

Sumitomo Hydrogen Project

Planning report addendum

Summit Hydrogen Gladstone Pty Ltd



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20 June 2024

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ACRONYMS/ABBREVIATIONS

Acronyms/Abbreviations	Definition
EA	Environmental authority
EPC phase	Engineering, procurement, and construction phase
ERA	Environmentally relevant activity
FEED phase	Front-End Engineering Design phase
GSDA	Gladstone State Development Area
HAZID	Hazard identification and assessment
LFL	Lower flammability limit
MCU	Material change of use
RTA	Rio Tinto Aluminium

1. INTRODUCTION

Project background, the purpose of this report and statutory considerations are presented in this section.

1.1 BACKGROUND

Summit Hydrogen Gladstone Pty Ltd (Summit Hydrogen Gladstone), a wholly owned subsidiary of Sumitomo Corporation is proposing to develop the Sumitomo Hydrogen Project (herein referred to as the project), a hydrogen production pilot plant in Gladstone, Queensland.

The proposed site is in RTA Yarwun Pty Ltd's (RTA Yarwun) alumina refinery which is on Lot 8 on SP218634. Carparking for construction and operation and maintenance activities will utilise the existing Jemena carpark in Lot 144 CTN2170, which is owned by Jemena Queensland Gas Pipeline (1) Pty Ltd. Yarwun alumina refinery is bounded by Gladstone–Mount Larcom Road to the north and Hanson Road to the east. The proposed 0.4 ha site is the former Air Liquide site adjacent the eastern boundary of the refinery and Hanson Road. Summit Hydrogen Gladstone will lease the site from RTA Yarwun. The Jemena carpark is accessed off the Yarwun alumina refinery main access road. The sites are in the Gladstone State Development Area.

The hydrogen will be produced by electrolysis using potable water and electricity from the Yarwun alumina refinery. The produced hydrogen will be used in the refinery and may be sold to third parties. Sumitomo Corporation engaged JGC Corporation and Japan NUS Co. Ltd. to provide engineering and environmental and planning approvals for the project respectively. Tetra Tech Coffey was engaged by Japan NUS Co., Ltd, on behalf of Sumitomo Corporation, to prepare the environment and planning approvals documentation for the project.

In 2022, Summit Hydrogen Gladstone applied for a State Development Area (SDA) material change of use (MCU) and environmental authority (EA) for the construction and operation of the pilot plant. The Coordinator-General approved the SDA MCU application with conditions (SDA approval) in July 2022. The Department of Environment and Science (DES) issued P-EA-100235984 in July 2022. P-EA-100235984 was amended in May 2023 to revise the date the authority takes effect.

Following approval of the SDA MCU and EA applications which were informed by the initial front-end engineering design (FEED) phase, detailed design was completed as part of the engineering, procurement, and construction (EPC) phase. The EPC detailed design incorporated several changes including:

- A nitrogen generator was added to continuously purge the electrolyser.
- The water treatment unit using reverse osmosis (RO) was relocated.
- The dry cooler was relocated to the north of the electrolyser power unit and arranged horizontally.
- The hydrogen mass inventory was increased from 1 kg to 3.3 kg.
- An emergency access gate was added.
- Using the Jemena carpark for construction workforce parking and operation and maintenance activities such as scheduled shutdowns for maintenance instead of the RTA Yarwun carpark.

The changes will necessitate amendment of the SDA approval and P-EA-100235984.

Following consultation with the Coordinator-General, it was agreed the changes would be provided in an addendum (this report) to the planning report lodged with the original applications. This report will inform Coordinator-General and DES decisions on the type of amendment required – minor or major. The report includes information to support assessment of the amendments by the Coordinator-General and DES.

Where appropriate, this addendum refers to the planning report prepared for the original SDA approval and EA applications and should be read in conjunction with that document.

1.2 PRE-LODGE MEETINGS

In the preparation of this report, meetings were held to inform relevant government agencies of the changes to the pilot plant design and seek preliminary advice regarding the information required to support amendment of the SDA approval and EA. The Coordinator-General was briefed on 19 January 2024.

Following advice from the Coordinator General, the Major Hazard Facilities Unit (MHFU) was briefed on 14 February 2024. The purpose of the meeting was to brief the MHFU on the design changes and the results of the updated studies (HAZID, fire and explosion, and atmospheric vent dispersion). The MHFU recommendations on the FEED design and how they have been addressed in detailed design were discussed in the meeting.

DES was briefed on 21 February 2024 and advice sought on the information required to support an application to amend P-EA-100235984.

The advice provided by the Coordinator-General, DES and MHFU has been considered in preparing this report. Notes from the MHFU meeting are provided in Appendix A.

1.3 STATUTORY CONSIDERATIONS

The proposed pilot plant is in the Gladstone State Development Area (GSDA) and subject to assessment and approval under the GSDA Development Scheme. The pilot plant was assessed and approved under the GSDA Development Scheme 2015. The GSDA Development Scheme was amended on May 2022. This addendum includes an assessment against the amended development scheme.

New development in the GSDA requires a MCU under the *State Development and Public Works Organisation Act 1971* (SDPWO Act) with consideration of the *Planning Act 2016*.

The pilot plant is a prescribed environmentally relevant activity (ERA) under the *Environmental Protection Act 1994* (Qld) (EP Act). The relevant ERA is 7(6)(a):

Chemical manufacturing - 6(a) - Manufacturing, in a year, the following quantities of inorganic chemicals, other than inorganic chemicals to which items 1 to 4 apply - 200t to 1000t.

Changes to proposed development following detailed design will require amendment of the SDA approval and P-EA-100235984.

1.3.1 Change to SDA approval

Amendments to the SDPWO Act in November 2014 override State development area development schemes for the purposes of making changes to SDA approvals. Two potential processes are available for changing an SDA approval. The applicable process depends on the nature of the change requested:

1. *A substantial change to an SDA approval will follow the assessment process for an SDA application in accordance with the relevant development scheme.*
2. *A minor change to an SDA approval will follow the assessment process for an SDA application in accordance with the relevant development scheme, however, the:*
 - *consent of the owner is not required to make the change application*
 - *referral, public consultation and review stages do not apply to the change application and*

- *relevant fee is 25 per cent of the application fee for the approved development.*

The changes to the proposed pilot plant design arise from electrolyser manufacturer detailed design that included addressing MHFU recommendations in the SDA approval. The changes are minor in nature and do not introduce new impacts on environmental values identified and assessed in the initial MCU and EA application. The changes introduce a new parcel of land being Lot 144 CTN2170.

A minor change to an SDA approval typically is when, in the Coordinator General's opinion, the change does not substantially alter the original SDA approval in a way that would:

- *result in a substantially different development, for example:*
 - *involve a use that is different to the approved use or*
 - *result in different or additional impacts that have not been assessed as part of the process to gain the original SDA approval*
- *cause (had the proposed change been assessed as part of the SDA application process to gain the original SDA approval):*
 - *the Coordinator-General or a referral agency to request additional information about the change*
 - *a referral entity to make or alter a referral agency submission about the change*
 - *a person to make or alter a submission about the change or*
 - *substantially alters any other matter of the original SDA approval.*

While the changes to the pilot plant design are minor, introducing a new parcel is not a minor change, necessitating a new application for SDA approval to be made.

1.3.2 GSDA Development Scheme

The GSDA Development Scheme May 2022 defines precincts and permissible development in those precincts. The scheme sets out the development assessment framework for making, assessing, and determining development applications in the GSDA. Development in the GSDA requires a material change of use or operational work (for clearing of native vegetation) depending on the nature of the proposed development.

An assessment of the change application against the GSDA Development Scheme is presented in Section 3 of this addendum, including assessment against:

- Strategic vision for the GSDA
- Overall objectives of development in the GSDA
- Port Related Industry Precinct Intent
- SDA wide assessment criteria.

1.3.3 Planning Act 2016

The State Assessment and Referral Agency (SARA) assesses development against the State Development Assessment Provisions (SDAP). The SDAP defines the State's interest in development assessment and prescribes assessment benchmarks or matters SARA will assess an application against.

State codes outline assessment benchmarks against which SARA will assess a development application. The state codes include:

- A purpose statement that identifies the intent of the code

- Performance outcomes that set benchmarks
- Acceptable outcomes that identify ways to meet the relevant performance outcome.

While the project is not assessable under the SDAP, it has considered the intent of relevant state codes. These include:

- State code 21: Hazardous chemical facilities.
- State code 22: Environmentally relevant activities.

The proposed pilot plant is not a hazardous chemical facility as defined in the code, as the inventory of hydrogen and other Work Health and Safety Regulation 2011 Schedule 15 chemicals does not exceed 10 per cent of the chemical's threshold quantity. The *Work Health and Safety Act 2011* requires hazardous chemical facilities to manage risks associated with the transport, handling, storage, use and disposal of hazardous chemicals. Risks associated with hydrogen production have been assessed considering performance outcomes of State code 21 (see Section 7.4.1 of the Planning Report).

The proposed development triggers environmentally relevant activity (ERA) 7(6)(a), a prescribed ERA under the Environment Protection Regulation 2019. While the proposed development is assessable under the GSDA Development Scheme the application has considered the intent and performance outcomes of State Code 22: Environmentally Relevant Activities (see Section 7.4.2 of the Planning Report).

The changes to the proposed pilot plant design do not change the assessments against State Code 21 Hazardous Chemical Facilities and State Code 22 Environmentally Relevant Activities presented in the planning report. Changing the carparking site to Lot 144 CTN2170 does not introduce any new environmentally relevant activities.

The pilot plant final design is not a hazardous chemical facility and chemicals produced and stored onsite do not exceed the threshold quantities of chemicals listed in Work Health and Safety Regulation 2011 Schedule 15.

1.3.4 Environmental Protection Act 1994

The pilot plant final design does not increase the quantities of inorganic chemicals above the 200 t to 1,000 t threshold permitted in ERA 7(6)(a).

1.3.5 Referral agencies

Relevant referral agencies for the original SDA approval were:

- Department of Environment and Science.
- Major Hazard Facilities Unit.
- Resources Safety and Health Queensland.
- Gladstone Regional Council.
- Department of Transport and Main Roads
- Rio Tinto (as a third party)

1.4 DETAIL OF CHANGES AGAINST THE PLANNING REPORT

Table 1.1 presents a detailed description of how changes from the FEED phase design of the project to the final EPC phase design affect the information and assessment presented in the Planning Report (Tetra Tech Coffey 2022). The changes identified in Table 1.1 are described in Section 2 of this report.

Table 1.1 Summary of changes to information and assessment in Planning Report

Section of the Planning Report	Status of change	Summary of change	Addendum section detailing change
1. Project overview			
1.1 Overview	Changed	<ul style="list-style-type: none"> • Use of the existing car park on Lot 144 CTN2170. • Figure 1 Site locality updated to reflect inclusion of Lot 144 CTN2170 • Figure 2 Project site updated to reflect inclusion of Lot 144 CTN2170 • Figure 3 Gladstone State Development Area - Development precincts updated to reflect inclusion of Lot 144 CTN2170 	Section 2.1 Figure 2.6 Site locality Figure 2.7 Project site Figure 2.8 Gladstone State Development Area – Development precincts
1.2 Proposed use	No change		
1.3 Application details	Changed	<ul style="list-style-type: none"> • The contact person has changed from Alana Barlow to Miro Moss • Figure 4 Plant Model updated to reflect EPC phase final design 	Section 2.1 Figure 2.1 Updated plant model.
2. Subject land and locality			
2.1 Site plan	Changed	<ul style="list-style-type: none"> • Addition of Lot 144 CTN2170 in the real property address. During construction, contractor personnel and visitor access will be from the Jemena carpark located on this lot. 	Section 2.1.
2.2 Planning context	No change		
2.3 Site characteristics	Changed	During construction, contractor personnel and visitor access will be from the Jemena carpark located on Lot 144 CTN2170.	Section 2.1.
2.4 Surrounding land uses	Changed	Figure 5 Surrounding land uses updated to reflect inclusion of Lot 144 CTN2170	Section 2.1. Figure 2.9 Surrounding land uses
3. Project background			
3.1 Pre-lodgement meetings	Changed	Meetings with the Coordinator-General, DES and MHFU have been held	Section 1.2

Section of the Planning Report	Status of change	Summary of change	Addendum section detailing change
		and informed this application.	
3.2 Community consultation	No change		
3.3 Previous approvals	No change		
4. Statutory considerations			
Section 4.1 Overview requirements for material change of use application	No change		
Section 4.2 State Development and Public Works Organisation Act 1971	No change		
Section 4.3 Central Queensland Regional Plan	No change		
Section 4.4 Gladstone State Development Area Development Scheme 2015	Changed	The GSDA development scheme was amended on May 2022.	Section 1.3.2
Section 4.5 Gladstone State Development Area Assessment Procedure and Process	No change		
Section 4.6 Planning Act 2016	No change		
Section 4.7 Gladstone Regional Council Planning Scheme	No change		
Section 4.8 Overview of approval requirements for entire project	No change		

Section of the Planning Report	Status of change	Summary of change	Addendum section detailing change
Section 4.9 Overview of any land access requirements	No change		
Section 5 Development proposal			
Section 5.1 Proposal detail			
<i>Section 5.1.1 Site Layout</i>	Changed	<ul style="list-style-type: none"> Nitrogen generator added to the north of the dry cooler. Water treatment unit (RO plant) relocated to south of the electrolyser. Dry cooler has been relocated north of the electrolyser power unit and arranged horizontally. Emergency access gate added to perimeter fence adjacent to the control room. 	Section 2.1 Figure 2.2 Updated site layout.
<i>Section 5.1.2 Built form and design specifics</i>	Changed	<ul style="list-style-type: none"> Anti-scalant introduced to water treatment package. Earthing and bonding of the electricity system incorporated. Emergency access gate added to perimeter fence adjacent to the control room. The hydrogen mass inventory increased from 1 kg to 3.3. kg. The process flow diagram changed to reflect the introduction of the nitrogen generator (Figure 7). The system flow diagram changed to reflect the introduction of the nitrogen generator (Figure 8). 	Section 2.1 Figure 2.3 Updated process flow diagram Figure 2.4 Updated system flow diagram
<i>Section 5.1.3 Construction detail</i>	Changed	<p>During construction, contractor personnel and visitor access will be from the Jemena carpark on Lot 144 CTN2170.</p> <p>The figure showing the contractor personnel and visitor carparking area and access routes to the site has changed (Figure 9).</p>	Section 2.1. Figure 2.5 Access routes to site for construction and operation.

Section of the Planning Report	Status of change	Summary of change	Addendum section detailing change
<i>Section 5.1.4 Operation detail</i>	No change		
<i>Section 5.1.5 Rehabilitation</i>	No change		
<i>Section 5.1.6 Infrastructure requirements</i>	No change		
<i>Section 5.1.7 Compatibility with existing and potential surrounding land uses</i>	No change		
<i>Section 5.1.8 Engineering overview</i>	Changed	<p>The following risk assessments have been updated to reflect the EPC phase final design:</p> <ul style="list-style-type: none"> HAZID study (Appendix C) Fire and explosion analysis (Appendix D) including changes to the jet fire and explosion scenarios modelling results shown in Figure 10 to Figure 13. Atmospheric vent dispersion study (Appendix E) including changes to Figure 14 and Figure 15. 	<p>Section 2.2.1 HAZID study (Appendix B) Section 2.2.2 and Section 2.3</p> <p>Figure 2.10 Jet fire scenario (flame length 1.5/F) – EPC phase Figure 2.11 Jet fire scenario (flame length 5/D) – EPC Phase Figure 2.12 Explosion scenario (flame length 1.5/F and 5/D) – EPC Phase Figure 2.13 Explosion scenario (flame length 5/D) – EPC Phase</p> <p>Section 2.2.3 and Section 2.3.4 Figure 2.14 Hydrogen release vent dispersion model – EPC Phase Figure 2.15 Hydrogen release vent dispersion model – LFL scenarios Figure 2.16 Oxygen release vent dispersion model – EPC Phase Figure 2.17 Nitrogen generator release vent (Vent A) dispersion Figure 2.18 Process container (electrolyser) release vent (Vent B) dispersion Fire and explosion assessment and atmospheric vent dispersion study (Appendix C)</p>
Section 6 Environmental values, potential impacts and management			
<i>Section 6.1 Environmental values</i>	No change		
<i>Section 6.2 Potential environmental impacts and management</i>	No change		
<i>Section 6.2.1 Flora and fauna</i>	No change		
<i>Section 6.2.2 Water</i>			

Section of the Planning Report	Status of change	Summary of change	Addendum section detailing change
<i>Section 6.2.2.1 Surface water drainage</i>	No change		
<i>Section 6.2.2.2 Wastewater</i>	Changed	An anti-scalant has been added to the water treatment process which uses reverse osmosis.	Section 2.4
<i>Section 6.2.3 Contamination</i>	No change		
<i>Section 6.2.4 Air quality</i>	No change		
<i>Section 6.2.5 Noise</i>	No change		
<i>Section 6.2.6 Traffic</i>	No change		
<i>Section 6.2.7 Natural hazards</i>	No change		
<i>Section 6.2.8 Waste</i>	No change		
<i>Section 6.2.9 Environmental management</i>	No change		
Section 6.3 Potential social impacts and management	No change		
Section 6.4 Potential cultural heritage impacts and management	No change		
Section 7 Statutory planning assessment			
Section 7.1 Overview	No change		
Section 7.2 Assessment against the Central Queensland Regional Plan	No change		
Section 7.3 Detailed assessment against the planning scheme	Changed	The GSDA development scheme was amended on May 2022. This report includes an assessment of the changes against the amended scheme.	Section 3.
<i>Section 7.3.1 Compliance with the</i>			

Section of the Planning Report	Status of change	Summary of change	Addendum section detailing change
<i>Gladstone State Development Area Development Scheme</i>			
<i>Section 7.3.2 Precinct provisions</i>			
<i>Section 7.3.3 Assessment against the SDA wide assessment criteria</i>			
Section 7.4 Assessment against the State Development Assessment Provisions	No change		
<i>Section 7.4.1 Consideration of State Code 21</i>	No change		
<i>Section 7.4.2 Consideration of State Code 22</i>	No change		
Section 7.5 Zones and overlays	No change		
Section 8 Conclusion	No change		
Section 9 References	No change		
Appendix A: Pre-Lodgement Meeting Notes	Changed		Appendix A: Major Hazard Facilities Unit meeting notes
Appendix B: Sumitomo's Group Environmental Policy	No change		
Appendix C: HAZID Study	Changed	Updated assessment to reflect EPC phase final design.	Appendix B: EPC HAZID Study
Appendix D: Fire And Explosion Assessment	Changed	Updated assessment to reflect EPC phase final design.	Appendix C: Fire and explosion assessment and atmospheric vent dispersion study

Section of the Planning Report	Status of change	Summary of change	Addendum section detailing change
Appendix E: Atmospheric Vent Dispersion Study	Changed	Updated assessment to reflect EPC phase final design.	Appendix C: Fire and explosion assessment and atmospheric vent dispersion study
Appendix F: Environmental Risk Assessment	No change		

2. CHANGES TO PROPOSAL FOLLOWING DETAILED DESIGN

The changes implemented in detailed design and updated HAZID and risk assessments are detailed in this section.

2.1 EPC PHASE DESIGN CHANGES

This section provides details of the changes to the FEED phase design presented in the Planning Report (Tetra Tech Coffey 2022) and approved by the Coordinator-General and DES in the SDA approval and EA respectively.

The EPC phase final design incorporates the following changes:

- A nitrogen generator was added to continuously purge the electrolyser system. The nitrogen generator is north of the dry cooler.
- The RO plant was relocated to south of the electrolyser.
- The dry cooler was relocated to the north of the electrolyser power unit and arranged horizontally.
- An emergency access gate has been added to the site perimeter fence adjacent to the control room.
- During construction, contractor personnel and visitor access will be from the Jemena carpark located on Lot 144 CTN2170. Contractor personnel and visitors will park in the Jemena carpark and be bused to the pilot plant site via the Yarwun alumina refinery carpark and pilot plant access road. Operator and visitor carparking during operation will be at the Jemena carpark or an alternative site agreed with RTA Yarwun.

The updated plant model is shown in Figure 2.1 and the updated site layout is shown in Figure 2.2. The updated process flow diagram is shown in Figure 2.3 and the updated system diagram in Figure 2.4. The updated site access plan is shown in Figure 2.5. The updated site locality is shown in Figure 2.6 and the updated project site is shown in Figure 2.7.

The following figures showing the site and lot boundary from the Planning Report have been updated to include the Jemena carpark located on Lot 144 CTN2170:

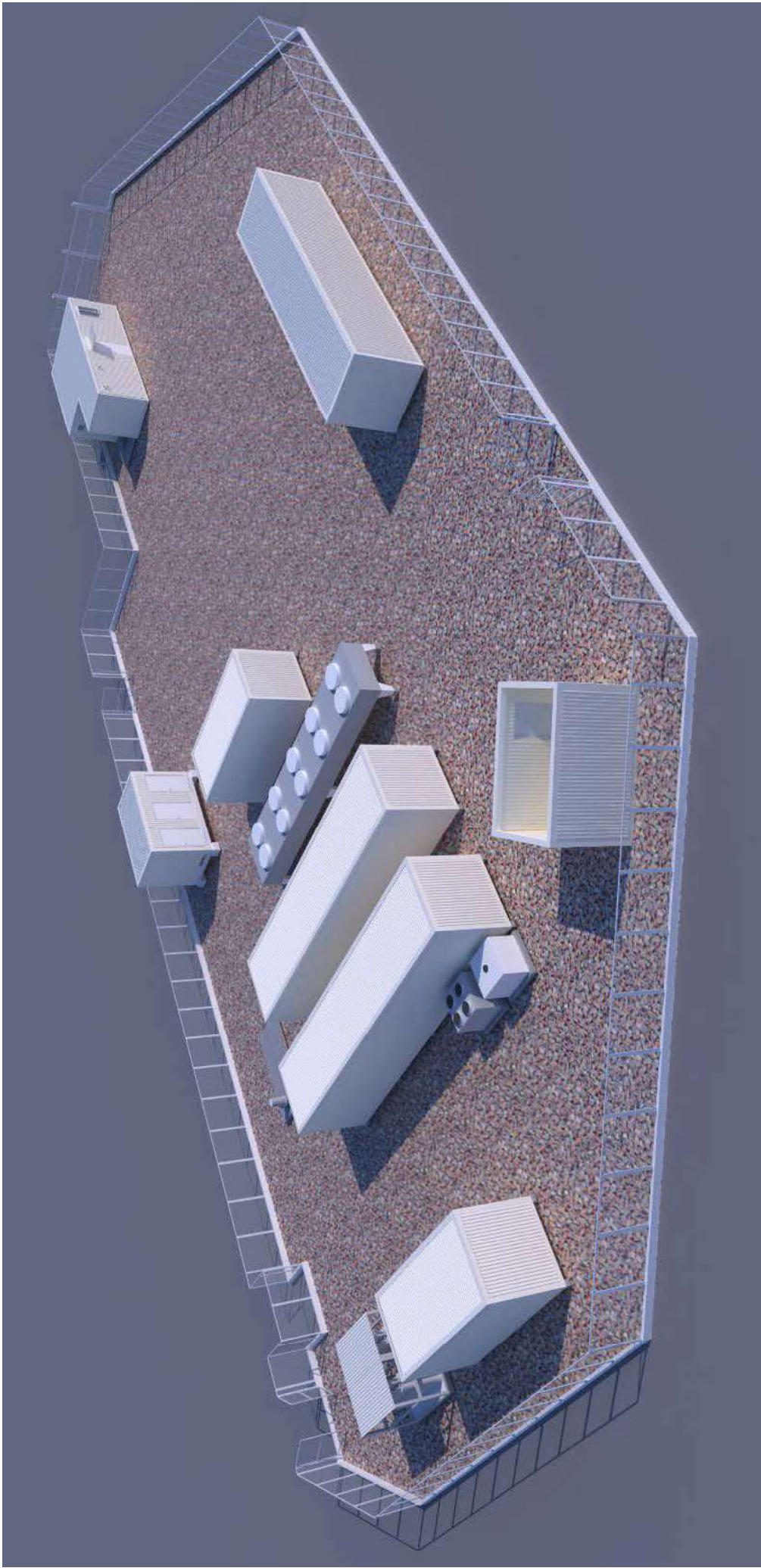
- Figure 3 showed the GSDA development precincts applicable to the site and lot boundary. Figure 2.8 includes that information and Lot 144 CTN2170.
- Figure 5 showed the land uses surrounding the site and lot. Figure 2.9 includes that information and Lot 144 CTN2170.

Table 2.1 outlines the changes to project components following finalisation of the detailed design during the EPC phase.

Table 2.1 Built form and design specifications

Component	FEED design	EPC design changes
Hydrogen process unit	This unit comprises of a rectifier transformer to transform the input electricity from alternating current to direct current and an electrolyser to split water into hydrogen and oxygen using electrical energy. The electrolyser will utilise proton-exchange or alkaline electrolysis technology. The electrolyser will produce 250 to 300 tonnes per annum of hydrogen gas. Oxygen produced in electrolysis will be vented to the atmosphere.	A nitrogen generator using pressure swing adsorption (PSA) has been added to provide nitrogen for continuous purging of the electrolyser to maintain inert operating conditions. The volume of nitrogen in the nitrogen generator during operation will be 1.3 m3 (the capacity of nitrogen buffer vessel). The volume of nitrogen produced by the generator per year is 36 tonnes which is within the EA conditions limit of 1000 tonnes per

Component	FEED design	EPC design changes
		<p>annum. Off-specification nitrogen and residual air will be vented to atmosphere.</p> <p>The hydrogen mass inventory has increased from 1 kg to 3.3 kg.</p> <p>See Figure 2.3 for the updated process flow diagram.</p> <p>The updated system flow diagram is shown in Figure 2.4.</p>
Electrolyser package	The electrolyser package will comprise of containerised modules.	The dry cooler has been relocated north of the electrolyser power unit and arranged horizontally to reduce work at height risks during maintenance.
Hydrogen storage	No hydrogen will be stored on site. Hydrogen will be used in RTA's Yarwun alumina refinery calciners.	No change.
Water supply	Potable water will be supplied from the Yarwun alumina refinery. A reverse osmosis plant will treat the potable water to produce demineralised water for use in the electrolyser. Reject water from the reverse osmosis plant will be collected in a sump and piped to the Yarwun alumina refinery's raw water tanks for reuse in its processes.	<p>The reverse osmosis plant has been relocated to south of the electrolyser. An anti-scalant has been introduced to the water treatment package. The total volume all chemicals remains under the current EA condition of 1000 tonnes per annum.</p> <p>Reverse osmosis plant reject water will be discharged to the Yarwun alumina refinery for reuse as previously proposed.</p>
Power supply	Electricity will be supplied from the Yarwun alumina refinery via an internal connection to a substation in the pilot plant. The electrolyser will use 6.6 kV, the substation supply voltage. Ancillary equipment will use lower voltages supplied by stepdown transformers.	Earthing and bonding of the electrical system has been implemented to address the MHFU recommendation regarding controls to manage the risk posed by static electricity.
Stormwater	Stormwater runoff from the site will be directed to the Yarwun alumina refinery eastern perimeter drain which drains to the Yarwun alumina refinery eastern first flush pond.	No change.
Site access	The project site will be accessed off Hanson Road via the Yarwun alumina refinery main entrance. Construction and operation and maintenance equipment and materials will be delivered to site via internal refinery access roads. Construction contractors and operation employees will use RTA's carpark, with pedestrian access provided from the carpark to the site.	Construction contractor personnel and visitors will park in the Jemena carpark on Lot 144 CTN2170 and will be transported to the project site via minibus or light vehicle. The Jemena carpark abuts the Yarwun alumina refinery boundary. Internal refinery roads will be used for transporting equipment and materials to the site. Operator and visitor carparking during operation will be at the Jemena carpark or an alternative site agreed with RTA Yarwun.



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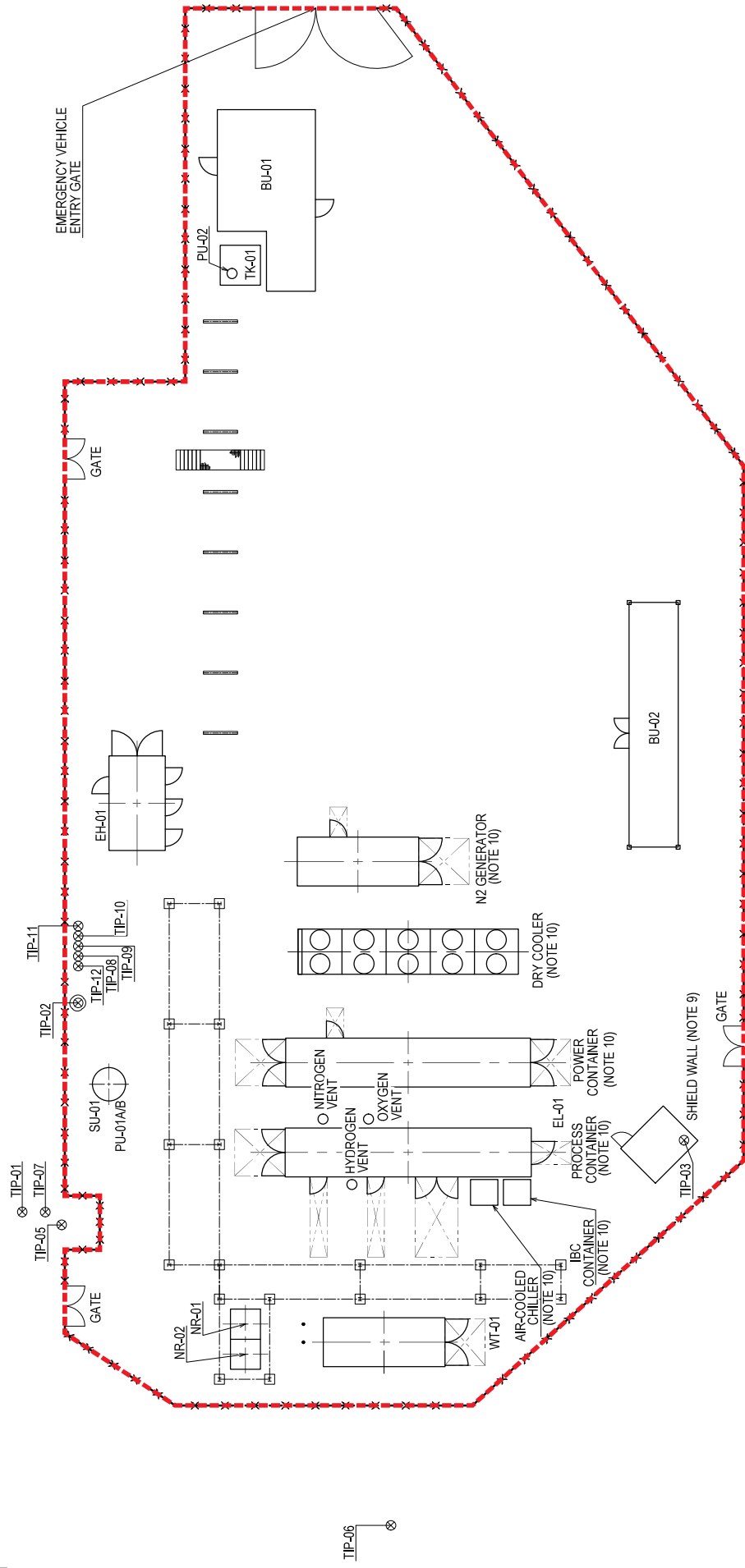
FIGURE 2.1

Updated plant model



SOURCE
JGC Corporation (June 2024)







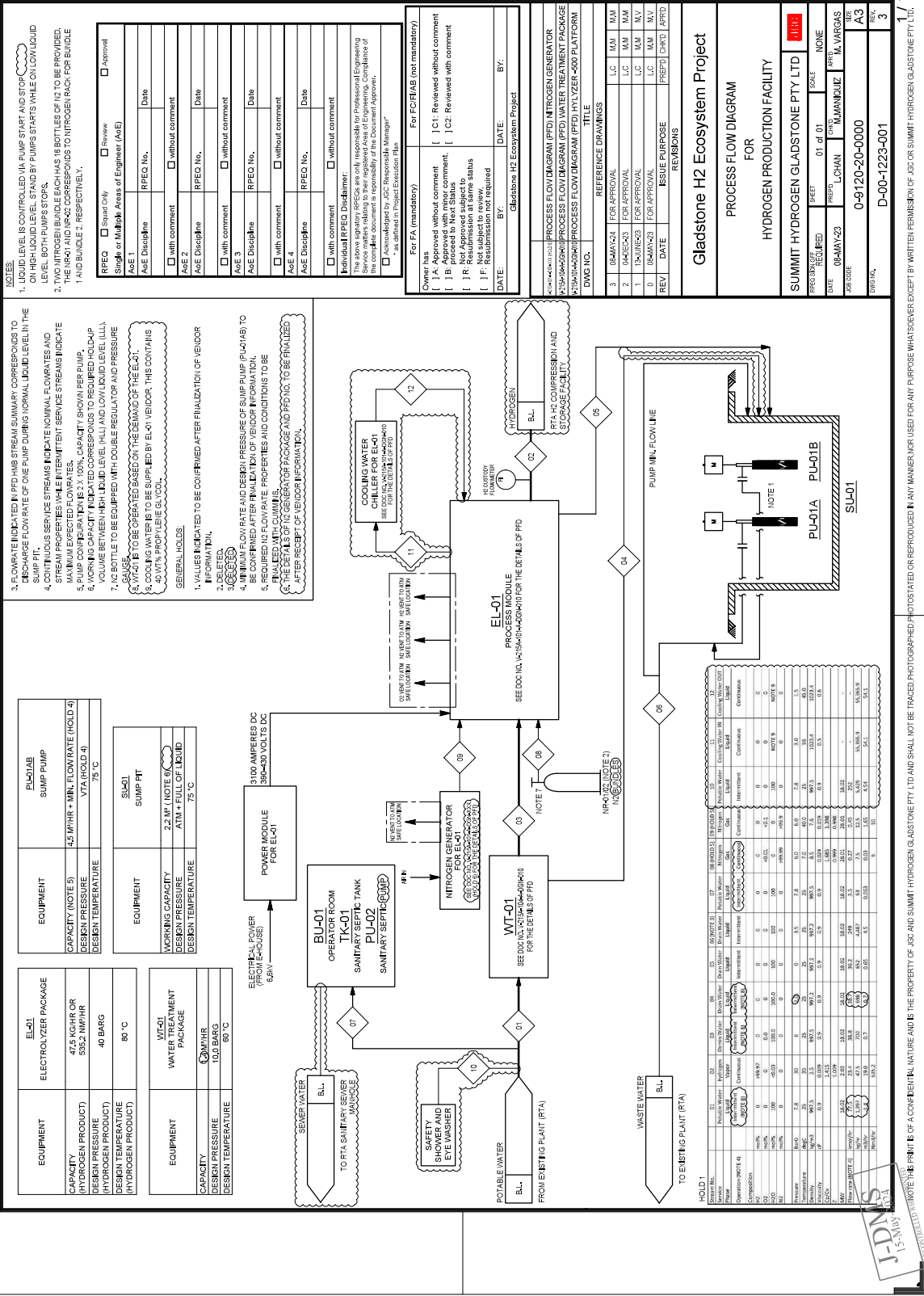
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FIGURE 2.3

Updated process flow diagram

SOURCE
JGC Corporation (June 2024)

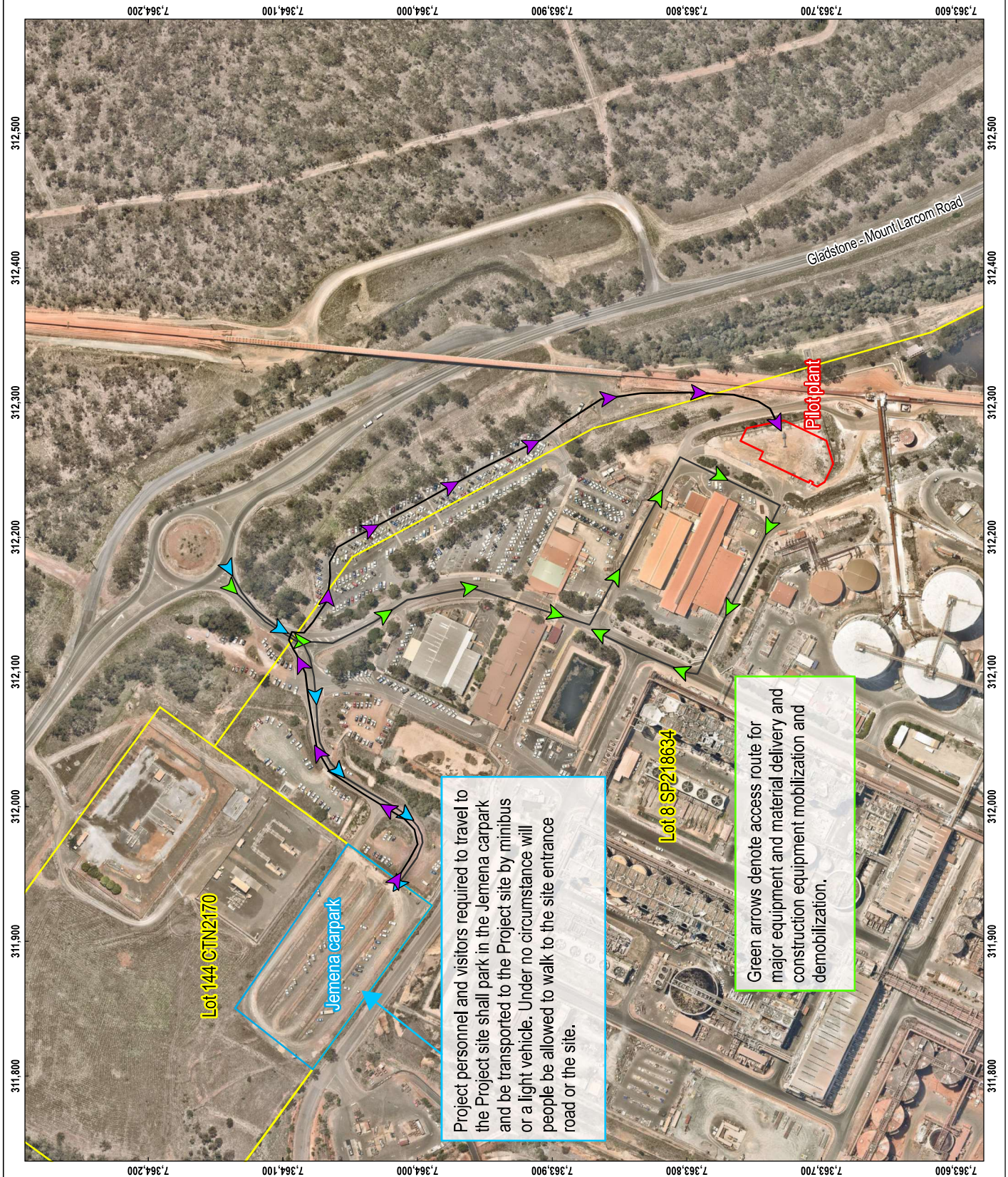


Rio Tinto Scope



Updated system flow diagram





LEGEND

- Equipment and materials route
- Personnel access route
- Personnel bus route
- Pilot plant site boundary
- Lot boundary
- Jemena carpark boundary

SOURCE:
Development area precincts from DSDIP,
Roads, railways and watercourses from DNRME,
Imagery from Neamap (01/11/2023)



SCALE 1:4,000
PAGE SIZE: A4
PROJECTION: GDA 1994 MGA Zone 56


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FIGURE 2.5

Access routes to site for construction and operation

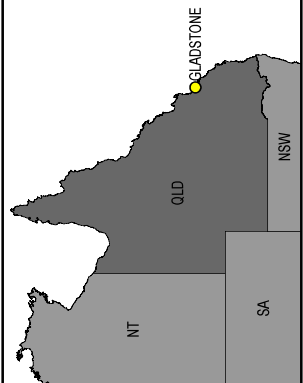






LEGEND

- Major road
- Minor road
- Railway
- Pilot plant site boundary
- Lot boundary
- Jemena carpark



SOURCE:
Cadastral from DCDB.
Roads, railways and watercourses from GEODATA 250k.
Imagery from ESRI Online


 **SCALE 1:80,000**
PAGE SIZE: A4
PROJECTION: GDA 1994 MGA Zone 56

FIGURE 2.6


Site locality

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Tt **TETRA TECH**
COFFEY

DATE: 30.05.24 PROJECT: 754-MELLEN323288 FILE: 232328_03_F02.06_GIS






LEGEND

- Major road
- Minor road
- Railway
- Minor watercourse
- Cadastral
- Pilot plant site boundary
- Lot boundary
- Jemena carpark boundary


SOURCE:
Cadastral from DCDB,
Roads, railways and watercourses from DNRME,
Imagery from ESRI Online



SCALE 1:20,000
PAGE SIZE: A4
PROJECTION: GDA 1994 MGA Zone 56

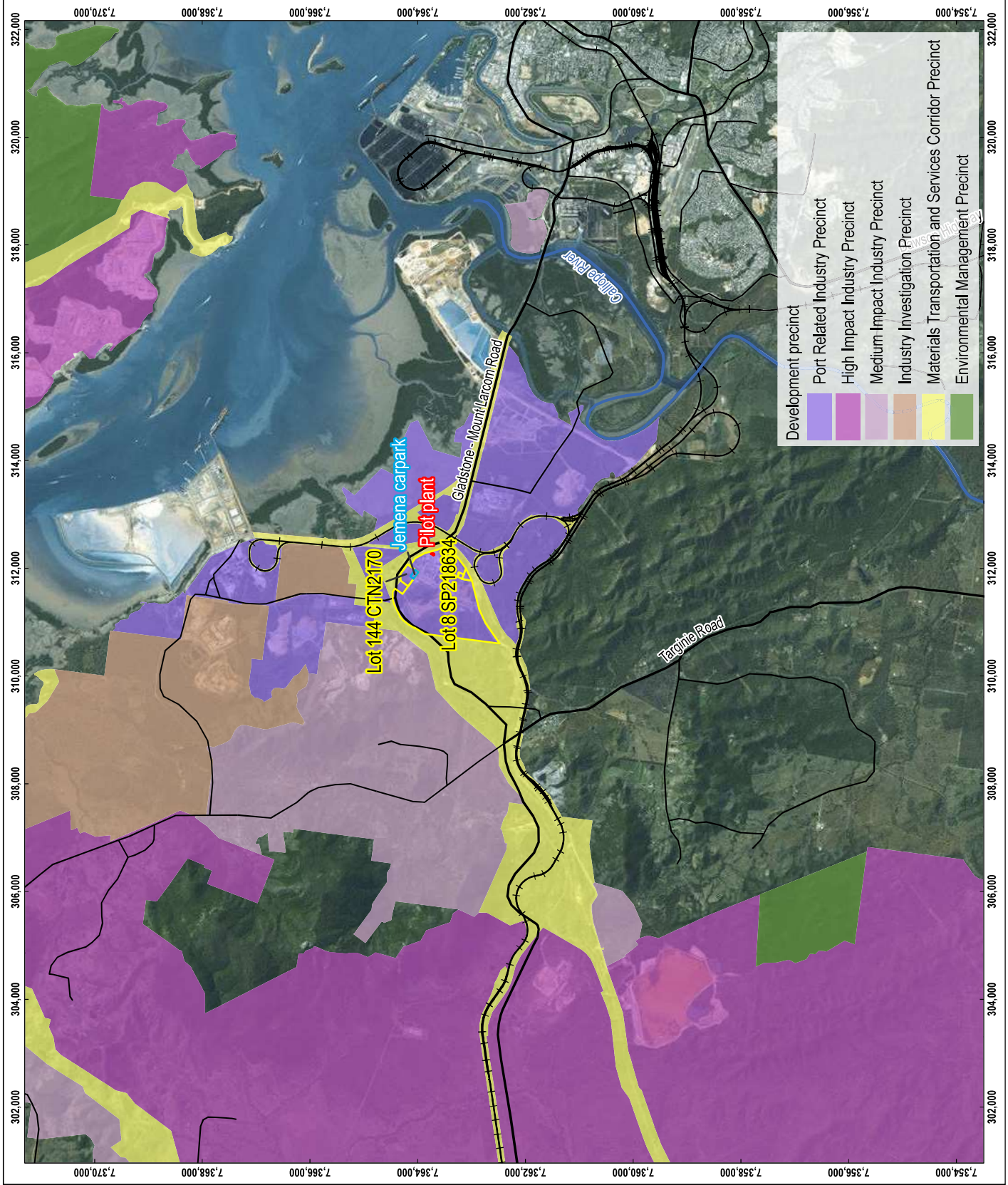
SUMMIT HYDROGEN GLADSTONE PTY LTD
SUMITOMO HYDROGEN PROJECT

FIGURE 2.7
Project Site



TETRA TECH
COFFEY

DATE: 30.05.24 PROJECT: 754-MELN03288 FILE: 23288_03_F02_07_GIS





LEGEND

- Major road
- Minor road
- Railway
- Major watercourse
- Pilot plant site boundary
- Lot boundary
- Jemena carpark boundary

SOURCE:
Development area precincts from DSDIP,
Roads, railways and watercourses from DNRME,
Imagery from ESRI Online



SCALE 1:100,000
PAGE SIZE: A4
PROJECTION: GDA 1994 MGA Zone 56

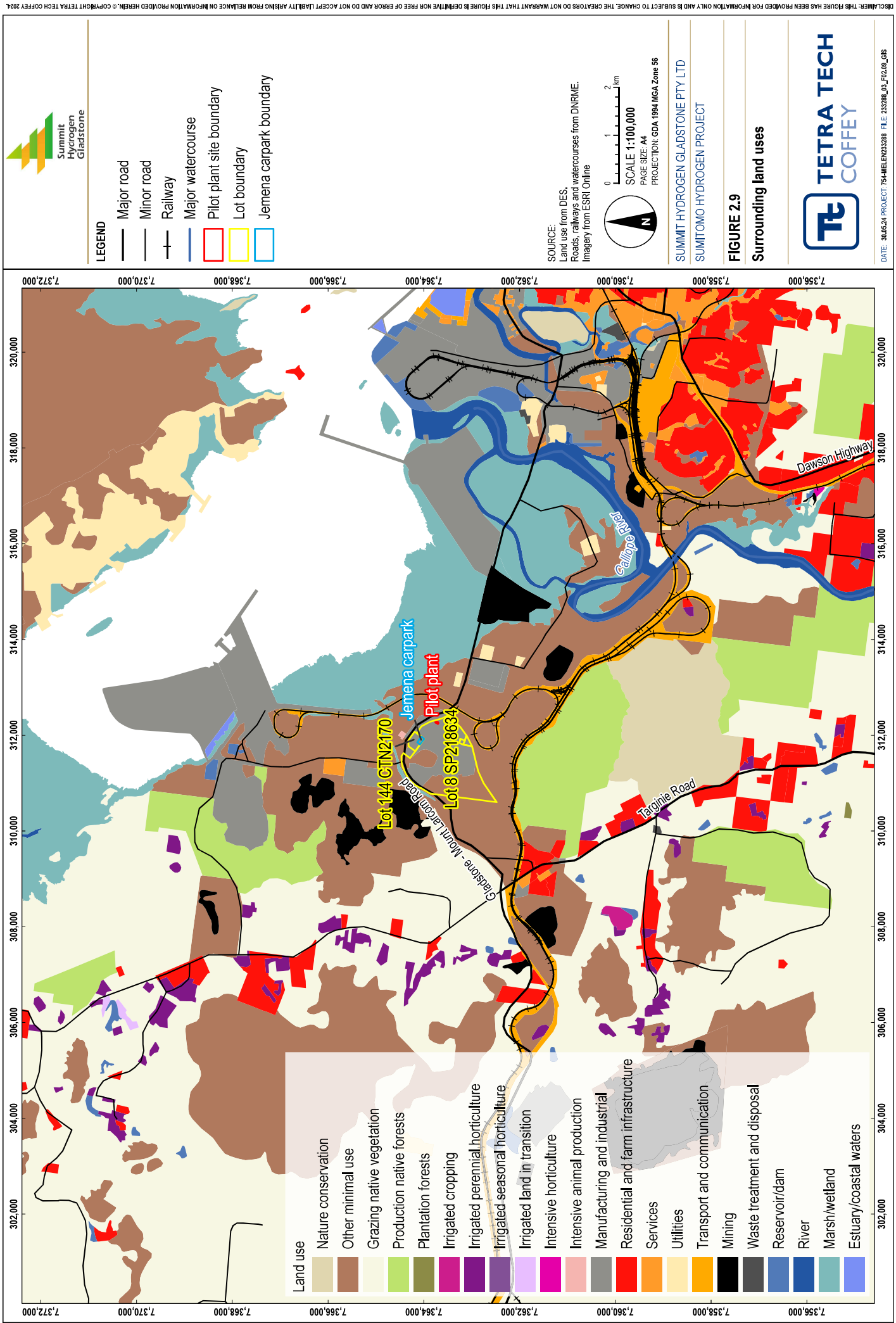
SUMMIT HYDROGEN GLADSTONE PTY LTD
SUMITOMO HYDROGEN PROJECT

FIGURE 2.8
**Gladstone State Development Area -
Development precincts**



**TETRA TECH
COFFEY**

DATE: 19.06.24 PROJECT: 754-MELN032288 FILE: 232288_03_F02.08_GIS



2.2 ENGINEERING OVERVIEW

The changes implemented in EPC phase final design necessitated review and revision of the risk assessments undertaken for the FEED phase design. The following risk assessments were updated:

- HAZID study (Appendix C)
- Fire and explosion assessment (Appendix D)
- Atmospheric vent dispersion study (Appendix E).

2.2.1 HAZID study

The HAZID study prepared during the FEED phase (JGC Corporation 2021a) was updated in the EPC phase (JGC Corporation 2024a attached as Appendix B) to include additional hazards introduced by the nitrogen generator and to address MHFU recommendations on the SDA approval.

The EPC HAZID study examined 33 scenarios from the EPC phase, in addition to those logged during the FEED phase (40 scenarios) resulting in a total of 73 scenarios.

An additional 36 recommendations were generated during the EPC HAZID study, in addition to the 35 recommendations from FEED phase resulting a total of 71 recommendations.

During the FEED phase, the HAZID study identified no very high risks, 20 high risks and 17 medium risks. Additional hazards identified during the EPC phase include:

- Out-of-specification nitrogen purity creates flammable atmosphere in the electrolyser container.
- Nitrogen generator regulator fails and nitrogen bundle does not activate causing overpressure in the electrolyser container.
- Nitrogen generator regulator fails causing overpressure in the electrolyser container.
- Nitrogen leak in electrolyser or nitrogen generator container causes asphyxiation.
- Atmospheric conditions (cyclones, wind speeds, static discharge from lightning).

The high risks were analysed in a fire and explosion assessment and atmospheric vent dispersion study, and their management informed by modelling.

2.2.2 Fire and explosion assessment

The fire and explosion assessment (JGC Corporation 2021b) assessed jet fire (heat radiation) and explosion (overpressure) scenarios for the electrolyser and hydrogen tie-in. The assessment was done in accordance with the following guidelines and standards:

- Guidelines for Evaluating the characteristics of Vapor Cloud Explosions, Flash Fires, and BLEVEs; CCPS (1994).
- RTA Standard GNMS0304 Mitigating process safety hazards on occupied buildings.

The scenarios considered were:

- HAZID No. 1 Release of inventory, hydrogen leak inside container.
- HAZID No. 2 Release of inventory, hydrogen leak outside container.
- HAZID No. 8 Overpressure, increased hydrogen operating pressure.

The fire and explosion assessment was updated in 2024 for the EPC phase (JGC Corporation 2024b attached as Appendix C). The modelling parameters were updated as detailed in Table 2.2.

Table 2.2 Updated fire and explosion assessment modelling parameters

Parameter		FEED Phase	EPC Phase
Jet fire			
Meteorological conditions	Design solar radiation flux	0.5 kilowatt (kW) / square metre (m ²)	1.2 kW/m ²
Jet fire condition	Model	Cone model	Miller model
Explosion			
Meteorological conditions	Design solar radiation flux	0.5 kW/m ²	1.2 kW/m ²
	Hydrogen mass inventory	1.0 kg	3.3 kg
	Electrolyser container volume	59.7 cubic meters (m ³)	49.4 m ³
	Electrolyser container vacancy ratio	100 %	77.6 %
	Electrolyser container flammable gas volume and mass inventory in stoichiometric ratio with air	39.6 m ³ 1.0 kg	38.3 m ³ (49.4 m ³ x 77.6 %) 0.97 kg

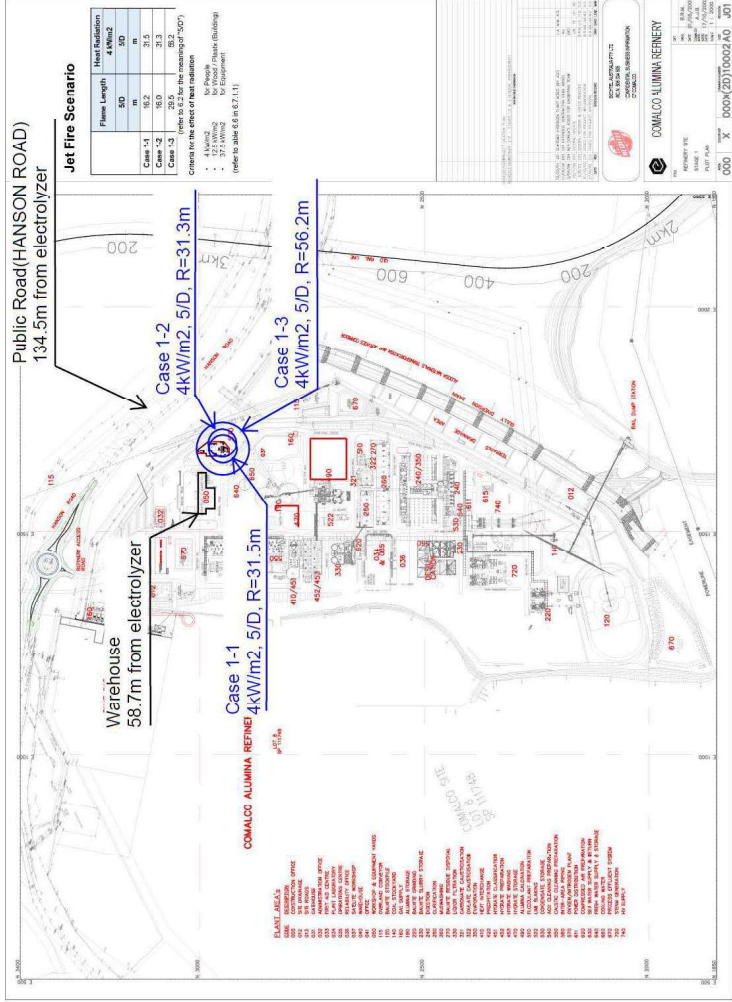
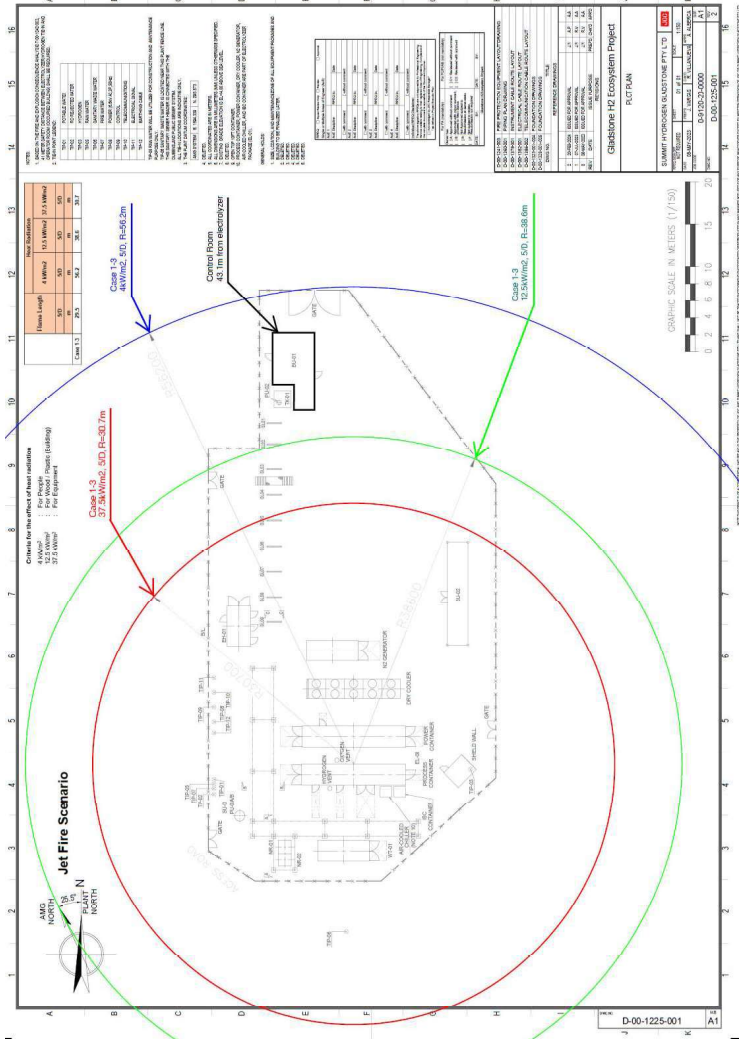
Explosion modelling for the FEED phase assumed the electrolyser container was vacant and that the volume of hydrogen that could accumulate in the container in a flammable gas-air mix was 1 kg. Modelling for the EPC phase used the calculated vacant space of electrolyser container, i.e., the total capacity of the container less that occupied by the electrolyser equipment. Despite the increased hydrogen mass inventory, the volume of flammable gas-air mix that could accumulate in the electrolyser container is 0.97 kg.

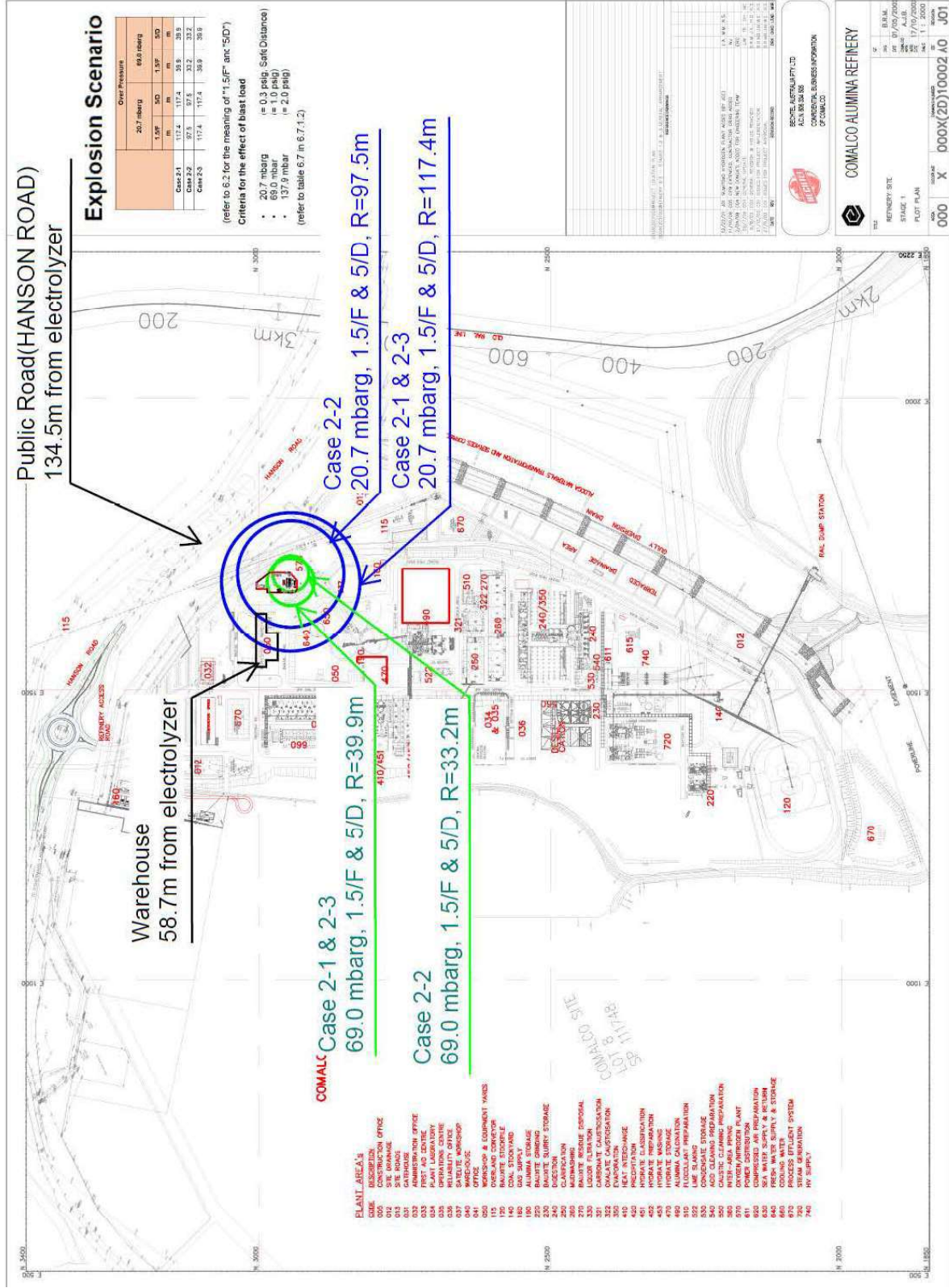
The updated assessment found that under the jet fire scenarios 1.5/F and 5/D for the electrolyser, the heat radiation contours reduced from that calculated in the FEED phase. The combined heat radiation contours for the electrolyser and hydrogen tie-in increased but did not encroach publicly accessible areas (Hanson Road) or the Yarwun alumina refinery warehouse.

The overpressure contours for the explosion scenarios 1.5/F and 5/D for the electrolyser reduced from the FEED phase. The combined electrolyser and hydrogen tie-in overpressure contours did not change, with the risk to the Yarwun alumina refinery warehouse assessed as tolerable based on RTA Yarwun alumina refinery risk assessments and applicable Australia and international standards.

The heat radiation and overpressure contours from updated jet fire and explosion scenarios respectively do not encroach on the control room maintaining the safety of the pilot plant operators.

The updated jet fire and explosion scenarios modelling results are shown in Figure 2.10, Figure 2.11, Figure 2.12 and Figure 2.13.





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FIGURE 2.13

Explosion scenario (flame length 5/D)
– EPC Phase



SOURCE
JGC Corporation (February 2024)



2.2.3 Atmospheric vent dispersion study

The atmospheric vent dispersion study (JGC Corporation 2021c) was undertaken to determine the safe location of hydrogen and oxygen atmosphere release vents. The study was updated in 2024 with the EPC phase detailed design (JGC Corporation 2024b attached as Appendix C).

The criteria used in the study were:

- Hydrogen dispersion: equipment and building shall not be within the Lower Flammable Limit (50%).
- Oxygen dispersion: operator access restricted due to high oxygen concentration (23.5%).
- Nitrogen dispersion: operator access restricted due to low oxygen concentration (19.5%).

The study determined that:

- The hydrogen release vent must be installed 7.36 m above ground and at least 6.9 m from ignition sources including other equipment and accessible places (Figure 2.14). Figure 2.15 shows the extent of hydrogen plumes for 5%, 50% and 100% LFL.
- The oxygen release vent must be installed 5.9 m above ground. No equipment or buildings should be installed, or access provided within a 2.9 m radius of the vent due to the high oxygen concentration (Figure 2.16).
- The nitrogen vents from the nitrogen generator (Vent A) and electrolyser (Vent B) will be installed at least 3 m above ground to ensure safe location criteria are applied and operators are not exposed to less than 19.5% oxygen atmosphere.

The Department of Science and Environment (DES) was invited to provide comments during the development of this addendum. DES commented:

“Given O2 has the potential to be act as a strong oxidiser that any venting may require additional information as to how risks associated with it will be managed”

Cummins, the manufacturer and supplier of the electrolyser was invited to respond to DES’ comment and confirmed the suitability of the oxygen release vent material to avoid oxidation and ignition in the 100% oxygen atmosphere, noting:

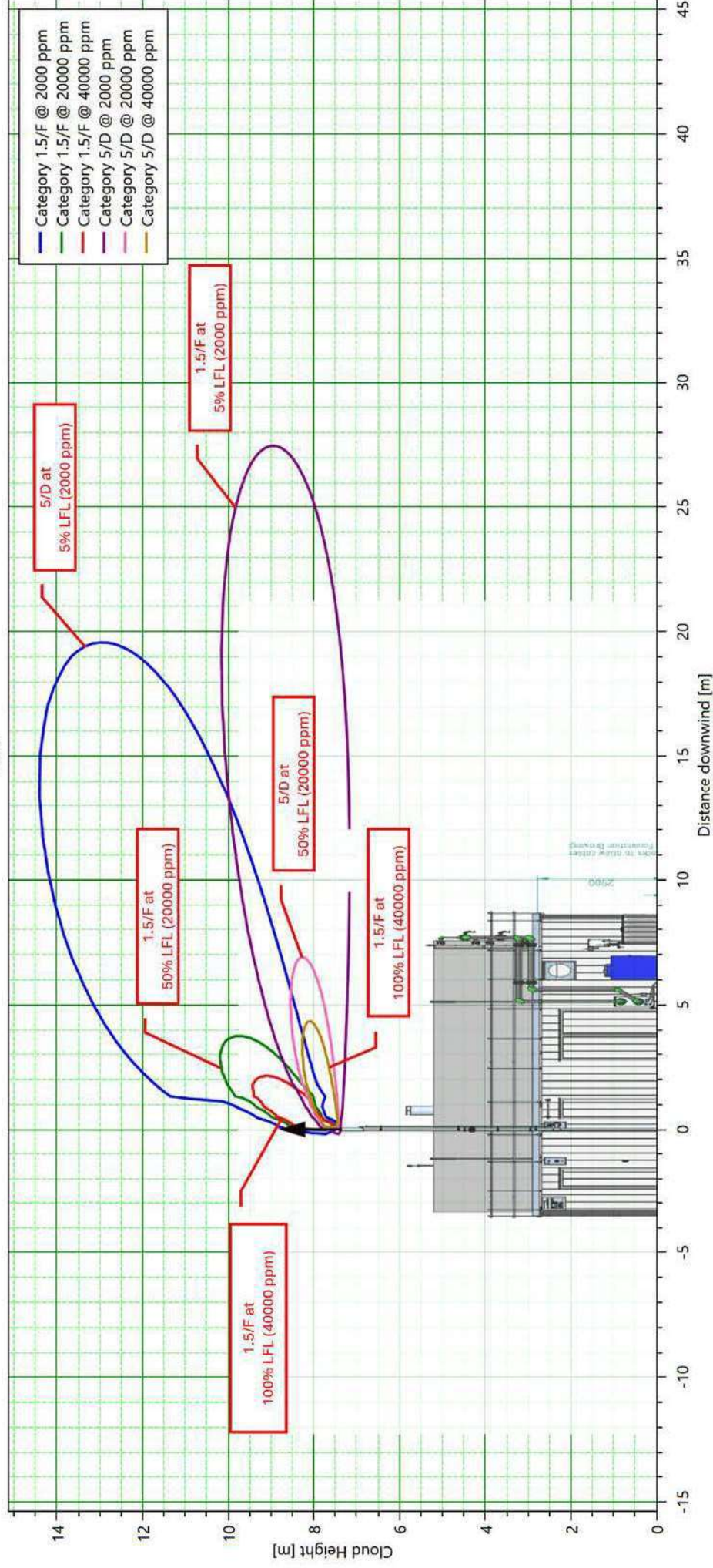
The oxygen vent is made from SS316/316L double certified. It is the same material as the lines we (Cummins) use for our 100% oxygen gas. This is the industry standard when working with oxygen and hydrogen.

DES enquired about the potential for secondary contaminants to be produced:

As N2, H2 and O2 aren’t currently considered indicators for air quality, it shouldn’t be necessary to undertake monitoring. However, it probably would be advisable to include a consideration of the potential for any secondary contaminants and the potential for them to be produced due to increased volumes of N2, H2 and O2 being available. (i.e. NH3 being unlikely due to there being insufficient heat to facilitate $H_2 + N_2 \Rightarrow NH_3$ etc).

No secondary containments will be generated even in the worst-case scenario. The production of ammonia (NH3) from hydrogen and nitrogen requires a catalyst and controlled environment (i.e., high temperature and high pressure). These conditions will not be present at the pilot plant.

Side view Leak



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FIGURE 2.15

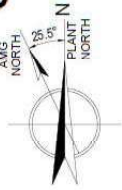
Hydrogen release vent dispersion model
– LFL scenarios



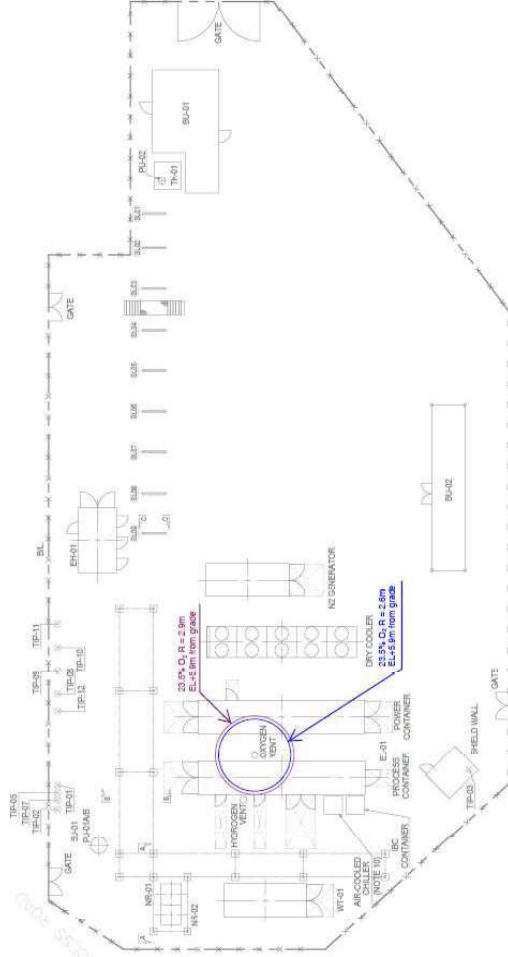
SOURCE
JGC Corporation (February 2024)



Oxygen Main Vent Stack



Category 1.5/F @ 31969 ppm
Category 5/D @ 31969 ppm



NOTES:

- 1. BASED ON THE FIRE AND EMISSION CONSEQUENCE ANALYSIS TO D-001.
- 2. A 100% SAFETY DISTANCE BETWEEN ELECTRICITY AND HYDROGEN IS REQUIRED.
- 3. THE 100% SAFETY DISTANCE IS REQUIRED.

TP-01	POTABLE WATER
TP-02	RECYCLED WATER
TP-03	WASTEWATER
TP-04	WASTEWATER
TP-05	WASTEWATER
TP-06	WASTEWATER
TP-07	WASTEWATER
TP-08	WASTEWATER
TP-09	WASTEWATER
TP-10	WASTEWATER
TP-11	WASTEWATER
TP-12	WASTEWATER
TP-13	WASTEWATER
TP-14	WASTEWATER
TP-15	WASTEWATER
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TP-100	WASTEWATER

THE WATER MAINS WILL BE PLACED FOR CONSTRUCTION AND MAINTENANCE PURPOSES ONLY.

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FIGURE 2.16

Oxygen release vent dispersion model
- EPC Phase



SOURCE
JGC Corporation (February 2024)



2.3 MHFU RECOMMENDATIONS IN SDA APPROVAL

The MHFU made two recommendations in its comments on the FEED phase HAZID and fire and explosion and atmospheric dispersion risk assessment. The recommendations were:

“Explosions in unvented containers, which have resulted in very high-pressure explosions and shrapnel damage. MHFU recommended installed of explosion (blast) vents to control pressures.”

“Cold hydrogen vents igniting due to static electricity. Consider static electricity sources in detailed design including site electrical facilities and thunderstorms associated with tropical storms and cyclones.”

The recommendations have been addressed in detailed design and discussed with the MHFU in the meeting held 14 February 2024. How the recommendations have been addressed is presented in this section along with information on how two further issues raised by the MHFU has been addressed.

2.3.1 Explosions in unvented containers

The MHFU recommended passive controls (explosion (blast) vents or hatches) as a preference to active controls. The objective being to limit the potential for catastrophic loss of containment and shrapnel being expelled by the explosion.

Passive controls have been integrated in the EPC phase final design by providing adequate separation from public roads and sensitive facilities, specifically the pilot plant control room and Yarwun alumina refinery warehouse.

A suite of active controls has been included in the EPC phase final design to reduce the risk of an explosion to so far as is reasonably practicable. These controls are considered effective given the small volume of flammable atmosphere in the electrolyser which is relatively low compared to other industrial gas production facilities with the potential for explosion (JGC Corporation 2024c which is attached as Appendix D).

Active controls that have been incorporated in the EPC phase final design to ensure that the risk of explosion is prevented are:

- Elimination: the number of flange connections have been minimised to reduce the potential for leaks.
- Prevention: potential sources of ignition around the electrolyser have been minimised reducing the likelihood of a fire or explosion event.
- Detection and control: In the event of leak, hydrogen gas detection is set at a level below the flammability limit to ensure that leak is detected at an early stage of release. If hydrogen gas is detected the following actions will be automatically implemented:
 - The ventilation rate of the electrolyser container in normal operation is 600 Nm³/hr. The rate will be increased to 1,000 Nm³/hr if a hydrogen leak is detected.
 - The electrolyser will be shutdown to prevent further hydrogen production and hydrogen leaking into the container space.

In the event an explosion occurs, emergency response controls include:

- Horn and beacon sound and flash at the onset of a release to alert the operator of the incident and to initiate the established emergency response.
- The operational manning plan is lower than usual for an industrial facility. The operators will be carefully selected and will be trained for hydrogen hazards.
- An escape path and emergency lighting will be provided at the facility.

- The emergency access gate will provide access for emergency services.

JGC Corporation (2024c) notes that an explosion hatch could introduce new potential hazards. If incorrectly maintained it could become a danger to the plant and personnel and, if installed on top of the electrolyser container to eliminate the hazard of direct impact to nearby equipment, maintenance of the explosion hatch would pose an additional hazard of working at height for operators.

Cummins, the manufacturer and supplier of the electrolyser notes:

Regarding explosion protection, which includes prevention and mitigation measures, and considering the deflagration venting panels (explosion hatches) for H500, given the robust emergency ventilation rate, the most frequent leakages within the container and their associated hydrogen release rates can be effectively diluted below the deflagration concentration level. It's worth noting that, according to NFPA 2, leaks less than 0.1 percent of the component flow areas represent 95 percent of the leakage frequency. In fact, the considered normal and emergency ventilation system, HAC zoning (a prevention measure causing a significant reduction in ignition probability), gas detection, emergency shutdown/depressurization, and HVAC ramp-up collectively ensure that the risk of explosion is primarily prevented, rather than relying on an approach to mitigate the severity of explosion consequences. Consequently, the explosion risk level is deemed acceptable, and there is no additional requirement for explosion mitigation measures such as explosion hatches.

Considering the low inventory of flammable material and the location of the pilot plant in relation to critical public places, JGC Corporation considers that an explosion hatch is not warranted for the scenario and the risk associated to the event is considered tolerable, so far as is reasonably practicable (JGC Corporation 2024c).

The MHFU acknowledged that given the location of the pilot plant and the small inventory, active controls are adequate. However, the MHFU noted that if the facility was in a residential area with a larger inventory, active and passive controls would be required to provide a comprehensive approach for managing explosion risk.

2.3.2 Cold hydrogen vents igniting due to static electricity

Earthing and bonding controls have been incorporated into the EPC phase final design in accordance with applicable laws, regulations, and Australian standards. Additionally, no equipment or personnel access will be allowed within the 50% LFL contour of the hydrogen release vent, ensuring that the impact on the operators is eliminated in the event of an explosion. Figure 2.11 shows the extent of the hydrogen release vent 5% LFL contour. The operating procedures which ensure no equipment or personnel in proximity to the vent and hydrogen atmosphere will protect operator safety.

2.3.3 Lower flammability limit

During the 2024 meeting the MHFU stated that the design should consider 5% LFL for the hydrogen release vent. Additional modelling was completed to assess the 5%, 50% and 100% LFL from the hydrogen release vent. As seen in Figure 2.15, the gas cloud at 5% also does not touch any platform or area accessible by the operators.

2.3.4 Nitrogen asphyxiation

During the 2024 meeting the MHFU noted that the addition of a nitrogen generator and using nitrogen in the electrolyser introduces an asphyxiation hazard for operators in the potential low oxygen atmosphere. The following control measures will be implemented to manage the asphyxiation hazard:

- Operators will be restricted from areas where the atmosphere is less than 19.5% oxygen.
- Portable oxygen detectors will be used by the operators.
- Oxygen detectors will be installed in the electrolyser and automatically trigger an emergency shutdown of the electrolyser in the event of a leak.
- Out-of-specification nitrogen from the nitrogen generator and leaks from nitrogen purging of the electrolyser will be vented to atmosphere. The vents will be installed at heights that avoid operators being exposed to low oxygen levels. Nitrogen vent dispersion model results are shown in Figure 2.17 and Figure 2.18. The figures show that plumes that could cause asphyxia extend approximately 1.2 m from the vent outlet under category 1.5/F and 5/D weather conditions.
- The nitrogen generator and residual air will not produce NO_x (oxides of nitrogen) or cause the generation of NO_x in the atmosphere through chemical reactions.

2.4 POTENTIAL ENVIRONMENTAL IMPACTS

Reverse osmosis will be used to treat potable water supplied by RTA Yarrow to the required specification for the electrolyser. The potable water will be pre-treated with an anti-scalant to reduce membrane fouling and improve water treatment plant operation. The reject water specification has changed due to detailed design and the introduction of the anti-scalant. The reject water quality from FEED design and EPC design is detailed in Table 2.3.

Table 2.3 Final reject water quality

Water quality parameter	FEED design concentration	EPC design concentration
Cations		
Calcium (Ca)	165 mg/L	58.2 mg/L
Magnesium (Mg)	108 mg/L	31.1 mg/L
Sodium (Na)	167 mg/L	114 mg/L
Potassium(K)	11 mg/L	6.8 mg/L
Anions		
Bicarbonate (HCO ₃)	248 mg/L	292.2 mg/L
Chloride (Cl)	158 mg/L	148.7 mg/L
Sulphate (SO ₄)	45 mg/L	50.4 mg/L
Silica (SiO ₂)	29 mg/L	21.9 mg/L
Total organic carbon (TOC)	14 mg/L	0 mg/L
Carbonate (CO ₃)	-	4 mg/L
Nitrate (NO ₃)	-	1.3 mg/L
Other dissolved elements		
Iron (Fe)	0.05 mg/L	0 mg/L
Manganese (Mn)	0.05 mg/L	0 mg/L
Zinc (Zn)	0.07 mg/L	0 mg/L
Aluminium (Al)	0.11 mg/L	0 mg/L
Boron(B)	0.23 mg/L	0.1 mg/L

Water quality parameter	FEED design concentration	EPC design concentration
Copper (Cu)	0.11 mg/L	0 mg/L
Carbon dioxide (CO ₂)	-	1 mg/L
Other water quality parameters		
pH	-	8.6
Total dissolved solids (TDS)	-	728.9 mg/L
Silt density index (SDI)	-	-
Chemical oxygen demand (COD)	-	-
Biochemical oxygen demand (BOD)	-	-
Hardness (as CaCO ₃)	-	273.08 mg/L

With few exceptions, the concentrations have reduced or remain unchanged. The exceptions are increased concentrations of bicarbonate (HCO₃), sulphate (SO₄), carbonate (CO₃), nitrate (NO₃) and carbon dioxide (CO₂).

Reject water from the water treatment plant will have slightly elevated concentrations of dissolved salts compared to the potable water specification. The reject water will be captured in a covered sump and piped to the Yarwun alumina refinery raw water tanks for reuse in the refinery.

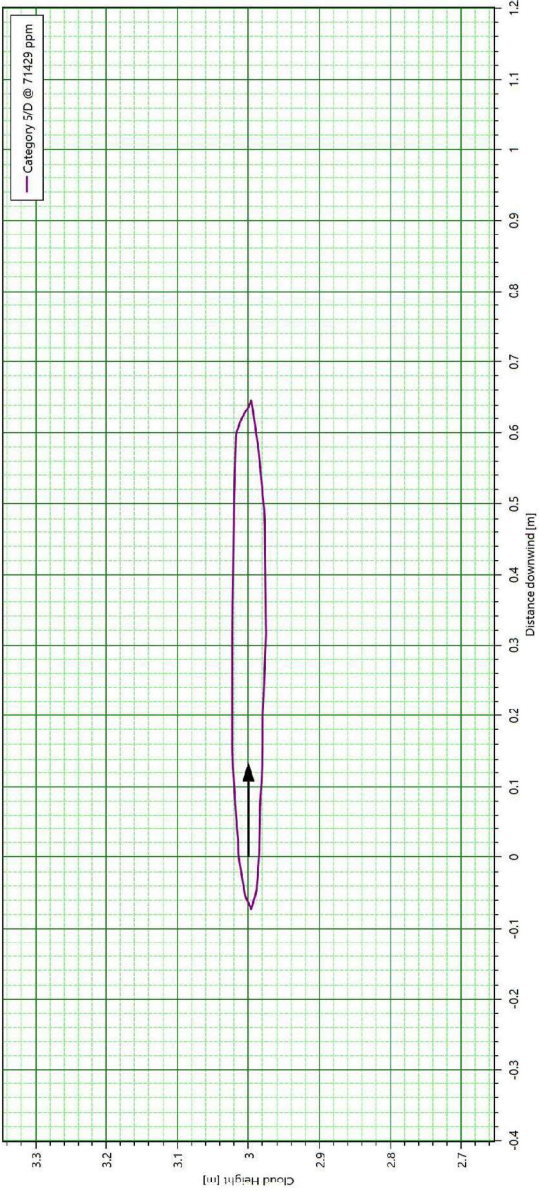
The wastewater will be managed in a closed system and will not have a significant impact on any matters of national environmental significance, including the Great Barrier Reef World Heritage Area or matters of state environmental significance.

Side view
Leak



Gas dispersion result for nitrogen generator release vent (Vent A)
for asphyxiation criteria limit (wind 1.5/F)

Side view
Leak



Gas dispersion result for nitrogen generator release vent (Vent A)
for asphyxiation criteria limit (wind 5/D)

SUMMIT HYDROGEN GLADSTONE PTY LTD

SUMITOMO HYDROGEN PROJECT

FIGURE 2.17

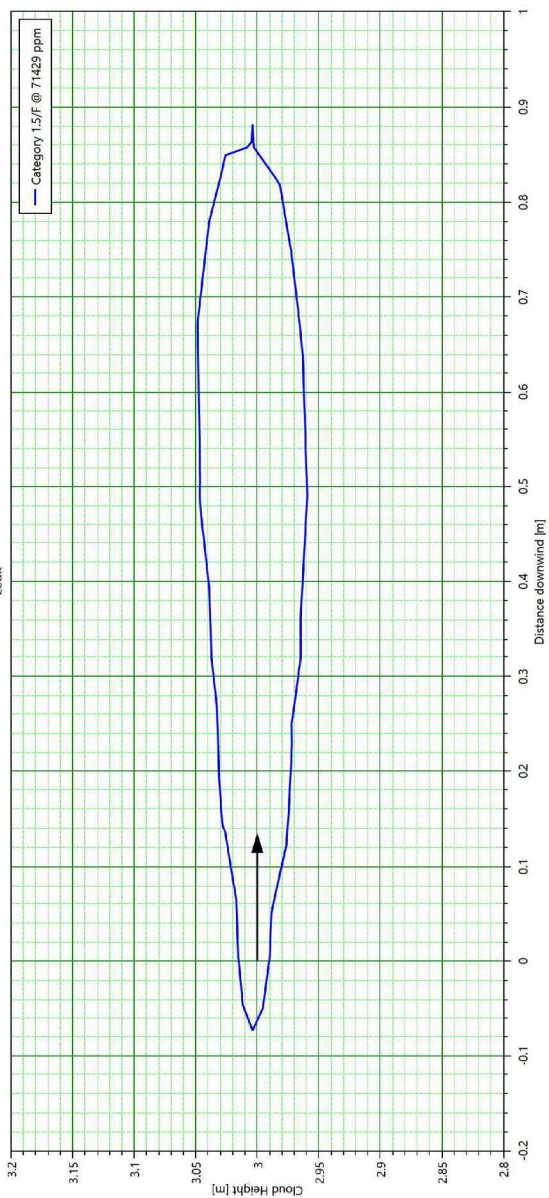
Nitrogen generator release vent (Vent A)
dispersion model



SOURCE
JGC Corporation (February 2024)

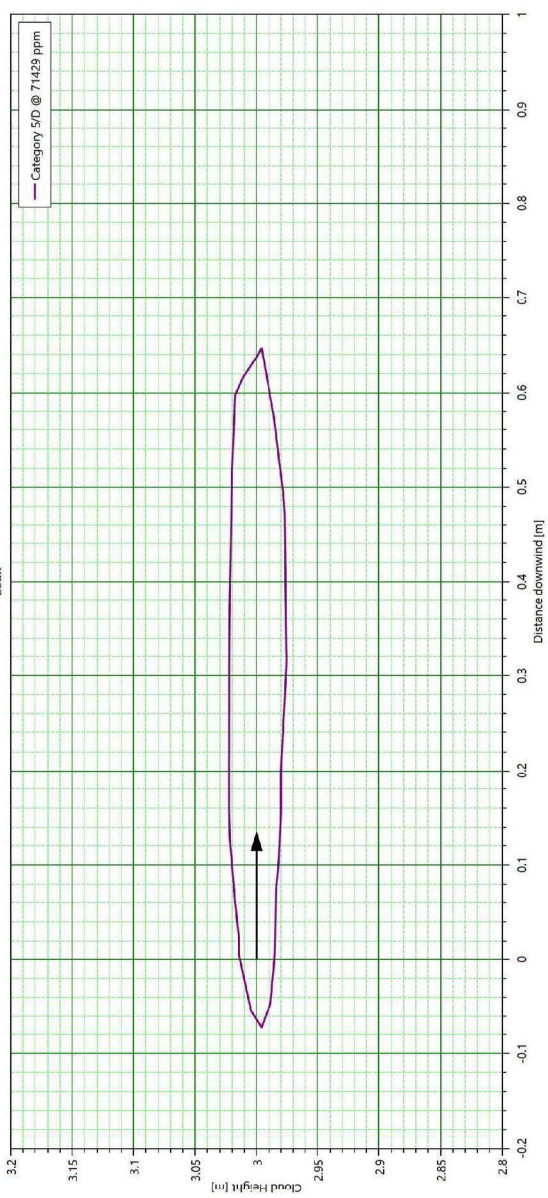


Side view
Leak



Gas dispersion result for electrolyser release vent (Vent B)
for asphyxiation criteria limit (wind 1.5(F))

Side view
Leak



Gas dispersion result for electrolyser release vent (Vent B)
for asphyxiation criteria limit (wind 5(D))

SUMMIT HYDROGEN GLADSTONE PTY LTD

SUMITOMO HYDROGEN PROJECT

FIGURE 2.18

Process container (electrolyser) release
vent (Vent B) dispersion model



SOURCE
JGC Corporation (February 2024)



3. COMPLIANCE WITH THE GLADSTONE STATE DEVELOPMENT AREA DEVELOPMENT SCHEME

As discussed in Section 1.3.2, the Planning Report was assessed under the previous Gladstone SDA Development Scheme (November 2015). The GSDA Development Scheme was amended on May 2022. An assessment against the amended GSDA Development Scheme is detailed in this section.

3.1 STRATEGIC VISION FOR THE GSDA

The strategic vision for the GSDA, as set out in the GSDA Development Scheme May 2022 is:

- Be Central Queensland's economic powerhouse, with an efficient concentration of large-scale industry of national, State and regional significance that benefit from the SDA's strategic location near the Port of Gladstone and major road and rail networks
- Support development that aligns with the Queensland Government's strategic priorities for the region, particularly related to the hydrogen industry
- Maintain environmental, cultural heritage and community values where possible to support wider ecological processes and provide community benefits

The strategic vision is supported by the overall objectives for development and preferred development intents of development precincts within the Gladstone SDA.

The proposed development aligns with the strategic vision for the GSDA as it:

- Aligns with the Queensland Government's aim to make Gladstone a renewable energy powerhouse incorporating a hydrogen industry (DSDI 2024).
- Is a hydrogen production pilot plant designed to investigate hydrogen production and its use in the aluminium industry.
- Will be built on an existing industrial site in the Yarwun alumina refinery avoiding and minimising impacts on environmental, cultural heritage and community values. The proposed development will not impact on the outstanding universal values of the adjacent Great Barrier Reef World Heritage Area.

3.2 GSDA SCHEME OVERALL OBJECTIVES

An assessment of the project against the overall objectives of the GSDA Development Scheme is detailed in Table 3.1.

Table 3.1 Proposed development assessment against the GSDA Development Scheme objectives

Development scheme objective	Proposed development assessment
a. Development will capitalise on Gladstone SDA's strategic location and support the role and function of the Port of Gladstone	The Queensland Government has identified the Gladstone SDA as a key site in Queensland's renewable energy transition with the hydrogen industry a key component (DSDI 2024). The proposed development is cited in DSDI 2024 as supporting the development of a hydrogen industry. Located adjacent to the Yarwun alumina refinery, the proposed development will capitalise on the strategic location and support the role and function of the Port of Gladstone.
b. Development will identify and implement opportunities for synergies and co-location	The proposed development will support research into the production of green alumina. Strategically

Development scheme objective	Proposed development assessment
between other uses, services and infrastructure to minimise waste and inefficiencies	located in the Yarwun alumina refinery, the proposed development will use existing refinery infrastructure and services. Reject water from reverse osmosis will be used in the refinery minimising wastewater and maximising reuse.
c. Development will use land and infrastructure efficiently and be adequately serviced by infrastructure	The proposed development is on the former Air Liquide site in the Yarwun alumina refinery. The pilot plant will use existing infrastructure and services including electricity and water. Reject water from reverse osmosis will be used in the Yarwun alumina refinery.
d. Development will ensure the integrity and functionality of the Gladstone SDA, including infrastructure corridors and future development opportunities, is maintained and protected from incompatible land.	The functionality and integrity of the GSDA will be maintained and protected as the proposed development is in the Yarwun alumina refinery and the land use is compliant with the precinct intent as outlined in Section 3.2.
e. Ensure new lots are appropriately sized to accommodate preferred development	The proposed development does not require the creation of a new lot. The site is appropriately sized and will be leased from RTA Yarwun. Construction and operation and maintenance and visitors will use the Jemena carpark on Lot 144 CTN2170, as the RTA Yarwun carpark has insufficient capacity.
f. Development will be designed, constructed, and operated to a high quality consistent with best practice	The final design has addressed Queensland Government comments and has been designed and will be constructed and operated in accordance with applicable laws, regulations, and Australian standards.
g. Avoid impacts on environmental, cultural heritage, and community values (including sensitive land uses), or minimise or mitigate impacts where they cannot be avoided and offset any residual impacts	The proposed development is on an industrial site previously used for air separation. The final design incorporates features and procedures to avoid impacts on environmental, cultural heritage and community values, as detailed in Section 6 of the Planning Report, and Section 2 of this addendum.
h. Not adversely impact on the outstanding universal values of the Great Barrier Reef World Heritage Area	The proposed development will not impact on the outstanding universal values of the Great Barrier Reef World Heritage Area (see Section 6.2.2 of the Planning Report).
i. Development will manage the risks associated with the projected impacts of climate change and natural hazards to protect people and property	<p>The project is not located in a flood hazard or coastal hazard (erosion prone or storm tide inundation) zone (see Section 6.2.7 of the Planning Report).</p> <p>The proposed development on an existing industrial site will not increase risks to people and property from climate change.</p>
j. Manage any adverse impacts on air quality on the capacity of the Gladstone airshed	Impacts on air quality and the Gladstone airshed will be avoided or minimised through controls outlined in Section 6 of the Planning Report and Section 2 of this addendum.

3.3 COMPLIANCE WITH THE PRECINCT

An assessment of the proposed development against the intent of the Port Related Industry Precinct is presented in Table 3.2. The proposed development is compliant with the intent of the precinct.

Table 3.2 Proposed development assessment against the Port Related Industry Precinct

Precinct intent	Assessment against proposed development
<p>1. The preferred development intent for the Port Related Industry Precinct is described below.</p> <p>a. This precinct is to accommodate industrial development that:</p> <p>(i) has links to the Port of Gladstone through the import and export of material</p> <p>(ii) benefits from close proximity to port related infrastructure and services</p> <p>(iii) is difficult to locate and requires separation from sensitive land uses.</p> <p>b. This precinct may also accommodate industrial development that requires co-location with uses that support the preferred development intent.</p>	<p>The proposed development supports research into hydrogen production and the production of green alumina. The produced hydrogen will be used in the refinery's calciners.</p> <p>Strategically located in the Yarwun alumina refinery, the proposed development maximises opportunities and benefits from close proximity to existing infrastructure and services. The proposed development is consistent with the Queensland Government's vision for the GSDA (DSDI 2024).</p>
<p>1. Defined uses that support the preferred development intent are:</p> <p>a. High impact industry</p> <p>b. Medium impact industry</p> <p>c. Port facilities</p> <p>d. Special industry</p>	<p>The proposed development is located in the Port Related Industry Precinct of the GSDA Development Scheme. As such, it is assessable under the provisions of this precinct. The project meets the definition of medium impact industry as defined in the GSDA Development Scheme May 2022, as:</p> <ul style="list-style-type: none"> the pilot plant will manufacture hydrogen for use in the Yarwun alumina refinery calciners, and nitrogen. the proposed pilot plant requires onsite controls for emissions, hazardous substances and dangerous goods. However: <ul style="list-style-type: none"> the proposed pilot plant has negligible impacts on sensitive surrounding land uses due to offsite emissions. Emissions from the proposed pilot plant will be contained on the site. the proposed pilot plant will have negligible offsite impacts from hazardous materials and processes as confirmed by fire and explosion and atmospheric vent modelling. construction and operation activities will generate minimal traffic. Earthworks and civil works will generate small volumes of heavy and light vehicle traffic during construction. Operation and maintenance activities will generate very small traffic movements and volumes with three operator vehicles visiting the site daily and two maintenance vehicles visiting the site monthly.
<p>2. Defined uses may be considered where the use does not compromise the preferred development intent.</p>	<p>The proposed development is a defined use within the Port Related Industry Precinct (medium impact industry). The pilot plant is a research and technology industry designed to investigate</p>

Precinct intent	Assessment against proposed development
	hydrogen production and its use in the aluminium industry.

3.4 ASSESSMENT AGAINST THE SDA WIDE ASSESSMENT CRITERIA

An assessment of the proposed development against the SDA wide assessment criteria is detailed in Table 3.3. The proposed development is compliant with the intent of the precinct within the GSDA.

Table 3.3 Proposed development assessment against SDA wide assessment criteria

SDA wide assessment criteria	Assessment against proposed development
Infrastructure and services	
Development is designed to maximise efficiency and minimise cost for infrastructure and services including telecommunications, transport, water, wastewater, recycled water, and energy networks, and state or local government infrastructure and services.	Electricity and potable water will be supplied from the Yarwun alumina refinery. Reject water from the reverse osmosis plant will be re-used in the Yarwun alumina refinery. The proposed pilot plant will have minimal impact on existing services (see Section 6 of the Planning Report).
Development plans for and manages the impacts of the development on existing and planned known infrastructure and services including telecommunications, transport water, wastewater, recycled water, and energy networks, and state or local government infrastructure and services.	The pilot plant site is located within the Yarwun alumina refinery and will use existing infrastructure and services. The project will utilise the existing Jemena carpark adjacent to the Yarwun alumina refinery on Lot 144 CTN2170. The pilot plant will have minimal impact on existing services (see Section 6 of the Planning Report). The proposed pilot plant and use of the Jemena carpark will not impact planned development in the GSDA.
Development is adequately serviced by infrastructure and services including telecommunications, transport water, wastewater, recycled water, and energy networks, and state or local government infrastructure and services to meet the demand generated by the development	The proposed development will use existing infrastructure and services. Electricity will be supplied from the Yarwun alumina refinery. Potable water will be supplied from the Yarwun alumina refinery and reject water from the reverse osmosis plant will be re-used in the Yarwun alumina refinery. The project will utilise existing road infrastructure and the existing Jemena carpark adjacent to the Yarwun alumina refinery on Lot 144 CTN2170.
Development integrates with existing and planned infrastructure and services where possible.	The proposed development is on an industrial site in the Yarwun alumina refinery. The project will utilise the existing Jemena carpark adjacent to the Yarwun alumina refinery on Lot 144 CTN2170. The proposed development will use existing infrastructure and services. Electricity and potable water will be supplied from the Yarwun alumina refinery. Reject water from the reverse osmosis plant will be re-used in the Yarwun alumina refinery. The project will have minimal impacts on existing services.
Transport	
Increased traffic arising from the development can be accommodated within the existing road networks	During construction, site access for contractors and visitors will be from the Jemena carpark adjacent to

SDA wide assessment criteria	Assessment against proposed development
or works are undertaken to minimise adverse impacts.	the Yarwun alumina refinery on Lot 144 CTN2170. Site access for equipment and materials is via the existing Yarwun alumina refinery main entrance. Traffic arising from the development can be accommodated within the existing road network (see Section 6.2.6 of the Planning Report).
Road networks within the SDA are to be designed to accommodate the proposed vehicle type and predicted traffic volumes associated with the development and the precinct/s.	The proposed vehicle type and predicted traffic volumes associated with the project can be accommodated by the local road network, as discussed in Section 6.2.6 of the Planning Report.
Development is designed to facilitate safe and efficient vehicular ingress and egress and does not unduly impact on the safe and efficient operation of transport infrastructure, including corridors.	Vehicles associated with the project will access and exit the site via Hanson Road and the Yarwun alumina refinery main access road and internal road network. The small traffic volumes produced by the project will not unduly impact on the safe and efficient operation of the use of external roads, rail, transport infrastructure or services (see Section 6.2.6 of the Planning Report).
Adequate car parking for the number and nature of vehicle expected are provided on site.	Adequate car parking for the number and type of vehicles will be provided by the Jemena carpark on Lot 144 CTN2170 and the Yarwun alumina refinery during operation (see Section 5.1.3, Section 5.1.4 and Section 5.1.5 of the Planning Report).
Environmental nuisance	
Development is designed to avoid or minimise adverse impacts from air, noise and other emissions that will affect health and safety, wellbeing and amenity of communities and individuals, and conflicts arising from spray drift, odour, noise, dust, smoke or ash emissions with sensitive uses.	The project is in an industrial site and will not affect the health, safety, wellbeing and amenity of adjacent communities. The nearest dwelling is in Yarwun township, 3.4 km from the proposed facility (see Section 6.2.4 and Section 6.2.5 of the Planning Report).
Development supports the achievement of the relevant acoustic and air quality objectives of the Environment Protection (Noise) Policy 2019 and the Environment Protection (Air) Policy 2019.	The project will meet the air quality objectives for sensitive receptors identified in the Environment Protection (Air) Policy 2019 and the Environment (Noise) Policy 2019.
Development with high levels of emissions is to avoid impacts on the cumulative air quality of the Gladstone airshed.	The development will not produce high levels of air pollutants that would cumulatively effect the Gladstone airshed (see Section 6.2.4 of the Planning Report). The pilot plant will emit high purity hydrogen, high purity oxygen, and off-specification nitrogen via separate atmospheric vents. The emissions will not cause the formation of air pollutants such as oxides of nitrogen as conditions that support their formation (temperature and pressure) do not exist in the process.
Contaminated	
Development on land likely to be contaminated or recorded on the Environmental Management Register or Contaminated Land Register does not adversely impact on human health or the environment by exposure, management or movement of contaminants.	The site is in Lot 8 on SP218634 which is registered on the Environmental Management Register but not the Contaminated Land Register. The site is unlikely to be contaminated as discussed in Section 6.2.3 of the Planning Report and will not impact human health or the environment by

SDA wide assessment criteria	Assessment against proposed development
Where required, develop a strategy to manage any existing contamination and the potential for additional contamination such that human health and the environment are not adversely affected.	<p>exposure, management or movement of contaminants.</p> <p>The site is not likely to be contaminated as discussed in Section 6.2.3 of the Planning Report. A site screening level investigation by Air Liquide as part of its handover obligations found no evidence that its activities had caused soil contamination and concluded that further site investigation or soil remediation works were not required.</p>
Natural hazards	
<p>Development, in accordance with current best practice:</p> <ul style="list-style-type: none"> identifies relevant natural hazards that may impact upon the project appropriately manages risk associated with identified hazards avoids adverse impacts from natural hazards to protect people and property and enhances the community's resilience to natural hazards, or where adverse impacts cannot be avoided, impacts are minimised, mitigated, or offset avoids directly or indirectly increasing the severity of coastal erosion either on or off the site 	<p>The site is not located in a flood hazard, coastal hazard (erosion prone or storm tide inundation) or bush fire hazard zone, as discussed further in Section 6.2.7 and Section 7.5 in the Planning Report.</p> <p>The HAZID study included an assessment of natural hazards and informed the design of the pilot plant with consideration to plant integrity and public safety, as discussed in Section 5.1.8 of the Planning Report and Section 2.2.1 of this addendum.</p>
Development, in accordance with current best practice, achieves an appropriate level of flood immunity and does not adversely affect existing flow rates, flood heights, or cause or contribute to other flooding impacts on upstream, downstream, and adjacent properties, or the state transport network (including potential impacts from changes to stormwater flows and local flooding).	<p>The site is not in a flood hazard zone and will not affect flow paths and rates or flood heights.</p> <p>The HAZID study included an assessment of natural hazards and informed the design of the pilot plant with consideration to plant integrity and public safety, as discussed in Section 5.1.8 of the Planning Report and Section 2.2.1 of this addendum.</p>
Climate change	
Development avoids or, if avoidance cannot be achieved, minimises net increases in the emission of greenhouse gases	<p>The pilot plant will be the first of its kind in Gladstone and is a part of a program aimed at lowering carbon emissions from the alumina refining process at the Yarwun alumina refinery.</p> <p>Rio Tinto Aluminium has stated: <i>"The trial is expected to produce the equivalent of about 6,000 tonnes of alumina per year while reducing Yarwun's carbon dioxide emissions by about 3,000 tonnes per year."</i></p> <p><i>Converting the entire plant to green hydrogen could reduce emissions by 500,000 tonnes per year, which is the equivalent of taking about 109,000 internal combustion engine cars off the road."</i> (Rio Tinto 2023).</p>
Development can adapt to current and future impacts of a changing climate (e.g., projected climate change conditions include potential impacts	The site is not located in a flood hazard, coastal hazard (erosion prone or storm tide inundation) or bush fire hazard zone, as discussed further in

SDA wide assessment criteria	Assessment against proposed development
<p>from sea level rises, increased maximum cyclone intensity, increased rainfall intensity or increased likelihood and intensity of bushfires).</p>	<p>Section 6.2.7 and Section 7.5 of the Planning Report.</p> <p>The HAZID study included an assessment of natural hazards and informed the design of the pilot plant with consideration to plant integrity and public safety. The final design incorporated modifications to manage static electricity from lightning associated with tropical storms.</p>
Acid sulfate soils	
<p>Development, in accordance with current best practice, is to:</p> <ul style="list-style-type: none"> • avoid the disturbance of acid sulfate soils • ensure that the disturbance of ASS avoids or minimises the mobilisation and release of acid and metal contaminants 	<p>The site is located on fill up to 10 m thick. Encountering acid sulfate soils is unlikely. If acid sulfate soils are encountered in excavating foundations, pits and sumps, they will be managed in accordance with the Queensland Acid Sulfate Soil Technical Manual, Soil Management Guidelines v5.</p>
Water quality	
<p>Development, consistent with the Environmental Protection (Water) Policy 2019, avoids or otherwise minimises adverse impacts on the environmental values and water quality objectives of receiving waters, arising from:</p> <ul style="list-style-type: none"> • altered stormwater quality or flow • wastewater (other than contaminated stormwater and sewage) • the creation or expansion of non-tidal artificial waterways • the release and mobilisation of nutrients and sediments 	<p>The project is in an industrial site in the Curtis Island, Calliope River, and Boyne River basins, in the Gladstone SDA waters (mainland) environmental value zone. Lowland fresh waters in the zone including Boat Creek are moderately disturbed.</p> <p>The proposed development will not cause environmental harm to receiving waters (see Section 6.2.2 of the Planning Report).</p> <p>Stormwater will be discharged via RTA Yarwun's approved discharge point W2 and meet the required water quality for that discharge.</p> <p>Wastewater will be accepted by RTA Yarwun with the site sewer connected to the Yarwun alumina refinery system and the refinery accepting reject water from the reverse osmosis plant for use in its raw water system.</p> <p>Stormwater and wastewater will not have a significant impact on any matters of national environmental significance, including the Great Barrier Reef World Heritage Area or matters of state environmental significance (see Section 6.2.2 of the Planning Report and Section 2.4 of this addendum).</p> <p>The project will meet the water quality objectives identified in the Environmental Protection (Water and Wetland Biodiversity) Policy 2019.</p>
<p>Development encourages a precinct-wide stormwater management approach that achieves an improved water quality outcome</p>	<p>Stormwater will be discharged via RTA Yarwun's approved discharge point W2 and meet the required water quality for that discharge.</p> <p>Stormwater discharges will not have a significant impact on any matters of national environmental significance, including the Great Barrier Reef World Heritage Area or matters of state environmental significance (see Section 6.2.2 of the Planning Report and Section 2.4 of this addendum).</p>

SDA wide assessment criteria	Assessment against proposed development
Development protects the ecological and hydraulic function of waterway corridors in and adjacent to the Gladstone SDA, with particular regard to the Great Barrier Reef World Heritage Area, fish passage and marine plants	The project is in an industrial site and will not cause environmental harm to waterway corridors in and adjacent to the GSDA (see Section 6.2.2.1 of the Planning Report).
Risk management	
<p>Development is located, designed, and operated to:</p> <ul style="list-style-type: none"> • minimise the health and safety risks to communities and individuals • avoid any potential adverse impacts from emissions and hazardous activities, or impacts are minimised or mitigated • protect high pressure gas pipelines from encroachment that would compromise the ability of the pipelines to function safely and effectively 	<p>The project is in an industrial site and will not affect the health, safety, wellbeing and amenity of adjacent communities. The nearest dwelling is in Yarwun township, 3.4 km from the proposed facility (see Section 6.2.4 and Section 6.2.5 of the Planning Report).</p> <p>Fire and explosion modelling and atmospheric vent dispersion modelling has shown the pilot plant can be operated safely without risk to the public and adjacent sensitive receptors.</p> <p>Located in the Yarwun alumina refinery the pilot plant does not encroach on adjacent high-pressure gas pipelines including the Wallumbilla–Gladstone gas pipeline (PPL 60) which is adjacent to Hanson Road.</p>
Activities involving the use, storage, and disposal of hazardous materials and prescribed hazardous chemicals, dangerous goods, and flammable or combustible substances are located and managed to minimise the health and safety risks to communities and individuals	<p>The HAZID study has been updated to incorporate and assess the design changes. The design has been further revised to manage hazards associated with the introduction of the nitrogen generator. The nitrogen generator was introduced to enable continuous purging of the electrolyser to ensure a volatile air-gas mix cannot form. Operating procedures involve multiple controls to detect, isolate and vent any hydrogen or nitrogen leaks.</p> <p>The proposed controls have been discussed with and endorsed by the Major Hazard Facilities Unit.</p> <p>The fire and explosion modelling and atmospheric vent dispersion modelling have been updated to incorporate changes as a result of developing the detailed design including increase in hydrogen mass inventory and introduction of a nitrogen vent (see Section 1.4).</p> <p>The fire and explosion modelling and dispersion modelling confirm that the pilot plant does not pose a health or safety risk to communities and individuals if operated as proposed in the design.</p>
Development provides adequate protection from the harmful effects of noxious and hazardous materials and chemicals manufactured or stored in bulk during natural hazard events.	<p>Noxious and hazardous materials will not be stored in bulk at the pilot plant site. The produced hydrogen will be used in the Yarwun alumina refinery. Produced oxygen and off-specification nitrogen will be vented to atmosphere. A small inventory of nitrogen will be stored in the buffer tanks to enable continuous purging of the electrolyser in the event of a nitrogen generator upset.</p> <p>The HAZID study and design have been updated to incorporate measures for managing static electricity from lightning.</p>

SDA wide assessment criteria	Assessment against proposed development
Cultural heritage and community	
Indigenous and non-Indigenous cultural heritage values, and community values of the premises on which the development is undertaken, and immediate surrounds, are identified and managed, consistent with current best practice	No registered cultural heritage sites have been identified on or in vicinity of the site. The site is on previously disturbed ground. RTA Yarwun's Cultural Heritage Management Plan indicates that the pilot plant will not require any further assessments or permits in relation to cultural heritage.
Development is located, designed and operated to avoid adverse impacts on cultural heritage and community values, or impacts are minimised, mitigated, or offset.	No registered cultural heritage sites have been identified on or in vicinity of the site. The site is on previously disturbed ground. RTA Yarwun's Cultural Heritage Management Plan indicates that the pilot plant will not require any further assessments or permits in relation to cultural heritage.
Development recognises and protects the cultural heritage values associated with: <ul style="list-style-type: none"> • The Euroa Homestead on Lot 200 on SP239672 • the Mount Larcombe Station Original Homestead Site on Lot 73 on SP272417 and Lot 20 on SP272417 • the Targinnie Cemetery on Lot 95 on DS287 	The proposed pilot plant site in Yarwun alumina refinery is over 10 km from the Euroa Homestead, Mount Larcom Station Original Homestead, and Targinnie Cemetery sites. The development will not impact on the values associated with these sites.
Where development requires a buffer to mitigate the adverse amenity impacts of the development, including, but not limited to, visual and acoustic impacts, that buffer is accommodated within the development site.	The development does not require a buffer to mitigate visual amenity impacts (visual and acoustic) as it is in the Yarwun alumina refinery, an industrial site.
Environment	
Environmental values of the premises on which the development is undertaken, and immediate surrounds are identified and managed, consistent with current best practice.	Environmental values and potential impacts on these values will be avoided or minimised through design and controls, consistent with current best practice, as outlined in Section 5 and Section 6 of the Planning Report, and this addendum.
Development is located, designed, and operated to: <ul style="list-style-type: none"> • avoid adverse impacts on environmental values including matters of local, state, and national environmental significance or impacts are minimised, mitigated, or offset • maintain ecological connectivity and processes • maintain the outstanding universal value of the Great Barrier Reef World Heritage Area • retain, to the greatest extent possible, tidal fish habitat and marine plants 	The proposed development will not impact on environmental values or the outstanding universal value of the Great Barrier Reef World Heritage Area, as it is an industrial site in the Yarwun alumina refinery and discharges will be managed within the site or within existing stormwater discharge parameters. The pilot plant site is cleared industrial land previously used for an air separation facility. No vegetation will be cleared to build and operate the facility (see Section 6.2.1 of the Planning Report). Stormwater will be discharged via RTA Yarwun's approved discharge point W2 and meet the required water quality for that discharge. Wastewater will be accepted by RTA Yarwun with the site sewer connected to the Yarwun alumina refinery system and the refinery accepting reject water from the reverse osmosis plant for use in its raw water system.

SDA wide assessment criteria	Assessment against proposed development
Any residual significant adverse impacts are offset in accordance with the relevant Commonwealth or Queensland environmental offset framework.	The proposed development will not have a significant impact on native vegetation or species habitat as native vegetation and species habitat will not be cleared.
Lighting associated with the construction and operation of development is designed to limit the impacts on aquatic wildlife, including turtles and migratory species.	The pilot plant is in the Yarwun alumina refinery. Lighting associated with the construction and operation of the pilot plant will not increase existing light spill from the Yarwun alumina refinery and is unlikely to impact aquatic wildlife.
Where development requires a buffer to mitigate the impacts of the development, that buffer must be accommodated within the development site	The development does not require a buffer to mitigate impacts as it is in the Yarwun alumina refinery, an industrial site, and impacts can be managed on-site.
<p>Development avoids native vegetation clearing, and where avoidance is not reasonably possible, minimises clearing to:</p> <ul style="list-style-type: none"> • conserve vegetation • avoid land degradation • avoid fragmentation and conserve connectivity 	No native vegetation or species habitat will be cleared for the proposed development.
Engineering standards	
Development is to be designed and constructed in accordance with the relevant engineering standards (and any subsequent revisions to the relevant standards) stated in Table 7 of the GSDA Development Scheme, unless it can be demonstrated that an alternative solution that at least produces the same outcome is appropriate.	<p>The pilot plant has been designed and will be built in accordance with relevant Australian and international engineering standards and Australian and Queensland legislation and regulations.</p> <p>Specifically:</p> <ul style="list-style-type: none"> • The site is located on fill, and it is unlikely acid sulfate soils will be encountered. • Adequate carparking is available in the existing Jemena carpark on Lot 144 CTN2170. • No native vegetation will be cleared for the proposed development. • Environmental values will be protected in developing the pilot plant, as demonstrated in the Planning Report and this addendum to that report. • Fill, if required, will be managed in accordance with AS3798. • No footpaths or cycle paths are proposed as part of the development. • The site is outside the flood hazard zone. <p>A HAZID study, fire and explosion modelling, and atmospheric vent dispersion modelling have been done and compliance with State code 21 assessed.</p> <p>No new state or local roads are required for the development. Traffic volumes are low in construction and lower in operation.</p> <p>Site access is via the Yarwun alumina refinery main gate.</p>

SDA wide assessment criteria	Assessment against proposed development
	<p>Soil erosion will be managed in accordance with the site-based management plan and incorporate relevant controls and guidelines.</p> <p>Stormwater will be discharged via Yarwun alumina refinery discharge point V2 and meet the applicable water quality parameters.</p> <p>The site is 0.4 ha and will not generate significant stormwater flows to Yarwun alumina refineries stormwater management system.</p> <p>The site will be serviced by existing infrastructure and services.</p>
Other government matters	
<p>Development is to demonstrate consistency with any other relevant legislative requirements that may be required for the development to proceed and operate and to the extent practicable, be consistent with regional plans, the State Planning Policy, the Port Overlay for the priority Port of Gladstone, and the SDAP where the State interests articulated by these instruments are likely to be affected by the development.</p>	<p>The planning report demonstrates consistency with relevant legislative requirements and is consistent with the Central Queensland Regional Plan, the State Planning Policy and SDAP provisions (see Section 7 of the Planning Report).</p> <p>The proposed development is within the Port Industry and Commerce precinct of the Port overlay for the priority Port of Gladstone, which does not apply to SDA assessable development.</p>
<p>Development recognises and protects the long-term availability of the extractive resource and access related to the Targinnie Key Resource Area (Number 119).</p>	<p>The pilot plant is located south of the Targinnie Key Resource Area and will not impact on access to the resource or its development.</p>
<p>Development does not compromise existing or future port facilities and operation on Strategic Port Land.</p>	<p>The site is in the Yarwun alumina refinery and will not compromise existing or future facilities and operation on Strategic Port Land.</p>
Energy and water efficiency	
<p>Building, site design and layout maximises energy efficiency having regard to:</p> <ul style="list-style-type: none"> • building orientation and passive solar design • maximising opportunities for cross ventilation • appropriate shade treatments • landscaping treatments to the western side of the building 	<p>The proposed pilot plant comprises containerised modules arranged on the site to maintain the required safety buffers. These objectives are not appropriate to the pilot plant.</p>
<p>Water efficiency is optimised through the use of alternative supply sources, including:</p> <ul style="list-style-type: none"> • rainwater harvesting systems • recycled water sources 	<p>The proposed pilot plant will use potable water sourced from the Yarwun alumina refinery. The potable water will be treated using reverse osmosis. The resulting demineralised water will be used in the electrolyser. Reject water from reverse osmosis will be captured and supplied to the Yarwun alumina refinery for reuse in the refinery (see Section 6.2.2.2 the Planning Report).</p>
<p>Where practicable, development should be consistent with the Queensland government's renewable energy policies.</p>	<p>The hydrogen pilot plant is consistent with the Queensland Government's Queensland Hydrogen Industry Strategy 2019-2024, which aims to grow a sustainable hydrogen industry that supports renewable resources, creates jobs and strengthens our economy (DEC 2024).</p>

SDA wide assessment criteria	Assessment against proposed development
	The pilot plant will also support the state in achieving its renewable energy targets, through the reduction of Yarwun alumina refinery's carbon dioxide emissions by about 3,000 tonnes per year (Rio Tinto 2023).
Visual impacts	
Visual impacts of buildings, retaining structures, or other development are minimised through building design, landscaping, and use of appropriate materials when viewed from a publicly accessible viewpoint such as major roads and the Mount Larcom landform.	The pilot plant site is in the Yarwun alumina refinery and will have minimal visual impact on the surrounding area, due to the industrial setting and containerised modules that are smaller than surrounding structures and buildings. Existing vegetation along Hanson Road screens the site from view.
Development maintains and enhances significant vegetation where possible and provides landscaping that: <ul style="list-style-type: none"> • minimises the visual impacts of the development • incorporates at least 50 per cent local species • is low maintenance 	The pilot plant site is cleared industrial land previously used for an air separation facility. No vegetation will be cleared to build and operate the facility (see Section 6.2.1 of the Planning Report). Existing vegetation along Hanson Road screens the site from view.
Reconfiguring a lot	
Development provides lawful, safe and practical access	Reconfiguring a lot is not required for the proposed development. The pilot plant site will be leased from RTA Yarwun. Construction and operation and maintenance personnel and visitors will use the existing Jemena carpark on Lot 144 CTN2170, which is adjacent to the Yarwun alumina refinery.
Lot sizes are adequate to accommodate a development footprint consistent with the preferred development in each precinct. A range of lot sizes is preferred to accommodate development in each precinct. Minimum lot sizes for development precincts are generally consistent with the following: <ul style="list-style-type: none"> • Port Related Industry Precinct – 2 hectares (ha) • High Impact Industry Precinct – 10 ha • Medium Impact Industry Precinct - 2 ha • Industry Investigation Precinct – 2 ha 	Reconfiguring a lot is not required for the proposed development. The pilot plant site will be leased from RTA Yarwun. Construction and operation and maintenance personnel and visitors will use the existing Jemena carpark on Lot 144 CTN2170, which is adjacent to the Yarwun alumina refinery.

4. PROPOSED CHANGES TO SDA APPROVAL AND EA

Proposed changes to the SDA approval and P-EA-100235984 are presented in this section.

4.1 PROPOSED CHANGES TO SDA APPROVAL CONDITIONS

The SDA approval is attached as Appendix E.

As a result of the changes described above in Section 2, Condition 1 – approved plans and documents and Condition 6 – risk management need to be updated. Additionally, it is proposed that Condition 12 – site-based management plan be updated to specify that separate plans for the construction and operation phase will be prepared. Table 4.1 details proposed changes to the SDA approval conditions.

Table 4.1 Proposed changes to SDA approval conditions

SDA approval condition	Proposed change to condition
Condition 1 lists the approved plans and documents as:	Revise Condition 1 to list the updated plans and documents as:
Japan Nus Co. Ltd Sumitomo Hydrogen Project Site. Document No. Figure 2. Prepared by Tetra Tech Coffey. 10 February 2022.	Summit Hydrogen Gladstone Pty Ltd Sumitomo Hydrogen Project. Document No. Figure 2.7 Project site. Prepared by Tetra Tech Coffey. 21 May 2024.
Japan Nus Co. Ltd Sumitomo Hydrogen Project Plant Model. Document No. Figure 4. Prepared by Tetra Tech Coffey. 20 January 2022.	Summit Hydrogen Gladstone Pty Ltd Sumitomo Hydrogen Project. Document No. Figure 2.1 Updated plant model. Prepared by Tetra Tech Coffey. 19 April 2024.
Japan Nus Co. Ltd Sumitomo Hydrogen Project Site Layout. Document No. Figure 6. Prepared by Tetra Tech Coffey. 20 January 2022.	Summit Hydrogen Gladstone Pty Ltd Sumitomo Hydrogen Project. Document No. Figure 2.2 Updated site layout. Prepared by Tetra Tech Coffey. 19 April 2024.
Japan Nus Co. Ltd Sumitomo Hydrogen Project Process flow diagram. Document No. Figure 7. Prepared by Tetra Tech Coffey. 20 January 2022.	Summit Hydrogen Gladstone Pty Ltd Sumitomo Hydrogen Project. Document No. Figure 2.3 Updated process flow diagram. Prepared by Tetra Tech Coffey. 19 April 2024.
Japan Nus Co. Ltd Sumitomo Hydrogen Project System flow diagram. Document No. Figure 8. Prepared by Tetra Tech Coffey. 20 January 2022.	Summit Hydrogen Gladstone Pty Ltd Sumitomo Hydrogen Project. Document No. Figure 2.4 Updated system flow diagram. Prepared by Tetra Tech Coffey. 19 April 2024.
Japan Nus Co. Ltd Sumitomo Hydrogen Project Access route to the site during construction and operation. Document No. Figure 9. Prepared by Tetra Tech Coffey. 11 February 2022.	Summit Hydrogen Gladstone Pty Ltd Sumitomo Hydrogen Project. Document No. Figure 2.5 Access routes to site for construction and operation. Prepared by Tetra Tech Coffey. 21 May 2024.
Japan Nus Co. Ltd Sumitomo Hydrogen Project Hydrogen release vent dispersion model. Document No. Figure 14. Prepared by Tetra Tech Coffey. 20 January 2022.	Summit Hydrogen Gladstone Pty Ltd Sumitomo Hydrogen Project. Document No. Figure 2.14 Hydrogen release vent dispersion model – EPC Phase. Prepared by Tetra Tech Coffey. 21 May 2024. Summit Hydrogen Gladstone Pty Ltd Sumitomo Hydrogen Project. Document No. Figure 2.15 Hydrogen release vent dispersion model – LFL scenarios. Prepared by Tetra Tech Coffey. 21 May 2024.
Japan Nus Co. Ltd Sumitomo Hydrogen Project Oxygen release vent dispersion model. Document No. Figure 15. Prepared by Tetra Tech Coffey. 20 January 2022.	Summit Hydrogen Gladstone Pty Ltd Sumitomo Hydrogen Project. Document No. Figure 2.16 Oxygen release vent dispersion model – EPC Phase. Prepared by Tetra Tech Coffey. 21 May 2024.
HAZID study. TT-00-1242-001. Prepared by JGC Corporation. 13 August 2021.	EPC HAZID Study Report. T-00-1242-005 Rev 0. Prepared by JGC Corporation. 26 January 2024.
Fire and explosion assessment (fire and explosion consequence-based analysis). TT-00-1242-003. Prepared by JGC Corporation. 27 August 2021.	FEA (Fire and explosion consequence based analysis and atmospheric vent dispersion study report. Prepared by JGC Corporation. 28 February 2024.

SDA approval condition	Proposed change to condition
Atmospheric vent dispersion study. Attachment E of the Planning Report. Prepared by JGC Corporation. Not dated.	FEA (Fire and explosion consequence based analysis and atmospheric vent dispersion study report. Prepared by JGC Corporation. 28 February 2024.
Condition 2 – commencement of the development / use	No change required
Condition 3 – ‘As constructed’ plans	No change required
Condition 4 – auditing	No change required
Condition 5 – inspection	No change required
Condition 6 – risk management	The mitigation measures recommended [by the MHFU] in the fire and explosion assessment have been implemented in detailed design. The changes and proposed controls are detailed in this report.
Condition 7 – hazardous materials	No change required
Condition 8 – disaster / emergency management	No change required
Condition 9 – complaints	No change required
Condition 10 – vehicle access and vehicle parking	No change required
Condition 11 – decommissioning and rehabilitation	No change required
Condition 12 – site-based management plan	<p>Revise the condition to specify separate plans will be prepared for the construction and operation phases, as such:</p> <p><i>Prepare a construction site-based management plan and an operation site-based management plan (by a suitably qualified person in accordance with best practice) that includes the following for each phase plan:</i></p> <ul style="list-style-type: none"> • <i>Erosion and sediment control, noise, dust</i> • <i>A monitoring program to identify issues of non-compliance, actions for correcting any non-compliance and who is responsible for undertaking those actions</i> • <i>A timetable and process for review of the site-based management plan to assess its effectiveness and to implement amendments as required.</i> <p><i>Undertake all works generally in accordance with the site-based management plan which must be current and available on site at all times.</i></p>
Condition 13 – stormwater drainage	No change required
Condition 14 – lighting	No change required
Condition 15 – noise and air	No change required
Currency period	No change required
Other approvals	No change required
Further approvals	No change required
Cultural heritage – duty of care	No change required

4.2 PROPOSED CHANGES TO P-EA-100235984

P-EA-100235984 is attached as Appendix F.

Condition G1(2) states:

The only chemicals authorised for manufacturing is hydrogen.

It is proposed that Condition G1(2) be revised to:

The only chemicals authorised for manufacturing are hydrogen and nitrogen.

5. CONCLUSION

Changes to the project implemented in EPC phase detailed design necessitate amendment of the SDA approval and EA.

The changes are the result of detailed design by JGC Corporation and Cummins, the electrolyser manufacturer and supplier.

A nitrogen generator to continuously purge the electrolyser has been introduced, the RO plant and dry cooler have been relocated, anti-scalant has been introduced to the water treatment process, and design responses and operating procedures have been developed to address the MHFU recommendations. The Jemena carpark on Lot 144 CTN2170 will be used instead of the RTA Yarwun carpark due to insufficient capacity in that carpark. The changes do not change the environmental impacts of the proposed development or the assessment against relevant planning and state codes.

The changes are minor but introduce a new lot. The changes to the project do not result in a substantially different development or different use.

Condition 1 – approved plans and documents and Condition 6 – risk management of the SDA approval will need to be amended to list the updated plans and documents and risk assessment documents respectively. Revision of Condition 12 is sought to enable the site-based management plan to be delivered as two separate plans – a construction site-based management plan and an operation site-based management plan – due to changes in the contracting strategy for the project.

Environmental authority P-EA-100235984 will need to be amended to include the manufacture of nitrogen (Condition G1(2)).

The changes do not substantially alter the original SDA approval in a way that would cause a referral entity to make or alter a referral entity submission about the changes or request additional information about the changes. The Coordinator-General, DES and MHFU were consulted during the preparation of this report.

6. REFERENCES

DEC 2024. Department of Energy and Climate. *Hydrogen in Queensland*. Queensland Government. A www publication access 3 April 2024 at <https://www.energyandclimate.qld.gov.au/hydrogen/qld>.

DSDI 2024. Department of State Development and Infrastructure. *Gladstone's next chapter – a clean and prosperous future*. A www publication accessed 15 April 2024 at [Gladstone's next chapter – a clean and prosperous future | State Development and Infrastructure](#)

JGC Corporation 2021a. *HAZID Study Report - FEED Services (Phase-2) for Gladstone H2 Ecosystem Project*. Prepared for Sumitomo Corporation.

JGC Corporation 2021b. *FEA Report (Fire and explosion consequence-based analysis) - FEED Services (Phase-2) for Gladstone H2 Ecosystem Project*. Prepared for Sumitomo Corporation.

JGC Corporation 2021c. *Atmospheric vent dispersion study (JGC Internal Study)*. Prepared for Sumitomo Corporation.

JGC Corporation 2024a. *EPC HAZID study report. Gladstone H2 Ecosystem Project*. 26 January 2024. Prepared for Summit Hydrogen Gladstone Pty Ltd.

JGC Corporation 2024b. *FEA (fire and explosion consequence-based analysis) and atmospheric vent dispersion study report*. 28 February 2024. Prepared for Summit Hydrogen Gladstone Pty Ltd.

JGC Corporation 2024c. *Close-out of MHFU Recommendation Gladstone H2 Ecosystem Project*. Prepared for Summit Hydrogen Gladstone Pty Ltd.

Rio Tinto 2023. *Rio Tinto and Sumitomo to build Gladstone hydrogen pilot plant to trial lower-carbon alumina refining*. Rio Tinto. A www publication access 3 April 2024 at <https://www.riotinto.com/en/news/releases/2023/rio-tinto-and-sumitomo-to-build-gladstone-hydrogen-pilot-plant-to-trial-lower-carbon-alumina-refining>.