Woolacotts.
CONSULTING ENGINEERS

Curl Curl North Public School

Stormwater Management Report

20 April 2017 | 16-258

Contents

Document control

Rev	Date	Revision details	Approved	Verified	Prepared
A	20/04/17	Issued for DA	SDC	JL	JG

1.0 Introduction

Curl Curl North Public School is an existing facility located on the corner of Playfair Road and Abbott Road. Currently the school facilities include games courts, outdoor learning areas, classroom blocks, a library, staff carpark and a series of demountable buildings.

Refer to Figure 1 below for the site location.

Figure 1 – Site location

The school is proposing to upgrade their facilities with major redevelopment to the southern zone of the site which is currently a large grassed area. The redevelopment works include the addition of a new permanent block of classrooms, outdoor learning areas and carpark to the south, and new sports courts and playground to the north.

2.0 Existing Conditions

2.1 Site Conditions

The major redevelopment area is located in the middle and south of the school. The redevelopment works zone is approximately 26% of the total school area. The remainder of the site will incorporate upgrades to existing outdoor activity areas.

The school site occupies approximately 2.8 hectares, with the major redeveloped works occupying approximately 0.7 hectares.

The site is bound by Playfair Road to the West, and Abbott Street to the South. The school neighbours a series of residential properties along its northern and eastern boundaries.

The site generally falls to the south-west at a grade of approximately 3.2%.

The site has been identified by Council to be within the medium flood risk planning precinct due to its proximity to Curl Curl Lagoon and location within the lower end of the larger catchment.

2.2 Existing Stormwater Drainage System

As part of the preparation of this report, the site was inspected on the 8th March 2017, to identify existing stormwater drainage structures within the site, and to gain further understanding of the overland flow paths.

Upon review of the available survey information and site visit, we believe stormwater runoff from the existing site drains to the south-west corner, collected by a series of pits and grated drains.

Stormwater runoff from the site is predominately via overland flow to a final pit at the south-east end of the site discharging through a 375 diameter pipe to Councils system within Abbott Road, directed towards Curl Curl Lagoon.

3.0 Proposed Development

The redevelopment works to the south of the site include the addition of a new permanent block of classrooms, outdoor learning areas, carpark and upgraded landscaping. A new sports field and outdoor playground is proposed to the north.

3.1 Stormwater Drainage

The proposed works area of the site currently drains by overland flow to an existing grated inlet pit within the site, discharging to Councils existing stormwater system within Abbott Road.

A stormwater management system has been developed to integrate the existing system and accommodate the redevelopment works, as well as comply with Council's requirements.

The piped stormwater drainage system will be designed to carry runoff from storms up to and including the 20 year ARI event, with pipes graded at a minimum fall of 1 in 100. For runoff from storms up to and including the 100 year ARI event, overland flow paths will be provided to ensure a minimum freeboard to habitable levels. External surfaces will be graded at a minimum fall of 1 in 100 to the stormwater collection and drainage system. We propose to maintain the existing stormwater outlet to council's drainage system towards Abbott Road.

As identified within the Northern Beaches Council flooding information report, the site is affected by 1 in 100 year ARI flooding (to RL 3.7m AHD). A portion at the lower end of the site is located within the PMF and below the Flood Planning Level. As a result the site is identified to be within the medium flood risk planning precinct. Refer to Woolacotts Flood Risk Assessment Report – Curl Curl North Public School (2017), for additional information.

The Flood Risk Assessment report identifies design flood levels and recommendations on all precautions to minimise risk to personal safety of occupants, including the risk of property damage of the total development in the event of a flood. Due to the sites proximity within the floodplain, on-site stormwater detention is not likely to provide significant benefit for the catchment with respect to flood mitigation and is therefore not required for this development.

3.2 Water Sensitive Urban Design

Water sensitive urban design principles have also been incorporated into the stormwater drainage design. Grassed swales, and Stormwater360 enviropod inserts to all new pits are proposed within the system design in order to achieve an overall increase of stormwater quality.

There is also opportunity for all clean rainwater from new roof areas to be collected in a rainwater tank for reuse in flushing of toilets and irrigation of landscape areas.

Refer to Appendix A - Drawings, for the proposed stormwater management plan.

3.2 Overland Flow

An open channel flow analysis using the computer model HEC-RAS was conducted to determine the sites flowpath, water depth and level at various locations for the existing and proposed development during the 100 year ARI event.

The peak flowrates of the site were determined based on calculations using the computer model XP-RAFTS. These results were split into numerous sub catchments as outlined below:

Cross-Section Reference	Peak Flow (m^3/s)
	100 Year ARI
3	8.098
2.2	8.190
2.1	8.250
2	8.810
1	9.060

A Manning's value of n = 0.012 was adopted within the model for impervious areas, and n = 0.03 was adopted for pervious areas.

Multiple cross sections were determined for the HEC-RAS analysis from existing survey information and proposed architectural plans.

Refer Appendix B – Calculations, for the catchment plan and additional information.

The following results table outline the water levels for the pre and post development as determined within the HEC-RAS model.

Cross-Section Reference	Water Level (RL)	
	100 Year ARI	
	Pre-Developed	Post-Developed
3	7.18	7.22
2.2	7.12	6.79
2.1	6.77	6.72
2	5.39	5.29
1	4.25	4.25

Details of cross sections and chainage locations are presented in Appendix B.

We note that finished floor levels of proposed buildings are above the 100 year ARI flowpath levels. Refer to Appendix B – Calculations, for additional information of proposed flowpaths, HEC-RAS results and critical levels throughout the site.

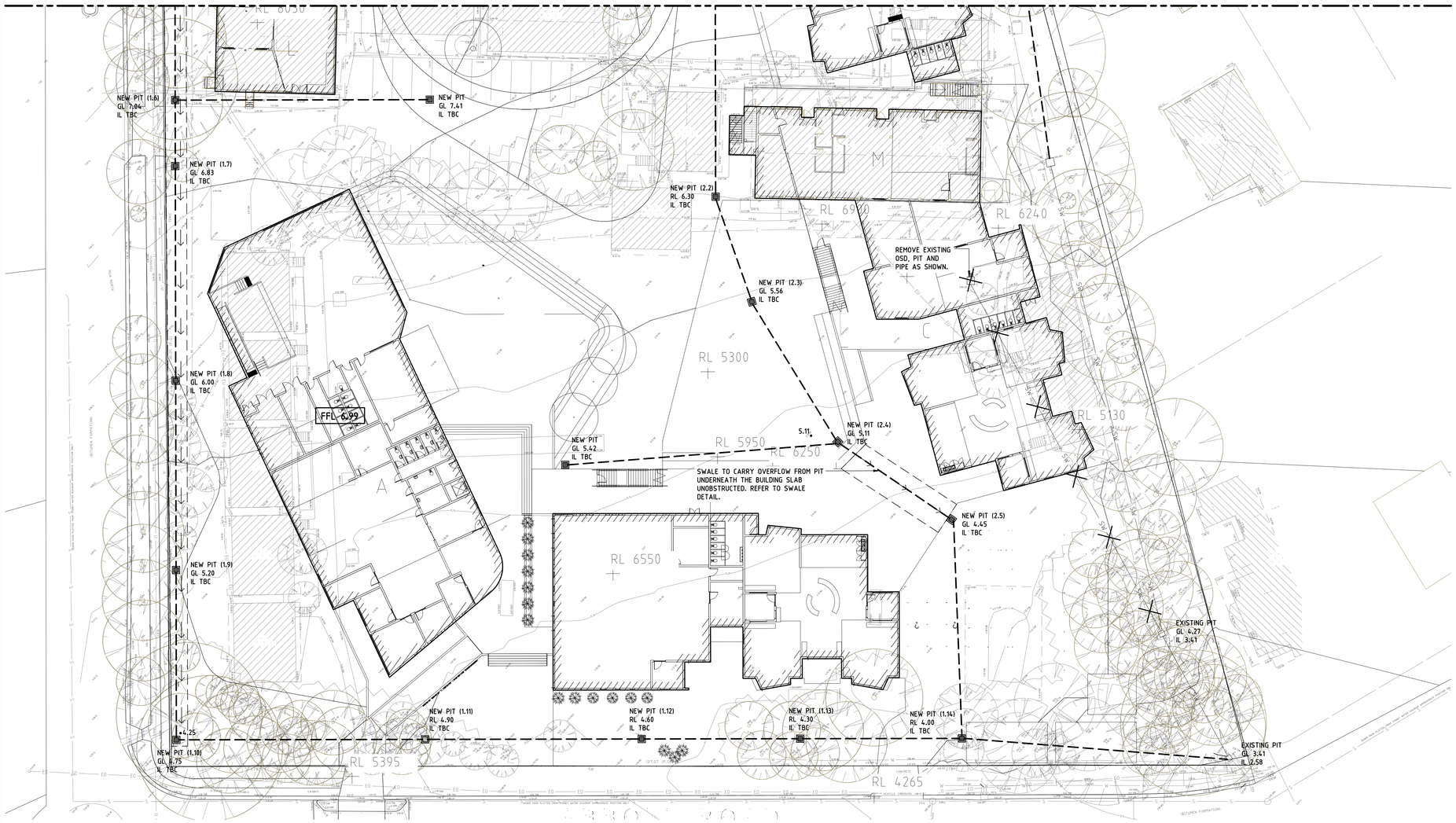
3.3 Erosion and Sediment Control

During construction, erosion and sediment control measures will be provided in accordance with the requirements of "Managing Urban Stormwater Soils and Construction, 4th Edition (Blue Book)". These measures will include silt fences on the low side of the site, silt traps at stormwater pits and a construction exit to remove silt from vehicles before they leave the site. Dust control measures will also be provided.

Refer to Appendix A – Drawings, ES1 for the Erosion and Sediment Control Plan.

Appendix A
Drawings

FOR CONTINUATION REFER DRAWING SW2



GENERAL NOTES

G1 THESE DRAWINGS SHALL BE READ IN CONJUNCTION WITH ALL OTHER CONSULTANTS DRAWINGS, SPECIFICATIONS AND AS1100 TECHNICAL DRAWING.

G2 ANY DISCREPANCIES SHALL BE REFERRED TO THE SUPERINTENDENT FOR DECISION BEFORE PROCEEDING WITH THE WORK.

G3 DIMENSIONS SHALL NOT BE OBTAINED BY SCALING THE DRAWINGS.

G4 ANY SET OUT DIMENSIONS SHOWN ON THE DRAWING SHALL BE VERIFIED BY THE BUILDER.

G5 DURING CONSTRUCTION THE CONTRACTOR SHALL MAINTAIN THE WORKS IN A STABLE CONDITION AND NO PART SHALL BE OVERSTRESSED.

G6 ALL WORK SHALL COMPLY WITH THE BUILDING CODE OF AUSTRALIA, CONDITIONS OF THE DEVELOPMENT CONSENT AND RELEVANT AUSTRALIAN STANDARD CODES.

LEGEND

SW	EXISTING STORMWATER PIPE
	PROPOSED STORMWATER PIPE
	PROPOSED STORMWATER PIT
	SWALE
TBC	TO BE CONFIRMED

DRAINAGE NOTES

D1 ALL WORKS SHALL BE IN ACCORDANCE WITH AS3500.3

D2 FOR PIPE DIAMETERS NOT EXCEEDING 150mm, USE:
- VITRIFIED CLAY PIPE TO AS1741 OR
- SEWER GRADE UPVC TO AS1260 OR
- CLASS 2 FIBRE REINFORCED CONCRETE TO AS4139

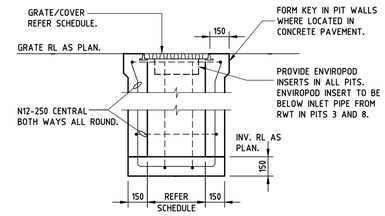
D3 FOR PIPE DIAMETERS EXCEEDING 150mm, USE:
- CLASS 2 REINFORCED CONCRETE PIPE TO AS4058 OR
- CLASS 2 FIBRE REINFORCED CONCRETE PIPE TO AS4139

D4 PVC PIPES SHALL BE SOLVENT WELDED. ALL OTHER PIPES SHALL BE RUBBER RING JOINTED UNLESS NOTED OTHERWISE.

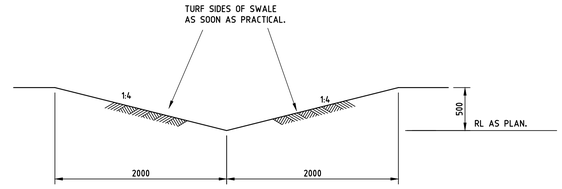
D5 UNLESS SPECIFIED OTHERWISE, BED & BACKFILL SHALL BE COMPACTED SAND TO 100mm ABOVE THE PIPE. REMAINDER OF BACKFILL SHALL BE COMPACTED EXCAVATED MATERIAL. WHEN UNDER VEHICULAR PAVEMENT, REMAINDER OF BACKFILL SHALL BE COMPACTED BASECOURSE.

D6 LOADS ON PIPES DURING CONSTRUCTION SHALL NOT EXCEED THE REQUIREMENT OF AS3725, OR THE RECOMMENDATIONS OF THE PIPE MANUFACTURER.

D7 TRENCH WIDTHS SHALL BE IN ACCORDANCE WITH AS3500, BUT NOMINALLY THE GREATER OF 1.5 PIPE DIAMETER OR PIPE DIAMETER PLUS 300.



PIT DETAIL



SWALE DETAIL
DESIGNER TO CONFIRM SIZES

NOTES:
- EXISTING STORMWATER PITS & PIPES TO BE RETAINED UNLESS NOTED OTHERWISE ON PLAN.
- REMOVE EXISTING OSD AND CONNECTION TO EXISTING SYSTEM.
- SWALE ON WESTERN BOUNDARY TO CARRY OVERLAND FLOW FROM UPSTREAM CATCHMENT.
- ENVIROPOD INSERTS AT ALL STORMWATER PITS.

No.	Date	Description	Ver.	Appr.
A	20.04.17	ISSUED FOR DA		

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CURL CURL NORTH
PUBLIC SCHOOL

STORMWATER MANGEMENT PLAN & DETAILS SHEET 1

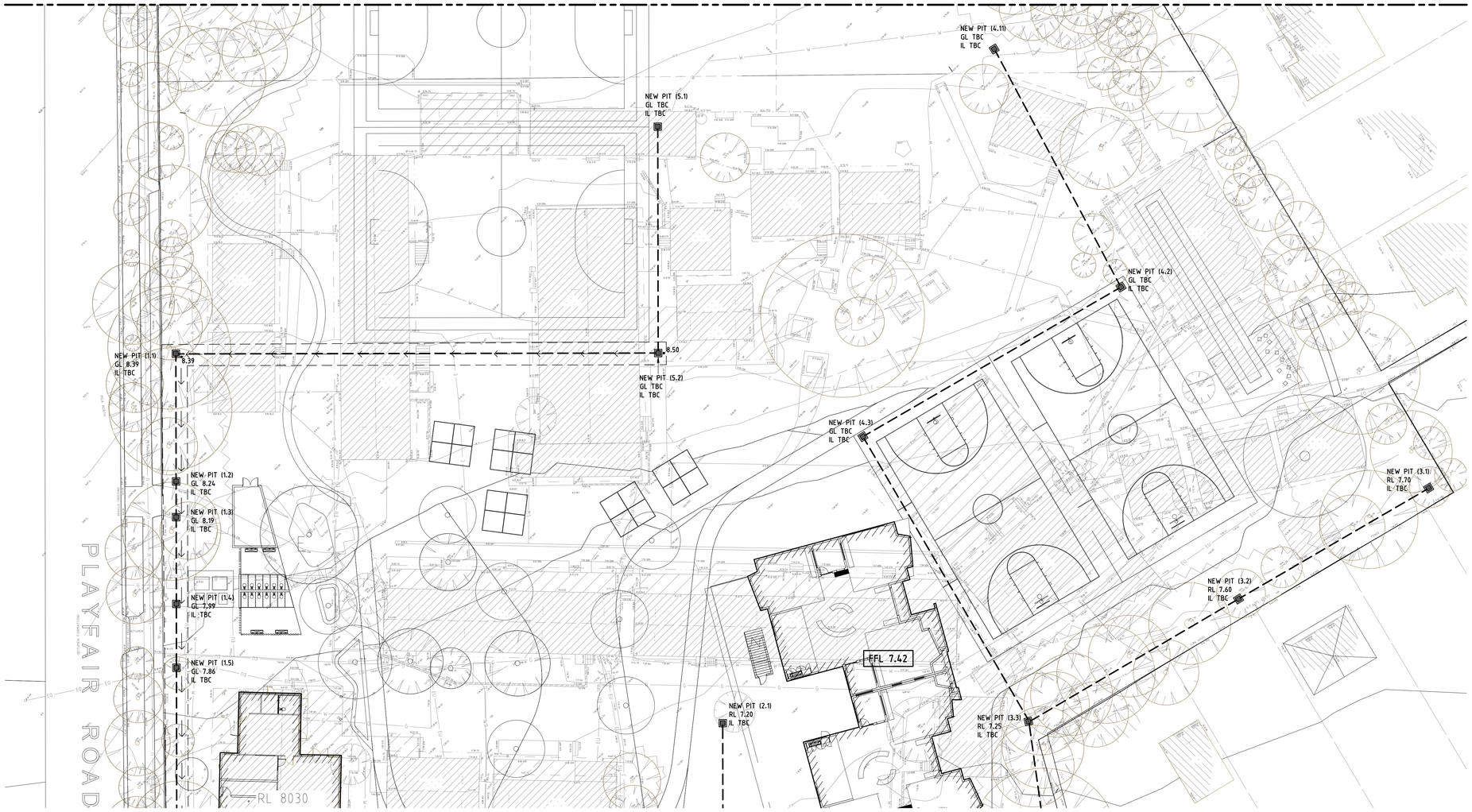
Date	Approved	Verified	Prepared
APRIL 2017			J.K 20.04.17
Scale @ B1 1:250, 20			

Job number	Drawing number	Amendment
16-258	SW1	A

LEGEND

SW	EXISTING STORMWATER PIPE
	PROPOSED STORMWATER PIPE
	PROPOSED STORMWATER PIT
	SWALE
TBC	TO BE CONFIRMED

FOR CONTINUATION REFER DRAWING SW1



No.	Date	Description	Ver.	Appr.
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CURL CURL NORTH
PUBLIC SCHOOL

STORMWATER MANGEMENT PLAN SHEET 2

Date	Approved	Verified	Prepared
APRIL 2017			J.K 20.04.17
Scale @ B1: 1:250			
Job number: 16-258	Drawing number: SW2		Amendment: A

No.	Date	Description	Ver.	Appr.
A	20.04.17	ISSUED FOR DA		

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CURL CURL NORTH PUBLIC SCHOOL

EROSION AND SEDIMENT CONTROL PLAN

Date	Approved	Verified	Prepared
APRIL 2017			J.K 20.04.17
Scale @ B1: 1:300			
Job number: 16-258	Drawing number: ES1		Amendment: A

Appendix B
Calculations

* XP-RAFTS Flowrates

Initial / Continuing losses

Pervious = 10 mm/hr Initial
2.5 mm/hr Continuous

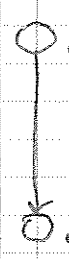
Impervious = 2 mm/hr Initial
0 mm/hr Continuous.

IFD Coefficients:

BOM website:

Location = -33.775(S)
151.300(E)

CATCHMENT A:

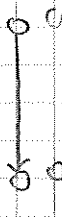


A_T = 126700 m²
A_{imp}: 101360 m² (Assumed 80%) ; n: 0.015
A_{perv} = 25340 m² ; n: 0.025

Slope ≈ 8%

RESULTS = MAX 100YR STORM → 100yr 30min = 7.342 m³/s.

CATCHMENT B:



A_T = 12650 m²
A_{imp} = 10120 m² (Assumed 80%) ; n: 0.015
A_{perv} = 2530 m² ; n: 0.025

Slope ≈ 4%

RESULTS = MAX 100yr STORM → 100yr 30min = 0.756 m³/s

NORTH CURL CURL
WINGALA RESERVE
NORTH CURL CURL POST OFFICE
CURL CURL NORTH PUBLIC SCHOOL
DEE WHY RSL BOWLING CLUB
BOWLING GREEN
ALAN NEWTON RESERVE
ABBOTT ROAD GROUND
JOHN FISHER PARK
DENZIL JOYCE OVAL
RUE HUDSON OVAL
ST LUKE'S GRAMMAR SCHOOL
DELMAR PRIVATE HOSPITAL
MAKIM RESERVE
HEADLAND ROAD
PITT ROAD
ABBOTT ROAD
PLAYFAIR ROAD
BLACKWOOD ROAD
SPRING ROAD
WHEELER PARADE
CASSIA LANE
BELLEVUE PARADE
REID AVENUE
GRAINGER AVENUE
JAMIESON AVENUE
ROSS STREET
CAREW STREET
BUSHEY PLACE
QUIRK STREET
PARR AVENUE
DELAIGH AVENUE
FAIRPORT STREET
JOCELYN STREET
MAKIM STREET
RABAUL ROAD
FAY STREET
BURILLA AVENUE
LILLIE STREET
NSW

Intensity-Frequency-Duration Table

Location: 33.775S 151.300E NEAR.. Curl Curl North Issued: 27/2/2017

Rainfall intensity in mm/h for various durations and Average Recurrence Interval

Duration	Average Recurrence Interval						
	1 YEAR	2 YEARS	5 YEARS	10 YEARS	20 YEARS	50 YEARS	100 YEARS
5Mins	96.2	124	158	178	204	238	264
6Mins	90.1	116	148	167	191	223	248
10Mins	73.8	95.1	122	138	159	186	207
20Mins	53.9	69.8	91.1	104	120	142	158
30Mins	43.8	56.9	74.8	85.4	99.3	117	131
1Hr	29.8	38.8	51.4	58.9	68.7	81.6	91.5
2Hrs	19.8	25.8	34.1	39.0	45.4	53.9	60.5
3Hrs	15.5	20.1	26.5	30.3	35.2	41.7	46.7
6Hrs	10.2	13.2	17.2	19.5	22.6	26.7	29.8
12Hrs	6.66	8.59	11.1	12.6	14.6	17.2	19.1
24Hrs	4.29	5.54	7.22	8.20	9.48	11.2	12.5
48Hrs	2.67	3.46	4.56	5.20	6.05	7.16	8.01
72Hrs	1.97	2.56	3.38	3.86	4.50	5.32	5.96

aw data: 38.96, 8.62, 2.56, 82.67, 17.18, 5.33, skew=0.00, F2=4.29, F50=15.88)

Revised Catchment Calc.:

@ XS ③ : $7.342\ m^3/s + 0.756\ m^3/s$
$= 8.098\ m^3/s$

EXTRA CATCHMENT = $1780\ m^2$

ASS USING RATIONAL METHOD:

$C = 1$ (Assume 100% imp.)

$I^{100}_{5\,MIN} = 264\ mm/hr$

$$Q = \frac{CIA}{3600} = \frac{1 \times 264 \times 1780}{3600}$$

$= 130.53\ L/s$

$= 0.13053\ m^3/s$

$\therefore Q_{TOTAL}$ @ ③ $= 8.098 m^3/s + 0.13053 m^3/s$
$= 8.23\ m^3/s$

@ XS ② = $7922\ m^2$

$$\therefore Q = \frac{1 \times 264 \times 7922}{3600} = 580.95\ L/s$$

$\therefore Q_{TOTAL} = 8.23\ m^3/s + 0.58095\ m^3/s$
$= 8.81\ m^3/s$

(a) XS (1): $3468m^2$

$\therefore Q = \frac{1 \times 264 \times 3468}{3600}$

$= 254.32 \text{ L/s}$

$= 0.25432 \text{ m}^3/\text{s}$

$\therefore Q_{TOTAL} = 8.81 \text{ m}^3/\text{s} + 0.25432 \text{ m}^3/\text{s}$

$= 9.06 \text{ m}^3/\text{s}$

2.2: Add. Area = 1304m²

Assume C=1,

I = 26ℓ

$$Q = \frac{CIA}{3600} = \frac{1 \times 26\ell \times 1304}{3600}$$

$$= 95.63\ \text{L/s}.$$

$$\therefore 0.09563\ell + 8.098$$

$$= 8.19\ \text{m}^3/\text{s}.$$

~~2.3~~ 2.1 Add Area: 858

As shown,

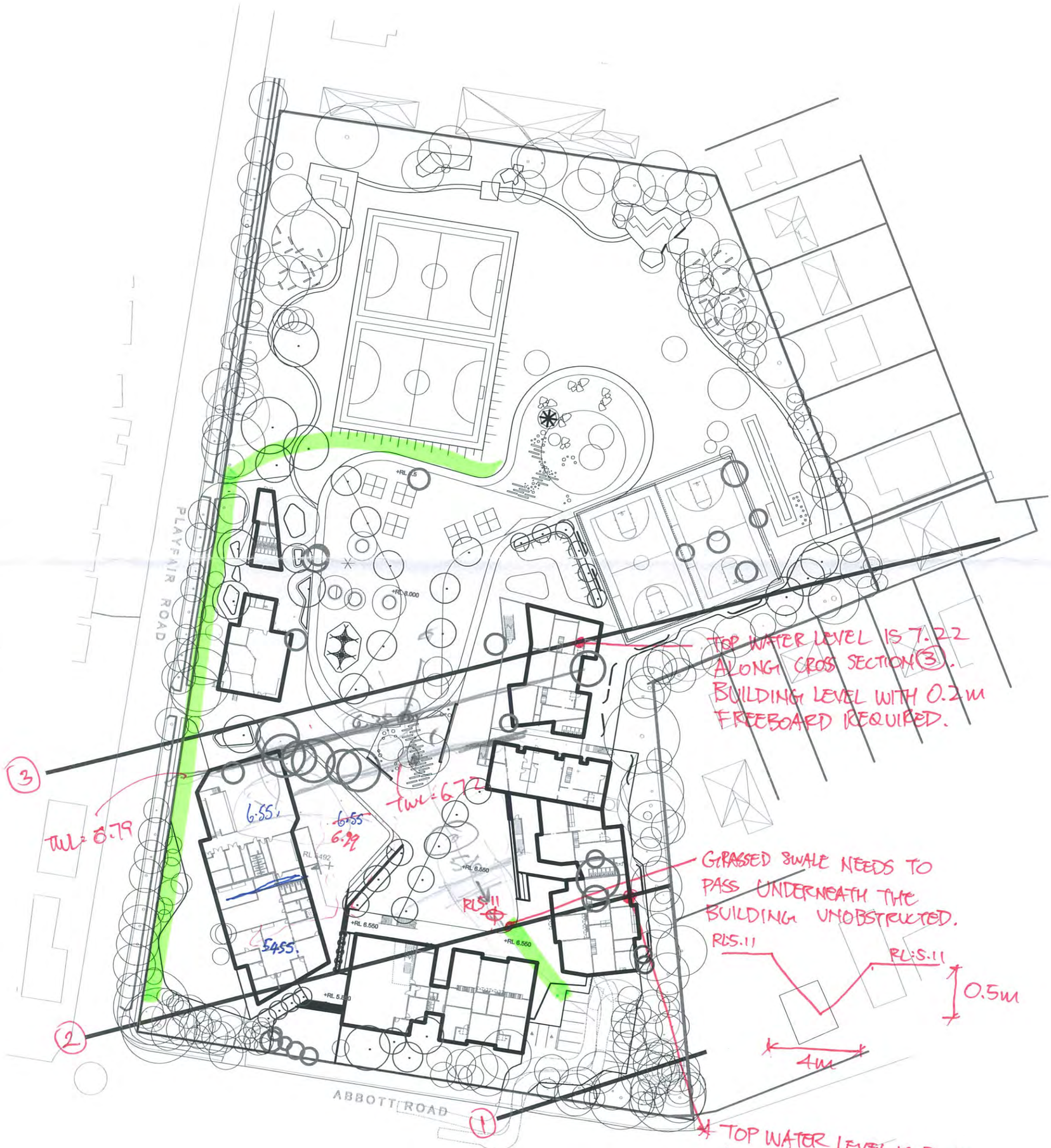
$$Q = \frac{1 \times 26\ell \times 858}{3600}$$

$$= 62.92 = 0.06292$$

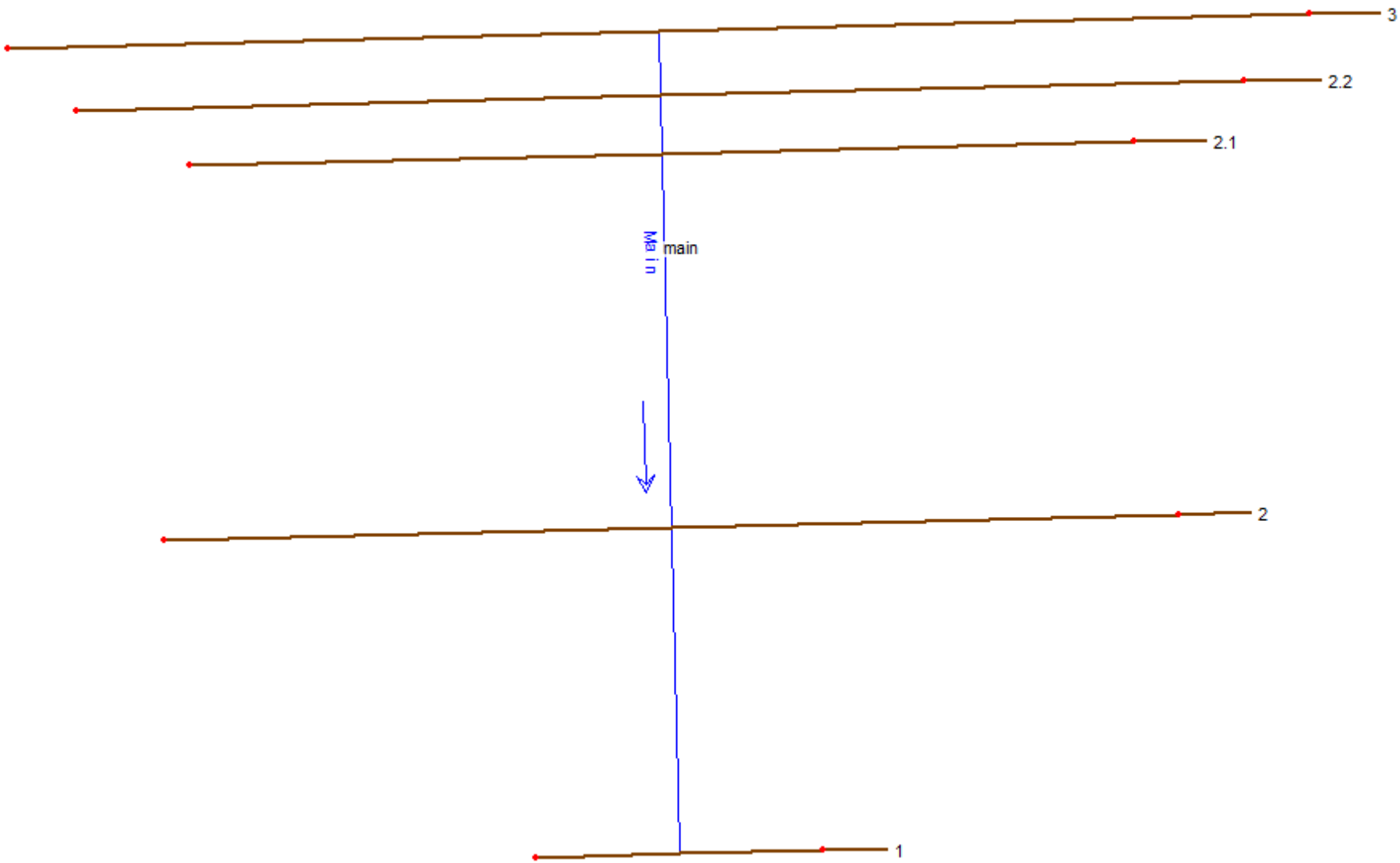
$$\therefore \Sigma_{Total} = 8.19\ell + 0.06292$$

$$= 8.25$$

SWALE

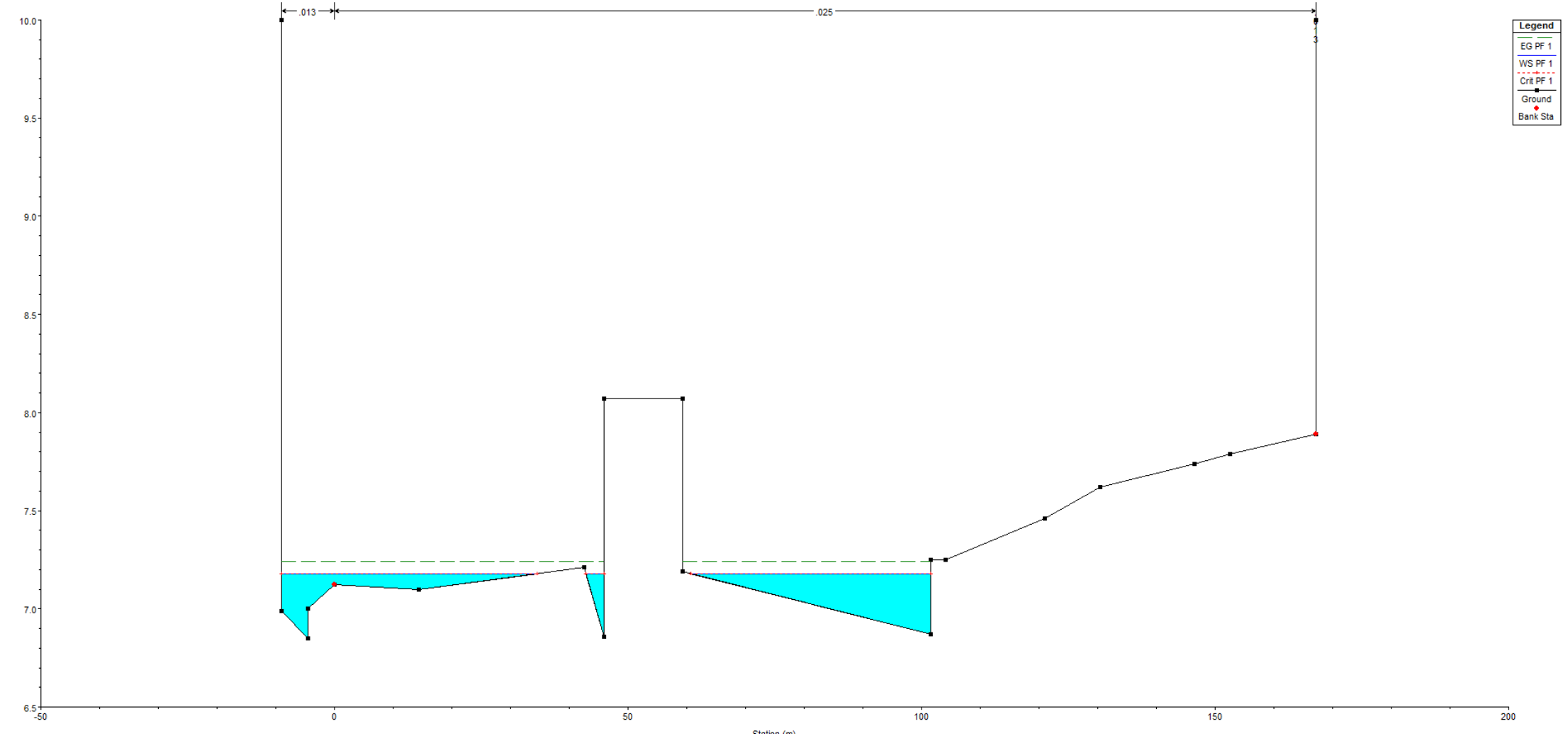


19.04.2017
J.L.


3
2.2
2.1
main
Main
2
1

Curl Curl PS Plan: 1) Existing 20/04/2017

Cross Section 3



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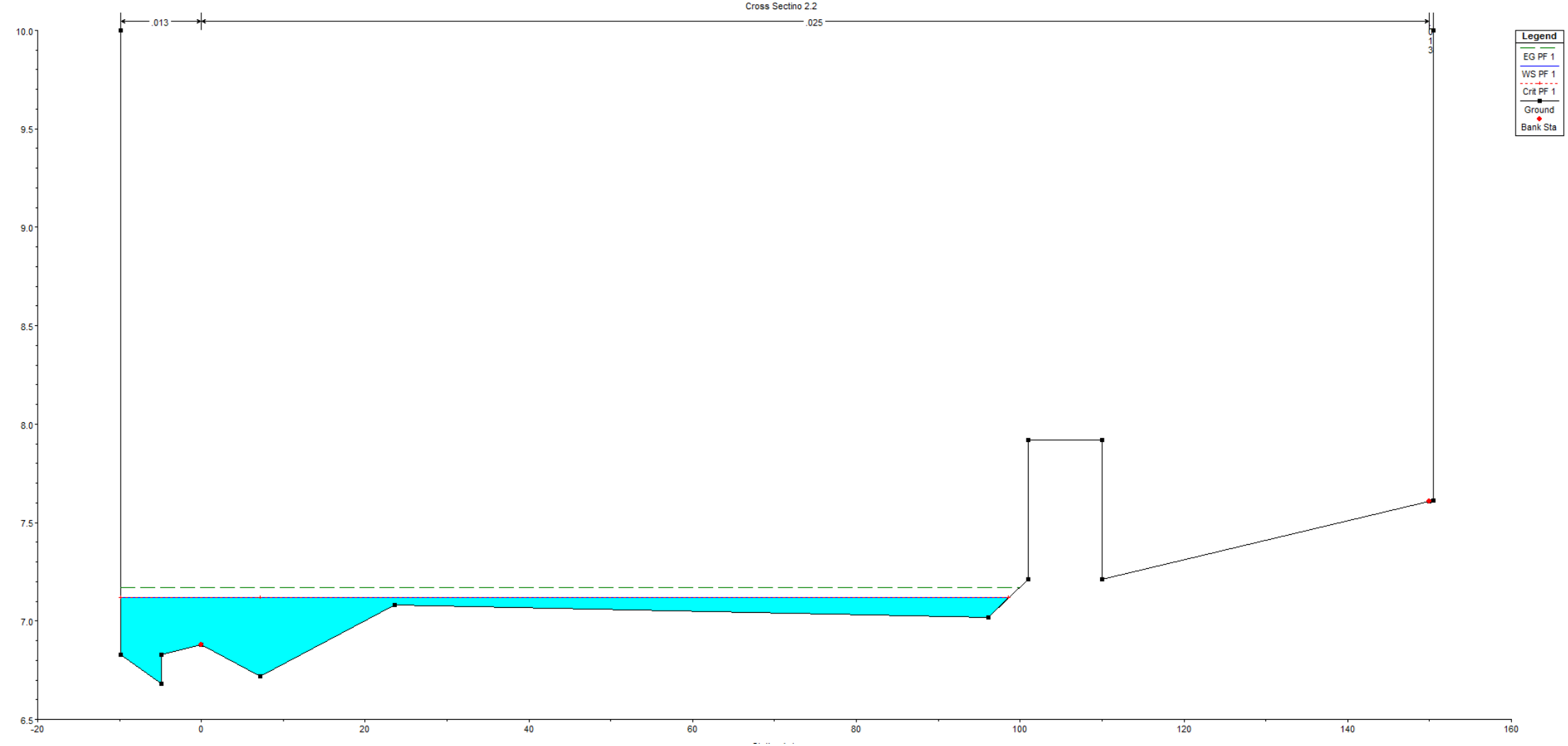
Cross Sectino 2.2



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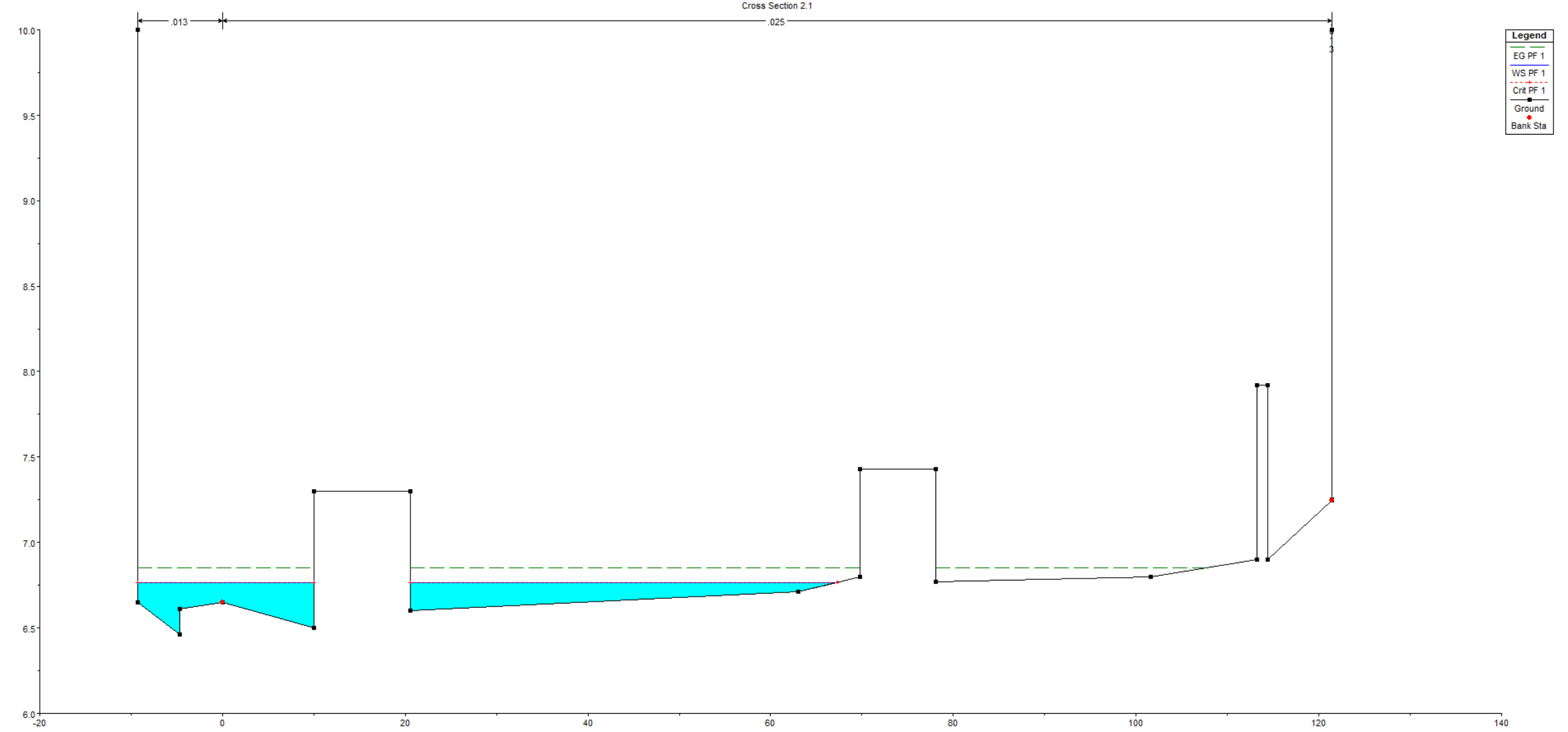
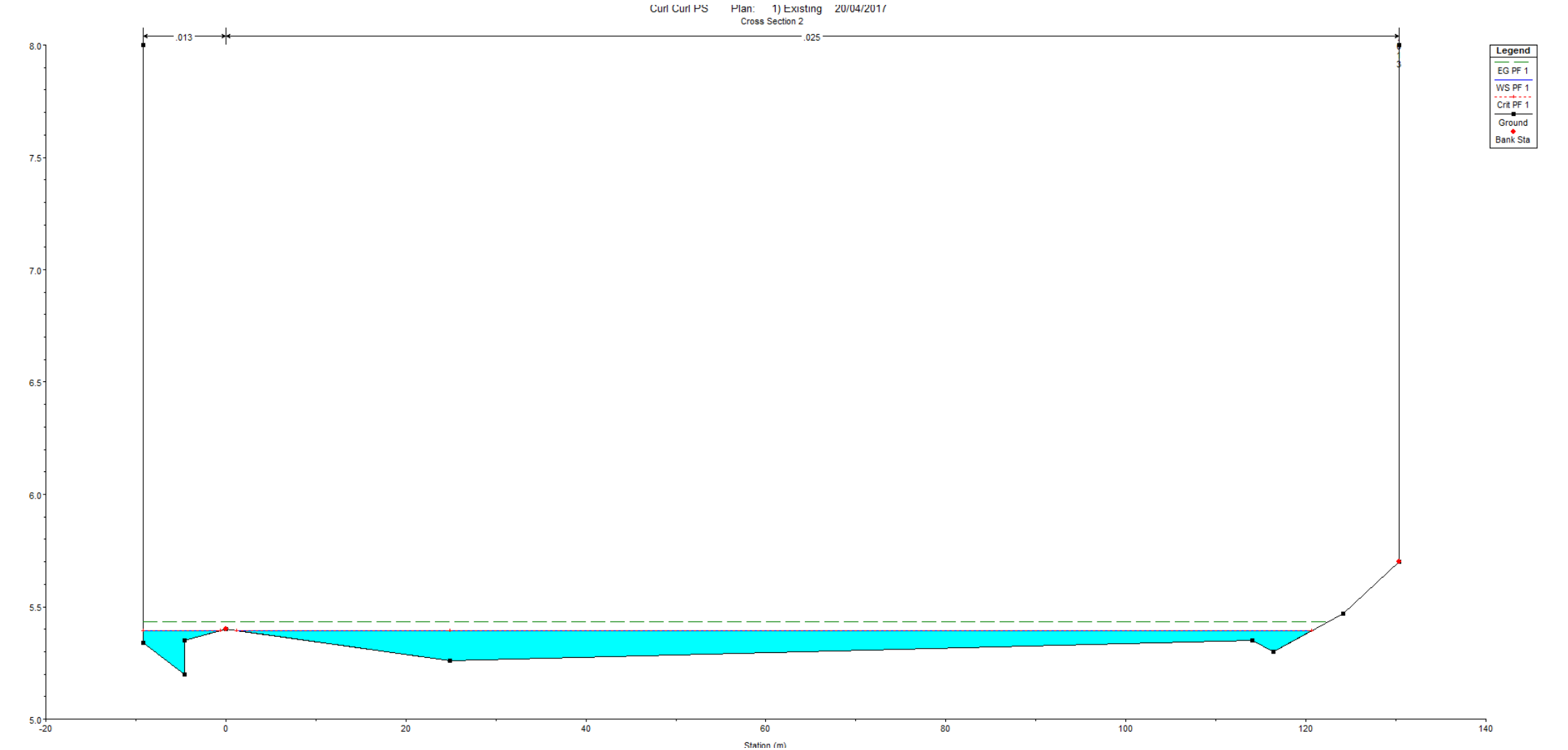
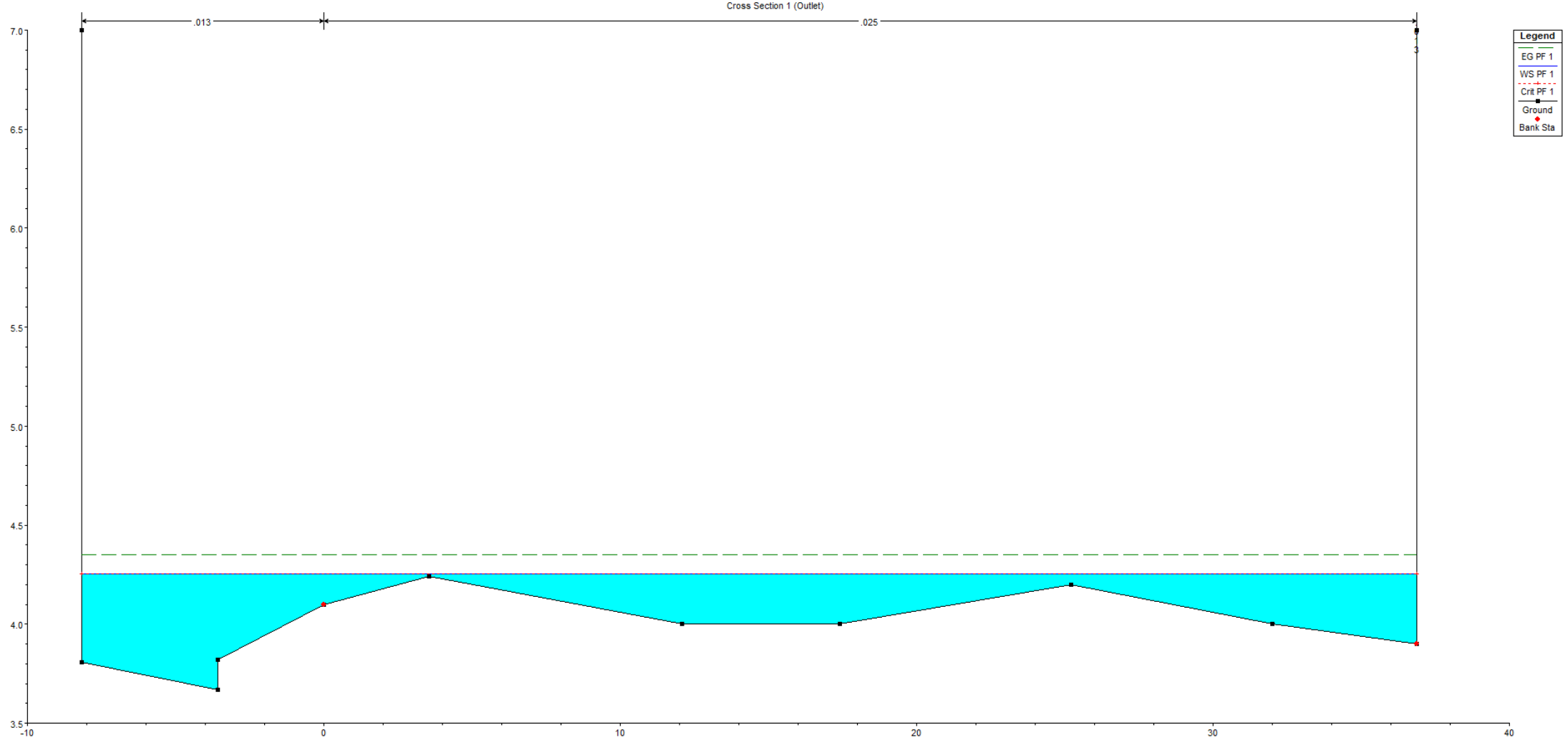
Cross Section 2.1

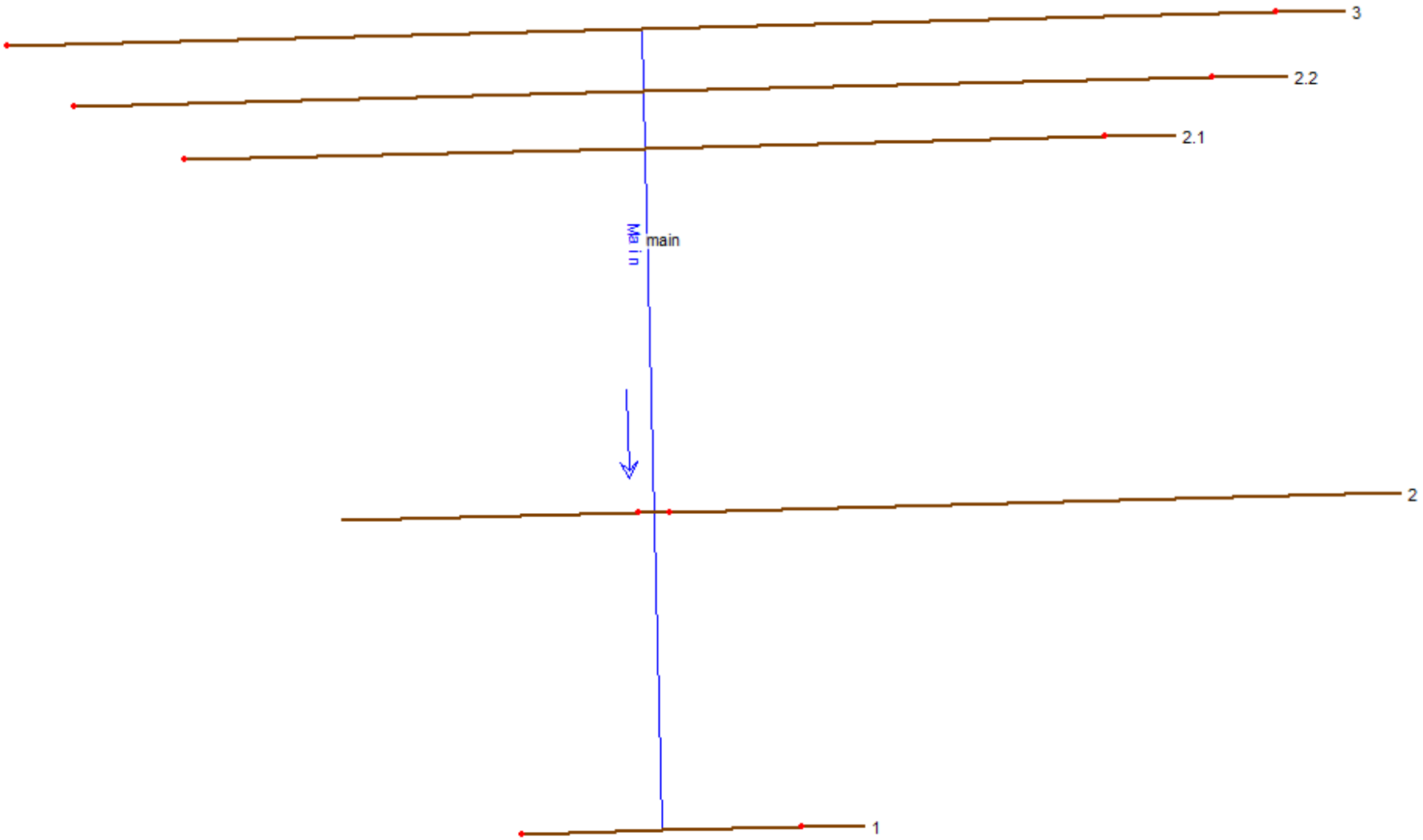



Curl Curl PS Plan: 1) Existing 20/04/2017
Cross Section 2
.013
.025
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
8.0
7.5
7.0
6.5
6.0
5.5
5.0
-20
0
20
40
60
80
100
120
140
Station (m)

Curl Curl PS Plan: 1) Existing 20/04/2017

Cross Section 1 (Outlet)

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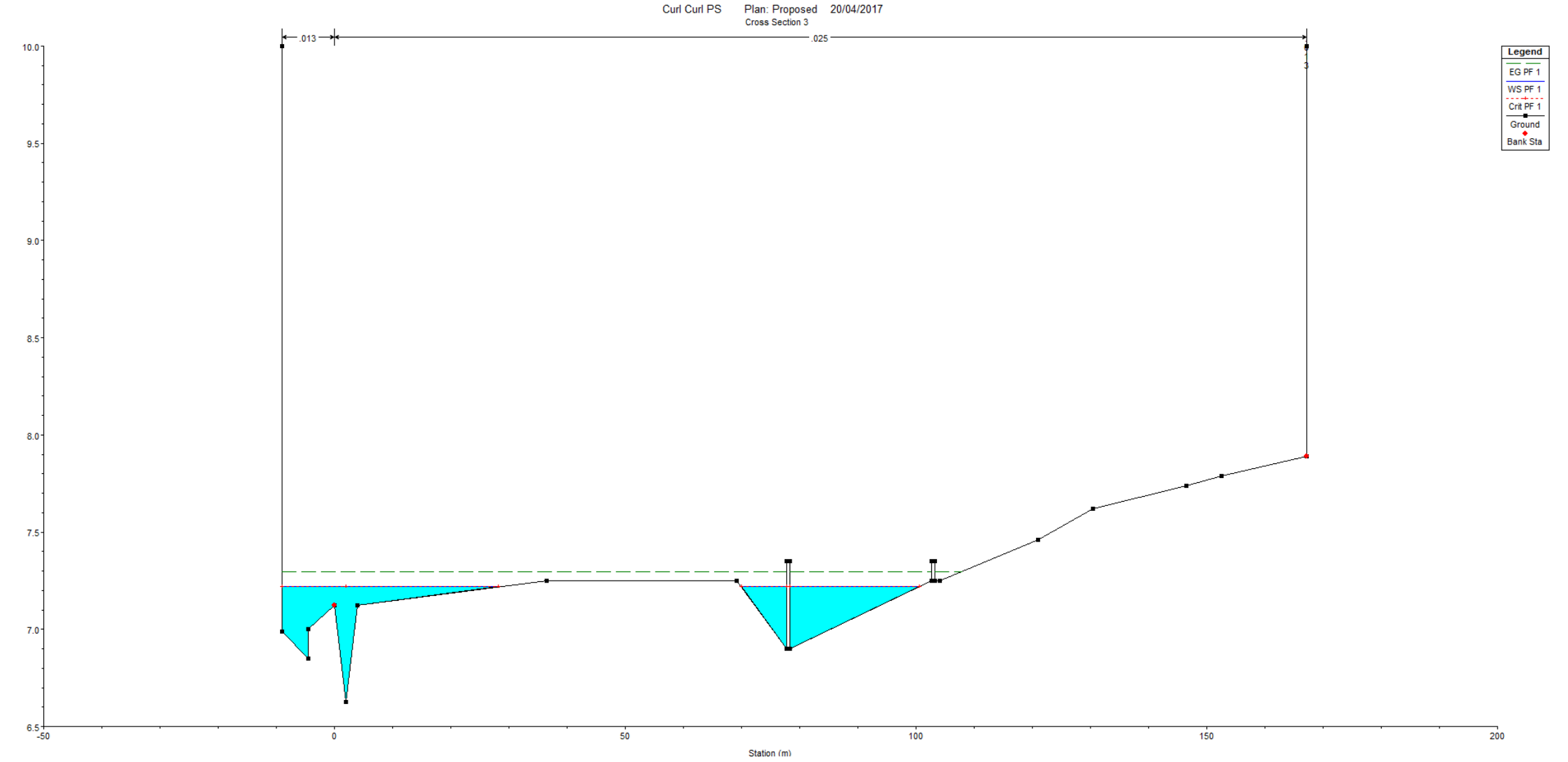
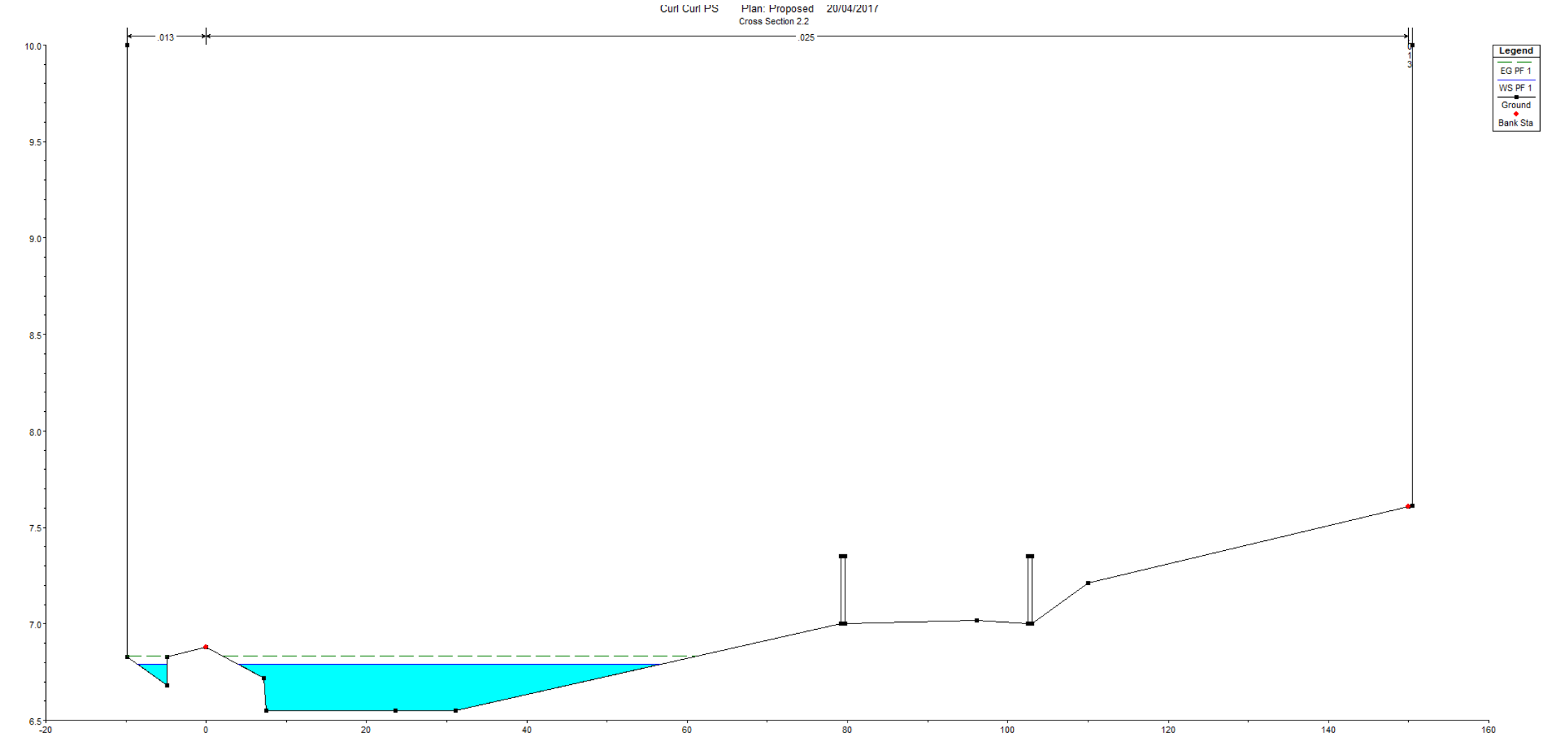
2.2
2.1
main
main
2
1


Curl Curl PS Plan: Proposed 20/04/2017
Cross Section 3
.013
.025
3
Legend
EG PF 1
WS PF 1
Crit PF 1
Ground
Bank Sta
10.0
9.5
9.0
8.5
8.0
7.5
7.0
6.5
-50
0
50
100
150
200
Station (m)


Curl Curl PS Plan: Proposed 20/04/2017
Cross Section 2.2
.013
.025
Legend
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WS PF 1
Ground
Bank Sta
10.0
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8.5
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7.5
7.0
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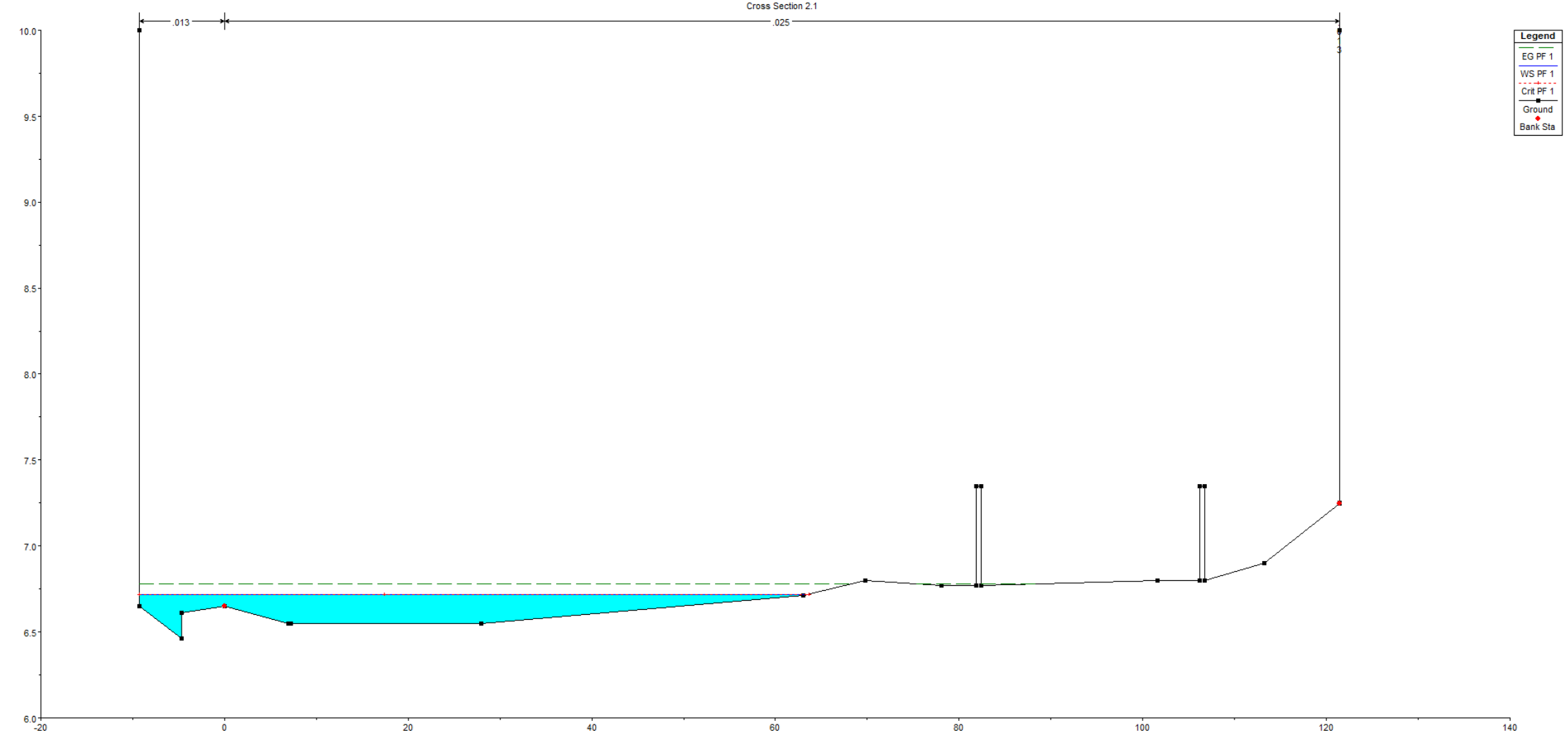
20
40
60
80
100
120
140
160

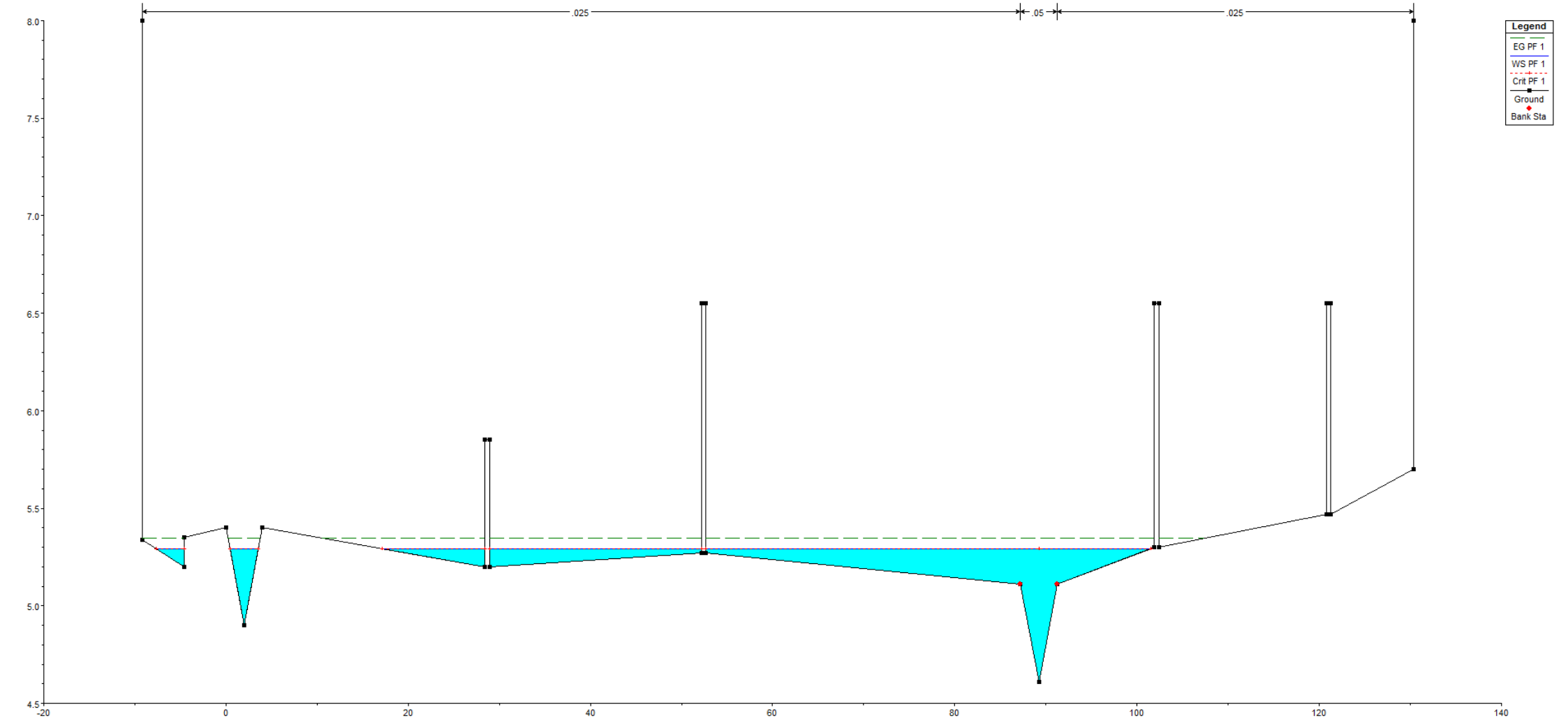
Curl Curl PS Plan: Proposed 20/04/2017

Cross Section 2.1



Curl Curl PS Plan: Proposed 20/04/2017

Cross Section 2



Curl Curl PS Plan: Proposed 20/04/2017

Cross Section 1 (Outlet)