THUNDERFLEX PHASE I GROUNDWATER AND SURFACE WATER ASSESSMENT

Thunderflex 78 (Pty) Ltd.

DRAFT Copy Pending Client Comments and Final Laboratory Results

Prepared For:
Thunderflex 78 (Pty) Ltd
Prieska
Northern Cape Provence
South Africa

Prepared By:
MojaTerre (Pty) Ltd.
PO Box 1105
Montana Park
Pretoria
0159
South Africa

MojaTerre

August 2015
PJ150002

Table of Contents

List of Tables and Diagrams

List of Annexures

1. Introduction

1.1 Terms of Reference

MojaTerre (Pty) Ltd (MojaTerre) was appointed by Thunderflex 78 (Pty) Ltd. (Thunderflex) to undertake a Phase I Groundwater and Surface Water Assessment of its operation located in the vicinity of Prieska, Northern ape Province, South Africa.

MojaTerre undertook the required field activities on 29 July 2015 in accordance with MojaTerre proposal PP1500015.

1.2 Project Background

Thunderflex is an Alluvial Diamond Mine situated approximately 16km north west of the town Prieska, which in turn is located 220km north east of Kimberley in the Northern Cape Province.

The Thunderflex operation currently comprises a prospecting facility occupying an area approximately 6km east of the Orange River. The Thunderflex prospecting rights were received on 9 October 2013 and will expire on 8 October 2016. Prospecting efforts to date have proven a profitable diamond resources for continued mining and Thunderflex is in the process of lodging a Mining Right Application for a minimum life of mine of 15 years with the Department of Mineral Resources (DMR).

In support of the authorisation processes, Thunderflex requires a description of current groundwater and surface water conditions within the vicinity of the proposed mining operations as well as an assessment of the potential impacts that mining may have on the available water resources. MojaTerre offered a Phase I Investigation approach for the required assessment. The approach comprises a comprehensive review of available relevant information as well as a site visit and assessment. No intensive intrusive work (additional drilling campaigns, pump testing, etc.) were undertaken during this phase.

MojaTerre provided Thunderflex with a proposal for the required Phase I investigation on 14 July 2015 (PP150015) and was formally appointed for the work on 20 July 2015. The required site assessment was undertaken on 29 July 2015 following a preliminary review of available in formation.

2. Scope of Work

MojaTerre undertook the following scope of work:

- Project kick-off meeting.
- Review of available information.
- Site walkover, personnel interviews and water sampling.
- Laboratory analyses.

3. Our Approach

3.1 Project Kick-Off Meeting

A project kick-off meeting was held on 24 July 2015 via a telephone call and served as an opportunity to:

- Introduction of the project teams.
- Source available site information.
- Project responsibilities and expectations.
- Project timelines.

Following the kick-off meeting, Thunderflex provided MojaTerre with a copy of the Scoping Report and Section 27 Water Use Licence Motivation Report recently prepared for Thunderflex as part of the environmental authorisation process.

3.2 Review of Available Information

MojaTerre obtained and used the following information sources to review available information relevant to the Thunderflex Mine and its surrounding environment:

- Thunderflex Scoping Report, prepared by Mrs. Roelien Oosthuizen in May 2015.
- Motivation Compiled for a Section 27 of the National Water Act no. 36 of 1998, prepared by Mrs. Roelien Oosthuizen in May 2015.
- National Groundwater Database, accessed 23 July 2015.
- Hydrogeological Map for Prieska (Sheet 2920), prepared on behalf of the Department of Water Affairs and Sanitation (DWS) by Potgieter and Meyer in 2001.
- Groundwater Harvesting Potential Map, prepared on behalf of DWS by Seymour and Seward in 1996.
- Internal Strategic Perspective Lower Orange Water Management Area Internal Strategic Perspective Lower Orange Water Management Area, developed on behalf of DWS by PDNA, WRP Consulting Engineering (Pty) Ltd, WMB and Kwezi-V3 in July 2004.
- Provincial Report on Education and Training for Agriculture and Rural Development in the Northern Cape, prepared by M K Bapela W Mariba in November 2002.
- SADC Hydrogeological Mapping Project (9ACP-RPR39-98), prepared by the Southern African Development Community in March 2010.
- Climate Change Vulnerability Index for South African Aquifers, prepared by the North West University in 2012.
- Geological Map of the Republic of South Africa and the Kingdoms of Lesotho and Swaziland, prepared by the Department of Mines in 1970.
- Resource Water Quality Objectives (RWQOs) for the Upper and Lower Orange Water Management Areas (WMAs 13 and 14), prepared by DWS as part of the Department's Water Resource Planning Systems in June 2009.
- Water Quality in the Orange River Report, prepared by WRP Consulting Engineers, Jeffares and Green, Sechaba Consulting, WCE Pty Ltd and Water Surveys Botswana (Pty) Ltd in August 2007.

Relevant and important information obtained from the abovementioned sources was combined with site specific information recorded during the site visit in preparation of this Phase I Groundwater and Surface Water Assessment Report.

3.3 Site Walkover, Personnel Interviews and Water Sampling.

MojaTerre, represented by Mr. Renier Pretorius, was accompanied onsite by Mrs. Roelien Oosthuizen, an Environmental Manager for the Thunderflex Operation. Mrs. Oosthuizen escorted Mr. Pretorius through a comprehensive site walkover across all Thunderflex operational units. Mrs. Oosthuizen had sufficient knowledge of the facility to provide MojaTerre with thorough technical and management information regarding the Thunderflex operations.

MojaTerre inspected a two surface water locations, six boreholes and one spring within the vicinity of the Thunderflex operation during the site visit.

MojaTerre collected four water samples during the site visit. The samples comprise two samples from available boreholes onsite (one upgradient and one downgradient of the mine) as well as a samples from the Orange River, upstream and downstream of the Thunderflex operation.

Water samples from the Orange River were collected from directly below the water surface whilst standing on the river bank (at locations with safe and secure access).

No open or accessible boreholes were available onsite at the time of the assessment to allow MojaTerre access for measurements of groundwater levels or to obtain water samples. Therefore, groundwater samples were collected from taps and reservoir dams connected to each borehole (also see ***Section 5.4***).

MojaTerre stored water samples in suitable sterilised containers provided by the laboratory. The MojaTerre field consultant ensured to wear a clean pair of nitrile gloves during sampling that were changed between sample locations to minimise risks of cross contamination. The sample containers were stored on ice until submission to the laboratory.

MojaTerre noted the following during water sampling:

- Weather conditions.
- Borehole depth, stagnant water level and presence of free phase products.
- Sample colour and suspended matter load.
- Sample odour.
- Comments on potentially uncharacteristic site conditions

3.4 Laboratory Analyses

MojaTerre submitted the water samples to UIS Laboratories based in Pretoria. The laboratory is accredited by the South African National Accreditation System (SANAS). MojaTerre requested that the laboratory analyses the water samples for the following parameters and constituents:

- ***Anions –*** Chloride, cyanide, fluoride, nitrogen, nitrate, orthophosphate and sulphate.
- ***Cations –*** Aluminium, free and saline ammonia, antinomy, arsenic, barium, beryllium, boron, cadmium, total chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, molybdenum, nickel, potassium, silicon, selenium, sodium, strontium, uranium, vanadium and zinc.
- ***Indicators –*** Alkalinity, conductivity, chemical oxygen demand, dissolved organic carbon and total organic carbon, total dissolved solids and pH.

4. Site Description

Site location and layout maps are provided in ***Annex A: Figure 1*** and ***Figure 2***.

4.1 Site Setting

The site is located approximately 16km north west of the town Prieska on undeveloped farm land at coordinates 29°31'37.70"S and 22°42'13.42"E. The Thunderflex operation is located on the farms Biaauputs 23 and Kliphuis 29. The total extend of the mine area is approximately 6 640 ha.

The site is accessed via an unpaved road (approximated 20km in length) which turns of from the R386 that connects Prieska and Niekerkshoop.

4.2 Site Ownership and History

Thunderflex is the owner of the current prospecting right as well as current mining equipment and infrastructure onsite. Additionally, Thunderflex will be the owner of the mining rights upon final approval as well as all equipment and infrastructure associated with future mining activities.

Ownership of the farm land on which the Thunderflex operation is situated is summarised in ***Table 1***.

Table 1 – Land Owner Information	
Farm Information	**Owner Information**
Farm Biaauputs (Farm Number 23.	Portion 1: JJ Botha Portion 2: JJ Botha Portion 3: JJ Botha Portion 4: Canton Trading 302 (Pty) Ltd. Remainder: Canton Trading 302 (Pty) Ltd.
Farm Kliphuis (Farm Number 29).	Portion 2: Temdale Eiendomme (Pty) Ltd. Remainder: JJ Botha

In terms of environmental management, agreements between Thunderflex and land owners are as such that responsibility and liability falls with Thunderflex.

4.3 Site Operations

At the time of the assessment, site operations predominantly comprised prospecting activities with the associated equipment.

Open trench based alluvial mining with continued backfilling has been used for prospecting purposes and has also been identified as the most economic method for mining during feasibility and alternative considerations. In general, this mining method entails the removal of over-burden to access the underlying gravel bed in which diamonds are found. The gravel is excavated and then taken to a plant where it is washed and screened for diamonds.

Operation shifts are reportedly comprise seven days production followed by and four days shut-down for maintenance. Production days comprise 08:00 to 17:00 shifts.

4.3.1 Site Layout

At the time of the assessment, the site comprised two open alluvial mining trenches within the northern portion of the site and a diamond recovery plant (DRP) located in the centre of the site. Staff quarters are located approximately 1.6km west of the plant. A raw water line, approximately 6km in length, extends from the Orange River to the DRP. A water line pressure booster unit is also located in the vicinity of the staff quarters.

A site layout map is provided in ***Annex A*** whilst a summary of the layout is provided in ***Table 2***. The DRP is located on predominantly softstanding (no concrete or tarmac covering) comprising compacted gravels rejected by the screening process.

Table 2 – Thunderflex Site Layout Summary	
Site Area	**Area Description**
Northern site portion.	• Prospecting trenches with maximum depth of 10m below ground level (mbgl). • Continual backfilling post gravel excavation is applied.
North eastern portion of the DRP.	• Three rotary screens and associated hoppers and intra-plant conveyor systems. • Rotary Pan (RP) Plant for concentrate production. • Dense Media Separation (DMS) Plant for final diamond recovery with ferrosilicon solution recycling tank. • Temporary DMS rock dump after final recovery pending second recovery process. Material is used as backfill after processed for a second time.

Table 2 – Thunderflex Site Layout Summary	
Site Area	**Area Description**
	• Stacked steel shipping container (container) site office (2 containers height). • DRP power plant comprising three diesel generators with on-board fuel tanks. No secondary containment (bunds) is provided for any of the generators.
Central portion of the DRP.	• Roofed Engineering Workshop. • Container based yellow fleet (earth moving trucks) servicing and tire replacement workshop. The workshop comprise three containers arranged in a hove shape. Two containers are sued as offices and one as a maintenance consumables store. • Diesel aboveground storage tank (AST) farm and fuel dispenser placed on a concrete floor within a masonry bund. Facility comprises two 23 000L and one 8 000L tanks. • Used oil AST and drum storage area. The 30 000L AST and drums area stored on a concrete floor within a masonry bund. Stored drums contained various hazardous chemicals and waste products such as fluorescent tubes, greases and lubricants, used filters and oily rags as well as empty chemical containers. • DRP wash bay comprising a concrete floor, masonry bund and concrete oil separator. • 80m^3 plant make-up water reservoir (known as the "Zink Dam"). The reservoir holds water pumped from the Orange River for use in the plant area. • Yellow fleet parking area situated on softstanding with High-Density Polyethylene (HDPE) sheet lining provided beneath each truck.
South western portion of the DRP.	• Tailings Storage Facility (TSF) and return water dam (RWD). Water that filters through the TSF wall is collected in the earthen RWD from which it is pumped to the plant reservoir for reuse in the process. The TSF and RWD are reportedly does not have engineered base lining.
Western site portion.	• Staff quarters comprising two former farmhouses which have been converted into a hostel, temporary general waste storage shed and a diesel power generator with an on-board fuel tank. • Raw water line pressure booster unit comprising an 80m^3 reservoir, a pump and diesel power generator with on-board fuel tank. The unit is located approximately 130m south of the staff quarters. • No secondary containment is provided for any of the generators.
Southern western site border.	• Raw water abstraction pump station located at the Orange River approximately 4.5km west of the DRP. The pumps station comprises a below water surface intake attached to an above water pump, a station pressure booster pump above the flood-line mark and a diesel power generator with an on-board fuel tank. No secondary containment is provided for the generator.

4.3.2 Prospecting and Future Mining Process

The Thunderflex prospecting and future mining activities generally comprise the following:

- ***Exploratory borehole advancement –*** Boreholes are advanced in a predetermined grit pattern to depth below the diamond host material/gravel (depths generally less than 10m). This technique is used to determine the most efficient excavation approach on the bases of over burden thickness and extend of the gravel for each predetermined grid area.
- ***Blasting and Excavation*** – Blasting programmes are developed on the basis of results from exploratory borehole advancements and are used to loosen overburden and gravel material for excavation and removal. Ammonium nitrate based explosives with diesel as ignition source are used for blasting purposes. Large track mounted excavators are used to remove material and in doing so, advance each prospecting/mining trench. Using the excavators, excavated material is loaded on heavy duty haulage trucks ("yellow fleet").

Overburden is hauled to overburden stockpiles for use during rehabilitation. Gravel material is hauled to a primary rotary screens in the DRP plant.

- ***Processing plant*** – The Thunderflex diamond extraction plant has 4 main processes comprising the following in consecutive order:
    - Material screening: Excavated material is trucked to a 70mm primary rotary screen within the DRP Plant to produce the Run-Of-Mine stockpile. Material rejected by the screen is loaded on trucks after the trucks have delivered material to the screen and is hauled to the prospecting/mining trenches as backfill material (no stockpiling). As production rates require, material is moved from the ROM stockpiles by front-end-loader and passed through one of two secondary 32mm rotary screen. As in the case of the 70mm screen, material rejected by the 32mm screens is also hauled by truck to the mining area for use a backfill. Material passing through the 32mm screens is conveyed to the RP Plant.
    - Puddle production: Puddle is only used in the RP Plant and only small quantities of the liquid is produced on an "as and when needed" basis. Soils are mixed with water to a consistency that yields a liquid density slightly lower than that of diamonds.
    - RPP: Screened diamond bearing material is conveyed to the RPP where it is mixed with puddle and stirred in one of two, 4,9m diameter pans by angled rotating steel "teeth". In each pan the heavier minerals, or "concentrate", settle to the bottom and are pushed toward an extraction point, while lighter waste remains suspended and overflows out of the centre of the pan as a separate stream of material. The concentrate, representing just a small percentage of the original alluvial gravels, is drawn off for final recovery of the diamonds in the DMS Plant whilst the waste stream is recycled as puddle or pumped to the onsite TSF.
    - (DMS) Plant: Concentrate from the RP Plant is conveyed to the DMS Plant where it is mixed with a Ferrosilicon solution to begin the separation process of the heavier minerals from the lighter material. Additional separation of the denser material occurs by centrifuge in "cyclones" that swirl the mixture at low and high speeds, forcing the diamonds and other dense minerals to the walls and then out the bottom of the cyclone. Waste water rises at the centre of the cyclones and is removed. The DMS process results in the final recovery of diamonds. Waste water from the plant is recycled through a 28 000L temporary ferrosilicon storage tank situated adjacent to the DMS plant for reuse in the process. Waste gravel from the process is temporarily stockpiled approximately 40m north west of the DM Plant for reprocessing before being hauled to the mining area as backfill.

4.4 Water Management

4.4.1 Surface Water

The Thunderflex operation relies solely on water from the Orange River for production purposes. Water from the river is used as make-up water in the DRP process and is pumped from the abstraction pump station located on the river bank, approximately 4km west of the DRP. The pump cycle of the pump station is reportedly 24 hours on and 24 hours off with pump rates in the region of approximately 110 000L/h. Therefore, on average, approximately 40 000m^3 of river water is pumped to the DRP on a monthly basis.

Water is used in the DRP for:

- ***Production of puddle –*** Fine soils are mixed with water to a consistency that yields a liquid density slightly lower than that of diamonds for use in the media separation plants. Water required for the process is obtained from the DRP reservoir. Puddle is recycled between the media separation plants or diverted to the dewatering plant.
- ***Equipment washing in the wash bay*** – Water for the wash bay is sourced from the DRP reservoir. Mine vehicles and mobile equipment is washed in the bay area using high pressure hoses. Wash water is collected by interception channels in the wash bay floor which are connected to silt trap and oil separator system. The system in cleaned on an "as and when needed" basis by hazardous waste management contractor Olegra.

- ***Onsite toilets and wash basins*** – Water for the toilets and wash basins is sourced from the DRP reservoir. Waste water from these facilities is diverted to the plant septic tank and soak-away system. The system retains waste water to allow time for biodegradation. Overflow from the system is discharge below ground level where it filters through the subsurface strata.
- ***Generally office cleaning***– Floor and dish washing waste water is diverted to the DRP septic tank and soak-away system.

Process water is managed in a closed water system with predominant losses comprising evaporation and subsurface infiltration (also see ***Section 4.4.3***). An illustration of the Thunderflex process water cycle is shown in ***Diagram 1***.

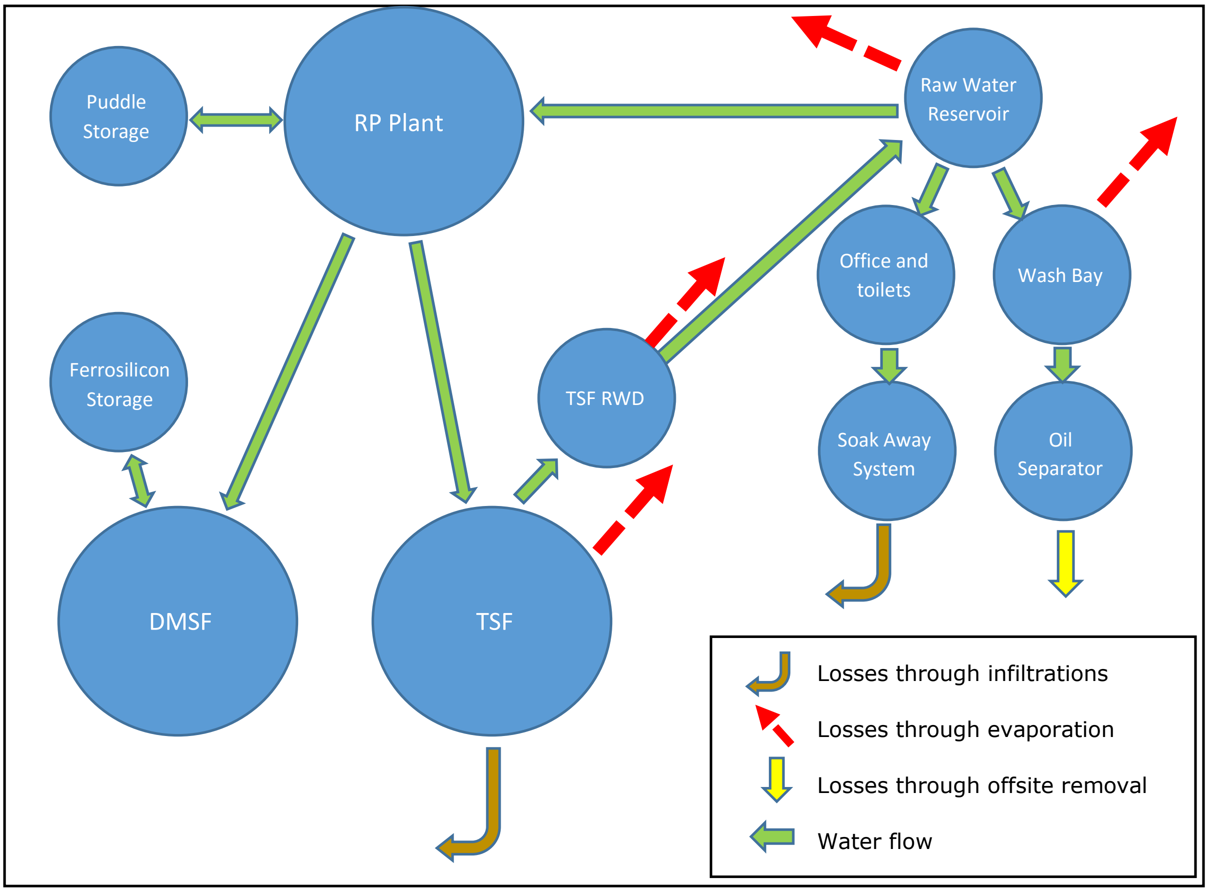


Diagram 1 – Water Management within the DRP

4.4.2 Groundwater

The Thunderflex operation uses groundwater only for domestic water use at the staff quarters. No groundwater is used in the Thunderflex process.

The staff quarters comprise two former farm houses which accommodates 11 workers. Based on information received from site personnel, approximately 800L of groundwater is used by the staff quarters on a daily basis (±22 400L/month and calculated average of 0.0093L/s).

Groundwater is abstracted from a former wind pump which has been converted to a submersible pump system. The borehole is located approximately 70m west of the farm houses. Water from the borehole is pumped to a 3 000L plastic tank (Jo-Jo Tank) placed on an approximately 2m high masonry tower situated next to one of the farm houses. The elevated water tank provides sufficient pressure/head for water distribution through the houses. Groundwater from the water tank is treated by inline filter systems at each farm house prior to use.

Waste water from the staff quarters (sewage and sanitation water) is diverted to a septic tank and soak-away system. The system retains water to allow time for biodegradation. Overflow from the system is discharge below ground level where it filters through the subsurface strata.

4.4.3 Plant Potable Water

Bottled water is used as potable water in the plant.

4.5 Potential Sources of Contamination

Potential surface water and groundwater contamination sources identified from available information and observations made during the site walkover are summarised in ***Table 3***.

Table 3 – Summary of Potential Water Resource Contamination Sources within the vicinity of the Thunderflex Operation

Potential Contamination Source	Source Description	Potential Water Receptor
Prospecting and mining trenches.	Potential contamination of trench water from blasting and minerals.	Groundwater.
Occasional surface spills.	Spills from trucks, conveyors, chemical containers, etc.	Surface Water and groundwater.
Soil stockpile.	Potential contaminant migration by wind, entrenched water (when material is wet) and storm water.	Surface Water and groundwater.
Waste rock dump.	Potential contaminant migration by entrenched water (when material is wet) and storm water.	Surface Water and groundwater.
Diesel power plants (DRP, raw water line and staff quarters).	Potential diesel spills.	Surface Water and groundwater.
Engineering workshop.	Potential chemical spills.	Surface Water and groundwater.
Yellow fleet servicing and tire replacement workshop.	Potential diesel and lubricant spills.	Surface Water and groundwater.
Diesel fuel AST farm.	Potential diesel spills.	Surface Water and groundwater.
Used oil AST and drum storage area.	Potential chemical spill.	Surface Water and groundwater.
DRP wash bay and oil separator.	Potential contaminated water and chemical spills.	Surface Water and groundwater.
Yellow fleet parking area.	Potential diesel and lubricant spills.	Surface Water and groundwater.
TSF.	Potential contaminant infiltration through dam base or potential overflows or spills.	Surface Water and groundwater.
Septic tank and soak-away systems.	Potential infiltration of contaminants through substrata.	Groundwater.

5. Environmental Setting

5.1 Land Use

Farm land adjacent to the Orange River has for decades been used extensively for irrigated agricultural development within the Boegoeberg Dam Irrigation Area. The earliest available aerial imagery for the Prieska area is from 2001 which shows evidence of large scale pivot systems adjacent to the Orange River from the R386 and Prieska (upstream of Thunderflex) and further upstream towards the east. Agricultural development adjacent to the Orange River appears to decrease notable from the R386 towards the downstream environment and towards Thunderflex.

Additionally, livestock farming is also practice within the area. In summary livestock farming within the Prieska area comprises:

- Livestock – Goats, sheep, cattle and dairy production to a lesser extent.
- Crop production – Grapes, wheat, groundnuts, cotton, maize and Lucerne.

The farms on which the Thunderflex operation is situated were formally and are currently used for livestock farming and is characterised with a low agricultural potential. Additionally, small scale asbestos mining of the surrounding hills and diamond mining of the underlying gravels were undertaken on the farms in the past (period not certain).

5.2 Precipitation and Evaporation

The climate of the area is described as semi-arid. The area receives between 250mm and 500mm of rain per annum whilst annual potential evaporation rates varies between 2 600mm and 2 800mm.

Rainfall events generally comprise showers and thunderstorms occurring the summer months during October to March (February and March are generally peak rainfall month).

5.3 Topography

The topography in the vicinity of the Thunderflex operation is described as plains with low relief, with a distinct escarpment going into closed hills with moderate and high relief. The topography ranges from terraces with a maximum altitude of 1 037m above sea level to the flood plain of the Orange River, which lies at 930m above sea level to the west.

The topography from the DRP slopes towards the north, towards an unnamed non-perennial tributary of the Orange River. In a more regional context, the topography slopes towards the Orange River to the west.

5.4 Hydrology

Maps and figures showing the location of surface water feature in the vicinity of the Thunderflex operation as well as relevant monitoring points are presented in ***Annex A: Figure 1*** to ***Figure 3***.

5.4.1 Catchment and Process Water Demands

The Thunderflex operation is situated within the quaternary drainage catchments D71D of the Boegoeberg Sub-Catchment. The Boegoeberg Sub-Catchment forms part of the Lower Orange Water Management Area.

There is only one surface water feature within 1km of the Thunderflex operation, namely an unnamed non-perennial tributary of the Orange River. The tributary originates within the hilly topography located approximately 4km north east of Thunderflex. The Thunderflex DRP is located less than 700m south of the main tributary corridor which trends east to west towards the Orange River whilst the Thunderflex TSF is constructed within a small branch of the tributary which trends south to north towards the main tributary. Plant personnel informed MojaTerre during the site visit that during excessive and prolonged rain events run-off water from the plant and mining area does reach the tributary.

The unnamed tributary flows westwards before joining the Orange River approximately 4km west of the DRP and roughly 50m downstream of the DRP river water abstraction pump station.

After its confluence with the unnamed tributary, the Orange River flows northwards into the Boegoeberg Dam which is situated more than 70km north west of the Thunderflex operation.

The Department of Water and Sanitation operates two water monitoring stations on the Orange River of which one station is located upstream (D7H2) and the other downstream (D7H8) of the Thunderflex operation.

Flow data for the stations for the period 2010 to 2014 is summarised as average monthly river volumes in million cubic meters in ***Table 4***. Also included in ***Table 4*** is the estimated Thunderflex operation water demand on a monthly bases.

The presented data shows that the Thunderflex water demand is approximately 0.02% of the lowest recorded river volume (171Mm^3) for the data set. The calculated differences between upstream and downstream conditions are considered to be influenced by complex relationships between large scale factors such as accumulative abstractions, seasonal rainfall, evaporation, occasional droughts etc.

Table 4 – Monthly Average Volumes (Mm^3)

Year	D7H2 - Upstream	Thunderflex Demand	D7H8 - Downstream	Difference
2010	577	±0,037	585	8
2011	1932	±0,037	2030	97
2012	195	±0,037	171	-24
2013	191	±0,037	184	-8
2014	288	±0,037	287	-1

5.4.2 Water Quality

MojaTerre sourced water quality data for the DWS monitoring localities D7H2 and D7H8. The data set includes data recorded since 1965 to 2015 and are included in ***Annex C***.

Data presented in the data diagrams shows that, in general the water quality of the Orange River section between station D7H2 and D7H8 is described by DWS as good to very good. Additionally, no significant change in the concentration ratios of common anions and cations are observed between the two monitoring locations for the data set. Sample frequencies for both monitoring station during the last four years are not as comprehensive as during the earlier monitoring period. It is noted that, although river water quality at both monitoring stations is still describes as good, notable increase in constituent concentrations were evident since 2011.

Thunderflex has undertaken water analyses of water from the tailings stream (sample "MRD Dam"), the TSF RWD (sample "Return Water Dam") and the DRP reservoir (sample "Zinc Dam") in March 2015. A set of laboratory results are included in ***Annex D***. The laboratory results are evaluated against the Resource Water Quality Objectives (RWQOs) developed for the Orange River at Prieska and at the Boegoeberg Dam by DWS in June 2009.

The laboratory results obtained for samples collected by Thunderflex in March 2015 show exceedances of the RWQOs in terms of pH values at all sampled localities as well as sodium and sulphate for the tailing stream (sample MRD Dam). However, the noncompliance in terms of pH values are considered insignificant due to the recorded neutral values. Additionally, it is noted that the TSF has a notable treatment effect on the quality of the delivered tailings which is represented by a significantly improved water quality profile recorded for the TSF RWD (samples Return Water Dam). The DRP reservoir (sample Zinc Dam) presented a water quality profile similar to that of the TSF RWD.

The improved water quality may be ascribed to the calcareous nature of the material used to construct the TSF dam wall through which water from the tailing filters before entering the TSF RWD. It is considered likely that subsurface seepage from the TSF will be subject to similar chemical change due to the underlying geology (also see ***Section 5.5***).

MojaTerre collected two water samples from the Orange River during the site walkover. A summary of sampling observations is provided in ***Table 5***. Laboratory results and certificates are provided in ***Annex D***.

Table 5 – Sampling Observation for Groundwater Samples	
Sample ID	**Sample Description**
TSW01	• Orange River water sampled downstream of the Thunderflex operation and in the vicinity of the river abstraction pump inlet. • Sampled on 29 July 2015 at 14:15. • Sample water is opaque and green with no odours or significant suspended solids. • River flow conditions are considered to be low.
TSW02	• Orange River water sampled upstream of the Thunderflex operation, 20m downstream of the R386 bridge. • Sampled on 29 July 2015 at 16:00. • Sample water is opaque and green with no odours or significant suspended solids. • River flow conditions are considered to be low.

The data evaluation table presented in Annex D show river quality profiles upstream and downstream of the Thunderflex operation, similar to that recorded for the DRP reservoir and TSD RWD. Additionally negligible changes in river water quality is observed towards the downstream environment.

5.5 Geology

A map indicating the regional and local geology within the vicinity of the Thunderflex operation is presented in ***Annex A: Figure 4***.

5.5.1 Regional Geology

The Orange River valley within the vicinity of the site is underlain by flat-lying Dwyka tillite and siltstone of the Karoo Supergroup. Dwyka sediments were deposited by the Dwyka ice sheet with flow direction from the north-east, in a broad valley, roughly corresponding with the present Vaal-Orange system.

The Dwyka comprises matrix supported diamicite, a sedimentary calcareous containing mixture of clay and boulders, of both local and transported lithologies. The clays and boulders include dropstone-bearing mudstone, shale and silt. Underlying the Dwyka, and exposed where the Orange Rive has carved through the sequence, are lavas and pyroclastic material of the Ventersdorp Supergroup, overlain in places by sediments of the Transvaal Supergroup. Transvaal Supergroup sediments comprise shale, quartzite and dolomite.

The bedrock is cut in places by faults and dolerite sheets which are rarely exposed at surface and can only be mapped using geophysics. A series of faults trending north-south is located west and south of the Thunderflex operation and the Orange River.

The present surface of the Dwyka, which also underlays the northern and eastern perimeter of the Thunderflex operation, comprise a gentle undulating terrain lying at an elevation of the between 1 050m and 1 100m above mean sea level (amsl).

The Orange River has carved into the surface to a depth of between 90m and 150m. Due to the irregularity of the pre-Dwyka surface, several reaches of the Orange River are superimposed on pre-Dwyka topography highs, which, due to its relative resistance to erosion, give rise to more rugged topography. In these area, the Orange River is confined to gorges with increased river gradients. In contrast, the easily-eroded Dwyka in the vicinity of the Thunderflex site has been dissected by minor tributaries of the Orange River, giving rise to a trellis-type drainage pattern. Within these regions, the dolomitic Ghaap Plateau represents an ancient surface of Transvaal Supergroup rocks.

The alluvial diamonds of the Middle and Lower Orange systems have several probable primary sources areas, including:

- Diamondiferous kimberlite of Lesotho eroded by the present Orange River.
- Diamonds from the same source as the Lichtenburg- Western Transvaal diamond fields that were eroded Vaal-Harts system.

- Diamonds derived from the kimberlites of the Kimberley area.
- Diamonds from Botswana and the Postmasburg fields including the Finsch kimberlite.

5.5.2 Site Geology

The Thunderflex operation is situated upon weathered material of the Ghaap Group with iron rich formations located west, north and east of the DRP. A surface comprising a mixture of diamictite and tillite of the Dwyka sediments is located south and south west of the DRP.

The staff quarters and water pipe line booster unit are situated on the edge of the weathered Ghaap material and a formation of carbonate rocks comprising dolomite and subordinate limestone. Similar carbonate rocks are found approximately 1.5km south of the DRP.

Diamond bearing gravels are encountered in the lower lying areas of the Thunderflex site. Overburden comprise thin layers of Hutton soils and sands, overlaying a diamicite and tillite mixture with the gravel matrix composed of calcrete sands and clays. The diamond bearing gravels are found beneath the diamicite and tillite mixture that can vary in thickness.

Average gravel composition comprise high percentages of Ventersdorp lavas and Banded Iron Formations (BIF) with constituents of quartz, quartzite, chert, granite and agate to lesser extent. Clasts are sub-angular to rounded and varies in size from <2mm to 150mm. The thickness of the gravels can vary between <0,5m to 6m.

5.6 Hydrogeology

A map indicating the regional and local hydrogeology within the vicinity of the Thunderflex operation is presented in ***Annex A: Figure 4***. ***Annex A: Figure 4*** shows the location of boreholes assessed during the borehole census.

5.6.1 Underlying Aquifers

The hydrogeological terrain beneath the Thunderflex operation comprise a combination of three different water bearing units.

Underneath the DRP and northwards groundwater generally occurs in the BIF of the Asbestos Hills Subgroup and Ghaap Group (Fractured Rock Aquifer). Groundwater availability in this unit is usually limited with aquifer yields less than 0,5L/s. Diabase intrusions and faults are commonly associated with this geological unit, however, none of these structures are found in close proximately to the Thunderflex operation. The quality of un-impacted groundwater within this hydrogeological unit is generally excellent with salinity values less than 50mS/m.

Groundwater south of the DRP groundwater is expected to occur in joints hosted in the diamicitie of the Dwyka. Groundwater yield from these units is generally very low and less than 0,1L/s (Fractured Rock Aquifer). Due to the chemical composition of the host rock, un-impacted groundwater quality within this unit is generally poor with salinity values above 700mS/m. This aquifer unit extends southwards and also underlays the Town of Prieska. Due to the yield potential and groundwater quality associated with the aquifer, Prieska reportedly relies solely on the Orange River as water source.

Two separate and isolated aquifers, that coincide with the location and extend of the carbonate rocks formations of the Ghaap Group, (see ***Section 5.5.1***) comprising dolomite and subordinate limestone are located beneath and south of the staff quarter as well as approximately 1,5km south of the DRP. Groundwater within these aquifers occurs irregularly in the karstic cavities and joints in the dolomite unit as well as interlayered chert band contact zones (Karst Aquifer).

As a combined hydrogeological unit, the underlying aquifers are considered a minor aquifer with low susceptibility and vulnerability to contamination from surface sources. However, due the variation in host rock, groundwater quality (prior to any surface related contamination) across the Thunderflex site is expected to vary significantly with salinity values ranging between 30mS/m and 300mS/m.

Aquifer recharge in the vicinity of the Thunderflex operation is very low and generally not more than 2.5mm/a. Aquifer transmissivity beneath the operation generally ranges between 1.51m^2/d and

6,25m^2/d. The groundwater harvest potential of the subsurface terrain beneath the Thunderflex operation ranges between 0.4L/s and 06L/s. Volumes of effective storage restricts the harvest potential of the aquifers and the storage coefficient for the area is expected to be less than 0.001.

Shallow groundwater flow direction is likely to follow the regional topography. From the DRP groundwater is anticipated to flow towards the unnamed tributary located north of the operation as well as towards the Orange River west of the Thunderflex Operation. However with groundwater levels within the area generally ranging between 40mbgl and 80mbgl (depending on topography), no aquifer base flow to these rivers is expected.

5.6.2 Boreholes and Springs

MojaTerre interrogated the National Groundwater Archive managed by the DWS to identify available boreholes within the vicinity of the Thunderflex operation that are registered in the archive. The search identified no registered borehole 5km radius of the site.

MojaTerre identified and inspected six boreholes during the site visit, all of which are former or still functioning wind pumps. Three of the boreholes are destroyed by blockages whilst two were fitted with submersible pump equipment. Therefore, only two groundwater samples could be collected during the site visit.

Unfortunately, due to no access (blockages or pump infrastructure), no groundwater levels could be measured. However, site personnel informed MojaTerre during the site visit that the groundwater level in the abstraction borehole for the staff quarters is approximately 12mbgl which was determined during routine maintenance of the pump equipment.

MojaTerre noted a spring in the valley below the staff quarters and abstraction borehole (also see ***Section 5.7***).

A summary of the identified and assessed boreholes are provided in ***Table 6***.

Table 6 – Summary of Identified and Assessed Boreholes Within the Vicinity of the Thunderflex Operation

Borehole ID	Coordinates	Borehole Description
TBH01	29°31'25.66"S, 22°41'10.33"E	• Abstraction borehole used for domestic use at the staff quarters. • Borehole situated downgradient of the mining and process activities. • ±22 400L of groundwater is abstracted from the borehole on a monthly basis (calculated average of 0.0093L/s). • Pump infrastructure specifications not known. • Groundwater level reportedly at 12mbgl. • Water sample collected from tap. Sample water is clear with no odour or suspended solids.
TBH02	29°32'17.78"S, 22°43'05.12"E	• Abstraction borehole used by landowner. • Borehole situated upgradient of the mining and process activities, located next to mine access road approximately 1.8km south east of the DRP. • Abstraction rate and groundwater use not certain. However, site observations suggest that the water is used for livestock watering. • Pump infrastructure specifications not known. • Groundwater level not known. • Water sample collected from cement dam. Sample water is clear with no odour or suspended solids.

Table 6 – Summary of Identified and Assessed Boreholes Within the Vicinity of the Thunderflex Operation		
Borehole ID	**Coordinates**	**Borehole Description**
BH Census 01	29°31'27.44"S, 22°41'13.36"E	• Borehole not in use and destroyed (reportedly blocked with rocks). • Borehole reportedly ran dry.
BH Census 02	29°31'30.02"S, 22°41'14.48"E	• Borehole not in use and destroyed (reportedly blocked with rocks). • Borehole reportedly ran dry.
BH Census 03	29°31'27.88"S, 22°41'14.13"E	• Borehole not in use and destroyed (reportedly blocked with rocks). • Borehole reportedly ran dry.
BH Census 04	29°31'46.38"S, 22°43'35.64"E	• Abstraction borehole used by landowner. • Abstraction rate and groundwater use not certain. However, site observations suggest that the water is used for livestock watering. • Pump infrastructure specifications not known. • Groundwater level not known.

5.6.3 Operation Demand

Thunderflex is dependent on 22 400m^3 per month (calculated average of 0.0093L/s) of groundwater for domestic use only. No groundwater is used in the Thunderflex process.

The total Thunderflex groundwater demand is three orders of magnitude smaller than the available groundwater harvest potential of the area which ranges between 0,4L/s and 0,6L/s.

5.6.4 Groundwater Quality

As mentioned in ***Section 5.6.1***, un-impacted groundwater underneath the Thunderflex operations may vary by one order of magnitude in terms of groundwater salinity values (30mS/m to 300mS/m).

MojaTerre collected two groundwater samples during the site walkover. A summary of sampling observations is provided in ***Table 7***. Laboratory results and certificates are provided in ***Annex D***. Laboratory results in ***Annex D*** were evaluated against the South African Water Quality Guideline Ranges for Domestic Use, prepared by DWS in 1996.

Table 7 – Sampling Observation for Groundwater Samples	
Sample ID	**Sample Description**
TBH01	• Sampled from a tap in the staff house on 29 July 2015 at 13:15. • Sample water is clear with no odours, discoloration or suspended solids.
TBH02	• Sampled from the cement dam next to the wind pump on 29 July 2015 at 15:30. • Sample water is clear with no odours, discoloration or suspended solids.

Laboratory results presented in ***Annex D*** are representative of the described underlying geology with chemical attributes which influence general water salinity recorded at concentrations exceeding the evaluation criteria for domestic use. Concentration recorded upgradient and downgradient of the Thunderflex operation are in the same order of magnitude with slightly higher concentrations recorded for the abstraction borehole at the staff quarters. The higher concentrations in the vicinity of the staff quarters are also considered a result of aquifer quality (dolomite).

5.7 Conceptual Site Model (CSM)

This section provides a CSM for the Thunderflex operation on the basis of information gathered during this investigation. The aim of the CSM is to provide an illustrative representation of the subsurface terrain in terms of geological formations, aquifer characteristics, location and elevation of surface water features and boreholes as well as inferred groundwater levels and flow. Additionally the CSM provides and illustrative description of potential impacts (quantity and quality) on water resources within the vicinity of the Thunderflex operation. The SCM is provided in ***Annex A: Figure 5***.

The SCM shows that the spring observed in the valley below the staff quarters is most likely formed as groundwater that flows through fractures in the banded iron formations is forced up along the contact plane with the carbonate rocks formations of the Ghaap Group. Additionally, the SCM suggests that two dry and one yielding borehole in close proximity of each other, in the vicinity of the staff quarters, may be ascribed to irregular groundwater distribution within the karstic subsurface terrain of the area.

5.8 Water Resource Sensitivity

The Orange River is the only perennial water feature within the vicinity of the Thunderflex operation. The river is an important source of water for towns and agriculture downstream of the Thunderflex operation and is considered to be of moderate sensitivity.

The hydrogeological setting within the vicinity of the Thunderflex operation has a low susceptibility and vulnerability to contamination from surface sources and is considered to be of low sensitivity.

6. Water Resource Impact Assessment

6.1 Activity Based Assessment

Mining activities that may have impacts on the identified water resources within the vicinity of the Thunderflex operation is provided are assessed in ***Table 9***. The criteria summarised in ***Table 8*** is used for the activity assessments.

Table 8 – Activity Impact Assessment Criteria

	Increase in Consequence		
Increase in Likelihood	1	2	3
	2	4	6
	3	6	9

Impact Significance:
1 – 3: Insignificant.
4 – 6: Marginal.
6 – 9: Significant.

Table 9 – Prospecting and Mining Activity Impact Assessment					
Potential Impact	**Potential Receptor**	**Likelihood**	**Consequence**	**Impact**	**Management**
Prospecting and mining trenches – Potential infiltration of contaminated (blasting and minerals) trench water to groundwater.	Groundwater.	1 – Semi-arid area and no shallow groundwater.	1 – Groundwater has low vulnerability and susceptibility.	2 - Insignificant.	• Continue rapid backfill approach. • Address spills within the trenches (hydraulic fluid leaks etc.) immediately (contain and remove affected material for proper disposal and management).
Occasional surface spills – Spills from trucks, conveyors, containers, dispensers, etc.	Surface Water and groundwater.	2 – Transfer of large material volume and prolonged use of site (<15 years).	1 – Compacted and flat softstanding. Underlying hydrogeological terrain has low vulnerability and susceptibility.	2 – Insignificant.	• Routinely maintain softstanding to ensure compaction and flat terrain not susceptible to erosion or infiltration. • Address spills immediately (contain and remove affected material for proper disposal and management).
Soil stockpile – Contaminant migration by wind, entrenched water (when material is wet) and storm water.	Surface Water and groundwater.	2 –Prolonged use of site (<15 years).	1 – Compacted and flat softstanding. Groundwater has low vulnerability and susceptibility.	2 – Insignificant.	• Maintain earthen diversion perms to direct run-off around stockpiles. • Routinely maintain softstanding surrounding stockpiles to ensure compaction and flat terrain not susceptible to erosion or infiltration.
Temporary waste rock dump – Contaminant migration by entrenched water (when material is wet) and storm water.	Surface Water and groundwater.	2 –Prolonged use of site (<15 years).	1 – Compacted and flat softstanding. Groundwater has low vulnerability and susceptibility.	2 – Insignificant.	• Maintain earthen diversion perms to direct run-off around stockpiles. • Routinely maintain softstanding surrounding stockpiles to ensure compaction and flat terrain not susceptible to erosion or infiltration.
Diesel generators (DRP, raw water line and staff quarters) – Potential diesel spills.	Surface Water and groundwater.	2 – All of the generators have on-board fuel tanks. However, no	2 – Large volumes of diesel are stored in each generator and	4 – Marginal	• Routinely maintain softstanding surrounding generator to ensure compaction and flat terrain not susceptible to erosion or infiltration.

Table 9 – Prospecting and Mining Activity Impact Assessment					
Potential Impact	**Potential Receptor**	**Likelihood**	**Consequence**	**Impact**	**Management**
		secondary containment is provided for any generator.	tank failure may result in significant localised soil contamination.		• Place all generator in plastic or engineered (concrete or masonry) bunds. • Frequently inspect bunds for spills and failure.
Engineering workshop – Potential chemical spills.	Surface Water and groundwater.	2 – Prolonged use of site (<15 years).	1 – No significant volumes of chemicals are used in the workshop	2 – Insignificant.	• Routinely maintain softstanding surrounding the workshop to ensure compaction and flat terrain not susceptible to erosion or infiltration. • Deploy chemical spill kits in areas where chemicals are used. • Empty containers to be removed from workshop for storage in the used oil storage area.
Yellow fleet servicing and tire replacement workshop – Potential diesel and lubricant spills.	Surface Water and groundwater.	2 – Prolonged use of site (<15 years) and weekly maintenance schedule.	2 – Large volumes of diesel and lubricants are used for each vehicle and potentially large spills may occur resulting in significant localised soil contamination.	4 – Marginal	• Routinely maintain softstanding within and around the service area to ensure compaction and flat terrain not susceptible to erosion or infiltration. • Provide and maintain HDPE lining underneath serviced vehicles in all servicing areas. • Deploy chemical spill kits in areas where chemicals are used. • Empty containers to be removed from maintenance area for storage in the used oil AST area.
Diesel fuel AST farm and fuel dispenser – Potential diesel spills.	Surface Water and groundwater.	2 – Prolonged use of site (<15 years) and no impermeable layer is provided for the fuel dispensing area.	1 – Sufficient bund capacity is provided.	2 – Insignificant.	• Routinely maintain softstanding surrounding AST farm to ensure compaction and flat terrain not susceptible to erosion or infiltration. • Frequently inspect bund for spills and failure. • Provide a removable plastic drip tray of appropriate surface are before refuelling commences. Spills to be decanted into a

Table 9 – Prospecting and Mining Activity Impact Assessment					
Potential Impact	**Potential Receptor**	**Likelihood**	**Consequence**	**Impact**	**Management**
					steel drum and stored in the used oil AST area for disposal by suitable contractor.
Used oil AST and drum storage area – Potential chemical spill.	Surface Water and groundwater.	2 – Prolonged use of site (<15 years).	1 – Sufficient bund capacity is provided.	2 – Insignificant.	• Routinely maintain softstanding surrounding the storage area to ensure compaction and flat terrain not susceptible to erosion or infiltration. • Frequently inspect bund for spills and failure. • Maintain stored content below acceptable bund storage capacity.
DRP wash bay as well as silt trap and oil separator – Potential contaminated water and chemical spills.	Surface Water and groundwater.	2 – Prolonged use of site (<15 years).	1 – Sufficient bund capacity and containment systems are provided.	2 – Insignificant.	• Routinely maintain softstanding surrounding the wash bay area to ensure compaction and flat terrain not susceptible to erosion or infiltration. • Frequently inspect available capacity of the silt trap and oil separator system. • Routinely inspect integrity of wash bay floor. • Routinely inspect integrity of the silt trap and oil separator when the system is cleaned by Olegra.
Yellow fleet parking area – Potential diesel and lubricant spills.	Surface Water and groundwater.	2 – Prolonged use of site (<15 years).	1 – Drip trays and HDPE lining is provided beneath parked vehicles.	2 – Insignificant.	• Routinely maintain softstanding within and around the parking area to ensure compaction and flat terrain not susceptible to erosion or infiltration. • Maintain HDPE lining underneath parked vehicles in all servicing areas. • Deploy chemical spill kits in the parking area.
TSF – Potential contaminant infiltration through dam base or potential overflows or spills.	Surface Water and groundwater.	2 – Prolonged use of site (<15 years).	1 –Quality of the RWD show no significant concentrations of potential contaminants. Additionally the	2 – Insignificant.	• Install appropriately placed and constructed groundwater monitoring boreholes around the TSF as per ***Section 7***. • Continue monitoring of tailings, RWD water and groundwater quality as per ***Section 7***.

Table 9 – Prospecting and Mining Activity Impact Assessment					
Potential Impact	**Potential Receptor**	**Likelihood**	**Consequence**	**Impact**	**Management**
			underlying hydrogeological terrain has low vulnerability and susceptibility.		
Septic tank and soak-away systems – Potential infiltration of contaminants through substrata.	Groundwater.	2 – Prolonged use of site (<15 years).	1 –Underlying hydrogeological terrain has low vulnerability and susceptibility.	2 – Insignificant.	• Install appropriately placed and constructed groundwater monitoring boreholes around at treatment systems as per ***Section 7***. • Continue monitoring of tailings, RWD water and groundwater quality as per ***Section 7***.
Average operational activity impact rating.				***2.3 - Insignificant***	

6.2 Qualitative Water Resource Balance Impact Assessment

A qualitative water balance on the basis of available information is provided in ***Table 10***. The presented information indicates that the water demand of Thunderflex operation on surface water features and groundwater is negligible in terms of available resource volumes. Additionally, the hydrogeological terrain comprises low yielding units with low recharge values. Therefore, the units have low groundwater harvesting potentials and contamination migration into the deep aquifers are considered unlikely (low susceptibility and vulnerability).

Table 10 – Qualitative Water Resource Balance

Surface Water Resources				
Source	**Availability Description**	**Availability**	**Thunderflex Demand**	**Balance**
Orange River	Min monthly available volume - 2010 to 2015	171 Mm^3	0.037 Mm^3	+170.963 Mm^3
	Max monthly volume - 2010 to 2015	2030 Mm^3	0.037 Mm^3	+2 029.963 Mm^3
Groundwater Resources				
Groundwater	Min groundwater harvest potential	0.4L/s	0.0093L/s	+0,3907L/s
	Max groundwater harvest potential	0.6L/s	0.0093L/s	+0,5907L/s

Depth of excavation is expected to remain shallower than 10mbgl, still within the weathered geological terrain. On this basis, the potential impact of a restructured shallow hydrogeological environment within the mining areas is considered to be low within the existing operational parameters.

7. Suggested Monitoring

Based on available information and observations made during the site visit, a suggested site specific water monitoring programme is provided in ***Annex E***. ***Annex E*** provides suggested monitoring locations, implementation periods, monitoring frequencies and analytical schedules for the suggested programme.

8. Conclusions

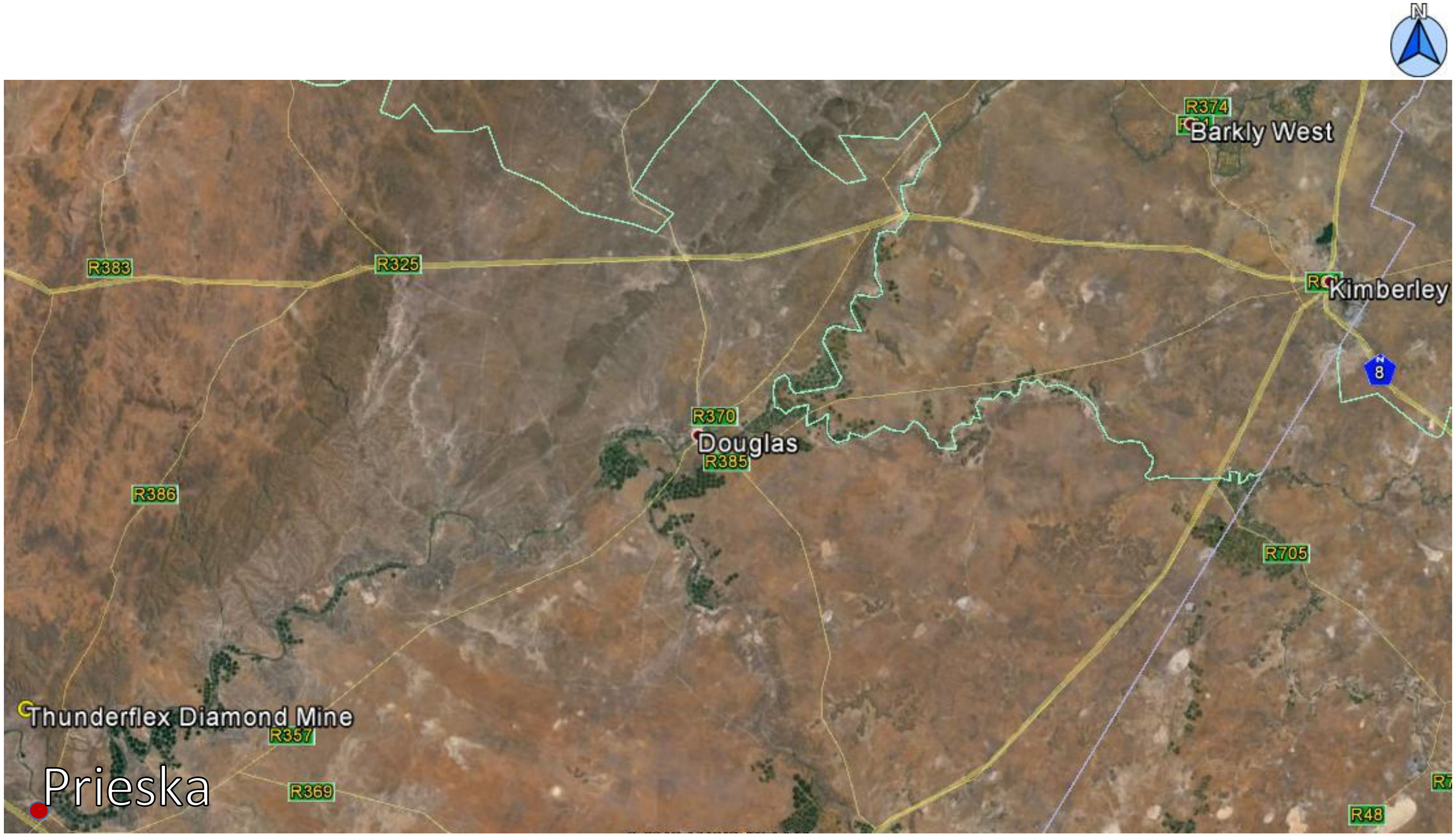
The Thunderflex alluvial diamond mine is located in an area where the Orange River represents the only sensitive (moderate) surface water feature and where the underlying hydrogeological terrain is not considered vulnerable or susceptible to potential surface contamination. The subsurface terrain also presents low groundwater harvesting potential values and may naturally vary considerably in term of salinity. These attributes makes groundwater not a reliable primary source of water within the regional context.

In contexts of its hydrological and hydrogeological environment, the Thunderflex operation is not anticipated to present activities that would result in significant impacts to available water resources if proper environmental management practices are implemented. Additionally, the required Thunderflex water demands are considered significantly lower than available water resources. It is therefore considered unlikely within the assessed process parameter that the Thunderflex operation will have a significant impact on the availability of water within the receiving environment.

The quality of groundwater used by workers at the staff quarters is as such that significant scaling in geysers and other heating appliances may occur if not treated before use. Additionally, the recorded concentrations are expected to influence the esthetical quality (taste) of the water if not treated.

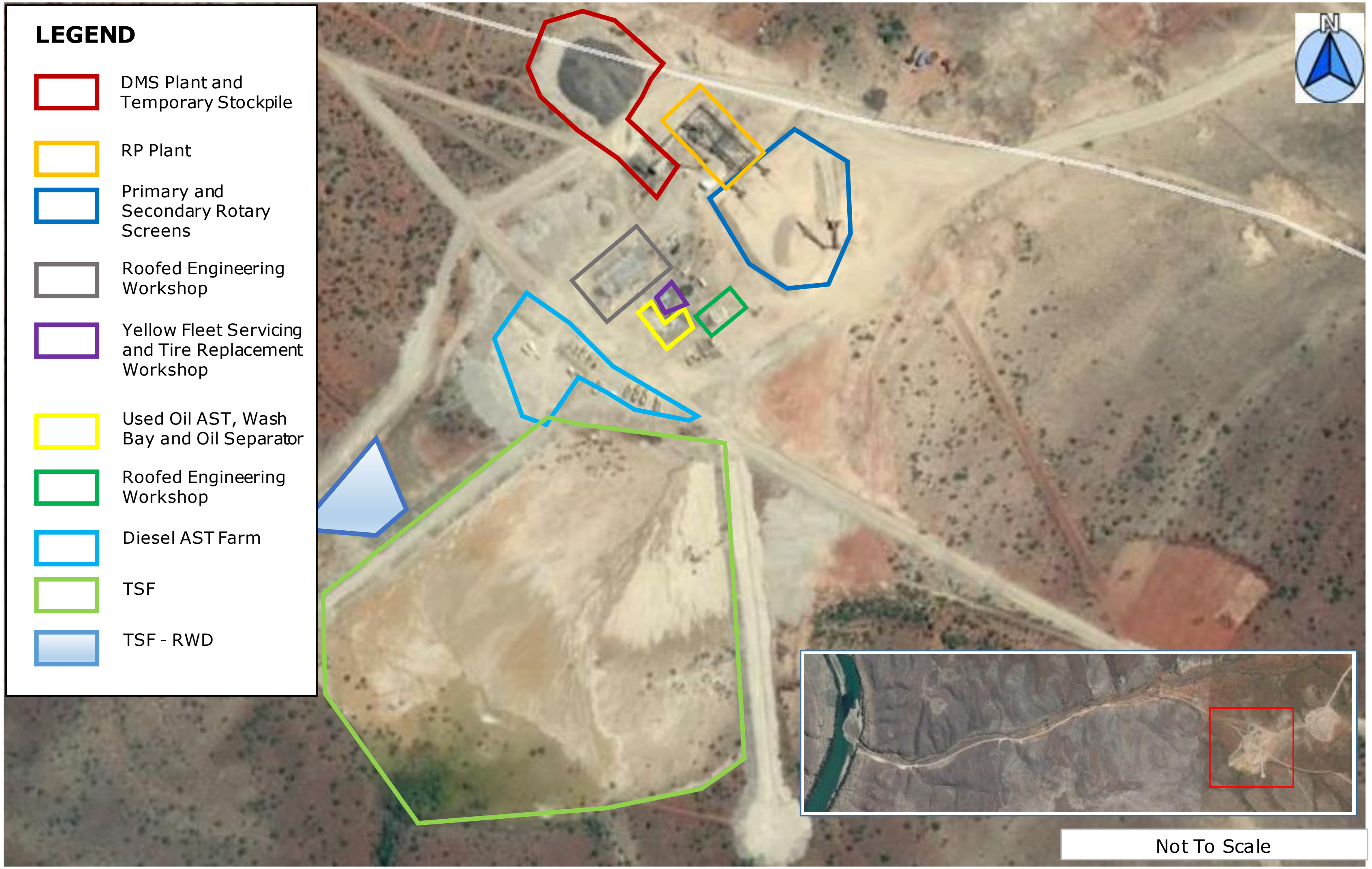
It is recommended that inline water softeners combined with activated carbon filters are installed if the taste of groundwater and scaling becomes a problem.

Annex A – Maps and Figures



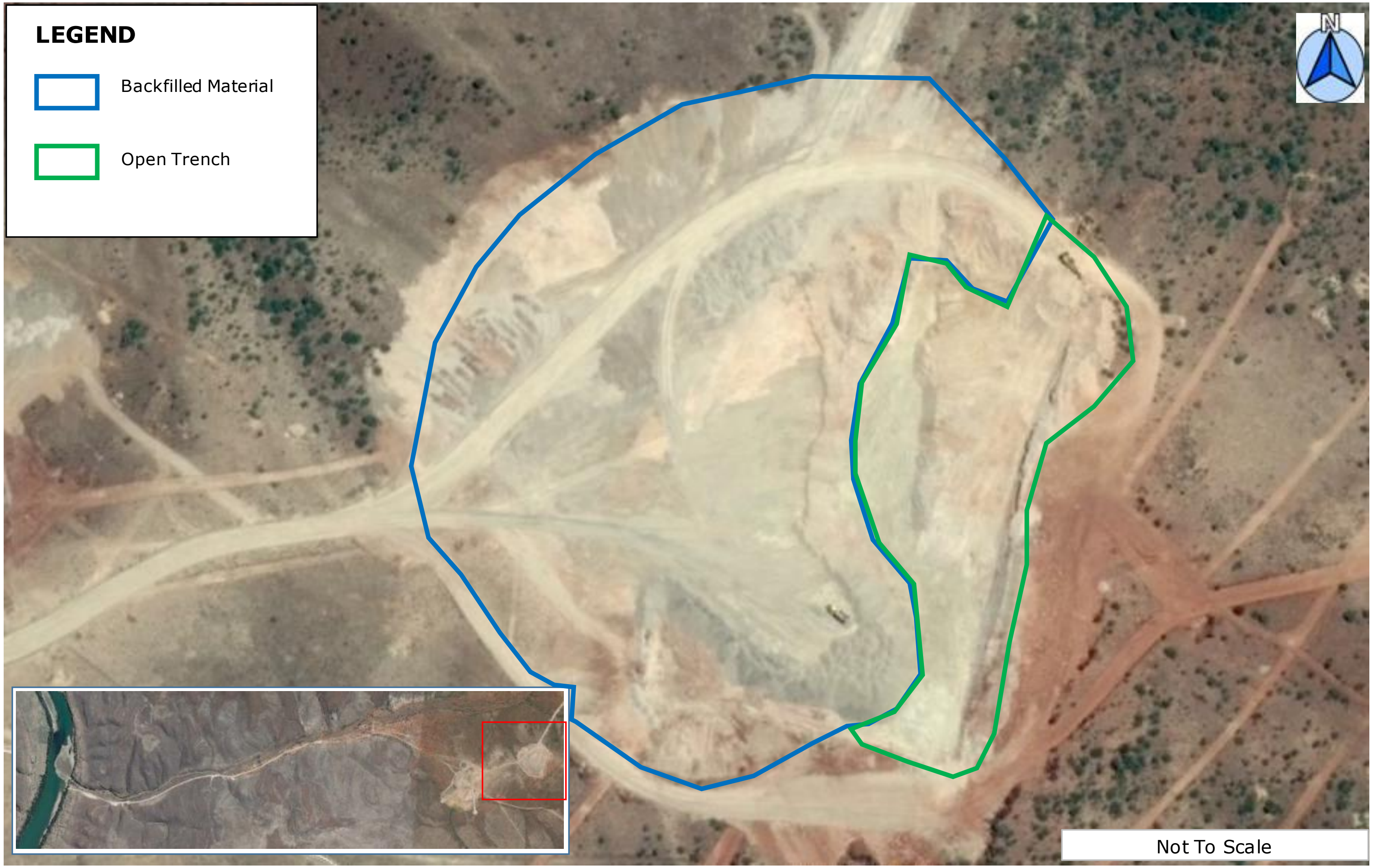
Not To Scale

Project Details:	PJ150002 - Thunderflex Phase I SW and GW Assessment
Map Name:	Figure 1 - Site Location Map
Prepared By:	Renier Pretorius
Source Data:	Google Maps (2015)



MojaTerre

Project Details:	PJ150002 - Thunderflex Phase I SW and GW Assessment
Map Name:	Figure 2a - Site Layout Map - Diamond Recovery Plant and TSF
Prepared By:	Renier Pretorius
Source Data:	Google Maps (2015)



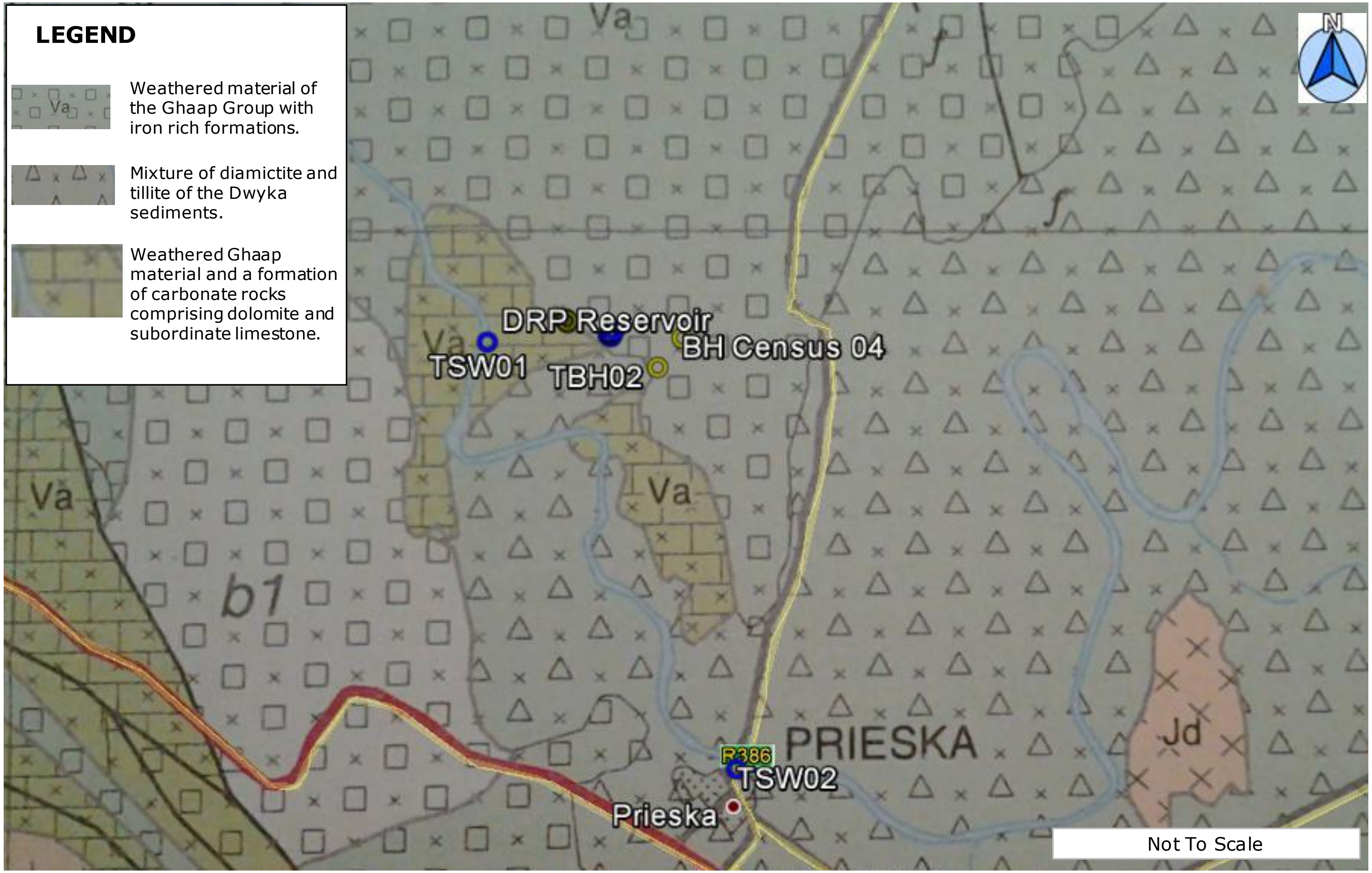
MojaTerre

Project Details: PJ150002 - Thunderflex Phase I SW and GW Assessment
Map Name: Figure 2b - Site Layout Map - Backfilling of Prospecting Trench
Prepared By: Renier Pretorius
Source Data: Google Maps (2015)

Project Details:	PJ150002 - Thunderflex Phase I SW and GW Assessment
Map Name:	Figure 2c - Site Layout Map - Staff Quarters (A) and River Pump Station (
Prepared By:	Renier Pretorius
Source Data:	Google Maps (2015)

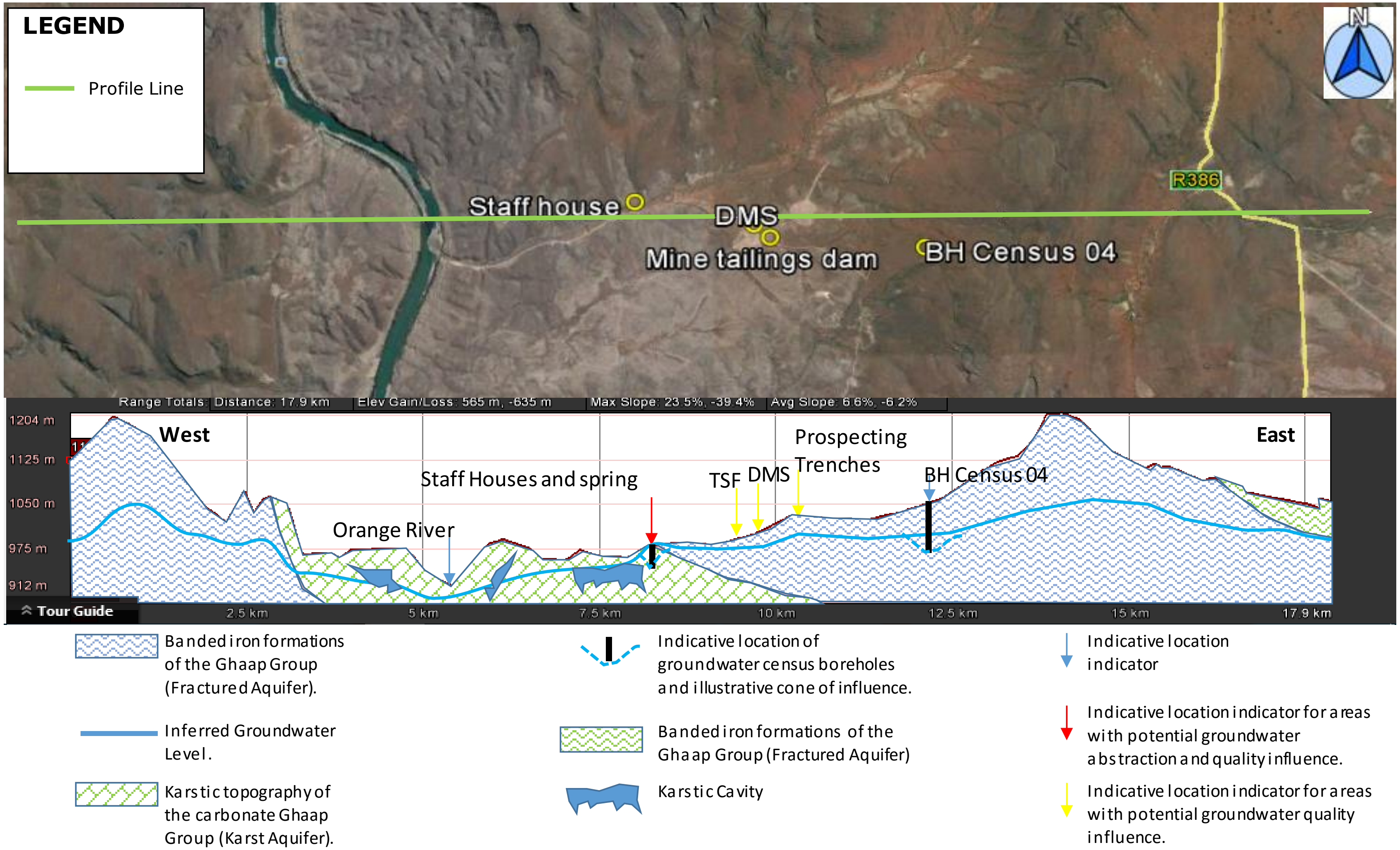
MojaTerre

Project Details:	PJ150002 - Thunderflex Phase I SW and GW Assessment
Map Name:	Figure 3: Locations of Water Points Assessed during the Investigation
Prepared By:	Renier Pretorius
Source Data:	Google Maps (2015)



MojaTerre

Project Details:	PJ150002 - Thunderflex Phase I SW and GW Assessment
Map Name:	Figure 4 - Illustrative Representation of the Regional Geology
Prepared By:	Renier Pretorius
Source Data:	Google Maps (2015)



MojaTerre

Project Details:	PJ150002 - Thunderflex Phase I SW and GW Assessment
Map Name:	Figure 5 - Conceptual Site Model
Prepared By:	Renier Pretorius
Source Data:	Google Maps (2015)

Annex B – Photologs

Figure 1: Thunderflex Tailings Storage Facility viewed towards the east.

Figure 2: Thunderflex Tailings Storage Facility Return Water Dam.

Figure 3: Thunderflex Dense Media Separation (DMS) Plant with Ferrosilicon recycling thank in the background and plant waste rock pile in the forefront.

Figure 4: Thunderflex Rotary Pan (RP) Plant viewed towards the south west.

Figure 5: Screen reject being hauled to prospecting trenches as backfill.

Figure 6: Prospecting trench with backfilling progressing from the left and trench void on the right.

Figure 7: Rotary screen plant viewed towards the south west.

Figure 8: Staff quarters with location of sample TBH01 indicated by the red circle.

Figure 9: Spring located in the corridor of the unnamed tributary, approximately 80m south of the staff quarters.

Figure 10: Raw water pump station on the banks of the Orange River viewed towards the north. Location of sample TSW01 downstream of the Thunderflex operation is indicated by the red circle.

Figure 11: Raw water line pressure booster unit viewed towards the south west. The diesel power generator with no provided secondary containment is evident in the forefront.

Figure 12: Diamond Recovery Plant Engineering Workshop viewed towards the south west.

Figure 13: Yellow fleet servicing and tire fitting workshop.

Figure 14: Used oil AST and chemical storage area viewed towards the south west.

Figure 15: Diamond Recovery Plant equipment wash bay. The location of the silt trap and oil separator is indicated by the green arrow.

Figure 16: Diesel AST farm with the dispensing unit on the left.

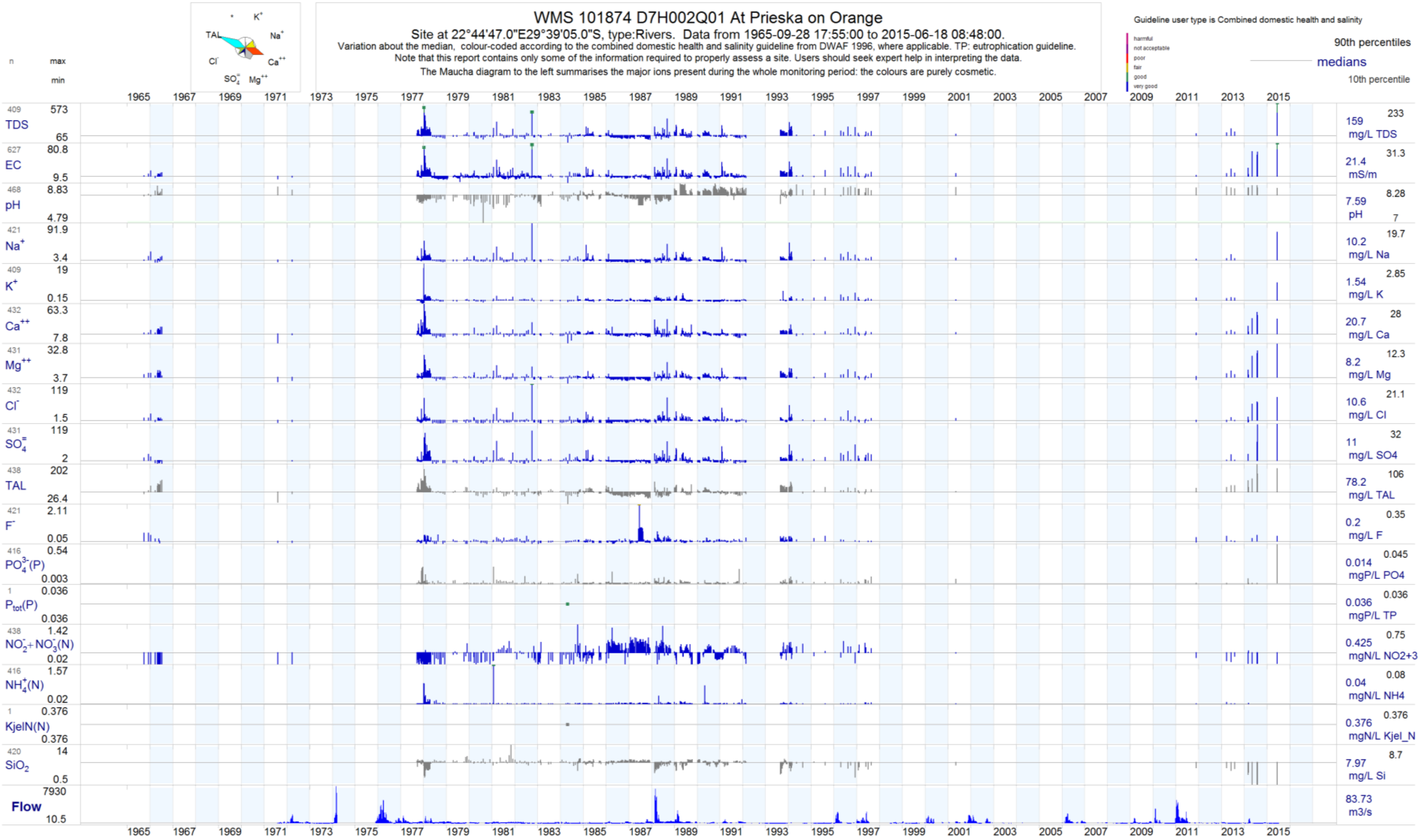
Figure 17: Sample location TBH02 located upgradient of the Thunderflex operation and viewed towards the south east.

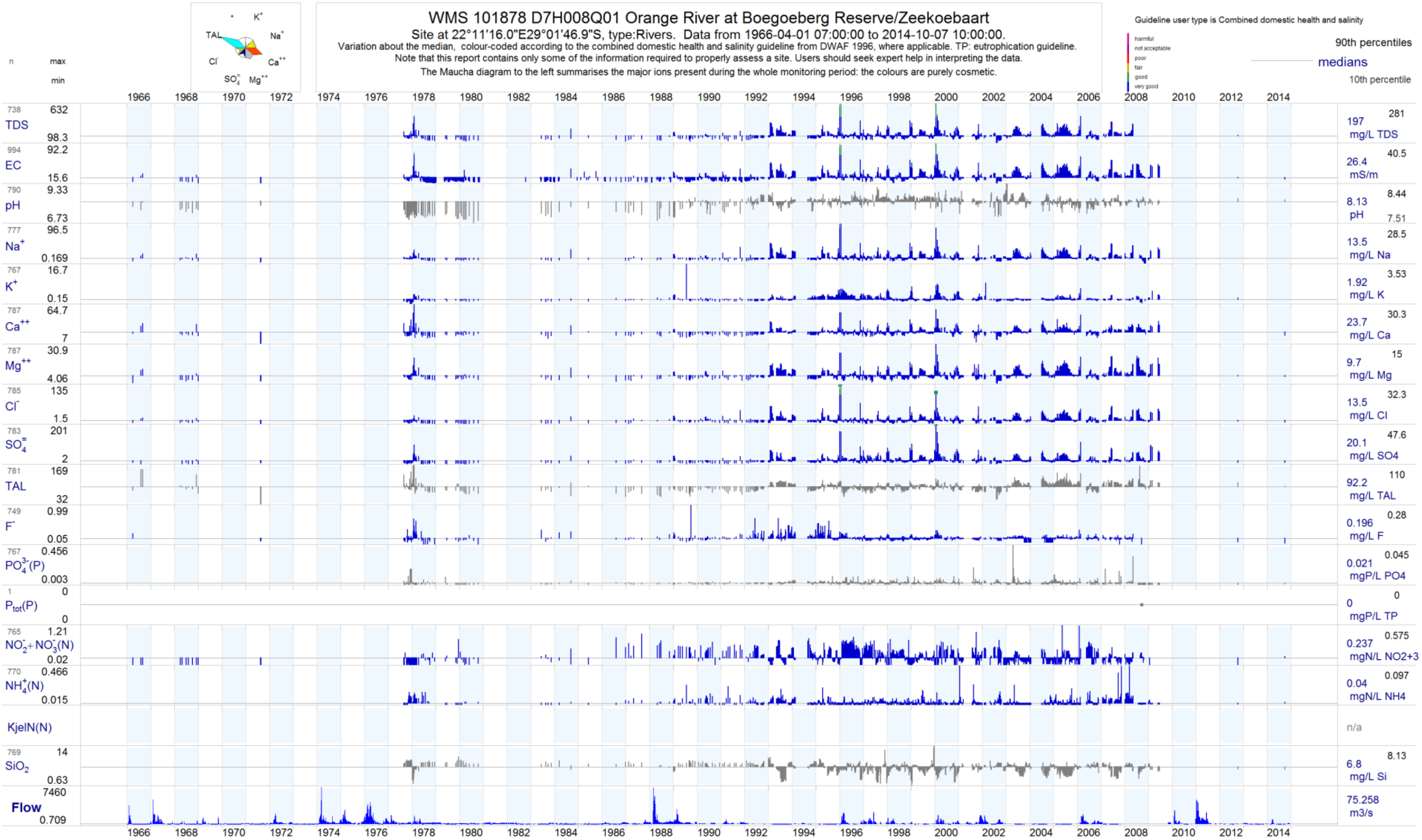
Figure 18: Sample location TSW02 upstream of the Thunderflex operation with the R386 shown in the background.

Annex C – Department of Water and Sanitation Orange River Water Quality Data

Data Diagram for Monitoring Station D7H002Q01: At Prieska on Orange

Data Diagram for Monitoring Station D7H008Q01: Orange River at Boegoeberg Reserve/Zeekoebaart


WMS 101874 D7H002Q01 At Prieska on Orange
Site at 22°44'47.0"E29°39'05.0"S, type:Rivers. Data from 1965-09-28 17:55:00 to 2015-06-18 08:48:00.
Variation about the median, colour-coded according to the combined domestic health and salinity guideline from DWAF 1996, where applicable. TP: eutrophication guideline.
Note that this report contains only some of the information required to properly assess a site. Users should seek expert help in interpreting the data.
The Maucha diagram to the left summarises the major ions present during the whole monitoring period: the colours are purely cosmetic.
Guideline user type is Combined domestic health and salinity
90th percentiles
medians
10th percentile
n max min
TDS 409 573 65 — 159 mg/L TDS 233
EC 627 80.8 9.5 — 21.4 mS/m 31.3
pH 468 8.83 4.79 — 7.59 pH 8.28 7
Na+ 421 91.9 3.4 — 10.2 mg/L Na 19.7
K+ 409 19 0.15 — 1.54 mg/L K 2.85
Ca++ 432 63.3 7.8 — 20.7 mg/L Ca 28
Mg++ 431 32.8 3.7 — 8.2 mg/L Mg 12.3
Cl- 432 119 1.5 — 10.6 mg/L Cl 21.1
SO4= 431 119 2 — 11 mg/L SO4 32
TAL 438 202 26.4 — 78.2 mg/L TAL 106
F- 421 2.11 0.05 — 0.2 mg/L F 0.35
PO4(P) 416 0.54 0.003 — 0.014 mgP/L PO4 0.045
Ptot(P) 1 0.036 0.036 — 0.036 mgP/L TP 0.036
NO2+NO3(N) 438 1.42 0.02 — 0.425 mgN/L NO2+3 0.75
NH4(N) 416 1.57 0.02 — 0.04 mgN/L NH4 0.08
KjelN(N) 1 0.376 0.376 — 0.376 mgN/L Kjel_N 0.376
SiO2 420 14 0.5 — 7.97 mg/L Si 8.7
Flow 7930 10.5 — 83.73 m3/s
1965 1967 1969 1971 1973 1975 1977 1979 1981 1983 1985 1987 1989 1991 1993 1995 1997 1999 2001 2003 2005 2007 2009 2011 2013 2015


WMS 101878 D7H008Q01 Orange River at Boegoeberg Reserve/Zeekoebaart
Site at 22°11'16.0"E29°01'46.9"S, type:Rivers. Data from 1966-04-01 07:00:00 to 2014-10-07 10:00:00.
Variation about the median, colour-coded according to the combined domestic health and salinity guideline from DWAF 1996, where applicable. TP: eutrophication guideline.
Note that this report contains only some of the information required to properly assess a site. Users should seek expert help in interpreting the data.
The Maucha diagram to the left summarises the major ions present during the whole monitoring period: the colours are purely cosmetic.
Guideline user type is Combined domestic health and salinity
90th percentiles
medians
10th percentile
n
max
min
TDS
EC
pH
Na+
K+
Ca++
Mg++
Cl-
SO4=
TAL
F-
PO4(P)
Ptot(P)
NO2+NO3(N)
NH4(N)
KjelN(N)
SiO2
Flow
197 mg/L TDS
26.4 mS/m
8.13 pH
13.5 mg/L Na
1.92 mg/L K
23.7 mg/L Ca
9.7 mg/L Mg
13.5 mg/L Cl
20.1 mg/L SO4
92.2 mg/L TAL
0.196 mg/L F
0.021 mgP/L PO4
0 mgP/L TP
0.237 mgN/L NO2+3
0.04 mgN/L NH4
n/a
6.8 mg/L Si
75.258 m3/s

Annex D – Sample Water Quality Data and Laboratory Certificates

Data Evaluation Table for Surface Water Samples

Data Evaluation for Groundwater Samples

Laboratory Certificates

Analytical Results Evaluation Table for Surface Water Sample Points - Thundeflex Diaomnd Mine										
Catergory	Constituents	Units	Screening Criteria		Mar-15	Mar-15	Mar-15	Jul-15	Jul-15	Differences: Towards Downstream Environment
			RWQO - Prieska (OS8)	RWQO - Boegoeberg Dam (OS9)	MRD Dam	Return Water Dam	Zinc Dam	TSW01	TSW02	
Physical Variables	TDS	mg/L	360	400	*694*	156	164	96	75	-21
	Hardness	mg/L	200	200	106	99,7	104	47,27	51,37	4,10
	EC	mS/m	55	60	*106*	28	28	27,33	28	0,67
	pH		7.2 - 8.4	7.1 - 8.4	*7*	*7*	*7*	*8,55*	*8,29*	-0,26
	TSS	mg/L	50	-	-	-	-	-	-	-
Chemical Variables	Alkalinity	mg/L	300	300	76	90,4	97,8	101,67	100	-1,67
	Ammonia	µg/L	58	15	-	-	-	-	-	-
	Calcium	mg/L	80	80	48,4	22,1	24,9	21,9	22,2	0,3
	Chloride	mg/L	100	100	*125*	10,5	7,67	14,6	17,1	-
	Fluoride	mg/L	0.7	15	0,646	0,271	BDL	BDL	BDL	-
	Magnesium	mg/L	70	80	33,4	10,8	10,1	9,4	9,7	0,3
	Potassium	mg/L	25	15	8,05	1,99	1,9	1,4	1,4	0
	SAR	mmol/L	2	1.5	-	-	-	-	-	-
	Sodium	mg/L	70	70	*114*	15,7	12,7	11,4	12,5	1,1
	Sulphate	mg/L	100	80	*246*	22,8	17,4	17,7	21,1	3,4
Cations	Aluminium	µg/L	150	-	BDL	BDL	BDL	BDL	0,82	-
	Cadmiun	µg/L	3	-	-	-	-	BDL	BDL	-
	Copper	µg/L	10	-	BDL	BDL	BDL	BDL	BDL	-
	Iron	µg/L	100	-	BDL	BDL	BDL	0,45	0,51	0,06
	Manganese	µg/L	20	-	BDL	BDL	BDL	BDL	BDL	-
	Lead	µg/L	50	-	BDL	BDL	BDL	BDL	BDL	-
	Vanadium	µg/L	100	-	-	-	-	BDL	BDL	-
	Zinc	µg/L	36	-	0,07	0,05	0,05	BDL	BDL	-
Nutrients	PO4 as P	µg/L	30	30	BDL	BDL	BDL	BDL	BDL	-
	NO2 and NO3 as N	mg/L	0.4	0.4	1,18	BDL	BDL	BDL	*0,5*	0,5
Microbial	*E. Coli*	/100mL	130	130	6	12	5	-	-	-

RWQO – Resource Water Quality Objectives) developed for the Orange River at Prieska and at the Boegoeberg Dam by DWS in June 2009

Analytical Results Evaluation Table for Surface Water Sample Points - Thundeflex Diaomnd Mine

Catergory	Constituents	Units	Screening Criteria		Jul-15	Jul-15	Differences: Towards Downgradient Environment
			SAWQGR - Target	SAWQGR - No Health Effects	TBH01	TBH02	
Physical Variables	TDS	mg/L	450	1000	*1098*	*681*	417
	Hardness	mg/L	200	300	*376,58*	*247,62*	128,96
	EC	mS/m	70	150	*109,8*	*104,3*	5,5
	pH		6,0 - 9,0	6,0 - 9,0	7,49	8,33	-0,84
Chemical Variables	Alkalinity	mg/L	-	-	*435*	*303,33*	131,67
	Calcium	mg/L	32	80	*123,2*	*53,8*	69,4
	Chloride	mg/L	100	200	*284,7*	*117,7*	167
	Fluoride	mg/L	1	1,5	*0,4*	BDL	-0,4
	Magnesium	mg/L	30	70	*72*	*58,7*	13,3
	Potassium	mg/L	50	100	15,6	7,5	8,1
	Sodium	mg/L	100	200	125,3	50,9	74,4
	Sulphate	mg/L	200	200	275,5	228,6	46,9
Cations	Aluminium	µg/L	150	500	0,06	BDL	-0,06
	Cadmiun	µg/L	5	5	BDL	BDL	-
	Copper	µg/L	1000	1000	BDL	BDL	-
	Iron	µg/L	100	300	BDL	BDL	-
	Manganese	µg/L	50	100	0,09	BDL	-0,09
	Lead	µg/L	10	10	BDL	BDL	-
	Vanadium	µg/L	100	100	BDL	BDL	-
	Zinc	µg/L	3000	3000	BDL	BDL	-
Nutrients	PO4 as P	µg/L	-	-	BDL	BDL	-
	NO2 and NO3 as N	mg/L	6	10	1,6	BDL	-1,6
Microbial	*E. Coli*	/100mL	0	0	-	-	-

SAWQGR – Target: South African Target Water Quality Ranges for Domestic Use.

SAWQGR – No Heath Effects: South African Target Water Quality Ranges for Domestic Use at which no health effects are expected.

UIS analytical services

UIS Analytical Services (Pty) Ltd • Reg. No. 2000/027788/07 • VAT No. 4920202969
13 Esdoring Nook, Highveld Technopark, Centurion • PO Box 8286, Centurion, 0046
Tel. +27 12 665 4291 • Fax. +27 12 665 4294 • info@uis-as.co.za • www.uis-as.co.za

Thunderflex 78 (Pty) Ltd
6 Millin Street
Kimberley
8306
South Africa
Elizna Visagie
Tel : +27 84 517 0421
Fax : +27 86 762 7142
E-Mail : diacor@telkomsa.net

FINAL CERTIFICATE OF ANALYSIS	
Report Date	2015-03-10
Date Required	2015-03-13
Contract No	
Order/Ref No	Quote 11619

sanas Testing Labora[illegible]

Notes
The results relate specifically to the items tested.
The report shall not be reproduced except in full, without the written approval of the laboratory.
[1] SANAS accredited analysis included in the SANAS Schedule of Accreditation for this laboratory.
[2] Not SANAS accredited analysis and not included in the SANAS schedule of accreditation for this laboratory.
[3] Outsourced not performed by this laboratory.

MRD Dam

Request ID: [illegible] Sample ID: [illegible] Received: 2015-03-03 Matrix: Water
Sample Numbers [illegible] Page: 1 / 3
Revision Number: 0

Method: [2]UIS-EA-KBY-T005 (Total Dissolved Solids) Completed: 2015-03-09

Parameter	Value	Unit
[1]Total Dissolved Solids	694	mg/l

Method: [2]UIS-EA-KBY-T001 (P and M Alkalinity) Completed: 2015-03-09

Parameter	Value	Unit	Parameter	Value	Unit
[2]P alkalinity	<0.6	mg/l CaCO3	[2]Total (M) Alkalinity	76	mg/l CaCO3

Method: [2]UIS-EA-KBY-T001 (Electrical Conductivity) Completed: 2015-03-09

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[2]TC temperature	21	Deg C	[2]Total Conductivity	106	mSm	[2]Total Conductivity 25C	106	mSm

Method: [2]UIS-EA-KBY-T001 (pH) Completed: 2015-03-09

Parameter	Value	Unit	Parameter	Value	Unit
[2]pH	7		[2]pH Temperature	20.6	Deg C

Method: [2]UIS-CP-T004 (Calculated Hardness) Completed: 2015-03-06

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[2]Ca Hardness	121	mg/l CaCO3	[2]Mg Hardness	138	mg/l CaCO3	[2]Total Hardness	258	mg/l CaCO3

Method: [2]UIS-TEA-T001 (Disolved Cations in Water by ICP-OES) Completed: 2015-03-06

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[2]Al	<0.05	mg/l	[2]As	<0.1	mg/l	[2]Ca	48.4	mg/l
[2]Cr	<0.05	mg/l	[2]Cu	<0.05	mg/l	[2]Fe	<0.05	mg/l
[2]K	8.05	mg/l	[2]Mg	33.4	mg/l	[2]Mn	<0.05	mg/l
[2]Na	114	mg/l	[2]Pb	<0.05	mg/l	[2]Zn	0.07	mg/l

Method: [1]UIS-EA-T008 (Anions by Ion Chromatography) Completed: 2015-03-06

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[1]F	0.646	mg/l	[1]Cl	125	mg/l	[1]NO2	<0.2	mg/l
[1]NO3	5.22	mg/l	[1]NO3 as N	1.18	mg/l	[1]PO4	<0.8	mg/l
[1]SO4	246	mg/l						

Method: [2]UIS-MB-T003 (Total Faecal Coliforms) Completed: 2015-03-09

Parameter	Value	Unit
[2]Faecal Coliforms	40	Colonies/100ml

Method: [2]UIS-MB-T004 (Escherichia coli) Completed: 2015-03-09

Parameter	Value	Unit
[2]Escherichia coli	6	Colonies/100ml

Return Water Dam

Request ID: [illegible] Sample ID: [illegible] Received: 2015-03-03 Matrix: Water Page: 2 / 3
Sample Number: [illegible] Revision Number: 0

Method: [2]UIS-EA-KBY-T005(Total Dissolved Solids) **Completed:** 2015-03-09

Parameter	Value	Unit
[2]Total Dissolved Solids	156	mg/l

Method: [2]UIS-EA-KBY-T001(P and M Alkalinity) **Completed:** 2015-03-09

Parameter	Value	Unit	Parameter	Value	Unit
[2]P alkalinity	<0.6	mg/l CaCO3	[2]Total (M) Alkalinity	90.4	mg/l CaCO3

Method: [2]UIS-EA-KBY-T001(Electrical Conductivity) **Completed:** 2015-03-09

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[2]TC temperature	21	Deg C	[2]Total Conductivity	28	mSm	[2]Total Conductivity 25C	28	mSm

Method: [2]UIS-EA-KBY-T001(pH) **Completed:** 2015-03-09

Parameter	Value	Unit	Parameter	Value	Unit
[2]pH	7		[2]pH Temperature	20.5	Deg C

Method: [2]UIS-CP-T004(Calculated Hardness) **Completed:** 2015-03-06

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[2]Ca Hardness	55.2	mg/l CaCO3	[2]Mg Hardness	44.5	mg/l CaCO3	[2]Total Hardness	99.7	mg/l CaCO3

Method: [2]UIS-TEA-T001(Disolved Cations in Water by ICP-OES) **Completed:** 2015-03-06

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[2]Al	<0.05	mg/l	[2]As	<0.1	mg/l	[2]Ca	22.1	mg/l
[2]Cr	<0.05	mg/l	[2]Cu	<0.05	mg/l	[2]Fe	<0.05	mg/l
[2]K	1.99	mg/l	[2]Mg	10.8	mg/l	[2]Mn	<0.05	mg/l
[2]Na	15.7	mg/l	[2]Pb	<0.05	mg/l	[2]Zn	0.05	mg/l

Method: [1]UIS-EA-T008(Anions by Ion Chromatography) **Completed:** 2015-03-06

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[1]F	0.271	mg/l	[1]Cl	10.5	mg/l	[1]NO2	<0.2	mg/l
[1]NO3	<0.3	mg/l	[1]PO4	<0.8	mg/l	[1]SO4	22.8	mg/l

Method: [2]UIS-MB-T003(Total Faecal Coliforms) **Completed:** 2015-03-09

Parameter	Value	Unit
[2]Faecal Coliforms	71	Colonies/100ml

Method: [2]UIS-MB-T004(Escherichia coli) **Completed:** 2015-03-09

Parameter	Value	Unit
[2]Escherichia coli	12	Colonies/100ml

Zink Dam River Water

Request ID: 11593 Sample ID: 424815 Received: 2015-03-03 Matrix: Water Page: 2 / 3
Sample Number: RIVIER DAM Revision Number: 0

Method: [2]UIS-EA-KBY-T005(Total Dissolved Solids) **Completed:** 2015-03-09

Parameter	Value	Unit
[2]Total Dissolved Solids	164	mg/l

Method: [2]UIS-EA-KBY-T001(P and M Alkalinity) **Completed:** 2015-03-09

Parameter	Value	Unit	Parameter	Value	Unit
[2]P alkalinity	<0.6	mg/l CaCO3	[2]Total (M) Alkalinity	97.8	mg/l CaCO3

Method: [2]UIS-EA-KBY-T001(Electrical Conductivity) **Completed:** 2015-03-09

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[2]TC temperature	21	Deg C	[2]Total Conductivity	28	mSm	[2]Total Conductivity 25C	28	mSm

Method: [2]UIS-EA-KBY-T001(pH) **Completed:** 2015-03-09

Parameter	Value	Unit	Parameter	Value	Unit
[2]pH	7		[2]pH Temperature	20.5	Deg C

Method: [2]UIS-CP-T004(Calculated Hardness) **Completed:** 2015-03-06

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[2]Ca Hardness	62.2	mg/l CaCO3	[2]Mg Hardness	41.6	mg/l CaCO3	[2]Total Hardness	104	mg/l CaCO3

Method: [2]UIS-TEA-T001(Disolved Cations in Water by ICP-OES) **Completed:** 2015-03-06

Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[2]Al	<0.05	mg/l	[2]As	<0.1	mg/l	[2]Ca	24.9	mg/l
[2]Cr	<0.05	mg/l	[2]Cu	<0.05	mg/l	[2]Fe	<0.05	mg/l
[2]K	1.9	mg/l	[2]Mg	10.1	mg/l	[2]Mn	<0.05	mg/l
[2]Na	12.7	mg/l	[2]Pb	<0.05	mg/l	[2]Zn	0.05	mg/l

Method: [1]UIS-EA-T008(Anions by Ion Chromatography)								Completed: 2015-03-06
Parameter	Value	Unit	Parameter	Value	Unit	Parameter	Value	Unit
[1]F	<0.1	mg/l	[1]Cl	7.67	mg/l	[1]NO2	<0.2	mg/l
[1]NO3	0.547	mg/l	[1]NO3 as N	<0.3	mg/l	[1]PO4	<0.8	mg/l
[1]SO4	17.4	mg/l						

Method: [2]UIS-MB-T003(Total Faecal Coliforms)		Completed: 2015-03-09
Parameter	Value	Unit
[2]Faecal Coliforms	11	Colonies/100ml

Method: [2]UIS-MB-T004(Escherichia coli)		Completed: 2015-03-09
Parameter	Value	Unit
[2]Escherichia coli	5	Colonies/100ml

Vivian van Wyk
AUTHORISED SIGNATORY

UIS sediba laboratory

CLIENT INFORMATION

MojaTerre (Pty) Ltd
Attention: Renier Pretorius
Office 1,Block 5 Tuscany,6 Coombe Place
Edenberg,Sandton

Water Test Report

LABORATORY NUMBER	3914 A	DATE RECEIVED	2015/08/03
SAMPLE NUMBER	TSW02		
REPORTING UNIT	mg/l [ppm] (unless elsely stated)		
TASK PO Nr	PJ150002	TASK STARTING DATE	2015/08/03

Cations and Metals (Method UISSL-WL-007)

Ag*	<0.05	Co*	<0.05	Mo*	<0.05	Sr*	0.10
Al*	0.82	Cr*	<0.05	Na*	12.5	Tl*	<1
As*	<1	Cu*	<0.05	Ni*	<0.05	V*	<0.05
B*	<0.05	Fe*	0.51	Pb*	<1	Zn*	<0.05
Ba*	<0.05	K*	1.4	Sb*	<1		
Be*	<0.05	Li*	<0.05	Se*	<1		
Ca*	22.2	Mg*	9.7	Si*	6.02		
Cd*	<0.05	Mn*	<0.05				

Anions

(Method UISSL-WL-005)

F*	<0.4
Cl	17.7
Br*	<0.25
NO2*	<2
NO3	<2
NO2 + NO3 as N	<0.45
SO4	21.2
PO4	<4

Other Parameters

pH	(Method UISSL-WL-003 @ 25 deg C)	8.29
EC (µs/cm)	(Method UISSL-WL-001 @ 25 deg C)	280.60
TDS	(Method UISSL-WL-004 @ 110 deg C)	75
M Alk as CaCO3	(Method UISSL-WL-002)	100.00
P Alk as CaCO3	(Method UISSL-WL-002)	0

Results approved by *WJ Havenga (Technical Manager)*

Reporting date: *20 August 2015* *Page 1 of 4*

sanas Testing Laboratory
Facility No T 0584

Parameters marked " ** "in this report are outsourced results.
Parameters marked " * "in this report are non-accredited results.

DISCLAIMER: The results only relate to the test items provided. This report may not be reproduced, except in full, without the prior written approval of the laboratory. The reusts for soil samples are not accredited.

UIS sediba laboratory

CLIENT INFORMATION

MojaTerre (Pty) Ltd
Attention: Renier Pretorius
Office 1,Block 5 Tuscany,6 Coombe Place
Edenberg,Sandton

Water Test Report

LABORATORY NUMBER	3914 A	**DATE RECEIVED**	2015/08/03
SAMPLE NUMBER	TSW01		
REPORTING UNIT	mg/l [ppm] (unless elsely stated)		
TASK PO Nr	PJ150002	**TASK STARTING DATE**	2015/08/03

Cations and Metals (Method UISSL-WL-007)

Ag*	<0.05	Co*	<0.05	Mo*	<0.05	Sr*	0.10
Al*	0.69	Cr*	<0.05	Na*	11.4	Tl*	<1
As*	<1	Cu*	0.06	Ni*	0.07	V*	<0.05
B*	<0.05	Fe*	0.45	Pb*	<1	Zn*	<0.05
Ba*	<0.05	K*	1.4	Sb*	<1		
Be*	<0.05	Li*	<0.05	Se*	<1		
Ca*	21.9	Mg*	9.4	Si*	6.15		
Cd*	<0.05	Mn*	<0.05				

Anions

(Method UISSL-WL-005)

F*	<0.4
Cl	14.6
Br*	<0.25
NO2*	<2
NO3	<2
NO2 + NO3 as N	<0.45
SO4	17.7
PO4	<4

Other Parameters

pH	(Method UISSL-WL-003 @ 25 deg C)	8.55
EC (µs/cm)	(Method UISSL-WL-001 @ 25 deg C)	273.30
TDS	(Method UISSL-WL-004 @ 110 deg C)	96
M Alk as CaCO3	(Method UISSL-WL-002)	101.67
P Alk as CaCO3	(Method UISSL-WL-002)	3.33

Results approved by *WJ Havenga (Technical Manager)*

Reporting date: *20 August 2015* *Page 2 of 4*

sanas testing laboratory
Facility No T 0584

Parameters marked " ** "in this report are outsourced results.
Parameters marked " * "in this report are non-accredited results.

DISCLAIMER: The results only relate to the test items provided. This report may not be reproduced, except in full, without the prior written approval of the laboratory. The reusts for soil samples are not accredited.

UIS Sediba laboratory

CLIENT INFORMATION

MojaTerre (Pty) Ltd
Attention: Renier Pretorius
Office 1,Block 5 Tuscany,6 Coombe Place
Edenberg,Sandton

Water Test Report

LABORATORY NUMBER	3914 A	**DATE RECEIVED**	2015/08/03
SAMPLE NUMBER	TBH02		
REPORTING UNIT	mg/l [ppm] (unless elsely stated)		
TASK PO Nr	PJ150002	**TASK STARTING DATE**	2015/08/03

Cations and Metals

(Method UISSL-WL-007)

Ag*	<0.05	Co*	<0.05	Mo*	<0.05	Sr*	0.15
Al*	<0.05	Cr*	<0.05	Na*	50.9	Tl*	<1
As*	<1	Cu*	<0.05	Ni*	<0.05	V*	<0.05
B*	0.07	Fe*	<0.05			Zn*	<0.05
Ba*	<0.05	K*	7.5	Pb*	<1		
Be*	<0.05	Li*	<0.05	Sb*	<1		
Ca*	53.8	Mg*	58.7	Se*	<1		
Cd*	<0.05	Mn*	<0.05	Si*	10.54		

Anions

(Method UISSL-WL-005)

F*	<0.4
Cl	117.7
Br*	<0.25
NO2*	<2
NO3	<2
NO2 + NO3 as N	<0.45
SO4	228.6
PO4	<4

Other Parameters

pH	(Method UISSL-WL-003 @ 25 deg C)	8.33
EC (µs/cm)	(Method UISSL-WL-001 @ 25 deg C)	1043.00
TDS	(Method UISSL-WL-004 @ 110 deg C)	681
M Alk as CaCO3	(Method UISSL-WL-002)	303.33
P Alk as CaCO3	(Method UISSL-WL-002)	15.00

Results approved by *WJ Havenga (Technical Manager)*

Reporting date: *20 August 2015* ***Page 3 of 4***

sanas Testing Laboratory
Facility No T 0584

Parameters marked " ** "in this report are outsourced results.
Parameters marked " * "in this report are non-accredited results.

CLIENT INFORMATION

MojaTerre (Pty) Ltd
Attention: Renier Pretorius
Office 1,Block 5 Tuscany,6 Coombe Place
Edenberg,Sandton

Water Test Report

LABORATORY NUMBER	3914 A	**DATE RECEIVED**	2015/08/03
SAMPLE NUMBER	TBH01		
REPORTING UNIT	mg/l [ppm] (unless elsely stated)		
TASK PO Nr	PJ150002	**TASK STARTING DATE**	2015/08/03

Cations and Metals (Method UISSL-WL-007)

Ag*	<0.05	**Co***	<0.05	**Mo***	<0.05	**Sr***	0.54
Al*	0.06	**Cr***	<0.05	**Na***	125.3	**Tl***	<1
As*	<1	**Cu***	<0.05	**Ni***	<0.05	**V***	<0.05
B*	0.22	**Fe***	<0.05	**Pb***	<1	**Zn***	<0.05
Ba*	<0.05	**K***	15.6	**Sb***	<1		
Be*	<0.05	**Li***	<0.05	**Se***	<1		
Ca*	123.2	**Mg***	72.0	**Si***	18.06		
Cd*	<0.05	**Mn***	0.09				

Anions

(Method UISSL-WL-005)

F*	0.4
Cl	284.7
Br*	<0.25
NO2*	<2
NO3	6.9
NO2 + NO3 as N	1.6
SO4	275.5
PO4	<4

Other Parameters

pH	(Method UISSL-WL-003 @ 25 deg C)	7.49
EC (µs/cm)	(Method UISSL-WL-001 @ 25 deg C)	1732.00
TDS	(Method UISSL-WL-004 @ 110 deg C)	1098
M Alk as CaCO3	(Method UISSL-WL-002)	435.00
P Alk as CaCO3	(Method UISSL-WL-002)	0

Results approved by *WJ Havenga (Technical Manager)*

Reporting date: *20 August 2015* *Page 4 of 4*

sanas Testing Laboratory
Facility No T 0584

Parameters marked " ** "in this report are outsourced results.
Parameters marked " * "in this report are non-accredited results.

DISCLAIMER: The results only relate to the test items provided. This report may not be reproduced, except in full, without the prior written approval of the laboratory. The reusts for soil samples are not accredited.

Annex E – Suggested Preliminary Monitoring Programme

Suggested Preliminary Monitoring Program						
Water Resource	Monitoring Point	Indicative Coordinates	Implementation	Monitoring Frequency	Sampling Technique	Analytical Schedule
Surface Water	Orange River downstream of Thunderflex at R386 bridge.	29°31'50.40"S 22°39'35.38"E	As soon as practically possible	Monthly	Grab sampling	As per the DWS RWQO variable range
	Orange River upstream of Thunderflex at river pump station, downstream of unnamed tributary confluence.	29°39'26.34"S 22°44'42.11"E	As soon as practically possible	Monthly	Grab sampling	As per the DWS RWQO variable range
	TSF RWD.	29°31'43.28"S 22°42'4.45"E	As soon as practically possible	Monthly	Grab sampling	As per the DWS RWQO variable range
Groundwater	Spring below staff quarters.	29°31'28.64"S 22°41'14.12"E	As soon as practically possible	Biannually	Purging prior to sampling	As per the DWS RWQO variable range
	1 x Monitoring borehole upgradient of TSF (depth to seepage or water strike with proper aquifer protection).	29°31'51.35"S 22°42'6.31"E	As soon as practically possible	Biannually	Purging prior to sampling	As per the DWS RWQO variable range
	1 x Monitoring borehole downgradient of TSF (depth to seepage or water strike with proper aquifer protection).	29°31'41.88"S 22°42'2.32"E	As soon as practically possible	Biannually	Purging prior to sampling	As per the DWS RWQO variable range
	1 x Monitoring borehole downgradient of plant septic tank and soak-away (depth to seepage or water strike with proper aquifer protection).	20m downgradient of tank.	Within one year	Biannually	Purging prior to sampling	As per the DWS RWQO variable range
	1 x Monitoring borehole downgradient of staff quarters septic tank and soak-away (depth to seepage or water strike with proper aquifer protection).	20m downgradient of tank.	Within one year	Biannually	Purging prior to sampling	As per the DWS RWQO variable range
	1 x Monitoring well downgradient of oil separator (±6m deep).	5m downgradient of unit	Within one year	Biannually	Purging prior to sampling	As per the DWS RWQO variable range