



BASIC ASSESSMENT REPORT IN TERMS OF NEMA

**PROPOSED EXPANSION OF THE CHEMICAL PLANT AT
BUSHVELD VANCHEM TO INSTALL ADDITIONAL TWO (2) TANKS
OF 60M³ EACH AS WELL AS A FILTER PRESS ON ERF 94 IN
FERROBANK, EMALAHLENI LOCAL MUNICIPALITY, NKANGALA
DISTRICT MUNICIPALITY, MPUMALANGA PROVINCE**

**APRIL 2021
(DRAFT)**



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Appendix A: EAP

- Company profile: HydroScience
- Curriculum vitae (Environmental Assessment Practitioner): Ms Paulette Jacobs
- Qualification: Ms Paulette Jacobs
- Professional affiliations: Ms Paulette Jacobs (SACNASP, EAPASA WISA, IAIAsa)
- NEMA project list

Appendix B: Applicant

- Bushveld Vanchem, registration number 2019/199064/07
- Title deed (T000012332/2019)
- eMalahleni SPLUMA certificate

Appendix C: Photographs & Designs

- Layout P201120-PFL-2060-001
- Design P201120-PFL-2060-002
- Process Flow Diagram (PFD) P201120-BFD-2060-001
- Design document P201120-DES-2010-001
- Mechanical equipment list P201120-MEL-2030-001

Appendix D: Legal

- WUL 04/B11K/CGI/1617 for Section 21 (c), (g) & (i) dated 2012-02-21
- WML 12/9/11/L89/6 for H:H waste storage, treatment and disposal of slimes and calcine (Site 2a) dated 2009-11-05
- AEL NDM/AEL/MP312/11/04/A for Category 4.18 dated 2020-10-07

Appendix E: Specialists

- Archaeology and Cultural Heritage: Archaetnos, 2021

Appendix F: Public participation

- Newspaper notice (Witbank News)
- Notification (emails & hand-delivery)
- Contact details of Interested and Affected Parties (confidential)
- Comments received from Interested and Affected Parties
- Comments received from Interested and Affected Parties on draft BAR

LIST OF ACRONYMS AND ABBREVIATIONS AND DEFINITIONS

AIS	Alien and Invasive Species Regulations (2014)
AMV	Ammonium vanadate
AQSR	Air Quality Sensitive Receptors
Biodiversity	Diversity of genes, species and ecosystems on earth, and the ecological and evolutionary processes that maintain this diversity.
BPG	Best Practice Guidelines
CAPEX	Capital Expenditure
CARA	Conservation of Agriculture Resources Act, 1983 (Act 43 of 1983)
CBA	Critical Biodiversity Area (terrestrial and aquatic areas required to meet biodiversity targets for ecosystems, species or ecological processes, as identified in a systematic biodiversity plan)
CBD	Central Business District (centre of a town/city)
CRSA	Constitution of the Republic of South Africa, 1996 (Act 108 of 1996) – Section 24 relates to environment
CSIR	Council for Scientific and Industrial Research
DEFF	Department of Environment, Forestry & Fisheries (national authority responsible for environmental protection and implementation of NEMA)
DOL	Department of Labour
DTI	Department of Trade and Industry
DWS	Department of Water and Sanitation (national authority responsible for water protection and implementation of NWA, custodian of South Africa's water resources)
EAP	Environmental Assessment Practitioner (independent consultant administering NEMA processes on behalf of applicant)
EAPASA	Environmental Assessment Practitioner Association of South Africa
ECA	Environment Conservation Act, 1989 (Act 73 of 1989) – preceded NEMA
ECO	Environmental Control Officer
EIA	Environmental Impact Assessment (process required in terms of NEMA to obtain authorisation for listed activities)
EMF	Environmental Management Framework
EMP	Environmental Management Programme/Plan
EO	Environmental Officer

EPRP	Emergency preparedness and response procedures
ERAP	Emergency Response Action Plan
ESA	Ecological Support Area (terrestrial and aquatic areas that are not essential for meeting biodiversity targets but play an important role in supporting the ecological functioning of one or more Critical Biodiversity Areas; or in delivering ecosystem services.
GIS	Geographic Information System
GNR	Government Notice Regulation (notices published in Government Gazette in terms of already promulgated laws, legislated by government)
GNR 324	Amendment of GNR 985 - Listing 3 deals with activities requiring environmental authorisation due to sensitive locations
GNR 325	Amendment of GNR 984 - Listing 2 deals with activities requiring environmental authorisation due to expected higher environmental impact – requires full EIA (scoping and EIA)
GNR 326	Amendment of GNR 982 - EIA regulations – procedures / requirements
GNR 327	Amendment of GNR 983 - Listing 1 deals with activities requiring environmental authorisation due to expected lower environmental impact – requires Basic Assessment only
GPS	Global Positioning System
HCS	Hazardous Chemical Substance
HIA	Heritage Impact Assessment
IAIA	International Association of Impact Assessment
IBA	Important Bird (and Biodiversity) Area – of international significance for conservation of birds as identified by BirdLife International.
I&APs	Interested and Affected Parties (as identified during the Public Participation Process)
IDP	Integrated Development Plan
IRP	Integrated Resource Plan
mamsl	Metres Above Mean Sea Level
Listed Activities	Activities identified in terms of NEMA Sections 24 and 24D, which require environmental authorisation prior to commencement due to their potential environmental impacts. See GNR 324, 325, 326, 327
MAE	Mean Annual Evaporation
MAP	Mean Annual Precipitation
Mn	Manganese

MSDS	Material Safety Data Sheets
NAAQS	National Ambient Air Quality Standards (13 March 2009 and 24 December 2009)
NDCR	National Dust Control Regulations (1 November 2013)
NEMA	National Environmental Management Act, 1998 (Act 107 of 1998) – overarching environmental legislation in South Africa
NEM:AQA	National Environmental Management: Air Quality Act, 2004 (Act 39 of 2004)
NEM:BA	National Environmental Management: Biodiversity Act, 2004 (Act 10 of 2004)
NEM:PAA	National Environmental Management: Protected Areas Act, 2003 (Act 57 of 2003)
NEM:WA	National Environmental Management: Waste Act, 2008 (Act 59 of 2008)
NFEPA	National Freshwater Ecosystems Priority Area
NHRA	National Heritage Resources Act, 1999 (Act 25 of 1999)
NWA	National Water Act, 1998 (Act 36 of 1998)
OHSA	Occupational Health and Safety Act, 1993 (Act 85 of 1993)
OPEX	Operational Expenditure
PFD	Process Flow Diagram
PM	Particulate Matter
PPE	Personal Protective Equipment
PPP	Public Participation Process
PRECIS	National Herbarium Pretoria (PRE) Computerised Information System
QDGC	Quarter Degree Grid Cell
SACNASP	South African Council for Natural Scientific Professions (body for the registration of professional natural scientists)
SAHRA	South African Heritage Resources Agency (authority responsible for implementation of NHRA)
SAHRIS	South African Heritage Resources Information System (electronic system onto which reports are loaded for comments from SAHRA)
SANBI	South African National Biodiversity Institute
SABS	South African Bureau of Standards
SANS	South African National Standards
SCC	Species of Conservation Concern

SDF	Spatial Development Framework
SDP	Site Development Plan
SHEQ	Safety, Health, Environment & Quality
SoE	State of the Environment Report
SO₂	Sulphur dioxide
SWMD	Storm Water Management Dam
SWMP	Storm Water Management Plan
TSP	Total Suspended Particulate – assess nuisance dust effects
US EPA	United States Environmental Protection Agency
WCMR	Waste classification and Management Regulations
WDF	Waste Disposal Facility
WHO	World Health Organisation
WISA	Water Institute of Southern Africa
WUL	Water Use License

1 ENVIRONMENTAL ASSESSMENT PRACTITIONER (EAP)

1.1 Details

Company:	HydroScience CC
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Email address:	paulette@hydroscience.co.za
Telephone number:	+ 27 (0) 82 850 5482
Fax number:	+ 27 (0) 86 692 8820
Contact person:	Ms Paulette Jacobs I.D. 680526 0104 08 4
Professional registration (Paulette Jacobs):	South African Council for Natural Scientific Professions (SACNASP): 400005/07 Environmental Assessment Practitioner Association of South Africa (EAPASA): 2020/357
Membership (Paulette Jacobs):	Water Institute of Southern Africa (WISA): 24906 International Association of Impact Assessment South Africa (IAIAsa): 5266

1.2 Experience and expertise

HydroScience CC was established in 2008 after Ms Paulette Jacobs acted as an independent consultant (sole proprietor) since 2000. HydroScience is an environmental, water and waste management solutions provider. Refer to Appendix A for a company profile.

Ms Paulette Jacobs obtained her qualifications from the Rand Afrikaans University in Johannesburg in 1990 and has been in the water, waste and environmental field for the last 30 years, first in research for seven (7) years at the Council for Scientific and Industrial Research (CSIR) and since then in consulting (Pulles, Howard and De Lange Water Quality Management Consultants, SRK Consulting, sole proprietor, HydroScience). Refer to Appendix A for Curriculum Vitae of Ms Paulette Jacobs. Ms Paulette Jacobs assisted Department of Water Affairs and Forestry (now Department of Water and Sanitation, DWS) to compile the Best Practice Guidelines (BPG) for water resource protection in the mining industry and has successfully completed many Water Use Licence (WUL) Applications in terms of the National Water Act (NWA), 1998 (Act 36 of 1998) as well as Environmental Impact Assessments (EIA) in terms of the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) as

amended for the industrial, retail, commercial/business and residential sectors to obtain environmental authorisations, Atmospheric Emissions Licenses (AEL) and Waste Management Licenses (WML) over the last 20 years. Refer to Appendix A for a project list of applications for environmental authorisation.

1.3 Supporting information

Appendix A contains:

- Company profile: HydroScience
- Curriculum vitae (Environmental Assessment Practitioner): Ms Paulette Jacobs
- Qualification: Ms Paulette Jacobs
- Professional affiliations: Ms Paulette Jacobs (SACNASP, EAPASA, WISA, IAIAsa)
- NEMA project list

1.4 Assumptions, limitations, disclaimer and copyright

The findings, results, observations, conclusions and recommendations given in this report are based on the author's best scientific and professional knowledge as well as available information at the time of compilation (March - April 2021). The report is based on survey and assessment techniques which are limited by time (one day on site) and budgetary constraints relevant to the type and level of investigation undertaken (Basic Assessment Process) and HydroScience and its staff / representatives reserve the right to modify aspects of the report if and when new information may become available from changes in legislation, on-going research or further work in this field, or pertaining to this investigation.

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Project description information contained in this report is based on information supplied by the client or client appointed sources. It has been assumed that the information provided to HydroScience is correct. Environmental data contained in this report is based on information supplied by specialists in their respective fields, as well as existing available information from official sources pertaining to the area in question (maps and reports published by the relevant government department and agencies). It has been assumed that the information from these specialists or official sources is correct. HydroScience has therefore not checked or verified historical/existing information provided for correctness. HydroScience accepts no responsibility for incomplete or inaccurate data supplied by others (the client and external sources). Where gaps or obvious errors have been identified, these are noted for consideration by the applicant and/or authority.

Bushveld Vanchem (Pty) Ltd is responsible for the implementation of recommendations and HydroScience cannot and will not take responsibility for its actions or lack thereof.

1.5 Declaration of independence

I, **Paulette Jacobs**, declare that –

- I act as an independent environmental, water and waste consultant in this investigation;
- I have expertise in water, waste and environmental management, including knowledge of the relevant Acts, Regulations and any guidelines that have relevance to the investigation;
- I have performed the work relating to this investigation in an objective manner, even if this results in views and findings that are not favourable to any party involved;
- I have included the specialist studies provided to me in Appendices as well as summarised findings and recommendations in this report;
- I undertake to disclose all material information in my possession that reasonably has or may have the potential to influence this investigation, unless access to that information is protected by law, in which case it will be indicated that such information exists;
- I do not have any vested interest (either business, financial, personal or other) in the investigation other than fair remuneration for work performed; and
- I will provide the parties with access to all information at my disposal regarding the investigation, whether such information is favourable or not.



Signature: Paulette Jacobs

2 APPLICANT / PROPONENT

2.1 Details

Company:	Bushveld Vanchem (Pty) Ltd
Registration Number:	2019/199064/07
Postal address:	Private Bag X7297 Suite 373 eMalahleni (Witbank) 1035
Physical address:	Erf 94 Ferrobank eMalahleni
Telephone number:	+ 27 (0) 13 696 6001 / 6174
Fax number:	+ 27 (0) 13 696 6217
Contact person:	Business Unit Manager: Mr Alex Oehmen Cellular number: 083 781 7121 Email address: Alex.Oehmen@bushveldvanchem.com

3 PROPERTY

3.1 Details

Province:	Mpumalanga
District Municipality:	Nkangala Contact: Stanford Mofore Telephone number: 083 946 3677 / 013 249 2173 Email address: mofores@nkangaladm.gov.za
Local Municipality:	eMalahleni Contact: Ms Sandile Felicity Maseko Telephone number: 071 755 2638 / 013 690 6911 Email address: environmental@emalahleni.gov.za
Ownership:	Bushveld Vanchem (Pty) Ltd Registration number: 2019/199064/07 Title deed: T000012332/2019
Land use and zoning:	Industrial – Vanadium production
Surrounding land uses:	Industrial (Ferrobank), residential (Kwa-Guqa) and mining
Farm & portions:	Erf: 94 Township: Ferrobank JS
SG numbers:	TOJS00000000029700094
Size:	Erf 94: 21.0011ha Tanks: ±300m ²
GPS locations:	Existing Plant: 25° 51' 45.55" South & 29° 09' 52.08" East Existing Waste Management Facilities: 25° 50' 12.01" South & 29° 09' 49.23" East New tanks: 25° 51' 55.76" South & 29° 09' 52.61" East
Surrounding towns:	Ackerville: 1km east Kwa-Guqa: 4.5km west eMalahleni: 9km east
Roads & access:	N4 between Pretoria and Nelspruit (Mbombela): 1.35 km south N4 via Schonland Drive off-ramp. Van Eck Road

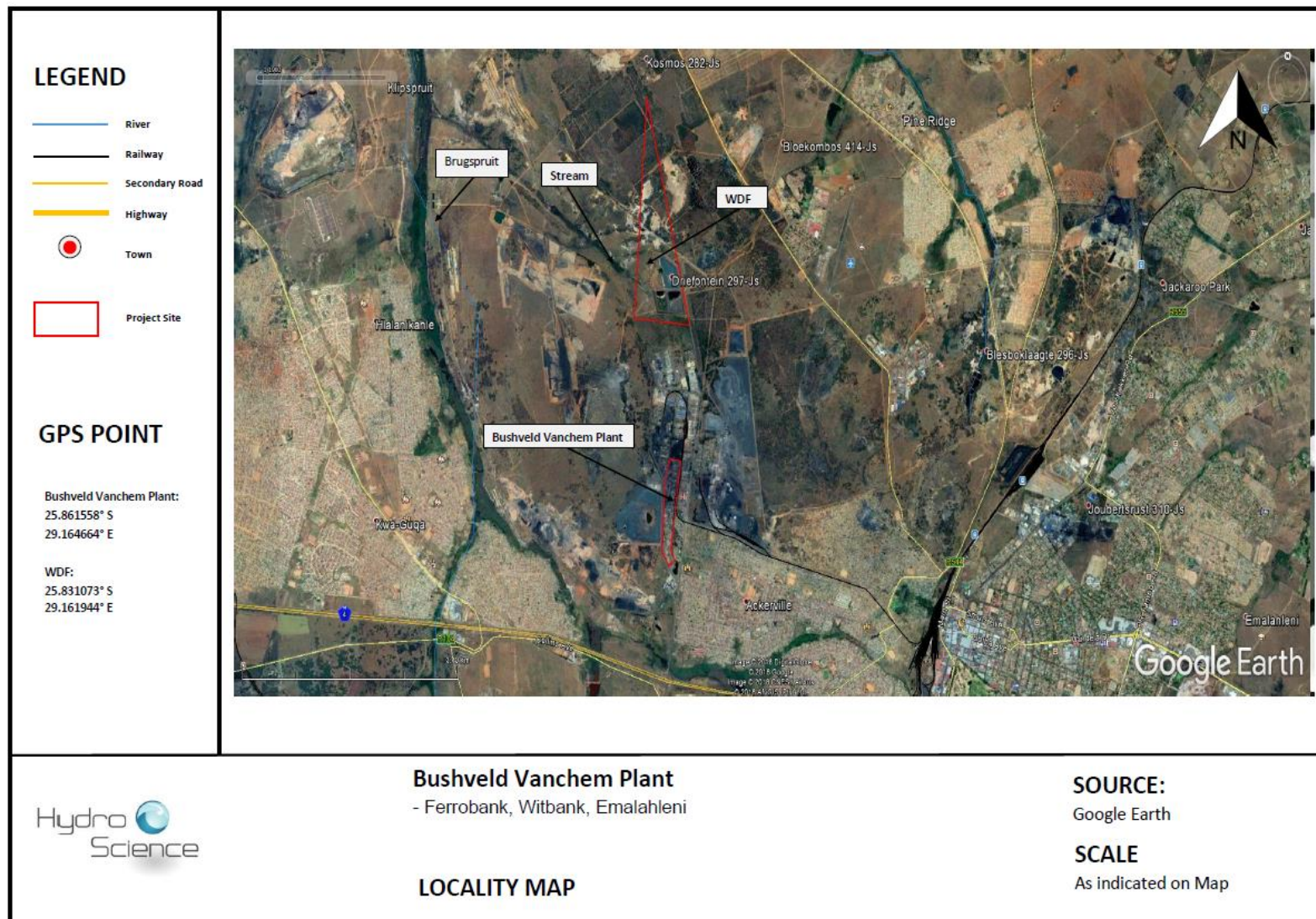


Figure 3-1: Bushveld Vanchem Locality (Google Earth)

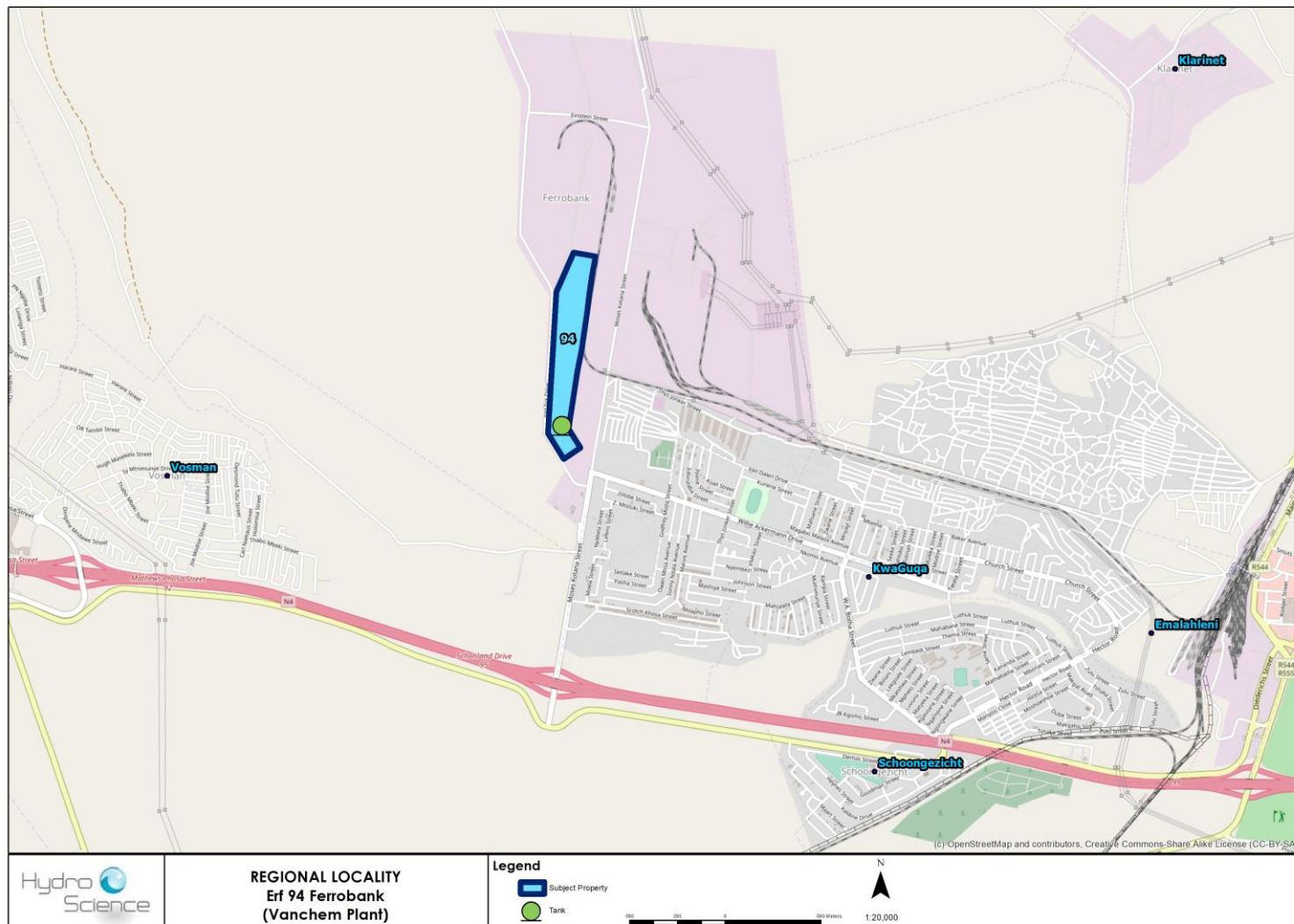


Figure 3-2: Bushveld Vanchem Locality

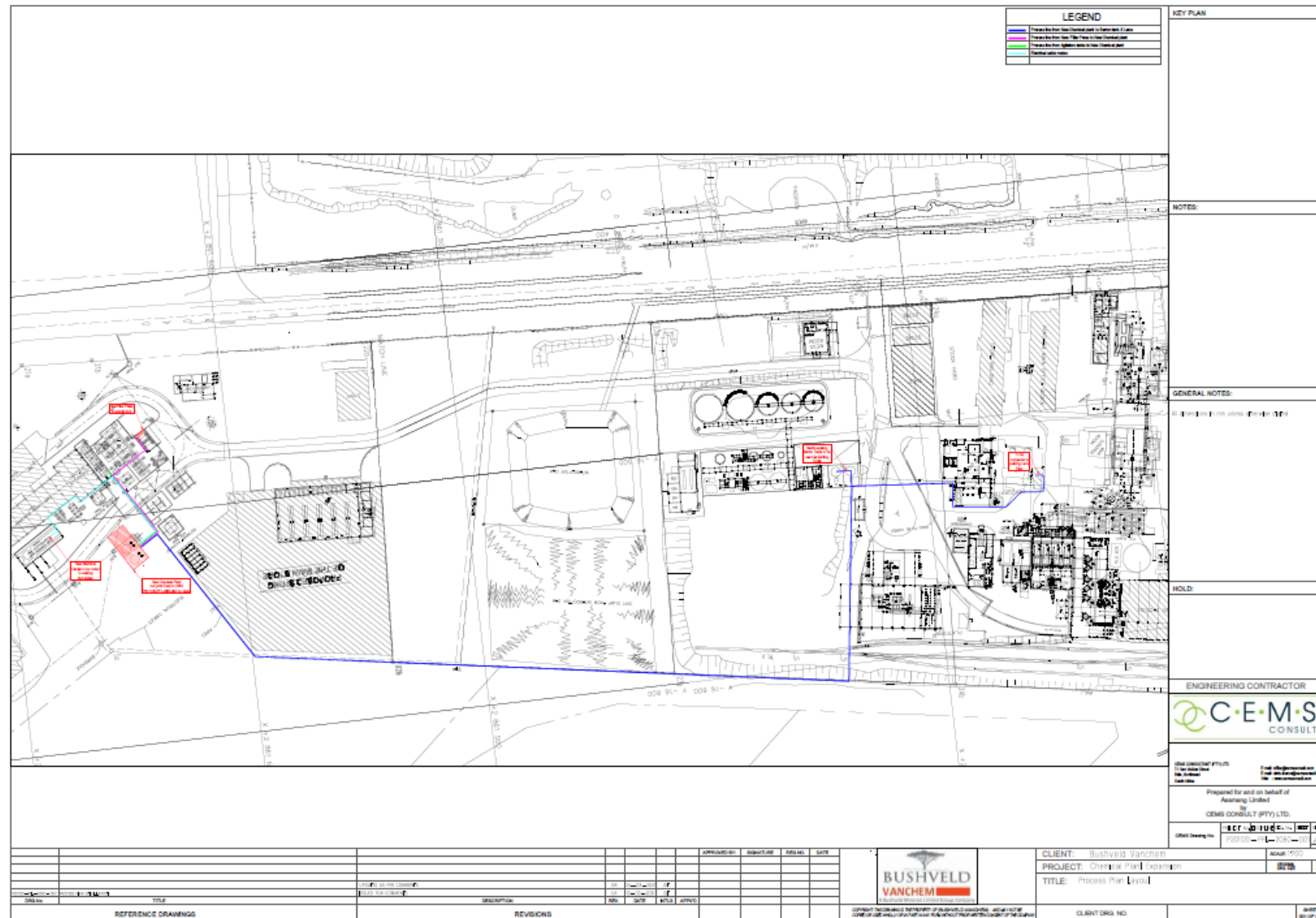


Figure 3-3: Location of changes and tanks on Bushveld Vanchem property (CEMS Consult)

4 PROJECT

4.1 Description of proposed project

Title:	The proposed expansion of the Chemical Plant at Bushveld Vanchem to install additional two (2) tanks of 60m ³ each as well as a filter press on Erf 94 in Ferrobank, eMalahleni Local Municipality, Nkangala District Municipality, Mpumalanga Province.
Changes:	<p>Two (2) tanks</p> <p><u>Capacity:</u> 2 X 60m³ = 120m³.</p> <p><u>Content:</u> Pregnant solution (dangerous good) to be processed to produce ammonium vanadate (AMV).</p> <p><u>Supporting structures:</u></p> <ul style="list-style-type: none"> • 5 Ton hoist mounted under roof to service the two tanks • Filter press • Electrical cables to existing substation • Overland pipeline connection to existing Larox Filter • Modification / conversion of Barren Tanks to serve as Settling tanks
Motivation for changes:	<p>Only Kiln 1 (32 tons/hour) is currently running at Vanchem and it supplies the Chemical Plant with pregnant solution. The Chemical Plant is running at capacity.</p> <p>There is an urgent need to restart Kiln 3 and have it running in order to increase production and improve financial viability. Kiln 3 (65 tons/hour) produces double the amount of pregnant solution of Kiln 1.</p> <p>Therefore, storage for the pregnant solution produced by Kiln 3 is required. A solution is to add capacity to the Chemical Plant.</p>
Objective of changes:	To use the pregnant solution produced by Kiln 3 in the Chemical Plant.
Benefits of changes:	<ul style="list-style-type: none"> • Kiln 3 can be started up again • Pregnant solution produced from Kiln 3 can be stored.
Schedule of project (phases):	Kiln 3 will be up-and-running and producing pregnant solution by 1 July 2021.

Purpose of application / process:	Apply for environmental authorisation for expansion of Chemical Plant to include two (2) additional tanks with total capacity of 120m ³ (listed activity above 80m ³).
Location:	25° 51' 55.76" South 29° 09' 52.61" East
Tank content:	<p><u>Input:</u> Pregnant solution – an acidic metal-laden solution resulting from leaching - in this case Vanadium (V)</p> <p><u>Output:</u> Ammonium vanadate (AMV)</p> <p><u>Reaction in tank:</u> $\text{NH}_4\text{SO}_4 + \text{Na}_2\text{VO}_3 \rightarrow \text{NH}_4\text{VO}_3 + \text{NaSO}_4$</p>
Capacity:	120m ³

4.2 Existing pregnant solution production

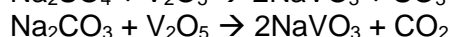
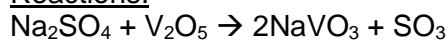
The production of pregnant solution is handled in the extraction section through the kilns and leach dams.

4.2.1 Extraction Section – Kiln

Objective:

To obtain a reaction between the magnetic ore containing vanadium and the added salts (reagents) so that the optimum amount of vanadium becomes available as a soluble salt and the vanadium is extracted in the leach dams.

Reactions:



Process Description:

The ore is prepared in the milling circuit. Ore from the dewatering belt filter in the milling circuit or the milled ore shed is fed onto the kiln feed table. In the case of Kiln 3, the reagents are added onto the feed table. The reagents that are added for extraction are sodium sulphate (Na_2SO_4) and sodium carbonate (Na_2CO_3). Na_2SO_4 reacts better with the ore but both reagents are used to ensure vanadium extraction is optimised in the leach dams.

The kiln feed screw discharges the salt-ore mix into the back of the kiln. When the salt-ore mixture is brought into contact with heat and an excess of oxygen, the vanadium in the ore which is water insoluble changes to a water-soluble vanadium-salt (this process is referred to as the extraction with the aim to extract > 85% of vanadium from the ore). The roasted salt-ore mix (also referred to as calcine) is discharged onto a cooling conveyor, which transports it into a leach dam.

The kiln is heated using pulverized coal, which is obtained by milling duff coal. Maximum temperature in the kiln is 1 150 °C. Built-up of chemicals (salts) against the kiln wall is removed by shooting either Lead or Zinc bullets into the kiln to break the built-up and release it (calcine lumps).

Suction through the system is obtained from a scrubber fan, which pulls the heat and fine dust through the kiln, through the dust collecting cyclones and through the wet scrubber at Kiln 3. The flue dust recovered at the dust collecting cyclones is returned as feed for the kiln. The dust that is taken out at the wet scrubber goes to the scrubber thickener, the clarified water then returns to the wet scrubber (recycling).

4.2.2 Extraction Section - Leaching

Objective:

To bring as much vanadium as possible into solution and to wash the calcine, so that only the insoluble or unconverted vanadium is left in the waste.

Process Description:

The calcine is conveyed onto a cooling conveyor to the quench tank. As the calcine discharges from the cooling conveyor, it is mixed with water in the quench tank and the calcine slurry then reports to one of the leach dams (tanks).

The dams are initially filled with water having a low vanadium content (slug dose), which was produced in the previous batch process. When the slug dose in the leach dam is at the correct level, the dam is ready to be put on line. The calcine is leached with water in the leach dam

until the concentration in the pregnant solution is at the desired value (60g/l if no slag is added or 95g/l if slag is added). The solution in the leach dam is circulated while the dam is on line. When the pregnant solution is at the required concentration, it is pumped to one of the pregnant solution tanks.

When the pregnant solution has been drained from the dams, the waste is then taken out and disposed of to the licensed Calcine Waste Disposal Facility (WDF), which is located north of the plant.

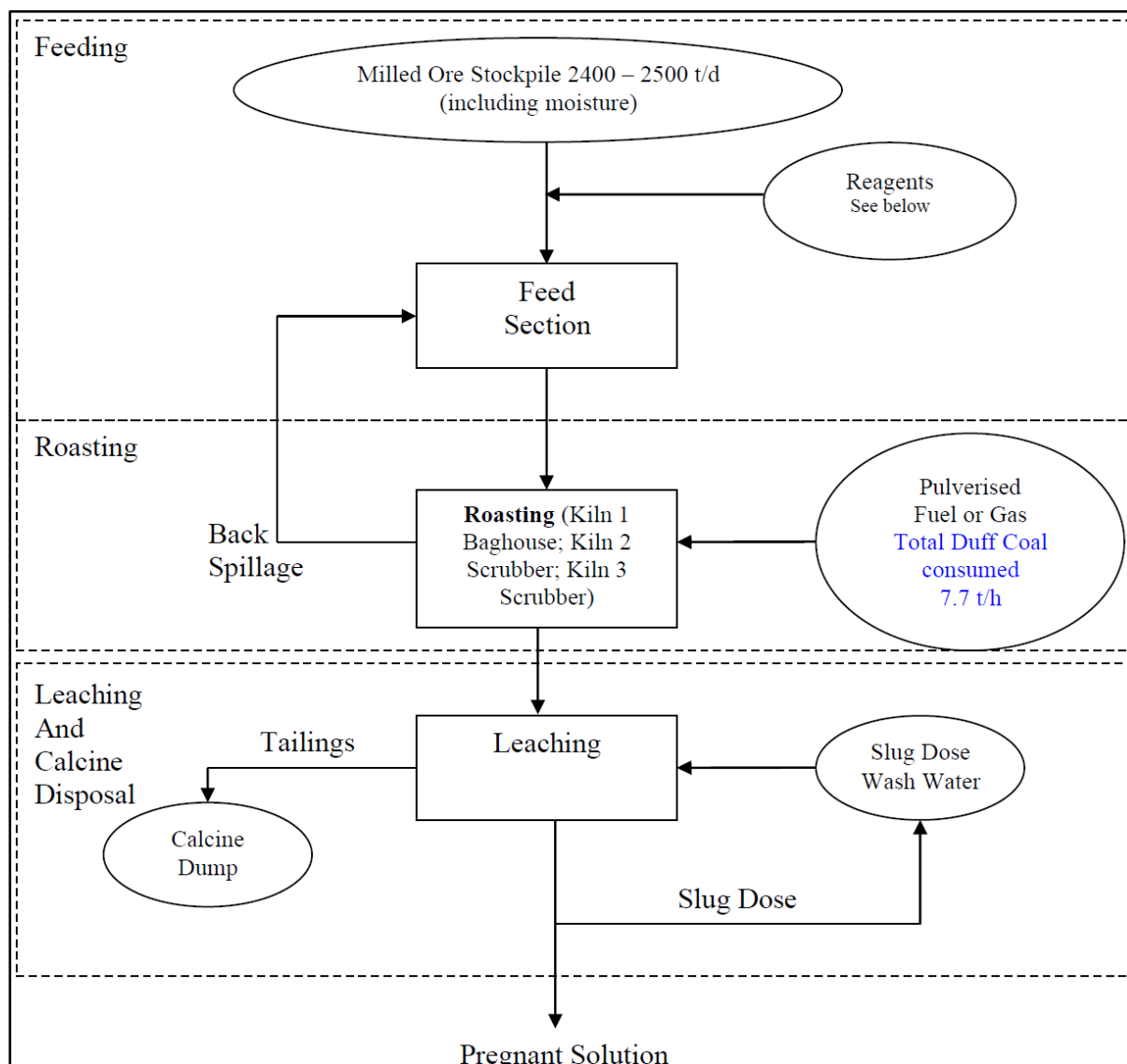


Figure 4-1: Extraction Section (existing) Process Flow Diagram

4.3 Existing Chemical Plant Operation

Objective:

Produce various vanadium chemicals.

Process Description:

When the pregnant solution is received, it is analysed. If the pH is incorrect, the pH is adjusted by either adding caustic soda or sulphuric acid. Aluminium sulphate is then added and the pregnant solution is heated to reduce the levels of the silica and aluminium. The pregnant solution is then pumped through a filter press, to remove the alumina silicate precipitate that was formed in the first process, to the clear tank. From the clear tank, the pregnant solution is pumped through a heat exchanger, to cool down the solution, to one of the stainless steel tanks (SST's). At the SST's either ammonium meta-vanadate (NH_4VO_3 [AMV]) or sodium ammonium vanadate ($2(\text{NH}_3)_2\text{O} \cdot \text{Na}_2\text{O}_5\text{V}_2\text{O}_5 \cdot 15\text{H}_2\text{O}$ [SAV]) is produced, by adding the correct amount of ammonium sulphate and maintaining the solution at the correct pH.

The AMV is used to produce potassium vanadate (KVO_3 [PMV]), with the addition of potassium carbonate and sodium meta-vanadate (NaVO_3 [SMV]), and with the addition of caustic soda.

Process of this application:

$\text{NH}_4\text{SO}_4 + \text{Na}_2\text{VO}_3$ (pregnant solution) \rightarrow NH_4VO_3 (ammonium vanadate) + NaSO_4 (salt for recycling)

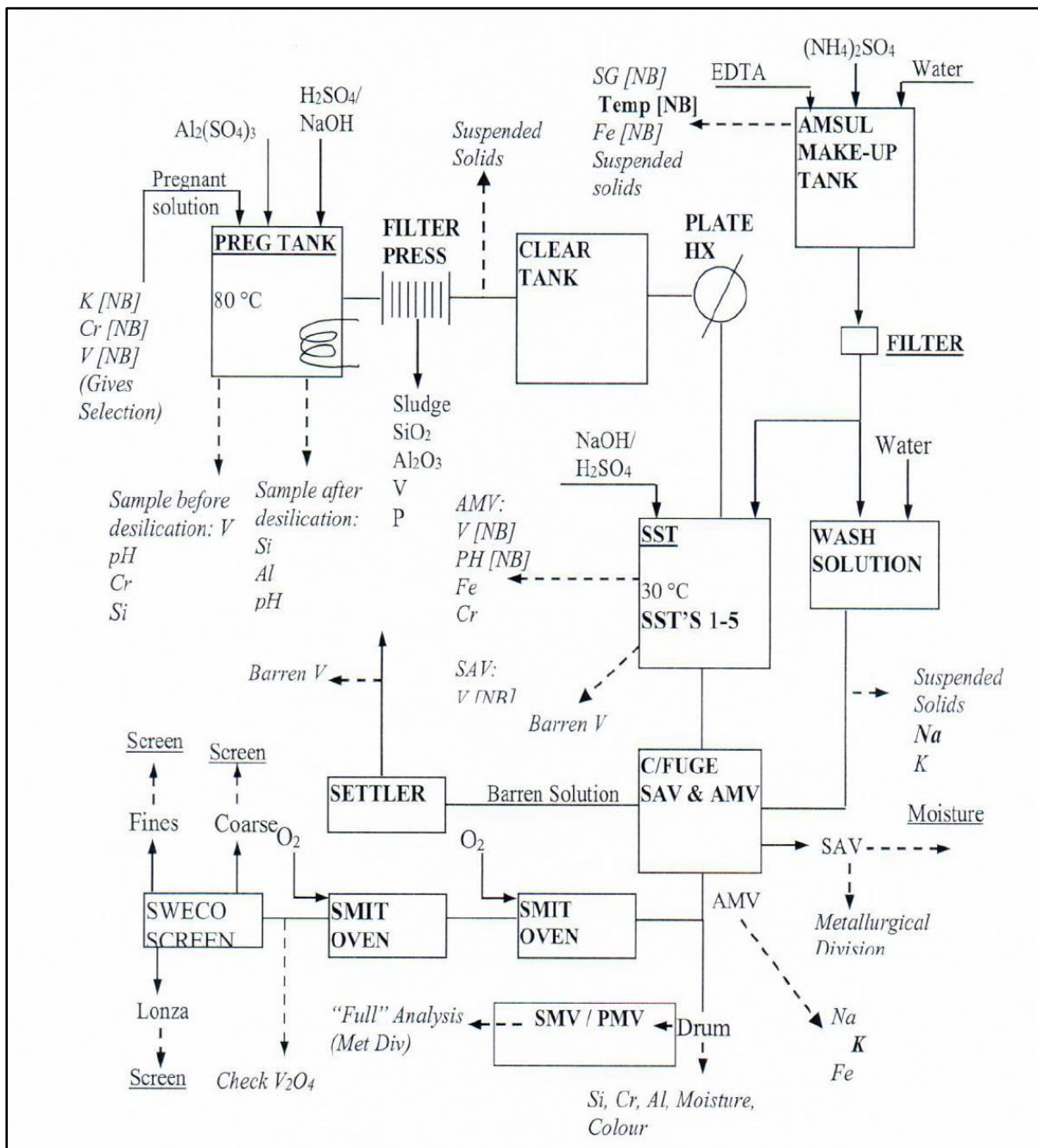


Figure 4-2: Chemical Plant (existing) Process Flow Diagram

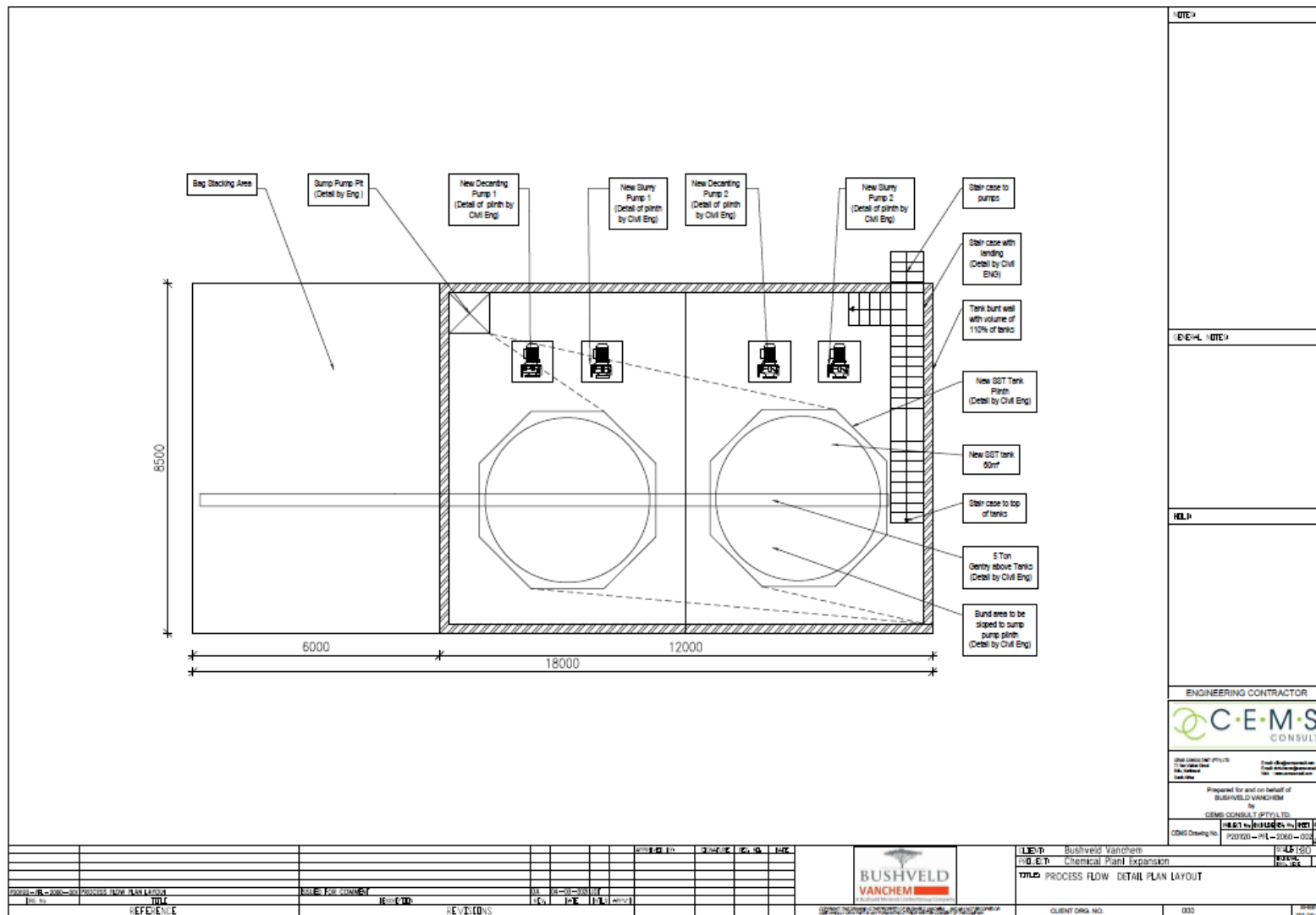


Figure 4-3: Proposed expansion layout – additional two tanks (CEMS Consult)

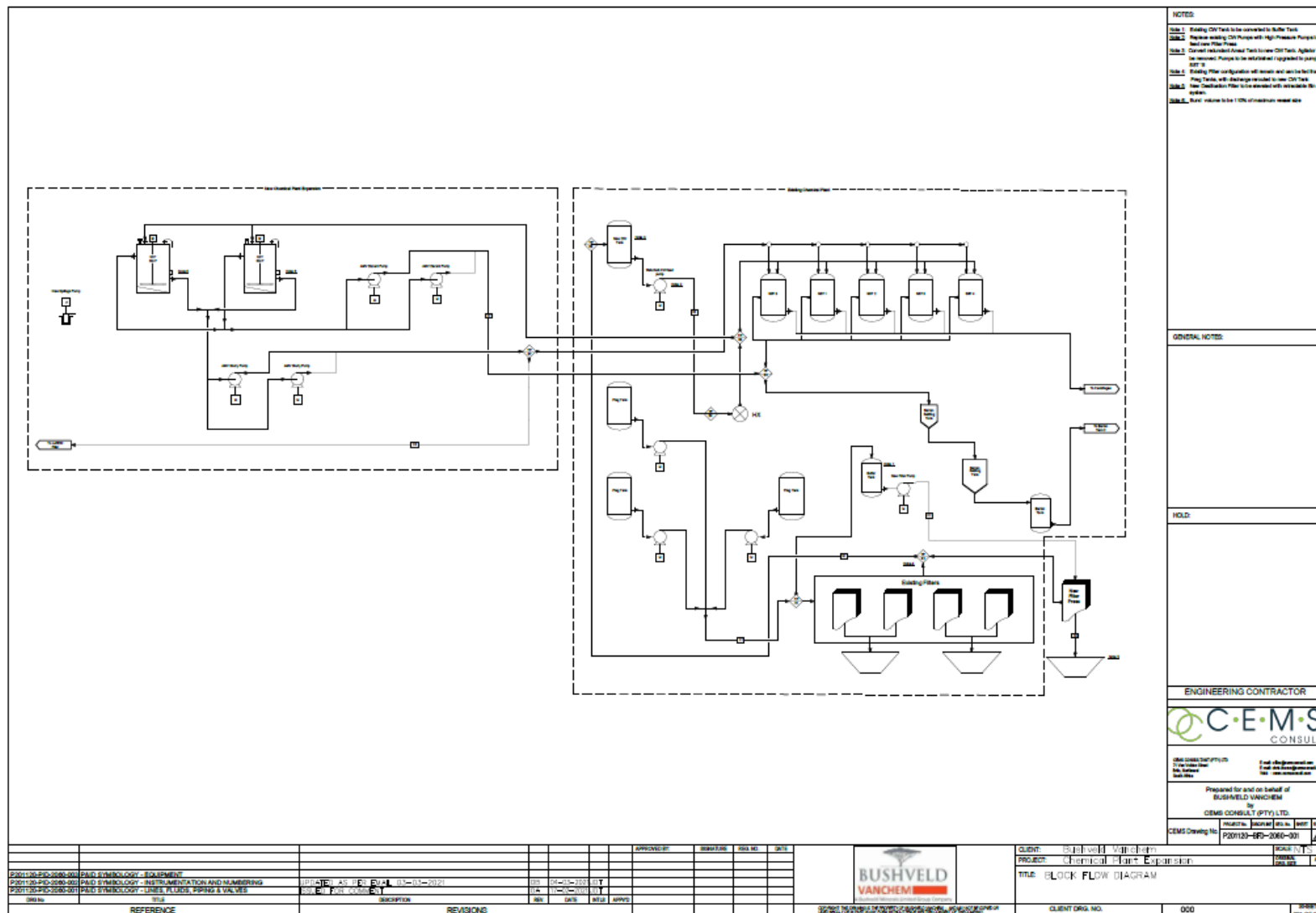


Figure 4-5: Process flow diagram (CEMS Consult)



Existing barren treatment tanks which will be used as settling tanks



Existing structures associated with the Chemical Plant surrounding the area of the proposed location of the new tanks (north)



Looking from the proposed location (west) towards the Chemical Plant



The proposed location of the new tanks (pioneer grasses covering the area) – looking east towards the property boundary (wall)

Figure 4-6: Photographs

4.4 Screening

The Department of Environment, Forestry & Fisheries (DEFF) screening tool was used and a screening report generated. The following came from the report:

Aspect:	Sensitivity:	Requirement:
EMF		Olifants Environmental Management Framework (EMF): EMF for Olifants and Letaba Rivers Catchment Areas – Zone A Highveld / Energy Hub Area
		Air Quality Priority Area Highveld Priority Area
Agricultural	High	The project property (Erf 94) has been used for industrial purposes for many years (since 1957) and is located within the Ferrobank Industrial Area of eMalaheni.
Animal	Medium	Mammalia: <i>Chrysoxalax villosus</i> (Rough-haired Golden Mole) Industrial site with industrial and human activity not allowing animals to naturally occur.
Aquatic biodiversity	Low	Industrial site. Brugspruit is >1.5km west with old T&DB mining site and Evraz Highveld dump between project site and water course.
Archaeological and Cultural Heritage	Low	Industrial site from 1957. See Archaeos exemption letter (Appendix E).
Civil aviation	High	Within 8km of civil aviation aerodrome. No impact on project. Project has no impact on aerodrome.
Defence	Low	No impact.
Palaeontology	Very High	Industrial site from 1957. Small footprint of approximately 300m ² . No further investigations conducted.
Plant	Low	Industrial site.
Terrestrial biodiversity	Very high	Vulnerable ecosystem. Industrial site which is developed and operational and therefore no ecosystem present / remaining on site.

4.5 Need and desirability

Addressing need and desirability is a way of ensuring sustainable development. Therefore, the project must be ecologically sustainable and socially and economically justifiable.

Economic Investment or Capital Value:	R30 million
Job created:	20 new permanent jobs created as part of refurbishment
Need & desirability	<p>Only Kiln 1 (32 tons/hour) is currently running at Vanchem and it supplies the Chemical Plant with pregnant solution. The Chemical Plant is running at capacity.</p> <p>There is an urgent need to restart Kiln 3 and have it running in order to increase production and improve financial viability. Kiln 3 (65 tons/hour) produces double the amount of pregnant solution of Kiln 1.</p> <p>Therefore, storage for the pregnant solution produced by Kiln 3 is required. A solution is to add capacity to the Chemical Plant.</p>
Fatal flaws:	No fatal flaws were identified.

5 LEGAL FRAMEWORK

5.1 Constitution of the Republic of South Africa (CRSA)

The Constitution of the Republic of South Africa (CRSA), 1996 (Act 108 of 1996) places a duty on the State to protect the environment. Section 24 states that:

“Everyone has the right

- a. to an environment that is not harmful to their health or well-being; and
- b. to have the environment protected, for the benefit of present and future generations, through reasonable legislative and other measures that
 - i. prevent pollution and ecological degradation;
 - ii. promote conservation; and
 - iii. secure ecologically sustainable development and use of natural resources while promoting justifiable economic and social development.”

The right in the CRSA is given effect in several articles of national legislation including the National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) as amended.

5.2 National Environmental Management Act (NEMA)

The National Environmental Management Act (NEMA), 1998 (Act 107 of 1998) as amended is the overarching environmental legislation in South Africa.

5.2.1 Sustainable development

The principle of Sustainable Development has been established in the CRSA and given effect by the NEMA. Section 1(29) of NEMA states that sustainable development means the integration of social, economic and environmental factors into the planning, implementation and decision-making process so as to ensure that development serves present and future generations. Thus, Sustainable Development requires that:

- The disturbance of ecosystems and loss of biological diversity are avoided, or, where they cannot be altogether avoided, are minimised and remedied.
- That pollution and degradation of the environment are avoided, or, where they cannot be altogether avoided, are minimised and remedied.
- That the disturbance of landscapes and sites that constitute the nation’s cultural heritage is avoided, or where it cannot be altogether avoided, is minimised and remedied.
- That waste is avoided, or where it cannot be altogether avoided, minimised and re-used or recycled where possible and otherwise disposed of in a responsible manner.
- That a risk-averse and cautious approach is applied, which takes into account the limits of current knowledge about the consequences of decisions and actions.
- Negative impacts on the environment, on people’s environmental rights be anticipated; and, prevented, and where they cannot altogether be prevented, are minimised and remedied.

Duty of care is addressed in Section 28 of the NEMA.

In terms of sustainable development:

- ***The disturbance of ecosystems, loss of biological diversity and the disturbance of landscapes and sites that constitute the nation’s cultural heritage are avoided through the placement of the additional Chemical Plant tanks within the existing***

operational footprint of the plant area (Erf 94) which is already disturbed and not on a green fields area.

- **Pollution and degradation of the environment are minimised through the license conditions and management measures.**
- **Waste cannot be avoided in an industrial process but will be handled at the existing licensed Waste Management Facilities (WML 12/9/11/L89/6) to the north of the plant or removed off-site for recycling / disposal.**
- **Other potential negative impacts identified will also be managed through the EMP.**

5.2.2 NEMA regulations

Government Notice Regulation (GNR) 982, 983, 984 and 985 of 4 December 2014 contain the latest regulations pertaining to Environmental Impact Assessment (EIA) under sections 24(5), 24M and 44 of the NEMA. These were amended / updated on 7 April 2017 under GNR 324, 325, 326 & 327.

GNR 982 as amended / updated in GNR 326 stipulate requirements in terms of processes to be followed and information to be included in documentation.

GNR 984 as amended / updated in GNR 325 was considered and no applicable activities were identified.

GNR 985 as amended / updated in GNR 324 was considered and no applicable activities were identified.

All activities identified for this project, which require environmental authorisation, are contained in GNR 983 as amended / updated in GNR 327.

5.2.3 Listed activities applicable

The following listed activities require environmental authorisation:

GNR & Date	Activity Number and Description	Project Description
GNR 983 as amended / updated in GNR 327 of 7 April 2017	Activity 51: The expansion and related operation of facilities for the storage, or storage and handling, of a dangerous good, where the capacity of such storage facility will be expanded by more than 80 cubic metres.	The existing Chemical Plant of Bushveld Vanchem's operations in Ferrobank, eMalahleni will be expanded to add facilities for the storage and handling of a dangerous good by constructing an additional two (2) X 60m ³ tanks to store pregnant solution.

5.3 National Environmental Management: Biodiversity Act (NEMBA)

5.3.1 Commitment to biodiversity conservation

Although South Africa became a signatory to the Convention of Biological Diversity in 1998, the more recent enactment of national legislation has affirmed our country's commitment to biodiversity and conservation as required in the CRSA. The National Environmental Management: Biodiversity Act (NEMBA), 2004 (Act 10 of 2004) has been promulgated by the South African President and was published in the Government Gazette in June 2004 (Volume 467; No. 26426). One of the objectives of this Act is to provide for the management and conservation of South Africa's biodiversity within the framework of the NEMA and to ensure the sustainable use of indigenous biological resources.

The Act, in protecting biodiversity, deals with:

- the protection of threatened ecosystems and species;
- the control of alien invasive species;
- the control of genetically modified organisms; and
- regulates bioprospecting.

As with NEMA, NEMBA incorporates and gives effect to international agreements relating to biodiversity.

5.3.2 Protection of threatened ecosystems and species

Ecosystems that are Critically Endangered, Endangered or Vulnerable can be listed in terms of Section 52 of the Act as threatened ecosystems at both national and provincial level. For example, Critically Endangered ecosystems are defined in the Act as being 'ecosystems that have undergone severe degradation of ecological structure, function or composition as a result of human intervention and are subject to an extremely high risk of irreversible transformation'. Importantly, any land-use change application occurring within an ecosystem listed as Critically Endangered or Endangered will automatically require environmental authorisation.

The terrestrial biodiversity theme indicates a vulnerable ecosystem. The area planned for the expansion is however within the operation footprint of the existing plant.

Threatened or Protected Species Regulations of 2013 (GNR388 of 2013): Part 2 of NEMBA provides for listing of species that are threatened or in need of protection to ensure their survival in the wild, while regulating the activities, including trade, which may involve such listed threatened or protected species and activities which may have a potential impact on their long-term survival. In February 2007, the Minister of Environmental Affairs and Tourism published a list of Critically Rare, Endangered, Vulnerable and Protected Species, according to Section 56(1) of the Act, which was updated again in 2013.

5.3.3 Control of alien invasive species

The list of alien and invasive species is intended to provide a legal framework to manage and control alien species that are considered invasive and that have the potential to threaten biodiversity, water resources and agricultural potential. NEMBA has identified all species that should be considered as alien or invasive species, as well as the restricted activities relating to each species. It is required by law (from 1 October 2014), for landowners to investigate the type and extent of alien invasive species growing on their property and to implement an effective control and eradication management plan.

116.26km² of tertiary catchment B11 is covered under alien invasive vegetation (EMF, 2009). Refer to Alien and Invasive Species Regulations, 2014 (GNR598). The Vanchem plant area has limited vegetation due to the industrial nature of the operations.

5.4 National Environmental Management: Waste Act (NEMWA)

In terms of the National Environmental Management: Waste Act (NEMWA), 2008 (Act 59 of 2008), the following is relevant to this project:

- DEA's Draft guidelines on the Separation of Waste at Source, 2018.
- GNR 926 of 29 November 2013. National Norms and Standards for the Storage of Waste. The storage of waste material on site has to comply with these Norms and Standards.
- GNR1093 of 11 October 2017. National Norms and Standards for the Sorting, Shredding, Grinding, Crushing, Screening or Bailing of General Waste.
- GNR 634 of 23 August 2013. Waste classification and Management Regulations (WCMR).
- GNR 635 of 23 August 2013. National Norms and Standards for the Assessment of Waste for landfill disposal.
- GNR331 of 2 May 2014. National Norms and Standards for the remediation of contaminated land and soil quality.
- Waste Management License (WML) 12/9/11/L89/6 for H:H waste storage, treatment and disposal of slimes and calcine (Site 2a) dated 2009-11-05. These existing facilities will be used for disposal of waste not taken off-site.

No amendments / changes are required to the WML as a result of this project.

5.5 National Environmental Management: Air Quality Act (NEMAQA)

In terms of the National Environmental Management: Air Quality Act (NEMAQA), 2004 (Act 39 of 2004), the following is relevant to this project:

- Location within Highveld Priority Area in terms of air quality.
- Existing AEL NDM/AEL/MP312/11/04/A dated 7 October 2020
 - Category 4: Metallurgical Industry.
 - Existing sub-categories:
 - Category 4.18: Vanadium ore processing

Storage tanks are not point source or fugitive emitting facilities, hence they do not trigger NEMAQA activities which result in atmospheric emissions as outlined in GN 893 of 22 November 2013 (Mr Rudzani Mudau).

5.6 National Water Act (NWA)

5.6.1 Water uses

The National Water Act (NWA), 1998 (Act 36 of 1998) Section 21 defines water use as:

- (a) taking water from a water resource.
- (b) storing water.
- (c) impeding or diverting the flow of water in a watercourse.
- (d) engaging in a stream flow reduction activity contemplated in section 36.
- (e) engaging in a controlled activity identified as such in section 37(1) or declared under section 38(1).

- (f) discharging waste or water containing waste into a water resource through a pipe, canal, sewer, sea outfall or other conduit.
- (g) disposing of waste in a manner which may detrimentally impact on a water resource.
- (h) disposing in any manner of water which contains waste from, or which has been heated in, any industrial or power generation process.
- (i) altering the bed, banks, course or characteristics of a watercourse.
- (j) removing, discharging or disposing of water found underground if it is necessary for the efficient continuation of an activity or for the safety of people.
- (k) using water for recreational purposes.

The project does not trigger any new water uses. Vanchem has an existing Water Use License (WUL) for Section 21 (c), (g) & (i).

5.6.2 Legal requirements

The NWA states in Section 22 (1) that a person may only use water –

- (a) without a licence –
 - (i) if that water use is permissible under Schedule 1;
 - (ii) if that water use is permissible as a continuation of an existing lawful use; or
 - (iii) if that water use is permissible in terms of a general authorisation issued under section 39;
- (b) if the water use is authorised by a licence under this Act; or
- (c) if the responsible authority has dispensed with a licence requirement under subsection (3).

Vanchem has a WUL 04/B11K/CGI/1617 for Section 21 (c), (g) & (i) dated 21 February 2012. No amendments / changes are required to the WUL as a result of this project.

5.7 National Heritage Resources Act (NHRA)

5.7.1 Legislation

The National Heritage Resources Act (NHRA), 1999 (Act 25 of 1999) requires protection of the following cultural heritage resources:

- a. Archaeological artifacts, structures and sites older than 100 years;
- b. Ethnographic art objects (e.g. prehistoric rock art) and ethnography;
- c. Objects of decorative and visual arts;
- d. Military objects, structures and sites older than 75 years;
- e. Historical objects, structures and sites older than 60 years;
- f. Proclaimed heritage sites;
- g. Grave yards and graves older than 60 years;
- h. Meteorites and fossils; and
- i. Objects, structures and sites of scientific or technological value.

The national estate includes the following:

- a. Places, buildings, structures and equipment of cultural significance;
- b. Places to which oral traditions are attached or which are associated with living heritage;
- c. Historical settlements and townscapes;
- d. Landscapes and features of cultural significance;
- e. Geological sites of scientific or cultural importance;
- f. Archaeological and paleontological importance;
- g. Graves and burial grounds;
- h. Sites of significance relating to the history of slavery; and

- i. Movable objects (e.g. archaeological, paleontological, meteorites, geological specimens, military, ethnographic, books etc.).

The area planned for the Chemical Plant expansion is within an existing operational industrial area but is classified as a high sensitivity in terms of Palaeontology. See Appendix E for Archaeologist exemption letter.

5.8 Other documents

The following documents were also considered:

- Department of Environmental Affairs (DEA), 2017. Integrated Environmental Management Guideline. Guideline on need and desirability. ISBN 978-0-9802694-4-4.
- DEA, 2017. Public participation guideline in terms of NEMA, 1998 EIA regulations. ISBN 978-0-9802694-2-0.
- Olifants Environmental Management Framework (EMF).

5.9 Supporting information

Appendix C contains copies of the existing licenses:

- WUL 04/B11K/CGI/1617 for Section 21 (c), (g) & (i) dated 2012-02-21
- WML 12/9/11/L89/6 for H:H waste storage, treatment and disposal of slimes and calcine (Site 2a) dated 2009-11-05
- AEL NDM/AEL/MP312/11/04/A for Category 4.18 dated 2020-10-07

6 ENVIRONMENTAL SETTING

6.1 Socio-economic Overview

Province:	Mpumalanga
District:	Nkangala District Municipality (NDM)
Local municipality:	eMalahleni
Spatial:	<p>The eMalahleni Local Municipality is strategically located in terms of the provincial context and transport network. It is situated in close proximity to the City of Johannesburg, City of Tshwane and Ekurhuleni Metropolitan Municipalities in Gauteng, and is connected to these areas by the N4 and N12 freeways.</p> <p>The southern areas of the eMalahleni Local Municipality form part of the region referred to as the Energy Mecca of South Africa, due to its rich deposits of coal reserves and power stations. The southward road and rail network connect the eMalahleni area to the Richards Bay and Maputo harbours, offering export opportunities for the coal reserves.</p> <p>In terms of the overall spatial structure, the eMalahleni Local Municipality can be described as a rural area, consisting of large farms, dispersed urban settlements, coal mines and power stations. A dominating feature in terms of the spatial structure is the transport network; specifically the N4 freeway and adjacent railway line which transverse the area from east to west and constitute the Maputo Corridor. The point of convergence of the N4 and N12 freeways and the railway lines that run parallel to these roads is a focal point in the spatial structure. eMalahleni town and its extensions have developed in a linear pattern along these freeways and railway lines, with the Central Business District (CBD) located north of the convergence point. There are various secondary roads in the area which provide strong north-south linkages. The dams and rivers in the area are also significant form-giving elements in the spatial structure. The rich coal deposits and coal mines throughout the area pose physical constraints to settlement development and expansion.</p> <p>The development pattern of the municipal area can be described as fragmented, due to the following attributes:</p> <ul style="list-style-type: none"> • The previous dispensation of separate development based on race; • Large areas within the municipal area are undermined or have mining rights. A good example of this is the area between the eMalahleni CBD and Kwa-Guqa, which resulted in the physical separation of these areas;

	<ul style="list-style-type: none"> • The Eskom power lines on the boundaries and within Kwa-Guqa hampers urban development within Kwa-Guqa; • Wetlands in the area between the eMalahleni CBD and Kwa-Guqa which pose a constraint to development in this area; • The Witbank Dam and Olifants River east of eMalahleni pose natural barriers for development in an easterly direction; and • The two freeways (N4 and N12) divide the eMalahleni urban areas in three (3) separate parts and hamper traffic flow between these areas.
<p>Demographics:</p>	<p><u>Area:</u> 2 677.67 km²</p> <p>Statistics South Africa: Population was 395 466 in 2011. Population was 455 228 in 2016. This represents a 3.2% growth rate per annum giving an estimate of 500 343 people in 2019. Population of 707 530 estimated for 2030. Households increased from 119 874 in 2011 to 150 420 in 2016 with household size declining from 3.3 to 3 over the same period. This is the third largest population in the province.</p> <p>Youth (15 – 34 years) make up 43.1% of population. Males are 52.9% of the population. Females are 47.1% of the population.</p> <p>(eMalahleni.gov.za)</p>
<p>Education:</p>	<p>25.5% increase in 20+ population from 2011 to 2016. No schooling declined from 14% (1996) to 5% (2016). Primary schooling declined from 20% (1996) to 10% (2016). Secondary schooling declined from 35% (1996) to 34% (2016). Matric increased from 18% (1996) to 37% (2016). Post matric declined from 10% (1996) to 8% (2016). Only one (1) satellite university in eMalahleni.</p> <p>(eMalahleni.gov.za)</p>
<p>Employment:</p>	<p>Unemployment decreased from 27.3% (2011) to 25.4% (2015) and then increased to 26.6% (2016). Poverty headcount deteriorated from 8% (2011) to 10.9% (2016).</p> <p>(eMalahleni.gov.za)</p>

<p>Health:</p>	<p>Top three (3) causes of death:</p> <ol style="list-style-type: none"> 1. Influenza & pneumonia 2. Tuberculosis 3. Other external causes of accidental injury <p>HIV prevalence rate was measured at 40.7% in 2013, the 9th highest of municipal areas in the province.</p> <p>(eMalahleni.gov.za)</p>
<p>Economy:</p>	<p>Population growth rate is higher than economic growth rate. This has a negative implication on GDP per capita, infrastructure, service delivery and job creation.</p> <p>eMalahleni contributes 45.9% of the economy of NDM (2019 Provincial Municipal Profile Report by Department of Economic Development & Tourism).</p> <p>eMalahleni is the biggest economic contributor to NDM and the second largest in the Province (after Mbombela) with 18% contribution to Provincial GDP in 2018.</p> <p>Economy was R66 billion in 2018.</p> <p>Sectors contributing (2017):</p> <ul style="list-style-type: none"> • Mining: 55% • Trade 9.1% • Community services: 8.9% • Finance: 7.9% <p>Projected GDP is 0.9% between 2018 and 2023.</p> <p>(eMalahleni.gov.za)</p>
<p>Land uses:</p>	<ul style="list-style-type: none"> • <u>Mining</u>: Coal mining is mainly conducted by opencast techniques, high extraction underground operations and conventional board-and-pillar underground operations. The coal mines provide essential fuel to the local power stations as well as to the domestic and international markets. Numerous abandoned mining operations are located towards the west and north-west of Witbank. • <u>Power stations</u>: Several large coal-fired power stations including Arnot, Hendrina, Komati, Duhva, Matla, Kriel and Kendal. These stations are all supplied from local feeder mines. Large ash disposal operations are associated with each power station. • <u>Industrial</u>: Although eMalahleni was traditionally known for coal mining and electricity production, other industries have also developed in the town, making eMalahleni a prominent industrial node. This includes metallurgical enterprises such as the production of steel, chrome and vanadium. Industries include Silicon Smelters, Glencore, Char Technologies, Bushveld Vanchem, Ferrobank Industrial area, Evraz Highveld, Ferrometals.

	<ul style="list-style-type: none"> • <u>Agricultural</u>: Crop cultivation & livestock farming. Both dryland and irrigated farmlands, with many areas in the southern and central portions producing high yields of maize. Irrigation farming of diverse crops, the largest of which is the Loskop Dam Irrigation Scheme. Intensive farming in the form of piggeries and cattle feed lots. 54.99km² of tertiary catchment B11 is under irrigation (EMF, 2009). • <u>Urban</u>: Witbank, Clewer & Kwa-Guqa
<p>Bushveld Vanchem's operations and products:</p>	<p>The Vanchem plant is a major producer of vanadium (V) products in the world market, exporting approximately 90% of its production. Vanchem is an ore processing facility that produces a variety of Vanadium based products:</p> <ul style="list-style-type: none"> • Ferrovandium is produced at the FeV Smelter and SAJV plants which are situated on the Highveld Steel site; • Vanadium Trioxide and Vanadium Pentoxide are produced in the Oxides plant at the Vanchem Plant; and • Ammonia Meta Vanadate (AMV), Sodium Meta Vanadate (SMV), Potassium Meta Vanadate (PMV) and V₂O₅ powders are produced inside the Chemical Plant at the Vanchem Plant. All products produced in the Chemical Plant are mainly for the high quality niche vanadium markets and represents about 20 % of the total exports.
<p>Bushveld Vanchem's processes:</p>	<p>Magnetite ore arrives in crushed aggregate form and undergoes further crushing in the ball mills (Milling circuit). The wet mill process produces fine slurry and the vanadium-containing magnetic portion is separated from other impurities (non-magnetics) by means of magnetic separation. The next step is a kiln roasting process that uses sodium sulphate and sodium carbonate to react with the vanadium in the milled ore and yield a soluble vanadium salt (Extraction section). The kiln product (a soluble salt containing the vanadium) then goes through a leaching process to yield a vanadium-rich solution. The resulting solution (pregnant solution) is then passed to the Oxides Section or Chemical plant where precipitation, filtration and final product finishing processes are completed to yield a variety of final products.</p>
<p>Bushveld Vanchem's structures & infrastructure:</p>	<ul style="list-style-type: none"> • Raw material handling – rail & road transport (ore arrival), stockpiles or storage areas, equipment such as tippler, silos etc. • Milling circuit to reduce particle size and remove waste <ul style="list-style-type: none"> ○ Ball mills & cyclone, ○ Magnetic separators and Belt filters (dewatering by vacuum), ○ Thickener (settling and thickening) & slimes disposal facility (SDF) for waste slimes,

	<ul style="list-style-type: none"> ○ Milled ore stockpiles & storage (product from milling circuit). ● Extraction section <ul style="list-style-type: none"> ○ Three (3) Kilns for roasting, ○ Wet scrubbers or baghouses for management of off gasses, ○ Leach tanks (preparation of vanadium salt solution or pregnant solution), ○ Preg storage tanks (for distribution to PV & chemical plants), ○ Waste disposal facility (WDF) for hazardous solid waste resulting from roasting (including wet scrubber sludge). ● Oxide Section <ul style="list-style-type: none"> ○ APV (Ammonia polyvanadate) plant, ○ Deammoniators & Fusion furnaces, ○ Hivox plant ● Chemical plant ● Ferrovandium plant (at Highveld Steel site) ● Product handling facilities - sorting, packaging (drums) and despatch ● Wastewater management facilities <ul style="list-style-type: none"> ○ Barren Treatment Plant (BTP) ○ Mechanical Vapour Recompression (MVR) ● Storm Water Management System <ul style="list-style-type: none"> ○ Storm Water Dam, ○ Van Eck Road channel, ○ Silt traps. ● Transport yard & workshops – maintenance ● Offices & canteen ● Laboratory - product analyses & testing ● Research & development section – pilot studies & developmental work
<p>Additional requirement: capacity</p>	<p>Only Kiln 1 (32 tons/hour) is currently running at Vanchem and it supplies the Chemical Plant with pregnant solution. The Chemical Plant is running at capacity.</p> <p>There is an urgent need to restart Kiln 3 and have it running in order to increase production and improve financial viability. Kiln 3 (65 tons/hour) produces double the amount of pregnant solution of Kiln 1.</p> <p>Additional pregnant solution will require storage facilities, hence the need for two (2) additional 60m³ tanks.</p> <p>An alternative solution is to add capacity to the Chemical Plant.</p>
<p>Economic Investment for project:</p>	<p>R30 million</p>

Job creation:	Vanchem employs over 300 people. The new project will create another 20 new permanent jobs as part of refurbishment.
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6.2 Biophysical Environmental Overview

Access:	<p>N4 between Pretoria and Nelspruit (Mbombela) is located 1.3 km south of Vanchem. From the N4 take the Schonland Drive (Ferrobank) off-ramp. Vanchem plant is located between Schonland Drive and Van Eck Road, entrance is along Van Eck Road.</p>
Services:	<p>Vanchem is supplied with municipal services.</p>
Climate:	<p>Highveld climatic region.</p> <p><u>Precipitation:</u> Dry cold winters and warm summers with thunderstorms. Annual rainfall, which falls mainly during summer, varies between 550 and 800 mm. Precipitation occurs as showers and thunderstorms mainly from October to March with maximum events occurring in November, December and January. Rainstorms are often violent (up to 80 mm can occur in one day) with severe lightning and strong winds, sometimes accompanied by hail. Frost can be expected to occur between May and mid-September, with an average of 58 frost days per annum.</p> <p>Mean Annual Precipitation (MAP): 687 mm/annum Mean Annual Evaporation (MAE): 1 597 mm/annum (WR90) Mean Annual Runoff (MAR): 22.9 million m³/annum (WR2005)</p> <p><u>Temperature:</u> The annual mean temperature is 15°C. The highest average maximum daily temperatures occur during November to March ranging from 25.2°C to 27.5°C. June, July and August can be regarded as the coldest months with the average minimum temperatures ranging from 5.0°C to 6.0°C. Monthly minimum: -2.3°C (July) Monthly maximum: 33.4°C (December)</p>
Topography:	<p>Mpumalanga Highveld region.</p> <p>The elevation at which the new tanks will be placed is 1 531 meters above mean sea level (mamsl).</p> <p>The low point on the site is just north of the Chemical Plant.</p>
Water environment:	<p><u>Water Management Area (WMA):</u> 4 Olifants (54 550 km²)</p> <p><u>Sub-catchment:</u> Upper Olifants River (12 285 km²). Klipspruit drains into Olifants River above Loskop Dam (before Olifants/Wilge confluence). The Upper Olifants River catchment comprises the drainage areas of the Olifants River, Klein Olifants River and Wilge River with tributaries down to the Loskop Dam. The headwaters of these rivers are located along the Highveld Ridge in the Secunda-Bethal area and the rivers then flow in a northerly direction towards</p>

	<p>Loskop Dam. The major tributaries are the Steenkoolspruit, Klein Olifants River, Wilge River and Elands River.</p> <p><u>Catchment area:</u> 376 km²</p> <p><u>Quaternary catchment:</u> B11K</p> <p><u>Dams:</u> The natural rivers and streams have been extensively dammed with the result that the stream flow is now highly regulated. The major impoundments upstream of Loskop Dam include Witbank Dam, Middelburg Dam, Bronkhorstspruit Dam and Premiere Mine Dam. Many smaller farm dams and water supply structures associated with the mining operations have also been constructed in the catchment.</p> <p><u>Streams / rivers:</u> The Brugspruit is located 3km west of the Vanchem Plant. The Brugspruit is a tributary of the Klipspruit.</p> <p><u>Legal:</u> Vanchem has a WUL 04/B11K/CGI/1617 for Section 21 (c), (g) & (i) water uses in terms of the NWA. No changes required for this license in terms of this project.</p> <p><u>Water sources:</u> Water for domestic and industrial purposes is sourced from the municipal water supply. Water in the waste management circuit (milling and slimes) is recycled in a closed circuit.</p> <p><u>Storm water:</u> Potentially contaminated storm water runoff from the plant area is channelled to the Storm Water Dam (SWD) in the south (Erf 4) for reuse.</p>
<p>Air environment:</p>	<p><u>Highveld Priority Area (HPA):</u> National air pollution hotspot in terms of Section 18(1) of the NEMAQA on 23 November 2007.</p> <p>Industrial sources are the largest contributor of emissions, accounting for 89% of PM₁₀, 90% of NO_x and 99% of SO₂. Major industrial source contributors fall into the following categories:</p> <ol style="list-style-type: none"> 1. Power Generation 2. Coal Mining 3. Primary Metallurgical Operations 4. Secondary Metallurgical Operations 5. Brick Manufacturers 6. Petrochemical Industry 7. Ekurhuleni Industrial Sources (excluding the above) 8. Mpumalanga Industrial Sources (excluding the above) <p>eMalahleni is a hot spot for PM₁₀ and SO₂ in terms of the HPA. Concentrations of PM₁₀ and SO₂ at the KwaGuqa Township monitoring station show major contributions from the northwesterly direction, with secondary sources in the</p>

	<p>southeasterly and southwesterly directions. This is consistent with the large industrial area, Ferrobank, in the northwest, and various mining operations to the south. (HPA AQMP, 2011)</p> <p><u>Legal:</u> Vanchem has an AEL NDM/AEL/MP312/11/04/A for Category 4 (Metallurgical Industry) Category 4.18 (Vanadium Ore Processing) in terms of the NEMAQA.</p>
Waste management:	<p><u>Location:</u> The waste management area (slimes and calcine) is located north of the Vanchem plant on the remaining extent of Portion 24 of the farm Driefontein 297JS.</p> <p><u>Legal:</u> Waste Management License (WML) 12/9/11/L89/6 for H:H waste storage, treatment and disposal of slimes and calcine (Site 2a) dated 2009-11-05.</p> <p><u>Chemical plant waste:</u> An alumina silica cake is produced by the Chemical Plant and is removed off-site for disposal.</p>
Site of expansion:	<p>Disturbed due to industrial activities. Vegetation consists of pioneer grasses indicating former disturbance.</p>
Archaeology & Cultural Heritage:	<p>Low sensitivity (screening report, Section 4.4). The chances of finding any heritage related features on the proposed site are indeed extremely slim, if any (Archaetnos exemption letter, 2021).</p>

7 ALTERNATIVES CONSIDERED

7.1 Land use alternative

The property is already used for industrial purposes and no alternative land use was therefore considered.

7.2 Location alternative

The expansion has to occur on an available vacant area in close proximity to the existing Chemical Plant. The position is available (void of other structures) and in close proximity to the existing Chemical Plant to allow links with existing structures and processes for optimal functionality. An alternative location on the property was therefore not considered as the property is fairly built-up with existing structures and this was the most practical location.

7.3 Capacity alternative

The capacity (120m³) was based on requirements in terms of pregnant solution produced and therefore no alternative capacity was considered.

7.4 Layout alternative

Only two (2) tanks will be established and therefore layout alternatives were not considered.

7.5 No-go alternative

The no-go alternative would be to not proceed with the project. In this case, Vanchem has three (3) options:

- To not start up Kiln 3 and therefore not increase pregnant solution production. Therefore operate the Vanchem Plant at minimal capacity.
- To delay Kiln 3 start up to when the Oxide Section has been refurbished and can be used again in 2025.
- To only establish a 60m³ tank (below listed activity threshold of 80m³) for storage and processing. This will provide inadequate capacity for the pregnant solution produced by Kiln 3.

8 PUBLIC PARTICIPATION PROCESS

8.1 Summary

Newspaper notice:	Newspaper: Witbank News Date: 2021-03-19 Page: 17 Refer to Appendix F for tear sheet.
Site notices:	Date placed: 2021-03-15 Size of notices: 800 X 600 mm Number of notices placed: 4 Size & wording: Figure 8-1. Location: Figure 8-2 & 8-3.
Interested and Affected Parties (I&APs):	Number of surrounding property owners: ±14 Number of hand-delivered notices: 7 Number of people emailed: 95 (2021-03-18) including: <ul style="list-style-type: none"> • Local municipality (14) • District municipality (3) • Province (13) • National (4) • DWS (5) • SAHRA (upload on SAHRIS) • Other (±6)
Comments received:	Registered: Shell (provided copy of report) NDM (changes to AEL required) MDARDLEA (Jan Venter – comments and copy of report) Motube & Dizmos (services offered) Enough is enough Workers Forum
Comments relate to:	Registration and requesting copies of document for review.

8.2 Introduction

The Public Participation Process (PPP) aims to provide all Interested and Affected Parties (I&APs) with clear, accurate and comprehensible information about the project for the proposed expansion of the Chemical Plant at Bushveld Vanchem to install another two (2) tanks of 60m³ each as well as a filter press on Erf 94 in Ferrobank, eMalahleni Local Municipality, Nkangala District Municipality, Mpumalanga Province. In addition, the process seeks to provide I&APs with the opportunity to indicate their viewpoints on issues and concerns about the proposed project.

This process, therefore, enhances transparency and accountability in decision-making, as it allows all I&APs to suggest ways of avoiding, reducing or mitigating potential negative impacts, as well as enhance positive impacts of the proposed project. All inputs from the I&APs are considered in the planning process. Consequently, clear recording of all issues and concerns raised have been maintained in a comments and response register. This register has been updated when new issues or concerns were raised.

This section provides a methodical description of the PPP followed. It also contains a complete record of public notices, details of all registered I&APs and all communications to and from I&APs pertaining to the application.

8.3 Approach

The aim of the PPP is not only to adhere to the required legislation, but also to give as many stakeholders and I&APs as possible, an opportunity to be actively involved in this process.

The PPP has been carried out in accordance with Chapter 6 of the NEMA and in support of the EIA Regulations of 2014 as amended. Based on these Regulations, published in terms of Sections 39 to 44 of GNR 982 amended in GNR 326 of NEMA, the following steps were undertaken:

- Potential I&APs were identified through using a historic stakeholder database, windeed searches, conducting a visit to the area and conducting interviews (15 March 2021), through site notices placed (Figures 8-1 – 8-3) as well as through placing a notice in the Witbank News;
- A stakeholder register was compiled in terms of Regulation 42 that includes national, provincial and local authorities, government departments, organisations, as well as landowners that may have an interest;
- I&APs were given two (2) months to register and raise concerns (March – May 2021) which included 30 days to review the draft BAR (19 April – 19 May 2021). A hard copy was intended to be placed at the eMalahleni (Witbank) Library but the site is under demolition. A soft copy was made available upon request. Any concerns that have been raised by I&APs were acknowledged, noted and addressed (Table 8-3 – 8-4) by the EAP where possible;
- A recorded summary of concerns raised by I&APs, as well as the responses from the EAP, were kept throughout the entire process.

8.4 Public awareness

8.4.1 Site Notices

Site notices, measuring 800 mm x 600 mm, were placed at locations where these would be most visible. The notices were placed as follows:

- At the Chemical Plant entrance: 25° 51' 58.5" South; 29° 09' 50.3" East
- At the Stores & Receiving Entrance: 25° 51' 45.0" South; 29° 09' 49.7" East
- At the Main Entrance (Administration): 25° 51' 42.1" South; 29° 09' 49.9" East
- At the Northern Entrance: 25° 51' 32.0" South; 29° 09' 50.8" EAST

Each notice contained details regarding the applicant (Bushveld Vanchem (Pty) Ltd), the nature of the activity (installation of another two (2) tanks of 60m³ each as well as a filter press at the Chemical Plant), location (Erf 94 in Ferrobank, eMalahleni Local Municipality, Nkangala District Municipality, Mpumalanga Province) and the contact details of the EAP (See Figure 8-1). The placement of the site notices was recorded by taking photographs of the placed notices on site, as well as by recording the GPS coordinates of these positions. See Figures 8-2 – 8-3. These notices remained on the site for the duration of the process (March – June 2021).

8.4.2 Newspaper Notice

A detailed newspaper notice was placed in the Witbank News (page 16) of 19 March 2021. The newspaper is distributed as follows:

25 000 copies per week to:

- Witbank
- Middelburg
- Ogies
- Phola
- Kriel
- Van Dyksdrift
- Kendal Power Station
- Wonderfontein
- Arnot
- Pullenshope
- Groblersdal
- Marble Hall
- Loskop
- Bronkhorstspuit
- Stoffberg

The aim of placing a notice in the local newspaper was to create a greater awareness of the project and to invite a broader spectrum of I&APs to register and be part of the process.

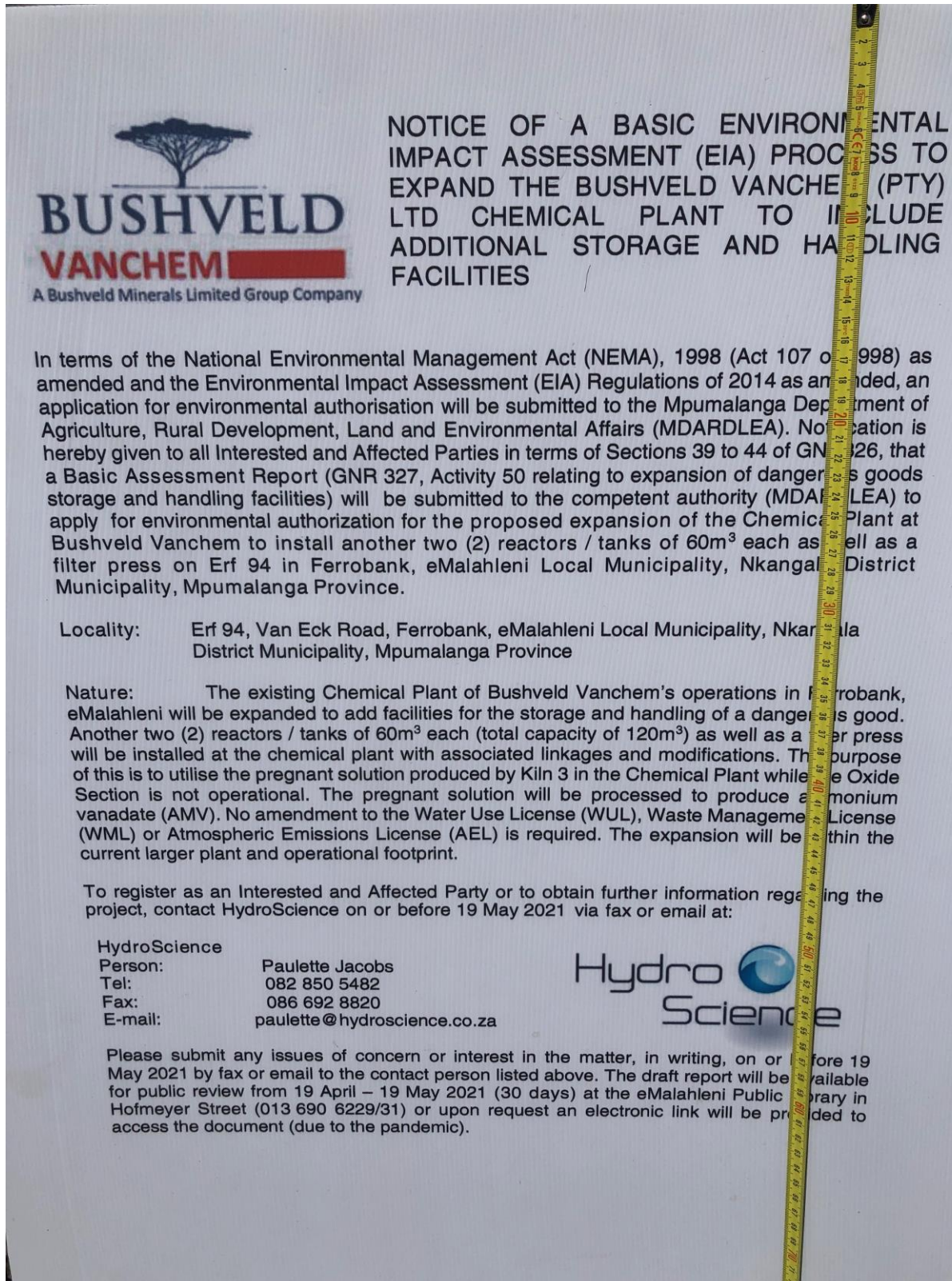


Figure 8-1: Wording and size of notices placed



Site notice 1: At the Chemical Plant entrance
25° 51' 58.5" South; 29° 09' 50.3" East



Site notice 2: At the Stores & Receiving Entrance
25° 51' 45.0" South; 29° 09' 49.7" East



Site notice 3: At the Main Entrance (Administration)
25° 51' 42.1" South; 29° 09' 49.9" East



Site notice 4: At the Northern Entrance
25° 51' 32.0" South; 29° 09' 50.8" East

Figure 8-2: Notices placed

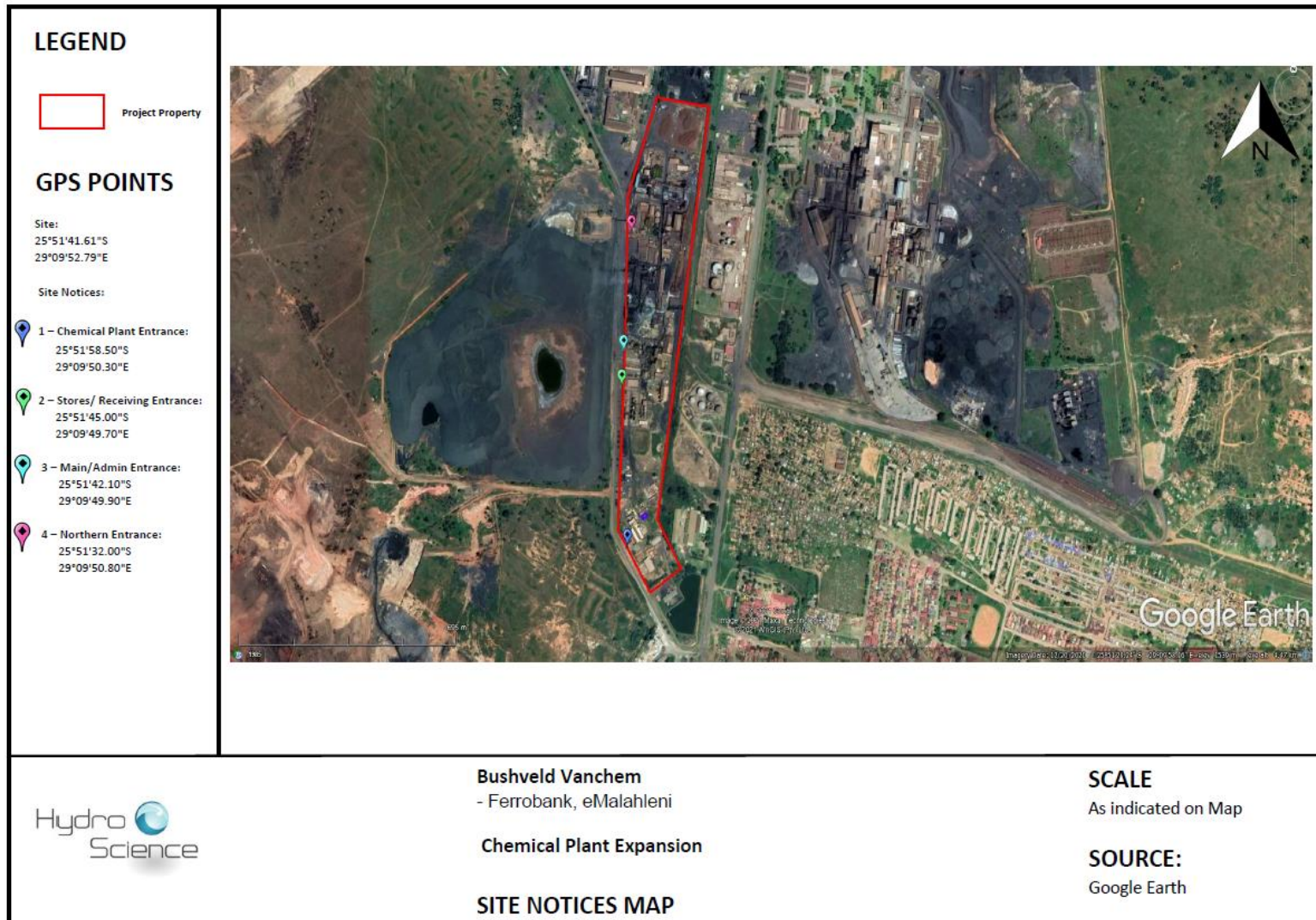


Figure 8-3: Aerial view of location of site notices

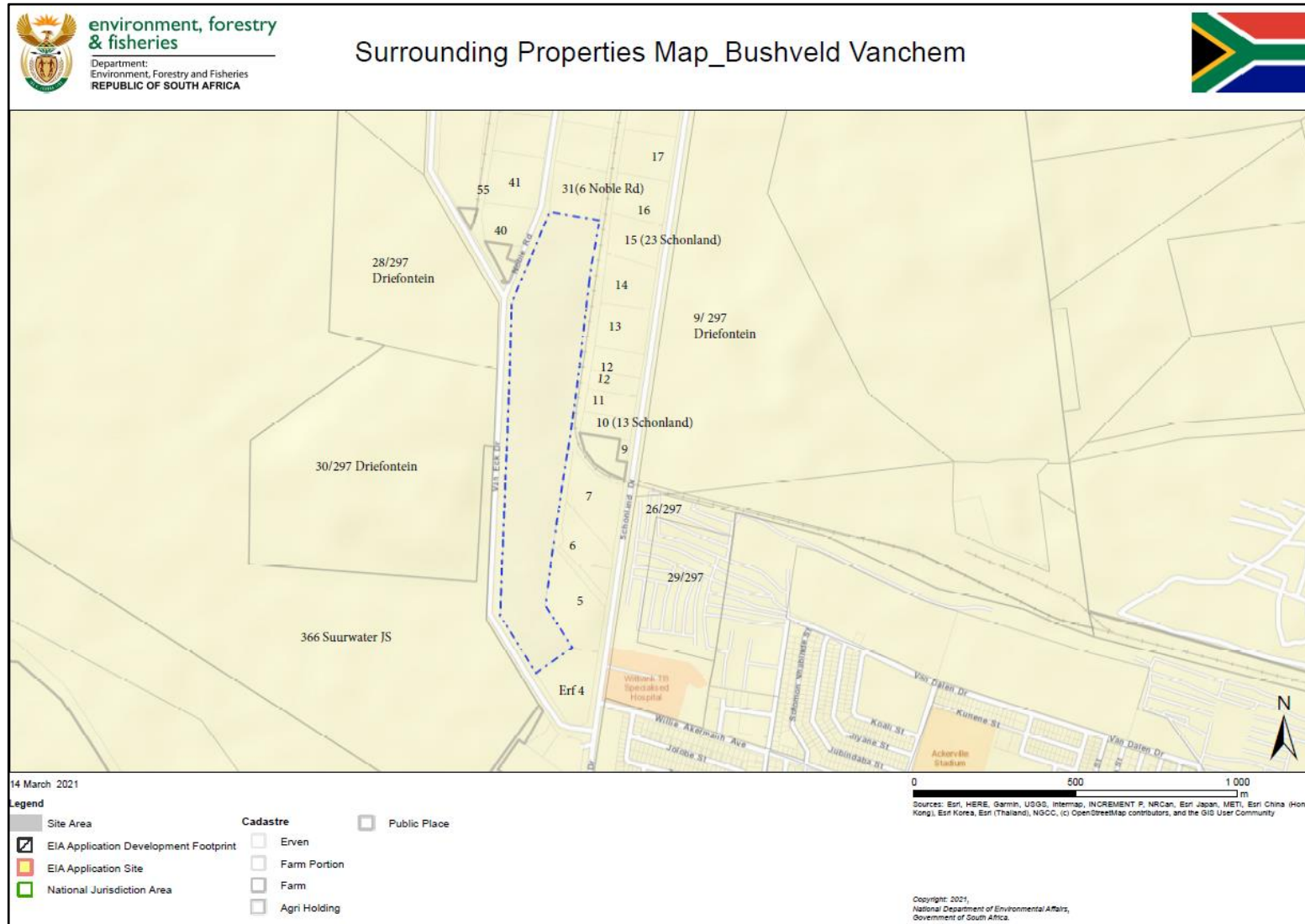


Figure 8-4: Aerial view of neighbouring properties

Table 8-1: List of I&APs**Direct neighbours:**

- Samancor Ferrochrome
- FLSmidth
- Evraz Highveld Steel
- Chartech
- Phola Coaches
- MST
- Engen Ferrobank
- Mpumalanga Regional Trust
- Shell
- Transnet Pipelines
- Blue Ribbon Business Park
- Reclam
- Cranes4hire etc.

Authorities:

- Local authority – eMalahleni (14 people)
- District authority – Nkangala (3 people)
- Provincial authority – MDARDLEA (13 people)
- National authority – DEFF (4 people)
- DWS (5 people)
- SAHRA (SAHRIS)

Others:

- Mpumalanga Wetland Forum
- National African Federated Chamber of Commerce (NAFCOC)
- NUMSA
- Solidariteit

8.5 Comments and Response Register

Any concerns that were raised by I&APs during the process were recorded and addressed by the EAP where possible (see Table 8-3). All proof of communication can be seen in Appendix F.

Furthermore, all registered I&APs were given an opportunity to comment in writing (19 April – 19 May 2021), on the draft BAR before its submission to the competent authority, MDARDLEA, in May 2021.

8.6 BAR Submission

The draft BAR was made available for public review, electronically upon request, from 19 April – 19 May 2021. All I&APs have therefore been given an opportunity to comment on this document. Once the period for comments lapsed, all comments made were included in the comments and response register.

After submission of the draft BAR to the authorities, during the public review period, the authorities were also afforded an opportunity to submit their comments to be addressed in the final BAR.

The final BAR (including all supporting documentation) will be submitted to MDARDLEA for consideration. A decision will be provided by MDARDLEA in terms of their considerations and findings and if authorised, conditions of the authorisation will be provided.

Figure 8-4: Bushveld Vanchem surrounding properties

Table 8-3: Comments and responses

Entity / Person:	Date:	Comment:	Response:
Service providers: Tshepo Motube (Motube and Ncongwane Projects) Sibongile (Dizmos Supplying & Services)	2021-03-19 2021-03-19	Offering services	Registered and forwarded details to Vanchem.
Enough is enough Workers Forum	2021-03-18	Register	Registered.
Shell Rashid Choonara	2021-03-23	Register Copy of document requested. Concern re impact on Shell assets (corrosion) due to corrosive & toxic chemicals.	Registered. Electronic copy provided: 2021-04-16
NDM Stanford Mofore	2021-03-18 onwards	Applicability of Activity 34 relating to changes to AEL	Water soluble reaction, no gasses. $\text{NH}_4\text{SO}_4 + \text{Na}_2\text{VO}_3 \rightarrow \text{NH}_4\text{VO}_3 + \text{NaSO}_4$ Feedback from Vanchem: Mr Rudzani Mudau: Storage tanks are not point source or fugitive emitting facilities, hence they do not trigger NEMAQA activities which result in atmospheric emissions as outlined in GN 893 of 22 November 2013.

		<p>Register. Copy of document</p> <p><u>Comments:</u> Primary and secondary impact on natural resources, especially soils.</p> <p>Possible impact on agriculture activities.</p> <p>Impact on water sources in view of possible spillage.</p> <p>Impact on existing or future agriculture projects.</p>	<p>Registered. Electronic copy provided: 2021-04-16</p> <p>The footprint area of $\pm 300\text{m}^2$, where the tanks will be established, is within the existing Vanchem Plant area in the Ferrobank Industrial area where the activities have been taking place since 1957. The disturbance over more than 60 years has already impacted the soils and I don't expect any further impact on the soil, except compaction of soil in the area for structure establishment for this project.</p> <p>No impact, it is an industrial site in an industrial area.</p> <p>This is possible and included in the impact assessment and addressed in the EMP – bunding around tanks etc.</p> <p>No impact, it is an industrial site in an industrial area</p>
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		<p>Current land use zonings and alignment thereof with regards to the relevant legislation such CARA Act 43 of 1983, Spatial Planning and Land Use Management Act, 2013.</p> <p>Chemical fallout with regards to surrounding areas.</p> <p>Mitigation actions in view of above-mentioned concerns.</p>	<p>Zoned for industrial use, see attached and in line with eMalahleni Spatial Planning and Land Use Management By-law as per attached.</p> <p>This specific process (reaction) is a water soluble reaction and therefor no emissions / gasses. Chemical fallout from the existing operations is addressed in the AEL. Reaction in tank: $\text{NH}_4\text{SO}_4 + \text{Na}_2\text{VO}_3 \rightarrow \text{NH}_4\text{VO}_3 + \text{NaSO}_4$</p> <p>Refer to EMP.</p>
Comments on Draft BAR			

9 IMPACT ASSESSMENT

9.1 Methodology

The significance of the adverse environmental impacts identified were assessed in terms of their:

- Duration;
- Extent;
- Probability; and
- Severity.

The above was used to determine the significance of an impact without any mitigation, as well as with mitigation.

Nature of an impact: An impact's nature can be positive (+) or negative (-).

Consequence: Considers duration, extent and severity

Consequence = duration + extent + severity

Table 9-1: Environmental risk and impact assessment criteria

DURATION (D)		
Immediate	Less than 1 month	1
Short-term	2 – 6 months (construction / assembly phase)	2
Life of project	Operational phase	3
Post-closure	Time of rehabilitation and for re-establishment of natural systems	4
Residual	A permanent impact (100 years or more)	5
EXTENT (E)		
Site specific	Site of the proposed work (Tanks' location, Chemical Plant)	1
Local	Site and immediate surroundings (Erf 94, Vanchem Plant)	2
Regional	Municipal area (eMalahleni)	3
Provincial	Provincial area (Mpumalanga)	4
National	Republic of South Africa	5
PROBABILITY (P)		
Rare	<5% probability of occurrence – may occur in exceptional circumstances	1
Unlikely	15% - 6% probability of occurrence – could potentially occur at some time	2
Possible	45% - 16% chance of occurrence – might occur at some time	3
Likely	65% - 46% probability of occurrence – will probably occur in most circumstances	4
Almost Certain	90% - 66% probability of occurrence – is expected to occur	5
Definite	100% - will occur	6
SEVERITY (S)		
Catastrophic (critical)	Total change in area of direct impact, relocation not an option, death, toxic release off-site with detrimental effects, irreversible loss, huge financial loss	6

Significant (High)	> 70% change in area of direct impact due to loss of significant aspect, extensive injuries, long term loss in capabilities, off-site release to high extent, major financial implications	5
Serious	50 – 70% long-term loss, extensive rehabilitation / restoration / treatment required, high financial impact, still restricted in extent	4
Moderate (medium)	20 – 49% change, medium term loss in capabilities, rehabilitation / restoration / treatment required, on-site release with outside assistance, medium financial impact	3
Minor	10 – 19% change, short term impact that can be absorbed, on-site release, immediate containment, low financial implications	2
Insignificant (low)	< 10 % change in the area of impact, no financial implications, localised impact, a small percentage of population	1

[Duration (D) + Extent (E) + Severity (S)] x Probability (P) = Impact Significance (IS)

IMPACT SIGNIFICANCE (IS)		
Impact Significance	IS score range	Description
Low (L)	<15	The impact is minor or insubstantial; it is of little importance to any stakeholder and can easily be rectified.
Moderate Low (ML)	16 – 45	The impact is limited in extent, even if the intensity is major; the probability will only be likely, the impact will not have a significant impact considered in relation to the bigger picture; no major material effect on decisions and will require only small-scale management intervention bearing moderate costs.
Moderate High (MH)	46 – 70	The impact is significant to one or more stakeholders, and its intensity will be medium or high; therefore, the impact may materially affect the decision, and management intervention will be required.
High (H)	71 <	The impact could render options controversial or the entire project unacceptable if it cannot be reduced to acceptable levels; and/or the cost of management intervention will be a significant factor in project decision-making.

9.2 Impact Assessment Ratings

The impacts and associated significance ratings for the Chemical Plant expansion for the assembly / construction phase and operational phase were assessed (Tables 9.2 – 9.3). The no-go option (Table 9.4) would not meet the project objective in terms of the socio-economic aspect.

The planning phase activities are considered to be of a negligible impact significance as these typically involve desktop assessment and site inspections.

Table 9-2: Construction / assembly – Impacts and Significance

Aspect and Description		Impact Rating (before mitigation)						Impact Rating (after mitigation)							
Aspect	Description	Nature of Impact (Positive/Negative)	Spatial Scope/ Extent (6)	Duration (6)	Severity (6)	Consequence (6)	Probability (6)	Significance (108)	Nature of Impact (Positive/Negative)	Spatial Scope/ Extent (6)	Duration (6)	Severity (6)	Consequence (6)	Probability (6)	Significance (108)
BIODIVERSITY: FLORA AND FAUNA	Pioneer grasses to be cleared; alien invasives	N	1	2	1	4	6	24 Moderate Low	N	1	2	1	4	2	8 Low
SURFACE WATER – Pollution of surface water	Spillage / leak of hydrocarbons (fuel / oil / grease) from vehicles and equipment / machinery.	N	2	2	3	7	5	35 Moderate Low	N	1	2	3	6	2	12 Low
GROUNDWATER – Pollution of the groundwater system	Spillage / leak of hydrocarbons (fuel / oil / grease) from vehicles and equipment / machinery.	N	2	2	3	7	5	35 Moderate Low	N	1	2	3	6	2	12 Low
SOIL - Pollution and Compaction	Spillage / leak of hydrocarbons (fuel / oil / grease) from vehicles and equipment / machinery.	N	1	2	3	6	5	30 Moderate Low	N	1	2	1	4	2	8 Low
	Erosion of soil (soil wash / blown away).	N	1	2	1	4	3	12 Moderate Low	N	1	2	1	4	2	8 Low
	Compaction of the soil.	N	1	2	2	5	6	30 Moderate Low	N	1	2	1	4	6	24 Moderate Low

Aspect and Description		Impact Rating (before mitigation)						Impact Rating (after mitigation)							
Aspect	Description	Nature of Impact (Positive/ Negative)	Spatial Scope/ Extent	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)	Nature of Impact (Positive/Negative)	Spatial Scope/ Extent	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)
AIR QUALITY – Polluting or decreasing the quality of the air	Particulate matter, dust and airborne particles flying through the air.	N	1	2	1	4	5	20 Moderate Low	N	1	2	1	4	3	12 Low
VISUAL IMPACT – Change in the sense of place or decreasing the aesthetic value	On an industrial site.	No impact.													
HEALTH – degradation in health	Inhalation / ingestion of dust created during site establishment	N	1	2	2	5	5	25 Moderate Low	N	1	2	1	4	3	12 Low
NOISE	On an industrial site.	No impact.													
SAFETY & SECURITY	On an industrial site with access control and security.	No impact.													
SOCIO-ECONOMIC	Disruption during assembly / construction due to unforeseen circumstances (pandemic, strike etc.)	N	2	2	4	8	3	24 Moderate Low	N	2	2	1	5	2	10 Low
ARCHAEOLOGY & CULTURAL HERITAGE		N	Insignificant due to low sensitivity and unlikely occurrence – see Exemption letter from Archaeos, 2021 (Appendix E)												

Table 9-3: Operation – Impacts and Significance

Aspect and Description		Impact Rating (before mitigation)							Impact Rating (after mitigation)						
		Nature of Impact (Positive/Negative)	Spatial Scope/ Extent (6)	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)	Nature of Impact (Positive/Negative)	Spatial Scope/ Extent (6)	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)
Aspect	Description														
SURFACE WATER – Pollution	Spillage / leak / overflow of chemicals	N	2	3	5	10	3	30 Moderate Low	N	1	3	3	7	2	14 Low
GROUNDWATER – Pollution	Spillage / leak / overflow of chemicals	N	2	4	5	11	3	33 Moderate Low	N	1	3	3	7	2	14 Low
SOIL - Pollution	Spillage / leak / overflow of chemicals	N	2	3	5	10	3	30 Moderate Low	N	1	3	3	7	2	14 Low
AIR QUALITY – Polluting or decreasing the quality of the air	No emissions/gasses – water soluble reaction	No impact from this project (overall impact addressed in AEL)													
HEALTH – degradation in health	No emissions/gasses – water soluble reaction	No impact from this project (overall impact addressed in AEL)													
SOCIO-ECONOMIC	Disruption during operation due to unforeseen circumstances (pandemic, strike etc.)	N	2	3	3	8	3	24 Moderate Low	N	2	3	2	7	1	7 Low

Table 9-4: No-go – Impacts and Significance

Aspect and Description		Impact Rating (before mitigation)						Impact Rating (after mitigation)							
Aspect	Description	Nature of Impact (Positive/ Negative)	Spatial Scope/ Extent (6)	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)	Nature of Impact (Positive/Negative)	Spatial Scope/ Extent (6)	Duration (6)	Severity (6)	Consequence	Probability (6)	Significance (108)
SOCIO-ECONOMIC	No additional production of pregnant solution	N	2	5	4	11	5	55 Moderate High	Proceed with project.						

Cumulative impacts relate to the impact on groundwater in the case of spillages / overflows from the tanks due to Vanchem’s existing impacts on the groundwater aquifer underneath the plant.

10 ENVIRONMENTAL MANAGEMENT PROGRAMME (EMP)

10.1 Alterations to the EMP

As EMPs should remain dynamic and flexible, certain conditions may require the EMP to be revised. These conditions may include the following:

- Changes in legislation;
- Published/gazetted norms and standards;
- Occurrence of unanticipated impacts or impacts of greater significance, intensity and extent than anticipated;
- Conditions in environmental authorisation which do not form part of the EMP;
- Inadequate mitigation measures, i.e. where the level of an environmental parameter is not conforming to the required level despite the implementation of the mitigation measure; and
- Secondary impacts which occur as a result of the mitigation measures.

10.2 Responsibility

Bushveld Vanchem (Pty) Ltd will be responsible for the implementation of all mitigation and management measures as well as the compliance with this EMP and any license and authorisation conditions.

Bushveld Vanchem (Pty) Ltd will delegate its responsibilities to an Environmental Control Officer (ECO) during the construction / assembly phase.

Each contractor involved in the project will comply with the EMP and authorisation conditions.

The ECO will be suitably qualified to perform the necessary tasks and will be appointed at a level such that he/she can interact effectively with site contractors, labourers and the public.

The ECO will be required to perform the following tasks:

- Monitoring and execution of the EMP by being on site regularly;
- Inspect the site as required to ensure adherence to the management actions of the EMP and authorisations/licences (compliance assessments/audits);
- Complete Site Inspection Forms on a weekly basis;
- Provide inputs to or compile the environmental compliance assessment report;
- Liaise with contractors on issues relating to implementation of, and compliance with, the EMP and authorisations/licences;
- Maintain a record of environmental incidents (spills, impacts, legal transgressions etc.) as well as corrective and preventive actions taken; and
- Maintain a public-complaints register in which all complaints are recorded.

The conditions of the authorisation, licences and EMP will be brought to the attention of all persons (employees, workers, consultants, contractors etc.) associated with the undertaking of these activities and Bushveld Vanchem (Pty) Ltd will take such measures that are necessary to bind such persons to the conditions thereof (contracts with penalties for non-compliances). All consultants and / or contractors will go through induction.

Bushveld Vanchem (Pty) Ltd can further enforce this by running workshops in order to raise environmental awareness. These workshops should cover aspects such as fire prevention,

strict use of ablution facilities, water conservation, waste management and general duty of care.

Entity:	Responsible Person:	Contact details:
Bushveld Vanchem (Pty) Ltd – project manager	Mr Leon Repsold	082 457 8296
Bushveld Vanchem (Pty) Ltd – environmental manager	Johanna Maloba	082 596 7600
Environmental Control Officer for construction / assembly phase	To be appointed	-

10.3 Activities causing potential impacts

The following activities are activities that could cause potential impacts if not managed properly or if no mitigation measure is implemented:

- Site preparation (clearance of grass, levelling, compaction etc.);
- Chemical solution spills / leakages / overflows;
- Poor waste management;
- Random events such as fire / explosion / strikes / pandemics etc;

10.4 Potential Impacts

10.4.1 Negative Impacts

- Pollution/contamination of soil, surface water and groundwater due to leakages or spillages or overflows of content of tanks.

10.4.2 Positive impacts

- The location of the tanks on an already disturbed industrial site with security and access control; and
- The use of pregnant solution and increase in production capacity at the Chemical Plant when Kiln 3 starts up again.

10.4.3 No-go Option impacts

If the project does not proceed, Vanchem

- Cannot restart Kiln 3; or
- Has pregnant solution which cannot be stored.

10.5 Management measures

Dedicated measures have been identified to manage the impacts identified above (Tables 9.2 – 9.4). The purpose of the EMP is to ensure that undue or reasonably avoidable adverse impacts of the project are prevented; that impacts which cannot be prevented are managed to reduce their significance; and that the positive benefits of the project are enhanced. Bushveld Vanchem (Pty) Ltd is responsible for the implementation of recommendations and mitigation/management measures and HydroScience cannot and will not take responsibility for the actions of Bushveld Vanchem (Pty) Ltd or lack thereof.

Table 10-1: Identified potential impacts and proposed management measures for the expansion of the Chemical Plant

1. Environmental Awareness Training

Management Outcome: All on-site staff, contractors and visitors are aware of and understand the individual responsibilities in terms of this EMP.				
Responsible person for implementation and monitoring: Environmental Manager and ECO				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<ul style="list-style-type: none"> • All staff, contractors and visitors must receive environmental awareness training; • All new staff coming onto site must receive environmental awareness training; • All staff are made aware of the conditions and controls linked to the Environmental Authorisation (EA), Water Use License (WUL), Waste Management License (WML), Atmospheric Emissions License (AEL) and within the EMP; • The responsible operator of vehicle / equipment / machinery must have the required training to make use of the spill kit in emergency situations; • All staff, contractors and visitors are made aware of their individual roles and responsibilities in achieving compliance with the EA, WUL, WML, AEL and EMP; • The Construction / Assembly Contractor must erect and maintain information posters at key locations on site; • Environmental awareness training should include the following: <ul style="list-style-type: none"> i. Description of significant environmental impacts, actual or potential, related to their work activities; 	<p>Presentations should be as visual as possible - it can include posters, power point, videos or any other material that will assist in the training.</p>	<p>Environmental awareness training must be continuous and as soon as new staff members start on site.</p> <p>Environmental posters / signage must be on site at all times and must be visible / readable.</p>	<p>As and when required</p>	<p>Photos</p> <p>Attendance Register</p> <p>Training material</p> <p>Induction video</p>

<ul style="list-style-type: none"> ii. Mitigation measures to be implemented when carrying out specific activities; iii. Emergency preparedness and response procedures (EPRP); iv. Procedures to be followed when working near or within sensitive areas; v. Water usage and conservation; vi. Solid waste management procedures; vii. Sanitation procedures. • A record of all environmental awareness training courses undertaken as part of the EMP must be available; • Educate workers on the dangers of open and/or unattended fires; • An attendance register of all staff, contractors or visitors that received environmental awareness training must be kept; • Course material must be available and presented in all appropriate languages; • Environmental training and topics can form part of the induction. 				
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2. Site Preparation (assembly / construction)

<p>Management Outcome: Impacts on the environment are minimised when establishing new infrastructure and the development footprints are kept to a minimum and within demarcated site establishment area.</p>				
<p>Potential Impacts:</p> <ul style="list-style-type: none"> • Loss of vegetation and fauna habitat – site only has grass. • Activities may lead to displeasing aesthetics, such as the storage of materials, excavation activities and the use and storage of machines / vehicles / equipment. • Pollution of soil and groundwater due to spills on site. 				
<p>Responsible person for implementation: Construction Contractor during Construction / Assembly; Environmental Manager and ECO during operation</p> <p>Responsible person for monitoring: Environmental Manager</p>				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<ul style="list-style-type: none"> • A Method Statement must be provided by the construction contractor prior to any on-site activity that includes: <ul style="list-style-type: none"> ○ overnight vehicle / machinery parking areas; ○ stockpile and lay down areas; ○ equipment cleaning areas; ○ eating and ablution facilities (use existing); ○ waste management; ○ access route (through chemical plant or service entrance). • Remain with demarcated area (site footprint); • Site is located on previously disturbed areas; • If possible, no temporary facilities or portable toilets to be setup due to existing facilities available in the plant; • Prefabricated structures should be prioritised in order to reduce on site fabrication; • No staff / contractors to be accommodated on the property; • Signs (safety) have been erected throughout the plant; • Housekeeping should be done daily. 	Area identified.	Before site establishment starts.	Daily during assembly / construction	Photos

3. Storm and Waste Water Management

Management Outcome: An effective system of storm water run-off control is implemented and impacts to the environment caused by storm water and wastewater discharges during activities are avoided.				
Potential Impacts:				
<ul style="list-style-type: none"> • Pollution of downstream watercourse (Brugspruit) • Pollution of soil • Erosion and siltation 				
Responsible person for implementation and monitoring: Environmental Manager				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<ul style="list-style-type: none"> • Bunding of tanks (concrete and sealed) to capture any spillage / overflow / leak; • Appropriate pollution control necessary to prevent discharge of chemical solution; • Runoff from the site must be strictly controlled, and contaminated water must be collected (drains) and stored (SWD) for reuse; • All spillages / leaks / overflows must be contained and controlled within the bunded area. 	<p>Sewage is handled in the municipal system.</p> <p>Contaminated storm water from the site will be diverted to the existing Storm Water Dam (SWD) on Erf 4.</p>	<p>Measures already in place and to be checked during activities.</p>	<p>Continuous</p>	<p>Photos</p> <p>Monitoring of SWD</p> <p>Monitoring of groundwater (boreholes)</p>

4. Solid Waste Management

Management Outcome: Wastes are appropriately stored, handled and safely disposed of at a licensed waste facility.				
Potential Impacts:				
<ul style="list-style-type: none"> • Loss of habitat through the damage of vegetation • Compaction of soil • Pollution of soil due to spillages associated with dumping of solid waste • Establishment of Alien Invasive Plant Species 				
Responsible person for implementation: Construction Contractor during Construction / Assembly; Environmental Manager and ECO during operation				
Responsible person for monitoring: Environmental Manager				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<u>General:</u> <ul style="list-style-type: none"> • All measures regarding waste management must be undertaken using an integrated waste management approach. • A suitable position must be found and clearly demarcated for waste collection and storage. <u>Prevention of waste:</u> <ul style="list-style-type: none"> • Waste material storage areas should be safe, secure and weather-proof to prevent damage to material (resulting in waste generation) and theft. Area with impermeable base or in sealed containers. • Due to the movement of people, there will be litter production and higher probability of littering. Therefore, there should be on-site signs raising the awareness of the impacts of littering on the natural environment and weekly litter patrols to collect litter. • Train staff/contractors to operate in an environmentally responsible manner (closing of taps for water conservation, reporting spills, no littering etc.). • No planned maintenance or servicing of vehicles / machinery / equipment on site (only in workshops). If emergency maintenance is required to on-site vehicles, machinery and/or 	Existing Integrated Waste Management and WML license conditions (Appendix C)	Measures must be implemented before site establishment starts and must be controlled during activities.	Continuously	Photos Documents Waste reporting to Department of Environment, Forestry & Fisheries (DEFF)

<p>equipment, drip trays and / or absorbent mats will be placed underneath the vehicles / machinery / equipment where maintenance work is conducted to prevent grease/oil spillages impacting the environment or generating waste (contaminated soil).</p> <p><u>Reduction / minimisation of waste:</u></p> <ul style="list-style-type: none"> • Reduce waste quantities and disposal costs through a reduction in the materials ordered. • Engage with the supply chain to supply products and materials that use minimal packaging. <p><u>Reuse / recycling of waste:</u></p> <ul style="list-style-type: none"> • Separate / sort / segregate waste for collection and recycling - make arrangements with recycling contractors to provide clearly marked bins for material separation / sorting. Make sure that contractors are aware of the placement of the bins and their responsibility to separate / sort materials. • Though no special disposal methods are required for non-hazardous waste, non-biodegradable refuse such as glass bottles, plastic bags, etc., must be stored in suitable containers to allow for recycling and emptied on an as-required basis for recycling purposes. <p><u>Waste handling on site:</u></p> <ul style="list-style-type: none"> • Separate / segregate / sort waste into different containers. • Collect waste in suitable containers (drums / skips / bins on site). • Waste containers should be marked, or colour coded to indicate which types of waste can be disposed to it. Staff to be trained in this regard to segregate waste. • Ensure sufficient containers are available for storage of waste prior to removal off site to prevent overflow and littering on the site and surroundings. • Ensure no litter, refuse, waste and rubble generated on the premises will be placed, dumped or deposited on this site, adjacent or surrounding sites or properties. • The waste collection and storage site must be maintained in a clean and orderly fashion. • Waste must be disposed, as soon as possible to a municipal transfer station, skip or on a licensed waste disposal facility 				
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<p>(WDF). Waste must not be allowed to stand on site to decay, resulting in malodours and attracting pests. Empty containers regularly and waste should not be stored on site in excess of 30 days.</p> <ul style="list-style-type: none"> • Waste collection bins with secure covers (scavenger and weatherproof) must be provided. • Waste may not be burnt on site. • Hazardous waste must be stored separately from general waste on an impermeable surface within a bund wall and disposed of at a licensed hazardous waste site if not recycled. • Comply with the Norms and Standards for Waste Storage (GNR 926 of 29 November 2013). <p><u>Waste removal & disposal:</u></p> <ul style="list-style-type: none"> • Companies that transport the waste must be registered / licenced to do so. • Site must be easily accessible for trucks picking up or dropping off the skips. • Remove waste from site for recycling or disposal to the WDF on a regular basis (at least weekly or when container is full). • No burning or burying of waste. • Any hazardous waste will be stored and handled according to the relevant legislation and only disposed to the licensed WDF (calcine dump for extraction section waste). • The chemical plant produces an alumina silica filter cake waste at the filter press which is removed off-site for disposal at Holfontein. <p><u>Documentation:</u></p> <ul style="list-style-type: none"> • Report on the quantities of different waste streams managed on each site (disposed, reuse, recycling, energy recovery). • Ensure copies of all waste manifests (safe disposal certificates) are kept, showing responsible handling, transport and disposal. • Include measure in contract that will ensure contractors are required to clean their work area after construction. 				
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5. Emergency Procedures

Management Outcome: Ensure emergency procedures are in place to enable a rapid and effective response to all types of environmental emergencies.				
Responsible person for implementation and monitoring: Environmental Manager				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<ul style="list-style-type: none"> The Emergency Preparedness and Response Plan (EPRP) must deal with accidents, potential spillages, emissions and fires / explosions in line with relevant legislation. All staff must be made aware of emergency procedures as part of environmental awareness training; The relevant local authority's fire department must be made aware of a fire as soon as it starts. In the event of emergency mitigation measures being necessary to contain the spill or leak, it must be implemented as per the section below - Hazardous Substances. 	EPRP (Appendix F)	Continuous.	Continuous	Photos Documentation Incident & accident reporting

6. Hazardous Substances

Management Outcome: Safe storage, handling, use and disposal of hazardous substances.				
Potential Impacts:				
<ul style="list-style-type: none"> Contamination of soil, groundwater or watercourse due to leaks / spills / overflows of tanks 				
Responsible person for implementation: Construction Contractor during Construction / Assembly; Environmental Manager during operation				
Responsible person for monitoring: Environmental Manager				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<ul style="list-style-type: none"> All hazardous substances (such as pregnant solution) will be stored in suitable containers (tanks) as defined in the Method Statement provided by the supplier. Containers will be clearly marked to indicate contents, quantities and safety requirements. All storage areas will be bunded. The bunded area will be of sufficient capacity to contain a spill / leak from the stored containers (110% of container capacity). An Alphabetical Hazardous Chemical Substance (HCS) control sheet will be drawn up and kept up to date on a continuous basis. All hazardous chemicals that will be used on site will have Material Safety Data Sheets (MSDS); All employees working with HCS will be trained in the safe use of the substance and according to the MSDS; Employees handling HCS must be aware of the potential impacts and follow appropriate safety measures. Appropriate personal protective equipment (PPE) must be made available. The tanks must be situated on a smooth impermeable surface (concrete) with a permanent bund. The impermeable lining must extend to the crest of the bund and the volume inside the bund must be 130% of the total capacity of all the storage tanks (110% statutory requirement plus an allowance for rainfall). The floor of the bund must be sloped, draining to a sump. 		Continuous	Continuous	<p>Photos</p> <p>Incident reporting</p>

<ul style="list-style-type: none"> • All empty dirty drums must be stored on a drip tray or within a bunded area. • No unauthorised access into the hazardous substances' storage areas shall be permitted. • No smoking must be allowed within the vicinity of the hazardous storage areas. • Adequate fire-fighting equipment must be made available at all hazardous storage areas. • An appropriately sized spill kit kept on-site relevant to the scale of the activity involving the use of hazardous substance must be available at all times. • The responsible operator must have the required training to make use of the spill kit in emergency situations. • In the event of a spill, contaminated soil must be collected in containers and stored in a central location and disposed of according to the National Environmental Management: Waste Act (Act 59 of 2008) and the Norms and Standards for waste storage (GNR 926 of 29 November 2013). • Refer to Figure 4-3. • Steelwork according to SABS 1431 & corrosion protection specification. • Fabrication & erection according to SABS 1200H. 				
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7. Dust

Management Outcome: Dust prevention measures are applied to minimise the generation of dust.				
Potential Impacts:				
<ul style="list-style-type: none"> Nuisance for residents or people at work from dust 				
Responsible person for implementation and monitoring: Environmental Manager				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<ul style="list-style-type: none"> Take all reasonable measures to minimise the generation of dust. Exposed surfaces must be stabilised / covered as soon as it is possible. Appropriate dust suppression measures must be used when dust generation is unavoidable, e.g. dampening / spraying with water on unpaved roads etc. PPE for workers. Shut-down when air quality and dust mitigation equipment fail or there is an emergency incident. 	Water sprayers across the site.	Continuously	As per AEL requirements. As per monitoring plan.	Photos - visual Dust results Compliance with AEL and legislated limits.

8. Communication

Management Outcome: Proper communication with landowners, neighbours and the public				
Responsible person for implementation and monitoring: Environmental Manager				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<ul style="list-style-type: none"> Notify landowners, neighbours and councillors at least 7 days before activities start of the intention to commence with the construction. Keep a complaints register on site. A notice board should be visible at the Chemical Plant entrance with the contact information of the Emergency Contact. 	Telephone calls Emails Notifications/ Posters	Continuously	Continuously	Photos Emails Signed registers

9. Archaeology and cultural heritage

Management Outcome: Rescue of archaeological material				
Potential impacts: Due to the nature of archaeological material, such sites, objects or features, as well as graves and burials may be uncovered during construction activities on site.				
Responsible person for implementation and monitoring: Construction Contractor and ECO				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<ul style="list-style-type: none"> • Cease work. • Contact an archaeologist 	Inspect excavations	Construction	During excavation	Photos

10. Alien invasive vegetation

Management Outcome: Eradication of alien invasive vegetation				
Potential impacts: Encroachment and establishment of alien invasive vegetation due to disturbance. Alien vegetation consume about 5% of our scarce water resources.				
Responsible person for implementation and monitoring: Environmental Manager				
Impact Management Actions	Implementation		Monitoring	
	Method of Implementation	Timeframe for Implementation	Frequency	Evidence of Compliance
<ul style="list-style-type: none"> Removal and disposal of alien invasive plant species to be conducted as required by law - Alien Invasive Species Regulations 2014 (NEMBA Act 10 of 2004) Alien invasive control and eradication plan. 	Physical removal Approved treatment	Continuously	On-going	Photos Progress on plan

10.6 Monitoring programme

10.6.1 Surface Water Monitoring

Bushveld Vanchem (Pty) Ltd has three (3) existing surface water monitoring points as part of its environmental monitoring programme for impacts from the plant area. Their positions are indicated on Figure 10-1 and include:

- Brugspruit Highway: On Brugspruit just before the bridge at the N4 Highway – upstream of Vanchem impacts
- Brugspruit Top: On Brugspruit below the Ferrobank Sewage Works
- Brugspruit Bottom: On Brugspruit below z-adit but before liming station – downstream of Vanchem plant impact

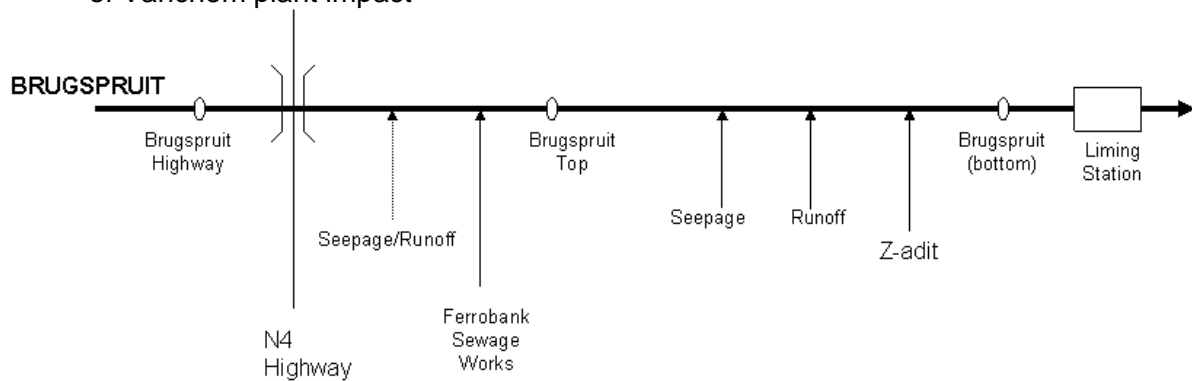


Figure 10-1: Vanchem' surface water monitoring points

The SWD on the plant is also monitored.

10.6.2 Groundwater Monitoring

Bushveld Vanchem (Pty) Ltd has sixteen (16) existing groundwater monitoring points as part of its monitoring programme. Their positions are indicated on Figure 10-3.

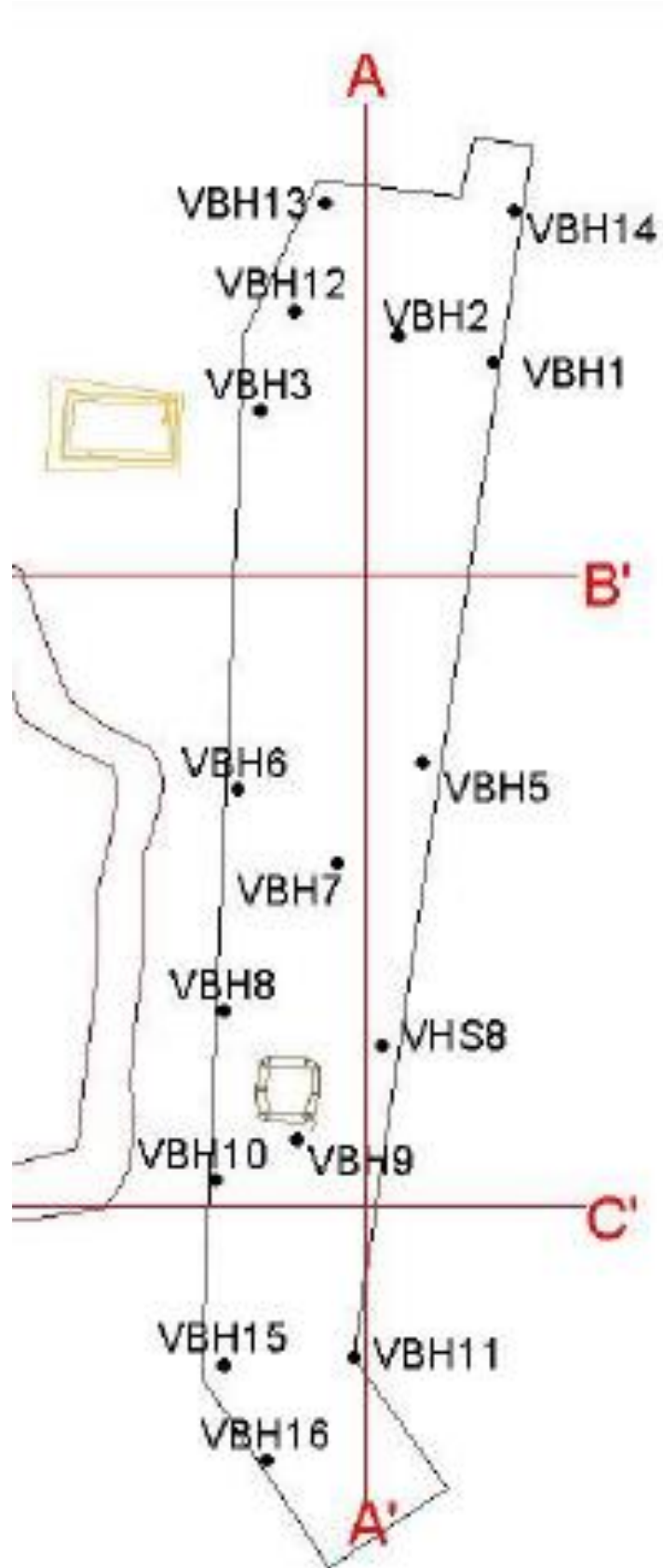


Figure 10-3: Vanchem' groundwater monitoring points

10.6.3 Air Monitoring

As per AEL.

10.6.4 Other monitoring

Keep a complaints' register as is currently the case and record measures taken to address these complaints.

Occupational Health and Safety Act (OHSA) compliance as is currently the case:

- Register to indicate that all the employees and contractors have been informed as to their rights under the Act; and
- Accident records as per the Act - reported to the Department of Trade and Industry (DTI) and the Department of Labour (DOL).

Environmental Incidents reports as is currently the case.

10.6.5 Additional monitoring required for project

Compliance with EMP and environmental authorisation - appoint an Environmental Control Officer (ECO) for the construction / assembly phase.

10.7 Record keeping and reporting

10.7.1 Compliance recording and reporting

Accurate and up-to-date records will be kept by the ECO of all system malfunctions resulting in non-compliance with the EMP, environmental authorisation and license conditions.

10.7.2 Incident recording and reporting

Bushveld Vanchem (Pty) Ltd will also, within 24 hours, ensure that the relevant authorities (MDARDLEA, NDM, DWS, DOL, DTI etc.) are notified of the occurrence or detection of any incident which has the potential to cause, or has caused pollution of the environment, health or safety risks or which is a contravention of the EMP, or any environmental authorisation or license condition. Bushveld Vanchem (Pty) Ltd is then to submit an action plan indicating measures, which will be taken to:

- Correct the impacts resulting from the incident;
- Prevent the incident from causing any further impact; and
- Prevent a recurrence of a similar incident.

10.7.3 Complaints recording and reporting

A complaints register will be kept and all complaints from the public / community will be noted therein as well as measures taken to rectify the situation as described above.

10.8 Environmental awareness plan

10.8.1 Objectives

The objectives of an environmental awareness plan are to:

- Inform employees, landowners, contractors and visitors of any environmental risk which may result from their presence, work or activities, and
- Inform employees, landowners, contractors and visitors of the manner in which the identified possible risks must be dealt with in order to avoid pollution or degradation of the environment and health and safety hazards.

In general, the purpose of implementing an environmental awareness plan is to optimise the awareness of those on the property and partaking in the activities, which have the potential to impact negatively on the environment, and in doing so, promote the goal of sustainable development.

10.8.2 Communication

Both objectives of the environmental awareness plan indicate that employees, landowners, contractors and visitors must be informed of environmental matters. Information sharing is only possible through effective communication channels.

The goal for proficient communication is to provide structures for effective communication, participation and consultation that relate to the occupational health and safety hazards, environmental hazards and the Safety, Health, Environment and Quality (SHEQ) management system.

The objective of the communication procedure is to ensure effective communication flow, involvement of all levels of employees in the communication chain and to comply with the requirements in terms of ISO 9001:2008 clause 5.5.3 and ISO 14001:2004 clause 4.4.3.

All visitors / contractors to the site undergo an induction.

10.8.3 Communication responsibility

It will be the responsibility of the SHEQ officer / manager to communicate the environmental awareness plan with employees, landowners, contractors and visitors. Should the SHEQ struggle with information or should there be a query regarding certain environmental issues it can be discussed with the appointed ECO.

The communication can be done in the following way:

- As part of the induction;
- As part of toolbox talks;
- Posters or information sheets on the notice boards;
- Signage in the operational areas;
- Environmental awareness training for the contractors and their staff members as well as the Bushveld Vanchem (Pty) Ltd employees that will be working on site. This should be done before the construction / assembly commences.

10.8.4 Aspects covered

The following Environmental Risks / Aspects should be covered as part of the Environmental Awareness Plan:

- Water saving;
- Waste Management / Recycling;
- Importance of Personal Protective Equipment (PPE);
- Erosion;

- Alien Invasive Species Eradication;
- Risk of spillages (fuel, oil, grease, cement and hazardous material);
- Dust
- Importance of nature and why we protect it.

11 CONCLUSIONS & RECOMMENDATIONS

The expansion of the Chemical Plant (two additional tanks) is required by Vanchem to store and handle additional pregnant solution produced by Kiln 3. The location was selected based on available space within the operational footprint area and in close proximity to the existing Chemical plant and its supporting structures / infrastructure.

Without the expansion, Vanchem will not be able to store the pregnant solution produced by Kiln 3.

The expansion of the Chemical Plant (two additional tanks) will not adversely impact the socio-economic or biophysical environment to such an extent that it cannot be mitigated or managed (Section 10 of this report).

The expansion of the Chemical Plant will have positive socio-economic impacts such as job creation, financial investment, production as well as associated economic contribution (investment and taxes) to the area (eMahlahlani Local Municipality and Mpumalanga Province) and country.

The expansion of the Chemical Plant may potentially have negative impacts on the biophysical environment (contamination of soil and water due to overflows, spillages or leaks) but these can all be mitigated to a low to moderate level.

Vanchem has monitoring programmes in place for environmental aspects such as surface water, groundwater, air and emissions which will alert to any impact to implement additional management measures timeously. Vanchem is an operational site with all the necessary access control, security and management measures in place required by an industrial site for storm water management, emergency management and waste management.

11.1 EAP Opinion

It is the opinion of the EAP that the project may continue based on the following:

- Existing industrial operation with an expansion within the existing operational footprint area.
- Financial considerations in terms of restarting Kiln 3 and subsequent production and use of pregnant solution to produce chemical products.
- Specialist findings: No negative impacts on Archaeology and Cultural Heritage.
- Water quality monitoring for surface water and groundwater already in place.

11.2 Conditions

The project can be authorised under the following conditions:

- Compliance with EMP.
- Continue with monitoring as per existing monitoring programmes (surface water, groundwater, air and emissions) in EMP and license conditions.
- Proper implementation as per design document by Cems Consult (P201120-DES-2010-001).

12 REFERENCES

Archaetnos, Culture and Cultural Resource Consultants, 2021. Letter for HIA exemption request: The proposed expansion of the Chemical Plant at Bushveld Vanchem, close to eMalahleni, Mpumalanga Province. 19 March 2021.

Department of Environmental Affairs (DEA), 2017. Integrated Environmental Management Guideline. Guideline on need and desirability. ISBN 978-0-9802694-4-4.

Department of Environmental Affairs (DEA), 2017. Public participation guideline in terms of NEMA, 1998 EIA regulations. ISBN 978-0-9802694-2-0.

Department of Environmental Affairs (DEA), 2011. Highveld Priority Area Air Quality Management Plan.

Department of Environmental Affairs, Department of Water Affairs, Limpopo Provincial Government, 2009. Environmental Consultants, Environmental Management Framework for the Olifants and Letaba Rivers Catchment Areas (OLEMF), December 2009.

HydroScience CC, previous projects and documents.

Legislation:

- Constitution of the Republic of South Africa (CRSA), 1996 (Act 108 of 1996)
- National Environmental Management Act (NEMA), 1998 (Act 107 of 1998)
- National Environmental Management: Air Quality Act (NEM:AQA), 2004 (Act 39 of 2004)
- National Environmental Management: Biodiversity Act (NEM:BA), 2004 (Act 10 of 2004)
- National Environmental Management: Waste Act (NEM:WA), 2008 (Act 59 of 2008)
- National Heritage Resources Act (NHRA), 1999 (Act 25 of 1999)
- National Water Act (NWA), 1998 (Act 36 of 1998)