## Appendix 3.

2015 WA KAOLIN PROJECT - MINING PROPOSAL and TENEMENT (Approval and Conditions)

# Mining Proposal – Revised Version #1

# WA Kaolin Project

Mining of kaolin clay and production of 360,000tpa kaolin products at locations in the Shire of Wickepin

## Tenements:

**M70/1143 (Mine site and initial process plants)**

**G70/251 (Final Process Plant)**

**L70/156 (Pipeline easement between mine site and final process plant)**

## Proponent: WA Kaolin Holdings Pty Ltd

## 5 January 2015

# Mining Proposal Checklist

| Q No | Mining Proposal checklist | Y/N NA | Page No | Comments |
|---|---|---|---|---|
| **Public availability** | | | | |
| 1 | Are you aware that this mining proposal is publicly available? | Y | | |
| 2 | Is there any information in this mining proposal that should not be publicly available? | N | | |
| 3 | If "No" to Q2, do you have any problem with the information contained in this mining proposal being publicly available? | NA | | |
| 4 | If "Yes" to Q2, has confidential information been submitted in a separate document/section? | NA | | |
| 5 | Has the mining proposal been endorsed? See last page Checklist. | Y | | |
| **Mining Proposal details** | | | | |
| 6 | Have you included the tenement number(s), site name, proposal overview and date in the title page? | Y | | |
| 7 | Who authored the mining proposal? (Please include telephone number of author) | Dr Alan Tingay 86854079/ 92996113 | | |
| 8 | State who to contact enquiries about the mining proposal | Dr Alan Tingay | | |
| 9 | How many copies were submitted to DMP? | Hard copies = 2<br>Electronic = 1 | | |
| 10 | Does this mining proposal support a lease application? | N | | |
| 11 | Has a geological resource statement been included (refer section 4.3.2 of mining proposal guidelines)? | N | | |
| 12 | Will more than 10 million tonnes of ore and waste be extracted per year? State total tonnage: | N | | |
| 13 | Will more than two million tonnes of ore be processed be year? State total throughout. | N | | |
| 14 | Is the mining proposal located on pre-1899 Crown Grant lands? (not subject to the Mining Act) | N | | |
| 15 | Is the mining proposal located on reserve land? If "Yes" state reserve types | N | | |
| 16 | Will the mining proposal occur within or affect a declared occupied town site? | N | | |
| 17 | Is the mining proposal within two km of the coastline or a Private Conservation Reserve? | N | | |
| 18 | Is the mining proposal wholly or partially within a World Heritage Property, Biosphere Reserve, Heritage Site or Soil Reference Site. | N | | |
| | | | | |
| **Tenement Details** | | | | |
| 19 | Are all mining operations within granted or applied for tenement boundaries? | Y | | |
| 20 | Are you the tenement holder of all tenements? | Y | | |
| 21 | If "No" at 20, do you have written authorisation from the tenement holder (s) to undertake the Mining proposal activities (Refer to section 4.2.1 of the Mining Proposal Guidelines) | NA | | |
| 22 | Is "Yes" at 21, is a copy of the authorisation contained within the mining proposal? | NA | | |
| 23 | Have you checked for compliance against tenement conditions? | Y | | |
| **Location and Site Layout Plans** | | | | |

| | | | | |
|---|---|---|---|---|
| 24 | Have you included location plans showing tenement boundaries and mining operations? | Y | | |
| 25 | Have you included site layout plans showing all mining operations and infrastructure in relation to tenement boundaries? | Y | | |
| 26 | Have you included Area of Disturbance Tables for all tenements impacted by mining operations? | Y | | |
| | | | | |
| **Environmental Protection Act** | | | | |
| 27 | Does the mining proposal require referral under part four or the MOU? If 'Yes' describe why in space below: | N | | |
| 28 | Has the EPA set a level of assessment? If yes state: | Y | | Works Approval |
| 29 | Is a clearing permit required? If 'No' then explain why in space below? | N | | No vegetation |
| 30 | If 'Yes' at Q29 then has a permit been applied for? | NA | | |
| 31 | Is a works approval required by the DEC? | Y | | |
| 32 | Has a Works Approval been submitted to the DEC? | Y | | |
| 33 | **Stakeholder Consultation** - Have the following stakeholders been consulted? (use N/A if not relevant) | | | |
| | Shire? | Y | | |
| | Pastoralist? | NA | | |
| | DEC? | Y | | |
| | Main Roads? | NA | | |
| | Others? (specify): | Y | | Neighbours |
| | | | | |
| **Environmental Assessment and Management** | | | | |
| 34 | Is the mining proposal wholly or partially within DEC managed areas? | N | | |
| 35 | If 'yes' at Q34 has DEC been consulted? | NA | | |
| 36 | Is the mining proposal wholly or partially within a red book area or a bush forever site? | N | | |
| 37 | Will the mining proposal impact upon a water resource area, water reserve, declared or proposed catchment, groundwater protection area, significant lake or wetland? | N | | |
| 38 | Is a water or de-watering licence required? | N | | |
| 39 | If 'Yes' at Q39 then has the licence(s) been applied for? | NA | | |
| 40 | Does the mining proposal include a new tailings storage or changes to existing tailings storage? | N | | |
| 41 | Has AMD assessment been undertaken? | NA | | |
| 42 | Have flora and fauna checks been undertaken? | NA | | |
| 43 | Are any rare species present? | N | | |
| 44 | Has preliminary closure plan been included? | Y | | |
| 45 | Do you acknowledge that the hard copies and the CD contain identical information? (this is important for DMP's electronic records system) | Y | | |

I hereby certify that to the best of my knowledge the above checklist accurately reflects the information contained within this Mining Proposal.

Name: ALF BAKER Position: DIRECTOR

Signed: [signature] Date: 5 JAN 2015

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## Summary

WA Kaolin Holdings Pty Ltd (WAK) is the holder of Mining Lease M70/1143 which is located east of Wickepin in the southern wheat-belt of Western Australia. The company has operated a small-scale kaolin mine on the lease, and a processing plant in the Kwinana Industrial zone to provide product for testing and evaluation. Those operations ceased in 2010 when testing was completed. WAK is now seeking approval to operate a mine and process plant with the capacity to produce 360,000t of kaolin each year with initial processing at the mine site and final processing at a location adjacent to the Wedin railway siding, approximately 18km south of the mine-site, rather than at Kwinana. The product will be transported by road and rail to Kwinana for direct loading onto ships.

The project will involve minimal environmental impact. The locations involved are owned by WAMCO Industries Group Pty Ltd which is the majority shareholder of WA Kaolin Holdings Pty Ltd, and are currently used for grazing and cropping. The mine site will be progressively rehabilitated to these agricultural uses and the process plant will be dismantled and removed from site at the end of the project. Groundwater will not be intercepted by mining and there is little potential for groundwater contamination. Surface water will be managed by site drainage plans. The nearest houses to the project sites are more than 2.5km away which will assist in the management of noise. Specific noise attenuation measures will be incorporated in the design of the operations and plant if required to ensure compliance with the noise regulations. The process largely consists of screening, pressing and drying the kaolin and there are few chemical additives and atmospheric emissions only from a stack attached to a drying plant.

The project will provide a significant boost to local economies and is expected to employ between 60 and 80 people most of who are expected to live either in the Shire of Wickepin or the Shire of Narrogin.

Mining will involve simple digging by excavator as the deposits are close to the surface. Excavation of about 1.25Mtpa of material will be required to yield 360,000tpa of kaolin. The kaolin reserves are sufficient for a mine life in excess of 100 years at the proposed level of production.

The project will produce kaolin of different specifications. Some ore will be processed at the mine-site to produce 100,000tpa of beneficiated 90% kaolin (K90) which will be trucked either directly to Kwinana or to the Wedin site for loading on to trains. The remaining ore will be partially processed at the mine-site to produce 260,000tpa of kaolin in slurry form which will be piped to the Wedin site for further processing, packaging and loading onto trains. The processing at the mine site involves de-gritting with screens and cyclones to separate kaolin of <45 microns from waste 'sand'.

The production of K90 will commence prior to the production from the Wedin plant as it involves less process equipment and time to establish.

At the Wedin site the slurry will pass through classification centrifuges that will separate the fine and coarse clay. These will be de-watered and then the thickened slurries will be rinsed and further de-watered in a cake press. Some of the damp kaolin filter cake will be treated further to optimize particle size and viscosity and then granulated and dried.

Both filter cake and granules will be packaged and stored in bulk bags and ISO shipping containers prior to loading onto rail wagons for haulage to Kwinana. The storage area will hold up to approximately 10,000 tonnes of product.

Fresh process water will be delivered to the Wedin plant by a buried pipeline from an existing Water Corporation main. Water from de-watering and pressing operations will be recycled through a pipeline to the de-gritting plant for use there. Recycling of water will also occur in the de-gritting process line at the mine site.

The project has been granted Works Approval by the Department of Environmental Regulation. It will not involve any significant environmental impacts or non-standard management requirements. The mine-site and the Wedin site have been developed for agriculture for many years. There is little remnant vegetation on the mine-site and only individual plants and small areas will need to be removed for mining to occur. There is a relatively large area of vegetation at the Wedin site but the process plant and other structures will be sited to avoid this area.

The mine site and the Wedin site are within the buffer zones of the Toolibin Reserves Threatened Ecologic Community (TEC). This TEC includes Toolibin Lake which is a wetland of international significance under the RAMSAR Convention, but the operations are distant from this. There is no natural surface run-off from the location of the mine-site and drainage management will ensure that there is no operational run-off. There is a small natural drainage channel at the Wedin site. The aim is to maintain this in its current state, but if there is any requirement to re-position a section this would not alter the present location of discharge from the site or the volume of water discharged. Run-off from buildings and pavements will be collected for use in the process cycle. None of the proposed operations will affect groundwater. Therefore there effectively is no risk that the proposal will affect the TEC.

The project area is sparsely populated with isolated farm houses. The nearest home to the mine site is 2.8km south-west. The nearest residence to the Wedin site is about 2.8km to the south-east. The noise levels from mining equipment at the mine site have been assessed and this has shown that noise levels at the closest residence to the mine will be well within acceptable limits. Noise from the processing plants has not yet been modeled but is not expected to be an issue given the separation distances involved. The plant does not include any equipment that generates high noise levels and is the same as that operated in the pilot plant at Kwinana. Parts of the operation will operate on a continuous basis.

Noise modelling of the process plants will be commissioned in the detailed design phase of the project and if necessary bund walls and other attenuation measures will be incorporated to ensure acceptable noise levels are achieved at all times.

The project will involve truck transport of the 100,000tpa of beneficiated kaolin from the mine site and periodic delivery of minor process requirements. The beneficiated kaolin will be packaged in bulk bags and placed in shipping containers at the mine site. This product either will be transported by road to the Wedin rail siding for loading onto trains or will be transported by trucks directly to Kwinana. In the latter case, the estimated number of truck movements each day is 5 each way. It is likely however, that the transport will not be continuous but will be timed with ship loading requirements. In this case, the number of loads per day will be more than this average but there will also be periods when there will be no truck movements.

Transport of products from the Wedin site to Kwinana is expected to involve 2 train movements a day (1 arrival and 1 departure) over a period of about 7 days per month.

The mine pit will be back-filled with reject soils and clay, finished with topsoil and returned to cropping on a continuous basis as mining progresses. This process will be completed prior to mine closure and

all plant, buildings etc. will be removed and the site treated to allow farming to resume – details are provided in a separate Mine Closure Plan.

## Summary of Conditions

WAK is committed to establishing mining and processing operations in accordance with best practices in environmental management, and to minimizing negative impacts on the natural and social environment. This commitment will be guided by the Conditions in the Works Approval. In summary, these are:

- The project will be constructed in accordance with the documents provided with the application for Works Approval
- Environmentally hazardous materials will be stored in accordance with the code of practice for the storage and handling of dangerous goods
- A Commissioning Plan will be submitted to the Director of DER for approval three months before commissioning commences. This will include:
  The commissioning stages and expected time scales;
  Expected emissions and discharges during commissioning and the environmental implications of the emissions;
  How emissions and discharges will be managed during commissioning;
  Monitoring that will be undertaken during the commissioning period;
  How accidents or malfunctions will be managed;
  Start up and shut down procedures, and
  Reporting proposals including accidents, malfunctions and reporting against the commissioning plan.
- Commissioning will be in accordance with the Commissioning Plan
- The kaolin mine and process will be commissioned for a period not exceeding 3 months
- A noise assessment will be undertaken during commissioning and a report on that assessment will be prepared in accordance with Part 3 of the Environmental protection (Noise) Regulations 1997 (Noise Regulations). The report will include:
  Methods used for monitoring and modelling of noise;
  An assessment of whether noise emissions from the premises comply with the assigned noise levels in the Noise Regulations, and
  Where they are not met, proposed measures to reduce noise emissions to assigned levels together with time scales for implementing the proposed measures.
- An ambient water quality monitoring program will be established at the mine site and the Wedin site to determine pH, total dissolved solids, total suspended solids and depth to groundwater in accordance with the relevant part of Australian Standard AS 5667
- A drainage plan for the mine site and the Wedin plant site will be prepared before commissioning
- A sampling port will be installed in the exhaust chimney of the drying plant at Wedin in accordance with Australian Standard 4323.1 to verify air emissions including NOx, Sox, $CO_2$, CO and $PM_{10}$ in accordance with the relevant parts of Australian Standard

Other operational conditions are associated with the mining tenements.

An extensive list of commitments relating to rehabilitation and mine closure also are included in Section 4.10 of this Mining Proposal.

# Consultation

WA Kaolin Holdings Pty Ltd excavated kaolin from within M70/1143 for several years up to 2010. Since that time meetings have been held with the Chief Executive Officer of the Shire of Wickepin to provide information about the proposed project and to discuss the requirements for planning and development approvals. Meetings have also occurred with adjacent land owners to discuss the project and the requirement for a pipeline easement and to obtain their consent for that easement.

The Works Approval process involved public advertising and no appeals or submissions were received as a result. During 2014, WA Kaolin also lodged applications for planning and development approval with the Shire of Wickepin. This process involved public advertisement and appeal periods and company executives attended a public meeting at Wickepin organized by the Shire.

# 1. Background Information

## 1.1 Ownership

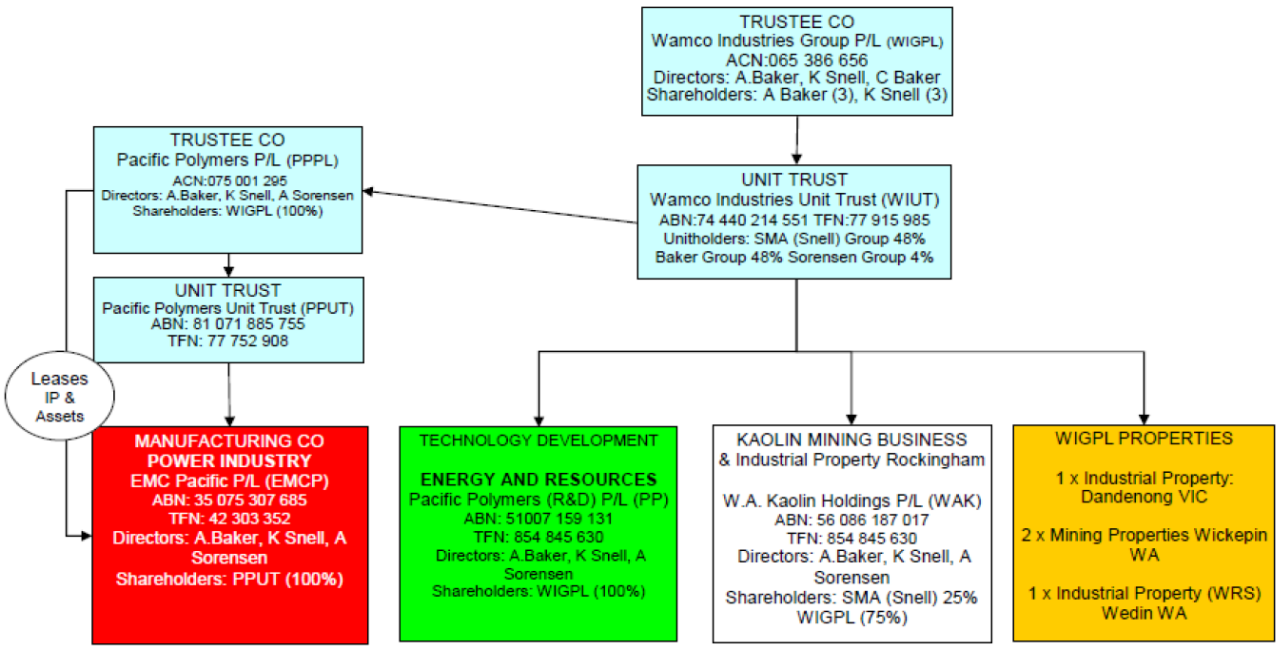
The WA Kaolin Project involves the following tenements all of which are in the Shire of Wickepin:

M70/1143 (Mine site and initial process plant)
G70/251 (Final Process Plant)
L70/156 (Pipeline easement between initial and final process plants)

The tenements are all held by WA Kaolin Holdings Pty Ltd of PO Box 147, Rockingham, WA 6968.

The main contact for WAK is the Director, Mr. Alf Baker at 03 87925212 and abaker@wakaolin.com.au

The properties on which the mine site, initial process plant and final process plant will be located are owned by WAMCO Industries Group Pty Ltd which holds a 75% interest in WA Kaolin Holdings Pty Ltd. The structure of this group is shown below.




The proposed mining and mineral processing activities will take place in the freehold properties listed in Attachment 1. The proposal is limited to mining activities taking place only within that portion of M70/1143 contained within Lot 14431, which is owned by WAMCO PACIFIC Pty Ltd. (part of the Wamco Industries Group Pty Ltd). Section 29 forms were completed and lodged with the Mineral Titles Division of the DMP soon after M70/1143 was pegged.

Other freehold lots affected include those listed in Attachment 2 covered by the pipeline tenement (L70/156). Landowner compensation agreements for all of the affected freehold titles (and the Shire of Wickepin for road reserves) were negotiated, agreed upon, and lodged with the Mineral Titles Division of the DMP as part of the tenement application process. Section 29 Consent forms are now being obtained and will be lodged with the Mineral Titles Division of the DMP.

At the Wedin site, the proposed activities covered by tenement G70/251 will only take place within freehold Lots 1 and 8798, both of which are owned by WAMCO. A compensation agreement (intra-company) is in place for the use of these two lots. Section 29 forms for these two titles are now being obtained and will be lodged with the Mineral Titles Division of the DMP.

Copies of the existing Section 29 forms, the landowner and Wickepin Shire compensation agreements and the compensation agreement for the Wedin site have been provided to DMP as separate pdf files.

## 1.2 Project Objectives

The objectives of the WA Kaolin Project are to establish a kaolin mine and process plants in the Shire of Wickepin with a capacity to produce 360,000 tonnes of kaolin product per annum for export. The proved ore reserve on ML70/1143 is 112 million tonnes. Mining operations would affect approximately 3 ha each year.

The kaolin will be de-gritted at a plant site close to the mine. The plant will separate the valuable clay from host sand using screens and cyclones. The project aims to export 100,000tpa of this beneficiated kaolin. The remaining 260,000tpa of kaolin will be pumped as a low density slurry through a pipeline to a location approximately 18km south of the mine site known as the Wedin Rail Siding (WRS).

Further processing to achieve a range of products will occur at the WRS as follows:

- Centrifuge refining of the kaolin into different size ranges.
- Centrifuge de-watering.
- Pressing to create a damp cake product.
- Rotary mixing and fluid bed drying with hot air for a granule product.

The finished products will be stored in a shed in one tonne bulk bags and freight containers and transported by rail to Kwinana for direct loading onto ships.

The project will employ approximately 60 to 80 people and will provide a major stimulus to the economies of the Shire of Wickepin and Narrogin.

WAK hopes that the project will be able to commence in the second half of 2015. This will depend on the time required for all approvals, detailed design and planning and commercial factors. The mine could operate at the target rate of 360,000tpa for considerably more than 100 years given the proved ore reserves.

## 1.3 Location and Site Layout Plans

The regional location of the project is shown in Drawing 000-GD-015. M70/1143 is located about 20km east of Wickepin. G70/251 also is approximately 20km east of Wickepin and 7km west of the small town of Tincurrin and is 18km south of the mining lease. The pipeline easement L70/156 which is also shown in the Drawing links the mine site and the Wedin site.

The locations of the mine and Wedin process plant within these tenements are also shown on Drawing 000-GD-015. The Wedin site is adjacent to Line Road and to an existing railway that connects to Kwinana.

A site plan of the mine-site and associated de-gritting plant is shown in Drawing 200-GD-020 and of the Wedin process plant in Drawing 400-GD-002.

The project is in an area that mostly has been cleared of natural vegetation and converted to agricultural uses for many years. There are no environmental constraints such as populations of rare plants and significant fauna, or aboriginal sites in the areas that will be disturbed by the project operations. There is a small drainage line on the Wedin site. There should not be any requirement to modify this drainage line.

## 1.4 Scope of the Mining Proposal

Some components of the WA Kaolin Project are not part of this Mining Proposal. These, and the reason for their exclusion are as follows:

- Most of the access road to the mine site, as it is located outside of the boundaries of M70/1143. This part of the access road is located on Lot 14431 which is owned by WAMCO PACIFIC Pty Ltd. The road will require Planning Approval from the Shire of Wickepin.

- The rail siding at Wedin is not compatible with tenure granted under the *Mining Act* 1978 and cannot be approved via a Mining Proposal. The connection of the siding to the existing railway will require the consent of the operating agency. The actual siding is located on land under the control of the Shire of Wickepin and on Lot 8798 which is owned by WAMCO. Planning approval from the Shire of Wickepin is required for the siding to be constructed on these sites.

## 1.5 History

Between 2007 and 2010 WAK established and operated a mine on ML70/1143, and a Pilot Production Facility for kaolin products at Lot 3, Ward Road, East Rockingham Kwinana. A range of innovative kaolin processing techniques were developed and proved in this initial stage of the project and a range of kaolin products for paper, ceramics and paint were produced and supplied to customers in China, Korea, Japan and India.

WAK now intends to expand to a commercially viable scale with the entire operation based in the Shire of Wickepin.

## 1.6 Existing Facilities

ML70/1143 is connected to Wickepin via Sparks Road and Williams – Kondinin Road. The Wedin site is adjacent to a sealed road (Line Road) and railway. There are no mining or processing facilities on either site at present.

## 1.7 Employment and Regional Benefits

The project is expected to employ between 60 and 80 people. WAK does not plan to operate a residential camp at the mine site and expects to employ local people wherever possible. These probably will mainly live in the Shires of Wickepin and Narrogin. Required services such as electricians, earthmoving contractors etc., will also be sourced from the local region provided these are cost competitive.

# 2. Existing Environment

## 2.1 Geology

The project sites are located in a region which is underlain by granitic rocks. Weathering of these rocks has produced the large scale kaolin clay deposits in the region. The proved ore reserve on ML70/1143 is 112 million tonnes.

The typical depth of mining will be 20 to 30m below the surface with a maximum of 35m. The production of 360,000tpa of refined kaolin will require removal of about 900,000tpa of overburden and clays that will be separated during processing. Therefore, the total mining will be approximately 1,260,000tpa.

## 2.2 Waste Rock and Tailings

There will be no permanent waste rock dumps as all waste material will be returned to the mined out pit as part of the rehabilitation works. There also will be no tailings.

There is no risk of acid mine drainage due to water shed from stockpiles or from other run-off, as XRF assays of the ore and overburden have shown that $SO_3$ levels are typically less than 0.08 ppm with many samples half this level. Kaolin is formed by high levels of weathering and leaching of the host rock which results in inert kaolin and quartz sand. As a result there are no soluble or reactive elements in the mined ore or overburden.

## 2.3 Soil Profile

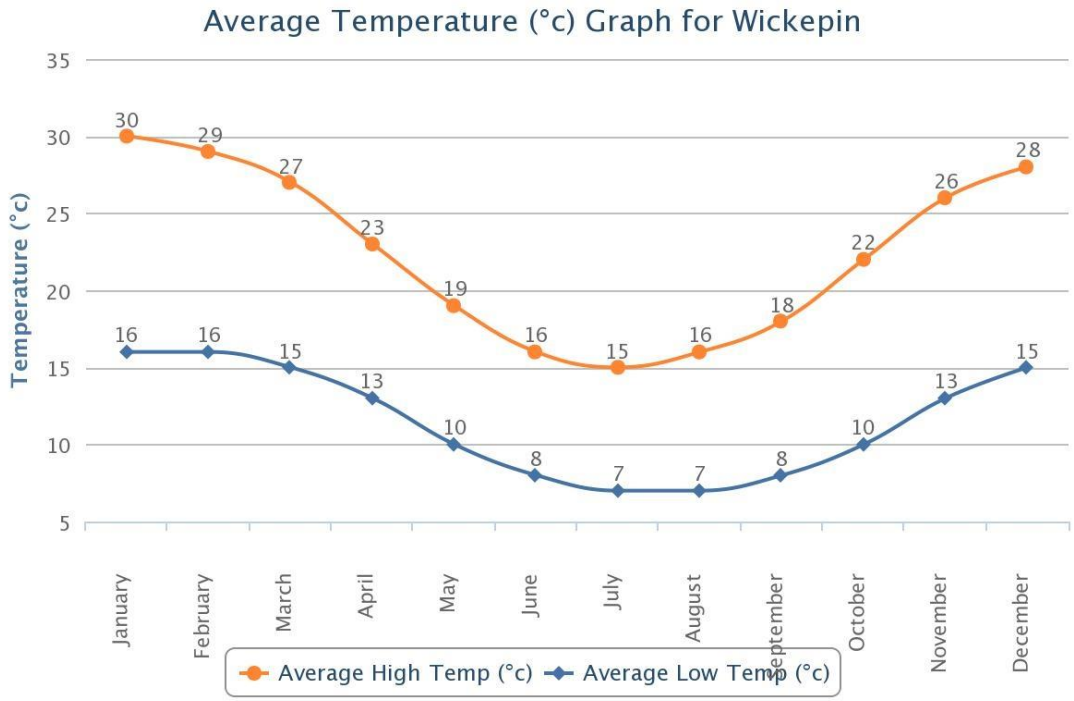
The soil profile has been determined at the mine-site by drilling and excavation. The typical profile comprises soil and laterite overburden to a depth of 1m then mottled iron stained clays to a depth of 3m. The kaolin deposit extends from 3m to 20m depth and in places to at least 40m. The clay deposits are underlain by saprolite. A typical lithological section is shown in Drawing 200-XD-002.

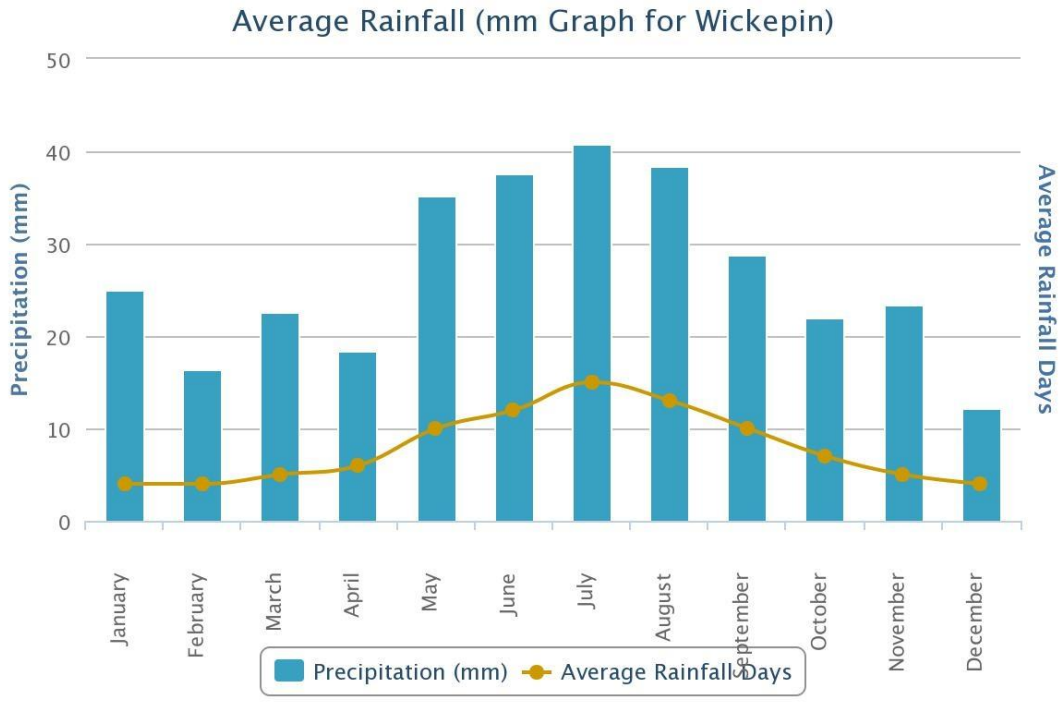
## 2.4 Hydrology

There is no surface water flow in the area of the mine and de-gritting plant as the surficial sands are highly permeable. A small intermittent stream crosses the Wedin site. Groundwater has not been detected by exploration drilling and excavation at the mine site.

## 2.5 Climate

Monthly temperature and rainfall averages for Wickepin are shown on the next page.




## 2.6 Flora and Fauna

The mine site and the Wedin site have been used for many years for cereal cropping and sheep grazing which is the main land use in the region. There are also small areas of disturbed woodland on the mine-site and a pine plantation as shown in Drawing 200-GD-023 and an area of planted tree lucerne

immediately to the south of the existing costean. A Remnant Vegetation Protection Area is located adjacent to Lot 1443 on Lot 10026.

An access road will be constructed east across Lot 14431 to connect with Helm Road. Only a small section of this road is within M70/1143 and is part of this mining proposal. A short length of this section of the road crosses an area of degraded remnant vegetation.

The Wedin site (Lot 8798) includes about 40ha of remnant vegetation that is contiguous with a larger area of vegetation on adjacent locations that include Reserve E11286 for Camping and Water Reserve E19839.

The remnant vegetation is the only significant fauna habitat at the sites.

The mine site and the Wedin site are within the buffer zones of the Toolibin Reserves Threatened Ecologic Community (TEC). These TECs include Toolibin Lake which is a wetland of international significance under the RAMSAR Convention.

## 2.7 Social Environment

The project area is sparsely populated with isolated farm houses. The nearest house to the mine site is 1.9km to the north-east. This is owned by WAK. The nearest residence is 2.8km away.

The nearest residence to the Wedin site is about 2.8km to the south-east.

There are no places or objects of significance within the meaning of the *Aboriginal Heritage Act 1972* or the *Heritage Act of Western Australia 1990* on the locations involved in this proposal.

# 3. Project Description

## 3.1 Area of Disturbance

### 3.1.1 Summary

M70/1143 has a total area of 996.35ha. The mining and degritting operations will affect only a small part of the tenement, as follows:

Open Pit – 3ha each year
Mine site operational area, including stockpiles for clay waste, ore and product, run-off dam, degritting plant, office, diesel fuel storage tank, and other minor components – 6ha.

The areas that will be disturbed on Lot 14431 are shown on Drawing 200-GD-023. The areas comprise cleared agricultural land, a pine plantation and a Tagasaste (tree lucerne) plantation. The mine pit will be rehabilitated progressively as mining proceeds and will be returned to agricultural uses. The disturbed area at any time will be less than 1% of the tenement area.

The Wedin process plant will require an area of approximately 2ha as shown in Drawing 400-GD-005.

The estimated areas that will be disturbed are detailed in Attachment 2. These tables apply only to this Mining Proposal. WA Kaolin intends to eventually expand mining and mineral processing activities into other areas of M70/1143 and at some point into the areas covered by the company's Retention Licences, but those activities will be the subject of separate (future) mining proposals.

### 3.1.2 M70/1143 Mine site

Attachment 2 includes two tables for the mine site (M70/1143). As the mining activity is a shallow strip or box-cut type operation, the total disturbed area for the activities included in this Mining Proposal is specified in the first Table. The areas expected to be in use (actively disturbed) during any typical 12 month period are listed in the second Table.

All overburden and plant tailings are required for use as back-fill in the strip mining operation. Therefore, any areas designated as waste dumps or topsoil stockpiles are temporary and will be completely removed as part of the rehabilitation works.

Areas nominated as pipeline corridors represent only those lengths of pipelines which are laid in areas which will not otherwise be disturbed as mining areas or haul roads. Where-ever possible, pipelines will be located in roadway corridors or on land which is at some point in time going to be used for mining or stockpiles. The pipes can easily be relocated as required.

The low grade ore stockpile listed in the second Table (typical disturbed area for a 12 month period) is only temporary and will be located on an area of ore close to the plant. The low grade stockpile is therefore not listed in the total disturbed area as this would be a duplication of a portion of the open pit area.

### 3.1.3 L70/156 Pipelines

The disturbed area for the pipeline route to the Wedin site is specified in the third Table. This area is calculated by multiplying the pipeline route length within L70/156 and a width of six (6) metres. In practice, the disturbed area is likely to be almost half that as both pipes can be laid within a 1.5m width and the disturbed area listed is due to need for firebreaks to protect the surface laid pipes from grass fires. Buried pipelines will have an even smaller disturbed area.

For almost the entire pipeline route the pipes will be installed in paddocks which are already cleared for broad-acre cropping and grazing activities. Clearing of remnant vegetation will only be required for less than 1,100 m of the total 17.8 km route length and where-ever possible the pipes will laid around large trees, avoiding the need to cut them down. Smaller vegetation will need to be cleared in order to remove the fire hazard.

### 3.1.4 G70/251 Wedin Rail Siding

The disturbed areas for the Wedin Rail Siding site are specified in the final Table. The area of the tenement is significantly larger than the present granted area as listed on the DMP's Tengraph system. This is due to WA Kaolin not obtaining landowner compensation agreements for freehold Lots 8318 and 12221. Compensation agreements were not pursued for these lots as the plant design has since been revised and these areas are not required.

The majority of the disturbed area required is already cleared for broad-acre cropping and grazing activities. Some vegetation will need to be cleared within the existing Wedin rail reserve to allow the installation of new track for the rail siding.

## 3.2 Mining Operations

The mining process involves soil stripping by scraper on a campaign basis, and overburden and ore extraction by excavator and articulated mining truck in a box-cut mining operation. No drilling, blasting or crushing is required. The mining fleet will consist of one excavator and two mining trucks. A front-end loader will be used at the process plant and will perform clean-up duties at the mine. A water truck will be used for dust suppression.

The typical depth of mining will be 20 to 30m below the surface with a maximum of 35m. The production of 360,000tpa of refined kaolin will require removal of about 900,000tpa of overburden and clays that will be separated during processing. Therefore, the total mining will be approximately 1,260,000tpa.

The location of the mine and de-gritting plant are shown in Drawing 200-GD-C21. A typical mining pit plan is shown in Drawing 200-XD-002 and plant elevations in Drawing 200-GD-022.

Washed sand tails will be returned to the pit as they are created and then covered with overburden and topsoil to recreate the original stratigraphy and to allow re-use for agricultural purposes. Some clay rich material will be included in the soil layers to improve retention of water and fertilizer in the rehabilitated areas.

All mining will occur well above the water table and no pit de-watering will be required other than to remove direct rainfall. The natural moisture level of the weathered granite is between 12 and 18% by

weight, and has a low potential for generating dust. Haul roads will be constructed of laterite gravel and washed tailings sand to create a well-drained and hard wearing surface. These will be watered regularly and treated with dust suppression agents (binders).

## 3.3 Ore Processing

### 3.3.1 Mine Site

The ore process plant at the mine site will include:

- Stockpiles for approximately 10,000 tonnes of ore,
- The process lines,
- Tanks for storage of recycled water,
- A diesel storage tank and bowser,
- Store shed and site office.

A portion of the ore will be treated by dry screening to produce beneficiated kaolin with a kaolin content from c.40% to c.90%. This product is known as Kaolin Ore K90. An operational process chart for this part of the project is provided in Drawing 00-PD-100.

The product will be transported by trucks from the mine site either directly to Kwinana, or to Cuballing Rail Siding or to the Wedin site operated by WA Kaolin.

This will require an average of 5 truck movements per day carrying the product (at 83t gross vehicle weight) and 5 return empty truck movements (at 28t). It is probable that the transport will not be continuous but will be timed with ship loading requirements. In this case, the number of loads per day will be more than this average but there will also be periods when there will be no truck movements.

The remainder of the ore will be processed as shown in Drawing 00-PD-101. The initial process involves a degritting plant with screens and cyclones. This will separate kaolin of <45 microns from waste 'sand'. The de-gritting plant has the following sequential components:

- A feed hopper
- Wet drum scrubber
- Vibrating Screens
- Hydro-cyclones
- Vacuum belt filter, and
- A de-gritting centrifuge

The process involves:

- Mixing of the ore with water
- Wet scrubbing to break up the kaolin lumps into discrete individual particles
- Separation of kaolin of <45 microns from waste materials by screening, the hydro-cyclones and the vacuum belt filter, and
- Further processing of the coarse kaolin fraction in the de-gritting centrifuge.

The process is mechanical but does involve 2 chemical additives namely sodium hydroxide (1200tpa) and a dispersant (Antiprex - 270tpa) to prevent flocculation.

The slurry will be pumped through a pipeline to the Wedin site for further processing. Operations at the mine-site may commence before the construction of the slurry pipeline has been completed. In this case kaolin will be transported to the Wedin site by trucks for a period.

Water for processing will be supplied from a new lateral pipeline connection to the existing Water Corporation pipeline that runs along the Williams - Kondinin Road. Water pumped from the mine process plant to the Wedin site is returned for re-use through a second pipeline from the Wedin site.

Waste materials from the de-gritting plant comprise washed and de-watered quartz sand and a minor amount of coarse clay mixed with fine sand. The sand will returned by truck to the pit soon after it is discharged from the plant. The coarse clay will be filtered and pressed to a damp cake before being returned to the mine pit by truck as backfill. Some of this clay may be dried further and mixed with topsoil to improve retention of water and nutrients for rehabilitation purposes.

### 3.3.2 Wedin Site

The general layout of the process plant at the Wedin site is shown in Drawing 400-GD-002 and plant components and elevations are shown in Drawing 400-GD-004. Other facilities at the site include:

- A container handling yard.
- Bunded diesel and chemical stores.
- Workshop and spare parts store.
- Storm water run-off collection pond and pump system.
- Administration and amenities buildings.
- Communication tower.

The tallest structures will be between 10 and 15m in height.

The processing plant at the Wedin site receives the kaolin and water slurry from the de-gritting plant at the mine-site. The Wedin process plant has the following components:

- Classification centrifuges
- De-watering
- Pressing
- Drying and
- Bagging of products.

The slurry is first passed through classification centrifuges that will separate fine clay and coarse clay (fractionation). The coarse and fine fractions are sold as different product grades and for different end uses. A small quantity (approx. 20,000 TPA) of very coarse clay will be returned by on-road truck to the mine unless a market can be found for this size fraction.

The fine and coarse kaolin streams are de-watered in centrifuges and membrane and tube presses to produce granulated and cake kaolin products. These are further dried using a gas-fired dryer. The gas supply will be butane or LNG delivered by road-train from Kwinana.

The dried products will be packaged and stored in bulk bags and ISO shipping containers prior to loading onto rail wagons for haulage to Kwinana by forklift. The storage area will hold up to approximately 10,000 tonnes of product.

### 3.3.3 Existing Conditions on the Wedin Site Tenement G70/251

The following conditions on tenement G70/251 relate to adjacent properties and the railway. The numbers are those used on the Mineral Titles Online tenement listing.

Conditions 5, 6, & 7. No mining is proposed anywhere within tenement G70/251. The tenement's purpose is solely for the construction and operation of a mineral processing plant and rail siding. Any excavations required for rail siding and process plant construction (e.g. foundations) will be carried out only after obtaining consent of the State Mining Engineer, and also the consent of the railway operator's engineer.

Conditions 8 & 9. Rail siding and mineral processing infrastructure will be required to be constructed within the Safety Zone. However, no activities of any type will be carried out within the Safety Zone until prior written approval and consent is obtained from both the railway operator and the State Mining Engineer, DMP. Prior to construction, detailed engineering design drawings will be provided to both the railway operator and the State Mining Engineer for approval and consent.

Condition 10. No explosives will be stored or used on any of the project tenements.

Condition 11. All rights of access to the rail corridor for the employees, contractors, and agents of the operator of the railway and the Public Transport Authority of WA will be maintained.

## 3.4 Workforce

The project is expected to employ between 60 and 80 people. WAK does not plan to operate a residential camp at the mine site and expects to employ local people wherever possible. These probably will mainly live in the Shires of Wickepin and Narrogin. Required services such as electricians, earthmoving contractors etc., will also be sourced from the local region provided these are cost competitive.

## 3.5 Water Supply and Recycling

### 3.5.1 Wedin Process Plant

Fresh process water will be delivered to the Wedin site by a buried pipeline connected to an existing Water Corporation main located approximately 7 km west of the site. Some upgrades to Water Corporation pumping and piping systems will be required to cater for the additional demand on the local network.

Most of the water from de-watering and pressing operations will be piped to the de-gritting plant for use there. The process as assessed for the Works Approval included treatment of the remaining water by reverse osmosis. This would have generated waste salt residues. WA Kaolin has now decided to modify the kaolin processing flow sheet by replacing the reverse osmosis process with evaporators. As a result no salt residues will be produced and any uncertainties regarding the management and long-term security of salt waste have been resolved. More details of the former and present proposal are provided below.

The original proposal involved a wet kaolin processing circuit using traditional filtering and drying process. All wet kaolin circuits must operate with the slurry in the classification area (refining into particle size ranges) having a slightly alkaline pH, typically around 8.0 to 8.5. In order to de-water the resulting refined

slurry in the traditional process acid is added to drop the pH of the slurry to approximately 5.0 to 5.5. This has the effect of flocculating the solids in the slurry so that the extremely fine solids particles can be collected in a filter-press of some type before thermal drying processes are applied. Long chain polymer flocculants cannot be used as these have a detrimental effect on the kaolin dispersion properties in its end-use.

After filtration, the permeate water (still at pH 5.0 to 5.5) is recycled back to the start of the refining process, where sodium hydroxide must be added to bring the pH back up to 8.0 to 8.5. This process is repeated again and again as the water goes around the circuit. Consequently, the reaction products of the acid and alkali constantly being added to lower and raise the pH build up in the recycled process water in the form of a salt; either sodium chloride or sodium sulphate, depending upon which acid is used. As kaolin processing must use fresh process water to achieve the required final product quality, the salt must constantly be removed from the recycle water stream.

To remove the salt, the initial proposal included a reverse osmosis (RO) plant with the saline waste being discharged into shallow solar evaporation ponds where it would evaporate to leave dry solid salt. The solid salt would be periodically harvested and returned to the mine site for encapsulation and burial.

In the revised process, rather than flocculate the kaolin solids contained in the refined slurry and de-water via filter-presses, the slurry is maintained at an elevated pH (8.0 to 8.5) and multi-stage evaporation is used to produce thickened paste slurry which is suitable for forming into granules and subsequent thermal drying into the final product form. This process has several advantages over that previously proposed:

- The kaolin going into the granulation and drying process is still slightly alkaline, rather than acidic as was the case previously. This is of benefit to the end-use customer, as it makes the dry kaolin much easier to re-disperse into slurry with good rheological properties, and reduces reagent consumption in the customer's process which is also alkaline.
- No acid is added to WA Kaolin's circuit, removing a hazardous reagent completely from the site and greatly reducing the consumption of sodium hydroxide.
- The number of physical processing stages and equipment items within the plant are greatly reduced, and the RO and solar evaporation ponds are no longer required. No waste salt is generated by the process.

The use of evaporation processes to de-water kaolin slurry is not novel, as evaporator equipment is used in several kaolin plants in the USA and Brazil.

The evaporator plant and equipment will be located at the Wedin Rail Siding site, and will replace the previously proposed filtration buildings and associated equipment.

### 3.5.2 Mine Site

Recycling of water will also occur in the de-gritting process line.

## 3.6 Pipelines

### 3.6.1 Description

Two pipelines are required to connect the mine site and Wedin process plants. These will be laid across a portion of M70/1143, along the length of L70/156, to G70/251. The route of L70/156 is shown in detail on Drawings 000-GD-010, 000-GD-011 and 000-GD-012. The first pipeline carries dilute kaolin slurry (approx. 15 to 20% solids by weight) to the Wedin site and the other returns clean water to the mine site. The liquid

in each pipeline is at ambient temperature and has a pH of 8. The only chemicals present are a biodegradable dispersant, and a small amount of sodium hydroxide to raise the pH slightly. The salinity of the water in the pipelines will be less than 1000 ppm TDS (and is expected to be less than 500 ppm TDS).

The pipeline lengths are identical at slightly over 20 km. The maximum pressure expected at any point in the pipeline should be less than 1000 kPa.

Preliminary pipeline design to-date consists of the following;

| | |
|---|---|
| Materials: | High Density Polyethylene (HDPE) |
| Specification: | PE100, PN16 (note that PN rating will vary along pipeline depending upon the pressure profile) |
| Size: | The slurry pipeline is expected to be DN 280mm (OD = 280mm), and the water return pipeline is expected to be DN 315mm (OD = 315mm). The final selected size may vary upon the pressure profile which will be determined during the detailed design engineering. |
| Location: | In order to minimise capital costs, the pipelines will be laid on the surface in a fenced corridor, using an existing property boundary wherever possible. If funds permit, the pipelines will be fully buried. At locations where the pipelines cross public roads or private property access-ways, the pipelines will be buried. A range of installation scenarios is shown in Drawing 000-GD-013. Consultation with each landholder and occupier will be carried out as part of the detailed design process to determine exactly where buried sections for paddock access, farm gates and fences will be located.<br>The pipelines will be installed underground where they cross the railway line at Wedin. The design of this section will be engineered in conjunction and with the approval of the rail track operator. |
| Installation: | The polyethylene pipeline material will be manufactured by a recognised and experienced manufacturer in accordance with AS4130.The installation of the pipeline will be carried out by a suitably qualified contractor in accordance with AS2033, and all pipe joints will be subjected to the installers' traceable weld quality inspection processes. Upon completion of pipeline construction, pressure testing will be carried out in accordance with AS2033 and the installation contractor's quality control system. |
| Control System: | Magnetic flowmeters and pressure instruments will be located on both pipeline entry points and discharge points. The PLC based process control systems at both ends of the pipeline will be linked by a telecommunications system (either direct radio or through the Telstra network). If the process control system detects a miss-match in the flow rates entering and leaving a pipeline or an unexpected pressure reading, actuated valves at the entry point to the pipeline are automatically closed and alarms are raised in the control rooms at both ends of the pipelines, alerting operators to immediately conduct a full inspection of the pipelines. Manual isolation valves will be located at a number of points along both of the pipeline routes. These can be closed to limit the quantity of liquid spilt in the event of a leak. A preliminary estimate is five intermediate isolation valves per pipeline (i.e. one every 4 kilometres), but the final locations and numbers of valves will be determined by the topography of the pipeline route. |
| Inspections: | In addition to the flow and pressure monitoring, the pipeline route will be visually inspected at least once every 48 hours whilst the pipelines are in operation. |
| Maintenance: | As the pipeline material is HDPE, corrosion (either internal or external) is not possible. Failure through wear is highly unlikely as kaolin is both extremely fine (100% passing 20 microns) and soft (by mineralogical standards), and the pipeline slurry velocity is |

| | |
|---|---|
| | very low (<1.5 m/sec). Flanges, valves and instruments will be inspected regularly in accordance with good maintenance practices.<br>To minimise the risk of damage to the polyethylene pipelines in the event of grass fire, areas where the pipes are located above ground will be regularly sprayed to prevent excessive weed and grass growth, and fire-breaks will be maintained along both sides of the pipes (refer Drawing 000-GD-013). Buried pipes will be marked with regularly spaced "Do Not Excavate" signage and the local Shire, Telstra, Western Power and the Water Corporation will be advised of the pipeline locations upon completion of an "As Built" survey. |
| Risk Assessment: | A formal risk assessment (HAZOP) will be carried out as part of the pipeline detailed design process. |
| Failure Mitigation: | In the detailed design engineering phase WA Kaolin will prepare a pipeline spill management plan. As the contents of both pipelines are environmentally benign, the main issue to be managed is localised water flows (e.g. shallow flooding and water on a road). The slurry pipeline carries only very dilute kaolin slurry (approx. 9% solids by volume), but the kaolin may dry leaving a thin layer of potentially slippery white mud. A post spill clean-up will include a using a water truck to wash the kaolin off a road if required. Other than the visual effect of very white kaolin clay, a slurry spill is harmless to vegetation and will not be cleaned-up from a spill in a paddock. The addition of kaolin to leached surface sands in the Wickepin area is a researched and known method of soil improvement as it increases moisture retention. |

### 3.6.2 Existing Conditions on Tenement L70/156

The following conditions on the pipeline tenement L70/156 relate to adjacent properties and the railway. The numbers are those used on the Mineral Titles Online tenement listing.

Conditions 8, 9, & 10. No mining is proposed anywhere within tenement L70/156. The tenement's purpose is solely for the laying and operation of slurry and water pipelines. Any excavations required for pipe-laying (e.g. buried pipeline crossing of the rail corridor) will be carried out only after obtaining consent of the State Mining Engineer, and also the consent of the railway operator's engineer.

Conditions 11 & 12. Pipelines will be required to be constructed within the Safety Zone as they must cross the railway line. However, no activities of any type will be carried out within the Safety Zone until prior written approval and consent is obtained from both the railway operator and the State Mining Engineer, DMP. Prior to construction, detailed engineering design drawings will be provided to both the railway operator and the State Mining Engineer for approval and consent.

Condition 13. No explosives will be stored or used on any of the project tenements.

Condition 14. All rights of access to the rail corridor for the employees, contractors, and agents of the operator of the railway and the Public Transport Authority of WA will be maintained.

### 3.6.3 Use of Roads

Sections of the pipelines will be sited on road reserves or will cross under roads. The roads are the responsibility of the Shire of Wickepin and approval of the Shire is required for the pipelines to be constructed at these locations. The Shire has consented in principle to this use subject to consultation

during the detailed design phase of the project. This consultation will aim at minimising disruption to normal use of the roads and to ensure public safety.

## 3.7 Utilities

Power to the mine site and Wedin will be provided by connection to the existing Western Power network. The location of the connection has not yet been determined.

Thermal energy for drying will be from LPG, trucked in and stored in on-ground storage tanks.

## 3.8 Hours of Operation

Mining operations will occur between 7am and 7pm, usually for 5 days per week but at times for 7 days. The processing plants at the mine and the Wedin will operate on a continuous basis.

## 3.9 Rail Haulage to Kwinana

### 3.9.1 The Railway Siding

A 1km long railway siding from the existing line will be constructed on the Wedin site. The container handling yard will be adjacent to the siding and a container forklift will be used to lift containers on and off the wagons.

These components of the project are not part of this Mining Proposal and require separate planning and development approvals from the Shire of Wickepin. This has been applied for.

All of the process plant and facilities other than the siding and handling yard will be more than 30m away from the railway and are part of this Mining Proposal. The closest part of the process plant to the railway will be at a distance of approximately 100m but a larger separation distance could be applied if required.

### 3.9.2 Train Movements

There are restrictions on the size of trains that can operate on the line to Kwinana due to rail conditions and length of sidings en-route. The maximum number of wagons per train is 26, each of which can carry two containers. The weight of kaolin on each wagon will 53MT and the total weight per train will be 1352MT. This means that 266 trains/year will be required to transport 360,000MT of kaolin. This equates to 5-6 loaded trains/week or 10 to 12 train movements/week.

Loading at the Wedin site will occur whenever a train arrives and this may include loading at night.

Delivery of bulk consumables to the Wedin site such as diesel, chemicals in ISO bulk containers, and packaging materials may be either by road or rail transport.

## 3.10 Road Haulage

The 100,000tpa of beneficiated kaolin will be packaged in bulk bags which will be placed in shipping containers at the de-gritting plant. There will be virtually no potential for dust emissions in transit.

This product will either be transported by road to the Wedin rail siding for loading onto trains or may be transported by trucks directly to Kwinana. In the latter case, using RAV 4 permitted contractor(s) and a load of 55tonnes (GVW 83t) there would be 1818 movements per annum of product out and 1818 empty returns (@ 28t). The weekly average is 35 movements product out and 35 inbound empty and the daily average is 5 movements each way. It is more probable however, that the transport will not be continuous but will be timed with ship loading requirements. In this case, the number of loads per day will be more than this average but there will also be periods when there will be no truck movements.

Road haulage also will be used to deliver LPG, small quantities of specialty chemicals and spare parts. Reject clay and salt from the Wedin site also will be returned to the mine-site in trucks.

**Road Traffic during Construction**

A rough estimate of tonnage of plant and equipment and building materials delivered by road to the sites over a 15 month construction period is 2000t. This equates to only 250 truck movements in and out with an 8t average payload. This is approximately 17 truck movements each way per month.

## 3.11 Compliance with Legislation and Other Approvals

WA Kaolin has a Works Approval from the Department of Environmental Regulation for the pilot processing plant at Kwinana and a Works Approval for the project described in this Mining Proposal.

WA Kaolin has also applied for Development and Planning Approvals.

# 4. Environmental Impacts and Management

## 4.1 Natural Environment

The mine site and the Wedin site have been used for many years for cereal cropping and sheep grazing which is the main land use in the region. There are also small areas of disturbed woodland on the mine-site. Most of this remnant vegetation will not be disturbed by the mining operations. There also is a pine plantation as shown in Drawing 200-GD-023 and an area of planted tree lucerne immediately to the south of the existing costean. Some of the pines and all of the tree lucerne will be removed during mining operations.

The Remnant Vegetation Protection Area located adjacent to Lot 1443 will not be affected.

An access road will be constructed east across Lot 14431 to connect with Helm Road. Only a small section of this road is within M70/1143 and is part of this Mining Proposal. The other longer section requires planning approval from the Shire of Wickepin. Applications for planning and development approval (inclusion of "industry extractive" as a permitted land use in the zoning) have been lodged with the Shire. A short length of this section of the road crosses an area of degraded remnant vegetation. A Native Vegetation Clearing Permit will be sought from the Department of Environmental Regulation during the detailed design phase of the project as part of the final determination of this alignment. An alternative but longer route to the south-east could be selected that would avoid the remnant vegetation if required.

The Wedin site (Lot 8798) includes about 40ha of remnant vegetation that is contiguous with a larger area of vegetation on adjacent locations that include Reserve E11286 for Camping and Water Reserve E19839. The proposed facilities on Lot 8798 will not require clearance of any of the remnant vegetation on the property.

## 4.2 Groundwater

There will be no requirement to pump, use or discharge groundwater at the project sites.

Bores will be installed at the mine and Wedin sites to determine whether groundwater is present. None has been detected to date at the mine site but no bores have been drilled at Wedin. All of these bores will be monitored regularly and the water quality will be assessed if any groundwater is present.

## 4.3 Surface Water

Perimeter drains will be used to contain all flows from the mine and plant areas and this water will be recovered for use in the process plants.

There is a small intermittent stream on the Wedin site. The intention is to leave this in its current position but it may need to be re-positioned to manage site drainage. If this is required, the entry and exit points of the stream from the site will not be modified and the natural flow of the stream will not be affected.

## 4.4 Toolibin Reserves Threatened Ecologic Community (TEC)

The project sites are within the buffer zones of the Toolibin Reserves TEC. Provisions for managing and recovering water on the project sites and the low potential for run-off will ensure that there are no impacts on water entering the wetlands and reserves.

## 4.5 Atmospheric Emissions

Apart from exhaust emissions from machinery the only atmospheric emission will be exhaust gases from the dryer at the Wedin site. The peak flows at the dryer and stack will be as detailed below. Peak flows are expected to occur for less than 600 hours per year. The average flows will be approximately 65% of these levels.

Gas consumption = 24 GJ/h

| Drier Exhaust gas | Nm3/h | Mol/h | MWt | kg/hr | mol% | mass% |
|---|---|---|---|---|---|---|
| O2 | 8,137 | 363 | 32 | 11,624 | 15% | 18% |
| N2 | 35,550 | 1,587 | 28 | 44,438 | 67% | 69% |
| CO2 | 656 | 29 | 44 | 1,289 | 1% | 2% |
| H2O | 8,565 | 382 | 18 | 6,882 | 16% | 11% |
| **TOTAL** | **52,908** | **2,362** | | **64,233** | | |

No part of the kaolin product feed to the dryer is combusted in the drying process, so the only components of the exhaust stream should be the products of natural gas combustion, plus any water evaporated from the kaolin.

The temperature of the exhaust gas will be around 90 – 105$^{o}$C.

The material being dried is kaolin clay, and a small portion of the clay will be entrained in the airflow leaving the dryer. An off-line pulsed bag-house type dust collector will be used to remove any particulate solids from the dryer airflow before it is exhausted to atmosphere via the stack. The same process has been used at the Kwinana pilot plant in the kaolin spray drier for several years and no solids were observed in the air-stream leaving the stack.

## 4.6 Noise

Herring Storer Consultants have modeled noise levels from mining equipment at the mine site. They conclude that noise levels at the closest residence to the mine will be well within acceptable limits.

Noise from the processing plants has not yet been modeled but is not expected to be an issue given the separation distances involved. The plant does not include any equipment that generates high noise levels and is the same as that operated in the pilot plant at Kwinana. The nearest residence is approximately 2.8 km to the south-east and all of the process plant will be enclosed in buildings and the cladding can be designed to achieve noise attenuation.

The modelling will be commissioned as part of the detailed design of the process plant and if necessary bund walls and other attenuation measures will be incorporated in the design to ensure acceptable noise levels are achieved at all times. The plant will operate on a 24/7 basis and will have to be designed to ensure compliance with night-time regulations. There also will be loading and other

machines operating outside but it would be possible to limit these to day-time operations if necessary to achieve the regulatory standards.

## 4.7 Light

The sites will be illuminated at night for process and safety requirements and are expected to be visible from the nearest residences. The separation distance will attenuate the light to some degree. The placement of individual external lights will be evaluated during detailed design of the plant and any effective means of further attenuating the light through placement, orientation and cowlings will be implemented.

## 4.8 Dangerous Goods

Chemicals used in the process consist of a biodegradable dispersant and sodium hydroxide. The alkali is used in minor quantities to control the pH of the kaolin slurry which has to be adjusted through the process to enable the circuit to function properly. Minor quantities of a biocide are also used to prevent bacteria consuming the dispersant.

These chemicals will be delivered in bulk liquid form by road tanker and will be stored on-site in accordance with the *Dangerous Goods Safety Act 2004*.

***Sodium Hydroxide - Class 8 UN 1824***

The project will require an estimated 1200tpa most of which will be delivered to, stored, and used at the mine site with a small amount used and stored at the Wedin site. It is expected that 50% sodium hydroxide solution will be delivered by road train with two trailers and a maximum capacity of 60 tonnes (40m³). There will be 2 deliveries per month. Each truck will visit the Wedin site first to top up the storage tank there before proceeding to the mine site. The storage tank at the Wedin site is expected to have a capacity of 20m³ and at the mine site 79m³.

***Antiprex (Dispersant) - Class 8 UN No.2218***

An estimated 270tpa (40 – 70% solution) will be required at the mine site and 100tpa at Wedin plant site. This will be delivered by road in 20m³ tankers with two deliveries per month to the mine site and one delivery every two months to the Wedin site. There will be a 40m³ storage tank at each site.

***Glutaraldehyde (Biocide) – Not classified but treated as Class 8***

5tpa will be delivered to the Wedin site by truck in a one tonne steel container, once every 3 months. The storage tank at the site will have a capacity of 1.5m³. The biocide is used to occasionally dose the process liquor, as the dispersant (Antiprex) is bio-degradable and promotes growth of moulds on the insides of tanks in warm conditions. Domestic bleach (dilute ammonia) is also used to wash down tanks and equipment to control mould and bacteria growth.

Glutaraldehyde must be stored away from strong bases (caustic) as contact would result in an exothermic reaction. Optimum product stability occurs when product is stored at pH of 3.7 - 4.5 and less than 38° C. This temperature can generally be achieved in a ventilated shed.

***Design of Storage Tanks***

All storage tanks and unloading facilities will be enclosed within fully lined and bunded areas, and will be designed in accordance with the relevant Dangerous Goods storage and handling codes, standards, and regulations. The services of a DMP accredited Dangerous Goods consultant will be used during the design engineering phase, and to prepare and achieve the required Dangerous Good licenses.

***Maintenance of Storage Tanks***

During periods of storage tank maintenance the plant will be supplied from Intermediate Bulk Containers (IBCs). Two IBC's of 50% sodium hydroxide per day will be required.

## 4.9 Waste Management

### 4.9.1 Domestic Waste

Domestic waste from the mine and Wedin sites will be disposed of in accordance with the requirements of the Shire of Wickepin. Sewage from amenities facilities will be treated at each site using a suitably sized "Biomax" (or equivalent) aerobic treatment system. The produced water will be used for watering of screening vegetation around the processing plant sites. An "Application to construct or install an apparatus for the treatment of sewage" will be made to the Shire of Wickepin

Garbage (non-sewage) from facilities at both sites will be stored in covered containers and regularly transferred to Great South Waste's Narrogin tip. Recyclables will be segregated from general waste and transferred to the recycling depot at the Narrogin tip.

### 4.9.2 Industrial Waste

Industrial wastes from the mine and Wedin sites will be disposed of as follows:

- Oils, lubricants, oil filters, oily rags, oil trap waste, and coolants will be stored in closed vessels in bunded areas, and collected for recycling by companies such as Wren Oil.
- Office type waste (paper and cardboard) will be collected for recycling.
- Solid wastes will typically be worn pipe and machinery items and packaging from delivered spare parts and consumables. Metal (steel and copper) items will be collected for recycling as will plastics (HDPE, LDPE, and polypropylene) and cardboard. The Narrogin Shire tip is a collection point for recyclable materials.
- Any non-recyclable solid wastes will be disposed of at the Narrogin tip, with hazardous materials segregated as per the requirements of the Narrogin Shire tip (e.g. batteries, paints and thinners).
- Intermediate bulk containers (IBCs) and pallets will be returned to the provider for re-use.
- Nucleonic sources (e.g. in slurry density gauges) will be disposed of at the end of their useful life in accordance with the Radiation Safety Act 1975.

No other industrial wastes are expected from the process.

## 4.9 Social Environment

The WA Kaolin Project will not cause any negative impacts on surrounding agricultural land use and the pipeline easement has been located adjacent to the boundaries of paddocks in order to minimize the loss of productive land. There also will not be any negative impacts on communities in the Shire of Wickepin. The impact of noise emissions on the two nearest neighbours will be assessed in detail during detailed design and commissioning.

The project is expected to have a very positive effect on the economies of Wickepin and Narrogin. It will be a major employer of local people and contractors and therefore will stimulate local incomes and expenditures.

## 4.10 Rehabilitation and Mine Closure

A Mine Closure Plan (Document WAK/MCP/1) has been submitted with this Mining Proposal.

The primary objective of closure of the mine and processing activities in general is, in consultation with relevant landholders, to return the land profile consistent with the surrounding topography and establish either productive agricultural land or native vegetation considering past land uses.

The primary objectives for rehabilitation are to achieve:

- A safe, stable and resilient landforms and soils.
- Appropriate hydrology to support rehabilitated habitats.
- Visual amenity and suitability for agreed land use.
- Broad-acre crops of relevance to the landholder and self-sustaining vegetation comprised of local provenance species and agreed targets for vegetation recovery.

The following commitments are made regarding these objectives:

***Compliance***

- The disturbed mining environment shall be made safe.
- Closure requirements of the regulatory authorities will be met.
- All legally binding conditions and commitments relevant to rehabilitation and closure will be met.

***Landforms***

- The landform of pit areas after mining and backfilling will be restored to a form similar to that pre-mining, with all areas being graded such that broad-acre cropping is possible with modern large-scale seeding, spraying and harvesting equipment. The landform of process plant and infrastructure areas will be unchanged from its original state as there are only very minimal bulk earthworks required for plant construction.
- All plant tailings and plant closure demolition products buried as part of pit back-fill operations will be non-polluting.
- Any landform depressions which may collect water will be designed as stock dams in consultation with the occupying farmer.
- Final landforms will be stable and no more prone to dust generation than the surrounding undisturbed farming land.

***Revegetation***

- Areas of disturbed farmland will be planted as soon as possible with crops such as lupins, in order to stabilise the topsoil and prevent erosion by wind or water. These areas can then re-join adjacent active farming areas in the normal cropping and grazing rotation.
- Consideration will be given to the planting of Tagasaste ('tree lucerne') in farmland locations where visual screening or wind-breaks are required.
- Any areas of native vegetation disturbed (along the pipeline route and rail siding) will be re-planted in consultation with landowners to achieve the owners objectives.
- The rehabilitated land will have equivalent functions and resilience as the pre-mining land.
- Soil properties will be appropriate to support the post mining land use.

***Fauna***

- The abundance and diversity of fauna will be equivalent to pre mining conditions for agricultural land in this area.

***Water***

- Backfilled mine areas will have surface and groundwater hydrological flow patterns appropriate for the specified post-mining land use.
- Where there is a backfill volume deficit in rehabilitated mining areas, the resultant lowered landform will be designed to collect any rainfall run-off in a managed way and not result in water-logged cropping areas. Any required low points in the resultant topography will be constructed as shallow farm dams suitable for stock watering and potential aquaculture.
- Areas on which plant and infrastructure were located will be returned to a landform which restores the pre-existing drainage patterns and farm dams.
- Surface and groundwater levels and quality will reflect original levels and water chemistry.
- There will be no long term reduction in the availability of water to meet local environmental values.

***Infrastructure and Waste***

- During decommissioning and through closure, wastes will be managed consistent with the waste minimisation principles.
- No infrastructure to be left on-site unless agreed to by regulators and post-mining land owners.
- The location and details of any buried hazards will be clearly defined and robust markers will be installed and maintained.

***Pollution***

- Any contaminants remaining on-site will be at or below agreed criteria.

***Socio-economic***

- All stakeholders will be consulted during the mine closure process.
- The Company will ensure that the closure process occurs in an orderly, cost-effective and timely manner.
- The Company will ensure that the cost of closure is adequately represented in Company accounts and the community is not left with a liability.

## 5. Attachment 1: List of Land Owners

| LOT | PLAN | VOL/FOLIO | Tenement | Activity | Owner Name | Occupier Name | Form of Agreement |
|---|---|---|---|---|---|---|---|
| **PROPOSED ACTIVITIES (THIS PROPOSAL)** | | | | | | | |
| 14431 | 155015 | 1372/127 | M70/1143, L70/156 | Mining, Mineral Processing, Pipelines | WAMCO PACIFIC P/L (was Alan Quartermaine at time of application) | David & Judith Quartermaine | Top 30m (Section 29 Lodged), Land use compensation (general) |
| 11547 | 85454 | 2061/204 | L70/156 | Pipelines | Dorothy Rae Easton & ELMHAM P/L | Tom Bayley | Land use compensation (pipelines) |
| 10538 | 83904 | 2061/205 | L70/156 | Pipelines | Dorothy Rae Easton & ELMHAM P/L | Tom Bayley | Land use compensation (pipelines) |
| 10544 | 83905 | 2061/208 | L70/156 | Pipelines | RL, JI & AN GREY | Adam Grey | Land use compensation (pipelines) |
| 7364 | 233522 | 1309/507 | L70/156 | Pipelines | RURAL ASSET P/L | Tom Bayley | Land use compensation (pipelines) |
| 1 | 16808 | 1173/997 | L70/156 | Pipelines | RURAL ASSET P/L | Tom Bayley | Land use compensation (pipelines) |
| 341 | 301945 | 1173/994 | L70/156 | Pipelines | RURAL ASSET P/L | Tom Bayley | Land use compensation (pipelines) |
| 12267 | 146133 | 1173/997 | L70/156 | Pipelines | RURAL ASSET P/L | Tom Bayley | Land use compensation (pipelines) |
| 5981 | 119677 | 1505/341 | L70/156 | Pipelines | Ronald George Edward Miller | Ron Miller | Land use compensation (pipelines) |
| 5982 | 119676 | 1505/341 | L70/156 | Pipelines | Ronald George Edward Miller | Ron Miller | Land use compensation (pipelines) |
| 9464 | 136607 | 1102/943 | L70/156 | Pipelines | Ronald George Edward Miller | Ron Miller | Land use compensation (pipelines) |
| 13097 | 151002 | 1871/624 | L70/156 | Pipelines | Ronald George Edward & Kelly Marie Miller | Ron Miller | Land use compensation (pipelines) |
| 12027 | 145221 | 1871/623 | L70/156 | Pipelines | Julie Marie Thompson | Peter Thompson | Land use compensation (pipelines) |
| 1 | 4774 | 1302/789 | L70/156 | Pipelines | Julie Marie Thompson | Peter Thompson | Land use compensation (pipelines) |
| 6109 | 119678 | 1148/349 | L70/156 | Pipelines | Julie Marie Thompson | Peter Thompson | Land use compensation (pipelines) |
| 12368 | 145364 | 2105/397 | L70/156 | Pipelines | GB & CL BAYLEY SUPERANNUATION FUND P/L | Scott Bayley | Land use compensation (pipelines) |
| 8801 | 132475 | 2224/666 | L70/156 | Pipelines | GB & CL BAYLEY SUPERANNUATION FUND P/L | Scott Bayley | Land use compensation (pipelines) |
| 13842 | 157616 | 1161/153 | L70/156 | Pipelines | GB & CL BAYLEY SUPERANNUATION FUND P/L | Scott Bayley | Land use compensation (pipelines) |
| 8799 | 132473 | 2224/667 | L70/156 | Pipelines | GB & CL BAYLEY SUPERANNUATION FUND P/L | Scott Bayley | Land use compensation (pipelines) |

| | | | | | | | |
|---|---|---|---|---|---|---|---|
| 1 | 92042 | 1205/399 | G70/251 | Mineral Processing | WAMCO INDUSTRIES GROUP P/L | D Bird (was Ken Thomson) | Land use compensation (process) |
| 8798 | 132472 | 1290/499 | G70/251 | Mineral Processing | WAMCO INDUSTRIES GROUP P/L | D Bird (was Ken Thomson) | Land use compensation (process) |
| **FUTURE ACTIVITIES (NOT INCLUDED IN THIS PROPOSAL)** | | | | | | | |
| 7495 | | 1107/798 | M70/1143 | Future Mining | Kiandra Grazing Co. Pty Ltd (at time of application), now WAMCO | M Orchard | Top 30m (Section 29 Lodged) |
| 13898 | | 1876/704 | M70/1143 | Future Mining | Kiandra Grazing Co. Pty Ltd (at time of application) | M Orchard | Top 30m (Section 29 Lodged) |
| 7493 | | 1881/319 | M70/1143 | Future Mining | Kiandra Grazing Co. Pty Ltd (at time of application) | M Orchard | Top 30m (Section 29 Lodged) |
| 7494 | | 1059/133 | M70/1143 | Future Mining | Francis & Mary Heffernan (at time of application) | (unknown) | Top 30m (Section 29 Lodged) |
| 10029 | | 1433/653 | M70/1143 | Future Mining | Francis & Mary Heffernan (at time of application) | (unknown) | Top 30m (Section 29 Lodged) |
| 7757 | | 1826/290 | M70/1143 | Future Mining | G & D Sims | G & D Sims | Top 30m (Section 29 Lodged) |
| 7125 | | 1826/291 | M70/1143 | Future Mining | G & D Sims | G & D Sims | Top 30m (Section 29 Lodged) |
| 10394 | | 1826/292 | M70/1143 | Future Mining | G & D Sims | G & D Sims | Top 30m (Section 29 Lodged) |
| 14941 | | 1826/294 | M70/1143 | Future Mining | G & D Sims | G & D Sims | Top 30m (Section 29 Lodged) |
| 11456 | | 1575/533 | M70/1143 | Future Mining | I Easton (at time of application) | G & K Spark | Top 30m (Section 29 Lodged) |

## 6: Attachment 2: Disturbance Table

## M70/1143 total disturbed area

| TENEMENT NUMBER: M70/1143 | | |
|---|---|---|
| | **DESCRIPTION OF MINING DISTURBANCES** | **AREA (ha)** |
| | Open Pit | 47.6 |
| | Tailings facilities | 0.0 |
| | Heap leach pads or vat leach dams | 0.0 |
| | Evaporation ponds | 0.0 |
| | Waste dumps (sulphide present, highly erodable, >25m high) | 0.0 |
| | Waste dumps (lower risk) (temporary) | 8.8 |
| | Topsoil stockpiles (temporary) | 4.1 |
| | ROM pad | 2.1 |
| | Low grade oxide stockpiles (located on areas to be mined) | 0.0 |
| | Plant site and mining infrastructure including office / workshops | 7.9 |
| | Camp site | 0.0 |
| | Strip mining (backfilled mining voids) (rehab in progress) | 0.0 |
| | Hypersaline pipeline corridors | 0.0 |
| | Fresh water pipeline corridors | 0.4 |
| | Haul roads | 5.0 |
| | Access tracks | 3.8 |
| | Hardstand areas | 0.0 |
| | Borrow pits | 0.0 |
| | Historical and areas mining by previous operators | 0.0 |
| | Exploration (where clearing takes place) | 0.0 |
| | | |
| | Undisturbed Land | 914.3 |
| | | |
| | **TOTAL (should equal tenement area)** | 993.8 |
| | **TENEMENT AREA** | 993.8 |

**Attachment 2 (continued): Disturbance Table**

**M70/1143 expected disturbed area for any 12 month period**

| **TENEMENT NUMBER: M70/1143** | | |
|---|---|---|
| | **DESCRIPTION OF MINING DISTURBANCES** | **AREA (ha)** |
| | Open Pit | 7.6 |
| | Tailings facilities | 0.0 |
| | Heap leach pads or vat leach dams | 0.0 |
| | Evaporation ponds | 0.0 |
| | Waste dumps (sulphide present, highly erodable, >25m high) | 0.0 |
| | Waste dumps (lower risk) (temporary) | 8.8 |
| | Topsoil stockpiles (temporary) | 4.1 |
| | ROM pad | 2.1 |
| | Low grade oxide stockpiles (located on areas to be mined in future) | 4.6 |
| | Plant site and mining infrastructure including office / workshops | 7.9 |
| | Camp site | 0.0 |
| | Strip mining (backfilled mining voids) (rehab in progress) | 3.8 |
| | Hypersaline pipeline corridors | 0.0 |
| | Fresh water pipeline corridors | 0.4 |
| | Haul roads | 5.0 |
| | Access tracks | 2.3 |
| | Hardstand areas | 0.0 |
| | Borrow pits | 0.0 |
| | Historical and areas mining by previous operators | 0.0 |
| | Exploration (where clearing takes place) | 0.0 |
| | | |
| | Undisturbed Land | 947.4 |
| | | |
| | **TOTAL (should equal tenement area)** | 993.8 |
| | **TENEMENT AREA** | 993.8 |

**Attachment 2 (continued): Disturbance Table**

**L70/156 Total disturbed area**

| TENEMENT NUMBER: L70/156 | | |
|---|---|---|
| | **DESCRIPTION OF MINING DISTURBANCES** | **AREA (ha)** |
| | Open Pit | 0.0 |
| | Tailings facilities | 0.0 |
| | Heap leach pads or vat leach dams | 0.0 |
| | Evaporation ponds | 0.0 |
| | Waste dumps (sulphide present, highly erodable, >25m high) | 0.0 |
| | Waste dumps (lower risk) | 0.0 |
| | ROM pad | 0.0 |
| | Low grade oxide stockpiles | 0.0 |
| | Plant site and mining infrastructure including office / workshops | 0.0 |
| | Camp site | 0.0 |
| | Strip mining (backfilled mining voids) | 0.0 |
| | Hypersaline pipeline corridors | 0.0 |
| | Fresh water pipeline corridors | 10.7 |
| | Haul roads | 0.0 |
| | Access tracks | 0.0 |
| | Hardstand areas | 0.0 |
| | Borrow pits | 0.0 |
| | Historical and areas mining by previous operators | 0.0 |
| | Exploration (where clearing takes place) | 0.0 |
| | | |
| | Undisturbed Land | 79.3 |
| | | |
| | **TOTAL (should equal tenement area)** | 90.0 |
| | **TENEMENT AREA** | 90.0 |

**Attachment 2 (continued): Disturbance Table**

**G70/251 Total disturbed area**

| TENEMENT NUMBER: G70/251 | | |
|---|---|---|
| | **DESCRIPTION OF MINING DISTURBANCES** | **AREA (ha)** |
| | Open Pit | 0.0 |
| | Tailings facilities | 0.0 |
| | Heap leach pads or vat leach dams | 0.0 |
| | Evaporation ponds | 0.0 |
| | Waste dumps (sulphide present, highly erodable, >25m high) | 0.0 |
| | Waste dumps (lower risk) | 0.0 |
| | ROM pad | 0.0 |
| | Low grade oxide stockpiles | 0.0 |
| | Plant site and mining infrastructure including office / workshops | 16.9 |
| | Camp site | 0.0 |
| | Strip mining (backfilled mining voids) | 0.0 |
| | Hypersaline pipeline corridors | 0.0 |
| | Fresh water pipeline corridors | 0.0 |
| | Haul roads | 0.6 |
| | Access tracks | 0.0 |
| | Hardstand areas | 0.0 |
| | Borrow pits | 0.0 |
| | Historical and areas mining by previous operators | 0.0 |
| | Exploration (where clearing takes place) | 0.0 |
| | | |
| | Undisturbed Land | 172.4 |
| | | |
| | **TOTAL (should equal tenement area)** | |
| | **TENEMENT AREA** | 189.9 |

## 7. Drawings

000-GD-05: Regional Location

200-GD-020: Mine Location Plan

400-GD-002: Wedin Rail Siding Plant

200-XD-002: Typical Mining Pit Arrangement

200-GD-023: Mine Site Disturbed Areas

400-GD-005: Wedin Site Disturbed Areas

200-GD-C21: Mine Site Plant Detail

200-GD-022: Mine Site Plant Elevations

00-PD-100: K90 Process Flow Chart

00-PD-101: Mine & Wedin Process Flow Chart

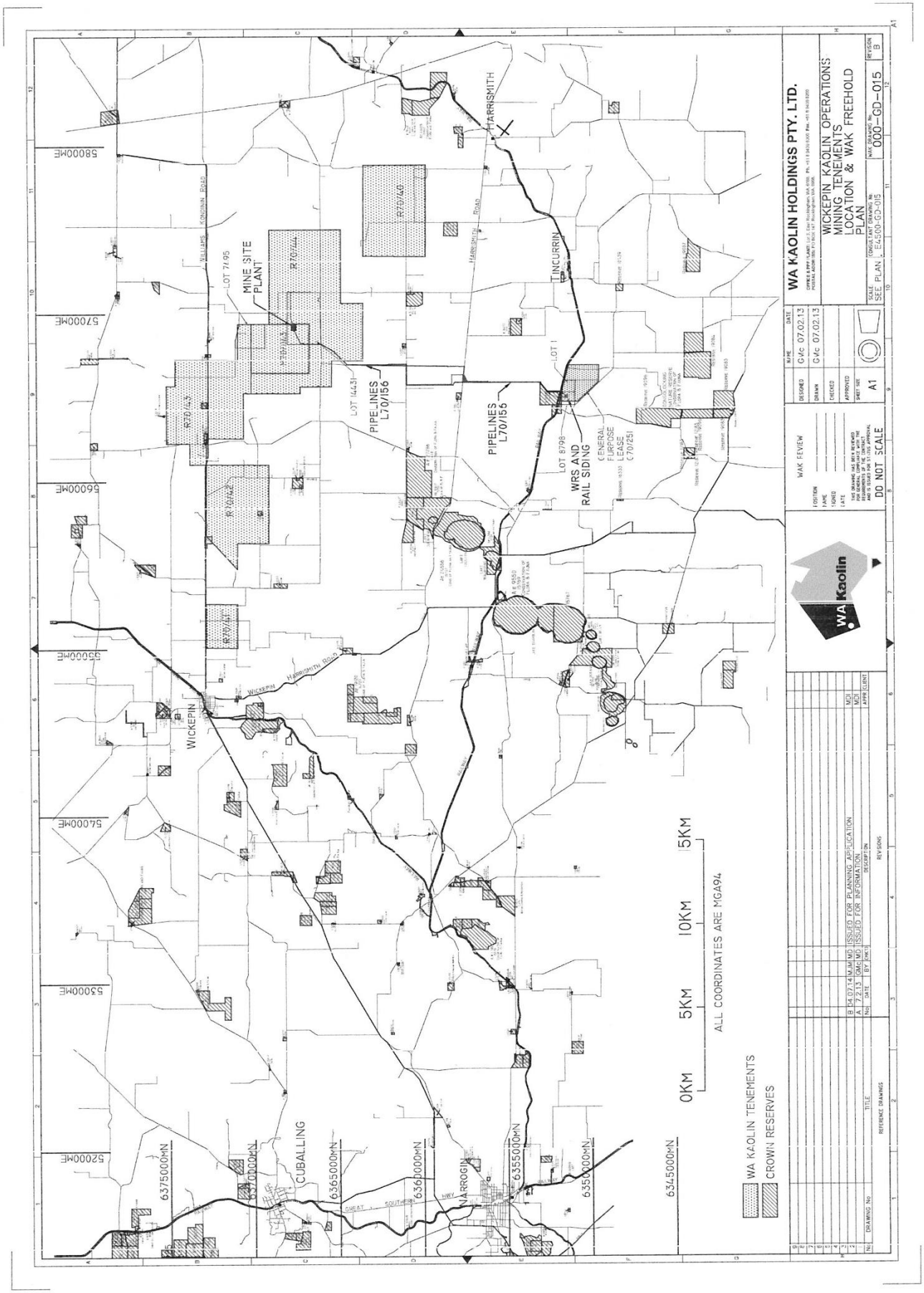
400-GD-004: Wedin Plant Elevations

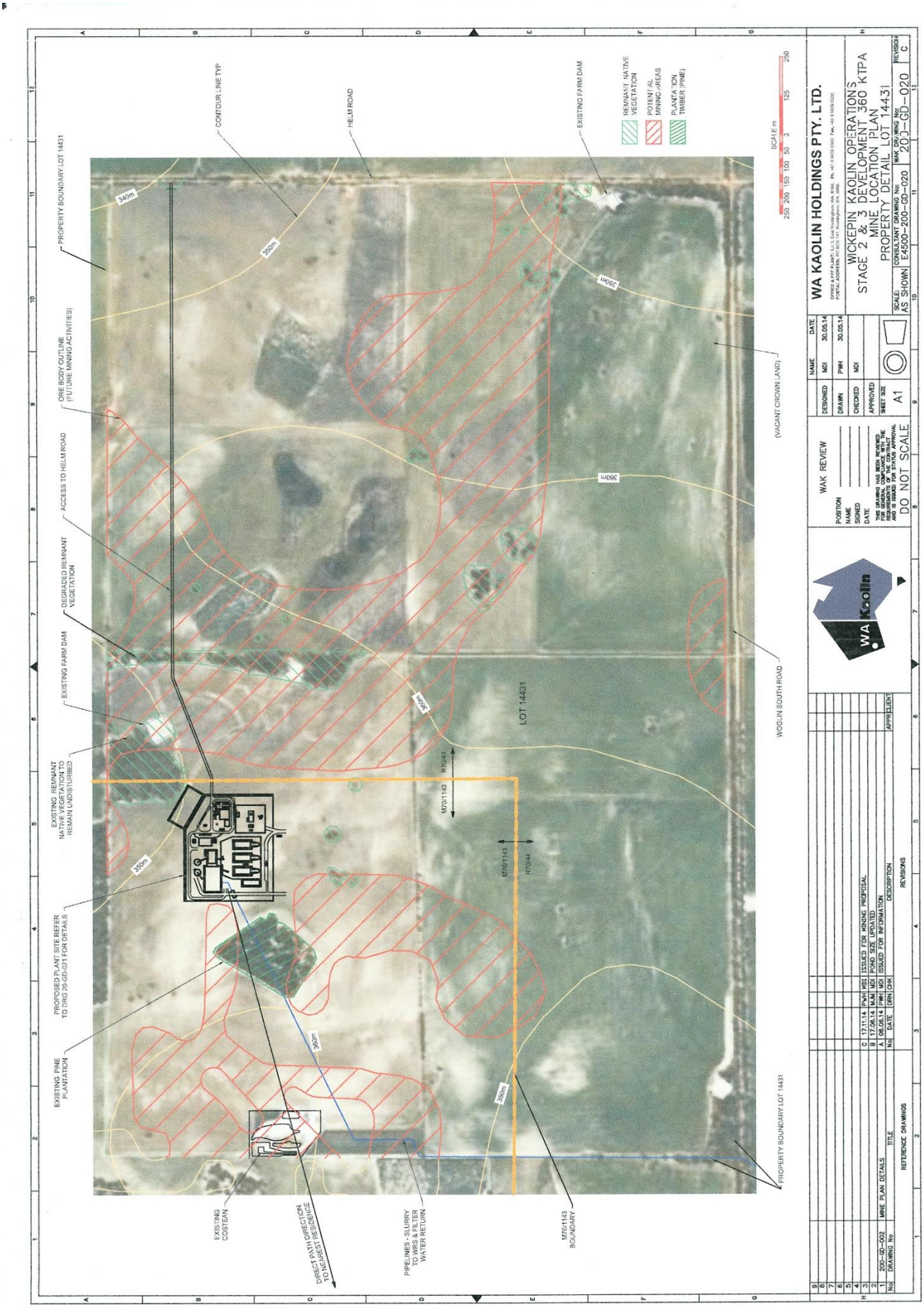
000-GD-010: Pipeline Route – Northern Section

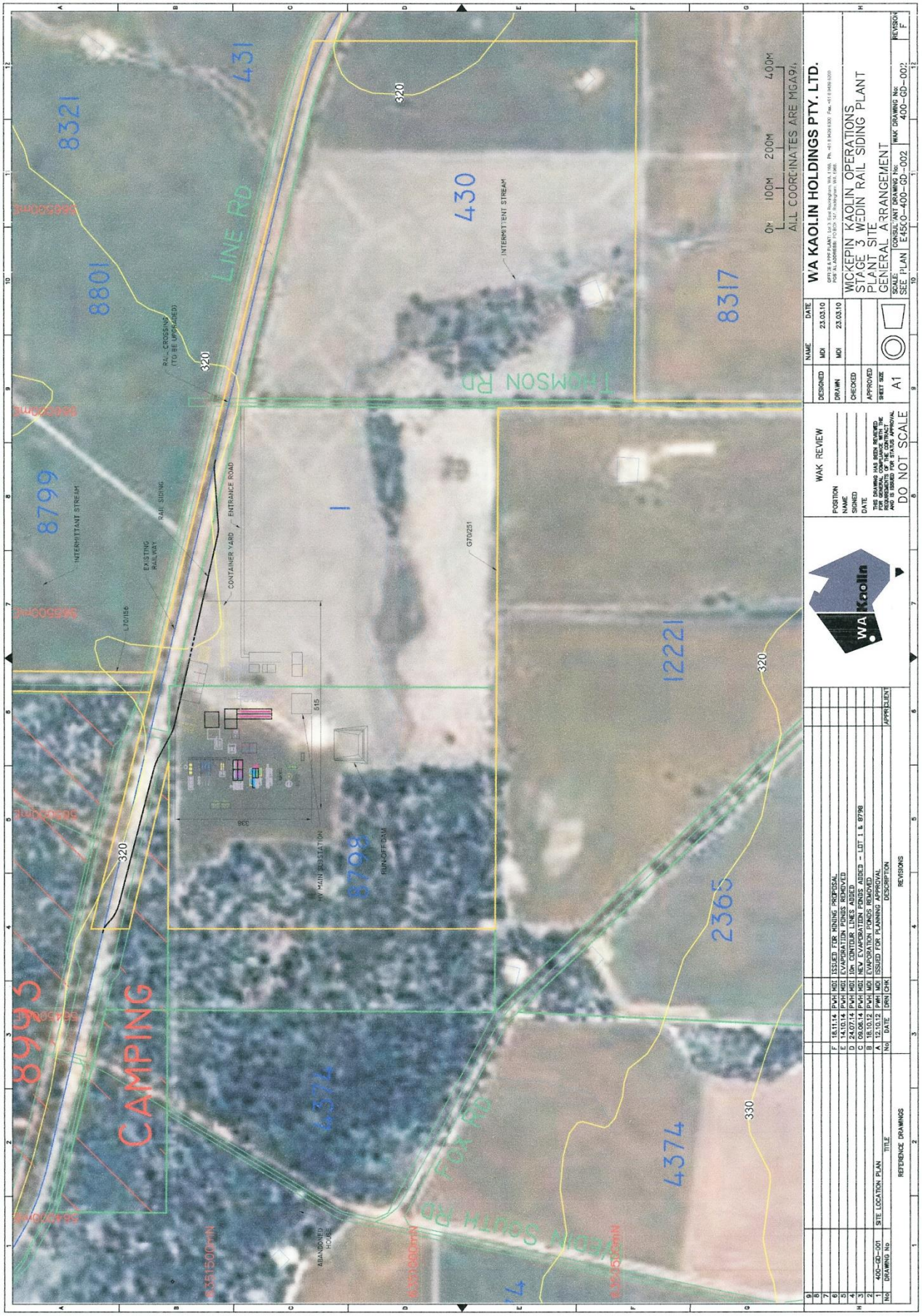
000-GD-011: Pipeline Route – Middle Section

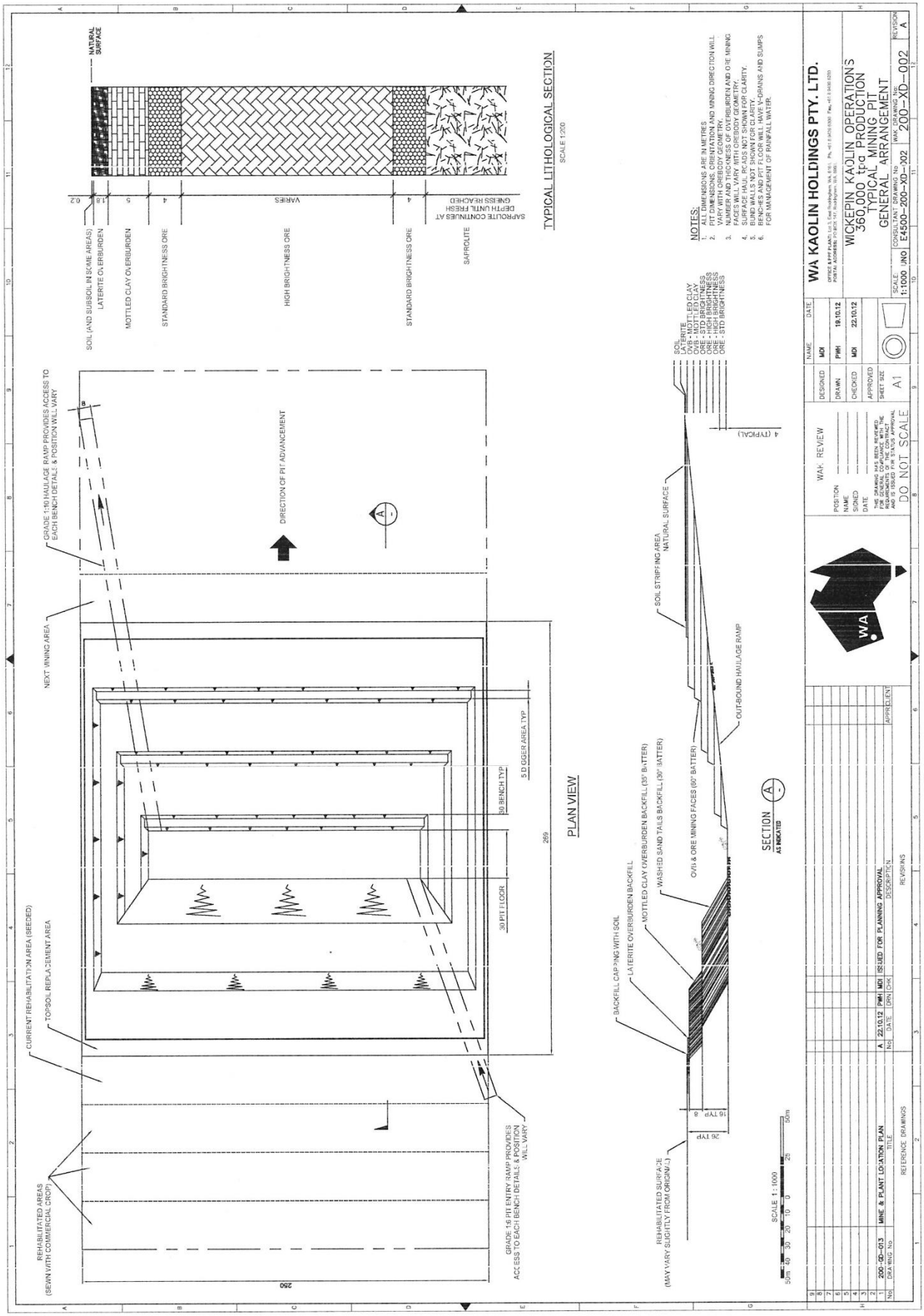
000-GD-012: Pipeline Route – Southern Section

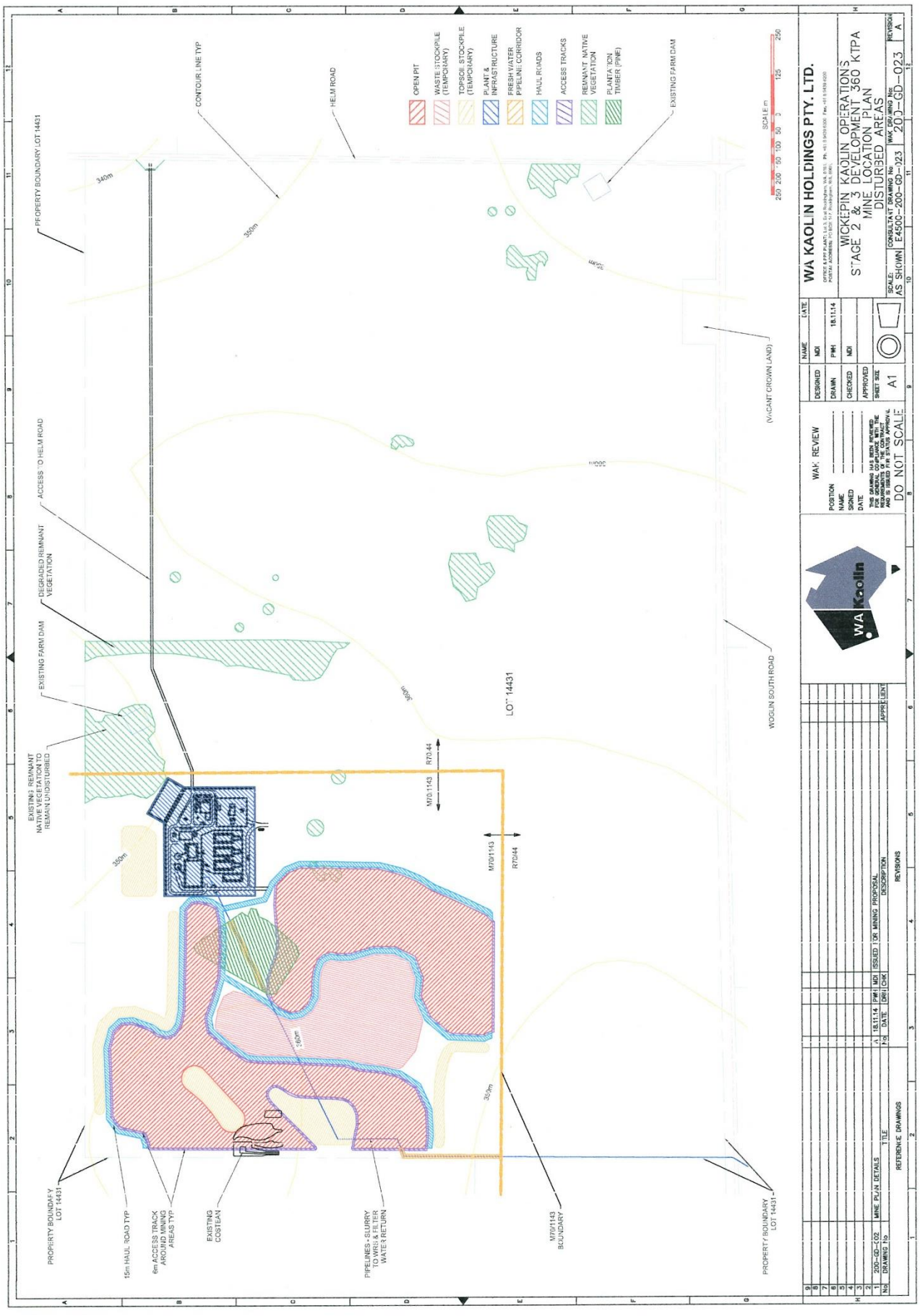
000-GD-013: Pipeline Sections

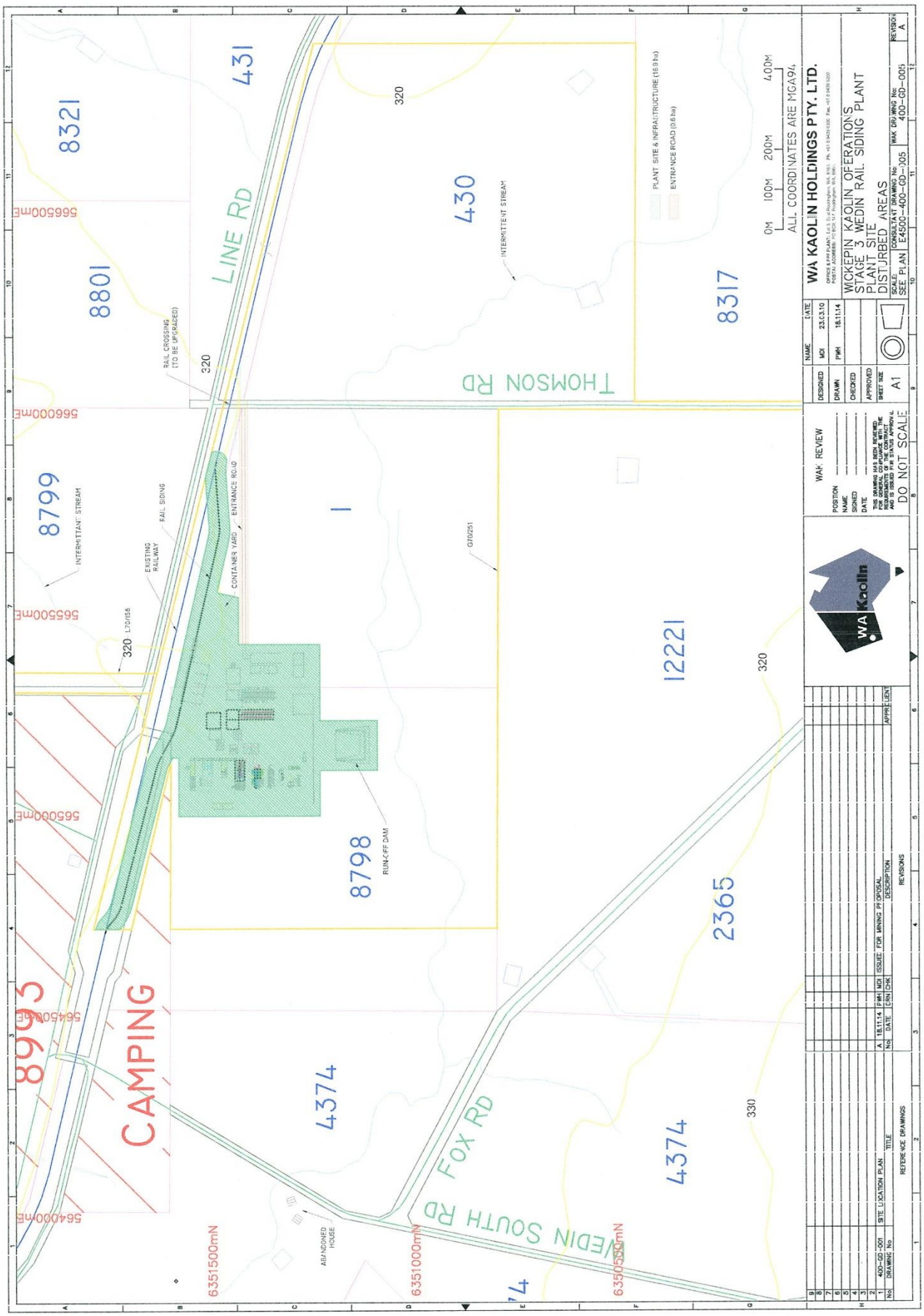


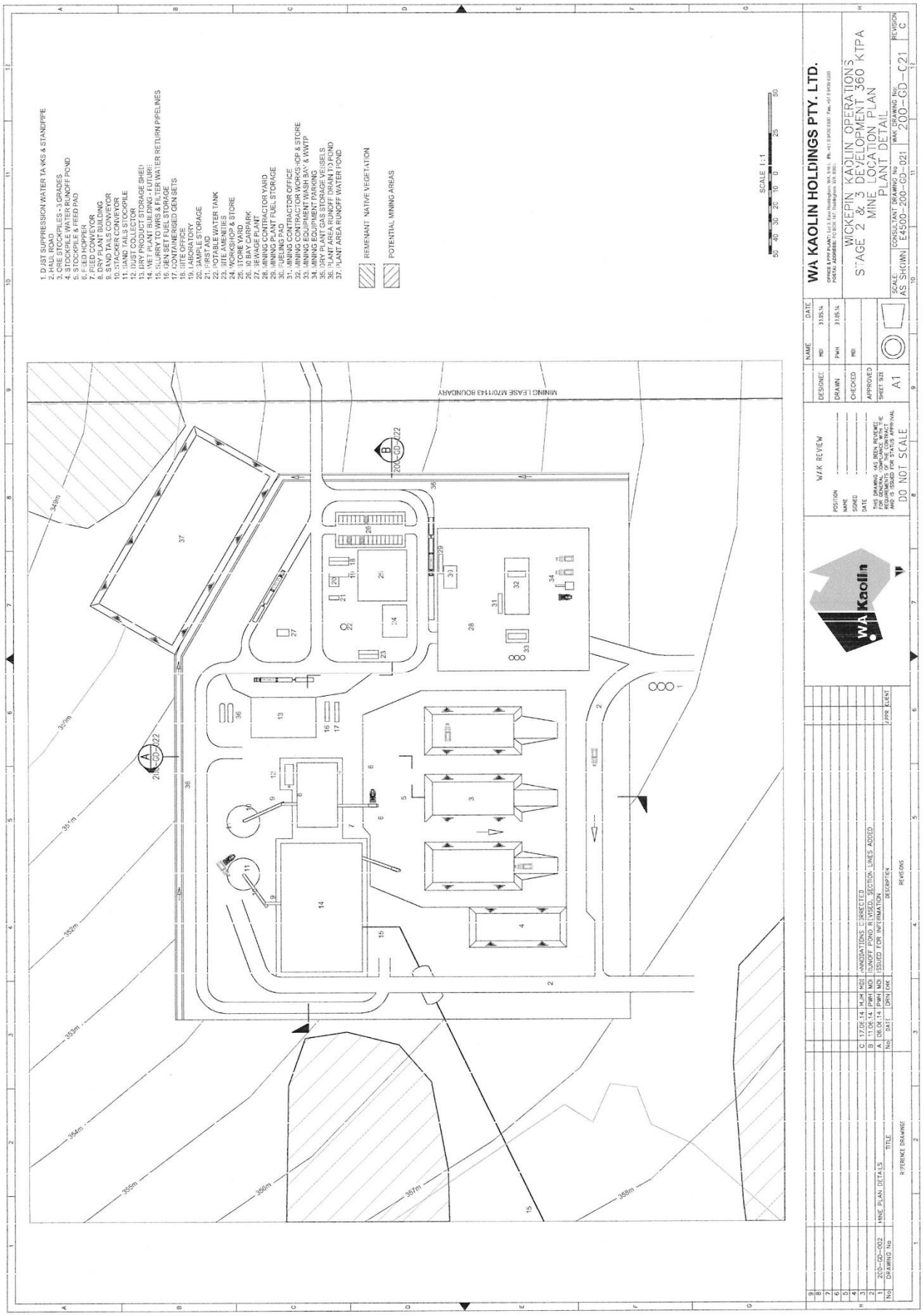


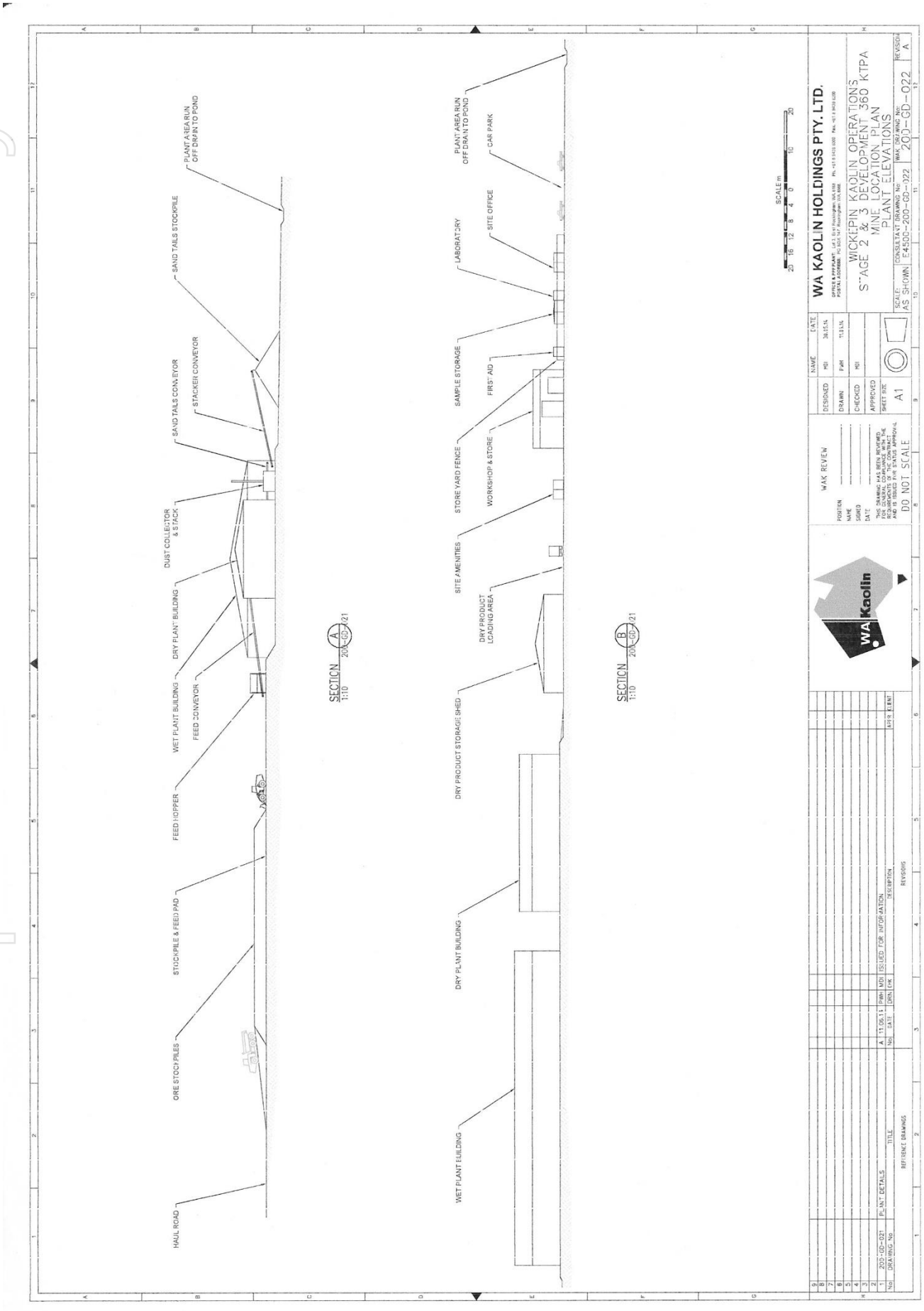


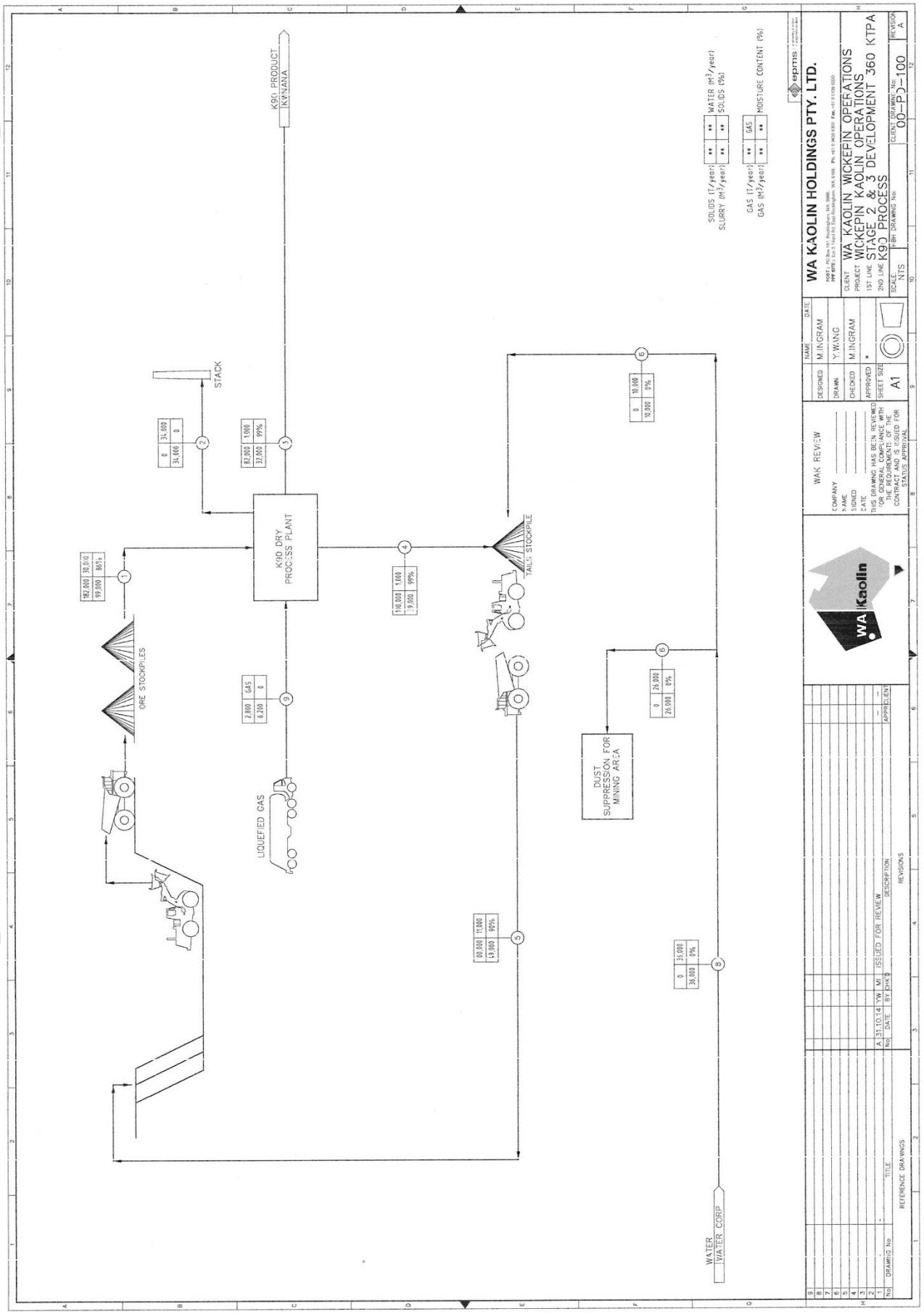


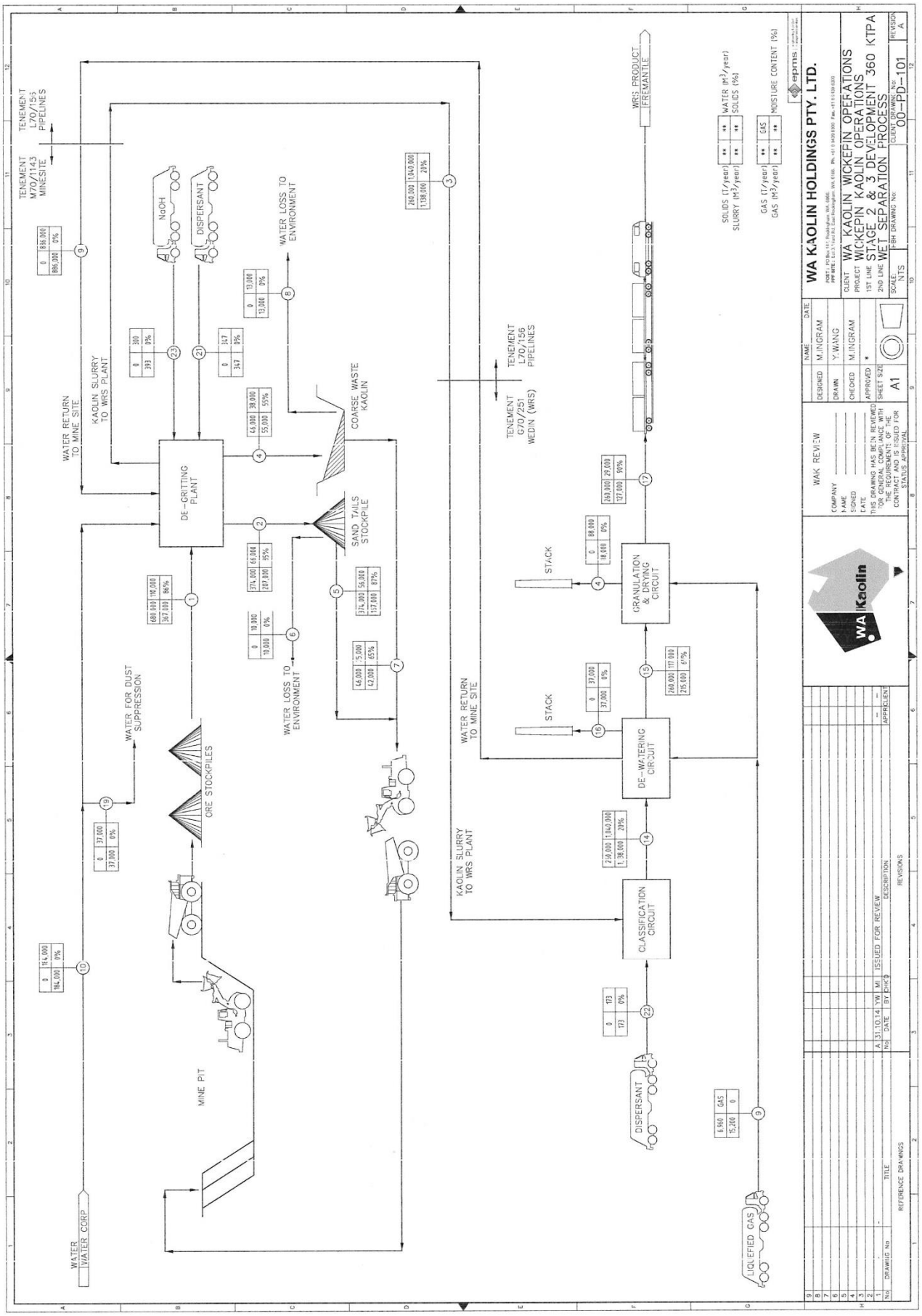


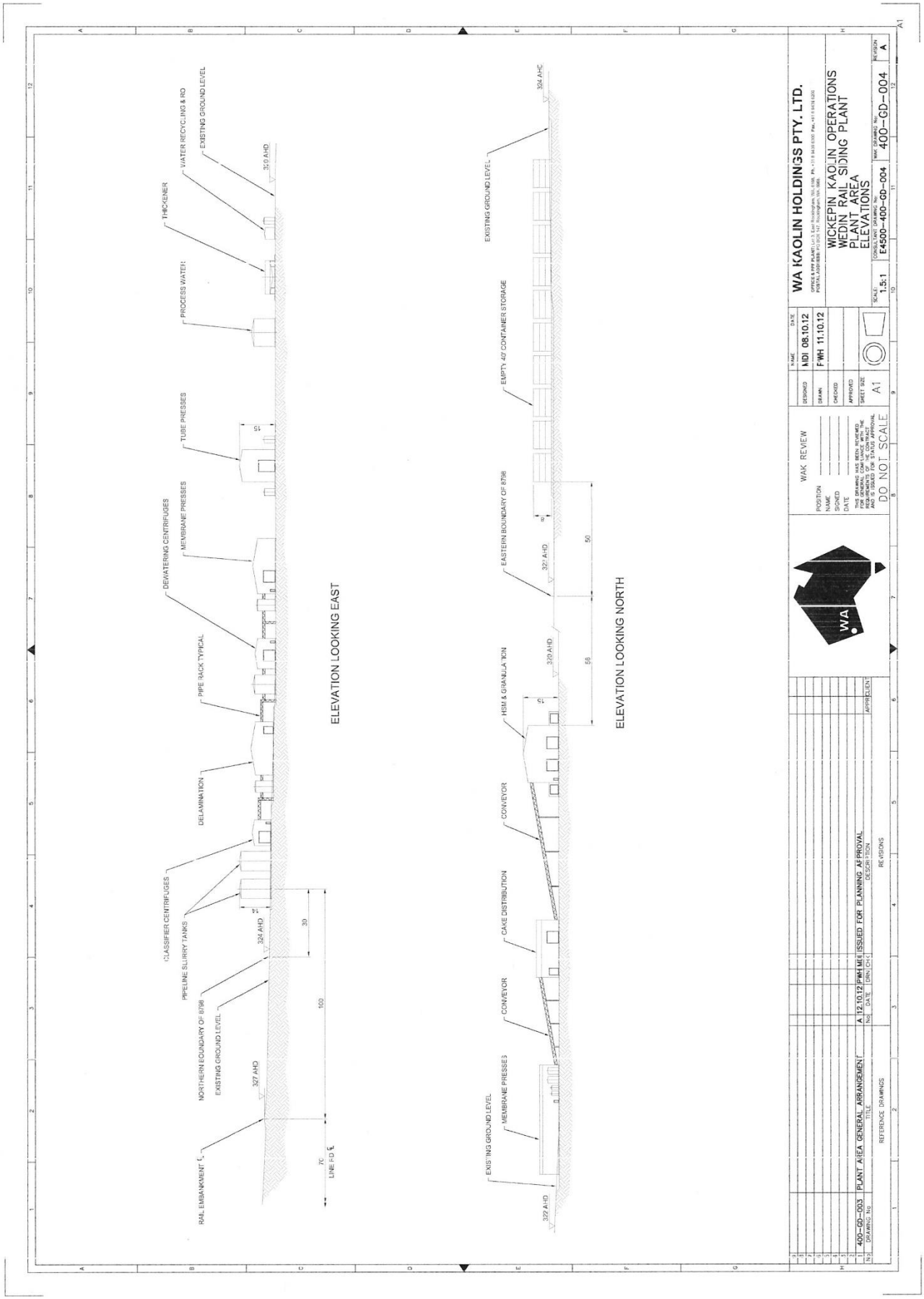


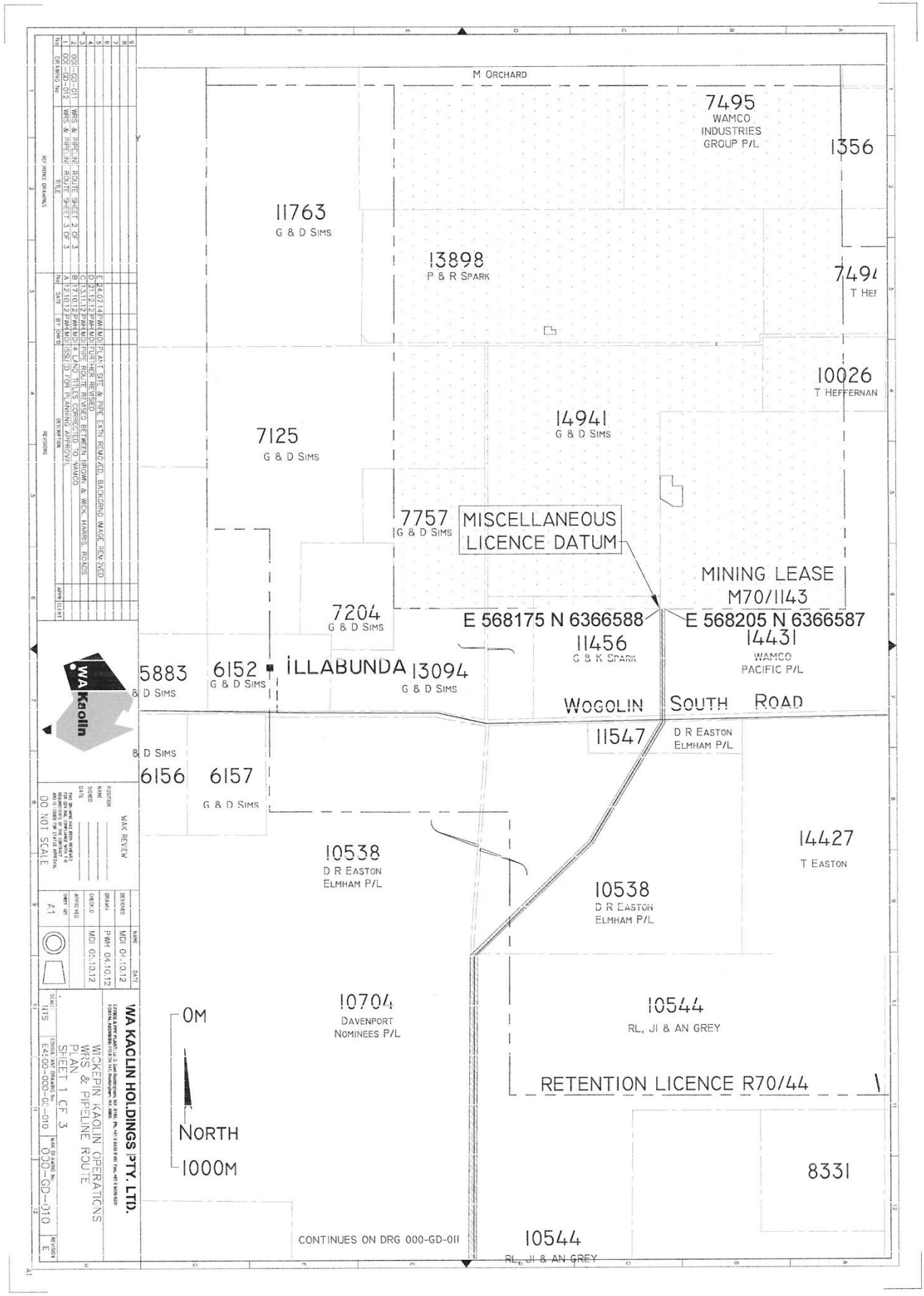


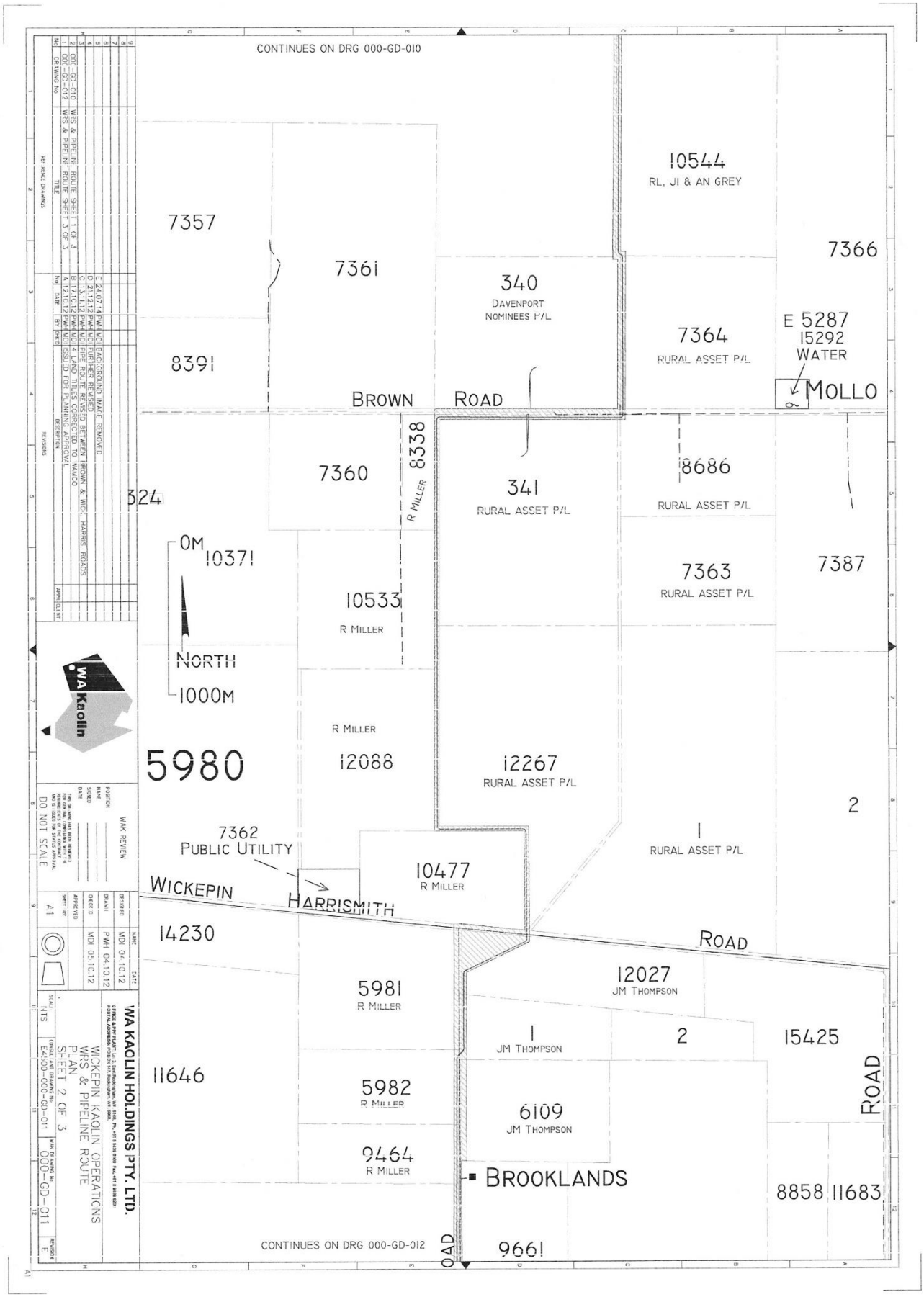


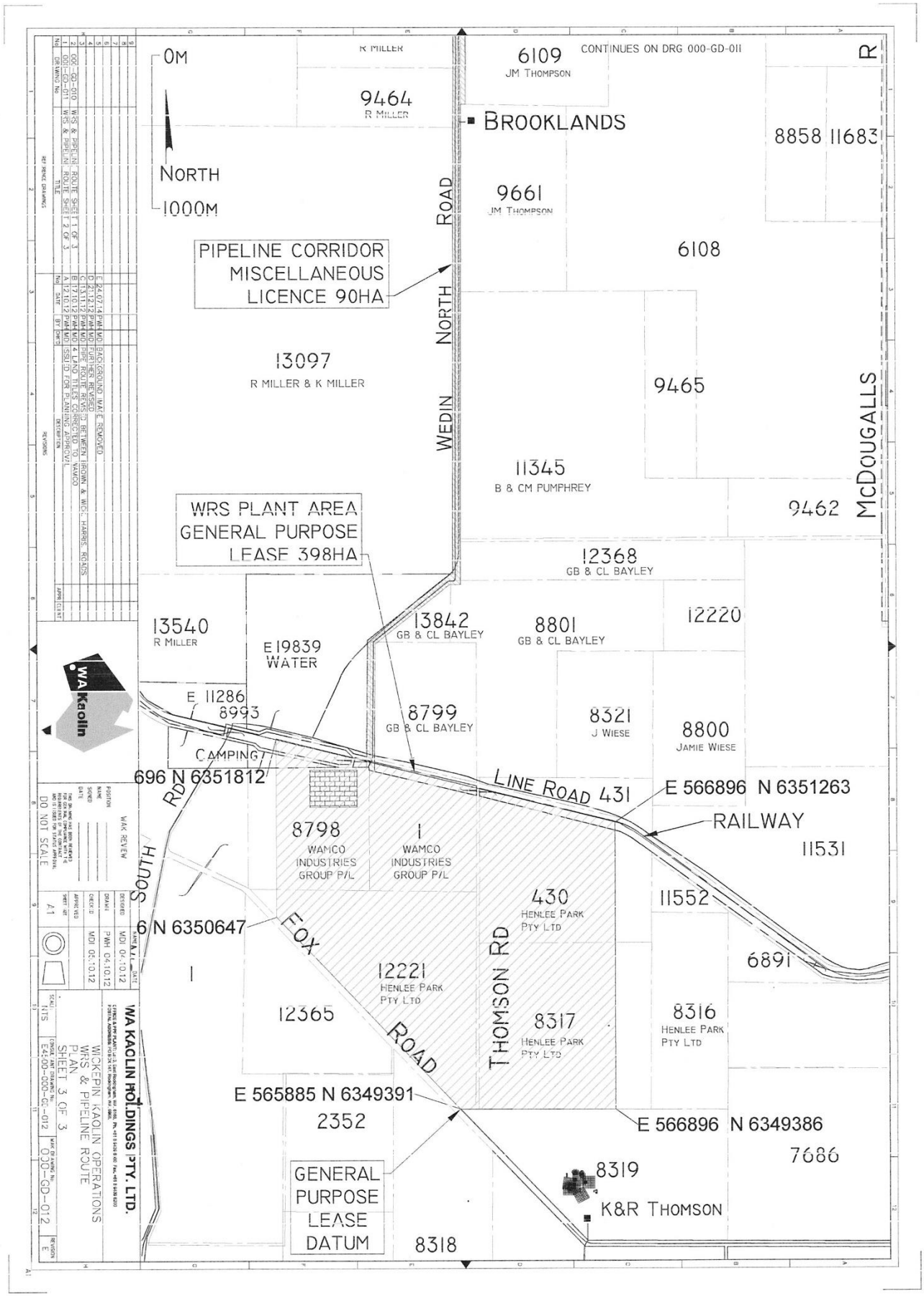


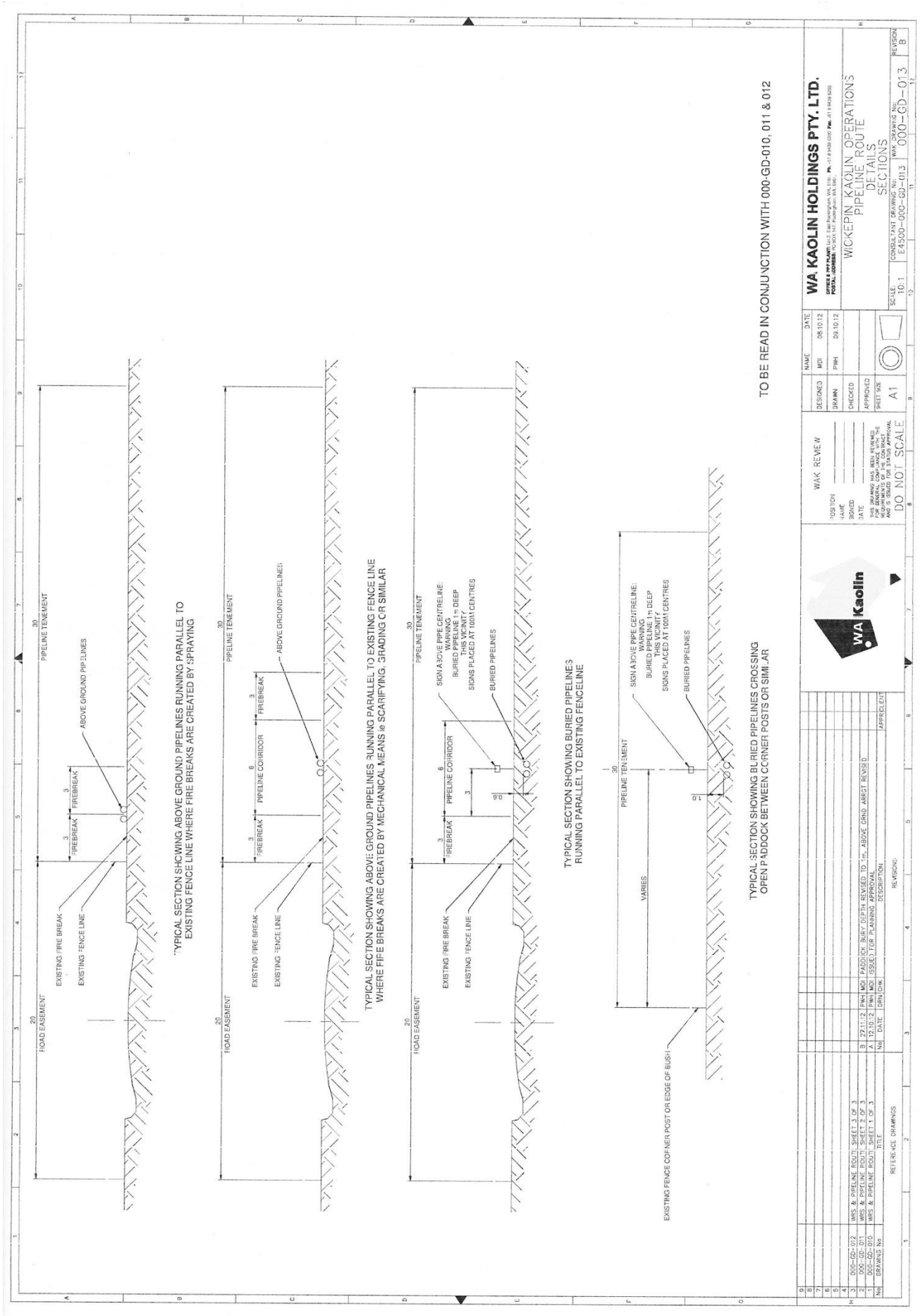












Government of Western Australia
Department of Mines and Petroleum

Our ref: Registration ID: 50959
Enquiries: Tyler Sujdovic (08) 9222 3851
Email: tyler.sujdovic@dmp.wa.gov.au



The Registered Manager
WA Kaolin Holdings Pty Ltd
PO BOX 147
ROCKINGHAM WA 6968

Dear Sir/Madam

**APPROVAL FOR MINING PROPOSAL WITH A MINE CLOSURE PLAN - WA KAOLIN PROJECT ON G 70/251, L 70/156 AND M 70/1143.**
**REGISTRATION ID: 50959**

I refer to your Mining Proposal dated 05 January 2015, for mining activities on Mining Lease (M) 70/1143, Miscellaneous Licence (L) 70/156 and General Purpose Lease (G) 70/251, which included a Mine Closure Plan (MCP) for the WA Kaolin Project. Both documents have been assessed by this Department and satisfy the Schedule of Conditions attached to M 70/56, L70/156 and G70/251.

Approval is hereby given to commence development and operation of the project in accordance with the Mining Proposal and to MCP in accordance with tenement conditions. However, this does not remove the need for any necessary approvals from other authorities. Please note that the MCP is due to be reviewed in accordance with the tenement conditions attached.

Please note the following points which need to be addressed when revising the Mine Closure Plan for submission in 2020.

| **Section of the Mine Closure Plan** | **Comments** |
|---|---|
| Identification of Closure Obligations and Commitments | The next revision of the MCP should include an obligations register referencing all relevant closure obligations and commitments under State and Federal legislation, the relevant tenement conditions relating to rehabilitation and closure and specific commitments relating to the project. |
| Closure Implementation | The proponent should detail contingencies to make the site safe, secure and non-polluting in the event of temporary closure/care and maintenance. |

I advise that I intend to recommend to the Minister responsible for the *Mining Act 1978* that he impose further conditions on M70/56, L70/156 and G70/251 under the provisions of Section 84/46A of the *Mining Act 1978*. A schedule of further conditions is attached.

Please be reminded that you are required to report disturbance data on an annual basis and pay any corresponding levy in accordance with the *Mining Rehabilitation Fund Act 2012* and associated Regulations.

It should be noted that the approvals hereby given relate only to environmental issues and do not in any way relate to safety. With respect to safety, you are reminded of your obligation to carry out the mining operation in accordance with the provision of the *Mines Safety and Inspection Act 1994* and Regulations 1995.

Please note that this letter does not constitute a clearing permit under Part V Division 2 of the *Environmental Protection Act 1986* for clearing of native vegetation. A clearing permit may be applied for through the Environment Division.

Should you have any queries regarding this letter, please contact Tyler Sujdovic on (08) 9222 3851.

Yours faithfully

_____

**Phil Gorey** | Executive Director
Environment
21 January 2015

*Attach: Recommended Further Conditions*

**RECOMMENDED FURTHER CONDITIONS**
**FOR MINING LEASE 70/1143**

Please add the following documents to existing condition 8.

- (MP Reg ID:50959) *"Mining Proposal – Revised Version #1 - WA Kaolin Project – Mining of kaolin clay and production of 360,000tpa kaolin products at locations in the Shire of Wickepin – 05 January 2015"* dated 05 January signed by Alf Baker, and retained on Department of Mines and Petroleum file no. EARS-MPMCP-50959 (DOC ID 3358794).
- (MCP Reg ID:50959) *"WA Kaolin Project – Mining Closure Plan – Revised – Version 1"* dated 05 January 2015 signed by Alf Baker, and retained on Department of Mines and Petroleum file no EARS-MPMCP-50959 (DOC ID 3358794).

Please impose the following new conditions:

13. Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the Executive Director, Environment Division, Department of Mines and Petroleum (DMP) for his assessment and until his written approval to proceed has been obtained. **[MTSD: Note Non-Standard Condition]**
14. At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Executive Director, Environment Division, DMP. **[MTSD: Note Non-Standard Condition]**
15. All rubbish and scrap is to be progressively disposed of in a suitable manner.
16. The Lessee taking all reasonable measures to prevent or minimise the generation of dust from all materials handling operations, stockpiles, open areas and transport activities.
17. Where saline water is used for dust suppression, all reasonable measures being taken to avoid any detrimental effects to surrounding vegetation and topsoil stockpiles.
18. On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self-sustaining, functional ecosystems comprising suitable, local provenance species or an alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP.

Please alter existing Mine Closure Plan Condition **12** to read 2020 in place of 2015

**[MTSD: Note Non-Standard Condition]**

**RECOMMENDED FURTHER CONDITIONS**
**FOR GENERAL PURPOSE LEASE 70/251**

Please impose the following new conditions:

12. The construction and operation of the project and measures to protect the environment to be carried out in accordance with the document titled:

    - (MP Reg ID:50959) *"Mining Proposal – Revised Version #1 - WA Kaolin Project – Mining of kaolin clay and production of 360,000tpa kaolin products at locations in the Shire of Wickepin – 05 January 2015"* dated 05 January signed by Alf Baker, and retained on Department of Mines and Petroleum file no. EARS-MPMCP-50959 (DOC ID 3358794).
    - (MCP Reg ID:50959) *"WA Kaolin Project – Mining Closure Plan – Revised – Version 1"* dated 05 January 2015 signed by Alf Baker, and retained on Department of Mines and Petroleum file no EARS-MPMCP-50959 (DOC ID 3358794).

    Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail:

13. Any alteration or expansion of operations within the lease boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the Executive Director, Environment Division, Department of Mines and Petroleum (DMP) for his assessment and until his written approval to proceed has been obtained. **[MTSD: Note Non-Standard Condition]**
14. The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.
15. All topsoil and vegetation being removed ahead of all mining operations and being stockpiled appropriately for later respreading or immediately respread as rehabilitation progresses.
16. At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Executive Director, Environment Division, DMP. **[MTSD: Note Non-Standard Condition]**
17. All rubbish and scrap is to be progressively disposed of in a suitable manner.
18. The Lessee taking all reasonable measures to prevent or minimise the generation of dust from all materials handling operations, stockpiles, open areas and transport activities.
19. Where saline water is used for dust suppression, all reasonable measures being taken to avoid any detrimental effects to surrounding vegetation and topsoil stockpiles.
20. On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self-sustaining, functional ecosystems comprising suitable, local provenance species or an alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP.
21. The Lessee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, mine site environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programme for the next 12 months. This report to be submitted each year in:

    - January

22. A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month (specified in tenement conditions) in the year specified below, unless otherwise directed by an Environmental Officer, DMP. The Mine Closure Plan is to be prepared in accordance with the "*Guidelines for Preparing Mine Closure Plans, June 2011*" available on DMP's website

    - 2020

**RECOMMENDED FURTHER CONDITIONS**
**FOR MISCELLANEOUS LICENCE 70/156**

Please impose the following new conditions:

16. The construction and operation of the project and measures to protect the environment to be carried out in accordance with the document titled:

    - (MP Reg ID:50959) *"Mining Proposal – Revised Version #1 - WA Kaolin Project – Mining of kaolin clay and production of 360,000tpa kaolin products at locations in the Shire of Wickepin – 05 January 2015"* dated 05 January signed by Alf Baker, and retained on Department of Mines and Petroleum file no. EARS-MPMCP-50959 (DOC ID 3358794).
    - (MCP Reg ID:50959) *"WA Kaolin Project – Mining Closure Plan – Revised – Version 1"* dated 05 January 2015 signed by Alf Baker, and retained on Department of Mines and Petroleum file no EARS-MPMCP-50959 (DOC ID 3358794).

    Where a difference exists between the above document(s) and the following conditions, then the following conditions shall prevail:

17. Any alteration or expansion of operations within the licence boundaries beyond that outlined in the above document(s) not commencing until a plan of operations and a programme to safeguard the environment are submitted to the Executive Director, Environment Division, Department of Mines and Petroleum (DMP) for his assessment and until his written approval to proceed has been obtained. **[MTSD: Note Non-Standard Condition]**
18. The development and operation of the project being carried out in such a manner so as to create the minimum practicable disturbance to the existing vegetation and natural landform.
19. All topsoil and vegetation being removed ahead of all mining operations and being stockpiled appropriately for later respreading or immediately respread as rehabilitation progresses.
20. At the completion of operations, all buildings and structures being removed from site or demolished and buried to the satisfaction of the Executive Director, Environment Division, DMP. **[MTSD: Note Non-Standard Condition]**
21. All rubbish and scrap is to be progressively disposed of in a suitable manner.
22. The Licensee taking all reasonable measures to prevent or minimise the generation of dust from all materials handling operations, stockpiles, open areas and transport activities.
23. Where saline water is used for dust suppression, all reasonable measures being taken to avoid any detrimental effects to surrounding vegetation and topsoil stockpiles.
24. On the completion of operations or progressively when possible, all waste dumps, tailings storage facilities, stockpiles or other mining related landforms must be rehabilitated to form safe, stable, non-polluting structures which are integrated with the surrounding landscape and support self-sustaining, functional ecosystems comprising suitable, local provenance species or an alternative agreed outcome to the satisfaction of the Executive Director, Environment Division, DMP.
25. The Licensee submitting to the Executive Director, Environment Division, DMP, a brief annual report outlining the project operations, mine site environmental management and rehabilitation work undertaken in the previous 12 months and the proposed operations, environmental management plans and rehabilitation programme for the next 12 months. This report to be submitted each year in:

    - January

26. A Mine Closure Plan is to be submitted in the Annual Environmental Reporting month (specified in tenement conditions) in the year specified below, unless otherwise directed by an Environmental Officer, DMP. The Mine Closure Plan is to be prepared in accordance with the "*Guidelines for Preparing Mine Closure Plans, June 2011*" available on DMP's website
    - 2020

## Appendix 4.

WA KAOLIN HOLDINGS PTY LTD – 2014 WORKS APPROVAL W5443/2013/1

Government of **Western Australia**
Department of **Environment Regulation**

Your ref W5443/2013/1
Our ref 2013/002439
Enquiries Alan Kietzmann
Phone 9621 3403
Email alan.kietzmann@der.wa.gov.au



Mr Andrew Sorensen
WA Kaolin Holdings Pty Ltd
2 Abbotts Road
Dandenong South Victoria 3175

Dear Mr Sorensen

***ENVIRONMENTAL PROTECTION ACT 1986*: WORKS APPROVAL GRANTED**
**Premises**
Kaolin Mine and Process Plant
Williams Location 13898; Lot 7495 on Diagram 233525; Lot 14431 on Deposited Plan 155015; Lot 8798 on Plan 132472; Lot 1 on Diagram 92042, Near Sparks Road and Line Road, East Wickepin
**Works Approval Number:** W5443/2013/1

A works approval under the *Environmental Protection Act 1986* (the Act) has been granted for the above premises. The Department of Environment and Conservation will advertise the issuing of this works approval in the public notices section of *The West Australian* newspaper.

The works approval includes attached conditions. Under Section 55(1) of the Act, it is an offence to contravene a condition of a works approval. This offence carries a penalty of up to $125,000 and a daily penalty of up to $25,000

In accordance with section 102(1)(c) of the Act, you have 21 days to appeal the conditions of the works approval. Under section 102(3)(a) of the Act, any other person may also appeal the conditions of the works approval. To lodge an appeal contact the Office of the Appeals Convenor on 6467 5190 or by email at admin@appealsconvenor.wa.gov.au.

Emissions from the premises that are the subject of a works approval are not authorised until or unless a licence is issued or unless the emissions are in accordance with the works approval and while that works approval is in force. If you have any queries regarding the above information, please contact Alan Kietzmann on 9621 3403.

Yours sincerely

Ed Schuller
Officer delegated under Section 20
of the *Environmental Protection Act 1986*

Thursday, 20 February 2014

enc: *Environmental Protection Act 1986* Works Approval W5443/2013/1

The Atrium, 168 St Georges Terrace, Perth WA 6000
Phone (08) 6467 5000 Fax (08) 6467 5562
Postal Address: Locked Bag 33, Cloisters Square, Perth WA 6850
www.der.wa.gov.au

Government of Western Australia
Department of Environment Regulation

# Works Approval

## *Environmental Protection Act 1986*, Part V

**Works Approval Holder:** **WA Kaolin Holdings Pty Ltd**

**Works Approval Number:** **W5443/2013/1**

**Registered office:** 2 Abbotts Road
DANDENONG SOUTH VICTORIA 3175

**ACN:** 083 187 017

**Premises address:** Kaolin Mine and Process Plant
M 70/1143, General purpose licence 70/251 and M 70/156
WICKEPIN WA 6370
as depicted in Schedule 1.

**Issue date:** Thursday, 20 February 2014

**Commencement date:** Monday, 24 February 2014

**Expiry date:** Saturday, 23 February 2019

The following category/s from the Environmental Protection Regulations 1987 cause this Premises to be a prescribed premises for the purposes of the Environmental Protection Act 1986:

| Category number | Category description | Category production or design capacity | Approved premises production or design capacity |
|---|---|---|---|
| 5 | Processing or benefication of metallic or non-metallic ore: premises on which –<br>(a) metallic or non-metallic ore is crushed, ground, milled or otherwise processed;<br>(b) tailings from metallic or non-metallic ore are reprocessed; or<br>(c) tailings or residue from metallic or non-metallic ore are discharged into a containment cell or dam. | 50,000 tonnes or more per year | 360, 000 tonnes per annual period |

**Conditions**
Subject to this Works Approval and the conditions set out in the attached pages.

.....
Officer delegated under section 20
of the *Environmental Protection Act 1986*

# Works Approval Conditions

## 1 General

### 1.1 Interpretation

1.1.1 In the Works Approval, definitions from the *Environmental Protection Act 1986* apply unless the contrary intention appears.

1.1.2 In the Works Approval, unless the contrary intention appears:

**'the Act'** means the *Environmental Protection Act 1986;*

**'AS 3580.1.1'** means the Australian Standard AS 3580.1.1 *Methods for sampling and analysis of ambient air – Guide to siting air monitoring equipment;*

**'AS 3580.4.1'** means the Australian Standard AS 3580.4.1 *Methods for sampling and analysis of ambient air - Determination of sulfur dioxide - Direct reading instrumental method;*

**'AS 3580.5.1'** means *the* Australian Standard AS 3580.5.1 *Methods for sampling and analysis of ambient air - Determination of oxides of nitrogen – Chemiluminescence method;*

**'AS 3580.9.6'** means the Australian Standard AS 3580.9.6 *Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - $PM_{10}$ high volume sampler with size - selective inlet – Gravimetric method;*

**'AS 3580.9.8'** means the Australian Standard AS 3580.9.8 *Methods for sampling and analysis of ambient air - Determination of suspended particulate matter - $PM_{10}$ continuous direct mass method using tapered element oscillating microbalance analyser;*

**'AS 3580.14'** means the Australian Standard AS *3580.14* Methods for sampling and analysis of ambient air - Meteorological monitoring for ambient air quality monitoring applications;

**'AS 4323.1'** means the Australian Standard AS4323.1 *Stationary Source Emissions Method 1: Selection of sampling positions;*

**'AS/NZS 5667.10'** means the Australian Standard AS/NZS 5667.10 *Water Quality – Sampling – Guidance on sampling of waste waters;*

**'AS/NZS 5667.11'** means the Australian Standard AS/NZS 5667.11 *Water Quality – Sampling – Guidance on sampling of groundwaters;*

**'averaging period'** means the time over which a limit or target is measured or a monitoring result is obtained;

**'code of practice for the storage and handling of dangerous goods'** means the Storage and handling of dangerous goods - code of practice, Department of Mines and Petroleum, Government of Western Australia;

**'Commissioning'** means the process of operation and testing that verifies the works and all relevant systems, plant, machinery and equipment have been installed and are performing in accordance with the design specification set out in the works approval application;

**'dangerous goods'** has the meaning defined in the Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007;

**'Director'** means Director, Environmental Regulation Division of the Department of Environment Regulation for and on behalf of the Chief Executive Officer as delegated under section 20 of the *Environmental Protection Act 1986;*

**'Director'** for the purpose of correspondence means;

Regional Leader, Industry Regulation, Wheatbelt Region
Department of Environment Regulation
75 York Road
NORTHAM WA 6312
Telephone: (08) 9621 3400
Facsimile: (08) 9621 3410
Email: WheatbeltIR@der.wa.gov.au;

**'environmentally hazardous material'** means material (either solid or liquid raw materials, materials in the process of manufacture, manufactured products, products used in the manufacturing process, by-products and waste) which if discharged into the environment from or within the premises may cause pollution or environmental harm. Note: Environmentally hazardous materials include dangerous goods where they are stored in quantities below placard quantities. The storage of dangerous goods above placard quantities is regulated by the Department of Mines and Petroleum;

**'NATA'** means the National Association of Testing Authorities, Australia;

**'NATA accredited'** means in relation to the analysis of a sample that the laboratory is NATA accredited for the specified analysis at the time of the analysis;

**'Premises'** means the area defined in the Premises Map in Schedule 1 and listed as the Premises address on page 1 of the Works Approval;

**'Schedule 1'** means Schedule 1 of this Licence unless otherwise stated;

**'Works Approval'** means this Works Approval numbered W5344/2013/1 and issued under the *Environmental Protection Act 1986;* and

**'Works Approval Holder'** means the person or organisation named as the Works Approval Holder on page 1 of the Works Approval;

1.1.3 Any reference to an Australian or other standard in the Works Approval means the relevant parts of the current version of that standard.

1.1.4 Any reference to a guideline or code of practice in the Works Approval means the current version of the guideline or code of practice.

### 1.2 General conditions

1.2.1 The Works Approval Holder shall construct the works in accordance with the documentation detailed in Table 1.2.1:

**Table 1.2.1: Construction Requirements**[1]

| Document | Parts | Date of Document |
|---|---|---|
| Works Approval Application Form | All | 23 May 2013 |
| Works Approval WA Kaolin Wickepin | All, including Drawings and Appendices | April 2013 |
| Email from Dr Alan Tingay to DER (Margaret Redfern) with subject: *WA Kaolin* | All, including Drawings and Appendices | 26 November 2013 |
| Email from Dr Alan Tingay to DER (Margaret Redfern) with subject: *re: WA Kaolin Works Approval application* | All | 10 December 2013 |

Note 1: Where the details and commitments of the documents listed in condition 1.2.1 are inconsistent with any other condition of this works approval, the conditions of this works approval shall prevail.

1.2.2 The Works Approval Holder, except where storage is prescribed in section 1.3, shall ensure that environmentally hazardous materials are stored in accordance with the code of practice for the storage and handling of dangerous goods.

1.2.3 The Works Approval Holder shall submit a commissioning plan to the Director for approval three months before commissioning commences.

1.2.4 The Works Approval Holder shall undertake commissioning in accordance with the commissioning plan

1.2.5 The Works Approval Holder shall commission the Kaolin Mine and Process Plant for a period not exceeding 3 months.

### 1.3 Premises operation

There are no specified conditions relating to Premises operation in this section.

## 2 Emissions

There are no specified conditions relating to emissions in this section.

## 3 Monitoring

There are no specified conditions relating to monitoring in this section.

# 4 Improvements

4.1.1 The Works Approval Holder shall complete the improvements in Table 4.1.1 by the date of completion in table 4.1.1.

**Table 4.1.1: Improvement program**

| Improvement reference | Improvement | Date of completion |
|---|---|---|
| IR1 | The Works Approval Holder shall, prior to commencing commissioning of the Kaolin Mine and Process Plant, submit a commissioning plan for approval by the Director. The commissioning plan shall include details relating to:<br>(a) the commissioning stages and expected timescales for commissioning;<br>(b) expected emissions and discharges during commissioning and the environmental implications of the emissions;<br>(c) how emissions and discharges will be managed during commissioning;<br>(d) the monitoring that will be undertaken during the commissioning period;<br>(e) how accidents or malfunctions will be managed;<br>(f) start up and shut down procedures; and<br>(g) reporting proposals including accidents, malfunctions and reporting against the commissioning plan.<br><br>Commissioning shall be carried out in accordance with the commissioning plan as approved. | Three months before commencing commissioning |
| IR2 | The Works Approval Holder shall undertake a noise assessment of the Premises during commissioning. A report on the noise assessment shall be prepared in accordance with Part 3 of the Environmental Protection (Noise) Regulations 1997 (Noise Regulations). The report shall be submitted to the Director for approval and shall include:<br>(a) methods used for monitoring and modelling of noise;<br>(b) an assessment of whether noise emissions from the Premises comply with the assigned noise level in the Noise Regulations; and<br>(c) where they are not met, proposed measures to reduce noise emissions to assigned levels together with timescales for implementing the proposed measures. | Before operation |
| IR3 | The Works Approval Holder shall establish and undertake ambient water quality monitoring at the minesite and Wedin Railway Siding to determine pH, TDS TSS and depth to groundwater in accordance with the relevant part of the Australian Standard AS 5667. | Before operation |
| IR4 | The Works Approval holder shall submit to the Director a Site drainage plan of the mine and process plant. | Before commissioning |
| IR5 | The Works Approval Holder shall install a sampling port in the exhaust chimney in accordance with the Australian Standard AS 4323.1 and verify the air emissions, including $NO_x$, $SO_x$, $CO_2$, CO & $PM_{10}$, in accordance with the relevant parts of the Australian Standards AS 3580. These results shall be compared to relevant air quality standards in a report submitted to the Director. | 30 days after commissioning |

# 5 Information

## 5.1 Reporting

5.1.1 The Works Approval Holder shall submit a compliance document to the Director, following the construction of the works and prior to commissioning of the same.

5.1.2 The compliance document shall:

(a) certify that the works were constructed in accordance with the conditions of the works approval;

(b) be signed by a person authorised to represent the Works Approval Holder and contain the printed name and position of that person within the company.

5.1.3 The Works Approval Holder shall submit a commissioning report for the Kaolin Mine and Process Plant, to the Director for approval within two months of the completion of commissioning.

5.1.4 The Works Approval Holder shall ensure the report includes;

(a) a summary of the monitoring results recorded under condition 4.1.1;

(b) a list of any original monitoring reports submitted to the Licensee from third parties for the commissioning period;

(c) a summary of the environmental performance of the Kaolin Mine and Process Plant as installed, against the design specification set out in the works approval application;

(d) a review of performance against the works approval conditions; and

(e) where they have not been met, measures proposed to meet the design specification and/or works approval conditions, together with timescales for implementing the proposed measures.

## 5.2 Notification

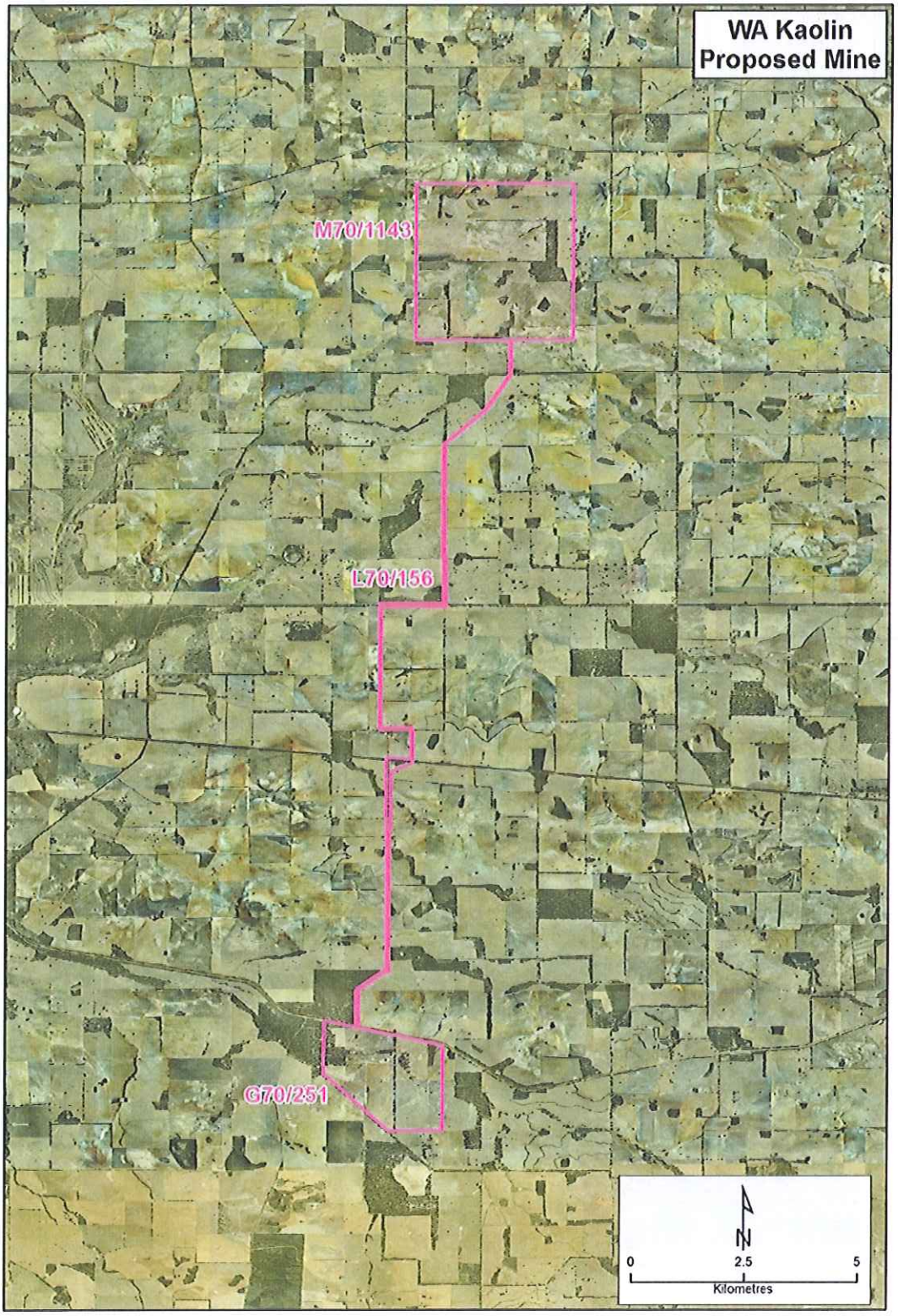
5.2.1 The Works Approval Holder shall ensure that the parameters listed in Table 5.2.1 are notified to the Director in accordance with the notification requirements of the table.

**Table 5.2.1: Notification requirements**

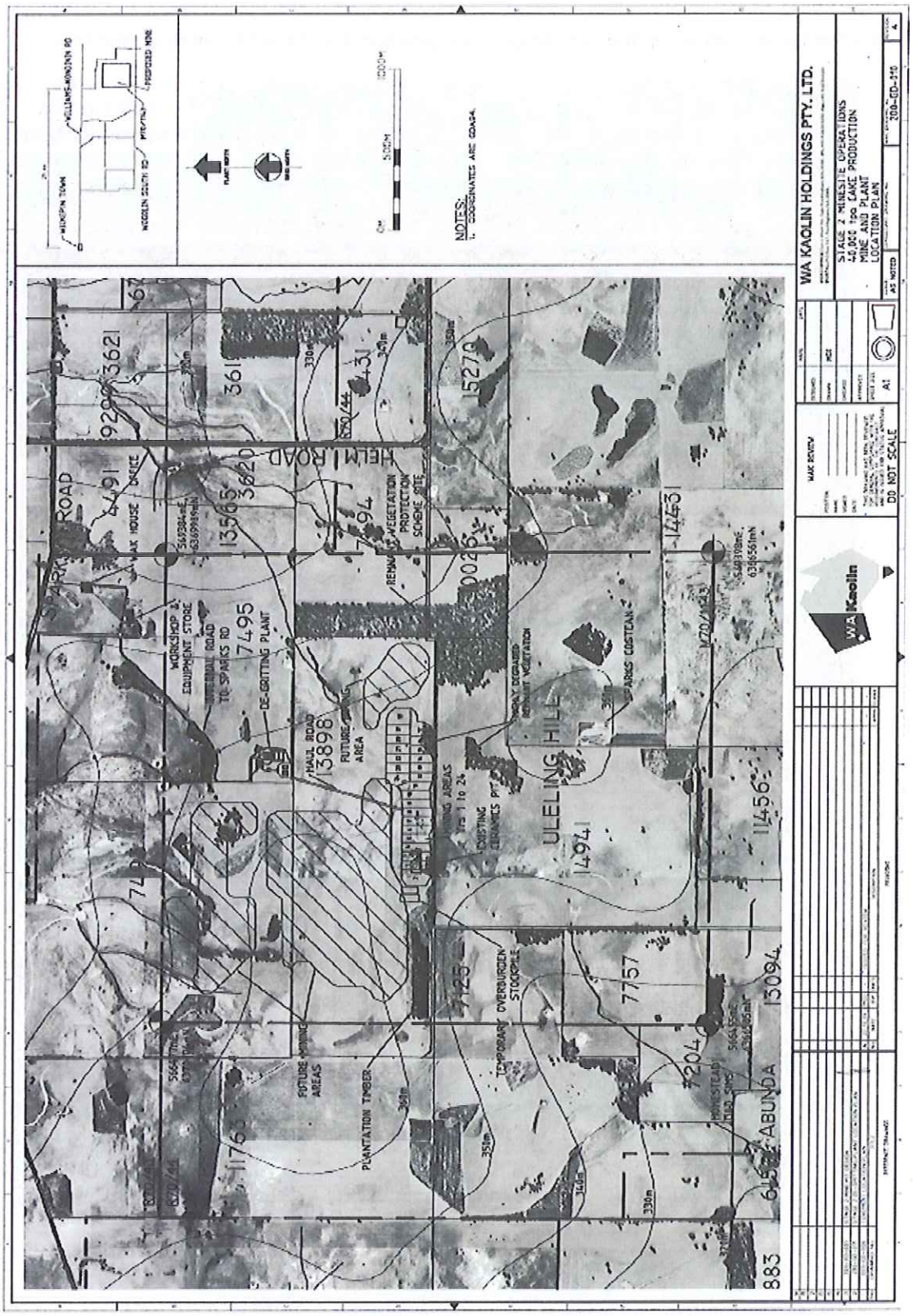
| Condition or table (if relevant) | Parameter | Notification requirement | Format or form |
|---|---|---|---|
| 1.2.4 | Commencement of commissioning | 7 days prior to start | None specified |
| | Completion of commissioning | 7 days after completion | |

Schedule 1: Maps

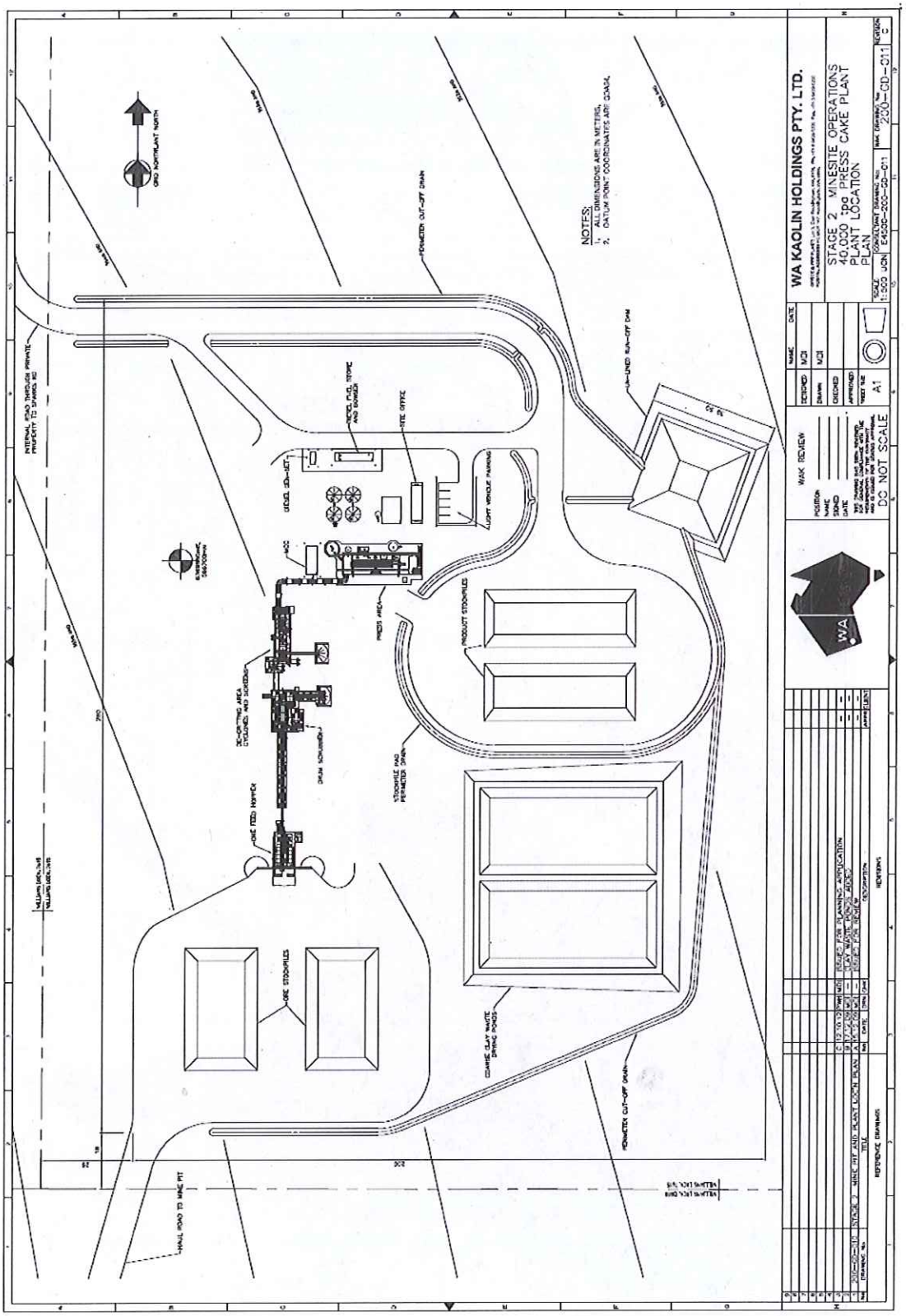
The Premises is shown in the map below. The pink line depicts the Premises boundary.



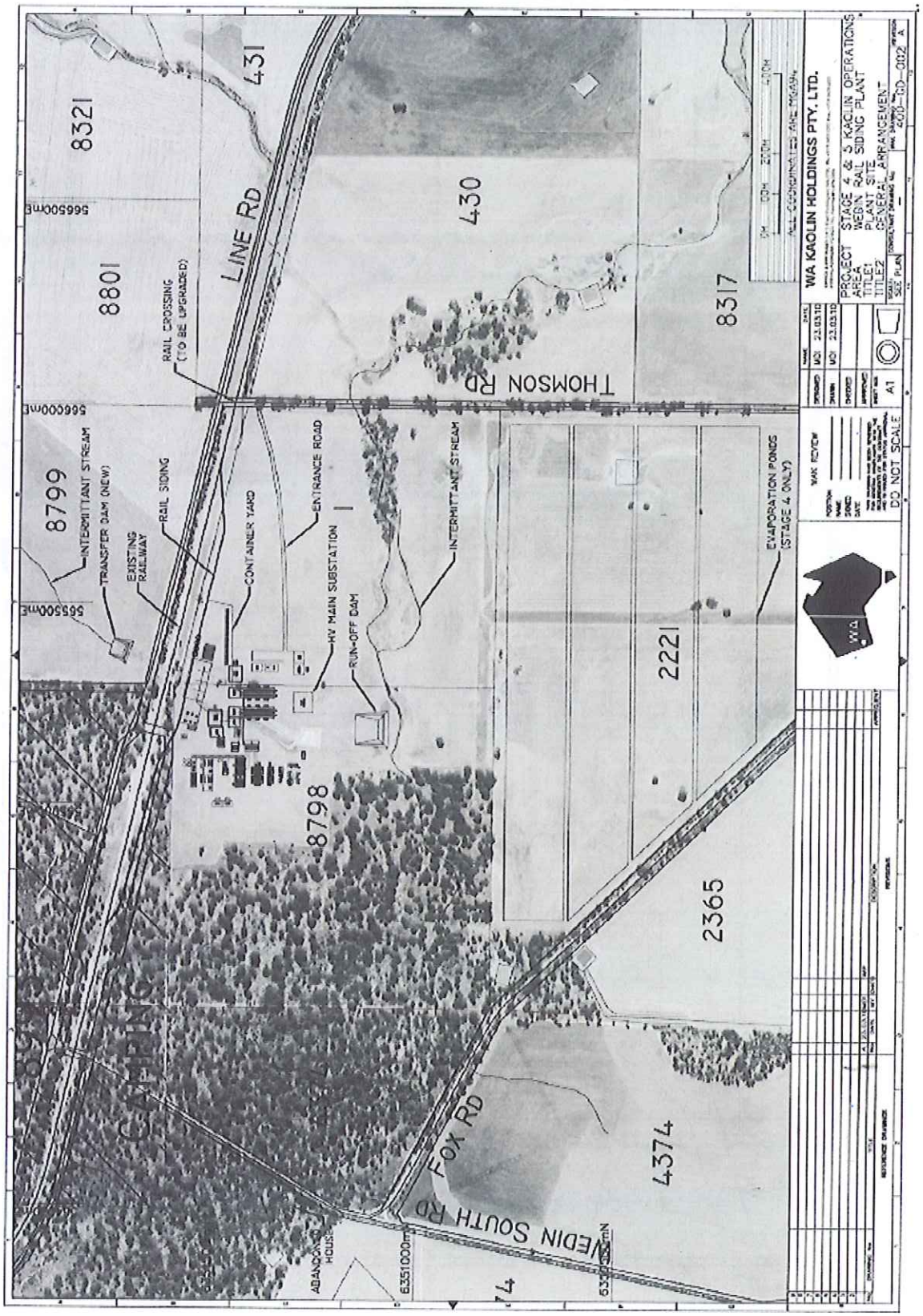
**Site map: Mine area and location of mine site process plant**



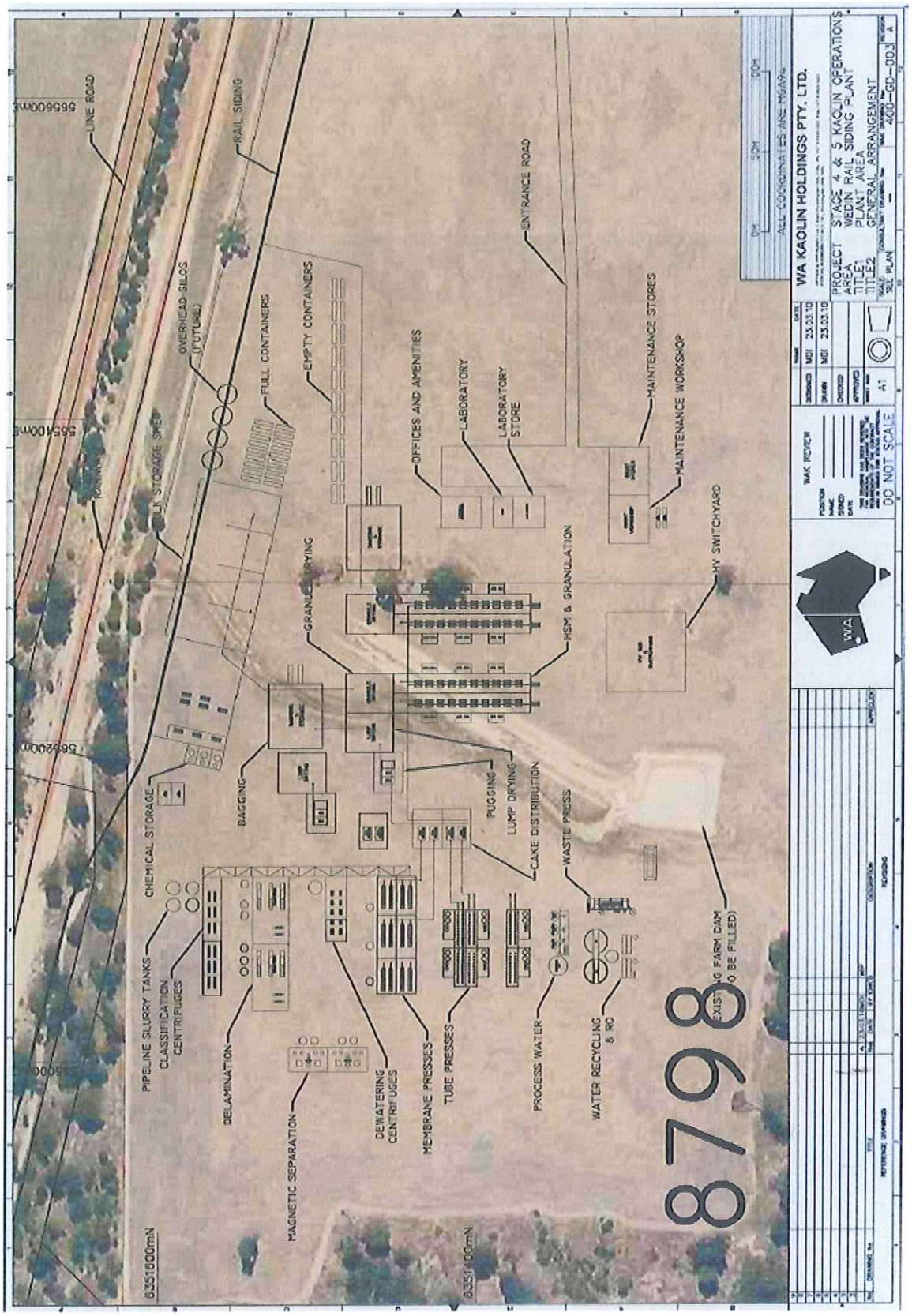
## Site Plan – Mine pit and Plant Location



**Site Plan: Location of Wedin Railway Siding process plant**



**Site Plan: Detailed site plan for the Wedin Railway Siding Processing Plant**



Government of **Western Australia**
Department of **Environment Regulation**

# Decision Document

## *Environmental Protection Act 1986,* Part V

## Proponent: WA Kaolin Holdings Pty Ltd

## Works Approval: W5443/2013/1

| | |
|---|---|
| **Registered office:** | 2 Abbotts Road<br>DANDENONG SOUTH VIC 3175 |
| Postal address: | PO Box 147<br>ROCKINGHAM WA 6968 |
| **ACN:** | 083 187 017 |
| **Premises address:** | Kaolin Mine and Process Plant<br>M 70/1143, General purpose licence 70/251 and<br>Miscellaneous licence 70/156<br>WICKEPIN WA 6370 |
| **Issue date:** | Thursday, 20 February 2014 |
| **Commencement date:** | Monday, 3 February 2014 |
| **Expiry date:** | Saturday, 23 February 2019 |

**Decision**

Based on the assessment detailed in this document, the Department of Environment Regulation (DER) has decided to issue a works approval. DEC considers that in reaching this decision, it has taken into account all relevant considerations.

Decision Document prepared by: Margaret Redfern
Regional Environmental Officer

Decision Document Authorised By: Alan Kietzmann
Regional Leader

# Contents



# 1 Purpose of this Document

This decision document explains how DER has assessed and determined the application for a works approval or licence, and provides a record of DER's decision-making process and how relevant factors have been taken into account. Stakeholders should note that this document is limited to DER's assessment and decision making under Part V of the *Environmental Protection Act 1986.* Other approvals may be required for the proposal, and it is the proponent's responsibility to ensure they have all relevant approvals for their Premises.

**Works approval and licence conditions**
DEC has three types of conditions that may be imposed on works approvals and licences. They are as follows;

**Standard conditions (SC)**

DEC has standard conditions that are imposed on all works approvals and licences regardless of the activities undertaken on the Premises and the information provided in the application. These are included as the following conditions on works approvals and licences:

Works approval conditions: 1.1.1-1.1.4, 1.2.1, 1.2.2, 5.1.1 and 5.1.2.

Licence conditions: 1.1.1-1.1.4, 1.2.1-1.2.4, 5.1.1-5.1.4 and 5.2.1.

For such conditions, justification within the Decision Document is not provided.

**Optional standard conditions (OSC)**

In the interests of regulatory consistency DER has a set of optional standard conditions that can be imposed on works approvals and licences. DER will include optional standard conditions as necessary, and are likely to constitute the majority of conditions in any licence. The inclusion of any optional standard conditions is justified in Section 4 of this document.

**Non standard conditions (NSC)**

Where the proposed activities require conditions outside the standard conditions suite DER will impose one or more non-standard conditions. These include both premises and sector specific conditions, and are likely to occur within few licences. Where used, justification for the application of these conditions will be included in Section 4.

# 2 Administrative summary

| Administrative Details | | |
|---|---|---|
| Application Type | Works Approval ☒<br>New Licence ☐<br>Licence amendment ☐<br>Works Approval amendment ☐ | |
| Activities that cause the premises to become prescribed premises | **Category number(s)** | **Assessed design capacity** |
| | 5 - Processing or beneficiation of metallic or non-metallic ore | 360,000 tonnes per year |
| Application verified<br>Application fee paid | Date: 10/05/2013<br>Date: 18/10/2013 | |
| Works Approval has been complied with<br>Compliance Certificate received | Yes ☐ No ☐ N/A ☒<br>Yes ☐ No ☐ N/A ☒ | |
| Commercial-in-confidence claim | Yes ☐ No ☒ | |
| Commercial-in-confidence claim outcome | | |
| Is the proposal a Major Resource Project? | Yes ☐ No ☒ | |
| Was the proposal referred to the Environmental Protection Authority (EPA) under Part IV of the *Environmental Protection Act 1986*? | Yes ☐ No ☒ | Referral decision No:<br>Managed under Part V ☐<br>Assessed under Part IV ☐ |
| Is the proposal subject to Ministerial Conditions? | Yes ☐ No ☒ | Ministerial statement No:<br>EPA Report No: |
| Does the proposal involve a discharge of waste into a designated area (as defined in section 57 of the *Environmental Protection Act 1986*)? | Yes ☐ No ☒<br>Department of Water consulted Yes ☐ No ☒ | |
| Is the Premises within an Environmental Protection Policy (EPP) Area Yes ☐ No ☒<br>If Yes include details of which EPP(s) here. | | |
| Is the Premises subject to any EPP requirements? Yes ☐ No ☒<br>If Yes, include details here, eg Site is subject to $SO_2$ requirements of Kwinana EPP. | | |

# 3 Executive summary of proposal

WA Kaolin Holdings Pty Ltd (WAK) holds the Mining Lease M70/1143 and has been operating a small-scale kaolin mine on the lease in Wickepin and a processing plant in Kwinana Industrial Zone to provide product for testing and evaluation (Works Approval W4147/2005/1 and Registration R1/2008/1). There are currently two small scale existing kaolin mine pits (beneath licensing thresholds) on Lot 13898 on Plan 161715 and Lot 14431 on Plan 155015, approximately 24 km east to southeast of Wickepin . Kaolin is an important industrial clay with a wide application in the manufacturing of high gloss paper, ceramics, paint, plastics and many other products and plastics.

As part of this works approval WAK propose to establish a mine with the capacity to produce 360,000 tonnes per annum (tpa) of Kaolin by mining approximately 1,260,000 tpa of ore. The proposed project has three main components:

- A kaolin mine and kaolin de-gritting plant;
- A processing plant at Wedin siding on the railway line; and,
- Pipelines connecting the mine/de-gritting plant and the process plant.

The process will involve the production of up to 100,000 tpa of beneficiated ore with 90% kaolin content at the mine site and approximately 260,000 tpa of refined product at the Wedin Railway Siding (WRS) processing plant.

The production of the refined product will require producing a slurry at the mine site (mining lease: M70/1143) which will be piped (pipe easement: Miscellaneous Licence 70/156) to the WRS (process plant: General Purpose Licence 70/251) approximately 18 km south from the mine site. The slurry will then be dried, processed and then transported by rail to Kwinana port. All of the locations are either owned or leased by WAK and are currently cleared and used for grazing or cropping.

The beneficiation at the mine site (up to 100,000 tpa of the clay) will involve de-gritting (dry process only). This will require less water and other process requirements and produce less salt waste than processing all the kaolin at WRS. The beneficiated kaolin will be packaged in bulk bags and placed in shipping containers at the mine site. This product may be transported by road to the WRS for loading onto trains or may be transported by trucks directly to Kwinana.

The closest sensitive receptor (residential house) to the mine is 2.8 km south-west and 3.2 km from the Wedin site. The site is relatively flat and no clearing of native vegetation will be needed. The sites are currently zoned General Agriculture, with the exception of Williams Location 13898 (Lot 13898 on Plan 161715) which is zoned for extractive industries. The Shire of Wickepin has advised that re-zoning is not required.

This works approval will entail the construction and installation of the following infrastructure:

**Mine site:**

- Stockpile area for ore (10,000 tonnes);
- Tanks for storage of recycled water;
- Bunded diesel and chemical storage areas;
- Degritting plant with the following components:
    - A feed hopper;
    - Wet drum scrubber;
    - Vibrating screens;
    - Hydro-cyclones;
    - Vacuum belt filter; and
    - degritting centrifuge.

- Underground piping to move the material to the processing plant and a second parallel one for return water; and
- Storage sheds and site office.

**At the Wedin Railway Siding:**

- Processing plant, which will include the following components:
  - Centrifuges for classification and dewatering,
  - Presses and granulation equipment;
  - Granule drying and bagging facilities; and
  - Water recovery and reverse osmosis plant.
- Saline water evaporation ponds (lined with HDPE and / or compacted clay);
- Stormwater runoff collection ponds
- Bunded diesel and chemical storage areas;
- Storage shed and site office; and
- A 1km long railway siding from the existing line will be constructed on Lots 8798 on Plan 132472 and Lot 1 on Diagram 92042.

This plant is expected to generate air emissions similar to the Kwinana plant (see Point source emissions to air section in the Decision table) which has not had any environmental issues.

An operational flowchart is reflected in Figure 1 below and more details of the operation are provided in Appendix A.

The proposed mine site involves the excavation of ore from typically less than 40 m depth and de-gritting the material at the mine site. The kaolin deposit extends from a depth of 3 m to 20 m and in some places to 40 m. No drilling, blasting or crushing is will be undertaken to extract the ore. Beneficiated ore, if produced will be packaged at the mine site and then transported by road to Wedin and then by either rail or road to Kwinana for export. The remaining ore will be pumped as slurry to the processing plant at the Wedin Railway Siding (WRS) processing plant where the kaolin will be processed, dewatered and pressed. The mine pit will be progressively back-filled with reject soil and clay, finished with topsoil and returned to cropping.

The final product will be stored onsite at the processing plant adjacent to the railway siding prior to transport off site. If the beneficiated ore is transported by road to Kwinana, it would require approximately 12 truck movements per day (6 arriving empty and 6 departing loaded), 7 days per week, assuming a capacity of 50 tonnes per truck and the total potential production of 100,000tpa. If the total kaolin product of 360,000tpa is transported to Kwinana by rail this will occur on a campaign basis when a ship is in port for loading. Trains are expected to run 10 to 12 movements each week. Loading may occur at night. If the railway line is closed by the State Government, the product will be transported by road.

The project potentially has a long lifespan and the mine closure plan will be updated and refined as required by regulatory authorities. A Rehabilitation Pit Closure Activities Plan has been submitted to DER.

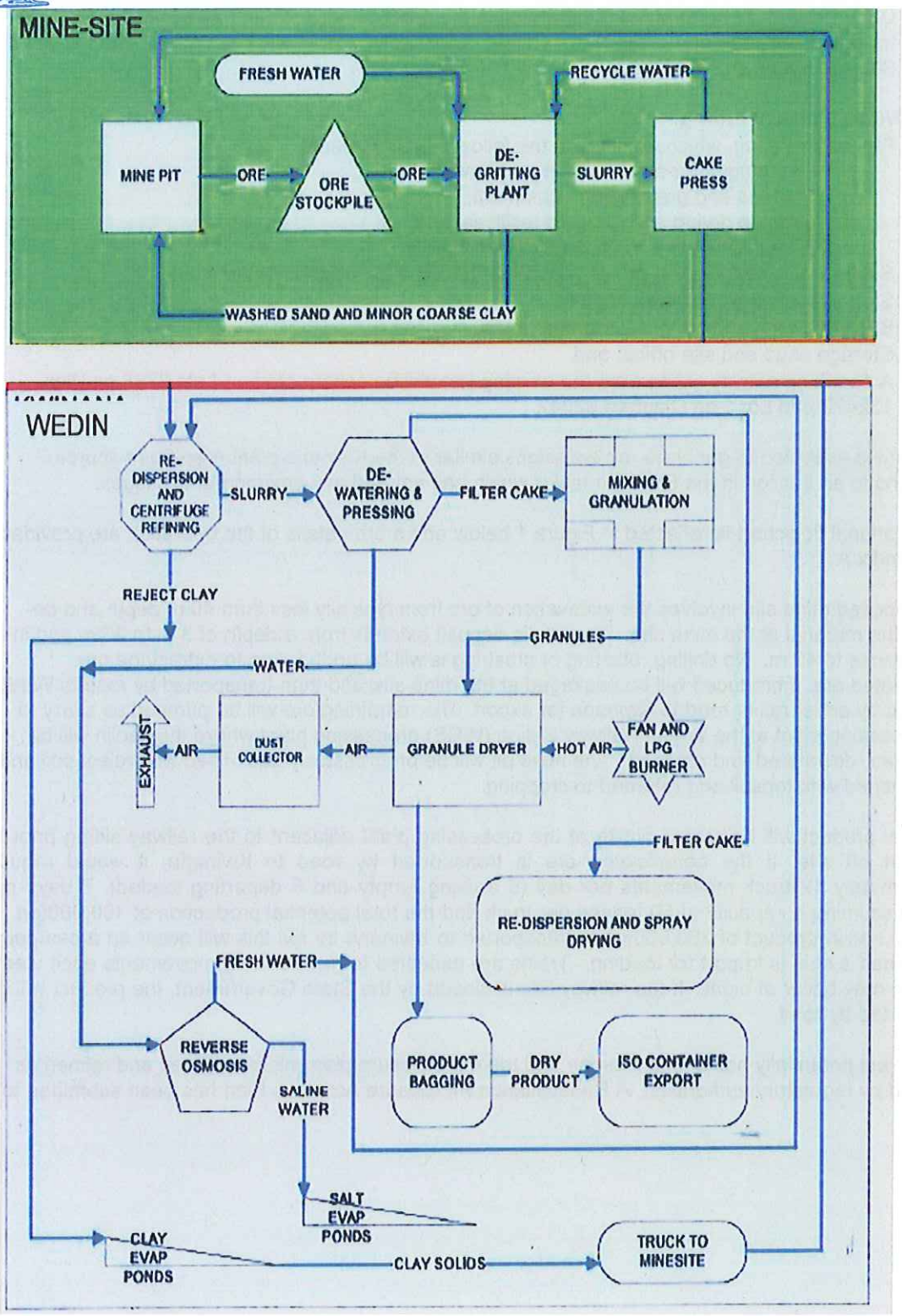



**Figure 1: Simplified process chart**

# 4 Decision table

All applications are assessed under the *Environmental Protection Act 1986*, the Environmental Protection Regulations 1987, DEC's Policy Statement - Limits and targets for prescribed premises 2006 and the risk matrix attached to this decision document in Appendix A [and DEC's Industry Regulation Emissions and Discharges Assessment Framework]. Where other references have been used in making the decision they are detailed in the decision table.

| DECISION TABLE | | | | |
|---|---|---|---|---|
| **Works Approval / Licence section** | **Condition number W = Works Approval L= Licence** | **OSC or NSC** | **Justification (including risk description & decision methodology where relevant)** | **Reference documents** |
| **General conditions** | W1.2.1 – 1.2.7 | OSC | **Construction and Operation**<br>*Emission Significance* - 1<br>*Socio-political context* - No concern or interest.<br>*Risk Assessment* - D – licence conditions<br><br>The construction of the infrastructure on the Premises will need to be in accordance with the Works Approval application to enable the mining and processing of kaolin ore under commissioning.<br><br>Environmentally hazardous material will be stored appropriately to prevent discharge to the environment.<br><br>Potentially contaminated process and stormwater is directed into suitably lined containment ponds with appropriate freeboards.<br><br>Waste products will be disposed of in an approved manner. | Application supporting documentation<br><br>Environmental Protection (Unauthorised Discharge) Regulations 2004 |
| **Emissions general** | N/A | N/A | No significant emissions are expected during construction of the facility.<br><br>The only emissions from the mining and processing operations will include exhaust fumes from diesel engines of machinery, sand and | N/A |

<table>
<tr><td></td><td></td><td></td><td>waste clay products returned to the mine pit as backfill, evaporated salt encapsulated and buried with the backfill, water vapour from drier exhausts, noise and light.<br><br>Descriptive limits will be set through condition L2.6 of the licence. Therefore L 2.1.1 regarding the recording and investigation of exceedence of limits or targets has been included.</td><td></td></tr>
<tr><td>Point source emissions to air including monitoring</td><td>L 1. 2.3<br>W4.1.1</td><td>OSC</td><td>Operation and Construction<br>Emission Significance - 1<br>Socio-political context - No concern or interest.<br>Risk Assessment - D – other management mechanisms<br><br>No significant point source air emissions are expected from the construction of the processing plant at Wedin.<br><br>During operation, particulates will be removed from the exhaust gases from the drying process in an off line pulsed bag house collector. The stack on the dryer exhaust will be approximately 18 m tall to give a clearance of 3 m above the crest of the adjacent building. The nearest residence is over 3 km away and not expected to be impacted. The emissions are expected to be the same as the Kwinana pilot plant. LPG will fuel the drying process and low pollutant emissions are expected.<br>The peak flows at the drier and stack will be:<br><br>
<table>
<tr><th>Drier Exhaust gas</th><th>Nm3/h</th><th>Mol/h</th><th>MWt</th><th>kg/hr</th><th>mol%</th><th>mass%</th></tr>
<tr><td>O2</td><td>8,137</td><td>363</td><td>32</td><td>11,624</td><td>15%</td><td>18%</td></tr>
<tr><td>N2</td><td>35,550</td><td>1,587</td><td>28</td><td>44,438</td><td>67%</td><td>69%</td></tr>
<tr><td>CO2</td><td>656</td><td>29</td><td>44</td><td>1,289</td><td>1%</td><td>2%</td></tr>
<tr><td>H2O</td><td>8,565</td><td>382</td><td>18</td><td>6,882</td><td>16%</td><td>11%</td></tr>
<tr><td>TOTAL</td><td>52,908</td><td>2,362</td><td></td><td>64,233</td><td></td><td></td></tr>
</table>
<br>Peak flows are only expected for less than 600 hours per year. The average flows will be approximately 65% of these levels. Gas consumption is 24 GJ/hr. The exhaust gas emission temperature will</td><td>Application supporting documentation</td></tr>
</table>

| | | | | |
|---|---|---|---|---|
| | | | be around 90-105 °C.<br><br>These levels will require confirmation on commissioning. The Kwinana Air Shed has strict air control, which the plant in Kwinana meets. The plant in Wickepin is the same as the one in Kwinana so it is expected to meet acceptable standards. | |
| **Point source emissions to surface water including monitoring** | N/A | N/A | **Operation and Construction**<br>*Emission Significance* – 1<br>*Socio-political context* –No concern or interest<br>*Risk Assessment* – E –no regulation, other management mechanisms<br><br>There will be no point source emissions to water during construction or operation of the plant. The nearest surface water body is approximately 15 km away south-west from the project site. No specified conditions relating to point source emissions to water or the monitoring of such emissions are required to be added to the Works Approval or Licence.<br><br>Both the mine site and the WRS are within the buffer zone of the Toolibin Lake Natural Diversity Recovery Catchment. This includes the Toolibin Lake Threatened Ecological Community and Toolibin Lake, a wetland of international significance. These assets are not expected to be impacted for the following reasons:<br>• No run off is expected from the mine or at the siding as all surface water is to be collected and used in the process;<br>• Groundwater is more than 50 meters deep and will not be intercepted at the mine as the process requires clay above the groundwater table; and<br>• Groundwater monitoring bores will be located near the excavated backfilled pits to check for salt movement but none is expected due to the impermeable nature of the clay $10^{-10}$ m/s.<br><br>All contaminated stormwater will be collected and used in the plant. Water will be recycled for process water as much as possible. Ponds will be designed for a 1 in 100 year flood event.<br><br>The mine has no natural drainage lines. A small drainage line is at the | Application supporting documentation |

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| | | | Wedin site, from where a culvert comes under the railway line. The process plant, salt water ponds and other structures will be sited to avoid this area.<br><br>A site drainage plan will be implemented to capture any surface runoff for recovery and use in the process plant. | |
| **Emissions to land including monitoring** | L3.1 | OSC | **Construction and Operation**<br>*Emission Significance* 2<br>*Socio-political context* – no concern or interest<br>*Risk Assessment* –no regulation, other management mechanisms<br><br>There will be no significant emissions to land during construction or operation of the plant. The natural soils are high in clay and due to the nature of kaolin, stockpiles will not pose an environmental hazard. All processing equipment will be on hardstand.<br><br>Leak detection equipment and isolation valves will be installed in the slurry pipeline, which need to be maintained and will require monitoring as part of the licence conditions.<br><br>Reject soils and clay will be returned to the pit after screening. Washed sand tails will be returned to the pit as they are created and then covered with overburden and topsoil. The land will be returned to cropping on a continuous basis. The site will be contoured to have a natural effect. The soil in rehabilitated areas will be analysed to ensure condition is at least similar to undisturbed soil.<br><br>Solid salt waste from the reverse osmosis plant and evaporation ponds will be placed in HDPE- encapsulated sections of the mine pit that has high clay content, at least 10 m above the natural groundwater table.<br><br>The evaporation ponds will consist of multiple cells and the water will be moved through these in sequence as evaporation proceeds. The initial ponds will be larger and will be lined with HDPE to promote absorption of solar energy and evaporation. This will produce brine which will be transferred to smaller clay lined ponds to dry out. The clay lining will facilitate drying out and removal with a front-end-loader. | Application supporting documentation |

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| | | | At this stage it is assumed that local clay will be used for the lining in the final evaporation ponds but this will depend on the results of geo-mechanical testing. If it is found that the available clay does not meet the permeability requirements then HDPE will be used in all of the ponds. The estimated area of the ponds is approximately 500 m x 500 m (250,000 $m^2$).and will be designed to cater for a 1 in 100 year flood event. | |
| **Emissions to land including monitoring (continued)** | | | A minimum freeboard of 500 mm will be maintained on ponds. Diesel tank and bowser will be bunded. All chemicals will be stored as per Dangerous Goods Safety (Storage and Handling of Non-explosives) Regulations 2007.<br><br>No specified conditions relating to emissions to land or the monitoring of such emissions are required to be added to the Works Approval. | |
| **Point source emissions to groundwater including monitoring** | W4.1.1 | NSC | **Construction and Operation**<br>*Emission Significance* – 1<br>*Socio-political context* – No concern or interest<br>*Risk Assessment* – no regulation, other management mechanisms<br><br>No point source emissions to groundwater are expected during construction or operation and no specified conditions are set in the works approval. Groundwater is determined to be 50 m below ground level. Excavation will take place to a depth of less than 40 m and will be separated by clays having a permeability of $1x10^{-10}$ m/s.<br><br>The encapsulation of salt will occur more than 20 m above ground water level. WA Kaolin have committed to surveying these storage locations and install monitoring bores to monitor any possible leachate or leaking in the future. | Application supporting documentation |
| **Fugitive emissions** | N/A | N/A | **Construction and Operation**<br>*Emission Significance* – 1<br>*Socio-political context* – No concern or interest<br>*Risk Assessment* – no regulation, other management mechanisms<br><br>Minor dust may be generated during construction and operation due to vehicles and machinery. The closest receptors are more than 2.8 km | Application supporting documentation |

| | | | | |
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| | | | away, and commitments have been made to mitigate dust.<br><br>Therefore no conditions relating to fugitive emissions will be placed on the Works Approval.<br><br>A water truck will be used at the mine for dust suppression. No drilling, blasting or crushing is required. Natural moisture level in the overburden and ore is 12 to 18% by weight.<br><br>Haul roads will be laterite gravel and washed tailings sands to create a well-drained, hard-wearing compacted surface.<br><br>Buildings at the siding will have placement of individual external lights with impact attenuation through placement, orientation and cowlings. The nearest residence is over 3 km away and not expected to be impacted by lighting.<br><br>Standard condition on dust not crossing the premises boundary will apply. | |
| **Odour** | N/A | N/A | No odour is expected from the construction or operation as Kaolin is an inert, odourless naturally occurring clay. No conditions are specified regarding odour on the Works Approval. | Application supporting documentation |
| **Noise** | IR2 | OSC | **Construction and Operation**<br>*Emission Significance* – 1<br>*Socio-political context* – No concern or interest<br>*Risk Assessment* – no regulation, other management mechanisms<br><br>The area is sparsely populated with isolated farm houses. Herring Storer has modelled noise at the mine site and concluded that noise levels at the closest residence are well within acceptable limits.<br><br>Noise at the process plant will be confirmed on commissioning. WA Kaolin have committed to installing noise bunds walls or other attenuation measures if required. | Application supporting documentation<br>Environmental Protection (Noise) Regulations 1997 |
| **Monitoring general** | L3.1 | OSC | **Construction**<br>*Emission Significance* – 1<br>*Socio-political context* – No concern or interest | Application supporting documentation |

| | | | | |
|---|---|---|---|---|
| | | | *Risk Assessment* – no regulation, other management mechanisms<br><br>No monitoring is required during construction and therefore no conditions have been placed on the Works Approval. General monitoring requirements will be required as part of the licence conditions to ensure monitoring equipment is maintained. | |
| **Monitoring of inputs and outputs** | L3.6 and L5.2 | OSC | **Construction and Operation**<br>*Emission Significance* – 2<br>*Socio-political context* – No concern or interest<br>*Risk Assessment* – no regulation, other management mechanisms<br><br>No conditions placed on Works Approval.<br><br>Excavation of about 1.25 Mtpa of material will produce 360,000 tpa of kaolin.<br><br>Volumes of ore processed, volumes produced, volumes of salt waste returned to the mine, and area rehabilitated will need to monitored and reported. | Application supporting documentation |
| **Process monitoring** | N/A | N/A | **Construction and Operation**<br>*Emission Significance* – 1<br>*Socio-political context* – No concern or interest<br>*Risk Assessment* – no regulation, other management mechanisms<br><br>No process monitoring is required during construction and therefore no conditions have been placed on the Works Approval.<br><br>Process monitoring conditions will be included in the licence. | Application supporting documentation |
| **Ambient quality monitoring** | IR3 | OSC | **Construction and Operation**<br>*Emission Significance* – 1<br>*Socio-political context* – No concern or interest<br>*Risk Assessment* – no regulation, other management mechanisms<br><br>Monitoring bores are to be installed around the evaporation ponds to monitor ambient groundwater quality. Baseline data will to be collected during commissioning. The proponent has committed to monitoring for pH, TDS. TSS, and depth to groundwater. | Application supporting documentation |

| | | | | |
|---|---|---|---|---|
| **Meteorological monitoring** | N/A | N/A | No meteorological monitoring is required during construction and therefore no conditions have been placed on the Works Approval. | Application supporting documentation |
| **Improvements** | IR1<br><br>IR2<br><br>IR3<br><br>IR4<br>IR5 | OSC | The Works Approval Holder will submit, prior to commissioning, a commissioning plan.<br>The Works Approval Holder shall undertake a noise assessment during commissioning.<br>The Works Approval Holder shall establish and undertake ambient groundwater quality monitoring at the mine and Weding Railway Siding.<br>Site drainage plan to be submitted before commissioning.<br>Install a sampling point on the exhaust chimney and verify air emissions. | Application supporting documentation |
| **Information** | 1.2.4-1.2.7<br>5.1.3 | | **Construction and operation**<br>A commissioning plan is to be submitted 3 months prior to commissioning. This is to include noise and emissions verification to ensure that the plant is operating as expected and that DER is notified of the commencement and completion of commissioning. | Application supporting documentation |

# 5 Advertisement and Consultation Table

| Date | Event | Comments received/Notes | How comments were taken into consideration |
|---|---|---|---|
| 28/10/2013 | Application advertised in West Australian | No comments received | N/A |
| 16/01/2014d | Application referred to interested parties listed:<br>Shire of Wickepin (Mark Hook, CEO)<br><br>Department of Mines and Petroleum (Clare Grosser) | The Shire approved the original mine and is expected to support the new proposal.<br><br>DMP has no significant issues. They are currently liaising with the proponent in regards to the development of the Mine Closure Plan. | Acknowledgement in in the Decision Document.<br><br>No influence |
| 17/01/2014 | Proponent sent a copy of draft instrument | Further information was provided on the detail of the two production options to retrieve the kaolin from the mining operation. | This information was incorporated in the Decision document and Works Approval summary. |

# 6 Emissions and discharges risk assessment framework

*Note: These matrix are taken from the DEC* Officer's Guide to Emissions and Discharges Risk Assessment *(2006).*

## Table 3: Measures of Significance of Emissions

| Emissions as a percentage of the relevant emission or ambient standard | | Worst Case Operating Conditions (95th Percentile) | | | |
|---|---|---|---|---|---|
| | | >100% | 50 – 100% | 20 – 50% | <20%* |
| Normal Operating Conditions (50th Percentile) | >100% | 5 | N/A | N/A | N/A |
| | 50 – 100% | 4 | 3 | N/A | N/A |
| | 20 – 50% | 4 | 3 | 2 | N/A |
| | <20%* | 3 | 3 | 2 | 1 |

*For reliable technology, this figure could increase to 30%

## Table 4: Socio-Political Context of Each Regulated Emission

| | | Relative proximity of the interested party with regards to the emission | | | | |
|---|---|---|---|---|---|---|
| | | Immediately Adjacent | Adjacent | Nearby | Distant | Isolated |
| Level of Community Interest or Concern* | 5 | High | High | Medium High | Medium | Low |
| | 4 | High | High | Medium High | Medium | Low |
| | 3 | Medium High | Medium High | Medium | Low | No |
| | 2 | Low | Low | Low | Low | No |
| | 1 | No | No | No | No | No |

Note: These examples are not exclusive and professional judgement is needed to evaluate each specific case

*This is determined by DER using the *Officer's Guide to Emissions and Discharges Risk Assessment* (2006).

## Table 5: Emissions Risk Reduction Matrix

| | | Significance of Emissions | | | | |
|---|---|---|---|---|---|---|
| | | 5 | 4 | 3 | 2 | 1 |
| Socio-Political Context | High | A | A | B | C | D |
| | Medium High | A | A | B | C | D |
| | Medium | A | B | B | D | E |
| | Low | A | B | C | D | E |
| | No | B | C | D | E | E |

PRIORITY MATRIX ACTION DESCRIPTORS
A = Do not allow (fix)
B = licence condition (setting limits + EMPs - short timeframes)(setting targets optional)
C = licence condition (setting targets + EMPs - longer timeframes)
D= EIPs, other management mechanisms/licence conditions (monitoring/reporting)/other regulatory tools
E = No regulation, other management mechanisms

# Appendix A

**Detailed Operation processes and storage of chemicals**

Production of the 360,000 tpa kaolin product involves beneficiation at the minesite and refining at the Weding Railway Siding. It is anticipated that 100,000 tpa of beneficiated (90%) kaolin product be produced at the mine site while clay will be slurried and piped to the WRS for further processing; to produce 260,000 tpa of fully refined product. Beneficiation at the mine site will have the benefit of reduced water and other processing requirements and less waste salt generated from the reverse osmosis plant.

The kaolin is dug by excavator. De-gritting with screens and cyclones will separate kaolin < 45 microns from waste "sand". Fine kaolin will be piped as slurry to the Wedin Railway Siding (WRS) for further processing. Coarse clay will be further treated in a de-grit centrifuge then fed into the pipeline.

At the WRS site, the slurry will pass through centrifuges that will separate the fine and course clay. These will be dewatered and pressed. Some of the damp kaolin filter cake will be treated further to optimise particle size and viscosity and then granulated and dried. Both filter cake and granules will be packaged and stored in bulka bags and ISO shipping containers. The storage area will hold approximately 10,000 tonnes product.

Fresh water used for the operations will be obtained from an existing water main. Some of the water from de-watering at the processing plant will be piped to the de-gritting plant at the mine site; the remainder will be treated by reverse osmosis and used in the Wedin process line. Saline water from the osmosis process will be discharged to clay lined ponds at the Wedin site for evaporation and crystal formation. Salt residues will be transported back to the mine and encapsulated in HDPE lined cells in surrounding clay in the pit approximately 20 metres above the water table. WAK have committed to putting in monitoring bores to detect leaching. Approximately 1,200 tonnes of salt will be produced each year. The reverse osmosis waste stream is expected to have a flow of approximately 4.5 $m^3$/h (or 33,750kL/year) at a concentration of 60,000 ppmTDS.

In the event that back-flushing of the Reverse Osmosis pre-filters is necessary more often than expected, the flow could increase to 6.7 $m^3$/h (50,000 kL/year) and the concentration would reduce to 40,000 ppm TDS.

Power will be from mains supply to both sites, The mine will operate 7am to 7pm usually for 5 days a week but at times for 7 days. The processing plant will operate on a continuous basis.

MINE SITE

All mining will occur well above the water table (which is greater than 50 m) to a depth of no greater than 40 m. No mine de-watering is required. Sodium hydroxide, sulphuric acid and a dispersant are stored in a bunded areas. Gas is used for the drying process will be LPG delivered by road train. All chemicals stored in accordance with *Dangerous Goods Safety Act 2007.*

***De-gritting Plant***

The de-gritting plant at the mine site will include:

- Stockpiles for approximately 10,000 tonnes of ore,
- The process line,
- Tanks for storage of recycled water,
- A diesel storage tank and bowser,

- Store shed and site office.

De-gritting with screens and cyclones will separate kaolin of <45 microns from waste 'sand'. The de-gritting plant has the following sequential components:

- A feed hopper
- Wet drum scrubber
- Vibrating Screens
- Hydro-cyclones
- Vacuum belt filter; and
- A de-gritting centrifuge.

The process involves:

- Mixing of the ore with water
- Wet scrubbing to break up the kaolin lumps into discrete individual particles
- Separation of kaolin of <45 microns from waste materials by screening, the hydro-cyclones and the vacuum belt filter, and
- Further processing of the coarse kaolin fraction in the de-gritting centrifuge.

The process is mechanical but does involve 2 chemical additives – sodium hydroxide (1,200 tpa) and a dispersant (Antiprex, 270 tpa) to prevent flocculation.

Production of beneficiated kaolin would involve dry screening only.

PROCESSING PLANT

The processing at the Wedin site will include:

- Centrifuge refining of the kaolin into different size ranges.
- Centrifuge de-watering.
- Pressing to create a damp cake product.
- Rotary mixing and fluid bed drying with hot air for a granule product.

The site will have a container handling yard, bunded diesel and chemical store, workshops and spare parts store, storm water run-off collection pond and pump system, administration and amenities buildings and a communication tower. Saline water from the reverse osmosis plant will be discharged to HDPE and clay lined ponds for evaporation. The stack on the dryer exhaust will be approximately 18 metres tall to give a clearance of 3 metres above the crest of the adjacent building.

A 1km long railway siding from the existing line will be constructed on Lots 8798 and 1. The container handling yard will be adjacent to the siding and a container forklift will be used to lift containers on and off the wagons.

CHEMICAL USE AND STORAGE

Chemicals will be delivered in bulk liquid form by road tanker and will be stored on-site in accordance with the *Dangerous Goods Safety Act 2007*. All storage tanks and unloading facilities will be enclosed within fully lined and bunded areas, and will be designed in accordance with the relevant Dangerous Goods storage and handling codes, standards, and regulations. The services of a DMP accredited Dangerous Goods consultant will be used during the design engineering phase, and to prepare and achieve the required Dangerous Good licenses.

The acid and alkali will be used in small quantities to control the pH in the kaolin slurry which needs to be adjusted through the process to enable the circuit to function properly. Minor quantities of a biocide will be used to prevent bacteria consuming the biodegradable dispersant. Diesel will be stored in double skinned tanks.

During periods of storage tank maintenance the plant will be supplied from Intermediate Bulk Containers (IBCs). One IBC per day of 98% sulphuric acid and two IBC's of 50 % sodium hydroxide per day will be required.

***Diesel Fuel – C1***
The minesite earthmoving contractor will require fuel for earthmoving machinery. Fuel for this purpose is expected to be less than 100 kL and will be stored in self-contained (double wall bunded) above ground tanks designed and manufactured in accordance with AS1940.

***Sodium Hydroxide - Class 8 UN 1824***
The project will require an estimated 1,200 tpa most of which will be delivered to, stored, and used at the mine site with a small amount used and stored at the Wedin site. It is expected that 50% sodium hydroxide solution will be delivered by road train with two trailers and a maximum capacity of 60 tonnes (40 $m^3$). There will be 2 deliveries per month. Each truck will visit the Wedin site first to top up the storage tank there before proceeding to the mine site. The storage tank at the Wedin site is expected to have a capacity of 20 $m^3$ and at the mine site 79 $m^3$.

***Sulphuric Acid - Class 8 UN 2967***
Estimated 600tpa 98% sulphuric acid. 32.6 $m^3$ delivered by road train to mine site. One delivery per month. Capacity of storage tank 79 $m^3$.

***Antiprex (Dispersant) - Class 8 UN No.2218***
Mine site 270 tpa. Wedin plant site 100 tpa. 40 – 70 % solution delivered by road in 20 $m^3$ tankers. 40 $m^3$ storage tank at each site. Two deliveries per month to the mine site and one delivery every two months to the Wedin site.

***Glutaraldehyde (Biocide) – Not classified but treated as Class 8***
Wedin site 5 tpa. Delivered by truck in one tonne steel container, once every 3 months and placed in a 1.5 $m^3$ storage tank. It is used to occasionally dose the process liquor because the dispersant used (Antiprex) is bio-degradable and promotes growth of moulds on the insides of tanks in warm conditions. Domestic bleach (dilute ammonia) is also used to wash down tanks and equipment to control mould and bacteria growth.

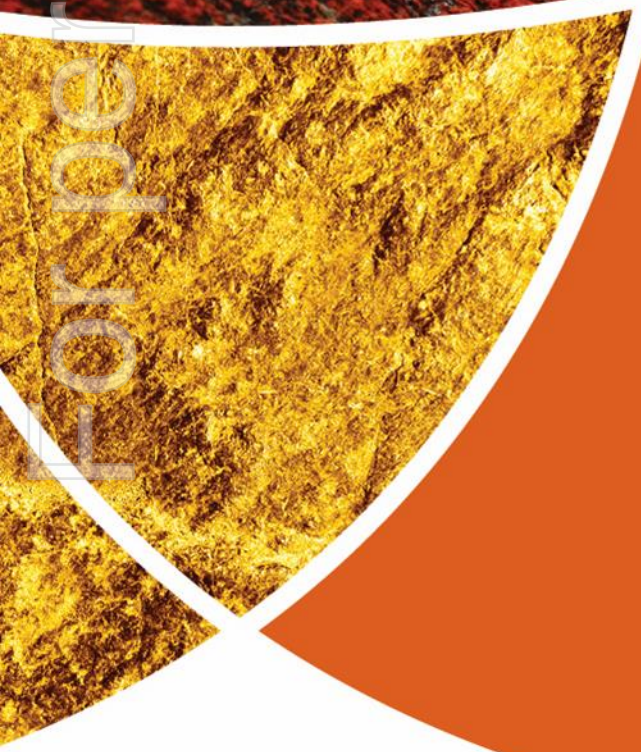
Glutaraldehyde must be stored away from strong acids (i.e. sulphuric) and strong bases (caustic) as contact with these results in an exothermic reaction. Optimum product stability occurs when product is stored at pH of 3.7 - 4.5 and less than 38 °C. This temperature can generally be achieved in a ventilated shed.

***Flocculant***
Flocculant will be used at the Wedin site for water clarification prior to reverse osmosis. An estimated 20 tpa will be required. Flocculant selections have not yet been confirmed. Typically flocculant is purchased in solid (powder) form and made down with a flocculant mixer unit. It is expected that flocculant will be delivered monthly and the maximum inventory would be circa 3 tonnes. Small quantities of flocculant such as this are usually delivered in plastic sacks on a pallet.

Flocculant palletized dry powder is typically stored in a concrete floored shed with forklift access. There is no need for bunding or dangerous goods licensing.

## Appendix 5.

MINERAL RESOURCE ESTIMATE — WAK PROJECT (CSA Report Nº R351.2019)





CSA Global
Mining Industry Consultants

# MINERAL RESOURCE ESTIMATE

## WA Kaolin Project (M70/1143), Wickepin, Western Australia

**CSA Global Report №** R351.2019
**31 July 2019**

**www.csaglobal.com**

## Report prepared for

| | |
|---|---|
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| Project Name/Job Code | WAKTAR01 |
| Contact Name | Alf Baker |
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## Report information

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## Author and Reviewer Signatures

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| Coordinating Author | Matthew Cobb<br>PhD (Geology), MSc (Geostatistics), MAIG, MIAMG | Signature: | Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. |
| Peer Reviewer | Trivindren Naidoo<br>MSc (Exploration Geology), FGSSA, MAusIMM, Pr.Sci.Nat. (Geology) | Signature: | Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. |
| CSA Global Authorisation | Aaron Meakin<br>BSc (Hons), Grad Dip. App. Fin., M App Fin, MAusIMM (CP Geo), FFin | Signature: | Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. Electronic signature not for duplication. |

# Disclaimers

## Purpose of this document

This Report was prepared exclusively for WA Kaolin Holdings Pty Ltd ("the Client") by CSA Global Pty Ltd ("CSA Global"). The quality of information, conclusions, and estimates contained in this Report are consistent with the level of the work carried out by CSA Global to date on the assignment, in accordance with the assignment specification agreed between CSA Global and the Client.

## Notice to third parties

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## Results are estimates and subject to change

The interpretations and conclusions reached in this Report are based on current scientific understanding and the best evidence available to the authors at the time of writing. It is the nature of all scientific conclusions that they are founded on an assessment of probabilities and, however high these probabilities might be, they make no claim for absolute certainty.

The ability of any person to achieve forward-looking production and economic targets is dependent on numerous factors that are beyond CSA Global's control and that CSA Global cannot anticipate. These factors include, but are not limited to, site-specific mining and geological conditions, management and personnel capabilities, availability of funding to properly operate and capitalise the operation, variations in cost elements and market conditions, developing and operating the mine in an efficient manner, unforeseen changes in legislation and new industry developments. Any of these factors may substantially alter the performance of any mining operation.

# Executive Summary

WA Kaolin Holdings Pty Ltd (WAK) commissioned CSA Global Pty Ltd (CSA Global) to prepare a Mineral Resource estimate for the WA Kaolin deposit. The WA Kaolin Project ("the Project"), held by WAK, comprises five retention licences and a single mining lease, situated in the Shire of Wickepin, in the south-eastern wheatbelt of Western Australia. Mineral Resources for the five retention licences have previously been reported by CSA Global (Report Number R280.2017). The Mineral Resources reported herein pertain wholly to mining licence M70/1143.

Mineralisation at the WA Kaolin Project is the result of intense weathering of the basement granite, to form a kaolinite-rich saprolite horizon within the regolith profile of the area. This horizon is variably overlain by a mottled zone (the upper layers of the saprolite horizon stained with iron-oxides), and a lateritic overburden.

Since discovery by Rio Tinto in 1994, approximately 17,514 m have been drilled over the Project by the air-core (AC) method. Numerous historical estimates of resources have been conducted since WAK acquired the Project with the latest, reported in 2012, reporting approximately 1.2 billion tonnes of kaolinized granite. No details regarding yield or brightness values are available for this estimate. Methods of geological modelling and estimation for this 2012 resource differ fundamentally from those used in the latest Mineral Resource estimate, and the two are not directly comparable.

CSA Global was provided with a drillhole database covering the Project in its entirety; comprising 688 AC collars for 17,514 m of drilling collar, survey, lithology logging and assay data, and geological surfaces as Surpac digital terrain models (DTMs) defining the top of fresh granite, the base of kaolinized granite, the base of mottled clay and the base of lateritic overburden. Holes were drilled vertically to optimally intersect the mineralised horizon, and 440 assayed drillholes intersect the interpreted mineralisation zones. Specific to M70/1143; contained Mineral Resources have been based upon 367 drillholes, for 9,259 m of drilling.

A topographic surface covering the entire Project area was built by CSA Global from the elevation data contained within collar location information. A three-dimensional solid model of mineralisation was built by CSA Global, constrained entirely by the upper and lower DTM surface limits of the kaolinized granite horizon (defined by base of kaolinized granite and base of mottled clay DTMs). Five separate domains were defined within this model. These solids were used to both select the data to be used during estimation, and to flag the blocks within the resultant block model which were to be populated during estimation. The block model for the Project, defined using a parent cell size of 100 m x 100 m x 2 m (XYZ), was used to define mineralisation.

A block model constrained by the interpreted mineralised envelopes and geological boundary surfaces was constructed. A parent cell size 100 m(E) x 100 m(N) x 2 m(RL) was adopted with standard sub-celling to one-quarter in all directions to maintain the resolution of the mineralised lenses. Samples composited to 2 m length were used to interpolate ISO brightness and kaolin yield (<45 µm in size) into the block model using ordinary kriging interpolation techniques, using two search passes of an oriented ellipsoid. With each successive pass, estimation parameters such as minimum number of informing samples, and restrictions on informing composites contributed from individual drillholes were relaxed. Blocks not estimated after two passes for either variable were assigned the mean of the composites belonging to that object. Block grades were validated both visually and statistically. All modelling was completed using Surpac software.

The density assigned to the mineralisation was 1.9 t/m$^3$.

The Mineral Resource for M70/1143 has been classified as Measured, Indicated and Inferred based on the guidelines specified in JORC Code[1]. The classification level is based upon an assessment of geological understanding of the deposit, geological and grade continuity, drillhole spacing, quality control results, search and interpolation parameters, and an analysis of available density information. The deposit appears to be of sufficient grade, quantity and coherence to have reasonable prospects for eventual economic extraction.

The Mineral Resources falling within M70/1143 are reported by classification in Table 1, reported for the material fraction below 45 µm.

*Table 1: Mineral Resources (<45 µm), M70/1143, May 2019*

| Classification | Kaolinized granite (Mt) | ISO brightness (%) | Yield (%) | Kaolin (Mt) |
|---|---|---|---|---|
| Measured | 38.0 | 82 | 51 | 21.3 |
| Indicated | 27.7 | 83 | 50 | 13.9 |
| Inferred | 43.3 | 83 | 49 | 19.3 |
| **Total** | **109.1** | **82** | **50** | **54.5** |

[1] Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. The JORC Code, 2012 Edition. Prepared by: The Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC).

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# Appendices

# 1 Introduction

## 1.1 Terms of Reference

WA Kaolin Holdings Pty Ltd (WAK) commissioned CSA Global Pty Ltd (CSA Global) to prepare an updated Mineral Resource estimate (MRE) for mining licence M70/1143; part of the WA Kaolin Project ("the Project"), near Wickepin in Western Australia. The WA Kaolin Project comprises five retention licences (R70/40, R70/41, R70/42, R70/44 and R70/45) and a single mining lease (M70/1143).

A large volume of drilling has been completed over much of the area covered by the licences, collected in numerous phases by at least three owners (current and historical). All drillholes have been geologically logged, using a comprehensive logging code system that has been generally consistently maintained between owners.

The deliverables under the scope of work included:

- Mineralisation and geological (lithological, structural, weathering) wireframes
- Block model in Surpac and .csv format
- Mineral Resource report
- Competent Person sign-off on the Mineral Resource report and public release.

## 1.2 JORC Code Compliance

The MRE for the WA Kaolin Project is reported in accordance with the JORC Code[2].

## 1.3 Sources of Information and Reliance on other Experts

CSA Global has completed the scope of work largely based on information provided by WAK. CSA Global has supplemented this information where necessary with other publicly available information.

CSA Global has made all reasonable endeavours to confirm the authenticity and completeness of the technical data on which this report is based; however, CSA Global cannot guarantee the authenticity or completeness of such third-party information.

The report author is not qualified to comment on any legal, environmental, political, or other issues relating to the status of the tenements, or for any marketing and mining considerations related to the economic viability of the WA Kaolin Project deposit.

CSA Global was provided with the information listed in Table 2 to complete the scope of work.

*Table 2: Sources of information*

| Data file | Description |
|---|---|
| wak201706.mdb | Microsoft Access database of drillhole data used to prepare the MRE |

## 1.4 Prior Association and Independence

Neither CSA Global, nor the authors of this report, has or has had previously, any material interest in the WA Kaolin Project nor the mineral properties in which WAK has an interest. CSA Global's relationship with WAK is solely one of professional association between client and independent consultant.

CSA Global is an independent geological and mining consultancy. This report is prepared in return for professional fees based upon agreed commercial rates and the payment of these fees is not contingent on the results of this report.

[2] Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves. The JORC Code, 2012 Edition. Prepared by: The Joint Ore Reserves Committee of The Australasian Institute of Mining and Metallurgy, Australian Institute of Geoscientists and Minerals Council of Australia (JORC).

No member or employee of CSA Global is, or is intended to be, a director, officer, or other direct employee of WAK.

## 1.5 Company and Author Summary

### *1.5.1 CSA Global*

This report has been prepared by CSA Global, a privately-owned consulting company that has been operating from Perth, Western Australia for 30 years.

CSA Global provides multi-disciplinary services to clients in the global resources industry. CSA Global's services include project generation, exploration, resource estimation, project evaluation, development studies, mining operations assistance, and corporate consulting such as valuations and independent technical reports. CSA Global has worked for major clients globally and many junior resource companies. CSA Global personnel have been involved in the preparation of independent reports for listed companies in most international mining jurisdictions.

### *1.5.2 Authors*

The principal author of this report is Matthew Cobb, CSA Global – Principal Resource Geologist. Matthew is a geologist with 19 years' experience in research, exploration, mining, resource development and modelling. His Mineral Resource estimation experience spans a variety of commodities and styles, including industrial minerals. Matthew holds a PhD in geology from Curtin University, and a MSc in geostatistics from Edith Cowan University.

Peer review of this report was completed by Trivindren Naidoo, CSA Global – Principal Geologist. Trivindren is a geologist with over 20 years' experience in mining, exploration and due diligence, spanning a variety of commodities.

Responsibility as Competent Person for Sections 1 and 2 of JORC Table 1 as it relates to this Mineral Resource estimate is held by Dr Ian Wilson, independent Consultant. Dr Wilson has over 40 years' experience in the exploration, and development of kaolin deposits worldwide, and was involved directly with the WA Kaolin Project from 2003 to 2012. Dr Wilson holds a PhD in geology from the University of Leeds. Competent Person responsibility for Section 3 of Table 1 as it relates to this Mineral Resource estimate is assumed by Dr Matthew Cobb.

## 1.6 Competent Person Statement

The information in this report that relates to Sampling Techniques, Data Collection and Exploration Results has been compiled by Dr Ian Wilson, who is an independent consultant to WA Kaolin Holdings Pty Ltd. Dr Wilson has over 40 years' experience in kaolin deposit exploration, definition and development. Dr Wilson is both a member the Institution of Materials Mining and Metallurgy and a fellow of the Geological Society of London. Dr Wilson has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activities which they are supervising to qualify as a Competent Person as defined in the JORC Code. Dr Wilson consents to the disclosure of this information in this report in the form and context in which it appears.

The information in this report that relates to Mineral Resources has been compiled by Dr Matthew Cobb, who is a full-time employee of CSA Global. Dr Cobb is a Member of the Australian Institute of Geoscientists, and has sufficient experience relevant to the style of mineralisation and type of deposit under consideration and to the activities which they are supervising to qualify as a Competent Person as defined in the JORC Code. Dr Cobb consents to the disclosure of this information in this report in the form and context in which it appears.

# 2 Project and Exploration History

## 2.1 Project Location and Access

The WA Kaolin Project is situated adjacent to the Western Australian wheatbelt town of Wickepin, approximately 200 km east-southeast of the state capital, Perth. The town and the Project are well serviced by sealed road, and by rail to the industrial deep-water port of Kwinana, in the southern regions of Perth.

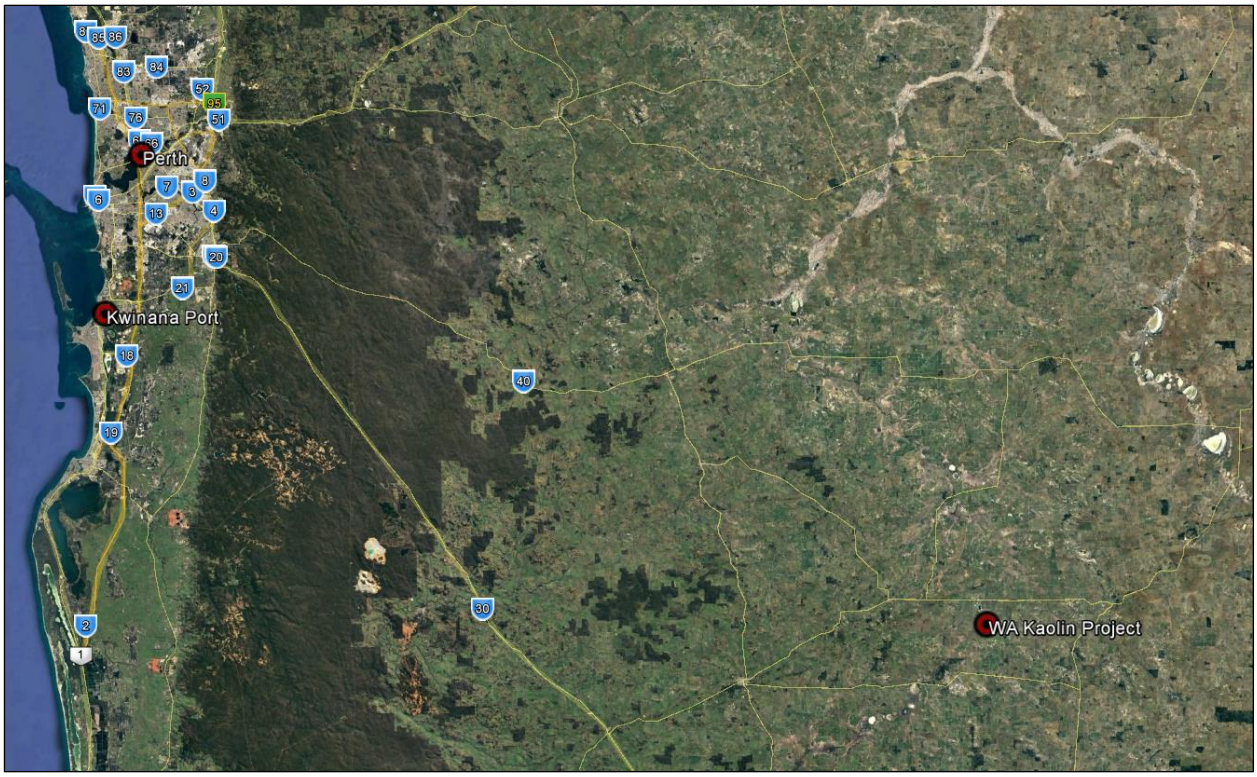


*Figure 1: WA Kaolin Project location and road access*

## 2.2 Tenure

The WA Kaolin Project currently comprises five retention licences and a single mining lease. These tenements are listed in Table 3 and presented in Figure 2.

*Table 3: Tenements within the WA Kaolin Project*

| WA Kaolin Project tenements | Area (ha) | Expiry |
|---|---|---|
| R70/40 | 2,010.3 | 09/05/2022 |
| R70/41 | 841 | 09/05/2022 |
| R70/42 | 1,822.8 | 09/05/2022 |
| R70/43 | 2,475.3 | 09/05/2022 |
| R70/44 | 2,849.3 | 09/05/2022 |
| M70/1143 | 996.3 | 20/05/2024 |

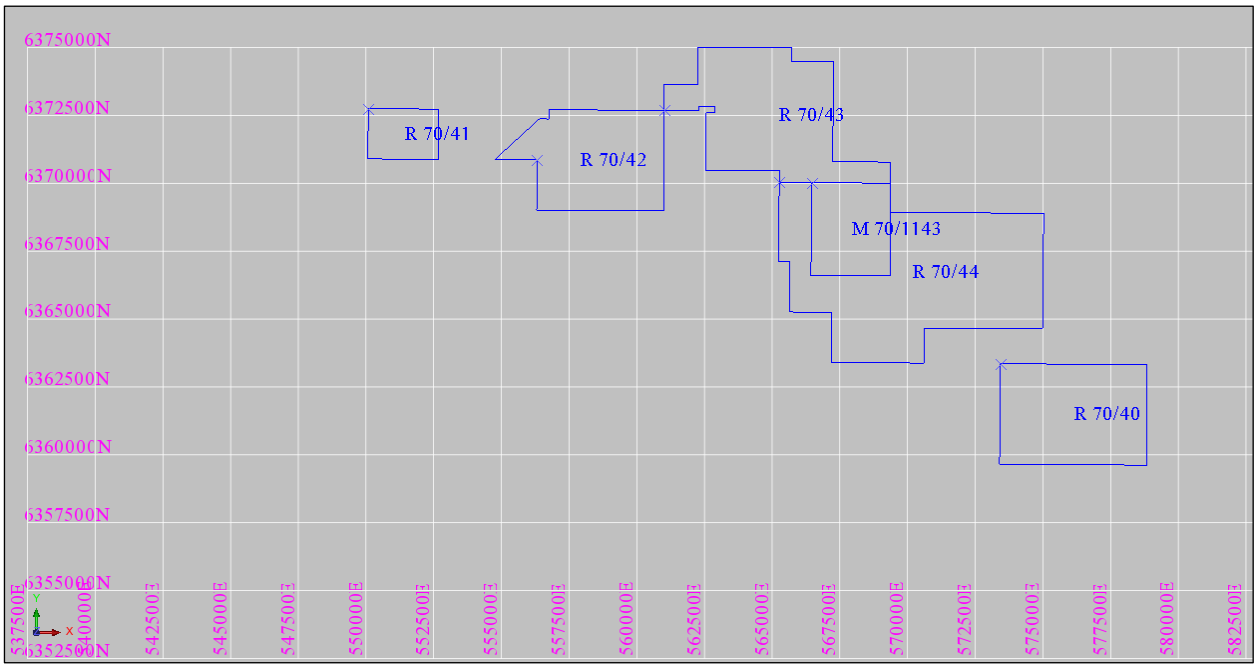


*Figure 2: Tenements comprising the WA Kaolin Project (grid is MGA94, Zone 50)*

## 2.3 Climate and Physiography

Regional climatic conditions for Wickepin are those typical of the Western Australian wheatbelt region, with maximum and minimum temperatures ranging from approximately 30–15°C, and 15–5°C respectively. The area experiences defined seasons, with January the historically hottest month and July the coldest. Average annual rainfall is historically more than 490 mm, with January the driest month, averaging only 13.2 mm; and July the wettest, averaging 85.8 mm.

The Project area is overwhelmingly dominated by farmland, upon which the predominant livestock and crops are sheep and wheat. The native vegetation system of the area is Wandoo and York-gum woodland. The area forms part of the Avon River catchment and drains to the north.

## 2.4 Infrastructure

Current Project infrastructure is minimal for the WA Kaolin Project, with mining taking place intermittently on a campaign basis, with no substantial permanent infrastructure other than two shallow pits within M70/1143 (Figure 3 and Figure 4) . No on-site facilities currently exist, with produced material being hauled by rail to a processing facility near the Kwinana Port.

As at May 2019, development applications are in place for the de-gritting and processing facility to be relocated to the Wickepin Shire.

*Figure 3: Main Pit M70/1143*

*Figure 4: Secondary Pit M70/1143*

## 2.5 Project History

Previously reported exploration history for the WA Kaolin Project indicates the earliest work being undertaken by CRAE (as a subsidiary of Rio Tinto) in 1994. During 1995, Rio Tinto withdrew from the kaolin business and looked to divest their kaolin assets. WAK acquired the Project during this time. WAK conducted a further round of drilling in 2003–2004, which was followed up again by further drilling in 2006. This last round of drilling was conducted as part of a due diligence process by CAEMI (a subsidiary of Valé), while looking for growth opportunities for their kaolin business. No further drilling has been conducted over the Project since 2006.

## 2.6 Previous Mineral Resource Estimates

Several historical estimates of kaolin resources have been produced for the WA Kaolin Project since 2003, with the most recent being reported with a cut-off date of July 2012.

This resource reports an endowment of kaolinized granite of 1.2 billion tonnes; however, the area over which mineralisation was considered, the paradigm by which ore and waste were identified, and the estimation methodologies employed were fundamentally different to those utilised in the current MRE. Historical resources were defined within larger exploration licences (subsets of which comprise the current retention licences) and the ore/waste contact was defined based on subjective visual logging of cream/white kaolinized granite as the ore horizon within individual drillholes.

The top and base of the identified ore horizon were contoured to generate digital terrain model (DTM) surfaces within the Project, and then polygons were defined in plan to encapsulate regions where the logged cream/white kaolinized granite thickness was estimated to exceed 8 m. Using a density value of 1.9, tonnages of kaolinized granite were subsequently calculated from these encapsulated volumes. No quantitative measure of yield nor brightness were produced.

Given the disparities in area considered, and estimation and reporting methodologies, these historical resources are not directly comparable to the current estimate.

## 2.7 Mining Status

The WA Kaolin Project is mined on a campaign basis from M70/1143.

# 3 Geological Setting and Mineralisation

## 3.1 Regional Geology

The WA Kaolin Project is located within the Western Gneiss Terrane of the Yilgarn Craton; an area dominated by Meso- to Neoarchaean granitoids and associated intervening greenstone belts. The granitoids of the region have been assigned ages of 3000–2600 Ma.

## 3.2 Property Geology

Within the WA Kaolin Project, the lithologies are dominated by granitic basement of the Yilgarn terrane, into which dioritic and/doleritic dykes of Paleoproterozoic age (c. 2400 Ma) have intruded. These dykes strike east-northeast through the Project area and are associated with the Widgiemooltha large igneous province. Both the granitic basement and dykes are overlain to varying depths, by a regolith profile which includes (in order of decreasing depth) transitional and saprolitic horizons, a mottled clay zone, and a lateritic/colluvial horizon.

## 3.3 Deposit Geology and Mineralisation

### *3.3.1 Lithology, Weathering and Oxidation*

The geology of the WA Kaolin Project deposits is typified by bleached saprolite, comprising predominantly of the minerals, kaolinite and quartz. To varying degrees, this composition may be overprinted by haematitic and goethitic iron oxides.

### *3.3.2 Summary of Mineralisation and Controls*

The mineralisation of the WA Kaolin Project is weathering derived; constrained by a particular regolith horizon in an area of generally low relief. The result is a shallow, laterally extensive and sub-horizontal deposit.

### *3.3.3 Factors Affecting Continuity of Grade and Geology*

Continuity of grade at the Project is heavily controlled by the depth and completeness of weathering over the parent primary lithology (granite) and the presence of potentially contaminating lithologies (intrusive mafic dykes).

# 4 Sampling Techniques and Data

This section addresses the requirements for the JORC Code Table 1 Section 1. This information is summarised in Appendix 1 of this report.

## 4.1 Data Collection Cut-Off Date

The Mineral Resource block model was prepared using all drilling data available at 1 May 2019 as supplied by WAK. The data was stored in a Microsoft Access database named "wak_20190507.mdb". No drilling has been undertaken over the Project since March 2006.

## 4.2 Drilling Techniques and History

All drillholes within the database provided by WAK have been drilled by air-core (AC), which is considered the most suitable method for the drilling and sampling of regolith. Holes were drilled to blade refusal. Collars have been drilled in a number of campaigns between 1994 and 2006, by three companies; CRA (now Rio Tinto), WAK, and CAEMI (part of Valé). The latest holes drilled by CAEMI were conducted in a campaign of due diligence while WAK maintained ownership of the Project. Samples were collected from the inside return tube, through a cyclone and deposited in spoils piles on the ground on a per-metre basis. A summary of all drilling over the whole project is provided in Table 4.

*Table 4: Drilling history*

| Year(s) | Company | No. of holes | Hole type | Metres |
|---|---|---|---|---|
| 1994 | CRA | 46 | AC | 1,394 |
| 1995 | CRA | 237 | AC | 7,363 |
| 1996 | CRA | 59 | AC | 1,792 |
| 2006 | CAEMI | 160 | AC | 3,261 |
| 2003 | WAK | 127 | AC | 2,471 |
| 2004 | WAK | 59 | AC | 1,233 |

## 4.3 Sampling Techniques and Sample Recovery

Samples were recovered directly from the rig-mounted cyclone via the inner return tube of the drill rods, whereupon they were deposited as spoils piles on the ground on a per-metre basis.

## 4.4 Logging

Logging for the WA Kaolin Project drilling was completed on a semi-qualitative basis using one of two defined set of codes corresponding to the main regolith horizons. While no documentation is available to definitively separate the two differing sets of logging codes, it is apparent from the dates of completion within the drilling, that CRA data have been collected using one set of codes, and WAK/CAEMI data have been collected using a second. However, the material of importance; kaolinized granite, mottled clay, granite and laterite are recorded using common codes across both sets of logging. The Competent Person, Dr Ian Wilson was involved in all phases of drilling, logging and sampling. The level of detail in the logging is considered appropriate for use in Mineral Resource estimation.

## 4.5 Subsampling Techniques and Sample Preparation

In all phases of drilling, samples were collected via scoop sampling of the drill spoil piles that were deposited on the ground on a per-metre basis. Approximately 1–2 kg of material was collected for each sample. Intervals from each drillhole were selected for sampling on the basis of visual appraisal of whiteness or coloration of each metre. The nature of the industrial mineral under consideration is such that scoop sampling in such a fashion is considered by the Competent Person to be an appropriate method of sampling.

## 4.6 Analytical Methods

Samples were screened to <45 µm, then yield values were determined via mass balance. Brightness values were determined via reflectance metering using standard operating conditions as specified in ISO 2470.

## 4.7 Verification and Sampling and Assaying

### *4.7.1 Twin Drilling*

Several holes within M70/1143, from drilling conducted by CRA in 1994 and 1995, were twinned by WAK in 2003. Results show very high correlation between both logged lithologies and brightness values (Figure 5).

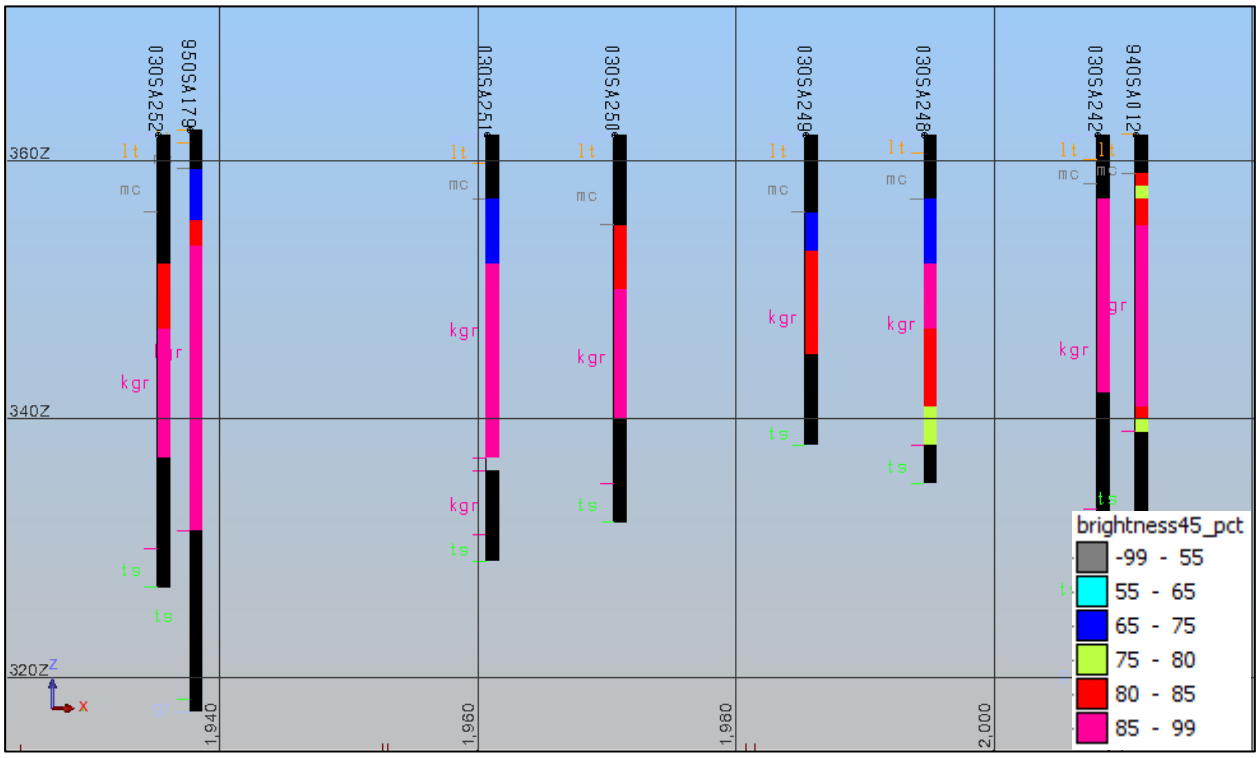


*Figure 5: Twin drilling from the WA Kaolin Project*

## 4.8 Location of Data Points

### *4.8.1 Collar Data*

Historical collars drilled by Vale were located by surveyor, though no detail exists on methods used. Collars drilled by WAK have been located by RTK global positioning system (GPS). Vertical positioning of collars was based upon a DTM purchased from the Department of Planning, Lands and Heritage (formerly the Department of Land Administration) and is accurate to within 1.5 m.

### *4.8.2 Downhole Survey Data*

Holes drilled into the WA Kaolin Project are all vertical and do not exceed 60 m in depth. Holes were not surveyed downhole, and deviation of holes is unlikely to be material.

## 4.9 Spacing and Distribution

Majority of drilling within M70/1143 is spaced at 100 m between collars, with select areas drilled down to 25 m. Spacing increases to between 200 m and 400 m at the peripheries of the tenement (Figure 6).

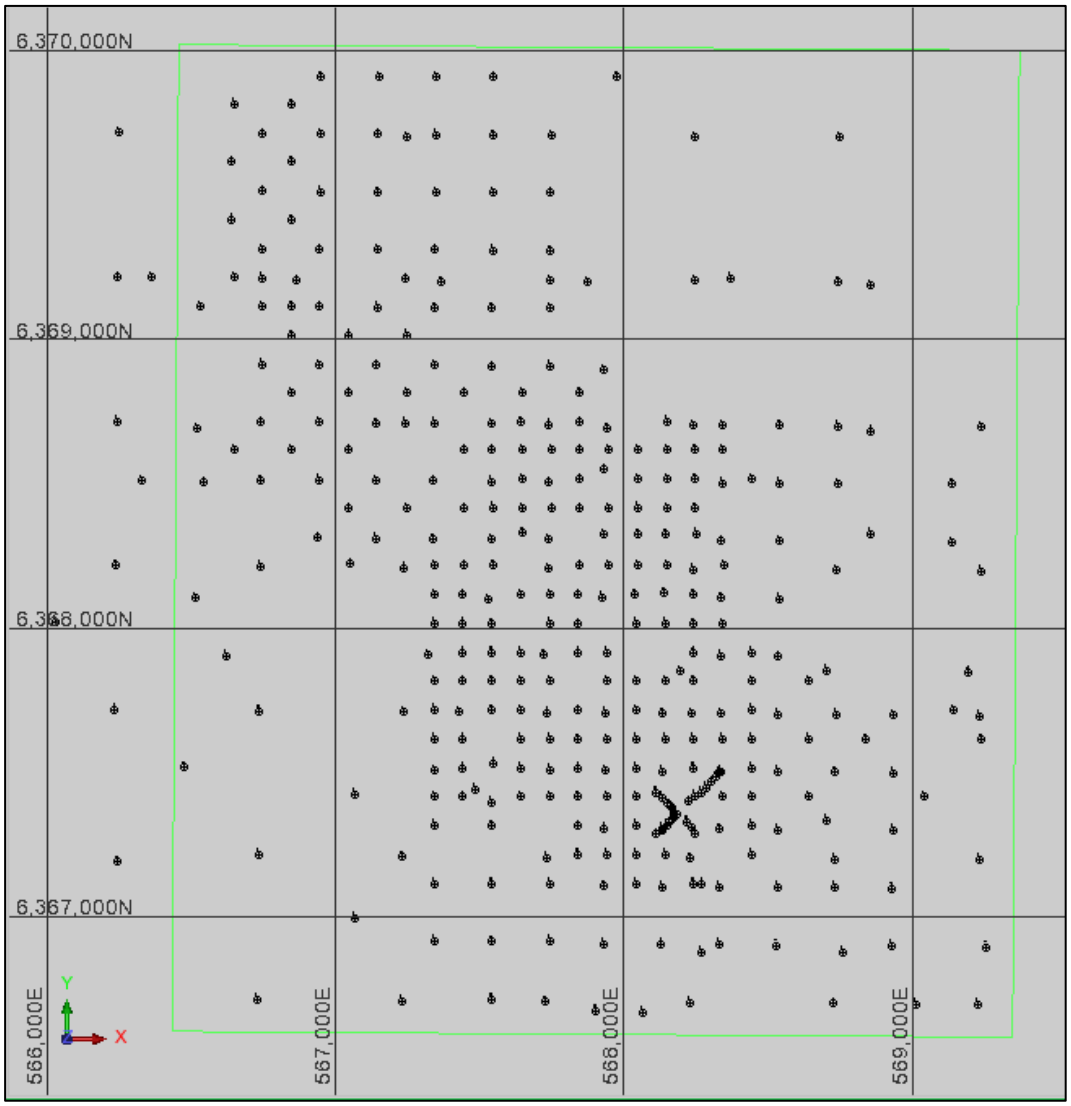


*Figure 6: M70/1143 drill collar distribution*

## 4.10 Orientation in relation to Geological Structure

The mineralisation of the WA Kaolin Project is weathering derived; constrained by a particular regolith horizon in an area of generally low relief. The result is a shallow, laterally extensive and sub-horizontal deposit. The vertical orientation of the holes drilled into the WA Kaolin Project deposit can all be assumed to orthogonally intersect the main geological structure controlling mineralisation (Figure 7).

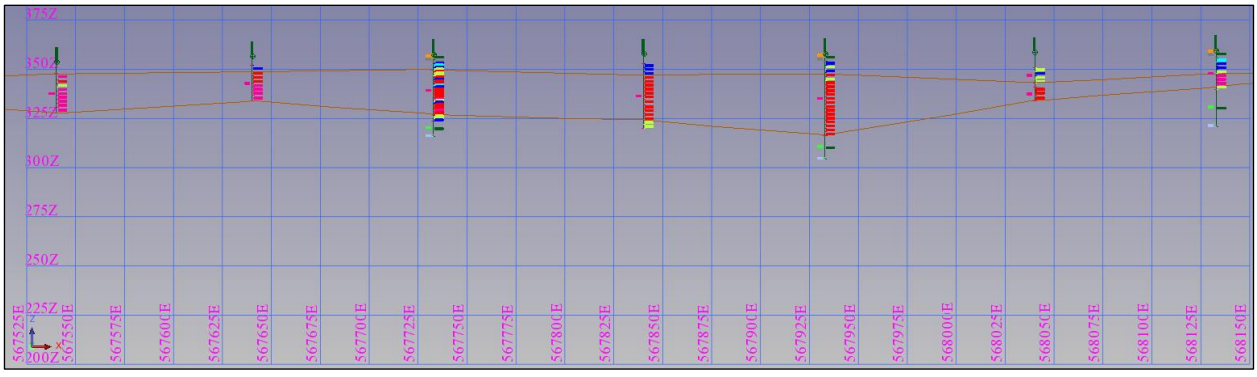


*Figure 7: WA Kaolin Project, mineralisation in relation to drillhole orientation (Section 6367715 mN)*

## 4.11 Sample and Data Security

Given the nature of the material under investigation, sample security is not considered a material risk to the Mineral Resource reported herein.

## 4.12 Audits and Reviews

Available historical reports do not detail the undertaking or results of any data audits.

## 4.13 Site and Laboratory Inspections

Dr Matthew Cobb visited site on 4 July 2019. At the time, no drilling activity was being undertaken. However, Dr Ian Wilson has visited the WA Kaolin Project numerous times and has been intimately involved in the collection of drilling data over the Project. This involvement has included:

- Inspection of operating drill rigs
- Review of sampling procedures
- Verification of the location of drill collars
- Inspection of data capture systems (logging)
- Review of the site geology
- Review sample handling and storage facilities.

The site visit by Dr Matthew Cobb confirmed that campaign mining is being undertaken for mineralisation volumes that are incorporated within the modelled mineralisation of this MRE. There were no negative outcomes from any of the above inspections, and all samples and geological data were deemed fit for use in the MRE.

# 5 Quality Assurance

Other than the verification twin drilling of historical holes by CAEMI, no details are available regarding the implementation of quality assurance procedures during sample collection. However, with consideration of the industrial mineral nature of the material under investigation and the application of an internationally recognised standard to the analytical procedure used for determining grade/quality values (brightness) both Dr Ian Wilson and Dr Matthew Cobb as Competent Persons consider the development and implementation of any quality assurance program to be unnecessary.

## 5.1 Data Quality Assessment by Competent Person

Based on an assessment of the data, the Competent Persons consider the entire dataset to be acceptable for resource estimation with assaying posing minimal risk to the overall confidence level of the MRE.

## 5.2 Data Import and Validation

All drillhole data was imported into Surpac™ software. Validation of the data was then completed which included checks for:

- Missing sample intervals
- Overlapping samples
- Drill collars with no downhole data.

No significant errors were detected in the supplied data.

# 6 Geological Modelling

## 6.1 Software

Geological modelling was undertaken by CSA Global using Surpac software.

All interpreted strings were "snapped" to drillholes based on logged lithologies and chemical assays. The strings were then triangulated to form wireframes.

## 6.2 Preliminary Statistical Assessment

Initial assessment of the values for both brightness and yield (<45 µm fraction) within the Project data reveals a slightly negatively skewed population for brightness values around a median of approximately 82% (Figure 8), and a pseudo-normal population for yield, centred around a value of approximately 50% (Figure 9).

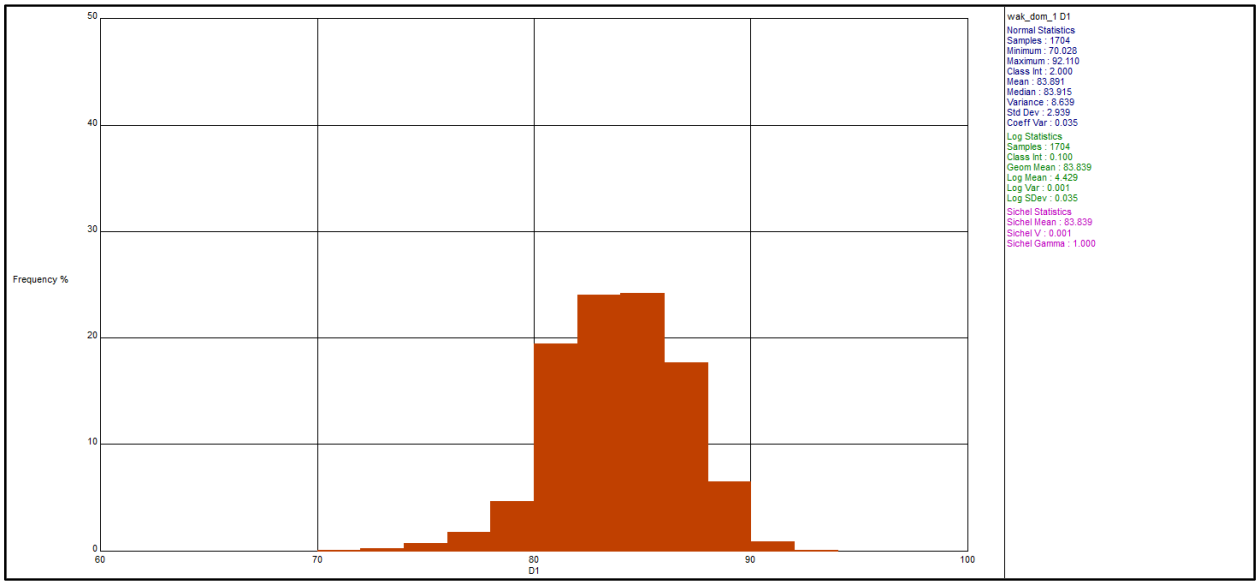


*Figure 8: Distribution of brightness values within data for M70/1143*

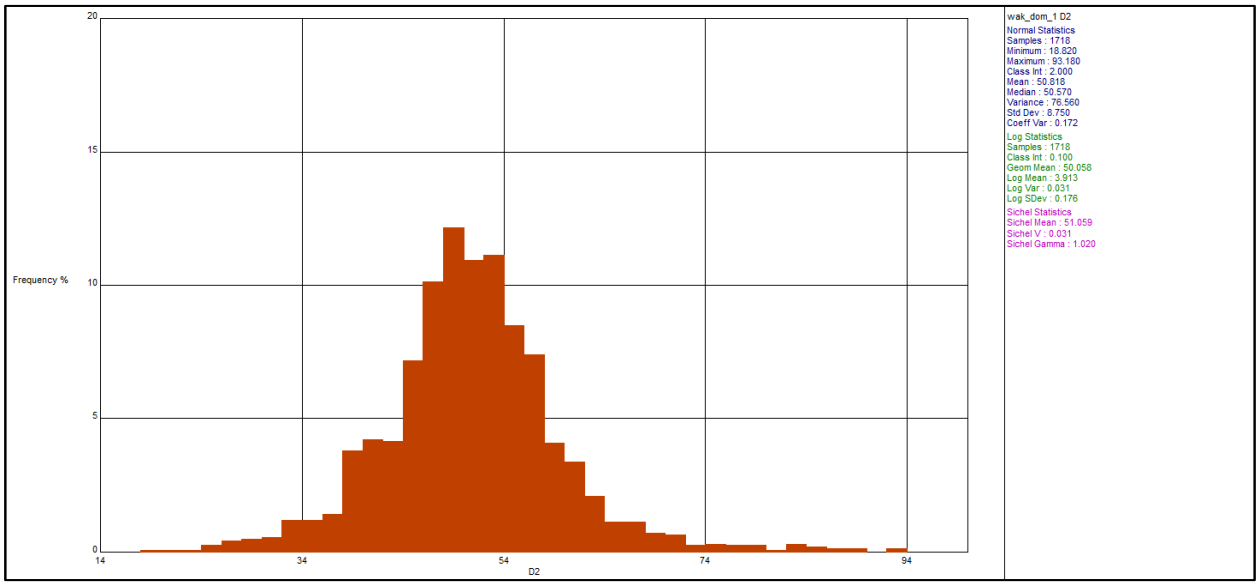


*Figure 9: Distribution of yield values for data within M70/1143*

## 6.3 Lithology, Structure and Alteration

The mineralisation contained within the WA Kaolin Project is the product of weathering of the underlying granite. Modelling of the upper and lower surfaces of the host horizon for kaolin mineralisation is tantamount to modelling the various oxidation states within the weathered granite.

## 6.4 Mineralisation

Mineralisation at the WA Kaolin Project is wholly constrained within the regolith horizon defined by the lithological code corresponding to "kaolinized granite", which represents the saprolitic horizon within the weathering profile above the host granite within the Project area. This horizon has been modelled by two DTM surfaces defining the lower contact to either transitionally weathered granite or granite, and the upper contact to either mottled zone clays or laterite (Figure 10 and Figure 11).

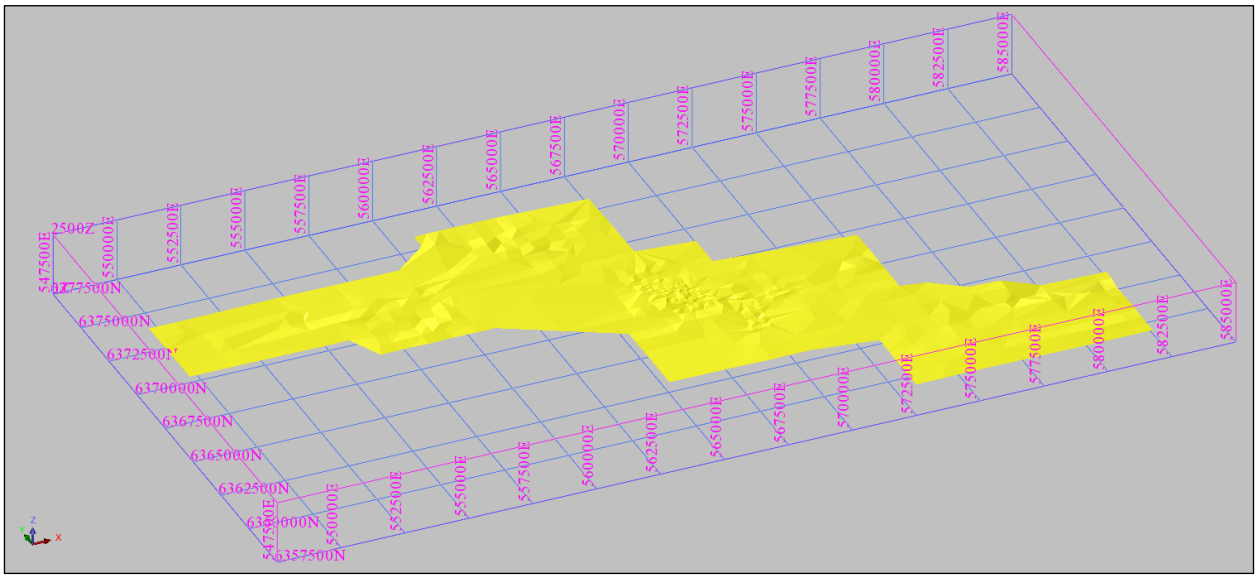


*Figure 10: Geological surface extents, WA Kaolin Project*

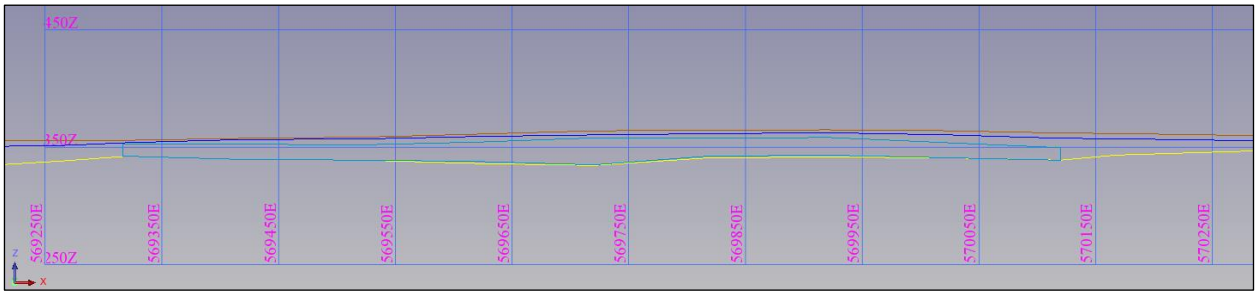


*Figure 11: Cross section showing (top to bottom) base of laterite surface, base of mottled clay surface, mineralisation, base of kaolinized granite (Section 6366500 mN)*

Within this horizon, the mineralised body has been defined by a nominal 80% brightness cut-off on the basis that this value is the target cut-off for production within the pits currently being mined on M70/1143. The result is a number of highly tabular bodies that are sub-horizontal and highly laterally continuous (Figure 12).

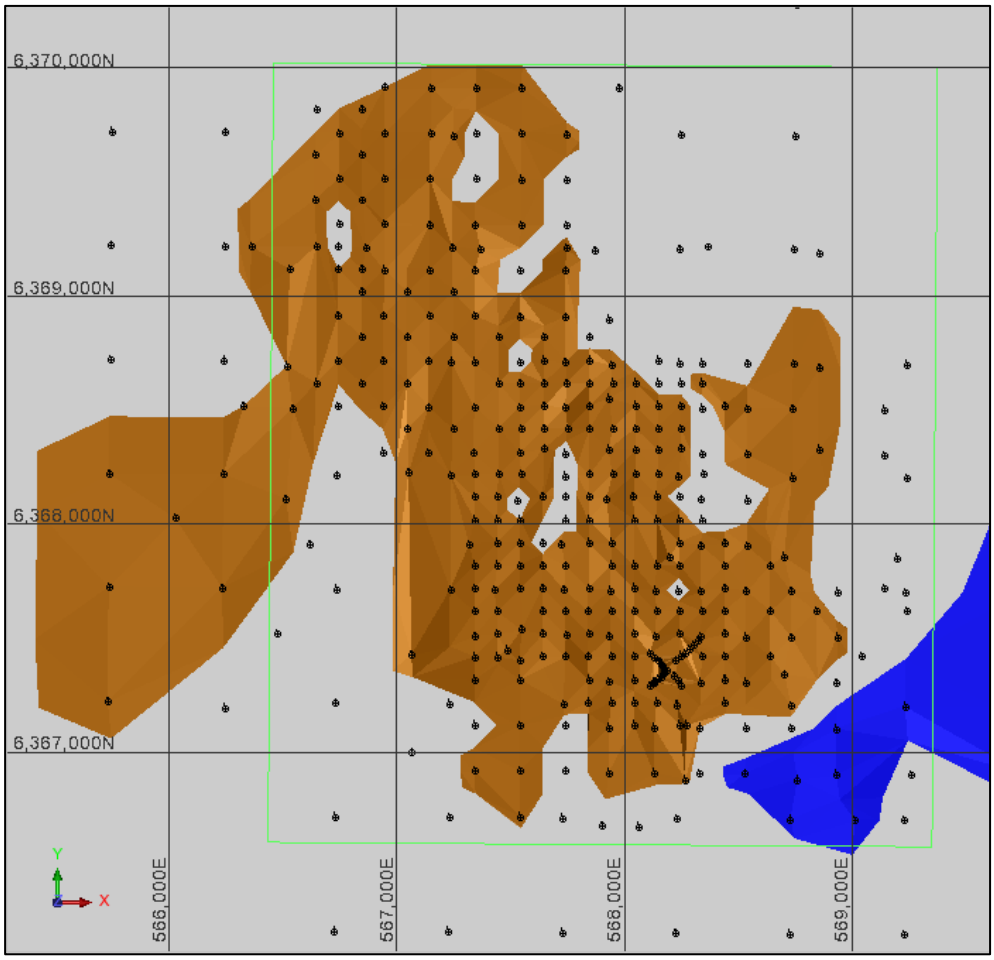


*Figure 12: Mineralisation domains M70/1143; WA Kaolin Project*

The following techniques and guidelines were employed when interpreting the mineralisation:

- Drillholes were appraised in north-south sections, displayed on screen with a clipping window set to half the distance from adjacent sections
- Interpreted strings were snapped to drillhole intervals
- A nominal 2 m minimum thickness was used for the purposes of mineralisation continuity
- Where drillholes existed, and had the host horizon (kaolinized granite) logged but no assay data, they were either excluded or in select cases, used as vertices for the interpreted mineralisation
- If a mineralised envelope did not extend to the next section, it was projected a maximum of halfway to the next section and terminated.

## 6.5 Topography

A topographic surface was built for the WA Kaolin Project using the drillhole collar data, and then extended horizontally where required to ensure coverage and appropriate coding of the subsequent block model (Figure 13).

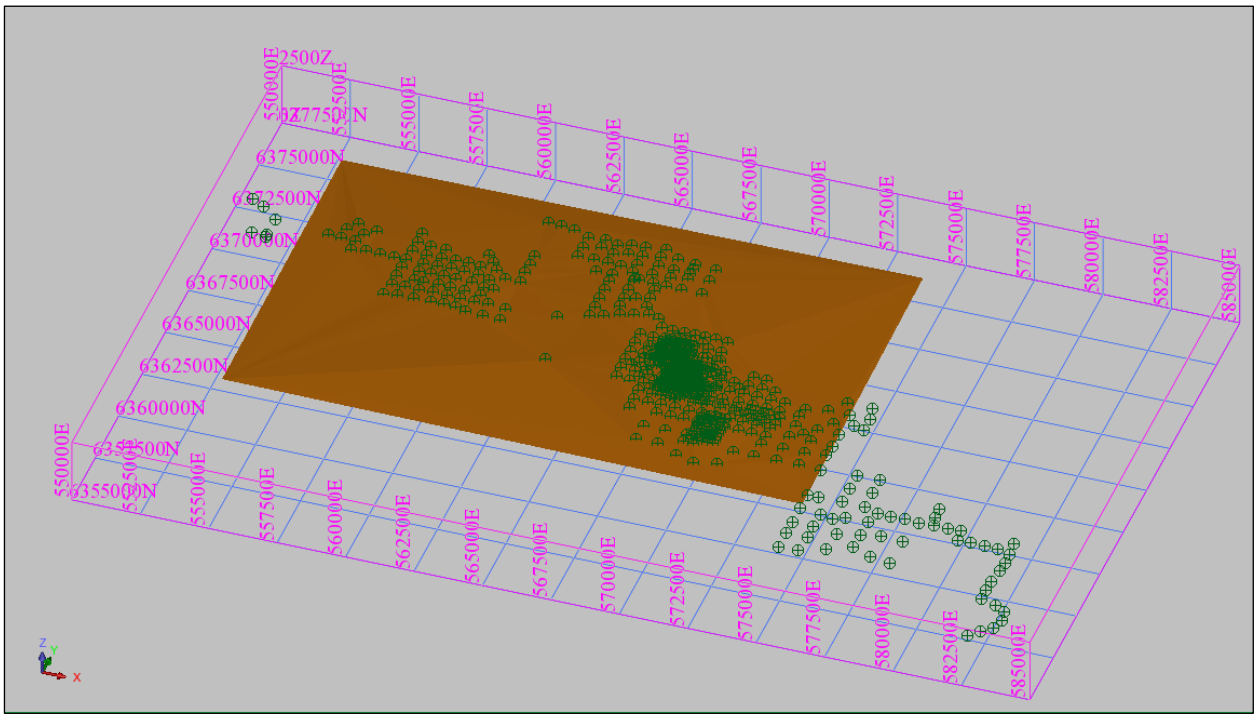


*Figure 13: WA Kaolin Project topographic surface, as built from drillhole collars*

# 7 Statistical and Geostatistical Analysis

## 7.1 Summary

Data were analysed using a combination of Surpac version 6.6.2, GeoAccess version 2.1.12.0.5, and Supervisor version 8.6.

The variables under consideration for the WA Kaolin Project are ISO brightness and yield. Each of these variables was subject to classical and geostatistical exploratory data analysis in preparation for Mineral Resource estimation.

## 7.2 Data Coding and Composite Length Selection

To ensure the appropriate data are used in both classical statistical and geostatistical analysis, the mineralised wireframes defined during modelling were used to flag drillhole samples within the drillhole database (using Surpac), where they intersected each wireframe object. Samples were then extracted on a per object basis for further analysis.

Raw sample lengths within the WAK database supplied to CSA Global were distributed across a variety of intervals ranging from 1 m to 10 m. Over 90% of the data comprised sample intervals of 2 m or less (Figure 14).

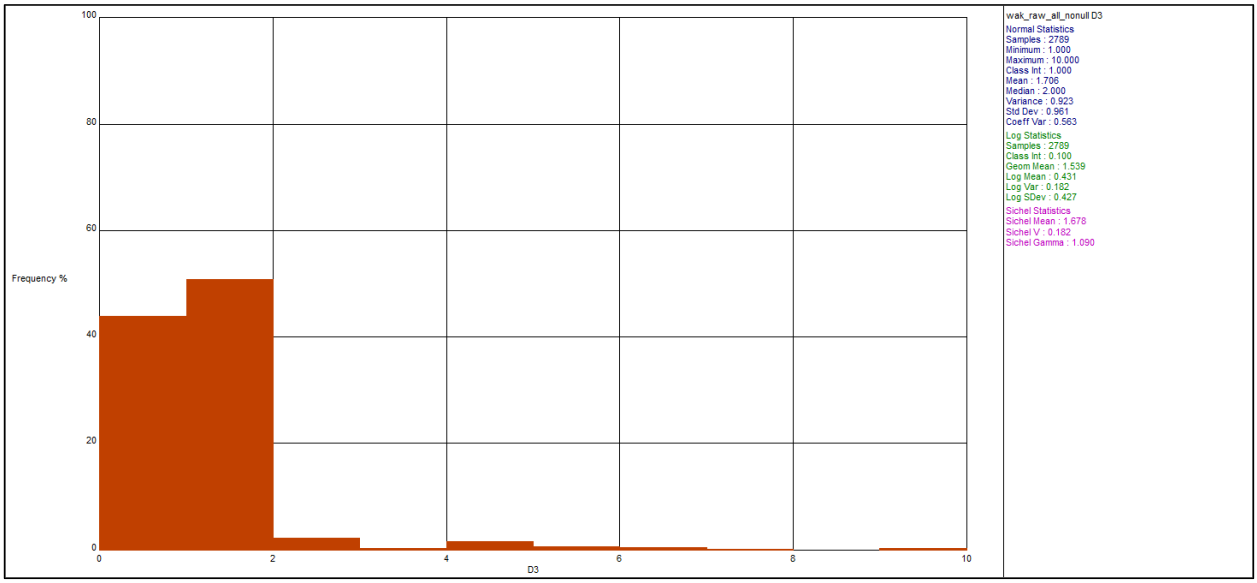


*Figure 14: Raw sample length histogram, WA Kaolin Project*

Based on the sample length analysis conducted, a composite interval of 2 m was selected for further analysis. This length was selected to provide the most consistent sample support length given the minimum interval selected for mineralisation modelling, while minimising the degree to which longer sample intervals were split.

## 7.3 Statistical Analysis

The two variables under consideration were the ISO brightness factor determined for the <45 µm fraction of each sample, and the yield percentage of the total sample for the <45 µm fraction.

Summary statistics for each domain for each variable are presented in Figure 12, Table 5 and Table 6.

*Table 5: Summary statistics; brightness, WA Kaolin Project, M70/1143*

| Summary statistics; brightness | |
|---|---|
| Count | 1,742 |
| Minimum | 0 |
| Maximum | 92.11 |
| Mean | 82.14 |
| Median | 83.75 |
| Variance | 149.61 |
| Coefficient of variation | 0.15 |

*Table 6: Summary statistics; yield, WA Kaolin Project, M70/1143*

| Summary statistics; yield | |
|---|---|
| Count | 1,742 |
| Minimum | 0 |
| Maximum | 93.18 |
| Mean | 50.12 |
| Median | 50.43 |
| Variance | 110.61 |
| Coefficient of variation | 0.21 |

## 7.4 Treatment of Outliers

A review of grade outliers was undertaken to ensure that extreme grades are treated appropriately during grade interpolation. Brightness and yield values for each mineralised domain were assessed using distribution coefficient of variation values, log-probability and histogram plots, to identify any extreme high-grade values. Data for both brightness and yield for each mineralised domain showed pseudo-normal distributions with no significantly high-grade outliers. Consequently, no top cuts were applied to either variable for any domain.

## 7.5 Geostatistical Analysis

### *7.5.1 Variography*

Variography for the WA Kaolin Project was conducted using Supervisor™ 8.6 software. Experimental semi-variograms were generated for both ISO brightness and yield utilising the input composites from all wireframe objects in combination. Model semi-variograms were fitted to these results along the three principal directions of anisotropy. Resultant models are presented in Figure 15.

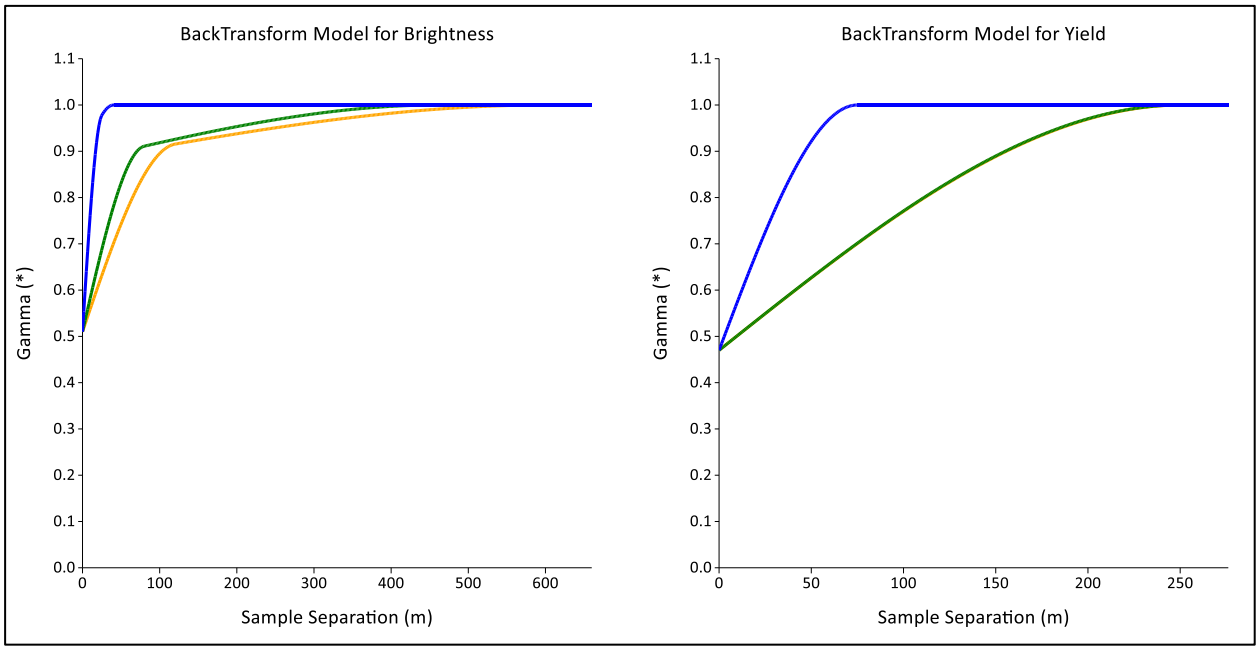


*Figure 15: Semi-variogram models used for brightness and yield estimation*

### *7.5.2 Quantitative Kriging Neighbourhood Analysis and Block Size Selection*

Using the semi-variogram model for ISO brightness, quantitative kriging neighbourhood analysis was used to define an optimal block size. Kriging efficiency and slope of regression were assessed for a variety of block sizes, in both a well and poorly informed portion of the deposit. The final block size selected was 100 m x 100 m x 2 m (X x Y x Z), which corresponds to the sample spacing within very well-informed areas of the Project but presents a suitably large block size for the less well-informed regions.

Quantitative kriging neighbourhood analysis was further undertaken to optimise the estimate as follows:

- On choosing a block size, optimum minimum and maximum samples were chosen. The maximum was set at the lowest number of samples from which consistently good slope of regression and kriging efficiency could be achieved. The minimum was defined as the lowest minimum from which moderate to good statistics could be derived.
- On choosing the minimum/maximum samples, search ellipse ranges were defined. The ranges chosen for Pass 1 approximated the first structure of the variogram. For Pass 2, the range equated to the full range in the variogram model in all three directions.
- Negative weights were reviewed at each stage to ensure the parameters chosen were not leading to excessive negative weights (sample redundancy).
- Discretisation was defined at X x Y x Z.
- Maximum number of samples allowed per each individual drillhole, per estimate, was set to 6.

Table 7 presents the resulting search parameters.

*Table 7: Search parameters for Mineral Resource estimation, WA Kaolin Project*

| Pass | Variable | Minimum samples | Maximum samples | Maximum per hole | Surpac rotation X | Surpac rotation Y | Surpac rotation Z | Range 1 | Range 2 | Range 3 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Brightness | 4 | 30 | 6 | 110 | 0 | 0 | 396 | 303 | 26 |
| | Yield | 4 | 30 | 6 | 90 | 0 | 0 | 166 | 166 | 50 |
| 2 | Brightness | 4 | 30 | 6 | 110 | 0 | 0 | 600 | 460 | 40 |
| | Yield | 4 | 30 | 6 | 90 | 0 | 0 | 251 | 251 | 75 |

# 8 Density

## 8.1 Methodology

Previous work by CRAE (Rio Tinto) on the WA Kaolin Project described a bulk density value of 1.9 for the Mineral Resources of the area. No details are available on the derivation of this value; however, cross-referencing with AusIMM Monograph 9 (Field Geologists Handbook) reveals this to be a suitable value and has been adopted for the current Mineral Resource. The Competent Person considers the selected value to be appropriate for the deposit type, and notes that the value is routinely used for estimating tonnages of kaolin deposits resulting from the weathering of granites.

# 9 Block Modelling

## 9.1 Software

Block modelling was undertaken using Surpac software.

## 9.2 Block Model Construction

Based on block size parameters selected during quantitative kriging neighbourhood analysis (see Section 7.5.2), a block model was built for the WA Kaolin Project with the dimensions and parameters presented in Table 8. The attributes shown in Table 9 were then added to the block model.

The block model was then coded using the appropriate wireframes for mineralisation and also lithology (granite, kaolinized granite, mottled zone, lateritic overburden). The topographic surface was used to code the model appropriately for air.

A block model (wak_20190515.mdl) was created to encompass the full extent of the modelled mineralisation for the WA Kaolin Project deposit. Block model parameters are shown in Table 8 and block model attributes are shown in Table 9.

The block model used a parent cell size of 100 m(E) x 100 m(N) x 2 m(RL) with sub-celling to one-quarter in all directions to maintain the resolution of the mineralised lenses.

*Table 8: Block model parameters, WA Kaolin Project*

| Parameter | X | Y | Z |
|---|---|---|---|
| Minimum coordinates | 553500 | 6359200 | 200 |
| Maximum coordinates | 579100 | 6375200 | 400 |
| Nominal block size | 100 | 100 | 2 |
| Minimum block size | 25 | 25 | 0.5 |

*Table 9: Block model variables, WA Kaolin Project*

| Attribute name | Description |
|---|---|
| ave_dis_bright | Average distance brightness |
| ave_dis_yield | Average distance yield |
| bid | bulk density – default set to minus 1; set default post estimation |
| bright | Brightness value |
| vibrato | Block variance brightness |
| vialed | Block variance yield |
| class | Measured, Indicated, Inferred, unclassified |
| class_code | 1 = Measured, 2 = Indicated, 3 = Inferred, 4 = unclassified |
| ke_bright | Kriging efficiency brightness |
| ke_yield | Kriging efficiency yield |
| kv_bright | Kriging variance brightness |
| kv_yield | Kriging variance yield |
| lag_bright | Lagrange multiplier brightness |
| lag_yield | Lagrange multiplier yield |
| lithology | Can be granite, kgr, mineralisation, mottled, laterite or air |
| min_dis_bright | Minimum distance brightness |
| min_dis_yield | Minimum distance yield |
| negwt_bright | Negative weights brightness |
| negwt_yield | Negative weights yield |
| num_sam_bright | Number of informing samples brightness |

| Attribute name | Description |
|---|---|
| num_sam_yield | Number of informing samples yield |
| pass_bright | Estimation pass brightness |
| pass_yield | Estimation pass yield |
| pod | Wireframe object number |
| slope_bright | Slope of regression brightness |
| slope_yield | Slope of regression yield |
| type | Can be oxide, transitional, fresh, overburden or air |
| yield | Yield value |
| yield_fraction | Yield expressed as a decimal fraction of 1 |

## 9.3 Grade Interpolation

For the purposes of domain coding, input data selection and estimation, each domain boundary was treated as a hard boundary. ISO brightness and yield were estimated into each mineralised domain via ordinary kriging using two search passes of an oriented ellipsoid. With each successive pass, estimation parameters such as minimum number of informing samples, and restrictions on informing composites contributed from individual drillholes were relaxed. Blocks not estimated after two passes for either variable were assigned the mean of the composites belonging to that object.

## 9.4 Block Model Validation

Validation of the grade estimates was completed by:

- Visual checks on screen in cross-section and plan view to ensure that block model grades honour the grade of sample composites
- Statistical comparison of sample and block grades
- Generation of swath plots to compare input and output grades in a semi-local sense, by easting, northing and elevation.

### *9.4.1 Visual Validation*

The estimation of ISO brightness and yield showed strong local representation of the raw, drillhole assays and input composites. No material risks were found for the global or local estimate.

### *9.4.2 Statistical Validation*

Comparison of Summary statistics between input data and block model results shows a suitable level of agreement, with a minor variance reduction and corresponding increase in minimum values and reduction of maximum values within the block estimates, as expected from the process of ordinary kriging (Table 10 and Table 11). Given the comprehensive and even distribution of drilling over the deposit for M70/1143 (Figure 6) data clustering is not considered to have had any material impact on the estimate.

*Table 10: Summary statistics for brightness estimates, M70/1143*

| Summary statistics; brightness | | |
|---|---|---|
| **Data** | **Input data** | **Block model** |
| Minimum | 0 | 25 |
| Maximum | 92.11 | 88.00 |
| Mean | 82.14 | 80.00 |
| Median | 83.75 | 83.00 |
| Variance | 149.61 | 80.00 |
| Coefficient of variation | 0.15 | 0.00 |

*Table 11: Summary statistics for yield estimates, M70/1143*

| Summary statistics; yield | | |
|---|---|---|
| **Domain** | **Input data** | **Block model** |
| Minimum | 0 | 0 |
| Maximum | 93.18 | 82.43 |
| Mean | 50.12 | 48.55 |
| Median | 50.43 | 49.72 |
| Variance | 110.61 | 72.87 |
| Coefficient of variation | 0.21 | 0.18 |

### *9.4.3 Swath Plots*

Model validation plots show a suitable reproduction of estimated block means and local grades compared to top-cut composites (Figure 16).

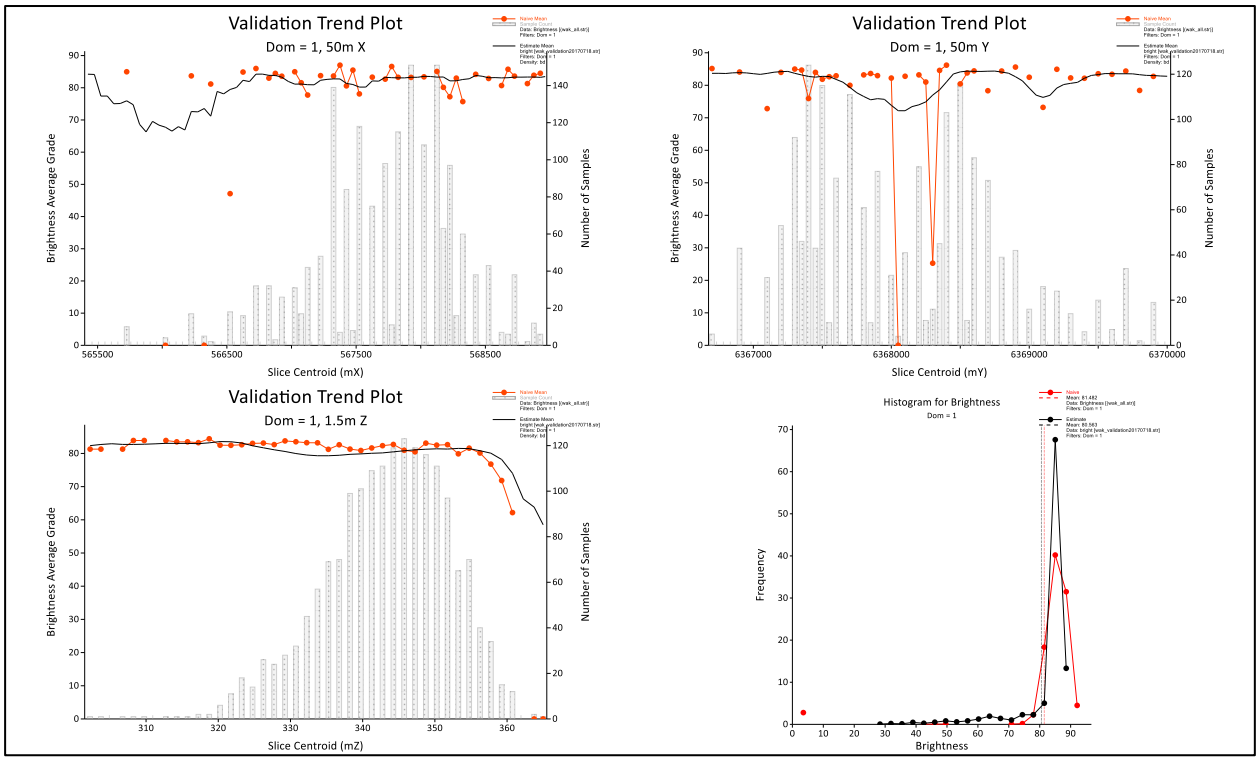


*Figure 16: Model validation plots, M70/1143*

# 10 Mineral Resource Reporting

## 10.1 Reasonable Prospects Hurdle

Clause 20 of the JORC Code requires that all reports of Mineral Resources must have reasonable prospects for eventual economic extraction, regardless of the classification of the resource.

The Competent Person deems that there are reasonable prospects for eventual economic extraction on the following basis:

- Portions of the deposit are currently being mined successfully, and necessary infrastructure currently exists
- Kaolinite in the region is currently being produced from similar deposits
- The relatively high tenor and generally shallow depths are amenable to extraction for those areas where mining is not planned nor active.

Clause 49 of the JORC Code requires that industrial minerals, including kaolin, must be reported including pertinent specifications. The Competent Person deems that the WA Kaolin Project is appropriately reported by considering ISO brightness and yield for the <45 µm fraction of kaolinized granite horizon within the Project area, as these specifications match those for run-of-mine feed from current mining operations at the Project, and also notes that a product meeting these specifications is currently being sold.

## 10.2 JORC Classification

The Mineral Resource has been classified in accordance with guidelines contained in the JORC Code. The classification applied reflects the author's view of the uncertainty that should be assigned to the Mineral Resources reported herein. Key criteria that have been considered when classifying the Mineral Resource are detailed in JORC Table 1 which is contained in Appendix 1. The Mineral Resource has been classified as Measured, Indicated and Inferred.

This classification is based upon assessment and understanding of the deposit style, geological and grade continuity, drillhole spacing, input data quality, interpolation parameters using in ordinary kriging, an assessment of the available density data, and the acknowledgement that the material within the Project is currently being mined and sold as a product.

Reasons for the classification are:

- Geological continuity and confidence in the geological model generally are high.
- The nominal spacing of the drilling in the Measured and Indicated areas is 25–100 m and 100–200 m respectively. The drillhole spacing and the estimation quality indicators for these areas are clearly higher than Inferred area, where drillhole spacing exceeds 200 m.

The resource classification applied is illustrated in Figure 17.

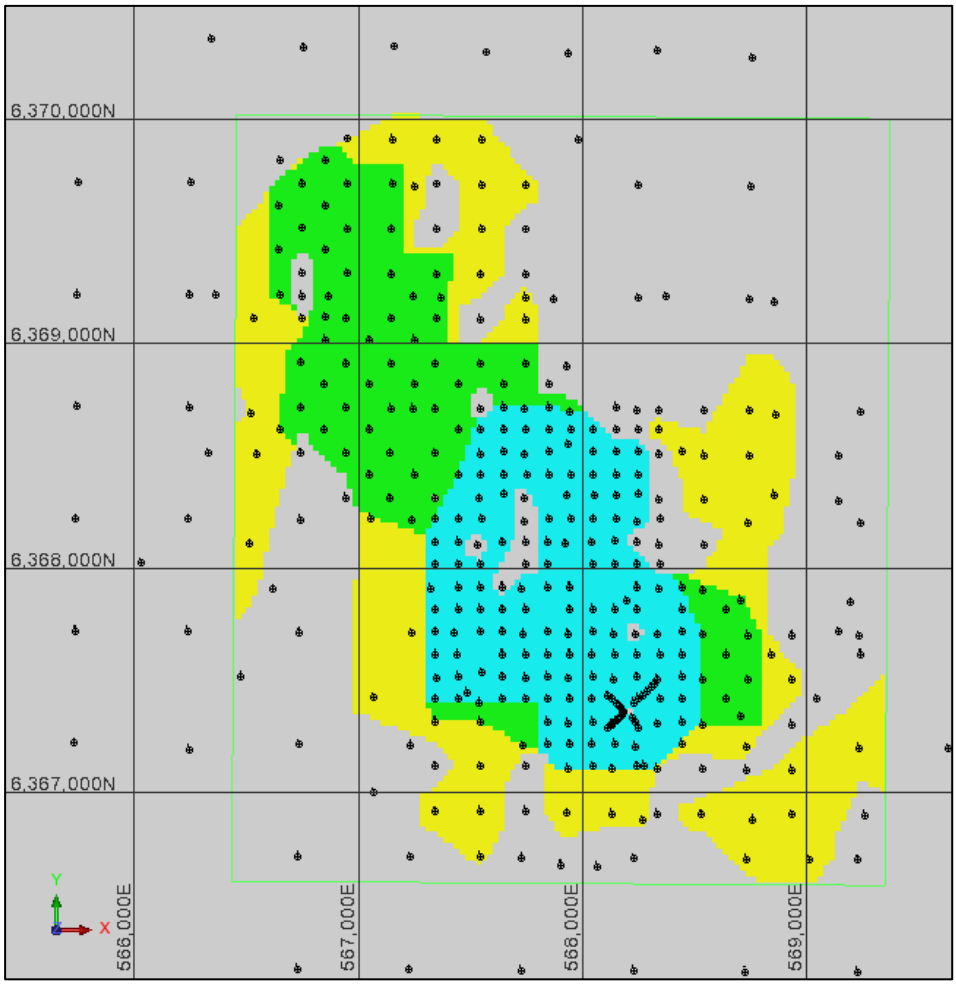


*Figure 17: Mineral Resource classification for M70/1143*
*Note: Cyan = Measured, Green = Indicated, and Yellow = Inferred.*

## 10.3 Mineral Resource Estimate

The MRE has been reported in accordance with the JORC Code and it is therefore suitable for public release. Mineral Resources are reported for the <45 µm fraction of the kaolinized granite horizon.

The kaolin Mineral Resource for the WA Kaolin Project is reported in Table 12.

*Table 12: WA Kaolin Project, Mineral Resources; M70/1143, May 2019*

| Classification | Kaolinized granite (Mt) | ISO brightness (%) | Yield (%) | Kaolin (Mt) |
|---|---|---|---|---|
| Measured | 38.0 | 82 | 51 | 21.3 |
| Indicated | 27.7 | 83 | 50 | 13.9 |
| Inferred | 43.3 | 83 | 49 | 19.3 |
| **Total** | **109.1** | **82** | **50** | **54.5** |

## 10.4 Comparison with Previous Estimates

As noted in Section 2.6, historical MREs exist for the WA Kaolin Project that differ fundamentally in approach and reporting. The estimates are not directly comparable to the current estimate.

## 10.5 Audits and Reviews

Internal audits were completed by CSA Global which verified the technical inputs, methodology, parameters and results of the estimate. No external audit of the MRE has been undertaken.

# 11 Conclusions and Recommendations

## 11.1 Conclusions

The WA Kaolin Project comprises five retention licences and a single mining lease within the Shire of Wickepin, in the south-eastern wheatbelt of Western Australia. Within these licences, deeply weathered basement granite has resulted in the formation of a kaolin-rich regolith horizon that is currently being exploited for kaolin by WAK.

Available historical drilling data has been used to define a Mineral Resource over M70/1143 within the Project area which has been classified and reported in accordance with the JORC Code as Measured, Indicated and Inferred. The current mining activities on M70/1143 satisfy both the Clause 20 reasonable prospects hurdle for reporting of Mineral Resources and also Clause 49 specific to Industrial Minerals in accordance with the JORC Code.

## 11.2 Recommendations

CSA Global recommends that a review be made of the available historical data to assess whether any quality assurance data may be available for historical drillhole information. Should such data exist and be able to provide even greater confidence in the input data used for Mineral Resource estimation, it may yield an increase in resource classification for portions of the Mineral Resource in accordance with the JORC Code. Additionally, CSA Global recognises that a substantial amount of auxiliary data such as yellowness measurements have been collected throughout the project's history. CSA Global would also recommend that a review of the utility of this data be conducted, insofar as its inclusion in future modelling work may offer the opportunity to characterise the WA Kaolin Project material in alternative ways. While the product of mining over M70/1143 has currently viable markets (meeting Clause 49 of the JORC Code) inclusion of extra quality parameters like yellowness may enable the opening of alternative markets for the WA Kaolin Project products.

# 12 Competent Person Sign-Off

I, Matthew Cobb confirm that:

- I have read and understood the requirements of the 2012 Edition of the Australasian Code for Reporting of Exploration Results, Mineral Resources and Ore Reserves ("JORC Code, 2012 Edition").
- I am a Competent Person as defined by the 2012 JORC Edition, having five years' experience which is relevant to the style of mineralisation and type of deposit described in this report, and to the activity for which I am accepting responsibility (Mineral Resource estimation).
- I am a Member of Australian Institute of Geoscientists.
- I am a full-time employee of CSA Global Pty Ltd.
- I have disclosed to the reporting company the full nature of the relationship between myself and the company, including any issue that could be perceived by investors as a conflict of interest.



_____
Dr Matthew Morgan Cobb
Principal Resource Geologist – CSA Global Pty Ltd

# Appendix 1: JORC Table 1

## Section 1: Sampling Techniques and Data

*(Criteria in this section apply to all succeeding sections)*

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| **Sampling techniques** | *Nature and quality of sampling (e.g. cut channels, random chips, or specific specialised industry standard measurement tools appropriate to the minerals under investigation, such as down hole gamma sondes, or handheld XRF instruments, etc). These examples should not be taken as limiting the broad meaning of sampling.* | Samples used in the production of this Mineral Resource estimate (MRE) have been collected from face sampled air-core (AC) drilling, with samples collected as regular metre interval composites, deposited from the cyclone attached to the return air-line. Drill spoils were deposited in piles on the ground adjacent to the drillhole. Samples were collected by scooping from each individual pile. |
| | *Include reference to measures taken to ensure sample representivity and the appropriate calibration of any measurement tools or systems used.* | Given the nature of the industrial mineral being sampled, scoop sampling of drill spoils is considered by the Competent Person to be an appropriate method of sampling for the deposit in question. |
| | *Aspects of the determination of mineralisation that are Material to the Public Report. In cases where 'industry standard' work has been done, this would be relatively simple (e.g. 'reverse circulation drilling was used to obtain 1 m samples from which 3 kg was pulverised to produce a 30 g charge for fire assay'). In other cases, more explanation may be required, such as where there is coarse gold that has inherent sampling problems. Unusual commodities or mineralisation types (e.g. submarine nodules) may warrant disclosure of detailed information.* | Drilling intervals selected for sampling were decided on a subjective basis by the person(s) responsible for supervision of the drilling campaign. Selection was based on the perceived whiteness or colouration of the interval, with a 1–2 kg sample collected via scoop from each selected interval. |
| **Drilling techniques** | *Drill type (e.g. core, reverse circulation, open-hole hammer, rotary air blast, auger, Bangka, sonic etc) and details (e.g. core diameter, triple of standard tube, depth of diamond tails, face-sampling bit or other type, whether core is orientated and if so, by what method, etc).* | All drillholes within the WA Kaolin Project have been AC, of either HQ or NQ diameter, using a rotary blade bit, face sampled. With minor exceptions, holes were drilled to blade refusal. |
| **Drill sample recovery** | *Method of recording and assessing core and chip sample recoveries and results assessed.* | Samples were collected and logged at metre intervals. |
| | *Measures taken to maximise sample recovery and ensure representative nature of the samples.* | The Competent Person is not aware of the drilling practices employed to maximise recoveries. |
| | *Whether a relationship exists between sample recovery and grade and whether sample bias may have occurred due to preferential loss/gain of fine/coarse material.* | Given the nature of the target material, no bias could be reasonably expected to occur from a grade/recovery relationship. |
| **Logging** | *Whether core and chip samples have been geologically and geotechnically logged to a level of detail to support appropriate Mineral Resource estimation, mining studies and metallurgical studies.* | Drill core was extensively logged in detail for geological characteristics, for every metre drilled, using a consistent set of logging codes to identify the specific weathering horizons which pertain to the characterisation of a kaolin deposit. |
| | *Whether logging is qualitative or quantitative in nature. Core (or costean, channel, etc) photography.* | Lithological logging was semi-quantitative in nature, based on visually estimated proportion of individual lithological components within each sample interval. |
| | *The total length and percentage of the relevant intersections logged.* | All drillholes were logged in full. |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| **Subsampling techniques and sample preparation** | *If core, whether cut or sawn and whether quarter, half or all core taken.* | Not applicable; no core taken. |
| | *If non-core, whether riffled, tube sampled, rotary split, etc and whether sampled wet or dry.* | Drill spoils from whole metre intervals were collected from the cyclone attached to the return air hose and deposited in piles adjacent to the drill collar. 1–2 kg samples were scooped from each pile. Samples were collected with natural moisture. |
| | *For all sample types, the nature, quality and appropriateness of the sample preparation technique.* | Given the nature of the industrial mineral under examination, the Competent Person considers that the quality of the samples collected, and the technique used for sample collection are appropriate. |
| | *Quality control procedures adopted for all sub-sampling stages to maximise representivity of samples.* | The Competent Person is not aware of the quality control measure taken to maximise sample representivity. |
| | *Measures taken to ensure that the sampling is representative of the in-situ material collected, including for instance results for field duplicate/second-half sampling.* | No information pertaining to sample representivity, as assessed by duplicate sampling and analysis, was available at the time of modelling and estimation. |
| | *Whether sample sizes are appropriate to the grain size of the material being sampled.* | Sample sizes are considered appropriate for the rock type, style of mineralisation, the thickness and consistency of the intersections, the sampling methodology and percent value assay ranges for the primary variable at the WA Kaolin Project. |
| **Quality of assay data and laboratory tests** | *The nature, quality and appropriateness of the assaying and laboratory procedures used and whether the technique is considered partial or total.* | Yield values have been determined via mass balance following size fraction screening to <45 µm, while brightness values have been determined via reflectance meter using standard operating conditions in accordance with the ISO test for kaolin brightness. |
| | *For geophysical tools, spectrometers, handheld XRF instruments, etc, the parameters used in determining the analysis including instrument make and model, reading times, calibrations factors applied and their derivation, etc.* | No geophysical tools were employed. |
| | *Nature of quality control procedures adopted (e.g. standards, blanks, duplicates, external laboratory checks) and whether acceptable levels of accuracy (i.e. lack of bias) and precision have been established.* | No documented quality assurance procedures have been located for the WA Kaolin Project drilling programs. |
| **Verification of sampling and assaying** | *The verification of significant intersections by either independent or alternative company personnel.* | The Competent Person was intimately involved in the collection of drilling data, having supervised a number of the drilling campaigns conducted. |
| | *The use of twinned holes.* | No twinned holes were located within the WA Kaolin Project dataset. |
| | *Documentation of primary data, data entry procedures, data verification, data storage (physical and electronic) protocols.* | Logging and assay data were collected into specifically designed Microsoft Excel spreadsheets to capture the pertinent information relating to de-gritted size fractions, brightness and lithology. Logging data were collected, assay data compiled by the Competent Person. |
| | *Discuss any adjustment to assay data.* | No adjustments or calibrations were made to any assay data. |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| **Location of data points** | *Accuracy and quality of surveys used to locate drillholes (collar and downhole surveys), trenches, mine workings and other locations used in Mineral Resource estimation.* | Collars were surveyed by RTK global positioning system (GPS), with an accuracy of sub 50 cm. Holes were all vertical and not surveyed downhole, due to their shallow nature. |
| | *Specification of the grid system used.* | The grid system used for collar location was UTM, based on the GDA94 datum in Zone 51. |
| | *Quality and adequacy of topographic control.* | A topographic surface has been built from surveyed collar data. This data captures the generally low relief of the topographic surface within the deposit area but does not adequately account for depletion due to previous mining activity. |
| **Data spacing and distribution** | *Data spacing for reporting of Exploration Results.* | Not applicable; Exploration Results are not being reported. |
| | *Whether the data spacing and distribution is sufficient to establish the degree of geological and grade continuity appropriate for the Mineral Resource and Ore Reserve estimation procedure(s) and classifications applied.* | The mineralised domains for the WA Kaolin Project have demonstrated sufficient continuity in both geological and grade continuity to support the definition of Mineral Resources and the classification applied under the JORC Code (2012). |
| | *Whether sample compositing has been applied.* | Samples were composited to lengths of 2 m, with a minimum composite length of 1 m and a maximum length of 3 m. |
| **Orientation of data in relation to geological structure** | *Whether the orientation of sampling achieves unbiased sampling of possible structures and the extent to which this is known, considering the deposit type.* | All holes drilled were vertical and adequately capture the horizontal tabular form of the mineralisation without significant bias. |
| | *If the relationship between the drilling orientation and the orientation of key mineralised structures is considered to have introduced a sampling bias, this should be assessed and reported if material.* | Drilling orientations are not considered to have introduced a bias to assay data. |
| **Sample security** | *The measures taken to ensure sample security.* | Information regarding the chain of custody, and sample security for the WA Kaolin Project deposit samples is not available in the currently accessible data. |
| **Audits or reviews** | *The results of any audits or reviews of sampling techniques and data.* | The Competent Person has reviewed the sampling techniques as part of the supervision of drilling and considers them to be acceptable. |

## Section 2: Reporting of Exploration Results

*(Criteria listed in the preceding section also apply to this section)*

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| **Mineral tenement and land tenure status** | *Type, reference name/number, location and ownership including agreements or material issues with third parties such as joint ventures, partnerships, overriding royalties, native title interests, historical sites, wilderness or national park and environmental settings.* | The licences in which the WA Kaolin Project deposit is held are owned by the company WA Kaolin Holdings Pty Ltd (WAK). The Competent Person is not aware of the status of any joint ventures, partnerships, royalties or other encumbrances which may be related to these licences. |
| | *The security of the tenure held at the time of reporting along with any known impediments to obtaining a licence to operate in the area.* | The Competent Person is not currently aware of any risks to the security of tenure, nor of any potential impediments to the development of the WA Kaolin Project deposit, which has been historically mined. |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| **Exploration done by other parties** | *Acknowledgment and appraisal of exploration by other parties.* | Drilling over the WA Kaolin Project deposit has been conducted by two main parties throughout the project's history, with the earliest exploration recorded by CRA Exploration during the mid-1990s to early 2000s (1994 to 2003). Subsequent drilling was conducted by owners WAK. Brazilian Caemi, – subsequently Vale) carried out drilling and evaluation in 2006. No recorded drilling has taken place since. |
| **Geology** | *Deposit type, geological setting and style of mineralisation.* | The deposit under consideration contains the industrial mineral kaolin and is considered to have formed as the result of weathering of the underlying parent rock; granite. The deposit is located within the bleached regolith horizon (considered to be saprolite), which is located beneath both a thin <5 m thick) semi-continuous veneer of laterite and a mottled clay zone of varying thickness and continuity. A semi continuous unit of transitional (saprock) material underlies the target saprolite horizon, beneath which the fresh parent granite is located.<br>Due to its petrogenetic setting, the deposit is extremely tabular and highly continuous in the XY plane. |
| **Drillhole information** | *A summary of all information material to the understanding of the exploration results including a tabulation of the following information for all Material drillholes:*<br>• *easting and northing of the drillhole collar*<br>• *elevation or RL (Reduced Level – elevation above sea level in metres) of the drillhole collar*<br>• *dip and azimuth of the hole*<br>• *down hole length and interception depth*<br>• *hole length.* | Not reporting Exploration Results. |
| | *If the exclusion of this information is justified on the basis that the information is not Material and this exclusion does not detract from the understanding of the report, the Competent Person should clearly explain why this is the case.* | Not applicable; not reporting Exploration Results. |
| **Data aggregation methods** | *In reporting Exploration Results, weighting averaging techniques, maximum and/or minimum grade truncations (e.g. cutting of high grades) and cut-off grades are usually Material and should be stated.* | Drillhole intervals used for definition of domains are calculated using a length-weighted average. Assay values were considered significant and composited if ISO brightness exceeded 80%. Maximum lengths of internal waste were unlimited. |
| | *Where aggregate intercepts incorporate short lengths of high grade results and longer lengths of low grade results, the procedure used for such aggregation should be stated and some typical examples of such aggregations should be shown in detail.* | Not applicable; not reporting Exploration Results. |
| | *The assumptions used for any reporting of metal equivalent values should be clearly stated.* | No metal equivalent values are currently being used. |
| **Relationship between mineralisation widths and intercept lengths** | *These relationships are particularly important in the reporting of Exploration Results. If the geometry of the mineralisation with respect to the drillhole angle is known, its nature should be reported. If it is not known and only the down hole lengths are reported, there should be a clear statement to this effect (e.g. 'downhole length, true width not known').* | Mineralisation is typically intersected with true-width equal to downhole lengths.<br>Not reporting Exploration Results. |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| **Diagrams** | *Appropriate maps and sections (with scales) and tabulations of intercepts should be included for any significant discovery being reported These should include, but not be limited to a plan view of drillhole collar locations and appropriate sectional views.* | Not reporting Exploration Results. |
| **Balanced reporting** | *Where comprehensive reporting of all Exploration Results is not practicable, representative reporting of both low and high grades and/or widths should be practiced to avoid misleading reporting of Exploration Results.* | Not reporting Exploration Results. |
| **Other substantive exploration data** | *Other exploration data, if meaningful and material, should be reported including (but not limited to): geological observations; geophysical survey results; geochemical survey results; bulk samples – size and method of treatment; metallurgical test results; bulk density, groundwater, geotechnical and rock characteristics; potential deleterious or contaminating substances.* | Reports accompanying historic estimates of the WA Kaolin Project indicate that CRA Exploration determined a bulk density for the kaolinite target material of 1.9 g/cm³. No detail surrounding the derivation of this value is currently available, however it is considered by the Competent Person to be a reasonable value and has been subsequently applied to the current Mineral Resource. |
| **Further work** | *The nature and scale of planned further work (e.g. tests for lateral extensions or depth extensions or large-scale step-out drilling).* | Further infill drilling is warranted to increase the confidence of the Inferred Mineral Resource. In the northern and south-eastern most portions. |
| | *Diagrams clearly highlighting the areas of possible extensions, including the main geological interpretations and future drilling areas, provided this information is not commercially sensitive.* | Not applicable; not reporting Exploration Results. |

## Section 3: Estimation and Reporting of Mineral Resources

*(Criteria listed in the preceding section also apply to this section)*

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| **Database integrity** | *Measures taken to ensure that data has not been corrupted by, for example, transcription or keying errors, between its initial collection and its use for Mineral Resource estimation purposes.* | The database used in the MRE was provided to CSA Global as a Microsoft Access database, prepared for use in Surpac. Creation of a Surpac database for use in resource estimation (from these spreadsheets) requires basic data integrity such as logging depths not exceeding recorded depths of holes and no overlapping assay or logging values.<br>The measures taken to ensure accurate data capture and ensure integrity of the data against transcription or keying errors are not currently known to CSA Global. |
| | *Data validation procedures used.* | Validation of the data by CSA Global included checks for overlapping intervals, missing survey data, missing assay data, missing lithological data and missing collars. |
| **Site visits** | *Comment on any site visits undertaken by the Competent Person and the outcome of those visits.* | The Competent Person has visited site in June 2019 and has verified the geology and location of selected drill collars used in the MRE. |
| | *If no site visits have been undertaken, indicate why this is the case.* | Not applicable. |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| **Geological interpretation** | *Confidence in (or conversely, the uncertainty of) the geological interpretation of the mineral deposit.* | Geological interpretation was completed by CSA Global geologists. The geological interpretations are suitable for the level of information available. Geological continuity of mineralisation appears to be very good, and in areas of dense drilling bay be assumed. In areas of lower density drilling extension of similar continuity may be implied by visual appraisal of grade continuity and also by the correlation between regional structure, lithology and the mineralisation.<br>The geological interpretation provided a suitable foundation for the modelling of a kaolin deposit. |
| | *Nature of the data used and of any assumptions made.* | Detailed geological logging, and available assay data, were used in the interpretation of the currently reported Mineral Resource. |
| | *The effect, if any, of alternative interpretations on Mineral Resource estimation.* | Geological continuity is implied between drillholes and conforms well to the anticipated geological model based on the interpretation of regional geology, and its association with mineralisation. The data do not readily offer alternative interpretations. |
| | *The use of geology in guiding and controlling Mineral Resource estimation.* | Grade (Brightness) has been the primary influence in controlling the Mineral Resource estimation. Wireframes have been constructed for the main mineralised horizons as determined by the brightness assays. |
| | *The factors affecting continuity both of grade and geology.* | Continuity of geology and structures may be assumed and can be readily traced between drillholes by visual and physical property characteristics. |
| **Dimensions** | *The extent and variability of the Mineral Resource expressed as length (along strike or otherwise), plan width, and depth below surface to the upper and lower limits of the Mineral Resource.* | The whole WA Kaolin Project deposit is expressed as a series of thin, tabular, sub-horizontal bodies within the regolith horizon extending along an easterly strike more than 17 km, and a northerly extent of greater than 12 km. Mineralisation depths are governed by the depth of weathering and generally do not exceed 50 m below the natural surface. The depth to the top of mineralisation is also governed by the depth of weathering, and is generally less than 12 m. |
| **Estimation and modelling techniques** | *The nature and appropriateness of the estimation technique(s) applied and key assumptions, including treatment of extreme grade values, domaining, interpolation parameters and maximum distance of extrapolation from data points. If a computer assisted estimation method was chosen include a description of computer software and parameters used.* | All modelling was undertaken using Surpac.<br>The model constructed comprises multiple thin tabular bodies defined on the basis of >80% ISO brightness values.<br>A block model of dimensions 100 m x 100 m x 2 m (XYZ) was generated and coded for belonging to one of the five grade domains (exclusive of the others). Statistical analysis was conducted wholly within Supervisor and GeoAccess on a per-domain basis, and then subsequently on an all-in basis. Variography was conducted on the complete dataset, with little statistical differentiation made between the brightness and yield values of each domain to justify individual modelling. Data were transformed via Gaussian Anamorphosis (through use of Hermite Expansions) to improve variography. Semi-variogram models were back-transformed into real space prior to use in estimation.<br>Block grades were interpolated using ordinary kriging. Only those composites belonging to the current target domain were used to inform blocks of that domain. |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| | | An orientated "ellipsoid" search was used to select data for interpolation. Search ellipsoid orientations were based on orientations derived from the variographical analysis. A single ellipsoid was generated and used for both brightness and yield estimation. Dimensions of the ellipsoid were based on the longest-range structure in variography for both brightness and yield in each of the three principal directions.<br>A two-pass search was used to complete estimation for brightness and yield within the domain objects. Any block not estimated after these two passes were assigned the mean value of the domain composites. |
| | *The availability of check estimates, previous estimates and/or mine production records and whether the Mineral Resource estimate takes appropriate account of such data.* | An historical estimate had been produced for the WA Kaolin Project; however, the methods used, differ fundamentally from those employed in the current MRE.<br>Historical figures report resources in excess of 1 billion tonnes of kaolinized granite, but do not provide yield or brightness values for the estimate. This tonnage figure was determined using contoured top and bottom of horizon values, based on subjective colour logging to define the "mineralised horizon". Thicknesses greater than 8 m were then constrained and a tonnage determined using a density value of 1.9.<br>Current Mineral Resources have been determined using more stringent controls on the lateral extent of mineralisation based on available drilling data, with thickness of the deposit determined by wireframing and not through estimation.<br>Historic figures are not directly comparable to the currently reported Mineral Resource. |
| | *The assumptions made regarding recovery of by-products.* | No by products will be recovered, and none have been considered. |
| | *Estimation of deleterious elements or other non-grade variables of economic significance (e.g. sulphur for acid mine drainage characterisation).* | No potentially deleterious elements have been considered. |
| | *In the case of block model interpolation, the block size in relation to the average sample spacing and the search employed.* | A parent cell size of 100 m(E) x 100 m(N) x 2 m(RL) was adopted with standard sub-celling to 25 m(E) x 25 m(N) x 1 m(RL) to maintain the resolution of the mineralised lenses. The block size is considered to be small given the dominant drillhole spacing, but necessary in order to preserve the resolution of the thin high-grade domains within the model. |
| | *Any assumptions behind modelling of selective mining units.* | No assumptions were made regarding selective mining units. |
| | *Any assumptions about correlation between variables.* | No assumptions were made about the correlation between variables. |
| | *Description of how the geological interpretation was used to control the resource estimates.* | Kaolin mineralisation is considered to have formed as a weathering product within the regolith horizon, and mineralised envelopes as modelled are constrained by this lithological horizon.<br>The wireframe objects were used as hard boundaries for grade interpolation. |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| | *Discussion of basis for using or not using grade cutting or capping.* | Statistical analysis was completed using GeoAccess and Supervisor.<br>Following statistical analysis, it was determined that no high-grade cuts were warranted. |
| | *The process of validation, the checking process used, the comparison of model data to drillhole data, and use of reconciliation data if available.* | Validation checks included statistical comparison between drill sample grades and ordinary kriging block estimate results for each domain. Visual validation of grade trends for each element along the drill sections was also completed in addition to swath plots comparing drill sample grades and model grades for northings, eastings and elevation. These checks show reasonable correlation between estimated block grades and drill sample grades.<br>No reconciliation data is available. |
| **Moisture** | *Whether the tonnages are estimated on a dry basis or with natural moisture, and the method of determination of the moisture content.* | Tonnages have been estimated on a dry in situ basis. No moisture values were reviewed. |
| **Cut-off parameters** | *The basis of the adopted cut-off grade(s) or quality parameters applied.* | The Mineral Resource has not been reported above a cut-off grade, as the nature of the Industrial Mineral that is being targeted is such that selective mining is not likely to take place. |
| **Mining factors or assumptions** | *Assumptions made regarding possible mining methods, minimum mining dimensions and internal (or, if applicable, external) mining dilution. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential mining methods, but the assumptions made regarding mining methods and parameters when estimating Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the mining assumptions made.* | No mining assumptions were incorporated into the current MRE, other than the assumption that the deposit will be mined via open pit methods. |
| **Metallurgical factors or assumptions** | *The basis for assumptions or predictions regarding metallurgical amenability. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider potential metallurgical methods, but the assumptions regarding metallurgical treatment processes and parameters made when reporting Mineral Resources may not always be rigorous. Where this is the case, this should be reported with an explanation of the basis of the metallurgical assumptions made.* | Metallurgical testwork is not necessary, due to the industrial mineral nature of the modelled mineralisation. |
| **Environmental factors or assumptions** | *Assumptions made regarding possible waste and process residue disposal options. It is always necessary as part of the process of determining reasonable prospects for eventual economic extraction to consider the potential environmental impacts of the mining and processing operation. While at this stage the determination of potential environmental impacts, particularly for a greenfields project, may not always be well advanced, the status of early consideration of these potential environmental impacts should be reported. Where these aspects have not been considered this should be reported with an explanation of the environmental assumptions made.* | No assumptions regarding possible waste and process residue disposal options have been made. Current mining activities being undertaken by WA Kaolin Holdings over the Mineral Resource sufficiently indicate that there are no significant environmental concerns with exploitation of the deposit. |

| Criteria | JORC Code explanation | Commentary |
|---|---|---|
| **Bulk density** | *Whether assumed or determined. If assumed, the basis for the assumptions. If determined, the method used, whether wet or dry, the frequency of the measurements, the nature, size and representativeness of the samples.* | Density was assigned on the basis of lithological logging, based on testwork undertaken by previous owners CRA Exploration. Densities are presented on a dry basis. No further information is available regarding the volume of density testwork undertaken to derive the assigned values. |
| | *The bulk density for bulk material must have been measured by methods that adequately account for void spaces (vugs, porosity, etc), moisture and differences between rock and alteration zones within the deposit.* | Bulk density value of 1.9 was determined by CRAE for kaolinized granite. A value of 1.9 is typical of many kaolinized granite deposits in the world. |
| | *Discuss assumptions for bulk density estimates used in the evaluation process of the different materials.* | Given the intended purpose of the MRE, bulk densities for the waste material have not been determined, and so the only material to have densities applied (for the purposes of kaolin content and tonnages) was the mineralised domain material – whose density values were assigned based on historical testwork. |
| **Classification** | *The basis for the classification of the Mineral Resources into varying confidence categories.* | The Mineral Resource was classified and Measured, Indicated and Inferred, taking into account the level of geological understanding of the deposit, quality of samples, density data, drillhole spacing and sampling and assaying processes. |
| | *Whether appropriate account has been taken of all relevant factors (i.e. relative confidence in tonnage/grade estimations, reliability of input data, confidence in continuity of geology and metal values, quality, quantity and distribution of the data).* | The classification reflects the level of data available for the estimate including input drillhole data spacing, the high level of geological continuity of the particular style of deposit and the currently successful mining of the deposit by WAK. |
| | *Whether the result appropriately reflects the Competent Person's view of the deposit.* | The MRE appropriately reflects the view of the Competent Person. |
| **Audits or reviews** | *The results of any audits or reviews of Mineral Resource estimates.* | Internal audits were completed by CSA Global which verified the technical inputs, methodology, parameters and results of the estimate. |
| **Discussion of relative accuracy/ confidence** | *Where appropriate a statement of the relative accuracy and confidence level in the Mineral Resource estimate using an approach or procedure deemed appropriate by the Competent Person. For example, the application of statistical or geostatistical procedures to quantify the relative accuracy of the resource within stated confidence limits, or, if such an approach is not deemed appropriate, a qualitative discussion of the factors that could affect the relative accuracy and confidence of the estimate.* | The Mineral Resource accuracy is communicated through the classification assigned to the deposit. The MRE has been classified in accordance with the JORC Code (2012 Edition) using a qualitative approach. All factors that have been considered have been adequately communicated in Section 1 and Section 3 of this table. |
| | *The statement should specify whether it relates to global or local estimates, and, if local, state the relevant tonnages, which should be relevant to technical and economic evaluation. Documentation should include assumptions made and the procedures used.* | The Mineral Resource statement relates to a global estimate of in-situ tonnes and grade. |
| | *These statements of relative accuracy and confidence of the estimate should be compared with production data, where available.* | The currently reported Mineral Resource is being campaign mined on a small scale on a campaign basis, however no production data are available for comparison. |

# Appendix 2: Key File and Field List

The following documentation gives details of key filenames associated with the resource modelling detailed in this report.

### Results Files

*Exploration Drilling Database*

- wak_201706.mdb
  - Microsoft Access database of all available drilling for the WA Kaolin Project.

*Wireframes*

- Wak_min_20190724.dtm / .str
  - Surpac wireframes of the mineralisation for the whole WA Kaolin Project
- Bomc.dtm / .str
  - Surpac DTM for the base of mottled clay zone for the WA Kaolin Project
- Bolt.dtm / .str
  - Surpac DTM for the base of laterite for the WA Kaolin Project
- Wak_topo3.dtm / .str
  - Surpac DTM of the topography for the WA Kaolin Project.

*Block Models*

- WAK_M70_1143_engineers_20190515.mdl
  - Engineering model for the WA Kaolin Project M70/1143 Mineral Resources
- WAK_M70_1142_20190515.mdl
  - Complete model for the WA Kaolin Projecy M70/1143 Mineral Resources.

All files have been saved on the Perth server in the directory L:\Clients\Files\WA Kaolin Holdings Pty Ltd\00 Corporate\WAKTAR01\03_Resources.


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