Draft Design Report

Upgrading of Herold's Bay Sewer Pump Station No. 1 and Associated Rising Main

Prepared for: George Municipality
30 August 2024
Client Reference No. T/ING/010/2020

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1 Introduction

1.1 Terms of Reference

SMEC South Africa was appointed for a Multi-Year Professional Services Contract (Tender No. T/ING/010/2020), which includes the upgrade of Municipal Infrastructure by the George Municipality (GM).

Included in the scope of work is the Design and Implementation for Project 20 (Work Package 3) for the Upgrading of Herold's Bay Sewer Pump Station No.1 and the associated rising main.

1.2 Problem Identification

The Herold's Bay Pump Station no. 1 is located at the Herold's Bay beachfront, at the main parking lot on Uitspanning Street and can be accessed by following the R404 into Herold's Bay.

The pump station was refurbished in 2004 and is the main sewage pump station in Herold's Bay, receiving all sewage gravity flows from the area and pumped flows from two smaller pump stations along the cove. The sewage is subsequently pumped to the Herold's Bay Wastewater Treatment Works (WWTW).

The harsh operating conditions (highly corrosive environment and sand loading) result in high maintenance requirements and frequent breakdowns of operations. The lack of critical spares and high variations in seasonal inflows compound the situation.

Based on the development plans received from the George Municipality, the sewage that this pumpstation will have to accommodate will increase to 52L/s to service the full developable area in and beyond the current urban edge. With the upgrade, the intention is to improve the service delivery and reduce the challenges that the George Municipality (GM) experiences with the pump station's operation.

During the Concept design phase of the project, the project was refined to an upgraded low-level pumpstation at Pumpstation 1 and a new high lift pumpstation (Pumpstation 4) higher up the valley with screening and de-gritting facilities.

1.3 Objectives of this report

The purpose of this Design Report is to provide the George Municipality with the design and a cost estimate for the refined project. The report is based on conclusions and recommendations from the concept design, outcomes of meetings and discussions with the George Municipality, and detailed site investigations.

2 Objectives and Scope of the project

2.1 Employer's Objectives

The George Municipality has the following objectives:

To upgrade the pumpstation in phases, with the civil, structural and bulk electrical works to accommodate the ultimate planned capacity of 52L/s, but the mechanical, and electrical, including the generator and instrumentation to 32L/s, and in a future phase to 52L/s;

- To construct a new pumpstation to remove grit and screenings;
- To address all the required planning aspects needed for the project outcomes, including Environmental Authorization, Water Use License (WUL), Survey, Material investigations, and approval from relevant authorities by application of Wayleaves;
- To ensure the project and the risks are managed and that the George Municipality is informed at all times about the progress of the project;
- To deliver public services infrastructure using labour-intensive construction methods wherever technically feasible and economically viable;
- To comply with the requirements of the statutory, legislative, and regulatory framework governing local government infrastructure provision and
- To comply with all funding conditions.

2.2 Scope of Works

In previous studies, it was recommended that the sewage transmission system be modified with the addition of an intermediate pumpstation, offset from the beachfront to ERF 116. The high-level scope of work for this project, thus, becomes:

- refurbishment and upgrade of the existing pumpstation number 1 on the beachfront,
- construction of the intermediate lifting pumpstation and
- the interlinking pipelines.

The scope of work for this project can further be broken down as follows:

- Existing Herold's Bay Pump Station Number 1 (PS1)
  - Upgrade the existing pump station's civil infrastructure to handle 32L/s (ultimate design flow) and the mechanical operating capacity from 19 L/s to 32 L/s .
  - Refurbish the entire pump station building and equipment, including all mechanical, electrical and electronic equipment. All structures are to be stormproof as much as reasonably possible.
  - Install mechanical equipment to cater to the highly abrasive pumping conditions.
  - Install new submersible vortex pumps. The pumps shall be operated on a rotational basis as duty/standby.
  - Refurbish/replace the odour control unit.
  - Refurbish/replace the telemetry and SCADA control equipment.
  - Provide a new emergency storage tank.
  - Provide an emergency generator supply
  - Provide a new sand trap and manual coarse screen.
  - Provide an architectural conceptual proposal and cost estimate for the aesthetic enhancement of the existing building.

- New Pump Station Number 4 (PS4)
  - Construct a new high lift pump station (civil works) with an operating capacity of 52 L/s.
  - Construct new inlet works comprising of:
    - a screening station,
    - a grit removal station.
  - Install new dry well pumps. The pumps shall be operated rotationally as duty/standby.
  - Variable-speed drives on all pumps.
  - Install odour control unit.
  - Installation of electrical and electronic equipment associated with the new pump station.
  - Provision of a backup generator.
  - Provide underground fuel storage for the generator.
  - The civil works will comprise the construction of new buildings, retaining walls, fences, access roads, etc.
  - Reduce sound pollution generated by the pump station as far as reasonably possible.

- Rising Main
  - Construction of a new rising main pipeline between the
    - existing pump station (PS1) and the new pump station (PS4)
    - new pump station (PS4) and the Herold's Bay WWTW.

- Bulk Electrical
  - Upgrade and relocation of the electrical mini-substation located close to the PS 4 site.
  - New backup electrical cable between PS 1 and PS 4

- Existing Operations
  - Interruptions to the operations of the existing system have to be minimised, and careful consideration is to be provided to the programming of the construction, the interfaces, and the modification of the existing pumpstation.

2.3 Scope of Professional Engineering Services

2.3.1 Normal Services

The Scope of Services as detailed in ECSA's Guideline for Services and Processes for Estimating Fees for Persons Registered in terms of the Engineering Profession Act, 2000 (Act No. 46 of 2000) are as follows:

- Stage 1: Inception (Completed)
- Stage 2: Concept and Viability (Completed)
- Stage 3: Design Development (This Document)
- Stage 4: Contract Documentation and Procurement
- Stage 5: Contract Administration
- Stage 6: Close-out
-

The disciplines included as part of the normal professional service for this project include the following:

- Civil Engineering services
- Structural Engineering services
- Mechanical Engineering services
- Electrical Engineering services
- Electronic Engineering services

2.3.2 Additional Services

(a) Construction monitoring services during construction

Site Monitoring will be required during the project's execution phase, and the level of service and site personnel will be agreed upon with the Employer at a later stage of the project.

(b) Architectural Services

During the design development, the need arises to appoint an Architect for the project. Although the building layout and functionality are engineering-oriented, the following services do not form part of normal engineering service, and a specialist professional had to be appointed:

- Building plan approval is required for the project; therefore, the building design needs to comply with the building regulations. An architect is the professional who will be responsible for ensuring that the building complies with the regulations and is approved by the local authorities.
- The pump stations will be visible to the public and are located in high-trafficked areas at the entrance to town and at the beachfront, so it is of the utmost importance that the buildings are not only functional but also aesthetically pleasing. Architectural services are required to enhance the aesthetic look of the new building and ensure it blends in with the existing surroundings of Herold's Bay.

(c) Quantity Surveyor Services

The services of a Quantity Surveyor become apparent when the services of an Architect are required. Quantifying and producing detailed bills of quantities are excluded from the services of an Architect and structural engineer on a multidisciplinary project.

(d) Environmental Considerations

It is envisaged that this project will require a Basic Environmental Impact Assessment process to be followed in terms of the National Environmental Management Act (NEMA). SMEC appointed Sharples Environmental Services on 20 January 2023 as the lead environmental consultant to provide the necessary environmental services for this project. It is also anticipated that a water use license application (WULA) be made since a significant amount of work will be performed on the coast and within 30m meters of the water course.

At the time of writing this report, the status of the environmental processes is summarized below:

- The Notice of Intent was submitted to DEADP.
- Specialist Site Verification Report (SSVR) has been prepared and submitted to DEADP. A revised SSVR will be submitted once the Freshwater Specialists have completed their report.
- The following specialist studies have been completed: Botanical Assessment, Terrestrial and Avifaunal Impact assessment.
- The freshwater specialist has started their assessment and can only finish his report and start the Water Use License Application (WULA) once this design report has been finalized
- A draft BAR report has been completed and will be finalized once this design report and all the specialist studies have been completed.

If further specialist studies are required, it will be communicated, and approval obtained from the George Municipality.

(e) Occupational Health and Safety Considerations

The George Municipality will appoint an independent Occupational Health and Safety Agent for the project. Once appointed the Health and Safety Agent will be involved in the design process and will be responsible for preparing the site-specific health and safety specifications, site-specific baseline risk assessment and the review of the bill of quantities for the health and safety portion under the preliminary and general items.

(f) Topographical Survey

No existing survey data was available at the commencement of the project. UDS Civils was appointed on 20 January 2023 for the provision of a detailed topographical and existing services survey of the works area.

The detailed survey with all supporting documentation was received on 24 February 2023. The survey was checked for any errors and ambiguities, and the relevant updates were completed. As the project developed, further areas were surveyed and merged with the existing information.

In addition, the topographical Survey data from the Rooidraai project currently under construction was also requested from the George Municipality and incorporated into the data used.

A further topographical survey was required to collect data for a small area that was not covered during the initial survey and was also not covered by the Rooidraai project survey. CDJ Surveyors was appointed to conduct this survey on 19 April 2024, and the data was received on 2 May 2024.

(g) Beacon relocation erf 116

During the project's design development, discrepancies were noticed in the position of ERF 116. CDJ Surveyors were appointed on 19 April 2024 to do a beacon relocation survey for erf 116 and submit the beacon data to the Surveyor General. The fieldwork was completed on 2 May 2024 and was accepted by the SG on 30 May 2024.

(h) Material Investigation

On March 9, 2023, SMEC appointed PeraGage Consulting to provide Geotechnical Services. The findings were summarised in the Geotechnical Investigation chapter, and the complete report was submitted as part of the Concept Design Report.

(i) Town Planning Services

ERF 116 is zoned as Transport Zone II and is owned by the George Municipality. Initially, the plan was to build the new pump station number 4 on ERF 116. However, it was later determined during the design phase that the erf was not big enough to accommodate the necessary infrastructure for the sewer pump station. In addition, it was found that a recently completed outfall stormwater infrastructure was built on a portion of ERF 116.

As a result, the George Municipality plans to purchase a portion of ERF 236/0 to ensure enough land is available for the construction of pump station number 4. The subdivision and rezoning of the portion of the land that will be acquired will require Town Planning Services.

2.4 Wayleaves and Existing Services

2.4.1 Way leaves

Before commencing with construction work, the Contractor will be responsible for applying for construction wayleaves. It is anticipated that wayleaves will be required by the following authorities:

- George Municipality:
  - Roads and Stormwater infrastructure
  - Water and Sewer infrastructure
  - Electrical infrastructure
- Other Service Providers:
  - Fibre and Telecommunication
  - Eskom

2.4.2 Existing Services

SMEC has obtained existing service layouts from local authority departments and service providers. The information received did not provide the exact locations of the services, but merely a confirmation of their presence and general position.

A GPR (ground-penetrating radar) survey of the works area was conducted to identify unknown underground services and obtain a more accurate location and depth of the services.

2.4.3 Relocating of Underground Services

The following known services will be affected by the infrastructure and will have to be relocated.

- PS1
  - The 300mm diameter stormwater outfall pipe, which currently discharges onto the beach through the terrace retaining wall at PS 1, must be relocated. This is necessary because its current position will clash with the new emergency storage tank that will be constructed at PS1.
  - Additionally, the existing 160mm diameter gravity sewer main must also be relocated to make space for the same emergency storage tank.
- PS4
  - The existing MV and LV cables at and around PS4 will need to be relocated before construction at this pump station can commence.
  - This will need to be done in conjunction with the required miniature substation work, as detailed in the section 0 below

3 Status Quo

3.1 Workshop Outcome

Post the submission of the concept design report, a workshop between the design team, environmental team and George Municipality (Infrastructure, project management and operations) was held to discuss the concept designs.

The following were the decisions from the workshop.

- The flow from the higher areas of Herold's Bay, will be diverted along Rooidraai Road to the site of Pumpstation 4. This will be designed and constructed as part of the existing contract, to upgrade Rooidraai Road (by others). The connection of the gravity sewer to Pumpstation 4 is to be designed by SMEC.
- A single generator to be supplied, sized to handle the new pumpstation with its screening and grit removal facilities and the refurbished Pumpstation 1 on the beachfront. Generator to be housed at new pumpstation site.
- Emergency storage volumes to be provided. The storage volumes shall be as large as reasonably possible.
- Pumpstation 1
    - A sand trap is to be provided before the sump. The sump is to be cleaned using a vacuum truck.
    - Submersible pumps to be installed in the sump.
    - Sump, to have an operational volume and emergency volume extending to the north
    - Volume for an emergency to be maximised considering the existing infrastructure and the beach.
    - Emergency overflow to remain on the beach
    - Existing building to remain, refurbished and used to house control systems, isolation equipment and an odour control system.
- Pumpstation 4
    - Top Floor
        - A flow stilling basin into which a gravity and pumping main will discharge, and exit into the screening channels.
        - Three inlet channels with manual screens (Two duty channels and an emergency channel)
        - Allowance for future installation of automated mechanical front raked screens, conveyors and washer compactors.
        - Two vortex degritters.
        - One grit classifier to the vortex degritters.
        - Odour control system.
        - MCC room
    - Lower floor
        - Pump room
        - Sump
        - Generator room
        - Screenings collection room
- Land adjacent to PS4 to be procured to reduce the space constraint on the site for the new pumpstation.

3.2 Geotechnical Investigation

The Geotechnical report has previously been circulated with the concept design report. The critical results are presented below.

- **Ground Profile – Existing Pump Station 1**
    - **Results**

    A layer of fill is present up to a depth of between 1.5m and 2.0m, which is underlaid by sandy alluvium that becomes sandy alluvium with cobbles and boulders down to a depth of 4.5m. After that, there is a completely weathered schist consisting of soft and very soft rocks.

    Groundwater was recorded at 3.0m and 4.6m

    - **Implication**

    At the existing pump station bulk excavations for a new sump could be challenging due to the substrate being predominantly saturated sandy material (below mean sea level) which means that shoring and de-watering will be essential for a safe and dry work area. For this portion of the work, allowance for sheet piling will be allowed in the cost estimate.

- **Ground Profile – New Pump Station 4**
    - **Findings**

    A layer of uncontrolled fill-and-dump material with poor engineering properties is present up to a depth of 1.6m. Then a layer of residual to completed weathered granite schist up to a depth of 2.3m, followed by soft to medium hard rock granite schist up to 4.0m deep. Moderately weathered granite schist was encountered between 4.0m to 8.0m.

    Groundwater was recorded at 2.4m and 0.98m. For design purposes and construction, it can be expected to be at the bedrock-soil interface at 2.4m.

    - Implications

    The confined area and the presence of hard rock could have potential challenges in terms of bulk excavations. Allowance will be made for chemical rock splitting in lieu of blasting and mechanical rock breaking.

    Battering the excavation will not be an option due to the confined area, and allowance will be made for shoring, more specifically sheet pilling.

    Dewatering will also be required to ensure a safe and dry excavation.

- **Ground Profile – New Rising Main**

    Test pits were excavated along the pipe route, starting at the end of Spekie Gericke Drive and continuing to the WWTW. No test pits were excavated in the roadway and this geotechnical assessment thus excludes this portion of the pipeline.

    The Geotechnical condition for the pipe route is summarised in and .

Figure 3-1: ZONE map of 20m wide rising main corridor

Table 3-1: Summary of Geotechnical Considerations

ZONE	Geotechnical considerations
ZONE I	• Variable excavatability in completely to highly weathered schist • "Soft" excavation conditions in upper transported and residual soils • "Intermediate" excavation conditions in weathered schist bedrock • Moderate slopes • Shallow subsurface water seepage along bedrock-soil interface during and after heavy rainfall
ZONE II	• "Soft" excavatability, with some sidewall instability, in upper sandy soils • Shallow subsurface water seepage along bedrock-soil interface during and after heavy rainfall

Groundwater was not encountered during the trial pit excavation. However, excavating the rising main will require battering or shoring, particularly in zone 1.

The material samples obtained from the trial pits showed that the material cannot be used as bedding since it does not conform to the SANS 1200LB specification. Therefore, bedding material will need to be imported from commercial sources. The excavated material can be used as fill, but it will require a selection and sorting process.

4 Design

During the design phase, careful consideration was given to the following key factors:

- Public safety and noise pollution,
- Public nuisance,
- Construction methodologies considering site constraints,
- Environmental hazards and regulations,
- Sustainable and efficient operating conditions,
- Robustness and damage prevention,
- National and Municipal design standards and guidelines,
- Continuous operation during implementation must be maintained.

4.1 Herold's Bay PS 1

4.1.1 Inlet

The inlet at the existing pump station comprises a cylindrical sand trap immediately upstream of the entrance to the sump. This structure will have a central pipe to the bottom, with a coupling at the top to connect a vacuum truck pipe for cleaning. In addition, a manual coarse screen (25mm bar spacing) will be installed to prevent rags from entering the sump. Both the vacuum truck suction connection and the screen will be accessible via a hinged manhole cover.

4.1.2 Sump and emergency storage

A new reinforced concrete emergency storage tank and sump will be constructed below the current parking area between PS 1 and the public ablution facilities. The tank will not protrude into the roadway of Uitspanning Street and will extend up to the terrace blocks located on the beach. The structure will be underground and not visible to the public. The only portion of the tank that will be visible will be the access manholes. The parking, kerbs, "terraforce" blocks, benches, and waste bins will be reinstated once the tank has been constructed, returning the area to its original state for use.

The incoming flow from the sand trap will enter the sump via a drop pipe or chute. The sump and emergency storage tank will be combined, with the deepest part of the tank forming the sump, being the operational volume, and will be located adjacent to the existing pump station building.

The floor of the emergency tank will slope towards the operational sump. The slope will be achieved by benching, which will assist in anchoring the structure to prevent floatation.

The rising main between PS 1 and PS 4 will scour into the new sump and enter the sump at the highest point to create a flushing volume to wash possible sediment build-up into the operational sump. Due to the "low" static pressure in the rising main during scouring, the flushing may not remove the solids settled during an emergency event, and periodic manual pressure washing of the emergency sump may be required as part of maintenance.

All the access points will be covered by removable precast concrete panels or hinged access covers. These covers are designed to minimize the airflow in and out to reduce odour issues. Access manholes will be provided for entry

The access cover will be too heavy for a single person to open and will require mechanical hoisting to reduce the possibility of unplanned entry.

Due to the space constraint at the PS4 location, the majority of the emergency storage capacity will be provided at PS 1. Once the emergency storage volume at PS 4 has reached capacity, the existing rising main will be utilised to convey sewage to the emergency storage tank at PS 1.

A total emergency storage volume of 780m^3 within the entire system. 180m^3 at PS4 and 600m^3 at PS1. This amounts to an estimated 8 hours capacity at the ultimate design inflow of both the pump stations combined.

Figure 4-1 Position of proposed emergency storage tank

During the design development, the George Municipality indicated they wanted the emergency storage to be as large as possible, to enable them to handle an emergency event and prevent the pollution of the beach, and that they intended to use the emergency storage volume or part thereof during to accommodate the flows during ESKOM load shedding, in order to reduce the additional financial burden of the use of diesel to run the generators to run the pumpstations. Although the numbers reflected above indicate that this will be possible in the short term, the standardisation of this practice should not be institutionalised.

The preliminary model and associated results are highly dependent on the diurnal flow patterns adopted for the two pumpstations in the system (PS1 and PS4).

The following four scenarios are presented to illustrate the possible range of normal operating conditions and “load shedding”. These do not consider the situations where and stormwater ingress occurs in the system. The operational philosophies are described in greater detail in chapters 4.1.4 and 4.2.7 respectively.

- General conditions
    - Design incoming peak flows*
        - PS1 10L/s
        - PS4 45L/s

        - Combined flow 55L/s
          * Flows are indicative based on extrapolations of information received.
    - Design emergency peak flows (pumps)
        - PS1 25L/s
        - PS4 70L/s
    - Emergency volume of start of event 0%

- Scenario 1
    - Loadshedding :
        - 2 hours
    - Commence night low flow period (diurnal flow)
- Results
    - At end of 2 hours
        - PS4 emergency tank: 70% full,
        - PS1 emergency tank 5% full
    - Period to empty emergency sumps 1 hour

- Scenario 2
    - Loadshedding :
        - 4 hours
    - Commence night low flow period (diurnal flow)
- Results
    - At end of 4 hours
        - PS4 emergency tank: 100% full,
        - PS1 emergency tank 12% full
    - Period to empty emergency sumps 2.5 hours

- Scenario 3
    - Loadshedding :
        - 2 hours
    - Commence at start of morning peak (diurnal flow)
- Results
    - At end of 2 hours
        - PS4 emergency tank: 100% full,
        - PS1 emergency tank 18% full
    - Period to empty emergency sumps 5 hours

- Scenario 4
    - Loadshedding :
        - 4 hours
    - Commence at morning peak flow (diurnal flow)
- Results
    - At end of 4 hours
        - PS4 emergency tank: 100% full,
        - PS1 emergency tank 85% full
    - Period to empty emergency sumps 8 hours

- Scenario 5
    - Loadshedding :
        - 4.5 hours
    - Commence at morning peak flow (diurnal flow)
- Results
    - At end of 4.5 hours

- PS4 emergency tank: 100% full,
- PS1 emergency tank 100% full

- Period to empty emergency sumps 8.5 hours

Note: The periods of accommodating sewage are significantly reduced if the initial volumes in the emergency storage tanks are not empty, at the start of the load-shedding event.

It is critical to consider the results of scenario 4. If during the operation, it is decided that the generator will not be operated for the shorter load shedding events of 2 hours, and at the end of the period, the pumps at PS4 fail to start, it leaves 2.5 hours for the operations team to be notified, get to the pumpstation and resolve the issue, before the system overflows onto the beach.

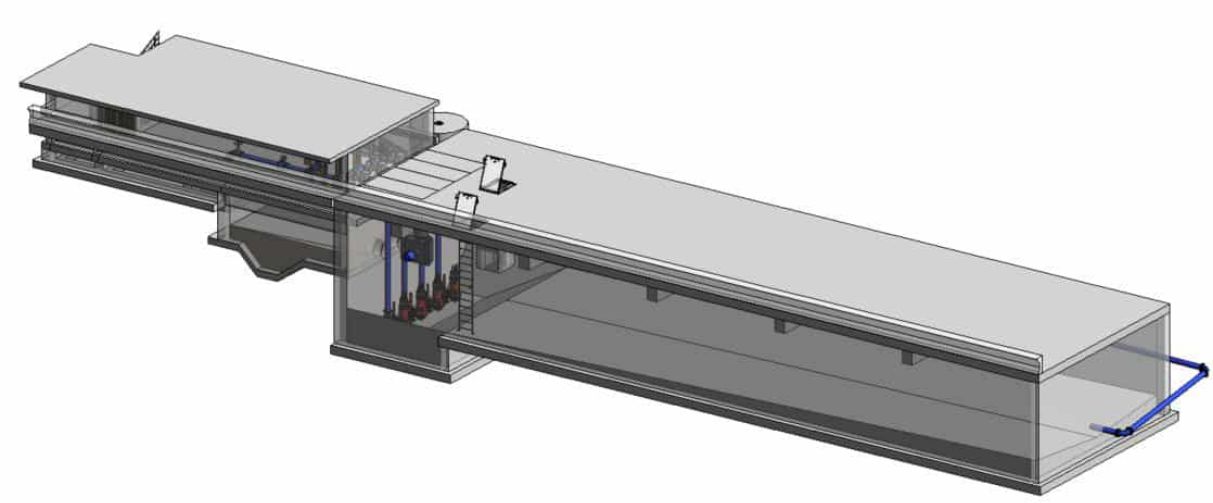

Figure 4-2 Model of proposed PS1 and emergency storage tank

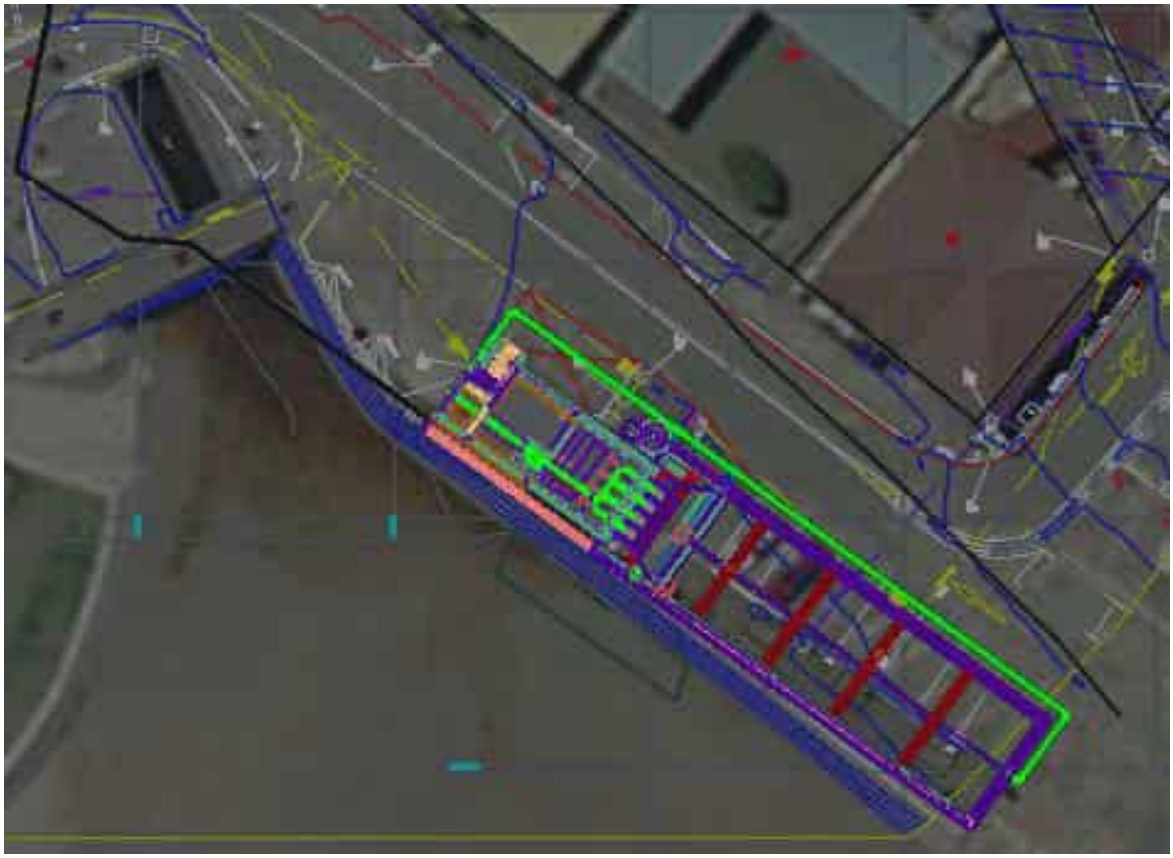

Figure 4-3 Overlay of proposed PS1 and emergency storage tank

4.1.3 Design Flows

The revised design flows (delivery) for the pump are

- Normal operating conditions:
- Low season: 4 L/s
- Peak season: 19 L/s
- Extreme events: 30 L/s

(extreme events are classified as events/situations where the emergency volume of the pumpstation has been utilised and needs to be drained, but exclude storm events and associated ingress).

4.1.4 Operational Philosophy

The pumpstation will primarily operate on a level control in the local sump, with an interlink to PS4. If the PS4 is not functioning for any reason, the pumps at the PS1 will not activate. Under other conditions, the pumps will operate one duty, three standby, on a rotational basis.

In the event of the liquid rising above the preset levels, the second and possibly third pumps will activate in sequence.

4.1.5 System Characteristics

The design of the pumping system is dependent on the pipeline system characteristics. The pipeline is discussed in paragraph 4.3.1.

Table 4-1: Pump System Characteristics

Description	Data
Maximum Water Level in Sump	3 m
Minimum Water Level in Sump	0.8 m
Discharge Level	28 masl
Pump Centreline Level	0 masl
Minimum Static Head	27.2 m
Pipe Length (To PS4)	185 m
Suction Pipe Size and Type	N/A
Delivery Pipework in the pumpstation	200mm Ø 316L SS
Delivery Pipe Size and Type	200 mm Ø uPVC
Pump Flow Rate (Interim)	19 L/s
Pump Head (Interim)	27.8 m
Pump Flow Rate (Ultimate)	30 L/s
Pump Head (Ultimate)	29 m

The provisional system curves based on the information above are presented below.

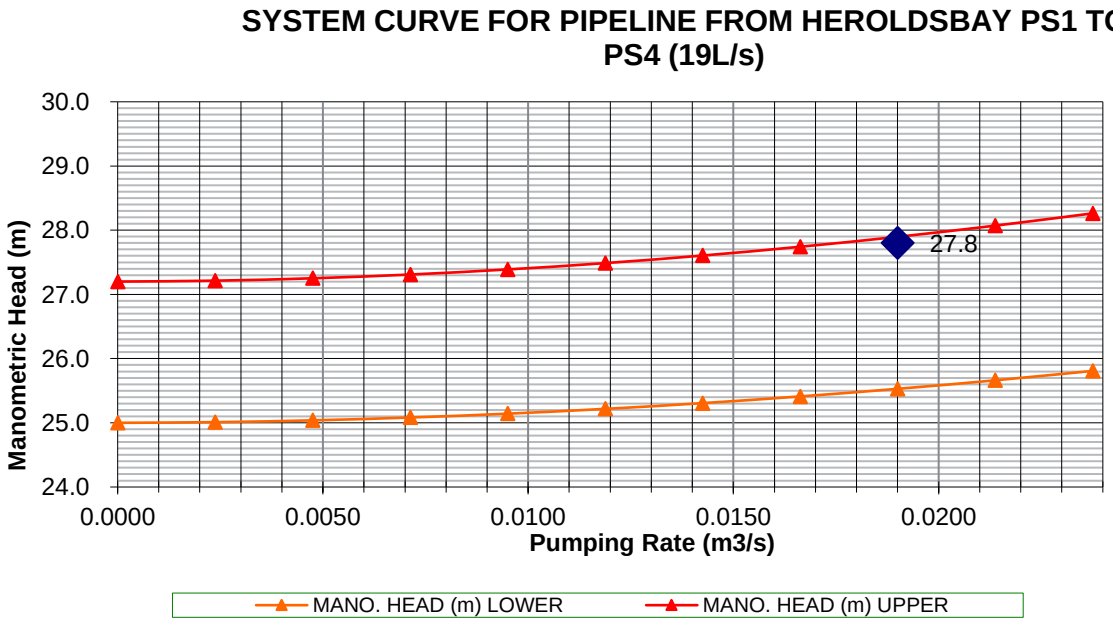

Figure 4-4 System Curve to PS4 @ 19L/s

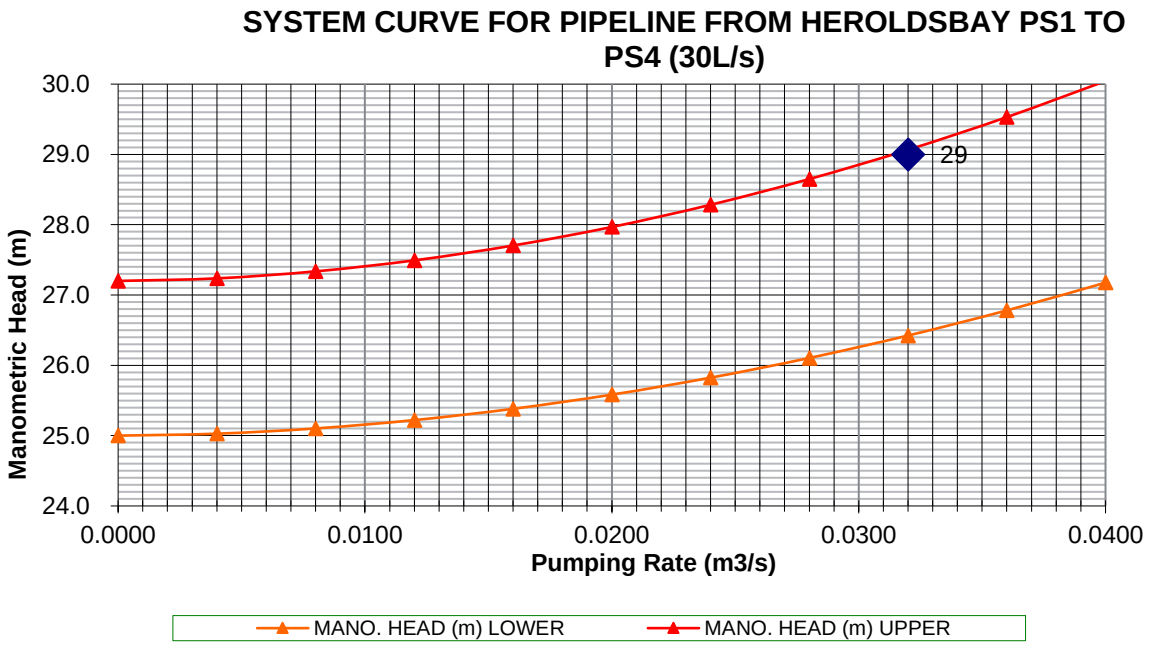

Figure 4-5 Preliminary System Curve pipeline to PS4 @ 30L/s

4.1.6 Control Philosophy

(a) Sump

For level control, the existing sump will be fitted with ultra-sonic / radar level sensors, including backup floats (other acceptable instrumentation) in case the primary level unit fails. These level sensors will control the pumps, with the main control levels being,

- low – switch off;
- high-low - switch one pump on;
- duty level – one pump at efficiency,
- switch the second pump off if the level lowers;
- high – switch the second pump on if the water level is rising

The duty level will be a targeting level. As the water level in the sump continues to rise, the speed on the variable speed drives (VSD) will increase (i.e., increase flows), and if the level drops below the level, the speed will reduce.

The pumps in PS1 must receive communication from the new PS4. If the pumps at PS4 are not operational or the emergency sump is full, then the pumps in PS1 shall not start or if operational, stop, and the emergency storage volume must be used to accommodate incoming sewage.

(b) Pump controls

VSDs will control the pump speeds. This will reduce the start-up current drawn from the grid and the associated peak, allow for flows to be modulated to suit incoming flows and reduce the size of the transient events in the pipeline.

The duty pumps will be rotated to try and even out wear and tear and maintenance can be properly planned and carried out (avoidance of one pump accumulating hours and the others remaining being nonoperational).

4.1.7 Pumps

Four pumps of the same manufacturer and model will be installed inside the sump of the pump station. The pumps shall be centrifugal, single-stage, close-coupled, submersible type pumps equipped with a self-cleaning vortex-style impeller designed to handle unscreened sewage. The pumps shall have a minimum spherical solid handling of 80mm. Due to the high sand loading at the pump station, the impeller material shall be Duplex Stainless Steel.

The pump installations shall be semi-permanent type, with auto-coupling equipment. Each pump shall be equipped with a suitable duck foot bend, 316L Stainless Steel guide rails and top bracket, and a 316 Stainless Steel lifting chain.

4.1.8 Pipe work and specials

The selection of pipe sizes in the pumping station is done to ensure the pump station is effectively and efficiently able to convey sewage throughout the required flow ranges, with minimum self-cleansing velocities taken into consideration.

A drop-chute / down-pipe will be installed at the gravity feed entrance to the sump to reduce the aeration and formation of scum, unwanted vortices at the pump intake and air intake into the pump. The down-pipe is sized such that the ultimate flow rate can enter the sump, as well as entrapped air be able to lose momentum and vent to the top of the pipe.

The minimum and maximum flow velocities in sewage pipework are 0.8 m/s and 2.5m/s respectively. The minimum flow velocity is to ensure a self-cleansing flow is achieved and the maximum flow velocity is to reduce friction losses in the pipework and to reduce the destructive action to the installed equipment due to the abrasive content of the sewage.

The pipework will consist of the delivery pipework for each individual pump, connecting to a common manifold, before connecting to the rising main outside of the pump station building.

An over-pumping connection shall be included for emergency purposes, to allow a mobile pump to be connected and pump into the pumping main.

Due to the corrosive environment of a sewage pump station, the proposed pipe material to be installed throughout the pump station is Stainless Steel 316L.

All pipework shall include pipe supports to handle all forces generated by the pumping system.

4.1.9 Valves

An isolation valve will be installed on the incoming pipeline between the grit settling structure and the sump for the purpose of maintenance/cleaning of the sump.

A set of non-return and isolation valves (in this order) will be installed on the delivery pipework of each pump line, the over-pumping connection on the delivery common manifold, as well as on the delivery common manifold.

A flanged, double-action air release valve designed to handle sewage will be installed on the delivery common manifold downstream of the common non-return valve. The air release valve will be installed with an isolation valve for maintenance purposes. The isolation valves shall be of flanged, cast iron, resilient seated gate valves with non-rising spindles equipped with hand wheels.

Non-return valves shall be of the flanged, single-door, swing-type valves equipped with a lever and counterweight. The non-return valves shall include required bracing to handle all static and dynamic forces generated by the system.

All equipment shall be rated to the maximum operating pressure of the installed pumps.

4.1.10 Electronic Metering

A single flow meter is proposed on the common single rising main. The flow meter will be located within the pump station building with a battery backup system.

It is further proposed that overflow from PS4 towards PS1 be monitored at PS4 to signal an alarm in this emergency situation. During operational monitoring, the overflows will have to be considered in the calculation of a water balance across the system.

4.1.11 Building Alterations

(a) Superstructure

The existing building will be completely refurbished as per the best practice guidelines. The existing pumps and pipework will be removed, and all the new pipework will be installed in the existing building.

(b) Electrical Control Room

The MCC room will be separate from the pump well to reduce noise for operators. However, it will still be visible for operators to see if any issues arise with pumps, pipework, or valves. The electronic system will have a “remote” status and control option for the pumps from the main GM control room.

(c) Access

One emergency access with doors opening outward for use during emergencies.

All external doors will be made of galvanised steel and equipped with stainless steel locking mechanisms to protect against corrosion.

All internal doors will be made of galvanized steel and equipped with stainless steel locking mechanisms to protect against corrosion.

(d) Natural Lighting

Make use of as much natural light as possible.

(e) Odour Control

Odour control to the sump and emergency tank to reduce and prevent any unpleasant smells to nearby residents and beachgoers.

(f) Ventilation

Forced ventilation into the sump and emergency tank and MCC control room.

(g) Accessibility

Adequate demarcated parking and accessibility to the pump station for emergencies. Particular consideration during the peak holiday season.

4.1.12 New Structures

(a) Emergency Storage and new Sump

The new sump and emergency storage tank will be an underground reinforced concrete structure and will be positioned under the parking bays between the existing pump station building and the ablution blocks. The parking

area will be reinstated after the construction, and the reinforced concrete roof slab will be designed to accommodate light vehicle parking.

Of concern are the expected groundwater level and possible ingress of seawater from the beach during high tides within the area. It is anticipated that the perched water table will influence the stability of the surrounding soils during construction, with possible collapse or failures within the working area. As such, consideration should be given to possible temporary works such as sheet piles, continuous water removal, excavation stabilizations, and cement-stabilised reinstatement of imported layer works.

It should further be noted that pending final design foundation piles or similar reinforced foundations might be needed. The structure's possible floatation has to be evaluated, and mass weight and /or footings will be required.

(b) Material

(i) Concrete

The emergency storage sump will be constructed using reinforced concrete.

All concrete surfaces to be exposed to raw sewage, sulphuric acid, or hydrogen sulfide will be coated with cementitious products (calcium aluminate cement/mortars) or HDPE linings.

Concrete elements to be designed to have the following minimum 28-day compressive strengths:

- Blinding: 15MPa
- Water retaining structures: 35MPa watertight concrete to BS8007
- All other concrete: 35MPa

(ii) Reinforcement

Concrete elements are to be detailed by specifying the following rebar sizes (complying with SANS 920):

- Mild steel (250MPa): R8, R10 and R12
- High yield steel (450MPa): Y10, Y12, Y16, Y20 and Y25

For corrosion protection of reinforcement, liquid retaining structures are specified to have a minimum concrete cover of 75mm.

(iii) Structural Steel

All steelwork located within the inside of liquid retaining structures is specified as 316L stainless steel to limit corrosion damage to the steelwork.

(c) Temporary Works

The design of the temporary work will be the Contractor's responsibility and will be included in the tender documentation as such. Shoring and dewatering will be required to construct the new emergency storage tank and the sump. Steel sheet piling is the preferred method of protecting the excavations and from water ingressing into the excavation.

4.1.13 Electrical

With the reduced flow to PS1 due to the diversion of the significant amount of sewage to PS4, the intended pump station upgrade, with associated pumps, motors and ancillary equipment, will require less power than the current pump station.

Pump station 4 will supply power and backup power to PS 1. Under normal supply conditions, the new bulk supply at PS4 will supply PS1 with the necessary power. As part of the PS4 generator design, an automatic changeover switch will do this. Therefore, a single cable will supply PS1.

The existing supply to the site is sufficient size for the upgrade requirement and will be kept as an emergency backup. It will be integrated into the MCC, in case the redundant supply from PS4 is off.

(a) Estimated New Load Requirements

The table below provides a summary of the expected maximum electrical demand after the upgrade.

Table 4-2: Electrical Load Summary

Description	Comment	Duty	Stand-by	Rating (kW)	Total Power (kW)	Power Factor	Total Power (kVA)
Sewage Pumps	4x New Pumps & Motors (Max 2 duty)	2	1	18.1	36.2	0.86 (TBC)	42.09
Mechanical Mixers	2x new Mechanical Mixer	2	0	2	4	0.8 (TBC)	5
Small Power & Lighting	Building & Security Lights	1	0	1.5	1.5	1.0	1.5
TOTAL (Expected Maximum Demand)					**27.6**		**53.41**
Rounded					**28**		**54**

As can be seen from the calculations presented in the table above, the maximum expected electrical demand for the pump station is calculated to be rounded to 54 kVA (for final future flows of 30 L/s).

The current supply cable and breaker size (150A) is rated for higher load requirements than the above estimated maximum load demand. The current supply is sufficient to supply the pump station after the upgrade. The final Minisub and kiosk capacity will need to be verified with the George Electrotechnical Department during the detailed design phase.

(b) New Standby Diesel Generator

The pumpstation will be supplied with standby power from the generator at PS4, with an automatic changeover switch. Additional manual bypass will be available, in case of possible change-over switch failure.

(c) Upgrade to the existing Motor Control Centre

The existing MCC will not be re-used in the project upgrade and a complete new MCC is proposed. The existing pump station will need to remain in operation for the duration of the project and the new board will be allow a parallel installation.

(d) Upgrade to Telemetry & SCADA

Spectrum Communications currently provides the telemetry and SCADA for George Municipality applications under a separate service level agreement (SLA). The telemetry RTU and associated system should be upgraded with the new motor control applications.

Seeing that this portion of the work will be subcontracted to Spectrum, a budgetary figure (provisional sum) should be allowed for the new hardware, software control, SCADA, and commissioning.

(e) Upgrade to Building Small Power & Lighting

The current wiring in the building will be replaced. All luminaires specified for the new and/or existing rooms will be energy-efficient LED type and will also be vaporproof.

4.1.14 Drawings PS 1

The following drawings of Pump Station number 1 are attached as **Annexure A**

- C1936 – PS1 – A101 - Sump Plan and Layout
- C1936 – PS1 – A102 - Ground Floor Plan and Pump Room Details
- C1936 – PS1 – A103 - Roof Plan
- C1936 – PS1 – A104 - Sections
- C1936 – PS1 – A105 - Sections
- C1936 – PS1 – A106 - Isometric and Pipework details

4.2 New Herold's Bay PS 4

4.2.1 Pump Station Design

Due to space constraints at the allocated site of the new pump station number 4, a double-storey standalone structure was designed to house all the equipment. A client's requirement was for all equipment to be housed out of view from the public and for the building to be aesthetically pleasing and blend in with the existing surroundings of Herold's Bay. The pump station will consist of the following areas:

- Ground Floor (Figure 4-7 below)
    - Generator room with underground fuel storage
    - Dry well pump room
    - Sump and emergency storage
    - Odour control room
    - Skip room
- First Floor (Figure 4-8 below)
    - MCC room
    - UPS room
    - Head of works, consisting of inlet works, screening and de-gritting
    - Space allocation for future mechanical screens with associated conveyors and washer compactors.

The raw sewage will be drained under gravity to the PS4 site from the higher areas of Herold's Bay along Rooidraai Road, with PS1 pumping the remaining flow from the lower zones of Herold's Bay to PS4.

The pump station will be designed with a dry well end-suction pump configuration. To ensure redundancy, it will operate with a duty standby pump setup. Emergency storage has been incorporated into the building design, with overflow from PS4 going to the larger emergency storage tank at PS1.

The PS4 will be built on a portion of ERF 116 and a portion of Erf 236/0 situated along Skimmelkrans Lane, across from Spekie Gericke Drive. Skimmelkrans Road bounds the site to the south, a channelised stream to the east, and a steep retaining wall and Rooidraai Road to the north and west, respectively.

Figure 4-6 Position of erf 116

4.2.2 General Arrangement of Screening & degritting

The general arrangement of the screening and degritting at PS4 is provided in **Figure 4-8.**

- The incoming flows discharges into a central chamber from where the flow discharges into either or both screening channels (green arrow).
- If both screens are blocked, the level in the division chamber rises and will enter the emergency bypass channel between the two main screening channels (yellow arrow). The bypass channel will be higher than the screening channels and have a coarse hand rake screen (yellow arrow).
- After exiting the screening and bypass channel(s), the screened sewage will be diverted to one or both vortex degritters (blue arrows). These will also have sluice valves on both sides to isolate them respectively. If both vortex degritters are isolated (not operational), the flow will over top an emergency overflow weir to the sump via a flume for measurement.
- Lastly, after passing through the vortex degritters, the screened and settled flow is collected in a common channel and measured by means of a flume before entering the sump (pink arrows).
- Provision has been made to connect a vacuum truck to the sump to allow manual emptying of the sump.

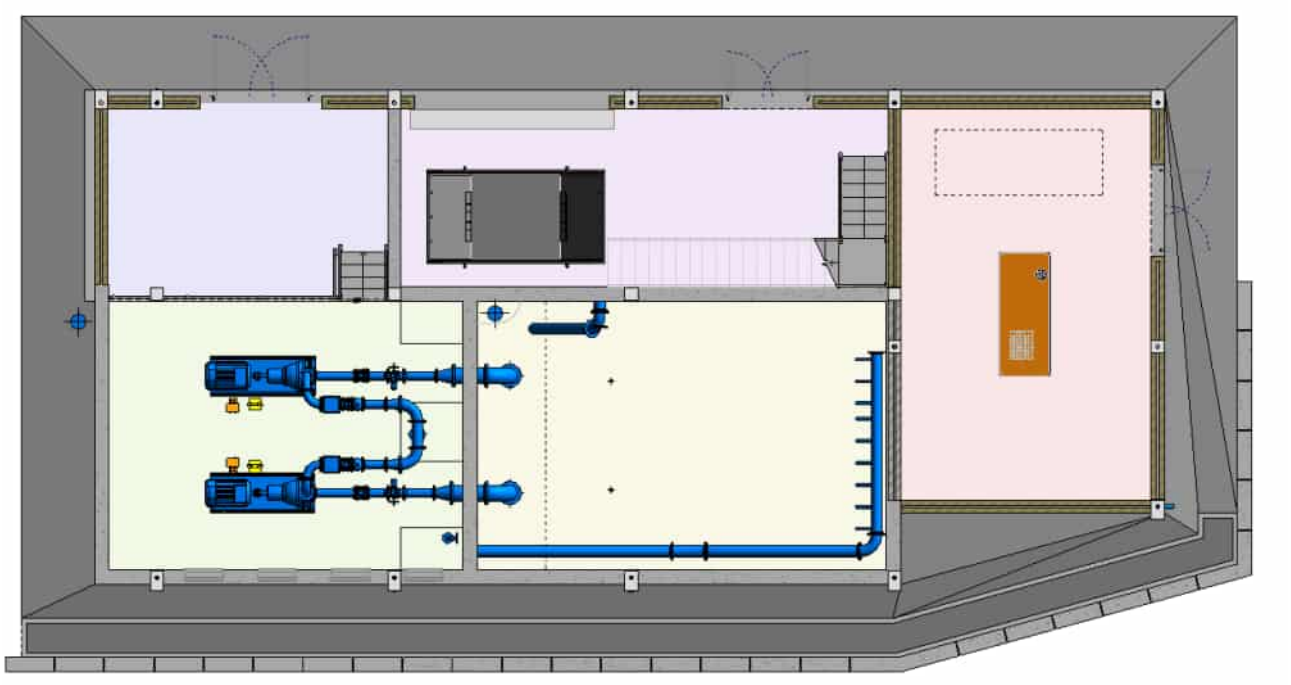

Figure 4-7 Pump Station 4 ground floor

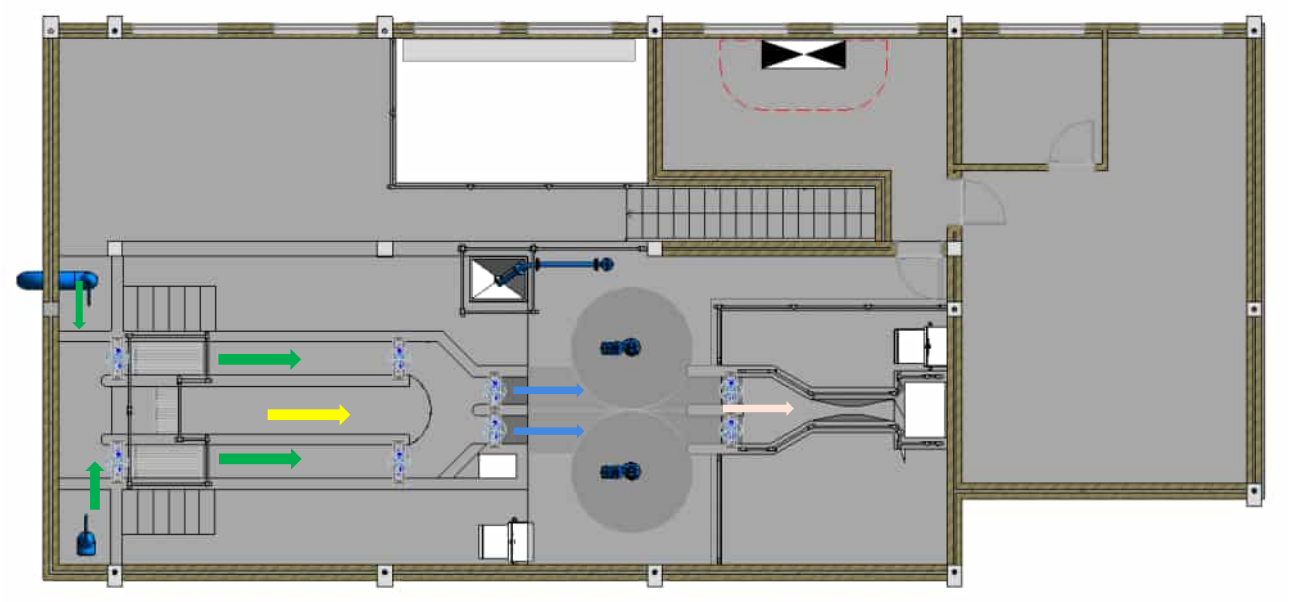

Figure 4-8: Pump Station 4 first floor

4.2.3 Screening

The flows received at the new pump station will be split between two channels, each with a manual hand-raked screen. Spatial allowance has been made in the two channels for the option of installing automated mechanical bar screens in the future, with a bypass channel provided with a hand-rake screen (aperture size 25mm) in the event that both future mechanical screens are not operational.

Sluice gates are provided upstream and downstream of the screens, to allow for the selection of either or both channels to be used or isolated in the operation.

4.2.4 Degritting

Degritting will be achieved using two vortex degritters which use gravity and centrifugal forces to remove the grit from the flow and deposit it into a sump. The structure has a conical shape, with a central sump. The grit is removed from the sump using a grit pump and discharged into a grit classifier. The grit classifier separates the moisture and the grit, disposing of the grit in a skip, with the effluent being redirected into the wet well.

The section through the proposed vortex degritter is shown in **Figure 4-9.**

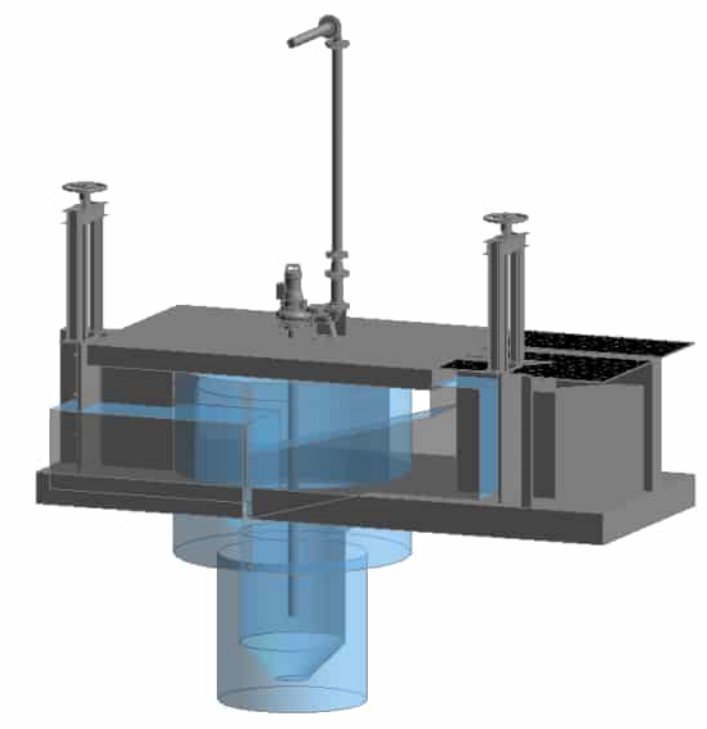

Figure 4-9 Vortex degritter with grit removal pump

4.2.5 Sump and emergency storage

The sump provided at PS4 will act as both an operational and emergency storage sump. Sizing of the sump resulted in a capacity in the region of 25-30m3 with an emergency volume of 170m3. This will provide sufficient storage and suction head for the pumps to operate at their best efficiencies. The sump will be located adjacent to the pump room to reduce suction pipe lengths as well as to ensure minimal secondary losses in the suction pipework. By having the sump adjacent to the pump room rather than below it, the pump suction pipework will be flooded, removing the need for self-priming pumps and making operations and required maintenance easier.

The emergency overflow from the sump will utilise the existing pumping main to drain the overflowing sewage from PS4 to the emergency storage tank at PS1. In the event that the emergency overflow fails, the sewage to discharge to the environment

The pumping main from PS4 to the WWTW, will scour back into the pumpstation sump.

4.2.6 System Characteristics

The design of the pumping system is dependent on the system characteristics and the connections to the existing infrastructure. This pump station will receive all its incoming flow from the existing pump station PS1.

The pipeline will follow the same route as the existing pipeline up to the WWTW and is discussed in 4.3.2The design of the pumping system depends on the system characteristics and the connections to the existing infrastructure. The static head that needs to be overcome is the difference between the sump level and the discharge elevation. The suction and delivery pipelines were sized to meet the current and future demands.

Table 4-3 below summarizes the key system characteristics.

Table 4-3: Pump System Characteristics

Description	Data
Maximum Water Level in Sump	26 masl
Minimum Water Level in Sump	24 masl
Discharge Level	138 masl
Pump Centreline Level	27 masl
Minimum Static Head	112 m
Maximum Static Head	114 m
Pipe Length (PS 4 to WWTW)	1,230 m
Suction Pipe Size and Type	150 mm Ø Steel Grade 316L
Delivery Pipe Size and Type	200 mm Ø uPVC & Steel Grade 316L
Pump Flow Rate	32 L/s
Pump Head	120 m

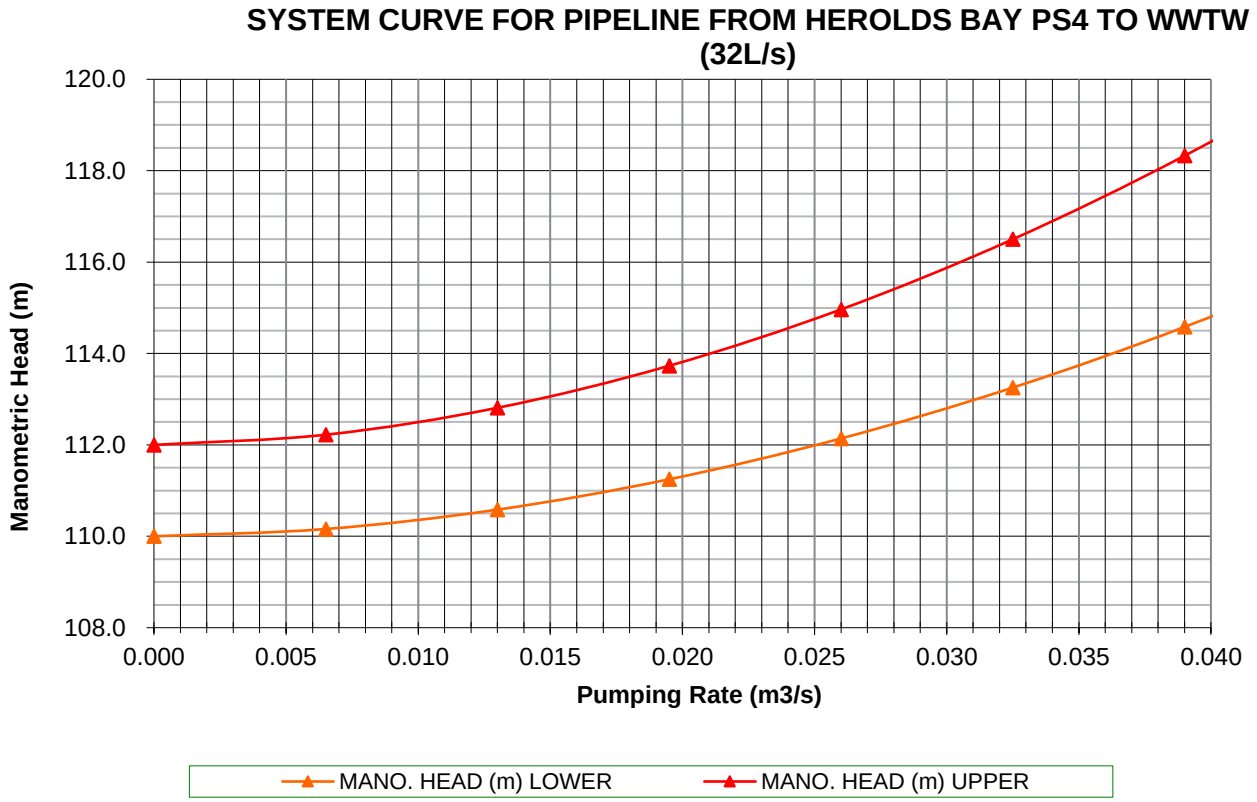

Figure 4-10 Preliminary System Curve pipeline between PS4 and the WWTW @ 32L/s

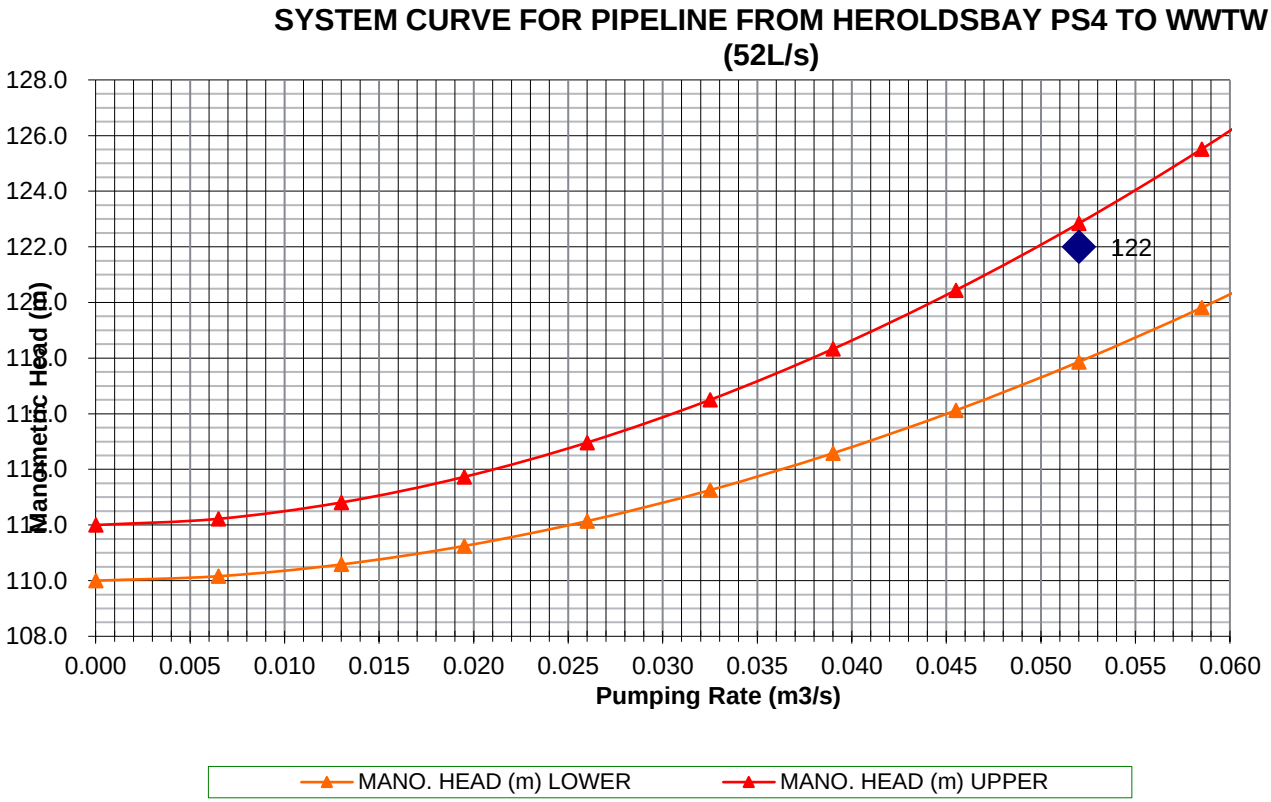

Figure 4-11 Preliminary System Curve for Pipeline between PS4 and WWTW @ 52L/s

4.2.7 Control Philosophy

(a) Vortex Degritting

The grit pumps pumping the grit from the base of the vortex degritter, will operate on a timer. The grit slurry will be discharged into a vortex degritter, which llll separate the grit from the remainder of the water. The grit pump and the grit classifier will be interlinked with the grit classifier operating for a set period of time.

(b) Pumps

The new sump will be fitted with ultra-sonic / radar level sensors including back-up floats (or other acceptable instrumentation) in case the level sensor fails. These level sensors will control the pumps with the main control levels being, low – switch off; duty level - switch pump on, high – switch second pump on. The duty level will be a targeting level, and as the water level in the sump continues to rise, the speed on the VSD drives will increase speed (i.e. increased flows), and if the level drops below the level, the speed will reduce until the level of switch off is reached.

4.2.8 Measurement

The flow will pass through a Parshall flume for measurements before entering the sump beneath the screening facility, and a magnetic flow meter will measure the flow leaving the pump station. A flow meter on the overflow, back to PS1, will also be provided.

4.2.9 Pumps

The proposed pumps of Herold's Bay PS 4 are selected in line with the information obtained from the GLS report in conjunction with the proposed future capacity as specified by GLS.

Due to the high static head required by the pump station, submersible pumps are not an option at this pump station. Dry-installed pumps of the enclosed solids handling, long-coupled, end-suction type centrifugal pumps are thus the only option. These pumps have a large flow range, and the minimum flow that will be pumped will be around 50L/s. Two pumps will thus be installed, with one being a standby pump.

Variable-speed drives are installed to operate the pumps, allowing the pumps' speed to be adjusted to the incoming flow range and assisting with the start-up demand of the pumps on the generator.

The levels in the wet well are set such that the effective pumping volume is sufficient to ensure the pumps do not operate more than six (6) cycles per hour and allow enough volume for pumps to speed up to meet their operational set point prior to reaching any other level set points in the sump such as the next start level or high level.

4.2.10 Pipework and specials

The selection of pipe sizes in the pumping station is done to ensure the pump station is effectively and efficiently able to convey sewage throughout the required flow ranges, with minimum self-cleansing velocities taken into consideration.

A drop-chute / down-pipe will be installed at the gravity feed entrance to the sump to reduce the formation of scum, unwanted vortices at the pump intake and air intake into the pump. The down-pipe is sized such that the ultimate flow rate can enter the sump, as well as entrapped air be able to lose momentum and vent to the top of the pipe.

Incoming sewage into the wet well has been screened and the remaining larger solids settled out in the grit settling channels, thus only organic material is expected in the wet well.

The minimum recommended suction pipe velocity for sewage with organic matter is 0.6 m/s, with the maximum being 1.5 m/s. The maximum recommended velocity in the inlet bell of the suction pipework is 1 m/s.

The minimum and maximum flow velocities in sewage delivery pipework are 0.8 m/s and 2.5m/s respectively. The minimum flow velocity is to ensure a self-cleansing flow is achieved and the maximum flow velocity is to reduce friction losses in the pipework and to reduce the destructive action to the installed equipment due to the abrasive content of the sewage.

The pipework will consist of the pump suction and delivery pipework, connecting to a common manifold, before connecting to the rising main outside of the pump station building.

Due to the corrosive environment of a sewage pump station, the proposed pipe material to be installed throughout the pump station is Stainless Steel 316.

All pipework shall include pipe supports to handle all forces generated by the pumping system.

4.2.11 Valves

Sluice gate valves shall be installed in the screening and degritting channels for maintenance and cleaning purposes. Hand-stops will be included in the design at specific locations for the maintenance of the sluice gate valves.

A set of non-return and isolation valves (in this order) will be installed on the delivery pipework of each pump line, as well as on the delivery common manifold.

A flanged, double-action air release valve designed to handle sewage will be installed on the delivery common manifold downstream of the common non-return valve. The air release valve will be installed with an isolation valve for maintenance purposes. The isolation valves shall be of flanged, cast iron, resilient seated gate valves with non-rising spindles equipped with hand wheels.

Non-return valves shall be of the flanged, single-door, swing-type valves equipped with a lever and counterweight. The non-return valves shall include required bracing to handle all static and dynamic forces generated by the system.

All equipment shall be rated to the maximum operating pressure of the installed pumps.

4.2.12 Building Infrastructure

The building structure design will be based on best practices, taking into consideration the available space at the location and the system requirements. The building size will be based on the size of the infrastructure needed to be housed within it; this includes the screens, degritting channels, sump, and pumps for the ultimate design capacity, along with the electrical equipment such as generators, transformers, and MCC panels chosen for the final approved design. The site is extremely small, and the layout configuration and building options are limited. The entire work will be housed within the structure with an odour control facility. The layout of the building must allow sufficient space for operations and maintenance.

The outside façade of the pumpstation will require special architectural consideration to minimise the aesthetic impact. The services of an architect have been engaged to soften the facades of the structure and reduce the aesthetic impact. This will, however, not alter the internal layout and functionality of the pumpstation.

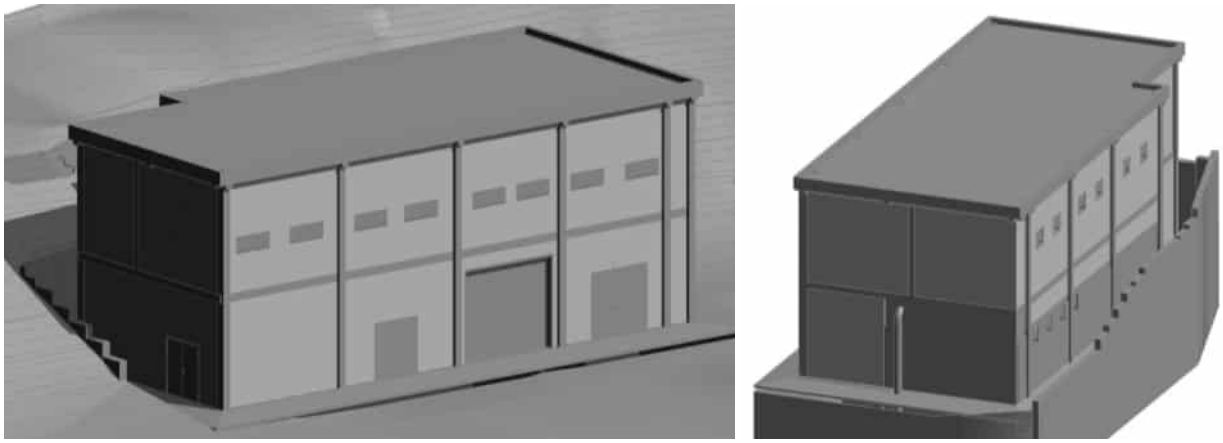

Figure 4-12 Overall building structure of PS4

4.2.13 Pipe Bridge

A 200mm diameter uPVC class 34 gravity sewer line draining sewerage from the higher areas of Herold' Bay along Rooidraai Road must be connected to the inlet works on the first floor of the new pump station. **Figure 4-13** below is information the George Municipality provided regarding the new connection point next to Rooidraai Road.

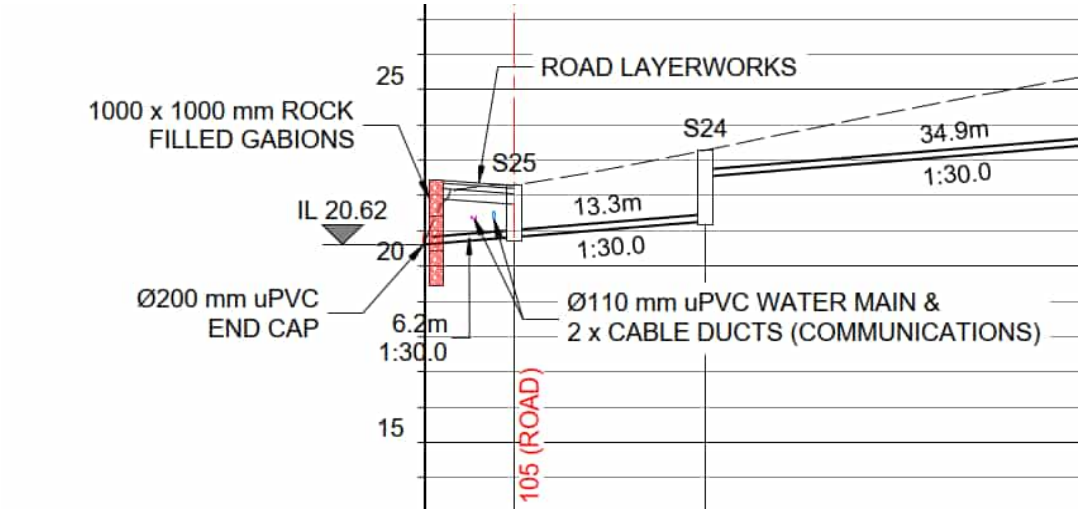

Figure 4-13: Road connection detail

Due to the elevation difference between Rooidraai Road and ERF 116, a pipe bridge spanning 25m will be required to support the pipeline.

This bridge will consist of a 2m deep, 1.5m wide galvanised lattice steel structure supported on reinforced concrete foundations and plinths as support.

Figure 4-14: Pipe Bridge location

As part of the pump station construction contract, the new pipeline along Rooidraai Road needs to be connected to the pump station, and the existing reticulation needs to be changed over to the Rooidraai Road outfall sewer.

4.2.14 Structure

The design of the structures will be done according to the guidelines as detailed in the Structure section of the Existing Herold's Bay PS 1.

(a) Foundation

The superstructure foundation along with the floors and walls will be integrated in such a manner as to form a monolithic structure.

The pumpstation superstructure will consist of a combination of concrete walls and floors as well as concrete frame and brick infill panels. Typically, the walls located below ground level will be concrete walls and, in combination with a series of columns will be supporting the suspended floors and brick infill walls above.

The roof will be designed as a flat reinforced concrete slab, complete with the capacity to handle the loads of a crawl beam.

All below-ground and roof concrete is to be cast with Penetron admixture.

(b) Retaining walls

Retaining walls to be a combination of Loffelstein blocks, reinforced concrete walls or other suitable applications, depending on the positioning and placement of such walls.

(c) Material

(i) Concrete

The emergency storage sump will be constructed using reinforced concrete, treated with "Penetron" admixture.

All concrete surfaces to be exposed to raw sewage, sulphuric acid, or hydrogen sulphide will be coated with cementitious products (calcium aluminate cement/mortars) or HDPE linings.

Concrete elements to be designed to have the following minimum 28-day compressive strengths:

- Blinding: 15MPa
- Water retaining structures: 35MPa watertight concrete to BS8007
- All other concrete: 35MPa

(ii) Reinforcement

Concrete elements are to be detailed by specifying the following rebar sizes (complying with SANS 920):

- Mild steel (250MPa): R8, R10 and R12
- High yield steel (450MPa): Y10, Y12, Y16, Y20 and Y25

For corrosion protection of reinforcement, liquid retaining structures are specified to have a minimum concrete cover of 75mm.

(iii) Structural Steel

All steelwork located within the inside of liquid retaining structures is specified as 316L stainless steel to limit corrosion damage to the steelwork.

(d) Temporary Works

Due to the proximity of the embankment of Rooidraai Road and the site, there is a need to provide temporary stabilization of the embankment during construction.

4.2.15 Electrical

The new Herold's Bay Pump Station No.4 will have an interim capacity of 32 L/s and require mechanical screening & grit removal. Two (2) new motors will be required, with an arrangement of 1 x duty, and 1 x standby.

The expected load requirements for each pump station which forms the basis for the electrical equipment design and specifications, are calculated and summarised in the paragraphs below.

(a) New Main Supply to Pump Station

The location of the new pump station is near an existing 315kVA minisub called Skimmelkrans on Skimmelkrans Lane next to ERF 116. It is fed from the same ring feeder as the Uitspanning minisub with a 70mm^2 3 core PILC underground cable.

A new supply is required for this pump station. It is recommended to upgrade it to a 630/800kVA minisub, but at a new location, due to the required pump station location. The discussions pertaining to the upgrade and the application with ETS will be required. A Provisional Sum has been included for now, assuming the new minisub will need to be installed at a suitable location adjacent to the new pump station site. Existing MV cables will need to be re-routed, as well as existing LV-kiosk and associated supply cables. Final capacity constraints will need to be confirmed with the Municipality before a decision is made on the final minisub sizing intended under the project.

(b) New Standby Diesel Generator

A new indoor generator will be provided at PS4, with an associated underground bulk fuel tank. This generator will have an automatic change-over system, providing emergency backup power for both PS4 and PS1.

The following high-level calculation can be done to confirm the generator requirements:

Capacity for one (1) motor starting (VSD):	16013.8 kVA (no in-rush loading)
Balance of Pump Station 4:	30 kVA
PS1 Loading:	30 kVA
Total generator capacity required:	220 kVA (future, with two duty pumps)
Generator capacity (80% loading):	250-300 kVA

The size of the generator required should be able to handle the power requirements of the pump station with one motor running, and the start-up requirements of the worst-case condition at PS1. A roughly 250-300kVA standby generator is suggested for the new pump station. This will however be subject to the final phasing and staging of the installed pumps. If there is only one duty pump for the initial phase, then the generator will need to be made either smaller or provided with a load bank to maintain acceptable generator operational levels.

The generator must be designed for low noise emission levels, due to pump station proximity within this residential area, It is recommended that noise levels of 60dBA be specified, measured at 7m, as per residential levels specified by the COCT. Any additional GM requirements will be confirmed during detailed design. This will be done through a combination of attenuation louvres, possibly installing a canopy set within the building, and utilising sound-absorption materials against the inner walls.

4.2.16 Future Consideration

Consideration has been made to the pump station's design and layout for the installation of automated front rake screens, screening conveyors, washer-compactors, and associated equipment. Thus, the manual hand rake screens being installed in this contract can be removed and replaced with the automated screens and associated equipment and controls without any major changes to the structure of the screening channels.

The automated screens, screw conveyor and washer compactors will be installed on the first floor, and discharge the screenings down a chute into the skip located on the ground floor.

The municipality thus have the option to install automated mechanical front rake screens including all the ancillary equipment.

4.2.17 Drawings PS 4

The following drawings of Pump Station Number 4 are attached as **Annexure B**

- C1936 – PS4 – A100 - Site Plan Layout
- C1936 – PS4 – A101 - Sump Plan and Section Views
- C1936 – PS4 – A102 - Ground Floor Plan and Pump Room Details
- C1936 – PS4 – A103 - First Floor Plan
- C1936 – PS4 – A104 - Inlet Works Plan
- C1936 – PS4 – A105 - Roof Plan
- C1936 – PS4 – A106 - Sections – Pump Room & Sump
- C1936 – PS4 – A107 - Sections -Sump & Generator Room
- C1936 – PS4 – A108 - Sections -Inlet Works
- C1936 – PS4 – A109 - Sections -Skip Room
- C1936 – PS4 – A110 - Sections -Pump Room & Inlet Works
- C1936 – PS4 – A111 - Sections -Skip Room & Inlet Works
- C1936 – PS4 – A112 - Elevations
- C1936 – PS4 – A113 - Isometric Views

4.3 Rising Main

The planning and design of the wastewater transfer infrastructure are based on the following principles:

- The provision and installation of isolating, air, non-return and scour valves will be limited to essential locations as required for the efficient functioning of the system;
- Pipelines are to be routed such that it has minimal interference with other structures, parallel to the existing pipe;
- Pipelines to follow services corridor where possible and available;
- All valve assemblies are to be housed in reinforced concrete valve chambers – non-accessible by the public;
- Pipes are to be placed underground where possible.

4.3.1 Pipeline between Pumpstation 1 to Pumpstation 4

(a) Horizontal Alignment

The new rising main will start at PS1, and be installed adjacent to the existing pipeline. The existing pipeline runs in the Skimmelkrans Road reserve and is installed below ground level. The road is an average of 6m wide, and the final route will have to be assessed very carefully to minimise the impact on vehicle access to the beachfront and properties during construction. The stream crossing at Uitspanning Road will be done at the same position as the

existing pipe crossing, which is upstream from the roadway. The suspended section of pipe will be of 316L stainless steel and will be self-supporting.

The pipeline route will follow the alignment of the existing pipeline with an offset of 2m.

(b) Vertical Profile

The pipeline will follow Skimmelkrans Road between PS1 and PS4, accordingly, there are no significant vertical bends in the profile.

The route and indicative vertical profile of the pipeline route are shown in **Figure 4-15** below.

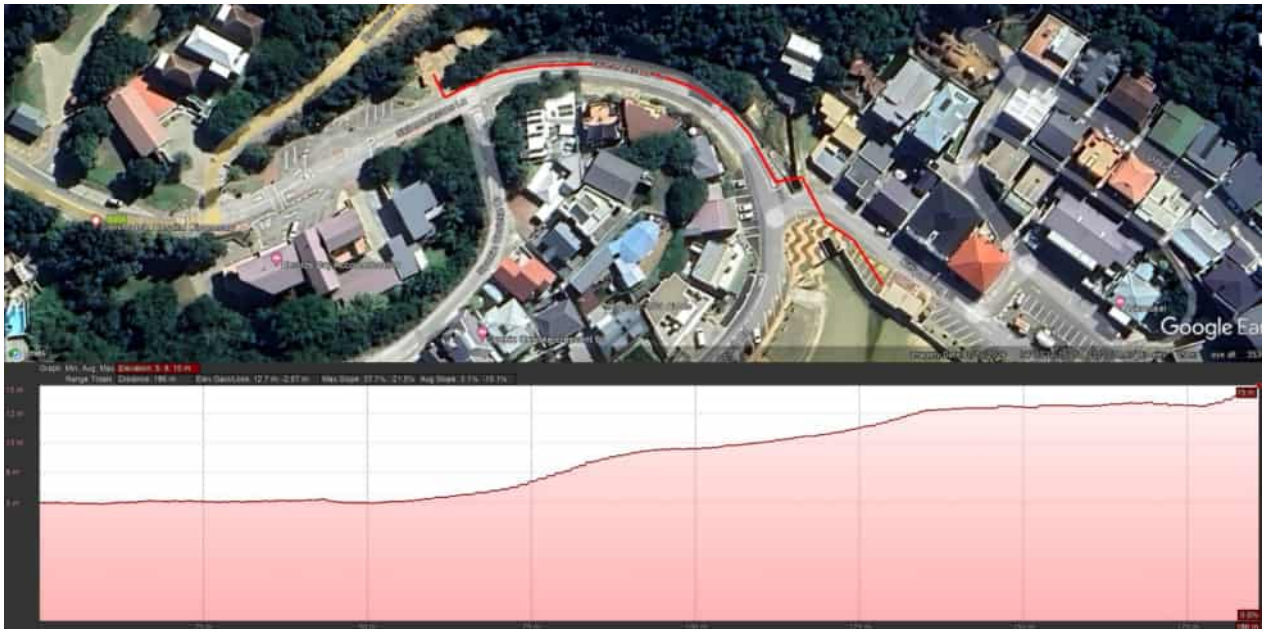

Figure 4-15 Route and vertical profile pipeline between PS1 and PS4

(c) Hydraulic Design

The pipeline will be designed to accommodate the ultimate flow of 32 L/s, however, the line will be evaluated against the interim design flow of 19 L/s.

The first-order friction head loss estimate was determined using the Hazen-Williams formula and associated coefficients.

For transient event estimates, the first-order pressure change estimate was made using Joukowsky's formula. Due to the low head, the short length of the pipeline, and the pipeline discharges into the atmosphere, no serious concerns were identified.

The provisional results have been provided below.

Table 4-4 - Pipeline between P1 and P4 - Provisional hydraulic results

Description	Result
Minimum internal diameter (mm)	200
Velocity @ 32L/s (m/s) (ultimate design)	1.36
Velocity @ 19L/s (m/s) (interim design)	0.9
Head loss @ 32L/s (m)	6.0
Head loss @ 19L/s (m)	2.4

Transient Event Estimate – Maximum (m)	<+-10
Pipe Class (PN)	10

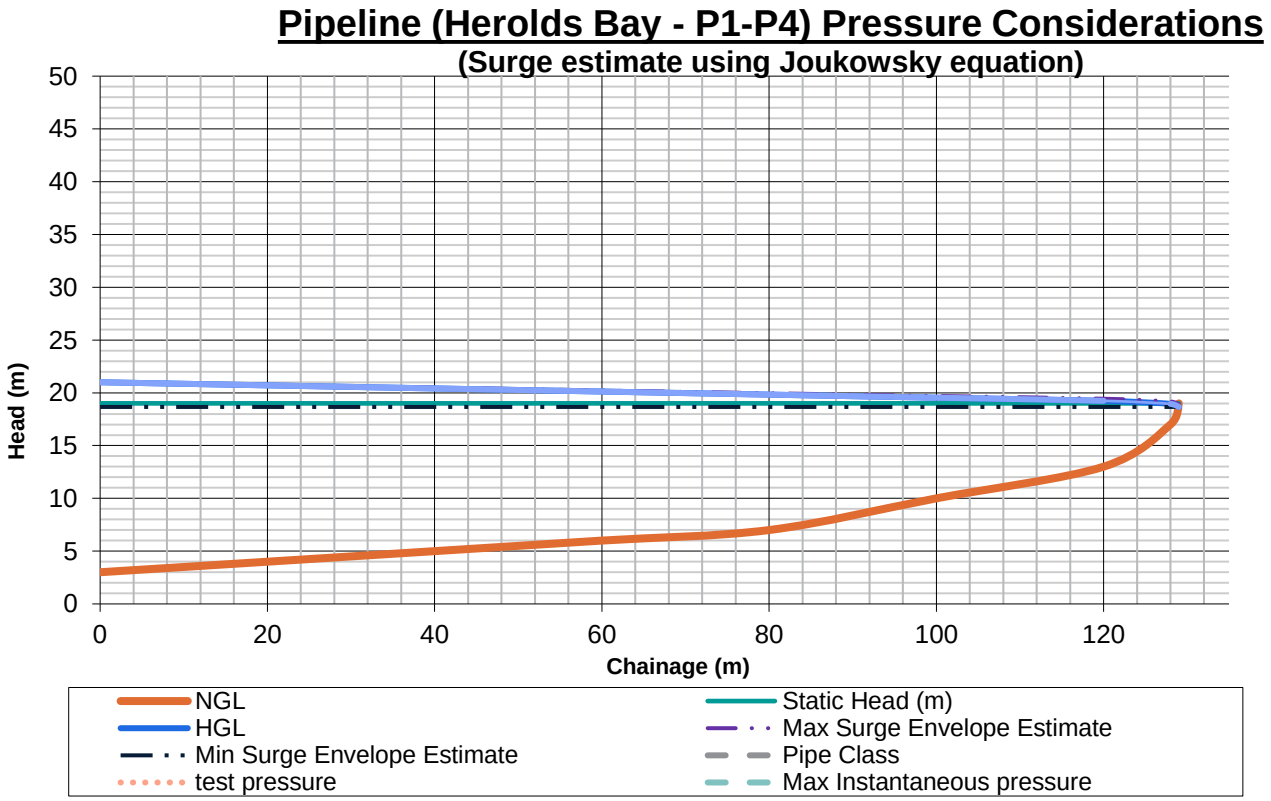

Figure 4-16 Pipeline between PS1 and PS4 - Preliminary hydraulic results @ 32L/s

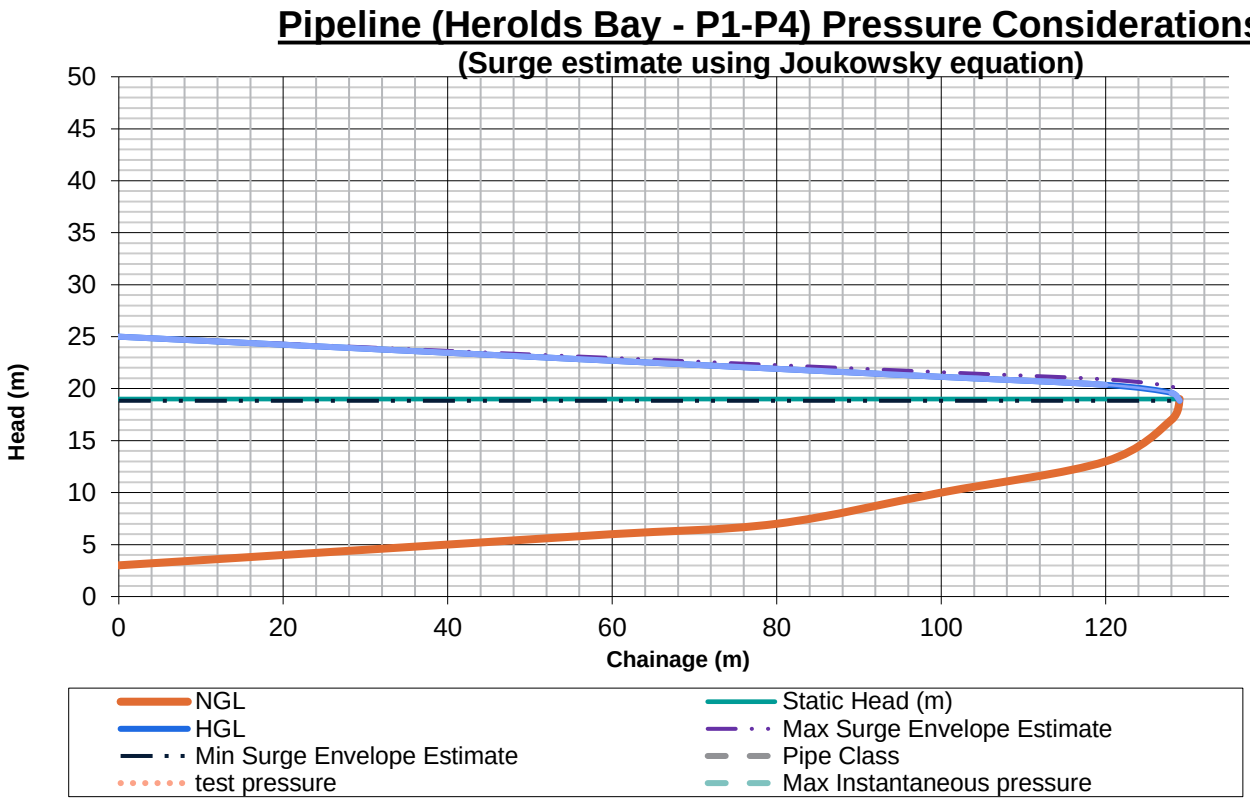

Figure 4-17 Pipeline between PS1 and PS4 - Preliminary hydraulic results @ 52L/s

Based on the assessment, the provisional pressure class of the pipeline is 10 bar (100m) for both flow scenarios.

(d) Implications of surge assessment

There are no critical concerns highlighted by the preliminary surge assessment on the pipeline between PS1 and PS4.

(e) Pipeline Material Selection

Placing the pipeline in the road reserve will require a directly buried pipeline at a minimum cover of 1m. Local deviations may be required to avoid existing services. The pipe material will be uPVC, class 10, with the exception of the stream crossing, which will be 316 SS, 5mm wall thickness.

4.3.2 Pipeline between PS4 and Herold's Bay WWTW

(a) Horizontal Alignment

The new pumping main will leave PS4 and follow Speckie Gerecke Drive up to the intersection of Gus Meyer Avenue (0-220m). From there, it will follow the existing pipeline and servitude up the ridge to the WWTW (220 m-1,470 m). The servitude will have to be expanded to accommodate the new pumping main.

Gus Meyer Road is approximately 5m wide with no sidewalks and provides access to the residential properties along the southern edge of the road and a steep slope on the northern side. This will require special attention during the detailed design and construction phases to ensure uninterrupted access to the properties, protect the existing pumping main, and have sufficient space to construct the new main.

(b) Vertical Profile

The pumping main will follow the road reserve for the first 200m. The slopes are moderate, but from here on, the route follows the existing servitude and pipeline. The route will cut through thick coastal shrubs and up a steep slope to the WWTW.

The pipeline route and first-order vertical profile have been provided in **Figure 4-18**, below.

Figure 4-18: Pipeline route and vertical profiles for the pipeline between PS4 to WWTW

(c) Servitude

Although the existing pipeline runs within the servitude, the width of the servitude is insufficient to accommodate the second pipeline. Accordingly, an additional servitude will have to be applied for. The extent of the additional servitude is 4m on the northern side of the existing servitude.

(d) Hydraulic Design

The pipeline will be designed to accommodate the ultimate flow of 52L/s.

The first-order Head loss was estimated using the Hazen-Williams formula for friction.

For transient events estimates, the first-order pressure change estimate was made using Joukowsky's formula. This assumes no impact from air valves or VSD drives and assumes a complete change in flow regime within 5 seconds.

The provisional results have been provided in **Table 4-5** below.

Table 4-5 Pipeline between PS4 and Oxidation Ponds - Provisional Hydraulic Results

Description	Results
Nominal diameter (mm)	350
Velocity @ 52L/s (m/s)	0.83
Head loss @ 52L/s: (m)	4.28
Transient Event estimated Maximum - (m)	+-70
Pipe Class (PN)	
0m to 200m	20
200m to 370m	16
370m to 1,470m	10

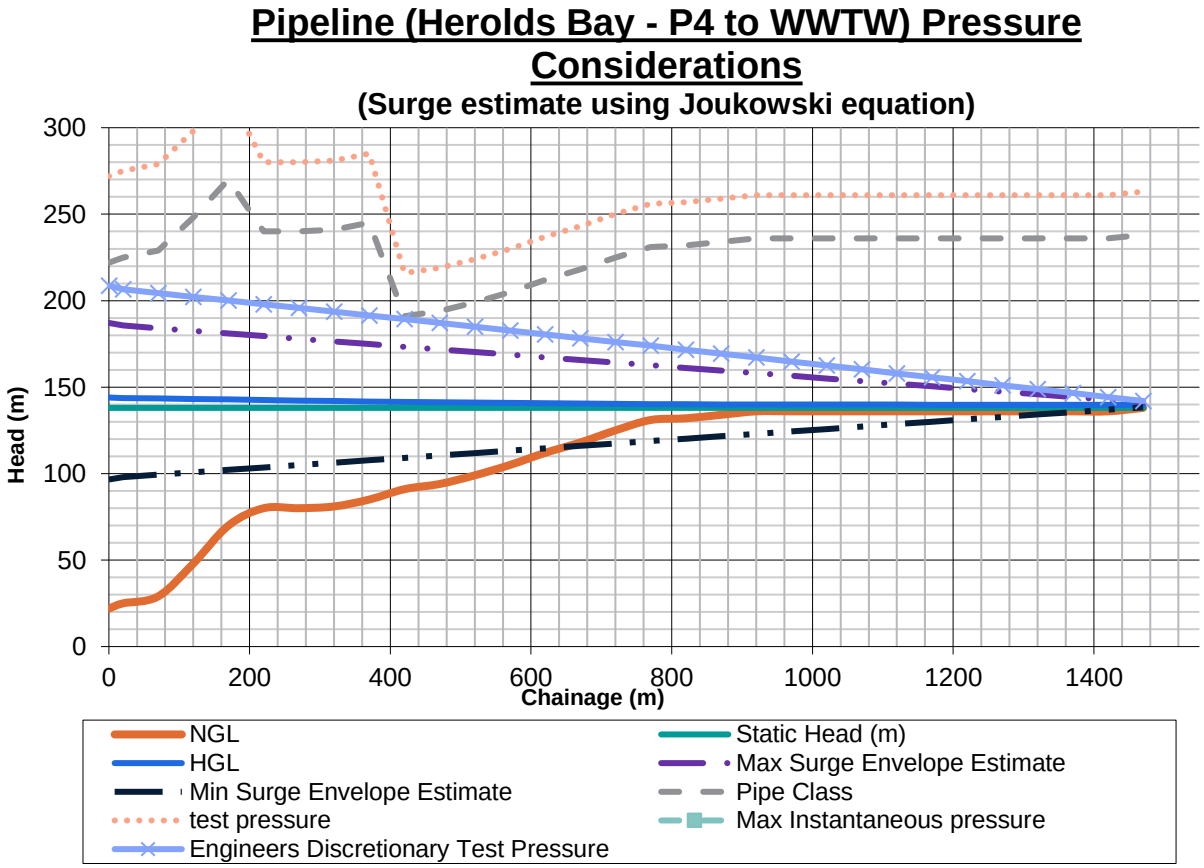

Figure 4-19 Pipeline between PS4 and WWTW- Preliminary hydraulic results @ 52L/s

(e) Implications of surge assessment

There are no critical concerns highlighted by the surge assessment on the positive pressure estimate on the pipeline. However, the lower pressure envelope indicates that during a transient event (surge), the water column may separate from chainage 200 to chainage 1,400. This will require the installation of dual functioning (vacuum and controlled air release valves), to prevent pipeline failure, and based on the current vertical alignment, two (2) sets will be required, the first at the high point between chainage 200 and 250 profile, and the second round chainage 800m.

(f) Pipeline Material Selection

The pipeline will be of uPVC class 16. All exposed pipework will be 316L stainless steel, as per GM preference.

(g) Site Clearance and Earthworks

The first 205 meters of the pipeline will be installed in the road reserve of Spekie Gerecke Drive. It will then run through coastal thicket and granite fynbos vegetation, requiring clearance. This latter section of the site is steep, with a maximum gradient of approximately 35%. A 10-meter-wide area will need to be cleared to allow for adequate working space during construction.

(h) Future Access to Pipeline

The disturbed area through the vegetation will be rehabilitated, and there will be no permanent vehicle access along the pipeline route. The only way to access the area will be via the existing jeep track from the WWTW to the cellular mast. The pipeline route is currently overgrown, and there is no access to the existing pipeline for maintenance. Therefore, the current access restrictions will remain unchanged.

4.3.3 Above-ground vs Below ground pipelines

(a) Above-ground pipelines

(i) Material selection

For above-ground pipelines, the typical design is either a pipe resting on the ground or placed on supports anchored on the ground. The former is typically used in the agricultural section for temporary installations and will not be considered here.

Rigid pipelines are typically used in these installations unless support trusses are added to allow the pipe segments to span from support to support. Rigid pipes would include thick-walled carbon steel, concrete and cast iron pipes.

(ii) Construction methodology

The pipeline is constructed by

- clearing the route of vegetation (if endangered plants are present, these are to be protected or removed and relocated).
- removing the topsoil from the support footing footprint and stockpile this to prevent contamination.
- excavate to footing founding level and dispose of at the approved site
- place precast pipe support / or cast in situ concrete plinths / pipe supports.
- deliver pipe segments to the site and install
- apply / install protection
- construct thrust blocks

(iii) Advantages:

- Less excavation required
- Marginally smaller footprint
- Possibly shorter construction period
- Easy visual inspection

- Easier pipe repair
- Possibly lower cost (if flanged steel pipes are used, the cost of the steel for the flanges may negate a significant portion of the saving in excavation)

(iv) Disadvantages:

- Only selected material can be used (typically steel pipes), due to the requirement to span from support to support. If thermos plastic pipes are used, additional supports are required
- Pipeline will be exposed to
    - the elements, including solar radiation, winds, rain and sea spray.
    - fire (during bushfire events)
    - increased likelihood of vandalism
- Permanent visual impact
- Create a permanent barrier
- Follows the natural ground level.
- Requires specialised movement joints
- Requires larger thrust blocks (does not use the in-situ soil as effectively)

(b) Below ground pipelines

Buried pipelines are where the pipes are buried below ground. This is the standard method for the construction of pipelines used in the public sector in South Africa.

(i) Material selection

There are numerous pipe materials available in South Africa. All of these can be buried.

Metal pipelines are typically used in high-temperature and higher-pressure systems. Most metal pipelines will require additional work to prevent corrosion, which includes coating, lining and possibly cathodic protection. This would be material-specific.

Thermo-plastic pipelines are typically used in low-pressure, low-temperature and highly corrosive liquids.

(ii) Construction methodology

The pipeline is constructed by

- clearing the route of vegetation (if endangered plants are present, these are to be protected or removed and relocated).
- removing the topsoil removed and stockpile to prevent contamination.
- Excavating a trench to the required depth. The excavation can be either, all or a combination of the following, hand excavation, back-actor, track excavator, rock fracturing, or blasting.
- The material removed from the trench, which cannot be used in the construction will then be removed from the site and used of elsewhere or disposed of at authorised site. The suitable material to backfill the trench will be stockpiled on site, to backfill the trench,
- A layer of bedding sand will be placed and compacted in the bottom of the trench.
- The pipe segments will be installed onto the sand.
- The pipe will then be covered with some more bedding material (sand) and compacted. This layer is to protect the pipe.
- The trench will then be backfilled and compacted in layers.

(iii) Advantages:

- All pipe material can be used for material selection.
- Vertical alignment can be levelled to reduce the number of high points to minimise the number of air valves / scour valves and associated chambers required.
- Bedding can assist with structural integrity and stability of the final structure.
- Well-known construction methodology.
- Infrastructure protected from:
    - elements (rain, solar radiation, heat, wind and sea spay)
    - fires

- Low permanent visual impact
- Does not cause permanent obstruction to animal or human movement.
- Less prone to vandalism

(iv) Disadvantages:

- Larger construction footprint (trench excavation, material storage, and working space)
- More costly to:
  - perform leak detection
  - repair leaks
- May be more costly due to the larger volume of excavation, and increased risk of hard rock excavation which may require blasting.
- If carbon steel pipes are used as material, cathodic protection will be required.
- reinforced concrete thrust blocks are required (the number may be reduced if a continuously welded pipe is used)

4.3.4 Pipework and Fittings

The following specifications shall apply to pipes and fittings:

SANS 719:	Electric welded carbon steel pipes for aqueous fluids – large bore for pipelines and fittings exceeding 150 mm in diameter
SANS 1123:	Pipe flanges
SANS 664:	Cast iron gate valves for waterworks
BS5155:	Butterfly valves
SANS 16422:	Pipes and joints made of oriented unplasticized polyvinyl chloride (PVCO) for the conveyance of water under pressure.

4.3.5 Thrust Blocks

The purpose of the thrust block is to support the bend and stop the pipe joints from being pulled apart causing a joint failure. The thrust block is part of the design to safely transit the unbalanced thrust forces to the undisturbed soil. As mentioned above, no thrust blocks will be designed for changes in the vertical profile due to changes in the direction being smaller than 10 degrees, but several thrust blocks are needed to support the pipe along with changes in the horizontal alignment of the new pipe and on the vertical steep alignment.

The internal pressure of the pipe acts perpendicular to any plane with a force equal to the pressure, P, times the area of the pipe (using the internal pipe diameter). The thrust block design is based on the SANS 2001-DP2:2010 manual for medium-pressure pipelines.

The shape of the thrust block is designed as a trapezium with a height that is adequate to ensure the area required to withstand the thrust forces with a minimum thickness of 100mm around the pipe.

The concrete of the thrust blocks is Class 25/19 for all Bends and Tees.

4.3.6 Valves, Fittings and Specials

(a) Valve Chambers and Ancillary Equipment

The following design approach was followed for the various components:

- Reinforced concrete valve chambers;
- Steel pipework to SANS 719, Grade B – painted epoxy lined; high build polyurethane coated; and
- All valves and fittings shall be internally and externally coated with fusion-bonded epoxy.

(b) Isolating Valves

The flanges shall be double-flanged with Ductile Iron bodies and stainless steel trim and shall conform with all relevant sections of SANS 664 or BS 5163, specifications, and subsequent amendments. The flanges shall be drilled to BS4504 or SANS 1123 for 16 bar working pressure as specified and compatible with pipework flanges.

Gate valves shall be of the RSV gate type, VOSA, Premier, or similar approved. Valves shall be Class 16, clockwise closing and shall have non-rising spindles of high-quality high tensile manganese bronze. The direction of closing shall be cast into the handwheel (where specified) or valve casing with the words "OPEN" and "CLOSE" respectively. The gate shall be guided within the body of the valve to fit accurately onto the seat and to avoid possible buckling. Where extended spindles are required, they shall be suitably supported to prevent swaying and buckling and to guarantee the intended use of the valve. All gate valves shall be drop-tight when tested in accordance with the requirements of BS 5163.

All valves shall be capable of being operated manually with a maximum applied torque of 100Nm.

Valves shall be grit blast cleaned to S15 standard and a solvent-free sintered epoxy powder applied in one coat by the use of arc-spray machines to provide a dry film thickness of not less than 450 microns.

The isolating valves for the air valve shall be supplied with a cast iron hand wheel. All other valves shall be provided with a cap top for use with a valve key.

(c) Air Valve

Air valves are to be positioned at key points in the pipeline, on equal tee pieces, and will be dual-functioning valves suitable for use in sewage applications. Minimum nominal diameter 100mm with isolating valve to facilitate easy replacement.

4.3.7 Rising Main Drawings

The following drawings of Rising mains pipelines are attached as **Annexure C.**

- C1936 – 520 – 001 - Plan and Profile – PS1 to PS4
- C1936 – 520 – 002 - Plan and Profile – PS4 to WWTW (CH0 – 300)
- C1936 – 520 – 003 - Plan and Profile – PS4 to WWTW (CH300 – 600)
- C1936 – 520 – 004 - Plan and Profile – PS4 to WWTW (CH600 – 900)
- C1936 – 520 – 005 - Plan and Profile – PS4 to WWTW (CH900 – End)

4.3.8 WWTW Inlet Works

Alterations are needed at the inlet structure to accommodate the new raising main pipeline.

4.4 Bulk Electrical

This section refers to specifically MV supply requirements for PS4, because of the new pump station.

Due to the intended upgrade of Skimmelkrans minisub, a final and updated site load study and capacity assessment will need to be performed by the GM's Electrical Department. A preliminary study was performed as part of the previous phase, confirming that although sufficient capacity exists for the intended upgrade, an additional section of the upstream MV network must be upgraded. This entails a section of MV cable upgrade, to be further clarified during the detailed design stage.

The final position of this new miniature substation will need to be coordinated and clarified with all affected parties involved. It is envisaged that the new minisub be located as close as possible to the new pump station number 4, and the existing miniature substation position. This would assist with the relocation and extension of both existing MV and LV cables.

5 Conclusion

This report is currently in draft format and will be further developed during the project's design development. The information in this report represents the full scope of the works and includes all the elements required to complete the project.

Annexure A PS 1 Drawings

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

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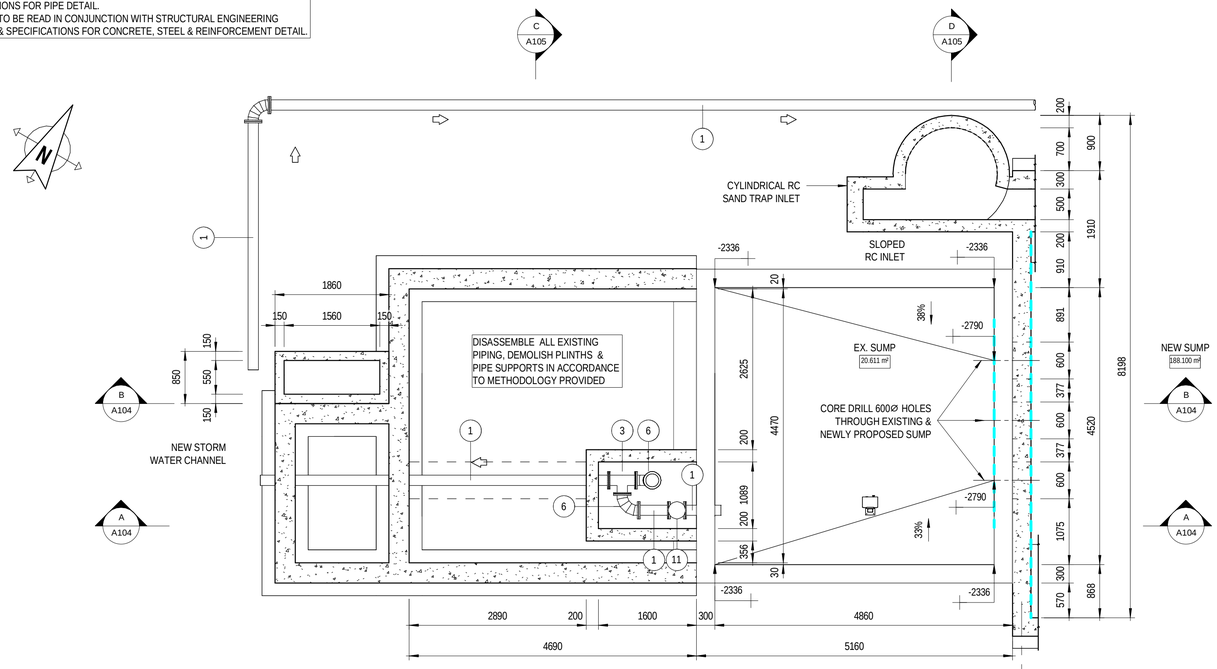

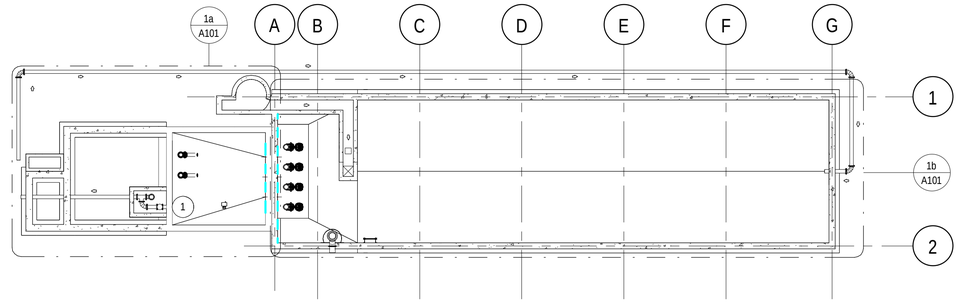

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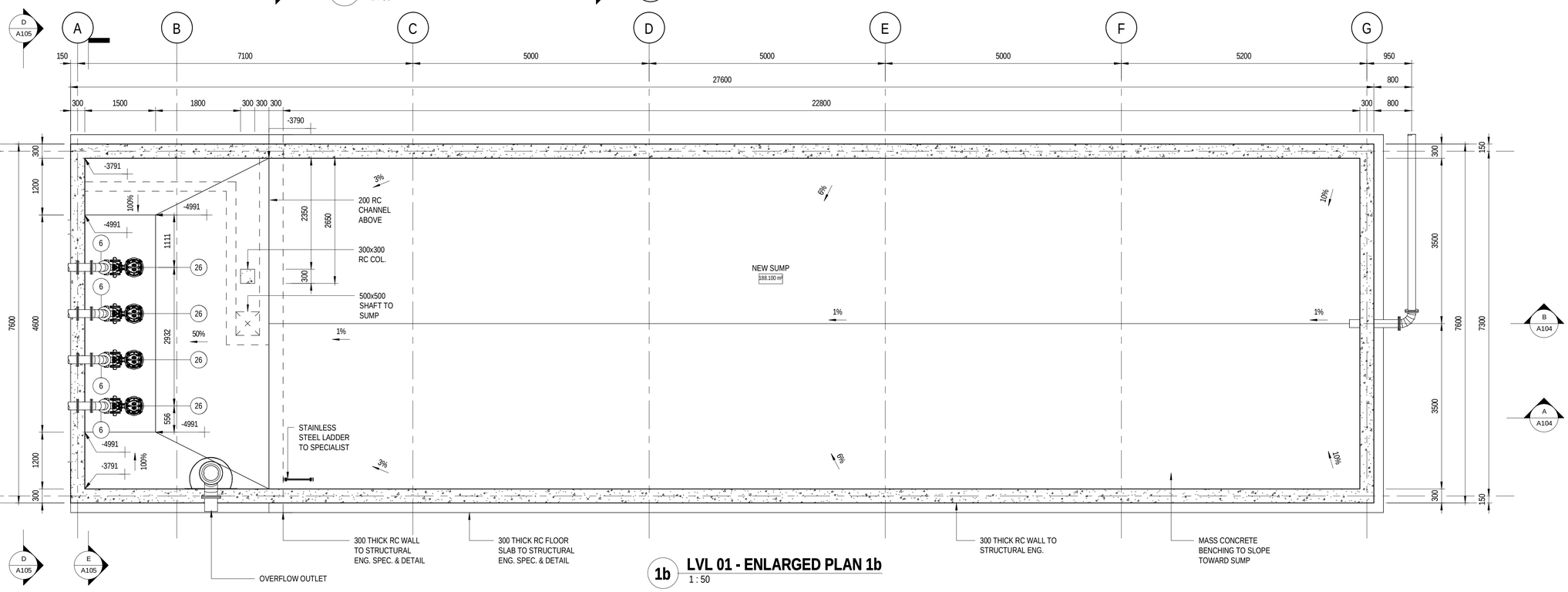

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DRAFTER	G. MAREDI
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DESIGNER	S. FAUSTINO
DESIGN CHECK	G. WHALLEY
PROJECT MANAGER	T.CRONJE
PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
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DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

CLIENT
GEORGE THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
PUMPSTATION 1 ADDITIONS & ALTERATIONS - LVL 01 PLAN SECTIONS

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
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- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

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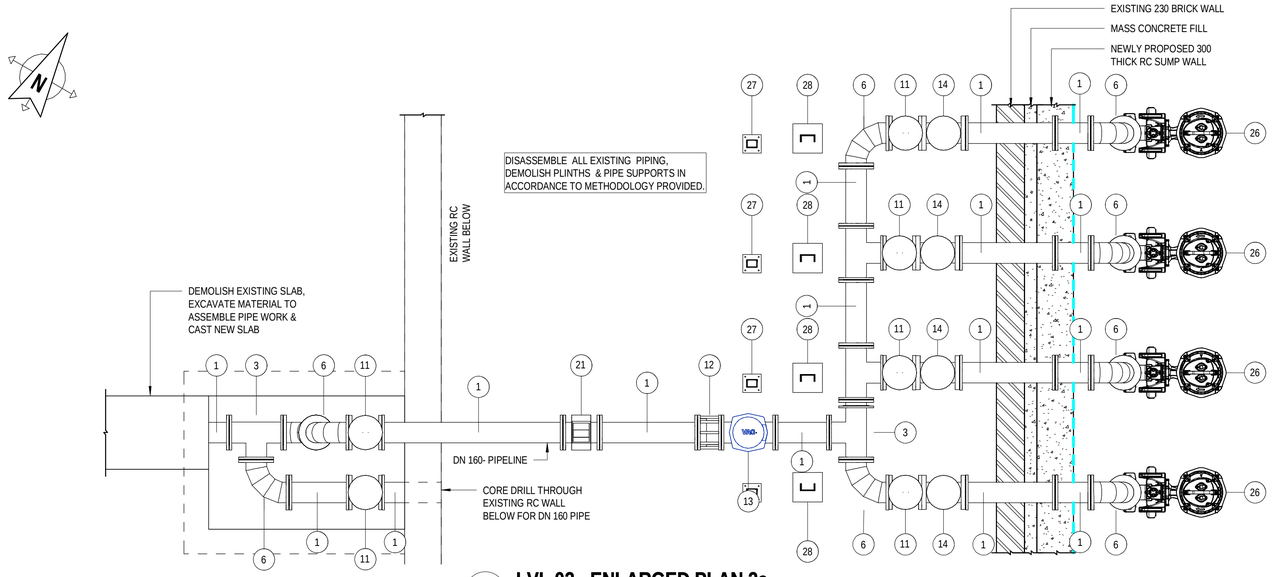

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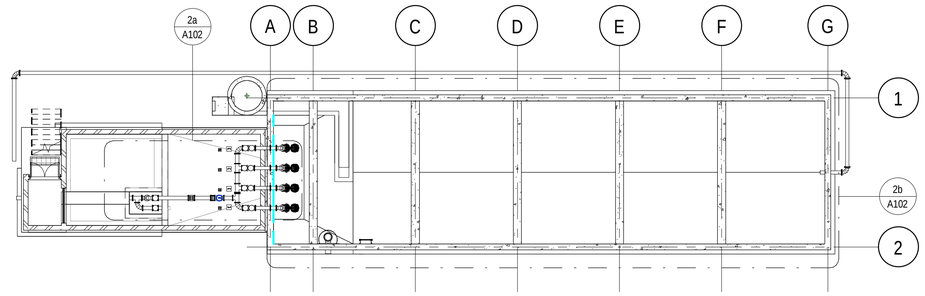

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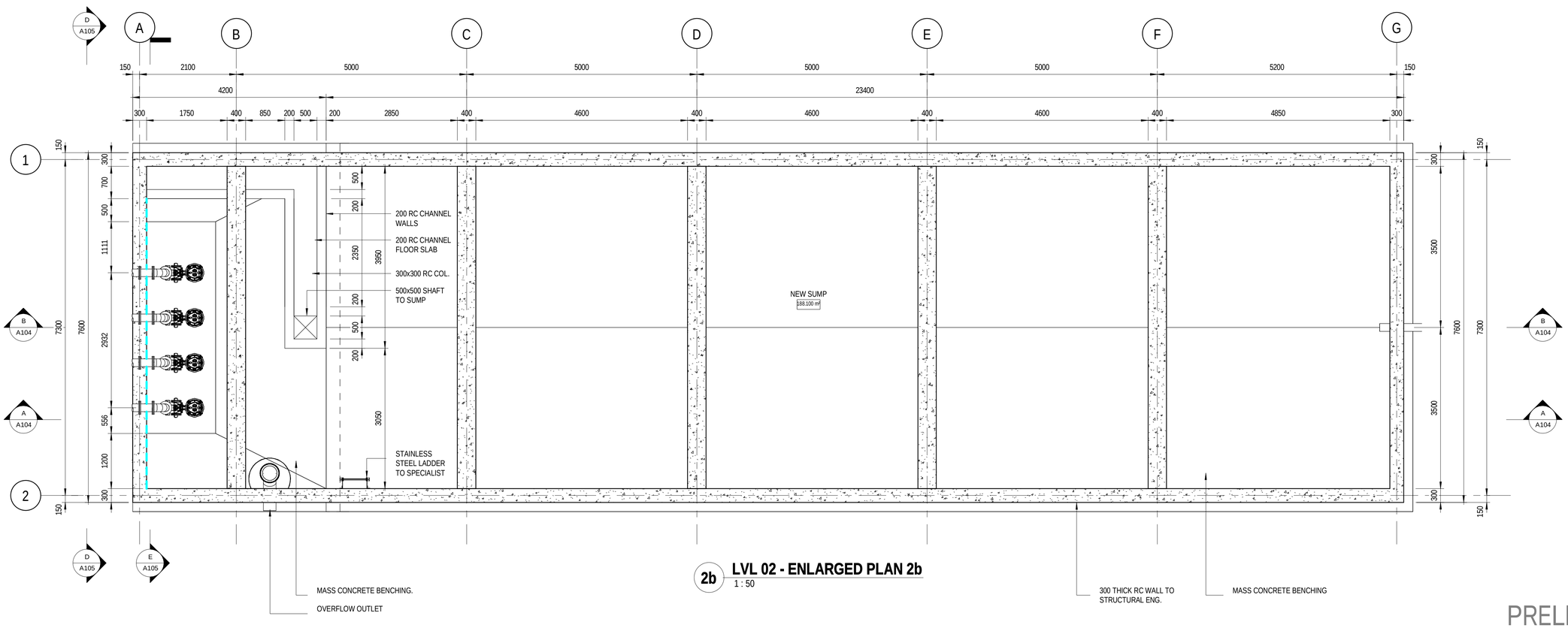

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DESIGN CHECK	G. WHALLEY
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PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
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DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

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GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
PUMPSTATION 1 ADDITIONS & ALTERATIONS - LEVEL 02
PLAN SECTIONS

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
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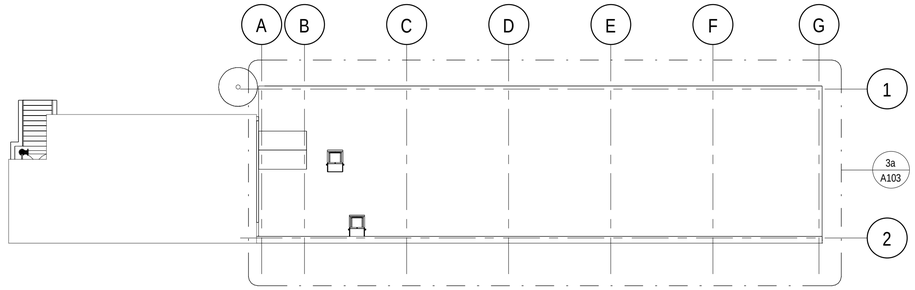

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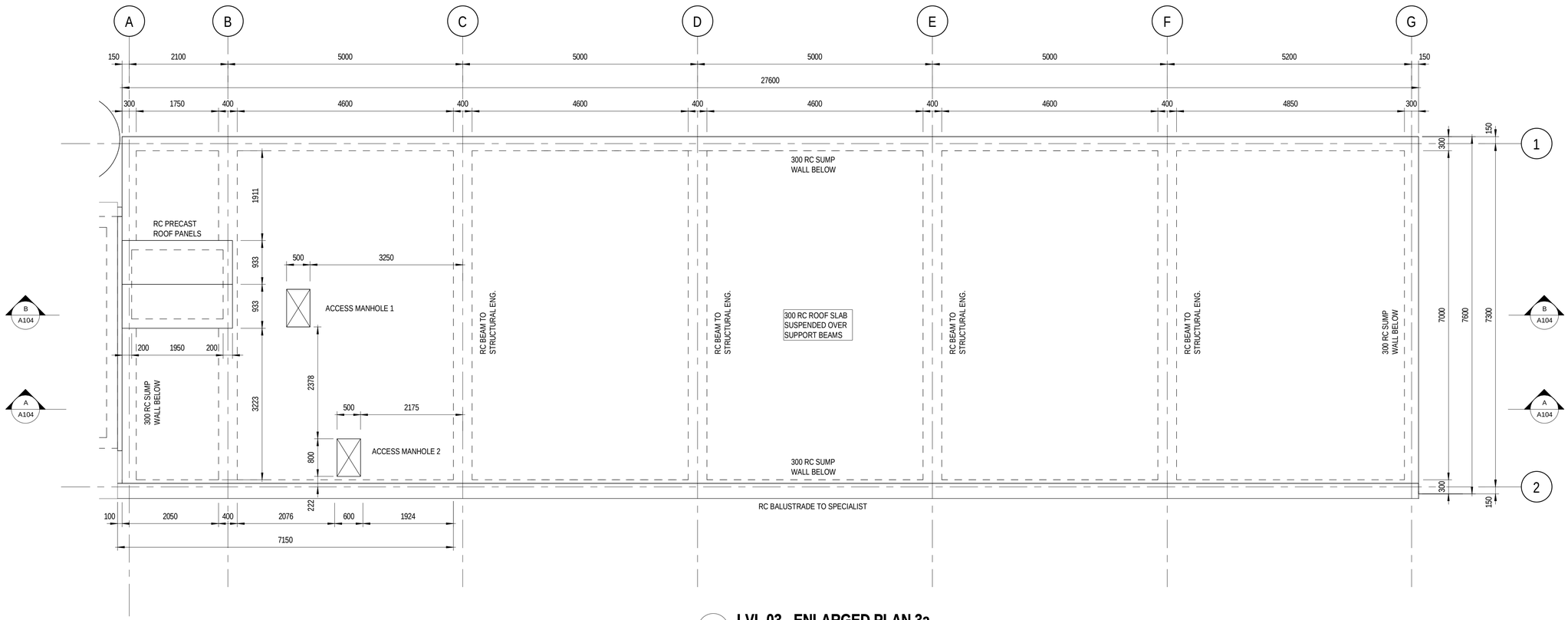

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TITLE	NAME
DRAFTER	G. MAREDI
DRAFTING CHECK	G. WHALLEY
DESIGNER	S. FAUSTINO
DESIGN CHECK	G. WHALLEY
PROJECT MANAGER	T.CRONJE
PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
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SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

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THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
PUMPSTATION 1 ADDITIONS & ALTERATIONS - LEVEL 03
PLAN SECTION

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- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

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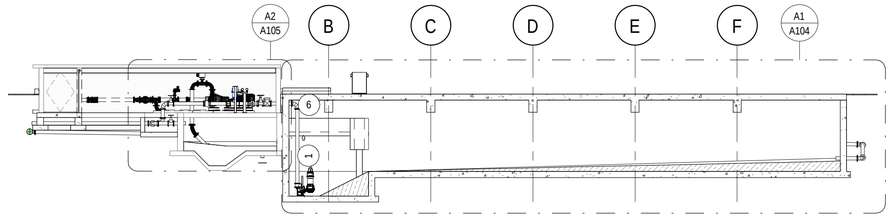

A KEY SECTION A-A & B-B
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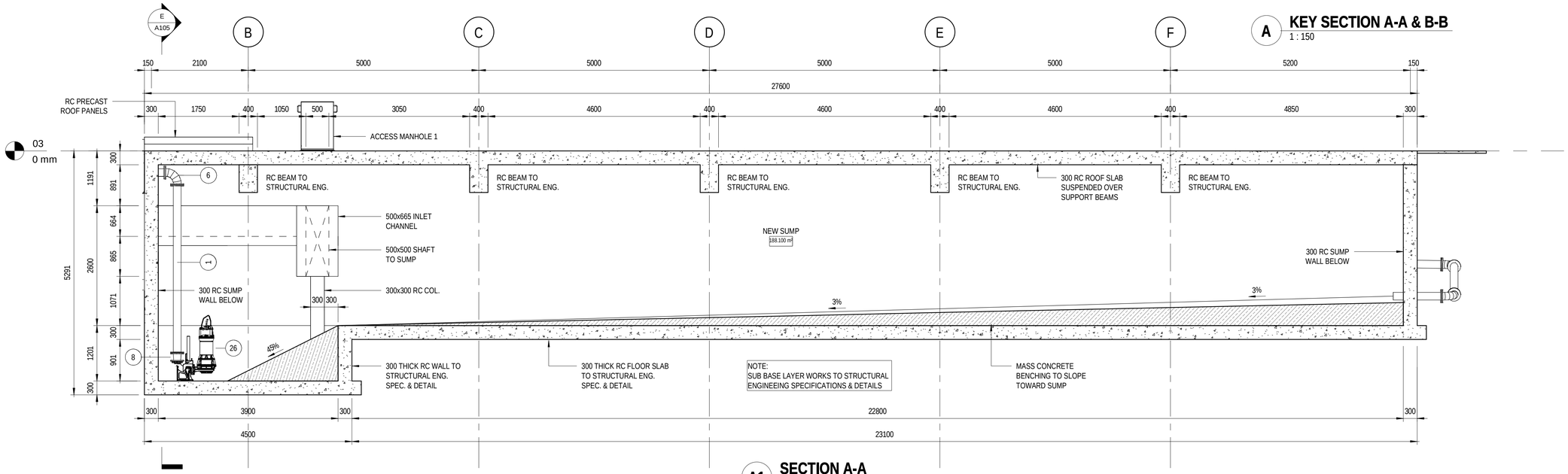

A1 SECTION A-A
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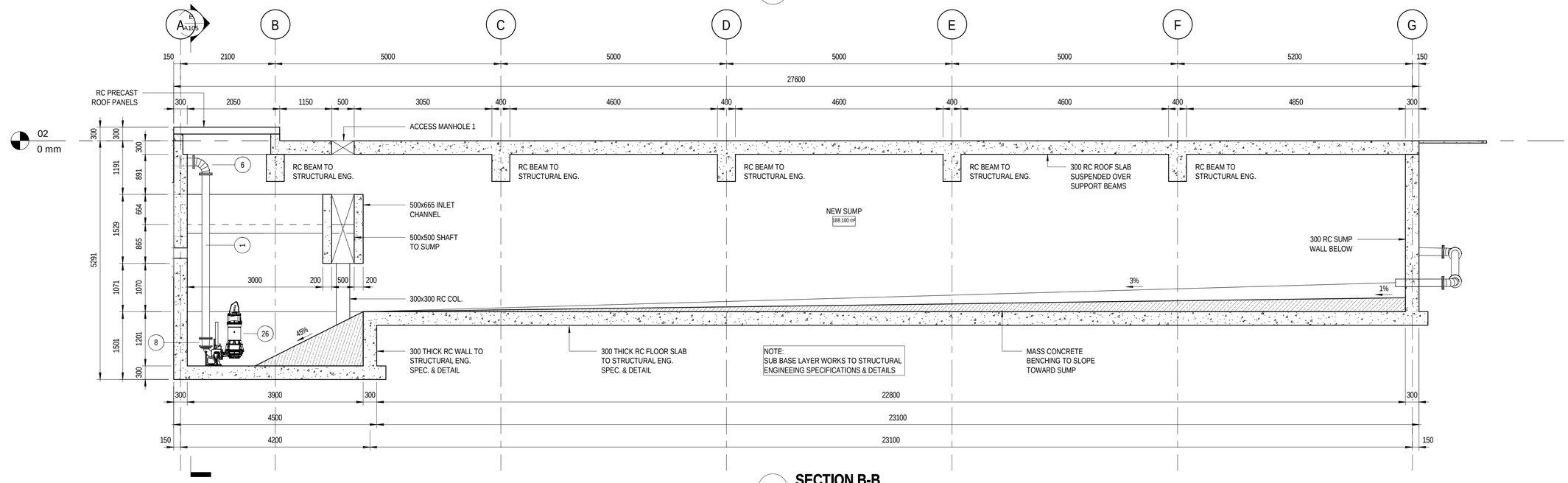

B SECTION B-B
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PRELIMINARY

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL
A1

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL
2			-	-
1			-	-
			-	-

TITLE	NAME
DRAFTER	G. MAREDI
DRAFTING CHECK	G. WHALLEY
DESIGNER	S. FAUSTINO
DESIGN CHECK	G. WHALLEY
PROJECT MANAGER	T.CRONJE
PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

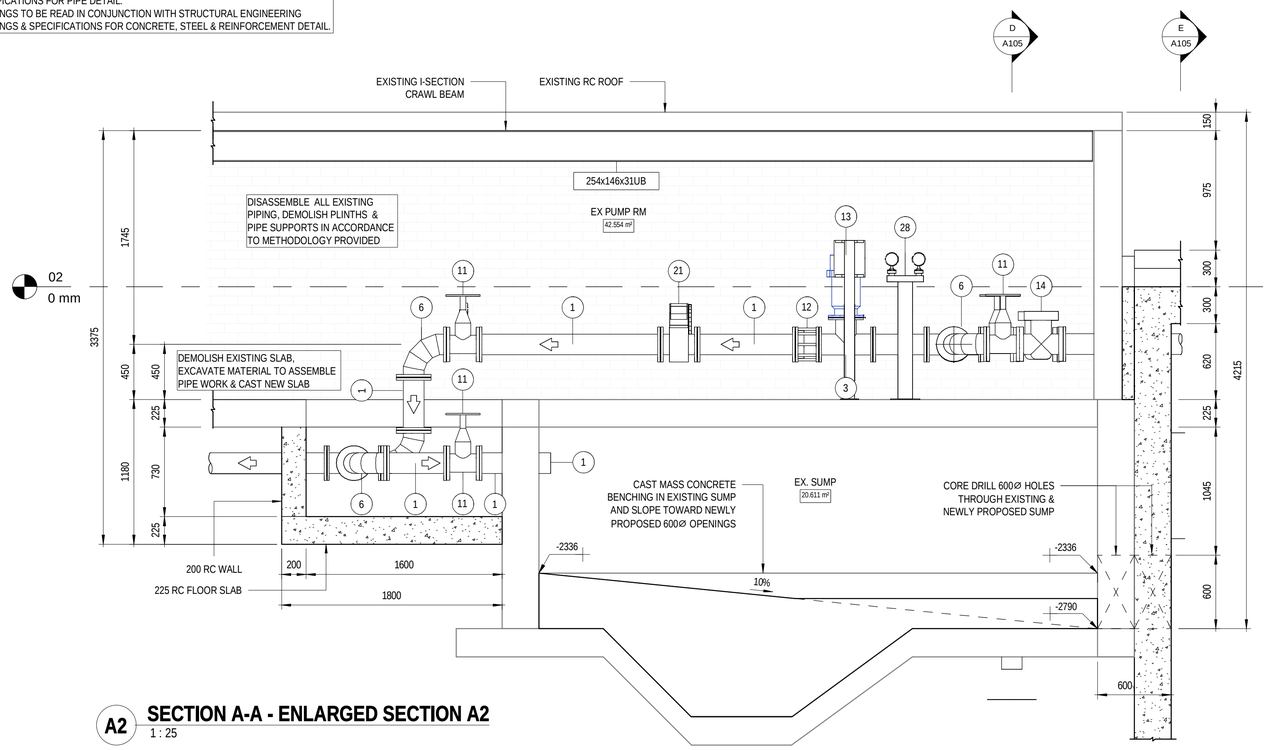
DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

CLIENT
GEORGE
THE CITY FOR ALL REASONS

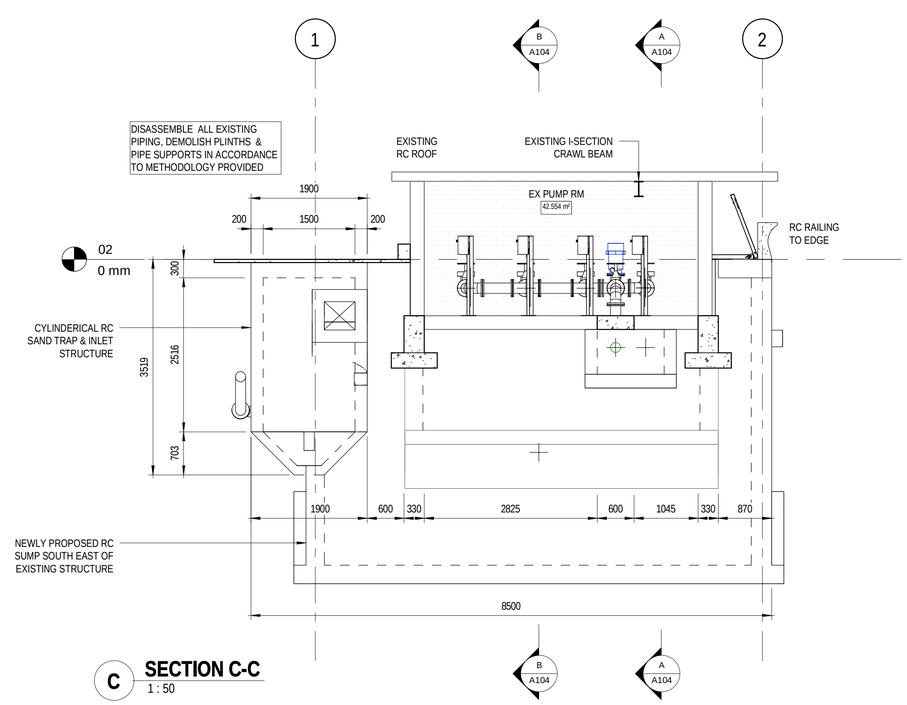
GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
PUMPSTATION 1 ADDITIONS & ALTERATIONS - SECTIONS A-A & B-B

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A104	

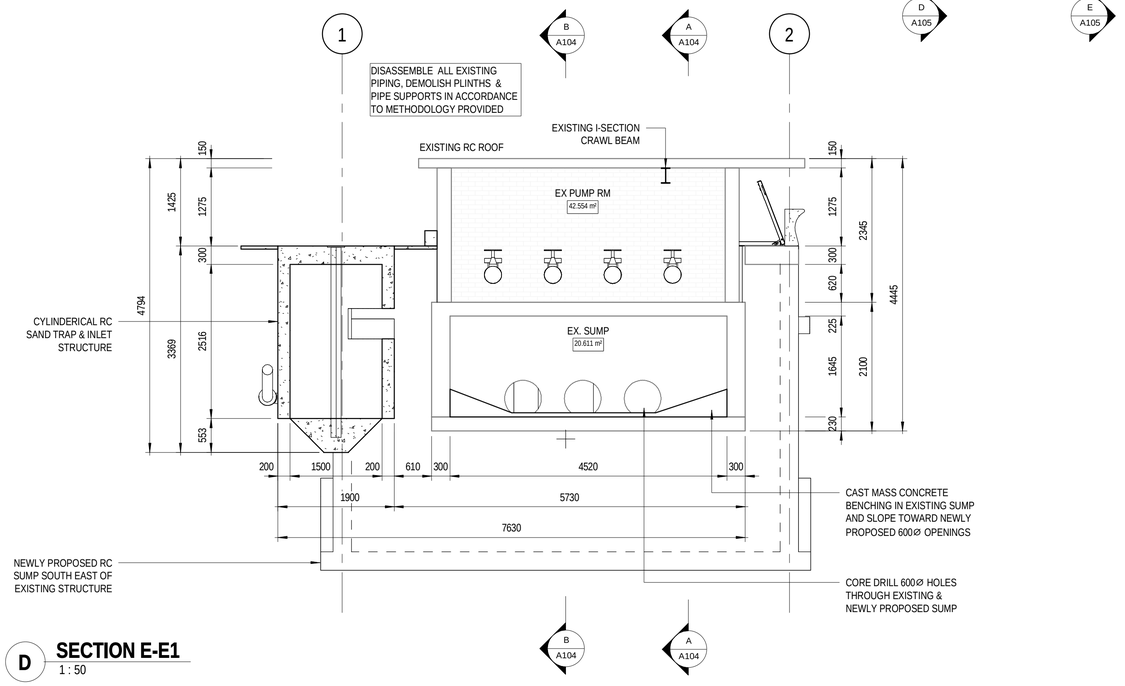
NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.



A2 SECTION A-A - ENLARGED SECTION A2
1 : 25



C SECTION C-C
1 : 50



D SECTION E-E1
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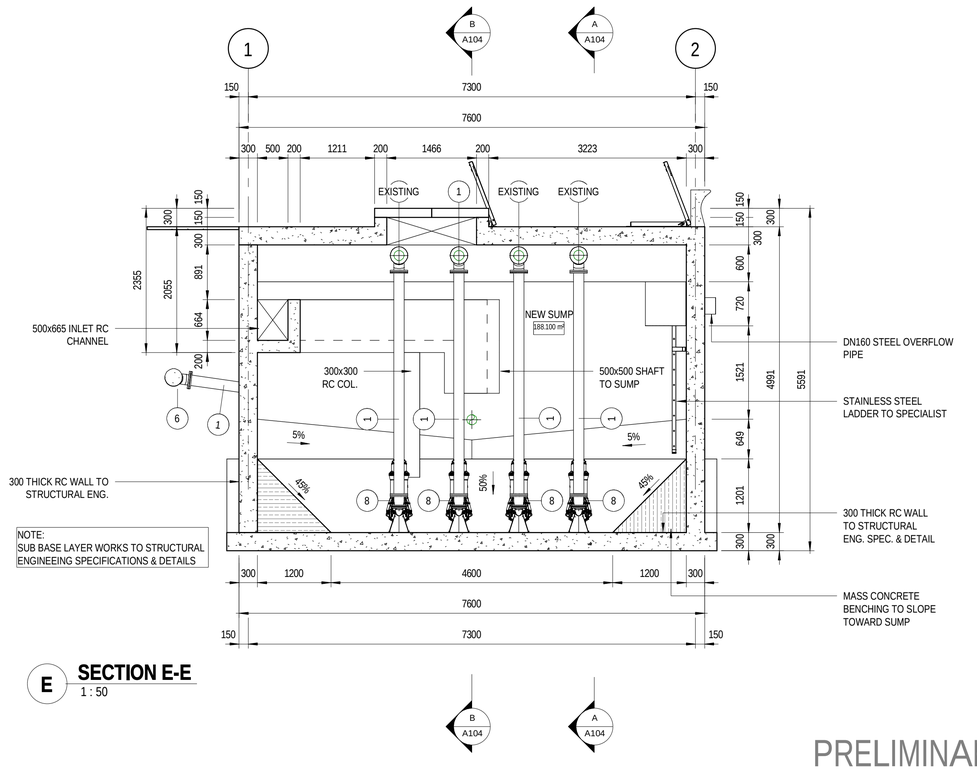

E SECTION E-E
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PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL
			-	-
			-	-
			-	-
2				
1				

TITLE	NAME
DRAFTER	G. MAREDI
DRAFTING CHECK	G. WHALLEY
DESIGNER	S. FAUSTINO
DESIGN CHECK	G. WHALLEY
PROJECT MANAGER	T.CRONJE
PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1
SCALE 1:50
SCALE 1:100

DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

CLIENT
GEORGE THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
PUMPSTATION 1 ADDITIONS & ALTERATIONS - SECTIONS C-C, D-D & E-E

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A105	

PLOT DATE TIME 2024/07/19 15:21:03
DRAWING FILE LOCATION / NAME
150 mm ON ORIGINAL
A1

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

PLOT DATE TIME
2024/07/19 15:21:14

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL
A1

TABLE 3 - PIPE ACCESSORY SCHEDULE

Mark	Description	Count	Diameter (NB)	Lining	Material	Coating	Color	Pressure Class 1
11	GATE VALE	6	<varies>	EPOXY	STAINLESS STEEL	EPOXY	BLUE	<varies>
12	DISMANTLING JOINTS	1	150	EPOXY	STAINLESS STEEL	EPOXY	BLUE	PN12
14	CHECK VALVE	5	150	EPOXY	STAINLESS STEEL	EPOXY	BLUE	PN12
21	FLOW METER	1	150	EPOXY	STAINLESS STEEL	EPOXY	BLUE	PN12
EXISTING	AIR RELEASE VALVE TO BE DISASSEMBLED FROM EXISTING ASSEMBLY	1	150	EPOXY	STAINLESS STEEL	EPOXY	BLUE	PN12
EXISTING	GATE VALE TO BE DISASSEMBLED FROM EXISTING ASSEMBLY	2	150	EPOXY	STAINLESS STEEL	<varies>	BLUE	PN12
EXISTING	NON RETURN VALVE TO BE DISASSEMBLED FROM EXISTING ASSEMBLY	1	150	EPOXY	STAINLESS STEEL	EPOXY	BLUE	PN12

Grand total: 17

TABLE 4 - MECHANICAL EQUIPMENT SCHEDULE

Mark	Description	Count
26	SUBMERSIBLE PUMP	4

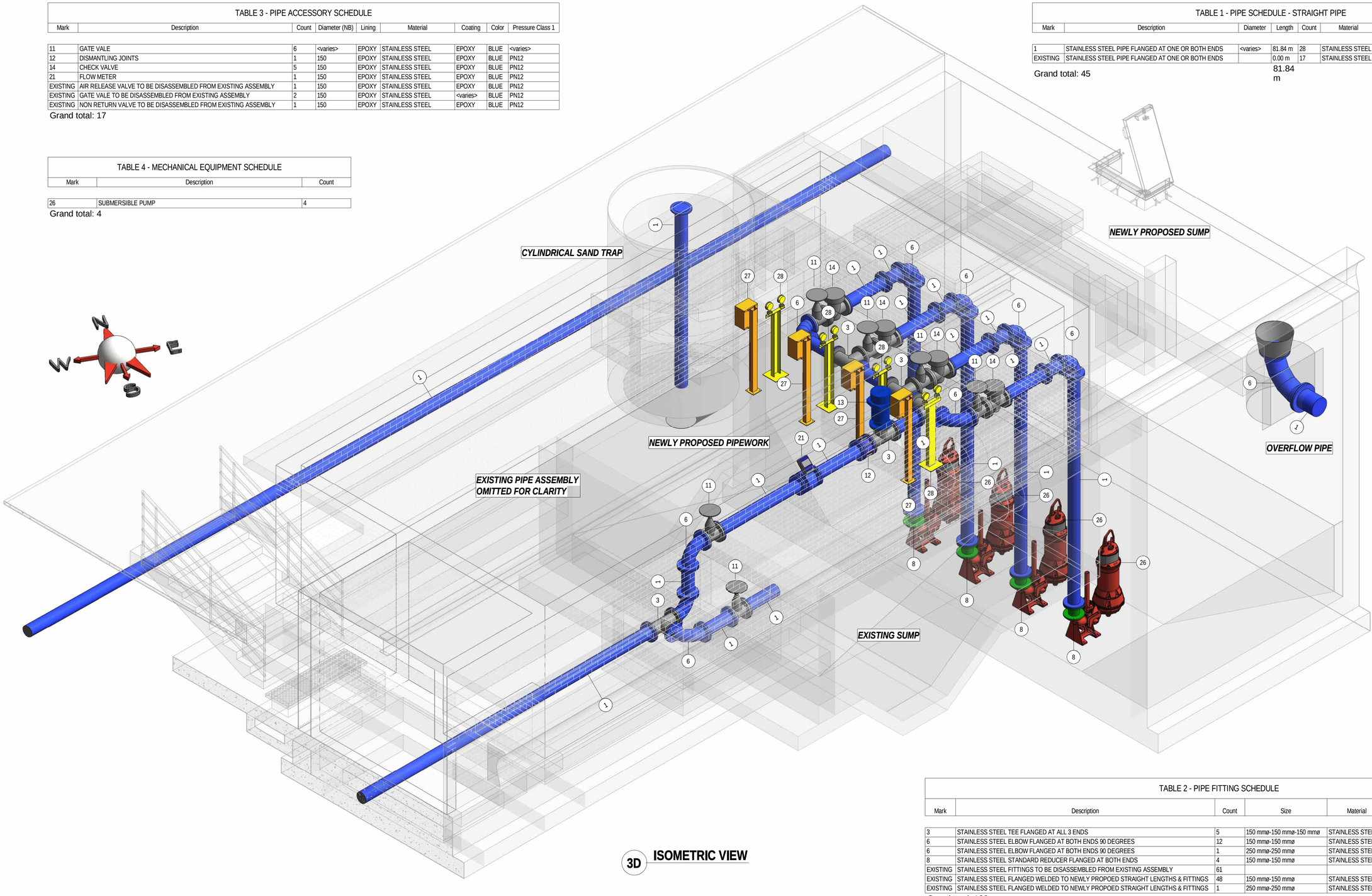
Grand total: 4

TABLE 1 - PIPE SCHEDULE - STRAIGHT PIPE

Mark	Description	Diameter	Length	Count	Material	Lining	Coating	Color	Pressure Class 1
1	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	<varies>	81.84 m	28	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
EXISTING	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS		0.00 m	17	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12

Grand total: 45

81.84 m



3D ISOMETRIC VIEW

TABLE 2 - PIPE FITTING SCHEDULE

Mark	Description	Count	Size	Material	Lining	Coating	Color	Pressure Class 1
3	STAINLESS STEEL TEE FLANGED AT ALL 3 ENDS	5	150 mmø-150 mmø-150 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
6	STAINLESS STEEL ELBOW FLANGED AT BOTH ENDS 90 DEGREES	12	150 mmø-150 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
6	STAINLESS STEEL ELBOW FLANGED AT BOTH ENDS 90 DEGREES	1	250 mmø-250 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
8	STAINLESS STEEL STANDARD REDUCER FLANGED AT BOTH ENDS	4	150 mmø-150 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
EXISTING	STAINLESS STEEL FITTINGS TO BE DISASSEMBLED FROM EXISTING ASSEMBLY	61						
EXISTING	STAINLESS STEEL FLANGED WELDED TO NEWLY PROPOED STRAIGHT LENGTHS & FITTINGS	48	150 mmø-150 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
EXISTING	STAINLESS STEEL FLANGED WELDED TO NEWLY PROPOED STRAIGHT LENGTHS & FITTINGS	1	250 mmø-250 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12

Grand total: 132

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED

ENGINEER: .....

PR ENG NR: .....

SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING

SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05

SCALE 1:50 — 0.5 0 1 2

SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER

SMEC South Africa
Member of the Surbana Jurong Group

SABS ISO 9001

CLIENT

GEORGE
THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY

HEROLD'S BAY PUMP STATION

PUMPSTATION 1 ADDITIONS & ALTERATIONS - ISOMETRIC VIEW

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A106	

Annexure B PS 4 Drawings

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

NOTE:
1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE ANY WORK IS PUT IN HAND. REFER ANY DISCREPANCIES TO THE ENGINEER.

NEWLY PROPOSED SITE BOUNDARY COORDINATES		
POINT	X COORDINATES	Y COORDINATES
A	-56214.0864	-3769681.4297
B	-56206.9553	-3769693.9078
C	-56197.2560	-3769690.3610
D	-56183.8550	-3769683.4060
E	-56183.9561	-3769680.7640
F	-56185.7544	-3769677.6174
G	-56181.4561	-3769675.1057
H	-56187.1353	-3769665.0095

PLOT DATE TIME
2024/08/12 09:58:50

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL
A1

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
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SABS ISO 9001

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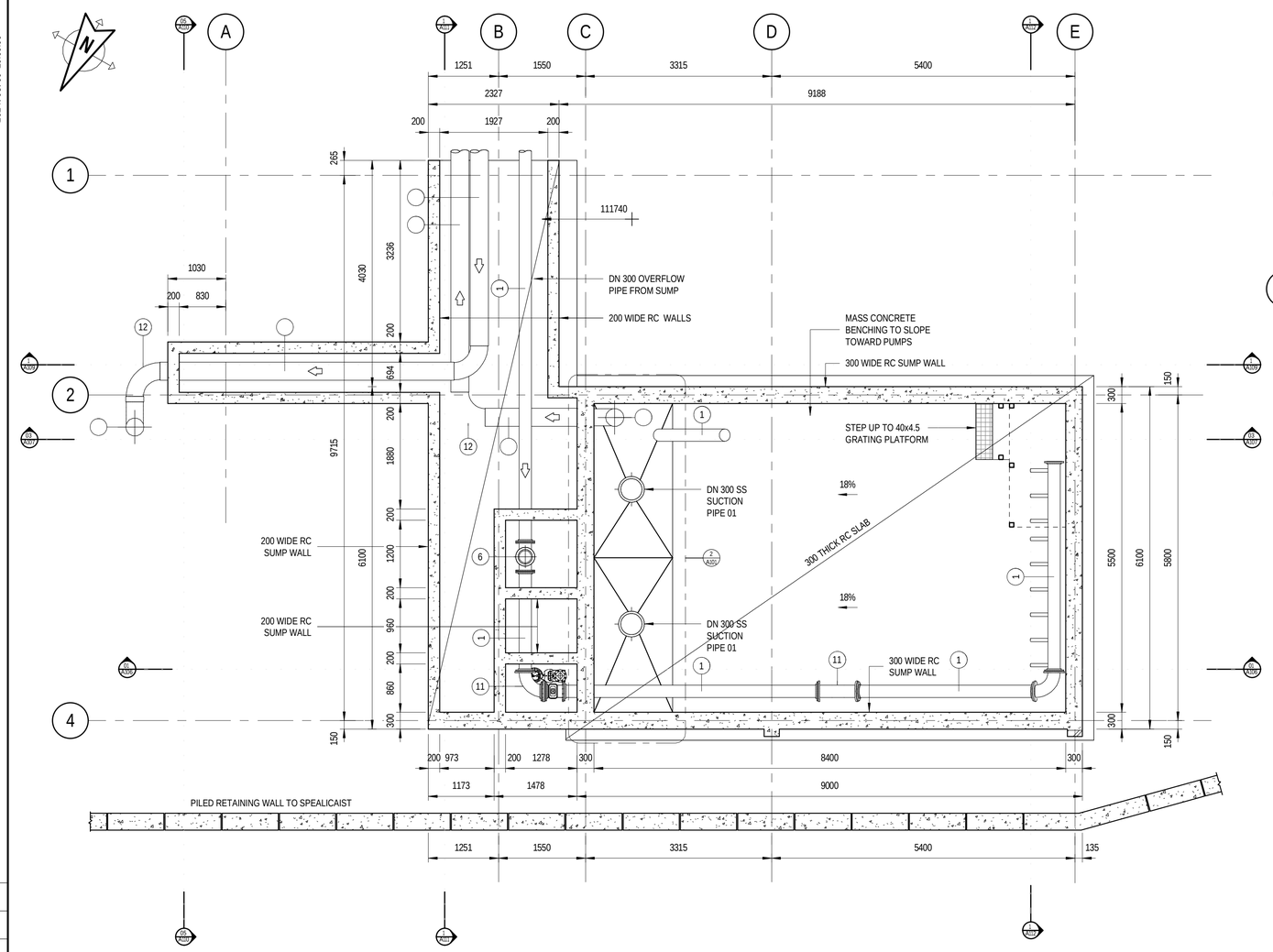
GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
NEW PUMP STATION 4 SITE PLAN LAYOUT

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A100	

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

PLOT DATE TIME
2024/08/09 20:00:06



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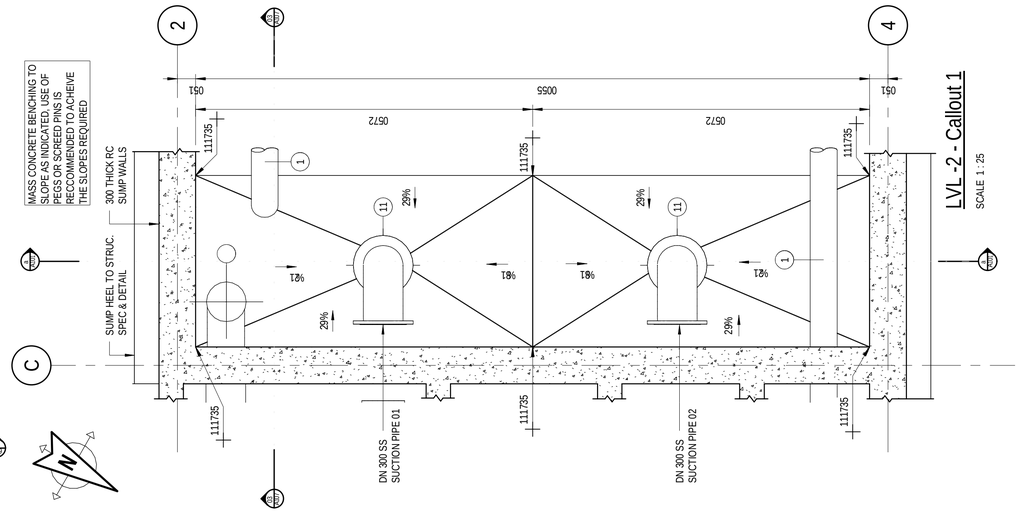

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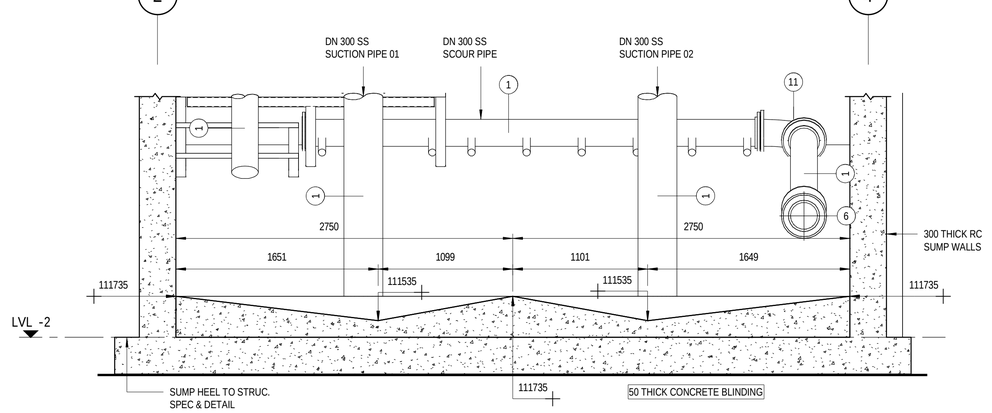
SCALE 1 : 25



LVL-2 SECTION a-a
SCALE 1 : 25

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL
2			-	-
1			-	-
			-	-

TITLE	NAME
DRAFTER	G. MAREDI
DRAFTING CHECK	G. WHALLEY
DESIGNER	S. FAUSTINO
DESIGN CHECK	G. WHALLEY
PROJECT MANAGER	T.CRONJE
PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

CLIENT
GEORGE THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION

PLAN SECTION 1-1, & SUMP ENLARGED DETAILS

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A101	

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL
A1

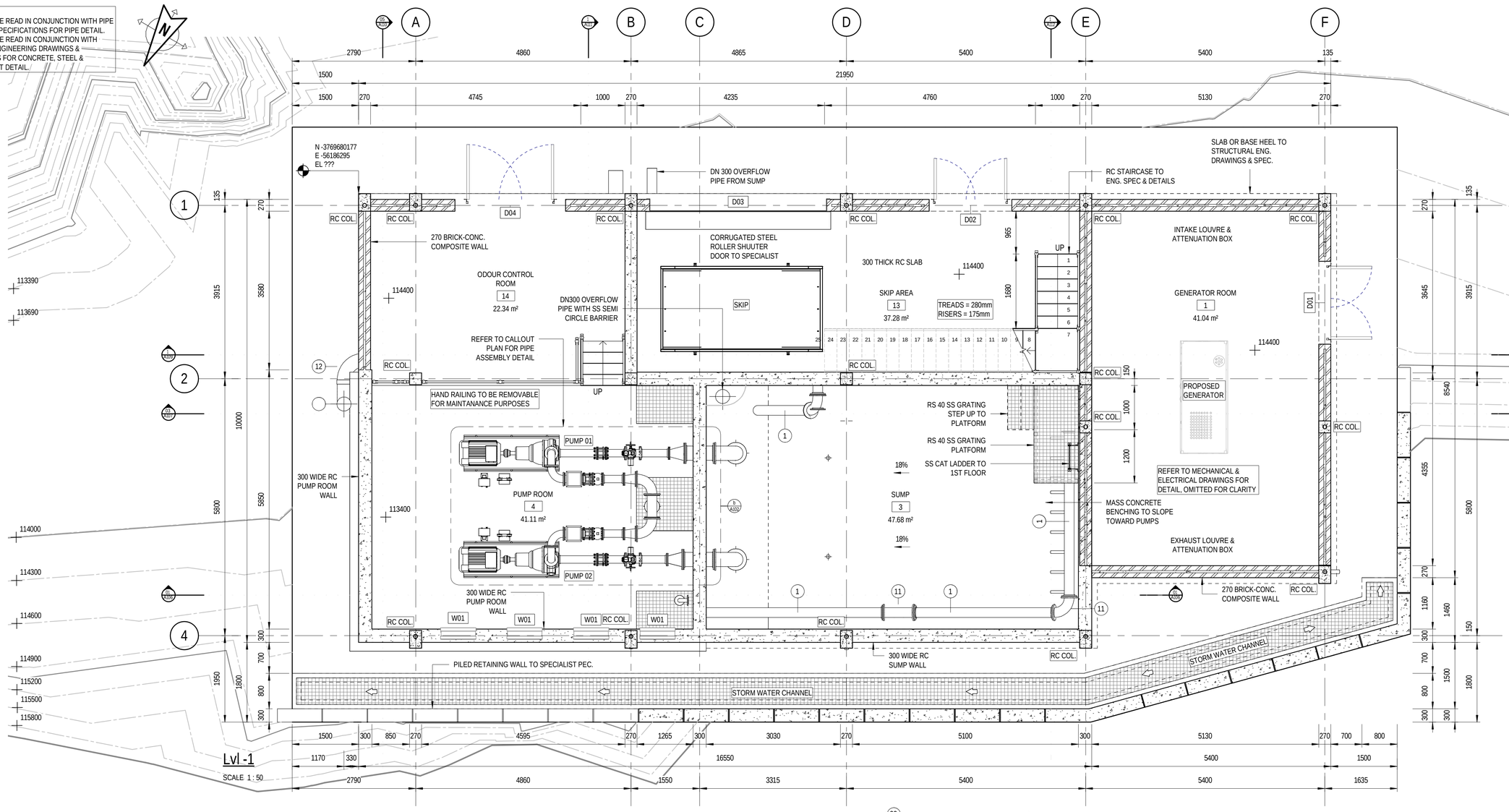
NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

PLOT DATE TIME
2024/08/09 20:00:13

DRAWING FILE LOCATION / NAME

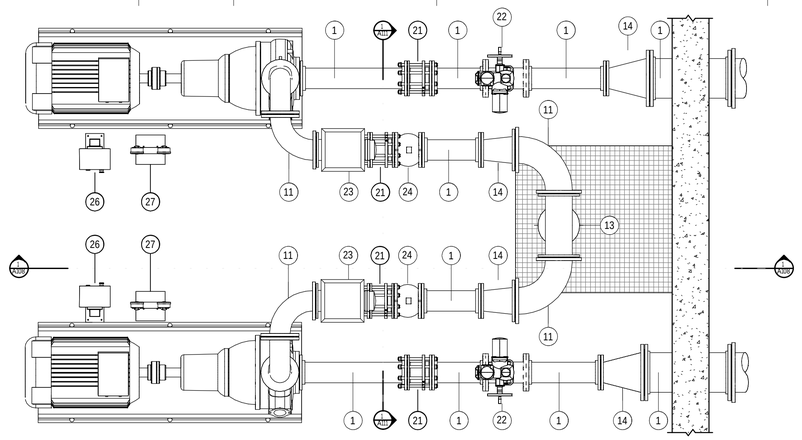
150 mm ON ORIGINAL

A1



Lvl -1

SCALE 1 : 50



Lvl -1 - Callout 1

SCALE 1 : 25

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED

ENGINEER: .....

PR ENG NR: .....

SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING

SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05

SCALE 1:50 — 0.5 0 1 2

SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER

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THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY

HEROLD'S BAY PUMP STATION

PLAN SECTION 2-2 & ENLARGED PUMPROOM PLAN

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A102	

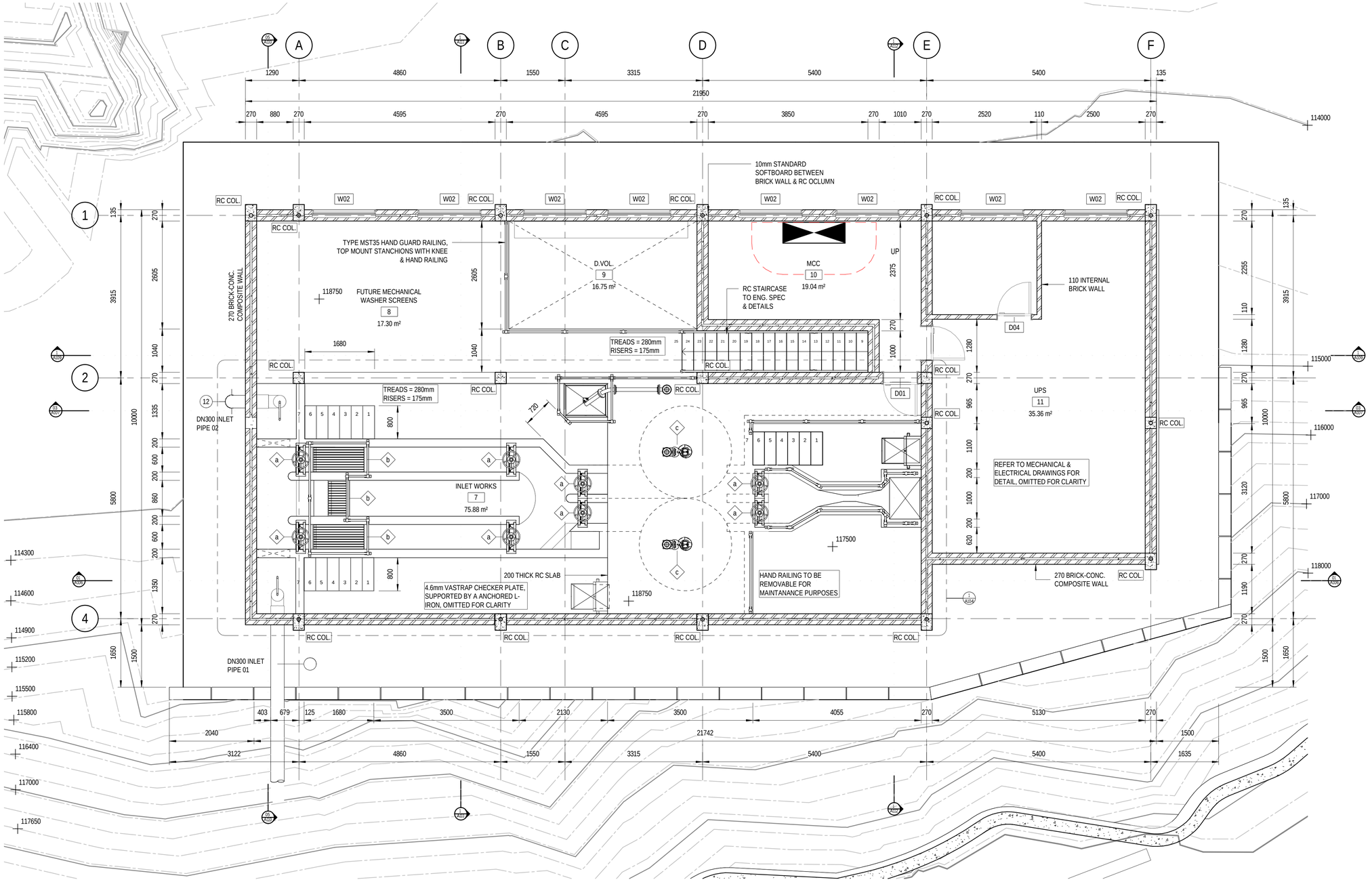
NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

PLOT DATE TIME
2024/08/09 20:00:20

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL

A1



PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

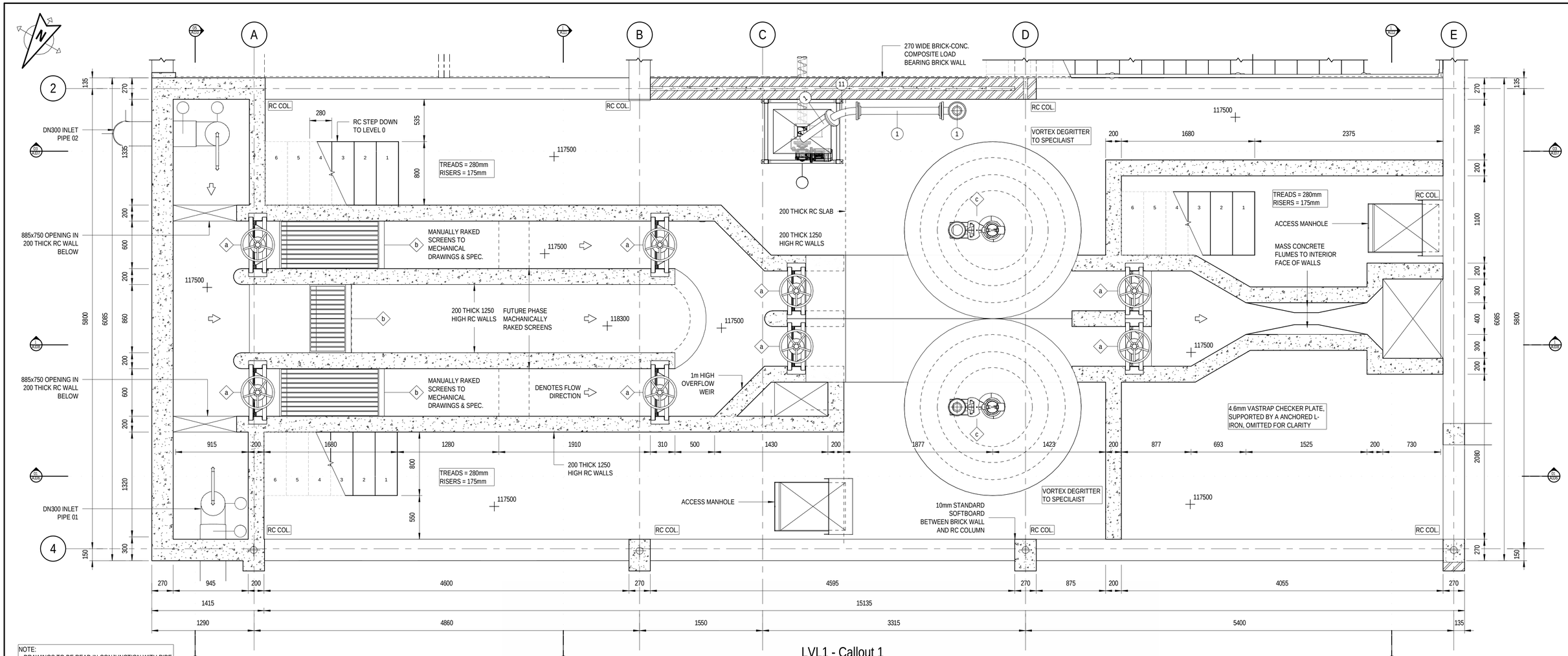
CLIENT
GEORGE THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
FIRST FLOOR PLAN

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A103	

PLOT DATE TIME
2024/08/09 20:00:53

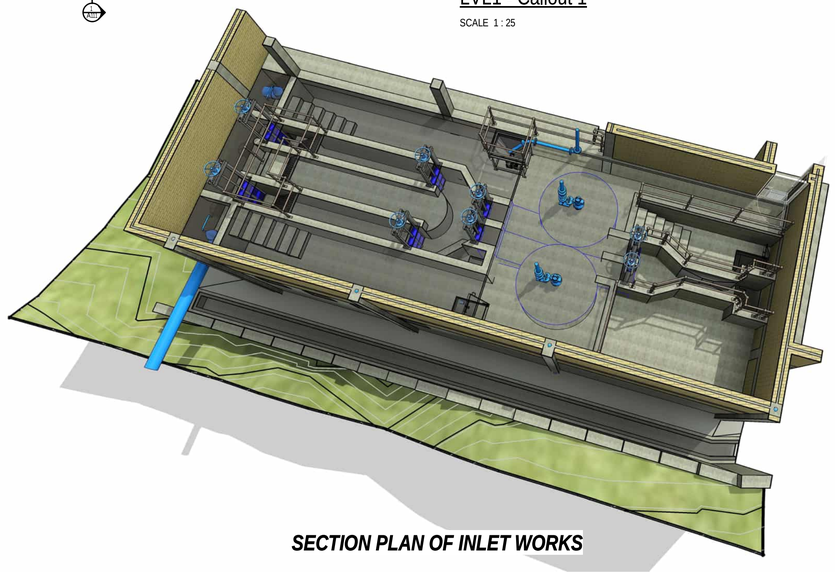
DRAWING FILE LOCATION / NAME



NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

LVL1 - Callout 1

SCALE 1 : 25



SECTION PLAN OF INLET WORKS

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED

ENGINEER: .....

PR ENG NR: .....

SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING

SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05

SCALE 1:50 — 0.5 0 1 2

SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER

SMEC South Africa
Member of the Surbana Jurong Group

SABS ISO 9001

CLIENT

GEORGE
THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY

HEROLD'S BAY PUMP STATION

ENLARGED INLET WORKS PLAN & INLET WORKS PERSPECTIVE VIEW

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A104	

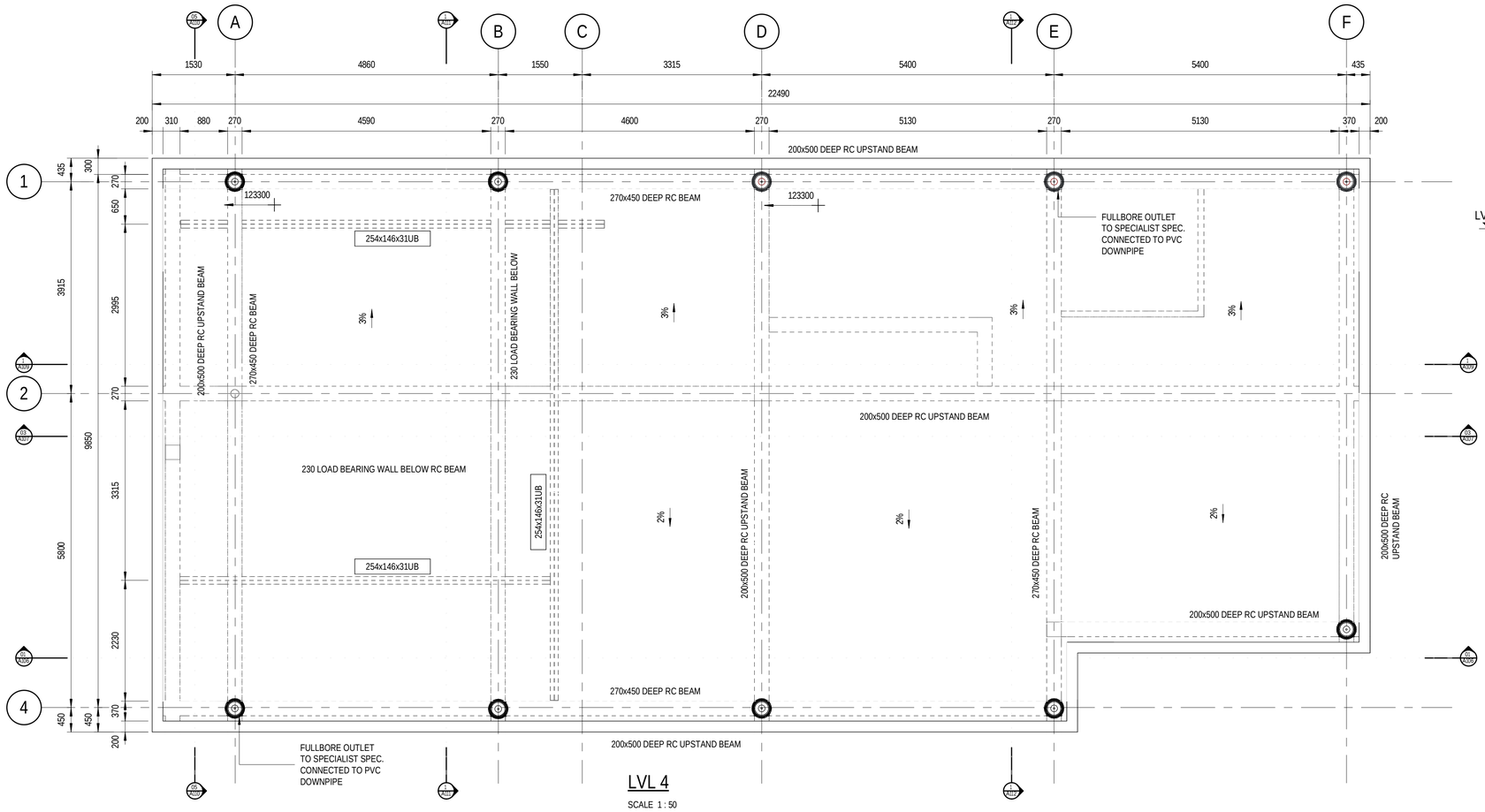
150 mm ON ORIGINAL

A1

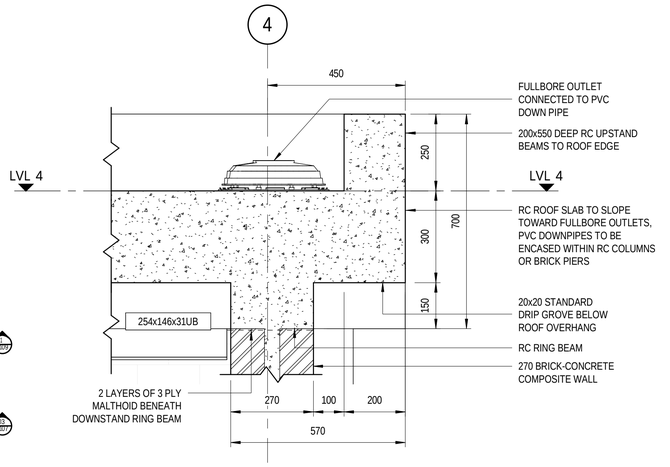
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

PLOT DATE TIME
2024/08/09 20:00:57



SCALE 1 : 50



SECTION 1 / A111
SCALE 1 : 10

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

CLIENT
GEORGE THE CITY FOR ALL REASONS

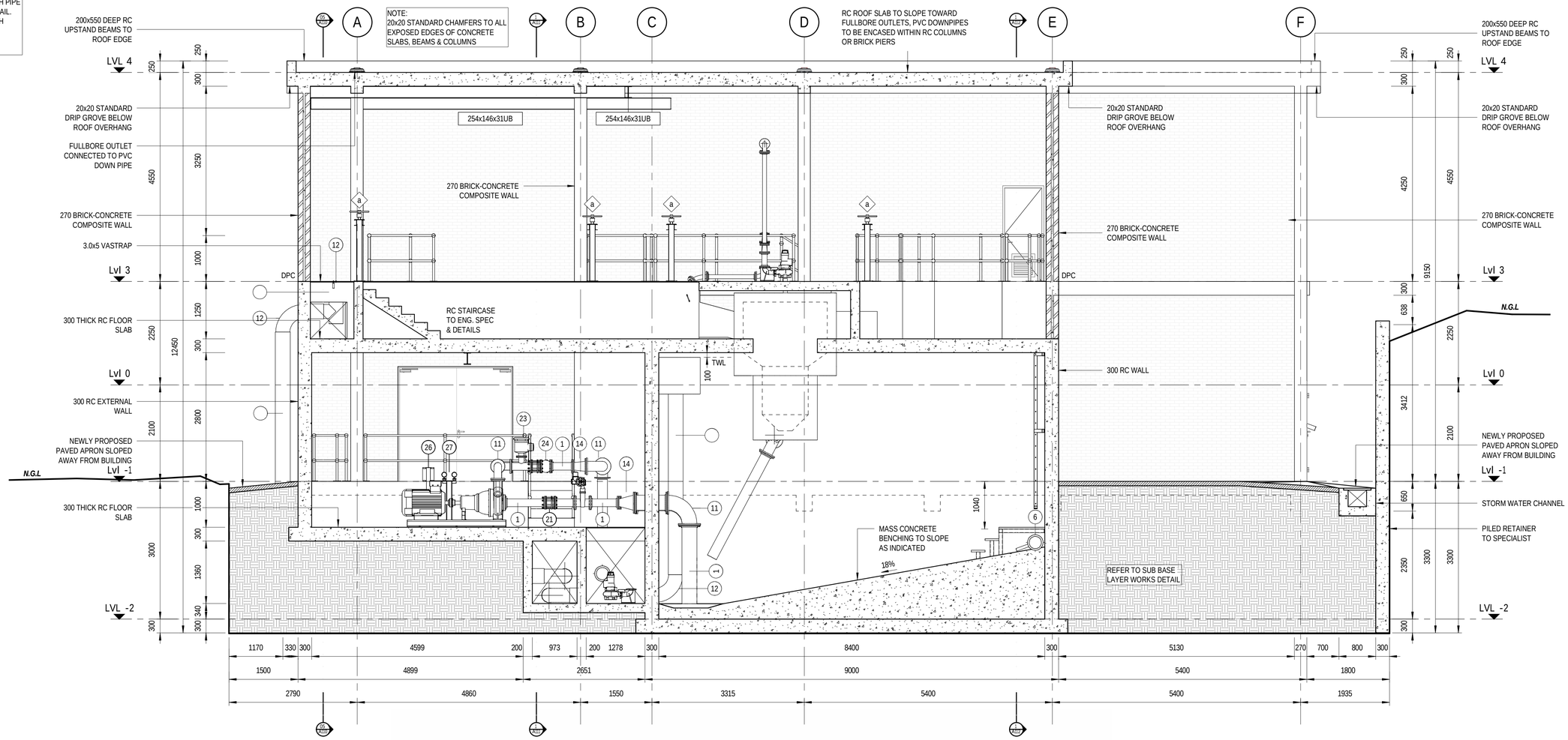
GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
ROOF PLAN

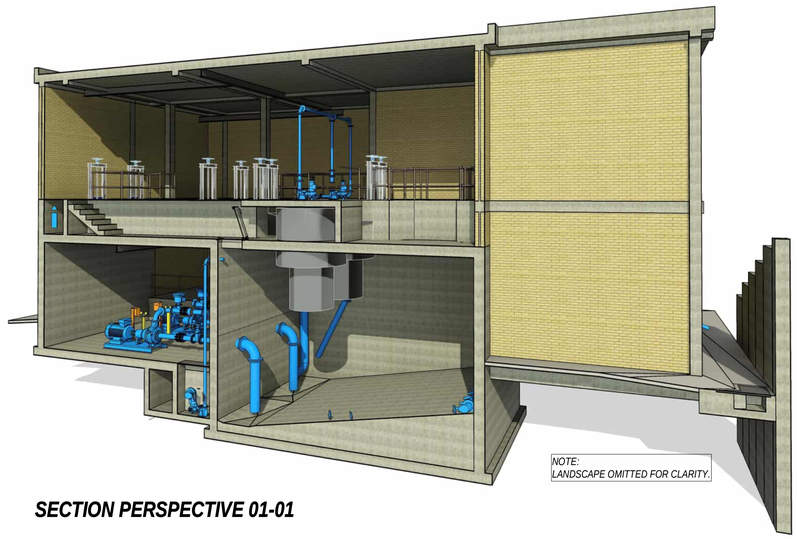
PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A105	

DRAWING FILE LOCATION / NAME

A1 150 mm ON ORIGINAL
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.





NOTE:
LANDSCAPE OMITTED FOR CLARITY.

SECTION PERSPECTIVE 01-01

PRELIMINARY

PLOT DATE TIME 2024/08/09 20:01:09

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL A1

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 0.5 0 1 2
SCALE 1:100 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

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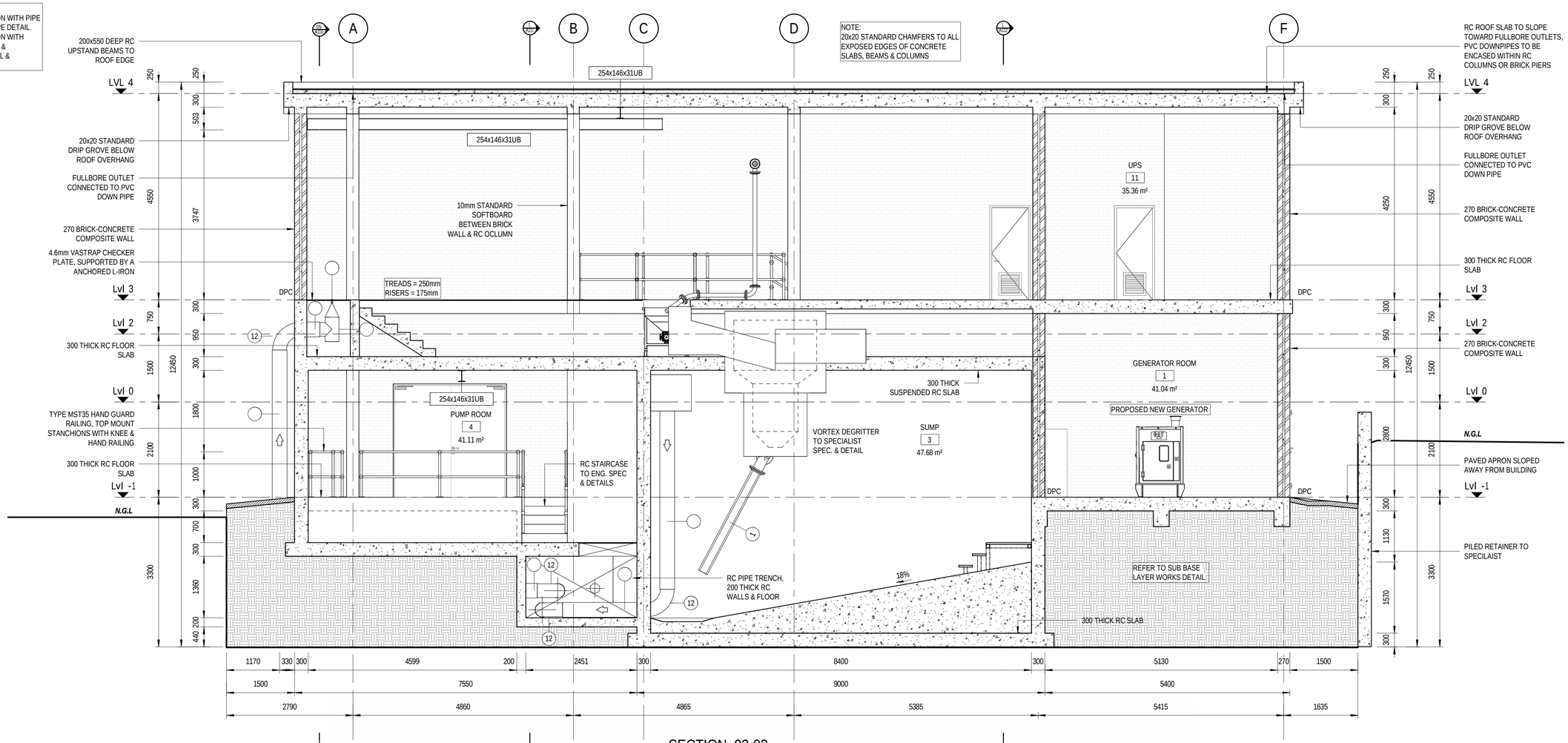
GEORGE THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
SECTION 01-01

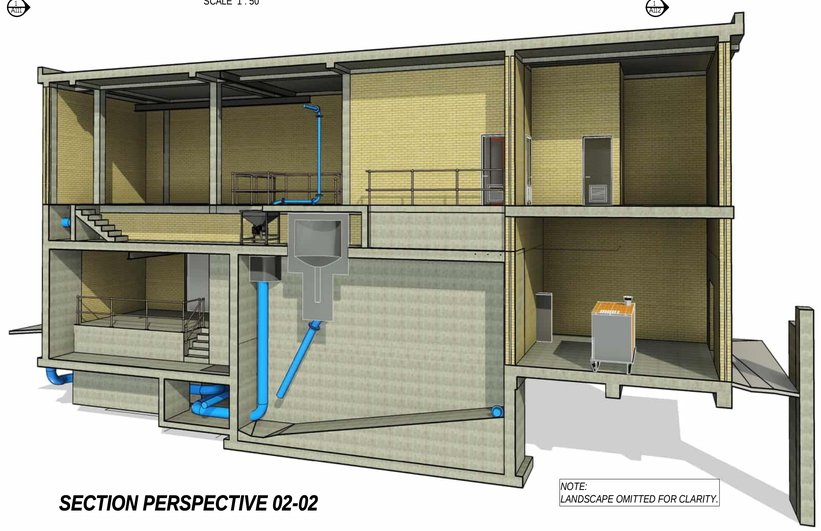
PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A106	

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.



SECTION 03-03

SCALE 1 : 50



NOTE:
LANDSCAPE OMITTED FOR CLARITY.

SECTION PERSPECTIVE 02-02

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
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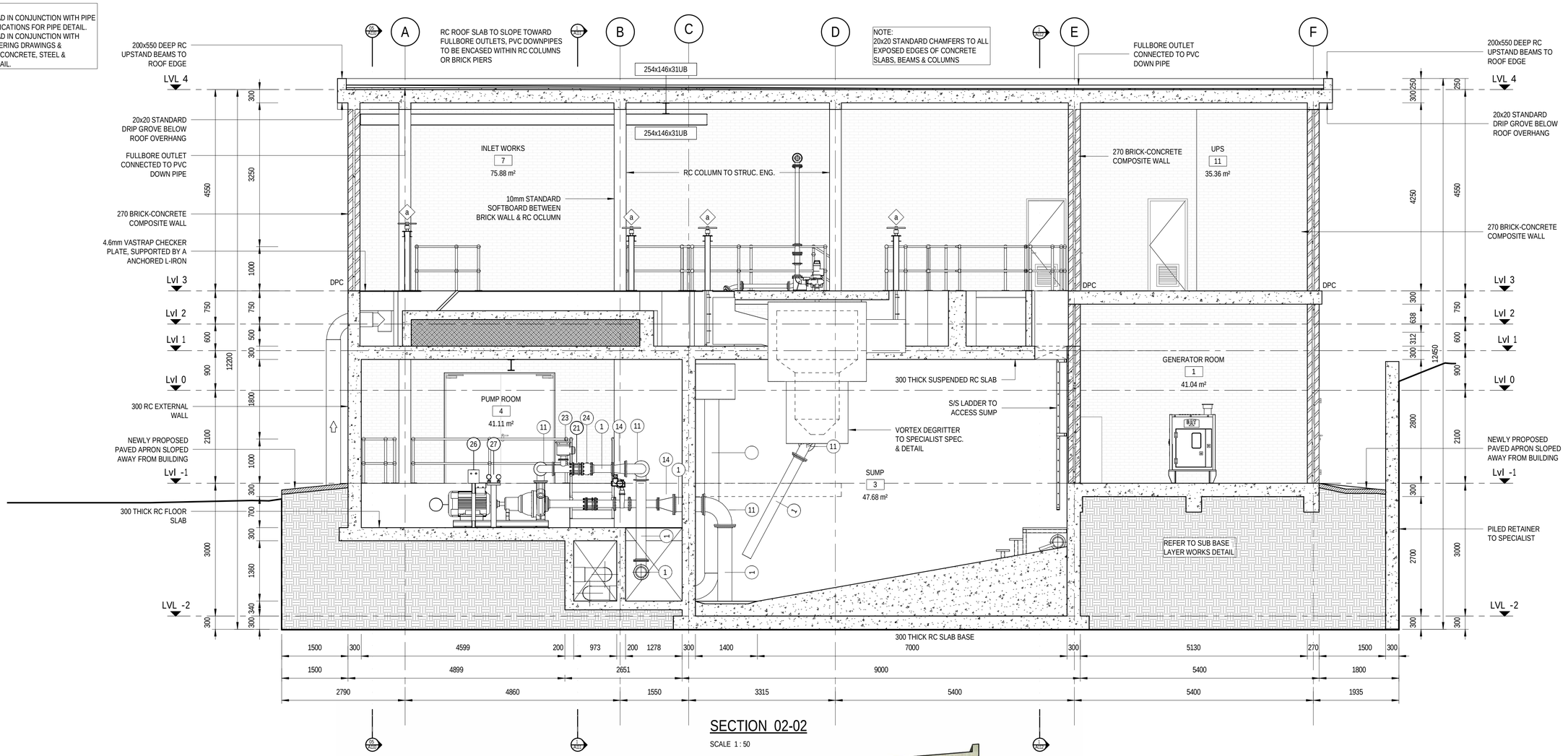
GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION

SECTION 02-02

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A107	

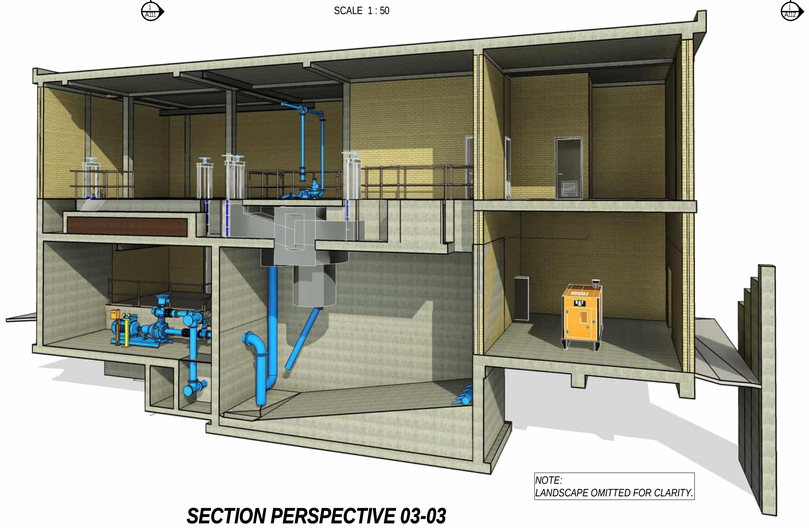
PLOT DATE TIME 2024/08/09 20:01:23
DRAWING FILE LOCATION / NAME
150 mm ON ORIGINAL
A1

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.



SECTION 02-02

SCALE 1 : 50



NOTE:
LANDSCAPE OMITTED FOR CLARITY.

SECTION PERSPECTIVE 03-03

PRELIMINARY

PLOT DATE TIME
2024/08/09 20:01:36

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL
A1

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

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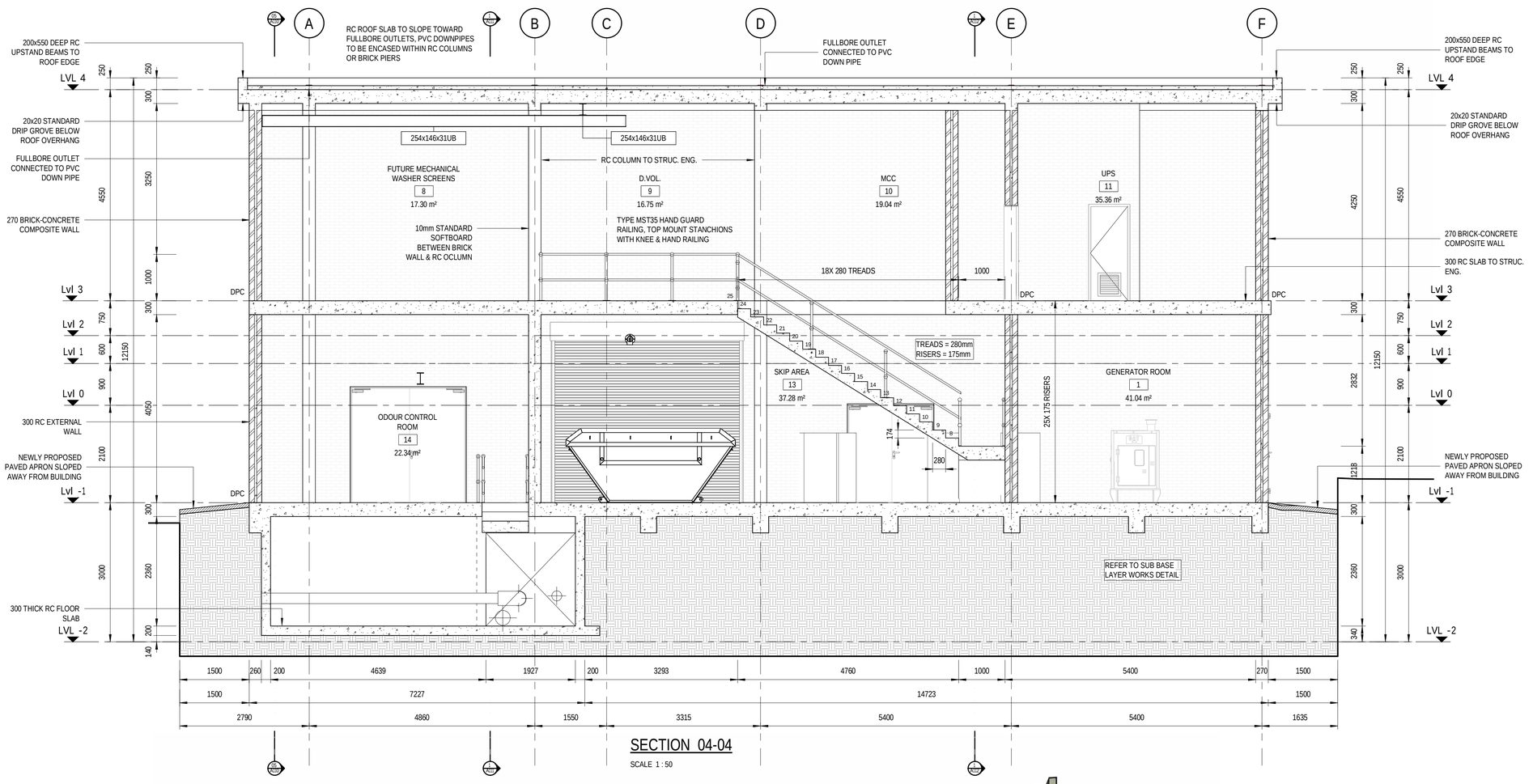
SECTION 03-03

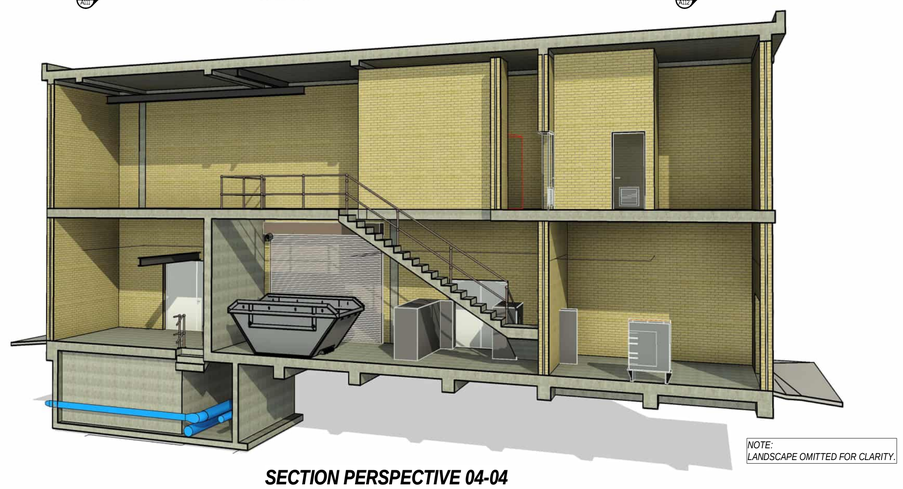
PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A108	

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.



SECTION 04-04

SCALE 1 : 50



NOTE:
LANDSCAPE OMITTED FOR CLARITY.

SECTION PERSPECTIVE 04-04

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
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SECTION 04-04

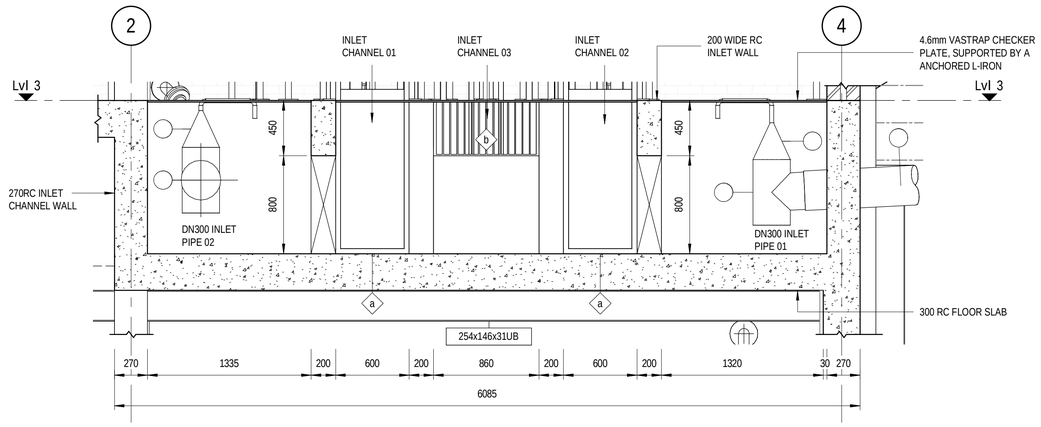
PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A109	

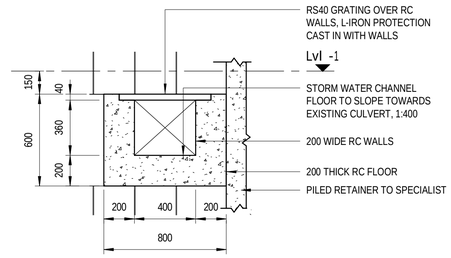
PLOT DATE TIME
2024/08/09 2001:55

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL
A1

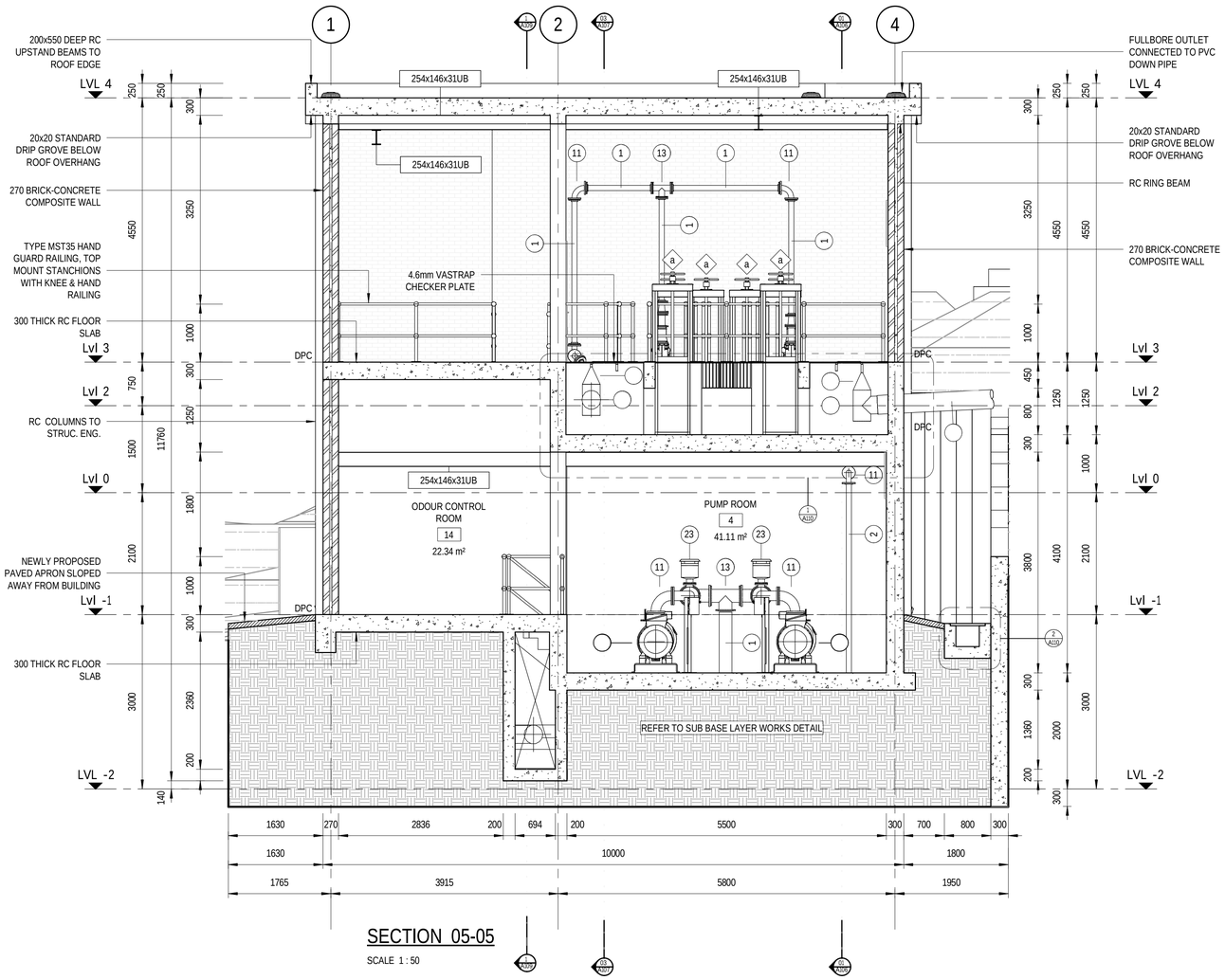
NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.





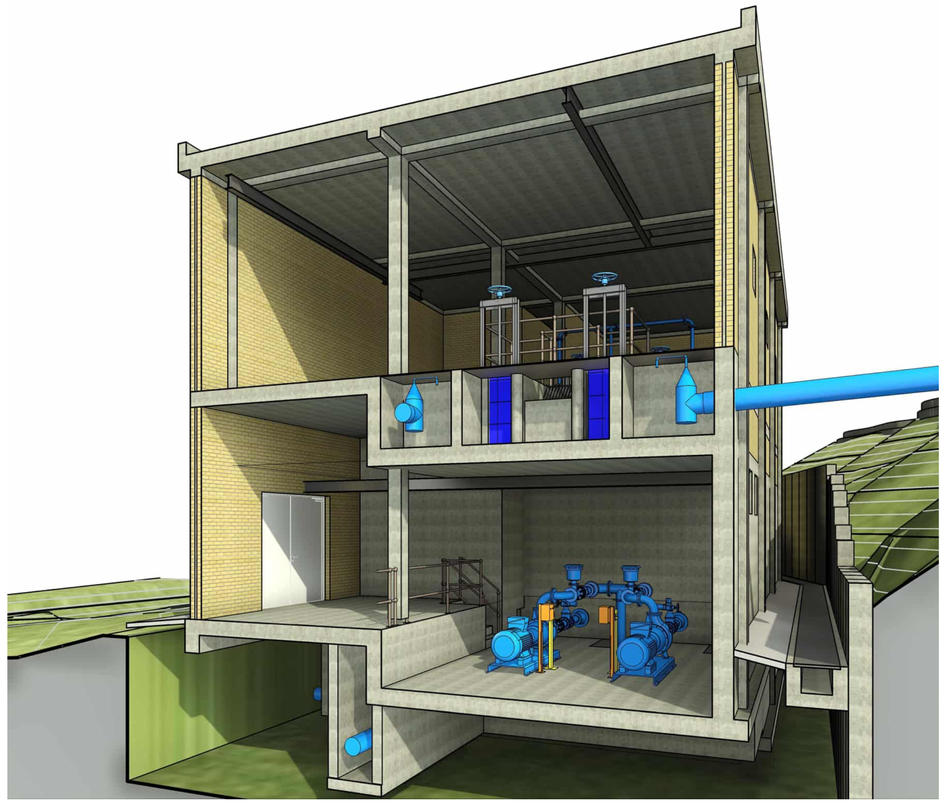
SECTION 05-05 - Callout 2

SCALE 1 : 20



SECTION 05-05

SCALE 1 : 50



SECTION PERSPECTIVE 05-05

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
					PROJECT MANAGER	T.CRONJE
2					PROJECT DIRECTOR	T.CRONJE
1						

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
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HEROLD'S BAY PUMP STATION

SECTION 05-05

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A110	

PLOT DATE TIME 2024/08/09 20:12:13
DRAWING FILE LOCATION / NAME
150 mm ON ORIGINAL
A1

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
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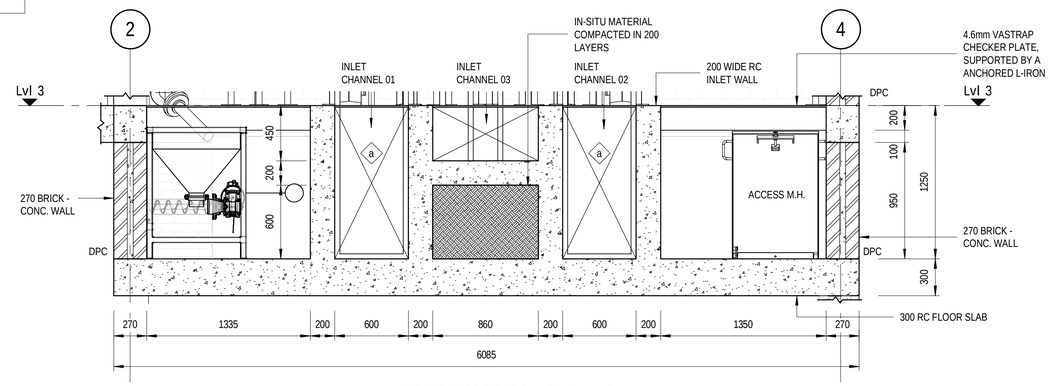
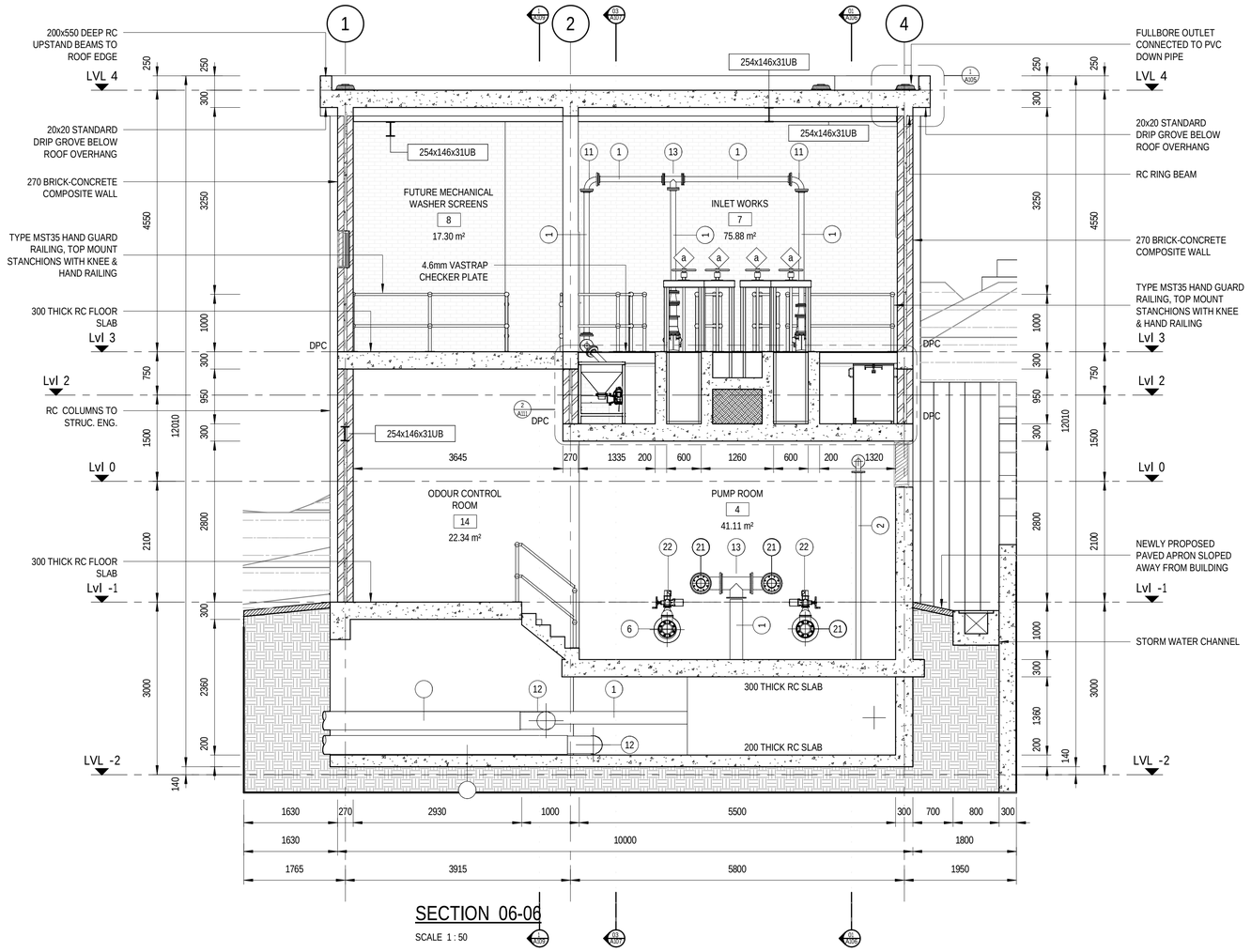


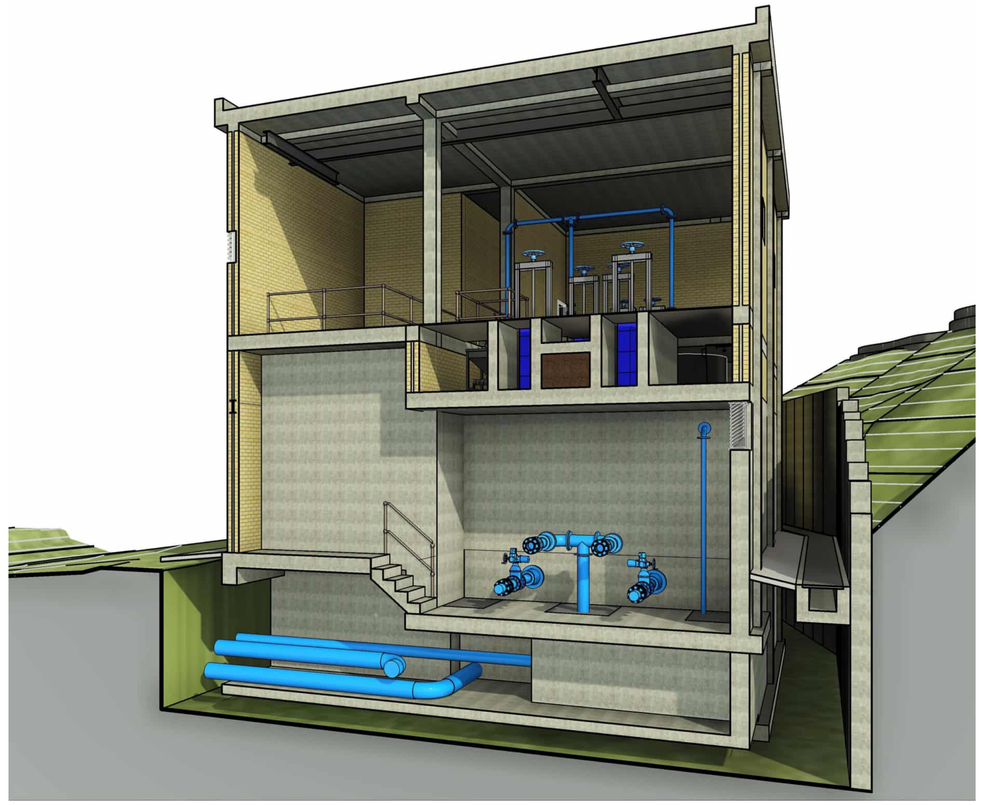
SECTION 06-06 - Callout 1

SCALE 1 : 25



SECTION 06-06

SCALE 1 : 50



SECTION PERSPECTIVE 06-06

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL
2			-	-
1			-	-
			-	-

TITLE	NAME
DRAFTER	G. MAREDI
DRAFTING CHECK	G. WHALLEY
DESIGNER	S. FAUSTINO
DESIGN CHECK	G. WHALLEY
PROJECT MANAGER	T.CRONJE
PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED

ENGINEER: .....

PR ENG NR: .....

SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING

SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05

SCALE 1:50 — 0.5 0 1 2

SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER

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HEROLD'S BAY PUMP STATION

SECTION 06-06

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A111	

PLOT DATE TIME 2024/08/09 20:03:38

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL

A1

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
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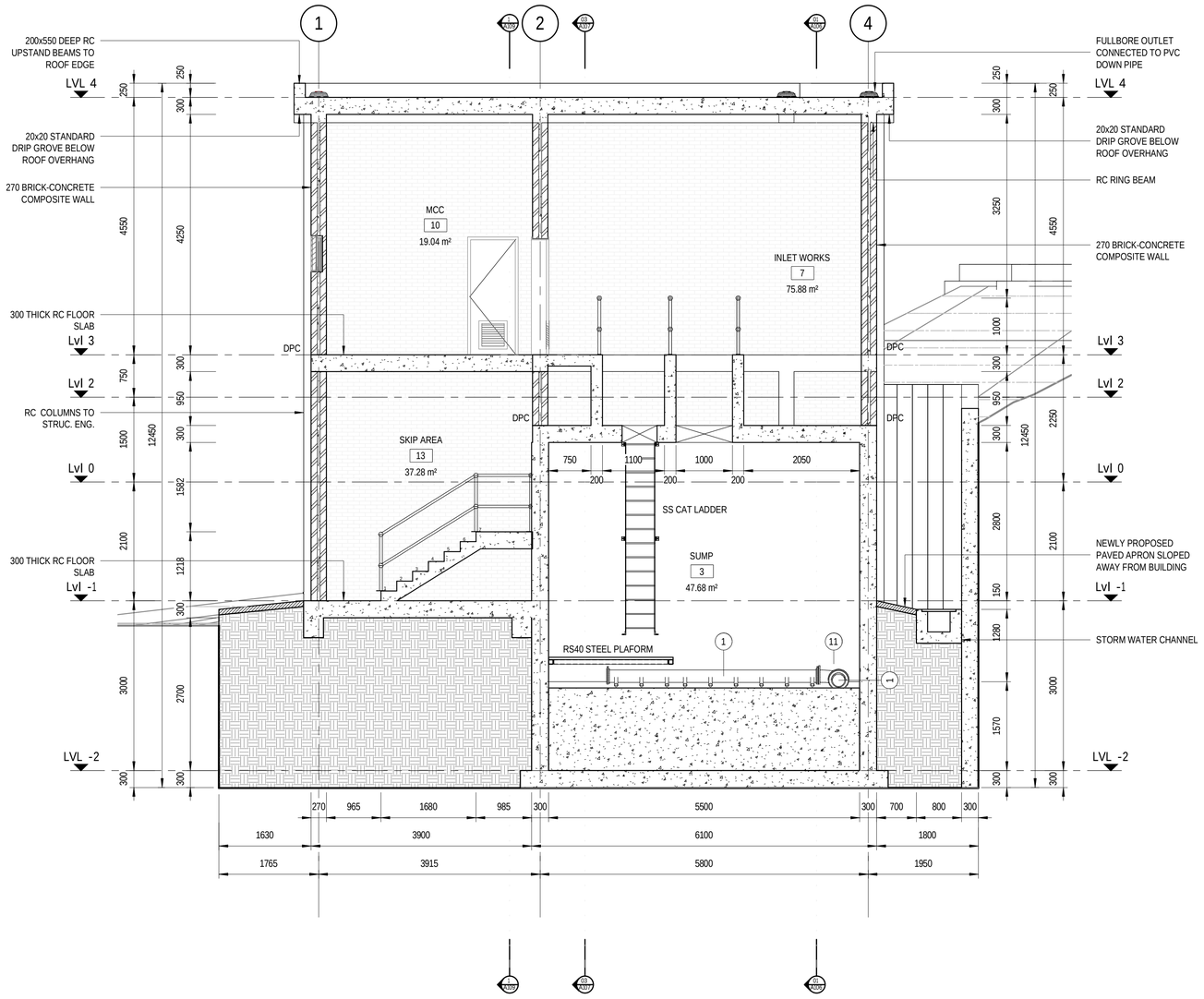
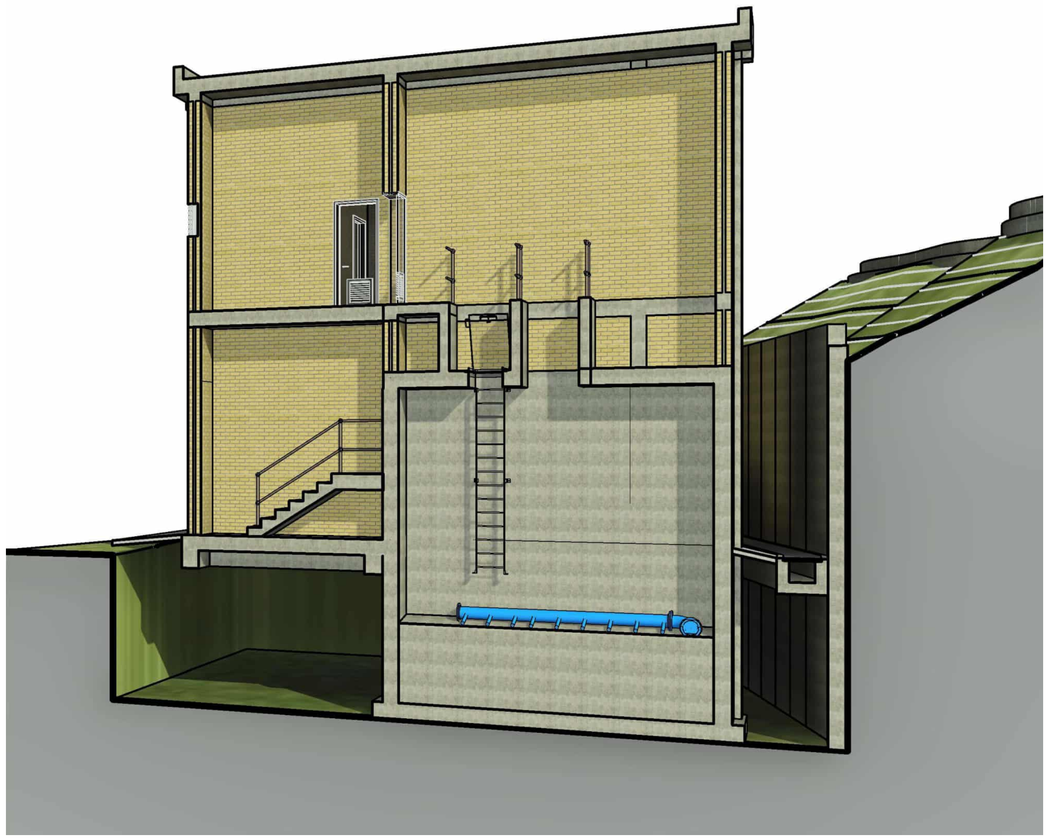
PLOT DATE TIME
2024/08/09 20:03:46

DRAWING FILE LOCATION / NAME





SECTION PERSPECTIVE 07-07

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
					PROJECT MANAGER	T.CRONJE
2					PROJECT DIRECTOR	T.CRONJE
1						

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
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SABS ISO 9001

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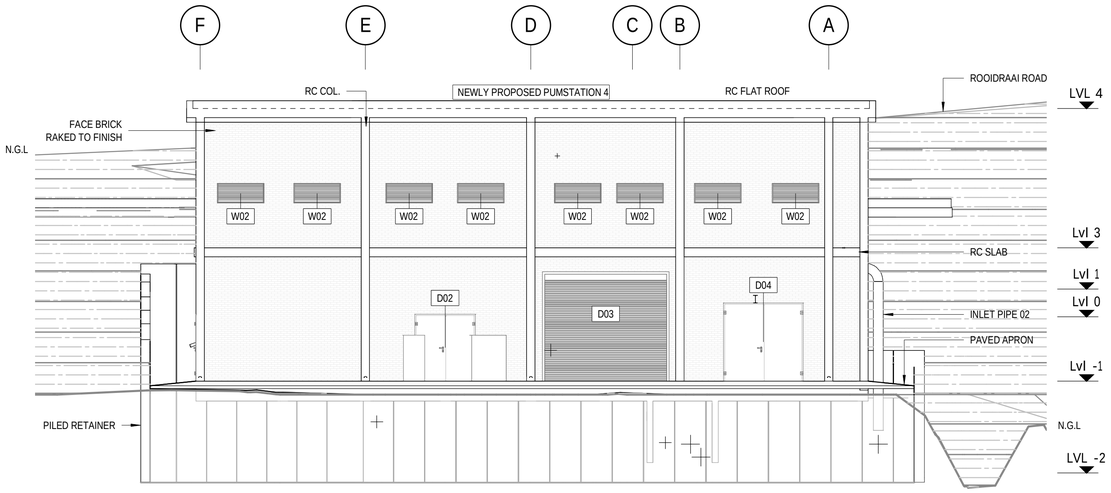
GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION
SECTION 07-07

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A112	

150 mm ON ORIGINAL
A1
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

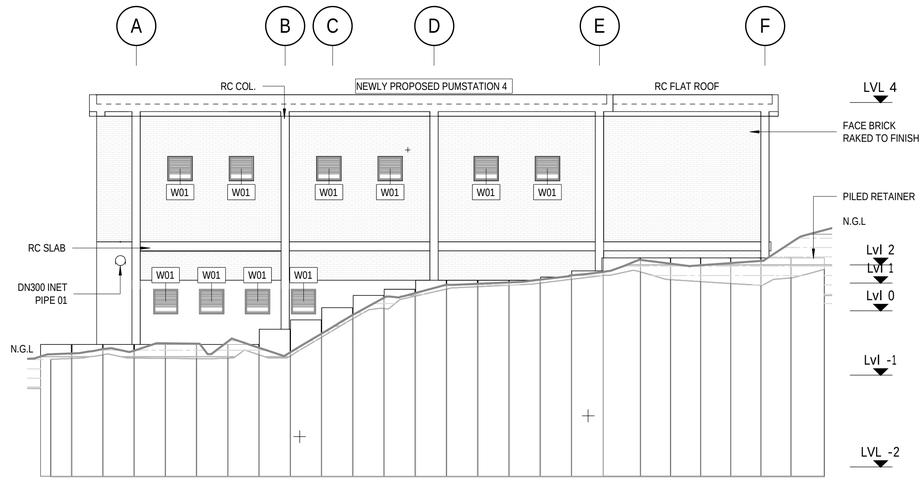
NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

PLOT DATE TIME
2024/08/09 20:03:54



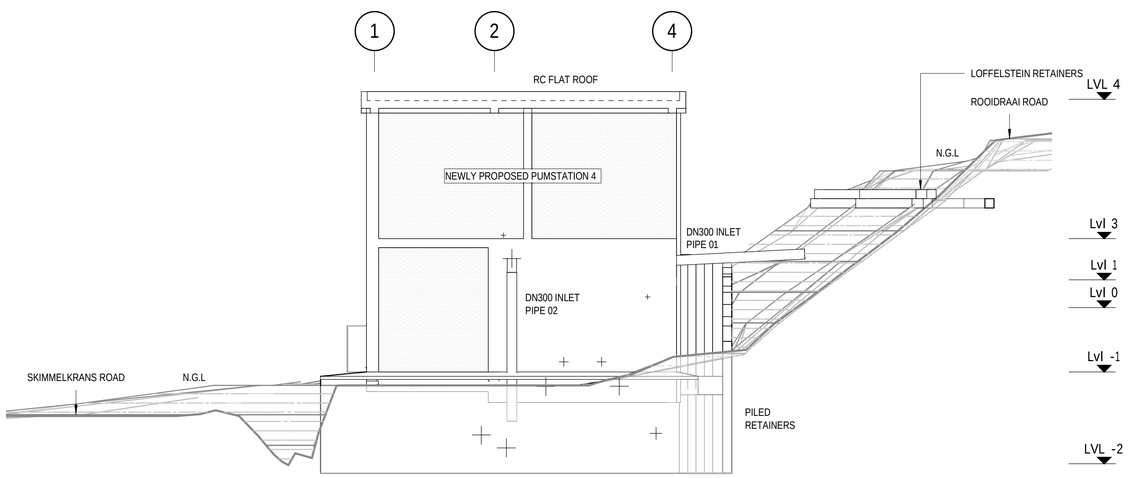
SOUTH EAST ELEVATION

SCALE 1 : 100



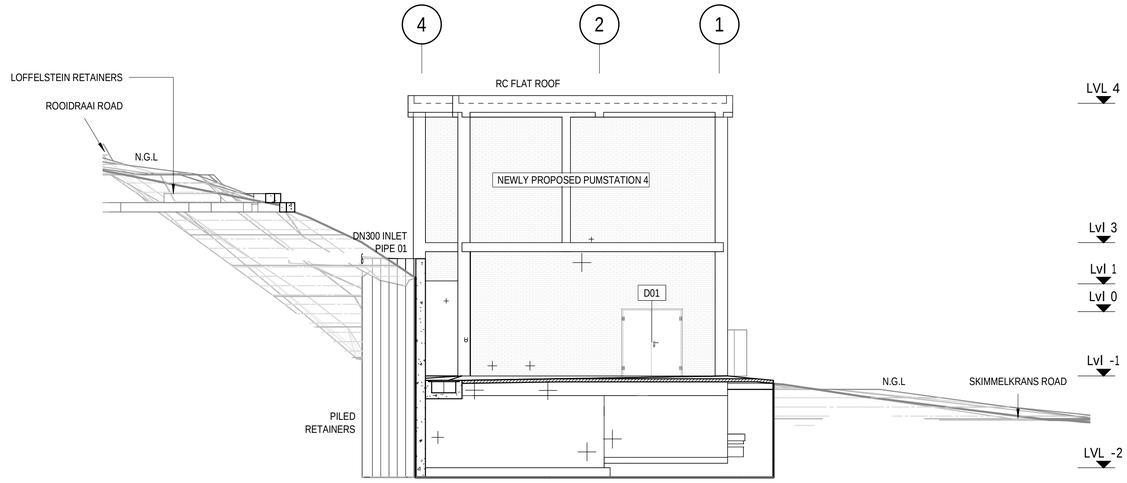
NORTH WEST ELEVATION

SCALE 1 : 100



NORTH EAST ELEVATION

SCALE 1 : 100



SOUTH WEST ELEVATION

SCALE 1 : 100

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL
2			-	-
1			-	-
			-	-

TITLE	NAME
DRAFTER	G. MAREDI
DRAFTING CHECK	G. WHALLEY
DESIGNER	S. FAUSTINO
DESIGN CHECK	G. WHALLEY
PROJECT MANAGER	T.CRONJE
PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 — 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 — 0.5 0 1 2
SCALE 1:100 — 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

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GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION

ELEVATIONS

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A113	

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL
A1
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

NOTE:
- DRAWINGS TO BE READ IN CONJUNCTION WITH PIPE SCHEDULES & SPECIFICATIONS FOR PIPE DETAIL.
- DRAWINGS TO BE READ IN CONJUNCTION WITH STRUCTURAL ENGINEERING DRAWINGS & SPECIFICATIONS FOR CONCRETE, STEEL & REINFORCEMENT DETAIL.

PLOT DATE TIME
2024/08/09 20:06:46

TABLE 1 - PIPE SCHEDULE - STRAIGHT PIPE

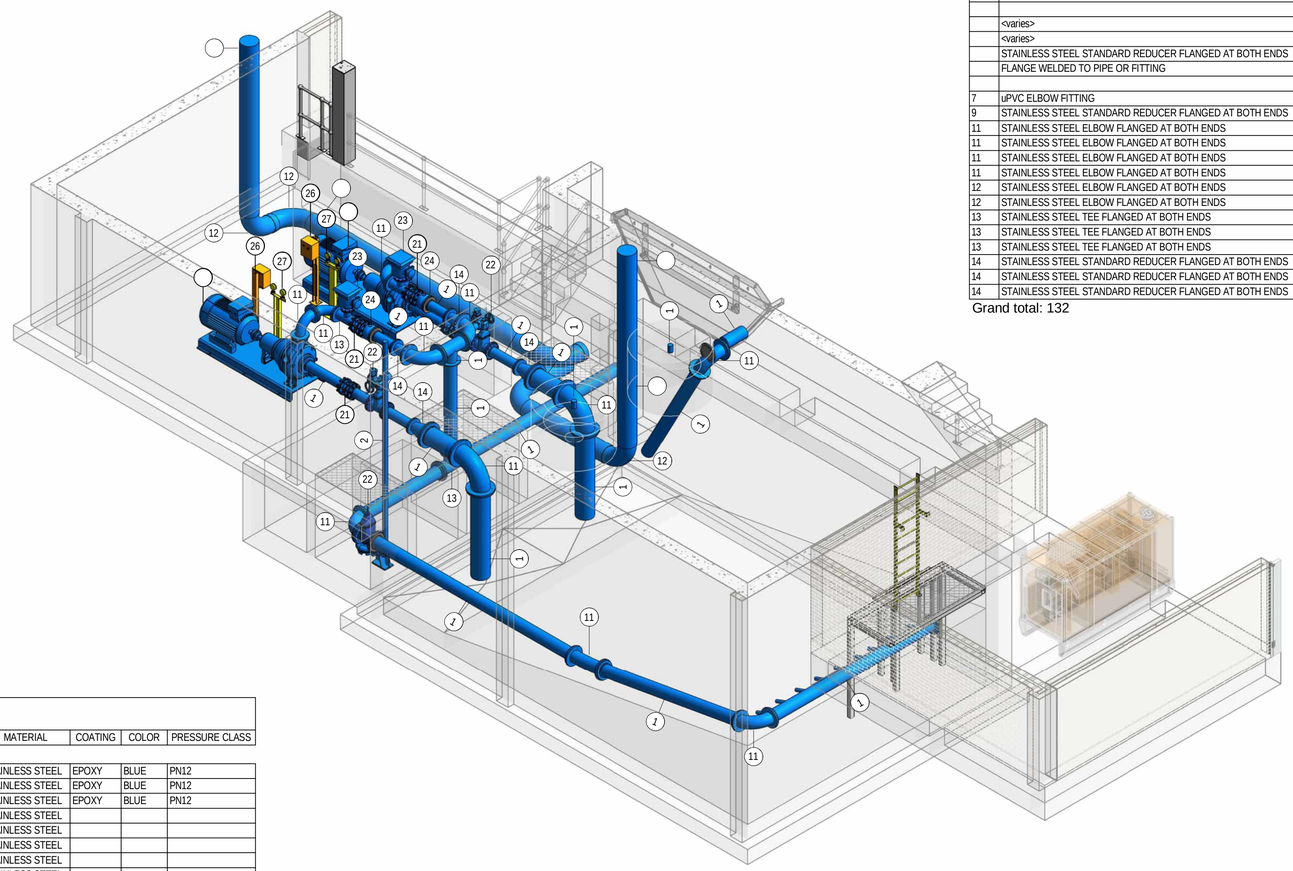
MARK	DESCRIPTION	DIAMETER	LENGTH	COUNT	MATERIAL	LINING	COATING	COLOR	PRESSURE CLASS
	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	25 mm	1.13 m	6	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
	uPVC ROOF DRAINAGE PIPE - STRAIGHT LENGTHS	80 mm	24.40 m	6	UNPLASTICIZED POLYVINYL CHLORIDE	-	-	CHARCOAL GREY	-
	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	300 mm	30.13 m	9	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
1	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	50 mm	3.96 m	9	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
1	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	80 mm	16.20 m	10	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
1	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	100 mm	0.42 m	2	STAINLESS STEEL	EPOXY	EPOXY	BLUE	
1	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	150 mm	4.16 m	8	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
1	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	200 mm	25.25 m	8	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
1	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	300 mm	4.52 m	4	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
2	STAINLESS STEEL PIPE FLANGED AT ONE OR BOTH ENDS	80 mm	5.02 m	2	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
3	uPVC ROOF DRAINAGE PIPE - STRAIGHT LENGTHS	80 mm	51.02 m	12	UNPLASTICIZED POLYVINYL CHLORIDE	-	-	CHARCOAL GREY	-

Grand total: 76 166.2 2 m

TABLE 2 - PIPE FITTING SCHEDULE

MARK	DESCRIPTION	COUNT	SIZE	MATERIAL	LINING	COATING	COLOR	PRESSURE CLASS
	<varies>	21	80 mmø-80 mmø	STAINLESS STEEL	<varies>	<varies>	<varies>	<varies>
	<varies>	7	100 mmø-100 mmø	STAINLESS STEEL	EPOXY	<varies>	<varies>	
		10	125 mmø-80 mmø	STAINLESS STEEL	EPOXY			
	<varies>	24	150 mmø-150 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
	<varies>	17	200 mmø-200 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
	STAINLESS STEEL STANDARD REDUCER FLANGED AT BOTH ENDS	2	300 mmø-25 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
	FLANGE WELDED TO PIPE OR FITTING	6	300 mmø-300 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
		2	300 mmø-300 mmø-300 mmø					
7	uPVC ELBOW FITTING	4	80 mmø-80 mmø	STAINLESS STEEL	-	-	CHARCOAL GREY	
9	STAINLESS STEEL STANDARD REDUCER FLANGED AT BOTH ENDS	1	100 mmø-80 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
11	STAINLESS STEEL ELBOW FLANGED AT BOTH ENDS	5	80 mmø-80 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
11	STAINLESS STEEL ELBOW FLANGED AT BOTH ENDS	4	150 mmø-150 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
11	STAINLESS STEEL ELBOW FLANGED AT BOTH ENDS	6	200 mmø-200 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
11	STAINLESS STEEL ELBOW FLANGED AT BOTH ENDS	2	300 mmø-300 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
12	STAINLESS STEEL ELBOW FLANGED AT BOTH ENDS	4	25 mmø-25 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
12	STAINLESS STEEL ELBOW FLANGED AT BOTH ENDS	6	300 mmø-300 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
13	STAINLESS STEEL TEE FLANGED AT BOTH ENDS	1	80 mmø-80 mmø-80 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	
13	STAINLESS STEEL TEE FLANGED AT BOTH ENDS	2	150 mmø-150 mmø-100 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
13	STAINLESS STEEL TEE FLANGED AT BOTH ENDS	2	200 mmø-200 mmø-200 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	<varies>
14	STAINLESS STEEL STANDARD REDUCER FLANGED AT BOTH ENDS	2	100 mmø-80 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	
14	STAINLESS STEEL STANDARD REDUCER FLANGED AT BOTH ENDS	2	200 mmø-150 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12
14	STAINLESS STEEL STANDARD REDUCER FLANGED AT BOTH ENDS	2	300 mmø-150 mmø	STAINLESS STEEL	EPOXY	EPOXY	BLUE	PN12

Grand total: 132



ISOMETRIC

SCALE

MECHANICAL EQUIPMENT SCHEDULE

FAMILY & TYPE	DESCRIPTION	COUNT
75_ME_ME_S_CHANNEL SLUICE GATE: TOP WHEEL	SLUICE GATE	8
Hand Screen1: Hand Screen	SEWER HAND SCREEN	1
Hand Screen2: Hand Screen	SEWER HAND SCREEN	1
Hand Screen4: Hand Screen	SEWER HAND SCREEN	1
Huber Mechanical Screen2: Huber Mechanical Screen	MECHANICAL SCREEN	1
Huber Mechanical Screen3: Huber Mechanical Screen	MECHANICAL SCREEN	1
SumpPump: Amarex Drainage Pump - 80mm Dia - PN16	MECHANICAL SCREEN	3

Grand total: 16

TABLE 3 - PIPE ACCESSORY SCHEDULE

MARK	DESCRIPTION	COUNT	DIAMETER	LINING	MATERIAL	COATING	COLOR	PRESSURE CLASS
22	VALVE - GATE	3	150	EPOXY	STAINLESS STEEL	EPOXY	BLUE	PN12
23	VALVE - AIR VALVE	2	150	EPOXY	STAINLESS STEEL	EPOXY	BLUE	PN12
24	NON RETURN VALVE AXIAL GUIDED DN15	2	150	EPOXY	STAINLESS STEEL	EPOXY	BLUE	PN12
31	FULL BORE OUTLET	7	80	EPOXY	STAINLESS STEEL			
32	FULL BORE OUTLET	1	80	EPOXY	STAINLESS STEEL			
33	FULL BORE OUTLET	1	80	EPOXY	STAINLESS STEEL			
34	FULL BORE OUTLET	1	80	EPOXY	STAINLESS STEEL			
35	FULL BORE OUTLET	1	80	EPOXY	STAINLESS STEEL			
36	FULL BORE OUTLET	1	80	EPOXY	STAINLESS STEEL			
38	FULL BORE OUTLET	1	80	EPOXY	STAINLESS STEEL			

Grand total: 20

GENERIC MODEL SCHEDULE

FAMILY & TYPE	COUNT
45 PRESSURE GAGES AZ01: 45 PRESSURE GAGES AZ01	2
45 Stop Start Box 2: 45 Stop Start Box 2	2
DismantlingJoint_DN150-PN16: DismantlingJoint_DN150-PN16	4
Family3: Family3	1
KSB Sewatec K150-503G: KSB Sewatec K150-503G	2
LADDER WITHOUT RAILS 3400 mm HEIGHT: LADDER WITHOUT RAILS 3400 mm HEIGHT	1
TD 49 Manhole Cover & Frame C: TD 49 Manhole Cover & Frame C	2
WasteContainer: WasteContainer	1

PRELIMINARY

REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No	APPROVAL	TITLE	NAME
			-	-	DRAFTER	G. MAREDI
			-	-	DRAFTING CHECK	G. WHALLEY
			-	-	DESIGNER	S. FAUSTINO
					DESIGN CHECK	G. WHALLEY
2					PROJECT MANAGER	T.CRONJE
1					PROJECT DIRECTOR	T.CRONJE

DRAWING APPROVED
ENGINEER: .....
PR ENG NR: .....
SIGNATURE: .....

SCALES AT AN A1 SIZE DRAWING
SCALE 1:1 0.01 0 0.01 0.02 0.03 0.04 0.05
SCALE 1:50 0.5 0 1 2
SCALE 1:100 1 0 1 2 3 4 5

DESIGNER
SMEC South Africa
Member of the Surbana Jurong Group
SABS ISO 9001

CLIENT
GEORGE THE CITY FOR ALL REASONS

GEORGE MUNICIPALITY
HEROLD'S BAY PUMP STATION

ISOMETRIC VIEW & SCHEDULES

PROJECT NO.	PHASE	DRAWING NUMBER	REVISION
C1924		A114	

DRAWING FILE LOCATION / NAME

150 mm ON ORIGINAL
A1
0 10 20 30 40 50 60 70 80 90 100 110 120 130 140 150

Annexure C Rising Main Drawings

NOTE:
1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE ANY WORK IS PUT IN HAND. REFER ANY DISCREPANCIES TO THE ENGINEER.

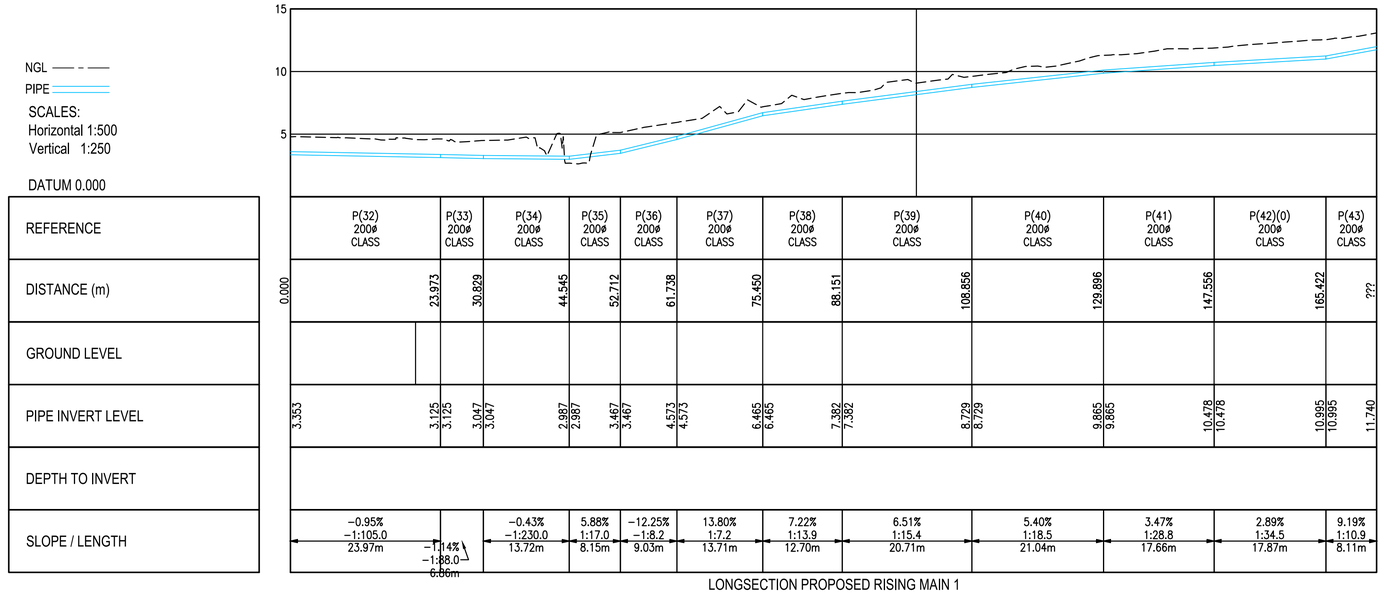
SEWER RISING MAIN PIPE TABLE

NAME	SIZE	LENGTH	SLOPE	MATERIAL
P(32)	250 mm	24.0 m	-0.95%	uPVC
P(33)	250 mm	6.9 m	-1.14%	uPVC
P(34)	250 mm	13.7 m	-0.43%	uPVC
P(35)	250 mm	8.2 m	5.88%	uPVC
P(36)	250 mm	9.0 m	-12.25%	uPVC
P(37)	250 mm	13.7 m	13.80%	uPVC
P(38)	250 mm	12.7 m	7.22%	uPVC
P(39)	250 mm	20.7 m	6.51%	uPVC
P(40)	250 mm	21.0 m	5.40%	uPVC
P(41)	250 mm	17.7 m	3.47%	uPVC
P(42)(0)	250 mm	17.9 m	2.89%	uPVC
P(43)	250 mm	8.1 m	9.19%	uPVC

NGL
PIPE

SCALES:
Horizontal 1:500
Vertical 1:250

DATUM 0.000



LONGSECTION PROPOSED RISING MAIN 1
FROM 0.000 TO 173.527

LEGEND:
- FIRE HYDRANT/ MARKER
- TREE
- GATE
- LAMP POLE
- WATER METER/ WATER VALVES
- TELEPHONE POLE
- ROCK OUTCROP
- BENCH MARKS
- ELECTRICITY BOX
- EXISTING SEWERLINE
- EXISTING MANHOLE
- EXISTING MANHOLE
- STORMWATER
- PROPOSED RISING PIPELINE
- SERVITUDE 4m WIDE
- EMERGENCY STORAGE TANK

FOR DISCUSSION

REVISIONS				
0B	07-07-2023	FOR DISCUSSION	WA	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	T CRONJE
CHECKED	J HOUGH
DRAWN	M GQWETHA
CHECKED	W ANNANDALE

SIGNED
SMEC South Africa
DATE

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SIGNED
George Municipality
DATE

Upgrading of Herolds Bay Pumpstation

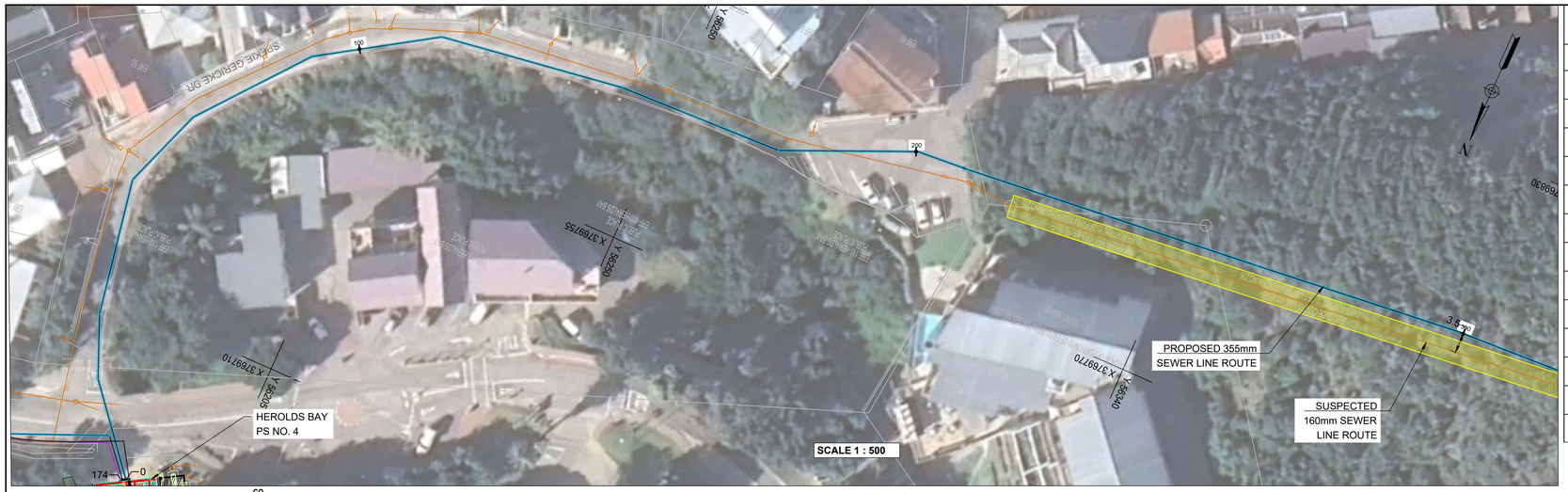
Sewer Rising Main From Herolds Bay PS No. 1 to Herolds Bay PS No. 4 SV 0 to SV 171

SIZE	SCALE
A1	AS SHOWN

PROJECT DRAWING NUMBER
C1936 - 520 - 001

REV	SHEET No.
OB	01 OF 05

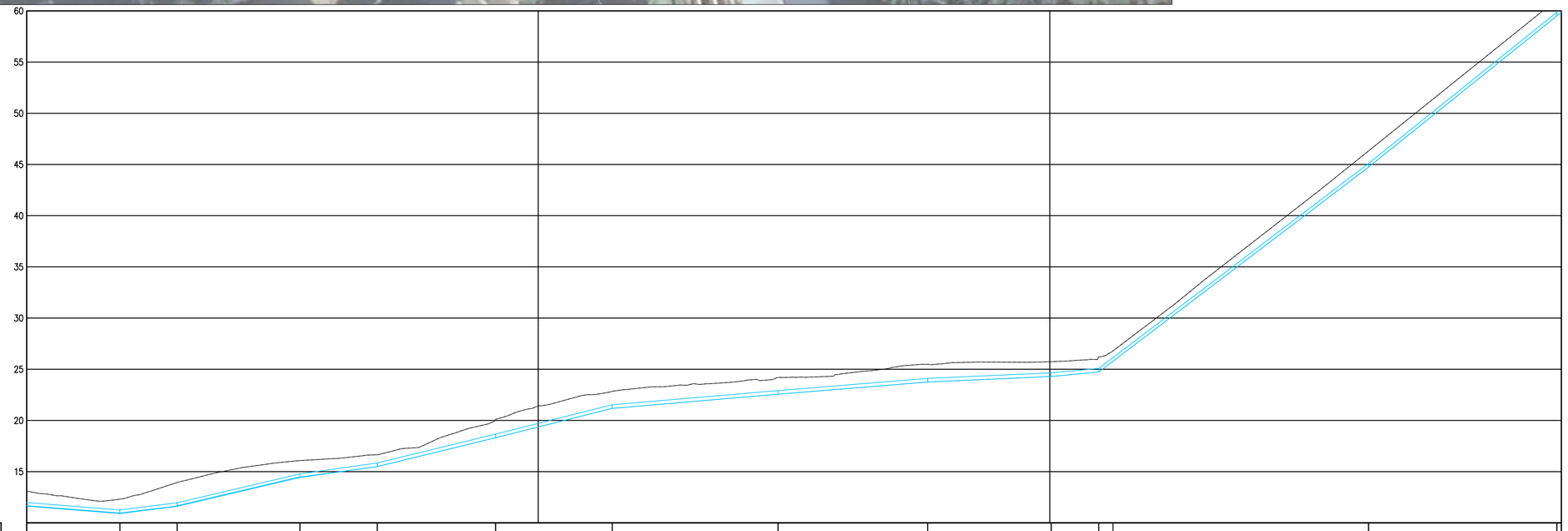
SCALE BAR 1 : 1000
0 10m 25m 50m 100m



SEWER RISING MAIN PIPE TABLE

NAME	SIZE	LENGTH	SLOPE	MATERIAL
P(1)	355 mm	18.2 m	-3.97%	uPVC
P(2)	355 mm	11.2 m	6.26%	uPVC
P(3)	355 mm	24.0 m	11.73%	uPVC
P(4)	355 mm	15.1 m	7.09%	uPVC
P(5)	355 mm	23.1 m	12.18%	uPVC
P(6)	355 mm	22.8 m	12.58%	uPVC
P(7)	355 mm	32.4 m	4.27%	uPVC
P(8)	355 mm	29.3 m	4.07%	uPVC
P(9)	355 mm	24.1 m	2.23%	uPVC
P(10)	355 mm	9.3 m	4.72%	uPVC
P(11)	355 mm	52.7 m	37.95%	uPVC
P(12)	355 mm	36.8 m	40.13%	uPVC
P(13)	355 mm	27.3 m	40.48%	uPVC

NOTE:
1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE ANY WORK IS PUT IN HAND. REFER ANY DISCREPANCIES TO THE ENGINEER.



NGL ——— - ———
PIPE ═══

SCALES:
Horizontal 1:500
Vertical 1:250

DATUM 10.000

REFERENCE	P(1) 355ø CLASS	P(2) 355ø CLASS	P(3) 355ø CLASS	P(4) 355ø CLASS	P(5) 355ø CLASS	P(6) 355ø CLASS	P(7) 355ø CLASS	P(8) 355ø CLASS	P(9) 355ø CLASS	P(10) 355ø CLASS	P(11) 355ø CLASS	P(12) 355ø CLASS	P(13) 355ø CLASS
DISTANCE (m)	0.000 / 18.223	29.409	53.422	68.541	91.645	114.452	146.879	176.137	200.280	209.581	262.293	299.106	326.406
GROUND LEVEL	13.079 / 12.318	13.939	16.078	16.645	20.057	22.851	24.184	25.476	25.736	26.182	46.315	61.000	
PIPE INVERT LEVEL	11.626 / 10.904	10.904 / 11.604	11.604 / 14.420	14.420 / 15.492	15.493 / 18.306	18.306 / 21.175	21.175 / 22.561	22.561 / 23.753	23.753 / 24.291	24.291 / 24.730	24.730 / 44.733	44.733 / 50.506	50.506 / 58.560
DEPTH TO INVERT	1.400 / 1.361	2.238	1.625	1.152	1.751	1.676	1.623	1.723	1.446	1.453	1.582	1.602	
SLOPE / LENGTH	−3.97% −1:25.2 18.22m	6.26% 1:16.0 11.19m	11.73% 1:8.5 24.01m	7.09% 1:14.1 15.12m	12.18% 1:8.2 23.10m	12.58% 1:7.9 22.81m	4.27% 1:23.4 32.43m	4.07% 1:24.5 29.26m	2.23% 1:44.9 24.14m	4.72% 1:21.2 9.30m	37.95% 1:2.6 52.71m	40.13% 1:2.5 36.81m	40.48% 1:2.5 27.35m

LONGSECTION PROPOSED RISING MAIN 2
FROM 0.000 TO 300.000

LEGEND:
- FIRE HYDRANT/ MARKER
- TREE
- GATE
- LAMP POLE
- WATER METER/ WATER VALVES
- TELEPHONE POLE
- ROCK OUTCROP
- BENCH MARKS
- ELECTRICITY BOX
- EXISTING SEWERLINE
- EXISTING MANHOLE
- EXISTING MANHOLE
- STORMWATER
- PROPOSED RISING PIPELINE
- SERVITUDE 4m WIDE

FOR DISCUSSION

REVISIONS				
0B	07-07-2023	FOR DISCUSSION	WA	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	T CRONJE
CHECKED	J HOUGH
DRAWN	M GQWETHA
CHECKED	W ANNANDALE

SIGNED
SMEC South Africa
DATE

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Fax (086) 529 9872

SIGNED
George Municipality
DATE

Upgrading of Herolds Bay Pumpstation

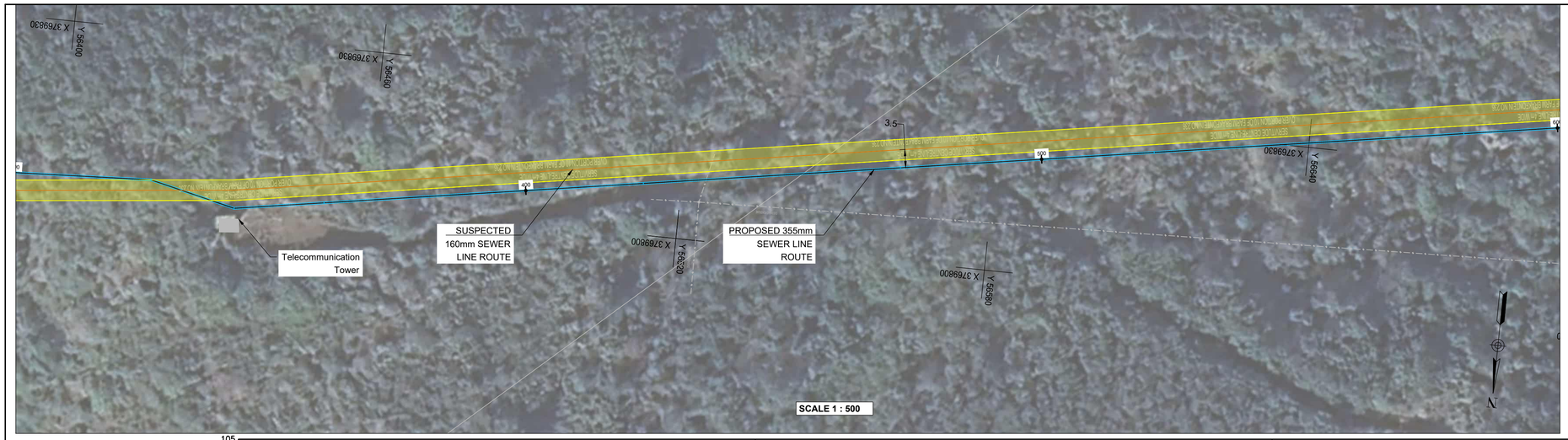
Sewer Rising Main from Herolds Bay PS No. 4 to Existing WWTW SV 0 to SV 300

SIZE	SCALE
A1	AS SHOWN

PROJECT DRAWING NUMBER: C1936 - 520 - 002

REV	SHEET No.
OB	02 OF 05

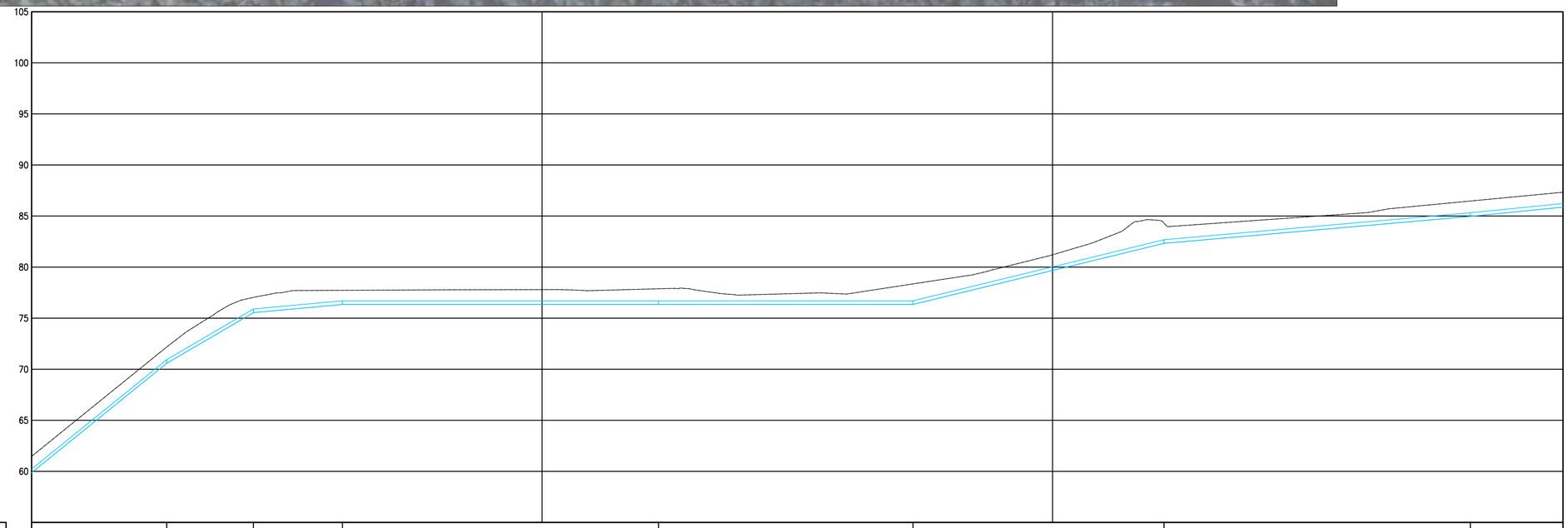
SCALE BAR 1 : 1000
100m 50m 25m 10m 0



NOTE:
1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE ANY WORK IS PUT IN HAND. REFER ANY DISCREPANCIES TO THE ENGINEER.

SEWER RISING MAIN PIPE TABLE

NAME	SIZE	LENGTH	SLOPE	MATERIAL
P(13)	355 mm	27.3 m	40.48%	uPVC
P(14)	355 mm	17.0 m	29.23%	uPVC
P(15)	355 mm	17.4 m	4.57%	uPVC
P(16)	355 mm	61.9 m	0.00%	uPVC
P(17)	355 mm	49.9 m	0.00%	uPVC
P(18)	355 mm	49.2 m	12.17%	uPVC
P(19)	355 mm	60.0 m	4.40%	uPVC
P(20)	355 mm	23.5 m	5.00%	uPVC



NGL — - —
PIPE ═══

SCALES:
Horizontal 1:500
Vertical 1:250

DATUM 55.000

REFERENCE		P(13) 355ø CLASS	P(14) 355ø CLASS	P(15) 355ø CLASS	P(16) 355ø CLASS	P(17) 355ø CLASS	P(18) 355ø CLASS	P(19) 355ø CLASS	P(20) 355ø CLASS
DISTANCE (m)	299.106	326.453	343.446	360.888	422.797	472.653	521.825	581.835	605.350
GROUND LEVEL		72.173	77.036		77.877	78.354	84.314	86.469	
PIPE INVERT LEVEL	59.506	70.576 / 70.576	75.543 / 75.543	76.341 / 76.341	76.341 / 76.341	76.341 / 76.341	82.324 / 82.324	84.965 / 84.965	86.141
DEPTH TO INVERT	1.602	1.597	1.493	1.385	1.536	2.013	1.990	1.504	1.459
SLOPE / LENGTH		40.48% 1:2.5 27.35m	29.23% 1:3.4 16.99m	4.57% 1:21.9 17.44m	0.00% Horizontal 61.91m	0.00% 1:110311.6 49.86m	12.17% 1:8.2 49.17m	4.40% 1:22.7 60.01m	5.00% 1:20.0 23.52m

LONGSECTION PROPOSED RISING MAIN 2
FROM 300.000 TO 600.000

LEGEND:
- FIRE HYDRANT/ MARKER
- TREE
- GATE
- LAMP POLE
- WATER METER/ WATER VALVES
- TELEPHONE POLE
- ROCK OUTCROP
- BENCH MARKS
- ELECTRICITY BOX
- EXISTING SEWERLINE
- EXISTING MANHOLE
- EXISTING MANHOLE
- STORMWATER
- PROPOSED RISING PIPELINE
- SERVITUDE 4m WIDE

FOR DISCUSSION

SCALE BAR 1 : 1000 — 0, 10m, 25m, 50m, 100m

REVISIONS					DESIGNED	T CRONJE
					CHECKED	J HOUGH
					DRAWN	M GQWETHA
0B	07-07-2023	FOR DISCUSSION	WA		CHECKED	W ANNANDALE
NO.	DATE	DESCRIPTION	INITIAL			

SIGNED _____ SMEC South Africa
DATE _____

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website: www.smec.com | Fax (044) 873-5086

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website: www.george.org.za | Fax (086) 529 9872

SIGNED _____ George Municipality
DATE _____

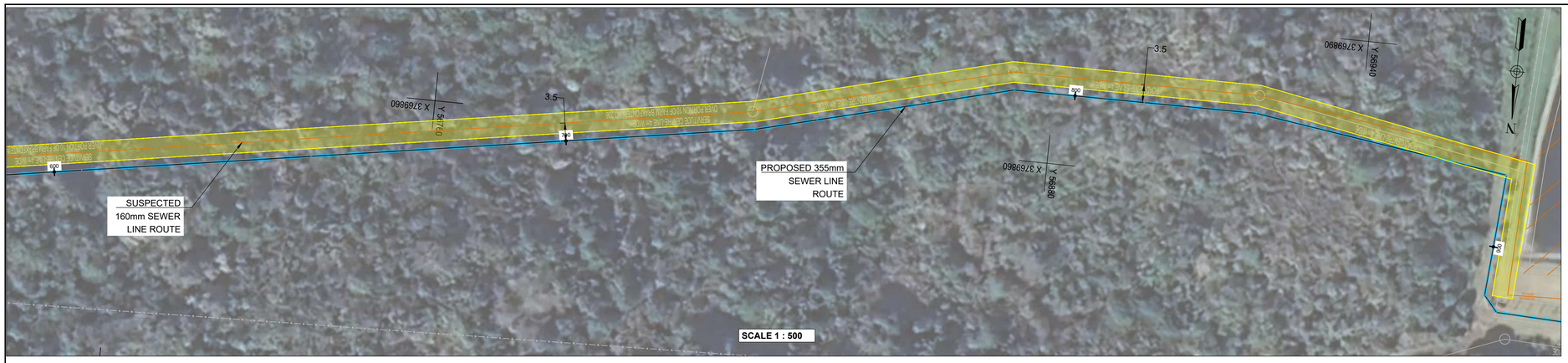
Upgrading of Herolds Bay Pumpstation

Sewer Rising Main from Herolds Bay PS No. 4 to Existing WWTW SV 300 to SV 600

SIZE	SCALE
A1	AS SHOWN

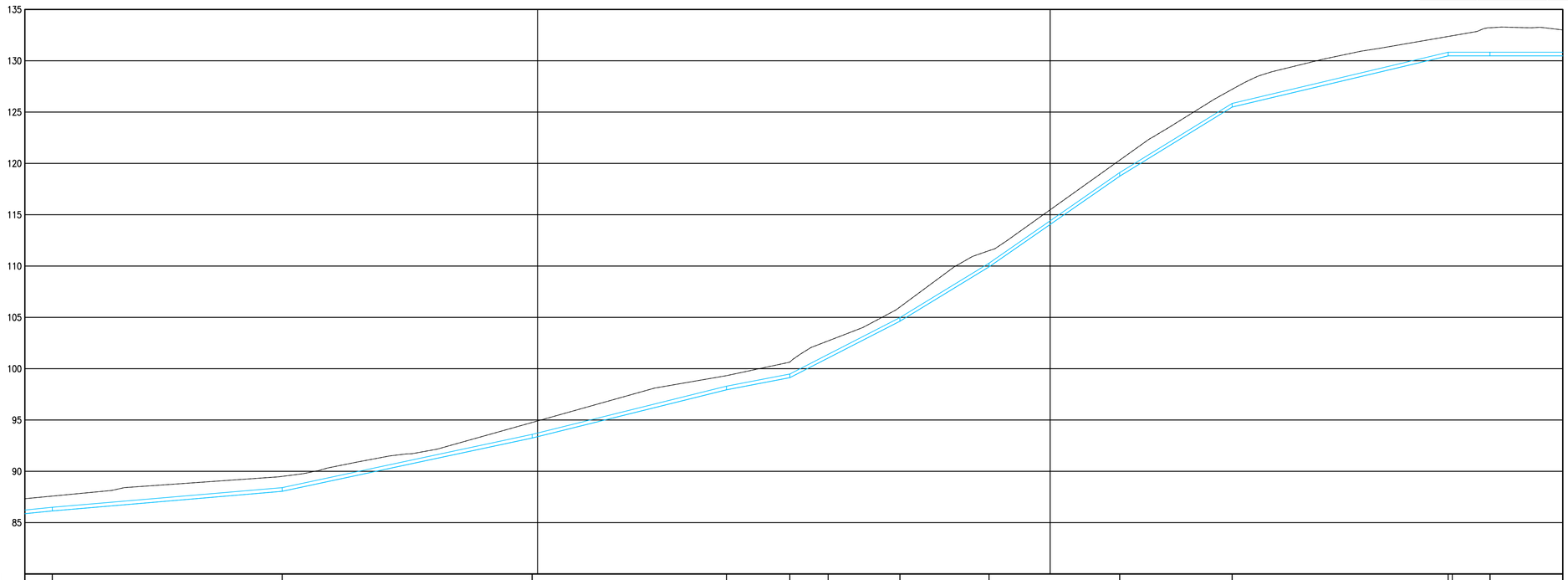
PROJECT DRAWING NUMBER: C1936 - 520 - 003

REV	SHEET No.
OB	03 OF 05



SEWER RISING MAIN PIPE TABLE

NAME	SIZE	LENGTH	SLOPE	MATERIAL
P(20)	355 mm	23.5 m	5.00%	uPVC
P(21)	355 mm	44.8 m	4.26%	uPVC
P(22)	355 mm	48.8 m	10.64%	uPVC
P(23)	355 mm	37.9 m	12.39%	uPVC
P(24)	355 mm	12.4 m	9.60%	uPVC
P(25)	355 mm	21.5 m	25.61%	uPVC
P(26)	355 mm	17.4 m	30.48%	uPVC
P(27)	355 mm	25.5 m	34.64%	uPVC
P(28)	355 mm	21.9 m	30.71%	uPVC
P(29)	355 mm	42.1 m	11.84%	uPVC
P(30)	355 mm	8.2 m	0.00%	uPVC



NGL ——— – ———
PIPE ═══

SCALES:
Horizontal 1:500
Vertical 1:250

DATUM 80.000

REFERENCE		P(20) 355ø CLASS	P(21) 355ø CLASS	P(22) 355ø CLASS	P(23) 355ø CLASS	P(24) 355ø CLASS	P(25) 355ø CLASS	P(26) 355ø CLASS	P(27) 355ø CLASS	P(28) 355ø CLASS	P(29) 355ø CLASS	P(30) 355ø CLASS	P(31) 355ø CLASS	
DISTANCE (m)	581.835	605.350	650.183	698.946	736.852	749.225	770.691	788.088	813.560	835.501	877.637	885.797	909.576	
GROUND LEVEL		87.655	94.759	99.319	100.648	111.502	127.222	132.369	133.216					
PIPE INVERT LEVEL	84.965 86.14	86.141	88.053 88.053	93.244 93.244	97.939 97.939	99.126 99.126	104.624 104.624	109.926 109.926	118.750 118.750	125.489 125.489	130.479 130.479	130.479 130.479	130.479 130.479	130.479
DEPTH TO INVERT	1.459	1.445	1.454	1.516	1.381	1.521	1.384	1.576	1.565	1.733	1.890	2.737	2.525	
SLOPE / LENGTH		5.00% 1:20.0 23.52m	4.26% 1:23.4 44.83m	10.64% 1:9.4 48.76m	12.39% 1:8.1 37.91m	9.60% 1:10.4 12.37m	25.61% 1:3.9 21.47m	30.48% 1:3.3 17.40m	34.64% 1:2.9 25.47m	30.71% 1:3.3 21.94m	11.84% 1:8.4 42.14m	0.00% Horizontal 8.16m	0.00% Horizontal 23.78m	

LONGSECTION PROPOSED RISING MAIN 2
FROM 600.000 TO 900.000

LEGEND:

- FIRE HYDRANT/ MARKER
- TREE
- GATE
- LAMP POLE
- WATER METER/ WATER VALVES
- TELEPHONE POLE
- ROCK OUTCROP
- BENCH MARKS
- ELECTRICITY BOX
- EXISTING SEWERLINE
- EXISTING MANHOLE
- EXISTING MANHOLE
- STORMWATER
- PROPOSED RISING PIPELINE
- SERVITUDE 4m WIDE
- EMERGENCY STORAGE TANK

NOTE:
1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE ANY WORK IS PUT IN HAND. REFER ANY DISCREPANCIES TO THE ENGINEER.

FOR DISCUSSION

REVISIONS						
				DESIGNED	T CRONJE	
				CHECKED	J HOUGH	
0B	07-07-2023	FOR DISCUSSION	WA	DRAWN	M GQWETHA	
NO.	DATE	DESCRIPTION	INITIAL	CHECKED	W ANNANDALE	

SIGNED _____
SMEC South Africa
DATE _____

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website: www.smec.com Fax (044) 873-5086

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e-mail: civilinfo@george.org.za Tel (044) 801 9496
website: www.george.org.za Fax (086) 529 9872

SIGNED _____
George Municipality
DATE _____

Upgrading of Herolds Bay Pumpstation

Sewer Rising Main from Herolds Bay PS No. 4 to Existing WWTW SV 600 to SV 900

SIZE	SCALE
A1	AS SHOWN

PROJECT DRAWING NUMBER: C1936 - 520 - 004

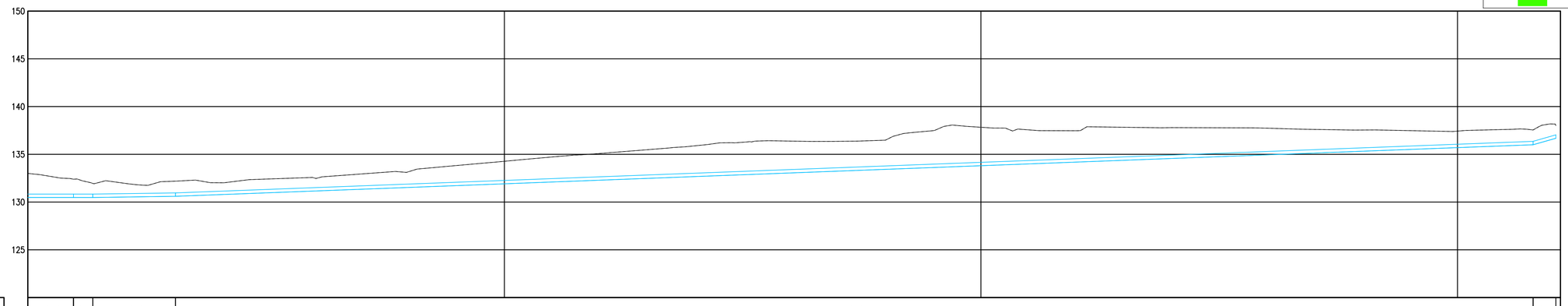
REV	SHEET No.
OB	04 OF 05

SCALE BAR 1 : 1000
0 10m 25m 50m 100m

SEWER RISING MAIN PIPE TABLE

NAME	SIZE	LENGTH	SLOPE	MATERIAL
P(31)	355 mm	23.8 m	0.00%	uPVC
P(32)	355 mm	4.1 m	-0.01%	uPVC
P(33)	355 mm	17.3 m	0.71%	uPVC
P(34)	355 mm	284.9 m	1.90%	uPVC
P(37)	355 mm	4.8 m	14.25%	uPVC

LEGEND:
- FIRE HYDRANT/ MARKER
- TREE
- GATE
- LAMP POLE
- WATER METER/ WATER VALVES
- TELEPHONE POLE
- ROCK OUTCROP
- BENCH MARKS
- ELECTRICITY BOX
- EXISTING SEWERLINE
- EXISTING MANHOLE
- EXISTING MANHOLE
- STORMWATER
- PROPOSED RISING PIPELINE
- SERVITUDE 4m WIDE
- EMERGENCY STORAGE TANK



REFERENCE		P(31) 355ø CLASS	P(32) 355ø CLASS	P(33) 355ø CLASS	P(34) 355ø CLASS	P(37) 355ø CLASS
DISTANCE (m)	885.797	909.576	913.631	930.977	1215.858	1220.646
GROUND LEVEL		132.394	131.941	132.186	137.548	138.017
PIPE INVERT LEVEL	130.479	130.479 / 130.479	130.479 / 130.479	130.479	130.601 / 130.601	136.001 / 136.684
DEPTH TO INVERT	2.525	1.915	1.470	1.585	1.547	1.343
SLOPE / LENGTH		0.00% Horizontal 23.78m	-0.01% 1:1333.0 4.06m	0.71% 1:141.1 17.31m	1.90% 1:52.8 284.88m	14.25% 1:7.0 4.79m

LONGSECTION PROPOSED RISING MAIN 2
FROM 900.000 TO 1221.608

NOTE:
1. ALL DIMENSIONS TO BE CHECKED ON SITE BEFORE ANY WORK IS PUT IN HAND. REFER ANY DISCREPANCIES TO THE ENGINEER.

FOR DISCUSSION

REVISIONS				
0B	07-07-2023	FOR DISCUSSION	WA
NO.	DATE	DESCRIPTION	INITIAL

DESIGNED	B BARTLETT
CHECKED	J HOUGH
DRAWN	M GQWETHA
CHECKED	W ANNANDALE

SIGNED _____ SMEC South Africa
DATE _____

smec an SMEC company
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e-mail: george@smec.com Tel (044) 873-5029
website: www.smec.com Fax (044) 873-5086

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PO Box 19 George 6530 | c/o York & Market Street George 6530
e-mail: civilinfo@george.org.za Tel (044) 801 9496
website: www.george.org.za Fax (086) 529 9872

SIGNED _____ George Municipality
DATE _____

Upgrading of Herolds Bay Pumpstation

Sewer Rising Main From Herolds Bay PS No. 4 to Exisiting WWTW SV 900 to SV 1227

SIZE	SCALE
A1	AS SHOWN

PROJECT DRAWING NUMBER: C1936 - 520 - 005

REV	SHEET No.
AB	05 OF 05

SCALE BAR: 0, 10m, 25m, 50m, 100m — 1 : 1000

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