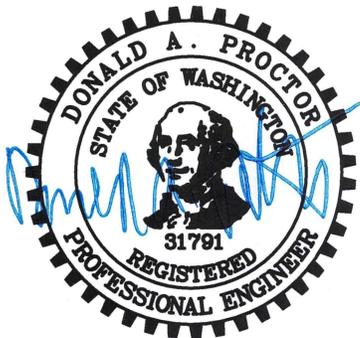


## TECHNICAL MEMORANDUM

**DATE:** April 14, 2023  
**TO:** Linda Frkuska, King County Parks and Recreation  
**FROM:** Nicole Nagao, Parametrix; Don Proctor, Parametrix  
**SUBJECT:** 30% Design Stormwater Approach  
**CC:** Jennifer Dvorak, Parametrix;  
**PROJECT NUMBER:** 214-1521-231 (700.01)  
**PROJECT NAME:** Green to Cedar Rivers Trail South Interim Segment A



4/14/2023

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### PURPOSE OF MEMORANDUM

The purpose of this technical memorandum (tech memo) is to identify how the Green to Cedar River Trail South Interim Segment A (project) will satisfy the core and special requirements of the 2021 King County Surface Water Design Manual (KCSWDM).

### PROJECT DESCRIPTION

King County, in partnership with the City of Maple Valley (City), is proposing to develop a 1.8-mile interim trail that extends from Southeast Kent Kangley Road in the City of Maple Valley to the Black Diamond Open Space, as shown in Figure 1 below. The interim shared-use path will be a 12-foot-wide gravel trail with 2-foot-wide gravel shoulders (on both sides) over existing railroad bed that is 6- to 8-foot-wide gravel in most locations. The project is located in the Duwamish Green watershed (WRIA 9) within the City of Maple Valley and unincorporated King County, both of which follow the KCSWDM. King County Parks anticipates paving the trail with hot mix asphalt (HMA) at some time in the future. The surface water management analyses prepared for this project will assume that the trail is paved with HMA and proposes infiltration trenches, closed depressions, and sheet flow for dispersion to meet flow control requirements.

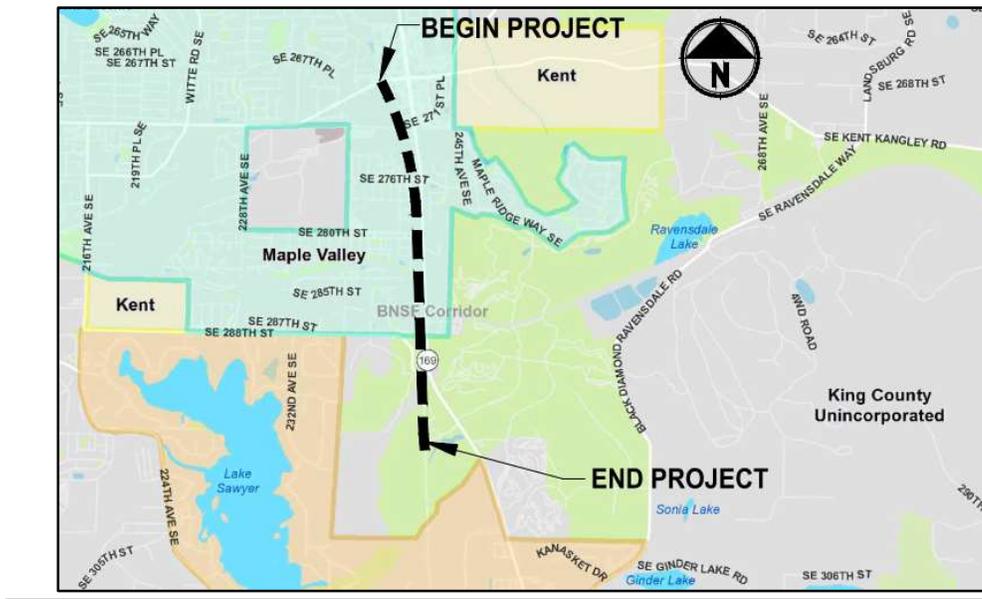


Figure 1. Vicinity Map

This tech memo summarizes how the project will meet all core and special requirements of the 2021 KCSWDM and focuses on Core Requirement No. 3, Flow Control. The other minimum requirements, while considered in the preliminary stormwater design development, are not directly addressed in this tech memo. They will be addressed in the Final Drainage Report that will be submitted to the City for permit review at a later time.

### EXISTING CONDITIONS

A threshold discharge area (TDA) is an on-site area draining to a single natural discharge location or multiple natural discharge locations that combine within 0.25 miles downstream (as determined by the shortest flow path). The following is a brief description of the existing drainage conditions for each TDA within the project area:

- TDA 1 – Runoff sheet flows over the existing gravel trail onto the adjacent vegetated property west of the trail for 0.25 miles, infiltrating into the ground and ultimately discharging to Jenkins Creek, which is located to the west approximately 0.9 miles from the project area.
- TDA 2 – Runoff sheet flows over the existing gravel trail onto the adjacent vegetated property west of the trail for 0.25 miles, infiltrating into the ground and ultimately discharging to Jenkins Creek, which is located to the west approximately 0.9 miles from the project area.
- TDA 3 – Runoff sheet flows over the existing gravel trail onto the adjacent vegetated property west of the trail for the north section of the TDA. At SE 276th Street, the existing trail ends, and runoff south of the intersection infiltrates to the vegetated ground or flows to the west until discharging to Jenkins Creek (located 0.9 miles west from the project area).
- TDA 4 – Runoff infiltrates to the vegetated ground or flows to the west until discharging to Jenkins Creek (located 0.9 miles west from the project area).
- TDA 5 – Runoff infiltrates to the vegetated ground or flows to the west until discharging to Lake Sawyer.
- TDA 6 – Runoff infiltrates to the vegetated ground or flows to the east until discharging to Ravensdale Creek. The proposed design uses infiltration trenches along the shoulder of the trail that infiltrate and reduce runoff to meet the Level 2 flow control standard.
- TDA 7 – Runoff infiltrates to the vegetated ground or flows to the east until discharging to Ravensdale Creek.

- TDA 8 – Runoff infiltrates to the vegetated ground or flows directly to Ravensdale Creek, which runs through the center of TDA 8.
- TDA 9 – Runoff infiltrates to the vegetated ground or flows to the west until discharging to Ravensdale Creek.

## STORMWATER REQUIREMENTS

Based on the 2021 KCSWDM, the project requires a full drainage review because it will result in greater than 2,000 square feet of new and replaced impervious surface. According to Table 1.1.2.A in the 2021 KCSWDM, full drainage review pertains to the project review of nine core requirements and five special requirements.

Table 1 below contains a general description of how the project design team proposes to meet each requirement. Further details regarding the preliminary design to meet Core Requirement 3 Flow Control are discussed in subsequent sections.

**Table 1. Summary of Core and Special Requirements**

Core and Special Requirements per Table 1.1.2.A of the 2021 KCSWDM	Proposed Stormwater Management Approach
C1 Discharge Location at the Natural Location	Runoff generally sheet flows over the existing gravel trail onto adjacent vegetated property, mostly infiltrates into the ground, and/or ultimately discharges to Jenkins Creek, Lake Sawyer, or Ravensdale Creek. The existing discharge locations will be preserved.
C2 Off-Site Analysis	Parametrix performed field observations along the trail corridor in October 2022 and February 2023. The purpose of the field observations was to confirm existing site drainage patterns and identify drainage or erosion problems downstream of the project corridor. Parametrix was unable to observe the full 0.25-mile downstream drainage path to the discharge points due to access restrictions; however, no existing or potential drainage problems were observed or reported. In areas where infiltration of trail runoff is proposed, there will be no off-site discharge of stormwater.
C3 Flow Control	The project proposes to meet flow control requirements by use of 1) infiltration trench, 2) closed depression infiltration, and 3) full dispersion. Flow control is discussed further in the section below.
C4 Conveyance System	Catch basins and storm drain pipe will be installed north and south of the BNSF railroad bridge crossing to convey stormwater runoff to nearby closed depressions. Some existing storm drains and catch basins will be replaced at the SE 276th St, SE 280th St, and SE 288th St intersections.
C5 Erosion and Sediment Control	The temporary erosion control (TESC) plans will be completed as part of the construction plans and will be provided in the Final Drainage Report. The Construction Stormwater Pollution Prevention Plan (CSWPPP) will be prepared and submitted prior to construction as a separate document.
C6 Maintenance and Operations	Flow control facilities will be maintained and operated in accordance with King County maintenance standards. Operation and maintenance requirements for new storm facilities will be included in the final storm report for this project.
C7 Financial Guarantees and Liability	King County is funding this project. Financial guarantees are not anticipated to be required for this government agency project.
C8 Water Quality	Water quality treatment is required if a project TDA has more than 5,000 square feet of new and replaced pollution generating impervious surface (PGIS). The proposed nonmotorized trail is a non-PGIS; therefore, water quality treatment is not required. Where the proposed trail crosses existing roadways, less than 5,000 square feet of new plus replaced PGIS per TDA is anticipated, so water quality treatment is not required for this project site.
C9 Flow Control BMPs (FCBMPs)	Full dispersion and full infiltration are proposed for trail runoff where feasible. See Attachment A for location of best management practices (BMPs).

<b>Core and Special Requirements per Table 1.1.2.A of the 2021 KCSWDM</b>	<b>Proposed Stormwater Management Approach</b>
S1 Other Adopted Area-Specific Requirements	No area-specific requirements apply to this project.
S2 Flood Hazard Area Delineation	This special requirement is not applicable because the project is not in the 100-year floodplain.
S3 Flood Protection Facilities	This special requirement is not applicable because the project is not in the 100-year floodplain.
S4 Source Control	This special requirement is not applicable because it does not meet the commercial development permit threshold.
S5 Oil Control	This special requirement is not applicable to this project because the trail is non-PGIS and it does not meet the high-use site threshold.

### Core Requirement 3 – Flow Control

Per the King County Flow Control Application Map, the trail weaves through both basic flow control areas and conservation flow control areas. TDAs 1 through 7 are located within a conservation flow control area, and TDAs 8 and 9 are located within a basic flow control area. Per Table 1.2.3.A of the 2021 KCSWDM, basic flow control areas apply the Level 1 Flow Control standard, which matches the proposed 2-year and 10-year peak flow runoff rates to the existing 2-year and 10-year peak flow runoff rates. Conservation flow control areas apply a Level 2 flow control standard, which matches developed discharge durations to predeveloped durations for the range of predeveloped discharge rates from 50% of the 2-year peak flow up to the full 50-year peak flow (assume historic conditions), as well as matches developed peak discharge rates to predeveloped peak discharge rates for the 2-year and 10-year return periods. Both Level 1 and 2 Flow Control standards will be met for this project using infiltration trenches (anticipated to provide 100 percent infiltration), closed depressions, and full dispersion.

### Exceptions to Flow Control Facilities Requirement

Flow control facility requirements are waived if the difference in the 100-year peak runoff flow rate between the developed site condition and the existing site condition does not exceed 0.15 cubic feet per second (cfs) using the 15-minute time step of the hydrologic model. The predeveloped condition used in the model would be completely forested area, and the post-developed condition modeled as only the proposed impervious area. With the post-developed condition as impervious area, the difference in the 100-year peak flows for all the TDAs would exceed 0.15 cfs. Therefore, no flow control exceptions are applied to this project.

### Flow Control Facilities

All TDAs require flow control. Table 2 and Attachment A show the proposed flow control facilities along the trail corridor.

**Table 2. Proposed Flow Control Facilities**

Trail Segment	Proposed Flow Control Facility	Preliminary Design Infiltration Rate (inch/hour) <sup>1</sup>	Soil Class at the Bottom of the Proposed Facility
A-LINE STA 2+23 to 5+87	Infiltration Trench 1	20	GW/GM
A-LINE STA 5+87 to 14+30	Infiltration Trench 2	20	GP
A-LINE STA 15+04 to 21+50	Infiltration Trench 3	20	GP and GW
A-LINE STA 21+50 to 28+99	Infiltration Trench 4	20	GW

Trail Segment	Proposed Flow Control Facility	Preliminary Design Infiltration Rate (inch/hour) <sup>1</sup>	Soil Class at the Bottom of the Proposed Facility
A-LINE STA 29+77 to 36+16	Infiltration Trench 5/Closed Depression 1A	20	GP
A-LINE STA 36+16 to 43+28	Closed Depression 1B	2.5	GP and GP/GM
A-LINE STA 44+14 to B-LINE STA 104+00	Closed Depression 2	2.5	GP/GM
B-LINE STA 104+00 to C-LINE STA 1004+22	Closed Depression 3	2.5	GP
C-LINE STA 1004+22 to 1009+31	Infiltration Trench 6	20	GP/GM
C-LINE STA 1009+31 to 1018+81	Sheet Flow for Dispersion	20	GP/GM
C-LINE STA 1019+65 to 1038+31	Sheet Flow for Dispersion	20	GP/GW

GM = silty gravel; GP = poorly-graded gravel; GW = well-graded gravel

<sup>1</sup>. Preliminary design infiltration rates are based on HWA Geosciences Inc. Draft Geotechnical Report (HWA 2023). Small-Scale Pilot Infiltration Tests shall be performed to verify infiltration rates (Parametrix 2023).

### Infiltration Trenches

Infiltration trenches are located adjacent to the proposed trail, offset from the gravel shoulder at the locations specified in Table 2. The hydrologic model, MGSFloodV4, was used to design the proposed infiltration trenches. The infiltration trenches were sized using the preliminary design infiltration rates shown in Table 2. According to the MGSFlood model, 100% of the surface water runoff will be infiltrated. The size and location of the infiltration trenches may be adjusted depending on the results from the Small-Scale Pilot Infiltration Tests (Parametrix 2023). MGSFlood results will be provided in the Final Drainage Report.

### Closed Depressions

Existing on-site closed depressions adjacent to the trail will be used to attenuate trail runoff and provide flow control along sections of the trail specified in Table 2. The existing closed depressions are within the trail right-of-way, receive off-site runoff from SR 169, and are modeled as outwash, forested area. A conservative, preliminary design infiltration rate of 2.5 inches per hour was used in MGSFlood to model trail runoff and the contributing off-site runoff to the existing closed depressions. The 100-year water surface elevation is less than 2.2 feet in all the closed depressions, which provides over 4 feet of freeboard from the top of the proposed trail finished grade. MGSFlood results will be provided in the Final Drainage Report.

### Full Dispersion

Full dispersion will be used as flow control for the trail segments, as listed in Table 2, in accordance with the 2021 KCSWDM Appendix C.2.1.6. This section of trail is within unincorporated King County, outside of the urban growth area (UGA), and in outwash soils so that the length of the flow path can be reduced to 10 feet for each 20-foot width of pavement. The proposed trail width is 18 feet, thus 10 feet of flow path is adequate and fits within the project right-of-way. Sections of trail that sheet flow over steep slopes (shown in Attachment A) will be inspected by a geotechnical engineer to confirm the stability of the existing embankment with the proposed design.

## CONCLUSION

The stormwater management approach for the Green to Cedar River Trail South Interim Segment A proposes to meet all core and special requirements specified in the 2021 KCSWDM, as summarized in Table 1. Based on soil information provided in the Draft Geotechnical Report (HWA 2023) and the preliminary design infiltration rates, infiltration trenches and closed depressions shall provide flow control for the portion of trail within the City of

Maple Valley. Sheet flow for dispersion will provide flow control for the remaining portion of trail, within unincorporated King County (outside of the UGA).

### Next Steps

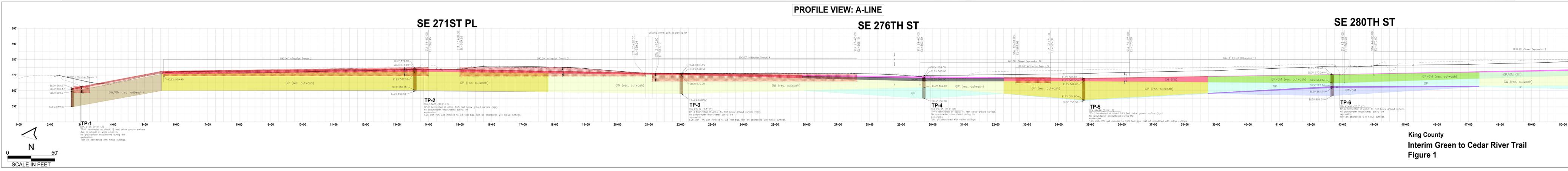
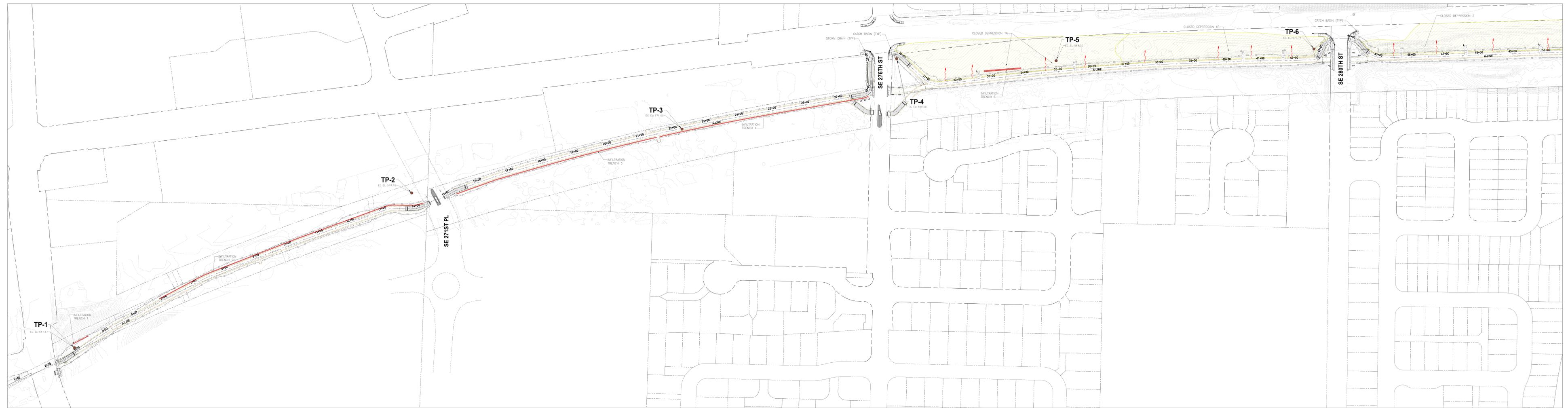
Once King County and the City of Maple Valley review and concur with the drainage analysis, final drainage plans and the Technical Information Report will be drafted. The Preliminary Drainage Report will be submitted with the 60% design package and the Final Drainage Report will be submitted with the 90% design package. In addition, results from the geotechnical engineer's infiltration testing and Final Geotechnical Report will be reviewed and used to update the flow control facilities as necessary.

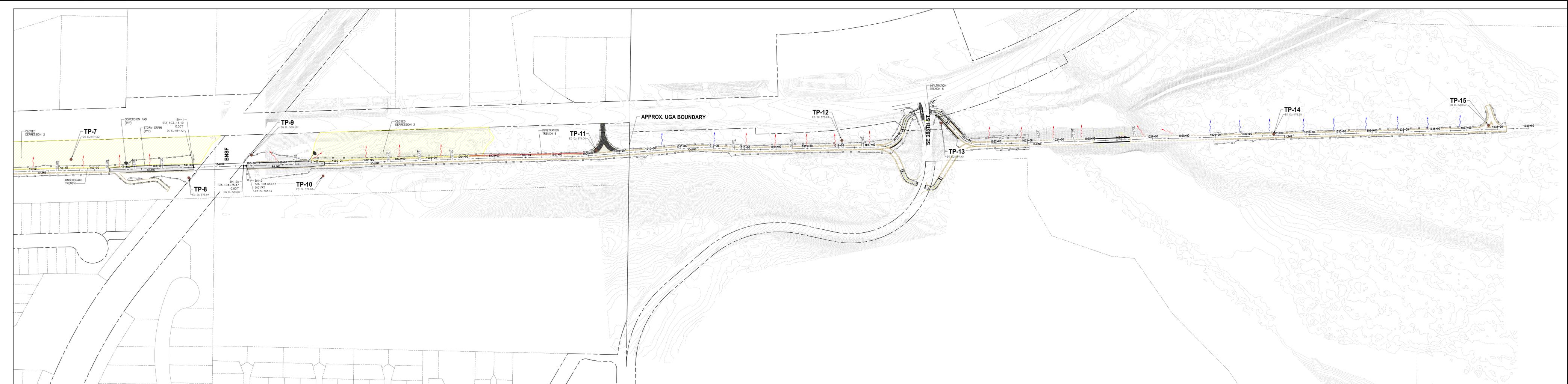
### REFERENCES

- HWA (HWA GeoSciences, Inc.) 2023. Draft Geotechnical Report, Green to Cedar Rivers Trail, Maple Valley, WA. Prepared by HWA GeoSciences, Inc., Bothell, WA. February 2023.
- King County. 2021. King County Surface Water Design Manual. Prepared by King County Department of Natural Resources and Parks, Seattle, WA
- Parametrix. 2023. Technical Memorandum: Small-Scale PIT Requirement Adjustment. Prepared by Parametrix, Seattle, WA. March 2023.

## Attachment A







PROFILE VIEW: B-LINE

