DISTRICT OF WEST VANCOUVER
INTEGRATED STORMWATER MANAGEMENT PLAN FOR PIPE, WESTMOUNT, CAVE, TURNER AND GODMAN CREEKS

APPENDIX K

HYDRAULIC STRUCTURE ASSESSMENT

Table K-1: HYDRAULIC STRUCTURE ASSESSMENT - Predevelopment Flow Summary

Culvert	Watercourse	Location	Size Dia. or WxH	Material and Type	Length (m)	Slope (%)	Capacity (m^3/s)	Q_{10}[1] (m^3/s)	Q_{25}[1] (m^3/s)	Q_{50}[1] (m^3/s)	Q_{100}[1] (m^3/s)	Q_{200}[1] (m^3/s)
G-3700	Godman	Marine Drive	1550	Concrete	14.7	3.8	15.0	7.2	7.2	10.5	14.9	17.0
G-3400	Godman	Rose Crescent	1500	Concrete	25.4	5.8	17.0	7.2	10.5	12.4	14.9	17.0
G-3100	Godman	British Columbia Railway	1200	Concrete	14.7	7.8	10.9	7.2	10.8	12.4	14.9	17.0
G-3150	Godman	British Columbia Railway	900	CSP	14.7	7.6	2.7					
G-2900	Godman	Sharon Place	3250 x 2000	CSP	17.5	4.2	40.3	7.2	10.5	12.4	14.9	19.0
G-2600	Godman	Bayridge Avenue	1350	Concrete	23.2	3.1	9.4	6.8	10.0	11.9	14.3	16.2
G-2200	Godman	Viewridge Place	1370	Concrete	22.0	5.2	12.7	6.5	9.7	11.6	12.4	16.5
G-2000	Godman	Westridge Avenue	1370	Concrete	16.1	2.7	9.1	6.5	9.6	11.6	13.8	16.0
G-1600	Godman	Upper Levels	1800	CSP	15.8	2.5	9.8	6.1	9.0	11.1	13.1	15.5
G-1400	Godman	Upper Levels	1800	CSP	18.3	2.7	10.2	6.1	9.0	11.0	13.1	16.5
G-1100	Godman	North of Upper Levels	600	CSP	10.3	7.5	0.9	5.6	8.6	10.9	12.7	14.6
G-1150	Godman	North of Upper Levels	600	CSP	10.3	6.8	0.9					
T-3400	Turner	Marine Drive	900	Concrete	70.0	15.9	7.2	2.4	3.2	3.8	4.1	4.6
T-3200	Turner	Hillcrest Street	600	Concrete	18.3	3.3	1.1	1.9	2.9	3.4	3.6	4.1
T-2900	Turner	Mathers Avenue	900	Concrete	20.4	1.4	2.1	1.9	2.7	3.1	3.3	3.8
T-2500	Turner	In Driveway	1200	Concrete	9.5	3.2	7.0	2.0	2.8	3.2	3.4	3.9
T-2300	Turner	Cedarridge Place	700	Concrete	27.0	5.1	2.1	1.9	2.6	3.0	4.2	5.1
T-2100	Turner	Westmount Road	1220	Concrete	18.9	4.5	8.6	1.9	2.5	2.8	3.2	3.9
T-1900	Turner	Southridge Place	1220	Concrete	19.2	7.2	10.9	1.9	2.5	2.8	3.2	3.9
T-1700	Turner	Southridge Avenue	770	Concrete	22.7	1.8	1.6	1.8	2.3	2.6	3.0	3.7
T-1750	Turner	Southridge Avenue	770	Concrete	22.7	1.6	1.5					
T-1500	Turner	Westridge Avenue	1220	Concrete	21.5	7	10.8	1.8	2.2	2.5	2.8	3.6
T-1300	Turner	Upper Levels	1220	Concrete	73.2	7.9	11.5	1.7	2.1	2.3	2.6	3.4
T-300	Turner	Cypress Bowl Road	900	CSP	44.8	2.2	1.5	1.4	1.6	1.8	2.0	2.1
T-100	Turner	Cypress Bowl Road	600	-	30.6	16.2	1.3	0.6	0.6	0.8	1.0	1.2
C-4200	Cave	Seawall	950 x 1450	Concrete	24.3	14.2	17.4	3.8	5.1	6.4	7.6	8.6
C-4000	Cave	Marine Drive	1250 x 1250	Concrete	26.7	20.8	25.2	3.8	5.1	6.4	7.6	8.5
C-3800	Cave	British Columbia Railway	1200	Concrete	21.9	34.3	22.8	3.8	5.1	6.4	7.6	8.5
C-3600	Cave	Mathers Avenue	1050	Concrete	17.0	18.5	11.7	3.8	5.1	6.4	7.5	8.5
C-3100	Cave	Upper Levels	1400	CSP	76.2	17.4	13.3	3.2	4.1	5.2	6.0	6.8
C-3150	Cave	Upper Levels	900	Concrete	78.6	17.4	7.6					
C-2900	Cave	Wentworth Avenue	1400	CSP	96.6	26	16.2	3.2	4.1	5.2	6.0	6.8
C-2500	Cave	Cypress Bowl Road	900	CSP	18.8	7.9	2.8	1.2	1.3	2.0	2.7	3.0
C-2000	Cave	Cypress Bowl Road	600	CSP	20.8	13.9	1.2	1.1	1.2	2.6	3.1	3.5
C-1400	Cave (east)	Cypress Bowl Road	900	CMP	24.4	20.6	4.5	1.5	2.1	2.8	3.2	3.6
C-900	Cave (east)	Cypress Bowl Road	600	CSP	32.8	25	1.7	1.1	1.5	2.1	2.4	2.6
C-100	Cave (middle)	Cypress Bowl Road	600	CSP	23.1	20.1	1.5	0.3	0.4	0.5	0.6	0.7
W-4000	Westmount	Seawall	1220 x 1220	Concrete	38.6	22.9	24.8	3.9	5.0	6.7	7.7	9.1
W-3900	Westmount	Marine Drive	1220 x 1220	Concrete	20.9	11.1	17.3	3.9	5.0	6.7	7.7	9.1
W-3700	Westmount	Upstream of Marine Drive	1220	-	40.8	22.6	10.5	3.9	5.0	6.7	7.7	9.1
W-3500	Westmount	British Columbia Railway	1220	Concrete	23.6	9.2	12.4	3.8	4.9	6.7	7.6	9.0
W-3300	Westmount	Mathers Avenue	1220	Concrete	15.7	8.2	11.7	3.8	4.9	6.6	7.5	8.9
W-3000	Westmount	Thompson Crescent	1220	Concrete	23.6	0.8	3.6	3.7	4.8	6.5	7.4	8.7
W-2800	Westmount	Westmount Place	1050	Concrete	21.7	6.6	7.0	2.8	4.0	5.1	5.8	7.2
W-2850	Westmount	Westmount Place	1050	Concrete	21.7	6.6	7.0					

Culvert	Watercourse	Location	Size Dia. or WxH	Material and Type	Length (m)	Slope (%)	Capacity (m^3/s)	Q_{10}[1] (m^3/s)	Q_{25}[1] (m^3/s)	Q_{50}[1] (m^3/s)	Q_{100}[1] (m^3/s)	Q_{200}[1] (m^3/s)
W-2600	Westmount	Benbow Road	1050	Concrete	16.8	15	10.6	2.7	4.0	5.0	5.8	7.1
W-2400	Westmount	Upper Levels	1600	CSP	74.4	13.5	16.7	2.6	3.8	4.8	5.5	6.9
W-2000	Westmount	Cypress Bowl Road	1220	CSP	16.5	9.8	6.9	1.5	2.7	3.3	3.7	4.4
W-1700	Westmount	Cypress Bowl Road	600	CSP	32.2	22.3	1.6	1.4	2.7	3.2	4.0	5.0
W-1500	Westmount	Cypress Bowl Road	600	-	30.2	9.9	1.0	0.9	1.0	1.0	1.1	1.2
W-1200	Westmount	Cypress Bowl Road	600	-	46.1	6.5	0.8	0.7	0.8	0.8	0.9	0.9
W-800	Westmount (east)	Upstream of Upper Levels	900	-	87.2	15.5	3.9	0.5	0.7	1.0	1.2	1.3
W-400	Westmount (east)	Deer Ridge Drive	600	-	16.4	12.2	1.2	0.4	0.5	0.7	0.8	0.9
W-100	Westmount (east)	Cypress Bowl Road	600	-	13.2	3.8	0.6	0.3	0.4	0.6	0.7	0.8
P-10700	Pipe	Seawall	1820 x 1820	Concrete	21.3	10.8	49.5	7.2	10.7	13.0	15.7	17.5
P-10500	Pipe	British Columbia Railway	1800	CSP	35.0	17.1	25.7	7.2	10.7	13.0	15.8	17.6
P-10300	Pipe	Marine Drive	1200 x 850	Concrete	20.3	12.7	11.1	7.2	10.7	13.0	15.7	17.5
P-10100	Pipe	Mathers Avenue	1200	Concrete	17.4	3.8	7.6	7.1	10.7	12.9	13.9	14.0
P-9800	Pipe (west)	Rosebery Avenue	1220	Concrete	12.3	27.7	21.4	3.5	5.6	6.6	7.1	7.5
P-9600	Pipe (west)	Spencer Place	1800	Concrete	16.1	7.1	30.6	3.5	5.5	6.4	6.8	7.3
P-9400	Pipe (west)	Spencer Drive	1050	Concrete	19.1	3.5	5.1	3.4	5.4	6.4	6.6	7.3
P-9200	Pipe (west)	Spencer Court	1500	Concrete	31.8	9	21.2	3.4	5.4	6.4	6.5	7.3
P-9000	Pipe (west)	Upper Levels	1500	CSP	56.1	11.4	12.9	3.4	5.4	6.3	6.4	7.2
P-8800	Pipe (west)	Cypress Bowl Road	1200	CSP	51.5	12	7.3	3.4	5.3	6.3	6.3	6.5
P-8300	Pipe (west)	Cypress Bowl Road	750	CSP	24.6	4.8	1.3	0.9	1.2	1.4	1.7	2.0
P-7800	Pipe (west)	Cypress Bowl Road	600	CMP	18.4	3.7	0.6	2.3	3.7	4.4	4.8	5.3
P-7200	Pipe (west)	Cypress Bowl Road	900	-	19.9	30.2	5.4	1.4	2.2	2.5	2.7	2.8
P-6600	Pipe (west)	Cypress Bowl Road	900	-	32.9	3	1.7	0.9	1.6	1.8	1.8	1.9
P-6100	Pipe (west)	Cypress Bowl Road	1150	CSP	23.3	7.9	5.3	0.2	0.3	0.3	0.4	0.5
P-6150	Pipe (west)	Cypress Bowl Road	600	CSP	23.6	7.3	0.9					
P-5800	Pipe (east)	Rosebery Avenue	1220	Concrete	26.0	12.4	14.3	4.0	5.7	6.8	8.6	9.9
P-5500	Pipe (east)	Spencer Drive	1510 x 2000	Concrete	13.1	1.1	13.9	2.5	3.7	4.4	5.6	6.5
P-5300	Pipe (east)	Upstream of Spencer Drive	1200	-	8.8	14.1	7.9	2.4	3.6	4.4	5.6	6.5
P-5100	Pipe (east)	Gisby Street	1050 x 1050	Concrete	14.2	5	7.8	2.4	3.6	4.4	5.6	6.5
P-4900	Pipe (east)	Upper Levels	750 x 750	Concrete	111.6	22.7	6.8	2.1	3.2	3.8	4.9	5.6
P-4950	Pipe (east)	Upper Levels	920 x 920	CSP	113.0	22.5	6.3					
P-4700	Pipe (east)	Cypress Bowl Road	900	CSP	90.1	32.1	5.6	2.0	3.0	3.6	4.6	5.2
P-4400	Pipe (east)	Cypress Bowl Lane	600	-	19.6	23.7	1.6	0.6	0.9	1.1	1.3	1.4
P-4200	Pipe (east)	Cypress Bowl Lane	600	-	8.5	8.9	1.0	0.4	0.6	0.8	0.9	0.9
P-3800	Pipe (east)	Cypress Bowl Road	600	-	28.8	22.4	1.6	0.4	0.7	0.8	0.9	1.0
P-3200	Pipe (east)	Cypress Bowl Road	600	-	40.1	31.2	1.9	0.0	0.0	0.0	0.0	0.0
P-2800	Pipe (east)	Cypress Bowl Road	750	CMP	20.7	3.8	1.2	1.2	1.9	2.3	1.5	1.6
P-2500	Pipe (middle)	Spencer Drive	850 x 850	Concrete	13.1	0.7	1.7	1.4	2.2	2.6	2.7	3.0
P-2300	Pipe (middle)	Spencer Court	750	Concrete	14.8	4.2	2.3	1.0	1.3	1.5	1.7	2.1
P-2100	Pipe (middle)	Upper Levels	750	CSP	80.0	16.4	2.4	0.9	1.2	1.4	1.6	2.0
P-2150	Pipe (middle)	Upper Levels	750	CSP	80.0	15.6	2.4					
P-1900	Pipe (middle)	Cypress Bowl Road	900	CSP	60.8	18.8	4.3	0.9	1.2	1.3	1.5	2.0
P-1700	Pipe (middle)	Cypress Bowl Lane	900	CSP	19.7	4.1	2.0	0.9	1.2	1.3	1.5	2.0
P-1300	Pipe (middle)	Cypress Bowl Road	600	-	18.4	7.8	0.9	0.7	0.8	0.9	0.9	1.0
P-1000	Pipe (middle)	Cypress Bowl Road	600	-	18.7	6.1	0.8	0.1	0.2	0.2	0.2	0.2
P-800	Pipe (middle)	Upstream of Spencer Drive	700	Concrete	22.1	9.3	2.8	0.4	0.6	0.7	0.8	0.8
P-600	Pipe (middle)	Spencer Court	750	Concrete	14.8	3.8	2.2	0.3	0.4	0.5	0.6	0.6
P-400	Pipe (middle)	Upper Levels	1050	CSP	61.0	13.1	5.4	0.2	0.3	0.4	0.5	0.5

Culvert	Watercourse	Location	Size Dia. or WxH	Material and Type	Length (m)	Slope (%)	Capacity (m^3/s)	Q_{10}[1] (m^3/s)	Q_{25}[1] (m^3/s)	Q_{50}[1] (m^3/s)	Q_{100}[1] (m^3/s)	Q_{200}[1] (m^3/s)
P-200	Pipe (middle)	Cypress Bowl Road	600	CSP/Concrete	84.1	21.9	1.6	0.1	0.2	0.2	0.3	0.3

Notes:

Shading indicates exceedance of capacity

[1] **Q_{10}, Q_{25}, Q_{50}, Q_{100}, Q_{200}** are expressed as pre-development full design flows with no diversion

Table K-2: HYDRAULIC STRUCTURE ASSESSMENT - Diversion Scenario Flow Summary

Culvert	Watercourse	Location	Size Dia. or WxH	Material and Type	Length (m)	Slope (%)	Capacity (m^3/s)	Q_{200}[1] (m^3/s)	Q_{200}[2] (m^3/s)	Q_{200}[3] (m^3/s)	Q_{200}[4] (m^3/s)
G-3700	Godman	Marine Drive	1550	Concrete	14.7	3.8	15.0	8.0	8.7	9.2	15.2
G-3400	Godman	Rose Crescent	1500	Concrete	25.4	5.8	17.0	8.0	8.6	9.2	15.2
G-3100	Godman	British Columbia Railway	1200	Concrete	14.7	7.8	10.9	7.9	8.6	9.1	15.1
G-3150	Godman	British Columbia Railway	900	CSP	14.7	7.6	2.7				
G-2900	Godman	Sharon Place	3250 x 2000	CSP	17.5	4.2	40.3	7.9	8.6	9.1	15.2
G-2600	Godman	Bayridge Avenue	1350	Concrete	23.2	3.1	9.4	6.6	7.2	7.5	14.1
G-2200	Godman	Viewridge Place	1370	Concrete	22.0	5.2	12.7	5.7	6.3	6.4	13.4
G-2000	Godman	Westridge Avenue	1370	Concrete	16.1	2.7	9.1	5.4	6.1	6.2	13.2
G-1600	Godman	Upper Levels	1800	CSP	15.8	2.5	9.8	4.2	4.8	4.8	12.0
G-1400	Godman	Upper Levels	1800	CSP	18.3	2.7	10.2	4.2	4.8	4.8	12.0
G-1100	Godman	North of Upper Levels	600	CSP	10.3	7.5	0.9	2.2	2.2	2.2	10.1
G-1150	Godman	North of Upper Levels	600	CSP	10.3	6.8	0.9				
T-3400	Turner	Marine Drive	900	Concrete	70.0	15.9	7.2	3.4	3.4	3.9	4.4
T-3200	Turner	Hillcrest Street	600	Concrete	18.3	3.3	1.1	2.8	2.8	3.0	3.8
T-2900	Turner	Mathers Avenue	900	Concrete	20.4	1.4	2.1	2.5	2.5	2.6	3.5
T-2500	Turner	In Driveway	1200	Concrete	9.5	3.2	7.0	2.5	2.5	2.6	3.6
T-2300	Turner	Cedarridge Place	700	Concrete	27.0	5.1	2.1	2.5	2.5	1.9	4.5
T-2100	Turner	Westmount Road	1220	Concrete	18.9	4.5	8.6	2.2	2.2	2.2	3.3
T-1900	Turner	Southridge Place	1220	Concrete	19.2	7.2	10.9	2.2	2.2	2.2	3.3
T-1700	Turner	Southridge Avenue	770	Concrete	22.7	1.8	1.6	1.8	1.8	1.9	3.0
T-1750	Turner	Southridge Avenue	770	Concrete	22.7	1.6	1.5				
T-1500	Turner	Westridge Avenue	1220	Concrete	21.5	7	10.8	1.7	1.7	1.7	2.9
T-1300	Turner	Upper Levels	1220	Concrete	73.2	7.9	11.5	1.4	1.4	1.4	2.6
T-300	Turner	Cypress Bowl Road	900	CSP	44.8	2.2	1.5	0.5	0.5	0.5	1.8
T-100	Turner	Cypress Bowl Road	600	-	30.6	16.2	1.3	1.2	1.2	1.2	1.2
C-4200	Cave	Seawall	950 x 1450	Concrete	24.3	14.2	17.4	3.2	3.2	3.4	6.7
C-4000	Cave	Marine Drive	1250 x 1250	Concrete	26.7	20.8	25.2	3.2	3.2	3.3	6.7
C-3800	Cave	British Columbia Railway	1200	Concrete	21.9	34.3	22.8	3.2	3.2	3.3	6.7
C-3600	Cave	Mathers Avenue	1050	Concrete	17.0	18.5	11.7	3.1	3.1	3.3	6.6
C-3100	Cave	Upper Levels	1400	CSP	76.2	17.4	13.3	1.1	1.1	1.1	4.7
C-3150	Cave	Upper Levels	900	Concrete	78.6	17.4	7.6				
C-2900	Cave	Wentworth Avenue	1400	CSP	96.6	26	16.2	1.1	1.1	1.1	4.7
C-2500	Cave	Cypress Bowl Road	900	CSP	18.8	7.9	2.8	3.0	3.0	3.0	3.1
C-2000	Cave	Cypress Bowl Road	600	CSP	20.8	13.9	1.2	2.8	2.8	2.8	2.8
C-1400	Cave (east)	Cypress Bowl Road	900	CMP	24.4	20.6	4.5	3.6	3.6	3.6	3.6
C-900	Cave (east)	Cypress Bowl Road	600	CSP	32.8	25	1.7	2.6	2.7	2.7	2.7
C-100	Cave (middle)	Cypress Bowl Road	600	CSP	23.1	20.1	1.5	0.7	0.7	0.7	0.7
W-4000	Westmount	Seawall	1220 x 1220	Concrete	38.6	22.9	24.8	4.6	4.7	4.9	7.6
W-3900	Westmount	Marine Drive	1220 x 1220	Concrete	20.9	11.1	17.3	4.6	4.7	4.9	7.6
W-3700	Westmount	Upstream of Marine Drive	1220	-	40.8	22.6	10.5	4.5	4.6	4.9	7.6
W-3500	Westmount	British Columbia Railway	1220	Concrete	23.6	9.2	12.4	4.5	4.6	4.8	7.5
W-3300	Westmount	Mathers Avenue	1220	Concrete	15.7	8.2	11.7	4.3	4.4	4.6	7.3
W-3000	Westmount	Thompson Crescent	1220	Concrete	23.6	0.8	3.6	4.1	4.2	4.4	7.1
W-2800	Westmount	Westmount Place	1050	Concrete	21.7	6.6	7.0	1.7	1.7	1.7	4.7
W-2850	Westmount	Westmount Place	1050	Concrete	21.7	6.6	7.0				
W-2600	Westmount	Benbow Road	1050	Concrete	16.8	15	10.6	1.6	1.6	1.6	4.6
W-2400	Westmount	Upper Levels	1600	CSP	74.4	13.5	16.7	1.1	1.1	1.1	4.2
W-2000	Westmount	Cypress Bowl Road	1220	CSP	16.5	9.8	6.9	4.9	4.9	4.9	4.9
W-1700	Westmount	Cypress Bowl Road	600	CSP	32.2	22.3	1.6	5.0	5.0	5.0	5.0

Culvert	Watercourse	Location	Size Dia. or WxH	Material and Type	Length (m)	Slope (%)	Capacity (m^3/s)	Q_{200}^{1} (m^3/s)	Q_{200}^{2} (m^3/s)	Q_{200}^{3} (m^3/s)	Q_{200}^{4} (m^3/s)
W-1500	Westmount	Cypress Bowl Road	600	-	30.2	9.9	1.0	1.8	1.8	1.8	1.8
W-1200	Westmount	Cypress Bowl Road	600	-	46.1	6.5	0.8	1.7	1.7	1.7	1.7
W-800	Westmount (east)	Upstream of Upper Levels	900	-	87.2	15.5	3.9	1.3	1.3	1.3	1.3
W-400	Westmount (east)	Deer Ridge Drive	600	-	16.4	12.2	1.2	0.9	0.9	0.9	0.9
W-100	Westmount (east)	Cypress Bowl Road	600	-	13.2	3.8	0.6	0.8	0.8	0.8	0.8
P-10700	Pipe	Seawall	1820 x 1820	Concrete	21.3	10.8	49.5	6.0	6.0	6.3	14.8
P-10500	Pipe	British Columbia Railway	1800	CSP	35.0	17.1	25.7	5.9	5.9	6.3	14.8
P-10300	Pipe	Marine Drive	1200 x 850	Concrete	20.3	12.7	11.1	5.9	5.9	6.2	11.6
P-10100	Pipe	Mathers Avenue	1200	Concrete	17.4	3.8	7.6	5.6	5.6	5.9	13.9
P-9800	Pipe (west)	Rosebery Avenue	1220	Concrete	12.3	27.7	21.4	1.8	1.8	1.8	6.5
P-9600	Pipe (west)	Spencer Place	1800	Concrete	16.1	7.1	30.6	1.4	1.4	1.4	2.2
P-9400	Pipe (west)	Spencer Drive	1050	Concrete	19.1	3.5	5.1	1.3	1.3	1.3	6.0
P-9200	Pipe (west)	Spencer Court	1500	Concrete	31.8	9	21.2	1.2	1.2	1.2	6.0
P-9000	Pipe (west)	Upper Levels	1500	CSP	56.1	11.4	12.9	1.0	1.1	1.1	5.9
P-8800	Pipe (west)	Cypress Bowl Road	1200	CSP	51.5	12	7.3	7.2	7.2	7.2	7.2
P-8300	Pipe (west)	Cypress Bowl Road	750	CSP	24.6	4.8	1.3	2.0	2.0	2.0	2.0
P-7800	Pipe (west)	Cypress Bowl Road	600	CMP	18.4	3.7	0.6	0.8	5.3	5.3	5.3
P-7200	Pipe (west)	Cypress Bowl Road	900	-	19.9	30.2	5.4	2.8	2.8	2.8	2.8
P-6600	Pipe (west)	Cypress Bowl Road	900	-	32.9	3	1.7	1.9	1.9	1.9	1.9
P-6100	Pipe (west)	Cypress Bowl Road	1150	CSP	23.3	7.9	5.3	0.4	0.4	0.4	0.4
P-6150	Pipe (west)	Cypress Bowl Road	600	CSP	23.6	7.3	0.9				
P-5800	Pipe (east)	Rosebery Avenue	1220	Concrete	26.0	12.4	14.3	3.5	3.5	3.7	7.9
P-5500	Pipe (east)	Spencer Drive	1510 x 2000	Concrete	13.1	1.1	13.9	1.9	1.9	1.9	4.8
P-5300	Pipe (east)	Upstream of Spencer Drive	1200	-	8.8	14.1	7.9	1.8	1.8	1.9	4.8
P-5100	Pipe (east)	Gisby Street	1050 x 1050	Concrete	14.2	5	7.8	1.8	1.8	1.8	4.8
P-4900	Pipe (east)	Upper Levels	750 x 750	Concrete	111.6	22.7	6.8	0.8	0.8	0.8	3.9
P-4950	Pipe (east)	Upper Levels	920 x 920	CSP	113.0	22.5	6.3				
P-4700	Pipe (east)	Cypress Bowl Road	900	CSP	90.1	32.1	5.6	5.2	5.2	5.2	5.2
P-4400	Pipe (east)	Cypress Bowl Lane	600	-	19.6	23.7	1.6	1.4	1.4	1.4	1.4
P-4200	Pipe (east)	Cypress Bowl Lane	600	-	8.5	8.9	1.0	0.9	0.9	0.9	0.9
P-3800	Pipe (east)	Cypress Bowl Road	600	-	28.8	22.4	1.6	1.0	1.0	1.0	1.0
P-3200	Pipe (east)	Cypress Bowl Road	600	-	40.1	31.2	1.9	0.0	0.0	0.0	0.0
P-2800	Pipe (east)	Cypress Bowl Road	750	CMP	20.7	3.8	1.2	3.3	3.3	3.3	3.3
P-2500	Pipe (middle)	Spencer Drive	850 x 850	Concrete	13.1	0.7	1.7	1.2	1.2	1.2	2.6
P-2300	Pipe (middle)	Spencer Court	750	Concrete	14.8	4.2	2.3	0.4	0.4	0.4	1.5
P-2100	Pipe (middle)	Upper Levels	750	CSP	80.0	16.4	2.4	0.3	0.3	0.3	1.5
P-2150	Pipe (middle)	Upper Levels	750	CSP	80.0	15.6	2.4				
P-1900	Pipe (middle)	Cypress Bowl Road	900	CSP	60.8	18.8	4.3	2.0	2.0	2.0	2.0
P-1700	Pipe (middle)	Cypress Bowl Lane	900	CSP	19.7	4.1	2.0	2.0	2.0	2.0	2.0
P-1300	Pipe (middle)	Cypress Bowl Road	600	-	18.4	7.8	0.9	1.6	1.6	1.6	1.6
P-1000	Pipe (middle)	Cypress Bowl Road	600	-	18.7	6.1	0.8	0.2	0.2	0.2	0.2
P-800	Pipe (middle)	Upstream of Spencer Drive	700	Concrete	22.1	9.3	2.8	0.4	0.4	0.4	0.7
P-600	Pipe (middle)	Spencer Court	750	Concrete	14.8	3.8	2.2	0.2	0.2	0.2	0.5
P-400	Pipe (middle)	Upper Levels	1050	CSP	61.0	13.1	5.4	0.0	0.0	0.05	0.4
P-200	Pipe (middle)	Cypress Bowl Road	600	CSP/Concrete	84.1	21.9	1.6	0.3	0.3	0.3	0.3
Diversion Pipe											
D-900	All	Main Branch	1.8		1351.5	8.2	32.9	34.8	35.6	35.6	9.9
D-800	Pipe/ Westmount	East Branch	1.8		442.5	2.3	17.4	17.2	17.2	17.2	5.0
D-700	Pipe	East Branch	1.35		359.4	5.6	12.6	12.2	12.1	12.1	2.7
D-600	Pipe	East Branch	1.35		75.3	5.3	12.3	6.4	6.4	6.4	1.7
D-500	Pipe	East Branch	1.2		78.1	5.1	8.8	6.0	6.0	6.0	1.7

Culvert	Watercourse	Location	Size Dia. or WxH	Material and Type	Length (m)	Slope (%)	Capacity (m^3/s)	Q_{200} [1] (m^3/s)	Q_{200} [2] (m^3/s)	Q_{200} [3] (m^3/s)	Q_{200} [4] (m^3/s)
D-400	Pipe	East Branch	1.05		137.2	8	7.7	4.7	4.7	4.7	1.5
D-300	Godman/Turner/Cave	West Branch	1.5		59.6	11.8	24.3	19.6	20.4	20.4	7.1
D-200	Godman/Turner	West Branch	1.35		647.0	10.6	17.4	14.4	15.1	15.1	5.3
D-100	Godman	West Branch	1.8		504.7	1.8	15.4	11.8	12.5	12.5	3.8

Notes:

Shading indicates exceedance of capacity

[1] Q_{200} full design flows with diversion for pre-development existing conditions

[2] Q_{200} full design flows with diversion for post-development conditions

[3] Q_{200} full design flows with diversion for post-development conditions and an increase in impervious area of 25% in the developed area below Highway One

[4] Q_{200} full design flows with diversion for post-development conditions; diverting all flows greater than flows generated in a 2hr25yr design storm event

DISTRICT OF WEST VANCOUVER
INTEGRATED STORMWATER MANAGEMENT PLAN FOR PIPE, WESTMOUNT, CAVE, TURNER AND GODMAN CREEKS

APPENDIX L

CRITICAL OUTPUT HYDROGRAPHS

Figure L-1: Godman Storage Facility - 200 yr Ponding Elevation
PCSWMM.NET Storage Node Godman

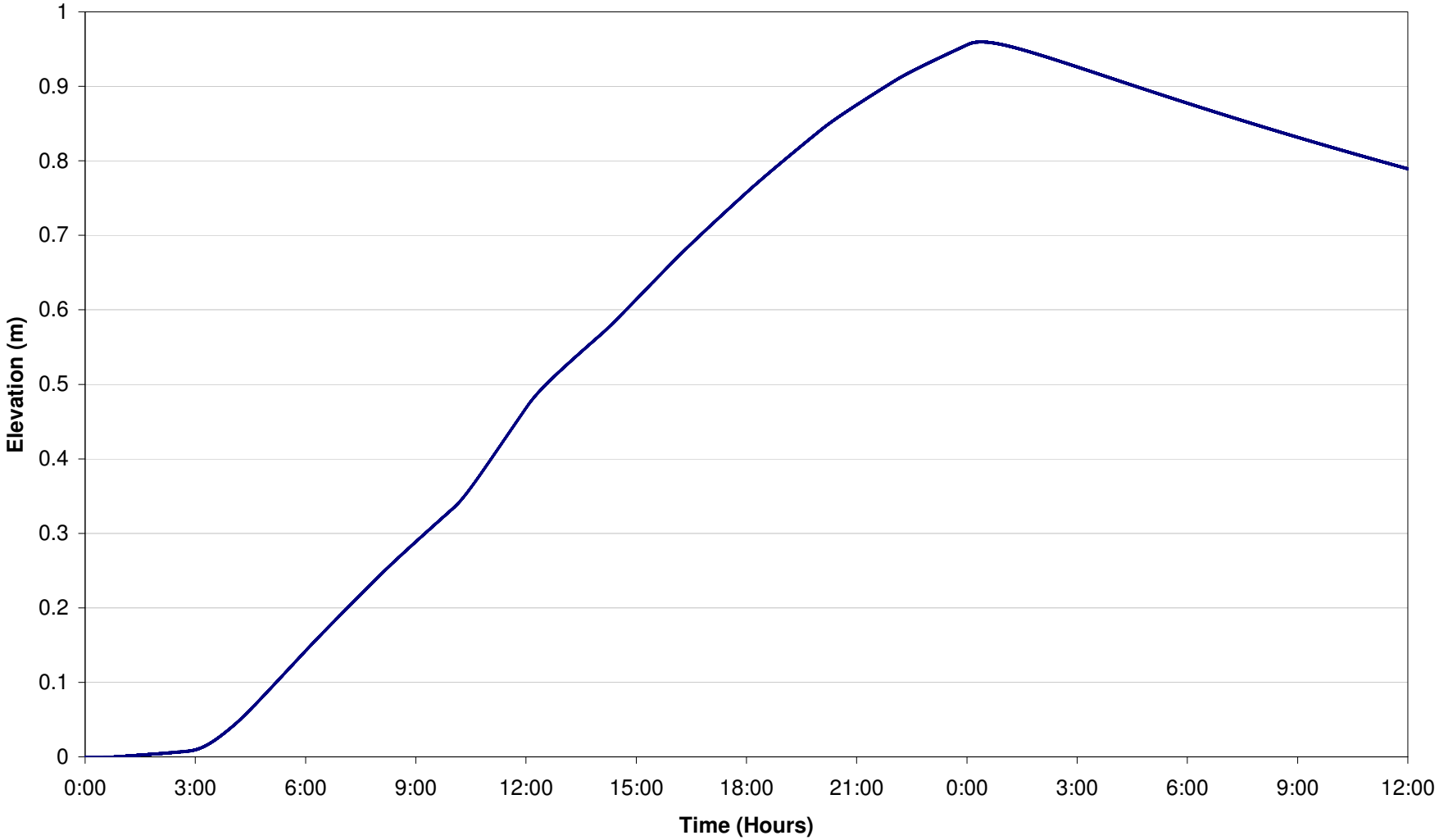


Figure L-2: Turner West Storage Facility - 200 yr Ponding Elevation
PCSWMM.NET Storage Node Godman

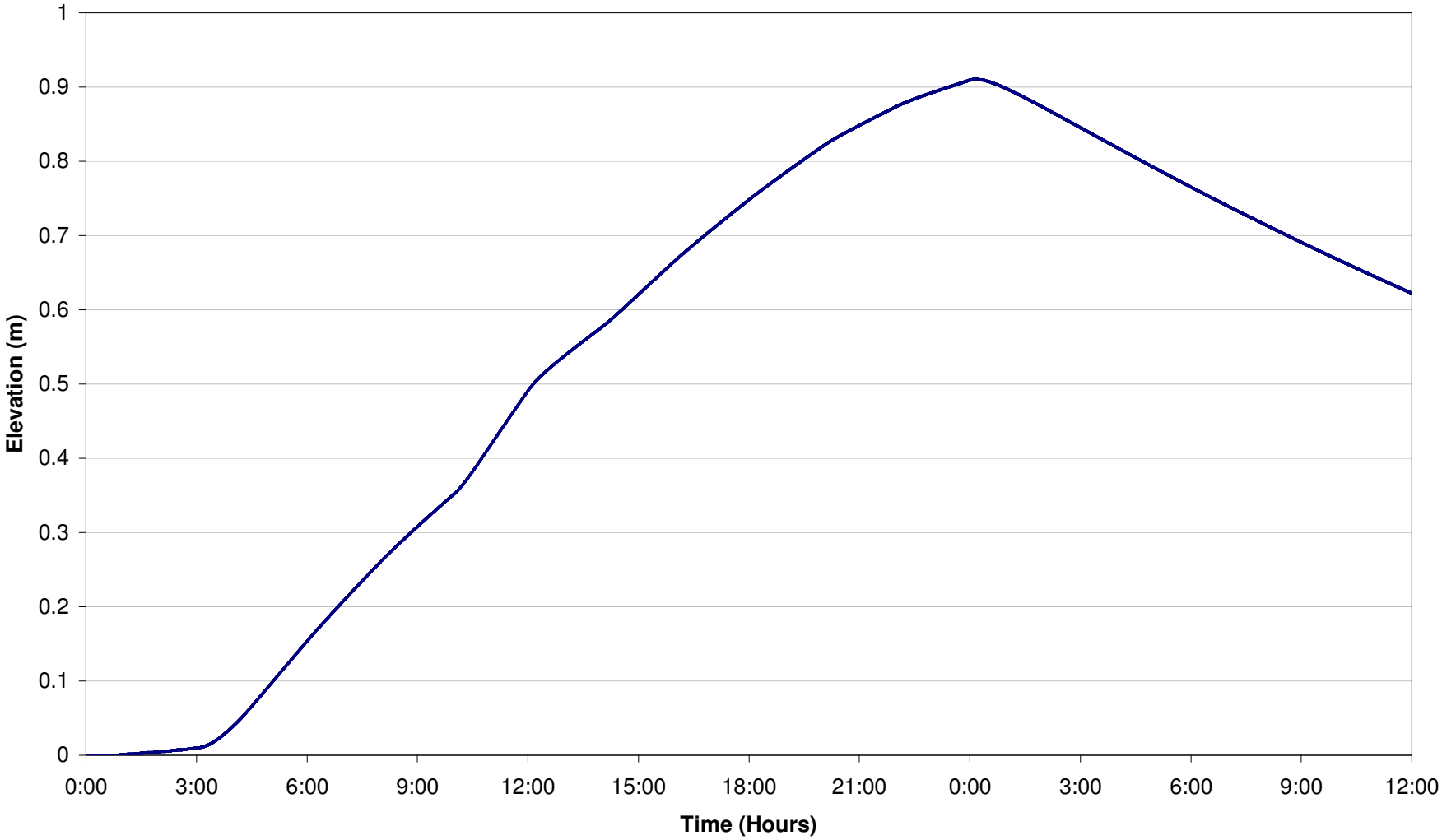


Figure L-3: Cave Storage Facility - 200 yr Ponding Elevation
PCSWMM.NET Storage Node Godman

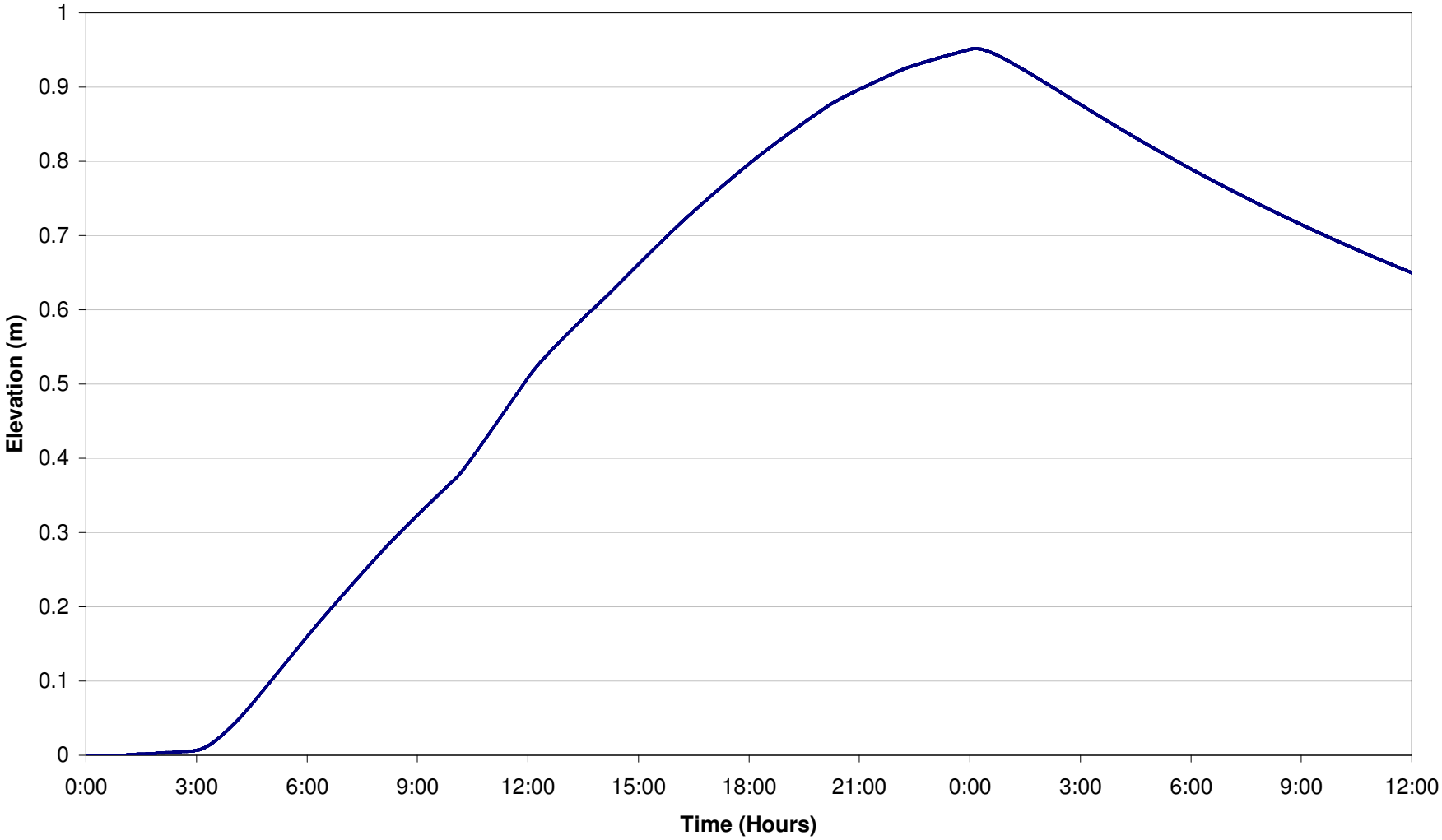


Figure L-4: Westmount Godman Storage Facility - 200 yr Ponding Elevation
PCSWMM.NET Storage Node Godman

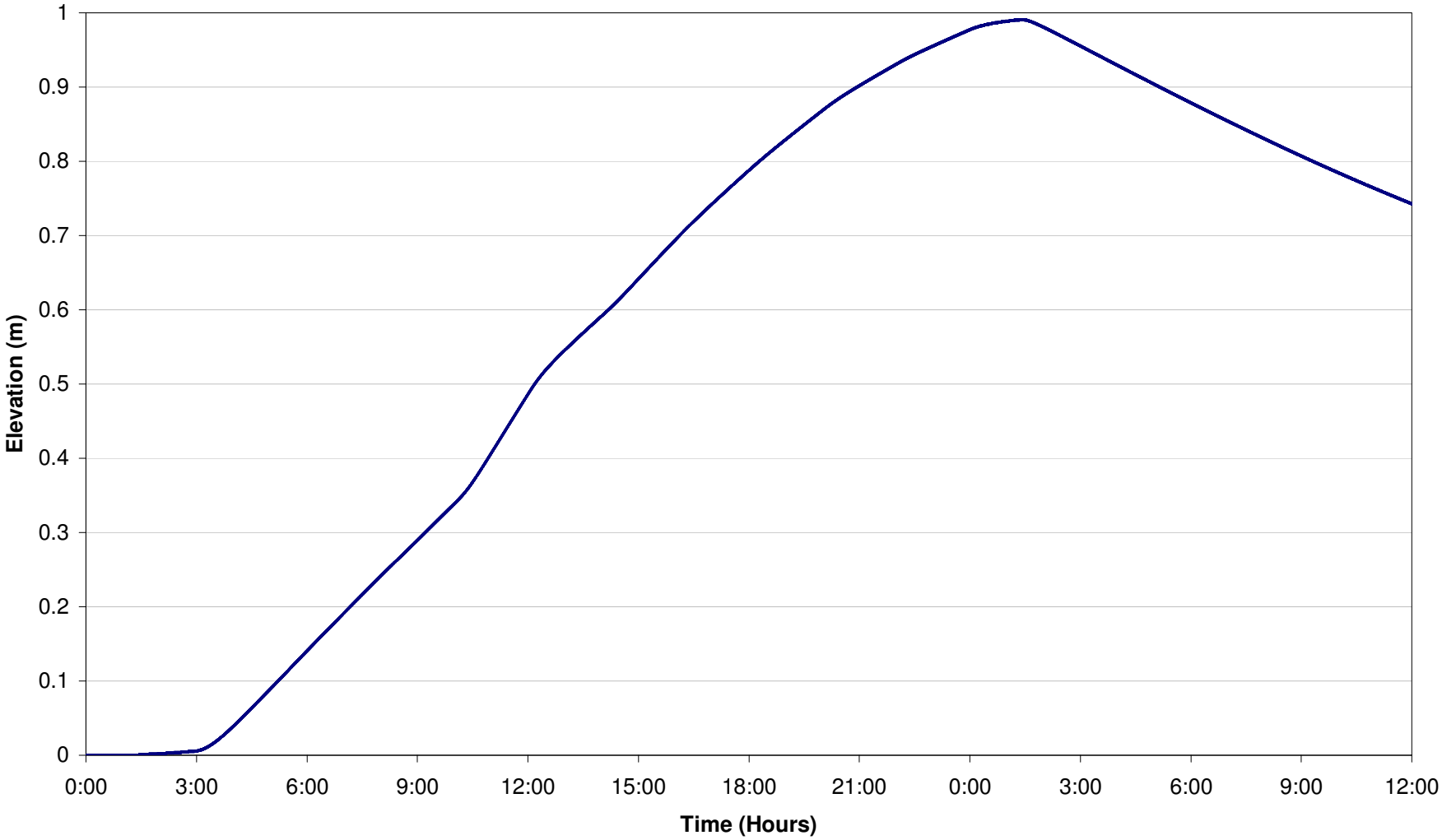


Figure L-5: Pipe West Storage Facility - 200 yr Ponding Elevation
PCSWMM.NET Storage Node Godman

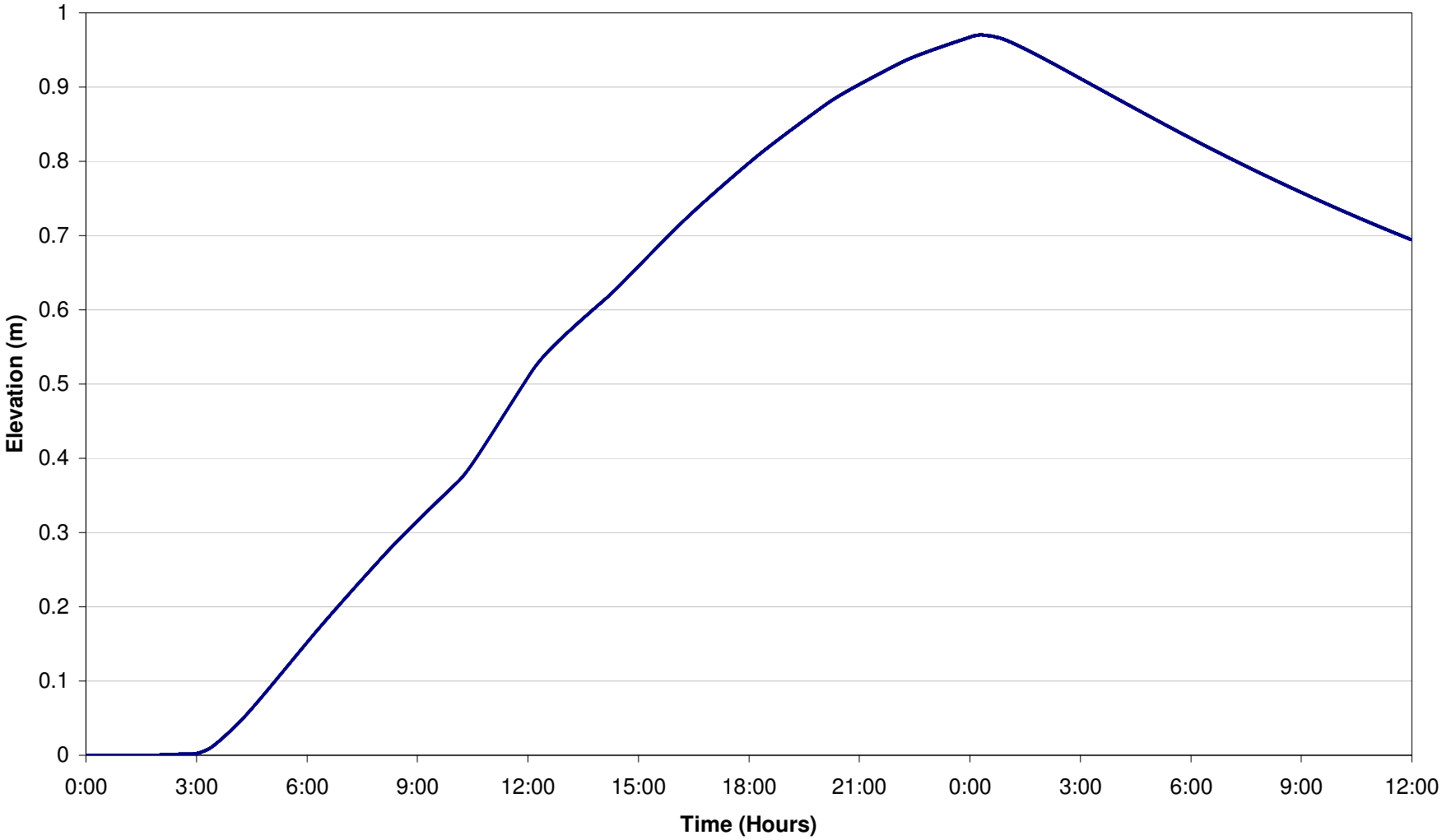


Figure L-6: Pipe Middle Storage Facility - 200 yr Ponding Elevation
PCSWMM.NET Storage Node Godman

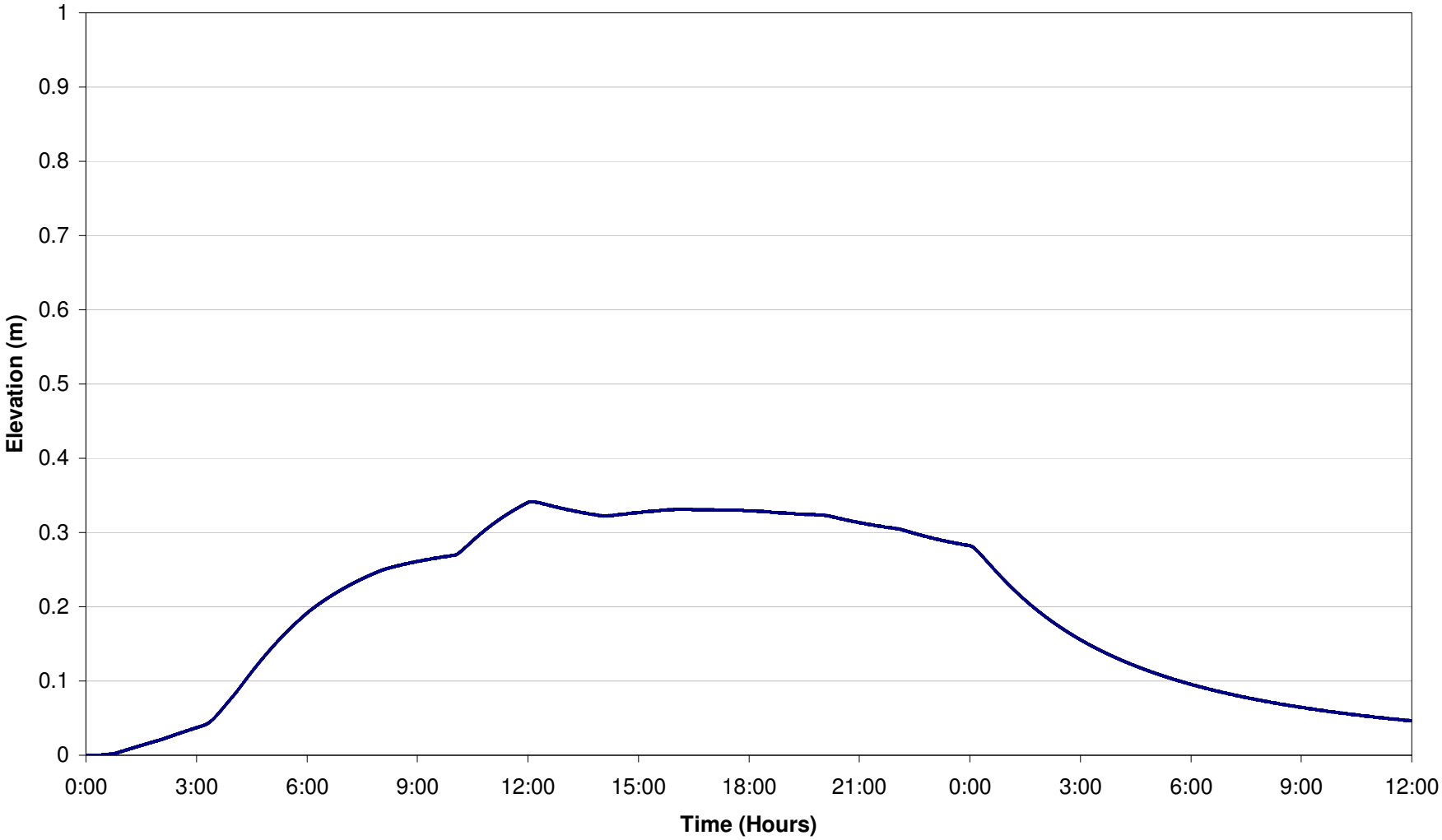


Figure L-7: Pipe East Branch 1 Storage Facility - 200 yr Ponding Elevation
PCSWMM.NET Storage Node Godman

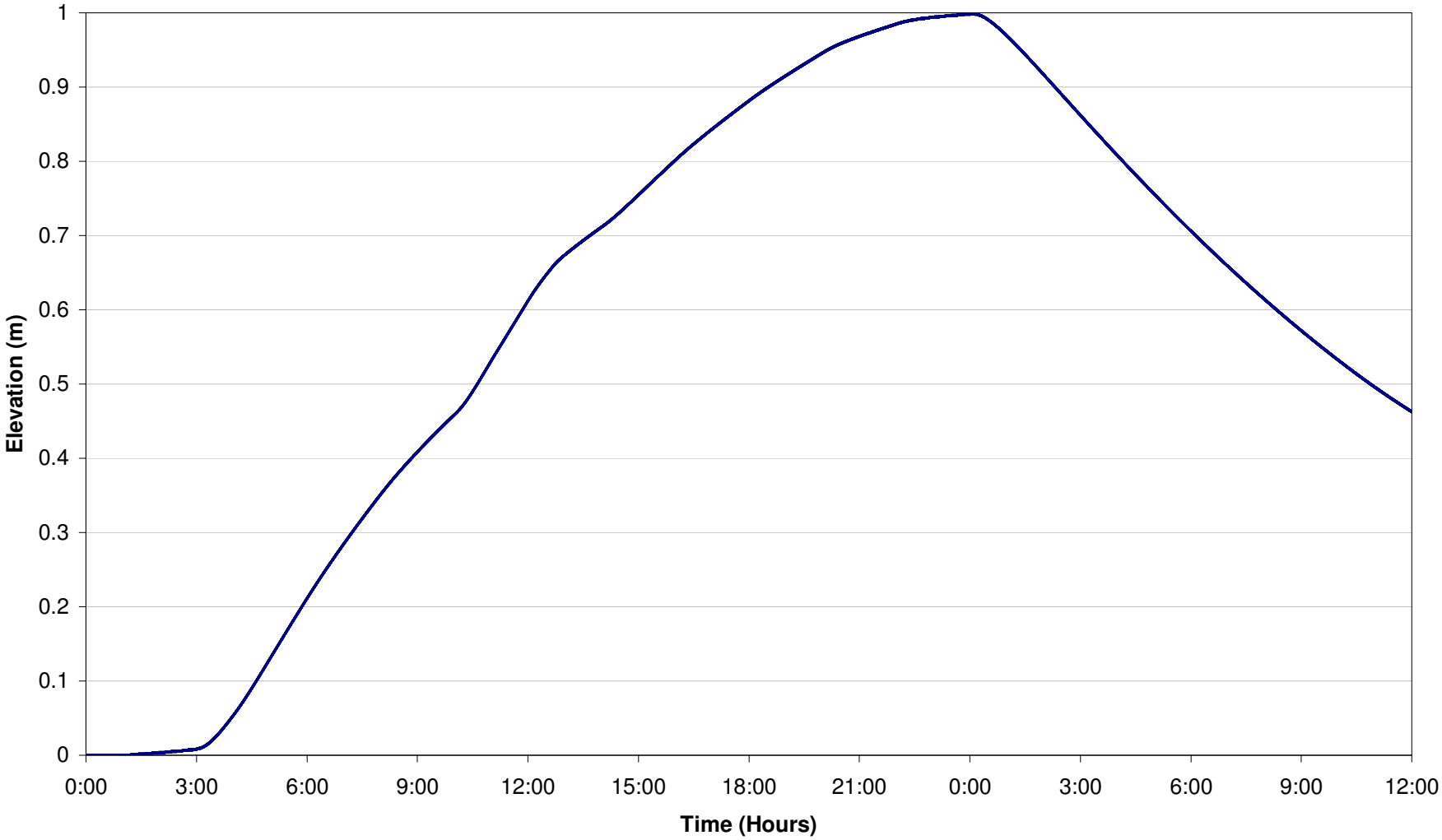
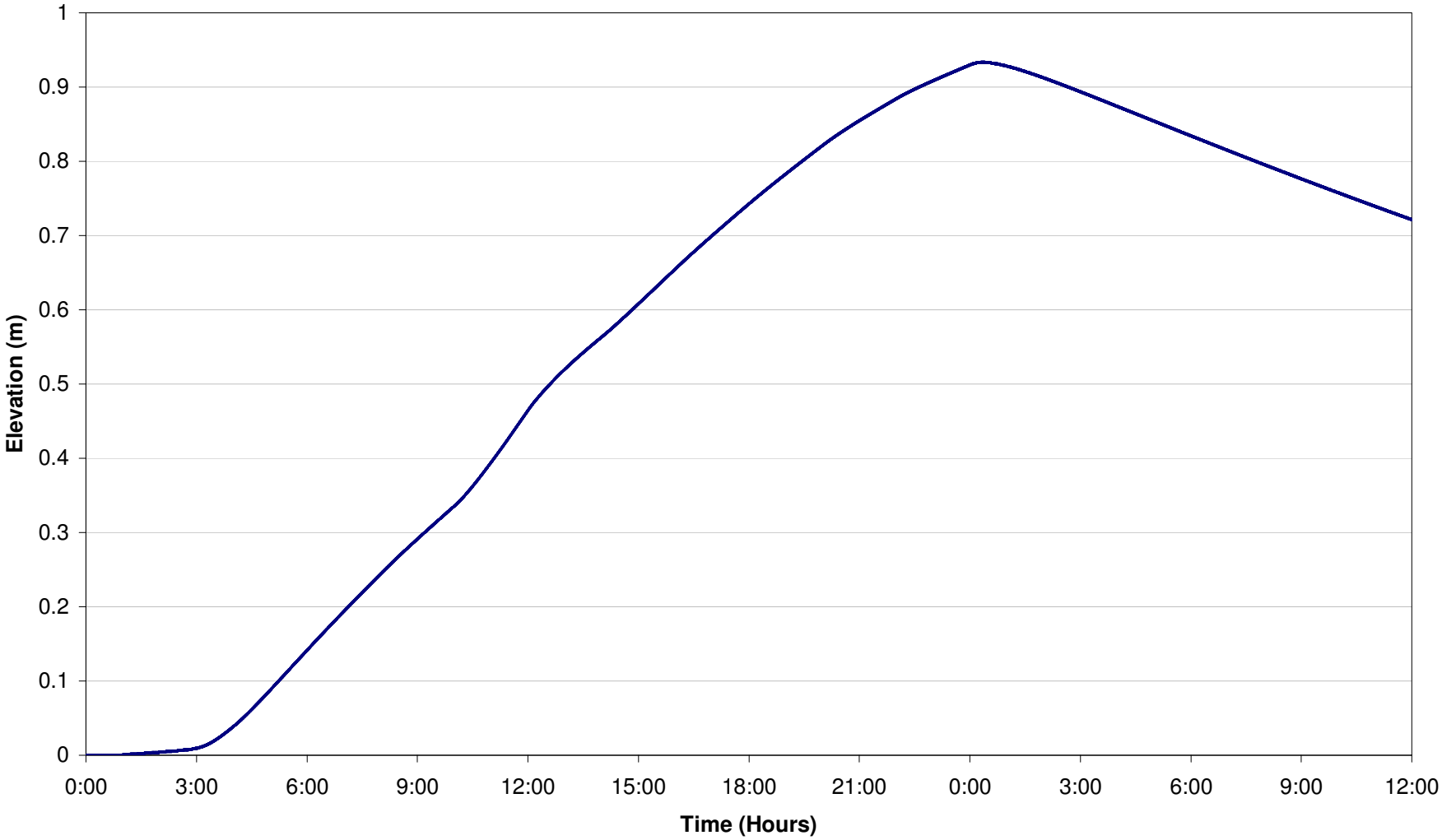


Figure L-8: Pipe East Branch 2 Storage Facility - 200 yr Ponding Elevation
PCSWMM.NET Storage Node Godman



DISTRICT OF WEST VANCOUVER
INTEGRATED STORMWATER MANAGEMENT PLAN FOR PIPE, WESTMOUNT, CAVE, TURNER AND GODMAN CREEKS

APPENDIX M

AQUA-TEX PFC ASSESSMENT EXECUTIVE SUMMARY

Executive Summary

Background

In the spring of 2011, Aqua-Tex Scientific Consulting Ltd. undertook a stream health assessment of the streams within the boundaries of the Rodgers Creek Area Development Plan to the west of Rodgers Creek. This assessment utilized the Proper Functioning Condition (PFC) Assessment criteria to determine the current physical condition of the streams, assess their ability to withstand a 1 in 25 year storm event, and make recommendations for their protection and remediation. This assessment was intended to guide the management of these steep mountain streams which have a history of logging, repeated forest fire, and the construction of Cypress Bowl Road. There are remnants of historical activities that may pose a risk to stream health such as abandoned skid roads and stream crossings, logging debris in the channels, and slope instability. The intent was to identify these issues such that they could be monitored and addressed in conjunction with planning for future activities on these hillsides.

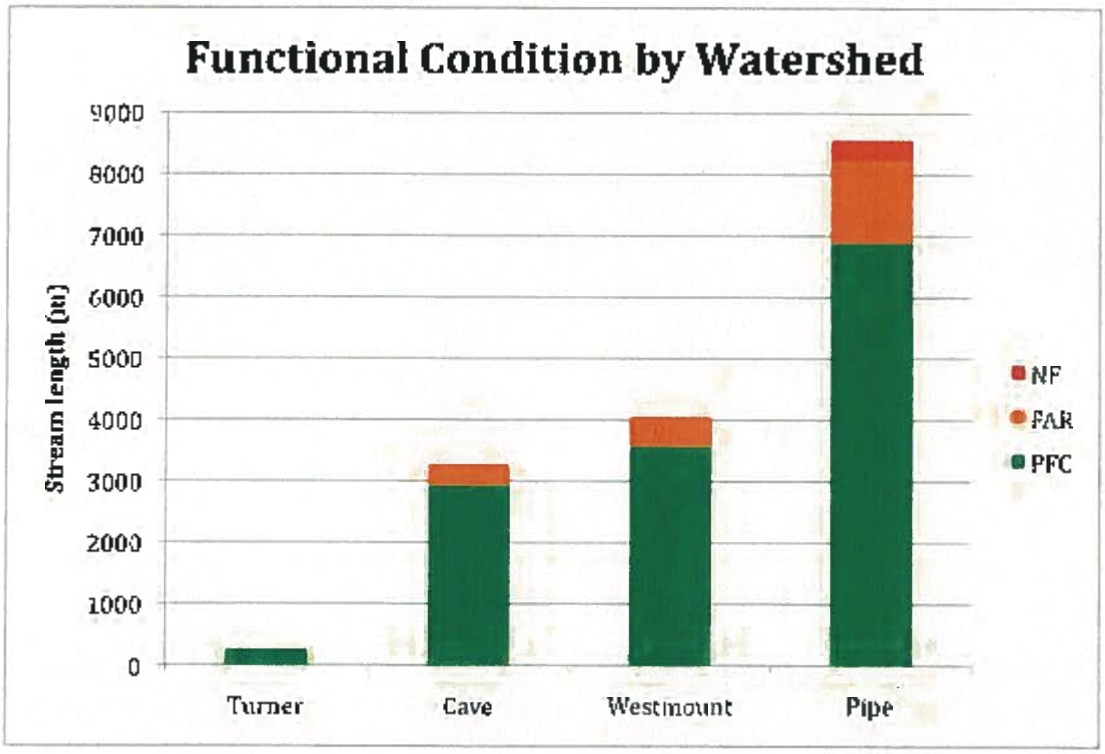
The PFC assessment method was developed by the US Bureau of Land Management and uses 17 criteria in the categories of hydrology, vegetation and erosion/deposition, to determine the status of each segment ("reach") of each creek. The assessment is performed by an interdisciplinary team who simultaneously walk each reach of the stream and determine whether the stream is in "proper functioning condition", or whether it is "functional- at-risk" or "non-functional". These determinations are then used to rate the priority of restoration activities both within the individual watershed (catchment), and between watersheds. They can also be used for future monitoring.

This assessment is a follow-up assessment to a more limited PFC assessment completed by the same team in 2006. The 2011 assessment covered the area between the Upper Levels Highway and the headwaters of each watershed, whereas in 2006 upper limit of the assessment was the 1200' elevation development area boundary.

Findings

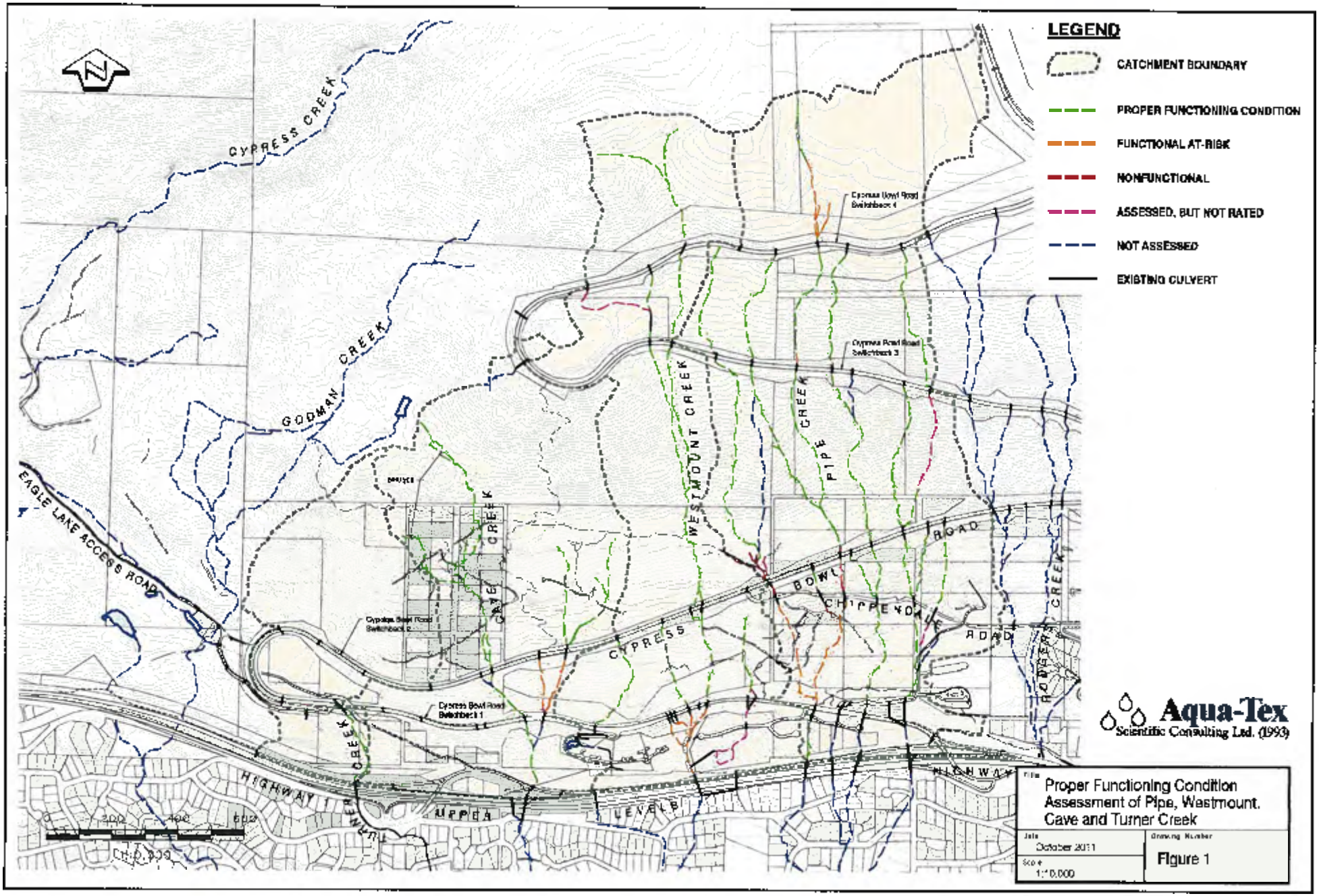
Pipe Creek and its many tributaries (West Branch, Tributary L, M, N, P, R, Q), Westmount Creek and its tributaries (West Branch, West Tributary, East Tributary and Tributary U), Cave Creek and it tributaries (Block C East Tributary, East Branch, West Tributary and West Branch) and Turner Creek were assessed from the Upper Levels Highway to the top of each watershed. In all, 58 reaches, representing 16.1 km of stream were assessed. Of all the reaches assessed, 13.6 km were in Proper Functioning Condition (PFC), 2.2 km were functional at risk, and 0.3 km were non-functional (see chart below). Of those that were in PFC, many reaches had

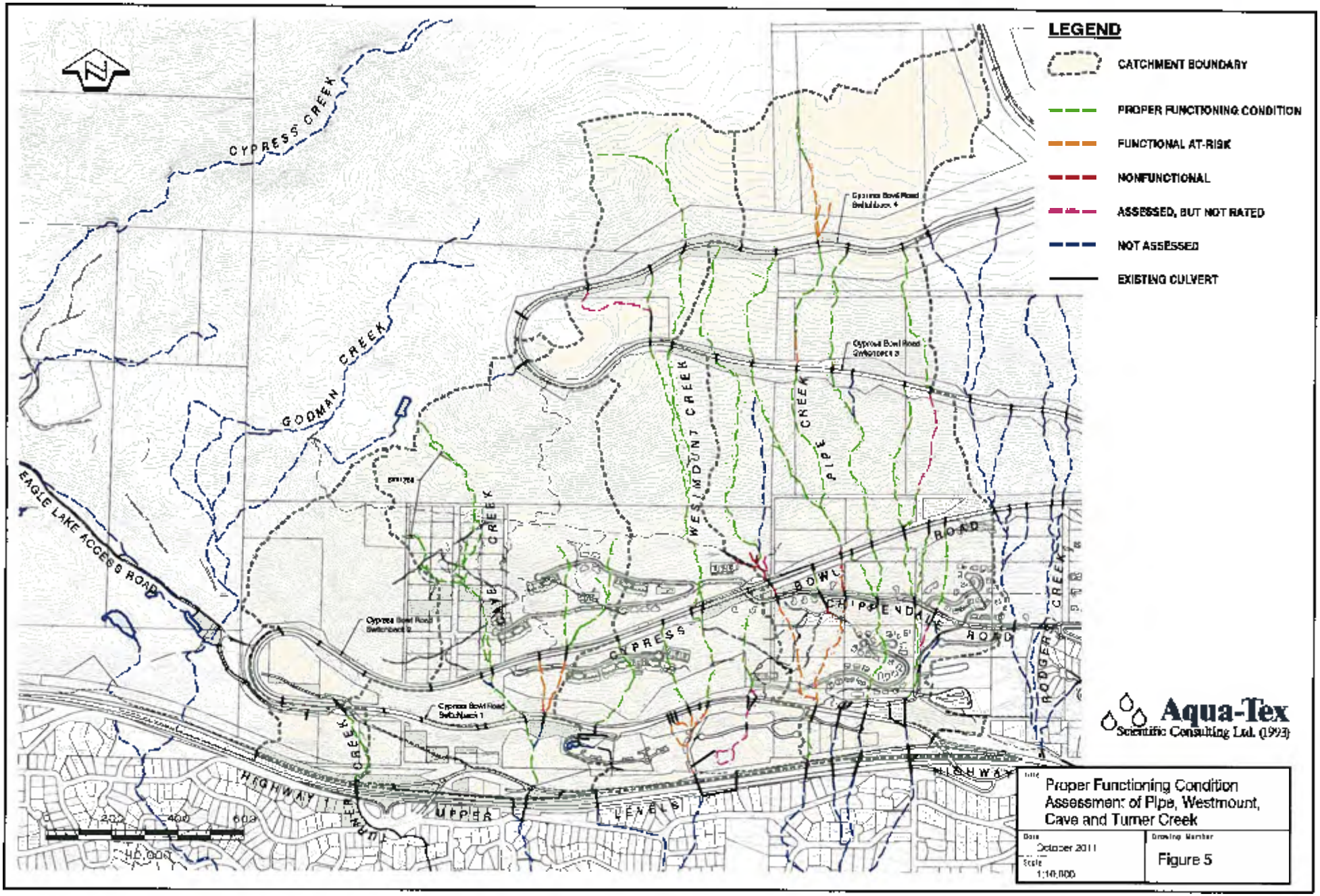
isolated sections that were at risk or non-functional (*e.g.*, old road crossings) but those issues were not significant enough to change the rating of the entire reach. The ratings are colour-coded on an overview map (Figure 1) and on individual watershed maps (Figures 2, 3 and 4). A second overview map of all four watershed areas is overlain with the proposed development (Figure 5).



The single greatest cause of stream degradation was old road crossings, particularly old haul and skid roads which had never been decommissioned, and the remnants of two logging flumes that had been used to transport logs down the hillsides in the 1920'a and 1930's. Many of these crossings are causing streams to "head cut" that is, to allow the stream bed materials to be washed away, moving in an upstream direction, until the water hits bedrock. The second greatest cause of degradation was excessive logging slash in the stream channels. Logging slash tended to cause the streams to avulse (jump out of their channels) and run over the forest floor in an undefined manner, picking up debris and washing away soil. In most cases, the old road crossings are relatively simple to fix with hand tools and careful placement of wood and rock. In some instances heavy equipment will be needed, but many of these sites coincide with proposed development areas, and can be remediated as part of the development process. Mountain bike trails, which tend to follow old roads in many places, are problematic in some areas.

Historical photographs of North Shore flumes, corduroy roads and logging practices are presented in the Logging and Fire History section of this report.


LEGEND
CATCHMENT BOUNDARY
PROPER FUNCTIONING CONDITION
FUNCTIONAL AT-RISK
NONFUNCTIONAL
ASSESSED, BUT NOT RATED
NOT ASSESSED
EXISTING CULVERT
CYPRESS CREEK
GODMAN CREEK
EAGLE LAKE ACCESS ROAD
WESTMOUNT CREEK
CAVE CREEK
PIPE CREEK
TURNER CREEK
CYPRESS BOWL ROAD
CHIPPEWA ROAD
HIGHWAY 1
UPPER LEVEL
Cypress Bowl Road Switchback 4
Cypress Bowl Road Switchback 3
Cypress Bowl Road Switchback 2
Cypress Bowl Road Switchback 1
Aqua-Tex
Scientific Consulting Ltd. (1993)
Proper Functioning Condition Assessment of Pipe, Westmount, Cave and Turner Creek
October 2011
Figure 1


LEGEND
CATCHMENT BOUNDARY
PROPER FUNCTIONING CONDITION
FUNCTIONAL AT-RISK
NONFUNCTIONAL
ASSESSED, BUT NOT RATED
NOT ASSESSED
EXISTING CULVERT
CYPRESS CREEK
GOODMAN CREEK
EAGLE LAKE ACCESS ROAD
WESTMOUNT CREEK
CAVE CREEK
TURNER CREEK
CYPRESS BOWL ROAD
CHIPPENDALE ROAD
RODGER CREEK
HIGHWAY 1
UPPER LEVELS
Aqua-Tex
Scientific Consulting Ltd. (1993)
Proper Functioning Condition Assessment of Pipe, Westmount, Cave and Turner Creek
October 2011
1:10,000
Figure 5

Recommendations

There are several overarching recommendations in addition to those that are specific to each reach. They are listed below. Recommendations pertaining to specific reaches have been ranked and presented in order of priority. These recommendations are made without specifying who is responsible for carrying them out as land ownership along these watercourses may be Provincial, District of West Vancouver or private. The highest priority recommendations are presented in the table following the general recommendations.

General Recommendations

1. Permanent Photopoint Monitoring (repeat photography) should be set up on key stream reaches to monitor changes in stream health, vegetation composition and growth and recreational activity. These sites should be permanently marked and tied to Aqua-Tex's existing database from this project.

2. Water level instrumentation should be installed in representative creeks in order to develop an understanding of flow patterns and the potential effects of both a changing climate and development. Both have the potential to increase the intensity of flows. Flow information will be particularly useful in those areas where minor tributaries, the were created as artifacts of Cypress Bowl Road construction, may need to be routed into other drainage courses.

   Water quality instrumentation to monitor temperature and conductivity should be installed at the top and bottom of Pipe Main and Westmount Main. Temperature sensors should be also be installed in Rodgers and Cave Creeks (main channels) at the top and bottom of the creeks, as well as in the soil and air at the top and bottom of one watershed.

3. Where each creek meets the Upper Levels Highway, there is a chainlink fence that crosses the stream. These crossings should either be removed, or hinged such that debris from high flow events cannot get entangled and block the channels.

4. There is a need to increase homeowner education and understanding of stream health and riparian areas. Dumping of yard waste, removal of trees and encroachment of invasive species (primarily from the yard waste) is becoming a greater issue in the lower reaches of the watersheds. An excellent resources is "Living by Water" (www.livingbywater.ca) both in electronic and book form. The District of West Vancouver should continue to work with the West Vancouver Streamkeepers to promote homeowner and strata council education.

5. All of the stream crossings on Cypress Bowl Road should be permanently marked with signs that name each stream.

6. Recreational use of the Rodgers Creek ADP area is extensive and will become more intense as development proceeds and the local population increases. Trails which currently receive minimal use, and which do not currently pose a threat to riparian health, could become problematic if traffic increase. Trails should be assessed to determine which should be retained and which ones should be permanently decommissioned or moved in order to prevent trampling and erosion of riparian areas. Where necessary, fencing and programmed access points may be required to protect stream health.

7. Historical files and photos pertaining to the Rodgers Creek ADP area should be assembled and catalogued. This should include mapping, particularly of the historical road, trail and flume networks, and photos of the community and landscape.

8. There is an extensive network of old skid roads, trails, flume rights-of-way and haul roads. These should be mapped both as part of the trail planning program and to identify key areas that need to be realigned, stabilized or decommissioned to protect stream health. Many of these corridors are being used as mountain bike trails. Most have temporary bridge crossings, which, in general, are not causing problems. Those trails that are retained should have proper stream crossings installed on them to prevent damage to stream banks.

Ranking of highest priority recommendations, by stream reach.

Reach Name	Recommendations	Restoration Priority	Priority Ranking
Cave Main Reach 1	Contact property owner (Highways) and notify them of the western red cedar that has blown over the fence near upper levels highway. Suggest to owner a modification to fence to prevent debris from being trapped.	High	1
Turner Reach 1	Send to DWV/Highways as property owners - consider clearing the culvert under Cypress Bowl Road and enact steps to prevent it from being clogged again. Do not allow the cleared material to enter the downstream channel. Pull back and stabilize the slope of the municipal fill dump. Install a retaining wall to ensure that the fill will not reach the edge of the riparian buffer. Have DWV crews remove the silt in the upper pools by hand. There is a serious water quality hazard in the Public Works Yard, as typified by a gas tank whose overflow/spillage drains into a catch basin that feeds Turner Creek. This risk should be managed by DWV through a proper spill reduction and mitigation program.	High	2

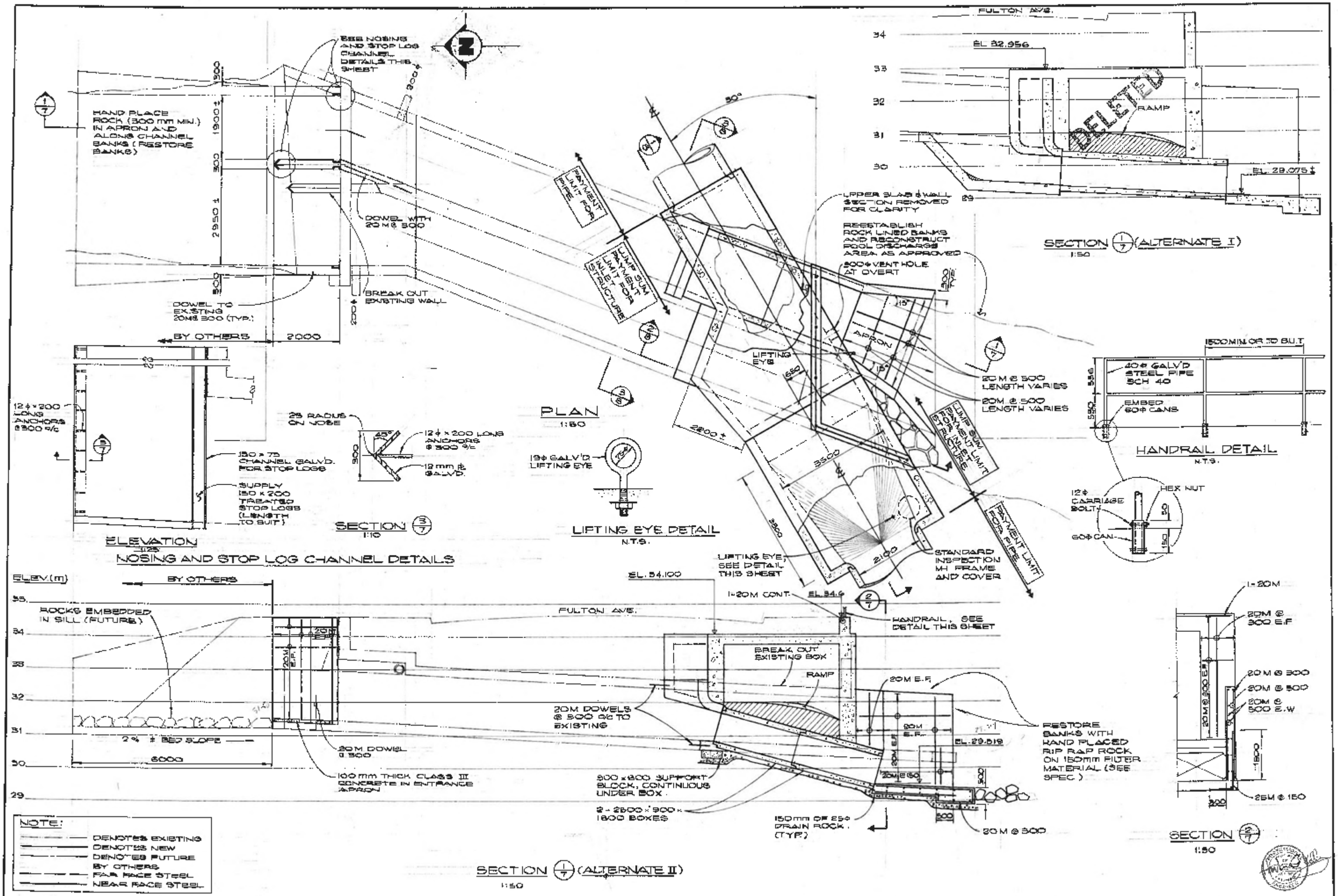
Reach Name	Recommendations	Restoration Priority	Priority Ranking
Pipe Main Reach 6	Monitor where there are avulsions and consider putting the creek back into its main channel (by hand) over time. This may include carefully removing the old cribbing along the road crossing, taking care not to destabilize the channel. The cribbing is unlikely to support the weight of heavy equipment, so caution should be exercised when removing the cribbing.	High	3
Pipe Tributary P Reach 5	Cribbing on the skid road could be removed. If the skid road is to be maintained as a trail, a proper culvert or bridge should be installed. Alternatively, the trail (road) could be decommissioned through the installation of water bars.	High	4
Westmount Main Reach 1	Install photopoint monitoring locations at the avulsion (high priority). Based on monitoring information over time consider future work to stabilize creek channel and improve structural diversity of riparian area through planting of native species at the direction of the aquatic ecologist and hydrological engineer.	High	5
Pipe Tributary R Reach 1	Monitor this system and consider work to prevent destabilization of the channel when the existing wood rots out. Consider planting some of the banks with native species which will add to structural and species diversity. Review the opportunity to realign upper watershed flows in Trib R, above Cypress Bowl Road Switchback 2, into the Westmount East Tributary, recognizing existing man-made lotic and lentic features within the existing development. Determine whether road construction has resulted in additional water being diverted into this channel. Also monitor bedload in the system and seek the input of a hydrological engineer on the further opportunities to stabilize the substrate if necessary.	High	6
Pipe Main Reach 2	Revisit the geotechnical assessment of slope stability along the channel. Consider stabilizing the slope below the proposed road crossing. Plant cedars and other conifers and restore the step-pools through the placement of large wood and rock, e.g., installation of log weirs following Rosgen's Applied Fluvial Geomorphology design.	High	7
Pipe Tributary N Reach 6	The culverts should be inspected by Highways to determine whether they are carrying water or are rusted through. The sizing of the culverts should also be checked (were they sized for 100 or 200 year storm event?). The creek should be studied for its potential to be realigned on both the secondary skid road and the haul road back into its old channel (high priority). This reach should be protected and considered a reference reach as it is in excellent condition, except for the road crossing. (Installation of Photopoint monitoring)	High	8

Reach Name	Recommendations	Restoration Priority	Priority Ranking
Pipe Tributary Q Reach 1	Redirect water into the old channel and berm off and fill the head cut channel.	High	9
Pipe Tributary N Reach 1	Managing large trees is a priority within this reach. The trees should be considered for their structural integrity and will require adequate setbacks to be safely retained. The input of a tree care professional on this process would be recommended.	High	10
Westmount Main Reach 2	Restore the channel to a single thread where skid road crosses (Chapman #5091). During trail construction and development, the stream channel disturbance must be designed to maintain proper functioning condition.	High	11
Westmount Main Reach 3	This stream is high energy and appropriate setbacks will have to be determined to retain PFC.	High	12
Pipe Main Reach 1	Photopoint monitor the shotcreted area, particularly following very large rain or runoff events. Further bank stabilization may be needed. Future view work on trees should be done under the direction of a tree care professional with the input of a biologist and approval by DWV.	High	13
Pipe Main Reach 4	This reach should be treated as a reference reach. It is representative of a typical stream that is in good condition. It is in transition between the logged condition and maturing overstory and has a very good age class distribution. Establish several long-term photopoint monitoring sites and permanently mark them (drill steel). The reach should be re-examined and photographed every few years.	High	14

DISTRICT OF WEST VANCOUVER
INTEGRATED STORMWATER MANAGEMENT PLAN FOR PIPE, WESTMOUNT, CAVE, TURNER AND GODMAN CREEKS

APPENDIX N

SAMPLE DIVERSION INLET AND INLET PROTECTION DESIGNS



ELEVATION
1:25

SECTION 3/7
1:10

PLAN
1:50

LIFTING EYE DETAIL
N.T.S.

NOSING AND STOP LOG CHANNEL DETAILS

SECTION 1/7 (ALTERNATE I)
1:50

SECTION 1/7 (ALTERNATE II)
1:50

SECTION 2/7
1:50

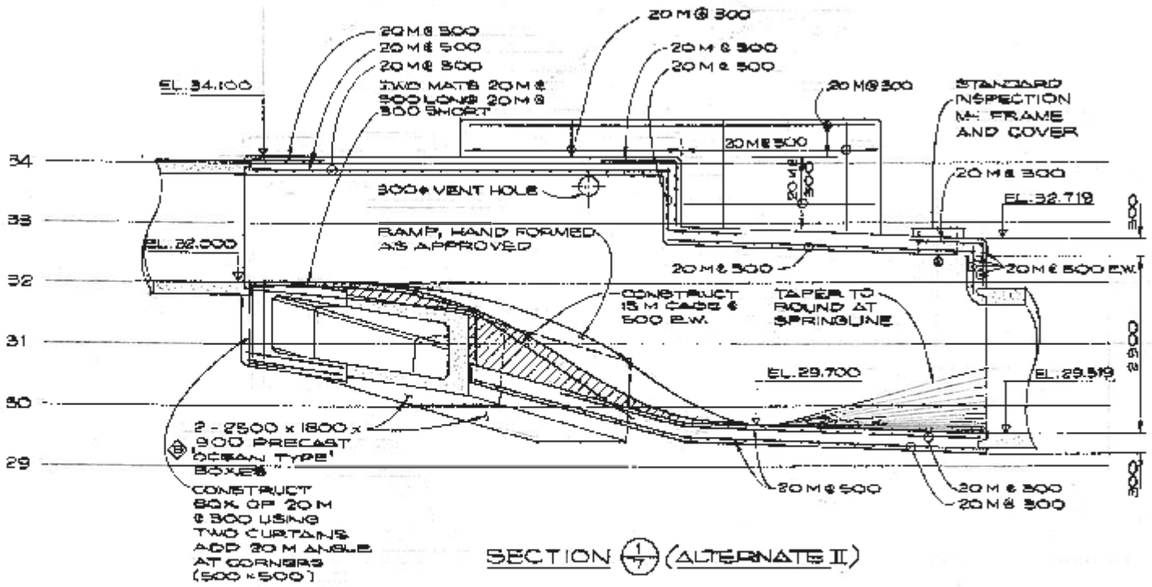
ISSUE	DATE	DSN	CHD	APPD	DESCRIPTION
B	03/09/84	V.B.	W.K.		CONC. RAMP ADDED IN SECTIONS 1/7 (ALTERNATE I AND ALTERNATE II)
C	SEP/84	R.H.			ISSUED FOR CONSTRUCTION
D	OCT.5/84		W.K.		REVISED WEST WALL INLET STRUCTURE

DESIGNED H.K.
DRAWN R.H./V.B.
CHECKED W.K.

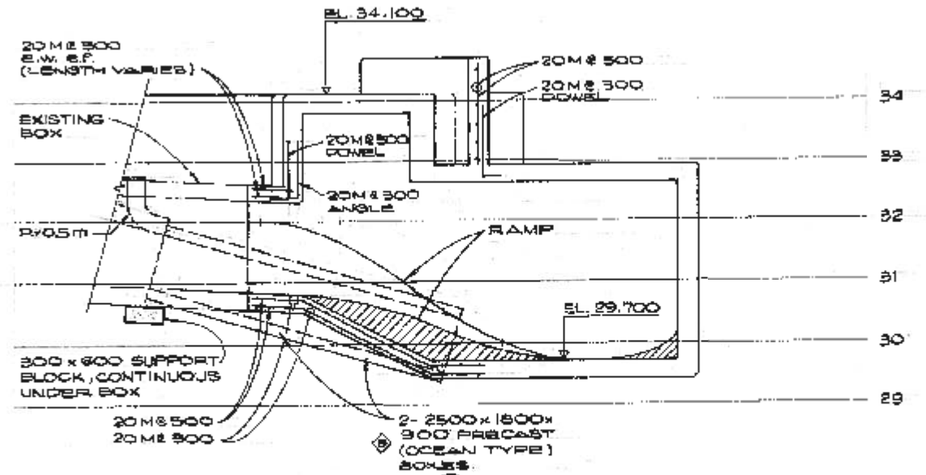
DAYTON & KNIGHT LTD.
CONSULTING ENGINEERS
Aug 31/84

DISTRICT OF WEST VANCOUVER
CONSTRUCTION OF LAWSON & McDONALD STORMWATER INTERCEPTOR-STAGE II
McDONALD CREEK INLET STRUCTURE-PLAN AND SECTIONS

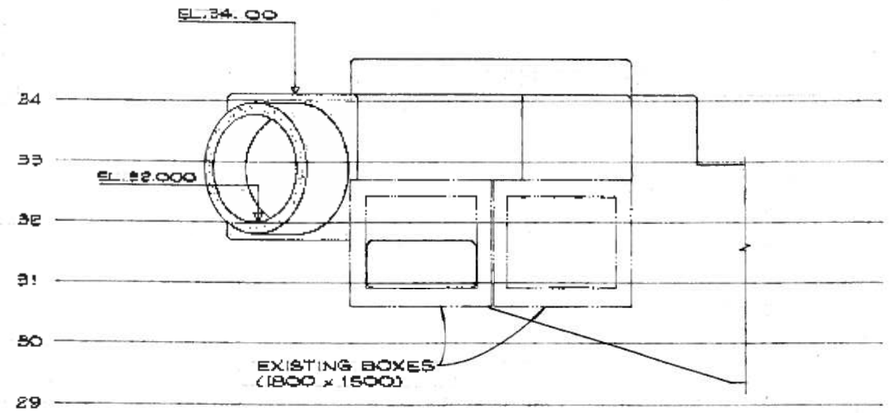
SCALE: AS SHOWN
DRAWING No. 32.29.4
SHEET 7 OF 10 ISSUE D



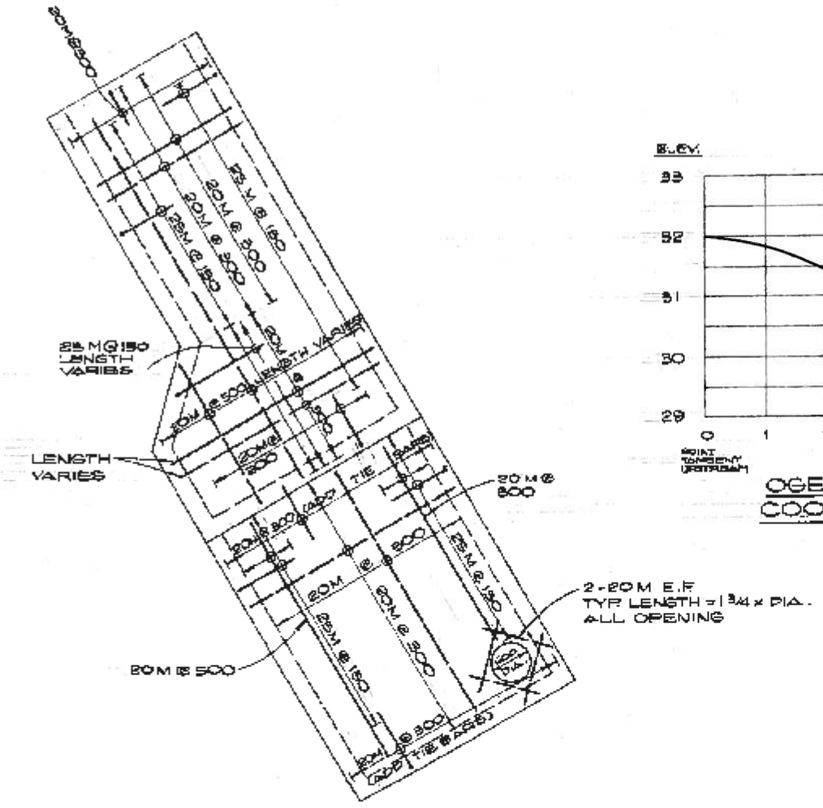
SECTION 1/7 (ALTERNATE II)



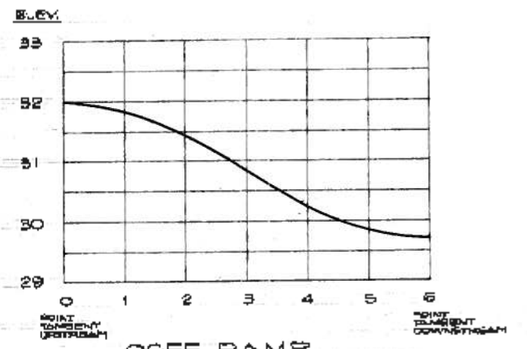
SECTION 2/7 (ALTERNATE II)



SECTION 3/7 (ALTERNATE II)



ROOF PLAN



OGEE RAMP COORDINATES (ALTERNATE II)

NOTE:
- DENOTES EXISTING
- DENOTES NEW
- FAR FACE STEEL
- NEAR FACE STEEL

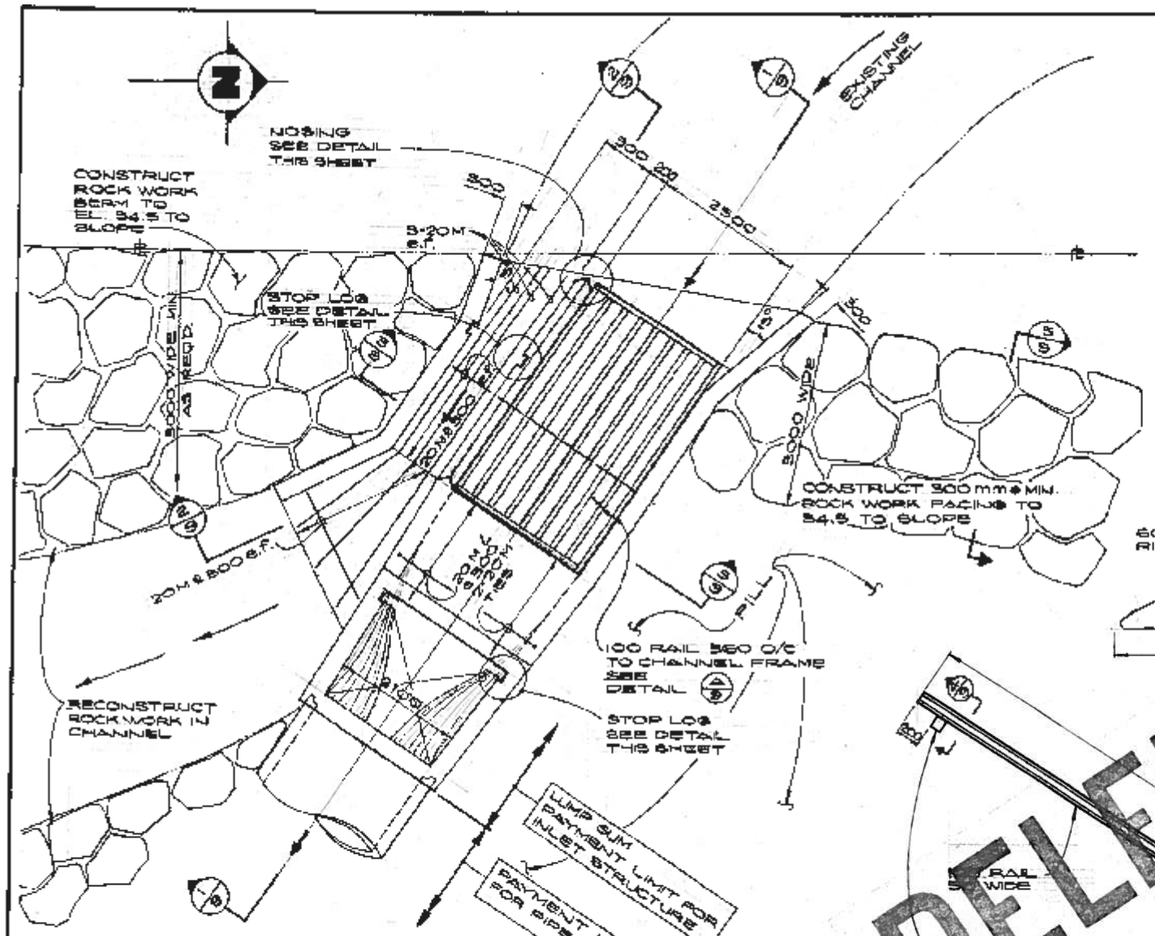
ISSUE	DATE	DRN	CHD	APPD	DESCRIPTION
B	12/09/84	V.B.			'DEPTH SIZE OF PRECAST OCEAN TYPE BOXES CHANGED TO 900mm'
C	SEPT/84	J.S.			'ISSUED FOR CONSTRUCTION'

DESIGNED H.K.
DRAWN V.A.S.
CHECKED

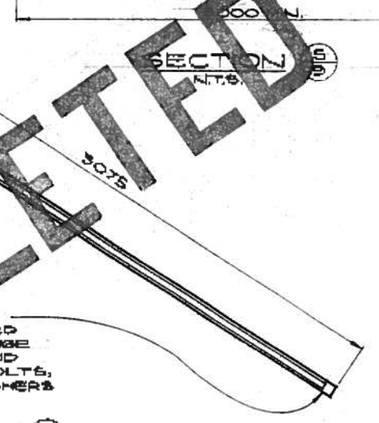
DAYTON & KNIGHT LTD.
CONSULTING ENGINEERS
Aug 31/84

DISTRICT OF WEST VANCOUVER
CONSTRUCTION OF LAWSON & McDONALD STORMWATER INTERCEPTOR--STAGE 11
McDONALD CREEK INLET: STRUCTURE-SECTIONS

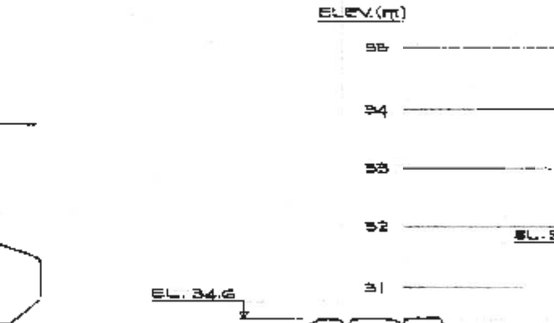
SCALE: 1:50
DRAWING No. 52.29.E
SHEET 8 of 10 ISSUE C



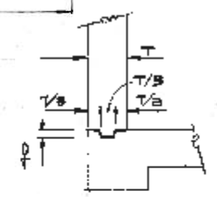
PLAN
1:50



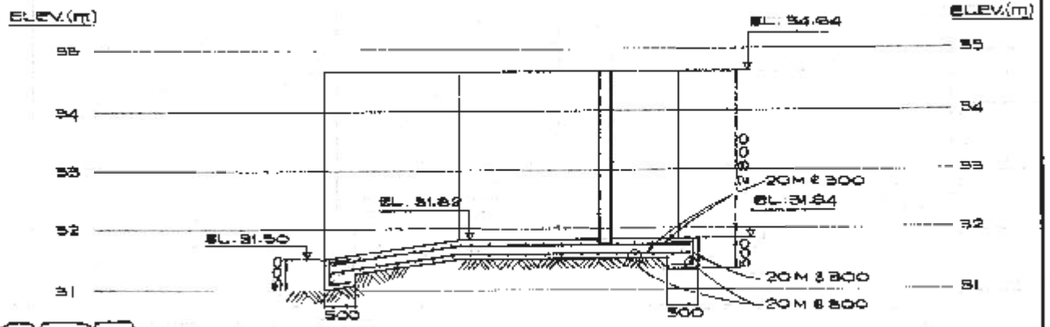
DETAIL (A/9)
N.T.S.



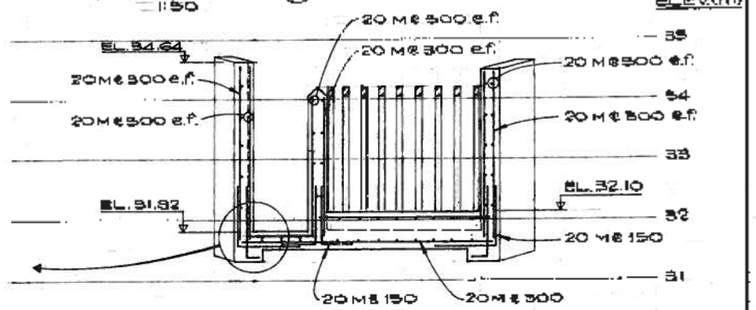
SECTION (5/9)
N.T.S.



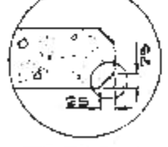
DETAIL (KEYWAY)
N.T.S.



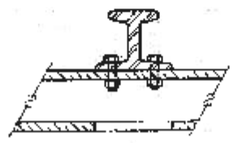
SECTION (2/9)
1:50



SECTION (3/9)
1:50

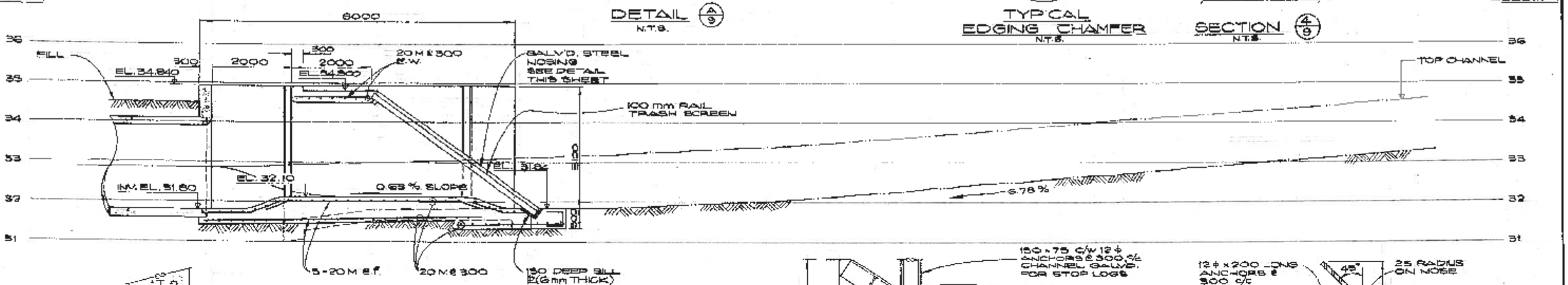


TYPICAL EDGING CHAMFER
N.T.S.

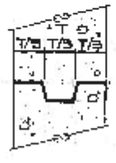


SECTION (4/9)
N.T.S.

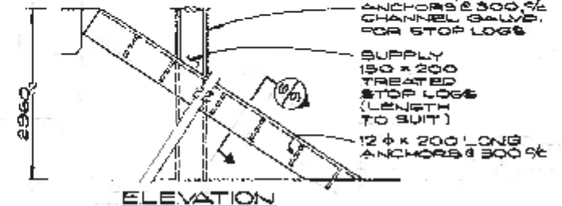
AFTER FABRICATION TOUCH UP WITH GALVANIZING PAINT (GALVACON OR EQUAL) GRIND ALL WELDS AND SHARP EDGES SMOOTH



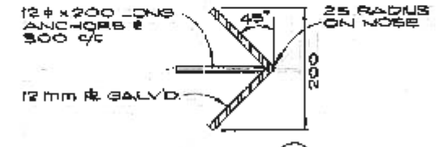
SECTION (1/9)
1:50



TYPICAL JOINT DETAIL



ELEVATION
1:10



SECTION (6/9)
1:5

NOSING AND STOP LOG CHANNEL DETAILS

DELETED

REVISIONS	ISSUE	DATE	DRN	CHD	APPD	DESCRIPTION
	B	SEPT./84	J.S.			"ISSUED FOR CONSTRUCTION"

ISSUE	DATE	DRN	CHD	APPD	DESCRIPTION

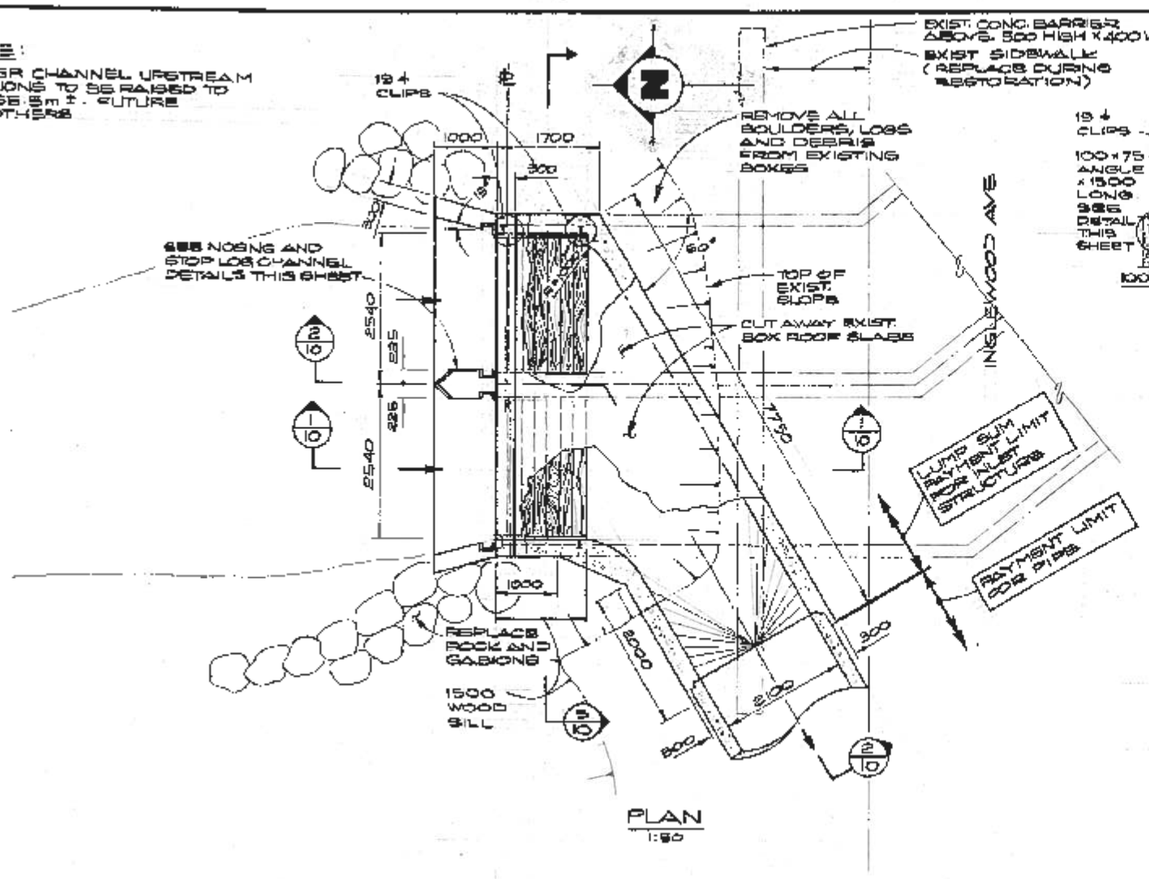
DESIGNED H.K.
DRAWN
CHECKED

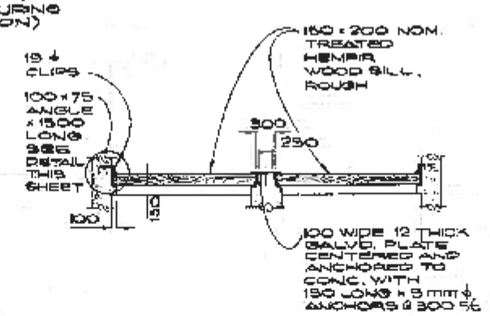
DAYTON & KNIGHT LTD.
CONSULTING ENGINEERS
Aug. 31/84

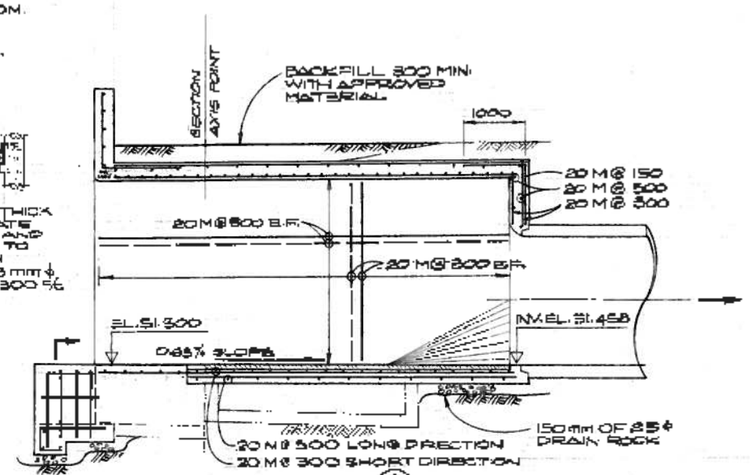
DISTRICT OF WEST VANCOUVER
CONSTRUCTION OF LAWSON & McDONALD STORMWATER INTERCEPTOR-STAGE II
LAWSON CREEK INLET STRUCTURE AT FULTON-ALTERNATE I

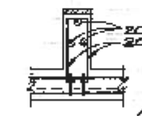
SCALE: AS SHOWN
DRAWING No. 52/49-4
SHEET 9 OF 10 ISSUE B

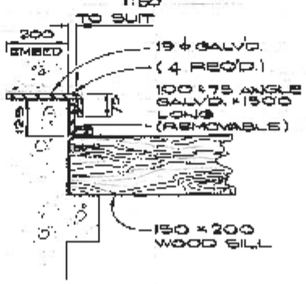
NOTE:
OUTER CHANNEL UPSTREAM GABIONS TO BE RAISED TO EL. 55.85m ± FUTURE BY OTHERS

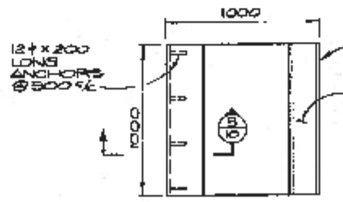


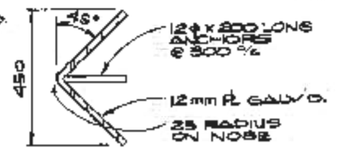




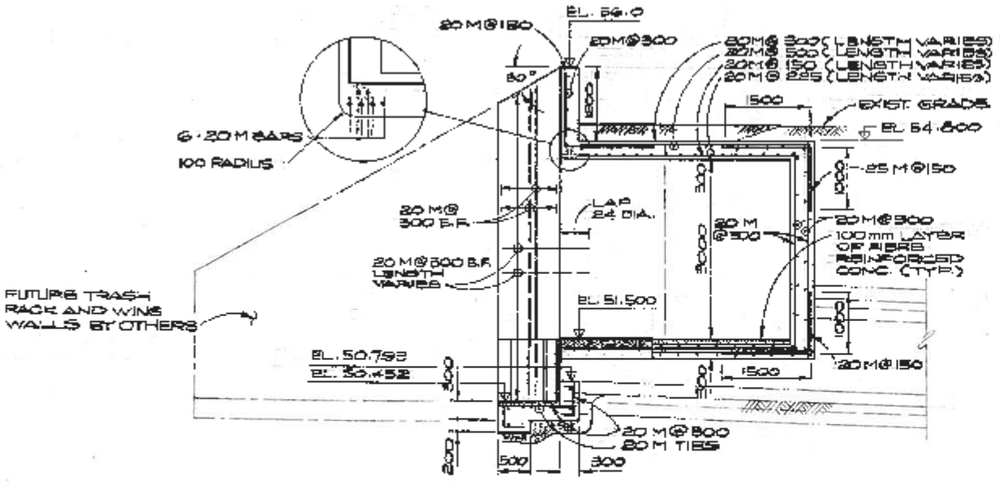


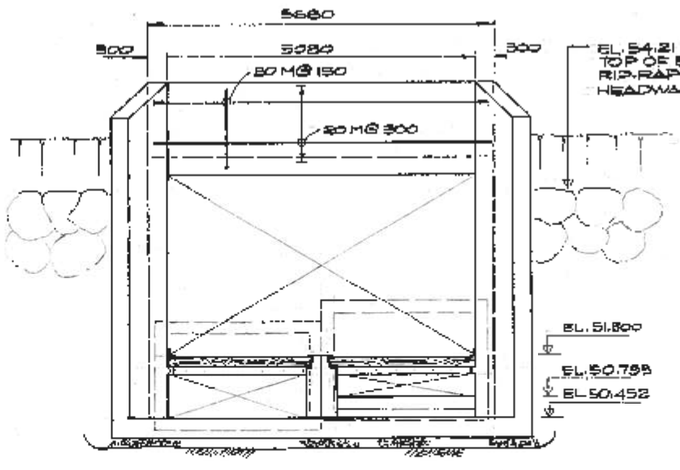


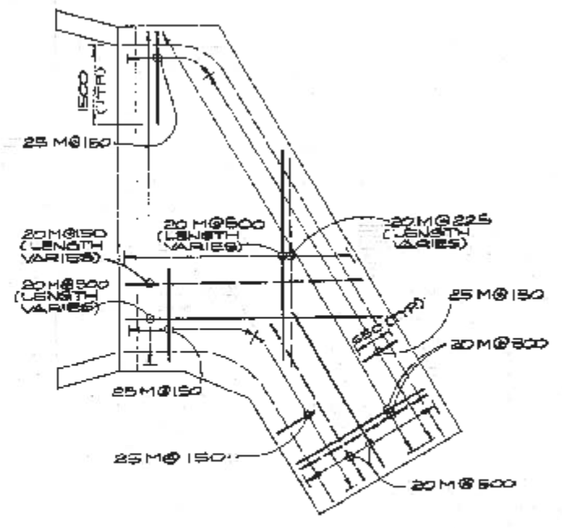




NOSING AND STOP LOG CHANNEL DETAILS







NOTE:
- ——— DENOTES EXISTING
- ——— DENOTES NEW
- ——— DENOTES FUTURE BY OTHERS
- ——— FAR FACE STEEL
- ——— NEAR FACE STEEL

ISSUE	DATE	DRN	CHD	APPD	DESCRIPTION
B	SEPT./84	J.S.			ISSUED FOR CONSTRUCTION
C	SEPT./84	J.R.			SLAB REVISED TO ADD WOOD SILL

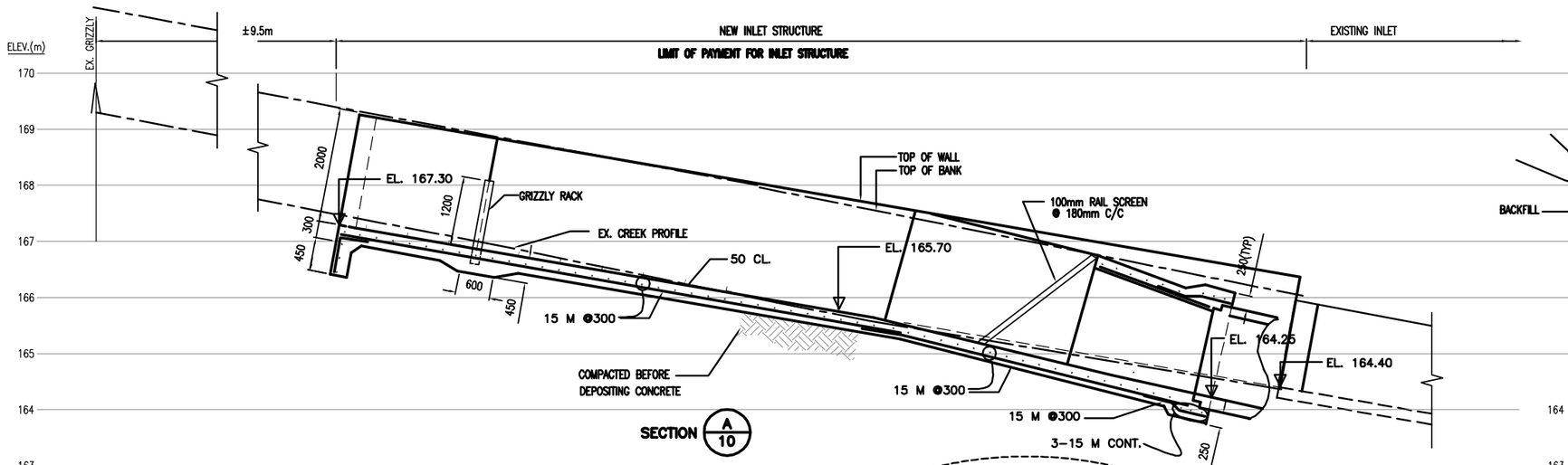
ISSUE	DATE	DRN	CHD	APPD	DESCRIPTION

DESIGNED H.K.
DRAWN DBS
CHECKED KW

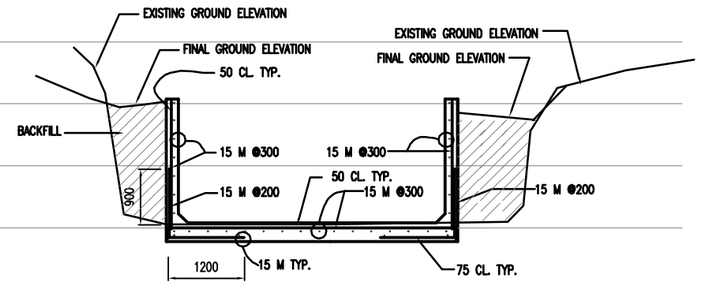
DAYTON & KNIGHT LTD.
CONSULTING ENGINEERS
Aug 31 /84

DISTRICT OF WEST VANCOUVER
CONSTRUCTION OF LAWSON & McDONALD STORMWATER INTERCEPTOR-STAGE 1
LAWSON CREEK INLET STRUCTURE AT INGLEWOOD-ALTERNATE II

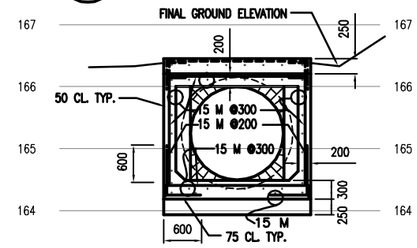
SCALE: AS SHOWN
DRAWING No. 22-48-4
SHEET 10 OF 10 ISSUE: C



SECTION A/10



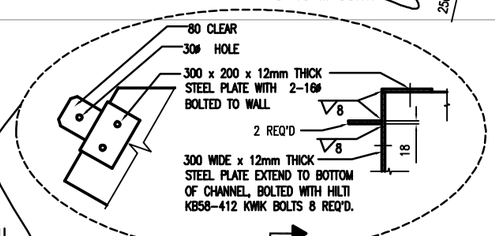
SECTION B/10

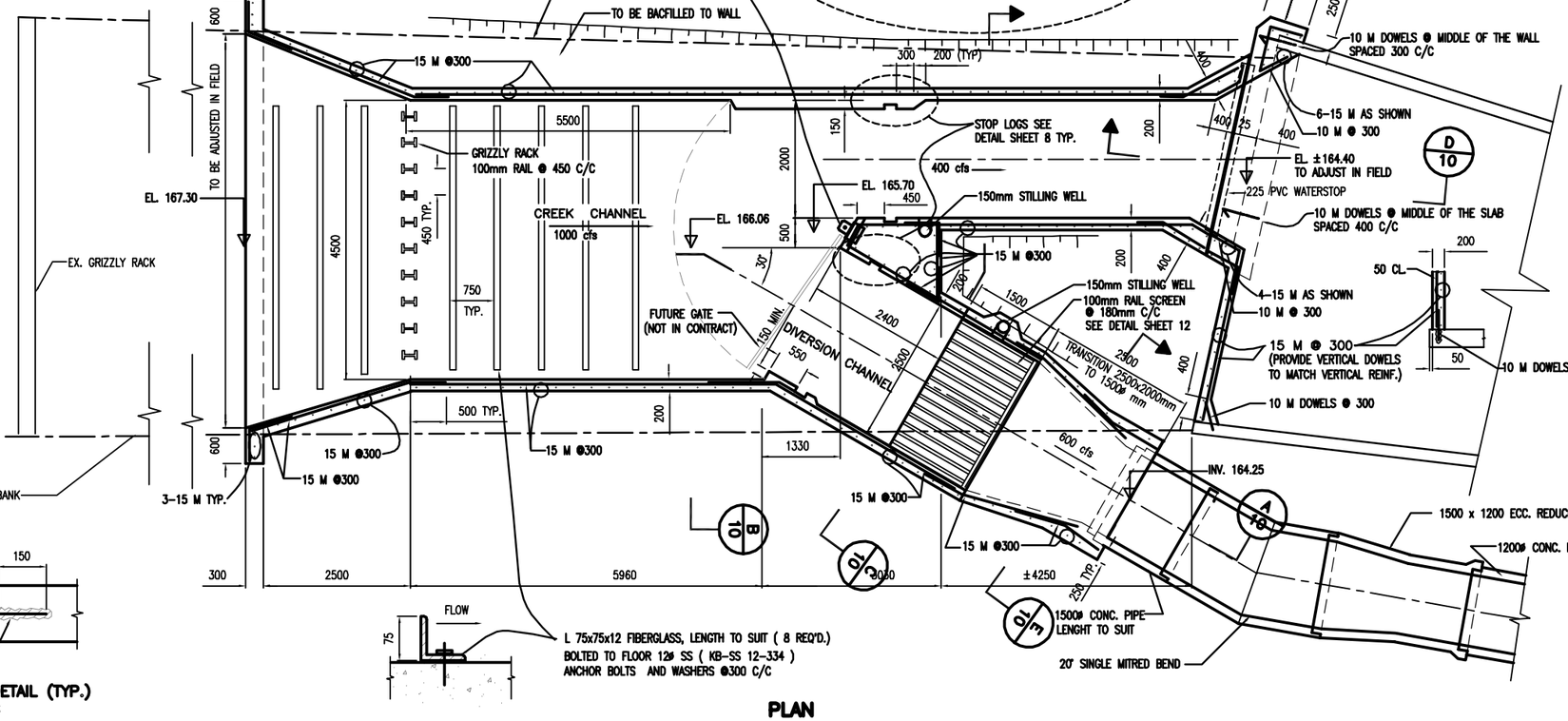


SECTION E/10

GENERAL NOTES TO ALL CONCRETE WORK IN CONTRACT :

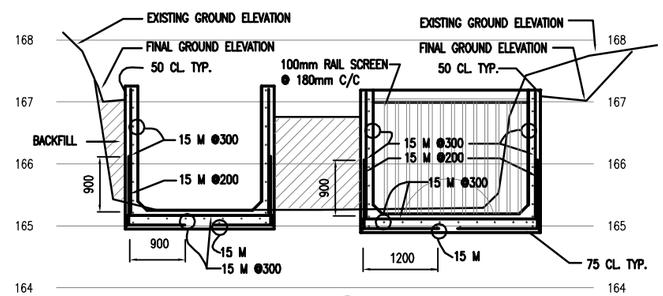
1. CONCRETE TO BE 30 MPa 28 DAYS STRENGTH.
2. REINFORCING STEEL: 400 MPa DEFORMED NEW BARS TO CSA G30.18
3. PROVIDE 20mm CHAMFER STRIPS ALONG ALL EXTERNAL CORNERS OF EXPOSED CONCRETE.
4. ALL STEEL TO BE HOT DIP GALV'D.



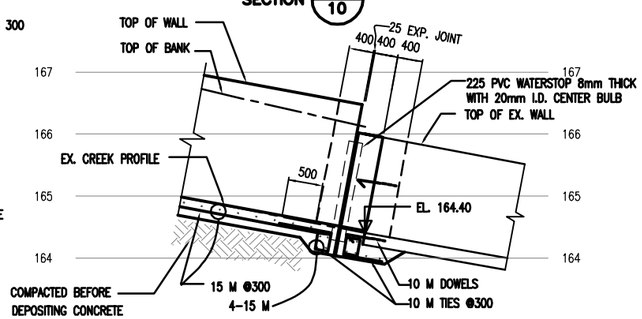


PLAN

DOWEL DETAIL (TYP.)
NTS



SECTION C/10



SECTION D/10

ACAD DWG 32-86-1K 1:50 99-12-16

TENDER No. T99-025

REVISIONS	ISSUE	DATE	DRAWN	CHK'D	APP'D	DESCRIPTION	ISSUE	DATE	DRAWN	CHK'D	APP'D	DESCRIPTION
AutoCAD DRAWING	A	DEC'98	KRC	IW		ISSUED FOR TENDER						
	B	DEC'99	KRC	IW	IW	RE-ISSUED FOR TENDER						

DESIGNED AB/SO/IW
DRAWN IW
CHECKED

DAYTON & KNIGHT LTD.
Consulting Engineers

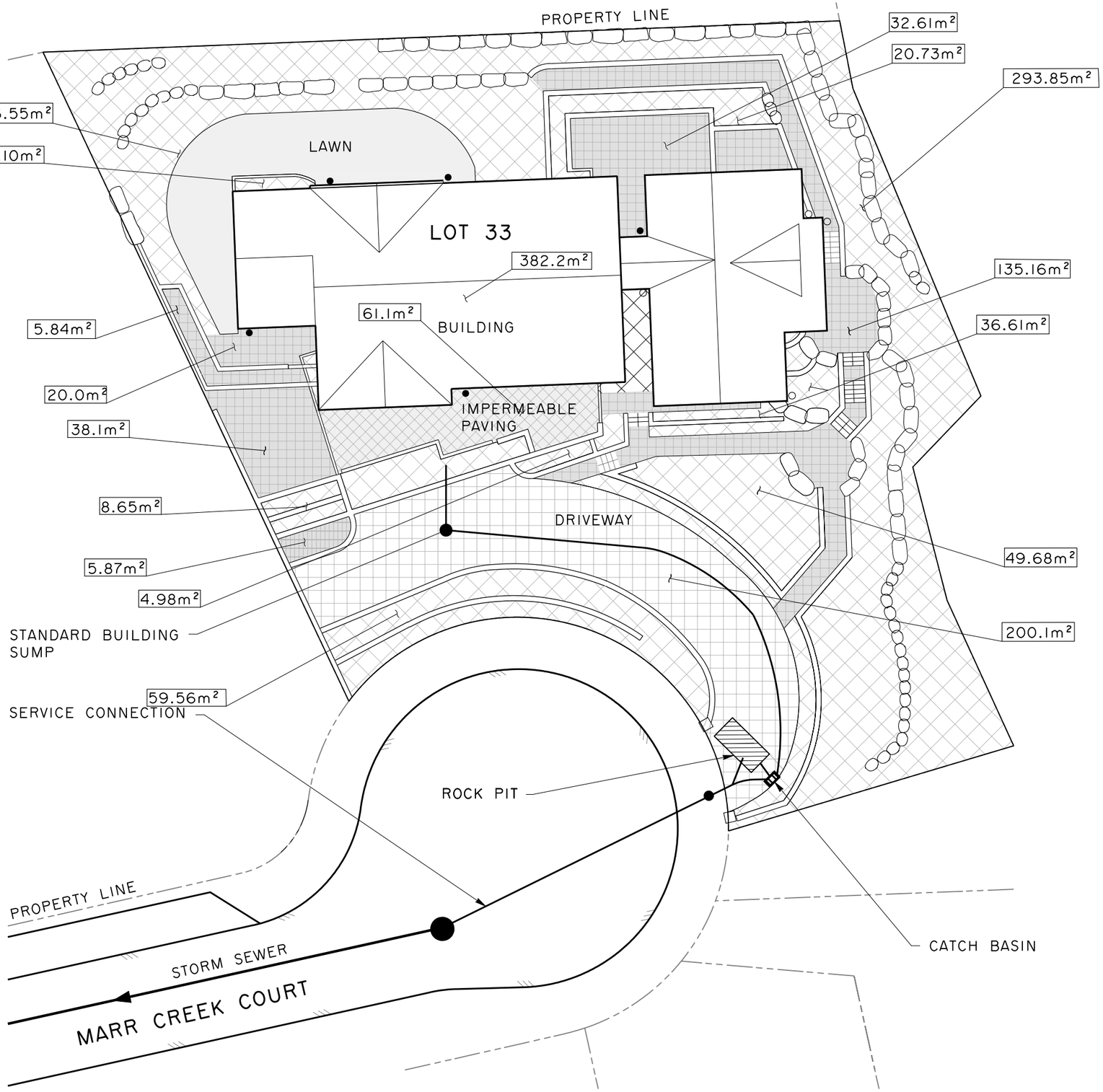
DISTRICT OF WEST VANCOUVER
PEAK STORM INTERCEPTOR EXTENSION
INGLEWOOD TO UPPER LEVELS HIGHWAY
INLET / CONTROL STRUCTURE ABOVE SERVICE ROAD

SCALE: 1:50
DRAWING No. 32.86.1
SHEET 10 OF 12 ISSUE B

DISTRICT OF WEST VANCOUVER
INTEGRATED STORMWATER MANAGEMENT PLAN FOR PIPE, WESTMOUNT, CAVE, TURNER AND GODMAN CREEKS

APPENDIX O

SAMPLE LID DESIGN DETAILS FROM INTERCAD SERVICES LTD. AND WEBSTER ENGINEERING LTD.



STORMWATER MANAGEMENT FACILITIES

PERMEABLE PAVING WITH MIN 300mm THICK CLEAR CRUSHED GRAVEL BASE (TOTAL 204.2m²)

LAWN WITH MIN 300mm THICK TOPSOIL (TOTAL 86.6m²) MAX 10% SLOPE

ABSORBENT LANDSCAPING AREA MIN 300mm THICK TOPSOIL. TERRACING REQUIRED TO PROVIDE MAX 10% SLOPE (TOTAL 484.5m²)

IMPERMEABLE PAVING (TOTAL 87.0m²)

DRIVEWAY TO BE CONSTRUCTED USING PERMEABLE PAVING WITH MIN 300mm THICK CLEAR CRUSHED GRAVEL BASE (TOTAL 200.1m²)

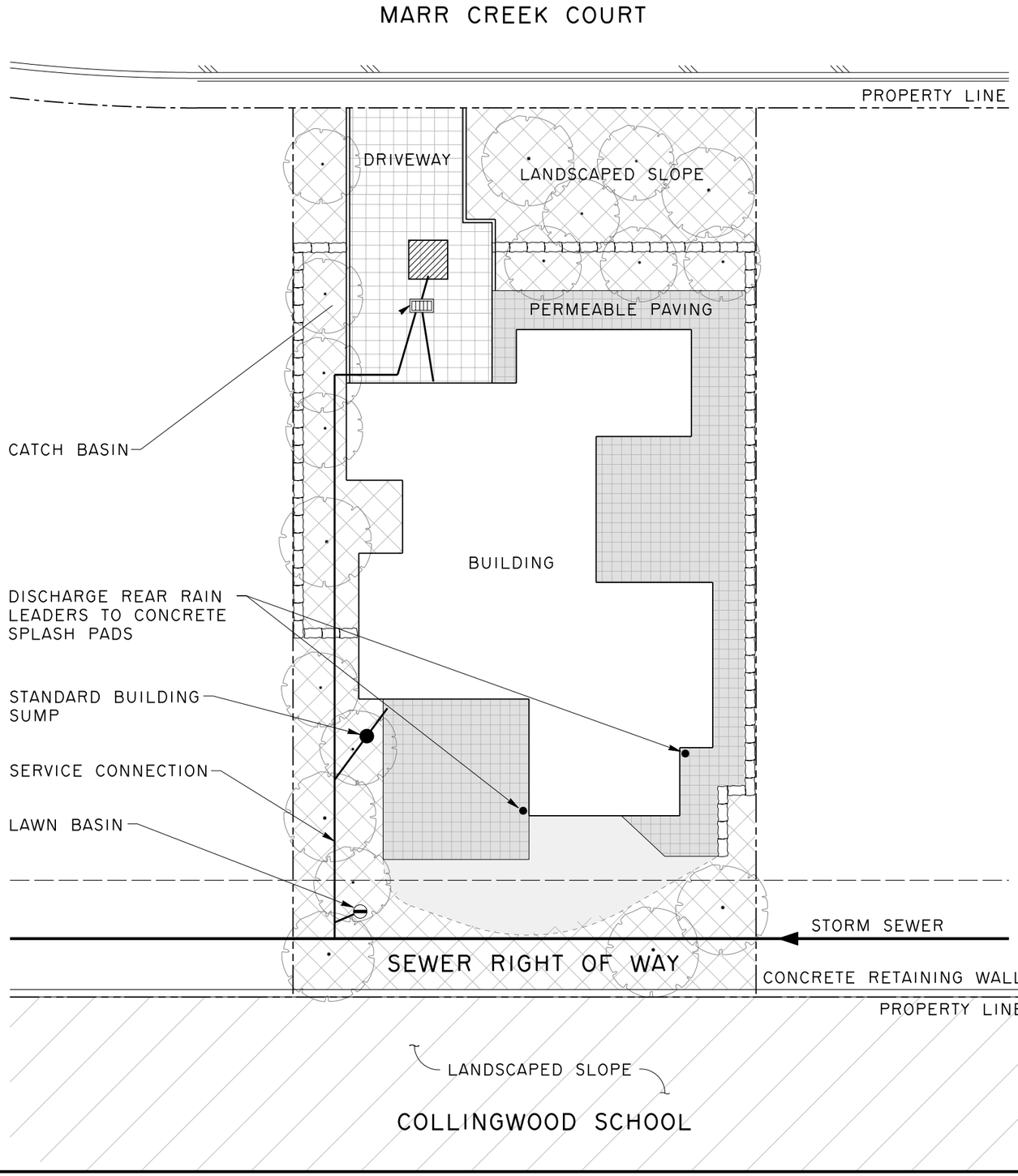
ROCK PIT MIN 6m³ CLEAR CRUSHED GRAVEL WITH OVERFLOW TO STORM SEWER

RAINWATER LEADER TO BE CONNECTED TO STORM SEWER

RAINWATER LEADER TO DISCHARGE TO CONCRETE SPLASH PADS

BRITISH PACIFIC PROPERTIES
SOUTH MARR CREEK DEVELOPMENT

STORMWATER MANAGEMENT PLAN
LOT 33 (2501 MARR CREEK COURT)



STORMWATER MANAGEMENT FACILITIES

PERMEABLE PAVING WITH MIN 300mm THICK CLEAR CRUSHED GRAVEL BASE

ROCK PIT MIN 4m³ CLEAR CRUSHED GRAVEL WITH OVERFLOW TO STORM SEWER

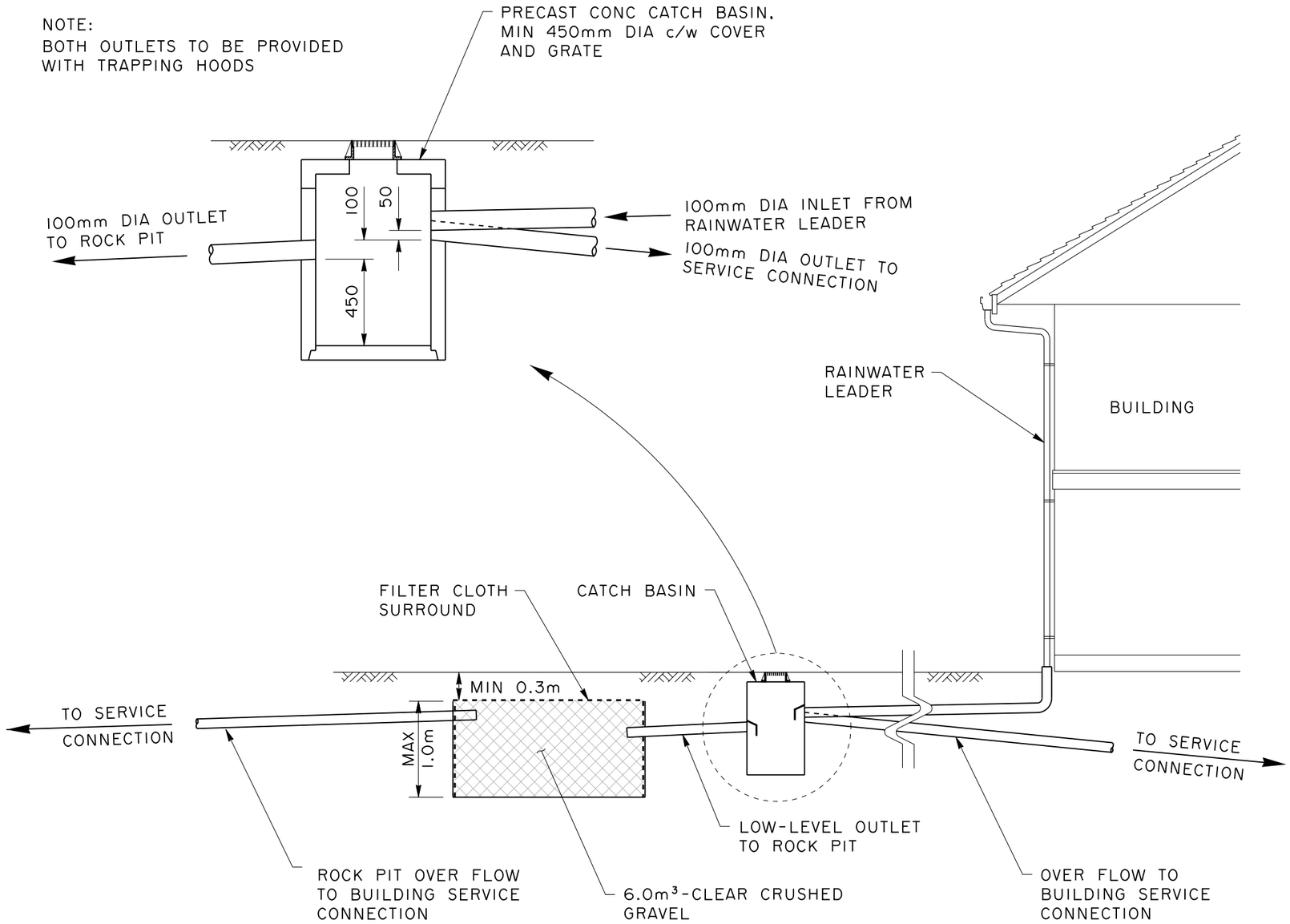
LAWN WITH MIN 300mm THICK TOPSOIL MAX 10% SLOPE

ABSORBENT LANDSCAPING AREA MIN 300mm THICK TOPSOIL. TERRACING REQUIRED TO PROVIDE MAX 10% SLOPE

BRITISH PACIFIC PROPERTIES
SOUTH MARR CREEK DEVELOPMENT

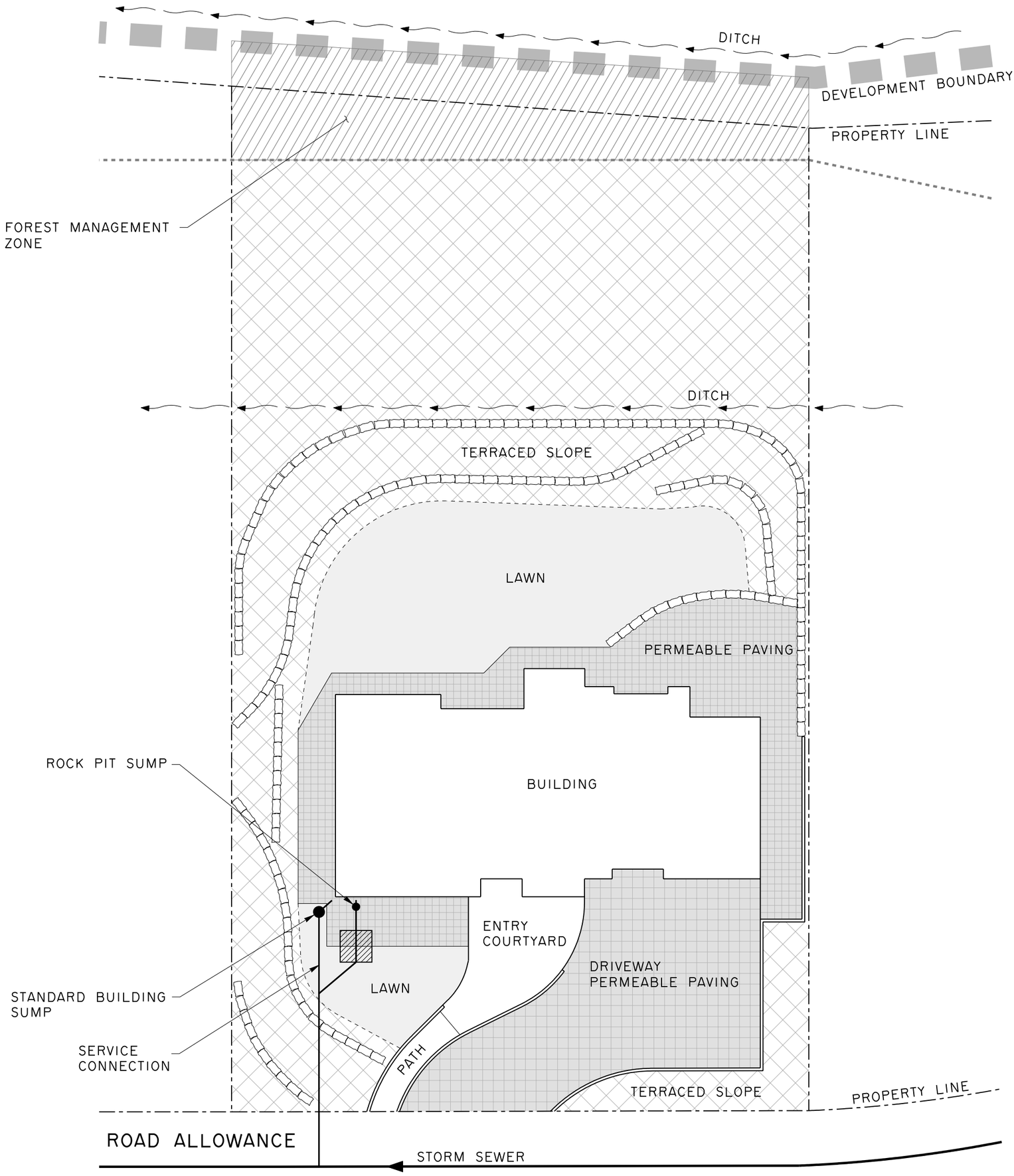
TYPICAL SMALL LOT STORMWATER MANAGEMENT PLAN

NOTE:
BOTH OUTLETS TO BE PROVIDED
WITH TRAPPING HOODS



BRITISH PACIFIC PROPERTIES
SOUTH MARR CREEK DEVELOPMENT

TYPICAL ROCK PIT SECTION



STORMWATER MANAGEMENT FACILITIES

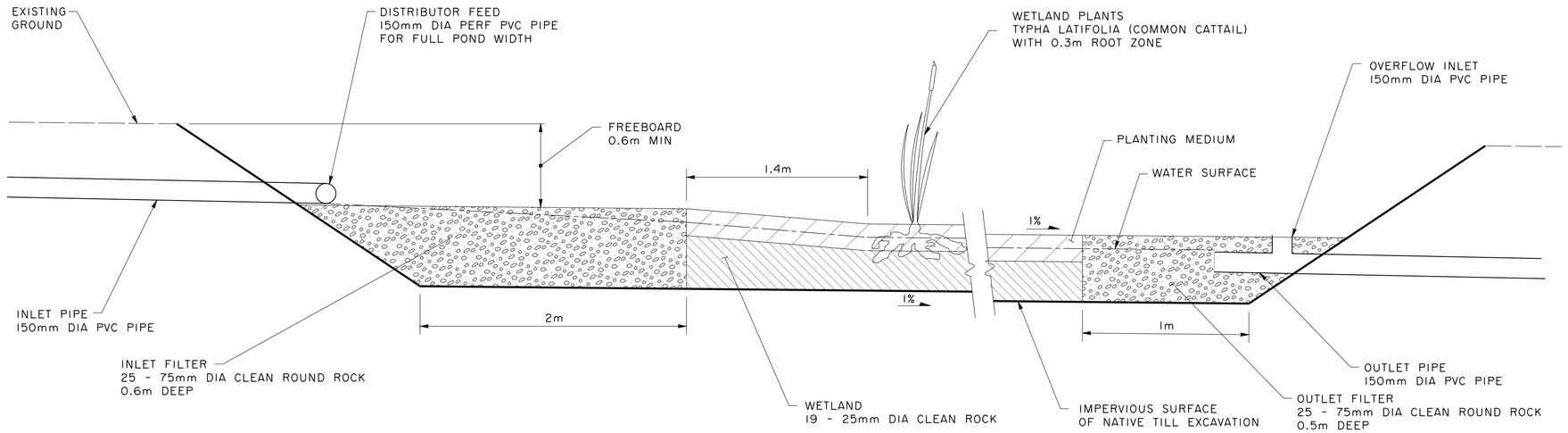
PERMEABLE PAVING WITH MIN 300mm THICK CLEAR CRUSHED GRAVEL BASE

LAWN WITH MIN 300mm THICK TOPSOIL MAX 10% SLOPE

ROCK PIT MIN 4m³ CLEAR CRUSHED GRAVEL WITH OVERFLOW TO STORM SEWER

ABSORBENT LANDSCAPING AREA MIN 300mm THICK TOPSOIL. TERRACING REQUIRED TO PROVIDE MAX 25% SLOPE

TYPICAL SINGLE-FAMILY HOME ON UPHILL LOT



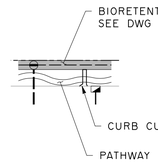
BRITISH PACIFIC PROPERTIES
AREA 1 : TYPICAL WETLAND SECTION

APRIL 2009

InterCAD
CONSULTING ENGINEERS

InterCAD
CONSULTING ENGINEERS

LEGEND



STORMWATER RETENTION TRENCH

ROCK PIT OUTLET

ROCK PIT MIN 4m³ CLEAR CRUSHED GRAVEL WITH OVERFLOW TO STORM SEWER

PROPOSED CUT-OFF DITCH

WALL SWALE

NO.	REVISION	DATE	BY
3	SECOND SUBMISSION TO CDWV	09-09-23	IL
2	ISSUED FOR CONSTRUCTION	09-09-10	IL
1	FIRST SUBMISSION TO CDWV	09-06-18	IL

DESIGNED IL | DRAWN SW

SCALE 1:500 | DATE JUNE 2009

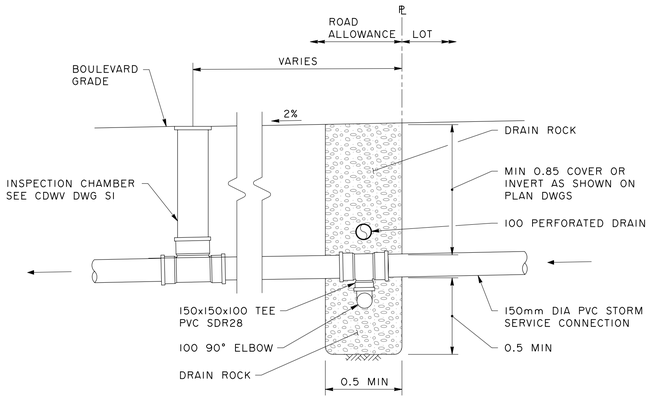
BRITISH PACIFIC PROPERTIES LTD

RODGERS CREEK DEVELOPMENT

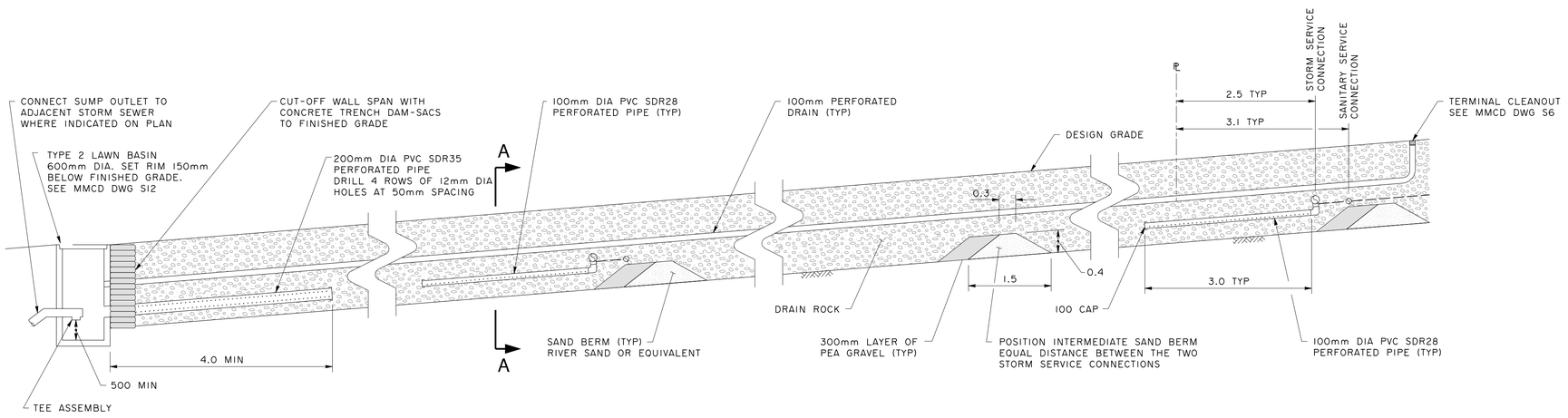
AREA 1

LOW IMPACT DEVELOPMENT PLAN

DRAWING NO. ABI9-RC2-1001 | REV. 3



SECTION A
SCALE 1:20



SECTION ALONG RETENTION TRENCH
SCALE 1:50

STORMWATER RETENTION TRENCH

InterCAD
CONSULTING ENGINEERS

NO.	REVISION	DATE	BY
6	THIRD SUBMISSION TO CDWV	09-09-23	IL
5	ISSUED FOR CONSTRUCTION	09-09-10	IL
4	SECOND SUBMISSION TO CDWV	09-06-18	IL
3	FIRST SUBMISSION TO CDWV	08-06-27	IL
2	ISSUED FOR TENDER	08-06-05	IL
1	INFORMAL SUBMISSION TO CDWV	07-08-09	LL

DESIGNED IL
DRAWN JZ
SCALE AS SHOWN
DATE MAY 2007

BRITISH PACIFIC PROPERTIES LTD

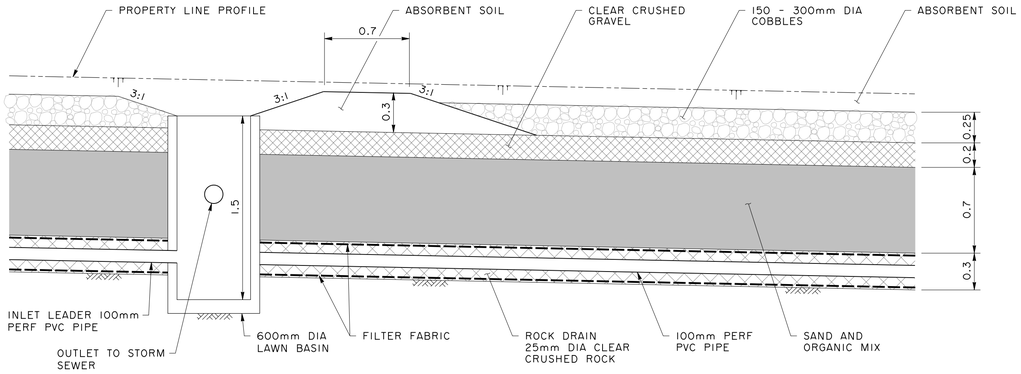
RODGERS CREEK DEVELOPMENT

AREA 1

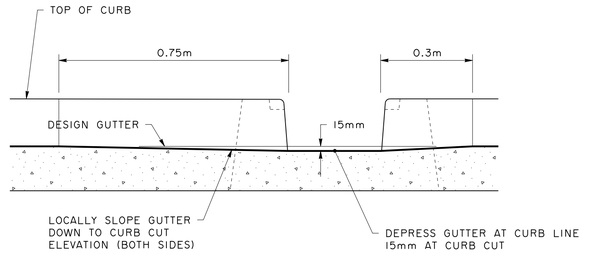
LOW IMPACT DEVELOPMENT DETAILS

DRAWING NO. ABI9-RC2-1002
REV. 6

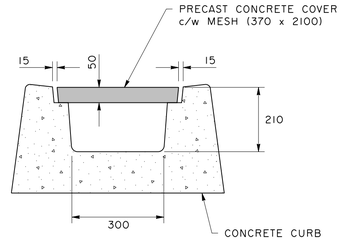
InterCAD
CONSULTING ENGINEERS



SECTION ALONG BIORETENTION SWALE TYPE A
SCALE 1:25

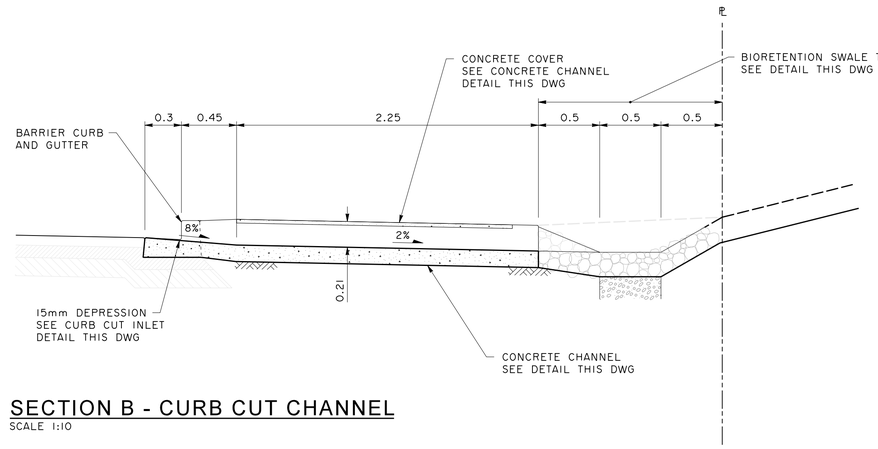


CURB CUT INLET
SCALE 1:10

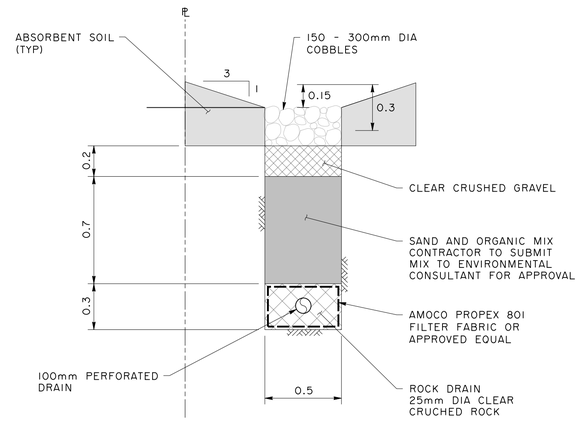


CONCRETE CHANNEL DETAIL
SCALE 1:10

ROAD A BIORETENTION SWALE TYPE A - GENERAL ARRANGEMENT
SCALE 1:25



SECTION B - CURB CUT CHANNEL
SCALE 1:10



BIORETENTION SWALE TYPE A
SCALE 1:20

NO.	REVISION	DATE	BY
3	SECOND SUBMISSION TO CDWV	09-09-23	IL
2	ISSUED FOR CONSTRUCTION	09-09-10	IL
1	FIRST SUBMISSION TO CDWV	09-06-18	IL

DESIGNED JN
DRAWN WL
SCALE AS SHOWN
DATE MAY 2007

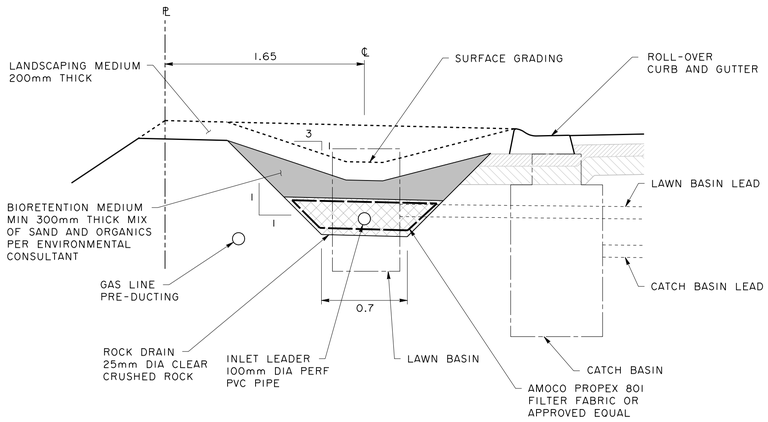
BRITISH PACIFIC PROPERTIES LTD

RODGERS CREEK DEVELOPMENT

AREA 1

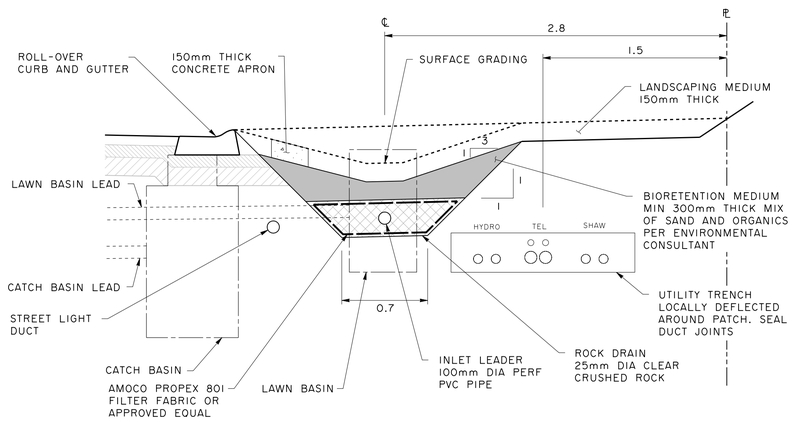
LOW IMPACT DEVELOPMENT DETAILS

DRAWING NO. ABI9-RC2-1003
REV. 3



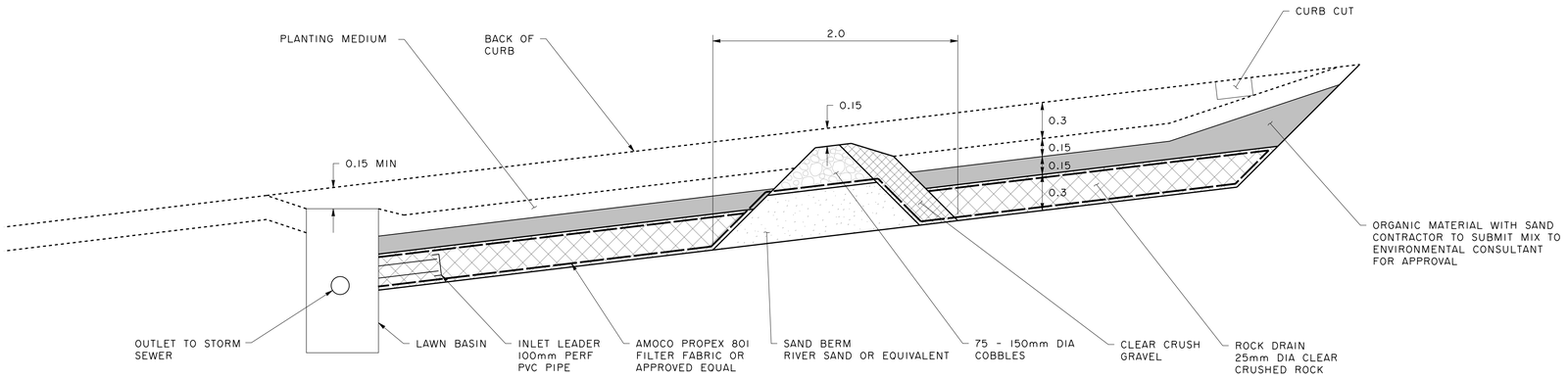
BIORETENTION SWALE TYPE B - NEAR GAS

SCALE 1:25



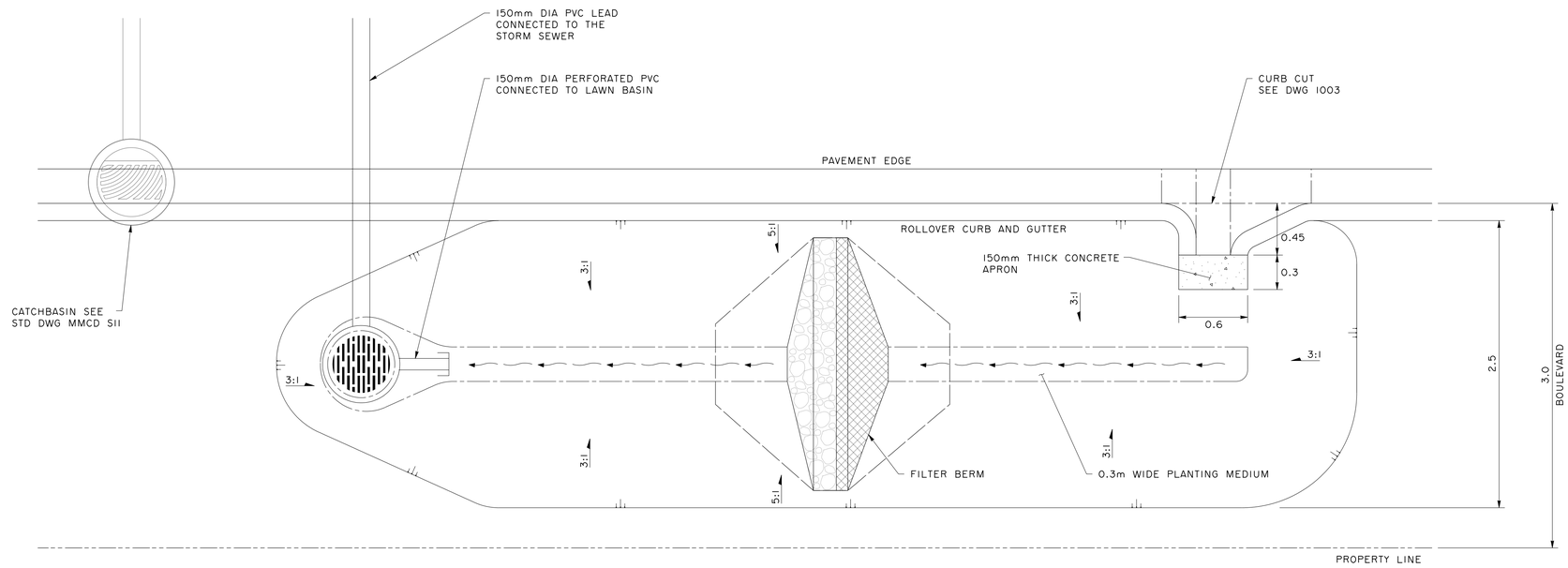
BIORETENTION SWALE TYPE B - NEAR HYDRO

SCALE 1:25



SECTION ALONG BIORETENTION SWALE TYPE B

SCALE 1:25



ROAD A BIORETENTION SWALE TYPE B - GENERAL ARRANGEMENT

SCALE 1:25

InterCAD
CONSULTING ENGINEERS

NO.	REVISION	DATE	BY
3	SECOND SUBMISSION TO CDWV	09-09-23	IL
2	ISSUED FOR CONSTRUCTION	09-09-10	IL
1	FIRST SUBMISSION TO CDWV	09-06-18	IL

DESIGNED JN | DRAWN WL

SCALE AS SHOWN | DATE MAY 2007

BRITISH PACIFIC
PROPERTIES LTD

RODGERS CREEK
DEVELOPMENT

AREA 1

LOW IMPACT DEVELOPMENT
DETAILS

DRAWING NO. ABI9-RC2-1004 | REV. 3

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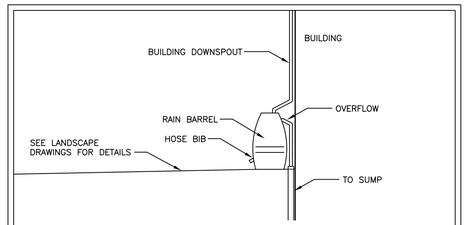
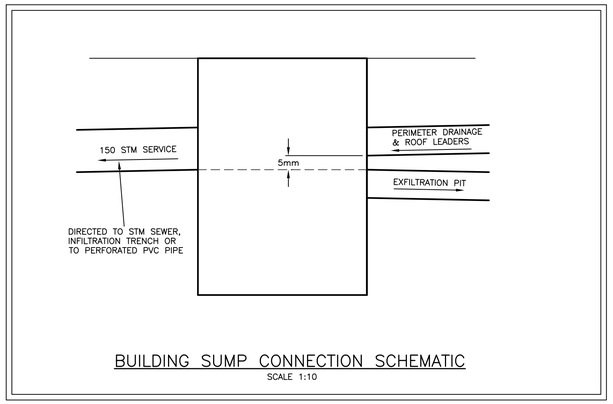
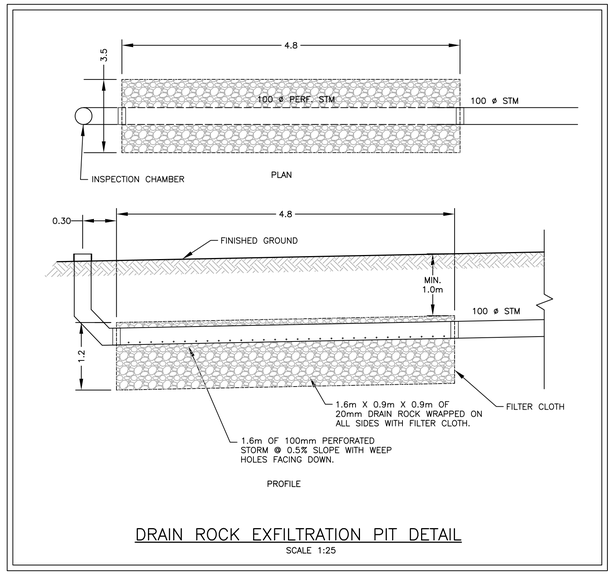


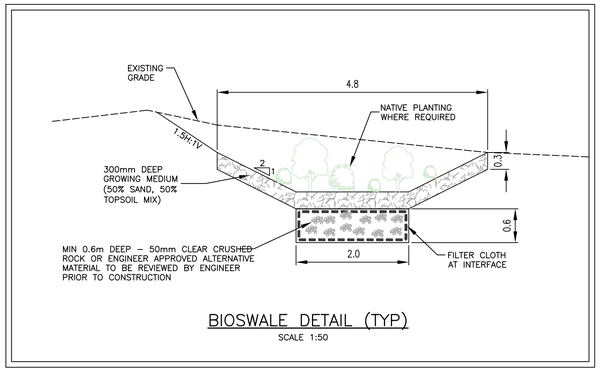
RAIN BARREL WITH OVERFLOW
TO BUILDING SUMP (TYP)
1:50



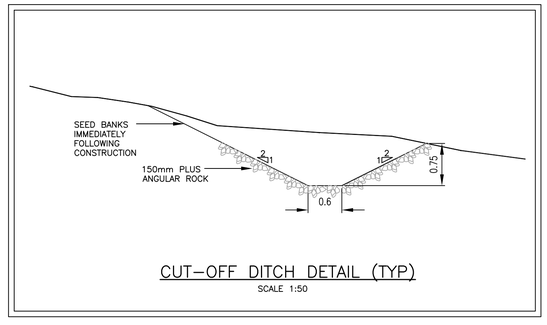
BUILDING SUMP CONNECTION SCHEMATIC
SCALE 1:10



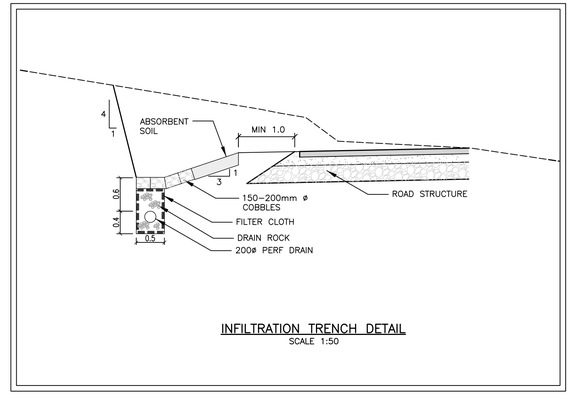
DRAIN ROCK EXFILTRATION PIT DETAIL
SCALE 1:25



BIOSWALE DETAIL (TYP)
SCALE 1:50



CUT–OFF DITCH DETAIL (TYP)
SCALE 1:50



INFILTRATION TRENCH DETAIL
SCALE 1:50

no.	date	revision	chk'd	no.	date	revision	chk'd

client: BRITISH PACIFIC PROPERTIES LIMITED & OMNI MARK PROPERTIES INC.

project: RODGERS CREEK AREA 3 EAST
WEST VANCOUVER, BRITISH COLUMBIA

PROFESSIONAL ENGINEERS
STEEP ROCKY TERRAIN SPECIALISTS
WEBSTER ENGINEERING LTD
LAND DEVELOPMENT CONSULTANTS
3745 DELBROOK AVENUE, NORTH VANCOUVER, B.C. V7N 3Z4 983-0458

approved

designed by P.M.W.
drawn by J.A.T.
checked by P.M.W.
date DEC.08.09

title: SMP DETAILS

scales: hor: - vert: -
file no. -
drawing no. -
rev. -