

CITY OF NORTH LITTLE ROCK, ARKANSAS
Finance Department
Commerce Division
Amy Smith, Purchasing Manger
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INVITATION TO BID

Bid Number : _____ 24-3867 _____ Date Issued: _____ June 24, 2024
Date & Time Bid Opening: _____ Tuesday, July 9, 2024 at 10:00 a.m.

Canopies for the North Little Rock Electric Department

TOTAL PROJECT PRICE TO PREPARE PROPERTY, PURCHASE BUILDING AND INSTALL

PURCHASED BUILDING: \$ _____

Specifications are attached. We are requesting a best and final total project price for:

- Site preparation based on the attached plan and geotechnical information.
- Design and construction of Two 60X250X16 covered canopies with rigid, T-shaped, iron supports.
- The contractor should provide an engineered design of the canopies and their foundation, stamped by a licensed PE in the state of Arkansas.
- All electrical to the canopies will be handled by the Electric Department and does not need to be included in the bid.

Any questions regarding the bid should be directed to

- Chris Ray at 501-995-4063 or cray@nlr.ar.gov
- Jessica Stephens at 501-850-6274 or jstephens@nlr.ar.gov

If you are obtaining this bid from our website, please be reminded that addendums may occur. It is therefore advisable that you review our listings for attachments including any changes to the bid.

The City of North Little Rock encourages participation of small, minority, and woman own business enterprises in the procurement of goods, services, professional services, and construction, either as a general contractor or sub-contractor. It is further requested that whenever possible, majority contractors who require sub-contractors, seek qualified small, minority, and woman businesses to partner with them

NOTE: FAILURE TO FILL OUT AND SIGN THE INVITATION TO BID SHEET WILL RESULT IN REJECTION OF THE BID.

EXECUTION OF BID

Upon signing this Bid, the bidder certifies that they have read and agree to the requirements set forth in this bid, including specifications, conditions and pertinent information regarding the articles being bid on, and agree to furnish these articles at the prices stated.

NAME OF FIRM: _____

PHONE NUMBER: _____ TAX ID NO. _____

BUSINESS ADDRESS: _____

DATE: _____

SIGNATURE OF AUTHORIZED PERSON & TITLE _____

UNSIGNED BIDS WILL BE REJECTED

GENERAL TERMS AND CONDITIONS FOR THE CITY OF NORTH LITTLE ROCK, AR

1. When submitting an "Invitation to Bid," the bidder warrants that the commodities covered by the bid shall be free from defects in material and workmanship under normal use and service. In addition, bidder must deliver new commodities of the latest design and model, unless otherwise specified in the "Invitation to Bid."
2. Prices quoted are to be net process, and when an error is made in extending total prices, the City may accept the bid for the lesser amount whether reflected by extension or by the correct multiple of the unit price.
3. Discounts offered will be taken when the City qualifies for such. The beginning date for computing discounts will be the date of invoice or the date of delivery and acceptance, whichever is later.
4. When bidding other than the brand and/or model specified in the "Invitation to Bid," the brand and/or model number must be stated by that item in the "Invitation to Bid," and descriptive literature be submitted with the bid.
5. **REJECTION**
 - A. The City reserves the right to reject any or all Bids, to waive any minor informality or irregularity in any Bid, to negotiate changes and/or modifications with the lowest responsible bidder and to make award to the response deemed to be the most advantageous to the City. Bidders shall be required to comply with all applicable federal, state and local laws.
 - B. The City reserves the right to cancel request for bids without penalty with it is in the best interest of the City. Notice of Cancellation shall be inserted on the City's website (www.nlr.ar.gov).
 - C. Any Bid not conforming to the specifications or requirements set forth by the City in this Bid Request may be rejected.
 - D. Bids may be also rejected if they are made by a Bidder that is deemed un-responsible due to lack of qualifications, capacity, skill, character, experience, reliability, financial stability or quality of services, supplies, materials, equipment or labor.
 - E. The City of North Little Rock reserves the right to reject any and all bids, to accept in whole or in part, to waive any informalities in bids received, to accept bids on materials or equipment with variations from specifications in those cases where efficiency of operation will not be impaired, and unless otherwise specified by the bidder, to accept any item in the bid. If unit prices and extensions thereof do not coincide, the City of North Little Rock may accept the bid for the lesser amount whether reflected by the extension or by the correct multiple of the unit price
6. The Purchasing office reserves the right to award items, all or none, or by line item(s).
7. Quality, time and probability of performance may be factors in making an award.
8. Bid quotes submitted will remain firm for 30 calendar days from bid opening date; however, the prices may remain firm for a longer period of time if mutually agreeable between bidder and the Department of Commerce.
9. Bidder must submit a completed signed copy of the front page of the "Invitation to Bid" and must submit any other information required in the "Invitation to Bid."
10. In the event a contract is entered into pursuant to the "Invitation to Bid," the bidder shall not discriminate against any qualified employee or qualified applicant for employment because of race, sex, color, creed, national origin or ancestry. The bidder must include in any and all subcontracts a provision similar to the above.
11. Sales or use tax is not to be included in the bid price, but is to be added by the vendor to the invoice billing to the City. Although use tax is not to be included in this bid, vendors are to register and pay tax direct to the Arkansas State Revenue Department.

12. Prices quoted shall be "Free on Board" (F.O.B.) to destination at designated facility in North Little Rock. Charges may not be added after the bid is opened.
13. In the event of two or more identical low bids, the contract may be awarded arbitrarily or for any reason to any of such bidders or split in any proportion between them at the discretion of the Department of Commerce.
14. Specifications furnished with this Invitation are intended to establish a desired quality or performance level, or other minimum dimensions and capacities, which will provide the best product available at the lowest possible price. Other than designated brands and/or models approved as equal to designated products shall receive an equal consideration.
15. Samples of items when required, must be furnished free, and, if not called for within 30 days from date of bid opening, will become property of the City.
16. Bids will not be considered if they are:
 1. Submitted after the bid's opening time.
 2. Submitted electronically or faxed (unless authorized by Purchasing Manager).
17. Guarantees and warranties should be submitted with the bid, as they may be a consideration in making an award.
18. **CONSTRUCTION**
 - A. Contractor is to supply the City with evidence of having and maintaining proper and complete insurance, specifically Workman's Compensation Insurance in accordance with the laws of the State of Arkansas, Public Liability and Property Damage. All premiums and cost shall be paid by the Contractor. In no way will the City be responsible in case of accident.
 - B. When noted, a Certified check or bid bond in the amount of 5% of total bid shall accompany bid.
 - C. A Performance Bond equaling the total amount of any bid exceeding \$50,000.00 must be provided for any contract for the repair, alteration or erection of any public building, public structure or public improvement (pursuant to Arkansas Code Annotated Section 22-9-203).
19. **LIQUIDATED DAMAGES** – Liquidated damages shall be determined at the time of contract negotiations, based upon the construction contract price and stated time period set for completion of the project. Liquidated damages shall be assessed beginning on the first day following the maximum delivery or completion time entered on this bid form and/or provided for by the plans and specifications.
20. **AMBIGUITY IN BID** - Any ambiguity in any bid as the result of omission, error, lack of clarity or non-compliance by the bidder with specifications, instructions, and all conditions of bidding shall be construed in the light most favorable to the City.
21. The bid number should be stated on the face of the sealed bid envelope. If it is not, the envelope will have to be opened to identify.
22. Whenever a bid is sought seeking a source of supply for a specified period of time for materials and services, the quantities of usage shown are estimated ONLY. No guarantee or warranty is given or implied by the participants as to the total amount that may or may not be purchased from any resulting contracts. These quantities are for the bidders information ONLY and will be used for tabulation and presentation of bid and the participant reserves the right to increase or decrease quantities as required.

23. The City of North Little Rock will follow procedures to check bidder eligibility through the federal System for Award Management (S.A.M.) as outlined in 2 C.F.R. § 200. This will be completed prior to the award of any contract in which federal grant funds will be expended.
24. Respondents acknowledge and understand that upon award of the winning Bid, the Respondent will be required to review and sign a contract with the City of North Little Rock, which will contain additional terms and conditions, prior to providing any services to the City. In the event of any discrepancy or contradiction between the bid documents, Terms and Conditions or other such documents, the provisions in the contract shall take precedence.
25. Additional information or bid forms may be obtained from:

COMMERCE DEPARTMENT, 700 West 29th Street, P.O. Box 5757, North Little Rock, Arkansas 72119 (501)975-8881
www.nlr.ar.gov

Bidding documents must be submitted on or before the bid's opening date and time. Unless noted, bids must be sealed and mailed or delivered to:

**Amy Smith, Purchasing Manager
Commerce Department
700 W. 29th Street, 3rd Floor
North Little Rock, AR 72114**

SECTION 00 01 00

NLR ELECTRIC – CANOPIES SITE PLAN

TECHNICAL SPECIFICATIONS

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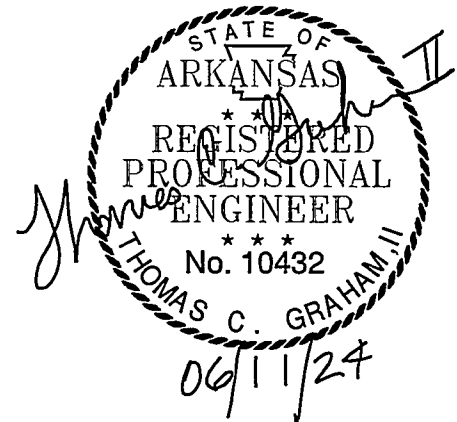
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DEMOLITION

PART 1 - GENERAL

1.1 SUMMARY

- A. Demolition, complete.

1.2 PROJECT DESCRIPTION

A. Demolition/Deconstruction Plan:

1. Prepare a Demolition Plan. Submit proposed salvage, demolition, and removal procedures for approval before work is started. Include in the plan procedures for careful removal and disposition of materials specified to be salvaged, coordination with other work in progress, a disconnection schedule of utility services, a detailed description of methods and equipment to be used for each operation and of the sequence of operations. Coordinate with Waste Management Plan. Include statements affirming Contractor inspection of the existing roof deck and its suitability to perform as a safe working platform or if inspection reveals a safety hazard to workers, state provisions for securing the safety of the workers throughout the performance of the work. Provide procedures for safe conduct of the work in accordance with EM 385-1-1. Plan shall be approved by Architect/Engineer prior to work beginning.
2. General Requirements: Do not begin demolition or deconstruction until authorization is received from the Architect/Engineer. Remove rubbish and debris from the project site; do not allow accumulations inside or outside the building. The work includes demolition, salvage of identified items and materials, and removal of resulting rubbish and debris. Remove rubbish and debris from Owner property daily, unless otherwise directed. Store materials that cannot be removed daily in areas specified by the Architect/Engineer. In the interest of occupational safety and health, perform the work in accordance with EM 385-1-1, Section 23, Demolition, and other applicable Sections.
3. Each trade is advised that information pertinent to its work may occur in various sections of the contract documents. Refer to every sheet of drawings for notes, abbreviations and symbols. Notes shall be reviewed and applied to related building components regardless of their locations in the drawings and specifications.
4. Remove any partitions, ceilings, ductwork, piping, sprinklers, or other constructions as required to provide access for mechanical, electrical, plumbing, or fire protection work indicated in the contract documents.

1.3 ITEMS TO REMAIN IN PLACE

- A. Take necessary precautions to avoid damage to existing items to remain in place, to be reused, or to remain the property of the Owner. Repair or replace damaged items as approved by the Architect/Engineer. Coordinate the work of this section with all other work indicated. Construct and maintain shoring, bracing, and supports as required. Ensure that structural elements are not overloaded. Increase structural supports or add new supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract. Do not overload structural elements or pavements to remain. Provide new supports and reinforcement for existing construction weakened by demolition, deconstruction, or removal work. Repairs, reinforcement, or structural replacement require approval by the Architect/Engineer prior to performing such work.
1. Existing Construction Limits and Protection: Do not disturb existing construction beyond the extent indicated or necessary for installation of new construction. Provide temporary shoring and bracing for support of building components to prevent settlement or other movement. Provide protective measures to control accumulation and migration of dust and dirt in all work areas. Remove dust, dirt, and debris from work areas daily.
 2. Weather Protection: For portions of the building to remain, protect building interior and materials and equipment from the weather at all times. Where removal of existing roofing is necessary to accomplish work, have materials and workmen ready to provide adequate and temporary covering of exposed areas.
 3. Trees: Protect trees within the project site which might be damaged during demolition or deconstruction, and which are indicated to be left in place, by a 6 foot high fence. Erect and secure fence a minimum of 5 feet from the trunk of individual trees or follow the outer perimeter of branches or clumps of trees. Replace any tree designated to remain that is damaged during the work under this contract with like-kind or as approved by the Architect/Engineer.
 4. Utility Service: Maintain existing utilities indicated to stay in service and protect against damage during demolition and deconstruction operations. Prior to start of work, utilities serving each area of alteration or removal will be shut off by the Owner and disconnected and sealed by the Contractor.
 5. Facilities: Protect electrical and mechanical services and utilities. Where removal of existing utilities and pavement is specified or indicated, provide approved barricades, temporary covering of exposed areas, and temporary services or connections for electrical and mechanical utilities. Floors, roofs, walls, columns, pilasters, and other structural components that are designed and constructed to stand without lateral support or shoring, and are determined to be in stable condition, must remain standing without additional bracing, shoring, or lateral support until demolished or deconstructed, unless directed otherwise by the Architect/Engineer. Ensure that no elements determined to be unstable are left unsupported and place and secure bracing, shoring, or lateral supports as may be required as a result of any cutting, removal, deconstruction, or demolition work performed under this contract.

1.4 BURNING

- A. The use of burning at the project site for the disposal of refuse and debris will not be permitted. Where burning is permitted, adhere to federal, state, and local regulations.

1.5 SUBMITTALS

- A. Preconstruction Submittals:
 - 1. Demolition Plan.
 - 2. Existing Conditions.
- B. Certificates:
 - 1. Notification.

1.6 QUALITY ASSURANCE

- A. Submit timely notification of demolition and renovation projects to Federal, State, regional, and local authorities in accordance with 40 CFR 61, Subpart M. Notify the Regional Office of the United States Environmental Protection Agency (USEPA) and the Architect/Engineer in writing 10 working days prior to the commencement of work in accordance with 40 CFR 61, Subpart M. Comply with federal, state, and local hauling and disposal regulations. In addition to the requirements of the "Contract Clauses," conform to the safety requirements contained in ASSE/SAFE A10.6. Comply with the Environmental Protection Agency requirements specified. Use of explosives will not be permitted.
 - 1. Dust and Debris Control: Prevent the spread of dust and debris to occupied buildings and avoid the creation of a nuisance or hazard in the surrounding area. Do not use water if it results in hazardous or objectionable conditions such as, but not limited to, ice, flooding, or pollution.

1.7 PROTECTION

- A. Traffic Control Signs:
 - 1. Where pedestrian and driver safety is endangered in the area of removal work, use traffic barricades with flashing lights. Notify the Architect/Engineer prior to beginning such work.
 - a. Provide a minimum of 2 FAA type L-810 steady burning red obstruction lights on temporary structures (including cranes) over 100 feet, but less than 200 ft, above ground level. The use of LED based obstruction lights is not permitted. For temporary structures (including cranes) over 200 ft above ground level provide obstruction lighting in accordance with FAA AC 70/7460-1. Light construction and installation shall comply with FAA AC 70/7460-1. Lights shall be operational during periods of reduced visibility, darkness, and as directed by the Architect/Engineer. Maintain the temporary services during the period of construction and remove only after permanent services have been installed and tested and are in operation.
 - 2. Protection of Personnel: Before, during and after the demolition work continuously evaluate the condition of the structure being demolished and take immediate action to protect all personnel working in and around the project site. No area, section, or

component of floors, roofs, walls, columns, pilasters, or other structural element will be allowed to be left standing without sufficient bracing, shoring, or lateral support to prevent collapse or failure while workmen remove debris or perform other work in the immediate area.

1.8 RELOCATIONS

- A. Perform the removal and reinstallation of relocated items as indicated with workmen skilled in the trades involved. Repair or replace items to be relocated which are damaged by the Contractor with new undamaged items as approved by the Architect/Engineer.

1.9 EXISTING CONDITIONS

- A. Before beginning any demolition or deconstruction work, survey the site and examine the drawings and specifications to determine the extent of the work. Record existing conditions in the presence of the Architect/Engineer showing the condition of structures and other facilities adjacent to areas of alteration or removal. Photographs sized 4 inch will be acceptable as a record of existing conditions. Include in the record the elevation of the top of foundation walls, finish floor elevations, possible conflicting electrical conduits, plumbing lines, alarms systems, the location and extent of existing cracks and other damage and description of surface conditions that exist prior to before starting work. It is the Contractor's responsibility to verify and document all required outages which will be required during the course of work, and to note these outages on the record document. Submit survey results.
 - 1. NOTE: Hazardous materials assessments indicated no asbestos or lead-based materials of sufficient quantity to require remediation. However, the assessment report on mold did determine there are minor amounts of mold present that will require remediation. Refer to asbestos, lead, and mold assessment reports included as appendices in Specification Volume 2.

PART 2 - PRODUCTS

2.1 FILL MATERIAL

- A. Comply with excavating, backfilling, and compacting procedures for soils used as backfill material to fill basements, voids, depressions or excavations resulting from demolition or deconstruction of structures.

PART 3 - EXECUTION

3.1 EXISTING FACILITIES TO BE REMOVED

- A. Inspect and evaluate existing structures onsite for reuse. Existing construction scheduled to be removed for reuse shall be disassembled. Dismantled and removed materials are to be separated, set aside, and prepared as specified, and stored or delivered to a collection point for reuse, remanufacture, recycling, or other disposal, as specified. Materials shall be designated for reuse onsite whenever possible.

1. Structures:
 - a. Remove existing structures indicated to be removed as indicated on drawings. Remove sidewalks, curbs, gutters, and street light bases as indicated.
 - b. Demolish structures in a systematic manner from the top of the structure to the ground. Complete demolition work above each tier or floor before the supporting members on the lower level are disturbed. Demolish concrete and masonry walls in small sections. Remove structural framing members and lower to ground by means of derricks, platforms hoists, or other suitable methods as approved by the Architect/Engineer.
 - c. Locate demolition equipment throughout the structure and remove materials so as to not impose excessive loads to supporting walls, floors, or framing.

- B. Utilities and Related Equipment:
 1. General Requirements: Do not interrupt existing utilities serving occupied or used facilities, except when authorized in writing by the Architect/Engineer. Do not interrupt existing utilities serving facilities occupied and used by the Owner except when approved in writing and then only after temporary utility services have been approved and provided. Do not begin demolition or deconstruction work until all utility disconnections have been made. Shut off and cap utilities for future use, as indicated.
 2. Disconnecting Existing Utilities: Remove existing utilities, as indicated and terminate in a manner conforming to the nationally recognized code covering the specific utility and approved by the Architect/Engineer. When utility lines are encountered but are not indicated on the drawings, notify the Architect/Engineer prior to further work in that area. Remove meters and related equipment and deliver to a location in accordance with instructions of the Architect/Engineer.
 3. Chain Link Fencing: Remove chain link fencing, gates and other related salvaged items scheduled for removal and transport to designated areas. Remove gates as whole units. Cut chain link fabric to 25-foot lengths and store in rolls off the ground or as indicated.
 4. Paving and Slabs: Remove concrete and asphaltic concrete paving and slabs as indicated. Pavement and slabs designated to be recycled and utilized in this project shall be moved, ground, and stored as directed by the Architect/Engineer. Pavement and slabs not to be used in this project shall be removed from the Installation at Contractor's expense.
 5. Concrete: Saw concrete along straight lines to a depth of a minimum 2 inch. Make each cut in walls perpendicular to the face and in alignment with the cut in the opposite face. Break out the remainder of the concrete provided that the broken area is concealed in the finished work, and the remaining concrete is sound. At locations where the broken face cannot be concealed, grind smooth or saw cut entirely through the concrete.
 6. Miscellaneous Metal: Salvage shop-fabricated items such as steel gratings, metal railings, and similar items as whole units. Salvage light-gage and cold-formed metal framing, such as steel studs, steel trusses, metal gutters, roofing and siding, metal toilet partitions, toilet accessories and similar items. Recycle scrap metal as part of demolition and deconstruction operations. Provide separate containers to collect scrap metal and transport to a scrap metal collection or recycling facility, in accordance with the Waste Management Plan.
 7. Patching: Where removals leave holes and damaged surfaces exposed in the finished work, patch and repair these holes and damaged surfaces to match adjacent finished surfaces, using on-site materials when available. Where new work is to be applied to existing surfaces, perform removals and patching in a manner to produce surfaces suitable for receiving new work. Finished surfaces of patched area shall be flush with the

adjacent existing surface and shall match the existing adjacent surface as closely as possible as to texture and finish.

8. Mechanical Equipment and Fixtures: Disconnect mechanical hardware at the nearest connection to existing services to remain, unless otherwise noted. Disconnect mechanical equipment and fixtures at fittings. Remove service valves attached to the unit. Salvage each item of equipment and fixtures as a whole unit; listed, indexed, tagged, and stored. Salvage each unit with its normal operating auxiliary equipment. Transport salvaged equipment and fixtures, including motors and machines, to a designated storage area as directed by the Architect/Engineer. Do not remove equipment until approved. Do not offer low-efficiency equipment for reuse.
 - a. Preparation for Storage: Remove water, dirt, dust, and foreign matter from units; tanks, piping and fixtures shall be drained; interiors, if previously used to store flammable, explosive, or other dangerous liquids, shall be steam cleaned. Seal openings with caps, plates, or plugs. Secure motors attached by flexible connections to the unit. Change lubricating systems with the proper oil or grease.
 - b. Piping: Disconnect piping at unions, flanges and valves, and fittings as required to reduce the pipe into straight lengths for practical storage. Store salvaged piping according to size and type. If the piping that remains can become pressurized due to upstream valve failure, end caps, blind flanges, or other types of plugs or fittings with a pressure gage and bleed valve shall be attached to the open end of the pipe to ensure positive leak control. Carefully dismantle piping that previously contained gas, gasoline, oil, or other dangerous fluids, with precautions taken to prevent injury to persons and property. Store piping outdoors until all fumes and residues are removed. Box prefabricated supports, hangers, plates, valves, and specialty items according to size and type. Wrap sprinkler heads individually in plastic bags before boxing. Classify piping not designated for salvage, or not reusable, as scrap metal.
 - c. Ducts: Classify removed duct work as scrap metal.
 - d. Fixtures, Motors, and Machines: Remove and salvage fixtures, motors and machines associated with plumbing, heating, air conditioning, refrigeration, and other mechanical system installations. Salvage, box and store auxiliary units and accessories with the main motor and machines. Tag salvaged items for identification, storage, and protection from damage. Classify broken, damaged, or otherwise unserviceable units and not caused to be broken, damaged, or otherwise unserviceable as debris to be disposed of by the Contractor.
2. Electrical Equipment and Fixtures: Salvage motors, motor controllers, and operating and control equipment that are attached to the driven equipment. Salvage wiring systems and components. Box loose items and tag for identification. Disconnect primary, secondary, control, communication, and signal circuits at the point of attachment to their distribution system.
 - a. Fixtures: Remove and salvage electrical fixtures. Salvage unprotected glassware from the fixture and salvage separately. Salvage incandescent, mercury-vapor, and fluorescent lamps and fluorescent ballasts manufactured prior to 1978, boxed and tagged for identification, and protected from breakage.
 - b. Electrical Devices: Remove and salvage switches, switchgear, transformers, conductors including wire and nonmetallic sheathed and flexible armored cable, regulators, meters, instruments, plates, circuit breakers, panelboards, outlet boxes, and similar items. Box and tag these items for identification according to type and size.

- c. Wiring Ducts or Troughs: Remove and salvage wiring ducts or troughs. Dismantle plug-in ducts and wiring troughs into unit lengths. Remove plug-in or disconnecting devices from the busway and store separately.
- d. Conduit and Miscellaneous Items: Salvage conduit except where embedded in concrete or masonry. Consider corroded, bent, or damaged conduit as scrap metal. Sort straight and undamaged lengths of conduit according to size and type. Classify supports, knobs, tubes, cleats, and straps as debris to be removed and disposed.

3.2 CONCURRENT EARTH-MOVING OPERATIONS

- A. Do not begin excavation, filling, and other earth-moving operations that are sequential to demolition or deconstruction work in areas occupied by structures to be demolished or deconstructed until all demolition and deconstruction in the area has been completed and debris removed. Fill holes, open basements, and other hazardous openings.

3.3 DISPOSITION OF MATERIAL

- A. Title to Materials: Except for salvaged items specified in related Sections, and for materials or equipment scheduled for salvage, all materials and equipment removed and not reused or salvaged, shall become the property of the Contractor and shall be removed from Owner property. Title to materials resulting from demolition and deconstruction, and materials and equipment to be removed, is vested in the Contractor upon approval by the Architect/Engineer of the Contractor's demolition, deconstruction, and removal procedures, and authorization by the Architect/Engineer to begin demolition and deconstruction. The Owner will not be responsible for the condition or loss of, or damage to, such property after contract award. Showing for sale or selling materials and equipment on site is prohibited.
- B. Reuse of Materials and Equipment: Remove and store materials and equipment listed in the Demolition Plan as indicated to be reused or relocated to prevent damage and reinstall as the work progresses.
- C. Salvaged Materials and Equipment:
 - 1. Remove materials and equipment that are listed in the Demolition Plan as indicated on the drawings to be removed by the Contractor and that are to remain the property of the Owner, and deliver to a storage site, as directed.
 - a. Salvage items and material to the maximum extent possible.
 - b. Store all materials salvaged for the Contractor as approved by the Architect/Engineer and remove from Owner property before completion of the contract. On site sales of salvaged material is prohibited.
 - c. Remove salvaged items to remain the property of the Owner in a manner to prevent damage, and packed or crated to protect the items from damage while in storage or during shipment. Items damaged during removal or storage must be repaired or replaced to match existing items. Properly identify the contents of containers.

3.4 CLEANUP

- A. Remove debris and rubbish as indicated on the drawings. Remove and transport the debris in a manner that prevents spillage on streets or adjacent areas. Apply local regulations regarding hauling and disposal.

3.5 DISPOSAL OF REMOVED MATERIALS

- A. Regulation of Removed Materials: Dispose of debris, rubbish, scrap, and other non-salvageable materials resulting from removal operations with all applicable federal, state, and local regulations as directed.
- B. Burning on Owner Property: Burning of materials removed from demolished structures will not be permitted on Owner property.
- C. Removal from Owner Property: Transport waste materials removed from demolished structures, except waste soil, from Owner property for legal disposal. Dispose of waste soil as directed.

3.6 REUSE OF SALVAGED ITEMS

- A. Recondition salvaged materials and equipment designated for reuse before installation. Replace items damaged during removal and salvage operations or restore them as necessary to usable condition.

END OF SECTION

SECTION 31 10 00

SITE CLEARING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Protecting existing vegetation to remain.
 - 2. Removing existing vegetation.
 - 3. Clearing and grubbing.
 - 4. Stripping and stockpiling topsoil.
 - 5. Removing above- and below-grade site improvements.

1.3 DEFINITIONS

- A. Topsoil: Top layer of the soil profile consisting of existing native surface topsoil or existing in-place surface soil; the zone where plant roots grow.
- B. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.4 MATERIAL OWNERSHIP

- A. Except for materials indicated to be stockpiled or otherwise remain Owner's property, cleared materials shall become Contractor's property and shall be removed from Project site.

1.5 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing trees and plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or video recordings.
- B. Topsoil stripping and stockpiling program.

1.6 QUALITY ASSURANCE

- A. Topsoil Stripping and Stockpiling Program: Prepare a written program to systematically demonstrate the ability of personnel to properly follow procedures and handle materials and equipment during the Work. Include dimensioned diagrams for placement and protection of stockpiles.

1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed trafficways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before site clearing. Also coordinate with the Owner prior to starting construction.
- C. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- D. Soil Stripping, Handling, and Stockpiling: Perform only when the soil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Section 31 20 00 "Earth Moving."
 - 1. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect and maintain benchmarks and survey control points from disturbance during construction.
- B. Protect existing site improvements to remain from damage during construction.
 - 1. Restore damaged improvements to their original condition, as acceptable to Owner.

3.2 TEMPORARY EROSION AND SEDIMENTATION CONTROL

- A. Provide temporary erosion- and sedimentation-control measures to prevent soil erosion and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways, according to erosion- and sedimentation-control Drawings and requirements of authorities having jurisdiction.
- B. Verify that flows of water redirected from construction areas or generated by construction activity do not enter or cross protection zones.
- C. Inspect, maintain, and repair erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Remove erosion and sedimentation controls and restore and stabilize areas disturbed during removal.

3.3 TREE AND PLANT PROTECTION

- A. Protect trees and plants remaining on-site .

3.4 EXISTING UTILITIES

- A. Locate, identify, disconnect, and seal or cap utilities indicated to be removed or abandoned in place.
 - 1. Arrange with utility companies to shut off indicated utilities.
- B. Interrupting Existing Utilities: Do not interrupt utilities serving facilities occupied by Owner or others, unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:
 - 1. Notify Owner not less than two days in advance of proposed utility interruptions.
 - 2. Do not proceed with utility interruptions without Owners's written permission.
- C. Excavate for and remove underground utilities indicated to be removed.

3.5 CLEARING AND GRUBBING

- A. Remove obstructions, trees, shrubs, and other vegetation to permit installation of new construction.
 - 1. Do not remove trees, shrubs, and other vegetation indicated to remain or to be relocated.
 - 2. Grind down stumps and remove roots, obstructions, and debris to a depth of 18 inches below exposed subgrade.
 - 3. Use only hand methods or air spade for grubbing within protection zones.
- B. Fill depressions caused by clearing and grubbing operations with satisfactory soil material unless further excavation or earthwork is indicated.
 - 1. Place fill material in horizontal layers not exceeding a loose depth of 8 inches and compact each layer to a density equal to adjacent original ground.

3.6 TOPSOIL STRIPPING

- A. Remove sod and grass before stripping topsoil.
- B. Strip topsoil to depth of 6 inches in a manner to prevent intermingling with underlying subsoil or other waste materials.
 - 1. Remove subsoil and nonsoil materials from topsoil, including clay lumps, gravel, and other objects larger than 2 inches in diameter; trash, debris, weeds, roots, and other waste materials.
- C. Stockpile topsoil away from edge of excavations without intermixing with subsoil or other materials. Grade and shape stockpiles to drain surface water. Cover to prevent windblown dust and erosion by water.
 - 1. Limit height of topsoil stockpiles to 72 inches.
 - 2. Do not stockpile topsoil within protection zones.
 - 3. Dispose of surplus topsoil. Surplus topsoil is that which exceeds quantity indicated to be stockpiled or reused.

3.7 SITE IMPROVEMENTS

- A. Remove existing above- and below-grade improvements as indicated and necessary to facilitate new construction.
- B. Remove slabs, paving, curbs, gutters, and aggregate base as indicated.
 - 1. Unless existing full-depth joints coincide with line of demolition, neatly saw-cut along line of existing pavement to remain before removing adjacent existing pavement. Saw-cut faces vertically.
 - 2. Paint cut ends of steel reinforcement in concrete to remain with two coats of antirust coating, following coating manufacturer's written instructions. Keep paint off surfaces that will remain exposed.

3.8 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus soil material, unsuitable topsoil, obstructions, demolished materials, and waste materials including trash and debris, and legally dispose of them off Owner's property.
- B. Separate recyclable materials produced during site clearing from other nonrecyclable materials. Store or stockpile without intermixing with other materials and transport them to recycling facilities. Do not interfere with other Project work.
- C. Burning is not permitted on site.

END OF SECTION

SECTION 31 20 00

EARTH MOVING

PART 1 - PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Excavating and filling for rough grading the Site.
 - 2. Preparing subgrades for walks, pavements, and turf and grasses.
 - 3. Subbase course for concrete walks and pavements.
 - 4. Excavating and backfilling trenches for utilities and pits for buried utility structures.
- B. Related Requirements:

Section 32 92 00 "Turf and Grasses" for finish grading in turf and grass areas, including preparing and placing planting soil for turf areas.

1.3 DEFINITIONS

- A. Backfill: Soil material or controlled low-strength material used to fill an excavation.
Initial Backfill: Backfill placed beside and over pipe in a trench, including haunches to support sides of pipe.
Final Backfill: Backfill placed over initial backfill to fill a trench.
- B. Base Course: Aggregate layer placed between the subbase course and hot-mix asphalt paving.
- C. Bedding Course: Aggregate layer placed over the excavated subgrade in a trench before laying pipe.
- D. Borrow Soil: Satisfactory soil imported from off-site for use as fill or backfill.
- E. Drainage Course: Aggregate layer supporting the slab-on-grade that also minimizes upward capillary flow of pore water.
- F. Excavation: Removal of material encountered above subgrade elevations and to lines and dimensions indicated.
Authorized Additional Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions as directed by Architect.
Bulk Excavation: Excavation more than 10 feet in width and more than 30 feet in length.
Unauthorized Excavation: Excavation below subgrade elevations or beyond indicated lines and dimensions without direction by Architect. Unauthorized excavation, as well as remedial work directed by Architect, shall be without additional compensation.
- G. Fill: Soil materials used to raise existing grades.

- H. Rock: Rock material in beds, ledges, unstratified masses, conglomerate deposits, and boulders of rock material that exceed 1 cu. yd. for bulk excavation or 3/4 cu. yd. for footing, trench, and pit excavation that cannot be removed by rock-excavating equipment equivalent to the following in size and performance ratings, without systematic drilling, ram hammering, ripping, or blasting, when permitted:
Equipment for Footing, Trench, and Pit Excavation: Late-model, track-mounted hydraulic excavator; equipped with a 42-inch-maximum-width, short-tip-radius rock bucket; rated at not less than 138-hp flywheel power with bucket-curling force of not less than 28,700 lbf and stick-crowd force of not less than 18,400 lbf with extra-long reach boom.
Equipment for Bulk Excavation: Late-model, track-mounted loader; rated at not less than 230-hp flywheel power and developing a minimum of 47,992-lbf breakout force with a general-purpose bare bucket.
 - I. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below the ground surface.
 - J. Subbase Course: Aggregate layer placed between the subgrade and base course for hot-mix asphalt pavement, or aggregate layer placed between the subgrade and a cement concrete pavement or a cement concrete or hot-mix asphalt walk.
 - K. Subgrade: Uppermost surface of an excavation or the top surface of a fill or backfill immediately below subbase, drainage fill, drainage course, or topsoil materials.
 - L. Utilities: On-site underground pipes, conduits, ducts, and cables as well as underground services within buildings.
- 1.4 ACTION SUBMITTALS
- A. Product Data: For each type of the following manufactured products required:
Warning tapes.
- 1.5 INFORMATIONAL SUBMITTALS
- A. Qualification Data: For qualified testing agency.
 - B. Material Test Reports: For each on-site and borrow soil material proposed for fill and backfill as follows:
Classification according to ASTM D2487.
Laboratory compaction curve according to ASTM D1557.
 - C. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.
- 1.6 QUALITY ASSURANCE
- A. Geotechnical Testing Agency Qualifications: Qualified according to ASTM E329 and ASTM D3740 for testing indicated. The Contractor is responsible for obtaining and paying for the services of the Geotechnical Testing Agency.

1.7 FIELD CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during earth-moving operations.
Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.
- C. Do not commence earth-moving operations until temporary site fencing and erosion- and sedimentation-control measures are in place, and a permit is obtained from the Arkansas Department of Environmental Quality (ADEQ).
- D. The following practices are prohibited within protection zones:
Storage of construction materials, debris, or excavated material.
Parking vehicles or equipment.
Foot traffic.
Erection of sheds or structures.
Impoundment of water.
Excavation or other digging unless otherwise indicated.
Attachment of signs to or wrapping materials around trees or plants unless otherwise indicated.
- E. Do not direct vehicle or equipment exhaust towards protection zones.
- F. Prohibit heat sources, flames, ignition sources, and smoking within or near protection zones.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
- B. Satisfactory Soils: Soil Classification Groups SC, GC, and CL according to ASTM D2487, or a combination of these groups; free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter. The top 18 inches of soil shall be free of rock or gravel larger than 1.5 inches in any direction. Satisfactory soils shall also include any soils listed as acceptable in the Geotechnical Report.
Liquid Limit: 40 maximum.
Plasticity Index: 18 maximum.

Note that on-site soils are not recommended for use as fill or backfill in building or pavement areas. On-site soils may be utilized as general fill in landscape areas outside of structure and pavement subgrade areas.

- C. Unsatisfactory Soils: Soil Classification Groups ML, OL, CH, MH, OH, and PT according to ASTM D2487, or a combination of these groups.

Unsatisfactory soils also include satisfactory soils (listed in 2.1.B) not maintained within -2 percent to +3 percent of optimum moisture content at time of compaction. Unsatisfactory soils also include the soil types that do not comply with the moisture content requirements listed in the Geotechnical Report.

- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D2940/D2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of crushed stone, or crushed or uncrushed gravel; ASTM D448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.
- I. Filter Material: Narrowly graded mixture of natural or crushed gravel, or crushed stone and natural sand; ASTM D448; coarse-aggregate grading Size 67; with 100 percent passing a 1-inch sieve and zero to 5 percent passing a No. 4 sieve.
- J. Sand: ASTM C33/C33M; fine aggregate.
- K. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
 - Red: Electric.
 - Yellow: Gas, oil, steam, and dangerous materials.
 - Orange: Telephone and other communications.
 - Blue: Water systems.
 - Green: Sewer systems.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

3.2 DEWATERING

- A. Provide dewatering system of sufficient scope, size, and capacity to control hydrostatic pressures and to lower, control, remove, and dispose of ground water and permit excavation and construction to proceed on dry, stable subgrades, if needed.
- B. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- C. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.
- D. Dispose of water removed by dewatering in a manner that avoids endangering public health, property, and portions of work under construction or completed. Dispose of water and sediment in a manner that avoids inconvenience to others.

3.3 EXPLOSIVES

- A. Explosives: Do not use explosives.

3.4 EXCAVATION, GENERAL

- A. **Unclassified Excavation:** Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. **No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.**
If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions:
 - a. 24 inches outside of concrete forms other than at footings.
 - b. 12 inches outside of concrete forms at footings.
 - c. 6 inches outside of minimum required dimensions of concrete cast against grade.
 - d. Outside dimensions of concrete walls indicated to be cast against rock without forms or exterior waterproofing treatments.
 - e. 6 inches beneath bottom of concrete slabs-on-grade.

- f. 6 inches beneath pipe in trenches and the greater of 24 inches wider than pipe or 42 inches wide.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.
Pile Foundations: Stop excavations 6 to 12 inches above bottom of pile cap before piles are placed. After piles have been driven, remove loose and displaced material. Excavate to final grade, leaving solid base to receive concrete pile caps.
Excavation for Underground Tanks, Basins, and Mechanical or Electrical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

3.6 EXCAVATION FOR WALKS AND PAVEMENTS

- A. Excavate surfaces under walks and pavements to indicated lines, cross sections, elevations, and subgrades.

3.7 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
Clearance: As indicated.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.
For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

3.8 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Proof-roll subgrade below the building slabs and pavements with a pneumatic-tired and loaded 10-wheel, tandem-axle dump truck weighing not less than 15 tons to identify soft pockets and areas of excess yielding. Do not proof-roll wet or saturated subgrades. Completely proof-roll subgrade in one direction, repeating proof-rolling in direction perpendicular to first direction. Limit vehicle speed to 3 mph. Excavate soft spots, unsatisfactory soils, and areas of excessive pumping or rutting, as determined by Architect, and replace with compacted backfill or fill as directed.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

3.9 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

3.10 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.11 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
 - Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
 - Surveying locations of underground utilities for Record Documents.
 - Testing and inspecting underground utilities.
 - Removing concrete formwork.
 - Removing trash and debris.
 - Removing temporary shoring, bracing, and sheeting.
 - Installing permanent or temporary horizontal bracing on horizontally supported walls.

- B. Place backfill on subgrades free of mud, frost, snow, or ice.

3.12 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.

- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill voids with satisfactory soil while removing shoring and bracing.
- D. Initial Backfill:
Soil Backfill: Place and compact initial backfill as shown in the drawings.
 - a. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping or conduit to avoid damage or displacement of piping or conduit. Coordinate backfilling with utilities testing.
- E. Final Backfill:
Soil Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation as shown on the drawings.
- F. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

3.13 SOIL FILL

- A. Plow, scarify, bench, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing material.
- B. Place and compact fill material in layers to required elevations as follows:
Under grass and planted areas, use satisfactory soil material.
Under walks and pavements, use satisfactory soil material.
Under steps and ramps, use engineered fill.
Under building slabs, use engineered fill.
Under footings and foundations, use engineered fill.
- C. Place soil fill on subgrades free of mud, frost, snow, or ice.

3.14 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content or as indicated in the Geotechnical Report.
Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

3.15 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 9 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.

- C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D1557:
Under structures, building slabs, steps, and pavements, scarify and recompact top 12 inches of existing subgrade and each layer of backfill or fill soil material at 95 percent.
Under walkways, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 95 percent.
Under turf or unpaved areas, scarify and recompact top 6 inches below subgrade and compact each layer of backfill or fill soil material at 80 percent.
For utility trenches, compact each layer of initial and final backfill soil material as shown on the drawings.

3.16 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated. Provide a smooth transition between adjacent existing grades and new grades. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Site Rough Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish subgrades to elevations required to achieve indicated finish elevations, within the following subgrade tolerances:
Turf or Unpaved Areas: Plus or minus 1 inch.
Walks: Plus or minus 1 inch.
Pavements: Plus or minus 1/2 inch.
- C. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10-foot straightedge.

3.17 SUBBASE AND BASE COURSES UNDER PAVEMENTS AND WALKS

- A. Place subbase course and base course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place subbase course and base course under pavements and walks as follows:
Shape subbase course and base course to required crown elevations and cross-slope grades.
Place subbase course and base course 6 inches or less in compacted thickness in a single layer.
Place subbase course and base course that exceeds 6 inches in compacted thickness in layers of equal thickness, with no compacted layer more than 6 inches thick or less than 3 inches thick.
Compact subbase course and base course at optimum moisture content to required grades, lines, cross sections, and thickness to not less than 95 percent of maximum dry unit weight according to ASTM D1557.

3.18 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified geotechnical engineering testing agency to perform tests and inspections.
- B. Allow testing agency to inspect and test subgrades and each fill or backfill layer. Proceed with subsequent earth moving only after test results for previously completed work comply with requirements.

- C. Testing agency will test compaction of soils in place according to ASTM D1556, ASTM D2167, ASTM D2937, and ASTM D6938, as applicable. Tests will be performed at the following locations and frequencies:
Paved and Building Slab Areas: At subgrade and at each compacted fill and backfill layer, at least one test for every 2000 sq. ft or less of paved area or building slab but in no case fewer than three tests.
Trench Backfill: At each compacted initial and final backfill layer, at least one test for every 150 feet or less of trench length but no fewer than two tests.
- D. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

3.19 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

3.20 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.

Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION

SECTION 32 13 13

CONCRETE PAVING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes Concrete Paving, including the following:
 - 1. Parking lots.
 - 2. Walks.
- B. Related Requirements:
 - 1. Section 32 13 73 "Concrete Paving Joint Sealants" for joint sealants in expansion and contraction joints within concrete paving and in joints between concrete paving and asphalt paving or adjacent construction.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of blended hydraulic cement, fly ash, slag cement, and other pozzolans.
- B. W/C Ratio: The ratio by weight of water to cementitious materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Design Mixtures: For each concrete paving mixture. Include alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified ready-mix concrete manufacturer and testing agency.
- B. Material Certificates: For the following, from manufacturer:
 - 1. Cementitious materials.
 - 2. Steel reinforcement and reinforcement accessories.
 - 3. Admixtures.
 - 4. Curing compounds.
 - 5. Applied finish materials.
 - 6. Bonding agent or epoxy adhesive.
 - 7. Joint fillers.
- C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Ready-Mix-Concrete Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C94/C94M requirements for production facilities and equipment.
- B. Testing Agency Qualifications: Qualified according to ASTM C1077 and ASTM E329 for testing indicated.
 - 1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-1 or an equivalent certification program.

1.7 FIELD CONDITIONS

- A. Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.
- B. Cold-Weather Concrete Placement: Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing, or low temperatures. Comply with ACI 306.1 and the following:
 - 1. When air temperature has fallen to or is expected to fall below 40 deg F, uniformly heat water and aggregates before mixing to obtain a concrete mixture temperature of not less than 50 deg F and not more than 80 deg F at point of placement.
 - 2. Do not use frozen materials or materials containing ice or snow.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in design mixtures.
- C. Hot-Weather Concrete Placement: Comply with ACI 301 and as follows when hot-weather conditions exist:
 - 1. Cool ingredients before mixing to maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated in total amount of mixing water. Using liquid nitrogen to cool concrete is Contractor's option.
 - 2. Cover steel reinforcement with water-soaked burlap, so steel temperature will not exceed ambient air temperature immediately before embedding in concrete.
 - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade moisture uniform without standing water, soft spots, or dry areas.

PART 2 - PRODUCTS

2.1 CONCRETE, GENERAL

- A. ACI Publications: Comply with ACI 301 unless otherwise indicated.

2.2 FORMS

- A. Form Materials: Plywood, metal, metal-framed plywood, or other approved panel-type materials to provide full-depth, continuous, straight, and smooth exposed surfaces.
 - 1. Use flexible or uniformly curved forms for curves with a radius of 100 feet or less.

- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and that will not impair subsequent treatments of concrete surfaces.

2.3 STEEL REINFORCEMENT

- A. Plain-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, fabricated from as-drawn steel wire into flat sheets.
- B. Deformed-Steel Welded-Wire Reinforcement: ASTM A1064/A1064M, flat sheet.
- C. Reinforcing Bars: ASTM A615/A615M, Grade 60; deformed.
- D. Epoxy-Coated Reinforcing Bars: ASTM A775/A775M or ASTM A934/A934M; with ASTM A615/A615M, Grade 60 deformed bars.
- E. Plain-Steel Wire: ASTM A1064/A1064M, as drawn.
- F. Epoxy-Coated, Joint Dowel Bars: ASTM A775/A775M; with ASTM A615/A615M, Grade 60 plain-steel bars.
- G. Tie Bars: ASTM A615/A615M, Grade 60; deformed.
- H. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars, welded-wire reinforcement, and dowels in place. Manufacture bar supports according to CRSI's "Manual of Standard Practice" from steel wire, plastic, or precast concrete of greater compressive strength than concrete specified, and as follows:
 - 1. Equip wire bar supports with sand plates or horizontal runners where base material will not support chair legs.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
- I. Epoxy Repair Coating: Liquid, two-part, epoxy repair coating, compatible with epoxy coating on reinforcement.

2.4 CONCRETE MATERIALS

- A. Cementitious Materials: Use the following cementitious materials, of same type, brand, and source throughout Project:
 - 1. Portland Cement: ASTM C150/C150M, white portland cement Type I or Type II.
- B. Normal-Weight Aggregates: ASTM C33/C33M, Class 4S, uniformly graded. Provide aggregates from a single source.
 - 1. Maximum Coarse-Aggregate Size: 1 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
 - 3. Aggregate Sizes: 3/4 to 1 inch nominal.
- C. Air-Entraining Admixture: ASTM C260/C260M.

- D. Chemical Admixtures: Admixtures certified by manufacturer to be compatible with other admixtures and to contain not more than 0.1 percent water-soluble chloride ions by mass of cementitious material.
 - 1. Water-Reducing Admixture: ASTM C494/C494M, Type A.
 - 2. Retarding Admixture: ASTM C494/C494M, Type B.
 - 3. Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type D.
 - 4. High-Range, Water-Reducing Admixture: ASTM C494/C494M, Type F.
 - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C494/C494M, Type G.
 - 6. Plasticizing and Retarding Admixture: ASTM C1017/C1017M, Type II.
- E. Water: Potable and complying with ASTM C94/C94M.

2.5 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 3, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. dry or cotton mats.
- B. Moisture-Retaining Cover: ASTM C171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.
- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 1, Class B, dissipating.
- E. White, Waterborne, Membrane-Forming Curing Compound: ASTM C309, Type 2, Class B, dissipating.

2.6 RELATED MATERIALS

- A. Joint Fillers: ASTM D1751, asphalt-saturated cellulosic fiber or ASTM D1752, cork or self-expanding cork in preformed strips.

2.7 STAMPED DETECTABLE WARNING MATERIALS

- A. Detectable Warning Stamp: Semirigid polyurethane mats with formed underside capable of imprinting detectable warning pattern on plastic concrete; perforated with a vent hole at each dome.
 - 1. Size of Stamp: One piece, matching detectable warning area shown on Drawings.
- B. Liquid Release Agent: Manufacturer's standard, clear, evaporating formulation designed to facilitate release of stamp mats.

2.8 CONCRETE MIXTURES

- A. Prepare design mixtures, proportioned according to ACI 301, for each type and strength of normal-weight concrete, and as determined by either laboratory trial mixtures or field experience.
 - 1. Use a qualified independent testing agency for preparing and reporting proposed concrete design mixtures for the trial batch method.
 - 2. When automatic machine placement is used, determine design mixtures and obtain laboratory test results that comply with or exceed requirements.

- B. Add air-entraining admixture at manufacturer's prescribed rate to result in normal-weight concrete at point of placement having an air content as follows:
 1. Air Content: 5 percent plus or minus 1-1/2 percent for 1-inch nominal maximum aggregate size.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Chemical Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing admixture, high-range, water-reducing admixture, high-range, water-reducing and retarding admixture, or plasticizing and retarding admixture in concrete as required for placement and workability.
 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
- E. Concrete Mixtures: Normal-weight concrete.
 1. Compressive Strength (28 Days): 4000 psi or as shown on the plans.
 2. Maximum W/C Ratio at Point of Placement: 0.45.
 3. Slump Limit: 4 inches, plus or minus 1 inch.

2.9 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Furnish batch certificates for each batch discharged and used in the Work.
 1. When air temperature is between 85 and 90 deg F, reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F, reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C94/C94M. Mix concrete materials in appropriate drum-type batch machine mixer.
 1. For concrete batches of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
 2. For concrete batches larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
 3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixing time, quantity, and amount of water added.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine exposed subgrades and subbase surfaces for compliance with requirements for dimensional, grading, and elevation tolerances.
- B. Proof-roll prepared subbase surface below concrete paving to identify soft pockets and areas of excess yielding.
 1. Completely proof-roll subbase in one direction and repeat in perpendicular direction. Limit vehicle speed to 3 mph.

2. Proof-roll with a pneumatic-tired and loaded, 10-wheel, tandem-axle dump truck weighing not less than 15 tons.
 3. Correct subbase with soft spots and areas of pumping or rutting exceeding depth of 1/2 inch according to requirements in Section 31 20 00 "Earth Moving."
- C. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 PREPARATION
- A. Remove loose material from compacted subbase surface immediately before placing concrete.
- 3.3 EDGE FORMS AND SCREED CONSTRUCTION
- A. Set, brace, and secure edge forms, bulkheads, and intermediate screed guides to required lines, grades, and elevations. Install forms to allow continuous progress of work and so forms can remain in place at least 24 hours after concrete placement.
- B. Clean forms after each use and coat with form-release agent to ensure separation from concrete without damage.
- 3.4 STEEL REINFORCEMENT INSTALLATION
- A. General: Comply with CRSI's "Manual of Standard Practice" for fabricating, placing, and supporting reinforcement.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, or other bond-reducing materials.
- C. Arrange, space, and securely tie bars and bar supports to hold reinforcement in position during concrete placement. Maintain minimum cover to reinforcement.
- D. Install welded-wire reinforcement in lengths as long as practicable. Lap adjoining pieces at least one full mesh, and lace splices with wire. Offset laps of adjoining widths to prevent continuous laps in either direction.
- E. Epoxy-Coated Reinforcement: Use epoxy-coated steel wire ties to fasten epoxy-coated reinforcement. Repair cut and damaged epoxy coatings with epoxy repair coating according to ASTM D3963/D3963M.
- F. Install fabricated bar mats in lengths as long as practicable. Handle units to keep them flat and free of distortions. Straighten bends, kinks, and other irregularities, or replace units as required before placement. Set mats for a minimum 2-inch overlap of adjacent mats.
- 3.5 JOINTS
- A. General: Form construction, isolation, and contraction joints and tool edges true to line, with faces perpendicular to surface plane of concrete. Construct transverse joints at right angles to centerline unless otherwise indicated.
1. When joining existing paving, place transverse joints to align with previously placed joints unless otherwise indicated.

- B. Construction Joints: Set construction joints at side and end terminations of paving and at locations where paving operations are stopped for more than one-half hour unless paving terminates at isolation joints.
1. Continue steel reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of paving strips unless otherwise indicated.
 2. Provide tie bars at sides of paving strips where indicated.
 3. Butt Joints: Use bonding agent at joint locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 4. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.
- C. Isolation Joints: Form isolation joints of preformed joint-filler strips abutting concrete curbs, catch basins, manholes, inlets, structures, other fixed objects, and where indicated.
1. Locate expansion joints at intervals of 50 feet unless otherwise indicated.
 2. Extend joint fillers full width and depth of joint.
 3. Terminate joint filler not less than 1/2 inch or more than 1 inch below finished surface if joint sealant is indicated.
 4. Place top of joint filler flush with finished concrete surface if joint sealant is not indicated.
 5. Furnish joint fillers in one-piece lengths. Where more than one length is required, lace or clip joint-filler sections together.
 6. During concrete placement, protect top edge of joint filler with metal, plastic, or other temporary preformed cap. Remove protective cap after concrete has been placed on both sides of joint.
- D. Contraction Joints: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of the concrete thickness, as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before developing random contraction cracks.
 - a. Tolerance: Ensure that sawed joints are within 3 inches either way from centers of dowels.
 2. Doweled Contraction Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or coat with asphalt one-half of dowel length to prevent concrete bonding to one side of joint.

3.6 CONCRETE PLACEMENT

- A. Before placing concrete, inspect and complete formwork installation, steel reinforcement, and items to be embedded or cast-in.
- B. Remove snow, ice, or frost from subbase surface and steel reinforcement before placing concrete. Do not place concrete on frozen surfaces.
- C. Moisten subbase to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

- D. Comply with ACI 301 requirements for measuring, mixing, transporting, and placing concrete.
- E. Do not add water to concrete during delivery or at Project site. Do not add water to fresh concrete after testing.
- F. Deposit and spread concrete in a continuous operation between transverse joints. Do not push or drag concrete into place or use vibrators to move concrete into place.
- G. Consolidate concrete according to ACI 301 by mechanical vibrating equipment supplemented by hand spading, rodding, or tamping.
 - 1. Consolidate concrete along face of forms and adjacent to transverse joints with an internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand spreading and consolidation. Consolidate with care to prevent dislocating reinforcement, dowels, and joint devices.
- H. Screed paving surface with a straightedge and strike off.

3.7 FLOAT FINISHING

- A. General: Do not add water to concrete surfaces during finishing operations.
- B. Float Finish: Begin the second floating operation when bleedwater sheen has disappeared and concrete surface has stiffened sufficiently to permit operations. Float surface with power-driven floats or by hand floating if area is small or inaccessible to power units. Finish surfaces to true planes. Cut down high spots and fill low spots. Refloat surface immediately to uniform granular texture.
 - 1. Medium-to-Fine-Textured Broom Finish: Draw a soft-bristle broom across float-finished concrete surface, perpendicular to line of traffic, to provide a uniform, fine-line texture.

3.8 DETECTABLE WARNING INSTALLATION

- A. Stamped Detectable Warnings: Install stamped detectable warnings as part of a continuous concrete paving placement and according to stamp-mat manufacturer's written instructions.
 - 1. Before using stamp mats, verify that the vent holes are unobstructed.
 - 2. Apply liquid release agent to the concrete surface and the stamp mat.
 - 3. Stamping: While initially finished concrete is plastic, accurately align and place stamp mats in sequence. Uniformly load, gently vibrate, and press mats into concrete to produce imprint pattern on concrete surface. Load and tamp mats directly perpendicular to the stamp-mat surface to prevent distortion in shape of domes. Press and tamp until mortar begins to come through all of the vent holes. Gently remove stamp mats.
 - 4. Trimming: After 24 hours, cut off the tips of mortar formed by the vent holes.
 - 5. Remove residual release agent according to manufacturer's written instructions, but no fewer than three days after stamping concrete. High-pressure-wash surface and joint patterns, taking care not to damage stamped concrete. Control, collect, and legally dispose of runoff.

3.9 CONCRETE PROTECTION AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures.

- B. Comply with ACI 306.1 for cold-weather protection.
- C. Evaporation Retarder: Apply evaporation retarder to concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete but before float finishing.
- D. Begin curing after finishing concrete but not before free water has disappeared from concrete surface.
- E. Curing Methods: Cure concrete by moisture curing, moisture-retaining-cover curing, curing compound, or a combination of these as follows:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Immediately repair any holes or tears occurring during installation or curing period, using cover material and waterproof tape.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating, and repair damage during curing period.

3.10 PAVING TOLERANCES

- A. Comply with tolerances in ACI 117 and as follows:
 - 1. Elevation: 3/4 inch.
 - 2. Thickness: Plus 3/8 inch, minus 1/4 inch.
 - 3. Surface: Gap below 10-foot-long; unlevelled straightedge not to exceed 1/2 inch.
 - 4. Alignment of Tie-Bar End Relative to Line Perpendicular to Paving Edge: 1/2 inch per 12 inches of tie bar.
 - 5. Lateral Alignment and Spacing of Dowels: 1 inch.
 - 6. Vertical Alignment of Dowels: 1/4 inch.
 - 7. Alignment of Dowel-Bar End Relative to Line Perpendicular to Paving Edge: 1/4 inch per 12 inches of dowel.
 - 8. Joint Spacing: 3 inches.
 - 9. Contraction Joint Depth: Plus 1/4 inch, no minus.
 - 10. Joint Width: Plus 1/8 inch, no minus.

3.11 FIELD QUALITY CONTROL

- A. Testing Agency: Contractor will engage a qualified testing agency to perform tests and inspections.
- B. Testing Services: Testing and inspecting of composite samples of fresh concrete obtained according to ASTM C172/C172M shall be performed according to the following requirements:

1. Testing Frequency: Obtain at least one composite sample for each 5000 sq. ft. or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 2. Slump: ASTM C143/C143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 3. Air Content: ASTM C231/C231M, pressure method; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 4. Concrete Temperature: ASTM C1064/C1064M; one test hourly when air temperature is 40 deg F and below and when it is 80 deg F and above, and one test for each composite sample.
 5. Compression Test Specimens: ASTM C31/C31M; cast and laboratory cure one set of three standard cylinder specimens for each composite sample.
 6. Compressive-Strength Tests: ASTM C39/C39M; test one specimen at seven days and two specimens at 28 days.
 - a. A compressive-strength test shall be the average compressive strength from two specimens obtained from same composite sample and tested at 28 days.
- C. Strength of each concrete mixture will be satisfactory if average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi.
- D. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
- E. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
- F. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect.
- G. Concrete paving will be considered defective if it does not pass tests and inspections.
- H. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
- I. Prepare test and inspection reports.
- 3.12 REPAIR AND PROTECTION
- A. Remove and replace concrete paving that is broken, damaged, or defective or that does not comply with requirements in this Section. Remove work in complete sections from joint to joint unless otherwise approved by Architect.

- B. Drill test cores, where directed by Architect, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory paving areas with portland cement concrete bonded to paving with epoxy adhesive.
- C. Protect concrete paving from damage. Exclude traffic from paving for at least 14 days after placement. When construction traffic is permitted, maintain paving as clean as possible by removing surface stains and spillage of materials as they occur.
- D. Maintain concrete paving free of stains, discoloration, dirt, and other foreign material. Sweep paving not more than two days before date scheduled for Substantial Completion inspections.

END OF SECTION

SECTION 32 13 73

CONCRETE PAVING JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Cold-applied joint sealants.
 - 2. Joint-sealant backer materials.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Paving-Joint-Sealant Schedule: Include the following information:
 - 1. Joint-sealant application, joint location, and designation.
 - 2. Joint-sealant manufacturer and product name.
 - 3. Joint-sealant formulation.
 - 4. Joint-sealant color.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For Installer.
- B. Product Certificates: For each type of joint sealant and accessory.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. Product Testing: Test joint sealants using a qualified testing agency.

1.6 FIELD CONDITIONS

- A. Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
 - 2. When joint substrates are wet.
 - 3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
 - 4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, backing materials, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

2.2 COLD-APPLIED JOINT SEALANTS

- A. Single-Component, Nonsag, Silicone Joint Sealant: ASTM D5893/D5893M, Type NS.
- B. Single-Component, Self-Leveling, Silicone Joint Sealant: ASTM D5893/D5893M, Type SL.

2.3 JOINT-SEALANT BACKER MATERIALS

- A. Joint-Sealant Backer Materials: Nonstaining; compatible with joint substrates, sealants, primers, and other joint fillers; and approved for applications indicated by joint-sealant manufacturer, based on field experience and laboratory testing.
- B. Round Backer Rods for Cold-Applied Joint Sealants: ASTM D5249, Type 3, of diameter and density required to control joint-sealant depth and prevent bottom-side adhesion of sealant.
- C. Backer Strips for Cold- and Hot-Applied Joint Sealants: ASTM D5249; Type 2; of thickness and width required to control joint-sealant depth, prevent bottom-side adhesion of sealant, and fill remainder of joint opening under sealant.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Before installing joint sealants, clean out joints immediately to comply with joint-sealant manufacturer's written instructions.
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

3.3 INSTALLATION OF JOINT SEALANTS

- A. Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated unless more stringent requirements apply.

- B. Joint-Sealant Installation Standard: Comply with recommendations in ASTM C1193 for use of joint sealants as applicable to materials, applications, and conditions.
- C. Install joint-sealant backings to support joint sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - 1. Do not leave gaps between ends of joint-sealant backings.
 - 2. Do not stretch, twist, puncture, or tear joint-sealant backings.
 - 3. Remove absorbent joint-sealant backings that have become wet before sealant application and replace them with dry materials.
- D. Install joint sealants immediately following backing installation, using proven techniques that comply with the following:
 - 1. Place joint sealants so they fully contact joint substrates.
 - 2. Completely fill recesses in each joint configuration.
 - 3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
- E. Tooling of Nonsag Joint Sealants: Immediately after joint-sealant application and before skinning or curing begins, tool sealants according to the following requirements to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint:
 - 1. Remove excess joint sealant from surfaces adjacent to joints.
 - 2. Use tooling agents that are approved in writing by joint-sealant manufacturer and that do not discolor sealants or adjacent surfaces.
- F. Provide joint configuration to comply with joint-sealant manufacturer's written instructions unless otherwise indicated.

3.4 CLEANING AND PROTECTION

- A. Clean off excess joint sealant as the Work progresses, by methods and with cleaning materials approved in writing by joint-sealant manufacturers.
- B. Protect joint sealants, during and after curing period, from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants are without deterioration or damage at time of Substantial Completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and replace with joint sealant so installations in repaired areas are indistinguishable from the original work.

3.5 PAVING-JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Joints within concrete paving.
 - 1. Joint Location:
 - a. Expansion and isolation joints in concrete paving.
 - b. Contraction joints in concrete paving.
 - c. Other joints as indicated.
 - 2. Joint Sealant: Single-component, nonsag, silicone joint sealant or Single-component, self-leveling, silicone joint sealant .

END OF SECTION

SECTION 32 92 00

TURF AND GRASSES

PART 1 - PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
 - 1. Seeding.
 - 2. Sodding.
 - 3. Hydroseeding.

1.3 DEFINITIONS

- A. Finish Grade: Elevation of finished surface of planting soil.
- B. Pesticide: A substance or mixture intended for preventing, destroying, repelling, or mitigating a pest. Pesticides include insecticides, miticides, herbicides, fungicides, rodenticides, and molluscicides. They also include substances or mixtures intended for use as a plant regulator, defoliant, or desiccant.
- C. Pests: Living organisms that occur where they are not desired or that cause damage to plants, animals, or people. Pests include insects, mites, grubs, mollusks (snails and slugs), rodents (gophers, moles, and mice), unwanted plants (weeds), fungi, bacteria, and viruses.
- D. Planting Soil: Existing, on-site soil; imported soil; or manufactured soil that has been modified with soil amendments and perhaps fertilizers to produce a soil mixture best for plant growth.
- E. Subgrade: The surface or elevation of subsoil remaining after excavation is complete, or the top surface of a fill or backfill before planting soil is placed.

1.4 INFORMATIONAL SUBMITTALS

- A. Certification of Grass Seed: From seed vendor for each grass-seed monostand or mixture, stating the botanical and common name, 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. Product Certificates: For fertilizers, from manufacturer.
- C. Pesticides and Herbicides: Product label and manufacturer's application instructions specific to Project.

1.5 QUALITY ASSURANCE

- A. **Installer Qualifications:** A qualified landscape installer whose work has resulted in successful turf establishment.
 - 1. **Experience:** Three years' experience in turf installation.
 - 2. **Installer's Field Supervision:** Require Installer to maintain an experienced full-time supervisor on Project site when work is in progress.
 - 3. **Pesticide Applicator:** State licensed, commercial.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. **Seed and Other Packaged Materials:** Deliver packaged materials in original, unopened containers showing weight, certified analysis, name and address of manufacturer, and indication of compliance with state and Federal laws, as applicable.
- B. **Sod:** Harvest, deliver, store, and handle sod according to requirements in "Specifications for Turfgrass Sod Materials" and "Specifications for Turfgrass Sod Transplanting and Installation" sections in TPI's "Guideline Specifications to Turfgrass Sodding." Deliver sod within 24 hours of harvesting and in time for planting promptly. Protect sod from breakage and drying.
- C. **Bulk Materials:**
 - 1. Do not dump or store bulk materials near structures, utilities, walkways and pavements, or on existing turf areas or plants.
 - 2. Provide erosion-control measures to prevent erosion or displacement of bulk materials; discharge of soil-bearing water runoff; and airborne dust reaching adjacent properties, water conveyance systems, or walkways.
 - 3. Accompany each delivery of bulk materials with appropriate certificates.

1.7 FIELD CONDITIONS

- A. **Weather Limitations:** Proceed with planting only when existing and forecasted weather conditions permit planting to be performed when beneficial and optimum results may be obtained. Apply products during favorable weather conditions according to manufacturer's written instructions.

PART 2 - PRODUCTS

2.1 SEED

- A. **Grass Seed:** Fresh, clean, dry, new-crop seed complying with AOSA's "Rules for Testing Seeds" for purity and germination tolerances.
- B. **Seed Species:**
 - 1. **Quality, State Certified:** State-certified seed of grass species as listed below for solar exposure.
 - 2. **Quality, Non-State Certified:** Seed of grass species as listed below for solar exposure, with not less than 85 percent germination, not less than 95 percent pure seed, and not more than 0.5 percent weed seed:
 - 3. **Full Sun, Warm-Season Grass Seed Mix:** Bermuda grass (Common) seed mix.

- a. If a plant species is not available by the producers, the other plant species in the recommended seed mixture will be increased proportionally by the PLS/acre of the missing plant species.
 - 4. Full Sun, Warm-Season Grass Seed Mix: Bermuda grass (Common) seed mix.
 - a. If a plant species is not available by the producers, the other plant species in the recommended seed mixture will be increased proportionally by the PLS/acre of the missing plant species.
 - C. Commercial Fertilizer: Commercial-grade complete fertilizer of neutral character, consisting of fast- and slow-release nitrogen, 50 percent derived from natural organic sources of urea formaldehyde, phosphorous, and potassium in the following composition:
 - 1. Composition:
 - a. 1 lb/1000 sq. ft. of actual nitrogen, 4 percent phosphorous, and 2 percent potassium, by weight.
- 2.2 SODDING
- A. Turfgrass Species, Warm-Season Grass: Bermudagrass (*Cynodon dactylon*)
- 2.3 MULCHES
- A. Straw Mulch: Provide air-dry, clean, mildew- and seed-free, salt hay or threshed straw of wheat, rye, oats, or barley.
- 2.4 PESTICIDES
- A. General: Pesticide, registered and approved by the EPA, acceptable to authorities having jurisdiction, and of type recommended by manufacturer for each specific problem and as required for Project conditions and application. Do not use restricted pesticides unless authorized in writing by authorities having jurisdiction.
 - B. Pre-Emergent Herbicide (Selective and Nonselective): Effective for controlling the germination or growth of weeds within planted areas at the soil level directly below the mulch layer.
 - C. Post-Emergent Herbicide (Selective and Nonselective): Effective for controlling weed growth that has already germinated.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to be planted for compliance with requirements and other conditions affecting installation and performance of the Work.
 - 1. Verify that no foreign or deleterious material or liquid such as paint, paint washout, concrete slurry, concrete layers or chunks, cement, plaster, oils, gasoline, diesel fuel, paint thinner, turpentine, tar, roofing compound, or acid has been deposited in soil within a planting area.
 - 2. Suspend planting operations during periods of excessive soil moisture until the moisture content reaches acceptable levels to attain the required results.
 - 3. Uniformly moisten excessively dry soil that is not workable or which is dusty.

- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. If contamination by foreign or deleterious material or liquid is present in soil within a planting area, remove the soil and contamination as directed by Architect and replace with new planting soil.

3.2 PREPARATION

- A. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.
 - 1. Protect adjacent and adjoining areas from hydroseeding and hydromulching overspray.
 - 2. Protect grade stakes set by others until directed to remove them.
- B. Install erosion-control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or airborne dust to adjacent properties and walkways.

3.3 TURF AREA PREPARATION

- A. Moisten prepared area before planting if soil is dry. Water thoroughly and allow surface to dry before planting. Do not create muddy soil.
- B. Before planting, obtain Architect's acceptance of finish grading; restore planting areas if eroded or otherwise disturbed after finish grading.

3.4 SEEDING

- A. Sow seed with spreader or seeding machine. Do not broadcast or drop seed when wind velocity exceeds 5 mph.
 - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other.
 - 2. Do not use wet seed or seed that is moldy or otherwise damaged.
 - 3. Do not seed against existing trees. Limit extent of seed to outside edge of planting saucer.
 - 4. Drill seed uniformly at a depth of 1/4 to 1/3 in using a pasture or rangeland type drill. Plant along the contour of the slopes.
- B. Sow seed at a total rate of 10 Lbs/Acre between March 1st and August 31st.
 - 1. If a plant species is not available by the producers, the other plant species in the recommended seed mixture will be increased proportionally by the PLS/acre of the missing plant species.
- C. Sow seed at a total rate of 20 Lbs/Acre between September 1st and February 28th/29th.
 - 1. If a plant species is not available by the producers, the other plant species in the recommended seed mixture will be increased proportionally by the PLS/acre of the missing plant species.
- D. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- E. Protect seeded areas with slopes not exceeding 1:6 by spreading straw mulch. Spread uniformly at a minimum rate of 2 tons/acre to form a continuous blanket 1-1/2 inches in loose thickness over seeded areas. Spread by hand, blower, or other suitable equipment.
 - 1. Anchor straw mulch by crimping into soil with suitable mechanical equipment.

3.5 SODDING

- A. Lay sod within 24 hours of harvesting. Do not lay sod if dormant or if ground is frozen or muddy.
- B. Lay sod to form a solid mass with tightly fitted joints. Butt ends and sides of sod; do not stretch or overlap. Stagger sod strips or pads to offset joints in adjacent courses. Avoid damage to soil or sod during installation. Tamp and roll lightly to ensure contact with soil, eliminate air pockets, and form a smooth surface. Work sifted soil or fine sand into minor cracks between pieces of sod; remove excess to avoid smothering sod and adjacent grass.
- C. Lay sod across slopes exceeding 1:3.
- D. Saturate sod with fine water spray within two hours of planting. During first week after planting, water daily or more frequently as necessary to maintain moist soil to a minimum depth of 1-1/2 inches below sod.

3.6 HYDROSEEDING

- A. Hydroseeding: Mix specified seed, commercial fertilizer, and fiber mulch in water, using equipment specifically designed for hydroseed application. Continue mixing until uniformly blended into homogeneous slurry suitable for hydraulic application.
 - 1. Spray-apply slurry uniformly to all areas to be seeded in a one-step process. Apply slurry at a rate so that mulch component is deposited at not less than 1500-lb/acre dry weight, and seed component is deposited at not less than the specified seed-sowing rate.

3.7 TURF MAINTENANCE

- A. General: Maintain and establish turf by watering, fertilizing, weeding, mowing, trimming, replanting, and performing other operations as required to establish healthy, viable turf. Roll, regrade, and replant bare or eroded areas and remulch to produce a uniformly smooth turf. Provide materials and installation the same as those used in the original installation.
 - 1. Fill in as necessary soil subsidence that may occur because of settling or other processes. Replace materials and turf damaged or lost in areas of subsidence.
 - 2. In areas where mulch has been disturbed by wind or maintenance operations, add new mulch and anchor as required to prevent displacement.
- B. Watering: Install and maintain temporary piping, hoses, and turf-watering equipment to convey water from sources and to keep turf uniformly moist to a depth of 4 inches.
 - 1. Schedule watering to prevent wilting, puddling, erosion, and displacement of seed or mulch. Lay out temporary watering system to avoid walking over muddy or newly planted areas.
- C. Mow turf as soon as top growth is tall enough to cut. Repeat mowing to maintain specified height without cutting more than one-third of grass height. Remove no more than one-third of grass-leaf growth in initial or subsequent mowings. Do not delay mowing until grass blades bend over and become matted. Do not mow when grass is wet. Schedule initial and subsequent mowings to maintain the following grass height:
 - 1. Mow bermudagrass to a height of 1/2 to 1 inch.
 - 2. For Bemuda mix mowing shall be 6 to 12 inches.

3.8 SATISFACTORY TURF

- A. Turf installations shall meet the following criteria as determined by Architect:
 - 1. Satisfactory Seeded Turf: At end of maintenance period, a healthy, uniform, close stand of grass has been established, free of weeds and surface irregularities, with coverage exceeding 90 percent over any 10 sq. ft. and bare spots not exceeding 5 by 5 inches.
 - 2. plants, and areas between sprigs are free of weeds and other undesirable vegetation.
 - 3. Satisfactory Sodded Turf: At end of maintenance period, a healthy, well-rooted, even-colored, viable turf has been established, free of weeds, open joints, bare areas, and surface irregularities.
- B. Use specified materials to reestablish turf that does not comply with requirements and continue maintenance until turf is satisfactory.

3.9 PESTICIDE APPLICATION

- A. Apply pesticides and other chemical products and biological control agents according to requirements of authorities having jurisdiction and manufacturer's written recommendations. Coordinate applications with Owner's operations and others in proximity to the Work. Notify Owner before each application is performed.
- B. Post-Emergent Herbicides (Selective and Nonselective): Apply only as necessary to treat already-germinated weeds and according to manufacturer's written recommendations.

3.10 CLEANUP AND PROTECTION

- A. Promptly remove soil and debris created by turf work from paved areas. Clean wheels of vehicles before leaving site to avoid tracking soil onto roads, walks, or other paved areas.
- B. Remove surplus soil and waste material, including excess subsoil, unsuitable soil, trash, and debris, and legally dispose of them off Owner's property.
- C. Erect temporary fencing or barricades and warning signs as required to protect newly planted areas from traffic. Maintain fencing and barricades throughout initial maintenance period and remove after plantings are established.
- D. Remove nondegradable erosion-control measures after grass establishment period.

3.11 MAINTENANCE SERVICE

Turf Maintenance Service: Provide full maintenance by skilled employees of landscape Installer. Maintain as required in "Turf Maintenance" Article. Begin maintenance immediately after each area is planted and continue until acceptable turf is established, but for not less than the following periods:

- 1. Seeded Turf: 60 days from date of Substantial Completion.
 - a. When initial maintenance period has not elapsed before end of planting season, or if turf is not fully established, continue maintenance during next planting season.
- 2. Maintenance Period: 40 days from date of Substantial Completion.
- 3. Sodded Turf: 30 days from date of Substantial Completion.

END OF SECTION

SECTION 33 42 00

STORMWATER CONVEYANCE

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. PVC pipe and fittings.
 - 2. Concrete pipe and fittings.
 - 3. Non-pressure transition couplings.
 - 4. Cleanouts.
 - 5. Manholes.
 - 6. Catch basins.
 - 7. Stormwater inlets.
 - 8. Stormwater detention structures.
 - 9. Pipe outlets.

1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings:
 - 1. Manholes: Include plans, elevations, sections, details, frames, and covers.
 - 2. Catch basins and stormwater inlets. Include plans, elevations, sections, details, frames, covers, and grates.
 - 3. Stormwater Detention Structures: Include plans, elevations, sections, details, frames, covers, design calculations, and concrete design-mix reports.

1.3 INFORMATIONAL SUBMITTALS

- A. Product Certificates: For each type of cast-iron soil pipe and fitting.
- B. Field quality-control reports.

1.4 QUALITY ASSURANCE

- A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 PVC PIPE AND FITTINGS

A. PVC Corrugated Sewer Piping:

1. Pipe: ASTM F949, PVC, corrugated pipe with bell-and-spigot ends for gasketed joints.
2. Fittings: ASTM F949, PVC molded or fabricated, socket type.
3. Gaskets: ASTM F477, elastomeric seals.

B. Adhesive Primer: ASTM F656.

2.2 CONCRETE PIPE AND FITTINGS

A. Reinforced-Concrete Sewer Pipe and Fittings: ASTM C76 (ASTM C76M).

1. Bell-and-spigot or tongue-and-groove ends and gasketed joints with ASTM C443 (ASTM C443M), rubber gaskets or sealant joints with ASTM C990 (ASTM C990M), bitumen or butyl-rubber sealant.
2. Class III, Wall A.

2.3 CLEANOUTS

A. Cast-Iron Cleanouts:

1. Description: ASME A112.36.2M, round, gray-iron housing with clamping device and round, secured, scoriated, gray-iron cover. Include gray-iron ferrule with inside caulk or spigot connection and countersunk, tapered-thread, brass closure plug.
2. Top-Loading Classification(s): Heavy Duty.
3. Sewer Pipe Fitting and Riser to Cleanout: ASTM A74, Service class, cast-iron soil pipe and fittings.

2.4 MANHOLES

A. Standard Precast Concrete Manholes:

1. Description: ASTM C478 (ASTM C478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Diameter: 48 inches (1200 mm) minimum unless otherwise indicated.
3. Ballast: Increase thickness of precast concrete sections or add concrete to base section as required to prevent flotation.
4. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
5. Riser Sections: 4-inch (102-mm) minimum thickness, and lengths to provide depth indicated.
6. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated, and top of cone of size that matches grade rings.

7. Joint Sealant: ASTM C990 (ASTM C990M), bitumen or butyl rubber.
8. Resilient Pipe Connectors: ASTM C923 (ASTM C923M), cast or fitted into manhole walls, for each pipe connection.
9. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of manhole to finished grade is less than 60 (1500) inches (mm).
10. Adjusting Rings: Interlocking HDPE rings with level or sloped edge in thickness and diameter matching manhole frame and cover, and of height required to adjust manhole frame and cover to indicated elevation and slope. Include sealant recommended by ring manufacturer.
11. Grade Rings: Reinforced-concrete rings, 6- to 9-inch (150- to 225-mm) total thickness, to match diameter of manhole frame and cover, and height as required to adjust manhole frame and cover to indicated elevation and slope.

2.5 CONCRETE

- A. General: Cast-in-place concrete in accordance with ACI 318 (ACI 318M), ACI 350 (ACI 350M), and the following:
 1. Cement: ASTM C150/C150M, Type II.
 2. Fine Aggregate: ASTM C33/C33M, sand.
 3. Coarse Aggregate: ASTM C33/C33M, crushed gravel.
 4. Water: Potable.
- B. Portland Cement Design Mix: 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio.
 1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.
- C. Manhole Channels and Benches: Factory or field formed from concrete. Portland cement design mix, 4000 psi (27.6 MPa) minimum, with 0.45 maximum water/cementitious materials ratio. Include channels and benches in manholes.
 1. Channels: Concrete invert, formed to same width as connected piping, with height of vertical sides to three-fourths of pipe diameter. Form curved channels with smooth, uniform radius and slope.
 - a. Invert Slope: 1 percent through manhole.
 2. Benches: Concrete, sloped to drain into channel.
 - a. Slope: 4 percent.
- D. Ballast and Pipe Supports: Portland cement design mix, 3000 psi (20.7 MPa) minimum, with 0.58 maximum water/cementitious materials ratio.
 1. Reinforcing Fabric: ASTM A1064/A1064M, steel, welded wire fabric, plain.
 2. Reinforcing Bars: ASTM A615/A615M, Grade 60 (420 MPa) deformed steel.

2.6 CATCH BASINS

A. Standard Precast Concrete Catch Basins:

1. Description: ASTM C478 (ASTM C478M), precast, reinforced concrete, of depth indicated, with provision for sealant joints.
2. Base Section: 6-inch (150-mm) minimum thickness for floor slab and 4-inch (102-mm) minimum thickness for walls and base riser section, and separate base slab or base section with integral floor.
3. Riser Sections: 4-inch (102-mm) minimum thickness, 48-inch (1200-mm) diameter, and lengths to provide depth indicated.
4. Top Section: Eccentric-cone type unless concentric-cone or flat-slab-top type is indicated. Top of cone of size that matches grade rings.
5. Joint Sealant: ASTM C990 (ASTM C990M), bitumen or butyl rubber.
6. Adjusting Rings: Interlocking rings with level or sloped edge in thickness and shape matching catch basin frame and grate. Include sealant recommended by ring manufacturer.
7. Grade Rings: Include two or three reinforced-concrete rings, of 6- to 9-inch (150- to 225-mm) total thickness, that match 24-inch- (610-mm-) diameter frame and grate.
8. Steps: Individual FRP steps or FRP ladder, wide enough to allow worker to place both feet on one step and designed to prevent lateral slippage off step. Cast or anchor steps into sidewalls at 12- to 16-inch (300- to 400-mm) intervals. Omit steps if total depth from floor of catch basin to finished grade is less than 60 (1500) inches (mm).
9. Pipe Connectors: ASTM C923 (ASTM C923M), resilient, of size required, for each pipe connecting to base section.

B. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include flat grate with small square or short-slotted drainage openings.

1. Size: 24 by 24 inches (610 by 610 mm) minimum unless otherwise indicated.
2. Grate Free Area: Approximately 50 percent unless otherwise indicated.

C. Frames and Grates: ASTM A536, Grade 60-40-18, ductile iron designed for A-16 (AASHTO HS20-44), structural loading. Include 24-inch (610-mm) ID by 7- to 9-inch (175- to 225-mm) riser with 4-inch- (102-mm-) minimum width flange, and 26-inch- (660-mm-) diameter flat grate with small square or short-slotted drainage openings.

1. Grate Free Area: Approximately 50 percent unless otherwise indicated.

2.7 STORMWATER INLETS

A. Curb Inlets: Made with vertical curb opening, of materials and dimensions in accordance with utility standards.

B. Gutter Inlets: Made with horizontal gutter opening, of materials and dimensions in accordance with utility standards. Include heavy-duty frames and grates.

C. Combination Inlets: Made with vertical curb and horizontal gutter openings, of materials and dimensions in accordance with utility standards. Include heavy-duty frames and grates.

- D. Frames and Grates: Heavy duty.

2.8 PIPE OUTLETS

- A. Head Walls: Cast-in-place reinforced concrete, with apron and tapered sides.
- B. Riprap Basins: Broken, irregularly sized and shaped, graded stone in accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control."
 - 1. Average Size: NSSGA No. R-5, screen opening 5 inches (127 mm).
- C. Filter Stone: In accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control," No. FS-2, No. 4 screen opening, average-size graded stone.
- D. Energy Dissipaters: In accordance with NSSGA's "Quarried Stone for Erosion and Sediment Control," No. A-1, 3-ton (2721-kg) average weight armor stone, unless otherwise indicated.

PART 3 - EXECUTION

3.1 EARTHWORK

- A. Excavation, trenching, and backfilling are specified in Section 312000 "Earth Moving."

3.2 PIPING INSTALLATION

- A. General Locations and Arrangements: Drawing plans and details indicate general location and arrangement of underground storm drainage piping. Location and arrangement of piping layout take into account design considerations. Install piping as indicated, to extent practical. Where specific installation is not indicated, follow piping manufacturer's written instructions.
- B. Install piping beginning at low point, true to grades and alignment indicated with unbroken continuity of invert. Place bell ends of piping facing upstream. Install gaskets, seals, sleeves, and couplings in accordance with manufacturer's written instructions for use of lubricants, cements, and other installation requirements.
- C. Install manholes for changes in direction unless fittings are indicated. Use fittings for branch connections unless direct tap into existing sewer is indicated.
- D. Install proper size increasers, reducers, and couplings where different sizes or materials of pipes and fittings are connected. Reducing size of piping in direction of flow is prohibited.
- E. When installing pipe under streets or other obstructions that cannot be disturbed, use pipe-jacking process of micro-tunneling.
- F. Install gravity-flow, non-pressure drainage piping in accordance with the following:
 - 1. Install piping pitched down in direction of flow.
 - 2. Install PVC sewer piping in accordance with ASTM D2321 and ASTM F1668.

3. Install nonreinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."
4. Install reinforced-concrete sewer piping in accordance with ASTM C1479 and ACPA's "Concrete Pipe Installation Manual."

3.3 PIPE JOINT CONSTRUCTION

- A. Join gravity-flow, nonpressure drainage piping in accordance with the following:
 1. Join PVC corrugated sewer piping in accordance with ASTM D2321 for elastomeric-seal joints.
 2. Join reinforced-concrete sewer piping in accordance with ACPA's "Concrete Pipe Installation Manual" for rubber-gasketed joints.

3.4 CLEANOUT INSTALLATION

- A. Install cleanouts and riser extensions from sewer pipes to cleanouts at grade. Use cast-iron soil pipe fittings in sewer pipes at branches for cleanouts and cast-iron soil pipe for riser extensions to cleanouts. Install piping so cleanouts open in direction of flow in sewer pipe.
 1. Use Heavy-Duty, top-loading classification cleanouts.
- B. Set cleanout frames and covers in earth in cast-in-place concrete block, 18 by 18 by 12 (450 by 450 by 300) inches (mm) deep. Set with tops 1 (25) inch(es) (mm) above surrounding earth grade.
- C. Set cleanout frames and covers in concrete pavement and roads with tops flush with pavement surface.

3.5 MANHOLE INSTALLATION

- A. General: Install manholes, complete with appurtenances and accessories indicated.
- B. Install precast concrete manhole sections with sealants in accordance with ASTM C891.
- C. Where specific manhole construction is not indicated, follow manhole manufacturer's written instructions.
- D. Set tops of frames and covers flush with finished surface of manholes that occur in pavements. Set tops 3 (76) inches (mm) above finished surface elsewhere unless otherwise indicated.

3.6 CATCH BASIN INSTALLATION

- A. Construct catch basins to sizes and shapes indicated.
- B. Set frames and grates to elevations indicated.

3.7 STORMWATER INLET INSTALLATION

- A. Construct inlet head walls, aprons, and sides of reinforced concrete, as indicated.
- B. Construct riprap of broken stone, as indicated.
- C. Install outlets that spill onto grade, anchored with concrete, where indicated.
- D. Install outlets that spill onto grade, with flared end sections that match pipe, where indicated.
- E. Construct energy dissipaters at outlets, as indicated.

3.8 CONCRETE PLACEMENT

- A. Place cast-in-place concrete in accordance with ACI 318 (ACI 318M).

3.9 CONNECTIONS

- A. Make connections to existing piping and underground manholes.
 - 1. Use commercially manufactured wye fittings for piping branch connections. Remove section of existing pipe; install wye fitting into existing piping; and encase entire wye fitting, plus 6-inch (150-mm) overlap, with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
 - 2. Make branch connections from side into existing piping, NPS 4 to NPS 20 (DN 100 to DN 500). Remove section of existing pipe, install wye fitting into existing piping, and encase entire wye with not less than 6 inches (150 mm) of concrete with 28-day compressive strength of 3000 psi (20.7 MPa).
 - 3. Make branch connections from side into existing piping, NPS 21 (DN 525) or larger, or to underground manholes and structures by cutting into existing unit and creating an opening large enough to allow 3 inches (76 mm) of concrete to be packed around entering connection. Cut end of connection pipe passing through pipe or structure wall to conform to shape of and be flush with inside wall unless otherwise indicated. On outside of pipe, manhole, or structure wall, encase entering connection in 6 inches (150 mm) of concrete for minimum length of 12 inches (300 mm) to provide additional support of collar from connection to undisturbed ground.
 - a. Use concrete that will attain a minimum 28-day compressive strength of 3000 psi (20.7 MPa) unless otherwise indicated.
 - b. Use epoxy-bonding compound as interface between new and existing concrete and piping materials.
 - 4. Protect existing piping, manholes, and structures to prevent concrete or debris from entering while making tap connections. Remove debris or other extraneous material that may accumulate.

3.10 FIELD QUALITY CONTROL

- A. Inspect interior of piping to determine whether line displacement or other damage has occurred. Inspect after approximately 24 inches (610 mm) of backfill is in place, and again at completion of Project.
 - 1. Submit separate reports for each system inspection.
 - 2. Defects requiring correction include the following:
 - a. Alignment: Less than full diameter of inside of pipe is visible between structures.
 - b. Deflection: Flexible piping with deflection that prevents passage of ball or cylinder of size not less than 92.5 percent of piping diameter.
 - c. Damage: Crushed, broken, cracked, or otherwise damaged piping.
 - d. Infiltration: Water leakage into piping.
 - e. Exfiltration: Water leakage from or around piping.
 - 3. Replace defective piping using new materials and repeat inspections until defects are within allowances specified.
 - 4. Reinspect and repeat procedure until results are satisfactory.
- B. Contractor will test new piping systems, and parts of existing systems that have been altered, extended, or repaired, for leaks and defects.
 - 1. Do not enclose, cover, or put into service before inspection and approval.
 - 2. Contractor will test completed piping systems in accordance with requirements of authorities having jurisdiction.
 - 3. Schedule tests and inspections by authorities having jurisdiction with at least 24 hours' advance notice.
 - 4. Gravity-Flow Storm Drainage Piping: Test in accordance with requirements of authorities having jurisdiction and the following:
 - a. Exception: Piping with soil tight joints unless required by authorities having jurisdiction.
 - b. Option: Test plastic piping in accordance with ASTM F1417.
- C. Leaks and loss in test pressure constitute defects that must be repaired.
- D. Replace leaking piping using new materials and repeat testing until leakage is within allowances specified.

3.11 CLEANING

- A. Clean interior of piping of dirt and superfluous materials.

END OF SECTION

APPENDIX A
GEOTECHNICAL REPORT



June 6, 2024
Job No. A24184.00117

North Little Rock Electric
P.O. Box 936
North Little Rock, Arkansas 72115

Attn: Ms. Jessica Stephens

**RESULTS of GEOTECHNICAL INVESTIGATION
PROPOSED COVERED PARKING ADDITION
NORTH LITTLE ROCK ELECTRIC DEPARTMENT
NORTH LITTLE ROCK, ARKANSAS**

INTRODUCTION

This report presents the results of the geotechnical investigation performed for the proposed covered parking addition planned at the North Little Rock Electric Department (NLRED) facility in North Little Rock, Arkansas. These services were authorized on behalf of North Little Rock Electric on March 26, 2024. This geotechnical investigation has been performed in general accordance with our proposal of December 19, 2023 (GHBW Proposal No. 23-154).

We understand that the covered parking addition will be located east of the North Little Rock Electric facility at 1400 West Maryland Avenue in North Little Rock. The covered parking addition consists of two (2) canopies with “T”-shaped configurations and approximate dimensions of 60 ft by 250 feet. Foundation loads of the new buildings are expected to be very light in compression but could be moderate in uplift and overturning. We also understand that preliminary plans are to utilize Portland cement pavements or housekeeping slabs under and around the sheds. However, consideration will be given to aggregate-surfaced pavements. Site grading information indicates the project will include up to approximately 8 ft of cut and 2 ft of fill.

The purposes of this study were to explore subsurface conditions at the project site and to develop recommendations to guide design and construction of foundations and pavements. The results of the field and laboratory studies are discussed in the following report sections. Conclusions and recommendations are discussed in subsequent report sections.



SUBSURFACE EXPLORATION

Subsurface conditions at the NLRED site were explored by drilling six (6) sample borings to 14- and 14.5-ft depth. The site vicinity is shown on Plate 1. The approximate boring locations are shown on the Plan of Borings, Plate 2. Boring logs, presenting descriptions of the subsurface strata encountered and results of field and laboratory tests, are included as Plates 3 through 8. The approximate ground surface elevation, as inferred from the topographic information provided by the Engineer (Garver), is also shown on the logs. It must be recognized that the elevations shown are approximate and actual elevations may vary. Keys to the terms and symbols used on the logs are presented as Plates 9 and 10.

The borings were drilled with a truck-mounted SIMCO 2800 rotary-drilling rig using dry-auger drilling procedures. Samples were typically obtained using a 2-inch-diameter split-barrel sampler driven into the strata by blows of a 140-lb automatic hammer. The number of blows required to drive the standard split-barrel sampler the final 12 inches of an 18-inch total drive, or portion thereof, is defined as the Standard Penetration Number (N). Recorded N-values are shown on the boring logs in the "Blows Per Ft" column. Where rock hardness precluded obtaining samples via the SPT, cuttings were obtained for use in visual classification.

All samples were removed from sampling tools in the field, examined and visually classified by the field geologist. Samples were then placed in appropriate containers to prevent moisture loss and/or change in condition during transfer to our laboratory for further examination and testing.

The borings were advanced using dry-auger drilling procedures to facilitate groundwater observations. Observations regarding groundwater are shown in the lower-right portion of each log. All boreholes were backfilled after obtaining final groundwater readings.

LABORATORY TESTING

To evaluate relevant soil properties, laboratory tests consisting of classification and natural water content determinations were performed. A total of 11 natural water content determinations were performed to develop data on *in-situ* soil water contents for each boring. Water content results are plotted on the log forms in accordance with the scale and symbols shown in the legend located in the upper-right corner of the log.

To verify field classification and to evaluate soil plasticity, three (3) liquid and plastic (Atterberg) limit determinations and five (5) sieve analyses were performed. The Atterberg limits are plotted on the boring logs as pluses connected with a dashed line using the water content scale. The percent of soil passing the No. 200 sieve is noted in the "Minus No. 200" column on the log forms.



Classification test results, along with soil classification by the Unified Soil Classification System and AASHTO Classification System, are summarized in Appendix A.

SITE and SUBSURFACE CONDITIONS

Site Conditions

The project site is located near the southwest corner of West Maryland Avenue and Aviator Way in North Little Rock, Arkansas. The location is directly east of the existing North Little Rock Electric facility on West Maryland Avenue. The site is presently an open and undeveloped field with some areas that have been recently cleared. Areas where clearing has recently occurred have soil and rock fragments exposed at the surface. The remaining areas have a short grass and weed cover. The surrounding terrain is undulating and grades to the west are generally higher than the grade of the subject site. The terrain of the project area is flat and generally slopes down to the southeast. A stormwater drain outlet is located near the northwest corner of the expansion site. Some areas of standing water were present at the time of the field studies. Surface drainage is considered poor to fair.

Seismic Conditions

According to the Arkansas Building Authority (2005), the Pulaski County project site is located in Seismic Zone 1, i.e., the zone of least seismic potential. Based on the subsurface conditions encountered in the borings, the local geology, and our experience in the area, a Seismic Site Class B (rock profile) is considered fitting as per the criteria of the International Building Code (IBC 2021) and ASCE 7, Chapter 20.

Subsurface Conditions

The Geologic Map of Arkansas¹ indicates the project location is in the mapped outcrop of the Pennsylvanian Period Jackfork Sandstone formation. The Jackfork Sandstone formation is comprised of thin- to massive-bedded fine- to coarse-grained quartzitic sandstone with subordinate silty sandstone and shale units. The sandstone sometimes occurs as discontinuous masses in the shale. The shale and sandstone units are typically moderately dipping to steep and quartz veins and inclusions are relatively common. The thickness of the formation varies from 3500 to 6000 feet. The Jackfork Sandstone rests conformably on the Stanley Shale.

Based on the results of the borings, the subsurface stratigraphy on the subsurface conditions may be generalized into the following primary strata.

¹ Geologic Map of Arkansas, Arkansas Geological Commission and U.S. Geological Survey; 1993



- Stratum I:** The surface soils on the east side of the site (see Borings 2, 3, and 6) are predominantly loose tan and brown fine sandy silt extending to 2- to 4-ft depth. The fine sandy silt contains occasional sandstone fragments. Interbedded discontinuous silty clay seams are present in the fine sandy silt surface stratum. On the southeast portion of the site, the fine sandy silt was on-site fill (see Boring 6). The fine sandy silt has low plasticity and exhibits low relative density and high compressibility. The fine sandy silt is considered highly moisture sensitive and will lose significant strength when saturated or disturbed.
- Stratum II:** The surface soils in areas where the Stratum I fine sandy silt is not present and the near-surface soils below the fine sandy silt are soft to stiff tan, red, light brown and reddish tan silty clay and fine sandy clay extends to variable depths of 2 to 6 ft below existing grades. The fine sandy clay and silty clay contain a variable content of shale and sandstone fragments indicating these overburden soils are likely residual soils weathered from the shale and sandstone bedrock. The Stratum II silty clay and fine sandy clay have low to medium plasticity with low to moderate shear strength, and moderate compressibility.
- Stratum IIa:** The clayey overburden soils are locally on-site fill comprised of silty clay extending to the top of the weathered sandstone (see Boring 5). The silty clay fill is of low plasticity and exhibits fair compaction and moderate compressibility. The depth, content, and compaction of on-site fill is likely to vary across the site.
- Stratum III:** The overburden soils are underlain by friable tan, reddish tan, and gray highly weathered fine-grained sandstone. The highly weathered sandstone is weakly cemented. These weathered sandstone units contain variable amounts of silty clay and clay laminations and seams down to approximately 6- to 8-ft depth. Cementation and rock hardness of the weathered sandstone increases below about 6-ft depth. The highly weathered sandstone has very poor rock quality, but high shear strength and low compressibility.

Groundwater Conditions

Groundwater was not encountered within the exploration depths of the borings drilled in May 2024. However, shallow perched water is likely to be encountered in the silty overburden soils and/or within fractured zones of the highly weathered sandstone. In addition, seasonal surface seeps could be present as infiltrated surface water migrates to areas of lower terrain. These seeps are more likely at rock cuts and in existing drainage features. Groundwater levels will vary with seasonal precipitation and surface water runoff and infiltration.

ANALYSES and RECOMMENDATIONS

Foundation Design

Foundations for the covered parking sheds must satisfy two (2) basic and independent design criteria. First, the maximum bearing pressure for foundation elements must not exceed the allowable



bearing pressure based on an adequate factor of safety with respect to shear strength. Secondly, foundation movements resulting from consolidation, shrinking, or swelling of the supporting soils must be within tolerable limits for the structure. Construction factors such as foundation construction, excavation procedures, and surface and groundwater conditions must also be considered.

Based on the subsurface conditions encountered in the borings, the anticipated light to moderate structural loads, and available site grading plans, we recommend that foundation loads of the new canopies be supported on a footing foundation system. Foundation recommendations are discussed in the following report sections.

Footing Foundation System

We recommend that foundation loads of the covered parking canopies be supported on footings. Continuous or individual footings should be founded in the friable tan, reddish tan and gray highly weathered fine-grained sandstone or compacted select granular fill. Footings founded as recommended may be sized based on a maximum net allowable bearing pressure of 6000 lbs per sq foot. The recommended bearing values include a minimum factor of safety of 2.5 with respect to the competence of the highly weathered sandstone and anticipated shear strength of properly compacted select granular fill.

Total settlement of foundations proportioned based on the recommended allowable bearing pressures should be less than 1.0 inch. Differential settlement is expected to be less than about one-half of the total settlement. Select granular fill should consist of crushed stone aggregate base (ARDOT Standard Specifications for Highway Construction, 2014 Edition, Section 303, Class 7) or an approved alternate.

Footing undercuts may be backfilled with select granular fill, flowable fill (minimum compressive strength 500 psi), or lean concrete. Footing undercuts backfilled with select granular fill should have a minimum width determined by a 1-horizontal to 2-vertical (1H:2V) projection from the edge of footings to the undercut bottom. Undercuts may be excavated next to plan footing dimensions where backfilled with flowable fill or concrete. Where site conditions warrant mass undercut, footings may be founded in the compacted undercut backfill.

Uplift resistance of footings will be provided by the weight of the structure and the foundation units. If needed, additional uplift resistance can be provided by use of grouted rock anchors. For the competent weathered sandstone (Stratum III) an allowable grout to rock adhesion value of 30 lbs per sq inch may be assumed. The assumed grout bond value includes a minimum



factor of safety of 2.0. Use of an increased grout adhesion value may be appropriate if verified by the results of load tests. A minimum anchor length of 10 ft should be used.

Anchors may consist of minimum 60 kips per sq inch deformed bars grouted into drilled holes at least 3 inches in diameter. Where cementitious grout is used, it should have a minimum 28-day compressive strength of 4000 lbs per sq inch. Alternatively, high-strength rock anchors, such as those manufactured by Williams, may be utilized if approved by the Architect. In this case, anchors and grout should be installed in compliance with manufacturer's guidelines. Drill holes for all rock anchors must be properly cleaned and grout must be placed in hard contact with the bedrock.

Resistance to lateral forces will be developed by the passive resistance of the foundation strata and sliding resistance at the footing bottom. The passive resistance of the soil within the upper 1.5 ft should be neglected. Below 1.5-ft depth, an ultimate passive resistance value of 300 lbs per sq ft may be assumed for the stable on-site soils or compacted select fill. For passive resistance of the compacted select granular fill or highly weathered sandstone within the embedded depth of the footings, an ultimate passive resistance value of 500 lbs per sq ft per ft depth may be utilized. Resistance to sliding may also be evaluated using an ultimate friction value ($\tan \delta$) of 0.55 for concrete on the competent weathered sandstone or compacted select granular fill. Where foundation undercuts are backfilled with flowable fill or concrete, these materials should be rough finished to enhance friction resistance. Alternatively, short dowels may be utilized to mobilize shear resistance between foundation bottoms and cementitious backfill. An appropriate factor of safety must be included in analysis of sliding.

Continuous and individual footings should have minimum dimensions of 30 and 36 in., respectively. A minimum footing depth of 2 ft is recommended for embedment.

All footing excavations and foundation undercuts should be observed by the Geotechnical Engineer to verify suitable bearing. Severely weathered sandstone zones, decomposed weathered sandstone, sandy clay or silty clay seams or layers, or other discontinuities found in footing or undercut bottoms should be excavated to competent, sound rock. Dental concrete may be used to backfill excavated discontinuities. Use of stepped footings is acceptable. All excavation overbreaks and any footing undercuts should be backfilled with approved concrete. Where footing excavations will remain open for extended periods the bearing stratum should be protected with a thin layer of seal concrete.



Pavements and Slabs

The project includes paved drives and parking areas. It is expected that both drives and parking will be subject to frequent electric department service vehicle traffic, typically two-axle, dual rear wheel trucks. A maximum of 40 vehicles per day has been assumed for traffic levels.

Based on the results of the borings and the anticipated site grading, the pavement subgrade is expected to consist of the highly weathered sandstone or compacted select fill. The on-site stiff silty clay/sandy clay will generally provide fair subgrade support for pavements. Where competent weathered sandstone is present at the subgrade elevation, it should be scarified to at least 8-in. depth and recompacted or undercut and replaced.

Localized undercut and replacement of unstable subgrade soils is expected for pavement subgrade preparation. Depending on seasonal site conditions and final site grading plans, subgrade preparation could warrant undercuts in pavement areas on the order of 2 to 4 ft, more or less.

The following subgrade support parameters have been utilized to develop design recommendations for Portland cement pavements and shed slabs and for aggregate pavements.

- California Bearing Ratio (CBR): 8
- Resilient Modulus (M_R), psi: 3500
- Modulus of subgrade reaction (k): 150

Portland Cement Concrete Storage Areas and Drives

- 8 in. Portland Cement Concrete (minimum $f'_c = 4000$ psi @ 28 days)
- 6 in. Aggregate Base (ARDOT Standard Specifications for Highway Construction, 2014 Edition, Section 303, Class 7)

Aggregate Surfaced Storage Areas and Drives

- 10 in. Crushed Stone Base (ARDOT Class 7) over a geotextile such as Mirafi 500X or an approved alternate

Periodic maintenance of concrete pavements should include sealing of all joints and cracks to restrict surface water infiltration. Joint spacing for concrete pavements is typically on the order of 10 to 12 ft but should be based on specific design.

The geotextile for aggregate pavements should have a minimum lap of 12 in. at all joints. The calculated thickness for aggregate pavements above is based on 2 in. of allowable rutting. Periodic grading and addition of aggregate should be expected for aggregate-surfaced pavements.

The pavement subgrade should be prepared in accordance with the recommendations discussed in the Site Grading section of this report. Particular attention should be given to maintaining subgrade moisture and density until pavements are constructed. Immediately prior to base construction, the subgrade should be proof-rolled. All weak, unstable or otherwise unsuitable



soils should be excavated, processed, and re-compacted or replaced with select granular fill, whichever is appropriate. Aggregate base should be compacted to a minimum of 98 percent of the AASHTO T 180 maximum dry density as per ARDOT criteria.

The importance of positive surface drainage for acceptable pavement performance cannot be overemphasized. Grades should direct water off paved areas and ditches or storm drains should be used to develop positive flow away from pavements.

Site Grading

Site preparation for the covered parking addition is expected to begin with required stripping of the zone of organic-containing surface soils. Based on the observed depth of the organic zone, a stripping depth on the order of 6 in. is expected. Following stripping and cutting, and prior to any fill placement, the subgrade should be proof-rolled with a loaded tandem-wheel dump truck or similar equipment. All soft or loose soils encountered in the building and pavement areas should be excavated, reprocessed and recompactd or replaced with select granular fill, whichever is appropriate. Depending on seasonal site conditions and final grading plans, localized undercuts on the order of 2 to 4 ft, more or less, could be warranted.

The on-site soils are not recommended for use as fill or backfill in pavement areas. These soils may, however, be utilized as general fill in landscape areas outside of structure and pavement subgrade areas. The moisture-sensitive characteristics of the on-site soils will make these difficult to use for fill and backfill.

Imported borrow for use as select fill or backfill may consist of an approved silty clay/shale fragment blend or low-plasticity clayey sand (SC), sandy clay (CL), or clayey gravel (GC) with a liquid limit less than 40 and a maximum plasticity index (PI) of 18 or an approved alternate. All fill should be free of organics and durable rock fragments in excess of about 3-in. dimension. The top 18 in. of fill should have a maximum particle dimension limited to 1.5 inches. All fill and backfill should be approved by the Geotechnical Engineer.

Fill, backfill, and recompactd soils should be compacted to a minimum of 95 percent of the Modified Proctor (ASTM D1557) maximum dry density. Low-plasticity soils (clayey sand, sandy clay, or clayey gravel) should be compacted within a water content range of 2 percent below to 3 percent above the optimum value. Shale fragment blends should be watered as necessary to obtain a water content ranging from optimum to 3 percent above optimum during compaction. If a silty clay-shale fragment blend fill is used, particular attention should be given to compaction and placement procedures.



Fill and backfill should be placed in horizontal, nominal 6- to 8-in.-thick loose lifts. Fills placed against existing slopes should be benched into the existing slope face as the new fill is constructed. Each lift of backfill and fill should be tested and approved prior to placing subsequent lifts.

CONSTRUCTION CONSIDERATIONS

Positive surface and subsurface drainage should be established at the start of construction, maintained during the work, and incorporated into final design to prevent surface water ponding and subsequent saturation of subgrade soils. Density and water content of all earthwork should be maintained until the building and slab are completed. Each lift of fill and backfill should be tested and suitable density and water content verified before placing the next lift. Foundation or subgrade soils that become saturated by ponding water or runoff should be excavated to undisturbed soils.

Shallow groundwater was not encountered in the borings drilled in May 2024. However, it is possible that some shallow perched water could be present during wet seasons. Limited seepage into shallow excavations can probably be controlled by ditching or via sump-and-pump methods.

Where surface seeps or springs are encountered during site grading, we recommend the seepage be directed via French drains or blanket drains to positive discharge at daylight or to storm drainage lines. If seepage infiltration cannot be controlled, construction of drains and/or the use of stone backfill (i.e., "B" stone or #57 stone) will be warranted. Stone backfill should be fully encapsulated in geotextile filter fabric and vented to positive discharge into storm lines or to daylight. The use of gravel or crushed stone bedding encapsulated in filter fabric for bedding of storm drain lines can be considered to provide economical interception of potential downgradient seepage. Granular pipe bedding should be vented into storm drainage structures or daylighted for positive discharge.

All footing excavations and undercuts should be observed by the Geotechnical Engineer to verify suitable bearing and adequate undercut. Concrete should be placed in footing excavations expeditiously following final clean up and approval to limit changes in foundation conditions. Footing excavations should be clean and dry at the time of concrete placement. Where footing excavations will be left open for extended periods, the bearing stratum should be protected with a thin layer of seal concrete.

Based on the results of the borings, it is expected that shallow cuts in the highly weathered sandstone units can be performed with conventional heavy-duty excavation equipment, though with some ripping required for more extensive cuts. Footing or trench excavations extending more resistant



weathered sandstone or sandstone units at depth which require rock excavation methods. The use of hoerams, jackhammers, or similar methods may be required in such conditions, particularly in narrow excavations.

The potential for rock excavation should be anticipated. Contract documents should include a unit price for removal and disposal of materials and obstructions that cannot be excavated with conventional heavy-duty excavating equipment. The conventional heavy-duty excavating equipment may be defined as a Caterpillar D-7 bulldozer with single tooth ripper, a Caterpillar 312 track excavator equipped with rock teeth, or equipment of similar power and capability. Rock excavation volumes should be determined based on in-place measurements via cross sectioning. If excavation is to be unclassified, the Contractor must be responsible for assessing rock excavation requirements.

CLOSURE

Site preparation, grading work, undercuts, and all foundation and pavement construction should be monitored by the Engineer or a designated representative thereof. Subsurface conditions significantly at variance with those encountered in the borings should be brought to the attention of the Geotechnical Engineer. The conclusions and recommendations of this report should then be reviewed in light of the new information.

The following illustrations are attached and complete this submittal.

Plate 1	Site Vicinity
Plate 2	Plans of Borings
Plates 3 through 8	Boring Logs
Plates 5 and 6	Keys to Terms and Symbols
Appendix A	Classification Test Results

* * * * *



We appreciate the opportunity to be of service to you on this project. Should you have any questions regarding this report, please call on us.

Sincerely,

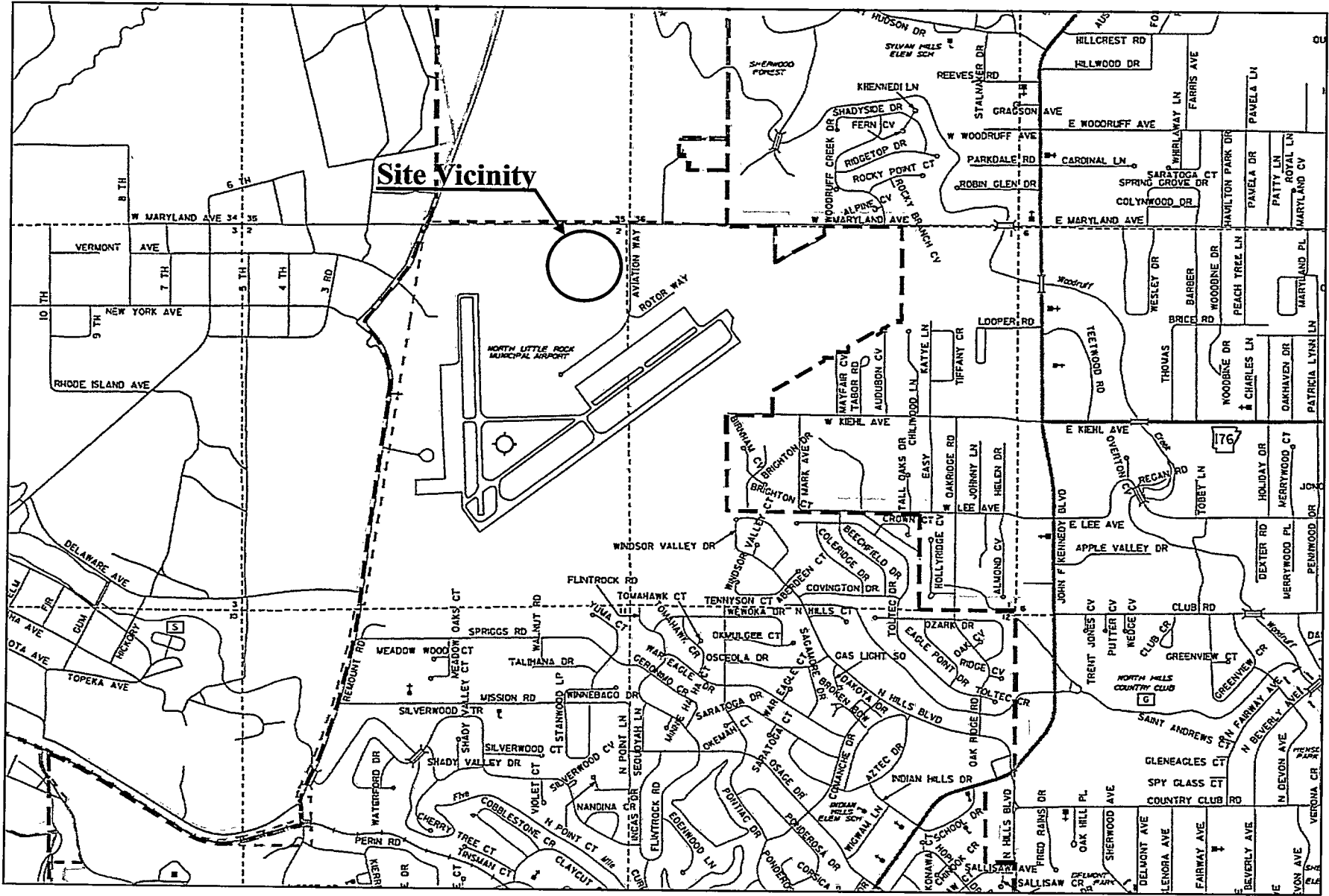
**GRUBBS, HOSKYN,
BARTON & WYATT, LLC**

Mark E. Wyatt, P.E.
President



JKB/MEW:jw

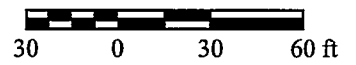
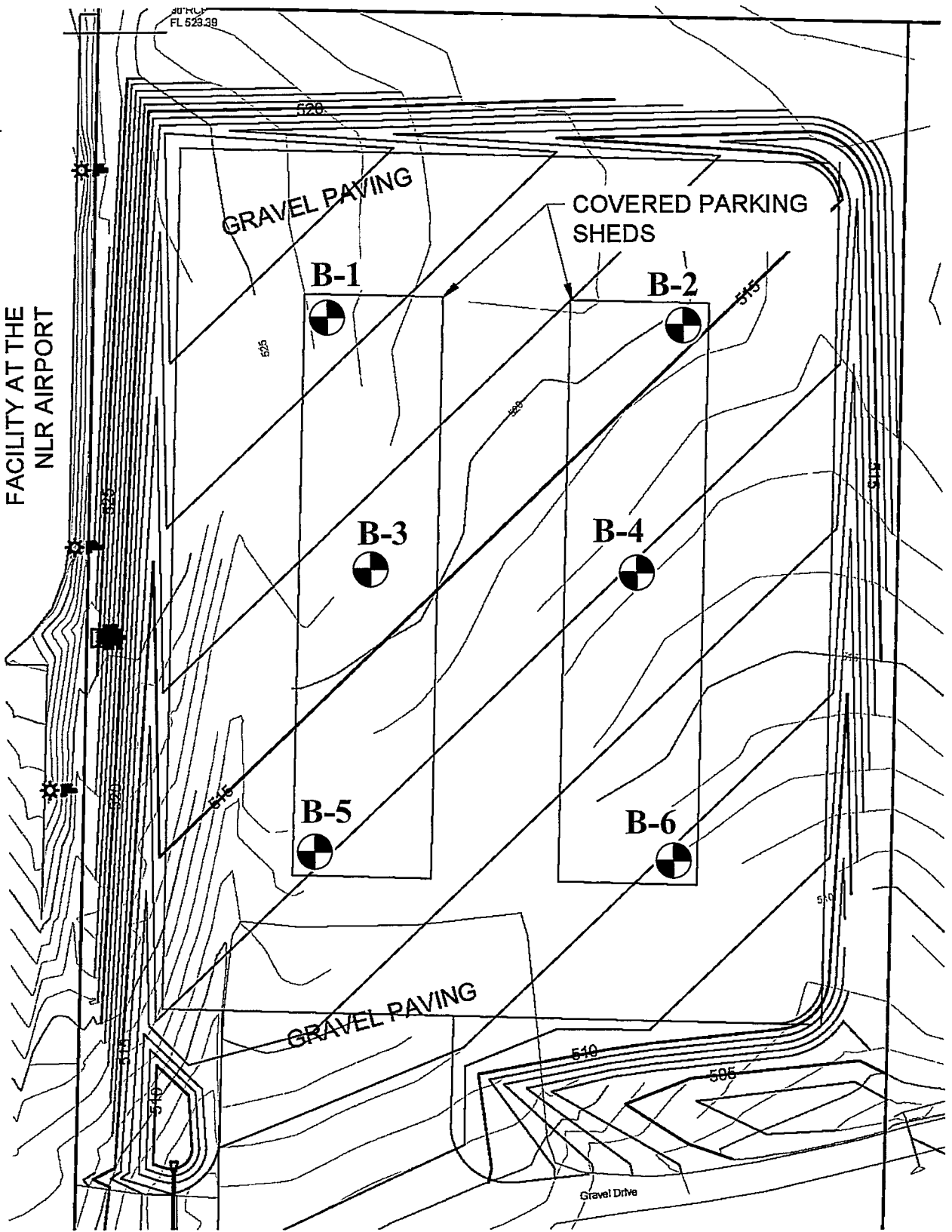
Copies submitted: North Little Rock Electric
Attn: Ms. Jessica Stephens (1-email)



NLR ELECTRIC
FACILITY AT THE
NLR AIRPORT



30" R/L
FL 529.38



**Grubbs, Hoskyn,
Barton & Wyatt, LLC**
CONSULTING ENGINEERS
A UES Company

PLAN of BORINGS
NLRED Covered Parking
North Little Rock, Arkansas

Scale: As Shown
Job No. A24184.00117
Plate 2

A24184.00117



**Grubbs, Hoskyn,
Barton & Wyatt, Inc.**
Consulting Engineers

LOG OF BORING NO. 1

NLRED Covered Parking
North Little Rock, Arkansas

TYPE: Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT			- No. 200 %				
						PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT					
			SURF. EL: 524±			0.2	0.4	0.6	0.8	1.0	1.2	1.4	
			Firm to stiff tan and red silty clay w/highly weathered sandstone partings (completely weathered sandstone)	10					●	+	+		59
			Friable tan, reddish tan, and gray highly weathered fine-grained sandstone, weakly cemented w/occasional silty clay lamnations	35									
5			- well cemented below 4 ft	50/1"									
			- tan with fewer silty clay laminations below 6 ft	50/1"									
			- tan and pale red below 8 ft	25/0"									
10													
15													

LGBNEW A24184.00117.GPJ 5-15-24

COMPLETION DEPTH: 14.0 ft
DATE: 5-1-24

DEPTH TO WATER
IN BORING: Dry

DATE: 5/1/2024



**Grubbs, Hoskyn,
Barton & Wyatt, Inc.**
Consulting Engineers

LOG OF BORING NO. 2

NLRED Covered Parking
North Little Rock, Arkansas

TYPE: Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT						- No. 200 %		
						0.2	0.4	0.6	0.8	1.0	1.2		1.4	
			SURF. EL: 520±			PLASTIC LIMIT		WATER CONTENT		LIQUID LIMIT				
						+	10	20	30	40	50	60	70	
	[Symbol]		Loose tan fine sandy silt	8			●							
	[Symbol]		Stiff light brown and red silty clay w/silty fine sand pockets	12			●	---	+					57
5	[Symbol]		Friable reddish tan and gray highly weathered fine-grained sandstone, weakly cemented w/silty clay laminations	39										
			- well cemented below 6 ft	50/2"										
10	[Symbol]		- tan with fewer silty clay laminations below 8 ft	50/1"										
15	[Symbol]			50/1"										

COMPLETION DEPTH: 14.5 ft
DATE: 5-1-24

DEPTH TO WATER
IN BORING: Dry

DATE: 5/1/2024

LGBNEW A24184.00117.GPJ 5-15-24



**Grubbs, Hoskyn,
Barton & Wyatt, Inc.**
Consulting Engineers

LOG OF BORING NO. 3

NLRED Covered Parking
North Little Rock, Arkansas

TYPE: Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT			- No. 200 %				
						PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT					
SURF. EL: 521±						0.2	0.4	0.6	0.8	1.0	1.2	1.4	
						10	20	30	40	50	60	70	
			Firm to stiff tan and red fine sandy clay w/occasional shale fragments	10			20						
			- stiff below 2 ft	17			20	30	40	50	60	70	56
5			Friable tan, gray, and red highly weathered fine-grained sandstone, weakly cemented	50/8"									
			- tan and pale red, well cemented below 6 ft	50/1"									
				50/2"									
10				25/0"									
15													

COMPLETION DEPTH: 14.0 ft
DATE: 5-1-24

DEPTH TO WATER
IN BORING: Dry

DATE: 5/1/2024

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**Grubbs, Hoskyn,
Barton & Wyatt, Inc.**
Consulting Engineers

LOG OF BORING NO. 4

NLRED Covered Parking
North Little Rock, Arkansas

TYPE: Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT			- No. 200 %				
						PLASTIC LIMIT	WATER CONTENT	LIQUID LIMIT					
			SURF. EL: 517±			0.2	0.4	0.6	0.8	1.0	1.2	1.4	
						10	20	30	40	50	60	70	
			Loose brown fine sandy silt w/rootlets and occasional sandstone fragments	7			20						47
			- tan below 2 ft										
5			Soft reddish tan silty clay	6			30						
			- firm, tan and grayish tan with occasional silty fine sand pockets below 4 ft	9			20						
			Friable reddish tan and gray highly weathered fine-grained sandstone, weakly cemented w/silty clay partings	25									
			- well cemented below 8 ft										
10				50/3"									
			- reddish tan and pale red with fewer silty clay laminations below 13 ft										
15				50/1"									

COMPLETION DEPTH: 14.5 ft
DATE: 5-1-24

DEPTH TO WATER
IN BORING: Dry

DATE: 5/1/2024

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A24184.00117



**Grubbs, Hoskyn,
Barton & Wyatt, Inc.**
Consulting Engineers

LOG OF BORING NO. 5

NLRED Covered Parking
North Little Rock, Arkansas

TYPE: Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT				- No. 200 %	
						0.2	0.4	0.6	0.8		1.0
			SURF. EL: 517±								
			Stiff tan silty clay w/numerous shale fragments, dry (fill)	13							
			Friable tan, reddish tan, and gray highly weathered fine-grained sandstone, weakly cemented w/clay laminations and seams	47							
5			- tan, pale red, and gray with clay laminations and seams below 4 ft	50/6"							
			- tan and pale red, well cemented below 6 ft	50/1"							
10				25/0"							
				25/0"							
15											

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COMPLETION DEPTH: 14.0 ft
DATE: 5-1-24

DEPTH TO WATER
IN BORING: Dry

DATE: 5/1/2024

A24184.00117



**Grubbs, Hoskyn,
Barton & Wyatt, Inc.**
Consulting Engineers

LOG OF BORING NO. 6

NLRED Covered Parking
North Little Rock, Arkansas

TYPE: Auger

LOCATION: See Plate 2

DEPTH, FT	SYMBOL	SAMPLES	DESCRIPTION OF MATERIAL	BLOWS PER FT	UNIT DRY WT LB/CU FT	COHESION, TON/SQ FT							- No. 200 %
						0.2	0.4	0.6	0.8	1.0	1.2	1.4	
			SURF. EL: 513±			PLASTIC LIMIT		WATER CONTENT			LIQUID LIMIT		
						+	20	30	40	50	60	70	
			Loose brown and tan fine sandy silt w/occasional sandstone fragments and rootlets (fill)	6									51
			- with silty clay seams below 2 ft	7									
5			Friable reddish tan, red, and gray highly weathered fine-grained sandstone, weakly cemented	35									
				50/9"									
			- tan and pale red, well cemented below 8 ft	50/1"									
10				25/0"									
15													

LGBNEW A24184.00117.GPJ 5-15-24

COMPLETION DEPTH: 14.0 ft
DATE: 5-1-24

DEPTH TO WATER
IN BORING: Dry

DATE: 5/1/2024



SYMBOLS AND TERMS USED ON BORING LOGS

SOIL TYPES

(SHOWN IN SYMBOLS COLUMN)



Gravel



Sand



Silt

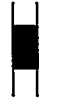


Clay

Predominant type shown heavy

SAMPLER TYPES

(SHOWN ON SAMPLES COLUMN)



Shelby
Tube



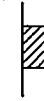
Rock
Core



Split
Spoon



No
Recovery



Cutting

TERMS DESCRIBING CONSISTENCY OR CONDITION

COARSE GRAINED SOILS (major portion retained on No. 200 sieve): Includes (1) Clean gravels and sands, and (2) silty or clayey gravels and sands. Condition is rated according to relative density, as determined by laboratory tests.

DESCRIPTIVE TERM	N-VALUE	RELATIVE DENSITY
VERY LOOSE	0-4	0-15%
LOOSE	4-10	15-35%
MEDIUM DENSE	10-30	35-65%
DENSE	30-50	65-85%
VERY DENSE	50 and above	85-100%

FINE GRAINED SOILS (major portion passing No. 200 sieve): Includes (1) Inorganic and organic silts and clays, (2) gravelly, sandy, or silty clays, and (3) clayey silts. Consistency is rated according to shearing strength, as indicated by penetrometer readings or by unconfined compression tests.

DESCRIPTIVE TERM	UNCONFINED COMPRESSIVE STRENGTH TON/SQ. FT.
VERY SOFT	Less than 0.25
SOFT	0.25-0.50
FIRM	0.50-1.00
STIFF	1.00-2.00
VERY STIFF	2.00-4.00
HARD	4.00 and higher

NOTE: Slickensided and fissured clays may have lower unconfined compressive strengths than shown above, because of planes of weakness or cracks in the soil. The consistency ratings of such soils are based on penetrometer readings.

TERMS CHARACTERIZING SOIL STRUCTURE

SLICKENSIDED - having inclined planes of weakness that are slick and glossy in appearance.

FISSURED - containing shrinkage cracks, frequently filled with fine sand or silt; usually more or less vertical.

LAMINATED - composed of thin layers of varying color and texture.

INTERBEDDED - composed of alternate layers of different soil types.

CALCAREOUS - containing appreciable quantities of calcium carbonate.

WELL GRADED - having a wide range in grain sizes and substantial amounts of all intermediate particle sizes.

POORLY GRADED - predominantly of one grain size, or having a range of sizes with some intermediate sizes missing.

Terms used on this report for describing soils according to their texture or grain size distribution are in accordance with the UNIFIED SOIL CLASSIFICATION SYSTEM, as described in Technical Memorandum No.3-357, Waterways Experiment Station, March 1953

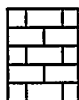


BORING LOG TERMS - ROCK

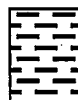
ROCK TYPES
(SHOWN IN SYMBOLS COLUMN)



Sandstone



Limestone



Siltstone



Coal



Shale

Joint Characteristics -	Spacing Very Close Close Moderately Close Wide Very Wide	0.75 to 2.5 in. 2.5 to 8 in. 8 to 24 in. 2 to 6 ft More than 6 ft	Degree of Weathering -	Fresh - No visible signs of decomposition or discoloration. Rings under hammer impact. Slightly Weathered - Slight discoloration inwards from open fractures, otherwise similar to fresh. Moderately Weathered - Discoloration throughout. Weaker minerals such as feldspar decomposed. Strength somewhat less than fresh rock, but cores cannot be broken by hand or scraped by knife. Texture preserved. Highly Weathered - Most minerals somewhat decomposed. Specimens can be broken by hand with effort or shaved with knife. Core stones present in rock mass. Texture becoming indistinct but fabric
Bedding Characteristics -	Very Thin Thin Medium Thick Massive	0.75 to 2.5 in. 2.5 to 8 in. 8 to 24 in. 2 to 6 ft More than 6 ft		Completely Weathered - Minerals decomposed to soil but fabric and structure preserved (Saprolite). Specimens easily crumbled or penetrated. Residual Soil - Advanced state of decomposition resulting in plastic soils. Rock fabric and structure completely destroyed. Large volume change.
Lithologic Characteristics -	Clayey Shaly Calcareous (limy) Siliceous Sandy (Arenaceous) Silty Plastic Seams			
Parting -	Less than 1/16 inch			
Seam -	1/16 to 1/2 inch			
Layer -	1/2 to 1 2 inches			
Stratum -	Greater than 1 2 inches			
Hardness-	Soft (S) - Reserved for plastic material alone. Friable (F) - Easily crumbled by hand, pulverized or reduced to powder and is too soft to be cut with a pocket knife. Low Hardness (LH) - Can be gouged deeply or carved with a pocket knife. Moderately Hard (MH) - Can be readily scratched by a knife blade; scratch leaves a heavy trace of dust and scratch is readily visible after the powder has been blown away. Hard (H) - Can be scratched with difficulty; scratch produces little powder and is often faintly visible; traces of the knife steel may be visible. Very hard (VH) - Cannot be scratched with a pocket knife. Knife steel marks left on surface.			
			Solution and Void Conditions -	Solid, contains no voids Vuggy (pitted) Vesicular (igneous) Porous Cavities Cavernous
			Swelling Properties -	Nonswelling Swelling
			Slaking Properties -	Nonslaking Slakes slowly on exposure Slakes readily on exposure
Texture -	Fine - Barely seen with naked eye Medium - Barely seen up to 1/8 in. Coarse - 1/8 in. to 1/4 in.			
Structure -	Bedding Flat - 0° - 5° Gently Dipping - 5° - 35° Moderately Dipping - 35° - 55° Steeply Dipping - 55° - 85° Fractures, scattered Open Cemented or Tight Fractures, closely spaced Open Cemented or Tight Brecciated (Sheared and Fragmented) Open Cemented or Tight Joints Faulted Slickensides		Rock Quality Designation (RQD) -	RQD (Percent) Greater than 90 75 - 90 50 - 75 25 - 50 Less than 25 Diagnostic Description Excellent Good Fair Poor Very Poor

APPENDIX A

SUMMARY of CLASSIFICATION TEST RESULTS

PROJECT: NLRED Covered Parking
 LOCATION: North Little Rock, Arkansas
 GHBW JOB NUMBER: A24184.00117

BORING No.	SAMPLE DEPTH (ft)	WATER CONTENT (%)	ATTERBERG LIMITS			PERCENT RETAINED #4	PERCENT PASSING #200	USCS CLASS.	AASHTO CLASS.
			LIQUID LIMIT	PLASTIC LIMIT	PLASTICITY INDEX				
1	05-1.5	23	49	30	19	2	59	ML	A-7-5
2	2.5-3.5	18	33	20	13	1	57	CL	A-6
3	2.5-3.5	21	45	28	17	8	56	ML	A-7-6
4	0.5-1.5	15	---	---	---	15	47	SM	A-4
6	0.5-1.5	18	---	---	---	6	51	ML	A-4

**Grubbs, Hoskyn,
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