 (V) slope configuration. The fills must be properly benched/keyed into existing slopes exceeding a 5(H) to 1 (V) slope configuration.

Positive surface drainage should be provided around all permanent cut and fill slopes to direct surface drainage away from the slope faces. All cut and fill slopes and other stripped areas should be protected against erosion by revegetation or other methods.

The fill materials to be placed at the site should be examined and tested by this office to determine suitability for use as fill material prior to placement.

The fill materials placed beneath the roadways, floor slab and flatwork areas should be constructed in 6 to 8 thick inch lifts and be compacted to at least 95% of the maximum standard Proctor density and within 2% of the optimum moisture content determined in accordance with ASTM D698. The natural soils and fill materials will likely require moisture conditioning (wetting and/or drying) to achieve the desired degree of compaction.

Proposed roadway areas should be proofrolled at subgrade elevation with a heavily loaded pneumatic-tired construction vehicle to assess the road stability. If a stable surface cannot be produced, then additional measures may be required to stabilize the area. These measures should be determined at the time of construction and typically include the removal and replacement of unstable materials and/or the placement of a layer of stabilization fabric and/or geogrid and imported granular fill materials.

Limitations: The recommendations given in this report are based on the soils encountered at this site and our assumptions regarding the proposed construction. We believe that this information gives a high degree of reliability for anticipating the behavior of the proposed structures; however, our recommendations are professional opinions and cannot control nature, nor can they assure the soils profiles beneath those or adjacent to those observed. No warranties expressed or implied are given on the content of this report.

Moisture-sensitive soils were encountered at this site. These soils are stable at their natural moisture content but can shrink or swell with changes in moisture and loading. The behavior of moisture-sensitive soils is not fully understood. The swell and/or consolidation potential of any particular site can change erratically both in lateral and vertical extent. Moisture changes also occur erratically, resulting in conditions, which cannot always be predicted. The recommendations presented in this report are based on the current state of the art for foundations and floor slabs on swelling/consolidating soils. The owner should be aware that there is a risk in construction on these types of soils. Performance of the structures will depend on following the recommendations and in proper maintenance after construction is complete. As water is the main cause for volume change in the soils, it is necessary that the changes in moisture content be kept to a minimum. This requires judicious irrigation and providing positive surface drainage away from the structures. Any distress noted in the structures should be brought to the attention of this office.

This report is based on the investigation at the described site and on the specific anticipated construction as stated herein. If either of these conditions is changed, the results would also most likely change. Therefore,

NWCC strongly recommends that our firm be contacted prior to finalizing the construction plans so that we can verify that our recommendations are being properly incorporated into the construction plans. Man-made or natural changes in the conditions of a property can also occur over a period of time. In addition, changes in requirements due to state of the art knowledge and/or legislation do from time to time occur. As a result, the findings of this report may become invalid due to these changes. Therefore, this report is subject to review and not considered valid after a period of 3 years or if conditions as stated above are altered.

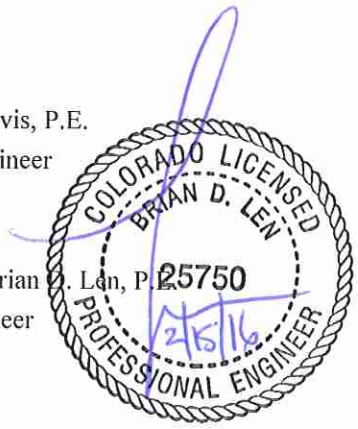
It is the responsibility of the owner or his representative to insure that the information in this report is incorporated into the plans and/or specifications and construction of the project. It is advisable that a contractor familiar with construction details typically used to dealing with the local subsoils and climatic conditions be retained to build the structure.

If you have any questions regarding this report or if we may be of further service, please do not hesitate to contact us.

Sincerely,
NWCC, INC.

Timothy S. Travis, P.E.
Sr. Project Engineer

Reviewed by Brian D. Len, P.E.
Principal Engineer



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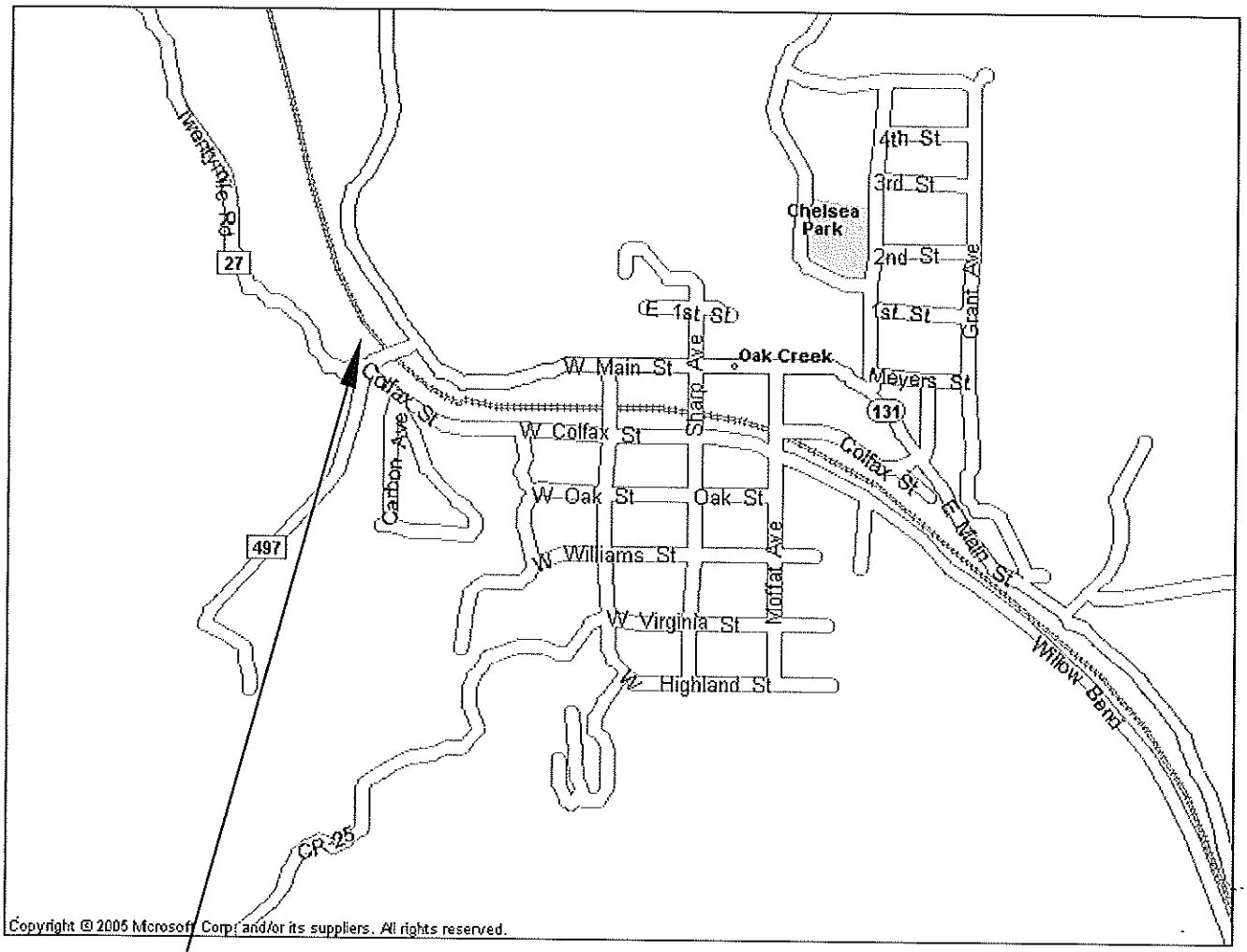
NOT TO SCALE



PROJECT SITE

Title: VICINITY MAP	**Date:** 2/12/16	NWCC Northwest Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing (970)879-7888 - Fax (970)879-7891 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: RCRB Oak Creek Shop Addition	**Job No.** 16-10301	
Location: 24500 County Road 27, Oak Creek, Colorado	**Figure** #1	

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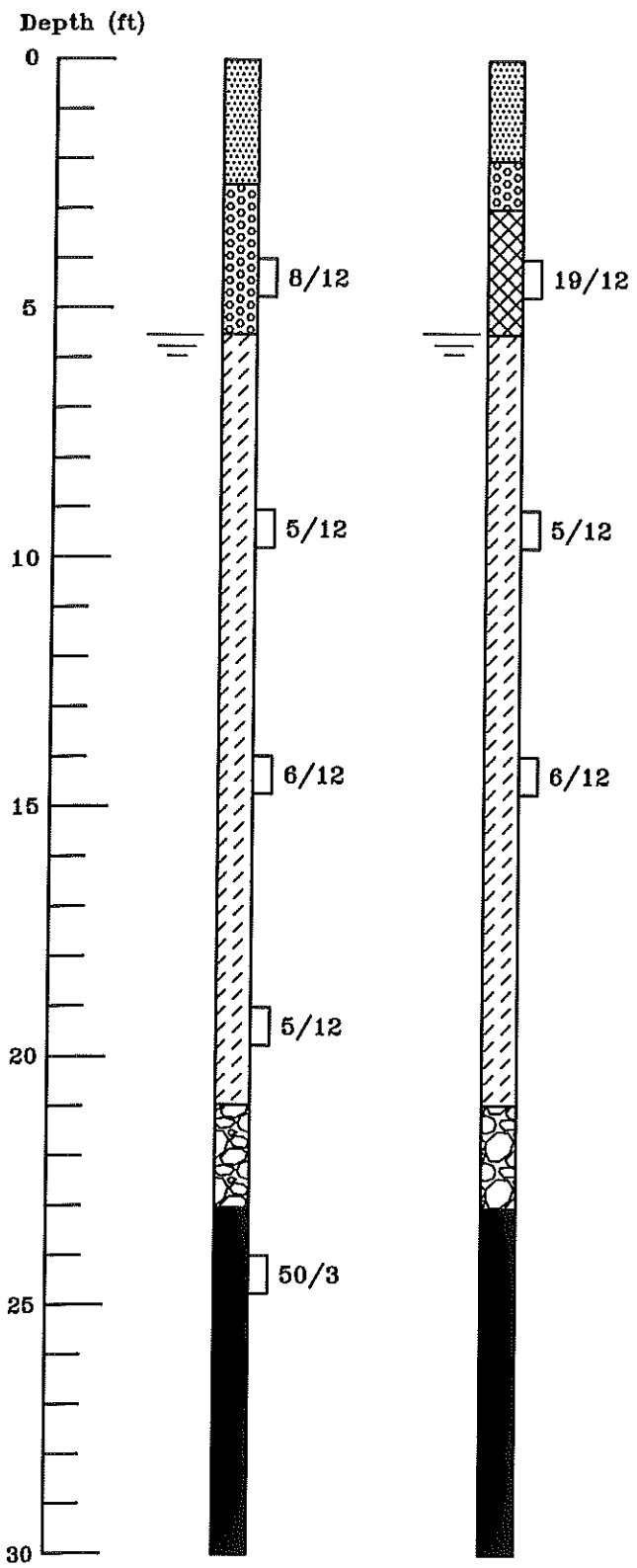
NOT TO SCALE

Title: SITE PLAN–LOCATION OF TEST HOLES	**Date:** 2/12/16	NWCC Northwest Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing (970)879-7888 - Fax (970)879-7891 2560 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: RCRB Oak Creek Shop Addition	**Job No.** 16-10301	
Location: 24500 County Road 27, Oak Creek, Colorado	**Figure** #2	



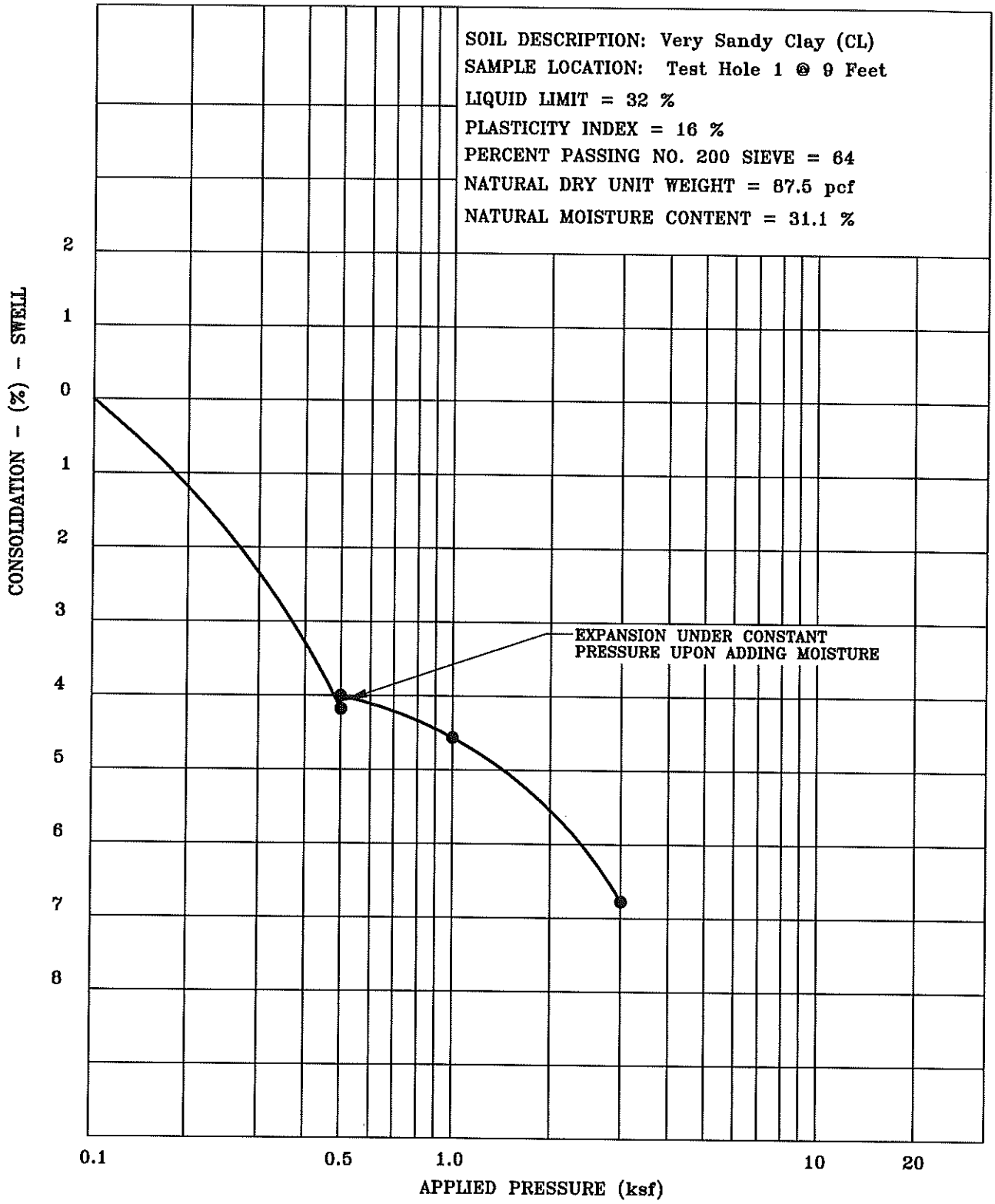
LEGEND:

- FILL: Road base sands and gravels.
- FILL: Coal.
- FILL: Sand and clay, fine to medium grained with sandstone and shale fragments, low to moderately plastic, loose to medium dense, slightly moist to moist and brown to dark brown in color.
- CLAYS: Very sandy to sandy, silty, fine-grained with occasional gravels, low plastic, soft to very soft, wet, and brown to gray in color.
- GRAVELS: Clayey to sandy, fine to coarse grained with occasional cobbles, low to non-plastic, medium dense, wet and brown to gray in color.
- SHALE BEDROCK: Slightly sandy to sandy with sandstone interbeds, fine to medium grained, low plastic, weathered to very hard, moist and brown to gray in color.
- Drive Sample-2-inch I.D. California Liner Sampler.
- 8/12 Drive Sample Blow Count, indicates 8 blows of a 140-pound hammer falling 30 inches were required to drive the sampler 12 inches.
- Indicates depth of free groundwater at the time of drilling and when measured 1 day after drilling.

NOTES:

1) Test holes were drilled on February 4, 2016 with a truck mounted drill rig using 4-inch diameter continuous flight power augers.
2) The location of the test holes was determined in the field by pacing from the existing shop building.
3) The elevations of the test holes were not determined and the logs are drawn to the depths investigated.
4) The lines between materials shown on the test hole logs represent the approximate boundaries between material types and transitions may be gradual.

Title: LOG, LEGEND AND NOTES	Date: 2/12/16	NWCC North West Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing (970)879-7888 - Fax (970)879-7891 2560 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: RCRB Oak Creek Shop Addition	Job No. 16-10301	
Location: 24500 County Road 27, Routt County, Colorado	Figure #3	



Title: SWELL-CONSOLIDATION TEST RESULTS		Date: 2/12/16	
Job Name: RCRB Oak Creek Shop Addition		Job No. 16-10301	
Location: 24500 County Road 27, Oak Creek, Colorado		Figure #4	

NWCC
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2593 Copper Ridge Drive
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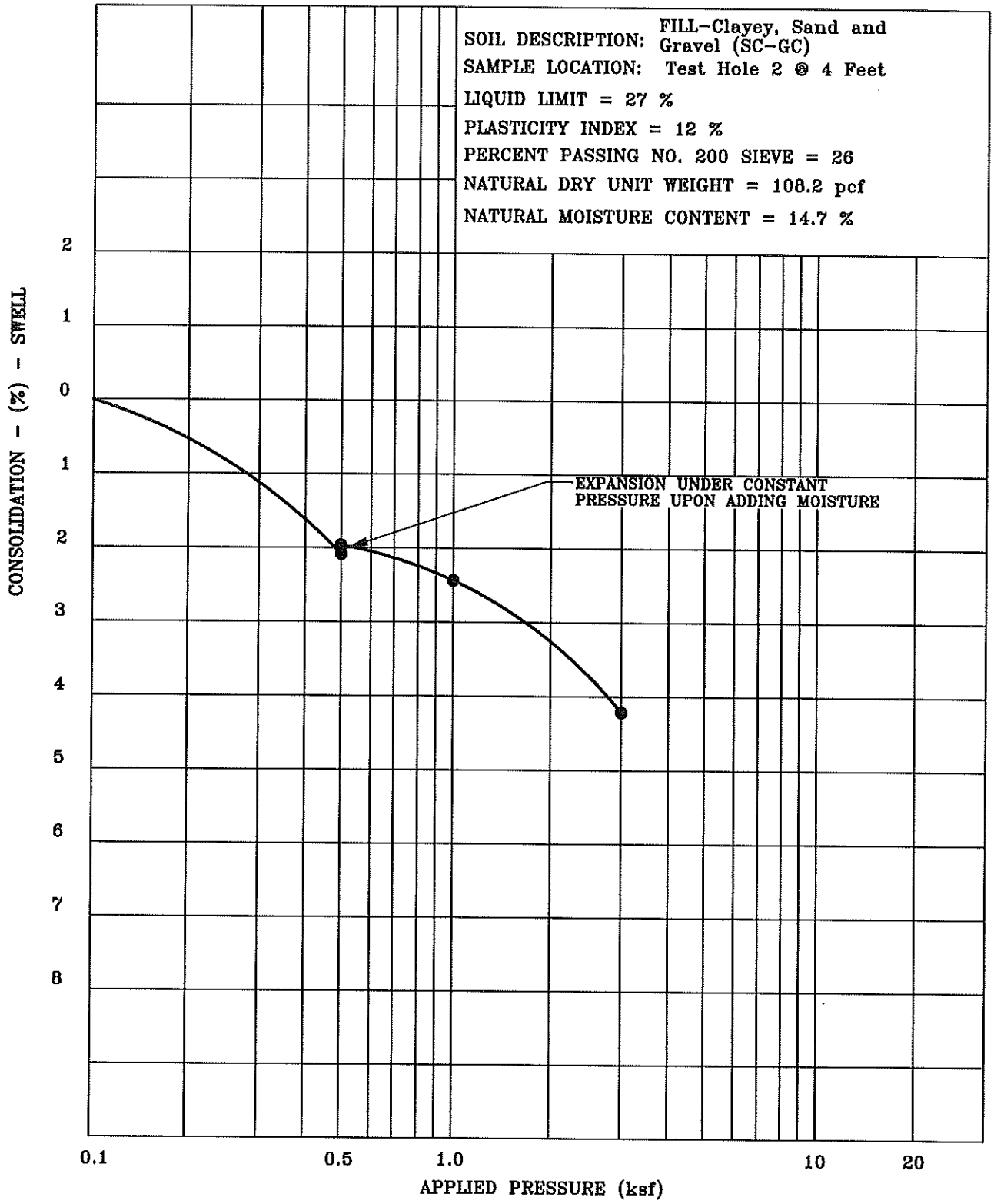
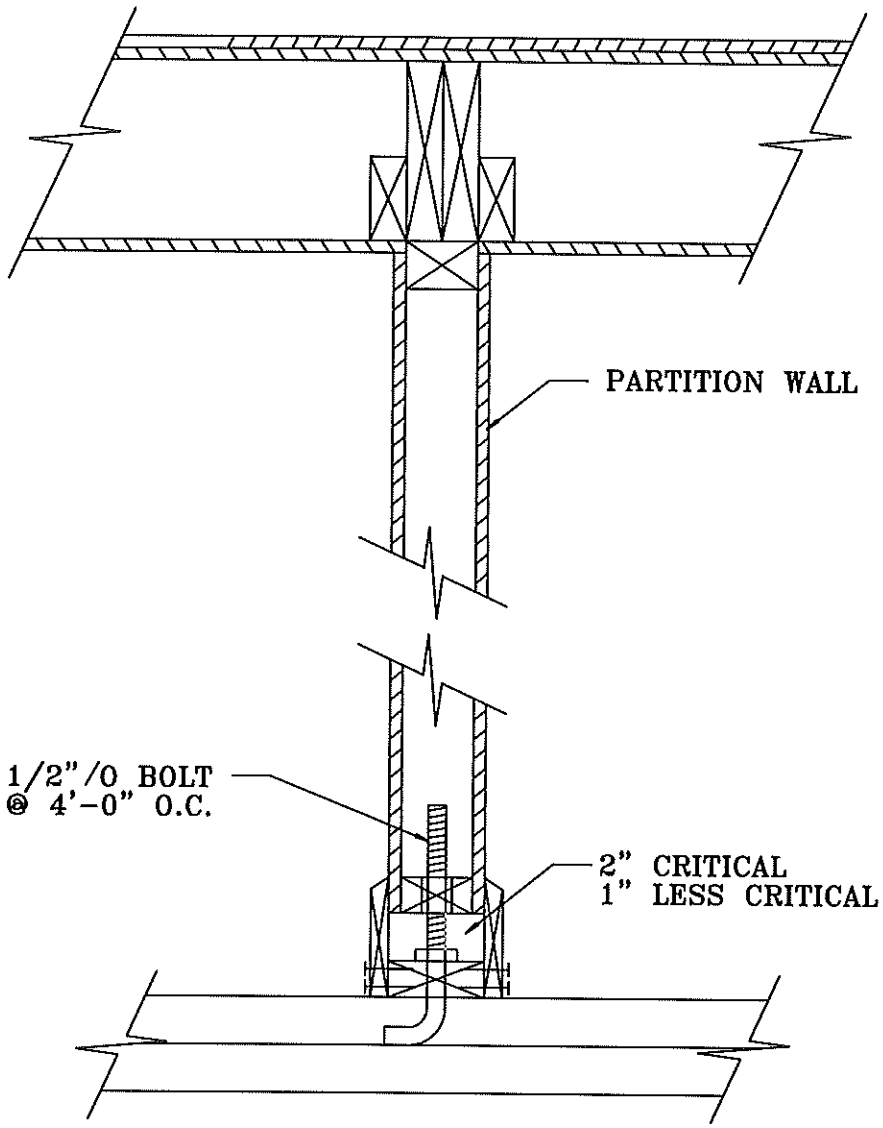
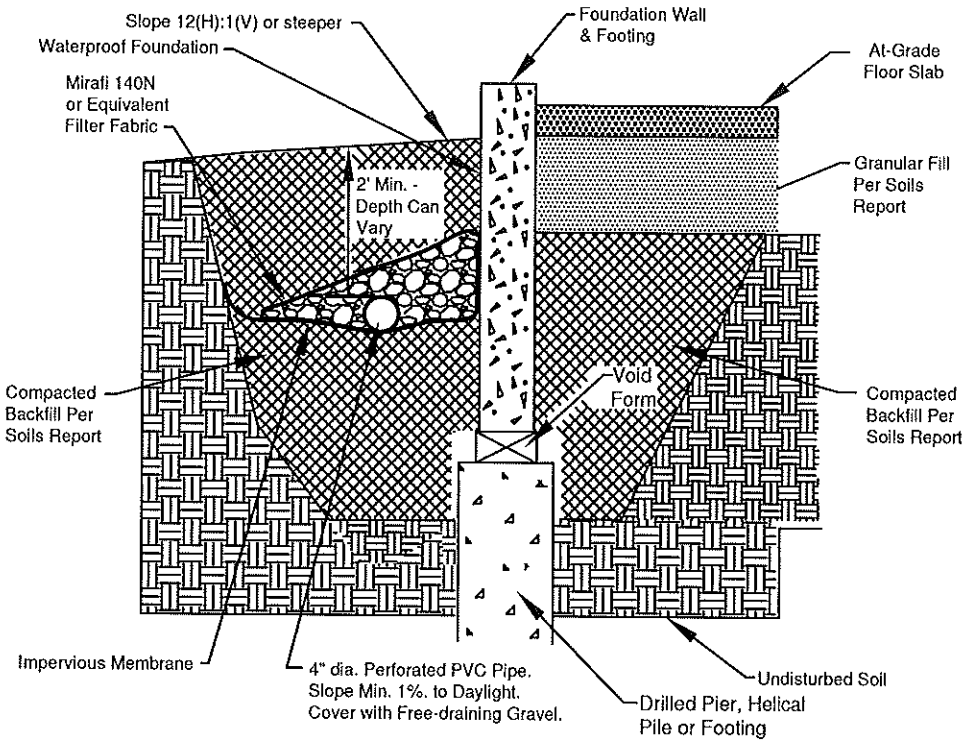


Title: SWELL-CONSOLIDATION TEST RESULTS		Date: 2/12/16	NWCC Northwest Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing (970)879-7858 - Fax (970)879-7851 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: RCRB Oak Creek Shop Addition		Job No. 16-10301	
Location: 24500 County Road 27, Oak Creek, Colorado		Figure #5	



Title: HUNG PARTITION WALL DETAIL	Date: 2/12/16	NWCC Northwest Colorado Consultants, Inc. Geotechnical / Environmental Engineering - Materials Testing (970)879-7658 - Fax (970)879-7851 2580 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: RCRB Oak Creek Shop Addition	Job No. 16-10301	
Location: 24500 County Road 27, Oak Creek, Colorado	Figure #6	

Slab-on-Grade



RCRB Oak Creek Shop Addition

Title: PERIMETER/UNDERDRAIN DETAIL	**Date:** 2/12/16	NWCC Northwest Colorado Consultants, Inc. Geotechnical / Environmental Engineering · Materials Testing (970)879-7888 · Fax (970)879-7891 2560 Copper Ridge Drive Steamboat Springs, Colorado 80487
Job Name: RCRB Oak Creek Shop Addition	**Job No.** 16-10301	
Location: 24500 County Road 27, Oak Creek, Colorado	**Figure** #7	

NWCC, Inc.

TABLE 1

SUMMARY OF LABORATORY TEST RESULTS

SAMPLE LOCATION		NATURAL MOISTURE CONTENT (%)	NATURAL DRY DENSITY (pcf)	ATTERBERG LIMITS		GRADATION		PERCENT PASSING No. 200 SIEVE	UNCONFINED COMPRESSIVE STRENGTH (psf)	SOIL or BEDROCK DESCRIPTION	UNIFIED SOIL CLASS.
TEST HOLE	DEPTH (feet)			LIQUID LIMIT (%)	PLASTICITY INDEX (%)	GRAVEL (%)	SAND (%)				
1	9	31.1	87.5	32	16	0	36	64		Very Sandy Clay	CL
1	14	32.0	90.5	30	8	0	7	93	950	Slightly Sandy Clay	CL
1	24	8.5	120.2	23	10	0	15	85		Sandy Shale	CL
2	4	14.7	108.2	27	12	36	38	26		FILL–Clayey, Sands and Gravels	SC–GC

JOB NUMBER: 16–10301