DEVELOPMENT OF CLAYVILLE EXTENSION 71
ENGINEERING BULK SERVICES
OUTLINE SCHEME REPORT
OCTOBER 2015

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CLAYVILLE EXTENSION 71 DEVELOPMENT

PRELIMINARY BULK SERVICES REPORT

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Executive Summary

This Outline Scheme report for the proposed Clayville Extension 71 residential development was commission by Valumax Midrand (Pty) Ltd and compiled by Bigen Africa Services (Pty) Ltd. The purpose of the report is evaluate the required bulk civil services for the proposed development and to estimate project costs for the implementation of those bulk services.

The site is situated in the northern areas of the Ekurhuleni Metropolitan Municipal jurisdiction immediately north of Tembisa and east of Ivory Park and is anticipated to yield 6 034 residential units.

Water, sanitation, roads and stormwater services are required to be installed to facilitate the feasibility of the development. A 20Ml water reservoir and 2Ml water pressure tower with pump house are required to be constructed at the development high point in the south western corner of the development to provide the required storage and operating pressure.

Three bulk sanitation outfall pipelines will be constructed from the developments' three drainage areas towards the east where the existing outfall sewers exist.

Access and distributor roads into the development and along the western and southern boundaries will provide regional transport routes and access to the development. The associated intersections will also be constructed allowing connections to the existing provincial roads.

Stormwater systems will be constructed draining runoff to attenuation ponds which will attenuate runoff on site to detain stormwater runoff to pre-development discharges in line with the Ekurhuleni Municipality's development requirements.

The estimated bulk costs are summarised below excluding VAT:

Bulk Services Construction	- R 199 591 597
Professional Services	- R 18 881 496
Allowance for CPA, Contingency & Project Management	- R 95 277 931
Total Project Estimate (excl VAT)	**- R 313 751 024**

CLAYVILLE EXTENSION 71 DEVELOPMENT

OUTLINE SCHEME REPORT

1. INTRODUCTION

1.1. Purpose of this report

Bigen Africa Services (Pty) Ltd was appointed by Valumax Midrand (Pty) Ltd to do the investigation on the existing and required external engineering services for the proposed Clayville Extension 71 integrated housing development which forms part of the Clayville/Tembisa Mega Housing Project.

The purpose of this report is the following:

- To stipulate the design norms and standards on which the estimation of the capital costs of the Engineering Services are based on;
- To establish the status of the existing infrastructure available to the development; and
- To determine the upgrading and new infrastructure needed for the development.

In addition to the above, the estimated cost of the external services is reported on. This will allow the Developer and the Local Authority to assess the impact and plan for the provision of external services to the proposed developments.

The Engineering Services addressed in this report are:

- Water Supply;
- Sanitation;
- Roads Infrastructure;
- Stormwater; and
- Electricity Supply

1.2. Project Brief

The Clayville Ext 71 development forms part of the larger Clayville/Tembisa Mega Housing Project which consists of Clayville Ext 45, 71 and 50, mixed typology and mixed tenure housing development, in accordance with the Breaking New Ground Policy of national government.

The development is assumed to consist of approximately 6 034 units situated on the southern Portion 207 (A Portion of Portion 183) of the farm Olifantsfontein 410-JR directly west of the Clayville Extension 45 development. See **Annexure A** for a key / locality plan of the area. Approximately 6 034 units are to be made available as single residential GAP/FLISP, multi-storey RDP and multi-storey Social/Rental units. The development will also make provision for community and business stands.

2. SITE DESCRIPTION

2.1. Locality

The Site of approximately 162 hectares is located directly west of Clayville Extension 45, north of Kaalfontein Extension 22 and south of the proposed Clayville Extension 50 and the PWV 5. The proposed development site borders the City of Johannesburg Metropolitan Municipality to the south and is located within the Ekurhuleni Metropolitan area of jurisdiction.

Clayville Ext 71 will be developed on Portion 207 (A Portion of Portion 183) of the farm Olifantsfontein 410 JR and Clayville Ext 50 on the Remainder of Portion 183 of the farm Olifantsfontein 410-JR.

A locality plan is attached to this report as **Annexure A**.

2.2. Flood Lines

Two flood plains initiate on the site, one at the southern border and one at the center of the development, as indicated on Drawing No 2374.00.ZA.04.A001, included as **Annexure B**. The flood areas have relatively shallow embankments and will be accommodated into the layout plan as open space and stormwater runoff.

3. WATER SUPPLY

3.1 Authority and Service provider

The Ekurhuleni Metropolitan Municipality is the Water Service Authority for the Clayville development in terms of the Water Services Act (Act No. 108 of 1997).

3.2 Regional Supply

The project area is sited within the EMM jurisdiction area. However, the existing bulk water infrastructure close to the development is located within the Johannesburg Metropolitan Municipality. Johannesburg's water entity, Johannesburg Water (Pty) Ltd, implements the stipulations of the Water Master plan for the Midrand MLC as compiled in 2000. This plan reflects the division of the Midrand supply area into 18 distribution zones, each served by either ground reservoirs or water towers. The project area falls within the PPT (President Park Tower) supply zone.

In addition to the above existing Johannesburg Water infrastructure, a 915mm diameter Rand Water Bulk RW3508 supply line is located within Allan Road to the west of the development. A 600ND connection from this Rand Water line exists to Clayville Extensions 71 and 50 and runs along the southern boundary of Clayville Extension 71. This bulk connection is to also supply water to Clayville Extensions 71 and 50 via two zones within Extensions 71 and 50; a direct feed zone and a reservoir and tower zone.

A GLS report was commissioned in 2009 which outlines the details of the water demand and zones. The locality of the abovementioned infrastructure is indicated on Drawings No. 2374.00.ZA.05.A001, attached as **Annexure C.**

3.3 Water Demands

The design of the bulk, link and internal reticulation required for the development will accommodate the ultimate demands anticipated. The proposed demands followed the identical approval process as that of the norms and standards. The total average annual daily demand (AADD) of the Clayville Ext 71 development project amounts to 4.9 Mℓ/day. The peak hour demand totals 230 ℓ/s.

The design demands used for this development is mostly derived from the guidelines proposed in *Table 4.1 Reference A* and are summarised below in table 3.1.

TABLE 3.1: Water Design Demands

ZONING	UNIT DEMAND	UNITS OR ERVEN	AADD (kℓ/d)	Flow (ℓ/s)	DESIGN PEAK FLOW (ℓ/s)
Res 1 / RDP Units	800 ℓ/unit/day	2 220 Units	1 332	23.13	61.67
3-4 Storey RDP/Social/Rental Units	600 ℓ/unit/day	3 814 units	2 288	39.7	105.9
Creche	2 000 ℓ/day/erf		1 500	17.4	69.4
Religious	2 000 ℓ/day/erf				
Schools	15 000 ℓ/day/erf)				
Business (Office, shops etc.)	20 000 ℓ/day/erf				
Industrial	20 000 ℓ/day/erf				
Community facilities	2 000 ℓ/day/erf				
Cultural Village	2 000 ℓ/day/erf				
		Total	**5 120**	**80.23**	**237**

3.4 Design Norms and Standards

The design criteria for the development of the site are based on the standards of Ekurhuleni Metropolitan Municipality: “Developer’s Guidelines to Installing Water and Sewer Services” which adopted the standards of the Guidelines for the Provision of Engineering Services and Amenities in Residential Township Development, summarized below in Table 3.2.

The design norms and standards are currently in draft format, but are being finalized by CES (Community Engineering Services).

Table 3.2: Standards and Specifications for Water supply:

PARAMETER	DETAIL	SPECIFICATION
Peak Factor	Entire Development	4
Placement of service	Distribution Network Supply to erven	High side of the street Street front of erven 1m to 1.5m from boundaries
Flow velocity	Residential areas ø⩽150mm ø≥200mm	1,0 m/s – 3.5m/s 1.5m/s – 2.5m/s
Pressure	Static pressure Dynamic pressure	*Max* - 90m *Min* - 25m residential 35m business / industrial
Losses	Secondary	10%
Fire flow: Central Business area and cluster housing	Hydrant spacing Flow at hydrant Total flow Minimum pressure: At node Rest of system	*Max* - 120m from furthest erf 25 ℓ/s 50 ℓ/s 15 m 10 m
Fire flow: Single residential erven	Hydrant Flow at hydrant Total flow Minimum pressure: At node Rest of system	*Max – 120 m for furthest erf* 15 ℓ/s 15 ℓ/s 8 m 8 m
Pipe-cover	Sidewalks Road-crossing Tarred Roads Across erven Other services present	*Min* - 1m *Min* - 1m Min – 1m *Max* -1m *Min* - 0,75m *Max* -1,5m *Min* - 0,8m
Piping	Sizes Material	*Min* – 75mm dia uPVC class 12 spigot and socket
	Adjacent house connections	1 stand: 25mm minimum 2 stands: 32mm minimum
	House connections across street	1 stand: 25mm minimum 2 stands: 32mm minimum
Valves	Type	RSV – class 16 to SANS664, cap top, non-rising spindle and anti-clockwise closing.

3.5 Required upgrade

As indicated in Paragraph 3.2, Johannesburg Water and Rand Water bulk water infrastructure exist in close proximity to the development. The utilization of both entities' infrastructure was considered for the provision of water, but the only viable option is the supply from the Rand Water infrastructure.

Summary of Phased Bulk Water Infrastructure Requirements

Item	Description	Estimated Cost Excl VAT
Phase 1	**20Ml Reinforced Conc. Reservoir 2Ml Concrete Pressure Tower ±1500m Bulk Lines & Fittings**	**R 33 939 400.20**
Phase 2	**±1600m of Link Mains & Fittings**	**R 1 314 464.45**
Phase 3	**±2110m of Link Mains & Fittings**	**R 1 644 514.73**
Phase 4	**±1440m of Link Mains & Fittings**	**R 1 169 054.69**
Phase 5	**±1700m of Link Mains & Fittings**	**R 1 364 000.42**
Phase 6	**±1900m of Link Mains & Fittings**	**R 1 493 064.01**
All	**Water Bulk/Link Sub-Total**	**R 40 924 498.50**

3.6 Rand Water Infrastructure

A 915mm diameter Klipfontein – Pretoria Rand Water Line RW3508 is situated within the road reserve of Allan Road to the West of the development. Supply to on-site infrastructure was considered by connecting to the abovementioned Rand Water pipeline. Rand Water requires that on-site storage facilities be provided if the peak flow rate exceeds 30% of the average annual daily demand flow rate.

As a result a 20Ml ground reservoir, a 2Ml Water tower and pump station which will supply the high and low pressure zone areas need to be constructed. A 700mm diameter supply line will be required between the Rand Water line and the new ground reservoir on site, as well as a new 400mm diameter steel connection line to the township. Refer to drawings 2374.00.ZA.05.A001, attached as **Annexure C**.

4 SEWERAGE

4.1 Authority and Service Provider

The Ekurhuleni Metropolitan Municipality is the Water Service Authority for the Clayville Extension 71 development in terms of the Water Services Act (Act No. 108 of 1997).

4.2 Design Norms and Standards

The design criteria for the development of the site have been based on the standards of Ekurhuleni Metropolitan Municipality: "Developer's Guidelines to Installing Water and Sewer Services" which adopted the Guidelines for the provision of engineering services and amenities in residential township development, summarised in Table 4.1.

Sewerage designs will be in line with the Sewer Master Plan of the area. The entire development will be in accordance with conventional level 3 – a metered pressure water connection with water-borne sanitation for each property.

Table 4.1: Standards and Specifications for Sewage Infrastructure:

PARAMETER	DETAIL	SPECIFICATION
Peak Factor	Entire Development	2.5
Minimum Flow Velocity	Residential areas	0.7 m/s
Minimum depth to invert	Mid blocks Road reserve Other areas	1m 1m 800mm
Manhole spacing	Network sewers	110m
Minimum Gradients	150mm diameter (fewer than 24 dwellings) 150mm diameter 200mm diameter 225mm diameter 250mm diameter 300mm diameter	 1/80 1/100 1/200 1/220 1/240 1/300
Pipe Material	110mm to 315mm diameter ≥ 355mm diameter	Solid wall uPVC class 400 to SANS 1601 Solid wall uPVC class 34 to SANS 791
Design Capacity	All Pipes	67% at design flow
Minimum Pipe diameter	Gravity sewers	150 mm

	Connections	100 mm
Stormwater Infiltration		15% of design flow
Hydraulic Calculations	Manning Equation	n = 0,012
Location of Sewers	All Areas	Sewers 2.5m from road reserve boundaries, unless otherwise indicated. 1m from the erf boundary for midblocks
Connections	For Stands	110 mm uPVC with slip on couplings

4.3 Connection to existing Bulk Services

The Kempton Park Water Master Plan categorizes the project area within the "Eastern Area" served by the 750mm diameter ERWAT Regional Outfall Sewer, draining the entire area and connecting to the Olifantsfontein Waste Water Treatment Works (WWTW) located to the North West of Clayville (refer to Drawing No. 2374.00.ZA.06.A001).

4.4 Required upgrade

The natural topography of the site divides it into three drainage areas as indicated on Drawing No. 2374.00.ZA.06.A001 attached as **Annexure D**.

Drainage Area One

Drainage area one (±52.5 ha) drains to the south where it will connect into a bulk sewer located in the vicinity of the Kaalspruit floodline in Kaalfontein. A 160mm diameter link sewer (Pipe 1 on drawing No. 2374.00.ZA.06.A001) of 1 100 m in length needs to be constructed and 475m of 250mm diameter need to be upgraded to a 315mm diameter pipeline. The sewer drains into the ERWAT Regional Outfall Sewer which drains into the Olifantsfontein WWTW.

Drainage Area Two and Three

Drainage area two (± 300 ha) slopes towards the east where a 450mm diameter communal link sewer (Pipe 2 on drawing No. 2374.00.ZA.06.A001) needs to be constructed which will drain both the Clayville Development and a future Ekurhuleni Housing Development (± 4 000 stands) located to the east. This pipe follows the Kaalspruit flood line at a minimum slope.

Drainage area three drains Extension 50 and (± 50 ha) drains toward the north where a new 250mm diameter link (Pipe 3 on drawing No. 2374.00.ZA.06.A001) needs to connect area three with the link of area two. A small pump station may be required to transfer the run-off from this area over the watershed into Drainage Area 2.

Pipe 2 and Pipe 3 will connect into the proposed 500mm outfall sewer (Pipe A on drawing No. 2374.00.ZA.06.A001) and a 500mm sewer bridge crossing need to be constructed upstream of the connection into the ERWAT sewer east of the Kaalspruit. The total length of the outfall sewer is approximately 1.5km and the sewer bridge crossing is approximately 80 m in length. The alignment of the outfall sewer and locality of future developments, which will connect to the collective sewer, are indicated on drawing No. 2374.00.ZA.06.A001.

The sewerage will be treated at the Olifantsfontein WWTW which has a total capacity of 105 Mℓ/day. Previously Ekurhuleni Metro Municipality indicated that the treatment works are currently operating at 65 Mℓ/day. ERWAT still needs to confirm that the works has sufficient capacity to accommodate sewer flows generated by the proposed development of 10.8 Mℓ/day.

Summary of Phased Sewer Infrastructure Requirements

Item	Description	Estimated Cost Excl VAT
Phase 1	**160mm Dia ±1630m Outfall & Connections**	**R 3 865 848.35**
Phase 2	**160mm Dia ±1700m Outfall & Connections**	**R 4 551 572.93**
Phase 3	**160mm Dia ±2200m Outfall & Connections**	**R 5 100 295.95**
Phase 4	**160mm Dia ±1580m Outfall & Connections**	**R 3 537 897.04**
Phase 5	**160mm Dia ±1800m Outfall & Connections**	**R 3 780 232.08**
Phase 6	**160mm Dia ±1900m Outfall & Connections**	**R 3 938 553.46**
All	**Sanitation Bulk/Link Sub-Total**	**R 24 774 399.81**

5 ROADS

5.1 Design Norms and Standard

The design guidelines of Ekurhuleni Metropolitan Municipality, supplemented by the Guidelines for Human Settlement Planning and Design (Red Book) were used to establish the criteria given in table 5.1. The criteria are given for various road classes on relevant road reserve widths. This design will be finalized after the township is approved, inputs from a Traffic Engineer in the form of a Traffic Impact Assessment are provided, and before construction drawings are submitted for approval.

A structural design period of 20 years will be adopted.

TABLE 5.1: ROAD DESIGN GUIDELINES

	ROAD CATEGORY				
	Local Distributor Class 4	**Access Collector Class 4**	**Access Collector Class5a**	**Access Loop Class 5b**	**Access Loop / Cul-de-Sac Class 5c**
Road Reserve Width (m)	30	25	25 / 20	16/13	10
Carriage Way Width (m)	14	14	7,4 / 8	6 / 5,5	5
Minimum Centre Line Radii for Angles of deflection > 60 Deg (m)	90	90	90/50	50/30	12,5
Minimum Centre Line Radii for Angles of deflection <= 60 Deg	500	500	130	110/60	30
Roadway Shoulders (m)	2,0	2,0	2,0	2,0	N/A
Desired Maximum Speed (km/h)	60	60	50	40	20
Minimum Stopping Distances (m)	85	85	65	65	20

Minimum Gradient	1:150	1:150	1:150	1:150	1:150
Maximum Gradient	1:10	1:10	1:10	1:8	1:5
Minimum K-Value	10	10	10	6	1
Minimum Vertical Curve (m)	40	40	40	30	20
Cross Fall / Camber	2% for Road Gradient <6% 3% for Road Gradient >6%				2,5%
Super Elevation	4%	4%	4%	None	None

5.2 Access

The N1 and R21 National Routes are in close proximity of the project area, as indicated on the locality Drawing No.2374.00.ZA.01.A001. The proposed development can either be accessed from the east via Thabana Ntlentana Drive which connects to K111 or from the south via Dale Road.

5.3 External Roads

Road servitudes in the vicinity of the development include the future PWV5 (East West direction) located to the North, the planned K109 (North South direction) to the west and the existing K111 (North South direction) to the East (Refer to Drawing No. 2374.00.ZA.03.A001, attached as **Annexure E**).

5.4 Required upgrade

It is envisaged that the majority of traffic will be generated from the Midrand City Centre. As a result access from the North and South East will to be achieved by extending Dale Road on the Southern border of the development and constructing the K109 link between Dale Road and Olifantsfontein Road with intersections. The cost of these extensions is summarized in paragraph 8.1.3.

Access from the North and South East will to be achieved by extending Dale Road on the Southern border of the development to Ruwenzori Road in the east and constructing the K109 link between Dale Road and Olifantsfontein Road as an initial phase. Stormwater Retention Dams need to be constructed at positions indicated on 2374.00.ZA.03.A001, attached as **Annexure E**.

6 STORMWATER

6.1 Design Norms and Standards

Permissible stormwater flow on roadways within the development will be based on guidelines included in the "The Red Book".

All streets in the township will be bitumen surfaced and will be designed to act as stormwater collectors and conveyors. The streets will be placed below natural ground level so that stormwater from adjacent erven can drain onto the streets. The layout and vertical alignment of the streets will be designed so that stormwater can be conveyed to the natural drainage channel that traverses the site.

An underground stormwater drainage system will be supplied to handle the minor floods (1:2 year) so that the traffic is not disrupted by the minor floods. Major floods that cannot be accommodated in the minor stormwater drainage system will be conveyed on the road surface and will not overspill into adjacent erven.

Table 6.1: Design Criteria and Standards

PARAMETER	SPECIFICATION
Recurrence Interval	No kerb overtopping 1:5 years
Maximum flow velocity on road edge	3 m/s
Kerb inlet position	At kerb overtopping, and road intersection
Kerb inlet size	1,5 m minimum 10,0 m maximum
Pipe Size	450 dia minimum
Rational model	C Value = 0,8 MAP = 740 mm Summer rainfall region

6.2 Natural River System and Flood Lines

A water course originates within the site towards the east of the site which will facilitate stormwater drainage.

The naturally occurring flood lines affecting the project site has been designated a wetland and will be retained for drainage, detention and ecological purposes.

6.3 Stormwater Attenuation

It is a requirement of EMM that provision is made for stormwater attenuation to reduce the increased stormwater run-off resulting from the development to pre-development volumes through the incorporation of stormwater attenuation ponds in the stormwater system.

Provision will be made for attenuation for the rate of run-off within the development area. The floods will be attenuated in proposed attenuation dams on site. Attenuation will be calculated to ensure that outflows do not exceed the undeveloped calculated floods.

Summary of Phased Roads & Stormwater Infrastructure Requirements

Item	Description (Inclusive of Stormwater & Attenuation)	Estimated Cost Excl VAT
Phase 1	**1400m of Access Intersections & Roads from X45 & Two Circles**	**R 13 666 574.79**
Phase 2	**1600m of Access Intersections & Roads from Ph1 & Two Circles**	**R 21 533 192.13**
Phase 3	**2000m of Access Intersections & Roads from X45 & Ph1 & One Circle**	**R 27 134 904.90**
Phase 4	**1300m of Access Intersections & Roads from Ph3 & One Circle**	**R 15 171 172.84**
Phase 5	**1500m of Access Intersections & Roads from Ph2, 3, 4 & Two Circle**	**R 23 206 613.79**
Phase 6	**1850m of Access Intersections & Roads from X45, Ph2 & 5**	**R 33 180 240.01**
All	**Roads & Stormwater Bulk/Link Sub-Total**	**R 133 892 698.47**

7 ESTIMATED CONSTRUCTION COST

The costs of the services' infrastructure were estimated using typical current rates and is summarised below. The services' estimates include P's and G's and contingencies, but exclude VAT. Professional fees, disbursements and site supervision costs are shown separately. Escalation for civil related costs has been included at a rate of 7% per annum with the implementation periods assumed as one year up to the commencement of the first bulk infrastructure element and with completion of the bulks within three years from commencement of it. MIG applications will be submitted for all bulk and link services.

7.1 Bulk Services

7.1.1 Water Supply

Estimated Water Costs		
Description	**Excl VAT**	**Incl VAT**
PHASE 1	R 33 939 400.20	R 38 690 916.23
PHASE 2	R 1 314 464.45	R 1 498 489.47
PHASE 3	R 1 644 514.73	R 1 874 746.79
PHASE 4	R 1 169 054.69	R 1 332 722.35
PHASE 5	R 1 364 000.42	R 1 554 960.47
PHASE 6	R 1 493 064.01	R 1 702 092.97
Sub-Total	**R 40 924 498.50**	**R 46 653 928.29**

7.1.2 Sewerage

Estimated Sewer Costs		
Description	**Excl VAT**	**Incl VAT**
PHASE 1	R 3 865 848.35	R 4 407 067.12
PHASE 2	R 4 551 572.93	R 5 188 793.14
PHASE 3	R 5 100 295.95	R 5 814 337.39
PHASE 4	R 3 537 897.04	R 4 033 202.63
PHASE 5	R 3 780 232.08	R 4 309 464.57
PHASE 6	R 3 938 553.46	R 4 489 950.95
Sub-Total	**R 24 774 399.81**	**R 28 242 815.78**

7.1.3 Bus Routes and Stormwater Drainage

The major bus routes will be constructed using funding from the MIG programme, while internal minor roads will be built with funding from the subsidy allocation.

The cost estimates and funding requirements for the bus routes and stormwater is provided below.

Estimated Roads & Stormwater Costs		
Description	**Excl VAT**	**Incl VAT**
PHASE 1	R 13 666 574.79	R 15 579 895.26
PHASE 2	R 21 533 192.13	R 24 547 839.03
PHASE 3	R 27 134 904.90	R 30 933 791.59
PHASE 4	R 15 171 172.84	R 17 295 137.04
PHASE 5	R 23 206 613.79	R 26 455 539.72
PHASE 6	R 33 180 240.01	R 37 825 473.61
Sub-Total	**R 133 892 698.47**	**R 152 637 676.25**

7.1.4 Total Internal Bulk Cost Estimate Summary And Cash Flow

Table 7.1 below summarises the total internal bulk/link costs as indicated:

Table 7.1

Estimated Total Costs		
Description	**Excl VAT**	**Incl VAT**
Water	R 40 924 498	R 46 653 928
Sewer	R 24 774 400	R 28 242 816
Roads & Stormwater	R 133 892 698	R 152 637 676
Sub-Total Works	***R 199 591 597***	***R 227 534 420***
Professional Services	R 14 688 421	R 16 744 800
OHS, WULA, EIA, etc	R 773 075	R 881 305
Construction Monitoring	R 3 420 000	R 3 898 800
Sub-Total Fees	***R 18 881 496***	***R 21 524 905***
Sub-Total Bulk	***R 218 473 093***	***R 249 059 326***
10% Contingency	R 21 847 309	R 24 905 933
Sub-Total	***R 240 320 402***	***R 273 965 258***
7% Escalation 3 Years	R 52 904 854	R 60 311 534
Sub-Total	***R 293 225 256***	***R 334 276 792***
7% Project Management Fee	R 20 525 768	R 23 399 375
Grand Total	**R 313 751 024**	**R 357 676 167**

CLAYVILLE EXT 71 BULK SERVICES ESTIMATED CASH FLOW - 20 OCTOBER 2015

ITEM	DESCRIPTION	VALUE	EXPENDITURE PERIOD FROM	EXPENDITURE PERIOD TO	LINE ITEM TOTAL CHECK
1.10	**WATER MAINS**	**R 40 924 498**	**01-Mar-16**	**28-Feb-19**	**R 40 924 498**
1.20	**SEWER OUTFALL**	**R 24 774 400**	**01-Mar-16**	**28-Feb-19**	**R 24 774 400**
1.30	**ROADS AND STORMWATER**	**R 133 892 698**	**01-Mar-16**	**28-Feb-19**	**R 133 892 698**
1.40	**MONTHLY CONSTRUCTION CASH FLOW**	**R 199 591 597**	**01-Mar-16**	**28-Feb-19**	**R 199 591 597**
2.00	**PROFESSIONAL SERVICES**				
2.01	SPECIALIST STUDIES*	R 579 806	15-Mar-15	28-Feb-16	**R 579 806**
2.02	PRELIMINARY DESIGN	R 4 406 526	01-Aug-15	30-Nov-15	**R 4 406 526**
2.03	DETAIL DESIGN	R 3 672 105	01-Dec-15	30-Mar-16	**R 3 672 105**
2.04	DOCUMENTATION & PROCUREMENT	R 2 203 263	01-Feb-16	30-Mar-16	**R 2 203 263**
2.05	CONTRACT ADMINISTRATION AND CONSTRUCTION MONITORING* (R95k/M)	R 7 092 105	01-Mar-16	28-Feb-19	**R 7 092 105**
2.06	ECO AND OHS DUTIES*	R 193 269	01-Mar-16	28-Feb-19	**R 193 269**
2.07	CLOSE OUT	R 734 421	28-Aug-16	30-Mar-19	**R 734 421**
2.08	**MONTHLY PROF. SERVICES CASH FLOW**	**R 18 881 496**	**15-Mar-15**	**30-Mar-19**	**R 18 881 496**
2.09	*7% PROJECT MANAGEMENT, 7% ESCALATION AND 10% CONTINGENCY*	*R 95 277 931*	*01-Apr-16*	*30-Mar-19*	**R 95 277 931**
3.00	**CUMULATIVE TOTAL CASH FLOW**	**R 313 751 024**			**R 313 751 024**

2015/2016

ITEM	Mar-15	Apr-15	May-15	Jun-15	Jul-15	Aug-15	Sep-15	Oct-15	Nov-15	Dec-15	Jan-16	Feb-16
1.10												
1.20												
1.30												
1.40												
2.00												
2.01	R 23 743	R 26 990	R 32 759	R 41 456	R 55 082	R 69 867	R 75 955	R 73 490	R 62 764	R 51 023	R 35 731	R 30 947
2.02						R 634 540	R 1 264 673	R 1 612 789	R 894 525			
2.03										R 528 783	R 1 053 894	R 1 343 991
2.04												R 949 606
2.05												
2.06												
2.07												
2.08	**R 186 580**	**R 186 580**	**R 188 892**	**R 194 903**	**R 194 903**	**R 211 858**	**R 225 422**	**R 225 422**	**R 242 762**	**R 246 230**	**R 251 239**	**R 291 315**
2.09												
3.00	**R 186 580**	**R 373 160**	**R 562 052**	**R 756 955**	**R 951 859**	**R 1 163 717**	**R 1 389 139**	**R 1 614 561**	**R 1 857 323**	**R 2 103 553**	**R 2 354 792**	**R 2 646 107**
Total	**R 2 646 107**											

2016/2017

ITEM	Mar-16	Apr-16	May-16	Jun-16	Jul-16	Aug-16	Sep-16	Oct-16	Nov-16	Dec-16	Jan-17	Feb-17
1.10	**R 550 435**	**R 550 435**	**R 574 989**	**R 574 989**	**R 665 023**	**R 665 023**	**R 726 410**	**R 726 410**	**R 859 414**	**R 859 414**	**R 1 033 344**	**R 1 033 344**
1.20	**R 333 216**	**R 333 216**	**R 348 080**	**R 348 080**	**R 402 584**	**R 402 584**	**R 439 746**	**R 439 746**	**R 520 262**	**R 520 262**	**R 625 554**	**R 625 554**
1.30	**R 1 800 857**	**R 1 800 857**	**R 1 881 192**	**R 1 881 192**	**R 2 175 756**	**R 2 175 756**	**R 2 376 595**	**R 2 376 595**	**R 2 811 747**	**R 2 811 747**	**R 3 380 791**	**R 3 380 791**
1.40	**R 2 684 507**	**R 2 684 507**	**R 2 804 262**	**R 2 804 262**	**R 3 243 363**	**R 3 243 363**	**R 3 542 751**	**R 3 542 751**	**R 4 191 424**	**R 4 191 424**	**R 5 039 688**	**R 5 039 688**
2.00												
2.01												
2.02												
2.03	R 745 437											
2.04	R 1 253 657											
2.05	R 95 389	R 95 389	R 99 644	R 99 644	R 115 247	R 115 247	R 125 885	R 125 885	R 148 934	R 148 934	R 179 076	R 179 076
2.06	R 2 599	R 2 599	R 2 715	R 2 715	R 3 141	R 3 141	R 3 431	R 3 431	R 4 059	R 4 059	R 4 880	R 4 880
2.07						R 11 113	R 11 223	R 11 608	R 12 416	R 13 426	R 14 252	R 14 665
2.08	**R 291 315**	**R 314 242**	**R 350 271**	**R 350 271**	**R 391 887**	**R 412 696**	**R 412 696**	**R 488 029**	**R 492 460**	**R 514 039**	**R 589 565**	**R 589 565**
2.09		*R 1 281 488*	*R 1 281 488*	*R 1 338 655*	*R 1 338 655*	*R 1 548 266*	*R 1 548 266*	*R 1 691 183*	*R 1 691 183*	*R 2 000 837*	*R 2 000 837*	*R 2 405 768*
3.00	**R 5 621 928**	**R 9 902 165**	**R 14 338 187**	**R 18 831 374**	**R 23 805 280**	**R 29 009 606**	**R 34 513 318**	**R 40 235 281**	**R 46 610 348**	**R 53 316 648**	**R 60 946 737**	**R 68 981 758**
Total	**R 66 335 651**											

2017/2018

ITEM	Mar-17	Apr-17	May-17	Jun-17	Jul-17	Aug-17	Sep-17	Oct-17	Nov-17	Dec-17	Jan-18	Feb-18
1.10	**R 1 217 504**	**R 1 217 504**	**R 1 452 820**	**R 1 452 820**	**R 1 739 291**	**R 1 739 291**	**R 1 800 678**	**R 1 800 678**	**R 1 759 753**	**R 1 759 753**	**R 1 713 713**	**R 1 713 713**
1.20	**R 737 038**	**R 737 038**	**R 879 491**	**R 879 491**	**R 1 052 912**	**R 1 052 912**	**R 1 090 074**	**R 1 090 074**	**R 1 065 299**	**R 1 065 299**	**R 1 037 428**	**R 1 037 428**
1.30	**R 3 983 308**	**R 3 983 308**	**R 4 753 191**	**R 4 753 191**	**R 5 690 440**	**R 5 690 440**	**R 5 891 279**	**R 5 891 279**	**R 5 757 386**	**R 5 757 386**	**R 5 606 757**	**R 5 606 757**
1.40	**R 5 937 850**	**R 5 937 850**	**R 7 085 502**	**R 7 085 502**	**R 8 482 643**	**R 8 482 643**	**R 8 782 030**	**R 8 782 030**	**R 8 582 439**	**R 8 582 439**	**R 8 357 898**	**R 8 357 898**
2.00												
2.01												
2.02												
2.03												
2.04												
2.05	R 210 990	R 210 990	R 251 770	R 251 770	R 301 414	R 301 414	R 312 053	R 312 053	R 304 961	R 304 961	R 296 982	R 296 982
2.06	R 5 750	R 5 750	R 6 861	R 6 861	R 8 214	R 8 214	R 8 504	R 8 504	R 8 311	R 8 311	R 8 093	R 8 093
2.07	R 17 052	R 17 741	R 20 862	R 22 101	R 24 580	R 27 219	R 29 331	R 33 829	R 35 115	R 36 354	R 36 170	R 35 528
2.08	**R 599 969**	**R 610 373**	**R 610 373**	**R 599 584**	**R 596 501**	**R 595 634**	**R 580 895**	**R 580 895**	**R 559 856**	**R 517 777**	**R 517 777**	**R 486 199**
2.09	*R 2 405 768*	*R 2 834 518*	*R 2 834 518*	*R 3 382 367*	*R 3 382 367*	*R 4 049 312*	*R 4 049 312*	*R 4 192 229*	*R 4 192 229*	*R 4 096 951*	*R 4 096 951*	*R 3 989 763*
3.00	**R 77 925 345**	**R 87 308 086**	**R 97 838 480**	**R 108 905 932**	**R 121 367 442**	**R 134 495 031**	**R 147 907 269**	**R 161 462 423**	**R 174 796 946**	**R 187 994 113**	**R 200 966 739**	**R 213 800 599**
Total	**R 144 818 841**											

2018/2019

ITEM	Mar-18	Apr-18	May-18	Jun-18	Jul-18	Aug-18	Sep-18	Oct-18	Nov-18	Dec-18	Jan-19	Feb-19
1.10	**R 1 527 507**	**R 1 527 507**	**R 1 375 063**	**R 1 375 063**	**R 1 113 146**	**R 1 113 146**	**R 880 900**	**R 880 900**	**R 760 173**	**R 760 173**	**R 712 086**	**R 712 086**
1.20	**R 924 704**	**R 924 704**	**R 832 420**	**R 832 420**	**R 673 864**	**R 673 864**	**R 533 269**	**R 533 269**	**R 460 184**	**R 460 184**	**R 431 075**	**R 431 075**
1.30	**R 4 997 545**	**R 4 997 545**	**R 4 498 795**	**R 4 498 795**	**R 3 641 881**	**R 3 641 881**	**R 2 882 040**	**R 2 882 040**	**R 2 487 057**	**R 2 487 057**	**R 2 329 733**	**R 2 329 733**
1.40	**R 7 449 756**	**R 7 449 756**	**R 6 706 278**	**R 6 706 278**	**R 5 428 891**	**R 5 428 891**	**R 4 296 209**	**R 4 296 209**	**R 3 707 414**	**R 3 707 414**	**R 3 472 894**	**R 3 472 894**
2.00												
2.01												
2.02												
2.03												
2.04												
2.05	R 264 713	R 264 713	R 238 295	R 238 295	R 192 905	R 192 905	R 152 658	R 152 658	R 131 736	R 131 736	R 123 403	R 123 403
2.06	R 7 214	R 7 214	R 6 494	R 6 494	R 5 257	R 5 257	R 4 160	R 4 160	R 3 590	R 3 590	R 3 363	R 3 363
2.07	R 35 115	R 34 598	R 32 092	R 30 839	R 28 103	R 27 174	R 22 473	R 20 910	R 17 784	R 16 430	R 15 347	R 14 592
2.08	**R 466 103**	**R 466 103**	**R 387 186**	**R 377 322**	**R 364 201**	**R 298 597**	**R 298 597**	**R 280 409**	**R 257 675**	**R 257 675**	**R 245 903**	**R 241 375**
2.09	*R 3 989 763*	*R 3 556 249*	*R 3 556 249*	*R 3 201 338*	*R 3 201 338*	*R 2 591 560*	*R 2 591 560*	*R 2 050 857*	*R 2 050 857*	*R 1 769 788*	*R 1 769 788*	*R 1 657 836*
3.00	**R 225 706 222**	**R 237 178 330**	**R 247 828 043**	**R 258 112 981**	**R 267 107 412**	**R 275 426 460**	**R 282 612 826**	**R 289 240 302**	**R 295 256 248**	**R 300 991 124**	**R 306 479 708**	**R 311 851 813**
Total	**R 98 051 214**											

2019/2020

ITEM	Mar-19	Apr-19	May-19	Jun-19	Jul-19	Aug-19	Sep-19	Oct-19	Nov-19	Dec-19	Jan-20	Feb-20
1.10												
1.20												
1.30												
1.40												
2.00												
2.01												
2.02												
2.03												
2.04												
2.05												
2.06												
2.07	R 14 376											
2.08	**R 241 375**											
2.09	*R 1 657 836*											
3.00	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**	**R 313 751 024**
Total	**R 1 899 211**											

7.1.5 Total External Bulk Roads Upgrade Cost Estimate Summary

Table 7.2 below summarises the total internal bulk/link costs as indicated:

Table 7.2

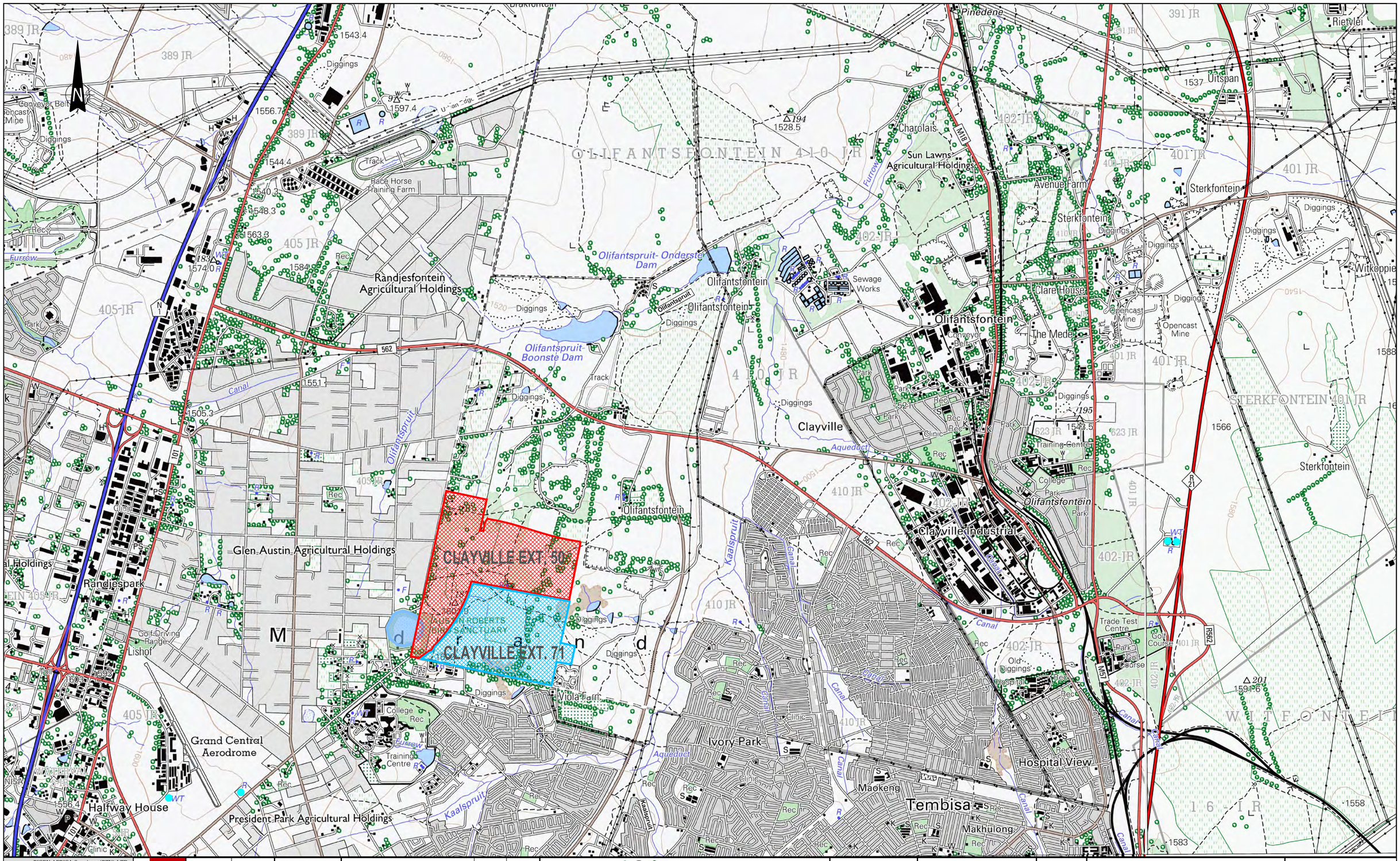
CLAYVILLE EXTENSIONS 50 & 71 EXTENAL BULK ROAD UPGRADES					
Extension	Phases	UPGRADES SPLIT BETWEEN EMM AND GDRT AUTHORITIES		*Estimated Cost As At Nov 2015	Construction Timeframe
		EKURHULENI	GAUTRANS		
71	1	• Intersection 1 upgrades as discussed in Section 7.2.1. • Intersection 2 upgrades for the west and east approach as discussed in Section 7.2.2. A 70m slip lane and the first 100m additional right turn lane is required on south approach. • Intersection 3 upgrades for the west approach as discussed in Section 7.2.3. A 90m slip lane is required on the south approach.		R 4 000 000.00 R 3 100 000.00 R 5 000 000.00	2016 Through To 2026
	2	• The access road (single carriageway) between intersection C and intersection 3. • Intersection 7 upgrades as discussed in Section 7.2.7. • Intersection 8 upgrades as discussed in Section 7.2.8. • Intersection 6 upgrades as discussed in Section 7.2.6.		R 11 000 000.00 R 15 500 000.00 R 2 000 000.00 R 8 700 000.00	
	3	• The construction of intersection B as discussed in Section 7.2.10.	•The future K111: Construction of the additional through lane (south bound) from intersection 2 to intersection 3.	R 25 000 000.00 R 18 900 000.00	
	4		•Construction of the additional through lane (south bound) from intersection 3 (100m). • The future K109: Construction of a single carriageway of the K109 from intersection 6 to the site access at intersection C.	R 1 000 000.00 R 5 320 000.00	
	5		• Intersection C to connect to the K109 construction discussed above so that access to the site will be gained from the south approach. • The future K111: Construction of the additional through lane (north bound) from intersection 4 to intersection 3.	R 3 500 000.00 R 3 500 000.00	
	6		• The future K109: Construction of the remaining carriageway (dual carriageway) of the K109 from intersection 6 to the site access at intersection C. • The future K111: Construction of the additional through lane (north bound) from intersection 5 to intersection 4.	R 5 320 000.00 R 10 500 000.00	
50	TBA		• The future K111: Construction of the additional through lane (north bound) from intersection 3 to intersection 2 and the additional through lane (south bound) from intersection 3 to intersection 5. This will complete the construction of the dual carriageway. • The construction of the additional lanes between intersection C and intersection 3 and creating a dual carriageway. • The construction of intersection A as discussed in Section 7.2.9. • The future K109: Construction of the single carriageway between intersection A and intersection C. • The future K109: Construction of the remaining carriageway between intersection C and intersection A creating a dual carriageway.	R 32 900 000.00 R 16 800 000.00 R 35 000 000.00 R 18 900 000.00 R 18 900 000.00	
				R 244 840 000.00	

Notes:

1. *Escalation of an average of 7% per annum to be allowed over and above the figures given.
2. Estimated figures are current as at November 2015.
3. Bulk External Roads upgrades to be programmed to suit the budget allocations of Ekurhuleni and Gautrans.

Annexure A

Locality & Phasing Plans



BIGEN AFRICA Services (PTY) LTD
Allan Cormack Street
The Innovation Hub Persequor Pretoria
PO Box 29 The Innovation Hub Pretoria 0087
Tel:+ 27 (0) 12 842 8700
Fax:+ 27 (0) 12 843 9000/9001
E-mail: pretoria@bigenafrica.com
www.bigenafrica.com

Engineering Services | Management Services | Project Services | Infrastructure Consulting Services

Engineering solutions

SURVEYED	–
DESIGNED	J Webster
DRAWN	L de Wet
CHECKED	J Webster
SERVICES CHECKED	WG 29
GEOTECHNICAL INVESTIGATION	
CO-ORD SYSTEM	–
APPROVED	P Reyneke

APPROVED ON BEHALF OF BIGEN AFRICA:
NAME: HV Strauss
SIGNATURE: .....
DATE: .....

AMENDMENTS	APPROVED	DATE

Ekurhuleni METROPOLITAN MUNICIPALITY

CLAYVILLE EXT. 50 & 71 HOUSING PROJECT

LOCALITY PLAN

valumax Create more value

EKURHULENI METROPOLITAN MUNICIPALITY

SCALE: AS SHOWN ON ORIGINAL – DRAWING

AS–BUILT RECORD

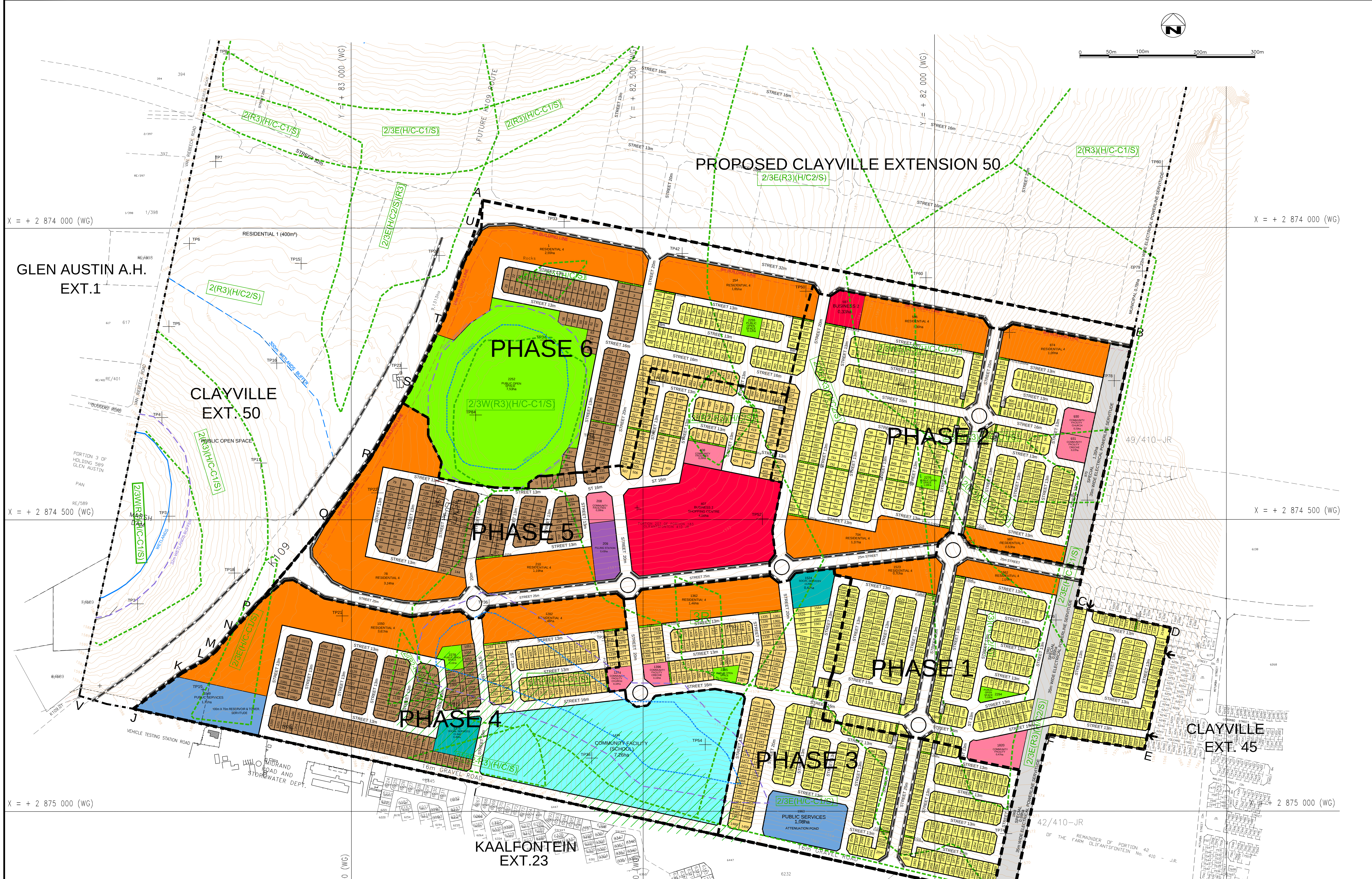
CONTRACT No.	CONTRACT DESCRIPTION	CERTIFIED	DATE

CERTIFIED AS–BUILT FOR CONTRACT :
ENGINEER DATE

DRAWING No.

FILE No.

PRIVATE DRAWING No.	REVISION	APPROVED: HV Strauss
2374.00.ZA.01.A001	1.0	Pr. Eng. No.: 850093 DATE: MAY 2009



GEOTECHNICAL NOTES:

Sub - Area	Commentary
(3R)	• Solid hard rock granite outcrop - most probably an un-developable sub-area
2/3W(R3)(H/C-C1/S)	• Seepage sub-areas (requiring special drainage design) masked by solid and organic waste materials. • Pockets of difficult excavation conditions in 0.0m to 1.5m profile and below. • Potentially collapsible (CC1) near surface soil conditions
2/3E(H/C-C1/S)	• Natural soils masked by solid and organic waste • Potentially collapsible (C C1) near surface soil conditions
2/3E(R3)(H/C2/S)	• Natural soils masked by solid and organic waste • Pockets of difficult excavation conditions in 0.0m to 1.5m profile and below, otherwise - • Thick layers of potentially collapsible near surface soils (C2) in these sub areas of the site.
2(R3)(H/C2/S)	• Pockets of difficult excavation conditions in 0.0m to 1.5m profile and below, otherwise - • Thick layers of potentially collapsible near surface soils (C2) in these sub areas of the site.
2(R3)(H/C -C1/S)	• Pockets of difficult excavation conditions in 0.0m to 1.5m profile and below, otherwise - • Thick layers of potentially collapsible near surface soils (CC1) in these sub-areas of the site.
2(R2R3)H/C/S	• Scattered outcrop and sub outcrop of medium and hard rock boulder conditions in these sub -areas of the site.

RESIDENTIAL SITES

Maximum slope on roads is 1:50
Minimum slope on roads is 1:18

CONTOURS

The contours on this plan are in accordance with the stipulations of Regulation 18(1)(a)(1) of the Town Planning- and Townships Ordinance, Ord. 15 of 1986. The contours on this plan were obtained from

26/3/2015
date

CO-ORDINATES

The Co-ordinate reference is based on WG27 system. Base Plan mapping was done by

26/3/2015
date

DIMENSION AND SIZES

1. All dimensions shown on the plan are approximate, scaled in meters and subject to final survey.
2. Township Layout Sketch Plan. Only calculated survey drawing to be used for Engineering Design and Construction purposes.

FLOODWATER

It is hereby certified that in accordance with the Water Act (Act 36 of 1998) that the floodline indicated on this plan represent the maximum levels that will properly be reached during floods with a recurrence interval of 1:100 years.

CONSULTING ENGINEER .... date ....

GEOTECHNICAL

It is hereby certified that the layout of the township complies with the recommendations and requirements set out in the geotechnical report no. IR1252 dated July 2014

Engineering Geologist........ 1/4/2015.
Firm........ INTRA CONSULT cc

WETLAND

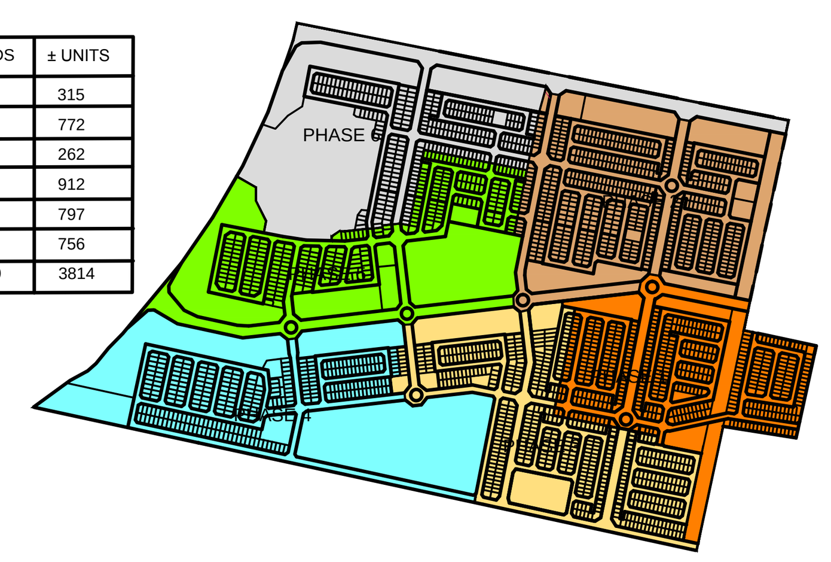
I hereby certify that the Wetland Delineation and the 30m Wetland Buffer as indicated on the layout are correct.

Dr. Gwen Theron .... 16/09/2015 Date

CLAYVILLE EXTENSION 71 PROPOSED PHASES

NOT TO SCALE

PHASES	STANDS	± UNITS
PHASE 1	434	315
PHASE 2	523	772
PHASE 3	480	262
PHASE 4	274	912
PHASE 5	257	797
PHASE 6	252	756
TOTAL	2220	3814



PROJECT

PROPOSED TOWNSHIP

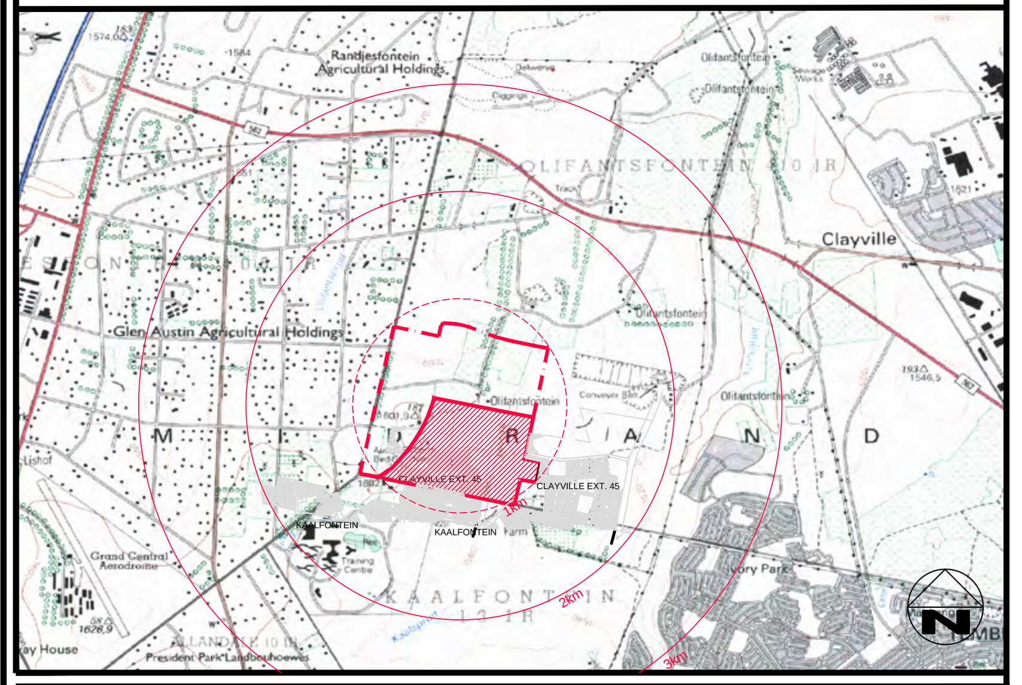
CLAYVILLE EXTENSION 71

SITUATED ON PORTION 207 OF PORTION 183
OF THE FARM OLIFANTSFONTEIN 410 JR

LOCAL AUTHORITY : EKURHULENI LOCAL MUNICIPALITY
DISTRICT : KEMPTON PARK
GEODETICAL SYSTEM : WG27

LOCALITY

SCALE: 1:50 000



LAND USE TABLE

ZONING	LAND USE	ERF NUMBERS	No. OF STANDS	AREA OF STANDS& STREETS	% OF AREA
RESIDENTIAL 2	DWELLING HOUSES 9m x 18m = 160m²	255–363,543–595, 598–703,705–873, 875–929,932–968, 971–1048,1483–1522, 1525–1660,1663–1819, 1821–1867,1869–1962, 1964–2251	1369	24,42	19,08
	DWELLING HOUSES 9m x 20m = 180m²	364–406,409–542, 1235–1273,1275–1281, 1283–1361,1363–1395, 1397–1433,1435–1482	420	8,05	6,29
	DWELLING HOUSES 9,8m x 22m = 216m²	2–77,79–207,211–253, 1051–1170,1172–1234	431	9,98	7,80
RESIDENTIAL 4	DWELLING HOUSES, DWELLING UNITS, RESIDENTIAL BUILDINGS PRIVATE ROADS 180 dwellings units per ha (3787 units)	1,78,210,254,596,704, 874,969,1050,1282, 1362,1523,1662	13	21,20	16,56
BUSINESS 2	FOR BUSINESS PURPOSES, SHOPS, PLACES OF PUBLIC WORSHIP, PLACES OF INSTRUCTION, PLACES OF EDUCATION, DWELLING UNITS, RESIDENTIAL BUILDINGS, RESTAURANTS, MEDICAL CONSULTING ROOMS, GYMNASIUM, PLANT NURSERIES, SERVICE INDUSTRIES, PARKING BAYS AND PARKING GARAGES	407,597	2	4,33	3,38
SPECIAL	ELECTRICAL POWERLINES, MUNICIPAL SERVICES	970,1661,1868	3	3,18	2,48
SOCIAL SERVICES	HOSPITALS, CLINICS, LIBRARIES, POLICE STATIONS, LAW COURTS, FIRE STATIONS, MUNICIPAL & GOVERNMENT OFFICES, INSTITUTIONS, PLACES OF PUBLIC WORSHIP, PLACES OF INSTRUCTION, CHILD CARE FACILITIES, SOCIAL HALLS, OLD AGE HOME	1171,1524	2	0,87	0,68
PUBLIC SERVICES	PRODUCE MARKETS, ABATTOIRS, CEMETERIES, WATER WORKS, RESERVOIRS, GAS WORKS, POWER/SUB STATIONS, MORTUARIES, SEWAGE DISPOSAL WORKS, WASTE DISPOSAL SITES, MUNICIPAL PURPOSES, POSTAL DEPOT, STORMWATER RETENTION AND ATTENUATION PONDS	1049,1963	2	2,39	1,87
PUBLIC GARAGE	FILLING STATION, CAR WASH, MOTOR DEALERS, MOTOR WORKSHOPS	209	1	0,43	0,34
COMMUNITY FACILITY	PLACE OF EDUCATION	1434	1	7,25	5,66
	PLACES OF INSTRUCTION, PLACES OF EDUCATION, SOCIAL HALLS, PLACES OF PUBLIC WORSHIP, LIBRARIES, CHILD CARE FACILITIES, SPORT AND RECREATION CLUBS, SPORTS GROUNDS, MONASTERIES, CONVENTS	208,408,930,931, 1274,1396,1820	7	1,75	1,37
PUBLIC OPEN SPACE	PARKS, GARDENS, BOTANICAL GARDENS, ZOOLOGICAL GARDENS, COSERVATION AREAS, ART GALLERIES, SPORT AND RECREATION CLUBS, SOCIAL HALLS, OPEN SPACES, PLAY PARKS, SQUARES AND BUILDING USED IN CONNECTION HEREWITH,MUNICIPAL PURPOSES, SPORTS GROUNDS, SWIMMING POOLS, STORMWATER RETENTION AND ATTENUATION PONDS	2252–2300	49	8,48	6,63
STREETS	STREET/ROADS, PRIVATE ROADS, TOLL GATES, WEIGH BRIDGES, PARKING, CYCLE LANES, BUS LANES, MUNICIPAL SERVICES AND INFRATRUCTURE			35,69	27,86
TOTAL			2300	128,00ha	100%

GENERAL NOTES

THE FIGURE ABCDEFGFHJKLMNPQRSTUA REPRESENTS OUTSIDE BOUNDARY OF THE PROPOSED TOWNSHIP BEING APPROXIMATELY 128ha IN EXTENT.

OUTSIDE BOUNDARY OF TOWNSHIP
FARM PORTIONS
LINE OF NO ACCESS
WETLANDS
WETLANDS BUFFER

GEOTECHNICAL NOTES:

PRESUMED BOUNDARY OF SITE CLASS SUB–AREA
TP72 TRIAL HOLES POSITION AND NUMBER
2/3E(H/C-C1/S) PRELIMINARY NHBRC SITE CLASS DESCRIPTION

REVISIONS

D : DRAFT C : CIRCULATED A : APPROVED

CLIENT: valumax Create more value

TOWN PLANNER: Nomfundo Sibanyoni

SCALE: 1:2 500

DRAWING REF: Clay71Lay D/2015.10.27

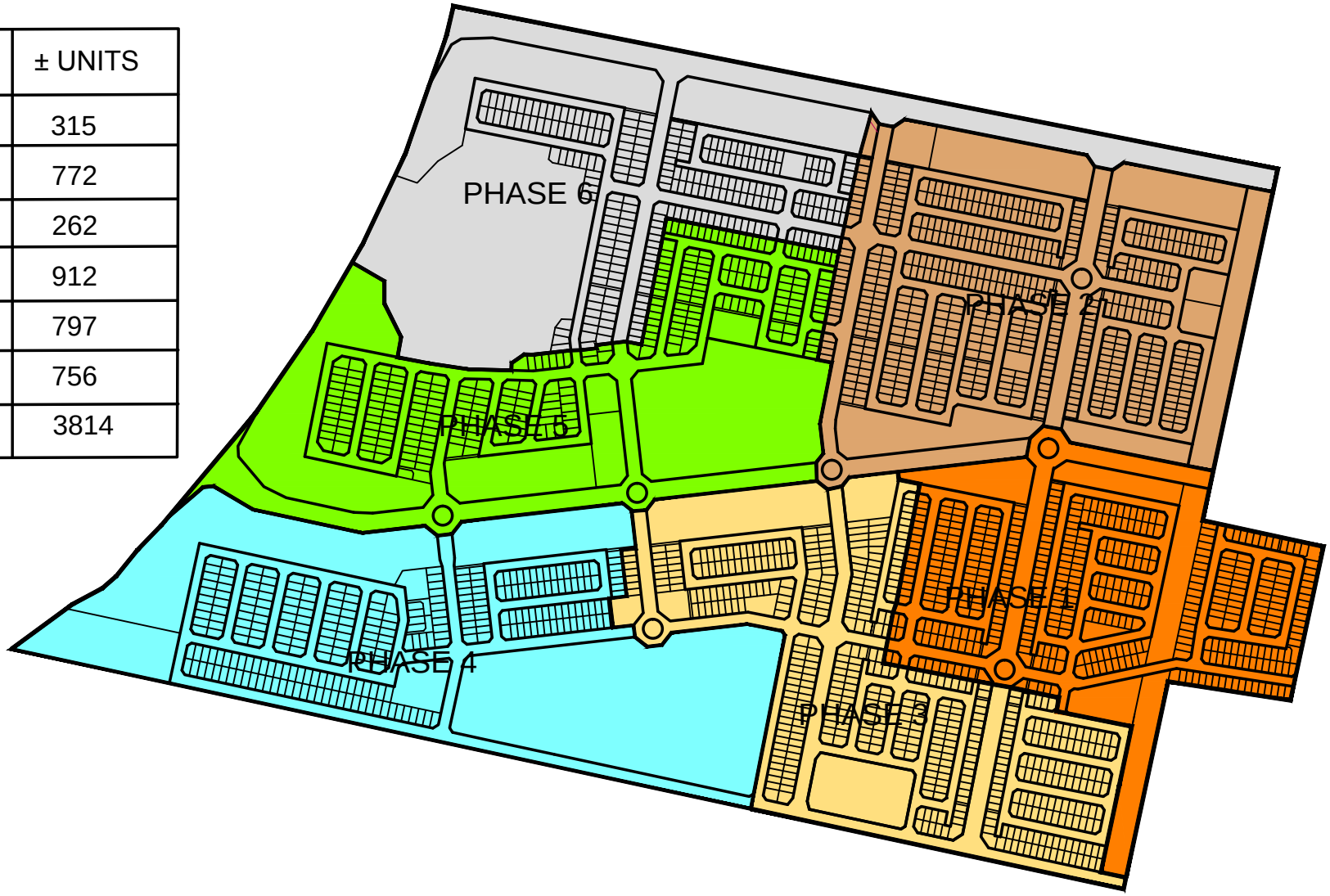
DRAWING STATUS: DRAFT

URBAN DYNAMICS
TOWN & REGIONAL PLANNERS
37 EMPIRE ROAD
PARKTOWN
P.O. BOX 291803
MELVILLE
2109
TEL: (+27 11) 482–4131
FAX: (+27 11) 482–9959
E–MAIL: nomfundos@urbandynamics.co.za

CLAYVILLE EXTENSION 71
PROPOSED PHASES

NOT TO SCALE

PHASES	STANDS	± UNITS
PHASE 1	434	315
PHASE 2	523	772
PHASE 3	480	262
PHASE 4	274	912
PHASE 5	257	797
PHASE 6	252	756
TOTAL	2220	3814



Annexure B

Flood Lines

BIGEN AFRICA Services (PTY) LTD
Allan Cormack Street
The Innovation Hub Persequor Pretoria
PO Box 29 The Innovation Hub Pretoria 0087
Tel:+ 27 (0) 12 842 8700
Fax:+ 27 (0) 12 843 9000/9001
E-mail: pretoria@bigenafrica.com
www.bigenafrica.com
Engineering Services | Management Consulting Services | Project Finance Services | Infrastructure Development Services
Engineering Solutions

BIGEN AFRICA

SURVEYED	–
DESIGNED	P J Koelewyn
DRAWN	M Steenberg
CHECKED	P J Koelewyn
SERVICES CHECKED	WG 29
GEOTECHNICAL INVESTIGATION	
CO-ORD SYSTEM	–
APPROVED	P Reyneke

APPROVED ON BEHALF OF BIGEN AFRICA:
NAME: HV Strauss
SIGNATURE:
DATE:

AMENDMENTS	APPROVED	DATE

Ekurhuleni METROPOLITAN MUNICIPALITY

CLAYVILLE EXT. 50 & 71 HOUSING PROJECT

1:50 & 1:100 YEAR FLOODLINES

valumax Create more value

EKURHULENI METROPOLITAN MUNICIPALITY

SCALE: AS SHOWN ON ORIGINAL – DRAWING

AS-BUILT RECORD

CONTRACT No.	CONTRACT DESCRIPTION	CERTIFIED	DATE

CERTIFIED AS-BUILT FOR CONTRACT :
ENGINEER DATE

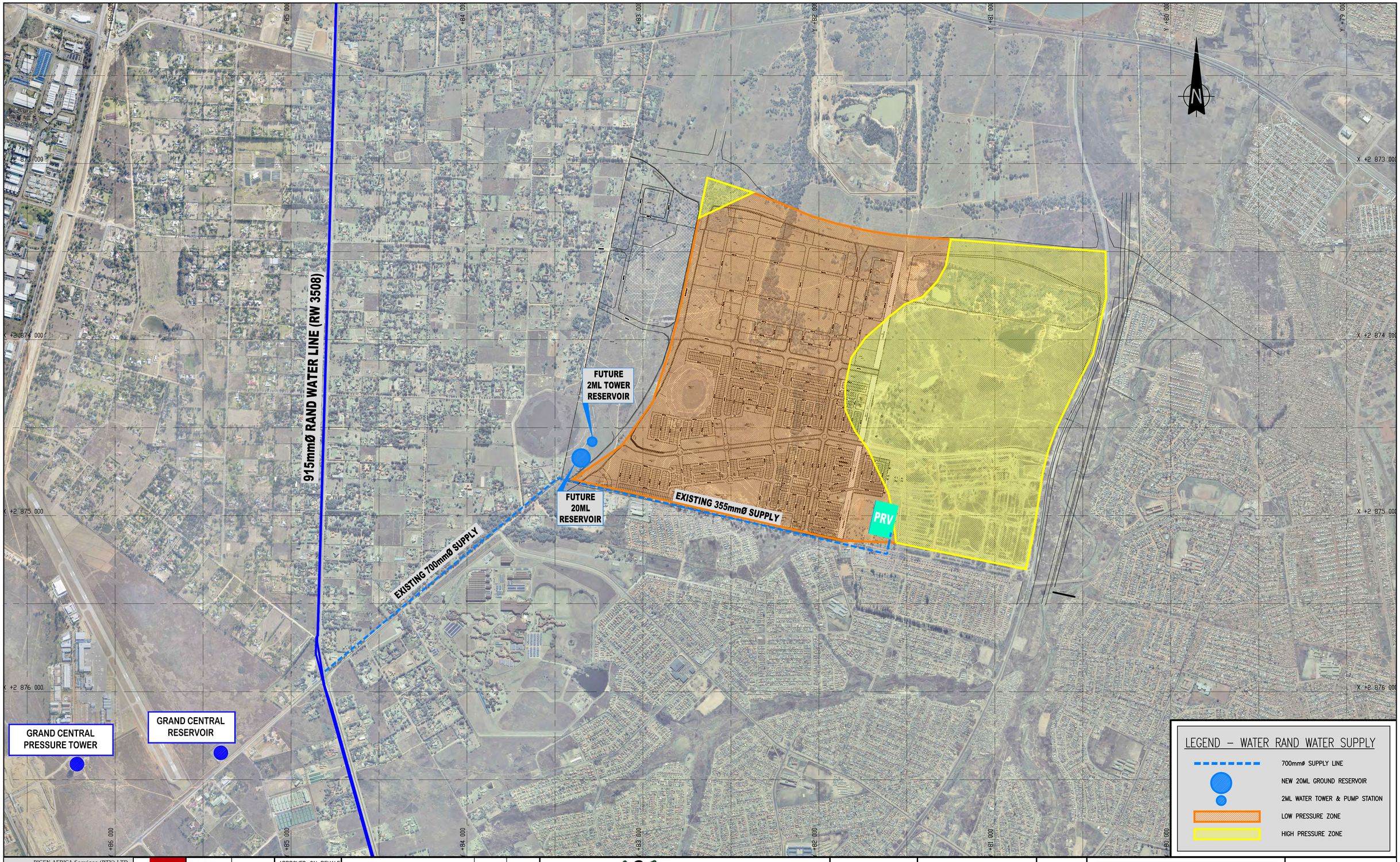
DRAWING No.

FILE No.

PRIVATE DRAWING No.	REVISION	APPROVED: HV Strauss
2374.00.ZA.04.A001	1.0	Pr. Eng. No.: 850093
		DATE: MAY 2009

Annexure C

Bulk Water



BIGEN AFRICA Services (PTY) LTD
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www.bigenafrica.com
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BIGEN AFRICA Engineering solutions

SURVEYED	–
DESIGNED	P J Koelewyn
DRAWN	M Steenberg
CHECKED	P J Koelewyn
SERVICES CHECKED	WG 29
GEOTECHNICAL INVESTIGATION	
CO-ORD SYSTEM	–
APPROVED	P Reyneke

APPROVED ON BEHALF OF BIGEN AFRICA:
NAME: HV Strauss
SIGNATURE: .....
DATE: .....

AMENDMENTS	APPROVED	DATE

Ekurhuleni METROPOLITAN MUNICIPALITY

CLAYVILLE EXT. 50 & 71 HOUSING PROJECT

PROPOSED BULK WATER INFRASTRUCTURE RAND WATER SUPPLY ZONES

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SCALE: AS SHOWN ON ORIGINAL – DRAWING

AS–BUILT RECORD

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FILE No.

PRIVATE DRAWING No.	REVISION	APPROVED: HV Strauss
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		DATE: MAY 2009

Annexure D

Bulk Sewer

BIGEN AFRICA Services (PTY) LTD
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SERVICES CHECKED	WG 29
GEOTECHNICAL INVESTIGATION	
CO-ORD SYSTEM	–
APPROVED	P Reyneke

APPROVED ON BEHALF OF BIGEN AFRICA:

NAME: HV Strauss

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DATE: ....

PRIVATE DRAWING No.	REVISION	
2374.00.ZA.06.A001	1.0	APPROVED: HV Strauss Pr. Eng. No.: 850093 DATE: MAY 2009

	AMENDMENTS	APPROVED	DATE

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CLAYVILLE EXT. 50 & 71 HOUSING PROJECT

PROPOSED BULK SEWER INFRASTRUCTURE

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SCALE

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CERTIFIED AS–BUILT FOR CONTRACT :

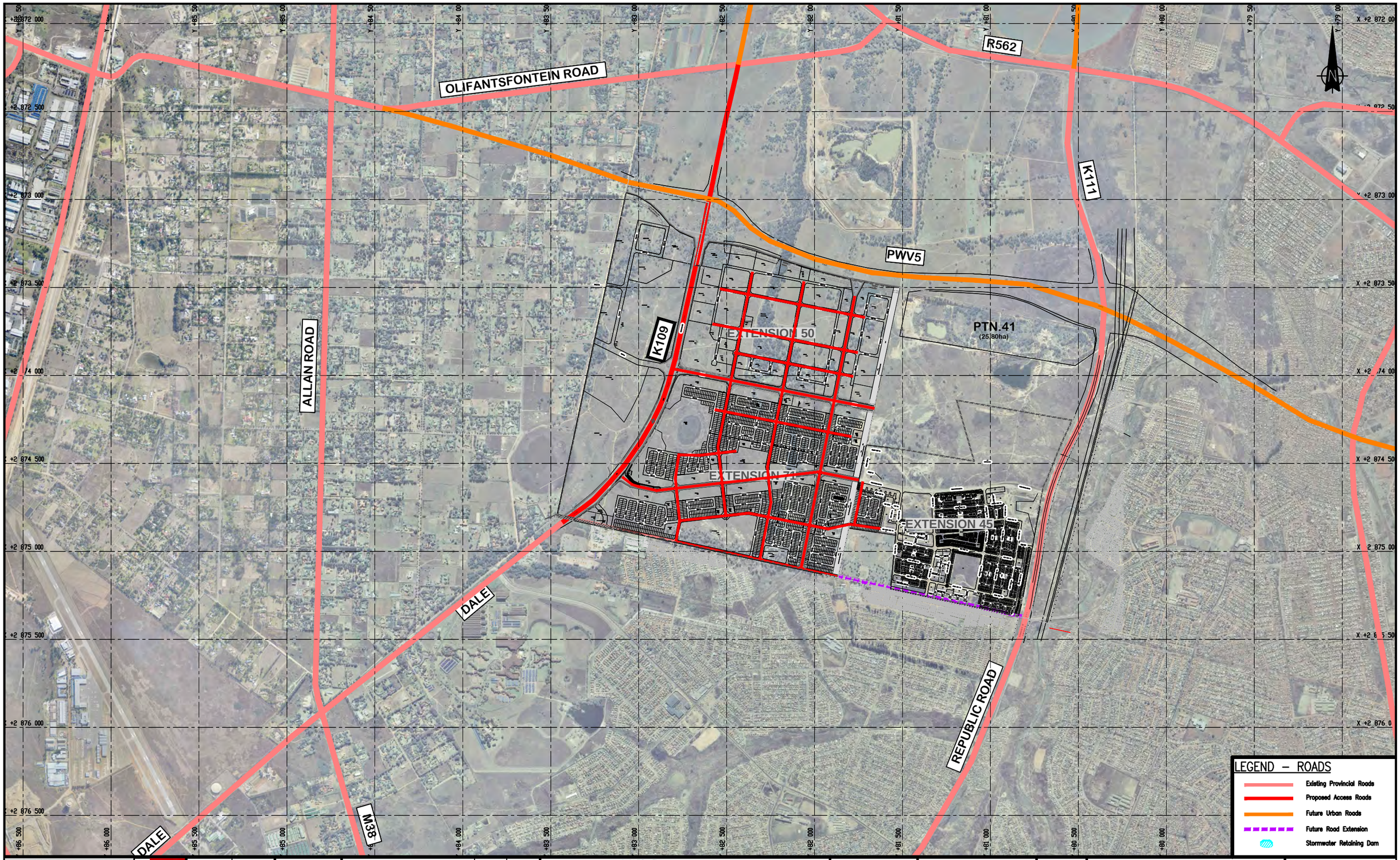
________________ ENGINEER ________ DATE

DRAWING No.

FILE No.

Annexure E

Bulk Roads



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SURVEYED	–
DESIGNED	P J Koelewyn
DRAWN	M Steenberg
CHECKED	P J Koelewyn
SERVICES CHECKED	WG 29
GEOTECHNICAL INVESTIGATION	
CO-ORD SYSTEM	–
APPROVED	P Reyneke

APPROVED ON BEHALF OF BIGEN AFRICA:
NAME: HV Strauss
SIGNATURE:
DATE:

AMENDMENTS	APPROVED	DATE

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CLAYVILLE EXT. 50 & 71 HOUSING PROJECT

PROPOSED BULK ROADS & STORMWATER INFRASTRUCTURE

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SCALE: AS SHOWN ON ORIGINAL – DRAWING

AS-BUILT RECORD

CONTRACT No.	CONTRACT DESCRIPTION	CERTIFIED	DATE

CERTIFIED AS-BUILT FOR CONTRACT :
ENGINEER ---------- DATE ----------

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FILE No.