NOTE TO CONSULTANTS: Edit with Track Changes turned on, any text in this section that appears in bold and italics then turn off the bold and italics for the final approved version. (Remove this Note).

PART 1- GENERAL

1.01 Description: Provide all labor, materials, and equipment to perform the following work of the Contract, including incidentals related to that work and coordination and support of other work specified elsewhere in the Contract Documents:

A. Safety Monitoring & Response.
B. Protection of Existing Features and Work in Progress.
C. Survey for horizontal and vertical control of all work of the Contract.
D. Grading and compaction as required achieving lines and grades on Drawings.
E. Excavation and backfill of trenches for Utilities, including; Irrigation Systems, Potable Water Systems, Storm/Sub-surface Drainage Systems, Sanitary Sewer Systems and Electrical Conduit to lines and grades as shown on the Drawings.
F. Grading & Compaction of sub-grade and base aggregates for Concrete, Concrete Masonry Unit and Asphalt Paving.
G. Import and placement of Playfield and Planting Soils for Lawn Areas and Landscape Plantings.
H. Placement and compaction of Structural Soils for Pre-cast Turf Reinforcement.
I. Removing materials from the site which are in excess of that which is required.
J. Coordinate Earthwork operations for Walls, Abutments, Footings, Building Foundations and other work associated with the project.

1.02 References:

A. City of Seattle Standard Plans and Specifications for Road, Bridge and Municipal Construction (most recent edition).
B. City of Seattle Title: Stormwater, Grading and Drainage Control Code (most recent edition)
C. R.C.W. - Chapter 39.04.180 Public Works/Trench Excavations - Safety Systems Required.
D. R.C.W. - Chapter 49.17 WISHA. WAC 296-155 - Safety Standards for Construction Work.

1.03 Related Sections: Coordinate related work specified in other parts of the Project Manual, including but not limited to following:

Section 01 56 00 - Temporary Fencing
Section 01 56 39 - Temporary Tree & Plant Protection
Section 01 57 13 - Construction Stormwater Control
Section 02 41 13 - Selective Site Demolition
Section 32 11 23 - Mineral Aggregates
Section 32 14 43 - Plastic Reinforced Turf Paving
Section 32 80 00 - Irrigation Systems
Section 33 30 00 - Sanitary Sewerage Utilities

Section 33 34 00 - Storm Drainage Utilities

1.04 Quality Assurance:

A. The Contractor is responsible for verifying the quality of the work and shall perform compaction and density tests on request of the Engineer to check compliance with these specifications. A copy of the test reports shall be furnished to the Engineer.

B. The Engineer's Testing Agency may perform compaction and density tests to verify compliance with these specifications.

C. The Engineer may require that an independent testing laboratory test imported materials at any time. If the material is found to be non-compliant with the Contract, the Contractor shall bear the cost of testing, removal of all non-compliant materials from the Project Site, and replacement of the materials with materials meeting the requirements of the Contract. If the materials tested are found to be compliant with the requirements of the Contract, the Owner will reimburse the Contractor for costs incurred by testing plus mark-ups as allowed for elsewhere in the Contract.

D. It is the responsibility of the Contractor to verify the accuracy of all survey information provided by the Owner prior to commencing excavations or filling operations. Commencement of these operations constitutes acceptance of the survey information as appropriate to meet the intent of the Contract.

E. Submittals:

1. Safety Products:
   a. Submit for the Engineer’s approval manufacturers product data for each worker safety product specified.
   b. Provide current calibration certificates for each piece of mechanical monitoring equipment to be used in the work. Perform field testing of equipment for the Engineers approval prior to commencing excavation.
2. Bulk Materials: The Engineer shall approve in principle all products used in the execution of this section prior to their importation to the Project Site. Submit a particle gradation analysis in graph and table form for each product specified. Approval of the Engineer of an analysis does not constitute approval of the actual product, which may be subject to additional testing at any time per paragraph 1.04.C above.

1.05 Existing Conditions: Documentation regarding existing conditions, in addition to the current survey supplied in the Contract Drawings, includes the following;

A. Project Site Record Drawings: Complete archival documentation of previous improvements made by the Owner at the project site may be reviewed during regular business hours at the offices of the **Park Engineer, located at 800 Maynard Ave. - 3rd Floor, Seattle WA. Telephone 206-684-7034** to arrange review of these

documents. Copy services are available for a fee, unless other arrangements are made.

B. Geotechnical and Soils Reports: The Owner shall provide updated geotechnical and/or soils reports in anticipation of this project if they are available. Those reports will be attached in their entirety, for informational purposes only, following this Section.

C. Other Available Information: Other information regarding utilities belonging to jurisdictions other than the Owner may be obtained through the City of Seattle Department of Parks and Recreation, Seattle Public Utilities (SPU) and/or King County - Metro.

1.06 Manufacturer's Qualifications: The Contractor shall cause the materials that are to be furnished under this section to be the product of firms that are experienced in the manufacture of the specified materials.

PART 2 - PRODUCTS

2.01 General:

A. Prior to the importation of any materials, the Contractor shall provide the Engineer with a certified test lab report of the sieve analysis of each aggregate product. The Engineer shall be the final determining factor in establishing compliance with sieve requirements. No material shall be brought onto the job site until the initial sieve analysis has been approved in writing by the Engineer.

B. During the course of importation of materials, the Contractor shall be responsible for continually checking the materials to insure that they continue to meet the Specifications.

2.02 Safety, Monitoring, & Response Products and Equipment: The Contractor shall provide barricades, safety guards, temporary fencing, signage and/or other methods to secure trenches, open excavations, and other unsafe conditions resulting from this construction. Undertake work in full compliance with all applicable regulatory requirements.

2***.03 Storm Drainage Backfill:***

A. Perforated Drain Pipe (Non-rigid PVC Pipe):

1. Pipe Bedding & Backfill shall be Type 4 Mineral Aggregate (aka 1½" Washed Gravel). Perforated pipe bedding shall consist of well-graded mineral aggregate with no fractured surfaces, meeting a particle gradation as follows:

Sieve Size	***Percent Passing***
1-1/2" square sieve	***100***
1-1/4" square sieve	***90-100***

3/4" square sieve	*0-20*
3/8" square sieve	*0-2*

2. *Pipe Bedding and backfill for solid piped drainage shall be of native soils occurring on-site, only if those soils meet or exceed the gradation standards per the City of Seattle Standard Specifications (most recent edition) and/or Section 32 11 23 - Mineral Aggregates., for Type 4 Mineral Aggregate (aka 1½" Washed Gravel), or as approved by the Engineer.*

B. *Solid Pipe/Tight Line (Non-rigid PVC or HDPE Pipe):*

1. *Bedding in solid pipe storm drainage trenches, shall be Type 22 Mineral Aggregate (aka 5/8" crushed rock, bearing no naturally occurring or worn surfaces), meeting the following particle gradation:*

Sieve Size	Percent Passing
5/8" square sieve	*100*
1/2" square sieve	*75-100*
1/4" square sieve	*0-25*

2. *Backfill for solid piped drainage shall be of native soils occurring on-site, only if those soils meet or exceed the gradation standards for Type 17 Mineral Aggregate (aka Bank Run Gravel), per the City of Seattle Standard Specifications (most recent edition) and/or Section 32 11 23 - Mineral Aggregates, or as approved by the Engineer.*

2.04 Irrigation Trench Backfill:

A. *Sand for pipe bedding and backfill around all irrigation heads shall be building sand that meets the following sieve gradation:*

Sieve Size	Percent Passing
No. 6 sieve	*95-100*
No. 8 sieve	*85-95*
No. 50 sieve	*15-30*
No. 200 sieve	*0-2*

B. *Suitable backfill material for use around all pipes and equipment as shown on the drawings shall be native topsoil with no rocks or other debris more than 1/2 inch diameter or common "Builders" sand. Provide proper screening of materials prior to backfilling.*

C. *Irrigation trench backfill shall comply with Section 32 80 00 - Irrigation Systems.*

2.05 Electrical Conduit Backfill:

A. *Sand for pipe bedding and backfill around all irrigation heads shall be building sand that meets the following sieve gradation:*

Sieve Size	Percent Passing
No. 6 sieve	*95-100*

No. 8 sieve	*85-95*
No. 50 sieve	*15-30*
No. 200 sieve	*0-2*

B. ***Suitable backfill material for use around all conduit, hand holes and equipment as shown on the drawings, shall be native topsoil with no rocks or other debris more than 1/2 inch diameter or Pea Gravel or "Builders" Sand. Provide proper screening of materials prior to backfilling.***

C. ***Electrical conduit trench backfill shall comply with Section 26 00 00 - Electrical.***

2.06 ***Pavement Base Aggregate: For use as imported base course for Concrete, Asphalt, and Concrete Masonry Unit Paving;***

A. ***Shall be Type 1 Mineral Aggregate (5/8" minus crushed rock), bearing no naturally occurring or worn surfaces, per City of Seattle Standard Specifications (most recent edition) and/or Section 32 11 23 - Mineral Aggregates. Gradation of the base course shall be:***

Sieve Size	***Percent Passing***
5/8" square sieve	*100*
1/4" square sieve	*55 - 75*
No. 40 sieve	*8 - 24*
No. 200 sieve wet	*10.0 maximum wet*

2.07 ***Selected Backfill (Common Fill): Where on-site soils prove to be insufficient in quantity or quality to achieve design sub-grades and compaction levels, imported fills may be accepted upon approval of the Engineer. Selected Backfill (Common Fill) shall be Type 17 (Bank Run Gravel), available from a recognized commercial source meeting the following sieve gradation, per the City of Seattle Standard Specifications (most recent edition) and/or Section 32 11 23 - Mineral Aggregates.***

Sieve Size	***Percent Passing***
3" square sieve	*95 - 100*
1/4" square sieve	*25 - 75*
No. 200 sieve wet	*0 - 5*

A. ***Organic content shall be no greater than 8% dry weight.***

B. ***Variations to this particle gradation may be considered dependant on the application.***

C. ***Submit to the Engineer a written request to import Selected Backfill (Common Fill) including the total volume of import anticipated (or range) and the source including name, address, and phone number of supplier, and geographic source of the material proposed to be imported.***

2.08 Utility Pipe Tracer Tape: Shall be detectable below ground surface and color coded, with utility name printed on the tape. Conductive Warning Tape is required over all water,

sewer, drainage, irrigation pipe and electrical conduit. Tape shall be manufacturer's standard permanent, bright-colored, continuous printed plastic tape, aluminum backed, intended for direct-burial service. Tape shall be not less than 3" wide x 4 mils thick.

Tape Schedule:	Piping	Color	Wording
	Sanitary Sewer	***Green***	***Caution - Sanitary Sewer***
	Storm Drain	***Green***	***Caution - Storm Drain***
	Irrigation Systems	***Blue***	***Caution - Irrigation***
	Domestic Water	***Blue***	***Caution - Water***
	Electrical Conduit	***Red***	***Caution - Electrical***

PART 3- EXECUTION

3.01 Safety Monitoring & Response: In addition to all current State and Local Safety Requirements;

A. Maintain conformance to the Contractors Health and Safety Plan.

B. When working in the presence of landfill materials (exposed refuse), the Contractor shall conform to all appropriate WAC codes and practices.

3.02 Protection of Existing Facilities:

A. Refer to Division 1 Specifications, for information pertinent to the protection of all existing facilities.

B. It is understood that there will be interfering utilities, service laterals and other underground pipes, drains or structures encountered that are not shown, or areas shown incorrectly on the plans, or have not been previously discovered in the field. Contractor agrees this is a normal and usual occurrence in the construction of underground improvements. Furthermore, Contractor understands and agrees that work in some cases must be done in close proximity to said utilities and underground pipes, drains and structures not shown or shown incorrectly on the plans, which may require a change in operations and may cause sloughing of the trench, additional traffic control, additional pavement and backfill costs and time. The Contractor agrees that these occurrences are usual and ordinary, and are reflected in the bid and plan of operation.

C. Contractor agrees to provide for these conflicts and interferences and agrees to provide for a reasonable amount of time for design changes and/or utility relocations due to said interferences.

D. Repair and or replacement of damaged facilities to the Engineer’s satisfaction will be accomplished at the Contractor's expense.

3.03 Protection of Work In Progress: It is the responsibility of the Contractor to protect all work in progress from damage due to extremes of cold, moisture, or drying, or mechanical damage from equipment traffic or foot traffic. Alert the Engineer to the presence or likelihood of conditions that may adversely affect the quality of the work, the physical structure of soils, or transport of site soils off-site.

A. Do not work frozen soils.

B. Protect soils from excessive moisture. During periods of prolonged precipitation, take aggressive steps to avoid over-saturation, erosion, or homogenization of soils by covering with protective plastic sheeting, collection and controlled dewatering, detention for sediment removal, and allowing excessively wetted soils to remain fallow until approved by the Engineer as appropriate for continued work. It shall be the Contractor's sole responsibility for soils that are contaminated by the weather and/or by his/her construction activities.

C. Apply supplemental moisture to overly dry soils.

D. Do not operate heavy equipment near excavations where trench wall or cut-slope failure may result.

3.04 Earthwork - General:

A. Removal of materials beyond indicated sub-grade elevations or dimensions without specific direction of the Engineer is not authorized. Unauthorized excavation, as well as remedial work directed by the Engineer, shall be at the Contractor's expense.

B. Stability of excavations:

1. Sides of excavations to be vertical as shown on the Drawings. Maintain sides of excavations in a clean and safe condition until completion of back filling.
2. Shoring and bracing are required at excavations deeper than 4 feet below adjacent existing grade. All shoring and bracing shall conform to the requirements of the Seattle Standard Specifications (most recent edition) and requirements of the Washington Industrial Safety and Health Act.

C. Dewatering: Prevent surface and subsurface water from flowing into excavations and from flooding project site. Establish and maintain temporary drainage ditches and other diversions outside excavation limits to convey rain water and water removed from excavations to collecting or run-off areas. If required, line ditches and sumps with coarse-grained material that acts as a filter. Do not use trench excavations as temporary drainage ditches. All dewatering shall conform to the requirements of the City of Seattle Standard Specifications (most recent edition) and Title 22.802 of the City of Seattle Stormwater, Grading, and Drainage Control Code (most recent edition).

D. Material Storage: Stockpile satisfactory excavated materials where directed, until required for backfill or fill. Place, grade, and shape all stockpiles for proper drainage.

E. Locate and retain soil materials away from edge of excavations and drip lines of trees to remain.

F. Dispose of excess soil material and waste materials as herein specified.

3.05 Grading:

A. Uniformly grade areas within limits of grading under this section, including adjacent transition areas. Smooth finished surface within specified areas. Smooth finished surface within specified tolerances, compact with uniform levels or slopes between points where elevations are shown, or between such points and existing grades. Finish surfaces free from irregular surface changes.

B. Landscape planting, lawns, and other landscape repair areas finish grade to be minus 1/2 inch from adjacent paving surfaces with smooth transition to adjacent grades.

3.06 Excavation:

A. Layout: All work shall be surveyed and staked by the Contractor as required to complete earthwork. Maintain all benchmarks, control monuments and stakes, whether newly established or previously existing. Protect from damage and dislocation. If necessary to disturb existing benchmarks, re-establish in a safe place. Notify Engineer a minimum of 3 days prior to excavation of work areas. Engineer shall inspect staking and layout of work.

B. Excavation for Trenches: Provide neat trenches to the depth, slope (where appropriate) and width as indicated in the Contract Drawings. Allow for import of surfacing materials and bedding. Provide clean, smooth trench walls and trench floors.

3.07 Excavation Safety Systems: Provide all trench excavation in excess of 4 feet in depth with a safety system conforming to the referenced requirements.

3.08 Compaction:

A. General: Control soil compaction during construction providing minimum percentage of density specified for area classification. Do not allow equipment traffic to overly compact areas beyond specified percentages. Remediate over-compaction as directed by the Engineer including ripping, re-grading and re-compaction or over-excavation and in-kind replacement per plan.

A. Percentage of Maximum Density Requirements: Compact soil to not less than the following percentages for maximum density for soils which exhibit a well-defined moisture density relationship (cohesive soils) determined in accordance with ASTM

D698; and not less than the following percentages of relative density; determined in accordance with ASTM 4253, for soils which will not exhibit a well defined moisture density relationship (cohesionless soils).

1. Backfill:
- ***a. Solid Piped Drainage Bedding under pipe- 95%***
- ***b. Solid Piped Drainage Bedding over pipe - 75%***
- ***c. Solid Piped Drainage Backfill - 95%***
- ***d. Perforated Piped Drainage Bedding and Top Lift, water settle, 75%.***
- ***e. Irrigation Pipe Bedding below pipe - 95%***
- ***f. Irrigation Pipe Bedding over pipe - hand tamp to 75%***
- ***g. Irrigation Pipe Backfill - 85%***
- ***h. Over excavation Backfill of Existing Sub-grade to remain - 95%***

2. Sub-grades:
- ***a. Sub-grade soils in lawn areas (outside Playfield) - 75%***
- ***b. Sub-grade soils on Playfield - 90%***
- ***c. Base Sand on Playfield - 95%***
- ***d. Sub-grade soils in landscape planting areas - 70%***
- ***e. Import aggregate base material in paving areas - 95%.***

3. Surface Fills:
- ***a. Playfield Soils - 85%***
- ***b. Planting Soils - 70%***
- ***c. Structural Soils - 95%***
- ***d. Fills on slopes exceeding 3:1, to prevent erosion – shall be determined on a project by project basis based on recommendations by the Engineer and the Geo-technical Engineer of Record for the project.***

C. Moisture Control:

1. Where sub-grade or lift of soil material must be moisture conditioned before compaction, uniformly apply water to surface of sub-grade, or layer of soil material, to prevent free water appearing on surface during or subsequent to compaction operations.
2. Before compaction, moisten or aerate each layer as necessary to provide optimum content. Compact each layer to required percentages of maximum dry density or relative dry density for each area classification.
3. Do not perform compaction operations on excessively wetted soils.

3.09 Trench Backfill:

A. Place fill materials in specified lifts to required sub-grade elevations, for each area classification as described in this Section.

B. Backfill excavations as promptly as work permits, but not until completion of the following:

1. Inspection, testing, approval, and recording locations of underground utilities.

2. Removal of shoring and bracing, and back filling of voids with satisfactory materials.
3. Removal of trash and debris.

C. Placement and Compaction: Place backfill and fill materials in layers of 2' maximum loose depth for material compacted by heavy compaction equipment and 1' maximum loose depth for material compacted by hand operated tampers. All compaction shall be by mechanical methods. Water settling may be used for Perforated Piped Drainage aggregates only. Do not place backfill for fill material on surfaces that are overly wet or dry, frozen, or graded inconsistently.

D. Perforated Piped Drainline Trench Backfill:

1. ***Provide a single, consistent 4" lift of Perforated Piped Drainage Bedding.***
2. ***Coordinate installation of piping per the requirements of Section 33 34 00 - Storm Drainage Utilities.***
3. ***Upon Engineers approval of installation of Perforated Piped Drainage, backfill with Perforated Piped Drainage bedding to within 12" of the design sub-grade.***
4. ***Place a uniform 6" settled lift of Perforated Piped Drainage Middle Lift Aggregate.***
5. ***Complete installation with 6" settled lift of Perforated Piped Drainage Top Lift Aggregate to design sub-grade.***
6. ***Where design depths of pipe do not accommodate the installation of the three specified products as described, delete the installation of middle lift aggregate following identification of the limit of the area to be modified and the approval of the Engineer.***

E. Solid Piped Drainline Trench Backfill:

1. ***Provide a single, consistent 4" compacted lift of Solid Piped Drainline Trench Bedding.***
2. ***Coordinate the installation of Solid Piped Drainlines per the requirements of Section 33 34 00 - Storm Drainage Utilities.***
3. ***Upon approval of the Engineer of installation of Solid Piped Drainlines, install an additional single lift of Solid Piped Drainage Bedding in a thickness allowing a minimum 4" compacted cover over crown of Solid Pipe.***
4. ***Complete installation with specified native soils or approved Common Fill compacted to design sub-grade.***

3.10 Pavement Base Backfill:

A. Provide a minimum 6" compacted lift of specified Pavement Base Aggregate true to the elevations either described or implied in the Contract Drawings or as required to match adjacent existing pavements or landscapes, and a minimum of 4" beyond the horizontal layout lines of pavement or as indicated on the Contract Drawings.

B. Pavement Bases shall be graded such that upon approval of compaction, the surface of the Base is at the correct elevation to receive pavement to design finished grade.

3.11 Backfill of Over-excavations: Backfill over-excavations with approved excess native soils or approved Common Fill true to the design elevations per the Contract Drawings unless otherwise directed. Install and compact to specified rates in lifts not exceeding 8" of loose material.

3.12 Structural Soil Base for Reinforced Turf: For all areas scheduled to receive Reinforced Turf Paving;

A. Sub-grade Preparation: On a rough native soil grade prepared to the design depth, establish a uniformly sloping sub-grade of a minimum 2 " lift of Type 17 Mineral Aggregate composed of Bank Run Gravel, compacted to 95% maximum dry density. Install geo-textile continuously over the compacted sub-base.

B. Following the Engineer's inspection and approval of the prepared sub-grade and geo-textile placement, begin placement of the 1:1 blend of the Type 2 Structural Aggregate & the 50/50 Sand/Organic Amendment Mix to ½ of the design cross section depth (minimum 4" depth). Place Structural Aggregate & Sand/Organic blend loosely and uniformly over the area to be covered. Water-settle and/or roll as necessary to achieve the specified compaction level and desired grades. After approval of this lift, continue with the installation of the upper ½ of the design cross-section with the same blend prior to final compaction. Prepare the grades for installation of the reinforced turf grid products by water settling, raking and rolling to a minimum 90% dry density, as required and specified.

B. Install the Reinforced Turf Paving Grid (as specified above) per manufacturer's specifications and recommendations. Fill all voids in the Grid with the 50/50 Sand/Organic Amendment Mix, making sure all voids are filled and compacted flush with the top of the grid.

D. Prepare for and install Hydroseeding or Sodding per Sections 32 92 19.16 or 32 92 23.

3.13 Disposal of Excess and Waste Materials: Remove from the Owner's property, all waste materials, including unacceptable excavated material, trash and debris, and dispose of it off site in a legal and timely manner. Provide dump receipts from an approved dumpsite if directed.

END OF SECTION