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: Furnish all material, labor, services and related items required to complete work indicated on Drawings and specified herein. The items of work to be performed shall include but may not be limited to: installation of maintenance holes, drainage pipes, catch basins and connections to existing control structures.

1.02 Related Sections: In addition to the Sections listed below, all Work of the Contract shall be performed in compliance with the requirements of this Section.

Section 01 56 39 - Temporary Tree & Plant Protection
Section 01 57 13 - Construction Stormwater Control
Section 01 76 00 - Protection of Existing Facilities
Section 02 41 13.23 - Site Utility Removal
Section 31 00 00 - Earthwork
Section 32 11 23 - Mineral Aggregates

1.03 References:

A. The City of Seattle Standard Plans and Specifications for Road, Bridge, and Municipal Construction, (most recent edition).

B. The City of Seattle Stormwater, Grading and Drainage Code, (most recent edition).

1.04 Quality Assurance:

A. The contractor responsible for the work of this section shall be a **Licensed Side Sewer Contractor registered with the City of Seattle Department of Planning and Development (DPD).** Prior to the commencement of the work, verify the accuracy of horizontal and vertical layout, and dimensions of excavations to receive the Work of this Section.

B. Permits, Inspections and Testing:

1. Permits: Permits are required by SPR for all service drain work. For all permits refer to the following website for permitting requirements: www.seattle.gov/dpd/sidesewer.
2. Inspections: 48 hours prior to the back-filling of any pipe, structures or appurtenances, notify the Engineer by calling the Call the **SPR Inspection Request Line @ (206) 684-7034 or by email at parksconstruction.inspection@seattle.gov** to make arrangements for inspections. Anticipate inspections to allow sufficient time for inspections to take place without affecting the work of other trades.

3. Testing will consist of water flooding to verify the function of the installation. In cases where long runs of tight line or perforated interceptor drainage is to be tested to allow backfill, and that work is not connected to the terminal downstream end of the work, verification of slope will be performed by surveying the crown or invert.

1.05 Submittals:

A. Submit the following for approval prior to delivery to the site and commencement of the work:

1. Manufacturer's product data for pipe, concrete and metal castings.
2. Manufacturer's installation instructions.

1.06 Project Record Documents:

A. Submit documents under provisions of Division 01 Specifications for recording of all pipe runs, connections, structures, and invert elevations. Identify and describe any unexpected variations from the designed plans.

B. Provide a record of inspection of internal conditions of existing sewers using television cameras.

1.07 Coordination: Coordinate Storm Drainage Utility work with the work in other sections of these specifications.

PART 2 - PRODUCTS

2.01 General: All materials and equipment listed herein shall be new and of the type specified. Comply with Specifications and manufacturer's data. Where these may be in conflict, the more stringent requirements govern, at the direction of the Engineer.

2.02 PVC Pipe and Fittings:

A. Perforated Drainage Pipe shall be PVC piping which meets or exceeds ASTM 3034 SDR 35, minimum 4-inch diameter or greater as sized per the contract drawings.

B. Solid/Tight Line Pipe shall be PVC piping which meets or exceeds ASTM 3034, minimum 6-inch diameter or greater as sized per the contract drawings.

C. Fittings:

1. All Fittings shall be injection molded PVC, conforming to ASTM 3034.
2. Where connecting new work conforming to these specifications to existing work of dissimilar materials, connections shall be made of materials similar to those of the existing work, unless otherwise directed by the Engineer.

2.03 HDPE Drainage Pipe and Fittings:

A. Drainage pipe and fittings shall meet or exceed the following performance standards:

AASHTO M-252 Type S	*Standard Specification for Corrugated Polyethylene Drainage Tubing; Smooth Interior Wall, Corrugated Exterior (Solid)*
AASHTO M-252 Type SP	*Standard Specification for Corrugated Polyethylene Drainage Tubing; Smooth Interior Wall, Corrugated Exterior (Perforated)*
AASHTO M-294	*Standard Specification for Corrugated Polyethylene Pipe, 300 t0 1500-mm Diameter.*
ASHTO Section 30	*Thermoplastic Pipe*
ASTM F 405	*Standard Specification for Corrugated Polyethylene (PE) Tubing and Fittings.*
ASTM F 667	*Standard Specification for Large Diameter Corrugated Polyethylene Tubing and Fittings.*
ASTM F 477	*Elastomeric Seals (Gaskets) for Joining Plastic Pipe.*
WSDOT 7001	*Drains Material Specification 9-05.1(6) Sizes 3" Through 10" for Drains. Material Specification 9-05.2(7) Sizes 3" Through 10" for Drains.*

B. Slotted Drainage Pipe shall be high density polyethylene (HDPE) corrugated pipe with an integrally formed smooth waterway and be made from virgin HDPE compounds which conform to the applicable current edition of the AASHTO Material Specifications. For cell classification definition and description, reference ASTM D3350. Slotted Drainage Pipe shall be ADS N-12, minimum 4-inch internal diameter or greater as sized per the contract drawings, or approved equal.

C. Solid/Tight Line Drainage Pipe shall be high density polyethylene (HDPE) corrugated pipe with an integrally formed smooth waterway and be made from virgin HDPE compounds which conform to the applicable current edition of the AASHTO Material Specifications. For cell classification definition and description, reference ASTM D3350. Solid/Tight Line Pipe shall be Hancor "Blue Seal", minimum 6-inch internal diameter or greater as sized per the contract drawings, or approved equal.

D. Fittings:

1. All Fittings shall be made from injection molded HDPE resins and supplied by the same manufacturer of the pipe. Fittings shall not reduce or impair the overall integrity or function of the pipeline. Coupling mechanisms shall provide sufficient longitudinal strength to preserve pipe alignment

and prevent separation at the joints. Fittings shall be soil tight which have leakage at the joint but inhibit soil infiltration.

2. *Where connecting new work conforming to these specifications to existing work of dissimilar materials, connections shall be made of materials similar to those of the existing work, unless otherwise directed by the Engineer.*

2.04 Ductile Iron Pipe

A. *Ductile-Iron Pipe (DIP): Ductile iron pipe shall conform to ANSI/AWWA C151/A21.51, standard thickness, Class 52. The pipe shall be lined with cement mortar conforming to ANSI/AWWA C104/A21.4 and coated with an asphaltic coating. Each length shall be plainly marked with the manufacturer's identification, year cast, class of pipe, and weight. Type of joint shall be rubber gasket, push-on type (Tyton), or mechanical joint (M.J.) conforming to ANSI/AWWA C111/A21.11. Flanged joints shall conform to ANSI B16.1.*

B. *Ductile Iron Fittings:*

1. *DIP Fittings shall be short-bodied ductile iron C110 or C153 for 350 psi pressure rated mechanical joint fittings and 250 psi pressure rated flanged fittings. All fittings shall have a cement mortar lining conforming to ANSI/AWWA C104/A21.4. The fittings shall be furnished with flanged ends or mechanical joints.*
2. *DIP Restrained Joints shall be made up with mechanical joint pipe and fittings. The mechanical joint restraint device shall have a working pressure of at least 250 psi with a minimum safety factor of 2:1 and shall be EBBA Iron, Inc., MEGALUG, Star Pipe Products, or approved equal.*
3. *DIP Fitting to Pipe Joint Restraint (6" through 12"): Fitting to Pipe Restraints shall meet the requirements of UNI-B-13-94. Grip ring serrations shall be machined. As cast serrations are not permitted. Restraint rods, bolts and nuts shall be of ductile iron per ASTM A563 or low alloy steel to AWWA/ANSI C111/A21.11. Fitting to Pipe Restraint shall be supplied by HARCO (Harrington Corporation), Lynchburg, VA, or approved equal.*
4. *DIP Solid Sleeve Pipe Couplings shall be long pattern sleeves constructed of ductile iron with a minimum pressure rating of 250 psi working pressure.*
5. *Gate Valve to Pipe Restraints: Valve to Pipe Restraints shall be ductile iron per (ASTM A536) grip rings with machined serrations and ductile iron restraint rods. The ring that grips the pipe shall meet the requirements of Uni-B-13-94. The restraint rod nuts shall be made from low alloy steel per AWWA/ANSI C111/A21.1 or ductile iron per ASTM A536. All valve restraints shall be as manufactured by HARCO (Harrington Corporation) of Lynchburg, VA, or approved equal.*

2.05 Flow Control Systems: Materials shall meet the requirements of the City of Seattle Standard Specification (most recent edition) and all flow control and detention systems

shall be constructed using Concrete Pipe (or HDPE, as approved by the Engineer, on Parks Property only):

A. Corrugated metal pipe (CMP) flow control systems and detention systems will not be allowed in any landslide-prone area as defined in SMC 25.05.908. Corrugated metal pipe flow control and detention systems which are owned, or are to be maintained by Seattle Public Utilities, will not be allowed. Flow control and detention systems to be owned or maintained by Seattle Public Utilities shall be concrete.

B. Concrete Flow Control Structures, Conduit, Fittings, and related materials, such as Maintenance Hole Components and Non-Shrink Cement Sand Grout shall meet the requirements of the City of Seattle Standard Specifications (most recent edition).

C. (Optional, as approved by the Engineer, on Parks Property only,) HDPE pipe and fittings may be used as specified above and on the Drawings, or approved equal.

D. All flow control or detention systems shall be water-tight and shall pass pressure tests as required and directed by the Engineer.

2.06 Filter Fabric: Non-woven polypropylene fabric.

2.07 Drainage Aggregates: Refer to the contract drawings for when and where one or more of the following aggregates shall be used and when used, shall meet or exceed the following requirements.

A. Washed sand shall meet the following sieve gradation:

Sieve Size	Percent Passing
No. 4	95-100
No. 6	82-98
No. 8	68-86
No. 50	9-20
No. 200	0-2.5

B. 4/8 Gravel shall meet the following sieve gradation:

Sieve	Percent Passing
1/4 inch	100%
#4	91%
#8	15%
#16	2%

C. Pea Gravel shall meet the following sieve gradation:

Sieve Size	Percent Passing
3/4” square	100
3/8” square	95-100
No. 8	0-10
No. 200	0-3

D. 1-1/2" Washed Rock shall meet the following sieve gradation:

Sieve Size	Percent Passing
1-1/2" square	100
1-1/4" square	90-100
3/4" square	0-20
3/8" square	0-2

2.08 Pipe Bedding (for Non-rigid PVC ***or HDPE Pipe***): Pipe bedding material shall be Class Mineral Aggregate Type 22, per City of Seattle Standard Specifications, (most recent edition).

2.09 Catch Basins (CB):

A. Catch Basins shall be as shown on the contract drawings and details. All Catch Basins that are installed on Seattle Parks and Recreation properties and are intended to be maintained by SPR shall have outlet traps per SPR Standard Details. Catch Basins that are installed in SDOT Rights of Way or are intended to be maintained by Seattle Public Utilities shall have outlet traps as shown in the City of Seattle Standard Plan #267a.

B. Catch Basin Frames & Grates shall be as shown on the drawings and details and shall vary based upon the site situation and accessibility requirements.

1. Most SPR project areas shall have typical Inlet Frame & Grate Type 264 "vaned" grate applications per SPR Standard Detail with bolt down capability with stainless steel bolt and hex key.
2. Catch Basins that are installed in paved areas where ADA accessibility requirements are in place shall have pedestrian-proof "wave" grates installed per SPR Standard Detail with bolt down capability with stainless steel bolt and hex key.
3. Catch Basins that are installed in non-paved areas of expected high flows and/or drainage ditches or swales with high levels of debris flow shall have either "vaned" grates for high flow situations per SPR Standard Details or "beehive" grates per SPR Standard Detail. All grates shall have bolt down capability with stainless steel bolt and hex key, unless otherwise directed by the Engineer. All bolts shall be installed using an "anti-seize" product.

2.10 Maintenance Holes (MH):

A. Maintenance Holes shall be City of Seattle Standard Type 200(A) maintenance hole (with SPR exceptions) as shown on the plans and details. Provide ladder, trap, frame, solid cover and all other required appurtenances per Plans and Details. The Grate shall be a Type 230(L) with "Drain" printed on the cover. All covers shall have cam-locks and shall be bolt down covers with stainless steel bolts and hex keys. All bolts shall be installed using an "anti-seize" product.

B. Detention System Control Structure:

1. Maintenance Holes shall be City of Seattle Standard Type 201(A) Maintenance Hole (with SPR exceptions) as shown on the Plans and Details. Provide ladder, trap, frame, solid cover and all other required appurtenances per Plans and Details. The Grate shall be Type 230(L) with "Drain" printed on the cover. All covers shall have cam-locks and shall be bolt down covers with stainless steel bolts and hex keys. All bolts shall be installed using an “anti-seize” product.
2. Control device and connection shall consist of PVC pipe and cross with orifice, a pipe connection and shear gate with a steel chain. The diameters of the control device and connection shall be the same as the diameter of the outlet pipe as indicated on the Drawings. The PVC pipe used for the cross and connection shall meet the specifications of ASTM D1785 schedule 40. The PVC material used for the orifice plate and shear gate shall be plate material meeting the specifications of ASTM D1784, PVC Class 12454-B. The orifice plate material shall be 1/4 inch thick; the shear gate material shall be 1/2 inch thick. The shear gate pin shall be of the same PVC material as the shear gate. The shear gated chain shall be 12 gauge galvanized steel straight link chain.

2.11 Maintenance Hole Adapters for PVC Pipe Only: PVC Maintenance Hole Adapter (Sand Collar) with silica impregnated surface and sure-seal gasket, per SPR Standard Details, or approved equal.

2.12 Clean-outs (CO): Clean-outs installed on Seattle Parks’ properties shall conform to the City of Seattle Standard Specifications (most recent edition) Type 280 (with SPR exceptions) and per SPR Standard Details. All Clean-outs shall be stubbed to the finish grade with a cast in place concrete collar and the appropriate cover per SPR Standard Details. All Clean Outs shall also be installed with Mechanical Compression Plugs.

2.13 Clean Out Cover Assembly: All Clean-out Covers shall be cast-iron, sleeve-type, body and cover, sized as appropriate for the terminal pipe run, as identified in the Contract Drawings. Cover shall include a stainless steel hex-keyed lock and be cast with the letters “CO” clearly visible. Concrete collar shall be constructed per the requirements of Section 32 13 13 - Concrete Paving.

2.14 Fittings, Couplings and Jointing:

A. All Fittings shall be made of the same material as the pipe.

B. All Tees on existing pipe installations shall be connected by core drilling and installing flexible connections.

C. Pipe to pipe connections (between pipes of differing materials) shall be made with a flexible gasketed coupling, adaptor or coupling-adaptor which shall make a watertight joint. Couplings shall be as manufactured by Romac, Omni, Caulder, or approved equal.

D. Jointing and/or Break-out & Reconnect of mismatched pipe wall thicknesses shall be installed per City of Seattle Standard Specifications (most recent edition).

2.15 Grout: Grout material for pipe penetrations and sediment trap hook installation at Pre-cast Concrete Structures shall be non-shrink cement sand grout only. **"Jet Set" or equivalent products are not acceptable.**

2.16 Identification:

A. Utility pipe tracer tape shall be detectable below ground surface, color coded, with utility name printed on tape. Conductive warning tape required over all water, sewer, drainage, and irrigation pipe at 6" below finished grades. Underground - Type Plastic Line Markers: Permanent, bright-colored, continuous-printed plasticized aluminum tape, intended for direct-burial service; not less than 3" wide x 5 mils thick. Detectable Marking Tape colors shall be as follows:

Tape Schedule: Piping	Color	Wording
Sanitary Sewers	Green	Caution Sanitary Sewer
Storm Drains	Green	Caution Storm Drainage

PART 3 - EXECUTION

3.01 General:

A. Verify that excavation base is ready to receive work and excavations, dimensions, and elevations are as indicated on the Drawings.

B. Excavation tolerance of sub-grade shall be +/- 0.05 feet. Sub-grade must be in a smooth, even condition prior to placement of any permeable material. All depths shown are to be compacted depths. Where material is placed as fill, the Contractor shall compact the material as required by Section 31 00 00 - Earthwork. If excavated material exceeds the quantity needed as on-site common fill, excess materials shall be removed from the site.

3.02 Trenching:

A. Trenches shall be cut with smooth sides, no less width than as shown on the Drawings. In the event that the trench has been over-excavated, the Contractor shall correct by use of the gravel filter material, as long as the invert elevations of the pipe and the minimum gravel filter material and fabric are per the Plans. Trench bottom shall be smooth and compact and to the grade specified. Also, refer to Section 31 00 00 - Earthwork for backfilling information.

B. All trenches shall be maintained with vertical sides and without loose or sloughed materials therein; care shall be taken in placement of gravel to insure no sloughing of

trench sides or contamination of the gravel. The Contractor shall not drive construction vehicles across excavated or backfilled trenches but shall use alleys between trenches for travel ways. Exception will be granted only when the Contractor can show evidence that the bridging scheme he proposes will ensure conformance with the foregoing.

3.03 Pipe Laying:

A. Pipe laying shall comply with the City of Seattle Standard Plans and Specifications (most recent edition).

B. Storm Sewer (Solid/Tight-line Pipe) - Install to grades and/or slopes as shown on contract drawings. Backfill with Type 22 bedding to a depth of 4 inches below the pipe, around the pipe and 6 inches above pipe. Backfill the remainder of trench with native material, only if that material can be compacted to 90% density at optimum moisture content. If native material cannot be compacted to 90%, the Contractor shall provide Type 17 (Bank Run Gravel) as backfill material. Backfilling shall be done in one foot lifts maximum.

C. Corrugated Metal Pipe (Detention) - Install to grades or slopes shown on contract drawings. Backfill with Type 22 bedding to a depth of 6 inches below the pipe, around the pipe and 6 inches above pipe. Backfill the remainder of trench with native material, only if that material can be compacted to 90% density at optimum moisture content. If native material cannot be compacted to 90%, the Contractor shall provide Type 17 (Bank Run Gravel) as backfill material. Backfilling shall be done in one foot lifts maximum.

3.04 Sub-surface Drainage Lines:

A. Drainage Aggregate: Bedding aggregate shall be placed in properly graded/approved trenches for the drain pipe with lines and grades as shown on the contract drawings. The aggregate shall be carefully placed on the clean and graded trench bottom and brought to the appropriate level, no less than four (4") inches deep at any point.

B. The perforated sub-drainage pipe shall be placed on and the balance of drainage aggregate shall be placed over the pipe and brought up to the level shown on the contract drawings. Aggregate shall be placed along the sides of the pipe and on the top of the pipe with the pipe held in place to prevent vertical or lateral displacement by the fluid effort of the aggregate. Cap the ends of pipe with end caps.

C. Backfill the remainder of the trench and compact as shown on the contract drawings avoiding any excessive mixing of drainage aggregates with surface (planting) soils.

3.05 Filter Fabric: If filter fabric is called for on the contract drawings, install the fabric as shown on those drawings and per the manufacturer's recommendations. Filter fabric shall be stapled down using jute net pins or equal at 4 feet on center when laying flat over drainage trenches.

3.06 Pipe Connections at Structures:

A. All new catch basins and maintenance holes shall be provided with openings or knockouts for insertion of pipe connections and with a trap for the outlet pipe. When connections are to be made to existing catch basin with no available hole or where a "knock out" of adequate size is not provided, pipe connections shall be accomplished by core drilling or line drilling. All openings must provide a minimum of 1 inch and a maximum of 2 inches clearance around the circumference of the pipe. Line drilling shall be accomplished with a small core drill or a rotary hammer. Jackhammers shall not be used.

B. Where the designed PVC line passes through the side-wall of the structure, provide a sand collar, type specified in the Drawings.

C. After pipes have been placed in position, they shall be grouted tightly in place with a trowel and brush finish, as required by the Engineer to achieve a smooth inside and outside surface. Grout material shall be non-shrink cement sand grout. Upstream pipes penetrating the walls of catch basins shall be placed with the bell facing out, such that the bell is placed as snug against the outside wall of the structure as the angle of penetration allows. Pipe leaving or entering catch basins shall be provided with a flexible joint within 1/2 of pipe diameter, or 12 inches, whichever is greater. Connection between PVC pipe and CMP shall have a Romac or Dressler coupler, or approved equal.

3.07 Detection Tape: Install detection tape in all pipe trenches located above the top of all pipes at 6” below finished grade.

3.08 Tie In: Connect new drainage equipment to existing using Romac, Omni or Caulder fittings, or approved equal. Provide shoring and de-watering per the requirements of the City of Seattle Standard Specifications (most recent edition). Provide and install couplers as described above. All connections to the existing sewer lines in the street ROW shall be done per the requirements of the Seattle Public Utilities and Street Use Permit and Side Sewer Permit.

3.09 Cleaning, Testing and Inspections: All new pipe and structures shall be cleaned and tested per City of Seattle Standard Specifications (most recent edition), or as directed by the Engineer. Testing shall be conducted under the direction of the Engineer, by calling the **SPR Inspection Request Line @ (206) 684-7034 or by email at parksconstruction.inspection@seattle.gov** to make arrangements for inspections.

END OF SECTION