Appendix E NISOURCE ENVIRONMENTAL CONSTRUCTION STANDARDS

ENVIRONMENTAL CONSTRUCTION STANDARDS

Gas Standard: HSE 4440.020

Companies Affected:

☑ NIPSCO	☑ CGV	☑ CMD
	☑ CKY	☑ COH
	☑ CMA	☑ CPA

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1. INTRODUCTION

NiSource is committed to complying with the applicable environmental rules and regulations of federal, state, and local governments. It is NiSource's goal to meet these requirements in the pursuit of a cleaner, safer environment for future operations.

Recognizing this goal, it is NiSource's practice that all construction, operation and maintenance activities be conducted in a safe manner that minimize impacts on stream and wetland ecosystems, upland ecosystems, wildlife habitat, cultural resources and the human environment. This Environmental Construction Standards document (ECS) reflects the minimum requirements to be applied to all construction, operation, and maintenance activities conducted in support of NiSource operations as outlined by federal and state agencies. Construction projects may require permits and/or approvals from governmental authorities prior to actual construction and the ECS is not a substitute for obtaining such authorizations. Contact the NiSource Natural Resources Permitting (NRP) Group prior to project construction for permit acquisition.

The general objective of the ECS is to provide NiSource personnel and contractors with instructional information and a practical approach to environmental concerns, which can arise before, during, and after facility construction. More specific objectives include:

a. minimize impacts to environmentally sensitive areas;

b. use the minimum land required for safe and efficient construction, operation, and maintenance of the facilities;

c. prevent erosion and sedimentation during construction; and

d. complete construction in a safe and timely manner.

Words and/or phrases which have special meaning (shown in **bold** at first occurrence in text) and acronyms have been defined in Section 8.

The intent of the ECS is to confine project-related disturbance to the identified **construction work areas** and to minimize erosion and enhance re-vegetation in those areas. Any project-related ground disturbance (including erosion) outside of these areas is subject to compliance with all applicable surveys. This includes all environmental and regulatory mandated surveys such as but not limited to, threatened and endangered species surveys, archeology surveys, wetland delineations, etc.

The ECS is focused primarily on pipeline related construction, operation, and maintenance. However, it can be equally applied to all NiSource construction activities, including facilities maintenance. The ECS shall be used as the base document from which the NRP Group will build individual project-specific Environmental Compliance Plans (ECP) where necessary. The ECP will include a written summary of requirements and recommendations from appropriate federal, state, and local agencies. Compliance with these items is required prior to and during construction. If a project specific ECP is not required, this document will provide the necessary environmental construction guidance. Federal, state, delegated county and local agencies having regulations more stringent than the ECS shall supersede those contained within this document. The ECS

covers erosion and sedimentation (E&S) control plan requirements but does not address safety codes or regulations. Descriptions within do not supersede any and all applicable state or federal safety regulations.

The various Best Management Practices (**BMPs**) described herein are primarily utilized during earth disturbances associated with land development and construction activities.

BMPs, when designed according to these standards, and properly implemented and maintained, may be assumed to achieve the regulatory standard of minimizing the potential for accelerated erosion and sedimentation.

BMPs that fail after installation must be repaired to function properly or be replaced by alternative BMPs that will serve the intended purpose. Likewise, if unforeseen conditions occur on a site, and the installed BMPs are obviously not effective, then alternate BMPs must be designed and installed. The need for redesign will be determined on a case-by-case basis.

For all construction projects in the State of Virginia, please review Appendix A for additional information.

2. UPLAND CONSTRUCTION

2.1. GENERAL

This chapter describes typical upland gas distribution facilities construction and Operation and Maintenance (O&M) activities.

The upland gas distribution pipeline construction spread usually operates as a moving assembly line performing specialized procedures in an efficient, planned sequence. In addition, special construction crews bore under roads and railroads, construct valve settings and install wetland and stream crossings. A typical construction sequence is illustrated in Figure 1.

While construction work is ongoing, the construction work area will be kept clean of all rubbish and debris resulting from the work. Non-hazardous materials and waste shall be disposed of in an approved landfill and/or recycled at an appropriate facility. Hazardous waste shall be disposed of in accordance with NiSource policies and federal, state and local regulations.

As outlined in Section 3, construction spreads within wetlands and/or streams will be completed separately from the upland construction methods outlined in this section (2). Specifically, special crews will install stream and **wetland** crossings that are not done by conventional upland techniques, including the use of flumed stream crossings, pump bypass stream crossings and directional drill of either wetland or stream resources. Stream or wetland crossings of any type require federal and state agency approval. Contact the NRP Group prior to project construction for permit acquisition and construction clearance.

2.2. RIGHT-OF-WAY WIDTH

For the construction work associated with gas distribution pipelines (ranging from 2 to 20-inch in diameter) the permanent right-of-way (**ROW**) can range from 20 to 50 feet in width; however, it is not uncommon for the gas distribution pipeline to be co-located within a wider ROW. This entire ROW width may not be required for construction. A typical 30-foot ROW is illustrated in Figure 2.

If a specific width is not recorded for the ROW, the following minimum widths should apply: for pipelines six-inches or less in diameter and less than or equal to 60 psi, the ROW width should be 20 feet wide. For pipelines greater than six-inches in diameter and/or pressure greater than 60 psi, the ROW should be 50 feet wide. After the construction work area is restored, temporary work areas are allowed to revert to their previous uses. The permanent ROW is maintained as the company's permanent ROW for the facility.

In addition, there may be instances where extra work areas are needed for topsoil conservation, side hill construction, equipment staging, pipe and material storage, temporary and permanent access, and related construction activities. Such areas will be identified on project plans and considered part of the project disturbance. Gas distribution pipelines may be constructed through confined areas; alternate construction methods may be required in narrow construction work area situations to safeguard workers, equipment, the pipeline, and the environment. Alternate construction methods shall be reviewed by the Project Manager or NRP Group prior to initiation.

For small diameter gas distribution pipeline installations, a smaller width ROW can be used (such as a 10-foot wide ROW) due to a narrow trench and the use of smaller equipment such as a ditch witch trencher, vibrating plow, or installation of pipe by hand. In many instances, these smaller diameter pipes will be installed within the construction area limited to that public ROW. Figure 3 illustrates the typical pipeline construction work area for paralleling existing facilities, such as roadside construction.

2.3. ROADSIDE OR IN-ROAD CONSTRUCTION

When a pipeline is being constructed parallel to a public or private roadway; or, within or adjacent to the public ROW, a primary concern is controlling runoff pollution from leaving the work site and reaching surface waters.

Appropriate BMPs should be installed and made functional prior to the start of the earth disturbance activity to effectively limit the entry of pollutants into surface waters both during and after construction.

2.3.1. Inlet Protection

For typical roadside or in-road construction, primary concern is given to the protection of storm water collection basins present within the work area. An inlet filter bag (Figures 4 & 5) shall be installed in any inlet

opening prior to the start of work to prevent soil and sediment from entering the storm sewer system. Inlet filter bags are designed to fit inside the inlet opening and filter runoff as it passes through the inlet opening. Inlet filter bags shall be installed according to the manufacturer's specifications.

Stone inlet protection (Figures 6 & 7) is also an option for those structures that are not flush with the road surface. A layer of mesh or filter fabric creates a barrier between the inlet opening and the stone to allow for the passage and treatment of runoff.

Inlet protection shall be maintained and cleaned out or replaced when the bag or structure is half full or when flow capacity has been reduced. Care should be taken to prevent ponding on roadways. Accumulated sediment shall be disposed of in the approved manner. Damaged filter bags or inlet protection shall be replaced immediately.

2.3.2. Perimeter Control

Sediment barrier BMPs should be installed around the perimeter of a disturbed area to prevent sediment from leaving the work area. While it may not be practical in all instances to install perimeter controls around construction taking place within or adjacent to the roadway, they should be included where possible. Refer to Figure 3 for the proper alignment of sediment barriers adjacent to a roadway. Compost filter socks (Figure 8) are an effective way of controlling sediment from leaving the work site. Compost filter socks can easily be installed downslope of any work areas (where feasible) or around spoil piles both within or adjacent to the roadway. Depending on the site characteristics, filter fabric fence (Figure 9) or straw bale barriers (Figure 10) may also be used as perimeter controls.

In areas where perimeter controls are not feasible, all erodible surfaces shall be stabilized at the end of each work day. This will include the placement of mulch or covering the area with an erosion control blanket or plastic sheeting.

2.3.3. Dewatering Work Areas

The proper disposal of water within the work area is also a primary concern during construction. Whenever water is pumped from an excavation, it must be treated for sediment removal prior to discharge into a surface water or storm sewer system. Water impounded in the trench or bore pits shall not be released directly into any waterbody or wetland unless authorized by NRP. Discharge by overland flow is permitted with proper treatment.

If it is necessary to remove water from the trench or bore pits, a Pumped Water Filter Bag (Figure 11) should be used. Bags should be located in a well-vegetated (grassy) area and discharge into a stable, erosion-resistant area. A suitable means of accessing the bag with machinery

required for disposal purposes shall be provided. Bags shall be placed on straps to facilitate removal unless bags come with lifting straps already attached. Additional requirements are outlined on Figure 11.

The Pumped Water Filter Bag should be designed to trap particles larger than 150 microns. The pump discharge hose shall be inserted into the bags in the manner specified by the manufacturer and securely clamped. When the bag has been filled to ½ its total capacity, it should be replaced with a new bag and disposed of properly. Wherever well-vegetated areas are not available, a geotextile underlayment or gravel pad shall be used. Consideration should be given to how the bag will be accessed and removed once it has been ½-filled with sediment. Additional requirements for the proper use of this control are outlined on Figure 11.

For greater dewatering capacity, pumped water could be discharged to a sediment trap (Figure 12) or compost sock sediment trap (Figure 13). Care should be taken in order to minimize erosion and subsequent sedimentation of streams or wetlands by monitoring and regulating the flow of water into the sediment trap. At no time shall the pumped water overtop the sediment trap.

2.3.4. Protect Existing Features

Vegetated areas are very effective sediment filters. Where feasible, retaining vegetative cover within the project area can help to reduce the volume of sediment leaving the site.

When a roadside ditch or drainage channel/swale is present (parallel or perpendicular) to the construction activity, sediment filter devices must be put into place where needed to prevent sediment from entering a waterway via the ditch. Compost filter socks (Figure 8) or rock filters (Figure 15) should be installed in the ditch to reduce runoff velocity and collect sediments that have entered the ditch during a runoff event. Filter fabric fence and straw bale barriers are not appropriate for these areas of concentrated flow.

2.3.5. Construction Entrances

Stabilized construction entrances are necessary to minimize off-site tracking of sediment. If construction traffic will be accessing a paved road directly from a disturbed area, a Rock Construction Entrance (Figure 16) shall be installed at every point where vehicles enter or exit the site.

A stabilized construction entrance may not be feasible during construction within or immediately adjacent to a roadway. In these cases, care should be taken to minimize vehicular access and the roadway shall be regularly cleaned of tracked sediment throughout the work day.

2.3.6. Operation and Maintenance

Inspection and maintenance of erosion and sediment control BMPs both during and after construction is important to ensure that the BMPs are operating properly and effectively.

During construction, maintenance will include inspection of all E&S control devices near the end of each work day or after any runoff/rain event. All preventative and remedial maintenance work, including BMP clean out, repair, and replacement, will be performed before leaving the project site for the day.

Sediment, sawed-out slurry, or broken asphalt/concrete shall be removed from the site regularly. This material should be removed using a shovel or vacuum, hauled from the site and disposed of according to local, state and federal regulations. Under no circumstances shall this material be swept or washed into storm water inlets within or adjacent to the construction area.

The on-site Environmental Inspector is responsible for conducting the regular inspections of BMPs and for directing any required maintenance that is to be performed by the crews or construction contractor.

Written documentation of inspections required by local, state or federal permits will be kept on-site and available for review at any time. For work in Virginia, see part 2.A of Appendix A. Inspections will continue after construction has been completed, until disturbed areas have been stabilized with perennial vegetation that has uniform, 70% coverage, is mature enough to survive, and will inhibit erosion.

2.3.7. Site Stabilization

As soon as disturbed areas reach final grade they must be stabilized. Areas that have significant potential for erosion should be stabilized with vegetation. Recommended seed mixtures for vegetative stabilization can be found in Table 1 (for work in Virginia, see part 2.C of Appendix A). The seed mixes referenced in Table 1 are standard guidance. For projects where a specific seed mix (such as a specialized pollinator or wildlife mix) will be used in place of the standard mix, detailed information and additional guidance will be included with the site-specific plans prepared for the project.

In areas where earth disturbance activity has temporarily ceased, temporary stabilization shall be completed as soon as possible, but at least within seven days or in accordance with any more restrictive state or local requirements (four days if working in PA). Areas that will be subject to earthmoving within 12 months may be stabilized with temporary seed mixtures. Graded areas where it is anticipated that future earth disturbance will take place (i.e. bare dirt areas along the mainline where service line installation is planned) can be stabilized with an erosion control blanket (Figure 17).

When final grade is achieved during non-germinating months, the disturbed area shall be temporarily seeded and mulched until the beginning of the next planting season. Critical areas (highly erodible soils, within 50 feet of a surface water, etc.) should be stabilized with an erosion control blanket.

The area will not be considered permanently stabilized until perennial vegetation that has uniform, 70% coverage, is mature enough to survive, and will inhibit erosion is present. . Temporary erosion control BMPs must remain in place and be maintained in working order until permanent stabilization is achieved.

2.4. CLEARING

When work is necessary outside of a previously cleared and maintained public ROW, the construction work area will be cleared to the width specified in the ROW agreements, E&S control plan, or ECP, whichever is less. During clearing operations, all brush and trees will be felled into the construction work area to prevent off-construction work area damage to trees and structures. Large or valuable trees may be retained, provided they will not interfere with the construction, operation, or maintenance of the facility. These trees shall be marked in a manner that allows construction to continue but keeps the trees protected (e.g., ribbons and/or safety fencing).

Temporary erosion and sedimentation controls (as described in Section 2.5.3) shall be installed and functioning properly prior to clearing activities.

2.4.1. Wood Products

Wood Products (saw logs, pulpwood, or cordwood) will revert to the landowner unless otherwise specified. Wood products should not be used for any purpose unless written permission is first obtained from the landowner. When the landowner requests salvage of these materials, they shall not be stockpiled within floodplains or wetlands.

2.4.2. Brush

All cleared brush can be disposed of by one of the following methods:

a. Brush may be piled at the edge of the construction work area but not within 50 feet of streams, floodplains or wetlands. Equipment stacking the brush should not leave the construction work area. Brush piles will be constructed approximately 12 feet wide and compacted to approximately 4 feet high, with periodic breaks at a minimum of every 200 feet to permit wildlife travel. The landowner should be consulted to determine acceptable brush pile locations along the construction work area.

b. Brush may be burned where permitted by law. The necessary burning permits must be obtained prior to burning. Fires will be of

reasonable size and located and patrolled so that they will not spread off the construction work area.

c. The brush may be chipped and given away, buried, thinly spread (less than 2 inches thick) over the construction work area, or blown off the construction work area (per documented landowner agreement) except in **agricultural lands** or within streams, floodplains, or wetlands. Chipping will be limited to those areas where agreed to with the landowner. During **restoration**, soil will be augmented by the addition of 12 to 15 pounds of nitrogen per ton of chips to aid revegetation. Follow the guidance contained in Section 2.10 for restoration and revegetation guidelines.

2.5. GRADING

Grading is necessary to provide a smooth and even surface for safe and efficient operation of construction equipment. Grade the minimum amount necessary; temporary E&S controls such as waterbars and **sediment filter devices** shall be installed and functioning properly prior to grading activities.

2.5.1. Tree Stump and Rock Removal and Disposal

Tree stumps and large rocks can be cut, graded or removed as necessary to permit construction and to provide adequate clearance for mechanical equipment and other vehicles. Tree stumps that are adjacent to roads will be cut close to the ground (flush cut) or removed.

Stumps and large rocks will be disposed of in one of the following approaches:

a. as allowed by state, county or local regulatory agencies, buried within the construction work area except in agricultural, residential, or wetland areas;

b. windrowed just off the edge of the construction work area with landowners' permission. Windrows shall not be located within streams, floodplains, or wetlands;

c. hauled from the site and disposed of in an approved landfill or other suitable area.

2.5.2. Topsoil Conservation

Unless the landowner or land management agency specifically approves otherwise, prevent the mixing of topsoil with subsoil by stripping topsoil from either the full work area or from the trench and subsoil storage area (ditch plus spoil side method) in:

a. actively cultivated or rotated croplands and pastures;

b. residential areas;

c. hayfields;

d. other areas at the landowner's or land managing agency's request; and

e. as outlined in the project specific Erosion Control Plans or ECP.

In deep soils (more than 12 inches of topsoil), segregate at least 12 inches of topsoil. In soils with less than 12 inches of topsoil make every effort to segregate the entire topsoil layer. Segregated topsoil may not be used for padding the pipe. Figure 2 illustrates topsoil conservation techniques.

The topsoil will be stockpiled separately from all subsoil and will be replaced last during backfilling and **final grading**.

In residential areas, topsoil replacement (i.e., importation of topsoil) is an acceptable alternative to topsoil segregation.

2.5.3. Erosion Control Devices Installed During Grading

Required temporary erosion controls shall be installed and made functional prior to the the start of initial land disturbance. Erosion control devices are illustrated in Figures 4 through 20.

All temporary erosion control devices shall be inspected near the end of each work day or after each storm (runoff) event of 1/4 inch or greater to ensure proper functionality. Any devices damaged beyond functioning will be repaired or replaced **promptly**.

The following erosion control devices are suitable for temporary erosion and sedimentation control for implementation before or immediately following clearing and grading operations:

a. Compost Filter Sock (Figure 8) may be used to control runoff from small disturbed areas or steep slope areas where runoff is in the form of sheet flow. Compost filter socks are an efficient and easy to maintain control and must be installed according to the specifications in Figure 8. As with other sediment barriers, filter socks should be placed parallel to contour with both ends of the sock extended upslope at a 45 degree angle to the rest of the sock to prevent sediment from traveling around the ends. Socks placed on earthen slopes should be anchored with stakes driven through the center of the sock or immediately downslope of the sock at intervals recommended by the manufacturer. Where socks are placed on paved surfaces, concrete blocks should be used immediately downslope of the socks (at the same intervals recommended for the stakes) to help hold the sock in place. Upon stabilization of the work

area, the filter sock may be left in place and vegetated or removed. In the latter case, the mesh is typically cut open and the compost spread as a soil supplement. In either case, the stakes should be removed. Refer to Table 3 for filter sock fabric and compost specifications.

b. Silt Fence (Figure 9) may be used to control runoff from small disturbed areas or short-slope disturbed areas when runoff is in the form of sheet flow and the discharge is to a stable area. The filter fabric fence must be installed according to the specifications outlined in Figure 9, including uniform anchoring in the soil. Silt fence should not be installed on uncompacted fills or in extremely loose soils, since this will likely result in undermining of the fence.

c. Straw Bale Barriers (Figure 10) may be used to control runoff from small disturbed areas where runoff is in the form of sheet flow. Straw bales tend to deteriorate within 3 months of installation and should be considered a short-term control measure.

d. Rock filters (Figure 15 or a NRP Group approved equivalent alternative) are considered temporary erosion controls. Curb or drop inlet protection devices (Figures 4-7), if required, will be installed at this time. In areas of concentrated flow, a rock filter outlet (Figure 18) should be used as an alternative to silt fence or straw bales. Refer to Section 2.3 for typical erosion control installation during roadside construction.

2.5.4. Waterbars

Waterbars (Figure 19) are a common and effective device used for erosion control on construction ROW. During construction, temporary waterbars are installed to control water on the graded ROW. During restoration, permanent waterbars are installed to protect the ROW from erosion until vegetation becomes reestablished on the disturbed areas.

Temporary diversions are generally made by building a curb 18 to 24 inches high across the ROW. The curbs are shaped to allow passage of construction equipment and inspector vehicles. The diversion should have a gradient of less than 2% and must drain off of the ROW. Where water is directed off the ROW, the outlet will be protected by a sediment filter device. Temporary diversions may be broken down by construction equipment during the workday, but will be restored by the end of each day. Temporary diversions will be spaced along the ROW in accordance with Figure 19. Position the outfall of each waterbar to prevent sediment discharge into wetland, waterbodies, or other sensitive areas.

Permanent waterbars typically consist of a curb 18 to 24 inches high below a shallow swale. The curb is constructed of compacted earth fill with side slopes of 2:1 or flatter to allow passage of maintenance equipment. The diversions should extend across the entire ROW and drain water with a less than 2% gradient. The outlets of final diversions

are stabilized with sediment filter devices, rock, brush, or heavy vegetation. Final diversions will be spaced along the ROW in accordance with Figure 19 and will tie into existing waterbars where present. In places where final grade creates side slopes or slopes which break in more than one direction, waterbar installation may need to vary to create an outslope of less than 2% which will carry water off the ROW.

2.5.5. Rock Construction Entrances

Rock Construction Entrances, as illustrated in Figure 16, shall be installed where the construction work area crosses public roads or where construction traffic will exit onto a roadway, public or private. The rock construction entrances are needed to maintain safe vehicle operation and to prevent tracking soil and mud onto public roads. These installations are designed to remove mud from vehicle tires and tracks before accessing the road. Access to the site should be limited to the stabilized construction entrance(s). At a minimum, the rock construction entrance should be constructed to the dimensions shown on Figure 16.

At temporary road entrances, geotextile fabric should be used as illustrated in Figure 16. The underlying bed of the entrance area should be cleared of small stumps and protruding organic material as these tend to puncture the fabric; thereby allowing fine soil particles to mix with the gravel. At existing gravel access roads the rock construction entrance does not have to be underlain with geotextile fabric.

In addition, public roads shall be swept, shoveled or scraped as necessary to keep the road surface safe. Washing the roadway or sweeping the deposits into roadway ditches, sewer, culverts, or other drainage ways is not acceptable. If a construction entrance becomes overly compacted and/or filled with soil, it may cease to function correctly. In these circumstances, the rock shall be decompacted by raking to roughen the surface and restore its functionality.

If no access is required onto the roadway, the installation of a rock construction entrance is not required; however, safety fencing should be installed across the ROW and signs designating “no entrance” can be erected to avoid any unintentional entrances.

2.6. ACCESS ROADS

Typically, access roads to the NiSource pipeline system already exist. All public roads are available for use as access roads without further environmental review. However, all private access roads intended for use are subject to applicable environmental reviews. Safe and accessible conditions will be maintained at all roadway crossings and access points during construction and restoration activities.

New access roads will be built only if existing access is inadequate. The access roads will be a maximum of 25 feet wide with additional width in tight turns and at

intersections with public roads. The roads will either be temporary (used for access during construction only) or permanent (used during and after construction for operation and maintenance of the facilities). Additional permitting requirements may be required for the construction of permanent roads and the NRP Group must be contacted in advance of planning permanent road construction.

Access road gradient will be as flat as local topography will practically allow. By breaking or changing grade frequently, fewer erosion problems will be encountered than on long, straight, continuous gradients. Waterbars (interceptor diversions or slope breakers) and/or other sediment control devices will be installed as needed.

Road crossings of streams and wetlands require special environmental construction standards as described in Section III. Roads will cross streams and wetlands as close as possible to right angles. Road gradients approaching these crossings will be graded to decrease runoff velocity. Runoff will be dispersed just prior to the crossing by means of an interceptor diversion with a sediment filter device at the outlet. Where conditions permit, new roads will be located at least 25 feet from any stream or wetland except at crossing locations. Culverts will be appropriately sized and placed to permit water flow under the access road.

After construction, temporary access roads (including any additional width used for construction) can be graded and left intact for the landowner's benefit or removed and the area restored using the same specifications as applied to the construction work area.

2.7. RESIDENTIAL AND COMMERCIAL AREAS

The following mitigation measures should be implemented for all residences and businesses within 50 feet of the construction work area:

a. Timely notification of required construction activities to ensure safe access and maneuverability;

b. Minimize disturbance to existing maintained areas by ensuring proper spoil pile placement;

c. While the trench is open, the edge of the construction work area adjacent to the residence or business will be protected by safety fence for a distance of approximately 100 feet on either side of the residence to ensure safety within the construction work areas;

d. In a timely manner after backfilling the trench, all lawns shall be restored to final restoration or temporary restoration pending weather and soil conditions.

2.8. TRENCHING

2.8.1. Trenching Specifications

The total length of excavated trench open at any one time should not be greater than the total length of utility line that can be placed in the trench and backfilled in one working day unless authorized by a written variance from the NRP Group. Additional restrictions for stream and wetland areas are provided in Section 3. Spoil shall be placed at least two (2) feet from the edge of the trench.

a. Sediment filter devices shall be installed before excavating bore pits, and before constructing stream and wetland crossings.

b. As the trench is completed, trench plugs (as illustrated in Figure 20) will be installed at a maximum spacing of 1,000 feet and as specified in the drawing. Trench plugs reduce water velocity along the pipeline bedding and result in less erosion/scour of the trench bottom. They shall be installed at all stream, waterbody and wetland crossings regardless of slope. Topsoil shall not be used to construct the trench plugs.

c. Whenever water is pumped from the excavation, it must be treated for sediment removal prior to discharge into a surface water or storm sewer system. Water impounded in the trench or bore pits shall not be released directly into any waterbody or wetland unless authorized by NRP. Discharge by overland flow is permitted with proper treatment.

   If it is necessary to remove water from the trench or bore pits, a Pumped Water Filter Bag (Figure 11) should be used. Bags should be located in a well-vegetated (grassy) area and discharge into a stable, erosion-resistant area. A suitable means of accessing the bag with machinery required for disposal purposes shall be provided. Bags shall be placed on straps to facilitate removal unless bags come with lifting straps already attached. Additional requirements are outlined on Figure 11.

   The Pumped Water Filter Bag should be designed to trap particles larger than 150 microns. The pump discharge hose shall be inserted into the bags in the manner specified by the manufacturer and securely clamped. When the bag has been filled to ½ its total capacity, it should be replaced with a new bag and disposed of properly. Wherever well-vegetated areas are not available, a geotextile underlayment or gravel pad shall be used. Consideration should be given to how the bag will be accessed and removed once it has been ½-filled with sediment. Additional requirements for the proper use of this control are outlined on Figure 11.

For greater dewatering capacity, pumped water could be discharged to a sediment trap (Figure 12) or compost sock sediment trap (Figure 13). Care should be taken in order to minimize erosion and subsequent sedimentation of streams or wetlands by monitoring and regulating the flow of water into the sediment trap. At no time shall the pumped water overtop the sediment trap.

When conditions dictate that the trench must remain open for a greater length of time than anticipated, appropriate erosion controls and safety measures will be employed as directed by the **Inspector**.

2.8.2. Blasting

All drilling and blasting will be completed in accordance with the rules and permits issued by the overseeing regulatory agency. Areas requiring blasting to adequately cover the pipeline shall be identified to the extent practicable before construction commences. No blasting shall occur in upland areas until appropriate regulatory permits have been issued; or until the NRP Group has indicated that none are required. All required precautions will be taken to avoid injury or damage to persons, livestock, environment, or other property.

2.8.3. Temporary Construction Access Over the Trenchline

Where access across the trenchline is required, temporary facilities such as wooden mats or steel plates will be constructed or installed to permit safe crossing of livestock, vehicles, equipment, and persons from one side of the trench to the other.

2.8.4. Directional Bore in Upland Areas

Directional bore is often used as an alternative to open trench construction when working within or adjacent to the roadway or within residential areas.

During the directional bore process an **inadvertent release of drilling fluid** may occur. An inadvertent release of drilling fluid occurs when the bore fluid seeps to the surface through cracks or voids in the soil. In the event of an inadvertent release of drilling fluid occurring in an upland area, the following inadvertent release of drilling fluid contingency plan procedures will be followed. The materials and equipment necessary to complete these steps must be present onsite prior to the start of drilling activities.

1. The source/pumps will be stopped temporarily or the pressure will be decreased;

2. The inadvertent release of drilling fluid will be contained immediately by installing straw bales, compost filter sock or equivalent.

3. The drilling mud will be removed from the site to the greatest extent possible by manual means such as by use of shovels, wheelbarrows and/or vacuum hoses. If these methods are unsuccessful, contact the NRP Group for your area.

4. The affected areas will be restored as closely as possible to their previous condition.

5. Documentation (including date, time, weather conditions, approximate volume and photographs) must be made and provided to the NRP Group as soon as possible.

6. Any special instructions from the Project Manager or NRP Group must be followed.

7. Once the inadvertent release of drilling fluid has been contained the boring process may continue. Typically, drilling activities will not be suspended unless the inadvertent release creates a threat to public health and safety or unless suspended by the Project Manager or NRP Group.

For work in Virginia see Appendix A, Section 2.B for additional requirements on all directional bore construction.

2.9. BACKFILLING SPECIFICATIONS

Backfilling will follow pipe installation as closely as practical using the excavated subsoil or imported material suitable for backfill operations in accordance with Gas Standard GS 3010.050. Topsoil will not be used to pad the pipe. Soil that has been excavated during construction and not used for backfill will be evenly spread over the construction work area or removed from the site and disposed of properly. All waste materials such as barrels, cans, drums, stumps, coating and wrap, rubbish, waste, or other refuse will not be placed in the trench, but removed from the construction area and disposed of at appropriate facilities.

Trench breakers (Figure 20) will be placed in the trench prior to backfilling to prevent water movement and subsequent erosion. Trench breakers shall be installed at the spacing illustrated in the figure, up-slope of any permanent waterbars and at all stream, waterbody, and wetland crossings.

Excess excavated rock, including blast rock with a dimension not larger than six (6) inches may be returned to the trench, but care should be used to prevent damage to the pipe or coating.

2.10. FINAL GRADING, RESTORATION AND STABILIZATION

Upon completion of construction activities, all disturbed areas will be stabilized with final grading and restoration. In the case where final grading and restoration is not immediately feasible, **temporary stabilization** measures (to

prevent erosion and sedimentation until final grading and restoration can be completed) are required.

2.10.1. Final Grading

Final grading should be completed within 14 calendar days of backfilling, weather and soil conditions permitting. When conditions require a delay, the 14-day time frame will not start until conditions are suitable for grading. If unsuitable soil conditions are expected to persist for more than 21 calendar days (or 14 days if working in Virginia), the Inspector will record the conditions and require the installation of temporary stabilization measures, and final grading and restoration will be delayed. In no case shall final grading be delayed beyond the end of the next recommended seeding season.

Segregated and conserved topsoil will be returned to the ROW during final grading.

If final grade can be established but conditions are not ideal for permanent seeding, the Inspector will specify application of temporary stabilization measures and may also consider concurrent application of final seed mix and mulch (as provided in Table 1, or per the seasonal recommendation of the local or county soil conservation service/authority). Temporary stabilization measures may consist of mulching or temporary seeding covered by mulch. These measures shall be implemented on a ground surface prepared by surface roughening, grooving, or tracking slopes as with permanent stabilization. Temporary erosion control BMPs must remain in place and be maintained in working order until permanent stabilization is achieved.

During final grading, soil over the trench may be mounded to allow for future settling. Where fill in the trench or major depressions have settled below ground level, additional fill will be added as needed and the area brought to final grade.

Excess rock will be removed from at least the top 12 inches of soil to the extent practicable in all rotated and permanent agricultural land, hayfields, pastures, residential areas, and other areas at the landowner's request. The size, density and distribution of rock on the construction work area should be similar to adjacent areas not disturbed by construction.

Final erosion control devices (filter fabric fence, straw bale barrier, waterbars) shall be installed during final grading. Sediment filter devices needed to protect off-construction work area resources shall be installed or rebuilt promptly after final grading. Final waterbars will not be installed in agricultural or pastureland without landowner's consent.

2.10.2. Soil Compaction Testing

Where required by the appropriate agency, test topsoil and subsoil for compaction at regular intervals in agricultural and residential areas disturbed by construction activities. Conduct tests on the same soil type under similar moisture conditions in undisturbed areas to identify approximate preconstruction conditions. Use penetrometers or other appropriate devices to conduct tests.

Plow severely compacted agricultural areas. In areas where topsoil has been segregated, plow the subsoil before replacing the segregated topsoil. Alternatively, make arrangements with the landowner to plant and plow under a "green manure" crop such as alfalfa to decrease soil bulk density and improve soil structure. If subsequent construction and cleanup activities result in further compaction, conduct additional tilling.

Perform appropriate soil compaction mitigation in severely compacted residential areas. Soil compaction testing of subsoil and topsoil may also be required in some roadways.

2.10.3. Restoration

As soon as disturbed areas reach final grade they must be stabilized in accordance with the project restoration plan. If no project specific plan is present, the restoration activities shall occur in accordance with the minimum requirements described in this section.

All disturbed areas that have not otherwise been stabilized should be stabilized with vegetation. This includes graded areas where it is anticipated that future earth moving will take place within the coming year. Areas that will be subject to earthmoving within 12 months may be stabilized with temporary seed mixtures, predominantly annual grasses. The area will be considered stabilized when perennial vegetation that has uniform, 70% coverage, is mature enough to survive, and will inhibit erosion is present.. For all work in Virginia see Appendix A, Section 2.C for additional minimum requirements.

As disturbed areas within a project approach final grade, preparations should be made for seeding and mulching to begin (i.e. anticipate the completion date and schedule the seeder). In no case should an area exceeding 15,000 square feet, which is to be stabilized by vegetation, reach final grade without being seeded and mulched. Before the seeding begins, topsoil shall be applied as required and any required soil amendments worked into the soil to a depth of 4 to 6 inches.

All seeded areas shall be mulched or blanketed to minimize the potential for failure to establish an adequate vegetative cover. The recommended seed mixtures and typical application rates for lime, fertilizer, and mulch in upland areas are listed in Tables 1 and 2. These specifications will be used unless the ROW agreement, permit, local Natural Resource

Conservation Service (NRCS), or NRP Group provides project-specific recommendations.

An erosion control blanket (Figure 17) or equivalent approved by the Inspector may be used on **steep slopes** to help stabilize the construction work area.

If sod is to be used, install as outlined below.

a. Site Preparation

    1. Install water control (subsurface irrigation) measures as applicable.

    2. Loosen soil surface to a depth of one inch with a shallow tillage tool and dampen soil before laying sod.

b. Selection

    1. Select sod grown from seed of adapted varieties and under cultural practices conducive to high quality sod that will be free of any serious thatch, weeds, insects, diseases, and other pest problems.

    2. Select species and varieties best suited for the sites to be planted and the purpose for which the turf will be used. The type of sod should be composed of plants adapted to the site conditions (dry or wet, full sun or shade, gentle slopes or steep, etc.).

    3. Select sod at least one year old, but less than three years. Cultivated turfgrass is usually considered ready for harvest when a cut portion of sod three feet in length and approximately half a foot in width will support its own weight. The most common age of sod when cut is 15 to 24 months.

    4. Select sod cuts of width and length suited to the equipment and job. Generally, sod cuts are 12 to 24 inches in width with 12 inches being the most common width. The length of cut varies from four to eight feet. Sod may be cut and rolled or folded in the middle and stacked on pallets. Folded sod is cut shorter than rolled sod, about three to four feet in length. Sod should be cut with a half to one inch layer of soil attached. The thinner the sod is cut (one-half to three-fourths of an inch), the more quickly it will knit to the site soil. About 80% of all rhizomes are in the top three-fourths of an inch of soil.

    5. Deliver sod to the site as soon as practical after lifting. During hot weather, delivery should be made within six

hours. For best results, sod should not be moved during cold seasons or during July and August. If moved during those periods, sod may need to be cut a quarter inch thick and will require extensive care.

c. Laying Sod

1. Lay strips of sod at right angles to direction of slope or flow of water starting at the lowest elevation. Wedge the edges and ends of the sod strips together and tamp or roll. Stagger joints and make the top of the sod strips flush with the surface of the undisturbed ground.

2. Use wire staples, fine mesh wire or wood pins and binder twine on very steep slopes to hold sod in place until secured in plant growth.

3. After the first growing season, the sod should be inspected to determine if additional fertilization or liming is needed.

Vegetation growth shall be monitored after completion of construction to ensure perennial growth has taken place as required. If this has not occurred, contact the NRP Group for remedial action.

2.10.4. Temporary Stabilization

In areas where earth disturbance activity has temporarily ceased, temporary stabilization shall be completed as soon as possible, but at least within seven days or in accordance with any more restrictive state or local requirements (four days if working in PA). Areas that will be subject to earthmoving within 12 months may be stabilized with temporary seed mixtures, predominantly annual grasses. When final grade is achieved during non-germinating months, the areas should be mulched until the beginning of the next planting season. Temporary erosion control BMPs must remain in place and be maintained in working order until permanent stabilization is achieved. The seeding and mulching rates for temporary stabilization are provided in Table 2 (for work in Virginia see Appendix A, Attachment 6, Table 1). Consideration will be given to the following when determining if temporary stabilization measures are to be implemented:

a. The length of time work within a portion of the construction area will be temporarily or permanently ceased;

b. anticipated weather conditions; and

c. resources on and off the construction work area to be protected.

If temporary stabilization measures are utilized, final grading and/or restoration must commence once weather and soil conditions permit.

2.11. NOISE IMPACT MITIGATION

Construction equipment will be properly muffled and maintained to avoid producing excessive noise near **noise sensitive areas**. Construction hours will be consistent with local or county ordinances, except in emergency construction situations.

2.12. DUST CONTROL

Dust control shall be implemented on construction areas where dust from disturbed soil and/or construction practices could create an environmental, health or visibility hazard. At a minimum all local or state laws regarding dust control must be followed.

In order to minimize dust on a worksite:

a. Haul roads and stockpiles should be located away from existing residential housing, businesses and public areas where practical. Use of haul roads should be limited to the extent practical and construction equipment should maintain low speeds of 15 miles per hour or less.

b. Trucks leaving a project site should be covered, especially where conditions may result in blowing of haul material.

c. Areas of disturbed, vegetated soil that are exposed to traffic and wind should be minimized.

d. Prior to construction activities, work practices should be evaluated to determine if excess dust could impact adjacent areas.

Standard practices to mitigate dust from construction activities include:

a. Irrigation,

b. temporary soil stabilization, and

c. physical barriers such as solid fencing and plastic enclosures. Other measures such as commercially available dust suppressants may be allowed with prior approval from the NRP Group.

2.13. HYDROSTATIC AND AIR TESTING

Typically, NiSource verifies a facility's integrity by air or nitrogen testing, which is pumped into the line, held at pressure for a given time and then released to the atmosphere.

On occasion, facility integrity can be verified using hydrostatic testing. Water will be drawn from local sources (streams, ponds, public water supplies) in a manner that will minimize impacts to the environment and other existing users while maintaining adequate stream flow. The withdrawal and/or discharge of

hydrostatic test water requires permit approval to be obtained prior to such activities.

Water from state designated **high quality streams** or **exceptional value waters**, waterbodies which provide habitat for federally listed threatened or endangered species, or streams utilized as public water supplies will not be used unless other water sources are not readily available and the appropriate federal, state or local agency permits its use. If test headers must be installed within 50 feet of streams and wetlands, additional sediment filter devices may be installed to prevent sediments from entering into the stream or wetland during discharge.

Comply with all approval/permit conditions which may include notifying the appropriate state agency of withdraw/discharge and collection of samples in accordance with permit conditions where required. Intake hoses will be screened.

The discharge of the hydrostatic test water will be performed in a manner that minimizes erosion. The energy of the released test water will be dissipated and particulates allowed to settle out by discharging the water:

a. into a tank(s), or

b. into a well-vegetated area through a dewatering structure for hydrostatic testing (Figure 14) to filter out various particulate matter prior to soil infiltration.

Regulate the water discharge rate from the above structures, and, if necessary, use energy dissipation device(s), and/or install sediment barriers to prevent erosion, streambed scour, suspension of sediments, or excessive stream flow. During the discharge, the Inspector must ensure that erosion and sedimentation are properly controlled.

Do not discharge into waters from state designated exceptional value waters, waterbodies which provide habitat for federally listed threatened or endangered species, or streams utilized as public water supplies unless an authorized federal, state or local agency permit has been issued.

This guidance is for hydrostatic testing of new pipe. Permitting requirements associated with hydrostatic testing of used pipe can be extensive. Contact the NRP Group prior to testing any used pipe.

3. STREAM AND WETLAND CROSSINGS

3.1. STREAM CROSSINGS

3.1.1. General

In-stream work, stream crossings, and earth disturbance within 50 feet of a stream require permit authorization. Contact the NRP Group prior to any work within or adjacent to a waterbody.

The main objective of any waterbody crossing is to construct the pipeline in a manner which minimizes erosion and subsequent sedimentation into the waterbody. Crossings will be constructed as close as possible to right angles with the waterbody channel. Adequate downstream flow rates will be maintained at all times to protect aquatic life and prevent the interruption of existing downstream uses. Each waterbody crossing will be treated as a separate construction entity, such that construction of culverted access roads, flumes, trenching, pipe installation, backfilling, and temporary stabilization or final restoration are completed in the minimum number of consecutive calendar days possible.

Construct stream crossings during the time windows designated by the appropriate permitting agency. If there are no time of year restrictions, conduct stream crossings during low flow periods, normally July through September. When work in a live watercourse is performed, precautions shall be taken to minimize encroachment, control sediment transport and stabilize the work area to the greatest extent possible during construction.

Directional Boring can be done any time throughout the year unless specifically restricted by a state agency; however, these activities require permit authorization. Contact the NRP Group prior to any work within or adjacent to a waterbody.

When water levels are temporarily high, the Inspector will direct that the commencement of any waterbody crossing construction activities be postponed until water levels subside.

Any extra work areas will be located at least 50 feet away from the water's edge (except in agricultural fields and previously disturbed sites) where topographic conditions permit and will be limited to the size needed to construct the crossing. If topographic conditions do not permit a 50-foot setback, these areas must be located at least 10 feet from the top of the waterbody bank. Pipe assembly for the waterbody crossing is usually performed in the extra work areas prior to or concurrently with trenching.

Guidance relating to spill prevention at waterbodies is contained in Section 4, "Spill Prevention".

If the facility parallels a waterbody, attempt to maintain at least 10 feet of undisturbed vegetation between the top of bank of the waterbody and the ROW except at the crossing location. Where waterbodies are adjacent to the construction ROW, install sediment barriers along the edge of the construction right-of-way as necessary to contain spoil and sediment within the ROW.

3.1.2. Clearing

Tree and brush clearing will be performed as previously described in Section II, "Upland Construction". Tree clearing within floodplain areas

should be limited to those absolutely necessary for construction. All cleared materials will be disposed outside the limits of the floodplain. If no Federal Emergency Management Agency (FEMA) floodplain maps are available for a specific area, assume a 50-foot setback from the waterbody top of bank.

3.1.3. Grading

Construction equipment will not enter the water to grade the banks. Waterbody banks will be graded only where, and as much as necessary to permit safe and efficient operation of construction equipment. Prior to or immediately after grading operations begin sediment filter devices will be installed promptly as close to the water edge as practical. All disturbed areas within 50 feet of the water's edge will be promptly mulched. The mulch will be maintained until the waterbody crossing restoration is complete. Spoil from grading will be piled at least 10 feet from the water's edge and immediately protected with sediment filter devices so as to minimize erosion into the waterbody. On waterbody crossings with approaches sloped 5 percent or greater, waterbars (Figure 19) will be installed to divert surface runoff into adjacent vegetation. If vegetation is sparse or nonexistent, a sediment filter device will be installed at the discharge of the waterbar.

Temporary equipment crossings as illustrated in Figures 21 and 22 will be installed during grading operations at all waterbodies. For proper culvert installation, the Inspector may permit grading/excavating equipment to enter the water. In-stream work, stream crossings, and earth disturbance within 50 feet of a stream requires permit authorization. Equipment bridges may not be required at minor waterbodies that do not have a state designated fishery classification (for example, agricultural or intermittent drainage ditches); however, contact the NRP Group prior to any in-stream work. If an equipment bridge is used it must be constructed in accordance with the approved permits for the site and this ECS.

3.1.4. Crossing Techniques

Stream and waterbody crossings require permit authorization from federal, state and/or county authorities. Accordingly, no stream or waterbody crossing shall occur until such permit has been issued or the NRP Group has indicated that a permit is not required.

Crossings shall utilize dry-ditch methodology, including Flumed Stream Crossing (Figure 23) or Stream Crossing with Pump Bypass (Figure 25) as outlined below.

Upland construction techniques (Figure 2) may be used for **minor waterbody** crossings without perceptible flow at the time of the crossing provided that a culvert is promptly installed to carry potential stormwater

flow across the trench area and that erosion and sediment control devices have been installed.

Whenever possible, work should be scheduled for low flow seasons. Any in-channel excavations should be done from the top of banks wherever possible unless this would require the removal of mature trees to access the channel.

Minor waterbody crossings including swales, ditches, channels, and waterways 10 feet or less in bottom width shall be flumed or pumped past the open trench at the time the crossing is made. All such bypasses shall be completed and stabilized prior to diverting flow. If there is an existing base flow or runoff at the time of the trenching, the flume shall be installed prior to trench excavation. The flume must be of sufficient size to convey normal stream flow over the open trench. Sandbags, or an equivalent measure should be used to direct flow into the flume.

If no base flow or runoff exists, the flume should be installed immediately following backfilling of the trench. In cases where the utility line installation is completed (from initial disturbance to final stabilization) within one day, no flume is required. The disturbed waterway must be re-established and stabilized as part of the final stabilization.

A minor waterbody crossing shall be completed within 24 hours (from start to finish) including the trench backfilling, stabilization of stream banks, and stabilization of the areas 50 feet back from the top of each stream bank. If it is anticipated that this requirement will not be met, the NRP Group should be contacted prior to the crossing for approval.

For **intermediate waterbodies** and streams between 10 and 100 feet in bottom width, directional boring is considered as a preferred alternative for pipeline installation. Directional boring shall be performed as presented in Figure 26, with the layout modified to suit the specific site conditions in a manner that minimizes disturbance.

If open trench methodology is required for intermediate waterbody crossings, pump bypass methodology as outlined in Figure 25 may be used. Other dry-ditch methodologies may be used with prior approval from the NRP Group. For intermediate streams or waterbodies where the above-referenced dry ditch methodologies will be adequate, the crossing, backfilling, and stabilization shall be completed within 48 hours or with prior approval from the NRP Group.

Major waterbodies or streams should not be constructed without a site specific crossing plan developed by the NRP Group in accordance with federal, state and county regulations. In-stream activities shall be completed within 72 hours. A **major waterbody** is classified as a watercourse greater than 100 feet in width.

Facilities for removing sediment from pumped water should be available at the utility line stream crossing site before trenching commences and maintained until trench backfilling is completed. Assembly areas, temporary equipment areas, and nonhazardous material storage areas should be located at least 50 feet back from the top of stream bank. Hazardous or potential polluting material storage areas should be located at least 100 feet back from the top of stream bank. All excess excavated material shall be immediately removed from the stream crossing.

Any pumped water from excavated areas must be filtered prior to discharge. The use of Pumped Water Filter Bags (Figure 11), Sediment Traps (Figure 12) or Compost Sock Sediment Traps (Figure 13) are acceptable methods if located on a relatively flat (<5% slope), well-vegetated area. The Sediment Trap or Compost Sock Sediment Trap should be constructed and maintained as presented in the respective figures. The Pumped Water Filter Bag should be designed to trap particles larger than 150 microns. The pump discharge hose shall be inserted into the bags in the manner specified by the manufacturer and securely clamped. When the bag has been filled to ½ its total capacity, it should be replaced with a new bag and properly disposed. Wherever well-vegetated areas are not available, a geotextile underlayment should be used. Consideration should be given to how the bag will be accessed and removed once it has been ½-filled with sediment.

If the dewatering activity results in discharged water directly entering a wetland or waterbody, the dewatering shall be stopped and the design of the discharge shall be changed to prevent reoccurrence.

3.1.5. Trenching

Whenever possible, in-stream work should be scheduled for low flow seasons. Normal flow should be conveyed past the work area by means of a bypass channel, pipe, pump or cofferdam. All such bypasses should be completed and stabilized prior to diverting flow.

Prior to trenching within the waterbody, water impounded in the upland trench will be pumped into a pumped water filter bag or sediment trap draining to a vegetated upland area.

Sediment filter devices for trench spoil will be installed prior to commencing trenching activities. Sediment filter devices can be temporarily removed from the trench line to allow trenching activities to proceed. Any in-channel excavations should be done from the top of banks wherever possible; however, in-stream activities may be acceptable as conditions require with agency approval. Upon completion, all channel banks should be restored and stabilized to pre-construction configurations as much as possible.

All spoil from minor and intermediate waterbody crossings shall be placed in the ROW at least 10 feet from the water's edge or in additional extra work areas. All excavated channel materials that will be subsequently

used as backfill should be placed in a temporary stockpile located outside the channel. A sediment barrier or other E&S control device should be installed between the storage pile and the stream channel.

For all new construction activities, the minimum depth of pipeline cover for all waterbody crossings is 36 inches, or as required by applicable regulatory agencies and permits.

Trench p (Figure 20) should be installed within the trench on both sides of the water body.

3.1.6. Blasting

All drilling and blasting will be done in accordance with the rules and permits issued by the overseeing regulatory agency. Areas requiring blasting to adequately cover the pipeline shall be identified to the extent practicable before construction commences. No blasting shall occur in streams or waterbodies until appropriate regulatory permits have been issued; or until the NRP Group has indicated that none are required. All required precautions will be taken to avoid injury or damage to persons, livestock, environment, or other property.

Upon issuance of a permit, if the waterbody bottom is consolidated rock, it can be drilled and shot at any time prior to commencing the crossing. However, removal of shot rock and any additional drilling, shooting and material removal must be completed within the minimum number of consecutive calendar days practical. The time frame for completing the crossing will immediately commence once a trench of appropriate dimensions is established.

3.1.7. Backfilling

If dewatering the trench is required before backfilling, pump the water into a properly installed pumped water filter bag or a sediment trap (Figures 11 and 12) or a series of compost filter socks (Figure 13). Dewater the trench in a manner that does not cause erosion and does not result in heavily silt laden water to enter the waterbody.

Waterbody bottoms will be returned as near as practical to their original contours. Spoil from the trench will be used as backfill. Blasted rock shall not be used for pipeline bedding or padding; rather, suitable material should be used to ensure the safety of the pipeline.

All disturbed areas within the existing channel should be completed and stabilized before flow is redirected into it. Suitable protection should be provided for the stream channel from any disturbed areas that have not yet achieved stabilization.

The sediment filter devices near the water line shall be promptly reinstalled after backfilling.

3.1.8. Restoration

Upon completion of the stream crossing, the waterbody, its banks, and 50-foot buffers should be stabilized immediately. In the absence of site-specific seeding recommendations, the specifications listed in Table 1 will be used. If conditions do not permit the preferred method, the construction work area not in use for access will be promptly rough graded and the waterbody banks will be temporarily stabilized with an erosion control blanket (Figure 17) until permanent stabilization can be completed.

For each waterbody crossed install a permanent waterbar (Figure 19) and a trench breaker (Figure 20) at the base of slopes near the waterbody. Locate the trench breaker immediately upslope of the waterbar.

All temporary equipment crossings will be removed once access in the area is no longer required.

Replacement of waterbody banks will be at the approximate original contour. If the waterbody banks are such that an unstable final soil grade would result and vegetative stabilization is inadequate, the Inspector will require mechanical stabilization of the waterbody banks. Mechanical stabilization includes riprap, gabions, or erosion control fabric. These stabilization methods must be pre-approved by federal, state or county agencies prior to installation. Consult with the NRP Group prior to construction.

Sediment filter devices shall be removed once permanent revegetation is successful.

3.2. WETLAND CROSSINGS

3.2.1. General

Wetland crossings require permit authorization from federal, state and/or county authorities. Accordingly, no wetland crossing shall occur until such permit has been issued or unless the NRP Group has indicated that a permit is not required. Contact the NRP Group prior to any work within or adjacent to a wetland.

The main objective of any wetland crossing is to construct the pipeline with the least amount of disturbance as possible and restore the original contour of the wetland. Wetlands will be marked in the field by a knowledgeable person prior to the start of construction. The Inspector will maintain these field markings during construction.

Mulch should not be used as a temporary erosion control measure in wetlands unless approved by the federal, state, county or local regulatory agency.

Aboveground facilities will not be located in any wetland except where the location of such facilities outside of wetlands would prohibit compliance with U.S. Department of Transportation (USDOT) regulations, or unless applicable permits are obtained by the NRP Group prior to construction.

When water levels are temporarily high, the Inspector will direct that starting construction in the wetland will be postponed until the water levels subside to a suitable level.

Guidance relating to spill prevention at wetlands is contained in Section 4, "Spill Prevention."

3.2.2. Crossing Techniques

Wetland crossings with standing water or saturated soils will be constructed as separate construction entities, as presented in Figure 27. Trenching, pipe installation, backfilling, and restoration will be completed in the minimum number of consecutive calendar days necessary. Clearing, grading and equipment crossing installations are not included as part of the separate construction entity. Pipeline installation by directional bore is the preferred method for wetland areas and shall be performed as presented in Figure 26. The "push-pull" or "float" technique of pipe installation should be utilized whenever water and other site conditions permit.

Crossing wetlands with construction equipment should be avoided wherever possible. Where that is not possible, the location of the crossing and its orientation must be selected so as to have the least possible impact upon the wetland. Temporary crossings should be constructed from materials that can be placed with a minimum disturbance to the soil surface and completely removed when no longer needed. Refer to Figure 28 for the illustration of a stable wetland crossing. Figure 27 and 29 show preferred wetland crossing methods.

Excavated topsoil (with the vegetative root mass) should be carefully removed and stockpiled separately from the subsoil (unless there is standing water or the soil is too saturated to segregate). If standing water or saturated soils are present, operate equipment on equipment mats (Figures 28 and 29) or utilize a bypass flume in conjunction with equipment mats as shown in Figure 24. Tree stumps, rock, brush, or soil imported from outside the wetland will not be used to stabilize the construction work area or used as equipment pads in wetlands. Remove all equipment pads during restoration of the wetland.

Staging areas will be located at least 50 feet from the wetland edge (unless area is a cultivated agricultural area or previously disturbed site) where topographic conditions permit and will be limited to the minimum

necessary to construct the crossing. If topographic conditions do not permit a 50-foot setback, these areas must be located at least 10 feet from the wetland's edge.

The only access roads other than the construction work area that can be used in wetlands are existing roads that require no modification and will have no impact on the wetland. Movement of vehicles across the wetland should utilize a stable wetland crossing as shown in Figure 28.

Limit construction equipment operating in wetland areas to that needed to clear the construction work area, dig the trench, fabricate and install the pipeline, backfill the trench, and restore the ROW. All other construction equipment shall use access roads located in upland areas to the maximum extent practicable. Where access roads in upland areas do not provide reasonable access, limit all other construction equipment to one pass through the wetland using the construction work area.

3.2.3. Clearing

Tree and brush clearing will be performed as previously described in Section 2, "Upland Construction". Tree clearing within wetlands should be limited to those absolutely necessary to complete construction. Cut vegetation off at ground level, leaving existing root systems in place, and remove vegetation from the wetland for disposal. Excavated topsoil with the root mass should be carefully removed and stockpiled separately from the subsoil (unless there is standing water or the soil is too saturated to segregate).

3.2.4. Grading

Grading in wetlands will consist of that necessary only for safe and efficient equipment operation. Limit pulling of tree stumps and grading activities to directly over the trenchline. Do not grade or remove stumps or root systems from the rest of the construction work area in wetlands unless the Inspector determines it necessary for safe construction.

Where wetlands are adjacent to the construction work area, install sediment barriers along the edge of the construction work area as necessary to prevent sediment flow into the wetland. These sediment filter devices shall be installed across the construction work area prior to grading or excavation activities and maintained until construction work area revegetation is complete. Temporary waterbars will be installed adjacent to wetlands. Sediment barriers shall be removed after successful construction work area restoration has been completed. Guidance for the location of these devices is shown on Figure 19.

3.2.5. Trenching

Sediment filter devices can be temporarily removed from the trench line to allow trenching activities to proceed. Spoil piles will be protected with

sediment filter devices to prevent the flow of spoil off the construction work area.

3.2.6. Blasting

All drilling and blasting will be done in accordance with the rules and permits issued by the overseeing regulatory agency. Areas requiring blasting to adequately cover the pipeline shall be identified to the extent practicable before construction commences. No blasting shall occur in wetland areas until appropriate regulatory permits have been issued; or until the NRP Group has indicated that none are required. All required precautions will be taken to avoid injury or damage to persons, livestock, environment, or other property.

During the pre-planning of crossing wetlands with standing water or saturated soils, an evaluation will be made concerning the need for blasting. If the evaluation is inconclusive, the wetland will be tested for consolidated rock prior to trenching. If the wetland has consolidated rock, it must be drilled and shot as part of the single permitted construction entity.

Upon issuance of a permit, if the wetland bottom at the desired pipeline depth is consolidated rock, it can be drilled and shot after the removal and segregation of surface material. However; removal of shot rock and any additional drilling, shooting, and material removal must be completed within the minimum number of consecutive calendar days practical. The time frame for completing the crossing will start once the removal of the surface material commences.

3.2.7. Backfilling

If trench dewatering is required, the water will be discharged through a pumped water filter bag (Figure 11), into a sediment trap (Figure 12) or into a compost sock sediment trap (Figure 13) that drains to a heavily vegetated area outside the wetland to prevent silt-laden water from entering the wetland. Spoil from the trench will be used as backfill. The surface will be restored as closely as practical to the original contours so that drainage patterns will not be changed. In wetlands without standing water or saturated soils, the conserved topsoil layer will be returned to the surface after backfilling. Sediment filter devices will be promptly installed after backfilling.

Trench breakers should be installed to prevent the trench from draining the wetland or changing its hydrology. For each wetland crossed, install a waterbar and trench breakers at the base of slopes near the boundary between the wetland and adjacent upland areas. Locate the trench breakers immediately upslope of the waterbars.

3.2.8. Restoration

Upon completion of construction in wetland areas with standing water or saturated soils, all access improvements will be promptly removed. In the absence of specific recommendations from conservation authorities, annual ryegrass at the rate of 40 lb. /acre should be applied to areas without standing water. Fertilizer, lime or mulch will not be used unless required as a permit condition. Straw mulch should be used at the rate of 3 tons per acre and without binding agents if allowed by the permitting agency.

Where stumps have been removed, woody native vegetation adapted to wetlands will be replanted (if required by the permit conditions), except within 5 feet of the pipeline centerline or appurtenances.

3.3. DIRECTIONAL BORE STREAM OR WETLAND

3.3.1. General

Directional bores of streams and wetlands require permit authorization from federal, state and/or county authorities, complete with water management and inadvertent release of drilling fluid contingency mitigation plans. Accordingly, none shall occur until such permit has been issued or the NRP Group has indicated that no permits are required.

Directional bore is considered a preferred method for stream and wetland crossings. Successful directional boring can significantly reduce impacts to the stream or wetland since it avoids the need for an open trench through these areas. The directional boring equipment should be set up on an upland site. Silt fence shall be installed between the bore entrance and exit pits and the stream or wetland to prevent any bore mud from draining into the waterbody. In areas adjacent to high quality waterbodies, or as required by a permitting agency, bore equipment shall be staged at the inspector's discretion using additional measures to prevent release of drilling mud or other pollutants into the water body. See Figure 26 for a typical directional bore layout illustration.

3.3.2. Inadvertent Release of Drilling Fluid

During the directional bore process an inadvertent release of drilling fluid may occur. An inadvertent release of drilling fluid occurs when the bore fluid seeps to the surface through cracks or voids in the soil. In the event of an inadvertent release of drilling fluid into a wetland or waterbody, the containment and corrective actions described below must be taken immediately to avoid adverse impact to the environment. The materials and equipment necessary to complete these steps must be present onsite prior to the start of drilling activities. For work in Virginia see Appendix A, Section 2.B for additional reporting requirements.

1. The source/pumps will be stopped temporarily or the pressure will be decreased;

2. The inadvertent release of drilling fluid will be contained immediately by installing straw bales or compost filter sock (do not construct earthen dikes or berms within wetland or stream areas).

3. Documentation (including date, time, weather conditions, approximate volume and photographs) must be made and provided to the NRP Group as soon as possible to ensure that agency reporting requirements are met.

4. The drilling mud will be removed from the site to the greatest extent possible by manual means such as by use of shovels, wheelbarrows and/or vacuum hoses. If these methods are unsuccessful, contact the NRP Group for your area.

5. The affected areas will be restored as closely as possible to their previous condition.

6. Any special instructions from the Project Manager or NRP Group must be followed.

7. Once the inadvertent release of drilling fluid has been contained the boring process may continue with approval from the NRP group.

4. SPILL PREVENTION, CONTAINMENT AND CONTROL

4.1. GENERAL

This Spill Prevention, Containment and Control (SPCC) Plan will be followed to help avoid spills and minimize the impact of spills which accidentally occur. Spills of any amount of petroleum products or polluting materials are to be prevented in accordance with company policies and the Contractor Health Safety and Environmental Manual (CHSEM). Applicable Safety Data Sheets (SDSs) will be included or available with the SPCC plan on site.

a. Storage of petroleum products in excess of 1320 gallons stored in aggregate in containers of 55 gallons or more, or single storage tanks with a capacity of 660 gallons or more are prohibited without coordination with the NRP Group. Adequate spill containment measures such as containment dikes with impervious lining will be installed before fuel storage tanks are filled and will be maintained throughout the Project. Bulk quantities of hazardous liquids (e.g., solvents and lubricants) will be stored at the fuel depot locations.

b. Generally, fuel will be stored at the equipment staging areas and as much equipment as practical will be refueled there. Any equipment that must be

refueled in the field will be fueled from tanks carried to the work site. Fuel carriers (greater than 110 gallons capacity) should not cross streams or wetlands unless absolutely necessary. If a stream or wetland crossing is unavoidable, fuel carriers should not cross wetlands or ford waterbodies during periods of high water or saturated soils. Equipment refueling will not be performed within 100 feet of any body of water or wetland except by hand-carried cans (5 gallon maximum capacity) when necessary. If construction equipment must be refueled within 100 feet of a waterbody, follow the procedures outlined in the project-specific SPCC Plan. Care will be taken during refueling not to overfill or spill fuel onto the housing of equipment.

c. Lesser quantities of fuel (up to 500 gallons), solvents, and lubricants (e.g., motor oils, hydraulic fluid) may be stored along the construction work area as necessary to service equipment used on the Project (quantities vary depending on the size of the construction spread being used) provided that this storage does not conflict with other parts of this plan. Sorbent booms and clean-up kits will be kept at all storage locations and will be readily available at all times.

d. All fuel storage areas will be located at least 100 feet from streams, ponds, or wetlands; at least 200 feet from active private water wells, and at least 400 feet from municipal water wells except where using an operational fuel storage area established on company property. All fuel storage areas will not be located within any designated municipal watershed area (except at locations designated for these purposes by an appropriate governmental authority). Equipment servicing, lubricating and refueling will also be in accordance with these requirements whenever possible. Where these conditions cannot be met, the Inspector will prepare a supplemental SPCC plan based on field conditions to protect these resources.

e. Use of hazardous materials for vehicle maintenance will follow the same requirements mentioned above for equipment refueling. Impervious or sorbent materials will be placed under the work area before the work begins. Additional sorbent materials will also be readily available. Waste materials created during maintenance will be collected for proper disposal. The work site and the vehicle will be checked by a company inspector after the maintenance work is complete to ensure that all hazardous materials are properly contained. All waste material, including partially used or empty containers, discarded parts, clean up rags, and used sorbent materials, as well as discarded hazardous materials containers will be collected for proper disposal.

f. All motor fuel, lube oil, chemicals, and other polluting substances will be tightly sealed and clearly labeled during transportation and storage.

g. Fuel trucks, pumps, mechanics' vehicles, the contractors' foremen's vehicles and company Inspectors' vehicles will be equipped with appropriate sized spill kits containing absorbent materials approved for petroleum products.

h. Construction equipment will not be washed in any body of water or wetland, nor will runoff resulting from washing operations be permitted to directly enter any body of water or wetland area.

i. Construction equipment, vehicles, materials, hazardous materials, chemicals, fuels, lubricating oils, and petroleum products will not be parked, stored, or serviced within 100 feet of all bodies of water or wetlands.

j. Prior to the use of any construction equipment or other vehicles on the work site, each vehicle shall be inspected to ensure that it is in sufficient working condition to minimize the threat of oil, fuel or hydraulic fluid spill/leaks to the maximum extent practicable.

k. All equipment will be checked by a company inspector daily for leaks prior to beginning work in bodies of water or wetlands. Steps will be taken to repair leaks or remove the equipment from service, if necessary.

l. Disposable personal protective equipment (2 person) and DOT labels shall be readily available.

m. Disposal of all wastes will be coordinated with NiSource Environmental personnel prior to shipment off-site.

If barge mounted equipment is to be employed, the contractor will develop specific spill-prevention plans to be reviewed and approved by the NRP Group.

4.2. SPILL CLEANUP

Spills occurring during construction or operation and maintenance are to be reported immediately in accordance with company policies and the CHSEM.

If a spill should occur, NiSource will ensure immediate action is taken to minimize the impact of the spill and see that appropriate cleanup action is immediately undertaken.

In the event of a spill into or in the vicinity of bodies of water or wetlands, the following will occur immediately:

1. the source will be immediately stopped;

2. the spill will be contained by placing sorbing booms or constructing dikes;

3. the spill will be collected with sorbing materials, skimmed off water surfaces with booms, and/or the contaminated soil will be excavated;

4. the waste materials will be properly stored and disposed of in accordance with company policy.

The affected areas will be restored as closely as possible to their previous condition.

5. ROW MAINTENANCE

Rights-of-way shall be maintained in a manner consistent with the integrity of the pipeline and operational needs.

Individual rights-of-way will be maintained in accordance with a site-specific integrated vegetation management (IVM) plan. IVM plans for new or newly restored rights-of-way will be developed in a manner that will promote the desired and/or required land coverage for a specific area.

Where applicable, NiSource's IVM program will involve the use of general use, low volume or ultra-low volume selective herbicides, which are used in a specific manner that targets undesirable vegetation along the right-of-way. Use of these herbicides within the IVM program will promote the development of a stable, native plant community, and eliminate the repeated need for mechanical methods that disturb wildlife habitat, like mowing or cutting. Initial follow up herbicide applications will normally take place within a year of the first restoration, followed by spot treatment every few years.

Deviations from any vegetation management plan, should be coordinated with the Vegetation Management Group and/or the NRP Group prior to implementation.

6. ENVIRONMENTAL CONSTRUCTION MANAGEMENT AND INSPECTION

6.1. GENERAL

The pertinent NiSource Company is responsible for compliance with the environmental conditions contained in a Project's ECP which include all permits and other approvals and or this ECS; for distribution projects, the company project manager or Inspector shall fill this role.

6.2. ENVIRONMENTAL INSPECTION

The Inspector is responsible for assuring that the construction activity is performed in accordance with the environmental conditions of the ECP or this document. At a minimum, the Inspector shall be responsible for:

a. ensuring compliance with the requirements of the ECP, ECS, and any permits obtained for the Project;

b. verifying that the limits of authorized construction work areas and locations of access roads are properly marked before clearing;

c. verifying the location of drainage and irrigation systems;

d. identifying stabilization needs in all areas;

e. locating dewatering structures and waterbars to ensure they will not direct water into residential maintained areas, known cultural resource sites, surface waters, or locations of sensitive species;

f. verifying that trench dewatering activities do not result in the deposition of sand, silt, and/or sediment near the point of discharge into a wetland or waterbody;

g. testing subsoil and topsoil in agricultural and residential areas to measure compaction and determine the need for corrective action;

h. advising the Project Manager when conditions (such as wet weather) make it advisable to restrict construction activities in agricultural areas;

i. ensuring restoration of contours and topsoil;

j. approving imported soils for use in agricultural and residential areas;

k. ensuring that temporary erosion controls are properly installed and maintained daily if necessary;

l. inspecting temporary erosion control measures at least on a daily basis in areas of active construction or equipment operation, on a weekly basis in areas with no construction or equipment operation, and within 24 hours of each 0.5-inch runoff event. This responsibility may be transferred to field operations after construction is complete but before restoration is successful;

m. ensuring the repair of all ineffective temporary erosion control measures within 24 hours of identification; and

n. maintaining written documentation of inspections required by all local, state and federal permits and records of compliance with the environmental conditions of the ECP and other applicable environmental permits during active construction and restoration. In Virginia, the Environmental Inspection Log Sheet (Appendix XI, Attachment 2) must be used.

It should be noted that there may be additional inspection requirements by certified personnel outlined in the project-specific ECP.

6.3. ENVIRONMENTAL TRAINING

The Project Coordinator assigned to the construction activity and/or the company employee in charge will be responsible for assuring that the Inspector or other inspectors and the environmental foreman have been trained in all environmental aspects of the activity and fully understand the environmental conditions contained in the activity's ECP.

6.4. ENVIRONMENTAL FOREMAN

For construction activities that utilize an outside contractor, the contractor will be required to provide at least one **environmental foreman**. For construction or operations activities completed by a company crew, each activity shall have an assigned environmental foreman.

This environmental foreman will become thoroughly familiar with the project specific ECP for the activity, and/or this ECS. The foreman shall have the appropriate training to be able to fulfill this role. The foreman will be responsible for the construction crew's efforts to correctly install and maintain environmental control devices and for construction in environmentally sensitive areas. The environmental foreman will work in cooperation with the company's employees responsible for environmental inspection and compliance.

The Contractor's Environmental Foreman can work/supervise other functions of the pipeline construction, however he/she must be available at all times during the project and have the appropriate number of available employees to adequately implement the project's ECP or this ECS.

6.5. ENVIRONMENTAL CONSTRUCTION MANAGEMENT

The Company Inspector and each functional inspector shall have the authority to stop work on a particular construction function to which they are assigned if it deviates from the environmental conditions of the activity's ECP. The deviation shall be reported immediately to the company employee in charge of the activity and the Inspector. The company employee in charge, the Project Coordinator and the NRP Group will be responsible for the resolution of the deviation.

A representative of the NRP Group may, from time to time, perform inspections of construction activities to review the implementation of the ECP. The NRP Group will have stop-work authority during these inspections should deviations from the activity's ECP occur. Any corrective actions that are required shall be taken as soon as possible.

6.6. ENVIRONMENTAL VARIANCES

Unapproved variances from an ECP and this ECS are not permitted. Any proposed variance from an ECP will require approval from the NRP Group prior to commencing the activity. The approval for a variance will be in writing. In instances where written approval is not practical (i.e., emergencies and weekends) verbal approval may be given provided that written confirmation is provided as soon as possible.

Any proposed variance from this ECS will require approval from the NRP prior to commencement of the activity.

7. EMERGENCY CONSTRUCTION

In the event of an **emergency**, the Company employee in responsible charge will take such action as is necessary to contain the emergency giving due regard to minimizing environmental impact. An emergency is defined as an immediate danger to life, health or the environment. In conjunction with other company policies, the requirements contained in this ECS will be followed as closely as possible. Emergency construction in wetland, streams or waterbodies will require the notification of the permit issuing agency; the NRP Group shall contact these agencies.

Emergency construction may trigger additional environmental and regulatory mandated surveys such as but not limited to, threatened and endangered species surveys, archaeology surveys, or wetland delineations. These surveys will be completed in the fewest number of days from the emergency determination.

8. DEFINITION OF TERMS

AGRICULTURAL LANDS: Permanent or rotated croplands, hayfields, and pastures.

BMPs: Best Management Practices

CHSEM: Contractor Health Safety and Environmental Manual

CONSTRUCTION WORK AREA: Construction work areas include permanent and temporary ROW, contractor's yards, pipe and materials storage yards, and access roads.

ECS: Environmental Construction Standards

ECP: Environmental Compliance Plan

EMERGENCY: An immediate danger to life, health or the environment.

ENVIRONMENTAL FOREMAN: The contractor or company foreman responsible for implementation of environmental compliance requirements.

ENVIRONMENTAL INSPECTOR: The Inspector responsible for environmental compliance on a construction project.

E&S: Erosion and Sediment

EXCEPTIONAL VALUE WATER(S): Generically, a stream or waterbody which constitutes an outstanding national, State, regional or local resource, such as waters of national, State or county parks or forests, or waters which are used as a source of unfiltered potable water supply, or waters of wildlife refuges or State game lands, and other waters of substantial recreational or ecological significance

FEMA: Federal Emergency Management Agency

FINAL GRADING: Includes returning the construction work area as closely as practical to its original contour, redistributing conserved topsoil, soil compaction testing in agricultural lands, and installing final interceptor diversions.

HIGH QUALITY STREAM: Surface waters having quality which exceeds levels necessary to support propagation of fish, shellfish, and wildlife; and recreation in and on the water.

IMMEDIATE: Without interval of time; "right now".

INADVERTENT RELEASE OF DRILLING FLUID: Directional bore/drill process when the bore fluid seeps to the surface through cracks or voids in the soil and enters an upland, wetland or waterbody.

INSPECTOR: Collectively: the Company Inspector, Chief Inspector, Environmental Inspector, Utility Inspector, or any other inspector assigned to do an environmental task.

INTERMITTENT WATERBODY: A waterbody channel which generally carries water in the spring or immediately after a runoff event, and is normally designated on topographic maps and environmental construction drawings with a broken line. Federal and state designations to the determination of “intermittent” vary and include taxa of three (3) or more benthic macroinvertebrates.

INTERMEDIATE WATERBODY: A waterbody greater than 10 feet wide (at normal flow depth) at the water's edge at the time of construction but less than or equal to 100 feet wide.

MAJOR WATERBODY: A waterbody greater than 100 feet wide (at normal flow depth) at the water's edge at the time of construction.

MINOR WATERBODY: A waterbody less than or equal to 10 feet wide (at normal flow depth) at the water's edge at the time of construction.

NPDES: National Pollutant Discharge Elimination System

NRCS: Natural Resource Conservation Service

NOISE SENSITIVE AREA: Includes residences, schools, churches, cemeteries, hospitals, farms, camping facilities and outdoor amphitheaters and playgrounds.

NISOURCE: This ECS refers specifically to all of NiSource’s gas distribution subsidiaries.

O&M: Operation and Maintenance activities

PERENNIAL WATERBODY: A waterbody which generally flows all year in years of normal rainfall. Waterbody level is generally lowest in the fall and highest in the spring. Perennial waterbodies are normally designated with a solid line on topographic maps and environmental construction drawings.

PROMPTLY: By the end of the work day.

RESTORATION: Includes fertilizing, liming, disking, seeding and mulching, and crimping mulch.

ROW: Right-of-way.

SCARIFY: To make shallow cuts into the soil surface. This should be accomplished with a disk, rake, tracked equipment (grousers) or other suitable means.

SDS: Safety Data Sheets

SEDIMENT FILTER DEVICE: Properly embedded silt fence or straw bales.

SPCC: Spill Prevention, Containment and Control Plan

STEEP SLOPE: Slope of 30% or greater.

TEMPORARY STABILIZATION: Includes installing temporary waterbars and sediment filter devices, mulching critical areas and at times, seeding to hold soil in place until final grading and restoration can be accomplished.

UPLAND CONSTRUCTION: All areas which are not waterbodies, streams, or wetlands.

WATERBODY: Includes any natural or artificial waterbody or drainage with perceptible flow at the time of crossing, and other permanent waterbodies such as ponds and lakes.

WETLAND: An area of special concern with soils prone to holding water for long periods of time, generally also characterized by distinctive plants such as rushes, sedges, cattails, or certain trees. Includes any area that satisfies the requirements of the current Federal methodology for identifying and delineating wetlands.

TABLES

TABLE 1
SEED MIX REQUIREMENTS FOR UPLAND ROW

Recommended Permanent Seed Mixtures Cool and Warm Season Grass

Mixture Number	Season	Species	Seeding Rate lb./ac.
1	Cool	Tall fescue*, or Fine fescue, plus Redtop, or Perennial ryegrass, plus Birdsfoot trefoil	79 46 4 19 8
2	Cool	Birdsfoot trefoil, plus Tall fescue*	8 40
3	Cool	Orchardgrass, or Smooth bromegrass, plus Birdsfoot trefoil	26 33 8
4	Warm	Flatpea, plus Tall fescue*, or Perennial ryegrass	27 26 25
5	Warm	Deertongue, plus Birdsfoot trefoil	21 8
6	Warm	Switchgrass, or Big Bluestem, plus Birdsfoot trefoil	15 15 8

Recommended Seed Mixtures for Stabilizing Disturbed Areas

Site Condition	Seed Mixture (Select One Mixture)
Cut Slopes and Fills (not mowed) Well-drained Variable drainage	 2, 4, or 6 2
Cut Slopes and Fills (mowed)	1
Cut Slopes and Fills (grazed/hay)	1, 2, or 3
Gullies and Eroded Areas	2 or 6
Erosion Control BMPs Channels, Drainage ditches, Trap embankments, etc. For hay or silage	 1 or 2 2 or 3
Right-of-way Well-drained Variable drainage Well-drained areas for grazing/hay	 4 or 6 2 2 or 3
Strip Mined Areas Spoils, waste areas, fly ash, slag, etc. (lime to soil test) For grazing/hay	 2, 4, or 5 2, 3, or 6
Lawns and Other Landscaped Areas	Use quality seed mix product to match adjacent areas

TABLE 2
SOIL AMENDMENT APPLICATION RATE EQUIVALENTS

Soil Amendment	Permanent Seeding Application Rate			Notes
	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	
Agricultural lime	6 tons	240 lb.	2,480 lb.	Or as per soil test; may not be required in agricultural fields
10-10-20 fertilizer	1,000 lb.	25 lb.	210 lb.	Or as per soil test; may not be required in agricultural fields
Temporary Seeding Application Rate				
Agricultural lime	1 ton	40 lb.	410 lb.	Typically not required for soil stockpiles
10-10-10 fertilizer	500 lb.	12.5 lb.	100 lb.	Typically not required for soil stockpiles

MULCH APPLICATION RATES

Mulch Type	Application Rate (Min.)			Notes
	Per Acre	Per 1,000 sq. ft.	Per 1,000 sq. yd.	
Straw	3 tons	140 lb.	1,240 lb.	Either wheat or oat straw, free of weeds, not chopped or finely broken
Hay	3 tons	140 lb.	1,240 lb.	Timothy, mixed clover and timothy or other native forage grasses
Wood Chips	4 – 6 tons	185 – 275 lb.	1,650 – 2,500 lb.	May prevent germination of grasses and legumes
Hydromulch	1 ton	47 lb.	415	See limitations above

TABLE 3
COMPOST SOCK FABRIC MINIMUM REQUIREMENTS

Material Type	3 mil HDPE	5 mil HDPE	5 mil HDPE	Multi-Filament Polypropylene (MFPP)	Heavy Duty Multi-Filament Polypropylene (HDMFPP)
Material Characteristics	Photo-degradable	Photo-degradable	Bio-degradable	Photo-degradable	Photo-degradable
Sock Diameters	12” 18”	12” 18” 24” 32”	12” 18” 24” 32”	12” 18” 24” 32”	12” 18” 24” 32”
Mesh Opening	3/8”	3/8”	3/8”	3/8”	1/8”
Tensile Strength		26 psi	26 psi	44 psi	202 psi
Ultraviolet Stability % Original Strength (ASTM G-155)	23% at 1000 hr.	23% at 1000 hr.		100% at 1000 hr.	100% at 1000 hr.
Minimum Functional Longevity	6 months	9 months	6 months	1 year	2 years
Two-ply systems					
Inner Containment Netting			HDPE biaxial net		
			Continuously wound		
			Fusion-welded junctures		
			¾” x ¾” Max. aperture size		
Outer Filtration Mesh			Composite Polypropylene Fabric (Woven layer and non-woven fleece mechanically fused via needle punch)		
			3/16” Max. aperture size		
Sock fabrics composed of burlap may be used on projects lasting 6 months or less.					

COMPOST STANDARDS

Organic Matter Content	25% - 100% (dry weight basis)
Organic Portion	Fibrous and elongated
pH	5.5 – 8.5
Moisture Content	30% - 60%
Particle Size	30% - 50% pass through 3/8” sieve
Soluble Salt Concentration	5.0 dS/m (mmhos/cm) Maximum

FIGURES

List of Referenced Figures	
No.	**Name**
1	Typical Upland Construction Sequence
2	Typical Construction Footprint & Soil Segregation
3	Typical Roadside Construction
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5	Drop Inlet Protection – Constructed
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7	Curb Inlet Protection – Constructed
8	Sediment Filter Device: Compost Filter Sock
9	Sediment Filter Device: Standard Silt Fence
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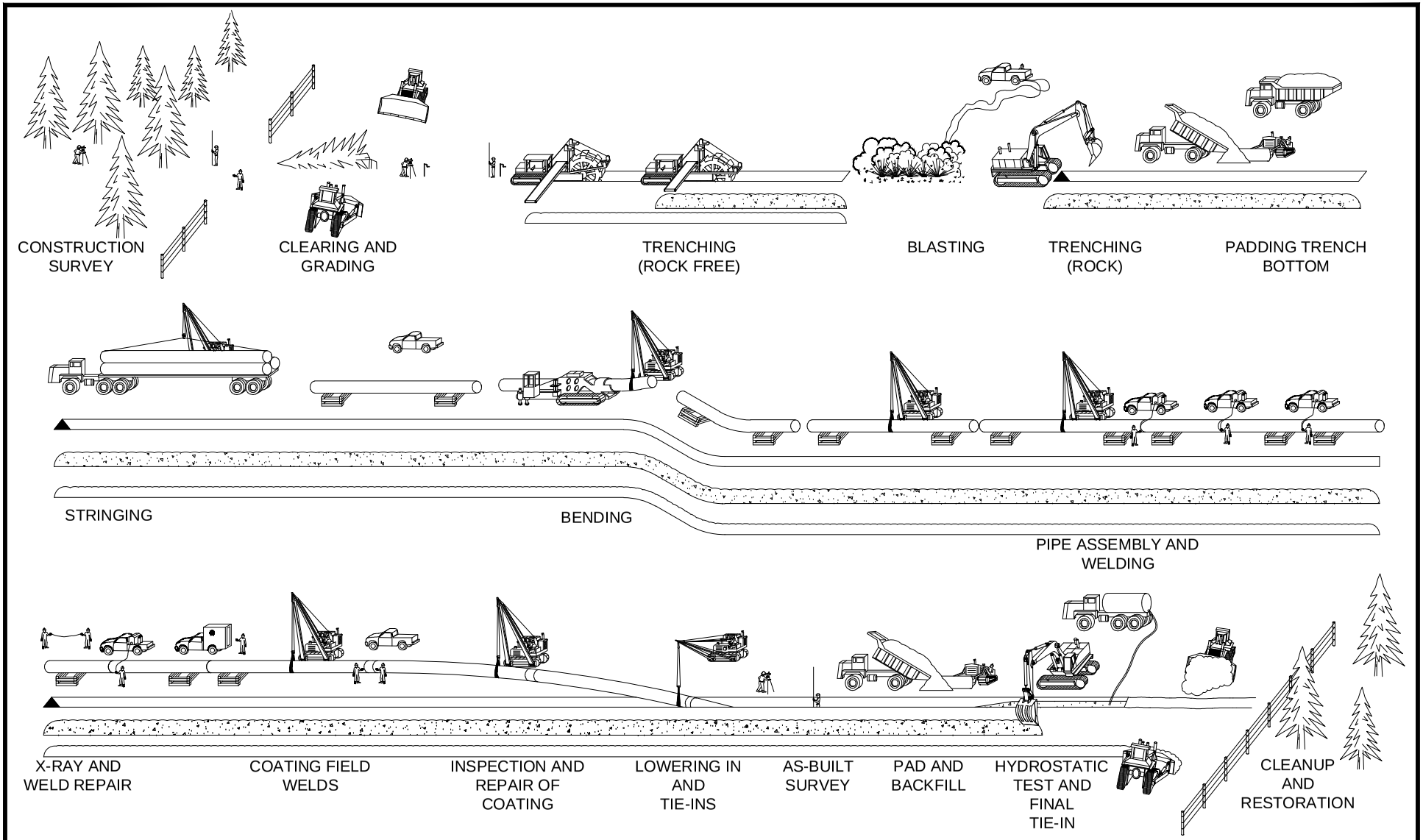
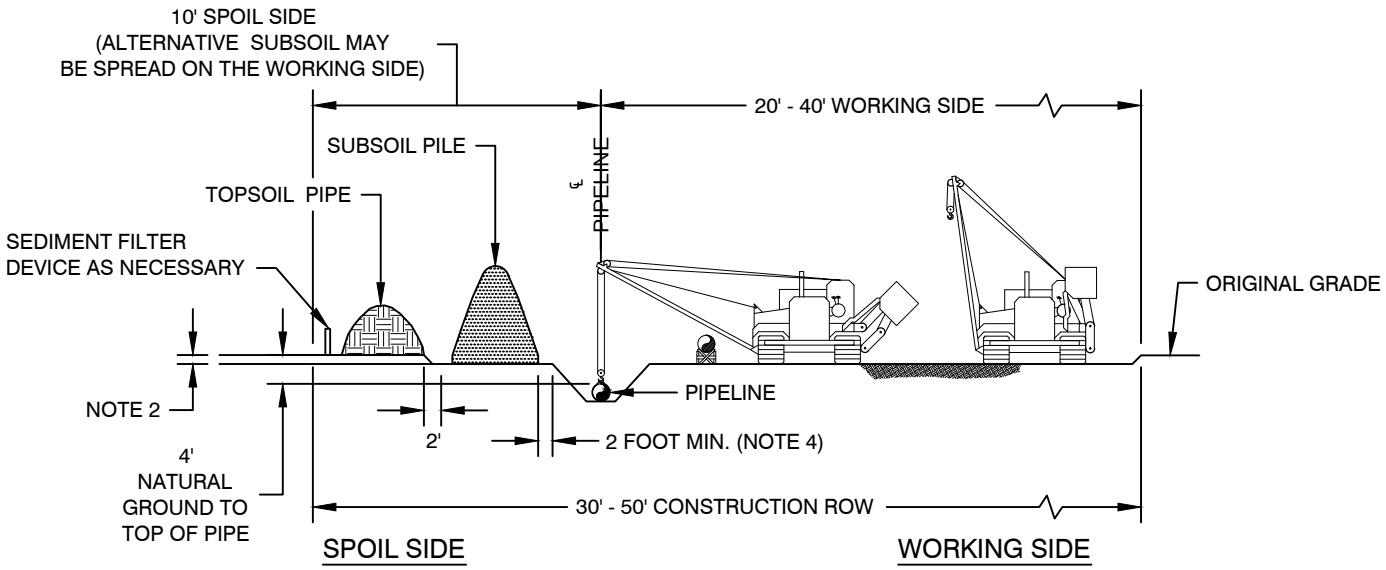
27	Typical Wetland Construction
28	Stable Wetland Crossing
29	Temporary Equipment Crossing – Wood Mat



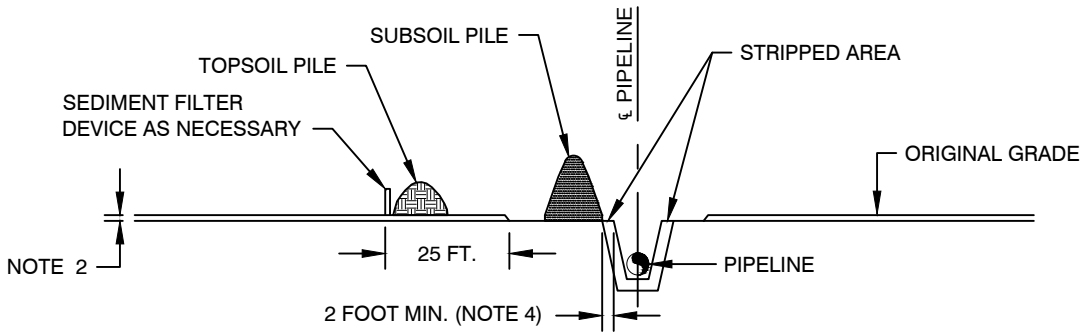
NiSource®
ENVIRONMENTAL CONSTRUCTION STANDARDS

TYPICAL PIPELINE CONSTRUCTION SEQUENCE

FIGURE-1
REVISED 5/16/2017
NOT TO SCALE



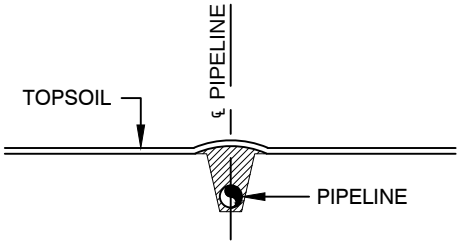
ENTIRE CONSTRUCTION ROW METHOD



NOTES:

1. IF SOIL IS SATURATED OR CONDUCIVE TO MIXING, MATTING MUST BE USED FOR VEHICULAR TRAFFIC.
2. DURING RESTORATION, ENSURE DECOMPACTION OF AREAS IMPACTED BY EQUIPMENT.

TRENCHLINE AND SPOIL SIDE METHOD



REPLACED

NOTES:

1. OTHER CONFIGURATIONS OF TOPSOIL AND SUBSOIL ARE ACCEPTABLE PROVIDED THEY ARE KEPT SEPARATE.
2. UP TO 12 INCHES OF TOPSOIL REMOVED.
3. PERIMETER SEDIMENT BARRIERS SHALL BE PLACED ALONG THE DOWNGRADIENT ROW SLOPE IF THE TRENCH IS TO REMAIN OPEN FOR LONGER THAN ONE WORKING DAY.
4. TOPSOIL AND SUBSOIL PILES WILL BE ADEQUATELY PROTECTED FROM EROSION AND SEDIMENTATION THROUGH THE USE OF TEMPORARY STABILIZATION IF THEY WILL REMAIN FOR LONGER THAN ONE DAY.
5. SPOIL SHALL BE PLACED A MINIMUM OF TWO (2) FEET FROM THE TRENCH PER 29 CFR 1926.650 (j) (2).

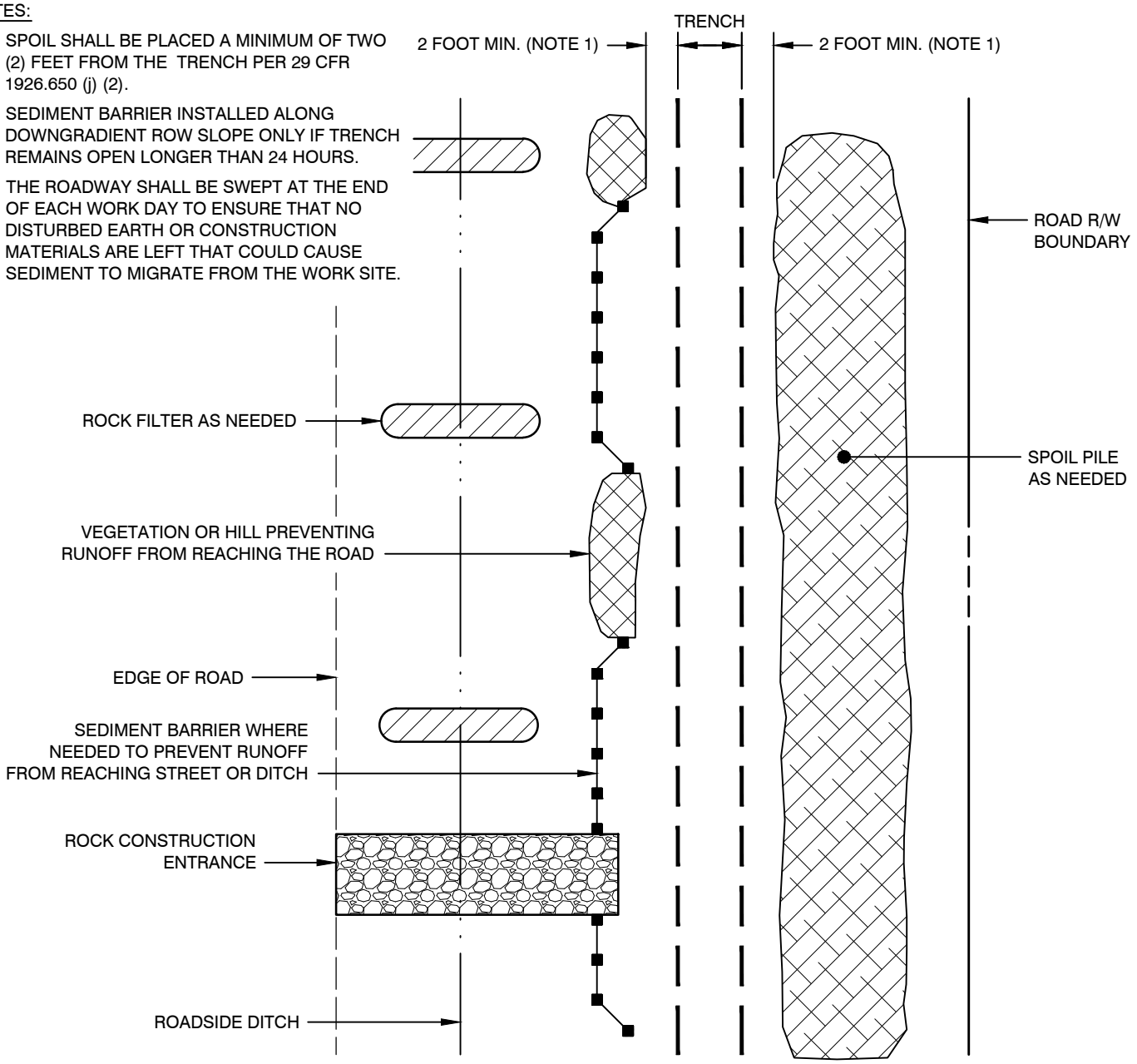
NiSource®
ENVIRONMENTAL CONSTRUCTION STANDARDS

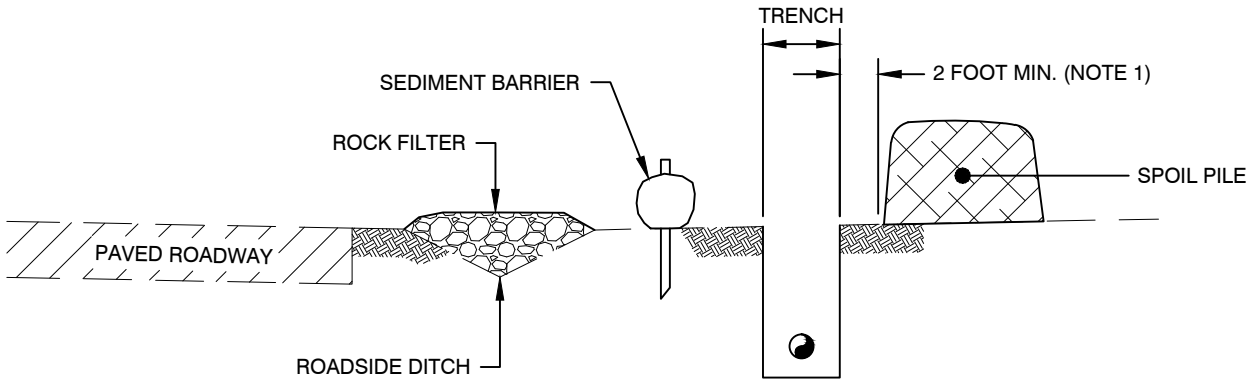
TYPICAL CONSTRUCTION
FOOTPRINT & SOIL SEGREGATION

FIGURE-2
REVISED 5/16/2017
NOT TO SCALE

NOTES:

1. SPOIL SHALL BE PLACED A MINIMUM OF TWO (2) FEET FROM THE TRENCH PER 29 CFR 1926.650 (j) (2).
2. SEDIMENT BARRIER INSTALLED ALONG DOWNGRADIENT ROW SLOPE ONLY IF TRENCH REMAINS OPEN LONGER THAN 24 HOURS.
3. THE ROADWAY SHALL BE SWEPT AT THE END OF EACH WORK DAY TO ENSURE THAT NO DISTURBED EARTH OR CONSTRUCTION MATERIALS ARE LEFT THAT COULD CAUSE SEDIMENT TO MIGRATE FROM THE WORK SITE.

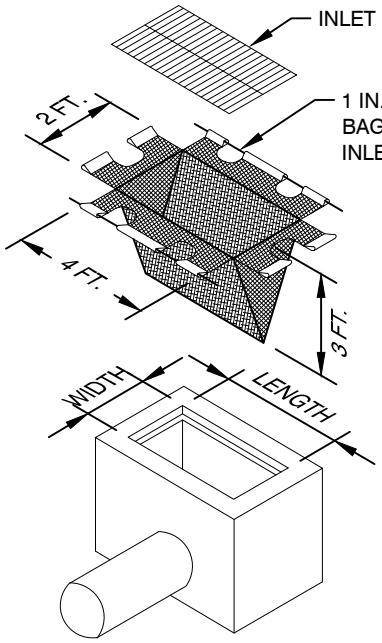




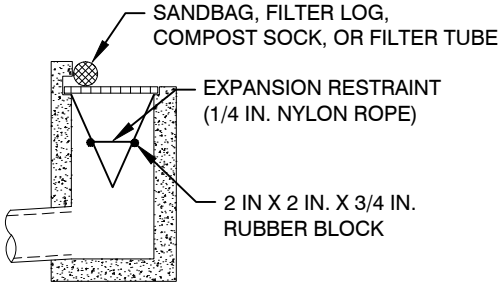
NiSource®
ENVIRONMENTAL CONSTRUCTION STANDARDS

TYPICAL ROADSIDE CONSTRUCTION

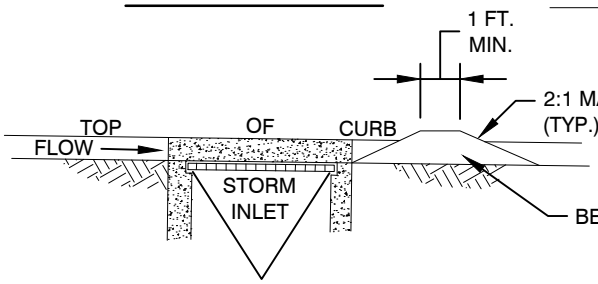
FIGURE-3
REVISED 5/16/2017
NOT TO SCALE



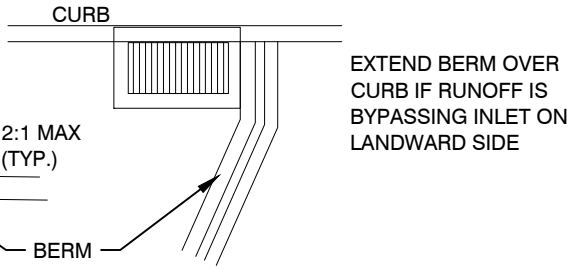
ISOMETRIC VIEW



INSTALLATION DETAIL



SECTION VIEW



PLAN VIEW

NOTES:

1. MAXIMUM DRAINAGE AREA = 1/2 ACRE.
2. INLET PROTECTION SHALL NOT BE REQUIRED FOR INLET TRIBUTARY TO SEDIMENT BASIN OR TRAP. BERMS SHALL BE REQUIRED FOR ALL INSTALLATIONS.
3. AT A MINIMUM, THE FABRIC SHALL HAVE A MINIMUM GRAB TENSILE STRENGTH OF 120 LBS., A MINIMUM BURST STRENGTH OF 200 PSI, AND A MINIMUM TRAPEZOIDAL TEAR STRENGTH OF 50 LBS. FILTER BAGS SHALL BE CAPABLE OF TRAPPING ALL PARTICLES NOT PASSING A NO. 40 SIEVE.
4. INLET FILTER BAGS SHALL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT. BAGS SHALL BE EMPTIED AND RINSED OR REPLACED WHEN HALF FULL OR WHEN FLOW CAPACITY HAS BEEN REDUCED SO AS TO CAUSE FLOODING OR BYPASSING OF THE INLET. DAMAGED OR CLOGGED BAGS SHALL BE REPLACED. A SUPPLY SHALL BE MAINTAINED ON SITE FOR REPLACEMENT OF BAGS. ALL NEEDED REPAIRS SHALL BE INITIATED IMMEDIATELY AFTER THE INSPECTION. DISPOSE OF ACCUMULATED SEDIMENT AS WELL AS ALL USED BAGS ACCORDING TO THE PLAN NOTES.
5. DO NOT USE ON MAJOR PAVED ROADWAYS WHERE PONDING MAY CAUSE TRAFFIC HAZARDS.
6. ALTERNATE PREFAB MATERIALS MAY BE USED IF MEET SIMILAR STANDARDS.

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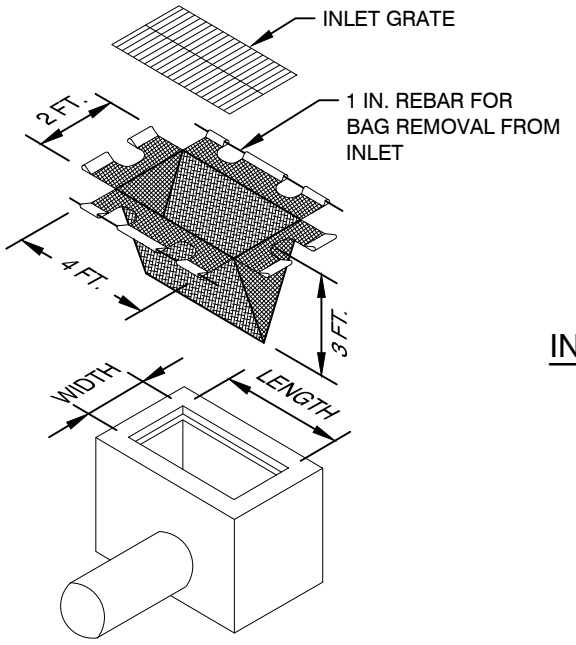
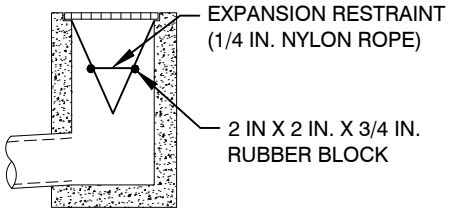
ENVIRONMENTAL CONSTRUCTION STANDARDS

DROP INLET PROTECTION
INLET TOP WITH CURB
"PRE-FABRICATED"

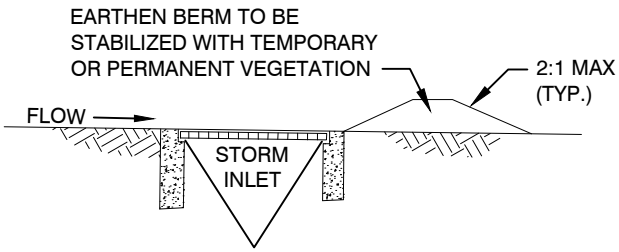
FIGURE-4
REVISED 5/16/2017
NOT TO SCALE



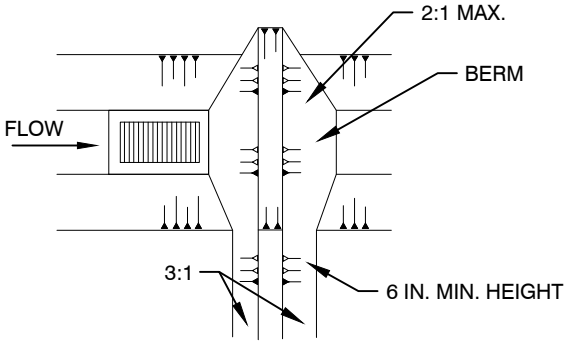
ISOMETRIC VIEW



INSTALLATION DETAIL



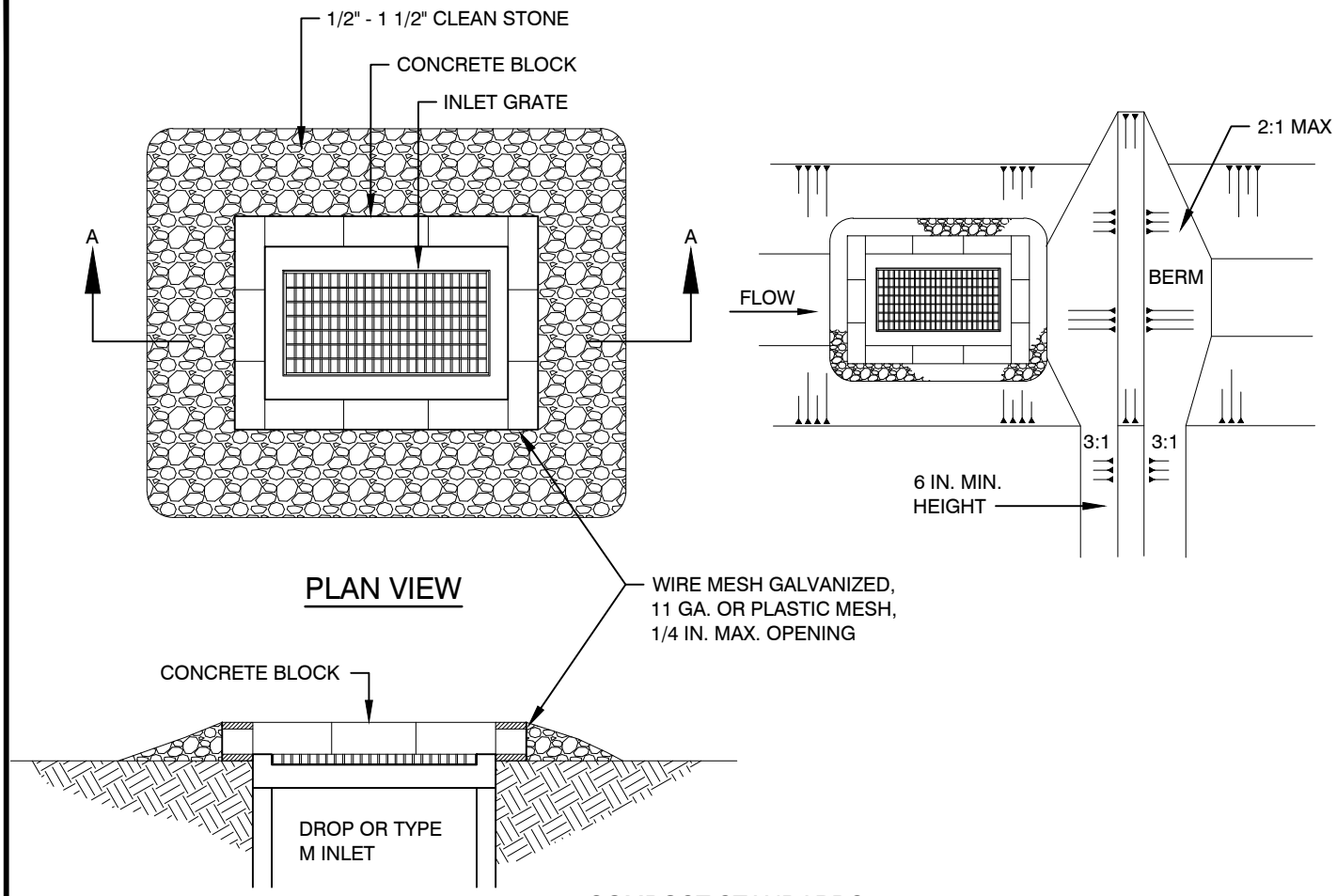
SECTION VIEW



PLAN VIEW

NOTES:

1. MAXIMUM DRAINAGE AREA = 1/2 ACRE.
2. INLET PROTECTION SHALL NOT BE REQUIRED FOR INLET TRIBUTARY TO SEDIMENT BASIN OR TRAP. BERMS SHALL BE REQUIRED FOR ALL INSTALLATIONS.
3. AT A MINIMUM, THE FABRIC SHALL HAVE A MINIMUM GRAB TENSILE STRENGTH OF 120 LBS., A MINIMUM BURST STRENGTH OF 200 PSI, AND A MINIMUM TRAPEZOIDAL TEAR STRENGTH OF 50 LBS. FILTER BAGS SHALL BE CAPABLE OF TRAPPING ALL PARTICLES NOT PASSING A NO. 40 SIEVE.
4. INLET FILTER BAGS SHALL BE INSPECTED ON A WEEKLY BASIS AND AFTER EACH RUNOFF EVENT. BAGS SHALL BE EMPTIED AND RINSED OR REPLACED WHEN HALF FULL OR WHEN FLOW CAPACITY HAS BEEN REDUCED SO AS TO CAUSE FLOODING OR BYPASSING OF THE INLET. DAMAGED OR CLOGGED BAGS SHALL BE REPLACED. A SUPPLY SHALL BE MAINTAINED ON SITE FOR REPLACEMENT OF BAGS. ALL NEEDED REPAIRS SHALL BE INITIATED IMMEDIATELY AFTER THE INSPECTION. DISPOSE ACCUMULATED SEDIMENT AS WELL AS ALL USED BAGS ACCORDING TO THE PLAN NOTES.
5. DO NOT USE ON MAJOR PAVED ROADWAYS WHERE PONDING MAY CAUSE TRAFFIC HAZARDS.
6. ALTERNATE PREFABRICATED MATERIALS MAY BE USED IF THEY MEET SIMILAR STANDARDS.

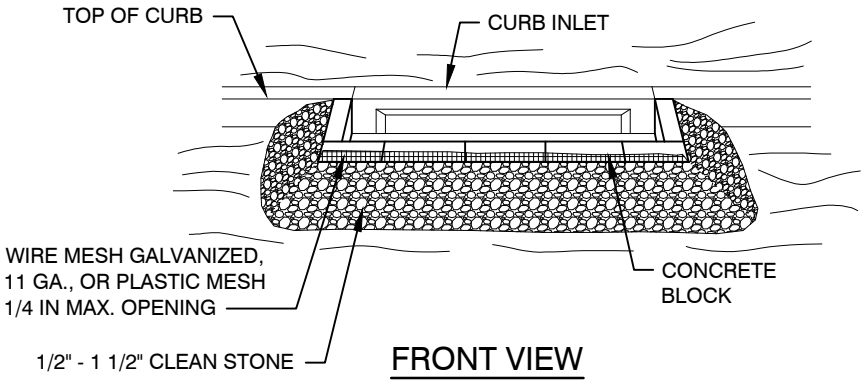


COMPOST STANDARDS

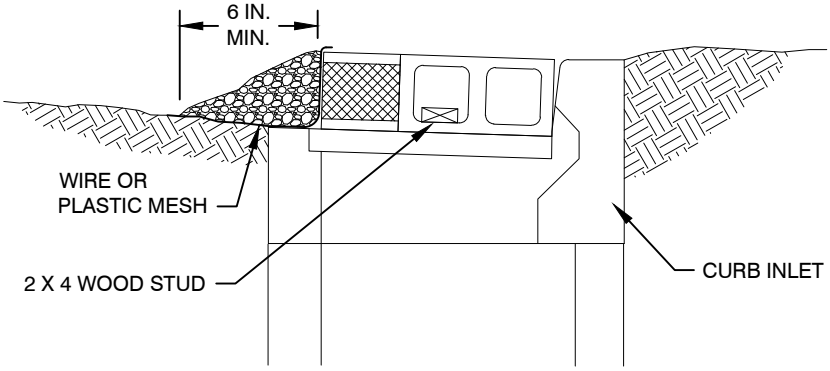
ORGANIC MATTER CONTENT	80% - 100% (DRY WEIGHT BASIS)
ORGANIC PORTION	FABROUS AND ELONGATED
pH	5.5 - 8.0
MOISTURE CONTENT	35% - 55%
PARTICLE SIZE	98% PASS THROUGH 1" SCREEN
SOLUBLE SALT CONCENTRATION	5.0 dS/m (mmhos/cm) MAXIMUM

NOTES:

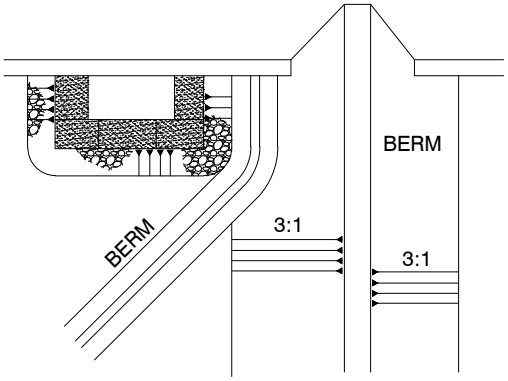
1. MAXIMUM DRAINAGE AREA =1 ACRE.
2. INLET PROTECTION SHALL NOT BE REQUIRED FOR INLET TRIBUTARY TO SEDIMENT BASIN OR TRAP. BERMS SHALL BE REQUIRED FOR ALL INSTALLATIONS NOT LOCATED AT A LOW POINT.
3. TOP OF BLOCK SHALL BE AT LEAST 6 INCHES BELOW ADJACENT ROADS IF PONDED WATER WOULD POSE A SAFETY HAZARD TO TRAFFIC.
4. SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE HEIGHT OF THE STONE. DAMAGED OR CLOGGED INSTALLATIONS SHALL BE REPAIRED OR REPLACED IMMEDIATELY.
5. FOR SYSTEMS DISCHARGING TO HQ OR EV SURFACE WATER, A 6-INCH THICK COMPOST LAYER SHALL BE SECURELY ANCHORED ON OUTSIDE AND OVER TOP OF STONE. COMPOST SHALL MEET THE STANDARDS IN THE "COMPOST STANDARDS" TABLE ABOVE.
6. IF CONDITIONS WARRANT, ALTERNATE METHOD/ MATERIALS MAY BE USED PER STATE REQUIREMENTS.



FRONT VIEW



SECTION VIEW



PLAN VIEW

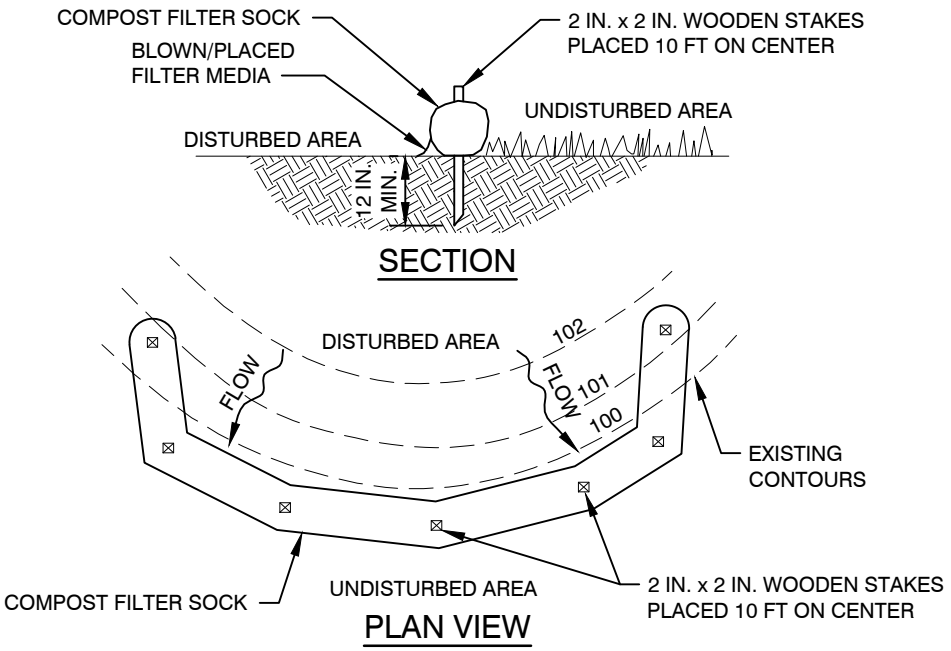
NOTES:

1. MAXIMUM DRAINAGE AREA = 1 ACRE.
2. INLET PROTECTION SHALL NOT BE REQUIRED FOR INLET TRIBUTARY TO SEDIMENT BASIN OR TRAP. BERMS SHALL BE REQUIRED FOR ALL INSTALLATIONS.
3. SEDIMENT SHALL BE REMOVED WHEN IT REACHES HALF THE HEIGHT OF THE STONE. DAMAGED OR CLOGGED INSTALLATIONS SHALL BE REPAIRED OR REPLACED IMMEDIATELY.
4. FOR SYSTEMS DISCHARGING TO HQ OR EV SURFACE WATER, A 6-INCH THICK COMPOST LAYER SHALL BE SECURELY ANCHORED ON OUTSIDE AND OVER TOP OF STONE.
5. DO NOT USE ON MAJOR PAVED ROADWAYS WHERE PONDING MAY CAUSE TRAFFIC HAZARDS.
6. IF CONDITIONS WARRANT, ALTERNATE METHOD/ MATERIALS MAY BE USED PER STATE REQUIREMENTS, OR PREFABRICATED MATERIALS MAY BE USED PER THE MANUFACTURERES RECOMMENDATIONS.

MSource®
ENVIRONMENTAL CONSTRUCTION STANDARDS

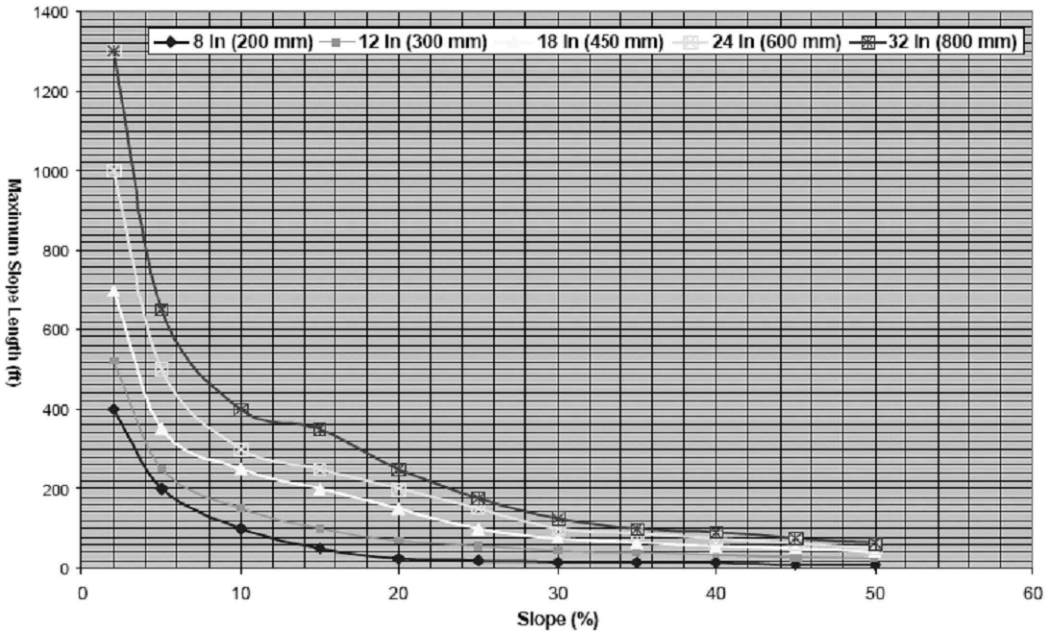
CURB INLET PROTECTION
"CONSTRUCTED"

FIGURE-7
REVISED 5/16/2017
NOT TO SCALE



NOTES:

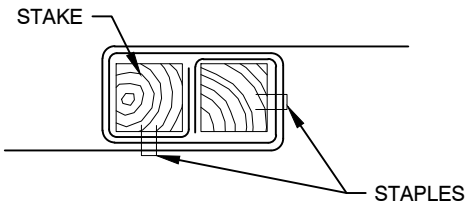
1. COMPOST FILTER SOCK SHALL BE PLACED AT EXISTING LEVEL GRADE. BOTH ENDS OF THE BARRIER SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT. MAXIMUM SLOPE LENGTH ABOVE ANY BARRIER SHALL NOT EXCEED THAT SHOWN IN THE SIZING CHART BELOW.
2. TRAFFIC SHALL NOT BE PERMITTED TO CROSS COMPOST FILTER SOCKS.
3. SOCK PLACED ON EARTHEN SLOPES SHALL BE ANCHORED WITH STAKES DRIVEN THROUGH THE CENTER OF THE SOCK OR IMMEDIATELY DOWNSLOPE OF THE SOCK AT RECOMMENDED INTERVALS.
4. ACCUMULATED SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/2 THE ABOVE GROUND HEIGHT OF THE BARRIER AND DISPOSED AT AN APPROPRIATE LOCATION. SOCKS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. DAMAGED SOCKS SHALL BE REPAIRED ACCORDING TO MANUFACTURER 'S SPECIFICATIONS OR REPLACED WITHIN 24 HOURS OF INSPECTION.
5. UPON STABILIZATION OF THE AREA TRIBUTARY TO THE SOCK, STAKES SHALL BE REMOVED. THE SOCK MAY BE LEFT IN PLACE AND VEGETATED OR REMOVED. IN THE LATTER CASE, THE MESH SHALL BE CUT OPEN AND THE MULCH SPREAD AS A SOIL SUPPLEMENT.



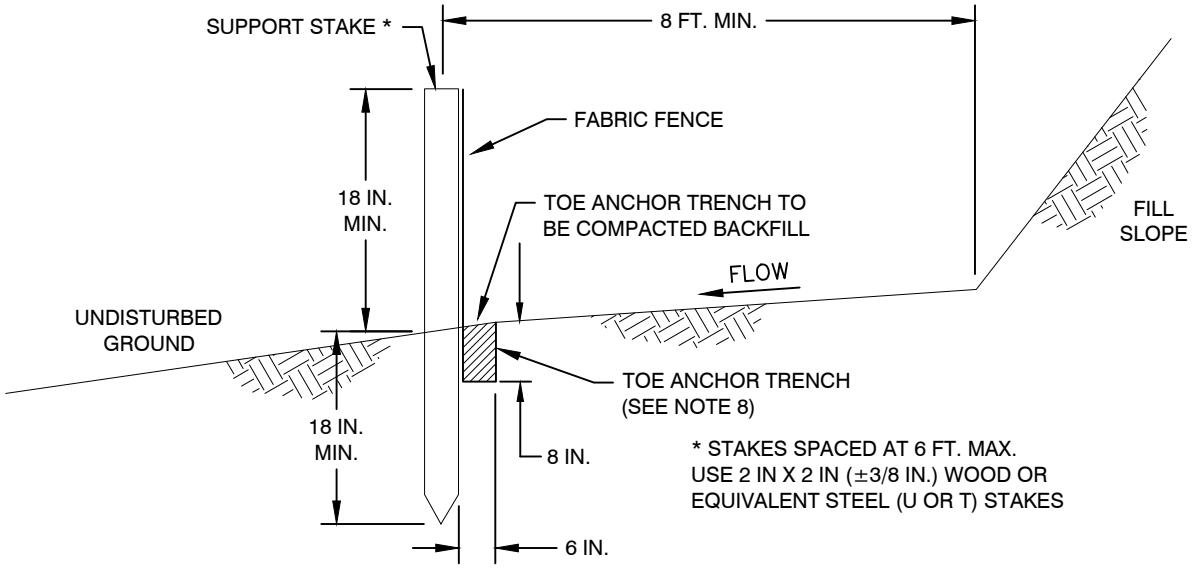
MnSource
ENVIRONMENTAL CONSTRUCTION STANDARDS

SEDIMENT FILTER DEVICE:
COMPOST FILTER SOCK

FIGURE-8
REVISED 5/16/2017
NOT TO SCALE



JOINING FENCE SECTIONS



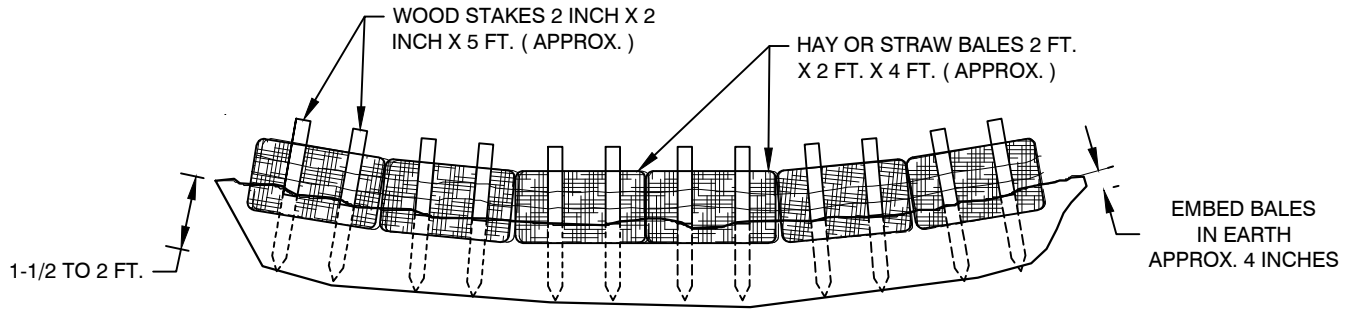
SECTION VIEW

MAXIMUM SLOPE LENGTH FOR SILT FENCE

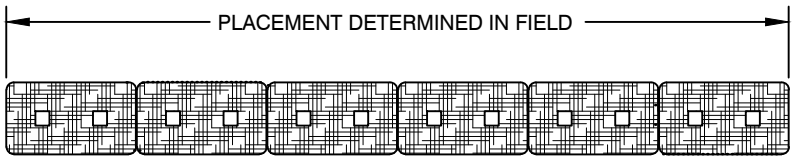
SLOPE - PERCENT	MAXIMUM SLOPE LENGTH (FT.) ABOVE FENCE
	STANDARD (18" HIGH) SILT FENCE
2 (OR LESS)	100
5 - 10	50
10 - 20	25
20 - 40	15
40 - 50	10

NOTES:

1. FABRIC SHALL HAVE THE MINIMUM PROPERTIES AS REQUIRED BY STATE SPECIFIC SPECIFICATIONS. FABRIC SHALL BE IN USE NO LONGER THAN THE MANUFACTURERS RECOMMENDED LIFE SPAN AND SHALL BE REPLACED WITH NEW FABRIC AFTER THE LIFE SPAN HAS BEEN EXCEEDED.
2. FABRIC WIDTH SHALL BE 30 IN. MINIMUM. STAKES SHALL BE HARDWOOD OR EQUIVALENT STEEL (U OR T) STAKES.
3. SILT FENCE SHALL BE PLACED AT LEVEL EXISTING GRADE. BOTH ENDS OF THE FENCE SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN FENCE ALIGNMENT.
4. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH HALF THE ABOVE GROUND HEIGHT OF THE FENCE.
5. ANY SECTION OF SILT FENCE WHICH HAS BEEN UNDERMINED OR TOPPED SHALL BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET (FIGURE 18).
6. FENCE SHALL BE REMOVED AND PROPERLY DISPOSED OF WHEN TRIBUTARY AREA IS PERMANENTLY STABILIZED.
7. SILT FENCE THAT HAS BECOME CLOGGED WITH SEDIMENT AND CAN NO LONGER BE CLEANED SHALL BE REPLACED.
8. TOE ANCHOR TRENCH MEASUREMENTS MAY BE REDUCED IN STATE SPECIFIC INSTANCES:
   VIRGINIA = 4" VERT. x 4" HORZ.
   PENNSYLVANIA & KENTUCKY = 6" VERT. x 6" HORZ.
   INDIANA = 8" VERT. x 4" HORZ.
   OHIO, MASSACHUSETTS & MARYLAND = 8" VERT.



SIDE VIEW



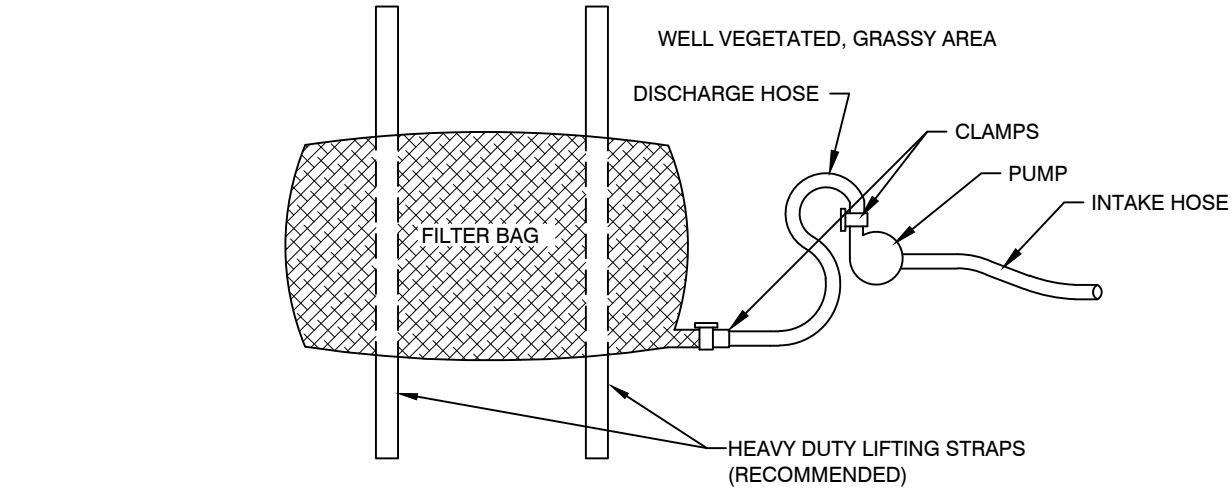
PLAN VIEW

MAXIMUM SLOPE LENGTH FOR STRAW BALE BARRIERS AND WOOD CHIP FILTER BERMS

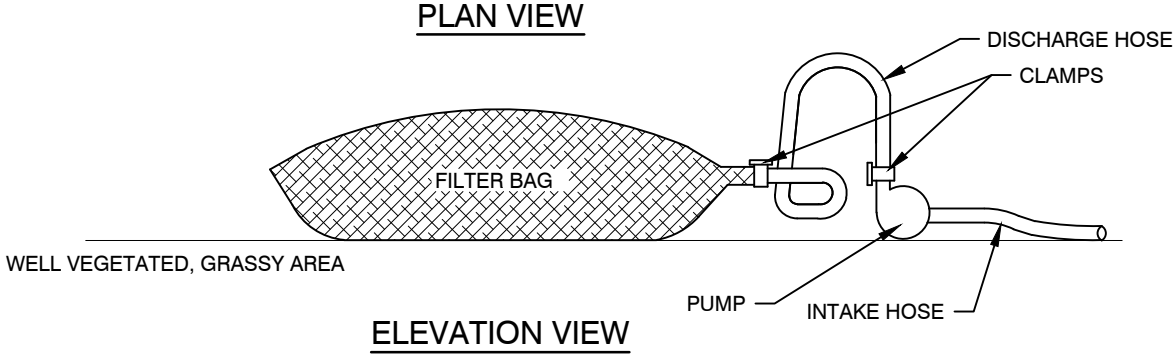
SLOPE - PERCENT	MAXIMUM SLOPE LENGTH (FT.) ABOVE BARRIER
2 (OR LESS)	150
5	100
10	50
15	35
20	25
25	20
30	15
35	15
40	15
45	10
>50	NOT PERMITTED

NOTES:

1. STRAW BALE BARRIERS SHALL NOT BE USED FOR PROJECTS EXTENDING MORE THAN 3 MONTHS.
2. STRAW BALE BARRIERS SHALL BE PLACED AT EXISTING LEVEL GRADE WITH ENDS TIGHTLY ABUTTING THE ADJACENT BALES. FIRST STAKE OF EACH BALE SHALL BE ANGLED TOWARD ADJACENT BALE TO DRAW BALES TOGETHER. STAKES SHALL BE DRIVEN FLUSH WITH THE TOP OF THE BALE. BOTH ENDS OF THE BARRIER SHALL BE EXTENDED AT LEAST 8 FEET UP SLOPE AT 45 DEGREES TO THE MAIN BARRIER ALIGNMENT.
3. COMPACTED BACKFILL SHALL EXTEND APPROXIMATELY 4 INCHES ABOVE GROUND LEVEL.
4. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH 1/3 THE ABOVEGROUND HEIGHT OF THE BARRIER. DAMAGED OR DETERIORATED BALES SHALL BE REPLACED IMMEDIATELY UPON INSPECTION.
5. ANY SECTION OF STRAW BALE BARRIER WHICH HAS BEEN UNDERMINED OR TOPPED SHALL BE IMMEDIATELY REPLACED WITH A ROCK FILTER OUTLET.
6. BALES SHALL BE REMOVED AND PROPERLY DISPOSED OF WHEN AREA IS PERMANENTLY STABILIZED.



PLAN VIEW



ELEVATION VIEW

NOTES:

1. LOW VOLUME FILTER BAGS SHALL BE MADE FROM NON-WOVEN GEOTEXTILE MATERIAL SEWN WITH HIGH STRENGTH, DOUBLE STITCHED "J" TYPE SEAMS. THEY SHALL BE CAPABLE OF TRAPPING PARTICLES LARGER THAN 150 MICRONS. FILTER BAGS SHALL BE PROPERLY SIZED; REFER TO THE MANUFACTURER SPECIFICATIONS TO DETERMINE APPROPRIATE SIZE.

2. A SUITABLE MEANS OF ACCESSING THE BAG WITH MACHINERY REQUIRED FOR DISPOSAL PURPOSES SHALL BE PROVIDED. FILTER BAGS SHALL BE REPLACED WHEN THEY BECOME 1/2 FULL OF SEDIMENT. SPARE BAGS SHALL BE KEPT AVAILABLE FOR REPLACEMENT OF THOSE THAT HAVE FAILED OR ARE FILLED. BAGS SHALL BE PLACED ON STRAPS TO FACILITATE REMOVAL UNLESS BAGS COME WITH LIFTING STRAPS ALREADY ATTACHED.

3. BAGS SHALL BE LOCATED IN WELL-VEGETATED (GRASSY) AREA, AND DISCHARGE ONTO STABLE, EROSION RESISTANT AREAS. WHERE THIS IS NOT POSSIBLE, A GEOTEXTILE UNDERLAYMENT AND FLOW PATH OR SECONDARY CONTAINMENT SHALL BE PROVIDED. BAGS MAY BE PLACED ON FILTER STONE TO INCREASE DISCHARGE CAPACITY. BAGS SHALL NOT BE PLACED ON SLOPES GREATER THAN 5%. FOR SLOPES EXCEEDING 5%, CLEAN ROCK OR OTHER NON-ERODIBLE AND NON-POLLUTING MATERIAL MAY BE PLACED UNDER THE BAG TO REDUCE SLOPE STEEPNESS.

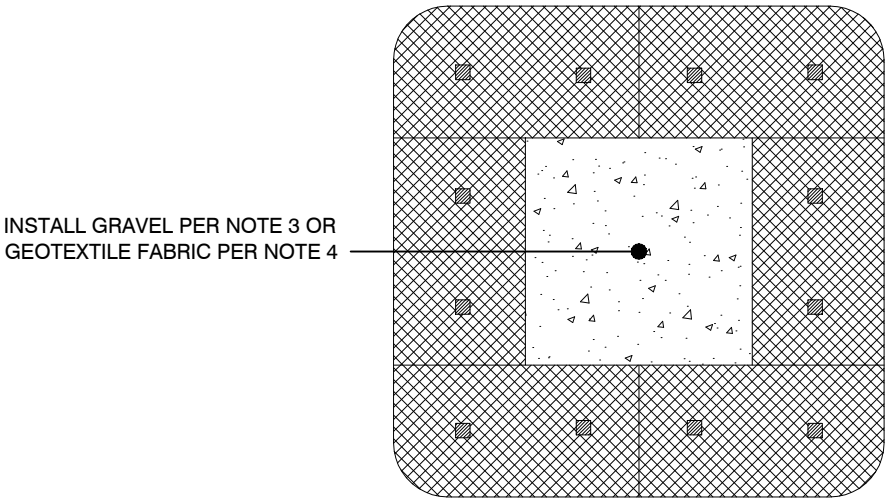
4. NO DOWNSLOPE SEDIMENT BARRIER IS REQUIRED FOR MOST INSTALLATIONS. COMPOST BERM OR COMPOST FILTER SOCK SHALL BE INSTALLED BELOW BAGS LOCATED IN HQ OR EV WATERSHEDS, WITHIN 50 FEET OF ANY RECEIVING SURFACE WATER OR WHERE GRASSY AREA IS NOT AVAILABLE.

5. THE PUMP DISCHARGE HOSE SHALL BE INSERTED INTO THE BAGS IN THE MANNER SPECIFIED BY THE MANUFACTURER AND SECURELY CLAMPED. A PIECE OF PVC PIPE IS RECOMMENDED FOR THIS PURPOSE.

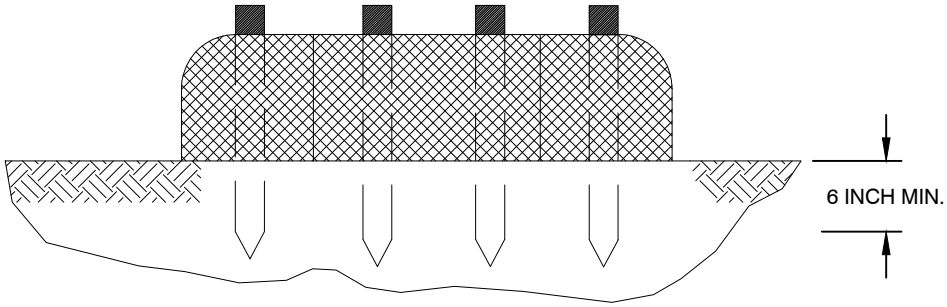
6. THE PUMPING RATE SHALL BE NO GREATER THAN 750 GPM OR 1/2 THE MAXIMUM SPECIFIED BY THE MANUFACTURER, WHICHEVER IS LESS. PUMP INTAKES SHALL BE FLOATING AND SCREENED.

7. FILTER BAGS SHALL BE INSPECTED DAILY. IF ANY PROBLEM IS DETECTED, PUMPING SHALL CEASE IMMEDIATELY AND NOT RESUME UNTIL THE PROBLEM IS CORRECTED.

NiSource ENVIRONMENTAL CONSTRUCTION STANDARDS	DEWATERING DEVICE: PUMPED WATER FILTER BAG	FIGURE-11 REVISED 5/16/2017 NOT TO SCALE



PLAN VIEW



SIDE VIEW

NOTES:

1. INSTALL BALES AS SHOWN. IF ADDITIONAL STORAGE VOLUME IS NECESSARY, SECURE ADDITIONAL BALES ON TOP OF INITIAL BOTTOM LAYER AND/OR BY INCREASING THE NUMBER BALES IN BOTTOM LAYER.

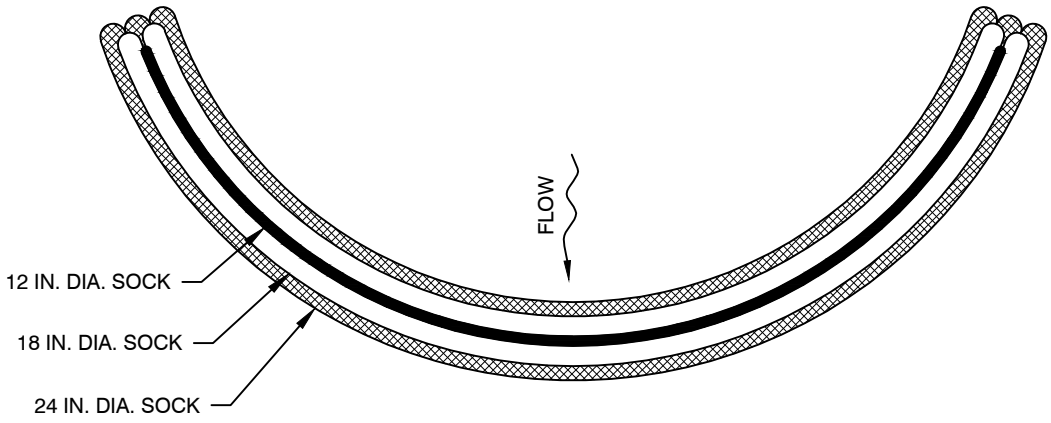
2. SECURE EACH BALE & EACH LAYER OF BALES USING EITHER TWO REBARS OR TWO WOODEN STAKES PER BALE.

3. PLACE A 5 TO 6 INCH DEEP LAYER OF 3/4 TO 1.0 INCH CLEAN STONE ON GROUND COVER INSIDE BALES.

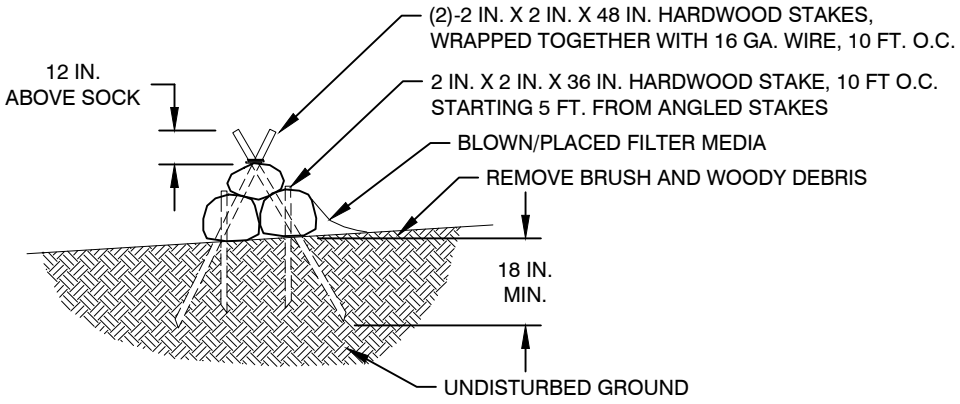
4. LINE TRAP WITH GEOTEXTILE FABRIC AND SECURE OVER HAY BALES USING STAKES.

5. THE SEDIMENT TRAP WILL NOT BE GREATER THAN TWO BALES IN HEIGHT FOR SIX-BALE BOTTOM CONSTRUCTION WITHOUT ADDITIONAL REINFORCEMENT OF TRAP WALLS.

6. CONSTRUCT DEWATERING STRUCTURE TO ACCOMODATE ANTICIPATED PUMPING RATES:
   EXAMPLE PUMPING RATE = 200 G.P.M.
   STORAGE VOLUME (C.F.) = 16 x 200 G.P.M. = 3,200 C.F.
   HEIGHT OF STRAW BALES STRUCTURE = 3 FEET (2 BALES STACKED)
   INSIDE DIMENSIONS OF STURCURE = 33 x 33 FEET SQUARE



PLAN VIEW



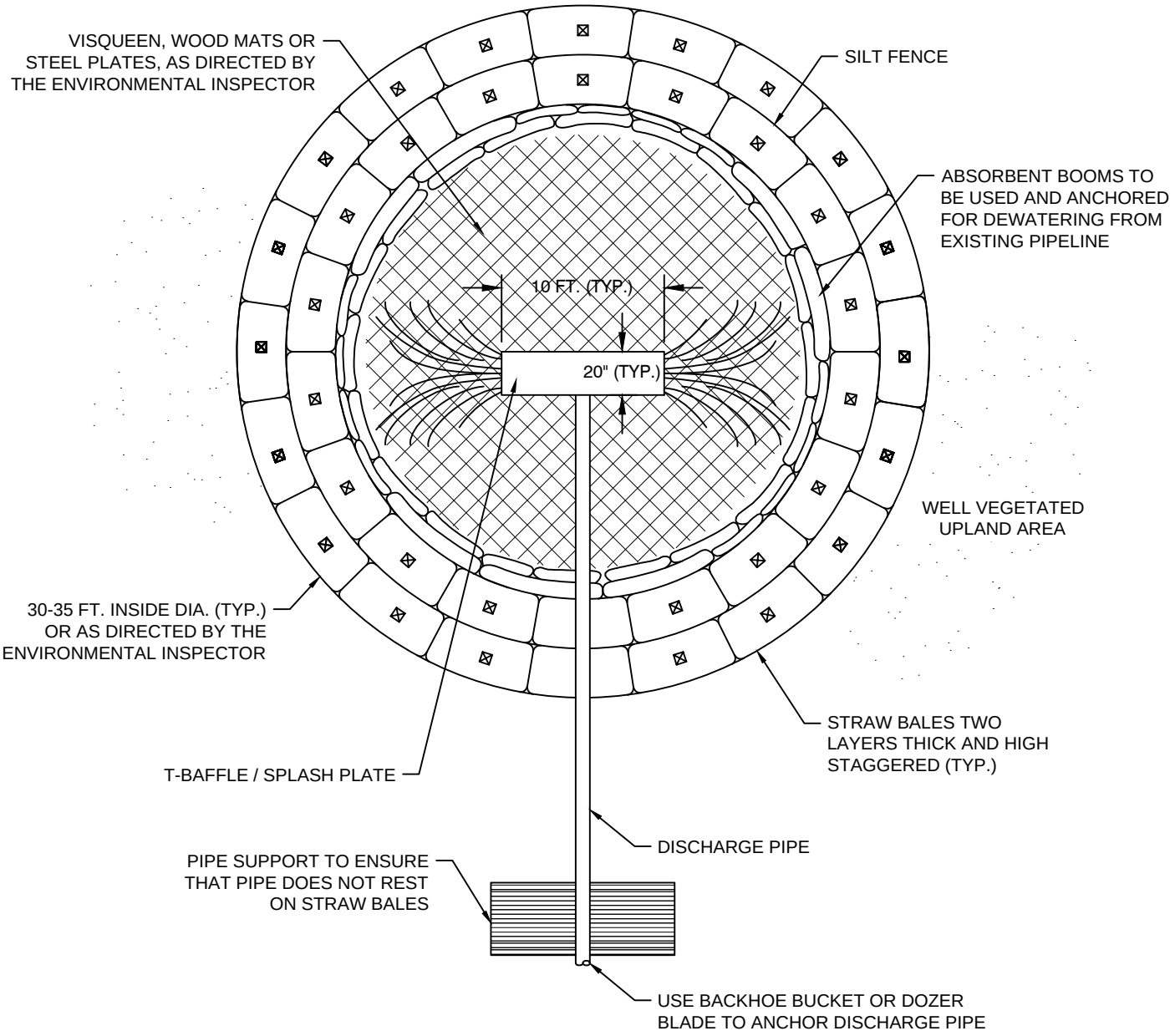
STAKING DETAIL

DESIGN NOTES:

1. COMPOST SOCK SEDIMENT TRAP SHALL BE SIZED TO PROVIDE 2000 CUBIC FEET OF STORAGE CAPACITY FOR EACH ACRE TRIBUTARY TO THE TRAP.
2. MINIMUM BASE WIDTH IS EQUAL TO THE HEIGHT.
3. SEDIMENT ACCUMULATION SHALL NOT EXCEED 1/3 THE TOTAL HEIGHT OF THE TRAP.
4. SOCKS SHALL BE OF LARGER DIAMETER AT THE BASE OF THE TRAP AND DECREASE IN DIAMETER FOR SUCCESSIVE LAYERS AS SHOWN ON THE PLAN VIEW.
5. ENDS OF THE TRAP SHALL BE A MINIMUM OF 1 FOOT HIGHER IN ELEVATION THAN THE MID-SECTION, WHICH SHALL BE LOCATED AT THE POINT OF DISCHARGE.

NOTES:

1. COMPOST SOCK SEDIMENT TRAPS SHALL NOT EXCEED THREE SOCKS IN HEIGHT AND SHALL BE STACKED IN PYRAMIDAL FORM AS SHOWN ABOVE. MINIMUM TRAP HEIGHT IS ONE 24" DIAMETER SOCK. ADDITIONAL STORAGE MAY BE PROVIDED BY MEANS OF AN EXCAVATED SUMP 12" DEEP EXTENDING 1 TO 3 FEET UPSLOPE OF THE SOCKS ALONG THE LOWER SIDE OF THE TRAP.
2. COMPOST SOCK SEDIMENT TRAPS SHALL PROVIDE 2,000 CUBIC FEET STORAGE CAPACITY WITH 12" FREEBOARD FOR EACH TRIBUTARY DRAINAGE ACRE. (SEE MANUFACTURER FOR ANTICIPATED SETTLEMENT.)
3. THE MAXIMUM TRIBUTARY DRAINAGE AREA IS 5.0 ACRES. SINCE COMPOST SOCKS ARE "FLOW-THROUGH," NO SPILLWAY IS REQUIRED.
4. COMPOST SOCK SEDIMENT TRAPS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT. SEDIMENT SHALL BE REMOVED WHEN IT REACHES 1/3 THE HEIGHT OF THE SOCKS.
5. PHOTODEGRADABLE AND BIODEGRADABLE SOCKS SHALL NOT BE USED FOR MORE THAN 1 YEAR.



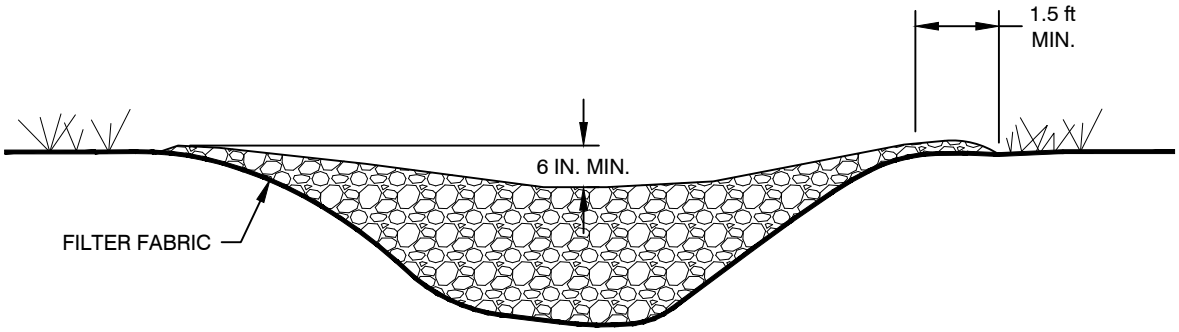
TOP VIEW

NOTE:
THE SHAPE AND CONFIGURATION CAN BE MODIFIED WITH COORDINATION WITH NATURAL RESOURCES PERMITTING COORDINATOR.

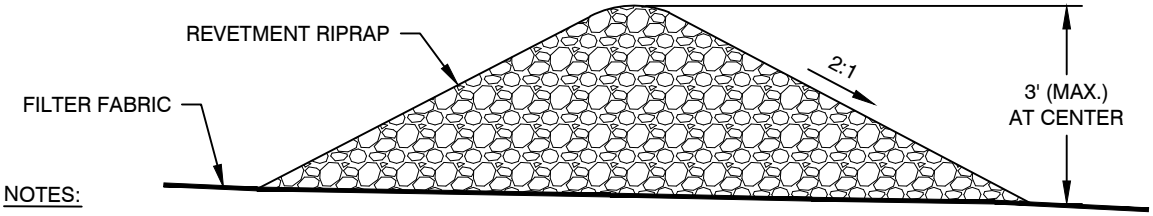
NiSource®
ENVIRONMENTAL CONSTRUCTION STANDARDS

TYPICAL
DEWATERING STRUCTURE
FOR HYDROSTATIC TESTING

FIGURE-14
REVISED 5/16/2017
NOT TO SCALE



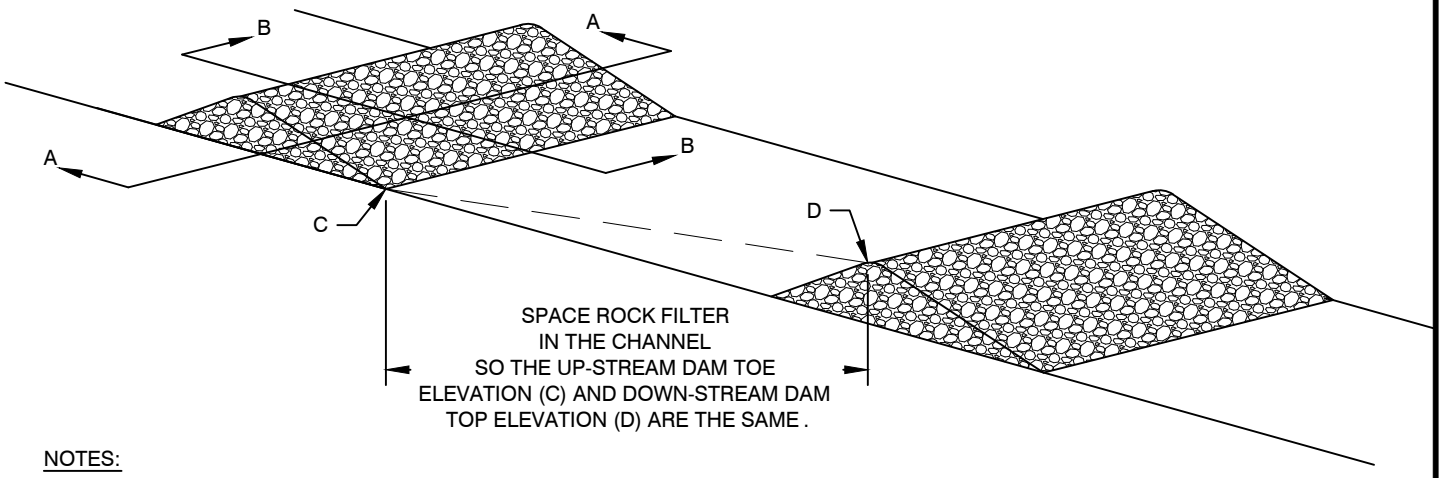
SECTION A-A



NOTES:

1. CONTRIBUTING DRAINAGE AREA: 2 ACRES MAXIMUM. DAM CENTER: 3 FT. MAXIMUM HEIGHT BUT AT LEAST 6 IN. LOWER THAN THE OUTER EDGES AT NATURAL GROUND ELEVATION.
2. DAM SIDE SLOPE: 2:1 OR FLATTER.
3. DISTANCE BETWEEN DAMS: SPACED SO THE TOE OF THE UPSTREAM DAM IS THE SAME AS ELEVATION AS THE TOP OF THE DOWNSTREAM DAM.

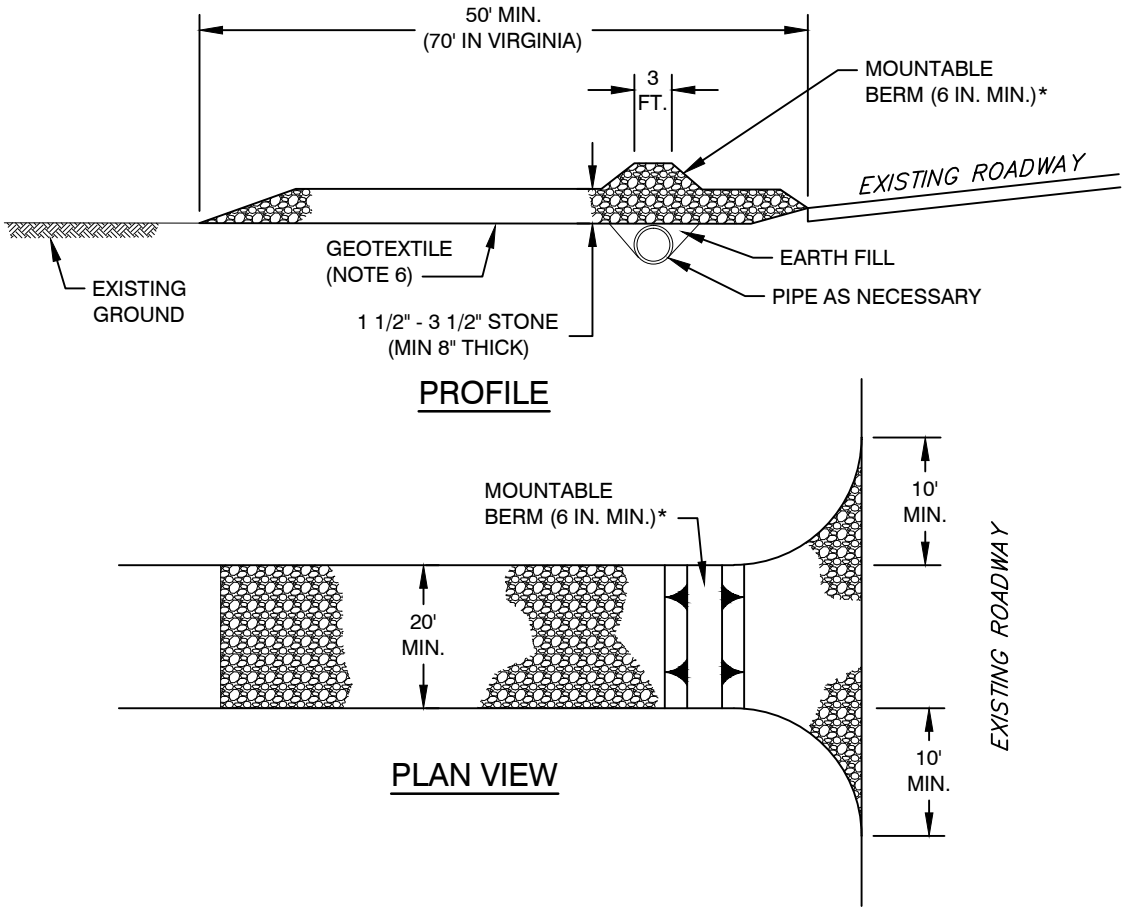
SECTION B-B



NOTES:

1. THIS DETAIL TO BE USED TO CONTROL RUNOFF WITHIN CONSTRUCTED CHANNELS.
2. ROCK FILTERS SHOULD BE CONSTRUCTED WITH RIPRAP SIZED AS FOLLOWS:
   - FOR CHANNELS WITH TOTAL DEPTH > 3 FEET, USE 6" - 12" ROCK.
   - FOR CHANNELS WITH TOTAL DEPTH BETWEEN 2 AND 3 FEET, USE 3" - 6" ROCK.
3. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH HALF THE HEIGHT OF THE FILTER.

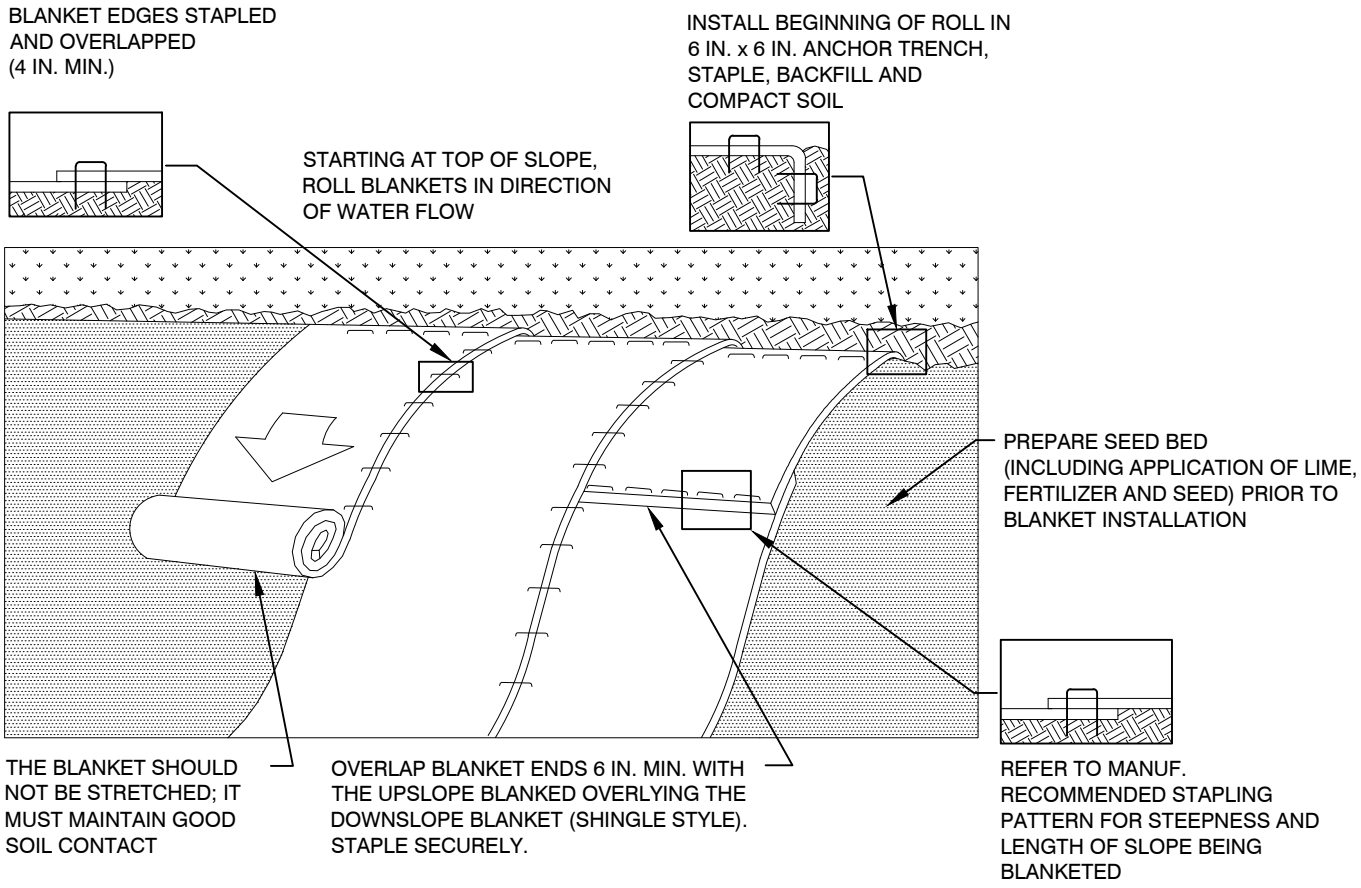
NiSource® ENVIRONMENTAL CONSTRUCTION STANDARDS	ROCK FILTER	FIGURE-15 REVISED 5/16/2017 NOT TO SCALE



* MOUNTABLE BERM USED TO PROVIDE PROPER COVER FOR PIPE

NOTES:

1. REMOVE TOPSOIL PRIOR TO INSTALLATION OF ROCK CONSTRUCTION ENTRANCE. EXTEND ROCK OVER FULL WIDTH OF ENTRANCE.
2. RUNOFF SHALL BE DIVERTED FROM ROADWAY TO A SUITABLE SEDIMENT REMOVAL BMP PRIOR TO ENTERING ROCK CONSTRUCTION ENTRANCE.
3. MOUNTABLE BERM SHALL BE INSTALLED WHEREVER OPTIONAL CULVERT PIPE IS USED AND PROPER PIPE COVER AS SPECIFIED BY MANUFACTURER IS NOT OTHERWISE PROVIDED. PIPE SHALL BE SIZED APPROPRIATELY FOR SIZE OF DITCH BEING CROSSED.
4. MAINTENANCE: ROCK CONSTRUCTION ENTRANCE THICKNESS SHALL BE CONSTANTLY MAINTAINED TO THE SPECIFIED DIMENSIONS BY ADDING ROCK. A STOCKPILE SHALL BE MAINTAINED ON SITE FOR THIS PURPOSE. ALL SEDIMENT DEPOSITED ON PAVED ROADWAYS SHALL BE REMOVED AND RETURNED TO THE CONSTRUCTION SITE IMMEDIATELY. IF EXCESSIVE AMOUNTS OF SEDIMENT ARE BEING DEPOSITED ON ROADWAY, EXTEND LENGTH OF ROCK CONSTRUCTION ENTRANCE BY 50 FOOT INCREMENTS UNTIL CONDITION IS ALLEVIATED OR INSTALL WASH RACK. WASHING THE ROADWAY OR SWEEPING THE DEPOSITS INTO ROADWAY DITCHES, SEWERS, CULVERTS, OR OTHER DRAINAGE COURSES IS NOT ACCEPTABLE.
5. ADDITIONAL METHODS FOR DECOMPACTION OF ROCK AND REMOVAL OF SEDIMENT MAY BE ACCEPTABLE. COORDINATE WITH NRP FOR APPROVAL.
6. GEOTEXTILE SPECIFICATIONS SHOULD MEET STATE SPECIFIC REQUIREMENTS (VA APPENDIX ATTACHMENT 7)



NOTES:

1. SEED AND SOIL AMENDMENTS SHALL BE APPLIED ACCORDING TO THE RATES IN THE PLAN DRAWINGS PRIOR TO INSTALLING THE BLANKET.
2. PROVIDE ANCHOR TRENCH AT TOE OF SLOPE IN SIMILAR FASHION AS AT TOP OF SLOPE.
3. SLOPE SURFACE SHALL BE FREE OF ROCKS, CLODS, STICKS, AND GRASS.
4. BLANKET SHALL HAVE GOOD CONTINUOUS CONTACT WITH UNDERLYING SOIL THROUGHOUT ENTIRE LENGTH. LAY BLANKET LOOSELY AND STAKE OR STAPLE TO MAINTAIN DIRECT CONTACT WITH SOIL. DO NOT STRETCH BLANKET.
5. THE BLANKET SHALL BE STAPLED IN ACCORDANCE WITH THE MANUFACTURER'S RECOMMENDATIONS.
6. BLANKETED AREAS SHALL BE INSPECTED WEEKLY AND AFTER EACH RUNOFF EVENT UNTIL PERENNIAL VEGETATION IS ESTABLISHED TO A MINIMUM UNIFORM 70% COVERAGE THROUGHOUT THE BLANKETED AREA. DAMAGED OR DISPLACED BLANKETS SHALL BE RESTORED OR REPLACED WITHIN 4 CALENDAR DAYS.
7. 100% BIODEGRADABLE BLANKET SHOULD BE USED WHEN AVAILABLE AND SHALL BE USED IN ENVIRONMENTALLY SENSITIVE AREAS.

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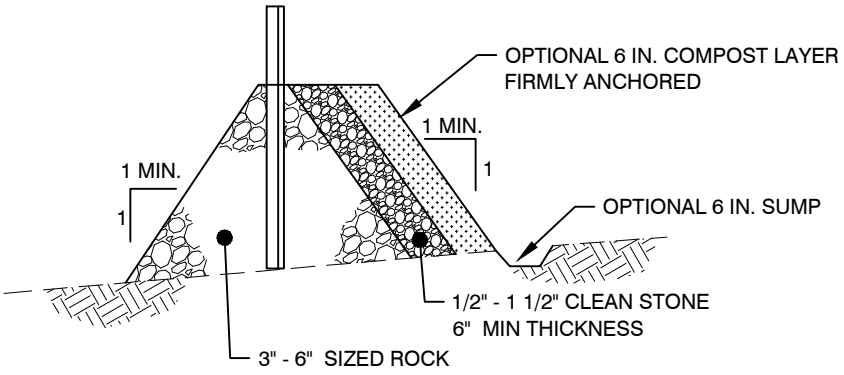
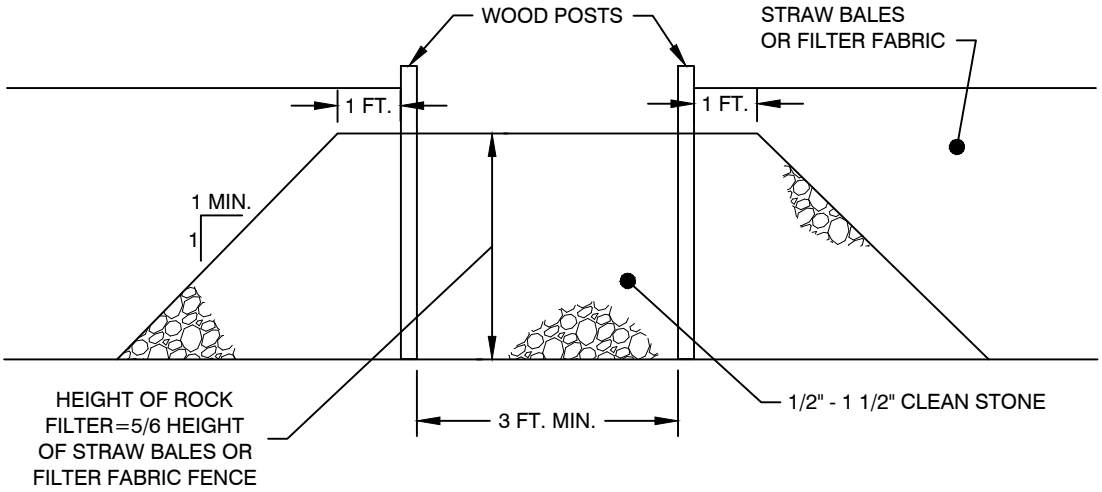
EROSION CONTROL
BLANKET INSTALLATION

FIGURE-17
REVISED 5/16/2017
NOT TO SCALE



OUTLET CROSS-SECTION

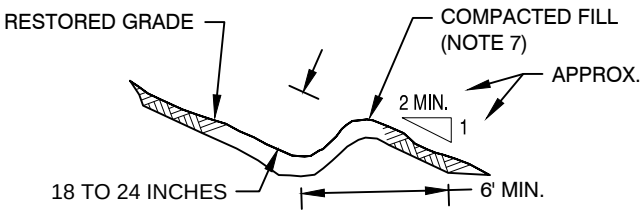


UP-SLOPE FACE

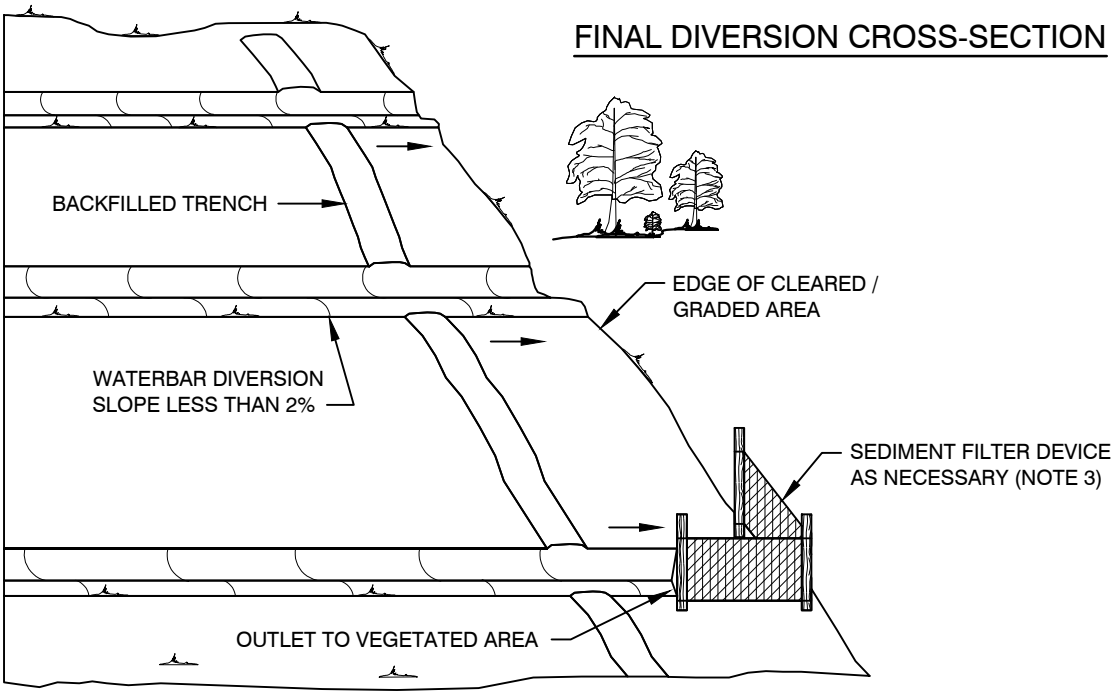
NOTES:

1. A ROCK FILTER OUTLET SHALL BE INSTALLED WHERE FAILURE OF A SILT FENCE OR STRAW BALE BARRIER HAS OCCURRED DUE TO CONCENTRATED FLOW. ANCHORED COMPOST LAYER SHALL BE USED ON UPSLOPE FACE IN HQ AND EV WATERSHEDS.

2. SEDIMENT SHALL BE REMOVED WHEN ACCUMULATIONS REACH 1/3 THE HEIGHT OF THE OUTLET.



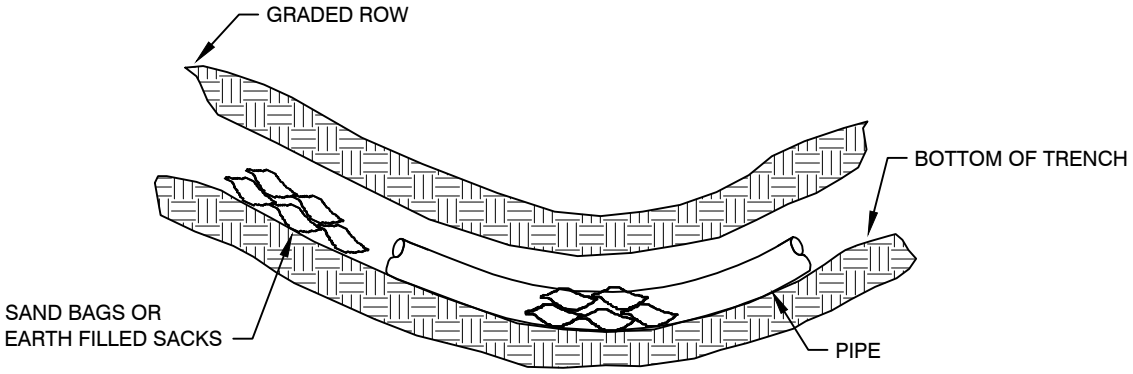
FINAL DIVERSION CROSS-SECTION



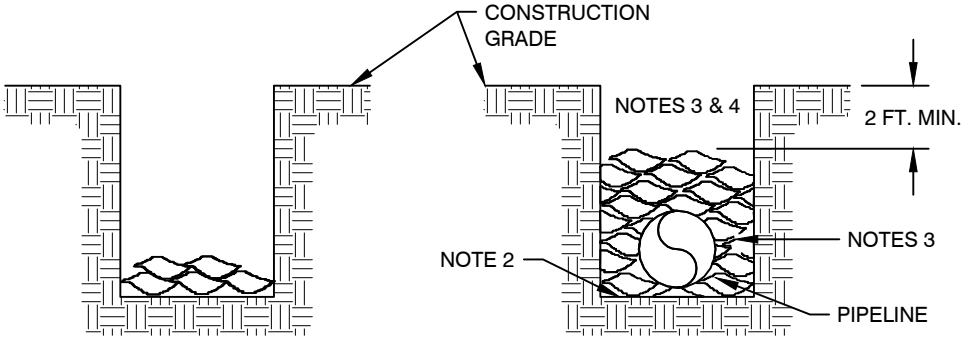
NOTE 1	
SLOPE	SPACING
<7%	100 FEET
7-25%	75 FEET
25-40%	50 FEET
>40+%	25 FEET
MINIMUM WATERBAR SPACING	

NOTES:

1. SPACING USED FOR BOTH TEMPORARY AND FINAL WATERBAR DIVERSIONS.
2. TEMPORARY WATERBARS WILL BE MAINTAINED DURING THE CONSTRUCTION PHASE UNTIL FINAL WATERBARS ARE INSTALLED.
3. IF EXISTING GROUND COVER IS SPARSE, SECURE SEDIMENT FILTER DEVICE IN OUTLET.
4. THE DIVERSION MAY BE EXTENDED UP TO 5 FEET OFF THE ROW, IF NECESSARY, TO PROVIDE AN ADEQUATE OUTLET.
5. DIVERSION OUTLETS WILL ALTERNATE FROM SIDE TO SIDE WHENEVER POSSIBLE.
6. WATERBARS SHALL BE INSPECTED WEEKLY (DAILY ON ACTIVE ROADS) AND AFTER EACH RUNOFF EVENT. DAMAGED OR ERODED WATERBARS SHALL BE RESTORED TO ORIGINAL DIMENSIONS WITHIN 24 HOURS OF INSPECTION.
7. MACHINE OR HAND COMPACTED IN 8" LIFTS.



SIDE VIEW



BEFORE PIPE INSTALLATION BREAKER

AFTER PIPE INSTALLATION BARRIER

FRONT VIEW

NOTES:

1. TRENCH PLUGS SHALL BE INSTALLED PER THE SPACING TABLE BELOW.
2. PRIOR TO LOWERING IN, REMOVE ALL DECOMPOSED MATERIAL AND ROCKS.
3. INSTALL SACKS TO TOP OF TRENCH ON STEEP GRADES THAT ARE NOT USED FOR FARMING.
4. TOP OF TRENCH PLUG WILL BE BELOW PLOW DEPTH IN AGRICULTURAL LAND.
5. DOUBLE STAKED HAY / STRAW BALES MAY BE SUBSTITUTED FOR SAND BAGS (EARTH FILLED SACKS) AS TEMPORARY BREAKERS WHERE APPROPRIATE.
6. WHERE PLUGS ARE ADJACENET TO STREAMS OF WETLANDS, PLUGS SHALL CONSIST OF CLAY, BENTONITE OR CONCRETE FILLED SACKS PER STATE REQUIREMENTS.

MAXIMUM SPACING AND MATERIAL FOR TRENCH PLUGS

TRENCH SLOPE (%)	SPACING - L (FT)
< 5	1,000
5 - 15	500
15 - 25	300
25 - 35	200
25 - 100	100
> 100	50

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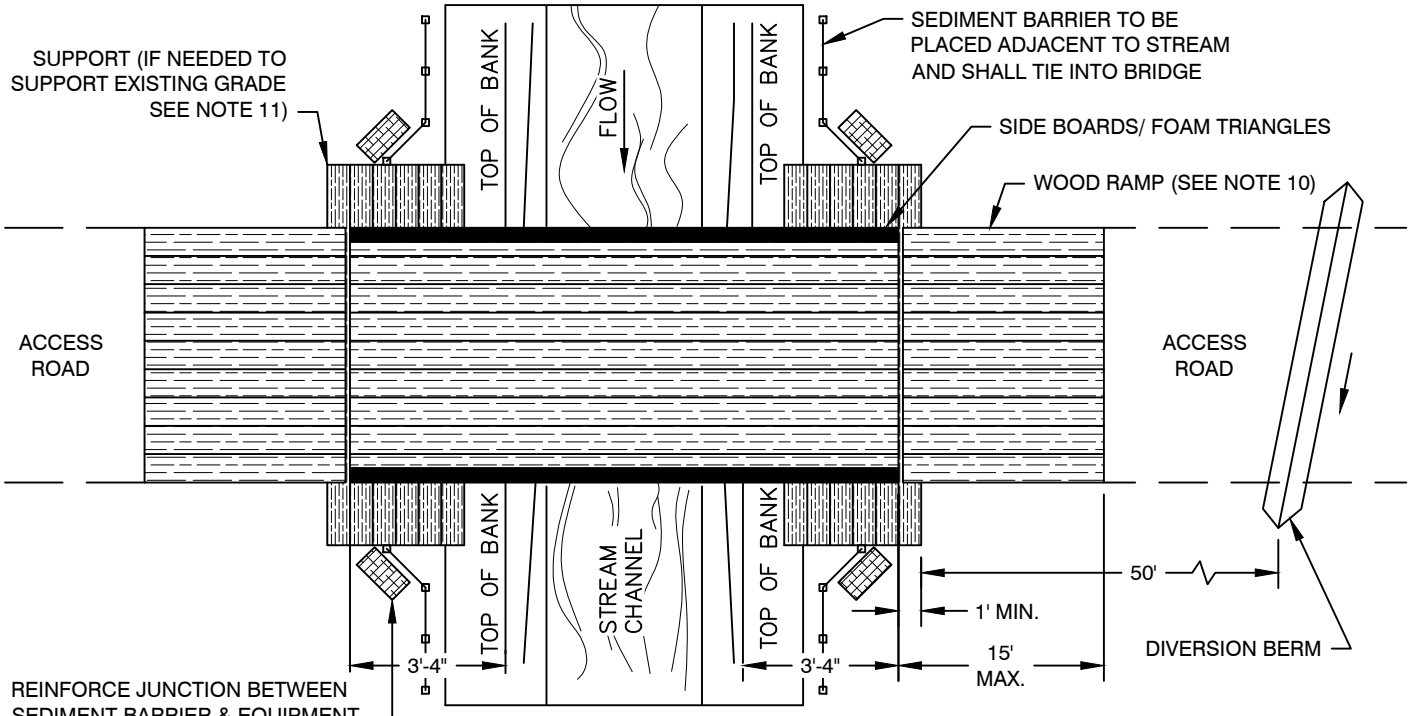
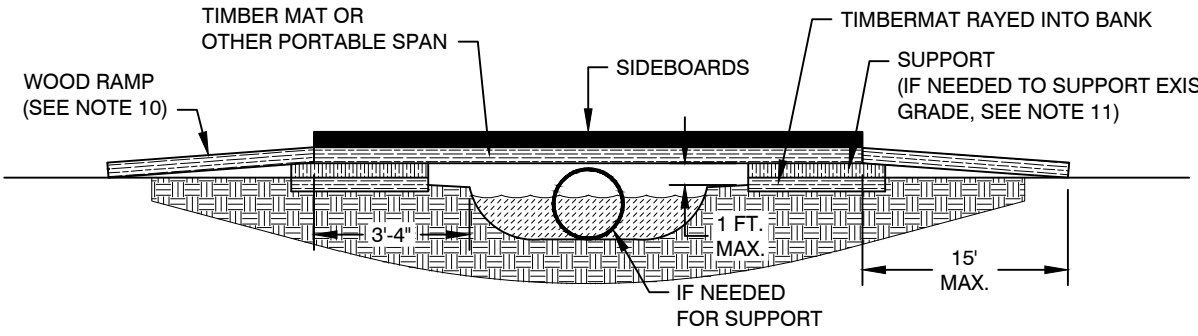
TRENCH PLUGS

FIGURE-20
REVISED 5/16/2017
NOT TO SCALE



PLAN VIEW

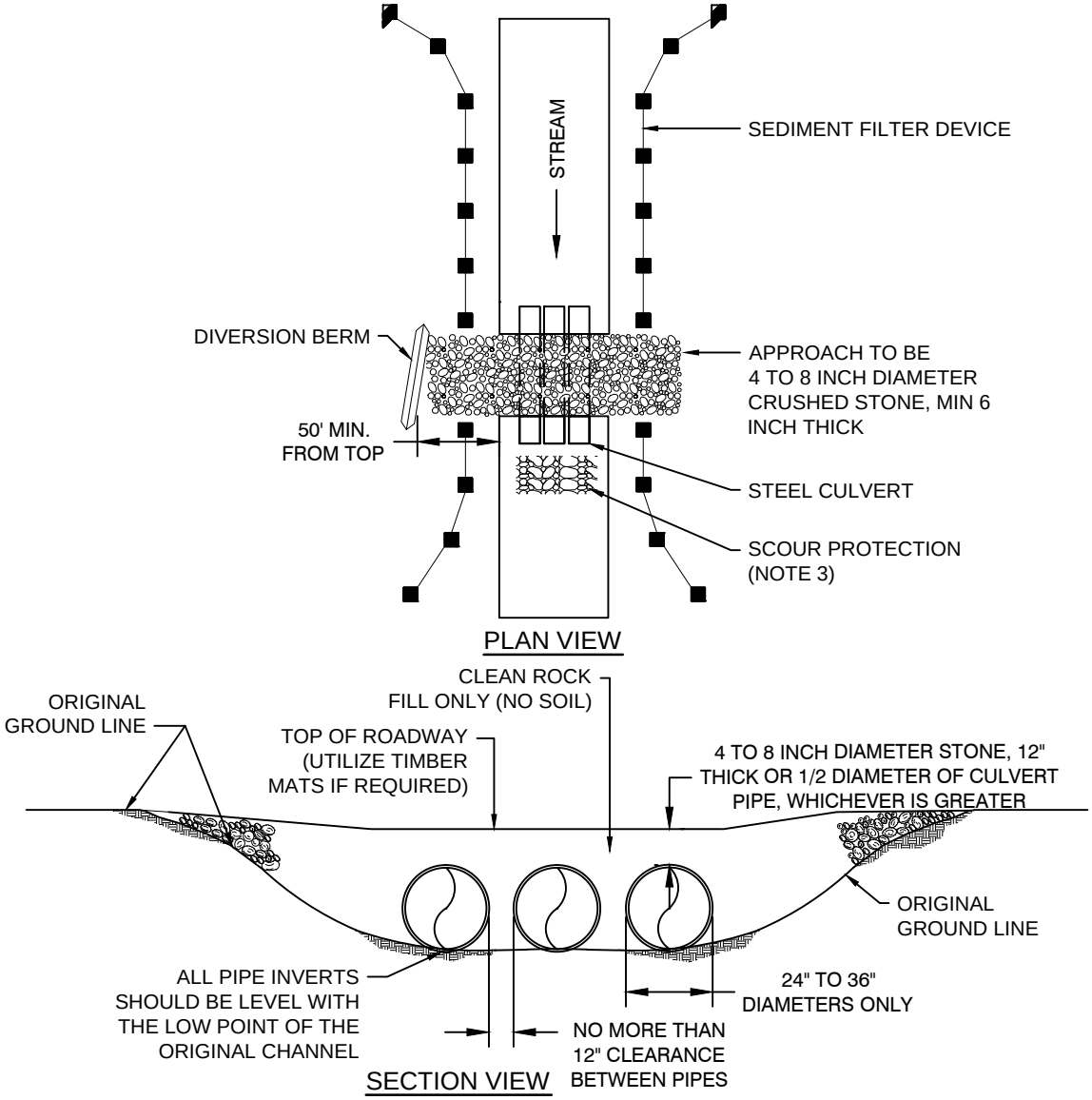


SECTION VIEW

NOTES:

1. CULVERT PIPE CAN BE UTILIZED IF ADDITIONAL SUPPORT IS REQUIRED. ALIGN CULVERT TO PREVENT SCOUR OR BANK EROSION, MUST BE ANCHORED TO STREAM BOTTOM AND MAY NOT BE SUPPORTED WITH FILL. MINIMUM CULVERT DIAMETER 20 INCHES (OR EQUIVALENT).
2. ADDITIONAL PADS CAN BE PUT SIDE BY SIDE IF EXTRA WIDTH IS REQUIRED.
3. STEEL CABLE OR CHAIN SHOULD BE USED TO ANCHOR THE EQUIPMENT PAD TO PREVENT WASH AWAY DURING A STORM EVENT.
4. EQUIPMENT PAD TYPICALLY CONSTRUCTED OF HARD WOOD; MUST ACCOMMODATE THE LARGEST PIECE OF EQUIPMENT BEING USED.
5. PADS MUST BE CONSTRUCTED WITH SIDEBOARDS AND GEOTEXTILE FABRIC PER FIGURE 29.
6. INSPECT BRIDGE ELEVATIONS SO BRIDGE REMAINS SUPPORTED ABOVE HIGH BANK AND DOES NOT SINK INTO BANK.
7. THE BRIDGE MUST SPAN FROM TOP OF BANK TO TOP OF BANK.
8. ADDITIONAL SUPPORT MUST BE ADDED ON TOP OF BANK AND UNDER SPAN IF INITIAL SUPPORT STARTS TO SETTLE.
9. RAMP APPROACHES CAN EITHER BE GRADED OR DUG INTO GROUND. IF NECESSARY, CRUSHED STONE WILL BE USED TO RAMP UP TO THE EQUIPMENT PADS.
10. IF PHYSICAL CIRCUMSTANCES PROHIBIT WOOD OR METAL RAMPS, EARTHEN RAMPS MAY BE USED AS APPROVED.
11. EARTHEN RAMP CANNOT BE TALLER THAN 1' AND CANNOT EXTEND FOR MORE THEN 15' ON EITHER SIDE OF THE CROSSING.
12. TEMPORARY FILTER DEVICES SHALL BE PLACED ACROSS BRIDGE OPENINGS AT THE END OF EACH DAY.
13. TEMPORARY STREAM CROSSING SHOULD BE INSPECTED ON A DAILY BASIS. DAMAGED CROSSING SHALL BE REPAIRED WITHIN 24 HOURS OF THE INSPECTION. REMOVE ANY DEBRIS RESTRICTING FLOW AND DEPOSIT IT AT AN UPLAND SITE OUTSIDE OF FLOODPLAIN.
14. AS SOON AS THE TEMPORARY CROSSING IS NO LONGER NEEDED, IT SHALL BE REMOVED. ALL MATERIALS SHALL BE DISPOSED OF PROPERLY AND DISTURBED AREAS STABILIZED.
15. IN-STREAM WORK, STREAM CROSSINGS, AND EARTH DISTURBANCE WITHIN 50 FEET OF A STREAM REQUIRE PERMIT AUTHORIZATION.

NiSource® ENVIRONMENTAL CONSTRUCTION STANDARDS	TEMPORARY EQUIPMENT CROSSING - EQUIPMENT PADS	FIGURE-21 REVISED 5/16/2017 NOT TO SCALE



NOTES:

1. MINIMUM CONTOURING OF THE BOTTOM AS NECESSARY TO LAY THE CULVERTS LEVEL IS PERMISSIBLE.
2. USE AS MANY CULVERTS AS REQUIRED TO SPAN ENTIRE STREAM BED. (CULVERTS SHALL BE PLACED SIDE BY SIDE)
3. STONES WILL BE PLACED AT THE OUTLET OF ALL CULVERTS TO PROVIDE SCOUR PROTECTION (MIN. ROCK SIZE 8-10 INCHES).
4. MINIMUM CULVERT DIAMETER 20 INCHES.
5. MAINTAIN ROCK AS NOT TO ALLOW MUD TO ENTER THE STREAM.
6. ALIGN CULVERTS TO PREVENT BANK EROSION.
7. TEMPORARY STREAM CROSSINGS SHOULD BE INSPECTED ON A DAILY BASIS. DAMAGED CROSSINGS SHALL BE REPAIRED WITHIN 24 HOURS OF THE INSPECTION AND BEFORE ANY SUBSEQUENT USE. SEDIMENT DEPOSITS ON THE CROSSING OR ITS APPROACHES SHALL BE REMOVED WITHIN 24 HOURS OF THE INSPECTION.
8. AS SOON AS THE TEMPORARY CROSSING IS NO LONGER NEEDED, IT SHALL BE REMOVED. ALL MATERIALS SHALL BE DISPOSED OF PROPERLY AND DISTURBED AREAS STABILIZED.
9. IN-STREAM WORK, STREAM CROSSINGS, AND EARTH DISTURBANCE WITHIN 50 FEET OF A STREAM REQUIRE PERMIT AUTHORIZATION.
10. PIPE DIAMETER TO MEET MIN. STATE REQUIREMENT (VA- SEE TABLE 8 IN APPENDIX A)

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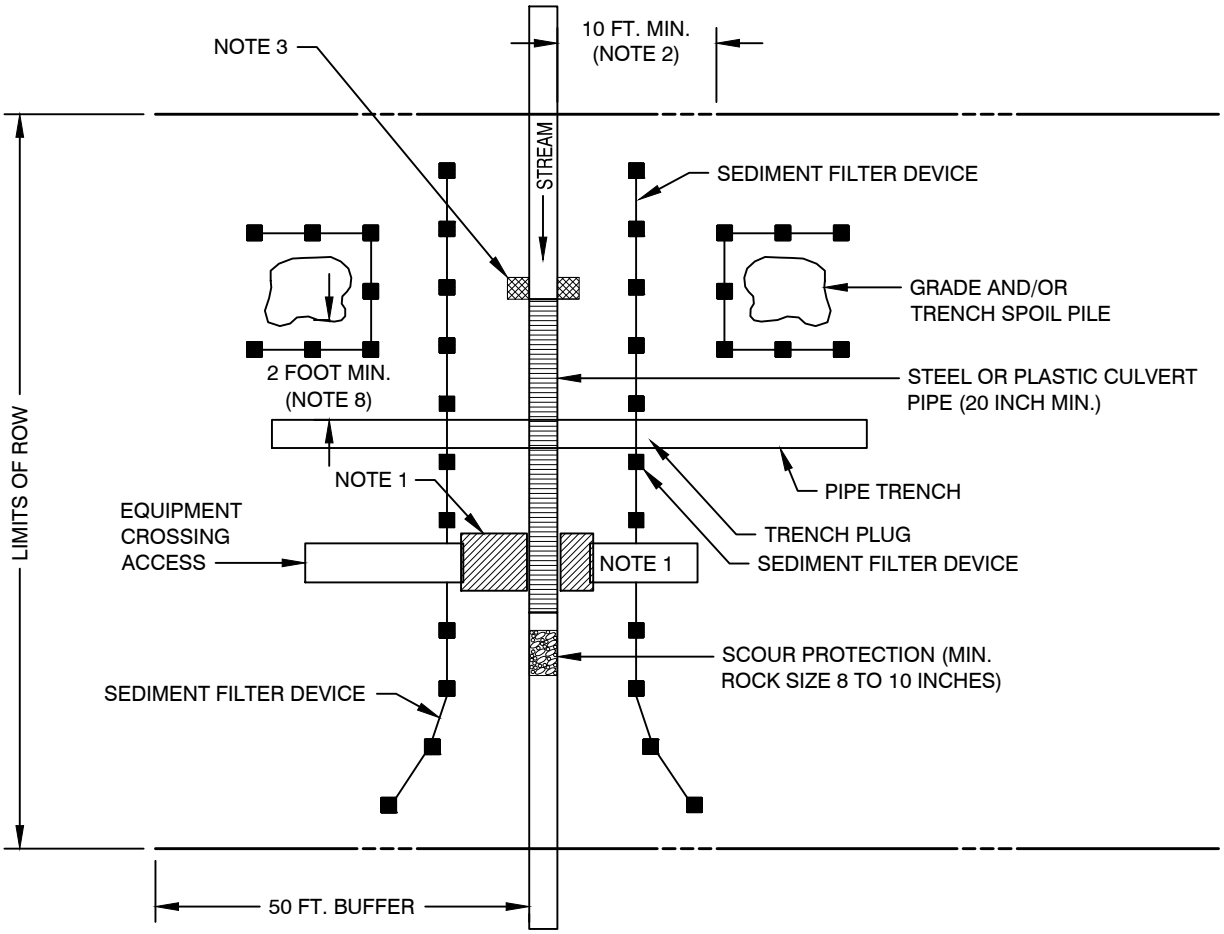
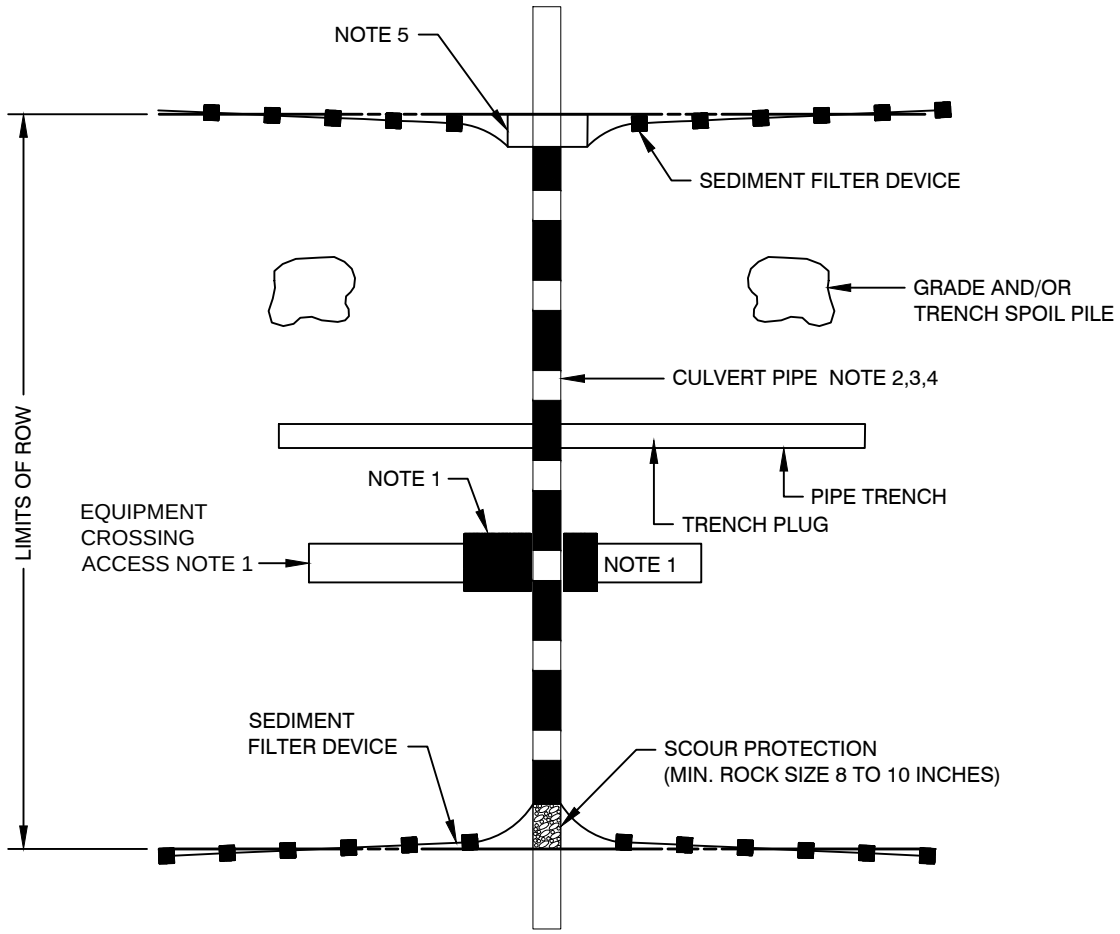
TEMPORARY EQUIPMENT CROSSING
- CULVERT AND STONE

FIGURE-22
REVISED 5/16/2017
NOT TO SCALE



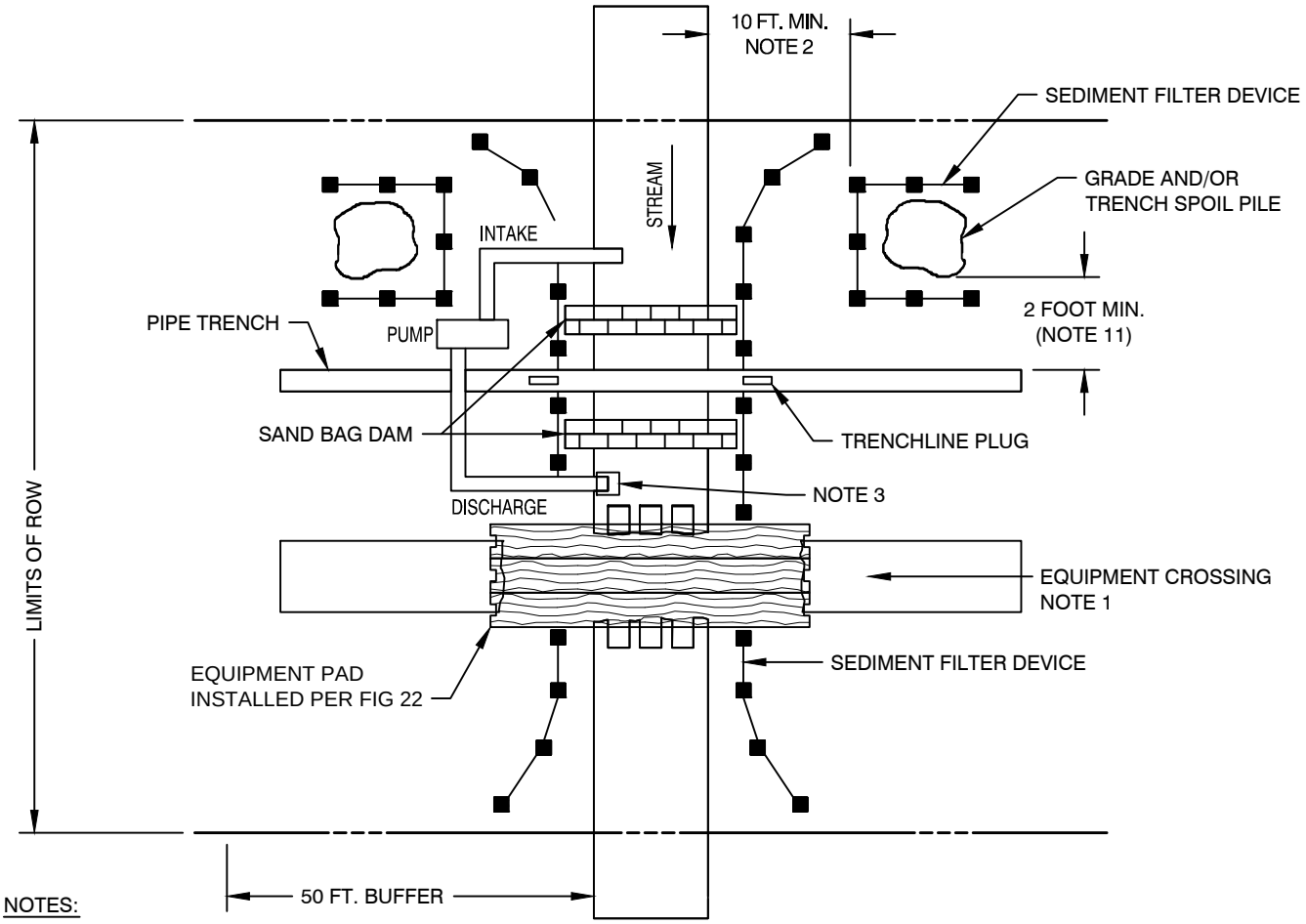
NOTES:

1. EQUIPMENT CROSSINGS ARE TO BE PREPARED AS ILLUSTRATED IN FIGURE 21 OR 22.
2. GRADE AND TRENCH SPOIL WILL BE STOCKPILED AT LEAST 10 FEET FROM THE WATER'S EDGE, TOPOGRAPHY PERMITTING.
3. SAND BAGS OR EARTH FILLED SACKS WILL BE PLACED AT UPSTREAM END OF CULVERT TO CHANNEL FLOW INTO THE CULVERT.
4. PIPE CULVERT FOR ACCESS ROAD AND FLUME PIPE MAY BE ONE CONTINUOUS PIPE.
5. TRENCH PLUGS SHALL BE INSTALLED WITHIN THE TRENCH ON BOTH SIDES OF THE STREAM CHANNEL (REFERENCE FIGURE 20).
6. WATER ACCUMULATING IN THE WORK AREA SHALL BE PUMPED TO A PUMPED WATER FILTER BAG OR SEDIMENT TRAP PRIOR TO DISCHARGING INTO ANY SURFACE WATER.
7. IN-STREAM WORK, STREAM CROSSINGS, AND EARTH DISTURBANCE WITHIN 50 FEET OF A STREAM REQUIRE PERMIT AUTHORIZATION.
8. SPOIL SHALL BE PLACED A MINIMUM OF TWO (2) FEET FROM THE TRENCH PER 29 CFR 1926.650 (j) (2).
9. EXCAVATION OF TRENCH SHALL BE COMPLETED IN THE DRY. FLOWING WATER SHALL NOT BE ALLOWED TO RETURN TO THE STREAM BED UNTIL BED/ BANK RESTORATION ACTIVITIES HAVE BEEN COMPLETED.
10. METHOD TO BE USED ON MINOR WATER BODY CROSSING NO GREATER THAN 10' IN BOTTOM WIDTH.



NOTES:

1. IF REQUIRED BY PERMIT , EQUIPMENT CROSSINGS ARE TO BE PREPARED AS ILLUSTRATED IN FIGURE 21 OR 22.
2. IN AREAS WITHOUT JURISDICTIONAL WATER FEATURES, EARTH OR STONE FILL MAY BE PLACED OVER THE PIPE FOR ACCESS. DEPTH OF COVER SHOULD BE EQUAL TO $\frac{1}{2}$ THE DIAMETER OF THE CULVERT OR 12 INCHES, WHICHEVER IS GREATER. IF MINIMUM COVER CANNOT BE ACHIEVED, CLASS "V" PIPE SHALL BE USED.
3. IF THIS DETAIL IS APPLIED TO PERMITTED WETLAND CROSSINGS BASED ON FIELD CONDITIONS AND THE CROSSING IS BRIDGED, FLEXIBLE PLASTIC CULVERT MAY BE USED FOR EASY REMOVAL DURING PIPE INSTALLATION.
4. PIPE CULVERT SHOULD BE ONE CONTINUOUS PIPE AND SHOULD BE APPROPRIATELY SIZED FOR DRAINAGE AREA, MINIMUM 18 INCHES DIAMETER.
5. SAND BAGS OR EARTH FILLED SACKS WILL BE PLACED AT UPSTREAM END OF CULVERT TO CHANNEL FLOW INTO THE CULVERT.
6. WATER ACCUMULATING IN THE WORK AREA SHALL BE PUMPED TO A PUMPED WATER FILTER BAG OR SEDIMENT TRAP PRIOR TO DISCHARGING INTO ANY SURFACE WATER.



NOTES:

1. EQUIPMENT CROSSINGS ARE TO BE INSTALLED PERPENDICULAR TO STREAM, AS ILLUSTRATED.
2. GRADE AND TRENCH SPOIL WILL BE STOCKPILED AT LEAST 10 FEET FROM THE WATERS' EDGE, TOPOGRAPHY PERMITTING.
3. PUMP INTAKES WILL BE SCREENED. PREVENT STREAMBED SCOUR AT DISCHARGE.
4. SUFFICIENT PUMP CAPACITY WILL BE USED TO MAINTAIN STREAM FLOW AT ALL TIMES UNTIL BACKFILL AND REMOVAL OF SANDBAG DAM.
5. BACKUP PUMPS (AS SAME NUMBER AND CAPACITY AS ACTIVE PUMPS) WILL BE READILY AVAILABLE IN WORKING CONDITION ON SITE AT CROSSING. PUMPS SHALL BE PLACED WITHIN SECONDARY CONTAINMENT WHEN IN USE TO PREVENT SPILLS ADJACENT TO THE WATER BODY.
6. CONSTRUCT DAMS WITH MATERIAL THAT PREVENT SEDIMENT AND OTHER POLLUTANTS FROM ENTERING THE WATER BODY.
7. MONITOR THE DAM AND PUMPS TO ENSURE PROPER OPERATIONS THROUGHOUT THE WATER BODY CROSSING.
8. TRENCH PLUGS SHALL BE INSTALLED WITHIN THE TRENCH ON BOTH SIDES OF THE THE STREAM CHANNEL (FIGURE 20).
9. WATER ACCUMULATING IN THE WORK AREA SHALL BE PUMPED TO A PUMPED WATER FILTER BAG (FIGURE 11) OR SEDIMENT TRAP PRIOR TO DISCHARGING INTO ANY SURFACE WATER.
10. IN-STREAM WORK, STREAM CROSSINGS, AND EARTH DISTURBANCE WITHIN 50 FEET OF A STREAM REQUIRE PERMIT AUTHORIZATION.
11. SPOIL SHALL BE PLACED A MINIMUM OF TWO (2) FEET FROM THE TRENCH PER 29 CFR 1926.650 (j) (2).
12. EXCAVATION OF TRENCH SHALL BE COMPLETED IN THE DRY. FLOWING WATER SHALL NOT BE ALLOWED TO RETURN TO THE STREAM BED UNTIL BED/ BANK RESTORATION ACTIVITIES HAVE BEEN COMLETED.

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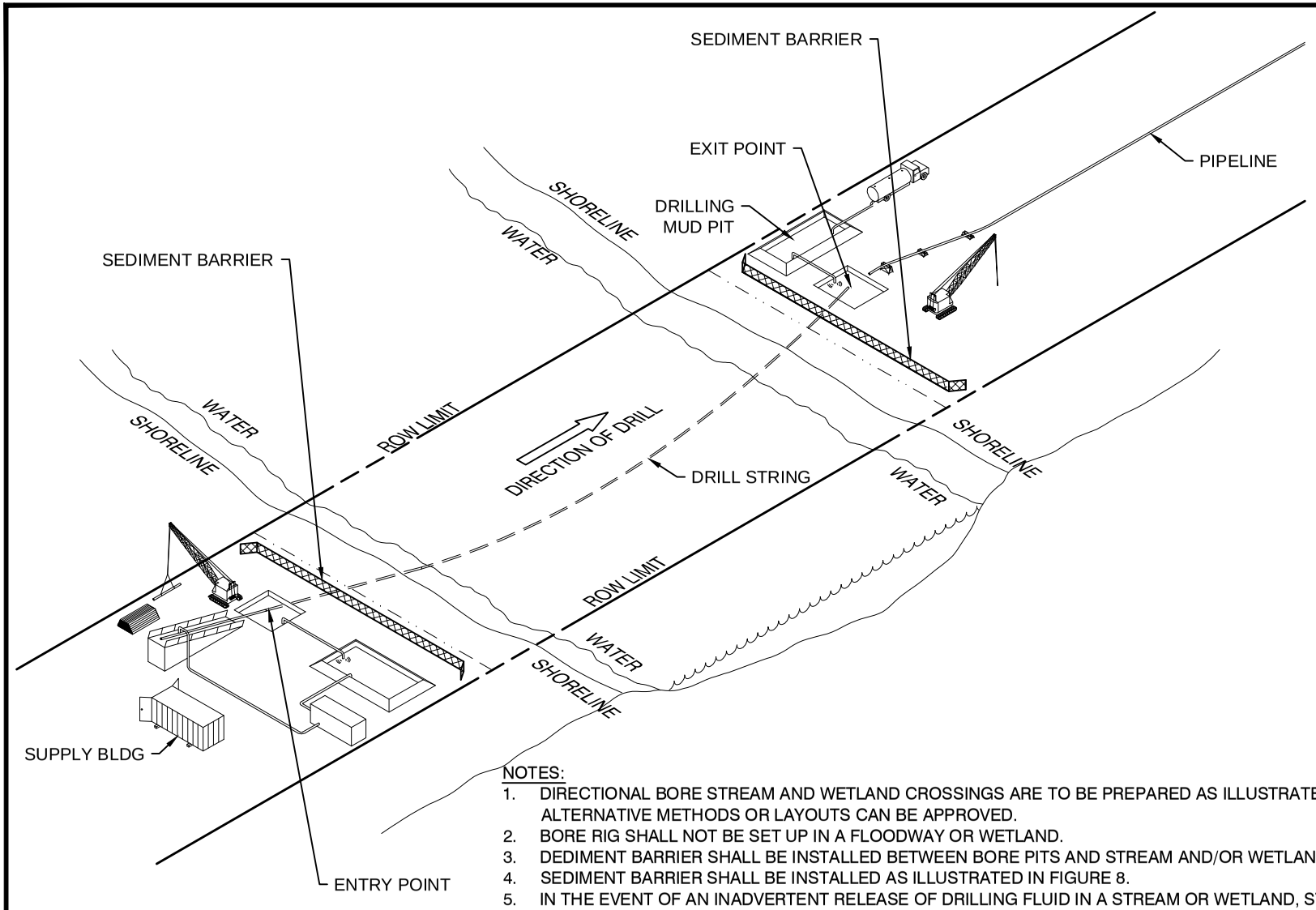
TYPICAL
STREAM CROSSING
WITH PUMP BYPASS

FIGURE-25
REVISED 5/16/2017
NOT TO SCALE



NOTES:

1. DIRECTIONAL BORE STREAM AND WETLAND CROSSINGS ARE TO BE PREPARED AS ILLUSTRATED; HOWEVER ALTERNATIVE METHODS OR LAYOUTS CAN BE APPROVED.
2. BORE RIG SHALL NOT BE SET UP IN A FLOODWAY OR WETLAND.
3. DEDIMENT BARRIER SHALL BE INSTALLED BETWEEN BORE PITS AND STREAM AND/OR WETLAND.
4. SEDIMENT BARRIER SHALL BE INSTALLED AS ILLUSTRATED IN FIGURE 8.
5. IN THE EVENT OF AN INADVERTENT RELEASE OF DRILLING FLUID IN A STREAM OR WETLAND, STRAW BALES OR APPROPRIATE CONTAINMENT DEVICE SHALL BE INSTALLED IMMEDIATELY TO CONTAIN MUD.
6. THE DRILLING FLUID RELEASE CONTINGENCY PLAN SHALL BE IMPLEMENTED PRIOR TO CONTINUING BORING ACTIVITIES.
7. PRIOR TO THE COMPLETION OF THE PROJECT, ALL HAY BALES AND MUD SHALL BE REMOVED FROM THE PROJECT AREA.
8. ALL SEDIMENT BARRIERS SHALL BE REMOVED UPON SUCCESSFUL REVEGETATION OF THE PROJECT AREA.
9. IN-STREAM WORK, STREAM CROSSINGS, AND EARTH DISTURBANCE WITHIN 50 FEET OF A STEAM REQUIRE PERMIT AUTHORIZATION.

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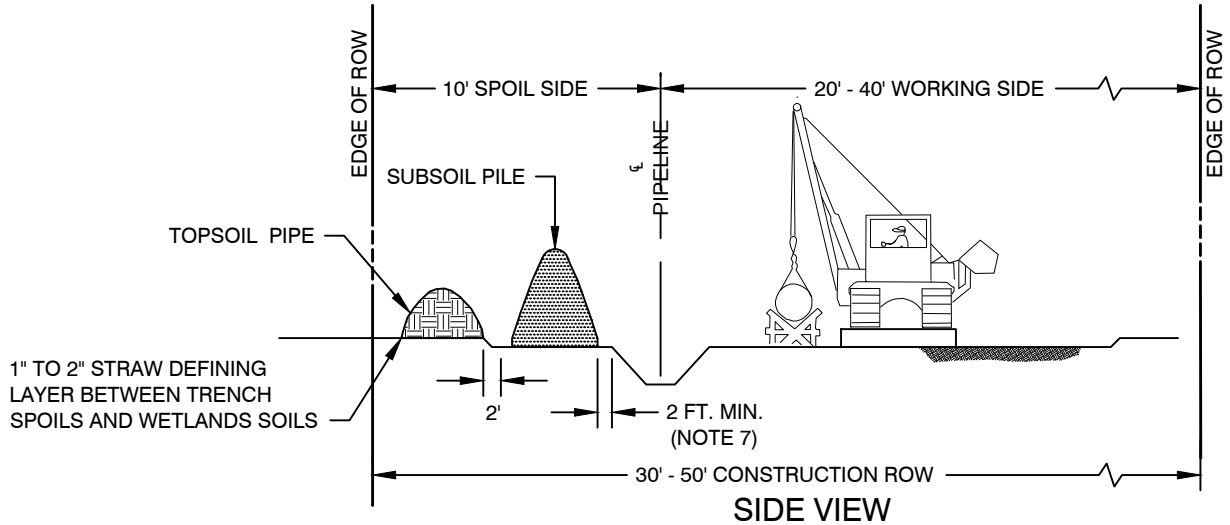
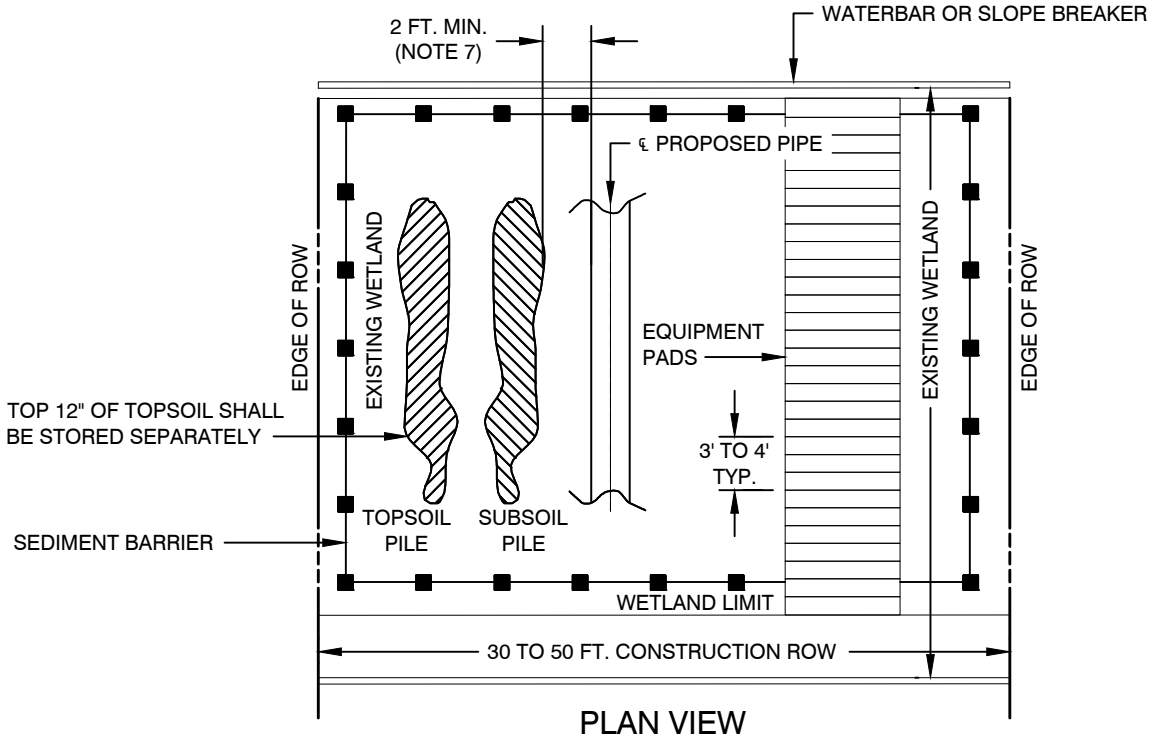
TYPICAL WORKSPACE LAYOUT HORIZONTAL DIRECTIONAL DRILL METHOD

FIGURE-26
REVISED 5/16/2017
NOT TO SCALE



SIDE VIEW



PLAN VIEW

NOTES:

1. THE DIMENSIONS SHOWN ON THIS FIGURE ARE TYPICAL.
2. VARIATIONS FOR STAGING AREAS MAY BE NECESSARY.
3. FILTER FABRIC FENCE INSTALLED ALONG DOWNGRADIENT ROW SLOPE ONLY IF TRENCH REMAINS OPEN LONGER THAN 24 HOURS.
4. A SEDIMENT FILTER DEVICE WILL BE PLACED ACROSS THE ROW AT THE WETLAND EDGE, AS NECESSARY.
5. DEWATERING OF EXCAVATION AREA, IF REQUIRED, WILL BE COMPLETED WITH A PUMP AND PUMPED WATER FILTERED BAG.
6. IF FLOWING OR EXCESS SURFACE WATER IS PRESENT, A FLUME PIPE MAY BE INSTALLED AS OUTLINED IN FIG. 24.
7. IN-STREAM WORK, STREAM CROSSINGS, AND EARTH DISTURBANCE WITHIN 50 FEET OF A STREAM REQUIRE PERMIT AUTHORIZATION.
8. SPOIL SHALL BE PLACED A MINIMUM OF TWO (2) FEET FROM THE TRENCH PER 29 CFR 1926.650 (j) (2) AND MUST BE PROTECTED WITH SEDIMENT TRAPPING DEVICE/ MEASURES.

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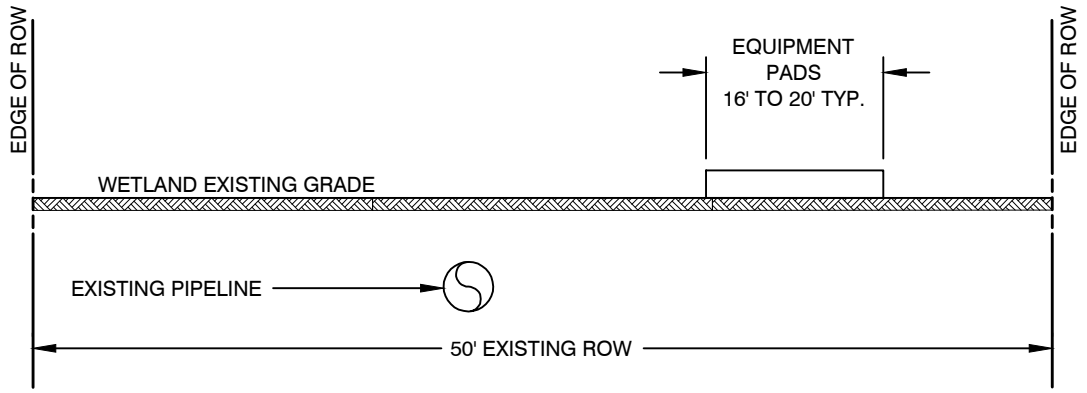
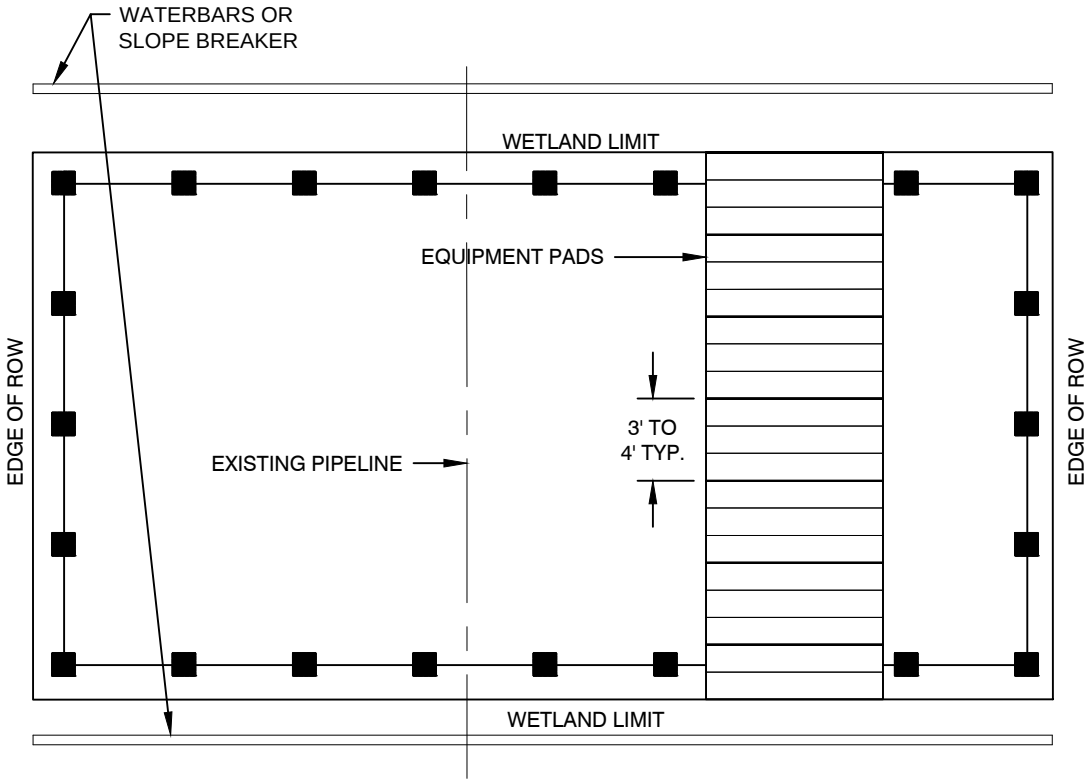
ENVIRONMENTAL CONSTRUCTION STANDARDS

TYPICAL WETLAND CONSTRUCTION

FIGURE-27
REVISED 5/16/2017
NOT TO SCALE



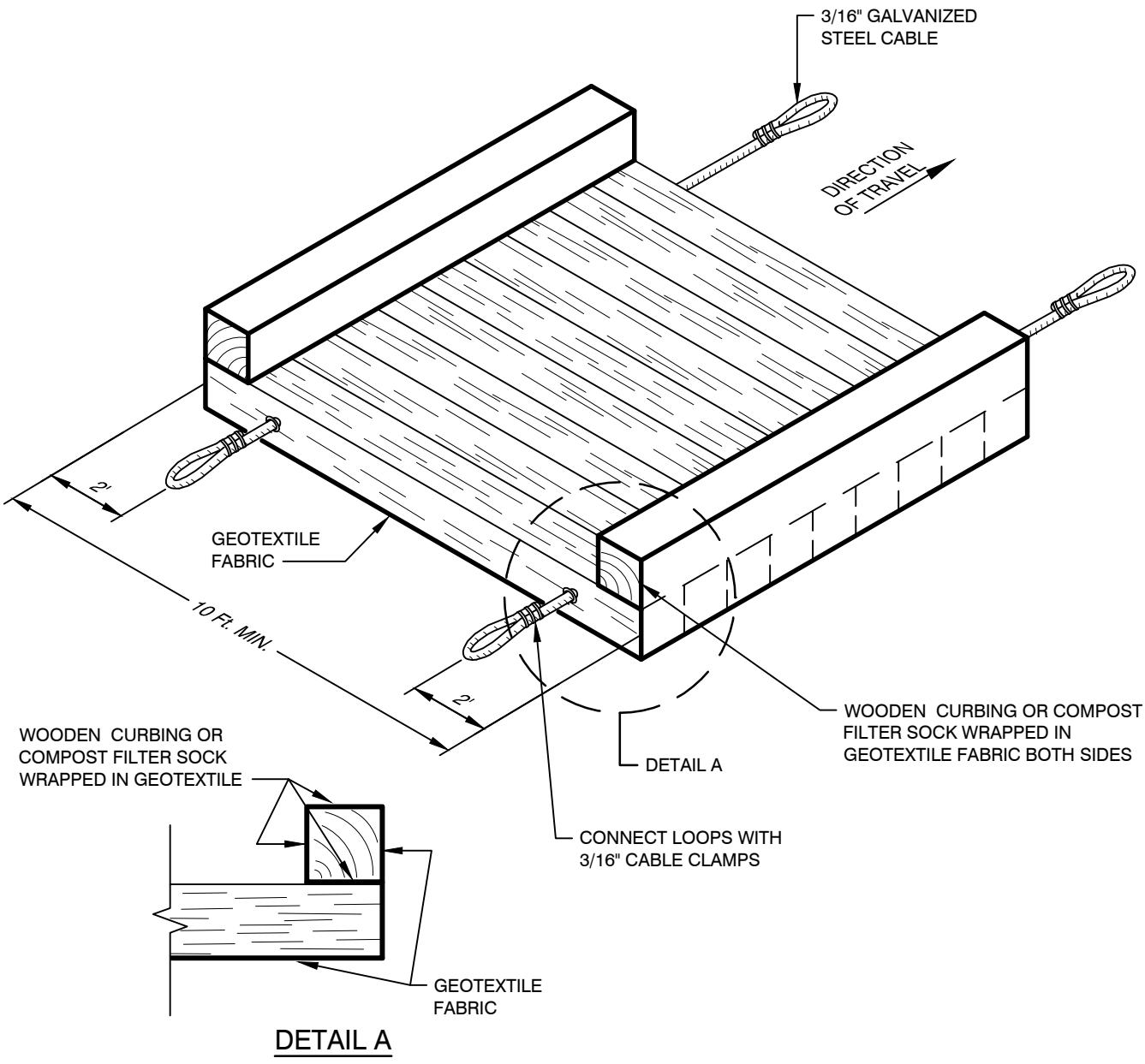
SIDE VIEW



PLAN VIEW

NOTES:

1. EQUIPMENT PADS WILL BE USED TO PROVIDE STABLE WETLAND CROSSING AND ACCESS WHEN SOIL CONDITIONS WILL NOT SUPPORT EQUIPMENT WEIGHT.
2. PADS ARE TYPICALLY 3 TO 4 FT. WIDE, 16 TO 20 FT. LONG AND 8 INCHES TO 1 FT. THICK. DIMENSIONS CAN VARY DEPENDING ON SITE CONDITIONS. SEE FIG. 29 FOR PAD CONSTRUCTION DETAILS.
3. A SEDIMENT FILTER DEVICE WILL BE PLACED ACROSS THE ROW AT THE WETLAND EDGE, AS NECESSARY.
4. IF FLOWING OR EXCESS SURFACE WATER IS PRESENT, A FLUME PIPE MAY BE INSTALLED AS OUTLINED IN FIG. 24.



DETAIL A

NOTES:

1. A GEOTEXTILE UNDERLAYMENT SHALL BE USED UNDER THE WOOMD MAT, WRAPPED UP THE SIDES, AND ANCHORED TO CURBING.
2. MATS ARE MADE FROM ALL WOOD MEMBERS AND ARE MINIMUM 4"X4" HARDWOOD AND ARE CABLED TOGETHER TO FORM A SINGLE LAYER CROSSING. LONGER LOGS ARE MORE USEFUL IN THE CASE OF A HEAVY LOAD OR VERY LOOSE SOIL.
3. WOOD MATS CAN BE CONSTRUCTED ON SITE AND ARE EASY TO BUILD AND MAINTAIN. UNDER NORMAL USE, A WOOD MAT IS EXPECTED TO LAST FOR SEVERAL YEARS. INDIVIDUAL WOOD MATS CAN BE CONNECTED TO CONSTRUCT A COMPLETE CROSSING.
4. IN-STREAM WORK, STREAM CROSSINGS, AND EARTH DISTURBANCE WITHIN 50' FEET OF A STREAM REQUIRE PERMIT AUTHORIZATION.

NiSource® ENVIRONMENTAL CONSTRUCTION STANDARDS	TEMPORARY EQUIPMENT CROSSING WOOD MAT	FIGURE-29 REVISED 5/16/2017 NOT TO SCALE

APPENDIX A - For Work in the State of Virginia

The following information should be used in addition to the preceding document to ensure that all work completed by Columbia Gas of Virginia, Inc. (CVA) in the state of Virginia meets the requirements of the Virginia Erosion and Sediment Control Law/Regulations (§62.1-44.15; 9VAC25-840), the Virginia Stormwater Management Act/Regulations (§62.1-44.15; 9VAC25-870) and the General VPDES Permit for Discharges of Stormwater from Construction Activities (9VAC25-880) as regulated by the Virginia Department of Environmental Quality (VDEQ).

For all construction projects in the state of Virginia, this appendix should be followed to ensure the more stringent laws are met unless there is prior authorization from the Natural Resources Permitting Group and/or VDEQ. In addition, all Virginia construction projects must meet the Virginia Minimum Standards (Attachment 1) and the minimum requirements of the Virginia Erosion and Sediment Control Handbook (VESCH).

1. Site Inspection Documentation

All site inspections for Virginia regulated land disturbing activities (as defined in the CVA ESC/SWM Program Manual) shall be completed as outlined in the project-specific ECP. All inspections completed for erosion and sediment control inspections shall be documented using the Erosion and Sediment Control Inspection Log included as Attachment 2. For projects requiring Construction General Permit Coverage for Stormwater Management the site inspections shall be documented using the VSMP & Erosion Control Inspection log included as Attachment 3.

2. Directional Boring

On all construction projects required to have a site-specific E&S Plan, as outlined in section 3.0 of the CVA Program Manual, a Drilling Fluid Disposal Worksheet, Attachment 4, should be completed prior the start of directional drilling activities. Any drilling fluids disposed of at an offsite location should be placed within erosion control structures and seeded/stabilized. Alternatives to this requirement are disposing of the material at a facility with a valid state or federal permit for disposal activities or to spread the material within the disturbed easement prior to seeding/stabilization of the easement area. In the absence of a site-specific E&S Plan, the worksheet may also be used by construction personnel to ensure that drilling fluid is being disposed of properly.

For any directional bore activities in the vicinity of wetlands or water of the U.S. the notification procedure included as Attachment 5 shall be followed in the event of an inadvertent release of drilling fluid.

3. Restoration

For work in Virginia, permanent stabilization must be completed within seven days of reaching final grade. (See Attachment 1, Minimum Standard-1). The placement of all seed, fertilizer and lime must be placed in accordance with the tables provided in Attachment 6 or with the site-specific permanent restoration plan, if provided. Soil tests should also be completed to determine the amounts of fertilizer and lime best suited to the site in accordance with the ESC Technical Bulletin No. 4 – Nutrient Management for Development Sites (http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/ESCTechnicalBulletin4.pdf).

Permanent seed mixes on large scale NiSource/CGV projects will be determined on a site-specific basis to select plant species that meet the general criteria NiSource has laid out for native grasses and pollinator species that are compatible with utility right of way maintenance and erosion control needs. Plant information available from the NRCS plant database and coordination with reputable seed suppliers will be used to determine actual mixes based on geographic location and site conditions. Technical permanent seeding specifications will be outlined on the site-specific erosion control plans for each project.

Seed mixes shall be purchased from a reputable seed supplier (such as Ernst) and shall meet the "certified seed" requirements as outlined by the Virginia Crop Improvement Association or similar certifying agency in another state. If certified seed is not available, the seed shall meet the minimum seed quality criteria as outlined in the VESCH.

In instances where the site-specific, non-VESCH control measures fail to effectively control soil erosion, sediment deposition and non-agricultural runoff, VESCH specified control measures shall be utilized.

Where applicable, site-specific restoration plans will be developed in accordance with the DEQ Guidance Memo 16-2001 – Updated Virginia Runoff Reduction Method Compliance Spreadsheets. All permanent restoration activities on small/standard construction and maintenance projects without a site-specific restoration plan or SWM plan shall be completed in accordance with Attachment 6 and the VESCH.

4. Rights-of-Way Maintenance

Integrated vegetation management (IVM) plans will be developed for new and newly restored rights-of-way (ROWs) in a manner that will promote the desired land cover and vegetation for a particular ROW. When required by a stormwater management plan to restore and maintain an area as open space as defined in Table 1 of Guidance Memo 16-2001, the IVM will be developed to ensure that mowing is minimized and will not occur more than four times per year. Where possible, mowing will be reduced or eliminated through the use of targeted herbicide application.

5. Construction Entrances

The Geotextile Specifications Table Attachment 7, must be used when selecting the proper geotextile fabric for use in Figure 16 – Construction Entrance.

6. Temporary Vehicular Crossings

The Culvert Sizing Table, Attachment 8, must be used when selecting culverts to be used in Figure 22 – Temporary Equipment Crossing Culvert and Stone.

Attachment 1 - Virginia Minimum Standards

Virginia Erosion and Sediment Control Regulations
Section 9VAC25-840-40

All land-disturbing activities undertaken on private and public lands in the Commonwealth of Virginia must meet the 19 "minimum standards" for erosion and sediment control (ESC) in Section 9VAC25-840-40 of the Virginia Erosion and Sediment Control Regulations. The applicant who submits the ESC plan to the program authority for approval is responsible for ensuring compliance with the minimum standards that apply to his/her activities. A condensed version of the minimum standards is provided below. Please refer to the Regulations for a complete, unedited copy of the minimum standards.

(1) Soil Stabilization.

- Permanent or temporary soil stabilization shall be applied to denuded areas within seven days after final grade is reached on any portion of the site
- Temporary soil stabilization shall be applied within seven days to denuded areas that may not be at final grade but will remain dormant for longer than 14 days, but less than one year
- Permanent stabilization shall be applied to areas that are to be left dormant for more than one year

(2) Soil Stockpile Stabilization. During construction, soil stockpiles and borrow areas shall be stabilized or protected with sediment trapping measures. Temporary protection and permanent stabilization shall be applied to all soil stockpiles on site and borrow areas or soil intentionally transferred off site.

(3) Permanent Stabilization. Permanent vegetative cover shall be established on denuded areas not otherwise permanently stabilized. Permanent vegetation shall not be considered established until a ground cover is achieved that is:

- Uniform
- Mature enough to survive
- Will inhibit erosion

(4) Sediment Basins & Traps. Sediment basins, sediment traps, perimeter dikes, sediment barriers, and other measures intended to trap sediment shall be constructed as a first step in any land-disturbing activity and shall be made functional before upslope land disturbance takes place.

(5) Stabilization of Earthen Structures. Stabilization measures shall be applied to earthen structures such as dams, dikes, and diversions immediately after installation.

(6) Sediment Traps & Sediment Basins. Sediment traps and basins shall be designed and constructed based upon the total drainage area to be served by the trap or basin as follows:

Sediment Traps

- Only control drainage areas less than three acres
- Minimum storage capacity of 134 cubic yards per acre of drainage area

Sediment Basins

- Control drainage areas greater than or equal to three acres
- Minimum storage capacity of 134 cubic yards per acre of drainage area
- The outfall system shall, at a minimum, maintain the structural integrity of the basin during a twenty-five year storm of 24-hour duration

(7) Cut and Fill Slopes Design & Construction. Cut and fill slopes shall be designed and constructed in a manner that will minimize erosion. Slopes found to be eroding excessively within one year of permanent stabilization shall be provided with additional slope stabilizing measures until the problem is corrected.

(8) Concentrated Runoff Down Slopes. Concentrated runoff shall not flow down cut or fill slopes unless contained within an adequate temporary or permanent channel, flume, or slope drain structure.

(9) Slope Maintenance. Whenever water seeps from a slope face, adequate drainage or other protection shall be provided.

(10) Storm Sewer Inlet Protection. All storm sewer inlets made operable during construction shall be protected so that sediment-laden water cannot enter the stormwater conveyance system without first being filtered/treated to remove sediment.

(11) Stormwater Conveyance Protection. Before newly constructed stormwater conveyance channels or pipes are made operational, adequate outlet protection and any required temporary or permanent channel lining shall be installed in both the conveyance channel and the receiving channel.

(12) Work in Live Watercourse. When work in a live watercourse is performed:

- Precautions shall be taken to minimize encroachment, control sediment transport, and stabilize the work area to the greatest extent possible during construction
- Nonerodible material shall be used for the construction of causeways and cofferdams
- Earthen fill may be used for these structures if armored by nonerodible cover materials

(13) Crossing Live Watercourse. When a live watercourse must be crossed by construction vehicles more than twice in any six-month period, a temporary vehicular stream crossing constructed of nonerodible material shall be provided.

(14) Regulation of Watercourse Crossing. All applicable federal, state and local regulations pertaining to working in or crossing live watercourses shall be met.

(15) Stabilization of Watercourse. The bed and banks of a watercourse shall be stabilized immediately after work in the watercourse is completed.

(16) Underground Utility Line Installation. Underground utility lines shall be installed in accordance with the following standards in addition to other applicable criteria:

- No more than 500 linear feet of trench may be opened at one time
- Excavated material shall be placed on the uphill side of trenches
- Effluent from dewatering operations shall be filtered or passed through an approved sediment trapping device, or both, and discharged in a manner that does not adversely affect flowing streams or off-site property
- Material used for backfilling trenches shall be properly compacted in order to minimize erosion and promote stabilization
- Restabilization shall be accomplished in accordance with these regulations
- Comply with applicable safety regulations

(17) Vehicular Sediment Tracking. Where construction vehicle access routes intersect paved or public roads:

- Provisions shall be made to minimize the transport of sediment by vehicular tracking onto the paved surface
- Where sediment is transported onto a paved or public road surface, the road surface shall be cleaned thoroughly at the end of each day. Sediment shall be removed from the roads by shoveling or sweeping and transported to a sediment control disposal area. Street washing shall be allowed only after sediment is removed in this manner

(18) Removal of Temporary Measures. All temporary erosion and sediment control measures shall be removed within 30 days after final site stabilization or after the temporary measures are no longer needed, unless otherwise authorized by the program authority. Trapped sediment and the disturbed soil areas resulting from the disposition of temporary measures shall be permanently stabilized to prevent further erosion and sedimentation.

(19) Stormwater Management . Properties and waterways downstream from development sites shall be protected from sediment deposition, erosion and damage due to increases in volume, velocity and peak flow rate of stormwater runoff for the stated frequency storm of 24-hour duration in accordance with the following standards and criteria. Stream restoration and relocation projects that incorporate natural channel design concepts are not man-made channels and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels:

a. Concentrated stormwater runoff leaving a development site shall be discharged directly into an adequate natural or man-made receiving channel, pipe or storm sewer system. For those sites where runoff is discharged into a pipe or pipe system, downstream stability analyses at the outfall of the pipe or pipe system shall be performed.
b. Adequacy of all channels and pipes shall be verified in the following manner:

    1) The applicant shall demonstrate that the total drainage area to the point of analysis within the channel is 100 times greater than the contributing drainage area of the project in question; or
    2) (a) Natural channels shall be analyzed by the use of a two-year storm to verify that stormwater will not overtop channel banks nor cause erosion of channel bed or banks.

(b) All previously constructed man-made channels shall be analyzed by the use of a 10-year storm to verify that stormwater will not overtop its banks and by the use of a two-year storm to demonstrate that stormwater will not cause erosion of channel bed or banks; and

(c) Pipes and storm sewer systems shall be analyzed by the use of a 10-year storm to verify that stormwater will be contained within the pipe or system.

c. If existing natural receiving channels or previously constructed man-made channels or pipes are not adequate, the applicant shall:
    1) Improve the channels to a condition where a 10-year storm will not overtop the banks and a two-year storm will not cause erosion to the channel, the bed, or the banks; or
    2) Improve the pipe or pipe system to a condition where the 10-year storm is contained within the appurtenances;
    3) Develop a site design that will not cause the pre-development peak runoff rate from a two-year storm to increase when runoff outfalls into a natural channel or will not cause the pre-development peak runoff rate from a 10-year storm to increase when runoff outfalls into a man-made channel; or
    4) Provide a combination of channel improvement, stormwater detention or other measures which is satisfactory to the VESCP authority to prevent downstream erosion.
d. The applicant shall provide evidence of permission to make the improvements.
e. All hydrologic analyses shall be based on the existing watershed characteristics and the ultimate development condition of the subject project.
f. If the applicant chooses an option that includes stormwater detention, he shall obtain approval from the VESCP of a plan for maintenance of the detention facilities. The plan shall set forth the maintenance requirements of the facility and the person responsible for performing the maintenance.
g. Outfall from a detention facility shall be discharged to a receiving channel, and energy dissipators shall be placed at the outfall of all detention facilities as necessary to provide a stabilized transition from the facility to the receiving channel.
h. All on-site channels must be verified to be adequate.
i. Increased volumes of sheet flows that may cause erosion or sedimentation on adjacent property shall be diverted to a stable outlet, adequate channel, pipe or pipe system, or to a detention facility.
j. In applying these stormwater management criteria, individual lots or parcels in a residential, commercial or industrial development shall not be considered to be separate development projects. Instead, the development, as a whole, shall be considered to be a single development project. Hydrologic parameters that reflect the ultimate development condition shall be used in all engineering calculations.
k. All measures used to protect properties and waterways shall be employed in a manner which minimizes impacts on the physical, chemical and biological integrity of rivers, streams and other waters of the state.
l. Any plan approved prior to July 1, 2014, that provides for stormwater management that addresses any flow rate capacity and velocity requirements for natural or man-made channels shall satisfy the flow rate capacity and velocity requirements for natural or man-made channels if the practices are designed to (i) detain the water quality volume and to release it over 48 hours; (ii) detain and release over a 24-hour period the expected rainfall resulting from the one year, 24-hour storm; and (iii) reduce the allowable peak flow rate resulting from the 1.5, 2, and 10-year, 24-hour storms to a level that is less than or equal to the peak flow rate from the site assuming it was in a good forested condition, achieved

through multiplication of the forested peak flow rate by a reduction factor that is equal to the runoff volume from the site when it was in a good forested condition divided by the runoff volume from the site in its proposed condition, and shall be exempt from any flow rate capacity and velocity requirements for natural or man-made channels as defined in any regulations promulgated pursuant to § 62.1-44.15:54 or 62.1-44.15:65 of the Act.

m. For plans approved on and after July 1, 2014, the flow rate capacity and velocity requirements of § 62.1-44.15:52 A of the Act and this subsection shall be satisfied by compliance with water quantity requirements in the Stormwater Management Act (§ 62.1-44.15:24 et seq. of the Code of Virginia) and attendant regulations, unless such land-disturbing activities (i) are in accordance with provisions for time limits on applicability of approved design criteria in 9VAC25-870-47 or grandfathering in 9VAC25-870-48 of the Virginia Stormwater Management Program (VSMP) Regulation, in which case the flow rate capacity and velocity requirements of § 62.1-44.15:52 A of the Act shall apply, or (ii) are exempt pursuant to § 62.1-44.15:34 C 7 of the Act.

n. Compliance with the water quantity minimum standards set out in 9VAC25-870-66 of the Virginia Stormwater Management Program (VSMP) Regulation shall be deemed to satisfy the requirements of this subdivision 19.

Attachment 2 – Erosion and Sediment Control Inspection Log

Project Name: _____ **Inspection Location:** _____

Date of Inspection: _____ **Inspector:** _____

Inspection Type: ☐ **Periodic** ☐ **Rainfall Event (Date)** _____

Stage of Construction: ☐ **Clearing and Grubbing** ☐ **Rough Grading**
☐ **Finish and Grading** ☐ **Final Stabilization**

Project Comments:

Minimum Standard:	**Yes**	**No**	**N/A**
Are all denuded areas stabilized? **(MS-1)**	☐	☐	☐
Are all required structural practices installed properly per plan? (**MS-2, 6, 10)**	☐	☐	☐
Does permanent vegetation provide adequate stabilization? **(MS-3)**	☐	☐	☐
Have perimeter sediment trapping facilities been constructed? **(MS-4)**	☐	☐	☐
Are earthen control structures seeded and mulched? **(MS-5)**	☐	☐	☐
Are all finished cut and fill slopes adequately stabilized? **(MS-7)**	☐	☐	☐
Are all channels and outlets adequately stabilized? **(MS-8, 9, 10, 11, 19))**	☐	☐	☐
Is re-stabilization of in-stream construction complete? **(MS-12, 15)**	☐	☐	☐
Are in-stream construction EC properly installed? **(MS-13)**	☐	☐	☐
Are utilities trenches dewatered, backfilled and stabilized? **(MS-16)**	☐	☐	☐
Are construction entrances maintained and soil and mud being kept off public roadways? **(MS-17)**	☐	☐	☐

Have all control structures no longer needed been removed and such areas stabilized? **(MS-18)**	☐	☐	☐

Minimum Standard Continued:	**Yes**	**No**	**N/A**
Are adjacent properties and waterways adequately protected? **(MS-19)**	☐	☐	☐
Have all deficiencies from previous inspection been addressed?	☐	☐	☐

Action Items Table:

Station #	**Date Action To Be Completed By**	**Occurrence**		**Action Item Description**	**Date Action Completed**
		Initial	**Repeat**		

Inspector (Printed): _____

Signature: _____ **Date:** _____

NOTE: This form should be completed:

1. During or immediately following initial installation of erosion and sediment controls;
2. At least once per week;
3. At the completion of the project**;** and,
4. By a DEQ certified EC Inspector.

Attachment 3 – VSMP & Erosion and Sediment Control Inspection Log

Project Name: _____ County/ City: _____

Inspection Location: _____ Inspector Name: _____

Inspection Date: _____ Time: _____ Rainfall Event Date/Amount: _____

N/A = If inspection frequency is at least once every four business days.

Pre-Construction Conference	☐	*Pipeline Construction*	☐	*Construction of SWM Facilities*	☐
Clearing & Grubbing	☐	*Finish Grading*	☐	*Maintenance of SWM Facilities*	☐
Rough Grading	☐	*Final Stabilization*	☐	*Other:*	☐

		Yes	*No*	*N/A*	**2) Recommended Corrective Action/Notes**
1	Copy of notice of coverage letter posted near main entrance:				
2	Information for public access to electronic format or hard copy of SWPPP posted near main entrance:				
3	Copy of complete SWPPP available onsite for operators:				
4	SWPPP is being amended, modified and updated:				

Inspection Requirements	***Have controls been installed in accordance with the approved Annual Standards & Specs?***	***Are controls effectively minimizing sediment discharges?***	**Have controls been inappropriately or incorrectly used?**	**Describe any maintenance needs or other deficiencies that were identified and the location of the deficiencies**
All perimeter erosion and sediment controls (silt fence, etc.)	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	
Completed earthen structures, such ditches and diversions for stabilization	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	
Sediment traps, barriers and other measures *(installed to control sediment discharges)*	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	
Storm drain and/or curb/drop inlet protection	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	
Dewatering devices (filter bags, sediment traps)	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	
Construction entrances and access routes	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	
Wetland and stream equipment crossings	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	
Wetland and stream utility crossings	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	
Wetland and stream crossing restoration	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	
Drilling fluid disposal areas (for stabilization or sediment trapping measures)	☐ YES ☐ NO	☐ YES ☐ NO	☐ YES ☐ NO	

Are all utility trenches dewatered, backfilled, and stabilized as required at the end of each day?	☐ YES ☐ NO ☐ NA
Have stabilization activities begun on areas that have reached final grade or that will remain dormant for more than 14 days?	☐ YES ☐ NO ☐ NA
Were stabilization activities completed within seven days of reaching final grade or stopping work on areas that have reached final grade or that will remain dormant for more than 14 days?	☐ YES ☐ NO ☐ NA
Is permanent vegetation uniform and mature enough to survive and inhibit erosion?	☐ YES ☐ NO ☐ NA
Have all control structures that are no longer needed been removed?	☐ YES ☐ NO ☐ NA

Inspect for the presence of the following:	**Present?**	**Location**
Concentrated flows of stormwater in conveyances *(such as rills, rivulets or channels)* that have not been filtered, settled, or similarly treated prior to discharge, *(or evidence thereof)*	☐ YES ☐ NO	
Sediment laden runoff that has not been filtered or settled to remove sediments prior to discharge	☐ YES ☐ NO	
Sediment deposition on any property *(including public and private streets)* outside of the construction activity covered by the general permit	☐ YES ☐ NO	
Required stabilization *(initiated or completed on portions of the site?)*	☐ YES ☐ NO	
Land disturbance outside of the approved limits of disturbance	☐ YES ☐ NO	

Inspect the pollution prevention controls associated with the pollutant generating activities identified in the Pollution Prevention Plan				
Inspect the pollution prevention controls associated with the pollution generating activities identified in Table 8.1 of the SWPPP		**Have the controls been properly implemented as shown in the PPP plan?**	**Are controls effectively minimizing pollutant discharges?**	**Describe any maintenance needs or other deficiencies that were identified and the location of the deficiencies**
Clearing, grading or excavating	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	
Dewatering operations	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	
Material delivery and storage	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	
Material use during building process	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	
Solid waste disposal	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	
Sanitary waste disposal *(porta-johns)*	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	
Landscaping operations	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	
Vehicle Fueling or Maintenance	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	
Other (describe)	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	
Inspect any authorized non-stormwater discharges from Table 8.2				
Hydrostatic Test Waters	☐ N/A	☐ YES ☐ NO	☐ YES ☐ NO	

Identify the material(s) and document the location or presence of any evidence of pollutant discharges that are not authorized by the general permit	

NOTE: This form should be completed:
- during or immediately following initial installation of erosion and sediment controls;
- at least once per week;
- at the completion of the project; and,
- by a DEQ certified EC/SWM Inspector, as applicable.

ACTION ITEMS TABLE

Crossing or Station #	Date Action To Be Completed By	Occurrence		Action Item Description	Date Action Completed
		Ini-tial	Re-peat		

Inspector (Printed): _____

Signature: _____ **Date:** _____

Attachment 4 – Drilling Fluid Disposal Worksheet

Drilling Fluid may be disposed of in one of the three following ways. Please note which disposal method will be used for the duration of the drilling project and complete the section as indicated below.

1) Drilling fluid may be spread over the onsite easement work area and stabilized within the easement as outlined in the erosion control plans for the project. Erosion Control structures (i.e. silt fence) should be in place per the plans during the disposal activities. The fluids shall then be seeded and stabilized as outlined in the Erosion Control Plans for the project.

2) Drilling fluid may be disposed of at an offsite location with an active state or federal permit that authorizes the facility to receive such material. (i.e. a mine permit from the Dept of Mines, Minerals & Energy or a landfill permit from the Dept. of Environmental Quality).

   Name of Facility:_____
   Address of Facility:_____
   Contact Name/Number of Facility:_____
   Permitting Agency:_____
   Permit Number:_____
   Permit Expiration Date:_____

3) Drilling Fluid may be disposed of at an offsite location that will be maintained in accordance with the approved erosion control plan requirements. The disposal area shall be protected with erosion control measures such as silt fence or a stabilized earth berm (or other measure detailed in the CGV ECS manual). Upon completion of the drilling portion of the project, the disposal site shall be seeded and stabilized per the requirements of the erosion control plan. The erosion control measures on the disposal site shall be inspected by a qualified inspector as required by the erosion control plan. The following Offsite Disposal Erosion Control Detail sheet should be completed prior to the start of construction.

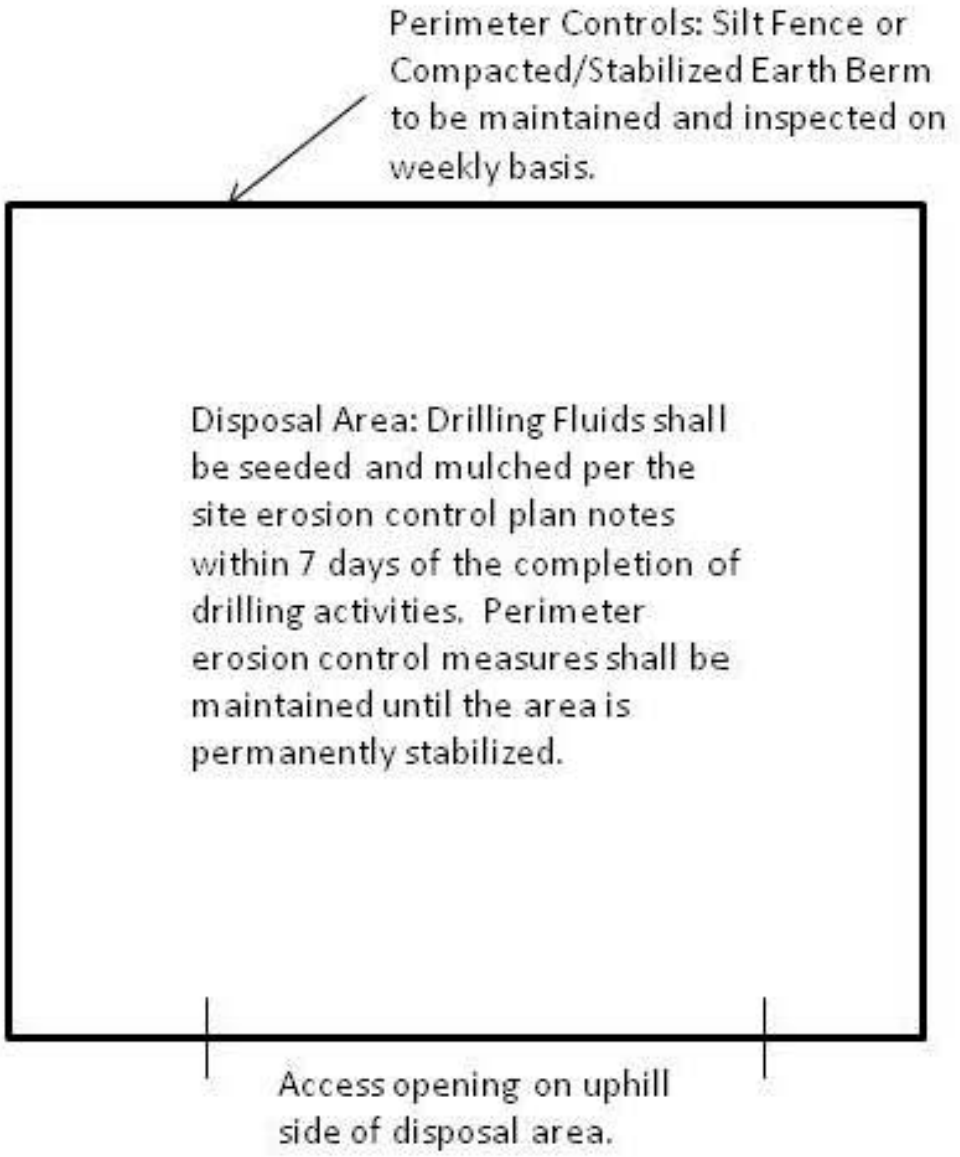
OFFSITE DISPOSAL EROSION CONTROL DETAIL SHEET

Disposal Site Address:_____

Owner Contact Info:_____

Typical Erosion Control Plan

Follow this plan for erosion control measures or note modifications below.



Attachment 5 - Inadvertent Release of Drilling Fluid Notification Procedure

- In the event of an inadvertent release of drilling fluid all drilling operations shall be ceased immediately.

- In the event that material from the inadvertent release of drilling fluid enters or has a high likelihood of entering Virginia waters, the onsite Columbia Gas Construction Inspector shall notify the NRP Group immediately.

- The NRP Group shall ensure that the appropriate state agencies are notified of the release:

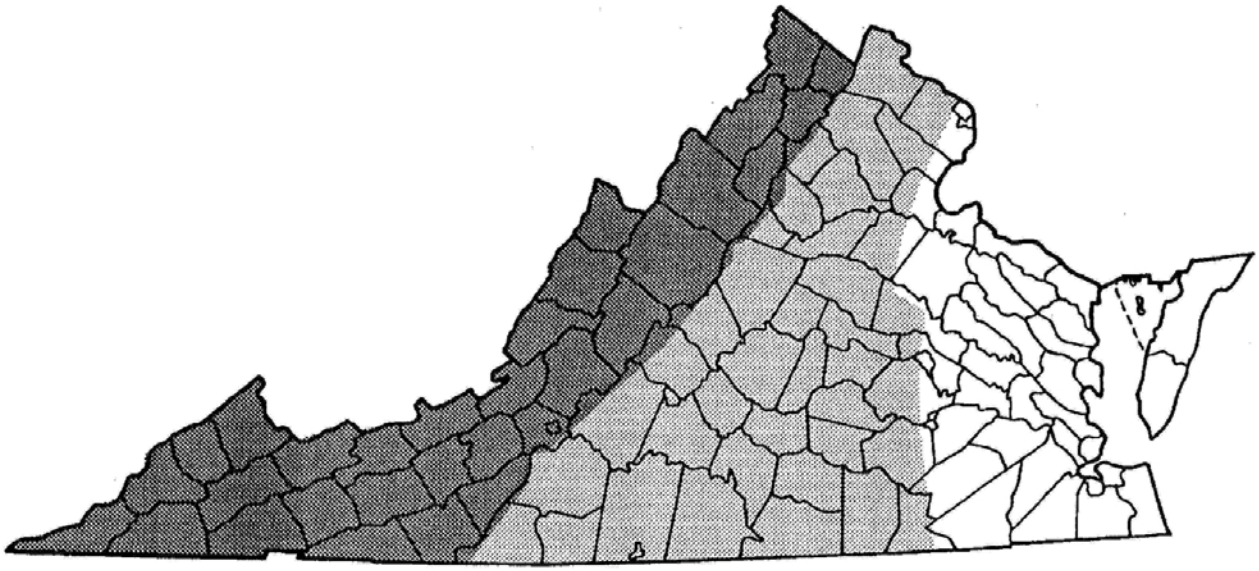
  - After business hours-VDEM, 1-800-468-8892
  - During business hours-VDEQ
    - Piedmont Regional Office, 804-527-5020
    - Northern Regional Office, (703) 583-3800
    - Blue Ridge Regional Office, (540) 562-6700
    - Southwest Regional Office, (276) 676-4800
    - Valley Regional Office, (540) 574-7800
    - Tidewater Regional Office, (757) 518-2000
  - Online at http://www.deq.state.va.us/prep_ext/

- Any material resulting from the inadvertent release of drilling fluid shall be contained and removed from the stream, river, wetland or other water body as is practical.

- Drilling operations shall only resume once measures approved by the NRP Group have been implemented to ensure that no further release to the stream, river, wetland or other water body will occur. These measures may include containment and removal activities taking place concurrently with the drilling operation. These measures may be similar to the measures discussed in the inadvertent release of drilling fluid containment and corrective action procedure outlined in Section 3.3 of the main document.

Attachment 6 – Seeding Requirements

VIRGINIA PHYSIOGRAPHIC PROVINCES
REFERENCE GUIDE FOR
TABLES 1-4



APPALACHIAN PIEDMONT COASTAL PLAIN

PHYSIOGRAPHIC PROVINCES IN VIRGINIA

Table 1

SEED MIX FOR TEMPORARY STABILIZATION

Application Dates	Species	Rate (lbs/acre)
Sept. 1 - Feb. 15	50/50 Mix of Annual Ryegrass (lolium multiflorum) & Cereal (Winter) Rye (Secale cereale)	50 -100 (lbs/acre)
Feb. 16 - Apr. 30	Annual Ryegrass (lolium multi-florum)	60 - 100 (lbs/acre)
May 1 - Aug. 31	German Millet	50 (lbs/acre)

FERTILIZER & LIME

- Apply 10-10-10 **fertilizer** at a rate of 450 lbs. / acre (or 10 lbs. / 1,000 sq. ft.)
- Apply **Pulverized Agricultural Limestone** at a rate of 2 tons/acre (or 90 lbs. / 1,000 sq. ft.)

NOTE:
1 - A soil test is necessary to determine the actual amount of lime required to adjust the soil pH of site.
2 - Incorporate the lime and fertilizer into the top 4 – 6 inches of the soil by disking or by other means.
3 - When applying Slowly Available Nitrogen, use rates available in Erosion & Sediment Control Technical Bulletin # 4, 2003 Nutrient Management for Development Sites at http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/ESCTechnicalBulletin4.pdf

TABLE 2
PERMANENT SEEDING SPECIFICATIONS FOR APPALACHIAN/MOUNTAIN AREA

SEED[1]		
LAND USE	**SPECIES**	**APPLICATION RATES**
Minimum Care Lawn (Commercial or Residential)	Tall Fescue[1] Perennial Ryegrass[2] Kentucky Bluegrass[1]	90-100% 0-10% 0-10% TOTAL: 200-250 lbs.
High-Maintenance Lawn	Minimum of three (3) up to five (5) varieties of Kentucky Bluegrass from approved list for use in Virginia[1]	TOTAL: 125 lbs.
General Slope (3:1 or less)	Tall Fescue[1] Red Top Grass or Creeping Red Fescue Seasonal Nurse Crop[3]	128 lbs. 2 lbs. 20 lbs. TOTAL: 150 lbs.
Low-Maintenance Slope (Steeper than 3:1)	Tall Fescue[1] Red Top Grass or Creeping Red Fescue Seasonal Nurse Crop[3] Crownvetch[4]	108 lbs. 2 lbs. 20 lbs. 20 lbs. TOTAL: 150 lbs.

1 - When selecting varieties of turfgrass, use the Virginia Crop Improvement Association (VCIA) recommended turfgrass variety list. Quality seed will bear a label indicating that they are approved by VCIA. A current turfgrass variety list is available at the local County Extension office or through VCIA at 804-746-4884 or at http://sudan.cses.vt.edu/html/Turf/turf/publications/publications2.html

2 - Perennial Ryegrass will germinate faster and at lower soil temperatures than Tall Fescues, thereby providing cover and erosion resistance for seedbed.

3 - Use seasonal nurse crop in accordance with seeding dates as stated below:

March, April - May 15th …… Annual Rye
May 16th - August 15th …… Foxtail Millet
August 16th - September, October …….. Annual Rye
November - February …….. Winter Rye

4 - All legume seed must be properly inoculated. If Flatpea is used, increase to 30 lbs/acre. If Weeping Lovegrass is used, include in any slope or low maintenance mixture during warmer seeding periods, increase to 30 -40 lbs/acre.

*Invasive/noxious species such as Crownvetch should not be used and should be replaced with another species listed on table 3.32-A/B of the Virginia Sediment & Erosion Control Handbook.

FERTILIZER & LIME

- Apply 10-20-10 **fertilizer** at a rate of 500 lbs. / acre (or 12 lbs. / 1,000 sq. ft.)
- Apply **Pulverized Agricultural Limestone** at a rate of 2 tons/acre (or 90 lbs. / 1,000 sq. ft.)

NOTE:
1 - A soil test is necessary to determine the actual amount of lime required to adjust the soil pH of site.
2 - Incorporate the lime and fertilizer into the top 4 – 6 inches of the soil by disking or by other means.
3 - When applying Slowly Available Nitrogen, use rates available in Erosion & Sediment Control Technical Bulletin # 4, 2003 Nutrient Management for Development Sites at http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/ESCTechnicalBulletin4.pdf

TABLE 3

PERMANENT SEEDING SPECIFICATIONS FOR PIEDMONT AREA

SEED[1]		
LAND USE	**SPECIES**	**APPLICATION RATES**
Minimum Care Lawn (Commercial or Residential)	Tall Fescue[1] Perennial Ryegrass Kentucky Bluegrass[1]	95-100% 0-5% 0-5% TOTAL: 175-200 lbs.
High-Maintenance Lawn	Tall Fescue[1]	TOTAL: 200-250 lbs.
General Slope (3:1 or less)	Tall Fescue[1] Red Top Grass or Creeping Red Fescue Seasonal Nurse Crop[2]	128 lbs. 2 lbs. 20 lbs. TOTAL: 150 lbs.
Low-Maintenance Slope (Steeper than 3:1)	Tall Fescue[1] Red Top Grass or Creeping Red Fescue Seasonal Nurse Crop[2] Crownvetch[3]	108 lbs. 2 lbs. 20 lbs. 20 lbs. TOTAL: 150 lbs.

1 - When selecting varieties of turfgrass, use the Virginia Crop Improvement Association (VCIA) recommended turfgrass variety list. Quality seed will bear a label indicating that they are approved by VCIA. A current turfgrass variety list is available at the local County Extension office or through VCIA at 804-746-4884 or at http://sudan.cses.vt.edu/html/Turf/turf/publications/publications2.html

2 - Use seasonal nurse crop in accordance with seeding dates as stated below:

February 16 - May 15th …… Annual Rye
May 1st - August 15th …….. Foxtail Millet
August 16th - October …….. Annual Rye
November - February 15th…… Winter Rye

3 - Substitute Sericea lespedeza for Crownvetch east of Farmville, VA (May through September use hulled seed, all other periods, use unhulled Sericea). If Flatpea is used, increase rate to 30 lbs./acre. If Weeping Lovegrass is used, include in any slope or low maintenance mixture during warmer seeding periods, increase to 30 -40.

*Invasive/noxious species such as Crownvetch should not be used and should be replaced with another species listed on table 3.32-A/B of the Virginia Sediment & Erosion Control Handbook.

FERTILIZER & LIME

- Apply 10-20-10 **fertilizer** at a rate of 500 lbs. / acre (or 12 lbs. / 1,000 sq. ft.)
- Apply **Pulverized Agricultural Limestone** at a rate of 2 tons/acre (or 90 lbs. / 1,000 sq. ft.)

NOTE:
1 - A soil test is necessary to determine the actual amount of lime required to adjust the soil pH of site.
2 - Incorporate the lime and fertilizer into the top 4 – 6 inches of the soil by disking or by other means.
3 - When applying Slowly Available Nitrogen, use rates available in Erosion & Sediment Control Technical Bulletin # 4, 2003 Nutrient Management for Development Sites at http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/ESCTechnicalBulletin4.pdf

TABLE 4
PERMANENT SEEDING SPECIFICATIONS FOR COASTAL PLAIN AREA

SEED[1]		
LAND USE	**SPECIES**	**APPLICATION RATES**
Minimum Care Lawn (Commercial or Residential)	Tall Fescue[1] Or Bermudagrass[1]	175-200 lbs. 75 lbs.
High-Maintenance Lawn	Tall Fescue[1] Or Bermudagrass[1] (seed) Or Bermudagrass[1](by other vegetative Establishment method, see Std & Spec 3.34	200-250 lbs. 40 lbs. (unhulled) 30 lbs. (hulled)
General Slope (3:1 or less)	Tall Fescue[1] Red Top Grass or Creeping Red Fescue Seasonal Nurse Crop[2]	128 lbs. 2 lbs. 20 lbs. TOTAL: 150 lbs.
Low-Maintenance Slope (Steeper than 3:1)	Tall Fescue[1] Bermudagrass[1] Red Top Grass or Creeping Red Fescue Seasonal Nurse Crop[2] Sericea Lespedeza[3]	93-108 lbs. 0-15 lbs. 2 lbs. 20 lbs. 20 lbs. TOTAL: 150 lbs.

1 - When selecting varieties of turfgrass, use the Virginia Crop Improvement Association (VCIA) recommended turfgrass variety list. Quality seed will bear a label indicating that they are approved by VCIA. A current turfgrass variety list is available at the local County Extension office or through VCIA at 804-746-4884 or at http://sudan.cses.vt.edu/html/Turf/turf/publications/publications2.html

2 - Use seasonal nurse crop in accordance with seeding dates as stated below:
February, March-April. …… Annual Rye
May 1st - August ….. …….. Foxtail Millet
September, October – November 15th….. Annual Rye
November 16th – January…… Winter Rye

3 – May through October use hulled seed. All other seeding periods, use unhulled seed. If Weeping Lovegrass is used, include in any slope or low maintenance mixture during warmer seeding periods, increase to 30-40 lbs/acre.

*Invasive/noxious species such as Crownvetch should not be used and should be replaced with another species listed on table 3.32-A/B of the Virginia Sediment & Erosion Control Handbook.

FERTILIZER & LIME

- Apply 10-20-10 **fertilizer** at a rate of 500 lbs. / acre (or 12 lbs. / 1,000 sq. ft.)
- Apply **Pulverized Agricultural Limestone** at a rate of 2 tons/acre (or 90 lbs. / 1,000 sq. ft.)

NOTE:
1 - A soil test is necessary to determine the actual amount of lime required to adjust the soil pH of site.
2 - Incorporate the lime and fertilizer into the top 4 – 6 inches of the soil by disking or by other means.
3 - When applying Slowly Available Nitrogen, use rates available in Erosion & Sediment Control Technical Bulletin # 4, 2003 Nutrient Management for Development Sites at http://www.deq.virginia.gov/Portals/0/DEQ/Water/Publications/ESCTechnicalBulletin4.pdf

Attachment 7 – Geotextile Fabric Specification

TABLE 302-A

CONSTRUCTION SPECIFICATIONS FOR FILTER CLOTH UNDERLINER

Fabric Properties[1]	Light Duty Entrance[2] (Graded Subgrade	Heavy Duty Entrance[3] (Rough Graded)	Test Method
Grab Tensile Strength (lbs)	200	220	ASTM D1682
Elongation at Failure (%)	50	220	ASTM D1682
Mullen Burst Strength (lbs)	190	430	ASTM D3786
Puncture Strength (lbs)	40	125	ASTM D751 (modified)
Equivalent Opening Size (mm)	40-80	40-80	U.S. Standard Sieve CW 02215

1 Fabrics not meeting these specifications may be used only when design procedure and supporting documentation are supplied to determine aggregate depth and fabric strength.

2 Light Duty Entrance: Sites that have been graded to subgrade and where most travel would be single axle vehicles and an occasional multi-axle truck. Examples of fabrics which can be used are: Trevira Spunbond 1115, Mirafi 100X, Typar 3401, or equivalent.

3 Heavy Duty Entrance: Sites with only rough grading and where most travel would be multi-axle vehicles. Examples of fabrics which can be used are: Trevira Spunbond 1135, Mirafi 600X, or equivalent.

Source: Virginia Highway and Transportation Research Council (VHTRC)

Attachment 8 – Culvert Sizing Table

TABLE 3.24-A
PIPE DIAMETER (INCHES) FOR STREAM CROSSINGS

Drainage Area (Acres)	Average Slope of Watershed			
	1%	4%	8%	16%
1-25	24	24	30	30
26- 50	24	30	36	36
51 - 100	30	36	42	48
101 - 150	30	42	48	48
151- 200	36	42	48	54
301 - 350	42	48	60	60
351 - 400	42	54	60	60
451- 500	42	54	60	72
501- 550	48	60	60	72
551- 600	48	60	60	72
601- 640	48	60	72	72

Note: Table is based on USDA-SCS Graphical Peak Discharge Method for 2-year frequency storm event, CN = 65; Rainfall depth = 3.5 inches (average for Virginia).

Source: Va. DSWC

Appendix F AGENCY CORRESPONDENCE

Office of Real Estate
John Kessler, Chief
2045 Morse Road – Bldg. E-2
Columbus, OH 43229
Phone: (614) 265-6621
Fax: (614) 267-4764

April 3, 2020

Charlie Allen
Stantec
1500 Lake Shore Drive Suite 100
Columbus OH 43204-3800

Re: 20-173; Columbia Gas of Ohio - Columbus Northern Pipeline Project

Project: The proposed project involves constructing a 24-inch high pressure transmission class natural gas steel pipeline and 16-inch distribution class steel pipeline, and one district regulator station.

Location: The proposed project is located in Jerome and Liberty Townships, Union and Delaware Counties, Ohio.

The Ohio Department of Natural Resources (ODNR) has completed a review of the above referenced project. These comments were generated by an inter-disciplinary review within the Department. These comments have been prepared under the authority of the Fish and Wildlife Coordination Act (48 Stat. 401, as amended; 16 U.S.C. 661 et seq.), the National Environmental Policy Act, the Coastal Zone Management Act, Ohio Revised Code and other applicable laws and regulations. These comments are also based on ODNR's experience as the state natural resource management agency and do not supersede or replace the regulatory authority of any local, state or federal agency nor relieve the applicant of the obligation to comply with any local, state or federal laws or regulations.

Natural Heritage Database: The Natural Heritage Database has the following records at or within a one-mile radius of the project area:

Arbor vitae (*Thuja occidentalis*), P
Purple wartyback (*Cyclonaias tuberculata*), SC
Kidneyshell (*Ptychobranchus exilis*), SC
Pondhorn (*Uniomerus tetralasmus*), T
Least bittern (*Ixobrychus exilis*), T
Sora rail (*Porzana carolina*), SC
King rail (*Rallus elegans*), E
Virginia rail (*Rallus limicola*), SC
Indiana bat (*Myotis sodalist*), E, FE
Cave or cavern
Sinkhole
Glacier Ridge Metro Park – Columbus & Franklin Co. Park District
O'Shaughnessy Reservoir Park – Columbus Recreation & Parks

The review was performed on the project area you specified in your request as well as an additional one-mile radius. Records searched date from 1980. This information is provided to inform you of features present within your project area and vicinity.

Please note that Ohio has not been completely surveyed and we rely on receiving information from many sources. Therefore, a lack of records for any particular area is not a statement that rare species or unique features are absent from that area. Although all types of plant communities have been surveyed, we only maintain records on the highest quality areas.

Statuses are defined as: E = state endangered; T = state threatened; P = state potentially threatened; SC = state species of concern; SI = state special interest; A = species recently added to state inventory, status not yet determined; X = presumed extirpated in Ohio; FE = federal endangered, FT = federal threatened, FSC = federal species of concern, FC = federal candidate species.

Fish and Wildlife: The Division of Wildlife (DOW) has the following comments.

The DOW recommends that impacts to streams, wetlands and other water resources be avoided and minimized to the fullest extent possible, and that best management practices be utilized to minimize erosion and sedimentation.

The project is within the vicinity of records for the Indiana bat (*Myotis sodalis*), a state endangered and federally endangered species. Presence of the Indiana bat has been established in the area, and therefore additional summer surveys would not constitute presence/absence in the area. The following species of trees have relatively high value as potential Indiana bat roost trees to include: shagbark hickory (*Carya ovata*), shellbark hickory (*Carya laciniosa*), bitternut hickory (*Carya cordiformis*), black ash (*Fraxinus nigra*), green ash (*Fraxinus pennsylvanica*), white ash (*Fraxinus americana*), shingle oak (*Quercus imbricaria*), northern red oak (*Quercus rubra*), slippery elm (*Ulmus rubra*), American elm (*Ulmus americana*), eastern cottonwood (*Populus deltoides*), silver maple (*Acer saccharinum*), sassafras (*Sassafras albidum*), post oak (*Quercus stellata*), and white oak (*Quercus alba*). Indiana bat roost trees consists of trees that include dead and dying trees with exfoliating bark, crevices, or cavities in upland areas or riparian corridors and living trees with exfoliating bark, cavities, or hollow areas formed from broken branches or tops. However, Indiana bats are also dependent on the forest structure surrounding roost trees. If suitable habitat occurs within the project area, the DOW recommends trees be conserved. If suitable habitat occurs within the project area and trees must be cut, the DOW recommends cutting occur between October 1 and March 31. If no tree removal is proposed, this project is not likely to impact this species.

The project is within the range of for the snuffbox (*Epioblasma triquetra*), a state endangered and federally endangered mussel, the clubshell (*Pleurobema clava*), a state endangered and federally endangered mussel, the Northern riffleshell (*Epioblasma torulosa rangiana*), a state endangered and federally endangered mussel, the rayed bean (*Villosa fabalis*), a state endangered and federally endangered mussel, the rabbitsfoot (*Quadrula cylindrica cylindrica*), a state endangered and federal candidate mussel, the elephant-ear (*Elliptio crassidens crassidens*), a state endangered mussel, and the pondhorn (*Uniomerus tetralasmus*), a state threatened mussel.

This project must not have an impact on freshwater native mussels at the project site. This applies to both listed and non-listed species. Per the Ohio Mussel Survey Protocol (2020), all Group 2, 3, and 4 streams (Appendix A) require a mussel survey. Per the Ohio Mussel Survey Protocol, Group 1 streams (Appendix A) and unlisted streams with a watershed of 5 square miles or larger

above the point of impact should be assessed using the Reconnaissance Survey for Unionid Mussels (Appendix B) to determine if mussels are present. Mussel surveys may be recommended for these streams as well. This is further explained within the Ohio Mussel Survey Protocol. Therefore, if in-water work is planned in any stream that meets any of the above criteria, the DOW recommends the applicant provide information to indicate no mussel impacts will occur. If this is not possible, the DOW recommends a professional malacologist conduct a mussel survey in the project area. If mussels that cannot be avoided are found in the project area, as a last resort, the DOW recommends a professional malacologist collect and relocate the mussels to suitable and similar habitat upstream of the project site. Mussel surveys and any subsequent mussel relocation should be done in accordance with the Ohio Mussel Survey Protocol. The Ohio Mussel Survey Protocol (2020) can be found at:

http://wildlife.ohiodnr.gov/portals/wildlife/pdfs/licenses%20&%20permits/OH%20Mussel%20Survey%20Protocol.pdf

The project is within the range of the Scioto madtom (*Noturus trautmani*), a state endangered and federally endangered fish, and the Tippecanoe darter (*Etheostoma Tippecanoe*), a state threatened fish. The DOW recommends no in-water work in perennial streams from April 15 to June 30 to reduce impacts to indigenous aquatic species and their habitat. If no in-water work is proposed, the project is not likely to impact these species.

The project is within the range of the American bittern (*Botaurus lentiginosus*), a state endangered bird. Nesting bitterns prefer large undisturbed wetlands that have scattered small pools amongst dense vegetation. They occasionally occupy bogs, large wet meadows, and dense shrubby swamps. If this type of habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of May 1 to July 31. If this type of habitat will not be impacted, the project is not likely to impact this species.

The project is within the range of the least bittern (*Ixobrychus exilis*), a state threatened bird. This secretive marsh species prefers dense emergent wetlands with thick stands of cattails, sedges, sawgrass or other semiaquatic vegetation interspersed with woody vegetation and open water. If this type of habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of May 1 to July 31. If this type of habitat will not be impacted, this project is not likely to impact this species.

The project is within the range of the king rail (*Rallus elegans*), a state endangered bird. Nests for this species are deep bowls constructed out of grass and usually hidden very well in marsh vegetation. If this type of habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of May 1 to August 1. If no wetland habitat will be impacted, the project is not likely to impact this species.

The project is within the range of the northern harrier (*Circus cyaneus*), a state endangered bird. This is a common migrant and winter species. Nesters are much rarer, although they occasionally breed in large marshes and grasslands. Harriers often nest in loose colonies. The female builds a nest out of sticks on the ground, often on top of a mound. Harriers hunt over grasslands. If this type of habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of May 15 to August 1. If this habitat will not be impacted, the project is not likely to impact this species.

The project is within the range of the loggerhead shrike (*Lanius ludovicianus*), a state endangered bird. The loggerhead shrike nests in hedgerows, thickets and fencerows. They hunt over

hayfields, pastures, and other grasslands. If thickets or other types of dense shrubbery habitat will be impacted, construction should be avoided in this habitat during the species' nesting period of April 1 to August 1. If this habitat will not be impacted, this project is not likely to impact this species.

Due to the potential of impacts to federally listed species, as well as to state listed species, we recommend that this project be coordinated with the U.S. Fish & Wildlife Service.

Parks and Watercraft: The Division of Parks and Watercraft has the following comment.

The ODNR Division of Parks and Watercraft has determined that there is a potential for impacts to recreational boating on the O'Shaughnessy Reservoir during the proposed Columbus-Northern pipeline project. We recommend the reservoir be kept open to boaters as much as feasibly and safely as possible during the project to keep impacts to recreation at a minimum. If impacts to recreation are foreseeable, we would recommend mitigation measures including signage and/or buoys to ensure safe boating in the project area. Tom Arbour, ODNR Division of Parks and Watercraft Trails Administrator, can assist with any necessary signage, coordination, and communications. Mr. Arbour can be reached at (614) 265-6575 or Thomas.Arbour@dnr.state.oh.us

Water Resources: The Division of Water Resources has the following comment.

The local floodplain administrator should be contacted concerning the possible need for any floodplain permits or approvals for this project. Your local floodplain administrator contact information can be found at the website below.

http://water.ohiodnr.gov/portals/soilwater/pdf/floodplain/Floodplain%20Manager%20Community%20Contact%20List_8_16.pdf

ODNR appreciates the opportunity to provide these comments. Please contact Sarah Tebbe, Environmental Specialist, at (614) 265-6397 or Sarah.Tebbe@dnr.state.oh.us if you have questions about these comments or need additional information.

Mike Pettegrew
Environmental Services Administrator (Acting)

In reply refer to:
2020-DEL-49418

September 24, 2020

Ryan J. Weller
Weller & Associates, Inc.
1395 West Fifth Avenue
Columbus, Ohio 43212

RE: Section 106 Review-Phase I Archaeological Survey for the Preferred Route of the Northern Columbus Loop Pipeline Project (Phase VII), Liberty/Concord Townships, Delaware County and Mill Creek/Jerome Townships, Union County, Ohio.

Dear Mr. Weller:

This letter is in response to the correspondence received on September 2, 2020 regarding the proposed 16.59-mile long Preferred Route of the Northern Columbus Loop Pipeline Project (Phase VII) in Liberty and Concord Townships, Delaware County, and Mill Creek and Jerome Townships, Union County, Ohio. We appreciate the opportunity to comment on this project. The comments of the Ohio State Historic Preservation Office (SHPO) are made pursuant to Section 149.53 of the Ohio Revised Code and the Ohio Power Siting Board (OPSB) rules. The comments of the Ohio SHPO are also submitted in accordance with the provisions of Section 106 of the National Historic Preservation Act of 1966, as amended (54 U.S.C. 306108 [36 CFR 800]).

The proposed undertaking involves the installation of a new 24-inch high pressure transmission natural gas steel pipeline, a 16-inch distribution steel pipeline, one district regulator station, and a launcher site within a proposed 16.59-mile corridor, which is defined as the Area of Potential Effect (APE). The following review and comments pertain only to the *Phase I Archaeological Investigations for the Approximately 26.7 km (16.59 mi) Preferred Route of the Northern Columbus Loop Pipeline Project (Phase VII) in Liberty/Concord Townships, Delaware County, and Mill Creek/Jerome Townships, Union County, Ohio* by Weller & Associates, Inc. (Weller) (2020). The architectural component has been submitted in a stand-alone report, and therefore the review will be under a separate cover.

The archaeological survey involved a literature review, shovel test unit excavations, surface collection, and visual inspection of the entire APE, as defined above. The survey resulted in the re-identification of two previously recorded archaeological sites, 33UN478 and 33UN479; and 25 previously undocumented sites, 33DL3388-33DL3393 and 33UN573-33UN587, 33UN589-33UN592. Sites 33UN478 and 33UN479 were identified during a separate corridor survey by Leary et al. (2014); both of which were determined not to be eligible for the National Register of Historic Places (NRHP) under Criterion D. Site 33UN478 was originally documented as an unassigned prehistoric lithic scatter consisting of eight non-diagnostic artifacts. The current survey found an additional five lithic artifacts, including a reworked Thebes point, which dates to the Early Archaic period (8000-6000 BC). Site 33UN479 was originally documented as an unassigned prehistoric isolated find. The current survey found an additional five lithic artifacts, all of which were also non-diagnostic of any particular time period. No fire-cracked rock (FCR) was identified as these sites.

The remaining sites, 33DL3388-33DL3393 and 33UN573-33UN587, 33UN589-33UN592, are, for the most part, prehistoric isolated finds and/or low-density lithic scatters. Although, two of these sites,

33DL3393 and 33UN587, are historic-era sites represented by a low-density scatter of artifacts and a foundation ruin, respectively.

After careful review of the archaeological report, our office concurs with Weller that these archaeological sites are not considered eligible for listing on the NRHP. Therefore, as proposed, there will be no effect on significant archaeological resources. No further archaeological investigations are warranted for the 16.59-mile project area. No further coordination in regards to archaeology are required for this project unless the scope of work changes or new/additional archaeological remains are discovered during the course of the project. In such a situation, this office should be contacted as required by 36 CFR § 800.13. If you have any questions concerning this review, please contact me via email at sbiehl@ohiohistory.org. Thank you for your cooperation.

Sincerely,

Stephen M. Biehl, Project Reviews Coordinator (archaeology)
Resource Protection and Review
State Historic Preservation Office

RPR Serial No. 1085423

"Please be advised that this is a Section 106 decision. This review decision may not extend to other SHPO programs."

United States Department of the Interior

FISH AND WILDLIFE SERVICE

Ecological Services
4625 Morse Road, Suite 104
Columbus, Ohio 43230
(614) 416-8993 / FAX (614) 416-8994

March 26, 2020

TAILS# 03E15000-2020-TA-0710

Dear Mr. Allen:

Re: Stantec, Columbia Gas, Northern Loop, Union and Delaware Counties

The U.S Fish and Wildlife Service (Service) has received your recent correspondence requesting information about the subject proposal. We offer the following comments and recommendations to assist you in minimizing and avoiding adverse impacts to threatened and endangered species pursuant to the Endangered Species Act of 1973 (16 U.S.C. 1531 et seq), as amended (ESA).

Federally Threatened and Endangered Species: The endangered Indiana bat (*Myotis sodalis*) and threatened northern long-eared bat (*Myotis septentrionalis*) occur throughout the State of Ohio. The Indiana bat and northern long-eared bat may be found wherever suitable habitat occurs unless a presence/absence survey has been performed to document absence. Suitable summer habitat for Indiana bats and northern long-eared bats consists of a wide variety of forested/wooded habitats where they roost, forage, and breed that may also include adjacent and interspersed non-forested habitats such as emergent wetlands and adjacent edges of agricultural fields, woodlots, fallow fields, and pastures. Roost trees for both species include live and standing dead trees ≥3 inches diameter at breast height (dbh) that have any exfoliating bark, cracks, crevices, hollows and/or cavities. These roost trees may be located in forested habitats as well as linear features such as fencerows, riparian forests, and other wooded corridors. Individual trees may be considered suitable habitat when they exhibit the characteristics of a potential roost tree and are located within 1,000 feet of other forested/wooded habitat. Northern long-eared bats have also been observed roosting in human-made structures, such as buildings, barns, bridges, and bat houses; therefore, these structures should also be considered potential summer habitat. In the winter, Indiana bats and northern long-eared bats hibernate in caves, rock crevices and abandoned mines.

Seasonal Tree Clearing for Federally Listed Bat Species: Should the proposed project site contain trees ≥3 inches dbh, we recommend avoiding tree removal wherever possible. If any caves or abandoned mines may be disturbed, further coordination with this office is requested to determine if fall or spring portal surveys are warranted. If no caves or abandoned mines are present and trees ≥3 inches dbh cannot be avoided, we recommend removal of any trees ≥3 inches dbh only occur between October 1 and March 31. Seasonal clearing is recommended to avoid adverse effects to Indiana bats and northern long-eared bats. While incidental take of northern long-eared bats from most tree clearing is exempted by a 4(d) rule (see http://www.fws.gov/midwest/endangered/mammals/nleb/index.html), incidental take of Indiana

bats is still prohibited without a project-specific exemption. Thus, seasonal clearing is recommended where Indiana bats are assumed present.
If implementation of this seasonal tree cutting recommendation is not possible, a summer presence/absence survey may be conducted for Indiana bats. If Indiana bats are not detected during the survey, then tree clearing may occur at any time of the year. Surveys must be conducted by an approved surveyor and be designed and conducted in coordination with the Ohio Field Office. Surveyors must have a valid federal permit. Please note that in Ohio summer mist net surveys may only be conducted between June 1 and August 15.

Section 7 Coordination: If there is a federal nexus for the project (e.g., federal funding provided, federal permits required to construct), then no tree clearing should occur on any portion of the project area until consultation under section 7 of the ESA, between the Service and the federal action agency, is completed. We recommend the federal action agency submit a determination of effects to this office, relative to the Indiana bat and northern long-eared bat, for our review and concurrence. This letter provides technical assistance only and does not serve as a completed section 7 consultation document.

Stream and Wetland Avoidance: Over 90% of the wetlands in Ohio have been drained, filled, or modified by human activities, thus is it important to conserve the functions and values of the remaining wetlands in Ohio (https://epa.ohio.gov/portals/47/facts/ohio_wetlands.pdf). We recommend avoiding and minimizing project impacts to all wetland habitats (e.g., forests, streams, vernal pools) to the maximum extent possible in order to benefit water quality and fish and wildlife habitat. Additionally, natural buffers around streams and wetlands should be preserved to enhance beneficial functions. If streams or wetlands will be impacted, the U.S. Army Corps of Engineers should be contacted to determine whether a Clean Water Act section 404 permit is required. Best management practices should be used to minimize erosion, especially on slopes. Disturbed areas should be mulched and revegetated with native plant species. In addition, prevention of non-native, invasive plant establishment is critical in maintaining high quality habitats.

Due to the project type, size, and location, we do not anticipate adverse effects to any other federally endangered, threatened, or proposed species, or proposed or designated critical habitat. Should the project design change, or additional information on listed or proposed species or their critical habitat become available, or if new information reveals effects of the action that were not previously considered, coordination with the Service should be initiated to assess any potential impacts.

Thank you for your efforts to conserve listed species and sensitive habitats in Ohio. We recommend coordinating with the Ohio Department of Natural Resources due to the potential for the proposed project to affect state listed species and/or state lands. Contact John Kessler, Environmental Services Administrator, at (614) 265-6621 or at john.kessler@dnr.state.oh.us.

If you have questions, or if we can be of further assistance in this matter, please contact our office at (614) 416-8993 or ohio@fws.gov.

Sincerely,

Patrice Ashfield
Field Office Supervisor

cc: Nathan Reardon, ODNR-DOW
Kate Parsons, ODNR-DOW

OHIO HISTORY CONNECTION

In reply refer to
2020-DEL-49418

October 1, 2020

Ryan Weller
Weller & Associates, Inc.
1395 W 5th Ave
Columbus, OH 43212

RE: Columbus Loop Pipeline Project (Phase VII) – History Architecture Report
Liberty/Concord Twp, Delaware County and Mill Creek/Jerome Twp, Union County, OH

Dear Mr. Weller:

This is in response to your correspondence, received September 2, 2020, regarding the proposed Northern Columbus Loop Pipeline Project (Phase VII). We appreciate the opportunity to comment on this project. The comments of the Ohio State Historic Preservation Office (SHPO) are made pursuant to Section 149.53 of the Ohio Revised Code and the Ohio Power Siting Board (OPSB) rules. The comments of the Ohio SHPO are also made pursuant to Section 106 of the National Historic Preservation Act of 1966, as amended, and the associated regulations at 36 CFR Part 800.

The proposed undertaking involves the installation of a new 24-inch high pressure transmission natural gas steel pipeline, a 16-inch distribution steel pipeline, one district regulator station, and a launcher site with a proposed 16.59-mile corridor, which is defined as the Area of Potential Effect (APE). The following review and comments pertain only to the History/Architecture Investigations for the Approximately 26.7 km (16.59 mi) Preferred Route of the Northern Columbus Loop Pipeline Project (Phase VII) in Liberty/Concord Townships, Delaware County, and Mill Creek/Jerome Townships, Union County, Ohio, by Weller & Associates, Inc. The archaeology component has been submitted in a stand-alone report, and therefore the review will be under a separate cover.

Within the APE, the report recommended the property at 3350 Clark-Shaw Road (OHI # DEL0111015) as being eligible for listing in the National Register of Historic Places under Criterion C. The report also recommended that the property at 12939 US 42 was not eligible, but we feel that more information is needed to make a final decision. However, based on available information, it is the opinion of the SHPO that the planned work, if completed as proposed, will meet the Secretary of Interior's Standards thereby having **No Adverse Effect** on historic properties. No further coordination is necessary unless there is a change in the project.

If you have questions regarding this review, please contact me at kkoehlinger@ohiohistory.org or 614-298-2000. Thank you for your cooperation.

Sincerely,

Kristen Koehlinger

Kristen Koehlinger, Project Reviews Manager
Resource Protection and Review

"Please be advised that this is a Section 106 decision. This review decision may not extend to other SHPO programs."

RPR Serial No: 1085424

Appendix G CONSTRUCTION PLANS

Figure No.
1

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Construction Plans
Project Area Updated: 11/4/2020

Client/Project
Columbia Gas of Ohio
Northern Columbus Loop Natural Gas
Pipeline Project (Phase VII)

Project Location
Union and Delaware Counties
Ohio

193707055

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Technical Review by MK on 2020-07-24
Independent Review by KC on 2020-07-24

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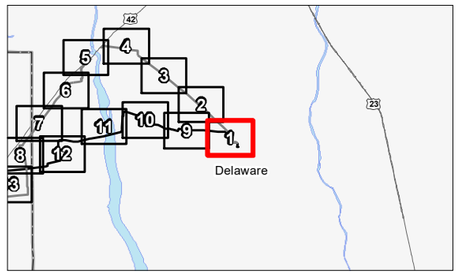

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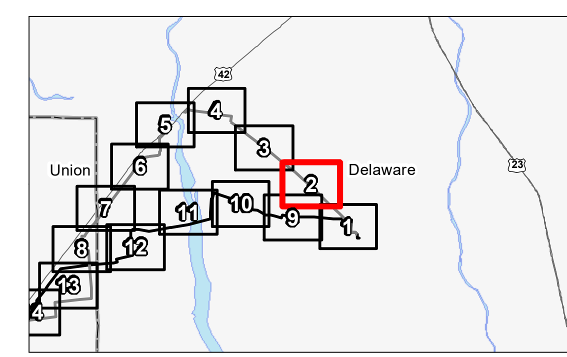

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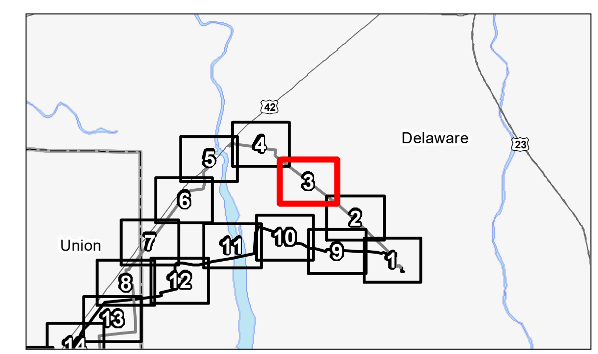

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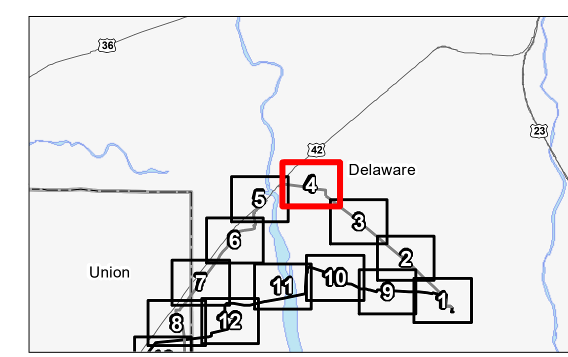

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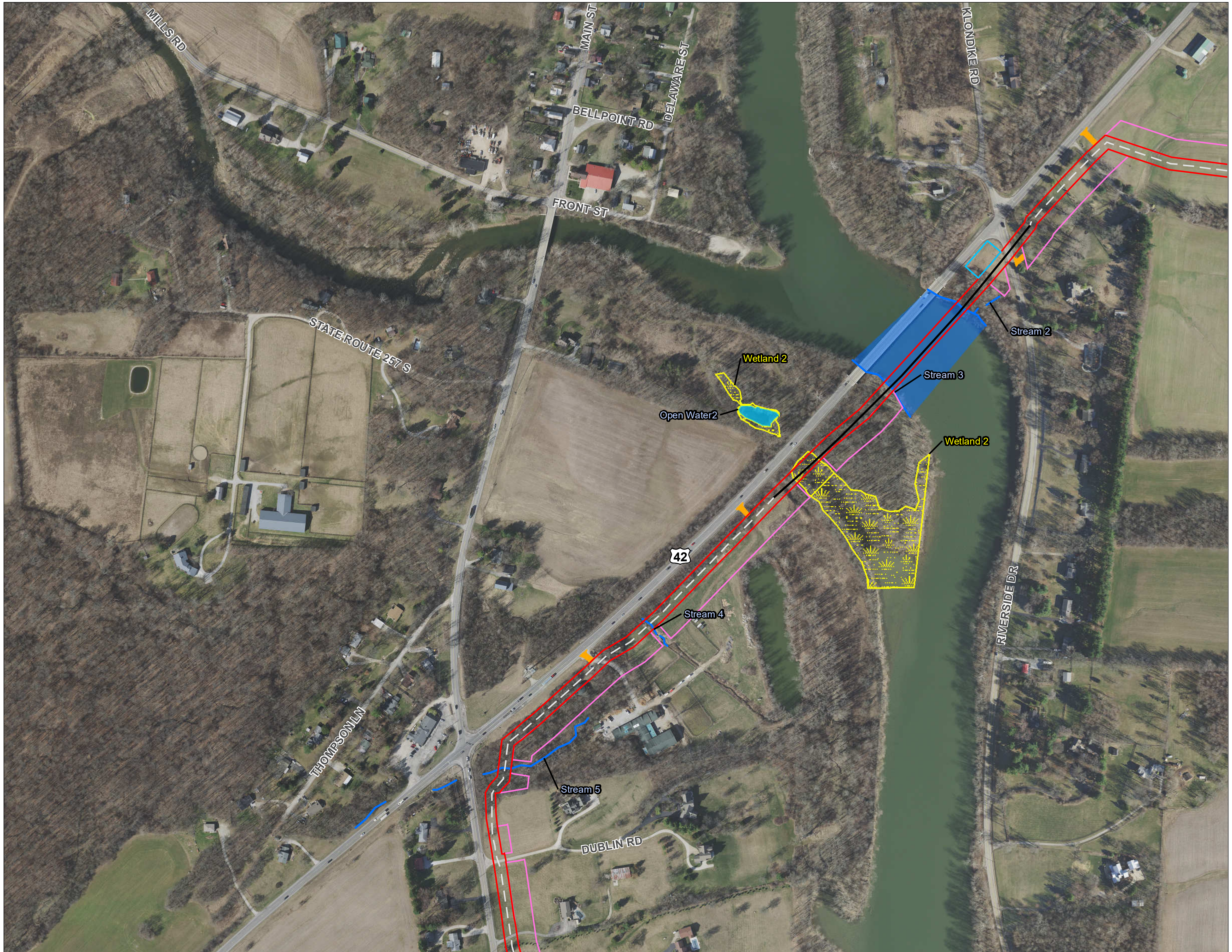

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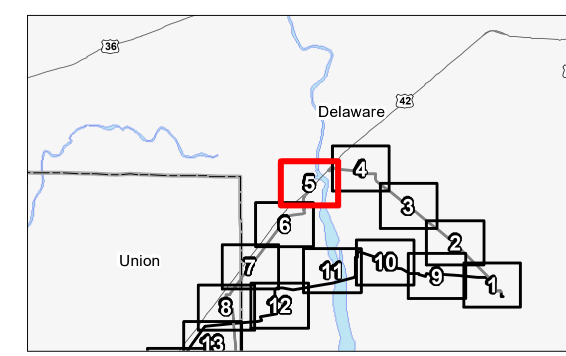

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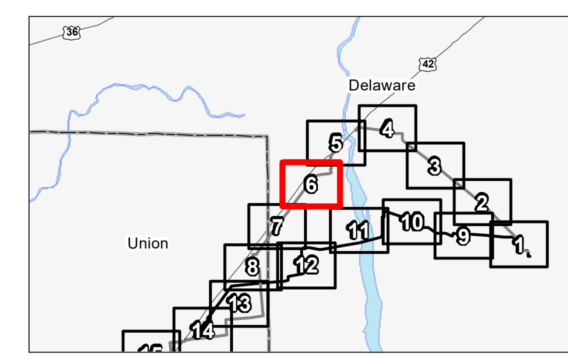

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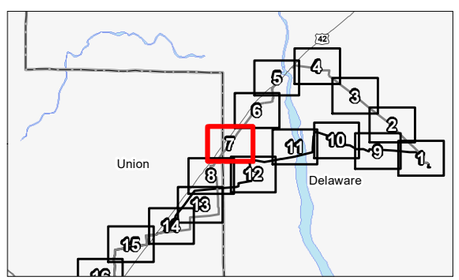

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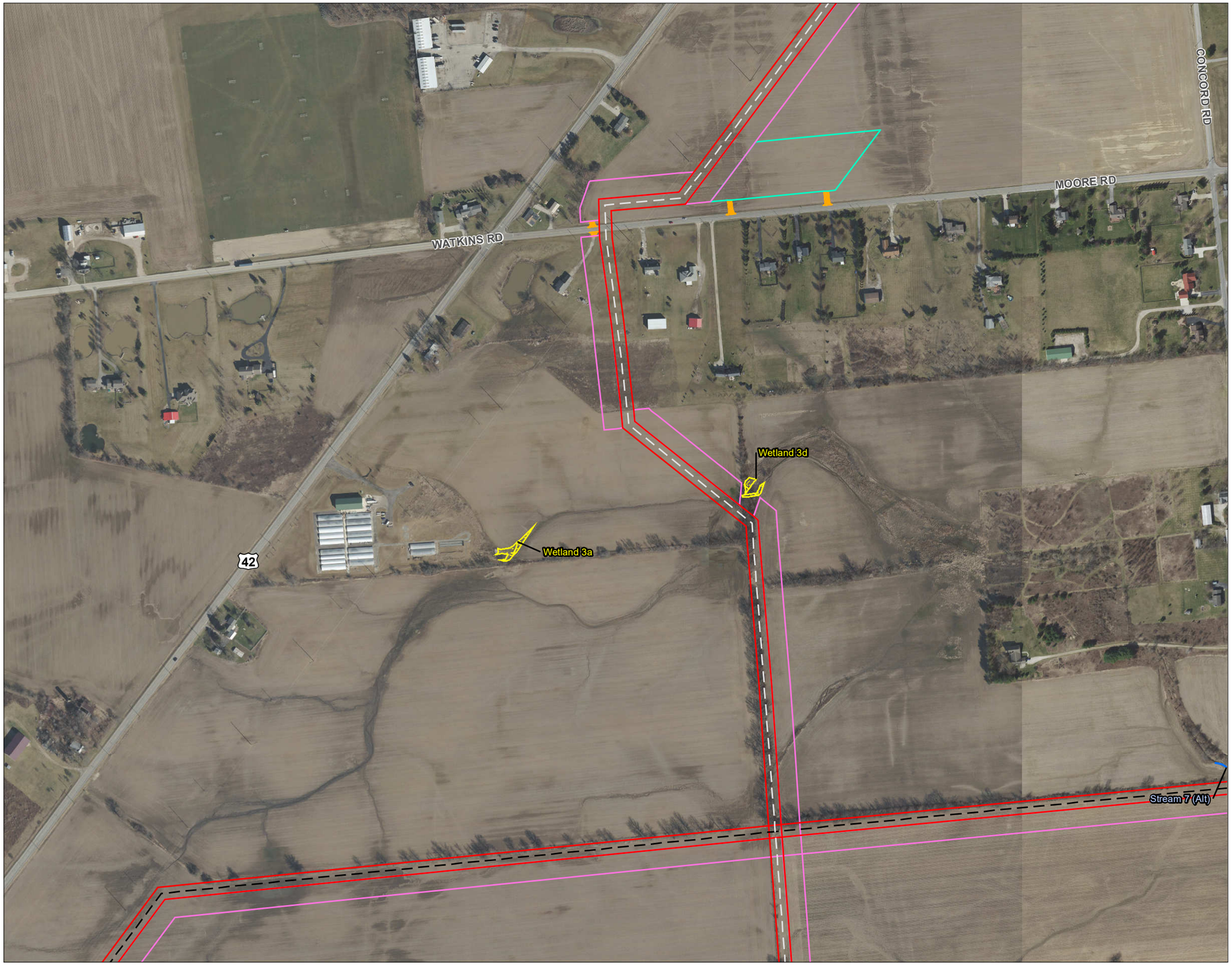

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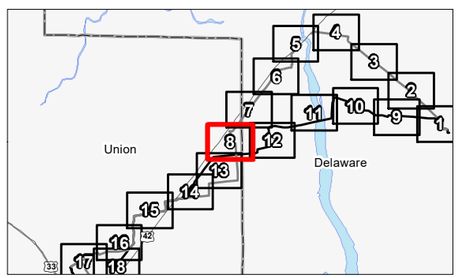

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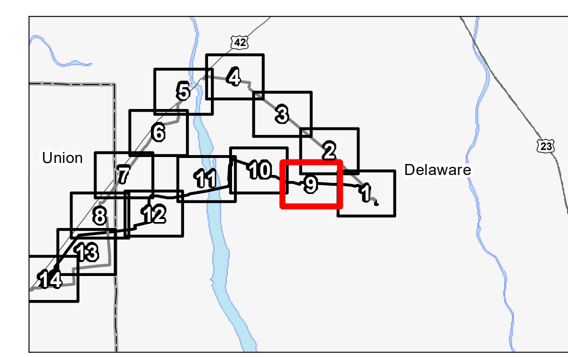

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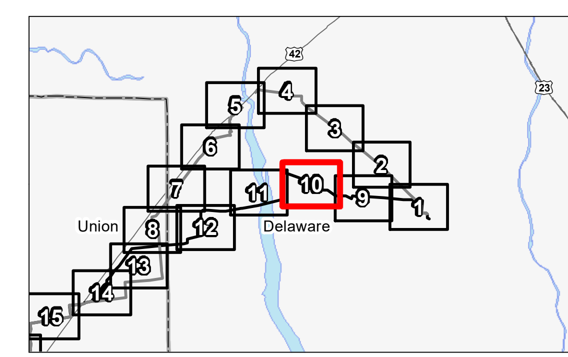

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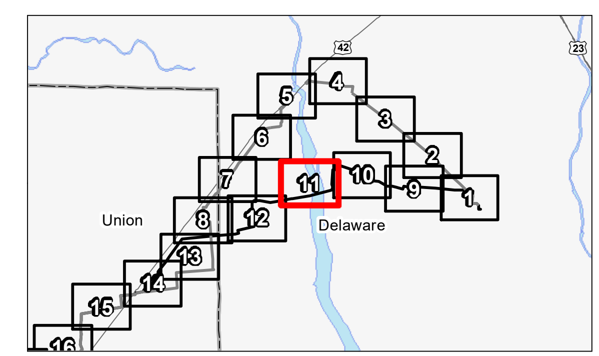

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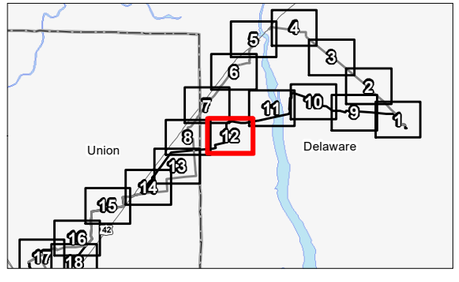

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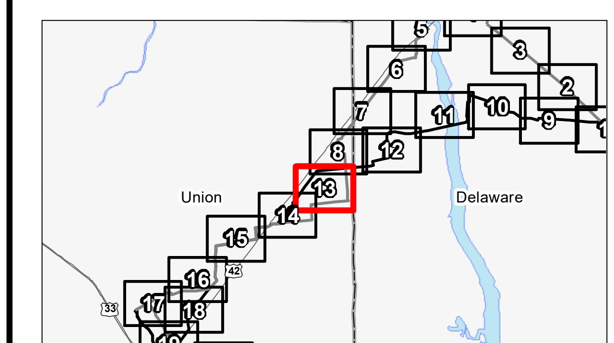

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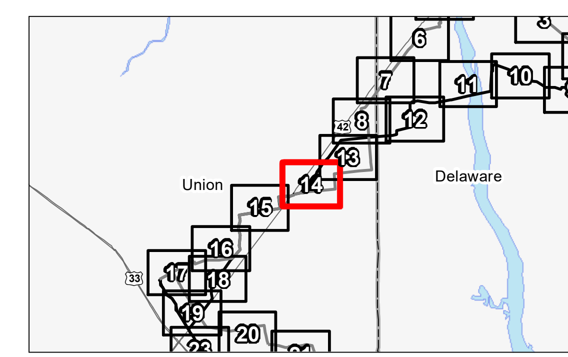

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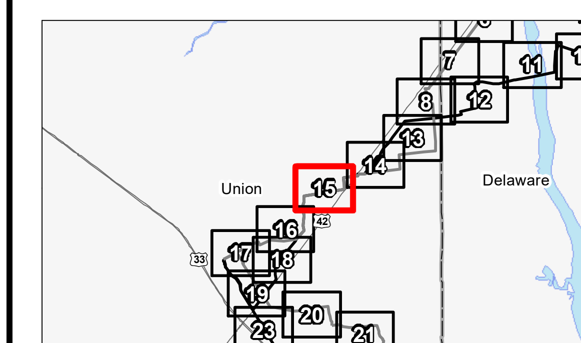

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Northern Columbus Loop Natural Gas
Pipeline Project (Phase VII)

Project Location
Union and Delaware Counties
Ohio

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Prepared by JD on 2020-06-07
Technical Review by MK on 2020-07-24
Independent Review by KC on 2020-07-24

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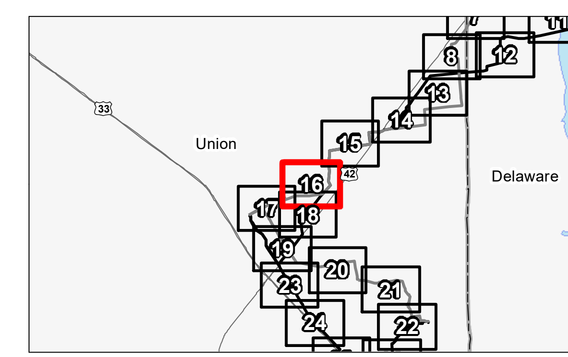

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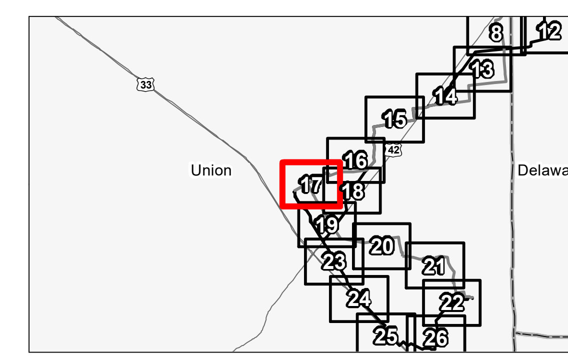

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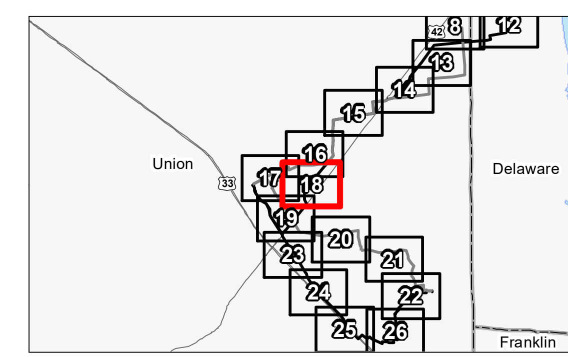

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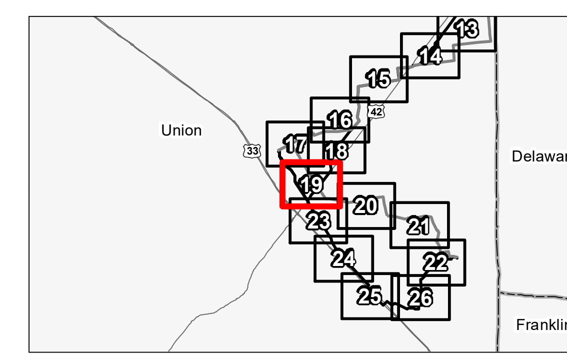

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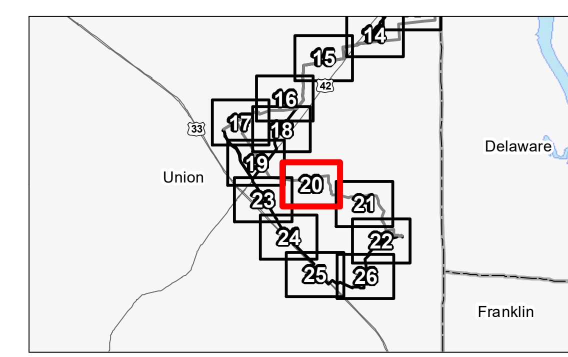

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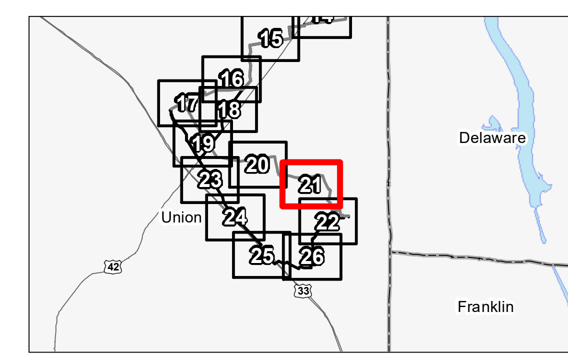

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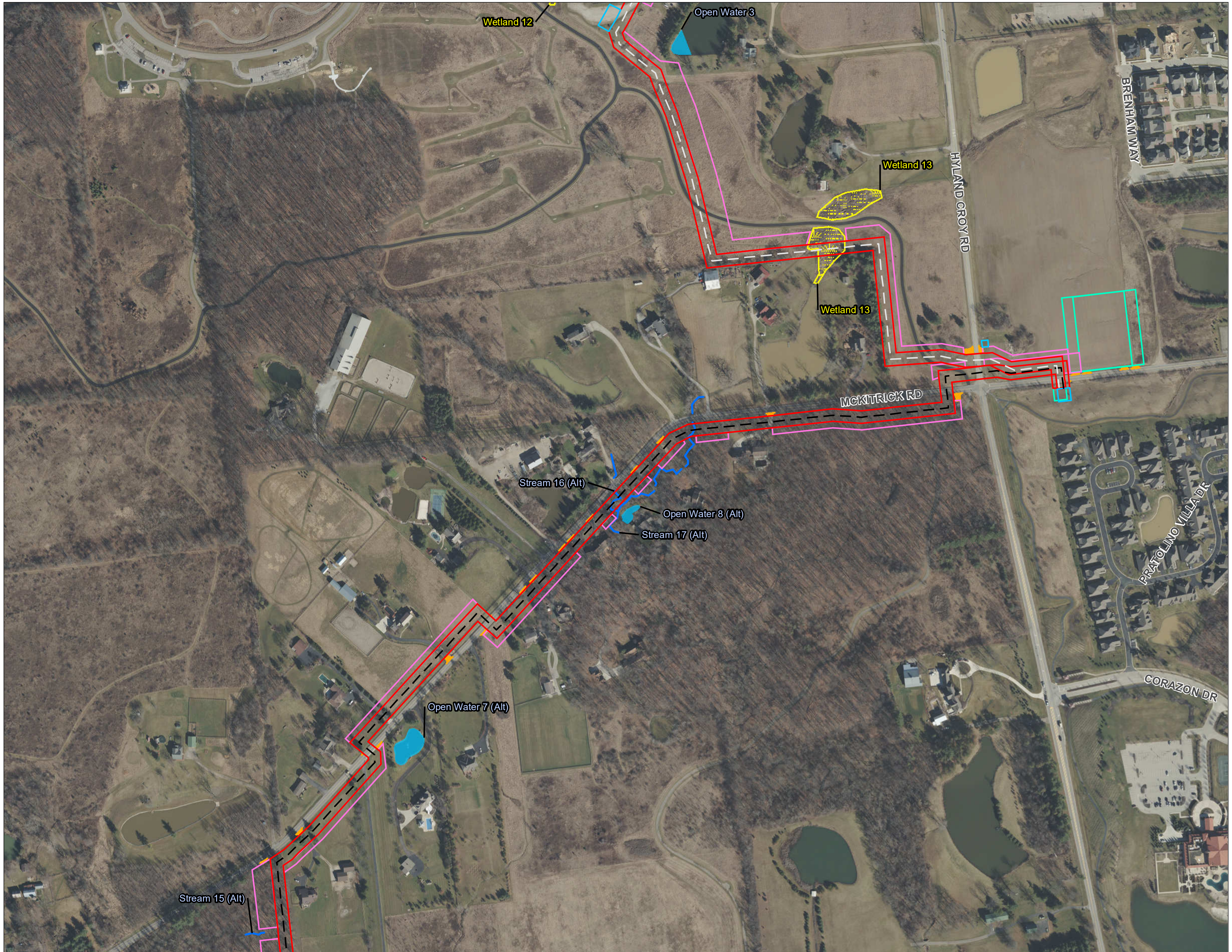

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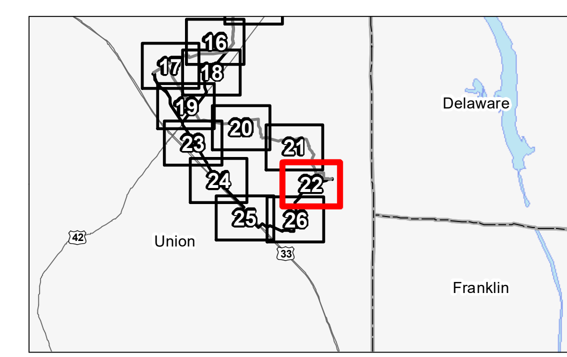

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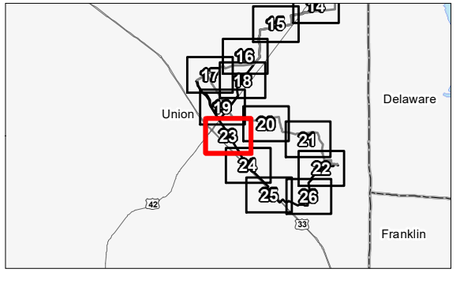

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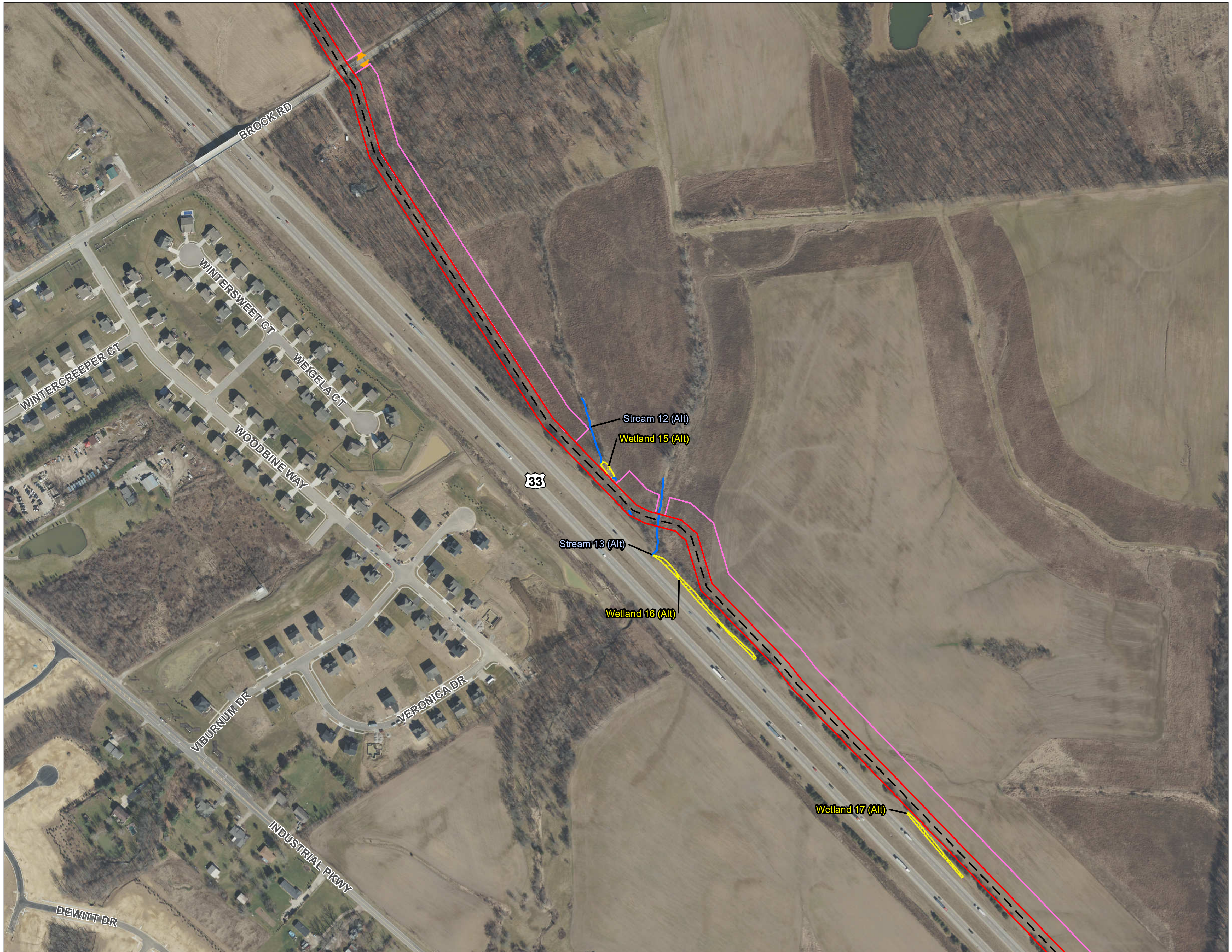

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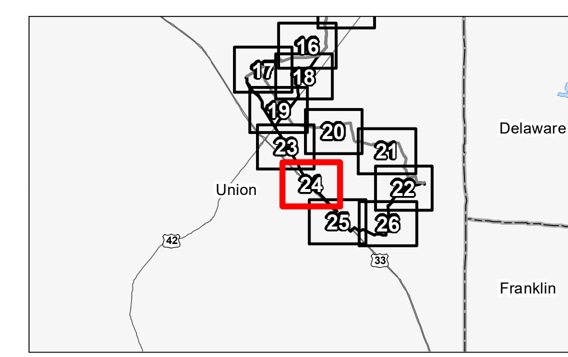

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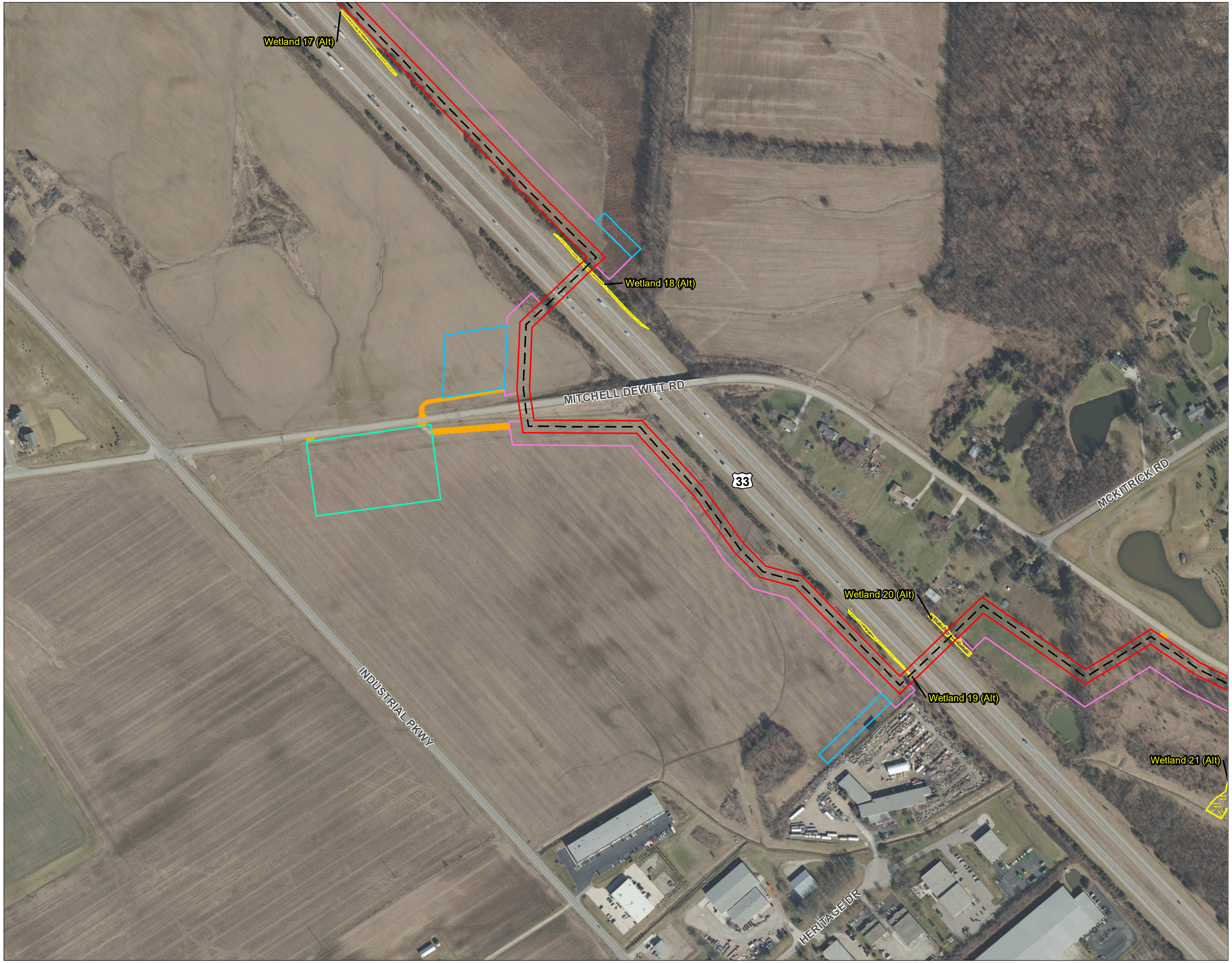

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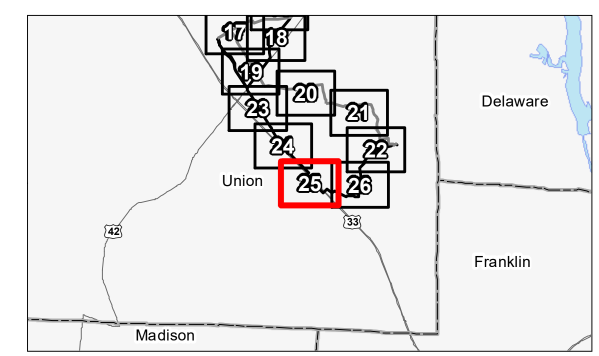

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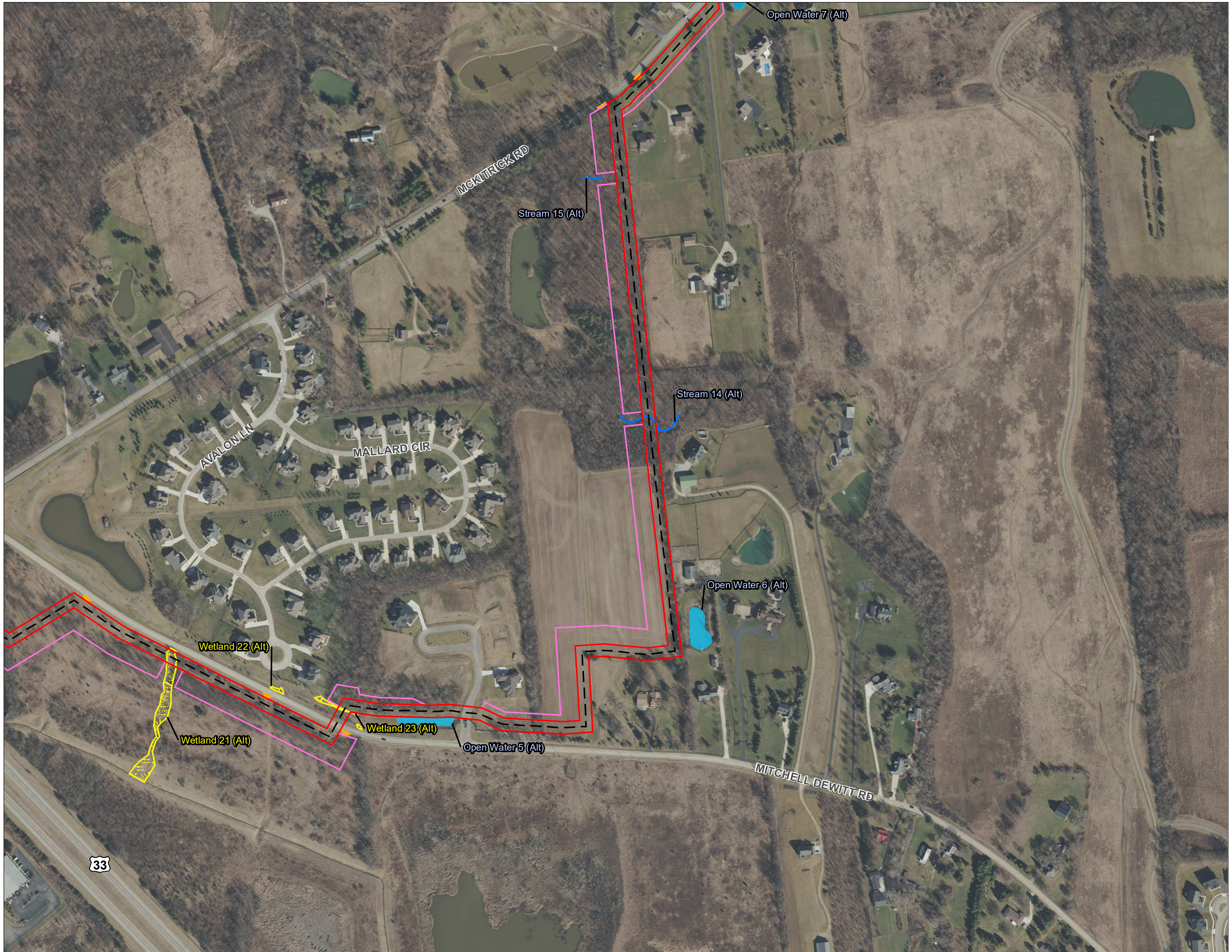

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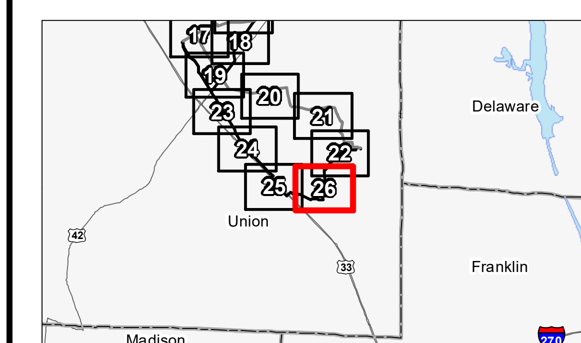

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Appendix H GEOTECHNICAL EXPLORATION AND FINDINGS REPORT

Northern Columbus Loop Natural Gas Pipeline Project (Phase VII)

Geotechnical Exploration and Findings Report

September 4, 2020

Prepared for:

Columbia Gas of Ohio Inc.
4580 Bridgeway Avenue, Suite C
Columbus, Ohio 43219

Prepared by:

Stantec Consulting Services Inc.
1500 Lake Shore Drive Suite 100
Columbus, Ohio 43204

Revision	Description	Author		Quality Check		Independent Review	
00	DRAFT	PFC	9/3/20	JMM	9/4/20	RJK	9/4/2020
00	FINAL	PFC	9/4/20				

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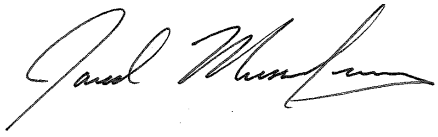
Prepared by  _____
(signature)

Paul Cichocki, PE

Reviewed by  _____
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Jared Musselman, PE

Approved by  _____
(signature)

Robert J. Kirkbride, PE

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Executive Summary

Columbia Gas of Ohio (COH) plans to construct a new 24-inch high pressure transmission class natural gas steel pipeline with associated 16-inch distribution class steel pipeline for a total of 16.59 miles. In addition, a launcher site and one district regulator station will be included as part of the project. The project begins near the intersection of Hyatts Road and Sawmill Parkway, extends northwest to U.S 42, crosses the Scioto River and extends southwest along U.S 42 ending near the intersection of Hyland Croy Road and McKitrick Road.

A total of seventy-six (76) borings were advanced during the exploration with depths ranging from 5.4 to 80.0 feet below the existing ground surface. Borings were advanced using a rubber track mounted drill rig with hollow-stem augers and Standard Penetration Test (SPT) sampling at 2.5-foot intervals, unless shown otherwise in the subsurface logs. Bedrock coring was performed using an NQ-sized rock coring equipment in nine (9) borings. A Stantec geotechnical engineer was on site logging and collecting samples of the encountered materials. Soil and bedrock samples were transported to Stantec's materials testing laboratory where specified testing was performed.

The ground surface elevation at boring locations across the site ranged from approximately Elevation (El.) 858.9 to 1016.2 feet with top of bedrock elevations ranging from approximately 838.3 to 952.0 feet. Boring locations in the Southern half of the project typically had higher surface elevations resulting in rarely encountering bedrock during drilling unlike the Northern half of the project.

The top 10 feet of overburden soil along the alignment generally consists of lean clays with varying amounts of silt, sand, gravel, and organic material. According to the Unified Soil Classification System (USCS), these layers are classified as Lean Clay (CL), Lean Clay With Sand (CL), Sandy Lean Clay (CL), Lean Clay With Gravel (CL), Gravelly Lean Clay (CL), Silty Clay (CL-ML), Silt with Sand (ML), and Silty Sand (SM). Most often the first clays encountered are brown lean clays mottled with orange which become grayer and/or sandier with depth. Corrected SPT N-values ranged from 3 to 80 blows per foot (bpf), and moisture contents ranged from 4 to 38 percent. Lean clay layers have plasticity indices ranging from 2 to 33.

Soils encountered deeper than 10 feet below ground surface are summarized as primarily glacial till consisting of sandy lean clays with fine grained gravel and stone fragments. Corrected SPT N-values ranged from 7 to 53 blows per foot (bpf), and moisture contents ranged from 0 to 28 percent. The glacial clay layers have plasticity indices ranging from 6 to 16.

Bedrock formations found across the project site consisted of Shale, Sandstone, Siltstone, and primarily Limestone. Typically, the limestone encountered was gray with mottling of brown, slightly to highly weathered, strong to very strong, fine grained, thin bedded, calcareous, fossiliferous, and vuggy.

1.0 INTRODUCTION

1.1 PROJECT LOCATION AND BACKGROUND

Columbia Gas of Ohio (COH) plans to construct a new 24-inch high pressure transmission class natural gas steel pipeline with associated 16-inch distribution class steel pipeline for a total of 16.59 miles. In addition, a launcher site and one district regulator station will be included as part of the project. The project begins near the intersection of Hyatts Road and Sawmill Parkway, extends northwest to U.S 42, crosses the Scioto River and extends southwest along U.S 42 ending near the intersection of Hyland Croy Road and McKitrick Road. Appendix A includes boring locations and the proposed alignment.

1.2 PURPOSE AND SCOPE

The purposes of this project are to evaluate the existing conditions along the proposed alignment and to provide a geotechnical explorations and findings report. A general overview of the project tasks include the following:

1. Alignment Evaluation – A geotechnical exploration program consisting of geotechnical drilling/sampling and laboratory testing to define subsurface conditions along the project alignment.

2. Geotechnical Report – A geotechnical exploration report including an overview of site geology in the project area, an outline of the exploration program and the findings of the exploration.

2.0 SITE GEOLOGY

2.1 GENERAL

The Physiographic Regions of Ohio Map (Ohio Department of Resources (ODNR), 1998) shows the project site to be located in the Till Plains region of Ohio. The project is in the general vicinity of the Central Ohio Clayey Till Plain. This region is described as having moderate relief (100 feet), clayey till surfaces, a surface of clayey till; moraines; silt, clay, and till-filled lake basins; few large streams; no boulder belts; and limited sand and gravel outwash. The ground surface elevation in this region varies from 700 to 1150 feet.

2.2 SOIL GEOLOGY

The Physiographic Regions of Ohio Map (ODNR,1998) indicates Wisconsinan-age till from the northeastern Erie glacial lobe and lacustrine materials, with loess thin to absent. The region includes lower Paleozoic-age carbonate rocks and shales.

Common soils in the project area from the Web Soil Survey (United States Department of Agriculture (USDA), 2014) primarily include Blount silt loam (Blg1A1), described as ground moraine with 0 to 2 percent slopes, Glynwood silt loam (Gwg1B1), described as ground moraine with 2 to 6 percent slopes, Pewamo silty clay loam (Pk), with 0 to 1 percent slopes and Udorthents clayey-Urban land complex (UdB) described as undulating.

2.3 BEDROCK GEOLOGY

The Bedrock Geologic Map of Ohio (ODNR, 2017) indicates the bedrock within the project site is in the Devonian Series, consisting of limestone and dolomoite with some shale and sandstone. The site also crosses into areas of the Silurian Series bedrock unit, consisting of sedimentary rock types such as dolomite, anhydrite, gypsum, salt and shales. Bedrock around the site was formed about 385 to 423 million years ago. Bedrock surface elevations range from 800 to 1,000 feet in the project area, as shown in the Shaded Bedrock Topography Map of Ohio (ODNR, 2004).

According the Abandoned Underground Mines of Ohio Map (ODNR, 2012), the project limits are not located in areas of coal-bearing rock and Union or Delaware County have no abandoned underground mines. The Ohio Karst Areas Map (ODNR, 2000) indicates a significant portion of the project vicinity is located within the Silurian and Devonian-age carbonate bedrock overlain by more than 20 feet of glacial drift and/or alluvium. There are probable karst areas near the project site in Delaware County.

2.4 HYDROLOGY AND HYDROGEOLOGY

The Hydrogeologic Settings of the Unconsolidated Aquifers of Ohio (ODNR, 2000) map indicates the soils near the project area are within a buried valley hydrogeologic setting, with ground moraine and thin upland settings nearby. The Yields of the Uppermost Bedrock Aquifers of Ohio Map (ODNR, 2000) indicates 5 to over 100 gallons per minute (gpm) yield of the bedrock groundwater in the project vicinity.

3.0 EXPLORATION

3.1 EXPLORATION PROGRAM AND SAMPLING METHODS

A total of seventy-six (76) borings were advanced during the exploration with depths ranging from 5.4 to 80 feet below the existing ground surface. The project area generally consisted of relatively flat, agricultural and industrial land, with interspersed roadways. The approximate 16.59-mile alignment begins near the intersection of Hyatts Road and Sawmill Parkway, extending northwest to U.S 42, crosses the Scioto River and extends southwest along U.S 42 and ending near the intersection of Hyland Croy Road and McKitrick Road.

The project consisted of forty-one (41) alignment borings, thirty-three (33) cross-road borings, and two (2) river crossing borings. The boring locations were obtained by conventional surveying and spaced at approximate intervals of 2,000 feet. The alignment borings were advanced within farm fields used for crops such as beans and corn to predetermined depths of 10.5 feet or drilling refusal. Cross-road borings occurred at seventeen (17) roadways across the entire project to predetermined depths of 30.5 feet or sampling refusal in which soil sampling would be replaced with NQ rock coring to target depth. River crossing borings were advanced to a depth of 80 feet and were located approximately 300 feet and 600 feet from the eastern and western banks of the Scioto River, respectively.

All borings were advanced with a CME 45 rubber tracked drill rig using 3.25-inch inside diameter hollow-stem augers. Standard Penetration Test (SPT) samples were obtained at 2.5-foot intervals across the project site, unless shown otherwise in the subsurface logs. The SPT samples were collected using an automatic hammer of 140-pounds with an efficiency of 86.2 percent. Bedrock sampling was conducted using a NQ-sized rock coring equipment. Field logs for each boring were prepared on site by a Stantec geotechnical engineer.

Upon completion of drilling, soil borings were backfilled with auger cuttings in general accordance with Ohio Department of Transportation guidelines for backfilling drilled borings. Borings where rock coring was performed were sealed with a bentonite cement grout mixture. Crews were careful to minimize disturbance to private property. Efforts included heeding special requests by property owners regarding restoration, offsets of borings, and backfilling. Standard site restoration of private property included tamping down disturbed ground with the drill rig and shovels as necessary. Access routes skirted the outsides of farm fields where possible. Photographs of before drilling and after completion were taken at all boring locations, with additional photographs showing before and after the track rig mobilized through access routes.

3.2 LABORATORY TESTING

Soil samples were transported to Stantec's materials testing laboratory where a natural moisture content (MC) was determined for each of the SPT soil samples obtained. Engineering classification testing was performed on selected samples reflecting the primary soil horizons indicated in the field. The engineering classification tests conducted on the samples included sieve and hydrometer analysis (ASTM D 422) and Atterberg Limits (ASTM D 4318). These samples were classified in accordance with the Unified Soil Classification System (USCS).

Additional laboratory testing was performed on select bedrock core samples to characterize the encountered bedrock regarding strength and durability. Results of the laboratory testing performed on the bedrock samples have been included on the corresponding Subsurface Logs in Appendix B and summarized in Table 1 and Table 2 in Section 4.0 of this report.

4.0 FINDINGS

The locations of the borings, as well as the proposed alignment are shown in Appendix A. Subsurface logs of the borings performed are provided in Appendix B.

Based on the geotechnical exploration performed, the following summary is provided:

- Ground surface at boring locations across the site range from approximate Elevation (El.) 858.9 to 1016.2 feet (MSL) with top of bedrock elevation ranging approximately 838.3 to 952.0 feet (MSL). Boring locations within the Southern half of the project had higher surface elevations and rarely encountered bedrock during drilling unlike the Northern half of the project.

- The top 10 feet of overburden soil along the alignment generally consists of lean clays with varying amounts of silt, sand, gravel, and organic material. According to the USCS system, these layers are classified as Lean Clay (CL), Lean Clay With Sand (CL), Sandy Lean Clay (CL), Lean Clay With Gravel (CL), Gravelly Lean Clay (CL), Silty Clay (CL-ML), Silt with Sand (ML), and Silty Sand (SM). Typically, the first clays encountered are brown and orange mottled lean clays which become grayer and/or sandier with depth. Corrected SPT N-values ranged from 3 to 80 blows per foot (bpf), and moisture contents ranged from 4 to 38 percent. Lean clay layers found in this stratum had Plastic Index values ranging from 2 to 33, where Plasticity indices is the different in the moisture percent between the liquid and plastic limits for the soils. Typically, the higher the plastic index, the more clay is in the soil, the lower the permeability, and more susceptible to shrinking and swelling.

- Overburden soils encountered deeper than 10 feet at borings performed for roadway crossings generally consisted of lean clays, silty clays, silty sands, silty clayey sands, and clayey sands. Minor components across the project area include clays, silts, sands, gravels, and organics. Soils encountered deeper than 10 feet below ground surface are summarized as primarily glacial till consisting of sandy lean clays with fine grained gravel and stone fragments. Corrected SPT N-values ranged from 7 to 53 blows per foot (bpf), and moisture contents ranged from 0 to 28 percent. The glacial clay layers have plasticity indices ranging from 6 to 16. Results of the laboratory testing, which were used to determine the soil classifications, are included in the subsurface logs included in Appendix B.

- Across the project site bedrock was encountered at various depths but was more prevalent for the Northern half of the borings with lower elevations. Where encountered, bedrock depths ranged from 5.3 to 28.8 feet below ground surface (BGS). Groundwater, where encountered, was typically encountered near the transition from soil to bedrock.

- Bedrock formations found across the project site consisted of Shale, Sandstone, Siltstone, and primarily Limestone. Typically, the Limestone encountered was gray with mottling of brown, slightly to highly weathered, strong to very strong, fine grained, thin bedded, calcareous, fossiliferous, and vuggy.

- Table 1 and Table 2 below provide a the summary of two types of laboratory testing (Slake Durability Index and Unconfined Compressive Strength) that was conducted on select bedrock samples obtained during the field exploration phase. Slake Durability Index (SDI) is used in estimating the resistance of a type of rock, particularly argillaceous rocks, by a combination of wetting and abrasion.

samples obtained during the field exploration phase. Slake Durability Index (SDI) is used in estimating the resistance of a type of rock, particularly argillaceous rocks, by a combination of wetting and abrasion.

Table 1: Slake Durability Index Laboratory Results

Boring	Sample Depth	Material Description	Slake Durability Index (%)
BL-03	26.5' – 27.0'	Shale, dark gray, soft	86.2
BL-09	25.0' – 25.2'	Shale, dark brown red, moderately hard	99.3
BL-25	35.6' – 36.0'	Sandstone, gray brown, hard	99.1
BL-25	66.0' – 66.9'	Sandstone with Limestone, gray, hard	99.5
BL-26	44.6' – 45.3'	Sandstone, gray, hard	99.0
BL-26	61.8' – 62.3'	Sandstone, gray, hard	99.1
BL-29	25.4' – 25.9'	Limestone, light gray, hard	99.1
BL-34	14.2' – 15.0'	Limestone, gray, hard	99.4
BL-37	28.7' – 29.2'	Limestone, gray, hard	99.4
BL-56	28.5' – 29.0'	Limestone, yellow gray, hard	99.0

Table 2: Unconfined Compressive Strength Laboratory Results

Boring	Sample Depth	Material	Unconfined Compressive Strength (PSI)
BL-25	35.0' – 35.4'	Sandstone	13,000
BL-25	65.0' – 65.4'	Sandstone	22,720
BL-26	38.0' – 38.4'	Sandstone	15,270
BL-26	56.5' – 56.9'	Sandstone	9,680
BL-29	27.5' – 27.9'	Limestone	23,290
BL-34	14.2' – 14.6'	Limestone	25,580
BL-37	29.4' – 29.8'	Limestone	11,560

- With Slake Durability Index values ranging from 86.2% to 99.5% and Unconfined Compressive Strengths ranging from 9,680 to 25,580 psi, laboratory testing suggests that the bedrock encountered across the project is very durable and will not be easily removed by rippable rock excavation.

5.0 REFERENCES

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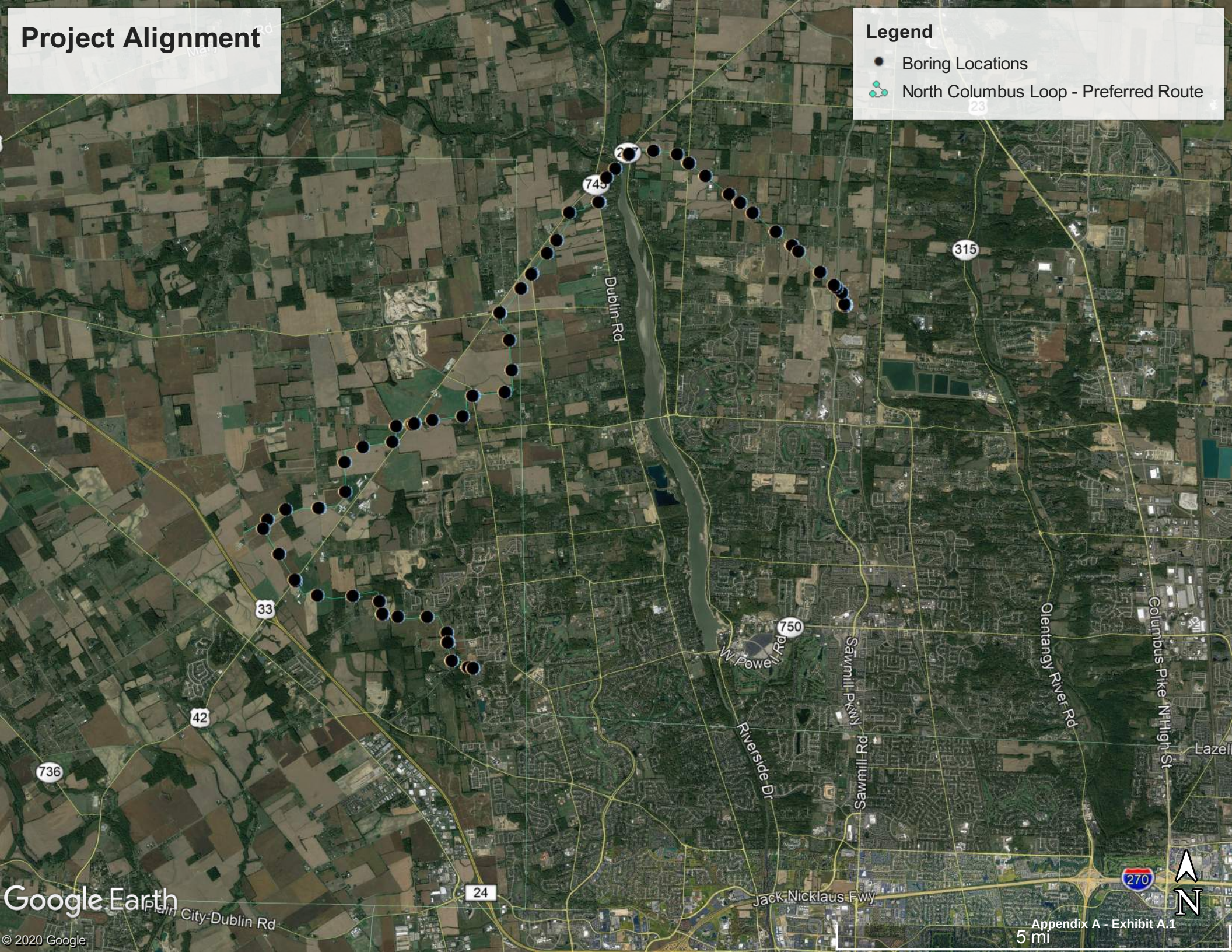
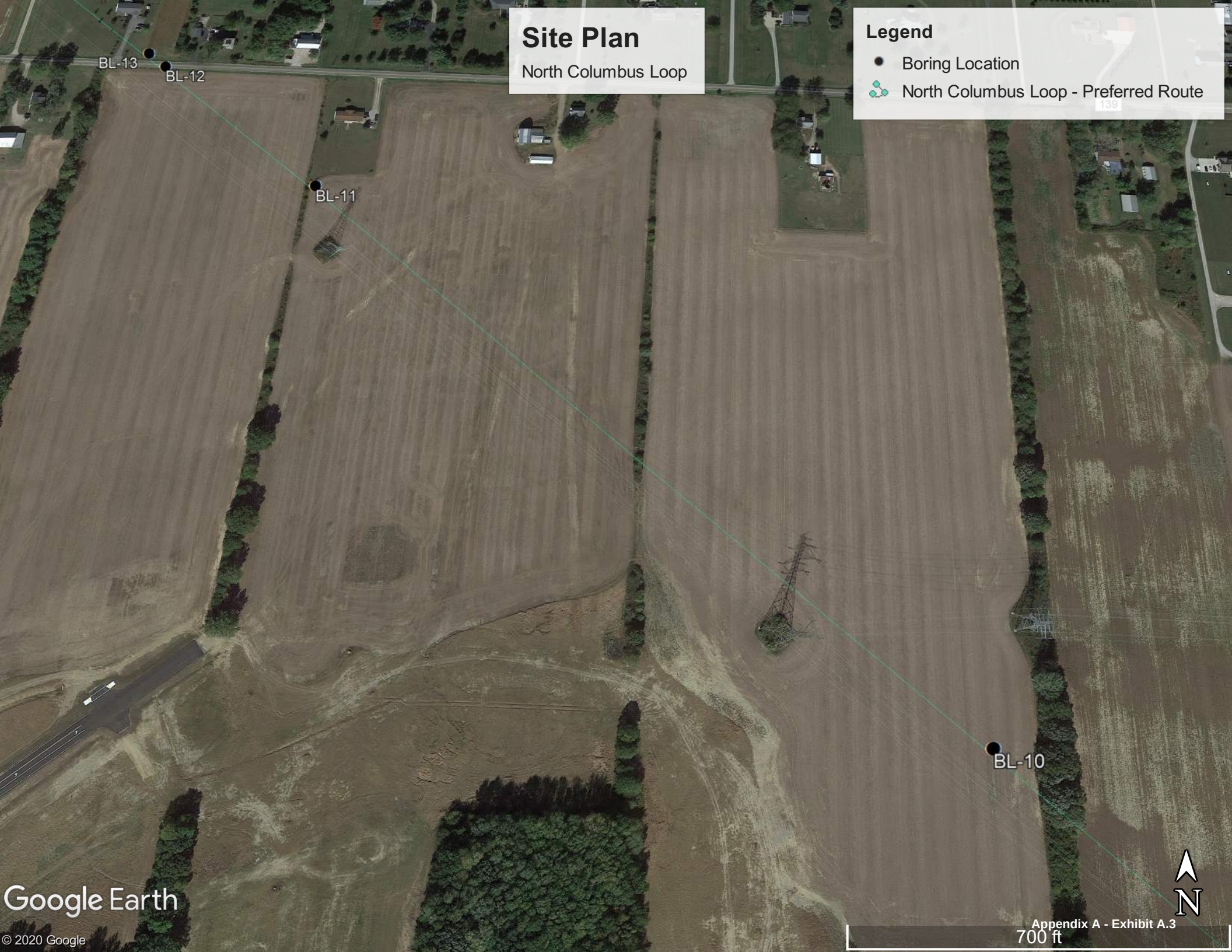
APPENDICES

Appendix A SITE PLAN


Project Alignment
Legend
Boring Locations
North Columbus Loop - Preferred Route
Dublin Rd
315
33
42
736
24
750
W Powell Rd
Sawmill Pkwy
Sawmill Rd
Riverside Dr
Olentangy River Rd
Columbus Pike-N High St
Jack Nicklaus Fwy
270
Google Earth
© 2020 Google
Appendix A - Exhibit A.1
5 mi
N


Site Plan
North Columbus Loop
Legend
Boring Location
North Columbus Loop - Preferred Route
BL-9
BL-8
BL-7
BL-2
BL-1
BL-4
BL-3
BL-5
BL-6
N
Google Earth
© 2020 Google
Appendix A - Exhibit A.2
700 ft



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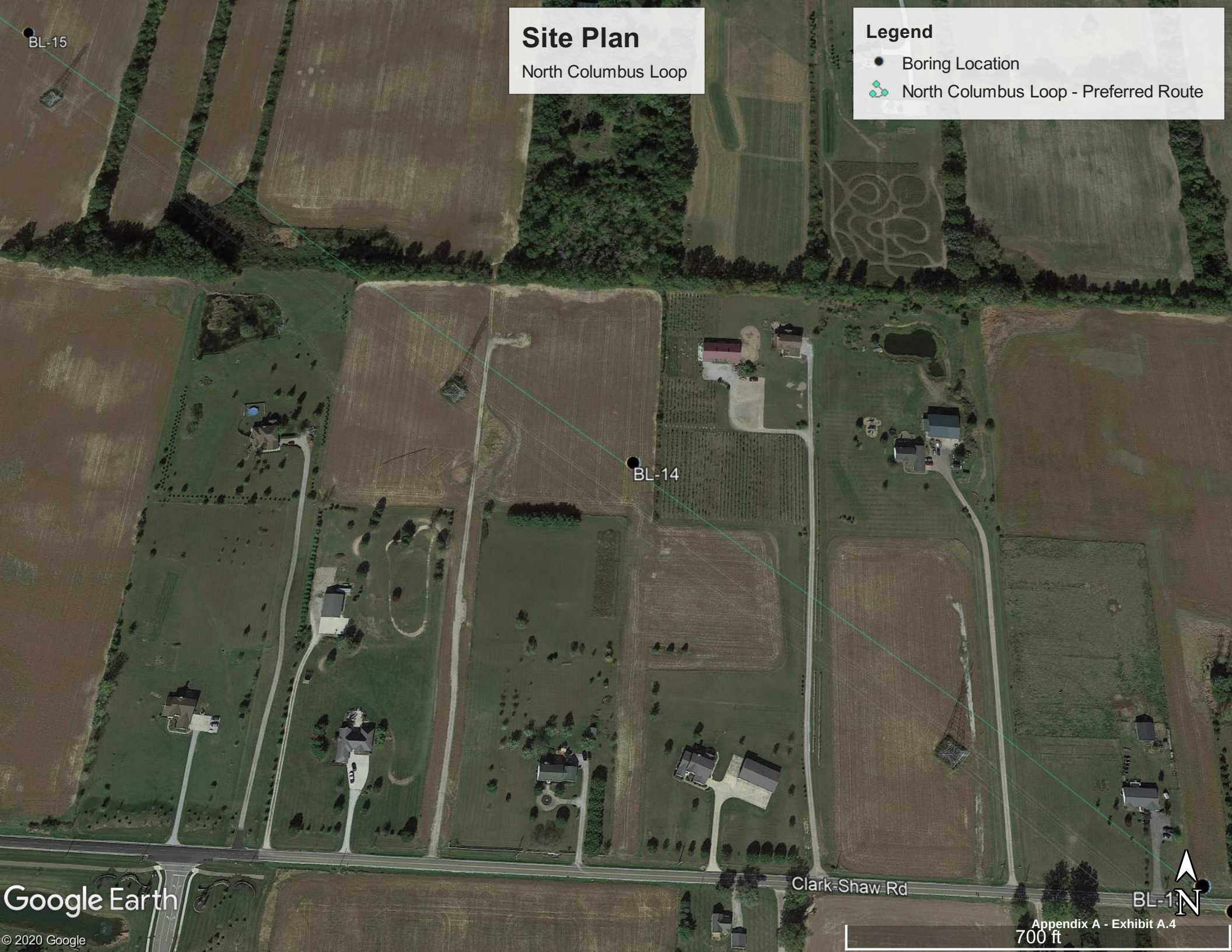
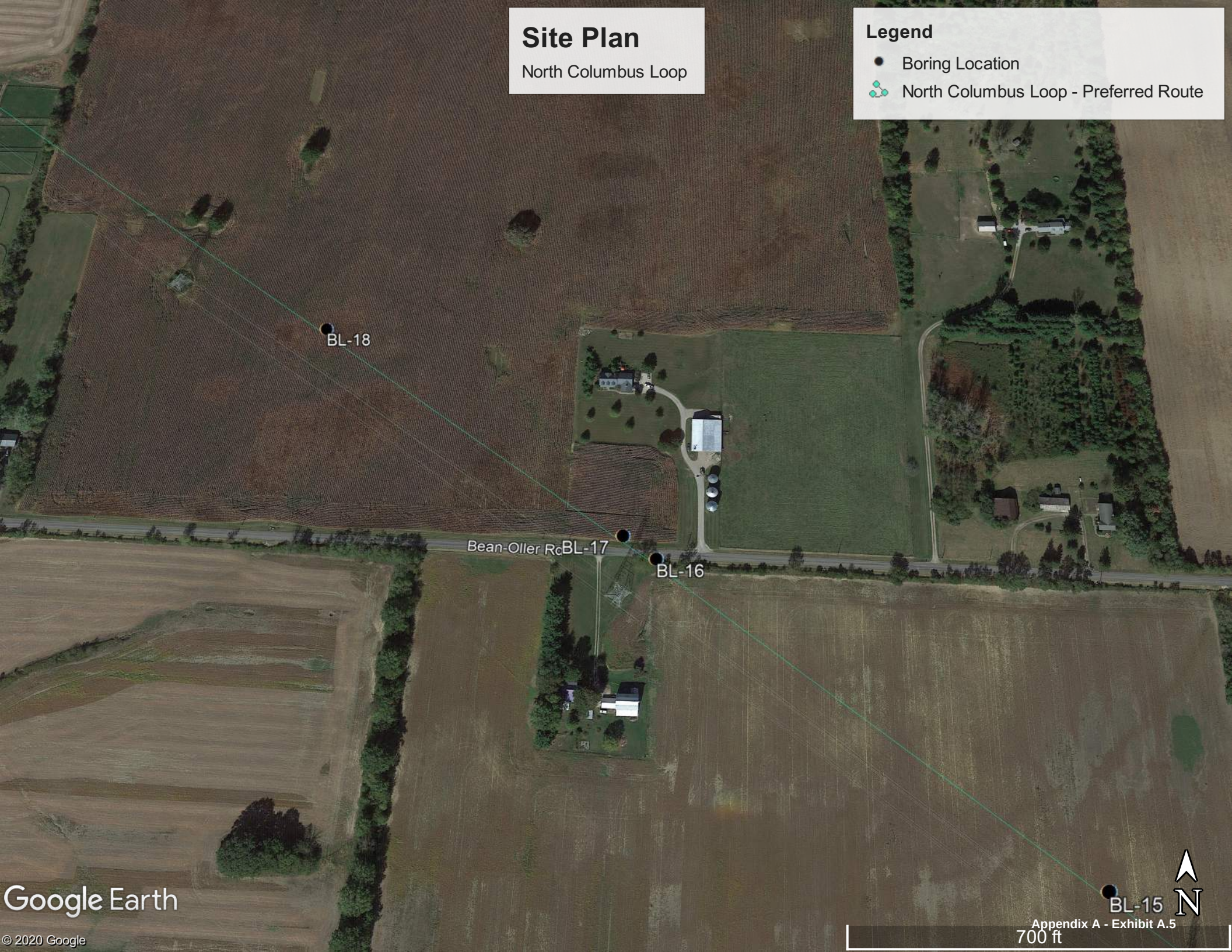
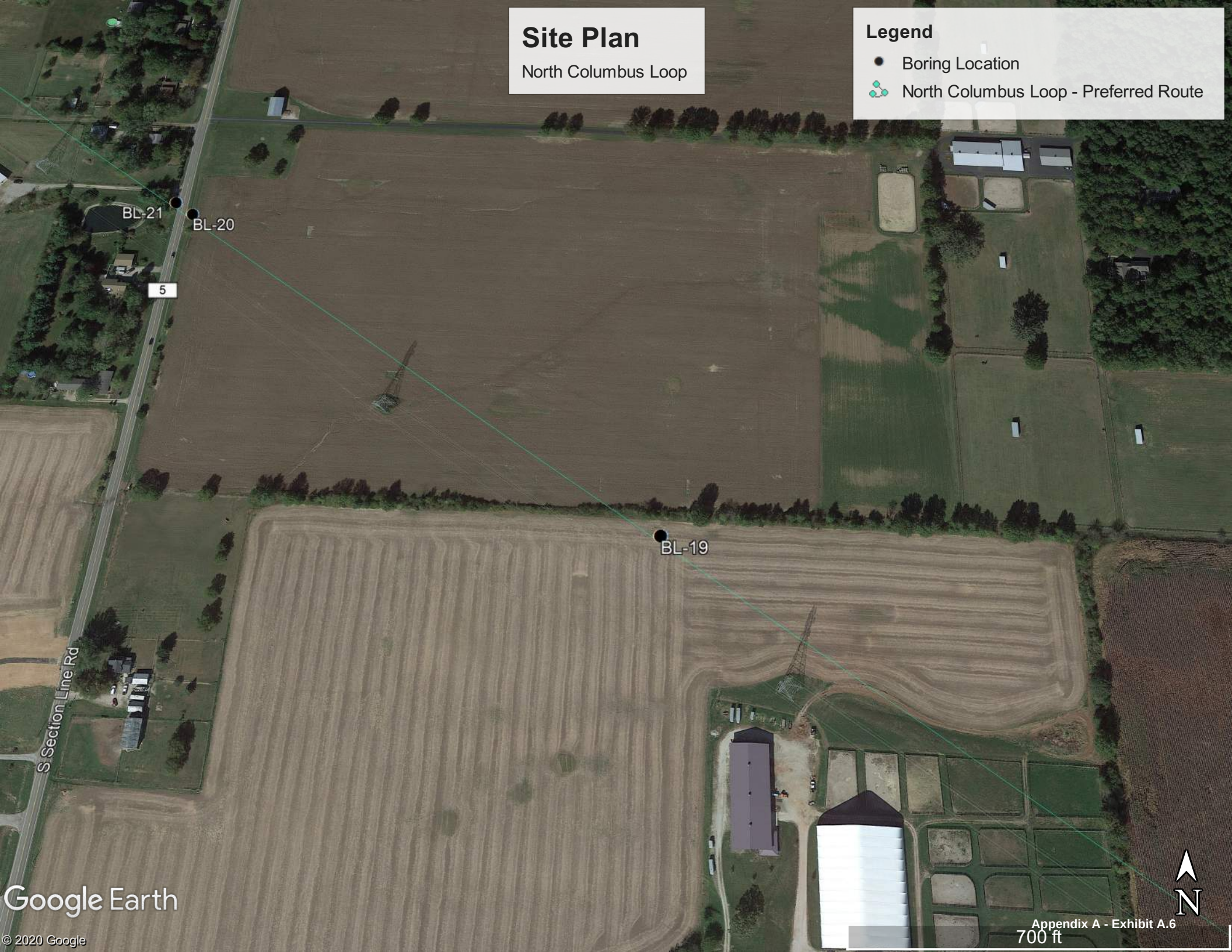


Appendix A - Exhibit A.4



Appendix A - Exhibit A.5



Appendix A - Exhibit A.6

Appendix A - Exhibit A.7

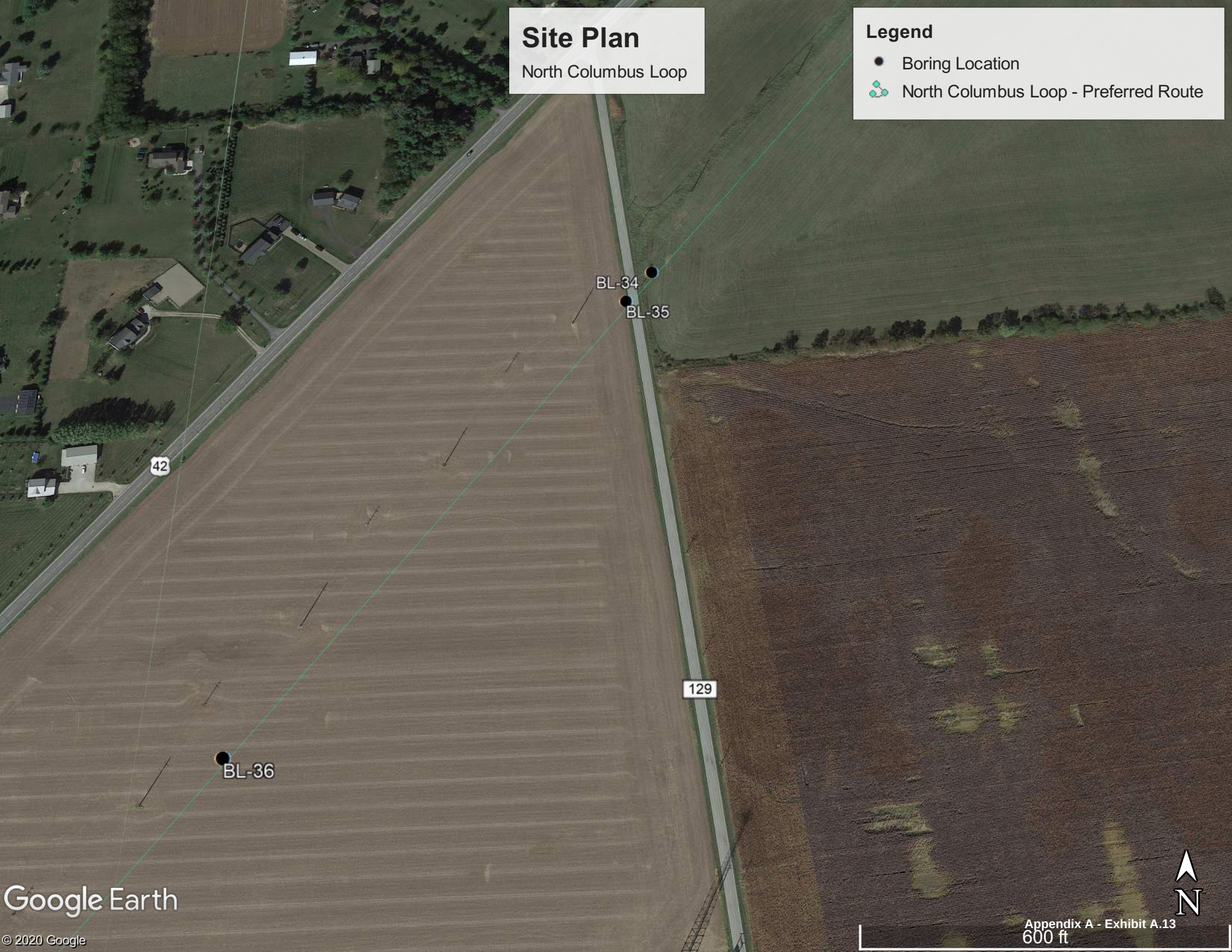
Appendix A - Exhibit A.8

Appendix A - Exhibit A.9

Appendix A - Exhibit A.10


Site Plan
North Columbus Loop
Legend
Boring Location
North Columbus Loop - Preferred Route
BL-31
Google Earth
© 2020 Google
N
Appendix A - Exhibit A.11
600 ft


Site Plan
North Columbus Loop
Legend
Boring Location
North Columbus Loop - Preferred Route
BL-32
BL-33
42
Google Earth
© 2020 Google
N
Appendix A - Exhibit A.12
600 ft



Appendix A - Exhibit A.13

Appendix A - Exhibit A.14

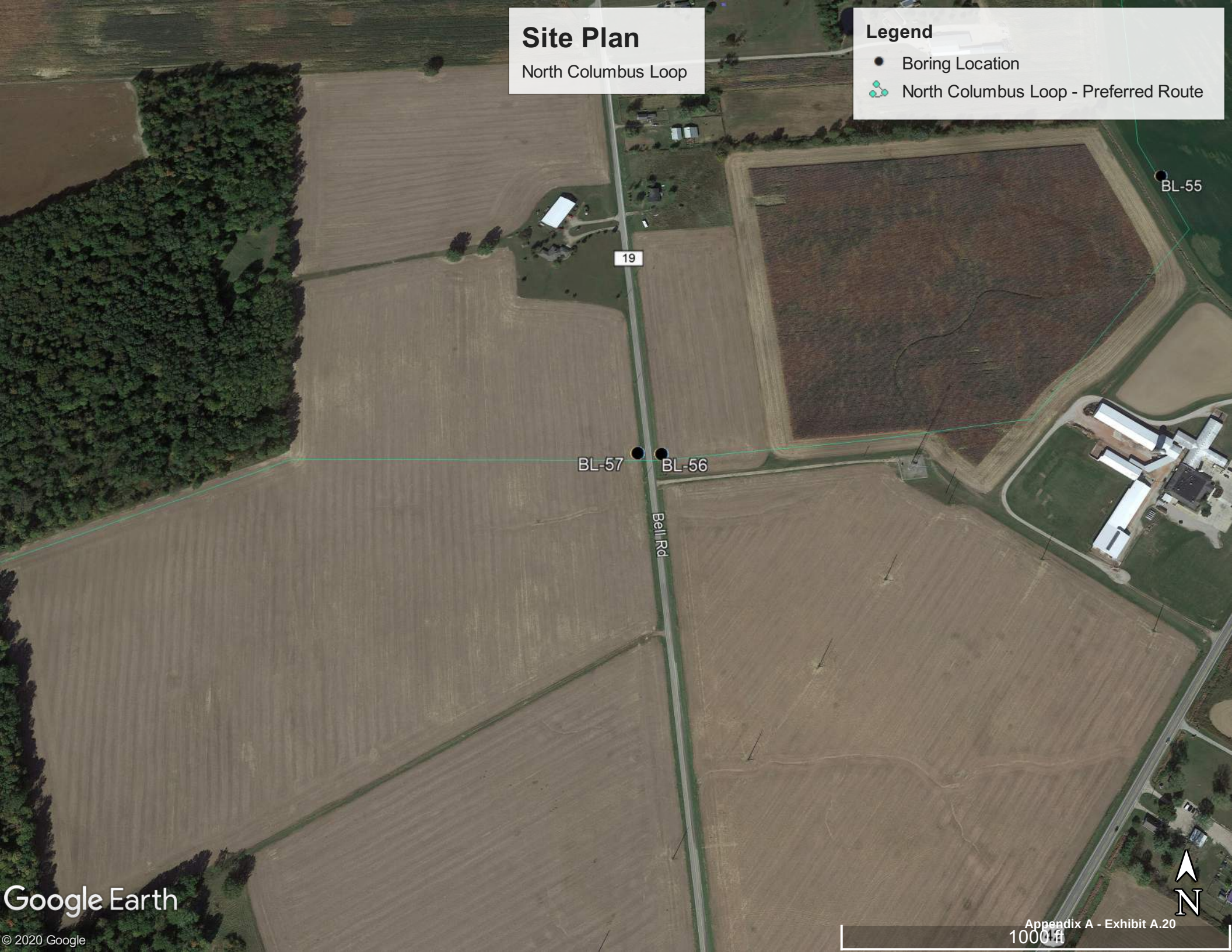
Appendix A - Exhibit A.15

Appendix A - Exhibit A.16

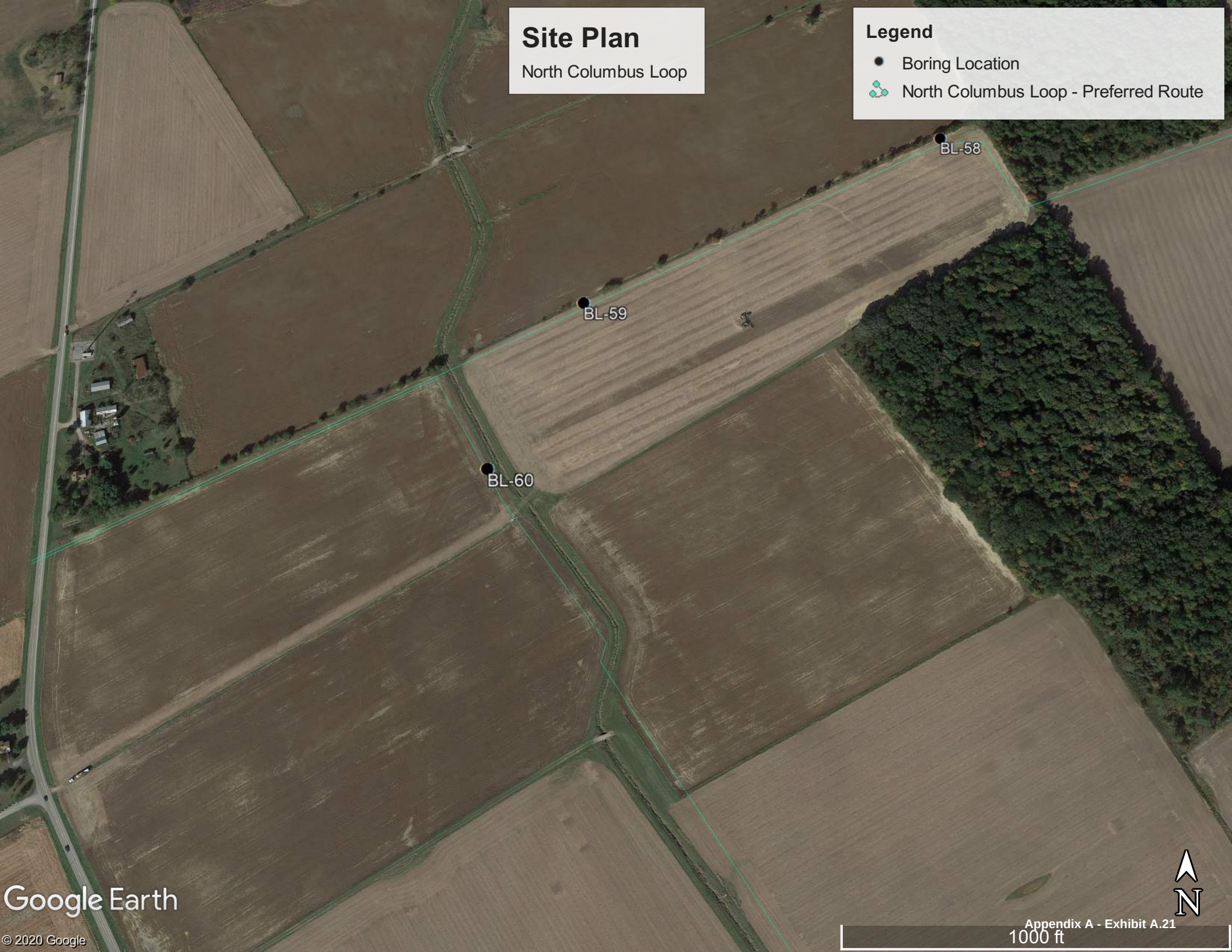
Appendix A - Exhibit A.17

Appendix A - Exhibit A.18

Appendix A - Exhibit A.19



Appendix A - Exhibit A.20

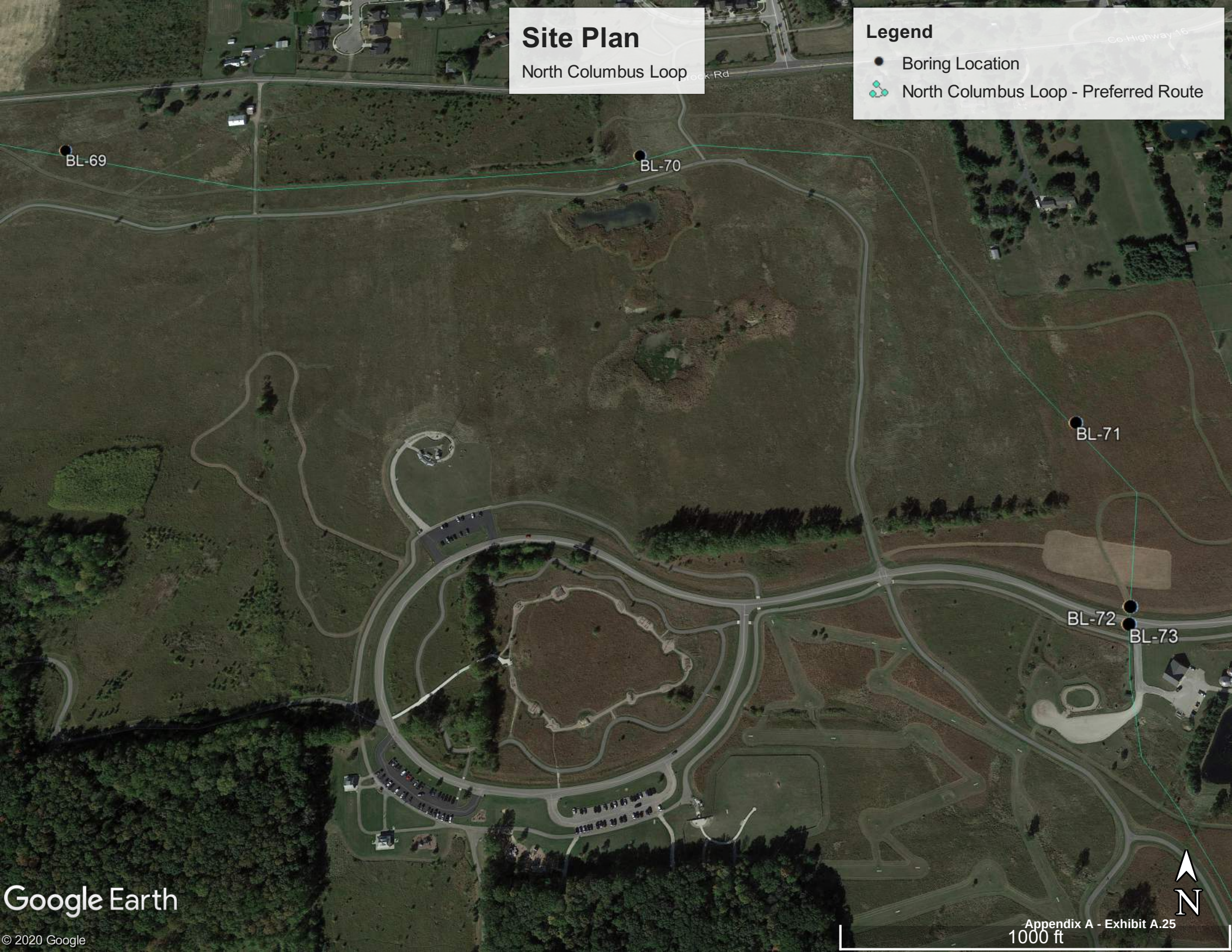


Appendix A - Exhibit A.21

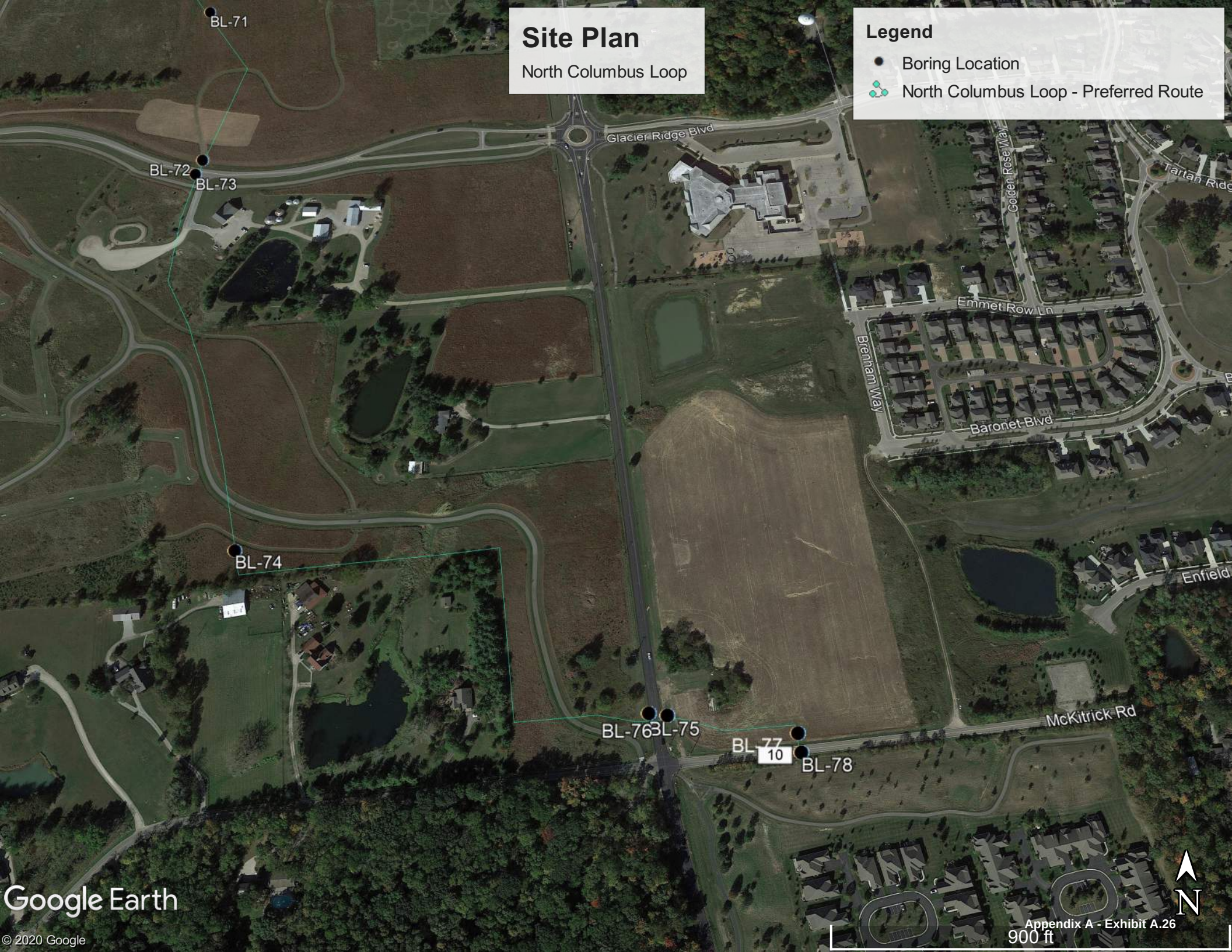
Appendix A - Exhibit A.22


Site Plan
North Columbus Loop
Legend
Boring Location
North Columbus Loop - Preferred Route
-62
BL-63
BL-64
BL-65
Google Earth
© 2020 Google
N
Appendix A - Exhibit A.23
1000 ft

Appendix A - Exhibit A.24



Appendix A - Exhibit A.25


Site Plan
North Columbus Loop
Legend
Boring Location
North Columbus Loop - Preferred Route
BL-71
BL-72
BL-73
BL-74
BL-75
BL-76
BL-77
BL-78
Glacier Ridge Blvd
Golden Rose Way
Tartan Ridg
Emmet Row Ln
Brenham Way
Baronet Blvd
Enfield
McKitrick Rd
10
Google Earth
© 2020 Google
N
900 ft
Appendix A - Exhibit A.26

Appendix B SUBSURFACE LOGS

Stantec

SUBSURFACE LOG

EXPLORATION ID: BL-01

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2176825°, -83.0934455°	**DATE STARTED**	6/3/20 **COMPLETED** 6/3/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE** Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL **DEPTH TO WATER** 12.0 ft **DATE/TIME** 6/3/20
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	937.2 ft	**DEPTH TO WATER**	N/A **DATE/TIME**
PROJECT NUMBER	193707055 **INSPECTOR** EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 937.203	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	(tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	936.7							-	-	-	-	-	-	-	21	CL (V)	
LEAN CLAY, LITTLE SILT, TRACE ORGANICS, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP			1-2-3	7	60	SS-1	3.5	-	-	-	-	-	-	-	21	CL (V)	
		2.5	4-5-7	17	60	SS-2	2.5	-	-	-	-	-	-	-	25	CL (V)	
	931.9	5.0					-	-	-	-	-	-	-	-	16	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, STIFF TO VERY STIFF, DAMP			4-6-8	20	93	SS-3	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		7.5	4-7-11	26	93	SS-4	4.5+	3	20	40	37	31	18	13	16	CL	
		10.0	5-7-8	22	100	SS-5	4.5+	-	-	-	-	-	-	-	13	CL (V)	
	6/3/2020 W 925.2																
CLAYEY SAND, WITH GRAVEL, BROWN GRAY, LOOSE, WET	924.1	12.5	3-5-4	13	60	SS-6	-	-	-	-	-	-	-	-	9	SC (V)	
SANDY LEAN CLAY, AND SILT, LITTLE GRAVEL, GRAY, SOFT TO MEDIUM STIFF, MOIST TO WET							1.5	-	-	-	-	-	-	-	16	CL (V)	
		15.0	2-3-4	10	73	SS-7	1.5	14	27	36	23	30	18	12	17	CL	
		17.5	3-5-7	17	33	SS-8	1.5	-	-	-	-	-	-	-	17	CL (V)	
		20.0	4-5-10	22	60	SS-9	4	-	-	-	-	-	-	-	11	CL (V)	
		22.5	19-23-36	85	40	SS-10	3	-	-	-	-	-	-	-	17	CL (V)	
STONE FRAGMENTS WITH SAND, SILT, AND CLAY, GRAY, VERY DENSE, WET	912.7	25.0	26-22-27	70	33	SS-11	-	-	-	-	-	-	-	-	17	GC (V)	
LEAN CLAY, SOME SILT, TRACE SAND AND GRAVEL, GRAY, HARD, DRY TO DAMP	910.2	27.5	13-20-29	70	100	SS-12	4.5+	-	-	-	-	-	-	-	9	CL (V)	
		30.0	24-47-50	139	47	SS-13	4.5+	-	-	-	-	-	-	-	11	CL (V)	
	906.7																
	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

Printed on 9/4/20

SUBSURFACE LOG

EXPLORATION ID: BL-02

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2176914°, -83.0938085°	**DATE STARTED**	6/3/20 **COMPLETED** 6/3/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY** 86.2 % (Avg.)	**ELEVATION DATUM**	MSL **DEPTH TO WATER** 15.0 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	937.1 ft	**DEPTH TO WATER**	N/A **DATE/TIME**
PROJECT NUMBER	193707055	**INSPECTOR** EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID** CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 937.127	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL																	
LEAN CLAY WITH SAND, LITTLE SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DAMP	936.5		2-2-4	9	73	SS-1	3	-	-	-	-	-	-	-	23	CL (V)	
		2.5	3-4-7	16	100	SS-2	4.5+	3	20	50	27	28	18	10	14	CL	
		5.0	4-5-6	16	47	SS-3	4	-	-	-	-	-	-	-	16	CL (V)	
		7.5	6-11-14	36	67	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		10.0	2-3-5	11	53	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
CLAYEY SAND WITH GRAVEL, BROWN TO GRAY, LOOSE, WET	925.1	12.5	2-6-5	16	47	SS-6	-	-	-	-	-	-	-	-	16	SC (V)	
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, MEDIUM STIFF, MOIST	923.1	W 15.0	2-2-3	7	67	SS-7	2.5	7	28	36	29	30	18	12	16	CL	
SANDY LEAN CLAY, BROWN GRAY, MEDIUM STIFF, WET	920.1	17.5	3-3-3	9	100	SS-8	1.5	-	-	-	-	-	-	-	22	CL (V)	
		20.0	2-6-10	23	73	SS-9	1.5	-	-	-	-	-	-	-	20	CL (V)	
SHALE, GRAY BROWN, SEVERELY WEATHERED, VERY WEAK, VERY FINE GRAINED, THINLY LAMINATED, FRIABLE	914.6	TR 22.5	27-29-9	55	60	SS-10	-	-	-	-	-	-	-	-	10	Rock (V)	
		25.0	2-3-5	11	27	SS-11	-	-	-	-	-	-	-	-	16	Rock (V)	
	909.2	27.5	50/4.8"	-	100	SS-12	-	-	-	-	-	-	-	-	13	Rock (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-03

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2175624°, -83.0937093°	**DATE STARTED**	6/2/20 **COMPLETED** 6/2/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY** 86.2 % (Avg.)	**ELEVATION DATUM** MSL	**DEPTH TO WATER** 22.0 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	937.6 ft	**DEPTH TO WATER** N/A	**DATE/TIME**
PROJECT NUMBER	193707055	**INSPECTOR** EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)** VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 937.572	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL																	
SANDY LEAN CLAY, SOME SILT, TRACE GRAVEL, TRACE ORGANICS, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP	936.9		WH-2-2	6	67	SS-1	3.0	-	-	-	-	-	-	-	28	CL (V)	
		2.5															
-CLAYEY SAND SEAM @ 3.6' TO 3.7'			3-5-7	17	100	SS-2	4.25	-	-	-	-	-	-	-	22	CL (V)	
		5.0	4-5-8	19	87	SS-3	4.0	3	27	35	35	30	20	10	17	CL	
		7.5	5-9-13	32	100	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
SANDY SILTY CLAY, LITTLE GRAVEL, GRAY BROWN MOTTLED, MEDIUM STIFF TO STIFF, DAMP	927.4	10.0	4-6-7	19	100	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		12.5	2-2-4	9	20	SS-6	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		15.0	3-4-6	14	100	SS-7	3.5	-	-	-	-	-	-	-	17	CL (V)	
		17.5	3-4-5	13	80	SS-8	3.0	11	37	37	15	21	14	7	8	CL	
		20.0	2-3-11	20	53	SS-9	4.5+	-	-	-	-	-	-	-	23	CL (V)	
	915.6 TR																
LIMESTONE, GRAY, SLIGHTLY WEATHERED, VERY STRONG, THIN BEDDED	914.9	22.5															
SANDY LEAN CLAY, SOME STONE FRAGMENTS, BROWN GRAY, STIFF, WET - SAMPLE LOSS @ 23.9' TO 25.8'			11		34	NQ-1										CORE	
		25.0															
SHALE, DARK BROWN, HIGHLY WEATHERED, WEAK TO MODERATELY STRONG, VERY FINE GRAINED, LAMINATED - SEVERLY FRACTURED @ 25.8' TO 26.5' - UNFRACTURED @ 26.5' TO 27.1' - SAMPLE LOSS @ 27.1' TO 29.8'	911.8	27.5	10		51	NQ-2										CORE	
SANDSTONE, GRAYISH BROWN, MODERATELY WEATHERED, STRONG, FINE GRAINED, THIN BEDDED, FERRIFEROUS	907.8	30.0															
	906.9 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

STANTEC BORING SUBSURFACE LOG -USCS - OH DOT.GDT - 9/4/20 12:21 - V:\1937\ACTIVE\193707055\03_DATA\FIELD\GEOTECHNICAL\BORING LOGS\NORTH COLUMBUS LOOP GINT LOGS\NORTH COLUMBUS LOOP GINT FILE 9-1-20 - COPY.GPJ

Printed on 9/4/20

Stantec

Page: 1 of 1

SUBSURFACE LOG

EXPLORATION ID: BL-04

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2175555°, -83.0935501°	**DATE STARTED**	6/2/20 **COMPLETED** 6/2/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE** Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL **DEPTH TO WATER** 13.5 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	937.5 ft	**DEPTH TO WATER**	N/A **DATE/TIME**
PROJECT NUMBER	193707055 **INSPECTOR** EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 937.54	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	936.9		1-1-2	4	67	SS-1	2.5	-	-	-	-	-	-	-	23	CL (V)	
SANDY LEAN CLAY, AND SILT, BROWN GRAY MOTTLED, SOFT TO HARD, DAMP		2.5	2-3-4	10	87	SS-2	3.75	-	-	-	-	-	-	-	25	CL (V)	
- WOOD FRAGMENT @ 5.3'		5.0	3-5-6	16	100	SS-3	4.5+	5	27	40	28	30	19	11	17	CL	
		7.5	21-19-15	49	33	SS-4	2.0	-	-	-	-	-	-	-	19	CL (V)	
LEAN CLAY, LITTLE SAND, TRACE SILT, GRAY, MEDIUM STIFF TO VERY STIFF, DAMP - SHALE FRAGMENTS @ 10.2' TO 10.3'	927.5	10.0	4-8-10	26	100	SS-5	4.5+	-	-	-	-	-	-	-	14	CL (V)	
CLAYEY SAND, TRACE GRAVEL, GRAY, LOOSE, WET	924.4 W	12.5	2-3-5	11	87	SS-6	2.0	-	-	-	-	-	-	-	19	CL (V)	
							-	-	-	-	-	-	-	-	12	SC (V)	
SANDY LEAN CLAY, TRACE GRAVEL, GRAY, MEDIUM STIFF, MOIST TO WET	923.0	15.0	2-2-3	7	67	SS-7	2.0	-	-	-	-	-	-	-	30	CL (V)	
		17.5	2-4-8	17	67	SS-8	1.5	-	-	-	-	-	-	-	21	CL (V)	
		20.0	2-4-9	19	40	SS-9	4.0	-	-	-	-	-	-	-	11	CL (V)	
SILTY, CLAYEY GRAVEL WITH SAND, BROWNISH GRAY, DENSE, WET	915.5	22.5	12-15-18	47	80	SS-10	-	54	25	16	5	20	14	6	12	SC	
		25.0	15-27-15	60	53	SS-11	-	-	-	-	-	-	-	-	18	SC (V)	
		27.5	4-9-10	27	100	SS-12	-	-	-	-	-	-	-	-	14	SC (V)	
SHALE, REDDISH BROWN, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE GRAINED, THINLY LAMINATED	909.3 TR 908.2 EOB						-	-	-	-	-	-	-	-	13	Rock (V)	
			050/0.3	-	100	SS-13	-	-	-	-	-	-	-	-	12	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

Stantec

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SUBSURFACE LOG

EXPLORATION ID: BL-05

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2173739°, -83.0937066°	**DATE STARTED**	6/1/20 **COMPLETED** 6/2/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE** Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL **DEPTH TO WATER** 7.0 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	938.4 ft	**DEPTH TO WATER**	N/A **DATE/TIME**
PROJECT NUMBER	193707055 **INSPECTOR** EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 938.398	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	937.8		WH-1-2	4	80	SS-1	3.0	-	-	-	-	-	-	-	27	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN AND GRAY MOTTLED TO DARK BROWNISH GRAY, SOFT TO VERY STIFF, DAMP		2.5	4-6-8	20	80	SS-2	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		5.0	4-5-9	20	93	SS-3	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	W	7.5	4-8-10	26	93	SS-4	4.5+	-	-	-	-	-	-	-	13	CL (V)	
		10.0	4-7-10	24	80	SS-5	4.5+	1	23	43	33	30	16	14	14	CL	
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, GRAY, SOFT TO MEDIUM STIFF, DAMP TO WET	925.7	12.5	2-2-3	7	100	SS-6	2.5	-	-	-	-	-	-	-	20	CL (V)	
		15.0	3-3-5	11	100	SS-7	3.25	5	32	37	26	30	18	12	14	CL	
LEAN CLAY, LITTLE SILT, TRACE SAND, GRAY, VERY STIFF, DAMP	921.4	17.5	5-7-9	23	67	SS-8	4.5+	-	-	-	-	-	-	-	14	CL (V)	
LEAN CLAY, SOME SILT, LITTLE SAND, TRACE GRAVEL, GRAYISH BROWN, STIFF TO VERY STIFF, DAMP TO MOIST	918.9	20.0	2-4-8	17	87	SS-9	2.0	-	-	-	-	-	-	-	16	CL (V)	
		22.5	7-10-16	37	80	SS-10	4.5+	-	-	-	-	-	-	-	10	CL (V)	
CLAYEY SAND, LITTLE SILT, LITTLE GRAVEL, GRAYISH BROWN, LOOSE, WET	912.7	25.0	4-2-3	7	80	SS-11	2.0	-	-	-	-	-	-	-	13	CL (V)	
							-	-	-	-	-	-	-	-	16	SC (V)	
SHALE, DARK REDDISH BROWN, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE GRAINED, LAMINATED, FLAT TO 10 DEGREE BEDDING	911.4 TR	27.5	38-42-50/2.4"	-	100	SS-12	-	-	-	-	-	-	-	-	9	Rock (V)	
	909.7 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

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SUBSURFACE LOG

EXPLORATION ID: BL-06

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2173651°, -83.093551°	**DATE STARTED**	6/1/20 **COMPLETED** 6/1/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE** Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL **DEPTH TO WATER** 28.2 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	938.1 ft	**DEPTH TO WATER**	N/A **DATE/TIME**
PROJECT NUMBER	193707055 **INSPECTOR** EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 938.086	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL																	
SANDY LEAN CLAY, SOME SILT, LITTLE SAND, TRACE GRAVEL, BROWN WITH SOME GRAY MOTTLING, BLACK SPOTS AND ORANGE STAINING, MEDIUM STIFF TO VERY STIFF, DAMP	937.5		1-2-3	7	60	SS-1	3.5	-	-	-	-	-	-	-	24	CL (V)	
		2.5	3-8-8	23	87	SS-2	45+	-	-	-	-	-	-	-	15	CL (V)	
		5.0	2-5-6	16	100	SS-3	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		7.5	5-10-13	33	100	SS-4	4.5+	-	-	-	-	-	-	-	14	CL (V)	
LEAN CLAY, TRACE SILT, TRACE SAND, TRACE GRAVEL, GRAY WITH LITTLE BROWN, MEDIUM STIFF TO VERY STIFF, DAMP TO WET	929.3	10.0	3-5-7	17	60	SS-5	3.25	-	-	-	-	-	-	-	15	CL (V)	
		12.5	2-6-7	19	33	SS-6	3.0	-	-	-	-	-	-	-	16	CL (V)	
		15.0	2-2-3	7	73	SS-7	2.0	-	-	-	-	-	-	-	17	CL (V)	
		17.5	1-2-3	7	100	SS-8	2.5	-	-	-	-	-	-	-	21	CL (V)	
SANDY LEAN CLAY, TRACE SILT, LITTLE GRAVEL, FEW CLAYEY SAND SEAMS, BROWNISH GRAY, SOFT TO MEDIUM STIFF, WET	920.0						1.5	-	-	-	-	-	-	-	17	CL (V)	
		20.0	2-3-6	13	87	SS-9	1.0	-	-	-	-	-	-	-	18	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, GRAY WITH BROWN STAINING, SOFT TO STIFF, DAMP TO WET	916.8	22.5	16-34-29	91	40	SS-10	0.5	4	24	44	28	23	14	9	18	CL	
		25.0	12-11-9	29	27	SS-11	2.0	-	-	-	-	-	-	-	14	CL (V)	
CLAYEY SILT, TRACE TO LITTLE SAND, LITTLE GRAVEL, GRAY TO BROWN, STIFF, DAMP	911.1	27.5	5-5-6	16	100	SS-12	1.0	-	-	-	-	-	-	-	13	ML (V)	
SHALE, DARK REDDISH BROWN, SEVERLY WEATHERED, VERY WEAK, FEW SILT SEAMS	909.9 TR						-	-	-	-	-	-	-	-	22	Rock (V)	
			2-18-19	53	100	SS-13	-	-	-	-	-	-	-	-	21	SW (V)	
	907.6	30.0					-	-	-	-	-	-	-	-	15	Rock (V)	
	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

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SUBSURFACE LOG

EXPLORATION ID: BL-07

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.219779°, -83.0944496°	**DATE STARTED**	6/29/20	**COMPLETED**	6/29/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	935.0 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 935.04	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
SILTY CLAY, TRACE SAND, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP TO MOIST			1-2-2	6	60	SS-1	2.5	-	-	-	-	-	-	-	30	CL (V)	
		2.5	2-2-2	6	100	SS-2	1.75	-	-	-	-	-	-	-	30	CL (V)	
		5.0	2-2-2	6	93	SS-3	1.5	-	-	-	-	-	-	-	24	CL (V)	
LEAN CLAY, LITTLE TO SOME SILT, TRACE SAND AND GRAVEL, DARK BROWNISH TO GRAY, STIFF TO HARD, DAMP TO MOIST	927.5	7.5	2-4-6	14	100	SS-4	4.25	-	-	-	-	-	-	-	17	CL (V)	
	924.5	10.0 EOB	11-15-16	45	100	SS-5	4.5+	-	-	-	-	-	-	-	17	CL (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-08

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2206993°, -83.0957131°	**DATE STARTED**	6/29/20	**COMPLETED**	6/29/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	937.5 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 937.462	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN ORANGE MOTTLED, MEDIUM STIFF, DAMP TO MOIST			1-3-4	10	47	SS-1	3.0	-	-	-	-	-	-	-	25	CL (V)	
		2.5	2-2-3	7	40	SS-2	2.0	5	20	41	34	37	20	17	17	CL	
		5.0	2-3-4	10	100	SS-3	3.25	-	-	-	-	-	-	-	17	CL (V)	
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, BROWN, STIFF TO VERY STIFF, DAMP TO MOIST	930.0	7.5	4-6-10	23	100	SS-4	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		10.0	5-9-8	24	100	SS-5	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		12.5	3-3-7	14	73	SS-6	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		15.0	3-5-7	17	100	SS-7	4.5+	10	37	35	18	22	14	8	18	CL	
		17.5	7-7-11	26	93	SS-8	4.5+	-	-	-	-	-	-	-	11	CL (V)	
POORLY-GRADED GRAVEL, GRAY, DENSE, DRY	917.5	20.0	29-26-23	70	33	SS-9	-	-	-	-	-	-	-	-	2	GP (V)	
CLAY, SOME GRAVEL, BROWN, HARD, DRY TO DAMP	915.0	22.5	25-37-25	89	27	SS-10	-	-	-	-	-	-	-	-	7	CL (V)	
SHALE, DARK BROWN, HIGHLY WEATHERED, VERY WEAK, FINE GRAINED, THINLY LAMINATED	912.5 TR	25.0	6-16-25	59	67	SS-11	-	-	-	-	-	-	-	-	17	Rock (V)	
	910.5 EOB																

NOTES: AUGER REFUSAL AT 27', OFFSET 12' NORTH FROM STAKED LOCATION

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

Stantec

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SUBSURFACE LOG

EXPLORATION ID: BL-09

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2211521°, -83.096336°	**DATE STARTED**	6/30/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	938.0 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/30/20
DEPTH TO WATER	17.5 ft
DATE/TIME	
DEPTH TO WATER	N/A
DATE/TIME	
BOREHOLE INCLINATION (VERT.)	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 938.038	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
SILTY CLAY, TRACE SAND AND GRAVEL, BROWN GRAY MOTTLED, MEDIUM STIFF, DAMP TO MOIST			1-2-4	9	47	SS-1	2.75	-	-	-	-	-	-	-	26	CL (V)	
SANDY SILTY CLAY, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP TO MOIST	935.5	2.5	2-3-4	10	100	SS-2	3.0	-	-	-	-	-	-	-	23	CL (V)	
		5.0	3-7-4	16	100	SS-3	2.25	6	26	28	40	34	23	11	20	CL	
		7.5	2-3-3	9	100	SS-4	1.75	-	-	-	-	-	-	-	18	CL (V)	
		10.0	3-3-4	10	100	SS-5	1.25	-	-	-	-	-	-	-	19	CL (V)	
		12.5	3-4-6	14	93	SS-6	2.0	8	38	32	22	22	16	6	12	CL	
		15.0	26-7-9	23	60	SS-7	2.5	-	-	-	-	-	-	-	11	CL (V)	
CLAY, LITTLE TO SOME SHALE FRAGMENTS, TRACE TO LITTLE SAND AND GRAVEL, DARK BROWN GRAY, VERY STIFF, MOIST TO WET	920.5 W	17.5	5-9-11	29	100	SS-8	3.0	-	-	-	-	-	-	-	14	CL (V)	
SILTSTONE, DARK GRAY, SLIGHTLY WEATHERED, MODERATELY STRONG, VERY FINE GRAINED, LAMINATED TO THIN BEDDED, CARBONACEOUS - HIGHLY FRACTURED @ 20.8' TO 21.8' - CARBONACEOUS ODOR FROM WATER RETURN, POSSIBLE PRESENCE OF PETROLEUM IN BEDROCK	917.5 TR	20.0	27-50/3.6"	-	100	SS-9	-	-	-	-	-	-	-	-	21	Rock (V)	
			0		90	NQ-1										CORE	
- THIN BANDS OF SILVER SANDSTONE @ 24.8'		22.5 25.0	0		100	NQ-2										CORE	
- HIGHLY FRACTURED AND HIGHLY WEATHERED @ 27.4' TO 27.6'		27.5	0		100	NQ-3										CORE	
	908.0	30.0 EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BENTONITE GROUT

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SUBSURFACE LOG

EXPLORATION ID: BL-10

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2235633°, -83.0996377°	**DATE STARTED**	6/30/20	**COMPLETED**	6/30/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	944.6 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 944.604	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY, TRACE TO LITTLE SAND AND GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP			1-2-2	6	93	SS-1	1.5	-	-	-	-	-	-	-	20	CL (V)	
		2.5	1-2-4	9	100	SS-2	2.0	-	-	-	-	-	-	-	23	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN, STIFF TO VERY STIFF, DAMP	939.6	5.0	4-4-6	14	100	SS-3	4.5+	3	22	39	36	33	19	14	18	CL	
		7.5	3-6-11	24	100	SS-4	4.5+	-	-	-	-	-	-	-	21	CL (V)	
		10.0	10-15-15	43	100	SS-5	4.5+	-	-	-	-	-	-	-	18	CL (V)	
	934.1	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-11

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2273418°, -83.1048331°	**DATE STARTED**	7/1/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	949.8 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/1/20	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY WITH SAND, SOME TO AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED WITH SOME ORANGE, STIFF TO VERY STIFF, DAMP	949.814		1-2-3	7	67	SS-1	2.0	-	-	-	-	-	-	-	29	CL (V)	
		2.5	1-2-2	6	93	SS-2	2.75	3	24	36	37	37	24	13	15	CL	
		5.0	2-5-7	17	100	SS-3	3.5	-	-	-	-	-	-	-	17	CL (V)	
		7.5	4-6-7	19	100	SS-4	4.5+	3	23	32	42	31	18	13	17	CL	
		10.0	10-15-16	45	100	SS-5	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	939.3	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-12

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2283893°, -83.1063291°	**DATE STARTED**	6/4/20 **COMPLETED** 6/4/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY** 86.2 % (Avg.)	**ELEVATION DATUM** MSL	**DEPTH TO WATER** 27.5 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	950.4 ft	**DEPTH TO WATER** N/A	**DATE/TIME**
PROJECT NUMBER	193707055	**INSPECTOR** EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)** VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 950.399	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	949.9																
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, TRACE ORGANICS, ORANGE BROWN TO BROWN AND GRAY MOTTLING, MEDIUM STIFF TO VERY STIFF, DAMP			2-2-3	7	60	SS-1	3.5	-	-	-	-	-	-	-	25	CL (V)	
		2.5	4-4-7	16	100	SS-2	4.0	-	-	-	-	-	-	-	16	CL (V)	
		5.0	6-6-7	19	100	SS-3	4.5+	2	30	29	39	32	20	12	18	CL	
		7.5	5-7-11	26	80	SS-4	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		10.0	5-6-9	22	100	SS-5	4.5+	-	-	-	-	-	-	-	18	CL (V)	
	939.9						4.25	-	-	-	-	-	-	-	16	CL (V)	
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, DARK BROWNISH GRAY TO GRAY, DAMP		12.5	5-5-6	16	87	SS-6	2.0	-	-	-	-	-	-	-	14	CL (V)	
		15.0	2-4-7	16	87	SS-7	4.25	-	-	-	-	-	-	-	14	CL (V)	
		17.5	4-5-8	19	100	SS-8	4.5+	-	-	-	-	-	-	-	14	CL (V)	
		20.0	5-5-7	17	87	SS-9	3.5	8	30	35	27	26	18	8	12	CL	
		22.5	3-4-4	11	87	SS-10	2.5	-	-	-	-	-	-	-	5	CL (V)	
	927.2						-	-	-	-	-	-	-	-	12	SC (V)	
CLAYEY SAND WITH GRAVEL, DARK GRAYISH BROWN, LOOSE, WET	926.5																
LEAN CLAY WITH SAND, SOME GRAVEL, DARK BROWNISH GRAY, SOFT TO MEDIUM STIFF, MOIST TO WET		25.0	3-4-4	11	86	SS-11	2.5	-	-	-	-	-	-	-	7	CL (V)	
	W	27.5	3-6-22	40	100	SS-12	0.5	-	-	-	-	-	-	-	13	CL (V)	
	922.1 TR						-	-	-	-	-	-	-	-	10	Rock (V)	
SHALE, REDDISH BROWN, HIGHLY WEATHERED, WEAK TO SLIGHTLY STRONG, VERY FINE GRAINED, THINLY LAMINATED, LITTLE INTERBEDDED SILTSTONE, FLAT BEDDED	920.6		44-50/3.6"	-	100	SS-13	-	-	-	-	-	-	-	-	15	Rock (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-13

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2285116°, -83.1065036°	**DATE STARTED**	7/6/20 **COMPLETED** 7/6/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY** 86.2 % (Avg.)	**ELEVATION DATUM**	MSL **DEPTH TO WATER** 15.0 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	950.8 ft	**DEPTH TO WATER**	N/A **DATE/TIME**
PROJECT NUMBER	193707055	**INSPECTOR** PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID** CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 950.782	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
SILTY CLAY, TRACE SAND AND GRAVEL, BROWN GRAY MOTTLED ORANGE, MEDIUM STIFF TO STIFF, DRY TO DAMP			2-2-3	7	93	SS-1	2.5	-	-	-	-	-	-	-	20	CL (V)	
		2.5	1-5-6	16	93	SS-2	4.5+	-	-	-	-	-	-	-	16	CL (V)	
SANDY LEAN CLAY, AND SILT, TRACE TO LITTLE GRAVEL, BROWN SLIGHTLY GRAY, STIFF TO VERY STIFF, DAMP	945.8	5.0	4-6-7	19	100	SS-3	4.5+	3	27	31	39	28	18	10	16	CL	
		7.5	2-3-5	11	80	SS-4	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		10.0	1-5-8	19	93	SS-5	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		12.5	3-8-9	24	100	SS-6	4.5+	-	-	-	-	-	-	-	14	CL (V)	
	W	15.0	3-5-6	16	40	SS-7	4.0	-	-	-	-	-	-	-	13	CL (V)	
CLAYEY SAND, SOME SILT AND GRAVEL, GRAY, VERY STIFF, DAMP TO MOIST	933.3	17.5	4-6-8	20	100	SS-8	4.5+	-	-	-	-	-	-	-	14	SP-SM (V)	
20.6' TO 25.8' - FINE TO COARSE GRAINED SAND LENSE		20.0	4-6-8	20	87	SS-9	4.5+	-	-	-	-	-	-	-	13	SP-SM (V)	
		22.5	6-6-8	20	87	SS-10	4.25	-	-	-	-	-	-	-	12	SP-SM (V)	
		25.0	5-5-5	14	100	SS-11	2.5	13	41	24	22	22	15	7	15	SP-SM	
		27.5	5-5-20	36	100	SS-12	2.0	-	-	-	-	-	-	-	17	SP-SM (V)	
SHALE, DARK GRAY, SEVERELY WEATHERED, VERY WEAK, VERY FINE GRAINED, THINLY LAMINATED, FRIABLE	922.0 TR 921.6 EOB		50/2.4"	-	50	SS-13	-	-	-	-	-	-	-	-	9	Rock (V)	
								-	-	-	-	-	-	-	9	Rock (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

STANTEC BORING SUBSURFACE LOG -USCS - OH DOT.GDT - 9/4/20 12:22 - V:\193\ACTIVE\193707055\03_DATA\FIELD\GEOTECHNICAL\BORING LOGS\NORTH COLUMBUS LOOP GINT LOGS\NORTH COLUMBUS LOOP GINT FILE 9-1-20 - COPY.GPJ

SUBSURFACE LOG

EXPLORATION ID: BL-14

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2309398°, -83.1102388°	**DATE STARTED**	6/4/20 **COMPLETED** 6/4/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY** 86.2 % (Avg.)	**ELEVATION DATUM** MSL	**DEPTH TO WATER** N/A **DATE/TIME** N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	949.1 ft	**DEPTH TO WATER** N/A	**DATE/TIME** N/A
PROJECT NUMBER	193707055	**INSPECTOR** EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)** VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 949.054	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	948.5																
SILTY CLAY WITH SAND, TRACE GRAVEL, BROWN TO BROWN AND GRAY MOTTLED, MEDIUM STIFF TO HARD, DAMP TO MOIST		2.5	1-2-3	7	60	SS-1	3.0	-	-	-	-	-	-	-	25	CL (V)	
			5-6-9	22	53	SS-2	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		5.0	5-6-9	22	100	SS-3	4.0	0	19	63	18	24	18	6	18	CL	
		7.5	4-6-12	26	100	SS-4	4.5+	-	-	-	-	-	-	-	19	CL (V)	
	938.6	10.0	12-17-22	56	100	SS-5	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-15

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2344021°, -83.1157973°	**DATE STARTED**	7/13/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	940.4 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/13/20	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP	940.36		1-4-4	11	73	SS-1	4.0	-	-	-	-	-	-	-	17	CL (V)	
		2.5	2-2-3	7	100	SS-2	1.5	-	-	-	-	-	-	-	22	CL (V)	
		5.0	2-3-5	11	100	SS-3	2.5	3	34	34	29	25	15	10	17	CL	
		7.5	3-6-8	20	73	SS-4	3.75	-	-	-	-	-	-	-	15	CL (V)	
SILTY CLAY, TRACE GRAVEL AND SAND, BROWN ORANGE MOTTLED, VERY STIFF, DAMP	931.4	10.0	6-11-13	34	100	SS-5	4.5	-	-	-	-	-	-	-	19	CL (V)	
	929.9	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-16

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2362471°, -83.118759°	**DATE STARTED**	7/13/20	**COMPLETED**	7/13/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	12.5 ft	**DATE/TIME**	
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	938.1 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 938.12	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	937.8		2-6-6	17	60	SS-1	4.5+	-	-	-	-	-	-	-	16	CL (V)	
LEAN CLAY, TRACE GRAVEL AND SAND, BROWN ORANGE GRAY MOTTLED, STIFF, DAMP		2.5	3-4-5	13	100	SS-2	4.0	-	-	-	-	-	-	-	20	CL (V)	
		5.0	3-3-6	13	100	SS-3	4.0	-	-	-	-	-	-	-	18	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, VERY STIFF, FINE TO COARSE GRAINED, DAMP TO MOIST	930.6	7.5	4-7-9	23	100	SS-4	4.25	-	-	-	-	-	-	-	16	CL (V)	
		10.0	4-6-8	20	100	SS-5	4.0	0	15	35	50	33	18	15	17	CL	
SANDY CLAY, SOME GRAVEL AND SAND, BROWN, STIFF TO VERY STIFF, WET	925.6	W 12.5	5-10-13	33	53	SS-6	-	-	-	-	-	-	-	-	26	CL (V)	
		15.0	8-8-6	20	67	SS-7	0.5	-	-	-	-	-	-	-	28	CL (V)	
LEAN CLAY, LITTLE GRAVEL AND SAND, GRAY, STIFF, DAMP TO WET	920.1	17.5	2-5-7	17	100	SS-8	0.5 to 4.0	-	-	-	-	-	-	-	15	CL (V)	
CLAYEY SAND WITH GRAVEL, LITTLE SILT, BROWN, LOOSE TO MEDIUM DENSE, FINE TO COARSE GRAINED, MOIST TO WET	917.6	20.0	2-7-12	27	100	SS-9	0.5 -	- -	- -	- -	- -	- -	- -	- -	9 0	CL (V) SC-SM (V)	
		22.5	3-3-8	16	7	SS-10	-	-	-	-	-	-	-	-	0	SC-SM (V)	
		25.0	6-6-6	17	100	SS-11	-	23	49	17	11	21	14	7	14	SC-SM	
SANDY CLAY, LITTLE GRAVEL, GRAY, VERY STIFF TO HARD, MOIST	910.6	27.5	6-12-14	37	80	SS-12	4.5+	-	-	-	-	-	-	-	12	CL (V)	
	907.6	30.0	6-13-15	40	67	SS-13	4.5	-	-	-	-	-	-	-	12	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-17

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2363942°, -83.1190056°	**DATE STARTED**	6/4/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	936.7 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/4/20	**DEPTH TO WATER**	12.7 ft
DATE/TIME		**DEPTH TO WATER**	N/A
DATE/TIME		**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 936.689	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL			1-3-4	10	67	SS-1	3.5	-	-	-	-	-	-	-	25	CL (V)	
	935.2	2.5															
LEAN CLAY, LITTLE SILT, TRACE GRAVEL, TRACE ORGANICS, ORANGE BROWN AND GRAY MOTTLED, MEDIUM STIFF			2-3-5	11	73	SS-2	2.5	-	-	-	-	-	-	-	23	CL (V)	
		5.0	2-3-5	11	80	SS-3	3.75	-	-	-	-	-	-	-	19	CL (V)	
	929.7	7.5															
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, VERY STIFF, DARK GRAYISH BROWN, DAMP			2-7-12	27	87	SS-4	4.5+	4	15	43	38	35	19	16	15	CL	
		10.0	3-6-9	22	27	SS-5	3.0	-	-	-	-	-	-	-	19	CL (V)	
	923.9	W 12.5					-	-	-	-	-	-	-	-	18	CL (V)	
WELL-GRADED SAND, LITTLE CLAY, BROWISH GRAY, LOOSE, WET			3-3-5	11	80	SS-6	-	-	-	-	-	-	-	-	18	SW (V)	
		15.0	3-29-8	53	100	SS-7	-	-	-	-	-	-	-	-	15	SW (V)	
	921.0						2.5	-	-	-	-	-	-	-	12	CL (V)	
SANDY LEAN CLAY WITH GRAVEL, SOME SILT, DARK GRAYISH BROWN, MEDIUM STIFF TO HARD, MOIST		17.5	2-3-5	11	67	SS-8	2.0	-	-	-	-	-	-	-	16	CL (V)	
		20.0	6-3-4	10	73	SS-9	2.0	-	-	-	-	-	-	-	20	CL (V)	
		22.5	4-2-5	10	80	SS-10	1.5	24	25	31	20	24	15	9	11	CL	
		25.0	6-10-14	34	100	SS-11	1.5	-	-	-	-	-	-	-	18	CL (V)	
		27.5	16-19-17	52	53	SS-12	2.5	-	-	-	-	-	-	-	13	CL (V)	
	906.2	30.0	12-14-15	42	53	SS-13	1.0	-	-	-	-	-	-	-	20	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

SUBSURFACE LOG

EXPLORATION ID: BL-18

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2378112°, -83.121411°	**DATE STARTED**	6/5/20	**COMPLETED**	6/5/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	938.6 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 938.554	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	937.9																
LEAN CLAY, LITTLE TO SOME SILT, TRACE SAND, ORANGE BROWN TO BROWN WITH GRAY MOTTLING, MEDIUM STIFF TO STIFF, DAMP		2.5	1-2-2	6	87	SS-1	2.5	-	-	-	-	-	-	-	25	CL (V)	
			3-5-7	17	80	SS-2	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		5.0	2-9-7	23	60	SS-3	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	931.6																
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, DARK BROWN WITH LITTLE ORANGE STAINING, VERY STIFF, DAMP		7.5	12-9-13	32	100	SS-4	4.5+	6	27	38	29	28	18	10	15	CL	
		10.0	11-15-16	45	73	SS-5	4.5+	-	-	-	-	-	-	-	17	CL (V)	
	928.1	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-19

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2411551°, -83.1270922°	**DATE STARTED**	7/6/20 **COMPLETED** 7/6/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY** 86.2 % (Avg.)	**ELEVATION DATUM** MSL	**DEPTH TO WATER** N/A **DATE/TIME** N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	936.5 ft	**DEPTH TO WATER** N/A	**DATE/TIME** N/A
PROJECT NUMBER	193707055	**INSPECTOR** PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)** VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 936.543	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY WITH SAND, AND SILT, LITTLE GRAVEL, BROWN GRAY MOTTLED ORANGE, MEDIUM STIFF, FINE TO COARSE GRAINED, DRY TO DAMP			2-3-3	9	100	SS-1	2.25	-	-	-	-	-	-	-	24	CL (V)	
		2.5	3-3-4	10	100	SS-2	1.75	2	25	26	47	44	19	25	24	CL	
LEAN CLAY, TRACE TO LITTLE SAND AND GRAVEL, BROWN GRAY MOTTLED, STIFF TO VERY STIFF, DAMP	931.5	5.0	5-7-7	20	100	SS-3	4.5+	-	-	-	-	-	-	-	19	CL (V)	
		7.5	4-5-7	17	100	SS-4	4.5+	-	-	-	-	-	-	-	19	CL (V)	
	926.0	10.0	12-17-18	50	100	SS-5	4.5+	-	-	-	-	-	-	-	19	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-20

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2434831°, -83.1310472°	**DATE STARTED**	6/8/20	**COMPLETED**	6/8/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	931.3 ft	**DEPTH TO WATER**	21.5 ft	**DATE/TIME**	
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**DEPTH TO WATER**	N/A
								DATE/TIME	
								BOREHOLE INCLINATION (VERT.)	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 931.299	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	930.8																
LEAN CLAY, SOME SILT, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP							1.5	-	-	-	-	-	-	-	30	CL (V)	
		2.5	2-3-5	11	80	SS-2	2.25	-	-	-	-	-	-	-	21	CL (V)	
		5.0	5-7-7	20	33	SS-3	3	-	-	-	-	-	-	-	18	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, GRAY, MEDIUM STIFF TO STIFF, DRY TO DAMP	924.3	7.5	4-7-8	22	80	SS-4	4.5+	4	13	37	46	32	20	12	13	CL	
		10.0	2-3-3	9	93	SS-5	3	-	-	-	-	-	-	-	15	CL (V)	
SANDY LEAN CLAY, LITTLE GRAVEL, GRAY, MEDIUM STIFF, WET	920.3																
SANDY LEAN CLAY, SOME SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, MEDIUM STIFF TO STIFF, DAMP	919.3	12.5	3-3-5	11	100	SS-6	4.25	-	-	-	-	-	-	-	16	CL (V)	
		15.0	5-6-7	19	100	SS-7	3.5	6	28	33	33	27	18	9	15	CL	
CLAYEY SAND, LITTLE GRAVEL, GRAY, LOOSE TO MEDIUM DENSE, WET	914.3	17.5	3-5-5	14	33	SS-8	-	-	-	-	-	-	-	-	11	SC (V)	
		20.0	8-10-11	30	100	SS-9	-	-	-	-	-	-	-	-	16	SC (V)	
LEAN CLAY, LITTLE SILT AND GRAVEL, TRACE SAND, BROWN GRAY MOTTLED, VERY STIFF, DRY TO DAMP	910.8						4.5+	-	-	-	-	-	-	-	13	CL (V)	
CLAYEY GRAVEL WITH SAND, GRAY, VERY DENSE, WET	909.8 W	22.5	10-50/4.8"	-	56	SS-10	-	-	-	-	-	-	-	-	6	GC (V)	
	906.1 TR	25.0 EOB															

NOTES: AUGER REFUSAL AT 25.2'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

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SUBSURFACE LOG

EXPLORATION ID: BL-21

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2435762°, -83.1312054°	**DATE STARTED**	6/9/20	**COMPLETED**	6/9/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	932.9 ft	**DEPTH TO WATER**	N/A	**DATE/TIME**	
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 932.924	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	932.6																
SILTY CLAY, LITTLE ORGANICS, TRACE SAND, BROWN MOTTLED GRAY, STIFF, DAMP	930.9		2-4-4	11	40	SS-1	4.5+	-	-	-	-	-	-	-	23	CL-ML (V)	
SANDY LEAN CLAY, SOME SILT, TRACE SAND AND GRAVEL, BROWN ORANGE GRAY MOTTLED, STIFF, DAMP		2.5	3-3-5	11	73	SS-2	2.25	-	-	-	-	-	-	-	23	CL (V)	
		5.0	2-4-5	13	87	SS-3	3.75	2	28	35	35	32	22	10	20	CL	
LEAN CLAY, SOME SILT, TRACE SAND AND GRAVEL, GRAY BROWN ORANGE MOTTLED, STIFF TO VERY STIFF, DRY TO DAMP	925.9	7.5	3-5-9	20	80	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		10.0	3-4-6	14	100	SS-5	3	-	-	-	-	-	-	-	19	CL (V)	
SANDY SILT, SOME CLAY, GRAY, LOOSE, MOIST	921.7		-	-	-	-	-	-	-	-	-	-	-	-	17	ML (V)	
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, GRAY, MEDIUM STIFF, MOIST	920.4	12.5	2-2-3	7	80	SS-6	1.5	5	34	36	25	27	18	9	15	CL	
		15.0	3-4-4	11	47	SS-7	0.25	-	-	-	-	-	-	-	17	CL (V)	
		17.5	2-3-3	9	33	SS-8	0.5	-	-	-	-	-	-	-	16	CL (V)	
LEAN CLAY, LITTLE SAND AND STONE FRAGMENTS, TRACE SILT, GRAY, MEDIUM STIFF, WET	912.9 W	20.0	2-3-4	10	7	SS-9	1.25	-	-	-	-	-	-	-	19	CL (V)	
SILSTONE, HIGHLY WEATHERED, STRONG, FLAT FRACTURES	910.2 TR 910.1 EOB	22.5	50/3.6"	-	100	SS-10	2.5	-	-	-	-	-	-	-	12	CL (V) Rock (V)	

NOTES: ELECTED NOT TO ROCK CORE, POSSIBLE PROPERTY DAMAGE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

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SUBSURFACE LOG

EXPLORATION ID: BL-22

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2451454°, -83.1338724°	**DATE STARTED**	6/15/20	**COMPLETED**	6/15/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	926.8 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 926.803	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL																	
	925.8		1-3-2	7	67	SS-1	2.0	-	-	-	-	-	-	-	23	CL (V)	
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, ORANGE BROWN GRAY MOTTLED, MEDIUM STIFF, DAMP		2.5															
			2-3-5	11	80	SS-2	4.5+	-	-	-	-	-	-	-	20	CL (V)	
		5.0															
			5-5-7	17	100	SS-3	4.5+	4	17	33	46	35	20	15	17	CL	
		7.5															
			3-5-13	26	100	SS-4	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		10.0															
STONE FRAGMENTS BLOCKING SAMPLER, NO RECOVERY			8-8-11	27	0	SS-5	-	-	-	-	-	-	-	-	24	CL (V)	
	914.8	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-23

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2457779°, -83.1395642°	**DATE STARTED**	7/15/20	**COMPLETED**	7/15/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	913.0 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 912.986	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	912.6																
LEAN CLAY, TRACE SAND AND SILT, BROWN ORANGE GRAY MOTTLED, STIFF TO VERY STIFF, DRY TO DAMP			2-4-5	13	87	SS-1	4	-	-	-	-	-	-	-	19	CL (V)	
		2.5	8-8-8	23	100	SS-2	4.5+	-	-	-	-	-	-	-	12	CL (V)	
		5.0	5-6-7	19	100	SS-3	4.5+	-	-	-	-	-	-	-	15	CL (V)	
- MOIST SEAM WITH INCREASE IN SAND AND GRAVEL @ 6.1' TO 6.3'	905.5	7.5	3-5-5	14	100	SS-4	4.5+	2	17	41	40	32	18	14	17	CL	
LEAN CLAY WITH SAND, AND SILT, TRACE TO LITTLE STONE FRAGMENTS, BROWN, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DAMP TO MOIST		10.0	7-10-11	30	100	SS-5	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	902.5	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

SUBSURFACE LOG

EXPLORATION ID: BL-24

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2452262°, -83.145393°	**DATE STARTED**	7/16/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	877.8 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/16/20	**DEPTH TO WATER**	17.5 ft
DATE/TIME		**DEPTH TO WATER**	N/A
DATE/TIME		**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	877.793																
	877.6		2-5-5	14	67	SS-1	4.5	1	83	11	5	NP	NP	NP	14	SM	
SILTY SAND, TRACE CLAY AND GRAVEL, BROWN, MEDIUM DENSE TO DENSE, FINE TO COARSE GRAINED, DAMP								-	-	-	-	-	-	-	-	SM (V)	
	875.3	2.5	4-8-14	32	67	SS-2		-	-	-	-	-	-	-	9	SM (V)	
SILTY SAND, SOME GRAVEL, TRACE CLAY, BROWN, DENSE TO VERY DENSE, FINE TO COARSE GRAINED, DAMP		5.0	12-13-17	43	53	SS-3		-	-	-	-	-	-	-	6	SM (V)	
		7.5	10-28-28	80	80	SS-4		3	66	22	9	18	16	2	5	SM	
		10.0	24-37-31	98	87	SS-5		-	-	-	-	-	-	-	6	SM (V)	
		12.5	7-20-37	82	73	SS-6		-	-	-	-	-	-	-	10	SM (V)	
		15.0	39-37-38	108	80	SS-7		-	-	-	-	-	-	-	8	SM (V)	
	W	17.5	9-13-28	59	67	SS-8		-	-	-	-	-	-	-	12	SM (V)	
		20.0	15-19-501.2"	-	100	SS-9		-	-	-	-	-	-	-	13	SM (V)	
	856.7	TR EOB															

NOTES: OFFSET 7' NORTH FROM STAKED LOCATION.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-25

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2450489°, -83.1455772°	**DATE STARTED**	7/15/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	876.4 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/16/20	**DEPTH TO WATER**	15.0 ft
DATE/TIME		**DEPTH TO WATER**	N/A
DATE/TIME		**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 876.392	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
LEAN CLAY, LITTLE SAND AND SILT, BROWN GRAY MOTTLED, SOFT TO MEDIUM STIFF, DAMP			1-1-1	3	33	SS-1	2.75	-	-	-	-	-	-	-	26	CL (V)	
		2.5	2-2-7	13	73	SS-2	3.75	-	-	-	-	-	-	-	18	CL (V)	
		5.0	8-13-10	33	13	SS-3	-	-	-	-	-	-	-	-	2	CL (V)	
SILTY SAND WITH GRAVEL, BROWN GRAY, DENSE, DRY	868.9	7.5	12-17-22	56	100	SS-4	-	39	40	18	3	NP	NP	NP	6	SM	
		10.0	6-15-15	43	47	SS-5	-	-	-	-	-	-	-	-	6	SM (V)	
SANDY CLAY, LITTLE GRAVEL, TRACE TO LITTLE STONE FRAGMENTS, BROWN, VERY STIFF, DAMP TO MOIST	863.9	12.5	6-5-18	33	87	SS-6	4.5	-	-	-	-	-	-	-	26	CL (V)	
	W	15.0	20-21-30	73	100	SS-7	4.5	-	-	-	-	-	-	-	12	CL (V)	
CLAYEY SAND, SOME GRAVEL, LITTLE SILT, BROWN, DENSE, FINE TO COARSE GRAINED, DAMP TO WET	858.9	17.5	15-25-14	56	100	SS-8	-	3	71	14	12	23	16	7	13	SW	
LIMESTONE, BROWN TO GRAY, HIGHLY TO SLIGHTLY WEATHERED, MODERATELY STRONG TO VERY STRONG, VERY FINE GRAINED, THIN BEDDED, ARENACEOUS, ARGILLACEOUS DP = 450 PSI	857.3 TR	20.0	37		100	NQ-1										CORE	
24.0' TO 25.5' VERTICAL FRACTURE		22.5	62		100	NQ-2										CORE	
DP = 450 PSI		25.0															
29.7' TO 30.2' VERTICAL FRACTURE		27.5	88		100	NQ-3										CORE	
31.0' TO 31.6' HIGHLY WEATHERED ZONE		30.0															

SUBSURFACE LOG

EXPLORATION ID: BL-25

PROJECT NORTH COLUMBUS LOOP **CLIENT** Columbia Gas **PROJECT NUMBER** 193707055 **SURFACE ELEVATION** 876.4 ft **LOCATION** 40.2450489°, -83.1455772° **DATE** 7/15/20 - 7/16/20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
DP = 450 PSI **LIMESTONE**, BROWN TO GRAY, HIGHLY TO SLIGHTLY WEATHERED, MODERATELY STRONG TO VERY STRONG, VERY FINE GRAINED, THIN BEDDED, ARENACEOUS, ARGILLACEOUS *(continued)* 35.0'-35.4' UNCONFINED COMPRESSIVE STRENGTH = 13,000 PSI DP = 450 PSI		32.5 35.0	100		100	NQ-4											CORE	
40.4' TO 40.7' VERTICAL FRACTURE 41.0' LOSS WATER RETURN DP = 450 PSI 41.4' TO 43.7 SLIGHTLY VUGGY ZONE		37.5 40.0	88		100	NQ-5											CORE	
46.0' DRILLING WATER RETURNED DP = 450 PSI		42.5 45.0	86		100	NQ-6											CORE	
DP = 450 PSI 51.5' TO 52.9' SHALE STRINGERS PRESENT		47.5 50.0	94		100	NQ-7											CORE	
DP = 450 PSI		52.5 55.0	72		100	NQ-8											CORE	
DP = 450 PSI		57.5 60.0	90		100	NQ-9											CORE	
DP = 450 PSI 65.0'-65.4' UNCONFINED COMPRESSIVE STRENGTH = 22,720 PSI		62.5 65.0	94		100	NQ-10											CORE	

SUBSURFACE LOG

EXPLORATION ID: BL-25

PROJECT NORTH COLUMBUS LOOP **CLIENT** Columbia Gas **PROJECT NUMBER** 193707055 **SURFACE ELEVATION** 876.4 ft **LOCATION** 40.2450489°, -83.1455772° **DATE** 7/15/20 - 7/16/20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
DP = 450 PSI **LIMESTONE**, BROWN TO GRAY, HIGHLY TO SLIGHTLY WEATHERED, MODERATELY STRONG TO VERY STRONG, VERY FINE GRAINED, THIN BEDDED, ARENACEOUS, ARGILLACEOUS *(continued)*		67.5	76		100	NQ-11										CORE	
DP = 500 PSI 71.3' TO 75.4' MODERATELY WEATHERED, CONGLOMETRITIC, SLIGHTLY VUGGY		70.0 72.5	76		100	NQ-12										CORE	
DP = 500 PSI		75.0 77.5	80		100	NQ-13										CORE	
SANDSTONE, BROWN, MODERATELY WEATHERED, STRONG, FINE GRAINED, THIN BEDDED	798.6																
LIMESTONE, BROWN TO GRAY, SLIGHTLY WEATHERED, VERY STRONG, VERY FINE GRAINED, THIN BEDDED, ARENACEOUS, ARGILLACEOUS	797.4 796.4	80.0 EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BENTONITE GROUT

STANTEC BORING SUBSURFACE LOG -USCS - OH DOT.GDT - 9/4/20 12:22 - V:\1937\ACTIVE\193707055\03_DATA\FIELD\GEOTECHNICAL\BORING LOGS\NORTH COLUMBUS LOOP GINT LOGS\NORTH COLUMBUS LOOP GINT FILE 9-1-20 - COPY.GPJ

SUBSURFACE LOG

EXPLORATION ID: BL-26

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2425166°, -83.1486782°	**DATE STARTED**	7/7/20	**COMPLETED**	7/7/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	858.9 ft	**DEPTH TO WATER**	10.5 ft	**DATE/TIME**	
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**DEPTH TO WATER**	N/A
								DATE/TIME	
								BOREHOLE INCLINATION (VERT.)	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
LEAN CLAY, LITTLE GRAVEL, TRACE SILT, TRACE SAND, BROWN, SOFT TO MEDIUM STIFF, DRY TO DAMP	858.917		6-6-4	14	100	SS-1	3.5	-	-	-	-	-	-	-	15	CL (V)	
LITTLE SAND, BECOMES DAMP TO MOIST		2.5	1-2-3	7	67	SS-2	2.0	-	-	-	-	-	-	-	18	CL (V)	
BECOMES MOIST		5.0	1-1-2	4	53	SS-3	0.5 -0.75	-	-	-	-	-	-	-	22	CL (V)	
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, DARK BROWN/GRAY, STIFF, FINE TO COARSE GRAINED, DAMP	851.4	7.5	2-4-7	16	100	SS-4	2.5	2	30	31	37	43	24	19	28	CL	
SILTY GRAVEL WITH SAND, TRACE CLAY, GRAY, MEDIUM DENSE, FINE TO COARSE GRAINED, WET	848.4 W	10.0	5-14-22	52	100	SS-5	1.75	-	-	-	-	-	-	-	12	CL (V)	
								-	-	-	-	-	-	-	12	GC (V)	
		12.5	4-6-11	24	53	SS-6		-	-	-	-	-	-	-	14	GC (V)	
		15.0	4-21-30	73	100	SS-7		-	-	-	-	-	-	-	18	GC (V)	
		17.5	14-18-9	39	100	SS-8		58	29	8	5	NP	NP	NP	15	GC	
TRACE LIMESTONE FRAGMENTS	838.3 TR	20.0	22-50/0.1'	-	100	SS-9		-	-	-	-	-	-	-	10	GC (V)	
LIMESTONE, GRAY, SLIGHTLY WEATHERED, VERY STRONG, VERY FINE GRAINED, THIN BEDDED, MICACEOUS, MODERATELY TO HIGHLY FRACTURED DP=350PSI		22.5	63		100	NQ-1										CORE	
DP=350PSI		25.0	79		100	NQ-2										CORE	
DP=350PSI		27.5	62		100	NQ-3										CORE	
SILTSTONE, GRAY, MODERATELY WEATHERED, STRONG, FINE GRAINED, VERY THIN BEDDED, ARGILLACEOUS, MODERATELY TO HIGHLY FRACTURED	830.9	30.0															

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SUBSURFACE LOG

EXPLORATION ID: BL-26

PROJECT NORTH COLUMBUS LOOP **CLIENT** Columbia Gas **PROJECT NUMBER** 193707055 **SURFACE ELEVATION** 858.9 ft **LOCATION** 40.2425166°, -83.1486782° **DATE** 7/7/20 - 7/7/20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
LIMESTONE, GRAY, MODERATELY WEATHERED, VERY STRONG, FINE GRAINED, THIN BEDDED, ARGILLACEOUS, MODERATELY TO HIGHLY FRACTURED	826.6	32.5	76		100	NQ-4										CORE	
		35.0															
38.0'-38.4' UNCONFINED COMPRESSIVE STRENGTH = 15,270 PSI		37.5	48		100	NQ-5										CORE	
		40.0															
DP=350PSI		42.5	74		100	NQ-6										CORE	
		45.0															
		47.5	70		100	NQ-7										CORE	
		50.0															
SHALE STRINGERS PRESENT		52.5	96		100	NQ-8										CORE	
		55.0															
SHALE STRINGERS PRESENT IN HIGHLY WEATHERED ZONE 56.5'-56.9' UNCONFINED COMPRESSIVE STRENGTH = 9,680 PSI		57.5	80		100	NQ-9										CORE	
		60.0															
VUGGY AT 60.0'-61.0'																	
VUGGY AREAS PRESENT		62.5	50		100	NQ-10										CORE	
		65.0															

SUBSURFACE LOG

EXPLORATION ID: BL-26

PROJECT NORTH COLUMBUS LOOP **CLIENT** Columbia Gas **PROJECT NUMBER** 193707055 **SURFACE ELEVATION** 858.9 ft **LOCATION** 40.2425166°, -83.1486782° **DATE** 7/7/20 - 7/7/20

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
HORIZONTAL STRINGERS PRESENT **LIMESTONE**, GRAY, MODERATELY WEATHERED, VERY STRONG, FINE GRAINED, THIN BEDDED, ARGILLACEOUS, MODERATELY TO HIGHLY FRACTURED *(continued)*		67.5	24		100	NQ-11										CORE	
SHALE STRINGERS MORE PRESENT IN WEATHERED ZONES		70.0 72.5	68		100	NQ-12										CORE	
		75.0 77.5	63		100	NQ-13										CORE	
	778.9	80.0 EOB															

NOTES: OFFSET 8' SOUTH FROM STAKED LOCATION. SPECIFIC FRACTURE DESCRIPTIONS, COORDINATES, AND ELEVATIONS NOT INCLUDED IN PRELIMINARY LOGS.

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SEALED WITH BENTONITE GROUT

SUBSURFACE LOG

EXPLORATION ID: BL-28

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2408729°, -83.1507911°	**DATE STARTED**	6/22/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	883.6 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/22/20	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 883.588	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	883.1																
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, BROWN GRAY WITH BLACK MOTTLED, STIFF TO VERY STIFF, DAMP			1-3-5	11	67	SS-1	3.5	-	-	-	-	-	-	-	19	CL (V)	
		2.5	3-3-5	11	53	SS-2	1.5	-	-	-	-	-	-	-	22	CL (V)	
		5.0	4-8-9	24	80	SS-3	4.5+	7	23	39	31	29	19	10	14	CL	
		7.5	5-7-8	22	100	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		10.0	8-12-15	39	67	SS-5	4.5+	-	-	-	-	-	-	-	14	CL (V)	
	873.1	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-29

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2363887°, -83.1524944°	**DATE STARTED**	7/14/20 **COMPLETED** 7/14/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY** 86.2 % (Avg.)	**ELEVATION DATUM** MSL	**DEPTH TO WATER** 12.2 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	905.6 ft	**DEPTH TO WATER** N/A	**DATE/TIME**
PROJECT NUMBER	193707055	**INSPECTOR** PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)** VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
SANDY LEAN CLAY, AND SILT, LITTLE GRAVEL, BROWN GRAY MOTTLED, MEDIUM STIFF TO STIFF, FINE TO COARSE GRAINED, DRY TO DAMP	905.642	2.5	4-3-4	10	47	SS-1	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		5.0	4-4-8	17	67	SS-2	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		7.5	4-5-2	10	87	SS-3	4.5+	7	28	35	30	28	16	12	17	CL	
		10.0	5-7-9	23	100	SS-4	4.5	-	-	-	-	-	-	-	17	CL (V)	
WET, "SOME" COARSE SAND		12.5	3-3-7	14	47	SS-5	1.25	11	33	33	23	25	16	9	19	CL	
	893.4 TR																
LIMESTONE, GRAY, MODERATELY WEATHERED, VERY STRONG, FINE GRAINED, THIN BEDDED, CRYSTALLINE, FOSSILIFEROUS, FERRIFEROUS DP = 350-400 PSI		15.0	21		100	NQ-1										CORE	
16.0' TO 17.0' FRACTURED IRON STAINED ZONE DP = 450 PSI HIGHLY FRACTURED THROUGHOUT		17.5															
19.1' TO 19.4' VERTICAL FRACTURE		20.0	8		100	NQ-2										CORE	
DP = 450 PSI		22.5	48		100	NQ-3										CORE	
DP = 450 PSI 27.5'-27.9' UNCONFINED COMPRESSIVE STRENGTH = 23,290 PSI		25.0	93		100	NQ-4										CORE	
	875.6 EOB	27.5 30.0															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

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SUBSURFACE LOG

EXPLORATION ID: BL-30

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2363624°, -83.1526908°	**DATE STARTED**	7/14/20	**COMPLETED**	7/14/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	905.7 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 905.72	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
SILTY CLAY, TRACE SAND, BROWN, MEDIUM STIFF, DAMP			2-3-2	7	100	SS-1	2.5	-	-	-	-	-	-	-	22	CL (V)	
	903.2	2.5															
LEAN CLAY WITH SAND, AND SILT, LITTLE GRAVEL AND STONE FRAGMENTS, BROWN, STIFF, DAMP			3-5-5	14	100	SS-2	4	-	-	-	-	-	-	-	22	CL (V)	
		5.0															
5.5' WET SAND SEAM			5-4-7	16	100	SS-3	3.5	8	22	33	37	32	17	15	17	CL	
	897.9	TR 7.5 EOB	050/3.6	-	100	SS-4	-	-	-	-	-	-	-	-	25	CL (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-31

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2344611°, -83.1597203°	**DATE STARTED**	6/9/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	939.2 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/9/20	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 939.187	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	938.5																
SANDY LEAN CLAY, SOME SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DRY TO DAMP		2.5	2-2-3	7	93	SS-1	2.5	-	-	-	-	-	-	-	22	CL (V)	
			4-6-9	22	100	SS-2	3.5	-	-	-	-	-	-	-	18	CL (V)	
		5.0	4-7-11	26	100	SS-3	4.5+	3	28	34	35	31	19	12	16	CL	
		7.5	7-9-10	27	60	SS-4	4.5+	-	-	-	-	-	-	-	16	CL (V)	
			11-14-18	46	80	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
	929.3	10.0					-	-	-	-	-	-	-	-	14	SC (V)	
CLAYEY SAND, SOME GRAVEL, ORANGE BROWN, LOOSE, WET	928.7	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-32

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2294048°, -83.162762°	**DATE STARTED**	6/9/20	**COMPLETED**	6/9/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	951.9 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 951.908	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	951.3																
LEAN CLAY WITH SAND, AND SILT, LITTLE GRAVEL AND STONE FRAGMENTS, MEDIUM STIFF TO VERY STIFF, BROWN AND GRAY MOTTLED TO BROWN, DAMP		2.5	2-2-3	7	87	SS-1	4.0	-	-	-	-	-	-	-	21	CL (V)	
		5.0	2-5-7	17	80	SS-2	4.5+	-	-	-	-	-	-	-	14	CL (V)	
		7.5	4-9-13	32	100	SS-3	4.5+	3	22	37	38	29	20	9	15	CL	
		10.0	5-7-8	22	100	SS-4	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	941.4	EOB	8-16-17	47	100	SS-5	4.5+	-	-	-	-	-	-	-	10	CL (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-33

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2270247°, -83.165064°	**DATE STARTED**	6/9/20	**COMPLETED**	6/9/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	953.7 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 953.664	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	953.0		1-1-3	6	93	SS-1	2.0	-	-	-	-	-	-	-	29	CL (V)	
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO VERY STIFF, DAMP		2.5	2-4-6	14	93	SS-2	2.5	7	19	29	45	42	25	17	27	CL	
		5.0	4-7-8	22	100	SS-3	4.5+	-	-	-	-	-	-	-	15	CL (V)	
LIMESTONE, HIGHLY WEATHERED ROCK FRAGMENTS	946.7 946.6	TR EOB	50/1.2"	-	100	SS-4	-	-	-	-	-	-	-	-	1	Rock (V)	

NOTES: AUGER REFUSAL AT 7.1'

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-34

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2233601°, -83.1686208°	**DATE STARTED**	6/9/20 **COMPLETED** 6/10/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.) **ELEVATION DATUM** MSL **DEPTH TO WATER** N/A **DATE/TIME** N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	957.4 ft	**DEPTH TO WATER**	N/A **DATE/TIME** N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815) **BOREHOLE INCLINATION (VERT.)** VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 957.372	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
TOPSOIL	957.1		2-2-4	9	80	SS-1	2.5	-	-	-	-	-	-	-	26	ML (V)	
SILT WITH SAND, SOME CLAY, LITTLE GRAVEL, TRACE TO LITTLE ORGANICS, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP		2.5	2-2-2	6	80	SS-2	1.5	1	27	27	45	48	29	19	26	ML	
	952.1	TR 5.0	50/3.6"	-	100	SS-3	-	-	-	-	-	-	-	-	20	ML (V)	
LIMESTONE, BROWN GRAY MOTTLED, MODERATELY WEATHERED, STRONG, FINE GRAINED, THIN BEDDED, MODERATELY FRACTURED, REACTANT TO HCL, FRACTURES ARE OXIDIZED ORANGE			0		100	NQ-1										CORE	
DP=150 PSI DP=400 PSI		7.5	14		100	NQ-2										CORE	
DP=450 PSI		10.0 12.5	66		100	NQ-3										CORE	
14.2'-14.6' UNCONFINED COMPRESSIVE STRENGTH = 25,580 PSI		15.0															
DP=450 PSI		17.5	70		100	NQ-4										CORE	
DP=450 PSI		20.0 22.5	82		100	NQ-5										CORE	
DP=450 PSI		25.0 27.5	23		80	NQ-6										CORE	
	927.0	30.0 EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BENTONITE GROUT

SUBSURFACE LOG

EXPLORATION ID: BL-35

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2231626°, -83.1688115°	**DATE STARTED**	6/22/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	957.2 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/22/20	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 957.21	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	956.9																
LEAN CLAY, LITTLE SILT, TRACE SAND, BROWN GRAY ORANGE MOTTLED, SOFT TO MEDIUM STIFF, DAMP			1-1-2	4	53	SS-1	1.0	-	-	-	-	-	-	-	29	CL (V)	
		2.5															
			1-3-5	11	61	SS-2	1.5	-	-	-	-	-	-	-	24	CL (V)	
		5.0															
5.3' - ROCK FRAGMENTS (LIMESTONE)	951.8	TR	50/4.8"	-	100	SS-3	-	-	-	-	-	-	-	-	5	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-36

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2205781°, -83.1712968°	**DATE STARTED**	7/8/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	954.0 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/8/20	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL
DEPTH TO WATER	N/A	**DATE/TIME**	N/A				

MATERIAL DESCRIPTION AND NOTES	ELEV. 953.984	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY WITH SAND, AND SILT, LITTLE GRAVEL, BROWN GRAY MOTTLED ORANGE, MEDIUM STIFF TO STIFF, FINE TO COARSE GRAINED, DRY TO DAMP			1-3-5	11	73	SS-1	4.5+	-	-	-	-	-	-	-	22	CL (V)	
		2.5	2-5-5	14	73	SS-2	4.5+	-	-	-	-	-	-	-	19	CL (V)	
		5.0	3-4-7	16	100	SS-3	4.5+	2	26	27	45	36	19	17	17	CL	
	946.5																
SANDY CLAY, TRACE TO LITTLE SAND, BROWN MOTTLED GRAY, STIFF TO VERY STIFF, DAMP TO MOIST		7.5	3-4-5	13	80	SS-4	2.0	-	-	-	-	-	-	-	19	CL (V)	
		10.0	8-8-9	24	100	SS-5	2.5	-	-	-	-	-	-	-	13	CL (V)	
	943.5	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

SUBSURFACE LOG

EXPLORATION ID: BL-37

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2161593°, -83.1763971°	**DATE STARTED**	7/9/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	951.7 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/9/20	**DEPTH TO WATER**	17.5 ft
DATE/TIME		**DEPTH TO WATER**	N/A
DATE/TIME		**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 951.731	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, MEDIUM STIFF TO STIFF, DAMP			1-3-5	11	60	SS-1	4.0	-	-	-	-	-	-	-	17	CL (V)	
		2.5	3-3-9	17	100	SS-2	4.5	3	22	31	44	33	18	15	16	CL	
		5.0	6-7-9	23	100	SS-3	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		7.5	5-10-14	34	100	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		10.0	4-8-10	26	100	SS-5	4.5+	-	-	-	-	-	-	-	12	CL (V)	
LEAN CLAY WITH SAND, AND SILT, LITTLE GRAVEL, GRAY, STIFF, FINE TO COARSE GRAINED, DAMP TO MOIST	939.2	12.5	2-3-5	11	100	SS-6	4.5+	6	23	31	40	27	16	11	14	CL	
		15.0	2-6-9	22	100	SS-7	4.5+	-	-	-	-	-	-	-	14	CL (V)	
WELL-GRADED SAND, TRACE SAND AND SILT, BROWN, MEDIUM DENSE, MOIST	935.5		-	-	-	-	-	-	-	-	-	-	-	-	12	SW (V)	
GRAVEL WITH SAND, SILT, AND CLAY, GRAY, MEDIUM DENSE TO DENSE, WET	934.2 W	17.5	6-7-19	37	53	SS-8	-	-	-	-	-	-	-	-	12	GC (V)	
		20.0	9-30-45	108	87	SS-9	-	-	-	-	-	-	-	-	12	GC (V)	
LIMESTONE, GRAY, MODERATELY TO HIGHLY WEATHERED, VERY STRONG, FINE GRAINED, THIN BEDDED, CRYSTALLINE, FOSSILIFEROUS, FRACTURED	930.2	22.5	0		100	NQ-1										CORE	
		25.0															
		27.5	20		100	NQ-2										CORE	
29.4'-29.8' UNCONFINED COMPRESSIVE STRENGTH = 11,560 PSI	921.7	30.0 EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BENTONITE GROUT

STANTEC BORING SUBSURFACE LOG -USCS - OH DOT.GDT - 9/4/20 12:22 - V:\1937\ACTIVE\193707055\03_DATA\FIELD\GEOTECHNICAL\BORING LOGS\NORTH COLUMBUS LOOP GINT LOGS\NORTH COLUMBUS LOOP GINT FILE 9-1-20 - COPY.GPJ

SUBSURFACE LOG

EXPLORATION ID: BL-38

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2159883°, -83.1763796°	**DATE STARTED**	7/9/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	951.2 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/9/20	**DEPTH TO WATER**	9.0 ft
DATE/TIME		**DEPTH TO WATER**	N/A
DATE/TIME		**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 951.237	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
SANDY CLAY, TRACE GRAVEL, BROWN GRAY MOTTLED ORANGE, MEDIUM STIFF TO STIFF, DRY TO DAMP			1-3-4	10	67	SS-1	4.5	-	-	-	-	-	-	-	17	CL (V)	
		2.5	2-3-6	13	73	SS-2	3.75	-	-	-	-	-	-	-	18	CL (V)	
LEAN CLAY, TRACE TO LITTLE SILT, TRACE SAND AND GRAVEL, BROWN GRAY MOTTLED, VERY STIFF, DAMP	946.2	5.0	6-7-9	23	100	SS-3	4.0	-	-	-	-	-	-	-	18	CL (V)	
SANDY SILT, LITTLE CLAY, TRACE GRAVEL, BROWN, MEDIUM DENSE, FINE TO COARSE GRAINED, MOIST	943.7	7.5	3-7-7	20	100	SS-4	-	0	48	28	24	17	15	2	15	ML	
	W																
LEAN CLAY, TRACE TO LITTLE STONE FRAGMENTS, TRACE SAND AND SILT, GRAY, VERY STIFF TO HARD, DAMP	941.2	10.0	4-9-13	32	100	SS-5	4.5+	-	-	-	-	-	-	-	14	CL (V)	
SANDY LEAN CLAY, AND SILT, LITTLE GRAVEL, GRAY, VERY STIFF, FINE TO COARSE GRAINED, MOIST TO WET	938.7	12.5	5-8-12	29	100	SS-6	4.5+	-	-	-	-	-	-	-	12	CL (V)	
		15.0	4-6-8	20	100	SS-7	3.75	1	32	30	37	26	15	11	14	CL	
SANDY SILT, LITTLE CLAY, TRACE GRAVEL, GRAY, MEDIUM DENSE, FINE TO COARSE GRAINED, WET	933.7	17.5	6-6-8	20	100	SS-8	-	0	38	46	16	NP	NP	NP	20	ML	
		20.0	16-50/3.6"	-	100	SS-9	-	-	-	-	-	-	-	-	18	ML (V)	
	930.4	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-39

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.211151°, -83.1740974°	**DATE STARTED**	8/3/20	**COMPLETED**	8/3/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	951.4 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 951.406	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN ORANGE MOTTLED, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DRY TO DAMP			2-4-5	13	73	SS-1	4.5+	-	-	-	-	-	-	-	13	CL (V)	
		2.5	5-6-6	17	73	SS-2	4.5+	1	18	40	41	32	17	15	12	CL	
		5.0	5-6-9	22	80	SS-3	4.5+	-	-	-	-	-	-	-	14	CL (V)	
CLAYEY GRAVEL WITH SAND, SOME SILT, DARK BROWN, LOOSE TO DENSE, FINE TO COARSE GRAINED, WET	943.9	7.5	2-2-5	10	73	SS-4		26	25	23	26	37	13	24	30	GC	
9.0' - BOULDERS ENCOUNTERED		10.0	11-15-16	45	47	SS-5		-	-	-	-	-	-	-	4	GC (V)	
	940.9	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-40

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2056493°, -83.1734961°	**DATE STARTED**	8/3/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	950.6 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	8/3/20	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
SANDY LEAN CLAY WITH GRAVEL, AND SILT, BROWN GRAY MOTTLED ORANGE, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DRY TO DAMP	950.576		2-5-5	14	60	SS-1	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		2.5	4-4-7	16	67	SS-2	4.5+	-	-	-	-	-	-	-	13	CL (V)	
		5.0	7-8-8	23	80	SS-3	4.5+	16	29	28	27	26	15	11	14	CL	
		7.5	5-6-7	19	100	SS-4	4.0	-	-	-	-	-	-	-	16	CL (V)	
	940.1	10.0	8-11-13	34	100	SS-5	4.25	-	-	-	-	-	-	-	15	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-42

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2016291°, -83.1751752°	**DATE STARTED**	8/3/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	950.5 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	8/3/20	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 950.465	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN ORANGE MOTTLED, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DRY			2-5-5	14	67	SS-1	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		2.5	7-7-9	23	60	SS-2	4.5+	-	-	-	-	-	-	-	13	CL (V)	
		5.0	6-8-11	27	100	SS-3	4.5+	2	17	33	48	33	18	15	16	CL	
		7.5	5-8-8	23	87	SS-4	4.5+	-	-	-	-	-	-	-	16	CL (V)	
CLAYEY SAND, DARK BROWN, MEDIUM DENSE, WET	942.4							-	-	-	-	-	-	-	-	SC (V)	
LEAN CLAY WITH SILT, LITTLE TO SOME SAND, DARK BROWN, VERY STIFF, DRY TO DAMP	941.5	10.0	10-11-15	37	87	SS-5	4.5+	-	-	-	-	-	-	-	14	CL (V)	
	940.0	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-43

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2009785°, -83.1826745°	**DATE STARTED**	7/30/20	**COMPLETED**	7/30/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	963.0 ft	**DEPTH TO WATER**	13.9 ft	**DATE/TIME**	
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**DEPTH TO WATER**	N/A
								DATE/TIME	
								BOREHOLE INCLINATION (VERT.)	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	HOLE SEALED
LEAN CLAY, LITTLE GRAVEL, TRACE TO LITTLE SILT AND SAND, BROWN GRAY ORANGE MOTTLED, MEDIUM STIFF TO STIFF, DRY TO DAMP	963.018		2-4-4	11	87	SS-1	3.75	-	-	-	-	-	-	-	23	CL (V)	
		2.5	3-3-3	9	87	SS-2	4.25	-	-	-	-	-	-	-	19	CL (V)	
		5.0	3-4-5	13	100	SS-3	4.5	-	-	-	-	-	-	-	15	CL (V)	
		7.5	6-8-10	26	100	SS-4	4.25	-	-	-	-	-	-	-	10	CL (V)	
SANDY SILTY CLAY, TRACE GRAVEL, GRAY MOTTLED BROWN, VERY STIFF, DAMP	953.0	10.0	3-8-9	24	100	SS-5	4.5	4	26	47	23	21	15	6	13	CL-ML	
		12.5	3-8-50/4.8"	83	93	SS-6	1	-	-	-	-	-	-	-	17	CL-ML (V)	
LIMESTONE, GRAY, MODERATELY WEATHERED, VERY STRONG, FINE GRAINED, THIN BEDDED, ARENACEOUS, FERRIFEROUS, FOSSILIFEROUS, FRACTURED, SLIGHTLY TO MODERATELY VUGGY	949.1 W	15.0	0		100	NQ-1										CORE	
		17.5	16		100	NQ-2										CORE	
		20.0															
		22.5	0		100	NQ-3										CORE	
		25.0															
		27.5	85		100	NQ-4										CORE	
	933.0	30.0 EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: BENTONITE GROUT

Stantec

Page: 1 of 1

SUBSURFACE LOG

EXPLORATION ID: BL-44

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.2009635°, -83.1829073°	**DATE STARTED**	7/30/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	964.5 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/30/20	**DEPTH TO WATER**	15.6 ft
DATE/TIME		**DEPTH TO WATER**	N/A
DATE/TIME		**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 964.454	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
FAT CLAY, AND SILT, TRACE SAND AND GRAVEL, BROWN ORANGE GRAY MOTTLED, STIFF TO VERY STIFF, DRY TO DAMP			3-4-6	14	100	SS-1	4.5+	-	-	-	-	-	-	-	24	CH (V)	
		2.5	3-4-5	13	100	SS-2	4.5+	0	7	32	61	56	23	33	21	CH	
		5.0	6-6-10	23	100	SS-3	4.25	-	-	-	-	-	-	-	13	CH (V)	
SANDY LEAN CLAY, AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, MEDIUM STIFF TO STIFF, FINE TO COARSE GRAINED, DAMP TO MOIST	957.0	7.5	3-4-5	13	93	SS-4	1.75	-	-	-	-	-	-	-	15	CL (V)	
		10.0	4-5-7	17	100	SS-5	1.75	-	-	-	-	-	-	-	17	CL (V)	
		12.5	2-2-3	7	100	SS-6	.75	3	34	38	25	24	15	9	16	CL	
	948.9	15.0 TR EOB	5-50/1.2"	-	100	SS-7	.25	-	-	-	-	-	-	-	15	CL (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-45

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1972146°, -83.1852637°	**DATE STARTED**	7/30/20	**COMPLETED**	7/30/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	966.0 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY, TRACE TO LITTLE SAND, TRACE SILT AND GRAVEL, BROWN ORANGE GRAY MOTTLED, STIFF, DRY TO DAMP	965.984		3-5-5	14	67	SS-1	4.5	-	-	-	-	-	-	-	16	CL (V)	
		2.5	3-4-5	13	100	SS-2	3.75	-	-	-	-	-	-	-	20	CL (V)	
		5.0	5-7-8	22	100	SS-3	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		7.5	4-5-7	17	100	SS-4	4.5	-	-	-	-	-	-	-	16	CL (V)	
SANDY LEAN CLAY, AND SILT, LITTLE GRAVEL, BROWN GRAY MOTTLED, FINE TO COARSE GRAINED, STIFF, DAMP TO MOIST	957.0	10.0	6-7-7	20	100	SS-5	2.25	6	29	35	30	26	15	11	17	CL	
	955.5	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-46

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1965283°, -83.1925061°	**DATE STARTED**	7/30/20	**COMPLETED**	7/30/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	965.6 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY, LITTLE SILT, TRACE SAND AND GRAVEL, BROWN GRAY ORANGE MOTTLED, STIFF TO VERY STIFF, DRY TO DAMP	965.614		3-4-5	13	80	SS-1	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		2.5	6-6-7	19	60	SS-2	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		5.0	5-7-10	24	100	SS-3	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		7.5	6-8-10	26	80	SS-4	4.5	-	-	-	-	-	-	-	17	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, VERY STIFF, DAMP	956.6	10.0	8-10-12	32	100	SS-5	4.5+	2	19	37	42	30	18	12	15	CL	
	955.1	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

Stantec

Page: 1 of 1

SUBSURFACE LOG

EXPLORATION ID: BL-47

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1960244°, -83.1967908°	**DATE STARTED**	7/30/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	963.5 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/30/20	**DEPTH TO WATER**	27.5 ft
DATE/TIME		**DEPTH TO WATER**	N/A
DATE/TIME		**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 963.501	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY, TRACE SAND, SILT AND GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DRY TO DAMP			2-2-4	9	53	SS-1	4.5+	-	-	-	-	-	-	-	26	CL (V)	
		2.5	1-2-2	6	33	SS-2	2.0	-	-	-	-	-	-	-	22	CL (V)	
		5.0	1-2-3	7	100	SS-3	4.0	-	-	-	-	-	-	-	19	CL (V)	
SANDY LEAN CLAY WITH GRAVEL, SOME SILT, BROWN GRAY MOTTLED, STIFF TO VERY STIFF, DAMP TO MOIST	956.0	7.5	4-5-6	16	100	SS-4	4.0	-	-	-	-	-	-	-	19	CL (V)	
		10.0	3-4-7	16	100	SS-5	4.25	-	-	-	-	-	-	-	14	CL (V)	
		12.5	3-4-5	13	100	SS-6	4.5	-	-	-	-	-	-	-	14	CL (V)	
		15.0	3-5-10	22	100	SS-7	3.75	-	-	-	-	-	-	-	14	CL (V)	
		17.5	2-4-6	14	100	SS-8	4.25	16	23	30	31	25	15	10	14	CL	
		20.0	3-6-8	20	100	SS-9	4.5	-	-	-	-	-	-	-	14	CL (V)	
		22.5	5-6-11	24	100	SS-10	4.5	-	-	-	-	-	-	-	14	CL (V)	
SILT, LITTLE CLAY, TRACE SAND, GRAY, STIFF, MOIST	938.0	25.0	5-7-7	20	100	SS-11	2.75	0	10	74	16	NP	NP	NP	21	ML	
SILTY SAND, LITTLE CLAY, BROWN GRAY MOTTLED, MEDIUM DENSE, MOIST TO WET	936.0 W	27.5	7-8-5	19	100	SS-12	NP	-	-	-	-	-	-	-	17	SM (V)	
SANDY CLAY, LITTLE SILT, BROWN GRAY MOTTLED, STIFF, MOIST TO WET	934.5	30.0	4-6-8	20	100	SS-13	2.5	-	-	-	-	-	-	-	14	CL (V)	
	933.0 EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

Stantec

SUBSURFACE LOG

EXPLORATION ID: BL-48

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1958522°, -83.1968555°	**DATE STARTED**	7/29/20 **COMPLETED** 7/29/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE** Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL **DEPTH TO WATER** 27.5 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	964.5 ft	**DEPTH TO WATER**	N/A **DATE/TIME**
PROJECT NUMBER	193707055	**INSPECTOR** PC / Stantec	**DRILLING CONTRACTOR** Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 964.529	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	964.0																
LEAN CLAY, TRACE TO LITTLE SAND, SILT AND GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO VERY STIFF, DRY TO DAMP			1-3-5	11	67	SS-1	4.5+	-	-	-	-	-	-	-	21	CL (V)	
		2.5	4-4-6	14	100	SS-2	4.25	-	-	-	-	-	-	-	15	CL (V)	
		5.0	4-7-8	22	67	SS-3	4	-	-	-	-	-	-	-	16	CL (V)	
		7.5	3-6-10	23	100	SS-4	4.5+	-	-	-	-	-	-	-	17	CL (V)	
LEAN CLAY WITH SAND, AND SILT, LITTLE SAND, TRACE GRAVEL, GRAY, STIFF, FINE TO COARSE GRAINED, DAMP TO MOIST	954.5	10.0	2-5-6	16	100	SS-5	2	-	-	-	-	-	-	-	16	CL (V)	
		12.5	2-2-6	11	100	SS-6	2	1	22	36	41	29	16	13	17	CL	
		15.0	3-5-5	14	100	SS-7	2.25	-	-	-	-	-	-	-	16	CL (V)	
		17.5	2-3-5	11	100	SS-8	3	-	-	-	-	-	-	-	15	CL (V)	
		20.0	4-5-6	16	100	SS-9	3.75	-	-	-	-	-	-	-	13	CL (V)	
SANDY SILTY CLAY, TRACE TO LITTLE STONE FRAGMENTS, GRAY, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DAMP TO MOIST	942.0	22.5	6-9-13	32	100	SS-10	4.5+	-	-	-	-	-	-	-	14	CL-ML (V)	
		25.0	5-9-10	27	100	SS-11	4.5+	-	-	-	-	-	-	-	14	CL-ML (V)	
W		27.5	2-3-5	11	100	SS-12	1	-	-	-	-	-	-	-	19	CL-ML (V)	
		30.0	4-4-8	17	100	SS-13	1	7	37	35	21	23	16	7	16	CL-ML	
	934.0	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-49

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1957637°, -83.1973516°	**DATE STARTED**	7/29/20	**COMPLETED**	7/29/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	965.3 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 965.273	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	964.8		2-3-3	9	80	SS-1	3.75	-	-	-	-	-	-	-	20	CL (V)	
LEAN CLAY, TRACE TO LITTLE GRAVEL, TRACE SAND AND SILT, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO VERY STIFF, DRY TO DAMP		2.5	3-4-6	14	100	SS-2	4.5+	-	-	-	-	-	-	-	20	CL (V)	
		5.0	4-5-8	19	100	SS-3	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		7.5	5-6-10	23	100	SS-4	4.5+	-	-	-	-	-	-	-	17	CL (V)	
CLAY, SOME SILT, TRACE TO LITTLE STONE FRAGMENTS, TRACE SAND, BROWN GRAY, VERY STIFF, DAMP	955.3	10.0	5-7-11	26	100	SS-5	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		12.5	3-4-6	14	100	SS-6	3.0	-	-	-	-	-	-	-	16	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, GRAY, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, MOIST	950.3	15.0	3-4-5	13	100	SS-7	3.0	0	20	46	34	26	16	10	19	CL	
		17.5	1-3-3	9	100	SS-8	1.5	-	-	-	-	-	-	-	17	CL (V)	
		20.0	3-4-6	14	100	SS-9	2.0	-	-	-	-	-	-	-	14	CL (V)	
		22.5	8-9-12	30	20	SS-10	1.5	-	-	-	-	-	-	-	15	CL (V)	
		25.0	4-7-10	24	100	SS-11	4.5	-	-	-	-	-	-	-	14	CL (V)	
SILTY CLAY, TRACE SAND AND GRAVEL, GRAY, MEDIUM STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DAMP TO MOIST	937.8	27.5	7-5-5	14	100	SS-12	1.75	0	1	58	41	26	20	6	24	CL-ML	
		30.0	3-5-9	20	93	SS-13	1.5	-	-	-	-	-	-	-	22	CL-ML (V)	
	934.8	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-50

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1957243°, -83.1976567°	**DATE STARTED**	6/18/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	964.5 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/19/20	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 964.53	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL																	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, TRACE ORGANICS, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP	963.5		1-3-4	10	80	SS-1	2.5	-	-	-	-	-	-	-	24	CL (V)	
		2.5															
			4-2-3	7	13	SS-2	3.0	-	-	-	-	-	-	-	22	CL (V)	
		5.0															
			1-2-2	6	53	SS-3	1.0	-	-	-	-	-	-	-	26	CL (V)	
		7.5															
			3-4-8	17	87	SS-4	4.25	2	24	40	34	32	19	13	16	CL	
LEAN CLAY, SOME SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, DARK BROWN GRAY WITH LITTLE ORANGE OXIDIZED STAINING, VERY STIFF, DRY TO DAMP	954.5	10.0															
			2-7-11	26	93	SS-5	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		12.5															
			4-5-7	17	93	SS-6	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		15.0															
			2-4-8	17	100	SS-7	2.0	-	-	-	-	-	-	-	18	CL (V)	
							4.0	-	-	-	-	-	-	-	18	ML (V)	
SANDY SILT, DARK GRAY, STIFF, MOIST	948.3	17.5															
SANDY LEAN CLAY, SOME SILT, LITTLE GRAVEL, DARK GRAYISH BROWN, STIFF, DAMP	946.5		3-4-6	14	100	SS-8	3.5	-	-	-	-	-	-	-	19	CL (V)	
		20.0															
			3-4-6	14	100	SS-9	1.5	-	-	-	-	-	-	-	16	CL (V)	
		22.5															
			4-7-12	27	100	SS-10	4.25	13	24	34	29	29	16	13	14	CL	
		25.0															
			3-3-5	11	100	SS-11	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		27.5															
			10-8-7	22	40	SS-12	1.0	-	-	-	-	-	-	-	21	CL (V)	
		30.0	4-5-6	16	33	SS-13	1.5	-	-	-	-	-	-	-	27	CL (V)	
	933.5	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-51

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1954124°, -83.2011449°	**DATE STARTED**	6/18/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	968.3 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/18/20	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 968.279	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	967.8																
SILT WITH SAND, AND CLAY, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DAMP			3-5-6	16	47	SS-1	2	-	-	-	-	-	-	-	18	ML (V)	
		2.5	2-3-5	11	67	SS-2	4.5+	-	-	-	-	-	-	-	16	ML (V)	
		5.0	2-5-7	17	80	SS-3	4.5+	1	20	36	43	33	24	9	16	ML	
		7.5	6-9-12	30	100	SS-4	4.5+	-	-	-	-	-	-	-	17	ML (V)	
		10.0	6-13-19	46	87	SS-5	4.5+	-	-	-	-	-	-	-	15	ML (V)	
	957.8	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-52

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1925366°, -83.2020813°	**DATE STARTED**	6/10/20	**COMPLETED**	6/10/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	968.8 ft	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 968.785	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	968.4																
LEAN CLAY, LITTLE TO SOME SILT, TRACE ORGANICS, BROWN ORANGE MOTTLED GRAY, MEDIUM STIFF, DAMP			2-3-3	9	60	SS-1	3.5	-	-	-	-	-	-	-	19	CL (V)	
		2.5	3-3-3	9	80	SS-2	3.0	-	-	-	-	-	-	-	21	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, VERY STIFF TO HARD, DAMP	963.8	5.0	3-6-6	17	87	SS-3	4.5+	2	20	36	42	31	22	9	15	CL	
		7.5	6-8-13	30	93	SS-4	4.5+	-	-	-	-	-	-	-	14	CL (V)	
		10.0	10-14-17	45	87	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
	958.3	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-53

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1915909°, -83.2091358°	**DATE STARTED**	6/10/20	**COMPLETED**	6/10/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	980.6 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 980.583	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	980.1																
SANDY LEAN CLAY, SOME SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DRY TO DAMP		2.5	1-3-3	9	73	SS-1	2.5	-	-	-	-	-	-	-	21	CL (V)	
			2-2-3	7	87	SS-2	2.5	-	-	-	-	-	-	-	24	CL (V)	
		5.0	3-3-4	10	80	SS-3	4.0	5	25	31	39	33	20	13	16	CL	
LEAN CLAY, SOME SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, STIFF TO VERY STIFF, DRY TO DAMP	973.1	7.5	3-6-12	26	87	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		10.0	2-5-9	20	100	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
	970.1	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-54

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1888109°, -83.2135067°	**DATE STARTED**	6/10/20	**COMPLETED**	6/10/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	974.6 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 974.585	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	974.2																
ELASTIC SILT WITH SAND, AND CLAY, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP TO MOIST			1-3-2	7	67	SS-1	3.0	-	-	-	-	-	-	-	20	CL (V)	
		2.5	1-2-3	7	100	SS-2	2.0	-	-	-	-	-	-	-	25	CL (V)	
		5.0	2-3-3	9	47	SS-3	1.25	0	19	26	55	54	32	22	24	CL	
LEAN CLAY, SOME SILT, LITTLE SAND AND GRAVEL, BROWN GRAY MOTTLED, DRY TO DAMP	967.1	7.5	5-7-9	23	100	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		10.0	8-11-13	34	100	SS-5	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	964.1	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-55

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1834059°, -83.2133096°	**DATE STARTED**	6/17/20	**COMPLETED**	6/17/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	971.2 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 971.193	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL																	
SILT WITH SAND, AND CLAY, TRACE GRAVEL, BROWN, STIFF, DRY	970.5		2-3-5	11	80	SS-1	4.5+	-	-	-	-	-	-	-	15	ML (V)	
		2.5	2-2-5	10	47	SS-2	3.0	4	25	35	36	34	26	8	8	ML	
LEAN CLAY, SOME SILT, LITTLE SAND, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DAMP	966.2	5.0	2-3-4	10	60	SS-3	4.5+	-	-	-	-	-	-	-	6	CL (V)	
		7.5	5-9-10	27	27	SS-4	2.5	1	20	34	45	39	-	-	19	CL (V)	
		10.0	4-12-15	39	47	SS-5	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	960.7	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-56

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1804345°, -83.2194652°	**DATE STARTED**	6/17/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	981.1 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/17/20	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 981.103	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL																	
SILT WITH SAND, TRACE GRAVEL, DARK BROWN ORANGE GRAY MOTTLED, SOFT TO MEDIUM HARD, STIFF, DAMP	980.4		WOH-1-2	4	80	SS-1	2.5	-	-	-	-	-	-	-	23	ML (V)	
		2.5	1-1-2	4	87	SS-2	1.5	-	-	-	-	-	-	-	26	ML (V)	
		5.0	2-2-4	9	80	SS-3	1.5 to 4.5+	0	17	36	47	41	26	15	21	ML	
		7.5	2-4-6	14	100	SS-4	1.5	-	-	-	-	-	-	-	25	ML (V)	
	972.7						4.5+	-	-	-	-	-	-	-	24	CL (V)	
SANDY LEAN CLAY, SOME SILT, LITTLE GRAVEL, BROWN, VERY STIFF, DAMP		10.0	4-8-11	27	73	SS-5	4.5+	-	-	-	-	-	-	-	20	CL (V)	
		12.5	4-7-12	27	100	SS-6	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		15.0	4-8-9	24	93	SS-7	4.25	11	28	31	30	27	17	10	15	CL	
		17.5	5-8-28	52	60	SS-8	4.5+	-	-	-	-	-	-	-	12	CL (V)	
		20.0	6-8-16	34	0	SS-9	-	-	-	-	-	-	-	-	16	CL (V)	
		22.5	3-8-15	33	100	SS-10	4.5+	-	-	-	-	-	-	-	-	CL (V)	
	956.6	TR															
LIMESTONE, LIGHT GRAY, MODERATELY WEATHERED, VERY STRONG, VERY FINE GRAINED, THIN BEDDED, TANISH YELLOW STAINING AROUND JOINTS DP=300 PSI DP=500 PSI		25.0	-	-	100	NQ-1		-	-	-	-	-	-	-	-		
		27.5	-	-	100	NQ-2		-	-	-	-	-	-	-	-		
	951.1	30.0 EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-57

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1804426°, -83.2197233°	**DATE STARTED**	6/18/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	981.5 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/18/20	**DEPTH TO WATER**	12.5 ft
DATE/TIME		**DEPTH TO WATER**	N/A
DATE/TIME		**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 981.468	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	981.0																
LEAN CLAY, LITTLE SILT, TRACE SAND, BROWN ORANGE GRAY MOTTLED, SOFT TO MEDIUM STIFF, DAMP			1-2-2	6	27	SS-1	4.0	-	-	-	-	-	-	-	19	CL (V)	
		2.5	1-3-3	9	80	SS-2	1.25	-	-	-	-	-	-	-	25	CL (V)	
		5.0	3-3-3	9	60	SS-3	4.0	-	-	-	-	-	-	-	27	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, DARK BROWN, STIFF, DAMP	974.5	7.5	3-5-9	20	100	SS-4	4.5+	5	23	36	36	32	21	11	15	CL	
		10.0	5-10-10	29	100	SS-5	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	W	12.5	3-4-4	11	100	SS-6	1.5	-	-	-	-	-	-	-	14	CL (V)	
SANDY LEAN CLAY, TRACE SILT AND GRAVEL, DARK BROWN, MEDIUM STIFF, WET	968.0																
SILT WITH SAND, TRACE GRAVEL, DARK BROWN, STIFF, DAMP TO MOIST	966.5	15.0	3-4-7	16	100	SS-7	2.5	1	15	36	48	34	24	10	17	ML	
		17.5	10-11-11	32	53	SS-8	1.0	-	-	-	-	-	-	-	17	ML (V)	
		20.0	6-9-8	24	20	SS-9	1.25	-	-	-	-	-	-	-	18	ML (V)	
	959.0	TR 22.5 EOB															

NOTES: AUGER REFUSAL AT 22.5', BORING TERMINATED

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-58

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1801585°, -83.2276166°	**DATE STARTED**	6/10/20	**COMPLETED**	6/11/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	986.2 ft	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 986.203	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	985.4																
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO VERY STIFF, DAMP			1-1-3	6	73	SS-1	1.5	-	-	-	-	-	-	-	29	CL (V)	
		2.5	3-4-5	13	100	SS-2	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		5.0	4-7-10	24	100	SS-3	4.5+	2	24	32	42	30	18	12	13	CL	
		7.5	4-7-11	26	100	SS-4	4.5+	-	-	-	-	-	-	-	14	CL (V)	
		10.0	8-17-18	50	100	SS-5	4.5+	-	-	-	-	-	-	-	12	CL (V)	
	975.7	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-59

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1782985°, -83.2319937°	**DATE STARTED**	6/11/20	**COMPLETED**	6/11/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	975.8 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 975.777	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	975.5																
SILTY CLAY, TRACE SAND, BROWN, SOFT TO MEDIUM STIFF, DAMP			WH-2-1	4	73	SS-1	3.0	-	-	-	-	-	-	-	18	CL-ML (V)	
		2.5	2-3-5	11	100	SS-2	4.25	-	-	-	-	-	-	-	23	CL-ML (V)	
	972.3						4.25	-	-	-	-	-	-	-	23	CL (V)	
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO VERY STIFF, DAMP		5.0	3-7-10	24	100	SS-3	4.5+	2	25	30	43	33	23	10	16	CL	
		7.5	4-7-9	23	100	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		10.0	9-13-14	39	100	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
	965.3	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-60

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1766424°, -83.2330097°	**DATE STARTED**	6/10/20	**COMPLETED**	6/10/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	973.2 ft	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 973.159	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	972.9																
SILTY CLAY, GRAY, SOFT, MOIST			1-1-2	4	60	SS-1	2.0	-	-	-	-	-	-	-	30	CL-ML (V)	
	971.2	2.5															
SILT, AND CLAY, TRACE SILT,TRACE SAND, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO VERY STIFF, DAMP			2-2-3	7	80	SS-2	2.0	-	-	-	-	-	-	-	25	ML (V)	
		5.0	3-3-5	11	53	SS-3	4.5+	0	3	38	59	45	29	16	20	ML	
		7.5	5-8-13	30	100	SS-4	4.5+	-	-	-	-	-	-	-	17	ML (V)	
			13-15-18	47	100	SS-5	4.5+	-	-	-	-	-	-	-	15	ML (V)	
	963.2	10.0					4.5+	-	-	-	-	-	-	-	15	CL (V)	
LEAN CLAY, SOME SILT, TRACE SAND AND GRAVEL, GRAY, HARD, DAMP	962.7	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-61

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1720063°, -83.2292128°	**DATE STARTED**	7/1/20	**COMPLETED**	7/1/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	979.4 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV.	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY WITH SAND, AND SILT, LITTLE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF, DAMP TO MOIST	979.405		WH-2-2	6	87	SS-1	1.25	-	-	-	-	-	-	-	29	CL (V)	
		2.5	1-2-3	7	100	SS-2	1.5	-	-	-	-	-	-	-	26	CL (V)	
		5.0	1-2-2	6	100	SS-3	1.5	3	23	35	39	43	25	18	23	CL	
		7.5	2-2-3	7	100	SS-4	2.0	-	-	-	-	-	-	-	20	CL (V)	
LEAN CLAY, TRACE GRAVEL, BROWN, VERY STIFF, DAMP	970.4	10.0	8-12-14	37	100	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
	968.9	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-62

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1673044°, -83.2254356°	**DATE STARTED**	7/1/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	997.0 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	7/1/20	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 997.029	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
SILTY CLAY, TRACE GRAVEL, BROWN, MEDIUM STIFF, DAMP			1-2-2	6	67	SS-1	2.25	-	-	-	-	-	-	-	38	CL (V)	
		2.5	2-3-3	9	100	SS-2	2.5	-	-	-	-	-	-	-	25	CL (V)	
		5.0	3-4-6	14	93	SS-3	4.5+	-	-	-	-	-	-	-	16	CL (V)	
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, BROWN, VERY STIFF, DAMP	989.5	7.5	4-8-14	32	100	SS-4	4.5+	3	16	34	47	36	19	17	16	CL	
		10.0	6-5-9	20	100	SS-5	4.5+	-	-	-	-	-	-	-	20	CL (V)	
LEAN CLAY, LITTLE SILT, TRACE GRAVEL, GRAY, MEDIUM STIFF TO VERY STIFF, DAMP TO MOIST	984.5	12.5	4-4-5	13	100	SS-6	3.5	-	-	-	-	-	-	-	18	CL (V)	
		15.0	2-4-6	14	100	SS-7	4.0	-	-	-	-	-	-	-	17	CL (V)	
		17.5	5-7-10	24	100	SS-8	4.5+	-	-	-	-	-	-	-	15	CL (V)	
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, GRAY, STIFF TO VERY STIFF, DAMP TO MOIST	977.0	20.0	3-5-8	19	100	SS-9	2.0	-	-	-	-	-	-	-	17	CL (V)	
		22.5	3-4-6	14	100	SS-10	3.5	5	18	35	42	30	19	11	16	CL	
		25.0	4-6-9	22	100	SS-11	3.0	-	-	-	-	-	-	-	17	CL (V)	
		27.5	4-6-8	20	100	SS-12	4.0	-	-	-	-	-	-	-	17	CL (V)	
	966.5	30.0	3-6-9	22	80	SS-13	3.0	-	-	-	-	-	-	-	18	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

SUBSURFACE LOG

EXPLORATION ID: BL-63

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1670547°, -83.2252054°	**DATE STARTED**	6/11/20	**COMPLETED**	6/11/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	998.8 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 998.817	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	998.7																
SILTY CLAY, TRACE SAND AND ORGANICS, BROWN GRAY MOTTLED, MEDIUM STIFF, DRY TO DAMP			1-2-3	7	73	SS-1	4.5	-	-	-	-	-	-	-	21	CL-ML (V)	
	996.3	2.5	2-3-3	9	100	SS-2	2.0	-	-	-	-	-	-	-	31	ML (V)	
SILT WITH SAND, AND CLAY, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DAMP		5.0	4-3-5	11	80	SS-3	4.0	1	16	32	51	44	28	16	20	ML	
		7.5	4-7-9	23	100	SS-4	4.5+	-	-	-	-	-	-	-	17	ML (V)	
	989.8	10.0	5-8-12	29	100	SS-5	4.5+	-	-	-	-	-	-	-	17	CL (V)	
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, STIFF TO VERY STIFF, DRY TO DAMP		12.5	3-5-8	19	100	SS-6	4.0	-	-	-	-	-	-	-	16	CL (V)	
		15.0	3-5-6	16	60	SS-7	-	-	-	-	-	-	-	-	15	CL (V)	
		17.5	3-3-5	11	100	SS-8	2.0	-	-	-	-	-	-	-	18	CL (V)	
		20.0	3-4-6	14	100	SS-9	1.75	2	17	27	54	34	18	16	18	CL	
		22.5	3-3-5	11	100	SS-10	1.75	-	-	-	-	-	-	-	17	CL (V)	
		25.0	3-4-8	17	100	SS-11	2.0	-	-	-	-	-	-	-	17	CL (V)	
		27.5	5-8-10	26	67	SS-12	2.75	-	-	-	-	-	-	-	19	CL (V)	
	968.3	30.0	11-13-13	37	40	SS-13	1.5	-	-	-	-	-	-	-	13	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-64

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1644561°, -83.2199989°	**DATE STARTED**	6/11/20	**COMPLETED**	6/11/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1013.7 ft	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 1013.726	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	1013.2																
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, ORANGE BROWN GRAY MOTTLED, MEDIUM STIFF TO HARD, DRY TO DAMP		2.5	1-2-2	6	80	SS-1	1.75	-	-	-	-	-	-	-	22	CL (V)	
		5.0	2-4-6	14	100	SS-2	4.5	-	-	-	-	-	-	-	18	CL (V)	
		7.5	6-7-11	26	93	SS-3	4.5	-	-	-	-	-	-	-	16	CL (V)	
			7-10-14	34	100	SS-4	4.5	2	18	40	40	36	19	17	16	CL	
	1003.2	10.0	16-24-21	65	40	SS-5	4.5	-	-	-	-	-	-	-	17	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-65

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1643857°, -83.2115129°	**DATE STARTED**	6/16/20	**COMPLETED**	6/16/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1016.2 ft	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 1016.222	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	1015.6																
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, ORANGE BROWN GRAY MOTTLED, MEDIUM STIFF TO STIFF, DRY		2.5	3-3-3	9	67	SS-1	2.0	-	-	-	-	-	-	-	20	CL (V)	
			3-4-5	13	93	SS-2	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		5.0	3-5-7	17	93	SS-3	4.5+	4	18	32	46	35	19	16	16	CL	
		7.5	5-7-10	24	100	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
LEAN CLAY, LITTLE TO SOME SILT, TRACE SAND, BROWN WITH GRAY MOTTLE, HARD, DAMP	1007.2	10.0	7-13-16	42	80	SS-5	4.5+	-	-	-	-	-	-	-	18	CL (V)	
	1005.7	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-66

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1633691°, -83.2051472°	**DATE STARTED**	6/16/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1004.7 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/16/20	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 1004.692	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	1004.0																
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, MEDIUM STIFF TO STIFF, DRY		2.5	1-3-3	9	67	SS-1	2.5	-	-	-	-	-	-	-	17	CL (V)	
		5.0	2-5-9	20	100	SS-2	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		7.5	5-8-11	27	100	SS-3	4.5+	3	19	35	43	36	21	15	17	CL	
		10.0	6-8-10	26	67	SS-4	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	994.2	EOB	12-16-17	47	100	SS-5	4.5+	-	-	-	-	-	-	-	17	CL (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-67

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1611114°, -83.2044441°	**DATE STARTED**	6/16/20 **COMPLETED** 6/16/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY** 86.2 % (Avg.)	**ELEVATION DATUM** MSL	**DEPTH TO WATER** 29.0 ft **DATE/TIME**
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1006.3 ft	**DEPTH TO WATER** N/A	**DATE/TIME**
PROJECT NUMBER	193707055	**INSPECTOR** EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)** VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 1006.294	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	1005.8																
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DRY TO DAMP			1-2-2	6	67	SS-1	3.0	-	-	-	-	-	-	-	24	CL (V)	
		2.5	3-6-7	19	100	SS-2	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		5.0	3-6-10	23	100	SS-3	4.5+	1	24	33	42	34	20	14	16	CL	
		7.5	6-8-10	26	100	SS-4	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		10.0	3-5-9	20	100	SS-5	4.5+	-	-	-	-	-	-	-	17	CL (V)	
LEAN CLAY, AND SILT, TRACE SAND AND GRAVEL, DARK GRAY, MEDIUM STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DAMP	994.3	12.5	4-7-10	24	100	SS-6	4.25	-	-	-	-	-	-	-	18	CL (V)	
		15.0	3-6-9	22	100	SS-7	3.75	-	-	-	-	-	-	-	19	CL (V)	
		17.5	3-5-7	17	100	SS-8	2.5	-	-	-	-	-	-	-	19	CL (V)	
		20.0	3-5-7	17	100	SS-9	2.5	0	14	34	52	37	24	13	19	CL	
		22.5	2-3-6	13	93	SS-10	1.5	-	-	-	-	-	-	-	17	CL (V)	
		25.0	2-4-4	11	100	SS-11	1.5	-	-	-	-	-	-	-	20	CL (V)	
	W	27.5	2-3-4	10	100	SS-12	1.5	-	-	-	-	-	-	-	17	CL (V)	
		30.0	3-4-8	17	100	SS-13	1.5	-	-	-	-	-	-	-	17	CL (V)	
	975.8	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-68

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1609257°, -83.204416°	**DATE STARTED**	7/27/20	**COMPLETED**	7/27/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1006.9 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 1006.894	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DAMP TO MOIST			2-5-6	16	53	SS-1	3.5	0	16	43	41	40	22	18	15	CL	
		2.5	3-2-3	7	47	SS-2	3.0	-	-	-	-	-	-	-	17	CL (V)	
LEAN CLAY, AND SILT, TRACE SAND AND GRAVEL, BROWN, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DAMP	1001.9	5.0	2-5-8	19	87	SS-3	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		7.5	5-7-11	26	100	SS-4	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		10.0	8-10-16	37	100	SS-5	4.5+	1	9	32	58	39	20	19	18	CL	
		12.5	6-10-13	33	100	SS-6	4.5+	-	-	-	-	-	-	-	17	CL (V)	
SILTY CLAY, TRACE SAND AND GRAVEL, GRAY, VERY STIFF, DAMP	991.9	15.0	5-7-13	29	100	SS-7	3.75	-	-	-	-	-	-	-	16	CL (V)	
		17.5	4-5-8	19	100	SS-8	4.25	-	-	-	-	-	-	-	18	CL (V)	
		20.0	3-5-8	19	100	SS-9	4.0	-	-	-	-	-	-	-	17	CL (V)	
		22.5	3-4-8	17	100	SS-10	3.0	-	-	-	-	-	-	-	20	CL (V)	
		25.0	3-6-7	19	100	SS-11	3.5	-	-	-	-	-	-	-	21	CL (V)	
		27.5	3-5-7	17	100	SS-12	2.0	-	-	-	-	-	-	-	22	CL (V)	
	976.4	30.0	6-8-10	26	100	SS-13	2.5	-	-	-	-	-	-	-	23	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-69

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1605776°, -83.2007382°	**DATE STARTED**	7/27/20	**COMPLETED**	7/27/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1002.0 ft	**DEPTH TO WATER**	9.0 ft	**DATE/TIME**	
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**DEPTH TO WATER**	N/A
								DATE/TIME	
								BOREHOLE INCLINATION (VERT.)	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 1001.963	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
SILTY CLAY, LITTLE TO SOME SAND, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DAMP			1-3-4	10	60	SS-1	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		2.5	4-3-5	11	100	SS-2	2.25	-	-	-	-	-	-	-	21	CL (V)	
		5.0	2-2-3	7	100	SS-3	.75	-	-	-	-	-	-	-	30	CL (V)	
		7.5	3-4-5	13	100	SS-4	2.75	-	-	-	-	-	-	-	17	CL (V)	
LEAN CLAY WITH SAND, AND SILT, LITTLE SAND, TRACE GRAVEL, BROWN GRAY MOTTLED, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DAMP TO MOIST	994.0	W	8-14-15	42	67	SS-5	4.5	1	24	37	38	31	16	15	17	CL	
	991.5	10.0 EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-70

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1605444°, -83.1937129°	**DATE STARTED**	7/28/20 **COMPLETED** 7/28/20
CLIENT	Columbia Gas	**PROJECT TYPE** Utility	**HAMMER TYPE** Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM** MSL	**DEPTH TO WATER** N/A **DATE/TIME** N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	990.4 ft	**DEPTH TO WATER**	N/A **DATE/TIME** N/A
PROJECT NUMBER	193707055	**INSPECTOR** PC / Stantec	**DRILLING CONTRACTOR** Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 990.383	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY, AND SILT, TRACE TO LITTLE SAND, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, FINE TO COARSE GRAINED, DRY TO DAMP			1-3-3	9	100	SS-1	3	0	14	38	48	42	21	21	20	CL	
		2.5	3-3-5	11	80	SS-2	3.75	-	-	-	-	-	-	-	20	CL (V)	
LEAN CLAY, TRACE TO LITTLE SILT AND GRAVEL, TRACE SAND, BROWN GRAY MOTTLED, VERY STIFF TO HARD, DAMP	985.4	5.0	6-8-10	26	100	SS-3	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		7.5	5-8-8	23	100	SS-4	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		10.0	10-15-18	47	100	SS-5	4.5+	-	-	-	-	-	-	-	16	CL (V)	
	979.9	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-71

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1576531°, -83.1889732°	**DATE STARTED**	7/28/20	**COMPLETED**	7/28/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	997.8 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 997.75	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY, TRACE SAND AND SILT, BROWN, MEDIUM STIFF, DAMP			2-2-3	7	33	SS-1	4.5+	-	-	-	-	-	-	-	22	CL (V)	
	995.3	2.5															
LEAN CLAY, TRACE SAND AND GRAVEL, BROWN ORANGE GRAY MOTTLED, SOFT TO MEDIUM STIFF, DAMP TO MOIST			2-2-2	6	100	SS-2	1.75	-	-	-	-	-	-	-	27	CL (V)	
		5.0	1-2-4	9	40	SS-3	3.0	-	-	-	-	-	-	-	18	CL (V)	
		7.5	3-3-3	9	100	SS-4	3.5	-	-	-	-	-	-	-	23	CL (V)	
	988.8																
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, DAMP		10.0	5-9-12	30	100	SS-5	4.5+	3	18	35	44	33	18	15	17	CL	
	987.3	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-72

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1559977°, -83.1887576°	**DATE STARTED**	7/28/20	**COMPLETED**	7/28/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1000.8 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 1000.801	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY, TRACE GRAVEL, BROWN ORANGE GRAY MOTTLED, STIFF, DRY TO DAMP			3-4-5	13	73	SS-1	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		2.5	4-6-7	19	100	SS-2	4.25	-	-	-	-	-	-	-	20	CL (V)	
LEAN CLAY WITH SAND, LITTLE TO SOME SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, VERY STIFF, FINE TO COARSE GRAINED, DAMP	995.8	5.0	7-9-10	27	100	SS-3	4.5+	-	-	-	-	-	-	-	21	CL (V)	
		7.5	6-7-13	29	100	SS-4	4.5+	4	18	32	46	30	18	12	16	CL	
		10.0	6-6-10	23	100	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		12.5	4-5-10	22	100	SS-6	4.5+	-	-	-	-	-	-	-	15	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE TO LITTLE STONE FRAGMENTS, GRAY, STIFF, DAMP TO MOIST	985.8	15.0	4-3-6	13	100	SS-7	2.5	-	-	-	-	-	-	-	16	CL (V)	
		17.5	3-3-6	13	100	SS-8	4.0	-	-	-	-	-	-	-	17	CL (V)	
		20.0	2-4-5	13	100	SS-9	2.0	-	-	-	-	-	-	-	16	CL (V)	
		22.5	3-4-6	14	100	SS-10	1.5	-	-	-	-	-	-	-	17	CL (V)	
		25.0	2-4-7	16	100	SS-11	1.5	2	16	42	40	30	17	13	18	CL	
		27.5	3-5-7	17	100	SS-12	1.5	-	-	-	-	-	-	-	17	CL (V)	
	970.3	30.0	4-5-8	19	100	SS-13	1.75	-	-	-	-	-	-	-	18	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-73

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.15585°, -83.1888051°	**DATE STARTED**	8/7/20	**COMPLETED**	8/7/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1001.0 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 1001.006	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	1000.8																
SANDY SILT, LITTLE CLAY, BROWN GRAY MOTTLED, VERY STIFF, DRY	999.5																
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN, VERY STIFF, FINE TO COARSE GRAINED, DRY TO DAMP		2.5	3-6-9	22	60	SS-1	4.5+	-	-	-	-	-	-	-	13	ML (V)	
		5.0	3-8-10	26	87	SS-2	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		7.5	4-8-11	27	100	SS-3	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		10.0	6-9-14	33	100	SS-4	4.5+	2	18	46	34	26	16	10	16	CL	
		12.5	5-10-13	33	100	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		15.0	6-9-11	29	100	SS-6	4.5+	-	-	-	-	-	-	-	15	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, DARK GRAY, STIFF, FINE TO COARSE GRAINED, DAMP	986.0	17.5	3-5-7	17	100	SS-7	4.0	-	-	-	-	-	-	-	15	CL (V)	
		20.0	3-6-7	19	100	SS-8	3.75	-	-	-	-	-	-	-	16	CL (V)	
		22.5	3-5-6	16	100	SS-9	3.75	-	-	-	-	-	-	-	15	CL (V)	
		25.0	3-5-8	19	100	SS-10	3.5	7	17	40	36	26	15	11	15	CL	
		27.5	4-6-9	22	100	SS-11	3.5	-	-	-	-	-	-	-	16	CL (V)	
		30.0	4-5-9	20	100	SS-12	3.0	-	-	-	-	-	-	-	16	CL (V)	
	970.5	EOB	5-8-14	32	100	SS-13	3.5	-	-	-	-	-	-	-	16	CL (V)	

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-74

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1525216°, -83.1878408°	**DATE STARTED**	7/28/20	**COMPLETED**	7/28/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)	**ELEVATION DATUM**	MSL	**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	986.7 ft					**DEPTH TO WATER**	N/A	**DATE/TIME**	N/A
PROJECT NUMBER	193707055	**INSPECTOR**	PC / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)			**BOREHOLE INCLINATION (VERT.)**	VERTICAL		

MATERIAL DESCRIPTION AND NOTES	ELEV. 986.686	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
LEAN CLAY WITH SAND, AND SILT, LITTLE GRAVEL, BROWN ORANGE GRAY MOTTLED, MEDIUM STIFF TO STIFF, DRY TO DAMP			1-3-4	10	73	SS-1	3.5	-	-	-	-	-	-	-	22	CL (V)	
		2.5	3-4-4	11	93	SS-2	1.75	-	-	-	-	-	-	-	23	CL (V)	
		5.0	3-3-6	13	100	SS-3	2.75	10	18	32	40	34	18	16	17	CL	
LEAN CLAY, LITTLE GRAVEL, BROWN GRAY MOTTLED, VERY STIFF TO HARD, DAMP	979.2	7.5	6-10-12	32	100	SS-4	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		10.0	7-12-18	43	100	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
	976.2	EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

SUBSURFACE LOG

EXPLORATION ID: BL-75

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1513272°, -83.1840587°	**DATE STARTED**	6/24/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1004.8 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/24/20	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 1004.752	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	1004.0		WH-2-2	6	80	SS-1	1.5	-	-	-	-	-	-	-	33	CL (V)	
LEAN CLAY WITH SAND, SOME TO AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED VERY STIFF, DRY TO DAMP		2.5	3-5-8	19	100	SS-2	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		5.0	4-7-11	26	100	SS-3	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		7.5	3-6-9	22	100	SS-4	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		10.0	3-7-10	24	100	SS-5	4.5+	5	21	32	42	36	23	13	17	CL	
		12.5	5-8-10	26	100	SS-6	4.5+	-	-	-	-	-	-	-	21	CL (V)	
		15.0	5-11-13	34	100	SS-7	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		17.5	7-8-11	27	100	SS-8	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		20.0	8-14-16	43	100	SS-9	4.5+	3	19	37	41	41	-	-	19	CL (V)	
		22.5	5-10-17	39	100	SS-10	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		25.0	6-11-14	36	100	SS-11	4.5+	-	-	-	-	-	-	-	19	CL (V)	
		27.5	6-10-15	36	100	SS-12	3.5	-	-	-	-	-	-	-	18	CL (V)	
	974.3	30.0	6-12-18	43	100	SS-13	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: NOT RECORDED

SUBSURFACE LOG

EXPLORATION ID: BL-76

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1513134°, -83.1838992°	**DATE STARTED**	6/24/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	1004.7 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/24/20	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 1004.674	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	1004.4		1-3-5	11	73	SS-1	4.0	-	-	-	-	-	-	-	20	CL (V)	
LEAN CLAY WITH SAND, SOME SILT, LITTLE GRAVEL, BROWN GRAY MOTTLED, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DRY		2.5	4-7-12	27	73	SS-2	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		5.0	5-8-9	24	100	SS-3	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		7.5	5-8-9	24	60	SS-4	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		10.0	6-8-12	29	93	SS-5	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		12.5	6-12-19	45	93	SS-6	4.5+	5	19	33	43	37	20	17	14	CL	
		15.0	6-9-11	29	100	SS-7	4.5+	-	-	-	-	-	-	-	26	CL (V)	
		17.5	6-9-13	32	100	SS-8	4.5+	-	-	-	-	-	-	-	17	CL (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, DARK GRAY TO BROWN, STIFF TO VERY STIFF, FINE TO COARSE GRAINED, DAMP	984.7	20.0	5-6-9	22	100	SS-9	3.25	-	-	-	-	-	-	-	16	CL (V)	
		22.5	6-8-11	27	60	SS-10	3.5	-	-	-	-	-	-	-	15	CL (V)	
		25.0	6-8-12	29	100	SS-11	3.0	3	19	45	33	30	17	13	16	CL	
		27.5	3-5-9	20	100	SS-12	2.5	-	-	-	-	-	-	-	15	CL (V)	
	974.2	30.0	6-10-14	34	100	SS-13	4.0	-	-	-	-	-	-	-	16	CL (V)	
		EOB															

NOTES: OFFSET 9' EAST FROM STAKED LOCATION

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

Stantec

SUBSURFACE LOG

EXPLORATION ID: BL-77

PROJECT NORTH COLUMBUS LOOP **DRILLING / SAMPLING TOOLS (TYPE / SIZE)** 3.25" HSA SPT **LOCATION** 40.1511984°, -83.1827815° **DATE STARTED** 6/23/20 **COMPLETED** 6/23/20
CLIENT Columbia Gas **PROJECT TYPE** Utility **HAMMER TYPE** Automatic 140lb/30" **EFFICIENCY** 86.2 % (Avg.) **ELEVATION DATUM** MSL **DEPTH TO WATER** 28.9 ft **DATE/TIME**
PROJECT LOCATION Union & Delaware County **ROCK CORING METHOD** NQ **SURFACE ELEVATION** 998.7 ft **DEPTH TO WATER** N/A **DATE/TIME**
PROJECT NUMBER 193707055 **INSPECTOR** EH / Stantec **DRILLING CONTRACTOR** Stantec / DC/JH **DRILL RIG TYPE AND ID** CME 45 Track #3 (#815) **BOREHOLE INCLINATION (VERT.)** VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 998.694	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	998.1		1-1-3	6	80	SS-1	1.75	-	-	-	-	-	-	-	21	CL (V)	
LEAN CLAY, LITTLE SILT, LIGHT BROWN TO BROWN, SOFT TO MEDIUM STIFF, DAMP		2.5	2-4-6	14	67	SS-2	4.5+	-	-	-	-	-	-	-	23	CL (V)	
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, STIFF TO VERY STIFF, DAMP	993.7	5.0	2-5-9	20	80	SS-3	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		7.5	7-11-13	34	87	SS-4	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		10.0	4-8-10	26	100	SS-5	4.5+	6	24	23	47	32	19	13	16	CL	
		12.5	4-7-9	23	67	SS-6	4.5+	-	-	-	-	-	-	-	18	CL (V)	
		15.0	4-8-12	29	100	SS-7	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		17.5	8-15-22	53	67	SS-8	4.5+	-	-	-	-	-	-	-	19	CL (V)	
		20.0	6-10-14	34	100	SS-9	4.5+	-	-	-	-	-	-	-	18	CL (V)	
LEAN CLAY WITH SAND, SOME SILT, TRACE GRAVEL, DARK GRAY, VERY STIFF, DAMP TO MOIST	976.7	22.5	2-5-12	24	73	SS-10	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		25.0	4-8-12	29	93	SS-11	3.5	6	18	34	42	30	17	13	15	CL	
		27.5	4-7-14	30	100	SS-12	3.75	-	-	-	-	-	-	-	14	CL (V)	
CLAYEY SAND WITH GRAVEL, DARK BROWN, DENSE, WET	969.8 W 969.1	30.0	12-12-14	37	100	SS-13	4.5+	-	-	-	-	-	-	-	16	SC (V)	
LEAN CLAY, LITTLE SILT AND SAND, DARK GRAY, VERY STIFF, DAMP	968.2						2.0	-	-	-	-	-	-	-	16	CL (V)	
	EOB																

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS

STANTEC BORING SUBSURFACE LOG -USCS - OH DOT.GDT - 9/4/20 12:24 - V:\193\ACTIVE\193707055\03_DATA\FIELD\GEOTECHNICAL\BORING LOGS\NORTH COLUMBUS LOOP GINT LOGS\NORTH COLUMBUS LOOP GINT FILE 9-1-20 - COPY.GPJ

SUBSURFACE LOG

EXPLORATION ID: BL-78

PROJECT	NORTH COLUMBUS LOOP	**DRILLING / SAMPLING TOOLS (TYPE / SIZE)**	3.25" HSA SPT	**LOCATION**	40.1510706°, -83.1827616°	**DATE STARTED**	6/25/20
CLIENT	Columbia Gas	**PROJECT TYPE**	Utility	**HAMMER TYPE**	Automatic 140lb/30"	**EFFICIENCY**	86.2 % (Avg.)
PROJECT LOCATION	Union & Delaware County	**ROCK CORING METHOD**	NQ	**SURFACE ELEVATION**	996.9 ft	**ELEVATION DATUM**	MSL
PROJECT NUMBER	193707055	**INSPECTOR**	EH / Stantec	**DRILLING CONTRACTOR**	Stantec / DC/JH	**DRILL RIG TYPE AND ID**	CME 45 Track #3 (#815)

COMPLETED	6/25/20	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**DEPTH TO WATER**	N/A
DATE/TIME	N/A	**BOREHOLE INCLINATION (VERT.)**	VERTICAL

MATERIAL DESCRIPTION AND NOTES	ELEV. 996.911	DEPTHS	SPT/ RQD (%)	N_{60}	REC (%)	SAMPLE ID	HP (tsf)	GRADATION (%) G	S	M	C	ATTERBERG LL	PL	PI	WC	CLASS	BACK FILL
TOPSOIL	996.5																
CLAYEY GRAVEL WITH SAND, SOME SILT, BROWN, LOOSE, DRY			1-2-4	9	40	SS-1	-	-	-	-	-	-	-	-	64	GC (V)	
		2.5	3-5-8	19	7	SS-2	-	-	-	-	-	-	-	-	23	GC (V)	
LEAN CLAY WITH SAND, AND SILT, TRACE GRAVEL, BROWN GRAY MOTTLED, STIFF TO VERY STIFF, DAMP	991.9	5.0	5-6-8	20	53	SS-3	4.5+	-	-	-	-	-	-	-	14	CL (V)	
		7.5	5-6-9	22	80	SS-4	4.5+	-	-	-	-	-	-	-	15	CL (V)	
		10.0	4-6-11	24	80	SS-5	4.5+	7	20	43	30	32	19	13	15	CL	
		12.5	7-10-15	36	87	SS-6	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		15.0	5-10-14	34	87	SS-7	4.5+	-	-	-	-	-	-	-	16	CL (V)	
		17.5	6-11-12	33	100	SS-8	4.5+	-	-	-	-	-	-	-	17	CL (V)	
		20.0	8-10-13	33	80	SS-9	4.5+	2	17	40	41	34	21	13	17	CL	
		22.5	7-12-13	36	20	SS-10	4.0	-	-	-	-	-	-	-	13	CL (V)	
LEAN CLAY, AND SILT, TRACE GRAVEL, DARK GRAY, STIFF TO VERY STIFF, DAMP	971.9	25.0	4-7-10	24	87	SS-11	3.5	-	-	-	-	-	-	-	15	CL (V)	
		27.5	3-5-8	19	100	SS-12	3.0	-	-	-	-	-	-	-	16	CL (V)	
	966.4	30.0	5-7-11	26	80	SS-13	3.5	-	-	-	-	-	-	-	16	CL (V)	
		EOB															

NOTES: NONE

ABANDONMENT METHODS, MATERIALS, QUANTITIES: SOIL CUTTINGS