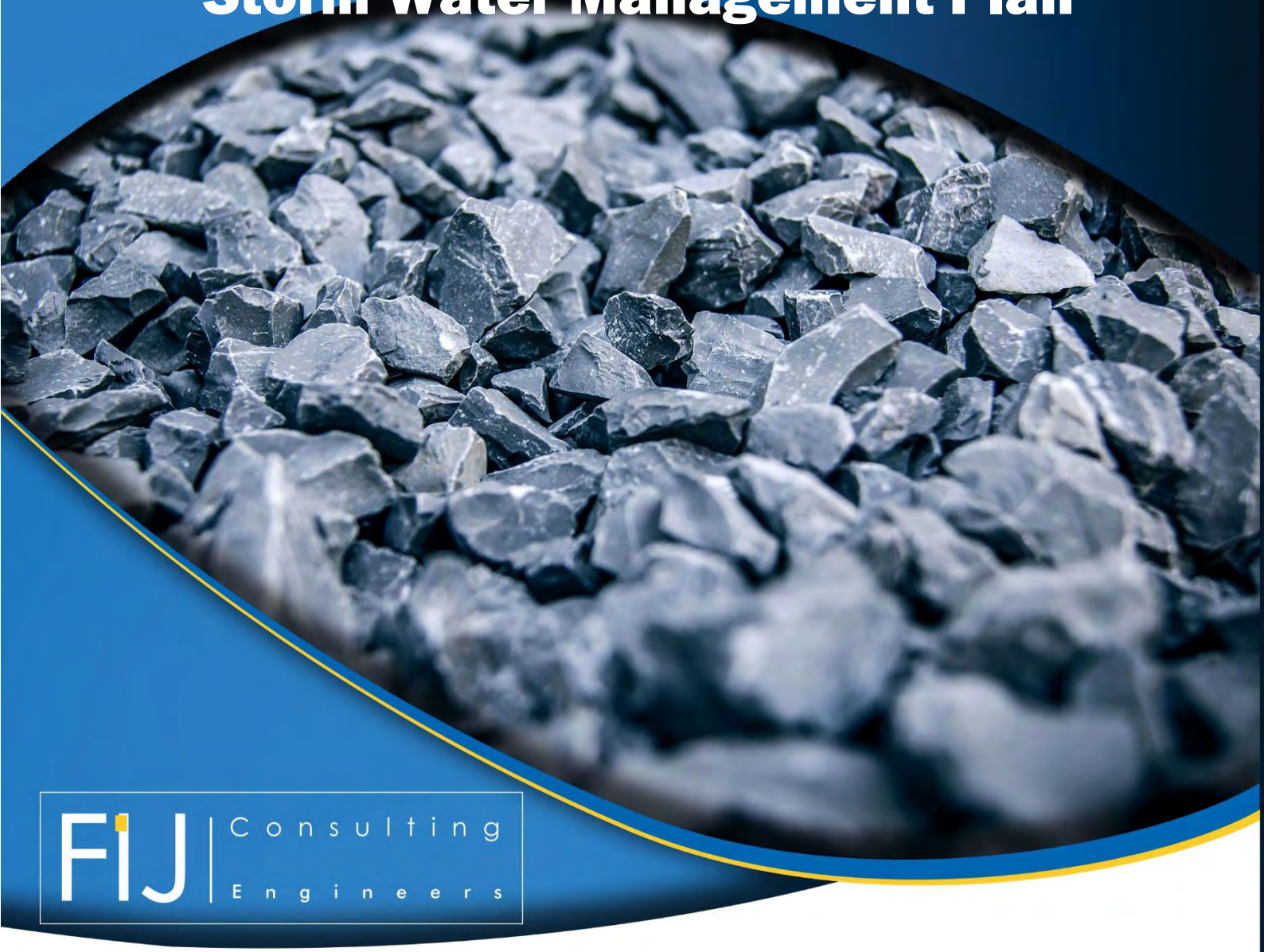
GLENCORE

Glencore Kroondal-Clover RCM

Storm Water Management Plan



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JULY 2025

REVISION C

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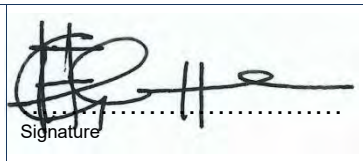
PREPARED BY:	Farai Gudza	Civil Engineer	 Signature
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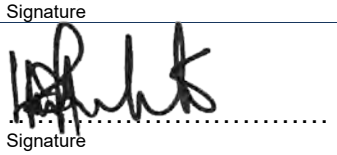
APPROVED BY:	Lloyd Feshete Pr Eng	Director	 Signature
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ACRONYMS AND ABBREVIATIONS

BPG	Best Practice Guideline
CN	Curve Number
DPC	Driefontein Plant Complex
DTM	Digital Elevation Model
DWS	Department of Water and Sanitation
ECO	Environmental Control Officer
GIS	Geographical Information Systems
GN704	Government Notice No. 704
MAP	Mean Annual Precipitation
MAE	Mean Annual Evaporation
MAR	Mean Annual Runoff
mamsl	metres above mean sea level
NWA	National Water Act, 1998 (Act No. 36 of 1998)
RWD	Return Water Dam
SCS	Soil Conservation Service
SWMP	Stormwater Management Plan
SACNASP	South African Council for Natural Scientific Professions
TSF	Tailings Storage Facility
WMA	Water Management Areas
WR2012	Water Resources of South Africa, 2012 Study
WUL	Water Use License
WULA	Water Use License Application

TERMINOLOGY

Activity - any mining related process on the mine including the operation of washing plants, mineral processing facilities, mineral refineries and extraction plants; the operation and the use of mineral loading and off-loading zones, transport facilities and mineral storage yards, whether situated at the mine or not; in which any substance is stockpiled, stored, accumulated, dumped, disposed of or transported.

Berm - a barrier constructed of compacted earth and other material that is generally intended to restrict or direct the flow of water.

Clean area - refers to any unpolluted area at or near a mine or activity, which has the potential to become contaminated by mining activities if not managed appropriately.

Clean water system - includes any dam, other form of impoundment, canal, works, pipeline and any other structure or facility constructed for the retention or conveyance of clean unpolluted water.

Channel - is a surface feature through which water travels.

Dirty area - refers to any area at a mine or activity which causes, has caused or is likely to cause pollution of a water resource (i.e. generate contaminated water as a result of mining activities).

Dirty water system - includes any dam, other form of impoundment, canal, works, pipeline, residue deposit and any other structure or facility constructed for the retention or conveyance of water containing waste.

Evaporation dam - dam like structures designed to efficiently evaporate water by sunlight and exposure to ambient temperature.

Pollution control dam - a dam that captures and retains dirty water from a mining area to minimize the area that is polluted as far as possible by separating out clean and dirty water catchments. The dam is then used to manage dirty water through recycling, reuse, evaporation and/or treatment.

1 EXECUTIVE SUMMARY

FIJ Consulting (Pty) Ltd was appointed by Glencore to render professional services for the expansion works at the Clover Rustenburg Chrome Mine (RCM) in Rustenburg. This report presents the Stormwater Management Plan for this planned development, prepared in accordance with standard engineering practices and environmental management requirements. The purpose of this plan is to ensure effective and sustainable stormwater control measures are in place to mitigate the impacts of the proposed development on the surrounding hydrological environment. The scope of the study includes the review and analysis of the proposed site development plan, the assessment of both pre-development and post-development hydrological conditions, and the design of suitable attenuation infrastructure to manage runoff volumes and peak flow rates for the clean water. The project scope and findings are summarized below as:

- To review the Site Development Plan (SDP) of the proposed layout for the Glencore Kroondal-Clover RCM, including infrastructure that will significantly alter existing surface runoff patterns. The SDP was obtained from the project design team and used as the basis for the hydrological and hydraulic assessments.
- Assess the pre-development conditions of the existing site, including topography, soil types, vegetation cover, and historical rainfall data. Baseline flow characteristics were modelled to establish the natural drainage behaviour of the undeveloped site.
- The post-development conditions were analysed. The anticipated changes in impervious surface coverage and land grading were analyzed to determine the increase in runoff volumes and peak flows due to development. The results indicate an increase in stormwater runoff as expected, requiring appropriate mitigation measures through the construction of an artificial wetland.
- A stormwater attenuation system has been designed as an artificial wetland to manage the increased runoff. The system has been designed to reduce post-development peak discharges to pre-development levels for relevant storm events, in compliance with local stormwater regulations.
- The stormwater management plan has been developed as a comprehensive management strategy to address stormwater quantity and quality. The plan includes the design of collection systems, attenuation facilities, and erosion protection measures, ensuring long-term functionality and minimal environmental impact. The proposed stormwater management measures are expected to effectively control runoff, minimize flooding risk, and protect downstream infrastructure and watercourses.

This report has been compiled for submission to **Glencore** for review and approval as part of the environmental and engineering design processes. The report will be part of the documents submitted to the Department of Water & Sanitation (DWS) as supporting documents to the Water Use License Application (WULA) that the environmental specialists are handling.

2 INTRODUCTION AND TERMS OF REFERENCE

2.1 Terms of Reference

The purpose of this report is to provide information to the client, Glencore, and the project team on the technical requirements and scope for stormwater engineering services for the proposed development.

Once approved, the report will be shared with DWS who will then advise Glencore on the viability of the proposed stormwater management infrastructure.

3 RELEVANT INFORMATION

3.1 Location of Proposed Development

The Glencore Kroondal-Clover RCM is located in the western limb of the Bushveld Igneous Complex, approximately 15 km southeast of Rustenburg in the Northwest Province of South Africa. The site falls under the administrative jurisdiction of the Rustenburg Local Municipality, within the Bojanala Platinum District.

The development site lies within a predominantly mining and semi-rural area, characterized by undulating topography and a mix of industrial, agricultural, and natural land uses. Access to the site is provided via existing mine roads, which connect to the regional road network, including the R104 and the N4 Platinum Highway.

The geographical coordinates (WGS84) of the approximate centre of the site are:

- **Latitude**: 25°43'37.08"S
- **Longitude**: 27°21'44.51"E

These coordinates place the site within the general mining footprint of the Glencore Kroondal-Clover RCM, where the proposed works will be developed to support the continued mining operations as an administrative area and not necessarily mining production.

The site locality is shown in the satellite map below.

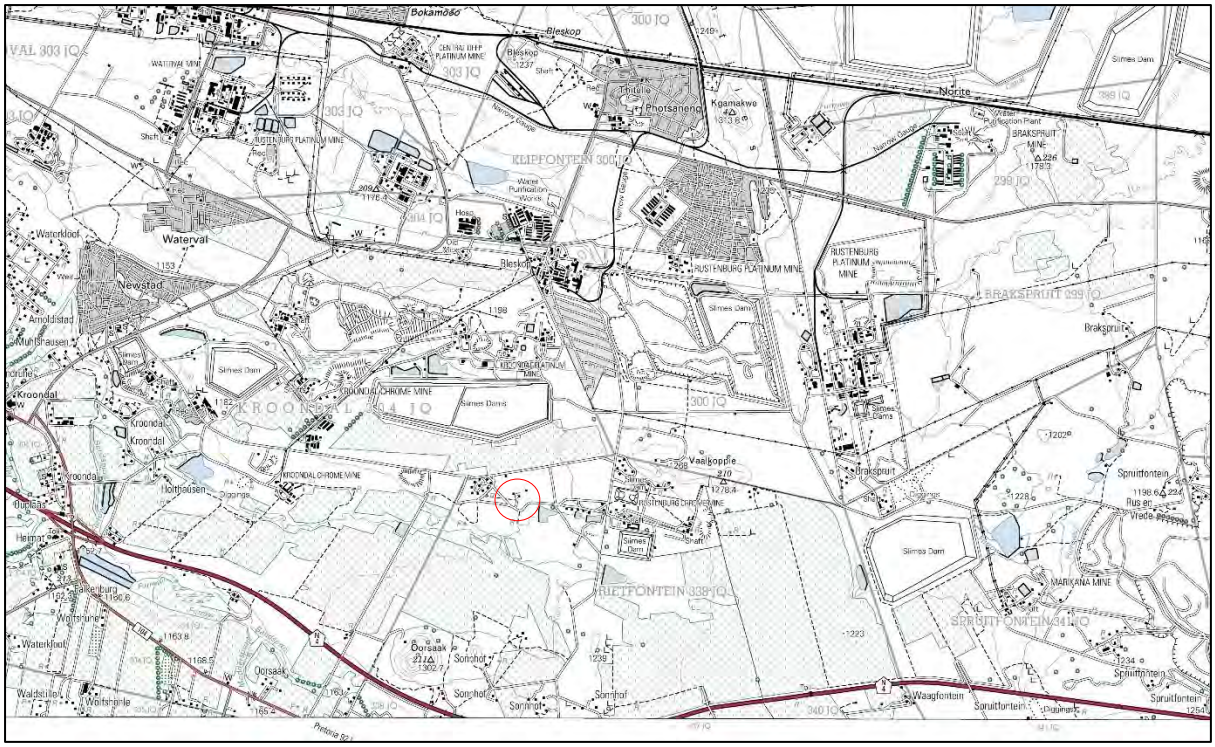


Figure 1: Overall Locality Map

Figure 2: Site Locality Map

3.2 Current Site Conditions

The site of the proposed works is located within the gently undulating terrain typical of the western limb of the Bushveld Igneous Complex. Elevations across the site range from approximately 1,130 to 1,160 meters above mean sea level, with a generally northward and north-eastward slope direction. Local drainage is characterized by shallow, seasonal watercourses and surface sheet flow, which typically converge into defined channels during periods of heavy rainfall.

The general topography of the site has been historically modified by mining activities, with disturbed ground, access roads, overburden dumps, and infrastructure pads present throughout the area. Vegetation is largely sparse, consisting of low-lying bushveld species and grassland, interspersed with cleared and compacted zones around active mining areas. The target area for the proposed development currently has permanent structures and some prefab offices all connected by paved and or unpaved walkways.

Below are sample pictures depicting the site conditions:

Pre-development conditions	Existing services and pre-development conditions	Unpaved walkways
Paved walkways	Existing ablutions	Paved walkways

Figure 3: Existing site conditions

3.3 Climate

Rustenburg in South Africa is characterized by a Koppen climate classification of C_{wa}, indicative of a Humid subtropical climate with a dry winter. Its geographical location allows for diverse weather patterns reflected in its monthly averages. Around the year, Rustenburg experiences a significant swing in its weather parameters demonstrated by temperatures, humidity levels, and rainfall. The highest average temperature recorded is 29.3°C while the lowest average is 6.3°C. The difference in temperature is a reflection of Rustenburg's varied climate, which shifts from comfortably warm to refreshingly cold within a span of few months.

Humidity levels hover around the 60% mark with slight variations throughout the year, the lowest being 44% and the highest reaching 61%. Rainfall patterns are notably distinguishing, with the highest rainfall recorded in December and January at 95mm and 83mm respectively, while the dry months correspond to a drastic fall to 1mm of rainfall. Unusual weather patterns include a significant drop in rainfall between the months of May and August. It is also noteworthy that the wind speed varies between 7km/h to 10.6km/h, influencing the local weather conditions.

Below is the representation of the maximum and minimum temperatures:

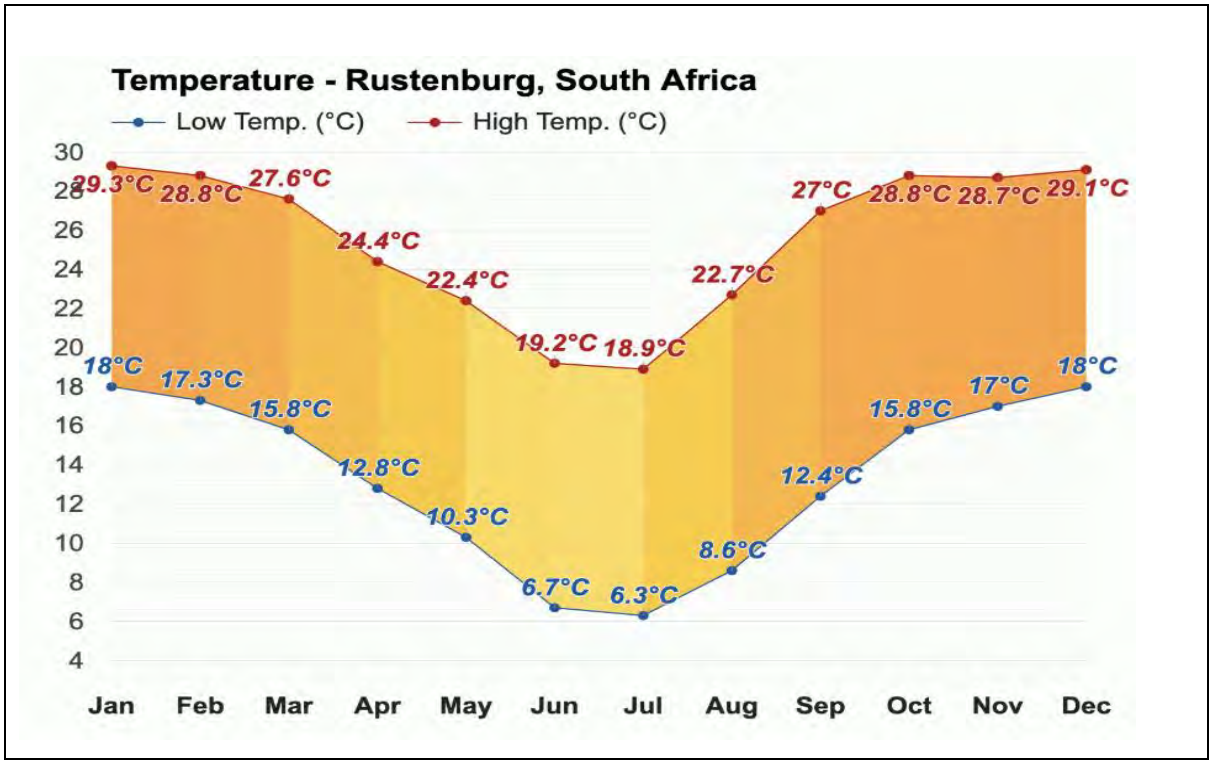


Figure 4: Maximum and minimum temperatures for Rustenburg

The rainfall pattern in Rustenburg shows significant variation throughout the year. Maximum precipitation of 117 mm can be expected during the wettest month of December, distributed

over 12 rainy days. July offers drier and sunnier days, with around 3.4 mm of rainfall over a single rainy day.

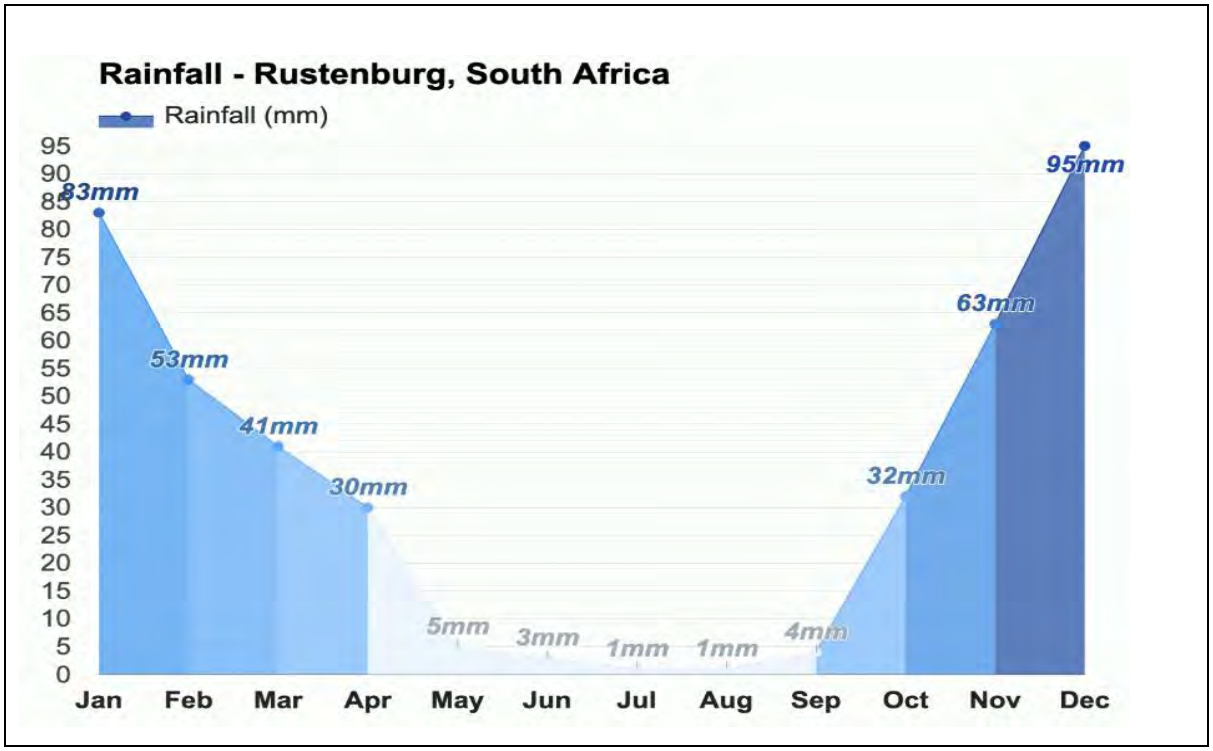


Figure 5: Rainfall pattern for Rustenburg

3.4 Geological conditions

From the geological maps, the site is underlain by formations of the Bushveld Igneous Complex, one of the world's richest mineral-producing geological structures. More specifically, the mine targets the Middle Group (MG) chromitite seams of the Critical Zone, which are hosted within layered mafic-ultramafic intrusive rocks, primarily norite, pyroxenite, anorthosite, and harzburgite.

These formations exhibit strong lateral continuity and are generally competent, though weathering and fracturing occur near surface. Soil cover over the hard rock varies in depth but is typically shallow, comprising transported colluvial materials and residual red to brown sandy clays and silty soils.

Geotechnical investigations in the area have indicated that rock quality is generally good for shaft development, though local stability conditions must account for jointing, weathering, and groundwater ingress potential—particularly within decline shaft excavations.

These topographical and geological conditions directly inform the stormwater design approach, as surface flow paths, infiltration capacity, and slope stability are integral to the performance of the proposed management system.

3.5 Rationale for Evaluating Pre- and Post-Development Effects

The evaluation of pre- and post-development stormwater runoff conditions for the proposed works is a critical component of responsible and sustainable civil engineering design, particularly for a mining infrastructure project such as the proposed project. Evaluating pre-development conditions establishes the natural or existing hydrological behaviour of the site, including runoff volumes, peak flow rates, infiltration capacity, and natural drainage paths. This serves as a baseline against which the impact of proposed development can be measured.

The post-development analysis quantifies the changes introduced by land disturbance, impervious surfaces (e.g., roads, infrastructure pads), and regrading activities. These changes typically result in increased surface runoff, reduced infiltration, and altered flow patterns—factors that can contribute to downstream flooding, pollution, erosion, and sedimentation if unmanaged.

Comparing these pre- and post-development conditions provides essential data for the design of mitigation measures, such as an artificial wetland as an attenuation pond, channels, and erosion protection. This ensures that the development does not exacerbate flood risk or negatively impact the downstream environmental conditions, watercourses and infrastructure.

Below is a depiction of the pre- and post- development scenarios on site:

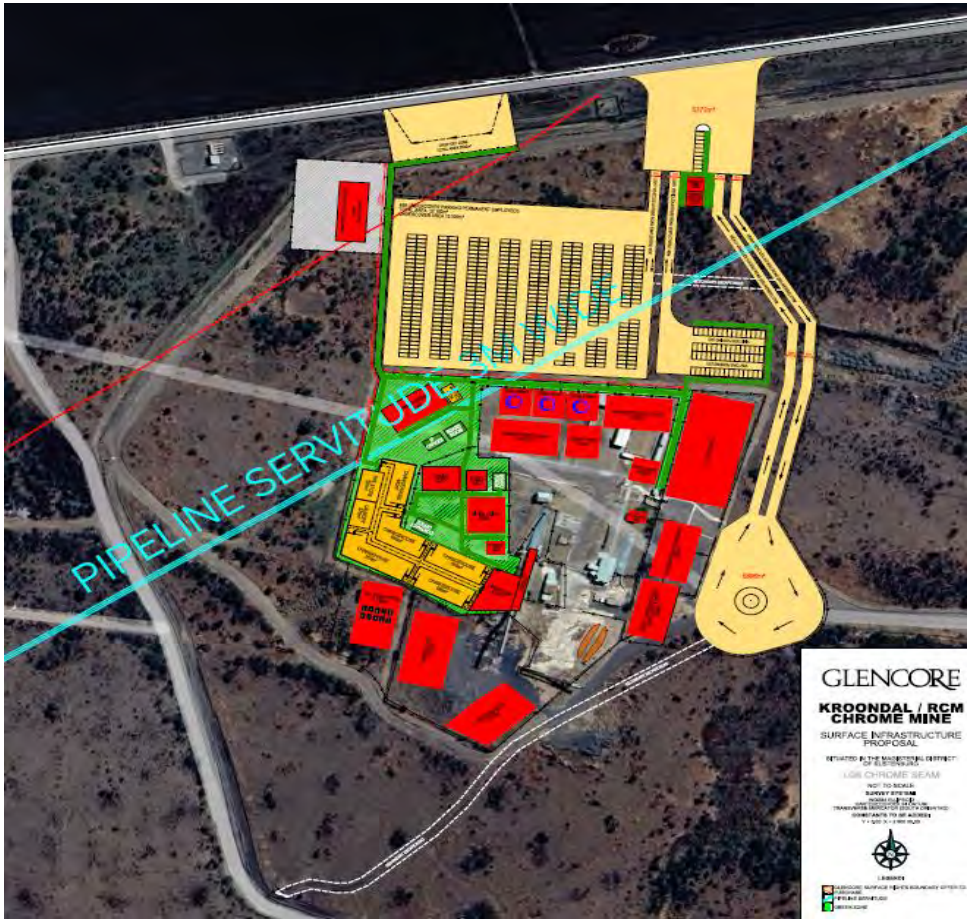
Pre- development conditions	Post- development conditions
	

Figure 6: Pre- and post- site development conditions

It is Glencore's intention that the existing stockpile and conveyor area be rehabilitated to accommodate the planned chair lift and laydown areas as indicated in the shaded area in the layout below:

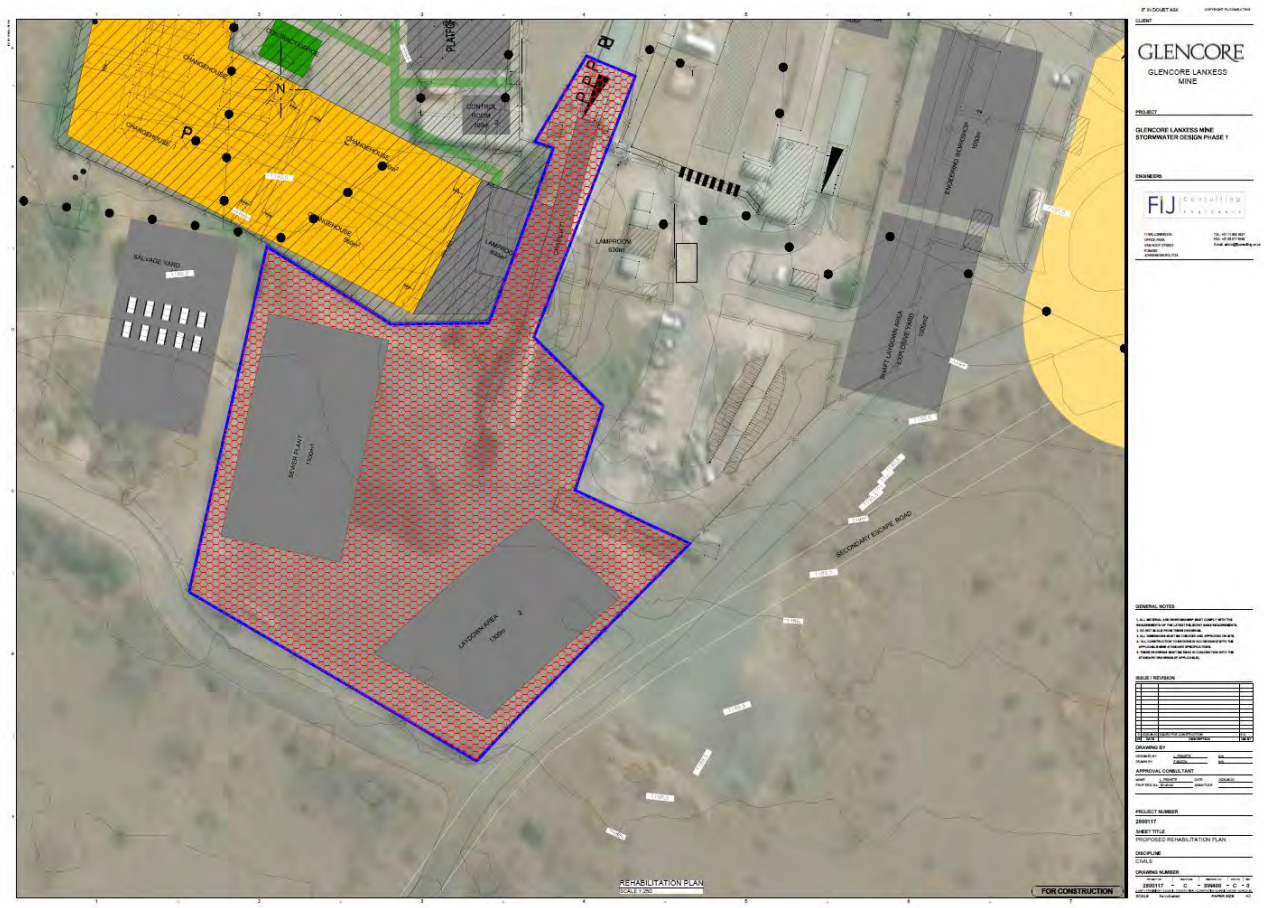


Figure 7: Post-Development proposal to rehabilitate the current stockpile and conveyor areas.

With this post-development proposal, there will be no dirty water produced on this entire area. Hence, the development will only produce clean water as planned. The SWMP will aim to address this.

4 STORMWATER MANAGEMENT

4.1 Regulatory Framework

The design and implementation of storm water management plan shall comply with:

- GN704 - Regulations on use of water for mining and related activities, published under the National Water Act, 1998;
- Department of Water and Sanitation (DWS) Best Practice Guideline G1: Storm Water Management;
- relevant SANS standards and local municipal by-laws.

4.2 Design Approach

The design philosophy adopted to guide the development of the SWMP was based on the above regulations which emphasis the principles of clean and dirty water separation, even though the planned office infrastructure to be built is categorized as a clean water area. The philosophy is preventive, aiming to ensure clean storm water remains uncontaminated and is discharged safely into the environment.

4.3 Site Characterisation

The site was characterised as below:

- impermeable surfaces - mainly rooftops, concrete pathways, parking lots,
- permeable zones - manicured and vegetated surfaces,
- runoff quality – the proposed works do not anticipate producing process-related or contaminated/dirty water, and
- the topography and drainage routes – these were meticulously delineated utilizing survey data.

4.4 Objectives for Stormwater Design

The aim of this SWMP is to:

- contain and control runoff from storm events with a recurrence interval of at least 1:50 years, contingent upon risk and development size,
- mitigate erosion and regulate runoff,
- safeguard downstream water consumers and aquatic habitats, and
- mitigate ponding and localized flooding.

4.5 Essential Storm Water Management Strategies

a) Clean water collection and diversion will be achieved through:
   - the use of roof gutters, downpipes, and channels to gather runoff from roofs and impervious surfaces,
   - lined channels and grassed swales to direct stormwater to the nearest clean water discharge location, and
   - stormwater attenuation pond to regulate peak flows.

b) Erosion and sediment management, which will:
   - guarantee that all outlets are safeguarded with energy dissipators or riprap,
   - vegetated buffer zones adjacent to drainage pathways, and
   - through constructing silt ponds and level spreaders to diminish velocity and improve infiltration where appropriate.

c) Infiltration and groundwater recharge in order to:
   - promote on-site infiltration when soil conditions permit via soakaways or permeable paving, and
   - reduce impervious surfaces to reduce runoff volume (roads and parking will be unpaved).

d) Infiltration and groundwater recharge in order to:
   - promote on-site infiltration when soil conditions permit via soakaways or permeable paving, and

e) Maintenance and sustainability by:
   - integrating designs that require minimal maintenance, and
   - routine inspections and maintenance of drainage systems, especially prior to the rainy season.

4.6 Pre-development (Clean and Dirty Areas)

For the pre-development conditions, the areas demarcated as Catchments 1 and 2 in the layout below have been designated as clean areas, whereas Catchment 3 and 4 have been designated as dirty areas.

The table below shows the catchment areas for clean and dirty water catchment areas for pre-development conditions.

Facility	Catchment Number	Run-off Water	Catchment Area
Glencore Laxness	1	Clean Water	39.3Ha
Glencore Laxness	2	Clean Water	29.9Ha
Glencore Laxness	3	Dirty Water	2.9Ha
Glencore Laxness	4	Dirty Water	4.8Ha *(not under this scope)*

Table 1: Pre-Development Catchment Areas

The diagram below shows the pre-development catchment delineations for clean and dirty water for the site.

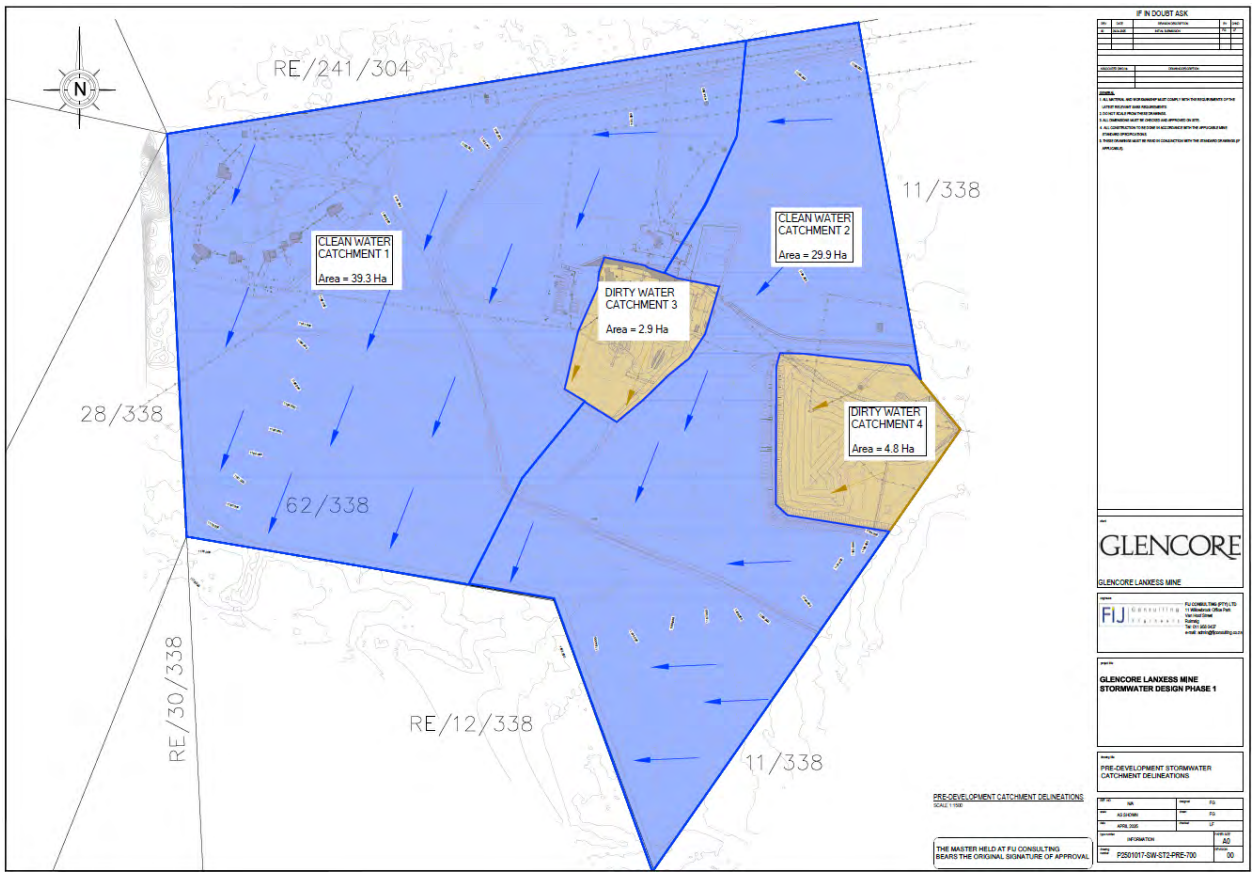


Figure 8: Pre-Development Clean & Dirty Water Catchment Delineation

4.7 Post-development Conditions (Clean Areas)

For the post-development conditions, the site will be designated as generating clean water as there is no anticipated production of process-related or contaminated/dirty water.

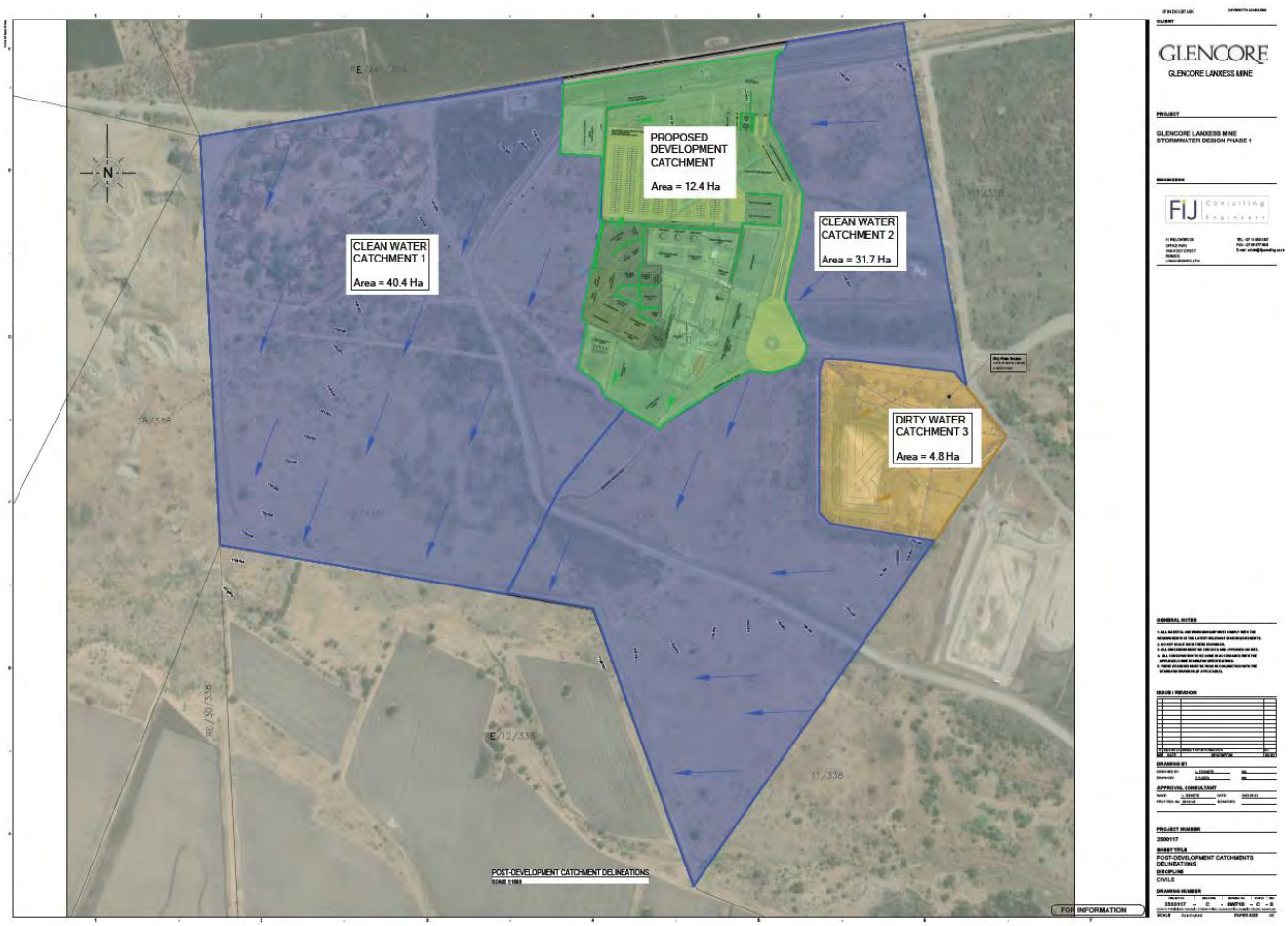


Figure 9: Post-Development Clean Water Catchment Delineation

Catchment 3 was not considered as part of the current scope as it is an old existing area.

4.8 Stormwater Infrastructure Design Criteria

Stormwater run-off peak flows were calculated using the Rational Method, which is based on the following equation.

$$Q = \frac{CIA}{3.6}$$

Where:

Q = Peak Flow for occurrence interval e.g. a 1:50 year flood (m^3/s)

C = Runoff coefficient (dimensionless)

I = Average rainfall intensity over the catchment (mm/hr)

A = Catchment area contributing to the peak flow (km^2)

3.6 = Conversion Factor

The runoff coefficient "C" is calculated from the physical characteristics of the contributing catchment area. This includes the land use, slope, and permeability of the catchment.

The average rainfall intensity "I" was calculated by firstly determining the time of concentration (T_c). The Tc is the amount of time required for all runoff within a catchment to contribute to the peak flow at the catchment outlet. The T_c determines the critical storm duration, which is the duration of a specific storm event (e.g. 1:50 year storm event), that creates the largest volume or highest rate of stormwater runoff. Once the storm duration has been determined, the storm rainfall depth for the required return period is obtained from Rainfall 3 Software. The average rainfall intensity is then calculated by dividing the storm
rainfall depth by the T_c.

The contributing catchment area "A" was calculated by delineating catchment areas from the DTM. The catchments were delineated based on the topography and existing and proposed stormwater measures.
A Microsoft Excel spreadsheet was used to calculate the peak flows. The Rational Method is based on the following key assumptions:

- Rainfall has a uniform area distribution across the total contributing catchment.
- Rainfall has a uniform time distribution for at least a duration equal to the T_c.
- The peak discharge occurs when the total catchment contributes to the flow occurring at the end of the critical storm duration, or T_c.
- The runoff coefficient "C" remains constant for the storm duration, or T_c; and
- The return period of the peak flow is the same as that of the rainfall intensity.

4.8.1 Open Channel Sizing

The Manning's Equation was used to calculate the channel sizes to convey the 1:50 year peak flows, while ensuring the Froude number calculations certify flow remain subcritical (Fr < 1, ideally < 0.8 for stability). The Manning's equation is applicable in uniform steady conditions which are mostly found in man-made channels. The Manning's Equation is as follows:

$$Q = A\frac{1}{n}R^{2/3}S^{1/2}$$

Where:

Q = Peak flow (m^3/s)

A = Cross sectional area of the channel (m^2)

R = Hydraulic radius (m)

S = Longitudinal slope of channel (m/m)

n = Manning's roughness coefficient 'n'

I. The channel geometry has been optimised. It was designed as wide and shallow sections to increase hydraulic radius and reduce flow velocity. The preferred trapezoidal section was considered over rectangular ones to provide smoother hydraulic transitions.

II. The channel slopes have been designed to limit the maximum velocity to 2.5m/s. This velocity will ensure that sub-critical flow is maintained and scouring of the channel is minimised. Longitudinal slopes have been limited to avoid excessively steep gradients. Energy dissipators will be installed at outlets into the wetland area to prevent erosion.

III. The proposed channels have been sized to contain post development flow. The channels are located mainly around the development area to control anticipated run-off. Soon after construction the open channels are susceptible to silting due to lack of grown vegetation within the catchment. Silt fences will be installed at strategic positions to reduce silting during this interim period. The silt fences will be installed according to manufacturer's specification.

4.9 Stormwater Design Outputs

4.9.1 Rainfall Data

Design Rainfall Software was used to obtain rainfall data for the project. The design rainfall data table is shown below. Johannesburg Road Agency Stormwater Management Policy specifies that 1:5 yr, 1:25 yr and 1:50 yr Return Intervals be analysed. The consultant has used 1:20 yr RI instead of 1:25 yr RI because the data source used for this project provides information at that interval.

Return Interval	1:5yr	1:20yr	1:50yr	1:100yr
1 Hr Intensity	36.2mm	49.4mm	58.6mm	65.9mm

Table 2: Design Rainfall Depths

4.9.2 Stormwater Catchments

Four stormwater catchments were used for delineating the site, and the "proposed development catchment area" of 12.4ha, was used to size various elements of the stormwater reticulation. The post development delineation was done using the DTM provided the appointed Land Surveyor. The post development catchment delineation is shown in Fig 9 above.

4.9.3 Stormwater Reticulation

The stormwater reticulation consists of open concrete lined channel reticulation system and surface evaporation pond for the clean water. Details of the stormwater reticulation are attached in the Annexures.

4.9.4 Rainfall Depth

The computer programme "Design Rainfall Estimation in South Africa" which accompanies the Water Research Commission Report titled "Design Rainfall and Flood Estimation in South Africa" by JC Smithers and RE Schulze, School of Bioresources Engineering and Environmental Hydrology, University of Natal, Pietermaritzburg, WRC Project No. K5/1060, dated December 2002 was used to complete a rainfall station locality search and to obtain storm rainfall depth data from the surrounding rainfall stations.

The applicable rainfall data is determined by means of weighted average rainfall data from the surrounding rainfall stations. The weighting is based on the distance from the specified locality to the specific rainfall station.

A summary of the rainfall station searches, and related data is summarised in the table below:

Station Name	SAWS Number	Distance from Proposed Dev	Length of Record (Yrs)	Coordinates	Mean Annual Precipitation, MAP (mm)	Altitude (mams)
WELTEVREDE	0365731_W	7.6km	84	Lat = 27º 41′ Long = 27º 25′	539	1420
RIENZI	0365855_W	10.9km	64	Lat = 27º 43′ Long = 27º 28′	519	1440
KROONSTAD	0365430_W	14.5km	26	Lat = 27º 40′ Long = 27º 15′	593	1350
LEEUSPRUIT WES	0365409_W	16.1km	68	Lat = 27º 48′ Long = 27º 14′	560	1404
KROONSTAD (PARKS)	0365400_W	17.0km	66	Lat = 27º 39′ Long = 27º 14′	567	1350
KROONSTAD (CON)	0365400AW	17.0km	53	Lat = 27º 39′ Long = 27º 14′	567	1342

Table 3: Rainfall Stations Data

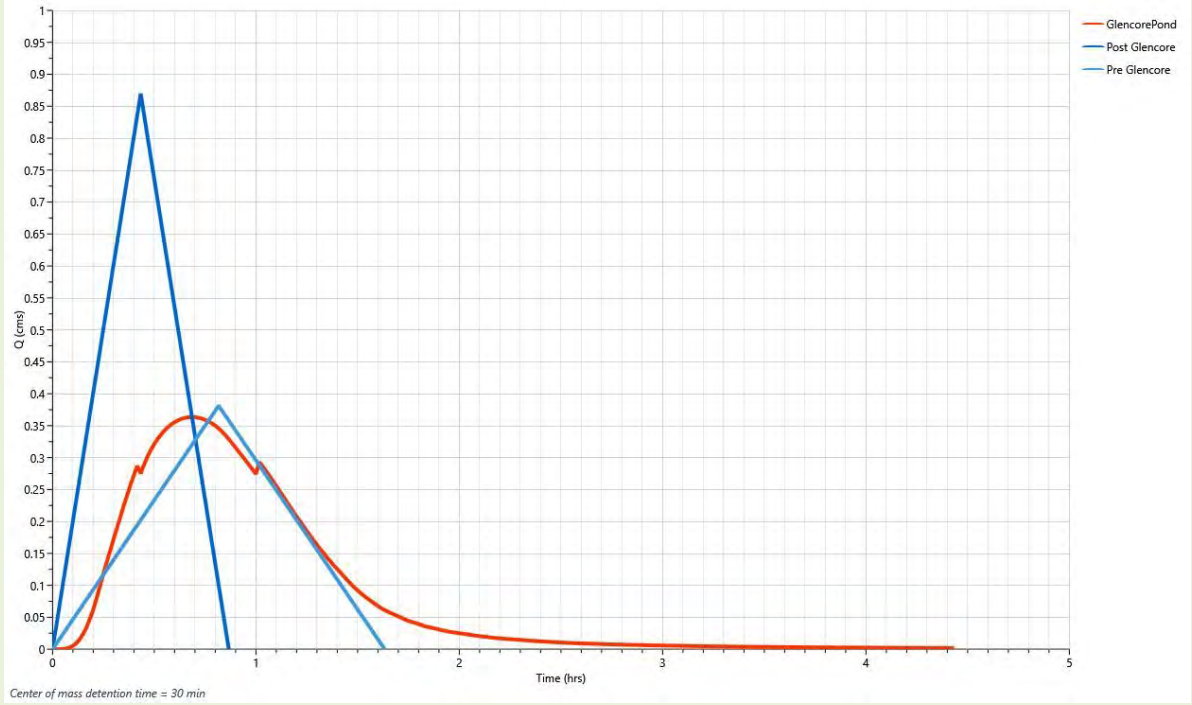
4.9.5 Hydrological Results

The following table shows calculated pre-development flows, post-development, and other catchment parameters for the proposed development.

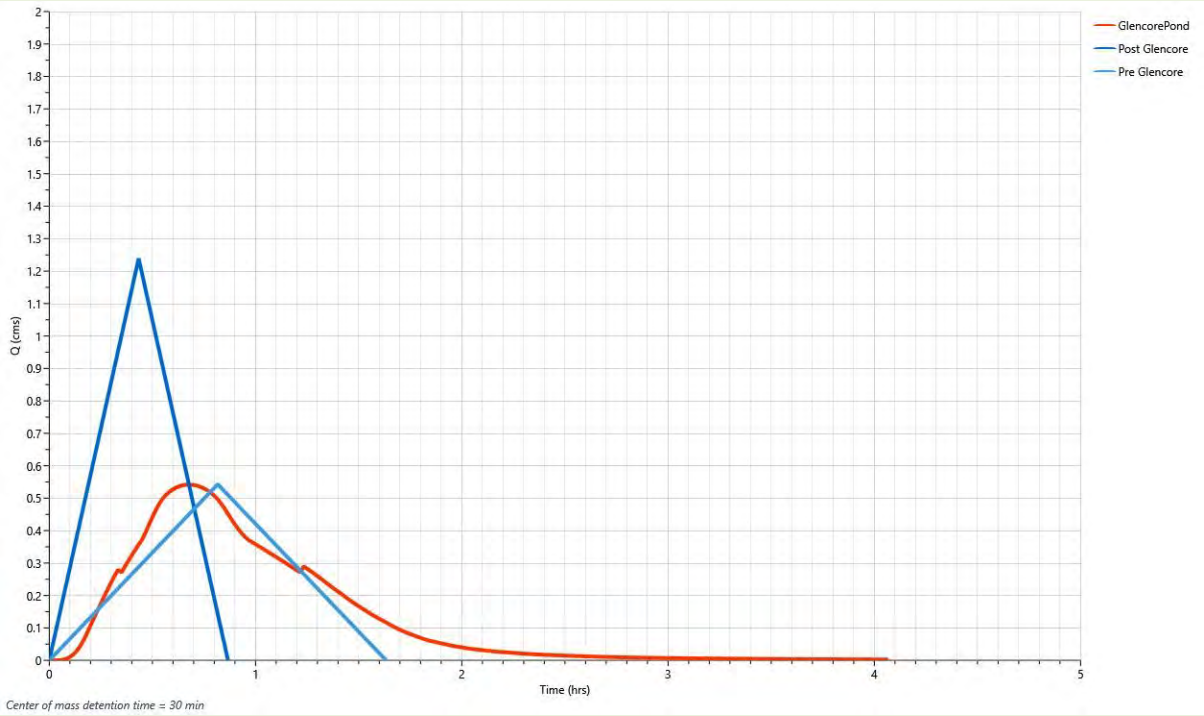
Catchment Area | Proposed Development				0.124 km^2		
Length of Longest Path				0.544 km		
Average Slope (S_{av})				0.013		
Run Off Coefficient	**Pre-Development**			**Post-Development**		
	C = 0.262			**C = 0.390**		
Peak Discharge (m^3/s)	**Pre-Development**			**Post Development**		
	1:5RI	1:20RI	1:50RI	1:5RI	1:20RI	1:50RI
	0.33	**0.49**	**0.65**	**1.05**	**1.48**	**1.84**

Table 4: Hydrological Results for Catchment No.1 Clean Water

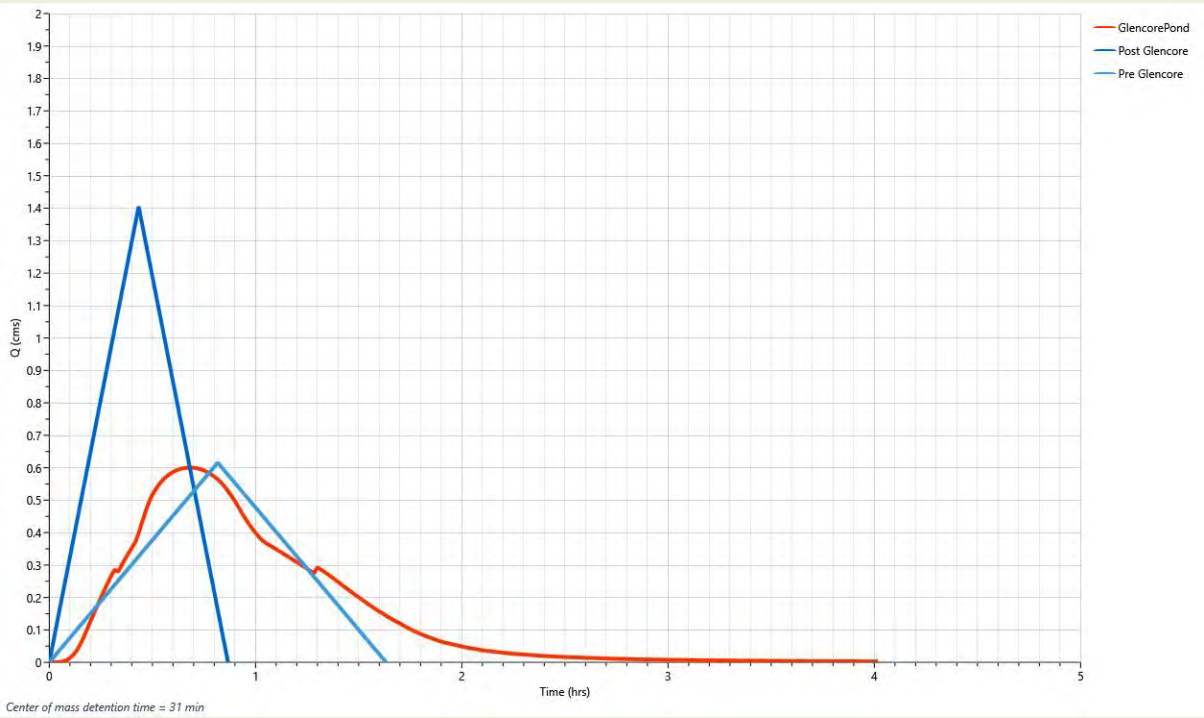
The diagrams below show the hydrological results of various flood return intervals.



1:5 Yr Return Interval: Pre+Post+ Route



1:20 Yr Return Interval: Pre+Post+ Route



1:50 Yr Return Interval: Pre+Post+ Route

The table below shows pre and post development hydrograph volumes for various return intervals.

	Hydrograph Volume		
	1:5 Yr RI	**1:20 Yr RI**	**1:50 Yr RI**
Pre-Development (m^3)	1 121	1 596	1 810
Post Development (m^3)	1 357	1 933	2 192

Table 5: Hydrograph Volumes for various RI

4.10 Stormwater Management

The proposed stormwater management system is aimed at minimising piped networks due to extra attention that is required during maintenance. The clean stormwater will be directed to the artificial wetland attenuation pond before being released into the natural drainage watercourses. The wetland specialist has detailed the artificial wetland concept (species composition, etc).

4.11 Stormwater Detention Pond Design Criteria

Stormwater detention is going to be managed by a proposed attenuation pond or artificial wetland located to the south of the development site.

The artificial wetland area will consist of primary and secondary zones. The wetland will attenuate excessive run-off by temporary storage and purification of run-off before discharge into existing natural water course. Details of the pond are indicated in the Annexures. The same are detailed in the report by wetland specialist.

Item	Classification	Criteria
1	Side slopes	Vertical = 2 : Horizontal =1
2	Pond Depth	Average Depth 0.6m
3	Attenuated Capacity	up to 1:50 year
4	Emergency Overflow	Above 1:50 year

Table 6: Detention Pond Design Criteria

The detention pond will incorporate energy dissipation devices and silt removal traps downstream of the inlets. A circular opening or pipe orifice (known as the primary outlet) will be constructed in the outlet box to regulate flows up to and including the 1 in 25-year event peak flows. The discharge of flows greater than the 1 in 50-year will flow over the structures and daylight into existing road to the north of the development.

4.12 Attenuation Pond Safety

The proposed stormwater attenuation pond will be constructed as an artificial wetland as indicated in the layouts attached. There is a risk of people and or animals falling into the attenuation pond and drown. This risk has been mitigated by proposing construction of 1.8m high ClearVu fence around the attenuation pond. Access to the pond will only be for maintenance purposes and it will be through a pedestrian gate which will be always locked.

5 STORMWATER MAINTENANCE

A maintenance and operating procedures, along with the monitoring programme for stormwater management plan infrastructure will be developed. This will be included in a Stormwater Management Report or Operations and Maintenance (O&M) Manual for the Client.

To maintain the stormwater infrastructure's operational efficacy, the following routine and periodic maintenance and operational operations will be executed:

5.1 General Operational Guidelines

As a norm, all stormwater infrastructure must undergo regular inspection and maintenance to avert blockages, sediment accumulation, or mechanical failure. Maintenance crews will get training in the management of stormwater facilities and spill prevention. Access to all structures (e.g., silt traps, inlets, energy dissipators) will be preserved and stay unobstructed.

5.2 Maintenance Protocols

5.2.1 Lined channels

- Eliminate silt, vegetation, or debris at a minimum of quarterly intervals, or more often during periods of elevated precipitation.
- Examine for erosion to berms, undercutting, or structural instability, particularly near bends or intersections.
- Rectify fissures or compromised linings and regrade lateral slopes where erosion transpires.

5.2.2 Silt traps and Stormwater Retention Ponds

- Examine silt traps after every rain or storm.
- Desilt every one to two years, contingent upon sediment accumulation.
- Conduct monthly inspections of inlets, outlets, and emergency spillways, as well as following significant storms.
- Vegetation surrounding embankments must be trimmed and preserved to avert root damage.

5.2.3 Energy Dissipators and Flow Regulation Structures

- Examine baffle blocks, riprap, or stilling basins quarterly.
- Promptly repair or replace any dislocated or impaired components.

5.3 Monitoring Program

A monitoring program will be established to evaluate the performance and efficacy of the SWMP infrastructure, consisting of the following components:

5.3.1 Maintenance Monitoring

- Monthly inspections through visual assessments for detritus, erosion, and sediment accumulation.
- Maintenance records for all maintenance activities (e.g., desilting, repairs) will be documented with dates, people, and descriptions.
- Annual maintenance audits thorough evaluation of all elements for structural soundness and adherence to the O&M manual.

5.3.2 Flow Surveillance

- The Client can consider installing flow meters at critical outlet locations to measure peak flow rates after substantial rainfall events (return periods of 1:2, 1:5, and 1:10 years).
- Ideally, the data will be gathered during a minimum of three substantial precipitation occurrences annually.
- A yearly assessment of data to confirm adherence to the design Froude number, ensuring subcritical flow ($Fr < 0.8$) will be conducted.

5.3.3 Monitoring of Water Quality

It is important that a quarterly analysis of stormwater for essential indicators be conducted to ensure the life of the artificial wetland, including suspended particulates and pH. Sampling will

be conducted at inflow and outflow sites to evaluate treatment efficacy, and maintenance schedules will have to be modified if performance declines within acceptable criteria.

5.4 Reporting and Adherence

All monitoring data will be compiled into an annual report for submission to the pertinent environmental authorities. Any non-compliance concerns will necessitate corrective action within 7 days.

5.5 Implementation Recommendations

It is recommended that a SWMP supervisor be designated, and that stormwater maintenance responsibilities be integrated into the mine's SHEQ or ISO 14001 Environmental Management System. Checklists and maintenance timelines for on-site staff will be availed and refresher training will be provided annually to maintenance crews and supervisors.

6 CONCLUSION

This Stormwater Management Plan has been developed to support the proposed development of the Glencore Kroondal-Clover RCM Works in Rustenburg. The plan addresses both the current and anticipated hydrological conditions resulting from the development and presents engineered solutions to mitigate adverse stormwater impacts of the clean water.

Understanding and planning for stormwater impacts reduces the risk of damage to infrastructure, operational disruptions at the mining facility, and environmental degradation. It also supports long-term operational sustainability and community relations.

The proposed stormwater reticulation system has been designed to mainly consist of open shallow concrete lined channels around the buildings, draining to the proposed artificial wetland attenuation pond.

The report confirms that the proposed development will result in increased surface runoff due to the introduction of impervious areas and alteration of natural drainage patterns. To address these changes, appropriate stormwater control measures have been designed, including an artificial wetland attenuation pond for the clean water, channelling systems, and erosion protection works, to ensure post-development runoff rates do not exceed pre-development levels.

The proposed stormwater infrastructure has been sized in accordance with applicable design standards and storm return periods and will ensure compliance with regulatory requirements and best management practices. The implementation of this plan will effectively:

- reduce the risk of localised flooding,
- protect on-site and downstream infrastructure,
- minimise environmental impacts,
- support the long-term sustainability of the mining operation.

It is recommended that the stormwater management measures outlined in this report be considered as part of the construction phase and maintained throughout the operational lifespan of the works. Periodic inspections and maintenance will be essential to ensure the continued effectiveness of the system.

This report is submitted to Glencore for review and approval as part of the project's environmental and civil design obligations in preparation for the DWS submission.

7 ANNEXURES

7.1 Annexure A: Stormwater Pre and Post Development Calculations

FLOOD ROUTING INPUT (RATIONAL METHOD)

Client: Glencore
Project: SWMP
Description: Catchment Runoff
Project No.: P25001-17
Date: May-25
Author: FIJ Consulting

DATA REQUIREMENTS

Catchment Area		A	0.124	km^2
Length of longest watercourse		L	0.544	km
Lowest Elevation		$H_{0.10L}$	1188	m
Highest Elevation		$H_{0.85L}$	1195	m
Mean Annual Precipitation		MAP	554	mm
Percentage of Dolomite Area		$D_{\%}$	0	%
Drainage Region	1 Coastal		2	
	2 Inland			
Rural Area as a percentage of total area		$R_{\%\ area}$	100	%
Urban Area as a percentage of total area		$U_{\%\ area}$	0	%

Enter the properties for a rural catchment

RURAL - C1						URBAN - C2	
SURFACE SLOPES		**PERMEABILITY**		**VEGETATION**			
Vlei's & pan's (<3%)	80	Very permeable	30	Dense Bush	17	Lawn and parks	0
Flat areas (3 to 10%)	19	Permeable	60	Cultivated land	2	Industrial	67
Hilly areas (10 to 30%)	1	Semi-permeable	10	Grass land	80	Business/residential	13
Steep areas (>30%)	0	Impermeable	0	Bare surface	1	Streets	20
Total %	**100**	**Total %**	**100**	**Total %**	**100**	**Total %**	**100**

Enter the properties for an urban catchment

Urban C2				
LAWNS	**RANGE**	**FACTOR**	**% OF AREA**	
Sandy, flat <2%	0.05 - 0.10	0.07	90%	
Sandy, steep >7%	0.15 - 0.20	0.17	0%	
Heavy, flat <2%	0.13 - 0.17	0.15	5%	
Heavy, steep >7%	0.25 - 0.35	0.3	0%	
			95%	0.0705
INDUSTRIAL	**RANGE**	**FACTOR**	**% OF AREA**	
Light	0.50 - 0.80	0.58	0%	
Heavy	0.60 - 0.90	0.6	0%	
			0%	0
RESIDENTIAL	**RANGE**	**FACTOR**	**% OF AREA**	
Houses	0.30 - 0.50	0.45	3%	
Apartments	0.50 - 0.70	0.6	0%	
BUSINESS	**RANGE**	**FACTOR**	**% OF AREA**	
Downtown	0.70 - 0.95	0.72	0%	
Neighborhood	0.50 - 0.70	0.6	0%	
			0%	0.0135
STREETS	**RANGE**	**FACTOR**	**% OF AREA**	
Asphalt	0.70 - 0.95	0.8	2%	
Concrete	0.80 - 0.95	0.9	0%	
Brick	0.70 - 0.85	0.8	0%	
			2%	0.016

Output 1				
Average Slope	S_{av}	0.013	m/m	
Time of concentration	T_c	0.817	hours	49.02 minutes

$$T_C = 0.604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467}$$

PRE-DEVELOPMENT FLOOD RUN-OFF CALCULATIONS

Client: Glencore
Project: SWMP
Description: Catchment Runoff
Project No.: P25001-17
Date: May-25
Author: FIJ Consulting

Catchment characteristics

Description of Catchment	**Development Area**
Name of watercourse (if applicable)	N/A

Physical characteristics		Meteorological characteristics	
Size of catchment	0.12400 km^2	Rainfall region:	
Longest watercourse (L)	0.54400 km	Weather Service Station	
Average slope (S_{av})	0.01300 m/m	Weather Service number	
Dolomitic area (D%)	0 %	Mean annual precipitation (MAP)	554 mm
Area distribution factors		2-year return period rainfall (M)	30.6
Rural (α) / Urban (β) / Lakes (ɣ)	**0.8 / 0.2 / 0**	Days of thunder per year (R)	65.5 days/year
		Comments:	

Catchment run-off coefficients

Rural				Urban			
Surface slope	**%**	**Factor**	**C_s**	**Description**	**%**	**Factor**	**C_s**
Vlei's & pan's (<3%)	0.0%	0.03	0.000	**Lawns**			
Flat areas (3 to 10%)	100.0%	0.08	0.080	Sandy, flat <2%	10.0%	0.10	0.010
Hilly areas (10 to 30%)	0.0%	0.16	0.000	Sandy, steep >7%	0.0%	0.20	0.000
Steep areas (>30%)	0.0%	0.26	0.000	Heavy, flat <2%	0.0%	0.17	0.000
Total	**100.0%**	**-**	**0.080**	Heavy, steep >7%	0.0%	0.35	0.000
Permeability	**%**	**Factor**	**C_s**	**Residential areas**			0.000
Very permeable	5.0%	0.04	0.002	Houses	50.0%	0.50	0.250
Permeable	80.0%	0.08	0.064	Apartments	0.0%	0.70	0.000
Semi-permeable	15.0%	0.16	0.024	**Industry**			0.000
Impermeable	0.0%	0.26	0.000	Light	0.0%	0.80	0.000
Total	**100.0%**	**-**	**0.090**	Heavy	0.0%	0.90	0.000
Vegetation	**%**	**Factor**	**C_s**	**Business**			0.000
Thick bush and plantation	1.0%	0.04	0.000	City Centre	0.0%	0.95	0.000
Light bush and farm-lands	1.0%	0.11	0.001	Suburban	0.0%	0.70	0.000
Grasslands	87.0%	0.21	0.000	Streets	40.0%	0.95	0.380
No vegetation	11.0%	0.28	0.031	Maximum flood	0.0%	1.00	0.000
Total	**100.0%**	**-**	**0.032**	**Total (C_2)**	**100.0%**	**-**	**0.640**

Adjustment of run-off coefficient

Return period (years), T	2	5	10	20	50	100	Max
Rural run-off coefficient, C_1 ($C_1 = C_S + C_P + C_V$)		0.202	0.202	0.202	0.202	0.202	-
Adjustment of above dolomitic areas, C_{1D} ($=C_1(1 - D_{\%}) + C_1D_{\%}$ ($\sum$ (D_{factor} x $C_{S\%}$)))		0.202	0.202	0.202	0.202	0.202	-
Adjustment factor for initial saturation of rural areas, F_1		0.550	0.600	0.670	0.830	1.000	-
Adjusted run-off coefficient, C_{1T} ($= C_{1D}$ x F_1)		0.111	0.121	0.136	0.168	0.202	-
Combined run-off coefficient, C_T ($= \alpha C_{1T} + \beta C_2 + \gamma 1$)		0.217	0.225	0.236	0.262	0.290	-

Time of concentration (T_c)

Overland / Sheetflow		Defined watercourse		Notes:
$T_C = 0.604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467}$		$T_C = \left(\frac{0.87L^2}{1000S_{av}}\right)^{0.385}$		
	hours	0.82	hours	

Flood run-off: Rational method

Return Period (years), T		5	10	20	50	100	Max
Point rainfall (mm), P_T		36.20	42.70	49.40	58.60	65.90	-
Point intensity (mm/hour), P_{IT} ($= P_T / P_C$)		44.31	52.26	60.47	71.73	80.66	-
Area reduction factor (%), ARF_T		100.00%	100.00%	100.00%	100.00%	100.00%	-
Average intensity (mm/hour), I_T ($= P_{IT}$ x ARF_T)		44.308	52.264	60.465	71.726	80.661	-
Peak flow (m^3/s), $Q_T = \frac{C_T I_T A}{3.6}$		0.33	0.41	0.49	0.65	0.81	-

FLOOD ROUTING INPUT (RATIONAL METHOD)

Client: Glencore
Project: SWMP
Description: Catchment Runoff | Post Development
Project No.: P25001-17
Date: May-25
Author: FIJ Consulting

DATA REQUIREMENTS

Catchment Area		A	0.124	km^2
Length of longest watercourse		L	0.544	km
Lowest Elevation		$H_{0.10L}$	1188	m
Highest Elevation		$H_{0.85L}$	1195	m
Mean Annual Precipitation		MAP	554	mm
Percentage of Dolomite Area		$D_{\%}$	0	%
Drainage Region	1 Coastal		2	
	2 Inland			
Rural Area as a percentage of total area		$R_{\%\ area}$	100	%
Urban Area as a percentage of total area		$U_{\%\ area}$	0	%

Enter the properties for a rural catchment

RURAL - C1						URBAN - C2	
SURFACE SLOPES		**PERMEABILITY**		**VEGETATION**			
Vlei's & pan's (<3%)	80	Very permeable	30	Dense Bush	8	Lawn and parks	0
Flat areas (3 to 10%)	19	Permeable	60	Cultivated land	2	Industrial	67
Hilly areas (10 to 30%)	1	Semi-permeable	10	Grass land	40	Business/residential	13
Steep areas (>30%)	0	Impermeable	0	Bare surface	50	Streets	20
Total %	**100**	**Total %**	**100**	**Total %**	**100**	**Total %**	**100**

Enter the properties for an urban catchment

Urban C2				
LAWNS	**RANGE**	**FACTOR**	**% OF AREA**	
Sandy, flat <2%	0.05 - 0.10	0.07	90%	
Sandy, steep >7%	0.15 - 0.20	0.17	0%	
Heavy, flat <2%	0.13 - 0.17	0.15	5%	
Heavy, steep >7%	0.25 - 0.35	0.3	0%	
			95%	0.0705
INDUSTRIAL	**RANGE**	**FACTOR**	**% OF AREA**	
Light	0.50 - 0.80	0.58	0%	
Heavy	0.60 - 0.90	0.6	0%	
			0%	0
RESIDENTIAL	**RANGE**	**FACTOR**	**% OF AREA**	
Houses	0.30 - 0.50	0.45	3%	
Apartments	0.50 - 0.70	0.6	0%	
BUSINESS	**RANGE**	**FACTOR**	**% OF AREA**	
Downtown	0.70 - 0.95	0.72	0%	
Neighborhood	0.50 - 0.70	0.6	0%	
			0%	0.0135
STREETS	**RANGE**	**FACTOR**	**% OF AREA**	
Asphalt	0.70 - 0.95	0.8	2%	
Concrete	0.80 - 0.95	0.9	0%	
Brick	0.70 - 0.85	0.8	0%	
			2%	0.016

Output 1				
Average Slope	S_{av}	0.013	m/m	
Time of concentration	T_c	0.428	hours	25.68 minutes

$$T_C = 0.604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467}$$

PRE-DEVELOPMENT FLOOD RUN-OFF CALCULATIONS

Client: Glencore
Project: SWMP
Description: Catchment Runoff | Post Development
Project No.: P25001-17
Date: May-25
Author: FIJ Consulting

Catchment characteristics

Description of Catchment	**Development Area Post Development**
Name of watercourse (if applicable)	N/A

Physical characteristics		Meteorological characteristics	
Size of catchment	0.12400 km^2	Rainfall region:	
Longest watercourse (L)	0.54400 km	Weather Service Station	
Average slope (S_{av})	0.01300 m/m	Weather Service number	
Dolomitic area (D%)	0 %	Mean annual precipitation (MAP)	554 mm
Area distribution factors		2-year return period rainfall (M)	30.6
Rural (α) / Urban (β) / Lakes (ɣ)	**0.53 / 0.47 / 0**	Days of thunder per year (R)	65.5 days/year
		Comments:	

Catchment run-off coefficients

Rural				Urban			
Surface slope	**%**	**Factor**	**C_s**	**Description**	**%**	**Factor**	**C_s**
Vlei's & pan's (<3%)	0.0%	0.03	0.000	**Lawns**			
Flat areas (3 to 10%)	100.0%	0.08	0.080	Sandy, flat <2%	10.0%	0.10	0.010
Hilly areas (10 to 30%)	0.0%	0.16	0.000	Sandy, steep >7%	0.0%	0.20	0.000
Steep areas (>30%)	0.0%	0.26	0.000	Heavy, flat <2%	0.0%	0.17	0.000
Total	**100.0%**	**-**	**0.080**	Heavy, steep >7%	0.0%	0.35	0.000
Permeability	**%**	**Factor**	**C_s**	**Residential areas**			0.000
Very permeable	5.0%	0.04	0.002	Houses	50.0%	0.50	0.250
Permeable	80.0%	0.08	0.064	Apartments	0.0%	0.70	0.000
Semi-permeable	15.0%	0.16	0.024	**Industry**			0.000
Impermeable	0.0%	0.26	0.000	Light	0.0%	0.80	0.000
Total	**100.0%**	**-**	**0.090**	Heavy	0.0%	0.90	0.000
Vegetation	**%**	**Factor**	**C_s**	**Business**			0.000
Thick bush and plantation	1.0%	0.04	0.000	City Centre	0.0%	0.95	0.000
Light bush and farm-lands	1.0%	0.11	0.001	Suburban	0.0%	0.70	0.000
Grasslands	87.0%	0.21	0.000	Streets	40.0%	0.95	0.380
No vegetation	11.0%	0.28	0.031	Maximum flood	0.0%	1.00	0.000
Total	**100.0%**	**-**	**0.032**	**Total (C_2)**	**100.0%**	**-**	**0.640**

Adjustment of run-off coefficient

Return period (years), T	2	5	10	20	50	100	Max
Rural run-off coefficient, C_1 ($C_1 = C_S + C_P + C_V$)		0.202	0.202	0.202	0.202	0.202	-
Adjustment of above dolomitic areas, C_{1D} ($=C_1(1 - D_{\%}) + C_1D_{\%}$ ($\sum$ (D_{factor} x $C_{S\%}$)))		0.202	0.202	0.202	0.202	0.202	-
Adjustment factor for initial saturation of rural areas, F_1		0.550	0.600	0.670	0.830	1.000	-
Adjusted run-off coefficient, C_{1T} ($= C_{1D}$ x F_1)		0.111	0.121	0.136	0.168	0.202	-
Combined run-off coefficient, C_T ($= \alpha C_{1T} + \beta C_2 + \gamma 1$)		0.360	0.365	0.373	0.390	0.408	-

Time of concentration (T_c)

Overland / Sheetflow	Defined watercourse	Notes:
$T_C = 0.604\left(\frac{rL}{\sqrt{S_{av}}}\right)^{0.467}$	$T_C = \left(\frac{0.87L^2}{1000S_{av}}\right)^{0.385}$	
hours	0.43 hours	

Flood run-off: Rational method

Return Period (years), T		5	10	20	50	100	Max
Point rainfall (mm), P_T		36.20	42.70	49.40	58.60	65.90	-
Point intensity (mm/hour), P_{IT} ($= P_T / P_C$)		84.58	99.77	115.42	136.92	153.97	-
Area reduction factor (%), ARF_T		100.00%	100.00%	100.00%	100.00%	100.00%	-
Average intensity (mm/hour), I_T ($= P_{IT}$ x ARF_T)		84.579	99.766	115.421	136.916	153.972	-
Peak flow (m^3/s), $Q_T = \frac{C_T I_T A}{3.6}$		1.05	1.25	1.48	1.84	2.16	-

7.2 Annexure B: Existing Site Conditions (Pre-development Conditions)

RE/241/304
11/338
28/338
62/338
RE/30/338
RE/12/338
11/338
N
1186.000
1185.000
1184.000
1183.000
1182.000
1181.000
1180.000
1179.000
1178.000
1177.000
1187.000
1188.000
1189.000
1190.000
1191.000
1192.000
1193.000
1194.000
1195.000
1196.000
1197.000
1198.000
1199.000
1200.000
1201.000
1202.000
1203.000
1204.000
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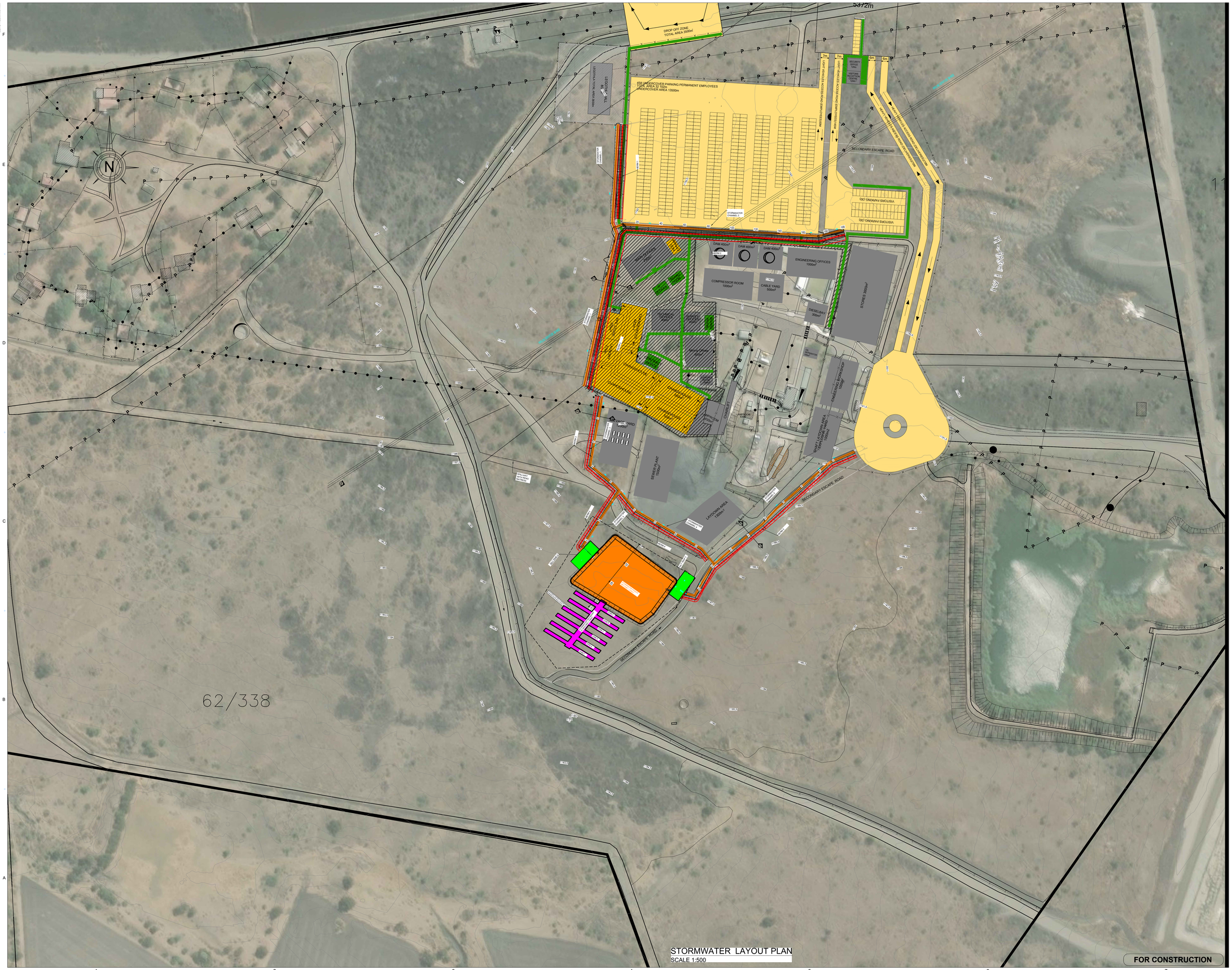
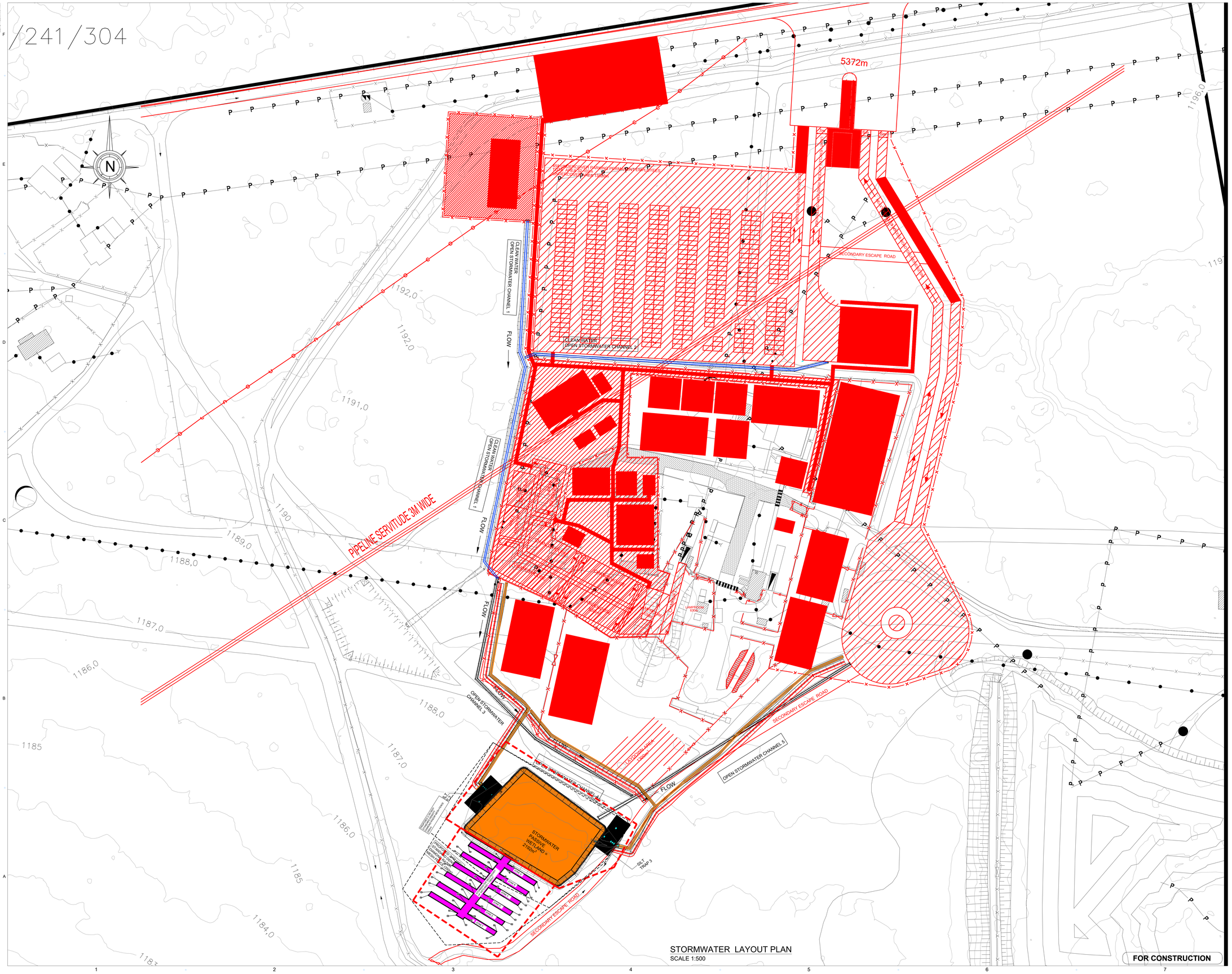
1226.000

7.3 Annexure C: Post-development Conditions

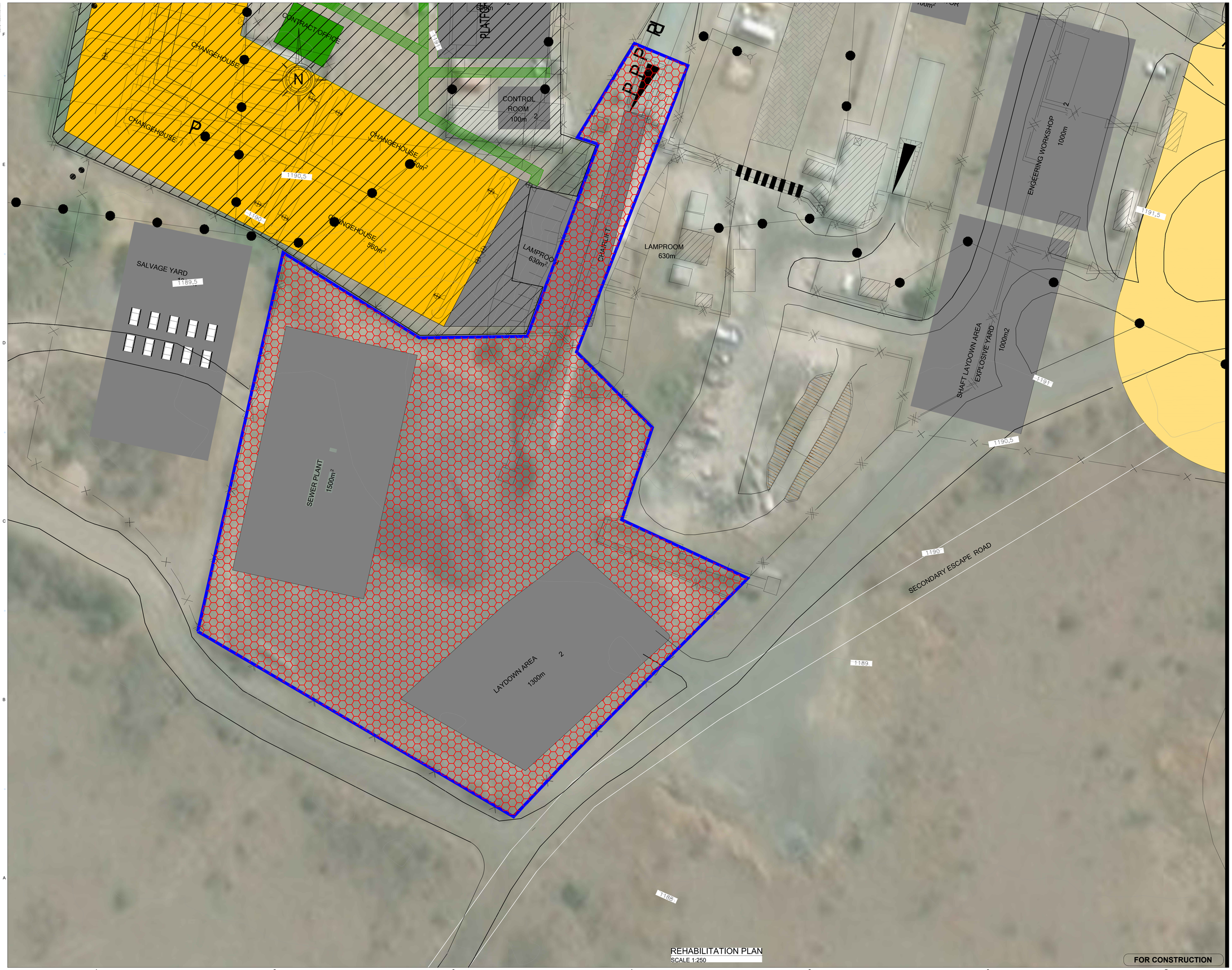

5372m
DROP OFF ZONE
TOTAL AREA 3000m²
458 UNDERCOVER PARKING PERMANENT EMPLOYEES
TOTAL AREA 12 152m
UNDERCOVER AREA 13500m
SECURITY OFFICE 12m²
ADMINISTRATION OFFICES 1200m²
LIGHT VEHICLE ACCESS ROAD (UNDERGROUND)
SECONDARY ESCAPE ROAD
VISITORS PARKING 120
DAM 400m³
DAM 400m³
DAM 600m³
ENGINEERING OFFICES 1000m²
COMPRESSOR ROOM 1000m²
CABLE YARD 500m²
STORES 3000m²
DIESEL BAY 250m²
WORKSHOP 1000m²
CHANGE HOUSE 1000m²
CHANGE HOUSE 1000m²
WASH BAY 1000m²
WASH BAY 1000m²
WASH BAY

7.4 Annexure D: Post-development Conditions

/241/304


5372m
1196,0
1192,0
1191,0
1190
1189,0
1188,0
1187,0
1186,0
1185
1184,0
SECURITY ROOM FOR GUARDS/ TRAINING/ OFFICES/ TOILET AREA TO BE USED BY CONTRACTORS AREA 1240m²
CLEAN WATER OPEN STORMWATER CHANNEL 1
CLEAN WATER OPEN STORMWATER CHANNEL 2
CLEAN WATER OPEN STORMWATER CHANNEL 4
OPEN STORMWATER CHANNEL 3
OPEN STORMWATER CHANNEL 5
FLOW
PIPELINE SERVITUDE 3M WIDE
SECONDARY ESCAPE ROAD
LAMPROOM 62M²
LAMPROOM 62M²
LAMPROOM 62M²

7.5 Annexure E: Post-development Conditions – Proposed Rehabilitation of Conveyor and Stockpile Areas



REHABILITATION PLAN
SCALE 1:250

FOR CONSTRUCTION

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GLENCORE KROONDAL-
CLOVER RCM

PROJECT

GLENCORE KROONDAL - CLOVER RCM
STORMWATER DESIGN PHASE 1

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GENERAL NOTES

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2. DO NOT SCALE FROM THESE DRAWINGS.
3. ALL DIMENSIONS MUST BE CHECKED AND APPROVED ON SITE.
4. ALL CONSTRUCTION TO BE DONE IN ACCORDANCE WITH THE APPLICABLE MINE STANDARD SPECIFICATIONS.
5. THESE DRAWINGS MUST BE READ IN CONJUNCTION WITH THE STANDARD DRAWINGS.(IF APPLICABLE).

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DESIGNED BY: L. FESHETE N/A
DRAWN BY: F.GUDZA N/A

APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No.: 20140140 SIGNATURE:

PROJECT NUMBER

2500117

SHEET TITLE

PROPOSED REHABILITATION PLAN

DISCIPLINE

CIVILS

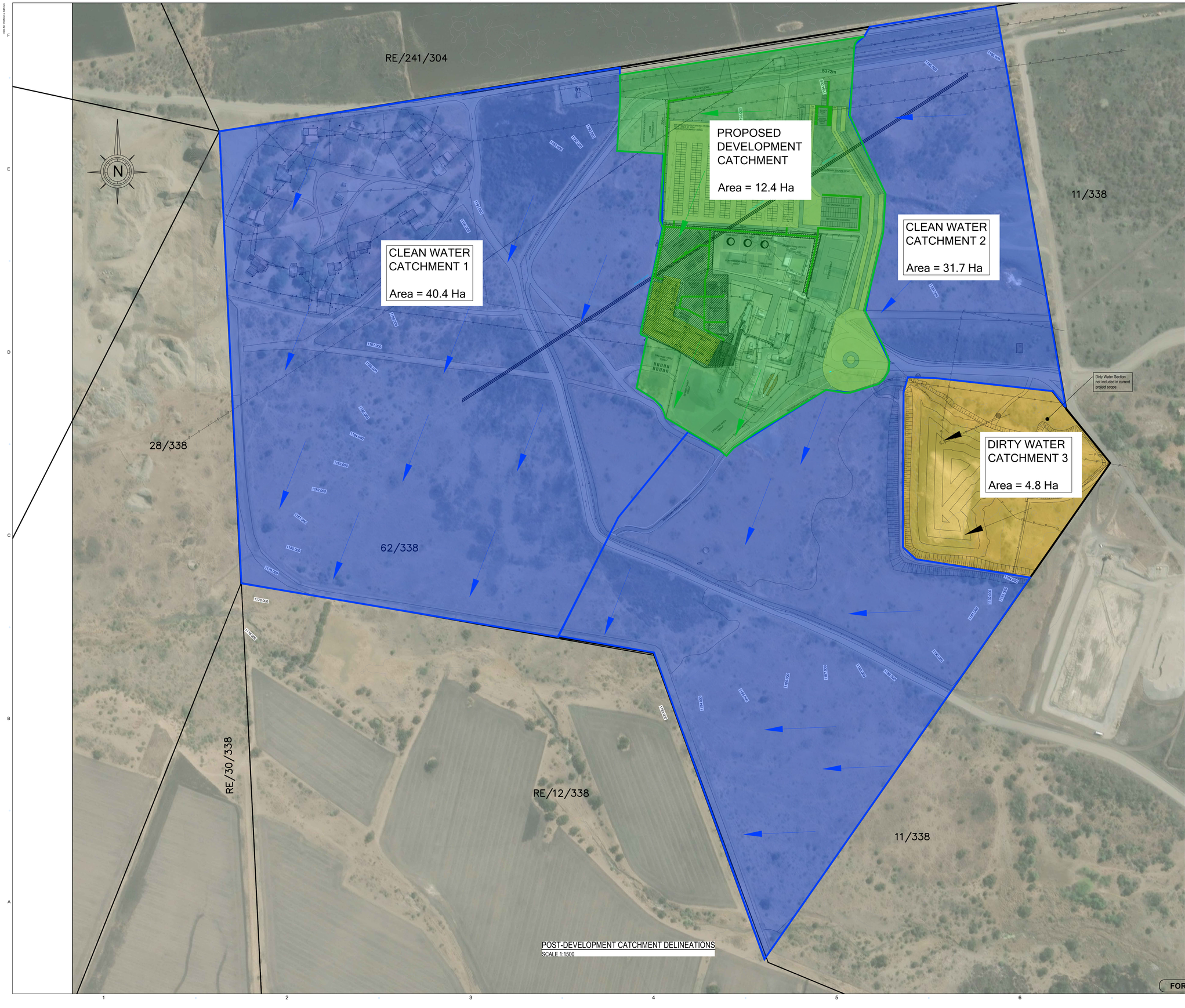
DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS	REV
2500117	-	C	-	SW400	-	C	- 0

E:\DRAFT / PRELIMINARY / E:\COUNCIL / T:\TENDER / F:\FINAL / E:\CONSTRUCTION / A:\AS-BUILT RECORD / X:\CANCELLED

SCALE As indicated **PAPER SIZE** A0

7.6 Annexure E: Post-development Catchment Area Delineation



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DESIGNED BY: L. FESHETE N/A
DRAWN BY: F.GUDZA N/A

APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No.: 20140140 SIGNATURE:

PROJECT NUMBER

2500117

SHEET TITLE

POST-DEVELOPMENT CATCHMENTS DELINEATIONS

DISCIPLINE

CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS		REV
2500117	-	C	-	SW710	-	C	-	0

BORAT / PYRELIMINARY / E.COUNCIL / TTENDER / F.FINAL / ECONSTRUCTION / A.AS-BUILT, RECORD / XCANCELLED

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7.7 Annexure F: Proposed Stormwater Reticulation

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DESIGNED BY: L. FESHETE N/A
DRAWN BY: F.GUDZA N/A

APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No. 20140140 SIGNATURE:

PROJECT NUMBER

2500117

SHEET TITLE

WATER CHANNEL DRAINAGE DETAILS
SHEET 1 OF 2

DISCIPLINE

CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS	REV
2500117	-	C	-	SW725	-	C	- 0

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SCALE As indicated **PAPER SIZE** A0

STORMWATER LAYOUT PLAN
SCALE 1:250

LONG SECTION A-A
SCALE 1:500

LONG SECTION B-B
SCALE 1:500

DETAIL OF TYPE A
CATCHWATER BERM

SCALE 1:50

FOR CONSTRUCTION

LONG SECTION A-A
SCALE 1:500

LONG SECTION B-B
SCALE 1:500

DETAIL OF TYPE A
CATCHWATER BERM

SCALE 1:50

FOR CONSTRUCTION

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DRAWN BY:	F.GUDZA	N/A

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NAME:	L. FESHETE	DATE:	2025-05-02
PROF REG. No.:	20140140	SIGNATURE:	

PROJECT NUMBER

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SHEET TITLE

WATER CHANNEL DRAINAGE DETAILS SHEET 2 OF 2

DISCIPLINE

CIVILS

DRAWING NUMBER

PROJECT NO.	DISCIPLINE	DRAWING NO.	STATUS	REV
2500117	C	SW730	C	0

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APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No. 20140140 SIGNATURE:

PROJECT NUMBER

2500117

SHEET TITLE

WATER CHANNEL DRAINAGE
DETAILS SHEET 1 OF 2

DISCIPLINE

CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS		REV
2500117	-	C	-	SW735	-	C	-	0

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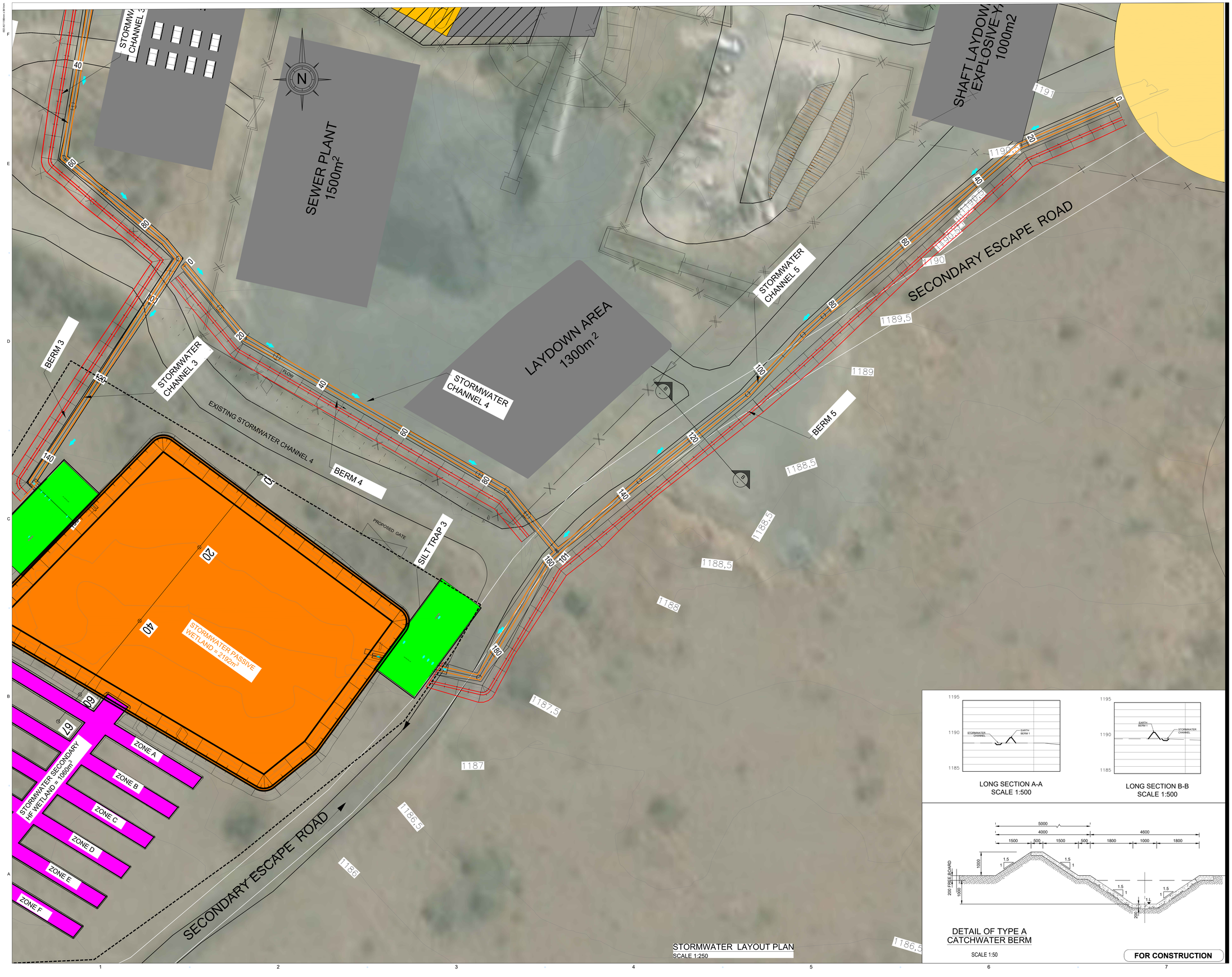

STORMWATER LAYOUT PLAN
SCALE 1:250

LONG SECTION A-A
SCALE 1:500

LONG SECTION B-B
SCALE 1:500

DETAIL OF TYPE A
CATCHWATER BERM

SCALE 1:50

FOR CONSTRUCTION

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DRAWN BY:	F.GUDZA	N/A	

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NAME:	L. FESHETE	DATE:	2025-05-02
PROF REG. No.:	20140140	SIGNATURE:	

PROJECT NUMBER

2500117

SHEET TITLE

WATER CHANNEL DRAINAGE DETAILS
SHEET 2 OF 2

DISCIPLINE

CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS		REV.
2500117	-	C	-	SW740	-	C	-	0

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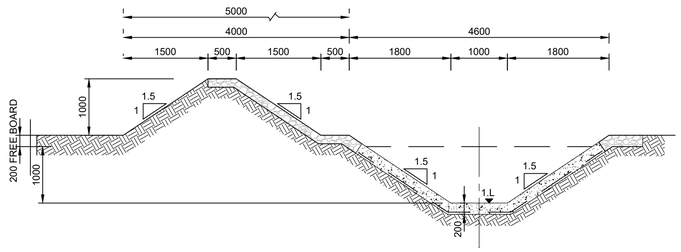
SCALE As indicated **PAPER SIZE** A0

ISO A1 560mm x 841mm



DETAIL OF TYPE A CATCHWATER BERM

SCALE 1:50

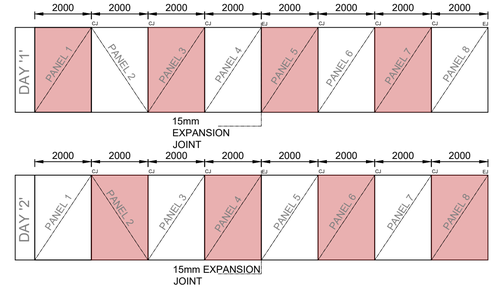
NOTE:

1. REMOVE TOP SOIL FOR STOCK PILING AS DIRECTED BY SUPERVISING PERSONNEL.
2. RIP AND COMPACT 150mm INSITU TO 90% M.O.D AASHTO

BERM MATERIALS:

MATERIAL SOURCE:CUT MATERIAL FROM THE ROAD PRISM

- COMPACT IN 200mm LAYER TO 90% M.O.D AASHTO.
- SHAPE BERM AS PER DETAIL.

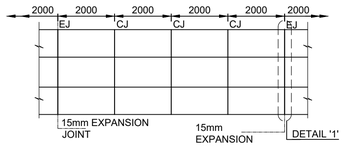


NOTE:

DAY 1: CAST PANEL 1;3;5 AND 7
DAY 2: CAST PANEL 2;4;6 AND 8

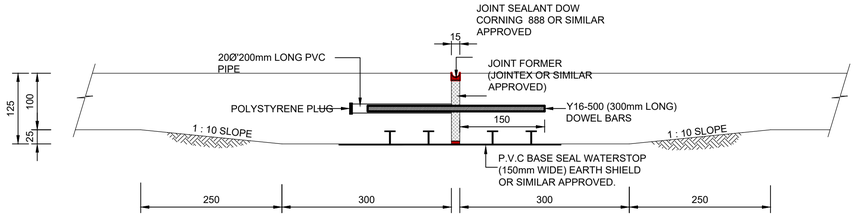
STORMWATER OPEN CHANNEL CASTING SEQUENCE

SCALE 1:100



STORMWATER OPEN CHANNEL

SCALE 1:100



DETAIL '1' STORMWATER OPEN CHANNEL EXPANSION JOINT

SCALE 1:5

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I/R	DATE	DESCRIPTION	ISS BY
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DRAWING BY

DESIGNED BY: L. FESHETE N/A
DRAWN BY: F.GUDZA N/A

APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No.: 20140140 SIGNATURE:

PROJECT NUMBER

2500116

SHEET TITLE

STORMWATER DRAINAGE DETAILS

DISCIPLINE

CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS		REV
2500116	-	C	-	SW760	-	C	-	0

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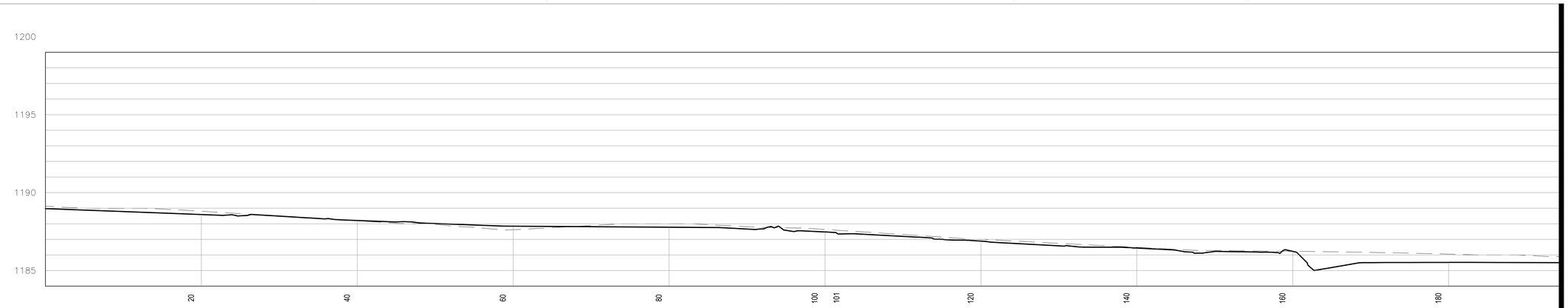

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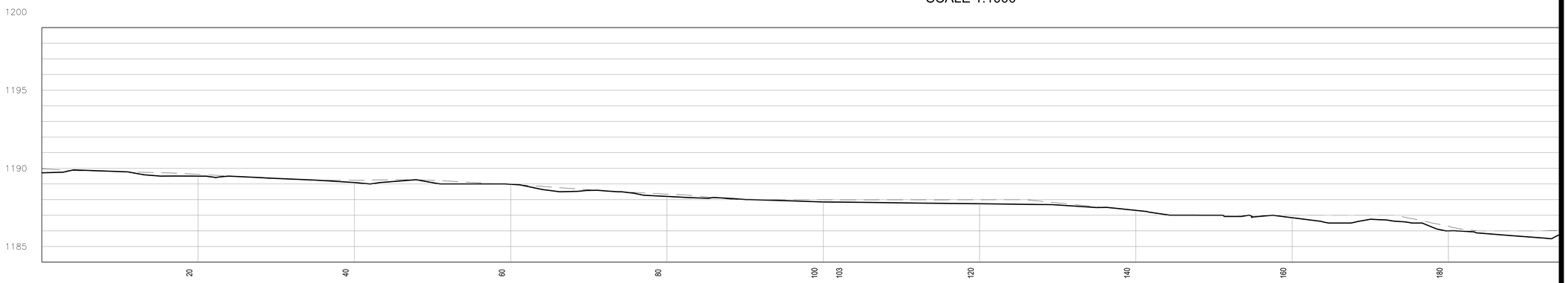
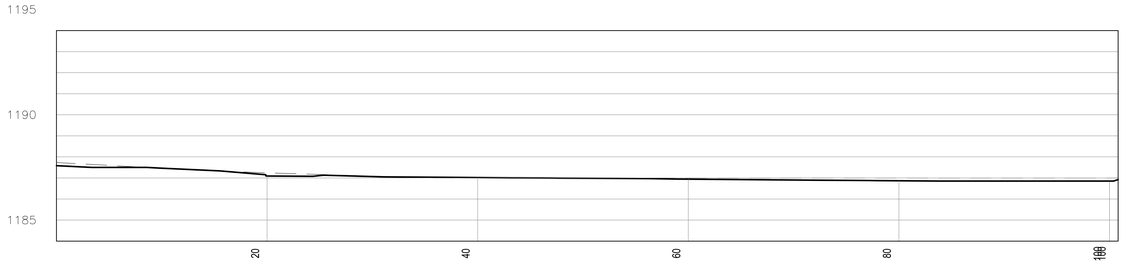
SCALE 1:1000



LONG SECTION A3
SCALE 1:1000



LONG SECTION A2
SCALE 1:1000

FOR CONSTRUCTION

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CLOVER RCM

PROJECT

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STORMWATER DESIGN PHASE 1

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ISSUE / REVISION

0	2025-05-02	ISSUED FOR CONSTRUCTION	S.C
I/R	**DATE**	**DESCRIPTION**	**ISS BY**

DRAWING BY

DESIGNED BY: L. FESHETE N/A
DRAWN BY: F.GUDZA N/A

APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No.: 20140140 SIGNATURE:

PROJECT NUMBER

2500117

SHEET TITLE

WATER STORMWATER CHANNEL LONG SECTIONS

DISCIPLINE

CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS	REV
2500117	–	**C**	–	**SW780**	–	**C**	– **0**

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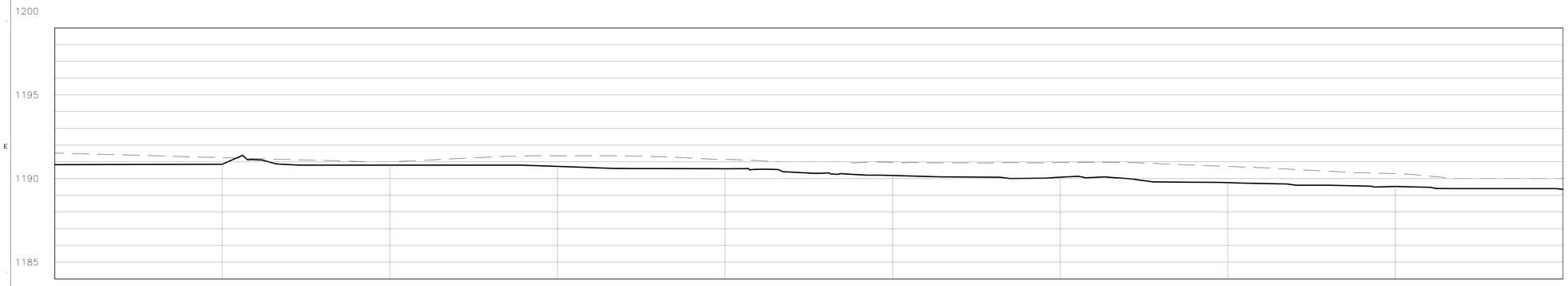
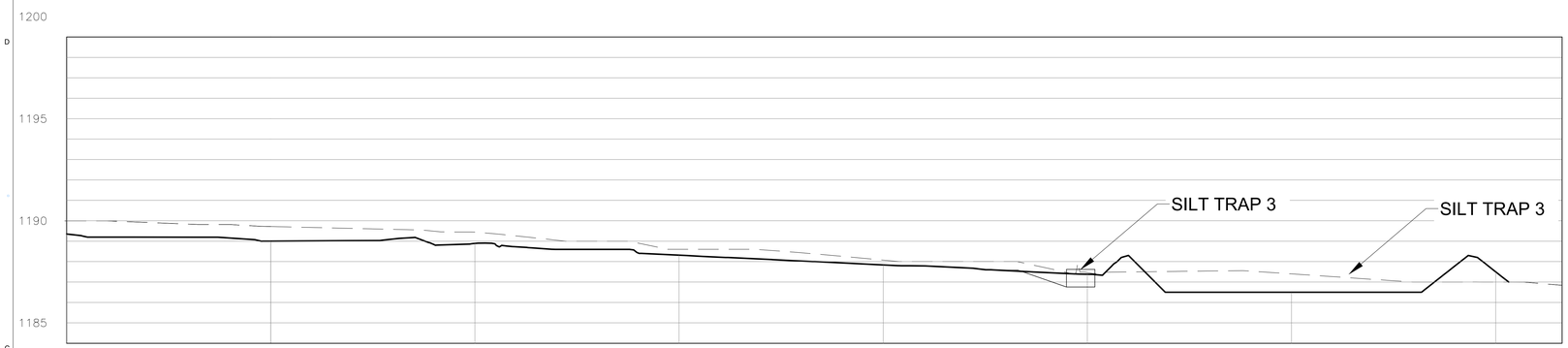


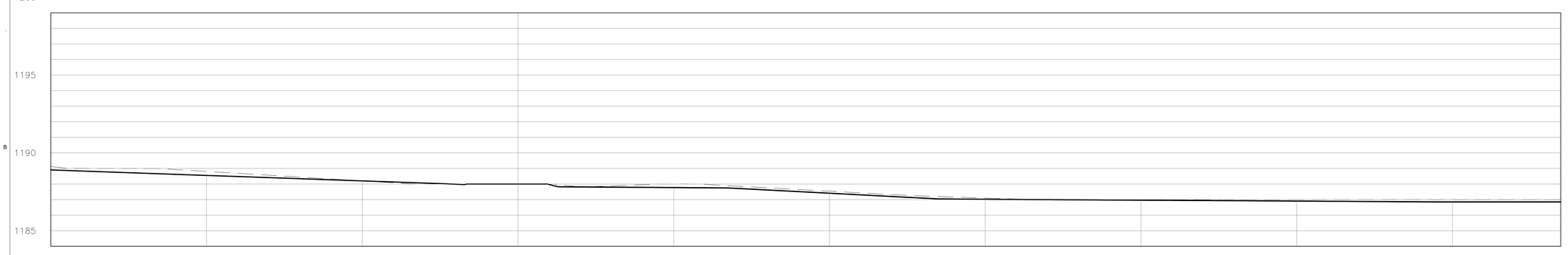
CHANNEL 1 LONG SECTION

SCALE 1:1000



CHANNEL 1 LONG SECTION

SCALE 1:1000



CHANNEL 2 LONG SECTION

SCALE 1:1000

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E-mail: admin@fijconsulting.co.za

GENERAL NOTES

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2. DO NOT SCALE FROM THESE DRAWINGS.
3. ALL DIMENSIONS MUST BE CHECKED AND APPROVED ON SITE.
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ISSUE / REVISION

VR	DATE	DESCRIPTION	ISS BY
0	2025-05-02	ISSUED FOR CONSTRUCTION	S.C.

DRAWING BY

DESIGNED BY: L. FESHETE N/A
DRAWN BY: F.GUDZA N/A

APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No.: 20140140 SIGNATURE:

PROJECT NUMBER

2500117

SHEET TITLE

WATER STORMWATER CHANNEL LONG SECTIONS

DISCIPLINE

CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS		REV
2500117	-	C	-	SW785	-	C	-	0

S:\0001 F\PRELIM\WIP\ / E:\COUNCIL / T:\TENDER / F:\FINAL / E:\CONSTRUCTION / A:\AS-BUILT RECORD / X:\CANCELLED\

SCALE As indicated **PAPER SIZE** A0

7.8 Annexure G: Proposed Artificial Wetland Attenuation Pond

IF IN DOUBT ASK

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EXISTING STORMWATER CHANNEL 3

EXISTING STORMWATER CHANNEL 4

EXISTING STORMWATER CHANNEL 5

FLOW

LAYDOWN AREA
1300m 2

SECONDARY ESCAPE ROAD

REFER TO SILT TRAP DRAWING DETAIL

PROPOSED 2.1M HIGH STANDARD DENSITY DIAMOND RAZOR MESH FENCE (350m)

INLET FROM CHANNEL

SILT TRAP SPILLWAY

RAMP DOWN 10°

2x600 OUTLET PIPES OUTLET TO POND

PROPOSED GATE

CATCH WATER BERM

STORMWATER PASSIVE WETLAND = 2192m³

STORMWATER SECONDARY HF WETLAND = 1060m³

ZONE A
ZONE B
ZONE C
ZONE D
ZONE E
ZONE F

22 000
8000
40 000
48 000

C1 810
C2 810
C3 810
C4 810
C5 810
C6 810
C7 810
C8 810
D8 810

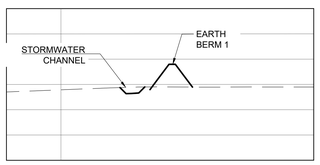
List of Coordinates

Point	Y Coordinate	X Coordinate	Level
1	-36301.891	2846774.877	1186.145
2	-36320.397	2846786.171	1186.061
3	-36323.366	2846782.475	1186.167
4	-36327.578	2846785.215	1186.069
5	-36324.717	2846788.776	1185.994
6	-36343.206	2846800.091	1186.189
7	-36341.312	2846802.449	1186.096
8	-36322.806	2846791.155	1185.933
9	-36319.649	2846795.086	1185.805
10	-36338.144	2846806.447	1186.008
11	-36336.260	2846808.738	1185.797
12	-36317.754	2846797.444	1185.719
13	-36314.597	2846801.375	1185.519
14	-36333.102	2846812.669	1185.500
15	-36331.208	2846815.028	1185.500
16	-36312.702	2846803.733	1185.502
17	-36309.545	2846807.664	1185.502
18	-36328.047	2846818.956	1185.496
19	-36326.162	2846821.320	1185.447
20	-36307.650	2846810.022	1185.501
21	-36304.496	2846813.955	1185.493
22	-36322.998	2846825.247	1185.271
23	-36321.076	2846827.588	1185.174
24	-36302.598	2846816.311	1185.406
25	-36299.735	2846820.288	1185.486
26	-36317.946	2846831.536	1185.012

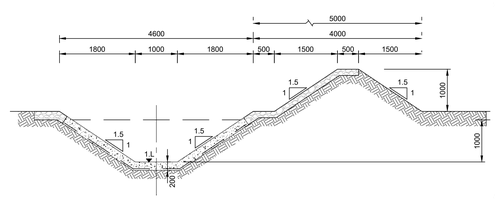
List of Coordinates

Point	Y Coordinate	X Coordinate	Level
27	-36316.051	2846833.894	1184.915
28	-36297.546	2846822.600	1185.174
29	-36296.599	2846823.779	1185.131
30	-36292.296	2846821.150	1185.129
31	-36293.242	2846819.974	1185.163
32	-36274.737	2846808.680	1185.286
33	-36276.631	2846806.321	1185.384
34	-36295.137	2846817.615	1185.236
35	-36298.294	2846813.685	1185.358
36	-36279.810	2846802.358	1185.508
37	-36282.034	2846799.953	1186.000
38	-36300.189	2846811.326	1185.432
39	-36303.346	2846807.396	1185.501
40	-36284.841	2846796.102	1185.500
41	-36286.737	2846793.743	1185.500
42	-36305.241	2846805.037	1185.501
43	-36308.398	2846801.107	1185.502
44	-36289.896	2846789.815	1185.499
45	-36291.789	2846787.456	1185.500
46	-36310.293	2846798.749	1185.535
47	-36313.450	2846794.818	1185.735
48	-36294.945	2846783.524	1187.470
49	-36296.839	2846781.166	1185.795
50	-36315.345	2846792.460	1185.855
51	-36318.517	2846788.594	1186.000
52	-36300.009	2846777.228	1186.012

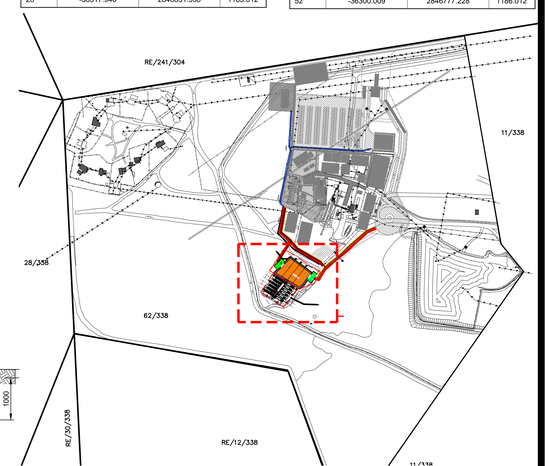
STORMWATER LAYOUT PLAN
SCALE 1:250



LONG SECTION B-B
SCALE 1:500



DETAIL OF TYPE A
CATCHWATER BERM
SCALE 1:50



KEY PLAN
SCALE 1:5000

FOR APPROVAL

CLIENT

GLENCORE

GLENCORE KROONDAL-
CLOVER RCM

PROJECT

GLENCORE KROONDAL - CLOVER RCM
STORMWATER DESIGN PHASE 1

ENGINEERS

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ISSUE / REVISION

IR	DATE	DESCRIPTION	ISS BY
A	2025-05-12	ISSUED FOR APPROVAL	S.C.

DRAWING BY

DESIGNED BY: L. FESHETE N/A
DRAWN BY: F.GUDZA N/A

APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No.: 20140140 SIGNATURE:

PROJECT NUMBER

2500117

SHEET TITLE

WETLAND SETTING-OUT LAYOUT

DISCIPLINE

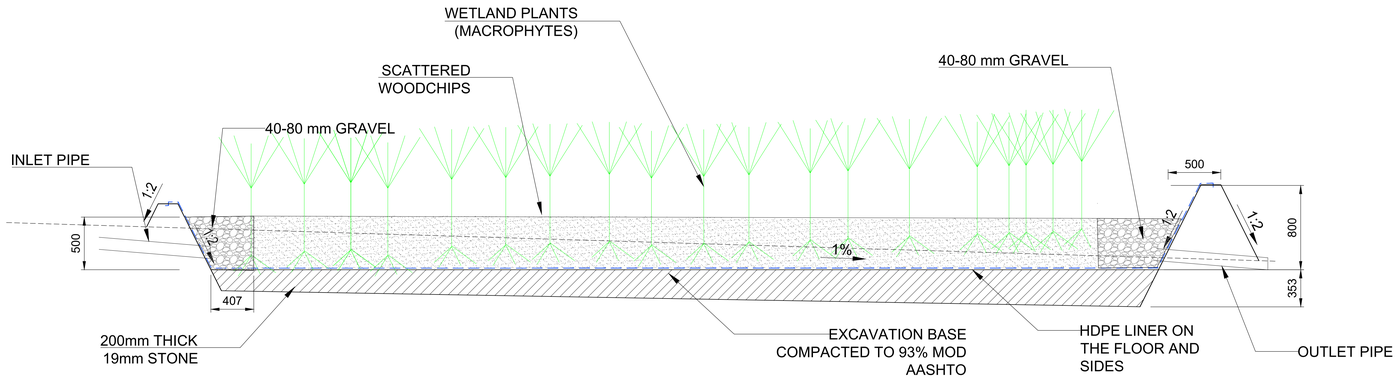
CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS		REV
2500117	-	C	-	W820	-	A	-	A

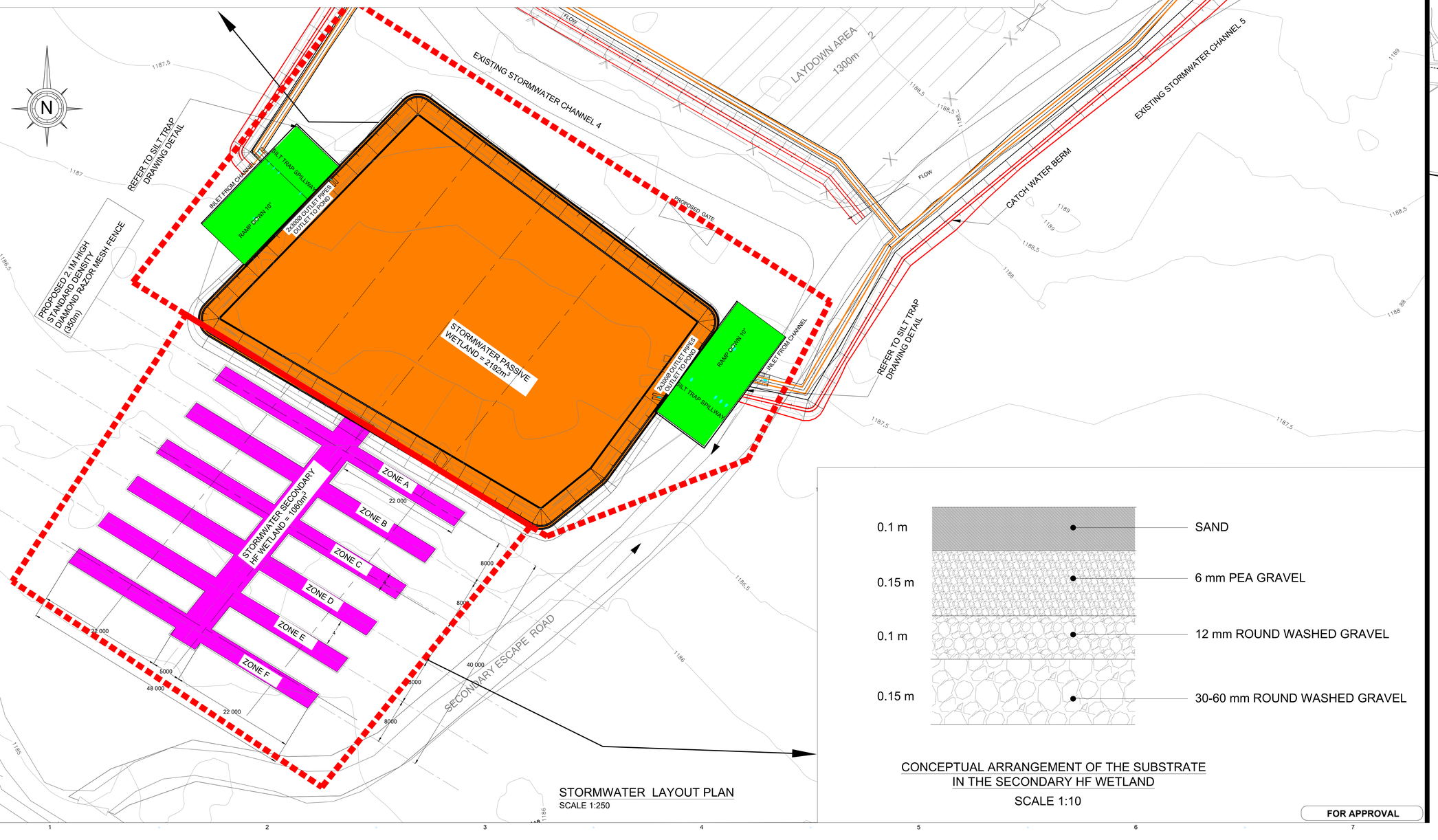
B:\PAY\ / PRELIMINARY / ECONCL / TTENDER / FINAL / ECONSTRUCTION / AS-BUILT / RECORD / ACANCELLED

SCALE As indicated **PAPER SIZE** A0



PASSIVE WETLAND DETAIL
SCALE 1:50

- FILL MATERIAL NOTES:
- THE ENTIRE EXCAVATION OF THE HF WETLAND MUST BE FITTED WITH AN IMPERVIOUS LINER. A SYNTHETIC LINER MADE OF POLYVINYL CHLORIDE (PVC); POLYETHYLENE (PE) OR POLYPROPYLENE IS RECOMMENDED;
- GRAVEL OF BETWEEN 40 - 80 MM MUST BE USED IN THE INLET AND OUTLET ZONES OF THE WETLAND. A 1.5 M FILL WIDTH IS RECOMMENDED FOR EACH ZONE. THE DEPTH OF THE FILL MUST BE 0.5 M;
- A MIXTURE OF 20 - 25 MM GRADE GRAVEL AND PEA GRAVEL OF 10 MM FOR THE TREATMENT ZONE. THE FILL AREA WILL BE 20 M IN WIDTH AND 0.5 M IN DEPTH; AND
- ADDITION OF WOOD CHIPS ON THE SURFACE OF THE TREATMENT ZONE OVER THE PEA GRAVEL SUBSTRATE TO PROMOTE HEALTHY MICROBIAL ACTIVITY.



STORMWATER LAYOUT PLAN
SCALE 1:250

CONCEPTUAL ARRANGEMENT OF THE SUBSTRATE IN THE SECONDARY HF WETLAND
SCALE 1:10

FOR APPROVAL

IF IN DOUBT ASK

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GLENCORE

GLENCORE KROONDAL-
CLOVER RCM

PROJECT

GLENCORE KROONDAL - CLOVER RCM STORMWATER DESIGN PHASE 1

ENGINEERS

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TEL: +27 11 958 0437
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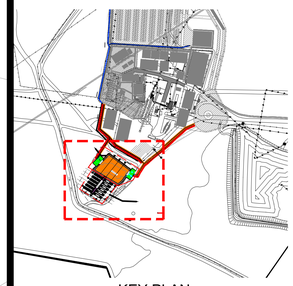

KEY PLAN
SCALE 1:5000

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I/R	DATE	DESCRIPTION	ISS BY
A	2025-06-12	ISSUED FOR APPROVAL	S.C.

DRAWING BY

DESIGNED BY: L. FESHETE N/A
DRAWN BY: F.GUDZA N/A

APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No.: 20140140 SIGNATURE:

PROJECT NUMBER

2500117

SHEET TITLE

WETLAND DETAIL LAYOUT

DISCIPLINE

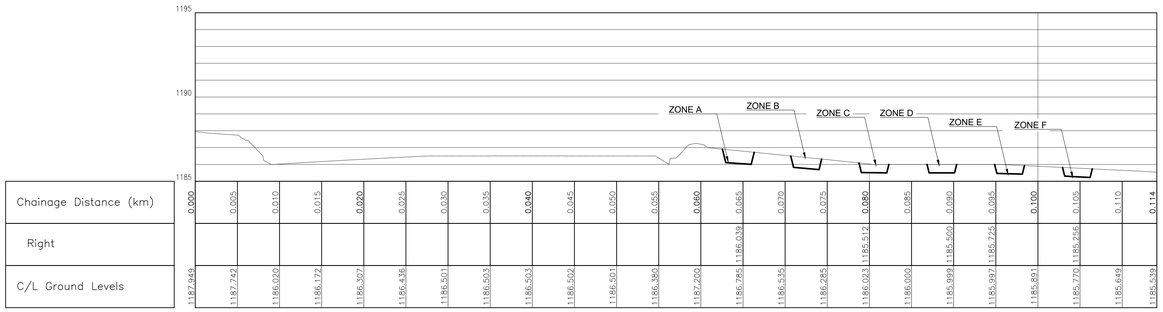
CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS		REV
2500117	-	C	-	W825	-	A	-	A

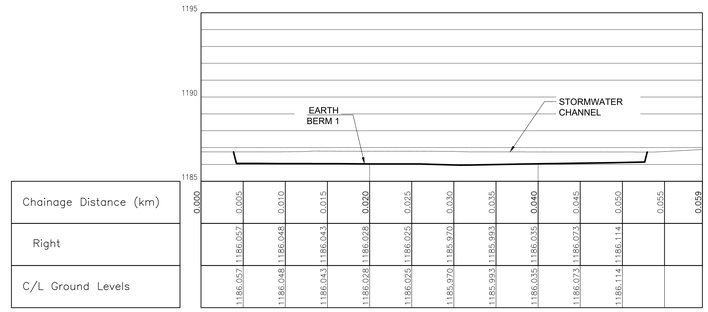
B:DRAFT / P:PRELIMINARY / E:COUNCIL / T:TENDER / F:FINAL / C:CONSTRUCTION / A:AS-BUILT, RECORD / X:CANCELLED

SCALE As indicated **PAPER SIZE** A0



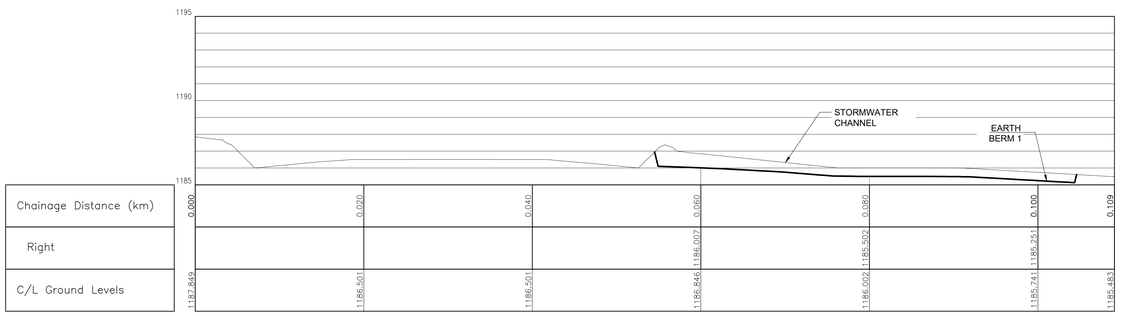
Chainage Distance (km)	0.000	0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055	0.060	0.065	0.070	0.075	0.080	0.085	0.090	0.095	0.100	0.105	0.110	0.114
Right														1186.039			1185.512		1185.500	1185.725		1185.256		
C/L Ground Levels	1187.949	1187.742	1186.020	1186.172	1186.307	1186.436	1186.501	1186.503	1186.503	1186.502	1186.501	1186.380	1187.200	1186.785	1186.535	1186.285	1186.023	1186.000	1185.999	1185.937	1185.891	1185.770	1185.649	1185.539

LONG SECTION C1
SCALE 1:250



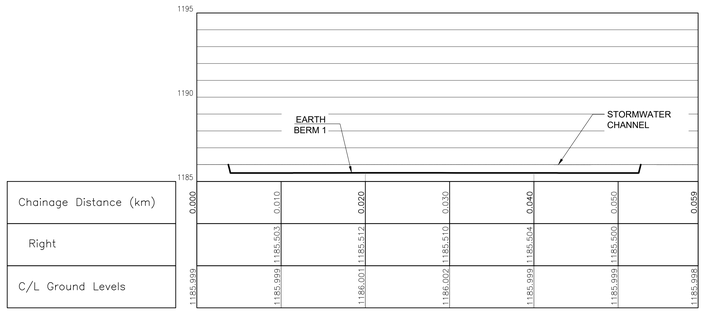
Chainage Distance (km)	0.000	0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055	0.059
Right													
C/L Ground Levels	1186.057	1186.057	1186.048	1186.043	1186.028	1186.025	1185.970	1185.935	1186.035	1186.073	1186.114		

LONG SECTION C4
SCALE 1:250



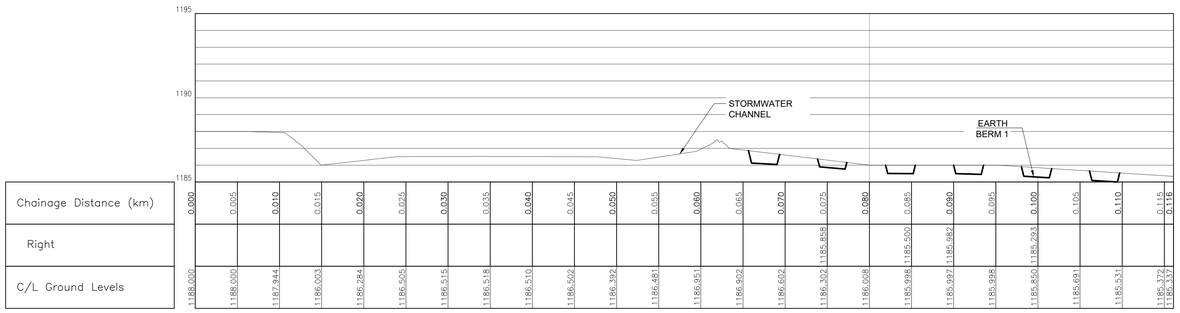
Chainage Distance (km)	0.000	0.020	0.040	0.060	0.080	0.100	0.109
Right				1186.007	1185.502	1185.293	
C/L Ground Levels	1187.849	1186.501	1186.501	1186.846	1186.002	1185.741	1185.483

LONG SECTION C2
SCALE 1:250



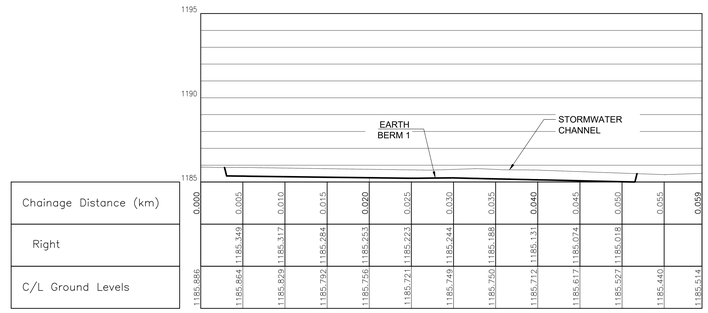
Chainage Distance (km)	0.000	0.010	0.020	0.030	0.040	0.050	0.059
Right							
C/L Ground Levels	1185.999	1185.503	1185.512	1185.510	1185.504	1185.500	1185.998

LONG SECTION C5
SCALE 1:250



Chainage Distance (km)	0.000	0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055	0.060	0.065	0.070	0.075	0.080	0.085	0.090	0.095	0.100	0.105	0.110	0.115	0.116
Right																1185.858		1185.500	1185.982		1185.293				
C/L Ground Levels	1188.000	1188.000	1187.944	1186.003	1186.284	1186.505	1186.515	1186.518	1186.510	1186.502	1186.392	1186.481	1186.951	1186.902	1186.602	1186.302	1186.008	1185.998	1185.997	1185.998	1185.850	1185.691	1185.531	1185.372	1185.337

LONG SECTION C3
SCALE 1:250



Chainage Distance (km)	0.000	0.005	0.010	0.015	0.020	0.025	0.030	0.035	0.040	0.045	0.050	0.055	0.059
Right													
C/L Ground Levels	1185.886	1185.864	1185.829	1185.792	1185.756	1185.721	1185.749	1185.750	1185.712	1185.617	1185.527	1185.440	1185.514

LONG SECTION C6
SCALE 1:250

FOR APPROVAL

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CLIENT

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GLENCORE KROONDAL-
CLOVER RCM

PROJECT

GLENCORE KROONDAL - CLOVER RCM
STORMWATER DESIGN PHASE 1

ENGINEERS

FIJ Consulting Engineers

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DRAWING BY

DESIGNED BY: L. FESHETE N/A
DRAWN BY: F.GUDZA N/A

APPROVAL CONSULTANT

NAME: L. FESHETE DATE: 2025-05-02
PROF REG. No.: 20140140 SIGNATURE:

PROJECT NUMBER

2500117

SHEET TITLE

LONG SECTIONS

DISCIPLINE

CIVILS

DRAWING NUMBER

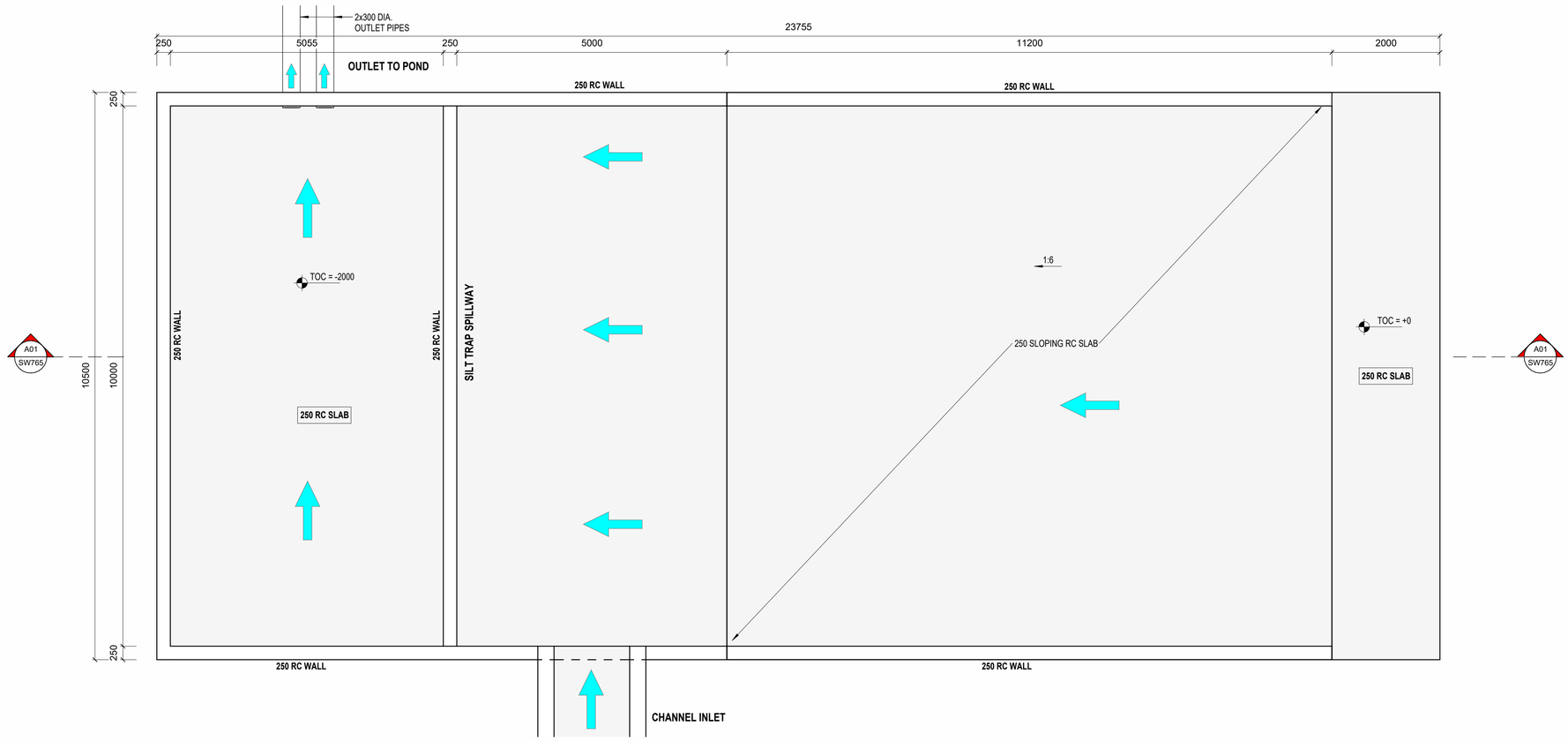
PROJECT NO. | DISCIPLINE | DRAWING NO. | STATUS | REV

2500117 - C - **SW630** - A - A

D:\DRAFT \ PYRELIMINARY \ E:\COUNCIL \ T:\TENDER \ F:\FINAL \ C:\CONSTRUCTION \ &:\AS-BUILT \ R:\CAD \ X:\CAD\LIBS

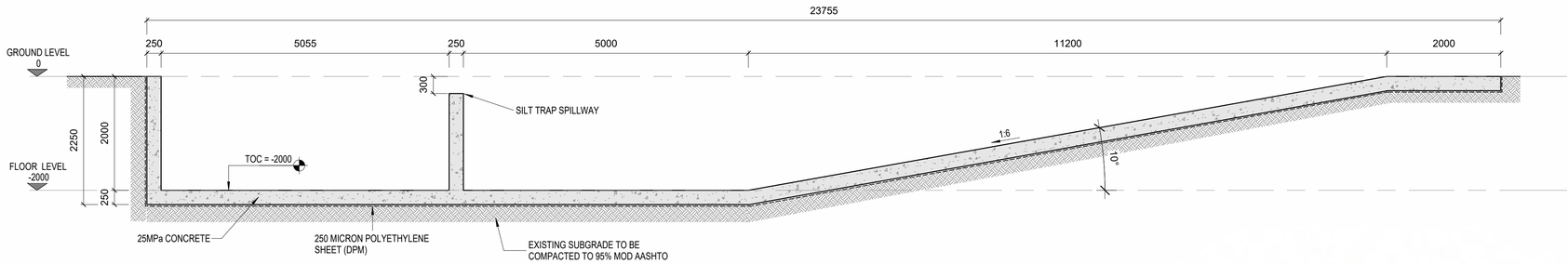
SCALE As indicated **PAPER SIZE** A0

7.9 Annexure H: Proposed Silt Trap



PLAN ON SILT TRAP

SCALE 1 : 50



SECTION A01

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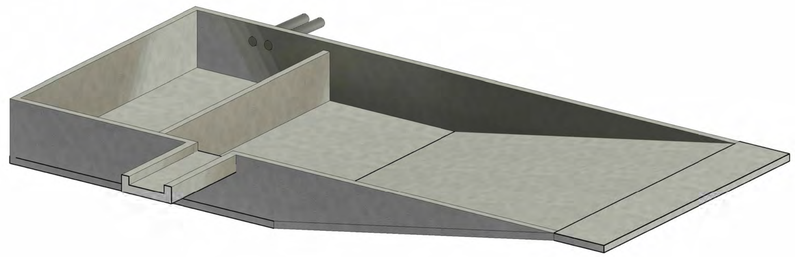

3D VIEW 1

SCALE

FOR CONSTRUCTION

IF IN DOUBT ASK

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CLIENT

GLENCORE

GLENCORE CLOVER RCM MINE

PROJECT

GLENCORE CLOVER RCM MINE
STORMWATER DESIGN PHASE 1

CONSULTANT

FIJ Consulting Engineers

11 WILLOWBROOK
OFFICE PARK
VAN HOOF STREET
RUIMSIG
JOHANNESBURG,1724

TEL: +27 11 958 0437
FAX: +27 86 677 8643
E-mail: admin@fijconsulting.co.za

GENERAL NOTES

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2.WORK TO FIGURED DIMENSIONS ONLY, SCALING OF DRAWINGS NOT PERMITTED
3.ALL DIMENSIONS MUST BE CHECKED AND APPROVED ON SITE.
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ISSUE / REVISION

I/R	DATE	DESCRIPTION	ISS BY
0	2025-05-02	ISSUED FOR CONSTRUCTION	CM

DRAWING BY

DESIGNED BY: L. FESHETE N/A
DRAWN BY: C. MAUMBE N/A

APPROVAL CONSULTANT

NAME: L.FESHETE DATE: 2025-05-02
PROF REG. No.: 20140140 SIGNATURE:

PROJECT NUMBER

2500116

SHEET TITLE

SILT TRAP LAYOUT AND DETAILS

DISCIPLINE

CIVILS

DRAWING NUMBER

PROJECT NO.		DISCIPLINE		DRAWING NO.		STATUS	REV
2500116	-	C	-	SW765	-	C	- 0

D DRAFT / P PRELIMINARY / E COUNCIL / T TENDER / F FINAL / C CONSTRUCTION / A AS-BUILT, RECORD / X CANCELLED

SCALE 1 : 50 **PAPER SIZE** A1