SECTION 01 01 00

SPECIAL CONDITIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

A. Special conditions to the project

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 01 14 00 – Control of Work

1.03 CONTRACTOR QUALIFICATIONS

A. The Contractor, including the Project Manager onsite, shall have appropriate technical experience on similar projects. This includes restoration experience within the past three (3) years, including but not limited to, mass earthwork, installation of wood and rock structures, and successful vegetation establishment.

B. The Contractor shall maintain a permanent place of business; have adequate construction facilities and equipment available for the work under the proposed contract; a suitable financial status to meet obligations incidental to the work and have in their employ a sufficient number of skilled and trained workers to carry to completion, within the contract time, the work to be done under this contract.

C. The Contractor and/or subcontractors shall meet the installer qualifications in Section 32 92 00 “Live Stakes,” Section 32 92 19 “Seed and Mulch”, and Section 33 05 07 “Jacking and Boring” (if used).

1.04 TIME OF COMPLETION AND LIQUIDATED DAMAGES

A. The Contractor hereby agrees to commence work under this contract on or before a date to be specified in the Notice to Proceed and to substantially complete the Work by November 30, 2022. Final Completion shall be achieved by December 31, 2022. The Contractor further agrees to pay as liquidated damages as provided in Article 21 of the General Conditions.

B. Delays and extensions of time shall be per Article 21 of the General Conditions.

1.05 TEMPORARY FACILITIES AND CONTROLS

A. Temporary facilities shall conform to Article 6 the General Conditions.

B. The location of the field office shall be located in an already cleared area, agreed upon at the pre-construction meeting.

C. A project sign shall be required during construction. See Article 7 the General Conditions for additional requirements.

D. Temporary access to the site shall be the existing gravel drive, per the Drawings.

E. Material storage locations shall be located in proposed disturbed areas. Additional locations may be approved by the Owner or Engineer.

F. See Section 01 14 00 “Control of Work” for proper trash disposal and project cleaning guidance.

1.06 WORK SCHEDULE

A. Work shall only take place during typical work hours on weekdays (Monday through Friday, 7AM to 5PM).

1.07 PROGRESS MEETINGS

A. A preconstruction conference will be held prior to construction commencement at a time to be agreed upon by the Owner, Engineer, and Contractor.

B. Construction progress meetings shall be held on the job site at a minimum of once per month.

C. The Contractor shall prepare and distribute the agenda and sign-in sheet in advance and will conduct the meeting.

D. Clermont SWCD shall prepare and distribute minutes following the meeting.

E. The Contractor shall be prepared to discuss the following: description of major categories of work accomplished and anticipated work in the next 30 days, status of required inspections and testing, summary of significant projects, coordination status, and safety and accident issues.

PART 2 - PRODUCTS

2.01 PROJECT SIGN

A. Project sign shall be per Article 7 the General Conditions.

PART 3 - EXECUTION

3.01 PROJECT PHASING

A. The project will be completed in a phased manner.

B. The project will proceed in the following order:

1. Construct the proposed wetland and low-flow channel in the floodplain first (i.e. Sheets 5, 6, and 7, with the exceptions of the connections to the East Fork Little Miami River).

2. Using excavated material from the wetland and low-flow channel creation, construct the berm along the access road to provide a barrier between the Village's property and their neighbor (i.e. Sheet 8). Additional excavated material may be placed/stored per the Drawings. The minimum amount of excavated soil that must be placed in the soil wasting area for Village use is included on the Drawings. Additional excavated material can also be placed in the soil wasting area per the Drawings or may be hauled off site by Contractor at no additional cost to Owner.

3. After constructing the proposed wetland and low-flow channel in the floodplain but before excavating the reservoir, harvest live stakes from within the disturbance limits within the reservoir (i.e. Sheet 4). Plant live stakes along low-flow channel banks per the Drawings.

4. After live stakes have been harvested and planted, work within the reservoir (i.e. Sheet 4) as well as pipe installation may begin.

5. Once vegetation has been established within the wetland, low-flow channel, and reservoir and approved by the Engineer, the connections to the East Fork Little Miami River may be constructed (i.e. the river connections on Sheets 5 and 7).

END OF SECTION 01 01 00

SECTION 01 11 00

SUMMARY OF PROJECT

PART 1–GENERAL

1.01 SECTION INCLUDES

A. Project – Work covered by all Contract Documents

B. Contract Milestones and other General Provisions

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 01 14 00 – Control of Work

1.03 PROJECT – WORK COVERED BY ALL CONTRACT DOCUMENTS

A. Work of the Project includes creation of an off-channel wetland along the East Fork Great Miami River, utilization of an existing reservoir onsite, and all site restoration. The Work shall be performed for the Owner in accordance with the Contract Documents. The Work includes, but is not limited to, clearing and grubbing, excavation, rock and wood placement, pipe and appurtenance installation, and restoration.

1.04 GENERAL CONSTRUCTION

A. The work to be performed under this section shall include all necessary demolition, the furnishing of all materials, equipment and tools; and performing all necessary labor and supervision, for the complete construction of the General Construction Work and all other work appurtenant thereto, as described in Divisions 1 through 48 of these Specifications except as called for under other parts of the Work described herein.

1.05 SEQUENCE OF WORK

A. Before starting any work, the Contractor shall attend a Pre-Construction Meeting with the Owner's Representative and Engineer. The Contractor will be notified of the date and the time of the meeting and shall submit a construction schedule.

B. A suggested sequence of work has been provided in the Drawings.

1.06 CONTRACTOR'S USE OF SITE

A. The Contractor shall locate field offices, store materials and equipment, and confine his construction activities to areas so indicated on the Drawings or as directed by the Owner's Representative. The Contractor shall also comply with all applicable provisions in Section 01 14 00 "Control of Work".

1.07 CONSTRUCTION PROCEDURE

A. It shall be the Contractor's responsibility during the construction of the Project to work equipment around poles, trees, or other obstructions which permit the passage of the bucket and boom but prevent passage of other portions of the equipment and, if necessary, to excavate from both sides of the poles, trees, or other obstruction, and to remove materials by hand labor, tunneling, or by other means, all at no additional cost to the Owner.

1.08 REQUESTS FOR SUPPLEMENTARY INFORMATION

A. It shall be the responsibility of the Contractor to make timely requests of the Owner's Representative for any additional information not already in the Contractor's possession and which should be furnished by the Owner's Representative under the terms of the Contract Documents, and which will be required in the planning and execution of the work. Such requests may be submitted from time to time as the need approaches, but each shall be filed in ample time to permit appropriate action to be taken by all parties involved so as to avoid delay.

B. Each request shall be in writing and list the various items and the latest day by which each will be required by the Contractor. The first list shall be submitted within two (2) weeks after contract award and shall be as complete as possible at that time. The Contractor shall, if required, furnish promptly any assistance and information the Owner's Representative may require in responding to these requests of the Contractor. The Contractor shall be fully responsible for any delay in work, or to the work of others, arising from failure to comply with the provisions of this section.

1.09 PERMITS

A. The Contractor shall be responsible to obtain and incur the cost of all required permits unless otherwise noted, including but not limited to, Ohio EPA NOI.

B. The Contractor shall not commence construction until the following permit(s) are on file (obtained by the Owner):

1. Clermont County Floodplain Development Permit.

C. The Contractor shall not commence construction below the Ordinary High Water Mark until the following permits are on file (obtained by the Owner):

1. US Army Corps of Engineers 404 Permit, and
2. Ohio EPA 401 Water Quality Certification.

D. Although the Owner may obtain and incur the cost of a permit, the Contractor shall comply with provisions of all permits and make any necessary submittals as detailed in Section 01 14 00 "Control of Work".

E. All Contractors and Subcontractors of any tier shall comply with all applicable standards, orders, regulations and permits, including but not limited to the Clean Water Act of 1970 (42 U.S.C. 1857, et seq.), the Federal Water Pollution Control Act (33 U.S.C. 1251, et seq.) as

amended, Permits to Install, and NPDES 401 and 404 Permit requirements.

PART 2–PRODUCTS

NOT USED

PART 3–EXECUTION

NOT USED

END OF SECTION 01 11 00

SECTION 01 14 00

CONTROL OF WORK

PART 1–GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Use of Premises

C. Easements and Site Access

D. Construction Layout

E. Protection of Trees

F. Open Excavations

G. Maintenance of Traffic

H. Care and Protection of Property

I. Protection of Existing Structures and Utilities

J. Water for Construction Purposes

K. Dust Control

L. Pollution Control

M. Maintenance of Flow

N. Equipment Staging and Material Storage

O. Cooperation within this Contract

P. Cleanup and Disposal of Excess Material

Q. Noise Control

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 01 01 00 – Special Conditions

C. Section 31 10 00 – Site Preparation

D. Section 32 31 13 – Chain link fences and gates

E. Section 33 05 07 – Jacking and Boring

1.03 SCOPE

A. The Contractor shall furnish labor and equipment which will be efficient, appropriate and large enough to secure a satisfactory quality of work and a rate of progress which will ensure the completion of the work within the Time for Completion required by the Contract Documents. If at any time such labor and equipment appears to be inefficient, inappropriate or insufficient for securing the quality of work required or for producing the rate of progress aforesaid, the Owner's Representative may order the Contractor to increase the efficiency or change the character and the Contractor shall conform to such order at no cost to the Owner. Failure of the Owner's Representative to give such order shall in no way relieve the Contractor of his obligations to secure the quality of the work and rate of progress required by the Contract Documents.

1.04 USE OF PREMISES

A. The Contractor shall not trespass upon or in any way disturb property outside the street right of way or outside the limits of construction, without first obtaining written permission from the property owner to do so. A copy of such written permission shall be furnished to the Owner's Representative.

B. If the Contractor finds it necessary to obtain additional working area, it shall be the Contractor's responsibility for its acquisition. All requirements listed under the "Use of Premises" shall apply if additional area is obtained.

C. The Contractor shall, at no additional cost to the Owner, restore such property to the full satisfaction of the property owner, and shall obtain from the property owner a written release stating that restoration has been satisfactorily made. A copy of the written release shall be furnished to the Owner's Representative.

D. The Contractor shall not waste any excess earth, stone, or other excavated material on any property without first obtaining written permission from the owner of the property. Along with written approval from the property owner, the Contractor shall apply, pay, and obtain all required permits, including cut and fill permits, and secure the approval of the Owner's Representative. One copy of the property owner's written permission stating that the work has been completed satisfactorily, and one copy of any necessary permits shall be furnished to the Owner's Representative. Materials deposited off-site without the required approvals may be ordered removed and properly disposed of without additional compensation.

E. All items within the construction limits shall be removed, or removed and replaced, or restored as required by the Contract Documents, including the Drawings and Specifications, and as directed by the Owner's Representative.

1.05 EASEMENTS AND SITE ACCESS

A. No temporary easements have been acquired for this Project.

B. Site access is shown on the Drawings. Any temporary stockpiling and storage outside of the

disturbance limits must be proposed by the Contractor and approved by the Owner. The Contractor shall coordinate with Owner's Representative prior to utilizing these areas.

1.06 CONSTRUCTION LAYOUT

A. The Contractor shall ensure a correct layout of the Work including locating and marking the construction limits and confirming existing elevations of utilities, structures, etc., as needed. The Owner/Owner's Representative will not provide any survey layout work. An electronic AutoCAD file will be provided to the Contractor for the horizontal and vertical layout.

B. The Contractor is responsible for having the finished Work conform to the lines, grades, elevations, and dimensions shown on the Drawings. Any inspection or checking of the Contractor's layout by the Owner's Representative and the acceptance of all or any part of it does not relieve the Contractor of the responsibility to secure the proper dimensions, grades, and elevations of the Work.

C. The Contactor shall be responsible for verifying the surface and the provided quantities.

D. Deviations from design line and grade, and small errors in quantity computations can be expected to occur but should be regarded as a departure from what is desired, and no extensive deviations or pattern of deviations should be allowed. The goal of construction must be to meet the lines and grades specified.

E. The Contractor shall be solely responsible for all locations, dimensions and levels. No data other than written orders of the Engineer shall justify departure from the dimensions and levels required by the Drawings. Tolerances shall be as follows:

1. For earthwork areas outside the low-flow channel, connection channels, and pipe entrances/exits, allowable tolerance is 0.3 ft ±.

2. For earthwork areas within the low-flow channel and connection channels, allowable tolerance is 0.1 ft ±. No adverse slopes are allowed.

3. For pipe entrances/exits, allowable tolerance is 0.06 ft ±. No adverse slopes are allowed. See Section 33 05 07 "Jacking and Boring" for additional details on tolerances for this method.

4. Soil wasting areas may deviate from the tolerances provided but must maintain stable slopes, drainage patterns, heights, etc.

5. See Section 32 31 13 "Chain link fences and gates" for applicable fence tolerances.

F. Control points for the project have not been provided. It is the responsibility of the Contractor to establish control points for their use using a qualified professional.

G. The Contractor shall protect all existing/established controls. Replace damaged controls at no additional cost.

H. Layout of work shall follow Paragraph 1.05 of Section 31 10 00 “Site Preparation”.

1.07 PROTECTION OF TREES

A. The Contractor shall take precautions to avoid any unnecessary damage to trees. Branches which overhang the construction limits and which interfere with the operation of equipment shall be tied back to avoid damage, if possible. Where injury to branches is unavoidable, the branches shall be sawed off neatly at the trunk or main branch and the cut area shall be painted with approved tree paint immediately. Any trees damaged beyond saving shall be identified by the Contractor for discussions with the Owner’s Representative regarding tree removal alternatives. In the case of trees damaged on private property during the project, the Contractor shall make restitution to the property owner.

B. When possible, preserve trees. This includes trees within the disturbance limit that are located where final grades do not depart more than six (6) inches from existing grades and where denoted on Drawings.

1.08 OPEN EXCAVATIONS

A. The Contractor shall adequately safeguard all open excavations by providing temporary barricades, caution signs, lights and other means to prevent accidents to persons and damage to property. Provide suitable and safe bridges and other crossings for accommodating travel by workers. Remove bridges provided for access during construction when no longer required. The length or size of excavation will be controlled by the particular surrounding conditions but shall always be confined to the limits prescribed by the Owner’s Representative or the authority having jurisdiction of any rights-of-way being occupied by the construction. Any limits prescribed by the Owner’s Representative shall not take away the Contractor’s responsibility to meet safety requirements.

B. The Contractor shall take precautions to prevent injury to the public/workers due to open trenches. Provide adequate light at all trenches, excavated material, equipment, or other obstacles which could be dangerous to the public/workers at night.

1.09 MAINTENANCE OF TRAFFIC

A. The Contractor shall perform the required work with the least inconvenience and maximum safety of the Contractor and the traveling public.

B. The Contractor shall be responsible for maintaining “local” traffic at all times and for notifying the proper authorities regarding the closing of roads/access drives.

1. The Contractor shall be required on an interim and/or permanent basis to furnish, erect, maintain, and subsequently remove all lights, signs, barricades and all other traffic control devices necessary for the safety and maintenance of traffic. This also includes all advance warning signage, regulatory signs, informational signs, detour signs and directional signs.

Keep all equipment clean and in proper working order.

2. This shall include obtaining any necessary permits.

3. The Manual on Uniform Traffic Control Devised by the Federal Highway Administration shall be followed as appropriate.

C. The cost of all traffic control devices, including replacing existing striping damaged due to construction, shall be incidental to the project.

1.10 CARE AND PROTECTION OF PROPERTY

A. The Contractor will be responsible for the preservation of all public and private property and use every precaution necessary to prevent damage thereto. If any direct or indirect damage is done to public or private property by or on account of any act, omission, neglect, or misconduct in the execution of the work on the part of the Contractor, restore such property to a condition similar or equal to that existing before the damage was done, or make good on the damage in other manners acceptable to the Owner's Representative.

B. Where the Contractor contemplates removal of small structures such as mailboxes, signposts, fencing, guardrails, and culverts that interfere with Contractor's operations, the Contractor shall obtain approval of property owner and the Owner's Representative. Move mailboxes to temporary locations accessible to postal service. Replace items removed in their original location and a condition equal to or better than original. This shall be considered as part of the work and replacement shall be done immediately after the related operation(s) are completed. The costs for the removal, relocation, and replacement shall be included with the price bid for various contract items.

1.11 PROTECTION OF EXISTING STRUCTURES AND UTILITIES

A. The Contractor shall assume full responsibility for the protection of all buildings, structures, and utilities, public or private, including poles, signs, services to buildings, utilities, gas pipes, water pipes, hydrants, sewers, drains and electric and telephone cables, whether or not they are shown on the Drawings. Carefully support and protect all such structures and utilities from injury of any kind. Immediately repair any damage resulting from the construction operations at no additional cost to the Owner.

B. The Contractor shall bear full responsibility for obtaining all locations of underground structures and utilities (including existing water services, drain lines and sewers). Maintain services to buildings and pay costs or charges resulting from damage thereto.

C. The Contractor shall notify the Ohio Utilities Protection Service (OUPS) at least 48 hours prior to start of excavating in any public way and also notify in writing all non-participating utility companies in writing at least forty-eight (48) hours (excluding Saturdays, Sundays and legal holidays) before excavating.

D. Refer to Section 31 23 00 “Excavation, Fill, and Grading” for disposition of utilities.

1.12 DUST CONTROL

A. The Contractor shall take reasonable measures to prevent dust. Earth surfaces subject to dusting shall be kept moist with water or by application of a chemical dust suppressant. When practical, dusty materials in piles or in transit shall be covered to prevent blowing dust.

B. Buildings or operating facilities which may be affected adversely by dust shall be adequately protected from dust. Existing or new machinery, motors, instrument panels, or similar equipment shall be protected by suitable dust screens. Proper ventilation shall be included with dust screens.

1.13 POLLUTION CONTROL

A. The Contractor shall prevent the pollution of drains and watercourses by sanitary wastes, sediment, debris, and other substances resulting from construction activities. No sanitary wastes shall be permitted to enter any drain or watercourse other than sanitary sewers. No sediment, debris, or other substance shall be permitted to enter sanitary sewers, and reasonable measures shall be taken to prevent such materials from entering any drain or watercourse.

1.14 MAINTENANCE OF FLOW

A. The Contractor shall become familiar with the flow behavior of the East Fork Little Miami River in the project area (see USGS Gage 3246500 for real-time flow data) and stay attuned to the threat of rain events to make efforts to avoid work during periods that could suspend unreasonable amounts of fine sediment. The Contractor shall sequence the work and/or employ temporary flow diversion strategies (e.g. pump arounds, bypass channels, berms, etc.) to conduct the majority of construction activities outside of flowing water or in low flow conditions and make every effort to minimize the suspension of unreasonable amounts of fine sediment into the flow. If temporary flow diversions are employed, they must not result in flooding of adjacent properties. The Contractor should stabilize the active work zone and withdraw equipment and employees if flood conditions are present or are likely to develop.

B. Should temporary flow diversion strategies be employed by the Contractor, the Contractor shall be responsible for the condition of any pipe or conduit used for drainage purposes, and all such pipe or conduit shall be left clean and free of sediment.

C. Temporary flow diversion measures shall be constructed such that they do not result in flooding of upstream properties.

D. The cost of this work shall be incidental to the project.

1.15 EQUIPMENT STAGING AND MATERIAL STORAGE

A. Equipment staging and material storage outside of the proposed disturbance limits shall utilize locations agreed upon by the Owner/Owner’s Representative and situated in such a way as to

minimize disturbance.

B. The Contractor is responsible for the protection and restoration of all surfaces and existing vegetation in areas that are used for access, staging, or otherwise used during construction.

C. Equipment shall be kept out of active flow to minimize sediment discharges.

D. The Contractor shall frequently remove materials no longer required on the project site, such as excess materials, temporary structures, and equipment so that the site shall, at all times, present a neat and orderly appearance.

1.16 COOPERATION WITHIN THIS CONTRACT

A. All firms or persons authorized to perform any work under the Contract Documents shall cooperate with Contractors and Subcontractors or trades and assist in incorporating the work of other trades where necessary or required.

B. Cutting and patching, drilling and fitting shall be carried out where required by the trade or subcontractor having jurisdiction, unless otherwise indicated herein or directed by the Owner's Representative.

1.17 CLEANUP AND DISPOSAL OF EXCESS MATERIAL

A. During the course of the Work, the Contractor shall keep the site of operations as clean and neat as possible. Dispose of all residues resulting from the construction Work and, at the conclusion of the Work, remove and haul away any surplus excavation, broken pavement, lumber, equipment, temporary structures and any other refuse remaining from the construction operations and leave the entire site of the work in a neat and orderly condition.

B. In order to prevent environmental pollution arising from the construction activities related to the performance of the Work under the Contract Documents, the Contractor and Subcontractors shall comply with all applicable Federal, State and local laws and regulations concerning waste material disposal, as well as the specific requirements stated in this Section and in other related Sections.

C. Disposal of excess excavated material in wetlands, stream corridors and plains is strictly prohibited even if the permission of the property owner is obtained. Any violation of this restriction by the Contractor or any person employed by him will be brought to the immediate attention of the responsible regulatory agencies, with a request that appropriate action be taken against the offending parties. The Contractor will be required to remove the fill and restore the area impacted at no increase in the Contract Sum.

D. The Owner/Owner's Representative reserves the right to instruct specific cleanup, relocation of equipment, or disposal of material at any time.

1.18 NOISE CONTROL

A. The Contractor shall take reasonable measures to prevent unnecessary noise. Such measures shall be appropriate for the normal ambient sound levels in the area during working hours. All construction machinery and vehicles shall be equipped with practical sound-muffling devices and operated in a manner to cause the least noise consistent with efficient performance of the Work.

B. The Contractor shall provide acoustical barriers effective in reducing noise so noise emanating from tools or equipment will not exceed legal noise levels.

C. During construction activities on or adjacent to occupied buildings, and when appropriate, Contractor shall erect screens or barriers effective in reducing noise in the building and shall conduct operations to avoid unnecessary noise which might interfere with the activities of building occupants.

D. See Paragraph 1.06 of Section 01 01 00 “Special Conditions” for allowable working hours.

PART 2–PRODUCTS

NOT USED

PART 3–EXECUTION

NOT USED

END OF SECTION 01 14 00

SECTION 01 71 33

RESTORATION OF IMPROVEMENTS

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Structures and Facilities

B. Roads, Streets, and Other Paved Surfaces

C. Stream Bed

D. Cultivated Areas and Other Surface Improvements

1.02 RELATED SECTIONS

A. Section 01 14 00 – Control of Work

B. Section 32 92 19 – Seed and Mulch

1.03 STRUCTURES AND FACILITIES

A. The Contractor shall take all precautions necessary to protect the integrity and usefulness of all existing facilities. The Contractor may, with the approval of the Owner's Representative, remove such existing structures, including but not limited to, curbs, gutters, conduits, pipelines, vaults, manholes, cables and conduits and poles as may be necessary for the performance of the Work and shall re-build the structures thus removed in as good a condition as found in accordance with the regulatory requirements and the Contract Documents. The Contractor shall also repair existing structures which may be damaged as a result of the Work under the Contract Documents as nearly as possible to the original condition, to the satisfaction of the Owner's Representative.

B. The Contractor is liable for all fines, legal fees, etc. that are placed on the Owner as a result of sewer discharges to any stream in the project area from a crushed or otherwise damaged sewer crossing that is inadequately protected, per Section 01 14 00 "Control of Work".

1.04 ROADS, STREETS, AND OTHER PAVED SURFACES

A. Unless otherwise specified, roads and streets in which the surface is removed, broken, or damaged during the Work under the Contract Documents, shall be resurfaced and brought to the original grade and section. Roadways used by the Contractor shall be cleaned and repaired. Before resurfacing material is placed, edges of pavements shall be trimmed back far enough to provide clean, solid, vertical faces, and shall be free of loose material. All paved surfaces shall be cut with a pavement saw. Rough cuts are not allowed. Repair work shall conform to the provisions of the Governing Agency, applicable specifications in Part 3 of this Section and as directed by the Owner's Representative.

B. The cost of all roadway, street, and other paved surface restoration shall be incidental to the project.

1.05 STREAM BED

A. Where the stream bed has been disturbed outside the work area as a result of the Work and/or construction activities, existing bed material shall be replaced and/or adjusted to match the pre-disturbance grades and contours.

1.06 CULTIVATED AREAS AND OTHER SURFACE IMPROVEMENTS

A. Cultivated or planted areas and other surface improvements which are damaged by actions of the Contractor shall be restored as nearly as possible to their original condition.

B. The cost of all surface improvement restoration outside those shown on the Drawings shall be incidental to the project.

PART 2–PRODUCTS

NOT USED

PART 3–EXECUTION

3.01 INSTALLATION

A. All restoration shall be completed in strict accordance with the appropriate items of the Specifications, as directed by the Owner's Representative. All disturbed areas shall be restored as nearly as practical to the condition they were prior to construction within thirty (30) days. All drainage ditches disturbed by the Contractor's Work shall be restored, reshaped, and graded to drain properly. Sod, erosion control mats, or other methods shall be used by the Contractor to ensure that drainage ditches are restored to the pre-construction condition as much as practical.

B. Pavement restoration shall be in accordance with the provisions of the Governing Agency responsible for the particular road, as directed by the Owner's Representative.

C. The Contractor shall restore unpaved areas by seeding and mulching. Commercial fertilizer shall be used and shall have a chemical analysis of 10-20-10. The fertilizer shall be delivered to the Project Site in manufacturer's containers, unopened. The container, or an attached tag, shall have printed upon it the manufacturer's name and the chemical analysis of the contents.

D. All maintained yards shall be restored with shredded topsoil and fertilizer prior to seeding and mulching. The Contractor shall remove all stones 1-inch and greater in any dimension.

Shredded topsoil shall be placed in loose lifts that construct a 4-inch compacted depth. Grass seed shall be similar to existing or per the Lawn Seed Mix in Section 32 92 19 “Seed and Mulch” unless otherwise approved by the Owner/Owner’s Representative. Mulch mats or other methods shall be employed to ensure that slopes are properly restored, with any staples or nails removed once the grass has sufficiently rooted to stabilize the slope.

E. When restoration is performed in the summer months of June, July, and August the Contractor shall utilize temporary mulching and seeding. Temporary mulching shall then be removed as necessary, with final seeding and mulching performed September 1 through September 15.

F. The cost of all restoration of streets, drives, walks, sod, curbs, etc., shall be included in the various items of the Contract Documents. When restoring walks, curb ramps shall be constructed at intersections where the existing walk has been disturbed. Contact the jurisdictional agency for curb ramp requirements.

END OF SECTION 01 71 33

SECTION 01 77 19

SUBSTANTIAL AND FINAL COMPLETION

PART 1–GENERAL

1.01 SECTION INCLUDES

A. Scope

B. Final Completion

1.02 SCOPE

A. Specific to this Project, Substantial Completion shall occur when all grading, rock and wood placement, pipe and appurtenance installation, and planting associated with this Contract have been completed.

B. The Contractor shall also have reasonable access to make corrections during the two (2) year Correction Period in accordance with Paragraph 22 of the General Conditions included in the Contract Documents.

1.03 FINAL COMPLETION

A. The Project shall be complete when all Work, including plantings and punch list items and all documents and permits and licenses, if any, are complete and submitted to the OWNER. These may include, but are not limited to: Certificate of Occupancy, Letters of Approval and/or applicable permits from various regulatory agencies, inspection certificates, and any other items as required by Laws and Regulations..

PART 2 - PRODUCTS

NOT USED

PART 3 - EXECUTION

NOT USED

END OF SECTION 01 77 19

SECTION 02 41 00

DEMOLITION

PART 1–GENERAL

1.01 SECTION INCLUDES

A. This section includes removal of existing fence, when indicated on the Drawings and when not shown on the Drawings but within the disturbed area. Also included is the removal, relocation, or re-routing of any existing piping, valves, conduit, equipment and appurtenances which are not specifically shown on the Drawings or specifications, but which are found to interfere with the installation of any Work included in this project.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 01 14 00 – Control of Work

1.03 REGULATORY REQUIREMENTS

A. Notify affected utility companies per Section 01 14 00 “Control of Work” and Owner before starting work and comply with their requirements.

PART 2–PRODUCTS

NOT USED

PART 3–EXECUTION

3.01 DEMOLITION OR REMOVAL

A. The Contractor shall perform demolition of existing fence where shown on the Drawings and where not shown on the Drawings but within the disturbance limits. Then, the Contractor shall dispose of fencing properly.

B. The cost for fence removal and disposal shall be incidental to the project.

C. Cease operations immediately if adjacent structures appear to be in danger. Notify Engineer. Do not resume operations until directed.

END OF SECTION 02 41 00

SECTION 03 30 00

CAST IN PLACE CONCRETE

PART 1–GENERAL

1.01 SUMMARY

A. The work in this section specifies cast-in-place concrete which consists of furnishing all material, mixing and transporting equipment, and performing all labor for the proportioning, mixing, transporting, placing, consolidating, finishing, and curing of concrete in the structure.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 31 23 00 – Excavation, Trenching and Backfill

C. Section 31 25 00 – Erosion and Sediment Control

D. Section 33 31 00 – Sewer Pipe

E. Section 33 39 00 – Sewer Appurtenances

1.03 REFERENCE STANDARDS

A. ASTM refers to American Society for Testing Materials (ASTM) specifications.

B. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Ohio Department of Transportation Construction and Materials Specifications (CMS), 2019 edition, including all issued supplemental specifications.

1.04 COORDINATION

A. Review installation procedures under other Sections and coordinate the installation of items that must be installed in the concrete.

B. Notify other contractors in advance of the placing of concrete to provide the other contractors with sufficient time for furnishing of items included in their contracts that must be installed in the concrete.

1.05 QUALITY ASSURANCE

A. To demonstrate conformance with the specified requirements for cast-in-place concrete, the Contractor shall provide the services of an independent testing laboratory which complies with the requirements of ASTM E329. The testing laboratory shall sample and test concrete materials as specified in paragraphs 2.01 and 2.02 of this specification. Costs of testing laboratory services shall be borne by the Contractor.

B. Certificates, signed by concrete producer and Contractor, may be submitted in lieu of material testing when acceptable to Engineer.

C. Reference Standards: Comply with the applicable provisions and recommendations of the latest editions of the following, except as otherwise shown or specified:

1. ACI 301, Specifications for Structural Concrete for Building (includes ASTM Standards referred to herein except ASTM A 36).
2. ACI 347, Recommended Practice for Concrete Formwork.
3. ACI 304, Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.
4. ACI 315, Manual of Standard Practice for Detailing Reinforced Concrete Structures.
5. ACI 305, Recommended Practice for Hot Weather Concreting.
6. ACI 306, Recommended Practice for Cold Weather Concreting.
7. ASTM A 36/A 36M, Carbon Structural Steel.
8. Concrete Reinforcing Steel Institute, Manual of Standard Practice, include ASTM Standards referred herein.

1.06 SUBMITTALS

A. Samples: Submit samples of materials as specified and as may be requested by Engineer, including names, sources and descriptions.

B. Shop Drawings: Submit for approval the following:

1. Copies of manufacturer's specifications with application and installation instructions for proprietary materials and items, including admixtures and bonding agents.
2. Drawings for fabrication, bending, and placement of concrete reinforcement. Comply with ACI 315, Chapters 1 thru 8. For walls, show elevations to a minimum scale of 1/4 inch to 1 foot. Show bar schedules, stirrup spacing, diagrams of bent bars, arrangements, and assemblies, as required for the fabrication and placement of concrete reinforcement.
3. List of concrete materials and concrete mix designs proposed for use. Include the results of all tests performed to qualify the materials and to establish the mix designs in accordance with ACI 301, 3.9. Submit written report to Engineer for each proposed concrete mix at least 30 days prior to start of Work. Do not begin concrete production until mixes have been reviewed and are acceptable to Engineer. Mix designs may be adjusted when material characteristics, job conditions, weather, test results or other circumstances warrant. Do not use revised concrete mixes until submitted to and accepted by Engineer.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver concrete reinforcement materials to the site bundled, tagged and marked. Use metal tags indicating bar size, lengths, and other information corresponding to markings shown on placement diagrams.

B. All materials used for concrete must be kept clean and free from all foreign matter during transportation and handling and kept separate until measured and placed in the mixer. Bins or platforms having hard clean surfaces shall be provided for storage. Suitable means shall be taken during hauling, piling and handling to ensure that segregation of the coarse and fine aggregate particles does not occur, and the grading is not affected.

PART 2–PRODUCTS

2.01 GENERAL

A. Unless otherwise stated in the Construction Documents, all concrete shall be Class QC-1 as specified in the Standard Specifications.

2.02 CONCRETE MATERIALS

A. Portland Cement: ASTM C 150/C 150M, Type I.

B. Aggregates: ASTM C 33/C 33M.

1. Fine Aggregate: Clean, sharp, natural sand free from loam, clay, lumps or other deleterious substances. Dune sand, bank run sand and manufactured sand are not acceptable.

2. Coarse Aggregate: Clean, uncoated, processed aggregate containing no clay, mud, loam, or foreign matter, as follows:

a. Crushed stone, processed from natural rock or stone.

b. Washed gravel, either natural or crushed. Use of slag and pit or bank run gravel is not permitted.

C. Coarse Aggregate Size: Size to be ASTM C 33/C 33M, Nos. 57 or 67, unless permitted otherwise by Engineer.

D. Water: Clean, drinkable.

E. Air-Entraining Admixture: ASTM C 260/C 260M.

F. Water-Reducing Admixture: ASTM C 494/C 494M. Only use admixtures which have been tested and accepted in mix designs.

2.03 FORM MATERIALS

A. Provide form materials with sufficient stability to withstand pressure of placed concrete without bow or deflection.

B. Exposed Concrete Surfaces: Acceptable panel-type to provide continuous, straight, smooth, as-cast surfaces. Use largest practical sizes to minimize form joints.

C. Unexposed Concrete Surfaces: Suitable material to suit project conditions.

D. Provide 3/4-inch chamfer at all exposed corners.

2.04 REINFORCING MATERIALS

A. Reinforcing Bars: ASTM A 615 / A 615M, Grade 60.

B. Welded Wire Fabric: ASTM A 185 / A 185M.

C. Steel Wire: ASTM A1064 / A1064M

D. Supports for Reinforcement: Provide bolsters, chairs, spacers and other devices for spacing, supporting and fastening reinforcement in place.

1. Use wire bar type supports complying with Concrete Reinforcing Steel Institute (CRSI) recommendations, except as specified below. Do not use wood, clay brick, or other unacceptable materials.

2. For slabs on grade, use solid concrete brick supports.

3. For all concrete surfaces, where legs of supports are in contact with forms, provide supports complying with CRSI, Manual of Standard Practice as follows:

a. Either hot-dip galvanized, plastic protected or stainless steel legs.

4. Over waterproof membranes, use precast concrete chairs.

2.05 RELATED MATERIALS

A. Waterstops:

1. Flat dumbbell or centerbulb type, size to suit joints, of Polyvinyl Chloride.

b. Manufacturer: Provide waterstops of one of the following:

1) W.R. Meadows, Incorporated.

2) W.R. Grace and Company.

3) Or approved equal.

2. Carbon steel complying with ASTM A 36/A 36M.

B. Concrete Curing Materials:

1. Absorptive Cover: Burlap cloth made from jute or kenaf, weighing approximately 10 ounces per square yard and complying with AASHTO M 182, Class 3.
2. Moisture-Retaining Cover: One of the following, complying with ASTM C 171.
    a. Waterproof Paper:
        1) Regular or white consisting of two sheets of kraft paper cemented together.
        2) Paper shall be light in color, shall be free from visible defects, and shall have a uniform appearance.
        3) White paper shall have a white surface on at least one side.
    b. Polyethylene Film:
        1) Film shall consist of a single sheet of polyethylene with a minimum thickness of 4 mils.
        2) Film shall be free of visible defects and shall have a uniform appearance.
        3) Clear or white opaque type is acceptable.
    c. White Burlap-Polyethylene Sheet:
        1) Sheet shall consist of burlap not less than 10 ounces per linear yard, 40 inches wide, impregnated on one side with white opaque polyethylene 4 mils minimum thickness.
        2) The polyethylene material shall be securely bonded to the burlap so that there will be separation of the materials during handling or curing of the concrete.
3. Curing Compound: Curing compound shall not be used unless approved by the Engineer, and if allowed, shall comply with ASTM C 309 Type 1 (water retention requirements):
    a. Product and Manufacturer: Provide one of the following:
        1) Aqua-Cure VOX by The Euclid Chemical Company.
        2) Sealtight 1100 by W.R. Meadows, Incorporated.
        3) Or approved equal.
    b. Provide fugitive dye when requested by Engineer.

C. Epoxy Bonding Agent:
1. Two-component epoxy resin bonding agent.
2. Product and Manufacturer: Provide one of the following:
    a. Sikadur 32 Hi-Mod by Sika Chemical Corporation.
    b. Dural by Euclid Chemical Company

c. Or approved equal.

D. Joint Fillers:

1. Provide preformed expansion joint filler in conformance with the following:

a. Cork: ASTM D 1752.

b. Asphalt Impregnated Fiberboard: ODOT Item 705.03.

c. Elastomeric: ODOT Item 705.11.

d. Or approved equal.

2.05 GROUT

A. Non-shrink, Nonmetallic Grout:

1. Premixed non-staining cementitious grout requiring only the addition of water at the job site.

2. Product and Manufacturer: Provide one of the following:

a. Euco N-S by the Euclid Chemical Company.

b. Masterflo 713 by Master Builders Company.

c. Five Star by Five Star Products.

d. Or approved equal.

B. Ordinary Cement-Sand Grout:

1. Except where otherwise specified use 1 part cement to 3 parts sand complying with the following:

a. Cement: ASTM C 150/C 150M, Type I.

b. Sand: ASTM C 33/C 33M.

PART 3–EXECUTION

3.01 INSPECTION

A. The Contractor and his or her installer shall examine the substrate and the conditions under which Work is to be performed, and notify Engineer of unsatisfactory conditions. Do not proceed with the Work until unsatisfactory conditions have been corrected in a manner acceptable to Engineer.

3.02 FORMWORK

A. Formwork: Construction so that concrete members and structures are correct size, shape,

alignment, elevation and position, complying with ACI 347.

B. Provide openings in formwork to accommodate Work of other trades and to facilitate cleaning and inspection. Accurately place and securely support items built into forms.

C. Clean and adjust forms prior to concrete placement. Apply form release agents or wet forms, as required. Retighten forms during and after concrete placement if required to eliminate mortar leaks.

3.03 REINFORCEMENT, JOINTS, AND EMBEDDED ITEMS

A. Comply with the applicable recommendations of specified codes and standards, and CRSI Manual of Standard Practice for details and methods of reinforcement placement and supports.

B. Clean reinforcement to remove loose rust and mill scale, earth, ice, and other materials which reduce or destroy bond with concrete.

C. Position, support, and secure reinforcement against displacement during formwork construction or concrete placement. Locate and support reinforcing by metal chairs, runners, bolsters, spacers, solid concrete brick and hangers as required.

1. Place reinforcement to obtain the minimum concrete coverages as shown below:

Location	**Minimum Cover**
Concrete cast against earth	3 inches
Concrete exposed to earth or liquid	2 inches
All other concrete	1-1/2 inches

2. Arrange, space, and securely tie bars and bar supports together with 16 gage wire to hold reinforcement accurately in position during concrete placement operations. Set with ties so that twisted ends are directed away from exposed concrete surfaces.

3. Reinforcing steel shall not be secured to forms with wire, nails or other ferrous metal. Metal supports subject to corrosion shall not touch formed or exposed concrete surfaces.

D. Provide sufficient numbers of supports of strength required to carry reinforcement. Do not place reinforcing bars more than 2 inches beyond the last leg of any continuous bar support. Do not use supports as bases for runways for concrete conveying equipment and similar construction loads

E. Splices:

1. Provide standard reinforcement splices by lapping ends, placing bars in contact, and tying tightly with wire. Comply with requirements shown for minimum lap of spliced bars.

F. Install welded wire fabric in as long lengths as practical, lapping at least one mesh.

G. Concrete shall not be placed until the reinforcing steel is inspected and permission for placing concrete is granted by Engineer. All concrete placed in violation of this provision will be rejected.

H. Joints: Provide construction, isolation, and control joints as indicated or required. Locate construction joints so as to not impair the strength and appearance of the structure. Place isolation and control joints in slabs on ground to stabilize differential settlement and random cracking. Additional construction joints shall be located as follows:

1. In walls locate joints at a spacing of 40 feet maximum.
2. In foundation slabs and slabs on grade locate joints at a spacing of approximately 40 feet.
3. In mats and structural slabs and beams, at a spacing of approximately 40 feet. Locate joints in compliance with ACI 301, Chapter 6.

I. Installation of Embedded Items: Set and build into the Work anchorage devices and embedded items required for other Work that is attached to or supported by cast-in-place concrete. Use setting diagrams, templates and instructions provided under other Sections and other contracts for locating and setting. Refer also to Paragraph 1.04 Coordination, above.

3.04 CONCRETE AND PLACEMENT

A. Proportioning and Design of Mix for concrete shall be per ODOT Class QC-1, as specified in the Standard Specifications.

B. Job-Site Mixing: Use drum type batch machine mixer, mixing not less than 1-1/2 minutes for one cubic yard or smaller capacity. Increase mixing time at least 15 seconds for each additional cubic yard or fraction thereof.

C. Ready-Mixed Concrete: ASTM C 94/C 94M.

D. Concrete Placement: Comply with ACI 304, placing concrete in a continuous operation within planned joints or sections. Do not begin placement until work of other trades affecting concrete is completed.

E. Consolidate placed concrete using mechanical vibrating equipment with hand rodding and tamping, so that concrete is worked around reinforcement and other embedded items and into all parts of forms.

F. Protect concrete from physical damage or reduced strength due to weather extremes during mixing, placement, and curing.

1. In cold weather comply with ACI 306.
2. In hot weather comply with ACI 305.

3.05 QUALITY OF CONCRETE WORK

A. Make all concrete solid, compact and smooth, and free of laitance, cracks and cold joints.

B. All concrete for liquid retaining structures, and all concrete in contact with earth, water, or exposed directly to the elements shall be watertight.

C. Cut out and properly replace to the extent ordered by Engineer, or repair to the satisfaction of Engineer, surfaces which contain cracks or voids, are unduly rough, or are in any way defective. Patches or plastering will not be acceptable.

D. Repair, removal, and replacement of defective concrete as ordered by Engineer shall be at no additional cost to Owner.

3.06 CONCRETE CURING AND PROTECTION

A. General:

1. Protect freshly placed concrete from premature drying and excessive cold or hot temperature and maintain without drying at a relatively constant temperature for the period of time necessary for hydration of the cement and proper hardening of the concrete.

2. Start initial curing after placing and finishing concrete as soon as free moisture has disappeared from the concrete surface. Keep continuously moist for not less than 7 days.

B. Curing Methods:

1. Perform curing of concrete by moist curing, absorptive cover, by moisture-retaining cover curing, or by curing compound. Use curing compound only in cold weather and only when permitted by Engineer.

   a. For curing, use water that is free of impurities which could etch or discolor exposed, natural concrete surfaces.

2. Provide moisture curing by any of the following methods:

   b. Keeping the surface of the concrete continuously wet by covering with water.

   c. Continuous water-fog spray.

   d. Covering the concrete surface with the specified absorptive cover, thoroughly saturating the cover with water, and keeping the absorptive cover continuously wet with sprinklers or porous hoses. Place absorptive cover so as to provide coverage of the concrete surfaces and edges, with a 4-inch lap over adjacent absorptive covers.

3. Provide moisture-retaining cover curing as follows:

   a. Cover the concrete surfaces with the specified moisture-retaining cover for curing concrete, placed in the widest practical width with sides and ends lapped at least 3

inches and sealed by waterproof tape or adhesive. Immediately repair any holes or tears during the curing period using cover material and waterproof tape.

4. Provide liquid curing compound as follows:

   a. Apply the specified curing compound to all concrete surfaces when permitted by Engineer. Slabs to receive chemical resistant heavy duty concrete topping shall not be cured with liquid curing compound but shall be moisture cured. The compounds shall be applied immediately after final finishing in a continuous operation by power spray equipment in accordance with the manufacturer's directions. Recoat areas which are subjected to heavy rainfall within 3 hours after initial application. Maintain the continuity of the coating and repair damage to the coat during the entire curing period. For concrete surfaces which will be in contact with potable water, the manufacturer shall certify that the curing compound used is EPA approved.

C. Curing Formed Surfaces:

1. Cure formed concrete surfaces, including the undersides of girders, beams, supported slabs and other similar surfaces by moist curing with the forms in place for the full curing period or until forms are removed. If forms are removed, continue curing by methods specified above, as applicable.

D. Curing Unformed Surfaces:

1. Cure unformed surfaces, such as slabs, floor topping, and other flat surfaces by using the appropriate method specified above.

E. Temperature of Concrete During Curing:

1. When the atmospheric temperature is 40°F and below, maintain the concrete temperature between 50°F and 70°F continuously throughout the curing period. When necessary, make arrangement before concrete placing for heating, covering, insulation or housing as required to maintain the specified temperature and moisture conditions continuously for the concrete curing period. Provide cold weather protection complying with the requirements of ACI 306.

2. When the atmospheric temperature is 80°F and above, or during other climatic conditions which will cause too rapid drying of the concrete, make arrangements before the start of concrete placing for the installation of wind breaks or shading, and for fog spraying, wet sprinkling, or moisture-retaining covering. Protect the concrete continuously for the concrete curing period. Provide hot weather protection complying with the requirements of ACI 305, unless otherwise specified.

3. Maintain concrete temperature as uniformly as possible and protect from rapid atmospheric temperature changes. Avoid temperature changes in concrete which exceed 5°F in any one hour and 50°F in any 24-hour period.

F. Protection from Mechanical Injury:

1. During the curing period, protect concrete from damaging mechanical disturbances including load stresses, heavy shock, excessive vibration, and from damage caused by rain or flowing water. Protect all finished concrete surfaces from damage by subsequent construction operations.

3.07 FINISHES

A. Finish:

1. After placing concrete slabs, do not work the surface further until ready for floating. Begin floating when the surface water has disappeared or when the concrete has stiffened sufficiently. Check and level the surface plane to a tolerance not exceeding 1/4 inch in 10 feet when tested with a 10-foot straightedge placed on the surface at not less than 2 different angles. Cut down high spots and fill all low spots. Uniformly slope surfaces to drains. Immediately after leveling, refloat the surface to a uniform, smooth, granular texture.

2. After floating, begin final troweling when the surface produces a ringing sound as the trowel is moved over the surface.

3. Consolidate the concrete surface by the final hand troweling operation. Finish shall be free of trowel marks, uniform in texture and appearance, and with a surface plane tolerance not exceeding 1/8 inch in 10 feet when tested with a 10-foot straight edge. Grind smooth surface defects which would telegraph through applied floor covering system.

4. Use trowel finish for the following:

a. All slabs unless otherwise shown or specified.

5. Apply non-slip broom finish to exterior concrete walkways, driveways and elsewhere as shown on the Drawings.

3.08 GROUT PLACEMENT

A. General:

1. Place grout as shown and in accordance with manufacturer's instructions. If manufacturer's instructions conflict with the Specifications do not proceed until Engineer provides clarification.

2. Drypacking will not be permitted.

3. Manufacturers of proprietary products shall make available upon 72 hours notification the services of qualified, full-time employee to aid in assuring proper use of the product under job conditions.
4. Placing grout shall conform to the temperature and weather limitations described in Paragraph 3.04 above.

END OF SECTION 03 30 00

SECTION 31 10 00

SITE PREPARATION

PART 1–GENERAL

1.01 SUMMARY

A. The work in this section consists of furnishing all labor, materials and equipment necessary to perform removal of trees, shrubs, and other plant life and strip and stockpile topsoil within the work areas as indicated on the Construction Drawings.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 01 14 00 – Control of Work

C. Section 01 71 33 – Restoration of Improvements

D. Section 31 23 00 – Excavation, Fill, and Grading

E. Section 35 40 00 – Rock

1.03 REFERENCE STANDARDS

A. ORC refers to Ohio Revised Code.

1.04 PROTECTION

A. The Contractor shall protect trees, plant growth, and features designated to remain as final landscaping.

B. Protection for all landscaping, existing structures, and utilities shall conform to Section 01 14 00 “Control of Work”.

C. The Contractor shall employ barricades and lanterns, erect and maintain temporary fences and guardrails and other provisions necessary to the safe and expeditious progress of the work and to safeguard against any damage to life and/or property.

1.05 LAYOUT OF WORK

A. Drawings indicate existing grades and finished grades required for construction. Existing grades shown are believed to be within accepted tolerance of error but are not absolute. Contractor shall satisfy themselves as to existing contours and elevations. The Contractor shall complete all excavating, filling, and grading indicated by solid line contours and spot elevations on the Contract Drawings.

B. The construction layout shall conform to paragraph 1.06 of Section 01 14 00 “Control of Work”.

PART 2–PRODUCTS

2.01 CONSTRUCTION AND TREE PROTECTION FENCING

A. Material shall be high density, polyethylene; 4 ft. high; color - orange or approved equal.

2.02 PAVEMENT AND INFRASTRUCTURE PROTECTION

A. Existing pavement (trail, driveways, roadways, parking lots, sidewalks, curbs, etc.) shall be protected from construction equipment using appropriate material for the loading and tread type.

B. Infrastructure shall be protected from construction equipment using appropriate material for the loading and tread type.

C. See Section 01 71 33 "Restoration of Improvements" for additional information on infrastructure protection.

2.03 TOPSOIL

A. Topsoil shall be as specified in paragraph 2.02 of Section 31 23 00 "Excavation, Fill, and Grading."

PART 3–EXECUTION

3.01 SITE PREPARATION

A. Trees at the edge of proposed contours and outside the grading limits shall have disturbance limited to the extent practical. Any properties, cultural sites, wetlands, and other sensitive areas shall be protected. The Contractor shall not encroach into any area designated to be preserved. If any cultural sites, areas of concern, or evidence of threatened or endangered species are encountered, the Contractor shall stop work in the area and notify the Engineer immediately.

1. One (1) archeological/cultural site, located south of the access drive near the stockpile location, is outside the disturbance areas and shall not be disturbed. The Contractor shall maintain a minimum of a 50-ft buffer between construction activities and the boundary of the archaeological site (shown on the Drawings).

B. The Contractor shall remove and relocate as required any existing signs which fall into his work area. The Contractor shall coordinate with governing authority for sign relocations.

C. The Contractor assumes sole responsibility for "in-kind" replacement of anything damaged within the protected areas, restoring these areas to equal or better conditions. It is the recommendation of the Engineer that the Contractor document pre-construction conditions on

all properties with photographic evidence.

3.02 CONSTRUCTION AND TREE PROTECTION FENCING

A. Install fencing prior to commencing clearing operations as necessary. Do not store vehicles, equipment or materials within this protected area. Repair or replace vegetation and trees to remain that are damaged during construction as directed by the Owner's Representative at no additional cost. Provide staking to support fencing.

B. Attaching to or using vegetation to support fence shall not be permitted.

C. The Contractor shall meet all requirements of Section 01 14 00 "Control of Work."

3.03 PAVEMENT PROTECTION

A. Material to protect asphalt and concrete surfaces shall be placed prior to any construction equipment unloading or use on the site. The Contractor shall replace all damaged surfaces.

3.04 CLEARING AND GRUBBING

A. The Contractor shall remove woody vegetation only when necessary and approved by the Engineer. The Contractor shall be responsible for sorting, use, and distribution.

B. The Contractor shall clear and grub woody material within the grading areas as shown on the Drawings. The Contractor shall use a stump grinder or similar implement to remove existing stumps on areas with traversable slopes (gradients less than 2:1), as directed by the Owner's Representative. The depth of grubbing below ground surface shall be sufficient to meet the Construction Drawings and relevant specifications, including but not limited to, finished grades, details, structures, and vegetation success.

C. The Contractor shall take precautions to save trees larger than 3 inches diameter at breast height (DBH) in proximity of the grading limits when possible. For trees within the grading limits, the Contractor shall remove and discard the tree and root system to conform to the proposed grade.

D. The Contractor shall clear trees larger than 3 inches DBH only between the dates of October 1 and March 31.

E. It is the Contractor's responsibility to harvest and stockpile for re-use branches, trunks, rootwads, brush, and other woody material in sufficient quantities to comply with the Drawings (e.g. Log Vanes, Anchored Brush, and Brush Piles). Excess woody material shall be collected and disposed of in appropriate collections areas, identified and approved by the Owner's Representative. There should be no haul-in or haul-off of woody material. If the management of woody material is performed in a way that requires haul-in/haul-off of woody material, it shall be performed by the Contractor at no additional cost to the Owner.

F. Burning of cleared vegetation is prohibited.

3.05 TOPSOIL STRIPPED AND STOCKPILED

A. The Contractor shall harvest and stockpile for re-use enough topsoil to ensure that all planted surfaces have a minimum of 1 inch of topsoil.

B. Topsoil that is temporarily stockpiled on site shall be protected from erosion.

END OF SECTION 31 10 00

SECTION 31 23 00

EXCAVATION, FILL, AND GRADING

PART 1–GENERAL

1.01 SUMMARY

A. The work in this section consists of furnishing all labor, materials and equipment necessary to perform excavation, storage, and finished grading within the work areas as indicated on the Drawings.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 01 14 00 – Control of Work

C. Section 31 10 00 – Site Preparation

1.03 REFERENCE STANDARDS

A. ASTM refers to American Society for Testing Materials (ASTM) specifications.

B. ORC refers to Ohio Revised Code.

C. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Ohio Department of Transportation Construction and Materials Specifications (CMS), 2019 edition, including all issued supplemental specifications.

D. OSHA refers to the Occupational Safety and Health Administration (OSHA)

1.04 REQUIREMENTS FOR REGULATORY AGENCIES

A. The Contractor shall fully comply with all applicable laws, ordinances, safety requirements, codes and regulations of federal, state and local governing bodies having jurisdiction.

B. The Contractor shall obtain from the appropriate agencies and authorities, the dewatering and stormwater discharge permits required to remove and dispose of groundwater, surface water, and any other water used in Contractor's operations. The permits shall be obtained prior to start of construction.

1.05 PROTECTION

A. Protection of on-site and adjacent properties and utilities shall be as specified in paragraph 1.04 of Section 31 10 00 “Site Preparation.”

1.06 DISPOSITION OF UTILITIES

A. Rules and regulations governing the respective utilities shall be observed in executing all work under this section. Notify all utilities existing in the area of this operation to verify locations,

prior to beginning as required by ORC Sec. 3781.28.(A). All known utilities are listed on the drawings. Contact OUPS 48 hours in advance of any excavations.

B. Active utilities shown on the Drawings shall be adequately protected from damage and removed or relocated only as indicated or specified.

C. Active utilities not shown on the Drawings shall be protected or relocated in accordance with written instruction from the Owner's Representatives. Report in writing the location of such active utilities not shown on the drawings.

D. Inactive and abandoned utilities encountered in excavating and grading operations shall be removed, plugged or capped as directed. Report in writing the location of such abandoned utilities.

1.07 EXISTING SITE CONDITIONS

A. The Contractor shall remain aware of the weather throughout the watershed that may contribute to flows that the Contractor may not otherwise be aware of.

B. The Contractor shall take all necessary precautions to avoid the nearby archaeological zone (location denoted on the Drawings) with all construction activities. See Paragraph 3.01 of Section 31 10 00 "Site Preparation".

C. The east-west reservoir embankment/berm is used as backdrop for a gun range. There is the potential that the amount of spent ammunition in the embankment could require hazardous disposal of any excavated material from this location. The Drawings have been developed to avoid disturbance to this area (i.e. locating the pipe in a wooded area that is outside of the shooting range). The Contractor should take care to minimize disturbance to any potentially contaminated soil. Any required hazardous disposal must be performed by the Contractor at no additional cost to the Owner.

1.08 CLASSIFICATION OF EXCAVATION

A. The Contract includes all trenching and finished grading necessary to complete the project on an "Unclassified Basis" and includes (without limitation thereto) the excavation and removal of all soil, shale, rock, boulders, fill, construction rubble, subsurface structures, foundations, etc., and every kind of subsurface condition encountered in contract area.

1.09 TESTING AND GEOTECHNICAL SERVICES

A. No geotechnical investigations were performed by the Owner prior to construction. The Contractor is responsible for geotechnical information as necessary.

B. Testing, as requested by the Owner, will be performed by the Contractor's independent laboratory to determine conformance with the specifications. Submit laboratory qualifications for review and approval. This testing shall be performed at no additional cost to the Owner. In addition, during critical times of construction, the Contractor shall provide on-site independent

geotechnical engineering services to observe installations.

1.10 SUBMITTALS

A. Inspection and test reports of materials and installations.

1.11 TOLERANCES

A. Refer to Section 01 14 00 “Control of Work” for tolerances for related Work.

PART 2–PRODUCTS

2.01 HARVESTED BED MATERIAL

A. Suitable material may include sediment, stones, and organic debris excavated and/or relocated from the channel bed.

B. Unsuitable Material: Material that fails to meet requirements for suitable materials; or contains any of the following:

1. Excavated bituminous pavement, construction debris, rubbish, or refuse.
2. Hazardous materials

2.02 TOPSOIL

A. Topsoil material shall contain loose friable loam, free of heavy clay, refuse, stumps and large roots, rocks over two (2) inches in diameter, brush, weeds and weed seeds, or other material which would be detrimental to the proper development of vegetative growth.

B. Any topsoil provided from off-site supplies shall be a silt loam soil with a pH of 5.5 to 7.0. Organic content shall be no less than 1% and no more than 12% by weight as determined by loss through ignition. The mechanical analysis shall be:

U.S. Standard Sieve Size	Percent Finer by Weight
¾”	100%
No. 4	90-100%
No. 200	0-10%

C. The clay content of the material passing the No. 200 sieve shall not be greater than 60% or as determined by the hydrometer test.

D. Tests will be performed by the Contractor's independent laboratory on topsoil stockpile and off-site supplies, as requested by Owner.

2.03 BEDDING MATERIAL

A. Bedding material for the perforated underdrain shall be geotextile fabric and No. 57 stone. Refer to Section 31 25 00 “Erosion and Sediment Control” for geotextile fabric.

B. Bedding material for the PVC pipe and assembly between the underdrain and the culvert shall be soil. Granular/rock backfill shall not be used.

C. Bedding material for the cast-in-place headwalls shall be native soil per Section 602.03 of the Standard Specifications. For pre-cast headwalls, granular base shall be used with low strength mortar backfill for watertightness.

D. Low strength mortar backfill per Section 613 of the Standard Specifications shall be used for the backfill around the 12" and 24" culverts to achieve watertightness within the reservoir. The remainder of the backfill may be compacted native material and shall conform to paragraph 3.07 of this Section.

2.04 EQUIPMENT

A. Compaction equipment shall be capable of consistently achieving the specified compaction requirements.

PART 3–EXECUTION

3.01 TOPSOIL STRIPPED AND STOCKPILED

A. The Contractor shall meet the requirements in Paragraph 3.05 of Section 31 10 00 "Site Preparation."

3.02 EXAMINATION AND PREPARATION

A. Verify that systems for dewatering/flow manipulation are in place before commencing with excavation to reduce suspended sediment.

B. Immediately notify the Owner's Representative if unexpected subsurface facilities or suspected hazardous materials are encountered during excavation. Discontinue affected work in area until notified to resume work.

C. Underpin adjacent structures that could be damaged by excavation work.

3.03 PROTECTION OF IN-PLACE CONDITIONS

A. Support and protect from damage – existing pipes, poles, wires, fences, curbs, property line markers, and other features or structures which must be preserved in place to avoid being temporarily or permanently relocated.

B. Discontinue digging by machinery when excavation approaches pipes, conduits, dams, or other underground structures. Continue excavation by use of hand tools. Include such manual excavation in work to be done when incidental to normal excavation and under items involving normal excavation.

3.04 EXCAVATION

A. Excavation shall be performed so as to permit segregation and selection of materials of different character in accordance with their suitability. Existing foundations, slabs, construction rubble, abandoned utilities, etc. discovered during excavations shall be removed within 2 feet of finished grades. Unsuitable materials, as determined by the Owner's Representative, will be disposed of as specified in paragraph 1.17 of Section 01 14 00 "Control of Work".

B. The Contractor shall stop excavation and/or grading activities if non-rippable (i.e., resistant) bedrock is found. The Contractor shall contact the Owner and Engineer, who will work to revise the design to exclude bedrock excavations. Discovery of bedrock material will not delay the project deadline. Shale that is encountered during grading is not considered non-rippable (i.e., resistant) bedrock.

C. All excavations shall be maintained in good condition during construction so as not to impair the attainment of the final slopes and grades called for on the Construction Drawings, and all necessary precautions shall be taken to prevent movement of cut slopes in all excavation areas.

D. Prior to commencing excavation, the Contractor shall install water control/maintenance of flow measures as necessary per Section 01 14 00 "Control of Work".

E. Construction shall be suspended during periods of rainfall which produces runoff that could leave the site/contaminate nearby waterways. Construction activities should be managed to minimize work during ponded water conditions or if residual soil moisture contributes significantly to the potential for clumping or other forms of compaction.

F. Keep excavations free from impounded water.

G. Topsoil shall be stripped and temporarily stockpiled, per Section 31 10 00 "Site Preparation".

H. Temporarily stockpile channel sediment/material and boulders on site in a manner to minimize erosion.

I. Excavations that are not shored and deeper than 4 feet (1.2 m) shall have banks laid back to a minimum stable slope matching the angle of repose of the excavated material.

J. Workers shall have an adequate means of exit from excavations that are 4 feet (1.2 m) or greater in depth. The means of exit shall not require more than 25 feet (7.5 m) of lateral travel.

K. Excavated material must in part remain onsite. See Drawings for requirements of excavated material to remain onsite. Soil left onsite shall be stabilized and seeded. The on-site soil wasting area is large enough to accommodate all excavated material not otherwise used on site or reserved for use by the Village; however, the Contractor does have the option to haul off a portion of the excavated material at no additional cost to Owner. Excavated material hauled offsite may be disposed of properly or reused by the Contractor at their discretion.

L. The Contractor shall not excavate into the toe of the reservoir embankment/berm.

M. The Contractor shall comply with all safety standards for trenching and excavation operations, including but not limited to OSHA 29 CFR Part 1926, Subpart P.

3.05 PROTECTION

A. Formulate excavation, backfilling, and filling schedule and procedures to eliminate possibility of undermining or disturbing foundations of partially and completed structures, pipelines and embankments or existing structures and pipelines.

B. Disturb as minimal an area as practical when completing the Work.

3.06 FILL

A. Fill to lines and grades necessary to provide finish grades.

B. Excess cut from the site may be placed in designated location shown on the Construction Drawings with a maximum slope of 3H:1V. The Contractor shall take care to avoid over-compaction of the top three inches.

C. Use a placement method that does not disturb or damage other work or existing features.

D. Fill for compacted clay groundwater barrier shall be placed and compacted in equal, approximately 6-inch lifts. The Contractor shall take care to avoid over-compaction of the top three inches.

3.07 BACKFILLING

A. Unless otherwise specified in the Drawings or Specifications, in and around underground utilities the backfill material shall be hand-placed in 6-inch lifts and shall be compacted as specified using mechanical hand tampers. Proper care shall be exercised during this operation so as not to disturb the pipe or utilities. Remaining backfill shall be machine placed in 6-inch lifts and compacted as specified.

B. For backfill of culverts, install low strength mortar backfill per the Drawings to provide structural integrity during placement and compaction of native material. Additionally, low strength mortar backfill shall be placed in such a manner as to provide watertightness around the culvert from the reservoir such that the underdrain system shall be the only means of discharge from the reservoir.

C. For backfilling around the underdrain system, complete as specified per the Drawings.

D. If excavation is performed along or within the reservoir embankment, the reservoir material shall be placed back and compacted in such a manner as to meet its original density and function, including but not limited to, keeping a water-tight condition in the reservoir. This may require the supply and installation of bentonite clay at no additional cost to the Owner.

3.08 GRADING

A. The Contractor shall grade to elevations and locations shown on the Drawings. Final grades and surfaces shall be smooth, even, and free from clods and stones, weeds, brush, and other debris.

B. The Contractor shall take steps to avoid over-compaction to the extent practical in wetland area.

C. The construction activities shall be conducted to minimize the extent of disturbed soils exposed at any one time and the length of soil exposure to the extent practical. The Contractor shall seed, mulch, and/or blanket areas as soon as possible after achieving final grades.

3.09 RESTORATION

A. Restore public and private property, structures, and infrastructure promptly. Begin restoration work within 24 hours of when damage occurred.

B. Existing surfaces, features, or utilities that are to remain but are damaged during construction shall be repaired or replaced to at least the condition in which they were found immediately before work began, unless noted otherwise.

C. Damaged Trees to Remain: Cut all damaged branches, limbs, and roots smoothly and neatly without splitting or crushing. Neatly trim, cut the injured portions and cover with an application of grafting wax or tree healing paint.

D. Cultivated Vegetation: Includes, but is not limited to, hedges, shrubs, and plants. Vegetation that is damaged shall be replaced with equal kind and of at least the quality before work began.

END OF SECTION 31 23 00

SECTION 31 25 00

EROSION AND SEDIMENT CONTROL

PART 1–GENERAL

1.01 SUMMARY

A. The work to be performed under this section consists of furnishing all labor, materials, and equipment necessary to stabilize the site with erosion and sediment control devices.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 32 92 19 – Seed & Mulch

C. Section 31 37 16 – Rock

1.03 REQUIREMENTS FOR REGULATORY AGENCIES

A. The Contractor shall fully comply with all federal, state, and local requirements, laws, and regulations.

1.04 REFERENCE STANDARDS

A. Ohio EPA Storm Water Pollution Prevention Plan checklist for construction activities.

B. Conservation Practice Standards in the Standard Specifications shall refer to Ohio Department of Natural Resources, Division of Soil and Water Conservation, Rainwater and Land Development, current edition.

C. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Ohio Department of Transportation Construction and Materials Specifications (CMS), 2019 edition, including all issued supplemental specifications.

1.05 SUBMITTALS

A. Samples and product data sheets of specified materials in Part 2 – Products.

1.06 QUALITY CONTROL

A. Construct and maintain erosion sediment control measures in accordance with the Conservation Practice Standards.

B. Check facilities weekly and after any 0.5-inch or larger rainfall event. Make needed repairs within 24 hours.

PART 2–PRODUCTS

2.01 STRAW MAT

A. Mat products shall be in conformance with criteria specified in Conservation Practice Standard Chapter 7, Soil Stabilization.

B. The Contractor shall furnish a straw mat with biodegradable netting and a minimum design shear stress of 2.0 lbs/ft^2.

C. Staples shall be used for fastening. Sizing shall be per manufacturer's recommendation.

D. A 300 mm by 300 mm sample of a product proposed for erosion mat may be required to verify that it is prequalified. When a sample is required, it shall be accompanied by the manufacturer's literature for the proposed product.

2.02 COIR FABRIC

A. The Contractor shall furnish a coir fabric mat that is biodegradable with a minimum design shear stress of 4.0 lbs/ft^2, such as Rolanka BioD-Mat 70 or equivalent.

B. Wood stakes shall be used for fastening coir fabric with minimum dimensions of 18 inches long and 1.25 inches by 1.25 inches, or per manufacturer's recommendation.

C. In addition to wood stakes, excess rock from other construction activities (ODOT D or larger) shall be used to assist with anchoring.

2.03 SILT FENCE

A. Material shall be composed of strong rot-proof polymeric fibers formed into a Type C sediment fence with woven or non-woven fabric, as specified in Section 712.09 of the Standard Specifications.

B. Furnish wrapping on each roll of fabric to protect the fabric from ultraviolet radiation and from abrasion during shipping and handling. Keep geotextile dry until installed.

C. Products that meet the erosion prevention and sediment control goals of temporary silt fence may alternatively be used, such as straw bales or mulch berms, as approved by the Owner's Representative.

2.04 CONSTRUCTION ENTRANCE

A. Construction entrances shall conform to Conservation Practice Standards Chapter 7, Section 7.4-Construction Entrance, or as otherwise shown in the Drawings.

B. Materials shall be per Section 31 37 16 "Rock".

2.05 MULCHING

A. Mulching shall be as specified in Section 32 92 19 "Seed & Mulch".

B. Binder shall be chemical mulch binder consisting of a polymer synthetic resin, polypectate or other material which gives similar properties as asphalt emulsion in tacking mulch.

2.06 GEOTEXTILE FABRIC

A. Geotextile fabric shall be non-woven.

B. Geotextile fabric shall be Mirafi 140N. Comparable product may be approved by the Engineer.

2.07 CONCRETE BLOCK MAT

A. Concrete block mat shall be Flexamat Standard (manufactured by Motz Enterprises, Inc.). Comparable product may be approved by the Engineer.

B. Provide fastening or anchoring as recommended by the manufacturer for the site conditions.

PART 3–EXECUTION

3.01 COIR FABRIC AND STRAW MAT

A. Coir fabric/straw mat shall be installed in accordance with manufacturer's recommendations and detail in the Drawings.

B. Stakes shall be installed at a minimum rate of 1 per every 3 feet at the top and toe of each bank of the channel, with a minimum rate of 1 per every 6 feet at the midpoint of each bank.

C. In addition to wood stakes, excess rock from other construction activities (ODOT D or larger) shall be used along the toe of bank and all seams to assist with anchoring.

D. It is the Contractor's responsibility to use enough rock, wood stakes, or equivalent to ensure that the fabric does not become dislodged by large floods (which can be common in this stream/floodplain). Fabric that becomes dislodged (and the associated seed, mulch, soil, etc.) must be replaced by the Contractor to conform with the Drawings at no additional cost to Owner.

3.02 SILT FENCE

A. Silt fence shall be constructed in conformance with the criteria specified in Conservation Practice Standards Chapter 6, Section 6.3 Silt Fence.

B. Stakes for silt fencing shall be installed one every three (3) feet. Leave no gaps between.

C. Remove sediment from fencing if deposits reach half the fence height.

D. Maintain until lawn is established.

3.03 CONSTRUCTION ENTRANCES

A. Stone tracking pads shall be installed where shown and as detailed in the Drawings.

Maintenance of tracking pad shall be in accordance with the criteria in Conservation Practice Standards Chapter 7, Section 7.4-Construction Entrances.

B. Rock shall be a minimum 6-inch-thick layer of stone, placed over the entire length and width of the construction entrance, as shown in the Drawings.

C. Surface water must be prevented from passing through construction entrances. Flows shall be diverted away from construction entrances and conveyed under and around them such as with culverts.

D. When erodible materials accumulate on the surface of the construction entrance, additional stone shall be furnished, as needed to prevent tracking, at no additional cost to Owner.

E. Any sediment tracked onto a road shall be removed before the end of each day. Flushing sediment shall not be allowed.

3.04 MULCHING

A. Straw mulch shall be applied per Section 32 92 19 “Seed & Mulch” and the Construction Drawings.

3.05 GEOTEXTILE FABRIC

A. Geotextile fabric shall be installed in accordance with manufacturer’s recommendations.

B. The Contractor shall protect the fabric from exposure to the sun until installation. Fabric shall be covered with stone or soil immediately upon placement.

C. Fabric shall be installed on the bottom of the underdrain trench within the reservoir.

3.06 CONCRETE BLOCK MAT

A. Prior to installation, prepare the subgrade. Subgrade shall be smooth and free of all rocks, stones, sticks, roots, and other protrusions or debris that would result in an individual concrete block being raised more than ¾ inch above the adjoining blocks.

B. Seed the area in advance of mat installation. See Section 32 92 19 “Seed and Mulch”.

C. Concrete block mat shall be installed to the line and grade shown on the Drawings and in accordance with manufacturer’s recommendations.

D. Provide a minimum 18-in. deep concrete mat embedment toe trench at all edges exposed to concentrated flows. Recess exterior edges subject to sheet flow a minimum of 6 inches.

E. Install fastening or anchoring as recommended by the manufacturer.

END OF SECTION 31 25 00

SECTION 31 37 16

ROCK

PART 1–GENERAL

1.01 SUMMARY

A. The work in this section consists of furnishing and placing all media for the structures and temporary construction entrance.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 31 23 00 – Excavation, Fill, and Grading

C. Section 31 25 00 – Erosion and Sediment Control

D. Section 35 43 00 – Structures

1.03 REFERENCE STANDARDS

A. ASTM refers to American Society for Testing Materials (ASTM) specifications.

B. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Ohio Department of Transportation (ODOT) Construction and Materials Specifications (CMS), 2019 edition, including all issued supplemental specifications.

PART 2–PRODUCTS

2.01 ROCK

A. Rock shall be clean/washed and consistent with the sizing categories in the Construction Drawings per the sizing categories in the Standard Specifications.

B. All rock shall be composed of durable limestone or dolomite.

C. Particles shall meet soundness requirements of Section 703.19 from the Standard Specifications.

2.02 TEMPORARY CONSTRUCTION ENTRANCE ROCK

A. Stone for the temporary construction entrance shall be No. 2 stone per ASTM D448.

PART 3–EXECUTION

3.01 STRUCTURES

A. See Section 35 43 00 “Structures” for installation of rock within structures.

3.02 TEMPORARY CONSTRUCTION ENTRANCE ROCK

A. See Section 31 25 00 “Erosion and Sediment Control” for installation of temporary construction entrance(s).

END OF SECTION 31 37 16

SECTION 32 31 13

CHAINLINK FENCES AND GATES

PART 1–GENERAL

1.01 SUMMARY

A. The work in this section consists of furnishing and installing chain link fence and gates where indicated on the Drawings.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 03 30 00 − Cast-in-Place Concrete

1.03 QUALITY ASSURANCE

A. Erector Qualifications: Erector must be a firm experienced in the erection of fencing of the type specified.

B. Design Criteria: Comply with the standards of the Chain Link Fence Manufacturer's Institute for "Galvanized Steel Chain Link Fence Fabric" and Federal Specification RR-F-191 (latest revision), unless otherwise shown or specified.

C. Source Quality Control: Provide each type of fence and gate as a complete unit produced by a single manufacturer, including necessary erection accessories, fittings and fastenings.

D. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified:

1. ASTM A53, Specification for Pipe, Steel, Black and Hot-Dipped Zinc-Coated (Galvanized) Welded and Seamless.

2. ASTM A121, Specification for Zinc-Coated (Galvanized) Steel Barbed Wire.

3. ASTM A153, Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.

4. ASTM A392, Specification for Zinc-Coated Steel Chain-Link Fence Fabric.

5. ASTM A491, Specification for Aluminum-Coated Steel Chain-Link Fence.

6. ASTM A585, Specification for Aluminum-Coated Steel Barbed Wire.

7. ASTM C33, Specification for Concrete Aggregates (Including Tentative Revision).

8. ASTM C150, Specification for Portland Cement.

9. Chain Link Fence Manufacturer's Institute, Galvanized Steel Chain- Link Fence Fabric.

10. Federal Specification, RR-F-191 (latest revision), Fencing, Wire and Post, Metal (Chain-Link Fence Fabric).

1.04 REGULATORY REQUIREMENTS

A. All fence construction shall comply with federal, state, and local fencing codes.

1.05 SUBMITTALS

A. Shop Drawings: Submit for approval the following:

1. Plan layout and details illustrating fence height, location and sizes of posts, rails, braces, gates, footings, operators, hardware list and erection procedures.

2. Copies of manufacturer's technical data test reports on physical properties, and installation instructions for steel fences and gates.

1.06 WARRANTY

A. Furnish manufacturer's written 10-year warranty against cracking and peeling of the vinyl coating and rusting or corrosion of the metal.

PART 2–PRODUCTS

2.01 CHAIN LINK FENCE AND GATES

A. All materials shall be provided for a 6-foot fence.

B. Framing: ASTM F1083, hot-dip galvanized, Schedule 40 steel pipe of the following sizes:

1. Line Posts: 2-½-inch O.D., 3.65 lb/ft., spaced per manufacturers' recommendations.

2. Corner, End, and Pull Posts: 3-inch O.D., 4 lb/ft.

3. Top and Brace Rail: 1-5/8-inch O.D., 2.27 lb/ft.

4. Gate Frame: 2-inch O.D., 2.72 lb/ft.

5. Gate Posts: 6.625-inch O.D., 5.79 lb/ft.

C. Fabric: Zinc-coated 9-gage, steel wire; 2-inch diamond mesh; top selvage twisted tight; bottom selvage knuckle end closed.

1. Zinc-coated: ASTM A392 Class 2; applied by hot-dip process at 2.0 ounces per square foot after weaving fabric.

D. Fittings:

1. General: Comply with ASTM F626.

2. Finish:

   a. Metallic Coating for Pressed Steel or Cast Iron: Not less than 1.2 oz./sq. ft. zinc.

   b. Aluminum: Mill finish.

E. Accessories:

1. Tension Wire: Marcelled 7-gage metallic coated steel wire; ASTM A824 Type I aluminum coated, or Type II zinc coated Class 2.

2. Tension and Brace Bands: 12-gage pressed steel, hot-dip galvanized, 3/4 inch wide.

3. Tension Bars: Steel strip, minimum 3/16 inch thick by 3/4 inch wide, hot-dip galvanized.

4. Tie Wires: 9-gage round wire of aluminum alloy 1350-H19.

5. Post Caps: Pressed steel or cast iron, hot-dip galvanized; designed to fit snugly over post and exclude moisture from inside.

6. Fasteners: Galvanized carriage bolts with nuts.

7. Base Flanges: Manufacturers standard galvanized base flanges for installation on retaining wall.

F. Gate Hardware:

1. Swing Gates:

   a. Hinges: Structurally capable of supporting gate leaf and allow opening and closing without binding. Permit gate to swing 180 degrees inward or outward.

   b. Single Gate Latch: Forked type, capable of retaining gate in closed position and have provision for padlock. Capable of operation from either side of gate.

   c. Double Gate Latch: Provide drop rod to hold inactive gate leaf. Provide locking device and padlock eyes as an integral part of latch.

   d. Keeper: Provide a keeper for each gate leaf over 5’-0”, consisting of mechanical device for securing free end of gate when in full open position.

2. Cantilever Slide Gates:

   a. System: Provided gate shall be a complete system from a single manufacturer consisting of pre-manufactured frame, track, rollers, brackets, gate stops and lockable latch.

   b. Framing: Cantilever gate framing shall be manufactured from ASTM B221 Aluminum, except as approved by Engineer.

c. Posts: Posts shall be of a size recommended by system manufacture and meet the material requirements of parts 2.01.A and 2.01.B above.

d. Operation: Cantilever gate system shall be designed for manual operation.

2.02 CONCRETE FOUNDATIONS

A. Fence Posts and Center Drop: Class F concrete; follow Section 03 30 00 “Cast-in-Place Concrete”.

PART 3–EXECUTION

3.01 INSTALLATION

A. Install framework, wire fabric, accessories, and gates in accordance with manufacturer’s instructions.

B. Place wire fabric on outside of posts and rails.

C. Set intermediate, terminal, gate, and line posts plumb, in concrete footings with top of footing 1 inch above finish grade, or as shown on Drawings. Slope top of concrete for water runoff.

D. Line Post Footing Depth Below Finish Grade: 3 feet.

E. Corner, Gate and Terminal Post Footing Depth Below Finish Grade: 3 feet.

F. Brace each gate and corner post to adjacent line post with horizontal center brace rail and diagonal truss rods. Install brace rail one bay from end and gate posts.

G. Provide top rail through line post tops and splice with 6-inch-long rail sleeves.

H. Install center and bottom brace rail on corner gate leaves.

I. Do not stretch wire fabric until concrete foundation has cured 28 days.

J. Stretch wire fabric between terminal posts or at intervals of 100 feet maximum, whichever is less.

K. Position bottom of fabric 1 inch above finished grade.

L. Fasten wire fabric to top rail, line posts, braces, and bottom tension wire with tie wire at maximum 15 inches on centers.

M. Attach fabric to end, corner, and gate posts with tension bars and tension bar clips.

N. Install bottom tension wire stretched taut between terminal posts.

O. Install gate with fabric to match fence. Install gate hardware.

P. Provide concrete center drop to footing depth and drop rod retainers at center of double gate openings.

3.02 ERECTION TOLERANCES

A. Maximum variation from plumb: ¼ inch

B. Maximum offset from true position: 1 inch

C. Components shall not infringe adjacent property lines.

END OF SECTION 32 31 13

SECTION 32 92 00

LIVE STAKES

PART 1–GENERAL

1.01 SUMMARY

A. The work to be performed under this section consists of furnishing all labor, materials, and equipment necessary to harvest and plant live stakes in conjunction with the project and other incidental items related to the work described herein.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 32 92 19 – Seed and Mulch

1.03 REQUIREMENTS FOR REGULATORY AGENCIES

A. The Contractor shall fully comply with all federal and state plant inspection requirements, fertilizer laws and other applicable laws and regulations.

1.04 REFERENCE STANDARDS

A. Scientific and common names for plants are generally in conformity with approved names given in Standardized Plant Names published by the American Joint Committee on Horticulture Nomenclature. Names of varieties not included in that reference are generally in conformity with names accepted in the nursery trade.

B. Quality as established by American Standard for Nursery Stock, AAN.

C. Operating procedures and other requirements by American National Standards Institute (ANSI).

1.05 SUBMITTALS

A. Qualification Data: For landscape installer qualifications in performing native landscape installations with a minimum of three (3) years' experience and provide proof of three (3) or more successful native landscape examples to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, photographs of completed projects, names and address of architects and owners, and other information specified. See paragraph 1.06 in this section for additional contractor requirements.

B. Planting Schedule: Indicating anticipated planting dates.

C. Maintenance Instructions: Recommended procedures to be established by the Contractor for maintenance of live stakes during the maintenance period. Submit before expiration of required maintenance periods.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: The submitting bidders shall be, and have been, actively and directly engaged in live stake installation for a period of three (3) or more years. Provide proof of three (3) or more successful live stake installations.

B. Installer's Field Supervision: Require Installer to maintain an experienced full-time supervisor on Project site when planting is in progress.

C. Pre-installation Conference: Conduct conference at Project site.

D. Post-installation Conference: Conduct conference at Project site with Owner, Maintenance Staff and Engineer.

E. Stakes that are damaged or desiccated, or do not meet the material specifications shall not be accepted. The Contractor shall remove all rejected material by the close of the working day.

1.07 SCHEDULING

A. Planting Restrictions: Coordinate planting periods with maintenance periods to provide required maintenance from date of Substantial Completion.

B. Live stakes should be installed during their dormancy period, unless otherwise approved by Owner or Engineer. Dormancy is typically the months of December, January, and February. Planting that occurs outside of the dormancy period shall be conducted at the Contractor's risk (refer to paragraph 3.07 in this section).

C. Basal end of live stakes shall be soaked in water for a minimum of 24 hours immediately after harvesting. Plant immediately after removing from water soaking buckets, ideally within two (2) days of harvesting, but no more than 10 days after harvesting.

PART 2–PRODUCTS

2.01 LIVE STAKES

A. Live stakes are defined as healthy, vigorous stock with a minimum diameter of 3/8 inches and minimum lengths of 24 inches (longer lengths may be necessary to reach wetted soil above ground water table). All planting materials shall be harvested onsite.

B. Live stakes shall be free of defects such as knots, sun-scald, or other injuries.

PART 3–EXECUTION

3.01 HARVESTING

A. Live stakes shall be ideally harvested one (1) to two (2) days prior to planting and immediately soaked in water for a minimum of 24 hours. If planting cannot occur within 48 hours of harvest, store harvested stakes with basal end soaked in water in refrigerated storage at thirty-four (34) to forty degrees Fahrenheit (40°F) with greater than ninety percent (90%) humidity.

B. Live stakes must be collected from on-site sources. The collection of plant material should occur in the reservoir in advance of construction in that location. Collection shall occur where grading is proposed.

C. Live stakes shall be straight branches or main stems, with a minimum of 3/8-inch diameter, although one to three inches (1-3") in diameter is preferred and a minimum length of 24 inches, although lengths up to four feet (4') is preferred. Cutting shall occur four to six inches (4- 6") above the ground using loping shears, hand or chain saw, or other method. Stakes shall have clean cuts and lateral branches removed with bark intact.

D. The basal end of the stake shall be cut at a forty-five-degree (45°) angle for easy insertion into the soil. The top of the stake shall be cut square to identify it and to allow a solid striking surface.

3.02 STORAGE

A. Live stakes shall be harvested no earlier than 10 days before planting and stored with basal end soaked in water in refrigerated storage at thirty-four to forty degrees Fahrenheit (34-40°F) with greater than ninety percent (90%) humidity.

B. Twenty-four (24) to forty-eight (48) hours prior to installation, the live stakes shall be soaked in clear water with the basal end of the stake in the water. If immediate planting cannot be performed, the basal end of the stake shall be kept in water and stored in a dark, refrigerated setting for a maximum of ten (10) days.

3.03 SITE PREPARATION AND EXAMINATION

A. Verify that the site is clean and free of debris. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Verify that erosion control fabric has been placed prior to installation of live stakes, if applicable.

C. In areas that shall also be planted with seed, prepare the site and seed per Section 32 92 19 "Seed and Mulch" prior to live stake installation.

3.04 GUIDE TO PLANTING

A. Live stakes shall be installed while in the dormant state unless otherwise approved by Owner.

Stakes that begin sprouting before installation shall be rejected. Installation of live stakes shall not occur while the ground is frozen, or when the temperature is forecasted to rise above ninety degrees Fahrenheit (90°F) within forty-eight (48) hours after installation.

B. A metal rod, tree planting dibble bar, pry bar, or other device, shall be used as needed to prepare a planting hole and allow for the installation of the live stake without damage to the bark and woody tissue. An iron bar or a stinger attached to a backhoe bucket can be used to make a pilot hole in firm or rocky soil. The pilot hole shall be less than the diameter of the stake to ensure firm contact between the stake and soil.

C. Live stakes shall be pushed into the soil by hand (preferred method) or tamped into the ground with a dead-blow hammer (where necessary). Care shall be taken not to split the stake during installation. Any stake that is split shall be removed and replaced.

D. Live stakes are to be installed through the erosion control fabric (if applicable).

E. Live stakes shall be installed such that four-fifths (4/5) of the length of the stake is in the ground, or until meeting solid resistance. Do not force or split the stake or scrape the bark off.

F. After the stake has been inserted to the final depth, the soil around the stake shall be compacted by foot to ensure that there is no gap between the soil and the stake.

G. Live stakes shall be installed at right (90 degree) angles to the bank beginning slightly above the normal water surface elevation and proceed up the bank. Stakes shall be installed parallel to the stream in staggered rows to create a triangular pattern. Stakes shall be installed at spacing and densities consistent with the number of planted stakes and optimized by the Contractor to maximize survivability.

3.05 CERTIFICATION OF LIVE STAKES

A. Live stakes are subject to inspection and possible rejection any time before, during or after planting until the final acceptance of the work.

3.06 MAINTENANCE OF PLANTING

A. The Contractor shall maintain all live stakes within the limits of the work in accordance with these specifications, and as directed by the Engineer, through the warranty period until final inspection and acceptance of the project by the Owner.

B. Maintenance through the warranty period shall include watering during dry periods as directed by the Engineer, weeding, cultivating, pruning, refertilization, application of anti-desiccant, and control of insects, fungus and other diseases by means of spraying with an approved insecticide or fungicide.

C. All weeds and invasive species shall be removed as often as required. Under no circumstances shall weeds be allowed to attain more than 6-inches of growth.

3.07 WARRANTY, GUARANTEE, AND REPLACEMENT

A. All work in this section shall be guaranteed against any and all defects in installation and materials appearing within a period of two (2) years after final completion and acceptance of the work by the Engineer. Survivability must be greater than 50%. Dead plant material in excess of 50% of all live staked material shall be quantified, doubled and replaced by the Contractor prior to the end of the warranty period without additional expense to the Owner.

B. At the end of the warranty period, inspection will be made by the Engineer upon written notice requesting such inspection submitted by the Contractor at least two (2) days before the anticipated date. Any plant required under this contract that is dead or not in satisfactory growth, as determined by the Engineer, shall be removed and replaced during the planting season.

C. All replacements shall be live stakes also harvested onsite from within the reservoir. They shall be furnished and planted as specified under planting; and cost shall be borne by the Contractor. The warranty for all original and replacement work shall be extended for two (2) years after replacement work is complete.

D. Final acceptance of this contract shall take place after replacement operation is satisfactorily completed and all live stakes are in a healthy growing condition.

3.08 CLEAN UP

A. The project areas shall be cleaned of foreign matter and placed in first-class condition immediately before the final acceptance of the work.

END OF SECTION 32 92 00

SECTION 32 92 19

SEED AND MULCH

PART 1–GENERAL

1.01 SUMMARY

A. The work to be performed under this section consists of furnishing all labor, materials, and equipment necessary to seed and mulch project areas and other incidental items related to the work described herein. Work provided in this section includes furnishing, handling, storing seed mixes, preparing the seedbed, planting selected seed mixes, and mulching seeded areas.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 31 10 00 – Site Preparation

C. Section 31 25 00 – Erosion and Sediment Control

1.03 REQUIREMENTS FOR REGULATORY AGENCIES

A. The Contractor shall fully comply with all federal and state plant inspection requirements, fertilizer laws and other applicable laws and regulations.

1.04 REFERENCE STANDARDS

A. Scientific and common names for seeds are generally in conformity with approved names published by the American Joint Committee of Horticulture Nomenclature.

B. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Ohio Department of Transportation (ODOT) Construction and Materials Specifications (CMS), 2019 edition, including all issued supplemental specifications.

1.05 SUBMITTALS

A. Certification of Native Seed: From seed vendor for each seed mixture stating the botanical and common name and percentage by weight of each species and variety, and percentage of purity, germination, and weed seed. Include the year of production and date of packaging.

B. Delivery slips as verification of materials delivered.

C. Qualification Data: For landscape installer qualifications, see paragraph 1.06 of this section.

D. Planting Schedule: Indicating anticipated planting dates for each type of planting.

E. Maintenance Instructions and Schedule: Recommended procedures to be established by the Contractor for maintenance of seeded areas during the maintenance period. Submit before

expiration of required maintenance periods.

F. Product data sheets of specified materials in Part 2 – Products.

1.06 QUALITY ASSURANCE

A. Installer Qualifications: The submitting bidders shall be, and have been, actively and directly engaged in native seed and mulch installation for a period of three (3) or more years. Provide proof of three (3) or more successful native seed and mulch installations.

B. Installer's Field Supervision: Require installer to maintain an experienced full-time supervisor on the project site when seeding is in progress.

PART 2–PRODUCTS

2.01 NATIVE SEED MIXES

A. Native seed mixes shown on the Drawings shall be by a preapproved supplier:

1. Cardno Native Plant Nursey – 128 Sunset Drive, Walkerton, IN 46574; (574) 586-2412)

2. Ernst Conservation Seeds – 9006 Mercer Pike, Meadville, PA 16335; (800) 873-3321

3. Ohio Prairie Nursery – 11961 Alpha Road, Hiram, OH 44234; (330) 569-3380

4. Roundstone Native Seed Company – 9764 Raider Hollow Road, Upton, KY 42784 (888) 531-2353

5. Spence Restoration Nursery, Inc. – P.O. Box 546, 2220 E. Fuson Road, Muncie, IN 47308; (765) 286-7154

B. Different seed suppliers than that specified may be used, per Owner's Representative's approval.

C. Different seed mixtures than that specified may be placed, per Owner's Representative's approval.

D. All seed shall be clean and free of pods, husks, and weed seeds, with an approved pure live seed (PLS) rating, available from the supplier. Pure live seed is a measure of viable seed stated as a percentage. It is the product of total germination times purity. (Example: 96% Germination x 93% Purity = 89% PLS).

E. Rate as per supplier's recommendation. All native seed must be pure live seed of wild ecotype. No hybrids, cultivars, or selections may be included. Locally adapted seed is preferred due to its adaptation to local soil and climate. These requirements do not apply to the temporary seed

mix. Seed mixes must be delivered in original sealed, labeled, and undamaged containers.

F. Bulking agents, used to assist with broadcasting and even distribution of the seed, shall consist of sand, vermiculite, or perlite. Any substitutions will require prior written approval from the Owner's Representative.

2.02 LAWN SEED MIX

A. Existing lawn areas outside the areas of native seed zones damaged by construction activities shall be replaced with a lawn seed mix specified by the Owner, unless otherwise directed by the Owner.

2.03 MULCH

A. Material shall be straw as specified in Section 659.14 from the Standard Specifications and used only to deter the growth of weeds.

B. Binder shall be chemical mulch binder consisting of a polymer synthetic resin, polypectate or other material which gives similar properties as asphalt emulsion in tacking mulch.

2.04 FERTILIZER

A. Fertilizers shall be composite commercial type and shall bear manufacturer's guaranteed statement of analysis. A minimum of 35% of the total nitrogen content shall be guaranteed to be water insoluble nitrogen.

Fertilizer Type	Nitrogen	Phosphorus	Potash
Type 1 Basic Fertilizer	12	12	12
Type 2 Slow Release Fertilizer	31	3	10

B. The rate of application to be used shall be based on results of laboratory tests conducted by the Contractor after final grading is completed.

2.05 TEMPORARY SEED MIX

A. The temporary seed mix for the wetland, reservoir, and soil wasting areas shall be per the Drawings, or comparable product as approved by Owner.

B. The temporary seed mix for the berm area shall be ReGreen by Rainier Seeds at a rate included on the Drawings, or comparable product as approved by Owner.

C. Seed must be delivered in original sealed, labeled, and undamaged containers.

PART 3–EXECUTION

3.01 SHIPPING AND STORAGE

A. Seed shall be kept in its original container with an intact and legible label listing the species, composition, and weight. Seed shall be stored in a secure location, protected from damage by rodents or insects. Seed shall be kept away from moisture, heat, and direct sunlight, until planted.

3.02 SEEDBED PREPARATION

A. The planting surface shall be prepared prior to seeding. Rocks, stumps, branches, trash, and debris greater than 2 inches in size shall be removed. The soil surface shall be scarified and broken down into a fine-particle seedbed to a depth of 3 inches.

B. Topsoil shall be spread per paragraph 3.05 in Section 31 00 00 “Site Preparation”.

3.03 NATIVE SEED AND MULCH

A. Install seed in accordance with Seed Supplier’s instructions.

B. Seed installation can be completed by one of the following methods: Hand-Broadcasting, Broadcast Spreader, or Seed Drill. Additional methods may be utilized, as approved by the Engineer or Owner.

1. Hand-Broadcasting
    a. The seed may be hand-broadcast, using a bulking agent. Place two parts bulking agent with one-part seed in a clean, dry bucket. Thoroughly mix sand and seed. Hand-broadcast sand/seed mixture across the seeding area. Apply half the sand/seed mixture over the entire area. Apply the second half over the same area utilizing the same procedure. This method will prevent using all seed before the entire area is covered.
    b. After seeding, the seed shall be raked into the soil surface to an average depth of 0.25 inches. The seedbed shall be rolled with a weighted roller to ensure good soil to seed contact. Raking and rolling operations should be carried out perpendicular to the slope. Seeded areas shall be promptly covered with straw mulch.

2. Seed Drill - If using seed drill, ensure the drill is properly calibrated to sow the specified amount of seed over the specified area. Ensure complete coverage of the specified area. Calibrate drill at 1/3 seeding rate and make three passes at 40 degrees from the previous to lessen row effect.
    a. Seeds should be placed 1/4 to 1/2-inch deep to maintain good moisture during germination.

b. Do not mix fine easily flowing seed with fluffy seeds in drill.

C. Seeding operations shall not occur if the ground is wet or muddy. If adult human footprints placed in the seedbed average more than ½-inch deep, then the seedbed must be cultipacked or rolled to create a firmer surface.

D. Install straw mulch over seeded areas per Drawings. Straw mulch seeded areas at the rate of 2 tons per acre from March 15 to October 30 and a rate of 3 tons per acre from October 31 to March 14. Take precautions to stabilize the mulch using chemical binder mulch as recommended by the manufacturer. Mulch within 48 hours of seeding. Hydro mulch shall be applied at the manufacturer's recommended rate.

E. For areas to be protected with erosion control mat, install matting per Section 31 25 00 "Erosion and Sediment Control" and the Construction Drawings.

F. The Contractor shall water all seeded areas within 24 hours of installation. The Contractor shall continue to maintain all seeded areas until final acceptance. Any damage caused to seeded areas during execution of this work shall be repaired by, and at the expense of, the Contractor.

G. Areas disturbed outside the limits of work shall be seeded at the Contractor's own expense with a seed mix similar to existing.

3.04 MAINTENANCE OF SEEDED AREAS

A. The Contractor shall maintain all seeded areas until final acceptance. Any damage caused to seeded areas during execution of this work shall be repaired by, and at the expense of, the Contractor. Maintain seeded areas by watering and replanting as necessary to establish a uniformly dense stand of specified herbaceous cover, and until accepted. The Contractor shall provide water for maintenance activities.

B. Scattered bare spots, smaller than one square foot will be allowed up to five (5%) percent of the seeded areas.

C. Any areas failing to establish a stand shall be reseeded, re-fertilized and re-mulched as directed by the Owner or Engineer at no additional cost to the Owner. Reseeding shall conform in all respects to these specifications.

D. The Contractor shall repair any damage to the work areas resulting from erosion and/or equipment. No additional payment shall be allowed for erosion and/or equipment maintenance. The Contractor shall repair damage, including regrading, reseeding, etc. as necessary, before significant damage occurs.

E. Type 2 Fertilizer shall be applied as specified in paragraph 2.04 of this Section.

3.05 WARRANTY, GUARANTEE, AND REPLACEMENT

A. All work in this section shall be guaranteed against any and all defects in installation and

materials appearing within a period of two (2) years after final completion and acceptance of the work by the Owner's Representative. Scattered bare spots will be allowed in up to five percent (5%) of the seeded areas. Areas in excess of 5% of all planted area shall be replaced by the Contractor prior to the end of the warranty period without additional expense to the Owner.

B. All replacements shall be seed mix(es) of the same kind as specified in the plant list. They shall be furnished and planted as specified under planting; and cost shall be borne by the Contractor.

C. Final acceptance of this contract shall take place after replacement operation is satisfactorily completed and all seed is in a healthy growing condition.

END OF SECTION 32 92 19

SECTION 33 05 06

PIPE TESTING

PART 1–GENERAL

1.01 SUMMARY

A. The work in this section consists of providing all labor, materials, equipment and incidentals as shown, specified and required to carry out testing of all sewer and water lines, force mains, trunk lines, laterals and service connections as directed by the Engineer.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 31 23 00 – Excavation, Fill, and Grading

C. Section 33 31 00 – Sewer Pipe

1.03 REFERENCE STANDARDS

A. ASTM refers to American Society for Testing Materials (ASTM) specifications.

1.04 QUALITY ASSURANCE

A. Reference Standards: Comply with applicable provisions and recommendations of the following, except as otherwise shown or specified.

1. ASTM C76, Standard Specification for Reinforced Concrete Culvert, Storm Drain and Sewer Pipe.

2. ASTM C361, Standard Specification for Reinforced Concrete Low-Head Pressure Pipe.

3. ASTM C828, Standard Test Method for Low-Pressure Air Test of Vitrified Clay Pipe Lines.

B. Inspection: All tests and procedures shall be performed in the presence of the Engineer. Document test procedures and results and provide a copy to the Engineer using an approved format.

1.05 SUBMITTALS

A. Submit copies of test procedures documentation format and testing schedule to be used.

B. Submit details of repair method for failed test sections of sewer. Include manufacturer's literature for clamps, sleeves or couplings to be used.

PART 2–PRODUCTS

NOT USED

PART 3–EXECUTION

3.01 TESTING OF PIPING

A. General:

1. Test all piping except as otherwise authorized by Engineer.
2. Notify Engineer 48 hours in advance of testing.
3. Provide all testing apparatus, including pumps, hoses, gages, and fittings.
4. Unless otherwise noted, the duration of tests shall be as noted in this section.
5. Repair and retest pipelines which fail to hold specified test pressure, or which exceed the allowable leakage rate, per paragraph 3.02 of this section.
6. Unless otherwise specified, test pressures required are at the lowest elevation of the pipeline section being tested.
7. Conduct all tests in the presence of Engineer.
8. Advise local authorities having jurisdiction if their presence is required during testing.
9. Clean pipeline prior to beginning test.
10. The Contractor shall furnish test plugs, test gages, stop watches, weirs, air compressors, and personnel and all required miscellaneous equipment to complete the test in a manner acceptable to Engineer.
    a. The Contractor shall provide certification of calibration of all gauges, watches and other similar devices when requested by the Engineer.
    b. The Contractor shall provide weirs for Infiltration Test leakage measurement in good condition and acceptable to the Engineer. The Contractor shall provide certification of calibration of weir when requested by the Engineer.
11. During sewer construction all service laterals, stubs, and fittings into the sewer test section shall be properly capped or plugged so as not to allow for air or fluid loss that could cause an erroneous test result.
12. Gravity service lines shall be tested as part of the main line leakage test.

B. Schedule of Pipeline Tests:

1. The Engineer will notify the Contractor in writing of the test pressure to be used.

C. Hydrostatic Pressure Test:

1. Complete backfill and compaction at least to the pipe centerline before testing, unless otherwise required or approved by the Engineer.

2. The Contractor is responsible for all labor and material required to restrain pipe during all testing procedures. Note that restrained joint systems that do not use thrust blocks for joint restraint must be compacted and backfilled as specified to full depth or use temporary blocking during pipe testing.

3. Allow concrete for thrust blocks (if allowed) to reach design strength before testing.

4. Fill section to be tested slowly with water and expel all air. Install corporation stops, if necessary, to remove all air.

5. Test:

    a. Water Main and Sanitary Force Main: Between consecutive valves, bulkheads or 2000 lineal feet of pipe whichever is less.

6. Apply specified test pressure for two hours and observe pressure gage. Check carefully for leaks while test pressure is being maintained.

7. Leakage Test Procedure:

    a. Examine exposed pipe, joints, fittings and valves. Repair visible leakage or replace the defective pipe, fitting or valve prior to beginning test.

    b. Allow concrete pipe to remain full of water at least 12 hours prior to starting leakage test.

    c. Refill the line under test to reach the required test pressure.

    d. Provide a new clean test container filled with a known quantity of water at the start of the test. Attach the test pump suction to the test container.

    e. Pump water from the test container into the line with the test pump to hold the specified test pressure for the test period. Water remaining in the container shall be accurately measured and the amount used during the test shall be recorded on the test report.

    f. Perform all repair, replacement, and retesting required because of failure to meet testing requirements at no additional cost to the Owner.

8. Allowable Leakage Rates (gallons per hour per 1,000 feet per inch diameter):

    a. Ductile Iron Pipe (Push-On or Mechanical Joints), PVC: 0.1.

    b. Concrete, Prestressed Cylinder: 0.2.

    c. Copper, HDPE: None.

9. All visible leaks shall be repaired by the Contractor even if the amount of leakage is within the allowable amount.

10. The Contractor shall submit description of test procedures and equipment to the Engineer for approval.

D. Hydrostatic Exfiltration Test:

1. Plug and bulkhead the section of pipe to be tested at both ends and admit water until the pipe is full.

2. Bring water level to a height of not less than 4 feet above the exterior crown of pipe (or 4 feet above the exterior groundwater level whichever is greater) at the upstream end.

3. Measure leakage from the pipe through drop in water surface in a manhole or other column used to maintain pressure, provided the part of the riser above the sewer where the water level is monitored is not less than 6 inches in diameter.

4. Duration of test shall not be less than one (1) hour.

5. See Allowable Leakage Table at the end of this section. The tables are based on measuring pipe leakage using the water level drop in the manhole itself.

6. All visible leaks shall be repaired by the Contractor even if the amount of leakage is within the allowable amount.

E. Infiltration Test:

1. The Engineer will establish when an infiltration test will be required. The infiltration test generally will be conducted on the portion of the sewage collection system where the ground water table is above the elevation of the sanitary sewer.

2. The infiltration test shall be made by installing a weir or other measuring device approved by the Engineer in the lower end of the sewer section to be tested.

3. The incoming sewer or sewers in the upper end of the test section shall be securely sealed.

4. The quantity of ground water infiltrating into the test section shall be measured.

5. The allowable leakage for sanitary sewers shall not exceed fifty (50) gallons per day per mile of pipe per inch of sewer diameter.

F. Air Test for Section 33 31 00 “Sewer Pipe” for Concrete Pipe (If allowed by Engineer):

1. The minimum time duration allowed for a pressure drop between two (2) consecutive manholes shall not be less than that shown in the table at the end of this Section.

2. Introduce air to the section to be tested until the air stabilizes between 4.0 and 3.5 psi greater than the average groundwater back pressure.

3. Duration of test is specified in the table at the end of the Section and is determined by the pipe diameter and length of span.

4. The pressure drop shall not exceed 1.0 psi during the duration of the test.

5. If the groundwater is above the sewer line being tested, the initial air test pressure shall be increased 0.433 psi for each foot the groundwater is above the invert of the pipe.

G. The Contractor or developer shall be responsible for the cleaning of the new sanitary sewers and any existing sanitary sewers where debris has been deposited as a result of the Contractor's Work. The Engineer shall witness the cleaning. Upon notification by the Contractor that the lines are ready for internal inspection, the Engineer shall televise and videotape the sanitary sewers. Any defects or unsatisfactory conditions discovered and resulting from the Contractor's Work shall be remedied by the Contractor.

3.02 REPAIR OF FAILED PIPE SECTIONS

A. Failed Pressure, Exfiltration, Infiltration, Air or Mandrel Test Pipe Repair:

1. The Contractor shall remove and replace, at no extra cost to the Owner, all sections of pipe which fail any of the tests specified in this section in accordance with the following procedures:

a. Excavate failed sections of pipe in accordance with Sections 31 23 00 "Excavation, Fill, and Grading" and 33 31 00 "Sewer Pipe" of these specifications.

b. Cut out and remove failed sections and relay new pipe beginning at nearest joint.

c. Close pipe at upstream end of replaced sections with an approved closure coupling or "Fernco", rubber coupling with 300 series stainless steel shear ring or equal. Two couplings may be required if pipe section is not replaced beginning at an existing pipe joint. Follow coupling manufacturer's recommendations for installation procedures.

d. The Contractor shall retest the repaired section for leakage and deflection, if applicable, 30 days or more after completion of the repair.

2. The Contractor shall provide all materials, labor and equipment necessary to repair the failed test section in accordance with methods approved under Section 1.05 of these specifications.

3. If allowed in writing by Engineer, concrete pipe may be repaired by pressure injection of the following:

a. Avanti AV-202 Flexible Grout.

AIR TEST FOR CONCRETE PIPE (SECTION 33 31 00)

MINIMUM SPECIFIED TIME REQUIRED FOR A 1.0 PSIG PRESSURE DROP

FOR SIZE AND LENGTH OF PIPE INDICATED **AIR TEST FOR SECTION 33 31 00 - SEWER PIPE**								
DIAM. (in)	**100**	**150**	**200**	**250**	**300**	**350**	**400**	**450**
12	1:48	2:42	3:36	4:30	5:24	6:18	7:12	8:06
15	2:06	3:09	4:12	5:15	6:18	7:21	8:24	9:27
18	2:24	3:36	4:48	6:00	7:12	8:24	9:36	10:48
21	3:00	4:30	6:00	7:30	9:00	10:30	12:00	13:30
24	3:36	5:24	7:12	9:00	10:48	12:36	14:24	16:12
30	4:48	7:12	9:36	12:00	14:24	16:48	19:12	21:36
36	6:00	9:00	12:00	15:00	18:00	21:00	24:00	27:00

The pressure test and time table above are based on ASTM Specification C924.

Minimum Required Test Time in Minutes:Seconds for Pressure Drop of 1.0 psig for Pipe Length L (feet)

END OF SECTION 33 05 06

SECTION 33 05 07

JACKING AND BORING

PART 1–GENERAL

1.01 SUMMARY

A. The work in this section consists of providing all labor, materials, equipment, supervision, and incidentals required to excavate, dewater, protect existing structures, and furnish and install casing pipe as shown on the Drawings and as specified. Also included is the provision of pipe support structures, grout, construction bulkheads, disposal of waste material and the installation of the water carrier pipe.

B. The Contractor shall provide all temporary means needed to prevent discharge of sediment to drainage courses or structures from dewatering systems or due to construction operations.

C. No classification of excavated or tunneled material will be made. Excavation and tunneling includes all materials regardless of type, character, composition, moisture, or condition thereof.

D. Installation of casing pipes shall be performed by the boring and jacking method unless culverts are installed via excavation.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 31 23 00 – Excavation, Trenching and Backfill

C. Section 33 05 06 – Pipe Testing

D. Section 33 31 00 – Sewer Pipe

E. Section 33 39 00 – Sewer Appurtenances

1.03 QUALITY ASSURANCE

A. Manufacturer Qualifications: Provide steel casing pipe or steel liner plates and accessories manufactured by a single firm specializing in the production of this Work and complying with all applicable standards of AASHTO.

B. Installer shall be a specialist in the installation of casing pipes by jacking or boring and shall have at least five years′ experience in this specialty. Installer shall have satisfactorily constructed completely in Installer's own name, during the past five years, not less than ten similar installations which are comparable in diameter and length to that shown and specified herein or as approved by the Engineer.

C. Installer shall use only personnel thoroughly trained and experienced in the skills required. The field supervisor of the operations and any machine operator shall have not less than 12 months

experience in the operations of the equipment being used.

D. Welds shall be made only by welders, tackers and welding operators who have been previously qualified by tests as prescribed by the Structural Welding Society to perform the type of work required. Installer shall show proof of certification when requested by the Owner's Representative.

E. Comply with applicable provisions and recommendations of the latest editions of the following, except where otherwise shown or specified:

1. AREA Chapter 1, Part 4, "Jacking Culvert Pipe through Fills."
2. AREA Chapter 1, Part 5, "Specification for Pipelines Conveying Non-Flammable Substances."
3. ASTM A53/A53M, Specification for Pipe, Steel Black and Hot-Dipped, Zinc Coated, Welded and Seamless.
4. ASTM A139/A139M, Grade B; ASTM A 252, Grade 2 for Welded and Seamless Steel Pipe Piles.
5. ASTM A153/A153M, Zinc-Coating (Hot Dip) on Iron and Steel Hardware.
6. ASTM A307, Standard Specification for Carbon Steel Bolts, Studs, and Threaded Rod 60 000 PSI Tensile Strength
7. ASTM A1011/A1011M, Standard Specification for Steel, Sheet and Strip, Hot-Rolled, Carbon, Structural, High-Strength Low-Alloy, High Strength Low-Alloy with Improved Formability, and Ultra-High Strength
8. ASTM C109/C109, Compressive Strength of Hydraulic Cement Mortars (using 2-in. or 50 mm. Cube Specimens).
9. ASTM C150/C150M, Portland Cement.
10. AWWA C206, Field Welding of Steel Water Pipe.

1.04 REFERENCES

A. AASHTO refers to American Association of State Highway and Transportation Officials (AASHTO).

B. AREA refers to American Railway Engineering Association (AREA) specifications.

C. ASTM refers to American Society for Testing Materials (ASTM) specifications.

D. AWWA refers to American Water Works Association (AWWA) specifications.

E. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Ohio Department of Transportation (ODOT) Construction and Materials Specifications (CMS), 2019 edition, including all issued supplemental specifications.

1.05 DESIGN CRITERIA

A. The tunnel casing pipe shall provide strength commensurate for the tunnel diameter, depth of cover and all loads imposed during construction and the service life in accordance with the design requirements of AASHTO and AREA.

B. The casing pipe and carrier pipe shall be installed in conformity with the line and grade shown on the Drawings.

C. The Contractor shall be wholly responsible for designing, installing and operating the jacking and boring system the Contractor selects as is necessary to satisfactorily accomplish all operations.

D. Tolerances:

1. The casing pipes shall be installed on the lines and grades shown on the Drawings and within tolerances required to allow the pipe to be installed in accordance with the lines and grades shown on the Plans.

2. Allowable vertical tolerance is 0.06 ft ±.

3. Allowable horizontal tolerance is 0.50 ft ±.

4. No adverse slopes are allowed.

1.06 SUBMITTALS

A. Within 30 days of Notice to Proceed submit for approval the following:

1. Method of installation and evidence of the Contractor's experience in jack and bore.

2. Drawings and details showing the casing pipe proposed. Drawings shall give location of grout holes and all pertinent design criteria.

3. Calculations demonstrating that the casing pipe provides adequate strength commensurate with the dead load, live load and depth of cover.

4. Casing pipe and carrier pipe installation procedure including equipment and manpower schedule.

5. Details of access or jacking pit, sheeting and bracing and analysis of soil capacity behind backstop to sustain maximum jacking load. All details and calculations shall be stamped by a professional engineer licensed in Ohio.

6. Description of tunneling, jacking or boring method; procedure; equipment; manpower schedule; design of leading-edge shield and method of directional control; bulkheading procedures and breasting jacks to support excavation face; and a certificate from manufacturer or professional engineer that casing pipe can withstand maximum jacking forces imposed, if applicable.

7. Grouting system including equipment, procedure, and schedule.

8. Dewatering system.

9. Protection methods.

10. During tunneling operation, submit daily reports indicating progress, line and grade of installed work.

B. Technical data, work schedules and any other information required by the authority having jurisdiction.

C. Certificates: Certificate of Conformance in accordance with paragraph 21.1 of ASTM A139/A139M.

D. Record Documents: During progress of the Work, keep an up-to-date set of Drawings showing field and Shop Drawing modifications. Submit record drawings at a scale satisfactory to the Engineer that show the actual in-place installation of casing pipe or tunnel liners and all piping installed under this Section. The drawings shall show all piping on plans and in sections and grouting details, with all reference dimensions and elevations required for complete record drawings of the Work. The record drawings shall be furnished not later than 30 days after Substantial Completion of the Work.

1.07 PRODUCT DELIVERY, STORAGE, AND HANDLING

A. Exercise special care during delivery not to damage the casing pipe and carrier pipe. Damaged materials will be rejected by the Engineer and replaced by the Contractor at his expense.

B. Deliver materials to such locations so as to avoid excessive handling.

C. Store casing pipe and carrier pipe on approved blocking for protection from corrosion until incorporation into the Work in accordance with manufacturer's recommendation.

D. Store in disturbed areas or in areas as approved by the Engineer. The Engineer shall be permitted access to inspect the materials in storage areas.

E. Handle materials in a manner so as to avoid damage. Materials damaged during handling shall be repaired or replaced as ordered by the Engineer.

1.08 JOB CONDITIONS

A. Existing Utilities: Locate existing underground utilities in the areas of Work. If utilities are to remain in place, provide adequate means of protection during tunneling operations. Should uncharted or incorrectly charted piping or other utilities be encountered during excavation, consult the Engineer immediately for directions as to procedure. Cooperate with Owner and owner of the utility service in keeping respective services and facilities in operation. Repair damaged utilities to satisfaction of utility owner.

B. Do not interrupt existing utilities serving facilities occupied and used by Owner or others,

except when permitted in writing by Engineer and then only after acceptable temporary utility services have been provided.

C. Protection: Guardrails, fences, signs, lights, barricades, barrels, and all other protective items necessary shall be provided in accordance with the requirements of all applicable permits, laws, regulations, and ordinances, and as necessary to prevent damage or injury to private or public property or to workers or the general public. Adequately support and protect structures, utilities, pavements and facilities that are encountered in, or may be affected by, the work from damage caused by settlement, lateral movement, undermining, washout and other hazards created by tunneling operations.

D. All excavations shall be sheeted, shored, and braced as required to prevent subsurface subsidence as specified in Section 31 23 00 "Excavation, Fill, and Grading".

E. Access and jacking pits shall be kept dewatered, and pumps shall be attended on a 24-hour basis if conditions so require. Close observation shall be maintained to detect any settlement or displacement of facilities during dewatering operations. Dewater into a sediment trap and comply with applicable environmental protection criteria.

F. Maintain the air in the excavation in a condition suitable for the health of workers at all times.

G. No subsurface information is available.

H. Use of explosives shall not be permitted.

1.09 GUARANTEE

A. Guarantee of work completed by the Contractor shall be as specified in the General Conditions of these specifications, except that longer periods may be required where noted in the permits or specified by applicable authorities.

PART 2–PRODUCTS

2.01 JACK AND BORE SYSTEM

A. The jack and bore system shall consist of, but not limited to, the following components:

1. Jacking system suitable for forcing the casing through the reservoir embankment/berm.

2. Auger boring and spoil removal system.

3. Pipe lubrication system.

B. The excavation equipment and system shall be fully capable of excavating and removing all material that will be encountered during the construction operations.

C. The automated spoil transportation system shall match the excavation rate to the rate of spoil

removal, maintaining settlement or heave.

D. The main jacking equipment installed shall have a capacity greater than the anticipated jacking load. The hydraulic cylinder extension rate shall be synchronized with the excavation rate of the boring, which shall be determined by the specific soils conditions.

E. A pipe lubrication system may be utilized when anticipated jacking forces on the pipe are expected to exceed the capacity of the main jacks or exceed the pipe design strength with the appropriate safety factor. A prior approved lubricant shall be injected at the rear of the auger, or boring machine and, if necessary, through the casing pipe walls to lower the friction developed on the surface of the pipe during jacking and thereby reduce the jacking forces

2.02 STEEL CASING PIPE

A. Casing pipe shall be steel pipe meeting the requirements of ASTM A139/A139M, Grade B, leakproof construction capable of withstanding Cooper E-80 loading. Pipe shall be seamless or have not more than one (1) longitudinal weld.

B. Minimum wall thickness shall be designed by the Contractor from design criteria specified in Paragraph 1.05 and any other applicable loads.

C. Unless shown otherwise on the Drawings, the inside diameter of casing pipe shall be selected by the Contractor and approved by the Engineer and shall be a minimum of 6 inches larger than the greatest outside dimension of the carrier pipe.

D. Casing pipe shall be furnished with plain ends, mill beveled for field butt welding. Field-welded joints shall be full penetration single-vee groove, butt type welds around the entire circumference of the pipe.

E. 1-1/2-inch or 2-inch holes shall be drilled with a maximum spacing of 15 feet on center alternating 30 degrees with a vertical plane through the casing pipe, before installation to check for voids after the casing pipe is installed. The holes shall be tapped for plugs. Plugs shall be furnished and installed by the Contractor.

2.03 CARRIER PIPE

A. The carrier pipe material, joint type, class, thickness, coating, finish, etc. shall be per Section 33 31 00 “Sewer Pipe”.

B. The carrier pipe shall be furnished with restrained joints throughout the casing pipe and 5 feet beyond each end.

2.04 CARRIER PIPE SPACES AND BLOCKS

A. Provide oak spacers strapped to pipe or spacers made from stainless steel, polyethylene, or precast nonmetallic composite/polypropylene with self-adhesive backing.

B. Spacers shall be installed a maximum of 8 feet center to center along the length of the casing

pipe, top and bottom.

C. Oak block spacers may be fabricated or provide spacers manufactured by one of the following:

1. Cascade Waterworks Mfg. Co.

2. Advanced Products and Systems, Inc.

3. Or equal.

D. Attach spacers to pipe with high strength steel bands or mechanically clamp to pipe with built-in clamping features of spacers.

2.05 GROUT

A. Grout for outside tunnel casing pipes: Use 1-part cement to approximately 3 parts sand. Adjust ratio as required to obtain 3,000 psi minimum strength.

B. Grout for inside tunnel casing pipes: Grout shall have a cementitious base with a maximum strength of 200 psi at 28 days and a minimum strength of 50 psi at 48 hours. Flowability shall be between 9 and 13 seconds when measured using a standard Marsh Cone. The Contractor shall submit a mix design for review and approval.

PART 3–EXECUTION

3.01 GENERAL

A. Installation of the pipes may be by jacking and boring and shall conform in all respects to the requirements contained herein and other applicable standards.

B. Lines and Grades: The Contractor is responsible for establishing and maintaining proper line and grade at each crossing.

1. The Contractor shall daily check line and grade to assure conformance with line and grade shown on the Drawings and within the tolerances indicated in this Section.

2. Work required because of the Contractor's failure to maintain the proper line and grade shall be performed by the Contractor at no additional cost to the Owner.

3. The Contractor shall submit daily reports, in a format approved by the Engineer, for recording progress and results of line and grade checks.

3.02 INSPECTION

A. Complete as required by the Engineer, Owner, or Regulatory Authority.

B. The Contractor will examine the areas and conditions under which tunneling is to be performed and notify the Engineer of conditions they may find that are detrimental to the proper and timely completion of the Work. Do not proceed with the Work until unsatisfactory conditions have

been corrected in an acceptable manner.

3.03 PREPARATION

A. Access pits at each end of the crossings shall be sufficiently large to permit satisfactory installation of the casing pipe. All excavation, backfill, sheeting, shoring, bracing, and dewatering shall comply with the applicable requirements of Section 31 23 00 "Excavation, Fill, and Grading", of these Specifications and the requirements of the applicable authorities.

B. The Contractor shall provide control points for the casing installation. The Contractor shall protect and safeguard such control points from damage or movement and utilize the control points to install the casing within the line and grade tolerance specified. As a minimum for vertical control, the Contractor shall set a vertical control benchmark and set points, PK nails or rebar at 25 feet spacing along the alignment, for daily settlement measurements.

3.04 INSTALLATION - GENERAL

A. Tunneling method shall be by boring or jacking a steel casing pipe.

B. Adequate methods of dewatering shall be provided to produce satisfactory and safe working conditions.

C. Stabilize soils at the excavation face using chemical grout or other approved means where necessary to advance the excavation without loss of ground.

D. Use bentonite slurry or other lubricant to facilitate jacking operation.

E. Installation of the carrier pipe shall be performed so as not to damage the pipe or joints.

F. Any pit necessary in the performance of the Work shall be located as approved by the Engineer and adequately sheeted and shored to protect the work, all persons and adjacent property.

3.05 INSTALLATION OF STEEL CASING PIPE BY JACKING

A. Install in accordance with current ODOT requirements and local authority requirements.

B. Design bracing and backstops and use jacks of sufficient rating such that jacking can be accomplished in a continuous manner until the leading edge of the pipe reaches the final positions shown on the Drawings.

C. If voids develop around the casing pipe as it is jacked, pump cement grout to fill all such voids, or fill by other means acceptable to the Engineer.

D. Fill all voids as specified hereafter as soon as possible after completion of jacking operation.

E. Provide casing pipe with a minimum yield strength of 35,000 PSI and in accordance with the Drawings.

3.06 INSTALLATION OF STEEL CASING PIPE BY BORING

A. The boring method shall consist of pushing the pipe into the fill with a boring auger rotating inside the pipe to remove the soil.

B. Provide the front of the casing pipe with suitable mechanical arrangements or devices that will positively prevent the auger and cutting head from leading the pipe so that there will be no unsupported excavation ahead of the pipe.

C. The equipment and mechanical arrangements or devices used to bore and remove the earth shall be removable from within the casing pipe in the event an obstruction is encountered.

D. The face of the cutting edge shall be arranged to provide reasonable obstruction to the free flow of soft or poor soil.

E. Do not use water or other liquids to facilitate casing emplacement or spoil removal.

F. If voids develop around the casing pipe as it is bored, pump cement grout to fill all such voids, or fill by others means acceptable to the Engineer.

G. Fill all voids as specified hereinafter as soon as possible after completion of boring operation.

H. Provide casing pipe with a minimum yield strength of 35,000 PSI and in accordance with the Drawings.

3.07 GROUTING

A. The following requirements apply to steel casing pipe installations:

1. Start at the lowest middle hole of each section to be grouted, grout holes above to remain open, and proceed upward progressively and, if possible, simultaneously on both sides of the casing or tunnel until all voids are completely filled with grout.

2. Provide grout holes in addition to those specified where directed by the Engineer to insure filling of all voids.

3. At any given location, grouting pressures shall not exceed one-half (1/2) PSI for each foot of overburden in earth.

4. Grouting shall be done as near the end of the tunnel as practicable and if required by Engineer, grout stops shall be placed behind the sections at or near the end of the tunnel to permit grouting to or near the end.

3.08 OBSTRUCTIONS

A. If an obstruction is encountered during installation stopping the forward action of the casing pipe, and it becomes evident that it is impossible to advance the pipe, the Contractor shall remove obstruction at the leading end of the casing pipe. No blasting shall be permitted.

3.09 INSTALLATION OF THE GRAVITY SEWER, FORCE MAIN, OR WATER MAIN CARRIER PIPE

A. After completion of the steel casing pipe, the carrier pipe shall be installed and pressure tested by an approved method. See Section 33 05 06 “Pipe Testing”.

B. Care shall be taken to prevent undue disturbance of the joints.

C. Pipe shall be laid to the line and grade shown on the Drawings.

D. The pipe shall be blocked in place using approved blocks or spacers at a maximum spacing of 8 feet center to center along the length of the casing pipe, top and bottom in accordance with the details at the end of this section.

E. The Contractor shall repair, replace or take whatever action is deemed necessary by the Engineer to correct all disturbed joints at no additional cost to the Owner.

3.10 BULKHEADS (CARRIER PIPE INSTALLATION ONLY)

A. After the carrier pipe is installed in the steel casing pipe and successfully pressure tested, construct brick and mortar bulkheads.

B. Prior to the installation of bulkheads, the carrier pipe shall be properly and sufficiently secured against flotation and against all movement which would disturb joints.

1. The Contractor shall be responsible for maintaining all joints.

2. The Contractor shall repair, replace, or take whatever action is deemed necessary by the Engineer to correct all disturbed joints at no additional expense to the Owner.

3. The annular space in the casing shall be filled with grout. Grout shall be pumped through a tremie pipe delivering grout material from the higher end of the casing to the face of the lower end bulkhead.

3.11 DISPOSAL

A. Dispose of by-products of operations in accordance with all applicable codes, regulations, ordinances, laws, etc. By-products shall be hauled off-site to final disposal on a daily basis.

END OF SECTION 33 05 07

SECTION 33 31 00

SEWER PIPE

PART 1–GENERAL

1.01 SUMMARY

A. The work in this section consists of furnishing pipe and fittings, complete with all jointing materials including, but not limited to, all necessary site preparation, excavation, dewatering, installation, connections to existing structures or pipe, sheeting, preparation of trench bottom, granular bedding and initial backfill, testing, disposal of waste material, dust, odor and noise control, signs and barricades, and clean up.

B. On the project, pipe may be laid using open cut or jack and bore methods. See Section 31 23 00 "Excavation, Fill, and Grading" and Section 33 05 07 "Jacking and Boring" for additional details.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 01 14 00 – Control of Work

C. Section 31 23 00 – Excavation, Fill and Grading

D. Section 33 05 07 – Jacking and Boring

E. Section 33 39 00 – Sewer Appurtenances

F. Section 35 43 00 – Structures

1.03 REFERENCES

A. ASTM refers to American Society for Testing Materials (ASTM) specifications.

B. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Ohio Department of Transportation (ODOT) Construction and Materials Specifications (CMS), 2019 edition, including all issued supplemental specifications.

1.04 REFERENCE STANDARDS

A. Concrete Pipe Handbook, American Concrete Pipe Association.

B. ASCE MOP No. 60, Gravity Sanitary Sewer Design and Construction

C. AWWA C606, Grooved and Shouldered Joints.

D. AWWA M23, PVC Pipe - Design and Installation.

1.05 SUBMITTALS

A. Shop Drawings: Submit for approval the following:

1. Laying schedules for all pipe.

2. Full details of piping, specials, manholes, joints, harnessing and thrust blocks (if allowed), and connections to existing piping, structures, equipment and appurtenances.

3. Manufacturer's recommended installation techniques, including manufacturer's recommended sealants, lubricants, etc.

B. Tests: Submit description of proposed testing methods, procedures and apparatus. Prepare and submit report for each test.

C. Certificates: Submit certificates of compliance with referenced standards.

1.06 TOLERANCES

A. Refer to Section 01 14 00 “Control of Work” for tolerances for related Work.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the site to ensure uninterrupted progress of the Work. Materials received from factory shall be in new, undamaged condition. Materials cracked, gouged, chipped, dented or otherwise damaged will not be acceptable and shall be removed from the site immediately.

B. Handle all pipe, fittings, specials and accessories carefully with approved handling devices. Do not drop or roll material off trucks. Do not otherwise drop, roll or skid piping. Materials cracked, gouged, chipped, dented or otherwise damaged will not be acceptable and shall be removed from the site immediately.

C. Unload pipe, fittings and specials opposite to or as close to the place where they are to be installed as is practical to avoid unnecessary handling. Keep pipe interiors completely free from dirt and foreign material.

D. Provide covered storage for all thermoplastic and ultraviolet sensitive piping and accessories.

E. All gaskets, seals and other resilient materials shall be stored in a protective environment in accordance with manufacturers' recommendations.

PART 2–PRODUCTS

2.01 GENERAL

A. General:

1. Pipe Marking:

a. Clearly mark each piece of pipe or fitting with a designation which conforms to

those shown on the laying schedule.

b. Cast or paint material, type and class designation on each piece of pipe or fitting 4 inches in diameter and larger.

c. Pipe and fittings smaller than 4 inches in diameter shall be clearly marked by manufacturer as to material, type and rating.

2.02 PIPE TRENCH AND BEDDING MATERIALS

A. If installed via open cut, pipe trench and bedding materials shall be provided as specified and shown in Section 31 23 00 "Excavation, Fill and Grading."

2.02 "REINFORCED CONCRETE PIPE"

B. Reinforced Concrete Pipe (RCP) shall be used for storm sewers and shall be in accordance with Section 706.02 of the Standard Specifications, Class IV with rubber gaskets. The gasket shall be installed as per the recommendations of the pipe and gasket manufacturer.

2.03 UNDERDRAIN

A. The underdrain shall be SDR 35 Polyvinyl chloride (PVC) pipe meeting the requirements of Section 707.41 of the Standard Specifications.

B. The underdrain system shall have a vertical, connecting standpipe to serve as a clean-out port as shown on the Drawings. The standpipe shall be rigid, non-perforated SDR 35 PVC pipe, in accordance with Items 605 and 707.45 of the Standard Specifications. Standpipe shall be covered with a removable watertight cap.

C. Perforated segments of underdrain shall be sized to prevent migration of the drain rock into the pipes. The total opening of all perforations combined shall be sufficient to allow the underdrain pipe to discharge at full capacity.

D. Each underdrain shall include a removable watertight cap.

2.04 PIPE TRENCH AND BEDDING MATERIALS

G. Pipe trench and bedding materials shall be provided as specified and shown in Section 31 23 00 "Excavation, Fill and Grading."

2.05 MISCELLANEOUS

A. Field-cut joints and connections to other piping material shall be made using Fernco "Flexible Couplings" or Mission "Eastern Standard Band-Seal Couplings" with stainless steel shear rings.

PART 3–EXECUTION

3.01 GENERAL

A. Pipe trench and bedding installation details shall be provided as specified and shown in Section 31 23 00 “Excavation, Fill and Grading.” Refer to Section 33 05 07 “Jacking and Boring” for additional details on alternative method of installation.

B. Install piping as shown, specified and as recommended by the manufacturer.

C. Request instructions from Engineer before proceeding if there is a conflict between the manufacturer's recommendations and the Drawings or Specifications.

D. All trench excavations shall be inspected by Engineer prior to laying pipe. Notify Engineer in advance of excavating, bedding and pipe laying operations.

E. Pipe, fittings, specials and accessories that are cracked, damaged or in poor condition or have damaged linings will be rejected.

F. All pipelines connecting to structures shall be provided with a flexible pipe joint connection within two (2) feet of the structure.

G. At all buried pipe terminations, laterals or other services, the Contractor shall provide a wood stake marker, 36" minimum above grade. Markers for water lines shall be painted blue, while markers for sewer lines shall be painted green.

H. Whenever pipe slope is greater than 20%, pipe material shall be Ductile Iron and shall be securely anchored to slope.

I. The Contractor shall comply with all safety standards, including but not limited to OSHA 29 CFR Part 1926, Subpart P.

3.02 BACKFILL AND BEDDING OF PIPE (IF INSTALLED VIA OPEN CUT)

A. Trench excavation, backfill, and bedding materials shall conform to the requirements of Section 31 23 00 “Excavation, Fill, and Grading”.

B. Where the existing trench bottom is deemed unsuitable by Engineer, remove and replace it with approved backfill.

C. Where pipe is installed in rock excavation, consult Engineer.

D. Excavate trenches below the pipe bottom by an amount shown and specified. Remove all loose and unsuitable material from the trench bottom.

E. Do not lay pipe until the Engineer approves the bedding condition. If a conflict exists obtain clarification from Engineer before proceeding.

F. No pipe shall be brought into position until the preceding length has been bedded and secured in its final position.

3.03 LAYING PIPE (IF INSTALLED VIA OPEN CUT)

A. If installation is by jack and bore, refer to Section 33 05 07 “Jacking and Boring”.

B. Conform to manufacturer's instructions and requirements of the standards listed, where applicable: Concrete Pipe: AWWA M9, Concrete Pipe Handbook.

C. Install all pipe accurately to line and grade shown unless otherwise approved by Engineer. Remove and relay pipes that are not laid correctly.

D. Slope piping uniformly between elevations shown.

E. Ensure that ground water level in trench is at least 6 inches below bottom of pipe before laying piping. Do not lay pipe in water. Maintain dry trench conditions until jointing and backfilling are complete.

F. Start laying pipe at lowest point and proceed towards the higher elevations, unless otherwise approved by Engineer.

G. Place bell and spigot pipe so that bells face the direction of laying, unless otherwise approved by Engineer.

H. Place concrete pipe containing elliptical reinforcement with the minor axis of the reinforcement in a vertical position.

I. Excavate around joints in bedding and lay pipe so that only the barrel receives bearing pressure from the trench bottom.

J. Deflections at joints shall not exceed 75 percent of the amount allowed by the pipe manufacturer unless specified in the joint deflection tables at the end of this Section.

K. Carefully examine all pipe, fittings and specials for cracks, damage or other defects while suspended above the trench before installation. Immediately remove defective materials from site.

L. Inspect interior of all pipe and fittings and completely clean all dirt, gravel, sand, debris or other foreign material from pipe interior before it is moved into the trench. Bell and spigot mating surfaces shall be thoroughly wire brushed and wiped clean and dry immediately before the pipe is laid.

M. Field cut pipe, where required, with a machine specially designed for cutting piping. Make cuts carefully, without damage to pipe or lining, and with a smooth end at right angles to the axis of pipe. Cut ends on push-on joint shall be tapered and sharp edges filed off smooth. Flame cutting will not be allowed.

N. Blocking under piping will not be permitted unless specifically approved by Engineer for special conditions. If permitted, conform to requirements of AWWA C600.

O. Touch up protective coatings in a satisfactory manner prior to backfilling.

P. Provide polyethylene encasement for ductile iron piping to prevent contact between the pipe

and surrounding bedding material and backfill when specifically required by the plans and specifications.

Q. The Contractor shall notify the Engineer in advance of backfilling operations schedule.

R. On steep slopes take measures acceptable to Engineer to prevent movement of the pipe during installation.

S. Thrust Restraint: During the installation of the pipe, thrust restraint systems shall be provided wherever required for thrust restraint.

T. Exercise care to avoid flotation when installing pipe in cast-in-place concrete.

U. Field welding for any purpose shall not be permitted unless approved by the Engineer.

3.04 UNDERDRAIN INSTALLATION

A. For the underdrain system, prepare bedding and backfill material at specified in Section 31 25 00 "Excavation, Fill, and Grading".

B. Mechanical joints shall be carefully assembled in accordance with the manufacturer's recommendations. If effective sealing is not obtained, the joint shall be disassembled, thoroughly cleaned, and reassembled. Over tightening of bolts to compensate for poor installation practice will not be acceptable.

3.05 CLEANING

A. Thoroughly clean all piping and flush prior to inspection in a manner approved by Engineer at no additional cost to Owner. Jet or mechanical cleaning shall be used as a minimum and flushing will not be allowed in gravity sewer pipes.

B. All piping shall be inspected by Contractor and Engineer from the inside using closed circuit television when pipe diameter limits direct inspection. All debris, dirt and foreign matter shall be removed. The Contractor shall provide all equipment necessary for inspection.

C. Remove dirt and debris from all joints and do not force dirt or debris into pipe joints during cleaning.

END OF SECTION 33 31 00

SECTION 33 39 00

SEWER APPURTENANCES

PART 1–GENERAL

1.01 SUMMARY

A. The work in this section consists of furnishing all labor, materials, equipment and incidentals necessary to provide all new structures where shown on the Drawings, and as specified herein, or otherwise required to complete the Work.

B. Appurtenance trenching, bedding, and backfilling are covered in Section 31 23 00 "Excavation, Fill and Grading".

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 02 41 00 – Demolition

C. Section 03 30 00 – Cast-In-Place Concrete

D. Section 31 23 00 – Excavation, Fill and Grading

1.03 REFERENCES

A. ASTM refers to American Society for Testing Materials (ASTM) specifications.

B. Standard Specifications: Unless otherwise indicated, Standard Specifications shall refer to the Ohio Department of Transportation Construction and Materials Specifications (CMS), 2019 edition, including all issued supplemental specifications.

1.04 SUBMITTALS

A. Shop drawings of sewer appurtenances shall be provided to Engineer prior to delivery to project site.

1.05 TOLERANCES

A. Refer to Section 01 14 00 "Control of Work" for tolerances for related Work.

PART 2–PRODUCTS

2.01 MATERIALS

A. Standard headwalls shall be in accordance with Clermont County Engineer's Office Standard Construction Drawings.

B. Trash rack shall be a hinged grate suitable for a 24-inch pipe, such as LPG-24 Hinged by Trashracks.com or equivalent approved by Engineer.

C. Check valve shall be CheckMate Inline Check Valve by Tideflex Technologies or equivalent approved by Engineer.

D. Steel restrictor plate shall have a minimum thickness of 3/16 inches.

E. Bolts used to fasten the steel restrictor plate to the headwall shall be 3-8/inch diameter stainless steel with 3/8-inch stainless steel drop-in expansion anchor.

PART 3–EXECUTION

3.01 INSPECTION

A. Precast concrete sections shall be inspected when delivered and all cracked or otherwise visibly defective units shall be rejected.

B. Refer to Section 03 30 00 "Cast-In-Place Concrete" for requirements on materials for poured structures.

3.02 STORM HEADWALL CONSTRUCTION

A. Construct storm headwalls in conformance of Item 602.03 of the Standard Specifications and Section 03 30 00 "Cast-In-Place Concrete".

3.03 TRASH RACK INSTALLATION

A. Install trash rack per manufacturer's specifications.

3.04 CHECK VALVE INSTALLATION

A. Install check valve per manufacturer's specifications.

B. The check valve shall function as intended after installed, including letting water into the reservoir when the stage of the East Fork Little Miami River exceeds the stage in the reservoir and forming a water-tight seal to prevent backflow out of the reservoir when the stage of the East Fork Little Miami River drops below the stage in the reservoir.

3.05 STAINLESS STEEL RESTRICTOR PLATE

A. Restrictor plate shall be attached to the headwall with a minimum of four (4) bolts. Bolts shall be embedded a minimum of 1-3/16 inches.

B. Attach the PVC underdrain with a water-tight seal.

END OF SECTION 33 39 00

SECTION 35 43 00

STRUCTURES

PART 1–GENERAL

1.01 SUMMARY

A. The work to be performed under this section consists of all labor, materials, equipment and incidentals required to install log vanes, anchored brush, brush piles, buried rock armoring, boulder toe, and bioengineered bank armoring as shown on the Drawings and as specified herein.

1.02 RELATED SECTIONS AND DIVISIONS

A. Applicable provisions of Division 1 shall govern work in this section.

B. Section 01 14 00 – Control of Work

C. Section 31 10 00 – Site Clearing

D. Section 31 23 00 – Excavation, Fill, and Grading

E. Section 31 37 16 – Rock

1.03 REQUIREMENTS FOR REGULATORY AGENCIES

A. The Contractor shall fully comply with all federal and state quarantines, requirements, laws, and regulations regarding the movement of wood and wood products.

1.04 TOLERANCES

A. Refer to Section 01 14 00 “Control of Work” for tolerances for related Work.

PART 2–PRODUCTS

2.01 LOGS

A. Logs for wood structures shall be harvested onsite as specified under Section 31 10 00 “Site Clearing”.

B. For log dimensions and diameters, refer to details in the Drawings.

C. For log vanes, root wads shall not be attached. For brush piles and anchored brush, root wads may or may not be attached.

D. For log vanes, all branches that are not the primary trunk shall be removed at a maximum of 6 inches from the tree trunk. For brush piles and anchored brush, some branches shall remain,

including a minimum of two (2) opposing branches extending at least five (5) feet from the tree trunk, although the majority shall be removed a maximum of 6 inches from the tree trunk.

E. Each log shall be free from large fractures or cracks, decay, and disease or pests.

2.02 BRUSH

A. Brush shall consist of woody material, including branches, root wads, and trunks of small dead trees/shrubs. Invasive species are not permitted.

B. It is assumed that brush/log collection shall occur from only the material cleared and grubbed for grading of the project. Harvesting of additional woody material is not anticipated. Brush/log collection shall not damage live trees or destabilize soils, slopes, or existing ground cover.

2.03 ROCK

A. Rock shall be as shown on the Drawings and as specified in Section 31 37 16 "Rock."

PART 3–EXECUTION

3.01 WATER CONTROL

A. Prior to commencing channel structure installation, the Contractor shall install water control measures as required to perform work in dry/low flow conditions. Water control measures shall include, but are not limited to, diversions, pumps, or other means necessary to divert surface water away from the work area and prevent excess discharge of suspended sediment to downstream waterways. The Contractor is responsible for investigating and familiarizing themselves with respect to all site conditions that may affect the work, including surface water, level of groundwater, and time of year the work is to be done. All requirements of Section 01 14 00 "Control of Work" shall apply.

3.02 LOG VANE INSTALLATION

A. Excavate for placement of log vane structure. All soft soils, organic material, and debris must be removed, and a firm foundation provided. Backfill over-excavations with native fill material or imported bedding material as specified or otherwise shown on the Drawings.

B. Each structure shall consist of only one (1) log, as indicated on the Drawings.

C. Center of log shall be placed in the center of the channel, with approximately one-third (1/3) of the log length buried into each channel bank, equally embedded in both banks. The log shall be buried such that the crest of the log is flush with the bed of the low-flow channel.

D. The logs shall be perpendicular to flow.

E. Compact soil around the log vane in a way that maintains flow in the low-flow channel

following connection to the East Fork Little Miami River. Fill void spaces with tightly packed smaller rock. Piping around the log vane shall result in reconstruction, re-compaction, or any other actions necessary to meet this performance.

F. The Contractor shall photographically document with scale (e.g., survey rod, measuring tape, etc.) installation was completed per the Drawings, including but not limited to, documentation of log dimensions and structure elevations. Elevations shown on Drawings shall be verified by the Contractor with a level or equivalent equipment and associated survey data.

3.03 ANCHORED BRUSH INSTALLATION

A. Brush/log installation shall not damage live trees.

B. Place brush for anchored brush structures in locations shown on the Drawings to meet the dimensions provided in the details.

C. Brush must be partially buried in the banks of the wetland. Brush shall be compacted into the wetland bed a minimum depth of 3 inches to minimize the risk of floating/dislodgement.

D. Cross logs shall be placed on top of the brush. The Contractor is responsible for anchoring the cross logs to prevent floating and dislodgment. The Contractor is encouraged to use strategic orientation, such as ramping the logs behind live trees, and is also permitted to use wood stakes, twine, and other organic materials for anchoring.

3.04 BRUSH PILE INSTALLATION

A. Brush/log installation shall not damage live trees.

B. Place brush piles in locations shown on the Drawings to meet the dimensions provided in the details.

C. Brush must be partially buried in the banks of the wetland. Brush shall be compacted into the wetland bed a minimum depth of 3 inches to minimize the risk of floating/dislodgement.

3.05 BURIED ROCK ARMORING INSTALLATION

A. Excavate for placement of rock armoring. All soft soils, organic material, and debris must be removed, and a firm foundation provided. Backfill over-excavations with native fill material.

B. Rock shall be placed to thicknesses, elevations and locations as shown on the Drawings and details.

C. Backfill void spaces with tightly packed smaller rock. The Contractor shall ensure mechanical connection on the individual stones such that all individual stones are in good contact with the adjacent stones and there are no loose members. This may include, but is not limited to, placement of stones in courses, compaction, and/or backfill with smaller stones. Hand placement may be necessary to fill in the cracks between larger stones.

D. The Contractor shall photographically document with scale (e.g., survey rod, measuring tape,

etc.) installation was completed per the Drawings, including but not limited to, documentation of rock dimensions, rock thicknesses, and structure dimensions.

3.06 BOULDER TOE INSTALLATION

A. Excavate as necessary for placement of rock. All soft soils, organic material, and debris must be removed, and a firm foundation provided. Backfill over-excavations with native fill material.

B. Rock shall be placed to thicknesses, elevations and locations as shown on the Drawings and details. At least two (2) layers of rock shall be placed in all locations, unless otherwise specified, meeting the minimum thicknesses in the Drawings. Rock shall be installed in lifts with a thickness of one (1) layer of rock.

C. Backfill void spaces with tightly packed smaller rock. The Contractor shall ensure mechanical connection on the individual stones such that all individual stones are in good contact with the adjacent stones and there are no loose members. This may include, but is not limited to, placement of stones in courses, compaction, and/or backfill with smaller stones. Hand placement may be necessary to fill in the cracks between larger stones.

D. The Contractor shall photographically document with scale (e.g., survey rod, measuring tape, etc.) installation was completed per the Drawings, including but not limited to, documentation of rock dimensions, rock thicknesses, and structure elevations. Structure elevations shown on Drawings shall be verified by the Contractor with a level or equivalent equipment and associated survey data.

3.07 BIOENGINEERED BANK ARMORING INSTALLATION

A. Excavate as necessary for placement of armoring. All soft soils, organic material, and debris must be removed, and a firm foundation provided. Backfill over-excavations with native fill material.

B. Rock shall be placed to thicknesses, elevations and locations as shown on the Drawings and details. At least two (2) layers of rock shall be placed in all locations, unless otherwise specified, meeting the minimum thicknesses in the Drawings. Rock shall be installed in lifts with a thickness of one (1) layer of rock.

C. Backfill void spaces with tightly packed smaller rock. The Contractor shall ensure mechanical connection on the individual stones such that all individual stones are in good contact with the adjacent stones and there are no loose members. This may include, but is not limited to, placement of stones in courses, compaction, and/or backfill with smaller stones. Hand placement may be necessary to fill in the cracks between larger stones.

D. The Contractor shall photographically document with scale (e.g., survey rod, measuring tape, etc.) installation was completed per the Drawings, including but not limited to, documentation

of rock dimensions, rock thicknesses, and structure elevations. Structure elevations shown on Drawings shall be verified by the Contractor with a level or equivalent equipment and associated survey data.

END OF SECTION 35 43 00