HANWHA MINING SERVICES

SCOPE OF WORKS

WUBIN EMULSION PLANT

Western Australia

Version 5

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Version/Date	Completed by	Reviewed by	Approved by
1/ 1 December 2015	Tim Walker		
2 / 29 April 2016	Shane Litchfield		
3 / 30 Aug 2016	Shane Litchfield		
4/ 12 Sep 2016	Shane Litchfield		
5/ 24 Jan 2018	Graham Morgan		

1. Project Definition

1.1 Project Statement

This scope sets out the project requirements for the Hanwha Mining Services emulsion manufacturing and storage facility to be located at Wubin in the Mid-West of Western Australian, the site will be located on 144 hectares just north of Wubin.

The facility will support mining operations across Western Australia and be a support/backup manufacturing facility for other Hanwha operations across Australia if required.

1.2 Project Objectives

This project will deliver a new, safe, efficient and modern emulsion manufacturing facility that will have the following equipment installed:

- 176t - Ammonium Nitrate Emulsion (ANE) storage
- 156kl - Ammonium Nitrate Solution (ANSol) storage complete with bund
- 1500t - Ammonium Nitrate Bagged Prill (AN) storage
- 1000t - Calcium Nitrate Bagged Prill (CN) storage
- 35.9kl - Diesel storage tank with pumping capability;
- 143kl - Mineral Oil Storage in tanks
- 59kl - Emulsifier stored in IBC, Isotainers or equivalent fixed tanks
- 8000l – Oxidiser Solution storage (production run tanks x 2)

The manufacturing facility will be capable of manufacturing emulsion at a nominal rate of 21 tonnes/hour with the ability to manufacture into any of two 80t emulsion tanks or direct to ANE truck.

Manufacturing facility to include but not limited to:

- Two oxidiser solution melt tanks
- Two Emulsification Blend Tanks
- PLC operation for manufacture and inline fuel blending
- Control room and laboratory facilities
- Workshop and spare parts
- Laydown area for raw material pallets of Calcium Nitrate or Ammonium Nitrate, depending on the products manufactured.
- Emulsifier laydown
- Office, crib and training room
- Male & Female restrooms
- Weighbridge

AN Melting will require the following additional equipment

- 1 x 25kl melt tank and 1 x 5kl flocculation tank
- Additional Boiler up to 50kW

Utilities required for ANSol storage and emulsion manufacture

- Steam Boiler and associated works
- Electrical Generator Set
- Cooling system – Heat Exchanger and associated works

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1.3 Project Allowances

While the plant will be built to the constraints of this scope, the following allowances will need to be considered and built into the design at either the layout or detailed engineering design phase.

Allowance	Implication
AN Melting The current plant intent is to use ANSOL to make the AN/CN solution, however ANSOL supply can be restricted at short notice and so the ability to melt AN in the facility must be accommodated.	The size of the manufacturing shed, design of the manufacturing skid and location of the skid within the shed will allow for some or all of the below equipment. • 2 x large inline Filters to remove the coating material used on AN Prill from the AN/CN Solution prior to emulsification, filters must be designed with easily removable lids of cleaning • Additional Melt Tanks to address the increased processing time when melting AN Prill • Dedicated AN Prill melting facility within the manufacturing shed with ability to clean and flush the melt tank to remove scum and coating build up if required • A small flocculation tank to be installed in the future (if AN with coatings are be used.)Increased design capacity of the boiler must to be considered to handle the melt process The AN melt process must take into consideration all types of AN to be melted, a high majority of AN for melt requires a crushing facility at the feed hopper, this is a critical step to allow the operator to successfully handle the product in a safe manner. Various concepts should be considered but the concept should be to handle up to a 1.2 tonne bulka bag
Emulsification Storage The current plant will receive and store Emulsifier in IBCs.	The IBC Storage area needs to be able to receive emulsifier in IBCs or Isotainers. With the option of having fixed Tanks that are filled from delivering tankers. If it is decided to move away from IBCs then fixed tanks is the preferred option. This will also involve installation of • Precision variable rate dosing pumps suitable for Emulsifier • Flow meter in the Fuel Phase deliver line • Static mixers in the Fuel Phase deliver line • PLC control of the dosing rate • Design of pipe runs to minimise mixed product retained in lines at end of batch cycle. Installation of fixed tanks does allow the option to bring in pre-blending Fuel Phase and Emulsifier.
Emulsification Processing The current plant will pre-blend Emulsifier with Mineral Oil prior to transfer into the manufacturing shed for further processing.	The detailed design will need to allow for direct dosing and mixing of emulsifier into the mineral oil delivery circuit.
Alternative Product Formulations The current plant is designed to produce one specific emulsion, XM1000	The detailed design will need to incorporate the follow capability into the design • Switch emulsifiers between batches, through a suitably located manifold. • Switch Fuels (Mineral Oil or Diesel grades) through a suitably located manifold

	• Fully empty process and finished product storage vessels to facilitate product changes • Load finished product directly into Isotainers or road tankers • Expand ANE Storage with space for a third finished product tank • Weighed addition of other dry raw materials (Urea) into the AN/CN blend • Selection of alternate raw materials by PLC and automated valve work. • PLC System capable of controlling plant and multiple formulations
Chemical Storage	Allowance of space to store additional Chemicals/Substances on site, 5m from any other Dangerous Goods

2.0 Background

The project is aimed at catering for the Bulk Explosive needs of the Western Australian mining market and will be Hanwha Mining Services first Emulsion Plant in WA.

The facility is designed with the intent to manufacture emulsion product volumes as the market flexes, the plant will have the ability to ramp up and down as required.

The facility will have flexible manufacturing capability able to produce a range of products tailor to individual markets.

The facility will also have adequate raw material storage to meet Hanwha's customer volume requirements.

The operation will be manned with a local workforce and all endeavours will be made to use local suppliers for goods and services

3.0 Scope of Works

3.1 Site Preparation

Contractor's to will be required to prepare the site and civil works

- Survey of site for access road, plant footprint and Truck laydown areas
- Site works to include Geo tech studies and reports, compaction results and compliance to app roval conditions for the intended works and structures, settlement ponds
- It is expected that suitable material for road and plant pads can be sourced onsite (testing to be completed)

3.2 Process Technology

The Emulsion Manufacturing facility is based on proven LDE technology and the majority of plant and equipment and the layout mirror other LDE facilities. For this facility the emulsification pump will be an equivalent to but not like for like replacement to that used in Hanwha's other Australian Plants and may require additional tuning time during the commissioning phase of the project.

With the close proximity of CSBP Kwinana the Emulsion manufacturing plant will utilise hot 90% ANSol delivered to site by solution tankers. AN Melt capability is not envisioned to be initially required, however the final engineering design should allow for this firstly as an emergency measure should the supply chain fail and secondly for the longer term as a full replacement for ANSOL use, with installation of additional equipment.

The AN melt process must take into consideration all types of AN to be melted, a high majority of AN for melt requires a crushing facility at the feed hopper, this is a critical step to allow the operator to successfully handle the product in a safe manner. Various concepts should be considered but the concept should be to handle up to a 1.2 tonne bulka bag

Emulsion storage capacity is expected to be 176 tonnes.

The plant is a mix of manual and PLC driven control, a control room and laboratory facilities are to be provided.

Fuel phase will be initially blended on site with provision to introduce a blend in delivery line process and eliminate this step.

3.3 Raw Material Storage

The raw materials coming into the site are listed below, along with the inventory required to be stored on site, and particulars pertaining to that storage.

	Storage Capacity		Unit
	Calculated	Nominal	
Ammonium Nitrate Prill	1500	1500	t
AN Solution	156	100	kl
Calcium Nitrate	1000	1000	t
Mineral Oil	142	100	kl
Emulsifier	50	25	tonnes
Diesel fuel	35.9	20	kl
Water	100000	80000	litres
Emulsion	176	100	t

- Emulsifier
  Emulsifier will be delivered in either Intermediate Bulk Containers (IBC) or Isotainers, which will be unloaded and stored in a bunded area. Provision will be made in the storage area to install fixed tanks which can be filled from road tankers

- Diesel
  The site facility will consist of one 31.4kl self-bunded storage tank and one 4.5kl day tank which will be connected as a feed for the steam boiler and diesel generator. The main storage tank will also be plumbed into the Mineral Oil to Manufacturing delivery line and be able to be selected as a choice of fuel phase in AN Emulsion manufacture. The diesel is to be unloaded using the diesel tank truck pump.

- Mineral Oil
  The site facility will consist of a 68kl and a 75kl storage tank, which will be connected as a feed for Fuel Blend manufacture. The Mineral Oil tanks will be able to be independently selected to supply the Manufacturing Shed allowing for a choice of Fuel Phases for AN Emulsion manufacture. The mineral oil is to be unloaded using a permanently installed pump.

- Fuel Phase Blending Area
  The loading point for the emulsifier and mineral oil will be contained in a bunded area for capturing of any spills during the blending process. Plant design will allow for this process to be phased out and replaced with inline dosing a blending of Emulsifier with Fuel Phase.

- ANSol Delivery Area
  The loading point for the AN Solution will be contained in a bunded area for capturing of any spills during connection, disconnection and loading. The storage tanks will be required to hold the inventory of the delivery vehicle.

- Calcium Nitrate
  Storage for 1000 tonne of Calcium Nitrate in 1 tonne bags is required. Calcium nitrate will be procured from approved suppliers and transferred to site. Storage of Calcium nitrate will be in the form of two dome shelters capable of holding 500t each.

- Minor Additives
  Provision will be made for the future storage and addition of minor dry additives, such as Urea, into the manufacturing process.

4 Services

4.1 Water

Initially potable water will be delivered on to site and stored in tanks for process, domestic and personal use. Subsequent to commissioning investigations will be made to supply water from town water, rain water runoff will be captured in tanks or a dam, where possible the rain water may be reused in the process or treated for irrigation.

4.2 Steam & Hot Water Generator

A 50 kW Steam Boiler will be installed to provide heating for:

- AN Solution tanks
- 2 x 30 t Oxidiser tanks

A hot water service will be installed for the laboratory and crib facilities.

AN melting will require the installation of a second boiler up to 50kW.

Note: Under current regulations the largest unattended boiler allowed is 50kW, to go above this size requires having a dedicated Boiler Attendant on site at all times.

4.3 Quality Control Facilities

A small half-container laboratory for quality control of the bulk emulsion matrix will be required, and will be located close to the manufacturing areas. The facility will be air-conditioned and have appropriate equipment to carry out all QC checks.

4.4 Plant Electrical

Plant power, through construction phase, will be by diesel power generator.

Initial power supply for commissioning and initial operations will be by diesel power generator whilst permanent plant power and connection to the grid is completed. Power lines run through the property and close to the plant locality, this will enable a short access from the grid. Investigations are underway to assess suitability of the existing power line infrastructure and the need for transformer and connection infrastructure from the line to the plant. From a sustainability aspect solar power will be considered as a possible alternative supply and a generator will be installed to maintain power during power outages.

The plant will require a distribution board (DB), and associated sub boards to service each system, all wiring and conduits will be supplied, installed and tested to meet appropriate regulations.

Additional yard lighting is required within the plant to provide safe access to work areas during plant operations. Exact locations and numbers are yet to be determined on site.

Where required, earthing of structures will be provided for lightning protection as per regulatory standards.

4.5 Stationary Safety Equipment

The will have a supply of 9kg DCP fire extinguishers, eye wash stations and safety showers as required, the amounts proposed are listed in Appendix A

Additional firefighting facilities such as hydrants and monitors will be considered as part of the Development Application and community consultation process.

Firefighting equipment has been chosen and limited to 9kg extinguishers after consideration of the AEISG Code of Practise “STORAGE AND HANDLING OF UN3375”, which states

“All ANE premises shall have sufficient firefighting capability to carry out “first aid” firefighting to extinguish and prevent the escalation of fires in their early stages. Typically this will consist of appropriate numbers and types of fire extinguishers to cater for foreseeable fires.”

And further

“Fixed fire systems may be required by regulatory authorities. Such systems are not otherwise required, but may be used if the owner or operator of the premises so wishes, however care shall be taken to ensure that the provision of any such system does not have the effect of encouraging people to stay and fight fires where there is a significant risk of explosion.”

First Aid stations will be located in the manufacturing plant, office and site based light vehicles.

5 SHEC Reviews, Compliance Assessments and Inherent Safety in Design.

Hanwha Mining services Australia will ensure safe operations by instilling a high degree of inherent safety into the plant design. This will be achieved during the following processes:

5.1. Choice of technology

The technology used in the plant will be based on similar plants that are currently in operation by Hanwha Mining Services Australia.

5.2. Standardisation of design

The design and layout will be based on a design and layout currently under construction in Narrabri Shire, New South Wales. This design has been assessed as compliant to

- AS 1940 The storage and handling of flammable and combustible liquids
- AS 4326 The storage and handling of oxidising agents
- AEISG Code of Practice Storage and handling of UN3375

5.3. SHEC Reviews during design

Three SHEC Reviews will be conducted during the design phase of the plant

- **SHEC Review 1** - A Project Definition Review to ensure that a clear understanding of the significant SHEC issues has been established, applicable Australian Standards and Codes of Practise have been identified, organisational capability to deliver the project has been established and the SHEC consent levels have been clearly defined.
- **SHEC Review 2** - Major Hazard Review where the significant hazardous scenarios and there causes are identified and adequate protection mechanisms are included in the design.
- **SHEC Review 3** - "Hazard and Operability" (HAZOP) studies to identify any hazards or obstacles to operability and where necessary initiate appropriate corrective actions.

5.4. Compliance of Design Reports

When the detailed engineering design has been completed the reports will be completed by an appropriately qualified specialist to ensure a compliant design:

- Compliance to the Dangerous Goods Act 2007
- Compliance to AS 1940 The storage and handling of flammable and combustible liquids
- Compliance to AS 4326 The storage and handling of oxidising agents
- Compliance to AEISG Code of Practice Storage and handling of UN3375
- Placarding Register
- Compliance to Separation Distances, AS2187.1-1998 Explosives Storage, Transport and Use Part 1 Storage
- Compliance to GUIDANCE FOR THE STORAGE OF HOT AMMONIUM NITRATE SOLUTIONS 2005
- Compliance to CODE OF PRACTICE Safe storage of solid ammonium nitrate

5.5. Management Plans

Prior to construction the following management plans will be completed:

- Safety Management Plan
- Emergency Management Plan
- Security Management Plan

These will be compliant to recognised Regulations, Standards and Guidelines that will include by not limited to the following:

- Western Australia - Dangerous Goods Safety (Explosives) Regulations 2007
- Work Safe NSW - Guide for explosives and security sensitive dangerous substances safety management plan
- Work Safe NSW - Security plan for storage and handling of explosives and security sensitive dangerous substances
- Safe Work Australia - Guide for Major Hazard Facilities - Emergency Plans

6 Operator Training and Inductions

- Operators will be trained in plant operation via the Hanwha CMO training competencies
- All visitors to site will require a site induction

7 Site Access and Procedures

- Site access will be controlled via an electronic swipe gate and intercom
- A Safety Management plan will be developed for the site which will included (but not limited to) all site operating procedures, hazard & risk identification and control, evacuation procedures, environmental management and management of change.

8 Engineering Support & Maintenance

8.1. Engineering

- Hanwha will be responsible for providing the design and layout of the plant.
- Engineering will be completed via approved contractors and signed off by Hanwha,
- Project Management will be carried out by Hanwha.
- Procurement will be shared across builder and Hanwha, Hanwha will control costs and approval of all spend.
- Construction will be carried out by approved suppliers and project managed by Hanwha.
- Hazard studies, commissioning and sign off will be completed by Hanwha and approved suppliers.
- All equipment and safety shutdown devices will be Hanwha authorised

8.2. Maintenance

Maintenance will be carried out by approved vendors, all engineering standards and procedures are in line with or above industry standards.

Critical equipment reviews will be carried out for all equipment that handles dangerous goods.

Regular maintenance schedules will be in place for all equipment, the schedules are generated from these reviews or in line with other Hanwha plant equipment maintenance schedules.

9 Project management

Project management responsibilities will sit with Hanwha.

10 Stakeholders

Hanwha Director	-	Patrick Kennedy
Hanwha Project Manager	-	Graham Morgan
Hanwha HSEC & Training	-	Graham Morgan
Engineering Project Manager	-	TBC
Engineering Project Supervisor	-	TBC
DMP	-	Henry Zuidersma
IEE	-	Brian Schofield
DG Consultant	-	Daniela Tutman
Landvision	-	Peter Driscoll

11 Implementation Strategy

TBC

12 Program (of key milestones for review)

TBC

Appendix A – Emergency Response Equipment

Emergency Response Equipment

Equipment	Location
Fire extinguishers 17 x 9 kg fire extinguisher powder-type with minimum rating 2A 60B (E), unless otherwise specified	At strategic locations near the risks, as follows: • 1 x dry powder inside the office • 1 x dry powder inside the crib room • 1 x dry powder inside the workshop • 1 x dry powder near the transfer/fill point to Diesel Tank TK-601 • 1 x dry powder near the transfer/fill point to Mineral Oil Tanks • 1 x dry powder at the end Mineral Oil Tanks • 2 x dry powder at the opposite ends of ANSOL Storage Tank Bund • 1 x dry powder at the entrance into the laboratory • 1 x 20 kg dry powder at the entrance into ANE Manufacturing Building • 1 x dry powder inside the ANE Manufacturing Building • 2 x dry powder at the entrances of the CN storage building • 1 x dry powder adjacent to the Fuel Make-up Skid • 1 x dry powder adjacent to the Boiler • 1 x dry powder adjacent to the Emulsifier IBC storage area • 2 x dry powder at either end of the ANE load out area
Protective clothing	• At strategic locations (e.g. High vis clothing, safety boots, safety glasses, safety hat, Impervious rubber gantlet gloves, face shield, disposable coverall suits).
First aid equipment/kit	• First aid equipment is located in the office and the laboratory
Safety showers and eye wash stations	At strategic locations near the risks: • In between the transfer points for Mineral Oil and Diesel Fuel • Near ANSOL transfer points • outside the ANSOL bund at the rear • inside the ANE manufacturing building, adjacent to the laboratory • at the rear of the ANE manufacturing skid • in the fuel make up shed • at the ANE load out area • at the workshop
Chemical Spill Kits	• At strategic locations near the risks e.g Labelled waste bins with absorbent materials, dedicated shovels
Communication	• Plant Mobile phones • Internet

Appendix B – Separation Distances

Separation Distances and Location of Potential Explosive Sites

1. Identification and categorisation of all Potential Explosive Sites (PES)
PES 1 = 176 T ANE, stored in 2 vertical tanks of 55 kL = 88 T each

2. PES Size and Category
The site can be categorised: “with-warning” potential explosion site. The adjusted NEQ is the mass of TNT that would produce an equivalent explosive effect to the inventory under consideration.

The adjusted NEQ for the PES, assuming the following TNT equivalents:

- 75% equivalent TNT for ANE (Class 5.1)
- PES 1 (ANE) “with-warning” NEQ = 132 T
-

3. Separation Distances for Potential Explosion Site (PES)
Separation distances are intended to give additional back-up protection to the community and are a consequence reduction control – and forms part of Hanwha’s diligent application of the prevention controls of the applicable CoP AIESG Code of Practice Storage and Handling of UN3375 and AS 2187.1 Explosives – Storage.

4. Separation Distances for Potential Explosion Site (PES1)
PES 1 is ANE = 176 T, “with-warning” NEQ = 132 T

The location of the depot is subject to acceptance by the Department of Mines, Industry Regulations (DMIRS), WA.

The following table describes the regulatory requirements regarding the separation distances according to AS 2187.1, Table 3.2.3.2:

Item	Possible impact of PSE 1 (ANE) 176 T NEQ = 132 T	Distance requirements	Actual separation	Result
1.	To AN storage (There are three dome structures with 500 T of AN each) $D = 1.8\ Q^{1/3}$	92 m	98 m to AN Dome 1 135 m To AN Dome 2 238 m To AN Dome 3	Sufficient separations distance
2.	To Protected Works Class A (PWA) (public road, public places, railway, open place of work in another occupancy) AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 $D = 14.8\ Q^{1/3}$	754 m	529 m to PWA Mullewa - Wubin Road 600 m to PWA Thomas Rd	Insufficient separations distance ERP will include road closure by emergency services

Item	Possible impact of PSE 1 (ANE) 176 T NEQ = 132 T	Distance requirements	Actual separation	Result
				and regular drills
3.	To Protected Works Class B (PWB) (town, residences/ houses, public buildings, factory, warehouse, depot of DG, building with employed persons) AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 D = 22.2 $Q^{1/3}$ 5.5 kPa blast overpressure	1,130 m	Closest residences are located at PWB to Residence 1 = 1,318 m SE PWB to Residence 2 = at 1,352 m NW	Sufficient separations distance
4.	To Protected Works Class B (PWB) (on site Mine office, mine workshop) AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 D = 22.2 $Q^{1/3}$ 5.5 kPa blast overpressure	1,130 m	None inside the required separation distance.	Not applicable
5.	To vulnerable facilities and critical infrastructure (hospitals, schools, child care, old age housing, major public utilities): AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 D=44.4 $Q^{1/3}$	2,261 m	There are no vulnerable facilities or critical infrastructure in the nearest town, Wubin – town boundary 1.4 km away 21 km to Dalwallinu	Sufficient separations distances

Item	Possible impact of PSE 1 (ANE) 176 T NEQ = 132 T	Distance requirements	Actual separation	Result
6.	To residential buildings, hotels, motels, tourist resorts: AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 17.8 $Q^{1/3}$ 7 kPa blast overpressure	906 m	There is a hotel 1.7 km away in the nearest town, Wubin.	Sufficient separations distance
7.	Commercial buildings AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 10.4 $Q^{1/3}$ = 416 m 14 kPa blast overpressure	530 m	None inside the required separation distance. 1.4 km to boundary of nearest town, Wubin	Sufficient separations distance
8.	Industrial and process buildings and factories, AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 7.8 $Q^{1/3}$ 21 kPa blast overpressure	407 m	None inside the required separation distance.	Not applicable
9.	To other explosive storage AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 D = 4.8 $Q^{1/3}$	244 m	There are no existing Explosive Magazines in this area	Not applicable

5. Separation Distances for SSAN

Total quantity of SSAN = 1,500 T, in 1.2 T bulka bags stored three high in three dome structures with 500 T.

The AN storage domes are not a PES and given that each dome is located beyond the required AN separation distance (AS 2187), these AN storages can't be knocked-on.

The adjusted NEQ for the AN store, assuming the following TNT equivalents:

- 32% equivalent TNT for AN (Class 5.1)
- AN "with-warning" NEQ = 160 T

The location of the depot is subject to acceptance by the Department of Mines, Industry Regulations (DMIRS), WA.

The following table describes the regulatory requirements regarding the separation distances according to AS 2187.1, Table 3.2.3.2:

Item	Possible impact of AN 500 T NEQ = 160 T	Distance requirements	Actual separation to ANE	Result
1.	To AN storage (There are three dome structures with 500 T of AN each) $D = 1.8\ Q^{1/3}$	98 m	98 m 140 m 239 m	Sufficient separations distance
2.	To Protected Works Class A (PWA) (public road, public places, railway, open place of work in another occupancy) AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 $D = 14.8\ Q^{1/3}$	803 m	625 m AN Dome Store 1,2,3 to PWA Mullewa - Wubin Road 580 m AN Dome Store 1 to PWA Thomas Rd	Sufficient separations distance
3.	To Protected Works Class B (PWB) (town, residences/ houses, public buildings, factory, warehouse, depot of DG, building with employed persons) AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 $D = 22.2\ Q^{1/3}$ 5.5 kPa blast overpressure	966 m	1,185 m AN Dome Store 3 to PWB Residence 1 1,288 m AN Dome Store 3 to PWB Residence 2	Sufficient separations distance
4.	To Protected Works Class B (PWB) (on site Mine office, mine workshop) AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 $D = 22.2\ Q^{1/3}$	1,205 m	None inside the required separation distance.	Not applicable

Item	Possible impact of AN 500 T NEQ = 160 T	Distance requirements	Actual separation to ANE	Result
	5.5 kPa blast overpressure			
5.	To vulnerable facilities and critical infrastructure (hospitals, schools, child care, old age housing, major public utilities): AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 $D=44.4\ Q^{1/3}$	2,410 m	There are no vulnerable facilities or critical infrastructure in the nearest town, Wubin – town boundary 1.4 km away 21 km to Dalwallinu	Sufficient separations distances
6.	To residential buildings, hotels, motels, tourist resorts: AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 $17.8\ Q^{1/3}$ 7 kPa blast overpressure	966 m	There is a hotel 1.7 km away in the nearest town, Wubin.	Sufficient separations distance
7.	Commercial buildings AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 $10.4\ Q^{1/3} = 416$ m 14 kPa blast overpressure	565 m	None inside the required separation distance. 1.4 km to boundary of nearest town, Wubin	Sufficient separations distance

Item	Possible impact of AN 500 T NEQ = 160 T	Distance requirements	Actual separation to ANE	Result
8.	Industrial and process buildings and factories, AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 7.8 $Q^{1/3}$ 21 kPa blast overpressure	423 m	None inside the required separation distance.	Not applicable
9.	To other explosive storage AIESG Sect.6 AS 2187. 1 Table 3.2.3.2 D = 4.8 $Q^{1/3}$	261 m	There are no existing Explosive Magazines in this area	Not applicable

6. Occupancy

The site is attended with a maximum of two-three people present during one shift operation. The site has "high" activity levels.

The secure depot is accessed by Hanwha's secure nominees or authorised persons, or by persons supervised by Hanwha's secure nominees.

There is no activity during night time.

Evacuation for the ANE Plant personnel is credible within 20 minutes to the evacuation Point which is 1.2 km away, North of the ANE Plant. This distance is more than 20% greater than the minimum separation distance (PWA) required, based on the worst-case scenario of an uncontrolled fire (with a substantial source of fuel) capable of engulfing the ANE tanks, assuming that the ANE may explode and evacuation shall take place.

There is an exclusion zone at 0.75 km, based on the required separation distance to Protected Works Class A (PWA), (public road, public places, railway, open place of work in another occupancy, AIESG Sect.6, AS 2187. 1 Table 3.2.3.2, D = 14.8 $Q^{1/3}$.)

7. Conclusion

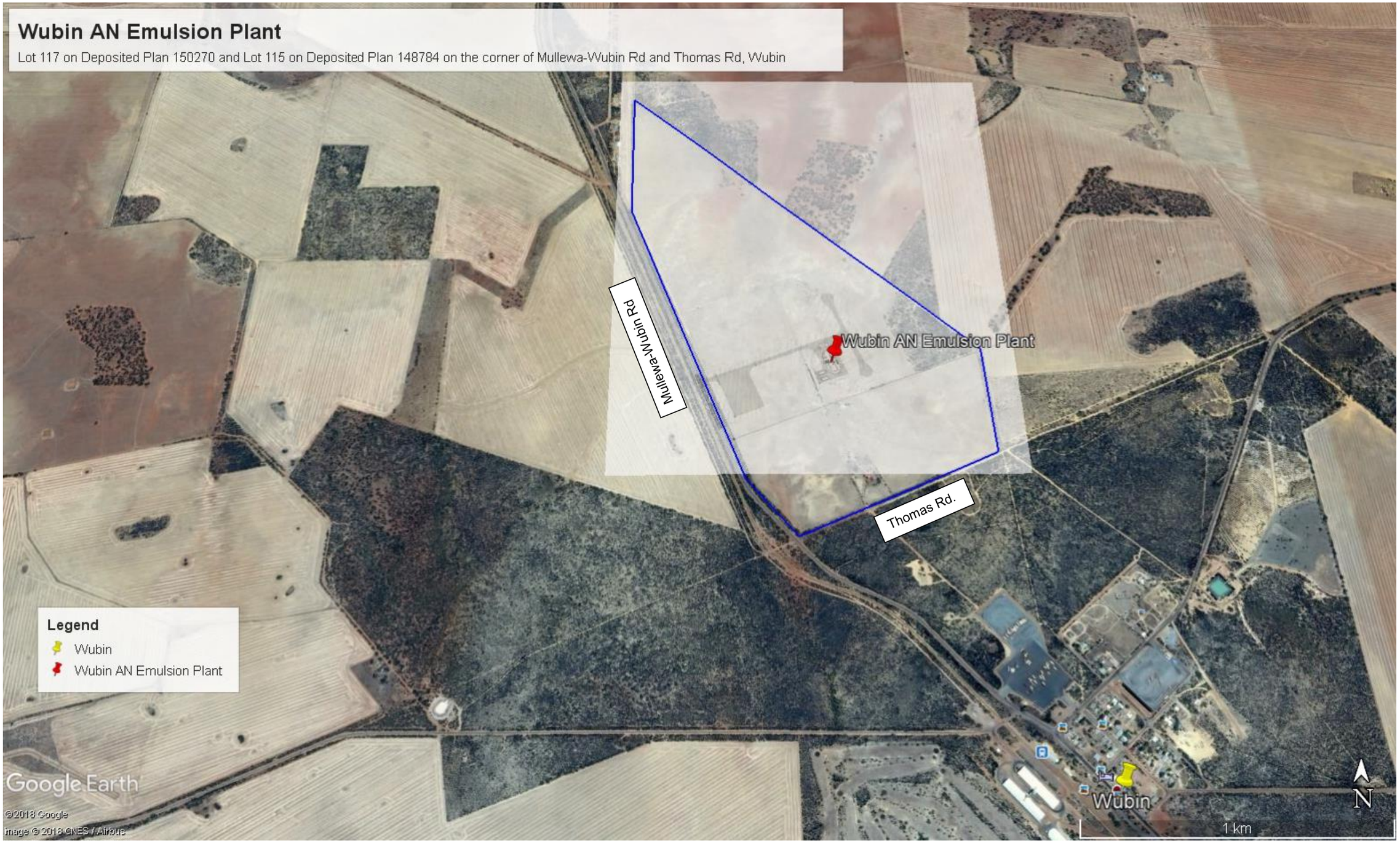
The location of the proposed Wubin AN Emulsion Plant has the PWB separation distance for "with warning PES" fully met.

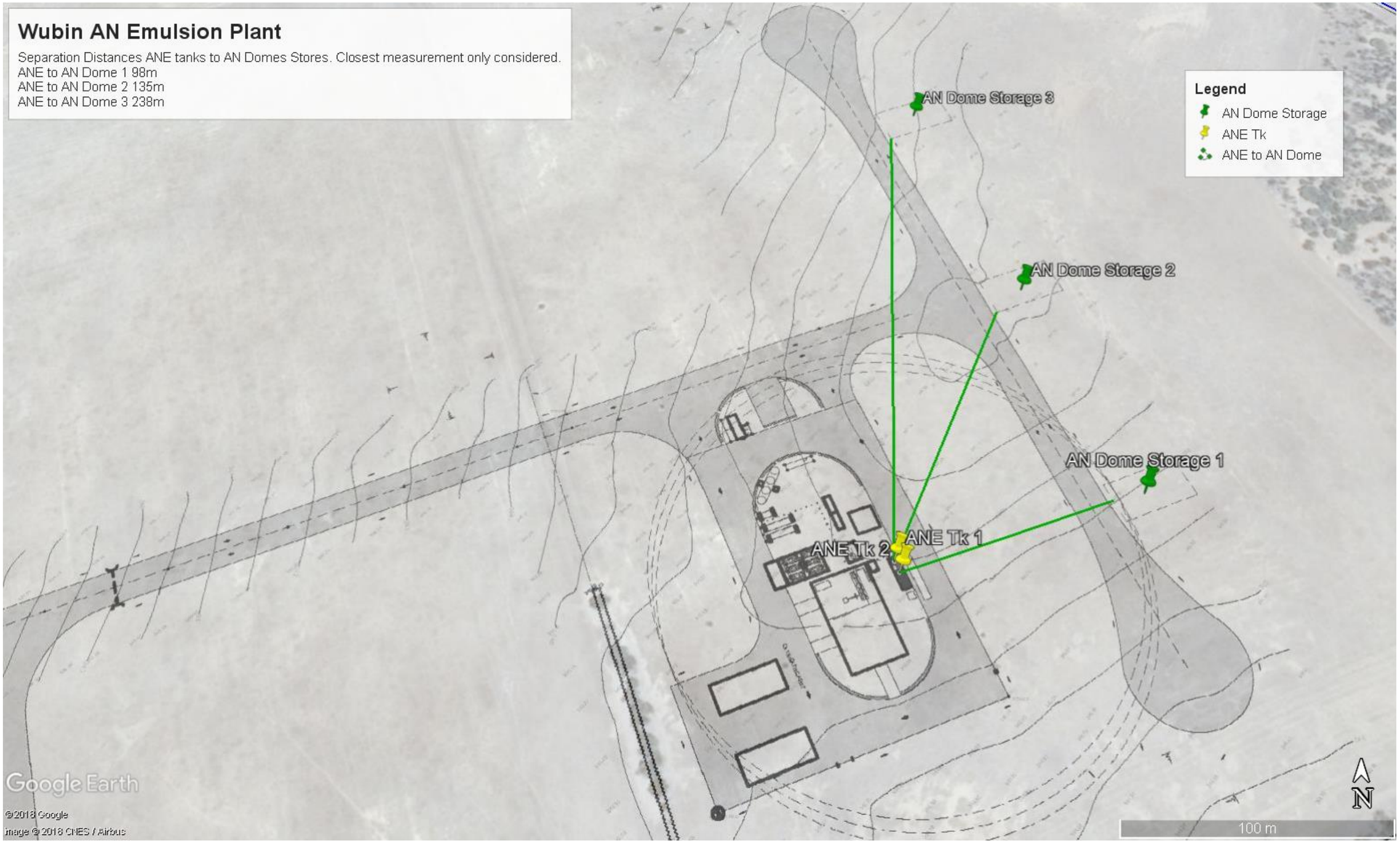
There are no facilities with "concentration of population" that cannot be evacuated or vulnerable facilities within 21 km from the plant.

The PWA separation distance for "with warning PES" is less than what is required, however, evacuation is credible, and the Hanwha will prepare the relevant emergency response procedure and plans in consultation with the local emergency services.

The location of the proposed Wubin AN Emulsion Plant is acceptable under the requirements of the applicable regulations and applicable CoP AIESG Code of Practice Storage and Handling of UN3375 and AS 2187.1 Explosives – Storage, provided there is an effective evacuation plan in place.

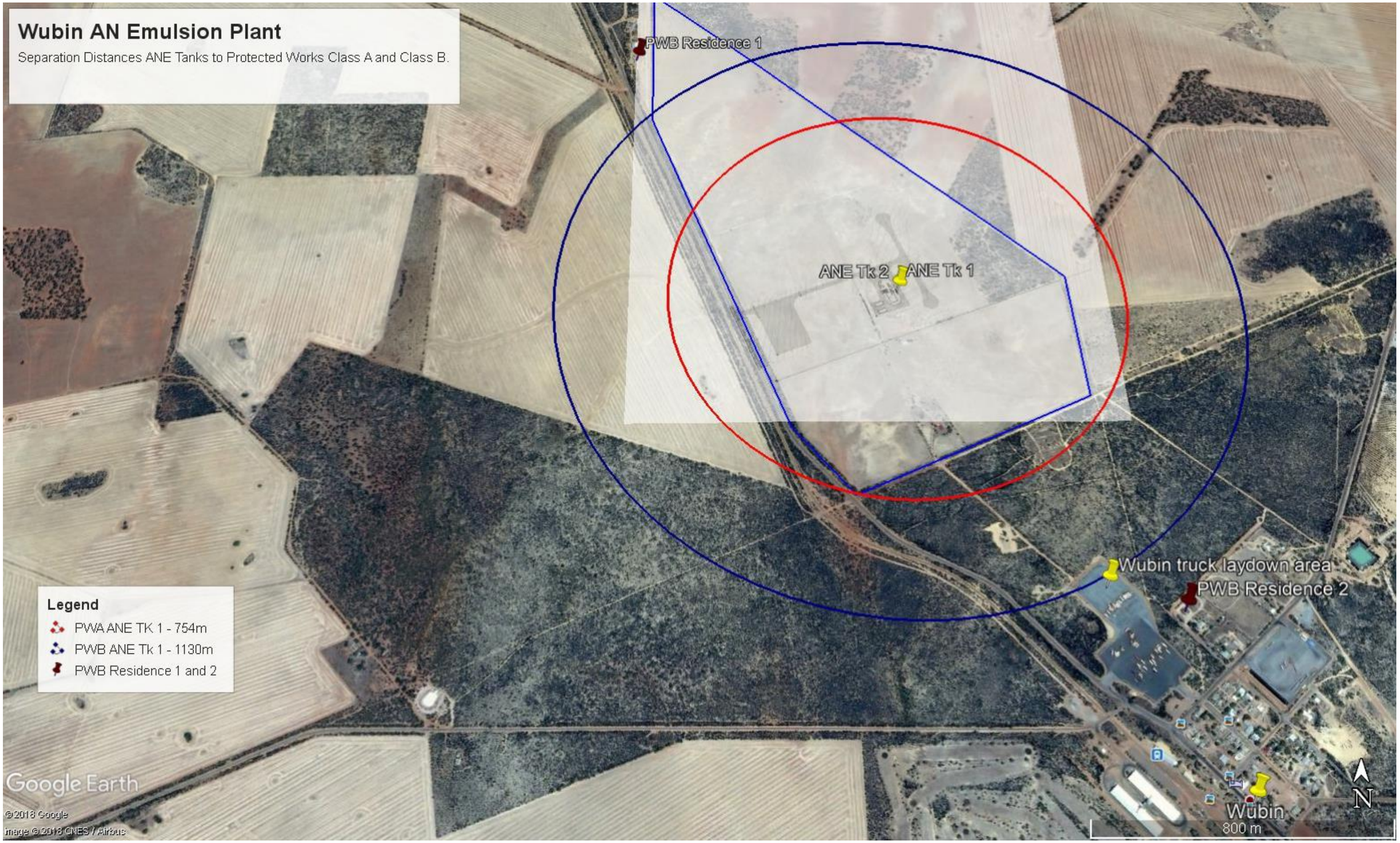
Appendix C – Location Drawings


Wubin AN Emulsion Plant
Lot 117 on Deposited Plan 150270 and Lot 115 on Deposited Plan 148784 on the corner of Mullewa-Wubin Rd and Thomas Rd, Wubin
Mullewa-Wubin Rd
Wubin AN Emulsion Plant
Thomas Rd.
Legend
Wubin
Wubin AN Emulsion Plant
Wubin
1 km
N
Google Earth
©2018 Google
Image © 2018 CNES / Airbus


Wubin AN Emulsion Plant
Separation Distances ANE tanks to AN Domes Stores. Closest measurement only considered.
ANE to AN Dome 1 98m
ANE to AN Dome 2 135m
ANE to AN Dome 3 238m
Legend
AN Dome Storage
ANE Tk
ANE to AN Dome
AN Dome Storage 3
AN Dome Storage 2
AN Dome Storage 1
ANE Tk 1
ANE Tk 2
Google Earth
©2018 Google
Image © 2018 CNES / Airbus
100 m
N


Wubin AN Emulsion Plant
Separation Distances ANE Tanks to Protected Works Class A. Closest measurement only considered.
ANE to Mullewa-Wubin Rd 529m
ANE to Thomas Rd 600m
ANE Tk 2
ANE Tk 1
Mullewa-Wubin Rd
Thomas Rd
Legend
ANE Tk
PWA ANE to nearest road
Google Earth
© 2018 Google
Image © 2018 CNES / Airbus
200 m
N


Wubin AN Emulsion Plant
ANE to PWB, closest residence, only nearest measurement considered
ANE Tank to PWB Residence 1 1352m
ANE Tank to PWB Residence 2 1318m
PWB Residence 1
ANE Tk 2
ANE Tk 1
PWB Residence 2
Legend
ANE Tk
PWB ANE
PWB Residence
Google Earth
©2018 Google
Image © 2018 CNES / Airbus
1 km
N


Wubin AN Emulsion Plant
Separation Distances ANE Tanks to Protected Works Class A and Class B.
PWB Residence 1
ANE Tk 2
ANE Tk 1
Wubin truck laydown area
PWB Residence 2
Legend
PWA ANE TK 1 - 754m
PWB ANE Tk 1 - 1130m
PWB Residence 1 and 2
Google Earth
©2018 Google
Image © 2018 CNES / Airbus
Wubin
800 m
N


Wubin AN Emulsion Plant
Separation Distances ANE Tanks to Vulnerable Facilities.
No Vunerable Facilities in Township of Wubin
Legend
Future upgrade space
Vunerable Facilities ANE Tk 2 - 2261m
Wubin
Google Earth
©2018 Google
Image © 2018 CNES / Airbus
1 km
N


Wubin AN Emulsion Plant
Separation Distances AN Dome Store to Protected Works Class A. Closest measurement only considered.
AN to Mullewa-Wubin Rd 625m
AN to Thomas Rd 580m
AN Dome Storage 3
AN Dome Storage 2
AN Dome Storage 1
Mullewa-Wubin Rd
Thomas Rd
Legend
AN Dome Storage
PWA AN Dome 3 to Thomas Rd - 580m
PWA AN to Mullewa-Wubin Rd 625m
Google Earth
©2018 Google
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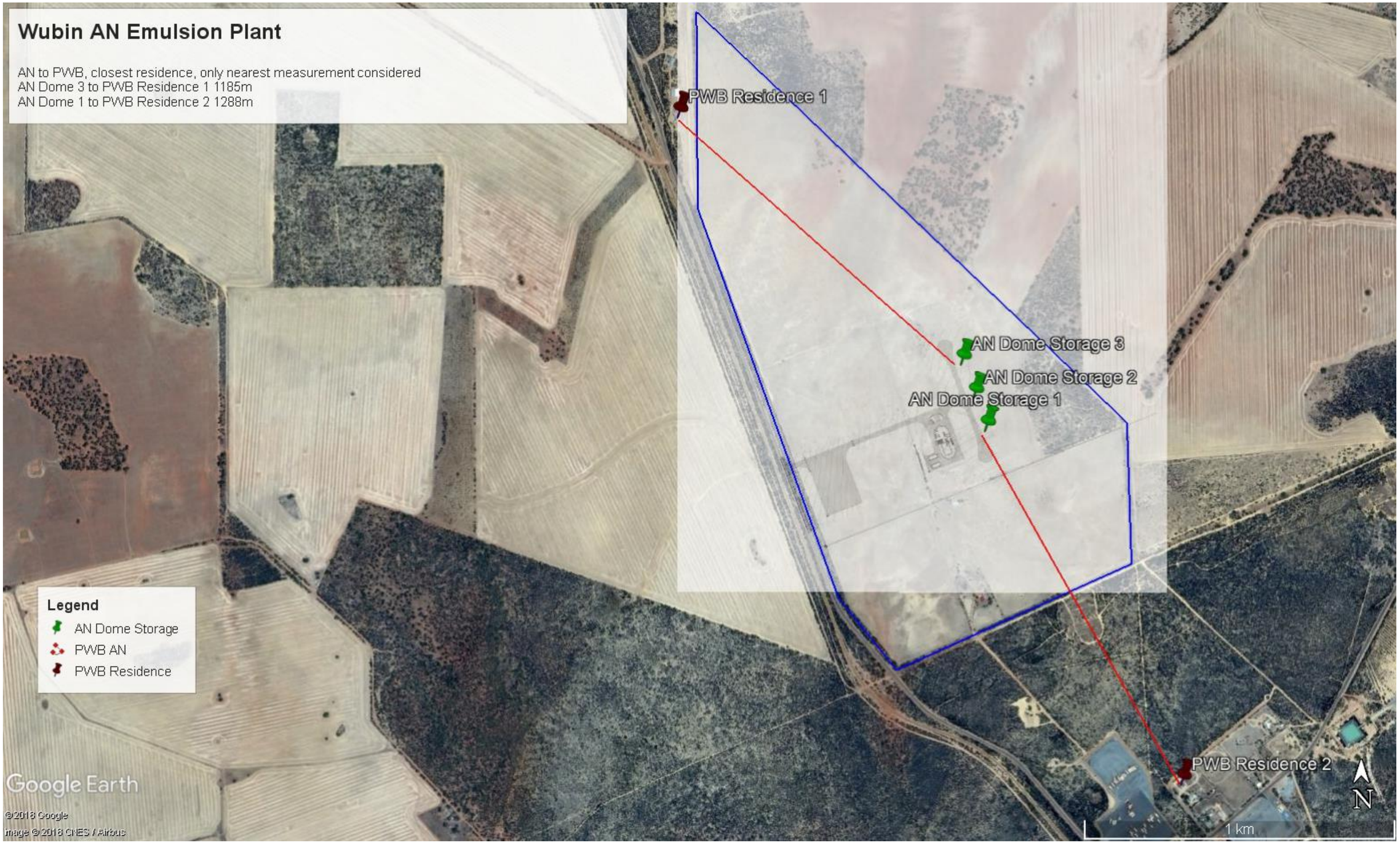
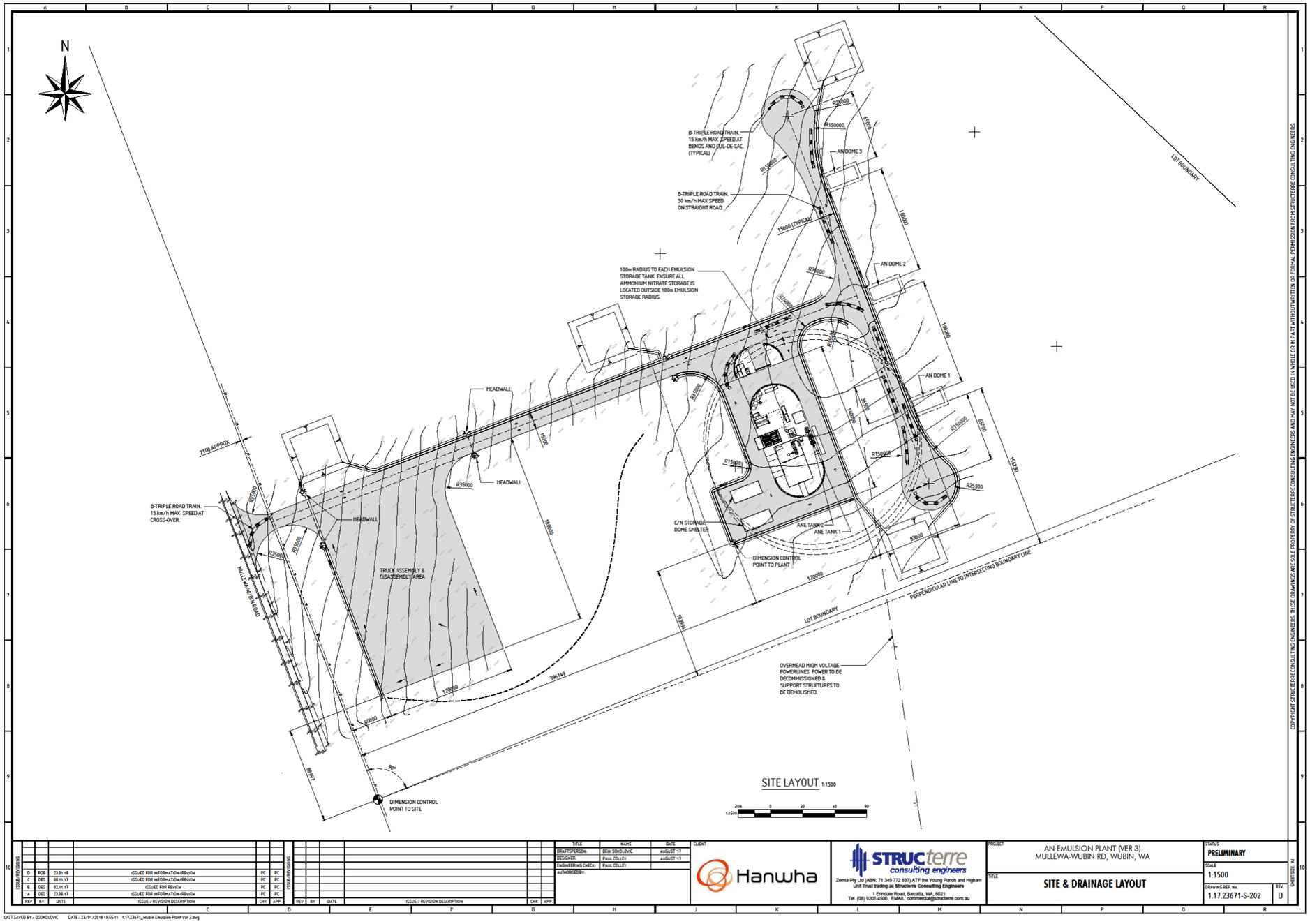
200 m
N


Wubin AN Emulsion Plant
AN to PWB, closest residence, only nearest measurement considered
AN Dome 3 to PWB Residence 1 1185m
AN Dome 1 to PWB Residence 2 1288m
PWB Residence 1
AN Dome Storage 3
AN Dome Storage 2
AN Dome Storage 1
PWB Residence 2
Legend
AN Dome Storage
PWB AN
PWB Residence
Google Earth
©2018 Google
Image © 2018 CNES / Airbus
1 km
N

Appendix D – Site Drawings


N
B-TRIPLE ROAD TRAIN. 15 km/h MAX. SPEED AT BENDS AND CUL-DE-SAC. (TYPICAL)
B-TRIPLE ROAD TRAIN. 30 km/h MAX SPEED ON STRAIGHT ROAD.
100m RADIUS TO EACH EMULSION STORAGE TANK. ENSURE ALL AMMONIUM NITRATE STORAGE IS LOCATED OUTSIDE 100m EMULSION STORAGE RADIUS.
AN DOME 3
AN DOME 2
AN DOME 1
HEADWALL
HEADWALL
HEADWALL
B-TRIPLE ROAD TRAIN. 15 km/h MAX. SPEED AT CROSS-OVER.
TRUCK ASSEMBLY & DISASSEMBLY AREA
MULLEWA-WUBIN ROAD
C/N STORAGE DOME SHELTER
ANE TANK 2
ANE TANK 1
DIMENSION CONTROL POINT TO PLANT
DIMENSION CONTROL POINT TO SITE
LOT BOUNDARY
PERPENDICULAR LINE TO INTERSECTING BOUNDARY LINE
OVERHEAD HIGH VOLTAGE POWERLINES. POWER TO BE DECOMMISSIONED & SUPPORT STRUCTURES TO BE DEMOLISHED.
SITE LAYOUT 1:1500
STRUCterre consulting engineers
Hanwha
AN EMULSION PLANT (VER 3)
MULLEWA-WUBIN RD, WUBIN, WA
SITE & DRAINAGE LAYOUT
PRELIMINARY
1:1500
1.17.23671-S-202
D
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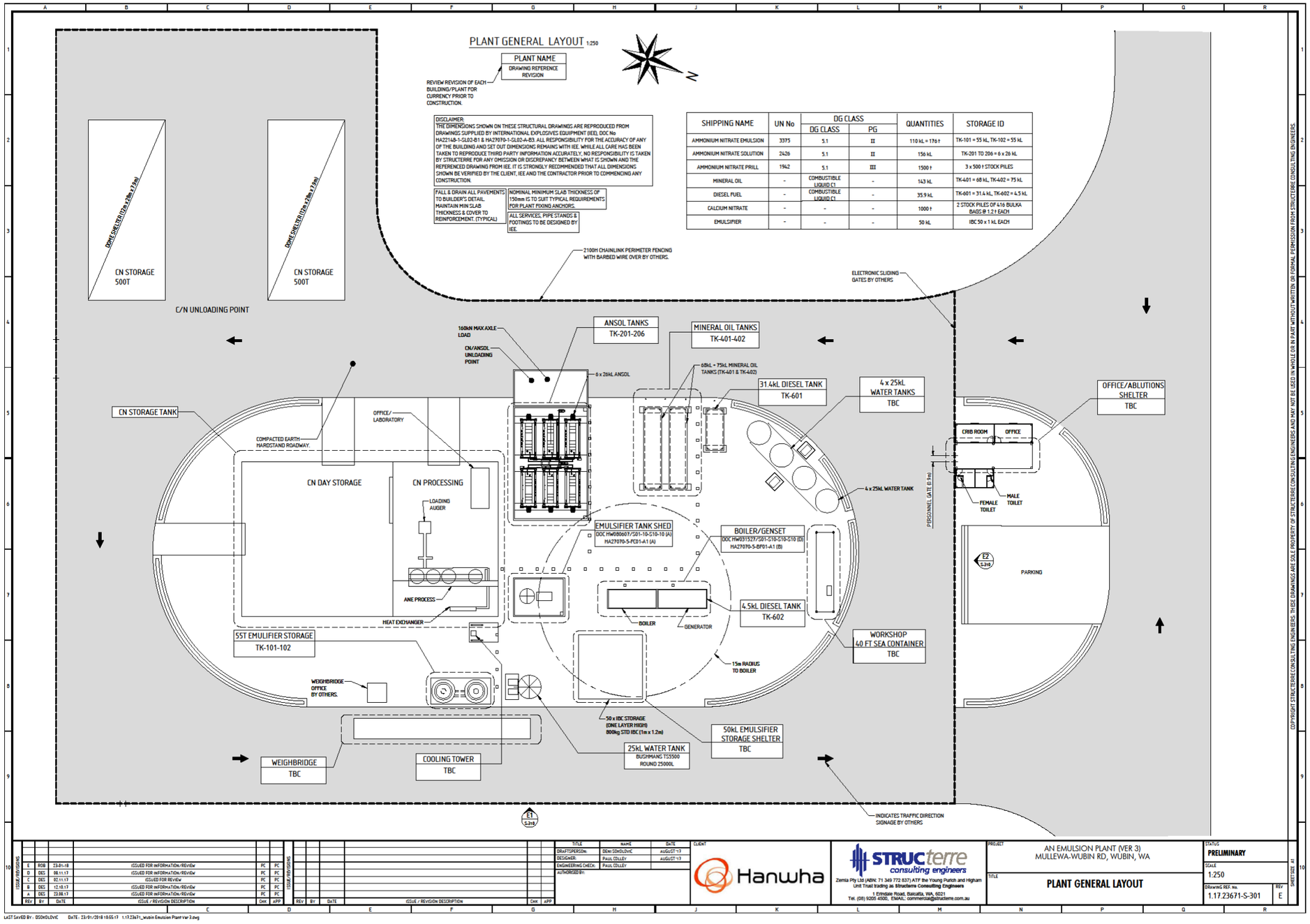
PLANT GENERAL LAYOUT 1:250
PLANT NAME
DRAWING REFERENCE
REVISION
REVIEW REVISION OF EACH BUILDING/PLANT FOR CURRENCY PRIOR TO CONSTRUCTION.
DISCLAIMER:
THE DIMENSIONS SHOWN ON THESE STRUCTURAL DRAWINGS ARE REPRODUCED FROM DRAWINGS SUPPLIED BY INTERNATIONAL EXPLOSIVES EQUIPMENT (IEE), DOC No HA2216A-1-SL02-B1 & HA27070-1-SL02-A-B3. ALL RESPONSIBILITY FOR THE ACCURACY OF ANY OF THE BUILDING AND SET OUT DIMENSIONS REMAINS WITH IEE. WHILE ALL CARE HAS BEEN TAKEN TO REPRODUCE THIRD PARTY INFORMATION ACCURATELY, NO RESPONSIBILITY IS TAKEN BY STRUCTERRE FOR ANY OMISSION OR DISCREPANCY BETWEEN WHAT IS SHOWN AND THE REFERENCED DRAWING FROM IEE. IT IS STRONGLY RECOMMENDED THAT ALL DIMENSIONS SHOWN BE VERIFIED BY THE CLIENT, IEE AND THE CONTRACTOR PRIOR TO COMMENCING ANY CONSTRUCTION.
FALL & DRAIN ALL PAVEMENTS TO BUILDER'S DETAIL. MAINTAIN MIN SLAB THICKNESS & COVER TO REINFORCEMENT. (TYPICAL)
NOMINAL MINIMUM SLAB THICKNESS OF 150mm IS TO SUIT TYPICAL REQUIREMENTS FOR PLANT FIXING ANCHORS.
ALL SERVICES, PIPE STANDS & FOOTINGS TO BE DESIGNED BY IEE.
SHIPPING NAME | UN No | DG CLASS | DG CLASS | PG | QUANTITIES | STORAGE ID
AMMONIUM NITRATE EMULSION | 3375 | 5.1 | II | 110 kL = 176 t | TK-101 = 55 kL, TK-102 = 55 kL
AMMONIUM NITRATE SOLUTION | 2426 | 5.1 | II | 156 kL | TK-201 TO 206 = 6 x 26 kL
AMMONIUM NITRATE PRILL | 1942 | 5.1 | III | 1500 t | 3 x 500 t STOCK PILES
MINERAL OIL | - | COMBUSTIBLE LIQUID C1 | - | 143 kL | TK-401 = 68 kL, TK-402 = 75 kL
DIESEL FUEL | - | COMBUSTIBLE LIQUID C1 | - | 35.9 kL | TK-601 = 31.4 kL, TK-602 = 4.5 kL
CALCIUM NITRATE | - | - | - | 1000 t | 2 STOCK PILES OF 416 BULKA BAGS @ 1.2 t EACH
EMULSIFIER | - | - | - | 50 kL | IBC 50 x 1 kL EACH
2100H CHAINLINK PERIMETER FENCING WITH BARBED WIRE OVER BY OTHERS.
ELECTRONIC SLIDING GATES BY OTHERS
CN STORAGE 500T
CN STORAGE 500T
C/N UNLOADING POINT
160kN MAX AXLE LOAD
CN/ANSOL UNLOADING POINT
ANSOL TANKS TK-201-206
6 x 26kL ANSOL
MINERAL OIL TANKS TK-401-402
68kL + 75kL MINERAL OIL TANKS (TK-401 & TK-402)
31.4kL DIESEL TANK TK-601
4 x 25kL WATER TANKS TBC
OFFICE/ABLUTIONS SHELTER TBC
CRIB ROOM
OFFICE
FEMALE TOILET
MALE TOILET
CN STORAGE TANK
COMPACTED EARTH HARDSTAND ROADWAY.
OFFICE/ LABORATORY
CN DAY STORAGE
CN PROCESSING
LOADING AUGER
ANE PROCESS
HEAT EXCHANGER
4 x 25kL WATER TANK
PERSONNEL GATE (5 m)
EMULSIFIER TANK SHED
DOC HW080607/501-10-510-10 (A)
HA27070-5-FC01-A1 (A)
BOILER/GENSET
DOC HW031537/501-10-510-510 (D)
HA27070-5-BF01-A1 (B)
BOILER
GENERATOR
4.5kL DIESEL TANK TK-602
PARKING
E2 S-310
WORKSHOP 40 FT SEA CONTAINER TBC
15m RADIUS TO BOILER
5ST EMULIFIER STORAGE TK-101-102
WEIGHBRIDGE OFFICE BY OTHERS.
50 x IBC STORAGE (ONE LAYER HIGH) 800kg STD IBC (1m x 1.2m)
50kL EMULSIFIER STORAGE SHELTER TBC
25kL WATER TANK BUSHMANS TS5500 ROUND 25000L
WEIGHBRIDGE TBC
COOLING TOWER TBC
E1 S-310
INDICATES TRAFFIC DIRECTION SIGNAGE BY OTHERS
ISSUE / REVISION DESCRIPTION
E | ROB | 23-01-18 | ISSUED FOR INFORMATION/REVIEW | PC | PC
D | DES | 08.11.17 | ISSUED FOR INFORMATION/REVIEW | PC | PC
C | DES | 02.11.17 | ISSUED FOR REVIEW | PC | PC
B | DES | 12.10.17 | ISSUED FOR INFORMATION/REVIEW | PC | PC
A | DES | 23.08.17 | ISSUED FOR INFORMATION/REVIEW | PC | PC
REV | BY | DATE | ISSUE / REVISION DESCRIPTION | CHK | APP
TITLE | NAME | DATE
DRAFTSPERSON: | SEAN SZMOLOVIC | AUG/OCT-17
DESIGNER: | PAUL COLLEY | AUG/OCT-17
ENGINEERING CHECK: | PAUL COLLEY
AUTHORISED BY:
CLIENT
Hanwha
STRUCterre consulting engineers
Zemia Pty Ltd (ABN: 71 349 772 837) ATF the Young Punch and Higham Unit Trust trading as Structerre Consulting Engineers
1 Erindale Road, Balcatta, WA, 6021
Tel. (08) 9205 4500, EMAIL: commercial@structerre.com.au
PROJECT
AN EMULSION PLANT (VER 3)
MULLEWA-WUBIN RD, WUBIN, WA
TITLE
PLANT GENERAL LAYOUT
STATUS
PRELIMINARY
SCALE
1:250
DRAWING REF. No.
1.17.23671-S-301
REV
E
SHEET SIZE A1
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