KNIGHTS ENVIRONMENTAL

HI-FOS (PTY) LTD

PHOSPHORIC ACID PLANT

STANDERTON

TECHNICAL REVIEW

Final Report

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2016-06-01	1	First Draft: Drawings and spec sheets to do
2016-07-17	2	First Draft: Missing information identified
2016-08-06	3	JB Comments and missing information added.
2016-11-28	4	PT Comments added.
2016-12-08	5	Plot plan, Inventories, emissions added. For Disp Anal
2017-01-17	6	Ion exchange rinse disposal; Chicken manure/Gypsum, emission temperatures, and some adjustments .
2017-03-30	7	Emissions data added related to AQA requirementss
2017-04-13	7	Final Data added.

HI-FOS (PTY) LTD PHOSPHORIC ACID PLANT PROJECT, STANDERTON

TECHNICAL REVIEW

EXECUTIVE SUMMARY

Sonskyn Kunsmis (Pty) Ltd (Sonskyn)supplies liquid and blended solid fertilizers to farms in the area around Standerton Mpumalanga. In this regard, Sonskyn purchase raw materials from suppliers throughout Southern Africa to produce the liquid fertilizer.

The solid raw materials currently used are potassium chloride, urea, mono-ammonium phosphate (MAP 33), limestone ammonium nitrate (LAN) and zinc sulphate. These materials are presently dissolved in water and filtered to produce the liquid fertilizer formulations. Liquid raw materials used are phosphoric acid and ammonium nitrate solution.

In addition, raw material in the form of solid granules are blended in a scroll mixer to give solid granular fertilizer formulations.

The objective of the proposed Phosphoric Acid Plant is to construct and operate the following:

- Phosphoric Acid Plant.
- Calcium Ammonium Nitrate (CNX) Plant.
- Pure Mono Ammonium Phosphate (MAP 39) Plant.
- Mono Ammonium Phosphate (MAP 33) Plant.
- Chicken manure/Gypsum granulation plant. (Gypsum Treatment).

Also, to move the Granular Fertilizer Blending Plant from Sonskyn in Standerton to the proposed Phosphoric Acid Plant site (Portion 4 of the farm Holfontein 399 (the site)).

One of the raw materials used by Sonskyn, phosphoric acid, is becoming increasingly difficult to procure. Accordingly, Hi-Fos (Pty) Ltd is investigating the construction and operation of a Phosphoric Acid Plant and auxiliary plants to manufacture phosphoric acid, CNX, MAP 39, MAP 33 and a chicken manure/gypsum mix granular product. These products are for their own use and for sales.

Trailblazer Technologies (Pty) Ltd (TBT), a chemical engineering design company, is providing the Nitrophos Process technology to manufacture the phosphoric acid, and their own Technology for the other products in this regard. The proposed Phosphoric Acid Plant would produce phosphoric acid from phosphate rock sourced from Phalaborwa and nitric acid from Sasol.

CONTENTS

Abbreviations and Definitions

Abbreviation	Description
B/d	Blowdown
CaF_2	Calcium fluoride – an end product
CNX	Calcium Ammonium Nitrate – an end product
CN_4	Calcium Nitrate $4H_2O$ – an end product
dB	Decibels
CSTR	Continuous Stirred Tank Reactor
EPCM	Engineering Procurement Construction Maintenance
EU IPPC	European Union Integrated Pollution Prevention and Control
FEL	Front end Loader
g/l	Grams per litre
HSEC	Health, Safety, Environment and Community
MagAmP	magnesium ammonium phosphate
mg/m^3	Milligrams per cubic metre
MSDS	Material Safety Data Sheet
MVA	Mega Volt Ampere
kW	Kilo Watt
Nm^3/h	Normal cubic metres per hour (ie at 25^oC and 1 atmosphere)
OEL	Occupational Exposure Limit
OHS Act	Occupational Health and Safety Act
PPE/C	Personal Protective Equipment/Clothing
ppm	Parts per million
RM(H)	Raw Materials (Handling)
SABS	South African Bureau of Standards
SHE	Safety Health and Environment
t; tpa; tpd; tph	Tons; Tons per annum; Tons per day; Tons per hour
t/month	Tons per Month
v/v; w/w	Volume/volume; Weight/weight

Definitions:

Phos Acid:

Phosphoric Acid H_3PO_4

Super Phosphate: $Ca(H_2PO_4)_2$,

Super Phosphate is a compound produced by treating rock phosphate with sulphuric acid or phosphoric acid, or a mixture of the two. It is the principal carrier of phosphate, the form of phosphorus usable by plants, and is one of the world's most important fertilizers.

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1 Introduction

1.1 Existing Factory

Sonskyn Kunsmis (Pty) Ltd (Sonskyn) supplies liquid and blended solid fertilizers to farms around the area of Standerton, Mpumalanga. In this regard Sonskyn purchase raw materials from suppliers throughout Southern Africa to produce the liquid fertilizer.

The solid raw materials currently used are potassium chloride, urea, mono-ammonium phosphate (MAP 33), limestone ammonium nitrate (LAN) and zinc sulphate. Liquid raw materials used are phosphoric acid and ammonium nitrate solution. These materials are presently dissolved in water and filtered to produce the liquid fertilizer formulations.

In addition, raw material in the form of solid granules are blended in a scroll mixer to give solid granular fertilizer formulations.

1.2 Objective and Description of the Project

The objective of the proposed Phosphoric Acid Plant is to construct and operate the following:

- Phosphoric Acid Plant.
- Calcium Ammonium Nitrate (CNX) Plant.
- Pure Mono Ammonium Phosphate (MAP 39) Plant.
- Mono Ammonium Phosphate (MAP 33) Plant.
- Chicken Manure/Gypsum Granulation Plant (Gypsum Treatment).

The project also includes a move of the Granular Fertilizer Blending Plant from Sonskyn in Standerton to the proposed Phosphoric Acid Plant site.

One of the raw materials used by Sonskyn, phosphoric acid, is becoming increasingly difficult to procure. Accordingly, Hi-Fos Pty Ltd (Hi-Fos) is investigating the construction and operation of a Phosphoric Acid Plant and auxiliary plants to manufacture phosphoric acid, CNX, MAP 39 and MAP 33 for their own use and for sales.

Trailblazer Technologies (Pty) Ltd (TBT), a chemical engineering design company, approached Hi-Fos with the Nitrophos Process technology in this regard. The would produce phosphoric acid from phosphate rock sourced from Phalaborwa and nitric acid from Sasol.

The calcium nitrate (CN4), as produced by the Phosphoric Acid Plant has a low melting point and is difficult to handle. It may have application as a liquid fertiliser (calcium nitrate liquid (CNL)) but will be converted to calcium ammonium phosphate (CNX) in the CNX Plant. CNX has a higher melting point and no significant handling problems.

The phosphoric acid produced by the Phosphoric Acid Plant, is combined with anhydrous ammonia to produce MAP 39 for sales. By-products from the process are magnesium ammonium phosphate (MagAmP) solution and the mother liquor from the crystalliser, which are fed to the MAP 33 process.

In the MAP 33 process, the mother liquor and the MagAmP from the MAP 39 process are blended with phosphoric acid and anhydrous ammonia to form MAP 33 solution. The MAP 33 solution is fed

to a spray drier and a granulator to produce granular MAP 33 for blending into granular fertiliser formulations.

The Gypsum Treatment will take a 30% mixture of chicken manure and 70% of the by-product gypsum. This whole blend will be granulated and dried in a rotary kiln heated with a coal fired hearth to produce the granular product.

The existing Granular Fertiliser Blending Plant will be relocated from the Standerton site. The MAP 33 potash and limestone ammonium nitrate (LAN) granules are blended according to the required recipe to produce the various fertiliser blends required for the market.

The various plants can operate in either a continuous or batch mode. They will run during the farming season, April to January, at 5500 hours per annum (h/a).

The first phase of the project is expected to cost 8 million rand with construction taking 6 to 7 months.

1.3 Project Phases

The objective is to build the various plant in phases with the initial production being half the design rate then increasing as follows:

Year	Phosphoric Acid tpa	Calcium Ammonium Nitrate (CNX) tpa	Mono Ammonium Phosphate (MAP 39) tpa	Mono Ammonium Phosphate (MAP 33) tpa	Granular Fertiliser Blend tpa
Plant Design	38 716	39468	3 005	9 857	21 963
2018	19 358	19734	1502	4929	10981
2019	23 230	23681	1803	5914	13178
2020	27 101	27627	2103	6900	15374
2021	30 973	31574	2404	7886	17570
2022	34 844	35521	2704	8872	19767
2023	38 716	39468	3005	9857	21963

The basis of this is to produce phosphoric acid at the rate of:

4 000 tpa as Phosphorus (P)

1.4 Trailblazer Technologies (Pty) Ltd (The Nitrophos Process)

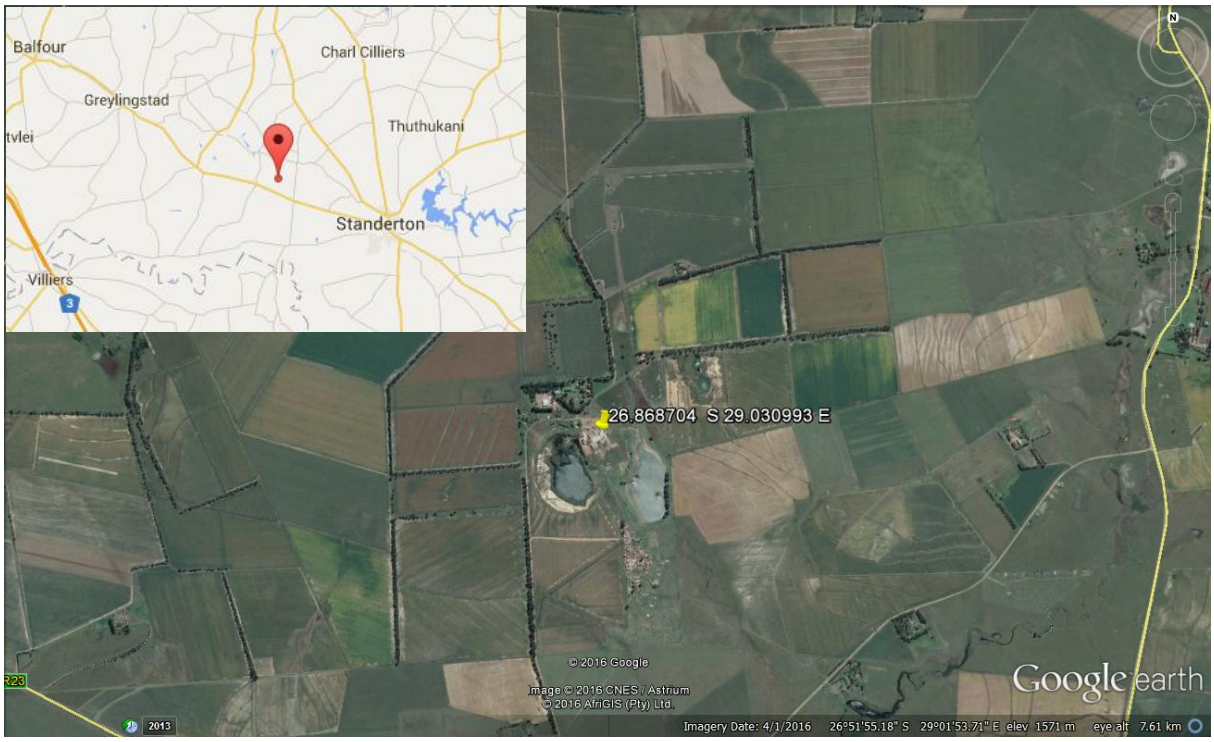
TBT has developed a simplified version of the standard Nitrophos Process for Liquid Acid Fertilizers used widely by Yara and some Indian manufacturers.

The Nitrophos Process produces phosphoric acid by the action of nitric acid on phosphate rock. It produces calcium nitrate as a by-product. Boiler ash and silica sand are produced as wastes.

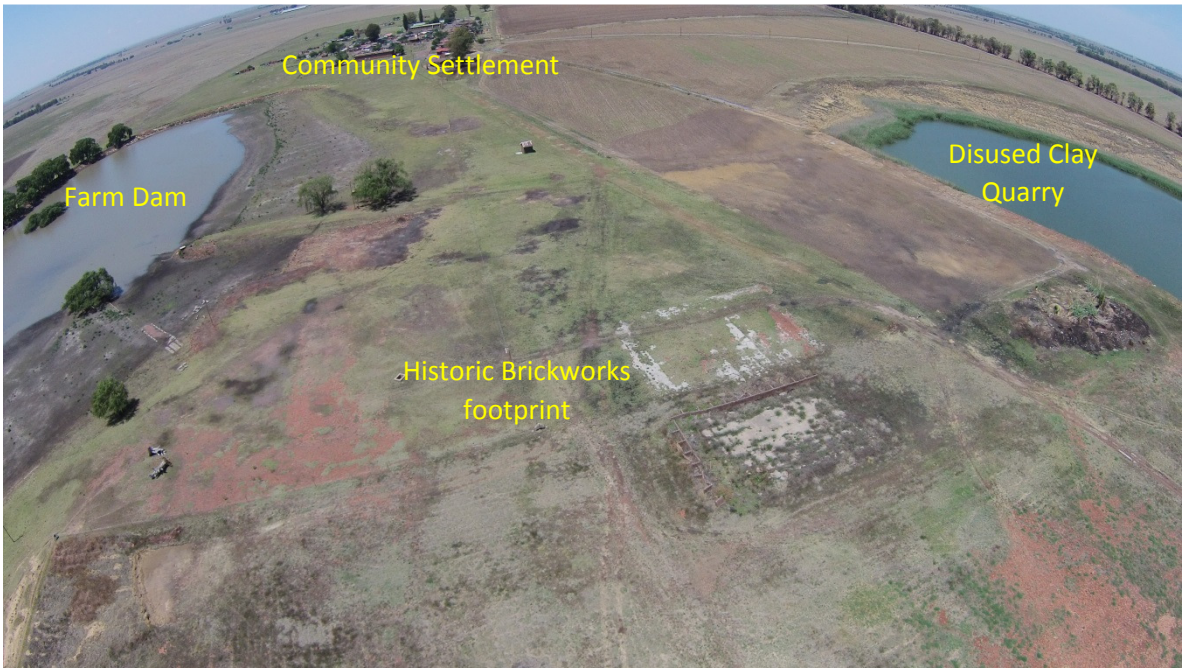
1.5 Site

The proposed Phosphoric Acid Plant site (the site) is located off the R23, approximately 27km from Standerton, on Portion 4 of the farm Holfontein 399 (S 26° 52‘ 11.25” E 29° 01‘ 51.79”) in the Mpumalanga Province. The proposed site falls within the jurisdiction of the Lekwa Local

Municipality, which forms part of the greater Gert Sibande Municipality. Portion 4 of the farm Holfontein 399 surveyor general code is T0IS00000000039900004.



Address: Farm Holfontein 399, Portion 4



Picture 1 The Historic Brick Factory at Holfontein

Although Portion 4 of the farm Holfontein 399 is currently zoned as agricultural, a historic brickworks (constructed in 1964, decommissioned in 1999), farm houses, a community settlement and other farming structures exist.

The historic brickworks has a substantial concrete floor area and various disused buildings that may be suitable for use. The Plant design and layout will confirm such. The used portion of the historic brick factory will be demolished and reused and/or disposed of.

Located on the site is a historic quarry and dam that can cater for the water requirements of the Plant.

2 Phosphoric Acid and Auxiliary Plant Process Descriptions

2.1 Phosphoric Acid Plant

Refer to Fig 1.

2.1.1 Charging the Reactor

The nitric acid and water are fed to the reactor to dilute the nitric acid from 58% to 52% in situ. The phosphate rock is added to the reactor at the same time.

2.1.2 The Phosphoric Acid Reaction

The mix is heated with live steam injection from the boiler and the phosphate rock powder is dissolved in the nitric acid solution. The mix is aerated by air from the compressor system. The aeration is to remove the hydrofluoric acid (HF) generated from the fluoride in the rock.

The Phosphoric acid reactors will operate on a continuous basis as this will require much less supervision than batch processing. Due to the easy stopping and starting of the process Hi-Fos's work methods could be followed. The HF extraction to run all the time to ensure that no HF is released to the atmosphere and is captured and neutralised with lime. The reaction mix is then cooled to 35°C using cooling water through a graphite heat exchanger.

The reactors are continuous stirred tank reactors (CSTR), 20m^3 in capacity, manufactured from polypropylene reinforced with glass fibre resin on the outside. They are equipped with an air sparge and steam injection equipment as well as a rubber-lined stainless steel (SS) stirrer.

2.1.3 Scrubber

The off gases from the reactor containing hydrogen fluoride gas (HF) are drawn by a fan into an alkaline scrubber to absorb the HF. In the scrubber, the off gases are scrubbed with calcium hydroxide solution.

The scrubber is a void column equipped with sprays throughout its length. It is manufactured of polypropylene. The number of sprays will be determined so that the concentration of HF in the exit stream will be well within the prescribed specification of 5 parts per million (ppm) volume/volume (v/v).

Solid Calcium Fluoride (CaF_2) crystals are formed in the alkaline scrubber by the reaction of the HF with the calcium hydroxide solution.

2.1.4 CaF_2 Filtration

The calcium hydroxide solution is circulated through the scrubber and then passes to the CaF_2 filter. This is a plate and frame filter, which removes the CaF_2 crystals.

The insoluble product CaF_2 that is filtered off is bagged for sale as a raw material.

2.1.5 Chiller and Centrifuge

The phosphoric acid reaction products pass to a second stage of cooling to 4°C in the crystalliser. This is achieved by a graphite heat exchanger and a chiller. At this temperature, the calcium nitrate with four molecules of water of crystallisation (CN4) crystallizes out.

The CN4 crystals are separated in a decanter centrifuge and are stored for further processing (Refer CNX and CNL below).

2.1.6 Gypsum Separator

There is residual calcium nitrate remaining in the phosphoric acid leaving the decanter centrifuge. The phosphoric acid, with the residual calcium nitrate, is passed into a vessel and mixed with the stoichiometric required quantity of ammonium sulphate. The calcium component is removed from the phosphoric acid by precipitation, with the use of ammonium sulphate to produce calcium sulphate (gypsum) and ammonium nitrate. The ammonium nitrate remains in solution in the phosphoric acid.

The precipitated gypsum is removed by pumping the phosphoric acid mix to a plate and frame filter. The gypsum is removed as a wet filter cake and sold.

2.1.7 Product Phosphoric Acid

The remaining acidic liquor is the product phosphoric acid, containing 12% P at a pH of about 1. The phosphoric acid product is stored for further use.

3 Calcium Ammonium Nitrate Plant (CNX)

Refer to Fig 2.

CN4 from the Phosphoric Acid Plant contains 30% water because of its water of crystallization. CN4 has a low melting point of <50^{o}C, which will cause handling problems in the market place. The heat of the sun will cause it to solidify. Due to the high water content, higher transport costs will be incurred. CNX contains 15% water and has a much higher melting point (90^{o}C). Therefore, the CN4 will be converted to CNX.

In the CNX process, the CN4 is put into a mixer and heated with steam to greater than 127°C. Ammonium nitrate is added to give a concentration of 6%. The compounds combine to form calcium ammonium nitrate. The CN4 mixture passes to an evaporator to reduce the water content to 15%, where two CNX molecules have three molecules of water of crystallization.

The liquid calcium ammonium nitrate is then sprayed into a granulation pan, the CNX granules are then screened, the oversize material is crushed and fed with the undersize material to the granulator.

The desired size of CNX granules are then bagged and sold.

The CNX plant will run continuously, although the feed make-up mixing equipment will be duplicate batch constituted. ie there will be two systems running alternately. This will ensure quality control.

4 Pure Mono Ammonium Phosphate Plant (MAP 39)

Refer to Fig 3.

Pure mono ammonium phosphate is produced by injecting anhydrous ammonia into a mixing vessel containing phosphoric acid. Water is added to give the correct concentration and live steam is injected to heat the mix to the reaction temperature. During this process, magnesium ammonium phosphate (MagAmP) is precipitated.

The MAP(39) plant will operate on a batch basis as the production is small.

The reaction mix is filtered to remove the MagAmP, which then passes to the mono ammonium phosphate (MAP 33) plant as a raw material. Refer to MAP 33 below.

The filtrate is cooled by a heat exchanger and MAP 39 crystals are formed before passing to a centrifuge. The crystals, which then pass to a drier to produce the final product, are bagged for sale.

The remaining filtrate (mother liquor) from the centrifuge passes to the Mono Ammonium Phosphate (MAP 33) Plant for further processing. Refer to MAP 33 below.

5 Mono Ammonium Phosphate Plant (MAP 33)

Refer to Fig 4.

MAP 33 granular is produced by injecting liquid anhydrous ammonia into a vessel containing phosphoric acid, and mother liquor and MagAmP from the MAP 39 Plant. The resultant dilute MAP solution is fed to a spray dryer. In this equipment, a mechanical atomizer generates a fine mist of MAP solution to enable the water content to be evaporated.

The evaporation air for the spray dryer is produced by a coal fired hot air generator. A hot air generator is a hearth burning coal making flue gas at about 450°C. Because this is fertilizer manufacture, there is no necessity in keeping the product pristine, so some fly ash entering with the flue gas will not present a problem. The spray drier gets inlet gas at 450°C from the burner and the

feed is atomized into this hot gas stream, where the water evaporates and leaves a dry powder. The outlet temperature is usually about 100°C.

The MAP(33) plant will operate on a continuous basis as the will use a spray drier and this always runs continuously.

The MAP powder from the spray dryer is fed to a pan granulator; the MAP 33 granules are then screened, bagged and fed to the Granular Fertilizer Blending Plant (refer to the Granular Fertilizer Blending Plant). The oversize is crushed and re-screened. The undersize are fed back to the granulator.

6 Granular Fertilizer Blending Plant

Refer to Fig 5.

MAP 33, potash, urea and LAN granules are blended according to the required recipe to produce the various fertiliser blends required for the market. Weighed quantities of these fertilizers, for a specific formulation, are placed into a rotating drum to mix . The blended granular fertilizers are then bagged for sale.

The existing Granular Fertiliser Blending Plant will be relocated from the Standerton site.

The granular blending plant will be a batch operation at the start but could change to continuous if the volumes become much larger than at present.

7 Auxiliary Processes

7.1 Raw Materials storage and Handling

The process will cater for three to four days' storage of raw materials. For amounts stored Refer to Section 10 Resource Use and Products and the Spec Sheets in the Appendix.

7.1.1 Liquid Raw Materials

a) Nitric Acid (HNO3)

A tanker containing 30 t of nitric acid (HNO_3) arrives from Sasol Secunda. Off loading will take place inside an area surrounded by a spill bund so that any spillage from coupling up is captured within the area. Should spillage occur, such will be recycled to the process.

The tanker is coupled up by flexible hoses with Camflex couplings to a pump which pumps the HNO_3 to an 80 t stainless steel storage tank.

The storage tank will be located in an area, which will be bunded to contain the contents of the full tank, plus 10%.

Ullage air from the tank will vent to atmosphere through a lime filter to remove any oxides of nitrogen in the ullage air. Spent lime from the filter will be recycled to the process.

b) Anhydrous Ammonia

Raw material ammonia arrives by road in the supplier's tanker. The tanker is connected to the plant high pressure steel storage tank, 30 t located on a concrete floor. The liquid ammonia will be pumped to the plant storage tank, which is vented back to the supplier's tanker.

c) Ammonium Nitrate (AN)

The ammonium nitrate (AN) delivery system is very similar to that for nitric acid.

A tanker containing 30 t of AN arrives from Sasol, Secunda. Offloading will take place inside an area surrounded by a spill bund so that any spillage from coupling up is captured within the area. Should spillage occur, such will be recycled to the process.

The tanker is coupled up by flexible hoses with Camflex couplings to a pump, which pumps the AN to a 50 t stainless steel storage tank.

The storage tank will be located in an area, which will be bunded to contain the contents of the full tank, plus 10%.

Ullage air from the tank will vent to atmosphere.

7.1.2 Solid Raw Materials

Raw material trucks will drive into the storage building and stop adjacent to the storage bay and discharge the load into the bay and then the truck will drive out. The building will have an entrance at one end, and exit at the other, so that the truck can drive through. The exit and entrance will be equipped with plastic slats, so that the vehicle can drive through easily and dust will be contained inside the building. The raw material stockpiles will be neatened by means of a front end loader.

a) Phosphate rock

The phosphate rock will be delivered in a side discharge enclosed truck containing 33t in bulk.

The phosphate rock arrives as crushed material, which has a coarse powdery consistency. It is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and contain any dust release.

b) Hydrated Lime

Hydrated lime arrives as a full 30 t load, delivered in 1 t bags. These bags will be stored on a concrete slab under cover.

c) Limestone Ammonium Nitrate (LAN)

Limestone ammonium nitrate (LAN) arrives as granules ready for blending into granular fertilizers. The LAN is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and contain any dust release. Dust release will be unlikely because of the granular nature of the material.

d) MAP

The MAP arrives as granules ready for blending into granular fertilizers. The MAP is delivered in bulk and discharged on a concrete slab which will be enclosed to keep the material dry and contain any dust release. Dust release will be unlikely because of the granular nature of the material.

e) Potash

The potash arrives as powder and is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and contain any dust release.

f) Ammonium Sulphate

The ammonium sulphate arrives as sugar like crystals. The ammonium sulphate is delivered in bulk and discharged on a concrete slab, which will be enclosed to keep the material dry and avoid any dust release. Dust release will be unlikely because of the crystalline nature of the material.

g) Urea

The urea arrives as granules ready for blending into granular fertilizers. The urea is delivered in bulk and discharged on a concrete slab which will be enclosed to keep the material dry and avoid any dust release. Dust release will be unlikely because of the granular nature of the material.

7.2 Boiler

Refer to Fig 7.

The boiler will be a fully automatic chain-grate stoker type package unit from a reliable supplier. The boiler will be monitored around the clock by a qualified boiler operator.

7.2.1 Boiler Specification

- Capacity – 2t/hr of steam at 10 bar saturated – 1230kW equivalent
- Coal Used – 244kg/hr
- Emissions – 0.63t/hr CO_2
- Water used – 1 630ℓ/hr
- Blow-down – 100ℓ/hr

7.2.2 Water Treatment Plant

Refer to Fig 7a.

The boiler will require Boiler Feed Water (BFW) of a quality that will not damage the boiler. Soft water is required and this will be achieved by an ion exchange plant. Raw water will be treated by this plant to make the boiler feed water of the required quality. Every few days the ion exchange plant must be regenerated and this will cause a production of a blowdown.

When regenerating an ion exchange column there will be an excess of regenerant needed (often up to 50% excess). This excess goes out into the regen solution and the rinse water for disposal. It means that all excess water will be acceptable for disposal to irrigation without having to be monitored for quality or diverted to some other waste storage. Potassium will also present in the softened water but will be eliminated in blowdowns so it too will either go to the reactor or to disposal.

Much of the blowdown water from the Hi-Fos cooling tower and boiler water will be recycled to the main phosphate reactor so that all the dissolved solids will report to the product phosphoric acid. However, there is an imbalance caused mainly by the rinse water from the ion exchange plant that will remove the calcium content of the raw water (9000 m^3/y).

For this water to be used in irrigation in the adjoining farmland the regenerant that will be used will be potassium chloride (in place of the usual sodium chloride). This means that the treated waters will be sodium, calcium and magnesium free while the regenerant stream and the required rinse waters will be sodium free but will be rich in potassium, calcium and magnesium making this an ideal water for use in irrigating nearby vegetable gardens.

Thus, what would normally be an unusable waste water will be turned into a productive resource.

7.3 Cooling Tower

Refer to Fig 7a.

The cooling tower will be standard type cooling tower from a reliable supplier. The cooling tower will be installed to cool the reaction product from boiling to 35°C and to dissipate the energy from the chiller plant that cools the reaction product to 4°C. The evaporation will use 1.3tph of water.

7.3.1 Cooling tower Specification

- Capacity – 3m³/hr of water evaporation
- Emissions – wet air
- Water used – 2.7 m³/hr
- Blow-down – 81ℓ/hr

7.4 Chiller System

The chiller will consist of a standard 150kW compressor system, using ammonia in a standard refrigeration cycle. The chiller will cool a glycol brine solution, which in turn, will cool the contents of the crystallizer to 4°C, causing the CN4 to crystallize out for separation on a continuous centrifuge.

Ammonia is the refrigerant, not a chlorofluorocarbon (CFC) or a hydrochlorofluorocarbon (HCFC). Ammonia is not ozone depleting, and not part of the Montreal Protocol.

The ammonia used will be refrigerant grade and of a purer quality to that used as a raw material. The ammonia will be delivered separately by the chiller vendor.

7.5 Compressor and Air Injection

The water ring compressor, delivering 60m³/h of air at 0.3 bar. The air will pass to the phosphoric acid reactor sparge , where it will strip the HF gas from the reactor contents. The stripped gases will pass from the reactor through to the scrubber where the HF will be removed.

7.6 Product Storage and Handling

7.6.1 Phosphoric Acid

The phosphoric acid product will pass from the centrifuge and be pumped into a 27 000ℓ product storage tank. From there it will be used on site or pumped into road tankers for delivery to the Sonskyn in Standerton or to alternative customers.

The tanker is coupled up by flexible hoses with Camflex couplings to a pump which pumps the phosphoric acid into the road tanker. The tanker is parked inside an area surrounded by a spill bund so that any spillage from coupling up is captured within the area. That spillage will be recycled to the process.

The storage tank will be located in an area which will be bunded to contain the contents of the full tank, plus 10%.

7.6.2 Calcium Nitrate (CN4)

The CN4 product can be stored in bulk bags but this could cause problems because of its low melting point. Alternatively, it can be melted at 50°C and pumped to bulk storage for delivery to a CN4 liquid user in the explosives and agriculture industries.

If the CN4 is intended to be sold as a more suitable product, then it will be passed into a vessel where it will be melted by a steam coil and then pumped into a heated tanker. After that it will be transported to the customer.

A more likely process is that the CN4 will be converted to CNX (refer above). This product has a high melting point and less water of crystallization. The CN4 can be bagged and sold as a fertilizer.

7.6.3 Calcium Fluoride (CaF_2)

The calcium fluoride is formed in the scrubber circuit as and is filtered out and forms a wet filter cake. It is bagged and then dispatched to customers.

7.6.4 Calcium Ammonium Nitrate (CNX)

The CNX is a dry granular solid screened to a specific size range. It is bagged and then dispatched to consumers.

7.6.5 Pure Mono Ammonium Phosphate (MAP 39)

The MAP 39 is a dry crystalline granular solid screened to a specific size range. It is bagged and then dispatched to consumers.

7.6.6 Mono Ammonium Phosphate (MAP 33)

MAP 33 is a regular granular solid screened to a specific size. It is bagged and then dispatched to consumers.

7.7 By-Product Storage

7.7.1 Boiler Ash

The ash is discharged from the Boiler and stored in a bunded area to contain such. The ash will then be loaded onto a truck dispatched to a 3rd party.

7.7.2 Silica

The wet silica material is discharged from the reactor products filter and stored in a bunded area to contain any free moisture that may be present. The silica will be loaded onto a truck and dispatched to a 3rd party.

7.7.3 Gypsum

The wet gypsum is discharged from the gypsum separator and stored in a bunded area to contain any free moisture that may be present. It may be sold in which case the gypsum will be loaded onto a truck and dispatched to a 3rd party.

Gypsum Treatment

Refer to Fig 9.

As an alternative to sales the gypsum may be treated. The Hi-Fos process will produce 8200 tpa of Gypsum dihydrate as a by-product that needs to be converted into saleable fertilizer for use by dry land farming operations. A suitable product will be a granule that can be added into fertilizer blends which will be beneficial for the acidifying the soil and adding some organics at the same time.
In this gypsum granulation process, dried chicken manure that has been treated by the suppliers with MAP from the HiFos process to give a pH4, will be brought to the site in bulk trailers and stored in a

bin in the granulation building. This will be moved by front-end loader to the gypsum granulation plant where it will be mixed with the filter cake from the gypsum filter.
The mixer will be a robust machine known in the brick making world as a blunger. This paste will be fed to a paddle-mixer which makes it into granules that are then fed to a drier. The dried granules are screened – the oversize particles are passed through rollers set at 4mm gap to break them into product size and rescreened – the undersize goes back to the blunger for regranulation.

As the manure will be acidic in formulation (see spec sheet) it will be almost odourless so the stack gases will be acceptable to exit to atmosphere.

A valuable additive that assists in granulation is chicken manure and supplies some fulvic acid useful in the soil as a chelating agent. The Hi-Fos product will be a 30% mixture of chicken manure with the by-product gypsum at 70% and this whole blend will be granulated and dried in a rotary kiln heated with a coal fired hearth. Any dust from the exit gases will be recovered in a cyclone and fed back into the feed mixing plant. This will give over 10000 tpa of a well-balanced organic based sulphate containing granule.

The spec for the gypsum/manure product will be based on: -

Gypsum	60%
Manure – acidic	40%

7.8 Materials of Construction

The plant will be constructed mainly from polypropylene which is resistant to the process materials. Most of the vessels, equipment and pipework will constructed of polypropylene. It is a strong plastic and resistant to all the chemicals involved in the process.

Exceptions to this are stainless steel 304, which will be used for the CNX section and the MAP 33 spray drier.

8 Design

There are no complex engineering processes involved in the design. Should there be a breakdown during Plant operation, the Plant will be shut down to fix the problem without there being significant disruption to operation.

9 Flow Diagrams

Fig 1: Phosphoric Acid Plant

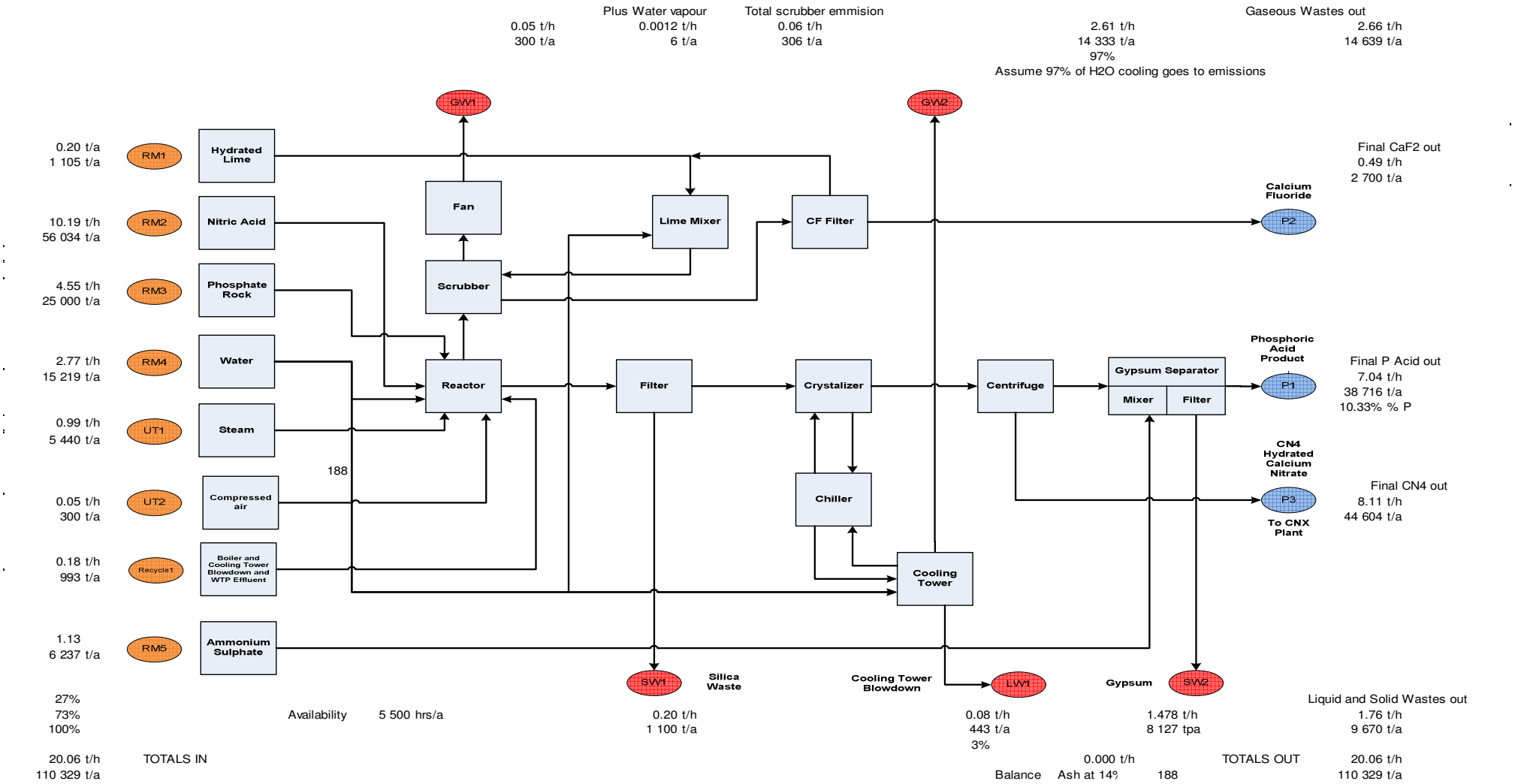


Fig 2: CNX Flow Diagram

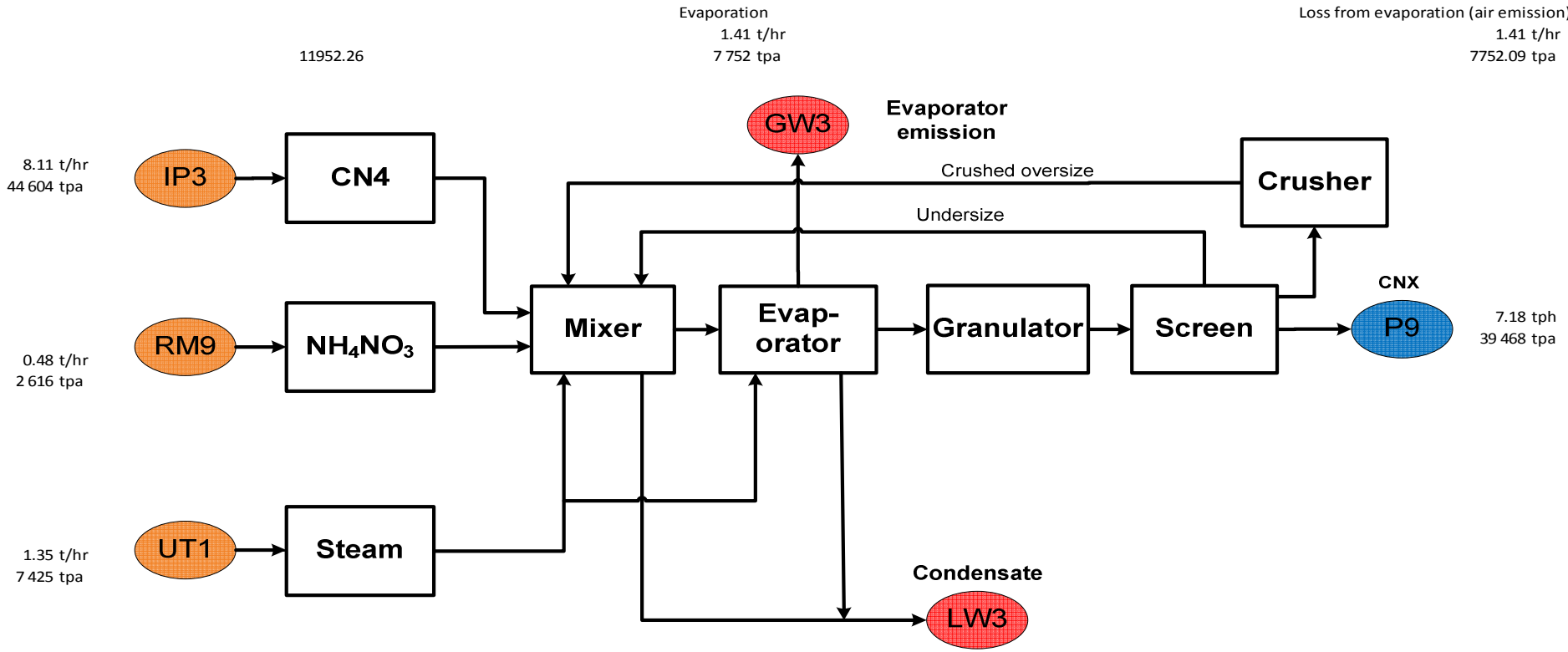


Fig 3: Map (39)

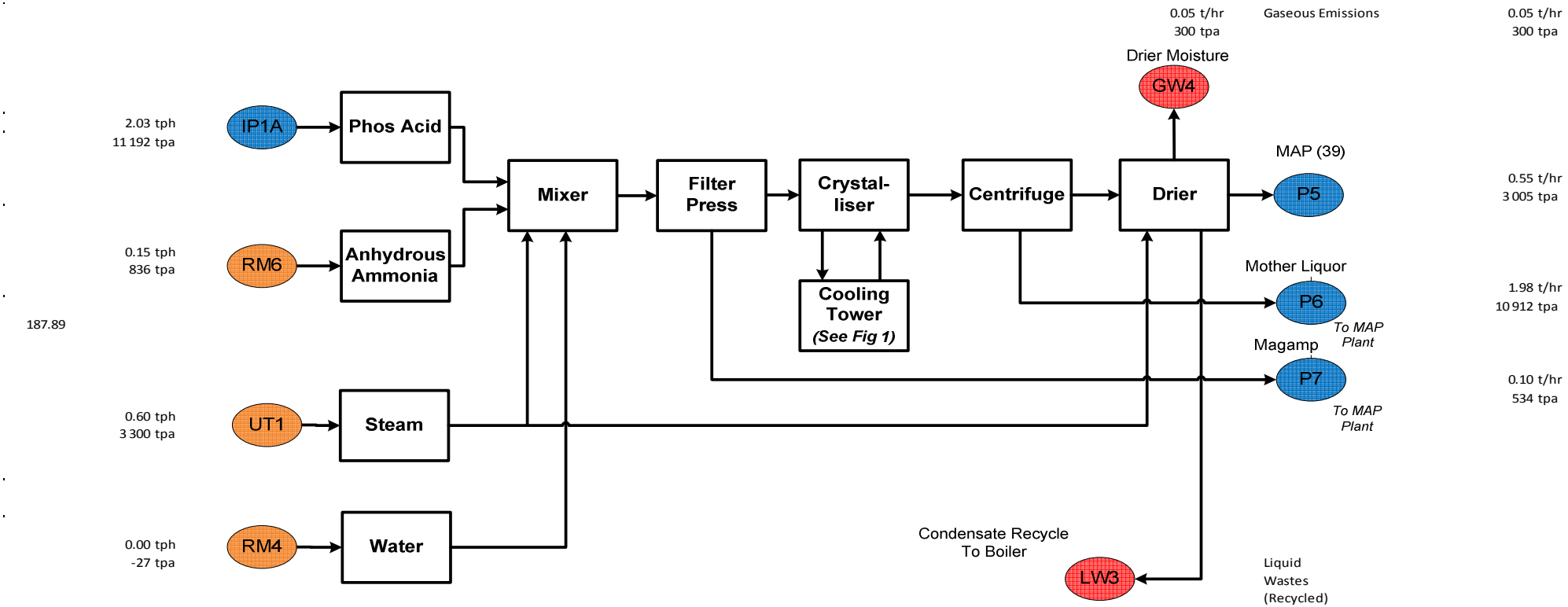

0.05 t/hr
300 tpa
Gaseous Emissions
0.05 t/hr
300 tpa
Drier Moisture
GW4
2.03 tph
11 192 tpa
IP1A
Phos Acid
Mixer
Filter Press
Crystal-liser
Centrifuge
Drier
MAP (39)
P5
0.55 t/hr
3 005 tpa
0.15 tph
836 tpa
RM6
Anhydrous Ammonia
Cooling Tower
(See Fig 1)
Mother Liquor
P6
1.98 t/hr
10 912 tpa
To MAP Plant
187.89
Magamp
P7
0.10 t/hr
534 tpa
To MAP Plant
0.60 tph
3 300 tpa
UT1
Steam
0.00 tph
-27 tpa
RM4
Water
Condensate Recycle
To Boiler
LW3
Liquid
Wastes
(Recycled)
Availability
5 500 hrs/a
0.10 t/hr
550 tpa
0.10 t/hr
550 tpa
Total In
2.78 tph
Total In
15 301 tpa
Ash at 14%
187.89
Total out
2.78 t/hr
Total out
15 301 tpa

Fig 4: Mono Ammonium Phosphate Plant (MAP)

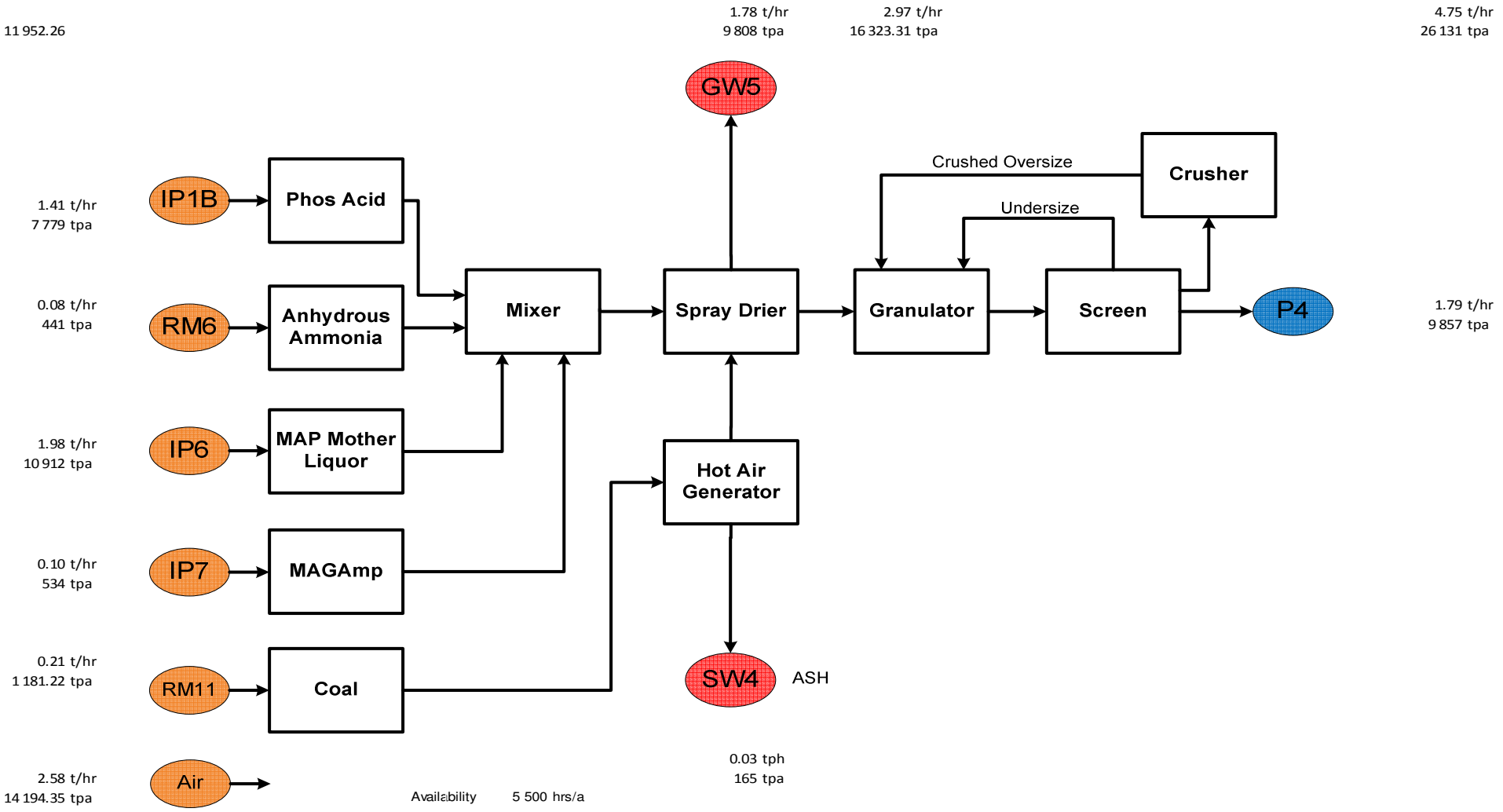
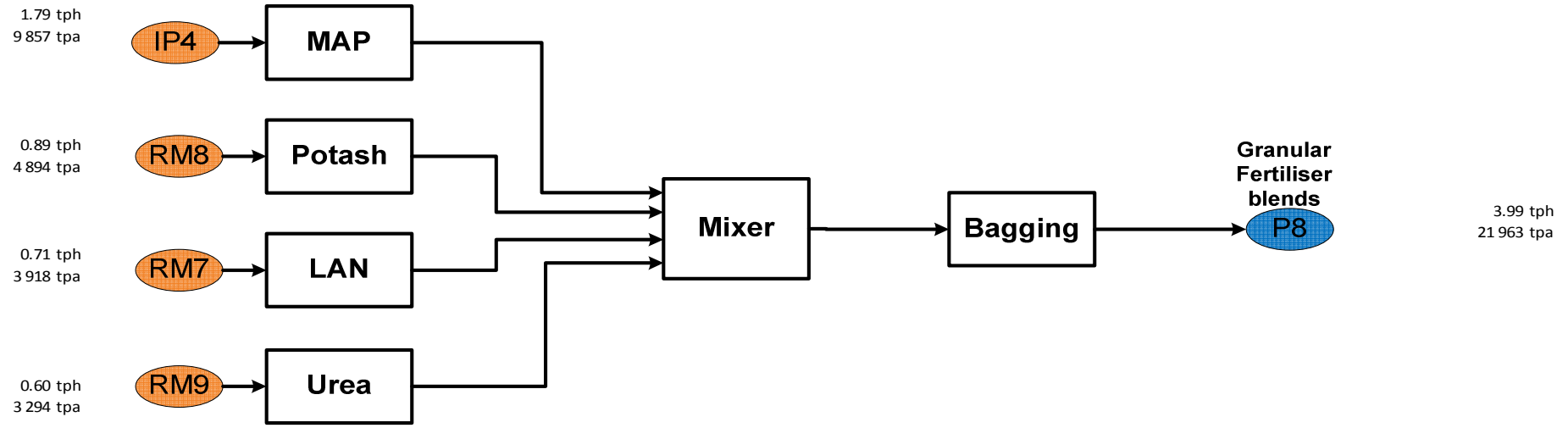


Fig 5: Granulation Plant



Availability 5 500 hrs/a

3.99 tph	**Total in**	**Total Out**	3.99 tph
21 963 tph	**Total out**	**Total Out**	21 963 tpa

Fig 6: Water Usage

SUMMARY

Total water used			Total Water recovered
Steam injection	P acid	8 190 tpa	7 975 tpa
	MAP		
Cooling H2O	P acid	15 219 tpa	443
Steam	CNX	7 425 tpa	239 *Assuming 3% all condensate loss
	MAP	550 tpa	
Water Treatment Plant		2 228 tpa	
Total		33 612 tpa	8 179 tpa
Total used		25 433 tpa	
		4.62 t/hr	

Fig 7: Boiler.

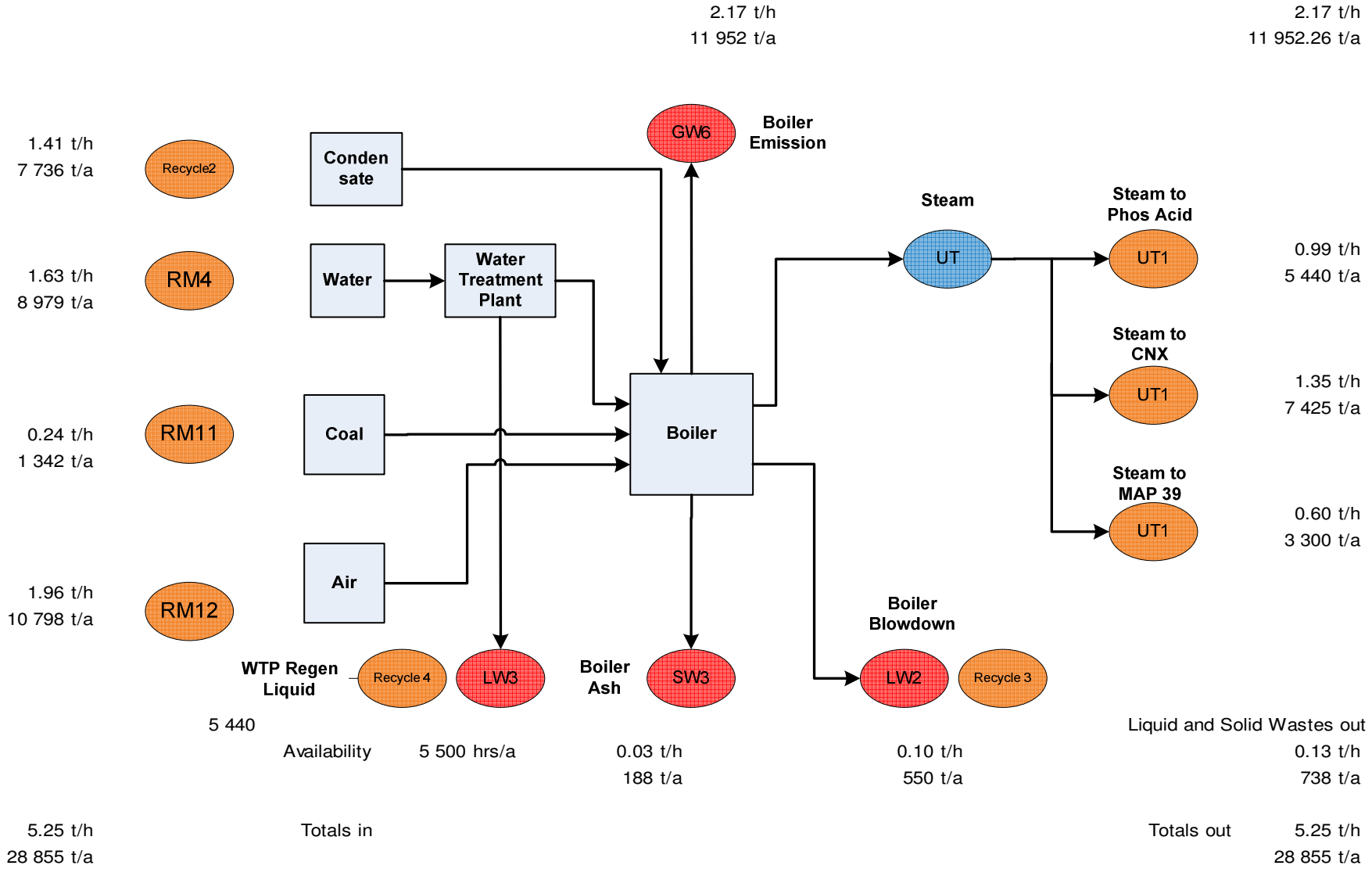
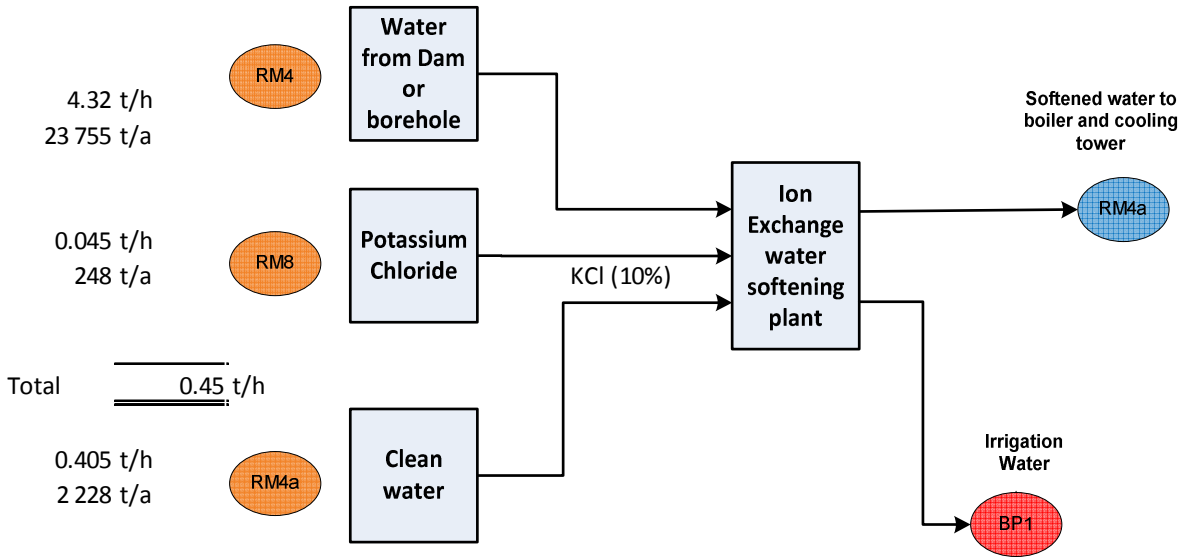

2.17 t/h
11 952 t/a
2.17 t/h
11 952.26 t/a
1.41 t/h
7 736 t/a
Recycle2
Conden sate
GW6
Boiler Emission
Steam
Steam to Phos Acid
1.63 t/h
8 979 t/a
RM4
Water
Water Treatment Plant
UT
UT1
0.99 t/h
5 440 t/a
Steam to CNX
UT1
1.35 t/h
7 425 t/a
0.24 t/h
1 342 t/a
RM11
Coal
Boiler
Steam to MAP 39
UT1
0.60 t/h
3 300 t/a
Air
1.96 t/h
10 798 t/a
RM12
Boiler Blowdown
WTP Regen Liquid
Recycle 4
LW3
Boiler Ash
SW3
LW2
Recycle 3
5 440
Availability
5 500 hrs/a
0.03 t/h
188 t/a
0.10 t/h
550 t/a
Liquid and Solid Wastes out
0.13 t/h
738 t/a
5.25 t/h
28 855 t/a
Totals in
Totals out
5.25 t/h
28 855 t/a

Fig 7a: Water Treatment Plant



4.32 t/h
23 755 t/a

To boiler 8 979 t/a
To cooling Tower 14 776 t/a
Total 23 755 t/a

0.45 t/h
2 475 t/a

4.77 t/h
26 230 t/a

Totals

Availability 5500 h/a

Totals 4.77 t/h
26 230 t/a

Fig 8 Factory Block Diagram

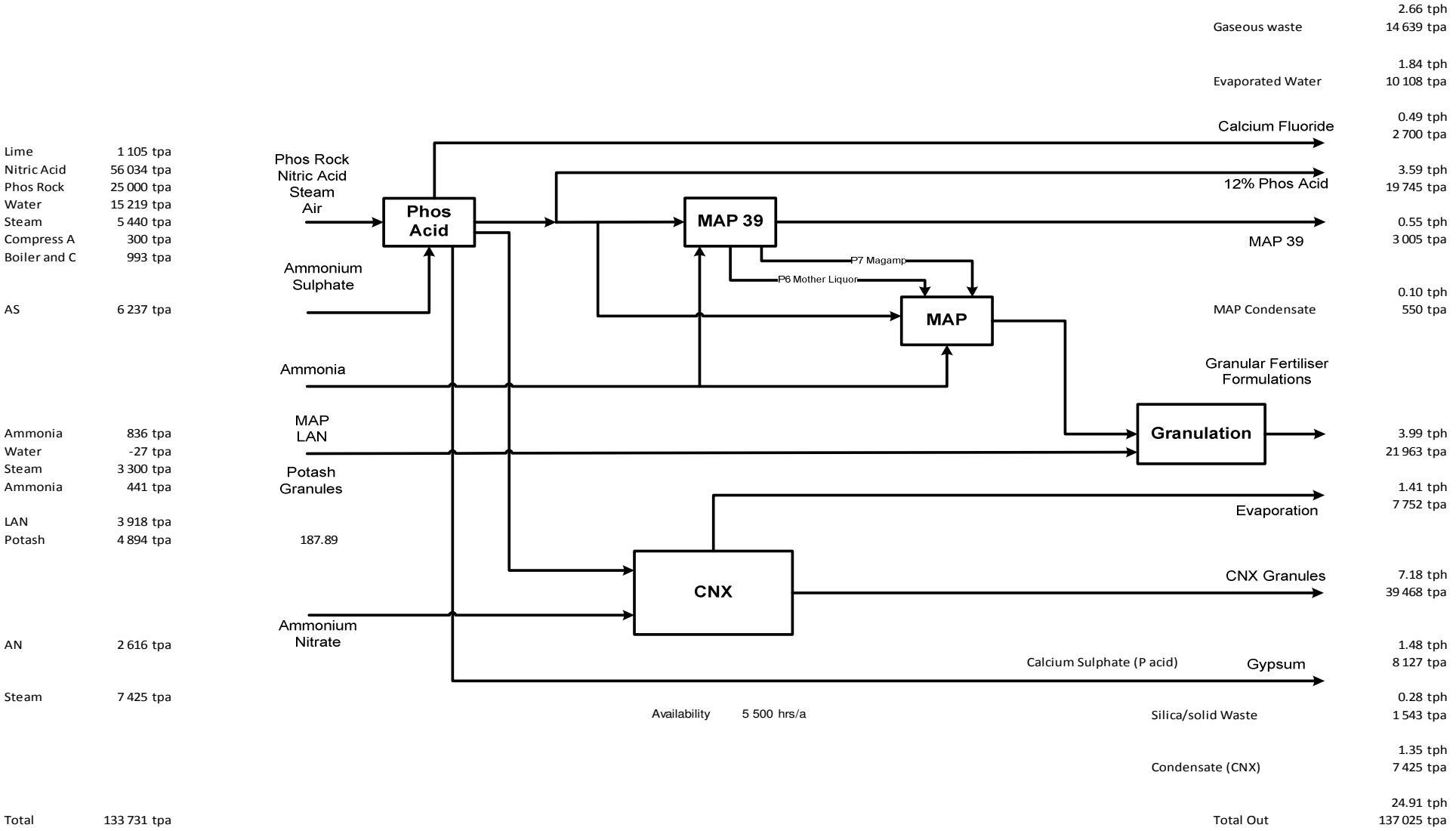
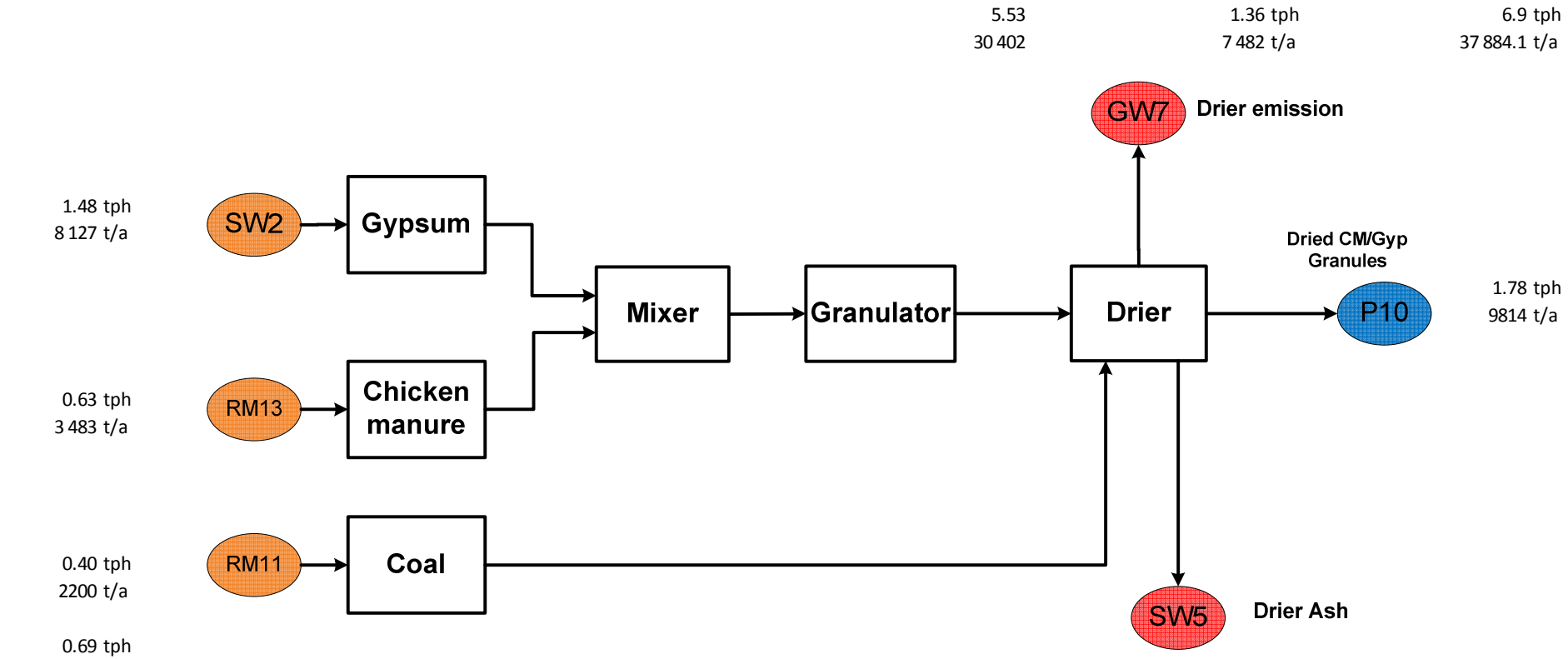


Fig 9: Gypsum Treatment



10 Resource Use and Products

10.1 Raw Materials and Utilities

				Plant Storage		
Stream No	**Raw Materials**			tpd	Days	t
RM1	Lime	1 105	tpa	5	7	35
RM2	Nitric Acid	56 034	tpa	245	3	735
RM3	Phos Rock	25 000	tpa	109	21	2 291
RM4	Water	15 192	tpa	66	3	199
RM5	Ammonium Sulphate	6 237	tpa	27	3	82
RM6	Ammonia	1 277	tpa	6	7	39
RM7	LAN	3 918	tpa	17	5	86
RM8	Potash	4 894	tpa	21	10	214
RM9	Ammonium Nitrate 90%	2 616	tpa	11	5	57
RM12	Urea					
RM11	Fuel - Coal	2 523	tpa	11	7	77
RM12	Chicken Manure		tpa			
Utilities						
UT1	Compress Air	300	tpa			
UT2	Steam	16 165	tpa			
	Boiler Blowdown	550	tpa	2	3	7
	Total In	**135 811**	tpa			

Also Refer the process block diagram and mass balance.

Also Refer the water balance Fig 6.

10.2 Recycle

Liquid Wastes	**All Recycled**			tpd	Days	t
LW1	Cooling Tower Blowdown	443	tpa	2	3	6
LW2	Boiler Blowdown	550	tpa	2	3	7
LW3	Steam Condensate	7 975	tpa	35	3	104
LW4	WTP Effluent	2 475	tpa			
	Total Aqueous Wastes	**11 443**	tpa			

300 Kilowatt (kW); chiller 150 kW

10.3 Products and Wastes

				Plant Storage		
Products				tpd	Days	t
P1	Phos Acid	19 745	tpa	86	3	258
P2	CaF2	2 700	tpa	12	3	35
P3	CN4 (1)	44 604	tpa	195	3	584
P4	MAP (1)	9 857	tpa	43	3	129
P5	MAP39	3 005	tpa	13	3	39
P6	Mother Liquor (1)	10 912	tpa	48	3	143
P7	Magamp (1)	534	tpa	2	3	7
P8	Granular Ferts	21 963	tpa	96	3	288
P9	CNX	39 468	tpa	172	3	517
P10	CM/Gyp Granules	9 814	tpa			
	Total	**152 787**	tpa			
Gaseous Wastes						
GW1	Scrubber Emission	306	tpa			
GW2	Cooling Tower Emission	14 333	tpa			
GW3	CNX Evap Emission	7 752	tpa			
GW4	Drier Emission	300	tpa			
GW5	Spray Drier Emission	9 719	tpa			
GW6	Boiler Emission	11 952	tpa			
GW7	CM/Gyp Drier Emission	7 482	tpa			
	Total Gaseous Wastes	**44 363**	tpa			
				Plant Storage		
Liquid Wastes	**All Recycled**			tpd	Days	t
LW1	Cooling Tower Blowdown	443	tpa	2	3	6
LW2	Boiler Blowdown	550	tpa	2	3	7
LW3	Steam Condensate	7 975	tpa	35	3	104
LW4	WTP Effluent	2 475	tpa			
	Total Aqueous Wastes	**11 443**	tpa			
Solid Wastes						
SW1	Silica Waste	1 543	tpa	7	3	20
SW2	Gypsum	8 127	tpa	35	3	106
SW3	Boiler Ash	188	tpa	1	3	2
SW4	Hot Air Generator Ash	165	tpa	1	3	2
SW5	CM/Gyp Drier Ash					
	Total Solid Wastes	**10 023**	tpa	44	3	131
	Total Out	**207 173**				

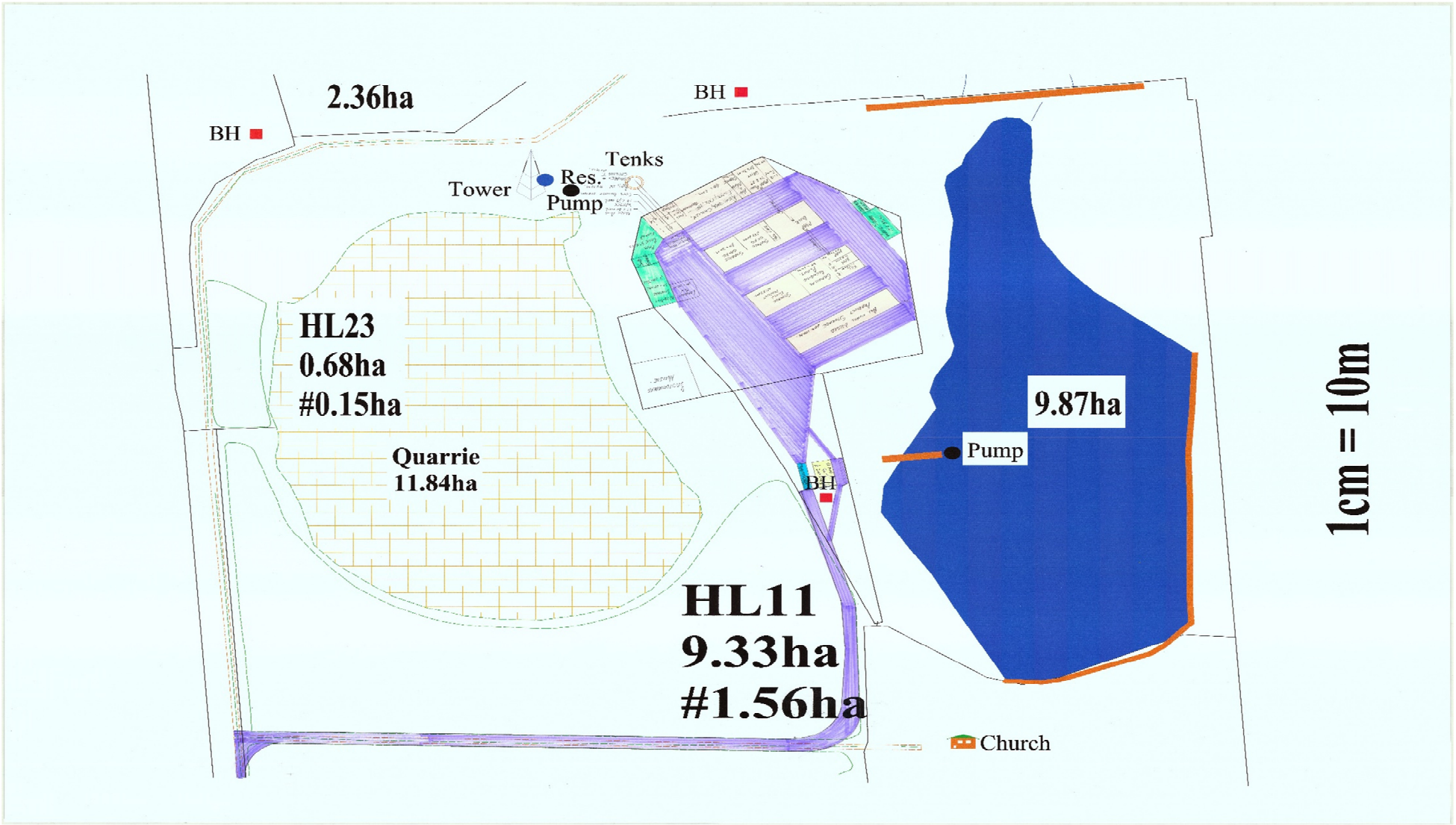
(1) Intermediate Product

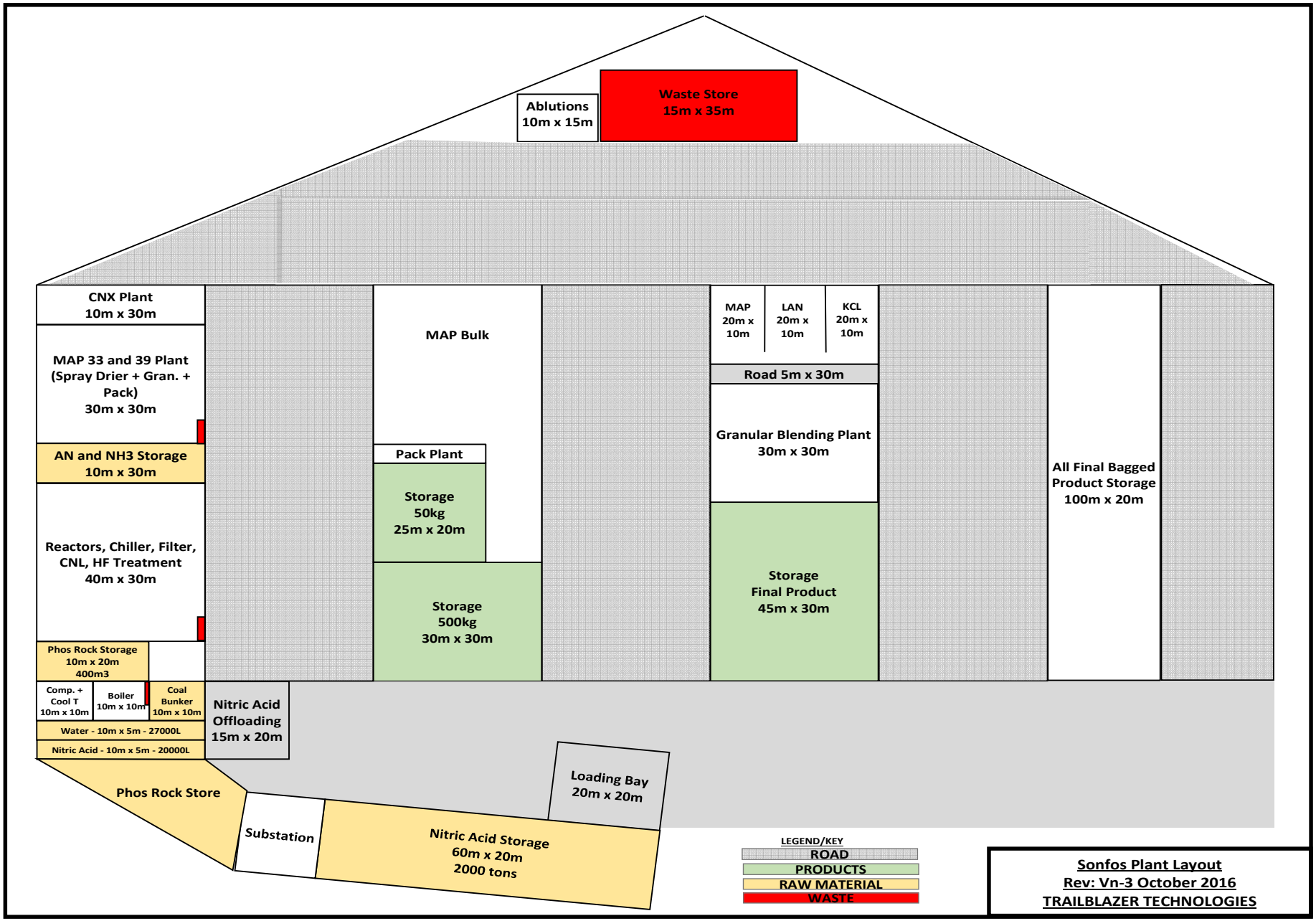
(2) All Recycled.

Note: The Resource Use and Products table will not balance because it includes intermediate products and recycles and excludes combustion air.

For balances refer to the overall Block Diagram and individual mass balance flow diagrams.

11 Plant Layout




Ablutions
10m x 15m
Waste Store
15m x 35m
CNX Plant
10m x 30m
MAP 33 and 39 Plant
(Spray Drier + Gran. +
Pack)
30m x 30m
AN and NH3 Storage
10m x 30m
Reactors, Chiller, Filter,
CNL, HF Treatment
40m x 30m
Phos Rock Storage
10m x 20m
400m3
Comp. +
Cool T
10m x 10m
Boiler
10m x 10m
Coal
Bunker
10m x 10m
Water - 10m x 5m - 27000L
Nitric Acid - 10m x 5m - 20000L
Phos Rock Store
Substation
Nitric Acid
Offloading
15m x 20m
MAP Bulk
Pack Plant
Storage
50kg
25m x 20m
Storage
500kg
30m x 30m
MAP
20m x
10m
LAN
20m x
10m
KCL
20m x
10m
Road 5m x 30m
Granular Blending Plant
30m x 30m
Storage
Final Product
45m x 30m
All Final Bagged
Product Storage
100m x 20m
Loading Bay
20m x 20m
Nitric Acid Storage
60m x 20m
2000 tons
LEGEND/KEY
ROAD
PRODUCTS
RAW MATERIAL
WASTE
Sonfos Plant Layout
Rev: Vn-3 October 2016
TRAILBLAZER TECHNOLOGIES

12 Operating Hours

The design will be around 5500 hours per annum using a three-shift system excluding Sunday operations.

13 Best Available Technology

Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals Ammonia, Acids and Fertilizers dated December 2006 (http://www.jrc.es/pub/english.cgi/0/733169/) refers "*the nitrophosphate process for producing NPK (nitrogen (N), phosphorus (P) and potassium (K)) grades is characterised by the use of nitric acid for rock phosphate digestion and the subsequent cooling of the digestion solution in order to separate out most of the calcium ions from the solution as calcium nitrate crystals*". The nitrophosphate process is the favoured process for manufacturing phosphoric acid.

An alternative to nitric acid is the use of sulphuric acid. The major disadvantage of using sulphuric acid is the large quantities of phosphor-gypsum that are produced for which there is a limited market.

Regarding the absorption of hydrogen fluoride gas, it says that absorption by alkaline medium can result in HF emission level of 1 – 5mg/Nm^3.

14 Legal Aspects

14.1 National Environmental Management Act (No. 107 of 1998)

In terms of section 24F of the NEMA, no person may commence an activity listed in terms of sections 24(2)(a) or (b) of the NEMA (listed activity) without an EA issued in terms of the NEMA. GNR 327, 325 and 324 published in terms of the NEMA on 7 April 2017 set out the listed activities that cannot be undertaken without an EA.

GNR 327 identifies those activities for which a basic assessment (BA) must be undertaken in accordance with the procedure set out in GNR 326; GNR 325 identifies those activities for which a S&EIR process must be undertaken in accordance with the procedure set out in GNR 326; and GNR 324 identifies geographical areas in respect of which environmental authorisation must be applied for by undertaking the BA process. It must be noted that GNR 327 and GNR 324 pertains to those activities which are deemed to have a lesser environmental impact whilst those listed in GNR 984 have a more significant impact on the environment and accordingly, a more detailed and extensive level of assessment is required.

EA in terms of section 24(2) and 24D of the NEMA is required for the following listed activities identified in terms of GNR 327 (7 April 2017):

Activity 24: The development of-

(i) a for which an environmental authorisation was obtained for the route determination in terms of activity 5 in Government Notice 387 of 2006 or activity 18 in Government Notice 545 of 2010; or

(ii) with a reserve wider than 13,5 meters, or where no reserve exists where the road is wider than 8 meters;

but excluding –

(a) which is identified and included in activity 27 in Listing Notice 2 of 2014;
(b) where the entire road falls within an urban area; or
(c) which is 1 kilometre or shorter.

EA in terms of section 24(2) and 24D of the NEMA is required for the following listed activities identified in terms of GNR 325 (7 April 2017):

Activity 4: The development and related operations of facilities or infrastructure, for the storage, or storage and handling of a dangerous good, where such storage occurs in containers with a combined capacity of more than 500 cubic metres.

Activity 6: The development of facilities or infrastructure for any process or activity which requires a permit or licence or an amended permit or licence in terms of national or provincial legislation governing the generation or release of emissions, pollution or effluent, excluding-

(i) activities which are identified and included in Listing Notice 1 of 2014;
(ii) activities which are included in the list of waste management activities published in terms of section 19 of the National Environmental Management: Waste Act, 2008 (Act No. 59 of 2008) in which case the National Environmental Management: Waste Act, 2008 applies; or
(iii) the development of facilities or infrastructure for the treatment of effluent, polluted water, wastewater or sewage where such facilities have a daily throughput capacity of 2000 cubic metres or less; or
(iv) where the development is directly related to aquaculture facilities or infrastructure where the wastewater discharge capacity will not exceed 50 cubic metres per day.

An application for an EA will be made to the DARDLEA.

14.2 National Environmental Management: Waste Act (No. 59 of 2008)

In terms of section 19(1) of the National Environmental Management: Waste Act (No. 59 of 2008) (NEM:WA), the Minister, in GNR 921 (29 November 2013), published a list of waste management activities that have, or are likely to have a detrimental effect on the environment. In terms of section 20(b) of the NEM:WA no person may commence, undertake or conduct a waste management activity, except in accordance with a waste management licence issued in respect of that activity, if a licence is required.

GNR 921 (29 November 2013) differentiates between Category A, Category B and Category C waste management activities. Category A waste management activities are those which require the conducting of a BA process as stipulated in the GNR 982 (4 December 2014) as part of the waste management licence application. Category B waste management activities are those that require the conducting of an S&EIR process stipulated in the GNR 982 (4 December 2014) as part of the waste management licence application. Category C waste management activities require that the Norms and Standards for the storage of waste be applied without the need to undertake an EA process. GNR 926 (29 November 2013) listed activities applicable to the proposed Phosphoric Acid Plant were identified as:

Category C (Norms and Standards in terms of GNR 926 (29 November 2013)):

Activity 5(1): The storage of general waste at a facility that has the capacity to store in excess of 100m^3 of general waste at any one time, excluding the storage of general waste in lagoons or temporary storage of such waste.

Activity 5(2): The storage of hazardous waste at a facility that has the capacity to store in excess of 80m^3 of hazardous waste at any one time, excluding the storage of hazardous waste in lagoons or temporary storage of such waste.

14.3 National Environmental Management: Air Quality Act 39 of 2004

Section 22 of the National Environmental Management: Air Quality Act (No. 39 of 2004) (NEM:AQA) states that "*no person may without a provisional atmospheric emission licence or an atmospheric emission licence conduct an activity listed on the national list anywhere in the Republic; or listed on the list applicable in a province anywhere in that province*".

GNR 839 of 22 November 2013 provides the list of activities resulting in atmospheric emissions which have or may have a significant detrimental effect on, inter alia, the environment and the Minimum Emission Standards (MES) for these activities as contemplated in section 21 of the NEM:AQA. The scheduled process, in terms of these regulations, applicable to the proposed Phosphoric Acid Plant was identified as:

Category 7: Inorganic Chemicals Industry

Subcategory 7.2: Production of Acids.

Subcategory 7.3: Production of Chemical Fertilizer.

An application for an Atmospheric Emissions Licence (AEL) will be made to the Gert Sibande District Municipality.

14.3.1 Government Notice Regulation 831

The boiler will be classified as a controller emitter in terms of GNR 831: Declaration of a small boiler as a controlled emitter and establishment of emission standards. The boiler will need to comply to GNR 831.

14.4 National Water Act (No. 36 of 1998)

In terms of section 22 of the National Water Act (No. 36 of 1998) (NWA), no person may undertake a water use as set out in section 21 of the NWA (water use) without a Water Use Licence (WUL) issued in terms of the NWA unless –

- such water use falls within the ambit of a water use as set out in schedule 1 to the NWA, which pertains to the use of water for, inter alia, domestic use or small gardening;
- such water use falls within the ambit of an existing lawful water use in terms of section 34 of the NWA, which pertains to a water use which has taken place at any time during a period of two years prior to the commencement of the NWA, being 1 October 1998;
- such water use falls within the ambit of a general authorisation issued in terms of section 39 of the NWA (General Authorisation); or
- the Minister of Department of Water and Sanitation (DWS) has dispensed with the requirement for a WUL in terms of section 22(3) of the NWA.

A WUL is sought in terms of section 41 of the NWA for activities listed in section 21 of the NWA. The water uses read as follows:

Section 21(a): Taking water from a water resource.

Section 21(b): Storing of water.

Section 21(e): Engaging in a controlled activity identified in section 37(1) or declared under section 38(1).

Section 21(g): Disposing of waste in a manner, which may detrimentally impact on a water resource.

An application for a WUL will be made to the DWS.

14.5 National Heritage Resources Act (No. 25 of 1999)

In terms of section 38 of the National Heritage Resources Act (No. 25 of 1999) (NHRA) the following developments require a Phase 1 Archaeological Impact Assessment prior to proceeding with construction:

- Any development or other activity which will change the character of a site:
    - exceeding 5 000m^2 in extent; or
    - involving three or more existing erven or subdivisions thereof; or
    - involving three or more erven or divisions thereof which have been consolidated within the past five years; or
    - the costs of which will exceed a sum set in terms of regulations by South African Heritage Resource Agency (SAHRA) or a provincial heritage resources authority;
    - the re-zoning of a site exceeding 10 000m^2 in extent; or
    - any other category of development provided for in regulations by the SAHRA or a provincial heritage resources authority, must at the very earliest stages of initiating such a development, notify the responsible heritage resources authority and furnish it with details regarding the location, nature and extent of the proposed development.

The proposed Phosphoric Acid Plant will exceed 5 000m^2 in extent and change the character of the site. For this reason, a Phase 1 Archaeological Impact Assessment will be required for the proposed Phosphoric Acid Plant.

14.6 Occupational Health and Safety Act (No. 85 of 1993)

The Occupational Health and Safety Act (No. 85 of 1993) (OHSA) makes provisions that address the health and safety of persons working at the site. The OHSA addresses amongst others the:

- safety requirements for the operation of plant machinery;
- protection of persons other than persons at work against hazards to health and safety, arising out of or in connection with the activities of persons at work;
- establishment of an advisory council for occupational health and safety; and
- provision for matters connected therewith.

The OHSA is applicable and states that any person:

- undertaking work on any premises shall ensure as far as is reasonably practicable that nothing about the manner in which the work is conducted makes it unsafe or creates a risk to health; and
- undertaking upgrades or developments for use at work or on any premises shall ensure as far as is reasonably practicable that nothing about the manner in which it is erected or installed makes it unsafe or creates a risk to health when properly used.

Thus, the OHSA is applicable to the proposed Phosphoric Acid Plant.

14.7 Ammonium Nitrate

Ammonium nitrate must be managed in accordance with the

- Explosives Act, 2003 (Act No. 15 of 2003)
- South African National Road Traffic Act, 1996 (Act 93 of 1996)
- Fire Brigade Act, 1987 (Act 99 of 1987)
- Occupational Health and Safety Act, 1993 (Act. No. 85 of 1993)

15 Safety, Health and Environmental (SHE) Issues

15.1 Gaseous Emissions Produced by the Process

The process produced six gaseous emissions, namely:

1. GW1: Scrubber emission.
2. GW2: Boilers stack emission.
3. GW3: Cooling tower emission.
4. GW4: Nitric acid tank vent emission.
5. GW5: Spray drier emission.
6. GW6: Evaporator emission.
7. GW7: Gypsum Treatment drier emission.

These are all quantified in the Material Spec Sheets Section 17. These emissions will be studied by Air Quality Dispersion Specialist to determine the impact on the environment and the community.

Note that no emission is associated with the chiller.

15.1.1 Scrubber Emission

A wet scrubber using hydrated lime is proposed to capture the acidic gases (hydrogen fluoride and oxides of nitrogen) by absorbing them from the carrier gas.

Scrubber emission composition – essentially wet air as almost all of the HF fumes will have been extracted.

The subsequent gas stream emitted from the scrubber will then contain such a low residual amount of acidic gas that it no longer poses a threat. The scrubber emission will meet the requirement of GNR 839 - Category 7: Inorganic Chemicals Industry, Subcategory 7.3: Production of Chemical Fertilizer.

Odour

The scrubbing processes will eliminate odours associated with hydrogen fluoride.

15.1.2 Effluent from the Scrubber

The scrubber liquid will then be passed through a filter which will remove the CaF_2 as a wet cake. The insoluble CaF_2 product will then be bagged for sale. Remaining liquid will be recycled in the process.

15.1.3 Boiler Stack Emission

A small coal fired boiler (with a design capacity equal to 1.2 megawatts (MW) but less than 50 MW net heat input per unit, based on the lower calorific valued used) will emit typical boiler stack emissions of carbon dioxide, sulphur dioxide, nitrogen and excess air. The coal fired boiler emission will meet the requirement of Government Notice Regulation 831: Declaration of small boiler as a controlled emitter and establishment of emission standards.

15.1.4 Cooling Tower Emission

A cooling tower is proposed as a heat exchanger, inside of which heat is withdrawn from the water by contact between the water and the air. The heat transfer occurs through the heat exchange between air and water and through the evaporation of a small part of the water that needs to be cooled. The cooling tower emission will be typical cooling tower emission of wet air.

15.1.5 Nitric Acid Tank Vent Emission

The nitric acid emissions vented from the storage tank will pass through a tank scrubber unit containing solid lime to absorb the oxides of nitrogen. The average movement of the tank will be $50m^3$ per day. A few kilograms of lime will be used, which when spent will be recycled to the process.

Odour

The scrubbing processes will minimise odours associated with nitric acid.

15.1.6 Chiller Emissions

The chiller will use a refrigeration medium which may be ammonia. The only point of gaseous emission will be at the seal of the ammonia compressor and this point will be continuously scrubbed using acidic phosphate liquor. In this way any leakage that can occur will be saved and used in the final product so no pollution threat can exist here.

15.1.7 Gypsum Treatment Drier Emission

The drier emission will consist of wet flue gas from a coal fired open hearth heater which generates hot flue gasses to dry the granules. The emission will be mostly wet air with some coal combustion products. It may have traces of chicken manure odour, but it will disperse rapidly because of its high temperature.

15.1.8 Gaseous Emission Measurement

Also refer legal aspects.

The only emission that will require monitoring is from the scrubber. A system will be designed and implemented that will sample the emission from the stack and measure the HF content using something like a Draeger Tube. This will be done regularly to start off with until a more practicable sampling rate can be determined.

15.1.9 Stack Heights

Emission Ref	Item	Height (m)	Diameter (mm)	Composition	Temp ^{o}C
GW1	HF Treatment	4	200	Air	30
GW2	Cooling Tower	3	750	Wet Air	16
GW3	CNX Plant	3	200	Steam	50
GW4	MAP (39)	10	500	Wet Air	60
GW5	MAP (33)	4	200	Wet Air	90
GW6	Boiler	7	500	Flue Gas	180
GW7	Gypsum Treatment	4	200	Wet Air	90

15.2 Liquid Effluents

The liquid effluents produced by the process are as follows:

1. Boiler blow down.
   This consists of contaminated water which will be reused in the process
2. Cooling tower blow down.
   This consists of contaminated water which will be reused in the process.
3. Effluent from the Scrubber.
   Zero flow rate. *Refer scrubber emission above*.
4. Water Treatment Plant effluent.
   Can be used for irrigation as it is an aqueous dilute solution of fertilizer.
5. Rain water run-off.
   While the materials are stored on site any rain water run-off will be contained within the concrete bunker in which they are stored. Phosphate rock, boiler ash and silica may generate contaminated rain water run-off and if so it will be captured and recycled to the process.
6. Steam condensate.
   Steam condensate from steam coils will be collected and recycled to the boiler.

There will be no net liquid effluents generated by the processes, all liquid wastes from the processes will be recycled back to the proposed Phosphoric Acid Plant.

15.3 By-Products

There are four by-products produced by the process:

1. Silica from the phosphate rock digestion process.
2. Boiler ash.

3. Calcium nitrate.
4. Calcium fluoride.

15.3.1 Silica

The silica will be loaded onto a truck and dispatched to a 3rd party for use.

15.3.2 Boiler Ash

It is envisaged that the ash will be dispatched to a 3rd party for use however, if no such 3rd party is found the ash such will be disposed of at a licenced waste disposal facility.

15.3.3 Calcium Nitrate

Calcium nitrate can be used by an explosives company to make emulsion explosives; but the likelihood is that it will be converted to CNX.

15.3.4 Calcium Fluoride

The 3rd party has expressed interest in taking this supply of material.

15.4 Rain Water Run-off

Any contaminated rain water run-off generated on site will be recycled into the process. Refer to Liquid Effluents.

16 Other Impacts

16.1 Noise

The noisiest piece of equipment, the fan, is expected to generate less than 80 decibels adjusted (dbA).

16.2 Visual

The plant equipment, vessels, pipework and steel support structures will be built on concrete foundations and floors. The plant will be contained in a building of aluminium or steel sheeting.

17 Specific Issues and Worst Case Scenarios

The main concerns of this process are hydrofluoric acid vapour and nitric acid vapour.

17.1 Hydrofluoric Acid Vapour

Small quantities of HF will be produced in the reactor which will be sealed from the outside. The vapours will pass to the alkaline scrubber, under negative pressure, where the HF and oxides of nitrogen will be absorbed. Any leaks will result in air intake to the system rather than effluent chemical release to the environment.

17.2 Nitric Acid Tank Failure

The worst case scenario is a nitric acid tank failure. This is extremely unlikely as the tank will be manufactured to the appropriate standards and materials of construction.

The plant will also be bunded to contain a spill, although a spill will result in some oxides of nitrogen fumes being and released, until the acid has been recovered.

18 Working Environment Health and Toxicology

Refer Tables 1, 2 and 3.

The hydrofluoric acid is an extremely corrosive chemical capable of dissolving glass and metals and severely damaging flesh including skin and eyes. It is however contained in the phosphoric acid reactor and scrubber system which is specifically designed to operate at a negative pressure. The scrubber absorbs the HF in a lime solution to produce the harmless, extremely insoluble calcium fluoride.

Phosphoric acid and nitric acid are very corrosive to skin and other materials. These acids will be properly contained and appropriate personal protective equipment (PPE) will be used when handling these materials, including gloves face shields and goggles.

Ammonium nitrate is an explosive and must comply with The Explosives Act (No. 15 of 2003) and the Explosives Inspector. However, only AN solution will be used on site so the hazardous nature of the chemical will be voided.

All the chemicals involved in the process can be regarded as irritants and appropriate PPE will be worn including gloves, face shields and goggles.

Phosphate rock and hydrated lime are dusty materials; appropriate PPE will be worn including dust masks.

18.1.1 First Aid

Several operators will be trained up as first aiders, so that every shift will be covered with qualified person. First Aid Boxes will be positioned in appropriate places, will be accessible and maintained.

18.1.2 Local Hospital and a Medic

The nearest hospital is in Standerton. They will be briefed with all the hazards present at the factory and provided with Material Safety Data Sheets (MSDS) for all the materials involved in the factory processes.

18.1.3 Toilets and Sewage

A longdrop is not acceptable due to the closeness of the dam and the nearby farming community.

One alternative is to use portable tank to Standerton Sewage plant. The factory could do its own transport on a 3 - 5t truck once or twice a week.

The project will also investigate small processing unit – solid waste will be sterile and used as organic matter in gypsum formulation. Gypsum formulating will involve heating for granulation so all organic matter will be sterile.

19 Alternatives

19.1 Product – Phosphoric Acid

In order to grow crops efficiently soluble phosphate is required as a fertilizer, there is no alternative to this.

19.2 Process Route

The Nitrophos Process has become the favoured process for manufacturing phosphoric acid. An alternative it is the sulphuric acid process which has the major disadvantage of producing large quantities of phosphor-gypsum which will not have a ready market.

19.3 Site

The two sites that were considered were Farm Vlakfontein 386, Portion 93 and Holfontein 399, Portion 4.

19.3.1 Farm Vlakfontein 386, Portion 93

This Farm Vlakfontein 386, Portion 93 is located off the R546, approximately 8km from Standerton on Portion 93 of the Farm Vlakfontein 386 in the Mpumalanga Province. This site alternative proved less favourable:

- as it is a Greenfield (undeveloped land) site;
- electricity provision is unavailable; and
- there is a hazard associated with vehicles accessing the R546 road.

19.3.2 Farm Holfontein 399, Portion 4

The second site is located off the R23, approximately 27km from Standerton located within the Lekwa Local Municipality on Portion 4 of the Farm Holfontein 399 in the Mpumalanga Province. This site alternative proved to be more favourable:

- it is a Brownfields (previously developed land) site;
- is currently supplied with electricity; and
- there is no hazard with vehicles accessing the R53.

19.4 Do Nothing Alternative

Soils naturally contain many nutrients like nitrogen, phosphorous, calcium, and potassium. These nutrients allow plants to grow. When soil nutrients are missing or in short supply, plants suffer from nutrient deficiency and stop growing. When the nutrient levels are too low, the plant cannot function properly and cannot produce the food necessary to feed the population.

Once crops are harvested for human consumption, the natural supply of nutrients in the soil must be replenished. Accordingly farmers add nutrients to their soils. Nutrients can be added from a variety of sources—organic matter, chemical fertilizers, and even by some plants. These maintain the soil fertility, so the farmer can continue to grow nutritious and healthy crops.

Farmers utilise fertilizers because these substances contain plant nutrients such as nitrogen, phosphorus, and potassium. Fertilizers are simply plant nutrients applied to agricultural fields to supplement required elements found naturally in the soil.

It is estimated that in 2013, Mpumalanga contributed some R269.9 billion in current prices or some 7.6% to the Gross Domestic Product (GDP) of South Africa. Agriculture contributed 8.6% of the GDP, R23.2 billion. The proposed Phosphoric Acid Plant falls within the Gert Sibande District Municipality that contributed 41.6% to the agricultural GDP, R9.7 billion. The proposed Phosphoric Acid Plant will produce fertiliser to support the commercial agricultural industry in the Gert Sibande District Municipality. Furthermore, the proposed Phosphoric Acid Plant will contribute towards employment.

If the proposed Phosphoric Acid Plant was not to continue, Hi-Fos would not produce:

- fertiliser to support the commercial agricultural industry in the Gert Sibande District Municipality; or
- the phosphoric acid required by Sonskyn.

The consequence to Sonskyn would be business interruption, financial loss and ultimate closure.

20 Conclusion

Sonskyn supplies liquid and blended solid fertilizers to farms around the area of Standerton, Mpumalanga. In this regard Sonskyn purchase raw materials from suppliers throughout Southern Africa to produce the liquid fertilizer.

The solid raw materials currently used are potassium chloride, urea, MAP 33, LAN and zinc sulphate. Liquid raw materials used are phosphoric acid and ammonium nitrate solution. These materials are presently dissolved in water and filtered to produce the liquid fertilizer formulations.

In addition, raw material in the form of solid granules are blended in a scroll mixer to give solid granular fertilizer formulations.

One of the raw materials used by Sonskyn, phosphoric acid, is becoming increasingly difficult to procure. Accordingly, Hi-Fos is investigating the construction and operation of a Phosphoric Acid Plant and auxiliary plants to manufacture phosphoric acid, CNX, MAP 39 and MAP 33 for their own use and for sales.

The objective of the proposed Phosphoric Acid Plant is to construct and operate the following:

- Phosphoric Acid Plant.
- CNX Plant.
- MAP 39 Plant.
- MAP 33 Plant.
- Chicken Manure/Gypsum Granulation Plant (Gypsum Treatment).

The project also includes a move of the Granular Fertilizer Blending Plant from Sonskyn in Standerton to the proposed Phosphoric Acid Plant site.

TBT, a chemical engineering design company, approached Hi-Fos with the Nitrophos Process technology in this regard. The would produce phosphoric acid from phosphate rock sourced from Phalaborwa and nitric acid from Sasol.

The various plants can operate in either a continuous or batch mode. The plant will run during the farming season, April to January, at 5500 hours per annum (h/a) and result in employment of 70 people.

21 References

NitroPhos Process from Trailblazer Technology.

Meetings with Sonskyn Kunsmis Management.

Meetings with Terra Pacis Management.

Meetings with Trailblazer Management.

European Commission for Integrated Pollution Prevention and Control.

Best Available Techniques for the Manufacture of Large Volume Inorganic Chemicals Ammonia Acids and Fertilizers dated December 2006. (LVIC-AAF).

Coal Ash Assay.

Determination and statistical evaluation of the effect of minerals and mineral associations in specific dense medium fractions on ash fusion temperature. Ashrltl Govender Hons. B.Sc. (Chemistry) (University of Natal)

22 Appendices

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Table 1 Chemicals used in the process that have hazards which could harm the health of employees.

HAZARDOUS CHEMICAL	*Phosphate rock*	*Nitric acid*	*Hydrated lime*	*Phos acid*	*CN4/CNX*	*HF emission*	*NH4 sulphate*	*NH4 nitrate*	*MAP Mother liquor*	*Magamp*	
Form (dust, vapour)	*Dust*	*Fumes*	*Dust*	*Liquid*	*Solid*	*Fumes*	*Solid*	*Solid*	*Liquid*	*Liquid*	
Health Effect	*Irritation*	*Coughing*	*Corrosive Irritation*	*Corrosive to skin*	*Corrosive to skin and eyes*	*Serious lung damage*	*Irritant to skin and eyes*	*Irritant to skin and eyes*	*Irritant to skin and eyes*	*Irritant to skin and eyes*	
Occupational Exposure Limit	*10 mg/Nm^3*	*5.2 mg/Nm^3*	*5 mg/Nm^3*	*1 mg/Nm^3*		*2.5 mg/Nm^3*					
Exposure Route (tasks)	*Inhalation*	*Fumes – inhalation;*	*Inhalation; Solution – Skin contact*	*Skin contact*	*Eyes; inhalation*	*Inhalation*		***EXPLOSIVE***			
Exposed Persons	*Operations staff*										
Exposure Level (relative to OEL) To be determined											

Table 2: Hazard Study 1 - Chemical Hazards Proforma

PROJECT : Sonskyn 2 Phos Acid Plant

Date: 21/9/2015

HAZARD	'Blank'	INSIGNIFICANT HAZARD
POTENTIAL	'K'	HAZARDS KNOWN AND UNDERSTOOD
KEY	'Sequential Number'	REFER NUMBERED NOTES

CHEMICAL (or group of chemicals)	PHYSICAL STATE	QUANTITY	EXPLOSION AND FLAMMABILITY			REACTIVE STABLITY HAZARDS	IMMEDIATE HEALTH HAZARDS				CHRONIC HEALTH HAZARDS	OTHER HEALTH HAZARDS		ENVIRONMENTAL HAZARDS			HAZARD-BREAK-DOWN	PROBLEMS IN
	S, L, G	(inventory / throughput) t/a	Fire	Deflagrate Detonate	Electrical Static		Inhalation	Corrosive	Sensitizer	Other		Odour	Radiation	Water	Air	Ground	PRODUCTS	HANDLING
PRODUCTS																		
Phosphoric acid	L	3 060	-	-	-	-	K	K	-	-	-	-	-	K	-	K	-	-
Calcium nitrate	S	24 445	-	K	-	-	-	K	-	-	-	-	-	K	-	-	-	-
Calcium fluoride	S		-	-	-	-	-	-	-	-	-	-	-	-	-	K	-	-
MAP	S		-	-	-	-	-	K	-	-	-	-	-	K	-	K	-	-
MAP (39)	S		-	-	-	-	-	K	-	-	-	-	-	K	-	K	-	-
RAW MATERIALS																		
Phosphate rock	S	13 665	-	-	-	-	K	-	-	-	-	-	-	-	-	-	-	1
Nitric acid	L	28 272	-	K	-	-	K	K	-	-	-	K	-	K	K	K	-	-
Hydrated lime	S	575	-	-	-	-	K	K	-	-	-	-	-	K	-	-	-	-
Water	L	8 084	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Ammonium sulphate	S		-	-	-	-	-	K	-	-	-	-	-	K	-	K	-	-
Anhydrous ammonia	G		K	K	-	-	K	K	-	-	-	K	-	K	K	K	-	-
Ammonium nitrate	S		K	K	-	K	-	-	K	-	-	-	-	K	-	K	-	-
LAN	S		K	K	-	-	-	-	-	-	-	-	-	K	-	K	-	-
Potash	S		-	-	-	-	-	-	-	-	-	-	-	K	-	K	-	-
Chicken Manure	S	3 483	-	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-

PROJECT : Sonskyn 2 Phos Acid Plant

Date: 21/9/2015

HAZARD	'Blank'	INSIGNIFICANT HAZARD
POTENTIAL	'K'	HAZARDS KNOWN AND UNDERSTOOD
KEY	'Sequential Number'	REFER NUMBERED NOTES

CHEMICAL (or group of chemicals)	PHYSICAL STATE	QUANTITY	EXPLOSION AND FLAMMABILITY			REACTIVE STABLITY HAZARDS	IMMEDIATE HEALTH HAZARDS				CHRONIC HEALTH HAZARDS	OTHER HEALTH HAZARDS		ENVIRONMENTAL HAZARDS			HAZARD-BREAK-DOWN	PROBLEMS IN
	S, L, G	(inventory / throughput) t/a	Fire	Deflagrate Detonate	Electrical Static		Inhala-tion	Corro-sive	Sens-itizer	Other		Odour	Radia-tion	Water	Air	Ground	PROD-UCTS	HANDLING
AUXILIARY CHEMICALS																		
Coal	S	15 254	K	K	-	-	-	-	-	-	-	-	-	-	-	-	-	-
WASTES																		
Silica	S	400	-	-	-	-	-	-	-	-	K	-	-	-	-	-	-	-
Gypsum	S	561	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Scrubber emission	G		-	-	-	-	K	-	-	-	-	-	-	-	K	-	-	-
Boiler emission	G		-	-	-	-	K	-	-	-	-	K	-	-	K	-	-	-
Coal Ash	S		-	-	-	-	-	-	-	-	-	-	-	K	-	K	-	-

Notes : 1.Dusty Material

2. .

Table 3: Hazard Study 1 - Chemical Interaction Proforma

PROJECT : Sonskyn 2 Phos Acid Plant

Date: 21/9/2015

HAZARD POTENTIAL 'Blank' -- Insignificant Hazard

KEY : 'K' -- Hazards known and understood

'Number'-- Refer numbered notes

	CHEMICAL (or group of chemicals)	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	Phosphoric acid	**K**	**K**	-	**K**	-	-	-	-	-	**K**	**K**	**K**	**K**	-	**K**	-	**K**	-	-	
B	Calcium nitrate	-	-	-	-	-	-	-	-	-	**K**	**K**	-	-	-	**K**	-	-	-	-	
C	Phosphate rock	C	**K**	-	-	-	-	-	-	-	-	-	-	-	**K**	**K**	-	-		-	
D	Nitric acid	D	**K**	-	-	-	**K**	-	**K**	-	**K**	-	**K**	-	-	**K**	-	**K**	-	-	
E	Hydrated lime	E	**K**	-	-	-	-	-	-	-	**K**	-	-	-	-	**K**	**K**	-	-	-	
F	Water	F	-	-	-	-	-	-	-	-	**K**	-	-	-	-	**K**	-	-	-	-	
G	Coal	G	-	-	**K**	-	-	-	-	-	-	-	-	-	-	**K**	-	-	-	-	
H	Silica	H	-	-	-	-	-	-	-	-	-	-	-	-	-	**K**	-	-	-	-	
I	Calcium fluoride	I	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
J	Air	J	**K**	-	-	-	-	-	-	-	**K**	-	-	-	-	**K**	-	-	-	-	
K	Ammonia	K	-	-	-	-	-	-	-	-	-	-	-	-	-	**K**	**K**	-	-	-	
L	Ammonium sulphate	L	-	-	-	-	-	-	-	-	-	-	-	-	-	**K**	-	-	-	-	
M	LAN	M	-	-	-	-	-	-	-	-	-	-	-	-	-	**K**	-	-	-	-	
N	Ammonium nitrate	N	-	**K**	-	-	-	-	-	-	-	-	-	-	-	**K**	-	-	-	-	
O	Potash	O	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
P	Hydrogen fluoride	P	-	**K**	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
Q	Boiler emission	Q	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
R	Coal ash	R	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
S	Gypsum	S	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	
T	Chicken Manure	T																		-	
U		U																			

Notes : 1.

23 Materials Data Sheets

23.1 RM1 Hydrated Lime

RM1 Hydrated Lime						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **RAW MATERIAL**						
PLANT : Phos Acid Plant			**Page**			
STREAM NAME: Lime feed to Scrubbing			**Reference**		**RM 1**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**		**2016/03/21**	
CONDITIONS DEFINED AT Site, ambient			**Revision**		**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**14.47**	**Actual t**	**15**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.20**				
FLOWRATE inc Availability	**t/a**	**1 105.26**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
CaO	**69.00**					
MgO	**1.30**					
Insolubles	**1.60**					
MSDS		http://www.sciencelab.com/msds.php?msdsId=9927122				
Particle Size Distribution including Dust		**<0.075mm 85%**				
Bulk Density		**0.45t/m^3**				
INTENDED MEANS OF HANDLING:						
Material arrives on site by rail or road truck and stored in 1t bulk bags at the Sonskyn Plant. The storage area will be under cover and totally enclosed so any dust release will be contained.						
POTENTIAL EFFECTS:						
There will be very few potential effects as dusts will be contained.						

23.2 RM2 Nitric Acid

RM2 Nitric Acid						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **RAW MATERIAL**						
PLANT : Phos Acid Plant		**Page**				
STREAM NAME: Feed to Reactor		**Reference**		**RM 2**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**		**2016/03/21**		
CONDITIONS DEFINED AT Site, ambient		**Revision**		**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**14.47**	**Actual t**	**15**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**10.19**				
FLOWRATE inc Availability	**t/a**	**56 034.48**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
HNO3	**60.00**					
Water	**40.00**					
MSDS		http://www.sciencelab.com/msds.php?msdsId=9926241				
Particle Size Distribution including Dust		**N/A**				
Bulk Density		**1.36**				
INTENDED MEANS OF HANDLING:						
Nitric acid is delivered from SASOL in tankers and discharged into the nitric acid storage tank at the factory. Secure connections are used so that there is no fumes, or liquid leakage. The plant tank vent is equipped with a fume filter containing lime to capture any nitric acid fumes.						
POTENTIAL EFFECTS:						
This chemical is extremely corrosive to skin and eyes and metals. It can form explosive mixtures with organic material.						

RM3 Phosphate Rock

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT
MATERIAL SPECIFICATION SHEETS
RAW MATERIAL

PLANT : Phos Acid Plant		**Page**	
STREAM NAME: Feed to Reactor		**Reference**	**RM 3**
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/03/21**
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**
REFERENCE SOURCE: J Bewsey; Sonskyn			
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**	**327.27** **Actual t** **350**

	UNIT	DESIGN	MAXIMUM	MINIMUM
FLOWRATE	**t/h**	**4.55**		
FLOWRATE inc Availability	**t/a**	**25 000.00**		
PRESSURE	**kPa(g)**	**Amb**		
TEMPERATURE	**°C**	**Amb**		

COMPOSITION -	**% w/w**	**IMPURITIES:**	**%**
P_2O_5	**33.00**	**CO_2**	**0.80**
F	**2.80**	**SO_3**	**0.10**
SiO_2	**2.50**	**Al_2O_3**	**0.70**
CaO	**44.70**	**MgO**	**0.20**
Fe_2O_3	**13.40**	**Na2O**	**0.10**
Moisture	**2.50**		
Total	**98.90**	**Total**	**1.90**
MSDS		http://www.rcfltd.com/webdocs/853/2016/02/Rock_Phosphate_MSDS.pdf	
Particle Size Distribution including Dust		**0 – 12mm with 53% > 1mm and 15% < 45micron**	
Bulk Density			

INTENDED MEANS OF HANDLING:

The phosphate rock will be delivered in a side discharge enclosed truck.
This it arrives as crushed material which has a coarse powdery consistency. It delivered in bulk and discharged on a concrete slab which will be enclosed to keep the material dry and avoid any dust release.

POTENTIAL EFFECTS:

The raw material is dusty, discharge however will be in an enclosed building and the dust will be contained. The dust is not harmful, and operators will be equipped with dust masks.

RM5 Ammonium Sulphate					
HI-FOS(Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**					
PLANT : Phos Acid Plant		**Page**			
STREAM NAME: Ammonium Sulphate feed to Gypsum Separator		**Reference**	**RM5**		
ANNUAL RATE - Case; Full rate; 35 000 tpa		**Date**	**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn					
AVAILABILITY 5500 days per annum		**AMOUNT STORED 3 days**	**81.65**	**t**	**100t**
	UNIT	**DESIGN**	**MAXIMUM**	**MINIMUM**	
FLOWRATE	**t/h**	**1.13**			
FLOWRATE inc Availability	**t/a**	**6 237.00**			
PRESSURE	**kPa(g)**	**Amb**			
TEMPERATURE	**°C**	**Amb**			
COMPOSITION -	**% w/w**	**IMPURITIES:**			**ppm**
NH4	**27%**				
SO4	**73%**				
Total	**100%**				
MSDS		http://www.sciencelab.com/msds.php?msdsId=9927078			
Particle Size Distribution including Dust					
Bulk Density					
INTENDED MEANS OF HANDLING:					
This arrives as sugar like crystals. It delivered in bulk and discharged on a concrete slab which will be enclosed to keep the material dry and avoid any dust release. Dust release will be unlikely because of the crystalline nature of the material.					
POTENTIAL EFFECTS:					
Ammonium Sulphate is an acidic substance, and can cause irritation to the skin and eyes; proper protective clothing should be worn when working with this substance.					

23.5 GW1 Scrubber Emission

GW1 Scrubber Emission						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT MATERIAL SPECIFICATION SHEETS GASEOUS WASTE						
PLANT : Phos Acid Plant - HF Treatment			**Page**			
STREAM NAME: Scrubber Emission			**Reference**		**GW1**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**		**2017/03/30**	
CONDITIONS DEFINED AT Site, ambient			**Revision**		**2**	
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum						
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.06**				
FLOWRATE inc Availability	**t/a**	**306.42**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**30**				
COMPOSITION -	**v/v**	**Mechanical Details**				
Air	**99.00%**	**Height**				**4m**
HF ppm v/v	**<5**	**Diameter**				**200mm**
Water Vapour t/h	**0.0012**					
Oxides of nitrogen	**<5**					
Screen size		**N/A**				
Particle Size Distribution including Dust		**N/A**				
Bulk Density		**N/A**				
INTENDED MEANS OF HANDLING:						
The emission from the scrubber is discharged to atmosphere.						
POTENTIAL EFFECTS:						
The scrubber emission is essentially wet air containing less than 5ppm of HF. Dispersion studies and toxicology studies will be carried out, but it is not expected that there will be any effect on the community or the environment.						

GW2 Cooling tower Emission

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT
MATERIAL SPECIFICATION SHEETS
GASEOUS WASTE

PLANT : Phos Acid Plant		**Page**	
STREAM NAME: Cooling tower Emission		**Reference**	**GW2**
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/04/14**
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**
REFERENCE SOURCE: J Bewsey; Sonskyn			
AVAILABILITY 5500 days per annum			

	UNIT	DESIGN	MAXIMUM	MINIMUM
FLOWRATE	**t/h**	**2.61**		
FLOWRATE inc Availability	**t/a**	**14 332.72**		
PRESSURE	**kPa(g)**	**Amb**		
TEMPERATURE	**°C**	**16**		

COMPOSITION -	**v/v**	**Mechanical Details**	
Air		**Height**	**3m**
Water Vapour		**Diameter**	**750mm**

Screen size	**N/A**
Particle Size Distribution including Dust	**N/A**
Bulk Density	**N/A**

INTENDED MEANS OF HANDLING:

The emission from the Cooling tower is discharged to atmosphere.

POTENTIAL EFFECTS:

The Cooling Tower emission is essentially wet air. It is not expected that there will be any effect on the community or the environment.

SW1 Silica Waste						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT MATERIAL SPECIFICATION SHEETS SOLID WASTE						
PLANT : Phos Acid Plant			**Page**			
STREAM NAME: Silica Waste from Reactor Filter Discharge.			**Reference**		**SW1**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**		**2016/04/14**	
CONDITIONS DEFINED AT Site, ambient			**Revision**		**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum%		**Amount Stored 3 days Calc t**		**14.40**	**Actual t**	**15**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.20**				
FLOWRATE inc Availability	**t/a**	**1 100**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
SiO_2		**Iron**				
Screen size						
Particle Size Distribution including Dust		**0 - 1 mm; wet.**				
Bulk Density						
INTENDED MEANS OF HANDLING:						
The wet silica material is discharged from the reactor products filter and stored in a bunded area to contain any free moisture that may be present. It is later loaded onto a truck and dispatched to a customer probably a local brick maker.						
POTENTIAL EFFECTS:						
This material is wet and therefore there will not be a dust problem.						

SW2 Gypsum

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT
MATERIAL SPECIFICATION SHEETS
SOLID WASTE

PLANT : Phos Acid Plant		**Page**	
STREAM NAME: Gypsum from the phos acid gypsum separator		**Reference**	**SW2**
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/07/04**
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**
REFERENCE SOURCE: J Bewsey; Sonskyn			
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**	**106.39**
	UNIT	**DESIGN**	**MAXIMUM**
FLOWRATE	**t/h**	**1.48**	
FLOWRATE inc Availability	**t/a**	**8 127.00**	
PRESSURE	**kPa(g)**	**Amb**	
TEMPERATURE	**°C**	**Amb**	

COMPOSITION -	**% w/w**	**IMPURITIES:**	**ppm**
Ca	**23%**		
H2O	**21%**		
SO4			
Total	**100%**		

MSDS	http://www.sciencelab.com/msds.php?msdsId=9923277
Particle Size Distribution including Dust	**0 - 1 mm; wet.**
Bulk Density	

INTENDED MEANS OF HANDLING:

The wet gypsum is discharged from the gypsum separator and stored in a bunded area to contain any free moisture that may be present.
It is consumed in the Gypsum Treatment Plant where it is mixed with RM13 Chicken Manure and granulated.

POTENTIAL EFFECTS:

7. LW1 Cooling Tower Blow Down

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT
MATERIAL SPECIFICATION SHEETS
LIQUID WASTE

PLANT : Phos Acid Plant		**Page**	
STREAM NAME: Cooling Tower Blow Down		**Reference**	**LW1**
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/04/14**
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**
REFERENCE SOURCE: J Bewsey; Sonskyn			
AVAILABILITY 5500 days per annum		**Amount Stored**	**Nil**

	UNIT	**DESIGN**	**MAXIMUM**	**MINIMUM**
FLOWRATE	**t/h**	**0.08**		
FLOWRATE inc Availability	**t/a**	**443**		
PRESSURE	**kPa(g)**	**Amb**		
TEMPERATURE	**°C**	**Amb**		

COMPOSITION -	**% w/w**	**IMPURITIES:**	**ppm**
Water	**99%**	**Cooling tower chemicals**	
		Concentrated water solids	
		Airborne dust	

Screen size	**N/A**
Particle Size Distribution including Dust	**N/A**
Bulk Density	**1kg/l; 1t/m^3**

INTENDED MEANS OF HANDLING:

The cooling tower blow down is recycled to the process to the reactor products before the filter.

POTENTIAL EFFECTS:

None, all recycled.

8. P1 Phosphoric Acid

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT

MATERIAL SPECIFICATION SHEETS
PRODUCT

PLANT : Phos Acid Plant			**Page**		
STREAM NAME: Phos Acid Product			**Reference**	**P1**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/07/04**	
CONDITIONS DEFINED AT Site, ambient			**Revision**	**1**	
REFERENCE SOURCE: J Bewsey; Sonskyn					
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**506.83**	**Actual t** **500**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**
FLOWRATE	**t/h**	**7.04**			
FLOWRATE inc Availability	**t/a**	**38 716.06**			
PRESSURE	**kPa(g)**	**Amb**			
TEMPERATURE	**°C**	**Amb**			
COMPOSITION -	**% w/w**	**IMPURITIES:**			**ppm**
%PO4	**33%**	**Fe**			**0.19%**
% H2O	**40%**	**Al**			**0.06%**
AN%	**19.53%**	**H and Oxide (Cation/anion balance)**			**0.26%**
Other NO3 %	**7%**	**Mg**			**0.00**
Total	**99%**	**Total**			**1%**
MSDS		http://www.sciencelab.com/msds.php?msdsId=9926534			
Hazards		**A non toxic liquid, highly corrosive to skin and metalic materials.**			
Bulk Density					

INTENDED MEANS OF HANDLING:

The Phos acid leaves the centrifuge and is pumped to storage.
From there tankers transport it to the Sonskyn fertilizer blending factory, or to customers.

POTENTIAL EFFECTS:

9. P2 Calcium Fluoride

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT

MATERIAL SPECIFICATION SHEETS
PRODUCT

PLANT : Phos Acid Plant			**Page**		
STREAM NAME: Feed to Reactor			**Reference**	**P2**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/04/14**	
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn					
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**35.35**	**Actual t** **40**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**
FLOWRATE	**t/h**	**0.49**			
FLOWRATE inc Availability	**t/a**	**2 700.00**			
PRESSURE	**kPa(g)**	**Amb**			
TEMPERATURE	**°C**	**Amb**			
COMPOSITION -	**% w/w**	**IMPURITIES:**			**ppm**
CO3	**42%**				
Ca	**20%**				
F	**19.44%**				
H2O	**18%**				
Total	**100%**				
MSDS		http://www.sciencelab.com/msds.php?msdsId=992712			
Particle Size Distribution including Dust					
Bulk Density					

INTENDED MEANS OF HANDLING:

The calcium fluoride is a wet filter cake which is bagged and then dispatched to customers.

POTENTIAL EFFECTS:

Highly insoluble, non toxic, non corrosive solid.

9. P3 Calcium Nitrate CN4 (IP3)

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT

MATERIAL SPECIFICATION SHEETS
PRODUCT

PLANT : Phos Acid Plant			**Page**		
STREAM NAME: Feed to Reactor			**Reference**	**P3**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/04/14**	
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn					
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**583.91**	**Actual t** **15**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**
FLOWRATE	**t/h**	**8.11**			
FLOWRATE inc Availability	**t/a**	**44 604.00**			
PRESSURE	**kPa(g)**	**Amb**			
TEMPERATURE	**°C**	**Amb**			
COMPOSITION -	**% w/w**	**IMPURITIES:**			**ppm**
CN4	**69%**				
H2O	**31%**				
Total					
MSDS		http://www.sciencelab.com/msds.php?msdsId=9927479			
Particle Size Distribution including Dust					
Bulk Density					

INTENDED MEANS OF HANDLING:

The calcium nitrate is a wet solid which is discharged from the centrifuge. There is some buffer storage for it as an intermediate product, and forms the raw material feed to the calcium ammonium nitrate plant (CNX).

POTENTIAL EFFECTS:

It is an acidic material, irritating to and eyes.

23.13 RM9 MDS Ammonium Nitrate AN

RM9 MDS Ammonium Nitrate AN						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
PLANT : Calcium Ammonium Nitrate Plant (CNX)		**Page**				
STREAM NAME: Feed to CNX mixer		**Reference**		**RM9**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**		**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient		**Revision**		**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**34.24**	**Actual t**	**35**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.48**				
FLOWRATE inc Availability	**t/a**	**2 615.70**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
NH_4NO_3	**90%**					
Water	**10%**					
Total	**100.00**					
MSDS		http://www.sciencelab.com/msds.php?msdsId=9927336				
Particle Size Distribution including Dust		http://eldoradochemical.com/MSDS_Sheets/EDC/EDC_Products/EDCC_AN_Solution_90_SDS_Nov_2014.pdf				
Bulk Density		**1.41**				
INTENDED MEANS OF HANDLING:						
How does AN arrive. Precautions, explosive regs?						
POTENTIAL EFFECTS:						
This material has a serrious explosive hazard. It is an acidic material, irritating to Skin and eyes.						

P9 Calcium Ammonium Nitrate CNX

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT

MATERIAL SPECIFICATION SHEETS
PRODUCT

PLANT : Calcium Ammonium Nitrate Plant (CNX)		**Page**	
CNX Plant Product		**Reference**	**P9**
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/07/05**
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**
REFERENCE SOURCE: J Bewsey; Sonskyn			
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**	**516.67**
	UNIT	**DESIGN**	**MAXIMUM**
FLOWRATE	**t/h**	**7.18**	
FLOWRATE inc Availability	**t/a**	**39 467.61**	
PRESSURE	**kPa(g)**	**Amb**	
TEMPERATURE	**°C**	**Amb**	

COMPOSITION -	**% w/w**	**IMPURITIES:**	**ppm**
H2O	**15**		
Ca	**19**		
NO3	**65**		
NH4	**1**		
Total	**100**		
MSDS		http://www.kochfertilizer.com/pdf/JHB_CAN_EU_EN_8Feb2013.pdf	
Particle Size Distribution including Dust			
Bulk Density			

INTENDED MEANS OF HANDLING:

The CNX is a dry granular solid screened to a specific size range. It is bagged and then dispatched to consumers.

POTENTIAL EFFECTS:

It is an acidic material, irritating to Skin and eyes.

GW3 CNX Evaporator Emission					
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**					
PLANT : Calcium Ammonium Nitrate Plant (CNX)		**Page**			
STREAM NAME: CNX Evaporator Emission		**Reference**		**GW3**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**		**2016/07/05**	
CONDITIONS DEFINED AT Site, ambient		**Revision**		**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn					
AVAILABILITY 5500 days per annum					
	UNIT	**DESIGN**	**MAXIMUM**	**MINIMUM**	
FLOWRATE	**t/h**	**1.41**			
FLOWRATE inc Availability	**t/a**	**7 752.09**			
PRESSURE	**kPa(g)**	**Amb**			
TEMPERATURE	**°C**	**50**			
COMPOSITION -	**% w/w**	**Mechanical Details**			
Water Vapour	**100%**	**Height**			**3m**
Air		**Diameter**			**200mm**
IMPURITIES	**mg/Nm^3**				
Ammonia (NH3)	**<35**				
Particulate Matter	**<30**				
HF	**<3**				
Screen size		**N/A**			
Particle Size Distribution including Dust		**N/A**			
Bulk Density					
INTENDED MEANS OF HANDLING:					
Wet air released to atmosphere					
POTENTIAL EFFECTS:					

23.16 RM6 Anhydrous Ammonia

RM6 Anhydrous Ammonia						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
PLANT : Mono Ammonium Phosphate Plant (MAP 39)			**Page**			
STREAM NAME: Feed to MAP39 Mixer			**Reference**	**RM6**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**10.95**	**Actual t**	**15**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.15**				
FLOWRATE inc Availability	**t/a**	**836.12**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
NH3	**100%**					
Total	**100%**					
MSDS		http://www.afrox.co.za/internet.global.corp.zaf/en/images/Ammonia%20(Rev%203)266_27591.pdf				
Particle Size Distribution including Dust		**N/A**				
Density		**Relative density to air 0.5862**				
INTENDED MEANS OF HANDLING:						
Raw material ammonia arrives in the supplier's tanker which is connected up to the plant storage tank. The liquid ammonia is pumped to the plant storage tank which is vented back to the tanker.						
POTENTIAL EFFECTS:						
Highly suffocating gas , inflammable can cause explosive mixtures with air.						

P5 Mono Ammonium Phosphate (39) (MAP (39)) Product						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
PLANT : Mono Ammonium Phosphate Plant (MAP 39)			**Page**			
STREAM NAME: MAP (39) Product			**Reference**	**P5**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per		**Amount Stored 3 days Calc t**		**39.34**	**Actual t**	**40**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.55**				
FLOWRATE inc Availability	**t/a**	**3 004.84**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
P	**27%**					
N	**12%**					
Mono Ammonium Phosphate	**100.00**					
MSDS		http://www.sciencelab.com/msds.php?msdsId=9927077				
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
The MAP39 is a dry granular solid screened to a specific size range. It is bagged and then dispatched to consumers.						
POTENTIAL EFFECTS:						
It is an acidic material, irritating to and eyes.						

GW4 MAP (39) Drier Moisture				
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**				
PLANT : Mono Ammonium Phosphate Plant (MAP 39)			**Page**	
STREAM NAME: MAP (39) Drier emission			**Reference**	**GW4**
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/07/05**
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**
REFERENCE SOURCE: J Bewsey; Sonskyn				
AVAILABILITY 5500 days per				
	UNIT	**DESIGN**	**MAXIMUM**	**MINIMUM**
FLOWRATE	**t/h**	**0.05**		
FLOWRATE inc Availability	**t/a**	**300.48**		
PRESSURE	**kPa(g)**	**Amb**		
TEMPERATURE	**°C**	**60**		
COMPOSITION -	**% w/w**	**Mechanical Details**		
Water Vapour	**100%**	**Height**		**10m**
		Diameter		**500mm**
Screen size		**N/A**		
Particle Size Distribution including Dust		**N/A**		
Bulk Density				
INTENDED MEANS OF HANDLING:				
Drier Moisture released to atmosphere				
POTENTIAL EFFECTS:				

P6 MAP (39) Mother Liquor

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT

MATERIAL SPECIFICATION SHEETS
PRODUCT

PLANT : Mono Ammonium Phosphate Plant (MAP 39)		**Page**	
STREAM NAME: MAP (39) Mother Liquor Product		**Reference**	**P6**
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/07/05**
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**
REFERENCE SOURCE: J Bewsey; Sonskyn			
AVAILABILITY 5500 days per		**Amount Stored 3 days Calc t**	**142.84**
	UNIT	**DESIGN**	**MAXIMUM**
FLOWRATE	**t/h**	**1.98**	
FLOWRATE inc Availability	**t/a**	**10 911.65**	
PRESSURE	**kPa(g)**	**Amb**	
TEMPERATURE	**°C**	**Amb**	

COMPOSITION -	**% w/w**	**IMPURITIES:**	**ppm**
MAP	**9%**		
AN	**29%**		
H2O	**61%**		
Cation/anion balance	**0%**		
	100%		
Screen size		**N/A**	
Particle Size Distribution including Dust		**N/A**	
Bulk Density			

INTENDED MEANS OF HANDLING:

The Mother Liquor isthe liquid filtrate which is discharged from the MAP (39) filter. There is some buffer storage for it as an intermediate product, but it forms a raw material feed to the MAP Plant.

POTENTIAL EFFECTS:

It is an acidic material, irritating to and eyes.

P7 Magnesium Ammonium Phosphate (Magamp)						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
PLANT : Mono Ammonium Phosphate Plant (MAP 39)			**Page**			
STREAM NAME: MAP (39) Magamp			**Reference**	**P7**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**6.99**	**Actual t**	**3**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.10**				
FLOWRATE inc Availability	**t/a**	**533.77**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
MgAMP	**83%**					
Fe phos	**11%**					
Al phos	**6%**					
Total	**100%**					
MSDS		http://msds.orica.com/pdf/shess-en-cds-020-000000020986.pdf				
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
The Magamp is a wet solid which is discharged from the MAP39 Filter There is some buffer storage for it as an intermediate product, but it forms a raw material feed to the calcium ammonium nitrate plant (CNX)						
POTENTIAL EFFECTS:						
It is an acidic material, irritating to and eyes.						

23.21 P4 Mono Ammonium Phosphate (MAP)

P4 Mono Ammonium Phosphate (MAP)						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
PLANT : Mono Ammonium Phosphate Plant (MAP)		**Page**				
STREAM NAME: MAP Product		**Reference**		**P4**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**		**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient		**Revision**		**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**129.04**	**Actual t**	**150**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**1.79**				
FLOWRATE inc Availability	**t/a**	**9 857.37**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
MAP	**62%**					
AN	**32%**					
Cation/anion balance						
MgAMP	**4%**					
Fe phos	**1%**					
Al phos	**0%**					
Total	**100%**					
MSDS		http://www.sciencelab.com/msds.php?msdsId=9927077				
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
The MAP is a dry solid which is discharged from the product screen. There is some buffer storage for it as an intermediate product, and forms the raw material feed to the granulation plant.						
POTENTIAL EFFECTS:						
Crystalline solid, no dust.						

GW5 MAP (33) Spray Drier Moisture Emission				
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**				
PLANT : MAP (33) Plant		**Page**		
STREAM NAME: MAP (33) Spray Drier emission		**Reference**	**GW5**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2017/03/30**	
CONDITIONS DEFINED AT Site, ambient		**Revision**	**1**	
REFERENCE SOURCE: J Bewsey; Sonskyn				
AVAILABILITY 5500 days per				
	UNIT	**DESIGN**	**MAXIMUM**	**MINIMUM**
FLOWRATE	**t/h**	**4.75**		
FLOWRATE inc Availability	**t/a**	**26 131.03**		
PRESSURE	**kPa(g)**	**Amb**		
TEMPERATURE	**°C**	**90**		
COMPOSITION -	**% w/w**	**Mechanical Details**		
CO2	**12%**	**Height**		**4m**
SO2	**0.08%**	**Diameter**		**200mm**
Other	**0.68%**			
Nitrogen	**14%**			
XS Air	**36%**			
Water Vap	**38%**			
Total	**100%**			
Screen size		**N/A**		
Particle Size Distribution including Dust		**N/A**		
Bulk Density				
INTENDED MEANS OF HANDLING:				
Wet flu gas released to atmosphere				
POTENTIAL EFFECTS:				

SW4 MAP Hot Air Generator Ash Solid Waste						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
PLANT : MAP Plant		**Page**				
STREAM NAME: SW4 MAP Hot Air Gen Ash		**Reference**		**SW4**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**		**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient		**Revision**		**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**2.16**	**Actual t**	**5**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.03**				
FLOWRATE inc Availability	**t/a**	**165.37**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
MSDS		http://www.sardiniaconcrete.com/concrete_info/images/msds/Concrete_Material/Duke_Energy_Flyash_MSDS.pdf				
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
The ash is discharged from the Hot Air Generator and stored in a bunded area to contain it. It is later loaded onto a truck and dispatched to a customer probably a local brick maker.						
POTENTIAL EFFECTS:						

23.24 RM8 Potash Granules

RM8 Potash Granules						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
Granulation Plant		**Page**				
STREAM NAME: RM8 Potash Granules		**Reference**		**RM8**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**		**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient		**Revision**		**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**64.06**	**Actual t**	**20**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.89**				
FLOWRATE inc Availability	**t/a**	**4 893.62**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
K	**47%**					
Na	**3%**					
Cl	**50%**					
Total	**100%**					
MSDS		http://www.sciencelab.com/msds.php?msdsId=9927402				
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
Raw Material feed to the Granulation Plant						
POTENTIAL EFFECTS:						

RM7 LAN Granules						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
Granulation Plant			**Page**			
STREAM NAME:RM7 LAN Granules			**Reference**	**RM7**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**51.29**	**Actual t**	**50**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.71**				
FLOWRATE inc Availability	**t/a**	**3 918.00**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
N - Ammonia	**14%**					
N - Nitrate	**14%**					
Limestone	**Bal**					
Total	**28%**					
MSDS		http://www.profert.co.za/upload/9378873.pdf				
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
Raw Material feed to the Granulation Plant						
POTENTIAL EFFECTS:						

23.26 RM 12 Urea Granules

RM12 Urea Granules						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
Granulation Plant			**Page**			
STREAM NAME:RM12 Urea Granules			**Reference**	**RM7**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**43.12**	**Actual t**	**50**
	UNIT	**DESIGN**		**MAXIMUM**	**MINIMUM**	
FLOWRATE	**t/h**	**0.60**				
FLOWRATE inc Availability	**t/a**	**3 294**				
PRESSURE	**kPa(g)**					
TEMPERATURE	**°C**					
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
Urea	**100**	**Formaldehyde**				**4 500**
Nitrogen	**46**	**Ammonia**				**60-100**
Water	**0.50**					
MSDS		http://www.profert.co.za/upload/2602779.pdf				
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
Raw Material feed to the Granulation Plant						
POTENTIAL EFFECTS:						

23.27 P8 Granular Fertiliser Formulations

P8 Granular Fertiliser Formulations						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
Granulation Plant		**Page**				
STREAM NAME: Gran Fert Product		**Reference**	**P8**			
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/07/05**			
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**			
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**287.52**	**Actual t**	**200**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**3.99**				
FLOWRATE inc Availability	**t/a**	**21 962.99**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
LAN						
Potash						
MAP						
Urea						
Various Blends						
Screen size						
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
Granulation Plant Products						
POTENTIAL EFFECTS:						

23.28 RM13 Chicken Manure

RM13 Chicken Manure						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
Gypsum Treatment Plant			**Page**			
STREAM NAME: RM13 Chicken Manure			**Reference**	**RM7**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**46**	**Actual t**	**50**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.63**				
FLOWRATE inc Availability	**t/a**	**3 483**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
Moisture	**14%**	**Iron**				**2 800**
Nitrogen	**6%**	**Manganese**				**1 500**
Phosphate	**4%**	**Zinc**				**350**
Potassium	**2%**	**Copper**				**60**
Calcium	**9%**	**Boron**				**30**
Magnesium	**1%**	**Molybdenum**				**20**
Total	**36%**					
MSDS						
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
POTENTIAL EFFECTS:						

23.29 P9 Chicken Manure Gypsum Granules

P9 Chicken Manure/Gypsum Granules						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
Granulation Plant		**Page**				
STREAM NAME: Chicken Manure/Gypsum Granules		**Reference**		**P9**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**		**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient		**Revision**		**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**128.47**	**Actual t**	**200**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**1.78**				
FLOWRATE inc Availability	**t/a**	**9 814**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
Water	**14**	**Iron**				**2 800**
Nitrogen	**6**	**Manganese**				**1 500**
Phosphate	**4**	**Zinc**				**350**
Calcium	**9**	**Copper**				**60**
Magnesium	**1**	**Boron**				**30**
Sulphur	**0.7**	**Molybdenum**				**20**
Screen size						
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
Granulation Plant Products will be bagged and sold.						
POTENTIAL EFFECTS:						

23.30 GW7 Chicken Manure Gypsum Granules Drier Emission

GW7 Chicken Manure/Gypsum Drier Emission				
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**				
PLANT : Chicken Manure/Gypsum Granulator		**Page**		
STREAM NAME: CM/Gyp Drier Emission		**Reference**	**GW7**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2017/01/05**	
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn				
AVAILABILITY 5500 days per annum				
	UNIT	**DESIGN**	**MAXIMUM**	**MINIMUM**
FLOWRATE	**t/h**	**6.89**		
FLOWRATE inc Availability	**t/a**	**37 884.13**		
PRESSURE	**kPa(g)**	**Amb**		
TEMPERATURE	**°C**	**90**		
COMPOSITION -	**% w/w**	**Mechanical Details**		
CO2	**12%**	**Height**		**4m**
SO2	**0.08%**	**Diameter**		**200mm**
Other	**0.68%**			
Nitrogen	**14%**	**IMPURITIES**		**mg/Nm^3**
XS Air	**36%**	**Ammonia (NH3)**		**<35**
Water Vap	**38%**	**Particulate Matter**		**<30**
Total	**100%**	**HF**		**<3**
Screen size		**N/A**		
Particle Size Distribution including Dust		**Flow rates and composition are calculated from MAP33 on a pro rata basis.**		
Bulk Density				
INTENDED MEANS OF HANDLING:				
Wet air released to atmosphere				
POTENTIAL EFFECTS:				

23.31 RM11 Coal

RM11 Coal						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
PLANT :Boiler Plant			**Page**			
STREAM NAME: RMII Coal to Boiler and Hot air generator			**Reference**		**RM11**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**		**2016/07/05**	
CONDITIONS DEFINED AT Site, ambient			**Revision**		**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**33.03**	**Actual t**	**300**
	UNIT	**Boiler**	**Hot Air Gen**		**MINIMUM**	
FLOWRATE	**t/h**	**0.24**	**0.21**			
FLOWRATE inc Availability	**t/a**	**1 342.05**	**1 181.22**			
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
Carbon	**70%**					
Sulphur	**1%**					
ash	**14%**					
Coal Volatiles	**15%**					
Total	**100%**					
MSDS		http://www.spragueenergy.com/docs/default-source/default-document-library/bituminous-coal-sds.pdf?sfvrsn=0				
Particle Size Distribution including Dust						
Bulk Density						
INTENDED MEANS OF HANDLING:						
Raw material delivered to factory in bulk and stored under cover.						
POTENTIAL EFFECTS:						

GW6 Boiler Emission					
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**					
PLANT : Boiler Plant			**Page**		
STREAM NAME: Boiler Flue gas emission			**Reference**	**GW6**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2017/03/30**	
CONDITIONS DEFINED AT Site, ambient			**Revision**	**1**	
REFERENCE SOURCE: J Bewsey; Sonskyn					
AVAILABILITY 5500 days per annum					
	UNIT	**DESIGN**	**MAXIMUM**	**MINIMUM**	
FLOWRATE	**t/h**	**2.17**			
FLOWRATE inc Availability	**t/a**	**11 952.26**			
PRESSURE	**kPa(g)**	**Amb**			
TEMPERATURE	**°C**	**180**			
COMPOSITION -	**% w/w**	**Mechanical Details**			
Nitrogen	**69%**	**Height**			**7m**
CO2	**29%**	**Diameter**			**500mm**
SO2	**0.20%**				
Other emissions	**1.59%**				
Total	**100%**				
Screen size		**N/A**			
Particle Size Distribution including Dust					
Bulk Density					
INTENDED MEANS OF HANDLING:					
Flue gas released to atmosphere					
POTENTIAL EFFECTS:					

UT1 Steam					
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**					
PLANT : Boiler			**Page**		
Steam to Phos Acid; CNX; MAP (39)			**Reference**	**UT1**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/07/05**	
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn					
AVAILABILITY 5500 days per		**AMOUNT: to each plant**			
	UNIT	**Phos Acid**	**CNX**	**MAP (39)**	
FLOWRATE	**t/h**	**0.99**	**1.35**	**0.60**	
FLOWRATE inc Availability	**t/a**	**5 439.62**	**7 425.00**	**3 300.00**	
PRESSURE	**kPa(g)**	**Amb**			
TEMPERATURE	**°C**				
COMPOSITION -	**% w/w**	**IMPURITIES:**			**ppm**
H2O	**100%**				
Total	**100%**				
Screen size		**N/A**			
Particle Size Distribution including Dust		**N/A**			
Superheat					
INTENDED MEANS OF HANDLING:					
Steam lines from the boiler to the plants					
POTENTIAL EFFECTS:					

SW3 Boiler Ash						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**						
PLANT : Boiler		**Page**				
STREAM NAME: SW4 MAP Hot Air Gen Ash		**Reference**		**SW3**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**		**2016/07/05**		
CONDITIONS DEFINED AT Site, ambient		**Revision**		**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum		**Amount Stored 3 days Calc t**		**2.46**	**Actual t**	**10**
	UNIT	**DESIGN**	**MAXIMUM**		**MINIMUM**	
FLOWRATE	**t/h**	**0.03**				
FLOWRATE inc Availability	**t/a**	**187.89**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**					**%ww**
SiO2	**40-50**	**P2O5**				**0.1-2**
Al2O3	**20-30**	**TiO2**				**1-2.5**
Fe2O3	**2-10**	**CaO**				**1-15**
		MgO				**1-5**
		K2O				**0.5-1.6**
		Na2O				**0.1-0.6**
		SO3				**1-5**
MSDS		http://www.sardiniaconcrete.com/concrete_info/images/msds/Concrete_Material/Duke_Energy_Flyash_MSDS.pdf				
Particle Size Distribution including Dust		**N/A**				
Bulk Density						
INTENDED MEANS OF HANDLING:						
The ash is discharged from the Boiler and stored in a bunded area to contain it. It is later loaded onto a truck and dispatched to a customer probably a local brick maker.						
POTENTIAL EFFECTS:						
Dust will be contained.						

LW2 Boiler Blow Down				
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT MATERIAL SPECIFICATION SHEETS LIQUID WASTE				
PLANT :Boiler		**Page**		
STREAM NAME: Boiler Blow Down		**Reference**	**LW2**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/04/14**	
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn				
AVAILABILITY 5500 days per annum%		**AMOUNT**		
	UNIT	**DESIGN**	**MAXIMUM**	**MINIMUM**
FLOWRATE	**t/h**	**0.10**		
FLOWRATE inc Availability	**t/a**	**550.00**		
PRESSURE	**kPa(g)**	**Amb**		
TEMPERATURE	**°C**	**Amb**		
COMPOSITION -	**% w/w**	**IMPURITIES:**		**ppm**
Water	**100%**	**Boiler water chemicals**		
		Concentrated water solids		
Screen size				
Particle Size Distribution including Dust		**N/A**		
Bulk Density		**1**		
INTENDED MEANS OF HANDLING:				
The Boiler blow down is recycled to the process to the reactor products before the filter.				
POTENTIAL EFFECTS:				

LW3 Condensate Recycle				
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT MATERIAL SPECIFICATION SHEETS LIQUID WASTE				
PLANT :Boiler		**Page**		
STREAM NAME: Condensate Recycle from MAP (39); CNX		**Reference**	**LW3**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/04/14**	
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn				
AVAILABILITY 5500 days per annum%		**AMOUNT**		
	UNIT	**MAP39**	**CNX**	**Total**
FLOWRATE	**t/h**	**0.10**	**1.35**	**1.45**
FLOWRATE inc Availability	**t/a**	**550.00**	**7425**	**7 975.00**
PRESSURE	**kPa(g)**	**Amb**		
TEMPERATURE	**°C**	**Amb**		
COMPOSITION -	**% w/w**	**IMPURITIES:**		**ppm**
Water	**100%**			
Screen size				
Particle Size Distribution including Dust		**N/A**		
Bulk Density		**1**		
INTENDED MEANS OF HANDLING:				
The condensate is recycled to the Boiler feed water				
POTENTIAL EFFECTS:				

RM4 Water						
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT MATERIAL SPECIFICATION SHEETS LIQUID WASTE						
PLANT : Factory			**Page**			
STREAM NAME: Water supply to the Factory			**Reference**	**RM4**		
ANNUAL RATE - Case; Full rate; Product: 35 000tpa			**Date**	**2016/04/14**		
CONDITIONS DEFINED AT Site, ambient			**Revision**	**0**		
REFERENCE SOURCE: J Bewsey; Sonskyn						
AVAILABILITY 5500 days per annum%		**Amount Stored 3 days Calc t**		**332.94**	**Actual t**	**10**
	UNIT	**Factory**	**Potable**		**Other**	
FLOWRATE	**t/h**	**4.62**				
FLOWRATE inc Availability	**t/a**	**25 432.75**				
PRESSURE	**kPa(g)**	**Amb**				
TEMPERATURE	**°C**	**Amb**				
COMPOSITION -	**% w/w**	**IMPURITIES:**				**ppm**
Water	**100%**	**RM4 Raw Water**				
		Traces of calcium and magnesium				
		RM4a Treated water				
		Traces of potassium				
Screen size						
Particle Size Distribution including Dust		**N/A**				
Bulk Density		**1**				
INTENDED MEANS OF HANDLING:						
Water taken from the reservoir and purified to suit the various needs						
POTENTIAL EFFECTS:						

UT1 Compressed Air				
HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT **MATERIAL SPECIFICATION SHEETS** **PRODUCT**				
PLANT : Boiler		**Page**		
STREAM NAME: HF Stripper Air		**Reference**	**UT1**	
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/07/05**	
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**	
REFERENCE SOURCE: J Bewsey; Sonskyn				
AVAILABILITY 5500 days per				
	UNIT	**DESIGN**	**MAXIMUM**	**MINIMUM**
FLOWRATE	**t/h**	**0.05**		
FLOWRATE inc Availability	**t/a**	**300.00**		
PRESSURE	**kPa(g)**	**600**		
TEMPERATURE	**°C**	**Amb**		
COMPOSITION -	**% v/v**	**IMPURITIES:**		**ppm**
Nitrogen	**81%**			
Oxygen	**19%**			
Total	**100%**			
Screen size		**N/A**		
Particle Size Distribution including Dust		**N/A**		
Bulk Density				
INTENDED MEANS OF HANDLING:				
Generates the Stripper emission which is released to atmosphere				
POTENTIAL EFFECTS:				

LW5 WTP Effluent

HI-FOS (Pty) Ltd PHOSPHORIC ACID PLANT PROJECT
MATERIAL SPECIFICATION SHEETS
LIQUID WASTE

PLANT : Factory		**Page**	
STREAM NAME: WTP Effluent		**Reference**	**RM4**
ANNUAL RATE - Case; Full rate; Product: 35 000tpa		**Date**	**2016/04/14**
CONDITIONS DEFINED AT Site, ambient		**Revision**	**0**
REFERENCE SOURCE: J Bewsey; Sonskyn			
AVAILABILITY 5500 days per annum%		**Amount Stored 3 days Calc t**	**32**	**10**
	UNIT	**Factory**	**Potable**	**Other**
FLOWRATE	**t/h**	**0.45**		
FLOWRATE inc Availability	**t/a**	**2 475**		
PRESSURE	**kPa(g)**	**Amb**		
TEMPERATURE	**°C**	**Amb**		
COMPOSITION -	**% w/w**	**IMPURITIES:**		**ppm**
Water	**90%**			
Potassium Chloride	**)**			
Calcium Chloride	**)10%**			
Magnesium Chloride	**)**			
Screen size				
Particle Size Distribution including Dust		**N/A**		
Bulk Density		**1**		

INTENDED MEANS OF HANDLING:

Ion Exchange plant regeneration water containing 10% of a mixture of Potassium Chloride, Calcium Chloride and Magnesium Chloride.
It will be collected in a tank and used as for irrigation and fertilizer on local gardens.

POTENTIAL EFFECTS:

None, a good fertilizer.