

CITY OF JOHANNESBURG



STORMWATER MANAGEMENT REPORT

REVISION 04

BLUE HILLS EXT.105: SITUATED ON HOLDING 105 & 106 BLUE HILLS AGRICULTURAL HOLDINGS

THE EXECUTIVE DIRECTOR – ROADS AND STORMWATER
CITY OF JOHANNESBURG
PROJECT NUMBER: 0053

JANUARY 2024



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CITY OF JOHANNESBURG



BLUE HILLS EXT.105: SITUATED ON HOLDING 105 & 106 BLUE HILLS AGRICULTURAL HOLDINGS

- TABLE OF CONTENTS -

1	INTRODUCTION	4
2	LOCALITY AND SITE DESCRIPTION	5
3	TOPOGRAPHY, CLIMATE AND VEGETATION	5
4	SITE GEOLOGY	5
5	ENVIRONMENTAL AUTHORIZATIONS AND WULA REQUIREMENTS	6
6	FLOOD LINES	6
7	STORMWATER MANAGEMENT	6
8	STORMWATER DESIGN	8
9	CONCLUSION	12

APPENDIX LIST

- APPENDIX 1: LOCALITY PLAN
- APPENDIX 2: APPROVED TOWNSHIP LAYOUT PLAN
- APPENDIX 3: TOWNSHIP APPROVAL LETTER
- APPENDIX 4: ENVIRONMENTAL AUTHORIZATION
- APPENDIX 5: STORMWATER LAYOUT DRAWINGS
- APPENDIX 6: STORMWATER CATCHMENT LAYOUT PLAN
- APPENDIX 7: ATTENUATION POND HYDROGRAPHS
- APPENDIX 8: POND ROUTING CALCULATIONS & SECTION
- APPENDIX 9: TYPICAL ATTENUATION POND DETAILS
- APPENDIX 10: ACACIA ROAD CULVERT LAYOUT, DETAILS & CALCULATIONS

CITY OF JOHANNESBURG



BLUE HILLS EXT.105: SITUATED ON HOLDING 105 & 106 BLUE HILLS AGRICULTURAL HOLDINGS

- EXECUTIVE SUMMARY -

Ndalamo Consulting Engineers (Pty) Ltd (NCE) was appointed to design, administer and report on the stormwater management for the proposed Residential township of Blue Hills Ext.105 on Holding 105 and 106, Blue Hills Agricultural Holdings. The objective of this report is to obtain Council approval of the stormwater management scheme for this proposed development.

The proposed township includes the following:

- Erf 1: Residential 3 - 125 units;
- Erf 2: Special - As per Scheme;
- Erf 3: Private Open Space - No Rights.

No existing stormwater infrastructure exists within the vicinity of the township. Stormwater run-off from the township will be discharged directly into the water course along the southern boundary of the township via the internal attenuation facility.

The report will indicate that Blue Hills Ext.105's proposed internal stormwater infrastructure is sufficient to manage the stormwater run-off from the proposed township as required by the relevant guidelines and will also adhere to the requirements of the City of Johannesburg. All relevant designs, calculations and hydrographs are included in support of the findings.

All Civil Engineering Services for the proposed sub-division and rezoning application was proposed with consideration of the latest details and specifications prescribed by The City of Johannesburg, i.e., Johannesburg Roads Agency.

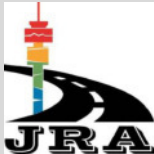
1 INTRODUCTION

Ndalamo Consulting Engineers (Pty) Ltd compiled this reports in support of the approval of the Site Development Plan for the Blue Hills Ext.105 township. Any additional information may be obtained from Ndalamo Consulting Engineers (Pty) Ltd:

Consultant:

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For submission to:

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Contact Person:	Mr Jose Monteiro
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2 LOCALITY AND SITE DESCRIPTION

The proposed township is located in the northern regions of Johannesburg close to the border with the City of Tshwane. Acacia Road forms the eastern boundary and Mimosa Road the northern boundary.

GPS Co-ordinate: 25°57'30.76"S, 28° 5'24.79"E. Attached as **APPENDIX 1: LOCALITY PLAN.**

The existing land-uses permitted on the application erven are indicated in the table below:

ERF NO.	USE ZONE	AREA (m ²)	FAR	GFA (m ²)	DENSITY	No. OF UNTIS
1	Residential 3	4.1753	-	-	2.2	125
2	Special	0.9510	a.p.s	TBC	1.8	
3	Private Open Space	0.0552	-	-	-	-
TOTAL		5.1592	-	-	100	125

Attached as **APPENDIX 2: APPROVED TOWNSHIP LAYOUT PLAN**

Attached as **APPENDIX 3: TOWNSHIP APPROVAL LETTER**

3 TOPOGRAPHY, CLIMATE AND VEGETATION

The proposed development comprises an area of approximately 26.4ha. The area experiences a mild climate, characterised by warm to hot moist summers and cool dry winters. Temperatures vary between 0°C and 34°C, with an average of 18°C.

The summer rainfall is between 650mm and 750mm with thunderstorms occurring frequently during the rainy season extending from October to March. On clear winter nights with little wind and dry air, frost can be expected. The site is currently overgrown with veld grass and contain traces of prior disturbance.

The site generally slopes from north to south at an average gradient of approximately 6.5%. The vegetation is characterised by typical veld grass. The site is situated at an average height of 1500 metres above sea level.

4 SITE GEOLOGY

A Geological Report was compiled by J Louis Van Rooy during December 2017, to confirm the developable capacity of the application site. The following is a summary of the findings from the report.

The site is suitable for development if the geotechnical constraints are taken into account and the designs incorporate measures to accommodate the on-site material properties and groundwater and hydrological conditions. Appropriate foundation design and building

procedures will be necessary as listed in this report.

The major geotechnical constraints for this site are:

- Collapsible and compressible soils on the granite soils and heave on the alluvium;
- Seasonal shallow perched groundwater tables and/or surface seepage;
- Intermediate erodibility of surficial soil horizons;
- Intermediate excavation conditions in weathered granite horizons and honeycomb ferricrete;
- Flooding in the stream floodplain is not expected that any dolomitic conditions will be found within the application site.

The upper sandy soils will generally be suitable as backfill, platform fill and subgrade for roads. Good site drainage will be necessary as the occurrence of a perched water table is a reality.

A complete copy of this report can be provided upon request should it be required.

5 ENVIRONMENTAL AUTHORIZATIONS AND WULA REQUIREMENTS

The Environmental Investigation or Authorization was approved by the Gauteng Department of Agriculture and Rural Development (GDARD) during August 2018.

The authorization was granted to undertake the activities which falls under the following listed activities of the Environmental Impact Assessment Regulations, 2014 (amended as of 7 April 2017):

- Activity 9 (i), 27, 28 (i) and 56(i) of Listing Notice 1 (GN. R 983);
- Activity 4 (c) (iv) and 12 © (ii) of Listing Notice 3 (GN. R 985).

Attached as **APPENDIX 4: ENVIRONMENTAL UTHORIZATION**

A WULA could be applicable for the discharge of stormwater run-off from the township. Any other possible listed activities will be identified and included in the application for environmental authorization.

6 FLOOD LINES

The township is affected by the 1:50yr and :100yr flood lines along the southern boundary of the township. A flood line calculation was done by a competent person and certified with the approved township layout plan.

Attached as **APPENDIX 2: APPROVED TOWNSHIP LAYOUT PLAN**

7 STORMWATER MANAGEMENT

7.1 EXISTING MUNICIPAL STORM WATER INFRASTRUCTURE/MANAGEMENT

The application site is located in an area with no formal municipal stormwater systems or infrastructure. Erf 1 of the township is however subject to a flood line with a water course

running along the southern boundary of the township from east to west.

Erf 2 of the township will be provided with a stormwater connection directly onto a new municipal stormwater network along Acacia Road. This new municipal network will not have any attenuation system and therefore the stormwater attenuation facility to be constructed for Erf 1 will be designed to compensate for the additional stormwater run-off to be generated by Erf 2. In principle a stormwater run-off off-set will be designed and provided.

7.2 PROPOSED EXTERNAL/MUNICIPAL STORMWATER NETWORK UPGARDES

No new municipal stormwater infrastructure upgrades will be required to accommodate the post-development stormwater run-off to be generated by the township.

The existing water course will directly receive the stormwater run-off from the township. Stormwater discharge into the water course will have to be managed and controlled as not to disturb the pre-development run-off conditions in a negative manner.

7.3 INTERNAL STORMWATER INFRASRUCTURE/MANAGEMENT

The internal stormwater management system of the township will comprise of a fully piped system with appropriate kerb and grid inlets and will discharge into the adjacent water course after attenuation.

The internal pipe system will consist of pipes varying from 375mm to 600mm diameters in size, with complementing grid and kerb inlets to facilitate surface runoff into the internal stormwater system. The stormwater systems drain in a southwestern direction where it will discharge into the attenuation facility, located on Erf 1 of the township.

The internal pipe system will be designed for the 1:5yr storm recurrence interval but the proposed road network will accommodate balance of the run-off up to the 1:25 year recurrence interval. Through surface flow towards the attenuation facilities, the 1:5 and 1:25 year storm recurrence intervals will be successfully managed by the township road and stormwater services. Recurrence floods greater than the 1:25yr flood up to the 1:100yr recurrence flood will be accommodated in the stormwater attenuation facility and will be catered for via overflow allowance as part of the attenuation facility.

As the site forms part of a private development, the maintenance of the proposed system will be undertaken by the Body Corporate/Home Owners Association of the township development and not by the municipality.

The attenuation facility on Erf 1, Blue Hills Ext.105 is a permanent element that will ensure compliance throughout the lifespan of the development. The attenuation facility will be designed to allow the discharge of the pre-development storm return periods by attenuating the post-development storm return periods up to the 1:100yr, with suitable overflow provisions. Erf 2, Blue Hills Ext.105 will not require any additional attenuation facilities.

The application of the design parameters indicated under Item 8.1, within the design of the attenuation facility will ensure that the existing water course can accommodate the pre-development run-off.

Attached as **APPENDIX 5: STORMWATER LAYOUT DRAWINGS**

8 STORMWATER DESIGN

8.1 DESIGN STANDARDS

All stormwater infrastructure will be designed and constructed to the following standards:

- “The Neighbourhood Planning and Design Guide”, - Redbook, latest edition; and
- The South African National Roads Agency – Drainage Manual.

DESIGN PARAMETERS	LIMITATIONS
Design Flood Frequency – Minor system	1:5-yr
Design Flood Frequency – Major system	1:25-yr (1:50 & 1:100-yr for special circumstances)
Minimum design capacity of stormwater systems	80 %
Minimum design velocity	1.0 m/s
Maximum discharge velocity at outlets	3.4 m/s
Minimum gradients	Dependant on pipe diameter
Minimum pipe size	450mm diameter
Pipe Type	Spigot & Socket

All works will be designed as per the Stormwater Design Manual for the City of Johannesburg and JRA requirements. This will be achieved by adopting the design principles of the JRA and the City and will aim to achieve the following to meet the requirements of the City’s by-laws:

- Peak discharge – No increase in discharge for any event of any duration up to the 25-yr RI event;
- Volume of run-off – No increase up to the annual 10-yr rainfall;
- Run-off frequency – No surface run-off for the 1-yr RI event of any duration;
- Water quality – No Deterioration.

8.2 STORMWATER CATCHMENT DETAILS

Stormwater runoff for the catchment areas drains on the natural ground as surface run-off in a south-western direction towards the southern boundary of the township. The township was divided into small sub-catchments to calculate the estimated post-development stormwater run-off.

Attached as **APPENDIX 6: STORMWATER CATCHMENT LAYOUT PLAN**

For the catchment run-off calculations, a pre-development run-off coefficient of 0.28 was used. For the post-development scenario, a run-off coefficient of 0.8 was used. The separate smaller catchment hydrographs were combined into one single hydrograph when performing

the pond routing and sizing. The details of the calculations and findings can be found in **APPENDIX 7: ATTENUATION POND HYDROGRAPHS.**

8.3 DESIGN RUN-OFF's, POND CAPACITIES AND BASIC CALCULATIONS

The rainfall data was derived from the latest revision of the “Design Rainfall Estimation in South Africa” software for the area of concern of the closest rainfall station available.

AutoCAD Civil3D design software can be used to estimate the design rainfall run-off for each catchment area through the Hydraflow Hydrograph Extensions Analysis Application by applying the data extracted from the “Design Rainfall Estimation in South Africa” software for the area of concern of the closest rainfall station available. This software has the capability of calculating reservoir/pond routing along with run-off calculations in the same time frame.

The stormwater design calculations will include but is not limited to the following:

- Stormwater Peak Discharge;
- Stormwater Volume;
- Stormwater Quality.

Summarized in the table below is the calculated stormwater run-off for several recurrence floods, pre- and post-development scenarios. The pre-development run-off volumes will be used as the target volumes to be discharged via the proposed attenuation facility.

As per the Johannesburg Road Agency, Code of Procedure, 30 June 2015, the post development c-factor of 0.8 was applied.

CAT. NAME	CAT. AREA (ha)	Pre-Dev. Run-off				Post-Dev. Run-off			
		1:5 Year (m³/s)	1:25 Year (m³/s)	1:50 Year (m³/s)	1:100 Year (m³/s)	1:5 Year (m³/s)	1:25 Year (m³/s)	1:50 Year (m³/s)	1:100 Year (m³/s)
CAT 1	0.3210	0.022	0.033	0.038	0.042	0.063	0.094	0.108	0.121
CAT 2	0.2800	0.019	0.029	0.033	0.037	0.055	0.082	0.094	0.106
CAT 3	0.2360	0.016	0.024	0.028	0.031	0.046	0.069	0.079	0.089
CAT 4	0.2620	0.018	0.027	0.031	0.035	0.051	0.076	0.088	0.099
CAT 5	0.4260	0.029	0.044	0.050	0.056	0.083	0.124	0.143	0.161
CAT 6	0.3160	0.022	0.032	0.037	0.042	0.062	0.092	0.106	0.119
CAT 7	0.307	0.022	0.032	0.037	0.042	0.060	0.090	0.103	0.116
CAT 8	0.1820	0.012	0.019	0.021	0.024	0.036	0.053	0.061	0.069
CAT 9	0.5930	0.041	0.061	0.070	0.078	0.116	0.173	0.199	0.224
CAT 10	0.290	0.020	0.030	0.034	0.038	0.057	0.085	0.097	0.110
CAT 11	0.0870	0.006	0.009	0.010	0.011	0.018	0.026	0.030	0.034

CAT 12	0.2470	0.017	0.025	0.010	0.033	0.048	0.072	0.083	0.093
CAT 13	0.1960	0.013	0.020	0.023	0.026	0.038	0.057	0.066	0.074
CAT 14	0.0730	0.005	0.007	0.009	0.010	0.014	0.021	0.024	0.027
CAT 15	0.0990	0.007	0.010	0.012	0.013	0.019	0.029	0.033	0.037
CAT 16	0.0780	0.005	0.008	0.009	0.010	0.015	0.023	0.026	0.030
CAT 17	0.0350	0.002	0.004	0.004	0.005	0.007	0.010	0.012	0.013
CAT 18	0.0690	0.005	0.007	0.008	0.009	0.014	0.020	0.023	0.026
CAT 19	0.0090	0.001	0.001	0.001	0.001	0.002	0.002	0.003	0.003
CAT 20	0.0910	0.006	0.009	0.011	0.012	0.018	0.027	0.031	0.035

Attached as **APPENDIX 7: ATTENUATION POND HYDROGRAPHS**

8.3.1 Attenuation Facility & Storage Requirements

The proposed attenuation facility will be a dry pond, earth filled structure with retaining walls. The attenuation facility will be covered with vegetation to form an eco-friendly and aesthetically pleasing feature as part of the proposed development. Suitable sized inlet and outlet structures will be constructed according to JRA's requirements. The attenuation pond will be constructed to accommodate the post-development run-off's up to and including the 100yr recurrence flood. The post-development discharge volumes will be restricted to the pre-development stormwater run-offs. Allowances will be made for stormwater run-off in excess of the 1:100yr return period.

The total designed storage capacity of the proposed dry attenuation pond will be approximately 1 305 m³. The pond will be constructed as per SANS1200DE and will conform to all other JRA and CoJ specifications.

The estimated storage volume is indicated in the table below:

STORM RECURRENTANCE	POST-DEV. INFLOW (m ³ /s)	STORAGE VOL. REQ. (m ³)	ORIFICE SIZE (mm)	PRE-DEV. OUTFLOW (m ³ /s)
1:5-yr	0.677	707	Top - 340L x 200W Bot. - 340L x 200W	0.288
1:25-yr	1.010	1 003	Top - 340L x 200W Bot. - 340L x 200W	0.430
1:50-yr	1.158	1 150	Top - 340L x 200W Bot. - 340L x 200W	0.493
1:100-yr	1.305	1 296	Weir – 1000L x 300D	0.556

Attached as **APPENDIX 8: POND ROUTING CALCULATIONS AND SECTION**

Attached as **APPENDIX 9: TYPICAL ATTENUATION POND DETAILS**

8.4 ACACIA ROAD CULVERT CROSSING

Acacia Road bounds the proposed development on the east. The future extent of Acacia Road crosses a natural water course south-east of the proposed development boundary. A culvert structure is therefore required to accommodate the flow in the natural watercourse crossing the road. It should be noted that the stormwater outflow of the proposed development, as described in the preceding sections above, discharges downstream of the proposed culvert structure.

8.4.1 Culvert Catchment Details

The proposed culvert has a catchment area of about 210.3 Ha. The catchment area comprises of mixed land use such as open, undeveloped areas as well as developed areas ranging from full title developments to sectional title developments. The longest watercourse identified within the catchment is about 1200m. The slope of this watercourse is roughly 4.03%, measured from the highest point to the location of the proposed culvert. For the purposes of this report, surface flow was assumed as this will result in a more conservative approach to determine the size of the culvert required. Satellite imagery showed that some of the developed areas implement attenuative measures before discharging stormwater run-off. Roads will also aid in the management of the stormwater before it reaches the watercourse. Taking into account the above information, a run-off coefficient of 0.6 was chosen when calculating the stormwater discharge at the culvert.

Attached as **APPENDIX 10: ACACIA ROAD CULVERT LAYOUT, DETAILS & CALCULATIONS**

8.4.2 Design Run-off, Basic Calculations and Culvert Size

The rainfall data was derived from the latest revision of the “Design Rainfall Estimation in South Africa” software for the area of concern and the closest rainfall station information available.

AutoCAD Civil3D design software was used to determine the rainfall run-off for the catchment as described above. The extensions program named, Hydraflow Hydrograph Extension Analysis Application, has the capability of calculating rainfall run-off hydrographs for a specific catchment according to the rational method. A full report of the catchment hydrographs determined for various storm events can be found in Appendix 10 of this report.

The summary of the peak outflows experienced for the various storm events are as follows:

CAT. NAME	CAT. AREA (ha)	Post-Dev. Run-off Runoff coeff. = 0.6					
		1:2 Year (m ³ /s)	1:5 Year (m ³ /s)	1:10 Year (m ³ /s)	1:25 Year (m ³ /s)	1:50 Year (m ³ /s)	1:100 Year (m ³ /s)
CAT 1	210.3	10.31	14.97	18.06	22.31	25.59	28.84

The stormwater design calculations included in Appendix 10 of this report will include but is not limited to the following:

- Stormwater Peak Discharge;
- Stormwater Volume;
- Stormwater Velocities;
- Stormwater depth upstream and downstream of the culvert;

AutoCAD Civil3D design software was also used to determine the culvert size required to accommodate the runoff generated by the different storm events. The Hydraflow Express Extension Analysis Application was used for these calculations. This application determines the flow characteristics for a given culvert design. The culvert design is therefore optimized to satisfy the flow characteristics required.

Assumptions and Design Criteria used for culvert sizing:

- Culvert entrance conditions – Tapered with less favourable edges (conservative)
- Embankment elevation 1.5m higher than upstream culvert invert level – to allow for 0.9m high culvert + 0.5m cover above culvert + 0.1m culvert slab thickness.
- Manning roughness value of $n = 0.013$
- 3% slope across culvert
- No tailwater downstream of culvert

The culvert size was optimised so that a 1:100-year storm event will not overtop the embankment level (shoulder of road).

A detailed summary of the flow characteristic experienced by the culvert during various storm events can be found in Appendix 10 of this report.

The culvert design chosen to satisfy the drainage requirements of the catchment is an assembly of rectangular portal culverts. One 3600mm x 1200mm culvert placed in the centre of the watercourse will manage insignificant stormwater runoff. Furthermore, 4 x 2100mm x 900mm culverts, positioned alongside the central culvert, will manage the larger storm events.

A detailed drawing of the catchment area layout, culvert layout and section through the culverts is included in Appendix 10 of this report as drawing 0533-SW-L07.

Attached as **APPENDIX 10: ACACIA ROAD CULVERT LAYOUT, DETAILS & CALCULATIONS**

9 CONCLUSION

The Site Development Plan of the Blue Hills Ext.105 township can be supported with the incorporation and inclusion of the findings of this report. The stormwater run-off generated from the township can be adequately and sufficiently managed with the aim of providing, much needed, housing to the local community.

In summary the findings of the report are as follow:

- No existing stormwater infrastructure exists within the vicinity of the township;
- A water course is located along the southern boundary of the township and all stormwater run-off will be discharged into the water course;
- Stormwater run-off from the township will be attenuated and discharged at pre-development run-off volumes and rates;
- The attenuation pond will cater for all storm recurrence intervals up to the 1:100yr storm;
- Stormwater will be drained into the attenuation pond via a combination of pipe networks and road surfaces;
- A new attenuation pond of approximately 1305m³ storage is to be provided to cater for storm events up to the 1:100yr storm.
- A new culvert assembly in the natural water course south of the development is required for crossing Acacia Road.

The approval and acceptance of this report in support of the Blue Hills Ext.105 township will fulfil a great need for housing in Gauteng and in particular the local community.

We trust that the information supplied will be sufficient to enable the City of Johannesburg i.e., Johannesburg Roads Agency to approve the storm water management scheme for the Blue Hills Ext.105 township.



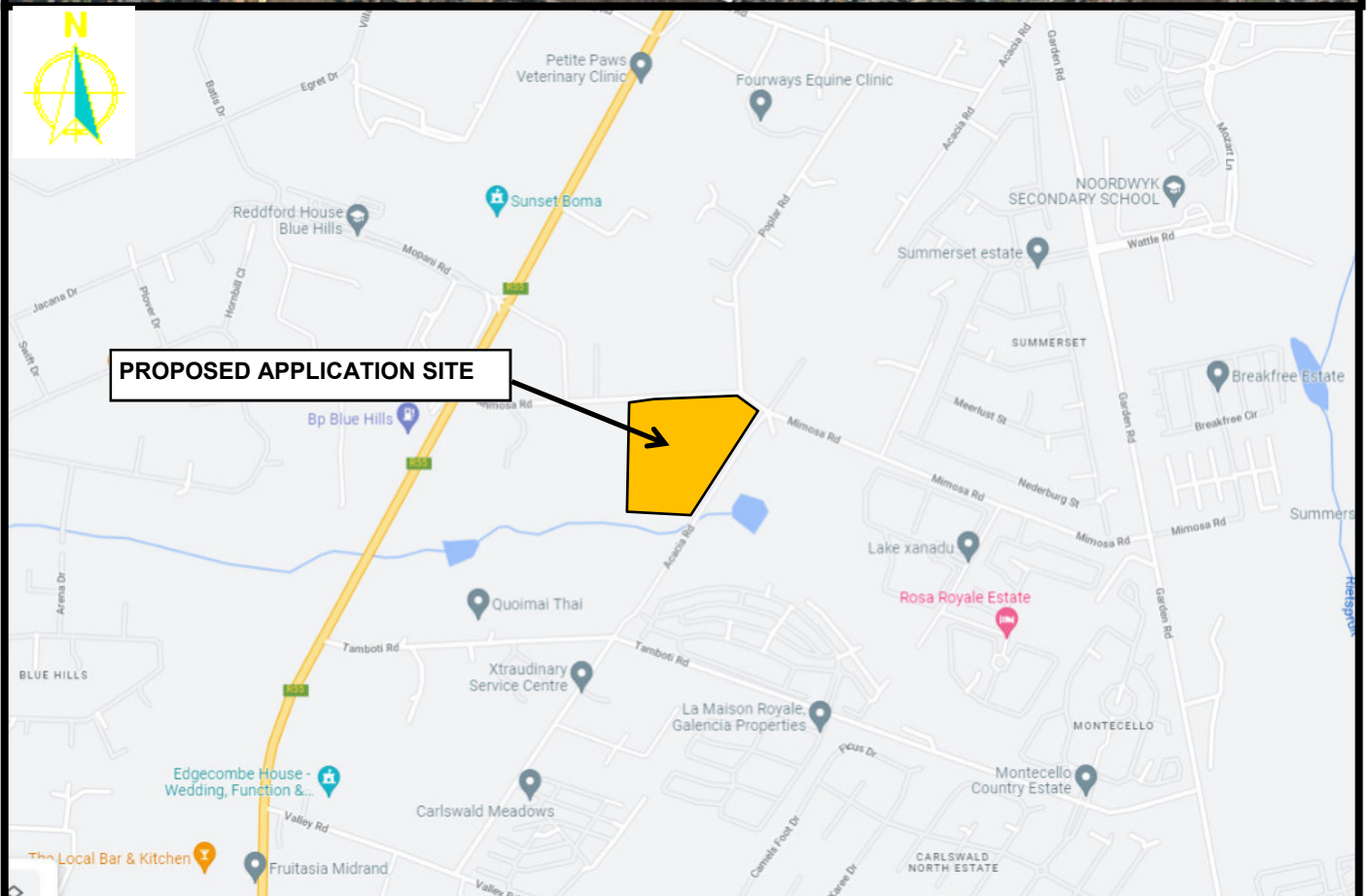
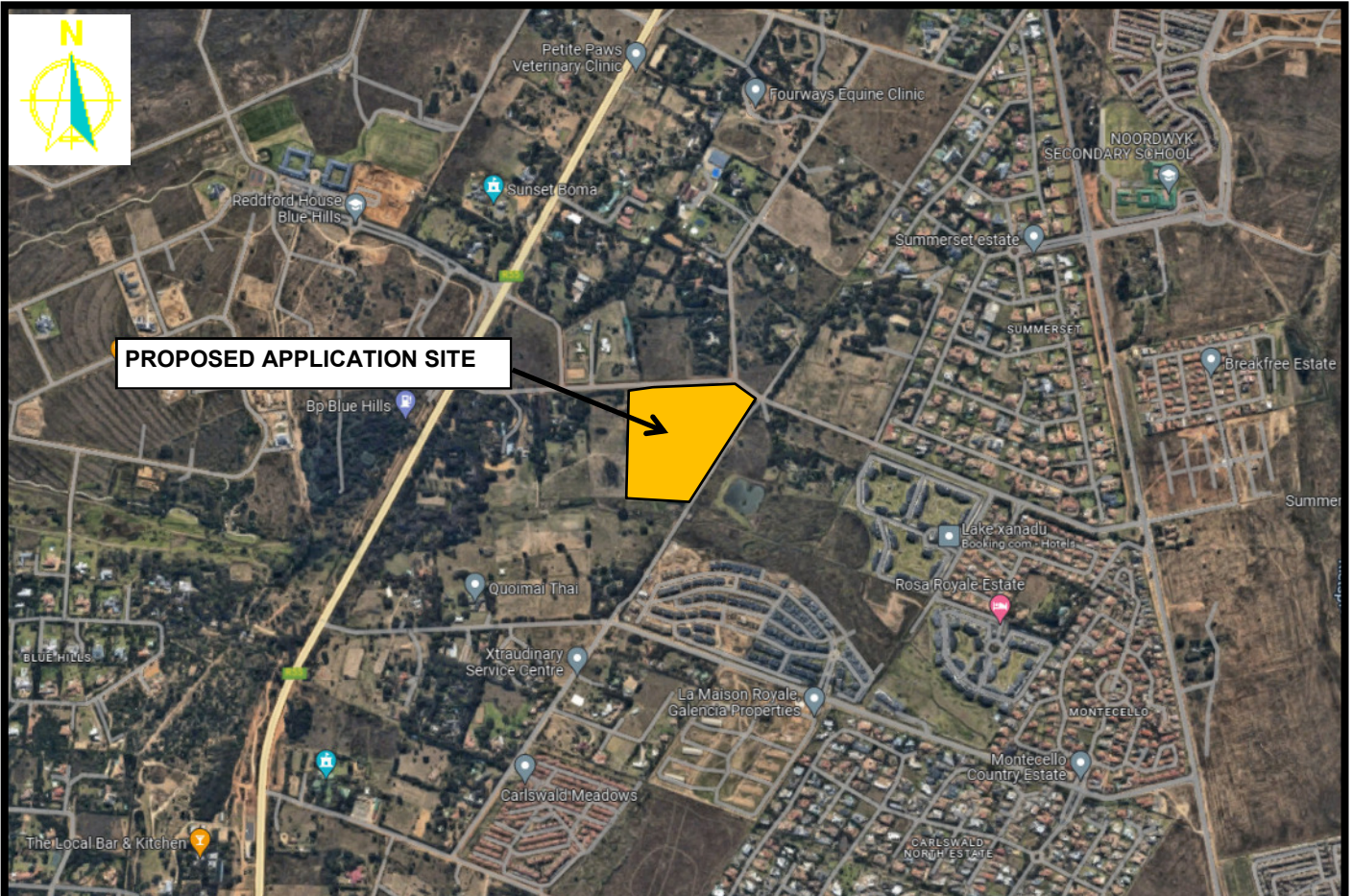
M. TSHOILOLI

for Ndalamo Engineering Consultants

- REFERENCES -

- 1) Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development (Red Book);
- 2) Stormwater Design Manual for the City of Johannesburg;
- 3) Provision of Municipal Services in Privately Developed Areas;
- 4) City of Johannesburg – Johannesburg Roads Agency (PTY) LTD – Standard Drawings and Specifications;
- 5) The South African National Roads Agency – Drainage Manual.

APPENDIX 1: LOCALITY PLAN



**0053 – BLUE HILLS EXT.105
LOCALITY PLAN**

APPENDIX 2: APPROVED TOWNSHIP LAYOUT PLAN

PROPOSED TOWNSHIP: BLUE HILLS EXT 105

SITUATED ON HOLDINGS 105 AND 106
BLUE HILLS AGRICULTURAL HOLDINGS

THE TOWNSHIP BOUNDARY IS REPRESENTED BY
FIGURE "A-B-C-D-E-F-A" AND MEASURES
APPROXIMATELY 5,7305ha IN EXTENT.

LOCAL AUTHORITY:
CITY OF JOHANNESBURG METROPOLITAN
MUNICIPALITY

GENERAL NOTES:

1. ALL DIMENSIONS AND AREAS ARE APPROXIMATE
PENDING FINAL SURVEY.
 2. THE CONTOURS ARE IN ACCORDANCE WITH SECTION 26
OF THE CITY OF JOHANNESBURG MUNICIPAL PLANNING
BY-LAW 2016.
 3. CADASTRAL SURVEY TO BE DONE BY LAND SURVEYOR
(PLS)
- COORDINATE SYSTEM WG
Y CONSTANT=2 800 000,00
X CONSTANT=2 800 000,00

SERVITUDE NOTES:

1. NONE

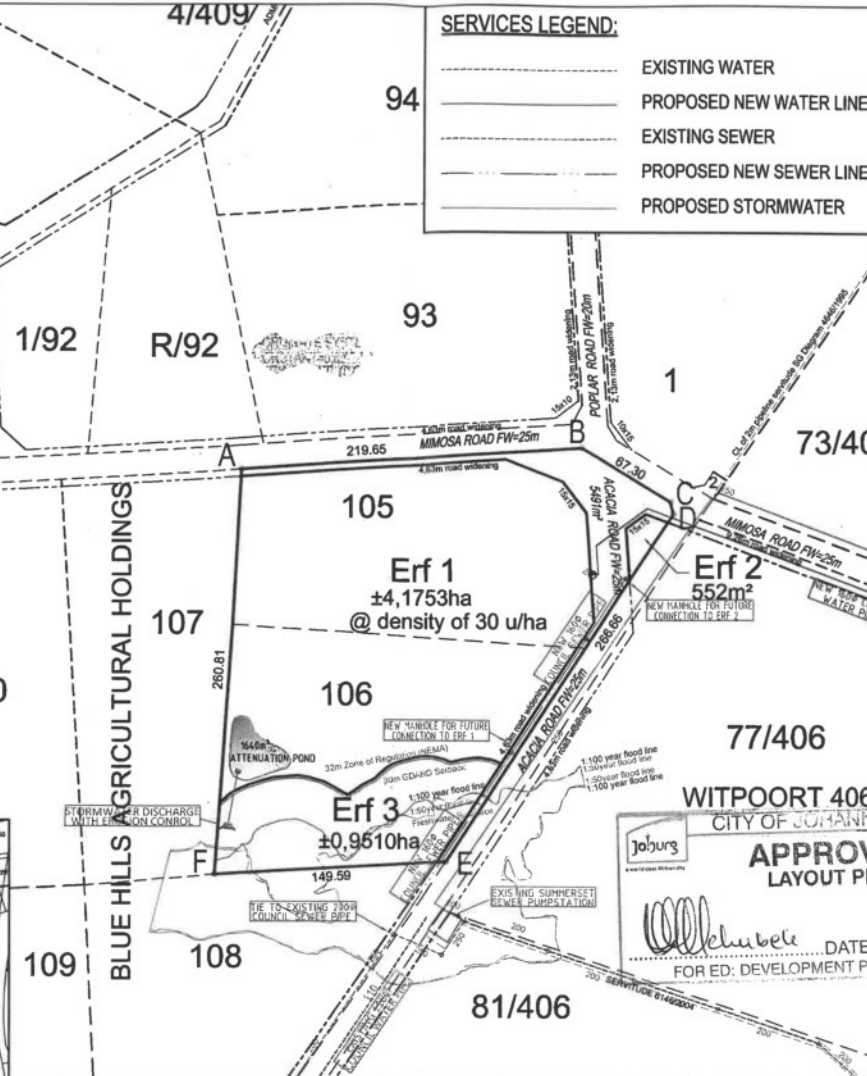
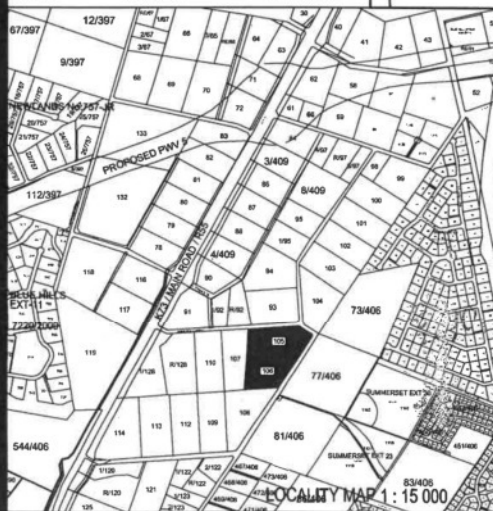
AMENDMENTS	DATE	NOTES
DATE	NOTES	
Jan 2018	Township submission	
May 2018	Floodline amendment	
July 2018	EIA services	

FLOODLINE NOTE:

IT IS HEREBY CERTIFIED THAT THE PROPERTY SHOWN ON
THIS DIAGRAM IS AFFECTED BY FLOODWATER UP TO THE
50 AND 100 YEAR RECURRENCE INTERVAL EVENT.
DETERMINED IN ACCORDANCE WITH SECTION 144 OF THE
NATIONAL WATER ACT (ACT 36 OF 1998)

GLJ102 - Holding 105, 106 Blue Hills Affloodline sign.jpg

NAME	SIGNATURE	PR NUMBER
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SERVICES LEGEND:

- EXISTING WATER
- PROPOSED NEW WATER LINE
- EXISTING SEWER
- PROPOSED NEW SEWER LINE
- PROPOSED STORMWATER

CONSOLIDATION NOTE:

HOLDING 105 AND 106 BLUE HILLS A/H TO BE
CONSOLIDATED AFTER EXCISION BUT PRIOR TO
PROCLAMATION.

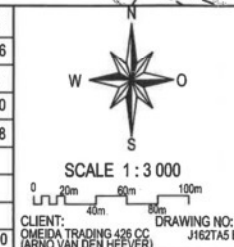
HOLDING DESCRIPTION:

THE FIGURE "A-B-C-D-E-F-A" REPRESENTS HOLDINGS
105 AND 106 BLUE HILLS AGRICULTURAL HOLDINGS,
ALSO THE TOWNSHIP BOUNDARY OF BLUE HILLS EXT
105. HOLDING 105 AND 106 MEASURES 3,0230ha IN
IN EXTENT AND IS HELD BY OMEIDA TRADING 426 CC
VIDE DEED OF TRANSFER T 12882 / 2008 AND SG
DIAGRAMS A 3289 / 1949 AND A 7143 / 1949
RESPECTIVELY.

DEVELOPMENT CONTROLS:

ZONING: Residential 3
FSR: 0,8
COVERAGE: 50%
HEIGHT: 3 storeys
DENSITY: 30 units per ha on Holdings 105 and 106

LAND USE	USE ZONE	ERF NUMBERS	NO OF ERVEN	UNITS	TOT. AREA	%
	"RESIDENTIAL 3" (30 UNITS / HA)	1	1	171	4,1753ha	72,86
	"SPECIAL" any use with consent	2	1	n/a	0,0552ha	0,96
	"PRIVATE OPEN SPACE" (Ecological)	3	1	n/a	0,9510ha	16,60
	"ROAD PURPOSES"	n/a	n/a	n/a	0,5490ha	9,58
	TOTAL	1-3	3	171	5,7305ha	100,0



APPLICANT: OPTICAL TOWNPLANNERS CC
TEL: 082 620 5747 (Elena Vermaak)
E-MAIL: elena@landlaw.co.za
POSTAL ADDRESS: P.O. Box 13530
Hillfield
Pretoria
00028
STREET ADDRESS: 14 Malan Street
Riverside
0004

Optical
town planners

APPENDIX 3: TOWNSHIP APPROVAL LETTER



City of Johannesburg
Department of Development Planning

Land Use Management
Metropolitan Centre
158 Civic Boulevard
Braamfontein

P O Box 30733
Braamfontein
South Africa
2017

Tel +27(0) 11 407 6142
Fax +27(0) 11 339 4000
www.joburg.org.za

REGISTERED POST

03 February 2021

Optical T.P
P.O Box 4366
Rietvalleirand
0174

Dear Sirs

TOWNSHIP PROPOSED BLUE HILLS EXTENSION 105 (SITUATED ONHOLDINGS 105 AND 106 BLUE HILLS AGRICULTURAL HOLDINGS) AMENDMENT SCHEME: (07-18535)

Our Ref: 07-18535

"That notwithstanding the provisions of any other law that the City of Johannesburg, approves the application under provision of Section 28(1) of the City of Johannesburg Municipal Planning By-law, 2016, for the township establishment of BLUE HILLS EXTENSION 105 (SITUATED ON HOLDINGS 105 AND 106 BLUE HILLS AGRICULTURAL HOLDINGS), subject to the following conditions:

1. INTERNAL REQUIREMENTS

1.1 LAYOUT PLAN

The township shall consist of erven as indicated on Layout Plan No 07-18535/P3/2018 (attached as Annexure A)

1.2 DEVELOPMENT CONTROLS (City of Johannesburg Land Use Scheme, 2018)

ERF 1

USE ZONE... 3 ... "RESIDENTIAL 3"

Primary Rights: Dwelling units, residential buildings, duplex dwellings, access, access control and related uses.

REGISTRATION LETTERS
M Reinecke
07-18535

Consent Rights: No Rights:	As per Scheme. As per Scheme.
Density:	30 dwelling units per hectare, permitting a maximum of 125 dwelling units on site.
Height:	Three (3) storeys
FAR:	As per Scheme – 0.8
Coverage:	As per Scheme – 50%
Parking:	Effective, paved parking spaces together with the necessary manoeuvring area, shall be provided on the erf to the satisfaction of the Local Authority in the following ratios: 1. 2 parking bays per unit with 4 or more habitable rooms; 2. 1 parking bay per unit with 2 or less habitable rooms; 3. 0.3 parking bays per unit for visitors
Building lines:	As per Scheme – Along all boundaries: 3 m Provided that the relevant authority may relax all buildings lines

Specific Conditions:

1. A Site Development Plan to the satisfaction of the Council shall be submitted for evaluation and approval prior to the approval of building plans and / or the development of the erf. The SDP for Erf 3 shall be submitted simultaneously with that of Erf 1 and such shall be circulated to EISD.
2. The erf shall be landscaped, by the planting of indigenous trees and shrubs only, and maintained to the satisfaction of the Council.
3. Ingress to and egress from the erf shall be located, paved, constructed and maintained to the satisfaction of the Council (JRA).
4. A screen wall or fence, of which the height, extent and material shall be to the satisfaction of the Council shall be erected and maintained along the boundaries of the erf, if and when required.
5. On-site storm water attenuation / management shall be provided and maintained to the satisfaction of the Council (JRA & EISD), if required.
6. The storm water attenuation area shall be fenced, if required, and all the necessary safety precautionary measures shall be imposed, implemented and maintained by the owner at all times to the satisfaction of the Council.

ERF 2

USE ZONE... 10 ... SPECIAL

Primary Rights: As per Scheme – Uses as the Council may approve by Consent.

Consent Rights: As per Scheme.

ERF 3

USE ZONE...26...PRIVATE OPEN SPACE

Primary Rights: Ecological Open Space – Open Space for the Conservation of and/or protection of natural areas.

Consent Rights: No Rights.

2. GENERAL CONDITIONS (application to all Erven)

- a) The erf lies in an area where soil conditions can affect buildings and structures and result in damage to them. Building plans submitted to the local authority must show measures to be taken, in accordance with recommendations contained in the Engineering-Geological report for the township, to limit possible damage to buildings and structures as a result of detrimental foundation conditions unless it can be approved to the local authority that such measures are unnecessary or that the same purpose can be achieved by other more effective means.
- b) The NHBRC classification for foundations is considered as C1/H2/P (flooding).
- c) Erven 1 and 3 shall be notorially tied and shall not be disposed of as separate entities. The maintenance and upkeep of the Private Open Space erf, to the satisfaction of the Council, shall be the sole responsibility of the owner/s of the respective notarialy attached Residential erf.

3. OTHER INTERNAL REQUIREMENTS

- 3.1 The township owner shall install and provide all internal services in and for the township at his own cost, subject to the approval of the Council.
- 3.2 If, by reason of the establishment of the township, it should become necessary to remove or replace any existing municipal services, the cost thereof shall be borne by the township owner.
- 3.3 Contributions in respect external sewerage, water, stormwater, and electricity services are payable to the Council in accordance with Section 25 of the City of Johannesburg Municipal Planning By-law, 2016, if required.
- 3.4 The conditions and recommendations of the Geotechnical Data Bank to be included in the conditions of establishment of this township.

3.5 The applicant shall adhere to the MOE's and internal Departments' (EISD) conditions and comments, to the satisfaction of the Council.

3.6 The conditions of the approved Traffic Impact Study dated 08th March 2018 shall be adhered to, to the satisfaction of the Council.

3.7 The conditions of the EISD, dated 04th September 2018 shall be adhered to, to the satisfaction of the Council.

3.8 Stormwater management must be provided to the satisfaction of the JRA.

3.9 Any cost for upgrading, provision or installation of services shall be borne by the applicant.

3.10 The following conditions shall be complied with prior to the opening of the Township Register in respect of the supply of electricity:

a) Neither the township register nor the proclamation of the township shall be done unless and until the Council and its authorized agent City Power is in a position to supply electricity to the township.

b) The City of Johannesburg and City Power is indemnified against claims for power until it is in a position financially and technically to provide it.

3.11 Street names shall be provided for all public roads in the township to the satisfaction of the Council, prior to the proclamation of the township.

3.12 The following conditions must be included as conditions of title in respect of all erven in the township:

a) The erf is subject to a servitude, 2 meters wide, in favour of local authority, for sewerage and other municipal purposes, along any two boundaries other than a street boundary and in the case of a panhandle erf, an additional servitude for municipal purposes 2 meters wide across the access portion of the erf, if and when required by the local authority: Provided that the local authority may dispense with any such servitude.

b) No building or other structure shall be erected within the aforesaid servitude area and no large-rooted trees shall be planted within the area of such servitude or within 2 meters thereof.

c) The local authority shall be entitled to deposit temporarily on the land adjoining the aforesaid servitude such material as may be excavated by it during the course of the construction, maintenance or removal of such sewerage mains and other works as it, in its discretion may deem necessary and shall further be entitled to reasonable access to the said land for the aforesaid purpose subject to any damage done during the process of the construction, maintenance or removal of such sewerage mains and other works being made good by the local authority.

3.13. The requirements of the following Council Departments and Municipal Entities (ME's) shall be complied with to their satisfaction (refer Annexure E):

Technical Co-Ordination
Johannesburg Road Agency
Johannesburg Water
Eskom

Environmental Impact Management and Compliance Monitoring
Environmental Health
Joburg City Parks

4. EXTERNAL REQUIREMENTS (Refer Annexure E)

2.1 Department of Transport and Public Works (Gauteng Provincial Government)
The requirement and conditions of the Department of Transport and Public Works shall be complied with to their satisfaction as per letter with Reference No: 23417 dated 11th April 2018.

2.2 Department of Agriculture and Rural Development (GDARD)
Environmental Authorisation granted for the township and conditions shall be complied with to their satisfaction as per letter with Reference No: GAUT 002/18-19/E0036dated 31st August 2018.

2.3 Eskom / Telkom

If, by reason of the establishment, it should become necessary to remove or replace any existing Eskom / Telkom services, the cost thereof shall be borne by the township owner.

5. EXCISION OF AGRICULTURAL HOLDING

As the relevant authority in terms of Section 45(6) of the Spatial Planning and Land Use Management Act, 16 of 2013, and for purposes of Section 6(1) of the Agricultural Holdings (Transvaal) Registration Act, 22 of 1919, read with Section 28(1) of the City's Municipal Planning By-law, 2016, the above approval also means that the City consents to the excision of Holdings 105 and 106 Blue Hills Agricultural Holdings from the Agricultural Holdings Register and for it to revert back to a farm portion and to be recorded in the Farm Register."

Should an appeal be submitted from the applicant or any formal objector, it must be submitted within 28 days from the date of receipt of the notification of the decision letter.

Yours faithfully

M Reinecke

for: DEVELOPMENT PLANNING

Contact Person: M Reinecke
Tel No: 407-6136
Fax No: 339-4000
/de

APPENDIX 4: ENVIRONMENTAL LETTER



GAUTENG PROVINCE

AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA

Reference: Gaut 002/18-19/E0036

Enquiries: Tsakani Sithole

Tel: +27 (0)11 240 3403

Tsakani.Sithole@gauteng.gov.za

Omeida Trading 426 CC

P O Box 307

GROENKLOOF

0027

Email: idemslie@mweb.co.za

By Registered Mail

Dear Lovell Emslie,

ENVIRONMENTAL AUTHORISATION GRANTED: PROPOSED MEDIUM DENSITY TOWNSHIP DEVELOPMENT ON HOLDINGS 105 AND 106 OF BLUE HILLS AGRICULTURAL HOLDINGS, CITY OF JOHANNESBURG METROPOLITAN MUNICIPALITY.

Regarding the above-mentioned application, please be advised that the Department has decided to grant Environmental Authorisation (EA). The EA and reasons for the decisions are attached herewith.

In terms of Regulation 4 (2) of the Environmental Impact Assessment Regulations, 2014, you must notify all registered interested and affected parties, in writing, and within 14 days of the date of this letter, of the Department's decision in respect of your application as well as the provisions regarding the making of appeals.

Your attention is drawn to Chapter 2 of the National Appeals Regulations, 2014 which regulates the appeal process. Should you wish to appeal any aspect of the decision, you must within 20 days of the date of the notification of the decision submit your appeal, including supporting documents, to the appeal administrator by any of the following means:

Postal Address:

The Appeals Administrator
Department of Agriculture and Rural Development
P.O. Box 8769
Johannesburg
2000

CDARD
Office of the HOD

31 AUG 2018

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Physical Address

The Appeals Administrator
Department of Agriculture and Rural Development
56 Eloff Street, Umnotho House, 23rd Floor
Johannesburg
2000

Fax No: 011 240 3158/2700

Email Address: appeals@gauteng.gov.za

Your appeal must be submitted in the prescribed appeal form obtainable from the appeal administrator, Ms. Tsholofelo Mere, at telephone number 011 240 3204 or email address tsholofelo.mere@gauteng.gov.za. The appeal form is also available from our website: www.gdard.gpg.gov.za. Should you have any queries or require additional information regarding the appeal process, you can contact the appeal administrator on any of the mentioned contact details.

Kind regards,



MS PRISCILLA PIETERSEN

ACTING HEAD OF DEPARTMENT: AGRICULTURE AND RURAL DEVELOPMENT

DATE: 30/08/18

GDARD
Office of the HOD

31 AUG 2018

000041



GAUTENG PROVINCE

AGRICULTURE AND RURAL DEVELOPMENT
REPUBLIC OF SOUTH AFRICA

ENVIRONMENTAL AUTHORISATION

GDARD
Office of the HOD
31 AUG 2018
000047

Reference Number:	GAUT 002/18-19/E0036	
Holder of Authorisation:	Omeida Trading 426 CC	
Location of Activity / Activities:	On Holdings 105 and 106 of Blue Hills Agricultural Holdings, City of Johannesburg Metropolitan Municipality.	
Coordinates:	Latitude (S)	Longitude (E)
	25° 57' 28.23" S	28° 05' 26.07" E
SG DIGIT CODE (S)	T0JR00160000010400000	

1. Decision

The Department is satisfied, based on the information available to it and subject to compliance with the conditions of this Environmental Authorisation (EA), that the applicant should be authorised to undertake the activities specified below:

2. Activities Authorised

Under the National Environmental Management Act, 1998 (Act No. 107 of 1998) (as amended) and the Environmental Impact Assessment Regulations, 2014, the Department hereby authorises-

Omeida Trading 426 CC

with the following contact details:

P O Box 307
GROENKLOOF
0027

E-mail: idemslie@mweb.co.za

Telephone No: 083 412 7931

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Office of the HOD
31 AUG 2018
000047

to undertake the activities applied for the proposed development which falls under Activities 19 (i), 27, 28 (i) and 56 (i) of Listing Notice 1 (GN. R 983.) as well as Activities 4 (c) (iv) and 12 (c) (ii) of Listing Notice 3 (GN R 985) of the Environmental Impact Assessment Regulations, 2014 (Amended as of 7 April 2017).

The Granting of this EA is subject to the conditions set out below:

3. Specific Conditions of Authorisation

- 3.1 Environmental Authorisation is granted for the proposed Layout Plan No. 07-18535/P2/2018, which entails medium density township development (to be known as Blue Hills Extension 105) as well as extension and widening of the existing roads on Holdings 105 and 106 of Blue Hills Agricultural Holdings, City of Johannesburg Metropolitan municipality.
- 3.2 No any other development must occur within the 30-meter wetland buffer except for the extension and widening of the existing roads and the installation of a new 160-mm council water pipe.
- 3.3 The edge of the wetland must be clearly demarcated in the field with pegs or poles that will last for the duration of the construction phase, colour-coded as follows:
 - ☐ RED – Indicating the edge of the wetland (Note: This includes the permanent, seasonal and temporal wetlands, or parts thereof) [These should be put along the entire length of the property/site.],
 - ☐ ORANGE – Indicating the edge of the buffer zone (30m within urban areas).
- 3.4 Furthermore, all water use authorisations must be obtained from Department of Water and Sanitation regarding the activities that will take place within the wetland.
- 3.5 It is indicated in the Terrestrial Ecological Habitat Integrity Investigation that there is likelihood that *Boophane disticha*, *Hypoxis hemerocallidea* and *Atelexis frontalis* are likely to be present within the proposed site. The orange listed species must be conserved within the private open space as indicated in the Layout Plan. However, should, a rescue operation in compliance with GDARD requirements be needed? An email entitled "request for rescue operation" must be sent to calvin.jonhasi@gauteng.gov.za within a minimum of six weeks prior to the site clearance. The following documents must be attached to the email: (1) A scanned version of the Environmental Authorisation, (2) a map clearly showing the location

- of the site, (3) a plant species list for the site, (4) the site layout plan, clearly indicating which areas are to be retained as natural open space. The email should also indicate (1) the size of the site, (2) the contact details (telephone, fax and email) of the environmental control officer, who must make themselves available during the rescue operations and (3) the contact details (telephone, fax and email) of the project proponent and/or landowner.
- 3.6 All naturally disturbed areas must be rehabilitated after construction by locally indigenous species.
 - 3.7 The surface storm water management plan must be approved by Johannesburg Roads Agency and must be based on Sustainable Urban Drainage Systems (SUDS) Principles and must consider source, local and regional controls.
 - 3.8 Dust suppression measures that include sprinkling of water must be implemented to reduce dust pollution to adjacent areas.

4. Management of the Activities

- 4.1 The Environmental Management Programme ("EMPr") submitted as part of the Final Basic Assessment Report dated July 2018 is approved. Recommendations and mitigation measures made by the all Specialist Report must be included in the EMPr and must be adhered to.
- 4.2 Compliance with the approved EMPr above is considered an extension to the conditions of the Environmental Authorisation. The contents of the EMPr and its objectives must be made known to all contractors, subcontractors, agents and other people working on the site.
- 4.3 All waste generated during construction and operational phase must be managed in accordance with the hierarchy of waste management principles and disposal at an authorised landfill site must be the last option. Proof of disposal of waste must be kept on site and made available to the Department upon request. Waste must be separated at source and record of recyclable materials must be submitted to this Department's Waste and Pollution Management Directorate.
- 4.4 Energy savings technologies (such as compact fluorescents, light emitting diodes lights, passive infra reds switches to switch off lighting when areas are unoccupied) and water savings technologies (such as rain water harvesting) must be implemented to contribute in reducing the impact of climate change.
- 4.5 If any subsurface archaeological material, bones or fossils are discovered, construction must be stopped immediately and a qualified archaeologist must be contacted to assess the findings and contact the Gauteng Provincial Heritage Resources Agency.
- 4.6 An Environmental Control Officer (ECO) must be appointed to ensure that regular inspections are performed during the construction and operation phase to allow for the implementation of mitigation measures and to monitor the applicant's compliance with all the conditions of this authorisation.

5. Monitoring and Reporting

- 5.1 Departmental official must be given access to the property referred to above for the purpose of ascertaining and/ or monitoring compliance with the conditions contained in this Environmental Authorisation at all times.

6. General Conditions

- 6.1 The conditions of this EA are binding on the holder of the EA ("The Holder"), including any person acting on his or her behalf, including but not limited to an agent, sub-contractor, employee or person rendering a service to the holder of the EA.
- 6.2 The activities authorised may only be carried out at the property or site indicated in this EA.
- 6.3 The activities must commence within a period of 10 years from the date of issue of this EA. If commencement of the activities does not occur within that period, and the EA lapses, a new application for EA must be made for the activity or activities to be undertaken.

GDARD
Office of the HOD

31 AUG 2018

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- 6.4 Any changes to, or deviation from, the activities description set out in this EA must follow the appropriate amendment process described in the Environmental Impact Assessment Regulations, and be approved, in writing, by the Department before such changes or deviation are effected. In assessing whether to approve such changes or not, the Department may request such information as it deems necessary to evaluate the significance and impacts of such changes or deviations and it may be necessary for the holder of EA to apply for further authorisations in terms of the Regulations.
- 6.5 Where any of the applicant's contact details change, including the name of the holder of the EA, the physical or postal address and/or telephonic details, the applicant must follow the relevant amendment process as prescribed in the Environmental Impact Assessment Regulations, by submitting an amendment application to the Department for consideration and decision making as soon as the new details become known to the applicant.
- 6.6 This EA does not negate the holder's responsibility to comply with any other statutory requirements that may be applicable to the undertaking of the activities.
- 6.7 This EA and EMPr must be kept at the property or site where the activity or activities will be undertaken. The documents must be produced to any authorised official of the Department who requests to inspect them and must also be made available for inspection by any employee or agent of the holder of the EA who works or undertakes work at the property.
- 6.8 Non-compliance with a condition of this EA may result in criminal prosecution or other actions provided for in the National Environmental Management Act, 1998 (Act No. 107 of 1998) (as amended) and the Environmental Impact Assessment Regulations 2014 (as amended).
- 6.9 If the Department has reason to believe that the EA was obtained through, fraud, non-disclosure of material information or misrepresentation of a material fact, the Department may, in writing, suspend or partially suspend, with immediate effect, the EA and direct the holder of such EA forthwith to cease any activities that have been commenced with or to refrain from commencing any activity, pending a decision to withdraw the EA.

Date of the Environmental Authorisation: 30 August 2018

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31 AUG 2018

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ANNEXURE 1: REASON FOR DECISION

1. Background

The applicant, **Omeida Trading 426 CC**, applied for EA to undertake activities listed as activities 19 (i), 27, 28 (i) and 56 (i) of Listing Notice 1 (GN.R 983.) as well as activities 4 (c) (iv) and 12 (c) (ii) of Listing Notice 3 (GN R 985) of the Environmental Impact Assessment Regulations, 2014 (Amended as of 7 April 2017) for the proposed medium density township development (to be known as Blue Hills Extension 105) as well as extension and widening of existing roads on holdings 105 and 106 of Blue Hills Agricultural Holdings, City of Johannesburg Metropolitan Municipality.

The applicant appointed **Seedcracker Environmental Consulting CC** to undertake the Basic Assessment process.

2. Information Considered in Making the Decision

In reaching its decision, the Department took, inter alia, the following into consideration:

- 2.1 The information contained in the application form received on 22 May 2018 and Basic Assessment Report dated July 2018 received by this Department on 02 August 2018 including:
 - 2.1.1 Freshwater resource ecological assessment.
 - 2.1.2 Terrestrial ecological habitat integrity investigation.
 - 2.1.3 Geotechnical investigation.
 - 2.1.4 Outline scheme report.
 - 2.1.5 Flood line determination.
 - 2.1.6 Heritage impact assessment.
 - 2.1.7 Traffic study.
- 2.2 The relevant information contained in the Departmental information base including the Geographical Information System (GIS), Gauteng Conservation Plan Version 3.3 and the Gauteng Provincial Environmental Management Framework (GPEMF, 2015).
- 2.3 The objectives and requirements of relevant legislation, policies and guidelines, including Section 2 of the National Environmental Management Act, 1998 (Act No. 107 of 1998) (as amended).
- 2.4 The findings of the site inspection undertaken by Edward Magaga, the official of this Department on 18 June 2018.

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Office of the HOD

37 AUG 2018

000047

3. Key Factors Considered in Making the Decision

All information presented to the Department was considered in the Department's consideration of the application. A summary of the issues which, in the Department's view, were of the most significance is set out below.

- 3.1 The impact the proposed development will have on the surrounding environment.
- 3.2 The biodiversity sensitivities of the site, and the fact that there is a wetland on the southern side of the site.
- 3.3 Zoning of the area in terms of the Gauteng Provincial Environmental Management Framework (GPEMF, 2015).
- 3.4 Public participation process was conducted in accordance to the EIA Regulations 2014 requirements.

4. Findings

After consideration of the information and factors listed above, the Department made the following findings:

- 4.1 In terms of the Gauteng Conservation Plan version 3.3, the site falls within an Ecological Support Area and Threatened Ecosystems, however, the site is transformed with existing buildings.
- 4.2 There is a wetland on the southern part of the site, however, the proposed residential development is outside the wetland area and its buffer.
- 4.3 The mitigation measures proposed in the EMPr are deemed adequate to manage impacts of the activities on both construction and operational phases.
- 4.4 The extension and widening of the existing roads and the installation of a new 160-mm council water pipe will encroach the wetland and its buffer, however, the permission to work within the wetland and its buffer must be sourced from Department of Water and Sanitation.
- 4.5 The Gauteng Environmental Management Framework, 2015 (GEMF, 2015) identifies the proposed site as falling within Environmental Management Zone 1 (Urban development zone) hence the proposed development is compatible with the intentions of this zone.
- 4.6 The public participation process was conducted and the comments from the registered interested and affected parties were included in the Basic Assessment Report dated July 2018. The proposed project was advertised on the Star dated 11 April 2018. Site notices were placed on various conspicuous places such as poles and along the road.

In view of the above, the Department is satisfied that, subject to compliance with the conditions contained in this EA, the activities will not conflict with the general objectives of integrated environmental management laid down in the National Environmental Management Act, 1998 (Act No. 107 of 1998) (as amended) and that any potentially detrimental environmental impacts resulting from the proposed activities can be mitigated to acceptable levels. The Environmental Authorisation is accordingly granted.

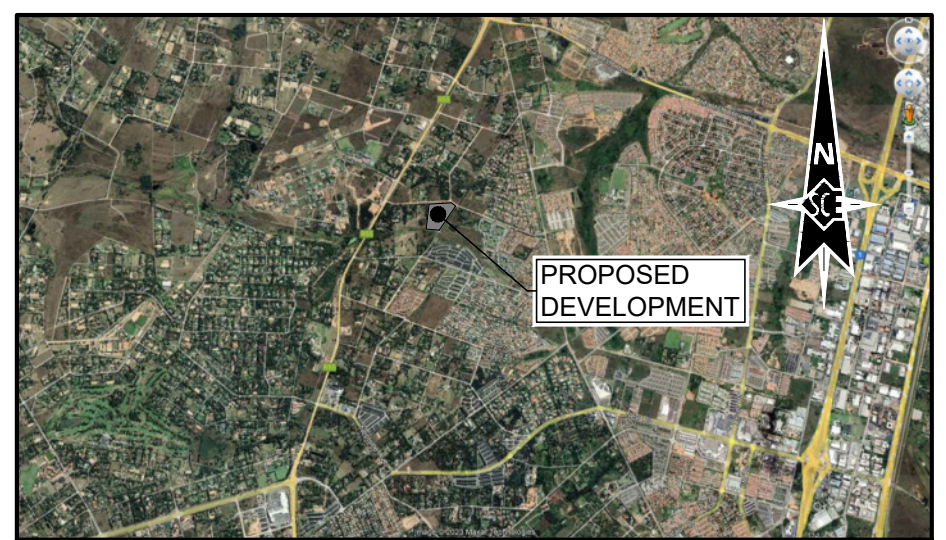
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31 AUG 2018

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APPENDIX 5: STORMWATER LAYOUT DRAWINGS

BLUE HILLS EXTENSION 105

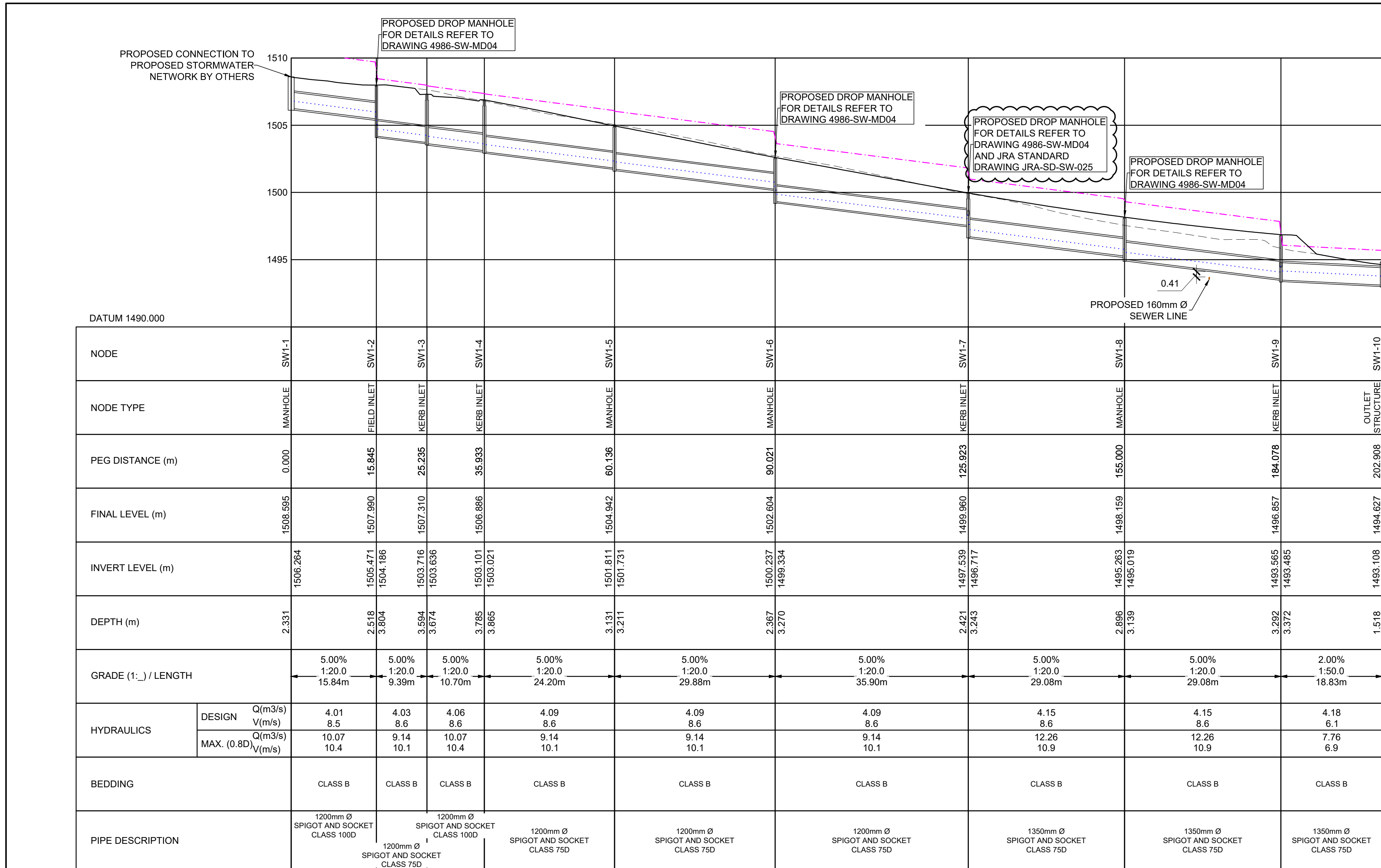


LOCALITY PLAN
NOT TO SCALE

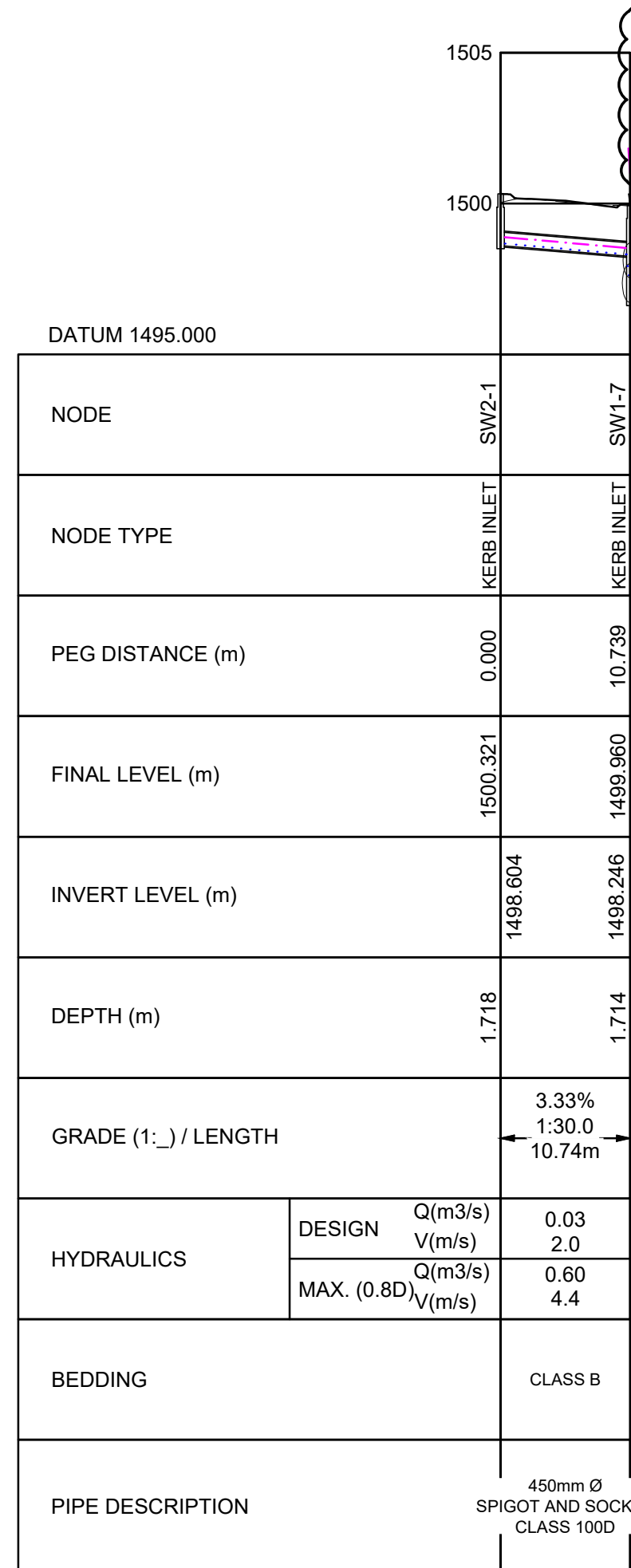
STORMWATER
SETTING OUT POINTS
SYSTEM: WGS84 (LO27)

CODE XXXX	Y (+0.0)	X (+0.0)
SW1-1	-109 339.714	2 872 634.378
SW1-2	-109 323.904	2 872 635.421
SW1-3	-109 314.534	2 872 636.039
SW1-4	-109 305.641	2 872 641.987
SW1-5	-109 304.249	2 872 666.149
SW1-6	-109 289.944	2 872 692.388
SW1-7	-109 269.543	2 872 721.930
SW1-8	-109 253.019	2 872 745.857
SW1-9	-109 236.496	2 872 769.783
SW1-10	-109 218.077	2 872 773.695
SW2-1	-109 280.247	2 872 722.797
SW3-1	-109 247.200	2 872 770.650

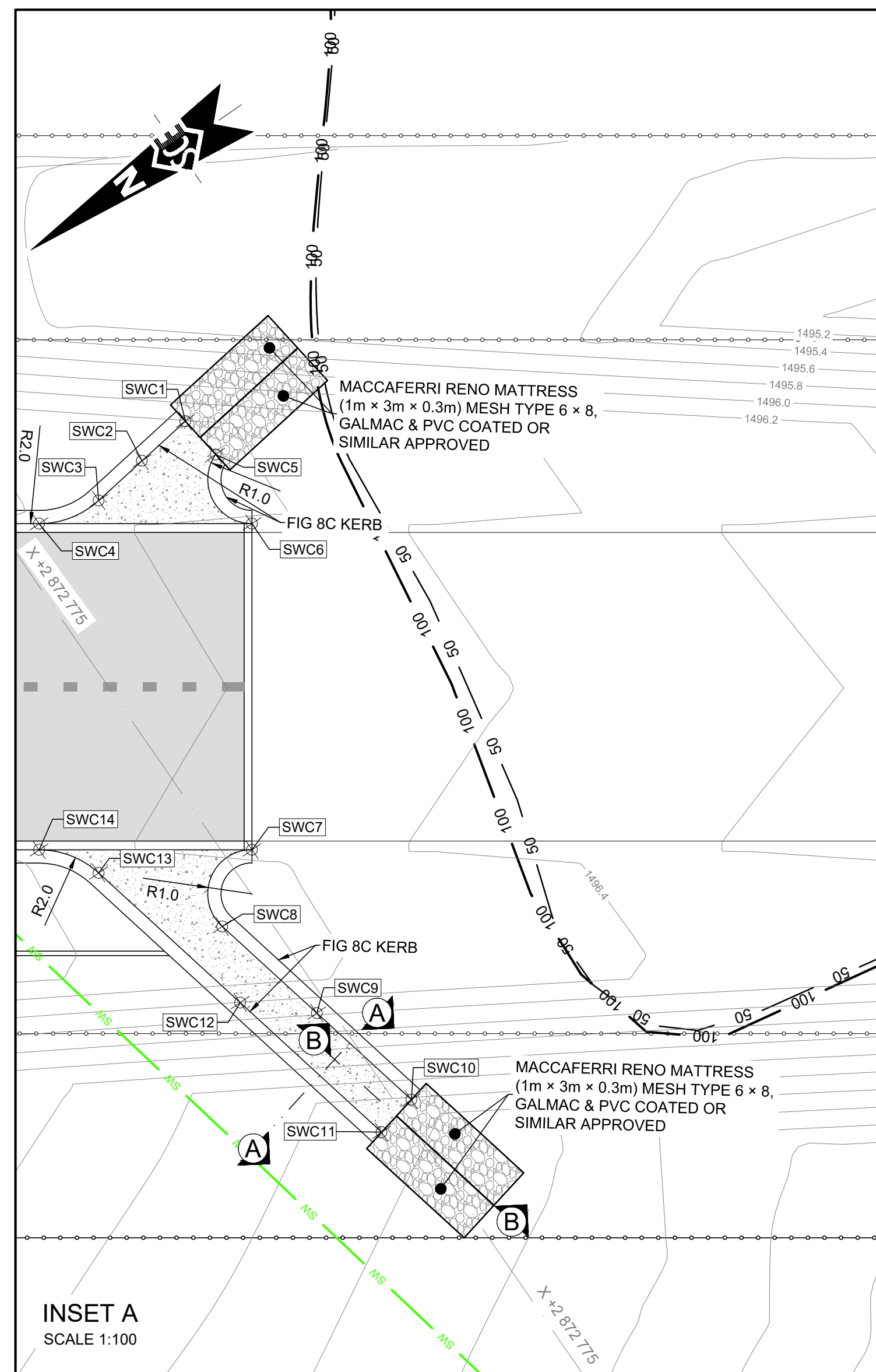
MUNICIPAL STORMWATER LAYOUT
SCALE 1:500



LONGSECTION SW1-1 TO SW1-10
SCALES
HORIZONTAL 1:500
VERTICAL 1:200



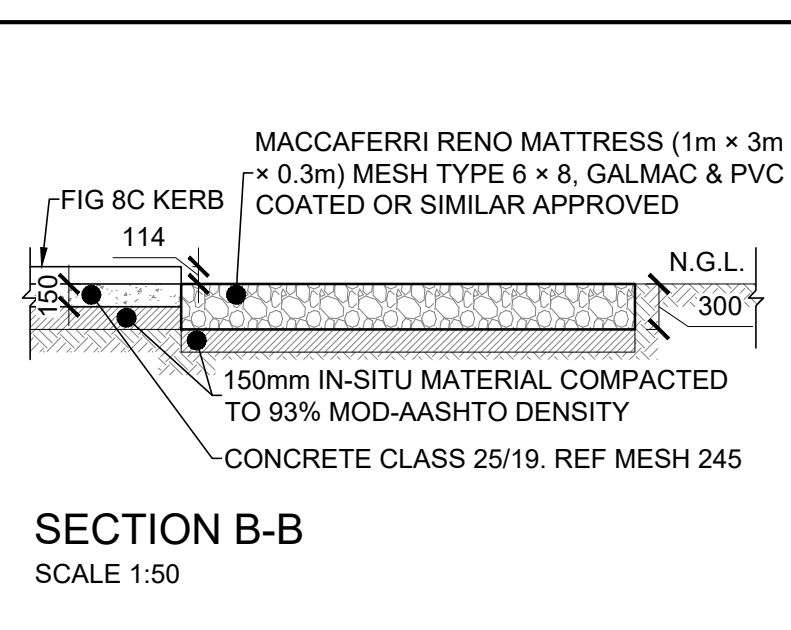
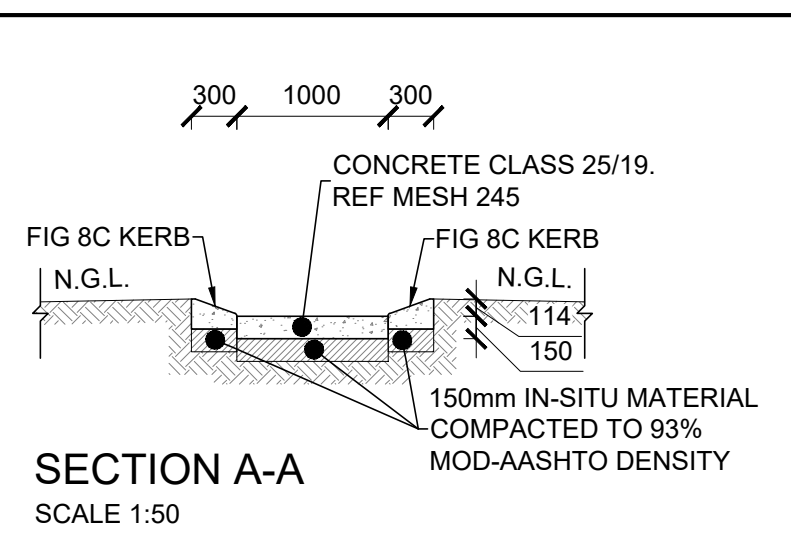
LONGSECTION SW2-1 TO SW1-7
SCALES
HORIZONTAL 1:500
VERTICAL 1:200



INSET A
SCALE 1:100

STORMWATER CHANNEL
SETTING OUT POINTS
SYSTEM : WGS84 (LO27)

CODE XXXX	Y (+0.0)	X (+0.0)
SWC1	-109 242.512	2 872 779.859
SWC2	-109 242.330	2 872 778.539
SWC3	-109 242.147	2 872 777.218
SWC4	-109 242.483	2 872 775.808
SWC5	-109 241.495	2 872 779.996
SWC6	-109 239.738	2 872 779.763
SWC7	-109 233.649	2 872 775.578
SWC8	-109 232.603	2 872 774.035
SWC9	-109 229.766	2 872 774.684
SWC10	-109 226.929	2 872 775.333
SWC11	-109 226.706	2 872 774.358
SWC12	-109 230.950	2 872 773.387
SWC13	-109 235.194	2 872 772.416
SWC14	-109 236.394	2 872 771.603



NOTES:

- ALL MATERIAL AND WORKMANSHIP MUST COMPLY WITH THE REQUIREMENTS OF THE LATEST RELEVANT SANS CODES.
- ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE INDICATED.
- DO NOT SCALE FROM THIS DRAWING.
- ALL DIMENSIONS AND SETTING OUT POINTS MUST BE CHECKED AND APPROVED ON SITE. VERTICAL AND HORIZONTAL ALIGNMENT TO FOLLOW THE EXISTING ROAD SURFACE, WITH A MINIMUM CROSS FALL OF 3%, IF APPLICABLE.
- ALL MATERIALS FOR PAVEMENT LAYERS SHALL CONFORM TO THE REQUIREMENTS OF THE TRH14, UNLESS OTHERWISE INDICATED IN THE PROJECT SPECIFICATIONS.
- ALL KERBS TO BE INSTALLED IN ACCORDANCE WITH JRA ROADS AND STORMWATER VOLUME 2, STANDARD DESIGN DETAILS FOR ROADS AND STORMWATER PART 1 - ROADS.
- ALL KERBS TO BE FIGURE 3, UNLESS OTHERWISE INDICATED.
- SLEEVES TO BE INDICATED BY FORMING LETTERS IN KERBS ACCORDING TO SCE STANDARD DRAWING SCE-SW011.
- CONTRACTOR TO COMPLY WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT (85 OF 1993), THE CONSTRUCTION REGULATIONS OF 2014 AND ALL RELEVANT REGULATIONS AS WELL AS THEIR AMENDMENTS.
- ALL KERB INLETS TO BE INSTALLED IN ACCORDANCE WITH JRA ROADS AND STORMWATER VOLUME 2, STANDARD DESIGN DETAILS FOR ROADS AND STORMWATER PART 2 - STORMWATER.

LEGEND:

- SW - PROPOSED STORMWATER LINE
- SW - PROPOSED STORMWATER LINE BY OTHERS
- EXSW - EXISTING STORMWATER LINE
- MH - PROPOSED MANHOLE
- EXMH - EXISTING MANHOLE
- JB - PROPOSED JUNCTION BOX
- EXJB - EXISTING JUNCTION BOX
- GI - PROPOSED GRID INLET
- EXGI - EXISTING GRID INLET
- FI - PROPOSED FIELD INLET
- EXFI - EXISTING FIELD INLET
- OS - PROPOSED OUTLET STRUCTURE
| EXOS | EXISTING OUTLET STRUCTURE |
| KI | PROPOSED KERB INLET |
| EXKI | EXISTING KERB INLET |
| (DS:ICP:XUS:X) | TRANSITION LENGTH UPSTREAM (US) |
| CATCHPIT LENGTH (CP) | CATCHPIT LENGTH DOWNSTREAM (DS) |
| FLOW DIRECTION OF STORMWATER | PERCENTAGE AND DIRECTION OF ROAD SLOPE |
| VAL | STORMWATER VALLEY LINE |
| SLB | STORMWATER SUBSOIL LINE |
| ERF BOUNDARY | BENCHMARK |
| SWXXXI-XI | STORMWATER SETTING OUT POINT |
| | PROPOSED ASPHALT |
| | EXISTING ASPHALT |
| | PROPOSED 60mm PAVERS |
| | PROPOSED BUILDING |
| | PROPOSED ATTENUATION FACILITY |
| | EXISTING STRUCTURES |
| | AREA OF CONSTRUCTION |
| 50 | 1:50 YEAR FLOOD LINE |
| 100 | 1:100 YEAR FLOOD LINE |
| | 32m ZONE OF REGULATION (NEMA) |
| | 30m GDARD SETBACK |
| | HYDRAULIC GRADE LINE |
| | ENERGY GRADE LINE |
| | NATURAL GROUND LEVEL |

REFERENCE DRAWINGS:

- 4986-BM-L01 BENCHMARK LAYOUT
- 4986-RD-ML03 MUNICIPAL ACACIA ROAD LAYOUT
- 4986-RD-ML06 MUNICIPAL MIMOSA ROAD LAYOUT AND LONGSECTION

CONSULTING ENGINEERS

DESIGNED	C. LEMMER
DRAWN	D. LHOENBERG
CHECKED	L. LOTTERING
SERVICES CHECKED	TBC
GEOTECHNICAL INVESTIGATION	TBC
SERVITUDES	TBC
APPROVED	M. TSHOLOLI
PR. ENG. NO. 201070156	DATE - 2023/08/21



CITY OF JOHANNESBURG

PROJECT:
ERF 1809, BLUE HILLS EXTENSION 105

DRAWING TITLE:
MUNICIPAL STORMWATER LAYOUT AND LONGSECTIONS

DESIGN MANAGER

DATE

SCALE

AS
SHOWN

AMENDMENTS

A

B

C

D

ISSUED FOR:

FILE NO.

CONTRACT NO.

APPR.

DATE

2023-06-01

2023-08-14

2023-10-20

2023-10-25

2023-10-25

2023-10-25

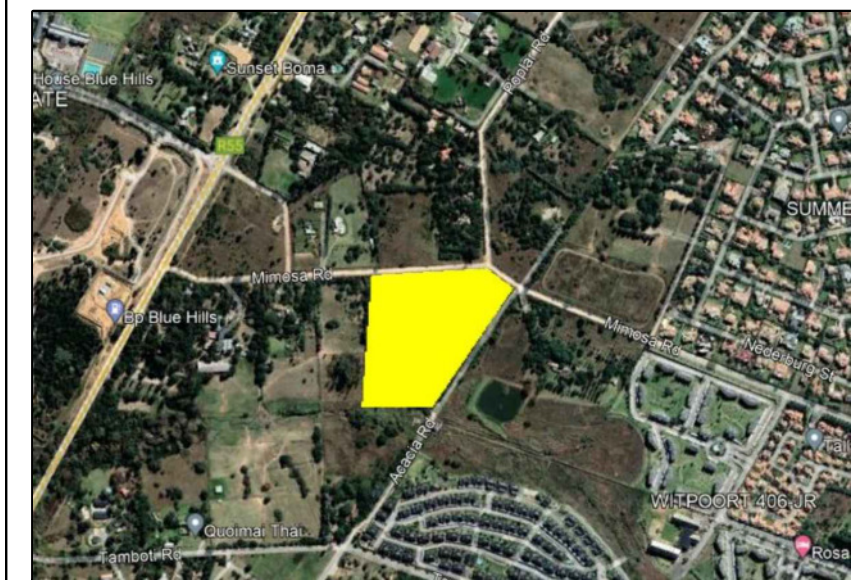
DRAWING NO.

4986-SW-ML02

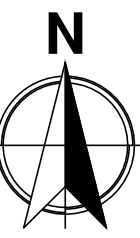
APPROVAL

APPENDIX 6: STORMWATER CATCHMENT LAYOUT PLAN

BLUE HILLS EXT.105



LOCALITY PLAN
NOT TO SCALE

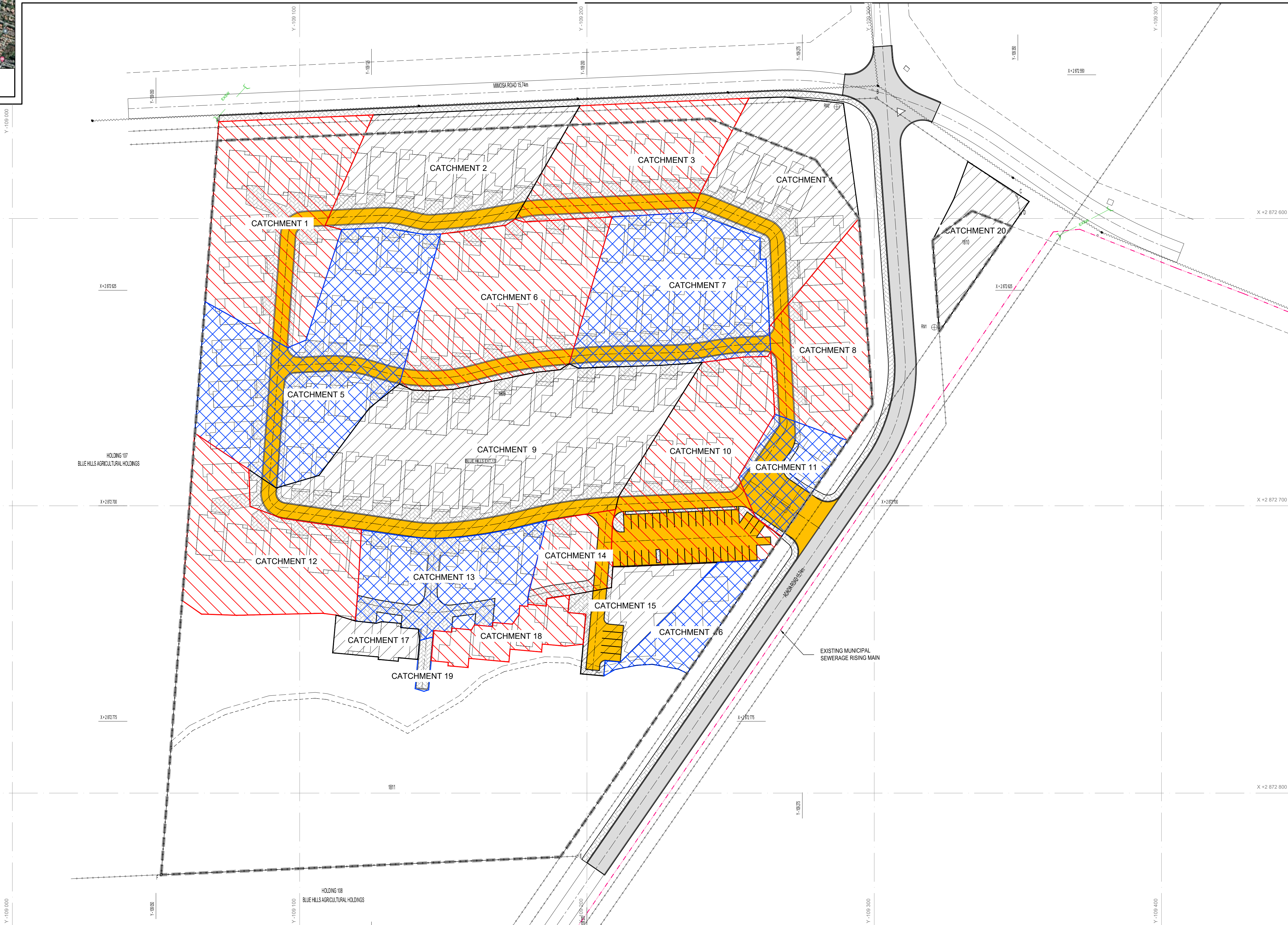


X +2 872 600

X +2 872 700

X +2 872 800

STORMWATER CATCHMENT LAYOUT
SCALE 1:500



NOTES:

1. ALL MATERIAL AND WORKMANSHIP MUST COMPLY WITH THE REQUIREMENTS OF THE LATEST RELEVANT SANS CODES.
2. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE INDICATED.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL DIMENSIONS AND SETTING OUT POINTS MUST BE CHECKED AND APPROVED ON SITE BEFORE CONSTRUCTION COMMENCES.
5. FINAL POSITION OF EXISTING SERVICES TO BE CONFIRMED ON SITE BY CONTRACTOR.
6. ALL EXISTING SERVICES TO BE EXPOSED BY HAND EXCAVATION AND INVERT LEVELS TO BE PROVIDED TO THE ENGINEER IN WRITING BEFORE CONSTRUCTION COMMENCES.
7. ALL STORMWATER PIPES SHALL BE A MINIMUM 450mm DIAMETER INTERLOCKING JOINT CLASS 500 AND SHALL COMPLY WITH SANS 677, UNLESS OTHERWISE INDICATED.
8. CONCRETE PRECAST MANHOLES TO BE SEALED WATERTIGHT WITH EPOXY SEALER SUCH AS EPIDERMIX 344 OR PRO-STRUCT 687.
9. ENGINEER OR THE ENGINEER'S REPRESENTATIVE TO BE INVITED FOR INSPECTIONS ACCORDING TO SCE CIVIL ENGINEERING INSPECTION NOTIFICATION REQUIREMENTS.
10. CLEAN EXISTING STORMWATER INLETS AND REPAIR WHERE NECESSARY (IF APPLICABLE).
11. KERB INLET STRUCTURES (STEEL FRAME AND PRECAST COVERS), TO COMPLY WITH JRA STANDARD DRAWINGS.
12. ALL STORMWATER JUNCTION BOX, MANHOLE AND COVER SLAB DETAILS TO COMPLY WITH JRA STANDARD DRAWINGS.
13. CALAMITE STEP IRONS MUST BE INSTALLED IN MANHOLE JUNCTION BOXES DEEPER THAN 1 METER.
14. ALL STORMWATER PIPE TRENCHES, BEDDING AND BACKFILLING TO COMPLY WITH JRA SPECIFICATIONS OR SANS1200 IF NONE IS PROVIDED.
15. MINIMUM FALL THROUGH ANY MANHOLE IS 80mm, UNLESS OTHERWISE INDICATED.
16. ALL STORMWATER PIPES TO BE LAID SOFFIT TO SOFFIT.
17. CONTRACTOR TO COMPLY WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT (85 OF 1993), THE CONSTRUCTION REGULATIONS OF 2014 AND ALL RELEVANT REGULATIONS AS WELL AS THEIR AMENDMENTS.
18. CONTRACTOR TO IMMEDIATELY REPORT ANY DAMAGE TO EXISTING SERVICES IN WRITING TO THE ENGINEER OR THE ENGINEER'S REPRESENTATIVE.
19. ON COMPLETION OF STORMWATER INSTALLATION, CONTRACTOR TO PROVIDE COMPLETE AS-BUILT INFORMATION TO THE ENGINEER.

LEGEND:

- DEVELOPMENT BOUNDARY
- PROPOSED 4500 STORMWATER PIPE
- PROPOSED 5250 STORMWATER PIPE
- PROPOSED 6000 STORMWATER PIPE
- PROPOSED 7500 STORMWATER PIPE
- PROPOSED 8000 STORMWATER PIPE
- PROPOSED 10500 STORMWATER PIPE
- PROPOSED 12000 STORMWATER PIPE
- PROPOSED RENO MATRESS
- PROPOSED OUTLET STRUCTURE
- PROPOSED FIELD INLET
- PROPOSED JUNCTION-BOX
- PROPOSED KKERB INLET

CONSULTING ENGINEERS

18 BOUNDARY PLACE
RIVONIA ROAD
SANDTON
2196

Tel: 082 924 5684
Email: Mulalo@mdpcconsulting.co.za

SURVEYED	-	-
DESIGNED	LJLOTTERING	20-01-2023
DRAWN	LJLOTTERING	20-01-2023
CHECKED	MTSHOLODI	24-01-2023
SERVICES CHECKED	TBC	-
GEOTECHNICAL INVESTIGATION	TBC	-
SERATUIDES	TBC	-
APPROVED	MTSHOLODI	
PR. ENG. NO.20107/99	DATE	-



CITY OF JOHANNESBURG

PROJECT:

BLUE HILLS EXT.105

DRAWING TITLE:

STORMWATER CATCHMENT LAYOUT PLAN

DESIGN
MANAGER

DATE

SCALE

1:2000

AMENDMENTS

A

CONCEPT

APPR.

DATE

DRAWING NO.

0053-SW-L01

ISSUED FOR:

CONCEPT

FILE NO.

CONTRACT NO.
0053

APPENDIX 7: ATTENUATION POND HYDROGRAPHS

Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Friday, 03 / 22 / 2024

Hyd. No. 51

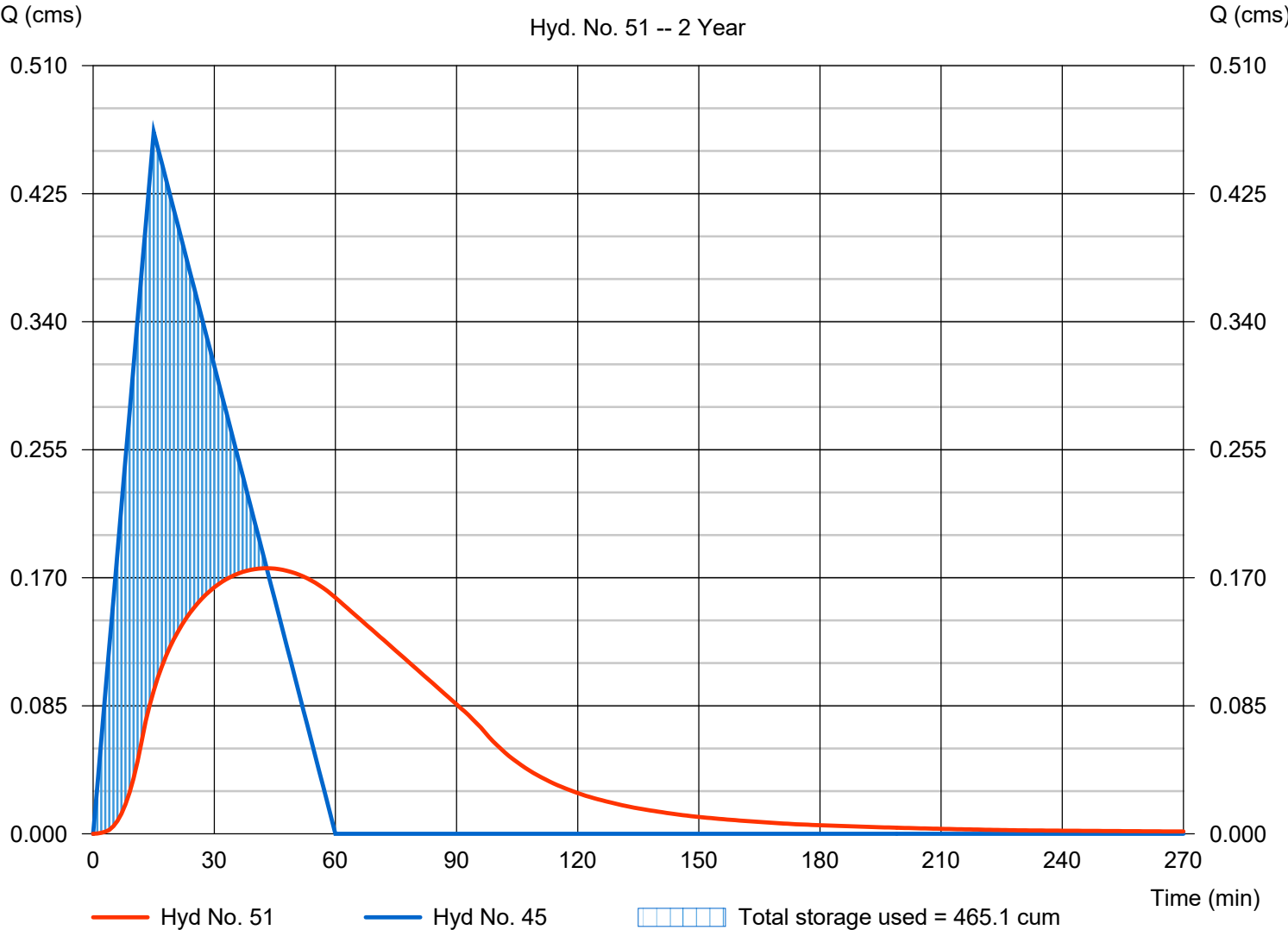
Blue Hills Ext.105

Hydrograph type	= Reservoir	Peak discharge	= 0.176 cms
Storm frequency	= 2 yrs	Time to peak	= 43 min
Time interval	= 1 min	Hyd. volume	= 838.5 cum
Inflow hyd. No.	= 45 - All Combined Post	Max. Elevation	= 101.12 m
Reservoir name	= Blue Hills Ext.105	Max. Storage	= 465.1 cum

Storage Indication method used.

Blue Hills Ext.105

Hyd. No. 51 -- 2 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

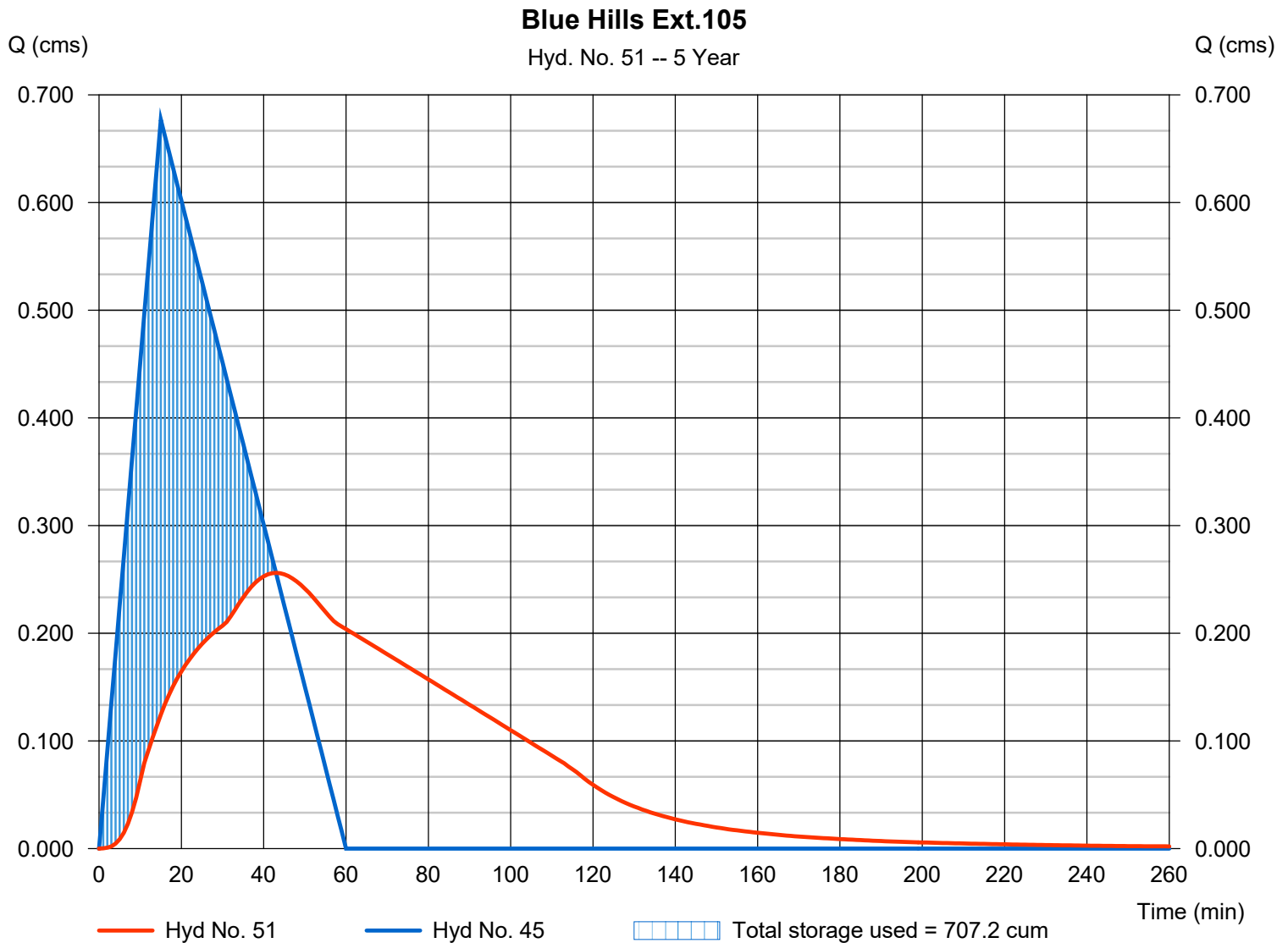
Friday, 03 / 22 / 2024

Hyd. No. 51

Blue Hills Ext.105

Hydrograph type	= Reservoir	Peak discharge	= 0.256 cms
Storm frequency	= 5 yrs	Time to peak	= 43 min
Time interval	= 1 min	Hyd. volume	= 1,218.3 cum
Inflow hyd. No.	= 45 - All Combined Post	Max. Elevation	= 101.70 m
Reservoir name	= Blue Hills Ext.105	Max. Storage	= 707.2 cum

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

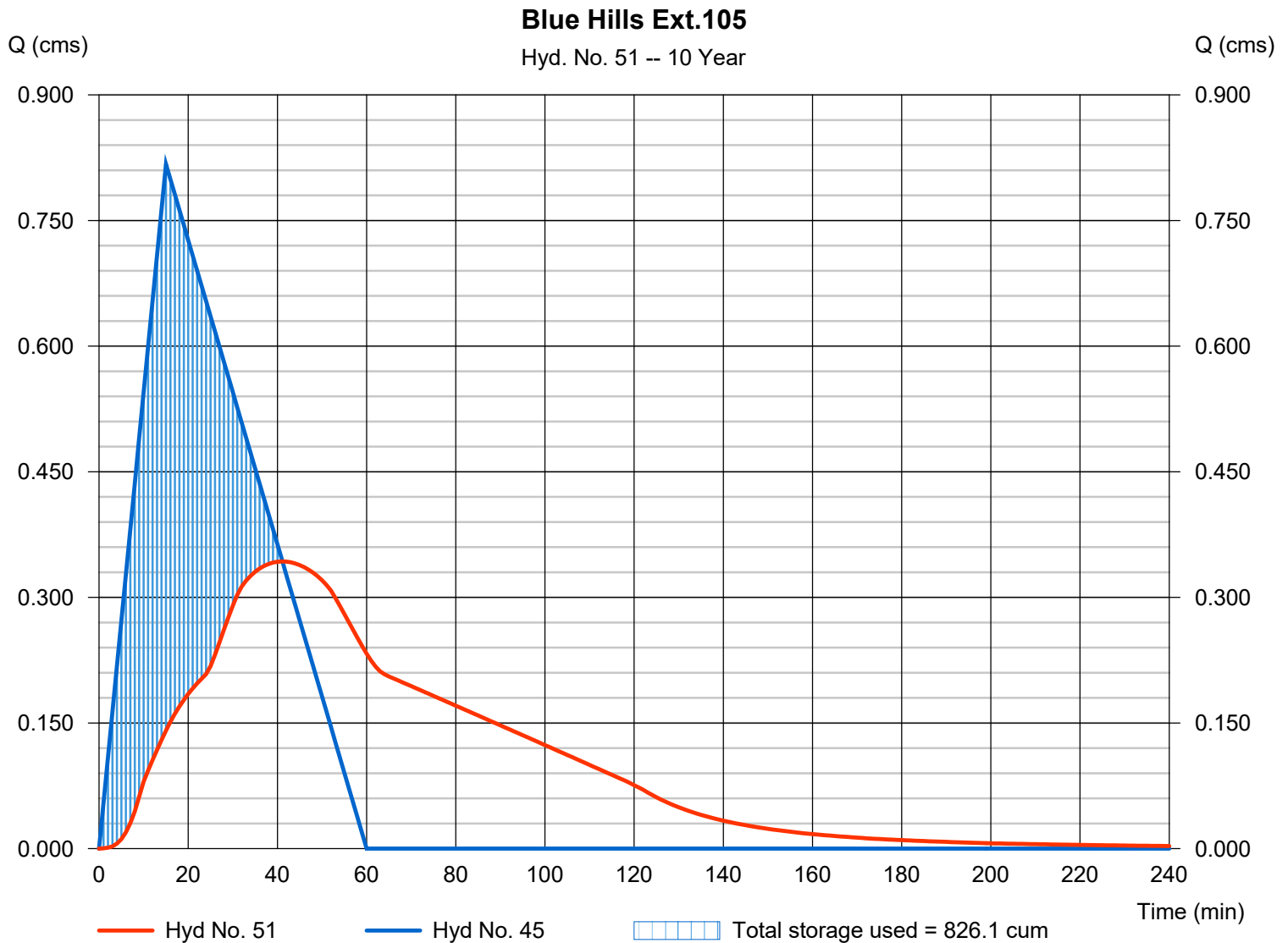
Friday, 03 / 22 / 2024

Hyd. No. 51

Blue Hills Ext.105

Hydrograph type	= Reservoir	Peak discharge	= 0.343 cms
Storm frequency	= 10 yrs	Time to peak	= 41 min
Time interval	= 1 min	Hyd. volume	= 1,470.9 cum
Inflow hyd. No.	= 45 - All Combined Post	Max. Elevation	= 101.98 m
Reservoir name	= Blue Hills Ext.105	Max. Storage	= 826.1 cum

Storage Indication method used.



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Friday, 03 / 22 / 2024

Hyd. No. 51

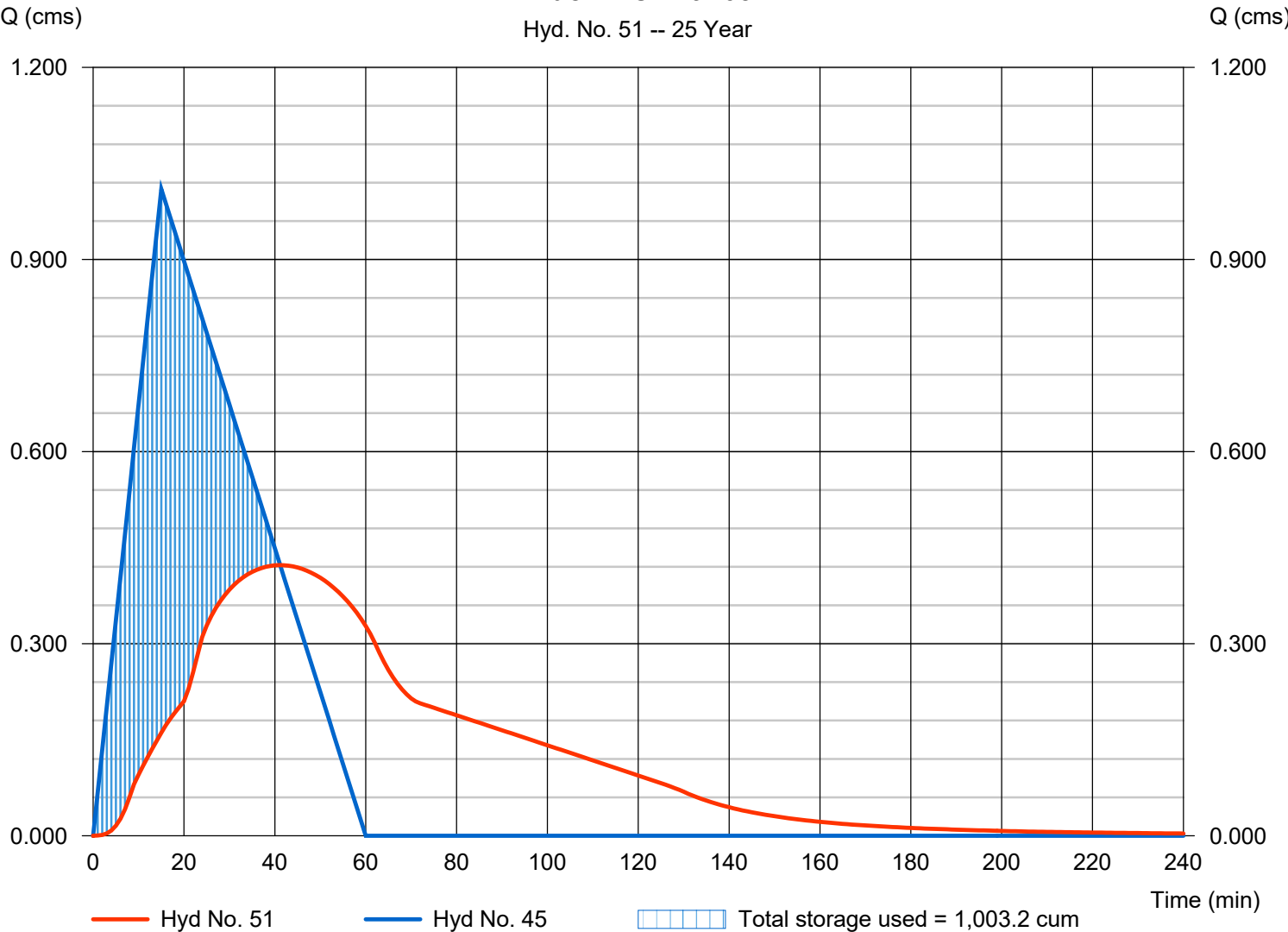
Blue Hills Ext.105

Hydrograph type	= Reservoir	Peak discharge	= 0.423 cms
Storm frequency	= 25 yrs	Time to peak	= 41 min
Time interval	= 1 min	Hyd. volume	= 1,817.6 cum
Inflow hyd. No.	= 45 - All Combined Post	Max. Elevation	= 102.39 m
Reservoir name	= Blue Hills Ext.105	Max. Storage	= 1,003.2 cum

Storage Indication method used.

Blue Hills Ext.105

Hyd. No. 51 -- 25 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Friday, 03 / 22 / 2024

Hyd. No. 51

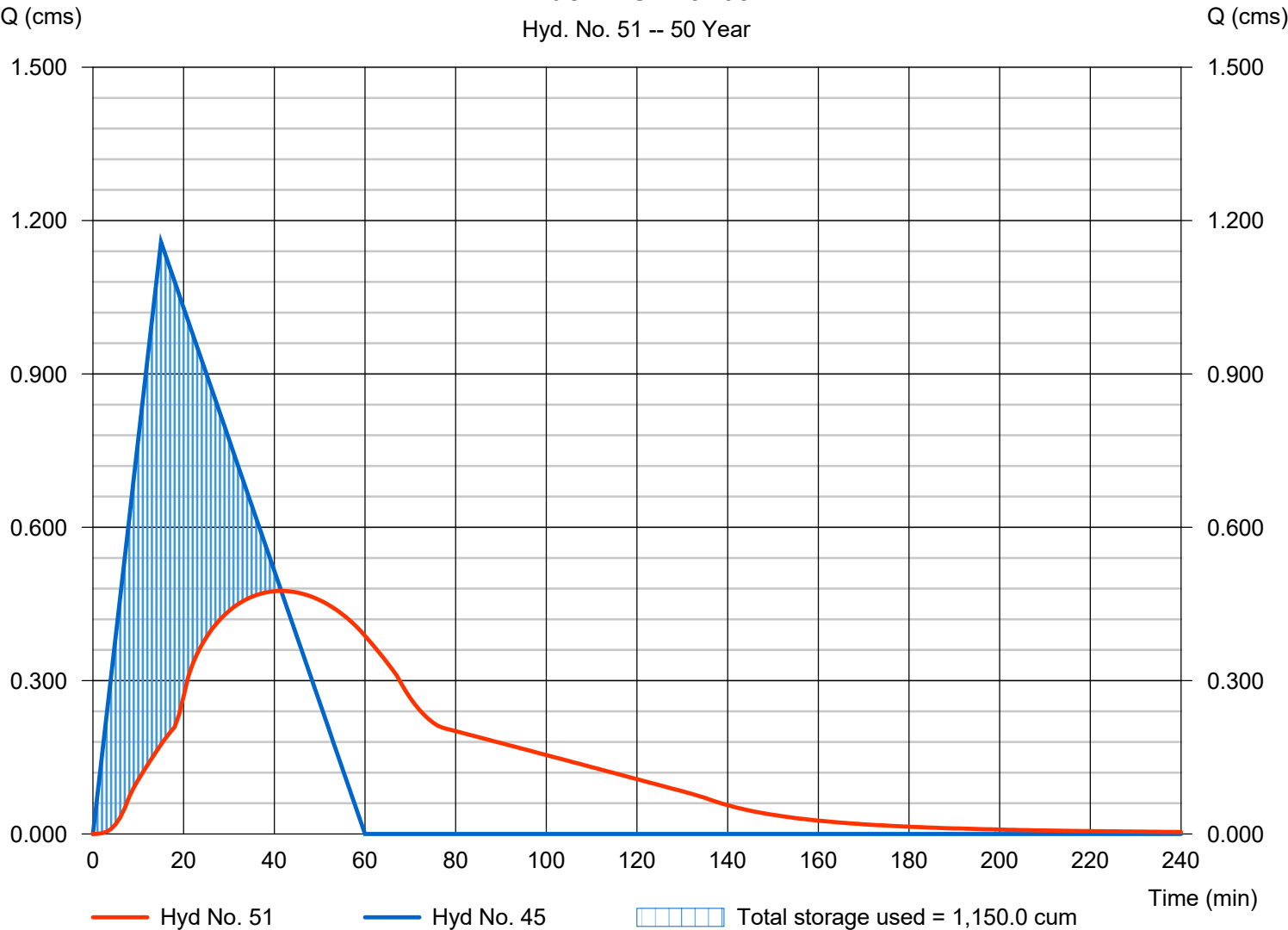
Blue Hills Ext.105

Hydrograph type	= Reservoir	Peak discharge	= 0.475 cms
Storm frequency	= 50 yrs	Time to peak	= 42 min
Time interval	= 1 min	Hyd. volume	= 2,084.4 cum
Inflow hyd. No.	= 45 - All Combined Post	Max. Elevation	= 102.73 m
Reservoir name	= Blue Hills Ext.105	Max. Storage	= 1,150.0 cum

Storage Indication method used.

Blue Hills Ext.105

Hyd. No. 51 -- 50 Year



Hydrograph Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Friday, 03 / 22 / 2024

Hyd. No. 51

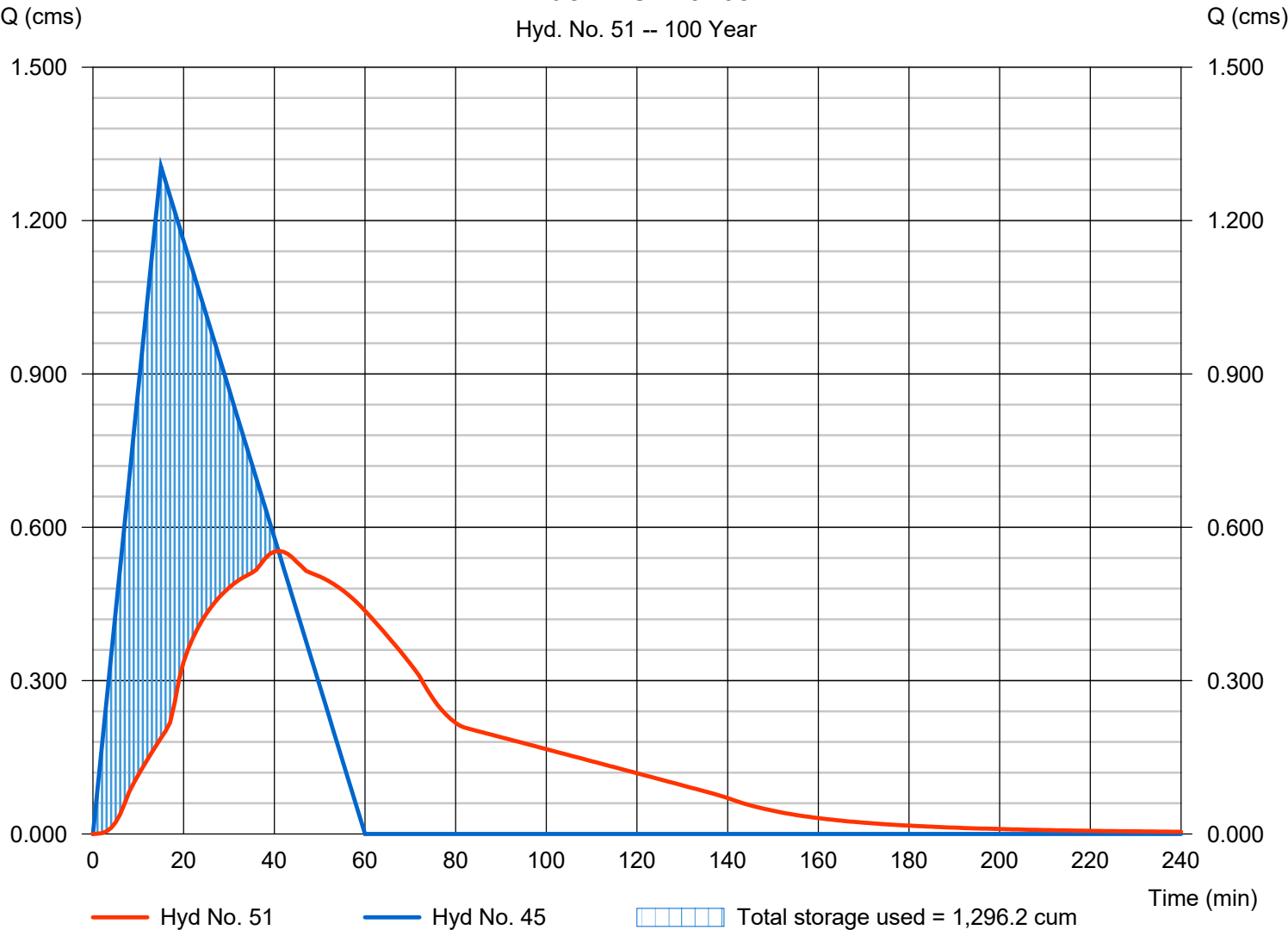
Blue Hills Ext.105

Hydrograph type	= Reservoir	Peak discharge	= 0.554 cms
Storm frequency	= 100 yrs	Time to peak	= 41 min
Time interval	= 1 min	Hyd. volume	= 2,349.6 cum
Inflow hyd. No.	= 45 - All Combined Post	Max. Elevation	= 103.07 m
Reservoir name	= Blue Hills Ext.105	Max. Storage	= 1,296.2 cum

Storage Indication method used.

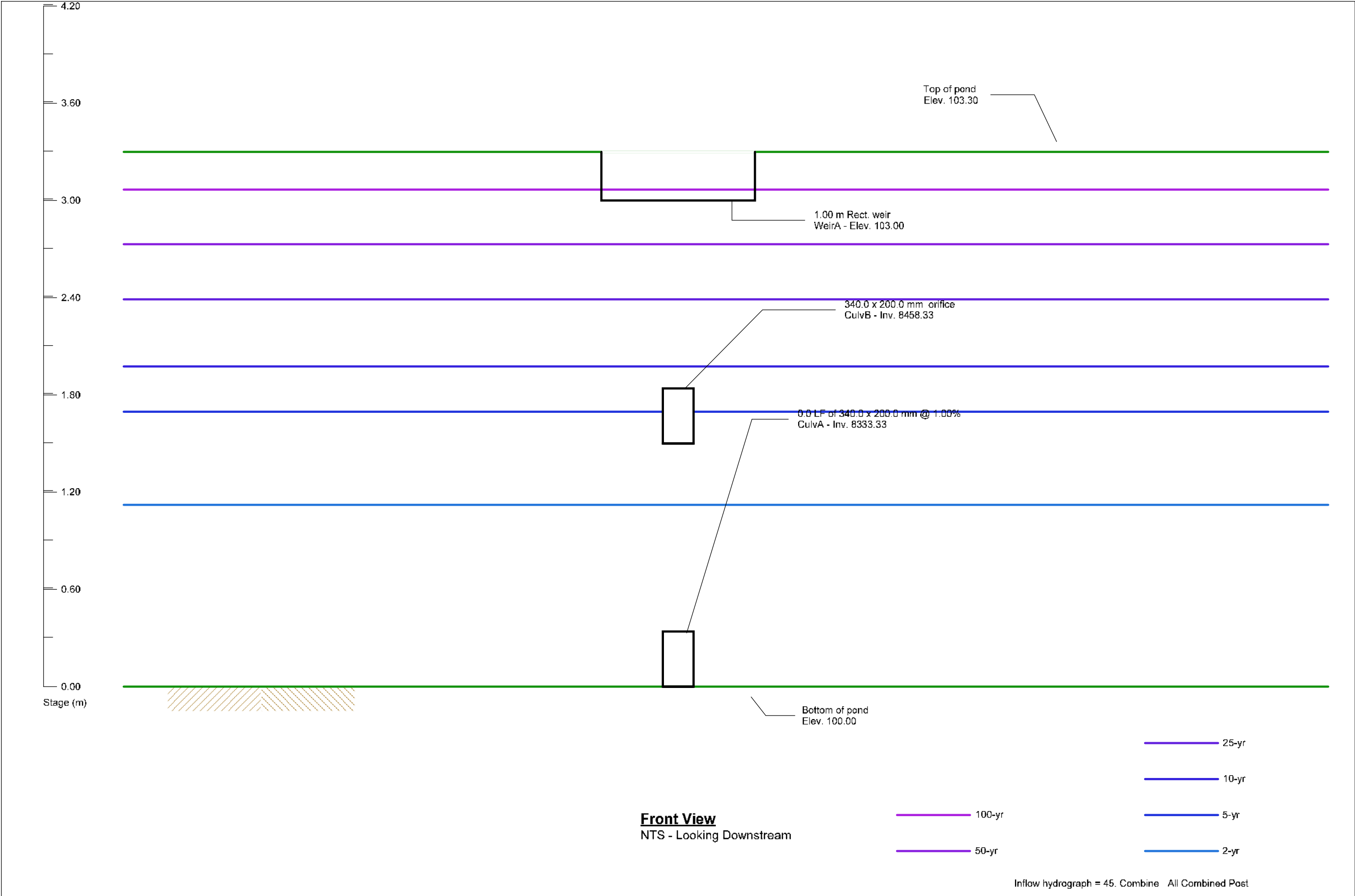
Blue Hills Ext.105

Hyd. No. 51 -- 100 Year



APPENDIX 8: POND ROUTING CALCULATIONS AND SECTION

Pond No. 1 - Blue Hills Ext.105



Pond Report

Pond No. 1 - Blue Hills Ext.105

Pond Data

Trapezoid -Bottom L x W = 20.5 x 20.0 m, Side slope = 0.10:1, Bottom elev. = 100.00 m, Depth = 3.30 m

Stage / Storage Table

Stage (m)	Elevation (m)	Contour area (sqm)	Incr. Storage (cum)	Total storage (cum)
0.00	100.00	410	0.0	0.0
0.33	100.33	413	135.7	135.7
0.66	100.66	415	136.6	272.4
0.99	100.99	418	137.5	409.9
1.32	101.32	421	138.4	548.3
1.65	101.65	423	139.3	687.6
1.98	101.98	426	140.2	827.8
2.31	102.31	429	141.1	968.9
2.64	102.64	432	142.0	1,110.9
2.97	102.97	434	142.9	1,253.8
3.30	103.30	437	143.8	1,397.6

Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (mm)	= 340.00	340.00	0.00	0.00
Span (mm)	= 200.00	200.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (m)	= 100.000	101.500	0.000	0.000
Length (m)	= 0.000	0.000	0.000	0.000
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (m)	= 1.000	0.000	0.000	0.000
Crest El. (m)	= 103.000	0.000	0.000	0.000
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(cm/hr)	= 0.000			
TW Elev. (m)	= 0.00			

Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).

Stage / Storage / Discharge Table

Stage m	Storage cum	Elevation m	Civ A cms	Civ B cms	Civ C cms	PrfRsr cms	Wr A cms	Wr B cms	Wr C cms	Wr D cms	Exfil cms	User cms	Total cms
0.00	0.0	100.00	0.00	0.00	---	---	0.00	---	---	---	---	---	0.000
0.33	135.7	100.33	0.07 ic	0.00	---	---	0.00	---	---	---	---	---	0.071
0.66	272.4	100.66	0.13 ic	0.00	---	---	0.00	---	---	---	---	---	0.127
0.99	409.9	100.99	0.16 ic	0.00	---	---	0.00	---	---	---	---	---	0.164
1.32	548.3	101.32	0.19 ic	0.00	---	---	0.00	---	---	---	---	---	0.194
1.65	687.6	101.65	0.22 ic	0.02 ic	---	---	0.00	---	---	---	---	---	0.242
1.98	827.8	101.98	0.24 ic	0.10 ic	---	---	0.00	---	---	---	---	---	0.344
2.31	968.9	102.31	0.26 ic	0.14 ic	---	---	0.00	---	---	---	---	---	0.409
2.64	1,110.9	102.64	0.28 ic	0.18 ic	---	---	0.00	---	---	---	---	---	0.462
2.97	1,253.8	102.97	0.30 ic	0.21 ic	---	---	0.00	---	---	---	---	---	0.509
3.30	1,397.6	103.30	0.32 ic	0.23 ic	---	---	0.30	---	---	---	---	---	0.853

Pond Report

Pond No. 1 - Blue Hills Ext.105

Pond Data

Trapezoid -Bottom L x W = 20.5 x 20.0 m, Side slope = 0.10:1, Bottom elev. = 100.00 m, Depth = 3.30 m

Stage / Storage Table

Stage (m)	Elevation (m)	Contour area (sqm)	Incr. Storage (cum)	Total storage (cum)
0.00	100.00	410	0.0	0.0
0.33	100.33	413	135.7	135.7
0.66	100.66	415	136.6	272.4
0.99	100.99	418	137.5	409.9
1.32	101.32	421	138.4	548.3
1.65	101.65	423	139.3	687.6
1.98	101.98	426	140.2	827.8
2.31	102.31	429	141.1	968.9
2.64	102.64	432	142.0	1,110.9
2.97	102.97	434	142.9	1,253.8
3.30	103.30	437	143.8	1,397.6

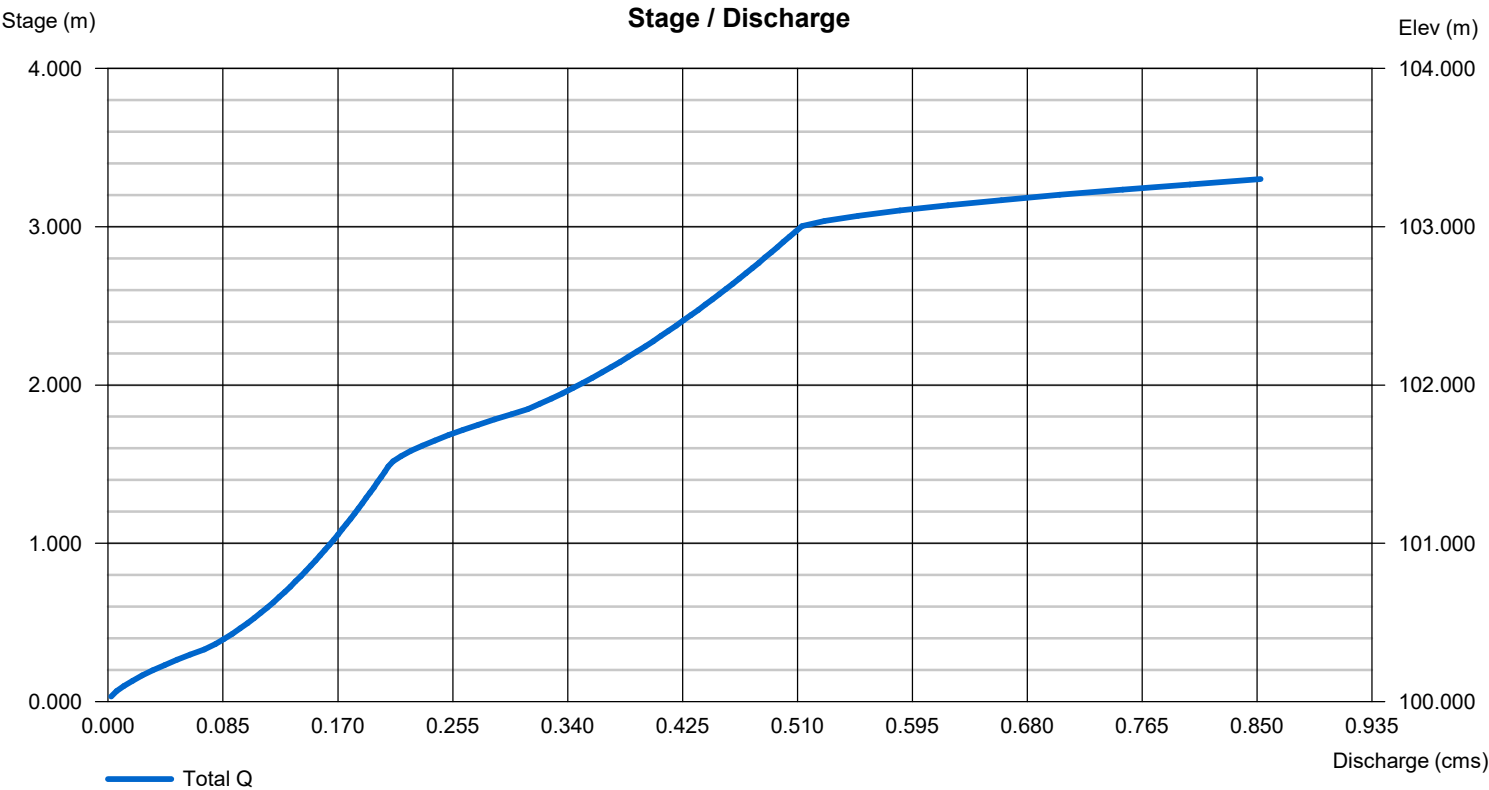
Culvert / Orifice Structures

	[A]	[B]	[C]	[PrfRsr]
Rise (mm)	= 340.00	340.00	0.00	0.00
Span (mm)	= 200.00	200.00	0.00	0.00
No. Barrels	= 1	1	0	0
Invert El. (m)	= 100.000	101.500	0.000	0.000
Length (m)	= 0.000	0.000	0.000	0.000
Slope (%)	= 1.00	1.00	0.00	n/a
N-Value	= .012	.013	.013	n/a
Orifice Coeff.	= 0.60	0.60	0.60	0.60
Multi-Stage	= n/a	No	No	No

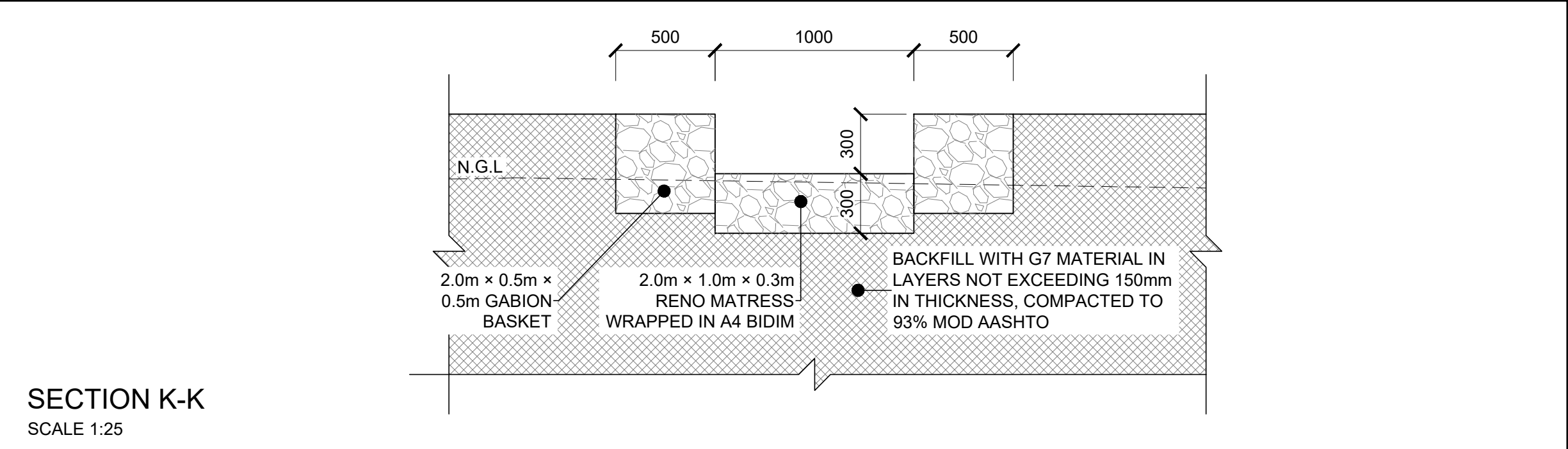
Weir Structures

	[A]	[B]	[C]	[D]
Crest Len (m)	= 1.000	0.000	0.000	0.000
Crest El. (m)	= 103.000	0.000	0.000	0.000
Weir Coeff.	= 3.33	3.33	3.33	3.33
Weir Type	= Rect	---	---	---
Multi-Stage	= No	No	No	No
Exfil.(cm/hr)	= 0.000			
TW Elev. (m)	= 0.00			

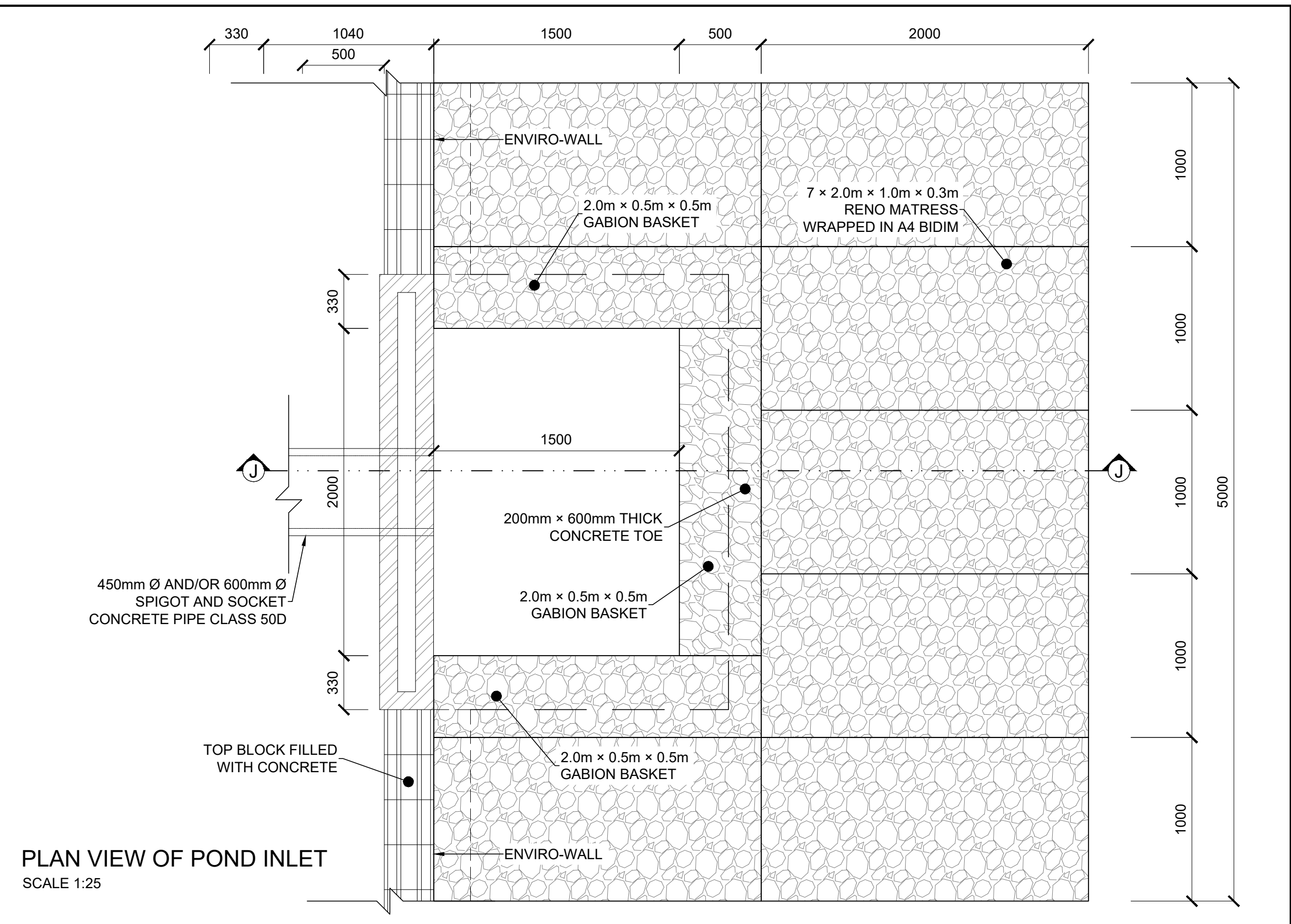
Note: Culvert/Orifice outflows are analyzed under inlet (ic) and outlet (oc) control. Weir risers checked for orifice conditions (ic) and submergence (s).



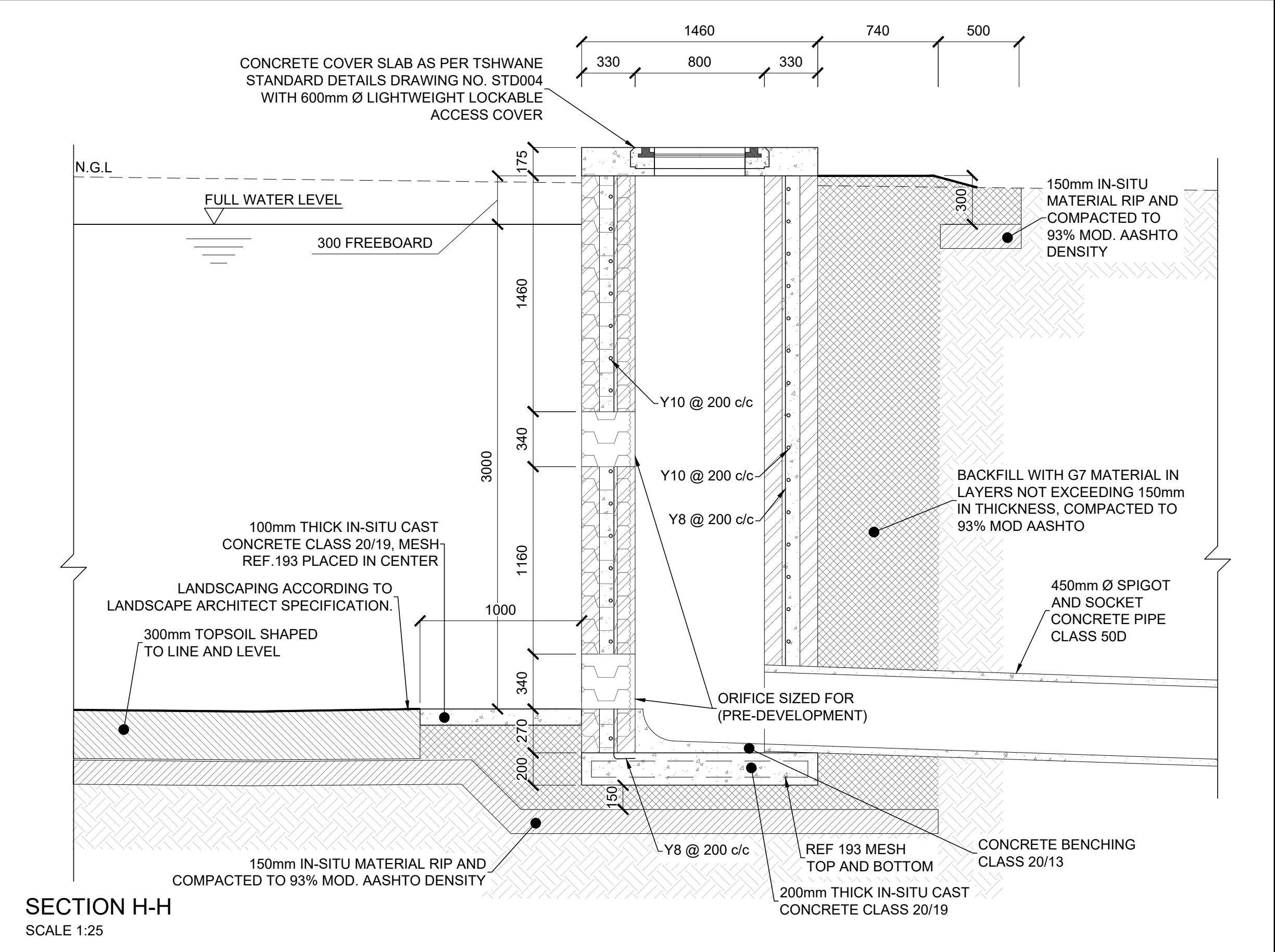
APPENDIX 9: TYPICAL ATTENUATION POND DETAILS



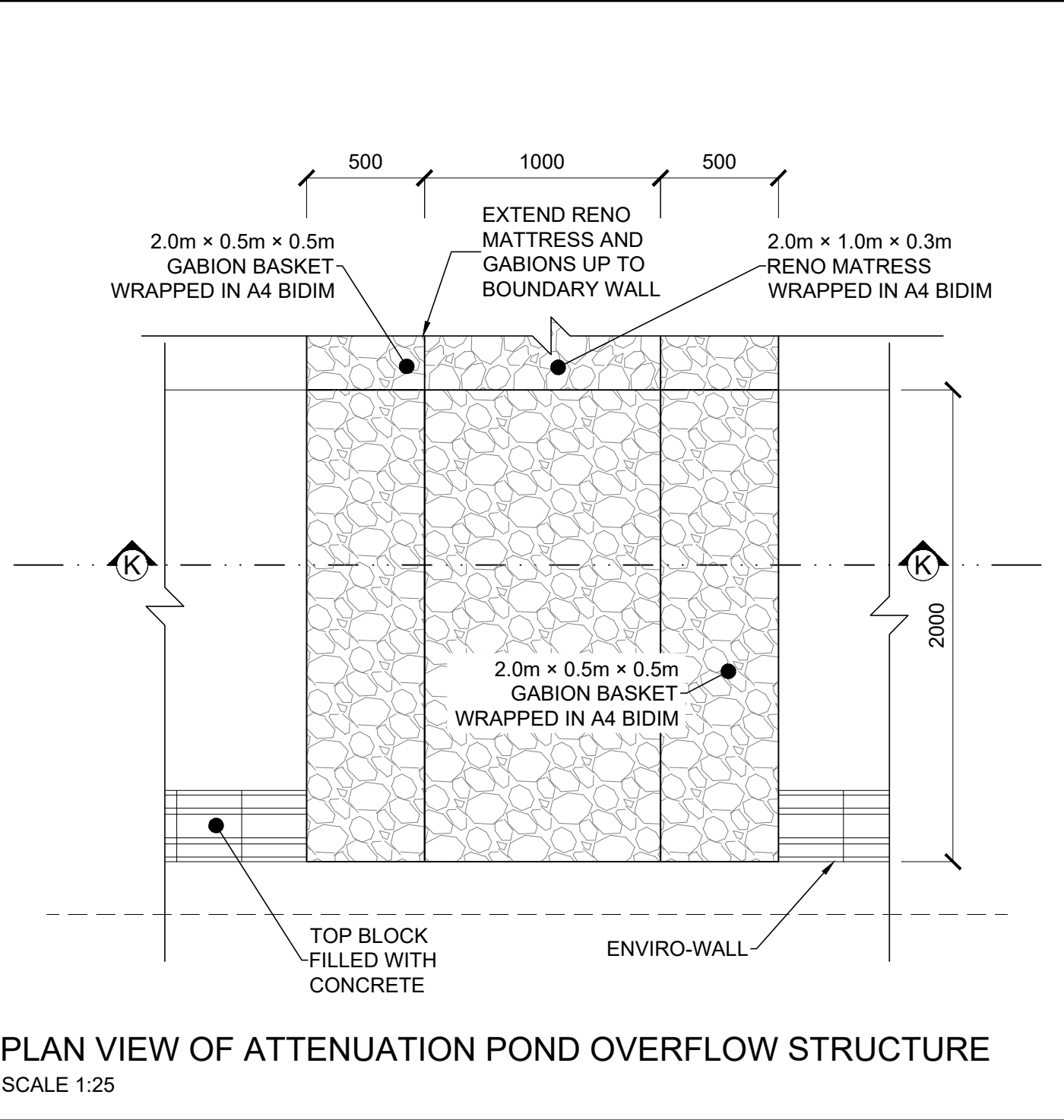
SECTION K-K
SCALE 1:25



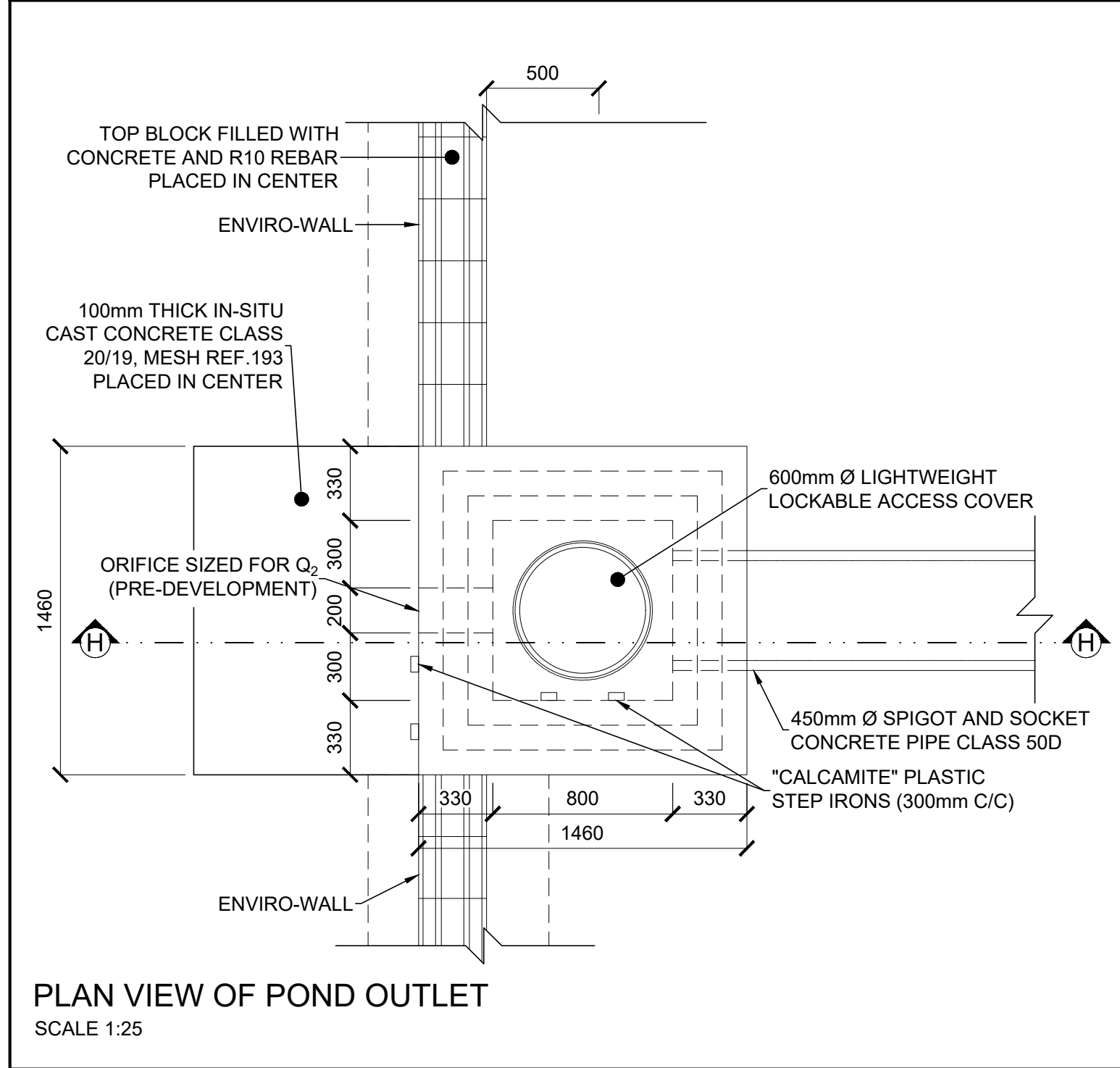
PLAN VIEW OF POND INLET
SCALE 1:25



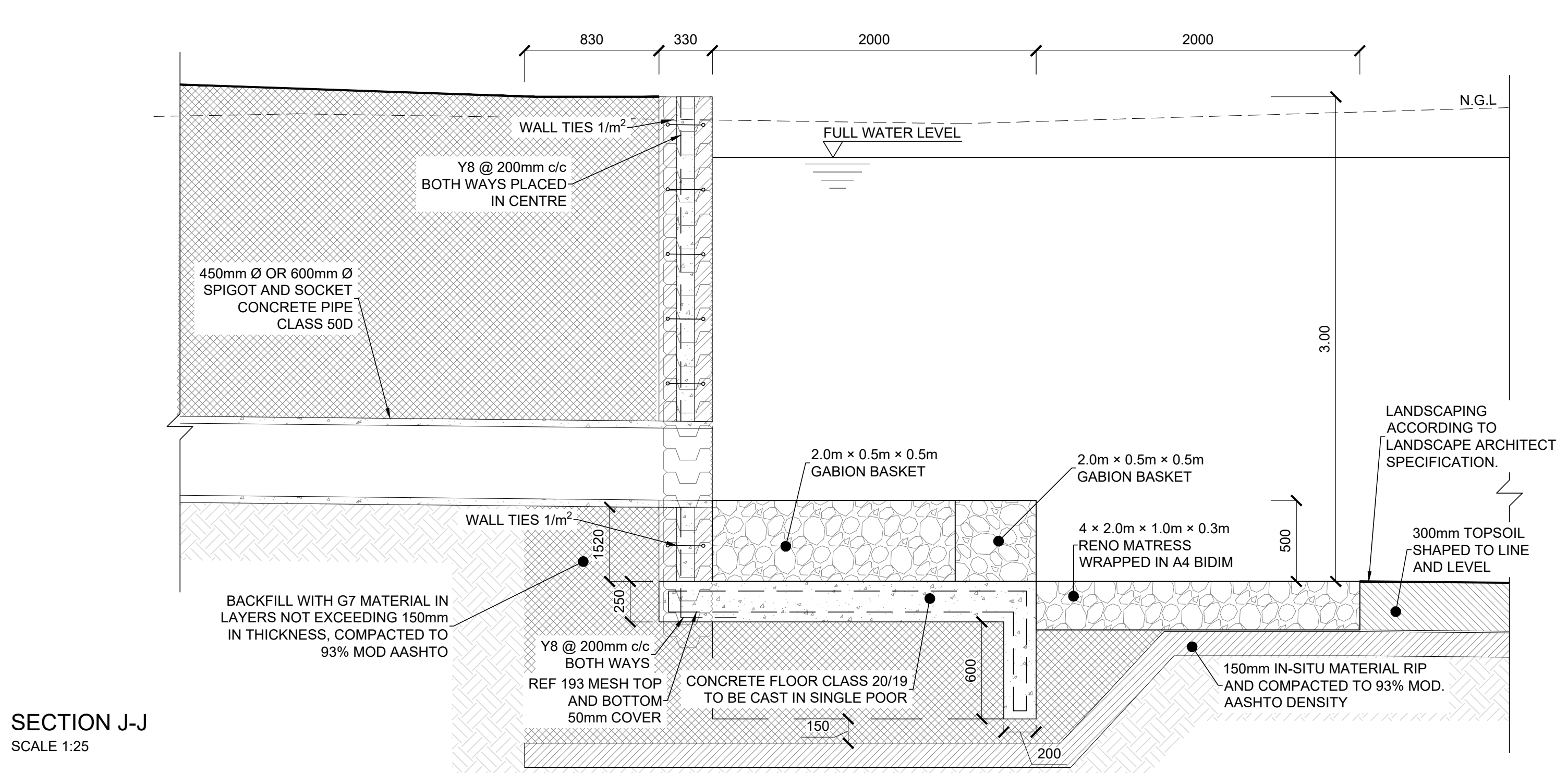
SECTION H-H
SCALE 1:25



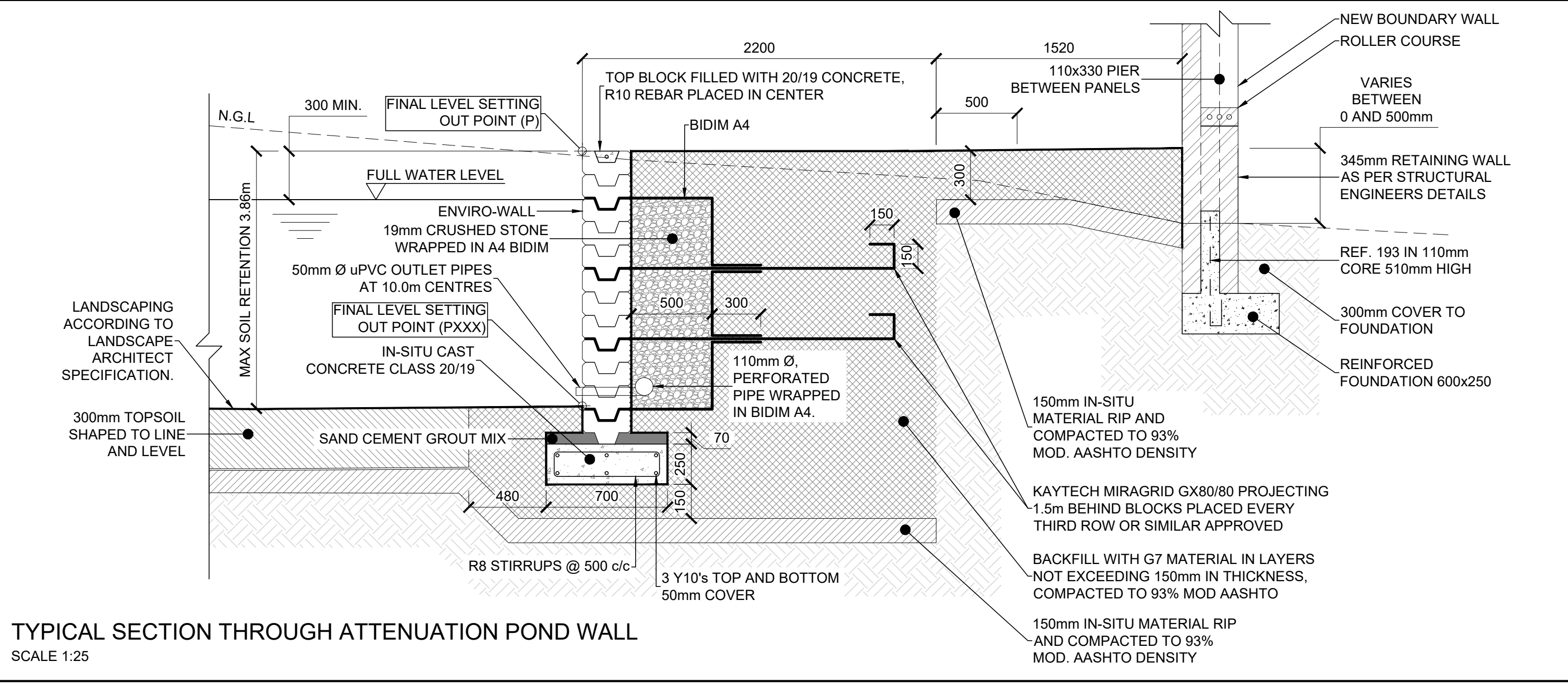
PLAN VIEW OF ATTENUATION POND OVERFLOW STRUCTURE
SCALE 1:25



PLAN VIEW OF POND OUTLET
SCALE 1:25



SECTION J-J
SCALE 1:25



TYPICAL SECTION THROUGH ATTENUATION POND WALL
SCALE 1:25

NOTES:

- ALL MATERIAL AND WORKMANSHIP MUST COMPLY WITH THE REQUIREMENTS OF THE LATEST RELEVANT SANS CODES.
- ALL DIMENSIONS ARE IN MILLIMETERS, UNLESS OTHERWISE INDICATED.
- DO NOT SCALE FROM THIS DRAWING.
- ALL DIMENSIONS AND SETTING OUT POINTS MUST BE CHECKED AND CONFIRMED BEFORE ANY CONSTRUCTION COMMENCES. ANY DISCREPANCIES TO BE BROUGHT TO THE ENGINEER'S IMMEDIATE ATTENTION IN WRITING.
- FINAL POSITION OF EXISTING SERVICES TO BE CONFIRMED ON SITE BY CONTRACTOR.
- ENGINEER OR THE ENGINEER'S REPRESENTATIVE TO BE INVITED FOR INSPECTIONS ACCORDING TO NDALAMO CIVIL ENGINEERING INSPECTION NOTIFICATION REQUIREMENTS.
- ALL FILL TO BE COMPACTED TO 95% MOD. AASHTO DENSITY IN LAYERS VARYING FROM 100-150mm THICKNESS, UNLESS OTHERWISE INDICATED.
- AREAS IN CUT OR FILL FOR AN EMBANKMENT OR BATTER TO BE DONE AT A MAX. SLOPE OF 1:2, UNLESS OTHERWISE INDICATED.
- AREAS IN CUT OR FILL FOR RETAINING WALL TO BE DONE AT A MAXIMUMSLOPE OF 70° FROM THE HORIZONTAL, UNLESS OTHERWISE INDICATED.
- CONTRACTOR TO COMPLY WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT (85 OF 1993), THE CONSTRUCTION REGULATIONS OF 2014 AND ALL RELEVANT REGULATIONS AS WELL AS THEIR AMENDMENTS.
- ON COMPLETION OF EARTHWORKS, CONTRACTOR TO PROVIDE COMPLETE AS-BUILT INFORMATION TO THE ENGINEER.

PROJECT RELEVANT NOTES:

ALL GABION BASKETS AND MATTRESSES TO BE MANUFACTURED FROM HEXAGONAL DOUBLE TWISTED WIRE MESH TO SANS 1580 AND PVC COATED

ALL WORK TO SANS 1200				
NO	DATE	DESCRIPTION	DESIGN	DRAWN
C	2024-03-21	UPDATED AS PER COMMENTS	CL	TVD
B	2023-03-02	JRA COMMENTS INCLUDED	LJL	LJL
A	2023-01-20	FOR INFORMATION	LJL	LJL



CLIENT:

PROJECT: BLUE HILLS EXT. 105

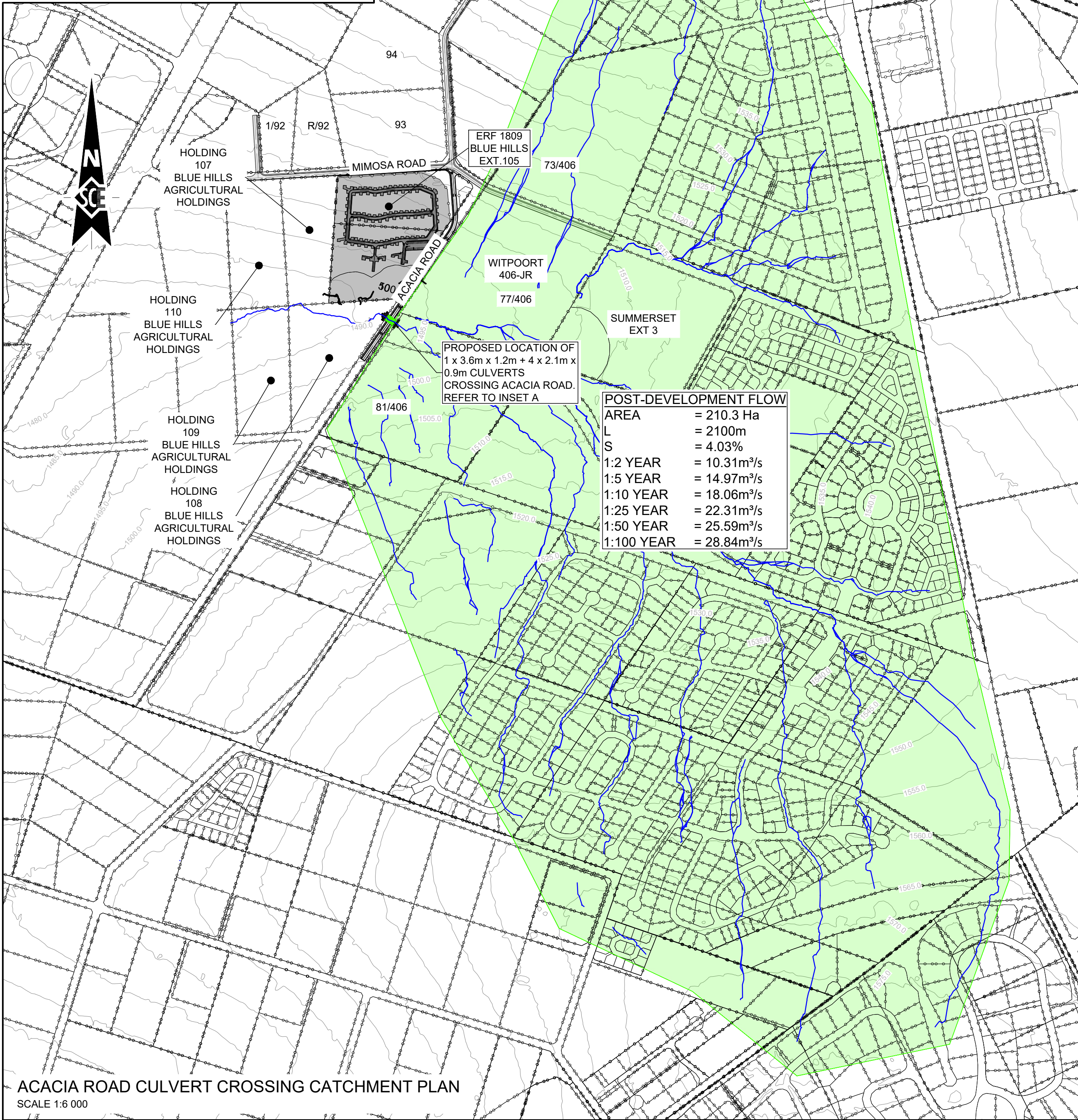
DRAWING TITLE: TYPICAL ATTENUATION POND DETAIL

DATE: 2023-01-20	SCALE: AS SHOWN	DRAWN: LJ LOTTERING
DESIGNED: LJ LOTTERING	CHECKED: M TSHOLODI	REVISION NUMBER: C
DRAWING NUMBER: 0053-SW-D01	FOR: INFORMATION	

APPENDIX 10: ACACIA ROAD CULVERT LAYOUT, DETAILS & CALCULATIONS

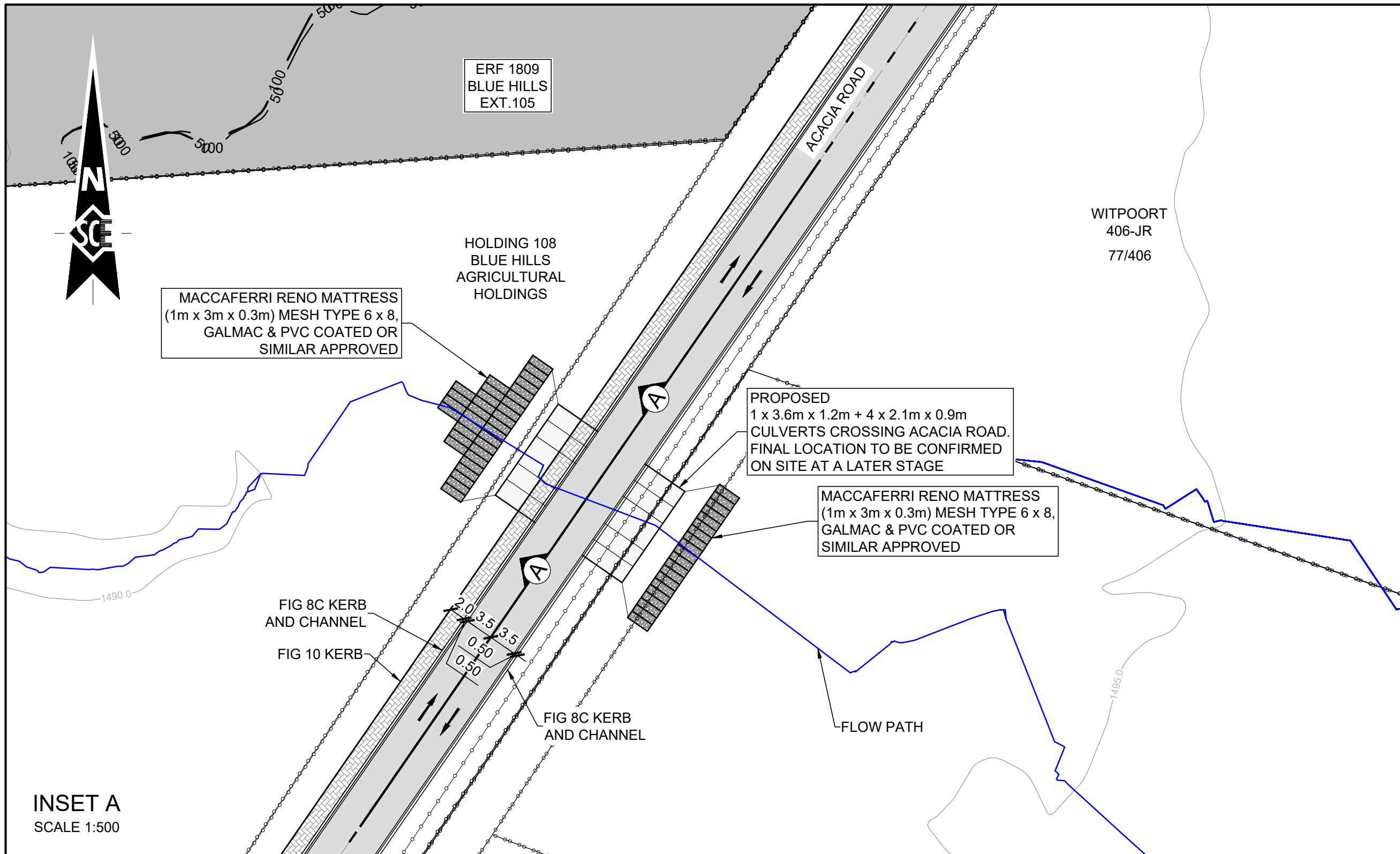


LOCALITY PLAN
NOT TO SCALE

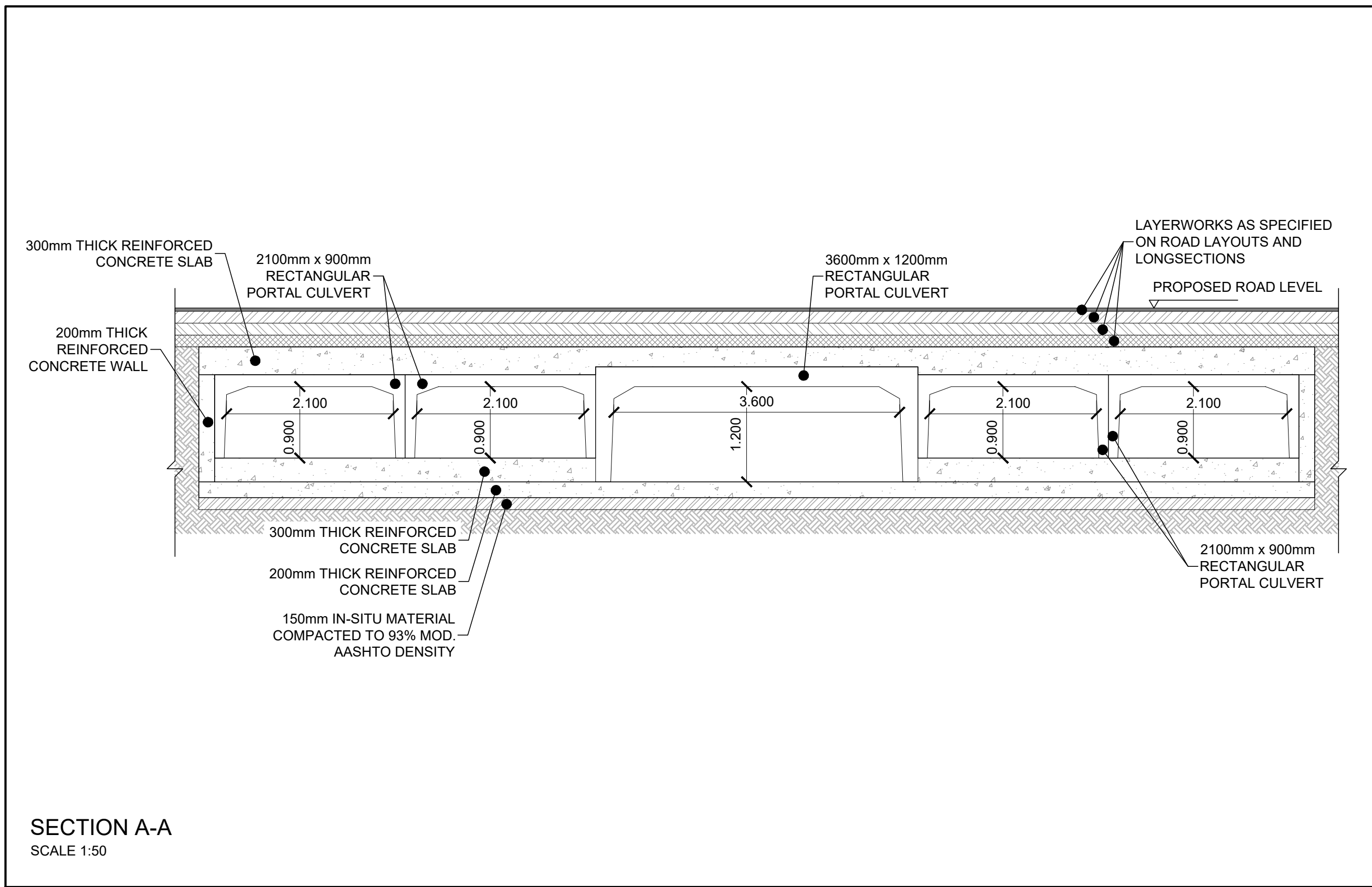


ACACIA ROAD CULVERT CROSSING CATCHMENT PLAN
SCALE 1:6 000

BLUE HILLS EXTENSION 105



INSET A
SCALE 1:500



SECTION A-A
SCALE 1:50

NOTES:

1. ALL MATERIAL AND WORKMANSHIP MUST COMPLY WITH THE REQUIREMENTS OF THE LATEST RELEVANT SANS CODES.
2. ALL DIMENSIONS ARE IN METERS, UNLESS OTHERWISE INDICATED.
3. DO NOT SCALE FROM THIS DRAWING.
4. ALL DIMENSIONS AND SETTING OUT POINTS MUST BE CHECKED AND APPROVED ON SITE.
5. VERTICAL AND HORIZONTAL ALIGNMENT TO FOLLOW THE EXISTING ROAD SURFACE, WITH A MINIMUM CROSS FALL OF 3%, IF APPLICABLE.
6. ALL MATERIALS FOR PAVEMENT LAYERS SHALL CONFORM TO THE REQUIREMENTS OF THE TRH14, UNLESS OTHERWISE INDICATED IN THE PROJECT SPECIFICATIONS.
7. ALL KERBS TO BE INSTALLED IN ACCORDANCE WITH JRA ROADS AND STORMWATER VOLUME 2, STANDARD DESIGN DETAILS FOR ROADS AND STORMWATER PART 1 - ROADS.
8. ALL KERBS TO BE FIGURE 3, UNLESS OTHERWISE INDICATED.
9. SLEEVES TO BE INDICATED BY FORMING LETTERS IN KERBS ACCORDING TO SCE STANDARD DRAWING SCE-SW011.
10. CONTRACTOR TO COMPLY WITH THE OCCUPATIONAL HEALTH AND SAFETY ACT (85 OF 1993), THE CONSTRUCTION REGULATIONS OF 2014 AND ALL RELEVANT REGULATIONS AS WELL AS THEIR AMENDMENTS.
11. ALL KERB INLETS TO BE INSTALLED IN ACCORDANCE WITH JRA ROADS AND STORMWATER VOLUME 2, STANDARD DESIGN DETAILS FOR ROADS AND STORMWATER PART 2 - STORMWATER.

LEGEND:

- ERF BOUNDARY
- BENCHMARK
- PROPOSED ASPHALT
- PROPOSED 60mm PAVERS
- ASPHALT BY OTHERS
- 60mm PAVERS BY OTHERS
- 50
- 100
- 1:50 YEAR FLOOD LINE
- 1:100 YEAR FLOOD LINE
- FLOW PATHS
- CATCHMENT AREA

PROJECT RELEVANT NOTE:

1. FIG 8C KERB AND CHANNEL AS PER JRA STANDARD DRAWINGS JRA-SD-RG-033
2. ALL EDGE BEAMS TO BE 200mm x 200mm AS PER JRA STANDARD DETAILS

CONSULTING ENGINEERS

SURVEYED	-	-
DESIGNED	U.DEPPE	
DRAWN	U.DEPPE	
CHECKED	L.LOTTERING	
SERVICES CHECKED	TBC	-
GEOTECHNICAL INVESTIGATION	TBC	-
SERVITUDES	TBC	-

APPROVED M.TSHILOLI
PR. ENG. NO. 201070156

DATE -



CITY OF JOHANNESBURG

PROJECT:
ERF 1809, BLUE HILLS EXTENSION 105

DRAWING TITLE:
ACACIA ROAD CULVERT CROSSING CATCHMENT PLAN & DETAILS

DESIGN MANAGER

DATE

SCALE

A
CONCEPT
AS
SHOWN

AMENDMENTS

APPR.

DATE

DRAWING NO.

0053-SW-L07

ISSUED FOR:

CONCEPT

FILE NO.

-

CONTRACT NO.

0053



34 DENNINGTON ROAD
WINSTON RIDGE
SANDTON
2196

PROJECT NO.
0053

DRAWING NO.
0053-SW-L07

FILE NO.
-

Watershed Model Schematic

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024



Legend

<u>Hyd.</u>	<u>Origin</u>	<u>Description</u>
1	Rational	Post-dev CulvertCross

Hydrograph Return Period Recap

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Inflow hyd(s)	Peak Outflow (cms)								Hydrograph Description
			1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr	
1	Rational	-----	-----	10.31	-----	14.97	18.06	22.31	25.59	28.84	Post-dev CulvertCross
Proj. file: Blue Hills - culvert crossing.gpw									Tuesday, 01 / 23 / 2024		

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	Rational	10.31	1	47	43 611.0	-----	-----	-----	Post-dev CulvertCross
Blue Hills - culvert crossing.gpw					Return Period: 2 Year			Tuesday, 01 / 23 / 2024	

Hydrograph Report

Hyd. No. 1

Post-dev CulvertCross

Hydrograph type	= Rational	Peak discharge	= 10.31 cms
Storm frequency	= 2 yrs	Time to peak	= 47 min
Time interval	= 1 min	Hyd. volume	= 43 611.0 cum
Drainage area	= 210.300 hectare	Runoff coeff.	= 0.6
Intensity	= 29.660 mm/hr	Tc by FAA	= 47.00 min
IDF Curve	= Blue hills-culvert crossing.IDFAsc/Rec limb fact		= 1/2

Post-dev CulvertCross

Hyd. No. 1 -- 2 Year



FAA Formula Tc Worksheet

$T_c = 1.8(1.1 - C) \times \text{Flow length}^{0.5} / \text{Watercourse slope}^{0.333}$ Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No. 1

Post-dev CulvertCross

Description

Flow length (m) = 2100.00

Watercourse slope (%) = 4.03

Runoff coefficient (C) = 0.60

Time of Conc. (min) = 47

Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	Rational	14.97	1	47	63 305.7	-----	-----	-----	Post-dev CulvertCross
Blue Hills - culvert crossing.gpw					Return Period: 5 Year			Tuesday, 01 / 23 / 2024	

Hydrograph Report

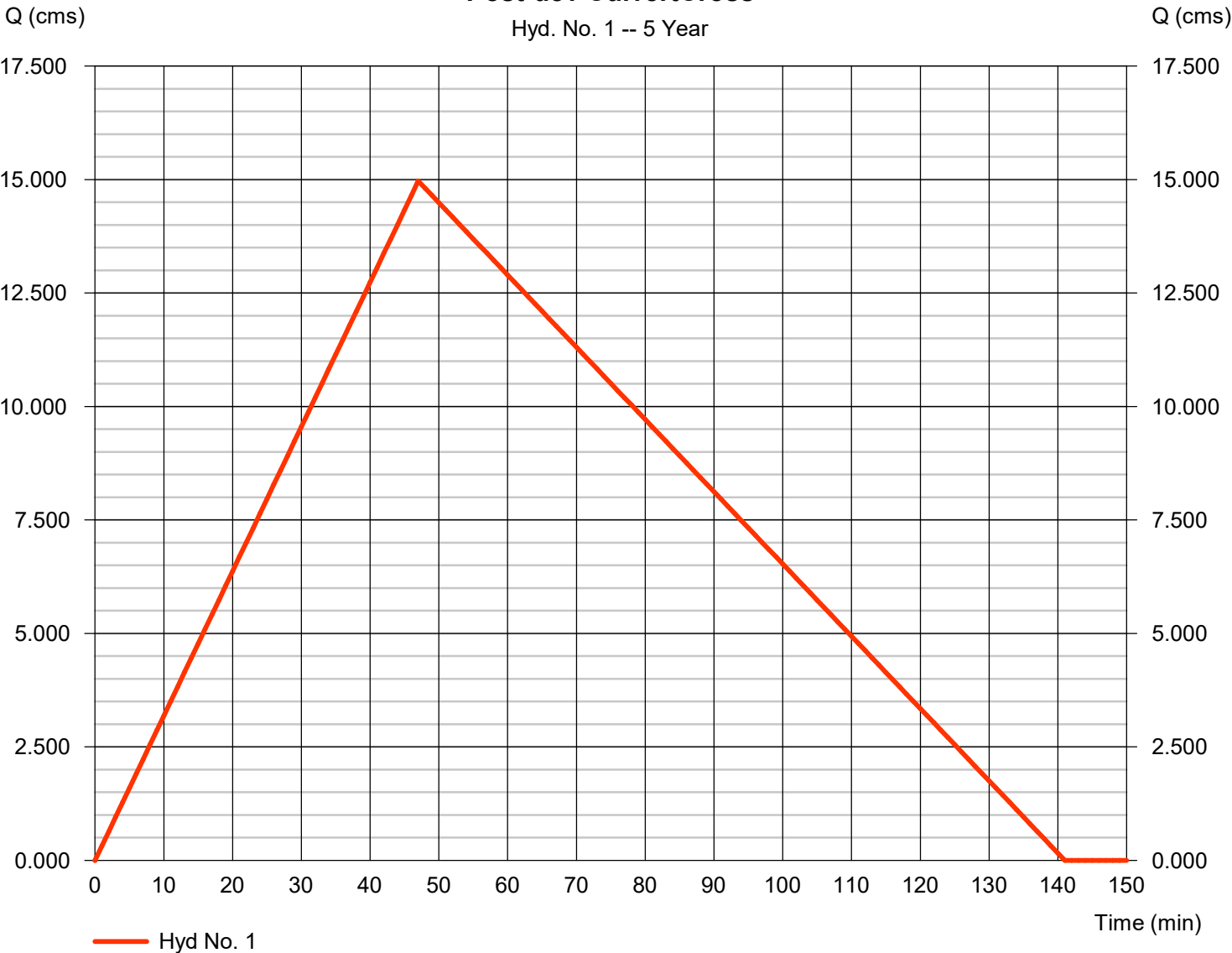
Hyd. No. 1

Post-dev CulvertCross

Hydrograph type	= Rational	Peak discharge	= 14.97 cms
Storm frequency	= 5 yrs	Time to peak	= 47 min
Time interval	= 1 min	Hyd. volume	= 63 305.7 cum
Drainage area	= 210.300 hectare	Runoff coeff.	= 0.6
Intensity	= 43.054 mm/hr	Tc by FAA	= 47.00 min
IDF Curve	= Blue hills-culvert crossing.IDFAsc/Rec limb fact		= 1/2

Post-dev CulvertCross

Hyd. No. 1 -- 5 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	Rational	18.06	1	47	76 402.4	-----	-----	-----	Post-dev CulvertCross
Blue Hills - culvert crossing.gpw					Return Period: 10 Year			Tuesday, 01 / 23 / 2024	

Hydrograph Report

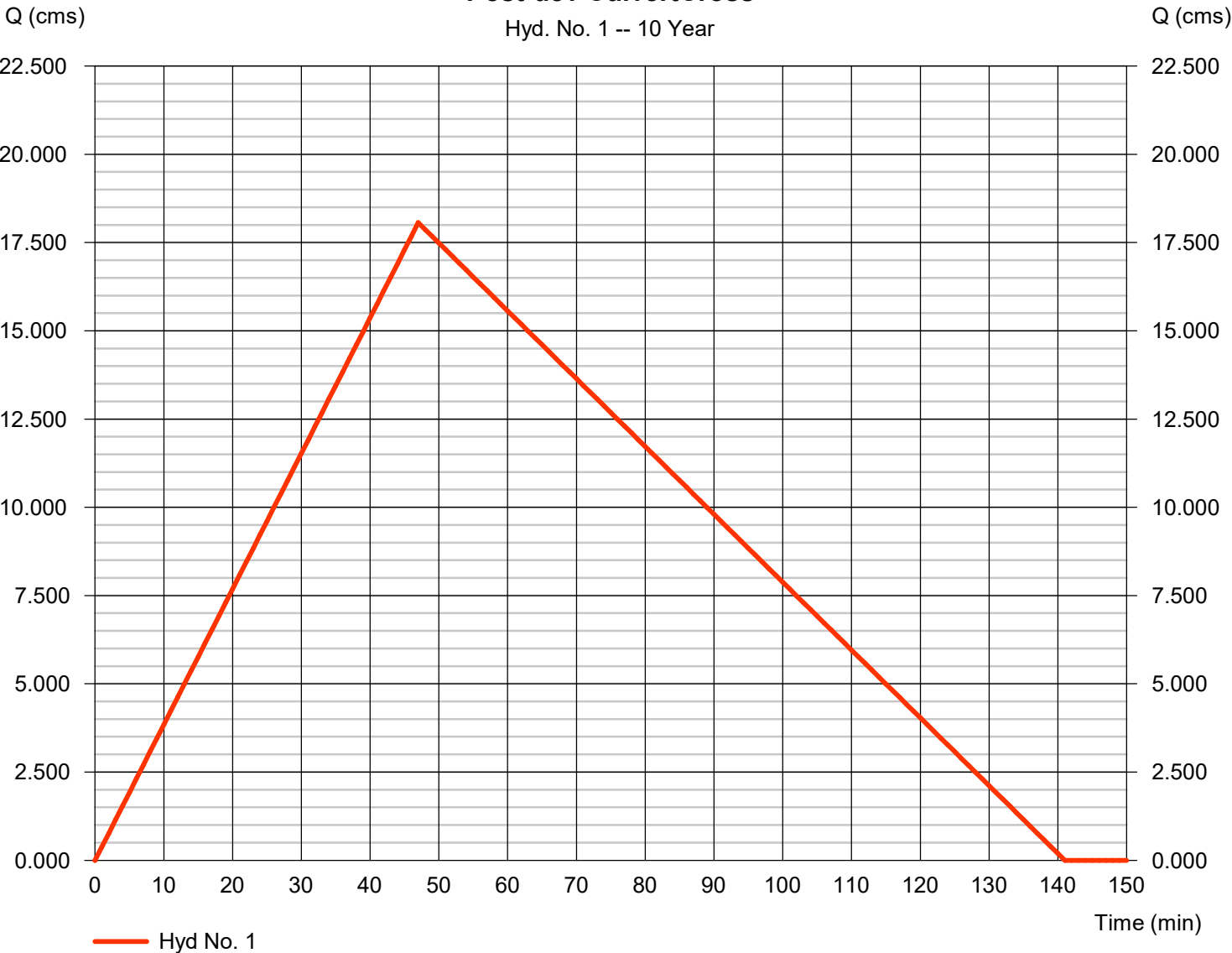
Hyd. No. 1

Post-dev CulvertCross

Hydrograph type	= Rational	Peak discharge	= 18.06 cms
Storm frequency	= 10 yrs	Time to peak	= 47 min
Time interval	= 1 min	Hyd. volume	= 76 402.4 cum
Drainage area	= 210.300 hectare	Runoff coeff.	= 0.6
Intensity	= 51.961 mm/hr	Tc by FAA	= 47.00 min
IDF Curve	= Blue hills-culvert crossing.IDFAsc/Rec limb fact		= 1/2

Post-dev CulvertCross

Hyd. No. 1 -- 10 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	Rational	22.31	1	47	94 386.1	-----	-----	-----	Post-dev CulvertCross
Blue Hills - culvert crossing.gpw					Return Period: 25 Year			Tuesday, 01 / 23 / 2024	

Hydrograph Report

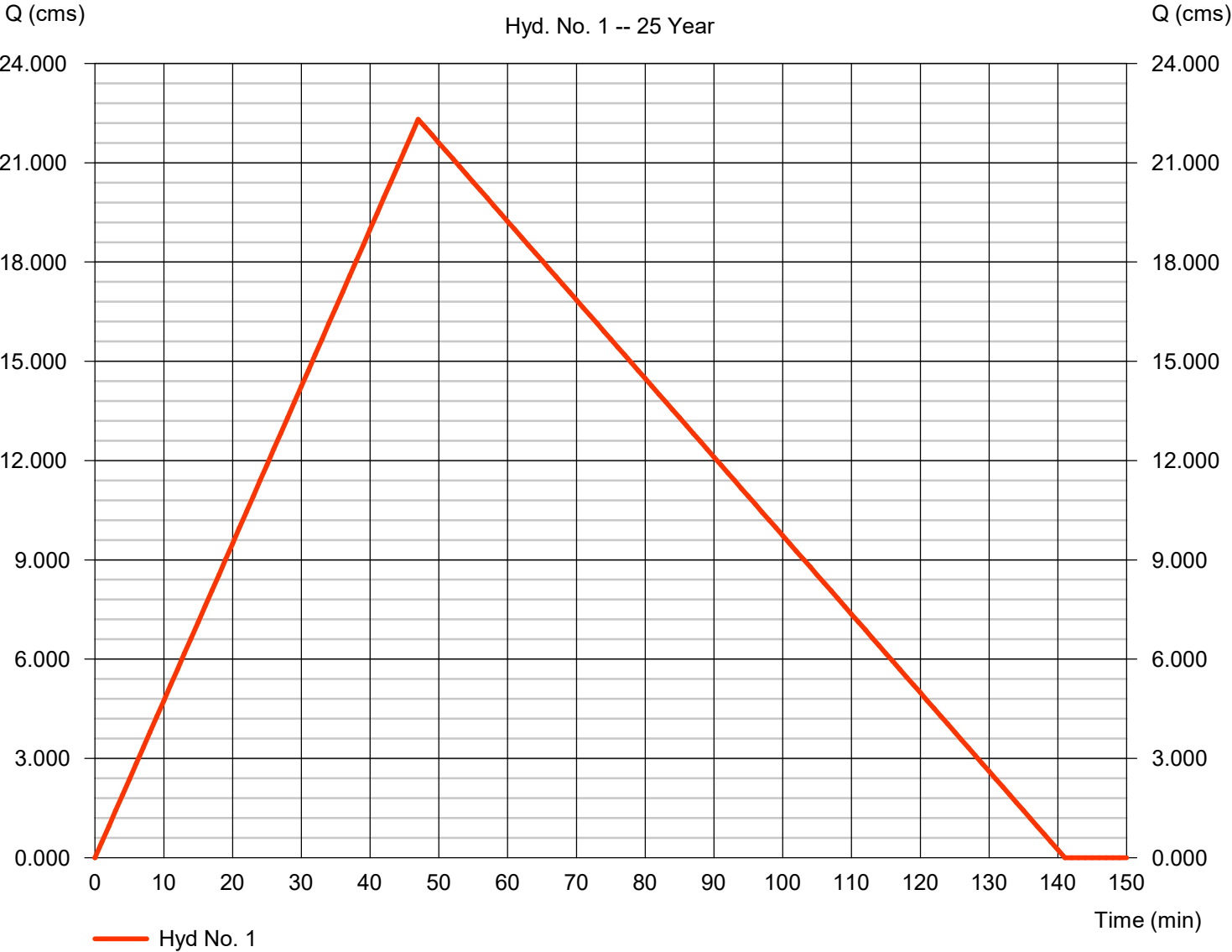
Hyd. No. 1

Post-dev CulvertCross

Hydrograph type	= Rational	Peak discharge	= 22.31 cms
Storm frequency	= 25 yrs	Time to peak	= 47 min
Time interval	= 1 min	Hyd. volume	= 94 386.1 cum
Drainage area	= 210.300 hectare	Runoff coeff.	= 0.6
Intensity	= 64.192 mm/hr	Tc by FAA	= 47.00 min
IDF Curve	= Blue hills-culvert crossing.IDFAsc/Rec limb fact		= 1/2

Post-dev CulvertCross

Hyd. No. 1 -- 25 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	Rational	25.59	1	47	108 224.7	-----	-----	-----	Post-dev CulvertCross
Blue Hills - culvert crossing.gpw					Return Period: 50 Year			Tuesday, 01 / 23 / 2024	

Hydrograph Report

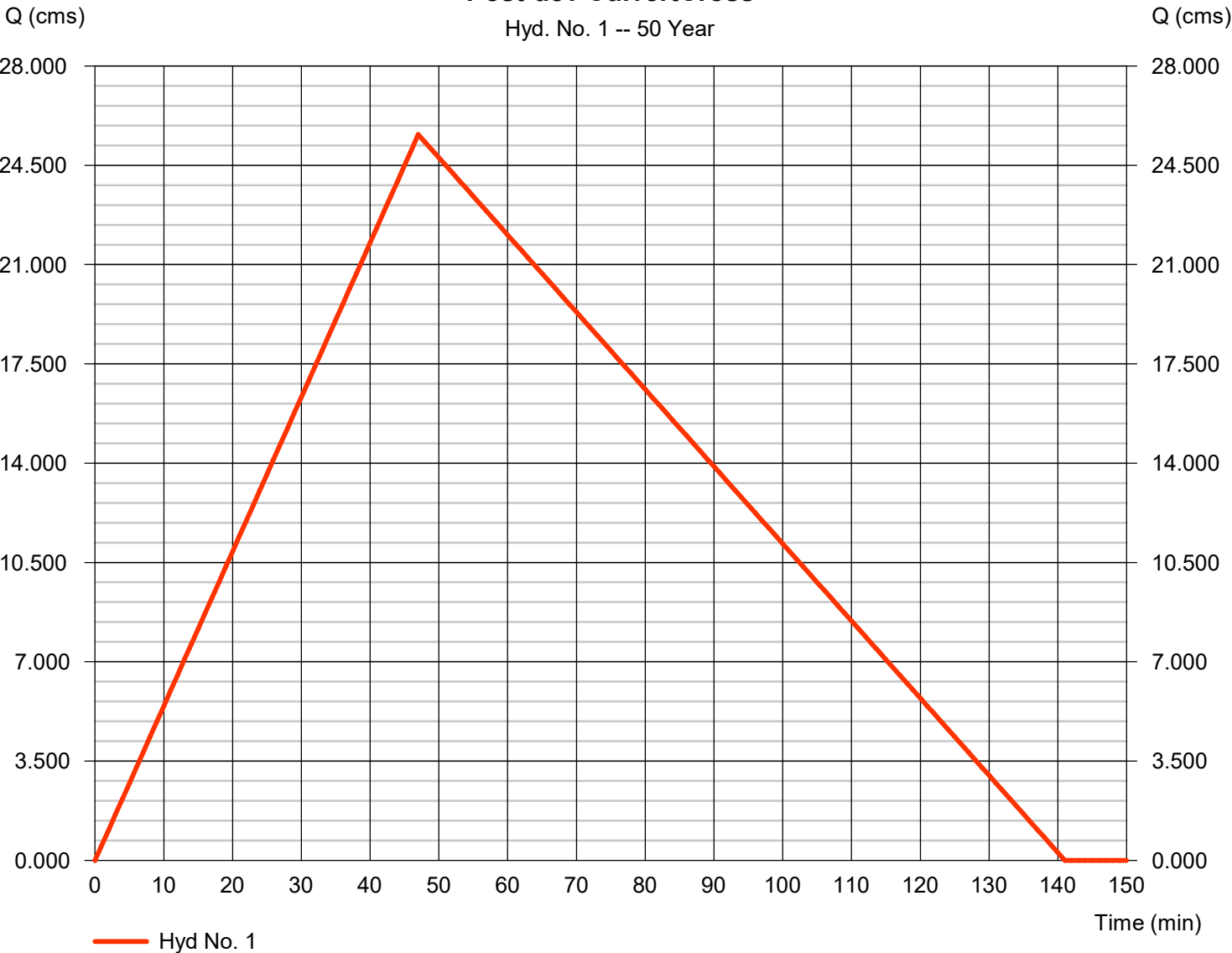
Hyd. No. 1

Post-dev CulvertCross

Hydrograph type	= Rational	Peak discharge	= 25.59 cms
Storm frequency	= 50 yrs	Time to peak	= 47 min
Time interval	= 1 min	Hyd. volume	= 108 224.7 cum
Drainage area	= 210.300 hectare	Runoff coeff.	= 0.6
Intensity	= 73.604 mm/hr	Tc by FAA	= 47.00 min
IDF Curve	= Blue hills-culvert crossing.IDFAsc/Rec limb fact	= 1/2	

Post-dev CulvertCross

Hyd. No. 1 -- 50 Year



Hydrograph Summary Report

Hydraflow Hydrographs Extension for Autodesk® Civil 3D® by Autodesk, Inc. v2024

Hyd. No.	Hydrograph type (origin)	Peak flow (cms)	Time interval (min)	Time to Peak (min)	Hyd. volume (cum)	Inflow hyd(s)	Maximum elevation (m)	Total strge used (cum)	Hydrograph Description
1	Rational	28.84	1	47	121 985.1	-----	-----	-----	Post-dev CulvertCross
Blue Hills - culvert crossing.gpw					Return Period: 100 Year			Tuesday, 01 / 23 / 2024	

Hydrograph Report

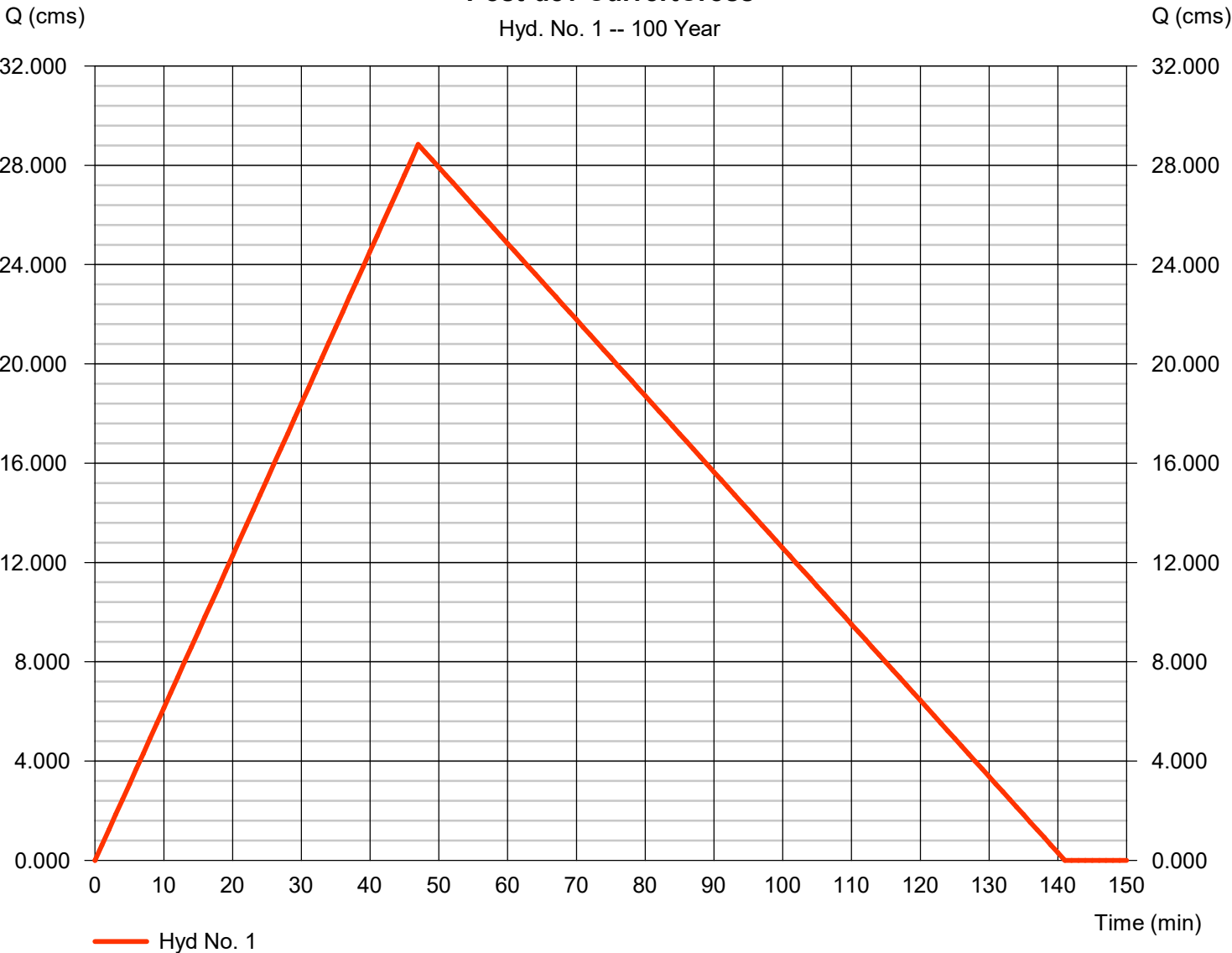
Hyd. No. 1

Post-dev CulvertCross

Hydrograph type	= Rational	Peak discharge	= 28.84 cms
Storm frequency	= 100 yrs	Time to peak	= 47 min
Time interval	= 1 min	Hyd. volume	= 121 985.1 cum
Drainage area	= 210.300 hectare	Runoff coeff.	= 0.6
Intensity	= 82.962 mm/hr	Tc by FAA	= 47.00 min
IDF Curve	= Blue hills-culvert crossing.IDFAsc/Rec limb fact		= 1/2

Post-dev CulvertCross

Hyd. No. 1 -- 100 Year



Hydraflow Rainfall Report

Return Period (Yrs)	Intensity-Duration-Frequency Equation Coefficients (FHA)			
	B	D	E	(N/A)
1	0.0000	0.0000	0.0000	-----
2	64.5418	14.7320	1.9724	-----
3	0.0000	0.0000	0.0000	-----
5	94.0499	14.7320	1.9748	-----
10	113.6548	14.7320	1.9757	-----
25	140.5560	14.7320	1.9764	-----
50	161.2525	14.7320	1.9767	-----
100	181.8318	14.7320	1.9770	-----

File name: Blue hills-culvert crossing.IDF

Intensity = $B / (T_c + D)^E$

Return Period (Yrs)	Intensity Values (mm/hr)											
	5 min	10	15	20	25	30	35	40	45	50	55	60
1	0	0	0	0	0	0	0	0	0	0	0	0
2	102	76	61	52	45	40	36	33	31	28	27	25
3	0	0	0	0	0	0	0	0	0	0	0	0
5	148	110	89	75	65	58	53	48	44	41	39	36
10	179	133	107	91	79	70	64	58	54	50	47	44
25	221	164	133	112	98	87	78	72	66	61	58	54
50	253	188	152	129	112	100	90	82	76	71	66	62
100	285	212	171	145	126	112	101	93	85	79	74	70

Tc = time in minutes. Values may exceed 60.

Precip. file name: Sample.pcp

Storm Distribution	Rainfall Precipitation Table (mm)							
	1-yr	2-yr	3-yr	5-yr	10-yr	25-yr	50-yr	100-yr
SCS 24-hour	0	50	0	80	70	0	0	0
SCS 6-Hr	0	590	40	380	110	0	0	0
Huff-1st	0	40	440	0	0	0	0	0
Huff-2nd	0	570	0	60	0	0	0	0
Huff-3rd	0	30	0	980	0	0	0	0
Huff-4th	0	940	0	0	0	0	0	0
Huff-Indy	0	0	0	0	0	0	0	0
Custom	0	0	0	0	0	0	0	0

Watershed Model Schematic..... 1

Hydrograph Return Period Recap..... 2

2 - Year

Summary Report..... 3

Hydrograph Reports..... 4

 Hydrograph No. 1, Rational, Post-dev CulvertCross..... 4

 FAA Tc Worksheet..... 5

5 - Year

Summary Report..... 6

Hydrograph Reports..... 7

 Hydrograph No. 1, Rational, Post-dev CulvertCross..... 7

10 - Year

Summary Report..... 8

Hydrograph Reports..... 9

 Hydrograph No. 1, Rational, Post-dev CulvertCross..... 9

25 - Year

Summary Report..... 10

Hydrograph Reports..... 11

 Hydrograph No. 1, Rational, Post-dev CulvertCross..... 11

50 - Year

Summary Report..... 12

Hydrograph Reports..... 13

 Hydrograph No. 1, Rational, Post-dev CulvertCross..... 13

100 - Year

Summary Report..... 14

Hydrograph Reports..... 15

 Hydrograph No. 1, Rational, Post-dev CulvertCross..... 15

IDF Report..... 16

Q			Veloc		Depth	
Total	Pipe	Over	Dn	Up	Dn	Up
(cms)	(cms)	(cms)	(m/s)	(m/s)	(mm)	(mm)
1.0000	1.0000	0.0000	1.6020	0.9137	48.7691	85.5018
2.0000	2.0000	0.0000	2.1360	1.1518	73.1490	135.6568
3.0000	3.0000	0.0000	2.4805	1.3188	94.4873	177.7194
4.0000	4.0000	0.0000	2.7710	1.4518	112.7745	215.2520
5.0000	5.0000	0.0000	2.9804	1.5642	131.0618	249.7336
6.0000	6.0000	0.0000	3.2039	1.6623	146.3073	281.9828
7.0000	7.0000	0.0000	3.3226	1.7502	164.5946	312.4646
8.0000	8.0000	0.0000	3.4754	1.8300	179.8309	341.5233
9.0000	9.0000	0.0000	3.5490	1.9034	198.1181	369.4007
10.0000	10.0000	0.0000	3.6616	1.9716	213.3637	396.2456
11.0000	11.0000	0.0000	3.7098	2.0354	231.6510	422.2161
12.0000	12.0000	0.0000	3.8447	2.0954	243.8363	447.4052
13.0000	13.0000	0.0000	3.9201	2.1522	259.0818	471.9061
14.0000	14.0000	0.0000	3.9871	2.2061	274.3181	495.7837
15.0000	15.0000	0.0000	4.0471	2.2575	289.5637	519.0939
16.0000	16.0000	0.0000	4.1010	2.3067	304.8000	541.8925
17.0000	17.0000	0.0000	4.1499	2.3539	320.0363	564.2167
18.0000	18.0000	0.0000	4.2327	2.3993	332.2309	586.1130
19.0000	19.0000	0.0000	4.2348	2.4430	350.5181	607.6001
20.0000	20.0000	0.0000	4.3078	2.4852	362.7127	628.7151
21.0000	21.0000	0.0000	4.3408	2.5261	377.9490	649.4766
22.0000	22.0000	0.0000	4.4054	2.5656	390.1436	669.9126
23.0000	23.0000	0.0000	4.4325	2.6040	405.3799	690.0416
24.0000	24.0000	0.0000	4.4902	2.6413	417.5745	709.8823
25.0000	25.0000	0.0000	4.5446	2.6775	429.7691	729.4531
26.0000	26.0000	0.0000	4.5645	2.7128	445.0054	748.7543
27.0000	27.0000	0.0000	4.6137	2.7472	457.2000	767.8136
28.0000	28.0000	0.0000	4.6302	2.7808	472.4363	786.6403

Q			Veloc		Depth	
Total	Pipe	Over	Dn	Up	Dn	Up
(cms)	(cms)	(cms)	(m/s)	(m/s)	(mm)	(mm)
29.0000	29.0000	0.0000	4.6457	2.8136	487.6819	805.2346
30.0000	29.3496	0.6504	4.6725	2.8249	490.7235	811.6900

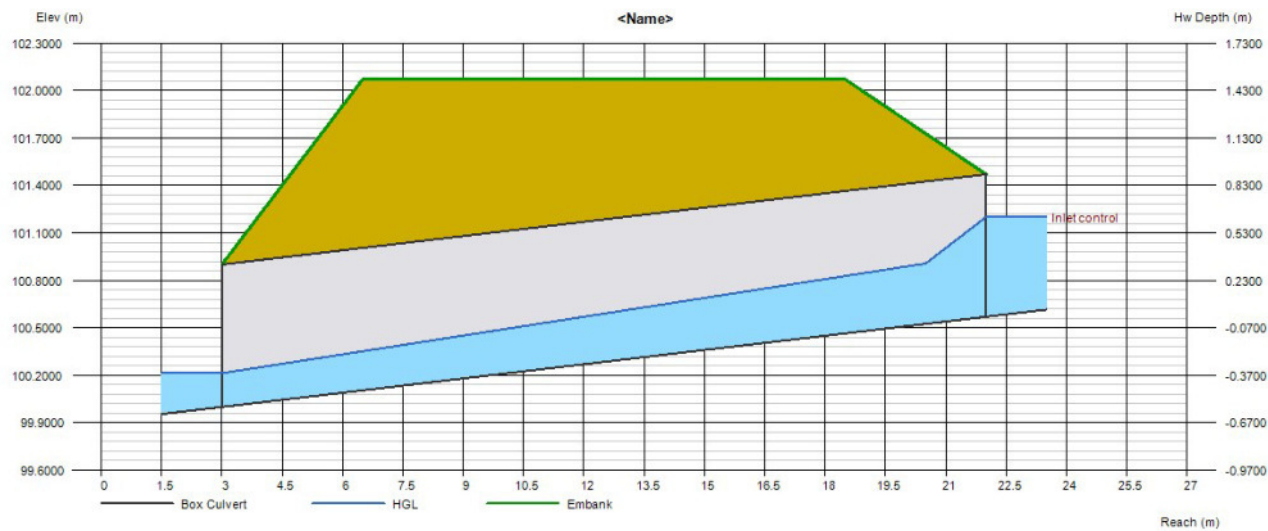
HGL			
Dn	Up	Hw	Hw /D
(m)	(m)	(m)	
100.0488	100.6555	100.7057	0.1508
100.0732	100.7057	100.7854	0.2394
100.0945	100.7477	100.8524	0.3137
100.1128	100.7853	100.9121	0.3801
100.1311	100.8197	100.9670	0.4411
100.1463	100.8520	101.0183	0.4981
100.1646	100.8825	101.0669	0.5521
100.1798	100.9115	101.1132	0.6035
100.1981	100.9394	101.1575	0.6528
100.2134	100.9662	101.2003	0.7004
100.2317	100.9922	101.2417	0.7463
100.2438	101.0174	101.2818	0.7909
100.2591	101.0419	101.3209	0.8343
100.2743	101.0658	101.3589	0.8766
100.2896	101.0891	101.3961	0.9179
100.3048	101.1119	101.4324	0.9582
100.3200	101.1342	101.4680	0.9978
100.3322	101.1561	101.5029	1.0365
100.3505	101.1776	101.5395	1.0773
100.3627	101.1987	101.5825	1.1250
100.3779	101.2195	101.6277	1.1753
100.3901	101.2399	101.6752	1.2280
100.4054	101.2600	101.7248	1.2831
100.4176	101.2799	101.7766	1.3407
100.4298	101.2995	101.8306	1.4007
100.4450	101.3188	101.8868	1.4632
100.4572	101.3378	101.9453	1.5281
100.4724	101.3566	102.0059	1.5955

HGL			
Dn	Up	Hw	Hw /D
(m)	(m)	(m)	
100.4877	101.3752	102.0688	1.6653
100.4907	101.3817	102.0913	1.6903

Culvert Report

Box Culvert

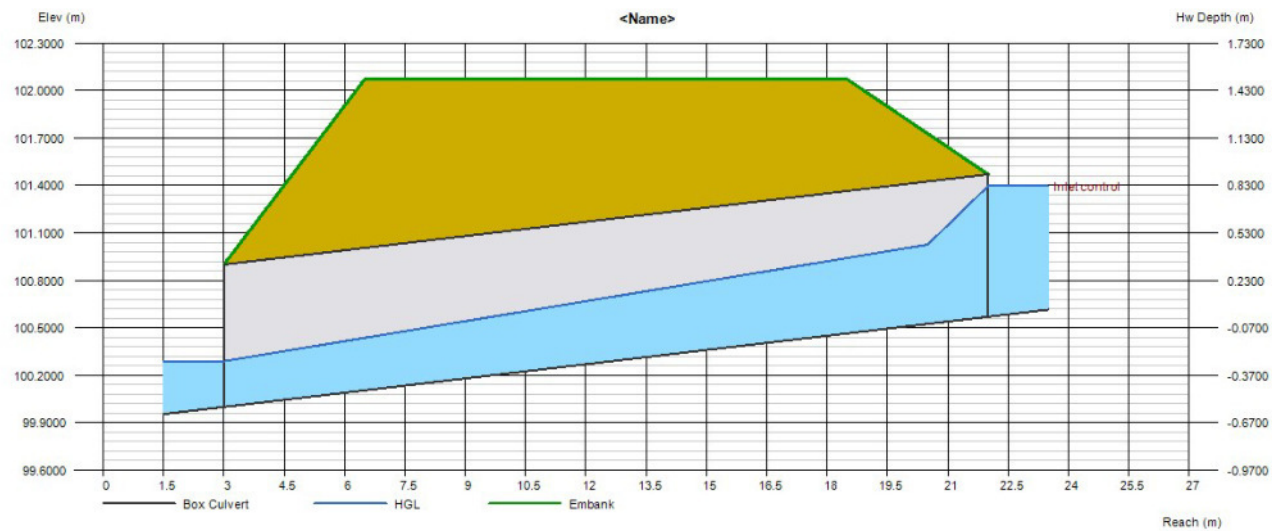
Invert Elev Dn (m)	= 100.0000	Calculations	
Pipe Length (m)	= 19.0000	Qmin (cms)	= 1.0000
Slope (%)	= 3.0000	Qmax (cms)	= 30.0000
Invert Elev Up (m)	= 100.5700	Tailwater Elev (m)	= 0.00
Rise (mm)	= 900.0		
Shape	= Box	Highlighted	
Span (mm)	= 3200.0	Qtotal (cms)	= 10.0000
No. Barrels	= 4	Qpipe (cms)	= 10.0000
n-Value	= 0.013	Qovertop (cms)	= 0.0000
Culvert Type	= Rectangular Concrete	Veloc Dn (m/s)	= 3.6616
Culvert Entrance	= Slope tapered, less favorable edges	Veloc Up (m/s)	= 1.9716
Coeff. K,M,c,Y,k	= 0.5, 0.667, 0.0446, 0.65, 0.5	HGL Dn (m)	= 100.2134
		HGL Up (m)	= 100.9662
		Hw Elev (m)	= 101.2003
		Hw/D (m)	= 0.7004
		Flow Regime	= Inlet Control
Embankment			
Top Elevation (m)	= 102.0700		
Top Width (m)	= 12.0000		
Crest Width (m)	= 125.0000		



Culvert Report

Box Culvert

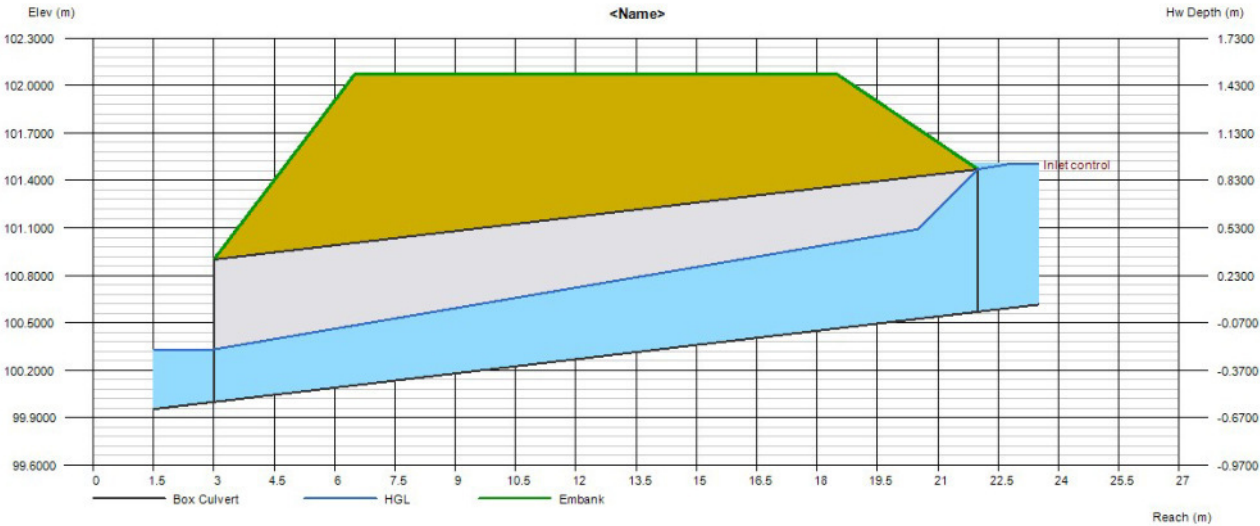
Invert Elev Dn (m)	= 100.0000	Calculations	
Pipe Length (m)	= 19.0000	Qmin (cms)	= 1.0000
Slope (%)	= 3.0000	Qmax (cms)	= 30.0000
Invert Elev Up (m)	= 100.5700	Tailwater Elev (m)	= 0.00
Rise (mm)	= 900.0		
Shape	= Box	Highlighted	
Span (mm)	= 3200.0	Qtotal (cms)	= 15.0000
No. Barrels	= 4	Qpipe (cms)	= 15.0000
n-Value	= 0.013	Qovertop (cms)	= 0.0000
Culvert Type	= Rectangular Concrete	Veloc Dn (m/s)	= 4.0471
Culvert Entrance	= Slope tapered, less favorable edges	Veloc Up (m/s)	= 2.2575
Coeff. K,M,c,Y,k	= 0.5, 0.667, 0.0446, 0.65, 0.5	HGL Dn (m)	= 100.2896
		HGL Up (m)	= 101.0891
		Hw Elev (m)	= 101.3961
		Hw/D (m)	= 0.9179
		Flow Regime	= Inlet Control
Embankment			
Top Elevation (m)	= 102.0700		
Top Width (m)	= 12.0000		
Crest Width (m)	= 125.0000		



Culvert Report

Box Culvert

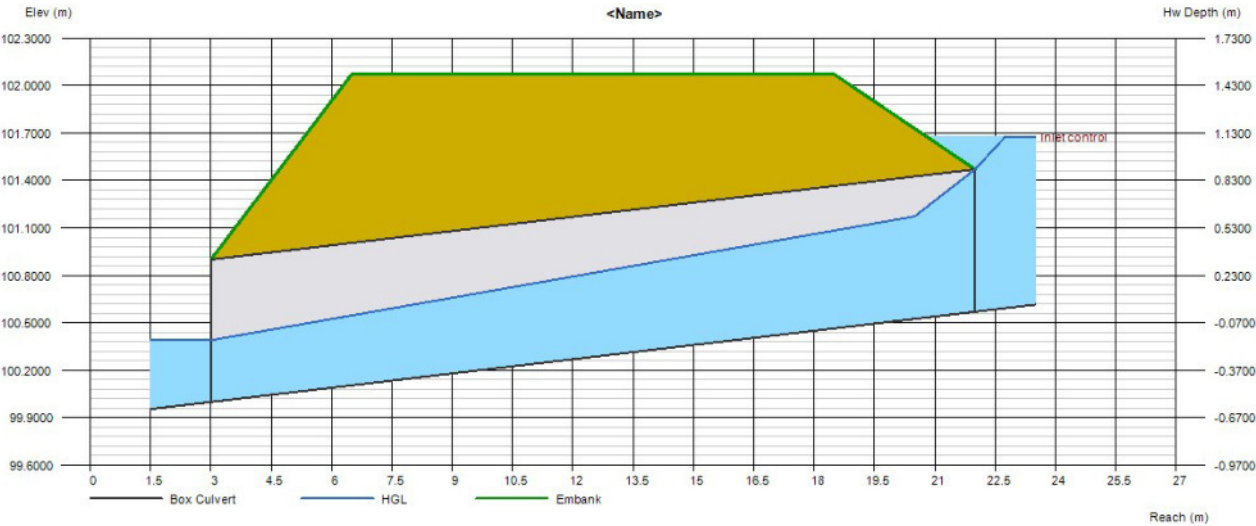
Invert Elev Dn (m)	= 100.0000	Calculations	
Pipe Length (m)	= 19.0000	Qmin (cms)	= 1.0000
Slope (%)	= 3.0000	Qmax (cms)	= 30.0000
Invert Elev Up (m)	= 100.5700	Tailwater Elev (m)	= 0.00
Rise (mm)	= 900.0		
Shape	= Box	Highlighted	
Span (mm)	= 3200.0	Qtotal (cms)	= 18.0000
No. Barrels	= 4	Qpipe (cms)	= 18.0000
n-Value	= 0.013	Qovertop (cms)	= 0.0000
Culvert Type	= Rectangular Concrete	Veloc Dn (m/s)	= 4.2327
Culvert Entrance	= Slope tapered, less favorable edges	Veloc Up (m/s)	= 2.3993
Coeff. K,M,c,Y,k	= 0.5, 0.667, 0.0446, 0.65, 0.5	HGL Dn (m)	= 100.3322
		HGL Up (m)	= 101.1561
		Hw Elev (m)	= 101.5029
		Hw/D (m)	= 1.0365
		Flow Regime	= Inlet Control
Embankment			
Top Elevation (m)	= 102.0700		
Top Width (m)	= 12.0000		
Crest Width (m)	= 125.0000		



Culvert Report

Box Culvert

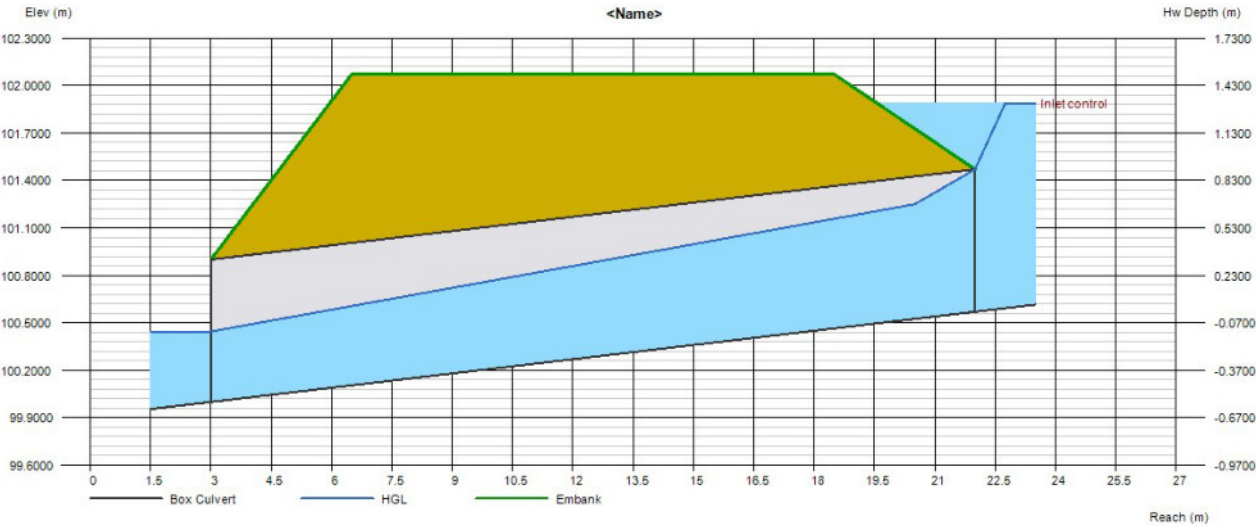
Invert Elev Dn (m)	=	100.0000	Calculations	
Pipe Length (m)	=	19.0000	Qmin (cms)	= 1.0000
Slope (%)	=	3.0000	Qmax (cms)	= 30.0000
Invert Elev Up (m)	=	100.5700	Tailwater Elev (m)	= 0.00
Rise (mm)	=	900.0		
Shape	=	Box	Highlighted	
Span (mm)	=	3200.0	Qtotal (cms)	= 22.0000
No. Barrels	=	4	Qpipe (cms)	= 22.0000
n-Value	=	0.013	Qovertop (cms)	= 0.0000
Culvert Type	=	Rectangular Concrete	Veloc Dn (m/s)	= 4.4054
Culvert Entrance	=	Slope tapered, less favorable edges	Veloc Up (m/s)	= 2.5656
Coeff. K,M,c,Y,k	=	0.5, 0.667, 0.0446, 0.65, 0.5	HGL Dn (m)	= 100.3901
			HGL Up (m)	= 101.2399
			Hw Elev (m)	= 101.6752
			Hw/D (m)	= 1.2280
			Flow Regime	= Inlet Control
Embankment				
Top Elevation (m)	=	102.0700		
Top Width (m)	=	12.0000		
Crest Width (m)	=	125.0000		



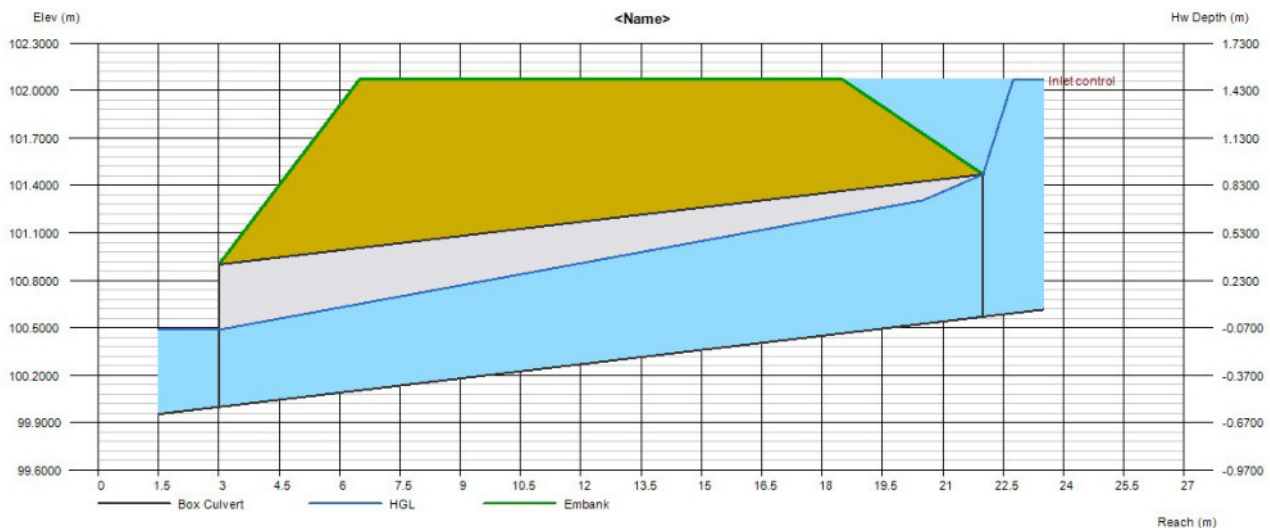
Culvert Report

Box Culvert

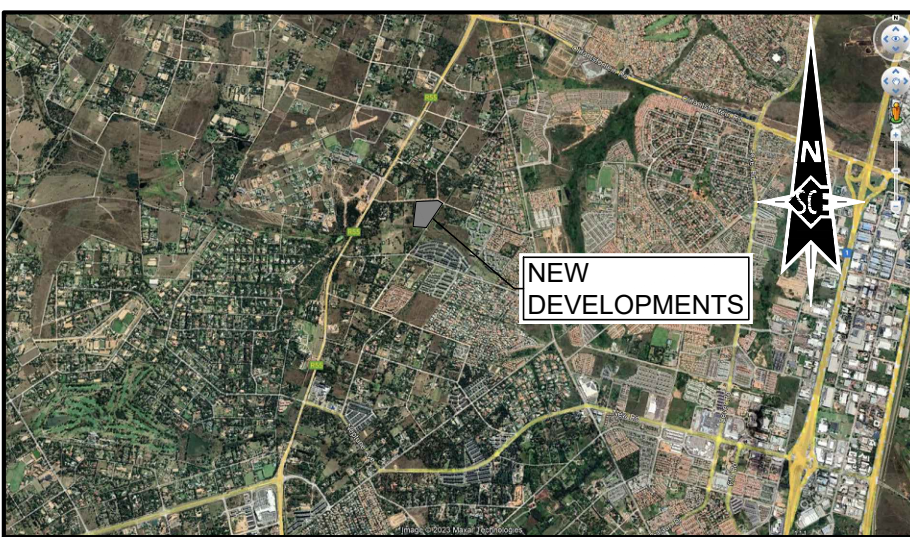
Invert Elev Dn (m)	=	100.0000	Calculations	
Pipe Length (m)	=	19.0000	Qmin (cms)	= 1.0000
Slope (%)	=	3.0000	Qmax (cms)	= 30.0000
Invert Elev Up (m)	=	100.5700	Tailwater Elev (m)	= 0.00
Rise (mm)	=	900.0		
Shape	=	Box	Highlighted	
Span (mm)	=	3200.0	Qtotal (cms)	= 26.0000
No. Barrels	=	4	Qpipe (cms)	= 26.0000
n-Value	=	0.013	Qovertop (cms)	= 0.0000
Culvert Type	=	Rectangular Concrete	Veloc Dn (m/s)	= 4.5645
Culvert Entrance	=	Slope tapered, less favorable edges	Veloc Up (m/s)	= 2.7128
Coeff. K,M,c,Y,k	=	0.5, 0.667, 0.0446, 0.65, 0.5	HGL Dn (m)	= 100.4450
			HGL Up (m)	= 101.3188
			Hw Elev (m)	= 101.8868
			Hw/D (m)	= 1.4632
			Flow Regime	= Inlet Control
Embankment				
Top Elevation (m)	=	102.0700		
Top Width (m)	=	12.0000		
Crest Width (m)	=	125.0000		



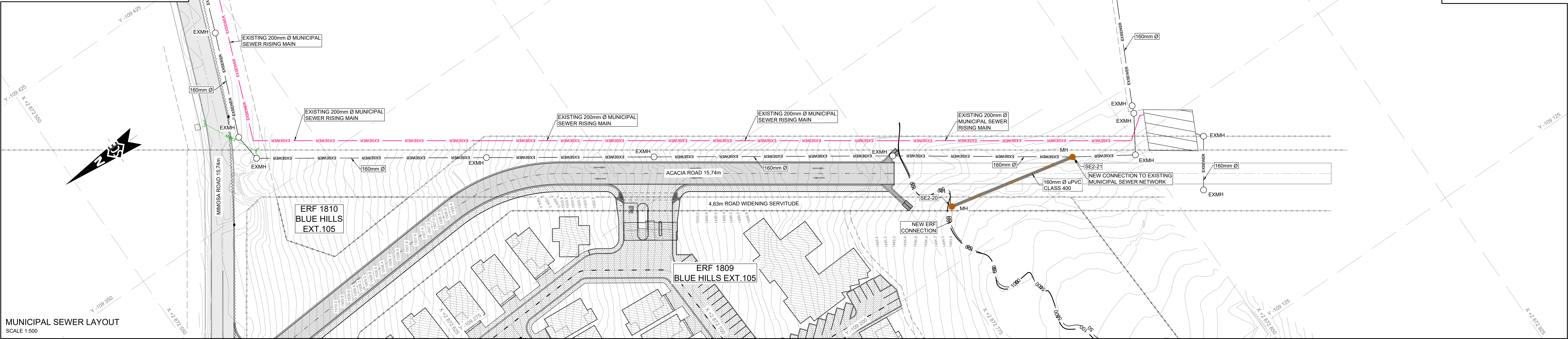
Tuesday, Jan 23 2024



BLUE HILLS EXTENSION 105



LOCALITY PLAN
NOT TO SCALE



MUNICIPAL SEWER LAYOUT
SCALE 1:500

SEWER SETTING OUT POINTS SYSTEM: WGS84 (LO27)

CODE XXXX	Y (+0.0)	X (+0.0)
SE2-20	-109 216.609	2 872 787.284
SE2-21	-109 207.312	2 872 829.969

1. GENERAL NOTES:

- THE NEW CUSTOMER MANAGER AT JOHANNESBURG WATER(PTY) LTD REGIONAL OFFICE MUST BE NOTIFIED BEFORE ANY CONSTRUCTION WORK RELATED TO THE INSTALLATION OF THE THE WATER OR SEWER MAY COMMENCE.
- ALL CONSTRUCTION WORK SHALL COMPLY WITH THE RELEVANT SANS 1200 SPECIFICATION AND JOHANNESBURG WATER (PTY) LTD SPECIFIC REQUIREMENTS.
- ALL MATERIAL USED IN INSTALLING WATER AND SEWER MAINS SHALL COMPLY WITH THE RELEVANT SANS SPECIFICATION AND WITH THE MINIMUM REQUIREMENTS OF JOHANNESBURG WATER(PTY) LTD. THE POSITION AND DEPTH OF ALL EXISTING SERVICES ON THE SITE AND OFF THE SITE WHERE AFFECTED BY THE WORKS SHALL BE CONFIRMED PRIOR TO ANY CONSTRUCTION WORK ON THE INSTALLATION OF WATER AND SEWER MAINS BEING COMMENCED.
- ONLY JOHANNESBURG WATER (PTY) LTD STAFF SHALL CARRY OUT TIE-IN CONNECTIONS TO EXISTING WATER AND SEWER MANHOLES AND MAINS. NOTE THAT A MINIMUM OF 2 WEEKS NOTICE SHALL BE GIVEN TO JOHANNESBURG WATER(PTY) LTD STAFF TO ATTEND SITE INSPECTIONS, MEETINGS AND ANY OTHER NECESSARY ON SITE LIAISON.

2. SPECIFIC SEWER REQUIREMENTS:

- FOR STANDARD DETAILS REFER TO JOHANNESBURG WATER STANDARD DWG 5.8 & 7.
- ALL MATERIALS SHALL COMPLY WITH THE RELEVANT SANS SPECIFICATION AND WITH THE REQUIREMENTS OF JOHANNESBURG WATER (PTY) LTD.
- ANCHORING OF SEWER MAINS:
 - GRADE - BETWEEN 1:10 AND 1:6 ANCHOR BLOCKS SHALL BE INSTALLED AT INTERVALS NOT EXCEEDING 12 METERS
 - GRADE - STEEPER THAN 1:6 : SEWER MAIN SHALL BE ENCASED FOR THE ENTIRE SECTION WHERE THE GRADE IS STEEPER THAN 1:6

3. TESTING & INSPECTIONS:

THE ONUS IS ON THE ENGINEER TO ENSURE THAT THE WORKS ARE PROPERLY CARRIED OUT. WITHOUT ABSOLVING THE ENGINEER OF THIS RESPONSIBILITY, JM SHALL REQUIRE THE FOLLOWING TESTS AND INSPECTIONS DURING THE CONSTRUCTION PHASE :

- INSPECTION ON THE COMPLETION OF THE EXCAVATION PRIOR TO LAYING THE BEDDING.
- INSPECTION OF PRESCRIBED BEDDING AND THE COMPACTION OF SURROUNDING MATERIAL UP TO THE CENTRE LINE LEVEL OF THE PIPE. PRESSURE TESTS TO BE CONDUCTED AFTER THE PLACING AND COMPACTION OF THE BACKFILLING. CONTRACTORS ARE ENCOURAGE TO PRESSURE TEST THE PIPELINE PRIOR TO BACKFILLING, AT THEIR OWN EXPENSE, TO AVOID EXCAVATION OF THE FINAL BACKFILL TESTING IN ACCORDANCE WITH SANS SPECIFICATIONS.
- DENSITY TESTS MUST BE CONDUCTED ON BACKFILL. CORRELATED DCP TESTS WILL BE ACCEPTED UNLESS OTHERWISE SPECIFIED.

GENERAL LEGEND:

- ERF BOUNDARY
- BENCHMARK
- DOLOMITIC ZONE
- SEWER SETTING OUT POINT

HATCH LEGEND:

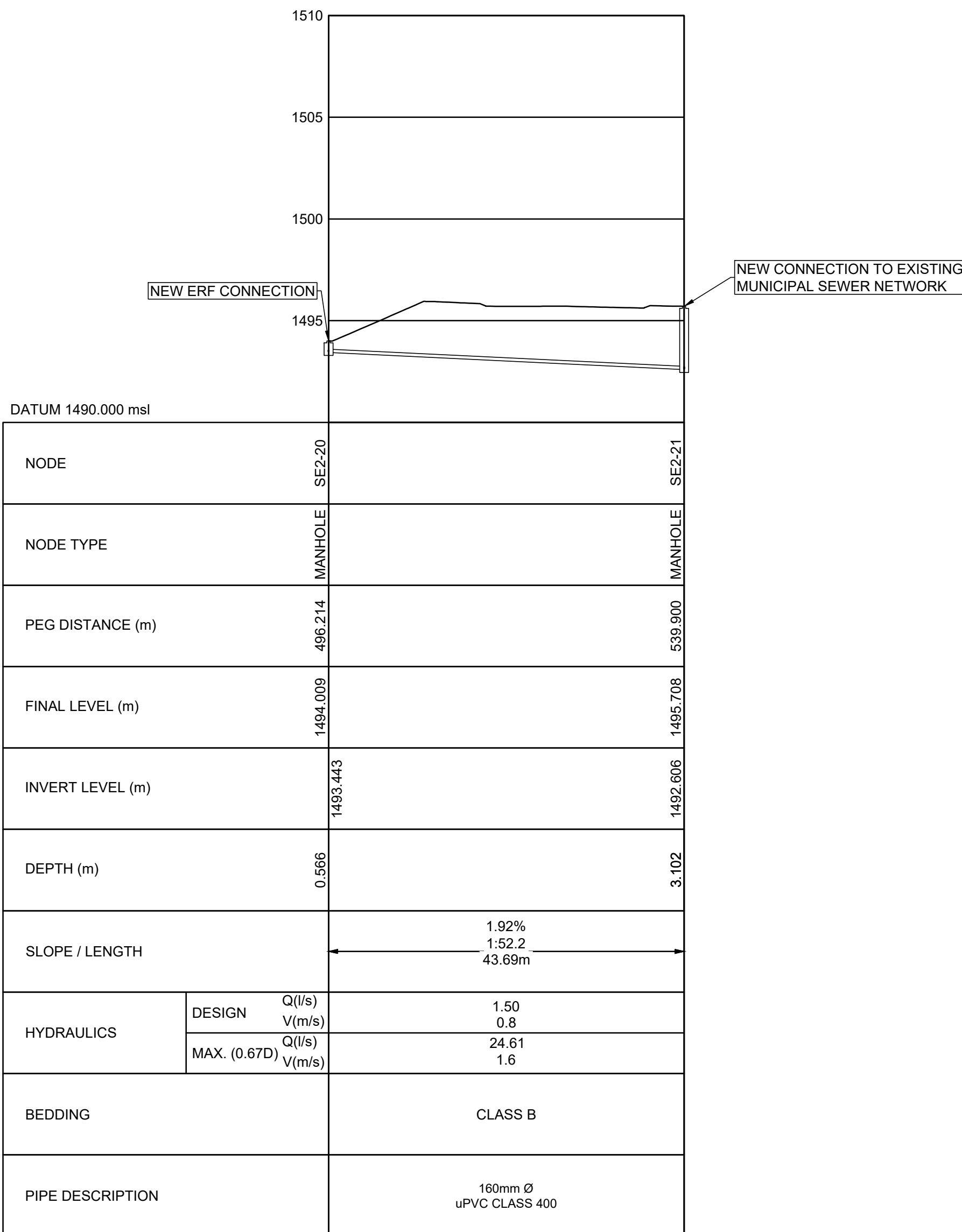
- NEW ASPHALT
- EXISTING ASPHALT
- NEW 80mm PAVERS
- NEW BUILDING
- NEW ATTENUATION FACILITY
- EXISTING STRUCTURES

SEWER LEGEND:

- SEWER NEW SEWER LINE
- EXSEWER EXISTING SEWER LINE
- EXSEWER EXISTING SEWER RISING MAIN
- J NEW JUNCTION
- MH NEW MANHOLE
- EXMH EXISTING MANHOLE
- RE NEW RODDING EYE
- EXRE EXISTING RODDING EYE
- LH NEW LAMP HOLE
- EXLH EXISTING LAMP HOLE
- SEWER BUILDING CONNECTION (AS PER ARCHITECTS LAYOUT & DETAILS)
- AREA OF CONSTRUCTION
- FINAL LEVEL
- NATURAL GROUND LEVEL

REFERENCE DRAWINGS:

- 4986-BM-L01 BENCHMARK LAYOUT
- 4986-SE-ML01 PRIVATE SEWER LAYOUT
- 4986-SE-ML-S01 LONGSECTIONS SHEET 1 OF 2
- 4989-SE-ML-S02 LONGSECTIONS SHEET 2 OF 2



LONGSECTION SE2-20 TO SE2-21
SCALES:
HORIZONTAL 1:500
VERTICAL 1:200

AS BUILT DRAWING And final inspection by

M. TSHOLOLO
(print name)
201070156
(print Prof. Reg. No.)
(signature)
2024/06/28
(date)

CONSULTING ENGINEERS

PROJECT NO. 4986	DRAWING NO. 4986-SE-ML02	FILE NO. -
DESIGNED T.V. DEVENTER	DRAWN W. BOTES	CHECKED L. LOTTERING
SERVICES CHECKED -	GEO-TECHNICAL INVESTIGATION -	SERVITUDES -
APPROVED M. TSHOLOLO	DATE 2023/06/21	

JOHANNESBURG WATER (PTY) LTD
65 NTEMI PILISO STREET
NEWTOWN
2001

Johannesburg Water

TEL : (011) 688-1400
FAX : (011) 688-1521

CITY OF JOHANNESBURG

PROJECT:
ERF 1809, BLUE HILLS EXTENSION 105

DRAWING TITLE:
MUNICIPAL SEWER LAYOUT AND LONGSECTION

DESIGN MANAGER

SCALE

1:500

AMENDMENTS

AB

AS-BUILT

APPR DATE

2024-06-28

2024-06-28

DRAWING NO.

4986-SE-ML02

ISSUED FOR:

AS-BUILT

FILE NO.

-

CONTRACT NO.

-