Surface Water Impact Assessment and Stormwater Management Plan for Tronox Namakwa Sands East OFS Project

Report Prepared for

Tronox Mineral Sands (Pty) Ltd

TRONOX

Report Number 548215/SW_Rev2

Report Prepared by

srk consulting

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Surface Water Impact Assessment and Stormwater Management Plan for Tronox Namakwa Sands East OFS Project

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Disclaimer

The opinions expressed in this Report have been based on the information supplied to SRK Consulting (South Africa) (Pty) Ltd (SRK) by Tronox Mineral Sands (Pty) (Ltd) (henceforth referred to as Tronox). The opinions in this Report are provided in response to a specific request from Tronox to do so. SRK has exercised all due care in reviewing the supplied information. Whilst SRK has compared key supplied data with expected values, the accuracy of the results and conclusions from the review are entirely reliant on the accuracy and completeness of the supplied data. SRK does not accept responsibility for any errors or omissions in the supplied information and does not accept any consequential liability arising from commercial decisions or actions resulting from them. Opinions presented in this report apply to the site conditions and features as they existed at the time of SRK's investigations, and those reasonably foreseeable. These opinions do not necessarily apply to conditions and features that may arise after the date of this Report, about which SRK had no prior knowledge nor had the opportunity to evaluate.

List of Abbreviations

DCC	Dual Carry Conveyor
DWAF	Department of Water Affairs and Sanitation (previous name for the government department responsible for the portfolio of water and sanitation)
DHSWS	Department of Human Settlements, Water and Sanitation
ECO	Environmental Control Officer
EOFS	East Orange Feldspathic Sand
EMPR	Environmental Management Plan Report
MAR	Mean annual runoff
MLM	Maztikama Local Municipality
NEMA	National Environmental Management Act 107 of 1998 as amended
NWA	National Water Act 36 of 1998
RAS	Red Aeolian Sand
RSF	Residual Storage Facility
SRK	SRK Consulting (South Africa) (Pty) Ltd
STF	Sand Tailings Facility
SWMP	Stormwater Water Management Plan
WCDM	West Coast District Municipality

1 Objectives and Scope of Report

1.1 Introduction and Objectives

Tronox Mineral Sands (Pty) (Ltd) (Tronox) mines heavy mineral sands at the existing Namakwa Sands Mine at Brand se Baai, using open-cast strip-mining methods at the East Mine and West Mine, in accordance with approved Environmental Management Programmes (EMPrs) and within an authorised mining area (see Figure 1-1).

The East Mine is currently a shallow mine, where mining of only the top Red Aeolian Sand (RAS) layer occurs. Mined material (sand ore) is processed at the Primary Concentration Plant at the East Mine (PCP East) to produce a heavy mineral concentrate (HMC). Waste products from the PCP East include sand tailings (coarser material) and (finer) residue called fines. Sand tailings are backfilled into the mining void(s), and residue slurry is disposed of in Residue Storage Facilities (RSFs).

Tronox is authorised to also mine and process the deeper Orange Feldspathic Sand (OFS) resource underlying the RAS material at the East Mine (known as the EOFS Project). For the EOFS Project to proceed, Tronox must modify the approved residue disposal plan (this project): this entails a single RSF to accommodate all fine residue from the project (as opposed to three smaller RSFs as per the current EOFS Project authorisation), backfilling that will change the topography of the area (shallow deposition area with trucks and deep deposition areas via conveyors (Sand Tailings Facilities (STFs)) and the upgrade of infrastructure.

SRK Consulting (South Africa) Pty Ltd (SRK) has been appointed by Tronox to undertake the Scoping and Environmental Impact Reporting (S&EIR, also referred to as EIA) process required in terms of the National Environmental Management Act 107 of 1998 (NEMA) and the NEM: Waste Act 59 of 2008. The EIA process is being undertaken in accordance with the EIA Regulations, 2014. A Surface Water Impact Assessment is one of the specialist studies commissioned for the EIA.

1.2 Study Area and Project Background

This section provides a summary of the proposed modification of the EOFS Residue Disposal Plan and focuses on elements that are relevant to the EIA and particularly the Surface Water Impact Assessment. A more detailed project description is provided in the EIA Report for the project.

The Mine is located at Brand se Baai which lies in the magisterial district of Vanrhynsdorp, in the Matzikama Local Municipality (MLM) and West Coast District Municipality (WCDM) of South Africa. The Mine is ~63 km north west of Lutzville by road on the R363. The mine locality is shown in Figure 1-1. This project is associated with operations that take place within Tronox's East Mine only, within an active mine and in an area authorised for further mining.

The currently approved method of coarse residue (tailings) management for the authorised EOFS Project entails hauling and backfilling all sand tailings into the EOFS pit and therefore mimicking the pre-mining topography (elevation). The following changes to the authorised EOFS Project and additional infrastructure are proposed and require authorisation (see Figure 1-2):

- Single stacking of fresh sand tailings and RAS tailings overburden in the approved EOFS pit by haul truck, leaving a profiled and rehabilitated void which is an average of 7 m deep across most of the East Mine by:
    - Returning RAS tailings overburden to the on average 8 m deep pit by haul truck, to a minimum depth of 1 m; and
    - Tipping (single stacking) sand tailings by haul truck to a minimum depth of 1 m in portions of the mining pit which have not been backfilled with RAS overburden;

- Deep filling of identified areas with the use of conveyor systems (on average 14 m from mined out floor) as part of backfilling to the mined out void, namely STFs (sand tailings facilities), thereby ensuring there is sufficient capacity for all material to be returned to the void;
- Establishing a ~400 ha, 47.6 Mm^3 (volumetric capacity) RSF (RSF 6) for the controlled disposal of fine residue generated by the EOFS operations (as opposed to three separate, smaller fine residue facilities which were approved in the original application) and associated residue and return water pipelines and pumps;
- Establishing a 50 ha Interim overburden stockpile with a capacity of 3.15 Mm^3 in an area approved for mining east of the proposed RSF;
- Installing two 3 400 m of fine residue pipelines and one 3 400 m return water pipeline on the south-eastern boundary (Figure 1-3);
- Changes to the approved upgrades at the seawater intake;
- Installing a 3.4 km long 22 kV overhead powerline; and
- Demolishing three buildings (houses and out-buildings / structures) within the East OFS pit, each more than 60 years old.

No additional fresh water will be required for the project and no additional sewage works will be required.

The RAS resource in the East Mine will deplete in mid-2024, and therefore the EOFS Project must come online by this date. The planned detailed design and construction will take three years and four months.

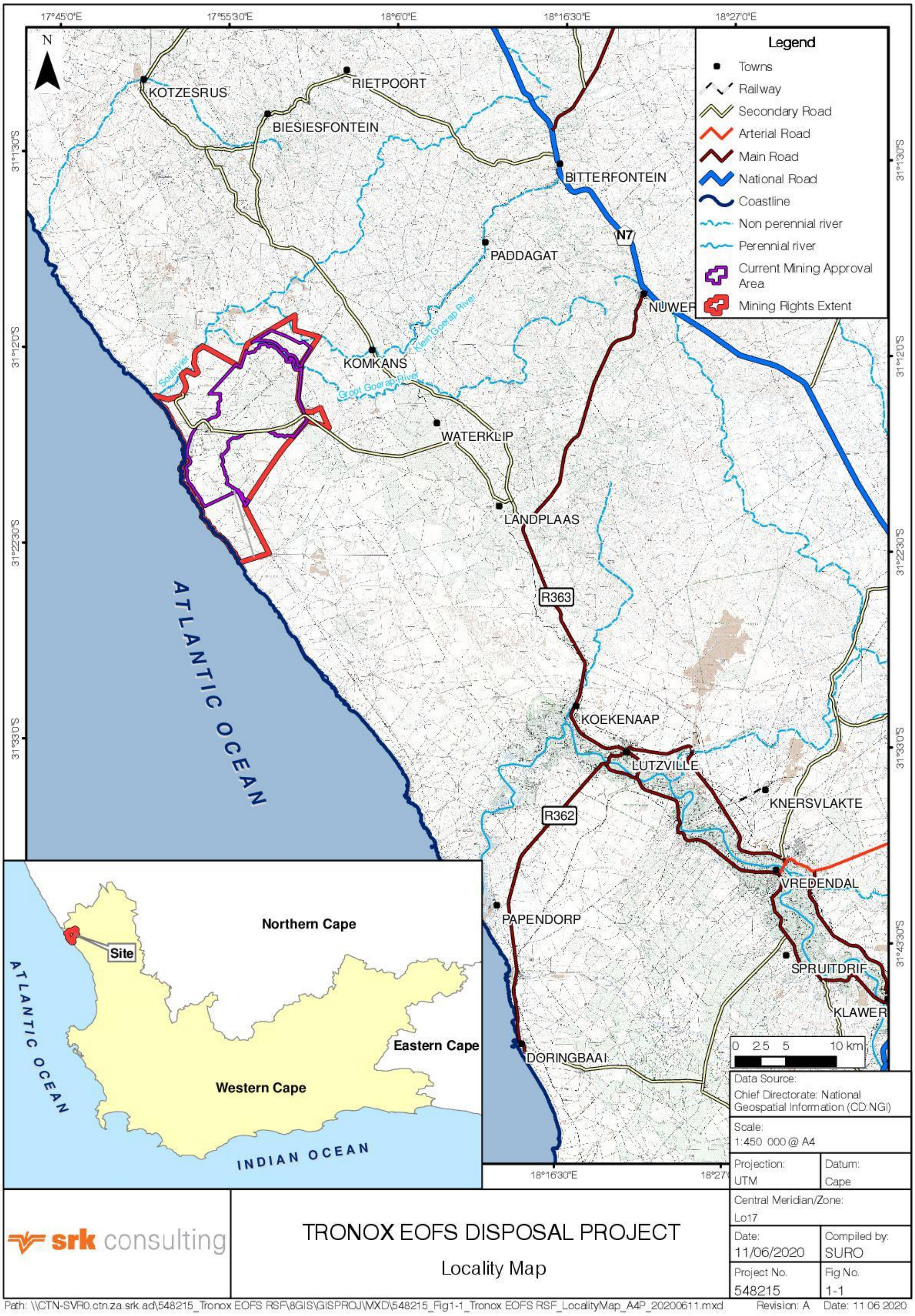


Figure 1-1: Locality map

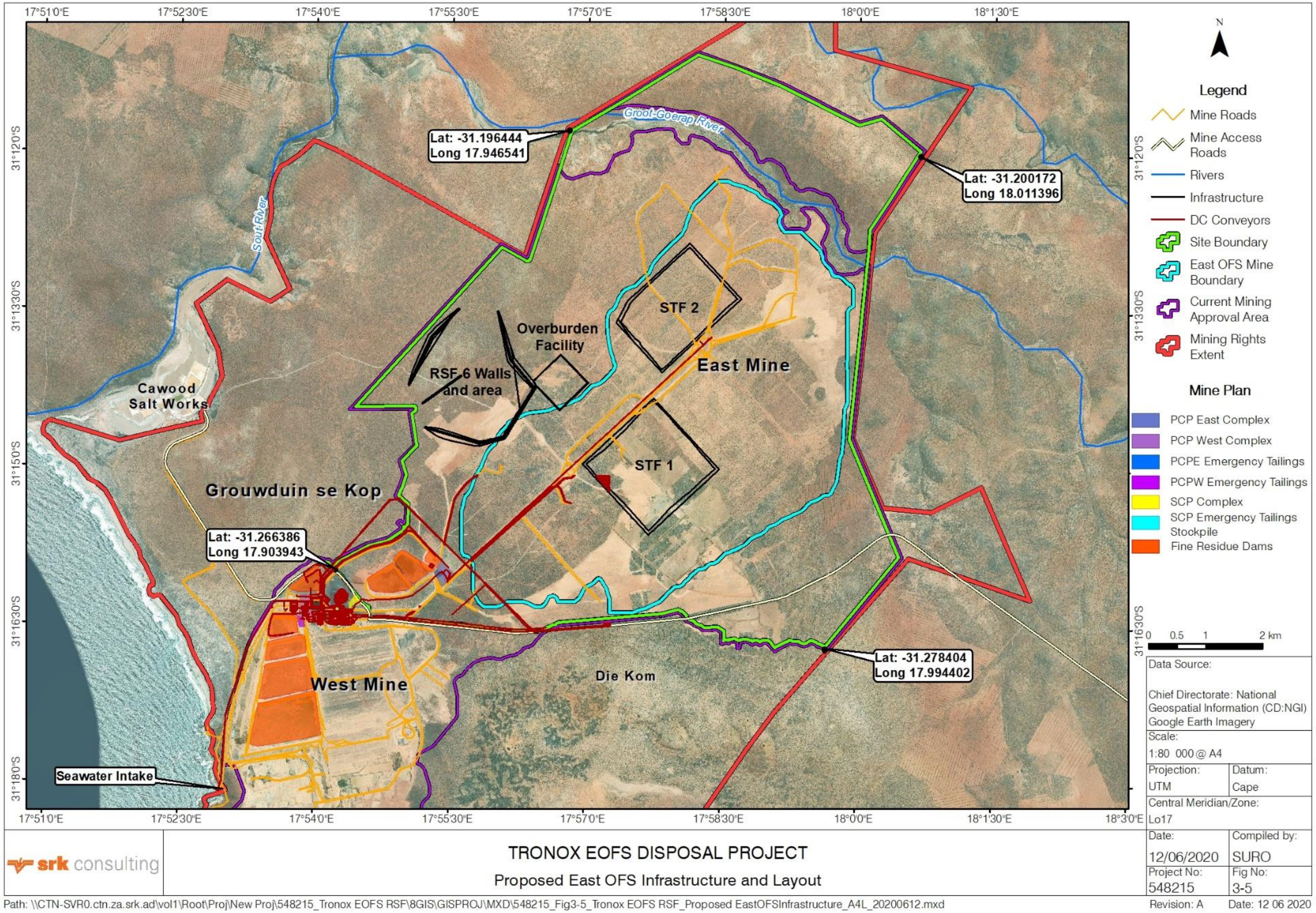
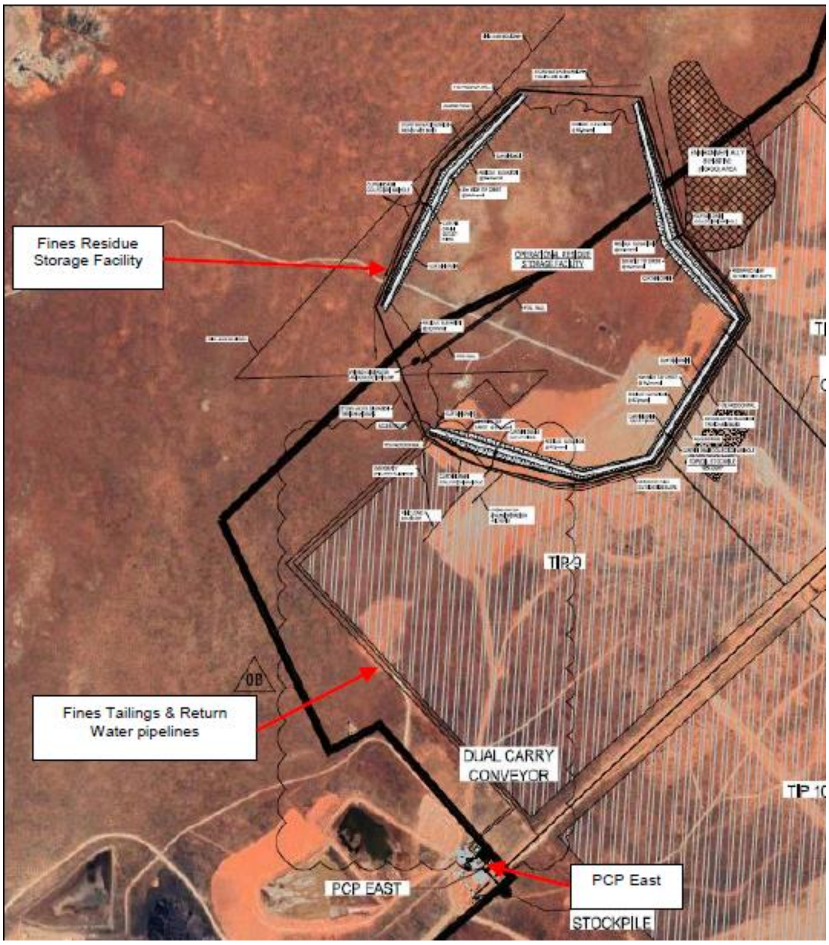


Figure 1-2: Proposed East OFS infrastructure and layout



TRONOX EOFS DISPOSAL PROJECT
RSF and associated pipelines
Project No. 548215

Figure 1-3: RSF and associated pipelines

2 Approach and Methodology

2.1 Methodology, Equipment and Modelling

The impact assessment is compliant with the requirements in the Environmental Impact Assessment (EIA) Regulations, 2014 (see Section 2.2.1). The stormwater management plan (SWMP) was developed based on the Best Practice Guidelines (DWAF, 2006).

A site visit by the surface water specialist was undertaken during the dry season in November 2019 over one day. No wet season visit is deemed necessary as no streams traverse the study area even during rainfall events, and flow is likely to only be seen in large rainfall events (probably manifesting mainly as sheet flow down the broad valleys in the site).

The following analytical methods were used in the study:

- SCS (Soil Conservation Services) method for estimation of peak flows and annual runoff; and
- WR2012 method for estimation of mean annual runoff.

These methods are appropriate for the conditions found in the project area, i.e. a very arid climate in which surface flows are rare (low in volume stormwater flows) and in which no watercourses traverse the construction and operations areas on-site. The site visit by the surface water specialist confirmed that surface water impacts were likely to be low and predictable using the above hydrological methods, as little erosion was noted.

Water sampling and complex hydrological models / numerical modelling were not deemed necessary to determine and assess potential surface water impacts of the project for the reasons cited above.

2.2 Legal Framework

2.2.1 National Environmental Management (Act 107 of 1998)

The requirements for specialist studies in the EIA Regulations of 2014 (GNR 326) Appendix 6, promulgated under the National Environmental Management Act (Act 107 of 1998), are outlined in Table 2-1. These were addressed as part of this study and the relevant report section for each requirement is listed in Table 2-1.

Table 2-1: Requirements of Appendix 6 and their locations in the report

Regulation 326 April 2017, as amended	Description	Section in the Report
Appendix 6 (1-a)	A specialist report prepared in terms of these Regulations must contain— details of— i. the specialist who prepared the report; and ii. the expertise of that specialist to compile a specialist report including a curriculum vitae;	3 and Appendix A
Appendix 6 (1-b)	A declaration that the specialist is independent in a form as may be specified by the competent authority;	Appendix B
Appendix 6 (1-c)	An indication of the scope of, and the purpose for which, the report was prepared;	1
Appendix 6 (1-cA)	An indication of the quality and age of base data used for the specialist report;	2.4
Appendix 6 (1-cB)	A description of existing impacts on the site, cumulative impacts of the proposed development and levels of acceptable change;	6
Appendix 6 (1-d)	The duration, date and season of the site investigation and the relevance of the season to the outcome of the assessment;	2.1
Appendix 6 (1-e)	A description of the methodology adopted in preparing the report or carrying out the specialised process inclusive of equipment and modelling used;	2.1
Appendix 6 (1-f)	Details of an assessment of the specific identified sensitivity of the site related to the proposed activity or activities and its associated structures and infrastructure, inclusive of a site plan identifying site alternatives.	6
Appendix 6 (1-g)	An identification of any areas to be avoided, including buffers;	Figure 5-1
Appendix 6 (1-h)	A map superimposing the activity including the associated structures and infrastructure on the environmental sensitivities of the site including areas to be avoided, including buffers;	Figure 4-7
Appendix 6 (1-i)	A description of any assumptions made and any uncertainties or gaps in knowledge;	2.5
Appendix 6 (1-j)	A description of the findings and potential implications of such findings on the impact of the proposed activity or activities;	7
Appendix 6 (1-k)	Any mitigation measures for inclusion in the EMPr;	6
Appendix 6 (1-l)	Any conditions for inclusion in the environmental authorisation;	7
Appendix 6 (1-m)	Any monitoring requirements for inclusion in the EMPr or environmental authorisation;	6
Appendix 6 (1-n)	A reasoned opinion— i. whether the proposed activity, activities or portions thereof should be authorised; (iA) regarding the acceptability of the proposed activity or activities; and	7

Regulation 326 April 2017, as amended	Description	Section in the Report
	ii. if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;	
Appendix 6 (1-o)	A description of any consultation process that was undertaken during the course of preparing the specialist report;	2.3
Appendix 6 (1-p)	A summary and copies of any comments received during any consultation process and where applicable all responses thereto; and	n/a
Appendix 6 (1-q)	Any other information requested by the competent authority.	n/a
Appendix 6 (2)	Where the government notice *gazetted* by the Minister provides for any protocol or minimum information requirement to be applied to a specialist report, the requirements as indicated in such notice will apply.	n/a

2.2.2 National Water Act (Act 36 of 1998)

The SWMP was developed to comply with GNR 704 of 1999 of the National Water Act, 1998 (Act No.36 of 1998). Regulation 704 applies to mining and associated activities and includes principles that should be applied at all mine sites. GNR 704 of 1999 stipulates the requirements for the separation of clean and dirty water on mines, and the management of dirty water generated by the mine operation.

The Best Practice Guidelines (DWAF, 2006) mentioned in Section 2.1 were used to expand on GN R704 of 1999. The guidelines (DWAF, 2006) provide additional information on best practices and a method for assessing a site and developing mitigation measures to protect stormwater.

2.3 Consultation Process

Discussions were held with the mine personnel, the EAP and the design engineers. A public consultation process is being conducted as part of the EIA process, and comments relevant to the surface water study will be considered by the specialist.

2.4 Information Sources, Data Quality and Age

Information sources and the data quality and age are listed in Table 2-2.

Table 2-2: Information sources, data quality and age

Information or data	Source	Quality of data	Age of Data
Daily Rainfall Software Application and Database	Institute for Commercial Forestry Research - Daily Rainfall Extraction Utility program (Software and database)	The Data Rainfall Extraction Utility program was used to obtain the rainfall data for the closest station to the site (Elandsfontein)	The data ends in 2001.
Design Rainfall	Design Estimation flow software and database (Gorven, 2002)	Design rainfall is the rain that falls for each event. The design rainfall data values were interpolated from the six closest rainfall stations	The rainfall stations have a record of between 22 years (closest station) and 50 years
Mean Annual Runoff	WR2012 Database (WRC, 2012)	The WR2012 database provides MAR values for different parts of South Africa. The site lies in the F60D and F60E regions	2012
Contour Data	Supplied by Tronox	1 metre contours (and sometimes finer) delineated by a registered surveyor	Less than 8 years

Information or data	Source	Quality of data	Age of Data
Location of water courses	50 0000 series Topographical maps of South Africa from the Department of Rural Development – National Geo-spatial Information	Water courses delineated on 20 metre contours	Maps for Lutzville area updated 2010

2.5 Assumptions, Limitations and Gaps

The following assumptions, limitations and gaps apply to this study:

- Based on observations at the site visit, the soil is deemed to be moderately erodible – no soil mapping was undertaken as the area is very large and it is possible to assess the impacts without the mapping.
- It is assumed, based on the site visit, experience of Tronox staff and supported by WR2012 data (WRC, 2012), that surface water flows are very rare and several years can elapse between flows.
- Surface water quality samples were not taken or analysed because surface water flows are rare. This is very unlikely to change the outcome of the assessment and was thus deemed a reasonable limitation.
- The final post-mining contours were assessed, and the mitigation measures written to allow for a progressing mining operation. Consideration of detailed contours for each year of mining operation is considered unnecessary, because of the dry climate in which rain events generating runoff are rare and because mining, for practical reasons, may proceed differently from any plan.
- It is assumed that the outer walls of the of STF and RSF are made from coarse tailings, and that therefore water erosion will not occur on these slopes despite their steepness. This is based on observations at other facilities on the site.

3 Surface Water Specialist Information

The study was conducted by surface water specialist Xanthe Adams. Xanthe is a Professional Engineer registered with the Engineering Council of South Africa. She is an environmental engineer with over 15 years of experience in hydrology, hydraulics, water treatment and water management. She has provided solutions to a wide range of clients in mining and industry. The specialist's CV is provided in Appendix A.

4 Surface Water Baseline

The study area falls within the Olifants / Doorn Water Management Area (WMA) and the Knersvlakte Sub-Water Management Area (subWMA). The existing mine area is situated in the quaternary catchments F60D and F60E.

4.1.1 Landforms, Soil and Vegetation

Landforms influence runoff because steeper areas generate more storm flow with higher velocity, whereas runoff water flows more slowly in flatter areas, thus allowing more opportunity for infiltration.

The typical landscape at the site is open plains with areas containing sparse natural vegetation or vegetation planted as part of the rehabilitation process for previous mining operations. Except for the area close to the Groot Goeraap river, the land is very flat and the direction in which water drains is difficult to determine visually (see Figure 4-1) – this is borne out when looking at the contour data for the site. This landscape will generate low runoff volumes and slow flowing runoff.

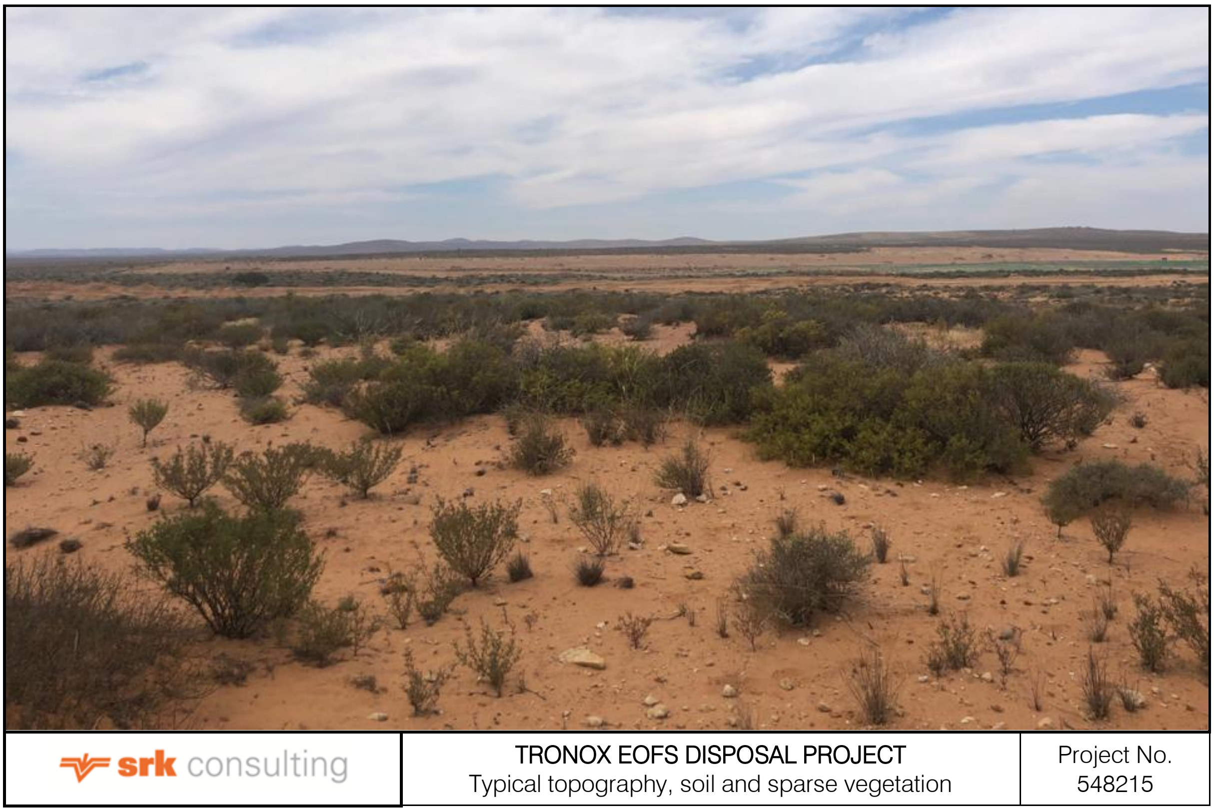


Figure 4-1: Typical topography, soil and sparse vegetation in a rehabilitated former mining area at Namakwa Sands

Soil type influences soil permeability, which in turn influences how much water will infiltrate in a storm event. In most areas, the soil is sandy and loose, but in a few areas Dorbank (calcrete)[1] outcrops or calcretised soils were present (Figure 4-3). Such soil will result in low runoff volumes and velocities with moderate volumes and velocities where Dorbank is encountered.

4.1.2 Soil Erodibility

During the site visit the following was observed:

- Almost no erosion was observed on hardened surfaces such as roads with gentle slopes (< 2%). Minor erosion was observed in slightly steeper areas. More severe erosion was noted on berms (Figure 4-4) and unvegetated areas with steeper slopes where slopes exceed 10%.
- No erosion was noted in areas where the land surface had not been hardened (e.g. revegetated areas). Tronox staff who oversee rehabilitation agreed that little erosion occurred during or prior to revegetation except in an area known as “the steeps” – this area commonly has slopes steeper than 10%. After mining, it is a rehabilitation strategy to revegetate (plant) at the beginning or during the wet season (winter). Consequently, some areas may be left unvegetated for a maximum of 6 months. Netting is placed perpendicular to the dominant wind directions as soon as possible after mining to limit wind erosion. This is to allow soil growing medium to deposit against wind erosion nets. Figure 4-5 shows a revegetated area with revegetation nets still in place shown). This practice will be implemented during the next phase of mining and will have implications for surface

[1] Calcrete occurs in well-developed layers in this area and is often referred to as *Dorbank* on this site.

water runoff. The nets and consequent windblown deposition of soil next to the nets will create small undulations in the landscape slowing surface water runoff and encouraging infiltration.

- No erosion was observed on calcretised soils, even on steeper grades, but few such areas were observed; and
- Soils when wetted, drained well, likely due to the unconsolidated nature thereof in many places as well as the flat terrain which will limit overland flow (Figure 4-3). Staff at the mine confirmed that they have observed that during rain events most rainfall infiltrates the sandy soil and minimal runoff occurs. This was tested by the specialist during the site visit, where water was placed on the surface and good drainage was noted.

In summary, the area is unlikely to have a high stormflow potential or high erosion potential from surface waters.

srk consulting	TRONOX EOFS DISPOSAL PROJECT Significant erosion visible on bare, compacted area with slope above 10%	Project No. 548215

Figure 4-2: Photo showing significant erosion visible on a bare, compacted area with a slope above 10%

srk consulting	TRONOX EOFS DISPOSAL PROJECT Deep sand with mold erosion transported in large storm events	Project No. 548215

Figure 4-3: Photo showing deep soft sand with mild erosion which could be transported in large storm events

srk consulting	TRONOX EOFS DISPOSAL PROJECT Significant erosion on berms	Project No. 548215

Figure 4-4: Photo showing significant erosion on berms

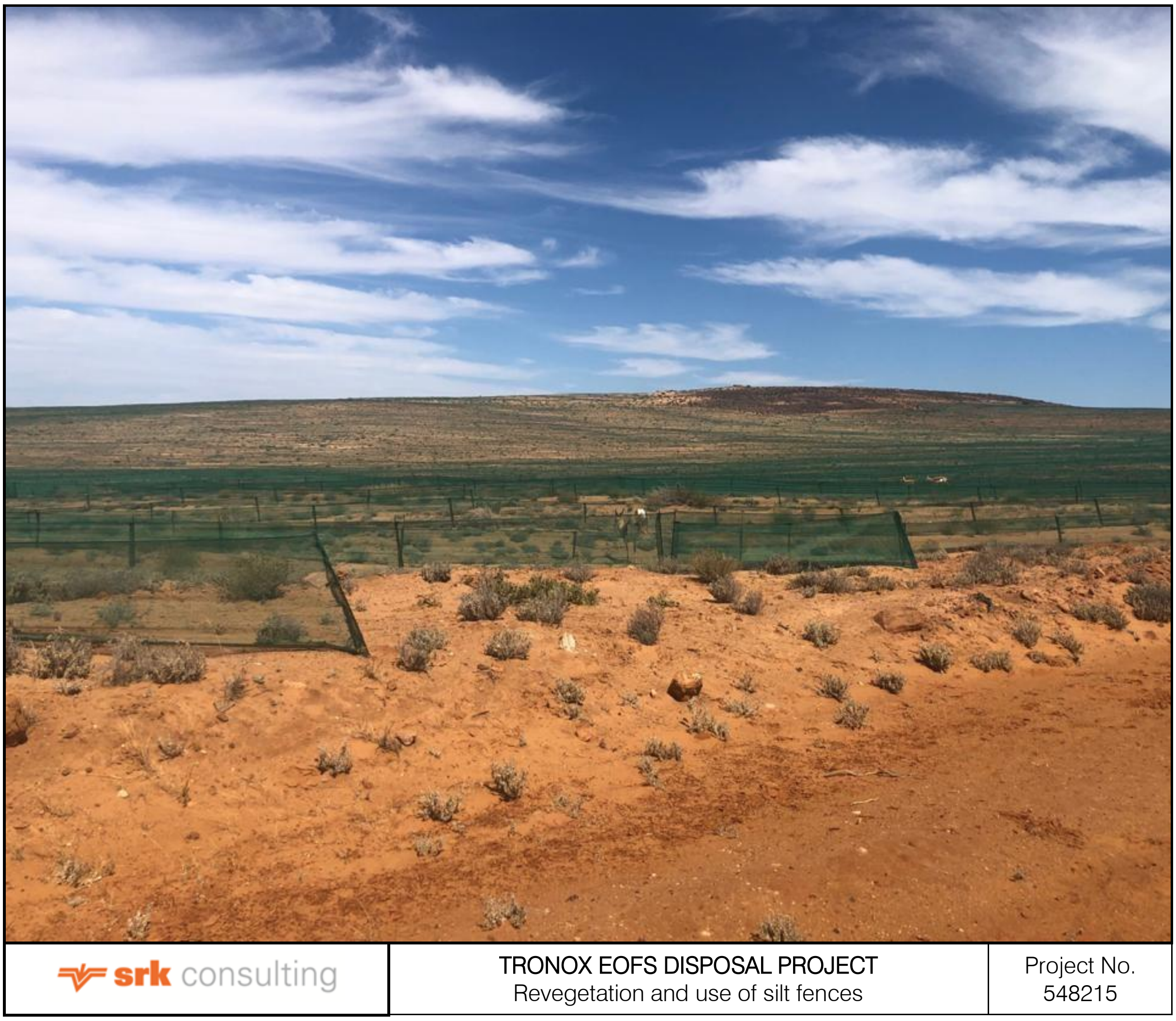


Figure 4-5: Photo showing revegetation in processes with fences to trap windblown soil and prevent soil between the fences from being blown away

4.1.3 Drainage and Stream Morphology

The ephemeral Groot Goeraap and Sout Rivers are the main surface drainage features in the area. The Sout River originates in the hills to the east and drains in a westerly direction towards the Atlantic Ocean. The Klein-Goeraap and Groot Goeraap rivers are tributaries of the Sout River system. The stream morphology of rivers includes low gradients (i.e. they are flat) and sandy beds. The rivers are characterised by broad channels (~20 m at their narrowest, and frequently wider than 150 m). The mean annual runoff (MAR) of the Sout River Catchment is 0.7 mm per year (WRC, 2012) which is very low. Surface flow is extremely rare due to the low MAR and explains the absence of well-defined drainage lines in the area (Figure 4-6).

Alterations to topography from mining on the site have altered surface water flow, and no natural watercourses cross the site. During infrequent and very high rainfall events, sub-catchments on the Mine site could channel surface flows in a stream-like manner. With reference to Figure 4-7 the following is noted in this regard:

- RC 1, RC 3, RC 4 and RC 5 sub-catchments discharge into the Groot Goeraap River;
- RC 2 sub-catchment discharges into the Sout River;
- OC 1 sub-catchment discharges towards the coast; and
- “De Kom” sub-catchment discharges into the Kom ephemeral pan (See Section 4.1.4); and

- NDC1, NDC2 and NDC3 sub-catchments are non-draining[2].

srk consulting	TRONOX EOFS DISPOSAL PROJECT Groot Goeraap River with mine in the background	Project No. 548215

Figure 4-6: Groot Goeraap River with mine in the background (to the south)

Source: (Helme, 2014)

[2] A non-draining catchment is topographically isolated from other surface water systems, and rain water falling in the catchment does not discharge to another catchment or to the ocean. Excessive rainwater in these systems is channelled towards a central pan-like depression, or depressions, where it would (depending on the nature of the catchment) evaporate, infiltrate or, in large events, spill into another catchment. At the Mine, these depressions are difficult to detect because of the flatness of the terrain and their large size.

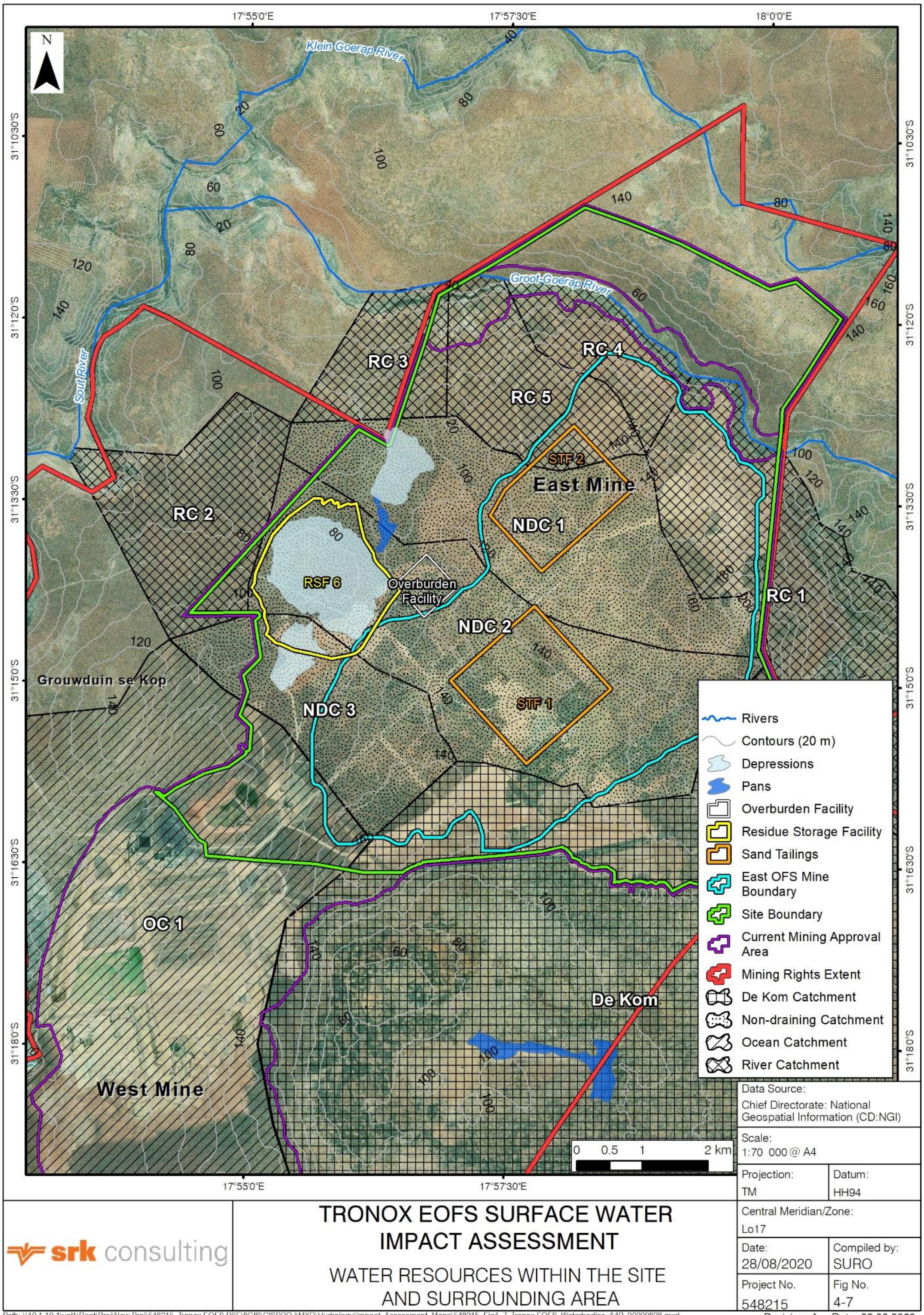


Figure 4-7: Water resources within the site and surrounding area

4.1.4 Wetlands and Pans

A number of features classified as wetlands occur in the Groot Goeraap River, and two ephemeral pans () occur in the study area: one east of the proposed RSF (Helme, 2014) and the other in the De Kom Catchment. The De Kom pan (mentioned in previous reports - Helme, 2014, Golder, 2011a) is empheral and has been previously noted as a sensitive environmental area. None of the activities or infrastructure noted in Section 1.2 are located within the catchment of De Kom, although some mining (already authorised) will occur in the upper reaches of the De Kom catchment.

In addition to these surface water features, topographical analysis has identified three other depressions within the non-draining sub-catchments in the study area (see Figure 4-7):

- Northern Depression – Previous specialist ecological surveys did not identify any floral / habitat incongruities in this area (which would have suggested water retention), confirming the extremely ephemeral nature of this system;
- Central Depression – This is located in a mined-out area; and
- Southern Depression – This is located in a mined-out area.

4.1.5 Rainfall

The site has an arid to semi-arid climate, with average rainfall below 200 mm per year. Rain falls mainly over the winter months (see Figure 4-8) and a significant portion of the moisture in the area precipitates from sea fogs. The Data Rainfall Extraction Utility program was used to obtain the rainfall data for the closest station to the site, at Elandsfontein. The average annual rainfall for Elandsfontein is 152 mm.

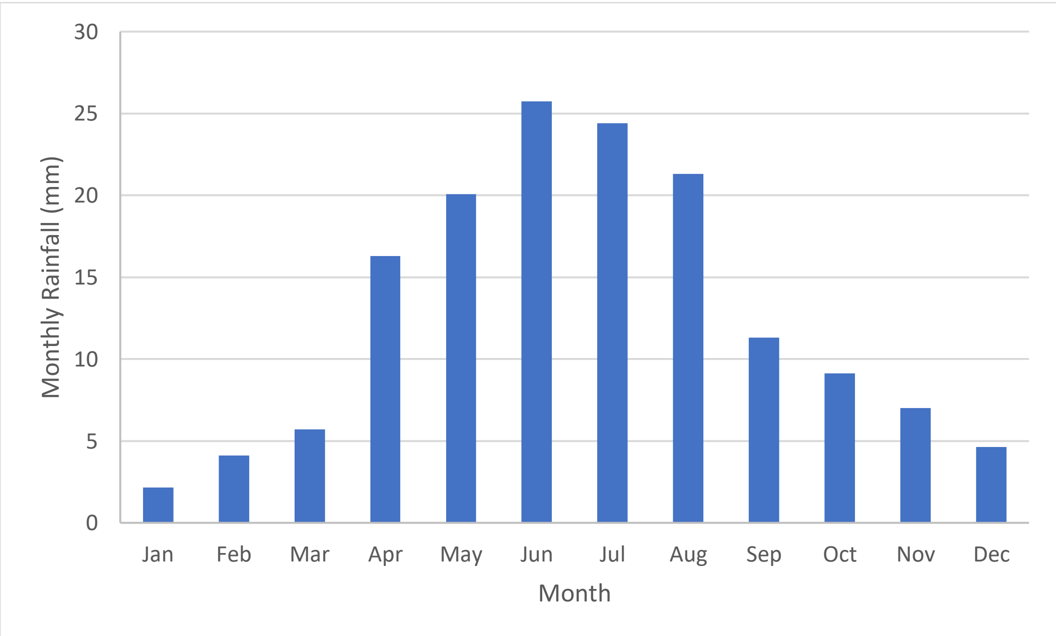


Figure 4-8: Average monthly rainfall

Source: (Institute for Commercial Forestry Research and Water Research Commission, 2012)

4.1.6 Extreme Rainfall Events

The likelihood and severity of extreme rainfall events are denoted by the design rainfall. The design rainfall data was obtained from the Pre-feasibility Study (Epoch Resources, 2019) and is shown in

Table 4-1. As shown in Table 4-1, a 78 mm rainfall event over a 24-hour period occurs approximately once every 100 years for example (marked in grey).

Table 4-1: Design rainfall (mm) data interpolated from six closest stations

Storm duration	Return Period (Years)						
	2	5	10	20	50	100	200
24 hours	30	41	49	58	69	78	87

4.1.7 Surface Water Use

There is no surface water use in the area other than infrequent use for livestock at times when rivers flow (Golder, 2011a).

A privately owned saltworks (Cawood Saltworks) is located on the Sout River estuary north of the mining authorisation area. Cawood Saltworks does not draw on saline estuarine surface water (Golder, 2011a). Rather, saline groundwater is pumped into the evaporation ponds. Local surface water resources are not used by the Namakwa Sands Mine.

5 Detailed Surface Water Situation Analysis

5.1 Delineation of Clean Water and Dirty Water Areas

The EOFS site was divided into clean and dirty water areas as defined in the best practice guidelines (DWAF, 2006). They are as follows and are provided in Figure 5-1:

- Dirty areas (facilities, infrastructure and their processes which will result in contamination):
    - Construction Workshops/work areas, if any, where oils and lubricants may be stored and used during construction;
    - The RSF Facility;
    - The STF facilities;
    - The overburden facility (Note however that this is an interim/temporary facility and will contain only dry material);
- Clean areas are deemed to be all areas within the mining extent and outside the “dirty areas” stated above. Note that mining will occur in these areas, but that mining was previously authorised and is not part of the scope of this report.

5.2 Delineation of Catchments, Runoff and Peak Flows

Sub-catchments have been delineated for the site, including for all areas where project activities will take place (see Section 4.1.3). Figure 4-7 shows the sub-catchments based on the current baseline topography, and Figure 5-2 shows the catchments after (authorised) mining of the OFS in the East Mine. Table 5-1 and Table 5-2 provide the estimated annual runoff and storm runoff under current baseline conditions and with (authorised) EOFS mining and the RSF / STFs. The changes and their implications to stormwater are discussed below.

At present, the catchments drain into the river or the ocean, while some are non-draining (as described in Section 4.1.3). Located within these catchments are three depressions, the Northern Depression, Central Depression and Southern Depression. Mining changes the catchments of all three depressions as follows:

- Northern Depression:

  - Sub-catchment NDC 1 currently drains to the Northern Depression. Following the authorised EOFS mining, NDC 1 will split into two non-draining catchments (NDC 1 and NN NDC 1 in Figure 5-2), and the Northern Depression will receive only 24% less of the original runoff volume (Table 5-1). As no wetland or salt pan features have been identified in the Northern Depression, the decrease in runoff is not expected to impact any water bodies.
  - STF 2 will straddle three sub-catchments: the new non-draining NN NDC 1, non-draining NDC 1 and the river-draining RC 5. As two of these sub-catchments are non-draining and only a very small portion of RC 5 is affected, most of the runoff from STF 2 will not reach a water body. However, some of the runoff could reach the Groot Goeraap river via RC 5 if not properly managed. Runoff is likely to contain elevated levels of sediment, which could disrupt river ecology and the downstream salt works. Engineering design in STF 2 will need to take this into account.
- Central Depression:
  - The central depression currently located in sub-catchment NDC 2 will be filled in completely by the RSF.
- Southern Depression:
  - Sub-catchments NDC 2 and 3 will combine due to the RSF, which straddles their boundary, and drains to the southern depression. A portion of the Southern Depression will also be filled by the RSF, and the future storage capacity of the depression will still be sufficient to contain large storm events (1:200 and possibly 1:100 year events, see Table 5-2).
- Other depressions:
  - Note that several smaller depressions will be created against the walls of the STF's because of the new topography.

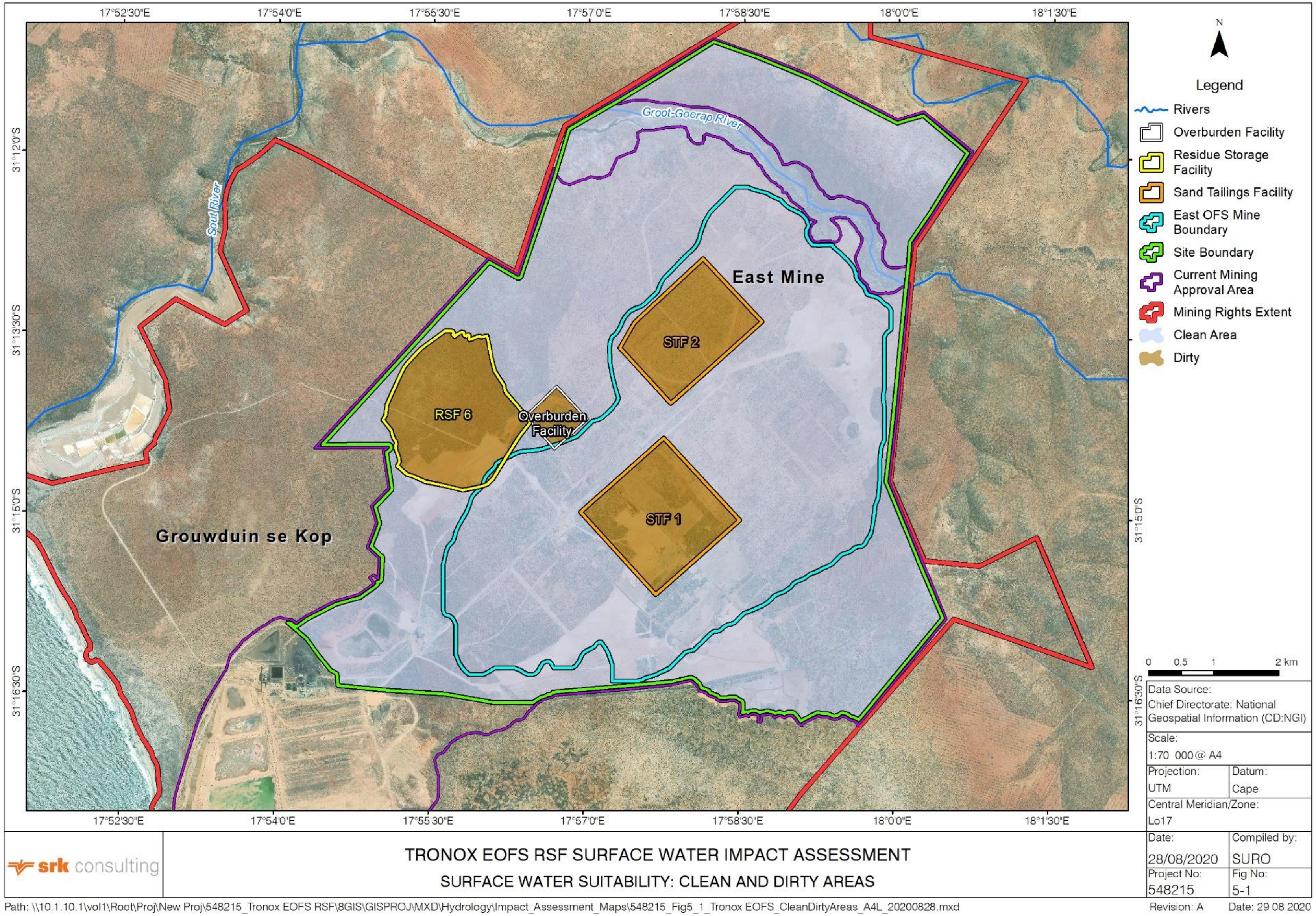
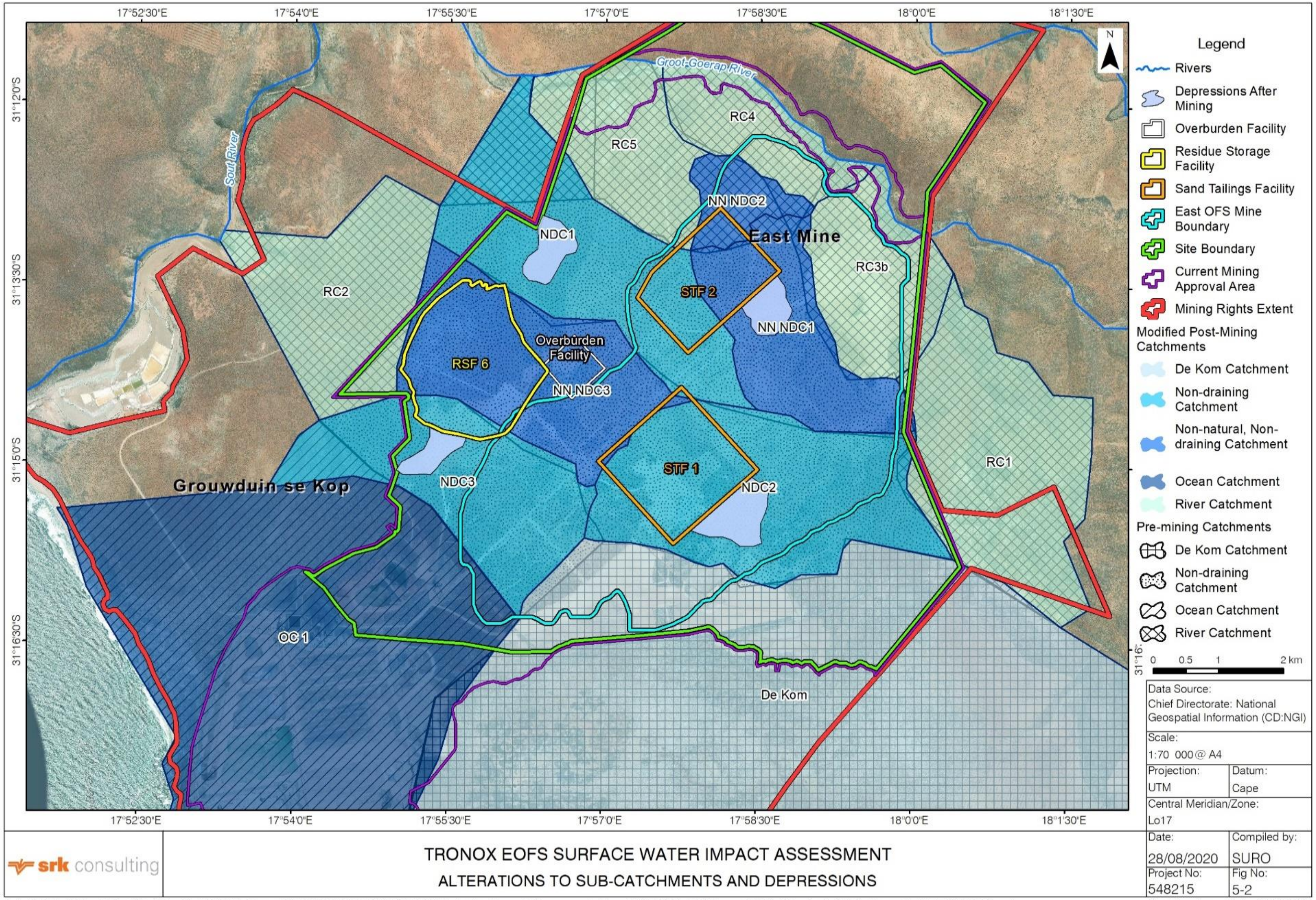


Figure 5-1: Clean and Dirty Areas



Path: \\10.1.10.1\vol1\Root\Proj\New Proj\548215_Tronox EOFS RSF\8GIS\GISPROJ\MXD\Hydrology\Impact_Assessment_Maps\548215_Fig5_2_Tronox EOFS_AlterationtoSubCatchments_A4L_20200828.mxd Revision: A Date: 29 08 2020

Figure 5-2: Alterations to Sub-catchments

Table 5-1 Mean Annual Runoff prior to mining and after mining

Sub-catchment	Time period	Catchment area (m^2)	MAR (mm)	MAR (m^3/year)	Percentage decrease/increase after mining starts
NDC 1	Current	12 753 734	0.7	8 927	
NDC 1	After EOFS mining and with RSF / STFs	9 519 236	0.7	6 663	The smaller NDC 1 will receive about 25% less of current runoff and thus the northern depression will receive less runoff after mining
NN NDC 1	After EOFS mining and with RSF / STFs	5 666 918	0.7	3 967	Does not currently exist, a portion of it is part of NDC 1 currently
NDC 2		18 463 942	0.7	12 925	
NDC 3		6 832 395	0.7	4 783	
NDC 2-3	After EOFS mining and with RSF / STFs	18 206 191	0.7	12 744	NDC 2&3 are smaller after mining but combine due to the stormwater channels around the RSF. The southern depression will thus receive a larger annual runoff. The central depression disappears due to the RSF

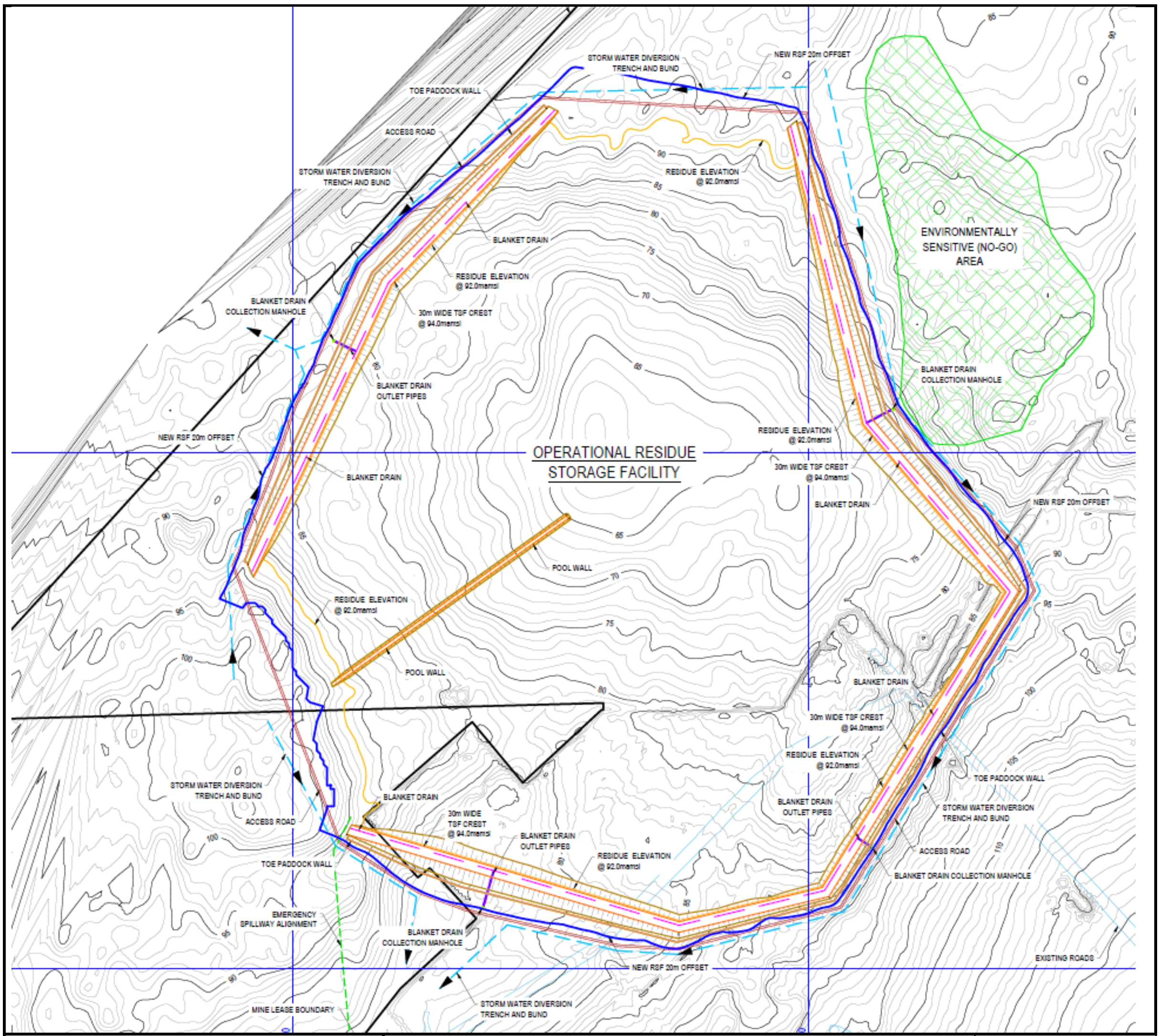
Table 5-2 Runoff volumes during extreme rainfall events prior to mining and after mining

Name of Depression	Runoff for each return period (m^3)							Volume (m^3)	Comment
Return period:	**1:2**	**1:5**	**1:10**	**1:20**	**1:50**	**1:100**	**1:200**		
Prior to Mining									
Northern Depression (Catchment NDC 1)	74 355	144 107	203 412	276 729	373 776	457 992	545 691	1 793 284	
Central Depression (Catchment NDC 2)	109 547	212 312	299 687	407 703	550 683	674 759	803 964	20 910 466	
Southern Depression (Catchment NDC 3)	40 537	78 564	110 896	150 866	203 775	249 688	297 499	2 048 112	
After Mining									
Northern Depression (Catchment NDC 1)	56 478	109 459	154 506	210 195	283 909	347 877	414 490	1 793 284	Now receives smaller volume in large events
Central Depression - No longer exists	N/A	N/A	N/A	N/A	N/A	N/A	N/A	N/A	Filled by RSF, no depression exists
Southern Depression (Catchment NDC 3)	108 018	209 348	295 503	402 012	542 996	665 339	792 741	1 024 056	Despite reduced depression volume coupled with higher (combined) runoff volumes, the catchment remains non-draining even in large events

5.3 Conceptual Design

The conceptual design of the infrastructure contained in the Scoping Report (SRK, 2020) and the pre-feasibility study report (Epoch Resources, 2019) was reviewed, and the following is noted:

- Stormwater diversion channels to divert clean water are as shown in Figure 5-3 in order to comply with NWA Regulation 704 of 1999;
- Proposed stormwater diversion channels were nominally 1 m deep, 2.5 m wide with 1:2 side slopes;
- Proposed RSF out wall slope is 1:2 (or 26.6 degrees) during operation;
- Pumps will be installed to pump water recovered in the RSF through a return water pipeline to the existing process water dam at the PCP East;
- Two additional stormwater pumps will pump return water to the PCP East in storm conditions;
- Proposed STF outer wall slope is 1:1.5 or 35 degrees (close to the angle of repose) during operation;
- Water seeping from the STFs will be removed via a submersible pump and pumped back to the new thickener feed tank;
- Wind erosion protection (netting) will be placed on the inactive embankments of the STF; and
- No new facilities for sewage will be required.



srk consulting	TRONOX EOFS DISPOSAL PROJECT Conceptual drawing of RSF (for information only) showing clean stormwater diversion channels as blue dashed lines (from Drawing number 126-003-900A by Epoch Resources 2019)	Project No. 548215

Figure 5-3: Conceptual drawing of RSF showing stormwater diversions

Source: Drawing number 126-003-900A (Epoch Resources, 2019)

Several items require more detailed design than is provided in the current conceptual design.

Stormwater management around the STFs is not addressed by the conceptual designs provided. Management of stormwater at the STFs is important to comply with Regulation 704 of 1999 (requiring the separation of clean and dirty water) and to prevent sediment transport.

The future topography of the site was assessed and conceptual locations for recommended stormwater controls were identified as shown in Figure 6-1 in more detail:

- Diversion berms: a few very short diversion berms to contain or divert water out of the catchment of the Groot Goerap river and thus prevent any transported sediment from reaching this point.
- Containment berms shaped as paddockes or similar will contain dirty water seeping out of the STFs. The dirty water should then be pumped back to processing operations as envisioned by the current design. These berms will also separate any clean water that might flow towards the STF's due to the modified topography. These berms will need to move with the advancing face of the STF and are thus not shown in layout view on Figure 1-1Figure 6-1. Instead a typical cross-section

is included. The proposed stormwater management installations in Figure 6-1 are conceptual and must be refined during detailed design. Berms must cater for a 1:50 year storm event and the expected seepage water volume.

- No other stormwater controls are required as the rest of the area is within non-draining catchments that do not drain to water courses. Note that if at any later date an aquatic ecologist or other specialist should identify water courses or wetlands or water sensitive species within the non-draining catchments, then this stormwater plan must be revised. Note that regular monitoring of erosion and sediment transport should be carried out and if any found, it should be remediated and preventative action taken. Lastly, note that this point is based on the assumption that Catchment NDC 3 is non draining which will remain true unless stormwater controls are later designed to move water out of that catchment. Consequently, should the stormweater channels shown in Figure 5-3 be extended or otherwise altered to drain out of NDC 3, then this stormwater management plan must be revised.

The **temporary overburden stockpile** is not considered in the design as it is an interim stockpile and the material will be dry. Furthermore, any sediment transported from this stockpile will remain within the non-draining catchments, collecting either within the stormwater channels around the RSF or, after conveyance through those stormwater channels, in the Southern Depression in Catchment NDC 3. In other words, the sediment will not reach a water course. Nonetheless if such sediment transport occurs it must be addressed and rememdiated immediately.

The **side slopes of both the STFs and the RSF** are steep. However, the outer walls of the of STFs and RSF are made from coarse tailings, and wind erosion rather than water erosion will occur. This must be monitored and confirmed during inspections prescribed in the mitigation measures. If erosion occurs, an engineer should assess the situation and consider the option of installing dissipators on the slopes or at the foot of the walls as necessary.

Several **non-draining depressions** will be created by the STFs and the mined out topography. Their volumes should be checked during detailed design to ensure they will not spill in an uncontrolled manner, mobilising sediments in the process. After closure, these depressions should be shaped to form sustainable pans or to drain in a controlled manner.

Environmentally sensitive areas shown in Figure 6-2 should be avoided (referred to a Low Suitability level 1). These areas include the pan and the Groot Goeraap floodline.

6 Surface Water Impact Assessment

6.1 Impact: Increased Erosion

High rainfall events can result in the erosion of soil and the transport of sedimentation. In particular:

- Construction activities also result in removal of vegetation on the RSF footprint and on laydown areas, which then leave these areas prone to erosion;
- The RSF, STFs and temporary overburden stockpile(s) will change the topography / gradient of the land and consequently the speed at which water runs off, possibly increasing erosion and transportation of sediments;
- Disposal of sand tailings in the STF with a 20% moisture content. It is estimated that 12% of this water will seep out over time. Without management, this water could collect and flow, causing erosion and potentially transporting sediments to the river; and
- Vehicles can harden surfaces, which increases flow velocities of surface water that potentially causes erosion.

Without the implementation of mitigation measures, erosion is likely to occur, with severity depending on the flood event and location. The intensity of the impact is still expected to be medium due to the low rainfall, and in the event of a large flood occurring, the eroded areas and transported sediment could alter the drainage patterns. The effects of any erosion occurring could be long-term, as infrequent rainfall results in the hardening of the surfaces including ridges created by sediment transport in the storm event.

The implementation of the mitigation measures would ensure that the duration of the impacts is short-term.

Table 6-1: Impacts on erosion

<table>
<tr><th></th><th>Extent</th><th>Intensity</th><th>Duration</th><th>Consequence</th><th>Probability</th><th>Significance</th><th>Status</th><th>Confidence</th></tr>
<tr><td>Without Mitigation</td><td>Local
1</td><td>Medium
2</td><td>Long-term
3</td><td>Medium
6</td><td>Possible</td><td>LOW</td><td>- ve</td><td>Medium</td></tr>
<tr><td colspan="9"><u>Essential Mitigation Measures</u>
• Ensuring stormwater flows from diversion channels and other stormwater infrastructure (Figure 5-3 and Figure 6-1) do not cause erosion in the 1:50 year flood – this includes ensuring that stormwater flows do not exceed 1 m/s. for earthen channels. This should be checked during detailed design as decisions taken in detailed design will affect the final velocities.
• Dissipation of stormwater where it flows from defined channels to natural ground
• Continue the practice of revegetation and use of netting (already standard practice for wind erosion) as this will aid in dissipating energy of flows and reduce the risk of erosion, this should be done as soon as possible upon completion of the deposition on the STF and Overburden stockpile side slopes
• Inspection of the site for erosion to be conducted monthly during construction and annually during operation and after storm events exceeding the 1 in 10 year event. A remedial plan should be set up for any erosion/sedimentation noted and should be implemented within a month of noted incident. The inspection should include the Overburden Stockpile, the STFs, the RSF, diversion channels, berms and the Southern Depression, where sediment might accumulate.
• Revise mitigation measures if new stormwater controls, that are significantly different to the conceptual design, are proposed (particularly stormwater channels exiting Catchment NDC 3 around the RSF).</td></tr>
<tr><td>With Mitigation</td><td>Local
1</td><td>Low
1</td><td>Short-term
1</td><td>Very low
3</td><td>Improbable</td><td>Insignificant</td><td>- ve</td><td>Medium</td></tr>
</table>

6.2 Impact: Changes to Catchments and Flow Patterns

A change to the catchments and watercourses is expected as the RSF, STF, Overburden facility and other laydown and stockpile areas will alter the current sub-catchments. The STFs will result in the formation of more non-draining areas and artificial pans. Authorised EOFS mining will also alter the topography of the area permanently.

Although the change in landform cannot be effectively mitigated, the formation of non-draining areas is not considered a significant concern as these are consistent with current drainage patterns of the area (i.e. natural non-draining catchments and pans).

Table 6-2: Change in catchments and watercourses

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without Mitigation	Local 1	Medium 2	Long-term 3	Medium 5	Definite	Low	- ve	High
Essential Mitigation Measures None								
With Mitigation	Local 1	Medium 2	Long-term 3	Medium 5	Definite	Low	- ve	High

6.3 Impact: Damage to Water Courses

Construction contractors and mine staff, if not informed of the location, may drive over the water courses or place materials or equipment within. The water course close enough to be at risk is the pan shown but the 1 in 100 year floodline is also in the vicinity (Figure 6-2). Damage to water courses could be short or long term and it could be of high or low intensity depending on exactly how the water course is damaged.

Table 6-3: Changes to water courses

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without Mitigation	Local 1	High 3	Long-term 3	High 7	Possible	Medium	- ve	High
Essential Mitigation Measures Areas on Figure 6-2 labelled “Low suitability” will be marked to ensure that it is clear that no access or activities are to take place in these areas. Revise mitigation measures if a specialist identifies sensitive aquatic life within the non-draining catchments (other than the pan already identified)								
With Mitigation	Local 1	Low 1	Short-term 1	Very low 3	Improbable	Insignificant	- ve	High

6.4 Impact: Deterioration of Water Quality

With various activities occurring on site, there are processes that will produce dirty water as well as natural process such as rainfall that will produce clean water. Water quality can be impacted when clean and dirty water is not separated, as the mixing of the clean and dirty water reduces overall water quality, which can deteriorate water quality in natural watercourses and water bodies or in the water that recharges aquifers. In particular:

- STF 2 will be partially situated in the Groot Goeraap river catchment. During extreme storm events, runoff from STF 2 could reach the river, carrying sediments. Ultimately STF 2 will be revegetated, but until that time large storm events will have the potential to mobilise sediments, particularly on the steep side slopes of the STF;
- General construction type activities might release potential pollutants such as litter, oils and greases and sewage. In large storm events these pollutants could reach the river;
- Storage of materials which can be washed away by surface water flows in large storm events;
- Disposal of sand tailings in the STF with a 20% moisture content. It is estimated that 12% of this water will seep out over time. Without management, this water could mix with clean stormwater.

- Installation of pipelines and ongoing pumping through these pipelines, which are a potential source of leaking water with elevated salinity (note that salinity in the surrounding area is already elevated, so the effect is unlikely to be significant);
- Vehicles are a potential source of pollution;

Potential pollutants during construction activities include:

- Sediment/silt which could be transported from stockpiles and cleared areas during rainfall events;
- Oils and greases from stationary machinery and equipment;
- Oils and greases from vehicles;
- Sewage, particularly for construction workers at the RSF which is distant from existing toilets; and
- Litter.

Potential pollutants that will remain on the site during operation are include:

- Materials with elevated salinity levels in the RSF and STF and the pipeline carrying RSF materials;
- Sediment/silt transport from STFs, RSF and mined areas which will be exposed to erosion before revegetation; and
- Litter.

Processing of the ore does not require any chemicals other than a flocculant, which is removed during the coagulation process that follows flocculation (Epoch Resources, 2019). Sewage is not considered during operation because toilets and sewage infrastructure already exist and can be used unchanged once operations begin and during closure (during operations, staff will spend less time at the RSF and will thus be able to make use of ablutions before arriving or after leaving the RSF).

The impacts on water quality could be long term especially if sediments are mobilised and then deposited in the stream.

Table 6-4: Impacts on water quality

	Extent	Intensity	Duration	Consequence	Probability	Significance	Status	Confidence
Without Mitigation	Local 1	Medium 3	Medium-term 2	High 7	Improbable	Very Low	- ve	Low
<u>Essential Mitigation Measures</u> • Clean and dirty water to be separated using stormwater controls in locations shown in Figure 6-1 and Figure 5-3. Adequate sizing of controls such that they contain the 1 in 50 year event to be confirmed in detailed design (Decisions in detailed design such as channel materials and width will affect final flow depths). • Bund any hazardous materials • Construct RSF to be a no-spill facility as planned • Inspect bunds for leaks and damage • Maintain all vehicles as per Operation and Maintenance specifications so that oil leaks do not occur • Training of staff and contractors to prevent littering and identify damage, leaks and blockages mentioned above.								
With Mitigation	Local 1	Low 1	Short-term 1	Very low 3	Improbable	Insignificant	- ve	Medium

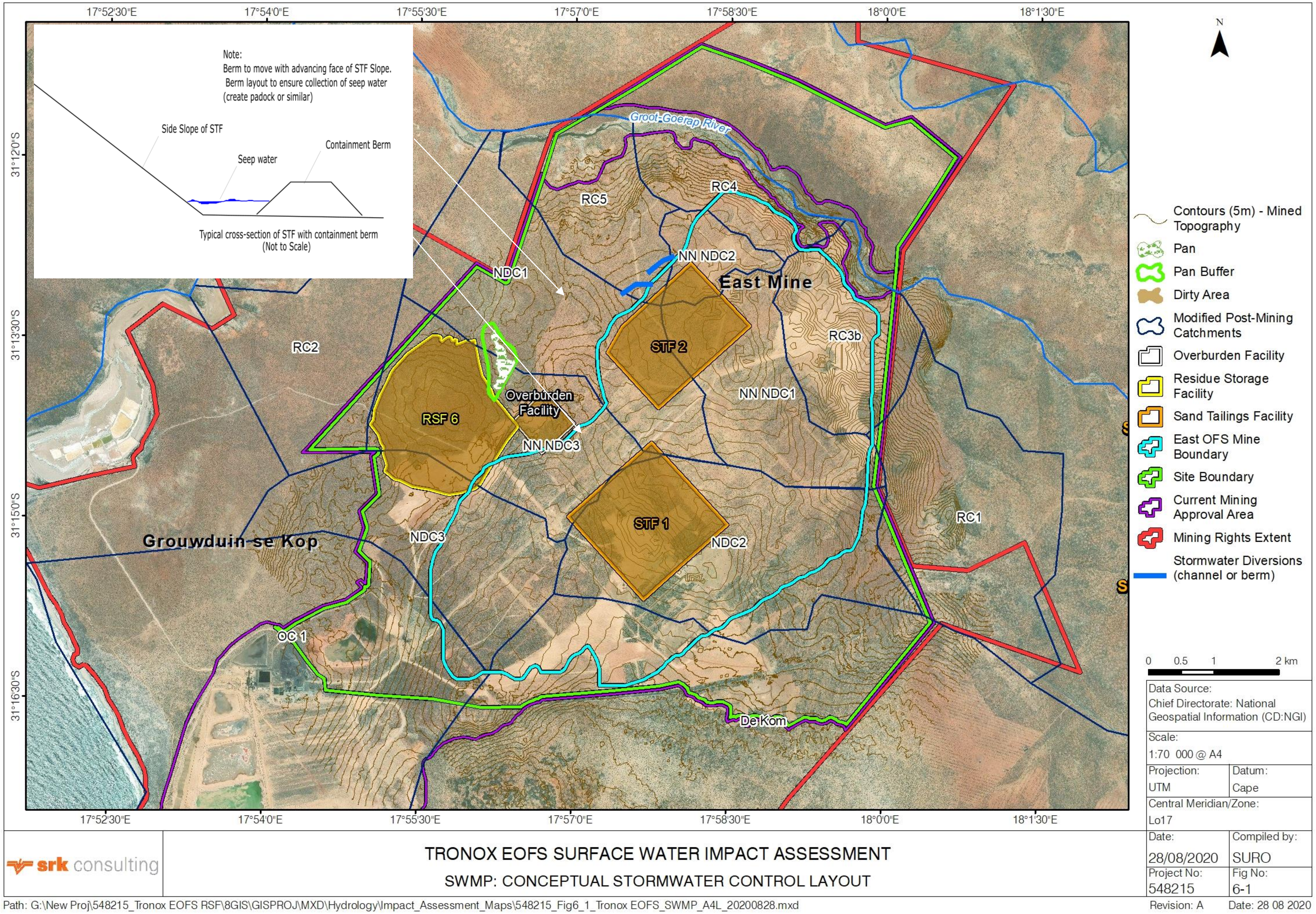


Figure 6-1: Stormwater controls layout map (controls for RSF shown on Figure 5-3)

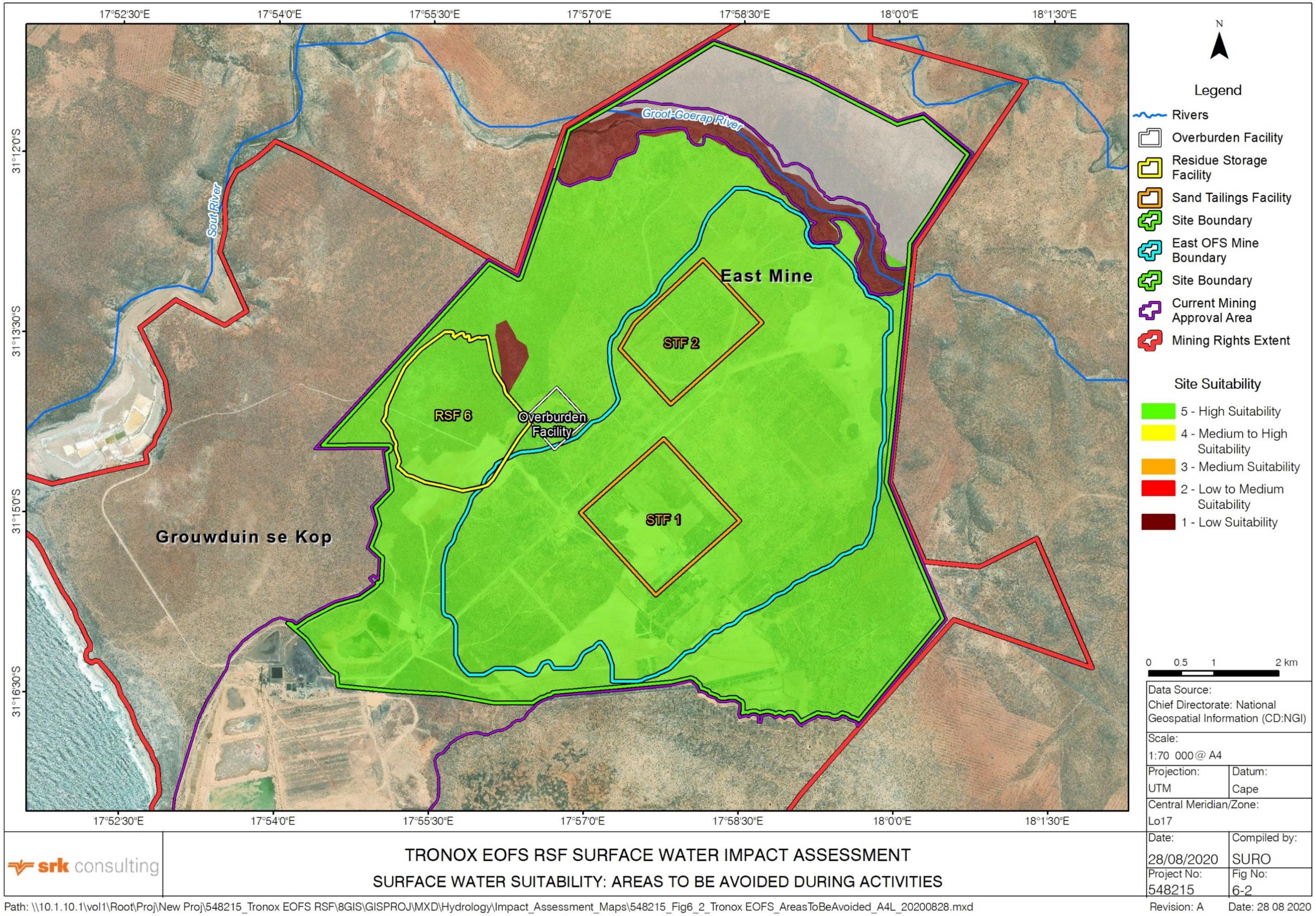


Figure 6-2: Area to be avoided (Labelled as Low suitability and shaded in dark red) during activities

7 Conclusion and Recommendations

The EIA Regulations, 2014 require that the specialist provide a reasoned opinion

i. whether the proposed activity, activities or portions thereof should be authorised;

(iA) regarding the acceptability of the proposed activity or activities; and

if the opinion is that the proposed activity, activities or portions thereof should be authorised, any avoidance, management and mitigation measures that should be included in the EMPr, and where applicable, the closure plan;

The surface water impact assessment shows that all impacts on surface water can be effectively mitigated to low or no significance. Although some permanent changes to the surface water drainage patterns will occur, these changes will still mimic the general drainage patterns of the area and their impacts will be limited to the site. Proposed mitigation measures are aimed primarily at preventing potential sediment transportation to the river, which could affect aquatic ecology and downstream users.

As such, the project can be authorised from a surface water perspective, provided the SWMP is implemented.

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Principal Engineer

Project Partner

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Bruce Engelsman, Pr. Eng, Pr. CPM
Partner

All data used as source material plus the text, tables, figures, and attachments of this document have been reviewed and prepared in accordance with generally accepted professional engineering and environmental practices.

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Appendix A: Specialists' CV

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Resume

Xanthe Adams (Nee Mayer)

Environmental Engineer/ Innovation Technical Lead

Profession	Principal Environmental Engineer
Education	MSc, Environmental Engineering, Colorado School of Mines, USA, 2011 BSc (Hons), Environmental Engineering, University of Western Australia, Australia, 2002
Registrations/ Affiliations	Professional Engineer (Civil), ECSA (South Africa), 20150490

Specialisation

Water with a particular focus on Surface Water, Remediation, Mine Closure, Treatment, Stormwater and Flood Studies.

Internal Innovation - Technical Lead

Expertise

Xanthe Adams (previously Mayer) has been involved in environmental engineering for the past 17 years. Her expertise includes:

- remediation and water treatment: MSc in water treatment, water treatment plant construction and design oversight, conceptual design of treatment plants, design of remediation measures groundwater,
- mine closure: civil engineering design for mine closure, contract management, construction monitoring;
- Floods, stormwater, hydrology: stormwater design and management, surface water hydrology, floodplain modelling with GIS and HEC-RAS, mine water balances, mine water management, water quality assessments;
- Innovation: Technical lead for SRK innovation programme;
- land fill closure: civil engineering design for land fill closure;
- software: Excel-VBA application development, ArcGIS for developers, optimization coding, numerical solver development, experience with C++;
- other: project management, training, EIA studies, ecological indicator assessments and data management;
- hydrogeology and field skills: hydraulic testing using IPI SWPS wireline packer system, deep well piezometer installations (down to 200m), vibrating wire piezometer installations, hydrogeological assessments;
- GIS: geographical analysis, HEC-geoRAS;
- Innovation Technical Lead and support.

Employment

2016 – present	SRK Consulting (Pty) Ltd, Senior Environmental Engineer, Cape Town
2012 – 2015	SRK Consulting (Pty) Ltd, Senior Environmental Engineer, Johannesburg
2009 – 2011	Colorado School of Mines, Master's Program, Env. Sci. & Eng (Water Treatment)
2005 – 2009	SRK Consulting (Pty) Ltd, Environmental Engineer South Africa & Denver (1 year)

Publications

Stream salinity status and trends in south-west Western Australia, Department of Environment, Report No. SLUI 38, (2005)

Coalbed methane produced water screening tool for treatment technology and beneficial use, Journal of unconventional oil and gas resources 5 (2014) 22-34.

Languages

English – read, write, speak (Excellent)

Afrikaans – read, write, speak (Basic)

srk consulting Resume

Xanthe Adams (Nee Mayer)

Key Experience:	**Surface Water, Stormwater and flood studies**
Location:	Western Cape
Project duration & year:	3 months, 2017
Client:	Go-Projects
Name of Project:	Floodline study for Firgrove Property
Project Description:	Several floodline delineations for a commercial property
Job Title and Duties:	Project management and technical oversight
Value of Project:	About R40 000
Location:	Western Cape
Project duration & year:	9 months, 2017
Client:	DEADP (Provincial Government)
Name of Project:	State of the Environment Report – Inland Water
Project Description:	Analysis and compilation of the state of the Inland Water Section of the State of the Environment report for the Western Cape.
Job Title and Duties:	Project management and technical oversight
Value of Project:	Confidential
Location:	South Africa
Project duration & year:	2006 - 2016
Client:	Various
Name of Project:	Floodlines, Stormwater management plans, stormwater design and attenuation plans, specialist hydrological studies.
Project Description:	Stormwater management plans for WUL's and EIAs. Floodlines for housing estates and to support EIAs. Specialist hydrological studies for EIAs. Designs included attenuation facilities, diversion canals and dams. Analysis included flow and storage analysis, deterministic modelling, hydrograph analysis and quantitative comparison of options.
Job Title and Duties:	Engineer, hydrological analysis, design, management
Value of Project:	About R20,000 – R200,000
Location:	Malawi
Project duration & year:	3 months, 2016
Client:	Confidential
Name of Project:	M1 EISA – Surface Water Study
Project Description:	EISA for M1 road in Malawi in line with World Bank/IFC requirements
Job Title and Duties:	Manager of impact assessment for integrated water aspects
Value of Project:	About R200,000
Location:	Northern Cape, South Africa
Project duration & year:	2016
Client:	SA Soutwerke (Pty) Ltd
Name of Project:	Surface water study for EIA or water use license
Project Description:	Hydrologist
Job Title and Duties:	R200 000
Value of Project:	R50 000
Location:	Lumbumbashi, Democratic Republic of the Congo
Project duration & year:	6 months, September 2013 – Present (Ongoing)
Client:	Trafigura
Name of Project:	Project management of hydrology, stormwater design and construction
Project Description:	Stormwater design for a railway siding in line with Regulation 704. Design included drains, sumps, silt traps, oil and grease traps and a dirty water retention dam.
Job Title and Duties:	Manager of water engineering for the project.
Value of Project:	About R500,000

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Resume

Xanthe Adams (Nee Mayer)

Key Experience:	**Surface Water, Stormwater and flood studies**
Location:	Zimbabwe
Project duration & year:	3 – 6 Months, 2020
Client:	SMC
Name of Project:	SMC Tailings Design - Stormwater Designs
Project Description:	Floodlines and design of a stormwater diversion channel
Job Title and Duties:	Hydrologist and Engineer
Value of Project:	R 100 000 - R 250 000
Location:	Limpopo, South Africa
Project duration & year:	3 - 6 Months, 2019
Client:	Anglo American Platinum
Name of Project:	Blinkwater wetland PFS-B Design
Project Description:	Engineering design in order to protect a wetland next to a proposed tailings dam at the mine. Designs centred around stormwater control and diversion of clean water to the wetland to ensure wetland vegetation received adequate flows without erosion being caused.
Job Title and Duties:	Project manager, Hydrualic Engineer
Value of Project:	R 250 000 - R 500 000
Location:	Western Cape, South Africa
Project duration & year:	0 - 3 Months 2019
Client:	Abland Pty Ltd
Name of Project:	Vergenoegd P468 Flood Study
Project Description:	Floodline study to delineate pre and post development floodline and estimate required flood protection berm heights. Study included a Hec-HMS study.
Job Title and Duties:	Engineer, Project Manager
Value of Project:	R 100 000 - R 250 000
Location:	Northern Cape, South Africa
Project duration & year:	0 - 3 months, 2019
Client:	Gransolar (Pty) Ltd
Name of Project:	Greefspan Solar Water Source Plan and SWMP
Project Description:	Water source plan as well as a stormwater management plan for construction and operation at a solar power facility
Job Title and Duties:	Project manager, report writing
Value of Project:	R 50 000 - R 100 000
Location:	Stellenbosch, Western Cape, South Africa
Project duration & year:	1 year, 2018
Client:	Livia Winery
Name of Project:	Floodline and flood mitigation plan for development
Project Description:	The project involved modelliong current flood conditions, developing a flood mitigation plan with the architect, modelling the flood mitigation measures, providing a flood management plan and meeting with the City of Cape Town.
Job Title and Duties:	Modelling, engineering, reporting
Value of Project:	In Range R100 000 – R250 000
Location:	Noordhoek, Western Cape, South Africa
Project duration & year:	2 months
Client:	EOH
Name of Project:	Noordhoek flood study
Project Description:	Floodline modelling
Job Title and Duties:	Modelling
Value of Project:	< R 50 000

srk consulting Resume

Xanthe Adams (Nee Mayer)

Key Experience:	**Surface Water, Stormwater and flood studies**
Location:	Gauteng, South Africa
Project duration & year:	6 years, 2012 - 2019
Client:	AECI Modderfontein
Name of Project:	AECI Modderfontein Water Balances
Project Description:	The project involved the compilation of a water balance annually since 2012 for water use license compliance. A further operational water balance was also developed with the aim of identifying the major sources of salt load within the industrial complex which included the development of specialised software.
Job Title and Duties:	Project manager, water balance developer.
Value of Project:	< R250 000 /year
Location:	Kathu, South Africa
Project duration & year:	1 months, 2016
Client:	Eskom
Name of Project:	WULA Application Kathu
Project Description:	Compilation of a WULA application for power lines near Kathu in the Northern Cape. The powerlines crossed a drainage line at one point.
Job Title and Duties:	Floodline delineation
Value of Project:	R25 000
Location:	Gauteng, South Africa
Project duration & year:	2 months, 2012
Client:	AECI Modderfontein
Name of Project:	AECI Stormwater management master plan
Project Description:	The project involved the development of a stormwater master plan in line with DWA best practice guidelines in order to fulfil water use license obligations.
Job Title and Duties:	Engineer conducting data collection, analysis, stormwater master designs and report compilation
Value of Project:	R200,000
Location:	Vaal Catchment, South Africa
Project duration & year:	9 months, 2007
Client:	Department of Water Affairs
Name of Project:	Regional water reuse strategy for the Vaal Catchment
Project Description:	Identification and investigation of large-scale water reuse projects in the Vaal River Basin, South Africa. This large project involved collecting data from mines and industries around the Vaal Basin, conducting interviews at mines, negotiating with government and industry on various water reuse options, collation of a report recommending promising options and a presentation to government recommending options to be pursued. The study was part of a larger Vaal River Basin strategy study.
Job Title and Duties:	Engineer, data collection and analysis, identification of water reuse option, liaising between DWA and industries/mines and report compilation
Value of Project:	Unknown

srk consulting

Resume

Xanthe Adams (Nee Mayer)

Publications

1. Mayer, XM, Ruprecht, JK & Bari, MA (2005), *Stream salinity status and trends in south-west Western Australia,* Department of Environment, Report No. SLUI 38

2. Plumee, M., Debroux, J., Taffler, D., Graydon, J., Mayer, X., Dahm, K., Hancock, N., Guerra, K., Xu, P., Drewes, J. and Cath, T., (2014), *Coalbed methane produced water screening tool for treatment technology and beneficial use*, Journal of unconventional oil and gas resources 5, 22-34.

Conference proceedings

1. Adams, XM, Mayne, R. & Engelsman, B. (2018), *Mine waste remediation as a stepping stone for new contractors in emerging economies,* Tailings and Mine Waste Conference, Keystone Colorado, October 2018

Appendix B: Specialist Declaration of Independence

environmental affairs

Department:
Environmental Affairs
REPUBLIC OF SOUTH AFRICA

DETAILS OF SPECIALIST AND DECLARATION OF INTEREST

	(For official use only)
File Reference Number:	12/12/20/ or 12/9/11/L
NEAS Reference Number:	DEAT/EIA
Date Received:	

Application for integrated environmental authorisation and waste management licence in terms of the-

(1) National Environmental Management Act, 1998 (Act No. 107 of 1998), as amended and the Environmental Impact Assessment Regulations, 2010; and

(2) National Environmental Management Act: Waste Act, 2008 (Act No. 59 of 2008) and Government Notice 718, 2009

PROJECT TITLE

Surface Water Impact Assessment and Stormwater Management Plan for Tronox Namakwa Sands East OFS Project

Specialist:	SRK Consulting		
Contact person:	Xanthe Margaret Adams		
Postal address:	Albion Spring, 183 Main Road, Rondebosch		
Postal code:	7700	Cell:	083 282 7974
Telephone:	021 659 3060	Fax:	
E-mail:	xadams@srk.co.za		
Professional affiliation(s) (if any)	ECSA		

Project Consultant:			
Contact person:			
Postal address:			
Postal code:		Cell:	
Telephone:		Fax:	
E-mail:			

XMA

4.2 The specialist appointed in terms of the Regulations_

I, Xanthe Margaret Adams, declare that --

General declaration:

I act as the independent specialist in this application;
I will perform the work relating to the application in an objective manner, even if this results in views and findings that are not favourable to the applicant;
I declare that there are no circumstances that may compromise my objectivity in performing such work;
I have expertise in conducting the specialist report relevant to this application, including knowledge of the Act, Regulations and any guidelines that have relevance to the proposed activity;
I will comply with the Act, Regulations and all other applicable legislation;
I have no, and will not engage in, conflicting interests in the undertaking of the activity;
I undertake to disclose to the applicant and the competent authority all material information in my possession that reasonably has or may have the potential of influencing - any decision to be taken with respect to the application by the competent authority; and - the objectivity of any report, plan or document to be prepared by myself for submission to the competent authority;
all the particulars furnished by me in this form are true and correct; and
I realise that a false declaration is an offence in terms of regulation 71 and is punishable in terms of section 24F of the Act.

Signature of the specialist:

SRK Consulting
Name of company (if applicable):

24/09/2020
Date:

XMA