MAERSK BELCON LOGISTICS HUB

STORMWATER MANAGEMENT PLAN

Report Number: 22093_REP_02

Revision: B

Date: 11 October 2023

Prepared for:

City of Cape Town
8 Voortrekker Rd
Bellville
7530

Prepared by:

KLS Consulting Engineers (P
13 Pasita Street
Bellville
7550

TABLE OF CONTENTS

LIST OF FIGURES

LIST OF TABLES

APPENDICES

ANNEXURES

1. INTRODUCTION

KLS Consulting Engineers has been appointed by Maersk Logistics & Services South Africa (Pty) Ltd and Profica (Pty) Ltd as the Civil Engineering consultants for the proposed BELCON Logistics hub in Bellville, Cape Town.

The development is classified as a Brownfield development, with a total size of 11 ha. The purpose of this report is to address the stormwater management strategy for this development, as well as all secondary stormwater related issues that may arise post-development.

The KLS-strategy for the effective management of stormwater, is to implement a sustainable urban drainage system for the effective reduction and treatment of all runoff generated from the post development site, to ensure the protection of downstream infrastructure, watercourses, and ecosystems against events of abnormally high rainfall. The internal stormwater system will comply with City of Cape Town *(hereafter referenced as CCT)* regulations and policies, as given in the following documents:

- CCT: Management of Urban Stormwater Impacts Policy (27 May 2009).
- CCT: Floodplain and River Corridor Management Policy (27 May 2009).
- CCT: Stormwater Management By-Law (30 August 2005).
- The Roads Drainage Manual (South African National Roads Agency Limited, 2006).
- The Georgia Stormwater Management Manual, Volume 2.
- The Neighbourhood Planning and Design Guide (2019).
- CCT: Standards and Guidelines for Roads and Stormwater, Version 3 (2022).

A preliminary meeting was held on 23rd of February 2023 at the *CCT* offices in Bellville, to engage with the *CCT officials* prior to submitting detailed plans and designs for approval and to determine if there are any major development constraints. *CCT* confirmed they agree with the *KLS approach and* can proceed with detail design.

Further guidelines and references used in the design of the internal stormwater network and the compilation of this report, is as follow:

- Topographical Survey of the Site (Joubert & Brink Surveys, 2022)
- Belcon Logistics Hub Site Plan (Anderson Perry Partnership Architect's, 2023)
- Geotechnical Investigation (SRK Consulting, 2023)
- Belcon Logistics Hub Landscape Plan (CNDV Landscape Architects, 2023)

2. DESCRIPTION OF THE SITE

The 11ha development is situated on Erf 14876, Erf 14777, Erf 14878, Remainder of. Erf 14867, Erf 12873, and Erf 1488. It is located within Transnet Park, along Robert Sobukwe Road. The property is located between the two entrances in Mc Donald and Belcon Road, respectively. See ***Figure 1***

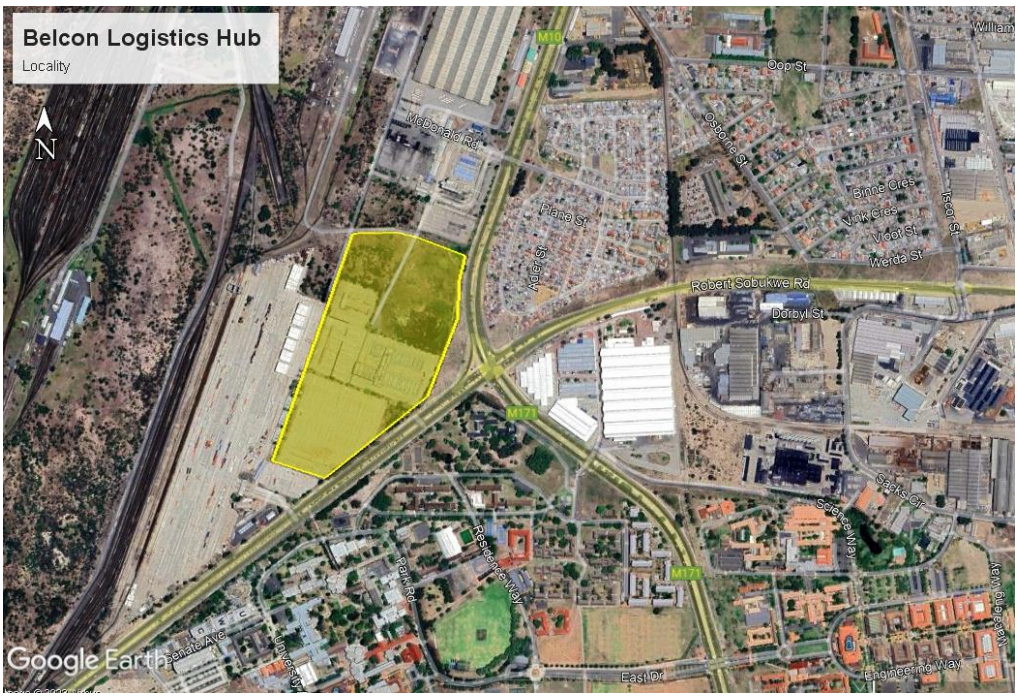


Figure 1: Belcon Logistics Hub Locality

2.1. EXISTING TOPOGRAPHY

The existing development site is flat, with no significant fall in one direction. The site has been developed, with slopes across the existing hardstands. The overall slope falls towards the North East, with heights varying from approximately 58 to 60 MSL.

*Refer to **Appendix A** for the pre-development Topographical Survey.*

2.2. CURRENT SITE COVERAGE

The proposed development would be constructed on existing marshalling yards that were constructed for Transnet in the 1980s.

The proposed area has numerous small structures and buildings. The main two buildings are the Motor Technical Vehicle (MTV) Workshop and the Paint Shop and Wash Bay.

The buildings are surrounded by concrete hardstands; however, the northern part of the proposed development has not been developed.

Well-established trees and vegetational growth are present in the undeveloped areas.

The site consists of approximately 66000 m^2 of permeable undeveloped areas, and 44000 m^2 of developed, impermeable surfaces.

2.3. CLIMATE

The development site falls within a winter rainfall region, with an average rainfall of 506 mm per annum. ***Table 1*** gives a summary of the rainfall data used for the internal stormwater network design, as obtained from the City of Cape Town Rainfall data, which includes a 15% increase for climate change.

Rainfall Data - Belcon Logistics Hub								
Reference Coordinates			33.93°, 18.63°					
Coordinates in (Degrees, minutes)			33°55', 18°37'					
MAP (mm)			506					
Return Period	**0.5**	**1**	**2**	**5**	**10**	**20**	**50**	**100**
1-day Precipitation depth (mm)			39.3	52.8	62.6	72.7	87.1	98.8
1440-min precipitation depth (mm)	19.5	32.0	44.5	61.0	73.5	86.0	102.5	115.0
30-min precipitation depth (mm)			12.2	16.3	19.4	22.5	27.0	30.7

Table 1: Rainfall data from CCT Climate Change Rainfall Grid

2.4. PROPOSED DEVELOPMENT

The proposed development is a logistics hub, which is primarily a new container depot facility. The following amenities are included:

- Relocated Container wash-bay facility.
- Container repair workshop.
- Warehouse facility for ambient and cold storage goods.
- Office building.
- Guardhouses.
- Marshalling yards.

Figure 2 *indicates the site layout.*

For the detailed plan refer to ***Appendix B***

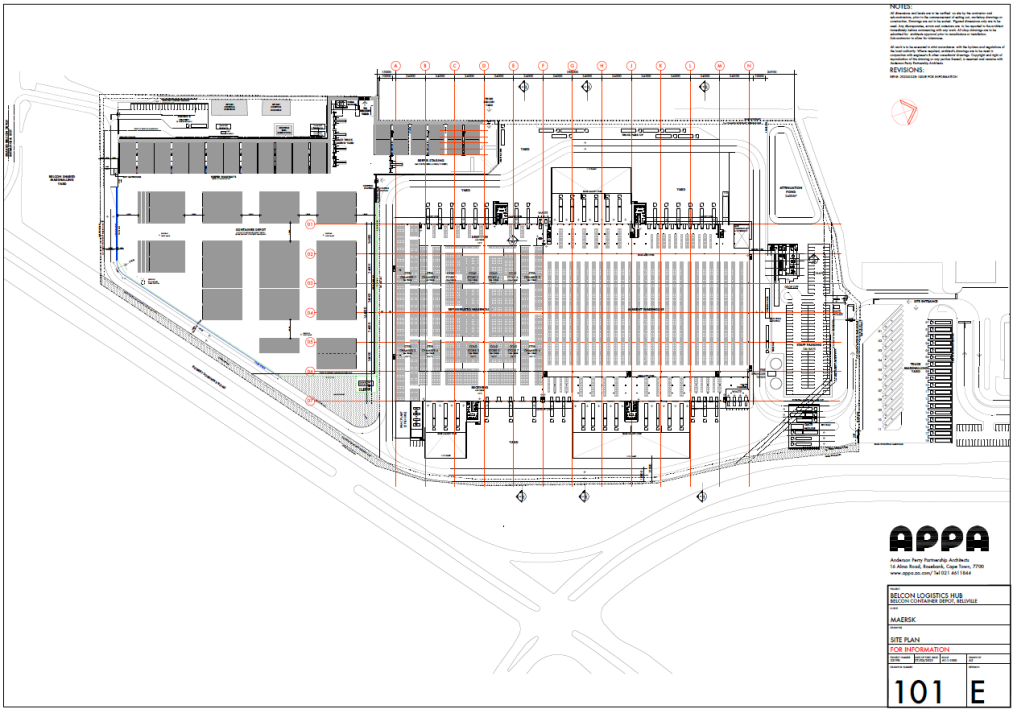


Figure 2: Belcon Logistics Hub Site Layout

2.5. GEOTECHNICAL INVESTIGATION

SRK Consulting South Africa (Pty) Ltd. was appointed by Maersk Logistics & Services South Africa (Pty) Ltd. to undertake a detailed geotechnical investigation of the proposed development site. The geotechnical investigation was done on 23 May 2023. For this report, 10 test pits were excavated at selected positions to cover both the Greenfields part of the site as well as the portion occupied by existing warehouses, with Dynamic Probe Light (DPL) penetrometer tests conducted at the locations of the test pits, indicated on ***Figure 3***. ***Table 2*** gives a summary of the water table levels at each test pit. The attenuation facility is proposed at the location of test pit 7, at which no seepage was found up to 2.6 m.

Test Pit	Rest Water Table Level
TP1	1.2 m
TP2	1.3 m
TP3	1.6 m
TP4	1.4 m
TP5	1.2 m
TP6	1.6 m
TP7	**No seepage up to 2.6 m**
TP8	1.6 m
TP9	1.4 m
TP10	1.4 m

Table 2: Water Table Depth At Test Pit Locations

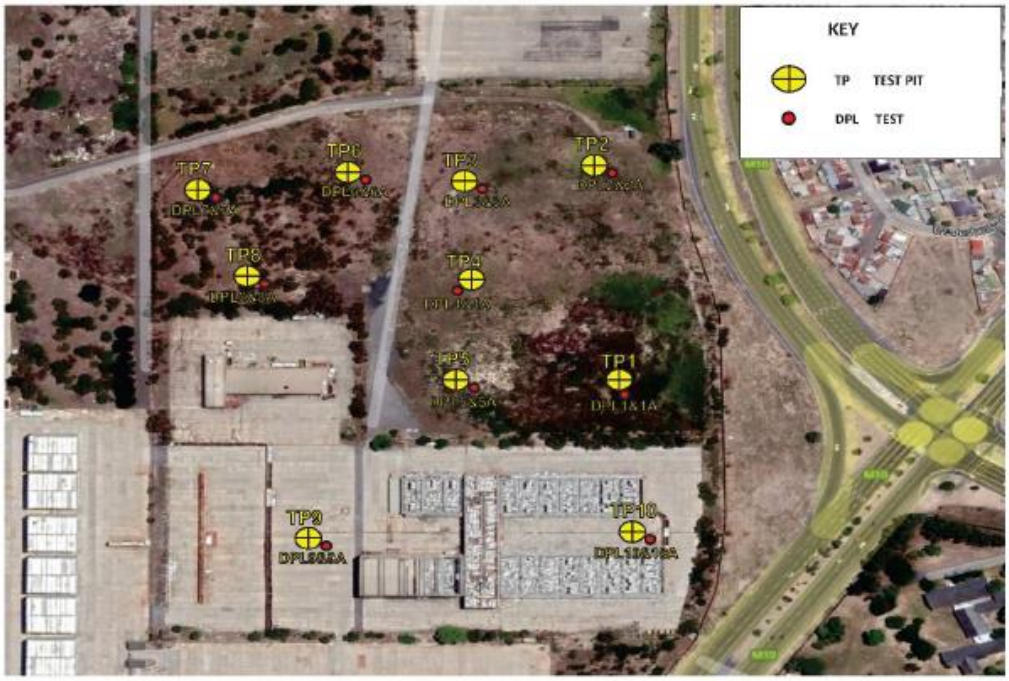


Figure 3: SRK Test Pit Locations

The region's published geological map shows deep weathered Malmesbury Group shale, and greywacke beneath more recent Quaternary layers. The test pits excavated at the site indicate a similar soil profile. A thin layer, varying in thickness from about 0.3 m to 0.9 m thick, of sandy/gravelly fill is present. The upper 300 mm soil profile contains abundant roots that should be removed or stockpiled. The fill is underlain by naturally transported, fine to medium sand which is generally of loose consistency and tends to improve to medium-dense consistency with increasing depth.

In addition to the on-site investigations and testing, soil samples were submitted for laboratory testing. The grading and Atterberg Limits indicate that the underlying transported soils are made up primarily of fine to medium sand with a total clay and silt concentration of less than 4%. The sand is granular non-cohesive with zero PI and has no expansion potential. *Refer to* ***Annexure A*** *for the full Geotechnical Report*

3. STORMWATER MANAGEMENT

The stormwater network is designed to manage post-development runoff for all minor and major storm events, in a sustainable manner, while simultaneously adhering to all authoritative requirements and conditions of approval as set out by the City of Cape Town. *Refer to correspondence from the relevant CCT departments in* ***Appendix C*** *for the conditions and requirements to be included in the stormwater design and management plan.*

The internal network consists of underground gravity fed stormwater box culverts and pipes, ACO Q-max drains, a series of inlet structures, and

open swales, which will drain the impermeable surfaces. All runoff will ultimately be conveyed into a newly constructed attenuation pond, which will discharge runoff from the site at pre-development rates.

The following minimum specifications, as per the City of Cape Town Municipal Guidelines, will be implemented for the underground stormwater infrastructure:

- Concrete spigot and socket class 100D pipes will be installed.
- A minimum pipe diameter of 300 mm for connections, and 375 mm for main lines is used.
- A Minimum velocity of 0.9 m/s is ensured in the design.
- A Maximum spacing of 90 m is adhered to.
- All stormwater structures will be constructed according to the CCT standard details.

The following assumptions and design principles are used in the stormwater management design:

- The rational formula is used for peak flow calculations for all design storm events:

$$Q = \frac{C \times I \times A}{3600}$$

- The run-off coefficient, C, is calculated as per the SANRAL Drainage Manual.

- Intensities used for design floods, are the average of the Rational Method (Alternatives 1, 2 and 3) and the SDF Method, as per the SANRAL Drainage Manual.

- Attenuation and treatment volumes are calculated as per the Georgia Stormwater Management Manual Water Quality Volume formula, which is the preferred CCT-formula:

$$WQv = \frac{P \times Rv \times A}{1000}$$

- Precipitation depth (P) used in the Rational Method, Alternative 3 and Water Quality volume calculations, is obtained from the CCT Design Rainfall Grid (2013).

- The underground stormwater network is designed to convey runoff of up to the 1:10 -year storm event to the attenuation pond.

- The attenuation pond is designed as a wet pond, to ensure that sustainable urban drainage system (SUDS) and LEED-certification requirements are met. The aim is to achieve LEED platinum accreditation.

The KLS approach for stormwater management, which will be discussed in this section, aims to:

- Keep natural drainage patterns in the post development site, where possible, within the constraints of the new developed site.
- Protect adjacent and downstream properties, water courses and infrastructure from the impacts of increased post development runoff.
- Improve the quality of runoff by reducing the total amount of suspended solids, nitrogen and phosphorus content.
- Promote infiltration and internal reuse of runoff.
- Implement best management practices for a water sensitive urban design and sustainable stormwater management.

For full stormwater calculations, refer to ***Appendix D.***

3.1. EXISTING STORMWATER NETWORK

The existing stormwater network consists of an underground gravity pipe network and inlet structures, that drain the impermeable areas. This system is designed to have sufficient capacity to convey a 1:5-year rainfall event.

3.2. MANAGING RUNOFF FROM ADJACENT PROPERTIES

CCT indicated that flooding occurs in Parow Industrial, north-west of the proposed development due to excessive stormwater runoff from Transnet Park.

The proposed solution from *CCT (see correspondence in* ***Appendix C2****),* was to install a cut-off drain along the railway lines and tying it into an existing earth drain as indicated in ***Figure 4***. GIBB consulting Engineers analysed the stormwater runoff for *CCT* and this led to the size of the cut-off drain to be 0.5m deep, 0.5 m wide with side slopes of 1:3 at the start. The cut-off drain increases to 1.2 m deep, 1.2 m wide with side slopes of 1:3 at the end.

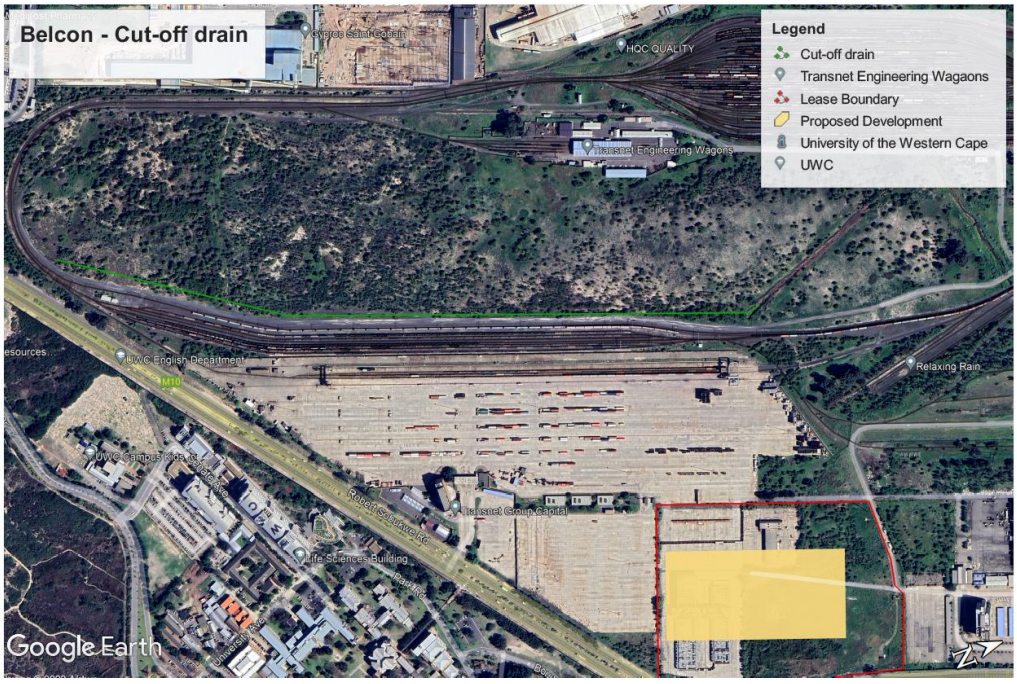


Figure 4: Cut-off drain position.

KLS will incorporate the cut-off drain into the works as this will be a condition with the SDP approval.

As per CCT instruction, a low point was identified in Robert Sobukwe Road, just North of the development site. During events of extreme rainfall, flooding may occur and runoff reaching the development site is a possibility, due to the natural overland flow routes. The post development site topography will convey runoff due to possible flooding towards the internal swale network, which channels runoff towards the attenuation pond.

The warehouse is ±1.4 m higher than the marshalling yards, therefore a very low risk of flooding of the buildings exists.

3.3. NEW INTERNAL NETWORK

The proposed development will increase the existing impervious cover to approximately 85%, which will result in an increase in stormwater runoff. The new development will drain the impervious areas via an underground network, consisting of the following elements:

- ACO Q-Max drains,
- ACO Q-Max junction boxes,
- Box culverts,
- Concrete spigot and socket pipes.
- Grids and side inlet structures.
- uPVC pipes class 34, heavy duty.

*Refer to **Appendix E** for the proposed stormwater layout plan.*

The development is divided into three main sub-catchments contributing to the attenuation facility. Catchment A covers the majority of the site. Catchment B and C drains towards a series of swales to the north of the site, which ultimately discharges into the attenuation dam in the northwestern corner of the site. Refer to ***Figure 5*** for the sub catchments and overland flow routes.

The stormwater network has capacity to effectively convey all runoff for up to the 1:10 year rainfall event to the attenuation facility in the northwestern corner of the site, before discharging into the municipal system via 450 mm ø concrete pipe.

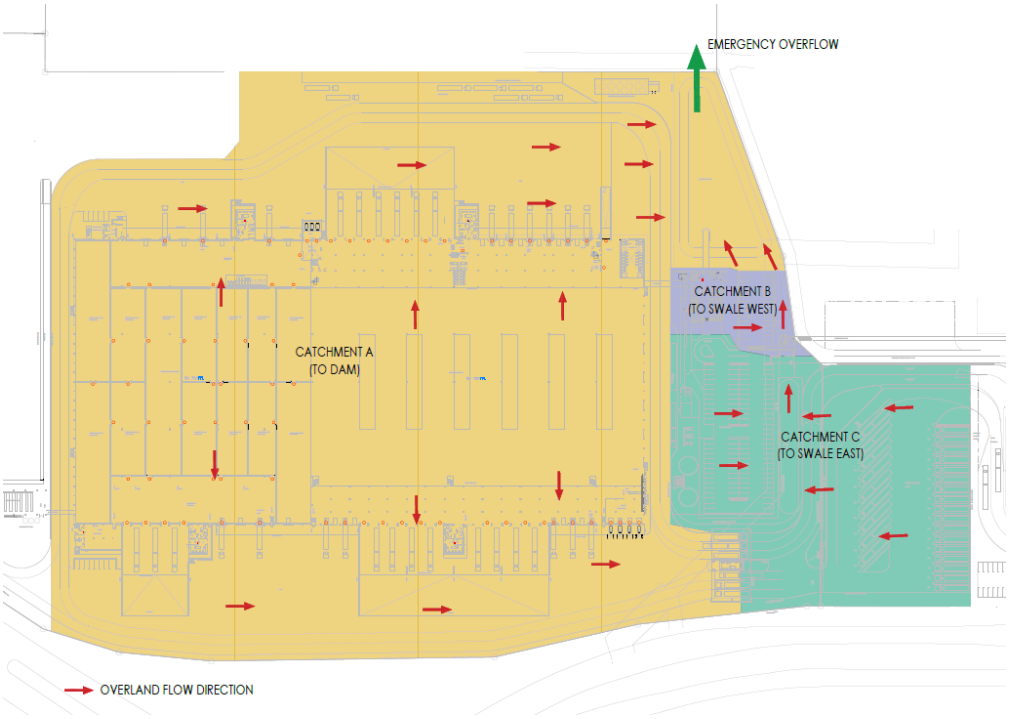


Figure 5: BELCON development sub-catchments and overland flow routes

3.4. ATTENUATION

The City of Cape Town Management of Urban Stormwater Impacts Policy requires that the stormwater infrastructure makes allowance for the attenuation of peak runoff flows to pre-development runoff rates, in order to protect downstream watercourses and infrastructure.

A stormwater attenuation dam will be constructed in the northwestern corner of the site. (*see **Appendix F1** for the Dam layout and sections*) The dam is designed as a wet pond with no engineered lining at this

stage, due to a high water table. The dam will have a permanent water level (PWL) of 1.6 m depth, to ensure no reed growth within the dam. The volume of 2156.6 m³ at PWL is more than the required water quality volume (*see section 3.5*). The dam is designed with additional storage capacity above the PWL, to attenuate runoff from up to a 1:100-year peak storm rainfall event. This also meets the CCT Management of Urban Stormwater Impacts Policy required storage capacity for a volume equal to the 1:1-year, 24-hour storm event, which amounts to 2878 m³.

The runoff volume generated by the 1:1-year, 24-hour storm event will be attenuated and released into the municipal system over 26.33 hours. See ***Figure 6*** for the graphical representation of the cumulative runoff volume generated, the total volume discharged into the municipal system and the equivalent attenuated volume for the 24 hour 1:1-year storm event. The fluctuation outflow is due to fluctuating water levels due to difference in inflow and outflow. Refer to ***Appendix B*** for the 1:1-yesr, 24-hour storm flow calculations.

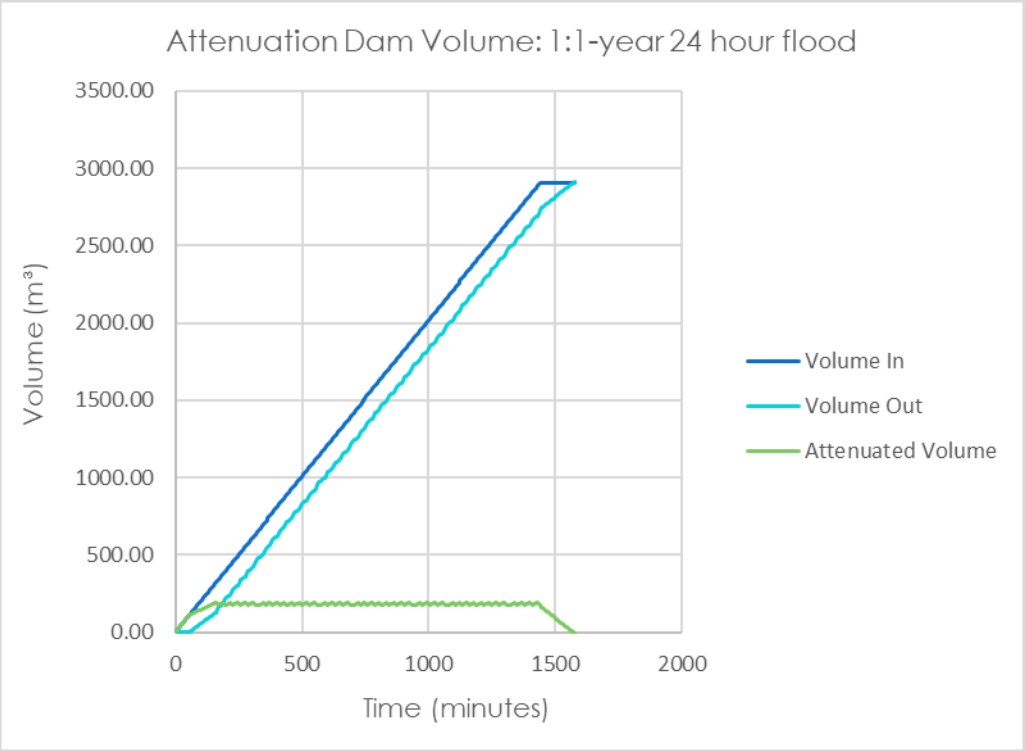


Figure 6: Attenuation Dam Volume: 1:1 year 24 hour storm event

The stormwater runoff inside the underground pipe network will pass through a stilling basin outlet structure before being discharged into the attenuation dams. ***Figure 7*** indicates an example of the proposed stilling basin into the attenuation dam. Refer to ***Appendix F2*** for the detailed drawing.

Figure 7: Proposed Stilling Basin Dam Inlet

Table 3 gives a summary of the total dam volume due to post development runoff, outflow rates, and the attenuated volume.

Design storm	Post-Dev Flow Rate	Pre-Dev Flow Rate	Total Outlet Capacity of Outlet Structure	Outlet Pipe Max Capacity	Max Outlet Capcity	Actual Attenuated Volume (Excl WQv)	Required Attenuation Volume (Based on Post - Pre)
	m³/s	m³/s	m³/s	m³	m³	m³	m³
1:2	0.49	0.34	0.3375	0.3089	0.3089	328.94	280.54
1:5	0.75	0.449	0.3932	0.3089	0.3089	785.32	533.82
1:10	0.94	0.534	0.4858	0.3089	0.3089	1133.16	728.10
1:20	1.13	0.619	0.5260	0.3089	0.3089	1481.00	922.37
1:50	1.42	0.743	0.5983	0.3089	0.3089	2007.73	1226.19
1:100	1.69	0.845	0.8482	0.3089	0.3089	2491.42	1526.59

Table 3: Attenuation dam design storm volumes

The maximum full storage capacity of the dam is 5087 m³. The proposed outlet structure (see ***Appendix F3***), is designed to release the attenuated volume into the municipal network at pre-development, or as close as possible to pre-development flow rates with a standardised outlet size. The proposed outlet pipe from the dam to the municipal network will however govern flow rates, with a maximum flow capacity of 0.309 m³/s, which is less than pre-development flow rates.

The emergency overflow system is designed to accommodate storms larger than the 1:100-year storm. A grass block emergency overflow channel for extreme or abnormal flooding events is proposed on the

northwestern bank of the dam. ***Figure 8*** shows an example of the proposed overflow channel.

Figure 8: Proposed overflow channel

For *full dam capacity and outlet sizing calculations, refer to* ***Appendix D***.

The developer aims to achieve LEED platinum accreditation. As a requirement, 20.1mm/m² of runoff should be attenuated. The attenuation facility has sufficient capacity to accommodate this volume of 2211m³.

3.5. STORMWATER QUALITY IMPROVEMENT

The CCT Management of Urban Stormwater Impacts Policy requires the improvement of the quality of runoff, through a combination of on-site and regional treatment facilities. The target is to reduce at least 80% of total suspended solids (TSS), and 45% of phosphorus content, for a volume equal to the 1:½-year 24-hour storm event.

The required water quality volume for the BELCON development is 1755.3 m³, calculated using the method as per the Georgia Stormwater Management Manual, as follow:

$$WQ_V = \frac{P \times R_V \times A}{1000}$$

With the following parameters:

- Precipitation depth (P): 19.528 mm
- Volumetric Runoff Coefficient (Rv): 0.8175
- Total Site Area (A): 110000 m²

The volumetric runoff coefficient, Rv, is calculated as follow:

$$R_V = 0.05 + (0.009 \times I)$$

With *I* equal to the percentage impermeable cover, in this case 85.23%, thus:

$$R_V = 0.05 + (0.009 \times 85.23) = 0.8175$$

Quality improvement targets will be reached through a combination of Best Management Practices along with Water Sensitive Urban Design initiatives, which includes rainwater harvesting, swales and a large attenuation dam which will promote infiltration and evaporation and the removal of suspended solids through settling and sedimentation control at inlet structures.

The attenuation dam in the northwestern corner of the site is the primary treatment facility for stormwater quality improvement, with the two swales also acting as treatment facilities for their respective contributing catchments, before releasing into the larger attenuation dam.

The swales are incorporated into the design as a best management practice. It will convey the runoff from its respective sub-catchments to the larger attenuation dam, which is designed with sufficient capacity for the whole site. Hence, the swales will provide additional storage to the more than sufficient primary attenuation facility, and will serve as pre-treatment facilities for their respective sub-catchments, before releasing into the main attenuation dam via grass block channel. A typical swale detail is included in ***Appendix F***, with final levels and dimensions still to be formalised. The respective swale capacities are currently the following, as modelled with *Civil Designer*.

- Eastern Swale: 350³
- Western Swale:64 m³

Refer to ***Appendix G*** for the proposed landscape plan for the BELCON Logistic Hub. The permeable, landscaped areas, promote infiltration and further improvement of runoff quality. The internal reuse of stormwater runoff for irrigation will also reduce the need for potable water. 70 000 litres, stored by means of tanks, will be used for irrigation purposes.

3.6. IMPACT OF MAJOR FLOWS

For the purpose of this design, major flows are classified as rainfall events with a return period larger than 1:10 -years, not included in the underground network capacity design.

The development is designed in such a manner that ponding will not disrupt the day-to-day activities within the development, or negatively impact the internal property or infrastructure. The topography and internal stormwater system of the proposed development site will ensure overland flow into the attenuation dam, which has capacity for the full volume generated from up to a 1:100-year peak storm event. Larger or abnormal rainfall event will be catered for by the north western overflow.

The current full dam capacity, excluding the additional swale storage capacity, is equal to 5086.91m³. The total volume generated by the peak 1:100-year storm event, for the total development site is 3047.38m³. The permanent water volume, is 2156.56m³ at full capacity. The combined permanent water volume and the peak 1:100-year generated runoff volume is 5203.94m³, not taking into account the outflow capacity. Based on a simplified, but conservative inflow vs outflow modelling of the attenuation dam, limited by the outflow pipe capacity, the maximum water level in the dam at any stage during the peak storm event will be 57.8 MSL, with the corresponding volume equal to 4820.42m³. See ***Figure 9*** for the graphical representation of the cumulative runoff volume generated, the total volume discharged into the municipal system and the equivalent attenuated volume for the peak 1:100 year storm event:

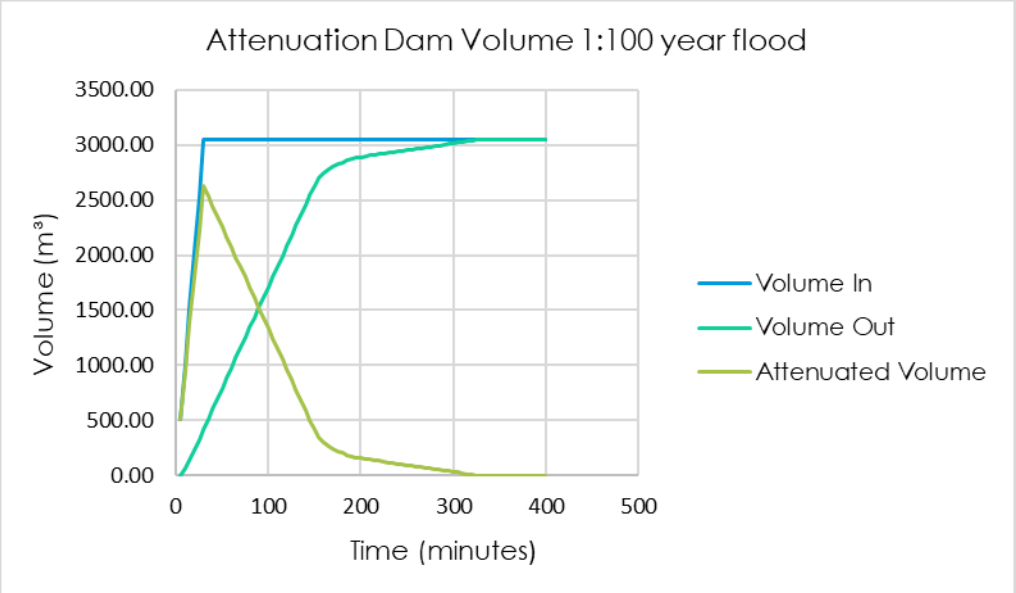


Figure 9: Attenuation Dam Volume: 1:100 year peak storm event

4. MAINTENANCE PROCEDURES

The internal stormwater system will be exposed to external elements and pollutants such as vehicle oils, litter and windblown sedimentation. This will significantly impact the operation and efficiency of the system. It is thus imperative that the stormwater infrastructure is maintained, checked, and cleaned at regular intervals to ensure optimal functioning of the system.

The completed development will be handed over to the facilities manager, who will be responsible for the maintenance and day-to-day operation of the development. This includes responsibility of the maintenance items specified in this section of the document.

It is imperative that maintenance personnel who carries out the routine inspections and maintenance procedures adhere to all Health and Safety standards, as per the Occupational Health and Safety Act (Act 85 of 1993).

4.1. ROUTINE CLEANING INSPECTIONS

Routine inspections and necessary cleaning should d be undertaken on a regular basis by a competent, responsible person, such as a facilities manager or caretaker. It is recommended that routine inspections are done on a monthly basis, as well as after heavy rainfall events during the rainfall season. The inspection should include, but is not limited to:

- Checking that all gully-, grid- and kerb inlets are in place, clean and free of any blockages such as litter, leaves or sand build up.
- Manhole covers should be in place and free of any blockages.
- All stormwater pipes must be free of blockages.
- ACO-drains must be clean and clear of any litter build up or blockages.
- The level of sand in sand traps should be assesses and cleaned if necessary.
- Stilling basins at outlet structures should be checked for the level of sand and sedimentation build up.
- Open swales and the attenuation dam must be free of blockages to ensure free flow, and vegetation must be maintained.
- The structural integrity and water quality of rainwater harvesting tanks should be assessed, and all connections should be in place and free of leaks.

Any of the items which are deemed to not be satisfactory, must be tended to immediately.

4.2. ENGINEERING INSPECTIONS FOR MAINTENANCE

Engineering maintenance inspections should be undertaken on a yearly basis by a qualified engineer to assess the current condition of the stormwater infrastructure, to determine any repairs that may be required.

The water quality of the attenuation dams and runoff being discharged into the municipal system should be measured on a bi-yearly basis, by an independent laboratory.

The routine cleaning inspection checklist should also be assessed and updated as necessary.

The findings and recommendations of the maintenance inspection should be submitted to the client, who should immediately attend to any required remedial work, via a qualified contractor.

4.3. FINANCIAL ALLOWANCES FOR MAINTENANCE AND REPAIR WORKS

Although specific risk components can be identified at this stage of the development, it is very difficult to accurately determine the future vulnerability of the stormwater network. In addition to this, the future maintenance and replacement costs will largely depend on a number of building-industry and economic factors which is difficult to predict. In order to avoid large future expenditure on replacement and maintenance, we would recommend that the developer make allowance for a yearly stormwater maintenance budget of at least 5% of the total capital cost for the installation of the stormwater network.

4.4. SAFETY CONSIDERATIONS

The stormwater infrastructure must always be operated and maintained in accordance with all provisions of the Occupational Health and Safety Act (Act 85 of 1993).

In addition to the guidelines and requirements of the Occupational Health and Safety Act, it is also recommended that maintenance staff work in a safe manner. Appropriate personal protection equipment must be worn at all times during maintenance of the stormwater network, and any unsafe conditions should be reported immediately.

All manholes should be properly shut after maintenance procedures, to avoid tripping hazards. Open manholes should be cordoned off with appropriate danger tape.

5. CONCLUSION

CCT confirmed that they are in agreement with the KLS approach for stormwater management*, and detail design can* proceed.

This stormwater strategy plan is based on the design principles as set out in this document, as well as the conditions of approval set by the City of Cape Town. It is a holistic approach, which will significantly improve stormwater runoff generated by the new development in terms of quality and quantity, which will reduce strain on the existing municipal system.

We are therefore confident that the design and management plan complies with the City of Cape Town policies and requirements.

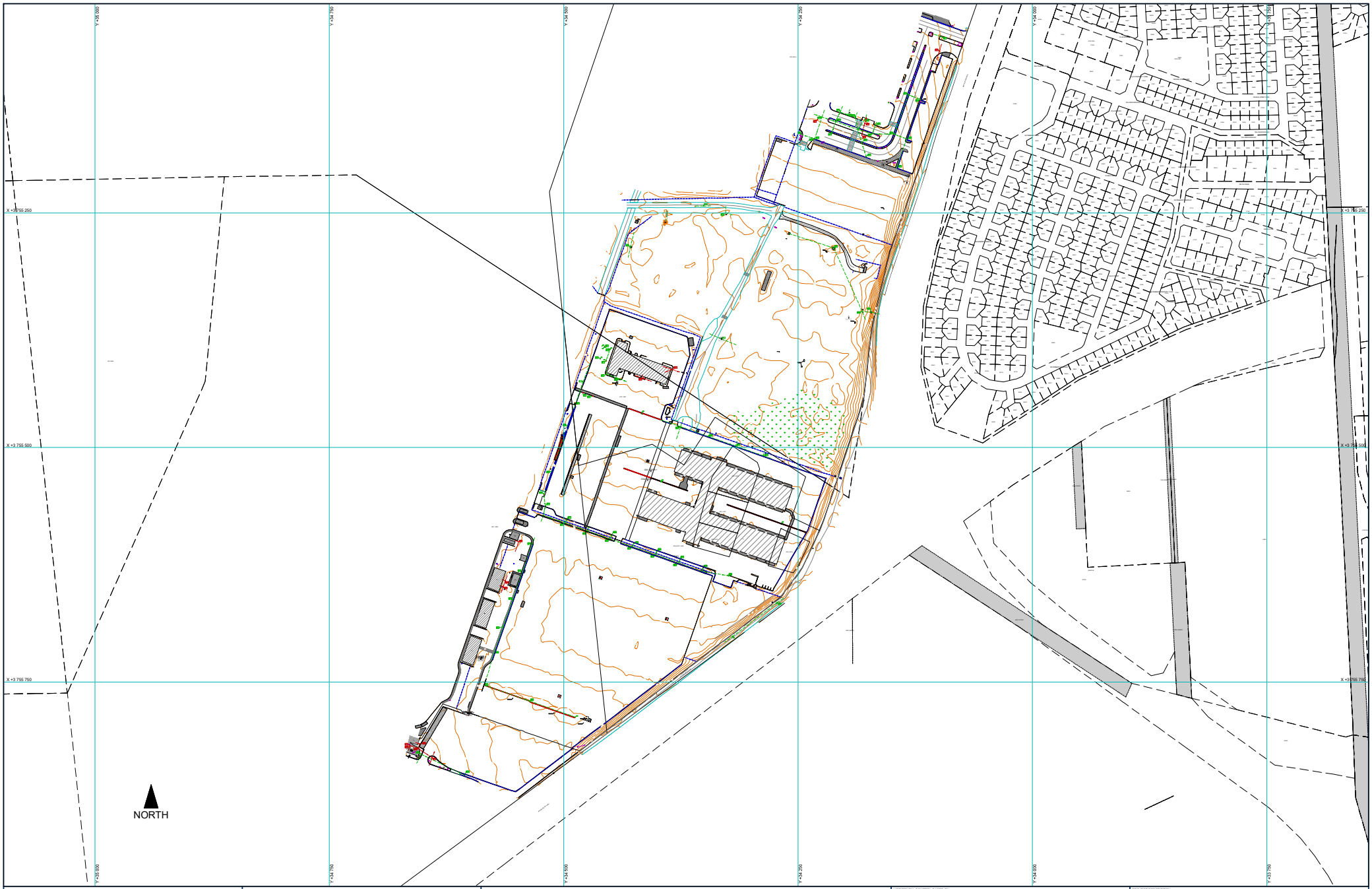
T Koegelenberg

Mr. D.J. Kotze

Director

Appendix A

Topographical Survey



JOUBERT & BRINK SURVEYS
TOPOGRAPHIC, ENGINEERING & CONSTRUCTION SURVEY SOLUTIONS

14 DELWYN CRESCENT
STELLENBERG, 7550
WESTERN CAPE
SOUTH AFRICA

+27 (0)21-910-2934
+27 (0)83-273-8266
jbsurr@mweb.co.za
SAGC REGISTERED SURVEYORS
CK1996/001136/23

PLEASE NOTE

1. Only use our tabled control points. No other control points shall be used without consulting the surveyor.
2. All spot heights and positions are single measurement elements and are therefore subject to error - any critical design points, especially services, should be discussed with the surveyor so that the appropriate survey methods can be used.
3. This survey includes only visible services which can be opened with hand tools and should be checked against local authority as built plans. Services which are blocked or unable to be opened should be referred to the local authority. Invert levels deeper than 5 metres are approximate unless otherwise discussed before the survey commences.
4. Boundary reconstructions from Surveyor General diagrams can sometimes be a time-consuming process. To save costs and time, a checked GIS overlay for information purposes are generally used, unless otherwise required.
5. This survey information is always sent as a zipped data package which includes this drawing in DWG and PDF format; the raw data in ASCII format; a digital terrain model in XML, TOT, BOT and CDM format. Survey codes and descriptions. If there are any queries or requests regarding these files, please send us an email at jbsurr@mweb.co.za.

HORIZONTAL CONTROL BASED ON: 284DC18, CHECKED ON 219DC18 AND 283DC18			
VERTICAL CONTROL BASED ON: 284DC18, CHECKED ON 219DC18 AND 283DC18			
SURVEY LEADER: I.SMITH	DRAWN BY: H.V.D.SANDT	CHECKED BY: C.STRYDOM	SURVEY DATE: 03 OKT 2022
REFERENCE ELLIPSOID: WGS84	REFERENCE MERIDIAN: WG19	DATUM: HART94	ELEVATIONS: MAMSL
ALLOTMENT AREA: BELLVILLE		ADMINISTRATIVE DISTRICT: CAPE	

PROJECT DESCRIPTION

TOPOGRAPHICAL SURVEY OF BELCON MAERSK

CLIENT: MAERSK: BOTHA PRETORIUS	PLOT SCALE: 1:1250 (A0)
DRAWING NAME:	SHEET: 9 of 9

Appendix B

BELCON Site Plan

NOTES:

All dimensions and levels are to be verified on site by the contractor and sub-contractors, prior to the commencement of setting out, workshop drawings or construction. Drawings are not to be scaled. Figured dimensions only are to be used. Any discrepancies, errors and omissions are to be reported to the architect immediately before commencing with any work. All shop drawings are to be submitted for architects approval prior to manufacture or installation. Sub-contractor to allow for tolerances.

All work is to be executed in strict accordance with the by-laws and regulations of the local authority. Where required, architect's drawings are to be read in conjunction with engineer's & other consultants' drawings. Copyright and right of reproduction of this drawing or any portion thereof, is reserved and remains with Anderson Perry Partnership Architects.

REVISIONS:

REV-A: 2023-03-28: ISSUED FOR INFORMATION
REV-B: 2023-05-09: GENERALLY REVISED AS PER ILS SPECIFICATION.
REV-C: 2023-05-18: SECURITY TURNSTILES @ WAREHOUSE LEVEL OMITTED. ATTENUATION PONDS ENLARGED/ADDED. TURNING CIRCLE @ NW CORNER REVISED.
REV-D: 2023-05-24: STAIRS TO OFFICE MEZZANINE REVISED.
REV-E: 2023-06-02: GENERALLY REVISED AS PER "DITLO" MEETING COMMENTS.
REV-F: 2023-06-05: REVISED ENTRANCE/EXIT ROADWAYS.
REV-G: 2023-06-08: REVISED AS PER "DITLO" MEETING COMMENTS & REVISED ENTRANCE/EXIT ROADWAYS.
REV-H: 2023-06-14: REFRIGERATED WAREHOUSE GENERALLY REVISED AS PER ILS DESIGN. REFRIGERATION PLANT ENLARGED.

CONTAINER DEPOT
REFER TO DRAWING 23198-102

FROM BELCON YARD

SAFETY WALKWAY
GATE
STACK TOWER 1
STACK TOWER 2
STACK TOWER 3
MINIBUS
REEFER STAGING
240 CONTAINERS (4 HIGH/10 DEEP)
JERSEY BARRIER
YARD
TRUCK PARK UP
3m COMMON BOUNDARY BUILDING LINE
LEASE BOUNDARY
WATER PLANT
12x200001 TANKS (RAINWATER & STORAGE)
FENCE LINE
CONTROL STATION
1:15 RAMP
EDGE CANOPY OVER
RAMP
CANOPY OVER
WASTE
DOCK
WASTE PROCESSING
LIFT
CUT UNDER DOOR
ESCAPE
CEILING & ROOF ACCESS STAIR
PPECB OFFICE
DESPATCH
6M CLEAR
10°C
MHE PARKING
MHE CHARGING
EDGE MEZZ OVER
BRIDGE OVER
ATTENUATION POND
2943M²
29 BAYS
SWALE
D 202
VOID
DROP OFF
PEDESTRIAN PATH IN
PASSENGER VEHICLE ROAD IN & OUT
TRUCK EXIT
TRUCK EXIT
GATE
WEIGHBRIDGE
STAFF PARKING
106 BAYS
STORM WATER SWALE
STORMWATER SERVITUDE
FIRE SPRINKLER TANKS
600kVA
600kVA
M.S.
FENCE LINE
SLIP LANE
MARSHALL CONTROL STATION
TRUCK ENTRANCE
TRUCK EXIT (EXTING. RD)
TRUCK MARSHALLING YARD
EDGE OF EXISTING HARDSTAND
5m COMMON BOUNDARY BUILDING LINE
LEASE BOUNDARY
POTENTIAL ADDITIONAL LANE OUT
RAD ALARM
FS PUMP
5m STREET BUILDING LINE
LEASE BOUNDARY

STERI CHAMBER 1 9m CLEAR -0.5°C
STERI CHAMBER 3 9m CLEAR -0.5°C
COLD STORE 1 10M CLEAR 24°C
COLD STORE 2 10M CLEAR 24°C
COLD STORE 4 10M CLEAR 24°C
COLD STORE 6 10M CLEAR 24°C
STERI CHAMBER 5 9m CLEAR -0.5°C
REFRIGERATED WAREHOUSE
59 750FFL
AMBIENT WAREHOUSE
59 750FFL
STERI CHAMBER 2 9M CLEAR -0.5°C
STERI CHAMBER 4 9M CLEAR -0.5°C
COLD STORE 3 10M CLEAR 24°C
COLD STORE 5 10M CLEAR 24°C
COLD STORE 7 10M CLEAR 24°C
STERI CHAMBER 6 9M CLEAR -0.5°C
80 PALLETS
60 PALLETS
320 PALLETS
170 PALLETS
RECEIVING
6M CLEAR
10°C
PPECB INSPECTION
EDGE CANOPY OVER
1:15 RAMP
YARD
EDGE MEZZ OVER
ELEC. DISTR.
VALVE CHAMBER
WASTE PROCESSING
CUT UNDER DOOR
ESCAPE

EXISTING KERB LINE
FENCE LINE
EXISTING KERB LINE
NEW KERB LINE
EDGE OF EXISTING HARDSTAND/KERB LINE
BOWSER
1600kVA GEN
1600kVA GEN
1600kVA GEN
M.S.
REFRIGERATION PLANT
HVAC PLANT
GANTRY OVER
CONDENSATE TANKS
5m STREET BOUNDARY BUILDING LINE
LEASE BOUNDARY

01 02 03 04 05 06 07

Anderson Perry Partnership Architects
16 Alma Road, Rosebank, Cape Town, 7700
www.appa.za.com/ Tel 021 4611844

PROJECT
BELCON LOGISTICS HUB
BELLVILLE CONTAINER DEPOT, BELLVILLE
CLIENT
MAERSK
DRAWING
WAREHOUSE GROUND GA PLAN
FOR INFORMATION
PROJECT NUMBER 23198
DATE OF FIRST ISSUE 25/03/2023
SCALE A0-1:500
DRAWN BY AS
DRAWING NUMBER 201
REVISION H

Appendix C – Departemental Reccommendations

C1. Water and Waste Directorate

C2. Road Infrastructure Management

C3. Environmental Management

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

WATER & WASTE DIRECTORATE
DEPARTMENT: WATER & SANITATION

Johann Terblanche
Head: Catchment, Stormwater and River Management Branch
E: **T** +27 21 400 3205 **M** +27 84 812 4153
E johann.terblanche@capetown.gov.za

MEMORANDUM

Date : 09 June 2023

To : Darrel Stevens and Ingrid Crous
(Development Management: Planning and Building Development Management)

Subject : **DAMS: LUMA – APPLICATION FOR FOR SUBDIVISION, CONSOLIDATION OF SUBDIVIDED SECTIONS, REZONING OF CONSOLIDATED ERF, CONSENT USE, PERMANENT REGULATION DEPARTURES, SDP APPROVAL AND REGISTRATION OF SERVITUDE ON ERVEN 20414, R/14867, 14881, R/14882, 14876, 14877, 14878 AND 14873 BELLVILLE.**

Our Ref : 2.3.2.7 Development Proposals (Elsieskraal River)

Applications with case number **1500100969_Erf 14881)** refers.

Herewith the Catchment Stormwater & River Management branch (this Office) recommendations for inclusion in the assessment of the aforementioned application applications.

CONTEXT

Nuplan Africa Town Planners have been appointed by Maersk Logistics & Services South Africa (Pty) LTD to lodge a land use application to the City of Cape Town on their behalf to enable the development of a logistics hub on a portion of land that they lease from Transnet at the existing Transnet Mashalling Yard in Bellville.
The application entails the following elements:

- Application for subdivision of 3 erven and consolidation of the subdivided portions and other erven.
- Rezoning of the consolidated portion to General Industrial Zone 1 and consent use for a container depot.
- Departure from the parking requirements and height restriction.
- Approval of the SDP.
- Registration of services servitudes and access servitudes.

The application consists of the following in terms of the City of Cape Town's Municipal Planning By-Law (2015):

1. In terms of Section 42(a) (rezoning of land, including rezoning to subdivisional area overlay zoning)
2. In terms of Section 42(b) (permanent departure)
3. In terms of Section 42(d) (Subdivision)
4. In terms of Section 42(i) (consent, approval or any other permission or requirement in terms of the development management scheme)

5. In terms of Section 42(u) (any other application which the City Manager may prescribe in terms of this By-Law)

COMMENTS

1. Taking into consideration the extent and nature of the proposed ultimate development, it is crucial that a sustainable stormwater management system be design, which is conducive to the Health & Safety of the general public and improves / protects the environment/ ecosystem.
2. As a precursor a stormwater strategy has been submitted as part of this application.
3. The submitted stormwater strategy of this precinct complies with the City of Cape Town's (the City) Stormwater Policies and By-law, noted here below:

   3.1 Management of Urban Stormwater Impacts Policy, approved by Council: 27 May 2009.

   3.2 Floodplain and River Corridor Management Policy, approved by Council: 27 May 2009.

   3.3 By-Law Relating to Stormwater Management, approved by Council: 30 August 2005.

Conditions

This Office supports this application, subject to the following conditions:

1. A Stormwater Management Plan (SWMP) must be submitted to this Office for approval prior to any building plan applications and/or submission.

2. The SWMP must comply with the City's Stormwater Policies and By-law, noted here below:
   2.1 Management of Urban Stormwater Impacts Policy, approved by Council: 27 May 2009.
   2.2 Floodplain and River Corridor Management Policy, approved by Council: 27 May 2009.
   2.3 By-Law Relating to Stormwater Management, approved by Council: 30 August 2005.

3. The appointed Design Engineer (Engineering Consultancy) and/or applicant is encouraged to consult with this office prior to the compilation of the SWMP to discuss its principles.

4. The Developer is encouraged to implement stormwater Best Management Practices (BMP's) along with other Water Sensitive Urban Design (WSUD) initiatives such as reduction of potable water use through rainwater harvesting, bio-retention areas, swales, rain gardens, etc.

5. Indicate stormwater servitudes for under/above ground services, e.g. overland escape routes etc. Obtain written approval from affected owners, where the route of a proposed civil service crosses private properties and register servitudes accordingly. Maintenance responsibility of servitudes must be included into the servitude conditions. All cost incurred is for the developer's account.

6. It should be noted, that this Office accepts all SWMP in good faith. Furthermore, this Office trusts that the developer/applicant/his professional team will incorporate into the SWMP, the City's internal departments, as well as Organs of State's conditions (i.e. authorisations and/or water use licenses, etc.). Failure to do so will result in unnecessary delays, and all costs associated with delays will be for the Developer's account.

7. Floodline maps/data provided by this Office were prepared for the purpose of assessing the degree of flood hazard and risk to assist in the identification and development of measures for managing the flood risk. They may, however, also be of use to the public and other parties as indicative floodlines of flood-prone areas for a range of purposes, including raising awareness of

flood risk, preparedness and response planning for flood events, assisting in planning and development decisions, etc.

8. The City's High Level Master Plan Floodlines are coarse; therefore, floodlines compiled prior to 2013 must be verified/vetted by the Developer's professional team to establish flood risk, etc. All costs incurred is for the Developer's account. Furthermore, this Office reserves the right to change the content and/or presentation of any of the information provided on these floodline maps at its sole discretion, including these notes and disclaimer.

9. All open spaces must be must be zoned as private open space and to be maintained by the overarching home owners' association and not public open space.

Please note that these comments are based on the information that has been received to date. Should any new information be provided to this office, then this office reserves the right to review the recommendations as deemed appropriate.

Yours faithfully,

Motlatsi Christian Nkhoesa

Digitally signed by Motlatsi Christian Nkhoesa
Date: 2023.06.09 11:13:25 +02'00'

p.p.
Johann Terblanche
Head: Catchment Planning: Region 4 (Northern Districts)

CC:

Sandra Hustwick	: Spatial Planning and Environment: Environment & Heritage Management (Northern region)
Louise du Toit	: Transport: Road Infrastructure Management (District 3)
Daneel du Toit	: Transport: Road Infrastructure Management (District 3)
Motlatsi Nkhoesa	: Water & Waste Services: Assistant Catchment Planner: Region 4 (Northern Districts)
Kloey Bam	: Water & Waste Services: Assistant Catchment Planner: Region 4 (Northern Districts)
Willem Burger	: Water & Waste Services: Assistant Catchment Planner: Region 4 (Northern Districts)
Phila Nkosinkulu	: Community Services and Health: Recreation and Parks

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

URBAN MOBILITY DIRECTORATE
ROADS INFRASTRUCTURE MANAGEMENT

Louise du Toit
Principal Professional Officer
T: 021 444 7118 **E**: Louise.DuToit@capetown.gov.za

MEMORANDUM

CASE ID	**1500100969**
DATE	30 June 2023
TO	Darrel Stevens (*Development Management*)
APPLICATION	**REZONING, SUBDIVISION, CONSOLIDATION, CONSENT USE, PERMANENT DEPARTURE ERVEN RE-20414, RE-14882, RE-14867, 14881, 14873, 14876, 14877 AND 14878, BELLVILLE (TRANSNET MARSHALLING YARD), BELLVILLE**

1. NATURE OF APPLICATION:

1.1 **Subdivision** of erven 20414, 14881 and RE-14882 into 2 portions each.
1.2 **Rezoning** of portion 1 of erven 20414 and RE-14882 from TR1 to GI 1 purposes
1.3 **Consolidation** of RE-14867, 14876, 14877, 14878, 14873, portion 1 of 20414, portion 1 of 14882 and portion 1 of 14881 with a right of way servitude.
1.4 **Consent use** to allow for a Container Depot to be operated from the newly consolidated property
1.5 **Parking departure** from the prescribed 408 bays to 274 bays and
1.6 Departure to increase the permissible height of 18m to 24m.

2. COMMENTS:

2.1 Our GIS records indicates an existing stormwater culvert traversing the site.

2.2 Existing rights: Six of the eight land portions have existing General Industrial 1 rights. The total combined area of these land portions is approximately 75,000m² which translates to an existing right of 112,800m² floor area. Therefore no Development Charges will be payable.

2.3 The access, transport impact, circulation and parking must be to the satisfaction of the *Urban Mobility: TIA & Development Control Branch*.

2.4 The application is to consolidate and rezone the full Lease Area to Industrial Zone 1 to permit:

(a) 40,782 m² GLA warehousing / cold storage

(b) 40,780 m² of Container Yard (as a consent use)

USE	GROSS LEASABLE AREA (GLA)
Warehouse (Ambient)	20646m²
Warehouse (Mezzanine)	4299m²
Warehouse (Cold Storage)	12774m²
Pilot offices & Staff Entrance	951m²
Offices (Mezzanine)	2 058m²
Gatehouse	54
Total	**40782m²**

2.5 Servitudes:

(a) The proposed R.O.W. servitudes (to provide access to the subject site from the north and the south) must be illustrated and dimensioned on the SDP and shown on the Consolidation Plan.

(b) An existing stormwater culvert traverses the site – according to the motivation report allowance has been made for a 12m wide servitude, however the SDP indicates a 6m wide servitude. Please clarify. Also, indicate the servitude width on the Consolidation Plan.

2.6 During a meeting with the consulting engineers on the 23rd of February 2023 the City requested that they include a cut-off drain along the railway lines - tying it into an existing earth drain. GIBB Consulting Engineers analysed the stormwater run-off for CCT and this led to the size of the cut-off drain to be 0.5m deep, 0.5m wide with side slopes of 1:3 at the start. The cut of drain increases to 1.2m deep, 1.2m wide with side slopes of 1:3 at the end. We recommended that KLS incorporate the cut-off drain into the works as this will be a condition with the SDP approval.

2.7 During abovementioned meeting a possible trapped low point in Robert Sobukwe Road was discussed. The engineers confirmed that they have survey data and will confirm if an overland escape route across the site will have to be accommodated. This was not mentioned in the engineering services report or the stormwater strategy plan – please confirm as this would require a servitude.

3. RECOMMENDATIONS:

This Department **reserves final comment** on the application until the abovementioned comments have been addressed.

Yours sincerely,

Louise du Toit
Roads Infrastructure Management
Urban Mobility Directorate

CITY OF CAPE TOWN
ISIXEKO SASEKAPA
STAD KAAPSTAD

SPATIAL PLANNING & ENVIRONMENT
ENVIRONMENTAL MANAGEMENT DEPARTMENT

INTERNAL MEMORANDUM

T: 021 400 6534
e: Ronelle.Clarke@capetown.gov.za

To : Darrel Stevens (Land Use Management)

From : Ronelle Clarke (Environment & Heritage Management Branch E&HM)

Subject : Erven 20414, R/14867, 14881, R/14882, 14876, 14877, 14878 & 14873 14881, Bellville, Case 1500100969.

Application for subdivision, consolidation of subdivided sections, rezoning of consolidated erf, consent use, permanent regulation departures, SDP approval and registration of servitudes

Date : 7 June 2023

Comment:-

1 The application as described above is to allow for the development of cold storage, warehousing and container depot facilities on a portion of land at the existing Transnet Marshalling Yard in Bellville.

2 A pre-consultation meeting and follow up was undertaken between the applicant and Environmental Management.

Figure 1: The site in question

3 E&HM supports the proposed application. There are no environmental constraints / issues that require further assessment or checks.

4 The Landscape Plan (LP) by CNDV Drwg No 2976 - 03 - LP - REV 01 dated 5 April 2023 (attached here for reference purposes only), is accepted BUT subject to the following amendments:

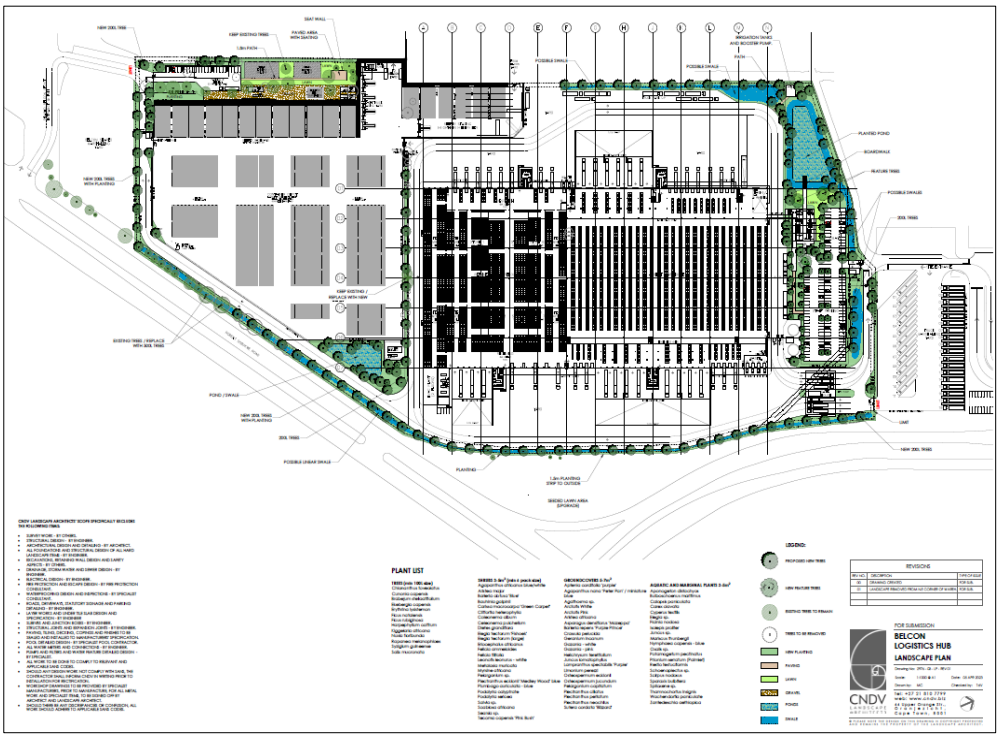


Figure 2: Landscape Plan by CNDV Drwg No 2976 - 03 - LP - REV 01 dated 5 April 2023

4.1 The interface between Robert Sobukwe and the proposed development is important and tree planting for screening and visual amenity is required. The proposed 200L trees are accepted. However, the Plan must be amended to indicate that the row of existing *Casuarina* trees along Robert Sobukwe (see Figure 3 below) are to be retained and that new planting is to take place alongside and continuing from these existing trees.

Figure 3: Existing row of matiure trees on Robert Sobukwe Road

4.2 The proposed tree species and diversity proposed is welcomed. However, remove the proposed tree species *Kiggelaria africana* (Wild Peach) from the suggested species to plant as this has been identified as a reproductive host species for the Polyphagus Shothole Borer, an alien invasive beetle that is causing the demise of trees in Cape Town and surrounds.

4.3 Show and provide on the LP details of irrigation to all new tree planting (to be a fully automated irrigation system). Indicate options for alternative sources of water.

4.4 Note on the LP maintenance of planting. A watering program is needed that is the responsibility of the developer for a minimum of 2 years after planting to ensure that trees can establish themselves.

4.5 Runoff from all hard surfaces and internal roads should remain on site for irrigation use / flow into adjacent vegetated areas. Surface treatment should be laid to fall towards the trees and planted areas to allow for passive irrigation. The proposed linear swales to allow for Sustainable Urban Drainage Systems (SUDS) is supported.

4.6 Show boundary treatment (is the existing vibracrete wall on Robert Sobukwe to remain?)

5 Note to LUM:

5.1 Attach as a condition of approval a time frame for implementation of all landscaping. Environment to be notified at such time so that a site visit can be arranged to confirm such implementation.

5.2 Conditions contained in Heritage Western Cape's response to the Notification of Intent to Develop dd 6 April 2023 must be carried through / referred to at approval.

RSClarke

Ronelle Clarke
Environmental Professional
ENVIRONMENTAL AND HERITAGE MANAGEMENT: TYGERBERG

Appendix D

D1. Pre-Development Runoff Calculations

D2. Post-Development Runoff Calculations

D3. Runoff Calculation Summary

D4. Outlet and Overflow Sizing

D5. Flow modelling & graphs

FLOOD RUN-OFF CALCULATIONS	PROJECT:	BELCON		
kls CONSULTING ENGINEERS progress delivered	Project no:	22093	Page No	1
	Catchment Name:	BELCON	Rev:	B
	Calculation Method:	SANRAL AND RATIONAL METHOD (ALTERNATIVE 3)		
	Calculated by:	Neil Wolter		
	Date:	2023-02-20		
	Checked By:	Neil Wolter	Signed:	
	Date:	2023-02-20		

Catchment characteristics (All methods)

Description of catchment	Beclon
Name of watercourse (If applicable)	N/A

Physical characteristics

Size of catchment (A)	0.110	km^2
Longest watercourse (L)	0.565	km
Average slope (S_{av})	0.002	m/m
Dolomitic area ($D_{\%}$)	0%	%

Meteorological characteristics

Rainfall region:	Cape Town	
Weather Service station Coordinates	33.93°, 18.63°	
Nearest Weather Station number	0021204_W	
CoCT Mean annual precipitation (MAP)	506	mm
2-year return period daily rainfall (M)	39.33	mm
Days of thunder per year (R)	3	days/year

Notes:

Area distribution factors

Rural (α)	Urban (β)	Lakes (γ)
0.000	1.000	0.000

Time of concentration (T_c) (All Methods)

Overland/Sheet flow $(= P_{rr} \times ARF_T)$		Defined watercourse	
$T_c = 0.604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467}$		$T_c = \left(\frac{0{,}87L^2}{1000S_{av}}\right)^{0.385}$	
0.318	hours	0.468	hours

Notes:
Minimum Tc of 15minutes (0.25 hours).
Choose Between Defined and Overland for TC

Catchment run-off coefficients (Rational Methods)

Rural

Surface slope	%	Factor	C_S
Vleis and pans (<3%)	0.0%	0.03	0.000
Flat Areas (3-10%)	0.0%	0.08	0.000
Hilly (10-30%)	0.0%	0.16	0.000
Steep Areas (>30%)	0.0%	0.26	0.000
Total	0.0%	-	0.000
Permeability	**%**	**Factor**	**C_P**
Very permeable	0.0%	0.04	0.000
Permeable	0.0%	0.08	0.000
Semi-permeable	0.0%	0.16	0.000
Impermeable	0.0%	0.26	0.000
Total	0.0%	-	0.000
Vegetation	**%**	**Factor**	**C_V**
Thick bush and plantation	0.0%	0.04	0.000
Light bush and farm-lands	0.0%	0.11	0.000
Grasslands	0.0%	0.21	0.000
No vegetation	0.0%	0.28	0.000
Total	0.0%	-	0.000

Urban

Description	%	Factor	C_S
Lawns in sandy soil, flat grade(<2%)	60.00%	0.10	0.060
Lawns in sandy soil, steep grade(>7%)	0.00%	0.20	0.000
Lawns in heavy soil, flat grade(<2%)	0.00%	0.17	0.000
Lawns in heavy soil, steep grade(>7%)	0.00%	0.35	0.000
Residential: Houses	0.00%	0.50	0.000
Residential: Flats	0.00%	0.70	0.000
Light industry	0.00%	0.80	0.000
Heavy industry	40.00%	0.90	0.360
Business complexes in the city centre	0.00%	0.95	0.000
Business complexes in suburban areas	0.00%	0.70	0.000
Street area	0.00%	0.95	0.000
Maximum Flood	0.00%	1.00	0.000
Total (C_2)	100.00%	-	0.420

Notes:

Adjustment of run-off coefficients (Rational Methods)

Return period (years), T	2	5	10	20	50	100	
Rural run-off coefficient, C_1 $(C_1 = C_S + C_P + C_V)$	0.000	0.000	0.000	0.000	0.000	0.000	
Adjustment of above for dolomitic areas, C_{1D} $\left(= C_1(1 - D_{\%}) + C_1 D_{\%}\left(\sum\left(D_{factor} \times C_{S\%}\right)\right)\right)$	0.000	0.000	0.000	0.000	0.000	0.000	
Adjustment factor for initial saturation of rural areas, F_t	0.750	0.800	0.850	0.900	0.950	1.000	
Adjusted rural run-off coefficient, C_{1T} $(= C_{1D} \times F_t)$	0.000	0.000	0.000	0.000	0.000	0.000	
Combined run-off coefficient, C_T $(= \alpha C_{1T} + \beta C_2 + \gamma 1)$	0.420	0.420	0.420	0.420	0.420	0.420	

FLOOD RUN-OFF CALCULATIONS	PROJECT:	BELCON		
kls CONSULTING ENGINEERS progress delivered	Project no:	22093	Page No	2
	Catchment Name:	BELCON	Rev:	B
	Calculation Method:	SANRAL AND RATIONAL METHOD (ALTERNATIVE 3)		
	Calculated by:	Neil Wolter		
	Date:	2023-02-20		
	Checked By:	Neil Wolter	Signed:	
	Date:	2023-02-20		

Flood run-off: Rational method (Alternative 1)

Return Period (years), T	2	5	10	20	50	100
Point rainfall (mm), P_T	6.50	9.00	11.00	13.00	18.00	25.00
Point intensity (mm/hour), P_{IT} (= P_T/T_C)	13.90	19.25	23.52	27.80	38.49	53.46
Area reduction factor (%), ARF_T	100%	100%	100%	100%	100%	100%
Average intensity (mm/hour), I_T	13.90	19.25	23.52	27.80	38.49	53.46
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3,6}$ $Q_T = \frac{C_T I_T A}{3,6}$	0.18	0.25	0.30	0.36	0.50	0.69

Flood run-off: Rational method (Alternative 2)

Return Period (years), T	2	5	10	20	50	100
Rainfall duration (minutes) t	28.06	28.06	28.06	28.06	28.06	28.06
Point rainfall (mm), P_T $PtT = 1.13(0.41+0.64LnT)(-0.11+0.27lnt)(0.79M^{\wedge 0.69} R^{0.20})$	9.45	15.95	20.86	25.77	32.26	37.17
Point intensity (mm/hour), P_{IT} (= P_T/T_C)	20.21	34.10	44.60	55.11	68.99	79.50
Area reduction factor (%), ARF_T	100%	100%	100%	100%	100%	100%
Average intensity (mm/hour), I_T	20.21	34.10	44.60	55.11	68.99	79.50
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3,6}$ $Q_T = \frac{C_T I_T A}{3,6}$	0.26	0.44	0.57	0.71	0.89	1.02

Flood run-off: Rational method (Alternative 3)

Return Period (years), T	2	5	10	20	50	100
Point rainfall (mm), P_T	12.20	16.30	19.40	22.50	27.00	30.70
Point intensity (mm/hour), P_{IT} (= P_T/T_C)	26.09	34.86	41.49	48.12	57.74	65.65
Area reduction factor (%), ARF_T	100%	100%	100%	100%	100%	100%
Average intensity (mm/hour), I_T	26.09	34.86	41.49	48.12	57.74	65.65
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3,6}$ $Q_T = \frac{C_T I_T A}{3,6}$	0.34	0.45	0.53	0.62	0.74	0.84

Flood run-off: SDF

Return Period (years), T	2	5	10	20	50	100	200
Basin	17.0						
Mean Annual Percipitation (MAP)	500.0						
Mean 24 hour maximum rainfall (1:2) - M	45.0						
Mean number of thunder days per annum - R	1.0						
Rainfall duration (minutes) t	28.06	28.06	28.06	28.06	28.06	28.06	28.06
Point rainfall (mm), P_T $PtT = 1.13(0.41+0.64LnT)(-0.11+0.27lnt)(0.79M^{\wedge 0.69} R^{0.20})$	8.33	14.05	18.37	22.70	28.42	32.75	37.07
Area reduction factor (%), ARF_T	100%	100%	100%	100%	100%	100%	100%
Average intensity (mm/hour), $I_T = P_{tT} \times ARF / T_c$)	17.81	30.04	39.29	48.54	60.78	70.03	79.28

Run-Off Coefficients

Calibration Factors	C_2 (2-year return period) (%)	40	C_{100} (2-year return period) (%)	80

Return Period (years), T	2	5	10	20	50	100	200
Retrun Period Y_T Factors	0.00	0.84	1.28	1.64	2.05	2.33	2.580
Run-off coefficient (C_T),	0.40	0.54	0.62	0.68	0.75	0.80	0.84
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3,6}$ $Q_T = \frac{C_T I_T A}{3,6}$	0.22	0.50	0.75	1.01	1.40	1.72	2.05

FLOOD RUN-OFF CALCULATIONS	PROJECT:	BELCON		
kls CONSULTING ENGINEERS progress delivered	Project no:	22093	Page No	1
	Catchment Name:	BELCON	Rev:	B
	Calculation Method:	SANRAL AND RATIONAL METHOD (ALTERNATIVE 3)		
	Calculated by:	Neil Wolter		
	Date:	2023-02-20		
	Checked By:	Neil Wolter	Signed:	
	Date:	2023-02-20		

Catchment characteristics (All methods)

Description of catchment	Beclon
Name of watercourse (If applicable)	N/A

Physical characteristics		
Size of catchment (A)	0.110	km^2
Longest watercourse (L)	0.565	km
Average slope (S_{av})	0.002	m/m
Dolomitic area ($D_{\%}$)	0%	%

Meteorological characteristics		
Rainfall region:	Cape Town	
Weather Service station Coordinates	33.93°, 18.63°	
Nearest Weather Station number	0021204_W	
CoCT Mean annual precipitation (MAP)	506	mm
2-year return period daily rainfall (M)	39.33	mm
Days of thunder per year (R)	3	days/year

Area distribution factors		
Rural (α)	Urban (β)	Lakes (γ)
0.000	1.000	0.000

Notes:

Time of concentration (T_c) (All Methods)

Overland/Sheet flow $(= P_{rr} \times ARF_T)$		Defined watercourse	
$T_c = 0.604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467}$		$T_c = \left(\frac{0{,}87L^2}{1000S_{av}}\right)^{0.385}$	
0.318	hours	0.468	hours

Notes:
Minimum Tc of 15minutes (0.25 hours).
Choose Between Defined and Overland for TC

Catchment run-off coefficients (Rational Methods)

Rural				Urban			
Surface slope	**%**	**Factor**	**C_S**	**Description**	**%**	**Factor**	**C_S**
Vleis and pans (<3%)	0.0%	0.03	0.000	Lawns in sandy soil, flat grade(<2%)	10.00%	0.10	0.010
Flat Areas (3-10%)	0.0%	0.08	0.000	Lawns in sandy soil, steep grade(>7%)	0.00%	0.20	0.000
Hilly (10-30%)	0.0%	0.16	0.000	Lawns in heavy soil, flat grade(<2%)	0.00%	0.17	0.000
Steep Areas (>30%)	0.0%	0.26	0.000	Lawns in heavy soil, steep grade(>7%)	0.00%	0.35	0.000
Total	0.0%	-	0.000	Residential: Houses	0.00%	0.50	0.000
Permeability	**%**	**Factor**	**C_p**	Residential: Flats	0.00%	0.70	0.000
Very permeable	0.0%	0.04	0.000	Light industry	0.00%	0.80	0.000
Permeable	0.0%	0.08	0.000	Heavy industry	80.00%	0.90	0.720
Semi-permeable	0.0%	0.16	0.000	Business complexes in the city centre	0.00%	0.95	0.000
Impermeable	0.0%	0.26	0.000	Business complexes in suburban areas	0.00%	0.70	0.000
Total	0.0%	-	0.000	Street area	10.00%	0.95	0.095
Vegetation	**%**	**Factor**	**C_v**	Maximum Flood	0.00%	1.00	0.000
Thick bush and plantation	0.0%	0.04	0.000	Total (C_2)	100.00%	-	0.825
Light bush and farm-lands	0.0%	0.11	0.000	Notes:			
Grasslands	0.0%	0.21	0.000				
No vegetation	0.0%	0.28	0.000				
Total	0.0%	-	0.000				

Adjustment of run-off coefficients (Rational Methods)

Return period (years), T	2	5	10	20	50	100
Rural run-off coefficient, C_1 $(C_1 = C_S + C_P + C_V)$	0.000	0.000	0.000	0.000	0.000	0.000
Adjustment of above for dolomitic areas, C_{1D} $\left(= C_1(1 - D_{\%}) + C_1 D_{\%}\left(\sum\left(D_{factor} \times C_{S\%}\right)\right)\right)$	0.000	0.000	0.000	0.000	0.000	0.000
Adjustment factor for initial saturation of rural areas, F_t	0.750	0.800	0.850	0.900	0.950	1.000
Adjusted rural run-off coefficient, C_{1T} $(= C_{1D} \times F_t)$	0.000	0.000	0.000	0.000	0.000	0.000
Combined run-off coefficient, C_T $(= \alpha C_{1T} + \beta C_2 + \gamma 1)$	0.825	0.825	0.825	0.825	0.825	0.825

FLOOD RUN-OFF CALCULATIONS	PROJECT:	BELCON		
kls CONSULTING ENGINEERS progress delivered	Project no:	22093	Page No	2
	Catchment Name:	BELCON	Rev:	B
	Calculation Method:	SANRAL AND RATIONAL METHOD (ALTERNATIVE 3)		
	Calculated by:	Neil Wolter		
	Date:	2023-02-20		
	Checked By:	H Kotze	Signed:	
	Date:	2023-02-20		

$PtT = 1.13(0.41+0.64LnT)(-0.11+0.27lnt)(0.79M^{0.69} R^{0.20})$

Flood run-off: Rational method (Alternative 1)

Return Period (years), T	2	5	10	20	50	100	
Point rainfall (mm), P_T	6.50	9.00	11.00	13.00	18.00	25.00	
Point intensity (mm/hour), P_{IT} (= P_T/T_C)	13.90	19.25	23.52	27.80	38.49	53.46	
Area reduction factor (%), ARF_T	100%	100%	100%	100%	100%	100%	
Average intensity (mm/hour), I_T	13.90	19.25	23.52	27.80	38.49	53.46	
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3,6}$	0.35	0.49	0.59	0.70	0.97	1.35	

Flood run-off: Rational method (Alternative 2)

Return Period (years), T	2	5	10	20	50	100	
Rainfall duration (minutes) t	28.06	28.06	28.06	28.06	28.06	28.06	
Point rainfall (mm), P_T	9.45	15.95	20.86	25.77	32.26	37.17	
Point intensity (mm/hour), P_{IT} (= P_T/T_C)	20.21	34.10	44.60	55.11	68.99	79.50	
Area reduction factor (%), ARF_T	100%	100%	100%	100%	100%	100%	
Average intensity (mm/hour), I_T	20.21	34.10	44.60	55.11	68.99	79.50	
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3,6}$	0.51	0.86	1.12	1.39	1.74	2.00	

Flood run-off: Rational method (Alternative 3)

Return Period (years), T	2	5	10	20	50	100	
Point rainfall (mm), P_T	12.20	16.30	19.40	22.50	27.00	30.70	
Point intensity (mm/hour), P_{IT} (= P_T/T_C)	26.09	34.86	41.49	48.12	57.74	65.65	
Area reduction factor (%), ARF_T	100%	100%	100%	100%	100%	100%	
Average intensity (mm/hour), I_T	26.09	34.86	41.49	48.12	57.74	65.65	
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3,6}$	0.66	0.88	1.05	1.21	1.46	1.65	

Flood run-off: SDF

Return Period (years), T	2	5	10	20	50	100	200
Basin	17.0						
Mean Annual Percipitation (MAP)	500.0						
Mean 24 hour maximum rainfall (1:2) - M	45.0						
Mean number of thunder days per annum - R	1.0						
Rainfall duration (minutes) t	28.06	28.06	28.06	28.06	28.06	28.06	28.06
Point rainfall (mm), P_T $PtT = 1.13(0.41+0.64LnT)(-0.11+0.27lnt)(0.79M^{0.69} R^{0.20})$	8.33	14.05	18.37	22.70	28.42	32.75	37.07
Area reduction factor (%), ARF_T	100%	100%	100%	100%	100%	100%	100%
Average intensity (mm/hour), $I_T = P_{tT} \times ARF / T_c$)	17.81	30.04	39.29	48.54	60.78	70.03	79.28

Run-Off Coefficients

Calibration Factors	C_2 (2-year return period) (%)	40	C_{100} (2-year return period) (%)	80

Return Period (years), T	2	5	10	20	50	100	200
Retrun Period Y_T Factors	0.00	0.84	1.28	1.64	2.05	2.33	2.580
Run-off coefficient (C_T),	0.40	0.54	0.62	0.68	0.75	0.80	0.84
Peak flow (m^3/s) $Q_T = \frac{C_T I_T A}{3,6}$	0.22	0.50	0.74	1.01	1.40	1.71	2.04

22093 BELCON DEVELOPMENT **2023/02/20**

STORMWATER RUNOFF AND SUDS SUMMARY

	Summary of Flow: Pre-Development						Summary of Flow: Post-Development					
		Alternative 1	Alternative 2	Alternative 3	SDF	KLS Design		Alternative 1	Alternative 2	Alternative 3	SDF	KLS Design
Flow (Q - m3/s)	Q_2	0.18	0.26	0.34	0.22	0.25	Q_2	0.35	0.51	0.66	0.22	0.43
	Q_5	0.25	0.44	0.45	0.50	0.41	Q_5	0.49	0.86	0.88	0.50	0.68
	Q_{10}	0.30	0.57	0.53	0.75	0.54	Q_{10}	0.59	1.12	1.05	0.74	0.88
	Q_{20}	0.36	0.71	0.62	1.01	0.67	Q_{20}	0.70	1.39	1.21	1.01	1.08
	Q_{50}	0.50	0.89	0.74	1.40	0.88	Q_{50}	0.97	1.74	1.46	1.40	1.39
	Q_{100}	0.69	1.02	0.84	1.72	1.07	Q_{100}	1.35	2.00	1.65	1.71	1.68
	Summary of Intensities: Pre-Development						Summary of Intensities: Post-Development					
		Alternative 1	Alternative 2	Alternative 3	SDF	KLS Design		Alternative 1	Alternative 2	Alternative 3	SDF	KLS Design
Intensities (mm/h)	I_2	13.90	20.21	26.09	17.81	19.50	I_2	13.90	20.21	26.09	17.81	19.50
	I_5	19.25	34.10	34.86	30.04	29.56	I_5	19.25	34.10	34.86	30.04	29.56
	I_{10}	23.52	44.60	41.49	39.29	37.23	I_{10}	23.52	44.60	41.49	39.29	37.23
	I_{20}	27.80	55.11	48.12	48.54	44.89	I_{20}	27.80	55.11	48.12	48.54	44.89
	I_{50}	38.49	68.99	57.74	60.78	56.50	I_{50}	38.49	68.99	57.74	60.78	56.50
	I_{100}	53.46	79.50	65.65	70.03	67.16	I_{100}	53.46	79.50	65.65	70.03	67.16

CoCT Design Rainfall Grid Data for 24 hour storm event		
1440 minutes		
RI	Depth	Intensity
1:	mm	mm/h
0.5	19.528	0.814
1	32.022	1.334
2	44.516	1.855
5	61.032	2.543
10	73.526	3.064
20	86.020	3.584
50	102.536	4.272
100	115.030	4.793
200	127.524	5.314

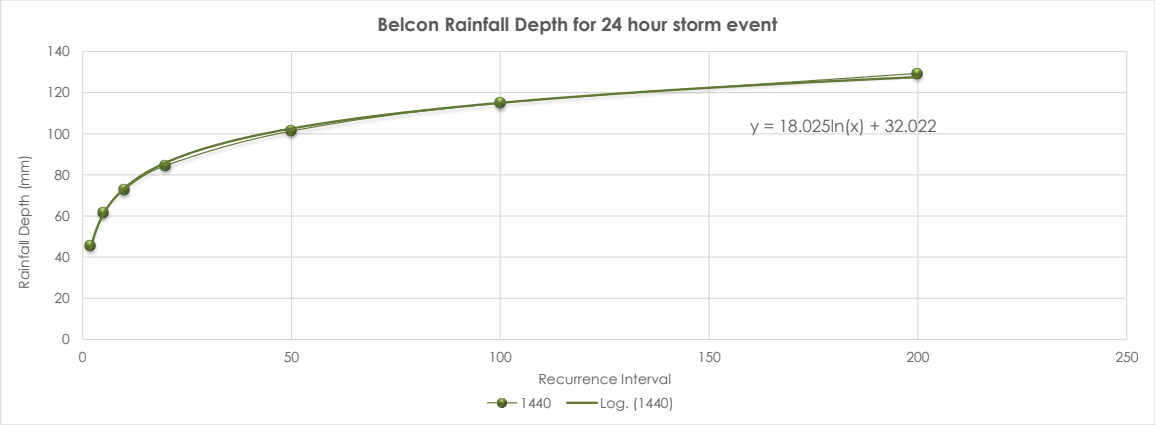
SANRAL Drainage Manual		
Pre-Dev Run-Off Coeff	C_{pre}	0.420
Post-Dev Run-Off Coeff	C_{post}	0.825

GSMM		
Volumetric Runoff Coefficient	R_v	0.8171
% Impervious Cover (post)		85%

Water Quality Improvement Requirement		Volume (m³)
SUDS	1:½-year 24 hour storm	1755.30
Attenuation Requirements		**Volume (m³)**
SUDS	1:1-year, 24 hour storm	2878.33
LEED	20.1mm/m²	2211.00

**Area of 110000m²

**LEED Requirements met, includes PWL, Swale Capacity, and Rainwater harvesting tanks



Rainfall Data - Belcon Logistics Hub								
Reference Coordinates	33°55' ; 18°37'							
MAP (mm)	506							
Return Period	0.5	1	2	5	10	20	50	100
1-day Precipitaion depth (mm)			39.3	52.8	62.6	72.7	87.1	98.8
440-min precipitation depth (mm)	19.5	32.0	44.5	61.0	73.5	86.0	102.5	115.0
30-min precipitation depth (mm)			12.2	16.3	19.4	22.5	27.0	30.7

kls CONSULTING ENGINEERS
progress delivered

22093 BELCON DEVELOPMENT **2023/10/10**

ATTENUATION FACILITY OUTLET SIZING CALCULATIONS

	Dam	Swale West	Swale East	Total	
Contributing Area	89847	2250	17903	110000	m²
Recurrence Interval	**Post Development Flow**				
2	0.402	0.010	0.080	0.49	m³/s
5	0.609	0.015	0.121	0.75	
10	0.766	0.019	0.153	0.94	
20	0.924	0.023	0.184	1.13	
50	1.163	0.029	0.232	1.42	
100	1.383	0.035	0.276	1.69	
	Total peak storm volume				
2	722.775	18.100	144.021	884.896	m³
5	1095.542	27.435	218.299	1341.276	
10	1379.655	34.550	274.911	1689.117	
20	1663.769	41.665	331.524	2036.958	
50	2093.997	52.439	417.252	2563.688	
100	2489.069	62.333	495.974	3047.375	

Attenuation Dam Outlet Structures

Treatment Volume m³ 1755.30 m³

Assumptions:

**Saturated Soil*

**Wet pond, with PWL = Water Quality(Treatment) Volume*

**Sized to accommodate full catchment runoff contribution*

**Rectangular outlets*

**Sharp Inlets*

Full Water Quality Volume: 2156.56 m³ (increased to ensure 1.5 m depth to preventreed growth)

Full Water Quality Level: 56.60 MSL

Design storm	Total Post - Development Volume	Max Water Level (Adjusted for outflow where needed)	Max Water Height Above Inlet	Post Development Flow Rate	Pre-development Flow Rate	Outflow Slots		Outlet Overflow	Total Outlet Capacity of Outlet Structure	Outlet Pipe Max Capacity	Max Outlet Capcity	Actual Attenuated Volume (Excl WQv)	Required Attenuated Volume (Based on Post - Pre)
	m³	MSL	m	m³/s	m³/s	m³/s		m³/s	m³/s			m³	m³
1:2	3041.46	57.00	0.40	0.49	0.34	0.16876	0.3375		0.3375	0.3089	0.3089	328.94	280.54
1:5	3497.84	57.10	0.50	0.75	0.449	0.19660	0.3932		0.3932	0.3089	0.3089	785.32	533.82
1:10	3845.68	57.30	0.70	0.94	0.534	0.24288	0.4858	N/A	0.4858	0.3089	0.3089	1133.16	728.10
1:20	4193.52	57.40	0.80	1.13	0.619	0.26299	0.5260		0.5260	0.3089	0.3089	1481.00	922.37
1:50	4720.25	57.60	1.00	1.42	0.743	0.29917	0.5983		0.5983	0.3089	0.3089	2007.73	1226.19
1:100	5203.94	57.8	1.20	1.69	0.845	0.33143	0.6629	0.185	0.8482	0.3089	0.3089	2491.42	1526.59

Alternative 3

Outlet Structure Sizing

Rectangular Inlet 1		
Inlet Level	**56.6**	MSL
Width (B)	0.6	m
Inlet Height (D)	0.2	m

Outlet Overflow			
Level	**57.7**	MSL	
Width (B)	0.7	m	
Water Height (D)	0.10	m	**1:100 storm
Bars Ø (m) x 7	0.01	m	

Outlet Control: Culverts

$$Q = \frac{2}{3} \times C_B B H \sqrt{\frac{2}{3} g H}$$

For H/D <= 1.2
With C = 0.9

$$Q = C_h B D \sqrt{2g(H - C_h D)}$$

For H/D>1.2
With C = 0.6

Orifice Control

$$Q = Cd \times F \times A \times \sqrt{2gH}$$

With C = 0.6
F = BLOCKAGE FACTOR OF 0.5

Emergency Overflow

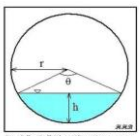
Channel Sizing:	**Manning**	
Flow Capacity (m³/s)	0.57	
A (m²)	0.485	
P (m)	5.33	
n	0.03	**Grass Blocks
S (m/m)	0.03	
**Trapezoidial Channel*		
Side Slopes 1:	1.5	
Top Width	5	
Bottom	4.7	
Height	0.1	
Level (MSL)	57.8	
	57.9	

Outlet-Municipal connection pipe

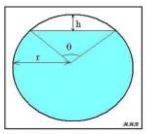
Pipe Capacity:	**Manning**	
Max Flow (m³/s)	0.309	
A (m²)	0.1590	
P (m)	1.4137	
n	0.012	**Concrete*
S (m/m)	0.01	**Approximate* TIE IN @ 55.802 IL
**Concrete Pipe*		
Water Heigth	0.45	**Input*
Design Level	0	
Pipe Radius	0.225	
Design Angle	0	**Radians*

Swale conveyance/Overflow

Channel Sizing	**Manning**	
Flow Capacity	0.24	
A (m²)	0.3	
P (m)	3.03	
n	0.03	**Grass Blocks
S (m/m)	0.0125	
**V-Channel*		
Side Slopes 1:	7.5	
Top Width	3	
Height	0.2	
Level (MSL)	58.1	



Partially Full Pipe Flow Parameters



Partially Full Pipe Flow Parameters

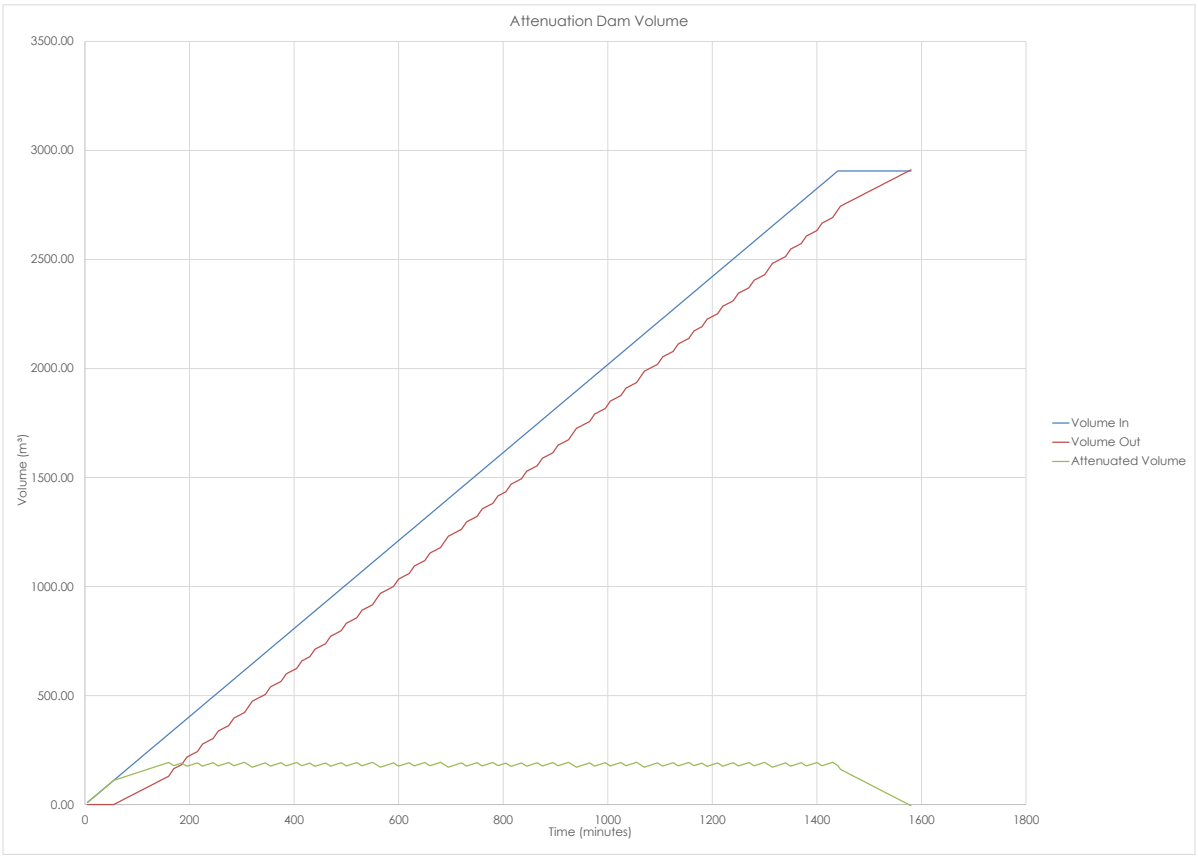
kls CONSULTING ENGINEERS
progress delivered

22093 BELCON DEVELOPMENT **2023/10/10**

ATTENUATION FACILITY FLOW MODELLING: 1:1 YEAR 24 HOUR STORM EVENT

	*V = Q*ttime increment*	*sum of inflow*	*water height of balance of flow*	*outlet control culvert formula*	*outlet overflow orifice formula*	*emergency overflow*	*Connecting to main line, max capacity, stepped, based on previous increments inflow*	*Combined outlets outflow*	*total volume out per increment, governed by minimum capacity*	*Sum of volume out*	*PWL+ V_{in}- Vout*	*in - out*	*Adjusted for outflow*
Time (min)	**Volume In**	**Cumulative Volume**	**Water Height Above Inlet**	**Weir Outflow**	**Orifice Overflow**	**Overflow Channel**	**pipe outflow**	**Max Outflow per Incre**	**Max Volume Out per Increme**	**Cumulative Volume Out**	**Total Dam Volume Incl PWL**	**Attenuated Volume**	**Actual Level**
5	10.090	10.09	0.00	0.0000	0.0000	0.0000	outflow only after initial inflow			0.0000	2166.65	10.09	56.60
10	10.090	20.18	0.00	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2176.74	20.18	56.60
15	10.090	30.27	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2186.83	30.27	56.60
20	10.090	40.36	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2196.92	40.36	56.60
25	10.090	50.45	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2207.01	50.45	56.60
30	10.090	60.54	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2217.10	60.54	56.60
35	10.090	70.63	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2227.19	70.63	56.60
40	10.090	80.72	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2237.28	80.72	56.60
45	10.090	90.81	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2247.37	90.81	56.60
50	10.090	100.90	0	0.0000	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2257.46	100.90	56.65
55	10.090	110.99	0.05	0.0206	0.0000	0.0000	0.0000	0.0000	0.000	0.000	2267.55	110.99	56.65
60	10.090	121.08	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2277.47	114.91	56.65
65	10.090	131.17	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2287.38	118.82	56.65
70	10.090	141.26	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2297.30	122.74	56.65
75	10.090	151.35	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2307.21	126.65	56.65
80	10.090	161.44	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2317.12	130.56	56.65
85	10.090	171.53	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2327.04	134.48	56.65
90	10.090	181.62	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2336.95	138.39	56.65
95	10.090	191.72	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2346.87	142.31	56.65
100	10.090	201.81	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2356.78	146.22	56.65
105	10.090	211.90	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2366.70	150.14	56.65
110	10.090	221.99	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2376.61	154.05	56.65
115	10.090	232.08	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2386.53	157.97	56.65
120	10.090	242.17	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2396.44	161.88	56.65
125	10.090	252.26	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2406.35	165.79	56.65
130	10.090	262.35	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2416.27	169.71	56.65
135	10.090	272.44	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2426.18	173.62	56.65
140	10.090	282.53	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2436.10	177.54	56.65
145	10.090	292.62	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2446.01	181.45	56.65
150	10.090	302.71	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2455.93	185.37	56.65
155	10.090	312.80	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2465.84	189.28	56.70
160	10.090	322.89	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2475.76	193.20	56.70
165	10.090	332.98	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2485.67	185.82	56.65
170	10.090	343.07	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2495.59	178.44	56.65
175	10.090	353.16	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2505.50	182.35	56.65
180	10.090	363.25	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2515.42	186.27	56.70
185	10.090	373.34	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2525.33	190.18	56.70
190	10.090	383.43	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2535.25	182.81	56.65
195	10.090	393.52	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2545.16	175.43	56.65
200	10.090	403.61	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2555.08	179.34	56.65
205	10.090	413.70	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2564.99	183.26	56.65
210	10.090	423.79	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2574.91	187.17	56.70
215	10.090	433.88	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2584.82	191.09	56.70
220	10.090	443.97	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2594.74	183.71	56.65
225	10.090	454.06	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2604.65	176.33	56.65
230	10.090	464.15	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2614.57	180.24	56.65
235	10.090	474.24	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2624.48	184.16	56.65
240	10.090	484.33	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2634.40	188.07	56.70
245	10.090	494.42	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2644.31	191.99	56.70
250	10.090	504.51	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2654.23	184.61	56.65
255	10.090	514.60	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2664.14	177.23	56.65
260	10.090	524.69	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2674.06	181.15	56.65
265	10.090	534.78	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2683.97	185.06	56.65
270	10.090	544.87	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2693.89	188.98	56.70
275	10.090	554.96	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2703.80	192.89	56.70
280	10.090	565.05	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2713.72	185.51	56.65
285	10.090	575.15	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2723.63	178.13	56.65
290	10.090	585.24	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2733.55	182.05	56.65
295	10.090	595.33	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2743.46	185.96	56.65
300	10.090	605.42	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2753.38	189.88	56.70
305	10.090	615.51	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2763.29	193.79	56.70
310	10.090	625.60	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2773.21	186.41	56.70
315	10.090	635.69	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2783.12	179.04	56.65
320	10.090	645.78	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2793.04	171.66	56.65
325	10.090	655.87	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2802.95	175.57	56.65
330	10.090	665.96	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2812.87	179.49	56.65
335	10.090	676.05	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2822.78	183.40	56.65
340	10.090	686.14	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2832.70	187.32	56.70
345	10.090	696.23	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2842.61	191.23	56.70
350	10.090	706.32	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2852.53	183.85	56.65
355	10.090	716.41	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2862.44	176.48	56.65
360	10.090	726.50	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2872.36	180.39	56.65
365	10.090	736.59	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2882.27	184.30	56.65
370	10.090	746.68	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2892.19	188.22	56.70
375	10.090	756.77	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2902.10	192.13	56.70
380	10.090	766.86	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2912.02	184.76	56.65
385	10.090	776.95	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2921.93	177.38	56.65
390	10.090	787.04	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2931.85	181.29	56.65
395	10.090	797.13	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2941.77	185.21	56.65
400	10.090	807.22	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2951.68	189.12	56.70
405	10.090	817.31	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2961.60	193.04	56.70
410	10.090	827.40	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2971.51	185.66	56.65
415	10.090	837.49	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	2981.43	178.28	56.65
420	10.090	847.58	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2991.34	182.19	56.65
425	10.090	857.67	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3001.26	186.11	56.70
430	10.090	867.76	0.1	0.0582	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3011.17	190.02	56.70
435	10.090	877.85	0.1	0.0582	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3021.09	182.65	56.65
440	10.090	887.94	0.05	0.0206	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3031.00	175.27	56.65
445	10.090	898.03	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3040.92	179.18	56.65
450	10.090	908.12	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3050.83	183.10	56.65
455	10.090	918.21	0.05	0.0206	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3060.75	187.01	56.65
460	10.090	928.30	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3070.66	190.93	56.70
465	10.090	938.39	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3080.58	183.55	56.65
470	10.090	948.48	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3090.49	176.17	56.65
475	10.090	958.58	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3100.41	180.08	56.65
480	10.090	968.67	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3110.32	184.00	56.65
485	10.090	978.76	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3120.24	187.91	56.70
490	10.090	988.85	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3130.15	191.83	56.70
495	10.090	998.94	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3140.07	184.45	56.65
500	10.090	1009.03	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3149.98	177.07	56.65
505	10.090	1019.12	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3159.90	180.99	56.65
510	10.090	1029.21	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3169.81	184.90	56.65
515	10.090	1039.30	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3179.73	188.82	56.70
520	10.090	1049.39	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3189.64	192.73	56.70
525	10.090	1059.48	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3199.56	185.35	56.65
530	10.090	1069.57	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3209.47	177.97	56.65
535	10.090	1079.66	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3219.39	181.89	56.65
540	10.090	1089.75	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3229.30	185.80	56.65
545	10.090	1099.84	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3239.22	189.72	56.70
550	10.090	1109.93	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3249.13	193.63	56.70
555	10.090	1120.02	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3259.05	186.25	56.70
560	10.090	1130.11	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3268.96	178.88	56.65
565	10.090	1140.20	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3278.88	171.50	56.65
570	10.090	1150.29	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3288.79	175.41	56.65
575	10.090	1160.38	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3298.71	179.33	56.65
580	10.090	1170.47	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3308.62	183.24	56.65
585	10.090	1180.56	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3318.54	187.16	56.70
590	10.090	1190.65	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3328.45	191.07	56.70
595	10.090	1200.74	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3338.37	183.69	56.65
600	10.090	1210.83	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3348.28	176.32	56.65
605	10.090	1220.92	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3358.20	180.23	56.65
610	10.090	1231.01	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3368.11	184.14	56.65
615	10.090	1241.10	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3378.03	188.06	56.70
620	10.090	1251.19	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3387.94	191.97	56.70
625	10.090	1261.28	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3397.86	184.60	56.65
630	10.090	1271.37	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3407.77	177.22	56.65
635	10.090	1281.46	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3417.69	181.13	56.65
640	10.090	1291.55	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3427.60	185.05	56.65
645	10.090	1301.64	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3437.52	188.96	56.70
650	10.090	1311.73	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3447.43	192.87	56.70
655	10.090	1321.82	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3457.35	185.50	56.65
660	10.090	1331.92	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3467.26	178.12	56.65
665	10.090	1342.01	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3477.18	182.03	56.65
670	10.090	1352.10	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3487.09	185.95	56.65
675	10.090	1362.19	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3497.01	189.86	56.70
680	10.090	1372.28	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3506.92	193.78	56.70
685	10.090	1382.37	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3516.84	186.40	56.70
690	10.090	1392.46	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3526.75	179.02	56.65
695	10.090	1402.55	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3536.67	171.64	56.65
700	10.090	1412.64	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3546.58	175.56	56.65
705	10.090	1422.73	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3556.50	179.47	56.65
710	10.090	1432.82	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3566.41	183.39	56.65
715	10.090	1442.91	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3576.33	187.30	56.65
720	10.090	1453.00	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3586.24	191.22	56.70
725	10.090	1463.09	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3596.16	183.84	56.65
730	10.090	1473.18	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3606.07	176.46	56.65
735	10.090	1483.27	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3615.99	180.38	56.65
740	10.090	1493.36	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3625.90	184.29	56.65
745	10.090	1503.45	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3635.82	188.20	56.70
750	10.090	1513.54	0.1	0.0582265	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3645.73	192.12	56.70
755	10.090	1523.63	0.1	0.0582265	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3655.65	184.74	56.65
760	10.090	1533.72	0.05	0.0206862	0.0000	0.0000	0.0000	0.0582	0.0582	17.468	3665.56	177.36	56.65
765	10.090	1543.81	0.05	0.0206862	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	3675.48	181.28	56.65

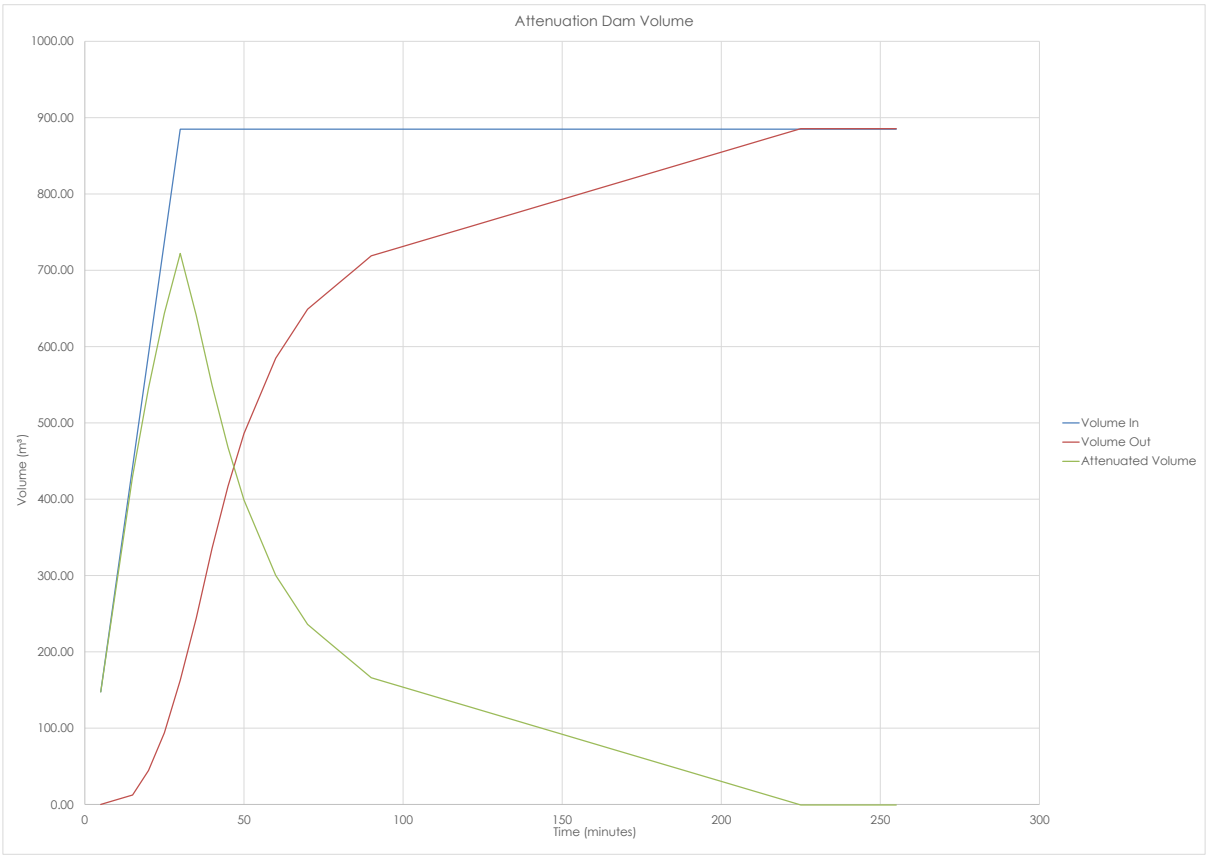
770	10.090	1553.90	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1368.709304	2341.75	185.19	56.65
775	10.090	1563.99	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1374.885167	2345.67	189.11	56.70
780	10.090	1574.08	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1381.06103	2349.58	193.02	56.70
785	10.090	1584.17	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1398.529007	2342.20	185.64	56.65
790	10.090	1594.26	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1415.996985	2334.82	178.26	56.65
795	10.090	1604.35	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1422.172848	2338.74	182.18	56.65
800	10.090	1614.44	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1428.348871	2342.65	186.09	56.65
805	10.090	1624.53	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1434.524573	2346.57	190.01	56.70
810	10.090	1634.62	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1451.99255	2339.19	182.63	56.65
815	10.090	1644.71	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1469.460528	2331.81	175.25	56.65
820	10.090	1654.80	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1475.636391	2335.73	179.17	56.65
825	10.090	1664.89	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1481.812253	2339.64	183.08	56.65
830	10.090	1674.98	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1487.988116	2343.56	187.00	56.70
835	10.090	1685.07	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1494.163979	2347.47	190.91	56.70
840	10.090	1695.16	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1511.631956	2340.09	183.53	56.65
845	10.090	1705.25	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1529.099934	2332.71	176.15	56.65
850	10.090	1715.35	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1535.275797	2336.63	180.07	56.65
855	10.090	1725.44	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1541.451659	2340.54	183.98	56.65
860	10.090	1735.53	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1547.627522	2344.46	187.90	56.70
865	10.090	1745.62	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1553.803385	2348.37	191.81	56.70
870	10.090	1755.71	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1571.271362	2340.99	184.43	56.65
875	10.090	1765.80	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1588.73934	2333.62	177.06	56.65
880	10.090	1775.89	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1594.915202	2337.53	180.97	56.65
885	10.090	1785.98	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1601.091065	2341.45	184.89	56.65
890	10.090	1796.07	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1607.266928	2345.36	188.80	56.70
895	10.090	1806.16	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1613.442791	2349.27	192.71	56.70
900	10.090	1816.25	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1630.910768	2341.90	185.34	56.65
905	10.090	1826.34	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1648.378746	2334.52	177.96	56.65
910	10.090	1836.43	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1654.554608	2338.43	181.87	56.65
915	10.090	1846.52	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1660.730471	2342.35	185.79	56.65
920	10.090	1856.61	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1666.906334	2346.26	189.70	56.70
925	10.090	1866.70	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1673.082196	2350.18	193.62	56.70
930	10.090	1876.79	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1690.550174	2342.80	186.24	56.70
935	10.090	1886.88	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1708.018152	2335.42	178.86	56.65
940	10.090	1896.97	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1725.486129	2328.04	171.48	56.65
945	10.090	1907.06	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1731.661992	2331.96	175.40	56.65
950	10.090	1917.15	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1737.837855	2335.87	179.31	56.65
955	10.090	1927.24	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1744.013717	2339.79	183.23	56.65
960	10.090	1937.33	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1750.18958	2343.70	187.14	56.70
965	10.090	1947.42	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1756.365443	2347.62	191.06	56.70
970	10.090	1957.51	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1773.83342	2340.24	183.68	56.65
975	10.090	1967.60	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1791.301398	2332.86	176.30	56.65
980	10.090	1977.69	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1797.47726	2336.77	180.21	56.65
985	10.090	1987.78	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1803.653123	2340.69	184.13	56.65
990	10.090	1997.87	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1809.828986	2344.60	188.04	56.70
995	10.090	2007.96	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1816.004848	2348.52	191.96	56.70
1000	10.090	2018.05	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1833.472826	2341.14	184.58	56.65
1005	10.090	2028.14	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1850.940804	2333.76	177.20	56.65
1010	10.090	2038.23	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1857.116666	2337.68	181.12	56.65
1015	10.090	2048.32	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1863.292529	2341.59	185.03	56.65
1020	10.090	2058.41	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1869.468392	2345.51	188.95	56.70
1025	10.090	2068.50	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1875.644254	2349.42	192.86	56.70
1030	10.090	2078.59	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1893.112232	2342.04	185.48	56.65
1035	10.090	2088.68	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1910.580209	2334.66	178.10	56.65
1040	10.090	2098.78	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1916.756072	2338.58	182.02	56.65
1045	10.090	2108.87	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1922.931935	2342.49	185.93	56.65
1050	10.090	2118.96	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1929.107798	2346.41	189.85	56.70
1055	10.090	2129.05	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	1935.28366	2350.32	193.76	56.70
1060	10.090	2139.14	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1952.751638	2342.94	186.38	56.70
1065	10.090	2149.23	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	1970.219615	2335.57	179.01	56.65
1070	10.090	2159.32	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	1987.687593	2328.19	171.63	56.65
1075	10.090	2169.41	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	1993.863456	2332.10	175.54	56.65
1080	10.090	2179.50	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2000.039318	2336.02	179.46	56.65
1085	10.090	2189.59	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2006.215181	2339.93	183.37	56.65
1090	10.090	2199.68	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2012.391044	2343.85	187.29	56.70
1095	10.090	2209.77	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2018.566906	2347.76	191.20	56.70
1100	10.090	2219.86	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2036.034884	2340.38	183.82	56.65
1105	10.090	2229.95	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2053.502862	2333.01	176.45	56.65
1110	10.090	2240.04	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2059.678724	2336.92	180.36	56.65
1115	10.090	2250.13	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2065.854587	2340.83	184.27	56.65
1120	10.090	2260.22	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2072.03045	2344.75	188.19	56.70
1125	10.090	2270.31	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2078.206312	2348.66	192.10	56.70
1130	10.090	2280.40	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2095.67429	2341.29	184.73	56.65
1135	10.090	2290.49	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2113.142267	2333.91	177.35	56.65
1140	10.090	2300.58	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2119.31813	2337.82	181.26	56.65
1145	10.090	2310.67	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2125.493993	2341.74	185.18	56.65
1150	10.090	2320.76	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2131.669855	2345.65	189.09	56.70
1155	10.090	2330.85	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2137.845718	2349.57	193.01	56.70
1160	10.090	2340.94	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2155.313696	2342.19	185.63	56.65
1165	10.090	2351.03	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2172.781673	2334.81	178.25	56.65
1170	10.090	2361.12	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2178.957536	2338.72	182.16	56.65
1175	10.090	2371.21	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2185.133399	2342.64	186.08	56.70
1180	10.090	2381.30	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2191.309261	2346.55	189.99	56.70
1185	10.090	2391.39	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2208.777239	2339.18	182.62	56.65
1190	10.090	2401.48	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2226.245216	2331.80	175.24	56.65
1195	10.090	2411.57	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2232.421079	2335.71	179.15	56.65
1200	10.090	2421.66	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2238.596942	2339.63	183.07	56.65
1205	10.090	2431.75	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2244.772805	2343.54	186.98	56.70
1210	10.090	2441.84	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2250.948667	2347.46	190.90	56.70
1215	10.090	2451.93	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2268.416645	2340.08	183.52	56.65
1220	10.090	2462.02	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2285.884622	2332.70	176.14	56.65
1225	10.090	2472.12	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2292.060485	2336.61	180.05	56.65
1230	10.090	2482.21	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2298.236348	2340.53	183.97	56.65
1235	10.090	2492.30	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2304.41221	2344.44	187.88	56.70
1240	10.090	2502.39	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2310.588073	2348.36	191.80	56.70
1245	10.090	2512.48	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2328.056051	2340.98	184.42	56.65
1250	10.090	2522.57	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2345.524028	2333.60	177.04	56.65
1255	10.090	2532.66	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2351.699891	2337.52	180.96	56.65
1260	10.090	2542.75	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2357.875754	2341.43	184.87	56.65
1265	10.090	2552.84	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2364.051616	2345.35	188.79	56.70
1270	10.090	2562.93	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2370.227479	2349.26	192.70	56.70
1275	10.090	2573.02	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2387.695457	2341.88	185.32	56.65
1280	10.090	2583.11	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2405.163434	2334.50	177.94	56.65
1285	10.090	2593.20	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2411.339297	2338.42	181.86	56.65
1290	10.090	2603.29	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2417.51516	2342.33	185.77	56.65
1295	10.090	2613.38	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2423.691022	2346.25	189.69	56.70
1300	10.090	2623.47	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2429.866885	2350.16	193.60	56.70
1305	10.090	2633.56	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2447.334862	2342.78	186.22	56.70
1310	10.090	2643.65	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2464.80284	2335.41	178.85	56.65
1315	10.090	2653.74	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2482.270818	2328.03	171.47	56.65
1320	10.090	2663.83	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2488.44668	2331.94	175.38	56.65
1325	10.090	2673.92	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2494.622543	2335.86	179.30	56.65
1330	10.090	2684.01	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2500.798406	2339.77	183.21	56.65
1335	10.090	2694.10	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2506.974268	2343.69	187.13	56.70
1340	10.090	2704.19	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2513.150131	2347.60	191.04	56.70
1345	10.090	2714.28	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2530.618109	2340.22	183.66	56.65
1350	10.090	2724.37	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2548.086086	2332.85	176.29	56.65
1355	10.090	2734.46	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2554.261949	2336.76	180.20	56.65
1360	10.090	2744.55	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2560.437812	2340.67	184.11	56.65
1365	10.090	2754.64	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2566.613674	2344.59	188.03	56.70
1370	10.090	2764.73	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2572.789537	2348.50	191.94	56.70
1375	10.090	2774.82	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2590.257515	2341.13	184.57	56.65
1380	10.090	2784.91	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2607.725492	2333.75	177.19	56.65
1385	10.090	2795.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2613.901355	2337.66	181.10	56.65
1390	10.090	2805.09	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2620.077217	2341.58	185.02	56.65
1395	10.090	2815.18	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2626.25308	2345.49	188.93	56.70
1400	10.090	2825.27	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2632.428943	2349.41	192.85	56.70
1405	10.090	2835.36	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2649.89692	2342.03	185.47	56.65
1410	10.090	2845.45	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2667.364898	2334.65	178.09	56.65
1415	10.090	2855.55	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2673.540761	2338.56	182.00	56.65
1420	10.090	2865.64	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2679.716623	2342.48	185.92	56.65
1425	10.090	2875.73	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2685.892486	2346.39	189.83	56.70
1430	10.090	2885.82	0.1	0.058226592	0.0000	0.0000	0.0206	0.0206	6.176	2692.068349	2350.31	193.75	56.70
1435	10.090	2895.91	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2709.536326	2342.93	186.37	56.70
1440	10.090	2906.00	0.1	0.058226592	0.0000	0.0000	0.0582	0.0582	17.468	2727.004304	2335.55	178.99	56.65
1445	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0582	0.0582	17.468	2744.472281	2318.08	161.52	56.65
1450	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2750.648144	2311.91	155.35	56.65
1455	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2756.824007	2305.73	149.17	56.65
1460	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2762.999869	2299.56	143.00	56.65
1465	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2769.175732	2293.38	136.82	56.65
1470	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2775.351595	2287.20	130.64	56.65
1475	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2781.527458	2281.03	124.47	56.65
1480	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2787.70332	2274.85	118.29	56.65
1485	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2793.879183	2268.68	112.12	56.65
1490	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2800.055046	2262.50	105.94	56.65
1495	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2806.230908	2256.33	99.77	56.65
1500	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2812.406771	2250.15	93.59	56.65
1505	0.000	2906.00	0.05	0.020586209	0.0000	0.0000	0.0206	0.0206	6.176	2818.582634	2243.97	87.41	56.60
1510	0.000	2906.00	0	0	0.0000	0.0000	0.0206	0.0206	6.176	2824.758496	2237.80	81.24	56.60
1515	0.000	2906.00	0	0	0.0000	0.0000	0.0206	0.0206	6.176	2830.934359	2231.62	75.06	56.60
1520	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2837.110222	2225.45	68.89	56.60
1525	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2843.286084	2219.27	62.71	56.60
1530	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2849.461947	2213.09	56.53	56.60
1535	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2855.63781	2206.92	50.36	56.60
1540	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2861.813673	2200.74	44.18	56.60
1545	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2867.989535	2194.57	38.01	56.60
1550	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2874.165398	2188.39	31.83	56.60
1555	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2880.341261	2182.22	25.66	56.60
1560	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2886.517123	2176.04	19.48	56.60
1565	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2892.692986	2169.86	13.30	56.60
1570	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2898.868849	2163.69	7.13	56.60
1575	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2905.044711	2157.51	0.95	56.60
1580	0.000	2906.00	0	0	0.0000	0.0000	0.0000	0.0206	6.176	2911.220574	2151.34	-5.22	56.55


Attenuation Dam Volume
3500.00
3000.00
2500.00
2000.00
1500.00
1000.00
500.00
0.00
Volume (m³)
0
200
400
600
800
1000
1200
1400
1600
1800
Time (minutes)
Volume In
Volume Out
Attenuated Volume

22093 BELCON DEVELOPMENT **2023/10/10**

ATTENUATION FACILITY FLOW MODELLING: 1:2 YEAR PEAK STORM EVENT

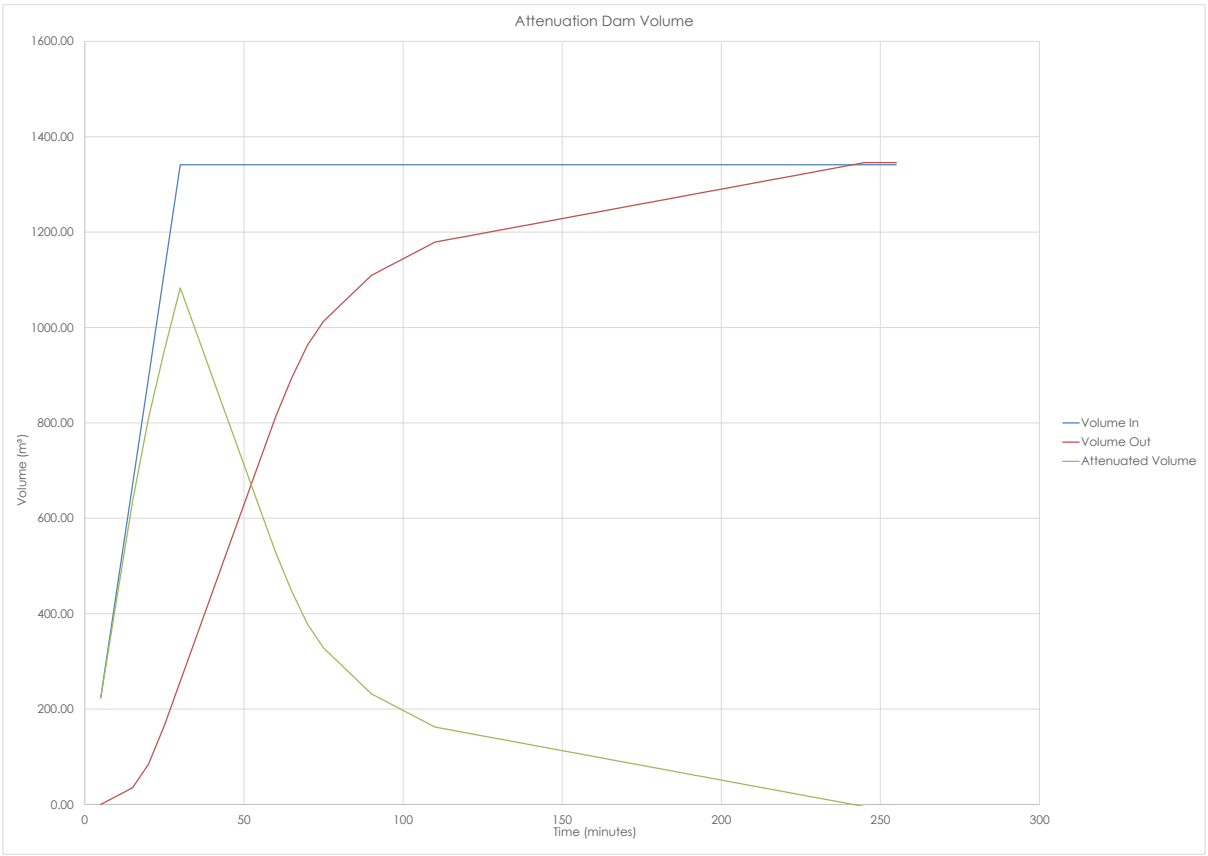
	*V = Q*time increment*	*sum of inflow*	*water height of balance of flow*	*outlet control culvert formula*	*outlet overflow orifice formula*	*emergency overflow*	*Connecting to main line, max capacity, stepped, based on previous increments inflow*	*Combined outlets outflow*	*total volume out per increment, governed by minimum capacity*	*Sum of volume out*	*PWL+ V_{in}- Vout*	*in - out*	*Adjusted for outflow*
Time (min)	**Volume In**	**Cumulative Volume**	**Water Height Above Inlet**	**Weir Outflow**	**Orifice Overflow**	**Overflow Channel**	**pipe outflow**	**Max Outflow per Incre**	**Max Volume Out per increme**	**Cumulative Volume Out**	**Total Dam Volume Incl PWL**	**Attenuated Volume**	**Actual Level**
5	147.483	147.48	0.05	0.0206	0.0000	0.0000	outflow only after initial inflow			0.0000	2304.04	147.48	56.65
10	147.483	294.97	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	6.176	2445.35	288.79	56.75
15	147.483	442.45	0.15	0.1070	0.0000	0.0000	0.0206	0.0206	6.176	12.352	2586.66	430.10	56.80
20	147.483	589.93	0.2	0.1647	0.0000	0.0000	0.1070	0.1070	32.091	44.442	2702.05	545.49	56.85
25	147.483	737.41	0.25	0.2300	0.0000	0.0000	0.1647	0.1647	49.407	93.849	2800.12	643.56	56.90
30	147.483	884.90	0.3	0.2706	0.0000	0.0000	0.2300	0.2300	68.993	162.842	2878.61	722.05	56.95
35	0.000	884.90	0.35	0.3059	0.0000	0.0000	0.2706	0.2706	81.184	244.026	2797.43	640.87	56.90
40	0.000	884.90	0.3	0.2706	0.0000	0.0000	0.3059	0.3059	91.769	335.795	2705.66	549.10	56.85
45	0.000	884.90	0.25	0.2300	0.0000	0.0000	0.2706	0.2706	81.184	416.979	2624.48	467.92	56.80
50	0.000	884.90	0.2	0.1647	0.0000	0.0000	0.2300	0.2300	68.993	485.972	2555.48	398.92	56.80
55	0.000	884.90	0.2	0.1647	0.0000	0.0000	0.1647	0.1647	49.407	535.379	2506.08	349.52	56.75
60	0.000	884.90	0.15	0.1070	0.0000	0.0000	0.1647	0.1647	49.407	584.786	2456.67	300.11	56.75
65	0.000	884.90	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	616.877	2424.58	268.02	56.70
70	0.000	884.90	0.1	0.0582	0.0000	0.0000	0.1070	0.1070	32.091	648.967	2392.49	235.93	56.70
75	0.000	884.90	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	666.435	2375.02	218.46	56.70
80	0.000	884.90	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	683.903	2357.55	200.99	56.70
85	0.000	884.90	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	701.371	2340.08	183.52	56.65
90	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0582	0.0582	17.468	718.839	2322.62	166.06	56.65
95	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	725.015	2316.44	159.88	56.65
100	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	731.191	2310.26	153.70	56.65
105	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	737.367	2304.09	147.53	56.65
110	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	743.543	2297.91	141.35	56.65
115	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	749.719	2291.74	135.18	56.65
120	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	755.895	2285.56	129.00	56.65
125	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	762.070	2279.39	122.83	56.65
130	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	768.246	2273.21	116.65	56.65
135	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	774.422	2267.03	110.47	56.65
140	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	780.598	2260.86	104.30	56.65
145	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	786.774	2254.68	98.12	56.65
150	0.000	884.90	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	792.950	2248.51	91.95	56.60
155	0.000	884.90	0	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	799.126	2242.33	85.77	56.60
160	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	805.301	2236.15	79.59	56.60
165	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	811.477	2229.98	73.42	56.60
170	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	817.653	2223.80	67.24	56.60
175	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	823.829	2217.63	61.07	56.60
180	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	830.005	2211.45	54.89	56.60
185	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	836.181	2205.27	48.71	56.60
190	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	842.357	2199.10	42.54	56.60
195	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	848.532	2192.92	36.36	56.60
200	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	854.708	2186.75	30.19	56.60
205	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	860.884	2180.57	24.01	56.60
210	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	867.060	2174.40	17.84	56.60
215	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	873.236	2168.22	11.66	56.60
220	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	879.412	2162.04	5.48	56.60
225	0.000	884.90	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	885.588	2155.87	-0.69	56.55
230	0.000	884.90	-0.05	#NUM!	0.0000	0.0000	0.0000	0.0000	0.000	885.588	2155.87	-0.69	56.55
235	0.000	884.90	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	885.588	2155.87	-0.69	56.55
240	0.000	884.90	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	885.588	2155.87	-0.69	56.55
245	0.000	884.90	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	885.588	2155.87	-0.69	56.55



22093 BELCON DEVELOPMENT **2023/10/10**

ATTENUATION FACILITY FLOW MODELLING: 1:5 YEAR PEAK STORM EVENT

	*V = Q*time increment*	*sum of inflow*	*water height of balance of flow*	*outlet control culvert formula*	*outlet overflow orifice formula*	*emergency overflow*	*Connecting to main line, max capacity, stepped, based on previous increments inflow*	*Combined outlets outflow*	*total volume out per increment, governed by minimum capacity*	*Sum of volume out*	*PWL+ V_{in}- Vout*	*in - out*	*Adjusted for outflow*
Time (min)	**Volume In**	**Cumulative Volume**	**Water Height Above Inlet**	**Weir Outflow**	**Orifice Overflow**	**Overflow Channel**	**pipe outflow**	**Max Outflow per Incre**	**Max Volume Out per Increme**	**Cumulative Volume Out**	**Total Dam Volume Incl PWL**	**Attenuated Volume**	**Actual Level**
5	223.546	223.55	0.10	0.0582	0.0000	0.0000	outflow only after initial inflow			0.0000	2380.11	223.55	56.70
10	223.546	447.09	0.10	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	17.468	2586.18	429.62	56.80
15	223.546	670.64	0.2	0.1647	0.0000	0.0000	0.0582	0.0582	17.468	34.936	2792.26	635.70	56.90
20	223.546	894.18	0.3	0.2706	0.0000	0.0000	0.1647	0.1647	49.407	84.343	2966.40	809.84	57.00
25	223.546	1117.73	0.4	0.3375	0.0000	0.0000	0.2706	0.2706	81.184	165.527	3108.76	952.20	57.05
30	223.546	1341.28	0.45	0.3664	0.0000	0.0000	0.3089	0.3089	92.659	258.186	3239.65	1083.09	57.10
35	0.000	1341.28	0.5	0.3932	0.0000	0.0000	0.3089	0.3089	92.659	350.846	3146.99	990.43	57.05
40	0.000	1341.28	0.45	0.3664	0.0000	0.0000	0.3089	0.3089	92.659	443.505	3054.33	897.77	57.05
45	0.000	1341.28	0.45	0.3664	0.0000	0.0000	0.3089	0.3089	92.659	536.165	2961.67	805.11	57.00
50	0.000	1341.28	0.4	0.3375	0.0000	0.0000	0.3089	0.3089	92.659	628.824	2869.01	712.45	56.95
55	0.000	1341.28	0.35	0.3059	0.0000	0.0000	0.3089	0.3089	92.659	721.484	2776.35	619.79	56.90
60	0.000	1341.28	0.3	0.2706	0.0000	0.0000	0.3059	0.3059	91.769	813.253	2684.58	528.02	56.85
65	0.000	1341.28	0.25	0.2300	0.0000	0.0000	0.2706	0.2706	81.184	894.437	2603.40	446.84	56.80
70	0.000	1341.28	0.2	0.1647	0.0000	0.0000	0.2300	0.2300	68.993	963.430	2534.41	377.85	56.75
75	0.000	1341.28	0.15	0.1070	0.0000	0.0000	0.1647	0.1647	49.407	1012.837	2485.00	328.44	56.75
80	0.000	1341.28	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	1044.927	2452.91	296.35	56.75
85	0.000	1341.28	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	1077.018	2420.82	264.26	56.70
90	0.000	1341.28	0.1	0.0582	0.0000	0.0000	0.1070	0.1070	32.091	1109.109	2388.73	232.17	56.70
95	0.000	1341.28	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1126.577	2371.26	214.70	56.70
100	0.000	1341.28	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1144.045	2353.79	197.23	56.70
105	0.000	1341.28	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1161.513	2336.32	179.76	56.65
110	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0582	0.0582	17.468	1178.981	2318.86	162.30	56.65
115	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1185.157	2312.68	156.12	56.65
120	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1191.332	2306.50	149.94	56.65
125	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1197.508	2300.33	143.77	56.65
130	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1203.684	2294.15	137.59	56.65
135	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1209.860	2287.98	131.42	56.65
140	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1216.036	2281.80	125.24	56.65
145	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1222.212	2275.62	119.06	56.65
150	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1228.388	2269.45	112.89	56.65
155	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1234.563	2263.27	106.71	56.65
160	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1240.739	2257.10	100.54	56.65
165	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1246.915	2250.92	94.36	56.65
170	0.000	1341.28	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1253.091	2244.74	88.18	56.60
175	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	1259.267	2238.57	82.01	56.60
180	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1265.443	2232.39	75.83	56.60
185	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1271.619	2226.22	69.66	56.60
190	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1277.794	2220.04	63.48	56.60
195	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1283.970	2213.87	57.31	56.60
200	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1290.146	2207.69	51.13	56.60
205	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1296.322	2201.51	44.95	56.60
210	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1302.498	2195.34	38.78	56.60
215	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1308.674	2189.16	32.60	56.60
220	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1314.850	2182.99	26.43	56.60
225	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1321.026	2176.81	20.25	56.60
230	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1327.201	2170.63	14.07	56.60
235	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1333.377	2164.46	7.90	56.60
240	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1339.553	2158.28	1.72	56.60
245	0.000	1341.28	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1345.729	2152.11	-4.45	56.55

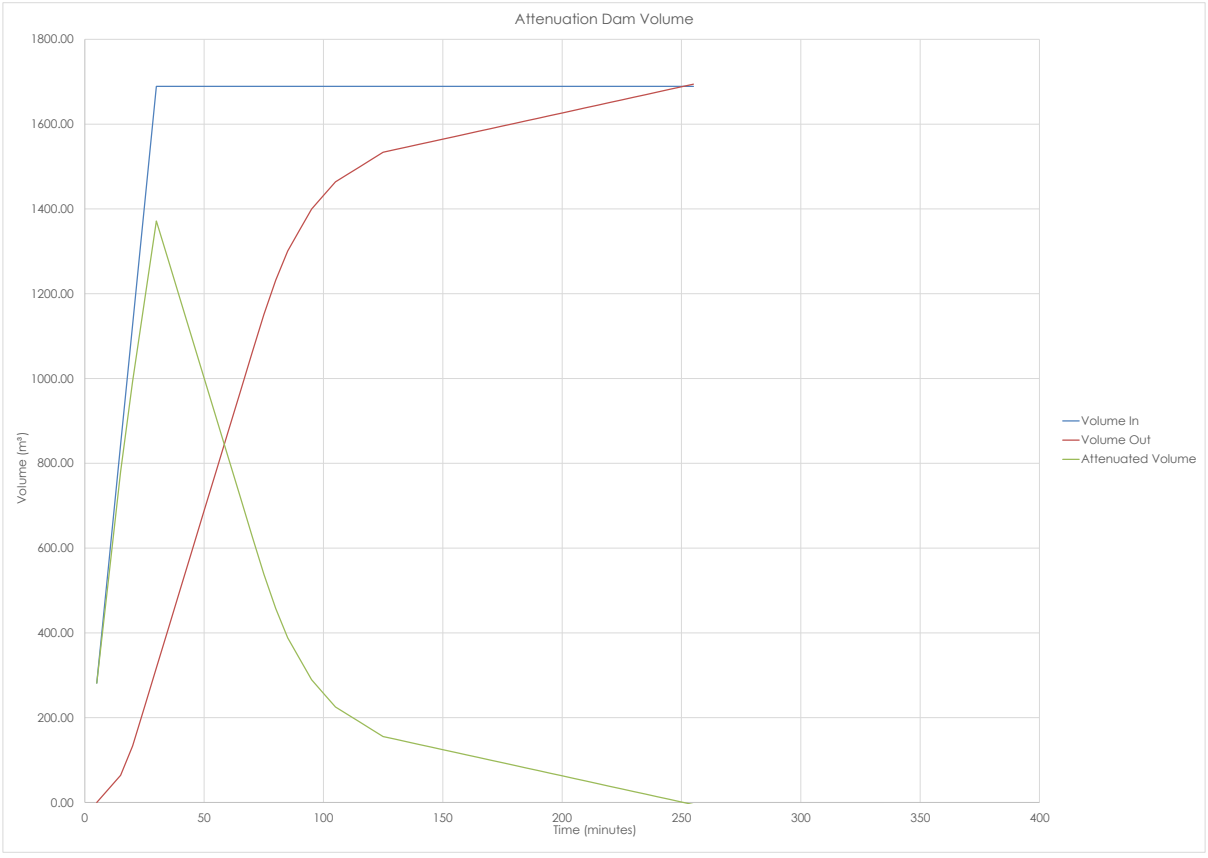


kls CONSULTING ENGINEERS
progress delivered

22093 BELCON DEVELOPMENT **2023/10/10**

ATTENUATION FACILITY FLOW MODELLING: 1:10 YEAR PEAK STORM EVENT

	*V = Q*time increment*	*sum of inflow*	*water height of balance of flow*	*outlet control culvert formula*	*outlet overflow orifice formula*	*emergency overflow*	*Connecting to main line, max capacity, stepped, based on previous increments inflow*	*Combined outlets outflow*	*total volume out per increment, governed by minimum capacity*	*Sum of volume out*	*PWL+ V_{in}- Vout*	*in - out*	*Adjusted for outflow*
Time (min)	**Volume In**	**Cumulative Volume**	**Water Height Above Inlet**	**Weir Outflow**	**Orifice Overflow**	**Overflow Channel**	**pipe outflow**	**Max Outflow per Incre**	**Max Volume Out per Increme**	**Cumulative Volume Out**	**Total Dam Volume Incl PWL**	**Attenuated Volume**	**Actual Level**
5	281.520	281.52	0.15	0.1070	0.0000	0.0000	outflow only after initial inflow			0.0000	2438.08	281.52	56.75
10	281.520	563.04	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	32.091	2687.51	530.95	56.85
15	281.520	844.56	0.25	0.2300	0.0000	0.0000	0.1070	0.1070	32.091	64.181	2936.94	780.38	56.95
20	281.520	1126.08	0.35	0.3059	0.0000	0.0000	0.2300	0.2300	68.993	133.174	3149.46	992.90	57.05
25	281.520	1407.60	0.45	0.3664	0.0000	0.0000	0.3059	0.3059	91.769	224.944	3339.21	1182.65	57.15
30	281.520	1689.12	0.55	0.4183	0.0000	0.0000	0.3089	0.3089	92.659	317.603	3528.07	1371.51	57.25
35	0.000	1689.12	0.65	0.4644	0.0000	0.0000	0.3089	0.3089	92.659	410.263	3435.41	1278.85	57.20
40	0.000	1689.12	0.6	0.4419	0.0000	0.0000	0.3089	0.3089	92.659	502.922	3342.75	1186.19	57.15
45	0.000	1689.12	0.55	0.4183	0.0000	0.0000	0.3089	0.3089	92.659	595.582	3250.10	1093.54	57.10
50	0.000	1689.12	0.5	0.3932	0.0000	0.0000	0.3089	0.3089	92.659	688.241	3157.44	1000.88	57.10
55	0.000	1689.12	0.5	0.3932	0.0000	0.0000	0.3089	0.3089	92.659	780.901	3064.78	908.22	57.05
60	0.000	1689.12	0.45	0.3664	0.0000	0.0000	0.3089	0.3089	92.659	873.560	2972.12	815.56	57.00
65	0.000	1689.12	0.4	0.3375	0.0000	0.0000	0.3089	0.3089	92.659	966.220	2879.46	722.90	56.95
70	0.000	1689.12	0.35	0.3059	0.0000	0.0000	0.3089	0.3089	92.659	1058.879	2786.80	630.24	56.90
75	0.000	1689.12	0.3	0.2706	0.0000	0.0000	0.3059	0.3059	91.769	1150.648	2695.03	538.47	56.85
80	0.000	1689.12	0.25	0.2300	0.0000	0.0000	0.2706	0.2706	81.184	1231.832	2613.84	457.28	56.80
85	0.000	1689.12	0.2	0.1647	0.0000	0.0000	0.2300	0.2300	68.993	1300.825	2544.85	388.29	56.80
90	0.000	1689.12	0.2	0.1647	0.0000	0.0000	0.1647	0.1647	49.407	1350.232	2495.44	338.88	56.75
95	0.000	1689.12	0.15	0.1070	0.0000	0.0000	0.1647	0.1647	49.407	1399.639	2446.04	289.48	56.75
100	0.000	1689.12	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	1431.730	2413.95	257.39	56.70
105	0.000	1689.12	0.1	0.0582	0.0000	0.0000	0.1070	0.1070	32.091	1463.820	2381.86	225.30	56.70
110	0.000	1689.12	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1481.288	2364.39	207.83	56.70
115	0.000	1689.12	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1498.756	2346.92	190.36	56.70
120	0.000	1689.12	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1516.224	2329.45	172.89	56.65
125	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0582	0.0582	17.468	1533.692	2311.98	155.42	56.65
130	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1539.868	2305.81	149.25	56.65
135	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1546.044	2299.63	143.07	56.65
140	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1552.220	2293.46	136.90	56.65
145	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1558.396	2287.28	130.72	56.65
150	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1564.572	2281.11	124.55	56.65
155	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1570.748	2274.93	118.37	56.65
160	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1576.923	2268.75	112.19	56.65
165	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1583.099	2262.58	106.02	56.65
170	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1589.275	2256.40	99.84	56.65
175	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1595.451	2250.23	93.67	56.65
180	0.000	1689.12	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1601.627	2244.05	87.49	56.60
185	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	1607.803	2237.87	81.31	56.60
190	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1613.979	2231.70	75.14	56.60
195	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1620.154	2225.52	68.96	56.60
200	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1626.330	2219.35	62.79	56.60
205	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1632.506	2213.17	56.61	56.60
210	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1638.682	2206.99	50.43	56.60
215	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1644.858	2200.82	44.26	56.60
220	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1651.034	2194.64	38.08	56.60
225	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1657.210	2188.47	31.91	56.60
230	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1663.385	2182.29	25.73	56.60
235	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1669.561	2176.12	19.56	56.60
240	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1675.737	2169.94	13.38	56.60
245	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1681.913	2163.76	7.20	56.60
250	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1688.089	2157.59	1.03	56.60
255	0.000	1689.12	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1694.265	2151.41	-5.15	56.55
260	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	0.0000	0.0000	0.000	1694.265	2151.41	-5.15	56.55
265	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
270	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
275	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
280	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
285	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
290	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
295	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
300	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
305	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
310	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
315	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
320	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
325	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55
330	0.000	1689.12	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	1694.265	2151.41	-5.15	56.55

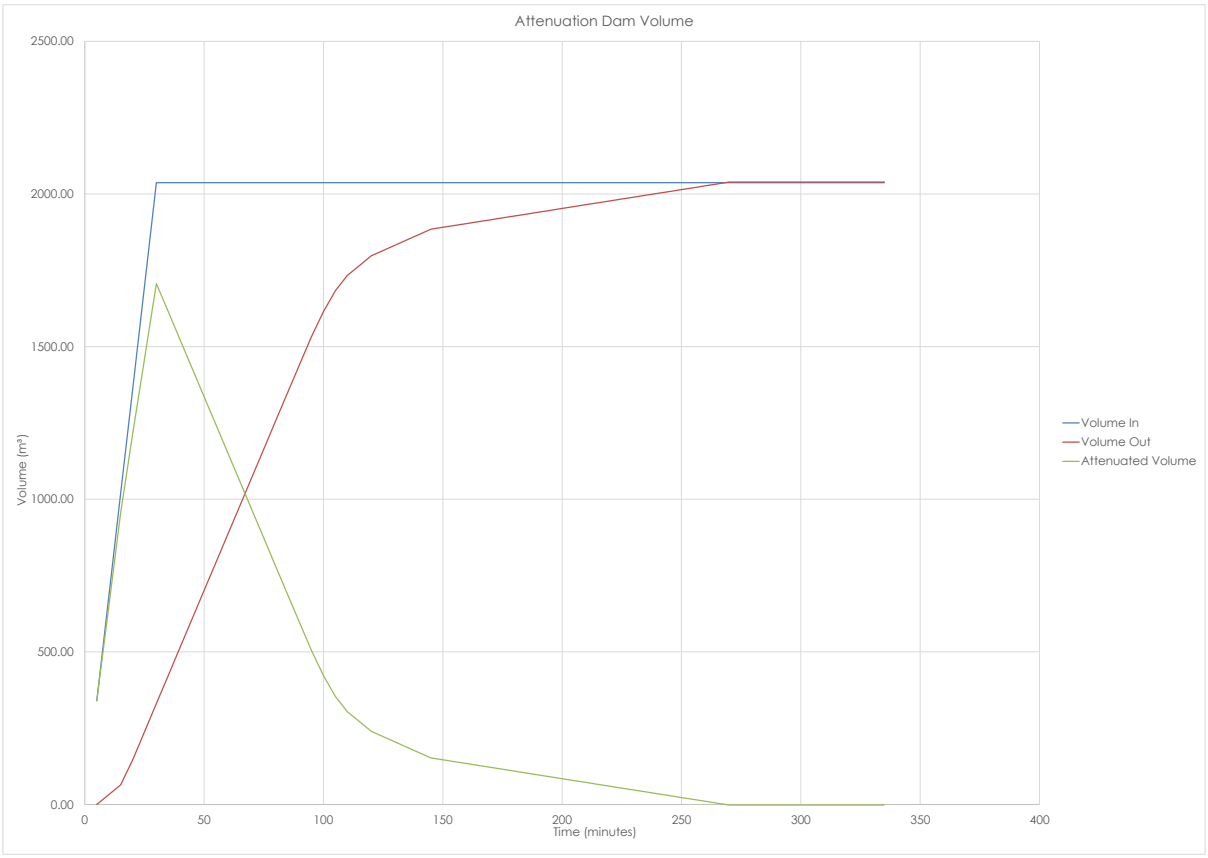


kls CONSULTING ENGINEERS
progress delivered

22093 BELCON DEVELOPMENT **2023/10/10**

ATTENUATION FACILITY FLOW MODELLING: 1:20 YEAR PEAK STORM EVENT

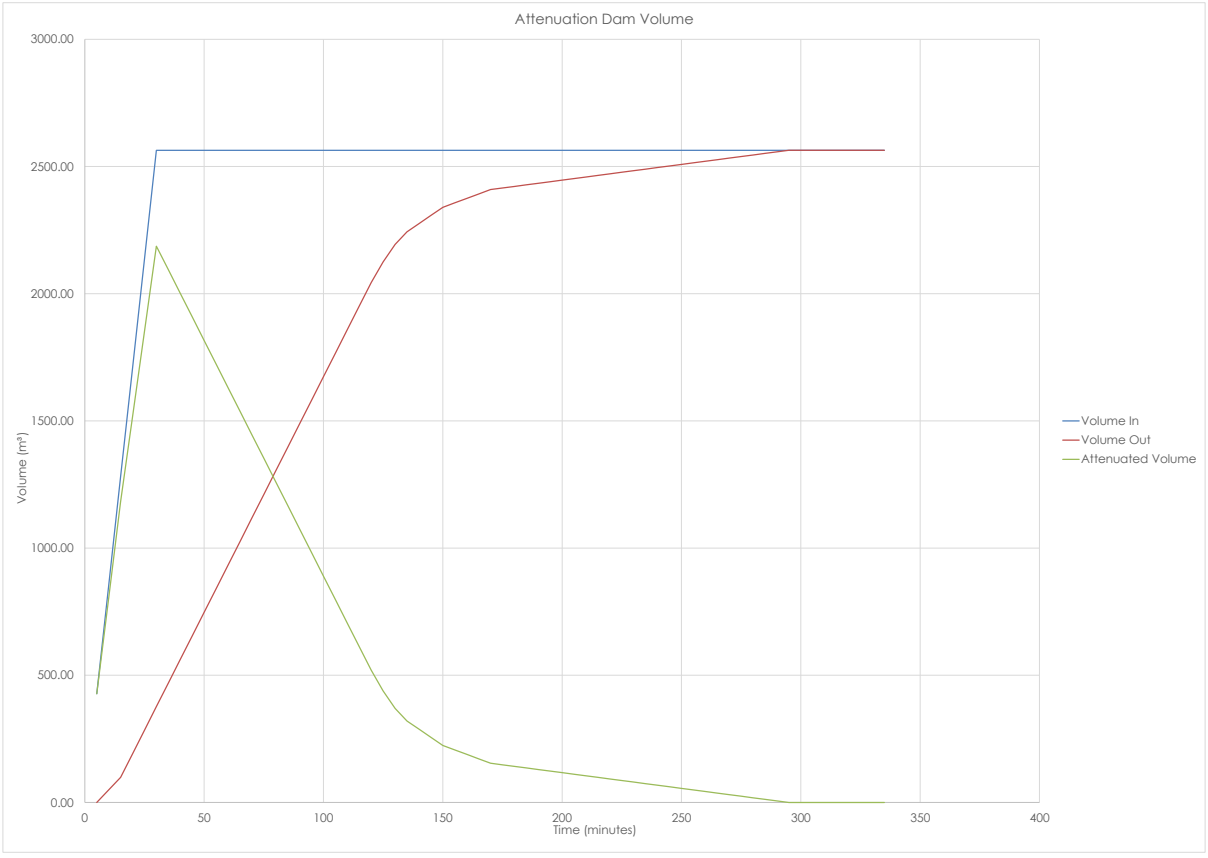
	*V = Q*time increment*	*sum of inflow*	*water height of balance of flow*	*outlet control culvert formula*	*outlet overflow orifice formula*	*emergency overflow*	*Connecting to main line, max capacity, stepped, based on previous increments inflow*	*Combined outlets outflow*	*total volume out per increment, governed by minimum capacity*	*Sum of volume out*	*PWL+ V_{in}- Vout*	*in - out*	*Adjusted for outflow*
Time (min)	**Volume In**	**Cumulative Volume**	**Water Height Above Inlet**	**Weir Outflow**	**Orifice Overflow**	**Overflow Channel**	**pipe outflow**	**Max Outflow per Incre**	**Max Volume Out per Increme**	**Cumulative Volume Out**	**Total Dam Volume Incl PWL**	**Attenuated Volume**	**Actual Level**
5	339.493	339.49	0.15	0.1070	0.0000	0.0000	outflow only after initial inflow			0.0000	2496.05	339.49	56.75
10	339.493	678.99	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	32.091	2803.46	646.90	56.90
15	339.493	1018.48	0.3	0.2706	0.0000	0.0000	0.1070	0.1070	32.091	64.181	3110.86	954.30	57.05
20	339.493	1357.97	0.45	0.3664	0.0000	0.0000	0.2706	0.2706	81.184	145.365	3369.17	1212.61	57.20
25	339.493	1697.47	0.6	0.4419	0.0000	0.0000	0.3089	0.3089	92.659	238.025	3616.00	1459.44	57.30
30	339.493	2036.96	0.7	0.4858	0.0000	0.0000	0.3089	0.3089	92.659	330.684	3862.83	1706.27	57.40
35	0.000	2036.96	0.8	0.5260	0.0000	0.0000	0.3089	0.3089	92.659	423.344	3770.17	1613.61	57.35
40	0.000	2036.96	0.75	0.5063	0.0000	0.0000	0.3089	0.3089	92.659	516.003	3677.51	1520.95	57.30
45	0.000	2036.96	0.7	0.4858	0.0000	0.0000	0.3089	0.3089	92.659	608.663	3584.86	1428.30	57.25
50	0.000	2036.96	0.65	0.4644	0.0000	0.0000	0.3089	0.3089	92.659	701.322	3492.20	1335.64	57.25
55	0.000	2036.96	0.65	0.4644	0.0000	0.0000	0.3089	0.3089	92.659	793.982	3399.54	1242.98	57.20
60	0.000	2036.96	0.6	0.4419	0.0000	0.0000	0.3089	0.3089	92.659	886.641	3306.88	1150.32	57.15
65	0.000	2036.96	0.55	0.4183	0.0000	0.0000	0.3089	0.3089	92.659	979.301	3214.22	1057.66	57.10
70	0.000	2036.96	0.5	0.3932	0.0000	0.0000	0.3089	0.3089	92.659	1071.960	3121.56	965.00	57.05
75	0.000	2036.96	0.45	0.3664	0.0000	0.0000	0.3089	0.3089	92.659	1164.620	3028.90	872.34	57.00
80	0.000	2036.96	0.4	0.3375	0.0000	0.0000	0.3089	0.3089	92.659	1257.279	2936.24	779.68	56.95
85	0.000	2036.96	0.35	0.3059	0.0000	0.0000	0.3089	0.3089	92.659	1349.939	2843.58	687.02	56.95
90	0.000	2036.96	0.35	0.3059	0.0000	0.0000	0.3059	0.3059	91.769	1441.708	2751.81	595.25	56.90
95	0.000	2036.96	0.3	0.2706	0.0000	0.0000	0.3059	0.3059	91.769	1533.477	2660.04	503.48	56.85
100	0.000	2036.96	0.25	0.2300	0.0000	0.0000	0.2706	0.2706	81.184	1614.661	2578.86	422.30	56.80
105	0.000	2036.96	0.2	0.1647	0.0000	0.0000	0.2300	0.2300	68.993	1683.654	2509.86	353.30	56.75
110	0.000	2036.96	0.15	0.1070	0.0000	0.0000	0.1647	0.1647	49.407	1733.061	2460.46	303.90	56.75
115	0.000	2036.96	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	1765.152	2428.37	271.81	56.70
120	0.000	2036.96	0.1	0.0582	0.0000	0.0000	0.1070	0.1070	32.091	1797.242	2396.28	239.72	56.70
125	0.000	2036.96	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1814.710	2378.81	222.25	56.70
130	0.000	2036.96	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1832.178	2361.34	204.78	56.70
135	0.000	2036.96	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1849.646	2343.87	187.31	56.70
140	0.000	2036.96	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	1867.114	2326.40	169.84	56.65
145	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0582	0.0582	17.468	1884.582	2308.94	152.38	56.65
150	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1890.758	2302.76	146.20	56.65
155	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1896.934	2296.58	140.02	56.65
160	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1903.110	2290.41	133.85	56.65
165	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1909.286	2284.23	127.67	56.65
170	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1915.462	2278.06	121.50	56.65
175	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1921.637	2271.88	115.32	56.65
180	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1927.813	2265.70	109.14	56.65
185	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1933.989	2259.53	102.97	56.65
190	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1940.165	2253.35	96.79	56.65
195	0.000	2036.96	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	1946.341	2247.18	90.62	56.60
200	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	1952.517	2241.00	84.44	56.60
205	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1958.693	2234.83	78.27	56.60
210	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1964.868	2228.65	72.09	56.60
215	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1971.044	2222.47	65.91	56.60
220	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1977.220	2216.30	59.74	56.60
225	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1983.396	2210.12	53.56	56.60
230	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1989.572	2203.95	47.39	56.60
235	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	1995.748	2197.77	41.21	56.60
240	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2001.924	2191.59	35.03	56.60
245	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2008.100	2185.42	28.86	56.60
250	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2014.275	2179.24	22.68	56.60
255	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2020.451	2173.07	16.51	56.60
260	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2026.627	2166.89	10.33	56.60
265	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2032.803	2160.72	4.16	56.60
270	0.000	2036.96	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2038.979	2154.54	-2.02	56.55
275	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	0.0000	0.0000	0.000	2038.979	2154.54	-2.02	56.55
280	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
285	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
290	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
295	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
300	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
305	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
310	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
315	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
320	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
325	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55
330	0.000	2036.96	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2038.979	2154.54	-2.02	56.55



22093 BELCON DEVELOPMENT **2023/10/10**

ATTENUATION FACILITY FLOW MODELLING: 1:50 YEAR PEAK STORM EVENT

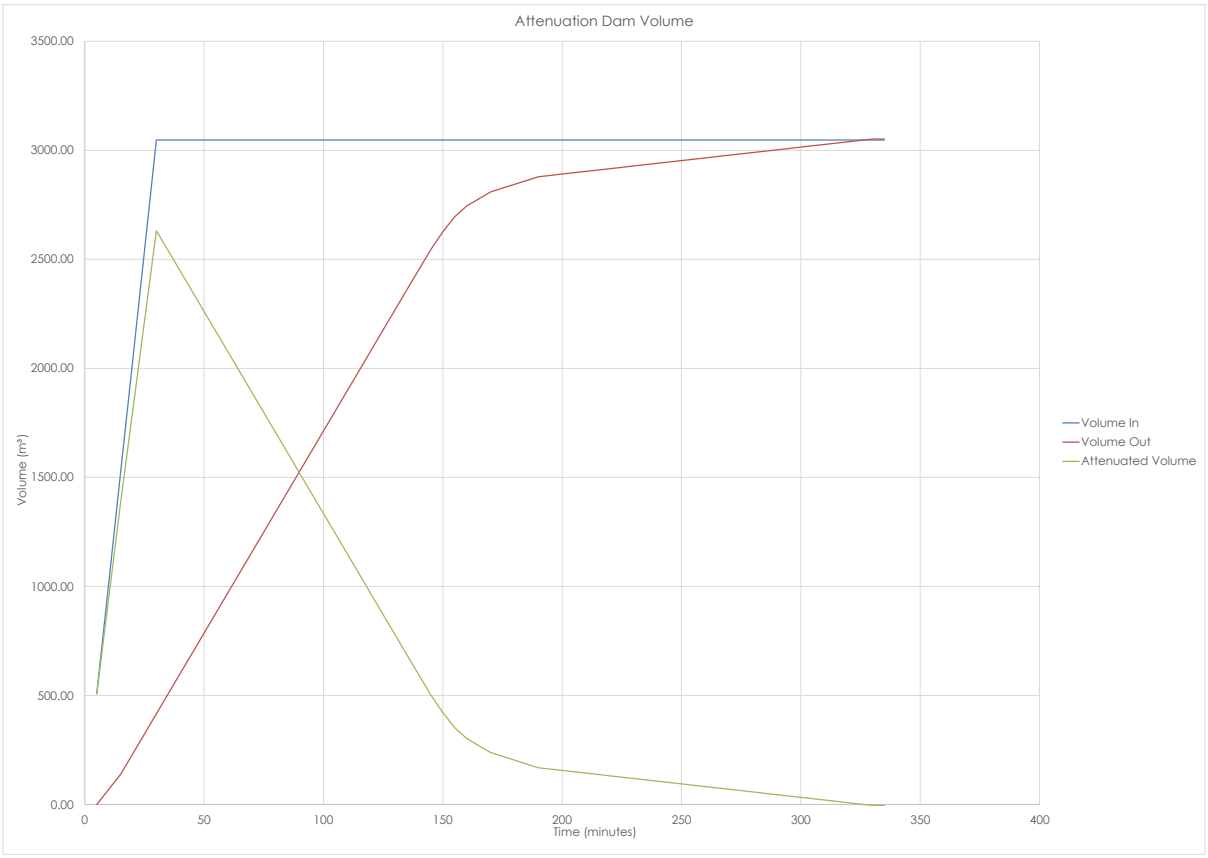
	*V = Q*time increment*	*sum of inflow*	*water height of balance of flow*	*outlet control culvert formula*	*outlet overflow orifice formula*	*emergency overflow*	*Connecting to main line, max capacity, stepped, based on previous increments inflow*	*Combined outlets outflow*	*total volume out per increment, governed by minimum capacity*	*Sum of volume out*	*PWL+ V_{in}- Vout*	*in - out*	*Adjusted for outflow*
Time (min)	**Volume In**	**Cumulative Volume**	**Water Height Above Inlet**	**Weir Outflow**	**Orifice Overflow**	**Overflow Channel**	**pipe outflow**	**Max Outflow per Incre**	**Max Volume Out per Increme**	**Cumulative Volume Out**	**Total Dam Volume Incl PWL**	**Attenuated Volume**	**Actual Level**
5	427.281	427.28	0.20	0.1647	0.0000	0.0000	outflow only after initial inflow			0.0000	2583.84	427.28	56.80
10	427.281	854.56	0.20	0.1647	0.0000	0.0000	0.1647	0.1647	49.407	49.407	2961.72	805.16	57.00
15	427.281	1281.84	0.4	0.3375	0.0000	0.0000	0.1647	0.1647	49.407	98.814	3339.59	1183.03	57.15
20	427.281	1709.13	0.55	0.4183	0.0000	0.0000	0.3089	0.3089	92.659	191.473	3674.21	1517.65	57.30
25	427.281	2136.41	0.7	0.4858	0.0000	0.0000	0.3089	0.3089	92.659	284.133	4008.83	1852.27	57.45
30	427.281	2563.69	0.85	0.5450	0.0000	0.0000	0.3089	0.3089	92.659	376.792	4343.46	2186.90	57.60
35	0.000	2563.69	1	0.5983	0.0000	0.0000	0.3089	0.3089	92.659	469.452	4250.80	2094.24	57.55
40	0.000	2563.69	0.95	0.5811	0.0000	0.0000	0.3089	0.3089	92.659	562.111	4158.14	2001.58	57.50
45	0.000	2563.69	0.9	0.5633	0.0000	0.0000	0.3089	0.3089	92.659	654.771	4065.48	1908.92	57.50
50	0.000	2563.69	0.9	0.5633	0.0000	0.0000	0.3089	0.3089	92.659	747.430	3972.82	1816.26	57.45
55	0.000	2563.69	0.85	0.5450	0.0000	0.0000	0.3089	0.3089	92.659	840.090	3880.16	1723.60	57.40
60	0.000	2563.69	0.8	0.5260	0.0000	0.0000	0.3089	0.3089	92.659	932.749	3787.50	1630.94	57.35
65	0.000	2563.69	0.75	0.5063	0.0000	0.0000	0.3089	0.3089	92.659	1025.409	3694.84	1538.28	57.30
70	0.000	2563.69	0.7	0.4858	0.0000	0.0000	0.3089	0.3089	92.659	1118.068	3602.18	1445.62	57.30
75	0.000	2563.69	0.7	0.4858	0.0000	0.0000	0.3089	0.3089	92.659	1210.728	3509.52	1352.96	57.25
80	0.000	2563.69	0.65	0.4644	0.0000	0.0000	0.3089	0.3089	92.659	1303.387	3416.86	1260.30	57.20
85	0.000	2563.69	0.6	0.4419	0.0000	0.0000	0.3089	0.3089	92.659	1396.047	3324.20	1167.64	57.15
90	0.000	2563.69	0.55	0.4183	0.0000	0.0000	0.3089	0.3089	92.659	1488.706	3231.54	1074.98	57.10
95	0.000	2563.69	0.5	0.3932	0.0000	0.0000	0.3089	0.3089	92.659	1581.366	3138.88	982.32	57.05
100	0.000	2563.69	0.45	0.3664	0.0000	0.0000	0.3089	0.3089	92.659	1674.025	3046.22	889.66	57.05
105	0.000	2563.69	0.45	0.3664	0.0000	0.0000	0.3089	0.3089	92.659	1766.685	2953.56	797.00	57.00
110	0.000	2563.69	0.4	0.3375	0.0000	0.0000	0.3089	0.3089	92.659	1859.344	2860.90	704.34	56.95
115	0.000	2563.69	0.35	0.3059	0.0000	0.0000	0.3089	0.3089	92.659	1952.004	2768.24	611.68	56.90
120	0.000	2563.69	0.3	0.2706	0.0000	0.0000	0.3059	0.3059	91.769	2043.773	2676.47	519.91	56.85
125	0.000	2563.69	0.25	0.2300	0.0000	0.0000	0.2706	0.2706	81.184	2124.957	2595.29	438.73	56.80
130	0.000	2563.69	0.2	0.1647	0.0000	0.0000	0.2300	0.2300	68.993	2193.950	2526.30	369.74	56.75
135	0.000	2563.69	0.15	0.1070	0.0000	0.0000	0.1647	0.1647	49.407	2243.357	2476.89	320.33	56.75
140	0.000	2563.69	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	2275.447	2444.80	288.24	56.75
145	0.000	2563.69	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	2307.538	2412.71	256.15	56.70
150	0.000	2563.69	0.1	0.0582	0.0000	0.0000	0.1070	0.1070	32.091	2339.629	2380.62	224.06	56.70
155	0.000	2563.69	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	2357.097	2363.15	206.59	56.70
160	0.000	2563.69	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	2374.565	2345.68	189.12	56.70
165	0.000	2563.69	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	2392.033	2328.21	171.65	56.65
170	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0582	0.0582	17.468	2409.501	2310.75	154.19	56.65
175	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2415.677	2304.57	148.01	56.65
180	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2421.852	2298.40	141.84	56.65
185	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2428.028	2292.22	135.66	56.65
190	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2434.204	2286.04	129.48	56.65
195	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2440.380	2279.87	123.31	56.65
200	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2446.556	2273.69	117.13	56.65
205	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2452.732	2267.52	110.96	56.65
210	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2458.908	2261.34	104.78	56.65
215	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2465.084	2255.16	98.60	56.65
220	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2471.259	2248.99	92.43	56.65
225	0.000	2563.69	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2477.435	2242.81	86.25	56.60
230	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2483.611	2236.64	80.08	56.60
235	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2489.787	2230.46	73.90	56.60
240	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2495.963	2224.28	67.72	56.60
245	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2502.139	2218.11	61.55	56.60
250	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2508.315	2211.93	55.37	56.60
255	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2514.490	2205.76	49.20	56.60
260	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2520.666	2199.58	43.02	56.60
265	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2526.842	2193.41	36.85	56.60
270	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2533.018	2187.23	30.67	56.60
275	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2539.194	2181.05	24.49	56.60
280	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2545.370	2174.88	18.32	56.60
285	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2551.546	2168.70	12.14	56.60
290	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2557.721	2162.53	5.97	56.60
295	0.000	2563.69	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2563.897	2156.35	-0.21	56.55
300	0.000	2563.69	-0.05	#NUM!	0.0000	0.0000	0.0000	0.0000	0.000	2563.897	2156.35	-0.21	56.55
305	0.000	2563.69	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2563.897	2156.35	-0.21	56.55
310	0.000	2563.69	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2563.897	2156.35	-0.21	56.55
315	0.000	2563.69	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2563.897	2156.35	-0.21	56.55
320	0.000	2563.69	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2563.897	2156.35	-0.21	56.55
325	0.000	2563.69	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2563.897	2156.35	-0.21	56.55
330	0.000	2563.69	-0.05	#NUM!	0.0000	0.0000	#NUM!	0.0000	0.000	2563.897	2156.35	-0.21	56.55



22093 BELCON DEVELOPMENT **2023/10/10**

ATTENUATION FACILITY FLOW MODELLING: 1:100 YEAR PEAK STORM EVENT

	*V = Q*time increment*	*sum of inflow*	*water height of balance of flow*	*outlet control culvert formula*	*outlet overflow orifice formula*	*emergency overflow*	*Connecting to main line, max capacity, stepped, based on previous increments inflow*	*Combined outlets outflow*	*total volume out per increment, governed by minimum capacity*	*Sum of volume out*	*PWL+ V_{in}- Vout*	*in - out*	*Adjusted for outflow*
Time (min)	**Volume In**	**Cumulative Volume**	**Water Height Above Inlet**	**Weir Outflow**	**Orifice Overflow**	**Overflow Channel**	**pipe outflow**	**Max Outflow per Incre**	**Max Volume Out per Increme**	**Cumulative Volume Out**	**Total Dam Volume Incl PWL**	**Attenuated Volume**	**Actual Level**
5	507.896	507.90	0.25	0.2300	0.0000	0.0000	outflow only after initial inflow			0.0000	2664.46	507.90	56.85
10	507.896	1015.79	0.25	0.2300	0.0000	0.0000	0.2300	0.2300	68.993	68.993	3103.36	946.80	57.05
15	507.896	1523.69	0.45	0.3664	0.0000	0.0000	0.2300	0.2300	68.993	137.986	3542.26	1385.70	57.25
20	507.896	2031.58	0.65	0.4644	0.0000	0.0000	0.3089	0.3089	92.659	230.645	3957.50	1800.94	57.45
25	507.896	2539.48	0.85	0.5450	0.0000	0.0000	0.3089	0.3089	92.659	323.305	4372.73	2216.17	57.60
30	507.896	3047.38	1	0.5983	0.0000	0.0000	0.3089	0.3089	92.659	415.964	4787.97	2631.41	57.75
35	0.000	3047.38	1.15	0.6473	0.1310	0.0000	0.3089	0.3089	92.659	508.624	4695.31	2538.75	57.75
40	0.000	3047.38	1.15	0.6473	0.1310	0.0000	0.3089	0.3089	92.659	601.283	4602.65	2446.09	57.70
45	0.000	3047.38	1.1	0.6314	0.0000	0.0000	0.3089	0.3089	92.659	693.943	4509.99	2353.43	57.65
50	0.000	3047.38	1.05	0.6151	0.0000	0.0000	0.3089	0.3089	92.659	786.602	4417.33	2260.77	57.60
55	0.000	3047.38	1	0.5983	0.0000	0.0000	0.3089	0.3089	92.659	879.262	4324.67	2168.11	57.60
60	0.000	3047.38	1	0.5983	0.0000	0.0000	0.3089	0.3089	92.659	971.921	4232.01	2075.45	57.55
65	0.000	3047.38	0.95	0.5811	0.0000	0.0000	0.3089	0.3089	92.659	1064.581	4139.35	1982.79	57.50
70	0.000	3047.38	0.9	0.5633	0.0000	0.0000	0.3089	0.3089	92.659	1157.240	4046.70	1890.14	57.45
75	0.000	3047.38	0.85	0.5450	0.0000	0.0000	0.3089	0.3089	92.659	1249.900	3954.04	1797.48	57.45
80	0.000	3047.38	0.85	0.5450	0.0000	0.0000	0.3089	0.3089	92.659	1342.559	3861.38	1704.82	57.40
85	0.000	3047.38	0.8	0.5260	0.0000	0.0000	0.3089	0.3089	92.659	1435.219	3768.72	1612.16	57.35
90	0.000	3047.38	0.75	0.5063	0.0000	0.0000	0.3089	0.3089	92.659	1527.878	3676.06	1519.50	57.30
95	0.000	3047.38	0.7	0.4858	0.0000	0.0000	0.3089	0.3089	92.659	1620.538	3583.40	1426.84	57.25
100	0.000	3047.38	0.65	0.4644	0.0000	0.0000	0.3089	0.3089	92.659	1713.197	3490.74	1334.18	57.25
105	0.000	3047.38	0.65	0.4644	0.0000	0.0000	0.3089	0.3089	92.659	1805.857	3398.08	1241.52	57.20
110	0.000	3047.38	0.6	0.4419	0.0000	0.0000	0.3089	0.3089	92.659	1898.516	3305.42	1148.86	57.15
115	0.000	3047.38	0.55	0.4183	0.0000	0.0000	0.3089	0.3089	92.659	1991.176	3212.76	1056.20	57.10
120	0.000	3047.38	0.5	0.3932	0.0000	0.0000	0.3089	0.3089	92.659	2083.835	3120.10	963.54	57.05
125	0.000	3047.38	0.45	0.3664	0.0000	0.0000	0.3089	0.3089	92.659	2176.495	3027.44	870.88	57.00
130	0.000	3047.38	0.4	0.3375	0.0000	0.0000	0.3089	0.3089	92.659	2269.154	2934.78	778.22	56.95
135	0.000	3047.38	0.35	0.3059	0.0000	0.0000	0.3089	0.3089	92.659	2361.814	2842.12	685.56	56.95
140	0.000	3047.38	0.35	0.3059	0.0000	0.0000	0.3059	0.3059	91.769	2453.583	2750.35	593.79	56.90
145	0.000	3047.38	0.3	0.2706	0.0000	0.0000	0.3059	0.3059	91.769	2545.352	2658.58	502.02	56.85
150	0.000	3047.38	0.25	0.2300	0.0000	0.0000	0.2706	0.2706	81.184	2626.536	2577.40	420.84	56.80
155	0.000	3047.38	0.2	0.1647	0.0000	0.0000	0.2300	0.2300	68.993	2695.529	2508.41	351.85	56.75
160	0.000	3047.38	0.15	0.1070	0.0000	0.0000	0.1647	0.1647	49.407	2744.936	2459.00	302.44	56.75
165	0.000	3047.38	0.15	0.1070	0.0000	0.0000	0.1070	0.1070	32.091	2777.027	2426.91	270.35	56.70
170	0.000	3047.38	0.1	0.0582	0.0000	0.0000	0.1070	0.1070	32.091	2809.118	2394.82	238.26	56.70
175	0.000	3047.38	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	2826.585	2377.35	220.79	56.70
180	0.000	3047.38	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	2844.053	2359.88	203.32	56.70
185	0.000	3047.38	0.1	0.0582	0.0000	0.0000	0.0582	0.0582	17.468	2861.521	2342.41	185.85	56.65
190	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0582	0.0582	17.468	2878.989	2324.95	168.39	56.65
195	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2885.165	2318.77	162.21	56.65
200	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2891.341	2312.59	156.03	56.65
205	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2897.517	2306.42	149.86	56.65
210	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2903.693	2300.24	143.68	56.65
215	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2909.869	2294.07	137.51	56.65
220	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2916.045	2287.89	131.33	56.65
225	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2922.220	2281.72	125.16	56.65
230	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2928.396	2275.54	118.98	56.65
235	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2934.572	2269.36	112.80	56.65
240	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2940.748	2263.19	106.63	56.65
245	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2946.924	2257.01	100.45	56.65
250	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2953.100	2250.84	94.28	56.65
255	0.000	3047.38	0.05	0.0206	0.0000	0.0000	0.0206	0.0206	6.176	2959.276	2244.66	88.10	56.60
260	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0206	0.0206	6.176	2965.452	2238.48	81.92	56.60
265	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2971.627	2232.31	75.75	56.60
270	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2977.803	2226.13	69.57	56.60
275	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2983.979	2219.96	63.40	56.60
280	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2990.155	2213.78	57.22	56.60
285	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	2996.331	2207.60	51.04	56.60
290	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	3002.507	2201.43	44.87	56.60
295	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	3008.683	2195.25	38.69	56.60
300	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	3014.858	2189.08	32.52	56.60
305	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	3021.034	2182.90	26.34	56.60
310	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	3027.210	2176.73	20.17	56.60
315	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	3033.386	2170.55	13.99	56.60
320	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	3039.562	2164.37	7.81	56.60
325	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	3045.738	2158.20	1.64	56.60
330	0.000	3047.38	0	0.0000	0.0000	0.0000	0.0000	0.0206	6.176	3051.914	2152.02	-4.54	56.55



kls CONSULTING ENGINEERS
progress delivered

22093 BELCON DEVELOPMENT **2023/10/10**

ATTENUATION FACILITY AND SWALE CAPACITY: CIVIL DESIGNER OUTPUT

Dam				
Cumulative Volume	Increment Volume	Level	Area	
0	0	55	0	
23.83	23.83	55.05	953.28	
72.13	48.3	55.1	978.72	
121.71	49.58	55.15	1004.34	
172.57	50.86	55.2	1030.14	
224.73	52.16	55.25	1056.14	
278.19	53.46	55.3	1082.32	
332.96	54.77	55.35	1108.68	
389.06	56.1	55.4	1135.23	
446.49	57.43	55.45	1161.97	
505.26	58.77	55.5	1188.9	
565.39	60.12	55.55	1216.01	
626.87	61.48	55.6	1243.31	
689.72	62.85	55.65	1270.8	
753.95	64.23	55.7	1298.47	
819.57	65.62	55.75	1326.33	
886.59	67.02	55.8	1354.38	
955.02	68.42	55.85	1382.61	
1024.86	69.84	55.9	1411.03	
1096.12	71.27	55.95	1439.63	
1168.83	72.7	56	1468.42	
1242.97	74.15	56.05	1497.4	
1318.57	75.6	56.1	1526.57	
1395.63	77.06	56.15	1555.92	
1474.17	78.53	56.2	1585.45	
1554.18	80.02	56.25	1615.18	
1635.69	81.51	56.3	1645.09	
1718.69	83.01	56.35	1675.19	
1803.21	84.52	56.4	1705.47	
1889.25	86.03	56.45	1735.94	
1976.81	87.56	56.5	1766.6	
2065.91	89.1	56.55	1797.44	
2156.56	90.65	56.6	1828.47	*PWL, 1.5m depth*
2248.76	92.2	56.65	1859.69	
2342.53	93.77	56.7	1891.09	
2437.88	95.34	56.75	1922.68	
2534.81	96.93	56.8	1954.46	
2633.33	98.52	56.85	1986.42	
2733.45	100.13	56.9	2018.57	
2835.19	101.74	56.95	2050.91	
2938.55	103.36	57	2083.43	
3043.54	104.99	57.05	2116.14	
3150.17	106.63	57.1	2149.04	
3258.45	108.28	57.15	2182.12	
3368.39	109.94	57.2	2215.39	
3479.99	111.61	57.25	2248.84	
3593.27	113.28	57.3	2282.49	
3708.24	114.97	57.35	2316.32	
3824.91	116.67	57.4	2350.33	
3943.28	118.37	57.45	2384.53	
4063.37	120.09	57.5	2418.92	
4185.18	121.81	57.55	2453.5	
4308.72	123.54	57.6	2488.26	
4434.01	125.29	57.65	2523.21	
4561.05	127.04	57.7	2558.34	*Outlet Structure Overflow*
4689.85	128.8	57.75	2593.66	
4820.42	130.57	57.8	2629.17	
4952.77	132.35	57.85	2664.86	
5086.91	134.14	57.9	2700.75	*Emergency Overflow*

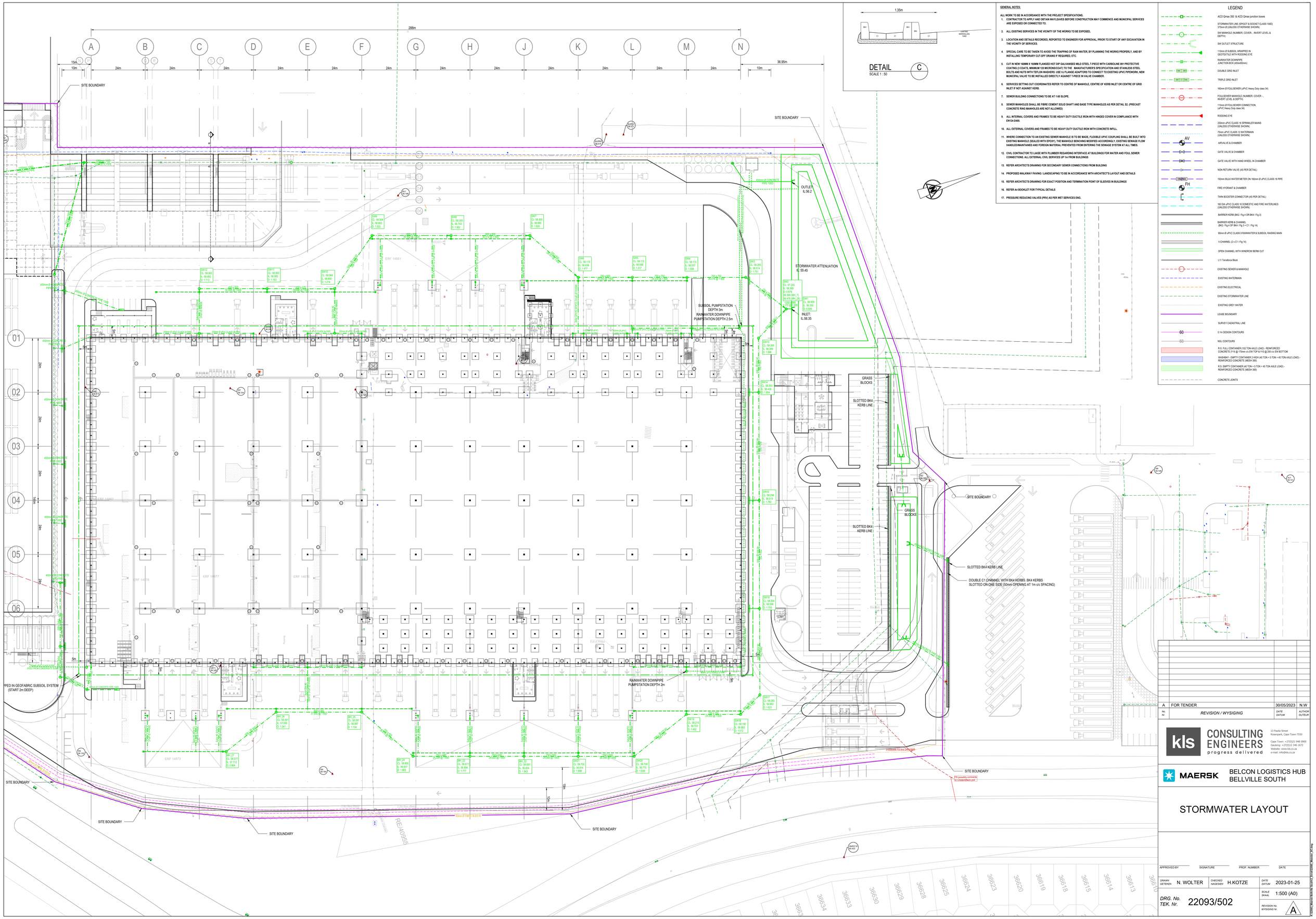
Swale West			
Cumulative V	Increment Volume	Level	Area
0	0	57.2	22
1.788	1.788	57.3	35.768
6.234	4.446	57.4	53.147
12.584	6.35	57.5	73.857
21.172	8.588	57.6	97.898
32.331	11.158	57.7	125.27
46.393	14.062	57.8	155.972
63.692	17.299	57.9	190.005

Swale East			
Cumulative V	Increment Volume	Level	Area
0	0	57.2	337
19.404	19.404	57.3	388.085
60.829	41.425	57.4	440.415
107.551	46.722	57.5	494.028
159.699	52.148	57.6	548.923
217.4	57.701	57.7	605.101
280.783	63.383	57.8	662.56
349.976	69.193	57.9	721.302

kls CONSULTING ENGINEERS
progress delivered

Appendix E

Stormwater Layout Plan



1.35m

DETAIL
SCALE 1 : 50
C

GENERAL NOTES:

ALL WORK TO BE IN ACCORDANCE WITH THE PROJECT SPESIFICATIONS.

1. **CONTRACTOR TO APPLY AND OBTAIN WAYLEAVES BEFORE CONSTRUCTION MAY COMMENCE AND MUNICIPAL SERVICES ARE EXPOSED OR CONNECTED TO.**
2. **ALL EXISTING SERVICES IN THE VICINITY OF THE WORKS TO BE EXPOSED.**
3. **LOCATION AND DETAILS RECORDED, REPORTED TO ENGINEER FOR APPROVAL PRIOR TO START OF ANY EXCAVATION IN THE VICINITY OF SERVICES.**
4. **SPECIAL CARE TO BE TAKEN TO AVOID THE TRAPPING OF RAIN WATER, BY PLANNING THE WORKS PROPERLY, AND BY INSTALLING TEMPORARY CUT-OFF DRAINS IF REQUIRED, ETC.**
5. **CUT IN NEW 160MM X 160MM FLANGED HOT DIP GALVANISED MILD STEEL T-PIECE WITH CARBOLINE 891 PROTECTIVE COATING (3 COATS, MINIMUM 125 MICRONS/COAT) TO THE MANUFACTURER'S SPECIFICATION AND STAINLESS STEEL BOLTS AND NUTS WITH TEFLON WASHERS. USE V.I FLANGE ADAPTORS TO CONNECT TO EXISTING UPVC PIPEWORK, NEW MUNICIPAL VALVE TO BE INSTALLED DIRECTLY AGAINST T-PIECE IN VALVE CHAMBER.**
6. **SERVICES SETTING OUT COORDINATES REFER TO CENTRE OF MANHOLE, CENTRE OF KERB INLET OR CENTRE OF GRID INLET IF NOT AGAINST KERB.**
7. **SEWER BUILDING CONNECTIONS TO BE AT 1:60 SLOPE.**
8. **SEWER MANHOLES SHALL BE FIBRE CEMENT SOLID SHAFT AND BASE TYPE MANHOLES AS PER DETAIL S2. (PRECAST CONCRETE RING MANHOLES ARE NOT ALLOWED)**
9. **ALL INTERNAL COVERS AND FRAMES TO BE HEAVY DUTY DUCTILE IRON WITH HINGED COVER IN COMPLIANCE WITH EN124-D400.**
10. **ALL EXTERNAL COVERS AND FRAMES TO BE HEAVY DUTY DUCTILE IRON WITH CONCRETE INFILL.**
11. **WHERE CONNECTION TO AN EXISTING SEWER MANHOLE IS TO BE MADE, FLEXIBLE UPVC COUPLING SHALL BE BUILT INTO EXISTING MANHOLE (SEALED WITH EPOXY), THE MANHOLE BENCHING MODIFIED ACCORDINGLY, EXISTING SEWAGE FLOW HANDLED/MAINTAINED AND FOREIGN MATERIAL PREVENTED FROM ENTERING THE SEWAGE SYSTEM AT ALL TIMES.**
12. **CIVIL CONTRACTOR TO LIAISE WITH PLUMBER REGARDING INTERFACE AT BUILDINGS FOR WATER AND FOUL SEWER CONNECTIONS. ALL EXTERNAL CIVIL SERVICES UP 1m FROM BUILDINGS**
13. **REFER ARCHITECTS DRAWING FOR SECONDARY SEWER CONNECTIONS FROM BUILDING**
14. **PROPOSED WALKWAY PAVING / LANDSCAPING TO BE IN ACCORDANCE WITH ARCHITECTS LAYOUT AND DETAILS**
15. **REFER ARCHITECTS DRAWING FOR EXACT POSITION AND TERMINATION POINT OF SLEEVES IN BUILDINGS**
16. **REFER A4 BOOKLET FOR TYPICAL DETAILS**
17. **PRESSURE REDUCING VALVES (PRV) AS PER WET SERVICES ENG.**

LEGEND

- ACO Qmax 350 & ACO Qmax junction boxes
- STORMWATER LINE (SPIGOT & SOCKET CLASS 100D) 375mm Ø (UNLESS OTHERWISE SHOWN)
- SW MANHOLE (NUMBER, COVER - , INVERT LEVEL & DEPTH)
- SW OUTLET STRUCTURE
- 110mm Ø SUBSOIL WRAPPED IN GEOTEXTILE WITH RODDING EYE
- RAINWATER DOWNPIPE JUNCTION BOX (450x450mm)
- DOUBLE GRID INLET
- TRIPLE GRID INLET
- 160mm Ø FOULSEWER (uPVC Heavy Duty class 34)
- FOULSEWER MANHOLE (NUMBER, COVER - , INVERT LEVEL & DEPTH)
- 110mm Ø FOULSEWER CONNECTION (uPVC Heavy Duty class 34)
- RODDING EYE
- 250mm uPVC CLASS 16 SPRINKLER MAINS (UNLESS OTHERWISE SHOWN)
- 75mm uPVC CLASS 12 WATERMAIN (UNLESS OTHERWISE SHOWN)
- AV — AIRVALVE & CHAMBER
- GATE VALVE & CHAMBER
- GATE VALVE WITH HAND WHEEL IN CHAMBER
- NON RETURN VALVE (AS PER DETAIL)
- 160mm BULK WATER METER ON 160mm Ø uPVC CLASS 16 PIPE
- FH — FIRE HYDRANT & CHAMBER
- TWIN BOOSTER CONNECTOR (AS PER DETAIL)
- 160 DIA uPVC CLASS 16 DOMESTIC AND FIRE WATERLINES (UNLESS OTHERWISE SHOWN)
- BARRIER KERB (BK2 / Fig 4 OR BK4 / Fig 3)
- BARRIER KERB & CHANNEL (BK2 / Fig 4 OF BK4 / Fig 3 + C1 / Fig 14)
- 90mm Ø uPVC CLASS 9 RAINWATER & SUBSOIL RAISING MAIN
- V-CHANNEL (2 x C1 / Fig 14)
- OPEN CHANNEL WITH WINDROW BERM CUT
- L11 Terraforce Block
- EXISTING SEWER & MANHOLE
- EXISTING WATERMAIN
- EXISTING ELECTRICAL
- EXISTING STORMWATER LINE
- EXISTING GREY WATER
- LEASE BOUNDARY
- SURVEY CADASTRAL LINE
- 60 — 0.1m DESIGN CONTOURS
- 60 — NGL CONTOURS
- R.S. FULL CONTAINER (102 TON AXLE LOAD) - REINFORCED CONCRETE (Y16 @ 175mm c/c EW TOP & Y10 @ 200 c/c EW BOTTOM
- WASHBAY - EMPTY CONTAINER (2 HIGH (40 TON + 5 TON + 45 TON AXLE LOAD) - REINFORCED CONCRETE (MESH 395)
- R.S. EMPTY CONTAINER (40 TON + 5 TON + 45 TON AXLE LOAD) - REINFORCED CONCRETE (MESH 395)
- CONCRETE JOINTS

No. Nr	REVISION / WYSIGING	DATE DATUM	AUTHOR OUTEUR
A	FOR TENDER	30/05/2023	N.W

kls CONSULTING ENGINEERS progress delivered
13 Fiesta Street
Rosenpark, Cape Town 7550
Cape Town: +27(0)21 948 0900
Gauteng: +27(0)12 346 1672
Website: www.kls.co.za
e-mail: info@kls.co.za

MAERSK

BELCON LOGISTICS HUB BELLVILLE SOUTH

STORMWATER LAYOUT

APPROVED BY	SIGNATURE	PROF. NUMBER	DATE

DRAWN GETEKEN	N. WOLTER	CHECKED NAGESIEN	H.KOTZE
DATE DATUM	2023-01-25		
SCALE SKAAL	1:500 (A0)		
DRG. No. TEK. Nr.	22093/502	REVISION No. WYSIGING Nr.	A

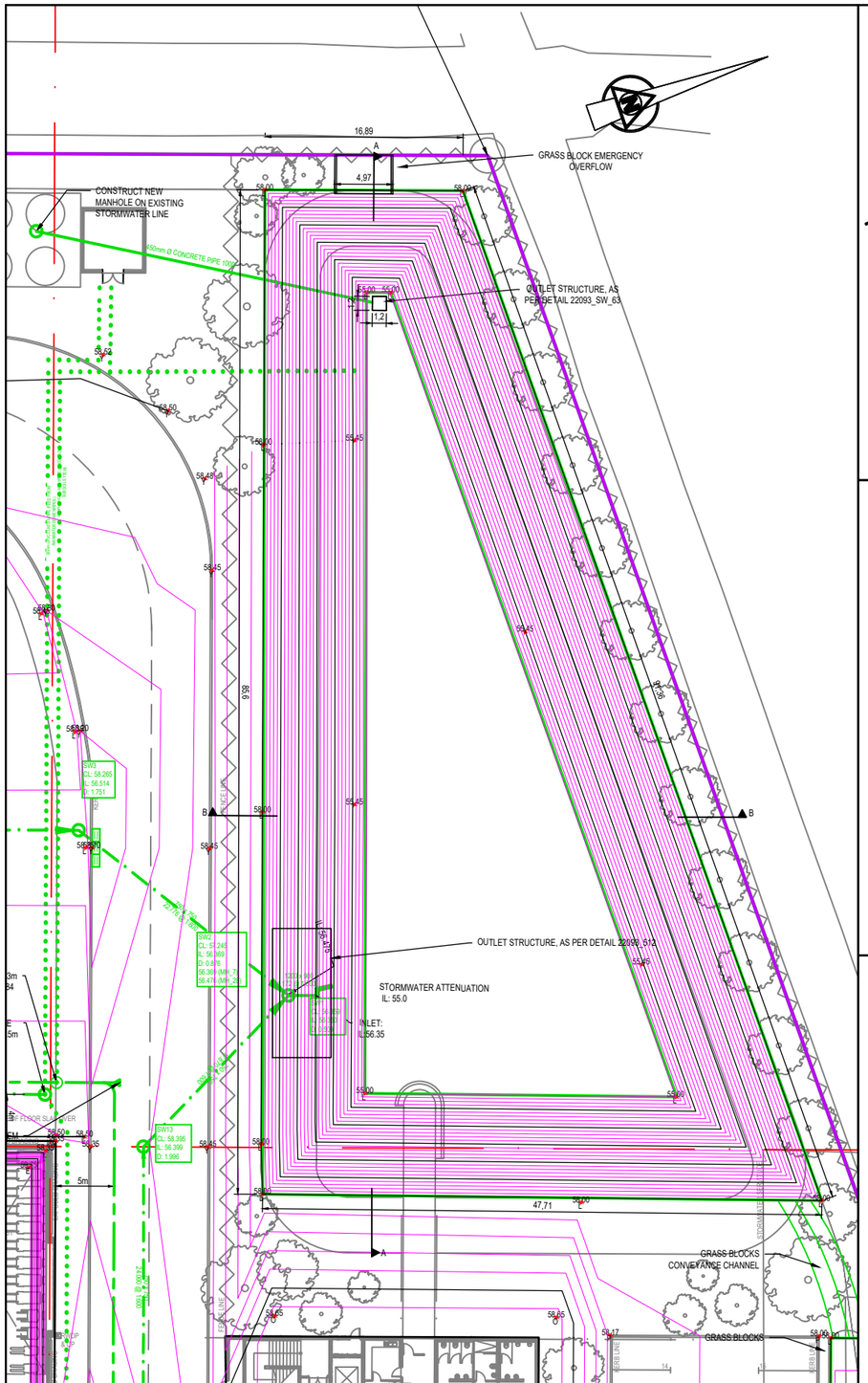
Appendix F

F1. Dam Layout and Sections

F2. Stilling Basin Typical Detail

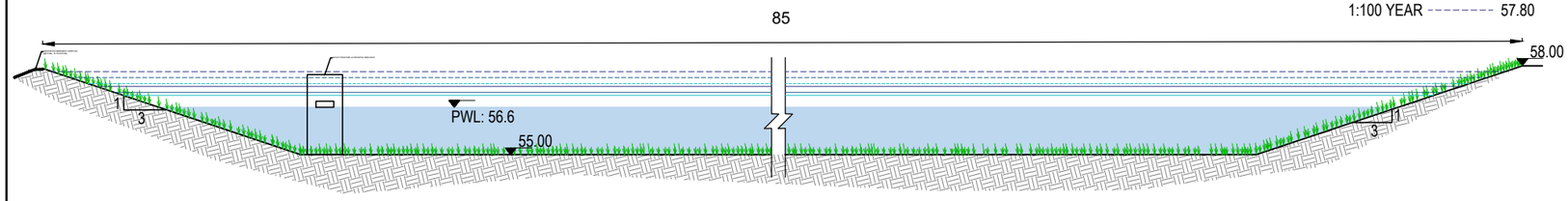
F3. Attenuation Facility Outlet Structure

F4. Swale Typical Detail



PEAK FLOOD LEVELS:

1:2 YEAR	57.00
1:5 YEAR	57.10
1:10 YEAR	57.30
1:20 YEAR	57.40
1:50 YEAR	57.60
1:100 YEAR	57.80

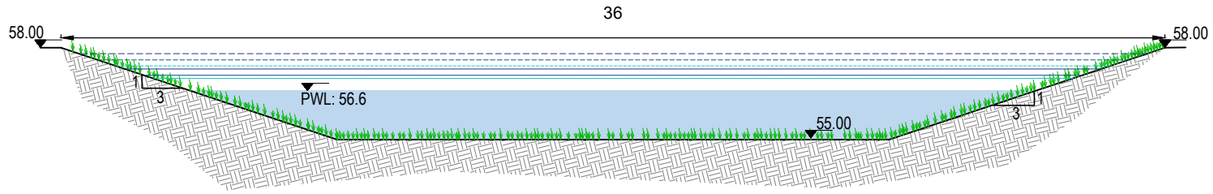


ATTENUATION DAM - SECTION A-A
SCALE: 1:200

NOTE
REFER TO LANDSCAPE ARCHITECTS DRAWING
FOR DETAILED RETENTION POND PLANTING SPECIFICATIONS

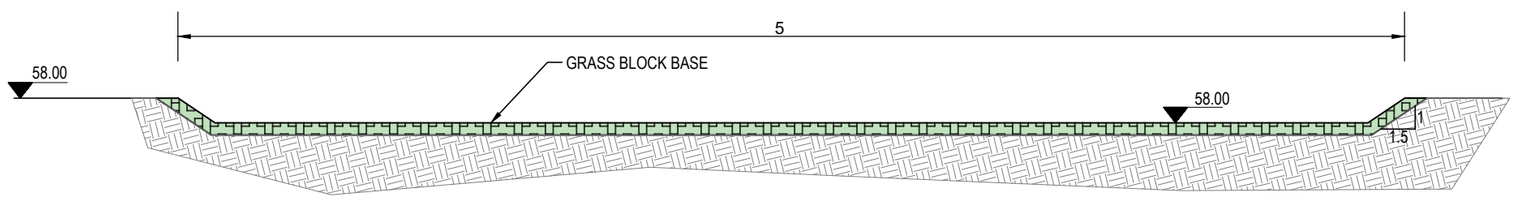
PEAK FLOOD LEVELS:

1:2 YEAR	57.00
1:5 YEAR	57.10
1:10 YEAR	57.30
1:20 YEAR	57.40
1:50 YEAR	57.60
1:100 YEAR	57.80



ATTENUATION DAM - SECTION B-B
SCALE: 1:200

NOTE
REFER TO LANDSCAPE ARCHITECTS DRAWING
FOR DETAILED RETENTION POND PLANTING SPECIFICATIONS



ATTENUATION DAM - EMERGENCY OVERFLOW
SCALE: 1:25

kls CONSULTING ENGINEERS
progress delivered

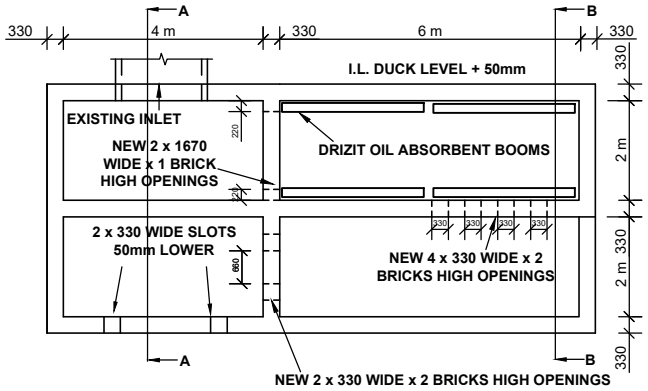
13 Pasita Street
Rosenpark, Cape Town 7550

Cape Town: +27(0)21 948 0900
Gauteng: +27(0)12 346 1672
Website: www.kls.co.za
e-mail: info@kls.co.za

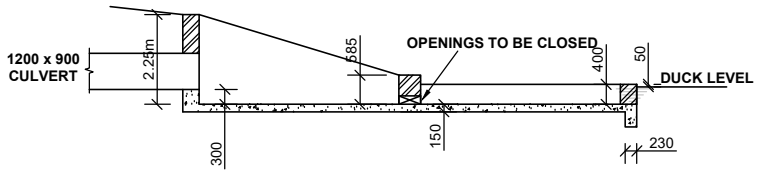
BELCON LOGISTICS HUB

ATTENUATION DAM LAYOUT AND SECTIONS

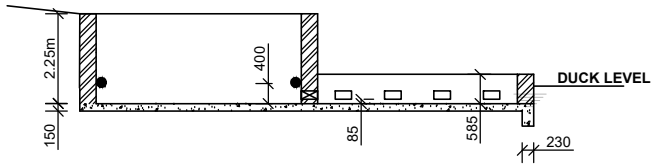
TEKENING Nr.
DRAWING No.
22093-510



PLAN



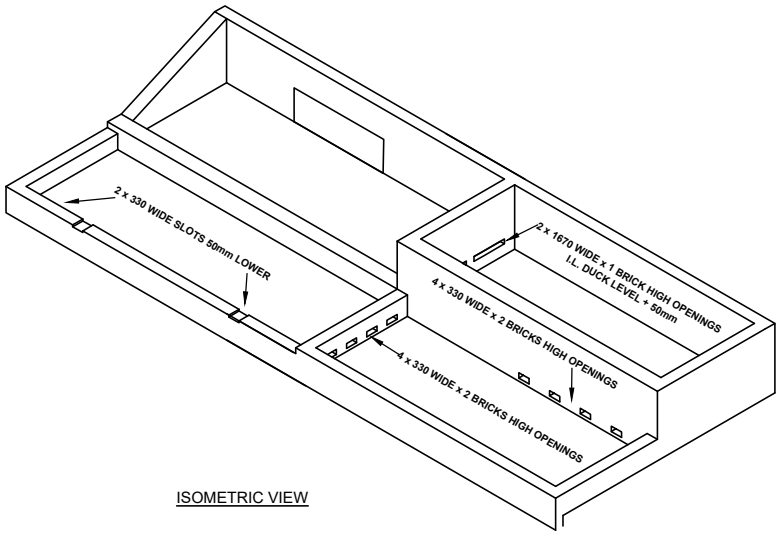
SECTION A - A



SECTION B - B

NOTES:

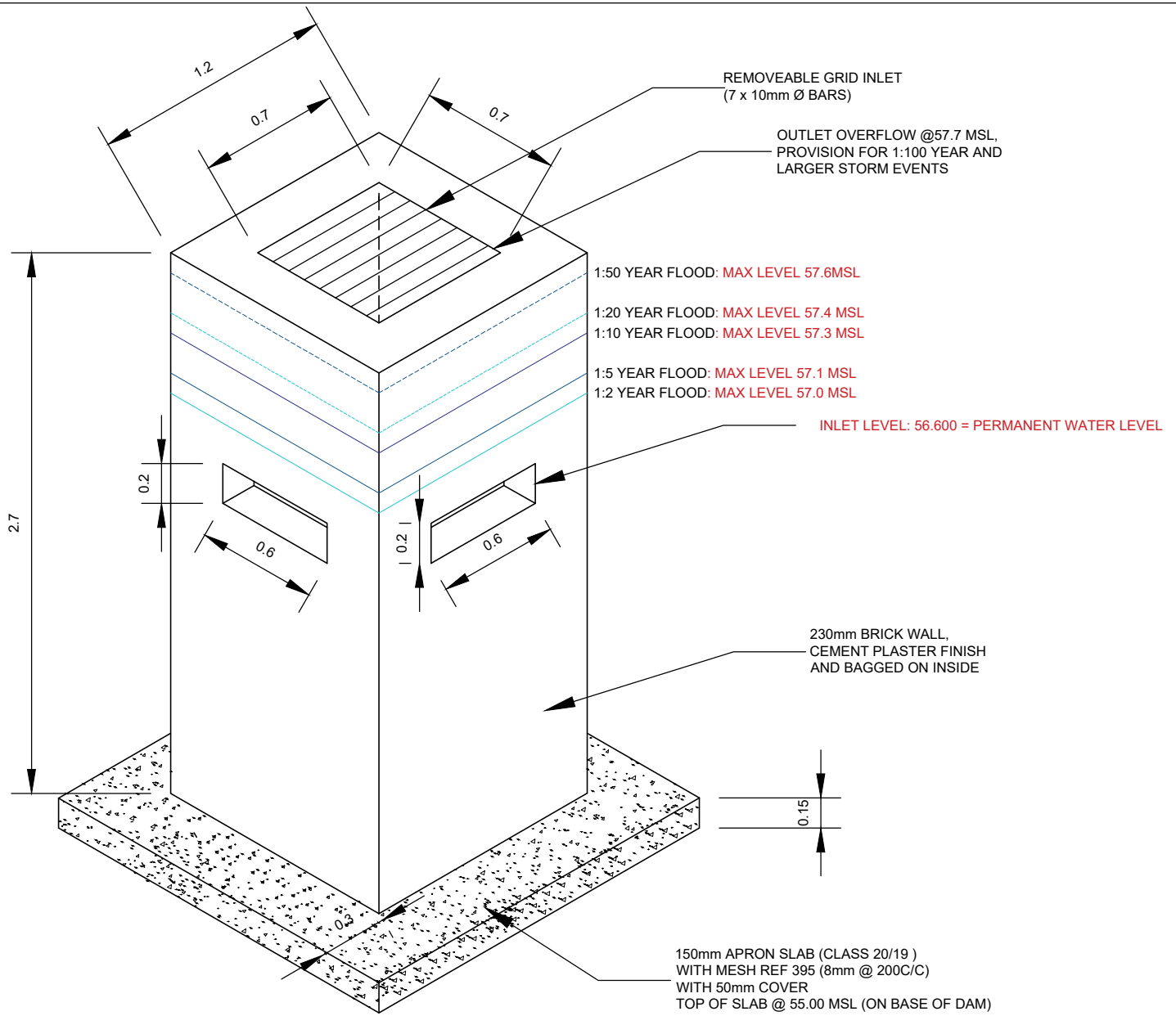
1. 330mm CAVITY WALL WITH REF 395 MESH AND CONCRETE INFILL
2. 25 MPa CONCRETE BASE WITH REF 395 MESH (TOP & BOTTOM)
3. WALL TO BE PLASTERED



ISOMETRIC VIEW

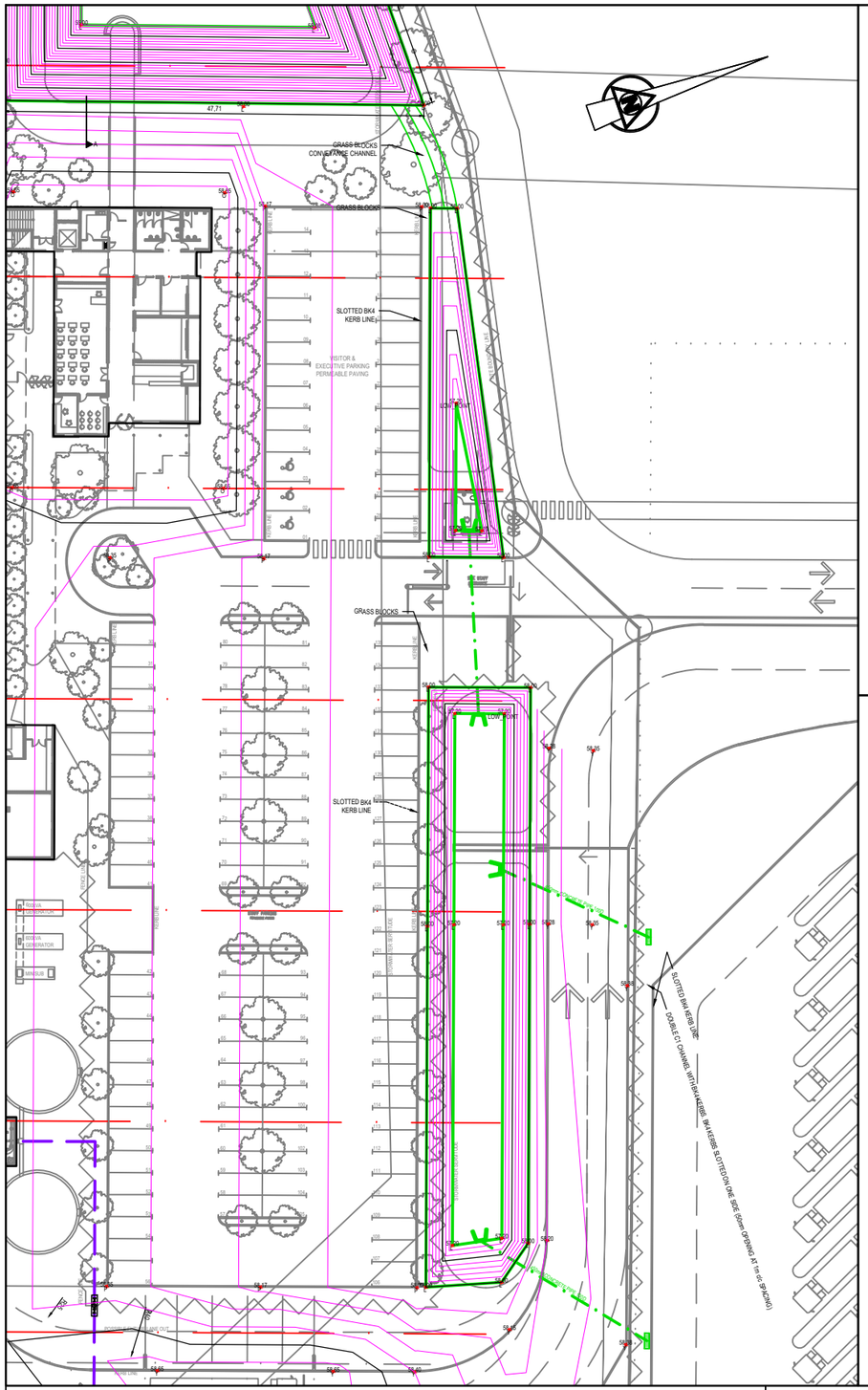
NOT TO SCALE

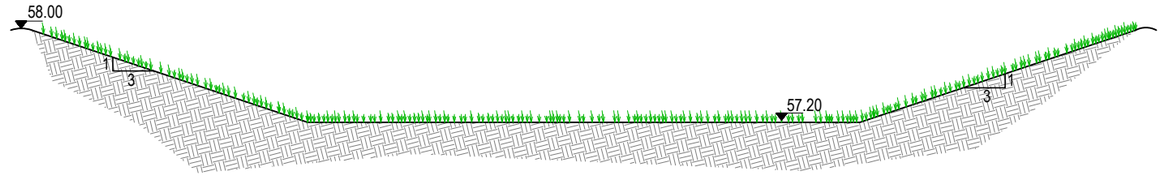
kls CONSULTING ENGINEERS progress delivered	MAERSK BELCON LOGISTICS HUB	ATTENUATION DAM STILLING BASIN OUTLET STRUCTURE	22093-512



NOT TO SCALE

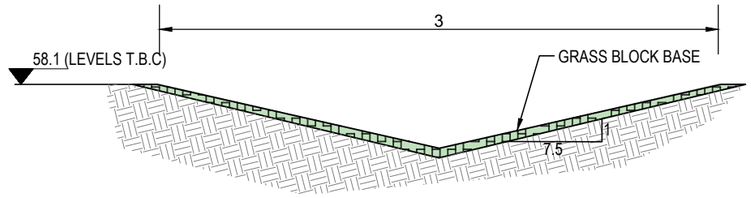
kls CONSULTING ENGINEERS progress delivered	TYPICAL DETAIL STORMWATER	ATTENUATION DAM OUTLET STRUCTURE	22093-SW-63





SWALES - TYPICAL SECTION
SCALE: 1:200

NOTE
REFER TO LANDSCAPE ARCHITECTS DRAWING
FOR DETAILED RETENTION POND PLANTING SPECIFICATIONS



CONVEYANCE CHANNEL/OVERFLOW TYPICAL SECTION
SCALE: N.T.S

kls CONSULTING ENGINEERS
progress delivered

13 Pasita Street
Rosenpark, Cape Town 7550

Cape Town: +27(0)21 948 0900
Gauteng: +27(0)12 346 1672
Website: www.kls.co.za
e-mail: info@kls.co.za

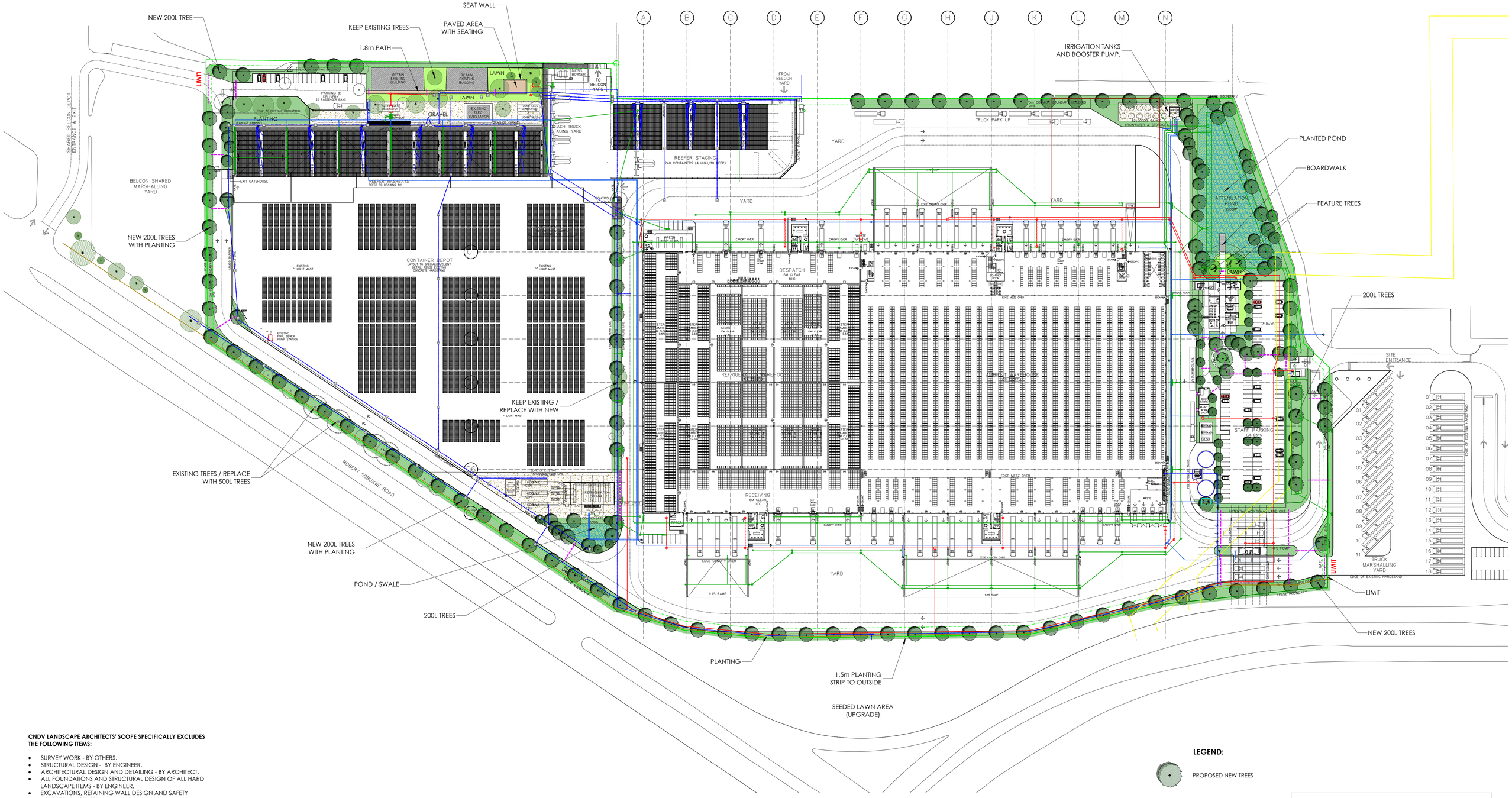
BELCON LOGISTICS HUB

TYPICAL DETAIL: SWALES

TEKENING Nr.
DRAWING No.
22093-511

Appendix G

Landscape Plan



CNDV LANDSCAPE ARCHITECTS' SCOPE SPECIFICALLY EXCLUDES THE FOLLOWING ITEMS:

- SURVEY WORK - BY OTHERS.
- STRUCTURAL DESIGN - BY ENGINEER.
- ARCHITECTURAL DESIGN AND DETAILING - BY ARCHITECT.
- ALL FOUNDATIONS AND STRUCTURAL DESIGN OF ALL HARD LANDSCAPE ITEMS - BY ENGINEER.
- EXCAVATIONS, RETAINING WALL DESIGN AND SAFETY ASPECTS - BY OTHERS.
- DRAINAGE, STORM WATER AND SEWER DESIGN - BY ENGINEER.
- ELECTRICAL DESIGN - BY ENGINEER.
- FIRE PROTECTION AND ESCAPE DESIGN - BY FIRE PROTECTION CONSULTANT.
- WATERPROOFING DESIGN AND INSPECTIONS - BY SPECIALIST CONSULTANT.
- ROADS, DRIVEWAYS, STATUTORY SIGNAGE AND PARKING DETAILING - BY ENGINEER.
- LAYER WORKS AND UNDER TILE SLAB DESIGN AND SPECIFICATION - BY ENGINEER
- SLEEVES AND JUNCTION BOXES - BY ENGINEER.
- STRUCTURAL JOINTS AND EXPANSION JOINTS - BY ENGINEER.
- PAVING, TILING, DECKING, COPINGS AND FINISHES TO BE SEALED AND INSTALLED TO MANUFACTURERS' SPECIFICATION.
- POOL DETAILED DESIGN - BY SPECIALIST POOL CONTRACTOR.
- ALL WATER METERS AND CONNECTIONS - BY ENGINEER.
- PUMPS AND FILTERS AND WATER FEATURE DETAILED DESIGN - BY SPECIALIST.
- ALL WORK TO BE DONE TO COMPLY TO RELEVANT AND APPLICABLE SANS CODES.
- SHOULD ANY DESIGN WORK NOT COMPLY WITH SANS, THE CONTRACTOR SHALL INFORM CNDV IN WRITING PRIOR TO INSTALLATION FOR RECTIFICATION.
- WORKSHOP DRAWINGS TO BE PROVIDED BY SPECIALIST MANUFACTURERS, PRIOR TO MANUFACTURE, FOR ALL METAL WORK AND SPECIALIST ITEMS, TO BE SIGNED OFF BY ARCHITECT AND LANDSCAPE ARCHITECT.
- SHOULD THERE BE ANY DISCREPANCIES OR CONFUSION, ALL WORK SHOULD ADHERE TO APPLICABLE SANS CODES.

NOTES:

1) AN IRRIGATION SYSTEM IS TO BE INSTALLED IN ALL PLANTED AREAS. SPRAYER OVERLAP TO BE 100%. ALL TREES TO HAVE IRRIGATION AS PART OF THE OVERALL SYSTEM. ALL PIPES AND FITTINGS TO BE SABS APPROVED AND TO THE LANDSCAPE ARCHITECTS APPROVAL. ALL IRRIGATION SLEEVES ARE TO BE 110mm Ø, POSITIONED 600mm BELOW FINISHED LEVEL OF ROAD KERBING OR PAVING, AND ARE TO EXTEND 600mm BEYOND EDGE OF ROAD KERBING OR PAVING. ALL SLEEVES ARE TO RUN TO THE SIDE OF TREE OPENINGS, NOT THE CENTRE.

2) A MIN. 40mm IRRIGATION WATER CONNECTION POINT MUST BE PROVIDED NEAR THE IRRIGATION MAINLINE

3) ALL TREES TO BE STAKED USING 2x50mm DIA. TANALITH TREATED POLES DRIVEN 600mm INTO THE GROUND AND TIED BY MEANS OF TWO RUBBER HOSES AND WIRE OR COMMERCIAL TREE TIES. CARE MUST BE TAKEN NOT TO DAMAGE THE ROOT BALL OF THE TREE.

PLANT LIST

TREES (min 100L size)
Chionanthus foveolatus
Cunonia capensis
Brabejum stellaatifolium
Ekebergia capensis
Erythrina lysistemon
Ficus natalensis
Ficus rubiginosa
Harpephyllum caffrum
Kiggelaria africana
Nuxia floribunda
Rapanea melanophloes
Syzigium guineense
Salix mucronata

SHRUBS 3-5m² (min 6 pack size)
Agapanthus africanus blue/white
Aristea major
Barleria obtusa 'Blue'
Bauhinia galpinii
Carissa macrocarpa 'Green Carpet'
Cliffortia heterophylla
Coleonema album
Celeonema pulchellum
Dietes grandiflora
Elegia tectorum 'Fishoek'
Elegia tectorum (large)
Eriocephalus africanus
Felicia ammeloides
Felicia filifolia
Leonotis leonurus - white
Metalasia muricata
Myrsine africana
Pelargonium sp.
Plectranthus ecklonii 'Medley Wood' blue
Plumbago auriculata - blue
Podalyria calyptrate
Podalyria sericea
Salvia sp.
Scabiosa africana
Searsia sp.
Tecoma capensis 'Pink Bush'

GROUNDCOVERS 5-7m²
Aptenia cordifolia 'purple'
Agapanthus nana 'Peter Pan' / miniature blue
Agathosma sp.
Arctotis White
Arctotis Pink
Aristea africana
Asparagus densiflorus 'Mazeppa'
Barleria repens 'Purple Prince'
Crassula pelucida
Geranium incanum
Gazania - white
Gazania - pink
Helichrysum teretifolium
Juncus lomatophyllus
Lampranthus spectabilis 'Purple'
Limonium perezzi
Osteospermum ecklonii
Osteospermum jucundum
Pelargonium capitatum
Plectranthus ciliatus
Plectranthus peltatum
Plectranthus neochilus
Sutera cordata 'Blizzard'

AQUATIC AND MARGINAL PLANTS 3-5m²
Aponogeton distachyos
Bulboschoenus maritimus
Calopsis paniculata
Carex clavata
Cyperus textilis
Elegia sp.
Ficinia nodosa
Isolepis prolifer
Juncus sp.
Mariscus thunbergii
Nymphaea capensis - blue
Oxalis sp.
Potamogetum pectinatus
Prionium serratum (Palmiet)
Restio festuciformis
Schoenoplectus sp.
Scirpus nodosus
Sparaxis bulbifera
Spiloxene sp.
Thamnochortus insignis
Wachendorfia paniculate
Zantedeschia aethiopica

LEGEND:

- PROPOSED NEW TREES
- NEW FEATURE TREES
- EXISTING TREES TO REMAIN
- TREES TO BE REMOVED
- NEW PLANTING
- PAVING
- LAWN
- GRAVEL
- PONDS
- SWALE
- SLEEVES BY OTHERS

REVISIONS

REV NO.	DESCRIPTION	TYPE OF ISSUE
00	DRAWING CREATED	FOR SUB.
01	LANDSCAPE REMOVED FROM N.E CORNER OF WAREH.	FOR SUB.
02	SWALES REVISED	FOR INFO.
03	SITEPLAN REVISED	FOR INFO.

FOR INFORMATION

BELCON LOGISTICS HUB

LANDSCAPE PLAN

Drawing No: 2976 - 03 - LP - REV 03
Scale: 1:1000 @ A1 Date: 01 JUN 2023
Drawn by: MC Checked by: TdV

CNDV LANDSCAPE ARCHITECTS
tel: +27 21 810 7799
web: www.cndv.biz
44 Upper Orange Str., Oranjezicht, Cape Town, 8001