DRAFT PRELIMINARY DESIGN REPORT

Upgrading of Airport Bulk Water Pipeline, George

Prepared for: George Municipality
11 November 2024
Client Reference No. T/ING/010/2020

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1. Introduction

1.1 Background

The George Municipality appointed SMEC South Africa for Project Number 12 (work package 1), the Extension of the Airport Pipeline under the Multi-Year Professional Services Contract (Tender No. T/ING/010/2020) appointment. This appointment included upgrading a portion of the existing bulk water pipeline along the R102. This pipeline portion starts approximately 150m east of the George Landfill Site entrance and extends to the intersection of the R404/R102 at the George Airport.

The work package is divided into two phases: one named the Groeneweide Park Bulk Water Pipeline and the other called the Airport Bulk Water Pipeline. This Concept and Viability Report specifically pertains to the Airport Bulk Water Pipeline. The construction of the Groeneweide Park Water Pipeline was completed in September 2024.

1.2 Objectives of this report

This Concept and Viability Report aims to present a conceptual design and high-level cost estimates for the George Municipality for this project. The report is based on conclusions and recommendations from previously prepared documents (which are discussed later in this report), outcomes from various meetings and discussions with the George Municipality and other consultants, as well as detailed site investigations and visual inspections that have been conducted. These findings will serve as the foundation for the design development.

1.3 Location

The project is located within the George Municipality, and this phase called the Airport Bulk Water Pipeline, starts at the Gwaing River Bridge and extends to the intersection of the R404 & R102 at the George Airport. **Figure 1-1** below, indicate the location of the project.

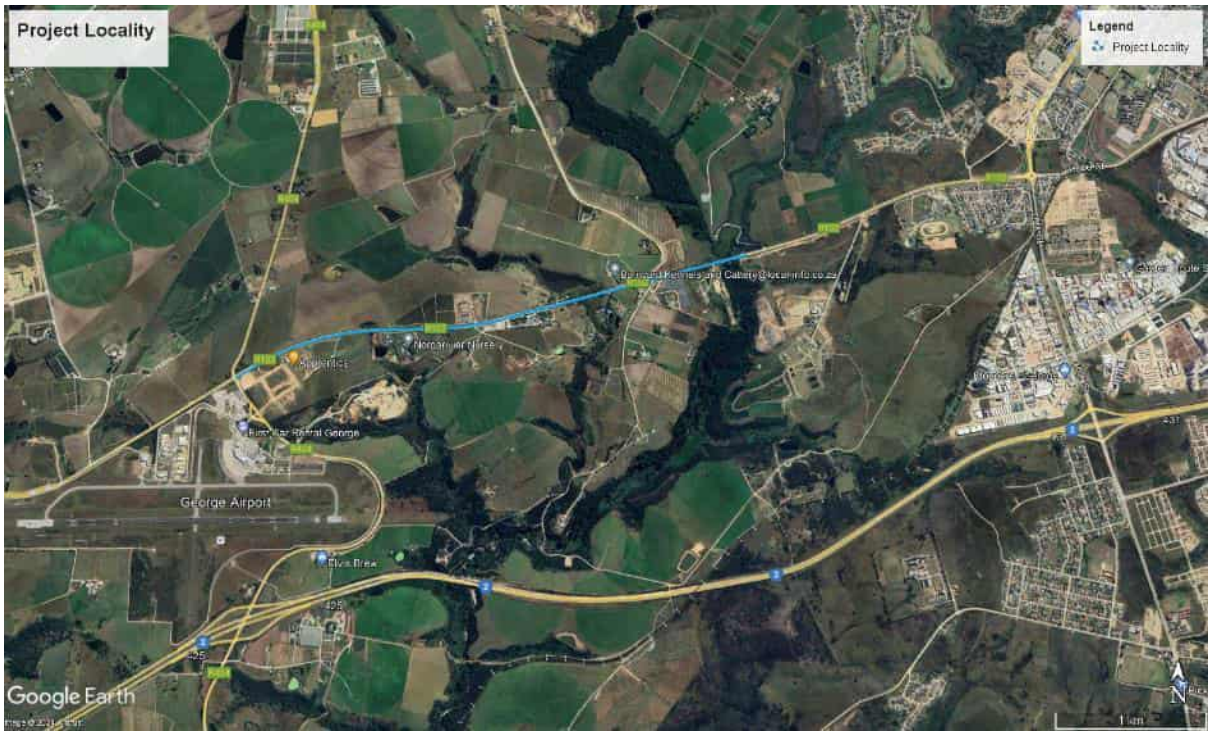


Figure 1-1: Project Locality

The Airport Bulk Water Pipeline will start and connect to the new scour valve chamber constructed under the Groeneweide Park Bulk Water Pipeline, east of the Gwaing River on the southern side of the R102. The new pipeline will be positioned to follow the best suitable route along the road reserve of the R102 and connect to the existing pipe network at the R102/R404 intersection near George Airport.

The extent of the Airport Bulk Water Pipeline along the R102 is shown in Figure 1-2.

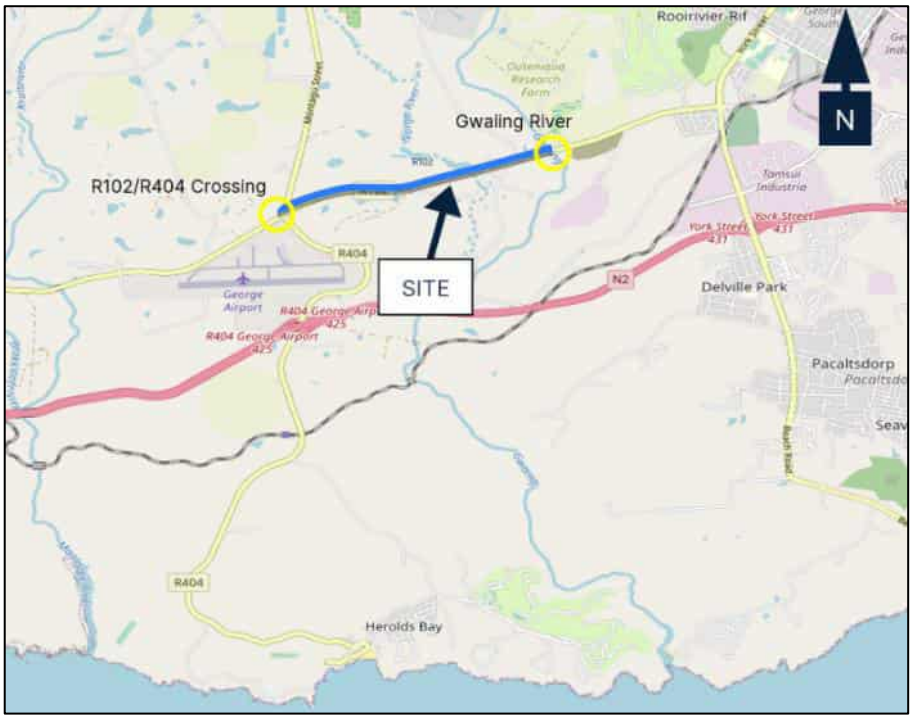


Figure 1-2: Airport Bulk Water Pipeline Location

1.4 Scope of Work

The existing 200mmØ AC water pipeline to the George Airport and Herold's Bay is past its design lifespan and often bursts, leading to frequent disruption and costly maintenance and repair works. Additionally, the growing demand along the R102 route has prompted the George Municipality to upgrade this main pipeline. The upgrade will span approximately 3.8km and ensure an adequate and reliable water supply for current properties and future developments along the pipeline route. This upgrade aims to provide sufficient water supply to developments along the R102 eastwards towards the N2 and future developments towards Herold's Bay, Oubaai, and the Airport Precinct.

1.4.1 Employer's Objective

The George Municipality has the following objectives:

- Rely on professional engineering services for the design and management of the project.
- Appoint a suitable Contractor for the construction phase.
- Address all the planning aspects needed for the project outcomes, including environmental authorization, water use licence applications (WULA), route survey, material investigations, and approvals from relevant authorities by Wayleave Applications.
- Proper project management and project control are needed to ensure that the Council is informed at all times about the progress of the project.
- Deliver public services infrastructure using labour-intensive construction methods wherever technically feasible and economically viable.

- Comply with all the requirements of the statutory, legislative, and regulatory framework governing local government infrastructure provision.
- Comply with all funding conditions.

1.4.2 Professional Services

The Scope of Services entails the full 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), and includes the following:

- Stage 1: Inception (completed under Groeneweide Park Pipeline project)
- Stage 2: Concept and Viability (This Report)
- Stage 3: Design Development
- Stage 4: Contract Documentation and Procurement
- Stage 5: Contract Administration
- Stage 6: Close-out

1.4.3 Construction Scope of Work

The work envisaged during construction to upgrade the existing 3.8km Airport Bulk Water Pipeline along R102 includes the following:

- Installation of a 400mm diameter pipeline for approximately 660m, including a 78m river/bridge crossing
- Installation of a 315mm diameter pipeline for approximately 2240m, including a 30m culvert crossing.
- Installation of a 250mm diameter line for approximately 790m.
- Install air, scour, and isolation valves on the new bulk pipeline.
- Install new connection tee-off points for future use.
- Install new connection tee-off points to existing properties and water meters.
- Construction of reinforced concrete chamber to house, scour, and air valves.
- Ensuring the existing water main remains operational for the duration of the construction of the new pipeline.
- Install all road crossings using horizontal directional drilling (HDD).
- Repairing and reinstating existing infrastructure that will be affected or damaged during construction.

2. Status Quo

2.1 Existing Pipeline System

The existing bulk water system along the R102 is the only potable water supply to the surrounding farms, private property, the airport, and the greater Herold's Bay area. The pipeline starts at the York Street/R102 roundabout and extends to the George Airport and the Herold's Bay area. The George Municipality appointed GLS Consulting to manage and update the Masterplan model to analyze and provide hydraulic information for all bulk service upgrades.

Data was obtained from the IMQS model of George Municipality. The existing pipeline along R102 is a 200 mm diameter asbestos cement pipe constructed in 1975. The section crossing R404 features a 315 mm diameter HDPE pipeline installed in 2004, while the segment parallel to R404 heading towards Herold's Bay is a 250 mm diameter pipeline constructed in 2004.

A 700m portion of the bulk water pipeline, adjacent to Groeneweide Park and the George Showgrounds, was previously upgraded to a 400mm diameter UPVC pipe and is positioned on the northern side of the R102 from the York Street/R102 roundabout to the George Showgrounds entrance.

As mentioned earlier in the report, construction to phase 1 of SMEC's appointment was completed in September 2024. This phase included completing an additional 1108-meter section under the Groeneweide Park Water Pipeline project. A 400mm diameter PVC-O pipeline was installed as part of this project.

Refer to **Figure 2-1** below for details on the existing pipeline.

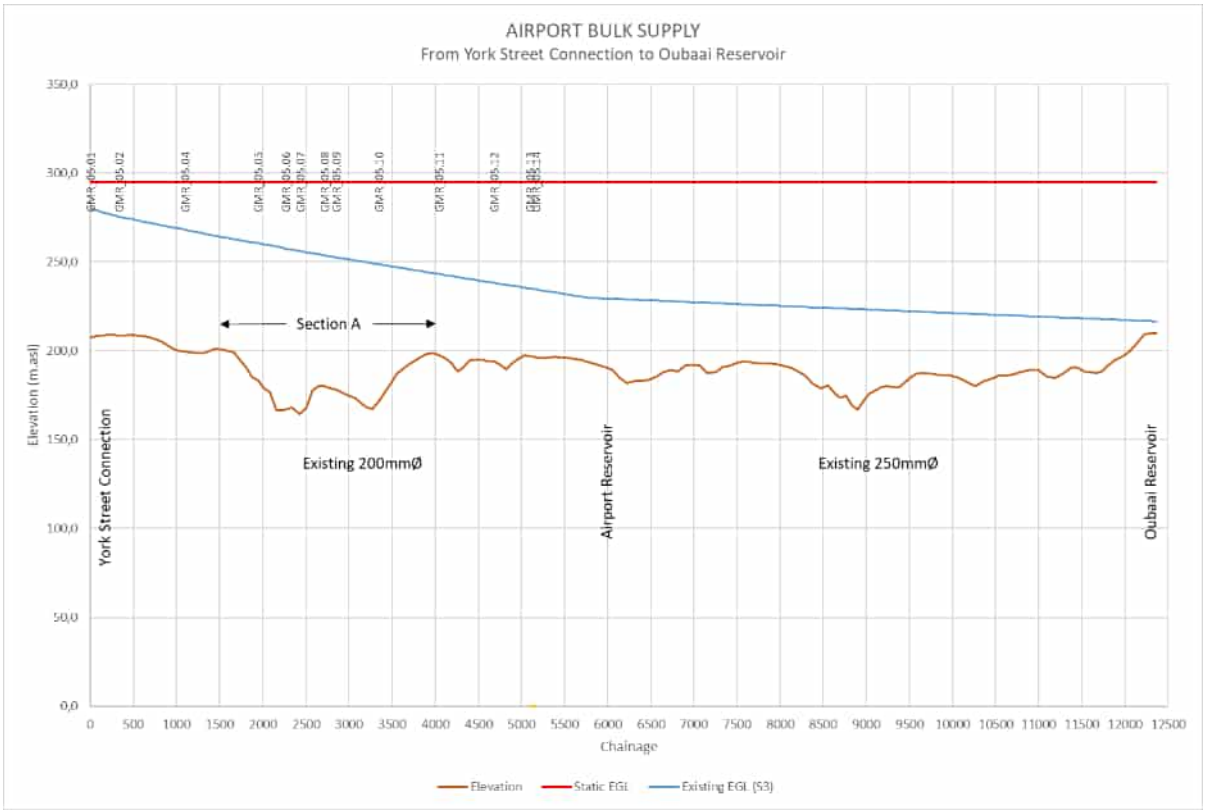


Figure 2-1: Existing 200/250mm diameter pipeline

3. Site Investigations

3.1 Topographical Survey

CDJ Land Surveyors was appointed to carry out a topographical survey. The final survey data was received on 18 July 2022. The survey provided all visible existing features in the area and the existing cadastral information along the proposed pipeline route. The survey will form the basis for the alignments and the detailed designs.
The results of the topographical survey showed:

- At the start of construction (connecting to the new scour chamber from the previous project), the R102 crosses a river (Gwaing River). All existing services are mounted to the northern side of the existing bridge. The bridge is approximately 78 m long.
- Contours indicate steep slopes to either side of the road for a 440 m portion after the bridge, from where it flattens towards the intersection at the Outeniqua Palms Nursery (Cape Garden George).
- From Farm Nr. 115/208, up to the entrance of Norga Nursery, there is a steep embankment sloping up on the southern side of the R102, with an existing dam and a gravel road along the dam's crest.
- From the Norga Nursery up to the end of the pipe route, the terrain is a relatively even grass area with two horizontal curves in the road.
- There is an embankment sloping down towards a small farm dam on the southern side of the R102 on Farm Nr: RE/102/208
- several stormwater culverts are going underneath the R102.
- Approximately 340 m to the east of the entrance of George Garden Centre, there is a bridge, approximately 30m long.
- Along the road, several existing services were identified, including stormwater concrete channels, signboards, light poles, manholes and electrical poles

The existing road width is approximately 10 m. There are several entrances along this route. The road reserve is approximately 30m wide but varies along the road. Each side of the road is covered with vegetation up to and beyond the fence line.

3.2 Visual Assessment

SMEC conducted a site inspection to identify potential routes for the new pipeline. The existing pipeline is visible at the Gwaing River bridge and the culvert. **Figure 3-1** Indicate the pipeline mounted on the bridge's north side crossing the Gwaing River. The existing pipeline is visible on the southern side of the culvert crossing at kilometre 24 275.

Figure 3-1: Bridge Crossing

Figure 3-2: Culvert Crossing

During this site visit, fiber manholes and cables were observed on the northern side of the R102 at the Gwaing River bridge. This indicated that there is possibly a lot of fiber running along the northern fence line, which was confirmed by the existing services information that was obtained. Refer to Figure 3-4 for fiber manhole.

Figure 3-4: Fibre Manhole

Figure 3-3: Existing Sewer Pipeline

The chamber in **Figure 3-3** was observed along the southern fence line and form part of the sewer rising main.

Figure 3-5: Property access

Figure 3-5 show a concrete entrance road, access gates, and walls constructed after the topographical survey. The pipeline will cross the concrete driveway, and this will be incorporated into designs.

The current bulk water main is the sole source of potable municipal water along the R102. All properties are equipped with metered connections. However, the George Municipality did not have records detailing the location or size of these property connections. To address this issue, a site inspection was scheduled for 28 February 2024, during which the Municipality pointed out all the meters to SMEC South Africa. All the existing metered connections are indicated on the drawings attached as **Appendix B.**

3.3 Ground Penetrating Radar Survey

If the pipeline is to be installed within the road reserve, the proposed pipe route is limited to a 1-meter corridor from the fence line along the provincial roads. This narrow space may pose challenges due to existing services. SMEC has gathered existing service layouts from service providers and local authority departments identified during the project's initial stages. However, this information only confirms the presence or absence of services and does not provide specific locations or depths.

The Municipality has approved hiring a service provider to conduct a ground-penetrating radar survey in areas identified by engineers, which will assist in identifying the exact location and depth of the service. SMEC appointed UDS Surveyors to perform the ground-penetrating radar survey on a quotation basis. The survey data was received on Tuesda29 September 2023.

Various utilities and services were located within the limits of the area:

- Electrical line
- Stormwater line
- Sewer line
- Water line
- Unknown services
- Fiber band

A drawing of the survey was received, showing the detected underground services, and is attached as **Appendix A.**

The results of the survey indicated the following:

- There are numerous fiber bands running parallel to the fence on the northern side of R102 along the entire route from the Gwaing River bridge to the R404 intersection. The distance from the fence varies from 0 meters to 2.75 meters.
- Several stormwater culverts are present along R102, with stormwater pipes from the adjacent farms connecting to these culverts. Additionally, stormwater culverts are located at most road and property entrances that connect to R102.
- A sewer line was detected on the northern side of R102, approximately 90 meters east of Gwaing Road. It crosses R102 just east of the Gwaing Road intersection at a depth of 1.2 meters from the top of the pipe. From that point, the sewer line runs parallel to the fence within a 500-meter offset, extending all the way to the R404 intersection. This sewer line includes various manholes and chamber structures.
- An unidentified service was found running parallel to the sewer line south of R102. It is assumed to be an existing 200 mm AC-D water pipe and is located approximately 2.5 meters away from the sewer line.

The design of the new water bulk pipeline needs to avoid any clashes with these existing services, which limits the available space within the road reserve for the proposed new pipeline.

3.4 Material Investigation

There was no material information available for the area in consideration. A request for quotations was sent to service providers and presented to the Municipality for acceptance to perform the material investigations for the proposed pipe route of the Groeneweide Park Bulk Water project. SMEC appointed Roadlab Laboratories (PTY) Ltd on a quotation basis to carry out the material investigation.
The results were received on Monday 18 September 2023 and was not included in the Detailed Design Report of the Groeneweide Park Bulk Water project, as it was already received after submitting the report. Since the entire area of the pipeline route has the same geology classification (Cape Granite Suite) the soil conditions can be assumed to be similar as found in the previous project for the purpose of Concept and Viability Design. The material investigation was taken for the first five test pits shown in Figure 3-6.
The objectives of the material investigation were to determine the soil conditions for the design and construction of the new water pipeline and the suitability of the material to be used for bedding or backfilling. The tests will also show the excitability of the material and the groundwater conditions.

The scope of the material investigation entailed the following:

- Material sampling and investigation
- Dynamic Probe Light penetration test
- Laboratory testing and reporting

Figure 3-6: Test Pit Positions

The cover depth of the water pipe will vary from approximately 1.2 m to 3 m below the natural ground surface. The test pits were excavated up to 3 m deep and the DPL tests were done up to a depth of 3 m or refusal. Soft excavations were encountered to an average depth of 3 m.
The results indicate:

- The first 150 mm to 200 mm is classified as topsoil.
- The soil deeper down is slightly moist, dense, predominantly fine to coarse grain sand with traces of silt/clay and the colour varies between brown, light brown and light yellowish brown.
- Test pit two indicated light reddish orange soil at a depth of 1.1 m up to 3m with predominant silt/clay with traces of sand.

The area mainly consists of soft material being classified as either sand, soil, or clayey soil. According to the DPL investigation, the soil is stiff. It was noticed that the side walls in all test pits were stable. Due to the predominant presence of fine-grained soils in the test results of the soil, bedding specifications will be considered from the SANS 1200 LB.
The material found between a depth of 150 mm to 1100 mm indicates G8 and G9 material. The PI of the soil does not exceed 6. The results indicate that the compatibility factor of the soil exceeds 0.4. The material might be suitable as selected fill material but not as selected granular material.
The bearing capacity of the soil between a depth of 1.2 m and 3 m ranges from x kPa to x kPa

3.5 Wayleaves

All visible existing services along the proposed pipe route have been identified through topographical surveys and visual inspections. SMEC also obtained existing service layouts from various service providers and local authority departments. However, the information provided does not guarantee the exact locations of these services; it merely confirms their presence and the existence of infrastructure.

The precise locations of the below-ground services were determined using Ground Penetrating Radar (GPR) surveys when it impacted the design proposals. Any services not detected will be located on-site through hand excavation during construction.

Before starting construction, the Contractor is responsible for obtaining wayleave information from the local authority and other service providers with services in the area. It is anticipated that wayleave information will be required from the following instances:

- George Municipality
- Stormwater infrastructure
- Sewer infrastructure
- Water infrastructure
- Electrical infrastructure
- Traffic department
- Telecommunication Service Providers
- Western Cape Provincial Roads Department
- Eskom
- The proposed pipeline is located along the R102 road reserve of the Western Cape Provincial Road network. The new pipeline must be approved in terms of Western Cape Provincial Road standards and requirements. Wayleave applications will be submitted once the pipe route is finalized.

3.6 Occupational Health and Safety Considerations

The George Municipality has appointed Xaks Consulting as the OH&S Agents to fulfil the duties of the Client in terms of the Occupational Health and Safety Act and Construction Regulations.

The OH&S Agent will be involved in the following stages of the project:

- Form part of the design review to ensure compliance with the OHS Act and Regulations
- Comment on the provision of items for Health and Safety in the Tender Document
- Compile the site-specific Baseline Risk Assessment and Health and Safety Specification for construction as required in the Construction Regulation 2014.
- Approve the Contractor’s H&S Plan.
- Apply for a construction work permit if applicable,
- Perform monthly compliance audits for the duration of the construction phase of the project.
- Perform a close-out audit on completion of the construction contract.

4. Design Concept

4.1 Pipeline Route

The Airport Bulk Water Pipeline is located outside the urban area, and most of the new pipeline will be buried underground. The pipeline route will run parallel to Trunk Road TR 002/9 (R102). Where the pipeline crosses the Gwaing River, it will be placed above ground on the side of the bridge, in the same position as the existing pipe. For the Norga River, the new pipeline will be mounted on top of a culvert, following the same approach as the existing pipe. Refer to **Figure 3-2** for a photo of the existing culvert crossing. However, the new pipeline will not follow the exact route of the existing one; instead, it will be installed on the northern side of the culvert.

The pipe will cross the R102 at various locations, and these crossings will be installed using the trenchless method known as Horizontal Directional Drilling (HDD). The R102 is a Western Cape Provincial Road, and the George Municipality would ideally prefer if the pipeline could be installed within the road reserve to allow for easy access for repairs and maintenance. However, the Western Cape Road Authority indicated they will only allow the pipeline to be installed in a 1-meter corridor next to the fence line within the road reserve.

During the project's initial stages, SMEC obtained drawings of the existing services from relevant service providers and local authorities. However, this information only confirms the presence or absence of services and does not specify their exact locations or depths. An extensive site investigation was conducted to determine if adequate space existed to install the pipeline within the 1-meter corridor. After the data was analyzed from the Ground Penetrating Radar Survey, it was found that services were already installed in the 1m corridor, which made it impossible to install the new pipeline in this location.

After consulting with the George Municipality, a decision was made to install the pipeline, where feasible, outside the road reserve, on private property within the 5-meter building line

During the Concept Design Development, various route options were investigated, and the following drawings route were produced and are attached to this report:

- **Appendix B: Pipeline Layout Drawings.** These drawings indicated the initial pipeline route, the position of all the future connections, the existing connections, potential road crossings, existing services, environmentally sensitive areas, the future planned western bypass road, and the start & end of the pipeline line.
- **Appendix C:** Alternative route options have been developed for the Gwaing Bridge Crossing, the tie-in at the R102/R404, and the culvert crossing, differing from the initial route as indicated on the drawings that are attached as **Appendix B.** During the route determination investigation, specific sections of the route were adjusted due to constraints identified during the assessment.
- **Appendix D: Preferred Route Option**. After consulting with the George Municipality, landowners, and the environmental practitioner, this route was identified as the preferred option, combining the initial and alternative routes.

Before the formal public participation process, which is part of the environmental authorization, the affected landowners were notified about the project on 17 April 2024. Two queries regarding the pipe route were received and reviewed. The preferred pipe route option addresses both queries. A second letter, which responded to the two previous queries, was sent to the landowners on 29 July 2024. The preferred route was also shared with all affected landowners.

4.1.1 Horizontal Alignment

The existing fence defines the road reserve along the R102. The pipe alignment will follow the fence line, and the pipe will be positioned within the 5m building line and run parallel to the fence line on the private property. When directorial changes are required, the following methodology will be followed:

- All road crossings will cross the road at right angles, and by means of HDD.

- The pipeline will be designed to use standard bends of 11.25°, 22.5°, 45°, and 90° for any horizontal direction change.
- To reduce the size of the anker blocks required, 90° bends with a diameter of 315mm and larger will be replaced with 2 x 45° bends.

An unsupported pipeline with flexible couplings or spigot-and-socket joints must be restrained. Therefore, anchor blocks will be constructed at each horizontal bend where there is a change of direction to balance the forces. Each horizontal change of direction will have a point of intersection (PI Point). Details indicating the size, angle, and type of bend will be provided for each PI point and the thrust block design for each specific application. As part of the prelim design stage of the project, diagrammatical details of each PI point are included in **0**. (these diagrammatical details are based on the initial layout drawings)

4.1.2 Vertical Alignment

Bends will not be used to adjust the vertical alignment of the pipeline. Instead, modifications to the pipeline's vertical profile will be accommodated within the pipe's deflection allowance. The excavation depth will also be adjusted to achieve the required vertical change in direction. The pipeline will maintain a minimum cover of 1.2 meters and will not exceed a cover of 2.5 meters at any point along its route.

The vertical profile of the pipeline relies heavily on the ground levels along its route. If the existing ground profile is uneven, bulk earthworks will first be performed to create a more level area before excavating the trench for the pipe.

Valves, air valves, or source chambers that need to be placed on steep vertical slopes will be built on horizontal floors. The pipework within these chambers will be installed horizontally. Any angle between the horizontal plane of the chamber and the pipeline will be accommodated with bends outside the chambers.

Air valves will be installed at all high points or significant changes in grade (negative breaks) along the pipeline route, ensuring they are no more than 700 meters apart.

Scour valves will be installed at low points to facilitate draining the pipeline, enabling the removal of sediment and water in a timely manner during maintenance.

4.1.3 Bridge Crossing

The pipeline route crosses the Gwaing River at approximately station value SV 90 to SV 170. Currently, all existing services, including the bulk water pipeline, are mounted on the northern edge of the bridge. Unfortunately, there is no additional space available on the bridge to accommodate a new pipeline.

Therefore, the only option is to replace the existing bulk water pipeline on the bridge with the new Airport Bulk Water Pipeline. During the construction of the new pipeline, the existing pipeline must remain active. Therefore, a temporary pipeline will have to be installed when the old line is decommissioned and removed from the bridge to make way for the new pipeline. The temporary line must remain active until the new pipeline is installed, tested, and commissioned.

4.1.4 Culvert Crossing

At SV 1230, the R102 crosses the Norga River by means of the culvert. The existing bulk water pipeline crosses the culvert on the southern side, as indicated in **Figure 3-2**. The new pipeline will cross the culvert on the northern side of the road and be positioned on the culvert deck, similar to the existing installation.

4.1.5 Road Crossings

All road crossings will utilize trenchless technology, specifically horizontal directional drilling (HDD). A sleeve will be installed along the entire length of the road reserve, through which the new pipeline (referred to as the product pipe) will be installed. The sleeves and product pipes will be HDPE (high-density polyethylene) and feature butt-welded joints.

4.1.6 Connections

Connections are categorized into existing and future connections. Existing connections supply properties along the R102 from the existing bulk water main. All existing connections are metered, and the meters were pointed out to SMEC South Africa during a site inspection conducted by the George Municipality on 28 February 2024.

Future connections refer to new links designated for upcoming developments. The positions and sizes of all future connections have been provided to SMEC South Africa by GLS and the George Municipality. Both existing and future connections are indicated on the drawings, attached as **Appendix B.** Additionally, diagrammatic details of all these connections are available in the drawings attached as **0.**

All the existing connections will be disconnected from the existing bulk water main and re-connected to the new bulk water main.

4.1.7 Environmental Sensitive Areas

Two environmentally sensitive areas have been identified between SV 2660 to SV 2870 and SV 2210 to 2250. The drawings attached to this report identify these areas. To minimize the disturbance of these two areas during construction, the pipeline will be installed using horizontal directional drilling (HDD).

4.2 Chambers

4.2.1 General

All air valves, scour valves, in-line valves, and tee-off valves will be housed in reinforced concrete chambers. These chambers will be positioned along the proposed alignment of the new pipeline, which runs within the boundary fences of the properties. The chambers will be constructed within a 5-meter building line from the fence. Locating the chambers within property boundaries provides an additional layer of security against theft. However, this arrangement means that access to these chambers for inspections and maintenance by the George Municipality or any appointed service providers will need to be requested from the landowners.

Each chamber will feature a precast cover slab with lifting hooks installed to facilitate easy access for maintenance or replacement of large fittings. The floor and walls of the chamber will be cast in situ, with reinforcement designed according to the structural engineer's specifications. Ladders fixed to the interior of the chamber will be made from glass-reinforced plastic (GRP), a material known for its strength and weather resistance, ensuring minimal maintenance and a long service life. The George Municipality has indicated that they do not use a “Bluetooth” locking mechanism for these chambers. Therefore, it is recommended that the covers be lockable, and a flat steel bar locking system is proposed.

Flexible flanged adapters will be used between fittings for easy installation and removal. SikaSwell S2 will be installed between the floor and chamber walls, as these components will be cast separately to prevent groundwater from entering the chamber. All chambers will be constructed so that the top level of the roof slab sits 300mm above the natural ground level.

4.2.2 Valve Chambers

The proposed isolating valve chamber houses an isolating valve along with a flexible flange adapter. If needed, a reducing fitting can be incorporated by designing the thrust pipe on the inflow end of the chamber as a reducing fitting, with a thrust flange welded on. This design allows for a flexible flange adapter to facilitate the easy fitting and removal of the valve. Please refer to the figure below for a typical detail.

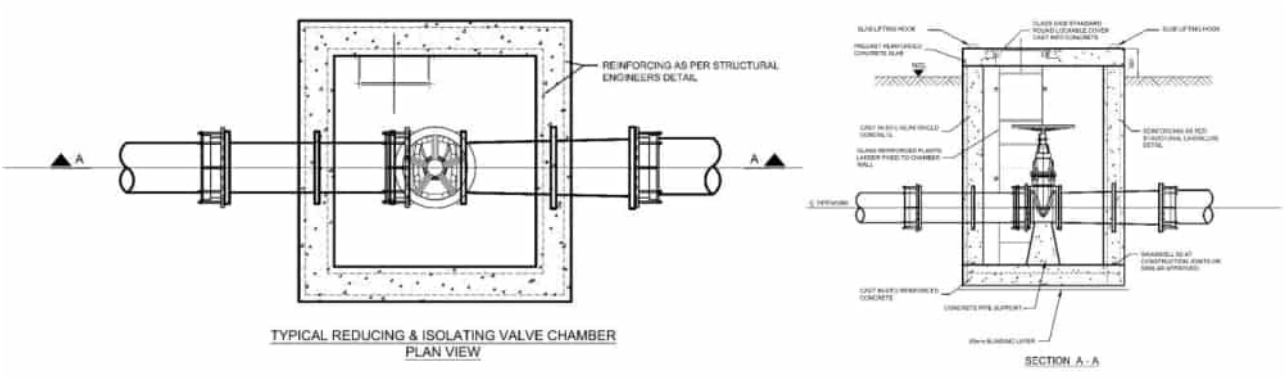


Figure 4-2: Typical detail of Valve Chamber

4.2.3 Scour Valve Chambers

The proposed scour valve chamber will feature an unequal tee fitting and an isolating valve. To facilitate easy installation and removal of the fittings, two flexible flange adapters will be included within the chamber. The chamber will also incorporate a drainpipe and a scour pipe, which will be embedded into the chamber walls. The locations of these pipes will vary based on the surrounding topography. The scour pipe may discharge either through a headwall or into existing infrastructure. A typical detail of the scour chamber can be seen in the figure below.

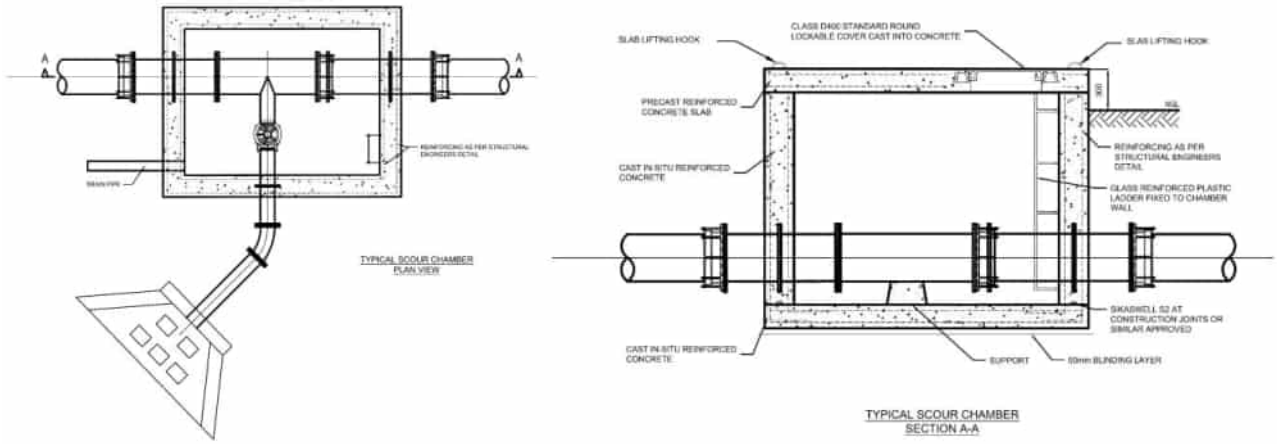


Figure 4-3: Typical detail of Scour Chamber

4.2.4 Air valve Chambers

The proposed air valve chamber is designed with a sump and a drainpipe, with the position of the drainpipe being determined by the surrounding topography. A tee piece will be used to connect the air valve and the gate valve to the main water line. To ensure efficient operation of the air valve, a vented manhole cover is specified for this chamber. The figure below illustrates a typical detail of the air valve chamber.

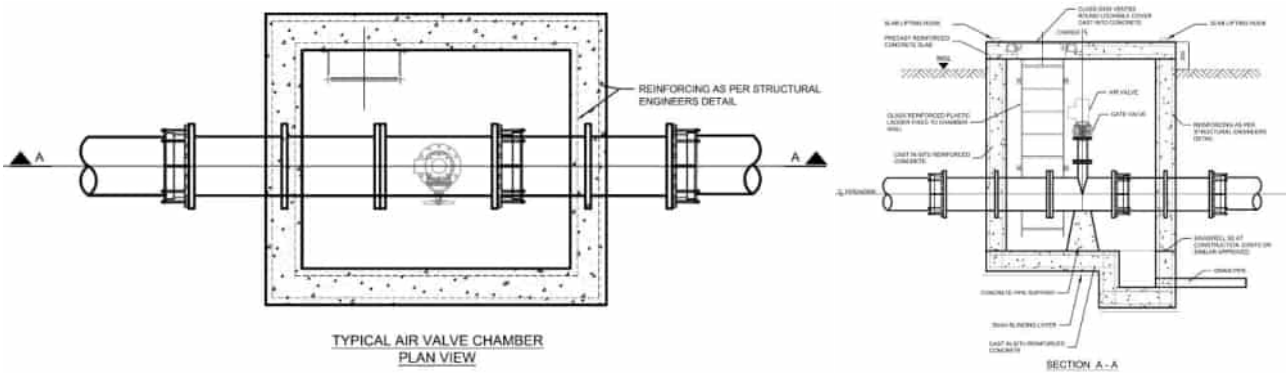


Figure 4-4: Typical detail of Air Valve Chamber

4.2.5 T-off Chambers

The proposed Tee-off chamber houses an isolating valve and a tee piece. The tee piece can be either equal or unequal, depending on the requirements for the junction. Additionally, two flexible flanged adaptors are included within the chamber's interior to facilitate the easy installation and removal of fittings. A typical example of a tee off chamber is illustrated in the figure below.

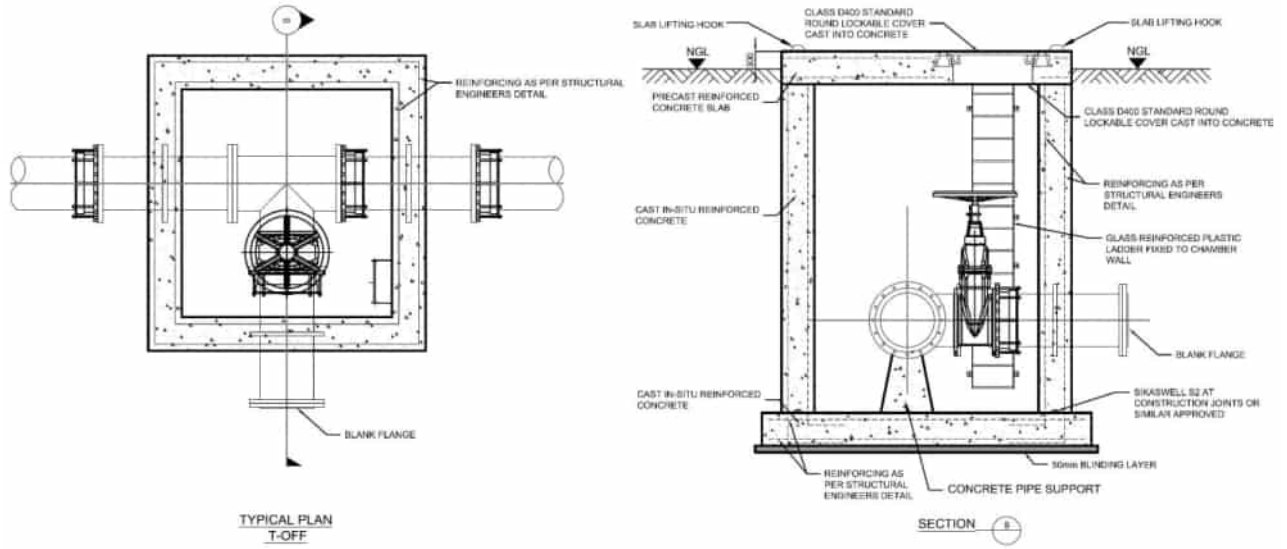


Figure 4-5: Typical detail of a T-off Chamber

4.3 Associated Infrastructure

4.3.1.1 Earthworks

4.3.1.2 Thrust Blocks

The purpose of the thrust block is to support the bend and stop the pipe joints 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 direction being smaller than 10 degrees, but several thrust blocks are needed to support the pipe along changes in the horizontal 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.

For horizontal bends the following formulas applies:

- Calculating the thrust force on the pipe bend by using formula: $T = 2PA \sin\left(\frac{\theta}{2}\right)$
- Obtaining the allowable bearing capacity (qal)
- Calculating the area required of the thrust block to withstand the force by using formula: $A_T = \frac{T}{q_{all}}$

For T-connection bends the following formulas applies:

- Calculating the thrust force on the pipe bend by using formula: $T = Pa$, where a is the cross-section area of the pipe from where the water flows into the T-connection
- Obtaining the allowable bearing capacity (qal)
- Calculating the area required of the thrust block to withstand the force by using formula: $A_T = \frac{T}{q_{all}}$

The pressure ($P = \rho gh$) in the pipe is calculated with a pressure head at the specific position and the density of water is taken as ρ=1000kg/m^3. A safety factor of 2 is applied throughout the network. 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 Tee's.

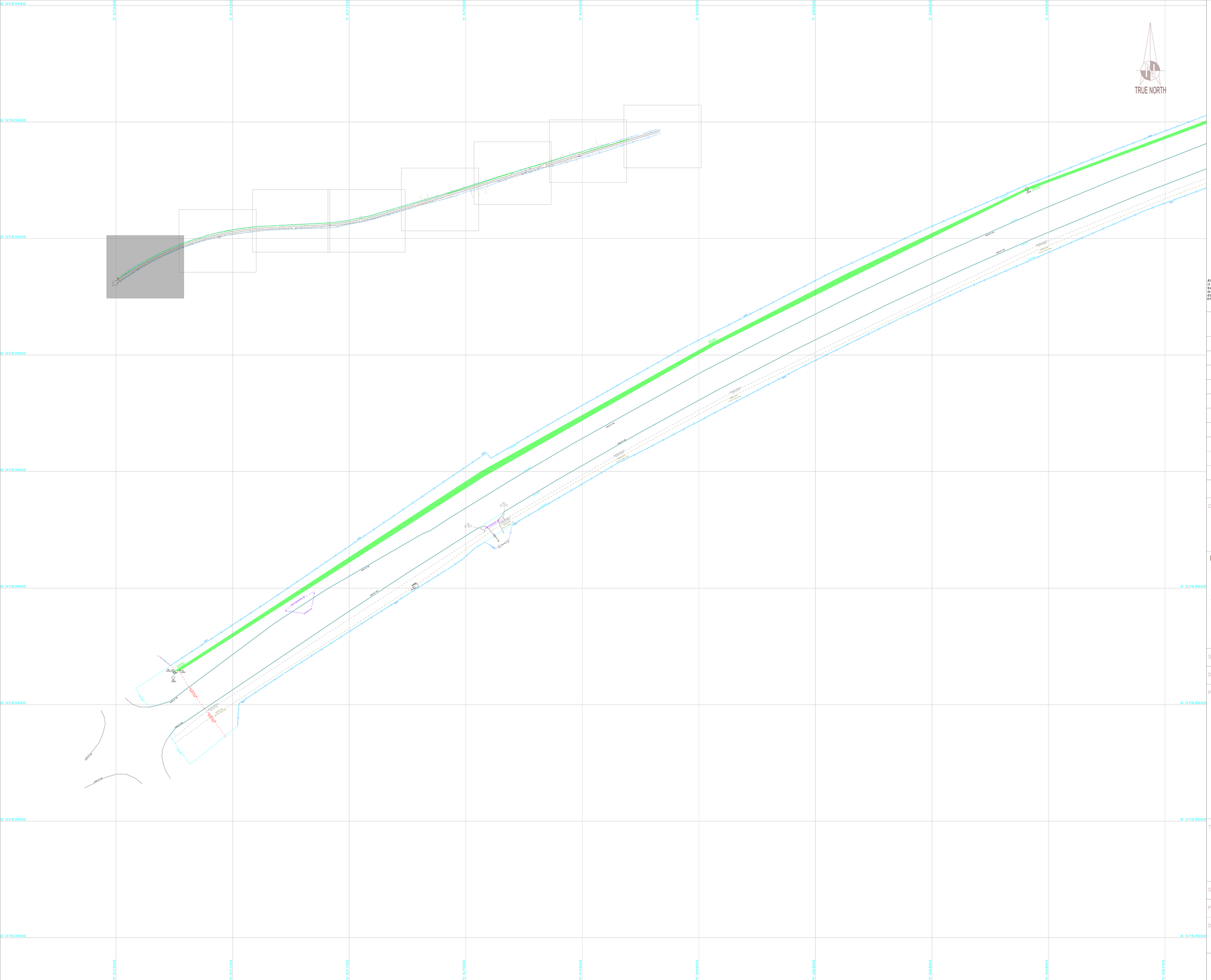
4.3.1.3 Erf Connection Metering

The location of the existing water meters for current users connected to the existing bulk water line will not change, and the meters will not be replaced. The meters are functioning properly, and their positions are known to both the George municipality and the landowners. This approach also avoids the need for any modifications to the pipe infrastructure supplying water to these users.

4.3.1.4 Bulk Metering

There was no instruction from the George Municipality to install any bulk meters on this phase of the project.

Appendix A UDS GRP Survey of Existing Services



LEGEND:

- FIRE HYDRANT
- TREE
- GATE
- LAMP POLE
- WATER METER

LINE TYPE

- ELECTRICAL
- SEWER
- STORM WATER
- TELECOMMUNICATIONS
- WATER PIPELINE
- UNKNOWN SERVICE
- BUILDING
- ROAD KERB

NOTES:

A. PIPES DIAMETER UNKNOWN UNLESS SPECIFIED.

B. THE DEPTH OF THE UTILITY IS FROM THE TOP OF THE SUFACE TO THE TOP OF UTILITY.

C. PIPE DIAMETERS ARE MEASURED FROM THE INSIDE

NB

All usual risks associated with mechanical excavation should still be adhered to, however, it always remains possible that within the boundary limits additional services may have been missed due to our limitations.If excavation is to take place, then identified services must firstlye exposed by means of hand excavation,and it is extremely important that when doing hand excavation extreme caution is applied.In addition, care should always be taken on site and all statutory records used in conjunction with mark-out on site.

No.	Amendments	Date

Client:

SMEC
Member of the Surbana Jurong Group

UDS CIVILS
Postnet Suite 321
Private Bag x5
2086

SOUTH AFRICA
TEL (011) 465 9756
Email:admin@udscivils.co.za

UDS CIVILS

Taso Holman Cell: +27 73 187 6805

Surveyed:	AV	Date :	18 SEPTEMBER 2023
Drawn :	GB	Date :	20 SEPTEMBER 2023

Project Title:

George Airport Pipeline

Title:

DETECTION OF UNDERGROUND SERVICES

Scale: 1:250

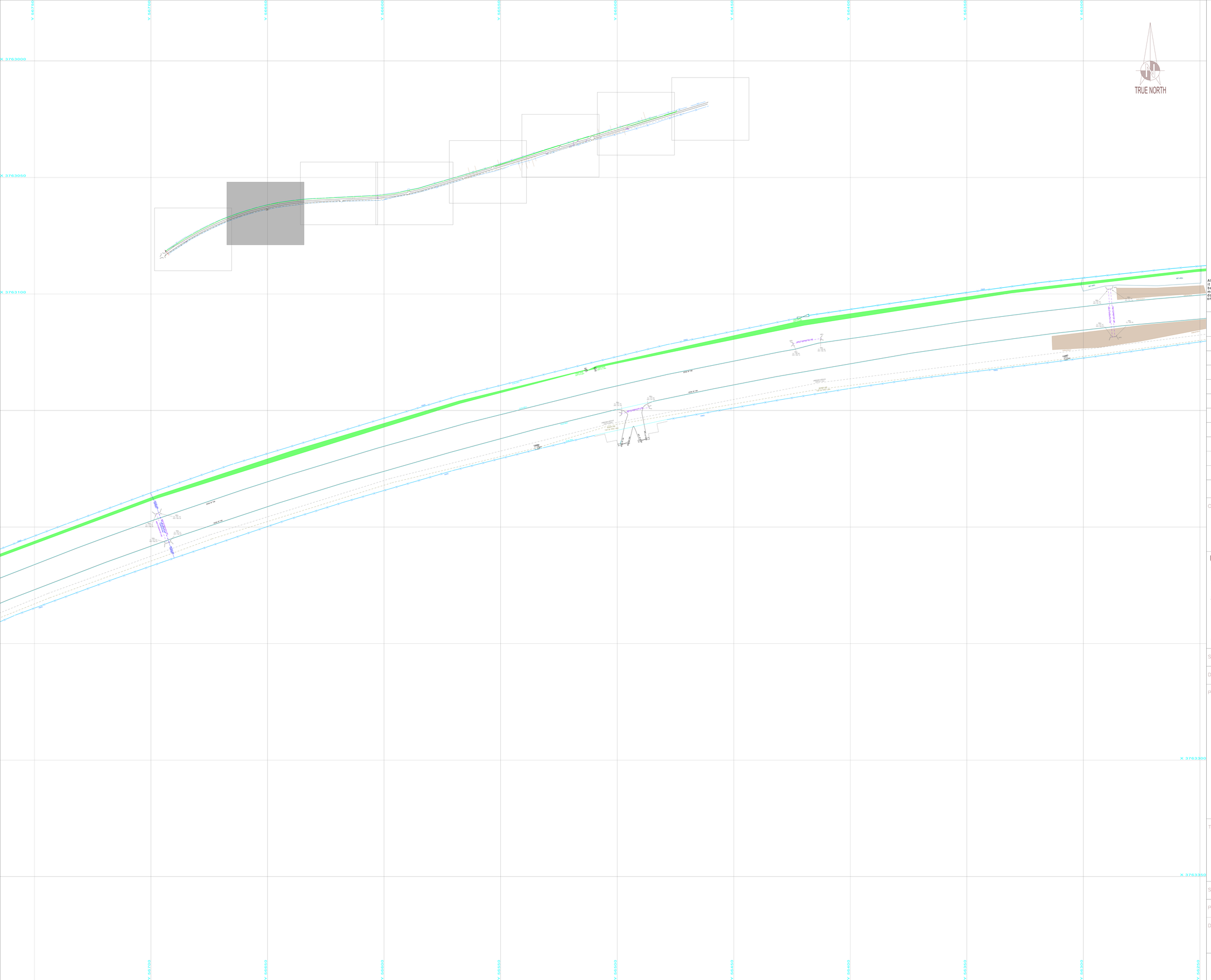
Project Number:

Drawing Number : DSMC-230920-001

Rev: 0

Sheet 1 of 8

PAGE A0



LEGEND:

- FIRE HYDRANT
- TREE
- GATE
- LAMP POLE
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LINE TYPE

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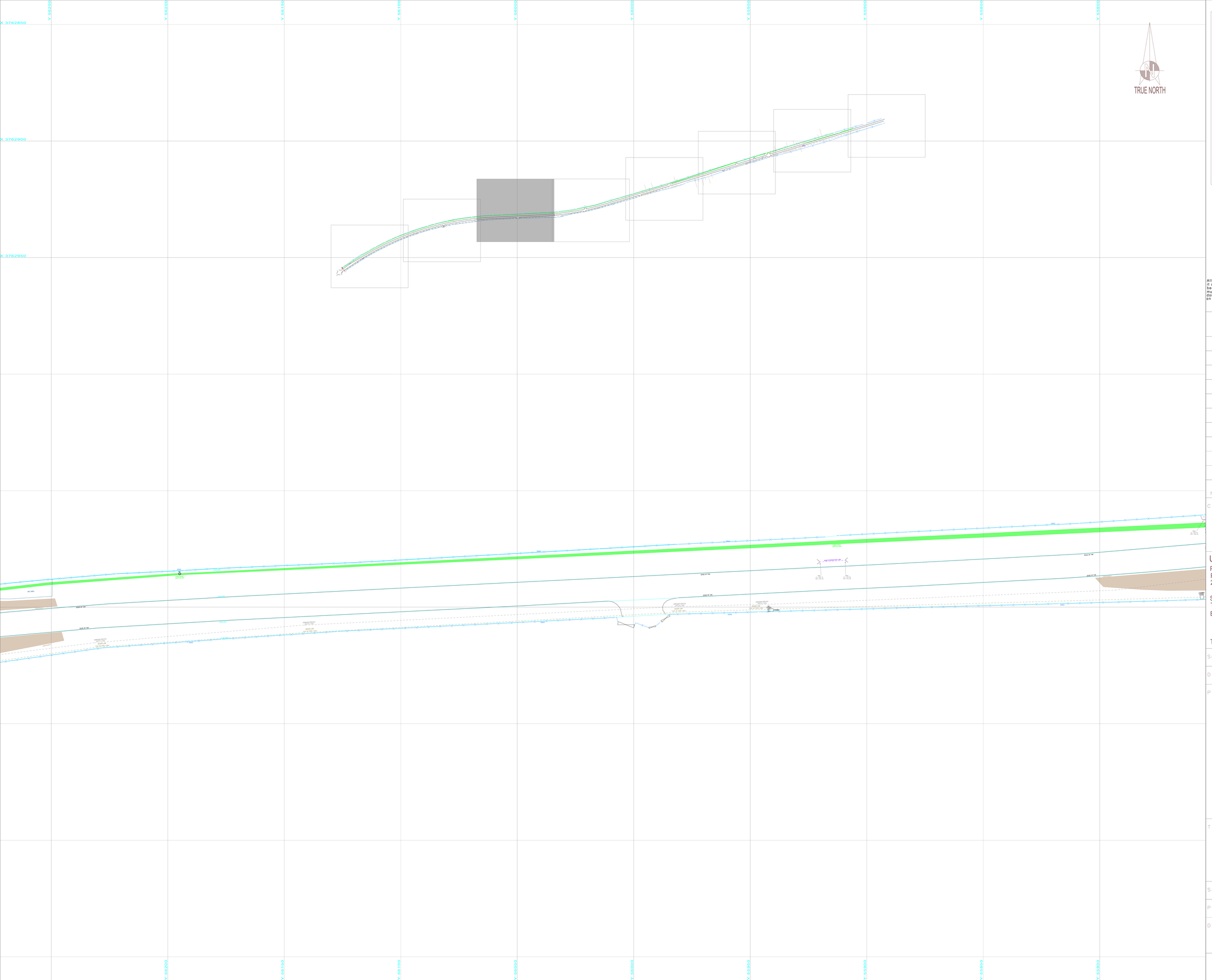
Sheet 2 of 8

PAGE A0



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Sheet 3 of 8

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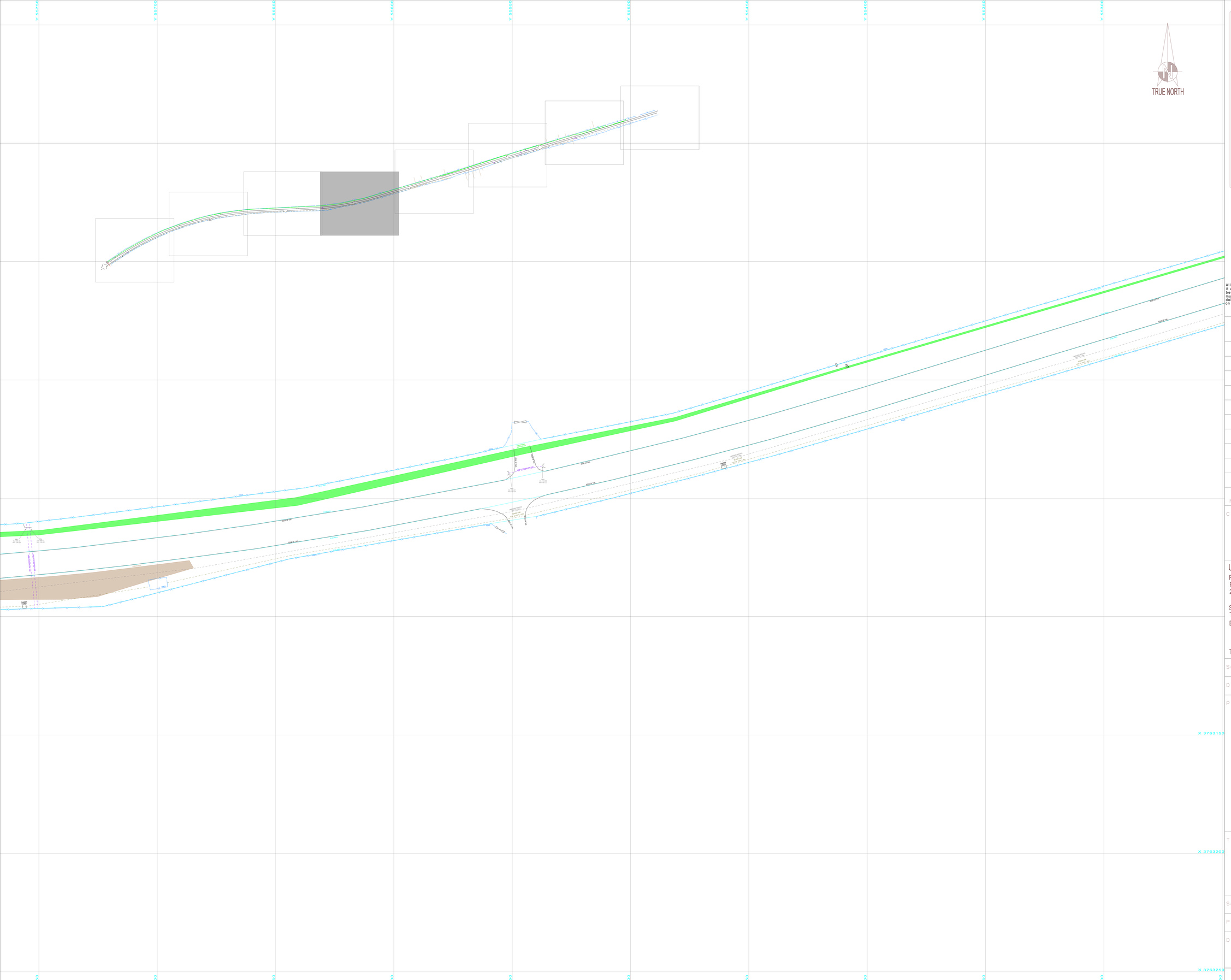

TRUE NORTH

LEGEND:

- FIRE HYDRANT
- TREE
- GATE
- LAMP POLE
- WATER METER

LINE TYPE

- ELECTRICAL
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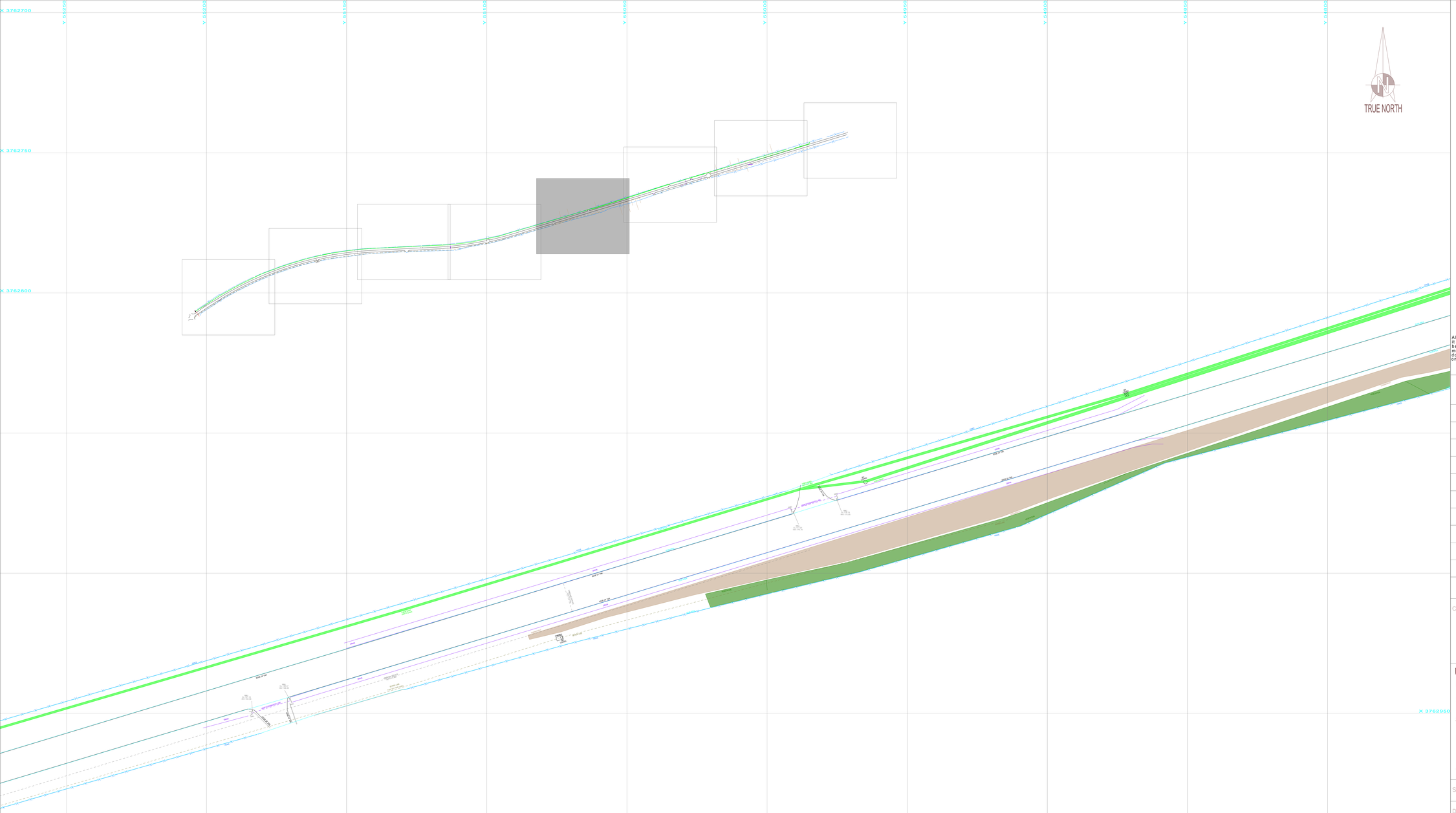

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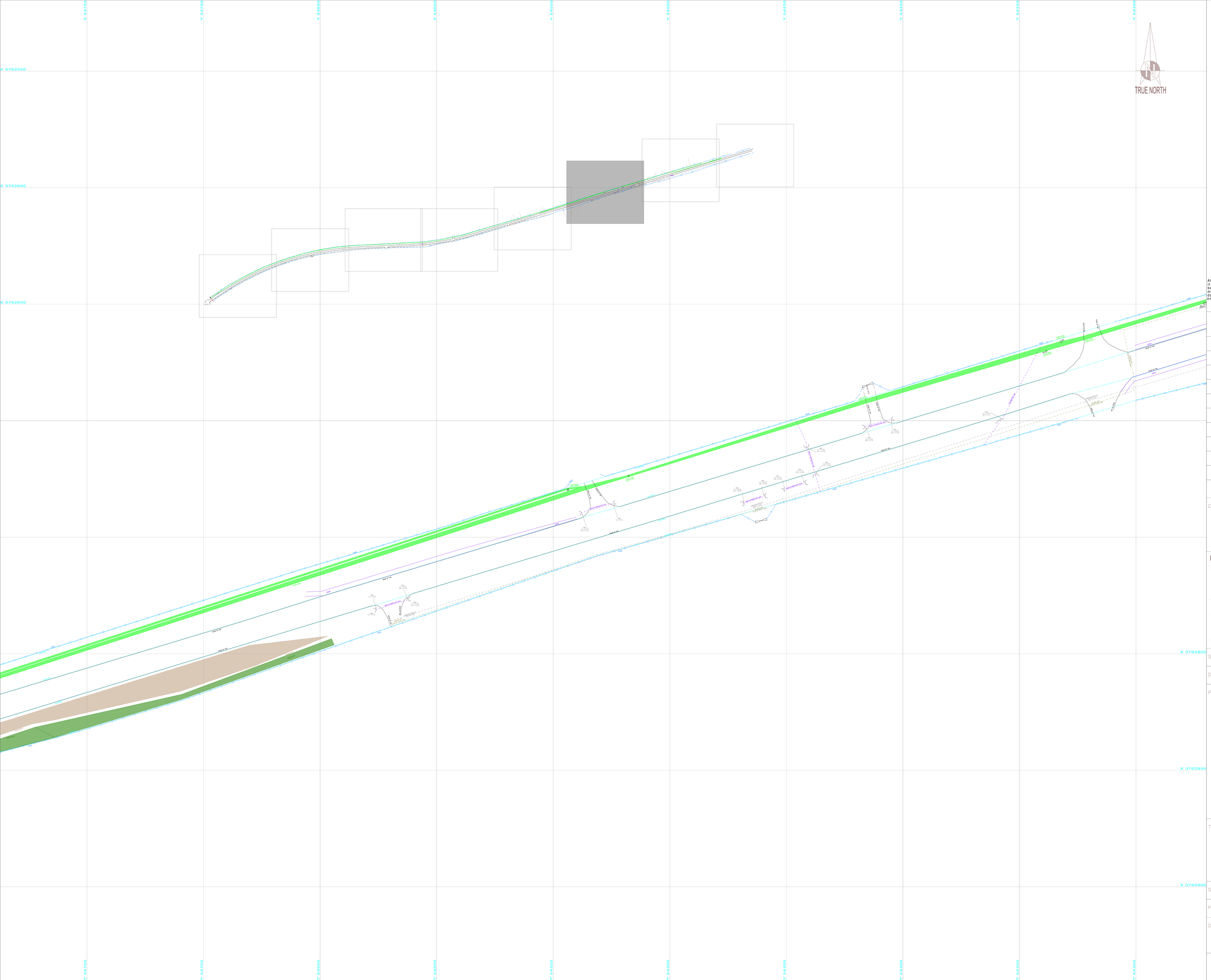

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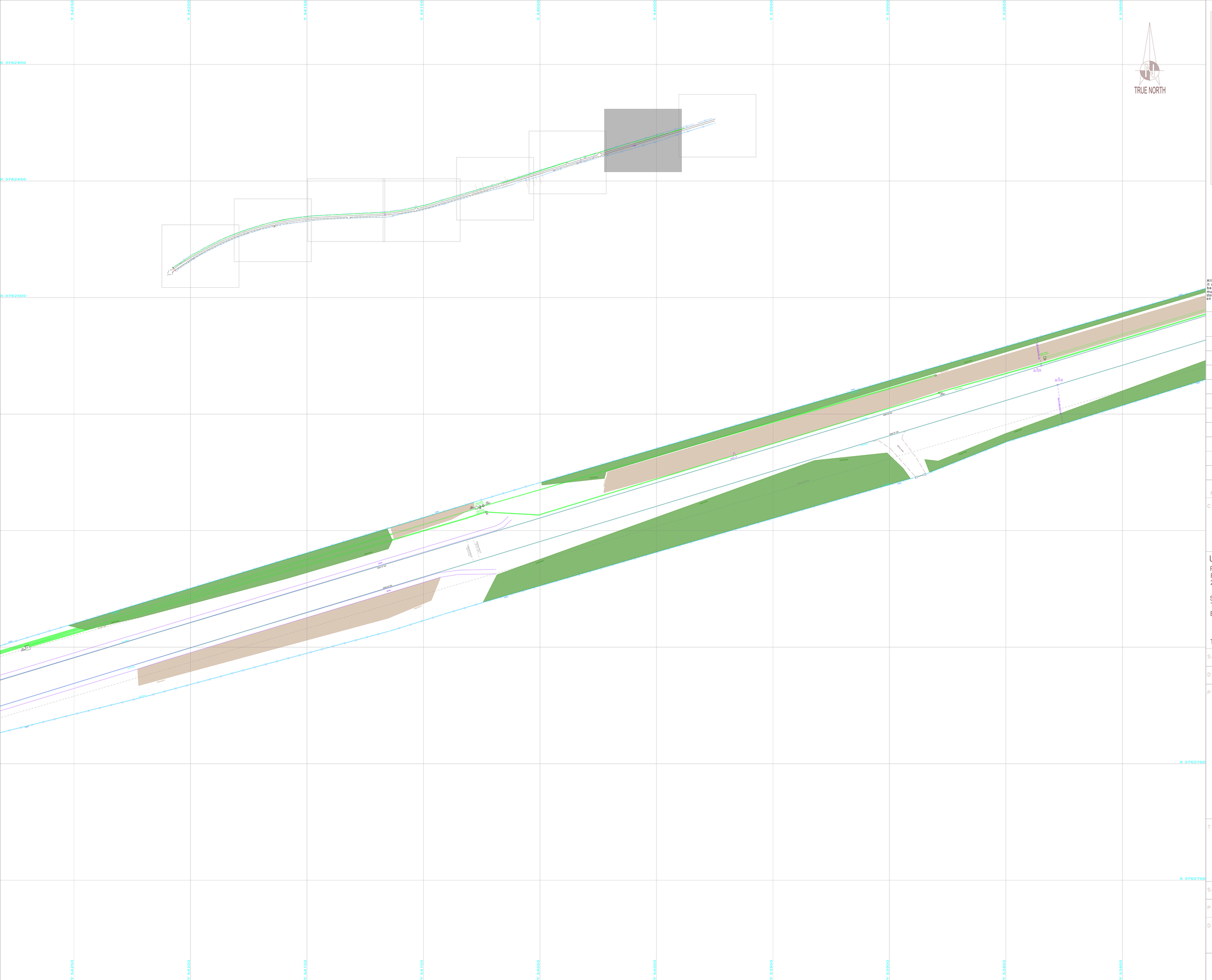

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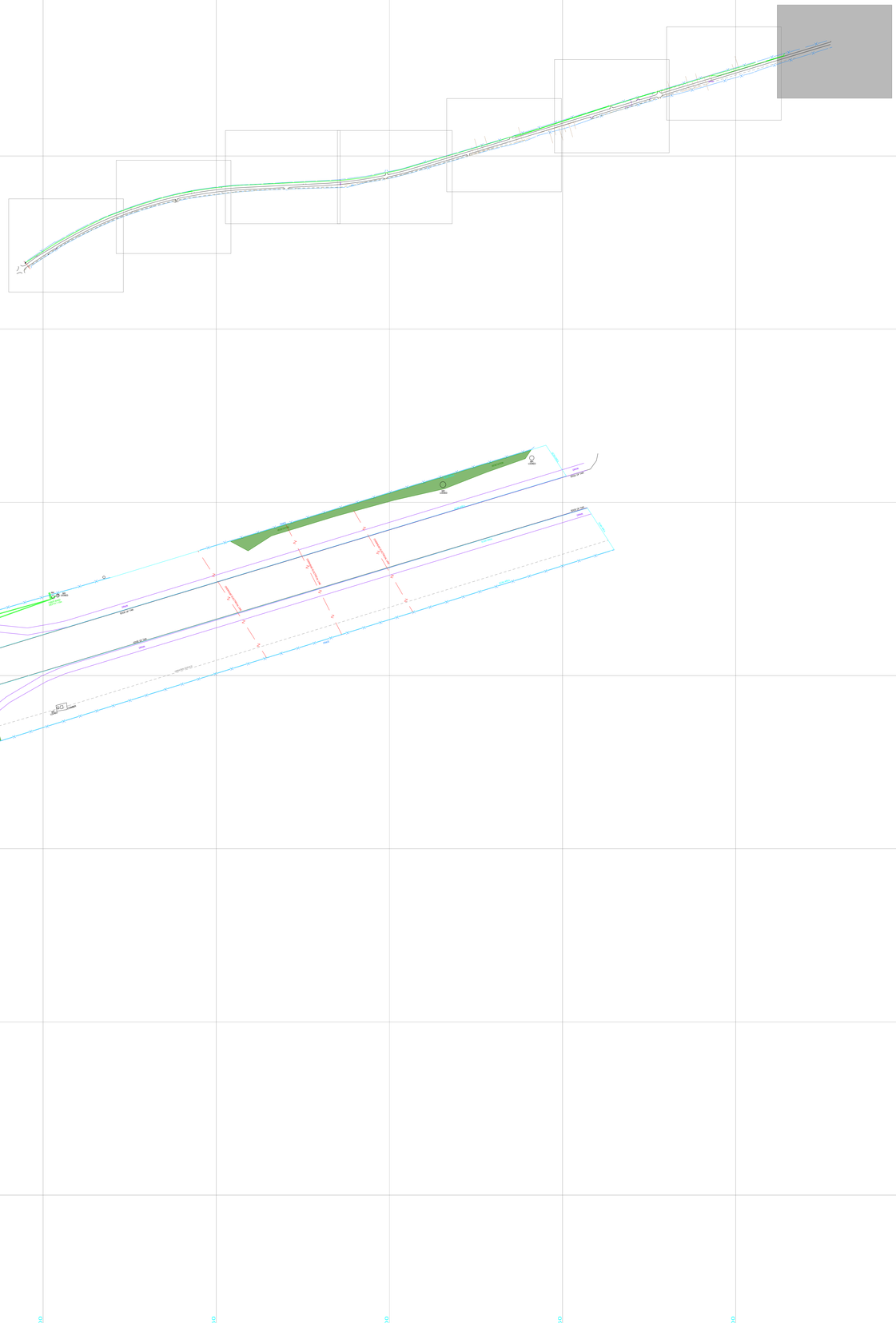

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Scale: 1:250

Project Number:

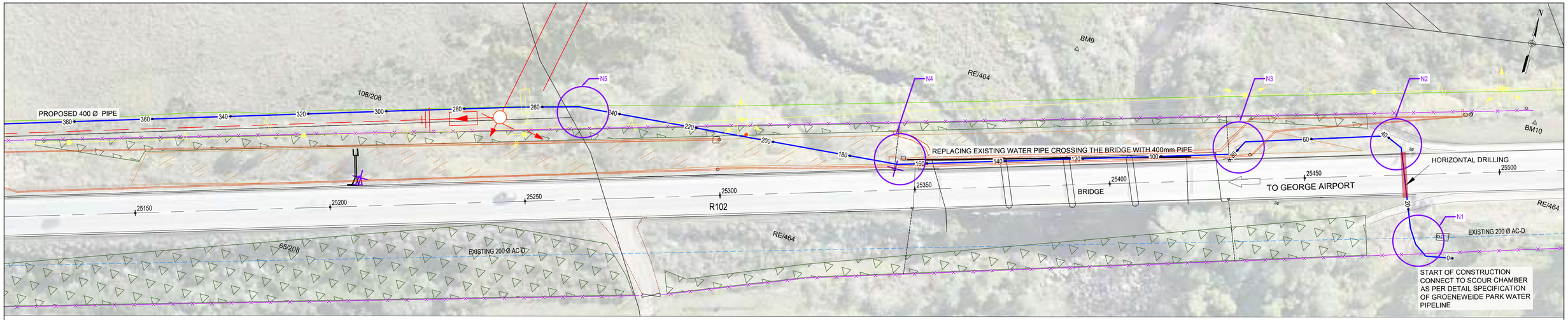
Drawing Number : DSMC-230920-001

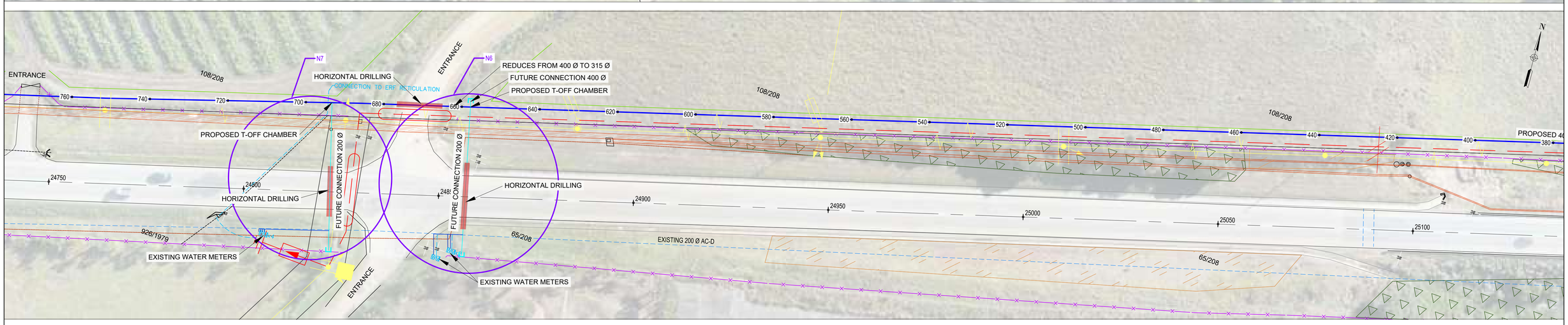
Rev: 0

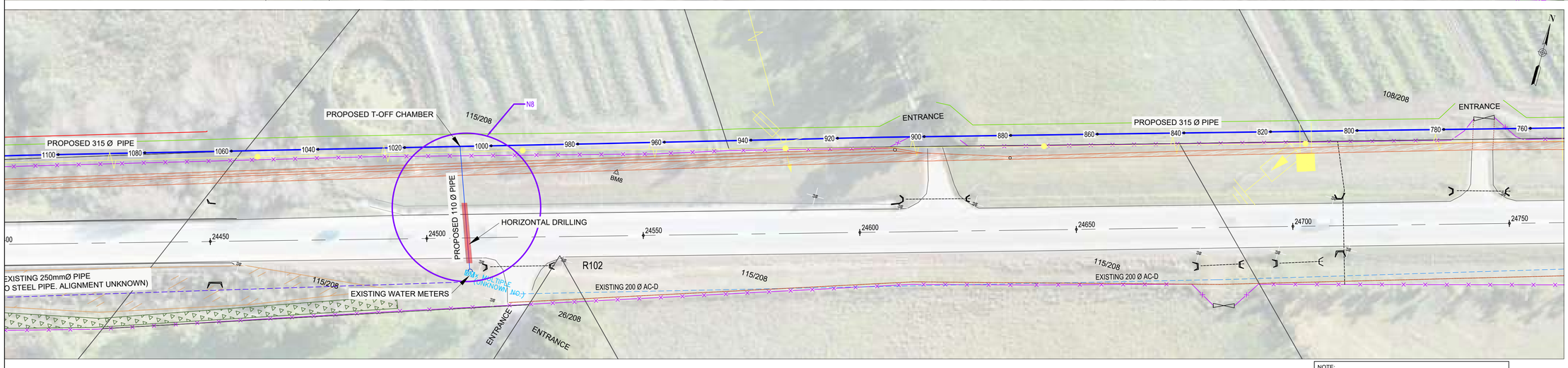
Sheet 8 of 8

PAGE A0

Appendix B Pipeline Layout Drawings







LEGEND

- EDGE OF ROAD
- EXISITNG 200 Ø AC-D PIPE TO BE UPGRADED
- FENCE
- SEWERAGE
- CADASTRALS
- CONCRETE CHANNEL
- STORMWATER PIPE
- VEGETATION
- EMBANKMENT
- OVERHEAD ELECTRICAL CABLES
- FIBRE CABLES
- POWER POLE
- LIGHT POLE
- SIGNBOARD
- CULVERT
- BENCHMARK
- EXISTING ELECTRICAL WORKS
- NEW ELECTRICAL WORKS
- 5 m BUILDING LINE FROM FENCE
- NEW PIPE
- EXISTING WATER METER
- EXISTING 25mmØ WATER PIPE
- EXISTING 250mmØ PVC WATER PIPE
- PROPOSED 110mmØ HDPE WATER PIPE
- PROPOSED 50mmØ HDPE WATER PIPE
- PROPOSED 25mmØ HDPE WATER PIPE
- PROPOSED FUTURE CONNECTIONS
- ENDCAP TO PROPOSED FUTURE CONNECTIONS

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

CONCEPT DESIGN

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

REVISIONS				
NO.	DATE	DESCRIPTION	INITIAL	
C00	16-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
C	05-04-2024	ISSUED FOR DISCUSSION	TC	
B	09-02-2024	ISSUED FOR DISCUSSION	TC	
A	04-12-2023	ISSUED FOR DISCUSSION	TC	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

SMEC South Africa
Member of the Surbana Jurong Group
PO Box 10633, George 6530 | 13 Progress St, George 6529
e-mail: george@smec.com | Tel (044) 873-5029
website: www.smec.com | Fax (044) 873-5086

GEORGE THE CITY FOR ALL REASONS
PO Box 19, George 6530 | c/o York & Market St, George 6529
e-mail: civilinfo@george.org.za | Tel (044) 801-9496
website: www.george.org.za | Fax (044) 529-9872

SIGNED
George Municipality
DATE

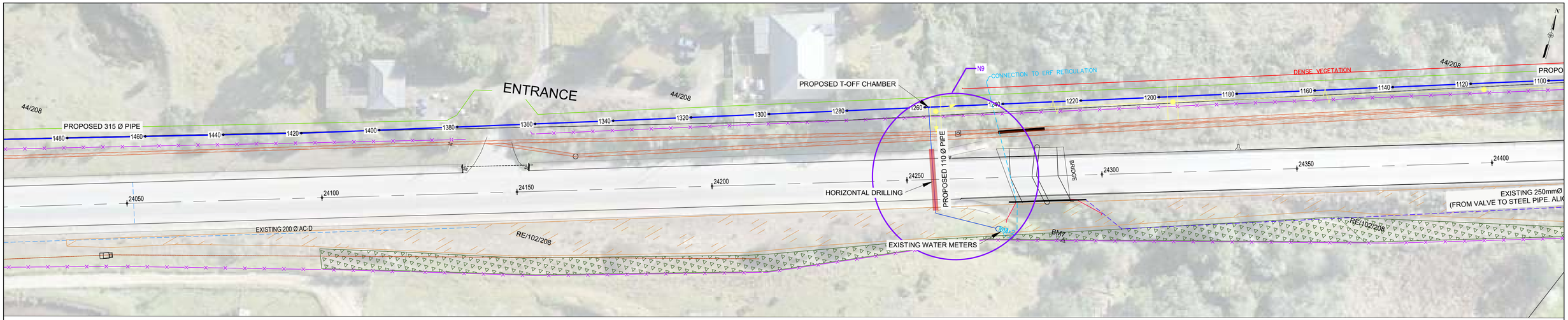
UPGRADE OF AIRPORT BULK WATER PIPELINE

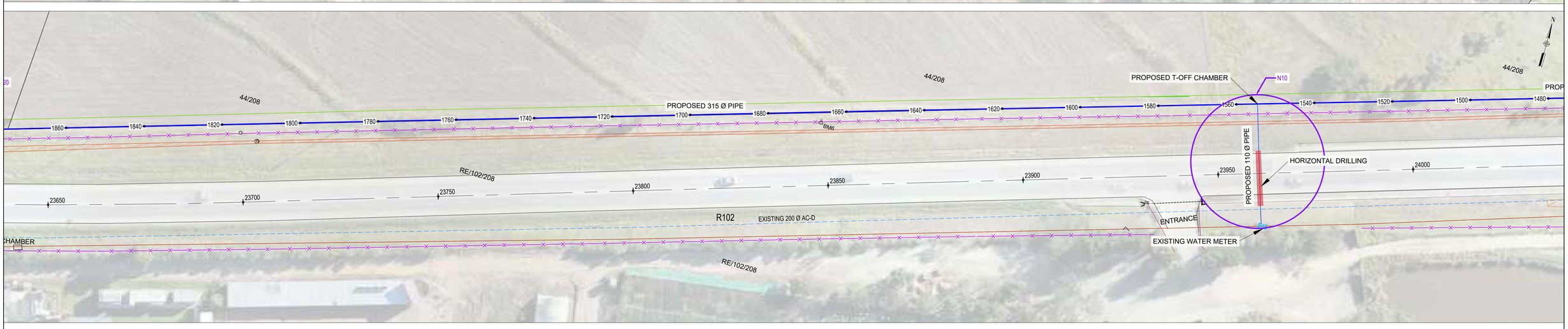
PIPELINE LAYOUT SHEET 01 OF 05

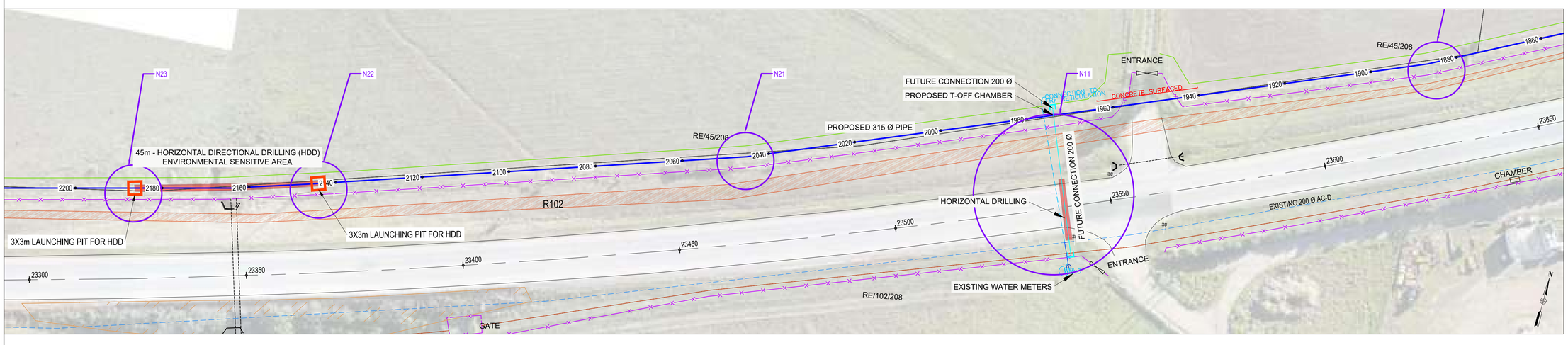
SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER: C1915 - 610 - 001

REV	SHEET No.
C00	01 OF 05







LEGEND

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- EXISITNG 200 Ø AC-D PIPE TO BE UPGRADED
- FENCE
- SEWERAGE
- CADASTRALS
- CONCRETE CHANNEL
- STORMWATER PIPE
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- OVERHEAD ELECTRICAL CABLES
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NO.	DATE	DESCRIPTION	INITIAL	

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CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

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Member of the Surbana Jurong Group
PO Box 10633 George 6530
13 Progress St George 6529
e-mail: george@smec.com Tel (044) 873-5029
website: www.smec.com Fax (044) 873-5086

GEORGE THE CITY FOR ALL REASONS
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c/o York & Market St George 6529
e-mail: civilinfo@george.org.za Tel (044) 801-9496
website: www.george.org.za Fax (044) 529-9872

SIGNED
George Municipality
DATE

UPGRADE OF AIRPORT BULK WATER PIPELINE

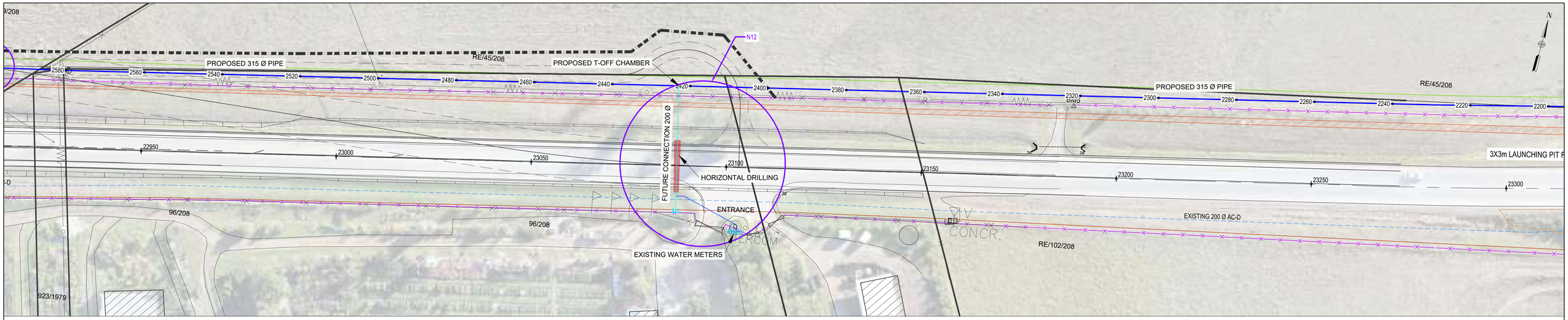
PIPELINE LAYOUT SHEET 02 OF 05

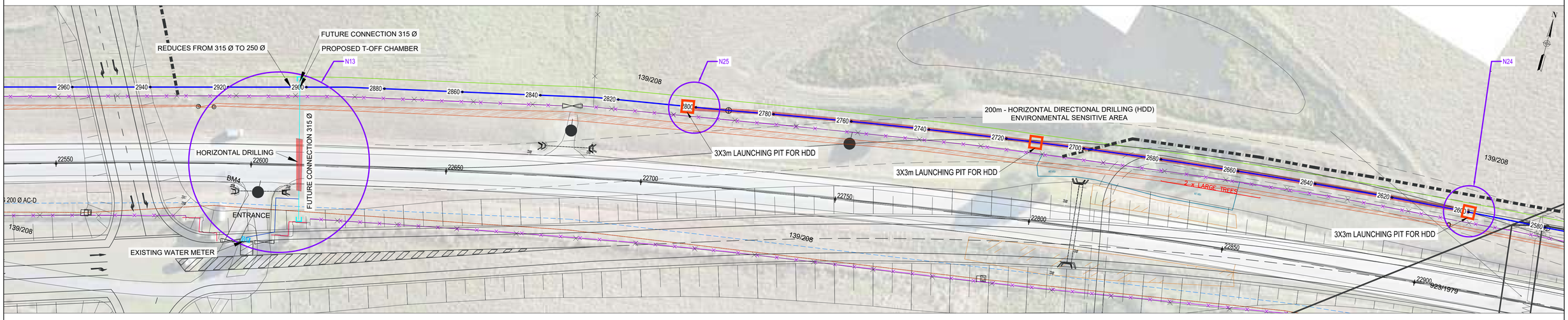
SIZE	SCALE
A1	1:500

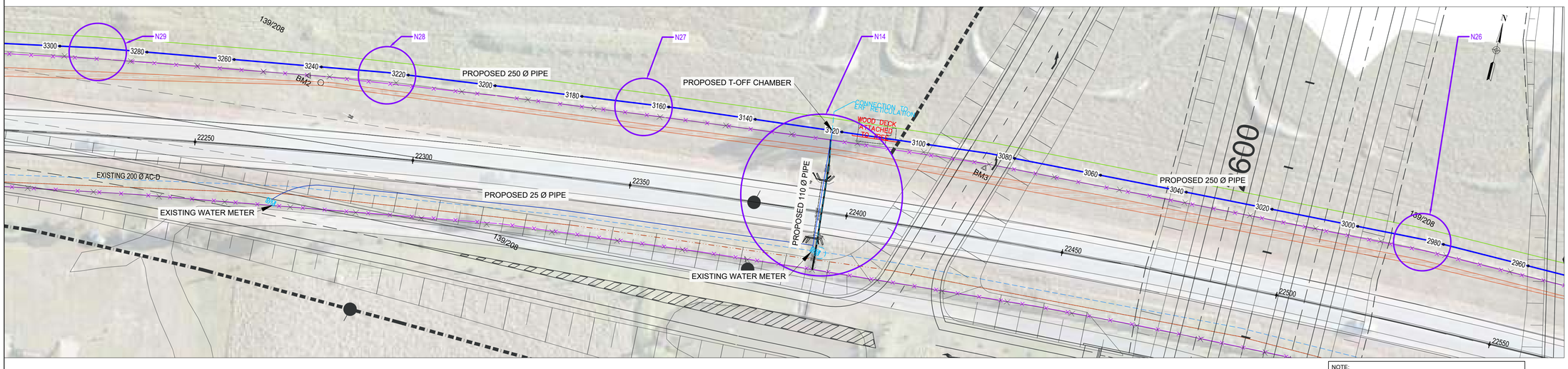
PROJECT DRAWING NUMBER: C1915 - 610 - 002

REV	SHEET No.
C00	02 OF 05

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







LEGEND

- EDGE OF ROAD
- EXISITNG 200 Ø AC-D PIPE TO BE UPGRADED
- FENCE
- SEWERAGE
- CADASTRALS
- CONCRETE CHANNEL
- STORMWATER PIPE
- VEGETATION
- EMBANKMENT
- OVERHEAD ELECTRICAL CABLES
- FIBRE CABLES
- POWER POLE
- LIGHT POLE
- SIGNBOARD
- CULVERT
- BENCHMARK
- EXISTING ELECTRICAL WORKS
- NEW ELECTRICAL WORKS
- 5 m BUILDING LINE FROM FENCE
- NEW PIPE
- EXISTING WATER METER
- EXISTING 25mmØ WATER PIPE
- EXISTING 250mmØ PVC WATER PIPE
- PROPOSED 110mmØ HDPE WATER PIPE
- PROPOSED 50mmØ HDPE WATER PIPE
- PROPOSED 25mmØ HDPE WATER PIPE
- PROPOSED FUTURE CONNECTIONS
- ENDCAP TO PROPOSED FUTURE CONNECTIONS

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

CONCEPT DESIGN

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

REVISIONS				
C00	16-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
C	05-04-2024	ISSUED FOR DISCUSSION	TC	
B	09-02-2024	ISSUED FOR DISCUSSION	TC	
A	04-12-2023	ISSUED FOR DISCUSSION	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

SMEC South Africa
Member of the Surbana Jurong Group
PO Box 10633, George 6530 — 13 Progress St, George 6529
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e-mail: civilinfo@george.org.za Tel (044) 801-9496
website: www.george.org.za Fax (044) 529-9872

SIGNED
George Municipality
DATE

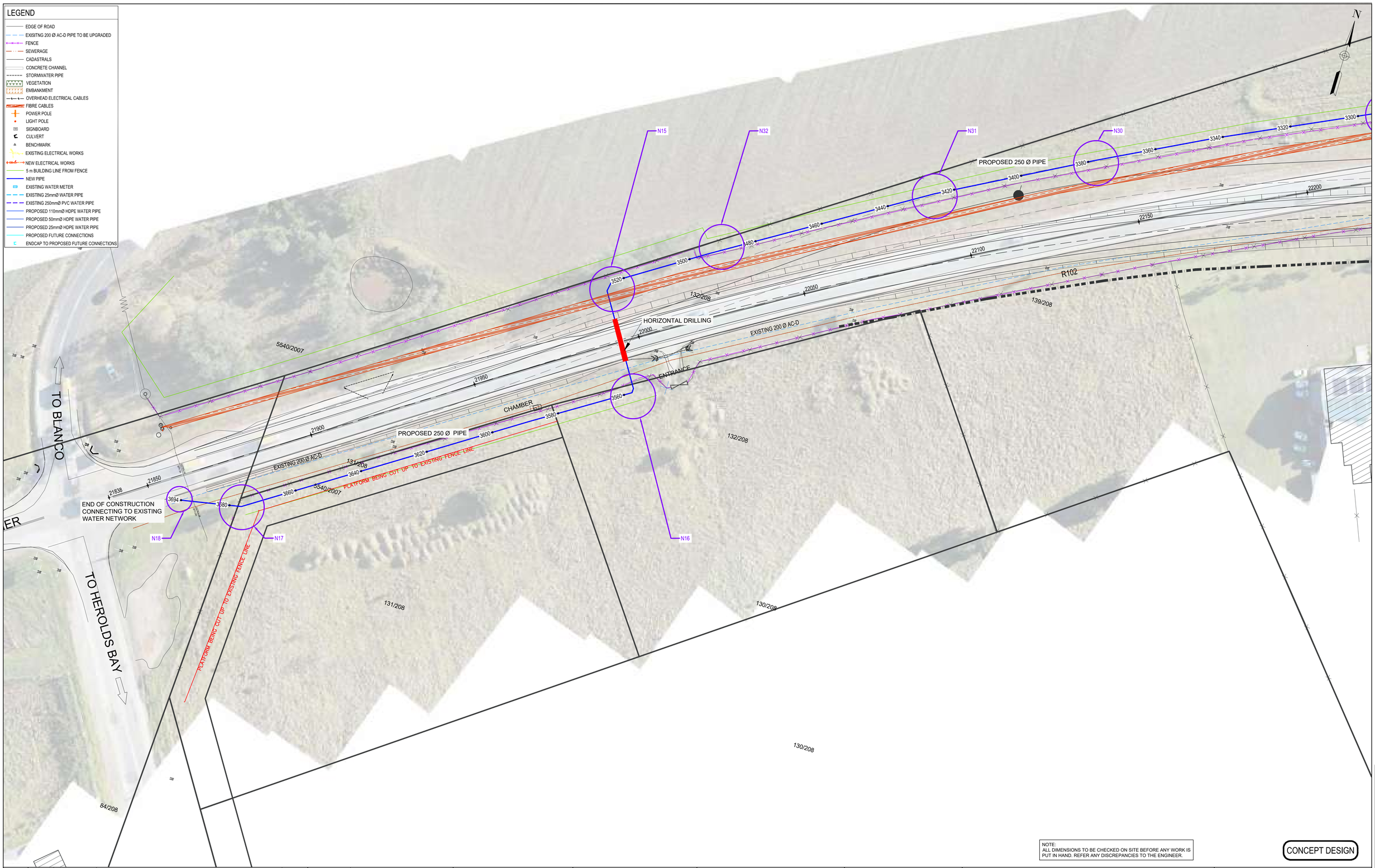
UPGRADE OF AIRPORT BULK WATER PIPELINE

PIPELINE LAYOUT SHEET 03 OF 05

SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER: C1915 - 610 - 003

REV	SHEET No.
C00	03 OF 05



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

CONCEPT DESIGN

REVISIONS				
C00	16-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
C	05-04-2024	ISSUED FOR DISCUSSION	TC	
B	09-02-2024	ISSUED FOR DISCUSSION	TC	
A	04-12-2023	ISSUED FOR DISCUSSION	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

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SIGNED
George Municipality
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UPGRADE OF AIRPORT BULK WATER PIPELINE

PIPELINE LAYOUT SHEET 04 OF 05

SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER
C1915 - 610 - 004

REV	SHEET No.
C00	04 OF 05

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

LEGEND

- EDGE OF ROAD
- EXISITNG 200 Ø AC-D PIPE TO BE UPGRADED
- FENCE
- SEWERAGE
- CADASTRALS
- CONCRETE CHANNEL
- STORMWATER PIPE
- VEGETATION
- EMBANKMENT
- OVERHEAD ELECTRICAL CABLES
- FIBRE CABLES
- POWER POLE
- LIGHT POLE
- SIGNBOARD
- CULVERT
- BENCHMARK
- EXISTING ELECTRICAL WORKS
- NEW ELECTRICAL WORKS
- 5 m BUILDING LINE FROM FENCE
- NEW PIPE
- EXISTING WATER METER
- EXISTING 25mmØ WATER PIPE
- EXISTING 250mmØ PVC WATER PIPE
- PROPOSED 110mmØ HDPE WATER PIPE
- PROPOSED 50mmØ HDPE WATER PIPE
- PROPOSED 25mmØ HDPE WATER PIPE
- PROPOSED FUTURE CONNECTIONS
- ENDCAP TO PROPOSED FUTURE CONNECTIONS

N

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

CONCEPT DESIGN

REVISIONS				
C00	16-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
C	05-04-2024	ISSUED FOR DISCUSSION	TC	
B	09-02-2024	ISSUED FOR DISCUSSION	TC	
A	04-12-2023	ISSUED FOR DISCUSSION	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

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George Municipality
DATE

UPGRADE OF AIRPORT BULK WATER PIPELINE

PIPELINE LAYOUT SHEET 05 OF 05

SIZE	SCALE
A1	1:1500

PROJECT DRAWING NUMBER: C1915 - 610 - 005

REV	SHEET No.
C00	05 OF 05

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

Appendix C Alternative Route Options

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				
C01	10-04-2024	FOR DISCUSSION PURPOSES	TC	
C00	09-04-2024	FOR DISCUSSION PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED _____
SMEC South Africa
DATE _____

SMEC South Africa
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SIGNED _____
George Municipality
DATE _____

UPGRADE OF AIRPORT BULK PIPELINE

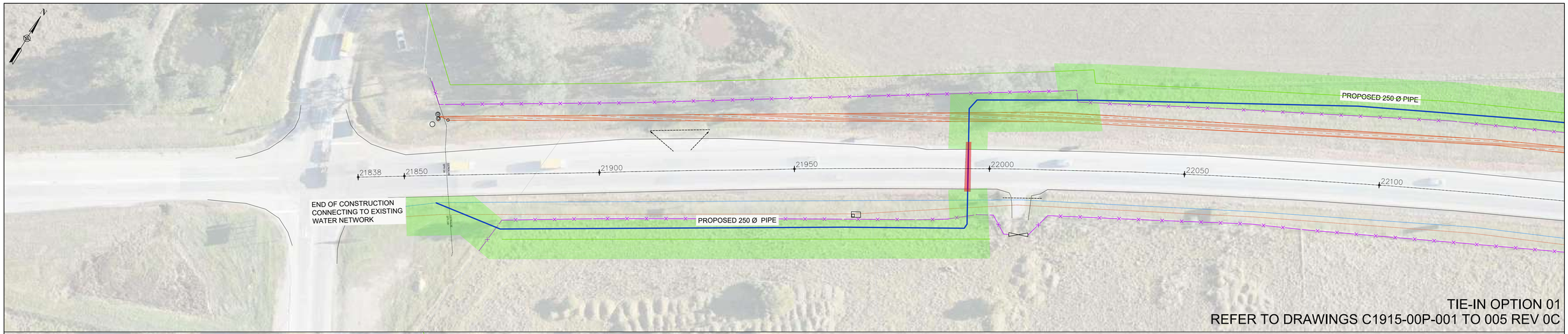
PROPOSED PIPELINE ROUTE OPTIONS AND ASSOCIATED WORKING AREA GWAIING RIVER BRIDGE CROSSING

SIZE	SCALE
A1	1:750

PROJECT DRAWING NUMBER
C1951 - 611 - 001

REV	SHEET No.
C01	01 OF 03

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



TIE-IN OPTION 01
REFER TO DRAWINGS C1915-00P-001 TO 005 REV 0C

TIE-IN OPTION 02
ALTERNATIVE OPTION WITH TIE-IN TO EXISTING JUST AFTER R102 CROSSING

TIE-IN OPTION 03
ALTERNATIVE OPTION WITH TIE-IN TO EXISTING AT R102 & R404 INTERSECTION

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				
C01	10-04-2024	FOR DISCUSSION PURPOSES	TC	
C00	09-04-2024	FOR DISCUSSION PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

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George Municipality
DATE

UPGRADE OF AIRPORT BULK PIPELINE

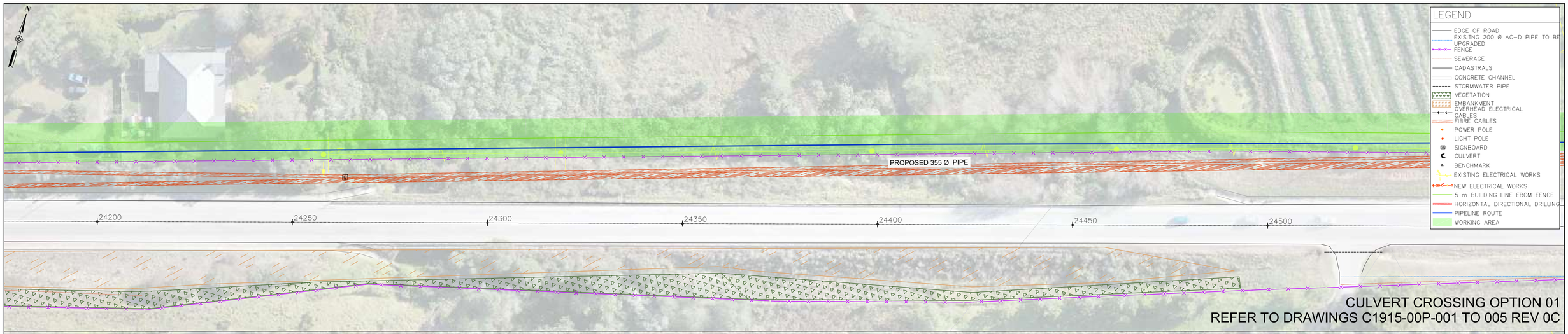
PROPOSED PIPELINE ROUTE OPTIONS AND ASSOCIATED WORKING AREA TIE-IN WITH EXISTING

SIZE	SCALE
A1	1:500

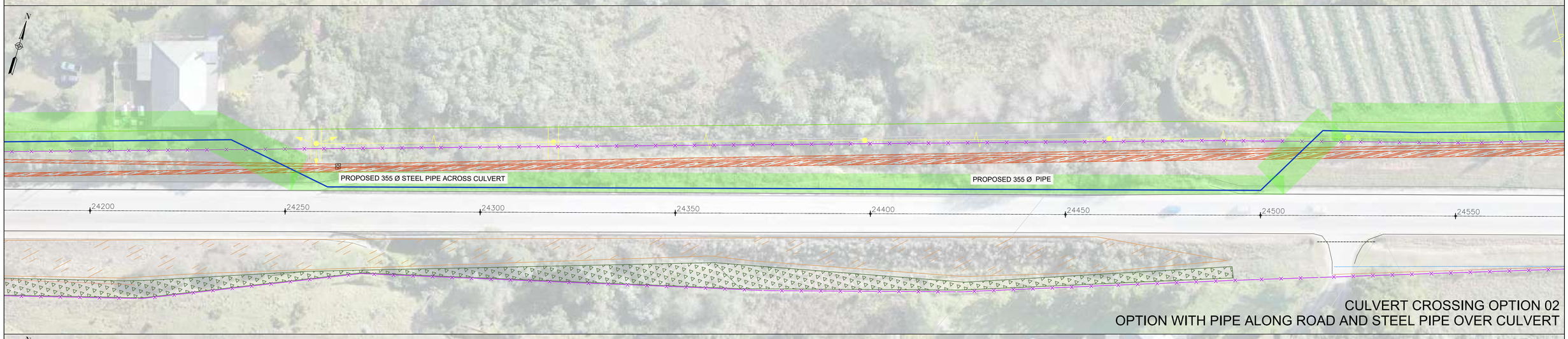
PROJECT DRAWING NUMBER: C1951 - 611 - 002

REV	SHEET No.
C01	02 OF 03

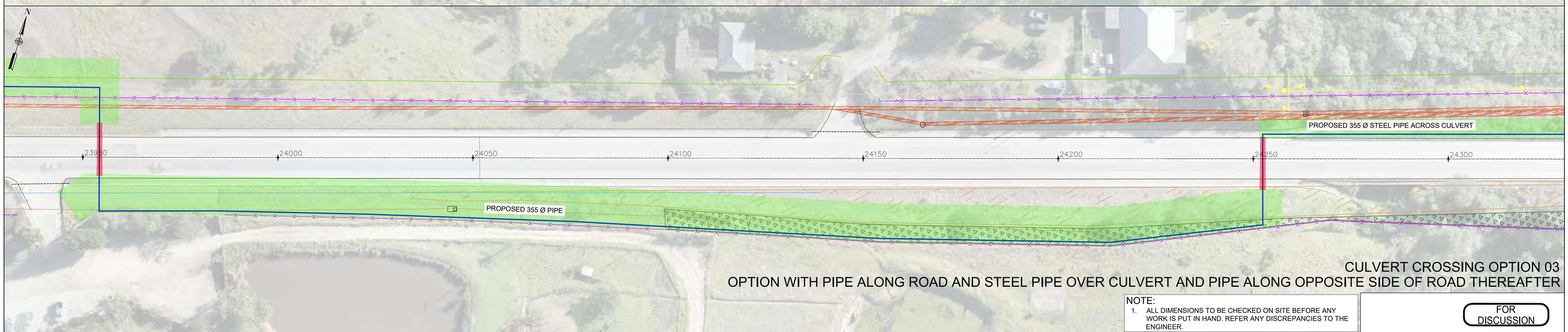
SCALE BAR
100m
50m
25m
10m
0
1 : 1000



CULVERT CROSSING OPTION 01
REFER TO DRAWINGS C1915-00P-001 TO 005 REV 0C



CULVERT CROSSING OPTION 02
OPTION WITH PIPE ALONG ROAD AND STEEL PIPE OVER CULVERT



CULVERT CROSSING OPTION 03
OPTION WITH PIPE ALONG ROAD AND STEEL PIPE OVER CULVERT AND PIPE ALONG OPPOSITE SIDE OF ROAD THEREAFTER

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				
C02	12-04-2024	FOR DISCUSSION PURPOSES	TC	
C01	10-04-2024	FOR DISCUSSION PURPOSES	TC	
C00	09-04-2024	FOR DISCUSSION PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

SMEC South Africa
Member of the Surbana Jurong Group
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Tel (044) 801 9496 Fax (086) 529 9872

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George Municipality
DATE

UPGRADE OF AIRPORT BULK PIPELINE

PROPOSED PIPELINE ROUTE OPTIONS AND ASSOCIATED WORKING AREA CULVERT CROSSING

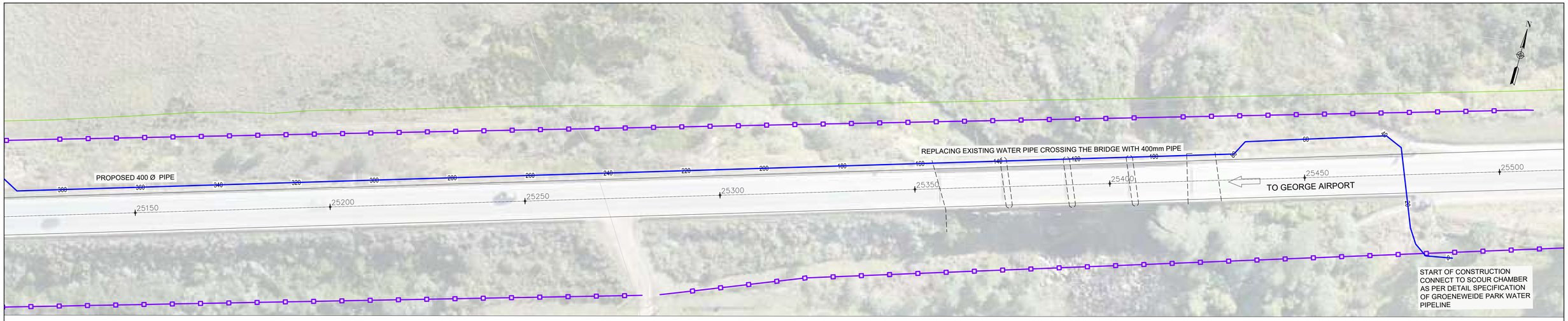
SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER: C1951 - 611 - 003

REV	SHEET No.
C02	03 OF 03

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

Appendix D Preferred Route



LEGEND

- EDGE OF ROAD
- FENCE
- CADASTRALS
- 5 m BUILDING LINE FROM FENCE
- PROPOSED NEW BULK WATER PIPELINE ROUTE

NOTE:

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

CONCEPT DESIGN

REVISIONS				
C00	16-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED _____
SMEC South Africa
DATE _____

SMEC South Africa
Member of the Surbana Jurong Group
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e-mail: george@smec.com | Tel (044) 873-5029
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website: www.george.org.za | Fax (044) 529-9872

SIGNED _____
George Municipality
DATE _____

UPGRADE OF AIRPORT BULK WATER PIPELINE

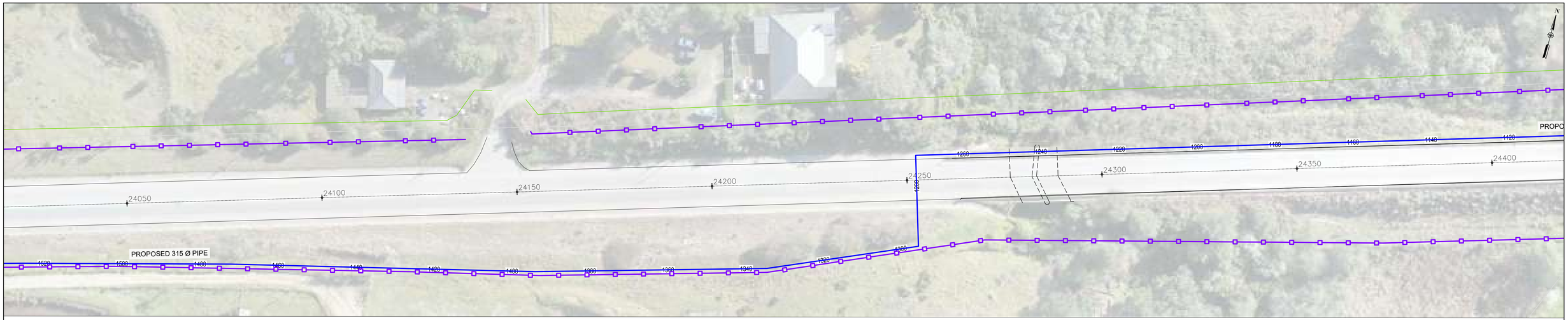
PREFERRED PIPELINE ROUTE LAYOUT SHEET 01 OF 04

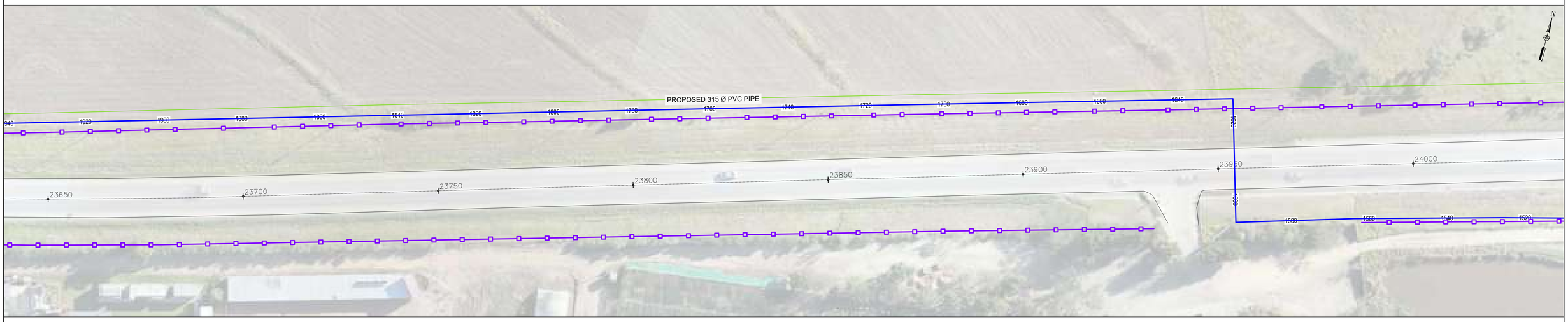
SIZE	SCALE
A1	1:500

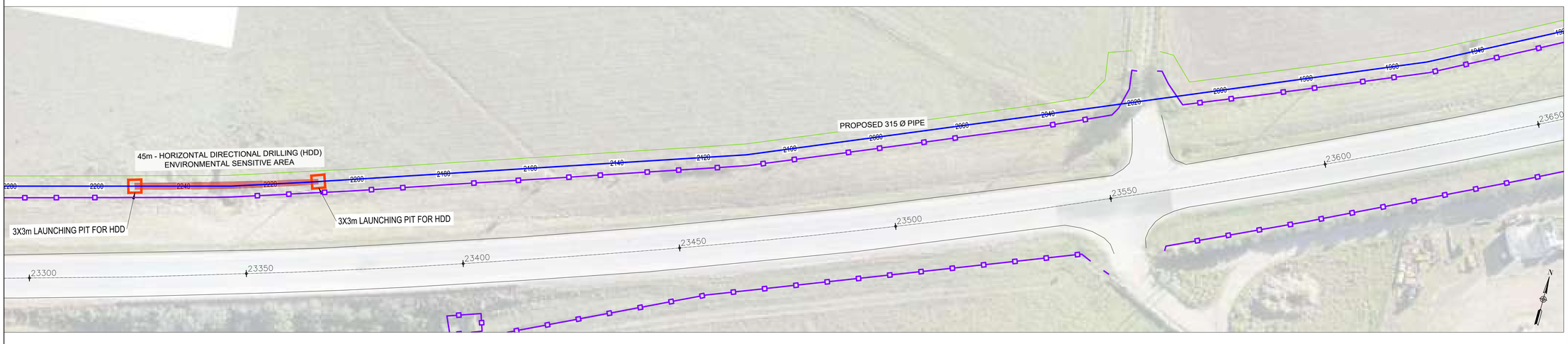
PROJECT DRAWING NUMBER: C1915 - 613 - 001

REV	SHEET No.
C00	01 OF 04

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







LEGEND

- EDGE OF ROAD
- FENCE
- CADASTRALS
- 5 m BUILDING LINE FROM FENCE
- PROPOSED NEW BULK WATER PIPELINE ROUTE

NOTE:

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

CONCEPT DESIGN

REVISIONS					
				DESIGNED	A TOOTLA
				CHECKED	T CRONJE
				DRAWN	A TOOTLA
C00	16-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	CHECKED	T CRONJE
NO.	DATE	DESCRIPTION	INITIAL		

SIGNED _____
SMEC South Africa
DATE _____

SMEC South Africa
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SIGNED _____
George Municipality
DATE _____

UPGRADE OF AIRPORT BULK WATER PIPELINE

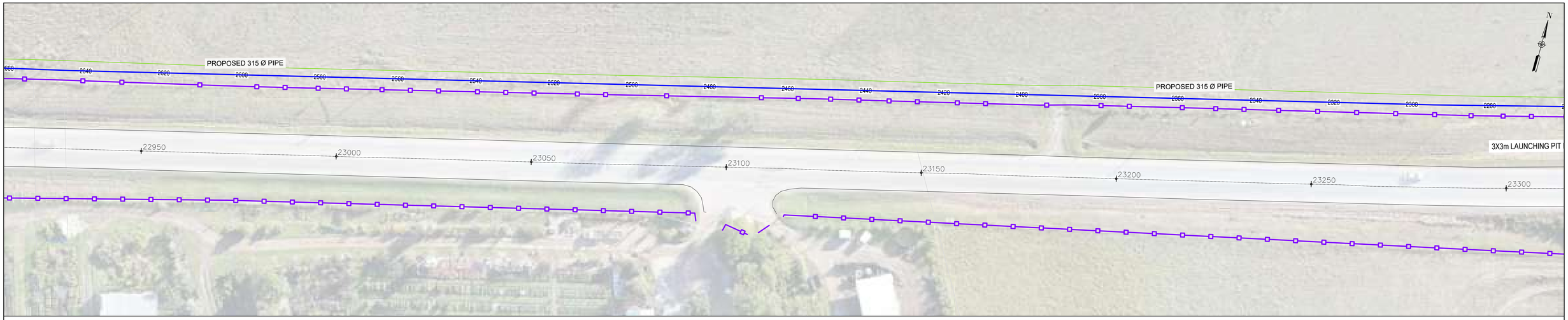
PREFERRED PIPELINE ROUTE LAYOUT SHEET 02 OF 04

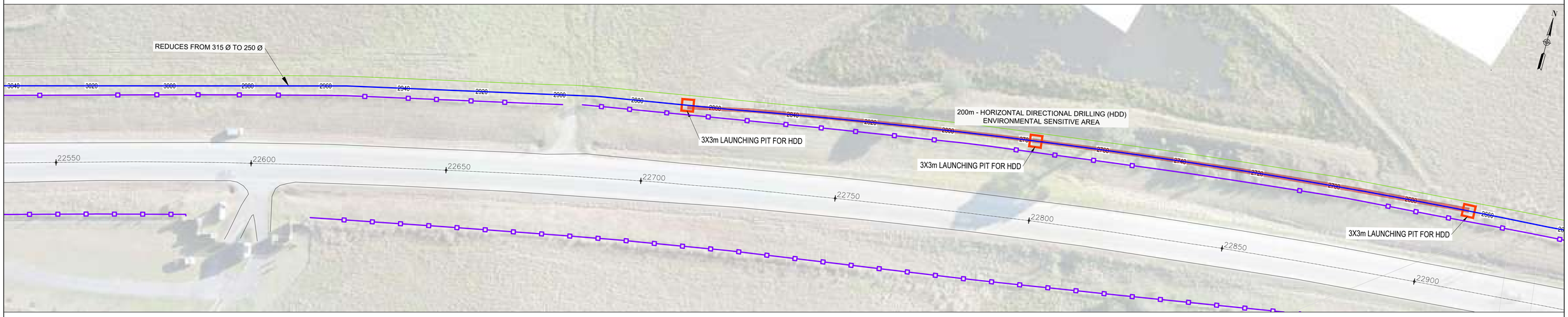
SIZE	SCALE
A1	1:500

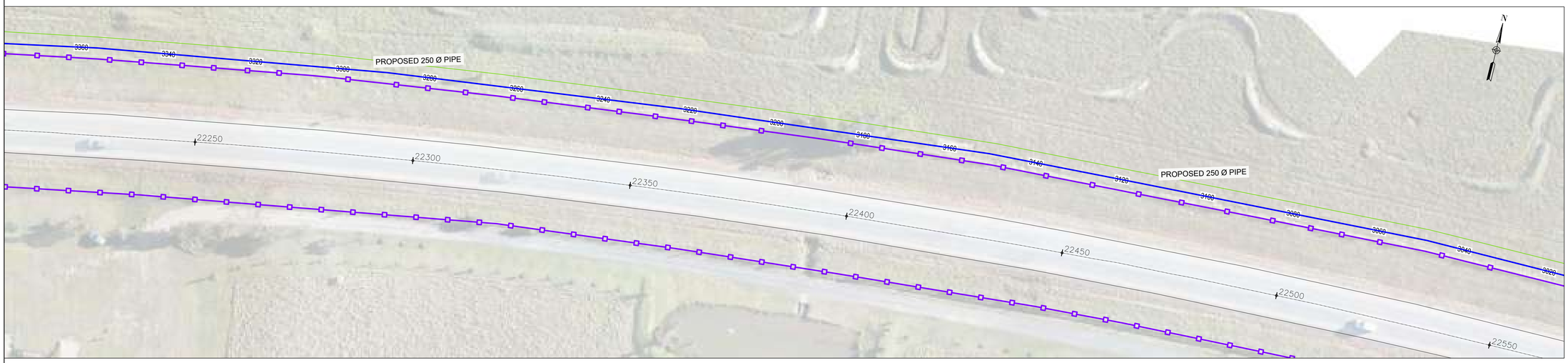
PROJECT DRAWING NUMBER: C1915 - 613 - 002

REV	SHEET No.
C00	02 OF 04

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







LEGEND

- EDGE OF ROAD
- FENCE
- CADASTRALS
- 5 m BUILDING LINE FROM FENCE
- PROPOSED NEW BULK WATER PIPELINE ROUTE

NOTE:

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

CONCEPT DESIGN

REVISIONS				
C00	16-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED _____ SMEC South Africa

DATE _____

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SIGNED _____ George Municipality

DATE _____

UPGRADE OF AIRPORT BULK WATER PIPELINE

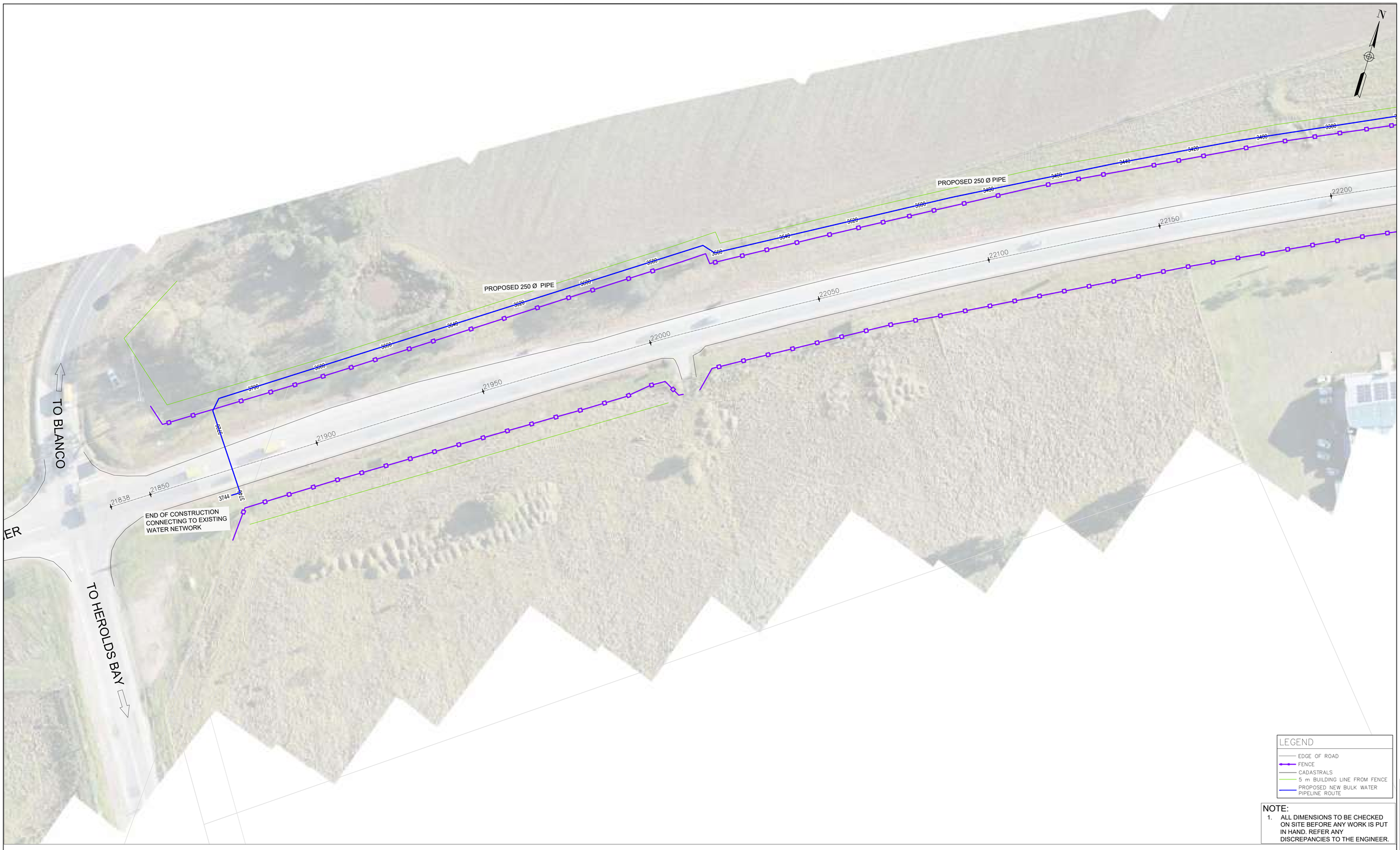
PREFERRED PIPELINE ROUTE LAYOUT SHEET 03 OF 04

SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER: C1915 - 613 - 003

REV	SHEET No.
C00	03 OF 04

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



LEGEND

- EDGE OF ROAD
- FENCE
- CADASTRALS
- 5 m BUILDING LINE FROM FENCE
- PROPOSED NEW BULK WATER PIPELINE ROUTE

NOTE:

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

CONCEPT DESIGN

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

REVISIONS				
C00	16-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED _____
SMEC South Africa
DATE _____

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SIGNED _____
George Municipality
DATE _____

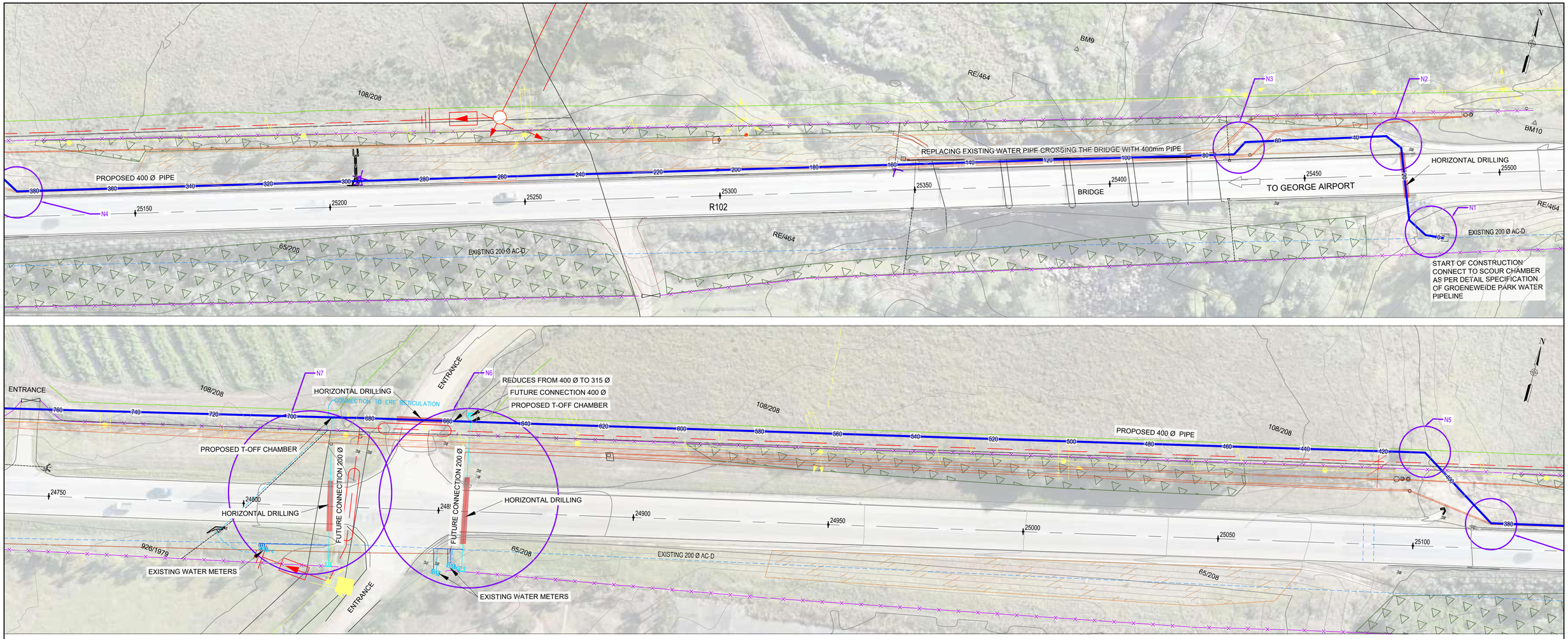
UPGRADE OF AIRPORT BULK WATER PIPELINE

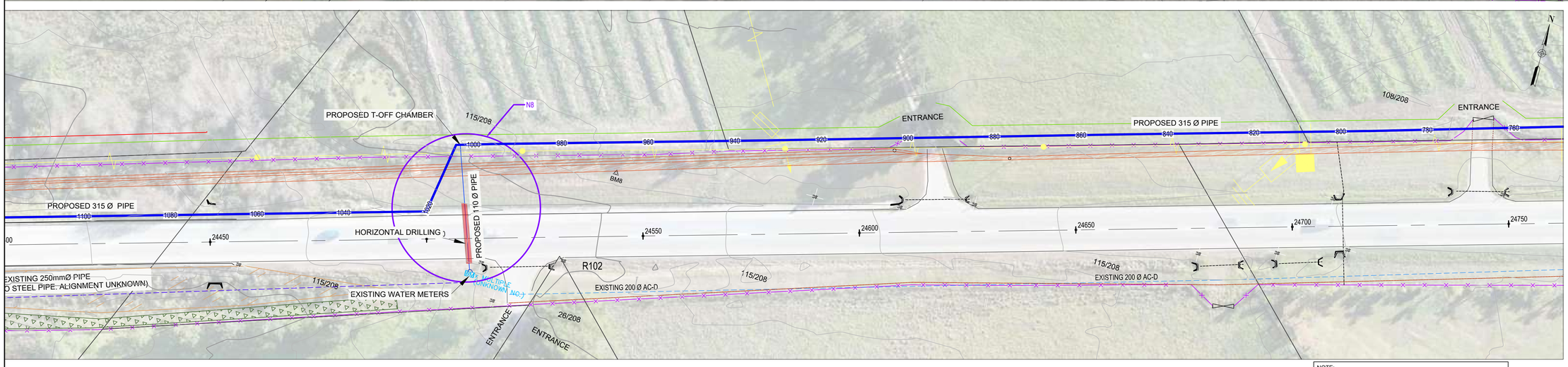
PREFERRED PIPELINE ROUTE LAYOUT SHEET 04 OF 04

SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER: C1915 - 613 - 004

REV	SHEET No.
C00	04 OF 04





LEGEND

- EDGE OF ROAD
- EXISITNG 200 Ø AC-D PIPE TO BE UPGRADED
- FENCE
- SEWERAGE
- CADASTRALS
- CONCRETE CHANNEL
- STORMWATER PIPE
- VEGETATION
- EMBANKMENT
- OVERHEAD ELECTRICAL CABLES
- FIBRE CABLES
- POWER POLE
- LIGHT POLE
- SIGNBOARD
- CULVERT
- BENCHMARK
- EXISTING ELECTRICAL WORKS
- NEW ELECTRICAL WORKS
- 5 m BUILDING LINE FROM FENCE
- NEW PIPE
- EXISTING WATER METER
- EXISTING 25mmØ WATER PIPE
- EXISTING 250mmØ PVC WATER PIPE
- PROPOSED 110mmØ HDPE WATER PIPE
- PROPOSED 50mmØ HDPE WATER PIPE
- PROPOSED 25mmØ HDPE WATER PIPE
- PROPOSED FUTURE CONNECTIONS
- ENDCAP TO PROPOSED FUTURE CONNECTIONS

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

CONCEPT DESIGN

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

REVISIONS				
C00	08-11-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	M MLALAZI
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

smec an SNC company
PO Box 10633 George 6530
13 Progress St George 6529
e-mail: george@smec.com Tel (044) 873-5029
website: www.smec.com Fax (044) 873-5086

GEORGE THE CITY FOR ALL REASONS
PO Box 19 George 6530
c/o York & Market St George 6529
e-mail: civilinfo@george.org.za Tel (044) 801-9496
website: www.george.org.za Fax (044) 529-9872

SIGNED
George Municipality
DATE

UPGRADE OF AIRPORT BULK WATER PIPELINE

PREFERRED PIPELINE ROUTE SHEET 01 OF 05

SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER: C1915 - 610 - 001

REV	SHEET No.
C00	01 OF 05

ENTRANCE
44/208
N9
CONNECTION TO ERF RETICULATION
DENSE VEGETATION
PROPOSED 315 Ø PIPE
HORIZONTAL DRILLING
BRIDGE
EXISTING 250mmØ
(FROM VALVE TO STEEL PIPE: AL
EXISTING 200 Ø AC-D
RE/102/208
BM7
EXISTING WATER METERS
PROPOSED T-OFF CHAMBER
PROPOSED 315 Ø PVC PIPE
BM6
N10
HORIZONTAL DRILLING
EXISTING WATER METER
ENTRANCE
PROPOSED T-OFF CHAMBER
R102
CHAMBER
N23
N22
N21
45m - HORIZONTAL DIRECTIONAL DRILLING (HDD)
ENVIRONMENTAL SENSITIVE AREA
3X3m LAUNCHING PIT FOR HDD
3X3m LAUNCHING PIT FOR HDD
RE/45/208
FUTURE CONNECTION 200 Ø
PROPOSED T-OFF CHAMBER
PROPOSED 315 Ø PIPE
FUTURE CONNECTION 200 Ø
HORIZONTAL DRILLING
EXISTING WATER METERS
CONCRETE SURFACED
EXISTING 200 Ø AC-D
GATE

LEGEND
- EDGE OF ROAD
- EXISITNG 200 Ø AC-D PIPE TO BE UPGRADED
- FENCE
- SEWERAGE
- CADASTRALS
- CONCRETE CHANNEL
- STORMWATER PIPE
- VEGETATION
- EMBANKMENT
- OVERHEAD ELECTRICAL CABLES
- FIBRE CABLES
- POWER POLE
- LIGHT POLE
- SIGNBOARD
- CULVERT
- BENCHMARK
- EXISITING ELECTRICAL WORKS
- NEW ELECTRICAL WORKS
- 5 m BUILDING LINE FROM FENCE
- NEW PIPE
- EXISTING WATER METER
- EXISTING 25mmØ WATER PIPE
- EXISTING 250mmØ PVC WATER PIPE
- PROPOSED 110mmØ HDPE WATER PIPE
- PROPOSED 50mmØ HDPE WATER PIPE
- PROPOSED 25mmØ HDPE WATER PIPE
- PROPOSED FUTURE CONNECTIONS
- ENDCAP TO PROPOSED FUTURE CONNECTIONS

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

CONCEPT DESIGN

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

REVISIONS				
C00	08-11-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	M MLALAZI
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

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SIGNED
George Municipality
DATE

UPGRADE OF AIRPORT BULK WATER PIPELINE

PREFERRED PIPELINE ROUTE LAYOUT SHEET 02 OF 05

SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER: C1915 - 610 - 002

REV	SHEET No.
C00	02 OF 05

PROPOSED 315 Ø PIPE
RE/45/208
PROPOSED T-OFF CHAMBER
N12
FUTURE CONNECTION 200 Ø
HORIZONTAL DRILLING
ENTRANCE
EXISTING WATER METERS
96/208
923/1979
PROPOSED 315 Ø PIPE
RE/45/208
BM5
3X3m LAUNCHING PIT F
EXISTING 200 Ø AC-D
RE/102/208
CONCR.

REDUCES FROM 315 Ø TO 250 Ø
FUTURE CONNECTION 315 Ø
PROPOSED T-OFF CHAMBER
N13
N25
139/208
3X3m LAUNCHING PIT FOR HDD
200m - HORIZONTAL DIRECTIONAL DRILLING (HDD)
ENVIRONMENTAL SENSITIVE AREA
3X3m LAUNCHING PIT FOR HDD
2 x LARGE TREES
N24
139/208
HORIZONTAL DRILLING
BM4
ENTRANCE
FUTURE CONNECTION 315 Ø
200 Ø AC-D
EXISTING WATER METER
139/208
139/206
3X3m LAUNCHING PIT FOR HDD
923/1979

N29
N28
N27
N14
N26
139/208
PROPOSED 250 Ø PIPE
PROPOSED T-OFF CHAMBER
BM2
BM3
CONNECTION TO EXP. RETICULATION
WOOD DECK DETACHED
PROPOSED 110 Ø PIPE
EXISTING 200 Ø AC-D
EXISTING WATER METER
PROPOSED 25 Ø PIPE
139/208
EXISTING WATER METER
PROPOSED 250 Ø PIPE
139/208
600

LEGEND

- EDGE OF ROAD
- EXISITNG 200 Ø AC-D PIPE TO BE UPGRADED
- FENCE
- SEWERAGE
- CADASTRALS
- CONCRETE CHANNEL
- STORMWATER PIPE
- VEGETATION
- EMBANKMENT
- OVERHEAD ELECTRICAL CABLES
- FIBRE CABLES
- POWER POLE
- LIGHT POLE
- SIGNBOARD
- CULVERT
- BENCHMARK
- EXISTING ELECTRICAL WORKS
- NEW ELECTRICAL WORKS
- 5 m BUILDING LINE FROM FENCE
- NEW PIPE
- EXISTING WATER METER
- EXISTING 25mmØ WATER PIPE
- EXISTING 250mmØ PVC WATER PIPE
- PROPOSED 110mmØ HDPE WATER PIPE
- PROPOSED 50mmØ HDPE WATER PIPE
- PROPOSED 25mmØ HDPE WATER PIPE
- PROPOSED FUTURE CONNECTIONS
- ENDCAP TO PROPOSED FUTURE CONNECTIONS

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

CONCEPT DESIGN

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

REVISIONS					
				DESIGNED	A TOOTLA
				CHECKED	T CRONJE
				DRAWN	M MLALAZI
C00	08-11-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	CHECKED	T CRONJE
NO.	DATE	DESCRIPTION	INITIAL		

SIGNED
SMEC South Africa
DATE

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SIGNED
George Municipality
DATE

UPGRADE OF AIRPORT BULK WATER PIPELINE

PREFERRED PIPELINE ROUTE LAYOUT SHEET 03 OF 05

SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER: C1915 - 610 - 003

REV	SHEET No.
C00	03 OF 05

LEGEND

- EDGE OF ROAD
- EXISITNG 200 Ø AC-D PIPE TO BE UPGRADED
- FENCE
- SEWERAGE
- CADASTRALS
- CONCRETE CHANNEL
- STORMWATER PIPE
- VEGETATION
- EMBANKMENT
- OVERHEAD ELECTRICAL CABLES
- FIBRE CABLES
- POWER POLE
- LIGHT POLE
- SIGNBOARD
- CULVERT
- BENCHMARK
- EXISTING ELECTRICAL WORKS
- NEW ELECTRICAL WORKS
- 5 m BUILDING LINE FROM FENCE
- NEW PIPE
- EXISTING WATER METER
- EXISTING 25mmØ WATER PIPE
- EXISTING 250mmØ PVC WATER PIPE
- PROPOSED 110mmØ HDPE WATER PIPE
- PROPOSED 50mmØ HDPE WATER PIPE
- PROPOSED 25mmØ HDPE WATER PIPE
- PROPOSED FUTURE CONNECTIONS
- ENDCAP TO PROPOSED FUTURE CONNECTIONS

N

N32 N31 N30 N15 N16

PROPOSED 250 Ø PIPE

PROPOSED 250 Ø PIPE

PROPOSED 250 Ø PIPE

HORIZONTAL DRILLING

EXISTING 200 Ø AC-D

EXISTING 200 Ø AC-D

EXISTING 315 Ø AC-D

EXISTING 250 Ø AC-D

CHAMBER

ENTRANCE

R102

TO BLANCO

TO HEROLDS BAY

END OF CONSTRUCTION CONNECTING TO EXISTING 315mm WATER NETWORK

PLATFORM BEING CUT OF TO EXISTING FENCE LINE

PLATFORM BEING CUT OF TO EXISTING FENCE LINE

5540/2007

5540/2007

132/208

132/208

131/208

131/208

130/208

130/208

84/208

3340 3360 3380 3400 3420 3440 3460 3480 3500 3520 3540 3560 3580 3600 3620 3640 3660 3680 3700

21838 21850 21900 21950 22000 22050 22100 22150 22200

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

CONCEPT DESIGN

REVISIONS				
C00	08-11-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	M MLALAZI
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

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SIGNED
George Municipality
DATE

UPGRADE OF AIRPORT BULK WATER PIPELINE

PREFERRED PIPELINE ROUTE LAYOUT SHEET 04 OF 05

SIZE	SCALE
A1	1:500

PROJECT DRAWING NUMBER
C1915 - 610 - 004

REV	SHEET No.
C00	04 OF 05

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

LEGEND

- EDGE OF ROAD
- EXISITNG 200 Ø AC-D PIPE TO BE UPGRADED
- FENCE
- SEWERAGE
- CADASTRALS
- CONCRETE CHANNEL
- STORMWATER PIPE
- VEGETATION
- EMBANKMENT
- OVERHEAD ELECTRICAL CABLES
- FIBRE CABLES
- POWER POLE
- LIGHT POLE
- SIGNBOARD
- CULVERT
- BENCHMARK
- EXISTING ELECTRICAL WORKS
- NEW ELECTRICAL WORKS
- 5 m BUILDING LINE FROM FENCE
- NEW PIPE
- EXISTING WATER METER
- EXISTING 25mmØ WATER PIPE
- EXISTING 250mmØ PVC WATER PIPE
- PROPOSED 110mmØ HDPE WATER PIPE
- PROPOSED 50mmØ HDPE WATER PIPE
- PROPOSED 25mmØ HDPE WATER PIPE
- PROPOSED FUTURE CONNECTIONS
- ENDCAP TO PROPOSED FUTURE CONNECTIONS

N

2600
2700
2600
2500
2400
2300
2400

TO GROOTBRAKRIVIER
TO HERCULOSBAY

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

CONCEPT DESIGN

REVISIONS				
C00	08-11-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	M MLALAZI
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

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website: www.george.org.za | Fax (044) 529-9872

SIGNED
George Municipality
DATE

UPGRADE OF AIRPORT BULK WATER PIPELINE

PREFERRED PIPELINE ROUTE LAYOUT SHEET 05 OF 05

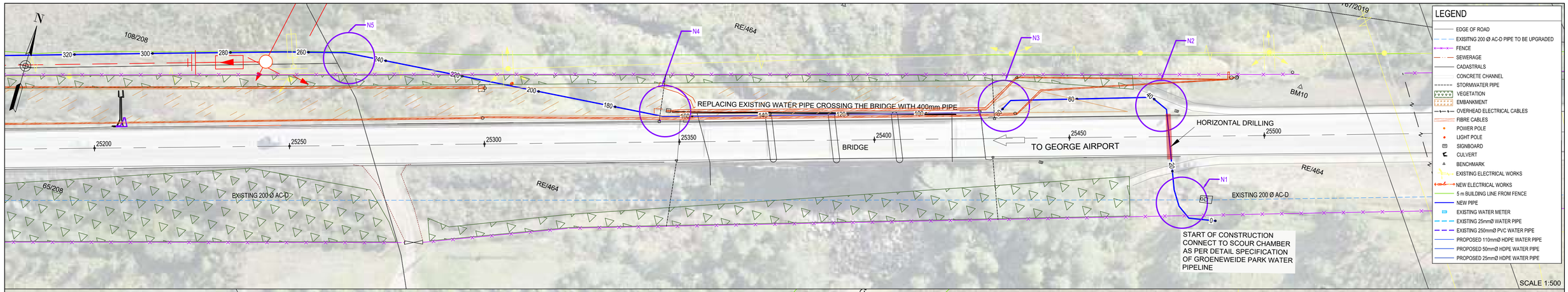
SIZE	SCALE
A1	1:1500

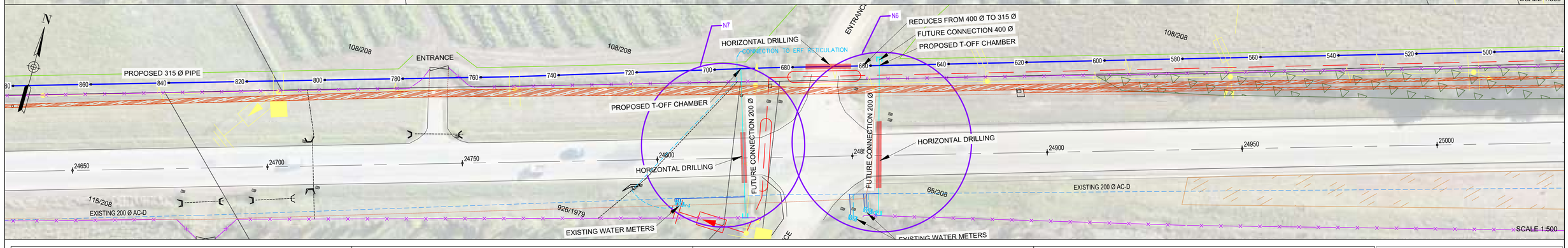
PROJECT DRAWING NUMBER: C1915 - 610 - 005

REV	SHEET No.
C00	05 OF 05

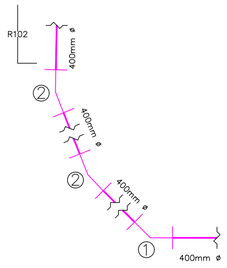
SCALE BAR 1 : 1000
100m 50m 25m 10m 0

Appendix E Diagrammatical Details



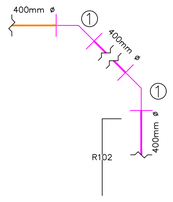


N1



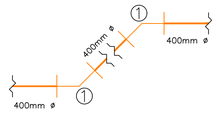
1. 400mm ø 45° BEND
2. 400mm ø 22.5° BEND

N2



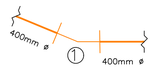
1. 400mm ø 45° BEND

N3



1. 400mm ø 45° BEND

N4

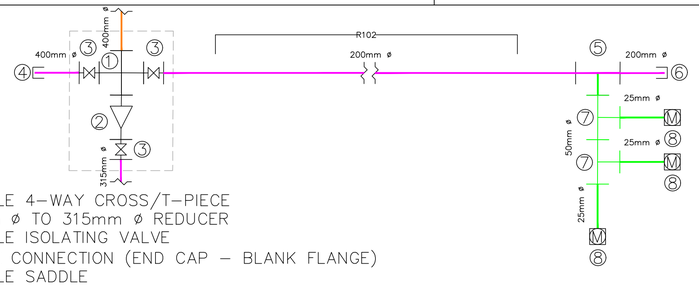


1. 400mm ø 22.5° BEND

N5

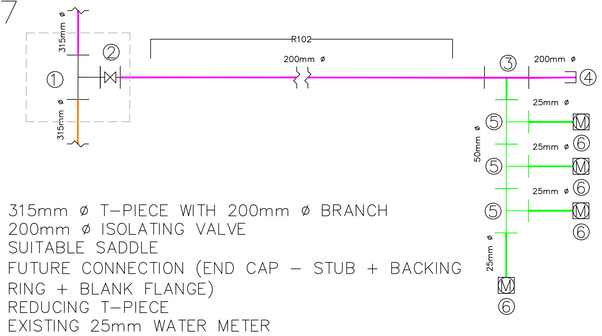
1. 400mm ø 22.5° BEND

N6



1. SUITABLE 4-WAY CROSS/T-PIECE
2. 400mm ø TO 315mm ø REDUCER
3. SUITABLE ISOLATING VALVE
4. FUTURE CONNECTION (END CAP - BLANK FLANGE)
5. SUITABLE SADDLE
6. FUTURE CONNECTION (END CAP - STUB + BACKING RING + BLANK FLANGE)
7. REDUCING T-PIECE
8. EXISTING 25mm WATER METER

N7



1. 315mm ø T-PIECE WITH 200mm ø BRANCH
2. 200mm ø ISOLATING VALVE
3. SUITABLE SADDLE
4. FUTURE CONNECTION (END CAP - STUB + BACKING RING + BLANK FLANGE)
5. REDUCING T-PIECE
6. EXISTING 25mm WATER METER

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

LEGEND - DIAGRAMS
- CHAMBER
- uPVC/oPVC PIPE
- HDPE PIPE + BUTT WELDING
- HDPE PIPE + COMPRESSION FITTINGS

CONCEPT DESIGN

REVISIONS				
C00	17-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
A00	20-03-2024	ISSUED FOR APPROVAL	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED _____ SMEC South Africa
DATE _____

SMEC South Africa
Member of the Surbana Jurong Group
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SIGNED _____ George Municipality
DATE _____

UPGRADE OF AIRPORT BULK WATER PIPELINE

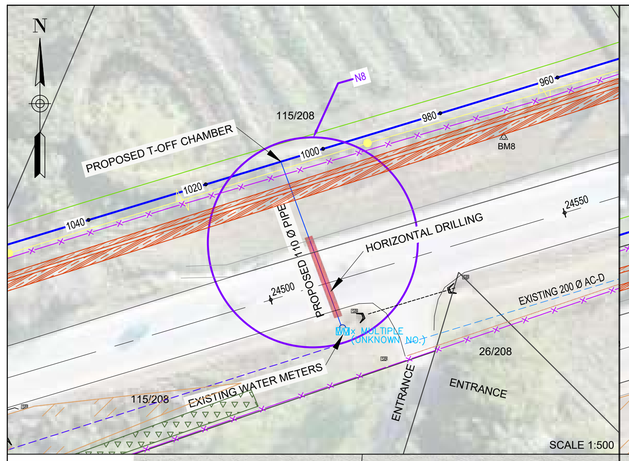
DIAGRAMMATICAL DETAILS SHEET 01 of 03

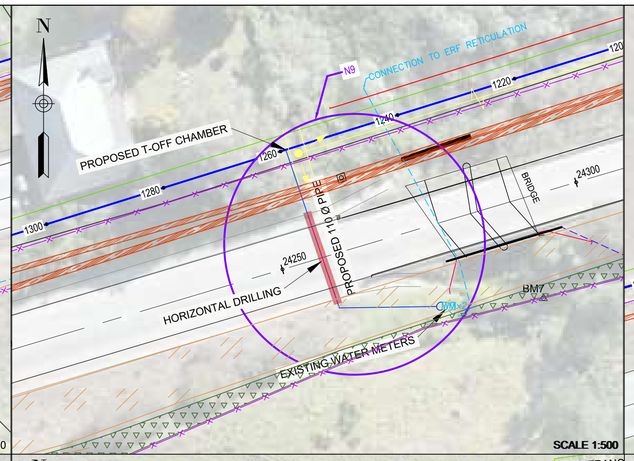
SIZE	SCALE
A1	AS SHOWN

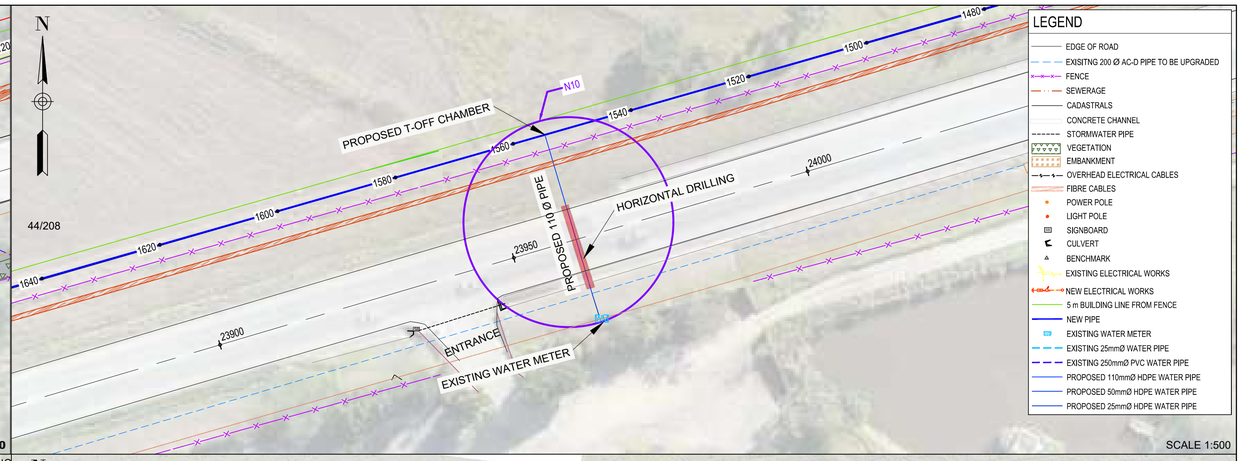
PROJECT DRAWING NUMBER: C1915 - 660 - 001

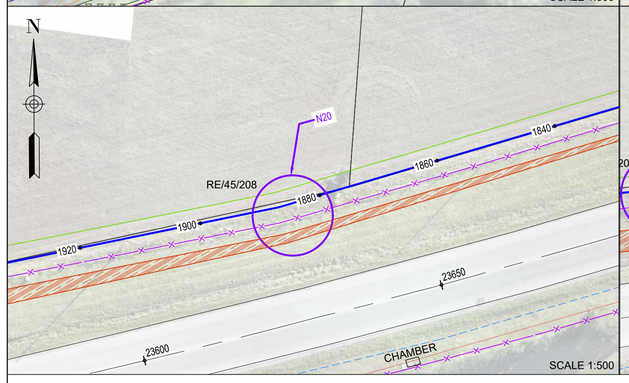
REV	SHEET No.
C00	01 OF 03

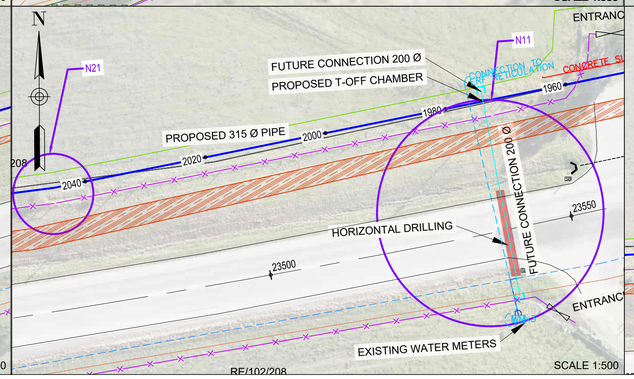
SCALE BAR: 100m, 50m, 25m, 10m, 0 — 1 : 1000

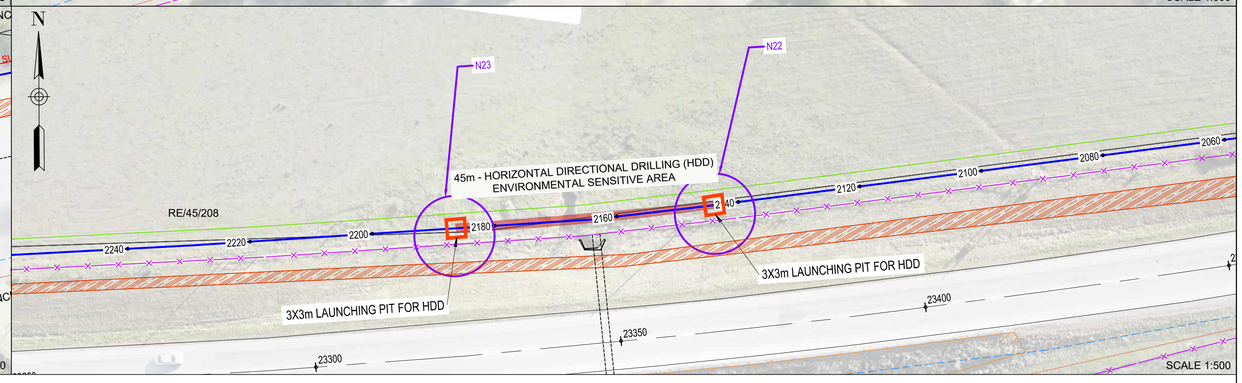




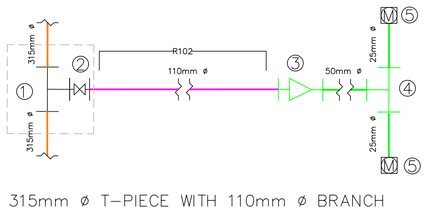






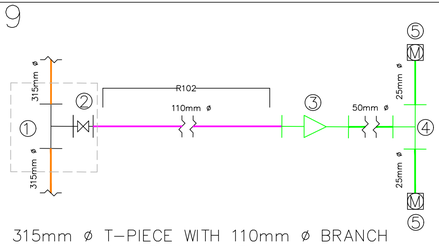


N8 (EXACT NO. OF 25mm WATER METERS UNKNOWN)



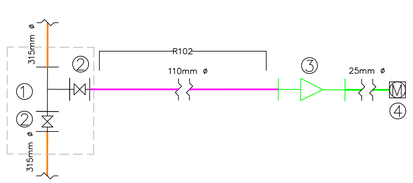
1. 315mm ø T-PIECE WITH 110mm ø BRANCH
2. 110mm ø ISOLATING VALVE
3. STUB + BACKING RING + COMPRESSION FLANGE ADAPTOR (110mm HDPE TO 50mm COMPRESSION)
4. INCREASING T-PIECE 25mm x 50mm x 25mm
5. EXISTING 25mm WATER METER

N9



1. 315mm ø T-PIECE WITH 110mm ø BRANCH
2. 110mm ø ISOLATING VALVE
3. STUB + BACKING RING + COMPRESSION FLANGE ADAPTOR (110mm HDPE TO 50mm COMPRESSION)
4. INCREASING T-PIECE 25mm x 50mm x 25mm
5. EXISTING 25mm WATER METER

N10

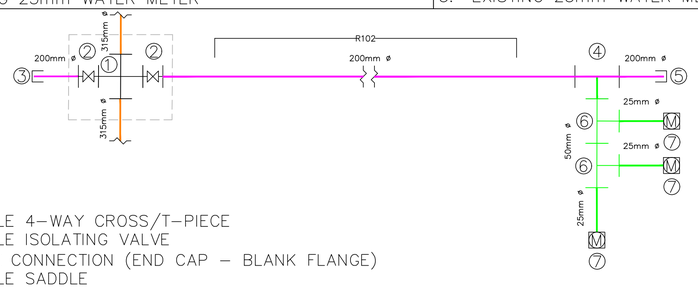


1. 315mm ø T-PIECE WITH 110mm ø BRANCH
2. SUITABLE ISOLATING VALVE
3. STUB + BACKING RING + COMPRESSION FLANGE ADAPTOR (110mm HDPE TO 25mm COMPRESSION)
4. EXISTING 25mm WATER METER

N20

1. 315mm ø 22.5° BEND

N11



1. SUITABLE 4-WAY CROSS/T-PIECE
2. SUITABLE ISOLATING VALVE
3. FUTURE CONNECTION (END CAP - BLANK FLANGE)
4. SUITABLE SADDLE
5. FUTURE CONNECTION (END CAP - STUB + BACKING RING + BLANK FLANGE)
6. REDUCING T-PIECE
7. EXISTING 25mm WATER METER

N21

1. 315mm ø 22.5° BEND

N22

1. FLANGED PUDDLE PIPE + THRUST BLOCK
2. STUB + BACKING RING
3. FLEXIBLE FLANGE ADAPTOR (VJ TYPE)

N23

1. FLANGED PUDDLE PIPE + THRUST BLOCK
2. STUB + BACKING RING
3. FLEXIBLE FLANGE ADAPTOR (VJ TYPE)

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

LEGEND – DIAGRAMS
- CHAMBER
- uPVC/oPVC PIPE
- HDPE PIPE + BUTT WELDING
- HDPE PIPE + COMPRESSION FITTINGS

CONCEPT DESIGN

REVISIONS				
C00	17-05-2024	ISSUED FOR CONCEPT DESIGN PURPOSES	TC	
A00	20-03-2024	ISSUED FOR APPROVAL	TC	
NO.	DATE	DESCRIPTION	INITIAL	

DESIGNED	A TOOTLA
CHECKED	T CRONJE
DRAWN	A TOOTLA
CHECKED	T CRONJE

SIGNED
SMEC South Africa
DATE

SMEC South Africa
Member of the Surbana Jurong Group
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website: www.smec.com Fax (044) 873-5086

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SIGNED
George Municipality
DATE

UPGRADE OF AIRPORT BULK WATER PIPELINE

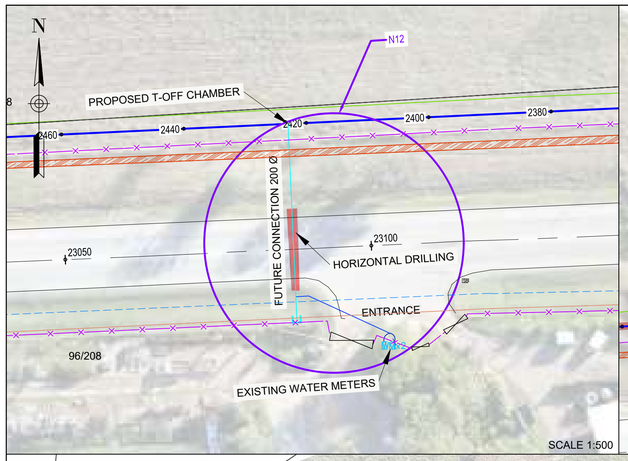
DIAGRAMMATICAL DETAILS SHEET 02 of 03

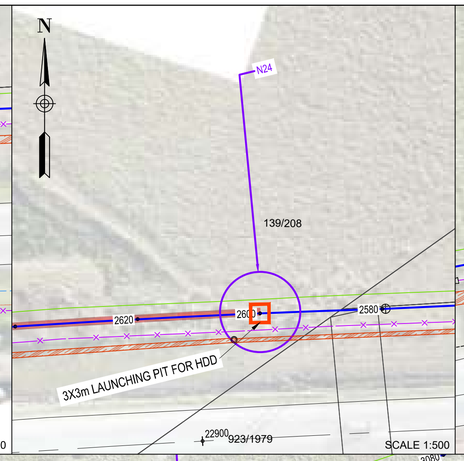
SIZE	SCALE
A1	AS SHOWN

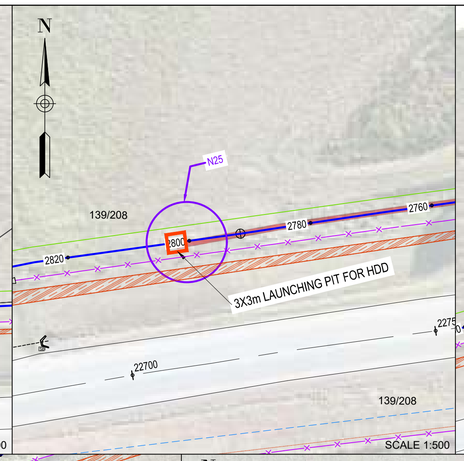
PROJECT DRAWING NUMBER: C1915 - 660 - 002

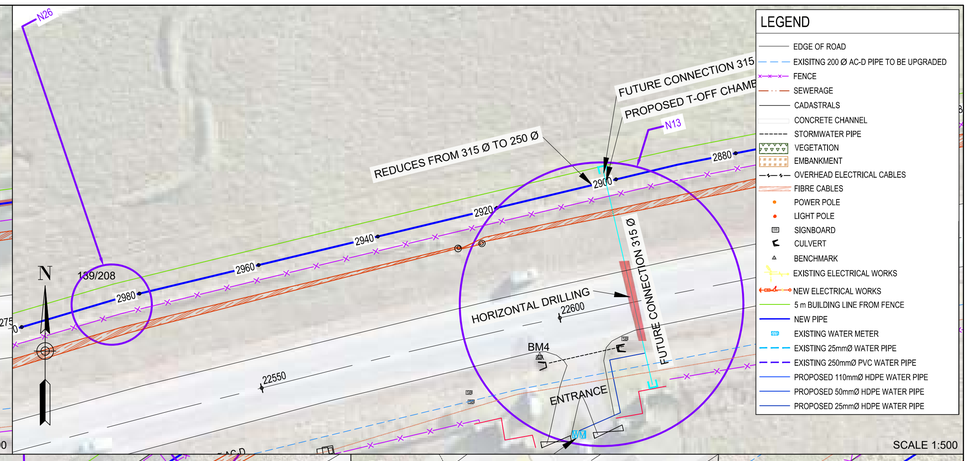
REV	SHEET No.
C00	02 OF 03

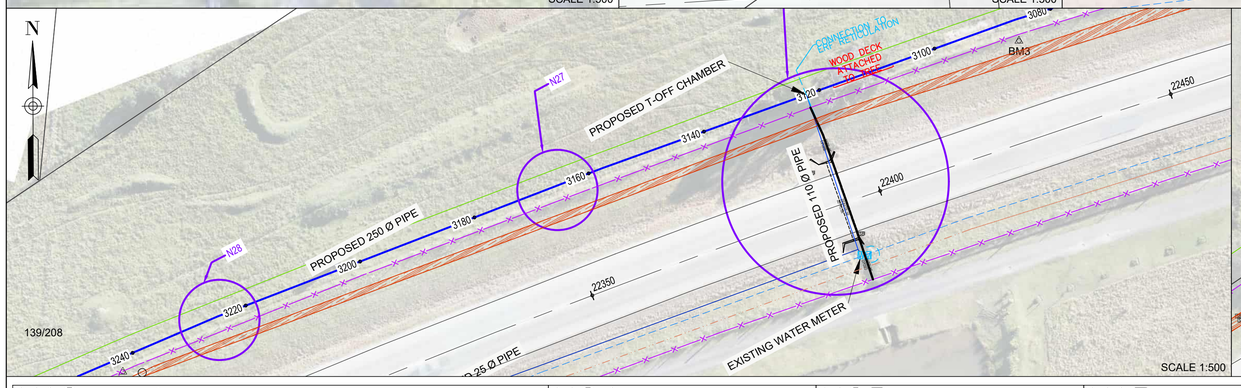
SCALE BAR: 100m, 50m, 25m, 10m, 0 — 1 : 1000

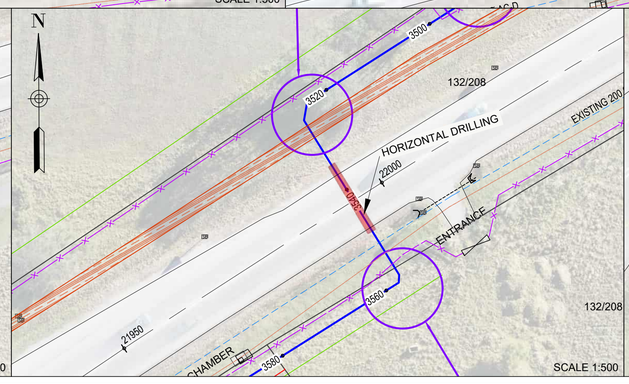


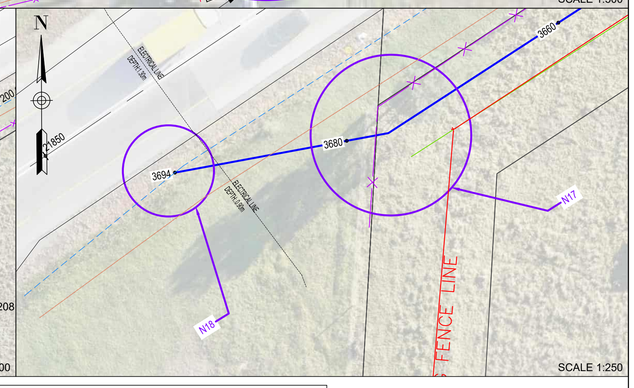




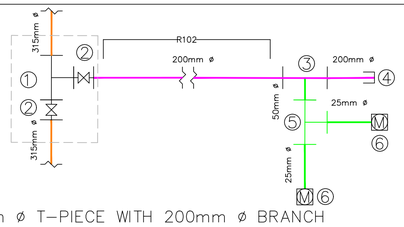








N12

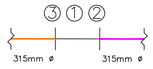


1. 315mm ø T–PIECE WITH 200mm ø BRANCH
2. SUITABLE ISOLATING VALVE
3. SUITABLE SADDLE
4. FUTURE CONNECTION (END CAP – STUB + BACKING RING + BLANK FLANGE)
5. REDUCING T–PIECE
6. EXISTING 25mm WATER METER

N24

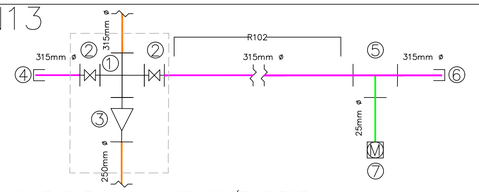
1. FLANGED PUDDLE PIPE + THRUST BLOCK
2. STUB + BACKING RING
3. FLEXIBLE FLANGE ADAPTOR (VJ TYPE)

N25



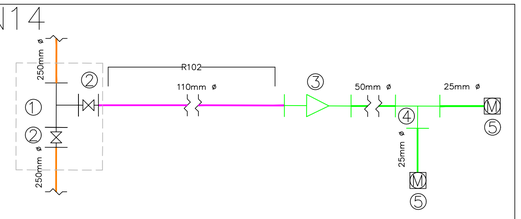
1. FLANGED PUDDLE PIPE + THRUST BLOCK
2. STUB + BACKING RING
3. FLEXIBLE FLANGE ADAPTOR (VJ TYPE)

N13



1. SUITABLE 4–WAY CROSS/T–PIECE
2. SUITABLE ISOLATING VALVE
3. 315mm ø TO 250mm ø REDUCER
4. FUTURE CONNECTION (END CAP – BLANK FLANGE)
5. SUITABLE SADDLE
6. FUTURE CONNECTION (END CAP – STUB + BACKING RING + BLANK FLANGE)
7. EXISTING 25mm WATER METER

N14

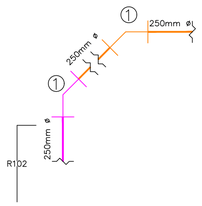


1. 250mm ø T–PIECE WITH 110mm ø BRANCH
2. SUITABLE ISOLATING VALVE
3. 110mm ø TO 50mm ø REDUCER
4. REDUCING T–PIECE
5. EXISTING 25mm WATER METER

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

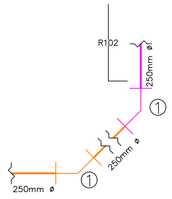
LEGEND – DIAGRAMS
- CHAMBER
- uPVC/oPVC PIPE
- HDPE PIPE + BUTT WELDING
- HDPE PIPE + COMPRESSION FITTINGS

N15



1. 250mm ø 45° BEND

N16

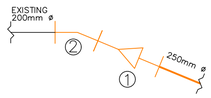


1. 250mm ø 45° BEND

N17

1. 250mm ø 22.5° BEND

N18 (CONNECTION TO EXISTING 200mm ø BULK LINE)



1. 250mm ø TO 200mm ø REDUCER
2. 200mm ø 22.5° BEND

N26 TO N31

1. 250mm ø 22.5° BEND

CONCEPT DESIGN

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UPGRADE OF AIRPORT BULK WATER PIPELINE

DIAGRAMMATICAL DETAILS SHEET 03 of 03

SIZE	SCALE
A1	AS SHOWN

PROJECT DRAWING NUMBER: C1915 - 660 - 003

REV	SHEET No.
C00	03 OF 03

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

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engineering positive change

SMEC simplifies the complex. We unlock the potential of our people to look at infrastructure differently, creating better outcomes for the future.

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