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**Consulting Services**

- Civil Engineering
- Electrical Engineering
- Structural Engineering
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**BOSCHENDAL VILLAGE DEVELOPMENT**

**BULK ENGINEERING SERVICES REPORT**

**Revised  
06 August 2017**

**1 INTRODUCTION**

As general background to the project, a Project Preamble is attached.

This report serves to provide an assessment of the availability of the existing bulk engineering services in the vicinity of the proposed development which will be available for the development, and what will be required to be provided.

The present masterplanning of the Municipality for all planned future developments has been examined, and discussions held with the Municipality. From here and further investigation, proposals have been compiled, and the likely requirements as they relate to this development proceeding first and on its own are summarised and reported on below, for all the civil and electrical services. With regard to the particular detail of the water and sewerage, on instruction from the Municipality, the Developer appointed the Municipality's masterplanning consultants GLS to analyse the detailed requirements for these services, on the basis of input from iCE.

Although the size of certain of the components identified may be able to be reduced if they were for this development alone, it is expected that where modular implementation is not practical or feasible, the eventual masterplanning sizes will be implemented in terms of a Services Agreement with the Municipality. This will include agreement on what Development

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Reg No:1999/008261/07

Contributions are payable by this development, what works can be implemented by this Developer in lieu of payment thereof, and what the Municipality will pay for or implement themselves.

The area falls in the Stellenbosch Municipality area, and the civil services infrastructure is operated by them, and the responsibility therefor will remain with them. Regarding electricity, although this area falls in the Stellenbosch Municipality area, present supply jurisdiction for the area is by Drakenstein Municipality, and supply to the overall area by a combination of Drakenstein and Stellenbosch Municipalities as well as Eskom. Ultimately, responsibility for supply to this development will be transferred to Stellenbosch Municipality, and therefore they will need to enter into agreements with the others if they need to obtain supply from them.

## **2 ENGINEERING SERVICES**

### **2.1 PROPOSED DEVELOPMENT**

This report is based on the land-use concept diagram of the Urban Designers dated February 2017, as attached. This in turn was arrived at after input from the Developer and the entire professional team.

The following summarises the land-use scenario envisaged for the proposed development, from a service usage point of view:

- Residential : 475 units
- Hotel/Guest units: 100 bedrooms
- High street retail: 5 500m<sup>2</sup> GLA
- General business: 9 000m<sup>2</sup> GLA
- Clinic/civic/community: 3000m<sup>2</sup>

### **2.2 STORMWATER DRAINAGE**

A separate Stormwater Management Plan (SMP) has been compiled for the development. Essentially the management of stormwater within the development will be designed in accordance with the general principles of sustainable urban water drainage systems, this to disconnect the system and protect the receiving waters, being that of the Dwars River to the east.

In addition, by means of attenuation ponds, the outflow from the development will be limited to the pre-development flows, which for a 1 in 50 year scenario is approximately 1.3m<sup>3</sup>/s. The stormwater from the development will ultimately flow out from the development from an attenuation pond at the north-east corner thereof, via a new channel and pipe south of the railway here, just inside the Boschendal farm boundary in a servitude to be registered, discharging into the Dwars River just upstream from the railway bridge. This system for this development will be kept separate from and not discharge into the existing system via the culvert under railway and road here, which therefore remains unaffected by this development.

The new channel for this development will be open and unlined along the first portion, and then become a 900dia pipe. Gabion drop-structures will be constructed at the outlet from the pond, and at the outlet to the river, where a double gabion drop-structure will be constructed to take up the level difference.

This is all addressed in the SMP, and indicated on the “External Stormwater” drawing attached.

The SMP also addresses the floodlines of the Dwars River and the requirements for the development as a result thereof. These have been calculated using the surveyed contours for the area. Two development alternatives are proposed. The preferred alternative is with a small and negligible area below the floodline being filled in, and an alternative without filling in.

## 2.3 SEWERAGE

The sewerage flows to be generated from this development are estimated as follows:

<b>SEWERAGE</b>	<b>ADWF</b>	<b>AVERAGE FLOW RATE</b>	<b>PDWF</b>	<b>PWWF</b>
	<b>l/day</b>	<b>l/s</b>	<b>l/s</b>	<b>l/s</b>
Residential	207 000	2.40	7.2	9.0
Business	56 000	0.65	1.95	2.5
Hotel	12 000	0.14	0.42	0.5
<b>Totals</b>	<b>275 000</b>	<b>3.19</b>	<b>9.57</b>	<b>12.0</b>

**Approximate required pumping rate = 12l/s**

After investigation of a number of alternatives, the following new masterplanning elements are required for this development, all as shown on the attached "External Sewer" drawing:

1. A gravity main of 200dia along the north-eastern boundary of the development
  - This will collect the internal reticulation sewer pipes from the development and convey the sewage to the pump-station in 2 below. It will run in a servitude to be registered just inside the Boschendal farm boundary, which will be shared with that for the rising main in 3 below, and that for the stormwater channel and pipe in 2.2 above.
  
2. A new sewage pump-station close to the Dwars River bridge
  - This will receive the above gravity main and pump the sewage via the rising main in 3 below.
  - The site area required for this is approximately 20mx10m, and a schematic preliminary layout is attached.
  - The sump will be about 5m below ground, and the structure size about 5mx5m.
  - Because the ground level here is below the 1 in 50 year floodline level, the floor level of the pump-station will be raised by about 1m from the ground level so that it is above the 1 in 100 year flood level. This will not affect any river flow, as it is well out of the main channel flow under the bridge here.
  - The pump station will be designed so that it can be upgraded in future on a modular basis to take more flow from other future developments. (i.e. 20l/s at present up to 40l/s in future.)
  - The structures (being the screen inlet chamber, sump and top structure, and emergency overflow tank) will be designed and constructed so as to accommodate the eventual future flow. The pumps, pipework, switchgear and instrumentation will be installed for this development's flow only, but will be designed such that additional equipment can be added on a modular basis, all within the initially built structures.
  - The sub-structures will be water-retaining reinforced concrete up to and including their top slabs, which will be above the 1 in 100 year flood-level. As such they will be sealed from leaking into the surrounding ground and against infiltration from the outside.

- The top structure (which will house the switchgear, instrumentation panels, distribution boards, emergency generator and fuel room) will be in brickwork with a tiled roof, all above the 1 in 100 year flood level. The specific building regulation requirements for the fuel room and other fire protection requirements will be adhered to.
  - As is standard in the design of such pump stations, the following measures will be implemented as back-up in the case of failure:
    - o stand-by pumps
    - o telemetry communication with the municipality depots and cell phones, as well as flashing lights at the building, all to provide alarms in the case of breakdowns or malfunction
    - o a back-up generator that automatically starts in the event of a power failure
    - o an emergency overflow tank to accommodate at least 4 hours of flow
  - This pump station will be owned, operated and maintained by the Municipality, in accordance with their O&M systems.
  - A separate erf will need to be sub-divided from the Boschendal farm here, to become the property of the Municipality, otherwise a servitude agreement entered into. The erf will be fenced in for safety and security.
  - Access to the pump station will be via roads through the development and then via gravel roads on the Boschendal farm, over which servitude rights will be written into either of the above-mentioned agreements.
3. A rising main of 200dia to the existing Pniel sewer pump-station
- Although there are a number of alternative routes, the preferred route is back through the abovementioned servitude and then through the development, along and inside the Helshoogte Road reserve and then via municipal road reserves in Pniel, to the Pniel pump-station. A drawing is attached showing typical crossings of watercourses.
  - This pipe size is designed to take the total future flow of 40l/s.
4. Upgrading of the pumping capacity in the existing Pniel sewer pump-station from 15l/s to 40l/s
- It is expected that this upgrade will be for the pumps, pipework and switchgear inside the existing structure only, and will be to increase the

pumping capacity to accommodate the existing flow plus that from this development, plus from the soon to be developed areas in Pniel draining to this position.

- From here the sewage is pumped along an existing rising main to the WWTW in 5 below. This rising main has sufficient capacity to convey the existing flow plus that from this development.

5. A 0.41 MI/d upgrade to the Dwars River Waste Water Treatment Works near Johannesburg

- This is part of a separate, phased project to upgrade the works for all future developments.
- A separate EIA has already been approved for this project

The above has all been confirmed and covered in detail in the report compiled by GLS Consultants.

## 2.4 WATER SUPPLY

The water demand expected from this development is estimated to be as follows:

<b>WATER</b>	<b>AADD</b>	<b>AVERAGE FLOW RATE</b>	<b>PEAK RESIDENTIAL</b>	<b>PEAK COMMERCIAL</b>
	<b>l/day</b>	<b>l/s</b>	<b>l/s</b>	<b>l/s</b>
Residential	310 000	3.59	21.5	21.5
Business	70 000	0.81	2.43	2.43
Hotel	15 000	0.17	1.02	
<b>Totals</b>	<b>395 000</b>	<b>4.57</b>	<b>25.0</b>	<b>53.8</b>
<b>FIRE DEMAND</b>			<b>25</b>	
<b>PEAK DEMAND (incl. FIRE)</b>			<b>50</b>	

**Reservoir size required = 3 x 0.395 MI = +/- 1.2 MI**

After investigation of a number of alternatives, and elimination of many, the following new masterplanning elements are required for this development, all as shown on the attached "External Water" drawing:

1. A storage reservoir above the Pniel area

- The reservoir is to be located adjacent to the existing reservoirs, where it can be fed by the existing supply pipe, which has sufficient capacity for the existing flow plus that of this development, and which runs all the way from an existing connection to the Wemmershoek pipeline via various pump-stations which also have sufficient capacity.
- A reservoir capacity of 1,5MI is needed for this development but the Municipality may wish to have a larger capacity of 2.0MI constructed to achieve economy of scale and/or to also serve other existing or future areas.
- The 1.5MI reservoir will be concrete and be approximately 20m diameter and 6m high, and a 2.0MI reservoir would be 23m diameter and 6m high. It will not fit onto the existing reservoir defined erf here, but will need to extend to outside the north-east corner thereof, also on municipal/Pniel-community land. It will be at the same levels as the existing reservoir and therefore cut into the side of the hill here, also to ensure being more than 32m from the adjacent watercourse. A schematic preliminary layout of this precinct is attached.

2. A gravity main of starting at 250dia and increasing to 315dia from the reservoir to the development

- This will skirt around the edge of the town's cadastral boundaries, either in municipal/Pniel-community land or in servitudes to be registered over the Boschendal farm here, until it reaches Helshoogte Road. It will then run inside the Helshoogte Road reserve until it reaches the development. A drawing is attached showing typical crossings of watercourses.
- The size is based on the future masterplanning and allows for all future development served by this pipe.

3. Two pressure reducing valves on the gravity main
  - This will be located such that the pressure at the development will not be greater than the municipal norms

It should be noted that the above is the minimum required for this development. In future as other developments proceed, an entirely new supply pipe with intermediate pump-stations will be needed from the Wemmershoek line up to the abovementioned and other future reservoirs. (The next phase of this infrastructure is referred to and shown in the GLS report. Should the Municipality wish to proceed with this next phase now already it should not be part of this development's responsibilities. Some of the minimum infrastructure being constructed for this development as listed above will be part of this eventual system, and needs to be designed accordingly however.)

The above has all been confirmed and is covered in detail in the report compiled by GLS Consultants.

In line with the Developer's intention to implement the development in as environmentally-friendly a manner as possible (as referred to in other sections of this report), the following water saving methods are envisaged:

- water-efficient plumbing fixtures in houses
- landscaping by means of indigenous and xeriscaping vegetation
- use of non-potable water for irrigation as much as possible e.g. possible rain-water tanks and grey-water re-usage, etc.

## **2.5 SOLID WASTE**

Being part of the overall planning of the Municipality, this development will be serviced by the Solid Waste department thereof in terms of refuse removal.

The volume of solid waste estimated to be generated is approximately 24t/week. After sorting and processing as mentioned below, the remaining waste will be removed by the Municipality from this development to one of the existing or planned municipal landfill facilities in the area, which have been planned to accommodate future developments including this one.



The development will have a central refuse collection facility, located between the police station and the railway on the eastern side of the Helshoogte Road. It will be the responsibility of the Homeowners Association(s) to transport the refuse from the individual units/precincts to this point. At this facility the refuse will be sorted, and the organic portion made available to the adjacent farm and /or whichever parties for re-use.

The remainder of refuse will be stored in standard bulk sized bins for collection by the Municipality. The collection point for the Municipality will be off the Helshoogte Road at this location, and designed to Municipal requirements to accommodate their vehicles.

A separate bin system for re-cycleable material will also be implemented e.g. glass, tin, plastic and paper.

The Homeowners Association rules and constitutions will be drawn up accordingly, to ensure proper management of the above system.

## **2.6 ELECTRICAL SERVICES**

### **Supply Authority**

The proposed development area falls within the area of the Stellenbosch Municipality, but the electrical supply jurisdiction of the Drakenstein Municipality. Both municipalities have been consulted, as it will at some stage be handed over from Drakenstein to Stellenbosch.

### **Estimated supply required**

The total estimated conventional electrical load for the Boschendal Development is approximately 2,4 MVA - (11 000 V). As covered in a later section below, due to the environmentally friendly principles of the development, certain energy saving interventions will be implemented, resulting in a maximum demand of 1,5 MVA.

### **Supply Availability**

The municipal electrical departments have advised that after June 2018, there will be at least 1,5 MVA spare capacity available at the existing main substation in the area, to serve this development. (This substation is located on Helshoogte Road diagonally opposite the police station, as shown on the attached sketch. The Municipality will upgrade this sub-station building in order to house the switchgear for this Boschendal Village development.)

### **Medium-Voltage (MV - 11kV) and Low-Voltage (LV - 400V) reticulation**

The complete MV and LV Reticulation systems to the development will comprise underground cabling only. Any existing MV overhead lines within the development will be removed and replaced with underground cabling.

A secondary 11kV reticulation system will be provided as required and approximately 7 mini-substations will be located at various locations to be determined, but as shown schematically on the attached sketch. These will be located on 5.5x4m sites.

LV connections to each erf will be provided as calculated.

All routes will be within existing road-reserves or the new road-reserves of the subdivision and/or municipal servitudes.

### **Energy Conservation**

As stated, conventionally the power required for this development would be approximately 2,4 MVA. However, it is intended to conserve energy and reduce the demand at peak periods to 1,5 MVA (as proposed in the Green Report by Agama Consultants, dated 7 June 2016) by means of the following:

- An Energy Management system
- Energy saving / controlling devices fitted to each consumer distribution board to limit the maximum power to the design limits
- Lighting fittings shall be fitted with LED lamps only
- Hot water generation by means solar panel together with LPG gas geyser back-up. In the case of three storey apartments, solar hot water units combined with gas geyser shall be provided.
- In the case of the hotel a centralised heat pump unit shall be provided.
- The Municipality advised that a control relay be provided to control each hot water unit. This relay will be controlled by the Municipality by switching it OFF during peak electricity consumption periods and switching it ON after the peak period. This will apply where a separate heat pump unit is provided for each separate hot water unit.

Further power savings will be achieved by means of the following:

- Installation of stoves with gas heating hob and gas oven
- Inclusion of smart meters and relay switches to limit consumption to non-essential appliances. Appliances like washing machines or driers are switched off in the event

that the development load is exceeded or the dwelling unit power allocation be exceeded.

- In the case of the hotel and Retail areas conservation of electricity in terms of mechanical ventilation shall have to be applied by the Mechanical Engineer.
- Power shall be supplemented by means of Photo-Voltaic (Solar energy Panels) where possible.

A table is attached, showing the estimated electrical power requirement after the various conservation measures, resulting in a total power requirement of 1,5 MVA.

It is understood that it will be a requirement of the Municipality for these limitations and measures to be recorded in the sales agreements with purchasers.

### **Future Demand and Availability**

Should the demand increase in future from this and other developments in the area, or should the above-mentioned limitations need to be relaxed, additional bulk power will need to be obtained. Apart from masterplanning being done by the Municipality for the area as a whole to bring in more power, and upgrades being done to the 66kV overhead lines, additional power will also become available at the Helshoogte Road sub-station due to the existing surrounding farm reducing their power consumption off the external supply. The Developer, who as stated also runs this farm that surrounds the development, has indicated that he intends to reduce the farm's power consumption from the external supply by at least 1.0 MVA, mainly by means of solar power panels, but also by other generation methods and/or and other power saving measures. The Municipality has indicated that once this is in place, an additional 0.5 MVA will become available from the above-mentioned sub-station opposite the police station, thus reducing reliance on the required load control interventions considerably.

### **Street Lighting**

The street lighting design together with controls shall comply with the Municipal Standards and SANS Standards for Public Lighting, and street and public lighting fittings shall comprise LED lamps only.

### **3 PHASING**

The development will be implemented in phases. The order in which these will proceed and the size of the phases will essentially be determined by the market demand, viability and cash-flow considerations.

The external road upgrades and phasing thereof are covered in the separate TIA report, and can be logically and progressively phased as the development phases proceed. The same applies to the stormwater, and bulk water/sewer/electrical reticulation internal to the site.

Regarding the bulk water/sewer/electrical pipelines and facilities external to the site however, most of these systems will be required with the first phase already, except possible phasing of the storage/pumps/switchgear infrastructure that can be implemented on a modular basis as the phases proceed. Should the initial phase be small enough, possible temporary arrangements can be made to link to existing basic infrastructure in the area.

All of these arrangements, and the exact phasing of bulk services, will need to be based on calculations of demands and capacities, and discussed and agreed with the Municipality.

**Dave Edwards (Civil) & Mahdie Kriel (Electrical)**  
**iCE Group (Pty) Ltd**

#### **ATTACHMENTS:**

- Project Preamble
- Land-Use Concept Diagram
- Electrical Power Requirements Rev2
- TC02339-ES-10 Rev B: External Stormwater
- TC02339-ES-11 Rev E: External Sewer
- TC02339-ES-12 Rev D: External Water
- TC02339-ES-13: Schematic Bulk Electrical
- TC02339-ES-14: Typical pipe crossings of watercourses
- TC02339-PS-01: Schematic Sewer Pump Station Layout
- TC02339-RES-01 Rev A: Schematic Reservoir Site Layout

### 3.13 PROPOSED LAND USE CONCEPT

The land use mix on the property is illustrated in the land use table (Fig.6.1) and furthermore illustrated on the land use concept plan in Figure 81.

The core of the development will comprise mixed use development which includes a farmers market, shops, and restaurants, places of entertainment, offices and other related businesses as well as apartments on the upper levels.

The mixed use core of the village will be surrounded with residential development of varying densities and unit sizes, ranging from 3 storey residential buildings near the core which contain medium to high density flats, double storeyed town & row houses to one and two storey free standing residential units. In line with provincial guidelines, the highest densities of the village will be located at the centre of the village, whilst the lower densities will be located around the edges.

Maximum 475 residential units are proposed in this development of which at least 10% (Maximum 47 units) of the accommodation will be housing for key workers such as teachers, policemen, nurses etc. in the form of a rental housing scheme owned by Boschendal (Pty) Ltd.)

A hotel or guest accommodation of approximately 100 rooms is also proposed.

**Controls:** The final land use mix in the development shall be generally in accordance with the land uses illustrated in Figure 81 and table 6.1. The maximum development extent which may not be exceeded is summarised as follows:

- Residential: 475 dwelling units
- General Business GLA: 14 500m<sup>2</sup>
- Hotel/Guest accommodation: 100 bedrooms
- Community facilities GLA: 3000 m<sup>2</sup> GLA

#### LAND USES:

- RESIDENTIAL: LOW DENSITY (Free standing)
- RESIDENTIAL: GARDENS ONLY (NO STRUCTURE)
- RESIDENTIAL: LOW DENSITY (Row houses)
- RESIDENTIAL: MEDIUM DENSITY (Row houses)
- RESIDENTIAL: HIGH DENSITY (Flats)
- RESIDENTIAL (HOSPITALITY)
- COTTAGES (WITH CONSENT FOR GUEST ACCOMODATION)
- BUSINESS: LOW DENSITY MU - 1 STOREY
- BUSINESS: MEDIUM DENSITY MU - 2 STOREY
- BUSINESS: HIGH DENSITY MU - 3 STOREY
- BUSINESS MARKET
- CIVIC BUILDINGS
- CLINIC, EARLY CHILD DEVELOPMENT + AFTERCARE
- UTILITY REFUSE
- OPEN SPACE
- AGRICULTURAL
- ROADS PUBLIC
- ROADS PRIVATE 1
- EXISTING FARM TRACKS INDICATED
- 50 yr FLOODLINE
- 100 yr FLOODLINE
- WETLAND + BUFFER ZONE
- RETENTION POND
- DEVELOPMENT SITE BOUNDARY

Community facilities, including a clinic, early child development and aftercare centre, maintenance and recycling facilities are also proposed. It is proposed that these facilities is clustered around and in close proximity to the existing police station. Possible locations for these facilities are indicated with a \* on plan.

Restricted maximum retail of 500m<sup>2</sup> floor area per franchise as principle to establish a balanced competitive market between local and national retailers. Preferable average size of retailers +/- 150m<sup>2</sup>.

The final land use mix for each superblock will be indicated on the subdivision plan for that superblock.

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EXISTING FOOD GROUP INDUSTRIAL

NEW PLANTING

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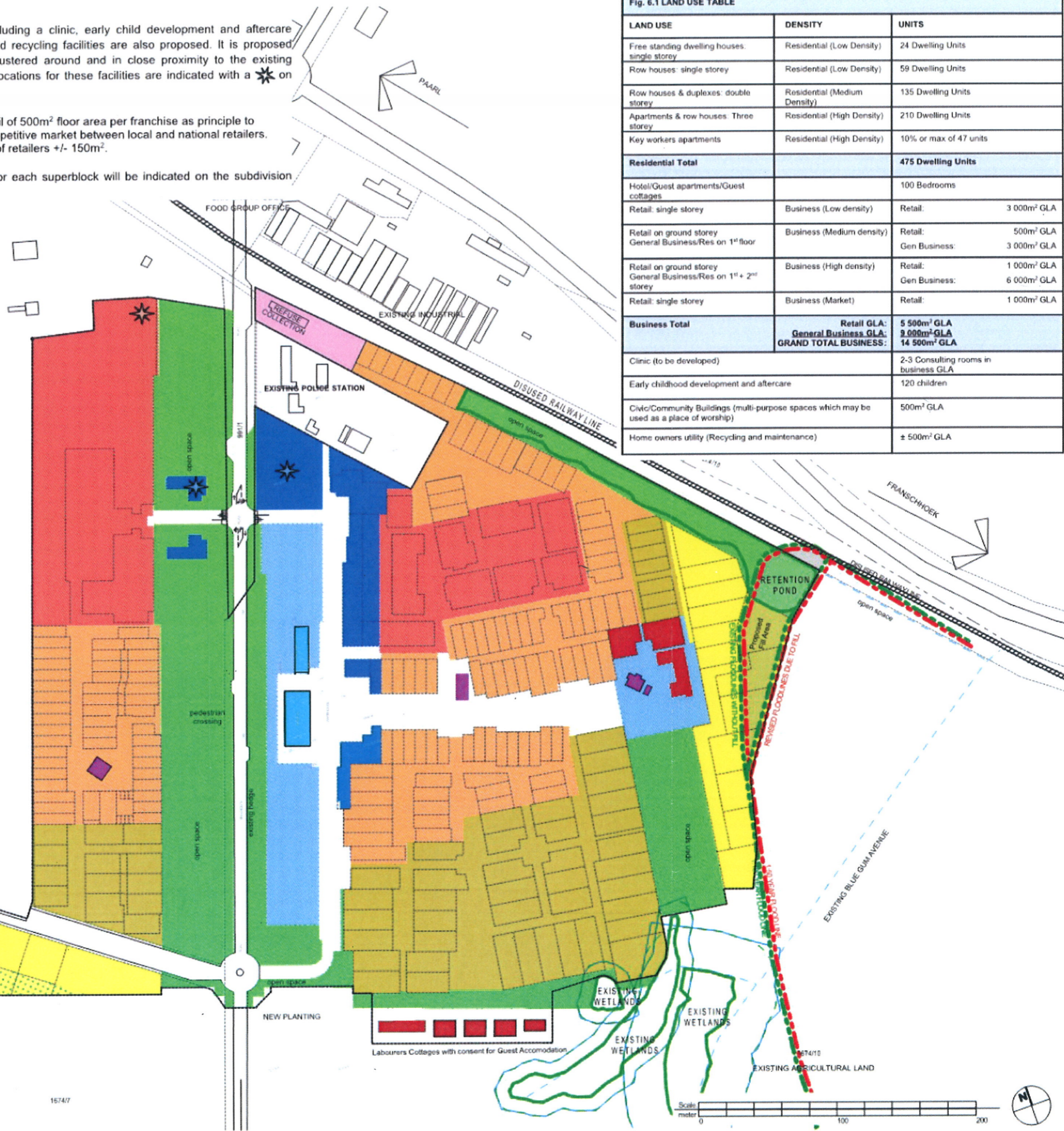


Fig. 6.1 LAND USE TABLE		
LAND USE	DENSITY	UNITS
Free standing dwelling houses: single storey	Residential (Low Density)	24 Dwelling Units
Row houses: single storey	Residential (Low Density)	59 Dwelling Units
Row houses & duplexes: double storey	Residential (Medium Density)	135 Dwelling Units
Apartments & row houses: Three storey	Residential (High Density)	210 Dwelling Units
Key workers apartments	Residential (High Density)	10% or max of 47 units
<b>Residential Total</b>		<b>475 Dwelling Units</b>
Hotel/Guest apartments/Guest cottages		100 Bedrooms
Retail: single storey	Business (Low density)	Retail: 3 000m <sup>2</sup> GLA
Retail on ground storey General Business/Res on 1 <sup>st</sup> floor	Business (Medium density)	Retail: 500m <sup>2</sup> GLA Gen Business: 3 000m <sup>2</sup> GLA
Retail on ground storey General Business/Res on 1 <sup>st</sup> + 2 <sup>nd</sup> storey	Business (High density)	Retail: 1 000m <sup>2</sup> GLA Gen Business: 6 000m <sup>2</sup> GLA
Retail: single storey	Business (Market)	Retail: 1 000m <sup>2</sup> GLA
<b>Business Total</b>		<b>Retail GLA: 5 500m<sup>2</sup> GLA General Business GLA: 9 000m<sup>2</sup> GLA GRAND TOTAL BUSINESS: 14 500m<sup>2</sup> GLA</b>
Clinic (to be developed)		2-3 Consulting rooms in business GLA
Early childhood development and aftercare		120 children
Civic/Community Buildings (multi-purpose spaces which may be used as a place of worship)		500m <sup>2</sup> GLA
Home owners utility (Recycling and maintenance)		± 500m <sup>2</sup> GLA

Fig. 81 Proposed land use | scale 1:3000 @ A3

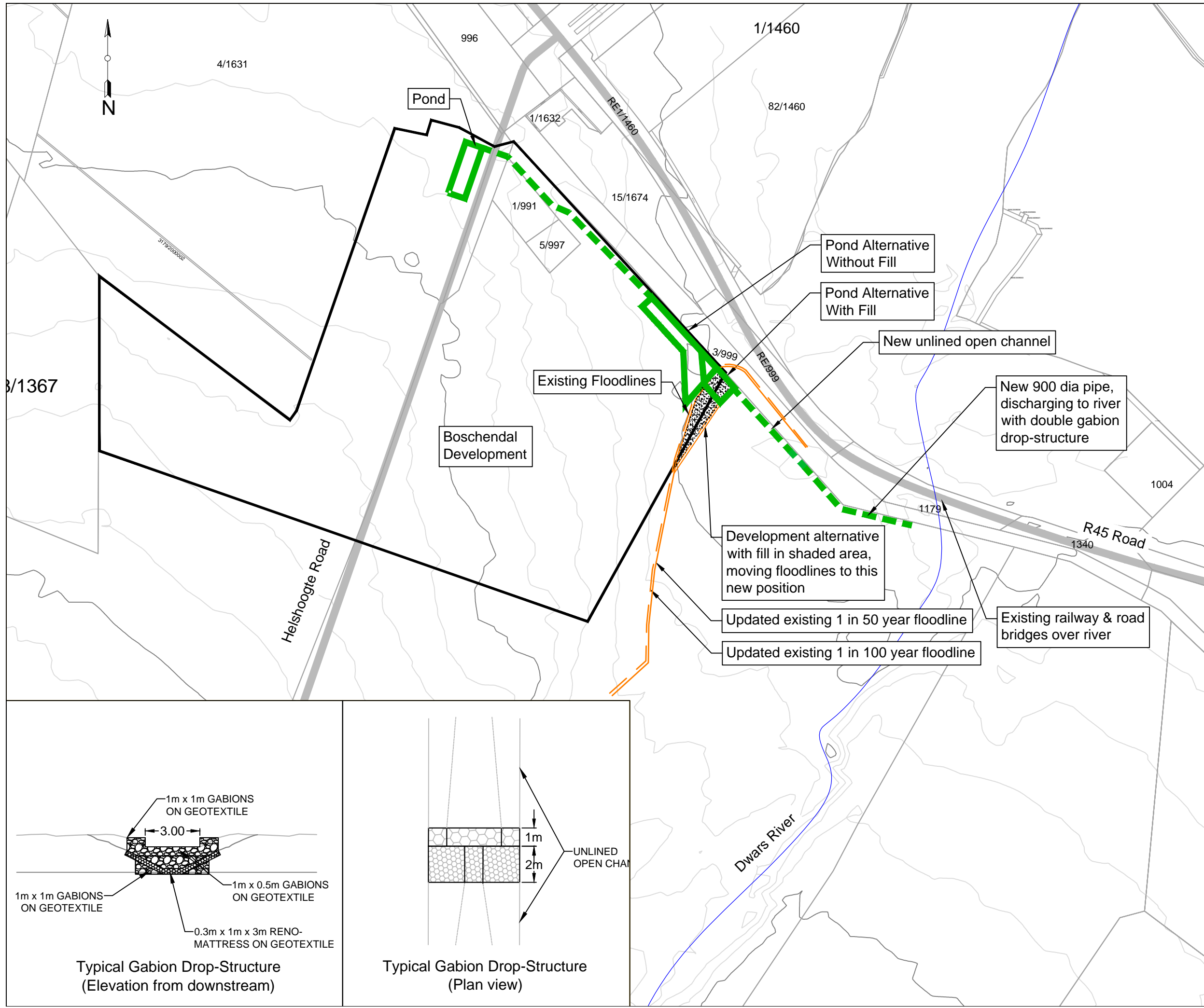
<b>BOSCHENDAL - ESTIMATED ELECTRICAL POWER REQUIREMENTS AFTER CONSERVATION MEASURES - Rev2</b> (kVA values based on Green Report submitted by AGAMA ENERGY dated 7/6/16 - Clauses 3.1.3, 3.2.1 and 4.2. and notes below)			Reduced Power (kVA)	Standard Calculation	Standard Power (kVA)
Residential (Low Density)	One storey: Free standing dwelling	24 Dwelling Units x 4	96	24 x 4kVA	96
Residential (Medium Density)	Two storey: Row houses and duplexes	194 Dwelling Units x 1.8	349.2	194 x 3kVA	582
Residential (High Density)	Three storey: Flat and row houses	210 Dwelling Units x 2	420	210 x 3kVA	630
Residential (Hospitality)	Two storeys (Hotel and self catering apartments)	50 Bedrooms (hotel) + 10 apartments (2 rooms each) -	100	100 x 2kVA	200
Worker Apartments	One storey	(up to) 47 Dwelling units x 2	94	141	90
<b>Residential Total</b>	dwelling units: bedrooms hotel/guests:	450 Dwelling Units 100 Bedrooms	<b>1060</b>		<b>1598</b>
Business (Retail)		5 500m <sup>2</sup> GLA x 30VA per m <sup>2</sup>			
Business (Retail)		9 000m <sup>2</sup> GLA x 30VA per m <sup>2</sup>			
Clinic		Part of 9 000m <sup>2</sup> GLA above			
Business Total	General Business (incl. office): GRAND TOTAL BUSINESS:	Retail: 5 500m <sup>2</sup> GLA 9 000m <sup>2</sup> GLA <b>14 500m<sup>2</sup> GLA - 30 VA per m<sup>2</sup></b>	435	14500 x 50VA	725
Civic/Community Building		500m <sup>2</sup> at 30 VA per m <sup>2</sup>	15		50
Early childhood development	120 children		20		50
Utility	Recycling and maintenance	500m <sup>2</sup> at 40 VA per m <sup>2</sup>	20		50
		<b>TOTAL SUPPLY</b>	<b>1550 kVA*</b>		<b>2473 kVA**</b>

\*\* - In this case, the power calculations are based upon the ratings as stipulated by NRS-034-1 Table 30. In the case of domestic consumers, the mandatory energy saving requirements are:

- Hot water generation shall be solar type or heat pump
- Lighting - LED

\* - In this case, the following energy saving interventions are applicable:

- Hot water generation - solar type with gas geyser backup
- Lighting - LED
- Stove - gas hob and gas oven
- Installation of smart meters and relay switches to limit consumption to non-essential appliances. Appliances like washing machines/driers be switched off in the event that the development load is exceeded, or the dwelling unit power allocation is exceeded.
- Provision of an Energy Management System



Notes

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Project/Projek  
**Boschendal Village**

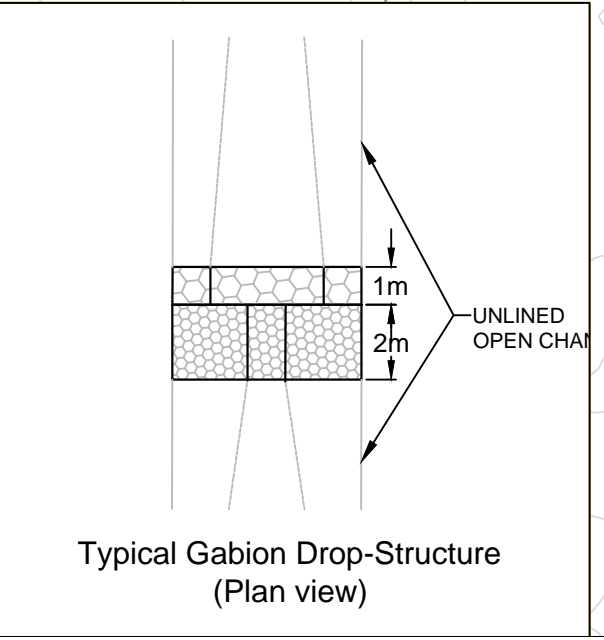
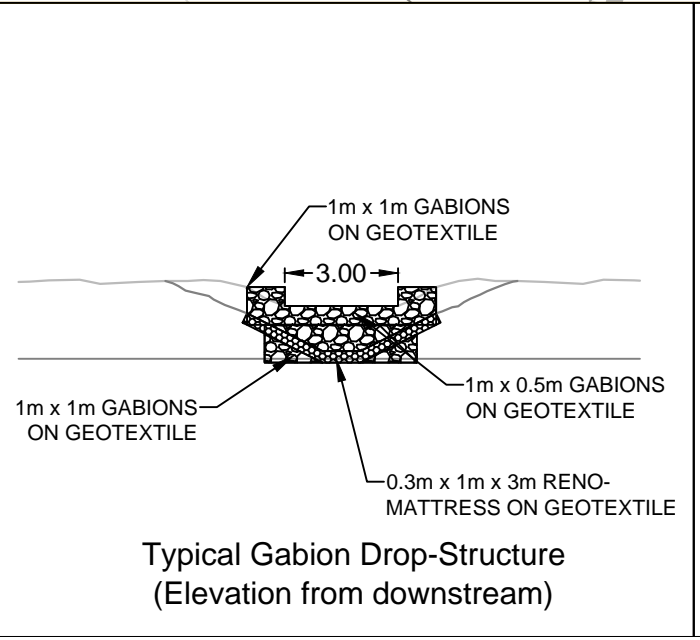
Draw. Description/Tek. Beskrywing  
**External Stormwater**

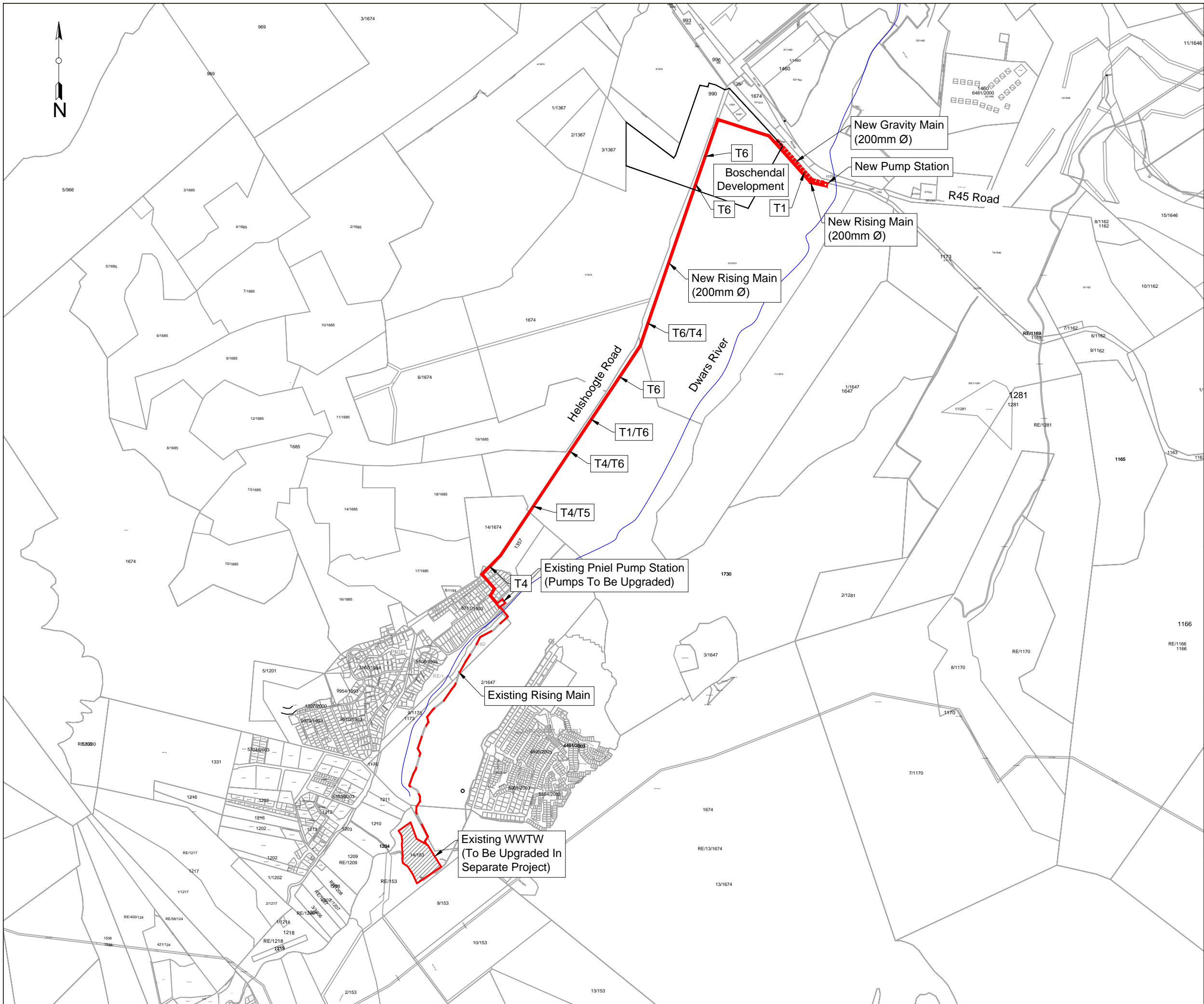
Drawing No  
 Tekening Nr.  
**TC02339-ES-10**

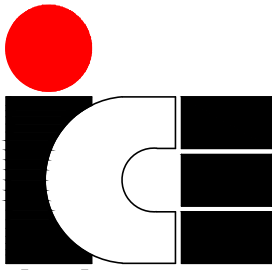
**B**

Scale :  
 Skaal :  
 1:5000

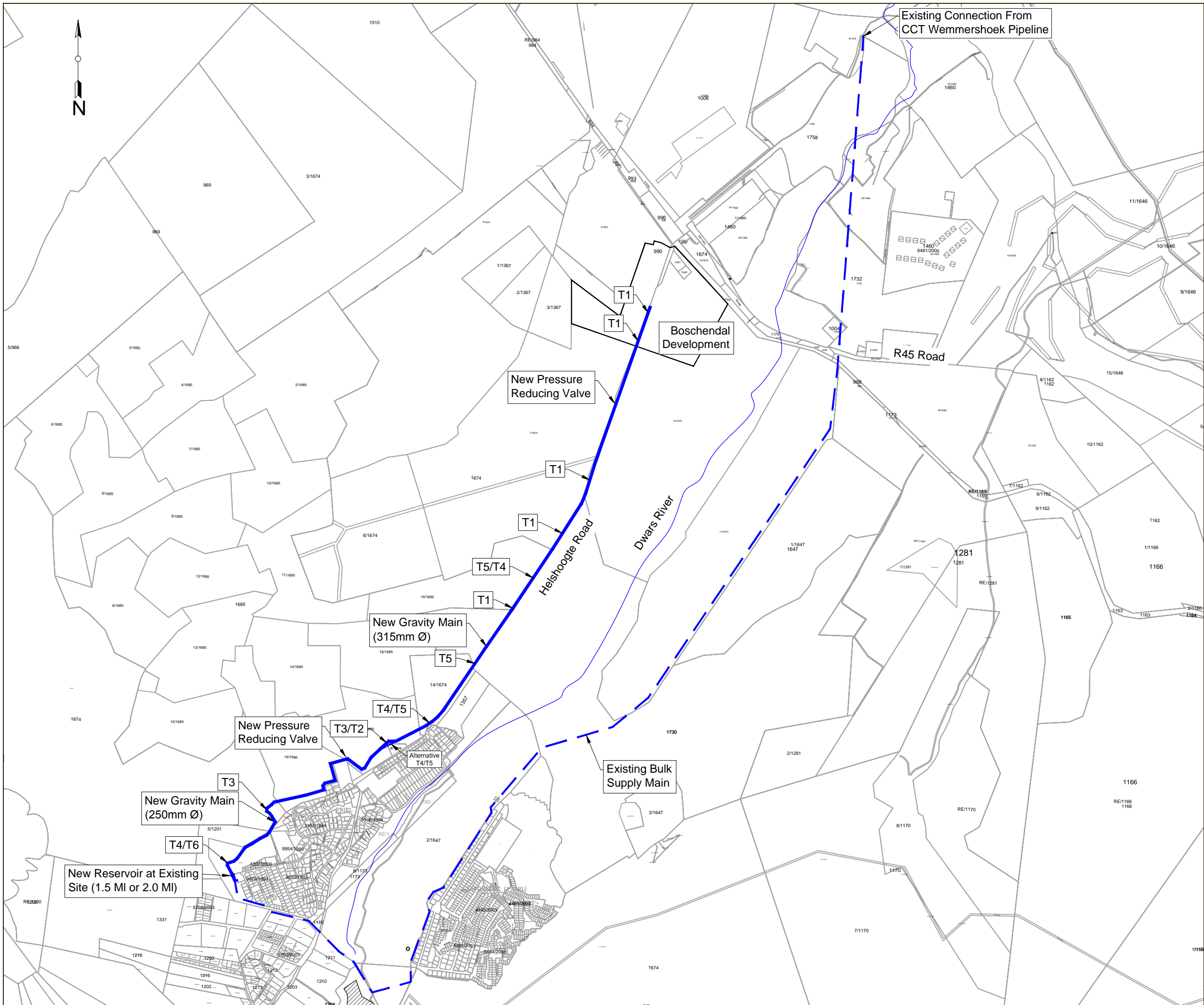
Date :  
 Datum :  
 April 2015

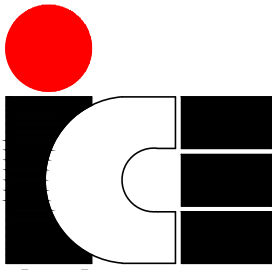


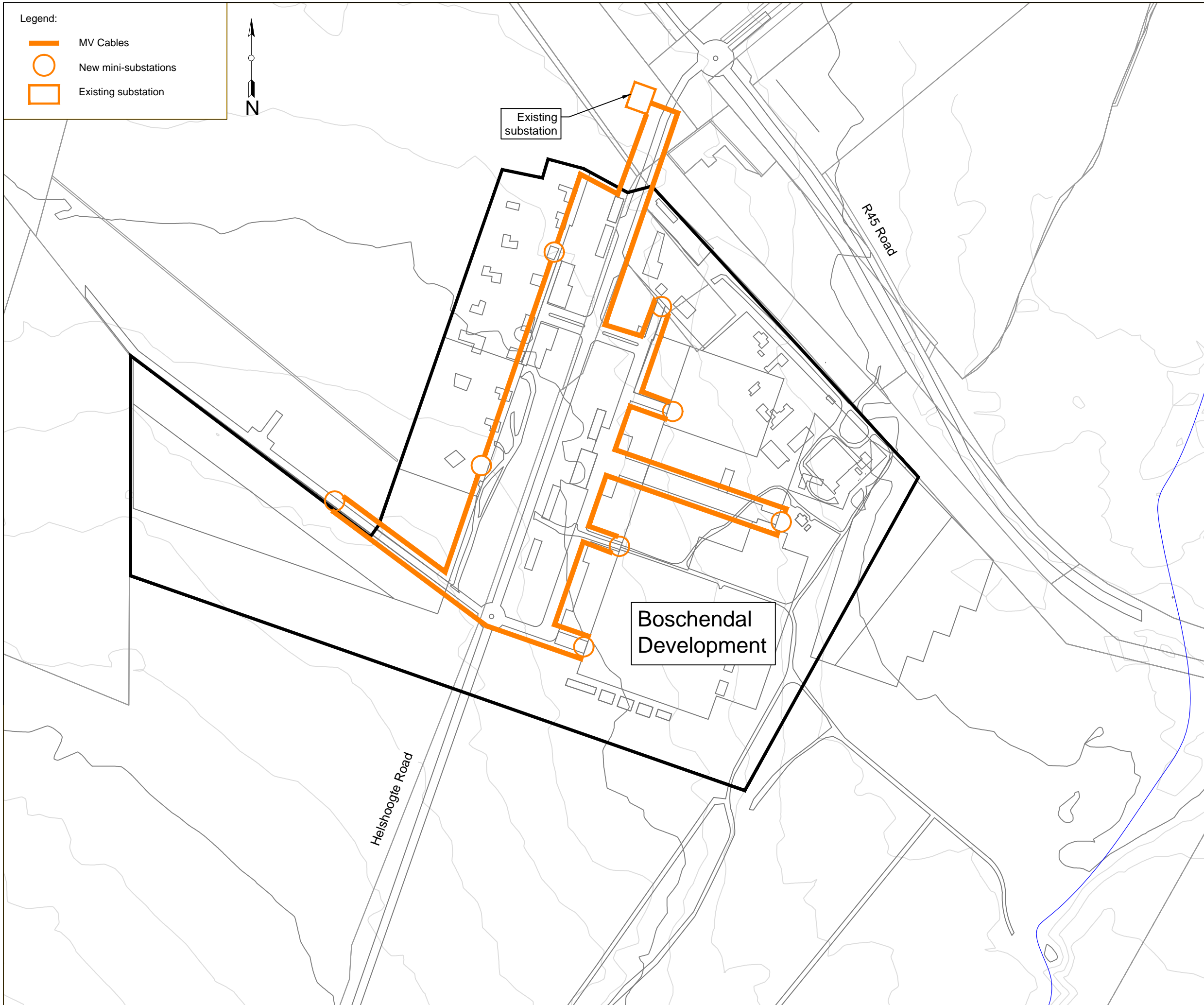


Notes	
T1 to T6 denotes the type of watercourse crossing.	
 <p><b>GROUP</b> (Pty) Ltd          iCE GROUP (PTY) LTD          TYGERBERG          P.O. Box 3970          Tygerpark 7536</p>	
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Client/Klient	
Boschendal (Pty) Ltd	
Project/Projek	
Boschendal Village	
Draw. Description/Tek. Beskrywing	
External Sewer	
Drawing No Tekening Nr.	
TC02339-ES-11	E
Scale : Skaal :	Date : Datum :
1:20000	April 2015






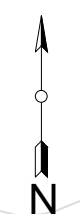


Notes	
T1 to T6 denotes the type of watercourse crossing.	
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Project/Projek	
Boschendal Village	
Draw. Description/Tek. Beskrywing	
External Water	
Drawing No Tekening Nr.	
TC02339-ES-12	D
Scale : Skaal :	Date : Datum :
1:20000	April 2015

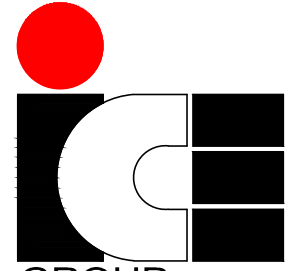


Legend:

-  MV Cables
-  New mini-substations
-  Existing substation



Notes



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**Boschendal Village**

Draw. Description/Tek. Beskrywing

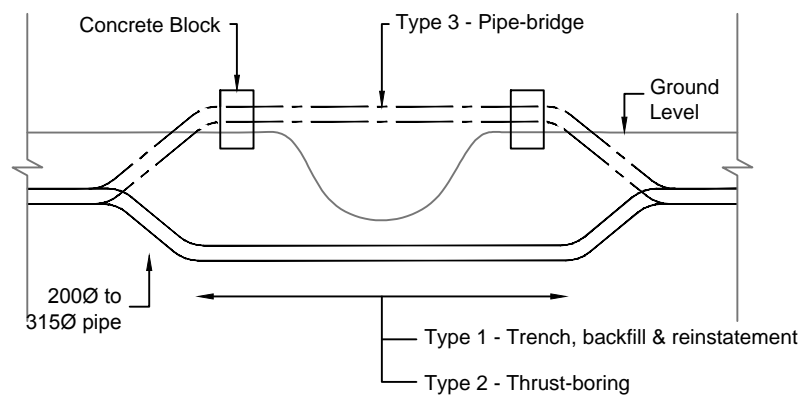
**Schematic Bulk Electrical**

Drawing No  
 Tekening Nr.

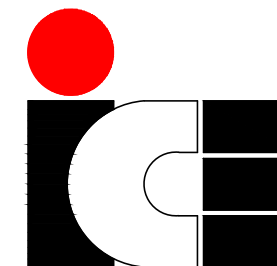
**TC02339-13**

Scale : Skaal :	Date : Datum :
1:4000	

Notes



STREAM / DITCH CROSSINGS



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Draw. Description/Tek. Beskrywing

Typical Pipe Crossings of Watercourses

Drawing No  
Tekening Nr.

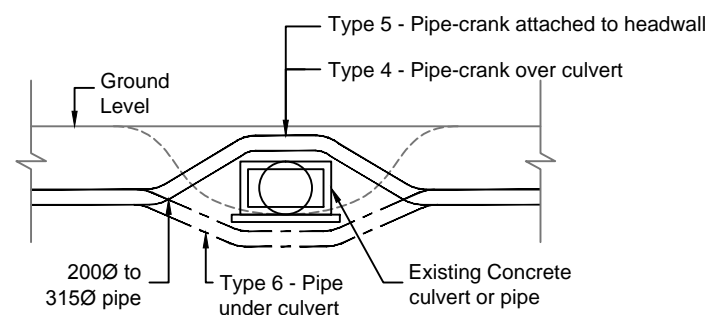
TC02339-ES-14

Scale :  
Skaal :

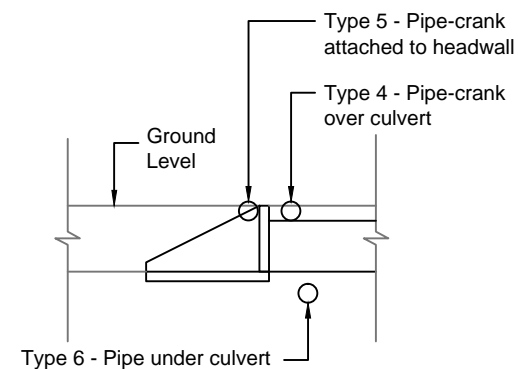
NTS

Date :  
Datum :

Sept 2016

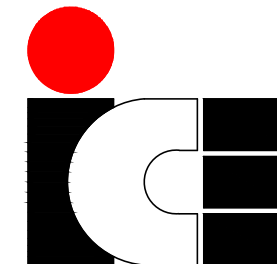


CULVERT CROSSINGS LONG-SECTION



CULVERT CROSSINGS CROSS-SECTION

Notes



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Boschendal Village

Draw. Description/Tek. Beskrywing

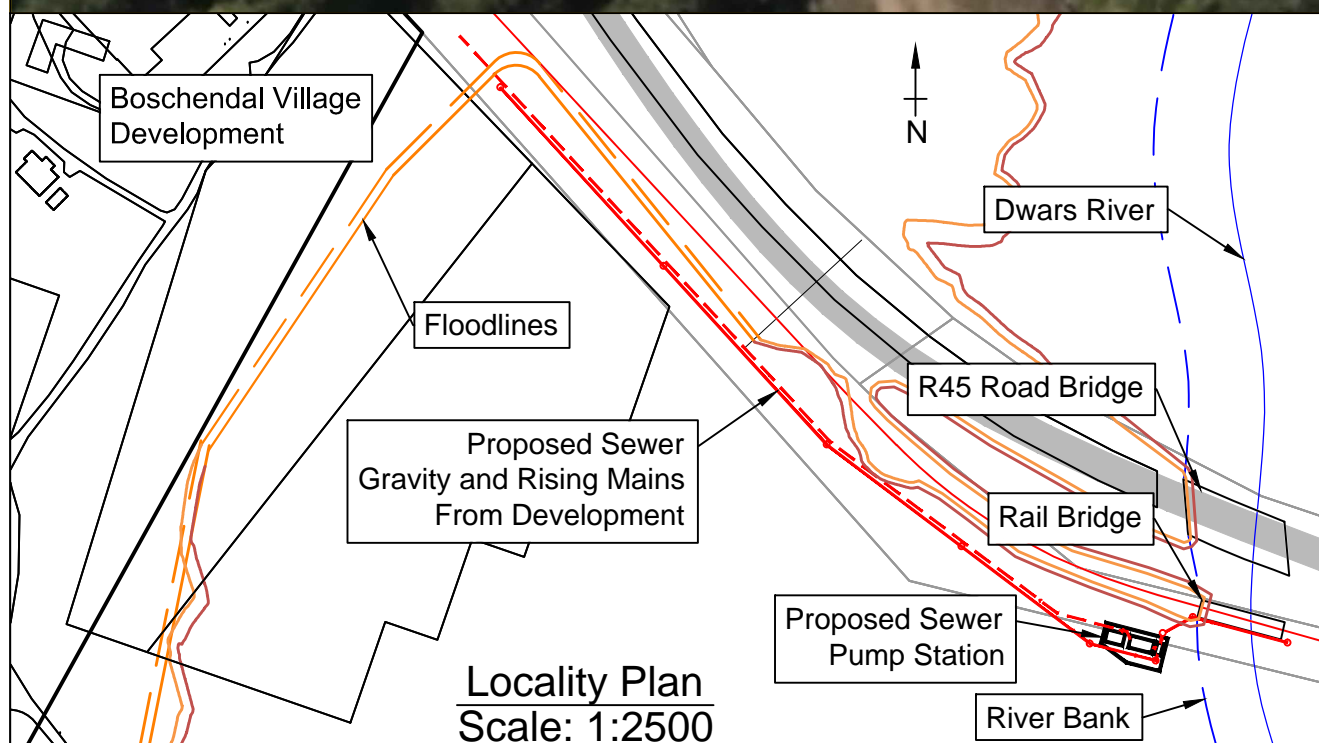
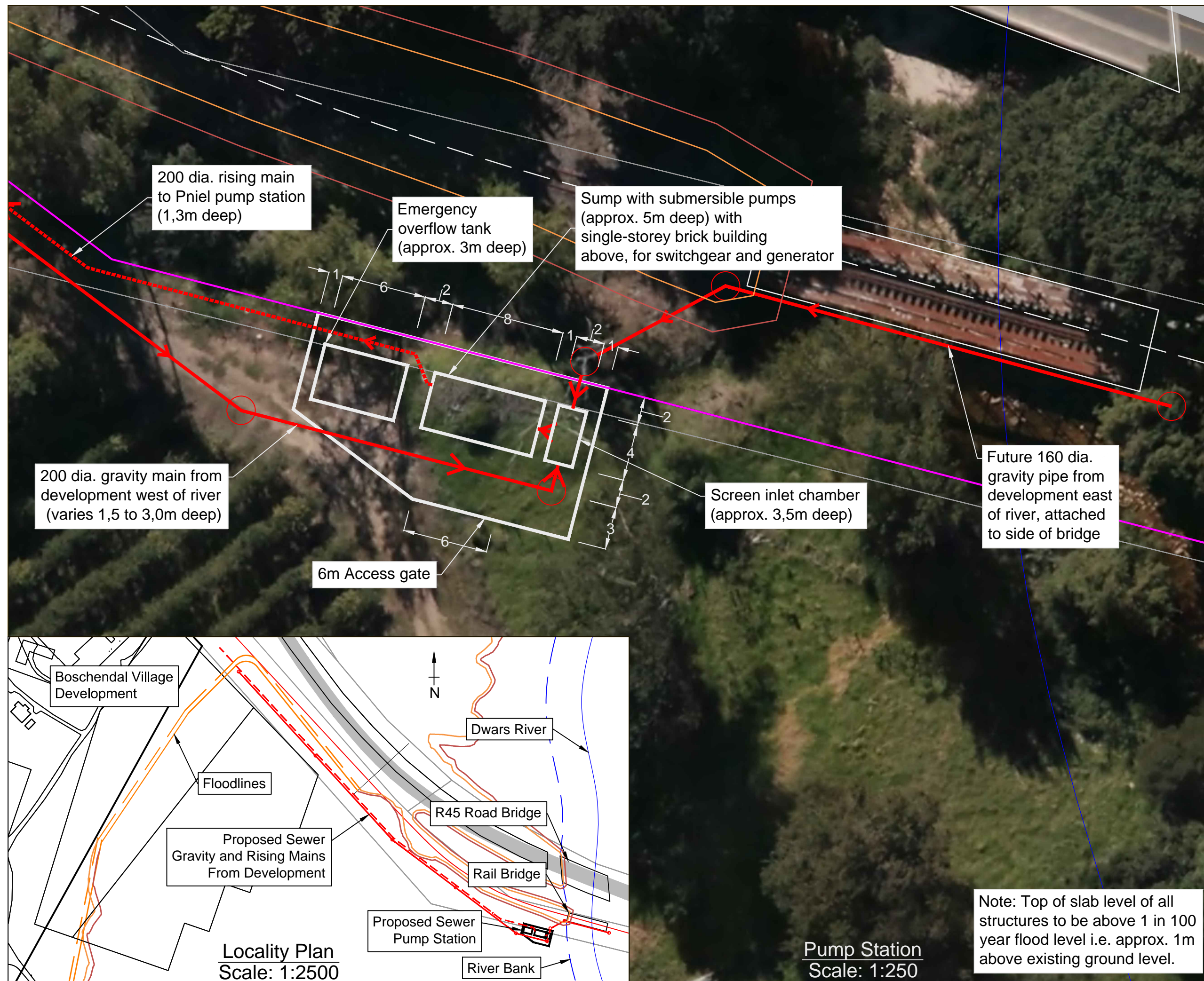
Schematic  
Sewer Pump Station  
Layout

Drawing No  
Tekening Nr.

TC02339-PS-01

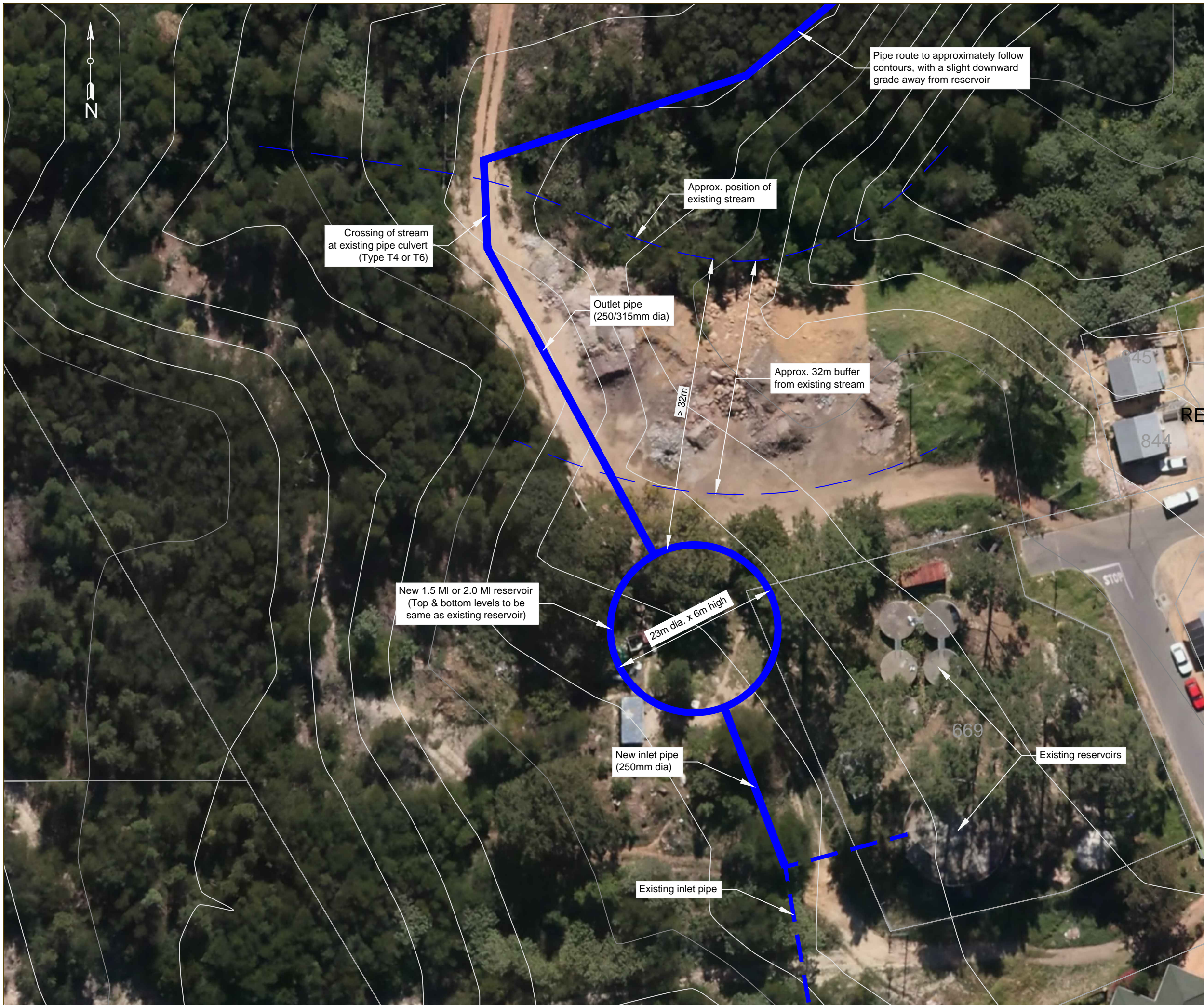
Scale :  
Skaal :  
AS SHOWN

Date :  
Datum :  
Jun 2015



Pump Station  
Scale: 1:250

Note: Top of slab level of all structures to be above 1 in 100 year flood level i.e. approx. 1m above existing ground level.



Notes

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Client/Kliënt  
**Boschendal (Pty) Ltd**

Project/Projek  
**Boschendal Village**

Draw. Description/Tek. Beskrywing  
**Schematic Reservoir Site Layout**

Drawing No  
 Tekening Nr.  
**TC02339-RES01**

Scale : Skaal :	Date : Datum :
1:500	Sept 2016