1.01 Trail Construction Standards:

A. General:

1. Work of this Section consists of all services, labor, equipment, and materials necessary to construct the trail system described in the Trail Stationing Plan. This includes construction of Standard Trail Section, Water Bars, Turnpike Section, Steps, and footbridges under 20’ in length.
2. Prior to performing the work of this section, verify the condition of the rough grade. Obtain Parks Engineer’s approval of conditions as adequate to proceed.
3. Provide clean, uncontaminated surfaces.

B. Standard Trail Section:

1. Standard Trail Section consists of a 48” (standard) or 72” (wide section) wide trail tread on grade; however some natural area trails should be constructed to a minimum of 36".
2. Import and place Trail Surfacing **(5/8”minus (normal trail) or 3/8” or 1/4”minus (ADA trail) crushed rock surfacing. Do not use wood-chips)** in a single lift to the dimensions specified in the details. Provide sufficient material to insure a full 3” depth following compaction. If poor soil conditions exist, additional base rock or geo-textile materials may be required. Depths for installation shall very depending on the site conditions.
3. Compaction:
   a. Perform compaction only under suitable conditions. Do not compact excessively wet or dry material or when the sub-grade soils are excessively wet or dry. Allow materials to dry or add clean water as necessary to achieve optimum moisture.
   b. Mechanically compact the Trail Surfacing to the maximum density supportable by the underlying soils.
4. Seattle Parks & Recreation (SPR) does not recommend the installation of "packed earth" or soil trails for any new trail construction; they are not appropriate given our wet climate, given the "clayey" nature of our native soil, and given the volumes of traffic on park trails. It is SPR's position that over time, from a maintenance perspective, trails constructed initially with a crushed rock surface will provide a longer lasting surface and be more user friendly. It is our experience that trails built with crushed rock, given the chance to weather and accumulate organic material (i.e. leaves, fir needles), will take on the appearance of a more natural or "packed Earth" type of trail while maintaining it structural strength and integrity.

C. Turnpike: (Structure used in areas where the ground is saturated and other drainage measures are not appropriate)

1. Turnpike shall consist of a 48” (standard) or 72” (wide section) wide trail tread on grade, retained by 4”x4”x8’ LP-22 timbers pinned to the sub-grade with 24” - #4 deformed reinforcing bar, 3 bars per timber.
2. Layout and set bottom of retaining timbers flush to, or up to ½” below, compacted sub-grade, end to end with no gaps between timbers. Stagger joints on opposing sides of tread where practical. Miter ends of timbers equally where trail alignment turns.

3. Pre-drill timbers 3/8”, to accept reinforcing bar pins, at 12” from each end and at center. Set 24” - #4 reinforcing bar pins into stable soil to a depth of ¾” below top of retaining timber.
4. Import and place, in one lift, sufficient Trail Surfacing to provide an average depth of 4” following compaction, with a crown of 1” above top of retaining timbers.
5. Compaction per 1.01.B.3 above.

D. Water Bars:

1. Water Bars are intended to both divert surface water off the trail and stabilize Trail Surfacing. Construct Water Bars of 4”x4” LP-22 timbers pinned to the sub-grade with 24” - #4 deformed reinforcing bar, 2 bars per timber. Install trail surfacing as for Standard Trail Section, paragraph 3.04.13 above.
2. Locate timbers flush to the prepared sub-grade, spaced per the Trail Stationing Plan. Where formal drainage ditching is scheduled, set timbers to divert surface run-off into these ditches. Where no formal drainage work is associated with the Water Bars, set the timbers so as to divert surface run-off down-slope.
3. Pre-drill timbers perpendicular to the prevailing slope 3/8”, to accept 24” - #4 reinforcing bar pins, at 6” from each end. Set reinforcing bar pins into stable soil to a depth of 1” below top of timber.

E. Steps:

1. Steps are constructed of 6”x6” pressure treated timbers arranged in a “crib-work” fashion, each riser consisting of 2 sides and a leading edge, stacked and staggered to fit the slope to the tolerances indicated in the drawings. Individual timbers are fastened with 30” - #4 deformed reinforcing bars as indicated below.
2. Begin all Step construction at the bottom of the slope by excavating a stable, flat bench slightly larger than the design dimensions of the Step. Mechanically compact this bench to the maximum density supportable by the soils present, assuming optimum moisture content per paragraph 1.01.B.3 above.
3. Arrange the timbers per the drawing, with the leading edge timber spanning the full width of the Steps. Length of the sides of the crib-work will vary depending on the slope. Provide sufficient length for the next Steps sides to overlap a minimum of 12”.
4. Pre-drill timbers plumb 3/8”, to accept 30” - #4 reinforcing bar pins, as follows;
   a. For leading edge timbers, drill 2 places, 4” from each end, and
   b. For side timbers 4” from exposed ends, and
   c. If tread will be longer than 24”, drill one place centered between exposed end and leading edge of the next riser, and
   d. If last riser at top of steps, drill 3 places 12” on center beginning 4” from each end. Set pins into stable earth to a depth of ¾” below top of each timber.
5. Backfill each Step as it is constructed by importing sufficient Trail Surfacing in a single lift too completely fill the crib-work upon compaction per 1.01.B.3 above.

6. Begin construction of successive risers directly atop the preceding riser, using then drilling and pinning procedure, paragraph 1.01.E.4 above, to secure the overlapped portions of the riser below.
7. Backfill the sides of the completed Steps with Native Mineral Soil to a point 2” below the bottom of the leading edge timber of each step.

F. Footbridges and Railings:

1. Footbridges are wooden structures constructed with either post and beam construction for sections over 14” above grade or mud-sill construction for sections under 14” above grade. Sections more than 30” above grade require a handrail.
2. Refer to other Specifications of the project for details regarding installation of all timbers, lumber, and fasteners.
3. At the Contractors option, all construction of Footbridges under 20’ in total length associated with a project may be of the post and beam construction technique described for Footbridges over 14” above grade, or per details provided for Boardwalks or Footbridges over 20’ in overall length.
4. Construct all Footbridge components plumb and level, with the exception of extreme ends, which may transition at up to; but no more than, a 5% slope to the successive or preceding trail detail.

1.02 Drainage:

A. General:

1. Work of this Section consists of all services, labor, equipment, and materials necessary to construct the Drainage work associated with the trail system described in the Trail Stationing Plan. This includes construction of Drainage Dips, Drainage Ditches, Rock-Lined Sumps, Culverts, Lead-off Ditches, and associated Rock Spillways.
2. The Trail Stationing Plan should be developed to meet the existing topography, soil conditions, and apparent hydrology of the Project Site.

B. Drainage Dips: (A carefully shaped depression built into an existing trail to divert water from the tread).

1. When directed by the Trail Stationing Plan to install a Drainage Dip, refer to the detail and provide the necessary grading alteration to the specified trail construction detail, paragraph 1.01, above. Each Drainage Dip shall collect and divert surface run-off down-slope to an associated Rock Spillway, paragraph 1.02.6, below.

C. Drainage Ditches:

1. Where indicated on the Trail Stationing Plan, Drainage Ditch refers to a surface run-off interceptor trench that runs parallel to and up-slope from the trail and perpendicular to the prevailing slope.
2. Where directed by the Trail Stationing Plan, excavate Drainage Ditches to the dimensions indicated in the details. Provide ditch bottoms that slope positively to the associated outlet.

3. Where Drainage Ditches slope at greater than 1’ vertically in 12’ for more than 30’, provide a 6”x6” timber check-dam across the bottom of the ditch, embedded 12” into each side, 10’ spacing. Secure the timber check-dam as for Water Bars, paragraph 1.01.D.3 above, except 12” from each end.

D. Rock-Lined Sump: (a feature that is used in association with a culvert to trap silt and other sediments before they enter the culvert).

1. When directed by the Trail Stationing Plan to install a Culvert associated with a Drainage Ditch, install on the up-slope side of the trail or trail structure a Rock-Lined Sump (Sump) as follows;
   a. Identify the intersection point of the flow-line of the culvert and the flow-line of the associated ditch to be drained. At the point of intersection, excavate sufficient undisturbed Native Mineral Soil to allow the excavation to be tightly lined with Rock, leaving a sump approximately 1 foot deep below bottom of ditch invert of Culvert with a capacity of 2 cubic feet. Dimensions for Sump should be approx. 1’-5” square or 1’-7” diameter.
   b. Beginning with the bottom of the Sump and working up to the bottom of the associated Drainage Ditch, line the sump with rock. Rock should fit tightly, with no gaps over 2” in any dimension. Provide additional Rock across the bottom of the Drainage Ditch which over-hangs the Sump 1” to protect the Sump walls from out-wash.
   c. Pack joints in the bottom of the Sump with 5/8” Minus Crushed Rock.

E. Culvert:

1. Culverts will be done, either at the apparent low-point of a Drainage Ditch or as a surface water run-off outlet along flat, wet runs of trail. If for reasons defined in paragraph
2. The Trail Stationing Plan identifies a location as scheduled to receive a Culvert that does not appear to meet these criteria, notify the Engineer and obtain specific direction before proceeding with the work.
3. Culverts have, normally associated with them,, the following additional elements;
   a. Rock-Lined Sump, paragraph 1.02.D, above
   b. Lead-off Ditch, paragraph 1.02.F, below.
   c. Rock Spillway, paragraph 1.02.6, below.
4. Install Culverts as follows;
   a. Generally perpendicular to trail, sloping to drain down-slope,
   b. Extend Culvert 12” beyond edge of trail up-slope or 4” into Sump
   c. Extend Culvert 12” beyond edge of trail down-slope
   d. Invert of pipe at inlet shall be either
      i. Flush with finish grade at Culverts not associated with Drainage Ditches, or
      ii. 6” below bottom of Drainage Ditch.
   e. Minimum cover over Culvert shall be 6”.
   f. Invert of Culvert out-fall shall be sufficiently lower than the inlet to provide adequate flow, generally 2-5%.
   g. Where the existing slope permits, construct a Rock Spillway, paragraph 3.05.G, at the outfall of the Culvert.

h. Where the existing slope would otherwise inhibit discharge of the out-fall, construct a Lead-off Ditch, paragraph 1.02.F

F. Lead-off Ditch:

1. Construct a Lead-off Ditch Where directed by the Trail Stationing Plan or where the elevation of the outfall of a Culvert would otherwise be below existing grade.
2. Lead-off ditches shall have a flat bottom 8” in width and be a minimum 12” in depth, depth increasing as necessary to provide a 2% slope to a point where natural grade allows for discharge. Lead-off Ditches shall be excavated into previously undisturbed earth.
3. At the out-fall point of all Lead-off Ditches, provide a Rock Spillway, paragraph 1.02.G

F. Rock Spillway: Install Rock Spillways (Spillway) at the out-fall point of all drainage structures as follows;

1. Use only imported rock which complies with 5/8” Minus Crushed Rock and 4'-8' Rip-Rap Rock.
2. Extend the Spillway the width or diameter of the drainage structure discharge to each side of the discharge point and 3 times that dimension down-slope. Slope the Spillway to drain a minimum 2% or to conform to the existing slope. Embed the Rock so that only the top plane is exposed, butting all joints as tightly as possible. Pack all resulting joints with 5/8” Minus Crushed Rock.

END OF SECTION