



TECHNICAL MEMO

TO: Valentino Tjia. M.Sc., P.E., P.Eng
FROM: Rob Moore. P.Eng. CEng.
SUBJECT: VFPA Fraser Surrey Port Lands – Preliminary Stormwater Management Plan (DRAFT)
DATE: December 04, 2020

1 INTRODUCTION AND BACKGROUND

The Vancouver Fraser Port Authority (VFPA) has appointed WSP to deliver the preliminary design for the Fraser Surrey Port Lands (FSPL) Transportation Improvement Project. VFPA proposes to realign the Robson Road-Timberland Road corridor within the project site, which includes several transportation-related improvements along this corridor.

This memorandum provides an overview of the proposed stormwater management plan for the project area and strategies to meet the design requirements and guidelines of both VFPA and the City of Surrey.

Details of the proposed stormwater management plan can be found on drawings 20M-00758-00-D-001 to D-005.

2 PREDEVELOPMENT CONDITIONS

The existing site consists of asphalt roadways with existing stormwater drainage systems and gravel areas used for storage and general access for VFPA and its tenants. Existing stormwater run-off from these areas either discharges directly into the Fraser River or the Manson Canal. The existing roadway stormwater drainage is a combination of curb and gutter, along with drainage ditches.

3 PROPOSED DEVELOPMENT

For the purpose of the stormwater management plan, the project area has been divided into three sections.

Section 1 – (STA. 1+000 to STA. 2+005)

Extends along the existing Robson Road between Elevator Road and the IDC Yard track crossing. The proposed works in this section primarily consist of mill and overlay on the existing road alignment. There are existing catch basins and drainage pipes along this section, though some



localized flooding issues have been observed historically. These catch basins and drainage pipes are owned by VFPA.

Section 2 – (STA. 2+005 to STA. 2+665)

Extends from the IDC Yard track crossing to the new VAC gates, just south of South Timberland Road. This new section of road will include full depth construction and will require all new drainage infrastructure.

Section 3 – (STA. 2+665 to STA. 3+447)

Extends from the new VAC gates, along South Timberland Road to the ‘Timberland Wye’ junction and the Mason Canal. The proposed works in this section includes mill and overlay on the existing road alignment, as well as widening of the road to the north-west. Drainage along South Timberland Rd currently drains directly into the existing ditches to the north-west and south-east, apart from some VFPA owned catch basins at either end of this section.

4 OBJECTIVES AND DESIGN CRITERIA

The development of the stormwater design should also comply with the following VFPA and City of Surrey guidance:

- City of Surrey Engineering Department Design Criteria Manual (April 2020)
- South Westminster Integrated Stormwater Management Plan (ISMP), City of Surrey (February 2015)
- Project & Environmental Review Guidelines – Developing Your Stormwater Pollution Prevention Plan, Vancouver Fraser Port Authority (July 2015)

The stormwater system shall be designed to meet the following servicing objectives, as per the City of Surrey Design Criteria Manual.

- a. A minor system, with a conveyance capacity up to the 1:5-year return period storm under free flow conditions, to minimize inconvenience of frequent surface runoff.
- b. A major system, with a conveyance capacity up to the 1:100-year return period storm, to provide safe conveyance of flows and to minimize damage to life and property.

Oil water interceptors shall be provided at the outlets of the system and should be designed to CCME standards and have the capacity to convey 90% of the 1:10-year return period storm flows. The design of the oil water interceptors will be discussed and coordinated with the environmental team and the City of Surrey.

Detention facilities will be provided in the stormwater system so that the pre- and post-development flows from the system are equal, utilizing a flow control structure.

An analysis of the site under the post development conditions has been undertaken to generate the sizing of the proposed stormwater management facilities. This analysis confirms the detention storage volume required and flow control measures to meet the required stormwater capture and treatment targets.

Details of the proposed Stormwater Management Plan can be found on drawings 20M-00758-00-D-001 to D-005.

5 SITE DRAINAGE STRATEGY AND ANALYSIS

A drainage analysis was completed for the post development condition, the site catchment and relative drainage areas were calculated and an analysis completed to size the proposed stormwater management facilities. The sizing is calculated on the basis of our appraisal of the proposed pervious and impervious catchment area conditions, in combination with the size of the catchment.

The stormwater analysis undertaken to assess the Stormwater Management Plan included modified rational analysis to determine inflow runoff rates in order to calculate required storage volume for the maximum release rate.

We do not currently have sufficient data of the existing storm sewer system (such as existing sewer diameter, inverts, etc...), as a result we are not able to clearly define the major flow routes during 100-year storm event. Proposed pipe slopes, lengths and sizes are subject to change during the next design phase once further information is collected. For the preliminary analysis all pipes are assumed to have the minimum grade of 0.5%, the worst case scenario for pipe flow capacity.

The proposed drainage strategy for each section is outlined below.

Section 1

It is proposed to utilize the existing VFPA owned drainage assets to provide drainage for this section. This includes the existing catch basins, drainage pipes and culverts. Where small adjustments to the existing road alignment and curb are required, the position of catch basins shall be modified to suit.

It is assumed that there is no increase in impervious area due to the mill and overlay works along this section.

If the existing drainage assets do not satisfy City of Surrey criteria, such as spacing of catch basin, additional catch basins will be provided.

We performed a catch basin coverage analysis to investigate the adequacy of the existing catch basins along Robson Road. In our analysis we assumed that each catch basin is able to drain approximately 400m² to maximum 500m² of rainwater falling on the road pavement, as per the City of Surrey Design Criteria. We also analyzed the catch basin locations compared to the proposed road grading design based on the preliminary roadworks drawings by a waterdrop analysis.

It was determined that the existing catch basins are sufficient to capture surface runoff in a 1:5-year return period storm, provided that all the existing catch basins are still functional and cleaned. We are proposing to add one new catch basin on the east side of the road near STA 1+980.

VFPA have observed localized flooding along this section of Robson Road, particularly near to the junction with Elevator Road. Based upon our site observation in this area, we will re-grade between Robson Road and Gunderson Road to allow this section to drain towards the existing ditch to the north-west. The Aplin & Martin Fraser Surrey Docks LP Stormwater Conveyance Assessment report (April 9, 2018) did not show any flooding of manholes in this area for the 1:5-year return period event with high winter tides, though nearby storm sewers were surcharged.

The Aplin & Martin report did however note flooding of manholes near to STA. 1+600 in this same event. This flooding is a result of the lower rim level of the manholes and insufficient capacity of the downstream sewers, which is worsened by the high tail-water resulting from the

high winter tide levels at the outfall. The Aplin & Martin report recommends this existing sewer is to be upgraded from STA. 1+600 to STA. 1+100. The pipe sizes would be increased from 200/400/500/900mm to 600/750/1050mm.

Given that this project will not increase the total flow into the existing storm sewers over the pre-development conditions, VFPA have confirmed that the downstream storm sewer will not be upgraded as part of this project.

Other smaller areas of localized flooding along Robson Road were also noted from our site observations. These were primarily resulting from low points in the gravel shoulder adjacent to the asphalt, or blocked flow paths to catch basins. These issues will be resolved by some minor re-grading in these areas to reinstate original road levels and flow paths.

Details of the proposed Stormwater Management Plan for Section 1 can be found on drawings 20M-00758-00-D-002 to D-003.

Section 2

It is proposed to provide curb and gutter with catch basins for this new section of road. The flow from the catch basins will collect into a new storm sewer, which will then connect into the existing VFPA storm sewer system.

The area where the new road is being proposed is currently mostly gravel surface, which is considered to be pervious material. We compared the 5-year rainfall intensities for the pre-development versus post-development condition by modified rational calculation. By transforming the existing gravel surface to asphalt surface, it is discovered that the imperviousness of the catchment area will be increased from 30% to 85%.

Due to the increase in impermeable area for this section as a result of new road construction, additional storage will be required to match pre and post-development flows. We are proposing to utilize oversized pipes to detain the excessive runoff triggered by the change of surface material. A flow control manhole that regulates the release rate to the pre-development flow of 13.6L/s will be installed at the downstream end of the proposed system, prior to the connection into the existing system. An oil water separator will be placed at the outlet of the new storm sewer.

The connection into the existing VFPA drainage network shall be a manhole on the south-eastern side of IFC Yard, which then connects into an existing 900mm and then 1050mm pipe which outfalls into the Fraser River. The invert of this existing pipe is unknown and should be verified at the next design phase. This information will be required to determine if this is a viable solution and if additional upgrades are required to meet the flow requirements.

The overland flows from this area of the project site currently flow into this existing VFPA drainage system, so provided additional storage is provided to mitigate for the increase in impermeable area, this project won't increase the flows into the existing downstream system.

The Aplin & Martin Fraser Surrey Docks LP Stormwater Conveyance Assessment report (April 9, 2018) shows that for the 1:5-year return period event with high winter tides, the system has no surcharged sections for the 1.968m-geodetic tide. For the 2.55m-geodetic tide the 1050mm section of pipe through the Catalyst Paper yard is surcharged.

Given that it is anticipated this project will not increase the total flows into the existing storm sewer over the pre-development conditions, it is not proposed to upgrade this downstream storm sewer as part of this project.



Details of the proposed Stormwater Management Plan for Section 2 can be found on drawing 20M-00758-00-D-004.

Section 3

It is proposed to provide curb and gutter with catch basins for this section of road. The flow from the catch basins will collect into a new storm sewer, which will run to the north-east towards Manson Canal.

The storm sewer will tie into an existing storm manhole on the south side the ‘Timberland Wye’ junction. The downstream conditions from this existing manhole are unknown, including the pipe size, inverts, material and outfall location. This information will be required to determine if this is a viable solution and if additional upgrades are required to meet the flow requirements. The ownership of this manhole and downstream pipework is also unknown and will need to be verified. In the next design phase, it is recommended that further utility investigations are undertaken, including a CCTV survey.

The new storm sewer is sized to capture flows from South Timberland Road and drainage from the north-west ditch, that will be narrowed due to road widening for the truck staging lane. In the rational calculation, we separated the ditch into different sections and assumed the worst-case scenario that the new pipe will capture all the flows from the existing ditch, which includes the stormwater drainage from the Westran storage area (area D) and the adjacent gravel railbed runoff. A manhole will be installed on the new storm sewer to capture the runoff from the Westran storage area, prior to it entering the existing ditch.

It is observed that the drainages from Westran Intermodal and TMS Transportation currently flows into the South-east ditch, this ditch will not be modified and therefore is not included as the contributive flow into the new sewer.

Due to the increase in impermeable area for this section as a result of widened road, additional storage will be provided to match pre and post-development flows. It is proposed to oversize the proposed storm sewer to provide the required additional attenuation storage in the system.

A flow control manhole and oil water separator will be placed at the outlet of the new storm sewer, just prior to discharging into the Manson Canal.

Areas of localized flooding around the ‘Timberland Wye’ junction were noted from our site observations. These were primarily resulting from low points along the curb and gutter which do not align with catch basins. These issues will be resolved by some minor regrading in these areas to reinstate original road levels and flow paths. It was observed a Hydrovac truck is used to clean the existing catch basins.

Details of the proposed Stormwater Management Plan for Section 3 can be found in drawing 20M-00758-00-D-005.

6 FRASER RIVER FLOODING

The lowland areas around the Fraser Surrey Port Lands are within the 500-year (or 1894 flood record) flood plain of the Fraser River, but it is protected by a dyke system. The system is intended to protect to the 1:500-year flood elevation of approximately 4.4 metres (including a 0.6 metre freeboard), but there are some known gaps.

The Northwest Hydraulic Consultants Ltd. Flood Protection Assessment Report (May 2018) reviewed the potential flood inundation at Fraser Surrey Port Lands in relation to a new Potash Export Facility. The report showed extensive flooding across the whole site for the 200-year and 500-year events, including sea level rise and climate change to 2100.

The Declan Surrey Dock Lands Master Drainage Plan report (August 2004) also shows areas of the site which are most vulnerable to flooding from the Fraser River due to known low points with surface elevation below 3.8m. One example of this is along Dock Road, which would allow flood water towards South Timberland Road well before it overtops the existing City dyke system.

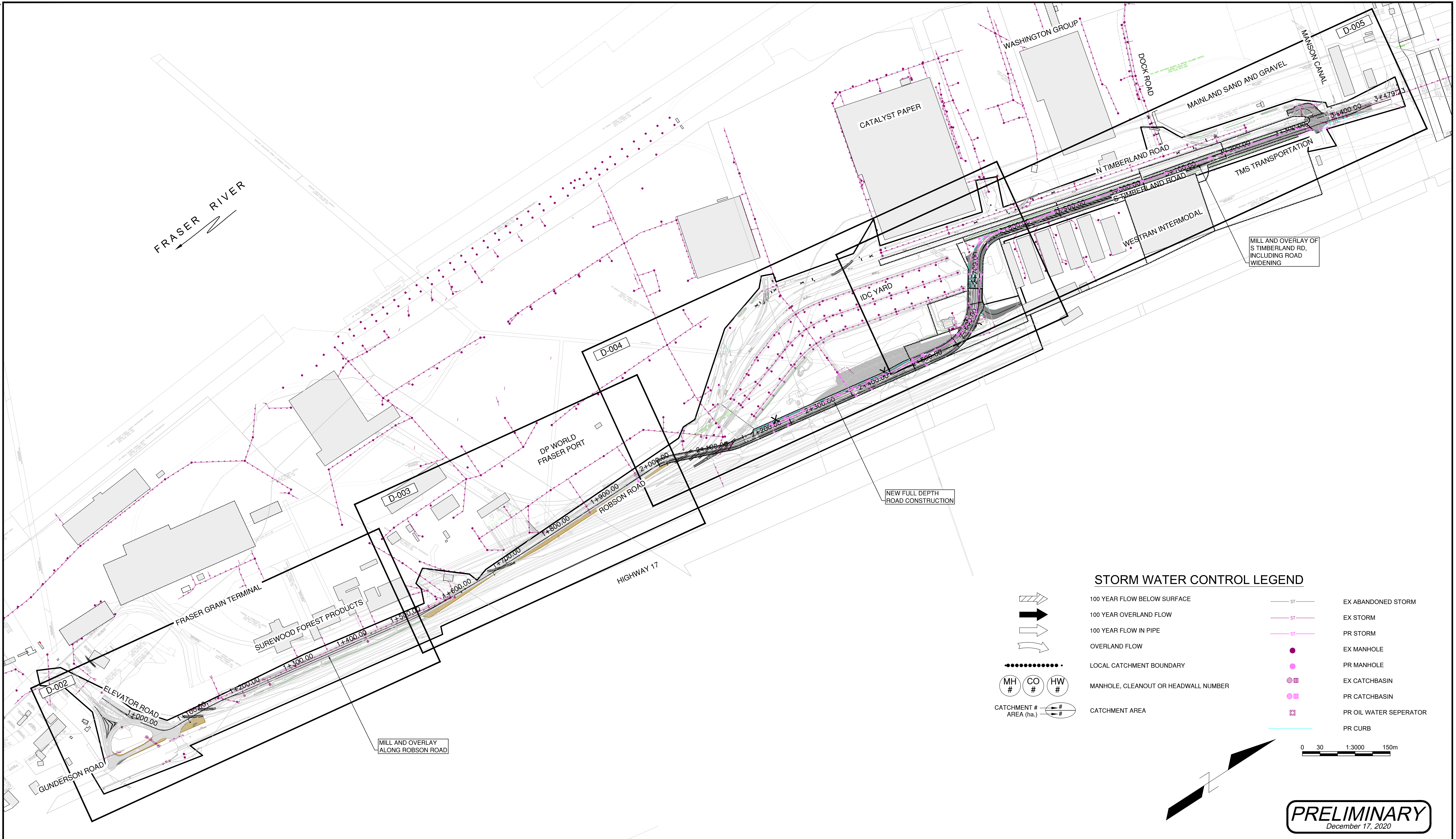
Approximate road elevations for each section are shown below:

- Section 1 – 2.9 to 4.1m
- Section 2 – 3.4 to 4.0m
- Section 3 – 2.0 to 3.8m

Depending on the level of protection required, between 1 to 3m ground level increases would be the needed to raise the new road above the flood risk area. Given the large number of properties connecting directly off the road, this is not a viable solution.

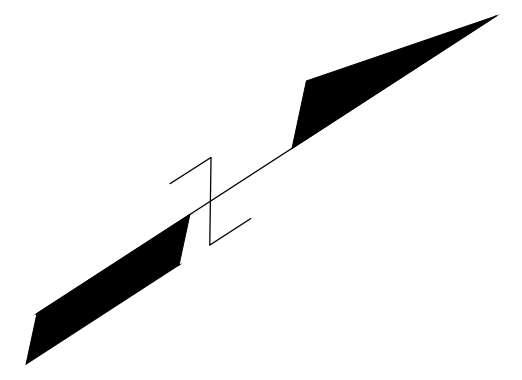
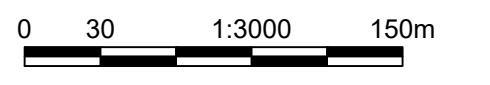
It is recommended that the VFPA implement a site wide solution with respect to resolving the issues of flooding of the site from the Fraser River, which are only going to increase with climate change and sea level rise. Raising this road as an isolated project is not economical or practical.

DATE: 2020/12/17 - 4:56pm
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 TITLE BLOCK: DL-TE.dwg



STORM WATER CONTROL LEGEND

- 100 YEAR FLOW BELOW SURFACE
- 100 YEAR OVERLAND FLOW
- 100 YEAR FLOW IN PIPE
- OVERLAND FLOW
- LOCAL CATCHMENT BOUNDARY
- MANHOLE, CLEANOUT OR HEADWALL NUMBER
- CATCHMENT # AREA (ha.)
- EX ABANDONED STORM
- EX STORM
- PR STORM
- EX MANHOLE
- PR MANHOLE
- EX CATCHBASIN
- PR CATCHBASIN
- PR OIL WATER SEPERATOR
- PR CURB



PRELIMINARY
 December 17, 2020

NOT FOR CONSTRUCTION
 December 17, 2020



DESIGN BY A. LAW
 DRAWN BY G. JUNG
 APPROVED R. MOORE
 DATE 2020/12/18
 SCALE 1:3000
 PMV SITE

GREATER VANCOUVER GATEWAY 2030
 OPTION STUDY
 FSPL TRANSPORTATION IMPROVEMENTS
 STORMWATER MANAGEMENT PLAN (OVERALL)

Ref.No.	REFERENCE
1	WSP PROJECT NO. 20M-00758-00

No.	Date	REVISION	Dr'n	Ch'd
A	20/12/18	ISSUED FOR 30% DESIGN	GJ	AL

VANCOUVER FRASER PORT AUTHORITY
 ENGINEERING DEPARTMENT

SIZE D DWG. D-001 SHEET 1 of 5 REV. A