

PART 1 - GENERAL

1.01 SUMMARY

- A. Description
 - 1. Work included: the soil preparation, coordination with the placement of inert materials and meadow seeding. See plans for the project limits.
 - 2. Coordinate this work with other Subcontractors working on the Project site.
 - 3. Related work described elsewhere:
 - a. Section 04 44 10 – Landscape Stonework
 - b. Section 31 23 23.43 - Geofoam
 - c. Section 32 13 13.13 – Exposed Aggregate Concrete Paving
 - d. Section 32 14 40 – Stone Paving
 - e. Section 32 16 13.43 – Stone Curbs
 - f. Section 32 91 00 – Planting Soil System
 - g. Section 32 93 00 – Planting and Fine Grading

1.02 METHODOLOGY

- A. The method specified herein is used for plant establishment following soil preparation for seeding using the material specified herein. This method is designed for irrigated or temporary-irrigated conditions.
- B. Work Specified Herein – The work of this Section shall include all labor, material, equipment, and services necessary to complete the work as detailed and specified, and all work incidental thereto.
- C. Pre-Construction Conference – The Contractor may schedule a pre-construction conference with the Subcontractor at least seven (7) days prior to beginning work under this Section. Purpose of this conference is to review questions the Subcontractor may have regarding the work, administrative procedures during construction and project work schedule.
- D. Samples and Tests –The Owner reserves the right to obtain and analyze samples of materials for conformity to specifications at any time. Subcontractor shall furnish samples upon request by The Owner. Rejected materials shall be immediately removed from the site and replaced at the Subcontractor's expense. Cost of testing of materials not meeting specification shall be paid by Subcontractor.
- E. Permits and Fees – Obtain all permits and pay required fees to any Governmental Agency having jurisdiction over the work. Arrange inspections required by local agencies and ordinances during the course of construction as required.
- F. Coordination and Responsibility – Coordinate and cooperate with other Subcontractors working on the site for successful completion of the project. Before commencing work on the site become thoroughly acquainted with layout of all underground utilities and

structures over the entire site. All requisite repairs to damage caused by work of this Section shall be at the Subcontractor's expense.

- G. Personnel – Seeding shall be performed by experienced workmen familiar with no till drilling seeding procedure and under the supervision of a qualified foreman. The foreman shall be on the job site whenever planting is in progress.
- H. Pesticide Applicator - The Contractor shall be a licensed pesticide applicator or shall employ a licensed pesticide applicator for the treatment of insects, diseases, animals as required by the Pesticide Laws and Regulations of the Arkansas Department of Agriculture. The Landscape Architect or designated representative may require documentation of such certification as necessary for his record.
- I. Herbicide Applicator - The Contractor shall possess a permit or employ a person who possesses a permit to apply herbicide as required by the Herbicide Laws of the Arkansas Department of Agriculture. The Landscape Architect and Ecologist or designated representative may require documentation of such certification as necessary for his records.
- H. Restoring native plant communities is a long-term process. It is imperative that a qualified contractor, with at least 5 years of experience with native plant community installation and maintenance, within the vicinity of the project location perform the installation and maintenance of restoration areas for the duration of the maintenance/warranty period.
- I. Weather – No seeding shall occur or will be permitted during weather conditions which will adversely affect materials, nor will it be permitted when soil is in a muddy or frozen condition.
- J. All existing plant material, save for those deemed to be undesirable or unwanted, shall be protected as necessary to ensure survival to the greatest extent possible.

1.03 SITE EVALUATION AND SOIL TESTING

- A. Bidder shall visit and inspect the site to become thoroughly informed of all existing conditions. Any discrepancies between existing conditions and those identified in the specifications should be immediately brought to the attention of the Owner for clarification.
- B. Soils shall be tested by approved laboratories for
 1. Biological activity (microorganisms)
 2. Chemical and physical characteristics.
- C. The site shall be evaluated at the onset of the project and prior to seeding operations to determine biotic potential and limiting growth factors. Testing will be used to determine quantities of organic and chemical amendments needed for optimum growth. This will supersede the standard fertilizer applications. For sites deemed low in biotic potential such as sterile cuts and fills, an organic amendment requirement shall be determined as an optional supplement (see optional materials).
- D. A minimum of five (5) soil samples shall be tested; these samples are to be taken from various areas of the site which are to receive hydroseed with the objective of identifying differing soil conditions. The location of each sample is to be identified on a map and a

written summary. Each individual sample is to be prepared and presented to the Owner's Representative. In addition to the analysis of the soil conditions the testing lab is to identify specific recommendations for supplementing and improving the soil to provide an optimal germination and growing condition. Coordinate soil testing requirements with Section 329100 Planting Soil System.

PART 2 – PRODUCTS

2.01 MATERIALS

- A. Materials shall reflect evidence of proper storage and handling. Any materials with indications of improper storage and handling, (water, heat, chemical damage and the like) will be removed from the site and replaced by the Subcontractor. All materials shall be fresh and delivered in unopened containers. All materials shall be labeled or supplied with test information concerning the analysis of the various components. All work shall be performed in a professional manner. Workmanship shall be performed to the best industry standards. Care shall be taken to avoid drift and displacement of material or any damage to structures and landscape. Protective covering shall be used where material would be objectionable. Cleanup shall be done daily. Seeded areas shall be protected from traffic and construction activities with fencing.
- B. Any plant species substitutions shall not be made without the express consent and approval of the Landscape Architect. Species substitutions must be presented to the Landscape Architect within a time frame that allows for review and approval. Changes to the Plans or Specifications must be approved in writing by the Landscape Architect or Ecologist. The Landscape Architect and Ecologist are in no way responsible for problems resulting from any changes to the design made by any party without their written approval.
- C. All species being seeded shall be supplied as pure live seed. Submit to the Owner lab germination test results for all species. For species that are not typically tested, submit an affidavit that describes estimated purity.
- D. Seed shall be native to Arkansas and seed source origin shall be from within a 250-mile radius of the project site unless denoted by Ecologist and Landscape Architect and approved by the Owner.
- E. Store seed in original packages in a conditioned, dry environment. Seed shall be inspected for mold and disease upon arrival. Seed tags shall be provided with each seed mix. Should seed show any form of mold, mildew, or disease, the Landscape Architect or Ecologist may reject the use of said seed.
- F. All native seed mixes to be applied at the rates and quantities of seeds per acre specified on the Drawings

G. HERBICIDES

- a. Invasive species to be removed in areas without standing water, saturated soils, or frequent flooding shall be treated with Glyphosate, N-(phosphonomethyl) glycine, trade name Roundup or equivalent, as approved in writing by Owner.

b. Species to be removed in areas with standing water, saturated soils, or frequent flooding shall be treated with Imazapyr herbicide, Isopropylamine salt of imazapyr (2-[4,5-dihydro-4-methyl-4-(1-methylethyl)-5-oxo-1 H-imidazol-2-yl]-3-pyridinecarboxylic acid) in a form approved for aquatic applications, such as Habitat or equivalent, as approved in writing by Owner.

c. Pre-emergent herbicide: Surflan WDG as manufactured by Elanco Chemical Company or approved equal. Contractor shall confer with Landscape Architect and Ecologist before treating areas with pre-emergent to avoid issues with seeding of native species.

d. Contact herbicide: Round-up as manufactured by Monsanto or approved equal.

H. Equipment having low unit pressure ground contact shall be utilized within planting areas.

1. Topsoil compaction shall not exceed 80% standard proctor density (ASTM D698).

2. Subsoil compaction shall not exceed 92% standard proctor density (ASTM D698).

I. Contractor shall schedule seeding after herbicide application only with approval of Ecologist and Landscape Architect.

J. PREFERRED NATIVE PLANT SEED SUPPLIERS

1. Native plant seed shall be supplied by one or more of the following pre-qualified seed suppliers. Owner approval must be obtained prior to installation for seed purchased by a nursery not listed below.

Roundstone Native Seed
9764 Raider Hollow Rd.
Upton, KY 42784

Native American Seed
3791 US-377
Junction, TX 76849

Douglas King Seed
4627 Emil St
San Antonio, TX 78219

K. Seed: Seed shall be specified site specific seed mix added at pure live seed (PLS) rates. All seed used shall be clearly tagged or labeled showing the type of seed, purity, germination, test date, and weed content. Tetrazilium staining shall be acceptable for germination of hard seed. Cut or fill testing will not be allowed. Certificate of analysis shall be provided in addition to seed tags. Seed shall contain no more than 1% common weed seed or other crop. For purpose of this specification, weed shall be designated as all other seed including other crop not specified for seeding purposes. Other crop seed specifically considered (but not limited to) as weed shall be bermuda grass, Cynodon dactylon, African lovegrasses, Eragrostis spp., and buffleggrass, Pennisetum cilare. No noxious weed seed shall be permitted within seed mixes. Seed providers shall provide seed testing and content data for single species seed and seed mixes.

- L. Specific Seed mix: See Planting Plans for specific varieties and quantities.
- M. Fertilizer: Slow release, organic MicroLife Ultimate (8-4-6) fertilizer is to be used at a rate of 40 lbs per 1000 square feet. It is likely fertilizer applications will occur with a higher frequency during establishment until plants and soil biota stabilize. In order to best manage applications, contractor will submit soil samples for testing to best determine fertilizer application schedules.
 - 1. Fertilization Program to Establish a Bid Price:
 - a. Fertilize ground cover every month for first three months, then twice per spring and fall.
 - b. Uniformly apply 40 lbs of granular MicroLife Ultimate (8-4-6) per 1000 square feet.
 - c. Granular fertilizer should initially be watered in, with irrigation occurring in short cycles so that run-off does not occur, but that plants and soil receive even coverage.
 - d. Prior to each fertilizer application, conduct a minimum of two soil tests in areas of intended application to determine necessary fertilizer requirements. Soil tests should include both the macro and micro soil nutrients.
 - 2. Fertilizer Application:
 - a. Apply fertilizer as specified by landscape architect/ecologist following inspection and/or soil analysis.
 - b. Meet requirements of fertilizer manufacturer's current printed instructions.
 - c. Apply fertilizers evenly over planting areas by spreading half the fertilizer in one direction and half in a direction 90 degrees to the first direction to assure even application.
 - d. Apply MicroLife Ultimate (8-4-6) granular organic fertilizer at rate of 40 lbs per 1000 square feet.

2.02 OPTIONAL MATERIALS:

- A. Additional materials shall be added based upon site evaluation and soil testing. The following types and quantities of materials are added as standard supplements. Professional site evaluation and soil testing shall determine the specific types and quantities to be used.
- B. Organic Amendments: Based upon site evaluation and soil testing, additional soil conditioners may be required. These materials are added to augment soil nutrients and biotic potential on sites severely deficient in these factors such as deep cuts and sterile fills. Use well composted natural organic materials high in humus, soil microbes, and plant nutrients. Refer to Section 32 91 00 Planting Soil System.
 - 1. Compost: Well-composted, stable, and weed-free organic matter, pH range of 5.5 to 8; moisture content 35 to 55 percent by weight; 100 percent passing through 3/4-inch;

soluble salt content of 5 to 10 decisiemens/m; not exceeding 0.5 percent inert contaminants and free of substances toxic to plantings; and as follows:

- a. 100% (volume) pass through 5/8" screen
- b. minimum 95% pass through 3/8" screen
- c. minimum 90% pass through 1/4" screen
- d. maximum particle length 1.0"
- e. Stability - less than 0.5 mg CO₂ carbon/g compost carbon/day
- f. Active Bacterial greater than 100 (µg/g)*
- g. Total Bacterial greater than 200 (µg/g)*
- h. Active Fungal greater 100 (µg/g)*
- i. Total Fungal greater than 200 (µg/g)*
- j. Organic Matter greater than 40%

*as measured by the Compost Foodweb analysis (Earthfort Laboratory Analysis)

2. Manure: Well-rotted, unleached, stable or cattle manure containing not more than 25 percent by volume of straw, sawdust, or other bedding materials; free of toxic substances, stones, sticks, soil, weed seed, and material harmful to plant growth.
3. Contractor will be to secure necessary amounts up to a year before application to ensure best product is available In amounts required.

C. Additional Amendments: As a supplement to other organic materials, add one or more of the following soil conditioners:

1. Granular humus base organic soil conditioner shall be added at 1000 lbs. per acre to the hydromulch slurry during seeding operations and shall meet the following minimum requirements:

Total Humus	50% minimum
Total humic acid	15% minimum
2. Liquid humic acid base soil conditioner shall be added at 15 gallons per acre to the hydroseeding slurry during seeding operations and shall meet the following minimum requirements:

Total humic acid	6% minimum
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3. Slow Release Nitrogen: Slow release nitrogen fertilizer shall be applied at 25 lbs. per acre total N as water insoluble nitrogen such as methylene urea (38-0-0) or equivalent.

PART 3 – EXECUTION

3.1 PREPARATION

- A. Prior to seeding, all site seed bed preparation is to be approved by the Landscape Architect and Ecologist. Any seeding may not proceed without the express consent and approval of the Landscape Architect and Ecologist.

B. Herbicide Application:

1. Site Preparation: Prepare site by applying contact herbicide as per label directions to weed growth on site. Provide minimum of three (3) applications, spaced as per manufacturer's recommendation for repeat applications. Scarify planting areas to a minimum depth of six (6) inches. Float beds to grade and rake to remove weeds, clods, or rocks one (1) inch in diameter or greater. Thoroughly water-settle all soil.
2. Contractor shall verify whether or not specific herbicide requires non ionic surfactant solution and at what rates per manufacturer's specifications. Overuse of non ionic surfactant can result in plant damage/mortality and contractor will be responsible for addressing adverse impacts resulting from incorrect applications.
3. The Contractor shall maintain a supply of chemical absorbent at the project site. Any chemical spills shall be properly cleaned up immediately and reported to the Owner within 24 hours.
4. The Contractor shall maintain at the project site copies of all current pesticide applicator's licenses, herbicide labels, and MSDS's (Material Safety Data Sheets) for all chemicals utilized during completion of the work.
5. The Contractor shall mix herbicide and place in containers away from any natural area, trees, shrubs, herbaceous or woody growth, body of water, drain inlets, or primary pedestrian circulation routes. Herbicides shall not be transported to the Work area in any container other than that used for application.
6. The Contractor shall utilize log sheets to record time spent herbiciding, weather conditions, and amount of product applied. Record herbicide usage to the nearest ounce; indicate if basal oil, dye, surfactant, or other additives were used. The Contractor is required to return all log sheets to the Owner upon completion of the Work. Log sheets will not serve as an invoice.

C. Protect structures; utilities; sidewalks; pavements; and other facilities, trees, shrubs, and plantings from damage caused by planting operations.

i. Protect adjacent and adjoining areas from seeding operations.

ii. Protect grade stakes set by others until directed to remove them.

D. 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.

E. Ensure runoff is diverted from Adjacent waterways. Contractor shall ensure that water quality will not be adversely affected from construction runoff.

F. Description: Create a, evenly roughened, friable seedbed to capture and retain water and establish micro-habitat for seed germination and seedling establishment. Seeding Contractor is to coordinate with the Landscape Contractor and the Owner to coordinate surface material placement and grading prior to application of seed.

G. Soil Amendments: Apply pre-plant soil amendments (e.g., compost, biochar) prior to tillage operations (refer to site evaluation and soil test).

H. Tillage: Till soil by contour chisel rip furrowing a minimum of 4 inches deep. Ripper shanks shall be set 3 inches apart with a minimum of 5 shanks in operation on each pass. Using sufficiently sized machinery, rip soil along natural site contours to a minimum depth

of 6 inches. Incorporate soil amendments into the soil profile. Do not pulverize the soil. Cultipack or lightly harrow to break up large clods or fill soil voids if necessary. Leave contour furrows, do not smooth finish. Remove obtrusive and hazardous rocks and debris. Standard proctor density ranges shall not be exceeded.

- I. Examine areas to receive seeding for compliance with requirements outlined above. Check that finish grades slope to drain, are free of depressions or other irregularities after thorough settlement and compaction of soil and are uniform in slope between grading controls and the elevations indicated in the Plans. If finish grades are determined by the Landscape Architect or Ecologist or Owner to be insufficient for seeding, the Contractor shall re-grade areas as directed by the Landscape Architect or Ecologist or Owner.
- J. Within seeding and planting areas (see plans), ensure ground layer is cleared of leaf litter and other duff prior to seeding. Submit to the Owner for approval the method for making seed contact with the soil where the soil will not be graded or otherwise disturbed prior to seeding.
- K. Ensure any imported soils are uniformly distributed in a quantity sufficient to provide a suitable seeding surface after subgrading and compaction, and was spread, cultivated, lightly compacted to prevent future settlement, dragged, and graded to finish grade.
- L. Proceed with installation only after unsatisfactory conditions have been corrected. Obtain approval from Landscape Architect and Ecologist regarding pre-installation conditions before proceeding.

3.2 SEEDING

- A. PLANTING RESTRICTIONS: Planting is preferred during one of the following periods. Coordinate planting periods with initial maintenance periods to provide required maintenance from date of Substantial Completion. Climate can expand and condense these periods. Consult with Owner, Landscape Architect or Ecologist for approval to install seed other than during the preferred planting periods.
 - 1. Planting Windows:
 - a) Spring Planting: Between March 1 and May 31.
 - b) Fall Planting: Between October 1 and November 17.
 - c) NO SEEDING: June to Mid September, December to February.
 - 2. Seeding operations must occur when soil moisture is appropriate, and areas are in a friable condition and neither hard nor muddy.
 - 3. Do not seed against existing trees in critical root zones. Limit extent of seed to outside edge of planting saucer.
- B. The Contractor shall install all seed with a rangeland no-till planter or type grain drill, such as by Truax or Dew Drop, or equivalent where conditions permit. Hand broadcast seed IS ONLY ALLOWED in areas that are difficult to access with large equipment or by approval of Landscape Architect and Ecologist. Contractor shall submit a plan demonstrating any zones that may require hand seeding for approval by Landscape Architect and Ecologist and will wait for approval before moving forward with hand seeding. Contractor shall have experience with not till drills and how to calibrate equipment

to ensure seeds are planted at appropriate depths. DO NOT BURY SEED TOO DEEPLY OR GERMINATION WILL NOT OCCUR.

- C. Seeding shall occur no sooner than ten days after herbicide application and no greater than 14 days after herbicide application. See Material Safety and Data Sheet of applied herbicide for guidance on herbicide residual activity. Do not proceed with seeding or planting until adequate time has elapsed as stated in Material Safety and Data Sheet.
- D. Sow seed with no till drill or seeding machine.
 - 1. Evenly distribute seed by sowing equal quantities in two directions at right angles to each other. Contractor shall install seed in one pass and then follow with second pass perpendicular to first pass so that coverage by no till drill is even.
- E. Sow seed mixes at rates as indicated on the drawings.
- F. Rake seed lightly into top 1/8 inch of soil, roll lightly, and water with fine spray.
- G. Make sure seed is integrated into soil surface, but not buried deeper than top 1/8 inch of soil.
- H. In areas with critical root zones, soil shall be loosened to 6" by air spade. Soil amendments (e.g., compost, biochar) shall be placed onto surface and lightly hand mixed with native soil to ensure integration of amendments into top 4" of native soil. Seed will then be hand broadcast and lightly raked in to ensure integration of seed into top 1/4" of amended soil.
- I. Lightly roll seeded areas with a cultipack roller and irrigate according to irrigation establishment specifications. Do not let seed dry out for a minimum of ten days.
- J. Ensure seeds have proper stratification and/or scarification to break seed dormancy for spring emergence.
- K. Protect seeded areas with slopes exceeding 1:4 with erosion-control blankets and 1:6 with erosion-control fiber mesh installed and stapled according to manufacturer's written instructions. Erosion control fiber mesh shall be fabricated from seed free, loose, aspen fiber. (see www.erosion-control-products.com)
- L. Sequence installation so that trees and shrubs that are within seeded areas are installed prior to seeding, unless otherwise approved by the Owner, Landscape Architect, and Ecologist. Complete planting work as quickly as possible on portions of the site as they become available for planting.
- M. Verify that temporary irrigation work is installed and available for watering at time of installation. Do not proceed with work until irrigation is available. If water service is discontinued, for any reason, before final acceptance, provide water as needed to maintain seeded areas in a healthy condition and immediately notify Ecologist and Landscape Architect.
- N. Weather Limitations: Proceed with planting only when existing and forecasted weather conditions permit.

- O. ESTABLISHMENT IRRIGATION SCHEDULE – Seed and soil should be kept moist, not allowed to dry out, for a minimum of ten (10) days. Thereafter:
1. Irrigation event equivalent of 1” rain event should occur every other day for the first three (3) weeks post seeding.
 2. Irrigation event equivalent of 1” rain event should occur twice (2) a week for the next two weeks.
 3. Irrigation event equivalent of 1” rain event should occur once (1) a week per month for remainder of growing season.
- P. After seeding, establishment irrigation schedule should be strictly adhered to as seed must stay adequately moist. Failure to adhere to establishment irrigation schedule can result in seedling mortality. Contractor will be responsible for correcting all establishment issues resulting from deviation from establishment irrigation schedule which can translate into reworking soils, reseeding, irrigation, and longer establishment timeline.

3.3 MAINTENANCE AND MONITORING

- A. The site shall be maintained and monitored for a minimum of two years. Seeded areas shall be regularly inspected for germination and vigor of seeded species. Weeds shall be identified and removed prior to setting seed or spreading. Irrigated areas shall be carefully monitored to avoid under and over watering. Surfaces with loss of materials, eroded or damaged shall be repaired and reseeded. The Ecologist will prepare inspection reports based on the quarterly site visits and assess landscape health as well as address any problems.
- B. The Subcontractor shall be responsible for protecting and caring for seeded areas until final acceptance of the work and shall repair, at his expense, any damage to the seeded areas caused by: pedestrian or vehicular traffic, flooding or erosion as a result of irrigation runoffs or other causes.
- C. NATIVE SEED MAINTENANCE
1. Maintain and establish native seed areas for two full growing seasons following Provisional Acceptance by watering, weeding, applying herbicide, mowing, trimming, reseeding, replanting, and other operations as specified in the approved “Annual Maintenance Plans.”
 2. Areas with herbaceous meadow species and understory canopy herbaceous components shall be reseeded by hand every 3-5 years to ensure continuing diversity.
 3. Meadow areas will be monitored four times annually by the Owner or its representative(s) for a minimum period of two years.

- (a) Reports will be prepared by the Landscape Architect and Ecologist and submitted to the Owner after each quarterly inspection. Each report shall address establishment and grassland maturation trajectory and whether disturbed areas are revegetating adequately and not suffering erosion damage. Each report shall include photographs and a description of the state of the landscape as well as directions for correcting any issues.
- (b) Monitoring shall be conducted by ecologist and maintenance contractor.
 - (i) Representative photographs for each ecotype shall be collected during monitoring and included in reports. Designate photo stations to collect photographic data from the same areas to capture change over time.
 - (ii) Monitoring will identify: 1) species within each seeding zone, 2) the five most dominant plant species within each seeding zone, 3) the percent coverage by non-native or invasive species in each seeding zone, 4) erosion and sedimentation issues, or drainage problems.

END OF SECTION