

## Attachment # 2

### **Stantec Memo on Temporary Trail Options**

To: Ammar Mahdi, Evan Colyer  
Metro Vancouver  
4515 Central Blvd, Burnaby, BC  
V5H 0C6

From: Maciej Golaszewski, Darryl Harty  
Stantec Consulting Ltd.  
4515 Central Blvd, Burnaby, BC  
V5H 0C6

Project/File: 111700639-107

Date: December 15, 2022

**Reference: Glenbrook Combined Sewer Overflow Gate Replacement - Temporary Trails Conceptual Design**

Revision	Description	Author	Date	Quality Check	Date	Independent Review	Date
C	RE-ISSUED	DH/MG	2022/12/15	BDS	2022/12/15	CC	2022/12/15
B	FINAL	DH/MG	2022/12/13	BDS	2022/12/13	CC	2022/12/13
A	90% DRAFT	DH/MG	2022/10/26	BDS	2022/10/26	CC	2022/10/26

## 1 Project Background

Stantec was retained by Metro Vancouver (MV) to provide engineering services for the *Glenbrook Combined Sewer Overflow Gate Replacement Project* (the Project) in New Westminster. The Project involves the replacement of the combined sewer overflow (CSO) chamber gate on the New Westminster Interceptor sewer (NWI), located within Glenbrook Ravine Park. Because the sewer is active, the replacement of this CSO gate requires that the sewer be bypassed to allow safe access to the gate while maintaining service.

Several bypass options were considered, including pumping bypass options and gravity bypass options. A gravity bypass option was selected by MV, which requires the installation of two (2) overbuilt manholes on the existing sewers.

Because of the significant construction traffic through the Project area, and open excavation removing a segment of the Glenbrook Ravine Trail during construction, it is required that the north-west trail segment from Glenbrook Drive to the trail fork south of the Project construction site will be closed for public safety during the construction of the Project, which is estimated to extend from the beginning of April 2023 through to the end of September 2023 (six months). However, pedestrian traffic through the park to the north-west end of the ravine will still be maintained by the trail to Ginger Drive. See **Appendix A** for the project area and trail closures required.

The City of New Westminster (CoNW) has reviewed the trail closures required for the Project's construction and has asked that MV reviews the feasibility of constructing a temporary trail to maintain public access through the park during construction. MV has requested that Stantec develop and review a conceptual design for two trail alignment options detouring the Project construction area and assess the impacts of the temporary trail construction to the park.

**Reference:** Glenbrook Combined Sewer Overflow Gate Replacement – Temporary Trails Conceptual Design

## 2 Site Description

The Project site is located at the northwest end of Glenbrook Ravine Park, adjacent to Glenbrook Drive. See **Appendix A** for a sketch showing the site location. The existing trail from Jameson Court connects to Glenbrook Drive at the northeast end of the ravine through the proposed construction site. On the north, east, and west sides of the Project area there are steep side slopes that are covered with heavy undergrowth and mature trees.

## 3 Temporary Trail Alignments

The conceptual design of two temporary trail alignments was developed and reviewed:

- An East Trail alignment starting at the existing trail at the northeast of Glenbrook Ravine Park, branching off the first switchback landing after the entrance to the park from Glenbrook Drive, and tying into the existing trail at the south end of the Project construction area.
- A West Trail alignment starting at Glen Ct., and tying into existing trail at the south end of the Project construction area.

It is assumed that the trails would be temporary boardwalk construction, minimizing the environmental impact of the trails as opposed to more permanent gravel trail construction. Refer to **Appendix B** for plan and profile sketches of the West and East Trail alignments.

When developing the conceptual design of the two trails, the evaluation criteria included aspects such as public safety and accessibility, drainage, environmental impacts, schedule, cost, and slope stability. A summary table of these criteria for comparison can be found in **Section 4**.

### 3.1 Feasibility and Constructability of the Paths

This temporary development for either trail option will be costly and challenging from a constructability perspective. Challenges include a restrictive working boundary, excavation and construction, steep side slopes, building foundations, and clearing trees and vegetation.

The conceptual designs were developed considering these constraints. **Section 3.1.1** and **3.1.2** provide the design assumptions for the conceptual designs of the East Trail and West Trail.

**Reference:** Glenbrook Combined Sewer Overflow Gate Replacement – Temporary Trails Conceptual Design

### **3.1.1 EAST TRAIL DESIGN HIGHLIGHTS**

Below is a summary of the key design items of the East Trail:

- The total length of the East Trail is approximately 158 m.
- This trail is designed to be compliant with the Park's Canada Design Guidelines for Accessible Outdoor Recreation Facilities, accessible for wheelchairs and is made from 9.0 m long ramps typically sloped at 8.33%, and 1.5 m long landings sloped at 2%.
- There are no staircases on this trail alignment.
- All the ramps will require handrails on both sides.
- Trail width 1.8 m nominal, excluding handrail supports (to be designed in the detailed design stage).
- Trail clearance between handrails is 1.5 m.

The East Trail is characterized by steep embankment from the north-east that makes it hard to meet accessible grades without concrete foundations to support the elevated boardwalk structure or cut and fill of the ravine side slopes. There is an opportunity to further refine the proposed concept to minimize site disturbance, but existing grades are steep, and the vegetated embankment make it challenging for construction. The proposed concept would require 7.0 m long pressure treated lumber retaining walls on the returns.

### **3.1.2 WEST TRAIL DESIGN HIGHLIGHTS**

Below is a summary of the key design items of the West Trail:

- Total length of the West Trail is approximately 125 m.
- This trail alignment includes several staircases is not designed to be compliant with ADA standards and is not wheelchair accessible.
- The maximum grade between staircases is 5%, so no handrail is required.
- There is one staircase which has 15 risers at 2.25 m height. This exceeds the typical 11 risers at 1.65 m height for safety and sightlines.
- Trail width 1.8 m nominal, excluding handrail supports (to be designed in the detailed design stage).
- Trail clearance between handrails is 1.5 m.

The West Trail is characterized by steep embankment from the south-west that makes it challenging to meet accessible grades without significant fill or foundations to construct. There is an opportunity to further refine alignment to minimize site disturbance, but existing site constraints require a series of staircases and ramps to negotiate the steep side slopes.

Average grades are under 5% for pathways between staircases. In general, the staircases are designed to have less than 11 steps in each run. However, there is one staircase requiring 15 steps.



Reference: Glenbrook Combined Sewer Overflow Gate Replacement – Temporary Trails Conceptual Design

## 3.2 Safety and Accessibility Considerations

### 3.2.1 SAFETY

While both trail alignments were designed to lie outside of the Project's construction area to allow public access around the site, the tie-in to the existing trail is situated near the construction vehicle entrance to the site. The construction of a temporary trail may encourage a higher volume of pedestrians to move through the park in an area that will be congested with construction traffic, increasing the risk and safety concern that an incident may occur.

### 3.2.2 ACCESSIBILITY

The access point for the East Trail will be from the existing trail. The East Trail alignment features a series of accessible ramps supported with handrails and multiple landings, which creates a rest area as well as a lookout.

For the West Trail alignment, the access point of the trail from Glen Ct. is new and will connect perpendicularly to the existing cul de sac. Because this access point is not existing, an increase in foot traffic may be promoted to this residential street. Additional enhancements with signage and wayfinding, or widening the trail head can improve visibility and safety while creating a more discernible space. Preference was given to more gradual slopes, typically under 5% grades, and sets of staircases under 11 steps (where possible) to allow eye sights beyond the staircases.

## 3.3 Highlight of Impacts to the Existing Site Drainage

The proposed boardwalk style pathway for the East and West Trails lie slightly above the existing ground elevations where possible. For both trail alignments, it is anticipated that there will be areas along the length of the pathways where the existing site drainage will be impeded. To address this eventuality, a series of temporary culverts, to ensure no ponding is occurring due to the construction of the trail, will be sized during the detailed design phase.

It is always recommended that when changing the surface permeability, grading, and when performing underground construction, a stormwater review of the site be performed to ensure the site will still drain as per the pre-construction conditions, and to ensure there is no unwanted ponding and surface erosion in the construction area or other areas caused by the trail construction.

## 3.4 Impact on Trees

Both the East Trail and the West Trail will require the removal of trees in the park to facilitate construction.

Talus Consulting (the Arborist) reviewed the site based on the conceptual designs of the East and West Trail alignments and drafted an Arborist Report dated November 28, 2022, attached in **Appendix C**. The Arborist Report assessed the impact that the temporary trails would have on trees in the park. The report identified 23 trees that will be impacted by the East trail alignment and 40 trees impacted by the West Trail alignment, either requiring removal by being in the path of the trail or crossing through the Critical Root

**Reference:** Glenbrook Combined Sewer Overflow Gate Replacement – Temporary Trails Conceptual Design

Zone (CRZ) of the trees. The report notes that trees impacted will likely require removal. As such, the East Trail would be preferred from the perspective of reducing the impact on trees in the park. However, the eastern trail appears to be approximately 35 metres longer and, as such, would affect more understory vegetation.

For compensation planting of removed trees, the Arborist Report recommends the 2:1 replacement of removed trees, and assumes that all impacted trees will require removal and replacement. The East Trail will require 46 trees to be planted, and the West Trail will require 80 trees planted, with a minimum 3 cm caliper.

### 3.5 Environmental Review

Three potential environmental interactions have been identified for the proposed temporary trails. These consist of a loss of terrestrial habitat, possible interactions with aquatic habitat, and increased erosion potential.

The eastern trail also has a greater potential to interact with nesting birds if work is undertaken in the breeding bird window for the Lower Mainland (which can extend from February to August). Based on this, the western trail would be preferred. However, the differences are quite limited, particularly once restoration is factored into the design.

From an aquatic perspective, there appears to be no watercourses associated with the eastern trail. However, the survey for the western trail suggests that a watercourse crossing may be present where the proposed trail transitions back to the existing trail. The survey would need to be extended to confirm. However, on the assumption that the watercourse is present, a site assessment would be required to confirm habitat values and determine whether environmental permitting under the federal *Fisheries Act* and provincial *Water Sustainability Act* would be required. Regardless of permitting requirements, a temporary culvert installation would be required, which might also necessitate site isolation during installation and removal.

The western trail is considerably steeper than the eastern trail and as such, it would be expected to have a greater potential for erosion and sedimentation. However, this difference is not considered significant.

Based on these factors, there does not appear to be a significant difference associated with environmental impacts for either proposed trail.

### 3.6 Area of Land Required for Construction Easement

It was assumed that easement required for trail construction is typically 3.0 m to either side of the trail center line. This will be re-examined during the detailed design phase to establish both the easement for the pathway and a working easement for the construction of it.

Based on the conceptual designs, the East Trail alignment requires approximately 850 m<sup>2</sup> of temporary construction easement, and the West Trail requires approximately 730 m<sup>2</sup> of temporary construction easement.

**Reference:** Glenbrook Combined Sewer Overflow Gate Replacement – Temporary Trails Conceptual Design

## 3.7 Further Geotechnical Assessment

We recommend the contractor retain their own geotechnical engineer to assess the construction of the trail on the existing ravine slopes and design the temporary boardwalk trail foundations, including carrying out supplementary geotechnical investigations, if necessary.

Both trail options require significant tree removal from the slopes, which may have an impact on slope stability, though this would have to be confirmed through further geotechnical investigation during the detailed design of the trail.

## 3.8 Construction Schedule

It is anticipated that construction of the temporary trail is to occur during the wet season, prior to the construction of the Project. Construction during the wet season is challenging due to the nature of working in wet conditions on a steep slope, and work during the wet season may face scheduling challenges for required concrete works.

By using a boardwalk-style pathway, the boardwalk can be constructed modularly, in pieces and lengths, offsite, to be trucked onsite and assembled in place. This can greatly reduce the assembly time onsite as most of the carpentry needed to make the boardwalk can be done offsite.

### 3.8.1 CONSTRUCTION DURATION

The construction steps necessary are as follows:

- Start construction of modular pieces for the boardwalk.
- Protect salvageable trees and remove trees requiring removal.
- Clear and grub site as required.
- Perform any grading as required in the design.
- Install any foundations (piles, footings, etc.), bases, temporary retaining walls, etc. as required.
- Install modular boardwalk.
- Transition boardwalk into existing trail.

It would be anticipated that construction of this type of temporary pathway would take, with all materials available, approximately two (2) to three (3) months to complete during which it is expected the existing trail will be closed for public safety.

**Reference:** Glenbrook Combined Sewer Overflow Gate Replacement – Temporary Trails Conceptual Design

### 3.9 Temporary vs Permanent Trail Installation

Stantec has assumed temporary boardwalk construction to minimize environmental impacts. With an elevated boardwalk, cut and fill can be minimized, but structural pile footings are required in locations where the boardwalk needs to be supported. This method is often used in ecologically sensitive areas as it minimizes the physical impact of the pathway on the existing vegetation. Trail removal could be relatively quick if either pathway was constructed as modules. During deconstruction, these modules can be reused and salvaged as needed.

For a permanent installation, it is assumed that a gravel trail with asphalt landings would be constructed, similar to the switchback trail that is currently installed on the northeast side of the ravine, which would require more significant cuts and fills of the existing side slopes, creating a greater impact on the existing vegetation in the area. A geotechnical investigation would be required to determine the feasibility of this construction as it would cause greater disturbance to the side slopes in the Project area.

It is noted that the environmental impact of the gravel trail will make it less suitable for this application.

### 3.10 Class D Opinion of Probable Cost (OPC)

Refer to **Appendix D** for Class D OPCs (50% contingency included) for the East Trail and West Trail, assuming temporary boardwalk construction, to be used as a budgetary cost estimate.

The cost for the East Trail is estimated at **\$343,950.00**, and the West Trail at **\$313,650.00**.

## 4 Summary Comparison – East, West, and No Trail

The table below summarizes each trail option, as well as the option of no trail construction, and the additional impacts to the Glenbrook Ravine Park at the Project construction area.

Table 4-1 Trail Options Summary Comparison

Item	East Trail	West Trail	No Trail
Accessibility	<ul style="list-style-type: none"> <li>Allows public access through the North-East corner of the park</li> <li>Designed according to Parks Canada Guidelines for Accessible Outdoor Recreation Facilities, wheelchair accessible</li> </ul>	<ul style="list-style-type: none"> <li>Allows public access through the North-East corner of the park</li> <li>Not designed to be wheelchair accessible due to site constraints, includes stairs</li> </ul>	<ul style="list-style-type: none"> <li>Public access through trail to Ginger Drive</li> </ul>
Public Safety	<ul style="list-style-type: none"> <li>High exposure to the public where the temporary trail connects to the existing trail</li> <li>Risk to adjacent properties during tree falling</li> </ul>	<ul style="list-style-type: none"> <li>High exposure to the public where the temporary trail connects to the existing trail</li> <li>Risk to adjacent properties during tree falling</li> </ul>	<ul style="list-style-type: none"> <li>No exposure to trail construction traffic</li> </ul>
Drainage Impact	<ul style="list-style-type: none"> <li>Elevated trail, minimal impact</li> </ul>	<ul style="list-style-type: none"> <li>Elevated trail, minimal impact</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Number of Trees Impacted	<ul style="list-style-type: none"> <li>23 trees will be impacted and assumed to require removal</li> </ul>	<ul style="list-style-type: none"> <li>40 trees will be impacted and assumed to require removal</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Environmental impact	<ul style="list-style-type: none"> <li>Very High, significant tree and vegetation removal</li> <li>High potential for erosion due to steep side slopes</li> </ul>	<ul style="list-style-type: none"> <li>Very High, significant tree and vegetation removal</li> <li>High potential for erosion due to steep side slopes</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Area required for easement	<ul style="list-style-type: none"> <li>850 m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>730 m<sup>2</sup></li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Assumed Geotechnical Risk	<ul style="list-style-type: none"> <li>High, steep unstable side slopes and nearby properties settling</li> </ul>	<ul style="list-style-type: none"> <li>Very high, steep unstable side slopes and nearby properties settling</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Length of Closure of Trail Segment due to Temporary Trail Construction	<ul style="list-style-type: none"> <li>2-3 Months</li> </ul>	<ul style="list-style-type: none"> <li>2-3 Months</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>
Opinion of Probable Cost (Class D)	<ul style="list-style-type: none"> <li>\$343,950</li> </ul>	<ul style="list-style-type: none"> <li>\$313,650</li> </ul>	<ul style="list-style-type: none"> <li>None</li> </ul>

## 5 Conclusion

The construction of a temporary trail will have significant and lasting environmental impacts to Glenbrook Ravine Park, including the requirement to remove trees from the park, regardless of which trail option is selected. An Arborist assessed the trail concepts and anticipates that 23 trees will be removed for the East Trail and 40 trees will be removed for the West Trail.

The temporary trail will have no benefit to public safety when compared to a trail closure, and maintaining trail access to Glenbrook Drive may encourage additional pedestrian traffic through areas of the site that will be congested with construction equipment, which will increase the risk and safety concern of an incident occurring.

It is expected that during the design and construction of the temporary trail, the existing trail segment to Glenbrook Drive will be closed for approximately two (2) to three (3) months.

Considering public safety and the potential long-term impacts to the environment within Glenbrook Ravine Park, and considering that access through the park will still be maintained through the alternate trail towards Ginger Drive during the Project construction, a temporary trail around the Project construction site is not recommended to be constructed.

**Reference:** Glenbrook Combined Sewer Overflow Gate Replacement – Temporary Trails Conceptual Design

Regards,

**STANTEC CONSULTING LTD.**



**Maciej Golaszewski** BCSLA, CSLA, MLA, BLA, ENV SP, LEED® GA  
Landscape Architect  
Phone: 604-587-8407  
Maciej.Golaszewski@stantec.com

**Reviewed by:**

**Bandula De Silva** MSc, P.Eng.  
Senior Civil Engineer, Water  
Phone: 604-587-8407  
Bandula.DeSilva@stantec.com

**Darryl Harty** P.Eng.  
Senior Civil Engineer, Water  
Phone: Phone Number  
Darryl.Harty@stantec.com

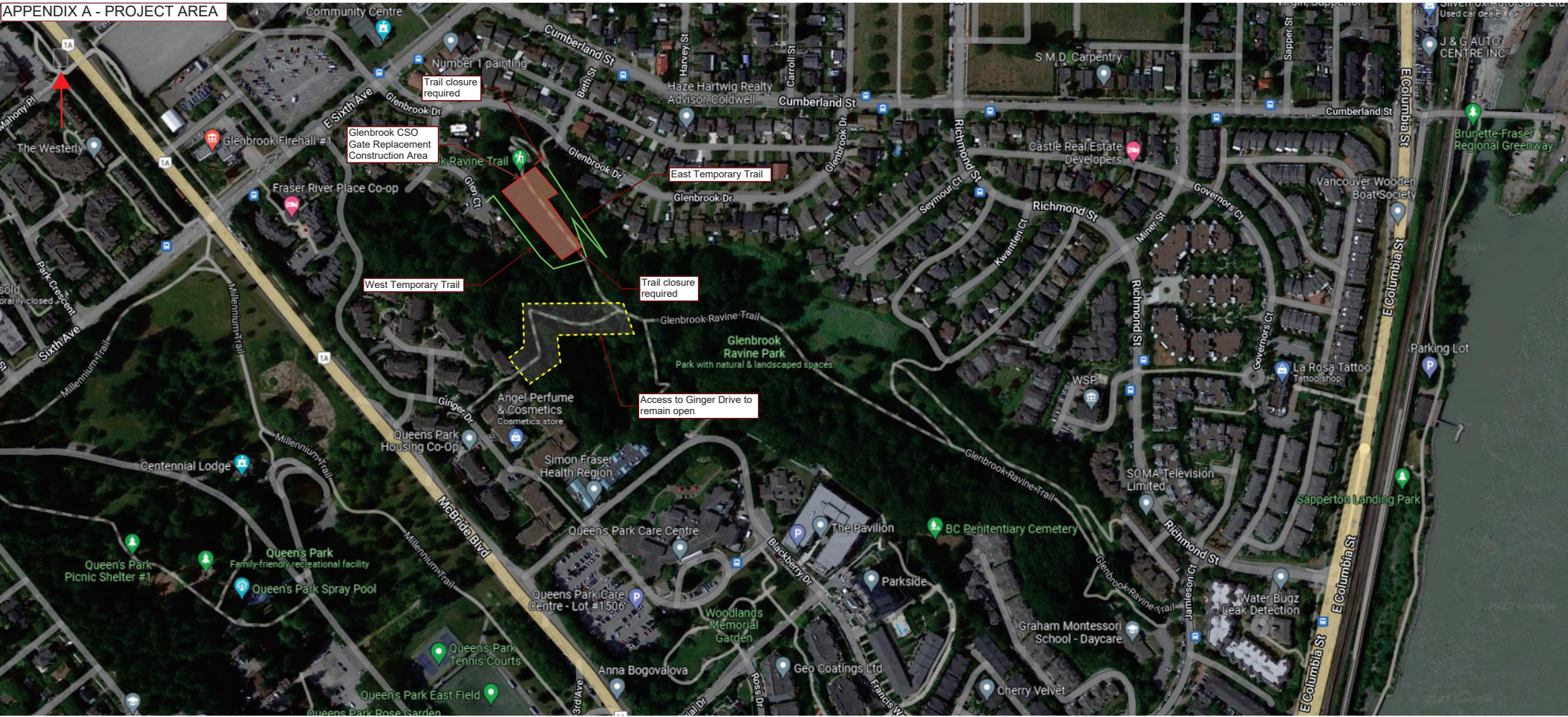
Attachment:

- Appendix A – Project Area
- Appendix B – Conceptual Trail Design Drawings
- Appendix C – Arborist Report
- Appendix D – Class D OPC

## **APPENDIX A – PROJECT AREA**

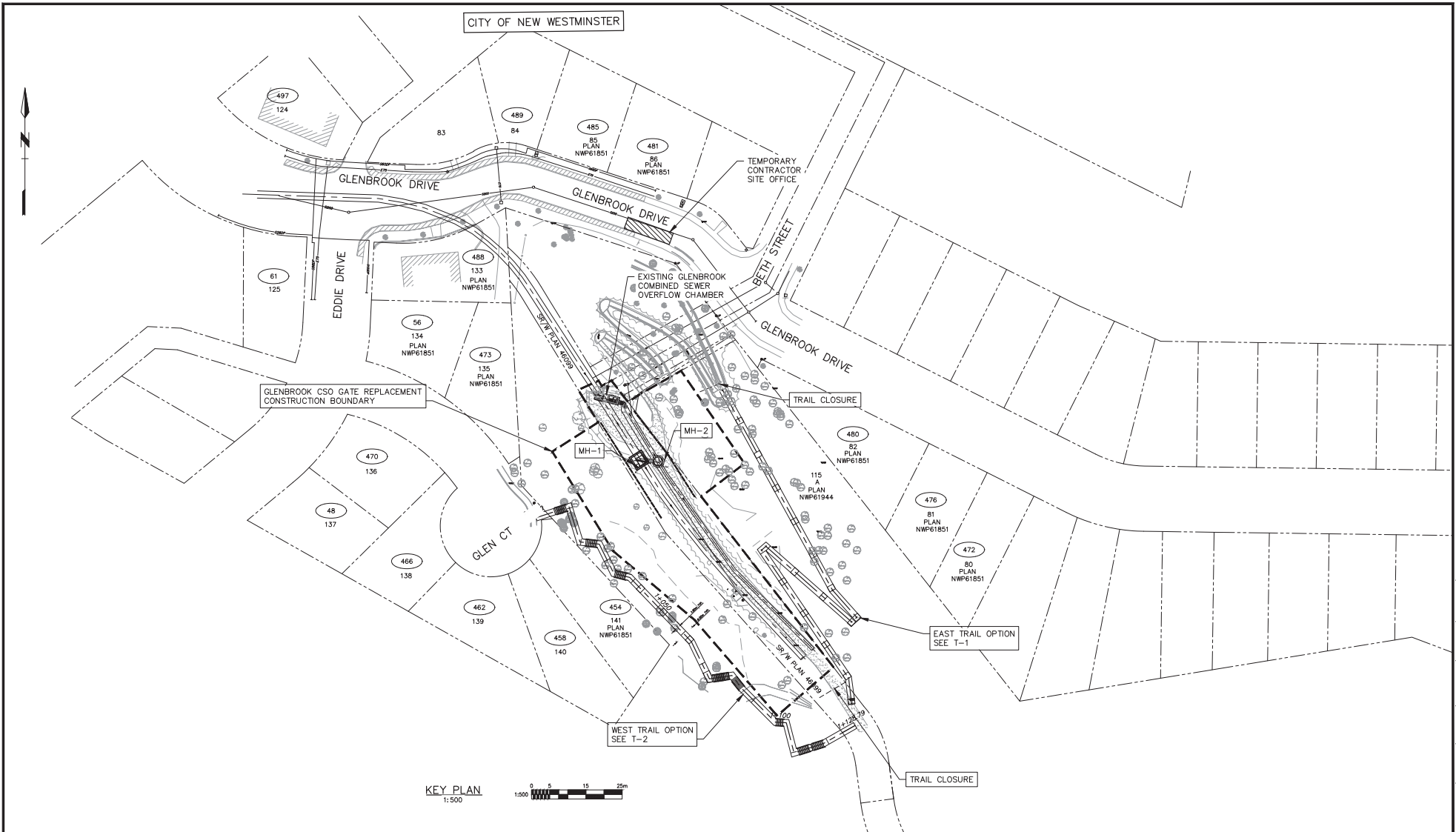


APPENDIX A - PROJECT AREA



**APPENDIX B – CONCEPTUAL TRAIL DESIGN DRAWINGS**





KEY PLAN  
1:500

- NOTES:
1. ALL DIMENSIONS ARE IN mm UNO
  2. ALL ELEVATIONS ARE GEODETIC NAD83 CSRS (2005).
  3. REFERENCE MONUMENT 89H5553 ELEVATION: 64.190m. MONUMENT LOCATED IN CITY OF NEW WESTMINSTER SET IN SOUTHERLY LANE OF 6th AVENUE NEAR WESTERLY LIMIT OF GLENBROOK DRIVE.
  4. DATE OF R.F. BINNIE SURVEY: JUNE 17 - 18, 2013 AND OCT 17, 2014.
  5. COMBINED SCALE FACTOR = 0.9996.
  6. CONTRACTOR TO ASSUME EVERY HOUSE IS SERVICED BY SEWER, WATER, STORM, GAS, ELECTRICAL, AND COMMUNICATIONS. ONLY STORM AND SANITARY ARE SHOWN ON DRAWINGS. CONTRACTOR IS TO CONTACT ALL UTILITY COMPANIES TO OBTAIN MOST UP TO DATE RECORDS. ANY RECORDS THE DISTRICT HAS ARE INCLUDED IN THE APPENDICES.

Issue	Date	Drawn	Checked	Appr'd	Description	
P1	DEC 2022	MG	HL	BDS	CC	CONCEPTUAL DESIGN FOR REVIEW & DISCUSSION

<b>GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT</b>	
Design: BDS	NEW WESTMINSTER INTERCEPTOR
Drawn: DV	GLENBROOK DIVERSION
Checked: GC	GLENBROOK COMBINED SEWER OVERFLOW GATE REPLACEMENT
Approved: GC	KEY PLAN - TRAIL CONCEPTS
Manager:	CITY OF NEW WESTMINSTER - GLENBROOK DR
SCALE: AS NOTED	DISTRICT FILE SF-1345
DRAWING NUMBER	<b>T-0</b>



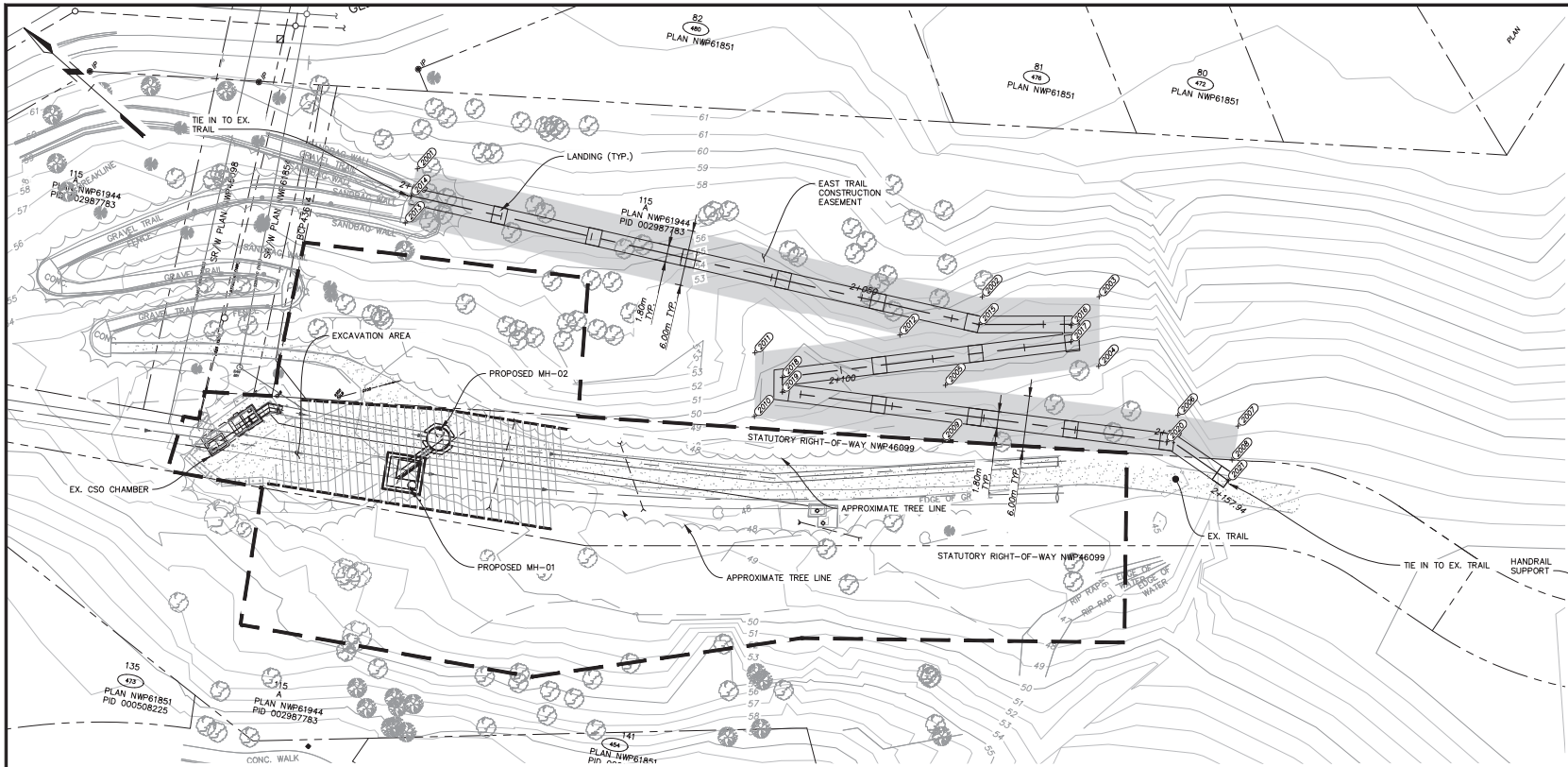
4015 Centennial Blvd.  
Burnaby BC, Canada V5H 0C4  
Tel: (604) 436-0014  
www.stantec.com

Copyright Reserved  
The Contractor shall own and be responsible for all drawings. DO NOT scale the drawings or alter any dimensions. All dimensions shall be in millimeters (mm). The Contractor shall design and construct any and all structures, foundations, and other works shown on drawings unless otherwise indicated by the project's contract documents.

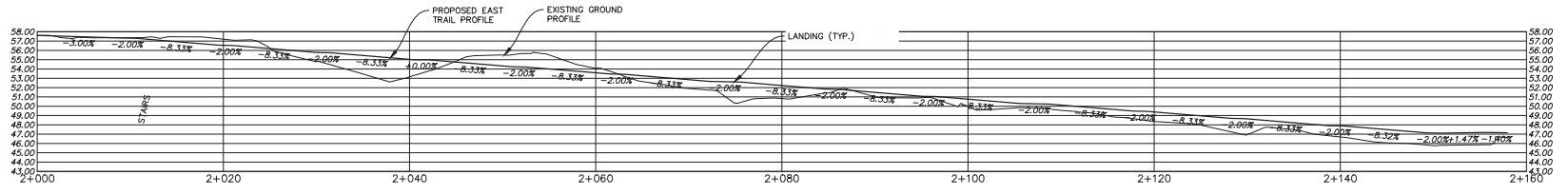
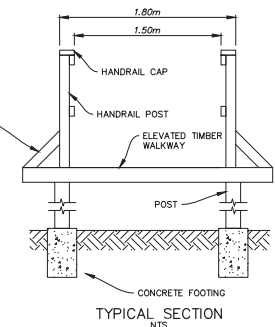
Professional Seal: \_\_\_\_\_  
Bar is 20mm On Original Drawing. If Not On This Sheet, Adjust Scales Accordingly.

SUPERSEDES PRINTS OF THIS DRAWING NUMBER WITH LETTERS PREVIOUS TO P1

PRINTED: 2022-12-06 16:03 d:\projects\2022\12-06\1603 d:\projects\2022\12-06\1603 d:\projects\2022\12-06\1603 d:\projects\2022\12-06\1603 d:\projects\2022\12-06\1603 d:\projects\2022\12-06\1603



East Trail		
Point #	Northing	Easting
2001	5454104.478	507190.634
2002	5454049.520	507220.843
2003	5454040.089	507229.258
2004	5454035.097	507223.573
2005	5454046.151	507211.046
2006	5454025.166	507225.304
2007	5454019.511	507228.758
2008	5454017.568	507225.576
2009	5454042.413	507206.332
2010	5454059.400	507194.789
2011	5454063.925	507199.970
2012	5454053.460	507211.831
2013	5454101.587	507185.376
2014	5454103.032	507188.005
2015	5454047.778	507218.377
2016	5454040.276	507224.938
2017	5454039.091	507223.582
2018	5454059.933	507199.960
2019	5454058.888	507198.764
2020	5454024.148	507222.369
2021	5454016.384	507223.637



**PRELIMINARY**  
FOR DISCUSSION PURPOSES ONLY

[Symbol]	TEMPORARY CONSTRUCTION EASEMENT
[Symbol]	LIMIT OF GLENBROOK CSO GATE REPLACEMENT CONSTRUCTION

4015 Central Blvd. Suite 200  
Burnaby BC V5H 4R6  
Tel: (604) 436-0014  
www.stantec.com

Copyright Reserved

The Copyright in this drawing and all other rights therein are reserved by Stantec Inc. No part of this drawing may be reproduced or transmitted in any form or by any means electronic or mechanical, including photocopying, recording, or by any information storage and retrieval system, without the prior written permission of Stantec Inc.

- NOTES:
1. ALL DIMENSIONS ARE IN mm UNO
  2. ALL ELEVATIONS ARE GEOCENTRIC NAD83 CSRS (2005).
  3. REFERENCE MONUMENT 89H5553 ELEVATION: 64.190m. MONUMENT LOCATED IN CITY OF NEW WESTMINSTER SET IN SOUTHERLY LANE OF 6th AVENUE NEAR WESTERLY LIMIT OF GLENBROOK DRIVE
  4. DATE OF R.F. BINNIE SURVEY: JUNE 17 - 18, 2013, OCTOBER 17, 2014, AND JUNE 28, 2022.
  5. COMBINED SCALE FACTOR = 0.09196
  6. CONTRACTOR TO ASSUME EVERY HOUSE IS SERVICED BY SEWER, WATER, STORM, GAS, ELECTRICAL AND COMMUNICATIONS. ONLY STORM AND SANITARY ARE SHOWN ON DRAWINGS, CONTRACTOR IS TO CONTACT ALL UTILITY COMPANIES TO OBTAIN MOST UP TO DATE RECORDS. ANY RECORDS THE DISTRICT HAS ARE INCLUDED IN THE APPENDICES.

Issue	Date	Drawn	Checked	Design	Appr'd	Description
P2	DEC 2022	MG	HL	BDS	CC	CONCEPTUAL DESIGN FOR REVIEW & DISCUSSION
P1	OCT 2022	MG	HL	BDS	CC	CONCEPTUAL DESIGN FOR REVIEW & DISCUSSION

GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT

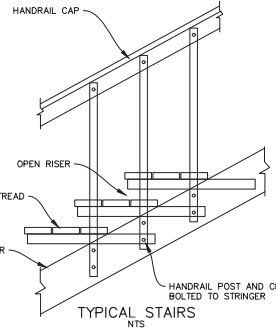
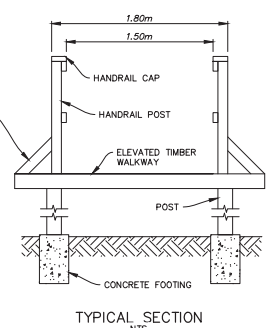
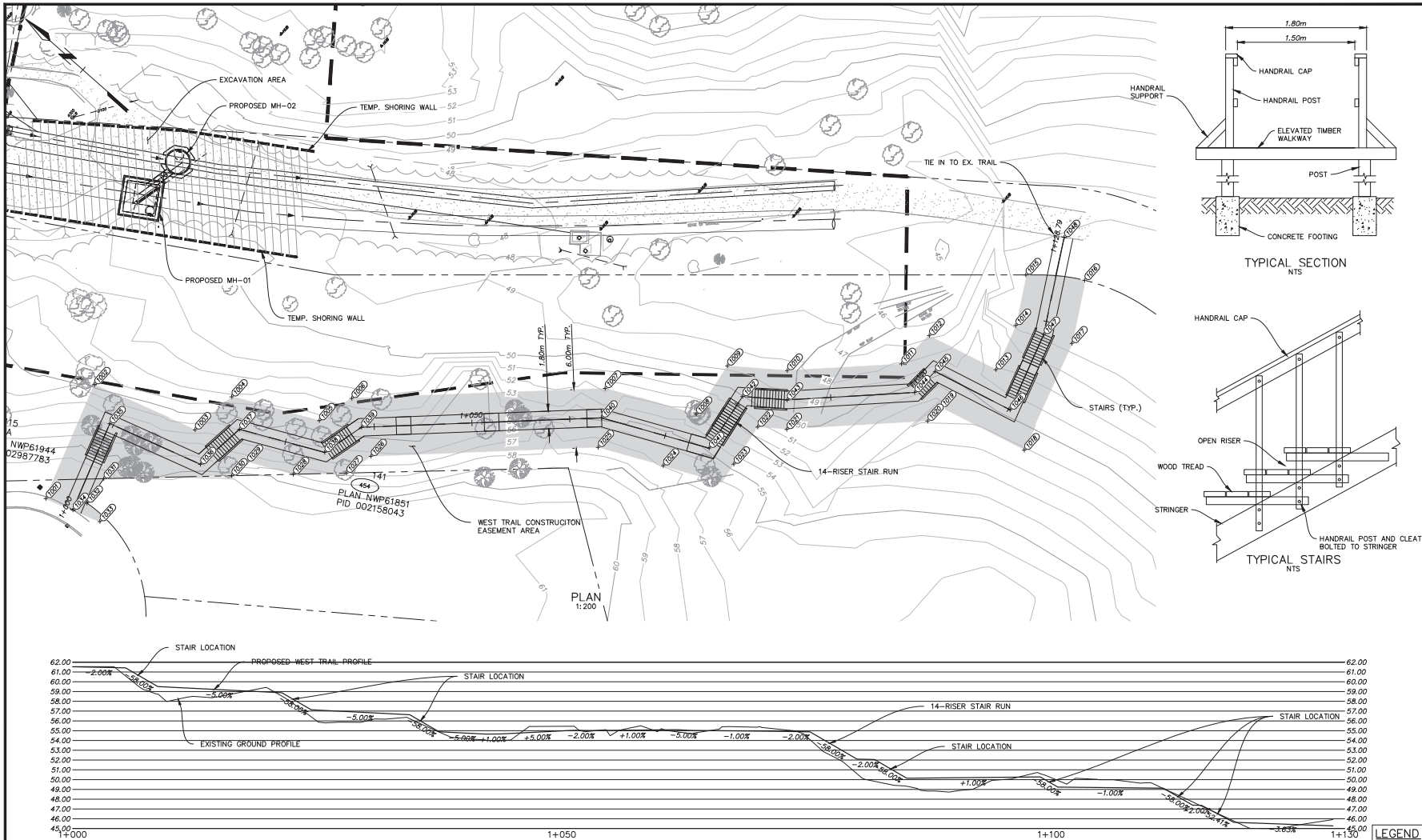
NEW WESTMINSTER INTERCEPTOR  
GLENBROOK COMBINED SEWER  
OVERFLOW GATE REPLACEMENT

EAST TRAIL CONCEPTUAL PLAN & PROFILE

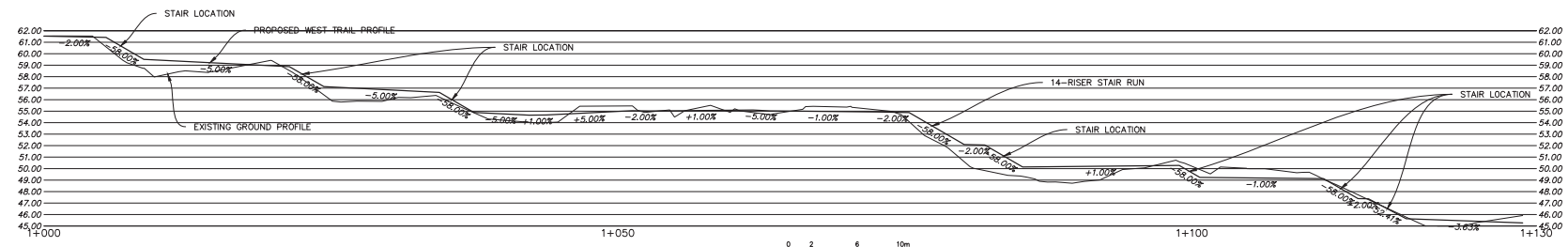
CITY OF NEW WESTMINSTER - GLENBROOK DR

SCALE: AS NOTED  
DISTRICT FILE SF-1345  
DRAWING NUMBER T-1

DESIGNED BY: MG  
DRAWN BY: HL  
CHECKED BY: BDS  
APPROVED BY: CC  
SUPERSEDES PRINTS OF THIS DRAWING NUMBER WITH LETTERS PREVIOUS TO P2



West Trail		
Point #	Northing	Easting
1001	5454070.639	507135.564
1002	5454074.646	507147.576
1003	5454063.807	507150.934
1004	5454063.324	507155.946
1005	5454055.021	507160.060
1006	5454054.046	507163.963
1007	5454035.348	507181.900
1008	5454026.639	507186.113
1009	5454027.527	507191.911
1010	5454022.626	507195.619
1011	5454014.345	507203.873
1012	5454014.152	507207.926
1013	5454006.737	507209.829
1014	5454008.226	507214.549
1015	5454010.873	507219.101
1016	5454006.013	507222.679
1017	5454002.704	507216.989
1018	5453999.110	507205.592
1019	5454008.369	507203.216
1020	5454008.462	507201.265
1021	5454018.680	507191.080
1022	5454021.055	507189.284
1023	5454020.373	507184.833
1024	5454025.661	507179.921
1025	5454031.880	507176.913
1026	5454048.644	507160.831
1027	5454049.379	507157.887
1028	5454053.365	507154.184
1029	5454057.734	507152.020
1030	5454057.976	507149.900
1031	5454067.558	507140.999
1032	5454067.194	507137.997
1033	5454064.948	507137.462
1034	5454067.794	507136.513
1035	5454070.833	507145.625
1036	5454061.138	507148.653
1037	5454060.529	507153.983
1038	5454052.446	507157.987
1039	5454051.345	507162.397
1040	5454033.614	507179.407
1041	5454023.338	507184.377
1042	5454024.291	507190.598
1043	5454020.653	507193.349
1044	5454011.403	507202.569
1045	5454011.261	507205.571
1046	5454002.924	507207.710
1047	5454005.465	507215.769
1048	5454010.489	507224.578



PROFILE  
H 1:200 V 1:200

**LEGEND**

- TEMPORARY CONSTRUCTION EASEMENT
- LIMIT OF GLENBROOK CSO GATE REPLACEMENT CONSTRUCTION

**PRELIMINARY**  
FOR DISCUSSION PURPOSES ONLY

4015 Centennial Blvd  
Burnaby BC V5C 2S9  
Tel: (604) 436-3014  
www.stantec.com

Copyright Reserved  
The Corporation and its subsidiaries and its divisions, and its employees, are the authors of this work. All rights reserved. No part of this work may be reproduced, stored in a retrieval system, or transmitted in any form or by any means, electronic, mechanical, photocopying, recording, or by any information storage and retrieval system, without the prior written permission of Stantec Inc.

- NOTES:**
- ALL DIMENSIONS ARE IN mm UNO
  - ALL ELEVATIONS ARE GEODETIC NAD83 CSRS (2005).
  - REFERENCE MONUMENT 89H5553 ELEVATION: 64.190m. MONUMENT LOCATED IN CITY OF NEW WESTMINSTER SET IN SOUTHERLY LANE OF 6th AVENUE NEAR WESTERLY LIMIT OF GLENBROOK DRIVE.
  - DATE OF R.F. BINNIE SURVEY: JUNE 17 - 18, 2013 AND OCT 17, 2014.
  - COMBINED SCALE FACTOR = 0.9996.
  - CONTRACTOR TO ASSUME EVERY HOUSE IS SERVICED BY SEWER, WATER, STORM, GAS, ELECTRICAL, AND COMMUNICATIONS. ONLY STORM AND SANITARY ARE SHOWN ON DRAWINGS. CONTRACTOR IS TO CONTACT ALL UTILITY COMPANIES TO OBTAIN MOST UP TO DATE RECORDS. ANY RECORDS THE DISTRICT HAS ARE INCLUDED IN THE APPENDICES.

Issue	Date	Drawn	Checked	App'd	Description	
P2	DEC 2022	MG	HL	BDS	CC	CONCEPTUAL DESIGN FOR REVIEW & DISCUSSION
P1	OCT 2022	MG	HL	BDS	CC	CONCEPTUAL DESIGN FOR REVIEW & DISCUSSION

Bar is 20mm On Original Drawing. If Not On This Sheet, Adjust Scales Accordingly.

**GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT**

NEW WESTMINSTER INTERCEPTOR  
GLENBROOK DIVERSION  
GLENBROOK COMBINED SEWER  
OVERFLOW GATE REPLACEMENT  
WEST TRAIL PLAN & PROFILE

CITY OF NEW WESTMINSTER - GLENBROOK DR

SCALE: AS NOTED  
DISTRICT FILE SF-1345  
DRAWING NUMBER **T-2**

DESIGNED: MG  
DRAWN: HL  
CHECKED: BDS  
APPROVED: CC  
MANAGER: SG

Supersedes prints of this drawing number with letters previous to P2

Professional Seal

**APPENDIX C – ARBORIST REPORT**

# Arborist Report

## Glenbrook CSO Gate Replacement Project

Temporary Pathway Tree-Impact Assessment  
New Westminster, BC

November 28, 2022

**T A L U S**

Talus Consulting • 604-354-7799 • [talusbc@gmail.com](mailto:talusbc@gmail.com)  
Joe McLeod - BCSLA, ISA Certified Arborist # SO-4337A  
Tree Risk Assessment Qualified (TRAQ)

November 28, 2022

Joe McLeod  
Talus Consulting  
1934 Parkside Lane  
North Vancouver, BC  
V7G-1X5

ATTN: Ammar Mahdi, P.Eng., PMP, ENV SP  
Senior Project Engineer  
Engineering, Design and Construction, Collection Systems  
Liquid Waste Services  
Metro Vancouver

RE: Arborist Report - Glenbrook CSO Gate Replacement Project  
Temporary Pathway Tree-Impact Assessment

Please accept this arborist report as an account of tree and site conditions as encountered at the time of the site visit on the morning of November 14, 2022. These observations inform the input and analysis related to the two temporary pathways under discussion at the north end of the Glenbrook Ravine.

Sincerely,



Joe McLeod  
BCSLA, ISA Certified Arborist (SO-4337A), TRAQ, LEED-AP

---



## Introduction:

This arborist report relates to trees located at the north end of the Glenbrook Ravine in New Westminister. Specifically, trees are examined within the study area (Fig.1) associated with the Glenbrook CSO Gate Replacement project led by Metro Vancouver. This report examines tree impacts in consideration of two possible temporary trails to accommodate access to the north end of the ravine system. Trail 'A' is located on the west side of the Glenbrook Ravine Trail and impacts forty (40) trees, while Trail 'B' located on the east side of the trail ties into the existing switchback ramp and impacts twenty-three (23) trees. Potential impacts of proposed development activities and associated mitigation recommendations are included to guide tree and forest stewardship decisions.

This report has been prepared in keeping with regional expectations of the City of New Westminister and the standards of the International Society of Arboriculture.



Figure 1: Context – Study Area at North End of Glenbrook Ravine in New Westminister

## Methods:

The trees in this arborist report were inventoried with a ground-based inspection on November 14, 2022. The alignment of Trail 'A' and Trail 'B' were flagged in the field to inform the tree inventory. The tree locations are noted in the *Tree Location Plan* in the Appendix – the drawing notes tree locations as superimposed on Stantec's 'Conceptual Alternate Trail Alignments' drawing. The drawing does not include the location of Tree #1 - #11 or Tree #59- #63 and these locations are on the east extent of the proposed alignments and not included in the conceptual drawing by Stantec. This arborist report presents tree inventory metrics and associated analysis of existing trees on and adjacent to the subject site. The following inventory data were collected for each tree:

- Location - based on drawing as provided by Stantec
- Tree Number
- Species
- DBH (diameter at breast height in centimetres, assumed to be 1.4m above grade).
- Height (in metres)
- Condition, summarized as follows: Dead; Very Poor; Poor; Fair; Good; and Very Good
- CRZ (Critical Root Zone): This zone is considered to be the zone around the perimeter of the tree that is necessary to protect critical roots essential for stability and to ensure ongoing health. The term CRZ refers to a dimension that is based on the following formula in which the main variable is tree diameter:

$$\text{CRZ(m)} = \text{DBH(cm)} \times 0.06\text{m}.$$

For example, a tree with a diameter of 30cm will have a CRZ dimension of 1.8m radius from the stem and therefore a Tree Protection Zone (TPZ) equal to 10.2m<sup>2</sup> (Area= $\pi r^2$ , where r=CRZ). If trees are to be retained, the adoption of any CRZ dimension less than those recommended in the inventory table in this report should be approved by the project arborist.

## Results:

More specific attributes of trees and site conditions can be examined in further detail in the Appendices, which includes the *Tree Inventory Table; Tree Location Plan; and Photo Compilation of Tree / Site Conditions*. The *Tree Inventory Table* provides characteristics such as DBH, Height and Condition.

The study area is located at the north end of the Glenbrook Ravine. The west and east slopes of the ravine are the proposed locations of alternative Trail 'A' and Trail 'B' respectively. The slopes are moderate and have limited native groundcovers such as swordfern. The majority of the groundcovers are invasive and include English ivy, Himalayan blackberry and limited Japanese knotweed. The forest is dominated by an over-storey of native early seral species that form the majority of the canopy – there are very few young and juvenile trees occupying the lower and mid-storey of the ravine forest environment.

There were 63 trees examined in this inventory – forty (40) which were within the footprint and potential construction area of Trail 'A' on the west side of the ravine and twenty-three (23) associated with Trail 'B' on the east side of the ravine. The species composition (Fig.2) is dominated by Red Alder, Black Cottonwood and Big Leaf Maple.

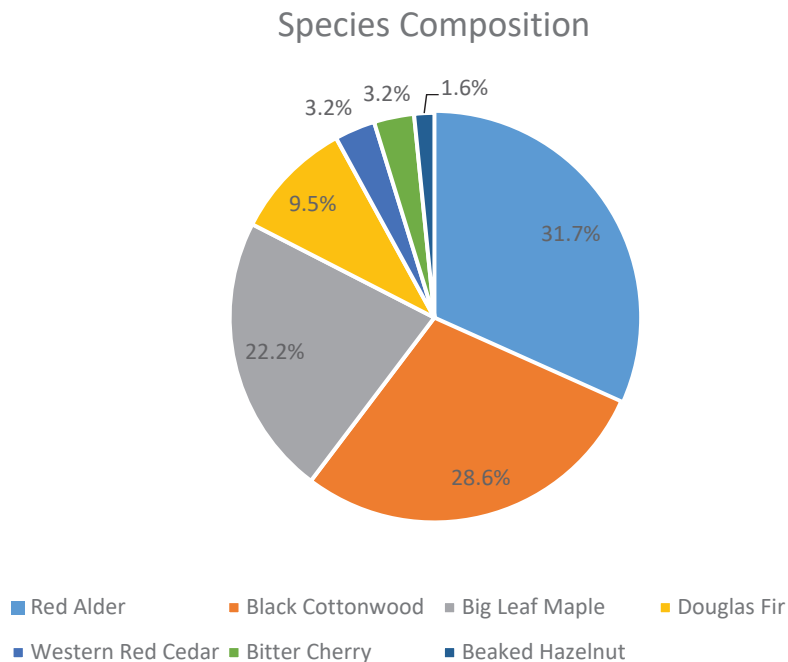


Figure 2: Species Composition (63-Trees inventoried)

The majority of the trees are currently in 'Fair' condition. These trees are rooting on moderate to steep portions of slope and have shallow roots within the top half metre (0.5m) of soil.

## Discussion and Recommendations:

In consideration of tree impacts, the loss of more than 25% of roots from the CRZ is enough to cause destabilization of the stem and root-plate. This decrease of structural integrity may increase the risk of failure and pose a threat to public safety. Construction activities to support the installation of Trail 'A' or Trail 'B' will result in the loss of significantly more than 25% of roots within the CRZ of identified trees.

**Trail 'A':** The construction of Trail 'A' will have a greater impact on trees due to steeper slopes and the number of trees (40) within the trail alignment and construction footprint. This considers the cut/fill necessary to construct the trails as well as grading and soil compaction to provide walkable grades.

**Trail 'B':** The construction of Trail 'B' will have less impact on trees, however up to twenty-three (23) are within the trail alignment and construction footprint and will likely need to be removed.

**Visual Impacts:** Extensive tree removals will be necessary within the north Glenbrook Ravine ecosystem to support the construction of either alternative trail alignment. Up to forty (40) trees on Trail 'A' and slightly less (23) for Trail 'B'. This degree of tree removal will have a significant visual impact to the recreation space and may result in community concerns. In addition, the footprint of the trail will not be able to be replanted and compensation plantings will be necessary outside of the trail footprint. Additional light reaching the forest floor from removals will support understorey plantings, but may also promote more aggressive establishment of invasive species unless managed.

**Compensation Planting:** The removal of trees to accommodate proposed trails will necessitate replacement tree planting at a ratio of 2:1 (two trees planted for each tree removed). Trail 'A' will require eighty (80) trees to be planted, while Trail 'B' will require forty-six (46) trees to be planted. The City of New Westminster states that all replacements shall meet the following criteria:

- Be at least 3cm caliper, but 5-6cm is optimal. Caliper is the diameter of a tree measured 15cm from the top of the root ball;
- Reach a minimum height of 5m (20ft) at maturity – approximately 25 years of age;
- No weeping, dwarf, hedge, or palm species or varieties; and
- No fruit-bearing species such as apple, pear, plum, cherry, and peach

With this in mind, replacement trees should be native species that provide slope stabilization and habitat values to improve the ravine environment. These species include: Douglas Fir; Grand Fir; Western Red Cedar; Vine Maple; Pacific Yew; and Big Leaf Maple.

**Other Considerations:** One current limitation of Stantec's proposed trail alignments is that although the centreline of each trail was laid out on site to support the field work, the full extent of the alignment and footprint was not laid out nor were site grades shown with survey stakes. As such, assumptions were made in the field based on experience and preliminary drawings. Exact

tree locations relative to the construction footprint are necessary for more accurate measurements and improved decisions related to tree retention and risk management decision-making.

The following interventions will offset potential tree removal impacts and enhance the forest environment following work:

**Coarse Woody Debris:** Small branches and brush should be chipped and removed from site during tree removals to limit accumulations of fine fuels. Large diameter logs greater than 20cm diameter should be left on site in safe and appropriate forested areas or edges. This coarse woody debris will allow for several benefits including retention of soil moisture and habitat for various flora and fauna.

**Landscaping:** Future tree planting should be in locations that will limit risks of trampling and also be sited in mixed shade to maximize water moisture in droughty summer periods. If tree planting takes place in higher use and solar exposed areas, the stems should be protected and watering should occur during dry months (May – Sept). Replacement trees should be large-stature nursery stock to assist in establishment. The future plantings may need to have brush matting placed around the growing root zone to hold-back competing vegetation during tree establishment.

**Tree Protection Fencing:** (See Appendix) - It is recommended that if tree retention is possible, tree protection fencing should be erected around retention trees. Tree protection fencing around all retained trees is necessary prior to construction and should remain throughout the duration of construction. This fencing should be installed on the perimeter of the CRZ where necessary. The construction of tree protection fencing closer to subject trees than the recommended CRZ dimensions should be approved by the project arborist. Tree protection fencing should be erected by the contractor and inspected by the project arborist prior to construction. The project arborist should be retained to inspect the site trees during construction and following construction to monitor the condition of the retained trees.

**Wildlife:** Prior to commencing any removals of trees, trees should be inspected to ensure no wildlife are nesting or hibernating in trees. Should tree removals proceed on this site, all removals should take place outside of seasons during which birds or small mammals may be nesting or hibernating. If removals do need to take place during this period, the trees should be inspected by a Registered Professional Biologist prior to work commencing.

Queries that arise in relation to this report can be directed to Talus Consulting ([talusbc@gmail.com](mailto:talusbc@gmail.com) - 604-354-7799).

## APPENDIX:

- Tree Inventory Table
- Tree Location Plan (overlaid on Stantec drawing)
- Photo Compilation of Tree / Site Conditions
- Tree Protection Fencing Detail (per: New Westminster)
- Limitations



## APPENDIX: Tree Inventory

### Arborist Report

Location: Glenbrook CSO, New Westminster, BC

Talus Consulting

Joe McLeod - ISA Certified Arborist #SO-4337A and TRAQ

Site visit: November 14, 2022

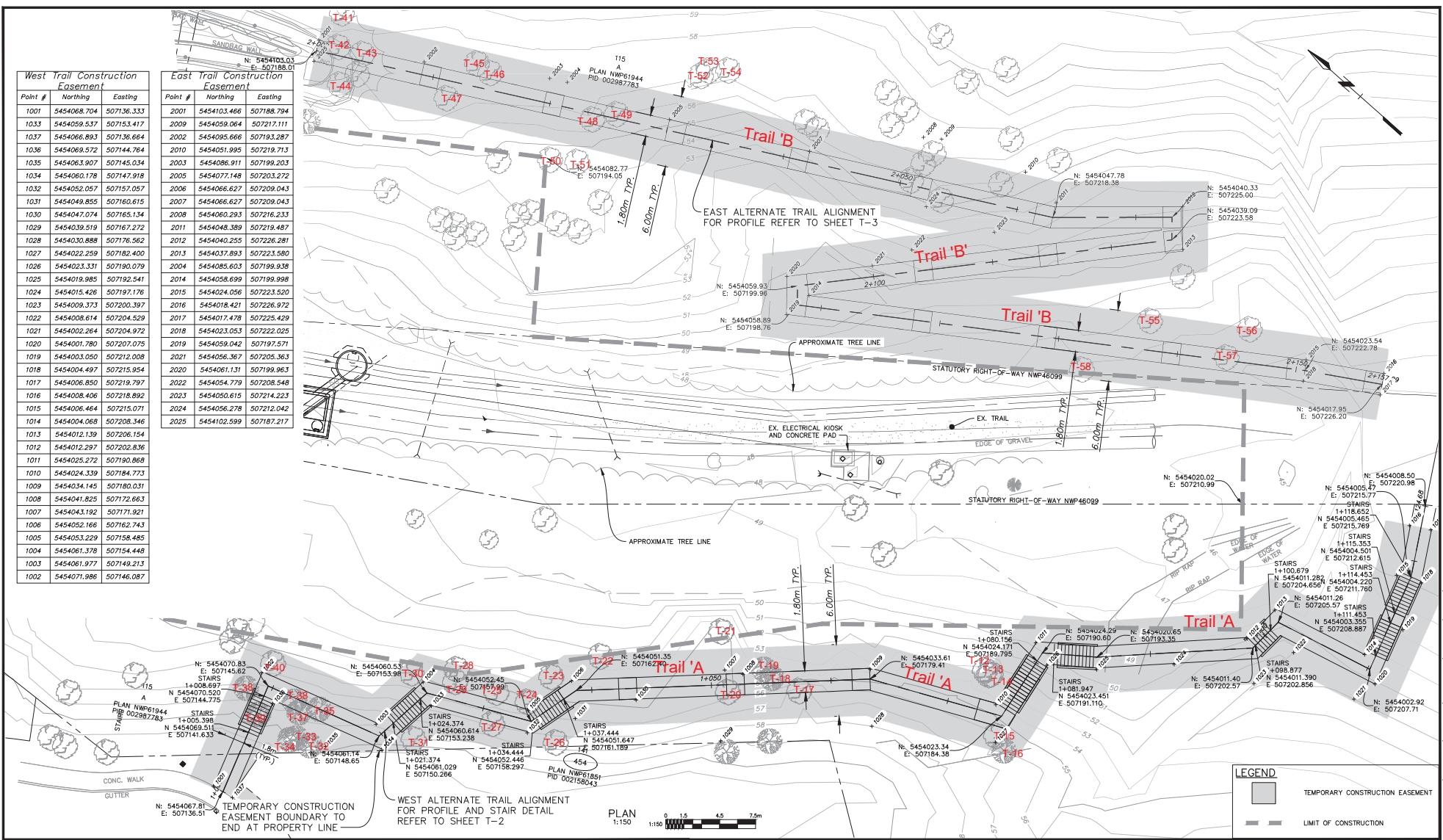
Tree #	Common	Latin	DBH (cm)	Height (m)	Condition	CRZ (m)	Location
1	Red Alder	<i>Alnus rubra</i>	15	15	Fair	0.9	Trail 'A' Westside
2	Black Cottonwood	<i>Populus trichocarpa</i>	55	20	Fair	3.3	Trail 'A' Westside
3	Big Leaf Maple	<i>Acer macrophyllum</i>	multistem: 30/60/25/25	25	Fair	4.5	Trail 'A' Westside
4	Black Cottonwood	<i>Populus trichocarpa</i>	80	25	Fair	4.8	Trail 'A' Westside
5	Black Cottonwood	<i>Populus trichocarpa</i>	45	20	Fair	2.7	Trail 'A' Westside
6	Black Cottonwood	<i>Populus trichocarpa</i>	70	25	Fair	4.2	Trail 'A' Westside
7	Black Cottonwood	<i>Populus trichocarpa</i>	80	25	Fair	4.8	Trail 'A' Westside
8	Red Alder	<i>Alnus rubra</i>	45	20	Fair	2.7	Trail 'A' Westside
9	Red Alder	<i>Alnus rubra</i>	30	20	Fair	1.8	Trail 'A' Westside
10	Red Alder	<i>Alnus rubra</i>	25	20	Fair	1.5	Trail 'A' Westside
11	Red Alder	<i>Alnus rubra</i>	20	15	Dead	1.2	Trail 'A' Westside
12	Big Leaf Maple	<i>Acer macrophyllum</i>	30	20	Poor	1.8	Trail 'A' Westside
13	Big Leaf Maple	<i>Acer macrophyllum</i>	25	20	Poor	1.5	Trail 'A' Westside
14	Big Leaf Maple	<i>Acer macrophyllum</i>	20	10	Poor	1.2	Trail 'A' Westside
15	Big Leaf Maple	<i>Acer macrophyllum</i>	30	15	Poor	1.8	Trail 'A' Westside
16	Big Leaf Maple	<i>Acer macrophyllum</i>	30	20	Fair	1.8	Trail 'A' Westside
17	Red Alder	<i>Alnus rubra</i>	25	15	Fair	1.5	Trail 'A' Westside
18	Red Alder	<i>Alnus rubra</i>	25	15	Fair	1.5	Trail 'A' Westside

19	Red Alder	<i>Alnus rubra</i>	15	10	Poor	0.9	Trail 'A' Westside
20	Black Cottonwood	<i>Populus trichocarpa</i>	50	25	Fair	3.0	Trail 'A' Westside
21	Red Alder	<i>Alnus rubra</i>	15	15	Fair	0.9	Trail 'A' Westside
22	Beaked Hazelnut	<i>Corylus cornuta</i>	10	5	Good	0.6	Trail 'A' Westside
23	Red Alder	<i>Alnus rubra</i>	20	10	Dead	1.2	Trail 'A' Westside
24	Black Cottonwood	<i>Populus trichocarpa</i>	50	25	Fair	3.0	Trail 'A' Westside
25	Black Cottonwood	<i>Populus trichocarpa</i>	60	25	Fair	3.6	Trail 'A' Westside
26	Red Alder	<i>Alnus rubra</i>	20	5	Dead	1.2	Trail 'A' Westside
27	Big Leaf Maple	<i>Acer macrophyllum</i>	multistem: 15/15	10	Fair	1.3	Trail 'A' Westside
28	Big Leaf Maple	<i>Acer macrophyllum</i>	5	5	Fair	0.3	Trail 'A' Westside
29	Red Alder	<i>Alnus rubra</i>	25	15	Fair	1.5	Trail 'A' Westside
30	Red Alder	<i>Alnus rubra</i>	25	15	Fair	1.5	Trail 'A' Westside
31	Red Alder	<i>Alnus rubra</i>	25	15	Poor	1.5	Trail 'A' Westside
32	Big Leaf Maple	<i>Acer macrophyllum</i>	30	15	Fair	1.8	Trail 'A' Westside
33	Western Red Cedar	<i>Thuja plicata</i>	45	20	Good	2.7	Trail 'A' Westside
34	Western Red Cedar	<i>Thuja plicata</i>	20	15	Good	1.2	Trail 'A' Westside
35	Douglas Fir	<i>Pseudotsuga menziesii</i>	30	15	Fair	1.8	Trail 'A' Westside
36	Douglas Fir	<i>Pseudotsuga menziesii</i>	25	15	Fair	1.5	Trail 'A' Westside
37	Douglas Fir	<i>Pseudotsuga menziesii</i>	20	15	Fair	1.2	Trail 'A' Westside
38	Douglas Fir	<i>Pseudotsuga menziesii</i>	20	15	Fair	1.2	Trail 'A' Westside
39	Douglas Fir	<i>Pseudotsuga menziesii</i>	multistem: 30/20	15	Fair	2.2	Trail 'A' Westside
40	Black Cottonwood	<i>Populus trichocarpa</i>	50	25	Fair	3.0	Trail 'A' Westside
41	Black Cottonwood	<i>Populus trichocarpa</i>	30	20	Fair	1.8	Trail 'B' Eastside



42	Black Cottonwood	<i>Populus trichocarpa</i>	60	20	Good	3.6	Trail 'B' Eastside
43	Black Cottonwood	<i>Populus trichocarpa</i>	30	15	Dead	1.8	Trail 'B' Eastside
44	Douglas Fir	<i>Pseudotsuga menziesii</i>	10	8	Good	0.6	Trail 'B' Eastside
45	Black Cottonwood	<i>Populus trichocarpa</i>	50	20	Dead	3.0	Trail 'B' Eastside
46	Black Cottonwood	<i>Populus trichocarpa</i>	65	25	Fair	3.9	Trail 'B' Eastside
47	Black Cottonwood	<i>Populus trichocarpa</i>	50	20	Dead	3.0	Trail 'B' Eastside
48	Big Leaf Maple	<i>Acer macrophyllum</i>	20	15	Poor	1.2	Trail 'B' Eastside
49	Big Leaf Maple	<i>Acer macrophyllum</i>	20	15	Poor	1.2	Trail 'B' Eastside
50	Bitter Cherry	<i>Prunus emarginata</i>	30	25	Fair	1.8	Trail 'B' Eastside
51	Bitter Cherry	<i>Prunus emarginata</i>	35	25	Fair	2.1	Trail 'B' Eastside
52	Big Leaf Maple	<i>Acer macrophyllum</i>	45	25	Fair	2.7	Trail 'B' Eastside
53	Big Leaf Maple	<i>Acer macrophyllum</i>	45	25	Fair	2.7	Trail 'B' Eastside
54	Big Leaf Maple	<i>Acer macrophyllum</i>	45	25	Fair	2.7	Trail 'B' Eastside
55	Black Cottonwood	<i>Populus trichocarpa</i>	80	25	Good	4.8	Trail 'B' Eastside
56	Black Cottonwood	<i>Populus trichocarpa</i>	90	25	Good	5.4	Trail 'B' Eastside
57	Black Cottonwood	<i>Populus trichocarpa</i>	80	25	Good	4.8	Trail 'B' Eastside
58	Red Alder	<i>Alnus rubra</i>	15	15	Fair	0.9	Trail 'B' Eastside
59	Red Alder	<i>Alnus rubra</i>	30	15	Fair	1.8	Trail 'B' Eastside
60	Red Alder	<i>Alnus rubra</i>	30	15	Fair	1.8	Trail 'B' Eastside
61	Red Alder	<i>Alnus rubra</i>	30	15	Poor	1.8	Trail 'B' Eastside
62	Red Alder	<i>Alnus rubra</i>	25	15	Poor	1.5	Trail 'B' Eastside
63	Red Alder	<i>Alnus rubra</i>	30	20	Dead	1.8	Trail 'B' Eastside

APPENDIX B - TEMPORARY TRAIL DRAWINGS



West Trail Construction Easement		
Point #	Northing	Easting
1001	5454068.704	507136.333
1033	5454059.537	507153.417
1037	5454066.893	507136.664
1036	5454069.572	507144.764
1035	5454063.907	507145.034
1034	5454060.178	507147.918
1032	5454052.057	507157.057
1031	5454049.855	507160.615
1030	5454047.074	507165.134
1029	5454039.519	507167.272
1028	5454030.888	507176.562
1027	5454022.259	507182.400
1026	5454023.331	507190.079
1025	5454019.985	507192.541
1024	5454015.426	507197.176
1023	5454009.373	507200.397
1022	5454008.614	507204.529
1021	5454002.264	507204.972
1020	5454001.780	507207.075
1019	5454003.050	507212.008
1018	5454004.497	507215.954
1017	5454006.850	507219.797
1016	5454008.406	507218.892
1015	5454006.464	507215.071
1014	5454004.068	507208.346
1013	5454012.139	507206.154
1012	5454012.297	507202.836
1011	5454025.272	507190.868
1010	5454024.339	507184.773
1009	5454034.145	507180.031
1008	5454041.825	507172.863
1007	5454043.192	507171.921
1006	5454052.166	507162.743
1005	5454053.229	507158.485
1004	5454061.378	507154.448
1003	5454061.977	507149.213
1002	5454071.986	507146.087

East Trail Construction Easement		
Point #	Northing	Easting
2001	5454103.466	507188.794
2009	5454059.064	507217.111
2002	5454095.666	507193.287
2010	5454051.995	507219.713
2003	5454086.911	507199.203
2005	5454077.148	507203.272
2006	5454066.627	507209.043
2007	5454066.627	507209.043
2008	5454060.293	507216.233
2011	5454048.389	507219.487
2012	5454040.255	507226.281
2013	5454037.893	507223.580
2004	5454085.603	507199.938
2014	5454058.699	507199.998
2015	5454024.056	507223.520
2016	5454018.421	507226.972
2017	5454017.478	507225.429
2018	5454023.053	507222.026
2019	5454059.042	507197.571
2021	5454056.367	507205.363
2020	5454061.131	507199.963
2022	5454054.779	507208.548
2023	5454050.615	507214.223
2024	5454056.278	507212.042
2025	5454102.599	507187.217

NOTES:  
 1. ALL DIMENSIONS ARE IN mm UNO  
 2. ALL ELEVATIONS ARE GEODETIC WAD83 CSRS (2005).  
 3. REFERENCE MONUMENT 89H5553 ELEVATION: 64.190m. MONUMENT LOCATED IN CITY OF NEW WESTMINSTER SET IN SOUTHERLY LANE OF 6th AVENUE NEAR WESTERLY LIMIT OF GLENBROOK DRIVE  
 4. DATE OF R.F. BINNIE SURVEY: JUNE 17 - 18, 2013, OCTOBER 17, 2014, AND JUNE 28, 2022.  
 5. COMBINED SCALE FACTOR = 0.9996.  
 6. CONTRACTOR TO ASSUME EVERY HOUSE IS SERVICED BY SEWER, WATER, STORM, GAS, ELECTRICAL AND COMMUNICATIONS. ONLY STORM AND SANITARY ARE SHOWN ON DRAWINGS, CONTRACTOR IS TO CONTACT ALL UTILITY COMPANIES TO OBTAIN MOST UP TO DATE RECORDS. ANY RECORDS THE DISTRICT HAS ARE INCLUDED IN THE APPENDICES.

4015 Centennial Blvd.  
 Surrey BC V3R 9H4  
 Tel: (604) 436-0014  
 www.stantec.com

Copyright Reserved  
 The Contractor shall not be held responsible for alterations, omissions, or errors in this drawing or any other drawings or documents prepared by the contractor or subcontractors.

Issue	Date	Drawn	Checked	By	App'd	Description
P1	OCT 2022	MG	HL	BDS	-	CONCEPTUAL DESIGN FOR REVIEW & DISCUSSION

GREATER VANCOUVER SEWERAGE AND DRAINAGE DISTRICT  
 NEW WESTMINSTER INTERCEPTOR  
 GLENBROOK DIVERSION  
 GLENBROOK COMBINED SEWER  
 OVERFLOW GATE REPLACEMENT  
 CONCEPTUAL ALTERNATE TRAIL ALIGNMENTS

CITY OF NEW WESTMINSTER - GLENBROOK DR

DESIGN: MG  
 DRAWN: HL  
 CHECKED: BDS  
 APPROVED: SG  
 MANAGER: [Signature]

SCALE: AS NOTED  
 DISTRICT FILE SP-1365  
 DRAWING NUMBER T-1



# APPENDIX I: Photo-Compilation of Tree / Site Conditions



View northwest to tree-covered slope and Trail 'A' path alignment. Note extensive English ivy



View of base of tree on Trail 'A' alignment. Note extensive groundcovers and understory.



Japanese Knotweed along Trail 'A' alignment

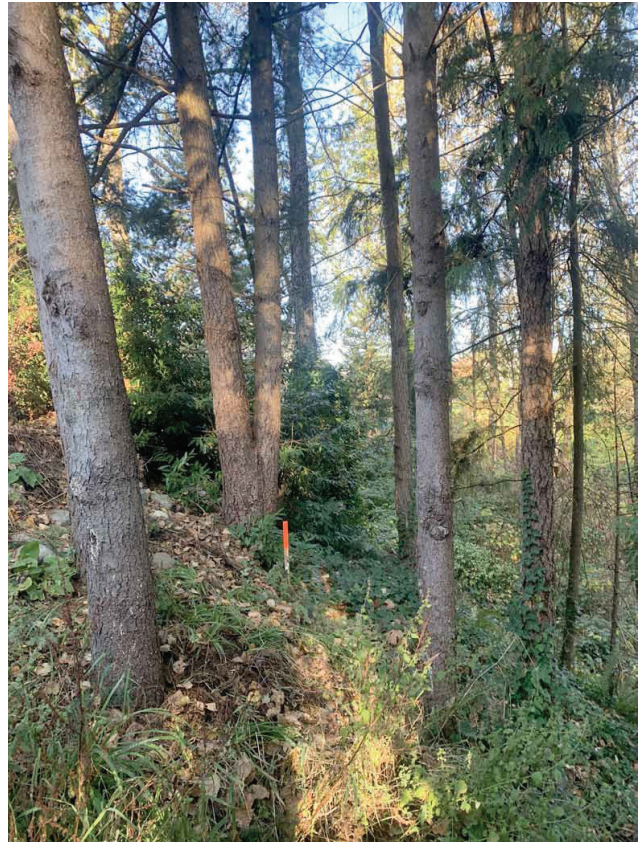


View of base of Tree #24 & #25





Canopy of Tree #24 & #25



View north toward Tree #33 - #41 at top of slope and west extent of Trail 'A' alignment



View south along Trail 'A' alignment



View of Tree #50 & #51 - both Bitter Cherries - along Trail 'B' alignment

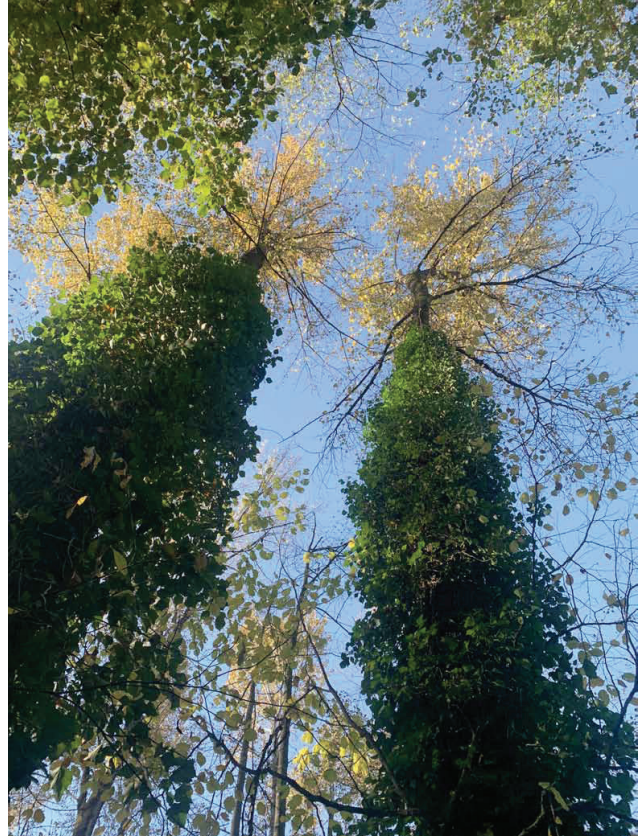




View north along centre of R.O.W. with Trail 'A' alignment on western slope (left image) and Trail 'B' alignment on eastern slope (right edge of image)



View northeast along Trail 'B' alignment with orange flagging tape demarcating alignment



View of canopy of Tree #62 & #63

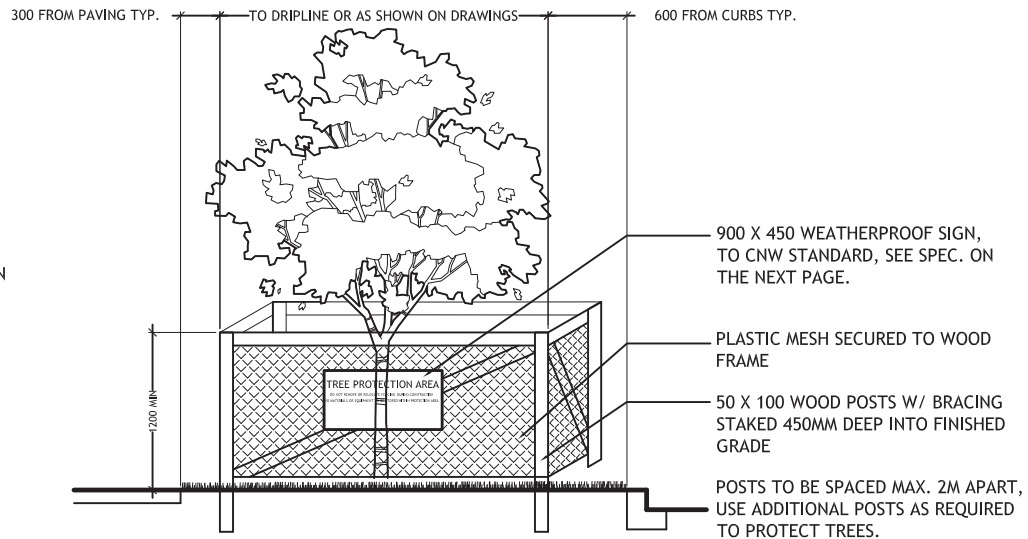
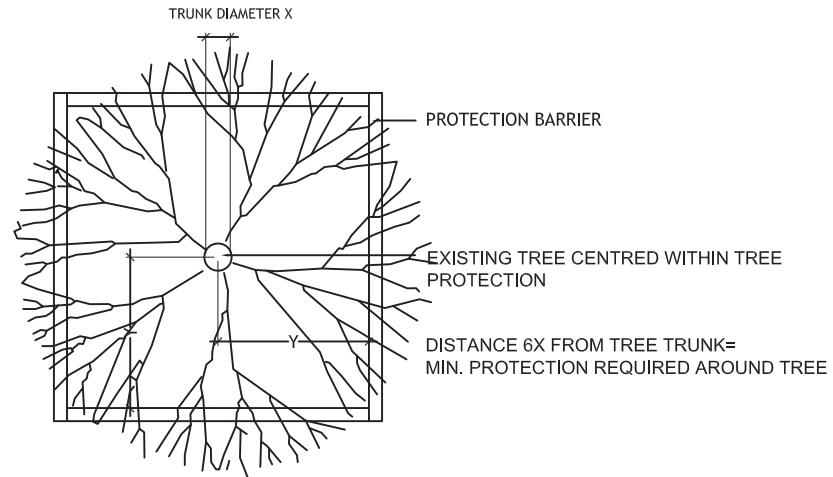




TRUNK DIAMETER X (cm)	MINIMUM PROTECTION REQUIRED AROUND TREE- DISTANCE FROM TRUNK Y (m)
X	6X
20 cm	1.2 m
25 cm	1.5 m
30 cm	1.8 m
35 cm	2.1 m
40 cm	2.4 m
45 cm	2.7 m
50 cm	3.0 m
55 cm	3.3 m
60 cm	3.6 m
75 cm	4.5 m
90 cm	5.0 m
100 cm	6.0 m

**NOTES:**

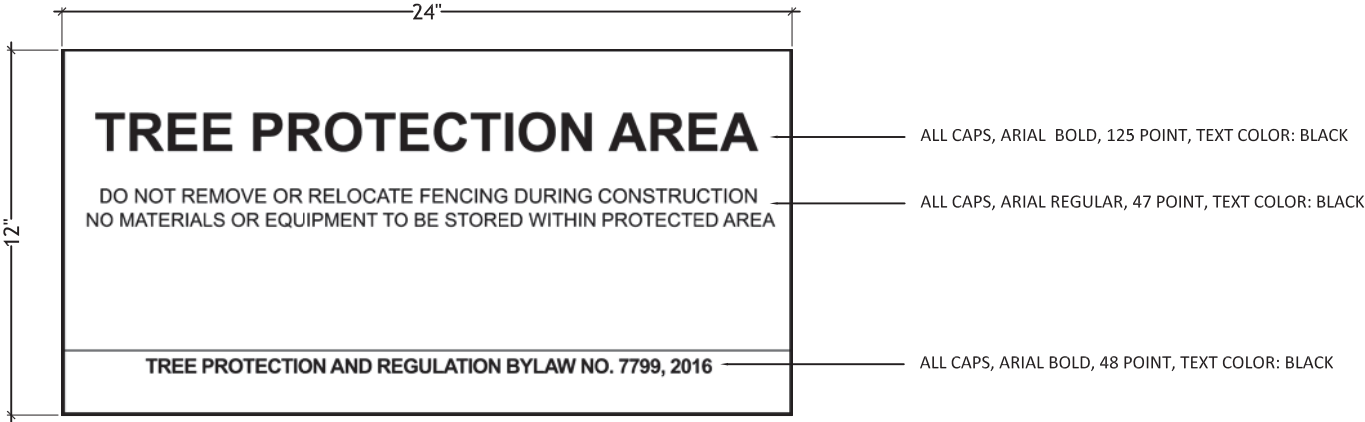
- 1) REFER TO CITY OF NEW WESTMINSTER (CNW) TREE PROTECTION BY-LAWS FOR STANDARD REQUIREMENTS.
- 2) INSTALL TREE PROTECTION BARRIER BEFORE CONSTRUCTION BEGINS AND KEEP IN PLACE UNTIL LANDSCAPE CONSTRUCTION IS COMPLETE.
- 3) STORAGE OF BUILDING MATERIALS AND LITTER WITHIN OR AGAINST TREE PROTECTION BARRIER IS PROHIBITED. DEVELOPER/ OWNER RESPONSIBLE FOR MAINTENANCE WITHIN TREE PROTECTION BARRIER.
- 4) DAMAGED TREES TO BE REPLACED AT DEVELOPER'S/ OWNER'S COST.
- 5) MAINTAIN EXISTING GRADES AT PROTECTION BARRIER FOR ALL PROTECTED AND RETAINED TREES.
- 6) REGRADING OUTSIDE OF THE PROTECTION BARRIER SHOULD NOT ADVERSELY COMPROMISE PROTECTED, RETAINED AND EXISTING TREES.



**Tree Protection Fencing**  
 NTS

TREE PROTECTION BARRIER SIGN SPECIFICATIONS:

THE SIGN SHOULD BE PRINTED ON YELLOW CHLOROPLAST AT 24" WIDE AND 12" HIGH.



## LIMITATIONS:

1. Talus Consulting makes no guarantee, representation or warranty (express or implied) with regard to: this report; the findings, conclusions and recommendations contained herein; or the work referred to herein.
2. Talus Consulting conducts all levels of service in adherence to the standards of the International Society of Arboriculture (ISA). That said, to state with 100% accuracy the exact health status and the inherent risk associated with every tree is impossible. Trees are dynamic organisms, not defined by physical stasis, but constantly changing from the actions of time, weather, gravity and countless abiotic and biotic forces. To add to the challenge, the absolute health of a tree can't be determined through visual inspection alone, while more complex tools of investigation also have their inherent limitations and will never reveal the full story of a tree's physical condition or life history. Even the most healthy trees may break apart spontaneously, while trees appearing stressed and on the verge of failure may remain intact presenting no hazard.
3. Arborist Reports prepared by Talus Consulting prepare a snapshot of the site tree(s) at a moment in time and describe their physical characteristics and site conditions affecting the trees. Arborist reports are visual inspections and do not examine each tree in the level of detail that may be required to determine with increased accuracy if a tree presents an increased risk of failure - this is the role of a Tree Risk Assessment. Tree Risk Assessments, which examine trees in much greater detail and postulate a likelihood of failure, may be prepared by Talus Consulting. It is entirely the responsibility of the client to pursue a Tree Risk Assessment, whether it is recommended in an Arborist Report or not. If Talus Consulting do not recommend a tree for a Tree Risk Assessment, it is no guarantee that the tree will not fail and cause harm. It is also the client's sole responsibility to remove any trees and/or portions of trees that present a risk to society whether or not Talus Consulting have identified the risk.
4. Except as expressly stated in this report, the findings, conclusions and recommendations set out in this report are valid for the exact time period during which the assessment leading to all findings, conclusions and recommendations was conducted. Talus expressly excludes any duty to provide any such modification if generally accepted assessment techniques and prevailing professional standards and best practices change.
5. It is intended for the sole and exclusive use by the Client for the purpose(s) set out in this report. Any use of, reliance on or decisions made based on this report by any person other than the Client, or by the Client for any purpose other than the purpose(s) set out in this report, is the sole responsibility of, and at the sole risk of, such other person or the Client, as the case may be. Talus accepts no liability or responsibility whatsoever for any losses, expenses, damages, fines, penalties or other harm (including without limitation financial or consequential effects on transactions or property values, and economic loss) that may be suffered or incurred by any person as a result of the use of or reliance on this report or the work referred to herein. The copying, distribution or publication of this report (except for the internal use of the Client) without the express written permission of Talus (which consent may



be withheld in Talus's sole discretion) is prohibited. Talus retains ownership of this report and all documents related thereto both generally and as instruments of professional service.

4. The Client acknowledges that it is both professionally and practically impossible to predict with absolute certainty the behaviour of any single tree, or groups of trees, in all given circumstances. Inevitably, a standing tree will always pose some risk. Most trees have the potential for failure and this risk can only be eliminated if the risk is removed (e.g. a tree or branch).
5. Nothing in this report is intended to constitute or provide a legal opinion, and Talus expressly disclaims any responsibility for matters legal in nature (including, without limitation, matters relating to title and ownership of real or personal property and matters relating to cultural and heritage values). Talus makes no guarantee, representation or warranty (express or implied) as to the requirements of or the compliance of applicable laws, rules, regulations, or policies established by federal, provincial, local government or First Nations bodies (collectively, "Government Bodies") or as to the availability of licenses, permits or authorizations of any Government Body. Revisions to any regulatory standards (including by-laws, policies, guidelines and any similar directions of a Government Bodies in effect from time to time) referred to in this report may be expected over time. As a result, modifications to the findings, conclusions and recommendations in this report may be necessary. Talus expressly excludes any duty to provide any such modification if any such regulatory standard is revised.
6. Talus shall not be required to give testimony or to attend court by reason of this report unless subsequent contractual arrangements are made, including payment of an additional fee for such services as described in the fee schedule and contract of engagement.
7. In preparing this report, Talus has relied in good faith on information provided by individuals including, but not limited to, certain persons, government bodies, government registries and agents and representatives of each of the aforementioned, and Talus assumes that such information is true, correct and accurate in all material respects. Talus accepts no responsibility for any deficiency, misinterpretations or fraudulent acts of or information provided by such persons, bodies, registries, agents and representatives.
8. Sketches, diagrams, graphs, and photographs in this report, being intended as visual aids, are not necessarily to scale and should not be construed as engineering or architectural reports or surveys.
9. Loss or alteration of any part of this report invalidates the entire report.

## **APPENDIX D – CLASS D OPINION OF PROBABLE COST**

GLENBROOK COMBINED SEWER OVERFLOW GATE REPLACEMENT PROJECT  
 OPINION OF PROBABLE COST FOR TRAIL CONSTRUCTION BASED ON CONCEPT DESIGN

East Trail					
Item	Quantity	Unit	Unit Cost	Total	Notes
Mob / Demob	1	LS	\$ 9,000.00	\$ 9,000.00	5% of construction, rounded to nearest 1000
Geotechnical Engineer	1	LS	\$ 30,000.00	\$ 30,000.00	On site 3 days a week for 2 months
Geotechnical Investigation	1	LS	\$ 20,000.00	\$ 20,000.00	Allowance, assume 3 boreholes
Arborist	1	LS	\$ 30,000.00	\$ 30,000.00	On site 3 days a week for 2 months
Tree Replacement	46	ea	\$ 300.00	\$ 13,800.00	Assume all impacted trees require removal, and 2:1 replacement
Erosion and Sediment Control	1	LS	\$ 13,000.00	\$ 13,000.00	
Clearing and Grubbing	880	m2	\$ 30.00	\$ 26,400.00	
Boardwalk (incl. footings)	158	Lm	\$ 300.00	\$ 47,400.00	Pressure treated spruce, includes footings
Retaining Walls	14	Lm	\$ 1,400.00	\$ 19,600.00	Pressure treated spruce
Restoration	1	LS	\$ 20,100.00	\$ 20,100.00	Includes removal of boardwalk, additional plantings as required, assumed 30% of boardwalk construction
			<b>Subtotal</b>	<b>\$229,300.00</b>	
			<b>Contingency (50%)</b>	<b>\$ 114,650.00</b>	
			<b>Total</b>	<b>\$ 343,950.00</b>	

West Trail					
Item	Quantity	Unit	Unit Cost	Total	Notes
Mob / Demob	1	LS	\$ 12,000.00	\$ 12,000.00	5% of construction, rounded to nearest 1000
Geotechnical Engineer	1	LS	\$ 30,000.00	\$ 30,000.00	On site 3 days a week for 2 months
Geotechnical Investigation	1	LS	\$ 20,000.00	\$ 20,000.00	Allowance, assume 3 boreholes
Arborist	1	LS	\$ 30,000.00	\$ 30,000.00	On site 3 days a week for 2 months
Tree Replacement	80	ea	\$ 300.00	\$ 24,000.00	Assume all impacted trees require removal, and 2:1 replacement
Erosion and Sediment Control	125	Lm	\$ 80.00	\$ 10,000.00	
Clearing and Grubbing	720	m2	\$ 30.00	\$ 21,600.00	
Boardwalk	125	Lm	\$ 300.00	\$ 37,500.00	Pressure treated spruce, includes footings
Stairs	8	ea	\$ 3,000.00	\$ 24,000.00	Pressure treated spruce
Restoration	1	LS	\$ 18,450.00	\$ 18,450.00	Includes removal of boardwalk, additional plantings, earthwork as required, assumed 30% of boardwalk construction
			<b>Subtotal</b>	<b>\$209,100.00</b>	
			<b>Contingency (50%)</b>	<b>\$ 104,550.00</b>	
			<b>Total</b>	<b>\$ 313,650.00</b>	