Member of the Surbana Jurong Group

28 July 2023

Office of the Coordinator-General
Department of State Development, Infrastructure, Local Government and Planning
PO Box 15517
City East QLD 4002

Dear Michael Moran,

RE: Information request for the Development Application for a Material Change of Use – Special Industry (Hydrogen Test Train Facility)

On behalf of our Client, we enclose a revised Development Application for Material Change of Use – Special Industry (Hydrogen Test Train Facility) that addresses the requested additional information table that was sent on 26 July 2023.

The following sections of the Planning Report have been amended to address the requested additional information table:

- Item 1 Major Hazards Facility

  Section 3.2, Section 4.3 and Section 4.5 of the Planning Report has been amended to better clarify the proposal in relation to the development not being considered a Major Hazard Facility .

- Item 2 Development Staging

  The Executive Summary, Introduction, Section 2.2.9, Section 3.1, Section 3.5.1 of the Planning Report has been amended to confirm how the development will be staged.

- Item 3 Refuelling Station

  A new section in 3.5.1 has been added to the Planning Report has been added to clarify the purpose of the refuelling stations and how they will operate.

- Item 4 Traffic Desk Top Assessment

  Appendix J has been updated to reflect this request.

I trust this is all the information you require at this point to accept this application as 'properly made' and commence your assessment. Should you require anything further please do not hesitate to contact me directly.

Yours sincerely,

Isaac Harslett
Senior Planner

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Email: Isaac.harslett@smec.com

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Nerang 4211 QLD
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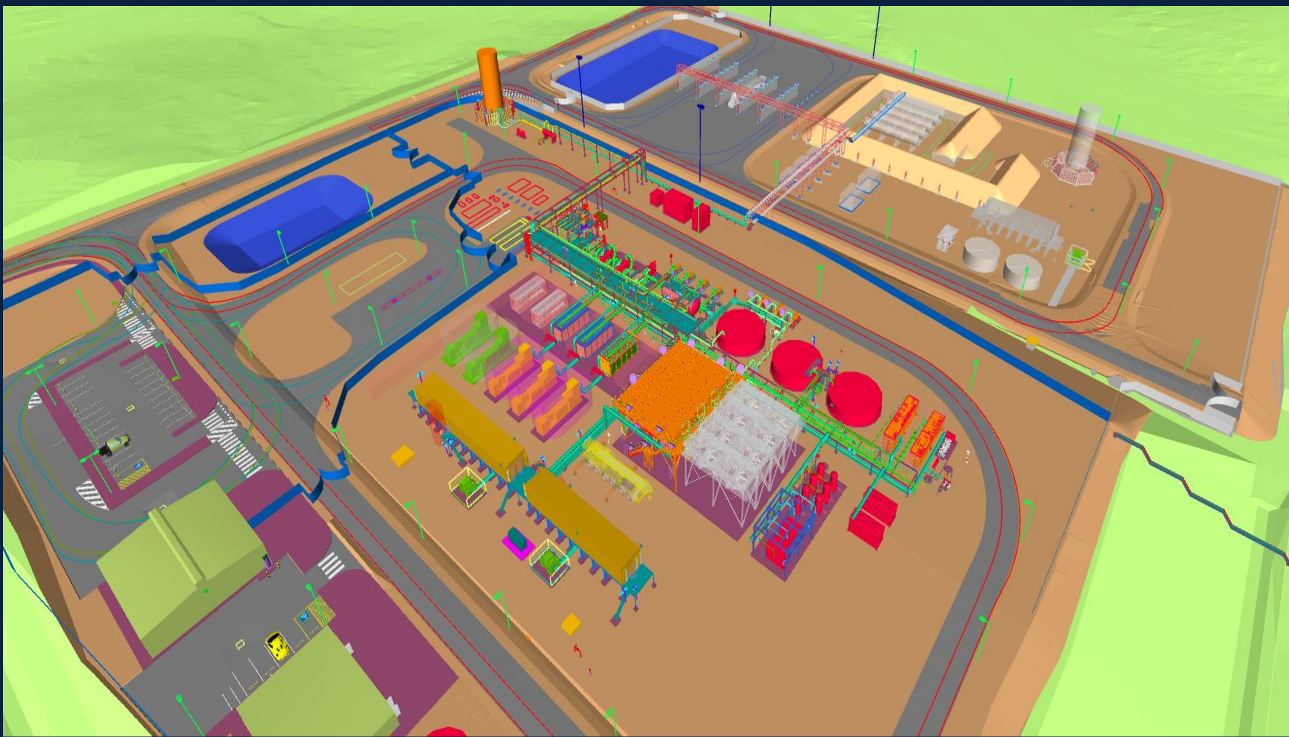
Member of the Surbana Jurong Group



Planning Report for Gladstone State Development Area Development Permit and Environmental Authority

GEM Stage 2 - Material Change of Use for Special Industry (50MW Hydrogen Test Train) on Land included in the Gladstone State Development Area

Project No. 30033831
Client Doc Ref No. AUSS0025-0000-EN-REP-0001
Prepared for Office of Coordinator General
28 July 2023

Document Control

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Revision No.	Date	Prepared By	Reviewed By	Approved for Issue By
0	14/06/2022	Rhys Castle	Martin Klopper	Isaac Harslett
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Important Notice

This report is provided solely for the purposes of planning permit application.

This report is provided pursuant to a Consultancy Agreement between SMEC Australia Pty Limited ("SMEC") and Gladstone Fortescue Future Industries Pty Ltd, under which SMEC undertook to perform a specific and limited task for Gladstone Fortescue Future Industries Pty Ltd. This report is strictly limited to the matters stated in it and subject to the various assumptions, qualifications and limitations in it and does not apply by implication to other matters. SMEC makes no representation that the scope, assumptions, qualifications and exclusions set out in this report will be suitable or sufficient for other purposes nor that the content of the report covers all matters which you may regard as material for your purposes.

This report must be read as a whole. The executive summary is not a substitute for this. Any subsequent report must be read in conjunction with this report.

The report supersedes all previous draft or interim reports, whether written or presented orally, before the date of this report. This report has not and will not be updated for events or transactions occurring after the date of the report or any other matters which might have a material effect on its contents, or which come to light after the date of the report. SMEC is not obliged to inform you of any such event, transaction or matter nor to update the report for anything that occurs, or of which SMEC becomes aware, after the date of this report.

Unless expressly agreed otherwise in writing, SMEC does not accept a duty of care or any other legal responsibility whatsoever in relation to this report, or any related enquiries, advice or other work, nor does SMEC make any representation in connection with this report, to any person other than the Proposal Proponent. Any other person who receives a draft or a copy of this report (or any part of it) or discusses it (or any part of it) or any related matter with SMEC, does so on the basis that he or she acknowledges and accepts that he or she may not rely on this report nor on any related information or advice given by SMEC for any purpose whatsoever.

Executive Summary

Fortescue Future Industries is seeking to construct a Green Hydrogen development, located within the Gladstone State Development Area (SDA). Each stage is set to carry out different aspects of the development, with the first stage being the construction of the Gladstone Electrolyser Manufacturing (GEM) Facility to create the electrolysers used in the second stage. This first stage has been previously approved as a Material Change of Use for Medium Impact Industry under AP2021/006, with initial earthworks and construction occurring at the time of writing.

The second stage, which is the subject of this application seeks to uses the electrolysers produced on-site and renewable energy through the process of electrolysis to create green hydrogen. This facility is the first to bring this cutting-edge technology to Queensland and aims to position Gladstone as a domestic and international hub for renewable hydrogen production. The facility will act as a green hydrogen production facility while also providing long term test data for the electrolyser's manufactured within GEM Stage 1.

The Proposed development is expected to:

(a) produce up to 6,500 tons per annum of green hydrogen
(b) create 20-40 jobs in operation and 80-120 jobs in construction; and
(c) have a total CAPEX of $225 Million.

To facilitate the creation of this facility, several statutory applications are required to ensure the facility can operate safely, efficiently, and with minimal impacts to the environment. To that extent, several approvals are required from a variety of stakeholders. The list of required applications includes:

- **Material Change of Use Application for Special Industry to be submitted to the Office of the Coordinator General:** The application pathway for SDA Applications requires submission to the Coordinator General rather than to Local Councils or to State Planning Entities, however the Application is internally referred to the relevant bodies to ensure proper assessments are still undertaken. For this application, the relevant bodies include the Department of Transport and Main Roads, and the Office of Industrial Relations.

- **Environmental Authority (EA) for Environmentally Relevant Activity (ERA) 7 (Hazardous Chemical Manufacturing) to be submitted to the Department of Environment and Science (DES):** The application pathway for SDA Applications also require applicants to submit EA / ERA Applications to DES directly for their assessment.

The proposed development is seeking to comply with the required assessment outcomes and has provided a host of supporting information to demonstrate this compliance. Where outcomes cannot be met, actions have been taken in other ways to either reach the most practicable level of compliance or provide a form of offset as a solution.

In general, this development represents a project of great potential, with the ability to generate large amounts of green hydrogen, greatly contributing to the State Government's renewable energy targets, and it is hoped that the assessing bodies will be in favour of this proposed development.

Table of Contents

Appendices

List of Tables

List of Figures

1 Introduction

This Town Planning Report has been prepared in support of a Development Application for a Material Change of Use to establish Special Industry (50MW Hydrogen Test Train) use on part of Lot 4 on SP245936 (the site), which is located within the Gladstone State Development Area (GSDA). The proposed development is co-located on the same premises (lot) where the Gladstone Electrolyser Manufacturing (GEM) Facility (approved as Medium Impact Industry under AP2021/006) is being developed.

The Stage 2 Gladstone Test Train is intended to be constructed in its entirety within a nine-month timespan. At the end this construction, the facility will commence producing hydrogen, with only 30MW of hydrogen being generated at opening (Stage 2A). Due to water access constraints in the area, the additional 20MW of hydrogen production and "bulk" load out facility will be bought online when water access constraints have been resolved that will allow the site to operate at full production capacity (Stage 2B).

Confirmation of landownership please refer to Title Search at **Appendix A**.

This documentation (Planning Report) has been prepared by SMEC for and on behalf of Gladstone Fortescue Future Industries Pty Ltd (FFI) the Proposal Proponent. This Planning Report supports a Development Application which has been made to the Office of the Coordinator General, Queensland (hereafter 'OCG'), who is the Assessment Manager for assessable development within the GSDA.

The '*Gladstone State Development Area Development Scheme*' (Development Scheme) dated May 2022, is the principal town planning instrument for all proposed development within the GSDA. The Gladstone Regional Council Planning Scheme is subordinate to the requirements and assessment provisions of the Development Scheme within the GSDA.

Specific forms of development under the Development Scheme are 'regulated' pursuant to the *State Development and Public Works Organisation Act 1971* (SDPWO Act). The Development Scheme sets out SDA Self-Assessable Development and SDA Assessable Development. Within the High Impact Industry Precinct, Material Change of Use for Special Industry (50MW Hydrogen Test Train) and ancillary warehouse (used for the storage of spare parts and equipment used to run the test train) is identified as SDA Assessable Development. The ancillary warehouse does not comply with Schedule 3 of the Development Scheme as it involves the construction of a permanent building and will be in use for more than three months per year, and therefore is assessable development. Section 2.4.2 of the Development Scheme provides specific planning provisions for development within the High Impact Industry Precinct.

The Planning Report has been prepared to support the proposed Special Industry land use (50MW Hydrogen Test Train) which also requires an Environmental Authority (EA) application for Prescribed Environmentally Relevant Activities (ERA) under the *Environmental Protection Act 1994* (EP Act).

The facility involves the storage and manufacture of hazardous chemicals which at any given point on site, will exceed the threshold quantity under the *Work Health and Safety Regulation 2011* (WHS Regulation), and hence will be regarded as a Hazardous Chemical Facility. Accordingly, should a failure occur, the development has the potential for extreme offsite impacts in the event of a fire or explosion, and requires significant separation from non-industrial uses. Therefore, the site plot plan has included buffer distances and configured internal infrastructure to address this risk to future adjoining industrial land uses.

This Planning Report will provide an overview of the project, describe the Site, the proposed development, and address the relevant town planning and design requirements with respect to the proposal and the assessment of the environmental impact of the ERA on the environmental values as required under the EP Act.

2 Site Details and Characteristics

2.1 Site Details

2.1.1 Location

The property address is Euroa Circuit, Aldoga, Queensland. It is located approximately 20km west of the centre of Gladstone. This portion of the SDA is still under development. Internal roads and other necessary utilities and infrastructure (water, power, telecommunications etc) will be accessible to the proposed development site prior to commencement of use.

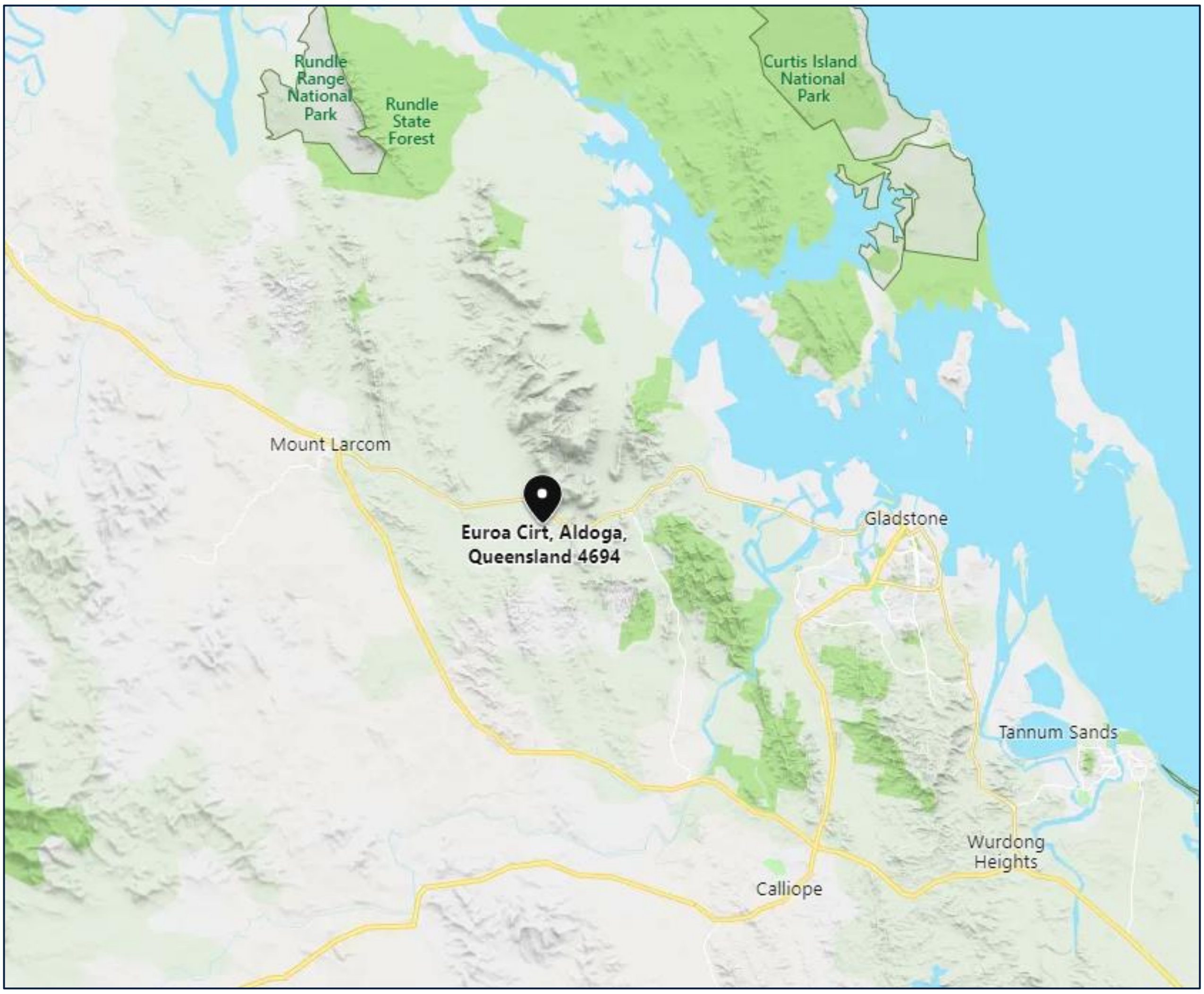


Figure 2–1 Location Plan Source: OpenStreetMap

Figure 2–2 Aerial Photo of the Subject Site (Source Nearmap)

Stage 2 Application Boundary
Stage 1 Application Boundary

2.1.2 Real Property Description

The Site's real property description is Lot 4 on SP245936. Only a portion of this allotment will be utilised by the Test Train facility.

2.1.3 Shape, Size and Ownership

The overall area of the Site is 99.84 hectares, is generally regular in shape with a splayed north-west corner. The Site is currently owned by the Minister for Economic Development Queensland. Land Owner's acknowledgement and consent for this Application is provided in **Appendix B.**

An easement (No. 714121392) comprising an area of 18.67 hectares dissects the northern extent of the Site. The easement is for the purpose of drainage.

2.1.4 Application Boundary

The Application boundary covers approximately 9 hectares of the overall Site and relates to the land on the southern edge, beside the previously approved 4 hectare GEM Stage 1 Electrolyser Facility (approved a Medium Impact Industry under AP2021/006).

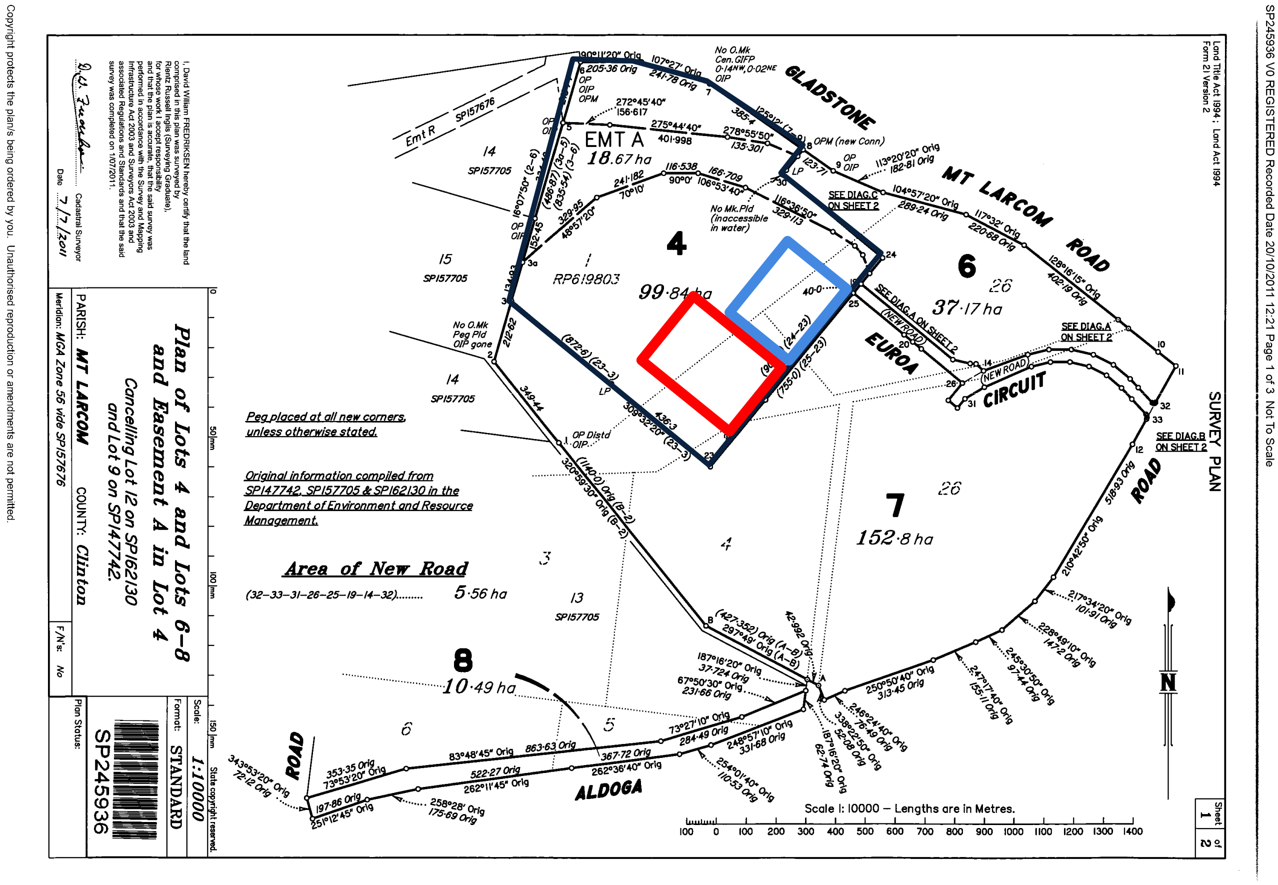


Figure 2–3 Title Plan

(dark blue outline)	Subject Site
(red outline)	Stage 2 Application Boundary
(light blue outline)	Stage 1 Application Boundary

2.2 Site Characteristics

2.2.1 Current Use

The Site is currently being used as a construction parking area and laydown area for the GEM Facility. Earthworks were conducted for the GEM Stage 1 Bulk earthworks under an operational works permit issued by Gladstone Regional Council on 16/03/2021 (OPW/54/21) refer to Figure 2–4 and **Appendix L**.

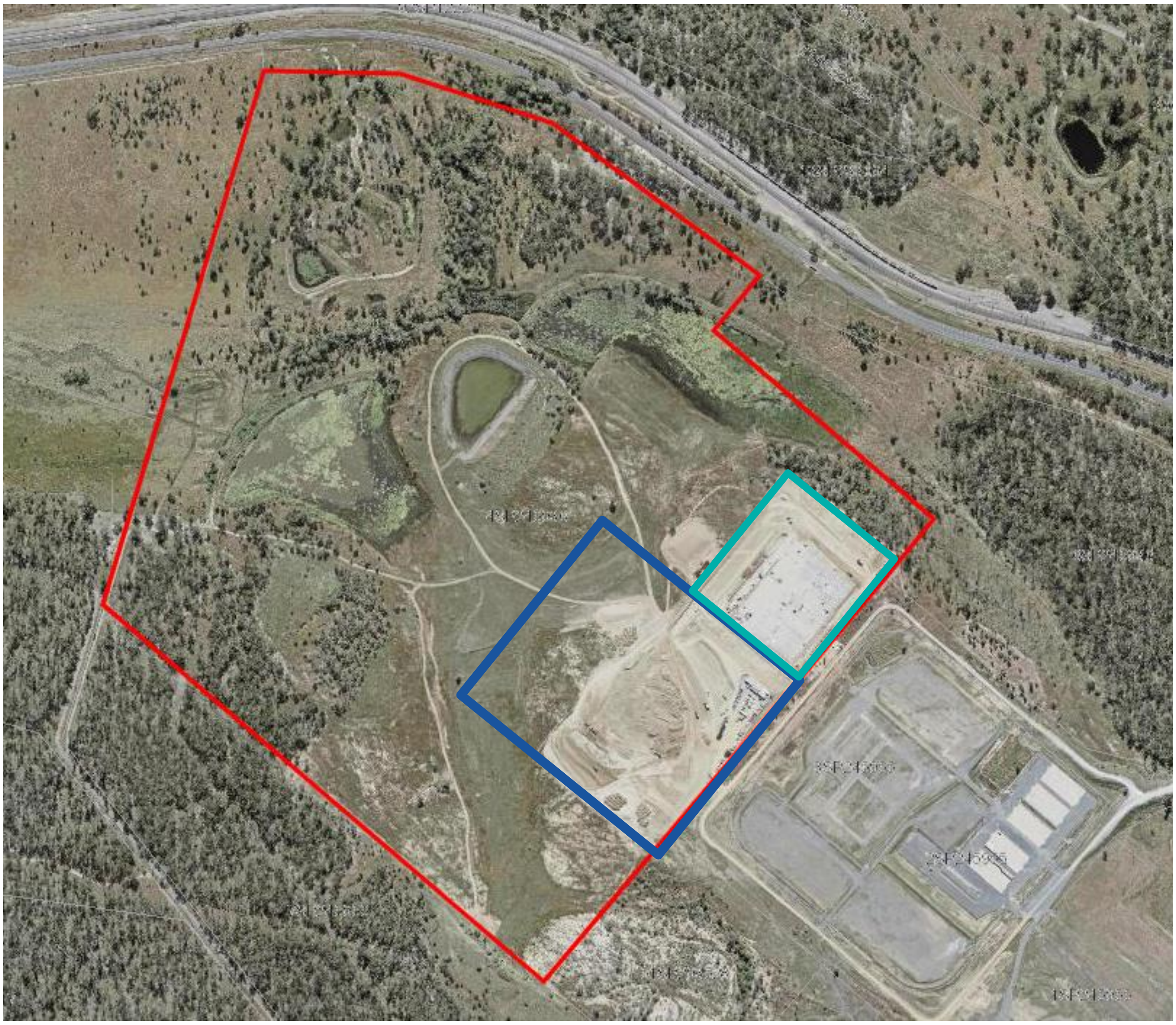


Figure 2–4 Aerial Photo Source: Queensland Globe

Stage 2 Application Boundary

Subject Site

Stage 1 Application Boundary

2.2.2 Road Frontages

The Site fronts onto Euroa Circuit which is partially constructed to facilitate construction for the Stage 1 GEM Facility. To allow for the construction and access of Stage 2, the constructed portion of Euroa Circuit is to be constructed in accordance with the Economic Development Queensland Eurora Circuit Road Upgrade General Arrangement Plan to reach the proposed driveway location for the site, as shown in the

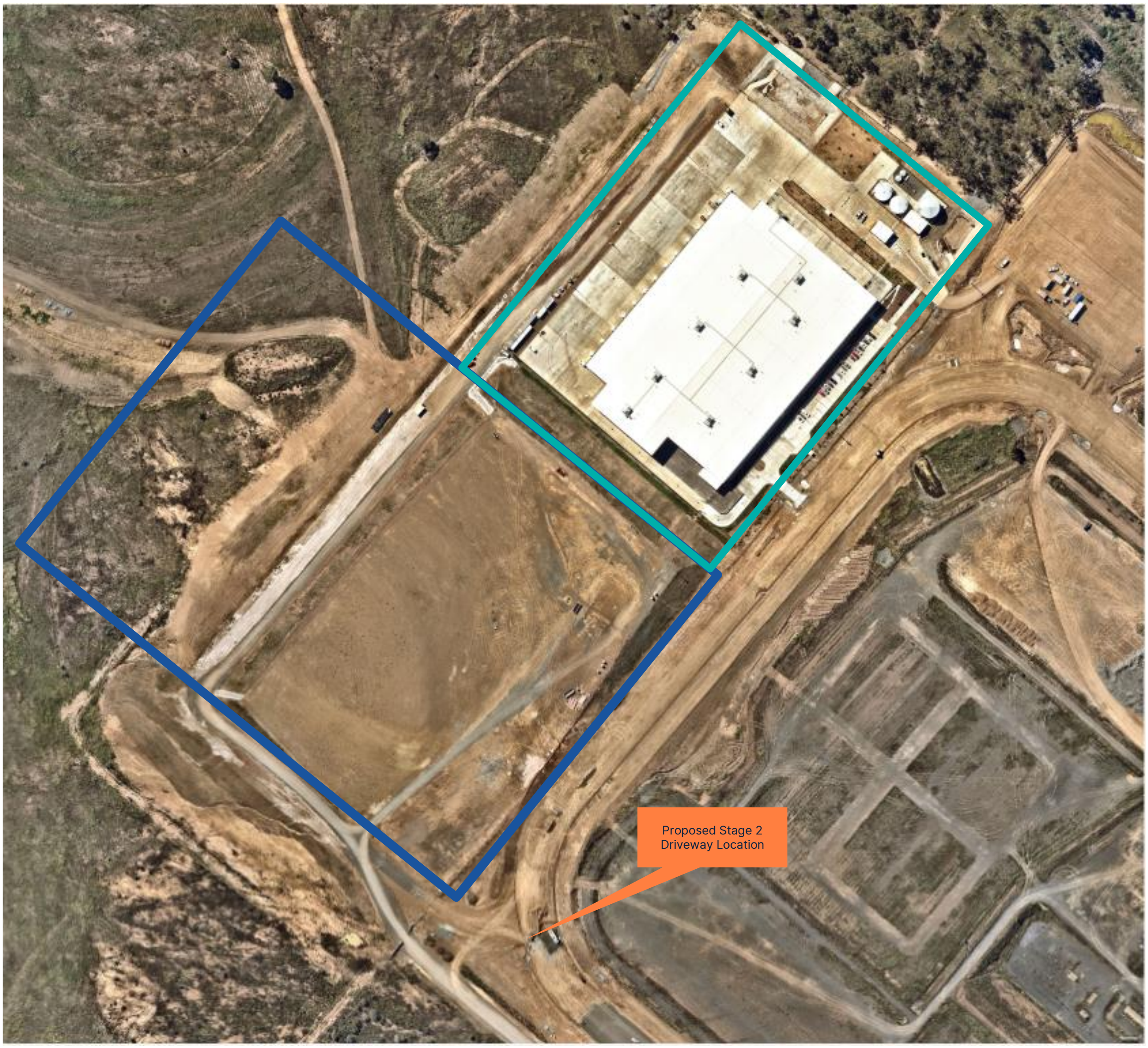


Figure 2–5 Aerial Photo Source: Nearmap

Stage 2 Application Boundary

Stage 1 Application Boundary

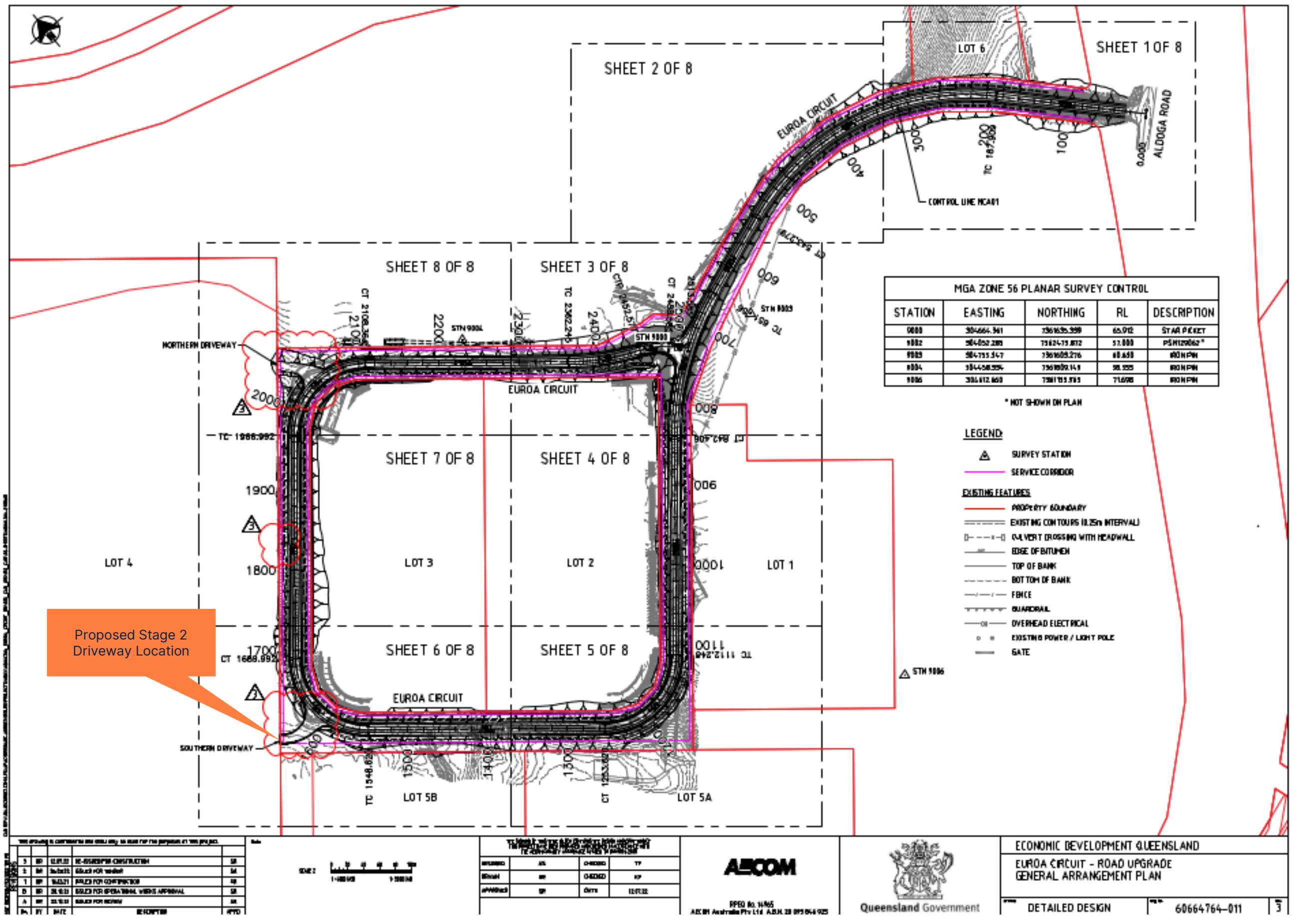


Figure 2–6 Southern Driveway Access Road

2.2.3 Existing Significant Vegetation

As shown in Figure 2–7, there is no vegetation within the Application Boundary as Site has been cleared under the OPW/11/2022 Operational Works Permit issued by Gladstone Regional Council. Some vegetation exists on the Subject Site in the north and north-east, primarily within the easement land. A small area of vegetation also exists in the south-west of the Site. The proposed works will not need to remove vegetation.

2.2.3 Existing Significant Vegetation

As shown in Figure 2–7, there is no vegetation within the Application Boundary as Site has been cleared under the OPW/11/2022 Operational Works Permit issued by Gladstone Regional Council. Some vegetation exists on the Subject Site in the north and north-east, primarily within the easement land. A small area of vegetation also exists in the south-west of the Site. The proposed works will not need to remove vegetation.

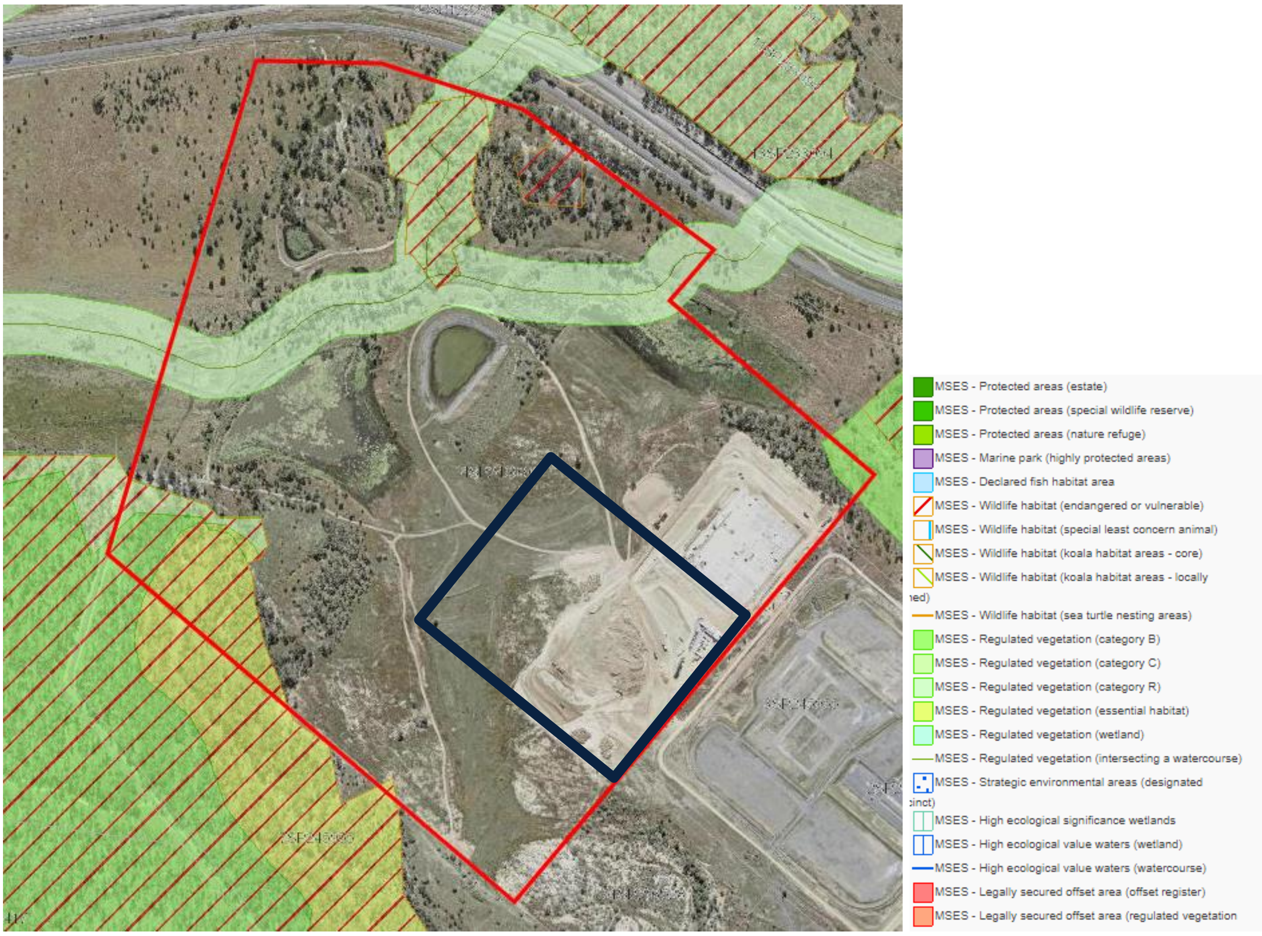


Figure 2–7 MSES Mapping Source: Queensland Globe

Application Boundary
Subject Site

2.2.4 Wetlands and waterways

The Queensland Globe Mapping indicates that there are three Lacustrine wetlands within habitat type artificial/ highly modified wetlands approximately 100m to the north/north-west of the boundary of the Subject Site. However these wetlands should not be classed as MSES as they have been constructed as stormwater controls as seen in Figure 2–8 below. These wetlands do not require conservation as they are still water ponds and are connected with pipes and manmade drainage features.

Mapped waterways for Queensland Waterway and Barrier works are located along the north and north-west side of the Site, however the application boundary is located outside of the mapped area.

Figure 2–8 Existing sediment dam/holding pond of the Aldoga Aluminium Smelter

2.2.5 Topography

As discussed previously, an Operational Works Permit (OPW/54/21) has been issued by Gladstone Regional Council which included bulk earth works. These works have been completed across the central portion of the Site, this means for the majority of the Site the topography is relatively flat, with steeper areas in the north-east and southern corners of the Site. Figure 2–9 and **Appendix C** shows the as-constructed drawing of the earthworks of the Operational Works approved by the GRSC**.** While most of the land within the Application Boundary will be flat, there will be retaining walls installed towards the northern and north-eastern portions of the boundary. Refer to **Appendix D**.

The Steep Land Overlay plan from the GRCPS (refer Figure 2–10) indicates that four small areas of steep land are identified, with one in the Application Boundary, this steep land was flattened as part of the preliminary earthworks included in OPW/54/21.

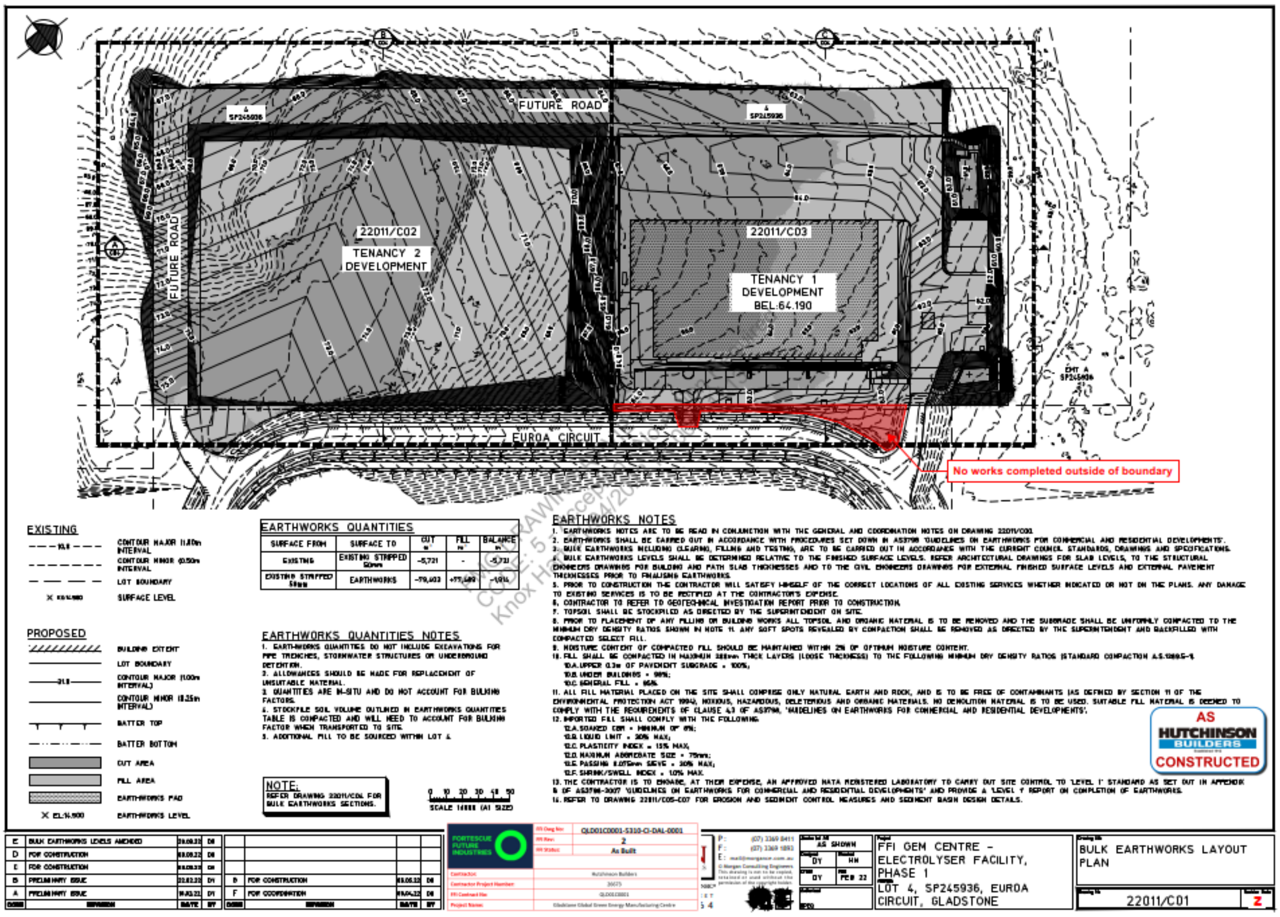


Figure 2–9 As Built Site Survey Source: Morgan Consulting Engineers

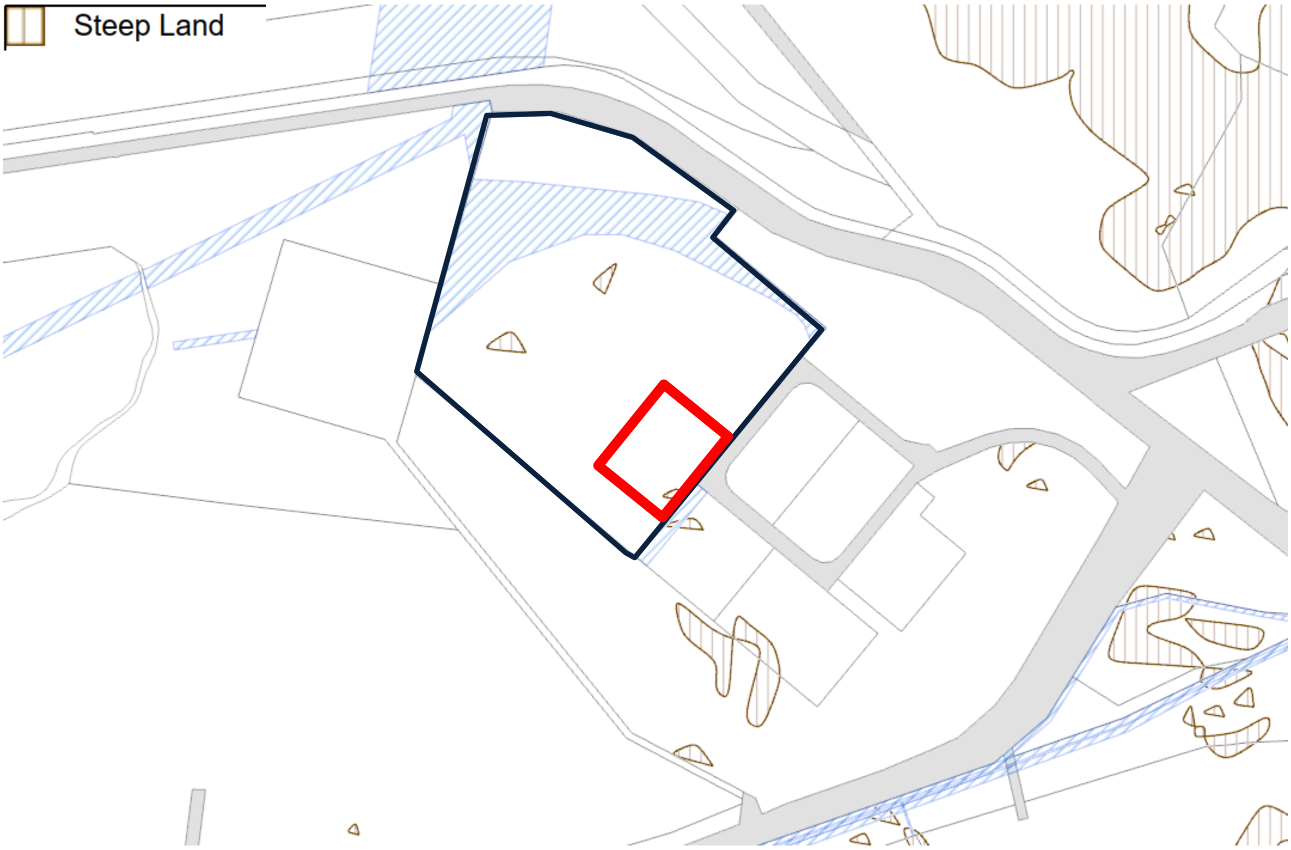


Figure 2–10 Steep land overlay Source: GRCPS

Subject Site

Application Boundary

2.2.6 Geology

There are two dominant soil types on the subject site: alluvium and residual soils. The alluvium generally consists of very stiff clay of high plasticity and dense sands and was found in the northern section of the Site. The residual material generally comprises a superficial surface layer of medium dense to dense sand overlying hard clay of high plasticity. Underlying this profile is bedrock. The general soil and rock profiles of the subject site have been integrated into the earthworks plan for the application to provide responsive designs that best suit the site. Some fill will be imported and compaction of pads to meet design standards. This data was sourced from the SMEC Desktop environmental assessment (**Appendix K**)

2.2.7 Flooding Characteristics

The Site is not within a flood hazard area, as determined by reference to the Gladstone Regional Council Planning Scheme (GRCPS) overlay for flood hazard (refer Figure 2–11).

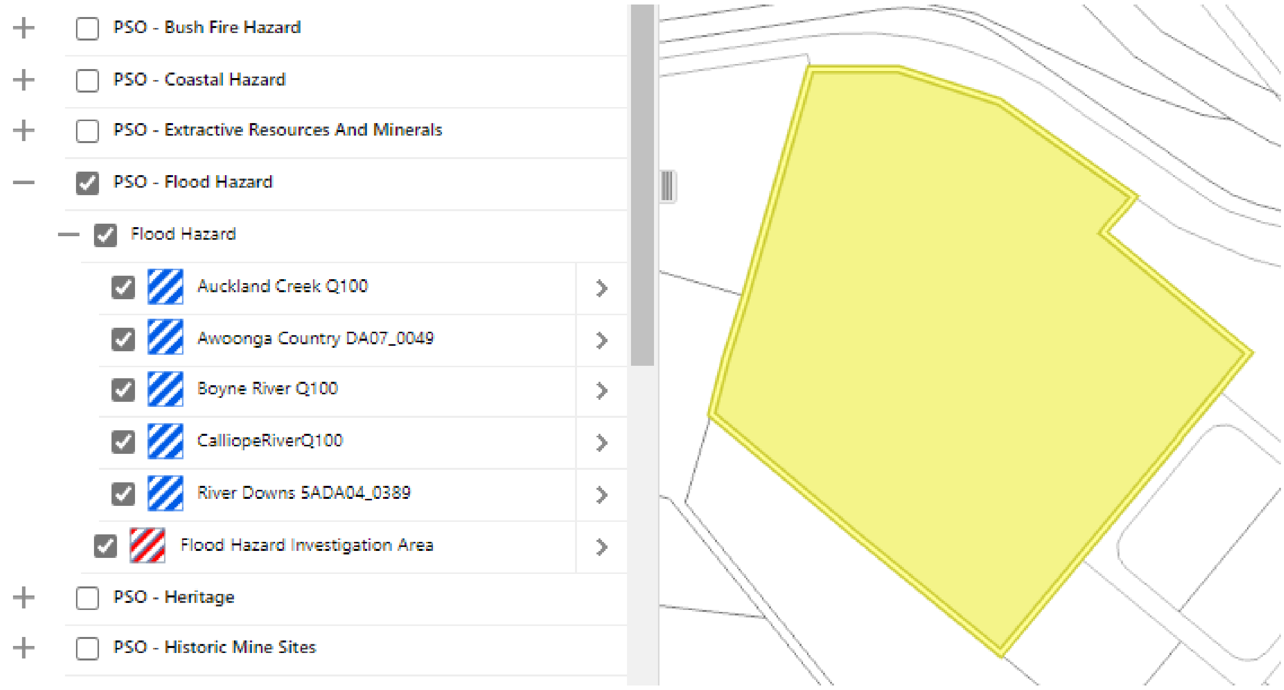


Figure 2–11 Flood Hazard overlay Source: GRCPS

2.2.8 Infrastructure Services

The Stage 1 Site is currently under construction and will be serviced by water and electricity to facilitate the requirements of the Stage 2 of this proposed development. Stage 2 will be able to connect to the existing services located on Site that have been built for the Stage 1 GEM Facility (water, power, telecommunications and road access). The GEM Facility has already obtained approval for ERA 63 (1) (a-i) to be conducted on Lot 4 on SP245936 (P-EA-1002685) for the treatment of on site sewage. As such, this application is seeking approval for ERA 7 (Chemical Manufacturing) to be conducted on Lot 4 on SP245936.

2.2.9 Surrounding Land Uses

The surrounding area is largely vacant, with the Rio Tinto Alcan Red Mud Repository approximately 300m south-east of the Site, currently being demolished. The nearest sensitive residential receptor appears to be approximately 2.8km to the east of the Site, however there are two commercial properties within the 2.5km buffer zone, including the Larcome Creek Terminal Substation to the north and the Yarwun bauxite processing plant and associated by-product storage facilities immediately to the south. Refer to Figure 2–12.

The Stage 2 Gladstone Test Train is intended to be constructed in its entirety within a nine-month timespan. At the end this construction, the facility will commence producing hydrogen, with only 30MW of hydrogen being generated at opening (Stage 2A). Due to water access/infrastructure constraints in the area, the additional 20MW of hydrogen production will be bought online when water access/infrastructure constraints have been resolved that will allow the site to operate at full production capacity (Stage 2B).

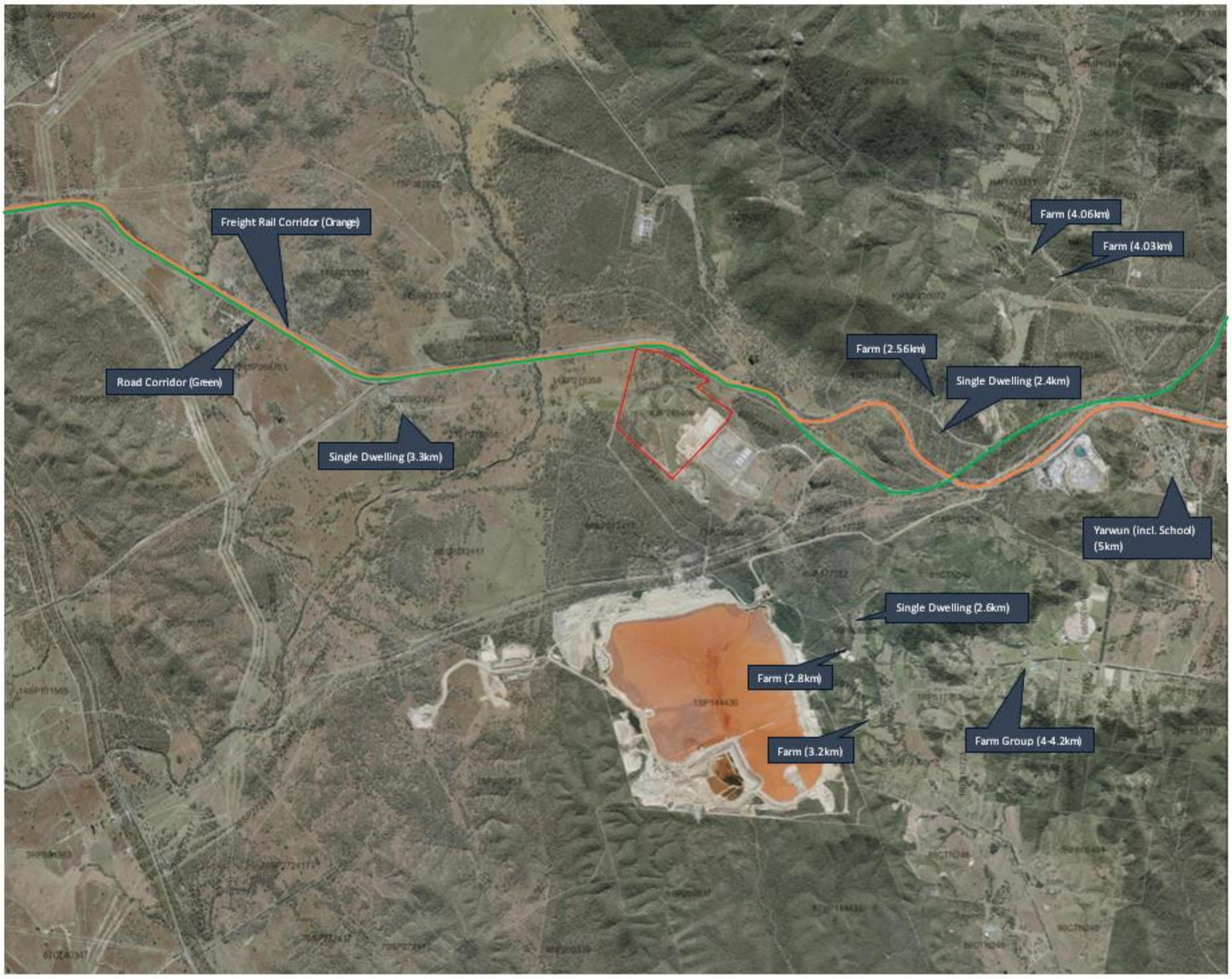


Figure 2–12 Sensitive users within a 5km radius of the proposed development

3 Proposed Development

3.1 Background

FFI is taking a global leadership position in the renewable energy and green products industry by harnessing the world's renewable energy resources to produce renewable electricity, green hydrogen and other green industrial products such as green ammonia and green iron.

FFI has already obtained approvals to develop Stage 1, the GEM Facility (Material change of use for medium impact industry (electrolyser manufacturing facility) under AP2021/006) and as part of its GEM Stage 2, FFI is proposing to develop a green hydrogen plant for long term testing requirements of 1MW Proton Exchange Membrane (PEM) electrolyser stacks. Upon completion of the construction of the facility, these stacks will be interconnected to achieve an initial 30 MW of electrolysis in three banks of stacks, which will work together with the Balance of System and supporting Balance of Plant which is identified as Stage 2A. Upon finalisation of the water access, the additional two banks of electrolyser stacks will be bought online to achieve up to 50MW of electrolysis which is identified as Stage 2B.

(See Figure 3–1 below).

The Proposed development is expected to:

(d) produce up to 6,500 tons per annum of green hydrogen
(e) create 20-40 jobs in operation and 80-120 jobs in construction; and
(f) have a total CAPEX of $225 Million.

3.2 Applications Particulars

The proposed development will require the following approvals:

(a) A Development Application for a Material Change of Use to establish Special Industry (50MW Hydrogen Test Train) under the SDPWO Act / Gladstone SDA Development Scheme.
(b) An Environmental Authority Application for Environmentally Relevant Activity (ERA 7 (6) (b):

- ERA 7 Chemical Manufacturing- (6) manufacturing, in a year, the following quantities of inorganic chemicals, other than inorganic chemicals to which items 1 to 4 apply— (b) more than 1,000t but not more than 10,000t, under the EP Act.

Due to the MCU for Special Industry taking place in an SDA, both the Department of Transport and Main Roads and Hazardous Chemical Manufacturing Aspects of the applications will be internally referred to the relevant entities and they will issue advice to the OCG. The ERA / EA Application will need to be submitted to DES directly, Figure 3–1 below provides an approximate process, note that these processes are to occur simultaneously.

The proposed Site has been chosen because it is co-located on the same lot of the Stage 1 GEM Facility and bulk earthworks have already been carried out. Operational works (under the GRCPS) will be required to modify the existing top pad. The pad for the production facility has been developed, therefore it is expected that operational works approval for earthworks will be required.

This Planning Report has been prepared in support of both applications and the assessment process is identified below.

Figure 3-1: Process of Applications

Gladstone State Development Area Assessment

The Development Application has been made to the OCG who is the Assessment Manager for the Development Application, due to the Site's location within the Gladstone State Development Area.

Under the Development Scheme the subject Site is identified as being located within High Impact Industry Precinct. Section 2.4.2 of the Development Scheme provides specific planning provisions for development within the High Impact Industry Precinct.

This application is seeking approval for Material Change of Use for Special Industry (50MW Hydrogen Test Train).

Specific forms of development under the Development Scheme are 'regulated' pursuant to the *State Development and Public Works Organisation Act 1971* (SDPWO Act). The Development Scheme sets out SDA Self-Assessable Development and SDA Assessable Development. Within the High Impact Industry Precinct, Material Change of Use for Special Industry (50MW Hydrogen Test Train) with ancillary warehouse is identified as SDA Assessable Development.

The Gladstone State Development Area Development Scheme (May 2022) specifies the requirements for an SDA application to be a properly made application, as shown in Table 3–1 below:

Table 3–1 Development Scheme Mandatory Requirements

Development Scheme Requirement	Consideration
An SDA application must *(a) be made to the Coordinator-General in the approved form*	Complies. The SDA application will be made to the Coordinator-General in the approved form.
(b) include: *(i) a clear and accurate description of the land subject to the application and* *(ii) the proponent's name, address and contact details*	Complies. An accurate description of the land subject to the application has been provided. The proponent's details have also been provided. Proponent's name: Gladstone Fortescue Future Industries Pty Ltd Address: Level 2, 87 Adelaide Terrace, East Perth, Western Australia 6004 Contact details: Mike Kilcullen Email: michael.kilcullen@fmgl.com.au Phone: 0418 911 954
(c) identify the development for which approval is being sought	The submitted Planning report identifies the development application is for Material Change of Use for Special Industry
(d) subject to subsection (3), include the written consent of the owner of the land	See attached **Appendix B**.
(e) state the referral triggers under the Planning Act (and referral entities if known) for the application	Department of Transport and Main Roads (Sch. 10, Part 9, Div. 4, Sub. 1, Table 1, 1(b)) Office of Industrial Relations (Sch. 10, Part 7, Div. 1, S.13 Department of Environment and Science (Sch. 10, Part 5, Div. 3, Table 1, 2)
(f) if the application is part of a larger development, include a description of the larger development and details of how the application relates to the larger development	This is Stage 2 of the Gladstone Electrolyser Manufacturing (GEM) Facility (Stage 1 approved as Medium Impact Industry under AP2021/006).
(g) include a statement on whether the development has been, is or will be subject to an EIS or IAR	N/A
(h) be accompanied by: *(i) a detailed and comprehensive planning report and* *(ii) if one has been prepared, an EIS or IAR relevant to the application including a Coordinator-General's report and* *(iii) payment of the relevant fee, if prescribed by regulation.*	See attached Planning report and Appendixes

Environmental Authority Assessment

The Environmental Authority Application for ERA 7 (6) (b) has been made to the Department of Environment and Science (DES) who is the Assessment Manager. Section 125 of the EP Act specifies the general requirements for an Environmental Authority application as shown in Table 3–2 below:

Table 3–2 Environmental Protection Act 1994 Requirements

Section 125 Requirement	Consideration
An application for an environmental authority must *(a) be made to the administering authority; and*	This report will accompany the EA application submitted to DES.
(b) be made in the approved form; and	The application will be made in the approved form using form ESR/2015/ 1793
(c) describe all environmentally relevant activities for the application; and	Chemical Manufacturing
(d) describe the land on which each activity will be carried out; and	Lot 4 on SP245936
(e) be accompanied by the fee prescribed under a regulation; and	The prescribed fee ($14,057.87) will accompany the application.
(f) if 2 or more persons (joint applicants) jointly make the application—nominate 1 joint applicant as the principal applicant; and	N/A
(g) state whether the application is— *(i) a standard application; or* *(ii) a variation application; or* *(iii) a Site-specific application; and*	Site-specific application.
(h) state whether the applicant is a registered suitable operator; and	Registered suitable operator: 100299124
(i) if a development permit under the Planning Act, or an SDA approval under the State Development Act, is required under either of those Acts for carrying out the environmentally relevant activities for the application—describe the permit or approval; and	SDA approval required
(j) if the application is a standard or variation application—include a declaration that each relevant activity complies with the eligibility criteria; and	N/A.
(k) if the application is a variation application— *(i) for a variation application under section 123(1)—state the standard conditions for the activity or authority the applicant seeks to change; or* *(ii) for a variation application under section 123(2)—state the standard conditions that are not the same as the Coordinator-General's conditions; and*	N/A.
(l) if the application is a variation or Site-specific application— *(I) include an assessment of the likely impact of each relevant activity on the environmental values, including—*	N/A

(A) a description of the environmental values likely to be affected by each relevant activity; and *(B) details of any emissions or releases likely to be generated by each relevant activity; and* *(C) a description of the risk and likely magnitude of impacts on the environmental values; and* *(D) details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and* *(E) if paragraph (n) does not apply—details of how the land the subject of the application will be rehabilitated after each relevant activity ceases; and* *(ii) include a description of the proposed measures for minimising and managing waste generated by each relevant activity; and* *(iii) include details of any Site management plan that relates to the land the subject of the application; and*	
(m) if the application is for a prescribed ERA—state whether the applicant wants any environmental authority granted for the application to take effect on a day nominated by the applicant; and	Day of grant of the DA for MCU
(n) if the application is a Site-specific application for a mining activity relating to a mining lease—be accompanied by a proposed PRC plan; and	N/A.
(o) include any other document relating to the application prescribed under a regulation.	N/A.

3.3 Pre-Lodgement Meeting(s)

The following pre-lodgement discussions have been held with the Office of Co-ordinator General (OCG), Department of Environment and Science (DES), Economic Development Queensland (EDQ) and Queensland Treasury:

10th November 2022, Preliminary Proposal

6th December 2022, Pre-lodgement Meeting OCG

16th December 2022, Pre-lodgement Meeting OCG & DES

Further meetings with the Office of Industrial Relations (OIR) and the Department of Transport and Main Roads (DTMR) as follows:

OIR – 17th of January 2023, Pre-lodgement Meeting.

DTMR – 18th of January 2023, Pre-lodgement Meeting.

OIR – 1st of March 2023. Discussion on preliminary consequence modelling results

A summary of key outcomes from pre-lodgement discussions is outlined below:

Table 3–3 Summary of Pre-Lodgement Meetings

Aspect	Relevance	Status
Use of the Site for Medium Impact Industry (Gladstone Test Train Facility) is generally in keeping	To ensure that potential development is consistent with the intent of the area to prevent inappropriate land use outcomes.	The proposed facility is still consistent with the intent of the precinct.

with the intent for the precinct under the Development Scheme.		
An Operational Works permit will be required from Gladstone Regional Council. Consultation with Gladstone Regional Council is recommended to discuss the details of the proposal prior to lodgement.	An Operational Works permit will be required from Gladstone Regional Council as set out by the Gladstone Planning Scheme 2016 to ensure works are carried out in accordance with construction standards.	FFI will prepare and submit and Operational Works Permit for earthworks following the MCU per instructions from GRSC.
Details are required to confirm development outcomes for the proposal relating to stormwater conveyance, access arrangements, bulk earth works and building design elements.	Supporting documentation is required to provide comprehensive information to all aspects of the construction and operation of the development.	The Application includes a Stormwater Management Plan refer **Appendix E**.
DTMR to confirm assessment requirement for transport impact assessment once traffic movements are known.	As the development enters onto a State Controlled Road / Rail Corridor, development must be careful to ensure the proposed traffic amounts can be efficiently serviced by the transport networks available.	The Application includes a Traffic Assessment refer **Appendix J**.
Facility design should ensure that there are no offsite risks when consequence modelling is completed.	Due to the site containing and working with hazardous chemicals, all steps should be taken to ensure safety at all levels of development and operation.	The Application includes consequence modelling refer **Appendix K**.

3.4 Proposal Description

The proposal is for development of an approximate 9-hectare Site on Lot 4 of Plan Number SP245936 (refer Figure 3–2, Figure 3–3 and Figure 3–4). The proposed 9-hectare development footprint will be located behind a 15-20-metre setback from Euroa Circuit, which contains the previously approved GEM Facility. The proposal is for a 50MW Hydrogen Test Train and ancillary warehouse and is referred to as “Special Industry (50MW Hydrogen Test Train)”. The development is a co-located hydrogen production facility which proposes to use up to 306 GWh annually, using supplied electrolyser stacks from the GEM facility and renewable generation in Queensland. The GEM facility for Material Change of Use for Medium Impact Industry (Electrolyser Production Facility) was approved under AP2021/006. The 50MW Test Train is to allow testing and refinement of electrolyser stacks and the associated systems.

FFI aims to control and own a Balance of System modular design and intellectual property rather than using and being at the mercy of a third-party design and construction; FFI can therefore implement cost reduction measures to lower the cost of electrolysis; and FFI can sell the Balance of Plant to its own projects and third parties along with its electrolyser stacks – creating revenue and return.

The existing stormwater infrastructure include three wetlands, a sedimentation pond and an artificial wetland. The existing stormwater infrastructure will be used to service the Site and this infrastructure will extend further into Lot 4, outside of the main 9-hectare Site. Further details on stormwater infrastructure are provided in section 3.8 below.

Detailed Site Plans prepared by Primero are at **Appendix D**.

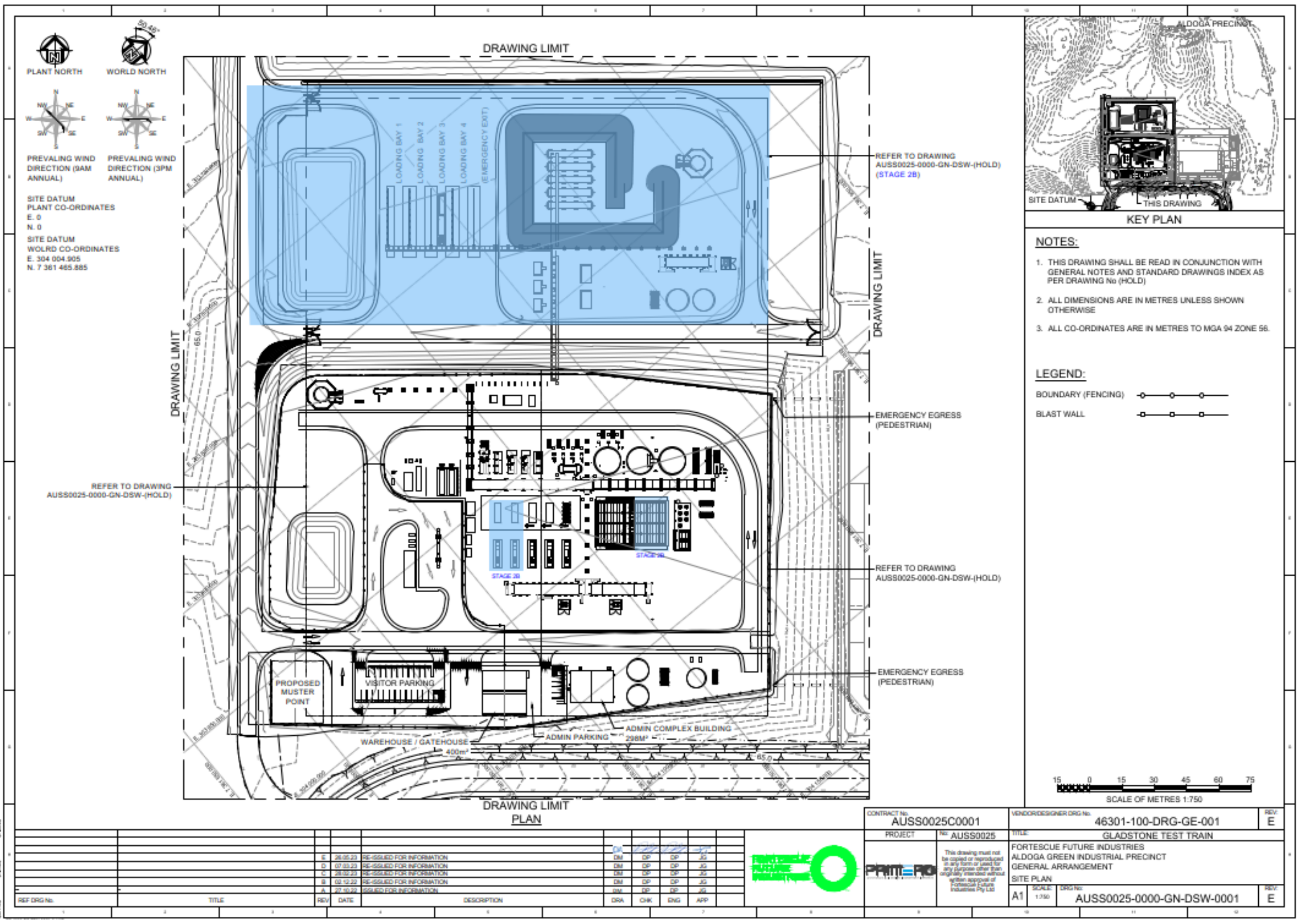


Figure 3–2 Overall Site Location Plan Source: Primero

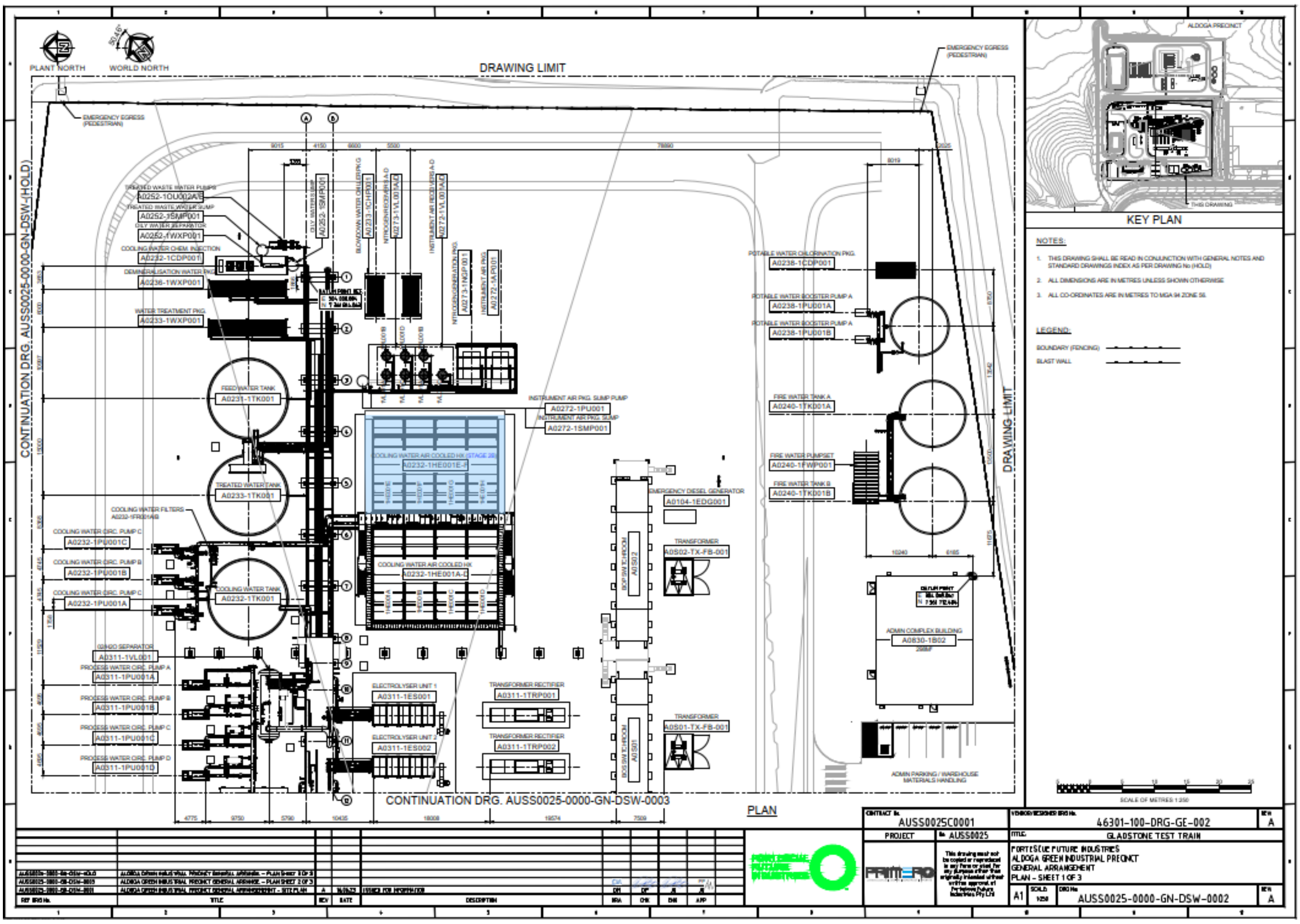


Figure 3–3 Upper Bench Site Plan (East) Source: Primero

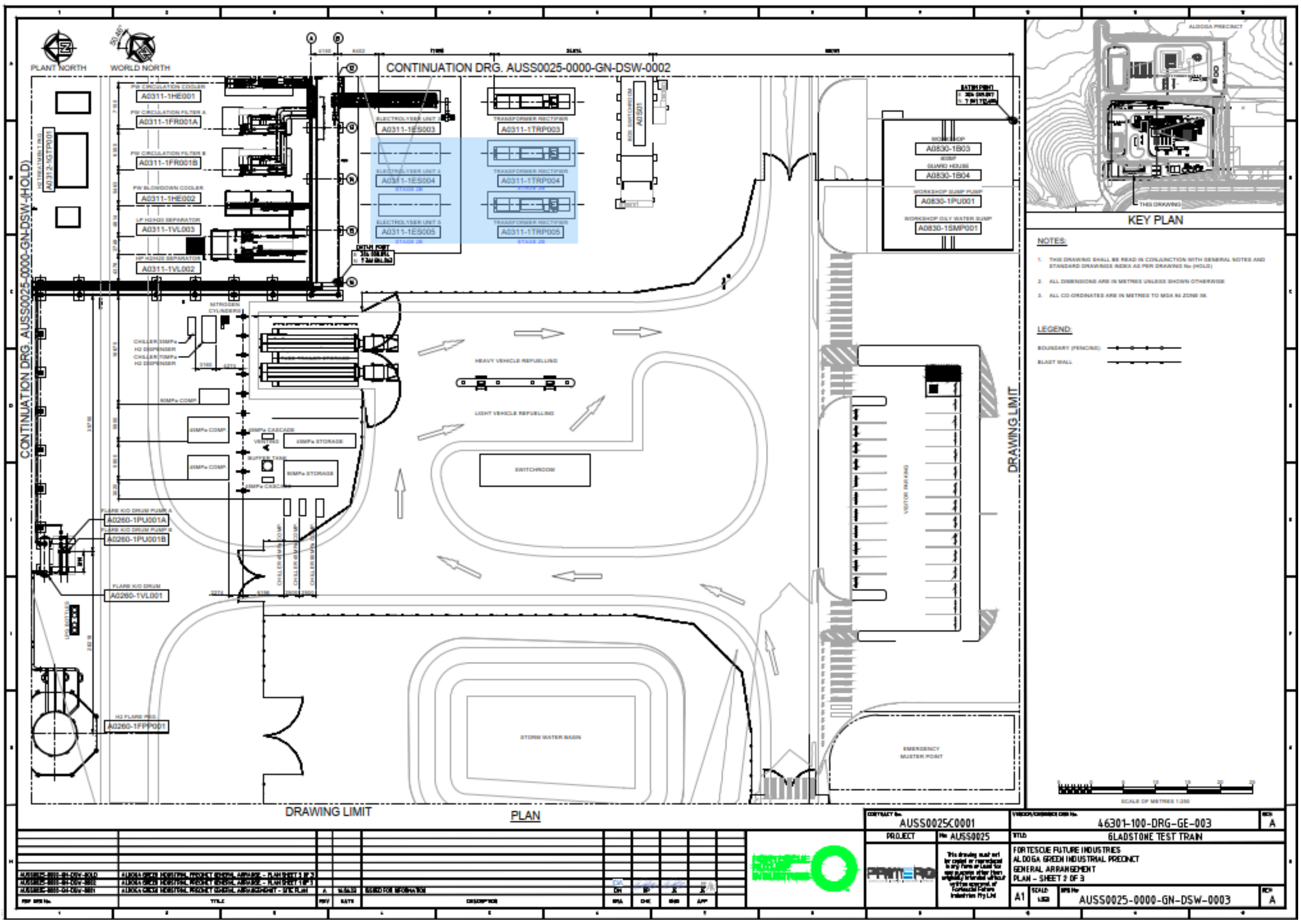


Figure 3–4 Upper Bench Site Plan (West) Source: Primero

3.5 Built Form

3.5.1 Site Layout

The physical elements of the proposed green Hydrogen production facility include:

- Electrolyser Units
- Balance of System
- Balance of Plant
- Storage and Loadout
- Non-Process Infrastructure.

<u>Electrolyser Units</u>

The Electrolyser Units will be brought online in two production stages but all infrastructure to support the electrolyser units will be constructed prior to the first production stage being Stage 2A. Stage 2A will bring online 30 identical 1MW Electrolyser Units that will commence production of hydrogen at the commencement of use associated with this approval. Stage 2B will be delayed due to water supply not being sufficiently available to ramp up to full production of hydrogen out of the additional 20 identical Electrolyser Units. It is expected that water supply to the site will be resolved in the short term and allow full production of Hydrogen in Stage 2B. It is expected Stage 2B will commence approximately 12 months after Stage 2A.

Each 10 electrolyser units will be mounted in skid like frames which are modular in nature and include pre-installed componentry to monitor the electrolysers inputs and outputs along with monitoring safety parameters. Each skid will allow for air to be forced in and out of the skid to ensure that no hydrogen can accumulate should there be a leak. Each skid will also be connected to a Nitrogen supply to ensure the system can be purged should a leak be detected.

Balance of System (BOS)

To support the electrolysers a 'Balance of System' will separate the hydrogen and oxygen from the water. The system consists of the following elements:

- Hydrogen Separators
- Oxygen Separator
- Water Circulation Pumps
- Water Filters
- Heat Exchangers
- Instrumentation
- Electrical Switchroom
- Transformer Rectifiers
- Pipework

Table 3–4 BOS Dimensions

BOS	Length (m)	Width (m)	Height (m)
Electrolysers 5x10MW Skids	35	12	4
Transformer/Rectifier x 5 units	35	13.3	5
Switchroom	29	5	6.6
O2/H2O Separation	11.3	5.3	8.5
Process Water Circulation Pumps Skid	15.6	10.7	3
Process Water Cooler	10.3	3.6	3.2
Ultrapure Water Blowdown Cooler	10.3	3.6	3

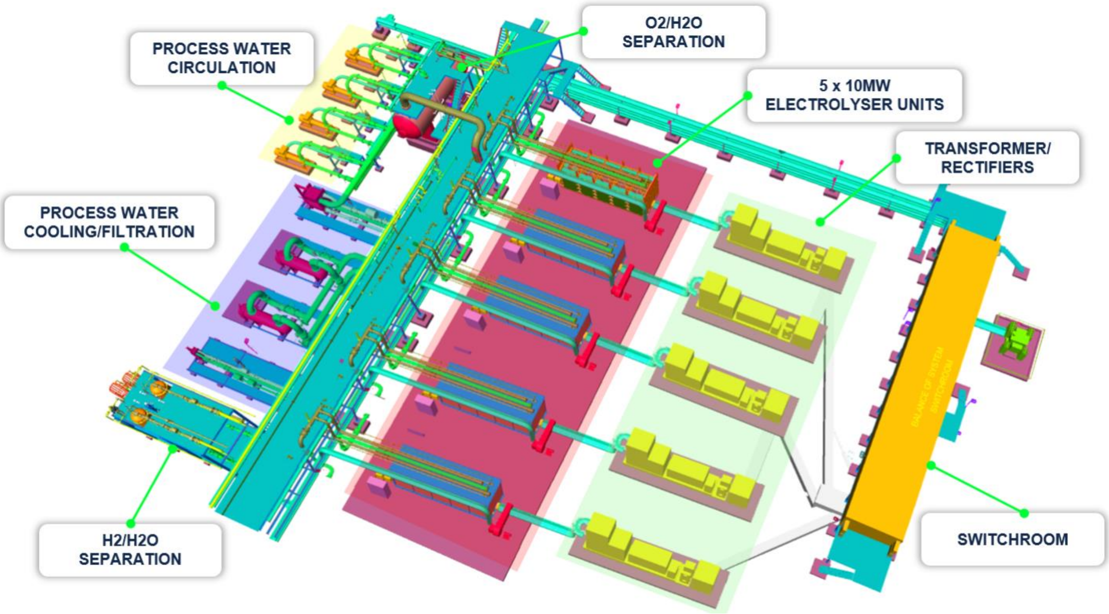


Figure 3–5 Balance of System Overview (Preliminary Only)

BOS shall be modularised into skid-based units conforming to industry norms for 'truckable' units. The design would maximise the use of unpiloted skids to allow for ease of transport. Where this is not possible or practicable, larger skid sizes may be used. Electrolyser stacks shall be shipped 'loose' from the GEM Stage 1 to the east of the proposed test train facility. The stacks will be installed within the skids and the system commissioned as a 10MW unit.

Balance of Plant (BOP)

To support the overall running of the facility the 'Balance of Plant' contains the following elements:

- Potable Water Tanks
- Water Treatment
- Treated Water Tank
- Feed Water Tanks
- Air Cooled Heat Exchangers
- Cooling Water Tank
- Instrument Air Package
- Nitrogen Package
- Low Pressure Flare
- Electrical Switch room

Table 3–5 BOP Dimensions

BOP	Length (m)	Width (m)	Height (m)	Volume (KL)
Switchroom	29	5	6.6	
Air Cooled Heat Exchanger (ACHE)	33.3	24.6	9.2	
Cooling Water Tank	12	12	2.5	247
Feed Water Tank	12	12	2.4	247
Treated Water Storage Tank	12	12	2.6	247
Cooling Water Pump Skid	12	7.6	3	
Water Treatment Package	33.3	14.6	2.8	
H2 Flare Package	6.8	6.8	18	
Knockout Drum	6.2	5.4	4.6	
Hydrogen Treatment	21	5.3	4.6	
East-West Pipe Rack	56	5.3	5.8	
North-South Pipe Rack	44	2.7	8	
Nitrogen and Instrument Package	23.2	7.6	6.5	

Storage and Loadout

To allow the export of hydrogen the following elements are required:

- Hydrogen Treatment Unit
- Hydrogen Refuelling Station
  - Compressors
  - Storage Units
  - Dispensers for Industrial Use for Light Vehicles, Heavy Vehicles and Truck Loading Units
  - Truck Loading Units

Hydrogen Refuelling Station:

The refuelling station's primary purpose is to fill tube trailers but has the functionality to fill trucks and buses (350bar dispenser) and light vehicles (700bar dispenser). The stations will not be accessible to the public. Controlled access will be managed through a controlled gate (RFID reader to open) which can only be accessed after a site induction for the refueller, or the full plant induction is completed. LV refuelling is separated from the HV refuelling by an island, all traffic is to be one way. When a tube trailer is being reversed into the gated tube trailer area the refuelling area will be inaccessible for HV and LV fuelling (will be included in the induction required for site access and signage will be in place confirming inaccessibility while tube trailers are being reversed).

Due to the slow fill times using a refueller to fill tube trailers they will be replaced once a day. The truck and bus (350bar) dispenser uses the same compressors as the tube trailer filling so it can fuel up to 26 heavy vehicles a day but currently there are no hydrogen heavy vehicles identified for use. FFI anticipate the usage to be up to 6 HVs a day. The light vehicle dispenser is limited to 6 refills a day due to the compressor size chosen. Refer to Figure 3–6 below.

Table 3–6 Storage and Loadout Dimensions

Storage and Loadout	Length (m)	Width (m)	Height (m)
East-West Pipe Rack	76	2.2	8.1
North-South Pipe Rack	60	2.2	7.4
H2 Compression Skid	23	5.5	3.7
H2 Chiller Skid	20	4.8	4.2
H2 Storage Units	28	21	6
Switchroom	26	7	6.4
Fire Tanks x 2	10	10	3.4

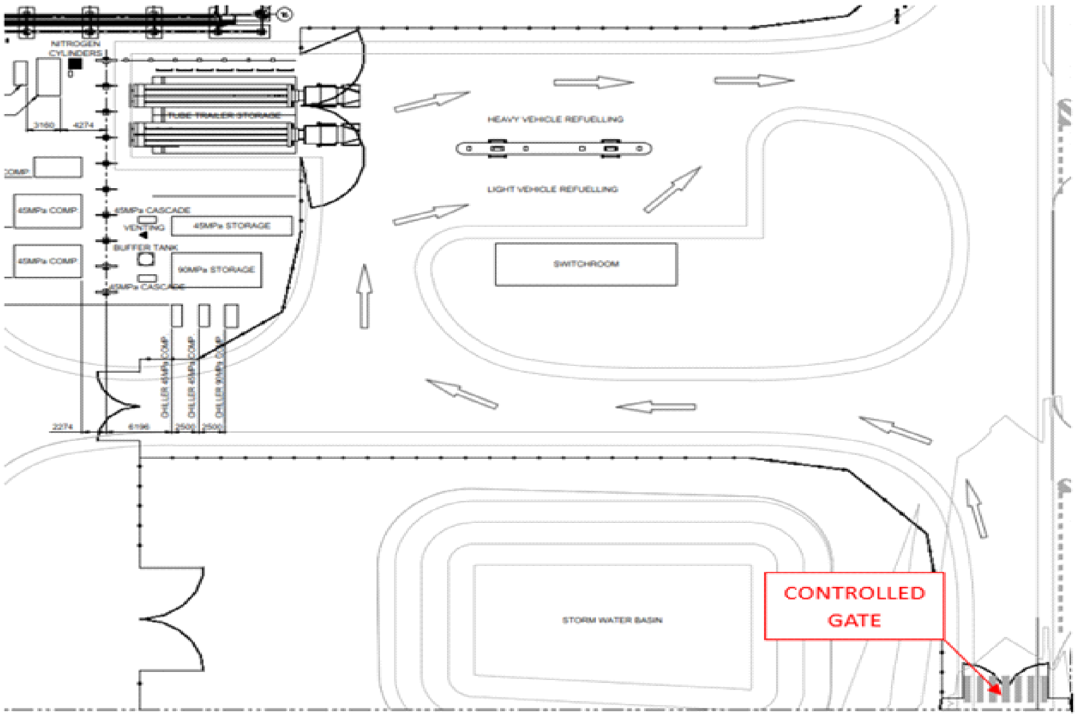


Figure 3–6: Layout of the access routes for vehicles being reloaded with hydrogen.

Non-Process Infrastructure

The following non-process infrastructure will locate on Site:

- Firefighting system
- Blast Wall Shielding
- Security and gatehouse
- Administration building
- Warehouse
- Ablutions

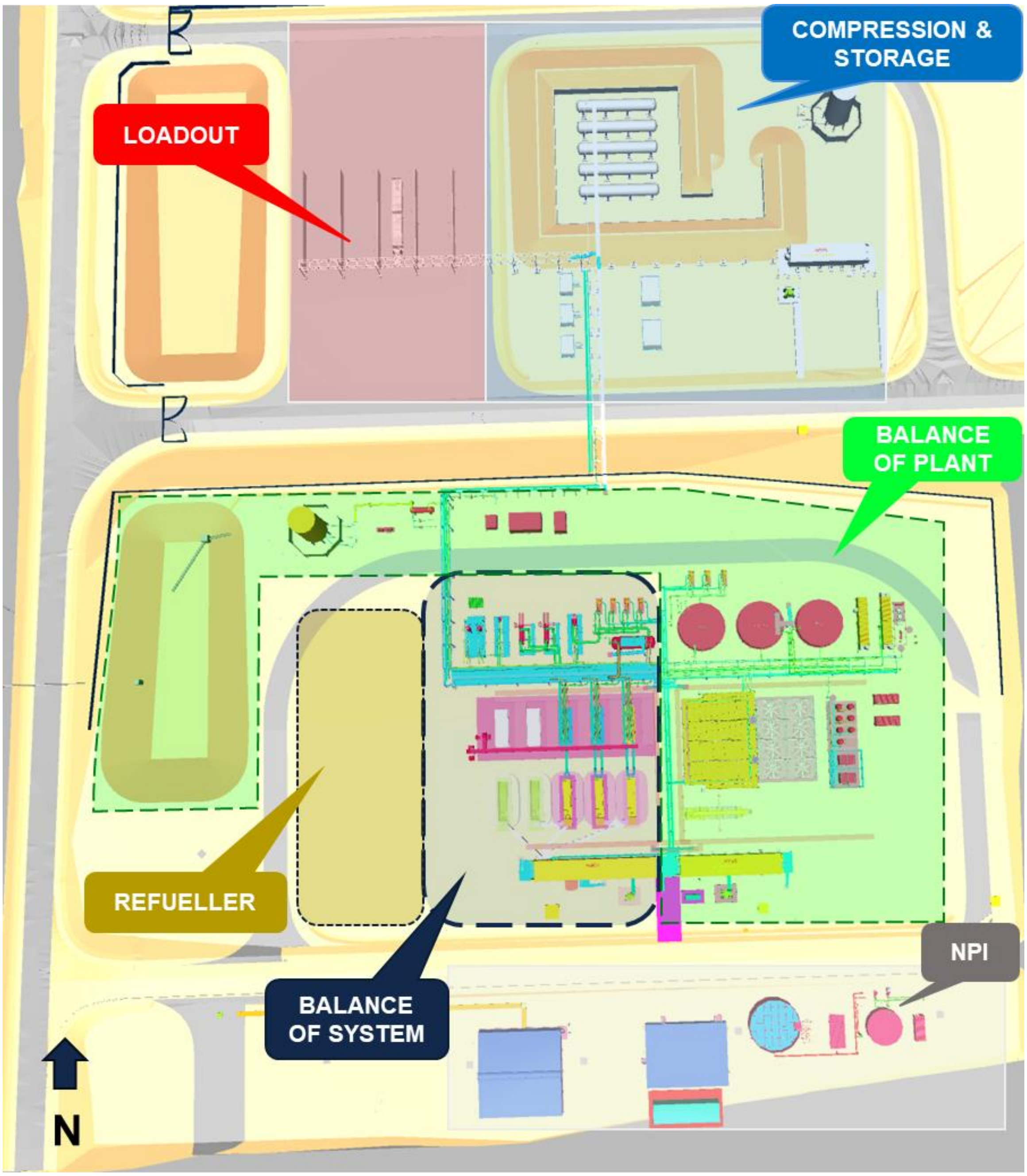


Figure 3–7 Overview of Subject Site, including Balance of System (Preliminary Only)

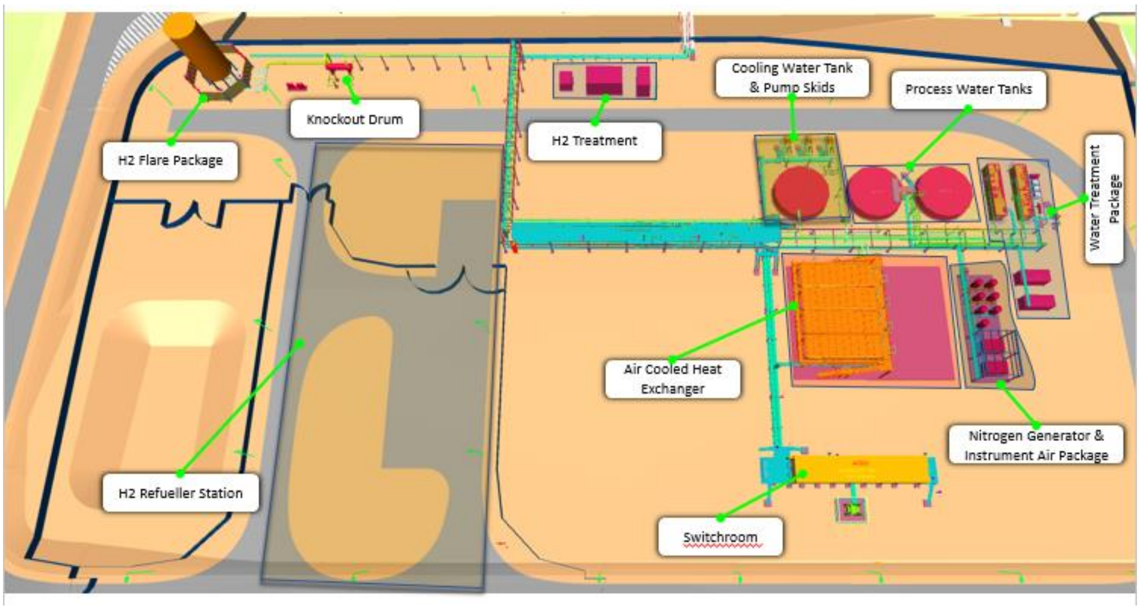


Figure 3–8 Balance of System Overview (Preliminary Only)

3.5.2 Site Boundary

The Site is to be securely fenced and gated. Electronic sliding gates are to be installed on the entry and exit point to the Site where not extensions to internal roads in the previously approved GEM facility. Security fencing on all perimeters of the Site is to be black chainmesh fencing. A security hut will be established with separate sliding electrical gates for HV (2x entry and exit) and LV traffic. Two Emergency Egress (Pedestrian) points will also be located on the eastern side as identified in Figure 3–9.

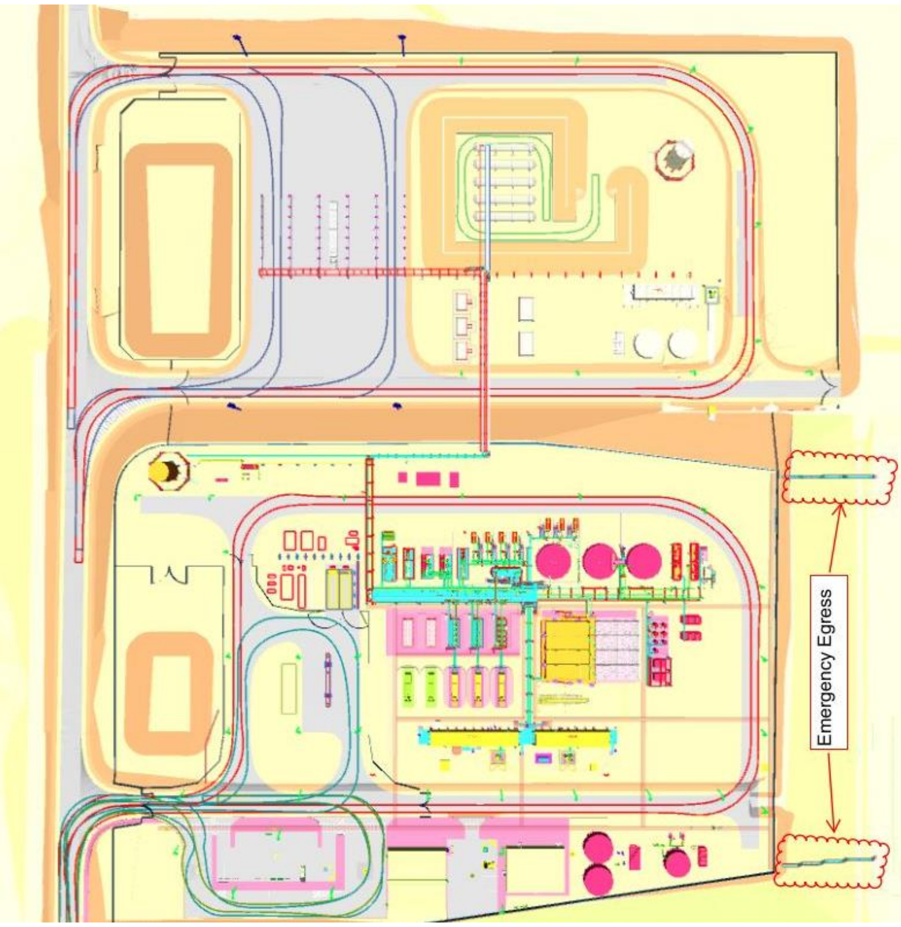


Figure 3–9 Emergency Access points (Preliminary Only)

3.5.3 Landscaping

The Site is screened by existing vegetation when viewed from Gladstone – Mt Larcom Road – refer photo at Figure 3–10 below. Landscaping is not proposed around the test train as it represents a bushfire risk to the facility.

Figure 3–10 Street View of Site Source: Google Street view

Figure 3–11 Existing vegetation screening the Site from Gladstone – Mt Larcom Road Source: QLD Globe

3.5.4 Height

The tallest structures will be the flare which will be 18m in height. The existing topography limits any adverse visual impacts within the surrounding landscape. The existing hill to the east blocks all visual impacts from this direction. The existing vegetation along Gladstone Mount Larcom Rd will predominately screen the test train from the highway. The test train will not be visible from any publicly accessible areas or sensitive receptors.

Figure 3–12 Structure Heights of Test Train Facility– (Preliminary Only)

3.6 Access, Parking and Servicing

3.6.1 Vehicular Access

Vehicular access to the Site will be via upgrades to Euroa Circuit as indicated in the plan at Figure 3–13 below**.** The proposed upgrade to Euroa Circuit will be in accordance with Gladstone Regional Council policy no. P-2014/32 Road Hierarchy Table 7 Rural Area - Collector Road: but with a design speed of 70Km/h and a posted speed of 60km/h. This will ensure safe access to the Site. This upgrade to Euroa Circuit is currently being constructed and will be completed prior to the operation of the test train.

Truck access and turning circles will accommodate Single Semi Trailer with entry and exit point to the Site off the Southern road located off Euroa Circuit. Truck circulation is present, with access in and out via the main access road to the Site.

Figure 3–13 Euroa Circuit Upgrade (Preliminary Only)

Emergency egress is available at each corner of the Site using a one-way gate, as shown in Figure 3–9 above. Single, one-way gates are to be for pedestrians only. Vehicle access is as shown, and one two-way road for LVs is to be constructed and a ring road for truck loading.

3.6.2 Carparking

Carparking for 26 staff vehicles (including 1 All-Access Carpark) is to be provided as there will be an estimated 20 staff on Site during each shift. This is considered to be a reasonable allocation of carparking given the nature of the proposed bespoke nature of the activities on the Site and number of staff during each shift. Public transactions are not proposed to take place, and access to the Site will be via prearranged registered visitors. The carparking area is to be constructed of sealed bitumen and marked in accordance with all appropriate Australian Standards and Building Codes.

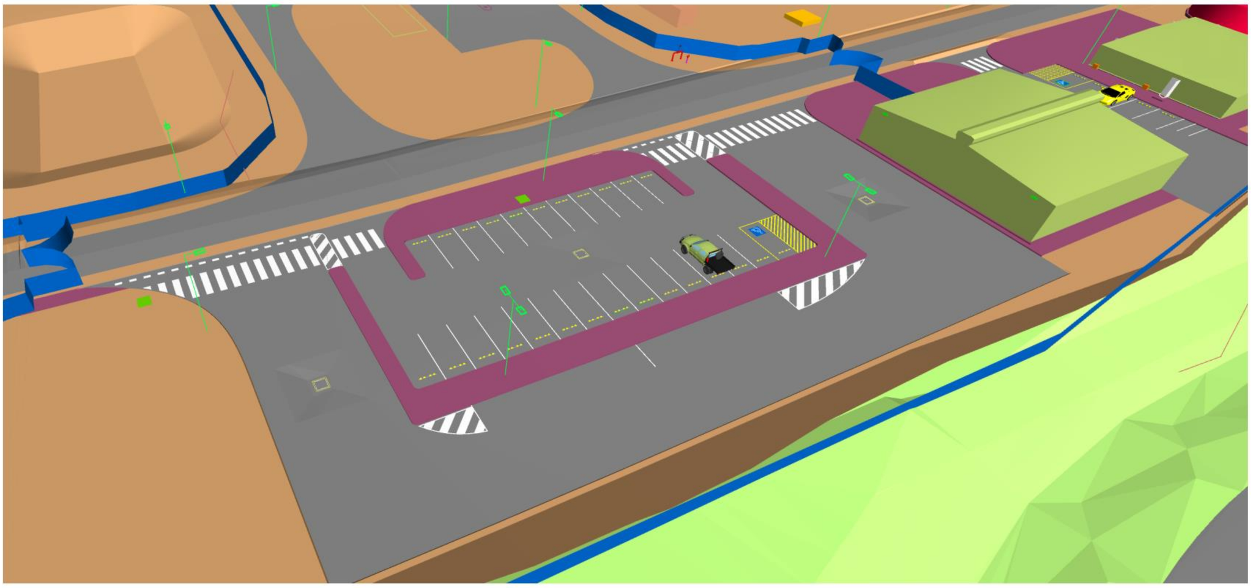


Figure 3–14 Carparking (Preliminary Only)

3.6.3 Servicing

Preliminary services upgrades to Euroa Circuit are indicated in the plan at Figure 3–2 above. The proposed development will be serviced by trunk water and electricity supplies provided to the southeast corner of the Site via the Euroa Circuit road reserve constructed as part of GEM Stage 1, no additional approvals will be required.

3.6.4 End of trip facilities

Bike racks and toilet facilities will be provided for staff on Site in addition to the following located at GEM Site:

- Bicycle Racks
- Dedicated Lockers
- Change Rooms: Male and Female
- Showers
- Toilets: Change Rooms are to include toilet facilities
- Drying Rooms: A drying room including electric drying cupboards are to be provided in each of the Change Rooms

3.7 Acoustic Generation

The Site generally consists of electrolysis plant and the associated power services to facilitate the process and export product. The majority of plant items are also located within enclosures which are either partially closed or fully enclosed. To determine the levels of noise for the Test Train, the Gibson Island Project which is a large-scale Hydrogen production facility has been used to determine the baseline noise levels for equipment to be used for preliminary review.

The source noise spectrum for the proposed plants equipment, as detailed in below. The listed source noise levels are indicative and subject to change during subsequent design stages when detailed vendor data is made available. The full Acoustic Modelling for Gibson Island is available in **Appendix M**.

Table 3–7: Acoustic Modelling of Sound Generation for equipment. Source: Gibson Island Acoustic Modelling

Plant	Sound power level (dB) for Octave band centre frequency (Hz)									Total, dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Pumps (100kW, 1600-1800 rpm)	93	94	95	97	97	100	97	93	87	104
Pumps (75kW, 1600-1800 rpm)	93	94	95	97	97	100	97	93	87	103
Pumps (75kW, 3600 rpm)	90	91	92	94	94	97	94	90	84	100
Electrolyser pump	93	94	95	97	97	100	97	93	87	104
Power transformer	80	89	92	87	87	79	72	64	52	86
Distribution transformer	80	89	92	87	87	79	72	64	52	86
Compressor	107	103	108	107	105	108	113	110	103	116
Transformer	80	89	82	87	87	79	72	64	52	86
Condensers	72	77	75	78	74	67	65	57	51	75

A high-level review of the equipment proposed for the site identified the air-cooled heat exchangers (ACHE) as the largest noise source. The expected noise of the fans was estimated to be 80dBA at 1m. By applying the inverse square law, the estimated noise level at the boundary (ACHE is 75m from the boundary) is expected to be less than 50dBA. Given the Site location these noise volumes will not impact on sensitive uses and would be expected for any new use development in an industrial estate. This will be verified during the detailed design process and the need for noise barriers to ensure acceptable outcomes for sensitive receivers will be confirmed. Any acoustic enclosure around equipment needs to be designed with consideration of the primary functional and safety requirements of the equipment, including the need for sufficient ventilation and air flow.

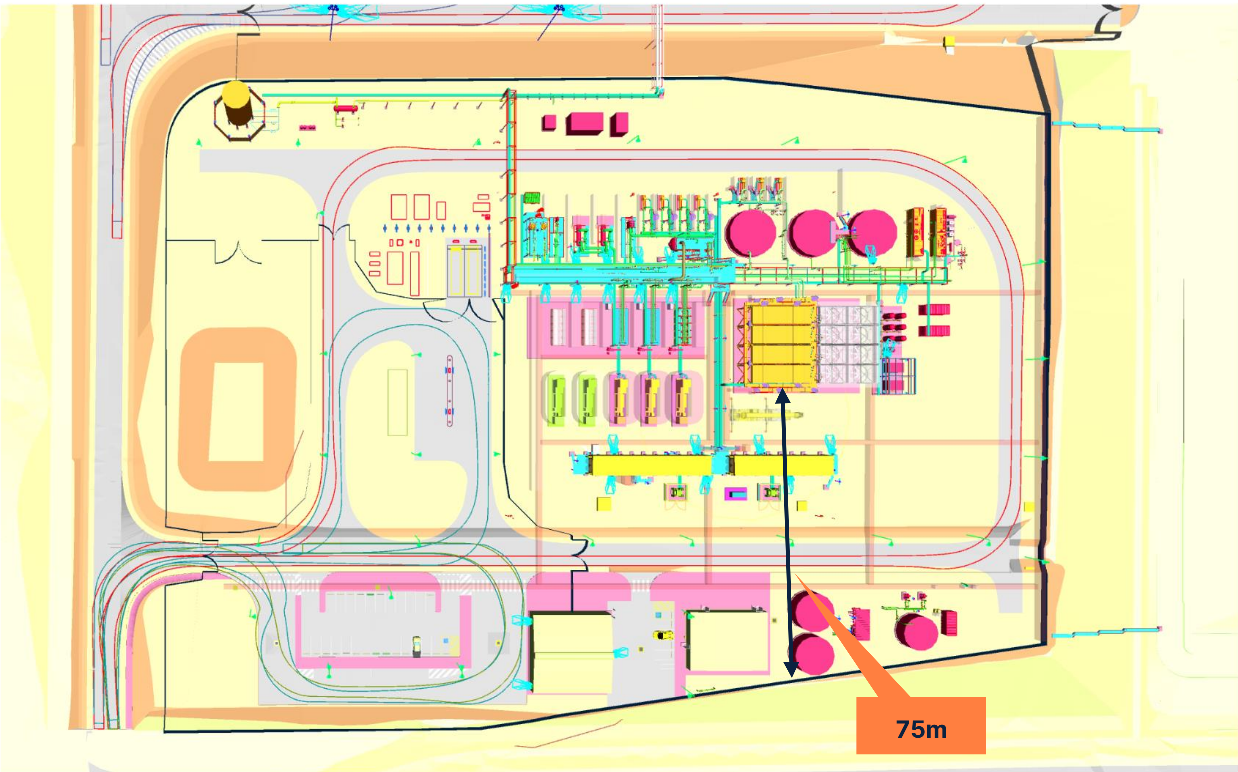


Figure 3–15 Proximity of Fin Fan Coolers and heat exchanges to Site boundary (Preliminary Only)

3.8 Infrastructure Services

Electrical Supply

Electricity is connected to the site via the new substation being built. The substation contains a 275kV to 33kV transformer. The test train will be supplied at 33kV via underground conduits.

Water Supply:

The required water will be provided by GAWB, which is potable grade. Potable water might contain dissolved organic carbon and excessive turbidity or conductivity that needs removal. The treatment process may consist of activated carbon filter and a Reverse Osmosis system. Water storage will be required for firewater, potable purposes, cooling water make-up, demineralisation system feed and demineralised water.

Telecommunications:

The following telecommunications are required:

- Industrial Wi-Fi network to support mobile workers,
- CCTV;
- Access control, telephony, corporate LAN connections and radio systems.

Fire Systems

All fire systems are to be designed in accordance with the relevant Australian Standards. The project has engaged a Queensland RPEQ fire expert to support the fire system detailed design to ensure the risk associated with fire hazards for the facility are managed in design and operation. All emergency exit lighting is to be LED type.

3.8.1 Stormwater

The development is proposed to connect to the existing stormwater network constructed to service the Aldoga Aluminium Smelter. The Aldoga stormwater network consists of two wetlands (north-western and north-eastern) and a sedimentation pond. All stormwater from the development will utilised the NW wetland (detention basin). No stormwater can get to the sedimentation pond as it is raised. An existing artificial wetland receives the underflow from the sedimentation pond which is separate from the site stormwater network as seen in Figure 3–17. Figure 3–17 shows the proposed connection to the current stormwater network after proposed earthworks have taken place. This network will be both for quality and quantity and was previously designed to treat all stormwater for the Aluminium Smelter with a lawful point of discharge being identified in the north west wetland pond located on-site.

On-site detention will be provided in the form of two detention basins to attenuate post-development peak flow rates and ensure non-worsening of flooding to properties and infrastructure adjacent to, and downstream of the subject site. The detention basins will be designed to contain all flows up to a Q100 storm event.

Sediment generated during the construction phase shall be dealt with in accordance with an Erosion and Sediment Control Plan to be kept on site during the construction phase. Details of the site-specific construction and operational runoff discharge treatment is to be incorporated as per development approval conditions in the MCU DA.

Refer to Stormwater Management Plan in **Appendix E**.

Figure 3–16: Aerial View of Gladstone Manufacturing Hub Precinct (Source: Aurecon)

Figure 3–17: Natural drain diverting catchment #1 and #2 to the north-west wetland (Source: FFI)

3.9 Ecologically Sustainable Development

Renewable Energy Supply

The proposed development will be run from a mixture of renewable energy generated off Site including solar and wind energy. When the Test Train is unable to purchase this renewable energy from the market, the plant will not produce hydrogen.

Site Impacted Water (Brine)

Process-impacted water which the majority will be the reject water from the water treatment plant on site which converts potable water into ultrapure water will be stored in the previously built sedimentation pond. The waste water will then be transported off site to a facility that we be licensed to handle this water.

Wastewater

Sewage from toilets and kitchen will be generated on a maximum rate of 1.5 m^3/d and will be sent to Gladstone Electrolyser Manufacturing facility located on the next tenancy. The existing treatment plant has the capacity to assimilate this flow. The treated wastewater is reused for irrigation.

3.10 Security

Access Control System

All buildings on the Site will include an electronic access control system. The system is to be a credit card size swipe system and be integrated into all external entry points (including car parking, fire doors and entry gates). The system will be able to be expanded to enable swipe card access to its various operational zones.

Closed Circuit Television

A closed-circuit television (CCTV) is proposed. The system will use a minimum of 8MP IP based high resolution cameras and allow for a minimum of 30-day storage for recordings. The system will cover all external areas and common areas. The system will be able to be expanded to enable additional cameras to be installed (approximately 30 additional cameras).

4 Statutory Planning Framework

4.1 State Development and Public Works Organisation Act 1971

This development application has been lodged under Section 84 of the *State Development and Public Works Organisation Act 1971* (SDPWO Act) and has provided all necessary supporting documentation, including landowners consent.

4.1.1 Assessment Manager

The Coordinator General, Queensland is the relevant Assessment Manager for development regulated by the Gladstone SDA Development Scheme.

4.2 Gladstone State Development Area Development Scheme

A comprehensive assessment of the development against the SDA Vision, SDA Objectives, Precinct Intent, and SDA-wide development criteria has been carried out and is provided in **Appendix F.**

4.2.1 Gladstone State Development Area

The Site is within the Gladstone State Development Area (GSDA). In December 1993, approximately 6,800 hectares of land at Aldoga, north-west of Gladstone, was declared a state development area. The declaration followed an extensive review of land in the Gladstone region suitable for future large-scale industrial development. This land was considered broadly suitable for large-scale industrial development on the basis that it conformed to acceptable engineering, environment and social criteria, as identified in the Gladstone Industrial Land Use Study.

Over time, the GSDA has been amended and now comprises approximately 26,934 hectares. In May 2022, amendments were made to support industrial development and to protect the environmental values of the GSDA.

Major industries currently established in the GSDA include:

- Rio Tinto (formerly Comalco) Alumina refinery (RTA Yarwun) which was first operational in 2004;
- Orica Chemical Manufacturing complex which commenced operations in 1989; and
- Transpacific Industries Waste Management and Recycling facility.

The Development Scheme includes a definition of a planning report as a document containing the following:

Table 4–1 Development Scheme Report Requirements

Development Scheme Planning Report Requirement	Relevant Section
(a) an accurate description of the land, the subject of the application	Section 2
(b) a detailed description of all aspects of the proposed development, including a detailed Site plan (to scale) and other plans necessary to describe the proposed development	Section 3
(c) a description of the current and historic (if known) land uses	Section 2.2.1
(d) a list of other approvals required for the development to proceed and the process for obtaining those approvals	Section 3.2 and section 4

(e) a description of any operational works necessary for the material change of use or reconfiguring a lot the subject of the SDA application to proceed	Section 3.2
(f) a description of adjacent land uses and a statement of the likely impact on the surrounding land uses from the proposed development	Section 2.2.9
(g) a detailed assessment of how the proposed development satisfies the strategic vision, overall objectives, the preferred development intent of the precincts, and relevant assessment criteria including: *(i) a detailed description and assessment of any adverse impacts of the proposed development* *(ii) a detailed description of how any adverse impacts are to be managed* *(iii) an assessment of any impact the proposed development may have on existing and planned infrastructure* *(iv) identification of any need for upgrades to existing infrastructure or the need for any future infrastructure to support the proposed development*	**Appendix F**
(h) relevant supporting information such as plans, drawings, and management plans. All supplied plans, drawings and management plans must be prepared by a suitably qualified person in accordance with current best practice. The relevant plans, drawings and management plans must demonstrate that: *(i) they have been prepared by a suitably qualified person* *(ii) they have been prepared in accordance with current best practice and* *(iii) the development satisfies the strategic vision, overall objectives, the preferred development intent of the precincts, and relevant assessment criteria*	**Appendix C** **Appendix D** **Appendix E** **Appendix J** **Appendix K** **Appendix N**
(i) relevant supporting information may be required to demonstrate how issues associated with the following may be addressed: *(i) environmental, cultural heritage, and community values (ii) engineering* *(iii) hydrological and hydraulic* *(iv) safety* *(v) emissions* *(vi) contaminated land* *(vii) acid sulfate soils* *(viii) traffic etc*	Section 5

4.2.2 Land Use Definition

This application is seeking approval for Material Change of Use for Special Industry. Pursuant to Schedule 1, Section 2 of the Development Scheme

> ***Special industry*** *means the use of premises for an industrial activity that:*
>
> *(a) includes the manufacturing, producing, processing, repairing, altering, recycling, storing, distributing, transferring, or treating of products*
>
> *(b) requires on Site controls for emissions hazardous substances and dangerous goods risks*
>
> *(c) has one or more of the following attributes:*
>
> *(i) potential for extreme impacts on sensitive land uses due to off Site emissions including aerosols, fumes, particles, smoke, odour, and noise*
>
> *(ii) potential for extreme off Site impacts in the event of fire, explosion, or toxic release*
>
> *(iii) may involve the storage and handling of large volumes of dangerous goods*
>
> *(iv) requires significant separation from non-industrial uses*
>
> *(v) generally involves night-time and outdoor activities.*
>
> *Note: examples of special industry include oil refining or processing, waste incineration, manufacturing chemicals, manufacturing or storing explosives, power plants, manufacturing fertilisers.*

The proposed development is consistent with the intended land uses being that the development seeks to process and produce energy using potentially hazardous chemicals that would be inappropriate to locate in more populated areas.

4.2.3 Level of Assessment

Specific forms of development under the Development Scheme are 'regulated' pursuant to the *State Development and Public Works Organisation Act 1971* (SDPWO Act). The Development Scheme sets out SDA Self-Assessable Development and SDA Assessable Development. Within the High Impact Industry Precinct, Material Change of Use for Special Industry is identified as SDA Assessable Development. The ancillary warehouse is proposed to be used for storage purposes for spare parts and the like.

It is noted that 'operational works' for bulk earthworks and 'buildings and works' associated with the proposed development are not regulated forms of development under the Development Scheme. These aspects of the proposal will therefore be subject to separate application processes under the *Planning Act 2016* and the relevant provisions of the Gladstone Planning Scheme.

Other assessable development under schedule 10 of the *Planning Regulation 2017* including MCU for Hazardous Chemical Facility and Environmentally Relevant Activities will be documented in a separate application to SARA. Section 4.4 and 4.6 contains information regarding the EA and MCU for Hazard Chemical Facilities.

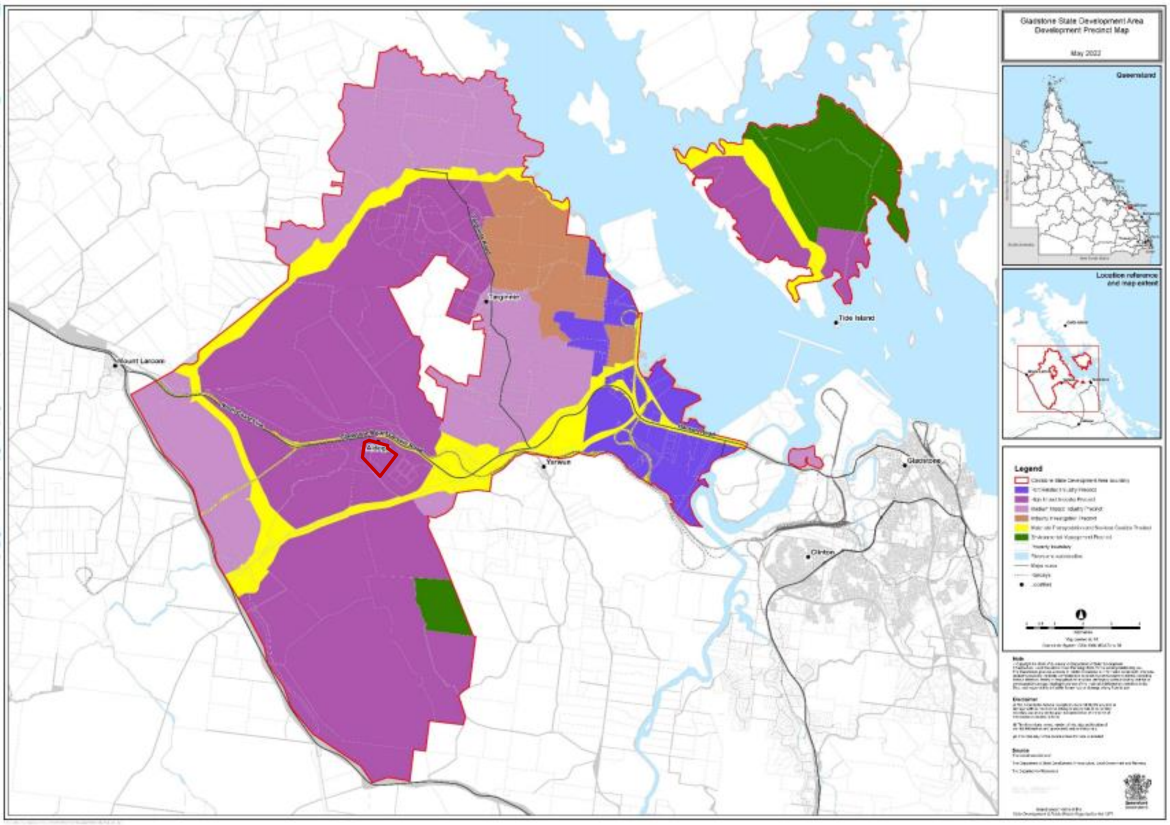
4.2.4 Development Precinct

As detailed earlier in this report, the subject Site is located within the High Impact Industry Precinct and the Development Scheme forms the higher order statutory planning instrument for development within the SDA, with specific Precinct controls applicable to the Site. The Development Scheme was developed under the SDPWO Act and was declared by regulation in 1993. The May 2022 edition of the Development Scheme is the current version of this document.

The SDA covers a total land area of 26,934 hectares of land adjacent to the Port of Gladstone, with connections to major rail networks and Australia's national highway. Under the Development Scheme, the SDA is split into six (6) precincts (refer to Figure 4–1 below). The subject Site is located within the High Impact Industry Precinct.

The Gladstone SDA – High Impact Industry Precinct contains the specific land use and built form provisions that future development within the Precinct is required to satisfy.

This Town Planning Report will undertake a thorough assessment against the Development Scheme and demonstrate compliance with all relevant assessment provisions.



Subject Site

Figure 4–1 Precincts of the Gladstone SDA Source: GSDAP

The road network, Euroa Circuit, located on the southern boundary of the site is assumed to also fall under the High Impact Industry land use category and therefore the State Code 21 Hazardous Chemical Facilities - Offsite Impacts – Industrial Land Use Performance Outcome 5 applies.

4.2.5 Development Assessment

Part 2.1.1(3) (Development Assessment Framework) of the Development Scheme identifies that the following elements of the Development Scheme are to be considered and addressed in preparation of a Development Application:

a) The strategic vision for the Gladstone SDA (see section 4.2.5 below)
b) The overall objectives for the development in the Gladstone SDA (see section 4.2.6 below)
c) The preferred development intent for each development precinct (see section 4.2.7 below); and
d) SDA wide assessment criteria (see section 4.2.8 below).

4.2.6 Strategic Vision

The strategic vision for the Gladstone SDA is defined as follows:

(1) The vision for the Gladstone SDA is to:

(a) 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

(b) support development that aligns with the Queensland Government's strategic priorities for the region, particularly related to the hydrogen industry

(c) maintain environmental, cultural heritage and community values where possible to support wider ecological processes and provide community benefits.

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

The proposed Special Industry (50MW Hydrogen Test Train) satisfies the above SDA vision, with the development being located within the High Impact Industry Precinct and delivering a 50MW Hydrogen Test Train that is aligned with state interests and act as a catalyst for an emerging industry of national and international significance.

The development will be integrated into the intended outcomes for the Precinct and utilises a planned traffic network and logical extension of utility services. Further, the design of the development provides a quality-built form with active frontage where possible. The Proposed Buildings will integrate with existing development in surrounding lots and the natural features of the Subject Site.

Lastly, the Special Industry (50MW Hydrogen Test Train) will contribute to the short-term and long-term economic benefits in the region and does not compromise the ability to deliver critical infrastructure/natural elements including waterways, rail corridors and road networks.

4.2.7 Overall Objectives

Section 2.3 of the Development Scheme identifies overall objectives for the Gladstone SDA. The following assessment confirms that the proposed development complies with all overall objectives seeking to:

(a) capitalise on Gladstone SDA's strategic location and support the role and function of the Port of Gladstone

(b) identify and implement opportunities for synergies and co-location between other uses, services and infrastructure to minimise waste and inefficiencies

(c) use land and infrastructure efficiently and be adequately serviced by infrastructure

(d) ensure the integrity and functionality of the Gladstone SDA, including infrastructure corridors and future development opportunities, is maintained and protected from incompatible land uses

(e) ensure new lots are appropriately sized to accommodate preferred development

(f) be designed, constructed, and operated to a high quality consistent with best practice

(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

(h) not adversely impact on the outstanding universal values of the Great Barrier Reef World Heritage Area

(i) manage the risks associated with the projected impacts of climate change and natural hazards to protect people and property

(j) manage impacts of air quality on the capacity of the Gladstone airshed.

As outlined in sections 4.2.5 and 4.2.7 of this report the proposed development is highly consistent with the preferred development intent for the High Impact Industry Precinct and will advance the strategic vision for the Gladstone SDA. In particular:

- The proposal gives consideration to the future land uses and is appropriately located to ensure the most efficient use of available industrial land.
- The Gladstone SDA has long held its strategic designation as a regionally significant industrial precinct and subsequently infrastructure planning has taken account of the intended future development outcomes. Existing and planned infrastructure to services will be drawn on to service the subject Site, without resulting in adverse impacts to infrastructure or out-of-sequence development limitations.
- Private infrastructure to be delivered within the Site boundaries will be delivered by the Applicant in conjunction with Economic Development Queensland (EDQ) in accordance with the Memorandum of Understanding.
- The proposed Special Industry (50MW Hydrogen Test Train) is highly compatible with the outcomes sought for the Gladstone SDA under the Development Scheme.
- The proposed development will not generate any unreasonable air quality impacts with the system designed to capture or appropriately flair the release of any hydrogen.

4.2.8 Precinct Preferred Development Intent and Outcomes

As identified previously, the subject Site is located within the High Impact Industry Precinct.

1. The preferred development intent for the high Impact Industry Precinct is described below.
    a) This precinct is to accommodate industrial development that:
        I. Is difficult to locate and require separation from sensitive land uses
        II. Requires access to key transport and supply chain networks
    b) Waste management related industries are supported south of Aldoga Road
    c) Development which adversely impacts existing or future LNG operations on Curtis Island will not be supported
    d) Development on Curtis Island must recognise the environmental values of the adjacent Environmental Management Precinct
2. Defined uses that support the preferred development intent are:
    a) High impact industry
    b) Special industry
3. Defined uses that may be considered where the use does not compromise the preferred development intent include:
    a) Freight terminal
    b) Linear infrastructure facility
    c) Medium impact industry
    d) Research and technology industry
    e) Utility installation
    f) Warehouse (Where ancillary to a use listed in 2.4.2(2)
4. Access from Gladstone-Mount Larcom Road to this precinct will be limited to three intersections at the following locations:
    a) A proposed intersection approximately 3.8 kilometres from the Bruce Highway
    b) A proposed intersection approximately 8.4 kilometres from the Bruce Highway (road/rail overpass)
    c) The intersection at Aldoga Road

The proposed development satisfies the preferred development intent by contributing to the provision of a difficult to locate Special Industry that requires separation from sensitive land uses, in the Precinct. The environmental impacts generated by the proposed development (noise, dust, odour, waste etc) will not be as significant as some other potential High Impact Industrial land uses (making them difficult to locate). Access to the proposed development will be from the upgraded Euroa Circuit and via Aldoga Road as contemplated by the Precinct intent. Further, proposed development will not detract from cultural heritage values identified in the surrounding area.

4.2.9 SDA Wide Criteria

The SDA-wide development criteria apply to the proposed development, and include the following 14 themes:

- Infrastructure and Services
- Transport
- Environmental Nuisance
- Contaminated Land
- Natural Hazards
- Climate Change
- Acid Sulfate Soils
- Water Quality
- Risk Management - Activities
- Cultural heritage and community
- Environment
- Engineering standards
- Other government matters
- Energy and Water efficiency
- Visual Impact
- Reconfiguring a Lot

4.3 State Development Assessment Provisions

Under the Planning Regulation 2017 a Hazardous chemical facility is defined as:

> ***Hazardous Chemical Facility*** *means the use of premises for a facility at which a prescribed hazardous chemical is present or likely to be present in a quantity that exceeds 10% of the chemical's threshold quantity under the Work Health and Safety Regulation, schedule 15.*

Hydrogen production is estimated to be 6,500T annually with approximately 6T to be stored in stationary storage on site (5T in designated storage and 1t allowed for pipework and vessels), and a further 12T could be contained in tube trailers which could be on site filling or full and awaiting transport. 18T is therefore used as the perceived maximum amount of hydrogen that could be produced and retained onsite in one day., Due to this exceeding the 10% threshold quantity of 5T, the proposed development is classified as a Hazardous Chemical Facility and assessment against the relevant State Development Assessment Provisions, specifically State code 21: Hazardous chemical facilities, is required.

As the proposed development is an ERA, assessment against Environmental Protection Regulation and State Code 22: Environmentally relevant activities are also required. An assessment against these three State codes has been undertaken and can be viewed in **Appendix F**.

Due to the development taking place in an SDA, the assessment of these State Codes will be carried out by the relevant referral entities being Department of Transport and Main Roads, Office of Industrial Relations, and the Department of Environment and Science. These referral entities will be sent the application by the OCG, they will assess the applications, then issue advice to the OCG who will then in turn carry out their own assessment. It should be noted that these referral entities cannot impact the outcome of the assessment, they can only issue advice to the OCG.

4.4 Environmental Protection Act 1984

4.4.1 Environmental Authority for ERA 7 - Chemical manufacturing

Under schedule 2, part 2, item 7.6(b) of the Environmental Protection Regulation 2019, Chemical manufacturing of more than 1000t but not more than 10,000t is identified as a Concurrence ERA. However, as the Concurrence ERA is not a development application for a material change of use of premises under *the Planning Act 2016* and is instead a development application being lodged under Section 84 of the SDPWO Act, the ERA type is classed as a 'concurrence ERA that is not a material change of use'. This means that the Environmental Authority application will be lodged in accordance with section 125 of the EP Act and the assessment process to be followed is as outlined in Chapter 5 of the EP Act. Operational assessment is also required under Schedule 8, Part 3, Division 1 of the Environmental Protection Regulation 2019.

It is requested that the following common conditions for prescribed ERAs are not applied to the development approval as they are not considered relevant to the proposed activity as the activity does not have an impact on groundwater, air or noise:

- PCG013 (G8)
- PMG012 (G10)
- PMG013 (G11)
- PCA003 (A3)
- PCA004 (A4)
- PCN006 (N1)
- PCN007 (N2)
- PCA004 (A4)
- PCW015 (WT2)
- PCW016 (WT3)
- PML003 (L3).

Assessment has been undertaken and can be viewed in **Appendix G** and **Appendix H**.

4.4.2 Assessment Manager

The Department of Environment and Science, Queensland is the relevant Assessment Authority for prescribed ERAs regulated by the EP Act.

4.5 Work Health and Safety Regulation 2011 – Hazardous Chemical Facility

The Queensland Planning Regulation 2017 defines a hazardous chemical facility as the use of premises for a facility at which a prescribed hazardous chemical is present or likely to be present in a quantity that exceeds 10% of the chemical's threshold quantity under Schedule 15 of the Work Health and Safety Regulation 2011.The operator of a proposed facility at which Schedule 15 chemicals are likely to be present in a quantity that exceeds 10 per cent of their threshold quantity must notify the regulator of this circumstance. A proposed facility with quantities exceeding the threshold quantity are classified as a Hazardous Facility.

Hydrogen production is estimated to be 6,500T annually with approximately 6 tonnes stored in stationary vessels onsite daily, exceeding the 10% threshold quantity of 5T for hydrogen, therefore the proposed development will require notification to the MHF regulator. FFI has been in discussions with the OIR MHF team, and the current design is expected to be a **Hazardous Chemical Facility** and therefore must be assessed against State Code 21: Hazardous chemical facilities.

The purpose of State Code 21 is to ensure the development is designed and sited, so far as reasonably practicable, to ensure:

1. human health and safety, and the built environment are protected from off-site risks resulting from physical or chemical hazards;
2. hazardous chemical facilities are protected from:
    a. off-site hazard scenarios at existing hazardous chemical facilities;
    b. natural hazards.

Review of the proposed facility against the Performance Objectives in State Code 21 is provided in **Appendix G**. A hazard assessment report to demonstrate compliance to State Code 21 will be prepared as part of the detailed design process.

The overarching requirements of the WHS Regulation for PCBU to eliminate health and safety risks in the workplace, or if that is not reasonably practicable, minimise the risks so far as is reasonably practicable (SFAIRP).

The overarching requirements of the WHS Regulation is for PCBU to eliminate health and safety risks in the workplace, or if that is not reasonably practicable, minimise the risks so far as is reasonably practicable (SFAIRP). Supporting documentation will be provided to demonstrate FFI has identified and risk assessed hazards, reduced risks and will continue to be reduced to so far as reasonably practicable as part of subsequent licence to operate approvals process.

4.6 Operating Conditions during Hazardous Events

Due to the proposed facility being located in an area with the potential for weather events, the facility has the potential to be without power. Should a natural hazard occur on-Site such as a flood or bushfire, the facility will also shut down in order to safely secure the Site and its products. The site will have backup Uninterruptable Power Supplies (UPS) and an emergency generator should the local energy grid fail.

4.6.1 Consequence Assessment Modelling

Consequence modelling was carried out by specialist risk consultant, Gexcon to determine the potential offsite hazardous impact of the facility and assess against State Code 21 consequence criteria.

Gexcon provided preliminary consequence modelling and QRA for FFI based on original proposed facility layout in February 2023 to support FFI's Development Assessment application and demonstrate compliance to State Code 21 offsite requirements. Conservative preliminary results showed exceedance of offsite industrial consequence criteria for very low likelihood scenarios. Based on FFI discussion with Qld MHF regulator in March, key feedback provided by regulator was offsite consequence impact regardless of frequency is not desirable, particularly for greenfield projects.

The project design has undergone various design changes in response to MHF regulator feedback and subsequent sensitivity work by Gexcon. Based on revised plant layout and design conditions (bulk storage pressure is reduced to 120 bar and shifted north), the preliminary hazard assessment shows the relevant State Code 21 Performance Outcome PO5 dangerous dose to built environment (i.e. 12.6 kW/m2 heat radiation and 14 kPa overpressure) is satisfied and are limited to within the site boundary.

Gexcon consequence assessment modelling to support the DA application can be found in **Appendix N.**

5 Key Planning Matters

5.1 Environmental Assessment

For the purpose of this application, an assessment has been undertaken by SMEC to identify the existing environmental values and to determine constraints to the proposed development and the likely impacts. The assessments outlined in the following sections are based on a desktop assessment of available reports and data (refer **Appendix K**).

Due to the Proposed Development Site being in the Gladstone State Development Area, within areas that have been previously disturbed and not highly vegetated and have very few sensitive receptors the likely impacts of the proposed development are low.

Controls and management and mitigation measures are proposed to ensure that environmental impacts when not avoidable, can be kept within the accepted State and National environmental parameters.

Environmental matters considered include:

- Soils and contamination
- Water resources
- Bushfire hazard
- Flora and fauna
- Emissions, noise and vibration, and chemical storage
- Cultural heritage (indigenous and non-indigenous)
- Traffic and transport
- Waste management
- Construction impacts
- Other matters (refer **Appendix M** for full environmental assessment).

5.1.1 Soils and Contamination

5.1.1.1 Contaminated land

A contaminated land search undertaken on 2 July 2021 concluded that the Site is not included on the Environmental Management Register (EMR) or the Contaminated Land Register (CLR). Refer to **Appendix H**.

5.1.1.2 Acid Sulfate Soil

The GRCPS does not identify Acid Sulfate Soils on Site. The Australian Soil Resource Information System (ASRIS) shows the general vicinity to have Extremely Low and Low Probability of Acid Sulfate Soils (refer **Appendix K**.

5.1.1.3 Topography

The Steep Land Overlay plan from the GRCPS (refer Figure 21) indicates that four small areas of steep land are identified within the lot boundary, however the Application Area is not impact be these steep areas. Additionally, the GEM Facility Stage 1 earthworks have already reduced the slope and profile of the steep land.

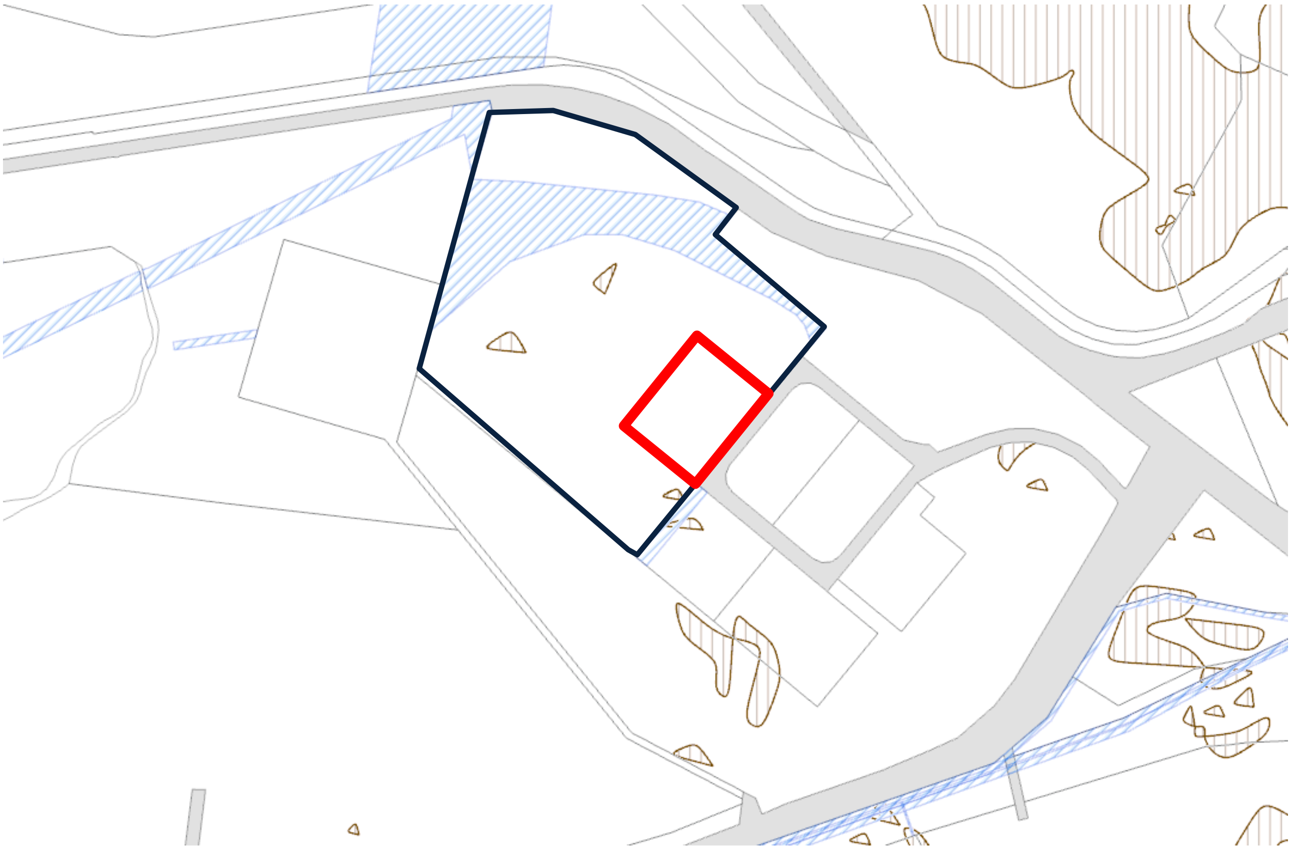


Figure 5–1 Steep land overlay Source: GRCPS

Subject Site

Application Boundary

Steep Land

Mitigation measures

- Erosion and sediment during construction can be managed with the appropriate control measures to ensure that downstream water quality is not impacted if construction requires removal and placement of soil and topsoil.
- The timing between grading and restoration should be limited to reduce the duration of soil exposure, while construction works should be minimised during high rainfall and flood events.
- Sediment control devices may be installed to minimise erosion and sediment loading to waterways.

It is respectfully requested that the above considerations are addressed in a Construction Management Plan to be required by condition of the development permit.

5.1.2 Water Resources

The Application Boundary is located alongside the boundary with Eurora Circuit. That part of the lot was previously cleared and subject to some earth movement. There is a gazetted drainage easement in favour of the State on the North and East of the area of works, forming man-made basins. Details of the performance of those basins are yet to be confirmed, however previous reports for the Site indicate they were constructed for the purpose of controlling sediment discharge from the Site. There are no other drainage features within the Site and the subject area of works is not affected by flooding.

The Site ultimately discharges into Larcom Creek to the north west. It is understood that a flood study for this creek was previously prepared by Aecom (2009), however details of the outcome of this study is subject to further investigation. Following review of the GRCPS, it has been determined that the Site is not located in a flood hazard area. Therefore, it is considered that a focused flood risk assessment and Flood Management Plan is not required.

5.1.3 Water Quality

The Queensland Globe Map indicates that there are three Lacustrine wetlands with habitat type artificial/ highly modified wetlands approximately 100m to the north/north-west of the boundary of the Application Boundary, this appears to be a mapping error as these are the previously constructed stormwater detention and treatment devices. Given this, a Detailed Surface Water Assessment is not required, however a Stormwater Management and Water Quality Plan (Concept Plan for construction and Site Specific Plan for operations) have been prepared. Refer wetland mapping at Figure 5–2 Wetlands area Source: Queensland Globe Map.

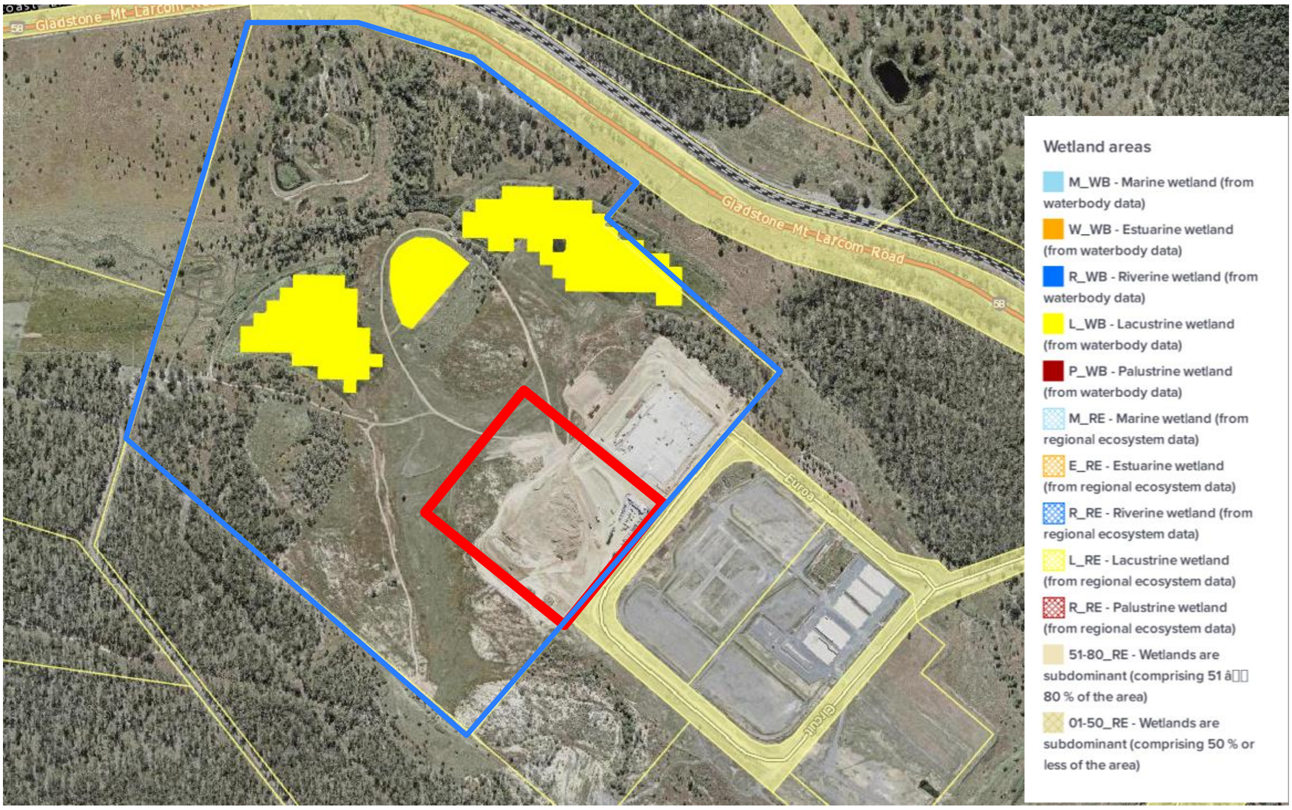


Figure 5–2 Wetlands area Source: Queensland Globe Map

Subject Site

Application Boundary

Mitigation measures

- Appropriate handling and storage of construction materials.
- Detailed planning and design of the construction phase water management and mitigation systems should be undertaken to adequately manage water quality related issues (for example, erosion and sediment control plan) arising throughout construction. Environmental control design should take into account seasonal weather conditions.
- Stage works to minimise erosion.
- Provide management procedures related to spill prevention are implemented to mitigate associated impacts to groundwater and surface water resources.

- Detailed planning and design of the operational phase water management devices and systems are required to adequately manage water quality related issues (for example, increased pollutant concentrations and loadings in stormwater).

5.1.4 Bushfire Hazard

The Proposed Development Site is not within a Bushfire Prone Area, as indicated in the GRCPS. Proposed building works will not occur on any areas classified as having medium, high and very high potential bushfire intensity. Refer excerpt from Bushfire Prone Areas map at Figure 5–3.

Mitigation measures

Currently there is no vegetation within the proposed development area. It is respectfully requested that the requirement for a Bushfire Management Plan be a condition of the development permit if indicated.

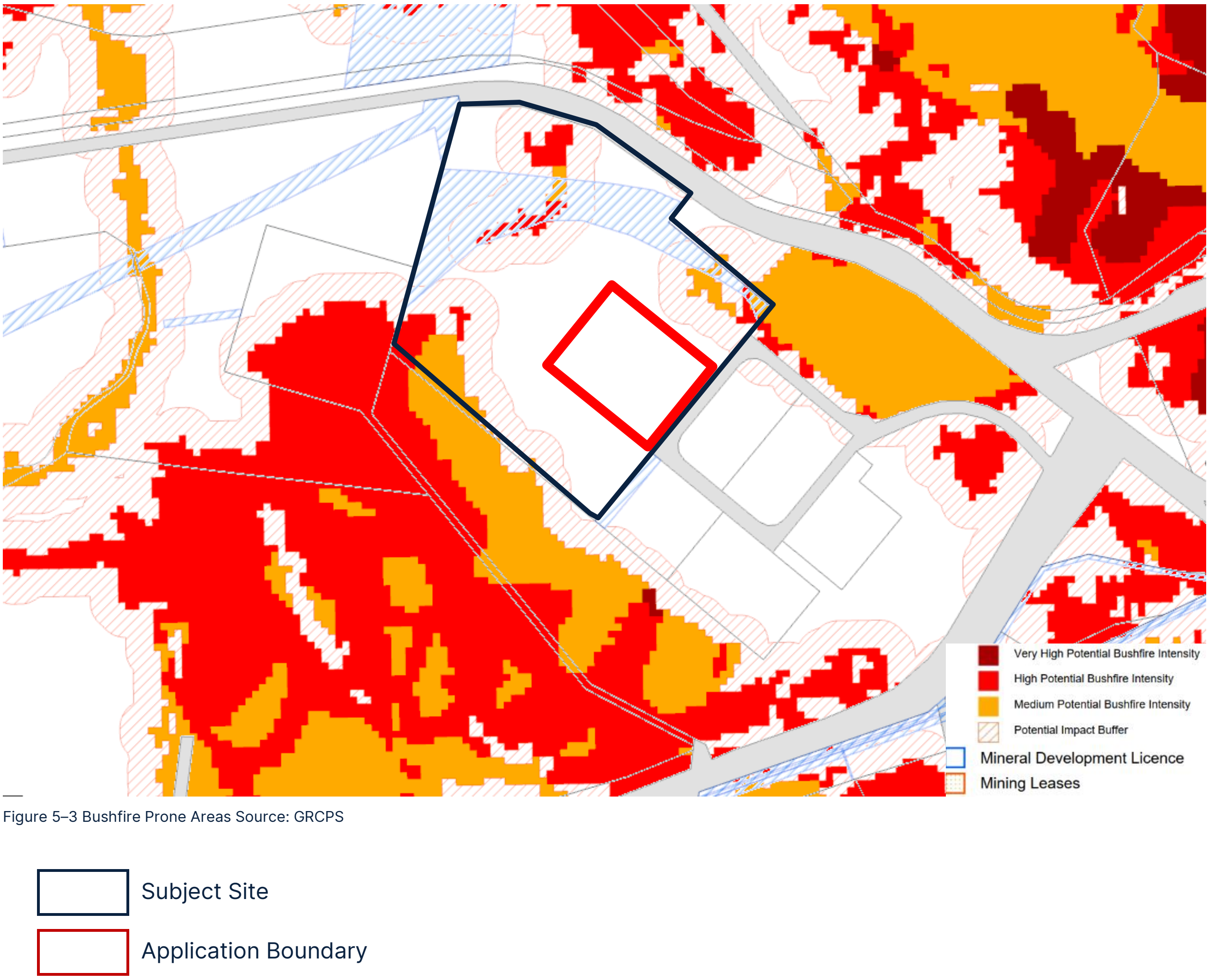


Figure 5–3 Bushfire Prone Areas Source: GRCPS

5.1.5 Flora and Fauna

The Site has previously been cleared and there is very little vegetation remaining on Site. The following flora and fauna impact assessment has been undertaken by SMEC (refer **Appendix K**), except where otherwise indicated. An environmental assessment has also been undertaken by SMEC and can be viewed in **Appendix K**.

Areas of National Environmental Significance

The Proposed Development Site is located within the Calliope River catchment, which discharges to the ocean at Port Curtis. Port Curtis is listed on the National Directory of Important Wetlands and is a partially enclosed embayment with shallow estuaries, including small, continental rocky islands, intertidal flats and estuarine islands. Stormwater from the plant is held in the sediment basins on the Site and then released to the detention basin on site (NW corner). This basin currently holds all the stormwater on the Western side of the development. This process ensures that only high-quality outlet water is sent into the environment from the site. The proposed development will seek to ensure that all stormwater runoff from the Sites is treated to a quality compliant with environmental regulations for this catchment.

5.1.5.1 Flora

Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act)

An EPBC Act Protected Matters Report was created on 3 January 2023, identifying four threatened ecological communities protected under the EPBC Act that may be present within a 2 km radius of the proposed development Site. These communities are the Endangered Ecological Community (EEC) Coastal Swamp Oak Forest of New South Wales and South East Queensland; Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions; Poplar Box Grassy Woodland on Alluvial Plains and Weeping Myall Woodlands. Previous field investigations Including field investigations undertaken by Aecom for the 2011 report did not locate any threatened species under the EPBC Act and/or Nature Conservation Act 1992 (NC Act) on the Site at the time of the assessment and the area has now been significantly disturbed and the little vegetation present has lawfully been removed.

Matters of State Environmental Significance

With regard to biodiversity, the following Matters of State Environmental Significance (MSES) are in the vicinity of the proposed development area but are not directly within it (refer MSES Mapping and GRCPS Biodiversity Overlay at Figure 5–5.

- MSES – Regulated vegetation (category B, C, and R, essential habitat)
- MSES – Wildlife habitat
- MSES – Regulated vegetation (intersecting a watercourse)

No matter of state significance will be impacted by the development proposed by the application.

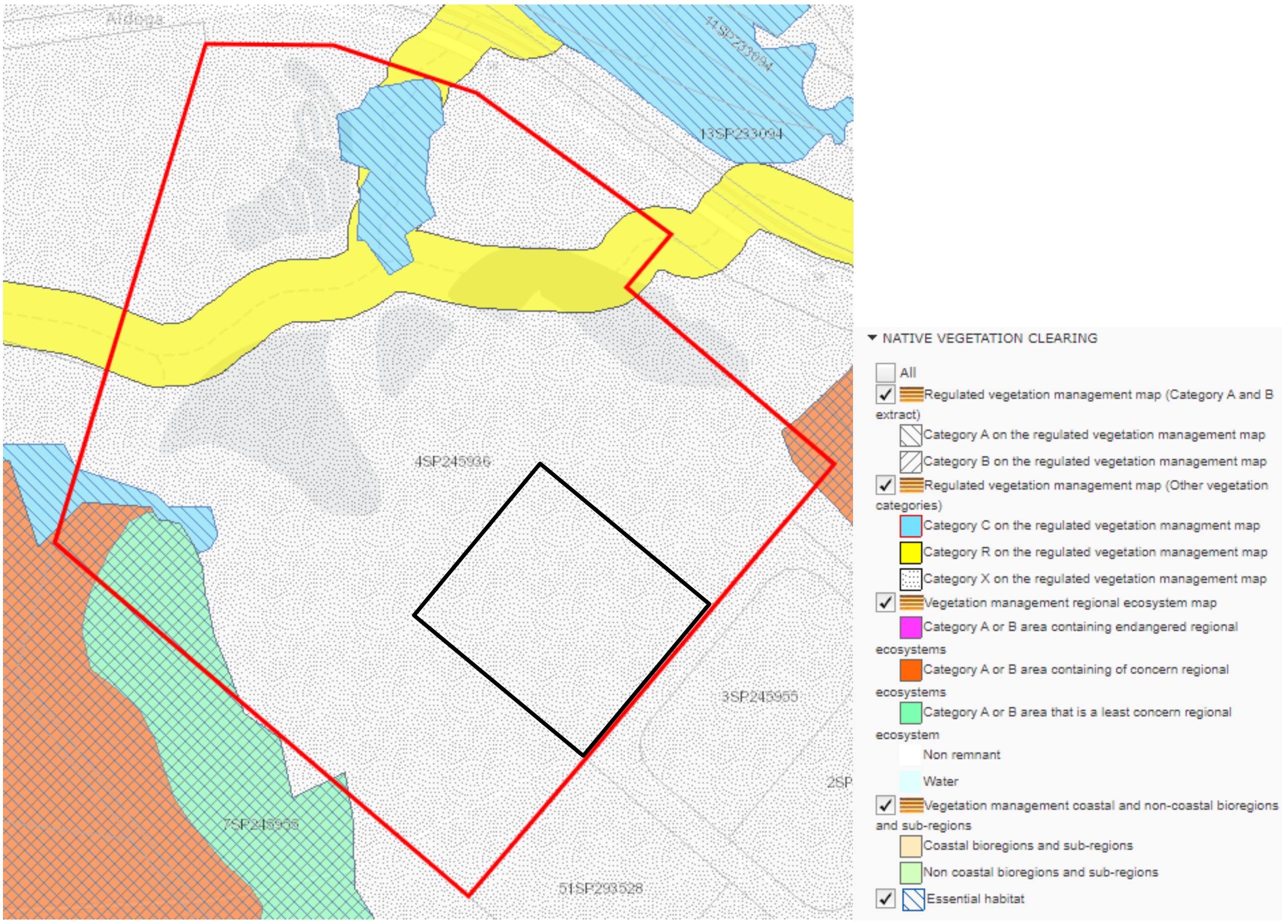


Figure 5–4 MSES Mapping Source: Queensland Globe

Subject Site

Application Boundary

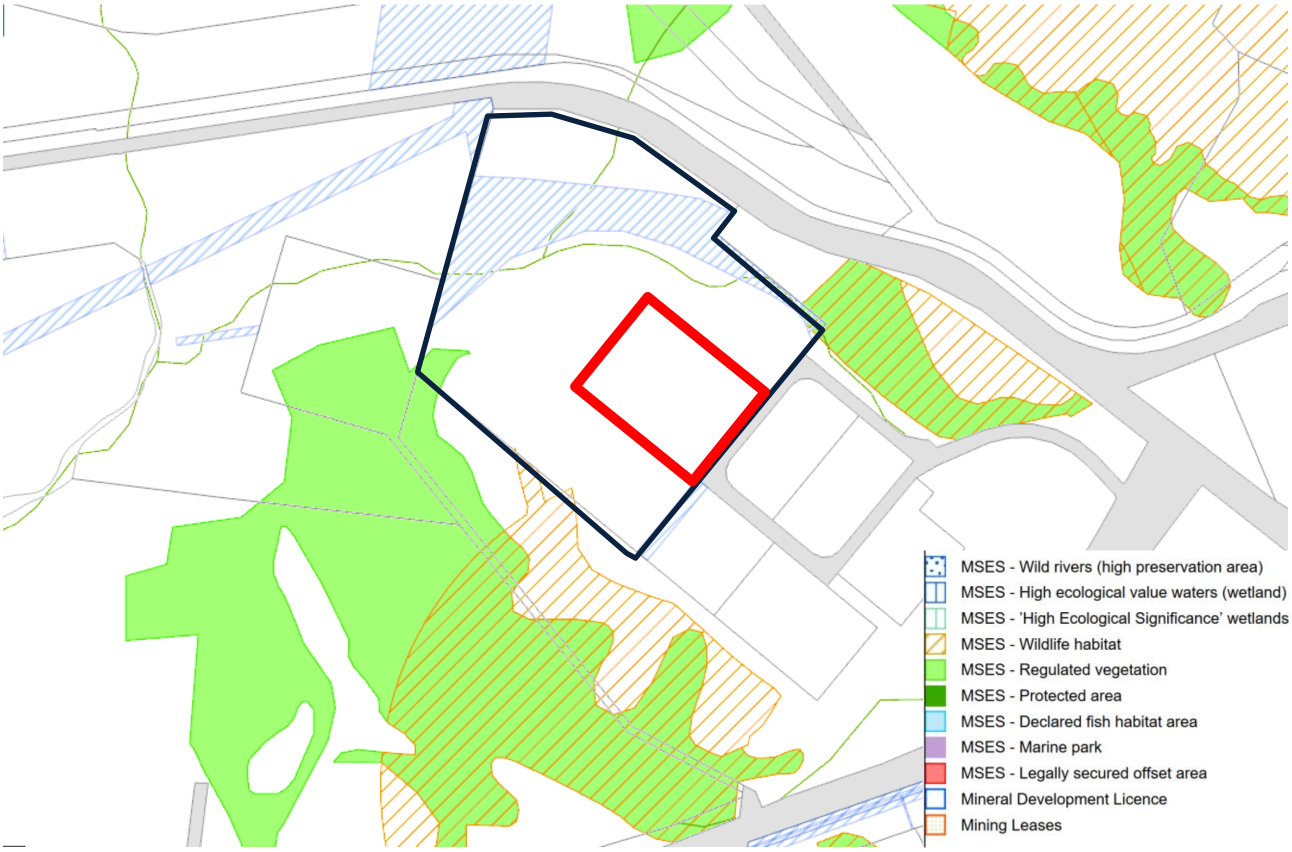


Figure 5–5 Biodiversity overlay Source: GRCPS

Subject Site

Application Boundary

5.1.5.2 Fauna

Aquatic habitats

There are no recognised wetlands on the Proposed Development Site.

Terrestrial fauna species

Whilst preparing the *Aldoga Precinct Stage 1 Environmental Assessment Report*, dated 21 February 2011, Aecom undertook field surveys. A total of 66 species were recorded during field surveys of the broader precinct including 13 amphibians, 44 birds, eight mammals and one reptile. Two of these species, Squatter Pigeon (*Geophaps scripta scripta*) and Radjah Shelduck (*Tadorna radjah*), are listed as threatened under the EPBC and or the NC Act. Seven bird species listed as migratory under the EPBC Act were also recorded within the broader precinct.

Four other bat species could potentially inhabit the broader area but their calls could not be positively identified. This includes Little Pied Bat (*Chalinolobus picatus*) which is listed as Near Threatened under the NC Act.

The Protected Matters Search Tool (PMST) report returned ten EPBC-listed threatened flora species as having the potential to occur within 2 km of the Site. While the Site contains areas of remnant vegetation that may provide suitable habitat for conservation significant flora species, it is unlikely for any to occur within the Proposed Development Area as vegetation is absent and has been cleared under pre-existing approvals.

Significant species

Nine species of fauna listed as threatened under the EPBC and /or NC Act were identified in searches of Commonwealth and State databases for an area within 2km of the broader precinct. Of these, eight species (one

Endangered and seven Vulnerable) are listed under the EPBC Act and eight (one endangered, four Vulnerable and three Near Threatened) are listed under the NC Act.

Mitigation measures

- Develop and implement best-practice Site management measures within an Environmental Management Plan (EMP) Framework.
- Develop and implement a detailed Soil, Water and Waste Management Strategy.
- Undertake weed management during and after construction.
- Avoid the removal of large hollow-bearing trees (if any exist on Site).

It is respectfully requested that the requirement for an EMP and Construction Management Plan forms a condition of the permit which will incorporate the above mitigation measures.

5.1.6 Air Emissions, Noise and Vibration, and Chemical Storage

5.1.6.1 Air Emissions

There will be no discharge to air of contaminants that may cause an adverse effect on any of the environmental values that are to be enhanced or protected under the *Environmental Protection (Air) Policy 2019* from the operation of the activity and the Environmental objectives under the *Environmental Protection Regulation 2019* for air can be met, therefore no assessment has been undertaken. Construction impacts are addressed at section 5.1.10 below.

5.1.6.2 Noise and Vibration

The proposed industrial activity is located in the High Impact Industrial Precinct of the SDA. The Precinct is strategically located away from sensitive receptors (refer **Appendix K**). With the exception of vehicle access, operational activities will be carried out entirely within the proposed building which will reduce noise emissions externally from the Site.

A noise and vibration assessment for operations at the Site has not been undertaken. Operational activities will be undertaken in two, twelve-hour shifts resulting in 24/7 continuous operation. Day shift will start at 6:00am, and night shift will start at 6:00pm each day. It is estimated that 20 personnel will be on Site at peak during day shift activities.

A detailed Construction Management Plan will be prepared to address potential construction impacts including noise, dust, sediment runoff, traffic, waste.

Mitigation measures

- Noise emissions will comply with the *Environmental Protection (Noise) Policy 2019* (legislation.qld.gov.au).
- Residents in close proximity to the Site shall be kept informed regarding construction activities and timing of noisy activities which will generally be scheduled between 7am and 6pm where practical.
- Landowners are to be advised of any planned activities that will cause loud and extensive periods of noise. Attenuation measures should be used where possible.
- Noise mitigation measures employed during construction shall be in accordance with AS2436, Guide to noise and vibration control on construction, demolition and maintenance Sites.
- A construction noise and vibration management plan is to be prepared for development on the Site. The plan should include recommendations on plant and equipment, staging, construction noise limits, vibration and liaison with local residents and sensitive receptors.

5.1.7 Cultural Heritage (indigenous and non-indigenous)

A Cultural Heritage Management Plan (CHMP) between the Port Curtis Coral Coast (PCCC) Registered Native Title Claimants and the Minister for Economic Development Queensland that covers the area of the proposed development has been prepared by Dillon Bowers Lawyers (refer **Appendix K**). The CHMP establishes the procedures to be carried out where activities are proposed that will disturb the surface of the land. The proposed development is being developed on an area that has already been surveyed and monitored for the bulk earthworks by the PCCC. During construction, the requirements under the CHMP are to be complied with.

5.1.8 Traffic and Transport

A Traffic Desk Top Assessment of traffic and transport impacts has been carried out by SMEC (refer **Appendix J**).

SMEC understand that construction on the Proposed Development Site is planned to commence in September 2023 with operation due to commence in January 2025. A design horizon to the year 2033 has been adopted for transport planning purposes.

The following operational requirements have been considered for the development:

- 26 parking spaces (including 1 disabled bays), including for visitors
- Two, twelve-hour shifts with three work crews allowing rotation from days to nights, 24/7 continuous operation
- Estimated 20 personnel at peak to be on Site during day shifts
- An average 16 trucks per day to distribute the hydrogen (24/7 load out).

Although the Guide to Traffic Generating Developments, RTA suggests 1.3 parking spaces per 100m^2 GFA for factories (equating to 208 parking spaces for the development), less carparking spaces are proposed by the development due to the highly automated nature of the manufacturing facility. It is assumed that 20 employees will be working at the Site in its operational state, with visitors likely to be kept to a minimum. It is therefore considered reasonable that 26 parking bays are assigned for this development.

Construction parking will be provided on a temporary formed parking area identified during the construction phase of the project and will be provided as part of the suite of management plans and documents associated with construction phase approvals for the project.

5.1.8.1 Operation Stage Traffic

In the 2022 Traffic Impact Assessment, the morning and evening peak hours at the Gladstone Mount Larcom Road / Aldoga Rd intersection were identified as 08:15-09:15 and 15:15-16:15 respectively. It is assumed that the morning and evening peak hour remains the same, this is because all workers would have arrived before 8:00am to commence work for the morning shift, as well as after 16:15 to commence work for the 18:00 evening shift. The proposed development will require 16 trucks per day to distribute the hydrogen (24/7 load out).

SMEC has conducted an assessment for the resulting vehicle trip generation at peak hours for the proposed development, which is presented in the tables 4 to 7 in **Appendix J**.

5.1.8.2 Construction Stage Traffic

As previously stated, construction on the Proposed Development Site is planned to commence in September 2023 with operation due to commence in January 2025. The construction phase traffic for this development is estimated based on the development area and examples of similar industrial developments.

The key traffic generation at construction stage will be from the movement of materials, plant / equipment and the transport of construction personnel to the Site. With regards to this Site it is envisaged that the majority of the construction personnel would be located within the vicinity of the Site (most likely the City of Gladstone located some 18km east of the Site) and will commute via both light vehicle and by buses provided.

The construction traffic generated for the proposed development, will be in the order of 30 two-way trips are assumed at the peak period, which is less than the traffic generated at the operation stage, therefore the construction phase traffic is has not been considered as part of this assessment.

5.1.8.3 Transport Assessment

Broadly, this assessment concludes that the proposed development will have a negligible impact on the existing road network.

A key consideration for the proposal is the impact of additional traffic on the intersection of Gladstone-Mt Larcom Road / Aldoga Road. SIDRA analysis of this intersection has been carried out for the following scenarios: 2023 Base, 2023 with Development, 2033 Base and 2033 with Development. The assessment concludes that:

- Gladstone-Mount Larcom Road / Aldoga Road intersection operates well within capacity in both AM and PM peak hour with minor queues and delays for all scenarios.
- Degree of Saturation (DoS), queues and average delays are increasing for this intersection, which is mainly caused by the natural traffic growth at the location.
- The proposed development will not have major impacts on traffic performance.
- The 2033 model shows that the intersection is adequate to support the 2033 traffic volume and no upgrade will be required for this intersection.

5.1.9 Waste Management

Waste will be created during construction and operation. There will be relatively small amounts of waste produced during the construction of the facility, produced from typical excavation and construction activities.

A Waste Management Plan will be prepared prior to construction which will identify types of wastes/by-products that may be produced during construction, excavated soils, scrap metal, offcuts of electrical cabling and conduit, some domestic wastes from construction/Site offices, sewage and typical construction and demolition wastes and general wastes. There are waste and recycling facilities within the GSDA and Gladstone area (refer **Appendix M**.

When the facility is operational, the majority of waste produced from the Site will originate from the office component of the development. This waste will be stored in a storage facility on Site and will be collected by a private collection service weekly. Sewage from toilets and kitchen will be generated on a maximum rate of 1.5 m^3/d and will be sent to Gladstone Electrolyser Manufacturing facility located at lot 1. The existing treatment plant has the capacity to assimilate this flow. The treated wastewater is reused for irrigation.

Process-impacted water consists primarily of the reject water from the water treatment, a reverse osmosis (RO) system. The reject contains the solids and salts removed from the water supply (potable water). The key parameters are presented in the table below. The wastewater flow averages 4.5 m3/h and the plant will operate approximately 20 hours per day. The total of 90 m3/d will be discharged to the existing evaporation pond. Other wastewater streams consist of condensates from the hydrogen production line, the flow is insignificant, and no contaminants are present. Note that the concentration of all parameters listed in the wastewater stream are within Australian drinking water guidelines, except hardness (aesthetic limit of 200 mg/L) and the anti-scalant added for the treatment.

Process-impacted water from FFI Aldoga will stored on site and not released to the environment. The wastewater will then be transported to a facility that will be licenced to handle this waste.

If for any reason the RO system experience issues, such as membranes clogging, the total flow of the wastewater will increase. At the same time it will become diluted, therefore, the concentration of the listed parameters will decrease during upset conditions.

Table 5–1 Process-impacted water from FFI Aldoga

Parameter	Units	Average
Total flow	m^3/d	90
Aluminium total	mg/L	0.177
Alkalinity (total)	mg/L	264
Calcium	mg/L	66
Chloride	mg/L	132
Conductivity	µS/cm	1135
DOC	mg/L	12.36
Hardness total	mg/L	322
Magnesium	mg/L	38
Manganese total	mg/L	0.005
Potassium	mg/L	11
pH	-	7.0
Sodium	mg/L	124
Suspended solids	mg/L	15
Sulphate	mg/L	115
Anti-scalant	L/h	0.5

Every 4 to 6 months the reverse osmosis membranes will require chemical cleaning. Approximately 100 litres of chemicals, including citric acid and sodium hydroxide solutions will be consumed per cleaning. Since these chemicals generally break down quickly and do not pose environmental risks, they will be neutralised (pH adjustment) and will be transported to a facility that will be licenced to handle this waste.

Mitigation measures

- Waste management is to be based on a hierarchy beginning with waste avoidance, minimisation and recycling before disposal. The majority of waste should be considered for re-use on Site or recycled off Site. Regulated waste, if produced, may be disposed of at licensed facilities, or treated in-situ on Site.
- Care needs to be taken when handling, transporting, and temporarily storing any potential regulated waste produced from the project.
- Disposal and pre-treatment prior to disposal of regulated waste shall comply with all relevant regulations.
- Poor operation of the construction Site and inefficient material management are likely to produce waste in this phase.
- A Waste Management Plan is to be developed prior to construction.

It is respectfully requested that the requirement for a Site Waste Management Plan forms a condition of the permit.

5.1.10 Construction Impacts

A detailed Construction Management Plan will be prepared prior to construction to address potential construction impacts including noise, dust, sediment runoff, traffic and waste.

Mitigation Measures

Construction impacts will be addressed through the preparation of a Construction Management Plan to address the management of potential environmental impacts, with sub-plans including:

- Noise and Vibration Management Plan
- Quality Management Plan
- Erosion and Sediment Control Plan
- Traffic Management Plan

- Stormwater Management Plan
- Weed Management Plan
- Waste Water Management Plan
- Waste Management Plan

An Operations Management Plan is required to address ongoing operational environmental impacts including noise, traffic and waste management.

It is respectfully requested that the requirement for a Construction Management Plan and Operations Management Plan forms a condition of the permit.

5.1.11 Other Matters

The regional infrastructure overlay map (refer) from the GRCPS identifies the following:

- PQ substation to the north of the Site
- Powerlink within the Site
- Ergon 66kv outside the Site's north-east corner

The proposed works will not affect mapped regional infrastructure.

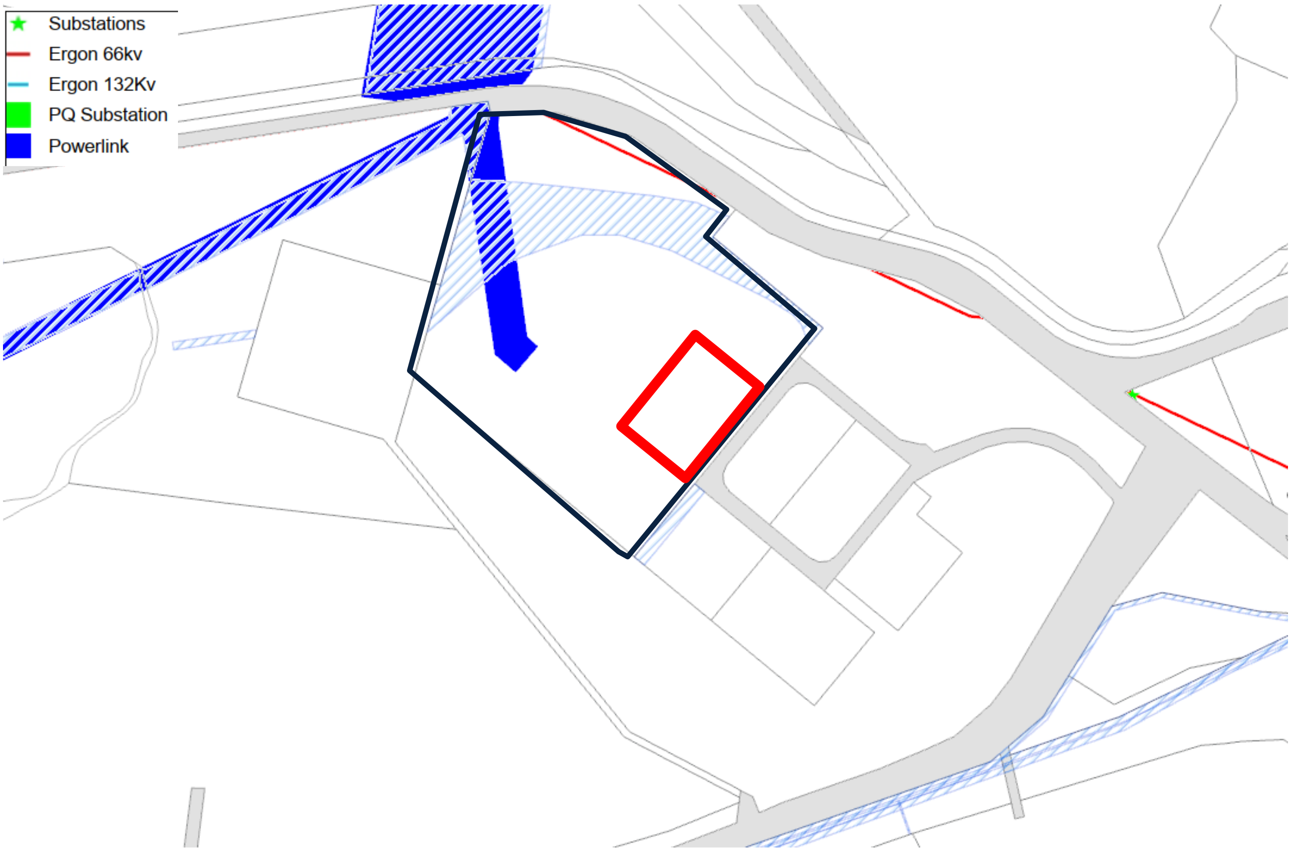


Figure 5–6 Regional infrastructure overlay Source: GRCPS

Subject Site

Application Boundary

5.1.12 Rehabilitation

Once the ERA has ceased, areas disturbed as part of the proposed development will be rehabilitated or restored to a condition that is safe to humans and wildlife, non-polluting, stable and able to sustain an appropriate land use.

5.2 Social Impacts

Up to 20 employees at peak during day shift activities may be on Site. During construction there will be employment benefits for the Gladstone area as around 80 people will be on-Site at the peak of construction. There will be short-term and long-term economic benefits for local businesses due to increased construction and operational employee activity in the area.

6 Conclusion and Recommendations

The findings of this planning report demonstrate that the proposed Development Application for Special Industry (50MW Hydrogen Test Train) Lot 4 of Plan Number SP245936, within the Gladstone SDA, is warranted subject to reasonable and relevant conditions on the following basis:

- The proposed Special Industry (50MW Hydrogen Test Train) satisfies the SDA vision, with the development being located within the High Impact Industry Precinct and delivering a 50MW Hydrogen Test Train that is aligned with State Interests and will act as a catalyst for an emerging industry of national and international significance.
- The development will be integrated into the intended outcomes for the Precinct and utilises a planned traffic network and logical extension of utility services. Furthermore, it will not compromise the ability to deliver critical infrastructure including rail corridors and road networks.
- The proposed development seeks to utilise pre-disturbed areas minimising impacts;
- The Gladstone SDA has long held its strategic designation as a regionally significant industrial precinct and subsequently infrastructure planning has taken account of the intended future development outcomes. Existing and planned infrastructure to services will be drawn on to service the subject Site, without resulting in adverse impacts to infrastructure or out-of-sequence development limitations. The potential impacts on the environmental values and expected impacts of the proposed development are minor and/or able to be minimised through proposed management and mitigation measures.
- The development is consistent with the vision statement for the SDA and satisfies all development criteria (SDA and Precinct), or provides an acceptable alternative outcome that will result in a positive contribution to the High Impact Industry Precinct;
- The proposal gives consideration to the future land uses and is appropriately located to ensure the most efficient use of available industrial land.
- In alignment with the outcomes listed in *SDAP Code 21: Hazardous Chemical Facilities*, the Proposed Development site is located in a compatible land use and can be safely operated within the Gladstone SDA

On the basis of the assessment contained within this report, it is requested that the OCG and DES favourably consider the development proposal subject to reasonable and relevant conditions.

Appendix A **Title Search**

Current Title Search

Queensland Titles Registry Pty Ltd
ABN 23 648 568 101

Title Reference:	**50861392**	**Search Date:**	28/07/2021 12:01
Date Title Created:	21/10/2011	**Request No:**	38016819
Previous Title:	50501837		

ESTATE AND LAND

Estate in Fee Simple

LOT 4 SURVEY PLAN 245936
Local Government: GLADSTONE

REGISTERED OWNER

Dealing No: 714121390 20/10/2011

MINISTER FOR ECONOMIC DEVELOPMENT QUEENSLAND

EASEMENTS, ENCUMBRANCES AND INTERESTS

1. Rights and interests reserved to the Crown by
   Deed of Grant No. 30176205 (POR 4)
   Deed of Grant No. 30181145 (POR 26)
   Deed of Grant No. 40012840 (Lot 1 on RP 619803)
2. EASEMENT No 714121392 20/10/2011 at 12:22
   burdening the land to
   LOT 6 ON SP245936 OVER EASEMENT A

ADMINISTRATIVE ADVICES

NIL

UNREGISTERED DEALINGS

NIL

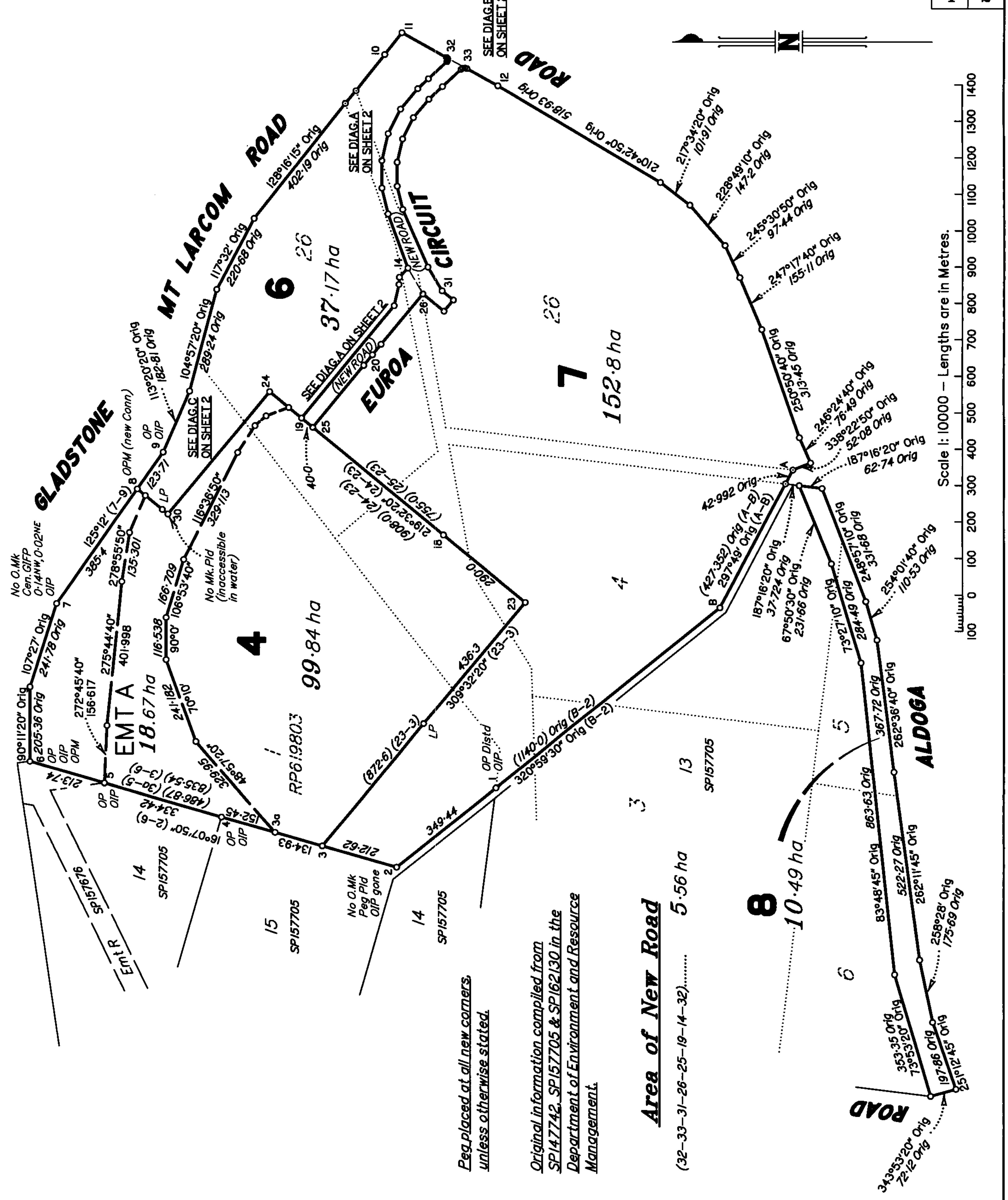
Corrections have occurred - Refer to Historical Search

Caution - Charges do not necessarily appear in order of priority

** End of Current Title Search **

Land Title Act 1994 ; Land Act 1994
Form 21 Version 2

SURVEY PLAN



0 50 mm 100 mm 150 mm

I, David William FREDRIKSEN hereby certify that the land comprised in this plan was surveyed by Rientz Russell Inglis (Surveying Graduate), for whose work I accept responsibility and that the plan is accurate, that the said survey was performed in accordance with the Survey and Mapping Infrastructure Act 2003 and Surveyors Act 2003 and associated Regulations and Standards and that the said survey was completed on 1/07/2011.

D.W. Fredriksen .... Cadastral Surveyor

Date 7/7/2011

Plan of Lots 4 and Lots 6–8 and Easement A in Lot 4

Cancelling Lot 12 on SP162130 and Lot 9 on SP147742.

PARISH: ***MT LARCOM*** COUNTY: *Clinton*

Meridian: *MGA Zone 56 vide SP157676*

F/N's: *No*

Scale: *1:10000*

Format: STANDARD

SP245936

Plan Status:

714121390

$609.10
20/10/2011 12:21

BE 400 NT

WARNING : Folded or Mutilated Plans will not be accepted.
Plans may be rolled.
Information may not be placed in the outer margins.

Registered

5. Lodged by
PROPERTY SERVICES GROUP
PO BOX 15517, CITY EAST, QLD, 4002
PH: 3224 2141
LODGER CODE : 2068
(Include address, phone number, reference, and Lodger Code)

1. Certificate of Registered Owners or Lessees.

I/We THE MINISTER FOR INDUSTRIAL DEVELOPMENT OF QUEENSLAND

(Names in full)

* as Registered ~~Owners~~ of this land agree to this plan and dedicate the Public Use Land as shown hereon in accordance with Section 50 of the Land Title Act 1994.

* as Lessees of this land agree to this plan.

The Official Seal of THE MINISTER FOR INDUSTRIAL DEVELOPMENT OF QUEENSLAND

Signature of *Registered Owners *Lessees

JOHN WHITE
ACTING EXECUTIVE DIRECTOR, PROPERTY SERVICES GROUP AS DELEGATE OF THE MINISTER FOR INDUSTRIAL DEVELOPMENT OF QUEENSLAND

* Rule out whichever is inapplicable

6.

Existing		Created					
Title Reference	Description	New Lots	Road	Emts	Cov.	Profit a prendre
50501837	Lot 12 on SP162130	4, 6, 7	New Rd	A	—	—
50383837	Lot 9 on SP147742	6, 7, 8	New Rd	—	—	—

EXISTING ADMINISTRATIVE ADVICE ALLOCATIONS

Administrative Advice	Lots to be Encumbered
710683234	4, 6, 7

Lots	Orig
4	Por4, Por26, Lot 1 on RP619803.
6	Por26, Lot 1 on RP619803.
7	Por3, Por4, Por26, Lot 1 on RP619803.
8	Por4, Por5, Por6.

2. Local Government Approval.

* THE MINISTER FOR INDUSTRIAL DEVELOPMENT OF QUEENSLAND
hereby approves this plan ~~in accordance with the~~ :
% SUBJECT TO SCHEDULE 4, TABLE 3, ITEM 2(f) OF THE SUSTAINABLE PLANNING REGULATION 2009

Dated this .... day of ....

.... #

.... #

* Insert the name of the Local Government. % Insert Integrated Planning Act 1997 or Local Government (Planning & Environment) Act 1990
# Insert designation of signatory or delegation

7. Portion Allocation :

8. Map Reference :
9150-34234

9. Locality :
ALDOGA

10. Local Government :
GLADSTONE REGIONAL COUNCIL

11. Passed & Endorsed : 16/8/11 D.W.F

By : D. W. Fredriksen
Date : ~~7/7/2011~~
Signed : D.W. Fredriksen
Designation : CADASTRAL SURVEYOR

12. Building Format Plans only.
I certify that :
* As far as it is practical to determine, no part of the building shown on this plan encroaches onto adjoining lots or road;
* Part of the building shown on this plan encroaches onto adjoining * lots and road

Cadastral Surveyor/Director* Date
*delete words not required

13. Lodgment Fees :

Survey Deposit	$..............
Lodgment	$..............
.......New Titles	$..............
Photocopy	$..............
Postage	$..............
TOTAL	$..............

3. Plans with Community Management Statement :
CMS Number :
Name :

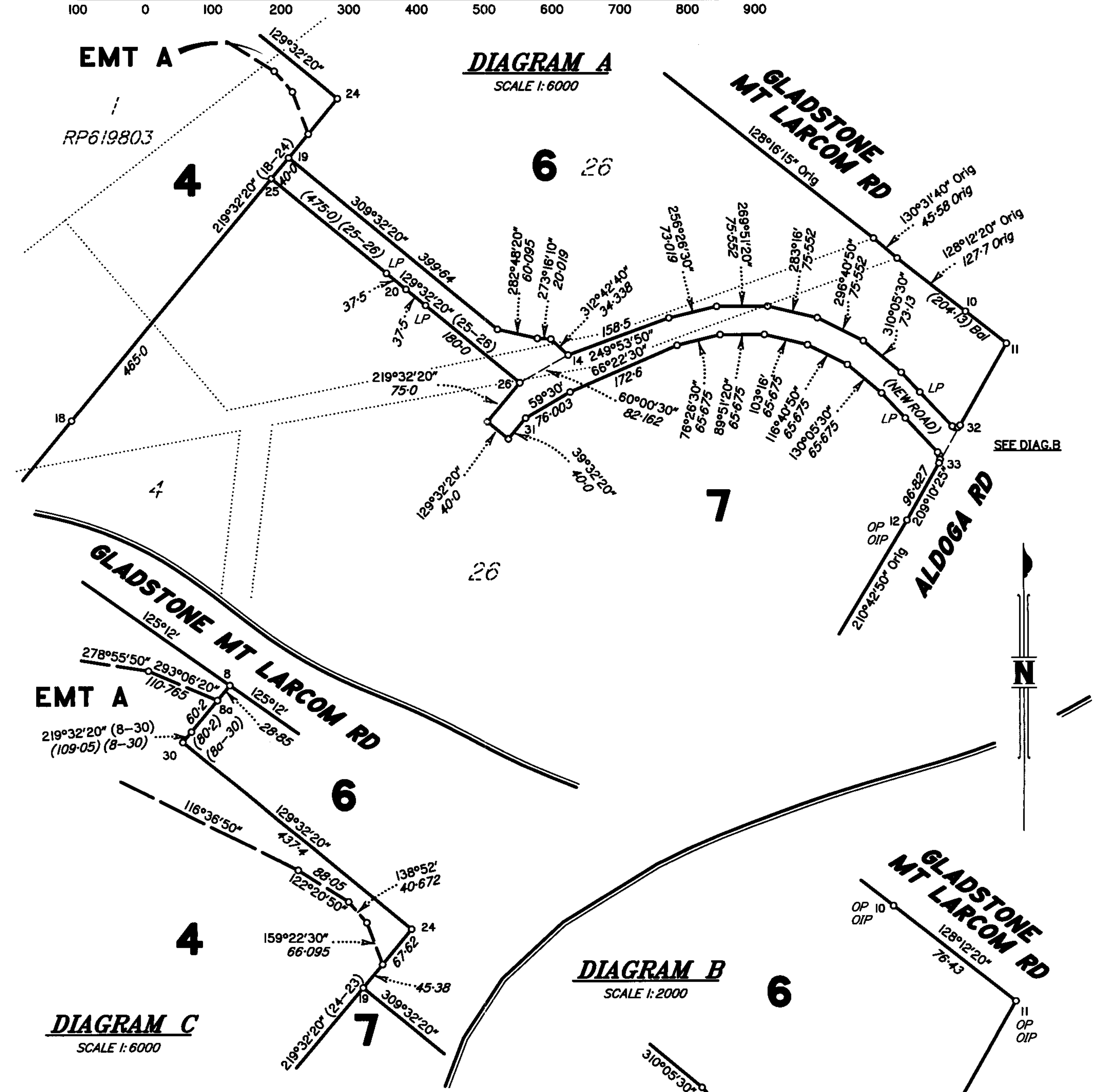
4. References :
Dept File :
Local Govt :
Surveyor : 4068

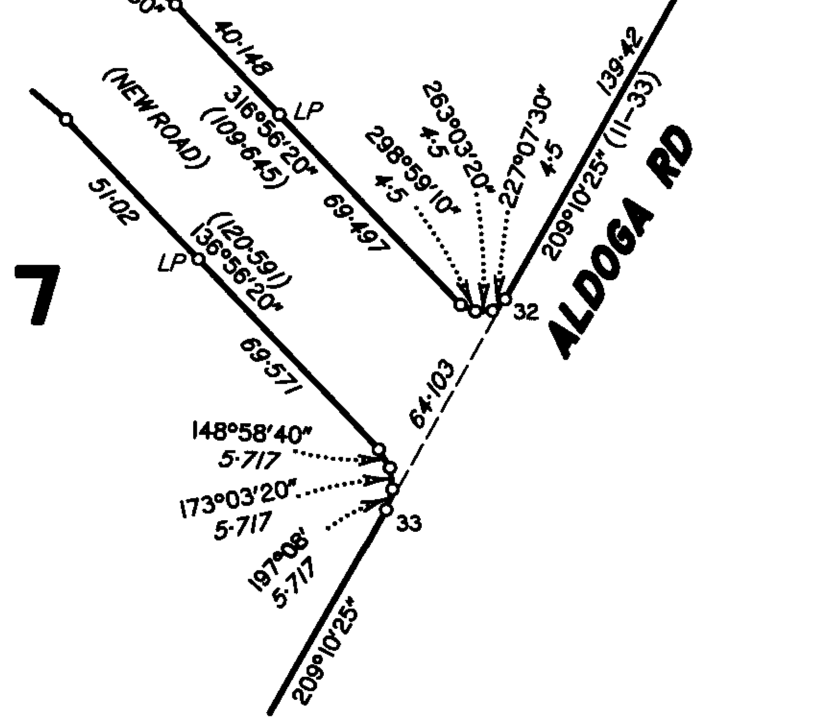
14. Insert Plan Number SP245936

Land Title Act 1994; Land Act 1994
Form 21A Version 1

ADDITIONAL SHEET

Scale 1: 6000 — Lengths are in Metres.





REFERENCE MARKS

STN	TO	ORIGIN	BEARING	DIST
1	OIP	SP147867	223°18'	0·82
2	OIP gone	SP147867	138°26'	0·94
2	Pin		139°51'	0.93
4	OIP	SP157705	105°40'	0·99
5	OIP	SP157676	137°42'	1·225
6	OIP	SP147867	206°06'	0·91
7	OIP	SP147867	207°17'	0·81
9	OIP	SP147867	239°59'	0·9
10	OIP	SP147742	210°40'	1·215
11	OIP	SP147742	89°08'	1·05
12	OIP	SP147742	75°30'	1·05
14	St.Pkt		225°02'	31·619
18	Pin		286°13'	49·237
19	Pin		86°19'	6·31
20	Pin		11°01'	55·116
24	Pin		137°43'	1.54

PERMANENT MARKS

PM	ORIGIN	BEARING	DIST	NO	TYPE
6–OPM	SP157705	353°11'05"	33·163	95195	Standard
8–OPM (New Conn)	SP157676	340°25'	78·912	129062	Star Picket

Scale 1: 2000 — Lengths are in Metres.

20 0 20 40 60 80 100 120 140 160 180 200 220 240 260 280

Insert Plan Number SP245936

0 50 mm 100 mm 150 mm

Appendix B Land Owners' Consent

Queensland
Government

Department of
State Development, Infrastructure,
Local Government and Planning

Our ref: F21/3823-3

Your ref:

Date: 8th March 2023

Mr. Matthew Jordan
SMEC
State Sector Leader – Urban Communities Qld and NT
Level 6, 480 St Pauls Tce
Fortitude Valley, QLD, 4006
Via Email: Matthew.jordan@smec.com

Dear Matthew,

RE: Owners Consent for land Lot 4 on SP245936 owned by the Minister for Economic Development Queensland.

I, John White, Executive Director for Economic Development Queensland as delegate of the Minister for Economic Development Queensland, hereby consent to the lodgment of applications to the relevant administering authorities by the following entity Fortescue Future Industries (FFI) or its agents required for the application for the Material Change of Use Permit and Operational Works application to council related to development of the GEM stage 2 Material Change of use special industry – 40 MW hydrogen test Train (the project) identified in the Coordinator-General's pre-lodgment meeting. The project to be developed on land within the Gladstone State Development Area being Lot 4 on SP245936.

This consent allows FFI or its agents when developing the Stormwater Management Plan for this application that storm water can be discharged into easement A SP 245936.

This owner's consent is provided on the basis that:

- This consent is not an agreement by, or confirmation from, the Minister for Economic Development Queensland that FFI or its agent will be given rights to occupy or use any part of the land for the Project.
- FFI or its agents remains obligated to obtain all necessary and subsequent environmental and Development Approvals from the relevant authority prior to commencement of construction or works relating to the project.
- Will not prejudice Economic Development Queensland from undertaking day to day operations or further detailed reviews of the proposed Project and its impacts on land controlled by the Minister of Economic Development Queensland.

Economic Development Queensland
PO Box 2202
Queensland 4002 Australia
Telephone + 61 3452 7469
Website www.statedevelopment.qld.gov.au
ABN 76 590 288 697

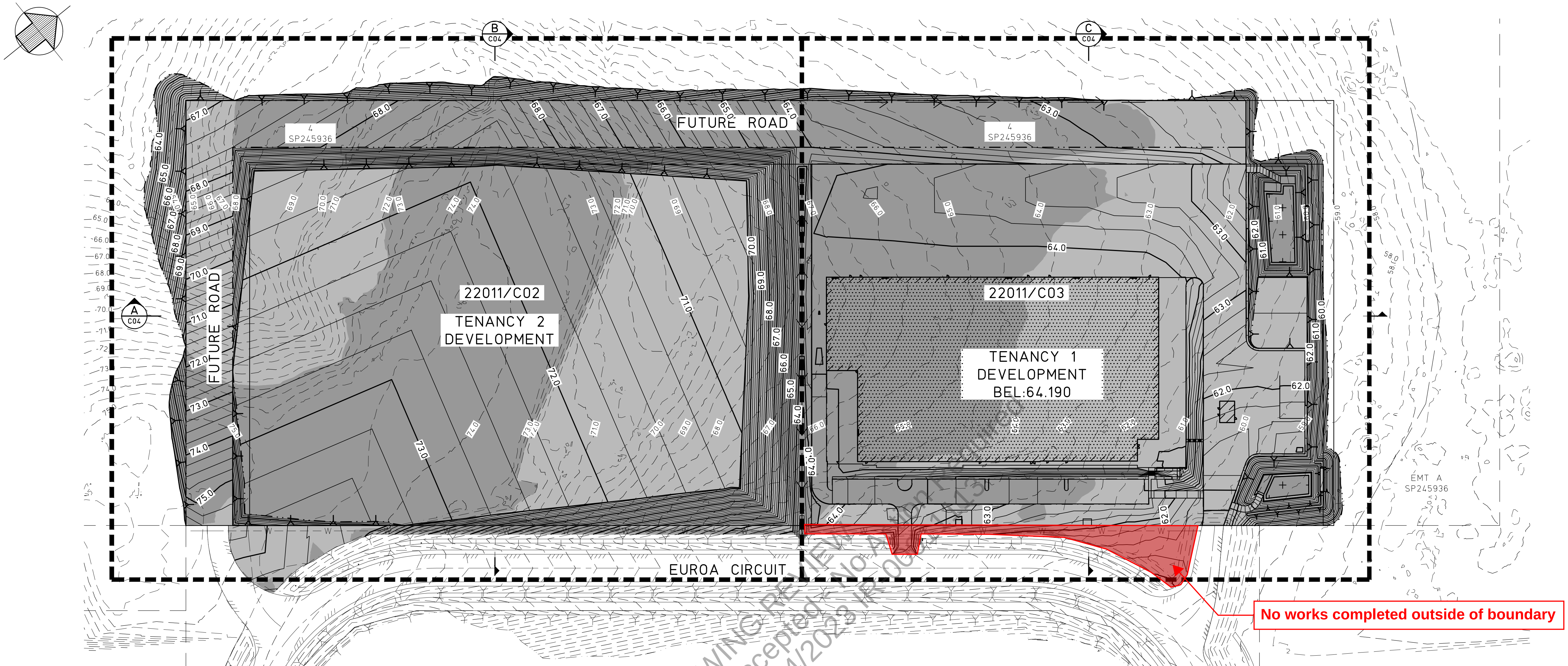
- Is only related to the Applicant lodging the above Material Change of Use and Operational Works Application with the Office of Coordinator General and the Gladstone Regional Council.
- Does not allow the recipient to act on behalf of the Minister of Economic Development Queensland and is not the Minister for Economic Development Queensland's' agent.
- Has an expiry date of twelve (12) months from the date of this letter.

Should you have any questions regarding the above consent you are encouraged to contact John Brun on 3452 7469 or email john.brun@dsdilgp.qld.gov.au.

Yours Sincerely

John White.
Executive Director.
Economic Development Queensland
Delegate of the Minister for Economic Development Queensland

Appendix C Site Survey



EXISTING

— — 10.0 — —	CONTOUR MAJOR (1.00m INTERVAL)
- - - - - -	CONTOUR MINOR (0.50m INTERVAL)
— — — —	LOT BOUNDARY
× EX:14.500	SURFACE LEVEL

PROPOSED

	BUILDING EXTENT
	LOT BOUNDARY
——31.0——	CONTOUR MAJOR (1.00m INTERVAL)
	CONTOUR MINOR (0.25m INTERVAL)
	BATTER TOP
	BATTER BOTTOM
	CUT AREA
	FILL AREA
	EARTHWORKS PAD
× EL:14.500	EARTHWORKS LEVEL

EARTHWORKS QUANTITIES

SURFACE FROM	SURFACE TO	CUT m^3	FILL m^3	BALANCE m^3
EXISTING	EXISTING STRIPPED 50mm	-5,721	-	-5,721
EXISTING STRIPPED 50mm	EARTHWORKS	-79,403	+77,489	-1,914

EARTHWORKS QUANTITIES NOTES

1. EARTHWORKS QUANTITIES DO NOT INCLUDE EXCAVATIONS FOR PIPE TRENCHES, STORMWATER STRUCTURES OR UNDERGROUND DETENTION.
2. ALLOWANCES SHOULD BE MADE FOR REPLACEMENT OF UNSUITABLE MATERIAL.
3. QUANTITIES ARE IN-SITU AND DO NOT ACCOUNT FOR BULKING FACTORS.
4. STOCKPILE SOIL VOLUME OUTLINED IN EARTHWORKS QUANTITIES TABLE IS COMPACTED AND WILL NEED TO ACCOUNT FOR BULKING FACTOR WHEN TRANSPORTED TO SITE.
5. ADDITIONAL FILL TO BE SOURCED WITHIN LOT 4.

NOTE:
REFER DRAWING 22011/C04 FOR BULK EARTHWORKS SECTIONS.

0 10 20 30 40 50
SCALE 1:1000 (A1 SIZE)

EARTHWORKS NOTES

1. EARTHWORKS NOTES ARE TO BE READ IN CONJUNCTION WITH THE GENERAL AND COORDINATION NOTES ON DRAWING 22011/C00.
2. EARTHWORKS SHALL BE CARRIED OUT IN ACCORDANCE WITH PROCEDURES SET DOWN IN AS3798 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS'.
3. BULK EARTHWORKS INCLUDING CLEARING, FILLING AND TESTING, ARE TO BE CARRIED OUT IN ACCORDANCE WITH THE CURRENT COUNCIL STANDARDS, DRAWINGS AND SPECIFICATIONS.
4. BULK EARTHWORKS LEVELS SHALL BE DETERMINED RELATIVE TO THE FINISHED SURFACE LEVELS. REFER ARCHITECTURAL DRAWINGS FOR SLAB LEVELS. REFER TO THE STRUCTURAL ENGINEERS DRAWINGS FOR BUILDING AND PATH SLAB THICKNESSES AND TO THE CIVIL ENGINEERS DRAWINGS FOR EXTERNAL FINISHED SURFACE LEVELS AND EXTERNAL PAVEMENT THICKNESSES PRIOR TO FINALISING EARTHWORKS.
5. PRIOR TO CONSTRUCTION THE CONTRACTOR WILL SATISFY HIMSELF OF THE CORRECT LOCATIONS OF ALL EXISTING SERVICES WHETHER INDICATED OR NOT ON THE PLANS. ANY DAMAGE TO EXISTING SERVICES IS TO BE RECTIFIED AT THE CONTRACTOR'S EXPENSE.
6. CONTRACTOR TO REFER TO GEOTECHNICAL INVESTIGATION REPORT PRIOR TO CONSTRUCTION.
7. TOPSOIL SHALL BE STOCKPILED AS DIRECTED BY THE SUPERINTENDENT ON SITE.
8. PRIOR TO PLACEMENT OF ANY FILLING OR BUILDING WORKS ALL TOPSOIL AND ORGANIC MATERIAL IS TO BE REMOVED AND THE SUBGRADE SHALL BE UNIFORMLY COMPACTED TO THE MINIMUM DRY DENSITY RATIOS SHOWN IN NOTE 11. ANY SOFT SPOTS REVEALED BY COMPACTION SHALL BE REMOVED AS DIRECTED BY THE SUPERINTENDENT AND BACKFILLED WITH COMPACTED SELECT FILL.
9. MOISTURE CONTENT OF COMPACTED FILL SHOULD BE MAINTAINED WITHIN 2% OF OPTIMUM MOISTURE CONTENT.
10. FILL SHALL BE COMPACTED IN MAXIMUM 200mm THICK LAYERS (LOOSE THICKNESS) TO THE FOLLOWING MINIMUM DRY DENSITY RATIOS (STANDARD COMPACTION A.S.1289.5-1).
    - 10.A. UPPER 0.3m OF PAVEMENT SUBGRADE = 100%;
    - 10.B. UNDER BUILDINGS = 98%;
    - 10.C. GENERAL FILL = 95%.
11. ALL FILL MATERIAL PLACED ON THE SITE SHALL COMPRISE ONLY NATURAL EARTH AND ROCK, AND IS TO BE FREE OF CONTAMINANTS (AS DEFINED BY SECTION 11 OF THE ENVIRONMENTAL PROTECTION ACT 1994), NOXIOUS, HAZARDOUS, DELETERIOUS AND ORGANIC MATERIALS. NO DEMOLITION MATERIAL IS TO BE USED. SUITABLE FILL MATERIAL IS DEEMED TO COMPLY WITH THE REQUIREMENTS OF CLAUSE 4.3 OF AS3798, 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS'.
12. IMPORTED FILL SHALL COMPLY WITH THE FOLLOWING:
    - 12.A. SOAKED CBR = MINIMUM OF 8%;
    - 12.B. LIQUID LIMIT = 30% MAX;
    - 12.C. PLASTICITY INDEX = 15% MAX;
    - 12.D. MAXIMUM AGGREGATE SIZE = 75mm;
    - 12.E. PASSING 0.075mm SIEVE = 30% MAX;
    - 12.F. SHRINK/SWELL INDEX = 1.0% MAX.
13. THE CONTRACTOR IS TO ENGAGE, AT THEIR EXPENSE, AN APPROVED NATA REGISTERED LABORATORY TO CARRY OUT SITE CONTROL TO 'LEVEL 1' STANDARD AS SET OUT IN APPENDIX B OF AS3798-2007 'GUIDELINES ON EARTHWORKS FOR COMMERCIAL AND RESIDENTIAL DEVELOPMENTS' AND PROVIDE A 'LEVEL 1' REPORT ON COMPLETION OF EARTHWORKS.
14. REFER TO DRAWING 22011/C05-C07 FOR EROSION AND SEDIMENT CONTROL MEASURES AND SEDIMENT BASIN DESIGN DETAILS.

AS HUTCHINSON BUILDERS Established 1912 CONSTRUCTED

CODE	REVISION	DATE	BY
E	BULK EARTHWORKS LEVELS AMENDED	29.03.22	DH
D	FOR CONSTRUCTION	09.03.22	DH
C	FOR CONSTRUCTION	09.03.22	DH
B	PRELIMINARY ISSUE	22.02.22	DY
A	PRELIMINARY ISSUE	18.02.22	DY

CODE	REVISION	DATE	BY
G	FOR CONSTRUCTION	06.05.22	DH
F	FOR COORDINATION	08.04.22	DH

FORTESCUE FUTURE INDUSTRIES

FFI Dwg No:	QLD01C0001-5310-CI-DAL-0001
FFI Rev:	2
FFI Status:	As Built
Contractor:	Hutchinson Builders
Contractor Project Number:	26673
FFI Contract No:	QLD01C0001
Project Name:	Gladstone Global Green Energy Manufacturing Centre

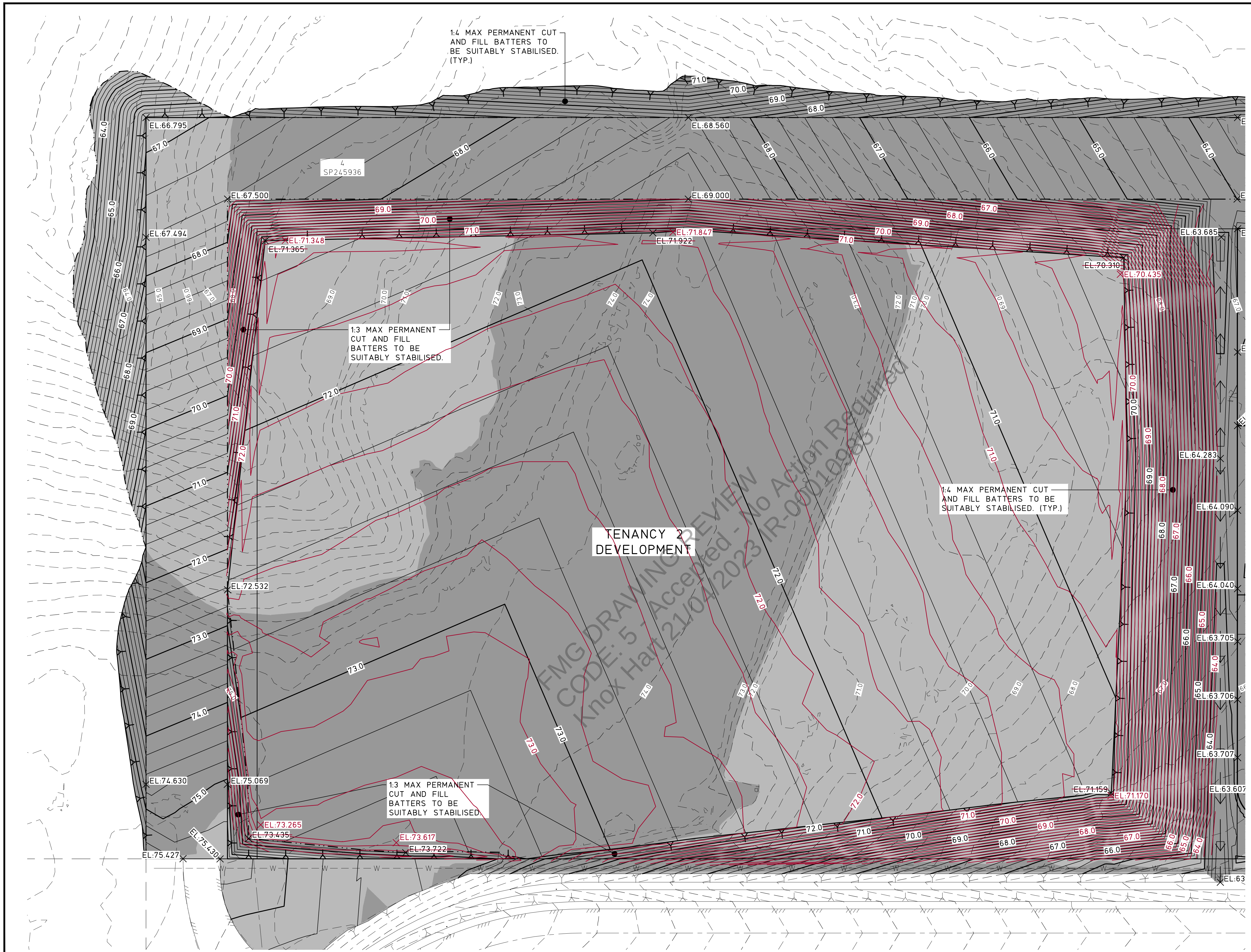
P: (07) 3369 8411
F: (07) 3369 1893
E: mail@morgance.com.au

Scales (at A1)	AS SHOWN
Designed: DY	Checked: HM
Drawn: DY	Date: FEB 22
Authorised	RPEQ

Project
FFI GEM CENTRE - ELECTROLYSER FACILITY, PHASE 1
Address
LOT 4, SP245936, EUROA CIRCUIT, GLADSTONE

Drawing title
BULK EARTHWORKS LAYOUT PLAN

Drawing No 22011/C01 — Revision Code Z



EXISTING

10.0	CONTOUR MAJOR (1.00m INTERVAL)
	CONTOUR MINOR (0.50m INTERVAL)
	LOT BOUNDARY
EX 14.500	SURFACE LEVEL

PROPOSED

	BUILDING EXTENT
	LOT BOUNDARY
31.0	CONTOUR MAJOR (1.00m INTERVAL)
	CONTOUR MINOR (0.25m INTERVAL)
	BATTER TOP
	BATTER BOTTOM
	CUT AREA
	FILL AREA
	EARTHWORKS PAD
EL:14.500	EARTHWORKS LEVEL

NOTE:
REFER DRAWING 22011/C01 FOR BULK EARTHWORKS NOTES.

NOTE:
REFER DRAWING 22011/C04 FOR BULK EARTHWORKS SECTIONS.

NOTE:
REFER DRAWING 22011/C05-C07 FOR EROSION AND SEDIMENT CONTROL REQUIREMENTS.

AS CONSTRUCTED

I CERTIFY THAT THE "AS CONSTRUCTED" DETAILS SHOWN ON THIS PLAN FOR EARTHWORKS ARE A TRUE AND ACCURATE RECORD OF THE WORKS.

SIGNED: H Morgan DATE: **28/02/2023**

NAME OF SIGNATORY: **HENRY MORGAN**

COMPANY: **MORGAN CONSULTING ENGINEERS PTY LTD**

RPEQ: **11950**

0 5 10 20 30
SCALE 1:500 (A1 SIZE)

CODE	REVISION	DATE	BY
E	FOR COORDINATION	08.04.22	DH
D	BULK EARTHWORKS LEVELS AMENDED	29.03.22	DH
C	FOR CONSTRUCTION	09.03.22	DH
B	PRELIMINARY ISSUE	22.02.22	DY
A	PRELIMINARY ISSUE	18.02.22	DY

CODE	REVISION	DATE	BY
G	AS CONSTRUCTED	28.02.23	DH
F	FOR CONSTRUCTION	06.05.22	DH

FORTESCUE FUTURE INDUSTRIES

FFI Dwg No:	QLD01C0001-5310-CI-DEW-0001
FFI Rev:	2
FFI Status:	As Built
Contractor:	Hutchinson Builders
Contractor Project Number:	26673
FFI Contract No:	QLD01C0001
Project Name:	Gladstone Global Green Energy Manufacturing Centre

AN
NEERS
•FORENSIC•
STREET
4064

P: (07) 3369 8411
F: (07) 3369 1893
E: mail@morgance.com.au

Scales (at A1) AS SHOWN	
Designed DY	Checked HM
Drawn DY	Date FEB 22
Authorised RPEQ	

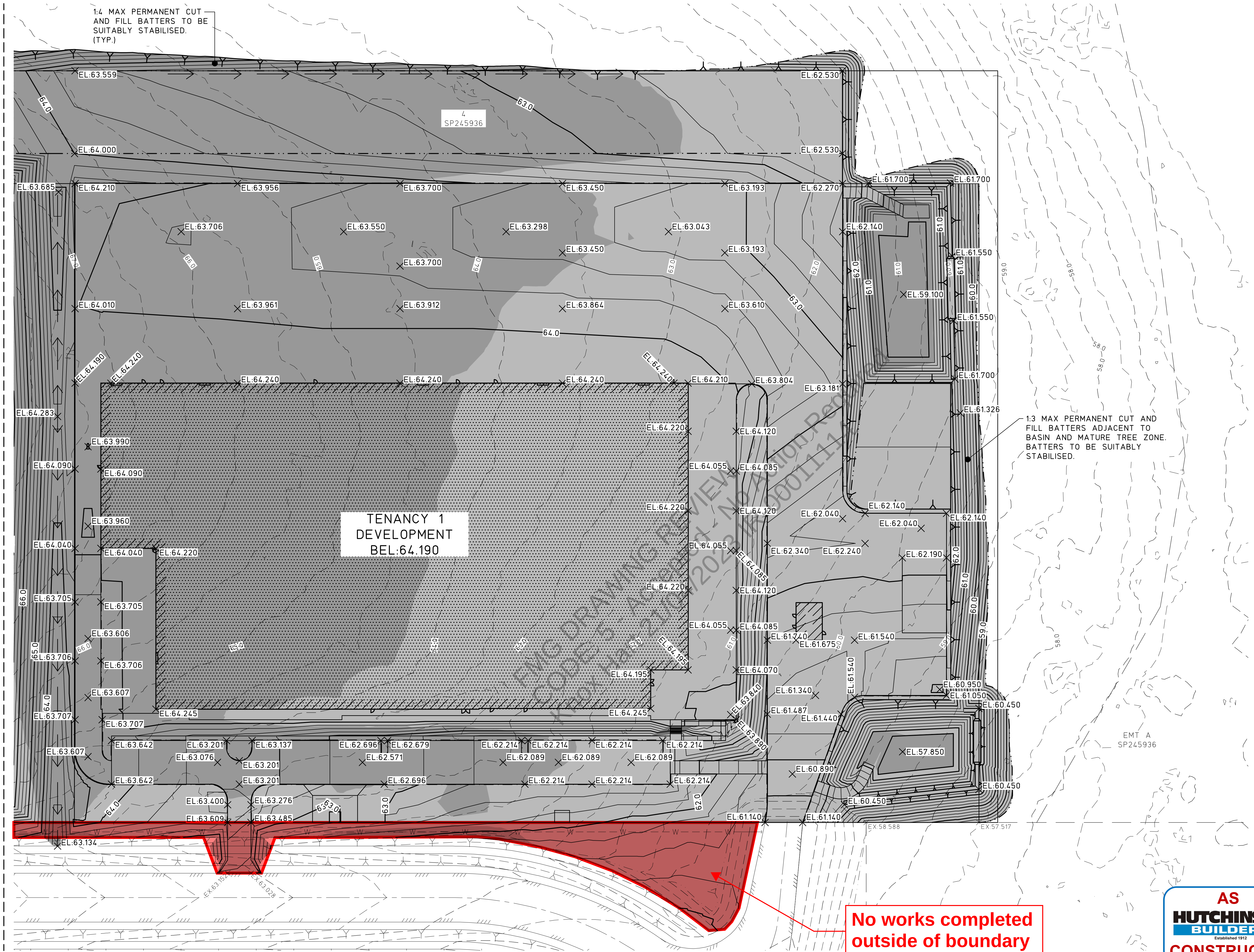
Project
FFI GEM CENTRE - ELECTROLYSER FACILITY, PHASE 1

Address
LOT 4, SP245936, EUROA CIRCUIT, GLADSTONE

Drawing title
BULK EARTHWORKS PLAN - SHEET 1

Drawing No 22011/C02

Revision Code G



AS CONSTRUCTED
HUTCHINSON BUILDERS Established 1912

EXISTING

10.0	CONTOUR MAJOR (1.00m INTERVAL)
	CONTOUR MINOR (0.50m INTERVAL)
	LOT BOUNDARY
EX 14.500	SURFACE LEVEL

PROPOSED

	BUILDING EXTENT
	LOT BOUNDARY
31.0	CONTOUR MAJOR (1.00m INTERVAL)
	CONTOUR MINOR (0.25m INTERVAL)
	BATTER TOP
	BATTER BOTTOM
	CUT AREA
	FILL AREA
	EARTHWORKS PAD
EL:14.500	EARTHWORKS LEVEL

NOTE:
REFER DRAWING 22011/C01 FOR BULK EARTHWORKS NOTES.

NOTE:
REFER DRAWING 22011/C04 FOR BULK EARTHWORKS SECTIONS.

NOTE:
REFER DRAWING 22011/C05-C07 FOR EROSION AND SEDIMENT CONTROL REQUIREMENTS.

0 5 10 20 30
SCALE 1:500 (A1 SIZE)

CODE	REVISION	DATE	BY
E	FOR COORDINATION	08.04.22	DH
D	BULK EARTHWORKS LEVELS AMENDED	29.03.22	DH
C	FOR CONSTRUCTION	09.03.22	DH
B	PRELIMINARY ISSUE	22.02.22	DY
A	PRELIMINARY ISSUE	18.02.22	DY

CODE	REVISION	DATE	BY
F	FOR CONSTRUCTION	06.05.22	DH

FORTESCUE FUTURE INDUSTRIES

FFI Dwg No:	QLD01C0001-5310-CI-DEW-0002
FFI Rev:	2
FFI Status:	As Built
Contractor:	Hutchinson Builders
Contractor Project Number:	26673
FFI Contract No:	QLD01C0001
Project Name:	Gladstone Global Green Energy Manufacturing Centre

P: (07) 3369 8411
F: (07) 3369 1893
E: mail@morgance.com.au

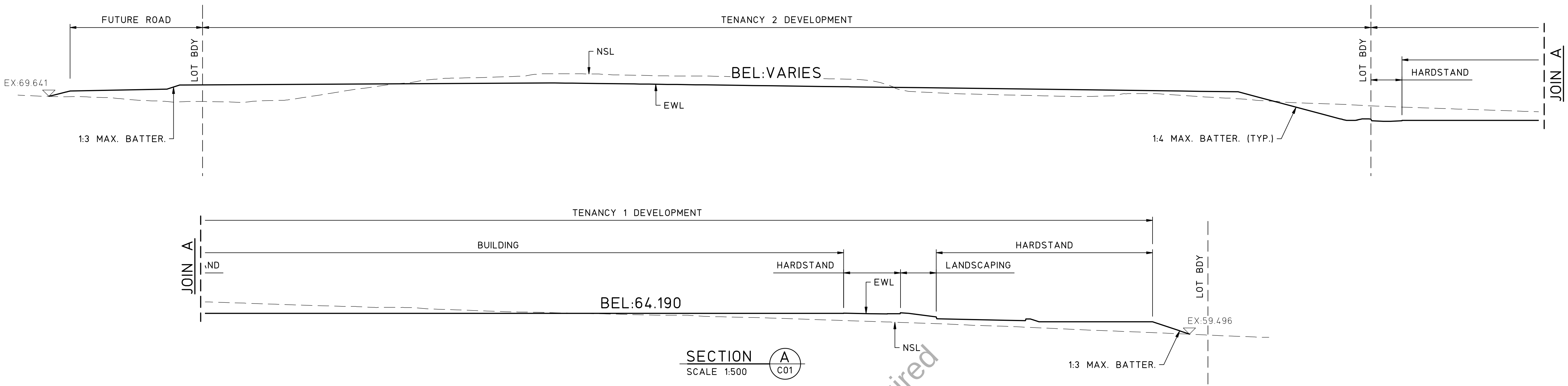
Scales (at A1) AS SHOWN	
Designed DY	Checked HM
Drawn DY	Date FEB 22
Authorised RPEQ	

Project
FFI GEM CENTRE - ELECTROLYSER FACILITY, PHASE 1

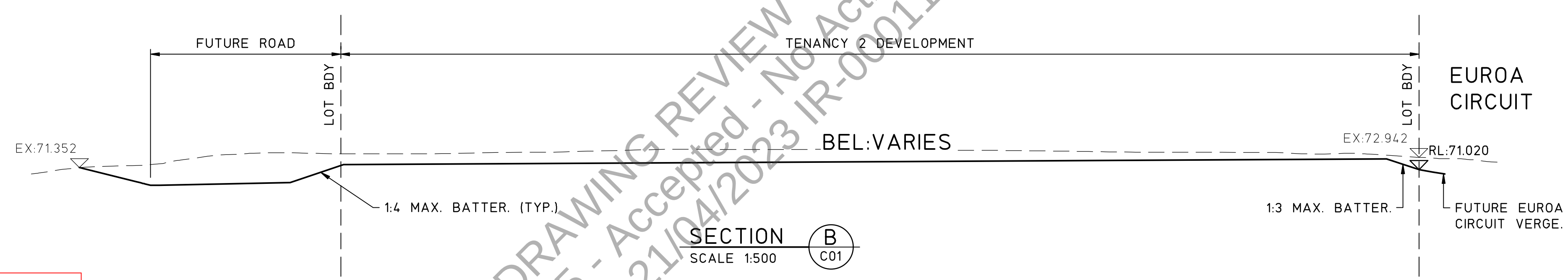
Address
LOT 4, SP245936, EUROA CIRCUIT, GLADSTONE

Drawing title
BULK EARTHWORKS PLAN - SHEET 2

Drawing No 22011/C03
Revision Code Z



SECTION A
SCALE 1:500 C01



SECTION B
SCALE 1:500 C01

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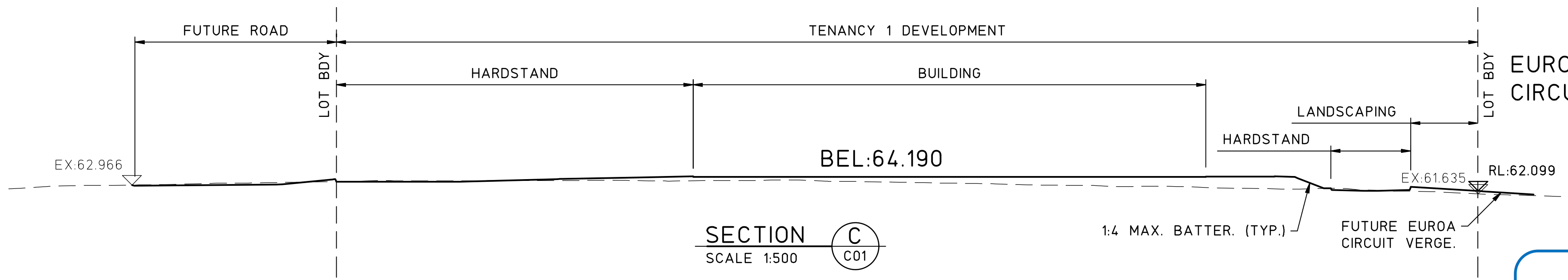
	FFI Rev:	2
	FFI Status:	As Built
Contractor:	Hutchinson Builders	
Contractor Project Number:	26673	
FFI Contract No:	QLD01C0001	
Project Name:	Gladstone Global Green Energy Manufacturing Centre	



SECTION C
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NOTE:
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AS HUTCHINSON BUILDERS Established 1912 CONSTRUCTED

0 5 10 20 30
SCALE 1:500 (A1 SIZE)

CODE	REVISION	DATE	BY
E	FOR COORDINATION	08.04.22	DH
D	BULK EARTHWORKS LEVELS AMENDED	29.03.22	DH
C	FOR CONSTRUCTION	09.03.22	DH
B	PRELIMINARY ISSUE	22.02.22	DY
A	PRELIMINARY ISSUE	18.02.22	DY

CODE	REVISION	DATE	BY
F	FOR CONSTRUCTION	06.05.22	DH

Client
HUTCHINSON BUILDERS

MORGAN CONSULTING ENGINEERS
•STRUCTURAL•CIVIL•HOUSING•FORENSIC•
1 GREAT GEORGE STREET
PADDINGTON QLD 4064
P: (07) 3369 8411
F: (07) 3369 1893
E: mail@morgance.com.au

Scales (at A1)	
AS SHOWN	
Designed DY	Checked HM
Drawn DY	Date FEB 22
Authorised	
RPEQ	

Project
FFI GEM CENTRE - ELECTROLYSER FACILITY, PHASE 1
Address
LOT 4, SP245936, EUROA CIRCUIT, GLADSTONE

Drawing title
BULK EARTHWORKS SECTIONS

Drawing No 22011/C04
Revision Code Z

Appendix D Proposal Plans

PLANT NORTH

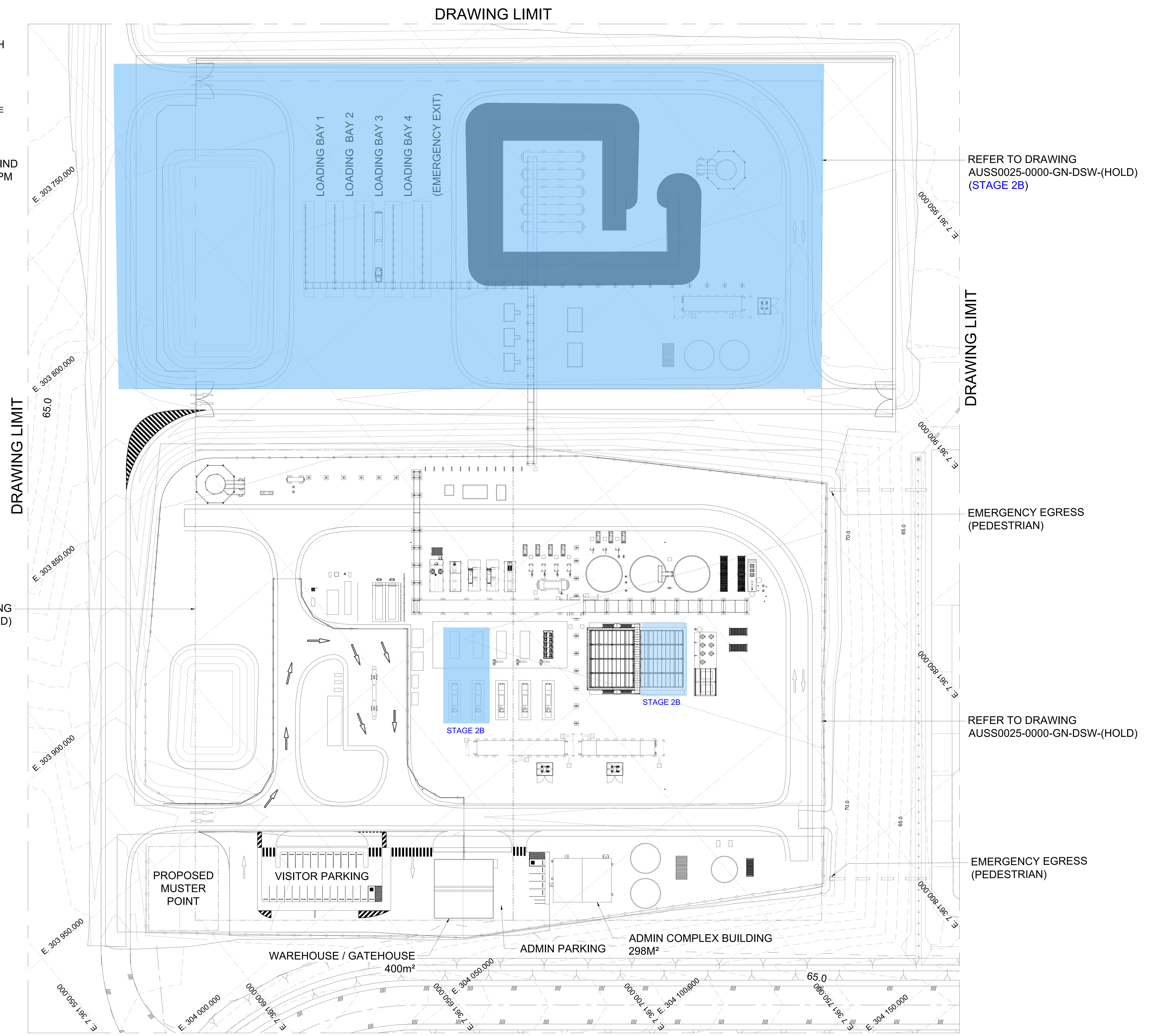
WORLD NORTH 50.46°

PREVALING WIND DIRECTION (9AM ANNUAL)

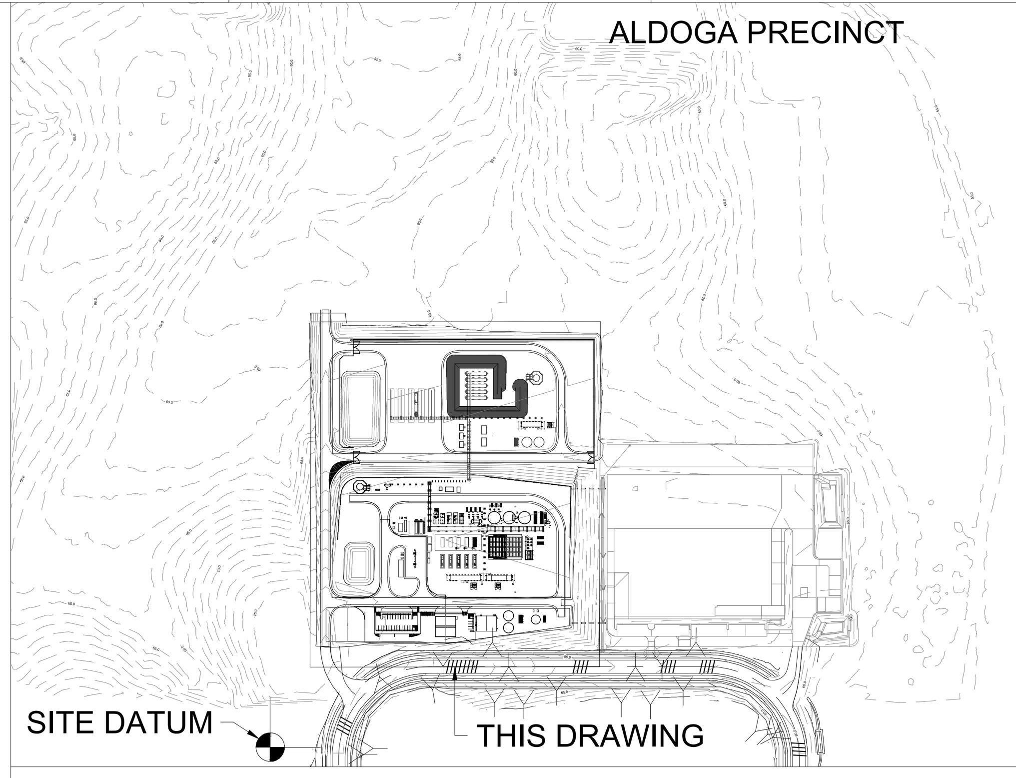
PREVALING WIND DIRECTION (3PM ANNUAL)

SITE DATUM
PLANT CO-ORDINATES
E. 0
N. 0

SITE DATUM
WOLRD CO-ORDINATES
E. 304 004.905
N. 7 361 465.885



DRAWING LIMIT
PLAN



KEY PLAN

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH GENERAL NOTES AND STANDARD DRAWINGS INDEX AS PER DRAWING No (HOLD)
2. ALL DIMENSIONS ARE IN METRES UNLESS SHOWN OTHERWISE
3. ALL CO-ORDINATES ARE IN METRES TO MGA 94 ZONE 56.

LEGEND:

BOUNDARY (FENCING)

BLAST WALL

15 0 15 30 45 60 75
SCALE OF METRES 1:750

REF DRG No.	TITLE	REV	DATE	DESCRIPTION	DRA	CHK	ENG	APP
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		D	07.03.23	RE-ISSUED FOR INFORMATION	DM	DP	DP	JG
		C	28.02.23	RE-ISSUED FOR INFORMATION	DM	DP	DP	JG
		B	02.12.22	RE-ISSUED FOR INFORMATION	DM	DP	DP	JG
		A	27.10.22	ISSUED FOR INFORMATION	DM	DP	DP	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

CONTRACT No. AUSS0025C0001

PROJECT No: AUSS0025

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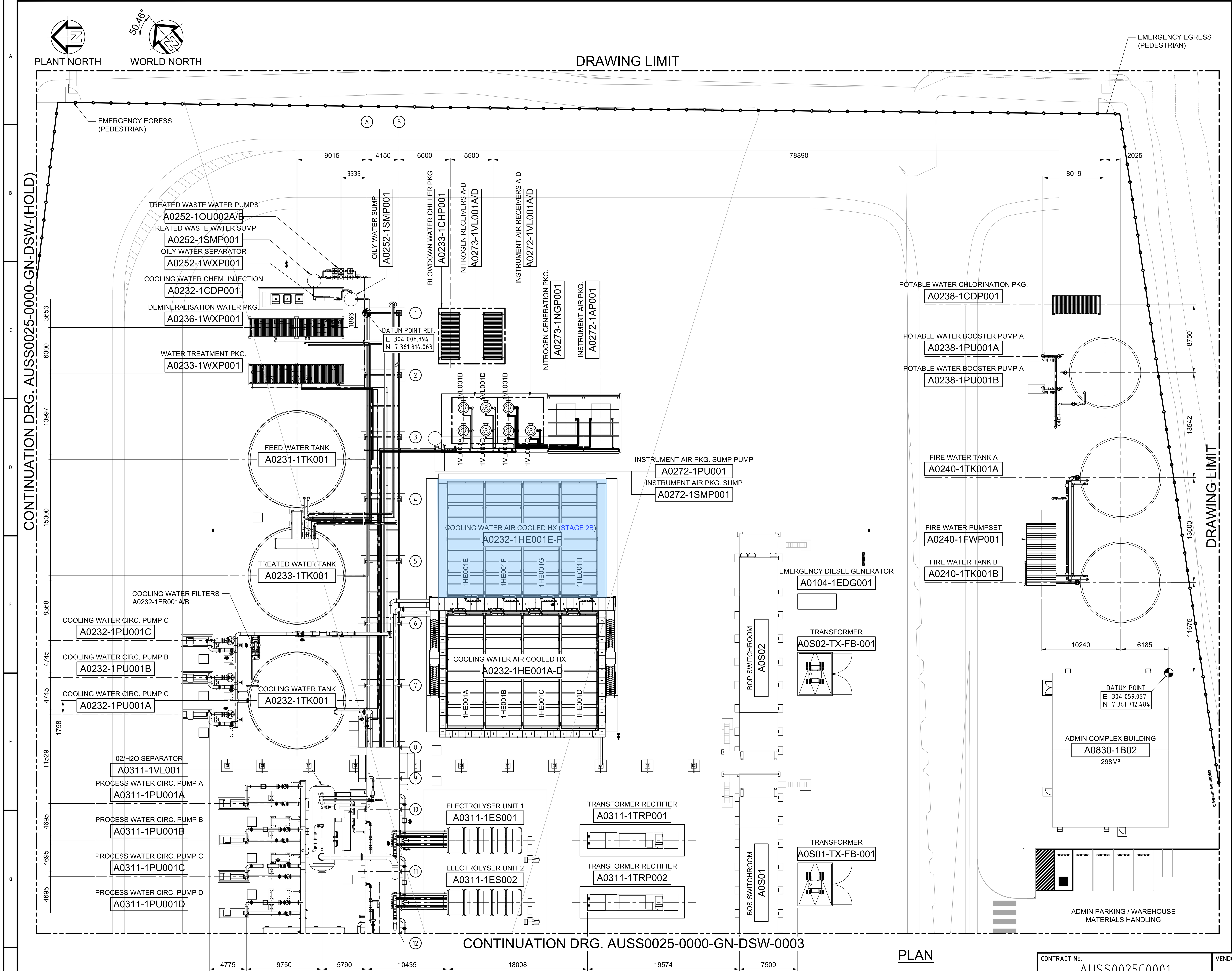
VENDOR/DESIGNER DRG No. 46301-100-DRG-GE-001 REV: E

TITLE: GLADSTONE TEST TRAIN
FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
GENERAL ARRANGEMENT
SITE PLAN

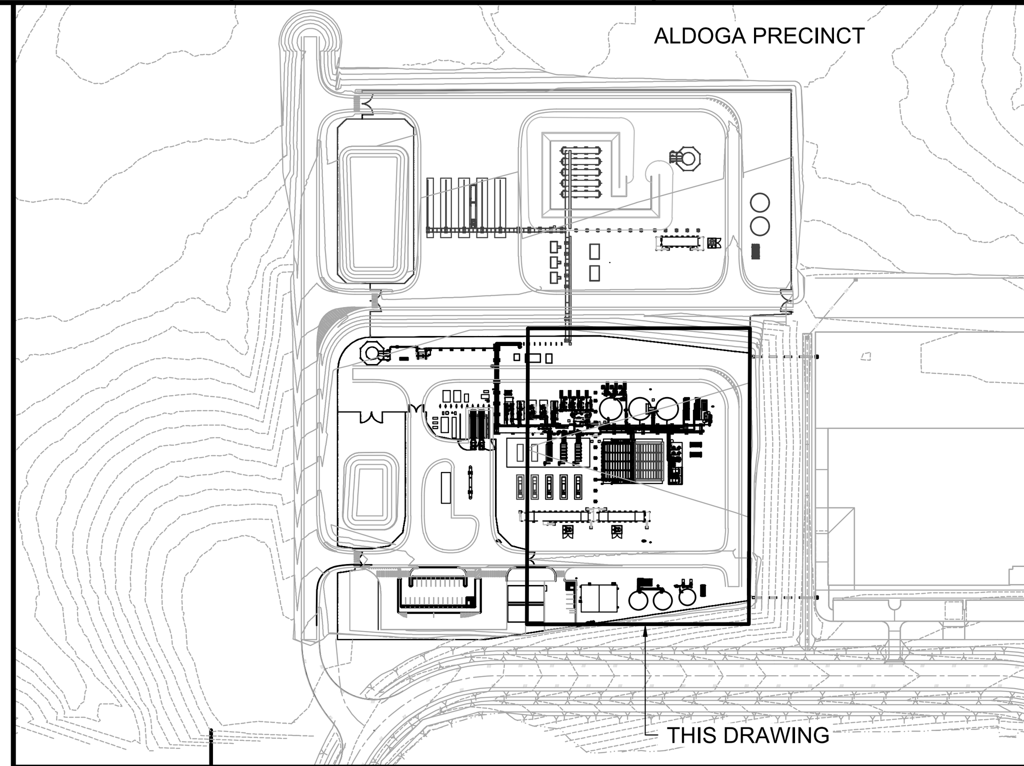
A1 SCALE: 1:750 DRG No: AUSS0025-0000-GN-DSW-0001 REV: E

$FILE$ $TIME$ $DATE$

FFI-0000-EG-TEM-0003_2_WIP



PLAN



KEY PLAN

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2. ALL DIMENSIONS ARE IN METRES UNLESS SHOWN OTHERWISE
3. ALL CO-ORDINATES ARE IN METRES TO MGA 94 ZONE 56.

LEGEND:

BOUNDARY (FENCING)

BLAST WALL

SCALE OF METRES 1:250

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AUSS0025-0000-GN-DSW-0003	ALDOGA GREEN INDUSTRIAL PRECINCT GENERAL ARRANGE. - PLAN SHEET 2 OF 3							
AUSS0025-0000-GN-DSW-0001	ALDOGA GREEN INDUSTRIAL PRECINCT GENERAL ARRANGEMEMNT - SITE PLAN	A	16.06.23	ISSUED FOR INFORMATION	DM	DP	JG	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

CONTRACT No. AUSS0025C0001

PROJECT No: AUSS0025

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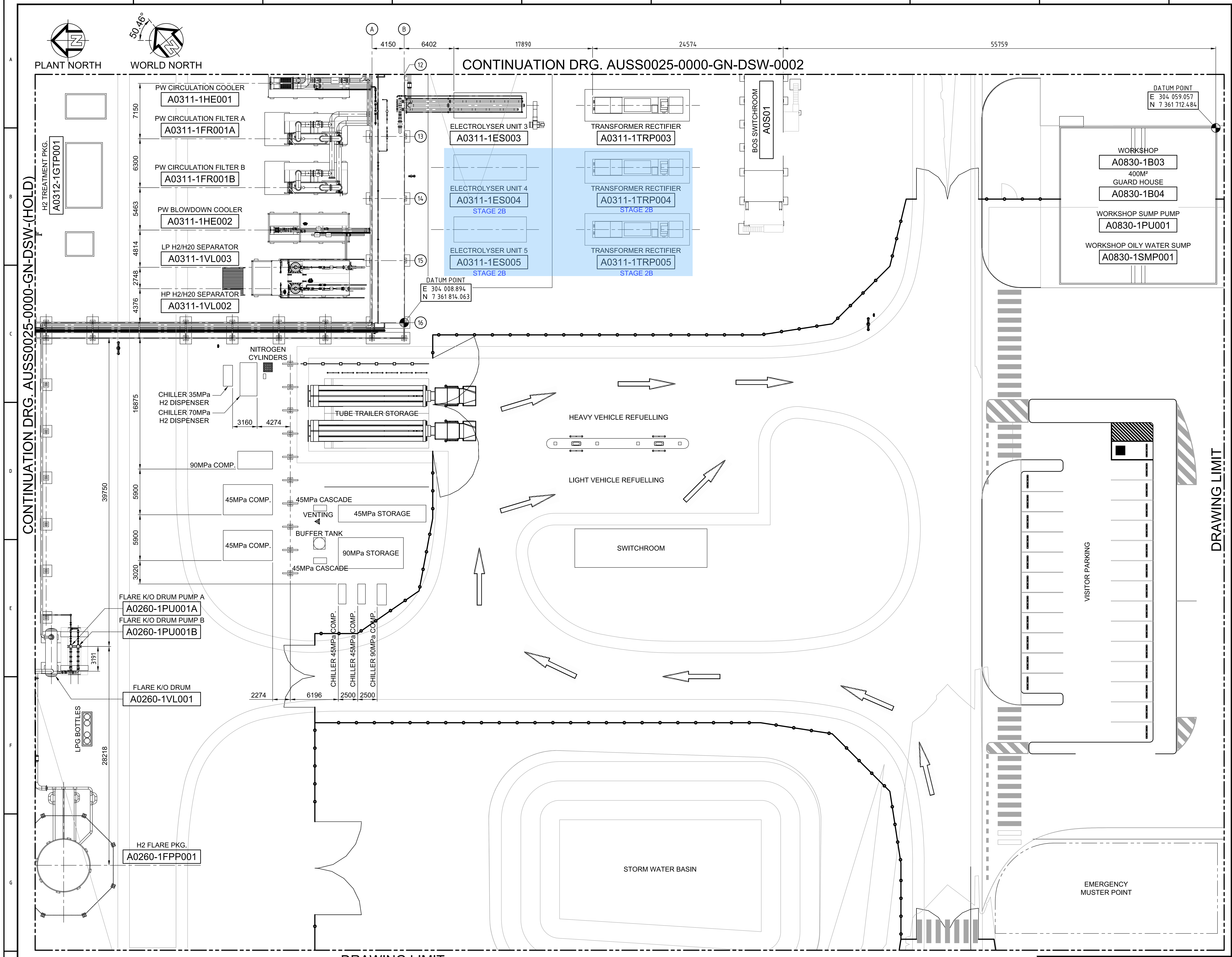
VENDOR/DESIGNER DRG No. 46301-100-DRG-GE-002 REV: A

TITLE: GLADSTONE TEST TRAIN

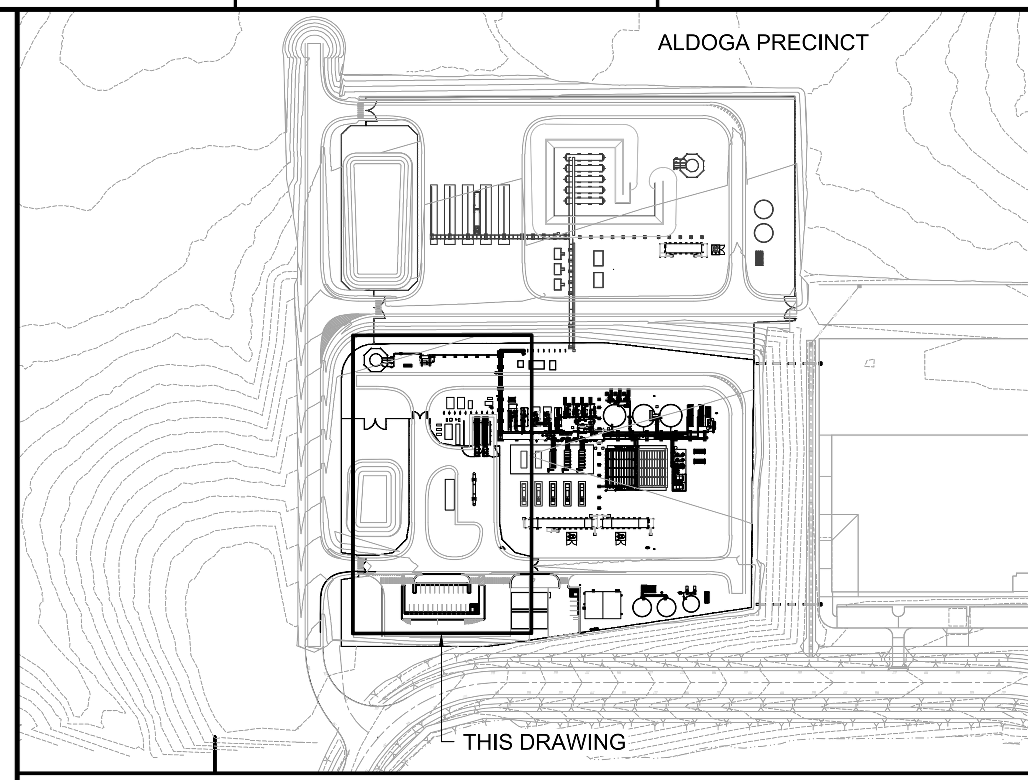
FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
GENERAL ARRANGEMENT
PLAN - SHEET 1 OF 3

A1 SCALE: 1:250 DRG No: AUSS0025-0000-GN-DSW-0002 REV: A

FFI-0000-EG-TEM-0003_2_WIP



PLAN



KEY PLAN

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1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH GENERAL NOTES AND STANDARD DRAWINGS INDEX AS PER DRAWING No (HOLD)
2. ALL DIMENSIONS ARE IN METRES UNLESS SHOWN OTHERWISE
3. ALL CO-ORDINATES ARE IN METRES TO MGA 94 ZONE 56.

LEGEND:

BOUNDARY (FENCING)

BLAST WALL

5 0 5 10 15 20 25

SCALE OF METRES 1:250

REF DRG No.	TITLE	REV	DATE	DESCRIPTION	DRA	CHK	ENG	APP
AUSS0025-0000-GN-DSW-HOLD	ALDOGA GREEN INDUSTRIAL PRECINCT GENERAL ARRANGE. - PLAN SHEET 3 OF 3							
AUSS0025-0000-GN-DSW-0002	ALDOGA GREEN INDUSTRIAL PRECINCT GENERAL ARRANGE. - PLAN SHEET 1 OF 3				DM			PP
AUSS0025-0000-GN-DSW-0001	ALDOGA GREEN INDUSTRIAL PRECINCT GENERAL ARRANGEMEMNT - SITE PLAN	A	16.06.23	ISSUED FOR INFORMATION	DM	DP	JG	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

CONTRACT No.	AUSS0025C0001
VENDOR/DESIGNER DRG No.	46301-100-DRG-GE-003
REV:	A
PROJECT	No: AUSS0025
TITLE:	GLADSTONE TEST TRAIN

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FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
GENERAL ARRANGEMENT
PLAN - SHEET 2 OF 3

SIZE	SCALE:	DRG No:	REV:
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$FILE$ $TIME$ $DATE$

FFI-0000-EG-TEM-0003_2_WIP

Appendix E PRIMERO (Stormwater Management Plan)

DESIGN
CONSTRUCT
OPERATE

PRIMERO

STORMWATER MANAGEMENT PLAN

GLADSTONE TEST TRAIN

46301-PLN-CI-001

AUSS0025-0201-CI-PLN-0001

FORTESCUE FUTURE INDUSTRIES

FORTESCUE FUTURE INDUSTRIES

DATE	REVISION	STATUS	PREPARED	REVIEWED	APPROVED
19-Jun-23	0	Issued for FEED	M Ehlers	S Ghaderi	J Gibbs
				RPEQ 18419	

TABLE OF CONTENTS

1 PROJECT OVERVIEW

Fortescue Future Industries (FFI) is looking to develop a hydrogen production facility GEM H2 Test Train (GTT) at the Gladstone Electrolyser Manufacturing (GEM) precinct which will include a Test Train for a 50 MW hydrogen production facility.

The proposed site is within a precinct located at Lot 4, SP245936 Euroa Circuit, Aldoga. It is located 20km west of the centre of Gladstone, Queensland.

The purpose of this Stormwater Management Plan (SMP) is to outline the hydrologic and hydraulic analysis performed to design the stormwater infrastructure to support the new facility in a way that discharges from the drainage network correspond with those that would have occurred under pre-development conditions.

This SMP follows the following steps:

- Evaluation of the existing environmental conditions of the site
- Describing the proposed development and its effect on stormwater quality
- Calculating peak flow for pre and post development conditions
- Sizing the detention volumes required to maintain the flow to the pre-development condition
- Identifying potential sources of contaminants and determination of measures for achieving the water quality objective

2 EXECUTIVE SUMMARY

The proposed GEM H2 Test Train (GTT) at the Gladstone Electrolyser Manufacturing (GEM) precinct (Lot 4 Euroa Circuit, Gladstone) has been assessed for its impact on the quantity and quality of stormwater drainage.

The lawful point of discharge is the existing north-west wetland pond constructed for the Aldoga Aluminium Refinery.

Onsite detention will be provided in the form of two detention basins to attenuate post development peak flow rates and mitigate the risk of flooding to properties and infrastructure adjacent to, and downstream of the subject site. The detention basins will be designed to contain all flows up to a 1 in 100 AEP, 24-hours storm event.

Sediment generated during the construction phase shall be dealt with in accordance with an Erosion and Sediment Control Plan to be kept on site during the construction phase developed by the project Superintendent.

Contaminated oily water from the refuelling area and the processing plant will be treated by oily water treatment systems and disposed to the detention ponds.

Peak flow from the firewater was assumed not coincide with a design storm.

The proposed development triggers the State Planning Policy 2017 (SPP 2017). The water quality objectives (WQO's) for Central Queensland (south) have therefore been achieved by treating the roof and surface stormwater runoff via two bio-retention, prior to discharging to the Lawful Points of Discharge.

The subject site is unaffected by flooding as further described in section 6 of this report.

3 REFERENCE CODES AND STANDARDS

- CMDG-D5 Stormwater Design
- FFI Civil Engineering Requirements, Doc No. FFI-0000-CI-SOR-0001_0

- Basis of Design, Doc. No. AUSS0025-0000-GN-BOD-0001_0
- State Planning Policy 2017 (SPP 2017)
- Urban Stormwater Quality Planning Guidelines 2010
- The Queensland Urban Drainage Manual (QUDM)
- Capricorn Municipal Development Guidelines
- Gladstone Regional Council, Engineering Design Planning Scheme Policy

4 EXISTING CONDITIONS

4.1 EXISTING INFRASTRUCTURE

Figure 4-1 shows an aerial view of the precinct inside which the GTT facilities will be built. This aerial is taken from Aurecon geotechnical report No. QLD01C0004-5000-GE-REP-0001_1 which was prepared for FFI in March 2022 for the larger Gladstone Manufacturing Hub.

Figure 4-1 – Aerial View of Gladstone Manufacturing Hub Precinct (Yellow Boundary)

Two wetlands (north-western and north-eastern) and a sedimentation pond are annotated in the aerial above. These ponds were designed for the Aldoga Aluminium Smelter in 2004 (refer the Permanent Environmental Controls Design Report Z1096-00CV-RP-1004-DE/C by Maunsell). In addition to the ponds referred in the aerial, there is an artificial wetland designed by Maunsell which receives the underflow from the sedimentation pond with the intent to high quality outlet water to the environment (Larcom Creek). Figure 4-2 which is an extract form drawing No. Z109-00CV-LP-11410_0 shows the artificial wetland located at the top left corner of the of the figure.

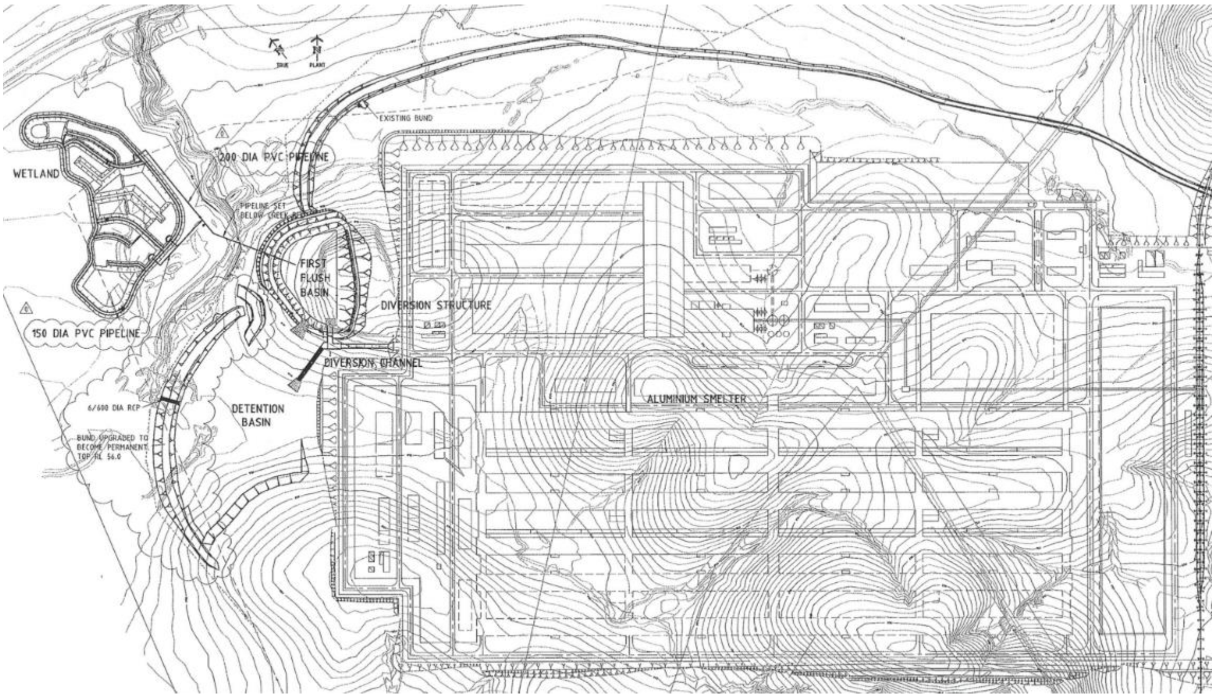


Figure 4-2 – Environmental Controls Designed by Maunsell for Aldoga Aluminium Smelter

Although the Aldoga Aluminium Smelter was never constructed, the environmental controls (ponds and artificial wetlands) were built in around 2004. The proposed site area of the Aldoga smelter project was 13 hectares; therefore, the ponds which were designed for it are adequate from a detention point of view for any new development with the same size or less provided that its slope and ground permeability are not significantly different from the Aldoga design. The surface area of GTT development, as specified in the next sections of this SWMP, is less than six hectares. Therefore the proposed development would not create peak flows at the discharge point of the ponds exceeding the pre-development limits. The focus of the stormwater management design for the GTT facility, will therefore be to maintain the peak flows between the GTT site and the pond to predevelopment conditions.

In 2022, the construction of FFI GEM centre – Electrolyser Facility (Phase 1) started in the areas shown in Figure 4-3, within the larger Gladstone Manufacturing Hub.

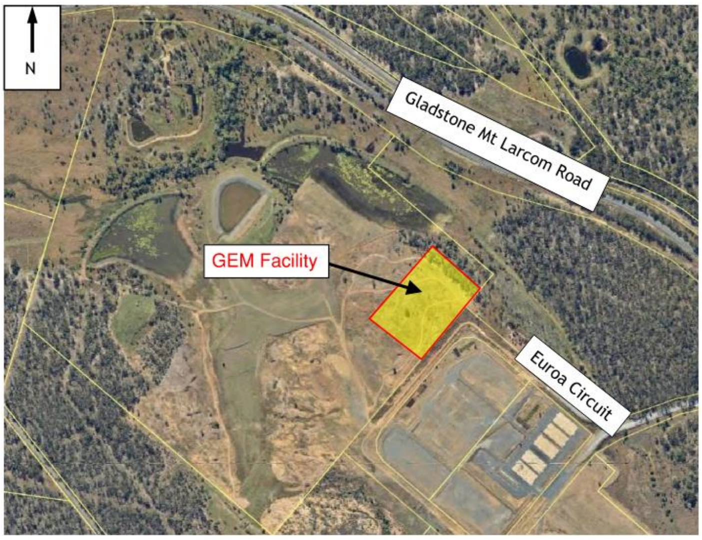


Figure 4-3 – GEM Facility Location

The bulk earthwork for this facility, shown in Figure 4-4 was not limited to its footprint. An earth pad located on the west (plant coordinate; 50.462° clockwise rotation of true North) was built using the excess cut from the footprint of GEM facility.

For the details of the stormwater design for the GEM facility, refer to Storm Water Management Plan No. QLD01C0001-5600-EN-PLN-0001_B_IFR_01 developed by Morgan Consulting Engineering.

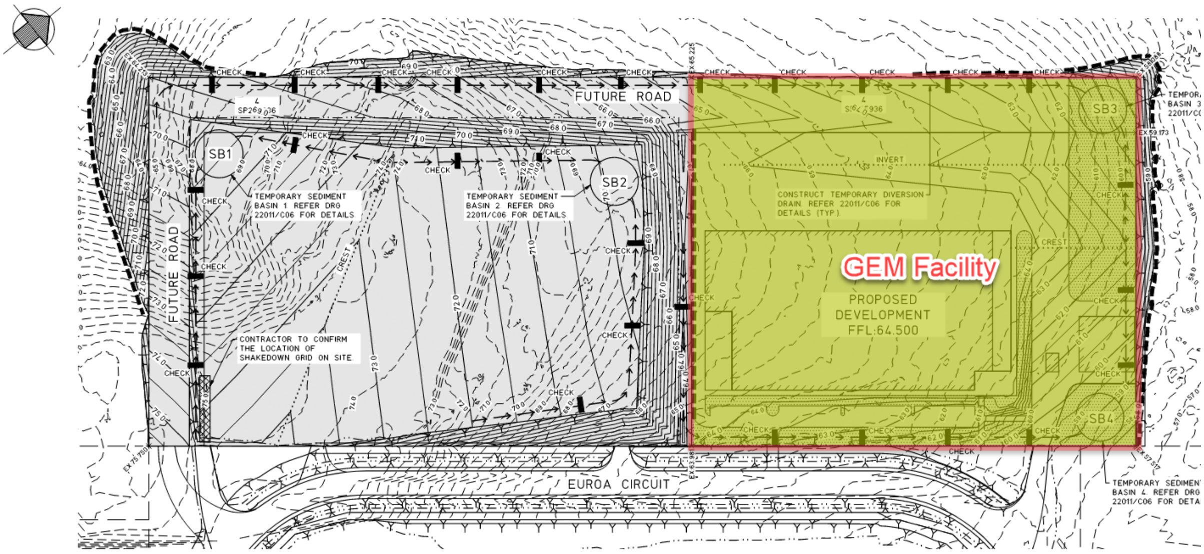


Figure 4-4 – GEM Facility Location

The southern part of the GTT plant is located over the extended earthwork pad which was built during the construction of GEM facility. Figure 4-5 shows the GTT plant location and its interface with the recently built earth pads.

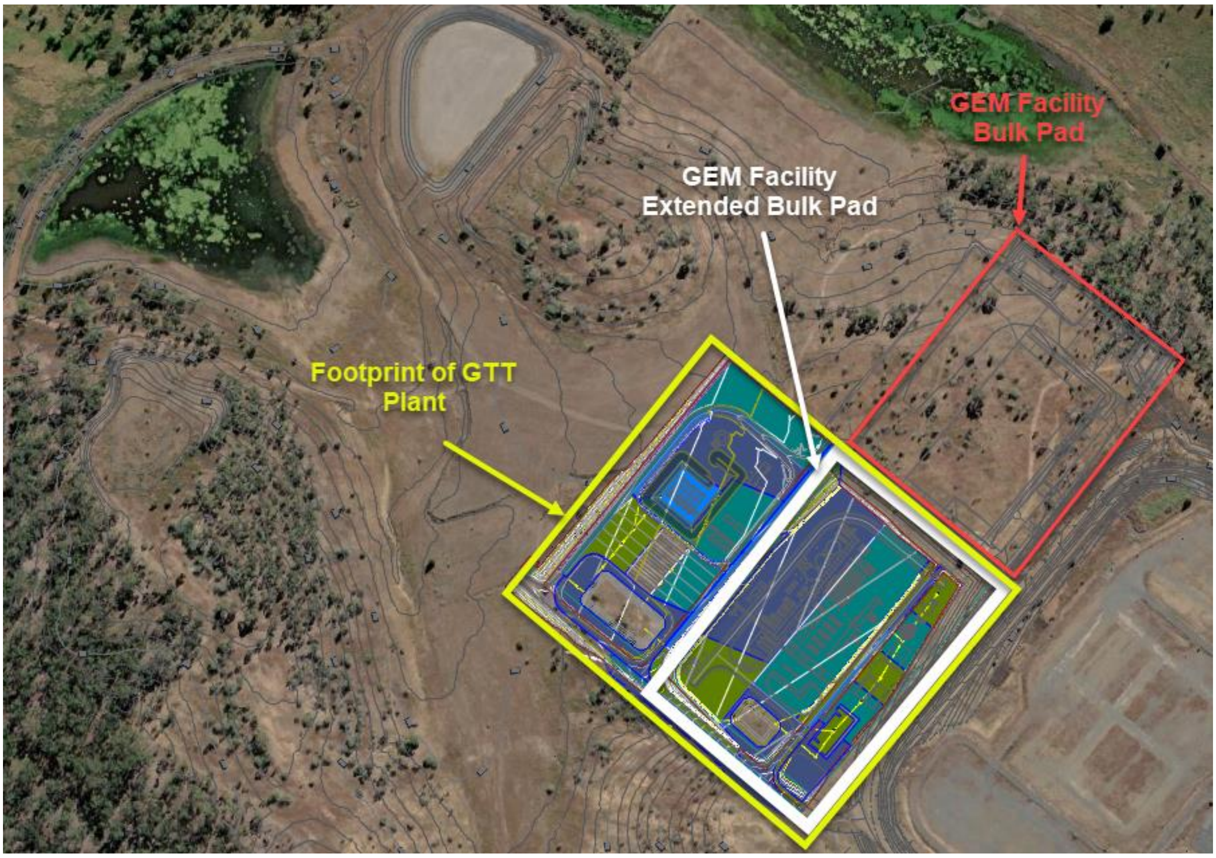


Figure 4-5 – GTT Plant Location and Interfaces with Existing Bulk Pad.

For the current SMP, the post development conditions were compared against the pre-development terrain of the area within the footprint of GTT plant before the construction of GEM facility's extended pad. This extended pad must be changed based on the bulk earthworks design of the GTT facility (refer to Appendix A) and its effect was considered in the post development conditions.

4.2 EXISTING DRAINAGE PATTERNS

Figure 4-6 shows the overland flow routes and catchment areas in the vicinity of the GTT plant which was developed from analysing detailed site survey of the precinct (submitted by FFI OneDrive transfer: 22-08-12 - 22011 - MCE CIVIL BASE.dwg). The analysis indicates that no runoff from external catchments reports to the plant footprint. The runoff from the plant itself flows away from the site towards the four major directions. The two major catchments with the largest overlap with the plant are Catchments #1 and #2 which are annotated in Figure 4-6. These two catchments direct flow to a natural drain which reports the north-west wetland pond as shown in Figure 4-7.

Note: Reference to Catchment #1 and Catchment #2 for the rest of this document is for pre-development condition.

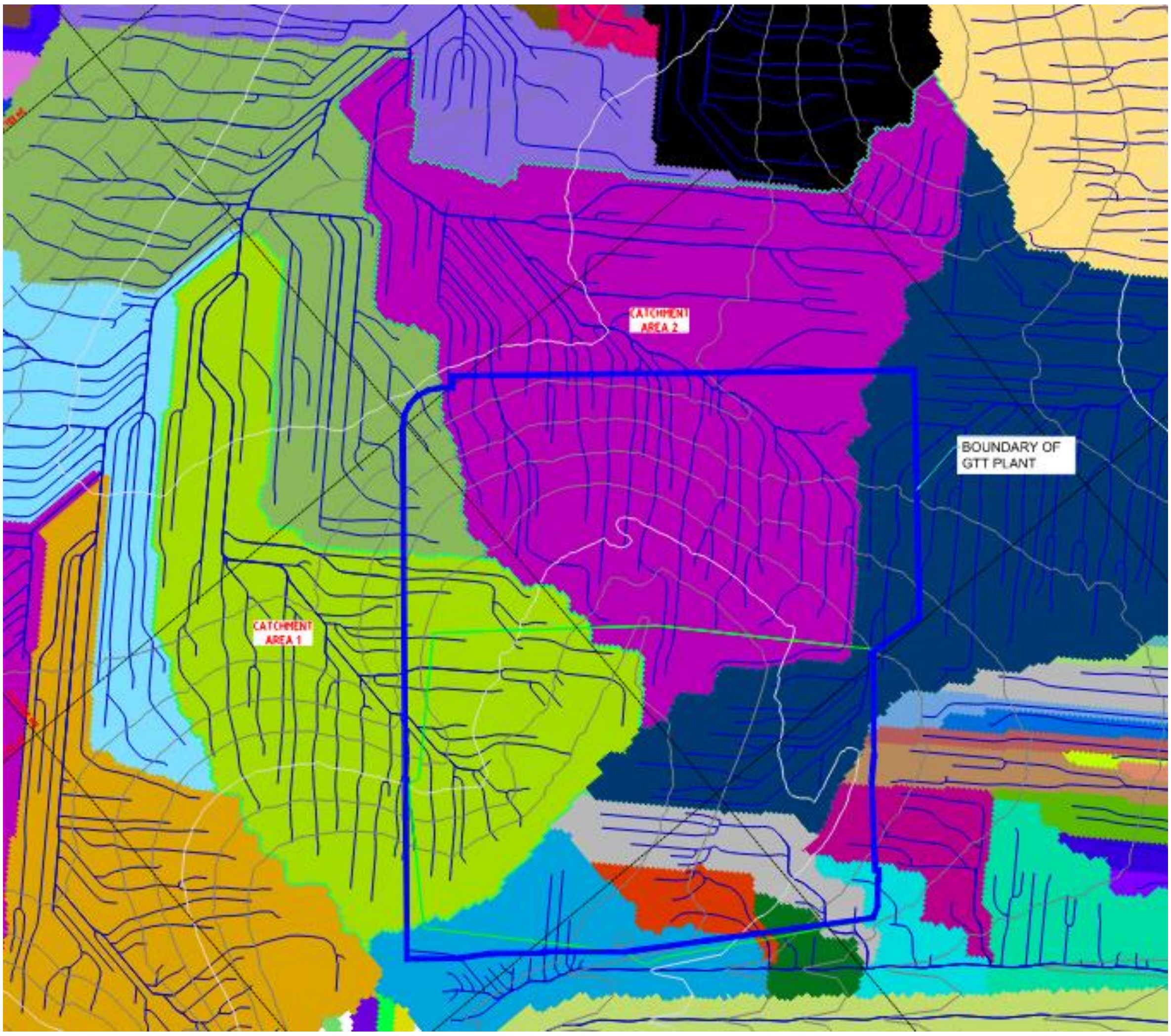


Figure 4-6 – Flow Patterns and Catchment Areas (Predevelopment)

Figure 4-7 – Natural Drain Diverting Catchment #1 and #2 to the North-west Wetland

4.3 LAWFUL POINT OF DISCHARGE

As per the FFI instructions the run-off from the GTT plant must report to the north-west wetland pond. Therefore, the bulk earthwork (Appendix A) and stormwater drainage (Appendix B) of the plant was designed to facilitate the flow of plant runoff towards the natural drain shown in Figure 4-7. In other words, the mentioned natural drain is proposed to be lawful point of discharge and as such shall be compliant with the criteria outlined in Section 3.9.1. of QUDM 2017:

a) *The location of the proposed discharge point is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received.*
b) *The post development discharge will not cause an actionable nuisance, nor environmental or property damage, as it is intended to implement measures to account for any change to the existing flow characteristics.*
c) *Authority to discharge over affected properties will not be required as the proposed development will discharge directly into the existing waterway and will be maintained as per existing drainage conditions.*

To achieve the criterion (b) above, the plant (proposed development) is divided into two major catchments as shown in Figure 4-8:

North Catchment: bigger catchment shown at the north side (yellow boundary).

South Catchment: smaller catchment shown at the south side (cyan boundary)

Each of these catchments consists of several sub catchments not shown in Figure 4-8 for clarity (refer to Appendix B for details of sub-catchments)

Note: Reference to each of these catchments for the rest of this document is for the proposed post-development condition.

The plant South Catchment will report its runoff to natural Catchment #1. The surface area of the plant South Catchment is about 2.4ha. The surface area of natural Catchment #1 overlap with the plant footprint (referred as Catchment 1.A hereon, as shown in Figure 4-9) is about 1.65ha which is less than the 2.4 ha of the plant South Catchment. This means that the natural Catchment #1 will experience extra inflow compared to its predevelopment conditions. This is because, in addition to the bigger area of the combined catchments (Catchment 1.A and plant South Catchment), the new development will increase the impervious areas, causing the increase of runoff flows. Therefore, a detention pond will be constructed in the west side of the plant South Catchment as shown in Figure 4-8. This pond will act as a buffer and maintain the flows which will report to the natural Catchment #1 to predevelopment conditions.

The plant North Catchment will report its runoff to natural Catchment #2. The surface area of the plant North Catchment is about 5.1 ha. The surface area of natural Catchment #2 overlap with the plant footprint (referred as Catchment 2.A hereon, as shown in Figure 4-9) is about 2.8ha which is less than the 5.1ha of the plant North Catchment. This means that the natural Catchment #2 will experience extra inflow compared to its predevelopment condition. This is because, in addition to the bigger area of the combined catchments (catchment 2.A and plant North Catchment), the new development will increase the impervious areas, causing the increase of runoff flows. Therefore, a detention pond will be constructed in the west side of the plant North Catchment as shown in Figure 4-8. This pond will act as a buffer and maintain the flows which will report to the natural Catchment #2 to predevelopment conditions.

Stormwater for the facility will primarily be collected by a combination of:

- Precast concrete structures with grated inlets and carried through a network of HDPE storm pipe to the detention ponds.
- New open channels, including swales, cut-off drains and diversion drains and conveyed to the detention ponds.

Refer to Concept Drainage Drawings (Appendix B) for the Proposed Drainage Philosophy.

Hydrologic and hydraulic calculations for the project site for the purpose of this SMP were prepared for 100-year, 24-hour storm events. This is to address the requirements of section 7.3.1.2 (Peak Flow Management) of Fortescue Future Industries Civil Engineering Requirements (FFI-0000-CI-SOR-0001) for the design of detention basins and is in line with the Gladstone Regional Council (GRC) Planning Scheme Policies for Major Drainage System.

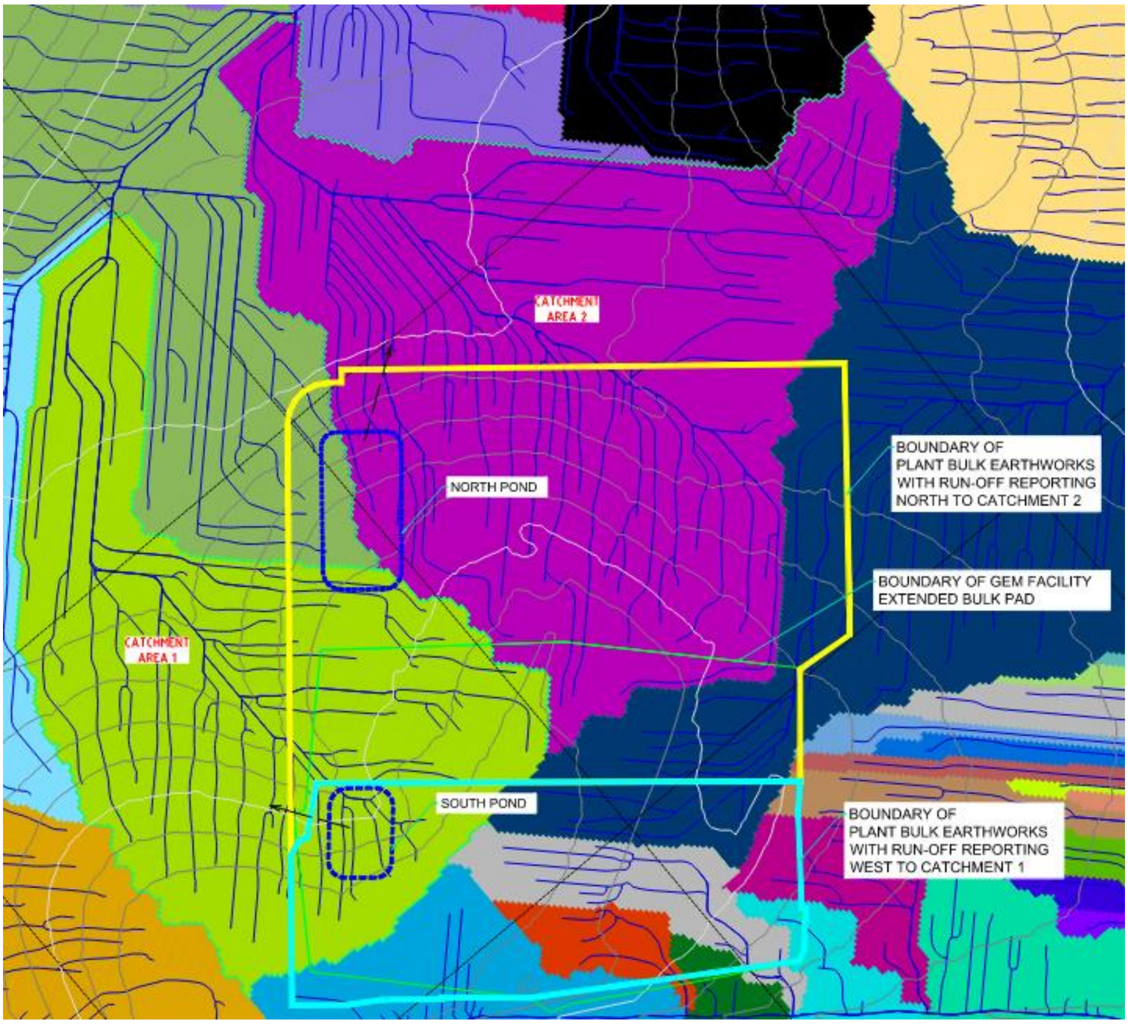


Figure 4-8 – Plant Main Catchments Overlay on the Predevelopment Catchments

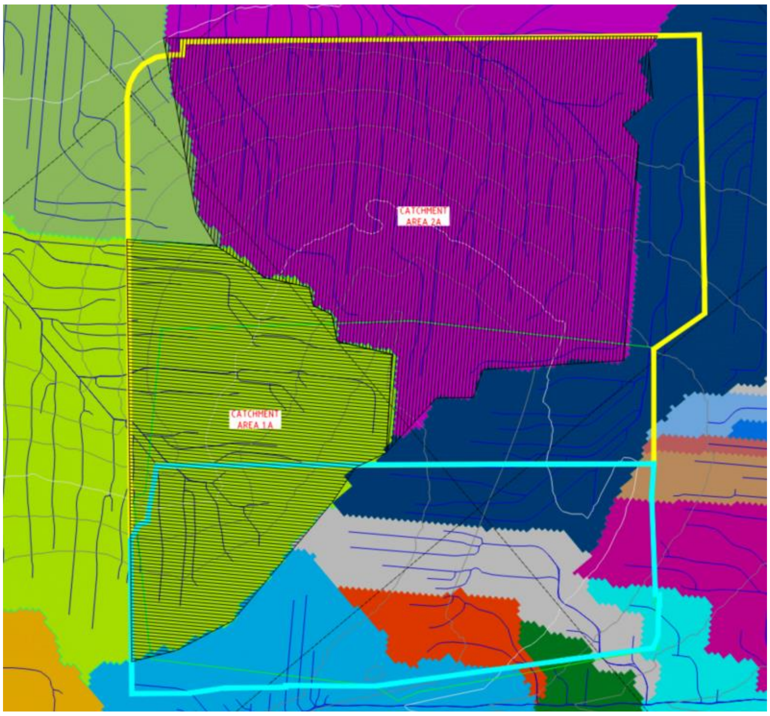


Figure 4-9 – Overlap of the Plant Footprint with Natural Catchments

5 METHOD OF ANALYSIS

5.1 RATIONAL METHOD ASSESSMENT

The Rational Method has been used to calculate the peak discharges from the site under the existing (pre-development) and proposed (post-development) conditions.

5.1.1 Design Storm

To satisfy the requirements of the GRC Planning Scheme Policies the design the drainage system 100-year Average Return Interval (ARI) statistical flood (Q_{100} storm) has been used for the design of the drainage system.

5.1.2 Rainfall Intensity

Rainfall intensities and temporal patterns data for this study were obtained from Australian Bureau of Meteorology. Refer to Appendix C for the report from Australian Rainfall & Runoff Data Hub.

5.1.3 Time of Concentration

Times of concentration (tc) were calculated as defined in the QUDM. Refer to Table 5-1 for the adopted tc's and Appendix D for tc calculations.

CATCHMENT #1.A		CATCHMENT #2.A	
PRE-DEVELOPMENT T_C (MINS)	POST-DEVELOPMENT T_C (MINS)	PRE-DEVELOPMENT T_C (MINS)	POST-DEVELOPMENT T_C (MINS)
13	9	17	14

Table 5-1 – Adopted tc Values

5.1.4 Runoff Coefficients

The 10-year runoff coefficient's (C_{10}) were determined as defined in the QUDM. Refer to Table 5-2 below for the adopted C10 values.

C_{10}	
PRE-DEVELOPMENT STATE	POST-DEVELOPMENT STATE
0.59	0.84

Table 5-2 – Adopted C_{10} Values

5.1.5 Peak Flows

Refer to Table 5-3 for a summary of the predicted peak flow rates for pre and post development conditions and Appendix D for the Rational Method calculations.

	PEAK FLOWS (M^3/S)			
	CATCHMENT #1.A		CATCHMENT #2.A	
ARI	PRE-DEVELOPMENT	POST-DEVELOPMENT	PRE-DEVELOPMENT	POST-DEVELOPMENT
Q_1	0.18	0.43	0.30	0.67
Q_2	0.22	0.51	0.36	0.80

ARI	PEAK FLOWS (M^3/S)			
	CATCHMENT #1.A		CATCHMENT #2.A	
	PRE-DEVELOPMENT	POST-DEVELOPMENT	PRE-DEVELOPMENT	POST-DEVELOPMENT
Q_5	0.32	0.76	0.53	1.18
Q_{10}	0.40	0.93	0.65	1.44
Q_{20}	0.47	1.11	0.78	1.72
Q_{50}	0.60	1.41	0.99	2.18
Q_{100}	0.69	1.63	1.13	2.51

Table 5-3 – Peak Flows _ Rational Method

As shown in Table 5-3, stormwater runoff will increase because of the proposed development. Hence, it is proposed to utilise on-site detention (OSD) systems to mitigate the stormwater runoff of the proposed development prior to discharging to the Lawful Point of Discharge, north of the site. Refer to section 4.3 for the proposed location of the OSDs. For the design of the OSDs dynamic hydrological modelling was used as described is section 5.2.

5.2 HYDROLOGIC AND HYDRAULIC ANALYSIS

The hydrologic and hydraulic analysis of existing and proposed site conditions for the GTT project was performed in Autodesk Storm and Sanitary Analysis 2020 (SSA) utilizing EPA SWMM hydrology method. Appendix E shows the key plan for how these were modelled in SSA.

5.2.1 Proposed Drainage Patterns

There are only a few buildings in the GTT facility such as the warehouse and admin buildings with small roof catchments. The runoff from these buildings will flow directly or via downpipes to the surrounding ground catchments.

Surface runoff from the proposed ground catchment will be collected by various stormwater pits connected to the internal drainage network, where it will be directed to the bio-retention/detention basins prior to discharge to the Lawful Point of Discharge described in section 4.3.

No runoff from external catchments will report to the plant GTT plant area. The run off from the external access road and earthwork batter is not considered to be contaminated and reports back naturally to the Lawful Point of Discharge.

The drainage patterns are shown in Appendix B.

5.2.2 Intensity Frequency Distribution

The IFD data and temporal patterns used for the SWMM modelling has been obtained from the Bureau of Meteorology. Refer to Appendix C for the report from Australian Rainfall & Runoff Data Hub.

As per the requirements of section 5.6.2 of QUDM, design of detention basin and its outlet structures must be based on a range of storm and durations and appropriate temporal patterns in order to ensure the basin design satisfies all of its design objectives. Dynamic flow modelling must be used for this which is more accurate compared to the conventional rational method. The temporal patterns referred above were used for defining the rain gages in SSA. Figure 5-1 shows the critical storm gage derived from the temporal pattern for the sizing of the pond.

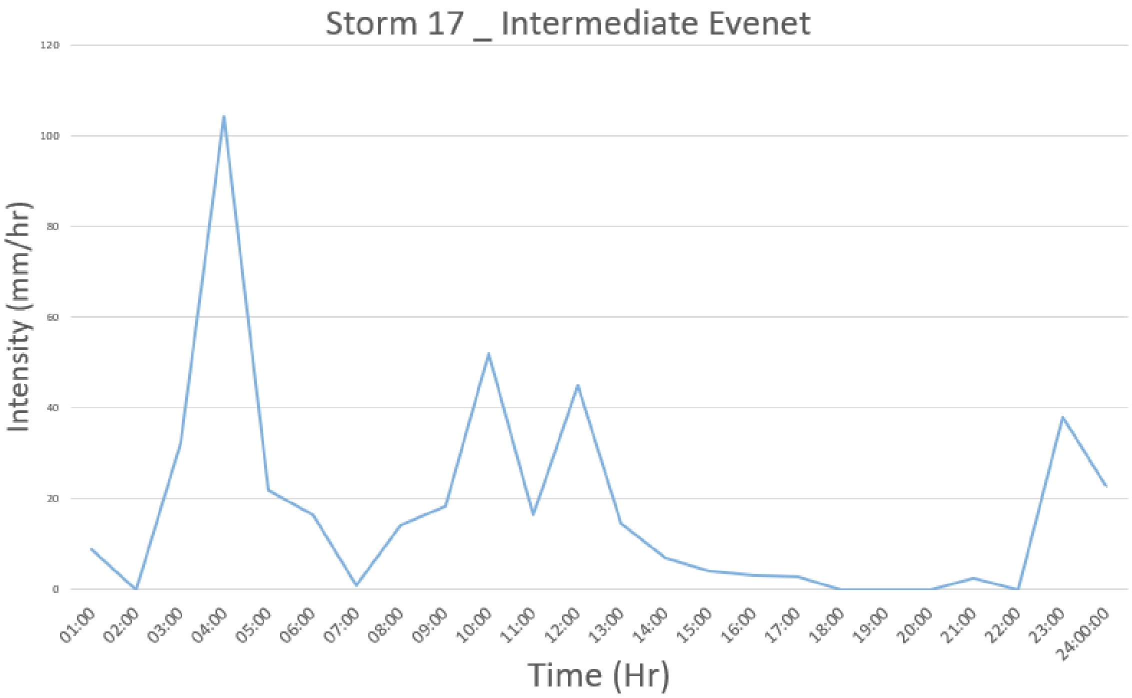


Figure 5-1 – Sample Temporal Pattern Storm Gage 1% AEP, 24-hours

however, the corresponding runoff from this storm distributions reporting to the ponds were smaller than the conventional Front-Loaded Storm events. Therefore, the following 24-hour Front-Loaded storm distribution was conservatively used for the SSA analysis and sizing of the ponds for the purpose of this plan The peak run off values from dynamic modelling using this distribution were comparable to the rational method.

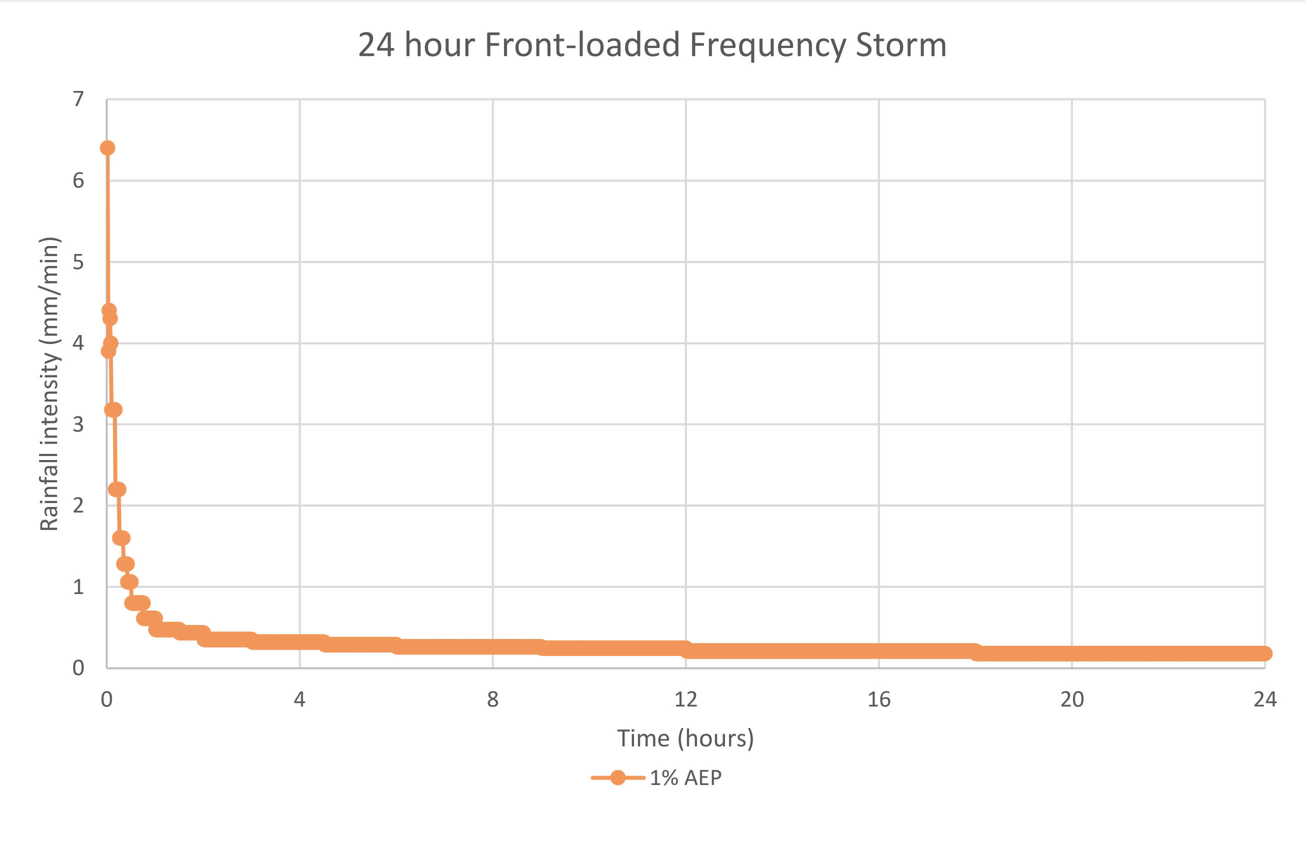


Figure 5-2 – 24-Hr Hyetograph 1% AEP, 24-hours

5.2.3 Initial and Continuous Losses

No initial and continuous losses were used for the SSA modelling.

5.2.4 On-Site Detention

For the post-development stormwater discharge conditions to match the pre-development conditions, it is proposed to incorporate an open detention basin with a maximum storage volume of 1600kL for the southern catchment and an open detention basin with a maximum storage volume of 6200kL for the northern catchment. The detention basins are to be located above ground within as described in section 4.3.

The proposed OSD basin for the southern catchment will have the following properties:

- Specified base area = 352m^2
- Specified internal depth = 3.5m
- Low flow orifice diameter = 0.45m
- Mid flow weir length = 1.80m
- Mid flow weir elevation = 1.70m
- High flow weir length = 3.00m
- High flow weir elevation = 2.90m
- Emergency overflow weir elevation from base of basin = 2.00m
- Required basin volume = 1100m^3
- Provided basin volume = 1600 m^3

The proposed OSD basin for the northern catchment will have the following properties:

- Specified base area = 1375m^2
- Specified internal depth = 3.5m
- Low flow orifice diameter = 0.60m
- Mid flow weir length = 1.80m
- Mid flow weir elevation = 1.40m
- High flow weir length = 3.50m
- High flow weir elevation = 2.90m
- Emergency overflow weir elevation from base of basin = 2.00m
- Required basin volume = 2400m^3
- Provided basin volume = 6200m^3

Note: The provided basin volumes are more than the required ones. It should be noted that maintenance ramps will be built inside these ponds which will reduce the live volumes of the ponds. During the detailed design the ponds will be optimised.

The detention basin will be designed to contain all flows up to a 1% AEP, 24-hours storm event and mitigated at or less than pre-development flows. Refer to Appendix B for the Site Levels and Drainage Plan which details the proposed on-site detention system.

5.3 COMPARISON OF PEAK FLOWS

The pre-development and post-development mitigated peak flow rates were compared for the catchments and are shown in Table 5-4 below.

<table>
<tr><th rowspan="4">ARI</th><th colspan="5">PEAK FLOWS (M^3/S)</th></tr>
<tr><th colspan="3">CATCHMENT #1.A</th><th colspan="2">CATCHMENT #2.A</th></tr>
<tr><th rowspan="2">PRE-DEVELOPMENT</th><th colspan="2">POST-DEVELOPMENT</th><th rowspan="2">PRE-DEVELOPMENT</th><th rowspan="2">POST-DEVELOPMENT</th></tr>
<tr><th>MITIGATED</th><th>UNMITIGATED</th></tr>
<tr><td>100</td><td>0.69</td><td>0.52</td><td>0.17</td><td>1.13</td><td>1.05</td></tr>
</table>

Table 5-4 – Comparison of Peak Flows

The SSA hydraulic modelling results have demonstrated that the proposed mitigation implemented will maintain pre-development flows (or less) LPD locations.

Refer to Appendix F for post-development SSA results.

Note: The unmitigated peak flow refers to the uncontaminated flow from the first 200m of the western access road as shown in Figure 5-3. A trench at the west side of this road concentrates the runoff on the road and discharge it at a spur drain which reports to Catchment #1. The sum of the mitigated and unmitigated flow from Catchment #1.A post development is equal to the predevelopment condition as shown in the table above.

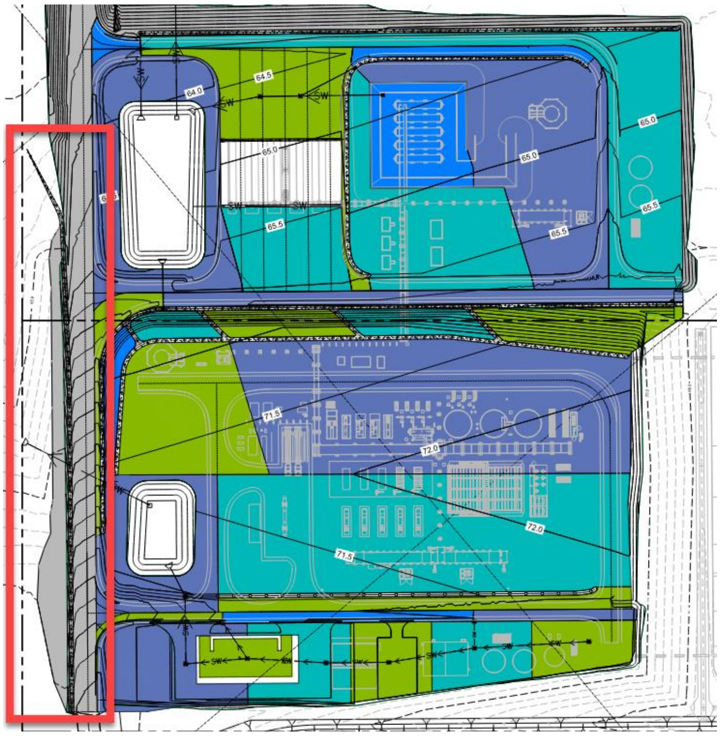


Figure 5-3 – Catchment area for Concentrated Uncontaminated runoff from Western Access Road (Red Box)

5.4 STORMWATER QUALITY

The adopted stormwater quality measures for the GTT plant are similar to those of the GEM facility as outlined is in GEM's SWM report no QLD01C0001-5600-EN-PLN-0001_B_IFR_01.

5.4.1 Construction Phase

Erosion and Sediment Control (ESC) Measures such as silt fences, diversion drains, drainage structure protection and dust control (clearing) will be implemented. Silt fences are to be erected along the boundary of the site and around the construction area. These fences are to be cleaned by the contractor when the capacity is reduced by 25%. Where possible, disturbance to the existing surface is to be limited to the immediate work area. The existing ground cover is not to be stripped until the contractor is ready for earthworks to begin.

Stockpiles and construction materials are not permitted to be stored within the road reserve and should be contained using silt fences. Diversion drains are to be provided at upstream catchments to reduce flows to earthworks areas. In any areas where flows could enter adjacent properties temporary stabilisation is to be provided.

All ESC measures are to be provided as soon as earthworks have commenced and staged to suit construction. The contractor is responsible for this action. A temporary construction exit is to be located at each entry point to the site and will be determined based on the stage of works being completed. The contractor is to ensure all dust tracked onto surrounding roads is immediately swept to remove silt/dust.

All new stormwater pits are to be protected from sediment infiltration by wrapping new pits and grates in geofabric or covering appropriately with timber board. Silt fences are to remain in place during the maintenance period until the site is established (80% ground cover).

Potential sources of contaminants identified for the construction phase of the development are outlined in Table 6.1 together with proposed stormwater quality improvement devices, management, and maintenance procedures.

POLLUTANT	POTENTIAL SOURCE	MANAGEMENT / MAINTENANCE PROCEDURE	PROPOSED TREATMENT DEVICE AND MAINTENANCE PROCEDURE
Sediment & Eroded material	Excavated material, fill material, exposed ground, stockpiles of material	Provision of sediment and silt barriers to the site drainage entry and exit points	Sand filled filter socks. Removal of excess sand/silt build-up at regular intervals and after every storm
Dust	Stockpiles of material, exposed ground	Covering the material or wetting it down at regular intervals	Coverage of material with plastic, geotextile, surface binding agents or regular watering
Litter	Refuse generated by staff	Construction waste is to be cleaned off the site area and disposed of into an industrial bin then removed by a refuse collection contractor	Industrial bin is to be provided within the construction area - to be emptied on at least a weekly basis
Concrete	Washing of concrete trucks/tools to remove wet/unused concrete	Provision of a closed area onsite for washing off concrete slurries	Liquids to be removed by a waste collection contractor. Solids to be placed into a refuse bin
Surfactants (detergents)	Washing down operations on hardstand area using detergent	No cleaning of vehicles will be permitted on site	Monitoring & prevention

POLLUTANT	POTENTIAL SOURCE	MANAGEMENT / MAINTENANCE PROCEDURE	PROPOSED TREATMENT DEVICE AND MAINTENANCE PROCEDURE
Chemical (Paints, thinners etc.)	Typically this may occur due to spillage of product	Where spills occur, the containment area is to stop escape. The material is to be treated (as required) and removed and cleaned by a licensed contractor. Minor spillage outside this area shall be cleaned up with cloths and disposed of to waste via the industrial bin	A temporary containment area. This is to be impermeable and of a size to permit mixing/transfer, and with a storage volume of twice the largest container used. Treatment of spills is to occur on site. No discharge of treated water to the stormwater system is to occur without council approval. Incidents are to be reported to the EPA
Wastewater	Spillage from the relocation of the existing sewerage reticulation	A licensed contractor shall remove any residue sewage from unused pipes and contaminated soils are to be disposed of via the industrial bin	No leakage is to be permitted to enter the groundwater or discharge to the stormwater system

Table 5-5 – Potential Containments and Proposed Treatments

5.4.2 Operational Phase

5.4.2.1 State Planning Policy Assessment

The purpose of this sub section is to determine if State Planning Policy (SPP 2017) stormwater quality requirements, as set out by the Department of Environment and Resource Management, will be triggered for this development. Refer to Table 5-6 for the State Planning Policy Checklist for stormwater quality.

MATERIAL CHANGE OF USE (MCU)	Y/N?
MCU for an urban purpose that involves premises ≥ 2500m^2	Y
AND Will result in 6 or more dwellings	N
OR Will result in impervious area greater than 25% of the net developable are	Y

Table 5-6 – State Planning Policy Checklist

The development has been assessed against the latest State Planning Policy 2017 (SPP 2017). The proposed development will entail the material change of use for urban purposes, which will involve a land area greater than 2,500m^2 and greater than 25% impervious. Consequently, State Planning Policy 2017 (SPP 2017) is triggered.

Water quality objectives (WQO's) for Central Queensland (south) as set out in State Planning Policy 2017 (SPP 2017) should be achieved by identifying and adopting best practise techniques in accordance with the abovementioned guidelines. Refer to Table 5-7 for the target WQO's.

CONTMINANT	Minimum Mean Annual **LOAD REDUCTION**
Total Suspended Solids (TSS)	≥ 85%
Total Phosphorus (TP)	≥ 60%
Total Nitrogen (TN)	≥ 45%
Gross Pollutants (GP)	≥ 90%

Table 5-7 – Minimum Mean Annual Load Reduction

5.4.2.2 Proposed Treatment for hardstand and paved areas

Surface runoff from the hardstand and paved areas will be collected by various pits and drains. The internal drainage networks will subsequently direct flow to the end-of-line bio-detention basins for treatment. runoff described above will then discharge to the lawful point of discharge.

Figure 5-4 shows a typical cross section of a bio-detention basin which has been incorporated into the design of the detention ponds for the GEM facility. Similar concept will be followed during the detailed design of detention ponds for GTT plant.

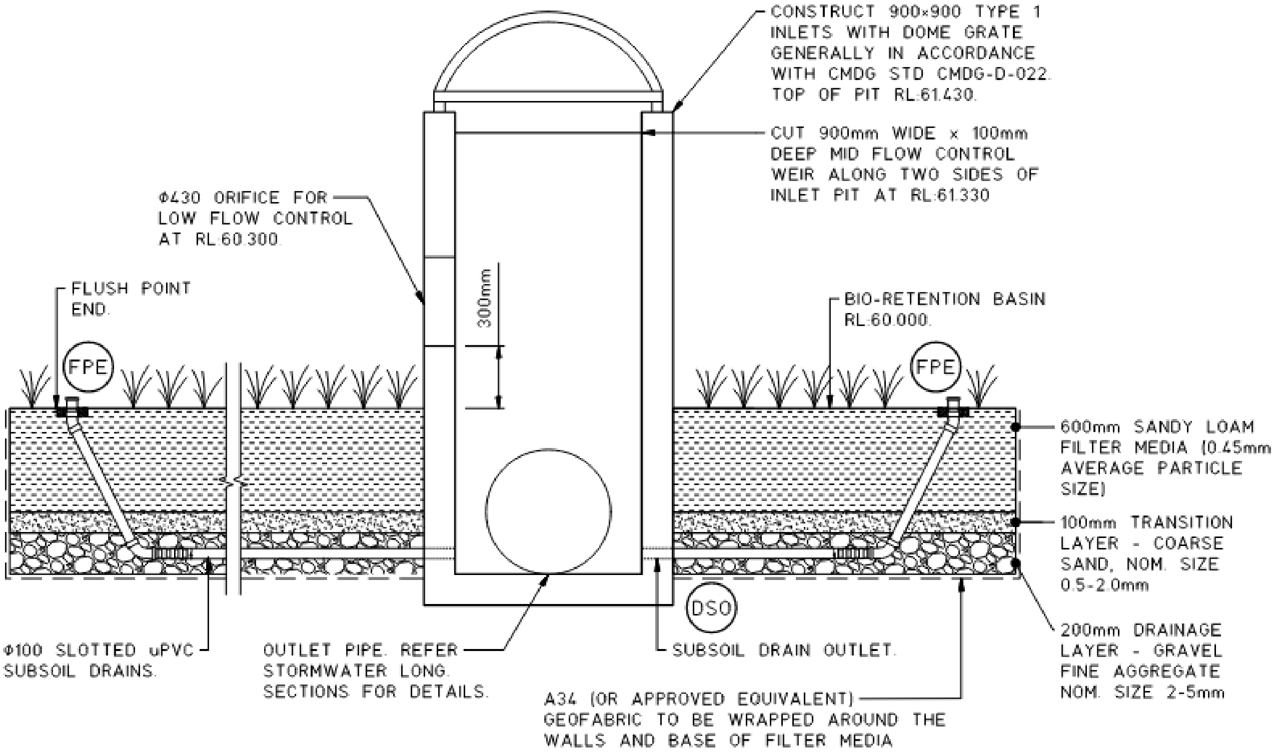


Figure 5-4 – Typical Cross Section of Bio-Detention Basin

For preliminary sizing of the bio-basins the curves below which show the pollutant removal performance expected for bioretention basins were used. The curves are based on the performance of the system at the reference site and were derived using the Model for Urban Stormwater improvement Conceptualisation (MUSIC)(eWater, 2009, Model for Urban Stormwater Improvement Conceptualisation (MUSIC) User Manual, Version 4.0, September).

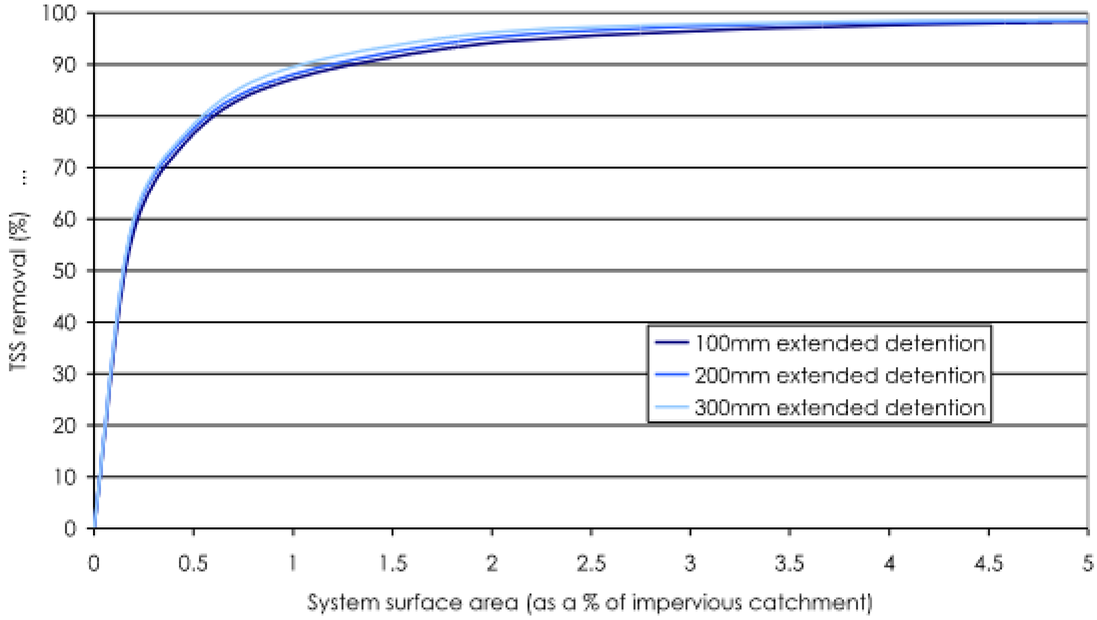


Figure 5-5 – TSS removal in bioretention systems with varying extended detention

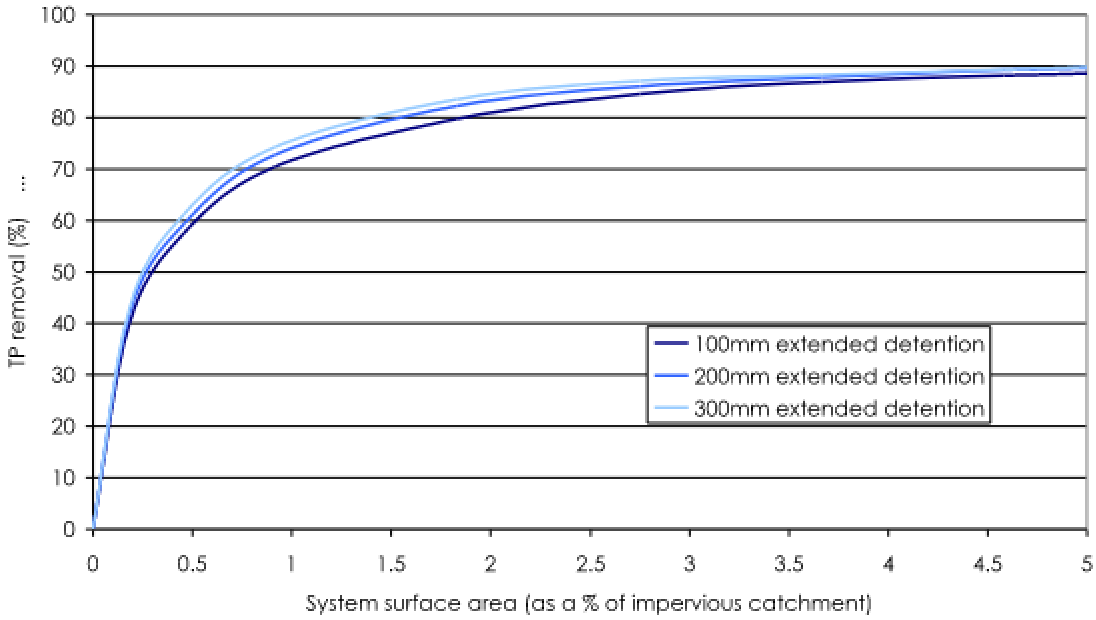


Figure 5-6 – TP removal in bioretention systems with varying extended detention

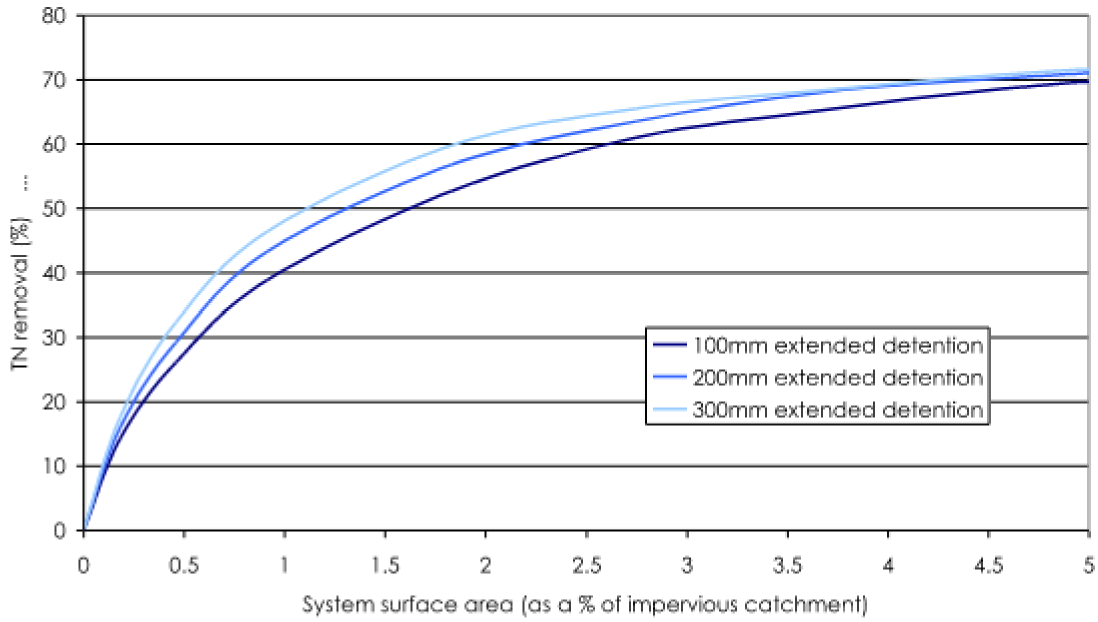


Figure 5-7 – TN removal in bioretention systems with varying extended detention

The curves were derived assuming the systems receive direct runoff (i.e. no pre-treatment) and have the following characteristics:

- Hydraulic conductivity of 36mm/hr
- Filtration media depth of 600 mm
- Particle size of 0.45 mm

These curves can be used to check the expected performance of the bioretention system for removal of TSS, TP and TN. Table 5-8 summarises the bio-basins pollutant removal capacity which shows that the pollutant reduction objectives are met for all contaminants given in Table 5-7.

To achieve the gross pollutant reduction objectives, measures such as pollutant traps will be implemented during the detailed design.

	BASIN #1	BASIN #2
A1= Bio-Detention Basin Area (m^2)	352	1375
A2= Total Impervious Area (m^2)	24000	47500
a=A1/A2	1.47	2.89
TSS Removal Capacity	90%	95%
TP Removal Capacity	75%	83%
TN Removal Capacity	52%	65%

Table 5-8 – Bio-Basins Retention Capacity

6 FLOODING

A Flood Hazard Overlay Map was obtained from Gladstone Regional Council's Online Mapping database confirming that the site is unaffected by river, creek/waterway and overland flow flooding.

Refer to Appendix G for the GRC Flood Map.

7 CONCLUSION

The proposed GEM H2 Test Train (GTT) at the Gladstone Electrolyser Manufacturing (GEM) precinct (Lot 4 Euroa Circuit, Gladstone) has been assessed for its impact on the quantity and quality of stormwater drainage.

The lawful point of discharge is the existing north-west wetland pond constructed for the Aldoga Aluminium Refinery.

Onsite detention will be provided in the form of two detention basins to attenuate post development peak flow rates and mitigate the risk of flooding to properties and infrastructure adjacent to, and downstream of the subject site. The detention basins will be designed to contain all flows up to a 1 in 100 AEP, 24-hours storm event.

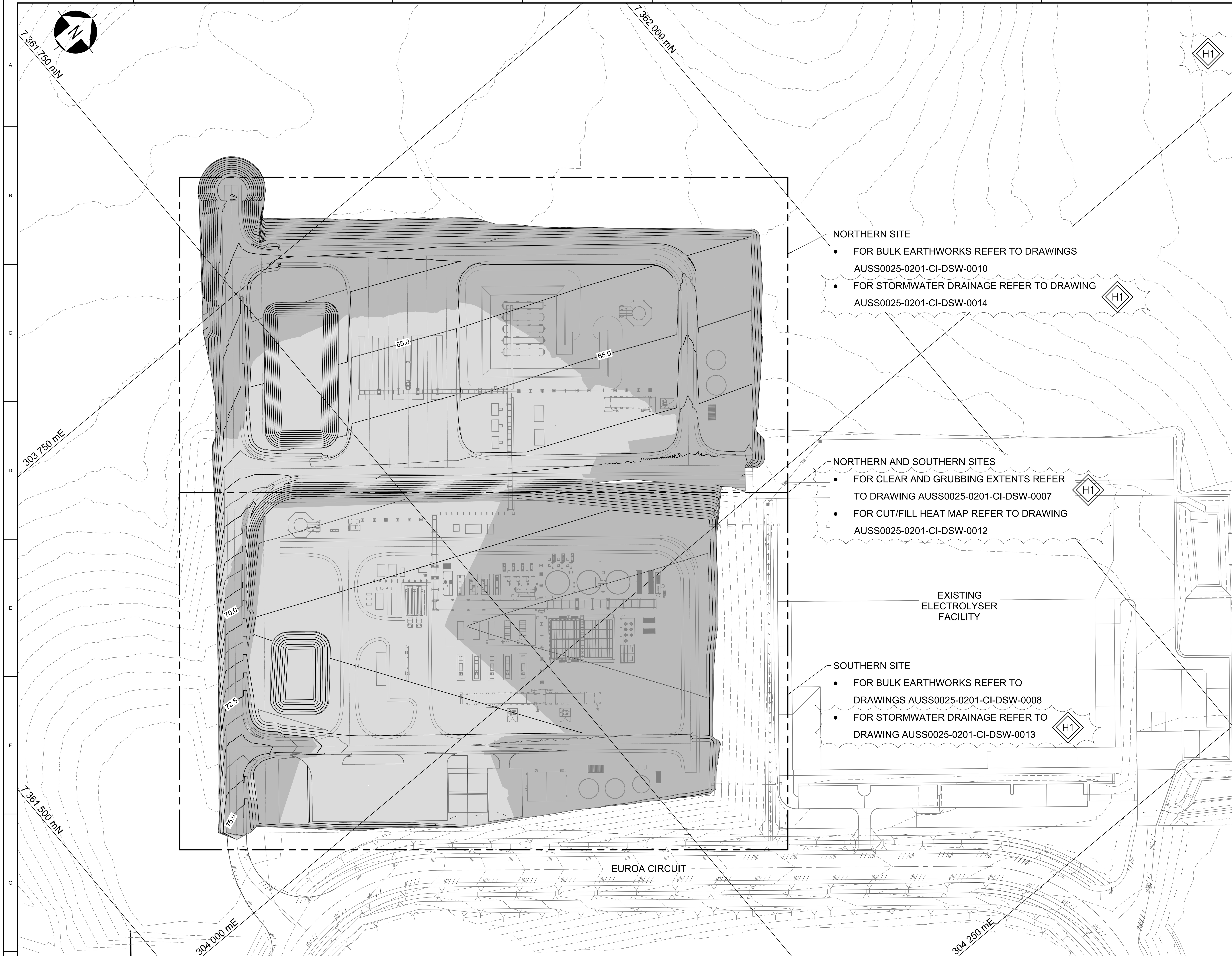
Sediment generated during the construction phase shall be dealt with in accordance with an Erosion and Sediment Control Plan to be kept on site during the construction phase developed by the project Superintendent.

Contaminated oily water from the refuelling area and the processing plant will be treated by oily water treatment systems and disposed to the detention ponds.

Peak flow from the firewater was assumed not coincide with a design storm. The proposed development triggers the State Planning Policy 2017 (SPP 2017). The water quality objectives (WQO's) for Central Queensland (south) have therefore been achieved by treating the roof and surface stormwater runoff via two bio-retention, prior to discharging to the Lawful Points of Discharge.

The subject site is unaffected by flooding as described in section 6 of this report.

APPENDIX A BULK EARTHWORK DESIGN



KEY PLAN

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH GENERAL NOTES AND DRAWING INDEX AS PER DRAWING AUSS0025-0201-CI-DSW-0002 (H1)
2. ALL COORDINATES AND DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED
   - HORIZONTAL DATUM IS MAP GRID OF AUSTRALIA - MGA 94 ZONE 56
   - VERTICAL DATUM IS AUSTRALIAN HEIGHT DATUM - AHD
3. ALL EARTHWORKS SHALL COMPLY WITH TECHNICAL SPECIFICATION AUSS0025-0201-CI-SPC-0001 "EARTHWORKS AND SITE PREPARATION ENGINEERING SPECIFICATION"
4. NATURAL GROUND SURVEY DATA HAS BEEN SUPPLIED BY FFI VIA A ONE DRIVE TRANSFER FILE RECEIVED 22-08-12 - 22011 - MCE CIVIL BASE.dwg
5. FFI GEM CENTRE ELECTROLYSER FACILITY SURVEY DATA HAS BEEN COMPILED BY USING TWO FILES RECEIVED FROM FFI. FIRST FILE RECEIVED VIA ONE DRIVE TRANSFER 22-08-12 - 22011 - FSL TRIANGLES.dwg. SECOND FILE Pad 1 Ascon 221212.dwg RECEIVED MARCH 17, 2023

LEGEND

EXISTING:

--- 65.0 ---	SURFACE CONTOUR MAJOR - (5.0 m INTERVAL)
	SURFACE CONTOUR MINOR - (1.0 m INTERVAL)
	DRAINAGE SWALE
— SW —	STORMWATER CULVERT

PROPOSED:

— 65.0 —	SURFACE CONTOUR MAJOR - (2.5 m INTERVAL)
	SURFACE CONTOUR MINOR - (0.5 m INTERVAL)
	CUT AREA
	FILL AREA

THE FOLLOWING ESTIMATED QUANTITIES ARE FOR GENERAL INFORMATION ONLY. THEY SHALL NOT BE USED FOR ANY CONTRACTUAL NEGOTIATIONS OR DETERMINATIONS UNLESS SPECIFIED OTHERWISE

DESCRIPTION	UNIT	QUANTITIY
BULK EARTHWORKS		
CUT	m^3	62 913.97
FILL	m^3	42 596.93

HOLDS:

H1. PENDING ISSUE OF DRAWING

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AUSS0025-0201-CI-DSW-0013	BULK EARTHWORKS - SOUTHERN SITE - DRAINAGE PLAN							
AUSS0025-0201-CI-DSW-0012	BULK EARTHWORKS - CUT/FILL HEAT MAP							
AUSS0025-0201-CI-DSW-0010	BULK EARTHWORKS - BULK PAD NORTHERN SITE - PLAN							
AUSS0025-0201-CI-DSW-0008	BULK EARTHWORKS - BULK PAD SOUTHERN SITE - PLAN							
AUSS0025-0201-CI-DSW-0007	BULK EARTHWORKS - CLEARING & GRUBBING - PLAN							
AUSS0025-0201-CI-DSW-0002	BULK EARTHWORKS - GENERAL NOTES & DRAWING LIST							
AUSS0025-0201-GN-DSW-0001	GENERAL ARRANGEMENT - SITE PLAN	A	16JUN23	ISSUED FOR APPROVAL (STORMWATER MANAGEMENT PLAN)	RDS	DB	SG	JG

FORTESCUE FUTURE INDUSTRIES

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CONTRACT No.	AUSS0025C0001
VENDOR/DESIGNER DRG No.	46301-100-DRG-CI-006
REV:	A
PROJECT No:	AUSS0025
TITLE:	GLADSTONE TEST TRAIN
	FORTESCUE FUTURE INDUSTRIES ALDOGA GREEN INDUSTRIAL PRECINCT BULK EARTHWORKS KEY PLAN
SIZE	A1
SCALE:	1:1000
DRG No:	AUSS0025-0201-CI-DSW-0006
REV:	A

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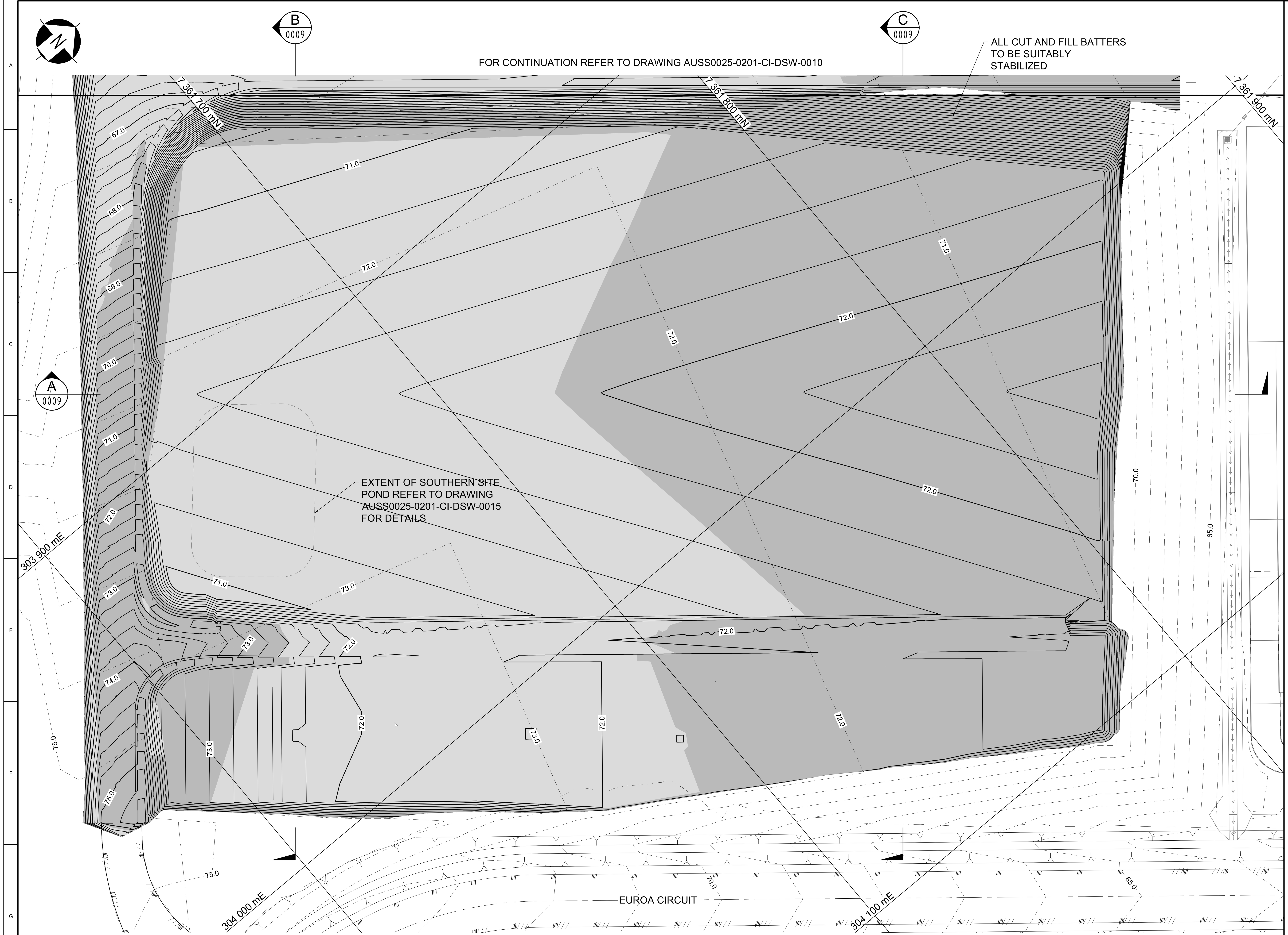

PLAN - SOUTHERN SITE BULK EARTHWORKS

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH KEY PLAN AND NOTES ON DRAWING AUSS0025-0201-CI-DSW-0006

LEGEND

EXISTING:

- 65.0 SURFACE CONTOUR MAJOR - (5.0 m INTERVAL)
- SURFACE CONTOUR MINOR - (1.0 m INTERVAL)
- DRAINAGE SWALE
- SW STORMWATER CULVERT

PROPOSED:

- 65.0 SURFACE CONTOUR MAJOR - (1.0 m INTERVAL)
- SURFACE CONTOUR MINOR - (0.2 m INTERVAL)
- CUT AREA
- FILL AREA

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SCALE OF METRES 1:500

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AUSS0025-0201-CI-DSW-0010	BULK EARTHWORKS - BULK PAD NORTHERN SITE - PLAN							
AUSS0025-0201-CI-DSW-0009	BULK EARTHWORKS - BULK PAD SOUTHERN SITE - SECTIONS							
AUSS0025-0201-CI-DSW-0006	BULK EARTHWORKS - KEY PLAN							
AUSS0025-0201-CI-DSW-0002	BULK EARTHWORKS - GENERAL NOTES & DRAWING INDEX	A	16JUN23	ISSUED FOR APPROVAL (STORMWATER MANAGEMENT PLAN)	RDS	DB	SG	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

CONTRACT No. AUSS0025C0001

VENDOR/DESIGNER DRG No. 46301-100-DRG-CI-008 REV: A

PROJECT No: AUSS0025

TITLE: GLADSTONE TEST TRAIN

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FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
BULK EARTHWORKS
BULK PAD SOUTHERN SITE - PLAN

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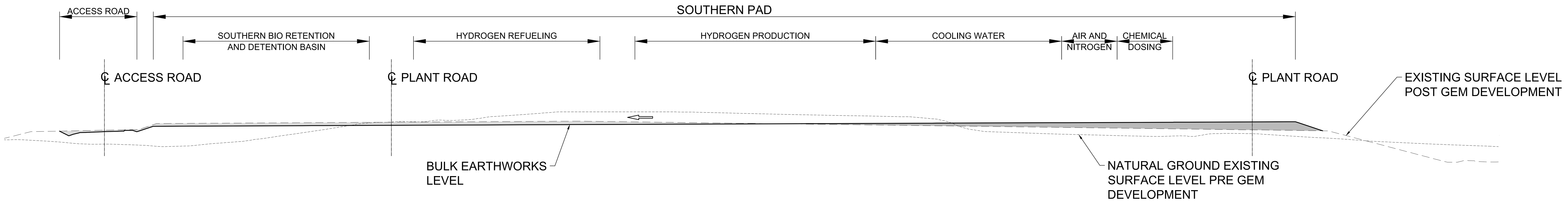

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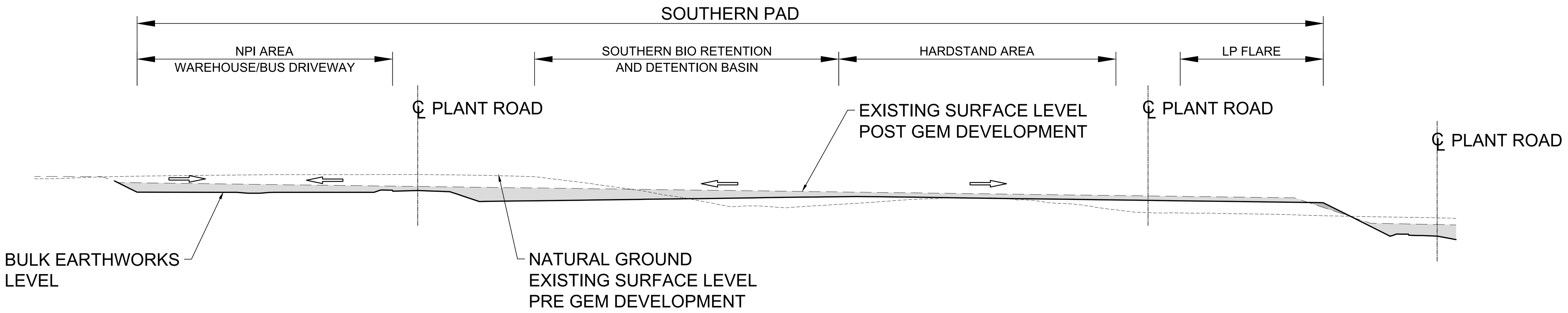

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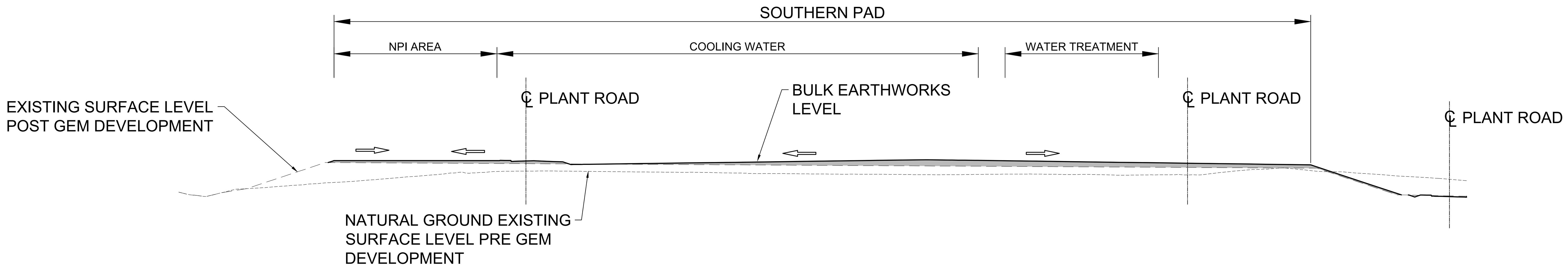

SECTION C 0008
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NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH KEY PLAN AND NOTES ON DRAWING AUSS0025-0201-CI-DSW-0006

LEGEND

CUT AREA

FILL AREA

PROPOSED PAD SLOPE

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SCALE OF METRES 1:500

REF DRG No.	TITLE	REV	DATE	DESCRIPTION	DRA	CHK	ENG	APP
AUSS0025-0201-CI-DSW-0008	BULK EARTHWORKS - BULK PAD SOUTHERN SITE - PLAN							
AUSS0025-0201-CI-DSW-0006	BULK EARTHWORKS - KEY PLAN							
AUSS0025-0201-CI-DSW-0002	BULK EARTHWORKS - GENERAL NOTES & DRAWING INDEX	A	16JUN23	ISSUED FOR APPROVAL (STORMWATER MANAGEMENT PLAN)	RDS	DB	SG	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

CONTRACT No. AUSS0025C0001

VENDOR/DESIGNER DRG No. 46301-100-DRG-CI-009 REV: A

PROJECT No: AUSS0025

TITLE: GLADSTONE TEST TRAIN

FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
BULK EARTHWORKS
BULK PAD SOUTHERN SITE - SECTIONS

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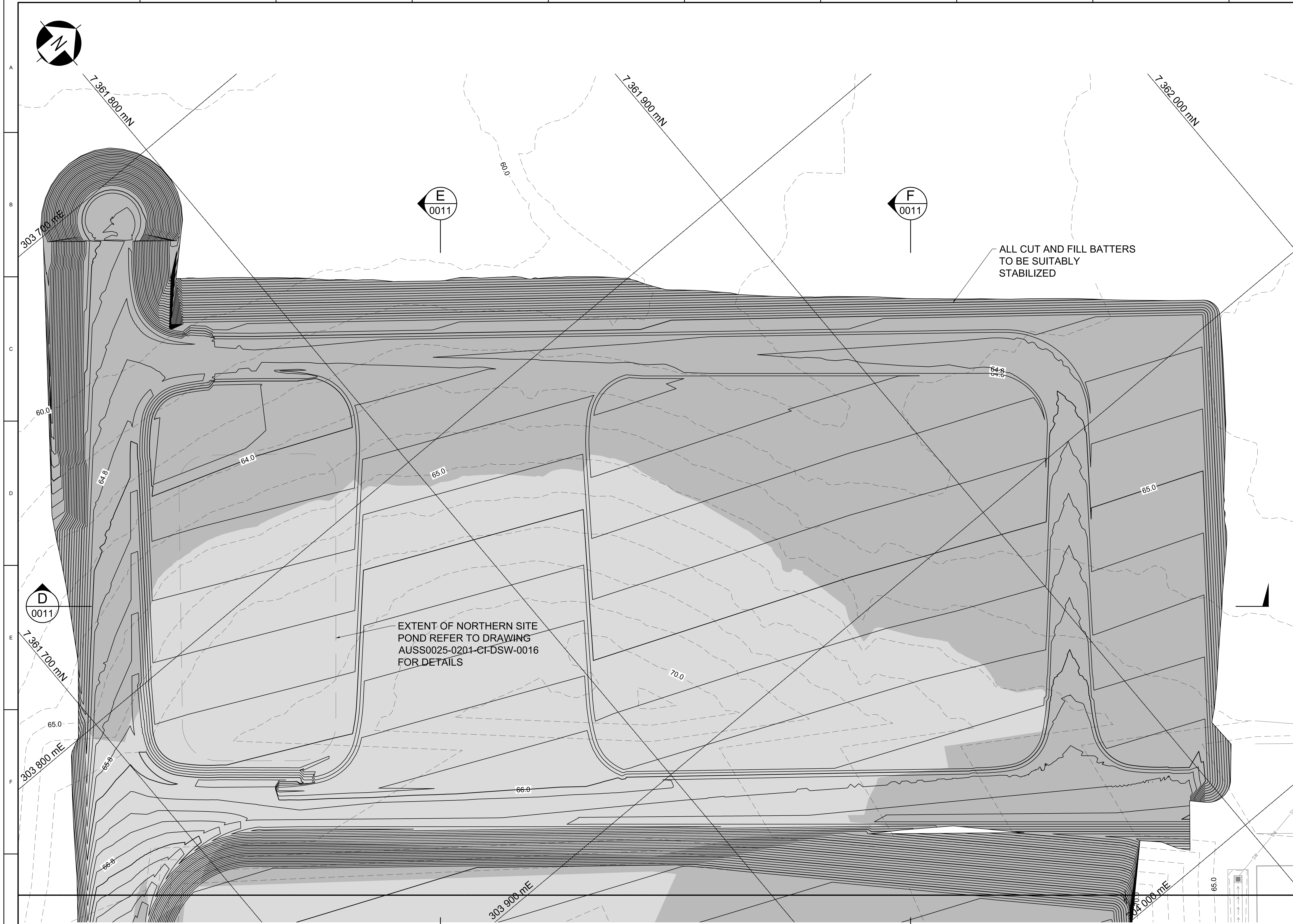

FOR CONTINUATION REFER TO DRAWING AUSS0025-0201-CI-DSW-0008

PLAN - NORTHERN SITE BULK EARTHWORKS

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH KEY PLAN AND NOTES ON DRAWING AUSS0025-0201-CI-DSW-0006

LEGEND

EXISTING:

- 65.0 — SURFACE CONTOUR MAJOR - (5.0 m INTERVAL)
- SURFACE CONTOUR MINOR - (1.0 m INTERVAL)
- DRAINAGE SWALE
- SW — STORMWATER CULVERT

PROPOSED:

- 65.0 — SURFACE CONTOUR MAJOR - (1.0 m INTERVAL)
- SURFACE CONTOUR MINOR - (0.2 m INTERVAL)
- CUT AREA
- FILL AREA

10 0 10 20 30 40 50
SCALE OF METRES 1:500

REF DRG No.	TITLE	REV	DATE	DESCRIPTION	DRA	CHK	ENG	APP
AUSS0025-0201-CI-DSW-0016	BULK EARTHWORKS - NORTHERN SITE POND - PLAN & DETAILS							
AUSS0025-0201-CI-DSW-0011	BULK EARTHWORKS - BULK PAD NORTHERN SITE - SECTIONS							
AUSS0025-0201-CI-DSW-0008	BULK EARTHWORKS - BULK PAD SOUTHERN SITE - PLAN							
AUSS0025-0201-CI-DSW-0006	BULK EARTHWORKS - KEY PLAN							
AUSS0025-0201-CI-DSW-0002	BULK EARTHWORKS - GENERAL NOTES & DRAWING INDEX	A	16JUN23	ISSUED FOR APPROVAL (STORMWATER MANAGEMENT PLAN)	RDS	DB	SG	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

CONTRACT No. AUSS0025C0001

VENDOR/DESIGNER DRG No. 46301-100-DRG-CI-010 REV: A

PROJECT No: AUSS0025

TITLE: GLADSTONE TEST TRAIN

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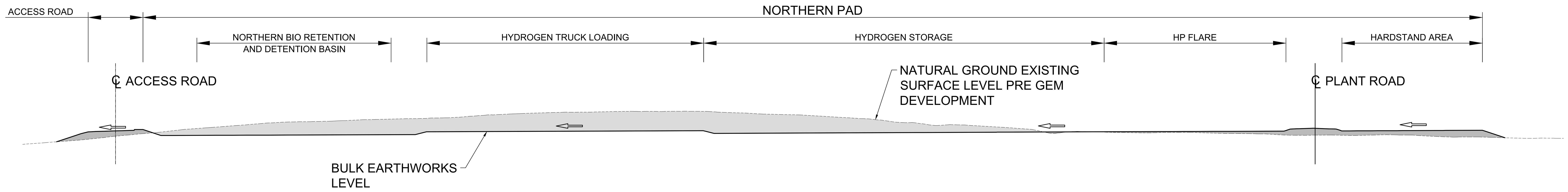
FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
BULK EARTHWORKS
BULK PAD NORTHERN SITE - PLAN

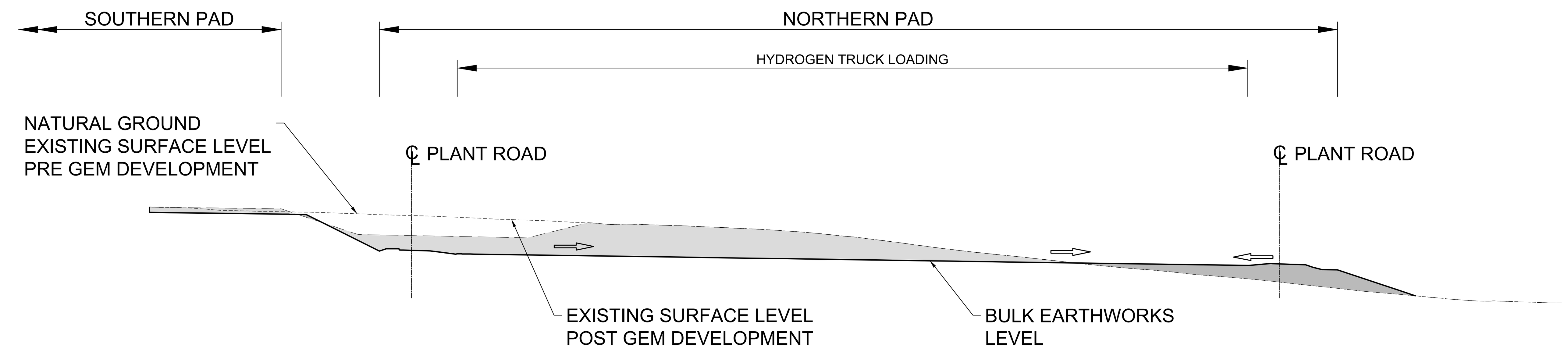
A1 SCALE: 1:500 DRG No: AUSS0025-0201-CI-DSW-0010 REV: A

$FILE$ $TIME$ $DATE$

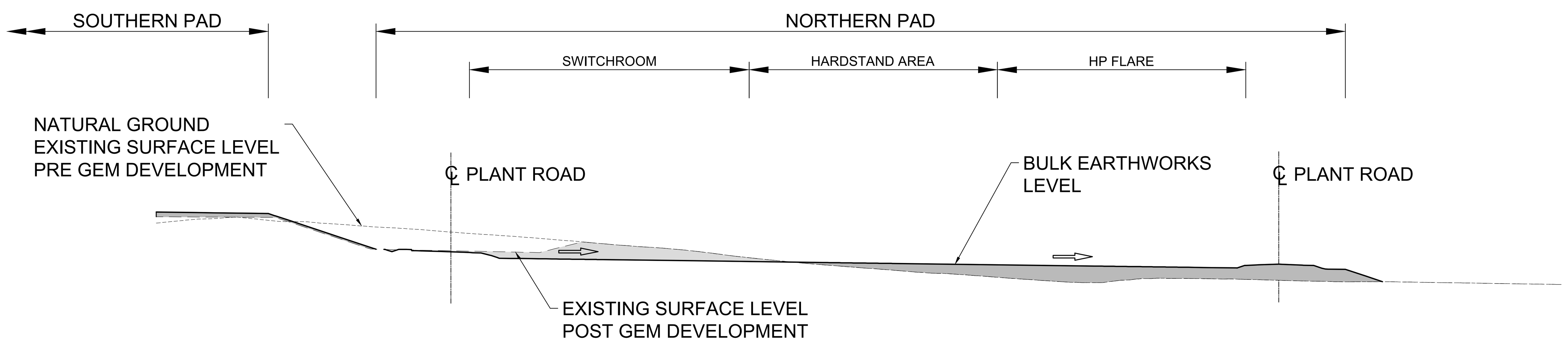
FFI-0000-EG-TEM-0003_2_WIP



SECTION D
1:500
0010



SECTION E
1:500
0010



SECTION F
1:500
0010

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH KEY PLAN AND NOTES ON DRAWING AUSS0025-0201-CI-DSW-0006

LEGEND

- CUT AREA
- FILL AREA
- PROPOSED PAD SLOPE

10 0 10 20 30 40 50
SCALE OF METRES 1:500

REF DRG No.	TITLE	REV	DATE	DESCRIPTION	DRA	CHK	ENG	APP
AUSS0025-0201-CI-DSW-0010	BULK EARTHWORKS - BULK PAD NORTHERN SITE - PLAN							
AUSS0025-0201-CI-DSW-0006	BULK EARTHWORKS - KEY PLAN							
AUSS0025-0201-CI-DSW-0002	BULK EARTHWORKS - GENERAL NOTES & DRAWING INDEX	A	12JUN23	ISSUED FOR APPROVAL (STORMWATER MANAGEMENT PLAN)	RDS	DB	SG	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

CONTRACT No. AUSS0025C0001

VENDOR/DESIGNER DRG No. 46301-100-DRG-CI-011

REV: A

PROJECT No: AUSS0025

TITLE: GLADSTONE TEST TRAIN

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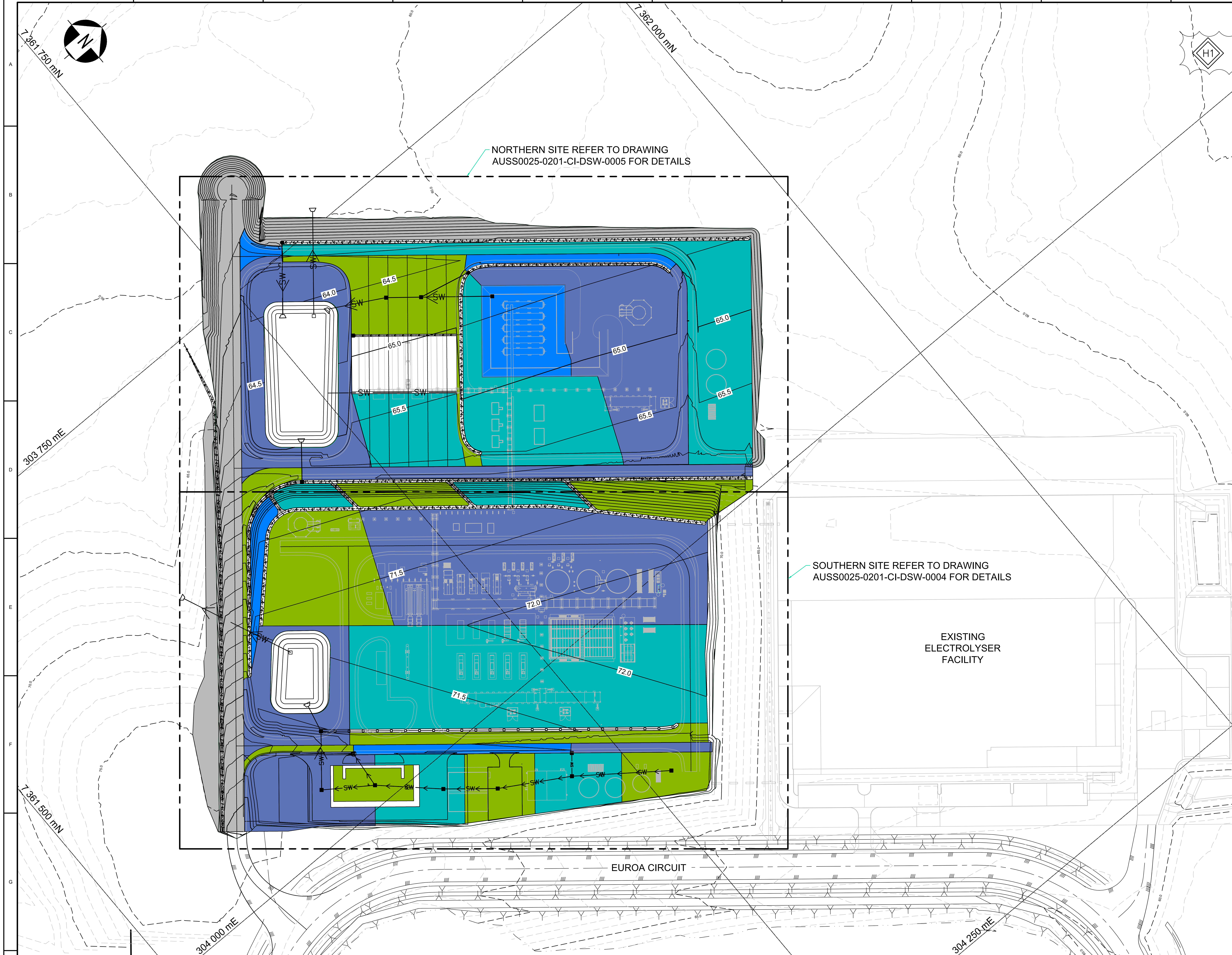
FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
BULK EARTHWORKS
NORTHERN SITE - SECTIONS

A1 SCALE: 1:500 DRG No: AUSS0025-0201-CI-DSW-0011 REV: A

$FILE$ $TIME$ $DATE$

FFI-0000-EG-TEM-0003_2_WIP

APPENDIX B STORMWATER DRAINAGE CONCEPT



CONCEPT DRAINAGE - KEY PLAN

NOTES:

H1

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH GENERAL NOTES AND DRAWING INDEX AS PER DRAWING AUSS0025-0201-CI-DSW-0002
2. ALL COORDINATES AND DIMENSIONS ARE IN METERS UNLESS OTHERWISE NOTED
   - HORIZONTAL DATUM IS MAP GRID OF AUSTRALIA - MGA 94 ZONE 56
   - VERTICAL DATUM IS AUSTRALIAN HEIGHT DATUM - AHD
3. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH THE "STORMWATER MANAGEMENT PLAN" AUSS0025-0201-CI-PLN-0001.
4. NATURAL GROUND SURVEY DATA HAS BEEN SUPPLIED BY FFI VIA A ONE DRIVE TRANSFER FILE RECEIVED 22-08-12 - 22011 - MCE CIVIL BASE.dwg
5. FFI GEM CENTRE ELECTROLYSER FACILITY SURVEY DATA HAS BEEN COMPILED BY USING TWO FILES RECEIVED FROM FFI. FIRST FILE RECEIVED VIA ONE DRIVE TRANSFER 22-08-12 - 22011 - FSL TRIANGLES.dwg. SECOND FILE Pad 1 Ascon 221212.dwg RECEIVED MARCH 17, 2023

LEGEND

EXISTING:

- 65.0 SURFACE LEVEL MAJOR CONTOUR - 5.0 m
- SURFACE LEVEL MINOR CONTOUR - 1.0 m
- DRAINAGE SWALE
- SW STORMWATER CULVERT

PROPOSED:

- 65.0 SURFACE LEVEL MAJOR CONTOUR - 2.5 m
- SURFACE LEVEL MINOR CONTOUR - 0.5 m
- SURFACE TABLE/VEE DRAIN
- VEE DRAIN LINED
- BOX CULVERT
- SW PROPOSED STORMWATER
- PROPOSED CATCHMENT AREA
- PROPOSED CATCHMENT AREA
- PROPOSED CATCHMENT AREA
- PROPOSED CATCHMENT AREA
- PROPOSED RUN OFF DIRECTION

HOLDS:

H1. PENDING ISSUE OF DRAWING

20 0 20 40 60 80 100

SCALE OF METRES 1:1000

REF DRG No.	TITLE	REV	DATE	DESCRIPTION	DRA	CHK	ENG	APP
AUSS0025-0201-CI-DSW-0005	BULK EARTHWORKS - CONCEPT DRAINAGE PLAN - NORTHERN SITE							
AUSS0025-0201-CI-DSW-0004	BULK EARTHWORKS - CONCEPT DRAINAGE PLAN - SOUTHERN SITE							
AUSS0025-0201-CI-DSW-0002	BULK EARTHWORKS - GENERAL NOTES & DRAWING INDEX							
AUSS0025-0201-GN-DSW-0001	GENERAL ARRANGEMENT - SITE PLAN	A	16JUN23	ISSUED FOR APPROVAL (STORMWATER MANAGEMENT PLAN)	RDS	DB	SG	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

CONTRACT No. AUSS0025C0001

VENDOR/DESIGNER DRG No. 46301-100-DRG-CI-003

REV: A

PROJECT No: AUSS0025

TITLE: GLADSTONE TEST TRAIN

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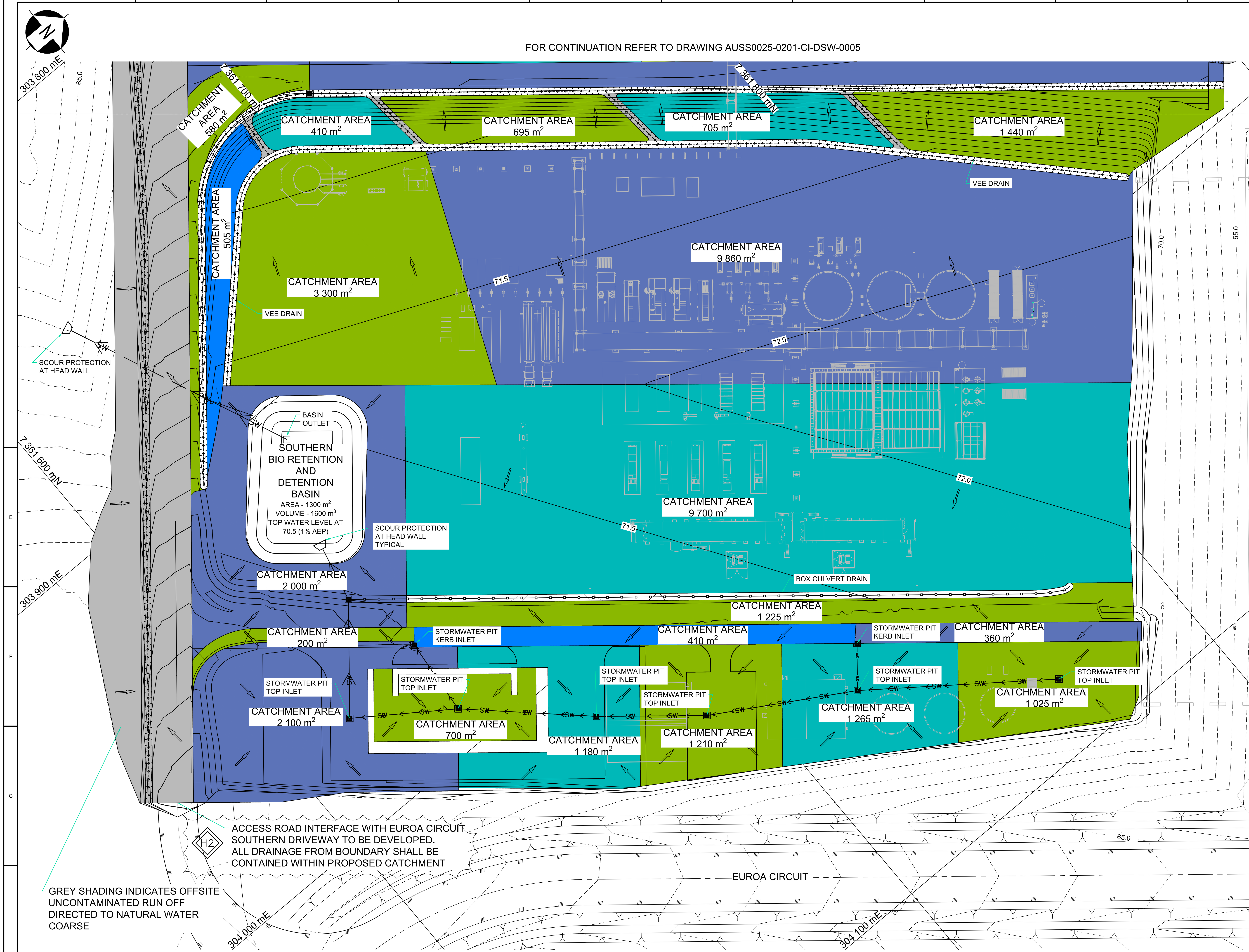
FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
BULK EARTHWORKS
CONCEPT DRAINAGE - KEY PLAN

A1 SCALE: 1:1000 DRG No: AUSS0025-0201-CI-DSW-0003 REV: A

$FILE$ $TIME$ $DATE$

FFI-0000-EG-TEM-0003_2_WIP

FOR CONTINUATION REFER TO DRAWING AUSS0025-0201-CI-DSW-0005



CONCEPT DRAINAGE - SOUTHERN SITE

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH KEY PLAN AND NOTES ON DRAWING AUSS0025-0201-CI-DSW-0003

LEGEND

EXISTING:

- 65.0 SURFACE LEVEL MAJOR CONTOUR - 5.0 m
- SURFACE LEVEL MINOR CONTOUR - 1.0 m
- DRAINAGE SWALE
- SW STORMWATER CULVERT

PROPOSED:

- 65.0 SURFACE LEVEL MAJOR CONTOUR - 2.5 m
- SURFACE LEVEL MINOR CONTOUR - 0.5 m
- SURFACE TABLE/VEE DRAIN
- VEE DRAIN LINED
- BOX CULVERT
- SW PROPOSED STORMWATER
- PROPOSED CATCHMENT AREA
- PROPOSED CATCHMENT AREA
- PROPOSED CATCHMENT AREA
- PROPOSED CATCHMENT AREA
- PROPOSED RUN OFF DIRECTION

HOLDS:

H2. PENDING DEVELOPMENT OF ACCESS ROAD DESIGN

10 0 10 20 30 40 50
SCALE OF METRES 1:500

REF DRG No.	TITLE	REV	DATE	DESCRIPTION	DRA	CHK	ENG	APP
AUSS0025-0201-CI-DSW-0005	BULK EARTHWORKS - CONCEPT DRAINAGE PLAN - NORTHERN SITE							
AUSS0025-0201-CI-DSW-0003	BULK EARTHWORKS - CONCEPT DRAINAGE PLAN - KEY PLAN	A	16JUN23	ISSUED FOR APPROVAL (STORMWATER MANAGEMENT PLAN)	RDS	DB	SG	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

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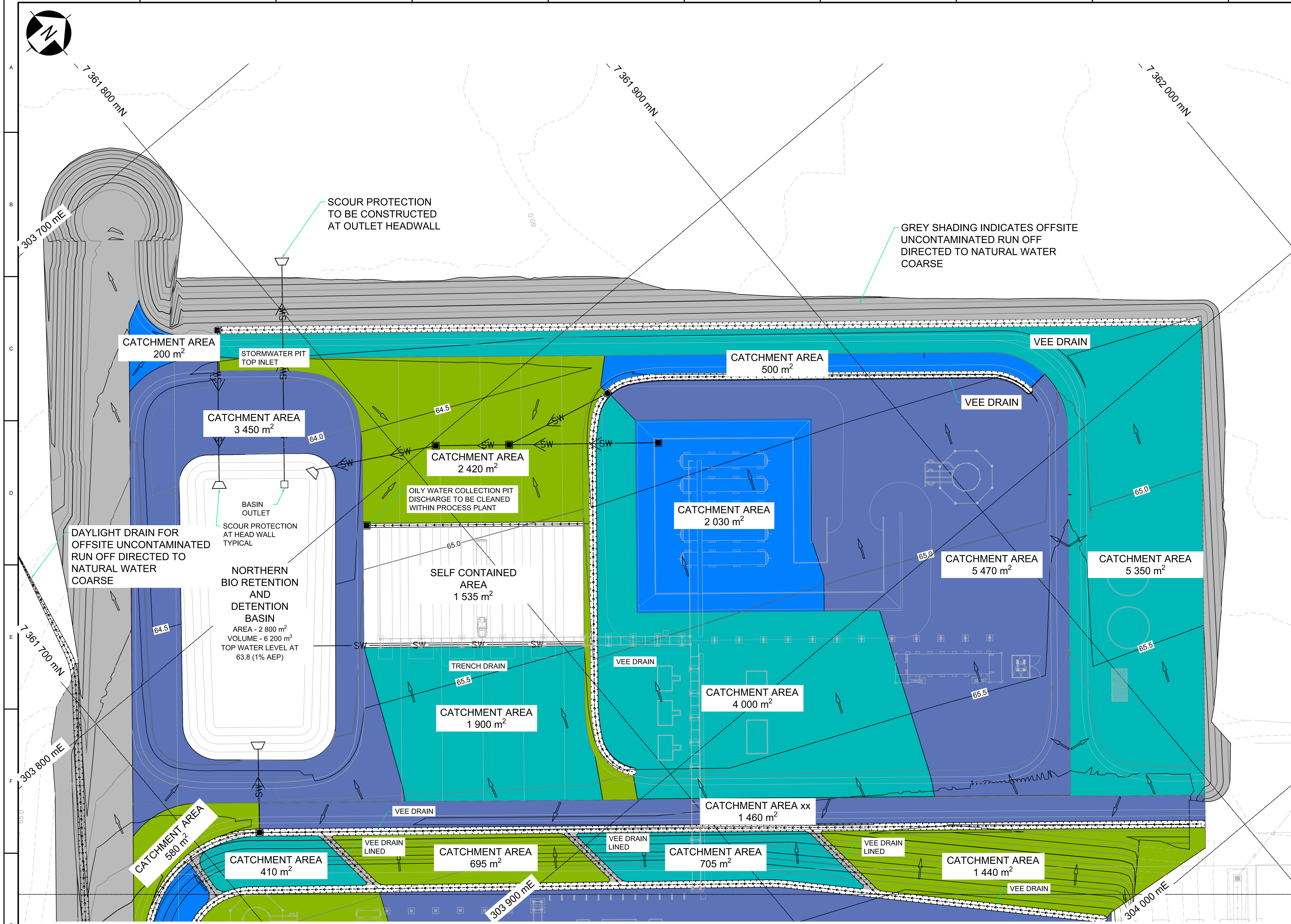
CONTRACT No. AUSS0025C0001
VENDOR/DESIGNER DRG No. 46301-100-DRG-CI-004 REV: A
PROJECT No: AUSS0025
TITLE: GLADSTONE TEST TRAIN
FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
BULK EARTHWORKS
CONCEPT DRAINAGE PLAN - SOUTHERN SITE
A1 SCALE: 1:500 DRG No: AUSS0025-0201-CI-DSW-0004 REV: A

FFI-0000-EG-TEM-0003_2_WIP



FOR CONTINUATION REFER TO DRAWING AUSS0025-0201-CI-DSW-0004

CONCEPT DRAINAGE - NORTHERN SITE

NOTES:

1. THIS DRAWING SHALL BE READ IN CONJUNCTION WITH KEY PLAN AND NOTES ON DRAWING AUSS0025-0201-CI-DSW-0003

LEGEND

EXISTING:

- 65.0 SURFACE LEVEL MAJOR CONTOUR - 5.0 m
- SURFACE LEVEL MINOR CONTOUR - 1.0 m
- DRAINAGE SWALE
- SW STORMWATER CULVERT

PROPOSED:

- 65.0 SURFACE LEVEL MAJOR CONTOUR - 2.5 m
- SURFACE LEVEL MINOR CONTOUR - 0.5 m
- SURFACE TABLE/VEE DRAIN
- VEE DRAIN LINED
- BOX CULVERT
- SW PROPOSED STORMWATER
- PROPOSED CATCHMENT AREA
- PROPOSED CATCHMENT AREA
- PROPOSED CATCHMENT AREA
- PROPOSED CATCHMENT AREA
- PROPOSED RUN OFF DIRECTION

10 0 10 20 30 40 50

SCALE OF METRES 1:500

REF DRG No.	TITLE	REV	DATE	DESCRIPTION	DRA	CHK	ENG	APP
AUSS0025-0201-CI-DSW-0004	BULK EARTHWORKS - CONCEPT DRAINAGE PLAN - SOUTHERN SITE							
AUSS0025-0201-CI-DSW-0003	BULK EARTHWORKS - CONCEPT DRAINAGE PLAN - KEY PLAN	A	16JUN23	ISSUED FOR APPROVAL (STORMWATER MANAGEMENT PLAN)	RDS	DB	SG	JG

FORTESCUE FUTURE INDUSTRIES

PRIMERO

CONTRACT No. AUSS0025C0001

VENDOR/DESIGNER DRG No. 46301-100-DRG-CI-005 REV: A

PROJECT No: AUSS0025

TITLE: GLADSTONE TEST TRAIN

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FORTESCUE FUTURE INDUSTRIES
ALDOGA GREEN INDUSTRIAL PRECINCT
BULK EARTHWORKS
CONCEPT DRAINAGE PLAN - NORTHERN SITE

A1 SCALE: 1:500 DRG No: AUSS0025-0201-CI-DSW-0005 REV: A

$FILE$ $TIME$ $DATE$

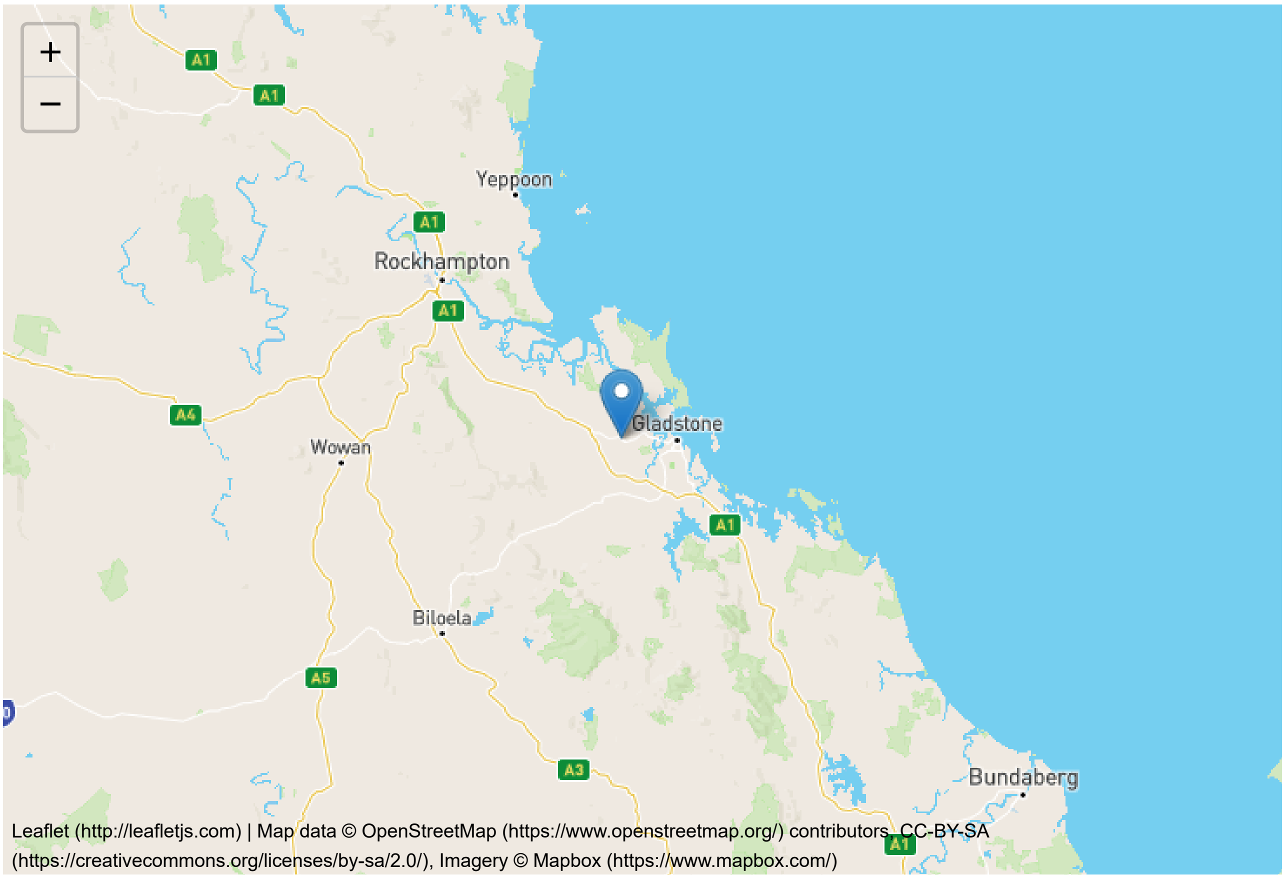
FFI-0000-EG-TEM-0003_2_WIP

APPENDIX C AUSTRALIAN RAINFALL & RUNOFF DATA HUB RESULTS

Australian Rainfall & Runoff Data Hub - Results

Input Data

Longitude	151.077
Latitude	-23.839
Selected Regions (clear)	
River Region	show
ARF Parameters	show
Storm Losses	show
Temporal Patterns	show
Areal Temporal Patterns	show
BOM IFDs	show
Median Preburst Depths and Ratios	show
10% Preburst Depths	show
25% Preburst Depths	show
75% Preburst Depths	show
90% Preburst Depths	show
Interim Climate Change Factors	show



Data

River Region

Division	North East Coast
River Number	31
River Name	Calliope River

Layer Info

Time Accessed	28 May 2023 02:28PM
Version	2016_v1

ARF Parameters

$$ARF = Min\left\{1, \left[1 - a\left(Area^{b} - c\log_{10}Duration\right)Duration^{-d} + eArea^{f}Duration^{g}\left(0.3 + \log_{10}AEP\right) + h10^{iArea\frac{Duration}{1440}}\left(0.3 + \log_{10}AEP\right)\right]\right\}$$

Zone	a	b	c	d	e	f	g	h	i
East Coast North	0.327	0.241	0.448	0.36	0.00096	0.48	-0.21	0.012	-0.0013

Short Duration ARF

$$ARF = Min\left[1, 1 - 0.287\left(Area^{0.265} - 0.439\log_{10}(Duration)\right).Duration^{-0.36} + 2.26 \text{ x } 10^{-3} \text{ x } Area^{0.226}.Duration^{0.125}\left(0.3 + \log_{10}(AEP)\right) + 0.0141 \text{ x } Area^{0.213} \text{ x } 10^{-0.021\frac{(Duration-180)^{2}}{1440}}\left(0.3 + \log_{10}(AEP)\right)\right]$$

Layer Info

Time Accessed	28 May 2023 02:28PM
Version	2016_v1

Storm Losses

Note: Burst Loss = Storm Loss - Preburst

Note: These losses are only for rural use and are **NOT FOR DIRECT USE** in urban areas

ID	18571.0
Storm Initial Losses (mm)	33.0
Storm Continuing Losses (mm/h)	2.3

Layer Info

Time Accessed	28 May 2023 02:28PM

Version	2016_v1

Temporal Patterns | Download (.zip) (static/temporal_patterns/TP/ECnorth.zip)

code	ECnorth
Label	East Coast North

Layer Info

Time Accessed	28 May 2023 02:28PM
Version	2016_v2

Areal Temporal Patterns | Download (.zip) (./static/temporal_patterns/Areal/Areal_ECnorth.zip)

code	ECnorth
arealabel	East Coast North

Layer Info

Time Accessed	28 May 2023 02:29PM
Version	2016_v2

BOM IFDs

Click here (http://www.bom.gov.au/water/designRainfalls/revised-ifd/?year=2016&coordinate_type=dd&latitude=-23.839495&longitude=151.077289&sdmin=true&sdhr=true&sdday=true&user_label=) to obtain the IFD depths for catchment centroid from the BoM website

Layer Info

Time Accessed	28 May 2023 02:29PM

Median Preburst Depths and Ratios

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.9 (0.021)	2.0 (0.039)	2.8 (0.046)	3.6 (0.051)	4.9 (0.060)	5.9 (0.066)
90 (1.5)	1.7 (0.038)	1.5 (0.025)	1.4 (0.020)	1.3 (0.016)	5.5 (0.058)	8.6 (0.082)
120 (2.0)	0.3 (0.006)	2.0 (0.030)	3.1 (0.039)	4.1 (0.046)	7.1 (0.068)	9.4 (0.080)
180 (3.0)	0.9 (0.016)	3.5 (0.046)	5.3 (0.058)	6.9 (0.066)	10.8 (0.087)	13.7 (0.099)
360 (6.0)	5.6 (0.079)	9.4 (0.094)	11.8 (0.098)	14.2 (0.100)	23.1 (0.136)	29.8 (0.154)
720 (12.0)	2.5 (0.026)	12.6 (0.092)	19.3 (0.115)	25.7 (0.128)	44.2 (0.179)	58.0 (0.204)
1080 (18.0)	1.0 (0.009)	12.9 (0.078)	20.8 (0.101)	28.3 (0.113)	34.4 (0.111)	38.9 (0.108)
1440 (24.0)	0.5 (0.004)	8.7 (0.046)	14.2 (0.059)	19.4 (0.067)	45.5 (0.125)	65.0 (0.153)
2160 (36.0)	0.2 (0.001)	8.5 (0.038)	14.1 (0.049)	19.4 (0.055)	45.6 (0.101)	65.2 (0.123)
2880 (48.0)	0.0 (0.000)	4.8 (0.019)	7.9 (0.024)	10.9 (0.027)	24.4 (0.047)	34.4 (0.057)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.1 (0.000)	8.3 (0.014)	14.4 (0.020)

Layer Info

Time Accessed	28 May 2023 02:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

10% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
180 (3.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
360 (6.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
720 (12.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	1.2 (0.005)	2.2 (0.008)
1080 (18.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.4 (0.001)	0.6 (0.002)
1440 (24.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	2.2 (0.006)	3.8 (0.009)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.1 (0.000)	0.1 (0.000)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	28 May 2023 02:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

25% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	0.0 (0.000)	0.1 (0.002)	0.2 (0.003)	0.2 (0.003)	0.8 (0.009)	1.2 (0.013)
90 (1.5)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.3 (0.003)	0.5 (0.005)
120 (2.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.5 (0.005)	1.0 (0.008)
180 (3.0)	0.0 (0.000)	0.1 (0.001)	0.1 (0.001)	0.1 (0.001)	0.6 (0.005)	1.0 (0.007)
360 (6.0)	0.0 (0.000)	0.3 (0.003)	0.5 (0.004)	0.7 (0.005)	3.4 (0.020)	5.5 (0.028)
720 (12.0)	0.0 (0.000)	0.8 (0.006)	1.3 (0.008)	1.8 (0.009)	10.2 (0.041)	16.5 (0.058)
1080 (18.0)	0.0 (0.000)	2.3 (0.014)	3.9 (0.019)	5.4 (0.021)	7.6 (0.025)	9.3 (0.026)
1440 (24.0)	0.0 (0.000)	1.6 (0.008)	2.6 (0.011)	3.6 (0.012)	6.7 (0.018)	9.0 (0.021)
2160 (36.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	11.7 (0.026)	20.4 (0.039)
2880 (48.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	3.0 (0.006)	5.2 (0.009)
4320 (72.0)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)	0.0 (0.000)

Layer Info

Time Accessed	28 May 2023 02:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

75% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	7.4 (0.186)	11.3 (0.216)	14.0 (0.227)	16.5 (0.235)	25.5 (0.312)	32.3 (0.356)
90 (1.5)	11.0 (0.244)	14.9 (0.247)	17.4 (0.247)	19.9 (0.247)	31.7 (0.335)	40.6 (0.385)
120 (2.0)	8.7 (0.176)	15.7 (0.238)	20.4 (0.262)	24.9 (0.279)	38.6 (0.367)	48.8 (0.415)
180 (3.0)	14.1 (0.252)	25.0 (0.329)	32.2 (0.357)	39.1 (0.375)	58.9 (0.477)	73.8 (0.531)
360 (6.0)	23.2 (0.323)	47.9 (0.478)	64.2 (0.533)	79.9 (0.565)	91.8 (0.539)	100.7 (0.520)
720 (12.0)	34.5 (0.366)	60.9 (0.445)	78.4 (0.466)	95.2 (0.473)	143.2 (0.580)	179.2 (0.630)
1080 (18.0)	32.8 (0.294)	60.5 (0.365)	78.8 (0.382)	96.4 (0.386)	121.1 (0.390)	139.6 (0.387)
1440 (24.0)	27.4 (0.218)	57.2 (0.302)	77.0 (0.323)	95.9 (0.329)	129.3 (0.355)	154.4 (0.363)
2160 (36.0)	20.4 (0.139)	50.9 (0.225)	71.1 (0.246)	90.5 (0.254)	106.8 (0.237)	119.1 (0.225)
2880 (48.0)	11.2 (0.069)	34.5 (0.136)	49.9 (0.153)	64.7 (0.160)	81.6 (0.159)	94.2 (0.156)
4320 (72.0)	0.0 (0.000)	19.0 (0.066)	31.6 (0.085)	43.6 (0.093)	47.8 (0.080)	50.9 (0.072)

Layer Info

Time Accessed	28 May 2023 02:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

90% Preburst Depths

Values are of the format depth (ratio) with depth in mm

min (h)\AEP(%)	50	20	10	5	2	1
60 (1.0)	26.4 (0.666)	34.9 (0.664)	40.6 (0.659)	46.0 (0.655)	62.5 (0.764)	75.0 (0.826)
90 (1.5)	39.6 (0.880)	51.0 (0.849)	58.6 (0.831)	65.8 (0.815)	93.9 (0.993)	115.0 (1.092)
120 (2.0)	51.8 (1.053)	62.8 (0.950)	70.1 (0.900)	77.0 (0.861)	132.9 (1.263)	174.8 (1.487)
180 (3.0)	60.4 (1.077)	78.5 (1.031)	90.4 (1.002)	101.9 (0.977)	187.6 (1.516)	251.8 (1.812)
360 (6.0)	72.7 (1.015)	118.3 (1.182)	148.4 (1.233)	177.4 (1.254)	207.4 (1.217)	229.9 (1.187)
720 (12.0)	77.7 (0.823)	129.4 (0.946)	163.7 (0.974)	196.5 (0.977)	262.6 (1.062)	312.0 (1.096)
1080 (18.0)	76.2 (0.683)	123.1 (0.743)	154.1 (0.746)	183.8 (0.735)	198.6 (0.639)	209.7 (0.582)
1440 (24.0)	53.2 (0.424)	124.7 (0.658)	172.0 (0.721)	217.3 (0.746)	225.4 (0.618)	231.5 (0.544)
2160 (36.0)	52.8 (0.360)	127.5 (0.564)	177.1 (0.614)	224.6 (0.631)	202.4 (0.449)	185.8 (0.352)
2880 (48.0)	35.0 (0.216)	93.0 (0.367)	131.4 (0.404)	168.3 (0.417)	152.6 (0.297)	140.9 (0.233)
4320 (72.0)	22.9 (0.126)	57.8 (0.201)	81.0 (0.217)	103.2 (0.221)	95.1 (0.159)	89.1 (0.126)

Layer Info

Time Accessed	28 May 2023 02:29PM
Version	2018_v1
Note	Preburst interpolation methods for catchment wide preburst has been slightly altered. Point values remain unchanged.

Interim Climate Change Factors

	RCP 4.5	RCP6	**RCP 8.5**
2030	**0.869 (4.3%)**	0.783 (3.9%)	**0.983 (4.9%)**
2040	**1.057 (5.3%)**	1.014 (5.1%)	**1.349 (6.8%)**
2050	**1.272 (6.4%)**	1.236 (6.2%)	**1.773 (9.0%)**
2060	**1.488 (7.5%)**	1.458 (7.4%)	**2.237 (11.5%)**
2070	**1.676 (8.5%)**	1.691 (8.6%)	**2.722 (14.2%)**
2080	**1.810 (9.2%)**	1.944 (9.9%)	**3.209 (16.9%)**
2090	**1.862 (9.5%)**	2.227 (11.5%)	**3.679 (19.7%)**

Layer Info

Time Accessed	28 May 2023 02:29PM
Version	2019_v1
Note	ARR recommends the use of RCP4.5 and RCP 8.5 values. These have been updated to the values that can be found on the climate change in Australia website.

Download TXT (downloads/a049e195-25af-447f-92e8-a98a9de91e49.txt)

Download JSON (downloads/ea12d6f3-6d8a-437f-8880-f67bdd45240a.json)

Generating PDF... (downloads/19ebaad8-8328-433c-8a7a-aa4928fd92c7.pdf)

APPENDIX D RATIONAL METHOD CALCULATIONS

1 Rational Method Peak Flow Calculations

1.1 METHODOLOGY

In this section the Rational method is used to determine the peak flows of affected catchments, in pre and post development conditions. The calculated peak run-offs will be used to calibrate the results of simulation results from Autodesk Storm and Sanitary Analysis.

1.2 Catchment #1

		Pre-Development	Post Development	
Standard Inlet Time				
Standard Inlet Time	=	0	5	*mins*
Overland Sheet Flow (Friends Equation)				
Sheet Flow Length (L)	=	150	N/A	*m*
Roughness (n)	=	0.035	N/A	
Slope of Surface (S)	=	8	N/A	*%*
tc	=	13.00	0	*mins*
Concentrated Overland Flow				
Flow distance	=	0	N/A	*m*
Channel slope	=	4	N/A	*%*
Flow travel time in channel	=	0	N/A	*mins*
Surface type multiplier	=	3	N/A	
tc	=	0.00	0	*mins*
Kerb Flow Time				
Pipe Flow Time				
Flow distance	=	N/A	233	*m*
Flow velocity	=	N/A	1	*m/s*
Surface type multiplier	=	N/A	N/A	
tc	=	0	4.00	*mins*
Channel Flow Time				
Total tc	=	13.00	9.00	*mins*

1.2.1 Runoff Peak Calculations

Pre-Development

Name	Area (ha)	tc	f_i	I_{10} (mm/hr)	C10
	1.65	13.00	0	61.5	0.59

ARI (years)	Frequency Factor (F_y)	Cy ($Fy*C_{10}$)	Iy (mm/hr)	A (ha)	Qy (m^3/s)
1	0.8	0.472	85.24	1.65	0.18
2	0.85	0.5015	95	1.65	0.22
5	0.95	0.5605	126	1.65	0.32
10	1	0.59	146.6	1.65	0.40
20	1.05	0.6195	166.8	1.65	0.47
50	1.15	0.6785	193.4	1.65	0.60
100	1.2	0.708	213	1.65	0.69

1.2.2 Runoff Peak Calculations

Name	Area (ha)	tc	f_i	I_{10} (mm/hr)	C10
	2.4	9.00	0.8	61.5	0.84

ARI (years)	Frequency Factor (F_y)	Cy ($Fy*C_{10}$)	Iy (mm/hr)	A (ha)	Qy (m^3/s)	Development Runoff Ratio
1	0.8	0.672	96.92	2.4	0.43	2.35
2	0.85	0.714	108	2.4	0.51	2.35
5	0.95	0.798	143	2.4	0.76	2.35
10	1	0.84	166.8	2.4	0.93	2.36
20	1.05	0.882	189.6	2.4	1.11	2.35
50	1.15	0.966	219.6	2.4	1.41	2.35
100	1.2	1.008	242.4	2.4	1.63	2.36

1.3 Catchment #2

		Pre-Development	Post Development	
Standard Inlet Time				
Standard Inlet Time	=	0	10	*mins*
Overland Sheet Flow (Friends Equation)				
Sheet Flow Length (L)	=	260	N/A	*mins*
Roughness (n)	=	0.035	N/A	
Slope of Surface (S)	=	6	N/A	*%*
tc	=	17.00	0	*mins*
Concentrated Overland Flow				
Flow distance	=	0	N/A	*mins*
Channel slope	=	4	N/A	*%*
Flow travel time in channel	=	0	N/A	*mins*
Surface type multiplier	=	3	N/A	
tc	=	0.00	0	*mins*
Kerb Flow Time				
Pipe Flow Time				
Flow distance	=	N/A	260	*m*
Flow velocity	=	N/A	1	*m/s*
Surface type multiplier	=	N/A	N/A	
tc	=	0	4.00	*mins*
Channel Flow Time				
Total tc	=	17.00	14.00	*mins*

1.2.1 Runoff Peak Calculations

Pre-Development

Name	Area (ha)	tc	f_i	I_{10} (mm/hr)	C10
	2.9	17.00	0	61.5	0.59

ARI (years)	Frequency Factor (F_y)	Cy ($Fy*C_{10}$)	Iy (mm/hr)	A (ha)	Qy (m^3/s)
1	0.8	0.472	79.8	2.9	0.30
2	0.85	0.5015	89	2.9	0.36
5	0.95	0.5605	118	2.9	0.53
10	1	0.59	137	2.9	0.65
20	1.05	0.6195	156	2.9	0.78
50	1.15	0.6785	181	2.9	0.99
100	1.2	0.708	199	2.9	1.13

1.2.2 Runoff Peak Calculations

Name	Area (ha)	tc	f_i	I_{10} (mm/hr)	C10
	4.75	14.00	0.8	61.5	0.84

ARI (years)	Frequency Factor (F_y)	Cy ($Fy*C_{10}$)	Iy (mm/hr)	A (ha)	Qy (m^3/s)	Development Runoff Ratio
1	0.8	0.672	75.68	4.75	0.67	2.21
2	0.85	0.714	84.4	4.75	0.80	2.21
5	0.95	0.798	112	4.75	1.18	2.21
10	1	0.84	129.8	4.75	1.44	2.21
20	1.05	0.882	148	4.75	1.72	2.21
50	1.15	0.966	171.4	4.75	2.18	2.21
100	1.2	1.008	189	4.75	2.51	2.21

APPENDIX E SSA KEY PLAN

Project Description

File Name .... 46301-100-CAL-CI-001 SSA Model_Min South Pond_190623.SPF

Project Options

Flow Units .... CMS
Elevation Type .... Depth
Hydrology Method .... EPA SWMM
EPA SWMM Infiltration Method .... SCS Curve Number
Link Routing Method .... Hydrodynamic
Enable Overflow Ponding at Nodes .... NO
Skip Steady State Analysis Time Periods .... NO

Analysis Options

Start Analysis On	00:00:00	00:00:00
End Analysis On	00:00:00	23:59:00
Start Reporting On	00:00:00	00:00:00
Antecedent Dry Days	0	days
Runoff (Dry Weather) Time Step	0 01:00:00	days hh:mm:ss
Runoff (Wet Weather) Time Step	0 00:05:00	days hh:mm:ss
Reporting Time Step	0 00:05:00	days hh:mm:ss
Routing Time Step	30	seconds

Number of Elements

	Qty
Rain Gages	1
Subbasins...	33
Nodes..	40
Junctions	35
Outfalls	3
Flow Diversions	0
Inlets	0
Storage Nodes	2
Links...	38
Channels	15
Pipes	19
Pumps	0
Orifices	4
Weirs	0
Outlets	0
Pollutants	1
Land Uses	0

Rainfall Details

SN	Rain Gage ID	Data Source	Data Source ID	Rainfall Type	Rain Units	State	County	Return Period (years)	Rainfall Depth (mm)	Rainfall Distribution
1	1	Time Series	TS-01_1AEP_24Hrs	Cumulative	mm				0.00	

Subbasin Summary

SN	Subbasin ID	Area	Impervious Area	Weighted Curve Number	Average Slope	Equivalent Width	Impervious Area Manning's Roughness	Pervious Area Manning's Roughness	Total Rainfall	Total Infiltration	Total Runoff	Total Runoff Volume	Peak Runoff	Time of Concentration
		(ha)	(%)		(%)	(m)			(mm)	(mm)	(mm)	(ha-mm)	(cms)	(days hh:mm:ss)
1	N-Sub-01	0.42	100.00	72.00	1.5000	49.00	0.0150	0.1000	483.54	0.0000	479.71	203.16	0.29	0 00:08:39
2	N-Sub-02	0.44	100.00	72.00	1.5000	47.00	0.0150	0.1000	483.54	0.0000	479.58	211.55	0.29	0 00:09:06
3	N-Sub-03	0.34	100.00	72.00	1.5000	42.00	0.0150	0.1000	483.54	0.0000	479.79	165.24	0.24	0 00:08:23
4	N-Sub-04	0.10	100.00	98.00	5.0000	12.00	0.0150	0.1000	483.54	0.0000	480.55	48.72	0.08	0 00:05:57
5	N-Sub-05	0.38	100.00	72.00	1.2000	32.00	0.0150	0.1000	483.54	0.0000	479.00	181.54	0.23	0 00:11:11
6	N-Sub-06	0.61	100.00	72.00	1.2000	39.00	0.0150	0.1000	483.54	0.0000	478.46	291.22	0.35	0 00:13:12
7	N-Sub-07	0.12	100.00	72.00	1.2000	12.00	0.0150	0.1000	483.54	0.0000	479.27	58.48	0.08	0 00:10:12
8	N-Sub-08	0.37	100.00	72.00	1.2000	40.00	0.0150	0.1000	483.54	0.0000	479.45	175.31	0.24	0 00:09:34
9	N-Sub-09	0.20	100.00	72.00	1.2000	38.00	0.0150	0.1000	483.54	0.0000	480.26	95.04	0.15	0 00:06:50
10	N-Sub-10	0.06	25.00	72.00	0.5000	500.00	0.0150	0.1000	483.54	61.5170	418.05	26.74	0.02	0 00:02:31
11	N-Sub-11	0.19	100.00	72.00	1.2000	28.00	0.0150	0.1000	483.54	0.0000	479.92	89.80	0.13	0 00:07:56
12	N-Sub-12	0.30	100.00	72.00	1.2000	28.00	0.0150	0.1000	483.54	0.0000	479.20	142.51	0.18	0 00:10:29
13	N-Sub-13	0.63	100.00	72.00	1.2000	292.00	0.0150	0.1000	483.54	0.0000	481.31	301.36	0.50	0 00:04:00
14	N-Sub-14	0.21	100.00	72.00	3.0000	23.00	0.0150	0.1000	483.54	0.0000	480.12	101.43	0.15	0 00:07:18
15	N-Sub-15	0.13	100.00	72.00	2.0000	19.00	0.0150	0.1000	483.54	0.0000	480.25	62.07	0.09	0 00:06:53
16	N-Sub-16	0.15	100.00	72.00	2.0000	22.00	0.0150	0.1000	483.54	0.0000	480.20	74.15	0.11	0 00:07:00
17	N-Sub-17	0.24	100.00	72.00	1.5000	37.00	0.0150	0.1000	483.54	0.0000	480.63	113.18	0.17	0 00:07:12
18	S-Sub-01	0.10	100.00	98.00	0.5000	34.00	0.0100	0.1000	483.54	0.0000	480.88	49.43	0.08	0 00:05:01
19	S-Sub-02	0.13	100.00	98.00	0.5000	47.00	0.0100	0.1000	483.54	0.0000	481.01	61.36	0.10	0 00:04:42
20	S-Sub-03	0.12	100.00	98.00	0.5000	48.00	0.0100	0.1000	483.54	0.0000	481.09	58.22	0.10	0 00:04:30
21	S-Sub-04	0.12	100.00	98.00	0.5000	30.00	0.0100	0.1000	483.54	0.0000	480.58	56.42	0.09	0 00:05:52
22	S-Sub-05	0.10	100.00	98.00	0.5000	39.00	0.0100	0.1000	483.54	0.0000	481.10	47.00	0.08	0 00:04:29
23	S-Sub-06	0.19	100.00	98.00	0.5000	42.00	0.0100	0.1000	483.54	0.0000	480.43	89.39	0.14	0 00:06:19
24	S-Sub-07	0.04	100.00	98.00	0.5000	5.20	0.0100	0.1000	483.54	0.0000	479.77	17.88	0.03	0 00:08:26
25	S-Sub-08	0.04	100.00	98.00	0.5000	5.20	0.0100	0.1000	483.54	0.0000	479.51	21.17	0.03	0 00:09:20
26	S-Sub-09	0.04	100.00	98.00	0.5000	5.20	0.0100	0.1000	483.54	0.0000	479.63	19.61	0.03	0 00:08:55
27	S-Sub-10	0.39	100.00	92.00	1.5000	47.00	0.0100	0.1100	483.54	0.0000	480.31	189.10	0.29	0 00:06:40
28	S-Sub-11	0.39	100.00	92.00	1.5000	46.00	0.0100	0.1100	483.54	0.0000	480.29	188.10	0.29	0 00:06:44
29	S-Sub-12	0.34	100.00	92.00	1.5000	42.00	0.0100	0.1100	483.54	0.0000	480.37	161.79	0.25	0 00:06:29
30	S-Sub-16	0.08	100.00	98.00	0.5000	49.00	0.0100	0.1000	483.54	0.0000	481.52	40.64	0.07	0 00:03:35
31	S-Sub-17	0.17	100.00	98.00	1.0000	68.00	0.0100	0.1000	483.54	0.0000	481.51	80.39	0.14	0 00:03:36
32	Sub-33	0.30	100.00	72.00	6.0000	14.00	0.0150	0.1000	483.54	0.0000	480.63	142.41	0.19	0 00:09:47
33	Sub-34	0.16	100.00	72.00	1.2000	28.00	0.0150	0.1000	483.54	0.0000	480.61	77.61	0.12	0 00:07:16

Node Summary

SN	Element ID	Element Type	Invert Elevation (m)	Ground/Rim (Max) Elevation (m)	Initial Water Elevation (m)	Surcharge Elevation (m)	Ponded Area (m^2)	Peak Inflow (cms)	Max HGL Elevation Attained (m)	Max Surcharge Depth Attained (m)	Min Freeboard Attained (m)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ha-mm)	Total Time Flooded (min)
1	1	Junction	70.70	71.97	70.70	71.97	0.00	0.08	71.13	0.00	0.84	0 00:00	0.00	0.00
2	2	Junction	70.40	71.76	70.40	71.76	0.00	0.20	71.12	0.00	0.64	0 00:00	0.00	0.00
3	3	Junction	70.35	71.61	70.35	71.61	0.00	0.26	71.07	0.00	0.54	0 00:00	0.00	0.00
4	4	Junction	70.20	71.50	70.20	71.50	0.00	0.35	70.71	0.00	0.79	0 00:00	0.00	0.00
5	5	Junction	70.02	71.75	70.02	71.75	0.00	0.46	70.53	0.00	1.22	0 00:00	0.00	0.00
6	6	Junction	69.88	72.60	69.88	72.60	0.00	0.59	70.45	0.00	2.15	0 00:00	0.00	0.00
7	7	Junction	70.52	71.76	70.52	71.76	0.00	0.03	71.12	0.00	0.64	0 00:00	0.00	0.00
8	8	Junction	70.24	71.42	70.24	71.42	0.00	0.06	70.54	0.00	0.88	0 00:00	0.00	0.00
9	9	Junction	71.12	71.72	71.12	71.72	0.00	0.03	71.33	0.00	0.39	0 00:00	0.00	0.00
10	10	Junction	70.92	71.52	70.92	71.52	0.00	0.29	71.31	0.00	0.21	0 00:00	0.00	0.00
11	11	Junction	70.65	71.25	70.65	71.25	0.00	0.54	71.22	0.00	0.03	0 00:00	0.00	0.00
12	12	Junction	69.72	70.99	69.72	70.99	0.00	1.34	70.33	0.00	0.66	0 00:00	0.00	0.00
13	13	Junction	71.40	71.80	71.40	71.80	0.00	0.00	71.40	0.00	0.40	0 00:00	0.00	0.00
14	14	Junction	71.03	71.43	71.03	71.43	0.00	0.29	71.18	0.00	0.25	0 00:00	0.00	0.00
15	15	Junction	70.91	71.31	70.91	71.31	0.00	0.29	71.05	0.00	0.26	0 00:00	0.00	0.00
16	16	Junction	70.53	70.93	70.53	70.93	0.00	0.41	70.70	0.00	0.23	0 00:00	0.00	0.00
17	18	Junction	65.92	66.42	65.92	66.42	0.00	0.00	65.92	0.00	0.50	0 00:00	0.00	0.00
18	19	Junction	65.37	65.87	65.37	65.87	0.00	0.44	65.73	0.00	0.14	0 00:00	0.00	0.00
19	20	Junction	64.93	65.43	64.93	65.43	0.00	0.76	65.41	0.00	0.02	0 00:00	0.00	0.00
20	21	Junction	63.90	65.01	63.90	65.01	0.00	1.24	64.53	0.00	0.48	0 00:00	0.00	0.00
21	22	Junction	64.90	65.30	64.90	65.30	0.00	0.13	65.10	0.00	0.20	0 00:00	0.00	0.00
22	23	Junction	63.79	64.19	63.79	64.19	0.00	0.03	63.97	0.00	0.22	0 00:00	0.00	0.00
23	24	Junction	63.64	64.04	63.64	64.04	0.00	0.23	63.96	0.00	0.18	0 00:00	0.00	0.00
24	25	Junction	63.07	63.57	63.07	63.57	0.00	0.33	63.44	0.00	0.13	0 00:00	0.00	0.00
25	26	Junction	62.09	63.09	62.09	63.09	0.00	0.40	62.39	0.00	0.70	0 00:00	0.00	0.00
26	27	Junction	63.08	64.38	63.08	64.38	0.00	0.15	63.58	0.00	0.80	0 00:00	0.00	0.00
27	28	Junction	62.88	64.72	62.88	64.72	0.00	0.50	63.51	0.00	1.21	0 00:00	0.00	0.00
28	30	Junction	63.02	63.32	63.02	63.32	0.00	0.60	64.41	0.00	0.11	0 00:00	0.00	0.00
29	31	Junction	64.76	65.06	64.76	65.06	0.00	0.00	64.76	0.00	1.50	0 00:00	0.00	0.00
30	32	Junction	64.30	64.60	64.30	64.60	0.00	0.24	64.46	0.00	1.34	0 00:00	0.00	0.00
31	33	Junction	63.92	64.22	63.92	64.22	0.00	0.15	64.41	0.00	1.01	0 00:00	0.00	0.00
32	37	Junction	70.65	71.05	70.65	71.05	0.00	0.00	70.65	0.00	0.50	0 00:00	0.00	0.00
33	38	Junction	67.37	67.87	67.37	67.87	0.00	0.08	67.50	0.00	0.37	0 00:00	0.00	0.00
34	39	Junction	67.10	69.10	67.10	69.10	0.00	0.53	67.59	0.00	1.51	0 00:00	0.00	0.00
35	40	Junction	59.60	61.60	59.60	61.60	0.00	1.05	60.83	0.00	0.77	0 00:00	0.00	0.00
36	17	Outfall	66.90					0.53	67.37					
37	29	Outfall	59.40					1.05	60.00					
38	35	Outfall	63.00					0.19	63.00					
39	Stor-01	Storage Node	68.00	70.90	68.00		0.00	1.51	69.76				0.00	0.00
40	Stor-02	Storage Node	60.50	63.40	60.50		0.00	2.69	62.09				0.00	0.00

Link Summary

SN	Element ID	Element Type	From (Inlet) Node	To (Outlet) Node	Length (m)	Inlet Invert Elevation (m)	Outlet Invert Elevation (m)	Average Slope (%)	Diameter or Height (m)	Manning's Roughness	Peak Flow (cms)	Design Flow Capacity (cms)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (m/sec)	Peak Flow Depth (m)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Reported Condition
1	Link-01	Pipe	1	2	51.25	70.70	70.40	0.5900	0.450	0.0130	0.08	0.27	0.29	0.83	0.38	0.98	0.00	Calculated
2	Link-02	Pipe	2	3	38.76	70.40	70.35	0.1300	0.600	0.0150	0.19	0.25	0.75	0.67	0.58	1.00	3.00	SURCHARGED
3	Link-03	Pipe	3	4	27.94	70.35	70.20	0.5400	0.450	0.0150	0.26	0.25	1.04	1.66	0.45	1.00	7.00	SURCHARGED
4	Link-04	Pipe	4	5	35.46	70.20	70.02	0.5100	0.600	0.0150	0.34	0.52	0.66	1.34	0.48	0.85	0.00	Calculated
5	Link-05	Pipe	5	6	27.32	70.02	69.88	0.5100	1.000	0.0150	0.46	1.95	0.24	1.08	0.51	0.54	0.00	Calculated
6	Link-06	Pipe	7	2	11.90	70.52	70.40	1.0100	0.450	0.0150	0.03	0.36	0.08	0.33	0.45	1.00	5.00	SURCHARGED
7	Link-07	Pipe	8	5	22.15	70.24	70.02	0.9900	0.450	0.0150	0.06	0.35	0.16	0.64	0.36	0.84	0.00	Calculated
8	Link-11	Pipe	6	12	31.66	69.88	69.72	0.5100	1.000	0.0150	0.59	1.94	0.30	1.22	0.56	0.59	0.00	Calculated
9	Link-12	Pipe	12	Stor-01	12.00	69.72	69.60	1.0000	1.000	0.0150	1.34	2.80	0.48	3.03	0.53	0.55	0.00	Calculated
10	Link-21	Pipe	31	32	42.89	64.76	64.30	1.0700	1.500	0.0150	0.00	6.35	0.00	0.00	0.08	0.05	0.00	Calculated
11	Link-22	Pipe	32	30	56.08	64.30	63.02	2.2800	1.500	0.0150	0.23	9.26	0.03	1.01	0.75	0.51	0.00	Calculated
12	Link-23	Pipe	33	30	94.27	63.92	63.02	0.9500	1.500	0.0150	0.15	5.99	0.02	0.23	0.91	0.62	0.00	Calculated
13	Link-28	Pipe	27	28	39.76	63.08	62.88	0.5000	0.450	0.0150	0.14	0.24	0.56	1.34	0.45	1.00	8.00	SURCHARGED
14	Link-30	Pipe	30	28	28.78	63.02	62.88	0.4900	0.450	0.0150	0.42	0.24	1.77	2.67	0.45	1.00	26.00	SURCHARGED
15	Link-35	Pipe	21	Stor-02	22.42	63.90	63.45	2.0100	1.000	0.0150	1.24	4.08	0.30	3.14	0.50	0.50	0.00	Calculated
16	Link-37	Pipe	28	Stor-02	44.84	62.88	62.66	0.4900	0.600	0.0150	0.50	0.51	0.99	1.90	0.53	0.89	0.00	Calculated
17	Link-38	Pipe	26	Stor-02	19.28	62.09	61.69	2.0700	0.600	0.0150	0.40	1.11	0.36	3.16	0.30	0.50	0.00	Calculated
18	Link-45	Pipe	39	17	37.00	67.10	66.90	0.5400	0.600	0.0150	0.53	0.54	0.99	2.17	0.48	0.80	0.00	Calculated
19	Link-46	Pipe	40	29	42.00	59.60	59.40	0.4800	0.600	0.0150	1.05	0.50	2.10	3.71	0.60	1.00	17.00	SURCHARGED
20	Link-08	Channel	9	10	49.66	71.12	70.92	0.4000	0.600	0.0150	0.03	0.52	0.06	0.28	0.26	0.49	0.00	
21	Link-09	Channel	10	11	67.81	70.92	70.65	0.4000	0.600	0.0150	0.27	0.52	0.51	0.98	0.45	0.80	0.00	
22	Link-10	Channel	11	12	63.19	70.65	70.39	0.4100	0.600	0.0150	0.53	0.53	1.01	1.77	0.47	0.83	0.00	
23	Link-18	Channel	18	19	90.79	65.92	65.37	0.6100	0.500	0.0320	0.00	0.95	0.00	0.00	0.18	0.36	0.00	
24	Link-19	Channel	19	20	69.76	65.37	64.93	0.6300	0.500	0.0320	0.40	0.97	0.41	0.65	0.42	0.84	0.00	
25	Link-20	Channel	20	21	70.73	64.93	64.51	0.5900	0.500	0.0320	0.73	0.94	0.78	1.01	0.43	0.85	0.00	
26	Link-24	Channel	23	24	30.46	63.79	63.64	0.4900	0.400	0.0320	0.03	0.47	0.05	0.19	0.24	0.63	0.00	
27	Link-25	Channel	24	25	113.10	63.64	63.07	0.5000	0.500	0.0320	0.26	0.86	0.30	1.90	0.32	0.66	0.00	
28	Link-26	Channel	25	26	96.18	63.07	62.59	0.5000	0.500	0.0320	0.25	0.86	0.30	0.69	0.30	0.61	0.00	
29	Link-36	Channel	22	Stor-02	11.50	64.90	64.70	1.7400	0.400	0.0320	0.13	0.88	0.15	0.90	0.18	0.48	0.00	
30	Link-39	Channel	37	38	65.50	70.65	67.37	5.0100	0.500	0.0320	0.00	2.72	0.00	0.00	0.06	0.13	0.00	
31	Link-40	Channel	38	21	49.61	67.37	64.51	5.7600	0.500	0.0320	0.07	2.92	0.03	1.16	0.12	0.25	0.00	
32	Link-41	Channel	14	19	14.19	71.03	65.37	39.8900	0.400	0.0320	0.38	4.23	0.09	4.28	0.25	0.63	0.00	
33	Link-42	Channel	15	20	13.20	70.91	64.93	45.3000	0.400	0.0320	0.49	4.51	0.11	5.32	0.27	0.68	0.00	
34	Link-43	Channel	16	21	20.18	70.53	63.90	32.8500	0.400	0.0320	0.41	3.84	0.11	2.95	0.28	0.72	0.00	
35	3	Orifice	Stor-01	39		68.00	67.10		0.450		0.48							
36	5	Orifice	Stor-02	40		60.50	59.60		0.600		0.76							
37	7	Orifice	Stor-01	39		68.00	67.10		0.100		0.05							
38	8	Orifice	Stor-02	40		60.50	59.60		0.200		0.29							

Subbasin Hydrology

Subbasin : N-Sub-01

Input Data

Area (ha) 0.42
Impervious Area (%) 100
Weighted Curve Number 72
Conductivity (mm/hr) 0.5
Drying Time (days) 0.25
Average Slope (%) 1.5
Equivalent Width (m) 49
Impervious Area
Manning's Roughness 0.015
Pervious Area
Manning's Roughness 0.1
Curb & Gutter Length (m) 0
Rain Gage ID 1

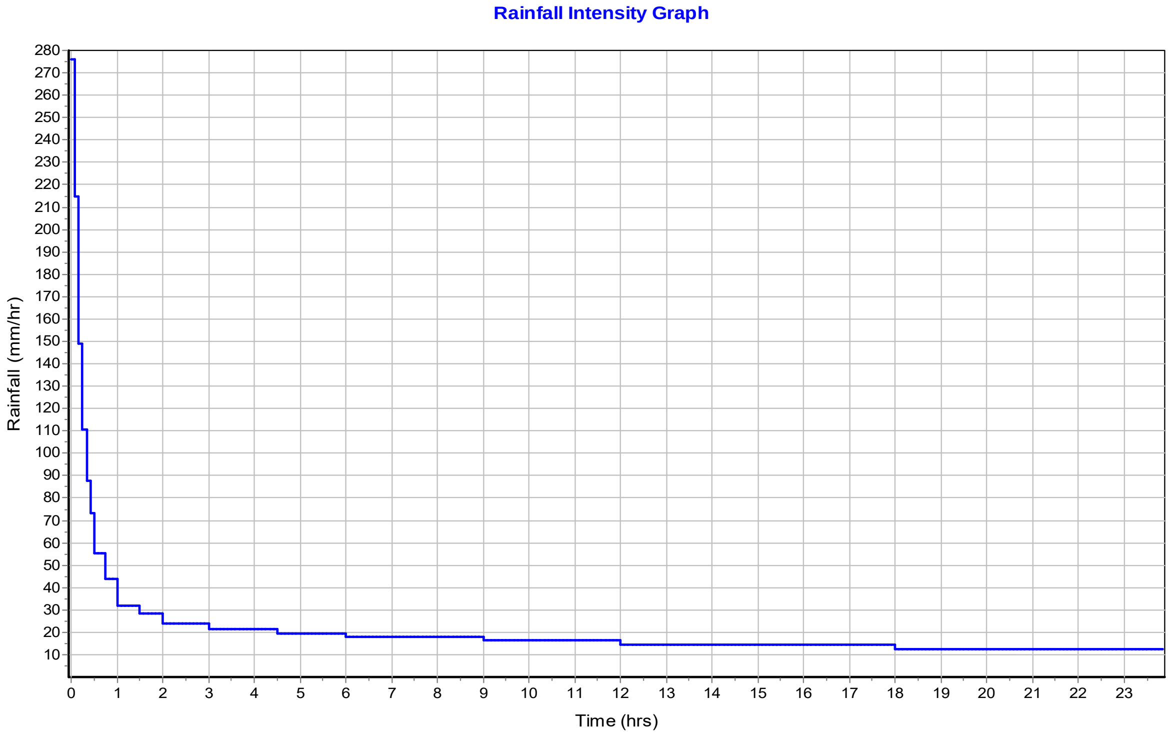
Composite Curve Number

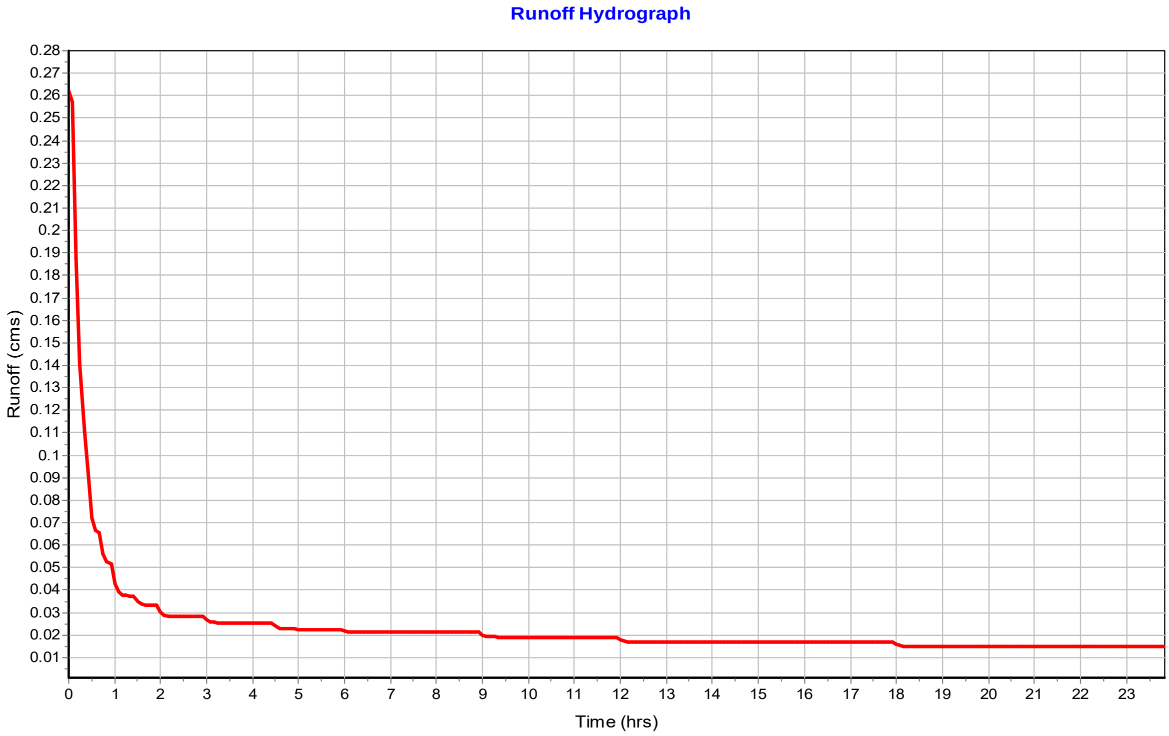
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
-	0.41	-	72
Composite Area & Weighted CN	0.41		72

Subbasin Runoff Results

Total Rainfall (mm) 483.54
Total Runon (mm) 0
Total Evaporation (mm) 0
Total Infiltration (mm) 0
Total Runoff (mm) 479.71
Peak Runoff (cms) 0.29
Weighted Curve Number 72
Time of Concentration (days hh:mm:ss) 0 00:08:39

Subbasin : N-Sub-01





Subbasin : N-Sub-02

Input Data

Area (ha)	0.44
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.5
Equivalent Width (m)	47
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

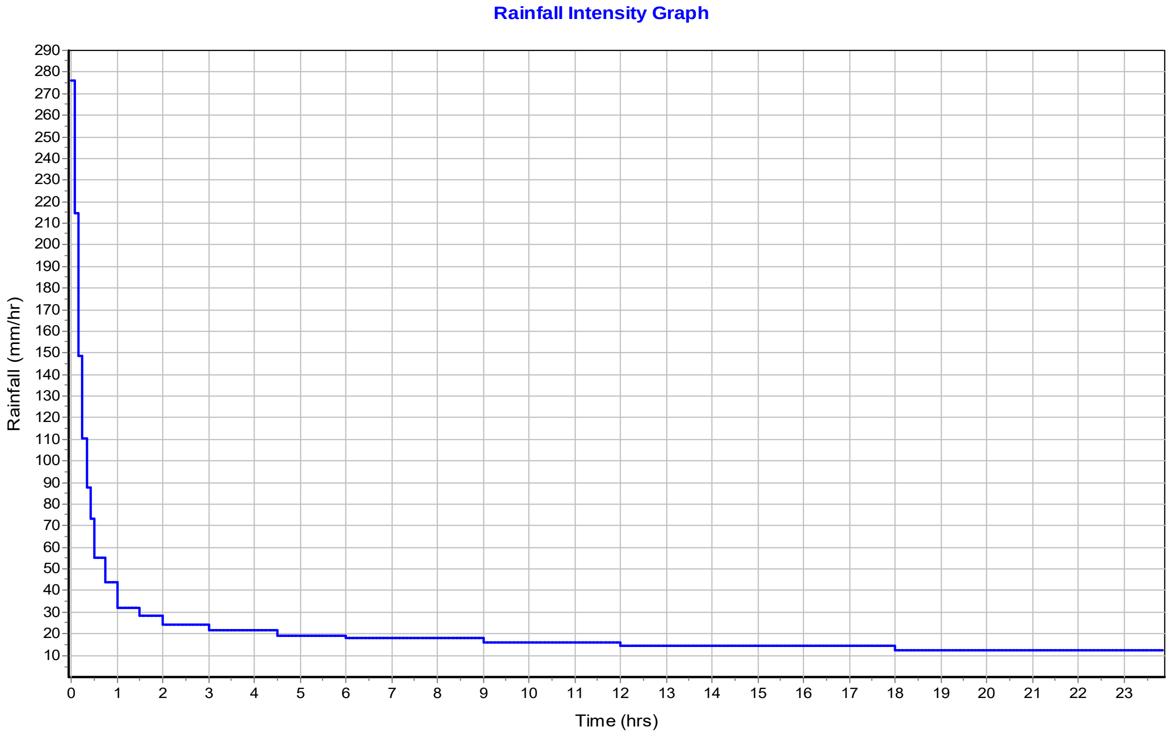
Composite Curve Number

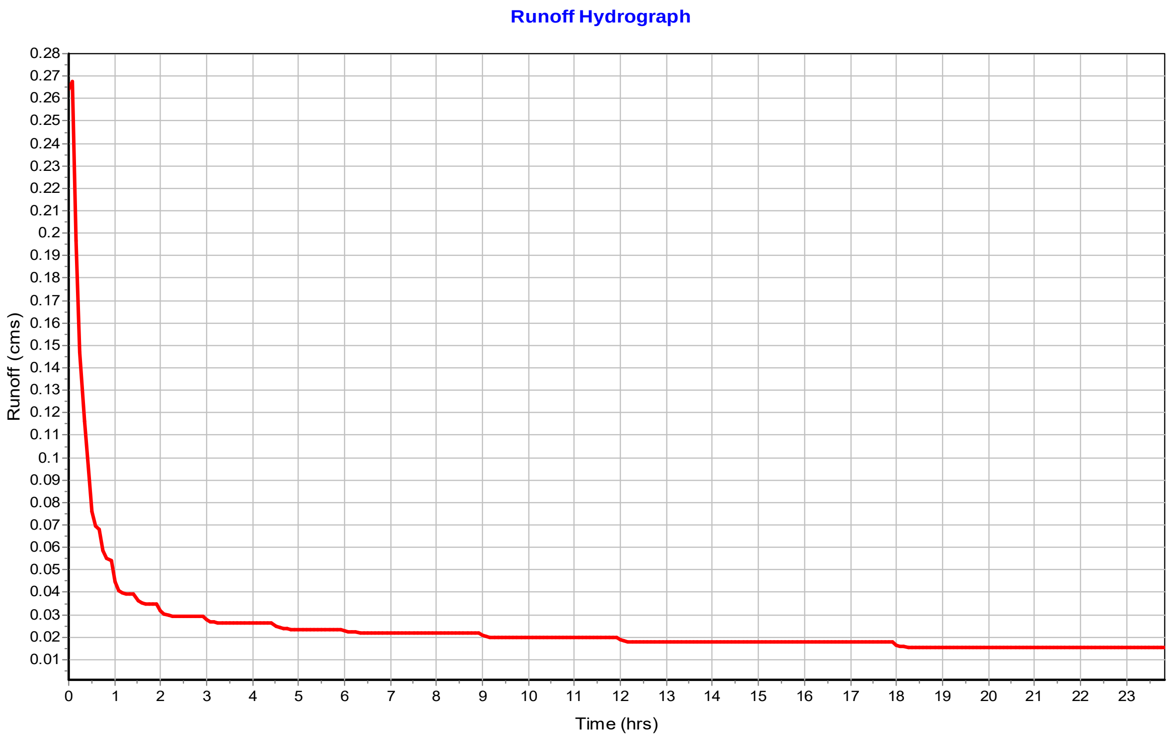
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
-	0.43	-	72
Composite Area & Weighted CN	0.43		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	479.58
Peak Runoff (cms)	0.29
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:09:06

Subbasin : N-Sub-02





Subbasin : N-Sub-03

Input Data

Area (ha) 0.34
Impervious Area (%) 100
Weighted Curve Number 72
Conductivity (mm/hr) 0.5
Drying Time (days) 0.25
Average Slope (%) 1.5
Equivalent Width (m) 42
Impervious Area
Manning's Roughness 0.015
Pervious Area
Manning's Roughness 0.1
Curb & Gutter Length (m) 0
Rain Gage ID 1

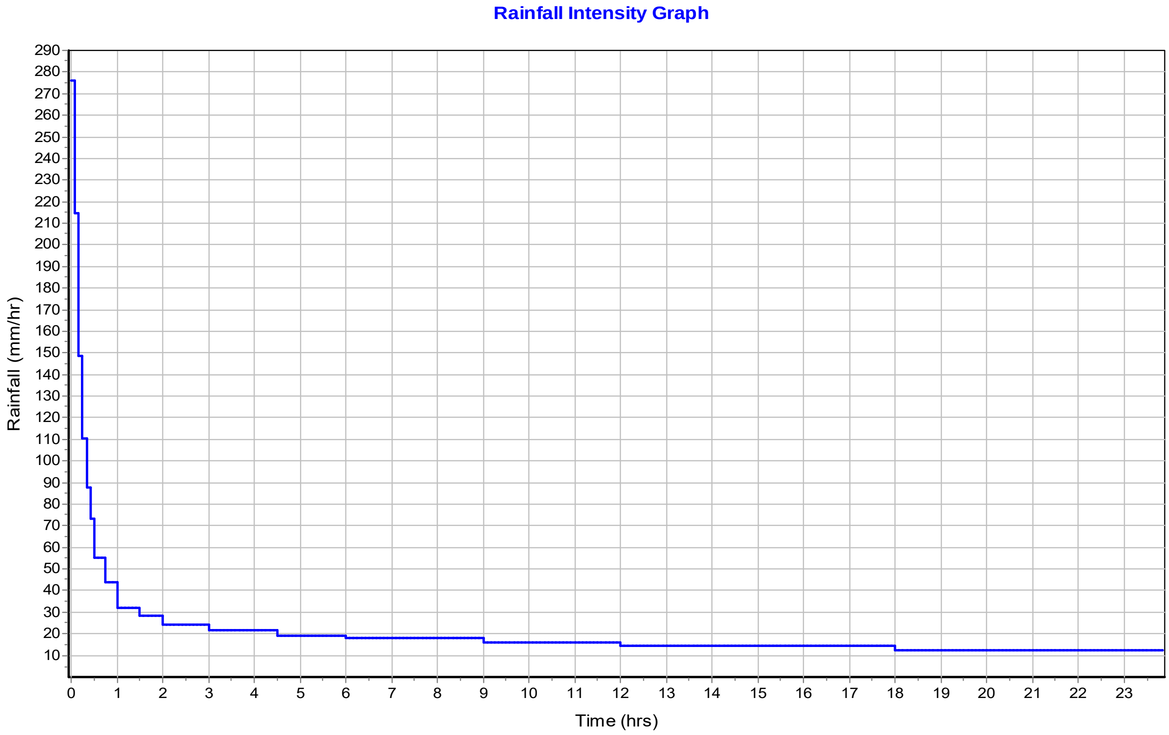
Composite Curve Number

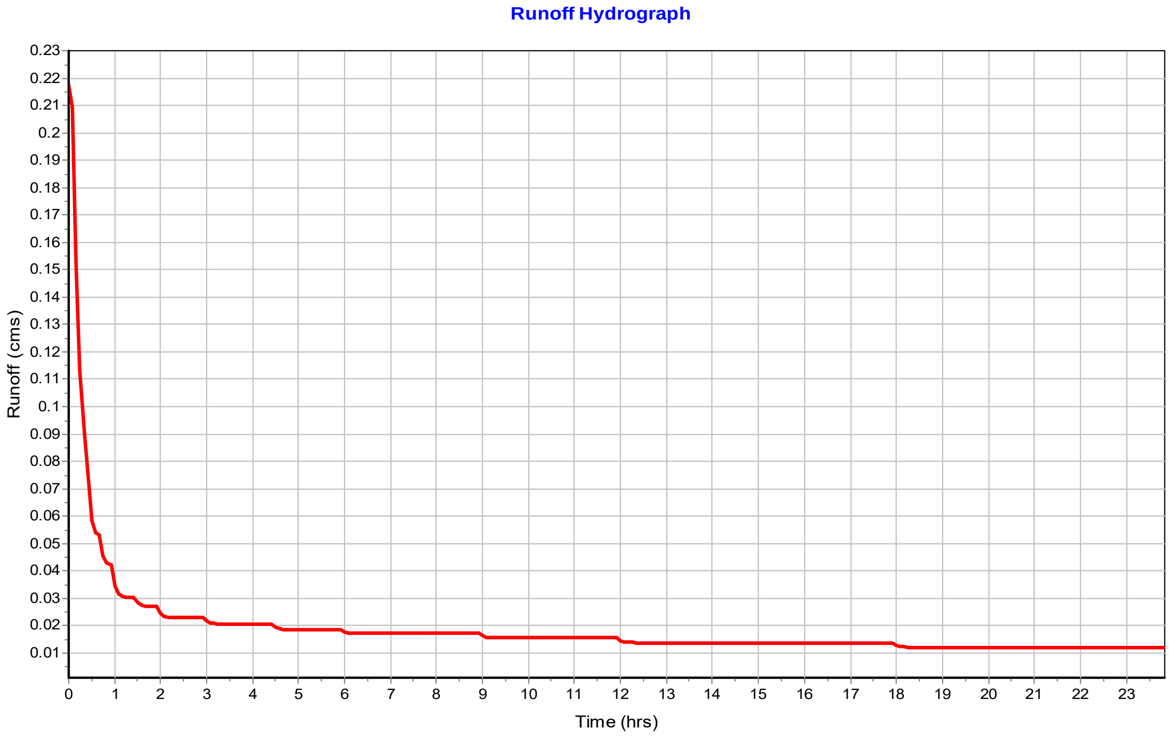
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
-	0.33	-	72
Composite Area & Weighted CN	0.33		72

Subbasin Runoff Results

Total Rainfall (mm) 483.54
Total Runon (mm) 0
Total Evaporation (mm) 0
Total Infiltration (mm) 0
Total Runoff (mm) 479.79
Peak Runoff (cms) 0.24
Weighted Curve Number 72
Time of Concentration (days hh:mm:ss) 0 00:08:23

Subbasin : N-Sub-03





Subbasin : N-Sub-04

Input Data

Area (ha) 0.1
Impervious Area (%) 100
Weighted Curve Number 98
Conductivity (mm/hr) 0.5
Drying Time (days) 0.25
Average Slope (%) 5
Equivalent Width (m) 12
Impervious Area
Manning's Roughness 0.015
Pervious Area
Manning's Roughness 0.1
Curb & Gutter Length (m) 0
Rain Gage ID 1

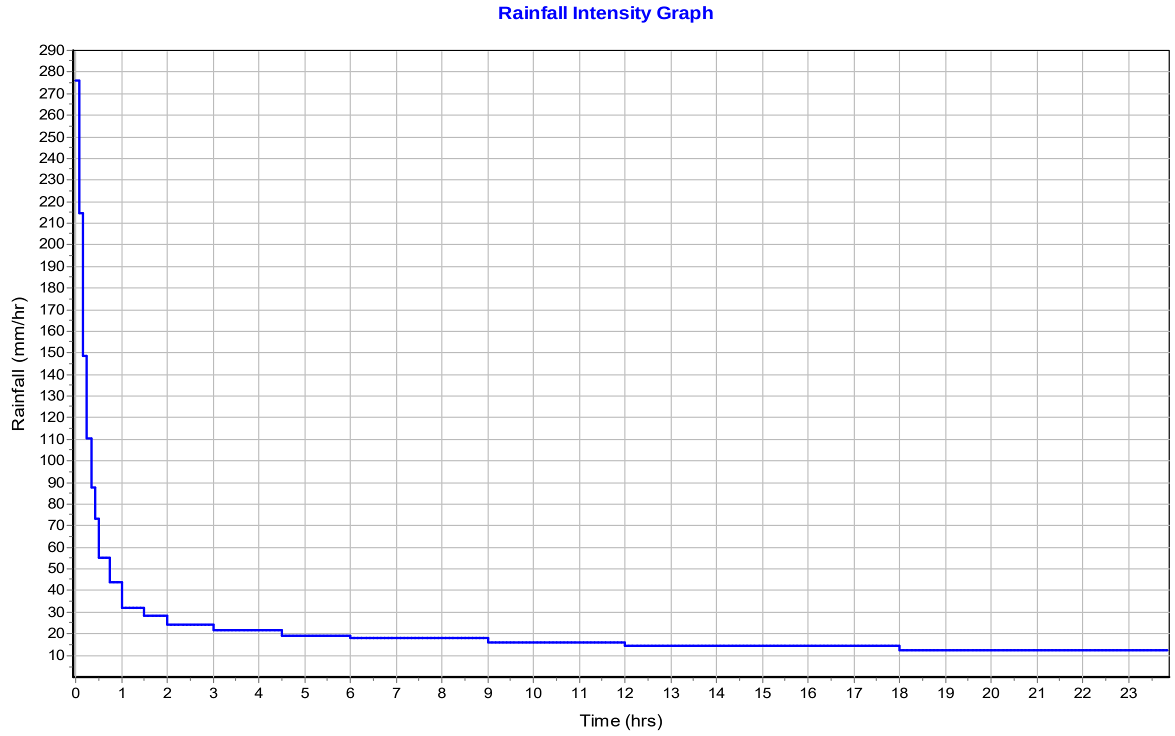
Composite Curve Number

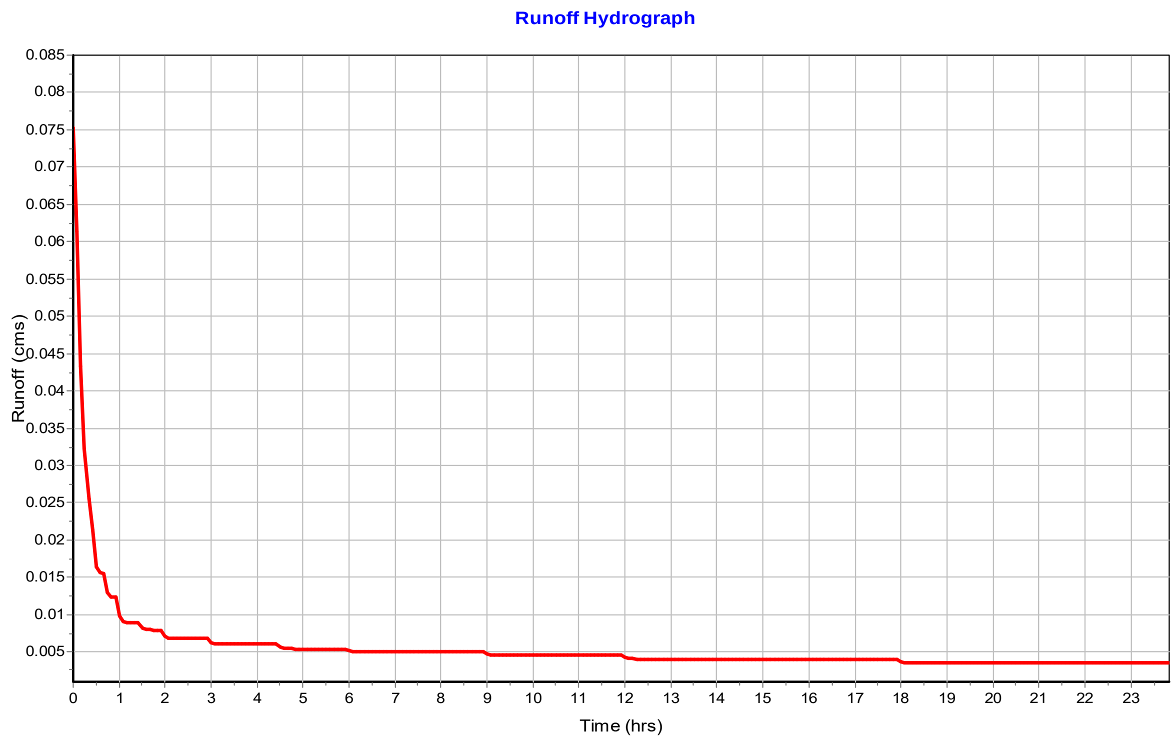
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
Paved roads with curbs & sewers	0.15	C	98
Composite Area & Weighted CN	0.15		98

Subbasin Runoff Results

Total Rainfall (mm) 483.54
Total Runon (mm) 0
Total Evaporation (mm) 0
Total Infiltration (mm) 0
Total Runoff (mm) 480.55
Peak Runoff (cms) 0.08
Weighted Curve Number 98
Time of Concentration (days hh:mm:ss) 0 00:05:57

Subbasin : N-Sub-04





Subbasin : N-Sub-05

Input Data

Area (ha)	0.38
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.2
Equivalent Width (m)	32
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

Composite Curve Number

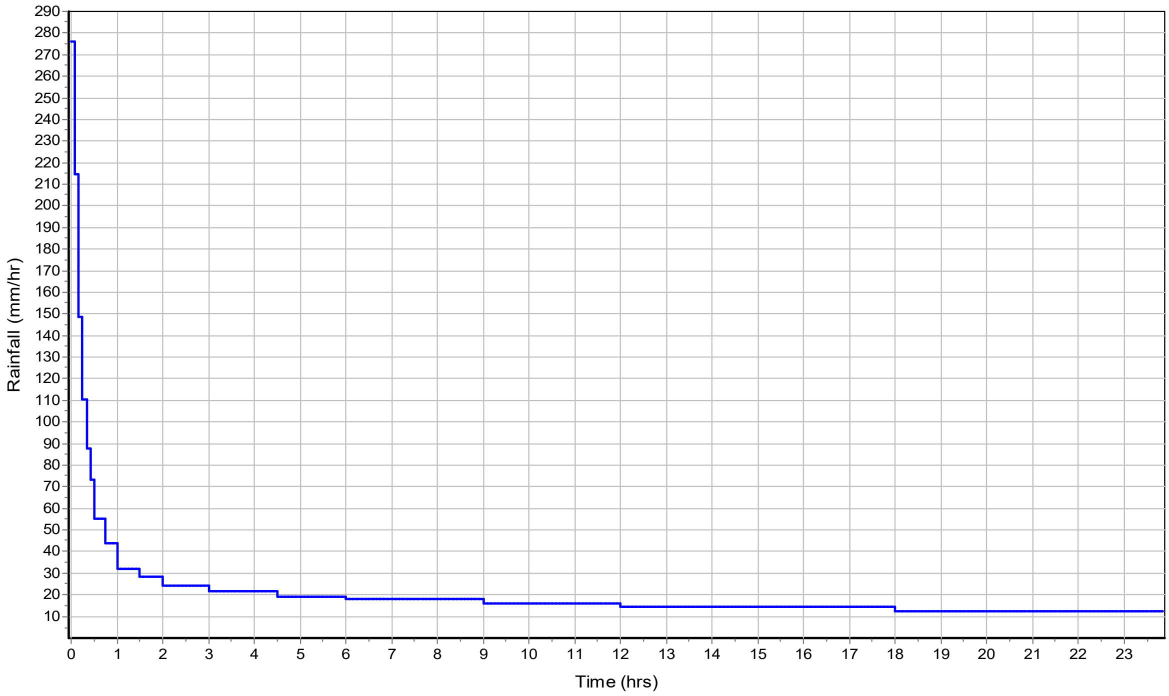
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
-	0.38	-	72
Composite Area & Weighted CN	0.38		72

Subbasin Runoff Results

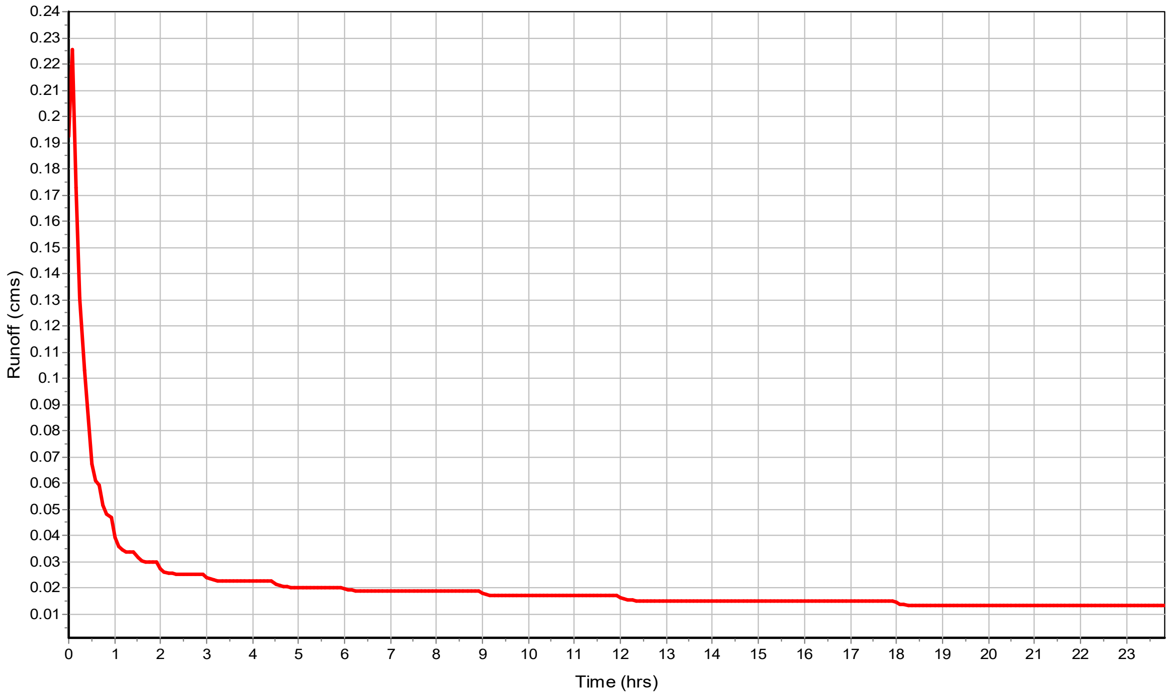
Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	479
Peak Runoff (cms)	0.23
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:11:11

Subbasin : N-Sub-05

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : N-Sub-06

Input Data

Area (ha)	0.61
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.2
Equivalent Width (m)	39
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

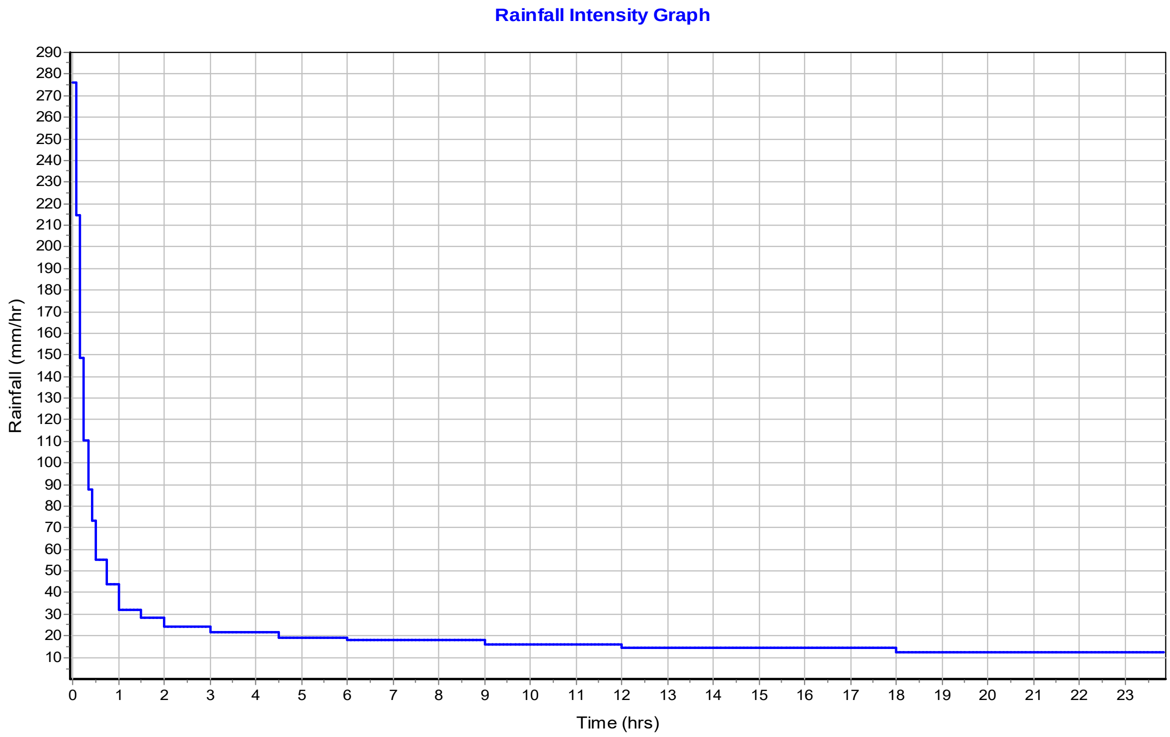
Composite Curve Number

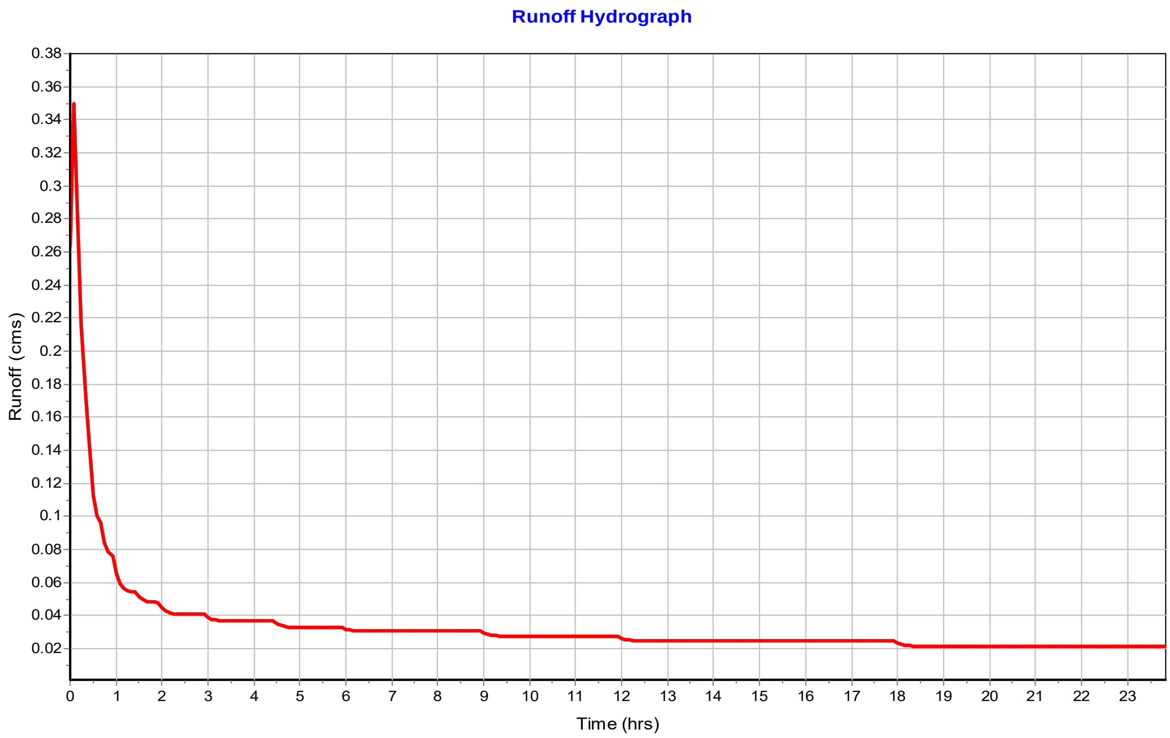
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
-	0.61	-	72
Composite Area & Weighted CN	0.61		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	478.46
Peak Runoff (cms)	0.35
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:13:12

Subbasin : N-Sub-06





Subbasin : N-Sub-07

Input Data

Area (ha) 0.12
Impervious Area (%) 100
Weighted Curve Number 72
Conductivity (mm/hr) 0.5
Drying Time (days) 0.25
Average Slope (%) 1.2
Equivalent Width (m) 12
Impervious Area
Manning's Roughness 0.015
Pervious Area
Manning's Roughness 0.1
Curb & Gutter Length (m) 0
Rain Gage ID 1

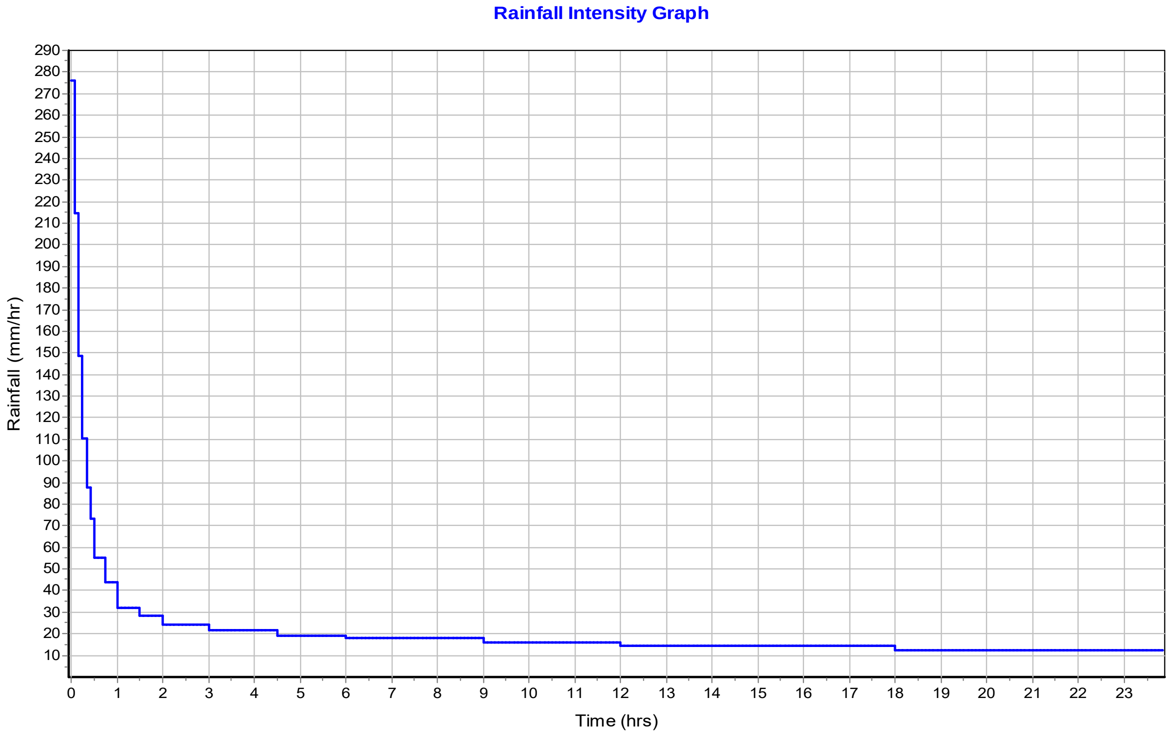
Composite Curve Number

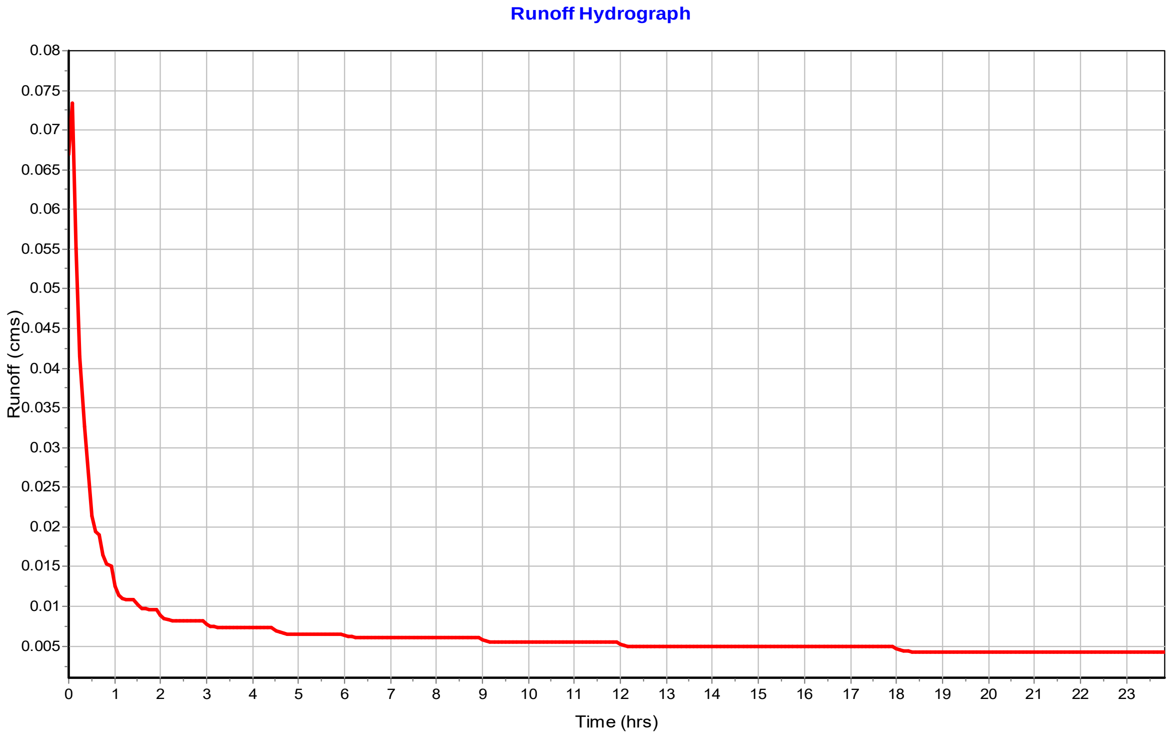
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
-	0.12	-	72
Composite Area & Weighted CN	0.12		72

Subbasin Runoff Results

Total Rainfall (mm) 483.54
Total Runon (mm) 0
Total Evaporation (mm) 0
Total Infiltration (mm) 0
Total Runoff (mm) 479.27
Peak Runoff (cms) 0.08
Weighted Curve Number 72
Time of Concentration (days hh:mm:ss) 0 00:10:12

Subbasin : N-Sub-07





Subbasin : N-Sub-08

Input Data

Area (ha)	0.37
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.2
Equivalent Width (m)	40
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

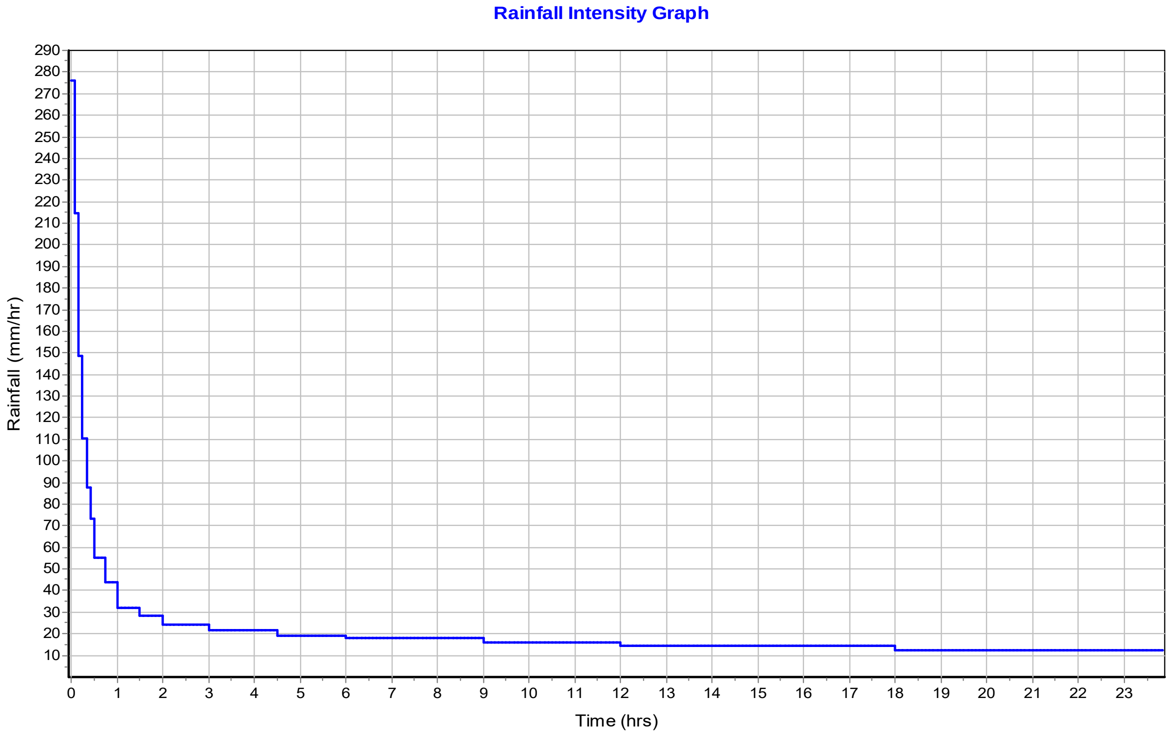
Composite Curve Number

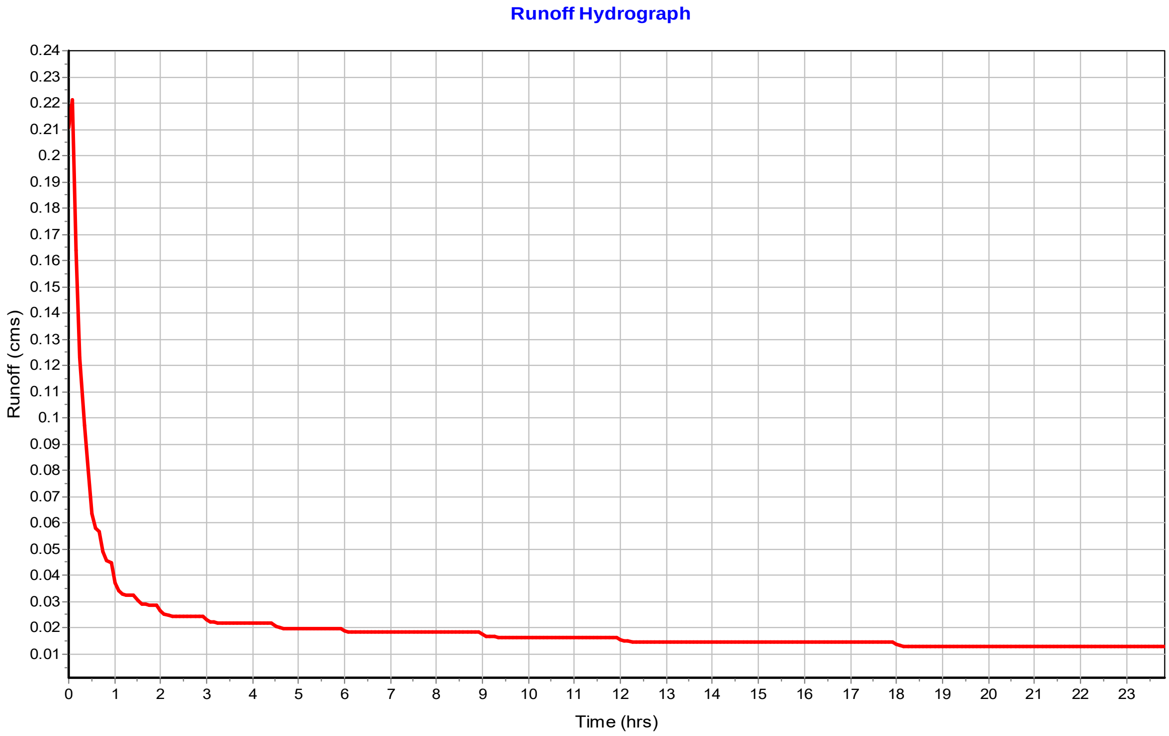
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
-	0.37	-	72
Composite Area & Weighted CN	0.37		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	479.45
Peak Runoff (cms)	0.24
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:09:34

Subbasin : N-Sub-08





Subbasin : N-Sub-09

Input Data

Area (ha)	0.2
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.2
Equivalent Width (m)	38
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

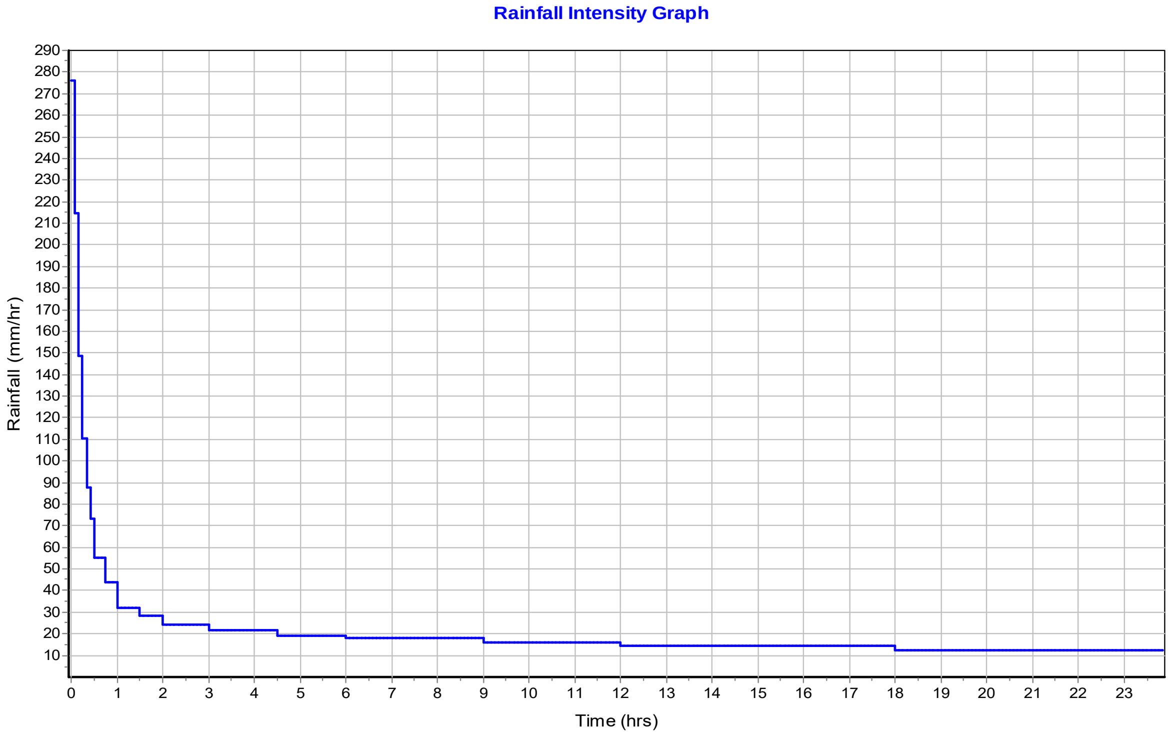
Composite Curve Number

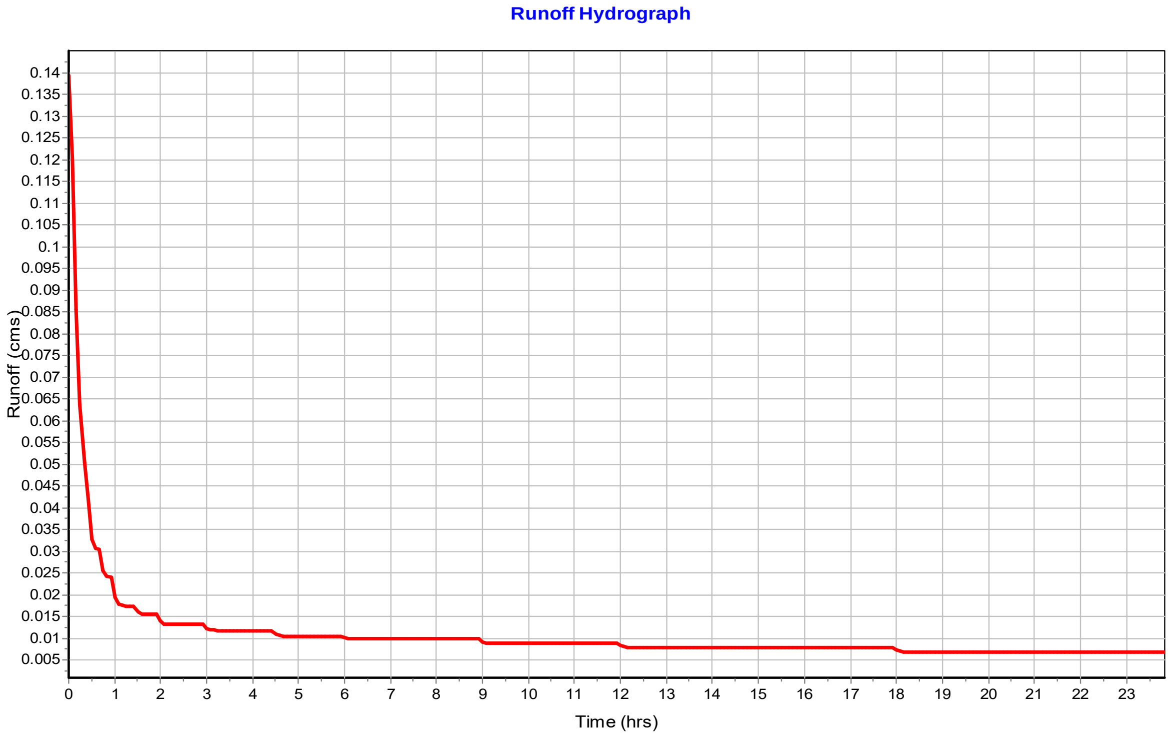
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
-	0.2	-	72
Composite Area & Weighted CN	0.2		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.26
Peak Runoff (cms)	0.15
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:06:50

Subbasin : N-Sub-09





Subbasin : N-Sub-10

Input Data

Area (ha)	0.06
Impervious Area (%)	25
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	500
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

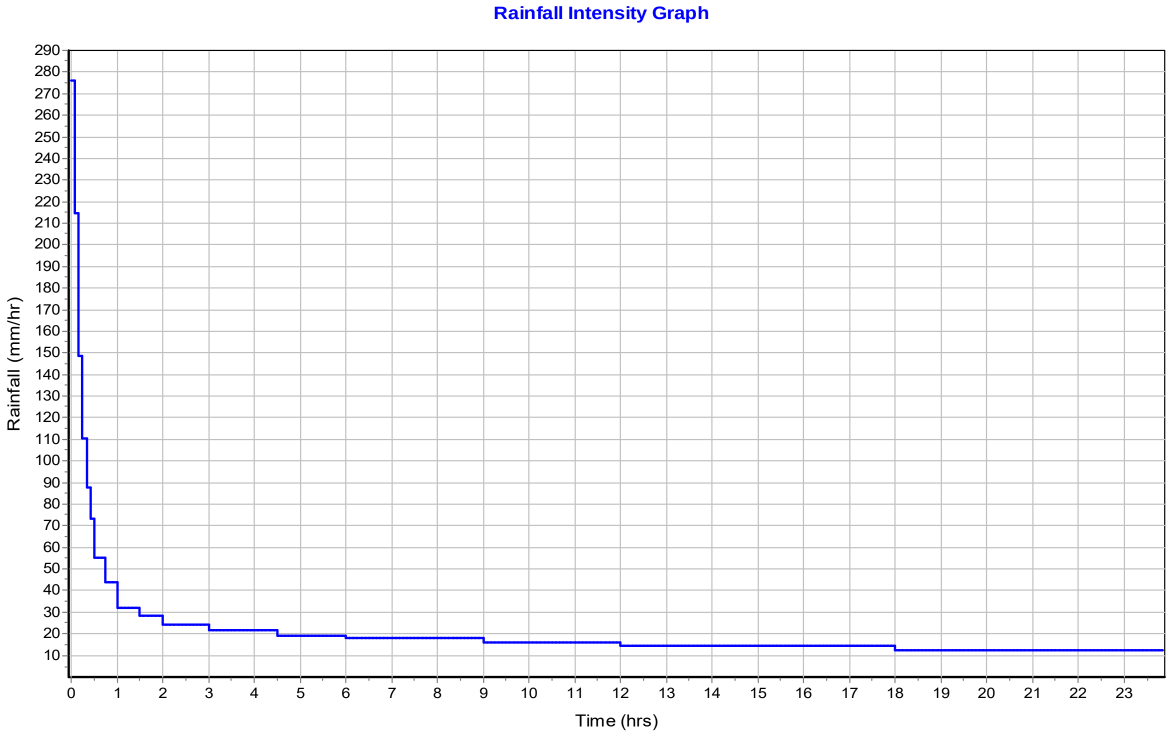
Composite Curve Number

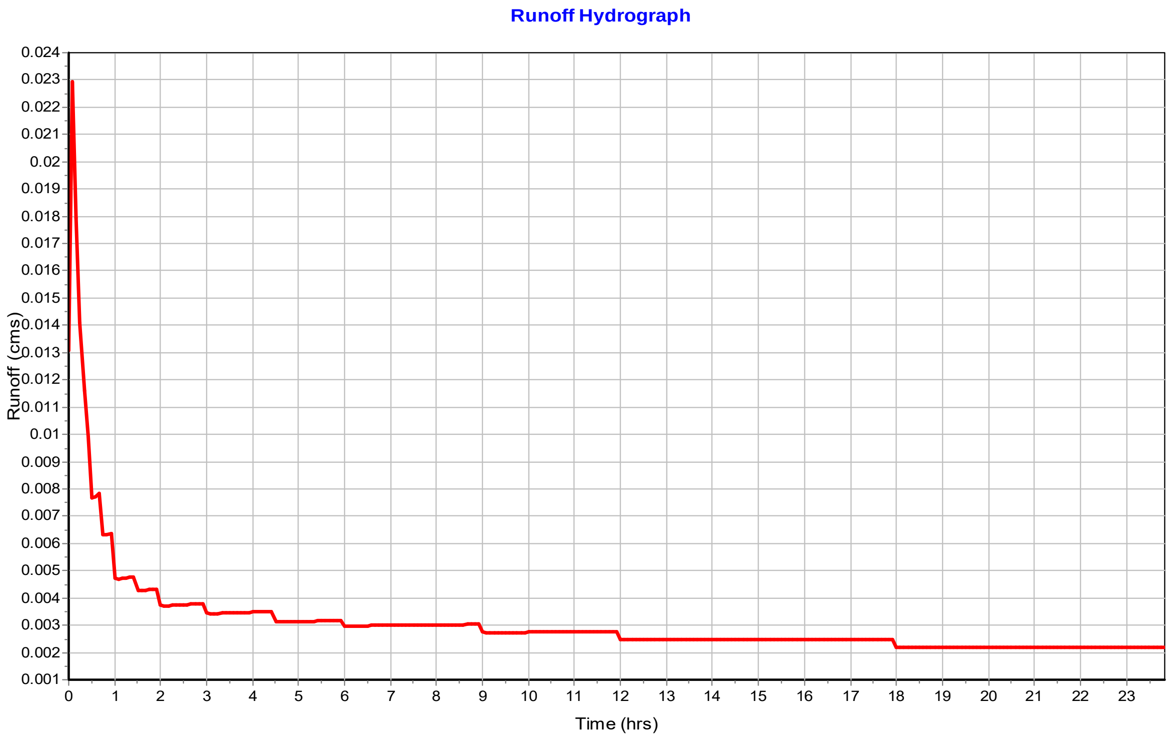
32 Soil/Surface Description	Area (ha)	Soil Group	Curve Number
-	0.06	-	72
Composite Area & Weighted CN	0.06		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	61.517
Total Runoff (mm)	418.05
Peak Runoff (cms)	0.02
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:02:31

Subbasin : N-Sub-10





Subbasin : N-Sub-11

Input Data

Area (ha)	0.19
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.2
Equivalent Width (m)	28
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

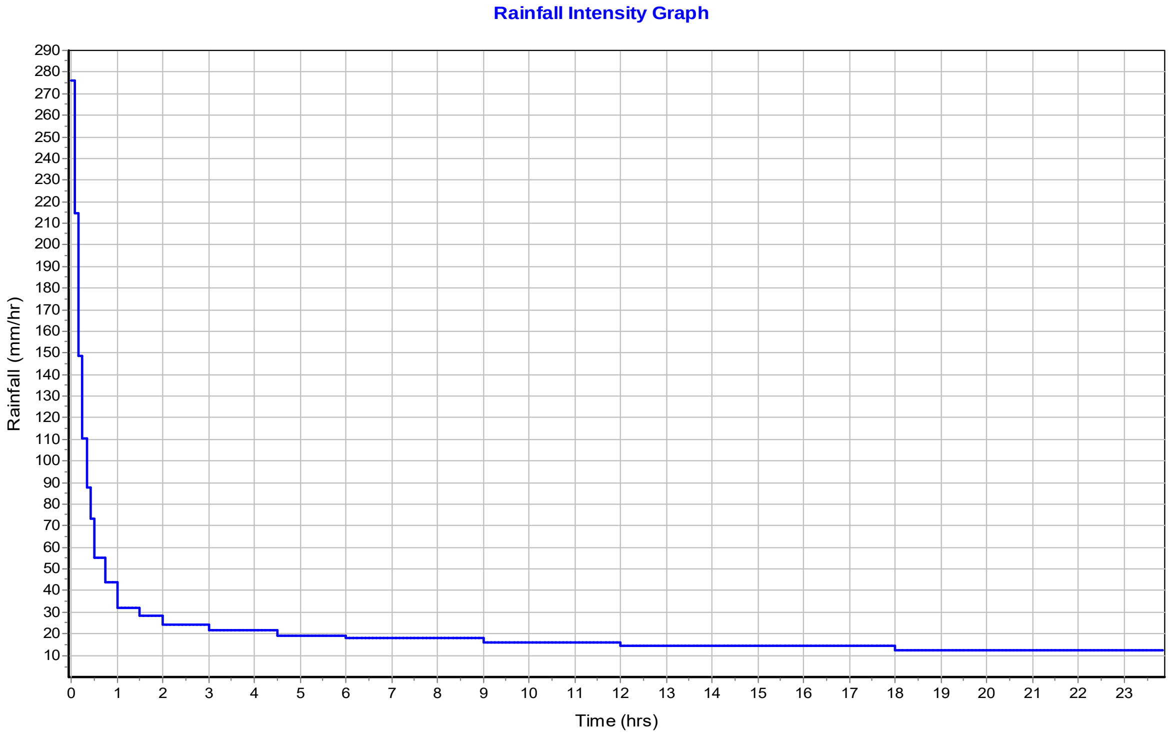
Composite Curve Number

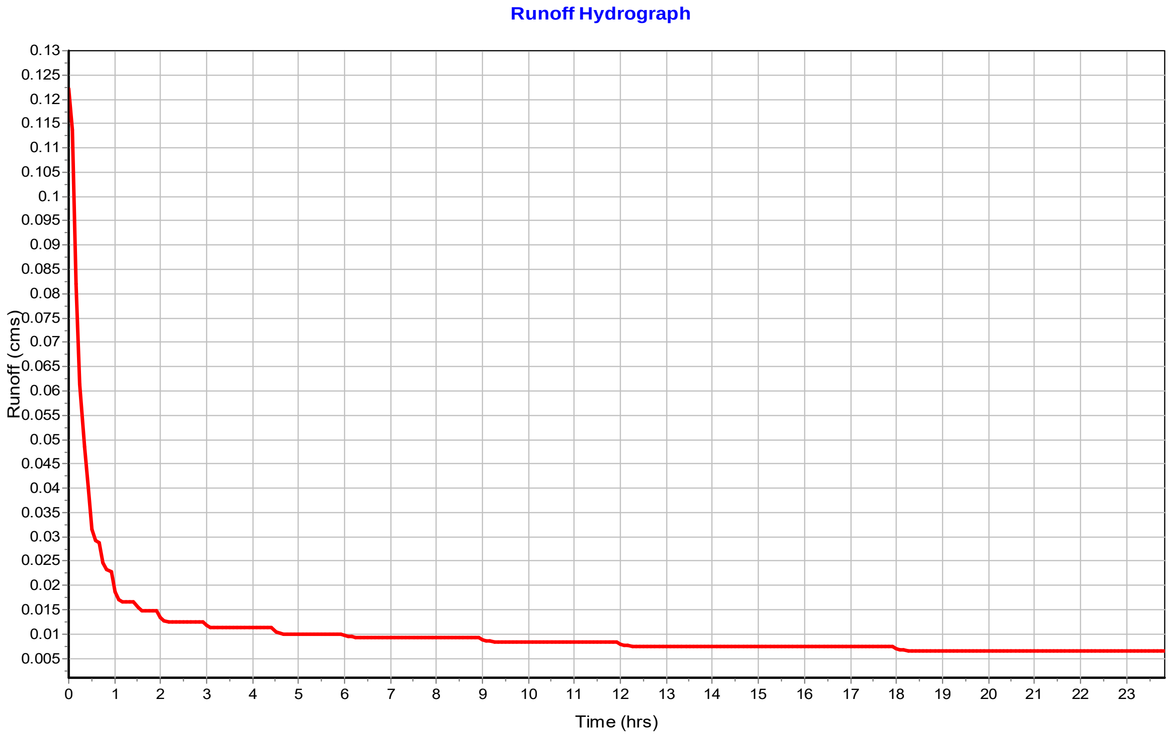
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
-		0.19	-	72
Composite Area & Weighted CN		0.19		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	479.92
Peak Runoff (cms)	0.13
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:07:56

Subbasin : N-Sub-11





Subbasin : N-Sub-12

Input Data

Area (ha)	0.3
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.2
Equivalent Width (m)	28
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

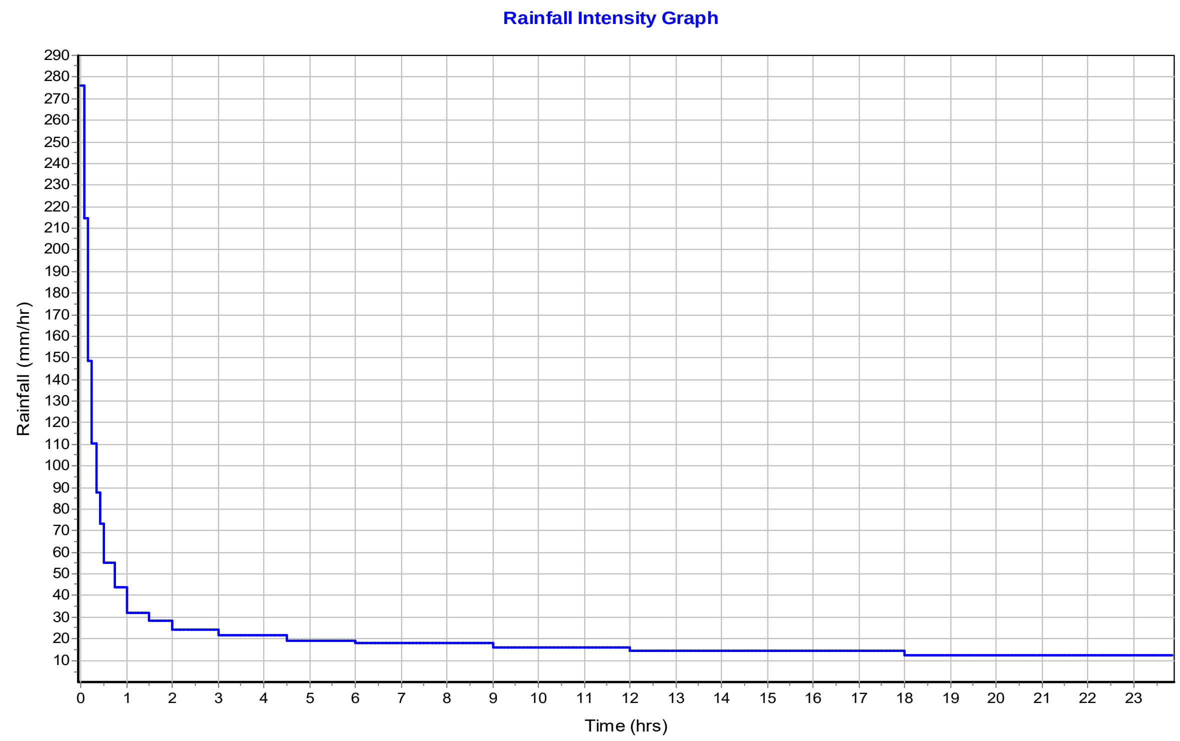
Composite Curve Number

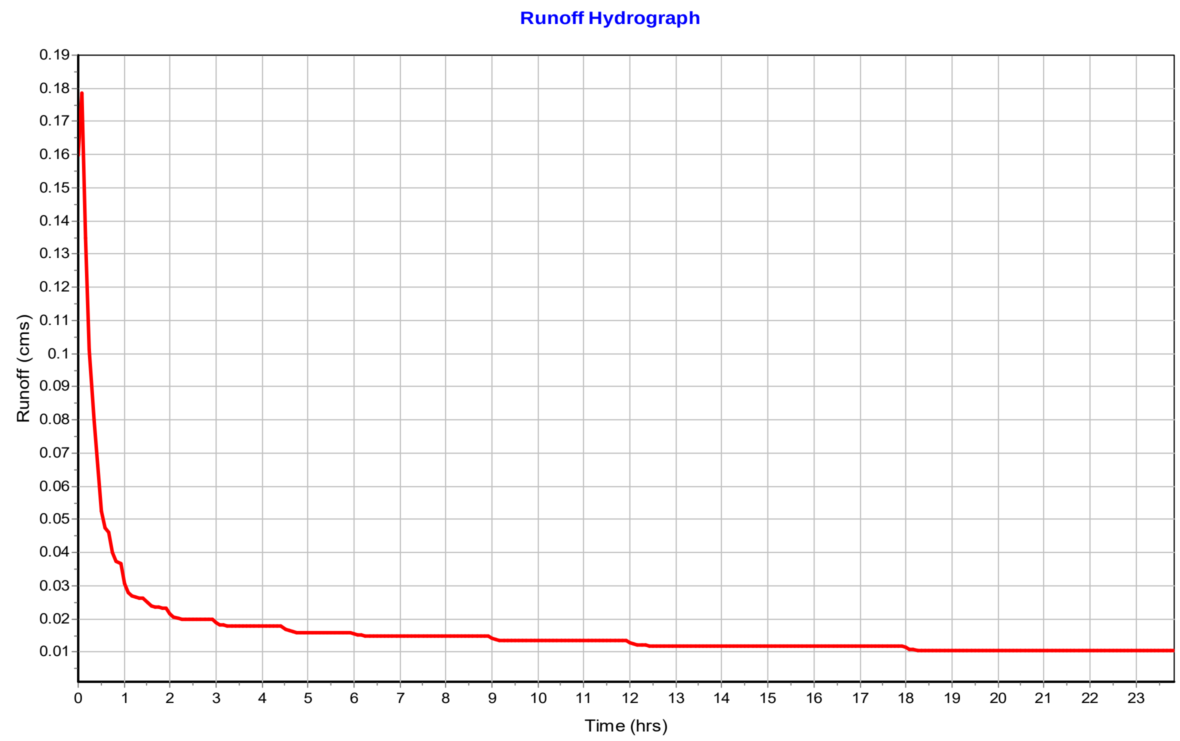
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
-		0.3	-	72
Composite Area & Weighted CN		0.3		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	479.2
Peak Runoff (cms)	0.18
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:10:29

Subbasin : N-Sub-12





Subbasin : N-Sub-13

Input Data

Area (ha)	0.63
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.2
Equivalent Width (m)	292
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

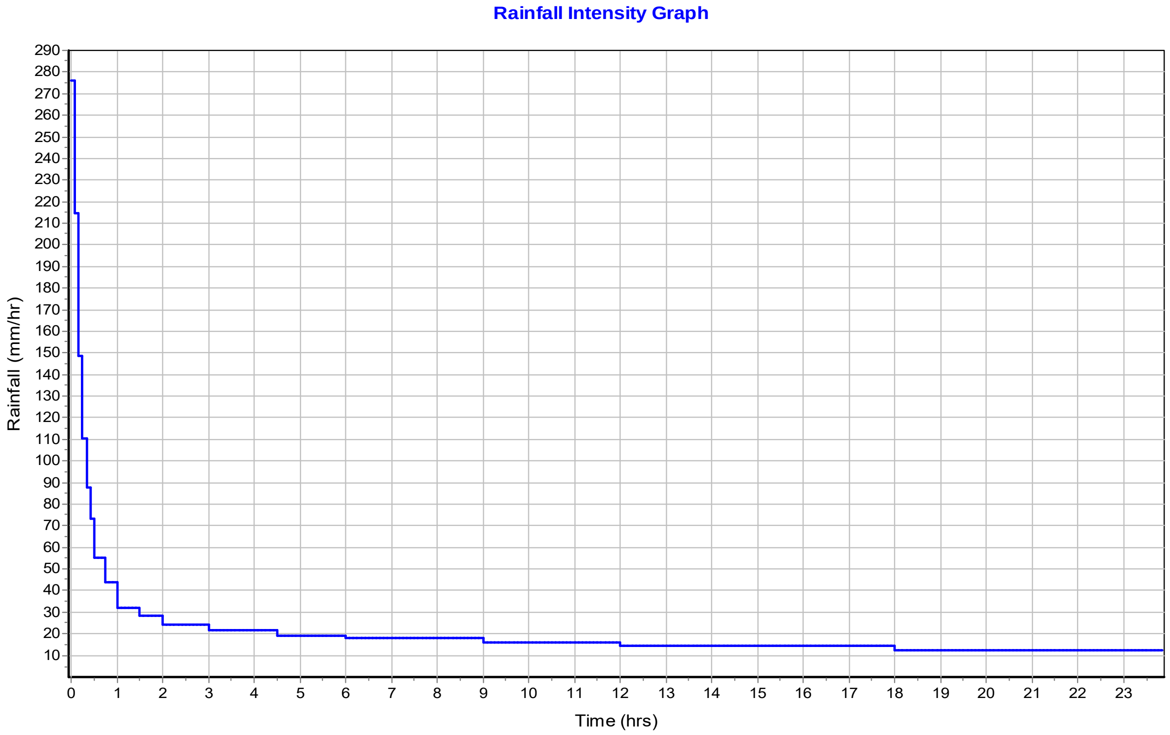
Composite Curve Number

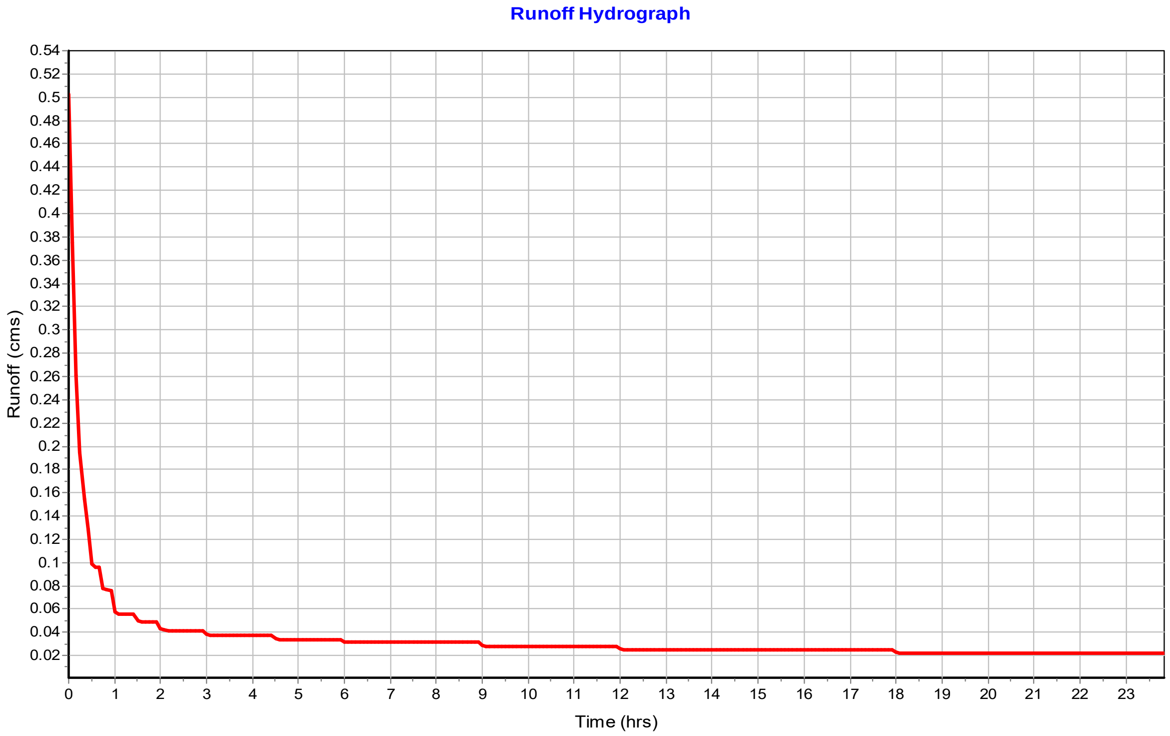
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
-		0.67	-	72
Composite Area & Weighted CN		0.67		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	481.31
Peak Runoff (cms)	0.5
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:04:00

Subbasin : N-Sub-13





Subbasin : N-Sub-14

Input Data

Area (ha)	0.21
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	3
Equivalent Width (m)	23
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

Composite Curve Number

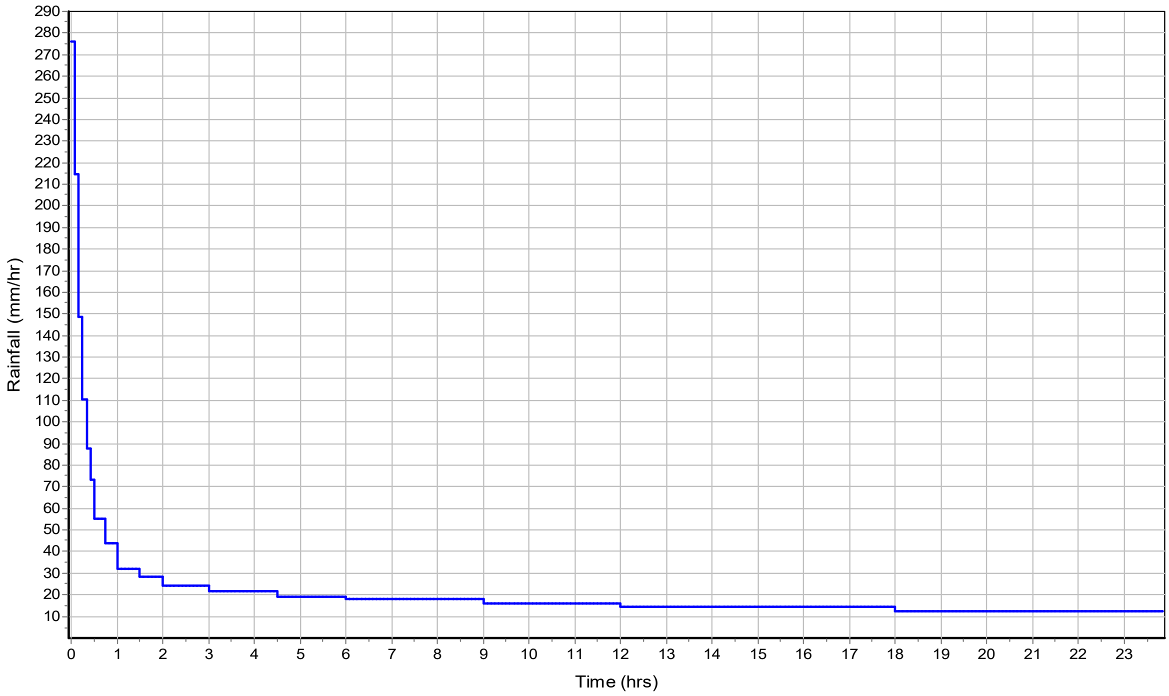
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
-		0.21	-	72
Composite Area & Weighted CN		0.21		72

Subbasin Runoff Results

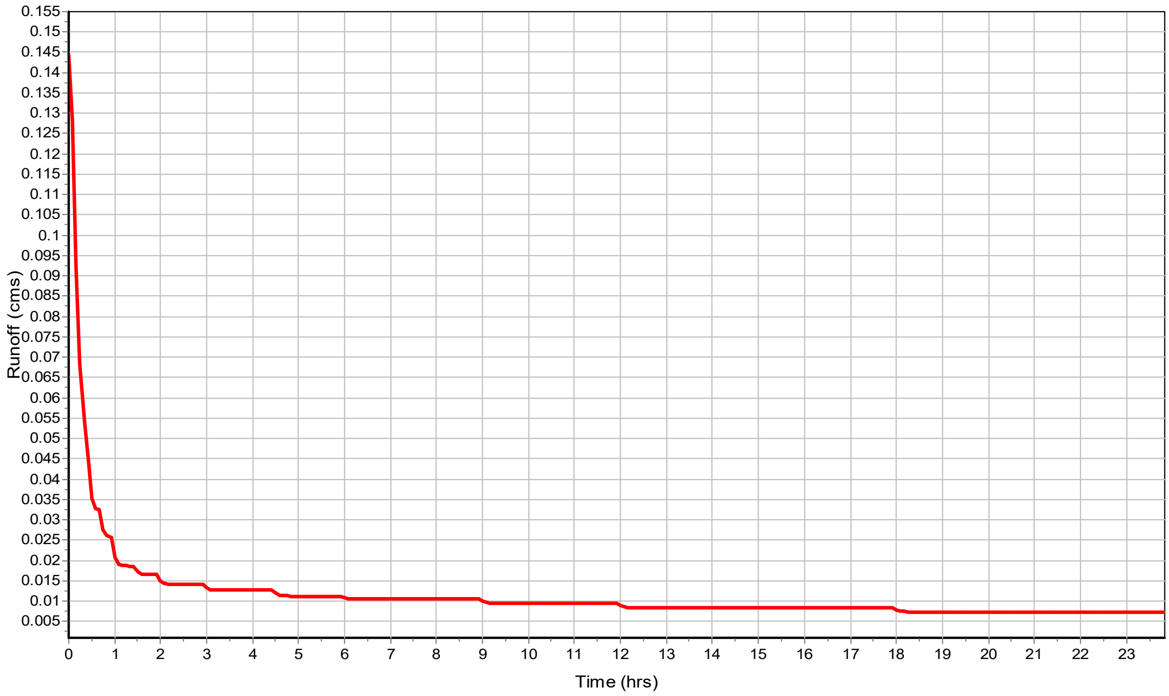
Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.12
Peak Runoff (cms)	0.15
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:07:18

Subbasin : N-Sub-14

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : N-Sub-15

Input Data

Area (ha)	0.13
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	2
Equivalent Width (m)	19
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

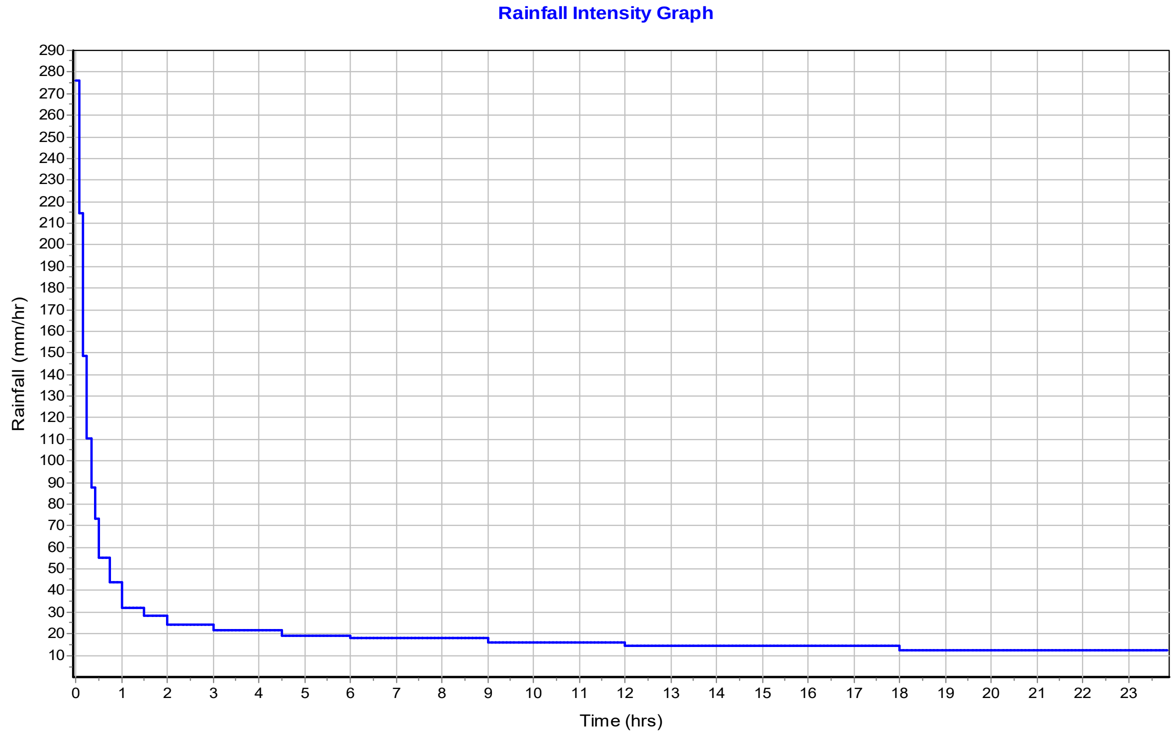
Composite Curve Number

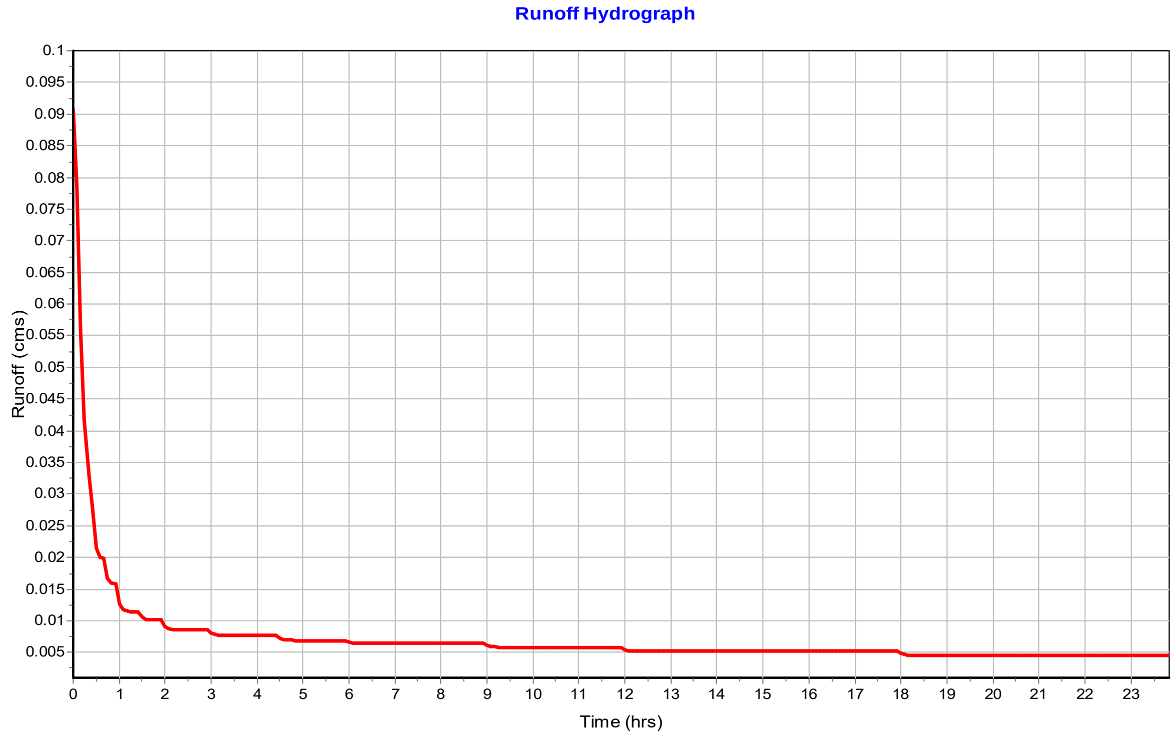
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
-		0.13	-	72
Composite Area & Weighted CN		0.13		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.25
Peak Runoff (cms)	0.09
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:06:53

Subbasin : N-Sub-15





Subbasin : N-Sub-16

Input Data

Area (ha)	0.15
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	2
Equivalent Width (m)	22
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

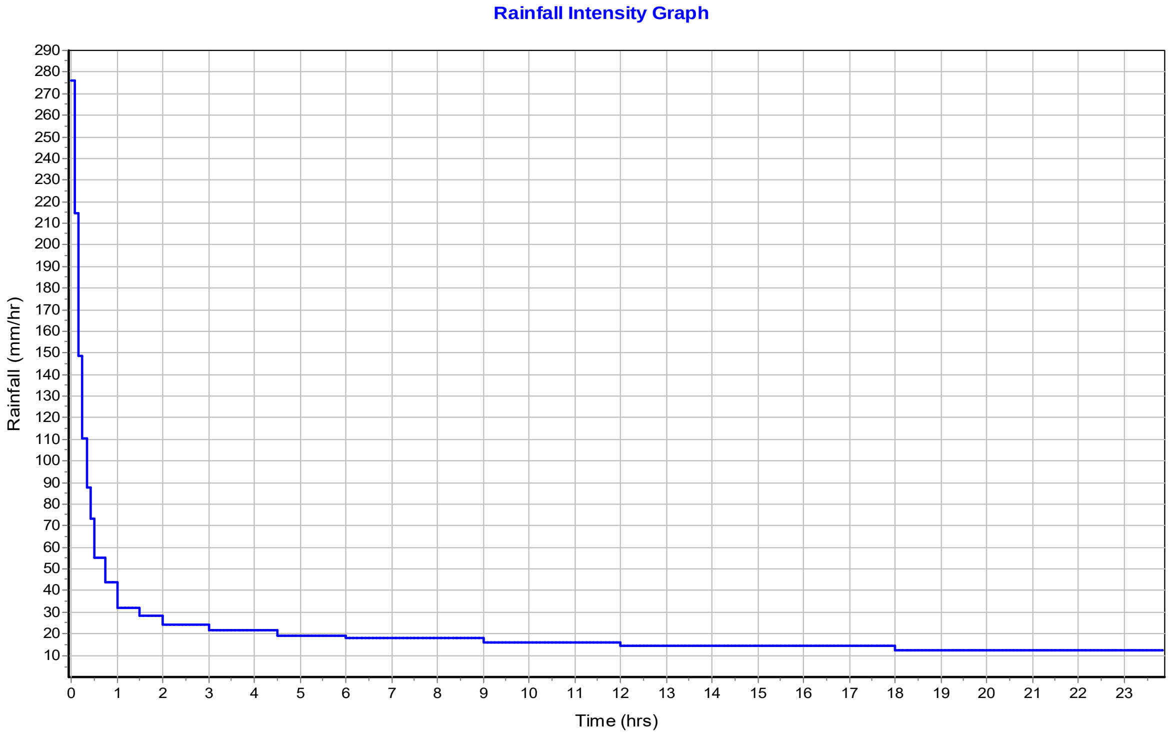
Composite Curve Number

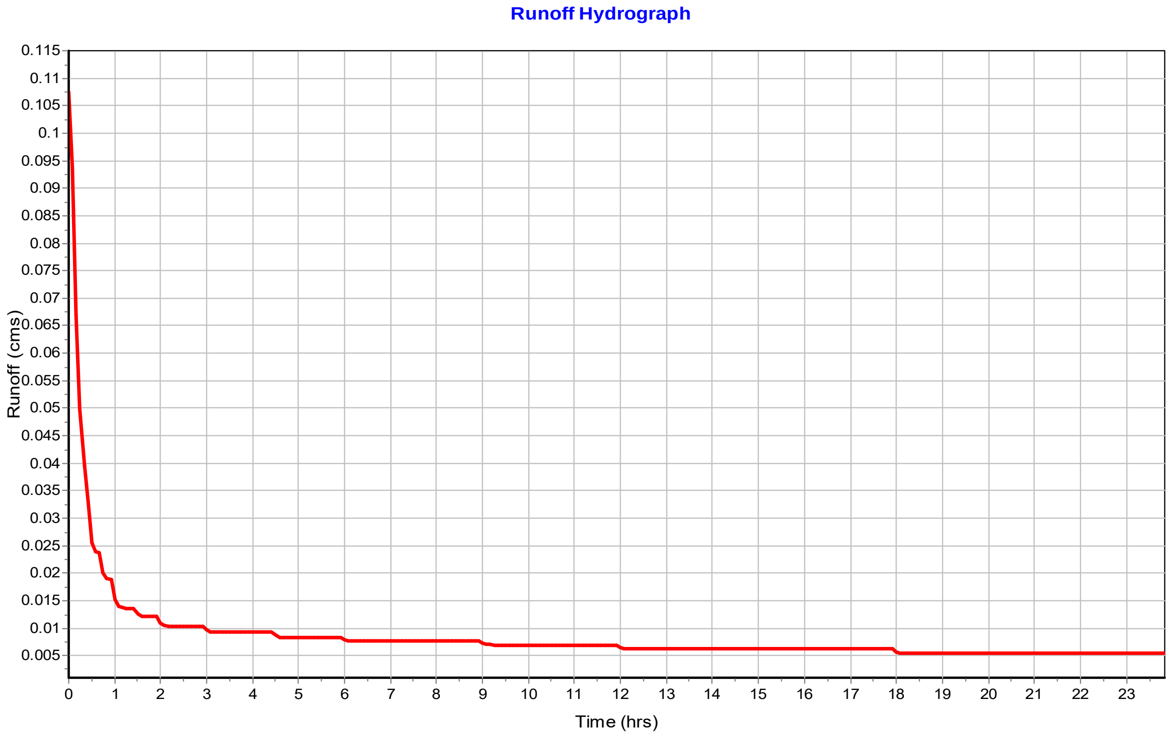
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
-		0.15	-	72
Composite Area & Weighted CN		0.15		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.2
Peak Runoff (cms)	0.11
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:07:00

Subbasin : N-Sub-16





Subbasin : N-Sub-17

Input Data

Area (ha)	0.24
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.15
Drying Time (days)	7
Average Slope (%)	1.5
Equivalent Width (m)	37
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

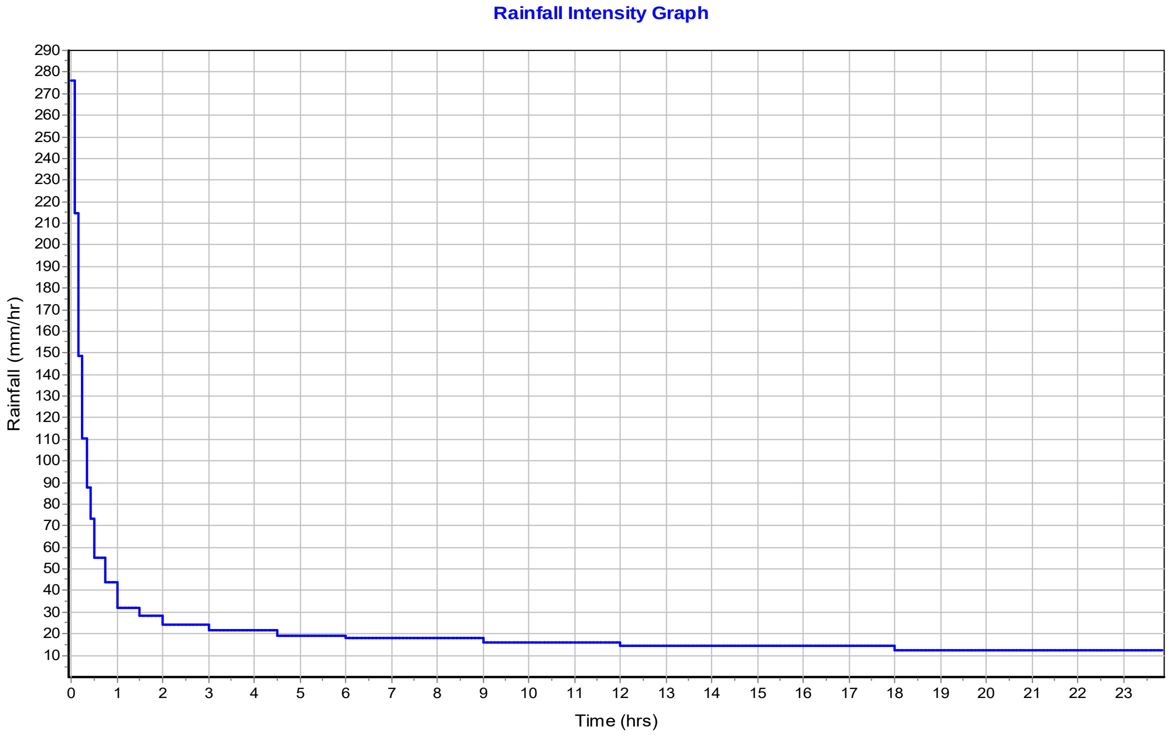
Composite Curve Number

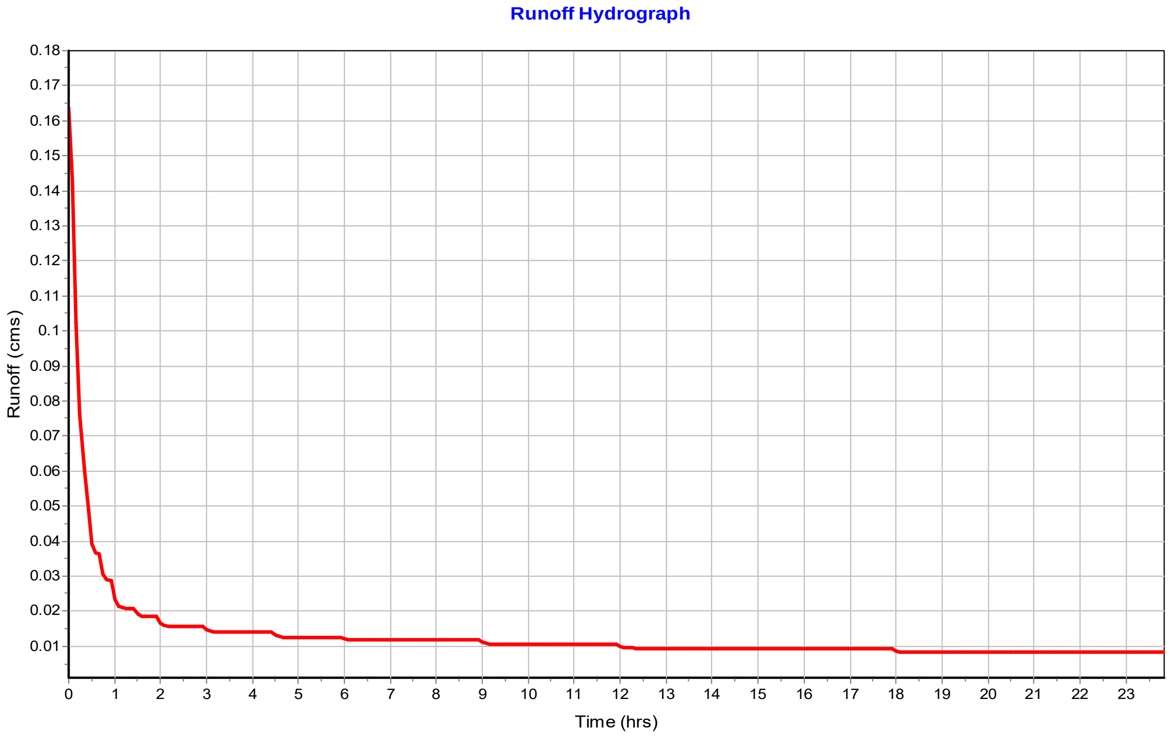
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
-		0.24	-	72
Composite Area & Weighted CN		0.24		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.63
Peak Runoff (cms)	0.17
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:07:12

Subbasin : N-Sub-17





Subbasin : S-Sub-01

Input Data

Area (ha)	0.1
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	34
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

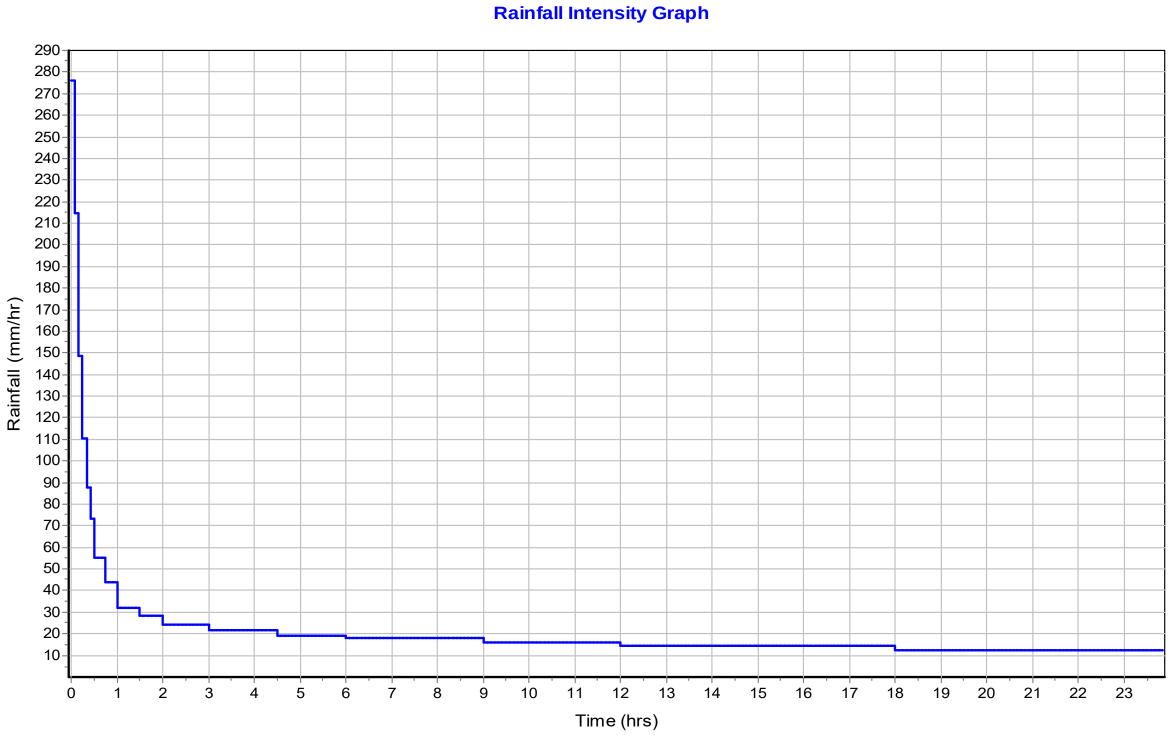
Composite Curve Number

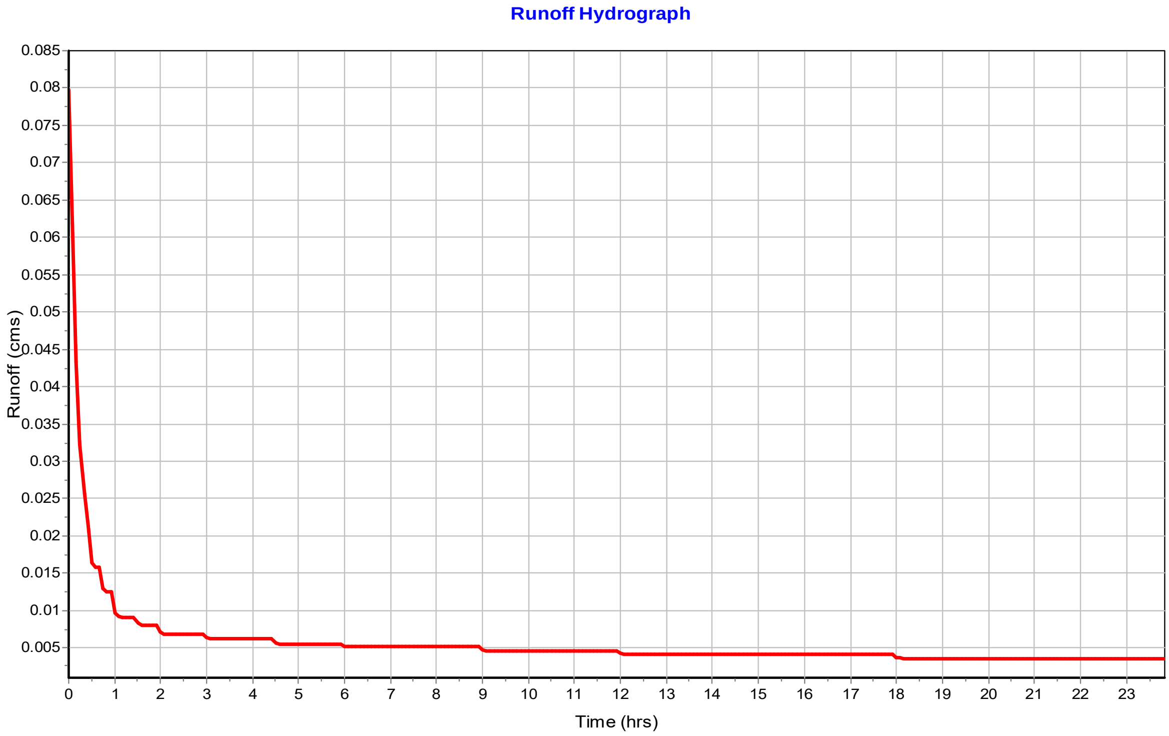
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with curbs & sewers		0.1	C	98
Composite Area & Weighted CN		0.1		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.88
Peak Runoff (cms)	0.08
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:01

Subbasin : S-Sub-01





Subbasin : S-Sub-02

Input Data

Area (ha)	0.13
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	47
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

Composite Curve Number

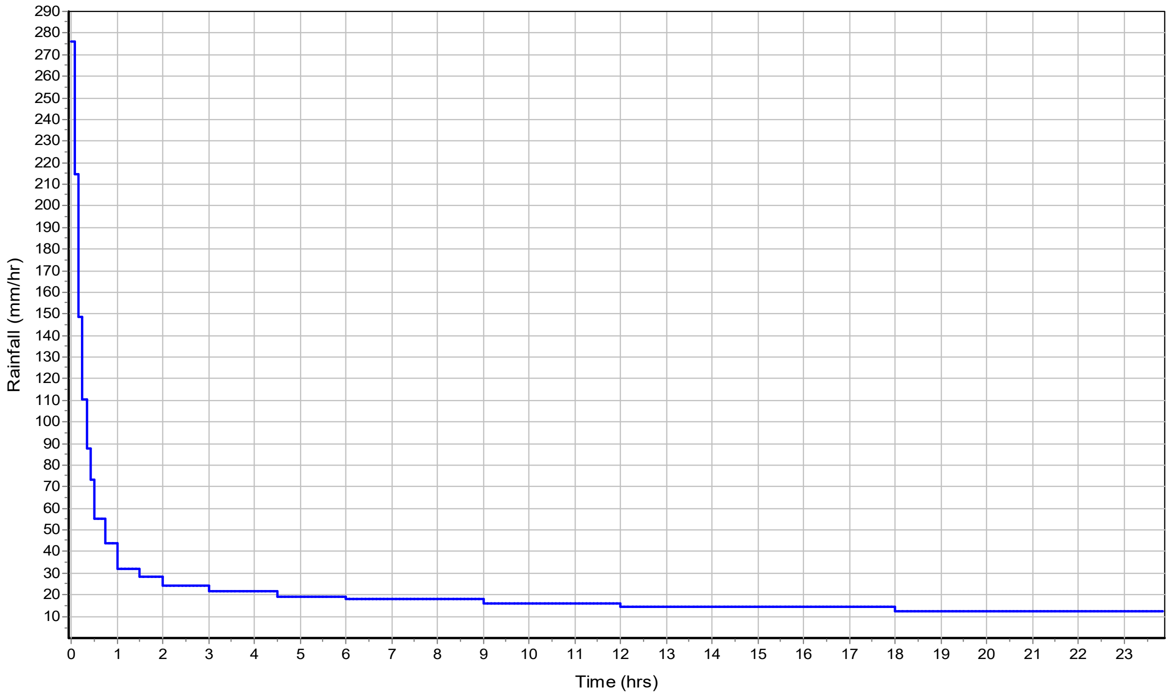
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with curbs & sewers		0.13	C	98
Composite Area & Weighted CN		0.13		98

Subbasin Runoff Results

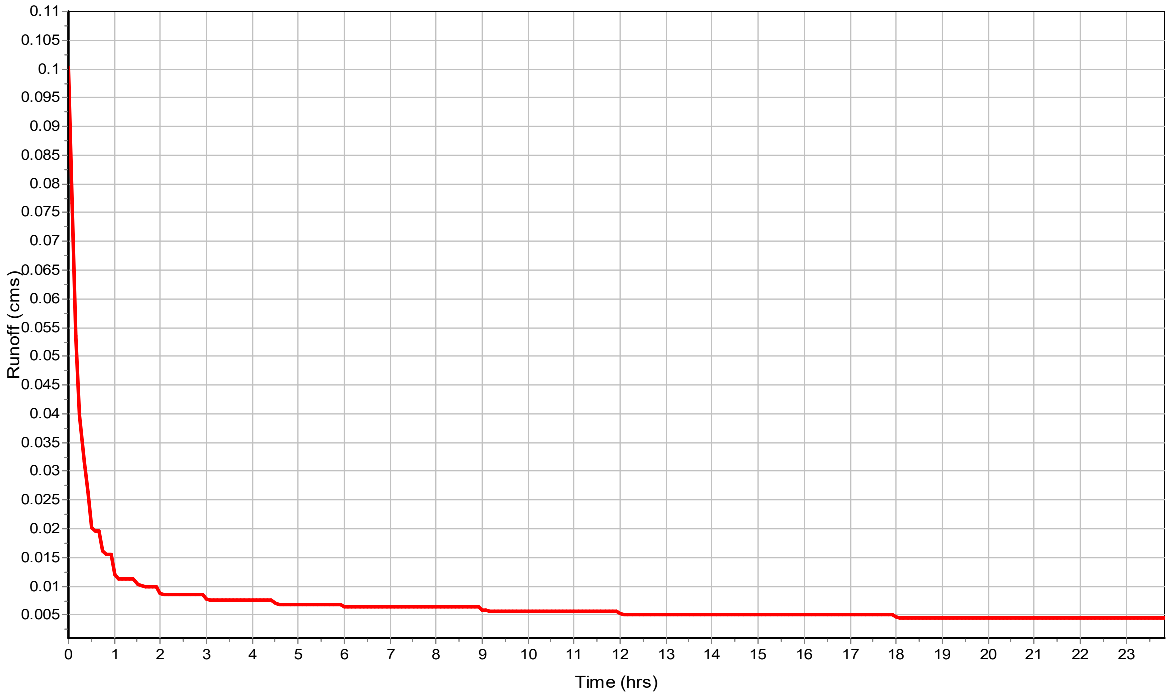
Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	481.01
Peak Runoff (cms)	0.1
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:04:42

Subbasin : S-Sub-02

Rainfall Intensity Graph



Runoff Hydrograph



Subbasin : S-Sub-03

Input Data

Area (ha)	0.12
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	48
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

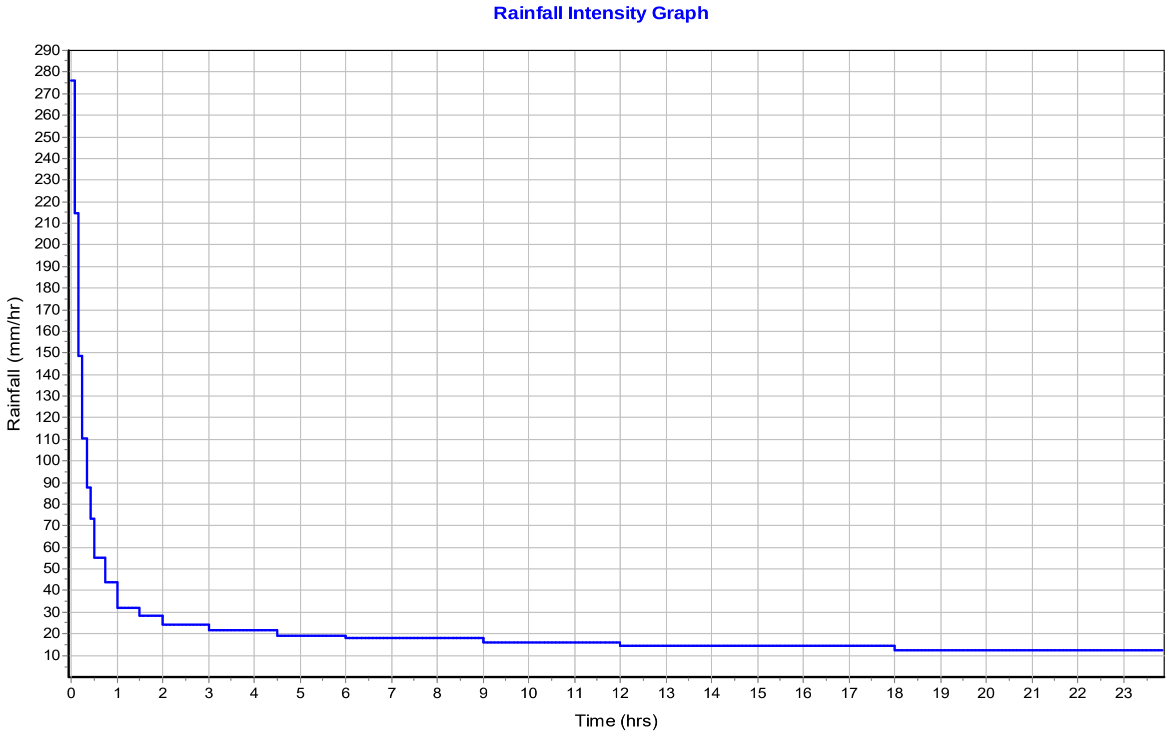
Composite Curve Number

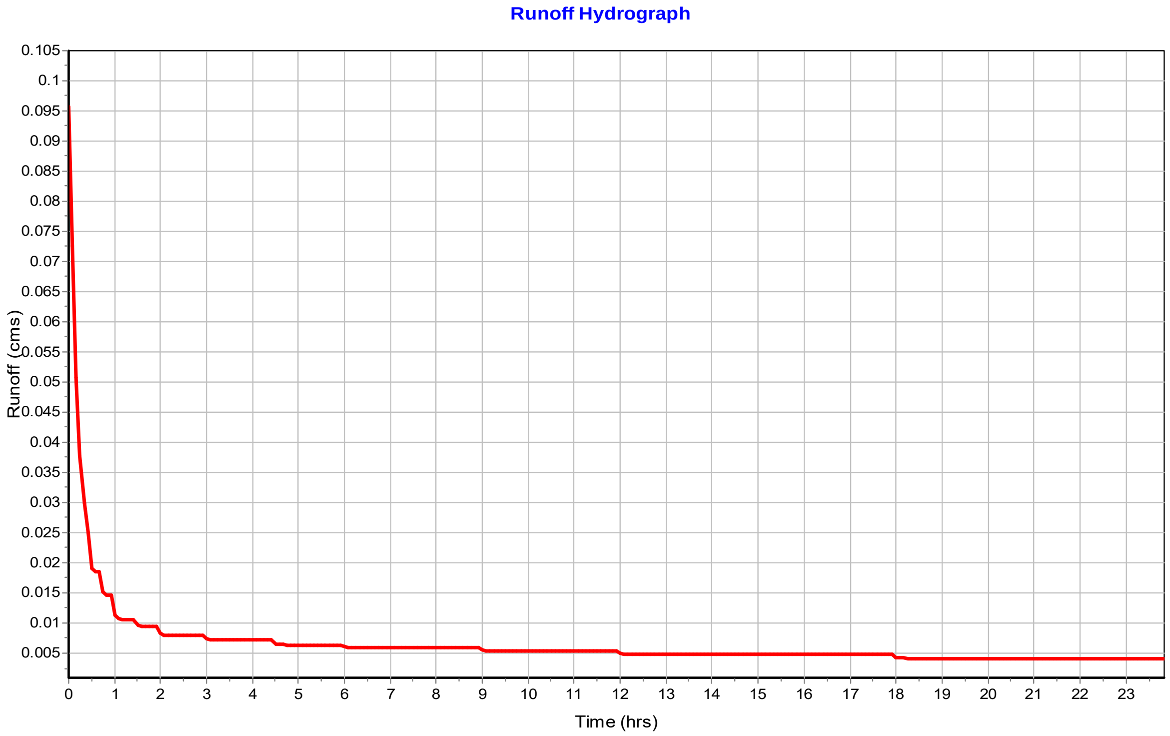
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with curbs & sewers		0.12	C	98
Composite Area & Weighted CN		0.12		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	481.09
Peak Runoff (cms)	0.1
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:04:30

Subbasin : S-Sub-03





Subbasin : S-Sub-04

Input Data

Area (ha)	0.12
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	30
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

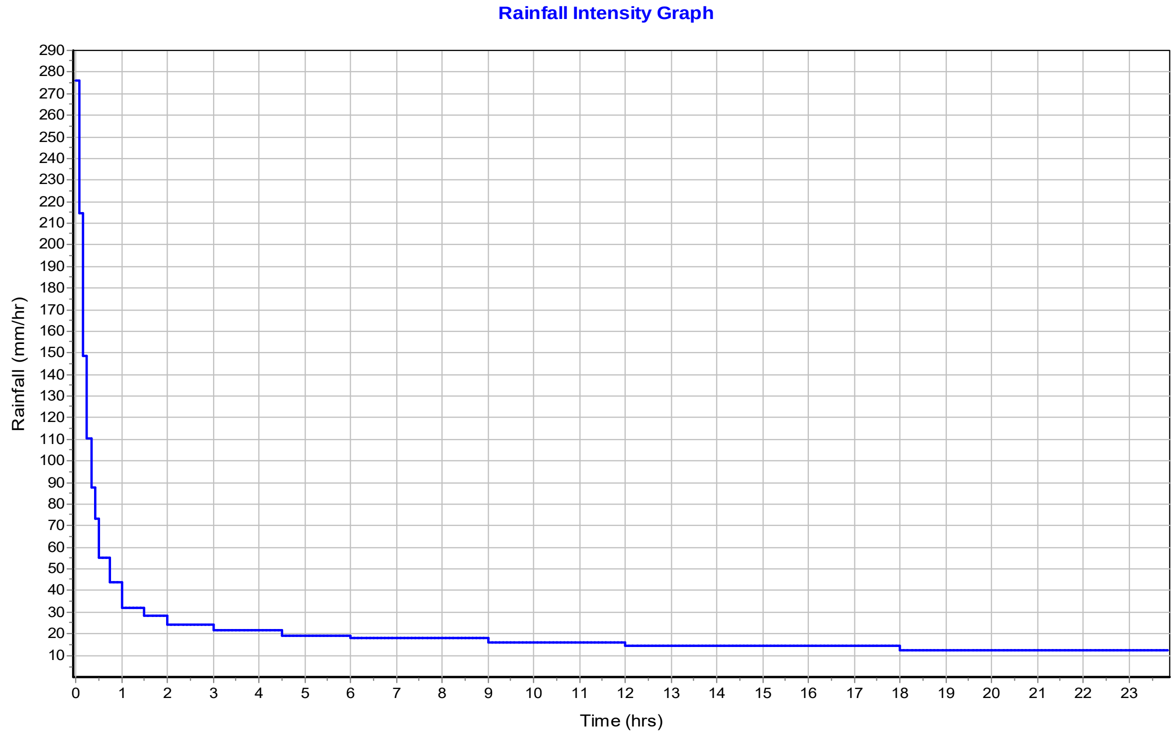
Composite Curve Number

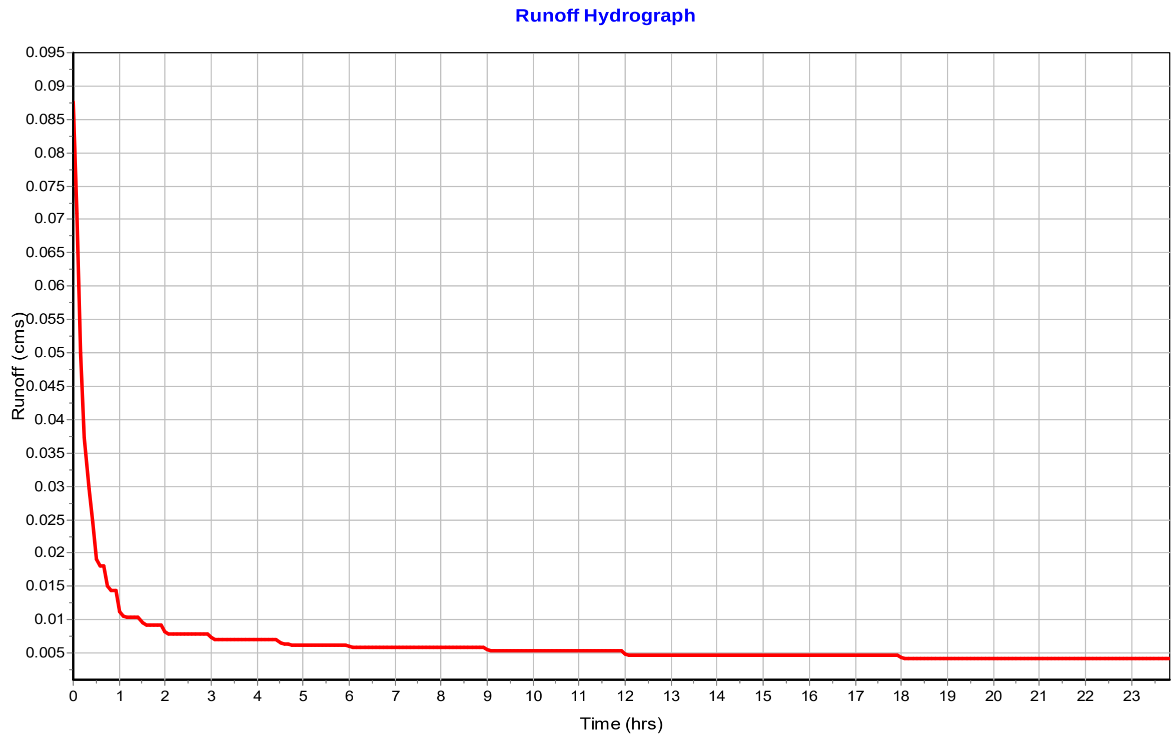
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved parking & roofs		0.12	C	98
Composite Area & Weighted CN		0.12		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.58
Peak Runoff (cms)	0.09
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:05:52

Subbasin : S-Sub-04





Subbasin : S-Sub-05

Input Data

Area (ha)	0.1
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	39
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

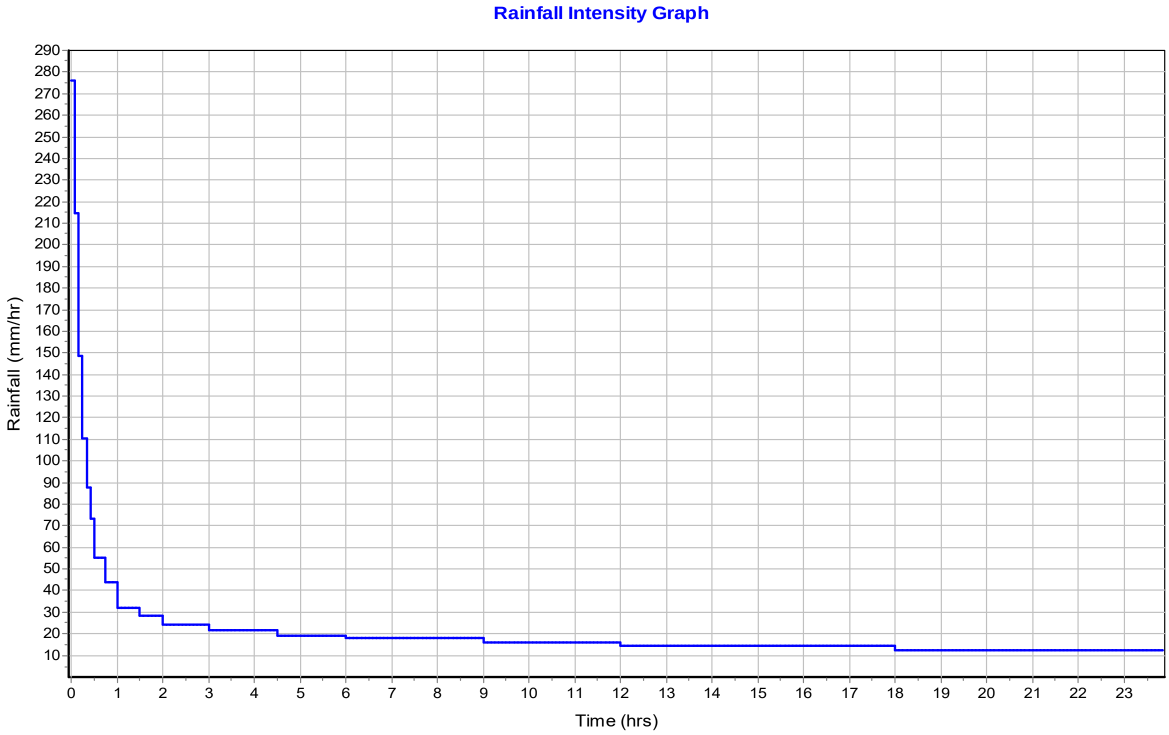
Composite Curve Number

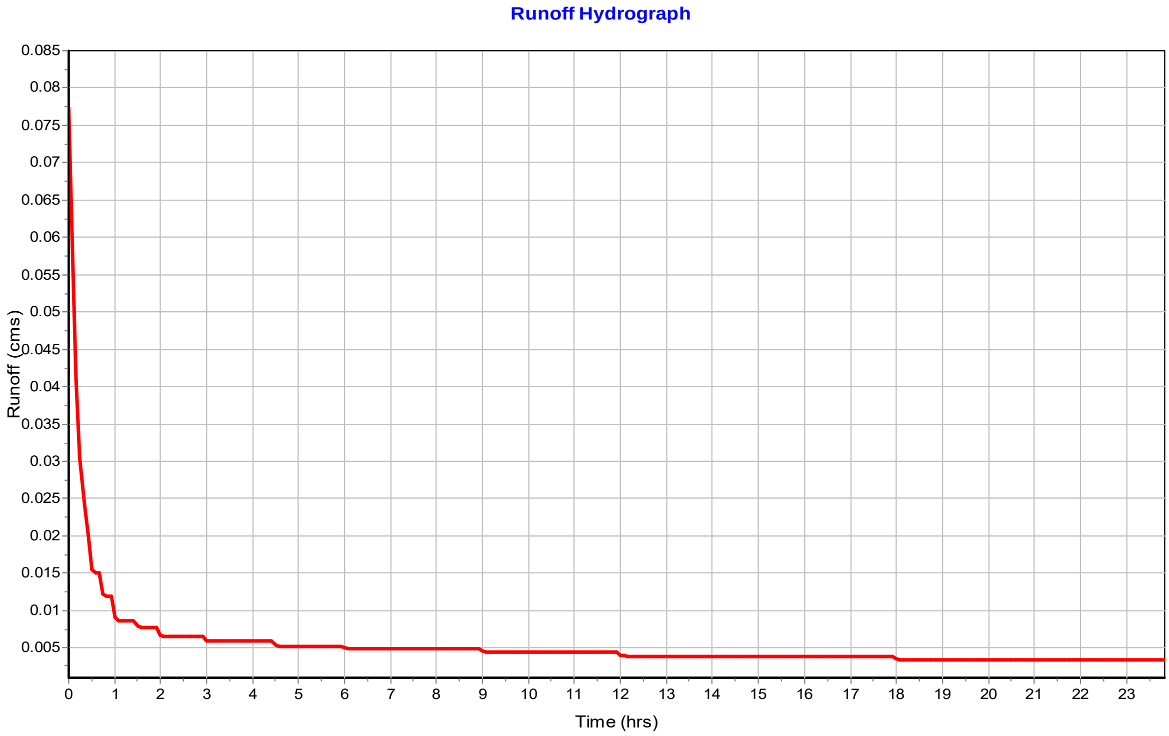
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with curbs & sewers		0.1	C	98
Composite Area & Weighted CN		0.1		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	481.1
Peak Runoff (cms)	0.08
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:04:29

Subbasin : S-Sub-05





Subbasin : S-Sub-06

Input Data

Area (ha)	0.19
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	42
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

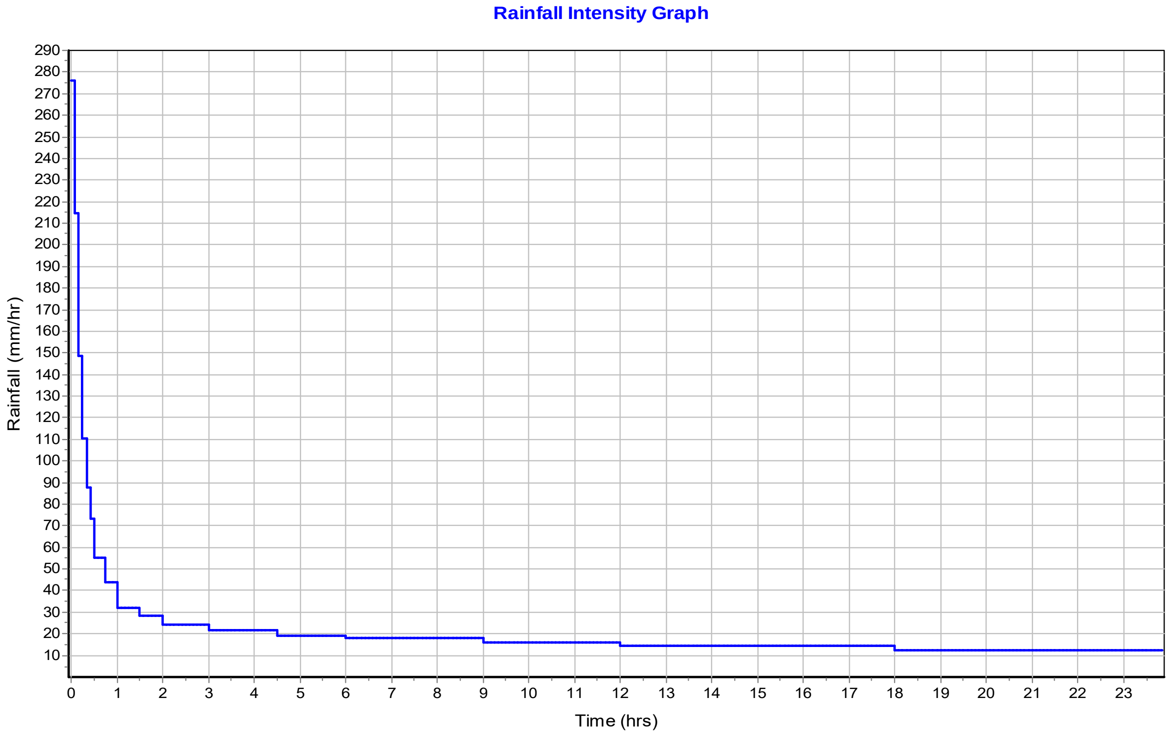
Composite Curve Number

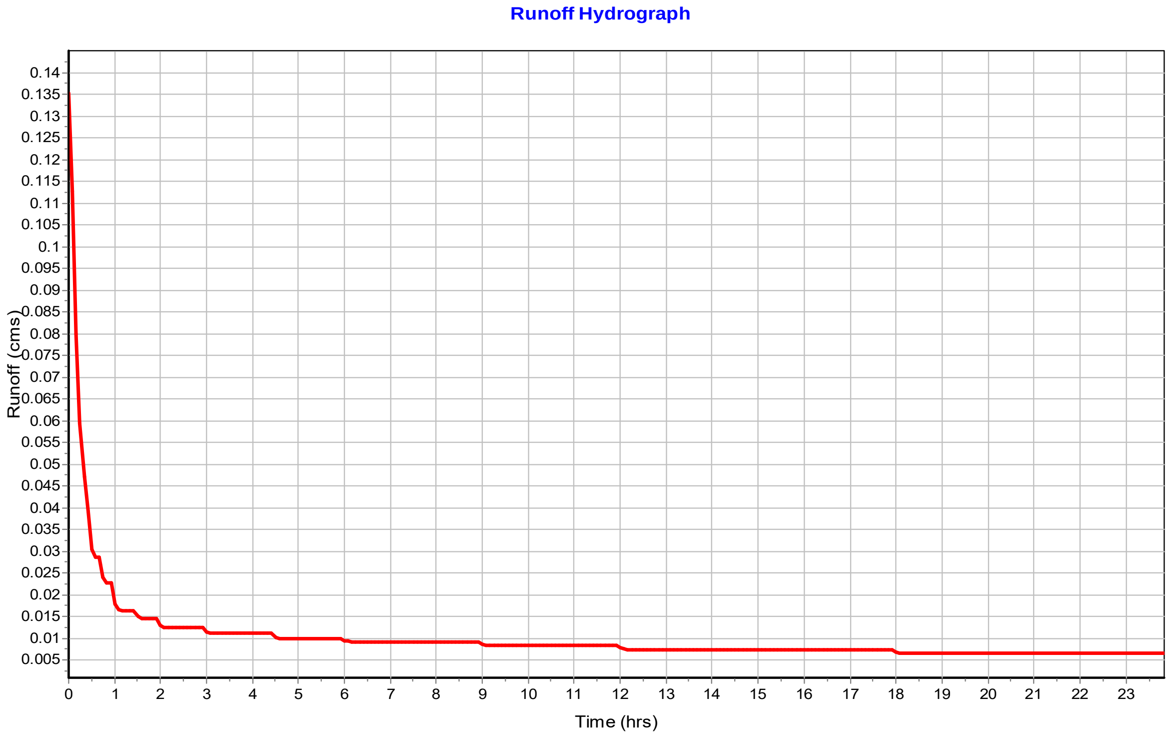
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved parking & roofs		0.2	C	98
Composite Area & Weighted CN		0.2		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.43
Peak Runoff (cms)	0.14
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:06:19

Subbasin : S-Sub-06





Subbasin : S-Sub-07

Input Data

Area (ha)	0.04
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	5.2
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

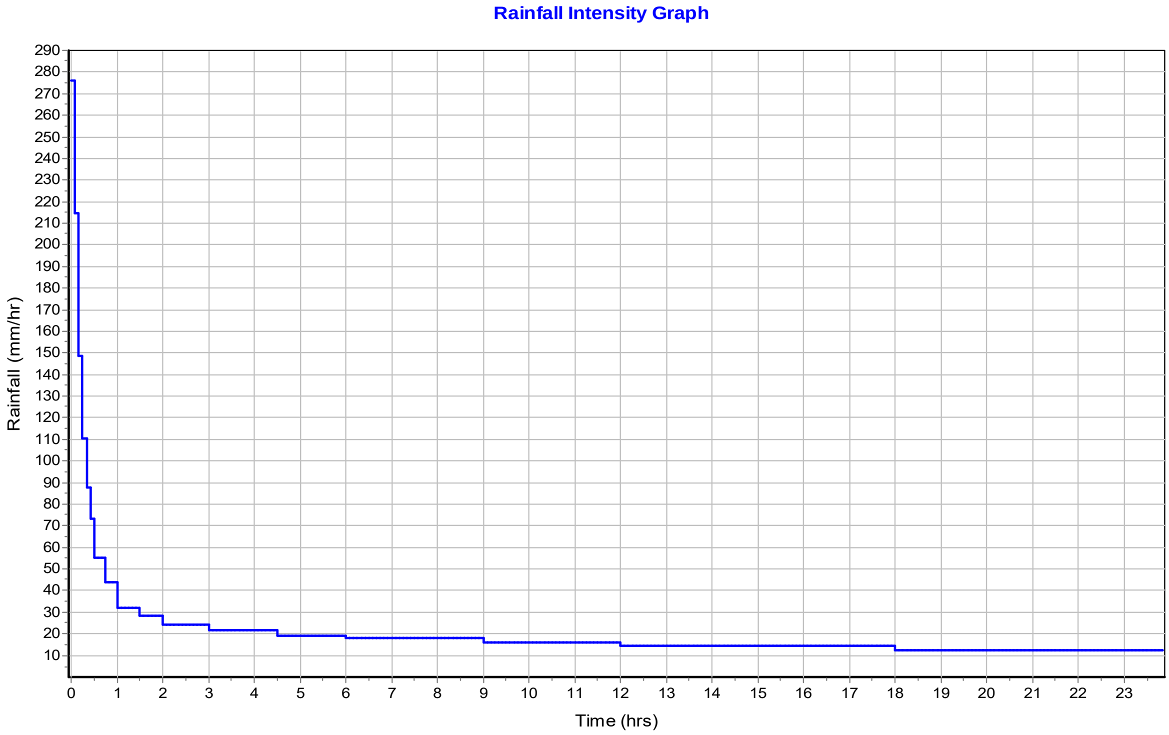
Composite Curve Number

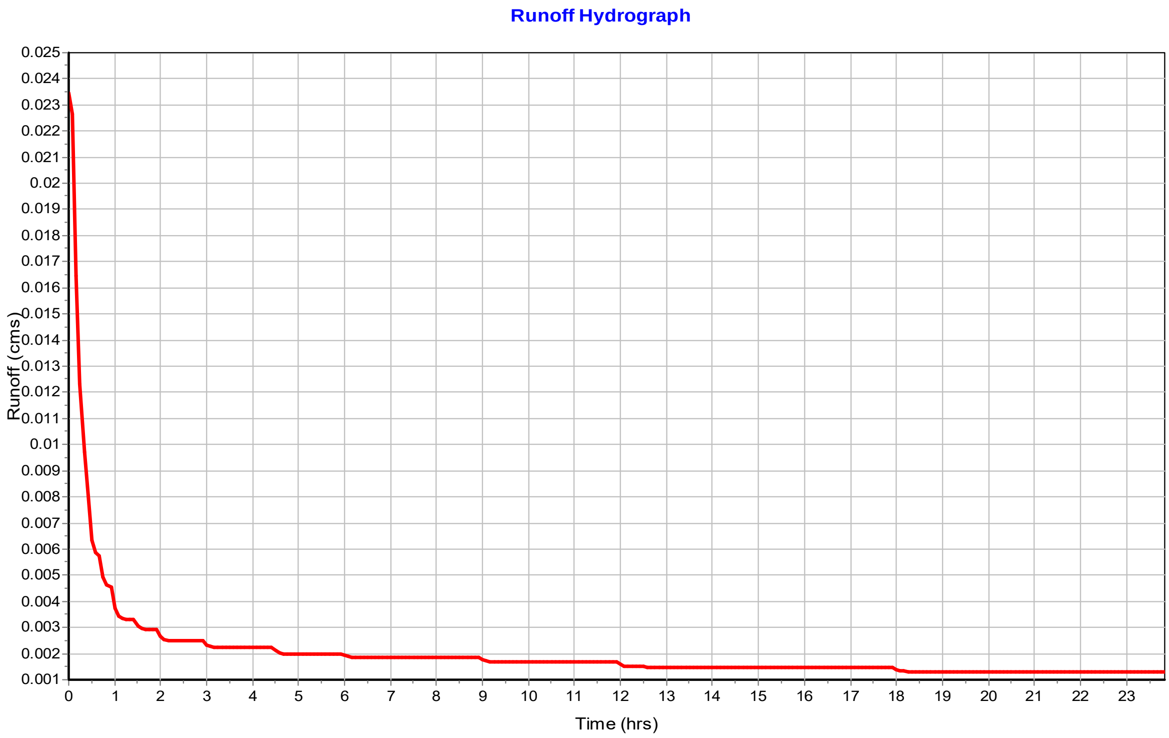
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with curbs & sewers		0.04	C	98
Composite Area & Weighted CN		0.04		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	479.77
Peak Runoff (cms)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:08:26

Subbasin : S-Sub-07





Subbasin : S-Sub-08

Input Data

Area (ha)	0.04
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	5.2
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

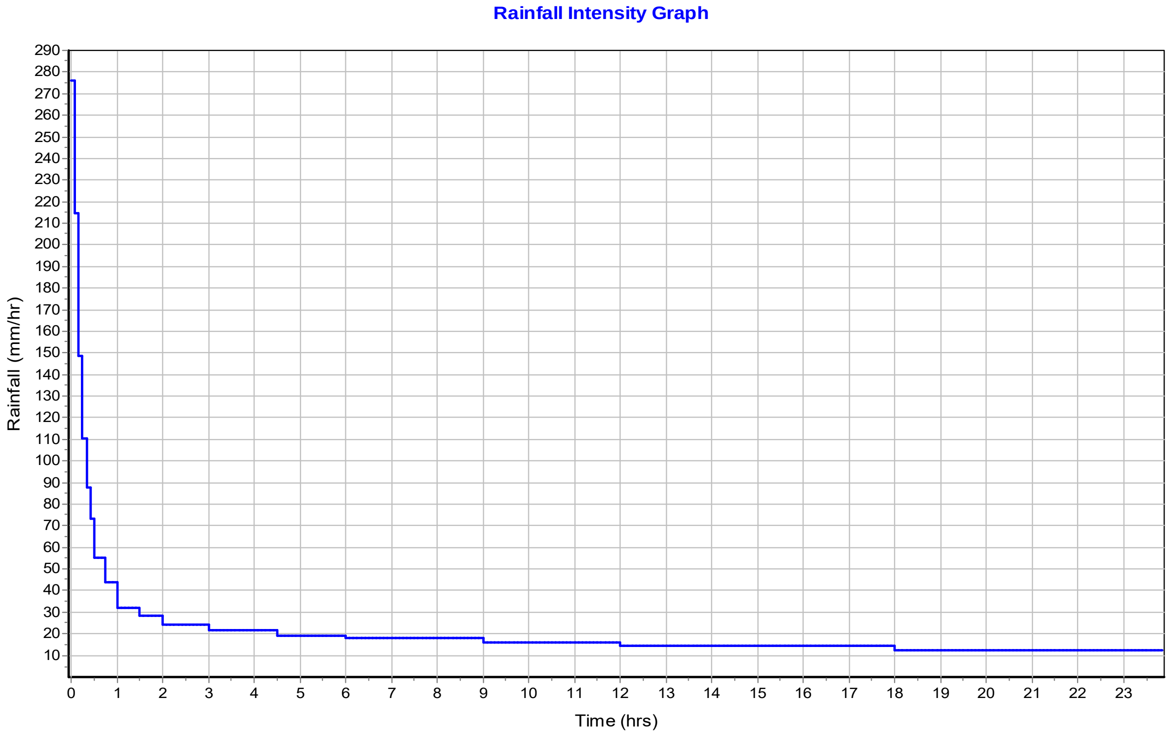
Composite Curve Number

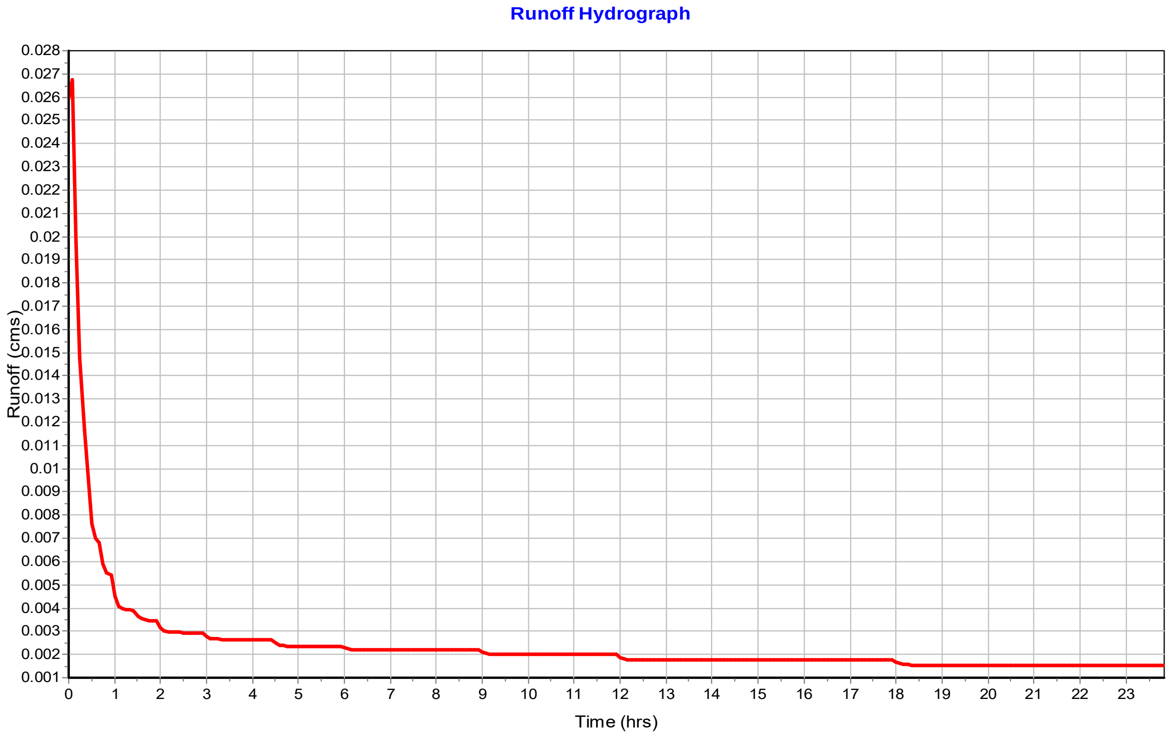
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with curbs & sewers		0.04	C	98
Composite Area & Weighted CN		0.04		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	479.51
Peak Runoff (cms)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:09:20

Subbasin : S-Sub-08





Subbasin : S-Sub-09

Input Data

Area (ha)	0.04
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	5.2
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

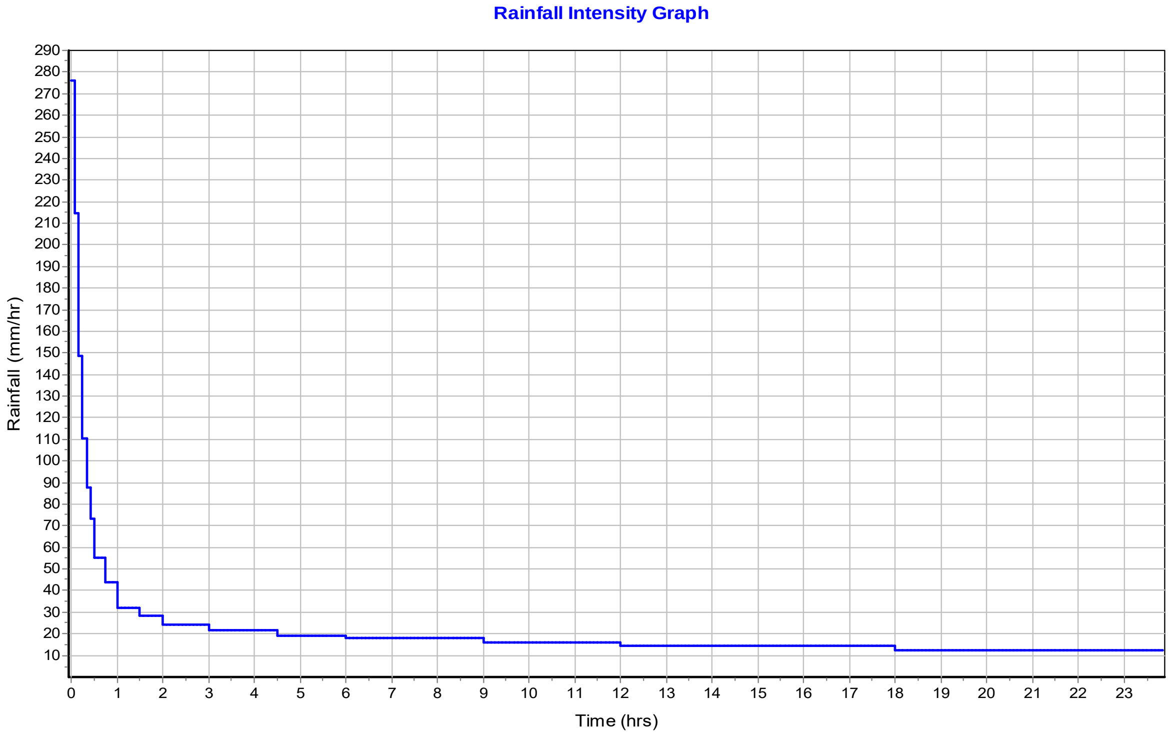
Composite Curve Number

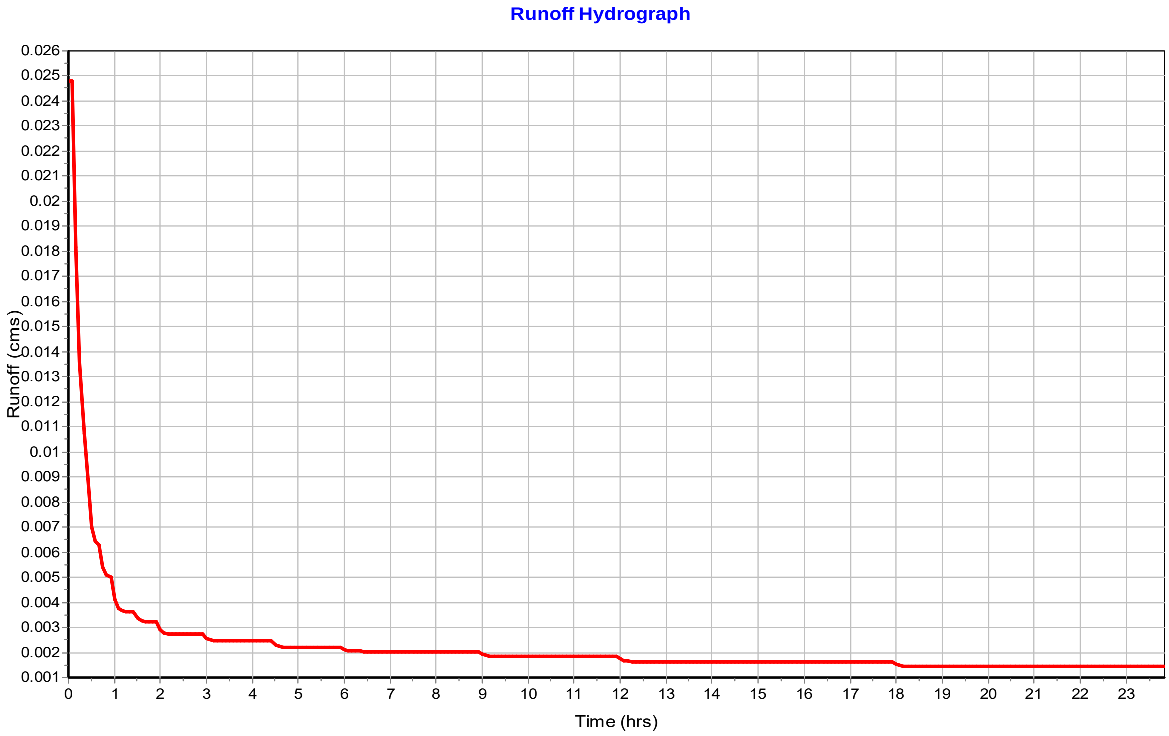
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with curbs & sewers		0.04	C	98
Composite Area & Weighted CN		0.04		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	479.63
Peak Runoff (cms)	0.03
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:08:55

Subbasin : S-Sub-09





Subbasin : S-Sub-10

Input Data

Area (ha)	0.39
Impervious Area (%)	100
Weighted Curve Number	92
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.5
Equivalent Width (m)	47
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.11
Curb & Gutter Length (m)	0
Rain Gage ID	1

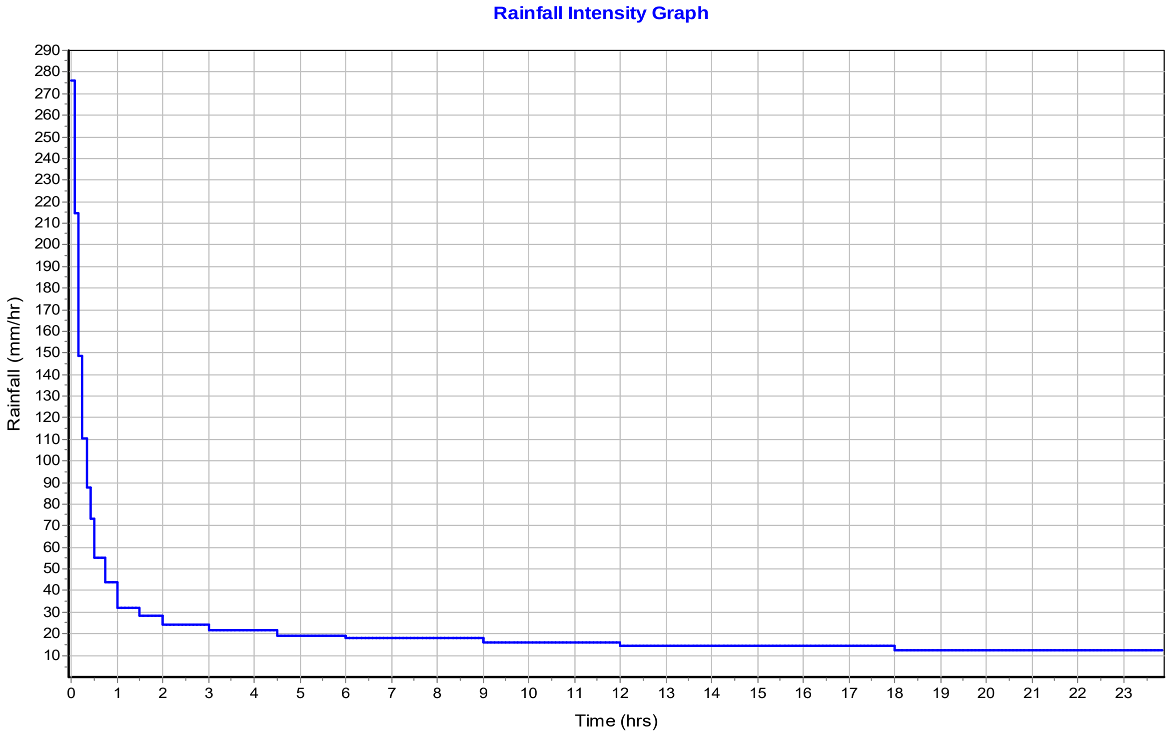
Composite Curve Number

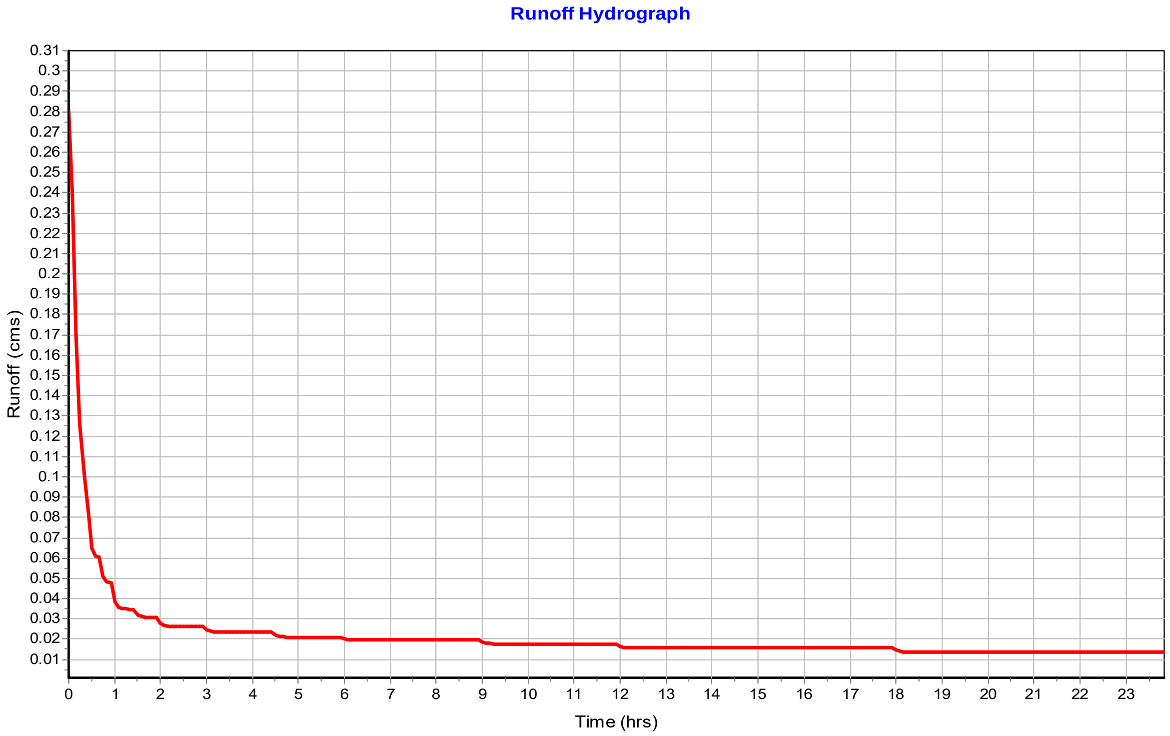
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with open ditches, 50% imp		0.41	C	92
Composite Area & Weighted CN		0.41		92

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.31
Peak Runoff (cms)	0.29
Weighted Curve Number	92
Time of Concentration (days hh:mm:ss)	0 00:06:40

Subbasin : S-Sub-10





Subbasin : S-Sub-11

Input Data

Area (ha)	0.39
Impervious Area (%)	100
Weighted Curve Number	92
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.5
Equivalent Width (m)	46
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.11
Curb & Gutter Length (m)	0
Rain Gage ID	1

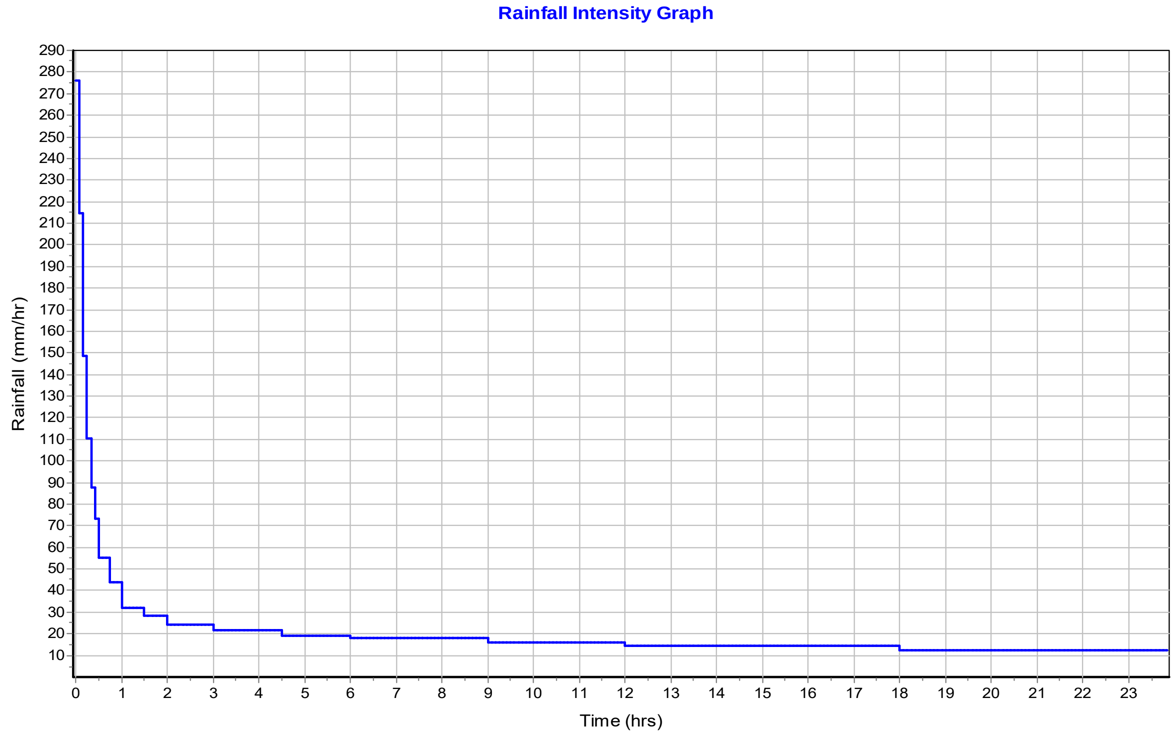
Composite Curve Number

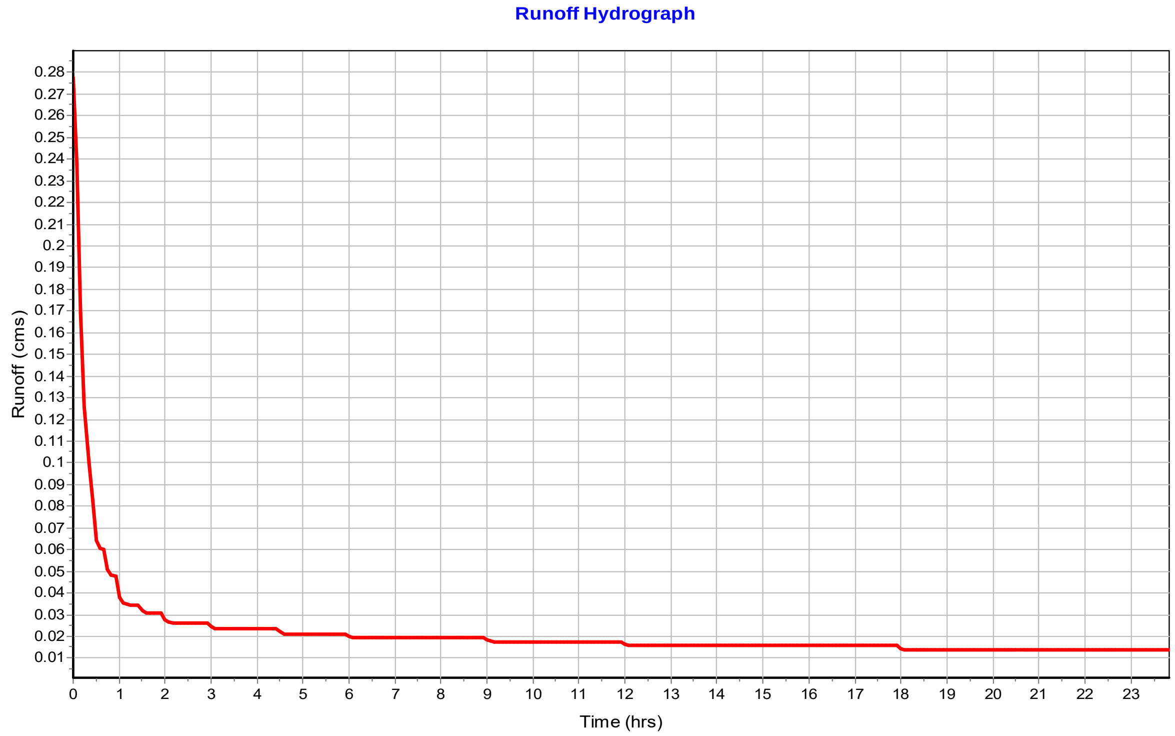
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with open ditches, 50% imp		0.4	C	92
Composite Area & Weighted CN		0.4		92

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.29
Peak Runoff (cms)	0.29
Weighted Curve Number	92
Time of Concentration (days hh:mm:ss)	0 00:06:44

Subbasin : S-Sub-11





Subbasin : S-Sub-12

Input Data

Area (ha)	0.34
Impervious Area (%)	100
Weighted Curve Number	92
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1.5
Equivalent Width (m)	42
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.11
Curb & Gutter Length (m)	0
Rain Gage ID	1

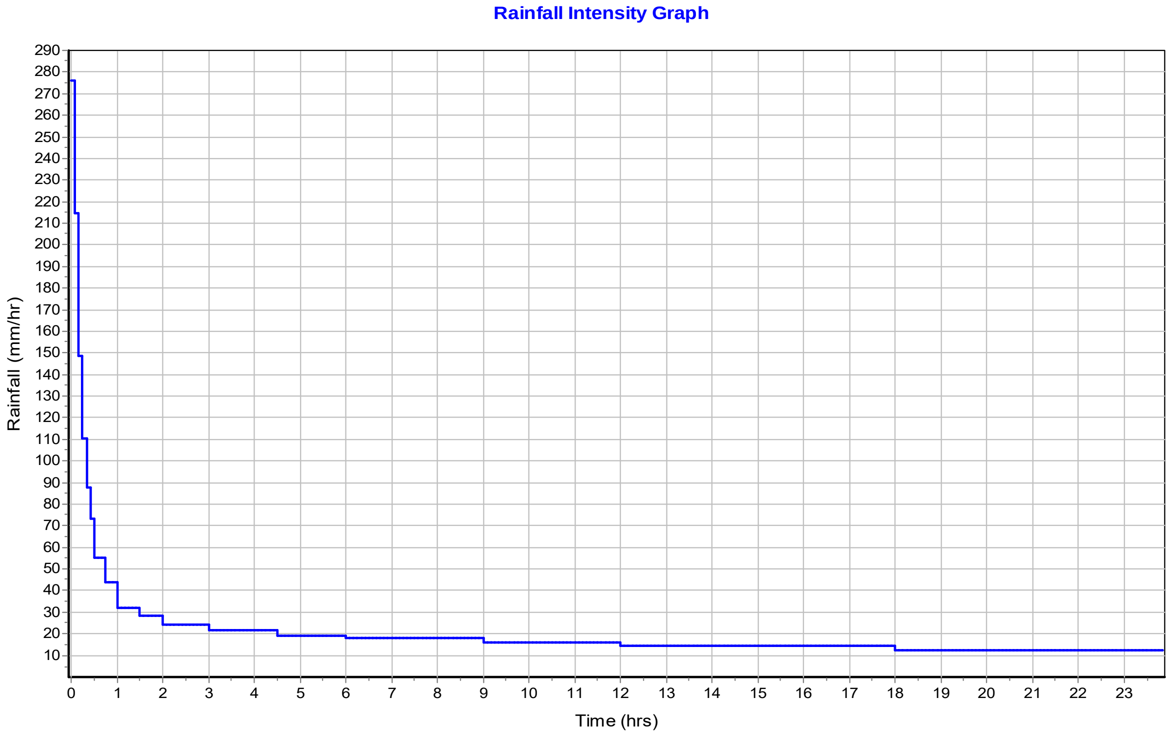
Composite Curve Number

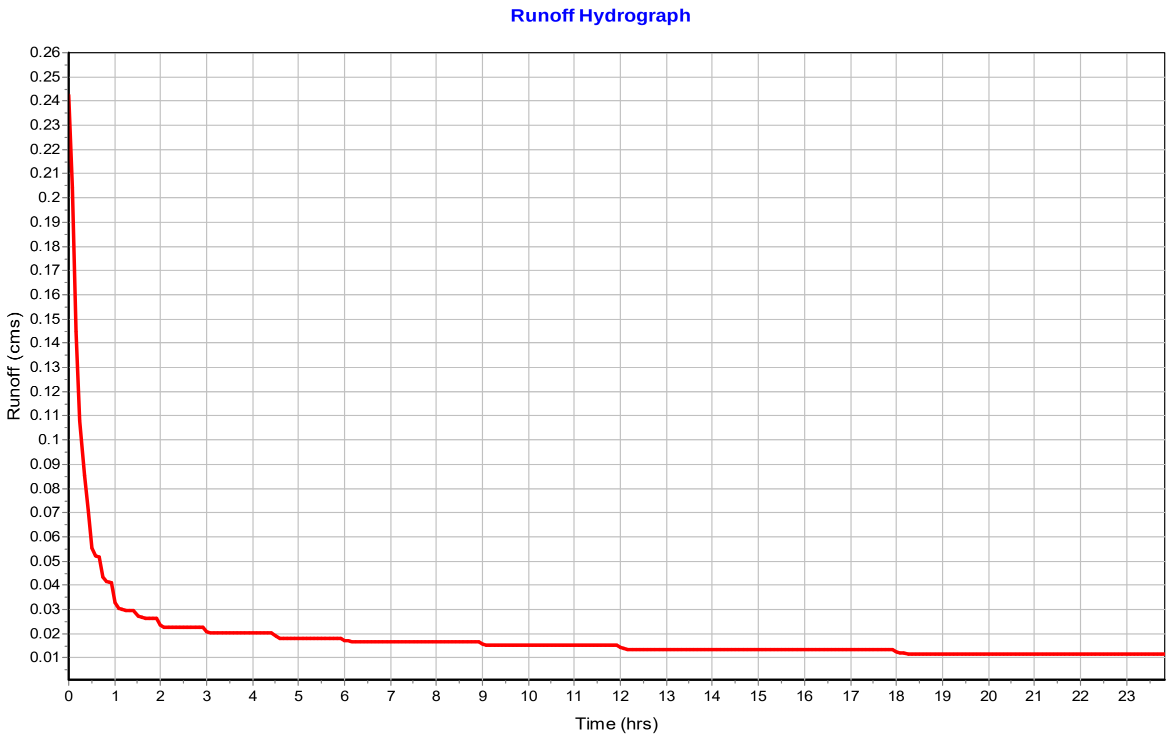
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with open ditches, 50% imp		0.37	C	92
Composite Area & Weighted CN		0.37		92

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.37
Peak Runoff (cms)	0.25
Weighted Curve Number	92
Time of Concentration (days hh:mm:ss)	0 00:06:29

Subbasin : S-Sub-12





Subbasin : S-Sub-16

Input Data

Area (ha)	0.08
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	0.5
Equivalent Width (m)	49
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

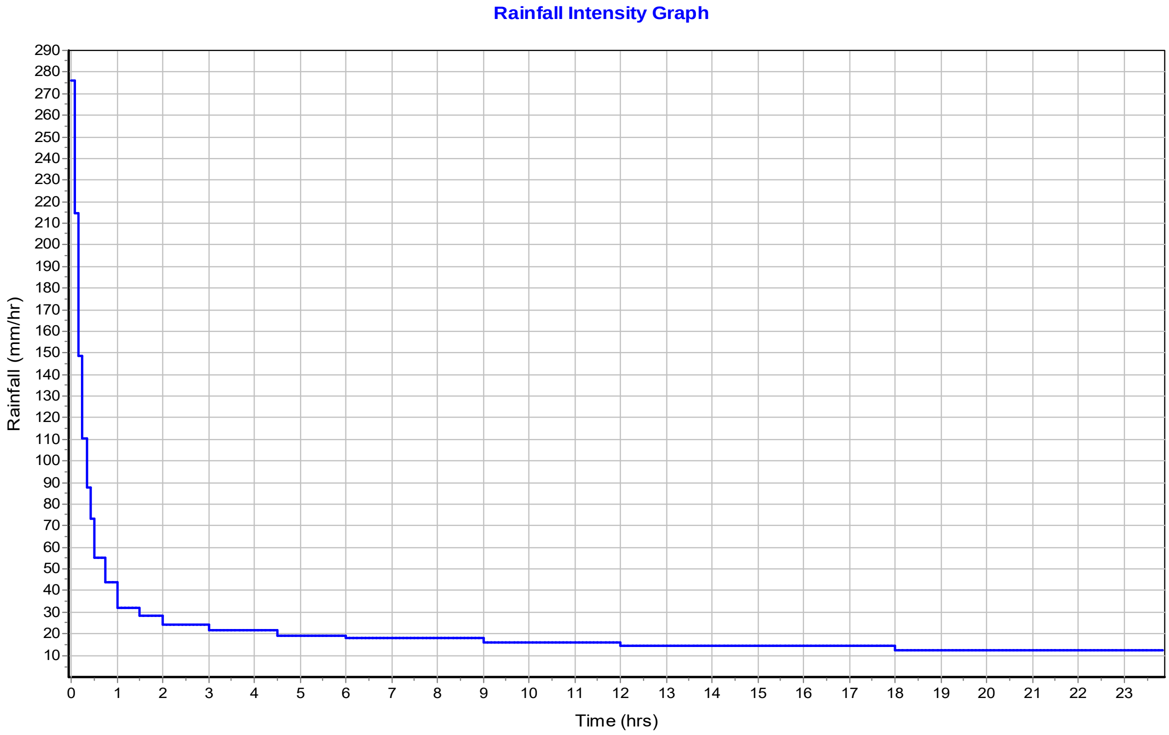
Composite Curve Number

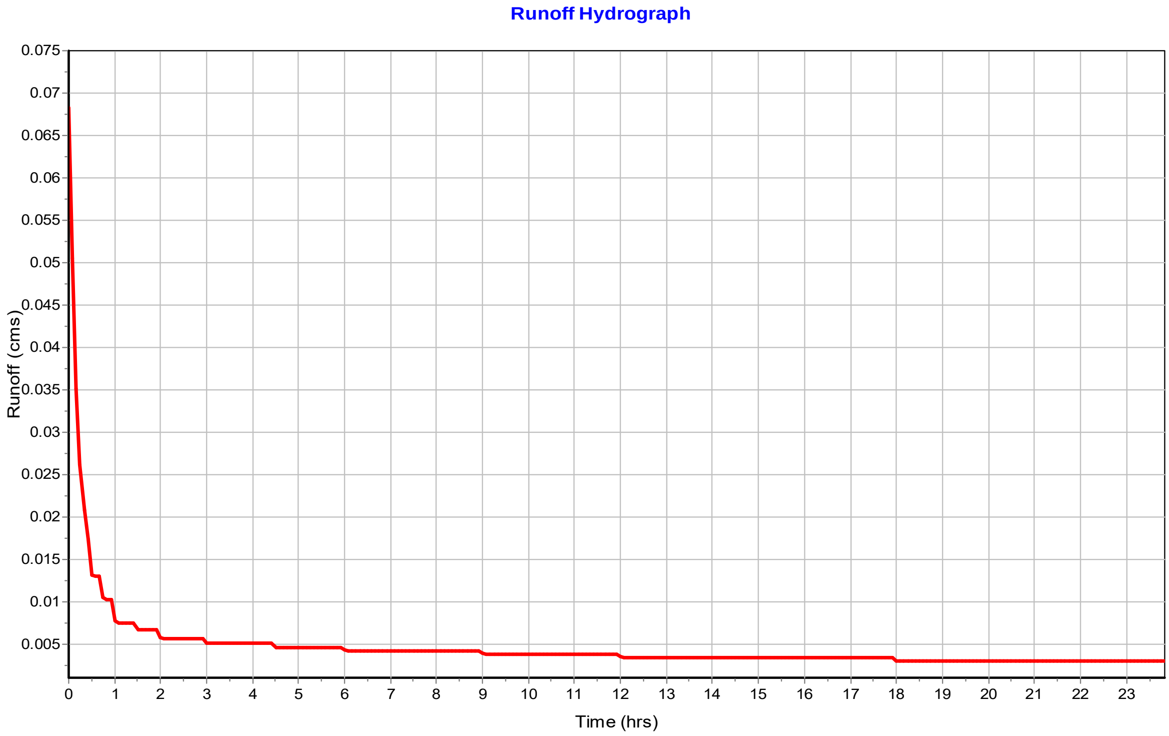
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved roads with curbs & sewers		0.02	C	98
Composite Area & Weighted CN		0.02		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	481.52
Peak Runoff (cms)	0.07
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:03:35

Subbasin : S-Sub-16





Subbasin : S-Sub-17

Input Data

Area (ha)	0.17
Impervious Area (%)	100
Weighted Curve Number	98
Conductivity (mm/hr)	0.5
Drying Time (days)	0.25
Average Slope (%)	1
Equivalent Width (m)	68
Impervious Area	
Manning's Roughness	0.01
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

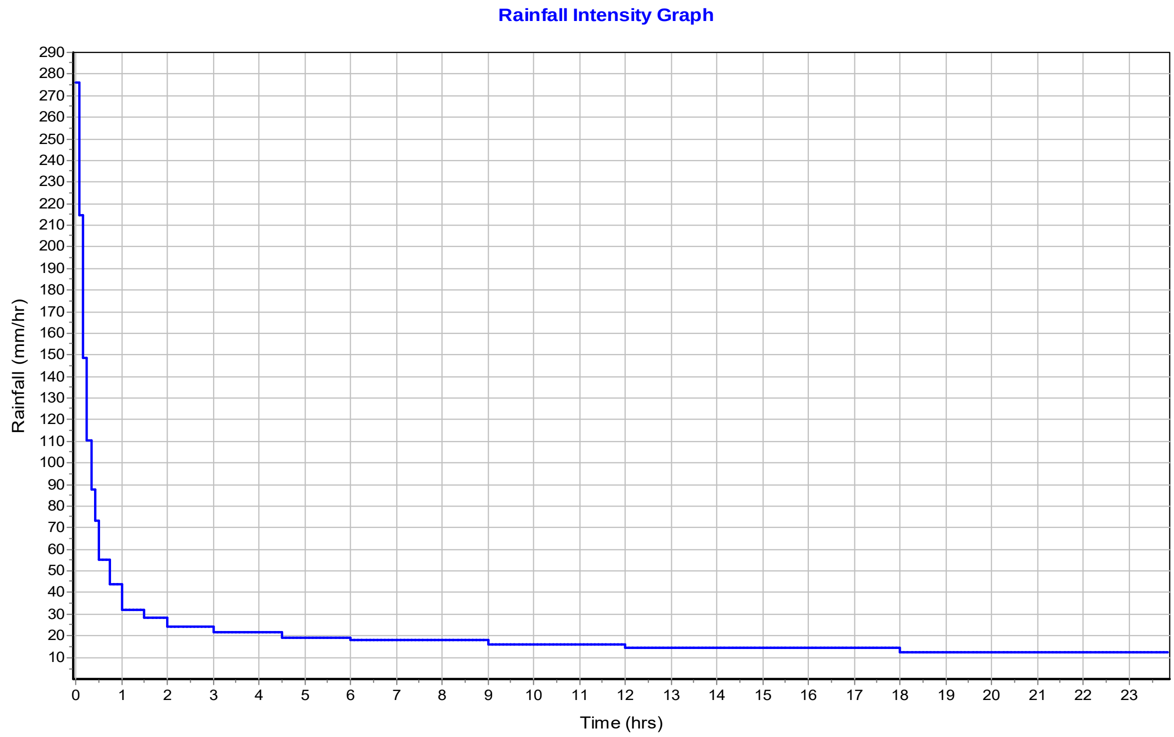
Composite Curve Number

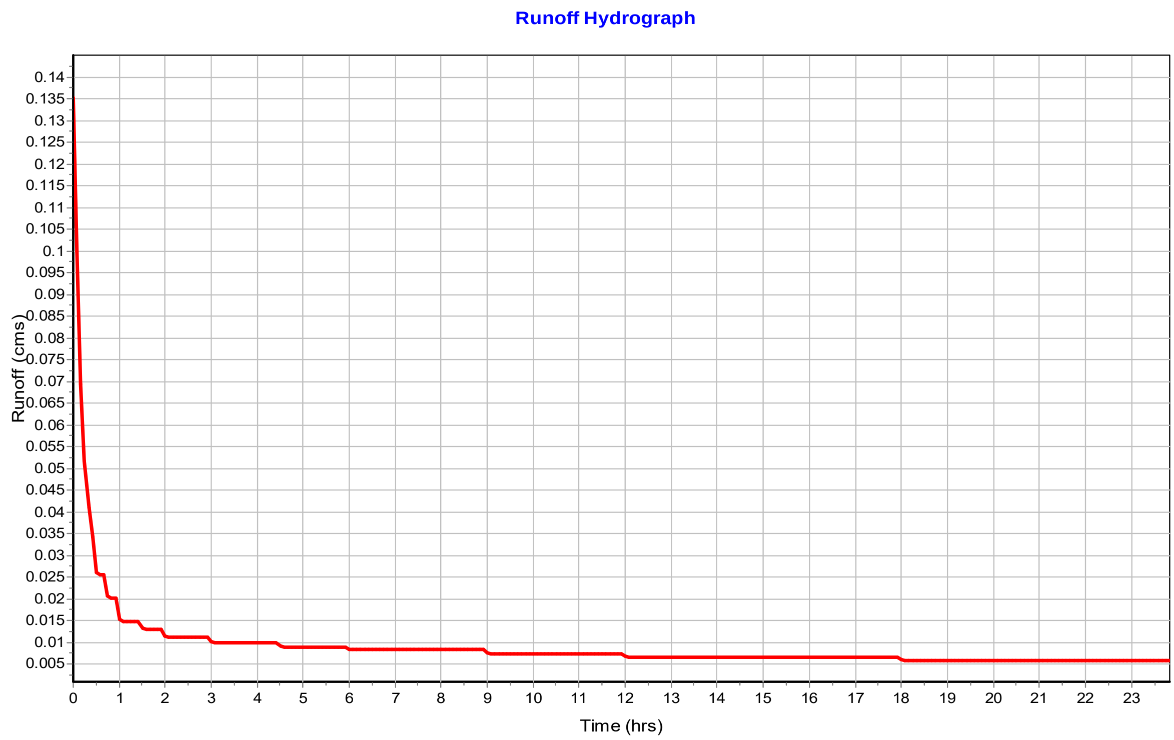
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
Paved parking & roofs		0.36	C	98
Composite Area & Weighted CN		0.36		98

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	481.51
Peak Runoff (cms)	0.14
Weighted Curve Number	98
Time of Concentration (days hh:mm:ss)	0 00:03:36

Subbasin : S-Sub-17





Subbasin : Sub-33

Input Data

Area (ha)	0.3
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.15
Drying Time (days)	7
Average Slope (%)	6
Equivalent Width (m)	14
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

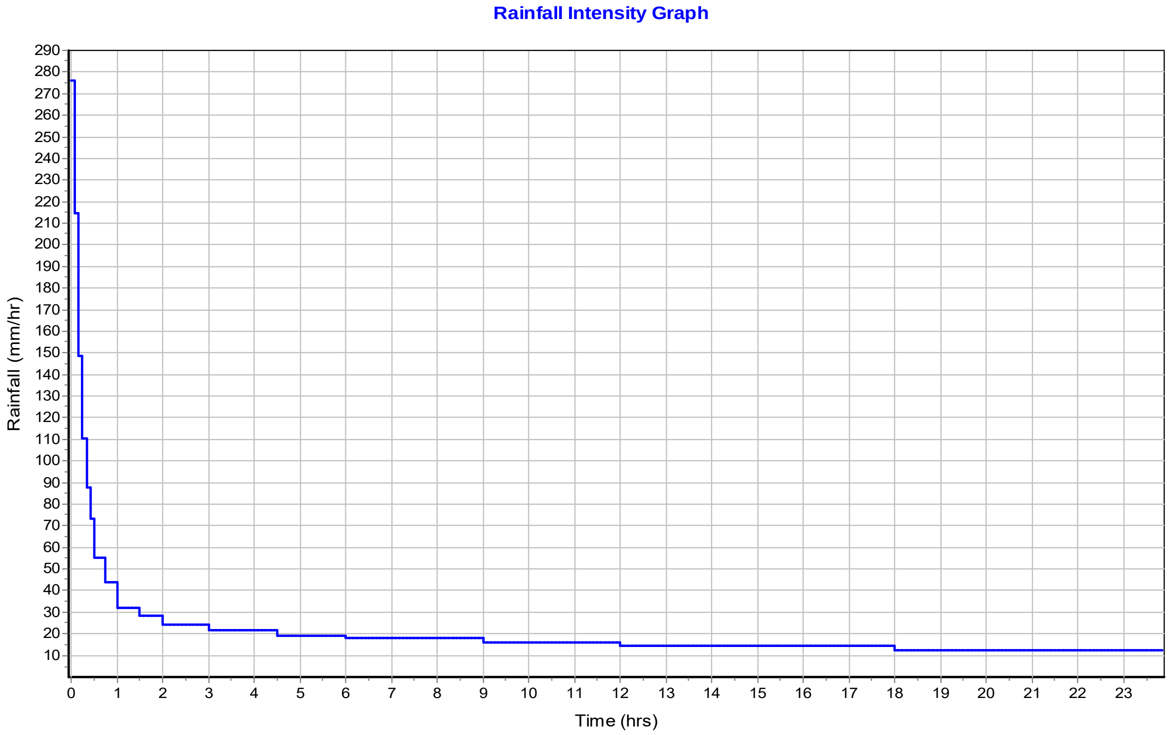
Composite Curve Number

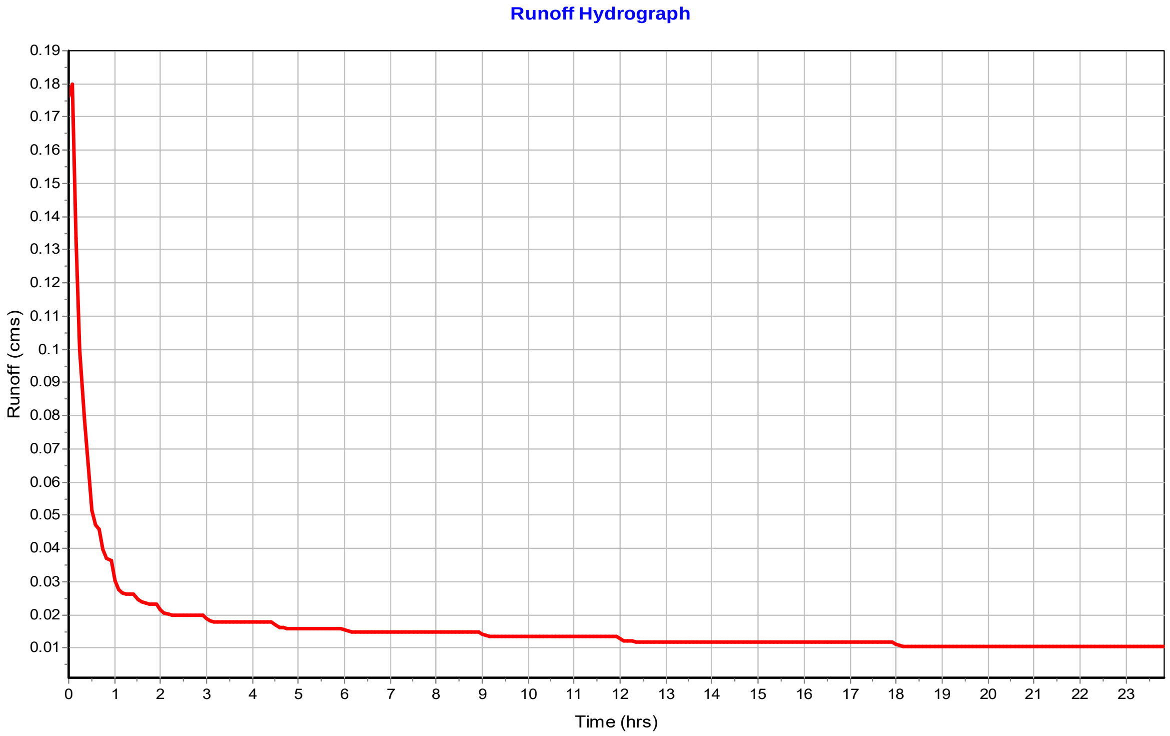
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
-		0.3	-	72
Composite Area & Weighted CN		0.3		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.63
Peak Runoff (cms)	0.19
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:09:47

Subbasin : Sub-33





Subbasin : Sub-34

Input Data

Area (ha)	0.16
Impervious Area (%)	100
Weighted Curve Number	72
Conductivity (mm/hr)	0.15
Drying Time (days)	7
Average Slope (%)	1.2
Equivalent Width (m)	28
Impervious Area	
Manning's Roughness	0.015
Pervious Area	
Manning's Roughness	0.1
Curb & Gutter Length (m)	0
Rain Gage ID	1

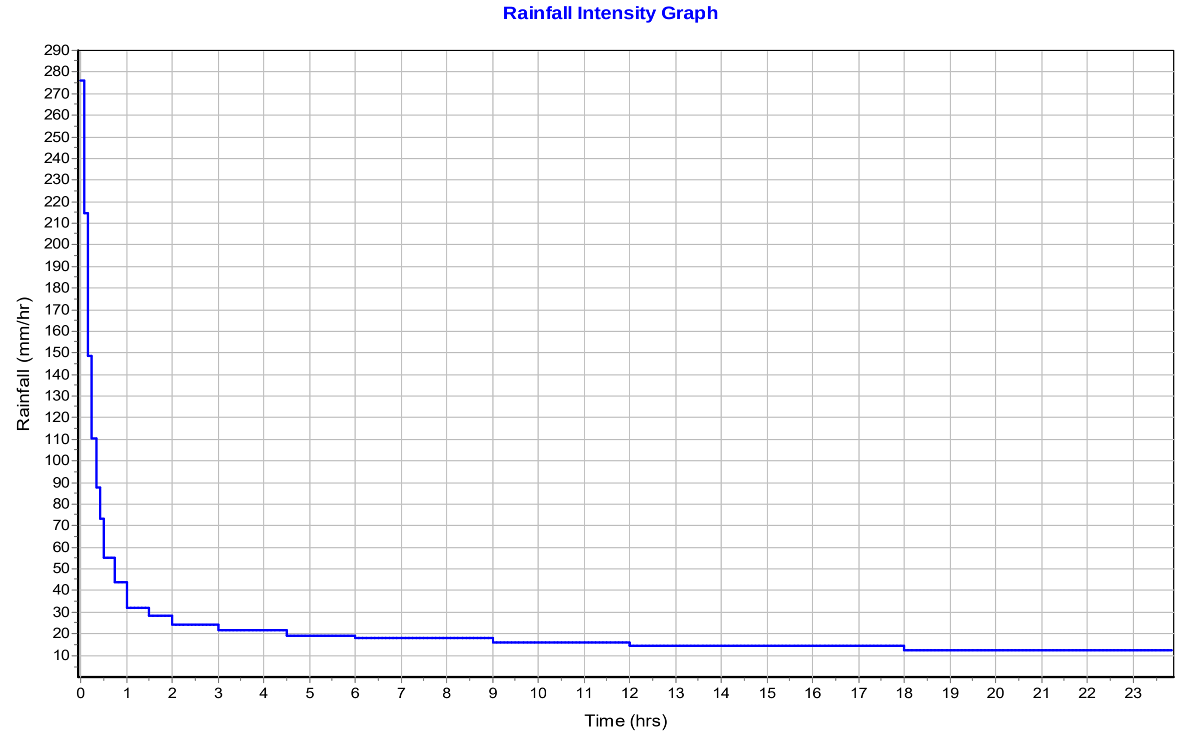
Composite Curve Number

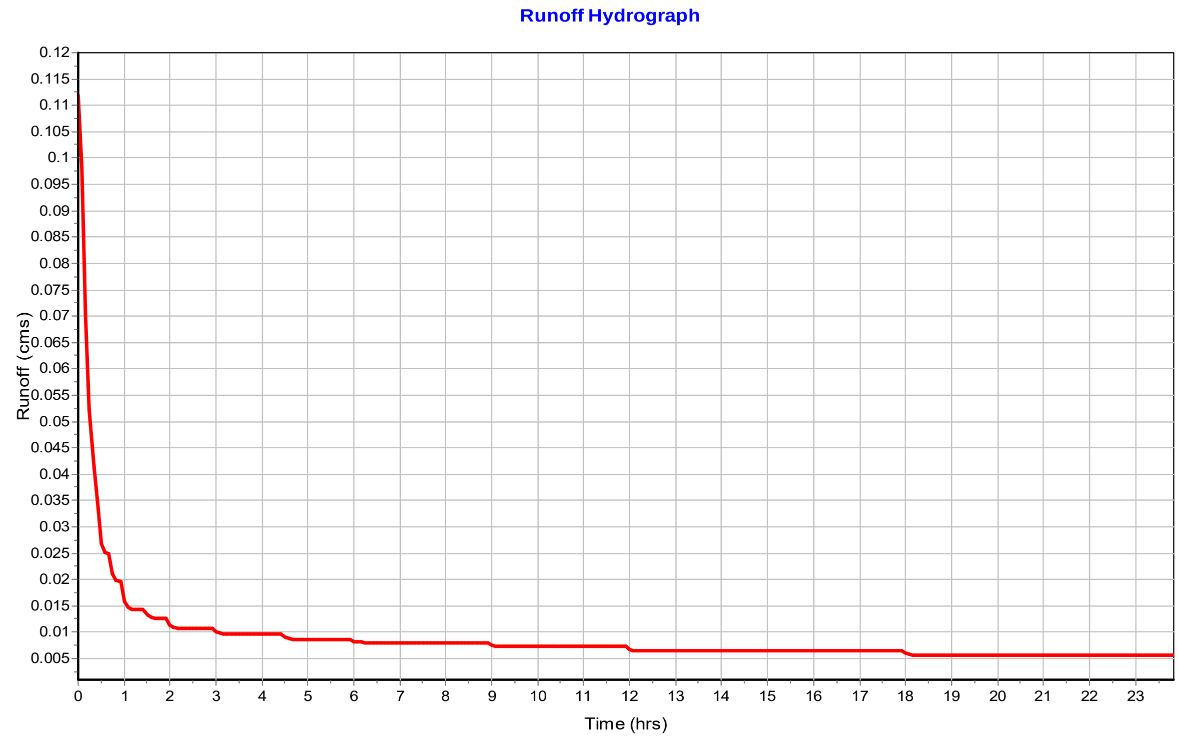
Soil/Surface Description	32	Area (ha)	Soil Group	Curve Number
-		0.16	-	72
Composite Area & Weighted CN		0.16		72

Subbasin Runoff Results

Total Rainfall (mm)	483.54
Total Runon (mm)	0
Total Evaporation (mm)	0
Total Infiltration (mm)	0
Total Runoff (mm)	480.61
Peak Runoff (cms)	0.12
Weighted Curve Number	72
Time of Concentration (days hh:mm:ss)	0 00:07:16

Subbasin : Sub-34





Junction Input

SN	Element ID	Invert Elevation (m)	Ground/Rim (Max) Elevation (m)	Ground/Rim (Max) Offset (m)	Initial Water Elevation (m)	Initial Water Depth (m)	Surcharge Elevation (m)	Surcharge Depth (m)	Ponded Area (m²)	Minimum Pipe Cover (m)
1	1	70.70	71.97	1.27	70.70	0.00	71.97	0.00	0.00	0.00
2	2	70.40	71.76	1.36	70.40	0.00	71.76	0.00	0.00	0.00
3	3	70.35	71.61	1.26	70.35	0.00	71.61	0.00	0.00	0.00
4	4	70.20	71.50	1.30	70.20	0.00	71.50	0.00	0.00	0.00
5	5	70.02	71.75	1.73	70.02	0.00	71.75	0.00	0.00	0.00
6	6	69.88	72.60	2.72	69.88	0.00	72.60	0.00	0.00	0.00
7	7	70.52	71.76	1.24	70.52	0.00	71.76	0.00	0.00	0.00
8	8	70.24	71.42	1.18	70.24	0.00	71.42	0.00	0.00	0.00
9	9	71.12	71.72	0.60	71.12	0.00	71.72	0.00	0.00	0.00
10	10	70.92	71.52	0.60	70.92	0.00	71.52	0.00	0.00	0.00
11	11	70.65	71.25	0.60	70.65	0.00	71.25	0.00	0.00	0.00
12	12	69.72	70.99	1.27	69.72	0.00	70.99	0.00	0.00	0.00
13	13	71.40	71.80	0.40	71.40	0.00	71.80	0.00	0.00	0.00
14	14	71.03	71.43	0.40	71.03	0.00	71.43	0.00	0.00	0.00
15	15	70.91	71.31	0.40	70.91	0.00	71.31	0.00	0.00	0.00
16	16	70.53	70.93	0.40	70.53	0.00	70.93	0.00	0.00	0.00
17	18	65.92	66.42	0.50	65.92	0.00	66.42	0.00	0.00	0.00
18	19	65.37	65.87	0.50	65.37	0.00	65.87	0.00	0.00	0.00
19	20	64.93	65.43	0.50	64.93	0.00	65.43	0.00	0.00	0.00
20	21	63.90	65.01	1.11	63.90	0.00	65.01	0.00	0.00	0.00
21	22	64.90	65.30	0.40	64.90	0.00	65.30	0.00	0.00	0.00
22	23	63.79	64.19	0.40	63.79	0.00	64.19	0.00	0.00	0.00
23	24	63.64	64.04	0.40	63.64	0.00	64.04	0.00	0.00	0.00
24	25	63.07	63.57	0.50	63.07	0.00	63.57	0.00	0.00	0.00
25	26	62.09	63.09	1.00	62.09	0.00	63.09	0.00	0.00	0.00
26	27	63.08	64.38	1.30	63.08	0.00	64.38	0.00	0.00	0.00
27	28	62.88	64.72	1.84	62.88	0.00	64.72	0.00	0.00	0.00
28	30	63.02	63.32	0.30	63.02	0.00	63.32	0.00	0.00	0.00
29	31	64.76	65.06	0.30	64.76	0.00	65.06	0.00	0.00	0.00
30	32	64.30	64.60	0.30	64.30	0.00	64.60	0.00	0.00	0.00
31	33	63.92	64.22	0.30	63.92	0.00	64.22	0.00	0.00	0.00
32	37	70.65	71.05	0.40	70.65	0.00	71.05	0.00	0.00	0.00
33	38	67.37	67.87	0.50	67.37	0.00	67.87	0.00	0.00	0.00
34	39	67.10	69.10	2.00	67.10	0.00	69.10	0.00	0.00	0.00
35	40	59.60	61.60	2.00	59.60	0.00	61.60	0.00	0.00	0.00

Junction Results

SN	Element ID	Peak Inflow (cms)	Peak Lateral Inflow (cms)	Max HGL Elevation Attained (m)	Max HGL Depth Attained (m)	Max Surcharge Depth Attained (m)	Min Freeboard Attained (m)	Average HGL Elevation Attained (m)	Average HGL Depth Attained (m)	Time of Max HGL Occurrence (days hh:mm)	Time of Peak Flooding Occurrence (days hh:mm)	Total Flooded Volume (ha-mm)	Total Time Flooded (min)
1	1	0.08	0.08	71.13	0.43	0.00	0.84	70.76	0.06	0 00:06	0 00:00	0.00	0.00
2	2	0.20	0.10	71.12	0.72	0.00	0.64	70.53	0.13	0 00:06	0 00:00	0.00	0.00
3	3	0.26	0.10	71.07	0.72	0.00	0.54	70.47	0.12	0 00:06	0 00:00	0.00	0.00
4	4	0.35	0.09	70.71	0.51	0.00	0.79	70.32	0.12	0 00:06	0 00:00	0.00	0.00
5	5	0.46	0.08	70.53	0.51	0.00	1.22	70.15	0.13	0 00:07	0 00:00	0.00	0.00
6	6	0.59	0.14	70.45	0.57	0.00	2.15	70.02	0.14	0 00:07	0 00:00	0.00	0.00
7	7	0.03	0.03	71.12	0.60	0.00	0.64	70.57	0.05	0 00:06	0 00:00	0.00	0.00
8	8	0.06	0.06	70.54	0.30	0.00	0.88	70.29	0.05	0 00:06	0 00:00	0.00	0.00
9	9	0.03	0.00	71.33	0.21	0.00	0.39	71.13	0.01	0 00:07	0 00:00	0.00	0.00
10	10	0.29	0.29	71.31	0.39	0.00	0.21	71.00	0.08	0 00:07	0 00:00	0.00	0.00
11	11	0.54	0.29	71.22	0.57	0.00	0.03	70.77	0.12	0 00:06	0 00:00	0.00	0.00
12	12	1.34	0.25	70.33	0.61	0.00	0.66	69.90	0.18	0 00:06	0 00:00	0.00	0.00
13	13	0.00	0.00	71.40	0.00	0.00	0.40	71.40	0.00	0 00:00	0 00:00	0.00	0.00
14	14	0.29	0.29	71.18	0.15	0.00	0.25	71.09	0.06	0 00:06	0 00:00	0.00	0.00
15	15	0.29	0.29	71.05	0.14	0.00	0.26	70.97	0.06	0 00:06	0 00:00	0.00	0.00
16	16	0.41	0.41	70.70	0.17	0.00	0.23	70.60	0.07	0 00:06	0 00:00	0.00	0.00
17	18	0.00	0.00	65.92	0.00	0.00	0.50	65.92	0.00	0 00:00	0 00:00	0.00	0.00
18	19	0.44	0.15	65.73	0.36	0.00	0.14	65.53	0.16	0 00:07	0 00:00	0.00	0.00
19	20	0.76	0.09	65.41	0.48	0.00	0.02	65.16	0.23	0 00:11	0 00:00	0.00	0.00
20	21	1.24	0.11	64.53	0.63	0.00	0.48	64.06	0.16	0 00:10	0 00:00	0.00	0.00
21	22	0.13	0.13	65.10	0.20	0.00	0.20	64.98	0.08	0 00:06	0 00:00	0.00	0.00
22	23	0.03	0.00	63.97	0.18	0.00	0.22	63.80	0.01	0 00:08	0 00:00	0.00	0.00
23	24	0.23	0.23	63.96	0.32	0.00	0.18	63.77	0.13	0 00:08	0 00:00	0.00	0.00
24	25	0.33	0.08	63.44	0.37	0.00	0.13	63.25	0.18	0 00:14	0 00:00	0.00	0.00
25	26	0.40	0.18	62.39	0.30	0.00	0.70	62.19	0.10	0 00:12	0 00:00	0.00	0.00
26	27	0.15	0.15	63.58	0.50	0.00	0.80	63.17	0.09	0 00:11	0 00:00	0.00	0.00
27	28	0.50	0.00	63.51	0.63	0.00	1.21	63.07	0.19	0 00:15	0 00:00	0.00	0.00
28	30	0.60	0.38	64.41	1.39	0.00	0.11	63.28	0.26	0 00:17	0 00:00	0.00	0.00
29	31	0.00	0.00	64.76	0.00	0.00	1.50	64.76	0.00	0 00:00	0 00:00	0.00	0.00
30	32	0.24	0.24	64.46	0.16	0.00	1.34	64.36	0.06	0 00:06	0 00:00	0.00	0.00
31	33	0.15	0.00	64.41	0.49	0.00	1.01	63.94	0.02	0 00:16	0 00:00	0.00	0.00
32	37	0.00	0.00	70.65	0.00	0.00	0.50	70.65	0.00	0 00:00	0 00:00	0.00	0.00
33	38	0.08	0.08	67.50	0.13	0.00	0.37	67.42	0.05	0 00:06	0 00:00	0.00	0.00
34	39	0.53	0.00	67.59	0.49	0.00	1.51	67.33	0.23	0 00:27	0 00:00	0.00	0.00
35	40	1.05	0.00	60.83	1.23	0.00	0.77	60.00	0.40	0 00:34	0 00:00	0.00	0.00

Channel Input

SN	Element ID	Length (m)	Inlet Invert Elevation (m)	Inlet Invert Offset (m)	Outlet Invert Elevation (m)	Outlet Invert Offset (m)	Total Drop (m)	Average Slope (%)	Shape	Height (m)	Width (m)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cms)	Flap Gate
1	Link-08	49.66	71.12	0.00	70.92	0.00	0.20	0.4000	Rectangular	0.600	0.600	0.0150	0.0000	0.0000	0.0000	0.00	No
2	Link-09	67.81	70.92	0.00	70.65	0.00	0.27	0.4000	Rectangular	0.600	0.600	0.0150	0.0000	0.0000	0.0000	0.00	No
3	Link-10	63.19	70.65	0.00	70.39	0.67	0.26	0.4100	Rectangular	0.600	0.600	0.0150	0.0000	0.0000	0.0000	0.00	No
4	Link-18	90.79	65.92	0.00	65.37	0.00	0.55	0.6100	Triangular	0.500	4.000	0.0320	0.0000	0.0000	0.0000	0.00	No
5	Link-19	69.76	65.37	0.00	64.93	0.00	0.44	0.6300	Triangular	0.500	4.000	0.0320	0.0000	0.0000	0.0000	0.00	No
6	Link-20	70.73	64.93	0.00	64.51	0.61	0.42	0.5900	Triangular	0.500	4.000	0.0320	0.0000	0.0000	0.0000	0.00	No
7	Link-24	30.46	63.79	0.00	63.64	0.00	0.15	0.4900	Triangular	0.400	3.200	0.0320	0.5000	0.5000	0.0000	0.00	No
8	Link-25	113.10	63.64	0.00	63.07	0.00	0.57	0.5000	Triangular	0.500	4.000	0.0320	0.5000	0.5000	0.0000	0.00	No
9	Link-26	96.18	63.07	0.00	62.59	0.50	0.48	0.5000	Triangular	0.500	4.000	0.0320	0.5000	0.5000	0.0000	0.00	No
10	Link-36	11.50	64.90	0.00	64.70	4.20	0.20	1.7400	Triangular	0.400	3.200	0.0320	0.0000	0.0000	0.0000	0.00	No
11	Link-39	65.50	70.65	0.00	67.37	0.00	3.28	5.0100	Triangular	0.500	4.000	0.0320	0.0000	0.0000	0.0000	0.00	No
12	Link-40	49.61	67.37	0.00	64.51	0.61	2.86	5.7600	Triangular	0.500	4.000	0.0320	0.0000	0.0000	0.0000	0.00	No
13	Link-41	14.19	71.03	0.00	65.37	0.00	5.66	39.8900	Triangular	0.400	3.200	0.0320	0.5000	0.5000	0.0000	0.00	No
14	Link-42	13.20	70.91	0.00	64.93	0.00	5.98	45.3000	Triangular	0.400	3.200	0.0320	0.5000	0.5000	0.0000	0.00	No
15	Link-43	20.18	70.53	0.00	63.90	0.00	6.63	32.8500	Triangular	0.400	3.200	0.0320	0.5000	0.5000	0.0000	0.00	No

Channel Results

SN	Element ID	Peak Flow (cms)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cms)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (m/sec)	Travel Time (min)	Peak Flow Depth (m)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-08	0.03	0 00:04	0.52	0.06	0.28	2.96	0.26	0.49	0.00	0.00	
2	Link-09	0.27	0 00:07	0.52	0.51	0.98	1.15	0.45	0.80	0.00	0.49	
3	Link-10	0.53	0 00:07	0.53	1.01	1.77	0.60	0.47	0.83	0.00	0.84	
4	Link-18	0.00	0 00:00	0.95	0.00	0.00		0.18	0.36	0.00	0.00	
5	Link-19	0.40	0 00:07	0.97	0.41	0.65	1.79	0.42	0.84	0.00	0.29	
6	Link-20	0.73	0 00:11	0.94	0.78	1.01	1.17	0.43	0.85	0.00	0.56	
7	Link-24	0.03	0 00:05	0.47	0.05	0.19	2.67	0.24	0.63	0.00	0.00	
8	Link-25	0.26	0 00:09	0.86	0.30	1.90	0.99	0.32	0.66	0.00	0.29	
9	Link-26	0.25	0 00:14	0.86	0.30	0.69	2.32	0.30	0.61	0.00	0.47	
10	Link-36	0.13	0 00:06	0.88	0.15	0.90	0.21	0.18	0.48	0.00	0.82	
11	Link-39	0.00	0 00:00	2.72	0.00	0.00		0.06	0.13	0.00	0.00	
12	Link-40	0.07	0 00:06	2.92	0.03	1.16	0.71	0.12	0.25	0.00	1.27	
13	Link-41	0.38	0 00:02	4.23	0.09	4.28	0.06	0.25	0.63	0.00	0.83	
14	Link-42	0.49	0 00:02	4.51	0.11	5.32	0.04	0.27	0.68	0.00	0.42	
15	Link-43	0.41	0 00:06	3.84	0.11	2.95	0.11	0.28	0.72	0.00	1.08	

Pipe Input

SN	Element ID	Length (m)	Inlet Invert Elevation (m)	Inlet Invert Offset (m)	Outlet Invert Elevation (m)	Outlet Invert Offset (m)	Total Drop (m)	Average Slope (%)	Pipe Shape	Pipe Diameter or Height (m)	Pipe Width (m)	Manning's Roughness	Entrance Losses	Exit/Bend Losses	Additional Losses	Initial Flow (cms)	Flap Gate
1	Link-01	51.25	70.70	0.00	70.40	0.00	0.30	0.5900	Circular Force Main	0.450	0.450	0.0130	0.5000	0.6000	0.0000	0.00	No
2	Link-02	38.76	70.40	0.00	70.35	0.00	0.05	0.1300	Circular Force Main	0.600	0.600	0.0150	0.5000	0.5000	0.0000	0.00	No
3	Link-03	27.94	70.35	0.00	70.20	0.00	0.15	0.5400	Circular Force Main	0.450	0.450	0.0150	0.5000	0.5000	0.0000	0.00	No
4	Link-04	35.46	70.20	0.00	70.02	0.00	0.18	0.5100	Circular Force Main	0.600	0.600	0.0150	0.5000	0.6000	0.0000	0.00	No
5	Link-05	27.32	70.02	0.00	69.88	0.00	0.14	0.5100	Circular Force Main	1.000	1.000	0.0150	0.5000	0.8000	0.0000	0.00	No
6	Link-06	11.90	70.52	0.00	70.40	0.00	0.12	1.0100	Circular Force Main	0.450	0.450	0.0150	0.5000	0.5000	0.0000	0.00	No
7	Link-07	22.15	70.24	0.00	70.02	0.00	0.22	0.9900	Circular Force Main	0.450	0.450	0.0150	0.5000	0.5000	0.0000	0.00	No
8	Link-11	31.66	69.88	0.00	69.72	0.00	0.16	0.5100	Circular Force Main	1.000	1.000	0.0150	0.5000	0.7000	0.0000	0.00	No
9	Link-12	12.00	69.72	0.00	69.60	1.60	0.12	1.0000	Circular Force Main	1.000	1.000	0.0150	0.5000	0.0000	0.0000	0.00	No
10	Link-21	42.89	64.76	0.00	64.30	0.00	0.46	1.0700	CIRCULAR	1.500	1.500	0.0150	0.5000	0.5000	0.0000	0.00	No
11	Link-22	56.08	64.30	0.00	63.02	0.00	1.28	2.2800	CIRCULAR	1.500	1.500	0.0150	0.5000	0.5000	0.0000	0.00	No
12	Link-23	94.27	63.92	0.00	63.02	0.00	0.90	0.9500	CIRCULAR	1.500	1.500	0.0150	0.5000	0.5000	0.0000	0.00	No
13	Link-28	39.76	63.08	0.00	62.88	0.00	0.20	0.5000	Circular Force Main	0.450	0.450	0.0150	0.5000	0.8000	0.0000	0.00	No
14	Link-30	28.78	63.02	0.00	62.88	0.00	0.14	0.4900	Circular Force Main	0.450	0.450	0.0150	0.5000	0.8000	0.0000	0.00	No
15	Link-35	22.42	63.90	0.00	63.45	2.95	0.45	2.0100	Circular Force Main	1.000	1.000	0.0150	0.5000	0.8000	0.0000	0.00	No
16	Link-37	44.84	62.88	0.00	62.66	2.16	0.22	0.4900	Circular Force Main	0.600	0.600	0.0150	0.8000	0.0000	0.0000	0.00	No
17	Link-38	19.28	62.09	0.00	61.69	1.19	0.40	2.0700	Circular Force Main	0.600	0.600	0.0150	0.5000	0.0000	0.0000	0.00	No
18	Link-45	37.00	67.10	0.00	66.90	0.00	0.20	0.5400	Circular Force Main	0.600	0.600	0.0150	0.0000	0.0000	0.0000	0.00	No
19	Link-46	42.00	59.60	0.00	59.40	0.00	0.20	0.4800	Circular Force Main	0.600	0.600	0.0150	0.0000	0.0000	0.0000	0.00	No

No. of Barrels
1
1
1
1
1
1
1
1
1
1
1
1
1
1
1
1
1
1
1

Pipe Results

SN	Element ID	Peak Flow (cms)	Time of Peak Flow Occurrence (days hh:mm)	Design Flow Capacity (cms)	Peak Flow/ Design Flow Ratio	Peak Flow Velocity (m/sec)	Travel Time (min)	Peak Flow Depth (m)	Peak Flow Depth/ Total Depth Ratio	Total Time Surcharged (min)	Froude Number	Reported Condition
1	Link-01	0.08	0 00:07	0.27	0.29	0.83	1.03	0.38	0.98	0.00	0.42	Calculated
2	Link-02	0.19	0 00:07	0.25	0.75	0.67	0.96	0.58	1.00	3.00	0.54	SURCHARGED
3	Link-03	0.26	0 00:07	0.25	1.04	1.66	0.28	0.45	1.00	7.00	0.95	SURCHARGED
4	Link-04	0.34	0 00:06	0.52	0.66	1.34	0.44	0.48	0.85	0.00	0.98	Calculated
5	Link-05	0.46	0 00:07	1.95	0.24	1.08	0.42	0.51	0.54	0.00	0.91	Calculated
6	Link-06	0.03	0 00:05	0.36	0.08	0.33	0.60	0.45	1.00	5.00	0.20	SURCHARGED
7	Link-07	0.06	0 00:07	0.35	0.16	0.64	0.58	0.36	0.84	0.00	0.40	Calculated
8	Link-11	0.59	0 00:07	1.94	0.30	1.22	0.43	0.56	0.59	0.00	0.80	Calculated
9	Link-12	1.34	0 00:07	2.80	0.48	3.03	0.07	0.53	0.55	0.00	1.59	Calculated
10	Link-21	0.00	0 00:00	6.35	0.00	0.00		0.08	0.05	0.00	0.00	Calculated
11	Link-22	0.23	0 00:06	9.26	0.03	1.01	0.93	0.75	0.51	0.00	0.35	Calculated
12	Link-23	0.15	0 00:09	5.99	0.02	0.23	6.83	0.91	0.62	0.00	0.00	Calculated
13	Link-28	0.14	0 00:05	0.24	0.56	1.34	0.49	0.45	1.00	8.00	0.37	SURCHARGED
14	Link-30	0.42	0 00:17	0.24	1.77	2.67	0.18	0.45	1.00	26.00	0.87	SURCHARGED
15	Link-35	1.24	0 00:10	4.08	0.30	3.14	0.12	0.50	0.50	0.00	2.07	Calculated
16	Link-37	0.50	0 00:15	0.51	0.99	1.90	0.39	0.53	0.89	0.00	1.11	Calculated
17	Link-38	0.40	0 00:12	1.11	0.36	3.16	0.10	0.30	0.50	0.00	2.20	Calculated
18	Link-45	0.53	0 00:28	0.54	0.99	2.17	0.28	0.48	0.80	0.00	1.24	Calculated
19	Link-46	1.05	0 00:34	0.50	2.10	3.71	0.19	0.60	1.00	17.00	1.03	SURCHARGED

Storage Nodes

Storage Node : Stor-01

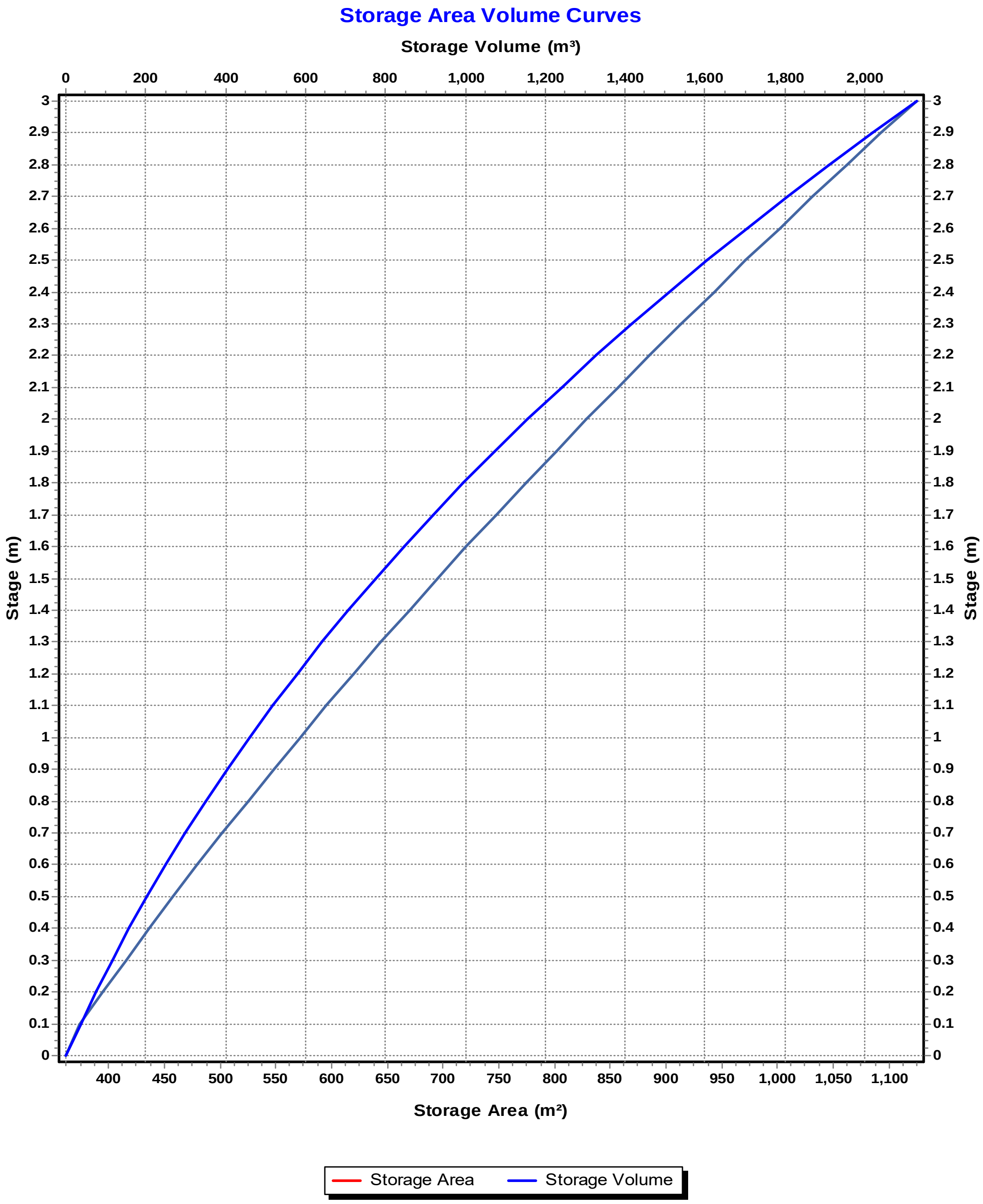
Input Data

Invert Elevation (m) 68.00
Max (Rim) Elevation (m) 70.90
Max (Rim) Offset (m) 2.90
Initial Water Elevation (m) 68.00
Initial Water Depth (m) 0.00
Ponded Area (m²) 0.00
Evaporation Loss 0.00

Storage Area Volume Curves

Storage Curve : South Pond Trial 2

Stage (m)	Storage Area (m²)	Storage Volume (m³)
0	361.338	0
0.1	373.663	36.75
0.2	394.071	75.14
0.3	414.868	115.59
0.4	436.061	158.14
0.5	457.645	202.83
0.6	479.622	249.69
0.7	501.993	298.77
0.8	524.758	350.11
0.9	547.916	403.74
1	571.468	459.71
1.1	595.413	518.05
1.2	619.751	578.81
1.3	644.482	642.02
1.4	669.607	707.72
1.5	695.126	775.96
1.6	721.038	846.77
1.7	747.343	920.19
1.8	774.042	996.26
1.9	801.135	1075.02
2	828.62	1156.51
2.1	856.5	1240.77
2.2	884.773	1327.83
2.3	913.439	1417.74
2.4	942.499	1510.54
2.5	971.952	1606.26
2.6	1001.798	1704.95
2.7	1032.037	1806.64
2.8	1062.67	1911.38
2.9	1093.696	2019.2
3	1125.117	2130.14


Storage Area Volume Curves
Storage Volume (m³)
Stage (m)
Storage Area (m²)
Storage Area
Storage Volume

Storage Node : Stor-01 (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (m)	Rectangular Orifice Height (m)	Rectangular Orifice Width (m)	Orifice Invert Elevation (m)	Orifice Coefficient
1	3	Side	CIRCULAR	No	0.45			68.30	0.61
2	7	Side	Rectangular	No		0.10	1.80	69.70	0.63

Output Summary Results

Peak Inflow (cms) 1.51
Peak Lateral Inflow (cms) 0.2
Peak Outflow (cms) 0.53
Peak Exfiltration Flow Rate (cmm) 0
Max HGL Elevation Attained (m) 69.76
Max HGL Depth Attained (m) 1.76
Average HGL Elevation Attained (m) 68.75
Average HGL Depth Attained (m) 0.75
Time of Max HGL Occurrence (days hh:mm) 0 00:28
Total Exfiltration Volume (1000-m³) 0
Total Flooded Volume (ha-mm) 0
Total Time Flooded (min) 0
Total Retention Time (sec) 2797.05

Storage Node : Stor-02

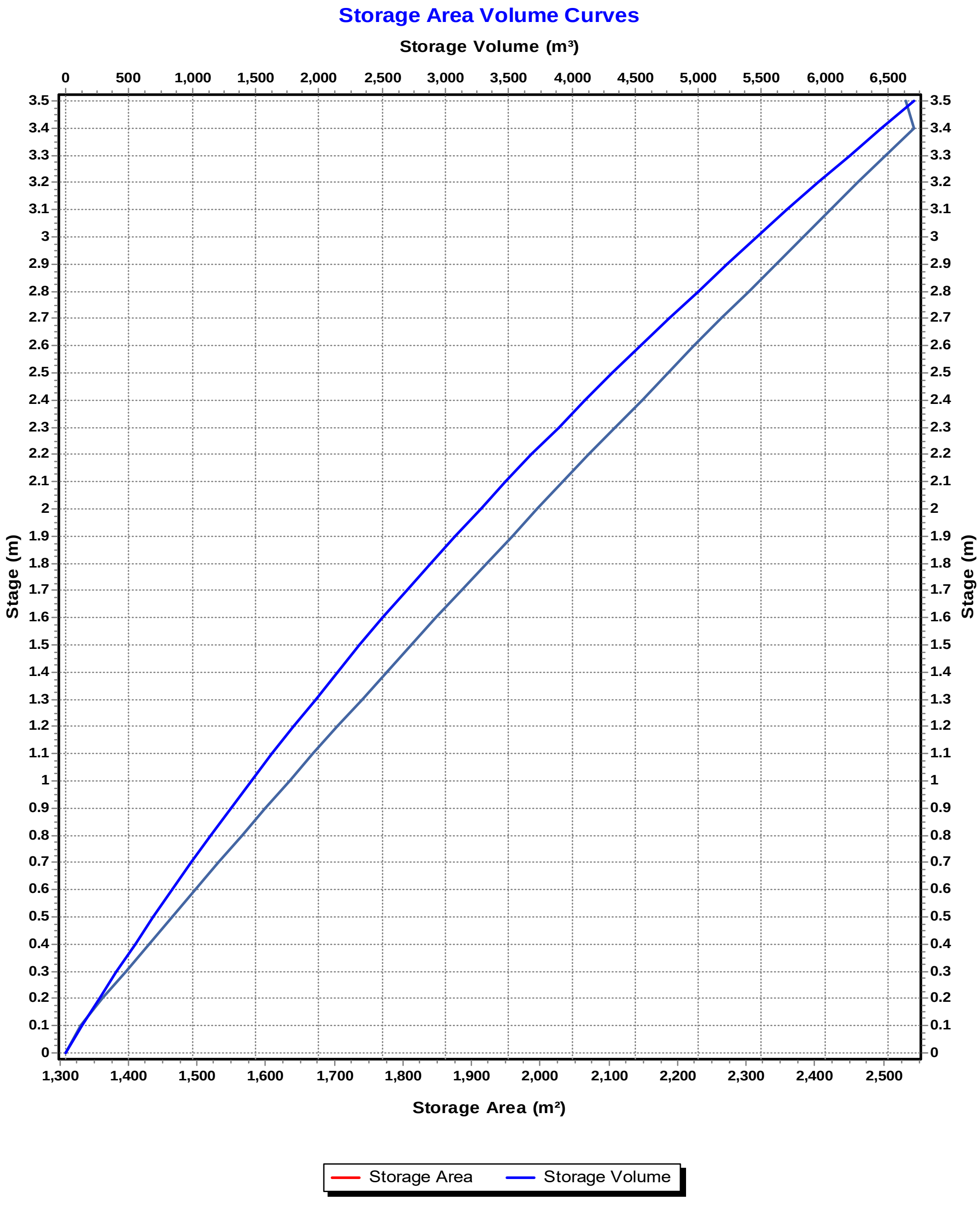
Input Data

Invert Elevation (m) 60.50
Max (Rim) Elevation (m) 63.40
Max (Rim) Offset (m) 2.90
Initial Water Elevation (m) 60.50
Initial Water Depth (m) 0.00
Ponded Area (m²) 0.00
Evaporation Loss 0.00

Storage Area Volume Curves

Storage Curve : North Pond Trial 3

Stage (m)	Storage Area (m²)	Storage Volume (m³)
0	1308.369	0
0.1	1330.095	131.92
0.2	1362.887	266.57
0.3	1395.926	404.51
0.4	1429.214	545.77
0.5	1462.756	690.37
0.6	1496.547	838.34
0.7	1530.588	989.7
0.8	1564.88	1144.47
0.9	1599.424	1302.69
1	1634.218	1464.37
1.1	1669.264	1629.54
1.2	1704.56	1798.23
1.3	1740.108	1970.46
1.4	1775.906	2146.26
1.5	1811.955	2325.65
1.6	1848.255	2508.66
1.7	1884.807	2695.31
1.8	1921.609	2885.63
1.9	1958.662	3079.64
2	1995.966	3277.37
2.1	2033.522	3478.84
2.2	2071.328	3684.08
2.3	2109.385	3893.12
2.4	2147.693	4105.97
2.5	2186.253	4322.67
2.6	2225.063	4543.24
2.7	2264.125	4767.7
2.8	2303.437	4996.08
2.9	2343.001	5228.4
3	2382.816	5464.69
3.1	2422.881	5704.97
3.2	2463.197	5949.27
3.3	2503.764	6197.62
3.4	2544.582	6450.04
3.5	2533.535	6703.95



Storage Area Volume Curves
Storage Volume (m³)
0
500
1,000
1,500
2,000
2,500
3,000
3,500
4,000
4,500
5,000
5,500
6,000
6,500
Stage (m)
3.5
3.4
3.3
3.2
3.1
3
2.9
2.8
2.7
2.6
2.5
2.4
2.3
2.2
2.1
2
1.9
1.8
1.7
1.6
1.5
1.4
1.3
1.2
1.1
1
0.9
0.8
0.7
0.6
0.5
0.4
0.3
0.2
0.1
0
1,300
1,400
1,500
1,600
1,700
1,800
1,900
2,000
2,100
2,200
2,300
2,400
2,500
Storage Area (m²)
Storage Area
Storage Volume

Storage Node : Stor-02 (continued)

Outflow Orifices

SN	Element ID	Orifice Type	Orifice Shape	Flap Gate	Circular Orifice Diameter (m)	Rectangular Orifice Height (m)	Rectangular Orifice Width (m)	Orifice Invert Elevation (m)	Orifice Coefficient
1	5	Side	CIRCULAR	No	0.60			60.80	0.61
2	8	Side	Rectangular	No		0.20	1.80	61.90	0.63

Output Summary Results

Peak Inflow (cms) 2.69
Peak Lateral Inflow (cms) 0.61
Peak Outflow (cms) 1.05
Peak Exfiltration Flow Rate (cmm) 0
Max HGL Elevation Attained (m) 62.09
Max HGL Depth Attained (m) 1.59
Average HGL Elevation Attained (m) 61.34
Average HGL Depth Attained (m) 0.84
Time of Max HGL Occurrence (days hh:mm) 0 00:34
Total Exfiltration Volume (1000-m³) 0
Total Flooded Volume (ha-mm) 0
Total Time Flooded (min) 0
Total Retention Time (sec) 5047.63

Water Quality Report

Pollutant Summary

SN	Pollutant ID	Units	Precipitation Concentration	Groundwater Concentration	Kdecay (1/days)	CoPollutant	CoFraction
1	TSS	mg/L	548.00	0.00	0.00	TSS	0.00

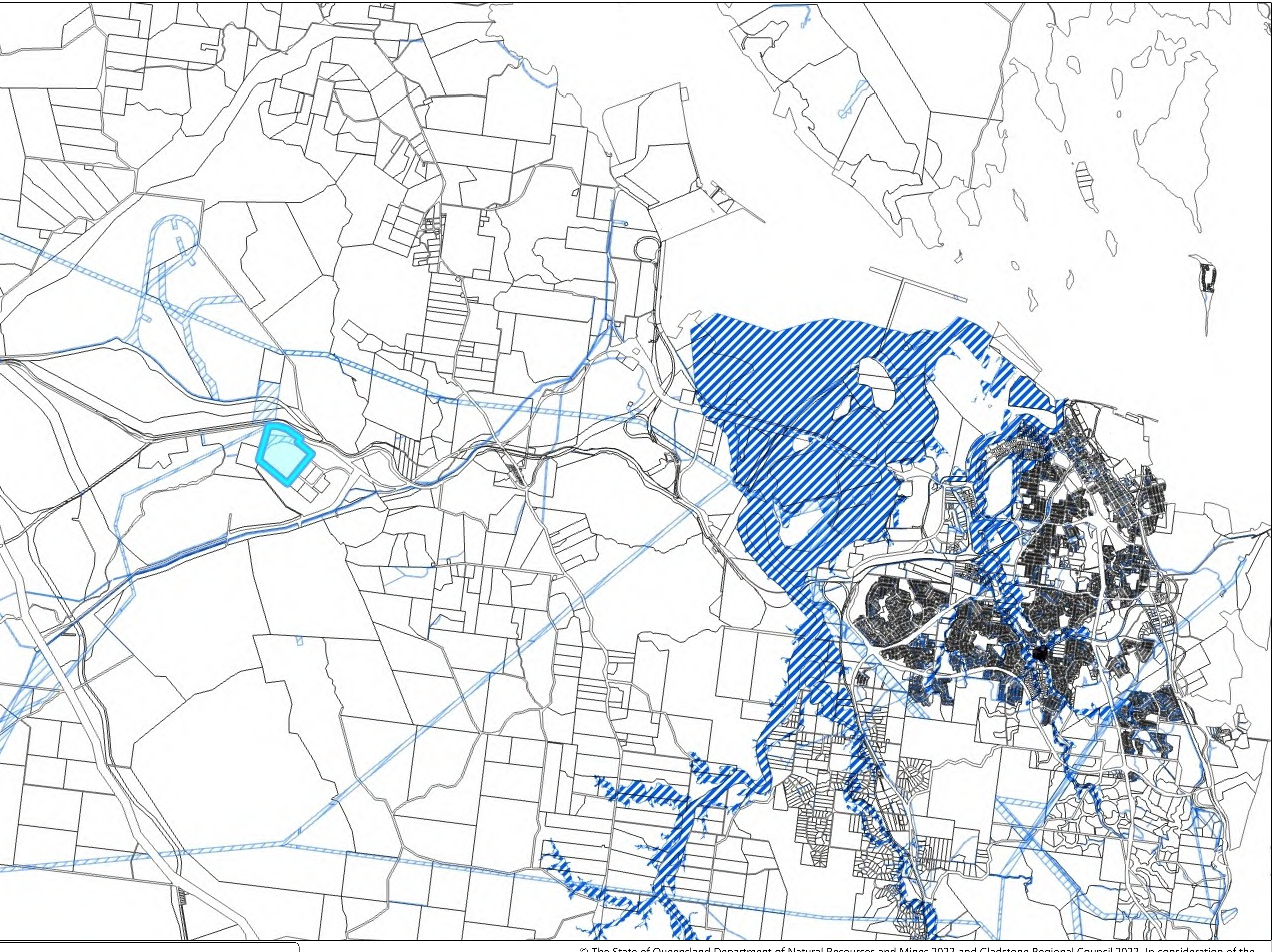
Pollutant Land Types Summary

SN	Land Type ID	Sweeping Interval (days)	Max Removal	Last Swept (days)

APPENDIX F SSA RESULTS

APPENDIX G GLADSTONE REGIONAL COUNCIL FLOOD MAP

Road Centrelines
Easement
Base Parcel
Base Point
Auckland Creek Q100
Awoonga Country DA07_0049
Boyne River Q100
CalliopeRiverQ100
River Downs 5ADA04_0389
Flood Hazard Investigation Area



GLADSTONE REGIONAL COUNCIL

Map Title

2,222.14 0 1,111.07 2,222.14 Meters

Printed: 23-Mar-2022
Map Scale 1: 88,885
Original Size: A3

Appendix F Assessment against the Development Scheme Aspects (Vision, Overall Objectives, Precinct Intent, SDA-Criteria, State Development Assessment Provisions)

Strategic vision of the Gladstone SDA

Section	Vision	Comment	Complies
1	The vision for the Gladstone SDA is to:		
1(a)	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	The proposed Special Industry (50MW Hydrogen Test Train) satisfies the SDA vision, with the development being located within the High Impact Industry Precinct and delivering a 50MW Hydrogen Test Train that is aligned with State Interests and will act as a catalyst for an emerging industry of national and international significance. It will establish Gladstone as the hydrogen manufacturing hub of Queensland.	✓
1(b)	support development that aligns with the Queensland Government's strategic priorities for the region, particularly related to the hydrogen industry		✓
1(c)	maintain environmental, cultural heritage and community values where possible to support wider ecological processes and provide community benefits.	The development will be integrated into the intended outcomes for the Precinct and utilises a planned traffic network and logical extension of utility services. Furthermore, it will not compromise the ability to deliver critical infrastructure including rail corridors and road networks. As demonstrated in this report, the proposed development will not have any adverse impacts on existing environmental values on and around the Site. The development will connect to the existing stormwater network, and therefore maintain the values of the Great Barrier Reef World Heritage Area. The development will take significant investment on behalf of the Proponent and is intended to be a long-term commitment to the Precinct and, more broadly, the Gladstone region. It will introduce further jobs into the region over time and will act as a catalyst in the long term for supporting industries.	✓
2	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 meets the overall objects and preferred intent for the High Impact Industry precinct.	✓

High Impact Industry Precinct Intent

Section	Intent	Comment	Complies
(1)	This precinct is to accommodate industrial development that: (i) is difficult to locate and requires separation from sensitive land uses (ii) requires access to key transport and supply chain networks. (b) Waste management related industries are supported south of Aldoga Road. (c) Development which adversely impacts existing or future LNG operations on Curtis Island will not be supported. (d) Development on Curtis Island must recognise the environmental values of the adjacent Environmental Management Precinct.	The proposed development satisfies the preferred development intent as it is difficult to locate and requires separation from sensitive land uses and does not adversely impact existing or future LNG operations on Curtis Island.	✓
(2)	Defined uses that support the preferred development intent are: (a) high impact industry (b) special industry.	The proposed use is for a special industry, being a 50MW Hydrogen Test Train.	✓
(3)	Defined uses that may be considered where the use does not compromise the preferred development intent include: (a) freight terminal (b) linear infrastructure facility (c) medium impact industry (d) research and technology industry (e) utility installation (f) warehouse (where ancillary to a use listed in 2.4.2(2).	The proposed development will not impact on the delivery of linear infrastructure around the Site. Furthermore, the development is for a Special Industry which is a preferred development for the Site. The development will be serviced by water and electricity provided to the Site by Economic Development Queensland prior to operation. It is understood these works will be brought forward to service the broader Precinct.	✓
(4)	Access from Gladstone-Mount Larcom Road to this precinct will be limited to three intersections at the following locations: (a) a proposed intersection approximately 3.8 kilometres from the Bruce Highway (b) a proposed intersection approximately 8.4 kilometres from the Bruce Highway (road/rail overpass) (c) the intersection with Aldoga Road	Access to the proposed development will be from the upgraded Euroa Circuit and via Aldoga Drive as contemplated by the Precinct intent. As demonstrated by the traffic assessment undertaken, the proposed development will have negligible impact on the intersection of Gladstone-Mt Larcom Road/Algoda Road. No further upgrades to this intersection are required to service the development.	✓

SDA Overall Objectives

Section	Objectives	Comment	Complies
(a)	capitalise on Gladstone SDA's strategic location and support the role and function of the Port of Gladstone	The proposal gives consideration to the future land uses and is appropriately located to ensure the most efficient use of available industrial land.	✓
(b)	identify and implement opportunities for synergies and co-location between other uses, services and infrastructure to minimise waste and inefficiencies	The Gladstone SDA has long held its strategic designation as a regionally significant industrial precinct and subsequently infrastructure planning has taken account of the intended future development outcomes. Existing and planned infrastructure to services will be drawn on to service the subject Site, without resulting in adverse impacts to infrastructure or out-of-sequence development limitations.	✓
(c)	use land and infrastructure efficiently and be adequately serviced by infrastructure		✓
(d)	ensure the integrity and functionality of the Gladstone SDA, including infrastructure corridors and future development opportunities, is maintained and protected from incompatible land uses	Private infrastructure to be delivered within the Site boundaries will be delivered by the Applicant in conjunction with Economic Development Queensland (EDQ) in accordance with the Memorandum of Understanding.	✓
(e)	ensure new lots are appropriately sized to accommodate preferred development	The proposed Special Industry (50MW Hydrogen Test Train) is highly compatible land with the outcomes sought for the Gladstone SDA under the Development Scheme.	✓
(f)	be designed, constructed, and operated to a high quality consistent with best practice	The proposed Special Industry use will be compatible with surrounding land uses in the Precinct it develops over time. In the short term, there will be minimal impacts to surrounding vacant/grazing land.	✓
(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 will not have an impact on the environmental and cultural values on, or surrounding the Site. Specifically: - There are no identified cultural heritage assets identified on the Site in accordance with the approved CHMP. - The development is well setback from any mapped vegetation on Site and will not result in any removal, loss or damage to significant flora and fauna values. - Water discharged from the Site will be treated to ensure no adverse downstream impacts on water quality within the catchment area.	✓
(h)	not adversely impact on the outstanding universal values of the Great Barrier Reef World Heritage Area	The Site is not affected by flooding. Stormwater generated by the development will be discharged into the existing stormwater network.	✓
(i)	manage the risks associated with the projected impacts of climate change and natural hazards to protect people and property	The orientation and design of the development seeks to meet best practice for energy and water efficient design where appropriate.	✓

Section	Objectives	Comment	Complies
(j)	manage impacts of air quality on the capacity of the Gladstone airshed	The proposed development will not generate any unreasonable air quality impacts. An Environmental Management Plan and Construction Management Plan will ensure that impacts are managed in accordance with the relevant planning policy and standards.	✓

SDA Wide Assessment Criteria

Section	SDA Wide Criteria	Comment	Complies
2.5.1 Infrastructure and Services	(a) is designed to maximise efficiency and minimise the cost for infrastructure and services	The regional infrastructure overlay map from the GRCPS identifies the following: • PQ substation to the north of the Site • Powerlink within the Site • Ergon 66kv outside the Site's north-east corner The proposed works will not affect mapped regional infrastructure. To mitigate any adverse impacts downstream, the existing detention basins will be used to ensure peak flows from the Site are not increased as part of the works. The detention basin was sized based on the existing Site conditions and taking in consideration the proposed works, consisted of a new industrial use building and associated hardstand areas and car parking. Tertiary water treatment systems will be provided in the operational phase of the Site and will be incorporated as part of the development of the Site, in accordance with the State Planning Policy. During the construction phases, sediment and erosion and control measures will be implemented to limit the discharge of any sediments into the drainage reserve.	✓
	(b) plans for and manages its impacts on existing and planned infrastructure and services		✓
	(c) is adequately serviced by the infrastructure and services necessary to meet the demand generated by the development		✓
	(d) integrates with existing and planned infrastructure and services where possible.		✓
2.5.2 Transport	(1) Increased traffic arising from development is able to be accommodated within existing road networks or works are undertaken to minimise adverse impacts.	Broadly, this assessment concludes that the proposed development will have a negligible impact on the existing road network. A key consideration for the proposal is the impact of additional traffic on the intersection of Gladstone-Mt Larcom Road / Aldoga Road. SIDRA analysis of this intersection has been carried out for the following scenarios: 2023 Base, 2023 with Development, 2033 Base and 2033 with Development. The assessment concludes that:	✓
	(2) Local 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.		✓
	(3) Development is designed to facilitate safe and efficient vehicular ingress and egress and does not unduly impact on the safe and		✓

Section	SDA Wide Criteria	Comment	Complies
	efficient operation of the use of external roads, rail, transport infrastructure or services.	• Gladstone-Mount Larcom Road / Aldoga Road intersection operates well within capacity in both AM and PM peak hour with minor queues and delays for all scenarios. • Degree of Saturation (DoS), queues and average delays are increasing for this intersection, which is mainly caused by the natural traffic growth at the location. • The proposed development will not have major impacts on traffic performance. • The 2033 model shows that the intersection is adequate to support the 2033 traffic volume and no upgrade will be required for this intersection. Emergency egress is available at each corner of the Site using a one-way gate.	
	(4) Adequate car parking for the number and nature of vehicles expected are provided on Site.		✓
2.5.3 Environmental Nuisance	(1) Development is located, designed, and operated to avoid, minimise or manage (a) adverse impacts from air, noise and other emissions that will affect the environment and/or health and safety, wellbeing, and amenity of communities and individuals (b) conflicts with sensitive uses arising from (but not limited to) spray drift, odour, noise, light spill, dust, smoke, or ash emissions.	Dust or other emissions will not be created during the operation of the facility. The proposed development will not generate air, noise and other emissions that will affect the environment and/or health and safety, wellbeing, and amenity of communities and individuals given the Sites location away from sensitive receptors and limited release air emissions. A detailed Construction Management Plan will be prepared to address potential construction impacts including noise, dust, sediment runoff, traffic, waste and so on. **Mitigation measures:** • Noise emissions will comply with the [Environmental Protection (Noise) Policy 2019 (legislation.qld.gov.au)]. • Residents in close proximity to the Site shall be kept informed regarding construction activities and timing of noisy activities which will generally be scheduled between 7am and 6pm where practical. • Landowners are to be advised of any planned activities that will cause loud and extensive periods of noise. Attenuation measures should be used where possible. • Noise mitigation measures employed during construction shall be in accordance with AS2436, Guide to noise and vibration control on construction, demolition and maintenance Sites. • A construction noise and vibration management plan is to be prepared for development on the Site. The plan should include recommendations on plant and equipment, hours of operation,	✓
	(2) The location, design and operation of development achieves the relevant acoustic objectives of the Environmental Protection (Noise) Policy 2019 and achieves the relevant air quality objectives of the Environmental Protection (Air) Policy 2019.		✓
	(3) Development: (a) avoids adverse impacts on the cumulative air quality of the Gladstone airshed or (b) where impacts cannot be avoided, conducts air shed modelling in accordance with current best practice to demonstrate compliance with air quality standards.		✓

Section	SDA Wide Criteria	Comment	Complies
		staging, construction noise limits, vibration and liaison with local residents and sensitive receptors.	
2.5.4 Contaminated Land	(1) 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.	A contaminated land search undertaken on 2 July 2021 concluded that the Site is not included on the Environmental Management Register (EMR) or the Contaminated Land Register (CLR). Refer to **Appendix H**.	✓
	(2) Where required, develop a strategy to manage any existing contamination and the potential for additional contamination, so that human health and the environment are not adversely affected.		✓ ✓
2.5.5 Natural hazards	(1) Development, in accordance with current best practice: (a) identifies relevant natural hazards that may impact upon the project (b) appropriately manages risk associated with identified hazards (c) avoids increasing the severity of natural hazards (d) 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 (e) avoids directly or indirectly increasing the severity of coastal erosion either on or off the Site.	With regard to bushfire hazard, the development Site is not within a Bushfire Prone Area, as indicated in the GRCPS. Proposed building works will not occur on any areas classified as having medium, high and very high potential bushfire intensity. **Mitigation measures:** As part of the proposed development, the high and medium bushfire intensity risk will be removed once the vegetation is removed within the development boundary. This will ultimately reduce the potential impact buffer across a large portion of the Site including the future building footprint. It is respectfully requested that the requirement for a Bushfire Management Plan be a condition of the development permit.	✓
	(2) Development, in accordance with current best practice, achieves an appropriate level of flood immunity and: (a) 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).	Following review of the GRCPS, it has been determined that the Site is not located in a flood hazard area. Therefore, it is considered that a focused flood risk assessment and Flood Management Plan is not required.	✓
2.5.6 Climate Change	(1) Development: (a) avoids or, if avoidance cannot be achieved, minimises net increases in the emission of greenhouse gases (b) can adapt to current and future impacts of a changing climate	The Proposed Development will use existing renewable energy network to fully offset the energy required. Hydrogen will only be realised through a flair if required due to an emergency.	✓
2.5.7 Acid Sulfate soils	(1) Development, in accordance with current best practice, is to: (a) avoid the disturbance of acid sulfate soils (ASS) or (b) ensure that the disturbance of ASS avoids or minimises the mobilisation and release of contaminants.	The Gladstone Regional Council Planning Scheme (GRCPS) does not identify Acid Sulfate Soils on Site. The Australian Soil Resource Information System (ASRIS) shows the general vicinity to have Extremely Low and Low Probability of Acid Sulfate Soils.	✓

Section	SDA Wide Criteria	Comment	Complies
2.5.8 Water Quality	(1) Consistent with the Environmental Protection (Water and Wetland Biodiversity) Policy 2019, development avoids or, if avoidance cannot be achieved, minimises, mitigates or offsets adverse impacts on the environmental values and water quality objectives of receiving waters and wetlands arising from: (a) altered stormwater quality and/or flow (b) wastewater (other than contaminated stormwater and sewage) (c) the creation or expansion of regulated structures or non-tidal artificial waterways (d) the release and mobilisation of nutrients and sediments.	The Queensland Globe Map indicates that there are three Lacustrine wetlands with habitat type artificial/ highly modified wetlands approximately 100m to the north/north-west of the boundary of the Site. **Mitigation measures:** • Appropriate handling and storage of construction materials. • Detailed planning and design of the construction phase water management and mitigation systems should be undertaken to adequately manage water quality related issues (for example, erosion and sediment control plan) arising throughout construction. Environmental control design should take into account seasonal weather conditions. • Stage works to minimise erosion. • Provide management procedures related to spill prevention are implemented to mitigate associated impacts to groundwater and surface water resources. • Detailed planning and design of the operational phase water management devices and systems are required to adequately manage water quality related issues (for example, increased pollutant concentrations and loadings in stormwater). It is respectfully requested that a condition of the development permit establish the requirement for a Stormwater Management and Water Quality Plan to be prepared to address the above mitigation measures during both the construction and operational phases of the project.	✓
	(2) Development encourages a precinct-wide stormwater management approach that achieves an improved water quality outcome.		✓
	(3) 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.		✓
2.5.9 Risk Management - Activities	(1) Development is located, designed, and operated to: (a) minimise the health and safety risks to communities and individuals (b) avoid any potential adverse impacts from emissions and hazardous activities, or where adverse impacts cannot be avoided, impacts are minimised or mitigated (c) protect high pressure gas pipelines from encroachment that would compromise the ability of the pipelines to function safely and effectively	Any hazardous substances located on-Site will be secured away from general traffic areas, in spaces that will be safe during natural hazard events.	✓
	(2) 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		✓

Section	SDA Wide Criteria	Comment	Complies
	(3) Development provides adequate protection from the harmful effects of noxious and hazardous materials and chemicals manufactured or stored in bulk during natural hazard events.		✓
2.5.10 Cultural heritage and community	(1) 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.	A Cultural Heritage Management Plan (CHMP) has been prepared (refer **Appendix K**). The CHMP establishes the procedures to be carried out where activities are proposed that will disturb the surface of the land. **Mitigation measures:** During construction, the recommendations of the CHMP are to be complied with.	✓
	(2) Development is located, designed and operated to avoid adverse impacts on cultural heritage and community values, or where adverse impacts cannot be avoided, impacts are minimised, mitigated, or offset.		✓
	(3) Development recognises and protects the cultural heritage values associated with: (a) the Euroa Homestead on Lot 200 on SP239672 (b) the Mount Larcombe Station Original Homestead Site on Lot 73 on SP272417 and Lot 20 on SP272417 (c) the Targinnie Cemetery on Lot 95 on DS287.		✓
	(4) 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.		
2.5.11 Environment	(1) Environmental values of the premises on which the development is undertaken, and immediate surrounds are identified and managed, consistent with current best practice.	**Environment:** The Site has previously been cleared and there is very little vegetation remaining on Site. Two Threatened Ecological Communities protected under the EPBC Act are listed as occurring within 2km of the Site. Previous field investigations have not identified either of these threatened ecological communities on the Site. Previous field investigations have also not located any threatened species under the EPBC Act and/or Nature Conservation Act 1992 (NC Act) on the Site. Three Matters of State Environmental Significance (MSES) are in the vicinity of the Site but are not directly within it. There are no recognised wetlands on the Site. Nine species of fauna listed as threatened under the EPBC and /or NC Act were identified in searches of Commonwealth and State databases for an area within 2km of the broader precinct.	✓
	(2) Development is located, designed, and operated to: (a) avoid adverse impacts on environmental values including matters of local, state, and national environmental significance or where adverse impacts cannot be avoided, impacts are minimised, mitigated, or offset (b) maintain ecological connectivity and processes (c) maintain the outstanding universal value (OUV) of the Great Barrier Reef World Heritage Area including the local attributes of the OUV identified in the Master plan for the Priority Port of Gladstone and Port overlay (d) retain, to the greatest extent possible, tidal fish habitat and marine plants.		✓

Section	SDA Wide Criteria	Comment	Complies
	(3) Any residual significant adverse impacts are offset in accordance with the relevant Commonwealth or Queensland environmental offset framework	**Mitigation measures:** • Develop and implement best-practice Site management measures within an Environmental Management Plan (EMP) Framework. • Develop and implement a detailed Soil, Water and Waste Management Strategy. • Undertake weed management before, during and after construction. • Avoid the removal of large hollow-bearing trees (if any exist on Site). It is respectfully requested that the requirement for an EMP and Construction Management Plan forms a condition of the permit which will incorporate the above mitigation measures.	✓
	(4) Lighting associated with the construction and operation of development is designed to limit the impacts on aquatic wildlife, including turtles and migratory species.		✓
	(5) Where development requires a buffer to mitigate the impacts of the development, that buffer must be accommodated within the development Site.3		✓
	(6) Development avoids native vegetation clearing, or where avoidance is not reasonably possible, minimises clearing to: (a) conserve vegetation (b) avoid land degradation (c) avoid fragmentation and conserve connectivity.		✓

2.5.12 Engineer and Design Standards	Acid Sulfate soils	• Queensland Acid Sulfate Soil Technical Manual – Soil Management Guideline v4.0 • National Acid Sulfate Soils Guidance – Guidance for the dewatering of Acid Sulfate soils in shallow groundwater environments – June 2018	A Site Based Management Plan and Decommissioning Plan is required. It is respectfully requested that these are provided as a condition of the permit, prior to commencement of the use. The proposal has adopted best practice building design, incorporating sustainability elements and technological efficiencies where appropriate.	✓
	Car parking	• Relevant local government standards		
	Clearing native vegetation	• State code 16: Native vegetation clearing		
	Environment	• Sea Turtle Sensitive Area Code • Pathways to a climate resilient Queensland – Queensland Climate Adaptation Strategy 2017-2030		
	Filling	• AS3798 – Guidelines on Earthworks for Commercial and Residential Developments		
	Footpaths and cycle paths	• Relevant local government standards • AustRoads, Guide to Road Design - Part 6A: Pedestrian and Cyclist Paths		
	Natural hazards - flooding	• Relevant local government standards		
	Rail	• Department of Transport and Main Roads (DTMR) Guide to Development in a Transport Environment - Rail		
	Risk management	• AS2885 – Pipelines – Gas and liquid petroleum • AS/NZS ISO 31000:2009 – Risk management		

	• AS/NZS 2022-2003: Anhydrous ammonia – Storage and handling • State code 21: Hazardous chemical facilities
Roads (major)	• DTMR Road Planning and Design Manual • DTMR Pavement Design Manual • DTMR Pavement Design Supplement • DTMR Bridge Design Manual • Queensland Urban Drainage Manual • DTMR Road drainage manual • Manual of Uniform Traffic Control Devices • DTMR Traffic and Road Use Management manual, Volume 3 – Signing and Pavement Making • AS1158 - Lighting for roads and public spaces • Institute of Public Works Engineering Australasia, Complete Streets: Guidelines for Urban Street Design - Section 17: Industrial Streets
Roads (minor)	• Relevant local government standards
Soil erosion	• International Erosion Control Association (IECA) – Best Practice Erosion and Sediment Control
Stormwater quality	• Water sensitive urban design: Design objectives for urban stormwater management • Health Land and Water, Construction and Establishment Guidelines: Swales, Bioretention

	Systems and Wetlands: Version 1.1 • Concept Design Guidelines for Water Sensitive Urban Design • Standard Drawings for Water Sensitive Urban Design • Curtis Island, Calliope River and Boyne River Basins - Environmental Values and Water Quality Objectives • Great Barrier Reef River Basins—End-of-Basin Load Water Quality Objectives • Water quality guidelines for the Great Barrier Reef Marine Park • State code 9: Great Barrier Reef wetland protection areas • State Planning Policy 2017 State Interest Water Quality Supplementary Implementation Guidelines February 2021
Stormwater quantity	• Queensland Urban Drainage Manual • Australian Rainfall and Runoff
Utilities (e.g. sewer, water, telecommunications, electricity supply)	• Relevant service provider standards (e.g. Gladstone Regional Council)

Section	SDA Wide Criteria	Comment	Complies
2.5.13 Other government matters	(1) Development is to demonstrate consistency with any other relevant legislative requirements that may be necessary for the development to proceed 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 State Development Assessment Provisions, where the State interests articulated by these instruments are likely to be affected by the development.	The proposed land use is highly compatible with the vision for the Gladstone SDA and outcome sought by the Development Scheme. Furthermore, the strategic land use for this area has been contemplated since the early 1990's and therefore State and local government policy supports the intent of the SDA and use of the subject Site for Special Industry (50MW Hydrogen Test Train). The proposed development will not have any negative impacts on existing State or local government infrastructure.	✓
	(2) Development recognises and protects the long-term availability of the extractive resource and access related to the Targinnie Key Resource Area (Number 119).		✓
	(3) Development does not compromise existing or future port facilities and operation on Strategic Port Land.		✓
2.5.14 Energy and water efficiency	(1) Building, Site design, and layout maximises energy efficiency having regard to: (a) building orientation and passive solar design (b) maximising opportunities for cross ventilation (c) appropriate shade treatments (d) landscaping treatments to the western side of the building.	The proposed building design seeks to adopt best practice principles for energy and water efficiency where appropriate.	✓
	(2) Water efficiency is optimised with alternative water supply sources, including: (a) rainwater harvesting systems (b) recycled water source.		✓
	(3) Where practicable, development should be consistent with the Queensland government's renewable energy policies.		✓
2.5.15 Visual Impacts	(1) 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.	(1) The proposed development will be only partially visible from Gladstone Mount Larcom Rd given existing vegetation between the Site and the Highway. This viewpoint will also be shielded from the existing GEM buildings from Gladstone Mount Larcom Rd. The design of the test train being cut into the Site will also limit the visual impact from Gladstone Mount Larcom Rd. Landscaping has not been proposed given the cutting and possible impacts of vegetation being built in close proximity to the plant equipment. The only area that could contain landscaping is proposed to be kept clear as an emergency evacuation point. (2) The proposed scale and form of the development is generally in keeping with the desired intent for the Precinct. It will introduce a high-	✓
	(2) Development maintains and enhances significant vegetation where possible and provides landscaping that: (a) minimises the visual impacts of the development (b) incorporates at least 50 per cent local species (c) is low maintenance.		✓

Section	SDA Wide Criteria	Comment	Complies
		quality built form to the area, with attractive street frontage to Euroa Circuit. The proposal has adopted best practice building design, incorporating sustainability elements and technological efficiencies where appropriate.	
2.5.16 Reconfiguring a Lot	(1) Development provides lawful, safe and practical access.	N/A - The Proposed Development is not reconfiguring any lots as part of the Proposed Works.	✓
	(2) 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: (a) Port Related Industry Precinct – 2 hectares (ha) (b) High Impact Industry Precinct – 10 ha (c) Medium Impact Industry Precinct - 2 ha (d) Industry Investigation Precinct – 2 ha		✓

Appendix G Assessment against State Development Assessment Provisions

State code 6: Protection of state transport networks

Performance outcomes	Acceptable outcomes	Response
Network impacts		
PO1 **Development does not compromise the safety of users of the** state-controlled road **network.**	No acceptable outcome is prescribed.	Complies Development does not compromise the safety of users of the state-controlled road network.
PO2 **Development does not adversely impact the structural integrity or physical condition of a** state-controlled road **or** road transport infrastructure**.**	No acceptable outcome is prescribed.	Complies Development does not adversely impact the structural integrity or physical condition of a state-controlled road or road transport infrastructure.
PO3 **Development ensures** no net worsening **of the operating performance the** state-controlled road **network.**	No acceptable outcome is prescribed.	Complies Development does not impact the efficiency of a state-controlled transport network.
PO4 **Traffic movements are not directed onto a** state-controlled road **where they can be accommodated on the** local road **network.**	No acceptable outcome is prescribed.	Complies Development does not impact the traffic movements on state-controlled transport networks.
PO5 **Development involving haulage exceeding 10,000 tonnes per year does not damage the pavement of a** state-controlled road**.**	No acceptable outcome is prescribed.	Complies Development does not impact the efficiency of a state-controlled transport network.
PO6 **Development does not require a new** railway **level crossing.**	No acceptable outcome is prescribed.	Complies Development does not expect to cross any rail lines.
PO7 **Development does not adversely impact the operating performance of an existing** railway crossing**.**	No acceptable outcome is prescribed.	Complies Development does not expect to cross any rail lines.
PO8 **Development does not adversely impact on the safety of an existing** railway crossing**.**	No acceptable outcome is prescribed.	Complies Development does not expect to cross any rail lines.
PO9 **Development is designed and constructed to allow for on-site circulation to ensure vehicles do not queue in a** railway crossing**.**	No acceptable outcome is prescribed.	Complies Development does not expect to cross any rail lines.
PO10 **Development does not create a safety hazard within the** railway corridor**.**	No acceptable outcome is prescribed.	Complies Development does not expect to cross any rail lines.
PO11 **Development does not adversely impact the operating performance of the** railway corridor**.**	No acceptable outcome is prescribed.	Complies

Performance outcomes	Acceptable outcomes	Response
		Development does not expect to cross any rail lines.
PO12 **Development does not interfere with or obstruct the** railway transport infrastructure **or** other rail infrastructure**.**	No acceptable outcome is prescribed.	Complies Development does not expect to cross any rail lines.
PO13 **Development does not adversely impact the structural integrity or physical condition of a** railway corridor **or** rail transport infrastructure**.**	No acceptable outcome is prescribed.	Complies Development does not expect to cross any rail lines.
Stormwater and overland flow		
PO14 **Stormwater run-off or overland flow from the development site does not create or exacerbate a safety hazard for users of a** state transport corridor **or** state transport infrastructure**.**	No acceptable outcome is prescribed.	Complies Stormwater runoff will be directed away from state transport- corridors or state transport infrastructure into nearby wetlands.
PO15 **Stormwater run-off or overland flow from the development site does not result in a material worsening of operating performance of a** state transport corridor **or** state transport infrastructure**.**	No acceptable outcome is prescribed.	Complies Stormwater runoff will be directed away from state transport- corridors or state transport infrastructure into nearby wetlands.
PO16 **Stormwater run-off or overland flow from the development site does not interfere with the structural integrity or physical condition of the** state transport corridor **or** state transport infrastructure**.**	No acceptable outcome is prescribed.	Complies Stormwater runoff will be directed away from state transport- corridors or state transport infrastructure into nearby wetlands.
PO17 **Development associated with a** state-controlled road **or** road transport infrastructure **ensures that stormwater is lawfully discharged.**	**AO17.1** Development does not create any new points of discharge to a **state transport corridor** or **state transport infrastructure**. AND **AO17.2** Development does not concentrate flows to a **state transport corridor**. AND **AO17.3** Stormwater run-off is discharged to a **lawful point of discharge**. AND	Complies Stormwater runoff will be directed away from state transport- corridors or state transport infrastructure into nearby wetlands.

Performance outcomes	Acceptable outcomes	Response
	AO17.4 Development does not worsen the condition of an existing **lawful point of discharge** to a **state transport corridor** or **state transport infrastructure**.	
Flooding		
PO18 **Development does not result in a material worsening of flooding impacts within a** state transport corridor **or** state transport infrastructure	*For a **state-controlled road** or **road transport infrastructure**, all of the following apply:* **AO18.1** For all flood events up to 1% **annual exceedance probability**, development ensures there are negligible impacts (within +/- 10mm) to existing flood levels within a **state transport corridor**. AND **AO18.2** For all flood events up to 1% **annual exceedance probability**, development ensures there are negligible impacts (up to a 10% increase) to existing peak velocities within a **state transport corridor**. AND **AO18.3** For all flood events up to 1% annual exceedance probability, development ensures there are negligible impacts (up to a 10% increase) to existing time of submergence of a **state transport corridor**. *No acceptable outcome is prescribed for a **railway corridor** or **rail transport infrastructure**.*	Complies Development does not impact the efficiency of a state-controlled transport network.
Drainage infrastructure		
PO19 **Drainage infrastructure does not create a safety hazard in a** state transport corridor**.**	*For a **state-controlled road** environment, both of the following apply:* **AO19.1** Drainage infrastructure associated with, or in a **state-controlled road** is wholly contained within the development site, except at the **lawful point of discharge**.	Complies *The drainage from site will be channeled through a lawful point of discharge, away from state controlled infrastructure and road corridors.*

Performance outcomes	Acceptable outcomes	Response
	AND **AO19.2** Drainage infrastructure can be maintained without requiring access to a **state transport corridor**. *For a **railway** environment both of the following apply:* **AO19.3** Drainage infrastructure associated with a **railway corridor** or **rail transport infrastructure** is wholly contained within the development site. AND **AO19.4** Drainage infrastructure can be maintained without requiring access to a **state transport corridor**.	
PO20 **Drainage infrastructure associated with, or in a** state-controlled road **or** road transport infrastructure **is constructed and designed to ensure the structural integrity and physical condition of existing drainage infrastructure and the surrounding drainage network is maintained.**	No acceptable outcome is prescribed.	Complies The development does not involve drainage infrastructure that is associated with state transport infrastructure. Drainage surrounding the site have management plans to maintain them.
Planned upgrades		
PO21 Development does not impede delivery of **planned upgrades** of **state transport infrastructure**.	No acceptable outcome is prescribed.	Complies development does not impede delivery of planned upgrades of state transport infrastructure.

State code 21: Hazardous chemical facilities

Performance outcomes	Response
Off-Site impacts—vulnerable land use or land zoned for a vulnerable land use	
PO1 The **hazardous chemical facility** does not create a **dangerous dose to human health**.	Complies. The development is designed and sited, so far as reasonably practicable, to ensure human health and safety are protected from off-site risks resulting from physical or chemical hazards. The subject Site is located within the High Impact Industry Precinct. This intent for this precinct is to accommodate industrial development that is difficult to locate and requires separation from sensitive land uses. The use of all materials and substances will be in accordance with occupational health and safety and relevant standards, codes and Authority requirements.
Off-Site impacts—sensitive land use or land zoned for a sensitive land use	
PO2 The **hazardous chemical facility** does not create a **dangerous dose to human health**.	Complies. The development is designed and sited, so far as reasonably practicable, to ensure human health and safety are protected from off-site risks resulting from physical or chemical hazards. The subject Site is located within the High Impact Industry Precinct. This intent for this precinct is to accommodate industrial development that is difficult to locate and requires separation from sensitive land uses. The use of all materials and substances will be in accordance with occupational health and safety and relevant standards, codes and Authority requirements.
Off-Site impacts—commercial or community activity land use or land zoned for a commercial or community activity land use	
PO3 The hazardous chemical facility does not create a dangerous dose to human health.	Complies. The development is designed and sited, so far as reasonably practicable, to ensure human health and safety are protected from off-site risks resulting from physical or chemical hazards. The subject Site is located within the High Impact Industry Precinct. This intent for this precinct is to accommodate industrial development that is difficult to locate and requires separation from sensitive land uses. The use of all materials and substances will be in accordance with occupational health and safety and relevant standards, codes and Authority requirements.

Off-Site impacts—open space land use or land zoned for an open space land use	
PO4 The hazardous chemical facility, does not create: a. a **dangerous dose to human health**; or b. where (a) cannot be achieved, an **individual fatality risk level** of 10 x 10^{-6}/year and the societal risk criteria in figure 21.1.	Complies. The development is designed and sited, so far as reasonably practicable, to ensure human health and safety are protected from off-site risks resulting from physical or chemical hazards. The subject Site is located within the High Impact Industry Precinct. This intent for this precinct is to accommodate industrial development that is difficult to locate and requires separation from sensitive land uses. The use of all materials and substances will be in accordance with occupational health and safety and relevant standards, codes and Authority requirements.
Off-Site impacts—industrial land use or land zoned for an industrial land use	
PO5 The **hazardous chemical facility**, does not create either of the following: a. a **dangerous dose to the built environment**; and b. an **individual fatality risk level** of 50 x 10^{-6}/year.	Complies. with PO5. Refer to Gexcon modelling in Appendix N.
Storage and handling areas	
PO6 Storage and handling areas for **fire risk hazardous chemicals** are provided with a 24-hour monitored fire detection system that has the ability to detect a fire in its early stages and notify an **emergency responder** at all times.	Complies All storage and handling areas for fire risk hazardous chemicals will be provided with a 24-hour monitored fire detection system that has the ability to detect a fire in its early stages and notify an emergency responder at all times. Queensland RPEQ fire expert consultant has been engaged to support design. It is respectfully requested that this requirement forms a condition of the permit.
PO7 Storage and handling areas for **packages** of liquid or solid **fire risk hazardous chemicals** are provided with a spill containment system with a working volume capable of containing a minimum of 100 percent of all **packages** (**prescribed hazardous chemicals** and/or non-hazardous chemicals) within the area plus the output of any **fixed firefighting system** provided for the area over a minimum of 90 minutes.	Complies. All storage and handling areas for fire risk hazardous chemicals will be provided with a 24-hour monitored fire detection system that has the ability to detect a fire in its early stages and notify an emergency responder at all times. Queensland RPEQ fire expert consultant has been engaged to support design and FFI are to prepare emergency response plan. It is respectfully requested that this requirement forms a condition of the permit.

PO8 Storage and handling areas for liquid or solid **fire risk hazardous chemicals** in **tanks** are provided with a spill containment system with a working volume capable of containing a minimum of: a. 110 percent of the largest **tank** within a spill compound or 25 percent of the aggregate where multiple **tanks** are located within a spill compound, whichever is the greater; and b. the output of any **fixed firefighting system** provided for any bulk **tank** within a spill compound over a minimum of 90 minutes.	**N/A** There are no identified flammable liquids in tanks currently stored or are planned to be stored in tanks.
PO9 Storage and handling areas for **prescribed hazardous chemicals** that, if in contact with each other, may react to produce a fire, explosion or other harmful reaction, or a flammable, toxic or corrosive vapour are designed to prevent contact between the **prescribed hazardous chemicals**.	Complies. Storage and handling areas for prescribed hazardous chemicals are designed to prevent contact between the prescribed hazardous material. The following key chemical hazardous interactions are identified for the proposal facility: • Mixing of hydrogen and air in the presence of an ignition source could potentially lead to a fire and explosion • Mixing of hydrogen and oxygen in the presence of an ignition source could potentially lead to a fire and explosion. . The system is designed to continuously monitor for hydrogen leaks. The electrolysers are contained in a mechanically ventilated container to ensure any potential small hydrogen gas leaks are vented to atmosphere rather than accumulating inside the container which could cause an explosive atmosphere. Should the hydrogen accumulate, the system will detect and will purge the electrolysers with nitrogen and flare the hydrogen to remove the potential of an explosive atmosphere. Potential mixing of hydrogen and oxygen could occur in the event of electrolyser membrane failure and cross over of hydrogen into oxygen side. This scenario is assessed in detailed risk assessments and preventative safeguards incorporated into design. Continuous nitrogen purge is provided to flare system and relevant storage tanks to prevent air ingress. The following guiding principles are applied in the design for hydrogen safety: • Eliminate hazards • Ensure system integrity • Provide proper ventilation to prevent accumulation • Detect and isolate leaks • Separation distances (minimise congestion & confinement) • Train personnel Enclosed Ground Flare: In regards to how often the facility will flare and for how long, the following information is provided:

	• Continuous = During normal operation the pilot will be lit • Emergency plant shutdown = 2-3 times per year, ~5 mins • H2 storage emergency shutdown = 1 per 10 years, max 15 mins. The estimated volume of exhaust gas from the flare: • Start-up = 50 kg/hr, lasting 5-10 mins • Continuous = max 1.9 kg/hr • Emergency plant shutdown = 5300 kg/hr of H2, lasting ~5 mins • H2 storage emergency shutdown = 5000 kg total over 15-minute duration. Composition of the flare exhaust gas is water vapour only in all cases. Combustion temperature: • H2 flame temperature ~1800-2000° C. Final temperature pending vendor selection. Thermal radiation effects fully contained within enclosure.
PO10 Development is designed and Sited to mitigate impacts on **storage and handling areas** from **natural hazard** including, but not limited to: a. flood; b. bushfire; c. erosion; d. storm tide inundation; e. landslide; f. earthquake; g. **wind action**.	Complies. The development is proposed to be designed and Sited to mitigate impacts on storage and handling areas from natural hazards. As identified in sections 2.1 and 2.2 above, the subject Site is located outside of all natural hazard areas.
All development	
PO11 Development is designed and Sited to mitigate the risks from **hazard scenarios** occurring at existing **hazardous chemical facilities**.	N/A No existing hazardous chemical facilities in the vicinity of the site.

State code 22: Environmentally relevant activities

Performance outcomes	Acceptable outcomes	Response
All ERAs		
PO1 Development is suitably located and designed to avoid or mitigate **environmental harm** to the acoustic **environment**.	**AO1.1** Development meets the acoustic quality objectives for sensitive receptors identified in the Environmental Protection (Noise) Policy 2019.	Complies. The proposed location within the State Development Area has been specifically set up by the QLD Government as the preferred location to limit environmental harm. The proposed test train will not pose an any additional noise to the acoustic environment as the test train is unlikely to operate above 50 db from the subject Site
PO2 Development is suitably located and designed to avoid or mitigate **environmental harm** to the air **environment**.	**AO2.1** Development meets the air quality objectives of the Environmental Protection (Air) Policy 2019.	Complies. The proposed test train's location away from sensitive uses will limit any environmental harm as the test plant would only release oxygen or hydrogen into the atmosphere.
PO3 Development (other than intensive animal industry for poultry farming), is suitably located and designed to avoid or mitigate environmental harm on adjacent sensitive land uses caused by odour.	No acceptable outcome is prescribed.	Complies. The proposed development is located within the High Impact Industry Precinct which intends for uses that are difficult to locate to establish. The proposed location within the Site avoids environmental areas and values of significance. The closest sensitive use (dwelling house) is over 2.5km to the east. The outputs of the test train will also not create an odour that will impact sensitive uses.

PO4 Development is suitably located and designed to avoid or mitigate **environmental harm** to the receiving waters **environment**.	**AO4.1** Development meets the management intent, water quality guidelines and objectives of the Environmental Protection (Water and Wetland Biodiversity) Policy 2019.	Complies. The development is proposed to connect to the existing stormwater network constructed to service the Aldoga Aluminium Smelter. The brine produced will be stored on Site until taken to a licenced facility for disposal.
PO5 Development is designed to include elements which: 1. prevent or minimise the production of **hazardous contaminants** and **waste** as by-products; or 2. contain and treat **hazardous contaminants** on-Site rather than releasing them into the **environment**; and 3. provide secondary containment to prevent the accidental release of **hazardous contaminants** to the **environment** from spillage or leaks.	No acceptable outcome is prescribed.	Complies. The proposed development will only produce waste products when treating portable water. The brine produced will be stored on Site until taken to a licenced facility for disposal.
PO6 Environmentally hazardous materials located on-Site are stored to avoid or minimise their release into the **environment** due to inundation during flood events.	**PO6 Environmentally hazardous materials** located on-Site are stored to avoid or minimise their release into the **environment** due to inundation during flood events.	Complies. The subject Site is not located in a flood area.
All development – matters of state environmental significance		
PO7 Development is designed and Sited to: 1. avoid impacts on **matters of state environmental significance**; or 2. minimise and mitigate impacts on **matters of state environmental significance** after demonstrating avoidance is not reasonably possible; and 3. provide an **offset** if, after demonstrating all reasonable avoidance, minimisation and mitigation measures are undertaken, the development results in an acceptable **significant residual impact** on a **matter of state environmental significance**. Statutory note: For Brisbane core port land, an offset may only be applied to development on land identified as E1 Conservation/Buffer, E2 Open Space or Buffer/Investigation in the Brisbane Port LUP precinct plan.	**PO6 Environmentally hazardous materials** located on-Site are stored to avoid or minimise their release into the **environment** due to inundation during flood events.	Complies. No MSES or MNES is located in proximity to the Test Train.
PO8 Poultry farming development (where farming more than 200,000 birds) is suitably located and designed to avoid or mitigate **environmental harm** on adjacent **sensitive land uses**, caused by odour.	**AO8.1** For poultry farming involving 300,000 birds or less, development meets the separation distances as determined using the S-factor methodology to: 1. a **sensitive land use** in a rural zone; and 2. boundary of a non-rural zone. OR	**N/A**

	AO8.2 Development meets the separation distances as determined by odour modelling using the following criteria: 1. 2.5 **odour units**, 99.5 percent, 1 hour average for a **sensitive land use** in a rural zone; or 2. 1.0 **odour units**, 99.5 percent, 1 hour average for the boundary of a non-rural zone.	

Appendix H Assessment against the Environmental Protection Regulation 2019

Environmental Protection Regulation 2019: Schedule 8, Part 3, Division 1 Operational Assessment

Air		
Environmental Objective	**Performance outcomes**	**Response**
The activity will be operated in a way that protects the environmental values of air.	1. There is no discharge to air of contaminants that may cause an adverse effect on the environment from the operation of the activity. 2. All of the following— a. fugitive emissions of contaminants from storage, handling and processing of materials and transporting materials within the Site are prevented or minimised; b. contingency measures will prevent or minimise adverse effects on the environment from unplanned emissions and shut down and start up emissions of contaminants to air; c. releases of contaminants to the atmosphere for dispersion will be managed to prevent or minimise adverse effects on environmental values.	Complies. The proposed test train's location away from sensitive uses will limit any environmental harm as the test plant would only release oxygen or hydrogen into the atmosphere. In the event of a failure the system has been designed to flare excess hydrogen into the atmosphere.
Water		
The activity will be operated in a way that protects environmental values of waters.	1. There is no actual or potential discharge to waters of contaminants that may cause an adverse effect on an environmental value from the operation of the activity. 2. All of the following— a. the storage and handling of contaminants will include effective means of secondary containment to prevent or minimise releases to the environment from spillage or leaks; b. contingency measures will prevent or minimise adverse effects on the environment due to unplanned releases or discharges of contaminants to water; c. the activity will be managed so that stormwater contaminated by the activity that may cause an adverse effect on an environmental value will not leave the Site without prior treatment;	Complies. Stormwater Stormwater will be treated in accordance with relevant standards before being released back into the environment. Please refer to PRIMERO Stormwater Management Plan for greater detail. Wastewater The proposed development will store all contaminated water which will include process-impacted water from FFI Aldoga so that it can be transported to a licensed facility for disposal. Storage of contaminants All other contaminants will operate as a no release. The brine produced will be stored on Site until taken to a licenced facility for disposal.

	d. the disturbance of any acid sulfate soil, or potential acid sulfate soil, will be managed to prevent or minimise adverse effects on environmental values; e. acid producing rock will be managed to ensure that the production and release of acidic waste is prevented or minimised, including impacts during operation and after the environmental authority has been surrendered; f. any discharge to water or a watercourse or wetland will be managed so that there will be no adverse effects due to the altering of existing flow regimes for water or a watercourse or wetland; g. for a petroleum activity, the activity will be managed in a way that is consistent with the coal seam gas water management policy, including the prioritisation hierarchy for managing and using coal seam gas water and the prioritisation hierarchy for managing saline waste; h. the activity will be managed so that adverse effects on environmental values are prevented or minimised.	
Wetlands		
The activity will be operated in a way that protects the environmental values of wetlands.	1. There will be no potential or actual adverse effect on a wetland as part of carrying out the activity. 2. The activity will be managed in a way that prevents or minimises adverse effects on wetlands.	Complies. The development will not adversely affect the wetland on the subject Site. It is proposed that the development will connect to the existing stormwater network construct to service the Aldoga Aluminium Smelter, please refer to PRIMERO Stormwater Management Plan for greater detail.
Groundwater		
The activity will be operated in a way that protects the environmental values of groundwater and any associated surface ecological systems.	1. Both of the following apply— a. there will be no direct or indirect release of contaminants to groundwater from the operation of the activity; b. there will be no actual or potential adverse effect on groundwater from the operation of the activity.	Complies. The development will not directly or indirectly release or contaminants to groundwater.

	2. The activity will be managed to prevent or minimise adverse effects on groundwater or any associated surface ecological systems. Note— Some activities involving direct releases to groundwater are prohibited under section 41 of this regulation.	
Acoustic		
The activity will be operated in a way that protects the environmental values of the acoustic environment.	1. Sound from the activity is not audible at a sensitive receptor. 2. The release of sound to the environment from the activity is managed so that adverse effects on environmental values, including health and wellbeing and sensitive ecosystems, are prevented or minimised.	Complies. The proposed development will be located in the High Impact Industry Precinct which intends for uses that are difficult to locate to establish and have higher impacts. The proposed location within the Site avoids environmental areas and values of significance.
Waste		
Any waste generated, transported, or received as part of carrying out the activity is managed in a way that protects all environmental values.	1. Both of the following apply— a. waste generated, transported or received is managed in accordance with the waste and resource management hierarchy under the Waste Reduction and Recycling Act 2011; b. if waste is disposed of, it is disposed of in a way that prevents or minimises adverse effects on environmental values.	Complies. The proposed development will only produce waste products when treating portable water. The brine produced will be stored on Site until taken from FFI Aldoga to a licensed facility for disposal.
Land		
The activity is operated in a way that protects the environmental values of land, including soils, subsoils, landforms and associated flora and fauna.	1. There is no actual or potential disturbance or adverse effect to the environmental values of land as part of carrying out the activity. 2. All of the following apply— (a) activities that disturb land, soils, subsoils, landforms and associated flora and fauna will be managed in a way that prevents or minimises adverse effects on the environmental values of land; (b) areas disturbed will be rehabilitated or restored to achieve Sites— (i) that are safe and stable; and	Complies. The development design and location ensures impacts on environmental values of land are minimised and mitigated.

	(ii) where no environmental harm is being caused by anything on or in the land; and (iii) that are able to sustain an appropriate land use after rehabilitation or restoration; c) the activity will be managed to prevent or minimise adverse effects on the environmental values of land due to unplanned releases or discharges, including spills and leaks of contaminants; d) the application of water or waste to the land is sustainable and is managed to prevent or minimise adverse effects on the composition or structure of soils and subsoils.	

Appendix I Contaminated Land Register Environmental Management Register searches

Queensland Government

Department of Environment and Science (DES)
ABN 46 640 294 485
400 George St Brisbane, Queensland 4000
GPO Box 2454 Brisbane QLD 4001 AUSTRALIA
www.des.qld.gov.au

SEARCH RESPONSE
ENVIRONMENTAL MANAGEMENT REGISTER (EMR)
CONTAMINATED LAND REGISTER (CLR)

Transaction ID: 50699197 EMR Site Id: 02 July 2021
This response relates to a search request received for the site:
Lot: 4 Plan: SP245936

EMR RESULT

The above site is NOT included on the Environmental Management Register.

CLR RESULT

The above site is NOT included on the Contaminated Land Register.

ADDITIONAL ADVICE

All search responses include particulars of land listed in the EMR/CLR when the search was generated.
The EMR/CLR does NOT include:-

1. land which is contaminated land (or a complete list of contamination) if DES has not been notified
2. land on which a notifiable activity is being or has been undertaken (or a complete list of activities) if DES has not been notified

If you have any queries in relation to this search please phone 13QGOV (13 74 68)

Administering Authority

Appendix J Traffic Desk Top Assessment

Member of the Surbana Jurong Group

SMEC INTERNAL REF. 30033831

Traffic Impact Assessment

Material Change of Use for High Impact Industry on land included in the Gladstone State Development Area

Client Reference No. -
Prepared for: FFI
31 August 2022

Through our specialist expertise, we deliver advanced infrastructure solutions for our clients and partners.

Leveraging our 70-year history of delivering nation-building infrastructure, we provide technical expertise and advanced engineering services to resolve complex challenges.

Through our network of global specialists collaborating with local partners, we connect you with the best teams and capabilities to deliver innovative and sustainable solutions.

We're redefining exceptional

Document Control

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Revision Number	01

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01	18 January 2023	Y. Wang	H. Strachan	I. Harslett

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The information within this document is and shall remain the property of: FFI

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Contents

Appendices

Figures

Tables

1. Introduction

1.1 Background

SMEC has been commissioned by FFI to prepare a Traffic Impact Assessment (TIA) report in support of a Development Application for a Material Change of Use to establish Special Industry (50MW Hydrogen Test Train) use on Lot 4 on SP245936 (the Site), which is located within the Gladstone State Development Area.

This report forms part of the Development Application, which is being prepared for submission to the Gladstone Regional Council (IRC or Council) and the Queensland Department of Transport and Main Roads (TMR).

1.2 Scope

The agreed scope of works included in this assessment are as follows:

- Analysis of the TMR annual traffic census counts on Gladstone-Mount Larcom Road (Site ID: 60076)
- Identify existing traffic design life of Gladstone Mount Larcom Road/Aldoga Road intersection.
- Traffic generation and distribution for assumed year of opening in 2025 and 10-year design horizon year in 2035 and the impact thereof on the Gladstone Mount Larcom Road/Aldoga Road intersection.
- Peak period intersection of the Gladstone Mount Larcom Road/Aldoga Road intersection traffic analysis using SIDRA Intersection 9.0.
- Undertake turn warrant assessment at Gladstone Mount Larcom Road/Aldoga Road intersection.
- Swept path analysis for of the Gladstone Mount Larcom Road/Aldoga Road intersection and Aldoga Road/Euroa Circuit intersections to confirm they have been designed to cater for B-doubles.

1.3 Exclusions

The following items are excluded from this TIA:

- Pavement Impact Assessment.
- Future upgrade of Aldoga Precinct.

1.4 Engineering References

- Department of Transport and Main Roads 2018, Guide to Traffic Impact Assessment (GTIA)
- Department of Transport and Main Roads 2017, Guide to Traffic Impact Assessment Case Studies
- Roads and Traffic Authority 2002, Guide to Traffic Generating Developments
- Queensland Government 2006–2021, Traffic Census Open Data

1.5 Study Area

The property address is Euroa Circuit, Aldoga, Queensland. It is located approximately 20km west of the centre of Gladstone (refer Figure 1).

Figure 1: Aldoga, proposed site location (Source: Queensland Globe)

The application boundary showed in **Figure 2.** covers approximately 29.63 hectares of the overall site and relates to the land in the southernmost corner and the land behind the previously approved electrolyser facility. The site does not front onto any road and will extend off the roads constructed in the previously approved Electrolyser facility to connect with Euroa Circuit.

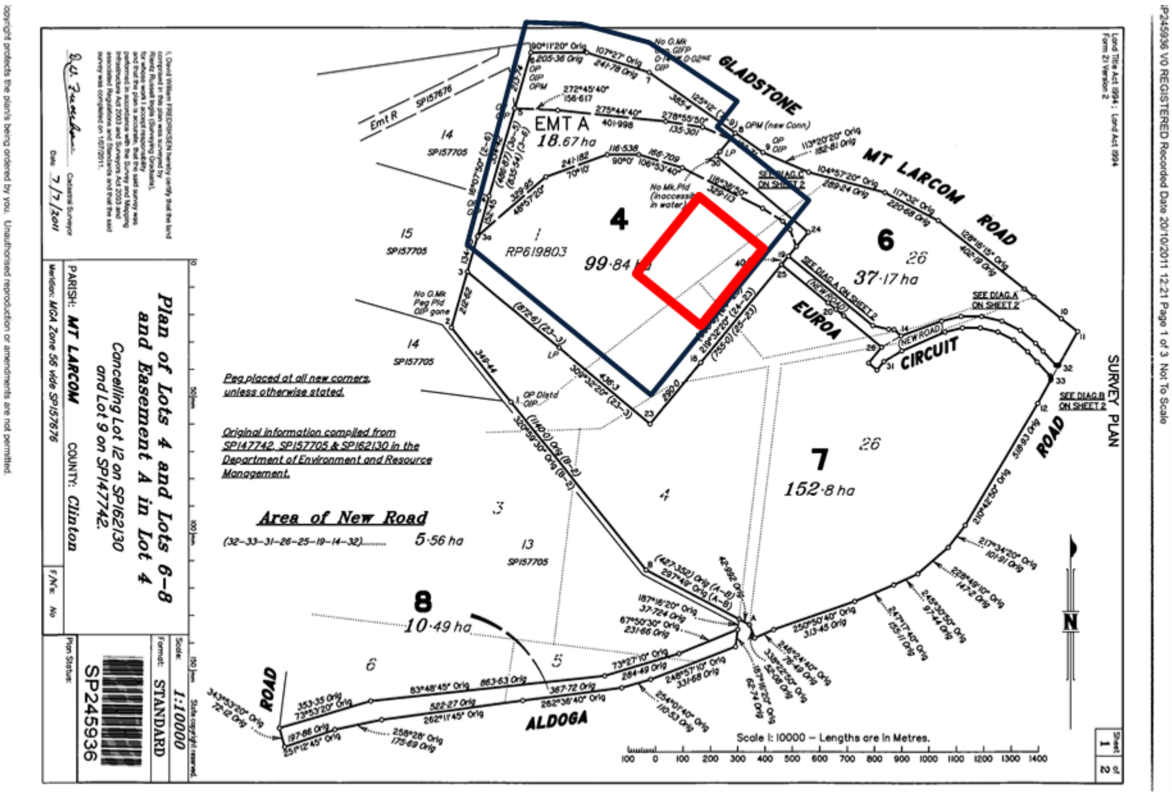


Figure 2: Title plan of proposed site

1.6 Gladstone State Development Area

The site is within the Gladstone State Development Area (GSDA). In December 1993, approximately 6,800 hectares of land at Aldoga, north-west of Gladstone, was declared a state development area. The declaration followed an extensive review of land in the Gladstone region suitable for future large-scale industrial development. This land was considered broadly suitable for large-scale industrial development on the basis that it conformed to acceptable engineering, environment and social criteria, as identified in the Gladstone Industrial Land Use Study.

Over time, the GSDA has been amended and now comprises approximately 29,000 hectares. In December 2010, amendments were made to support industrial development and to protect the environmental values of the GSDA.

1.7 Proposed Development Details

The proposal is for development of an approximate 29.63-hectare site on Lot 4 of Plan Number SP245936 (refer Figure 9). The proposed 4.49-hectare development footprint will be located behind a 200-metre setback from Euroa Circuit, which contains the previously approved GEM Facility. The proposal is for a 40MW Hydrogen Test Train and ancillary warehouse and is referred to as “Special Industry (40MW Hydrogen Test Train)”. The development is a co-located hydrogen production facility which proposes to use up to 306 GWh annually, using supplied electrolyser stacks from the GEM facility and renewable generation in Queensland. The 40MW Test Train is to allow testing and refinement of electrolyser stacks and the associated systems.

1.7.1 Site Layout

The physical elements of the proposed green Hydrogen production facility include:

- Electrolyser Units
- Balance of System
- Balance of Plant
- Storage and Loadout
- Non-Process Infrastructure

<u>Electrolyser Units</u>

A total of four electrolyser units will be constructed on the site. Each unit will contain 10 identical 1MW electrolyser unit. 10 electrolyser units will be mounted in skid like frame which are modular in nature and include pre-installed componentry to monitor the electrolysers inputs and outputs along with monitoring safety parameters. Each skid will allow for air to be forced in and out of the skid to ensure that no hydrogen can accumulate should there be a leak. Each skid will also be connected to a Nitrogen supply to ensure the system can be purged should a leak be detected.

<u>Balance of System</u>

To support the electrolysers a ‘Balance of System’ will separate the hydrogen and oxygen from the water. The system consists of the following elements:

- Hydrogen Separators
- Oxygen Separator
- Water Circulation Pumps
- Water Filters
- Heat Exchangers
- Instrumentation
- Electrical Switchroom
- Transformer Rectifiers

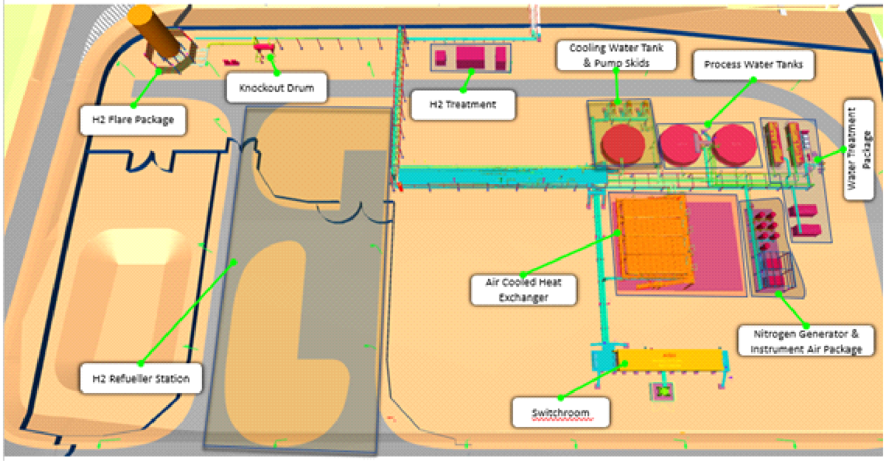


Figure 3: Balance of System Overview (Preliminary Only)

Balance of Plant

To support the overall running of the facility the 'Balance of Plant' contains the following elements:

- Potable Water Tanks
- Water Treatment
- Treated Water Tank
- Feed Water Tanks
- Air Cooled Heat Exchangers
- Cooling Water Tank
- Instrument Air Package
- Nitrogen Package
- Low Pressure Flare
- High Pressure Flare
- Electrical Switch room

Storage and Loadout

To allow the export of hydrogen the following elements are required:

- Hydrogen Treatment Unit
- Compressors
- Storage Units
- Truck Loading Units

Non-Process Infrastructure

The following non-process infrastructure will located on site:

- Firefighting system
- Security and gatehouse
- Administration building
- Control room
- Crib hut
- Warehouse
- Ablutions

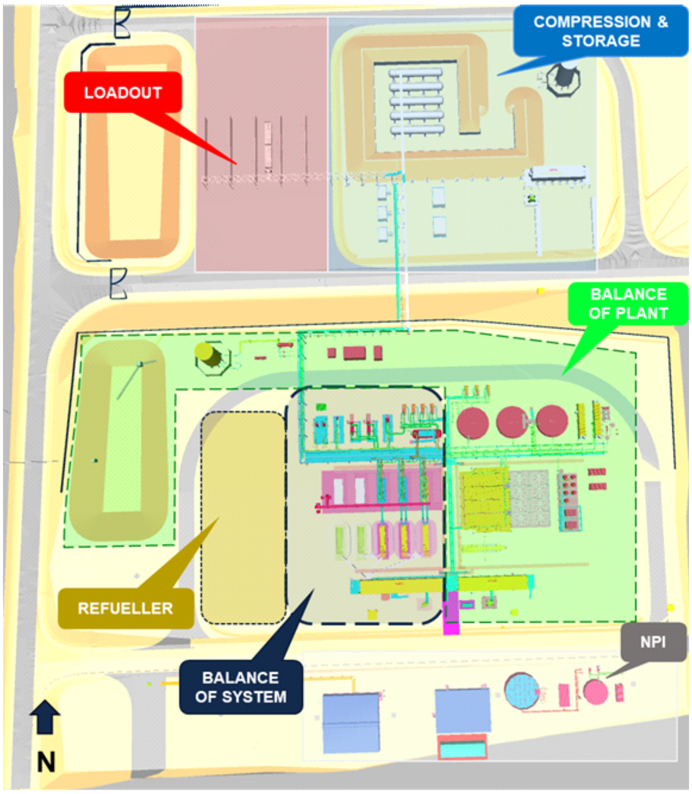


Figure 4 – Proposed Site Layout (Preliminary only)

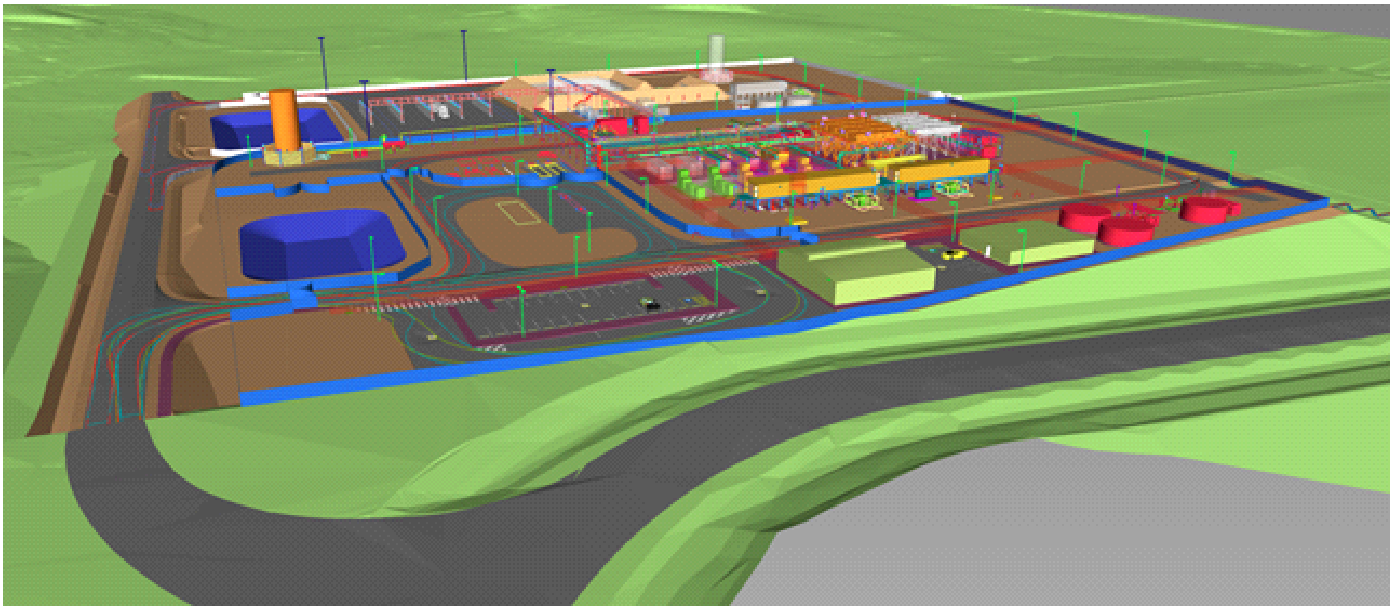


Figure 5 – 3D image of proposed Site Layout (Preliminary Only)

2. Existing Conditions

2.1 Surrounding Road Network – Key Links

Road hierarchy refers to the different road classifications where boundaries of the responsibility are for maintenance and operation of roads and intersections. Any potential changes to the network required due to developments need to be done in conjunction with the relevant road's stakeholders such as Council or TMR.

Some rural residential properties are within the vicinity of the site with the City of Gladstone located approximately 18km east of the site. The townships of Yarwun and Mount Larcom are approximately 4.5km and 11km northwest of the site respectively. Nearby State-controlled roads include the Bruce Highway and Gladstone Mount Larcom Road. However, only three key roads form part of the surrounding road network:

- The existing **Euroa Circuit** is a narrow, local gravel road and forms a loop that intersects with itself on the eastern side – refer Figure 6. The loop is accessed via the paved intersection with Aldoga Road. It is assumed that Euroa Circuit has a maximum speed limit of 60 km/h.
- **Aldoga Road** is a Council-controlled two-lane, two-way road that is oriented roughly north-south. The road is signposted at 60km/h connects Gladstone Mt Larcom Road with Euroa Circuit and currently provides access to the Rio-Tinto Yarwun RMA Site (approximately 2km from the Gladstone Mt Larcom Road/Aldoga Road intersection. This intersection has an unusual configuration, see Figure 7. Left turns from Aldoga Road are afforded a merge lane on Gladstone Mt Larcom Road, allowing a left turn at any time. Right turns are limited by a give-way.
- **Gladstone Mt Larcom Road** a State-controlled two-lane two-way road that is signposted at 100km/k. It has a roughly east-west orientation and connects Gladstone (east) to Mount Larcom and the Bruce Highway (west). Westbound, there is a "low angle" left turn which then becomes Aldoga Road while for the eastbound direction, there is a basic right turn treatment to allow through vehicles to pass turning vehicles safely, see Figure 7.

Figure 6: Aerial view of existing key links (Source: Metromap)

Figure 7: Gladstone Mt Larcom Road/Aldoga Road intersection (Source: Google Streetview, 2018)

2.2 Public and Active Transport

Public and active transport will not be considered in this assessment for this development due to the remoteness of the area. The 2021 traffic count also shows zero recorded pedestrians and cyclists.

2.3 Traffic Volumes

2.3.1 Traffic Data – Austraffic Surveys

The following traffic surveys conducted by Austraffic were undertaken for the Stage 1 TIA and will be sufficient for the Stage 2 TIA:

- Two-way Automatic Traffic Count Surveys for 7 days (Monday 9th May till Monday 16th May 2011) to the east and west of Aldoga Road's intersection with Gladstone Mount Larcom Road.
- Two-way Automatic Traffic Count Surveys for 24h (Thursday 14th October 2021) to the east and west of Aldoga Road's intersection with Gladstone Mount Larcom Road.

The morning and evening peak hours at the Gladstone Mount Larcom Road / Aldoga Road intersection were identified as 08:15-09:15 and 15:15-16:15 in 2021 respectively. The 2011 and 2021 traffic count at both AM and PM peaks are presented in Appendix A and Appendix B respectively, these two traffic counts were then compared to achieve a reasonable traffic growth rate at the study intersection.

TMR conducts an annual survey of State-controlled roads which includes the annual average daily traffic (AADT) and the percentage of heavy vehicles. The nearest TMR site to the Gladstone Mt Larcom Road/Aldoga Road intersection is located on Gladstone Mt Larcom Road approximately 2km east of the intersection. While these counts have been deemed adequate to corroborate the traffic surveys, they have not been used for this TIA.

Table 1 indicates the TMR site ID, count year, road name and the relevant volume metrics based on gazettal (G) and anti-gazettal (AG) directions, as well as the total for Gladstone Mt Larcom Road. Notably, this site references identical counts 2018 and 2019, and identical counts for 2020 and 2021. This indicates that counts were not conducted in 2019 and 2021. As a result, additional years have been shown to include five separate years of data counts.

Like the Austraffic surveys, the TMR data in Table 1 shows that there is an overall decrease in in traffic volume from 2015 to 2020/21. While the proportion of heavy vehicles in the gazettal direction remains relatively steady throughout, the anti-gazettal direction shows an increase in the proportion of heavy vehicles of approximately 5.01% from 2015 to 2020/21.

Table 1: Historical background traffic volumes (Source: Qld Government – Traffic Data Explorer)

Site ID	Year	Road Name	AADT			% Heavy Vehicles		
			G	AG	Total	G	AG	Total
60076	2021	GLADSTONE - MT LARCOM ROAD	1556	1499	3055	22.30	30.34	26.25
60076	2020	GLADSTONE - MT LARCOM ROAD	1556	1499	3055	22.30	30.34	26.25
60076	2019	GLADSTONE - MT LARCOM ROAD	1480	1482	2962	21.87	30.29	26.08
60076	2018	GLADSTONE - MT LARCOM ROAD	1480	1482	2962	21.87	30.29	26.08
60076	2017	GLADSTONE - MT LARCOM ROAD	1179	1204	2383	30.82	30.29	30.54
60076	2016	GLADSTONE - MT LARCOM ROAD	1358	1371	2729	22.40	25.18	23.80
60076	2015	GLADSTONE - MT LARCOM ROAD	1832	1805	3637	22.85	24.26	23.55

2.3.2 Background Traffic Volumes

As the development of Stage 2 will commence after Stage 1, **for the purposes of background traffic volumes, it is assumed that Stage 1 has been completed and will contribute to the background traffic**. As a result, Stage 2 background traffic will include the Stage 1 traffic volumes which have been sourced from the TIA completed for Stage 1.

The following Table 2 summarises traffic survey data collected in 2011 and 2021 in the locations outlined in Section 2.3.1. The results show a decrease in the traffic volumes from 2011 to 2021, consistent with nearby TMR annual survey sites on Gladstone Mt Larcom Road. However, to ensure consistency with the Stage 1 development assessment and to ensure a more conservative assessment, a growth rate of 1.87% has been adopted.

Table 2: Traffic Volume Summary

Approach	Movement	2011 AM Peak	2021 AM Peak	Linear Growth Rate (%)	Compound Growth Rate (%)	2011 PM Peak	2021 PM Peak	Linear Growth Rate (%)	Compound Growth Rate (%)
Gladstone Mount Larcom Road (SE)	L2	13	8	-3.85	-4.74	86	11	-0.73	-1.70
	T1	142	120	-1.55	-1.67	156	138	-0.10	-0.10
	Approach	155	128	-1.74	-1.90	242	149	-0.32	-0.40
Gladstone Mount Larcom Road (NW)	T1	153	135	-1.18	-1.24	131	123	-0.05	-0.05
	R2	1	1	0.00	0.00	2	1	-0.42	-0.58
	Approach	154	136	-1.17	-1.24	133	124	-0.06	-0.06
Aldoga Road	L2	1	1	0.00	0.00	1	3	1.67	0.92
	R2	7	9	2.86	2.54	167	11	-0.78	-2.24
	Approach	8	9	1.25	1.18	168	14	-0.76	-2.05
All Vehicles		317	273	-1.39	-1.48	543	287	-0.39	-0.53

3. Traffic Assessment

3.1 SIDRA Parameters and Performance Criteria

SIDRA 9 has been used to analyse the operational performance of the intersections. The base year is 2021, opening year 2025 and 10-year design horizon (2035) are analysed in this report.

3.1.1 SIDRA Parameters

The key parameters that were used in the SIDRA intersection analysis are illustrated in Table 3.

Table 3: SIDRA Parameters

Parameter	Value	Parameter	Value
Unit Time for Volumes	60 mins (Default Value)	Peak Flow Period (within the peak hour)	30 mins (Default Value)
Basic Saturation Flow	1950 through car units per hour (tcu/h) (Default Value)	Peak Flow Factor (within the peak hour)	95% (Default Value)
Gap Acceptance	SIDRA default values	Lane Utilisation Ratio	SIDRA default values

3.1.2 SIDRA Performance Criteria

In order to determine whether performance is acceptable at an intersection or not, the following criteria has been used:

- The level of service (LoS), based on average delay, must be D or better at an intersection approach level, and E or better at a movement level for minor movements and D or better at a movement level for major movements
- All queues must be accommodated within the intersection geometry
- The degree of saturation (DOS) must be less than or equal to 0.80 for unsignalised intersection

3.2 Traffic Generation

3.2.1 Operation Stage Traffic for Stage 2

The following operational stage traffic has been indicated by FFI at the site:

- Light vehicle parking - 31 car bays, 26 bays for staff vehicles.
- Estimated 20 personnel on site at peak periods during day shifts.
  - It is therefore assumed:
    - Peak hour will coincide with shift change over
    - 20 vehicles will arrive at shift change over and 20 depart at change over (40 peak hour trips)
- An average of 16 trucks per day to distribute the hydrogen (24/7 load out).
  - Takes 6 hours to load up a truck.
  - One truck will be responsible for multiple trailers.
  - This equates to an average of 4 trucks loaded every 6 hours. Assume a maximum of 4 HV enter site then 4 exit the site during peak hour (8 peak hour trips).
- The above equates to:
  - Total peak hour trips adopted = 48 trips (40 light vehicles, 4 HV's)

3.3 Traffic Split

For the additional traffic splits generated by the proposed development, the following assumptions have been made regarding for the Gladstone Mount Larcom Road / Aldoga Rd intersection:

- For traffic leaving the site at the end of a shift:
  - 10% turning west onto Gladstone Mount Larcom Road (adopt 2 trips)
  - 90% turning east onto Gladstone Mount Larcom Road (adopt 22 trips)
- For traffic approaching the site at the start of a shift:
  - 90% approaching from the east along Gladstone Mount Larcom Road (adopt 22 trips)
  - 10% approaching from the west along Gladstone Mount Larcom Road (adopt 2 trips)

3.4 Traffic Volumes

Based on TMR's Guide to Traffic Impact Assessment Table 6.5, Gladstone Mount Larcom Road / Aldoga Rd intersection should be assessed for the year of opening, and 10 years after the year of opening. The year of opening for this development is expected in 2025, making the 10-year post opening assessment for the year 2035. The summary of traffic volumes applied in SIDRA are presented in this section.

3.4.1 Stage 1 and Stage 2 Timeline Context

The expected timeframes for each stage are as follows:

- Stage 1 is expected to be operational by 2023 – a separate TIA was completed for this stage in 2021.
- Stage 2 is expected to be operational by 2025.

It is therefore assumed that Stage 1 traffic will contribute to the Base Case traffic for Stage 2.

3.4.2 Existing Stage 1 Traffic

The traffic assignment of Stage 1 traffic on the road network, based on the traffic generation, in/out distribution and assignment across the road network that was used in the Stage 1 TIA, is summarised in Figure 8.

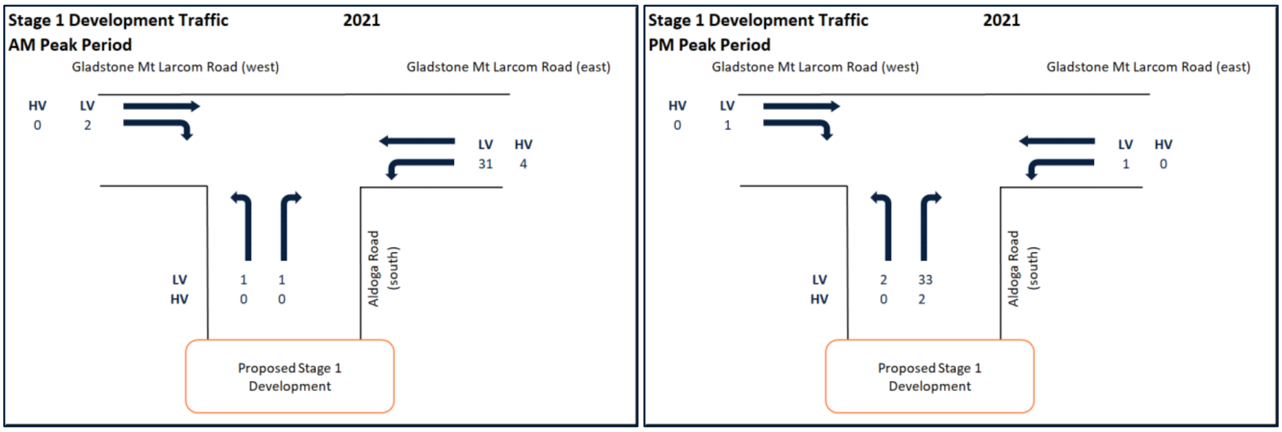


Figure 8: Proposed Stage 1 development traffic in peak periods

These Stage 1 traffic volumes will be added to the existing 2021 traffic to determine the background traffic. Based on the Stage 1 TIA, a conservative 1.87% compounding growth rate will be applied to determine the traffic for the 2025 opening year and 2035 design horizon year to undertake the traffic impact assessment analysis.

3.4.3 2021 Base Traffic without Stage 1 or 2 Development

Figure 9 shows the Base case background traffic in 2021. This figure shows the background traffic and excludes any traffic associated with Stage 1 or Stage 2 development.

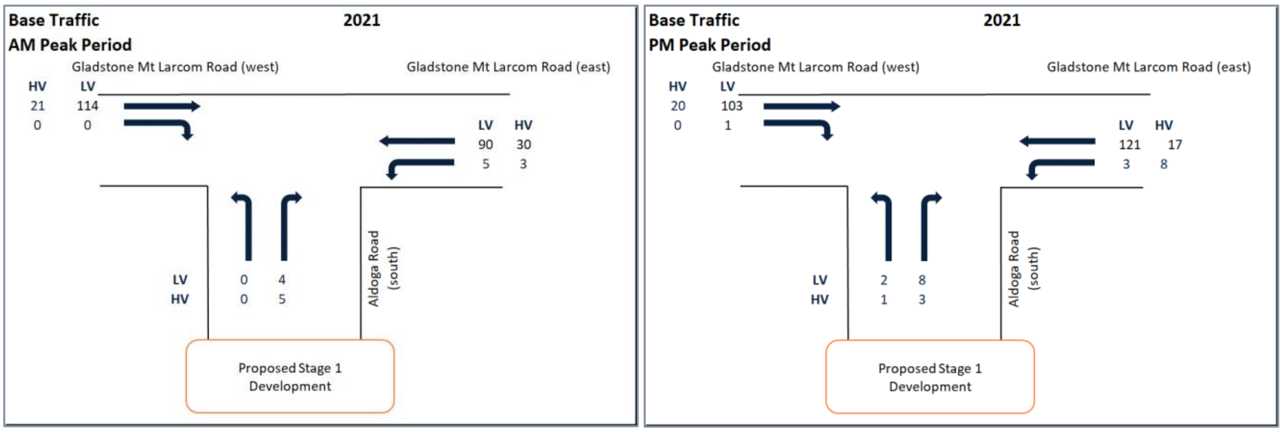


Figure 9: 2023 Base Scenario (without Stage 2 Development) Traffic Volume

3.4.4 2025 Base Case including Stage 1 Development (Without Stage 2)

Figure 10 shows the 2025 design scenario traffic volumes which include the expected traffic for Stage 1 development. These traffic volumes are assumed to form the 2025 opening year Base case without any Stage 2 development, but where Stage 1 is operational and associated traffic is included (see Section 3.4.1).

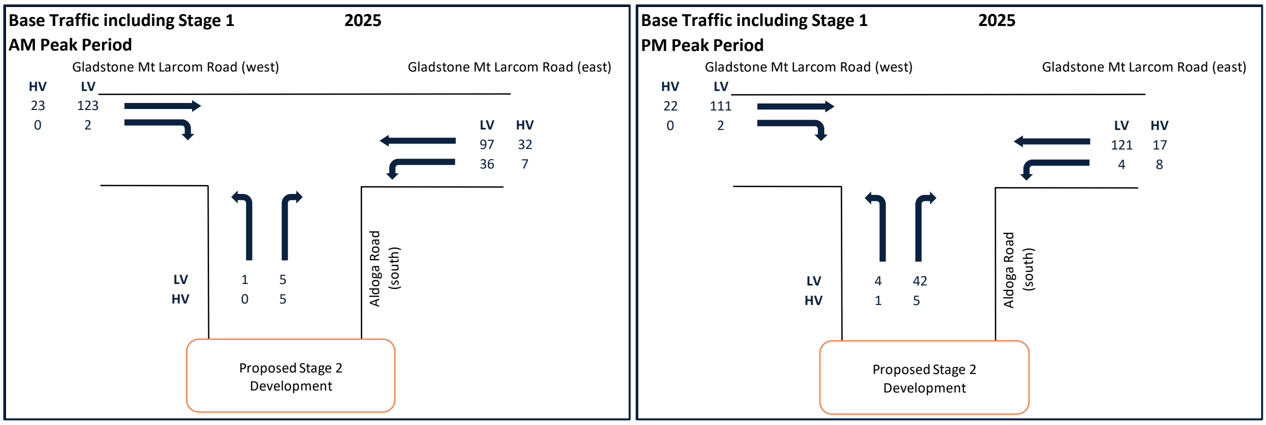


Figure 10: 2025 Base Scenario traffic volume (including Stage 1 Development)

3.4.5 Stage 2 Development Traffic Generation

The traffic assignment of Stage 2 traffic on the road network, based on the traffic generation, in/out distribution and assignment across the road network presented in the former sections, is summarised in Figure 11.

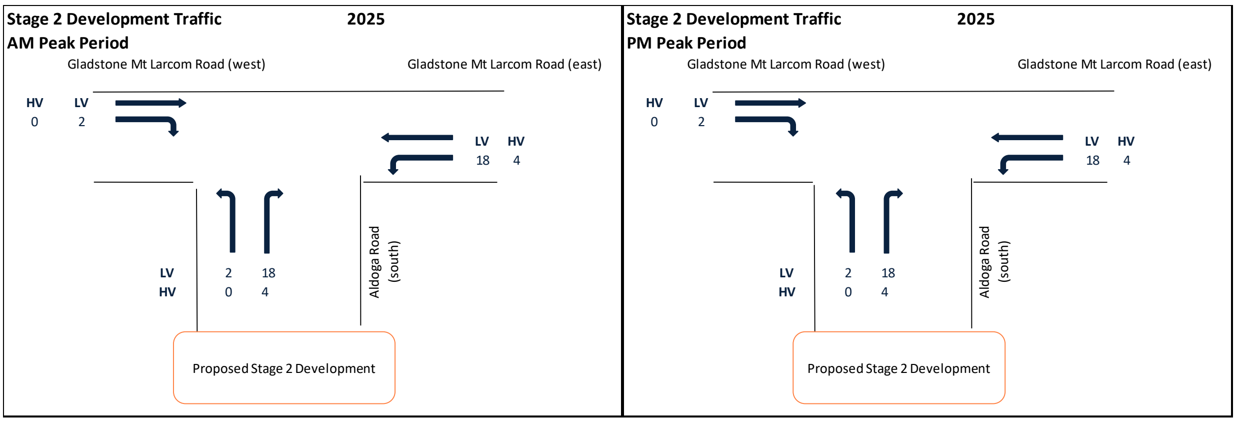


Figure 11: Proposed Stage 2 development traffic in peak periods

3.4.6 2025 Base Case including Stage 2 Development

Figure 12 shows the shows the 2025 design scenario traffic volumes which include the expected traffic for Stage 2 development.

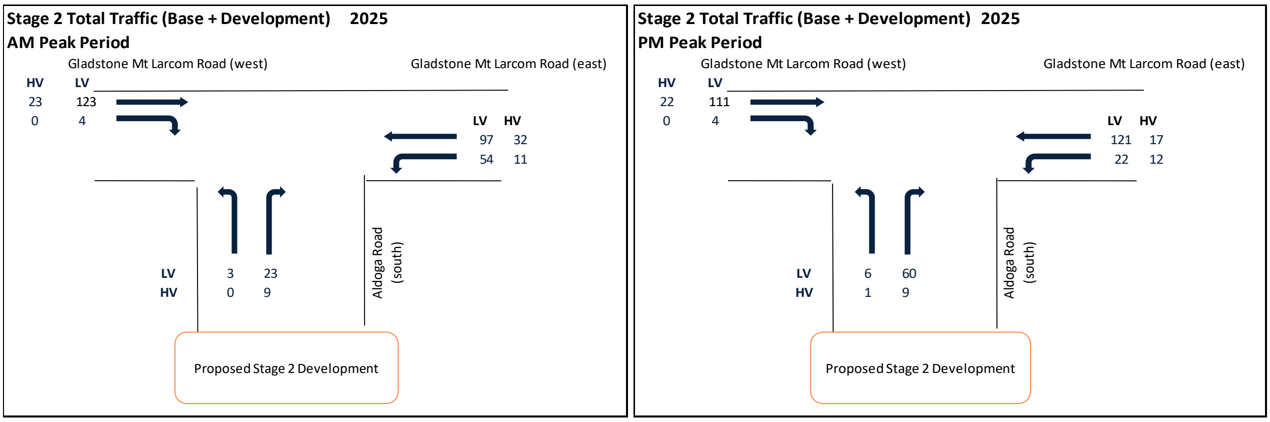


Figure 12: 2025 Base scenario with Stage 2 development traffic volumes

3.5 Intersection Performance

Due to the unusual configuration of the Gladstone Mount Larcom Road / Aldoga Rd intersection, a SIDRA Network was created to best represent and model the operation of the intersection. The SIDRA Network consists of two intersections that are combined to form the network presented in Figure 13. For the purposes of this report, these intersections are referred to and reported separately as Gladstone Mt Larcom Rd - Aldoga Road (North) and Gladstone Mt Larcom Rd - Aldoga Road (South).

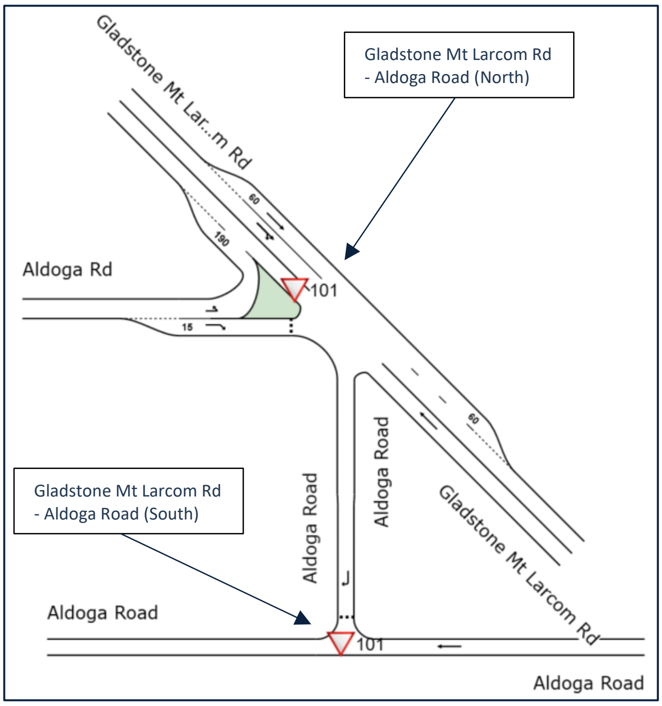


Figure 13: Gladstone Mount Larcom Road / Aldoga Rd intersection SIDRA Network configuration

The following Table 4 and Table 5 details the SIDRA approach movement summaries for 2025 and 2035 AM peak hour traffic conditions **with** and **without** the predicted development traffic at the Gladstone Mount Larcom Road / Aldoga Road intersection. For comparison, the same design years were also tested under the predicted traffic conditions assuming that the development has not been built. Results from the PM peak hour are presented in Table 6 and Table 7. More detailed SIDRA outputs are provided in Appendix C.

The results from the SIDRA analysis illustrates that the intersection operates within acceptable limits in both AM and PM peak with the all approach experiencing a LoS A and all movements experiencing DoS below 0.15. No excessive delays are experienced in both the opening year and following the 10-year period to 2035.

While the DoS and average delay figures remain relatively low, it is acknowledged that the Aldoga Road approach (intersection west approach) to Gladstone Mount Larcom Road will start experiencing higher traffic volumes, delay and DoS over the 10 years, but within acceptable limits.

Table 4: AM Peak hour SIDRA Approach movement summary - Gladstone Mt Larcom Rd - Aldoga Road (North)

Gladstone Mt Larcom Rd - Aldoga Road (North)										
Approach	Without Development - AM Peak					With Development - AM Peak				
	Total (veh/h)	DoS (v/c)	Average Delay (sec)	LoS	Avg Back of Queue (m)	Total (veh/h)	DoS (v/c)	Average Delay (sec)	LoS	Avg Back of Queue (m)
2025 Opening Year										
SouthEast: Gladstone Mt Larcom Rd	136	0.08	0	NA	0	136	0.08	0	NA	0
NorthWest: Gladstone Mt Larcom Rd	156	0.065	0.1	NA	0	158	0.066	0.2	NA	0.1
West: Aldoga Rd	12	0.021	8.7	LOS A	0.3	37	0.058	8	LOS A	0.8
All Vehicles	303	0.08	0.4	NA	0.3	331	0.08	1	NA	0.8
2035 Design Year										
SouthEast: Gladstone Mt Larcom Rd	163	0.096	0	NA	0	163	0.096	0	NA	0
NorthWest: Gladstone Mt Larcom Rd	188	0.078	0.1	NA	0.1	190	0.079	0.2	NA	0.1
West: Aldoga Rd	14	0.028	9.7	LOS A	0.4	44	0.078	8.9	LOS A	1
All Vehicles	365	0.096	0.5	NA	0.4	398	0.096	1.1	NA	1.0

Table 5: AM Peak hour SIDRA Approach movement summary - Gladstone Mt Larcom Rd - Aldoga Road (South)

Gladstone Mt Larcom Rd - Aldoga Road (South)										
Approach	Without Development - AM Peak					With Development - AM Peak				
	Total (veh/h)	DoS (v/c)	Average Delay (sec)	LoS	Avg Back of Queue (m)	Total (veh/h)	DoS (v/c)	Average Delay (sec)	LoS	Avg Back of Queue (m)
2025 Opening Year										
East: Aldoga Road	45	0.026	0	NA	0	68	0.039	0	NA	0
North: Aldoga Road	2	0.002	3	LOS A	0	4	0.003	3	LOS A	0
All Vehicles	47	0.026	0.1	NA	0	73	0.039	0.2	NA	0
2035 Design Year										
East: Aldoga Road	54	0.031	0	NA	0	82	0.047	0	NA	0
North: Aldoga Road	3	0.002	3	LOS A	0	5	0.004	3.1	LOS A	0
All Vehicles	57	0.031	0.1	NA	0	87	0.047	0.2	NA	0

Table 6: PM Peak hour SIDRA Approach movement summary - Gladstone Mt Larcom Rd - Aldoga Road (North)

Gladstone Mt Larcom Rd - Aldoga Road (North)										
Approach	Without Development - PM Peak					With Development - PM Peak				
	Total (veh/h)	DoS (v/c)	Average Delay (sec)	LoS	Avg Back of Queue (m)	Total (veh/h)	DoS (v/c)	Average Delay (sec)	LoS	Avg Back of Queue (m)
2025 Opening Year										
SouthEast: Gladstone Mt Larcom Rd	145	0.08	0	NA	0	145	0.08	0	NA	0
NorthWest: Gladstone Mt Larcom Rd	142	0.06	0.1	NA	0	144	0.06	0.2	NA	0.1
West: Aldoga Rd	55	0.075	7.3	LOS A	0.9	80	0.112	7.5	LOS A	1.4
All Vehicles	342	0.08	1.2	NA	0.9	369	0.112	1.7	NA	1.4
2035 Design Year										
SouthEast: Gladstone Mt Larcom Rd	175	0.096	0	NA	0	175	0.096	0	NA	0
NorthWest: Gladstone Mt Larcom Rd	171	0.072	0.2	NA	0.1	174	0.073	0.3	NA	0.1
West: Aldoga Rd	66	0.099	8	LOS A	1.2	96	0.148	8.3	LOS A	1.8
All Vehicles	412	0.099	1.4	NA	1.2	445	0.148	1.9	NA	1.8

Table 7: PM Peak hour SIDRA Approach movement summary - Gladstone Mt Larcom Rd - Aldoga Road (South)

Gladstone Mt Larcom Rd - Aldoga Road (South)										
Approach	Without Development - PM Peak					With Development - PM Peak				
	Total (veh/h)	DoS (v/c)	Average Delay (sec)	LoS	Avg Back of Queue (m)	Total (veh/h)	DoS (v/c)	Average Delay (sec)	LoS	Avg Back of Queue (m)
2025 Opening Year										
East: Aldoga Road	13	0.009	0	NA	0	36	0.023	0	NA	0
North: Aldoga Road	2	0.001	2.9	LOS A	0	4	0.003	3	LOS A	0
All Vehicles	15	0.009	0.4	NA	0	40	0.023	0.3	NA	0
2035 Design Year										
East: Aldoga Road	15	0.011	0	NA	0	43	0.027	0	NA	0
North: Aldoga Road	3	0.002	2.9	LOS A	0	5	0.004	3	LOS A	0
All Vehicles	18	0.011	0.4	NA	0	48	0.027	0.3	NA	0

4. Swept Path Assessment

It is noted that no B-doubles will be used at the construction and/or operational stage of this development. The size of the largest truck that might access the development is unknown at the time of writing this report, hence a swept path assessment using a 26m B-double was completed for both the Gladstone Mount Larcom Road / Aldoga Road intersection and the Aldoga Road / Euroa Circuit intersection. This assessment is to confirm that both intersections have been designed for use by large trucks. The results of this assessment are in Table 8 and the detailed assessments are in Appendix D.

Table 8: Swept path assessment results

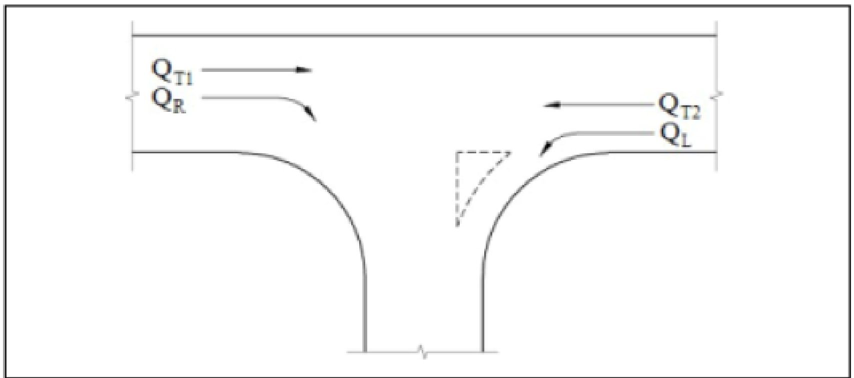
Movement	From	To	Result
Right turn	Gladstone Mount Larcom Road	Aldoga Road	Pass – within acceptable limits
Right turn	Aldoga Road	Gladstone Mount Larcom Road	Pass – within acceptable limits
Right turn	Aldoga Road	Euroa Circuit	Pass – within acceptable limits
Left turn	Euroa Circuit	Aldoga Road	Pass – within acceptable limits

5. Turn Warrant Assessment

A turn warrant assessment is undertaken in accordance with TMR Supplement to Austroads RPDM Part 4A for left/right turns into/from Aldoga Road using the traffic volumes with the development traffic for 2025 and 2035. Applying the Supplement, Figure 14 outlines the calculations applicable of variables whilst Table 9 details the values applied. These were then plotted on the Supplement Charts illustrated in Figure 15 to determine the turn treatments necessary.

Based on this assessment, a BAR is required for the right-turn movement for all design scenarios. It is acknowledged that the Gladstone Mount Larcom Road / Aldoga Rd intersection already has a BAR in place. No further upgrades are required at this stage.

Figure 4A-2 - Calculation of the major road traffic volume parameter 'Q_M'



Road Type	Turn Type	Splitter Island	Q_M (veh/h)
2 Lane 2 Way	Right	No	$= Q_{T1} + Q_{T2} + Q_L$
		Yes	$= Q_{T1} + Q_{T2}$
	Left	Yes/No	$= Q_{T2}$
4 Lane 2 Way	Right	No	$= 50\% \times Q_{T1} + Q_{T2} + Q_L$
		Yes	$= 50\% \times Q_{T1} + Q_{T2}$
	Left	Yes/No	$= 50\% \times Q_{T2}$
6 Lane 2 Way	Right	No	$= 33\% \times Q_{T1} + Q_{T2} + Q_L$
		Yes	$= 33\% \times Q_{T1} + Q_{T2}$
	Left	Yes/No	$= 33\% \times Q_{T2}$

Figure 14: Turn Warrant Input Parameters

Note, while it is acknowledged that the configuration of the Q_L movement at the existing intersection is not typical, to maintain a conservative analysis, Q_L is has still been included in the calculations. The results highlighted in orange in Table 9 have been plotted in Figure 15.

Table 9: Calculation of QM Methodology (Source: TMR Supplement to Austroads RPDM Part 4A)

Peak Hour Volumes		2025 Base AM	2025 Base PM	2025 Design AM	2025 Design PM	2035 Base AM	2035 Base PM	2035 Design AM	2035 Design PM
Q_M	Left Turn In	136	145	136	145	163	175	163	175
	Right Turn In	335	298	358	321	402	358	430	386
Q_L		45	13	68	36	54	15	82	43
Q_R		2	2	4	4	3	3	5	5

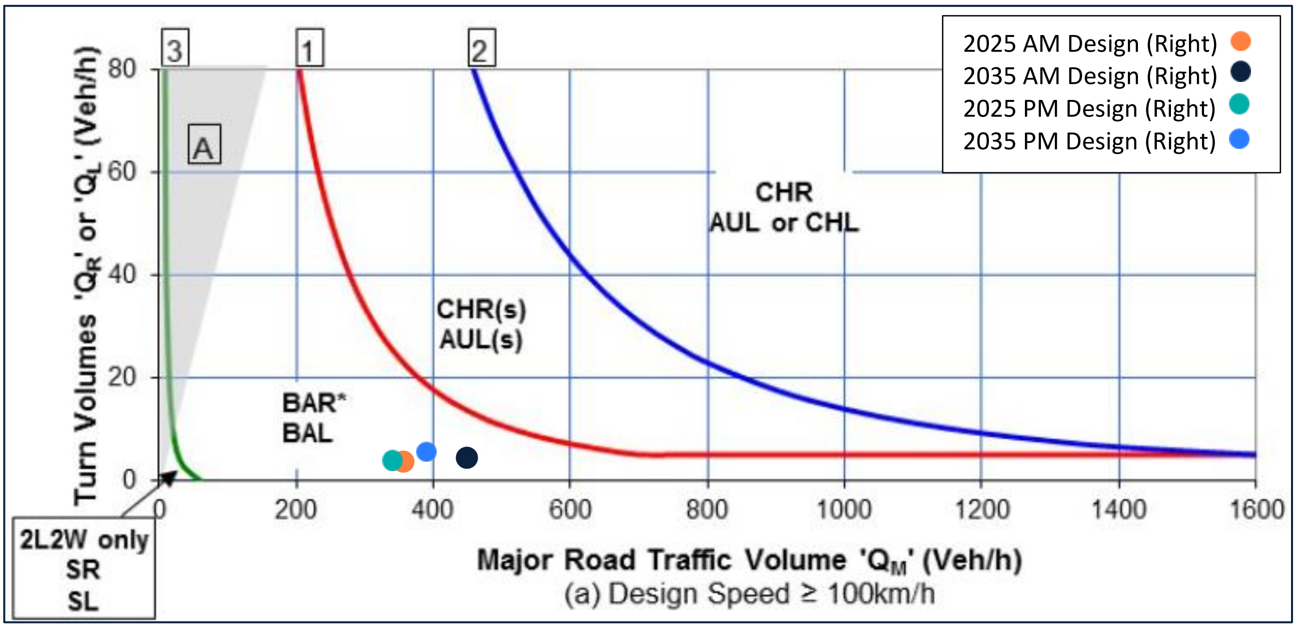


Figure 15: Right turn warrant assessment (with Development)

Based on the turn warrant assessment, no additional upgrades to the intersection will be required.

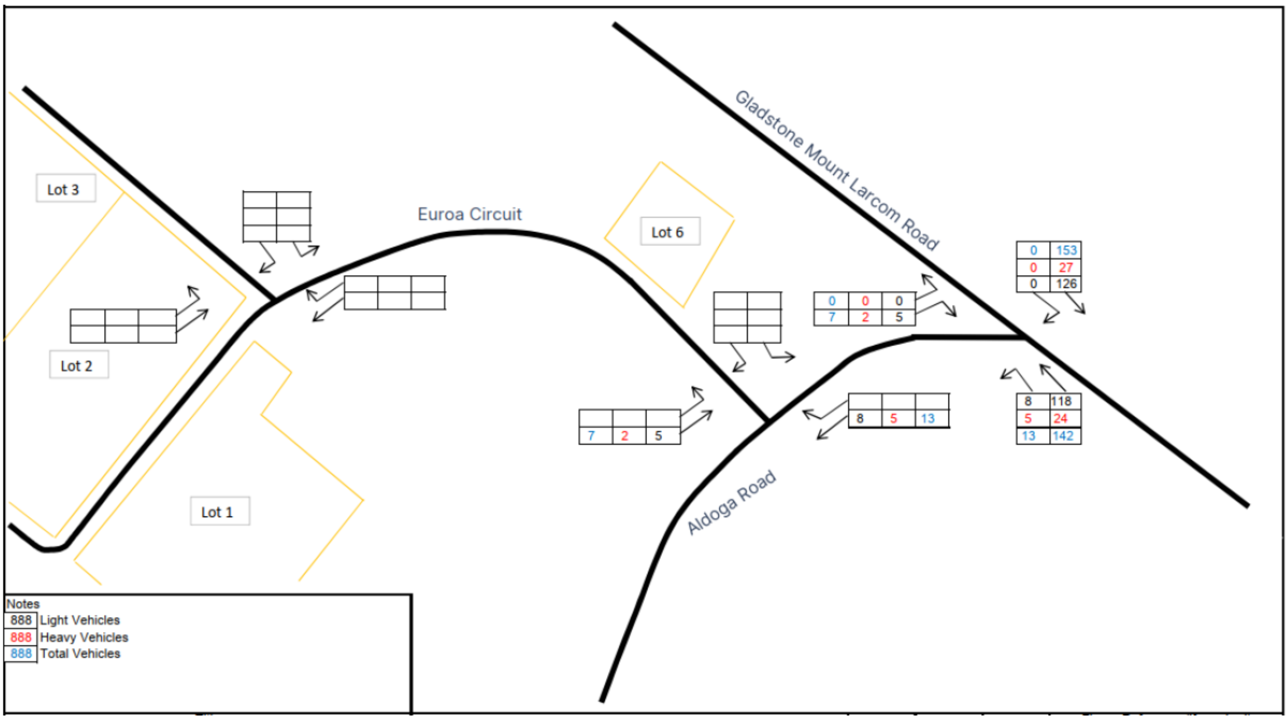
6. Conclusion

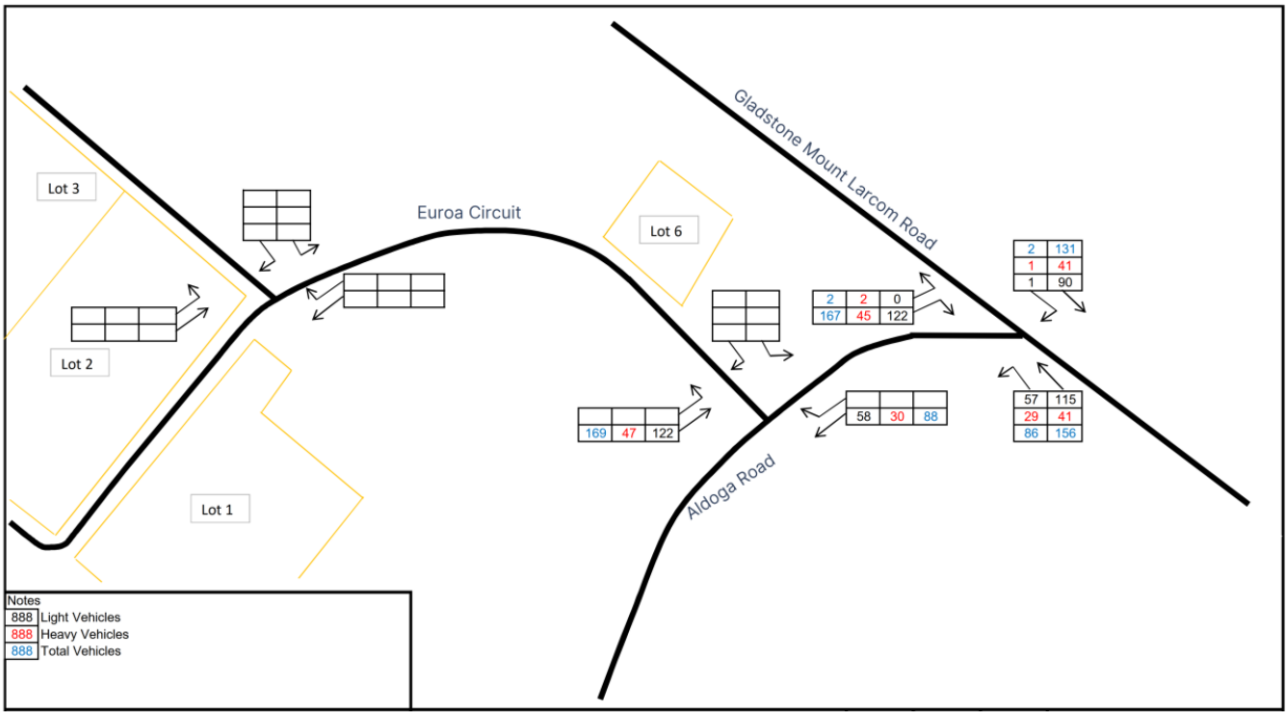
The key findings from this TIA for the proposed development are as follows:

- SMEC was commissioned to complete the Stage 1 TIA in 2021:
  - Austraffic was commissioned by SMEC to collect 7-day traffic counts in May 2021 and 24h traffic survey counts in October 2021) to the east and west of Aldoga Road's intersection with Gladstone Mount Larcom Road.
  - Based on this Stage 1 TIA, a growth rate of 1.87% was utilised.
  - The Aldoga Road's intersection with Gladstone Mount Larcom Road operates within acceptable limits for Stage 1 development.
- A 1.87% growth rate was used for this Stage 2 TIA to estimate the future traffic demands for 2025 (indicated opening year) to 2035 (10-year design horizon).
- The SIDRA assessment for 2025 and the 10-year design horizon showed that Gladstone Mount Larcom Road / Aldoga Road intersection perform within acceptable limits with the new development conditions at opening as well as the 10-year design horizon.
- It was noted that eastbound traffic on Aldoga Road will experience increasing delay and DoS over the 10-year design horizon although this is still well within acceptable limits.
- Turn warrant assessments for the Gladstone Mount Larcom Road / Aldoga Road intersection showed that a BAR is necessary. However, it is acknowledged that this intersection already contains a BAR and no further upgrades are required.

Appendix A

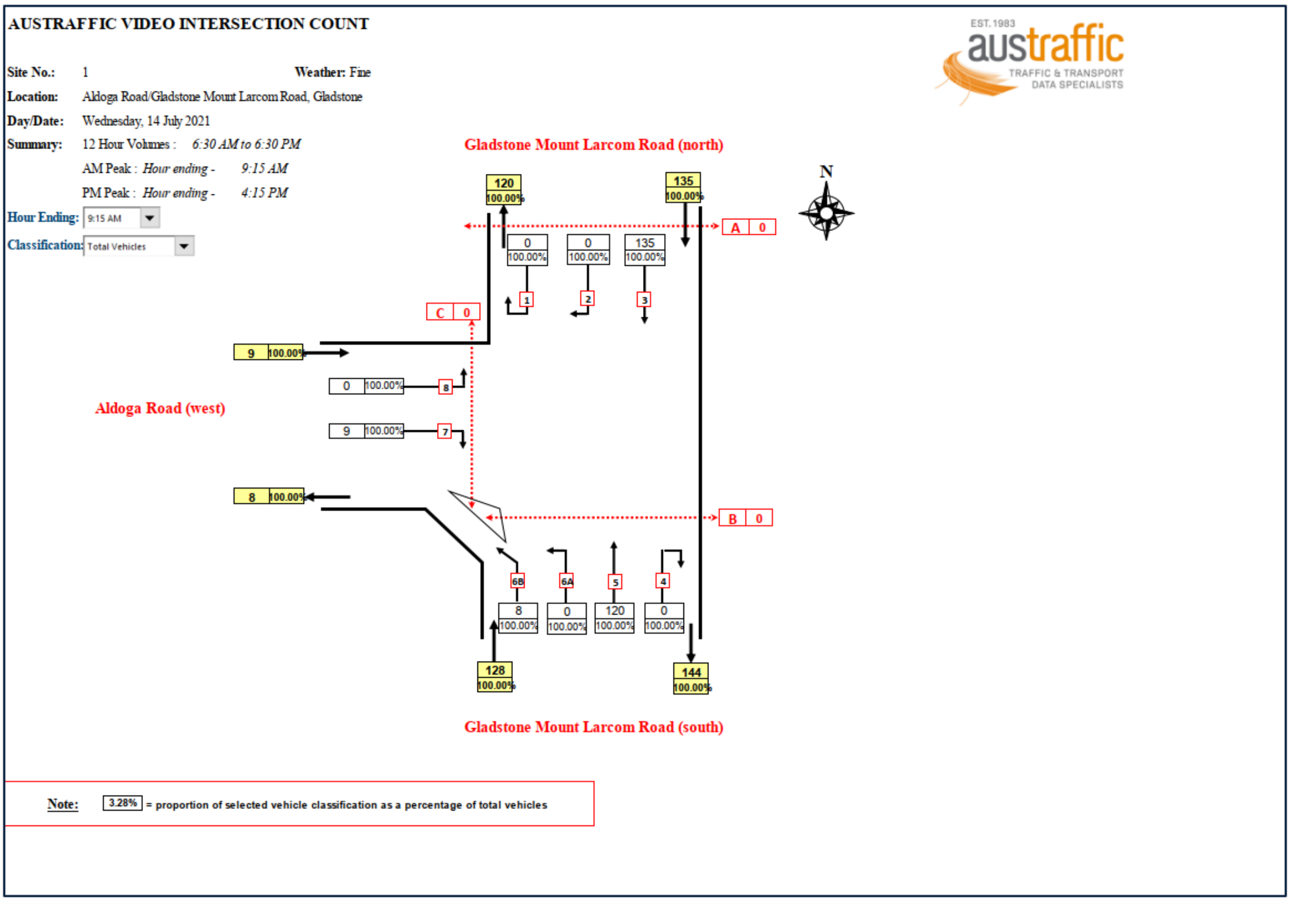
2011 Traffic Counts

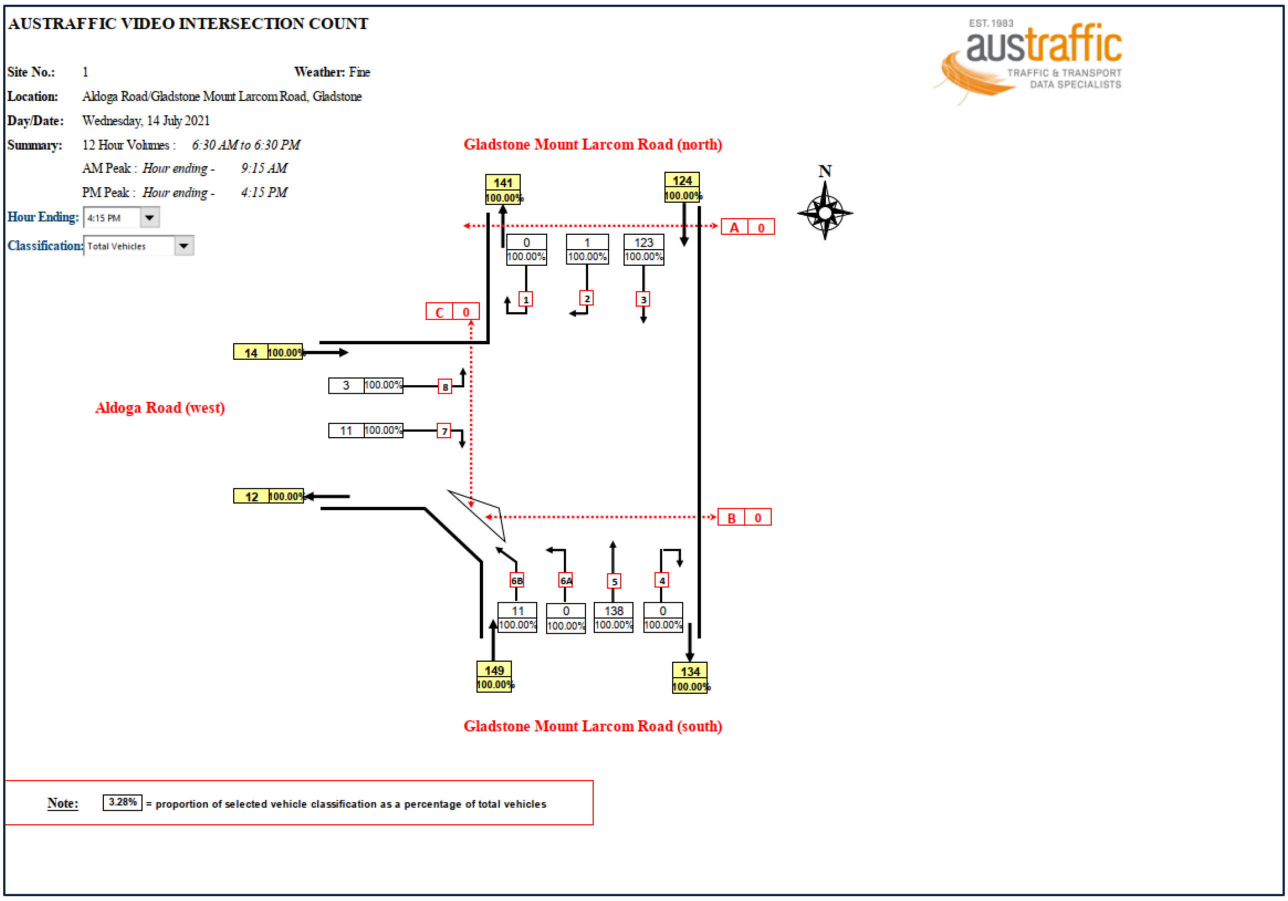

Gladstone Mount Larcom Road
Euroa Circuit
Aldoga Road
Lot 3
Lot 2
Lot 1
Lot 6
0 153
0 27
0 126
0 0 0
7 2 5
8 118
5 24
13 142
8 5 13
7 2 5
Notes
888 Light Vehicles
888 Heavy Vehicles
888 Total Vehicles


Gladstone Mount Larcom Road
Euroa Circuit
Aldoga Road
Lot 3
Lot 2
Lot 1
Lot 6
2 131
1 41
1 90
2 2 0
167 45 122
57 115
29 41
86 156
58 30 88
169 47 122
Notes
888 Light Vehicles
888 Heavy Vehicles
888 Total Vehicles

Appendix B

2021 Traffic Counts


AUSTRAFFIC VIDEO INTERSECTION COUNT
EST. 1983 austraffic TRAFFIC & TRANSPORT DATA SPECIALISTS
Site No.: 1
Weather: Fine
Location: Aldoga Road/Gladstone Mount Larcom Road, Gladstone
Day/Date: Wednesday, 14 July 2021
Summary: 12 Hour Volumes : 6:30 AM to 6:30 PM
AM Peak : Hour ending - 9:15 AM
PM Peak : Hour ending - 4:15 PM
Hour Ending: 9:15 AM
Classification: Total Vehicles
Gladstone Mount Larcom Road (north)
N
120 100.00%
135 100.00%
A 0
0 100.00%
0 100.00%
135 100.00%
1
2
3
C 0
9 100.00%
0 100.00%
8
Aldoga Road (west)
9 100.00%
7
8 100.00%
B 0
6B
6A
5
4
8 100.00%
0 100.00%
120 100.00%
0 100.00%
128 100.00%
144 100.00%
Gladstone Mount Larcom Road (south)
Note: 3.28% = proportion of selected vehicle classification as a percentage of total vehicles


AUSTRAFFIC VIDEO INTERSECTION COUNT
EST. 1983 austraffic TRAFFIC & TRANSPORT DATA SPECIALISTS
Site No.: 1
Weather: Fine
Location: Aldoga Road/Gladstone Mount Larcom Road, Gladstone
Day/Date: Wednesday, 14 July 2021
Summary: 12 Hour Volumes : 6:30 AM to 6:30 PM
AM Peak : Hour ending - 9:15 AM
PM Peak : Hour ending - 4:15 PM
Hour Ending: 4:15 PM
Classification: Total Vehicles
Gladstone Mount Larcom Road (north)
N
141 100.00%
124 100.00%
A 0
0 100.00%
1 100.00%
123 100.00%
1
2
3
C 0
14 100.00%
3 100.00%
8
Aldoga Road (west)
11 100.00%
7
12 100.00%
B 0
6B
6A
5
4
11 100.00%
0 100.00%
138 100.00%
0 100.00%
149 100.00%
134 100.00%
Gladstone Mount Larcom Road (south)
Note: 3.28% = proportion of selected vehicle classification as a percentage of total vehicles

Appendix C

SIDRA Results

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116

Template: New User Report

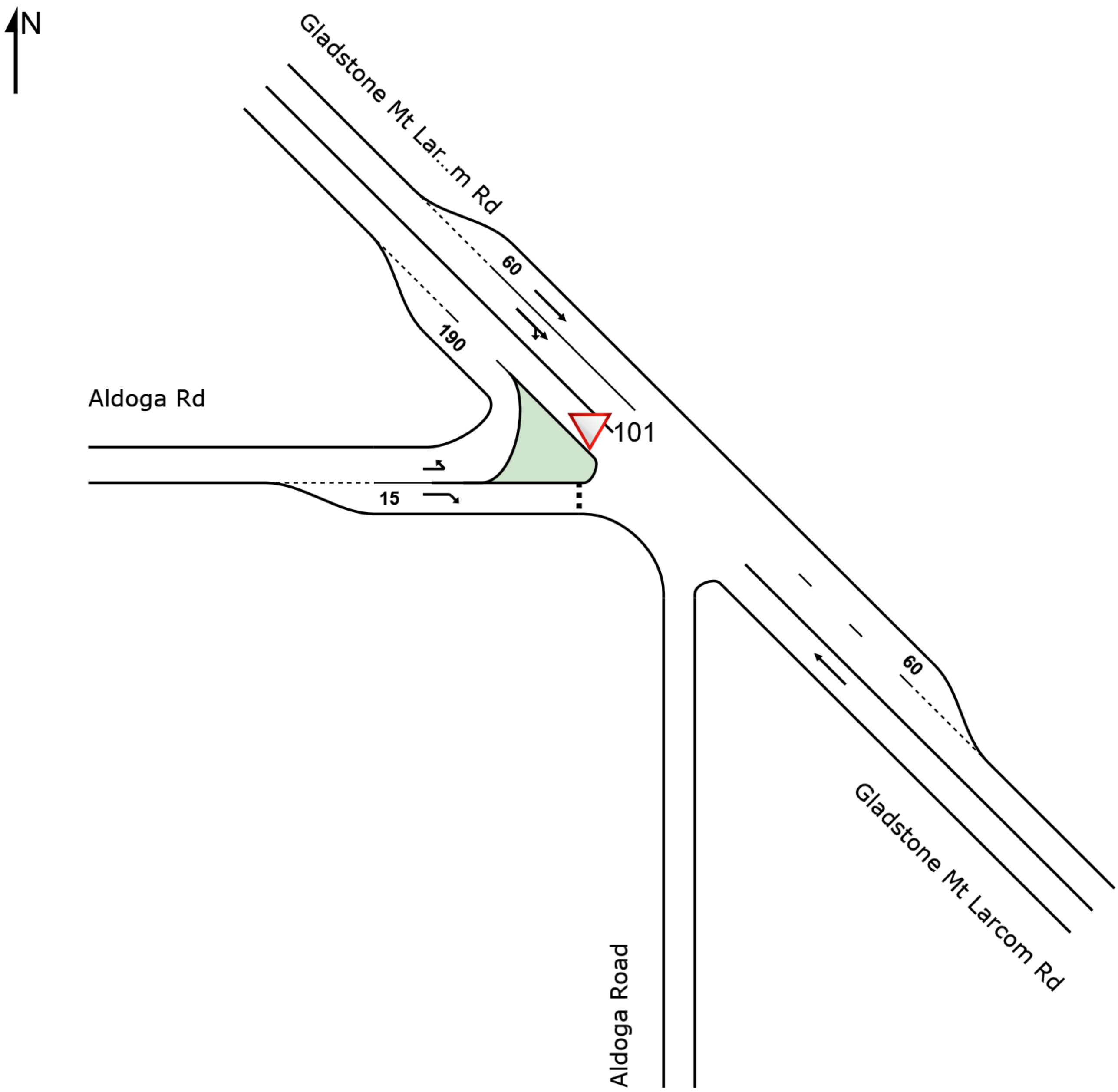
Site: 101 [2025AM - Gladstone Mt Larcom Rd - without development (Site Folder: Bases case 2025 AM - without development)]

Network: 1 [2025AM - Gladstone Mt Larcom Rd - without development (Network Folder: Gladstone Mt Larcom Road - AM)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Gladstone Mt Larcom Rd														
5	T1	136	24.8	136	24.8	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		136	24.8	136	24.8	0.080	0.0	NA	0.0	0.0	0.00	0.00	0.00	100.0
NorthWest: Gladstone Mt Larcom Rd														
11	T1	154	15.8	154	15.8	0.065	0.1	LOS A	0.0	0.0	0.01	0.01	0.01	99.1
29a	R1	2	0.0	2	0.0	0.065	5.0	LOS A	0.0	0.0	0.01	0.01	0.01	97.8
Approach		156	15.5	156	15.5	0.065	0.1	NA	0.0	0.0	0.01	0.01	0.01	99.1
West: Aldoga Rd														
10b	L3	1	0.0	1	0.0	0.001	7.0	LOS A	0.0	0.0	0.00	0.58	0.00	54.8
12a	R1	11	50.0	11	50.0	0.021	8.8	LOS A	0.0	0.3	0.48	0.62	0.48	50.0
Approach		12	45.5	12	45.5	0.021	8.7	LOS A	0.0	0.3	0.43	0.62	0.43	50.5
All Vehicles		303	20.8	303	20.8	0.080	0.4	NA	0.0	0.3	0.02	0.03	0.02	95.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Vehicle movement LOS values are based on average delay per movement.
Minor Road Approach LOS values are based on average delay for all vehicle movements.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance

	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
SouthEast: Gladstone Mt Larcom Rd															
Lane 1	136	24.8	136	24.8	1697	0.080	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	136	24.8	136	24.8		0.080		0.0	NA	0.0	0.0				
NorthWest: Gladstone Mt Larcom Rd															
Lane 1	40	15.8	40	15.8	1787	0.022	34 [6]	0.2	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	116	15.5	116	15.5	1785	0.065	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	156	15.5	156	15.5		0.065		0.1	NA	0.0	0.0				
West: Aldoga Rd															
Lane 1	1	0.0	1	0.0	1684	0.001	100	7.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	11	50.0	11	50.0	503	0.021	100	8.8	LOS A	0.0	0.3	Short	15	0.0	NA
Approach	12	45.5	12	45.5		0.021		8.7	LOS A	0.0	0.3				
Intersection	303	20.8	303	20.8		0.080		0.4	NA	0.0	0.3				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

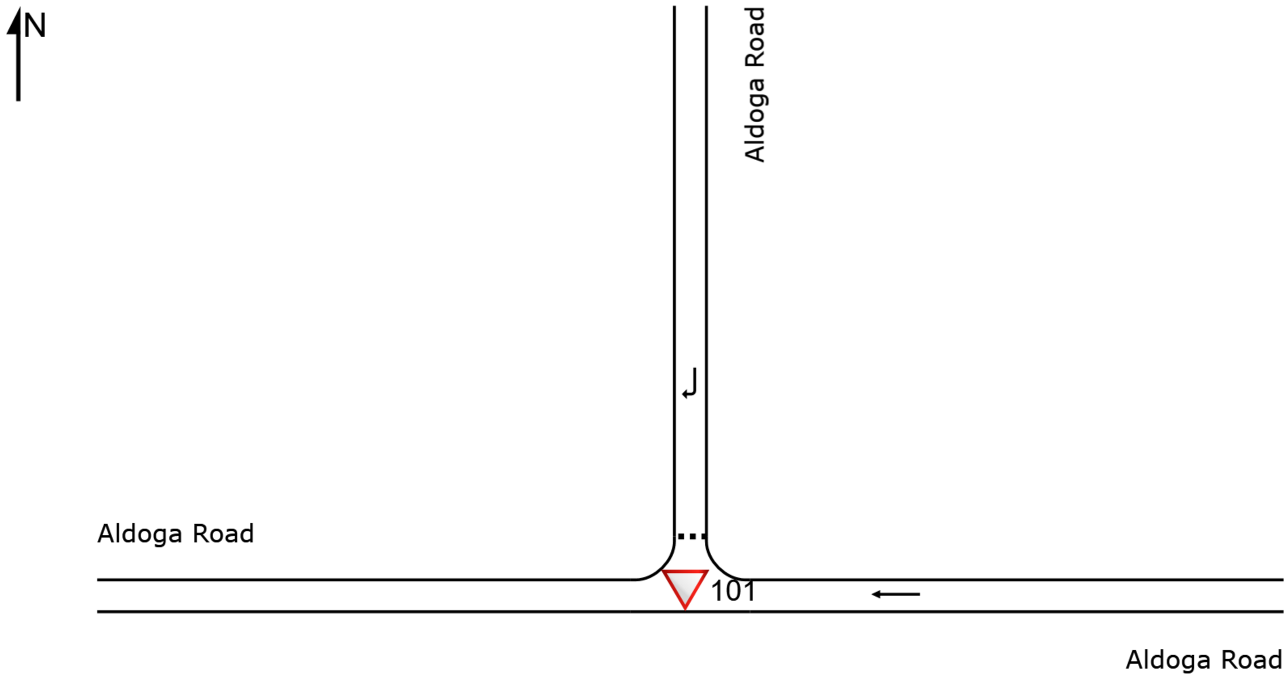
Site: 101 [2025AM - Aldoga Rd - without development (Site Folder: Bases case 2025 AM - without development)]

Network: 1 [2025AM - Gladstone Mt Larcom Rd - without development (Network Folder: Gladstone Mt Larcom Road - AM)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Aldoga Road														
5	T1	45	16.3	45	16.3	0.026	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		45	16.3	45	16.3	0.026	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
North: Aldoga Road														
9	R2	2	0.0	2	0.0	0.002	3.0	LOS A	0.0	0.0	0.10	0.54	0.10	42.7
Approach		2	0.0	2	0.0	0.002	3.0	LOS A	0.0	0.0	0.10	0.54	0.10	42.7
All Vehicles		47	15.6	47	15.6	0.026	0.1	NA	0.0	0.0	0.00	0.02	0.00	59.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance																
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
East: Aldoga Road															
Lane 1	45	16.3	45	16.3	1763	0.026	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Approach	45	16.3	45	16.3		0.026		0.0	NA	0.0	0.0				
North: Aldoga Road															
Lane 1	2	0.0	2	0.0	1390	0.002	100	3.0	LOS A	0.0	0.0	Full	25	0.0	0.0
Approach	2	0.0	2	0.0		0.002		3.0	LOS A	0.0	0.0				
Intersection	47	15.6	47	15.6		0.026		0.1	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116

Template: New User Report

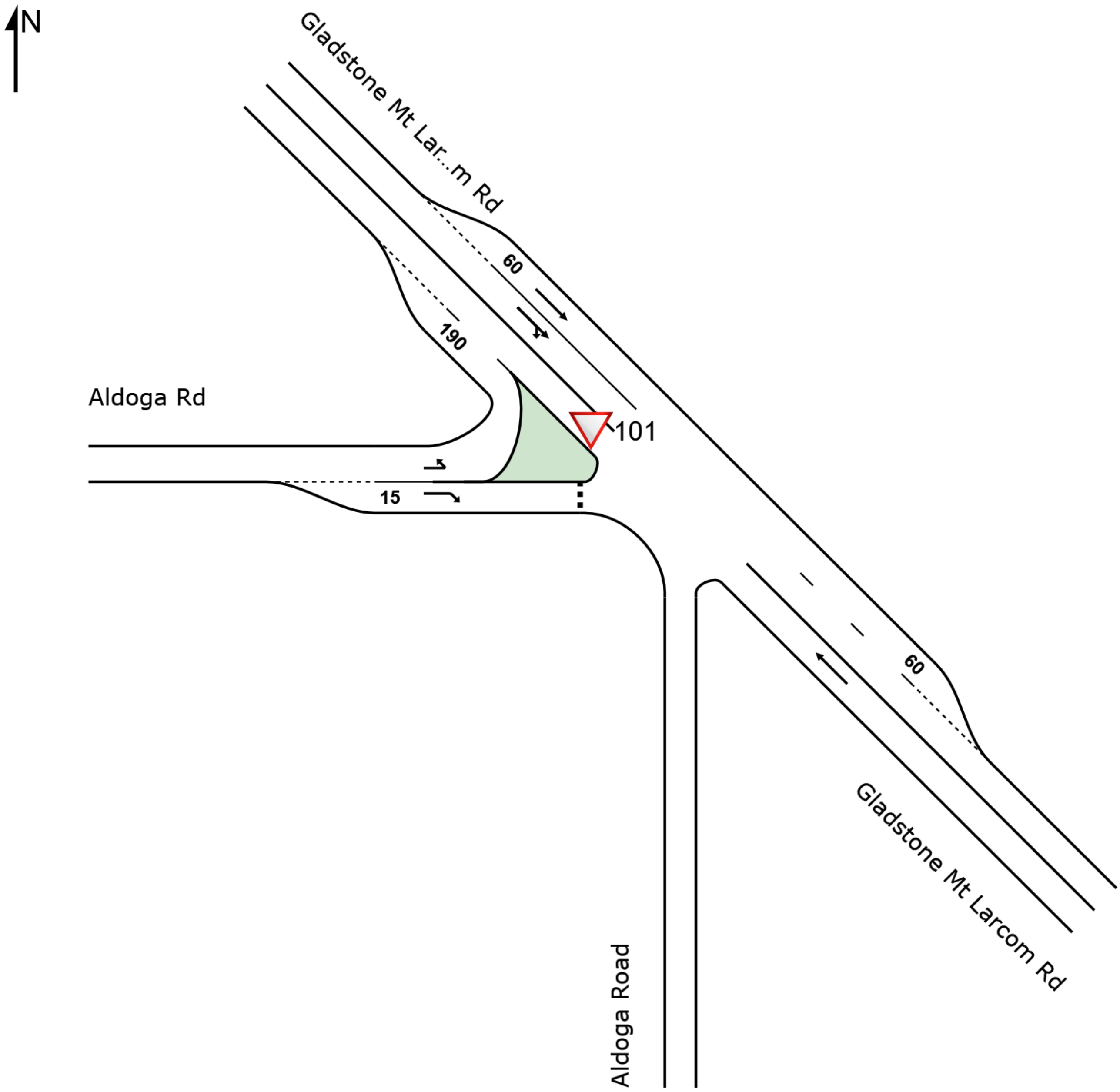
Site: 101 [2025AM - Gladstone Mt Larcom Rd - without development (Site Folder: Bases case 2025 AM - without development)]

Network: 3 [2035AM - Gladstone Mt Larcom Rd - without development - 1.87% (Network Folder: Gladstone Mt Larcom Road - AM)]

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Gladstone Mt Larcom Rd														
5	T1	163	24.8	163	24.8	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		163	24.8	163	24.8	0.096	0.0	NA	0.0	0.0	0.00	0.00	0.00	100.0
NorthWest: Gladstone Mt Larcom Rd														
11	T1	185	15.8	185	15.8	0.078	0.1	LOS A	0.0	0.1	0.01	0.01	0.01	99.1
29a	R1	3	0.0	3	0.0	0.078	5.1	LOS A	0.0	0.1	0.01	0.01	0.01	97.7
Approach		188	15.5	188	15.5	0.078	0.1	NA	0.0	0.1	0.01	0.01	0.01	99.1
West: Aldoga Rd														
10b	L3	1	0.0	1	0.0	0.001	7.1	LOS A	0.0	0.0	0.00	0.58	0.00	54.8
12a	R1	13	50.0	13	50.0	0.028	10.0	LOS A	0.0	0.4	0.52	0.67	0.52	49.3
Approach		14	45.5	14	45.5	0.028	9.7	LOS A	0.0	0.4	0.47	0.66	0.47	49.7
All Vehicles		365	20.8	365	20.8	0.096	0.5	NA	0.0	0.4	0.02	0.03	0.02	95.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance															
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
SouthEast: Gladstone Mt Larcom Rd															
Lane 1	163	24.8	163	24.8	1697	0.096	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	163	24.8	163	24.8		0.096		0.0	NA	0.0	0.0				
NorthWest: Gladstone Mt Larcom Rd															
Lane 1	48	15.8	48	15.8	1787	0.027	34[6]	0.3	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	140	15.5	140	15.5	1784	0.078	100	0.1	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	188	15.5	188	15.5		0.078		0.1	NA	0.0	0.1				
West: Aldoga Rd															
Lane 1	1	0.0	1	0.0	1684	0.001	100	7.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	13	50.0	13	50.0	448	0.028	100	10.0	LOS A	0.0	0.4	Short	15	0.0	NA
Approach	14	45.5	14	45.5		0.028		9.7	LOS A	0.0	0.4				
Intersection	365	20.8	365	20.8		0.096		0.5	NA	0.0	0.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

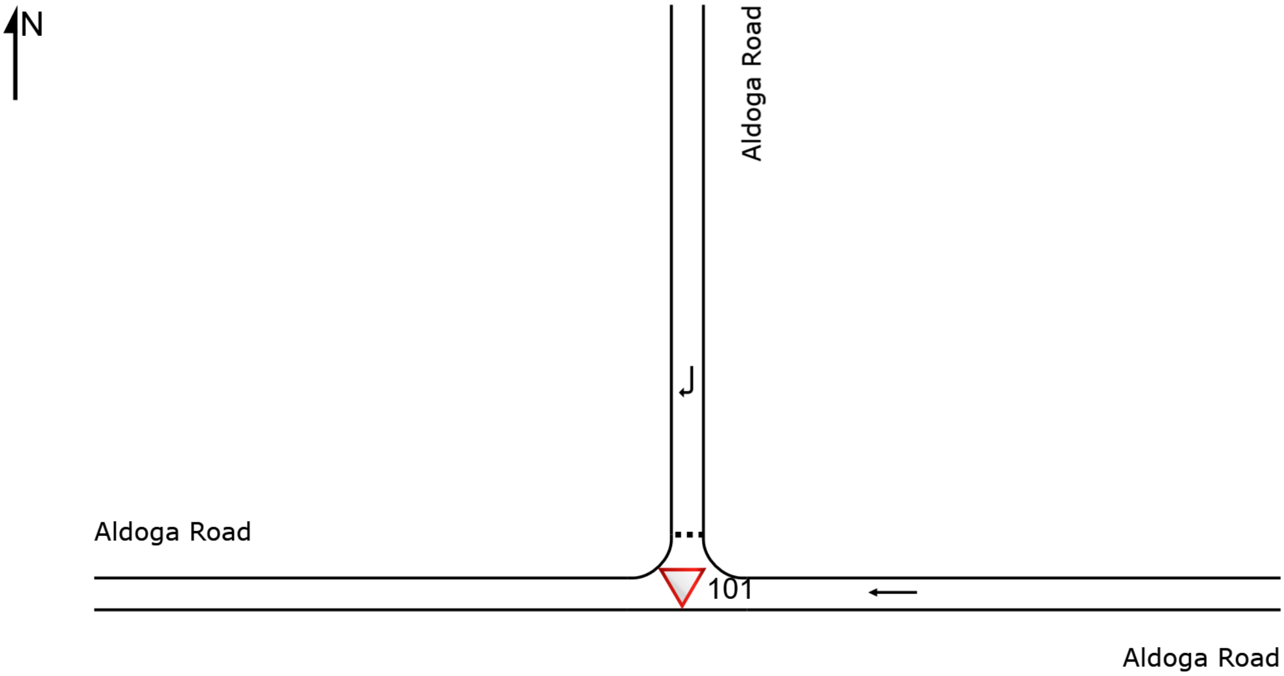
Site: 101 [2025AM - Aldoga Rd - without development (Site Folder: Bases case 2025 AM - without development)]

Network: 3 [2035AM - Gladstone Mt Larcom Rd - without development - 1.87% (Network Folder: Gladstone Mt Larcom Road - AM)]

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Aldoga Road														
5	T1	54	16.3	54	16.3	0.031	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		54	16.3	54	16.3	0.031	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
North: Aldoga Road														
9	R2	3	0.0	3	0.0	0.002	3.0	LOS A	0.0	0.0	0.11	0.54	0.11	42.7
Approach		3	0.0	3	0.0	0.002	3.0	LOS A	0.0	0.0	0.11	0.54	0.11	42.7
All Vehicles		57	15.6	57	15.6	0.031	0.1	NA	0.0	0.0	0.01	0.02	0.01	59.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance																
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Aldoga Road															
Lane 1	54	16.3	54	16.3	1763	0.031	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Approach	54	16.3	54	16.3		0.031		0.0	NA	0.0	0.0				
North: Aldoga Road															
Lane 1	3	0.0	3	0.0	1380	0.002	100	3.0	LOS A	0.0	0.0	Full	25	0.0	0.0
Approach	3	0.0	3	0.0		0.002		3.0	LOS A	0.0	0.0				
Intersection	57	15.6	57	15.6		0.031		0.1	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116

Template: New User Report

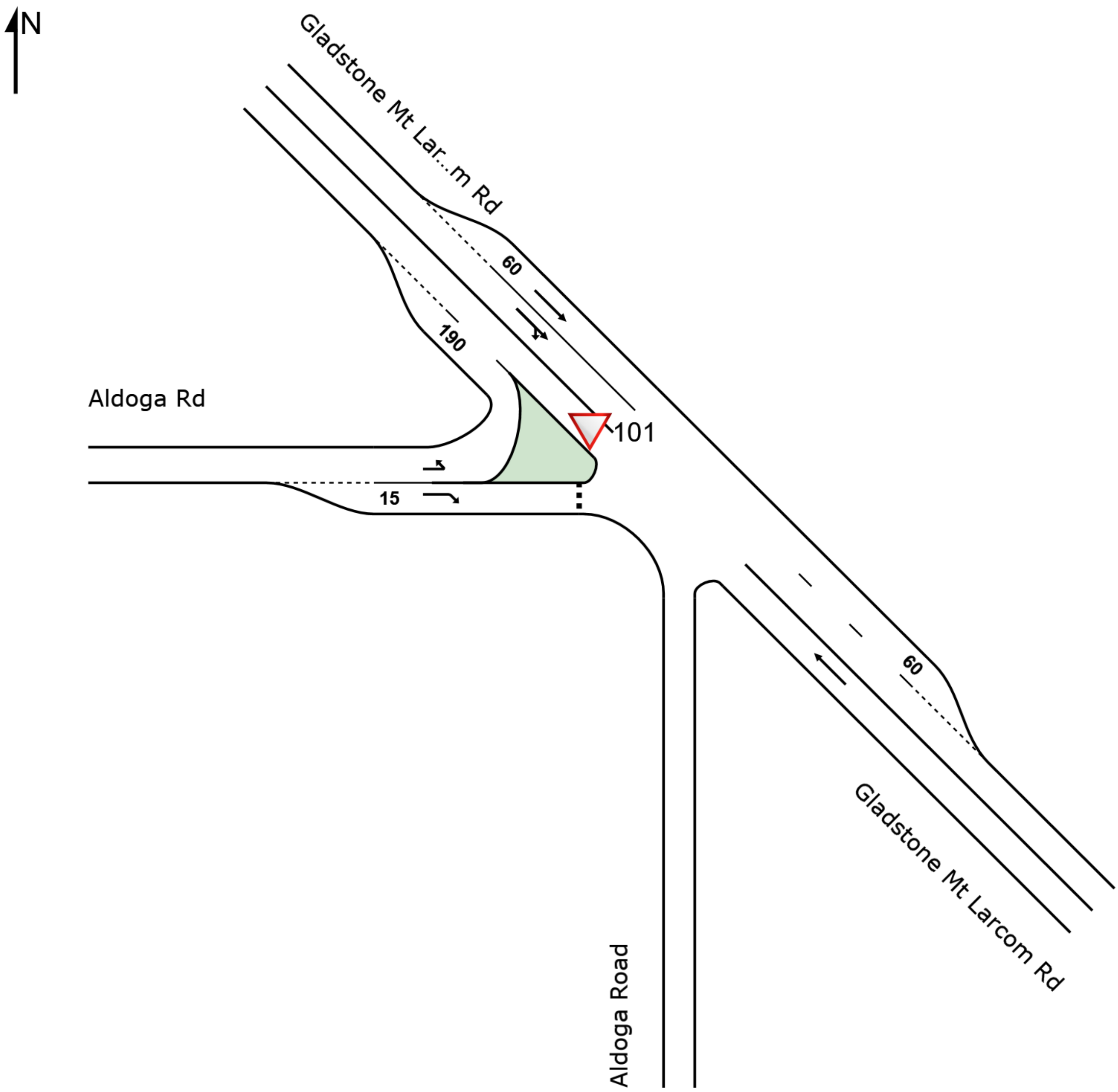
Site: 101 [2025AM - Gladstone Mt Larcom Rd - with development (Site Folder: Bases case 2025 AM - with development)]

Network: 2 [2025AM - Gladstone Mt Larcom Rd - with development (Network Folder: Gladstone Mt Larcom Road - AM)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	DEMAND FLOWS HV] %	ARRIVAL FLOWS [Total veh/h	ARRIVAL FLOWS HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	AVERAGE BACK OF QUEUE Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Gladstone Mt Larcom Rd														
5	T1	136	24.8	136	24.8	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		136	24.8	136	24.8	0.080	0.0	NA	0.0	0.0	0.00	0.00	0.00	100.0
NorthWest: Gladstone Mt Larcom Rd														
11	T1	154	15.8	154	15.8	0.066	0.1	LOS A	0.0	0.1	0.02	0.01	0.02	98.4
29a	R1	4	0.0	4	0.0	0.066	5.0	LOS A	0.0	0.1	0.02	0.02	0.02	95.7
Approach		158	15.3	158	15.3	0.066	0.2	NA	0.0	0.1	0.02	0.01	0.02	98.3
West: Aldoga Rd														
10b	L3	3	0.0	3	0.0	0.002	7.0	LOS A	0.0	0.0	0.00	0.58	0.00	54.8
12a	R1	34	28.1	34	28.1	0.058	8.1	LOS A	0.1	0.8	0.47	0.64	0.47	51.1
Approach		37	25.7	37	25.7	0.058	8.0	LOS A	0.1	0.8	0.43	0.64	0.43	51.5
All Vehicles		331	20.4	331	20.4	0.080	1.0	NA	0.1	0.8	0.06	0.08	0.06	89.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance															
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
SouthEast: Gladstone Mt Larcom Rd															
Lane 1	136	24.8	136	24.8	1697	0.080	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	136	24.8	136	24.8		0.080		0.0	NA	0.0	0.0				
NorthWest: Gladstone Mt Larcom Rd															
Lane 1	40	15.8	40	15.8	1787	0.023	34[6]	0.3	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	118	15.2	118	15.2	1783	0.066	100	0.2	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	158	15.3	158	15.3		0.066		0.2	NA	0.0	0.1				
West: Aldoga Rd															
Lane 1	3	0.0	3	0.0	1684	0.002	100	7.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	34	28.1	34	28.1	576	0.058	100	8.1	LOS A	0.1	0.8	Short	15	0.0	NA
Approach	37	25.7	37	25.7		0.058		8.0	LOS A	0.1	0.8				
Intersection	331	20.4	331	20.4		0.080		1.0	NA	0.1	0.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

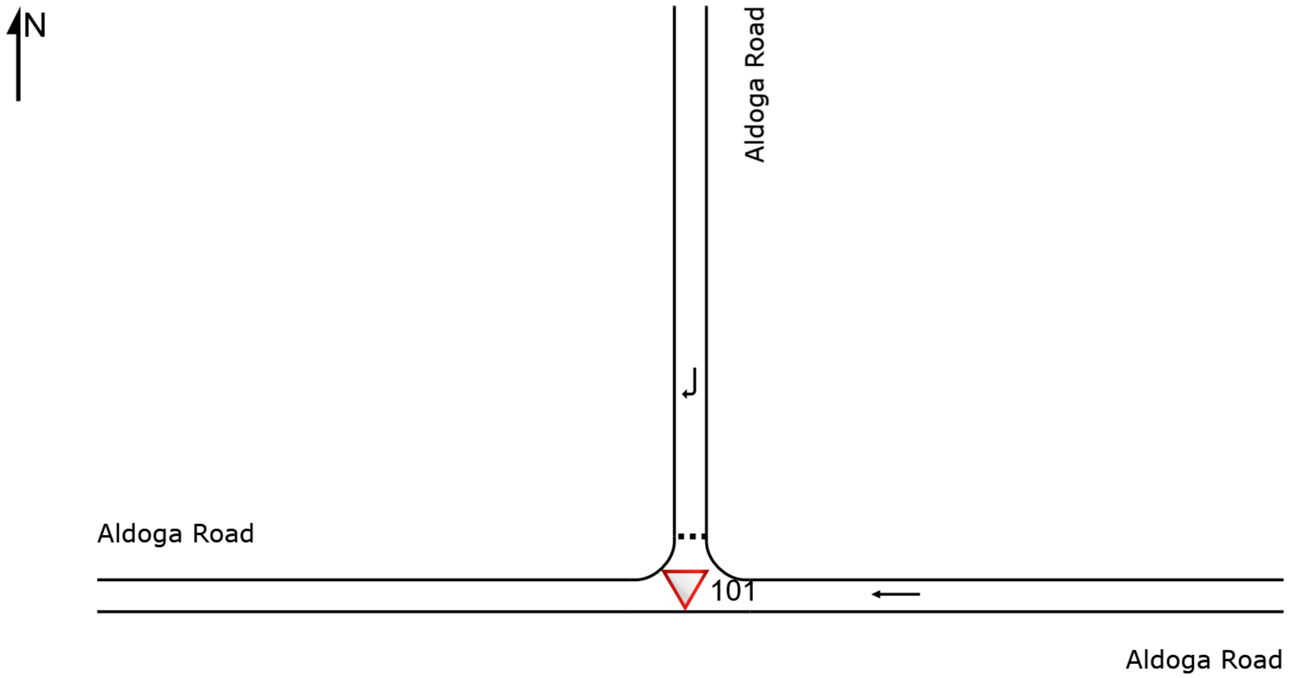
Site: 101 [2025AM - Aldoga Rd - with development (Site Folder: Bases case 2025 AM - with development)]

Network: 2 [2025AM - Gladstone Mt Larcom Rd - with development (Network Folder: Gladstone Mt Larcom Road - AM)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Aldoga Road														
5	T1	68	16.9	68	16.9	0.039	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		68	16.9	68	16.9	0.039	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
North: Aldoga Road														
9	R2	4	0.0	4	0.0	0.003	3.0	LOS A	0.0	0.0	0.13	0.54	0.13	42.6
Approach		4	0.0	4	0.0	0.003	3.0	LOS A	0.0	0.0	0.13	0.54	0.13	42.6
All Vehicles		73	15.9	73	15.9	0.039	0.2	NA	0.0	0.0	0.01	0.03	0.01	59.1

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance															
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
East: Aldoga Road															
Lane 1	68	16.9	68	16.9	1757	0.039	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Approach	68	16.9	68	16.9		0.039		0.0	NA	0.0	0.0				
North: Aldoga Road															
Lane 1	4	0.0	4	0.0	1364	0.003	100	3.0	LOS A	0.0	0.0	Full	25	0.0	0.0
Approach	4	0.0	4	0.0		0.003		3.0	LOS A	0.0	0.0				
Intersection	73	15.9	73	15.9		0.039		0.2	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116 **Template: New User Report**

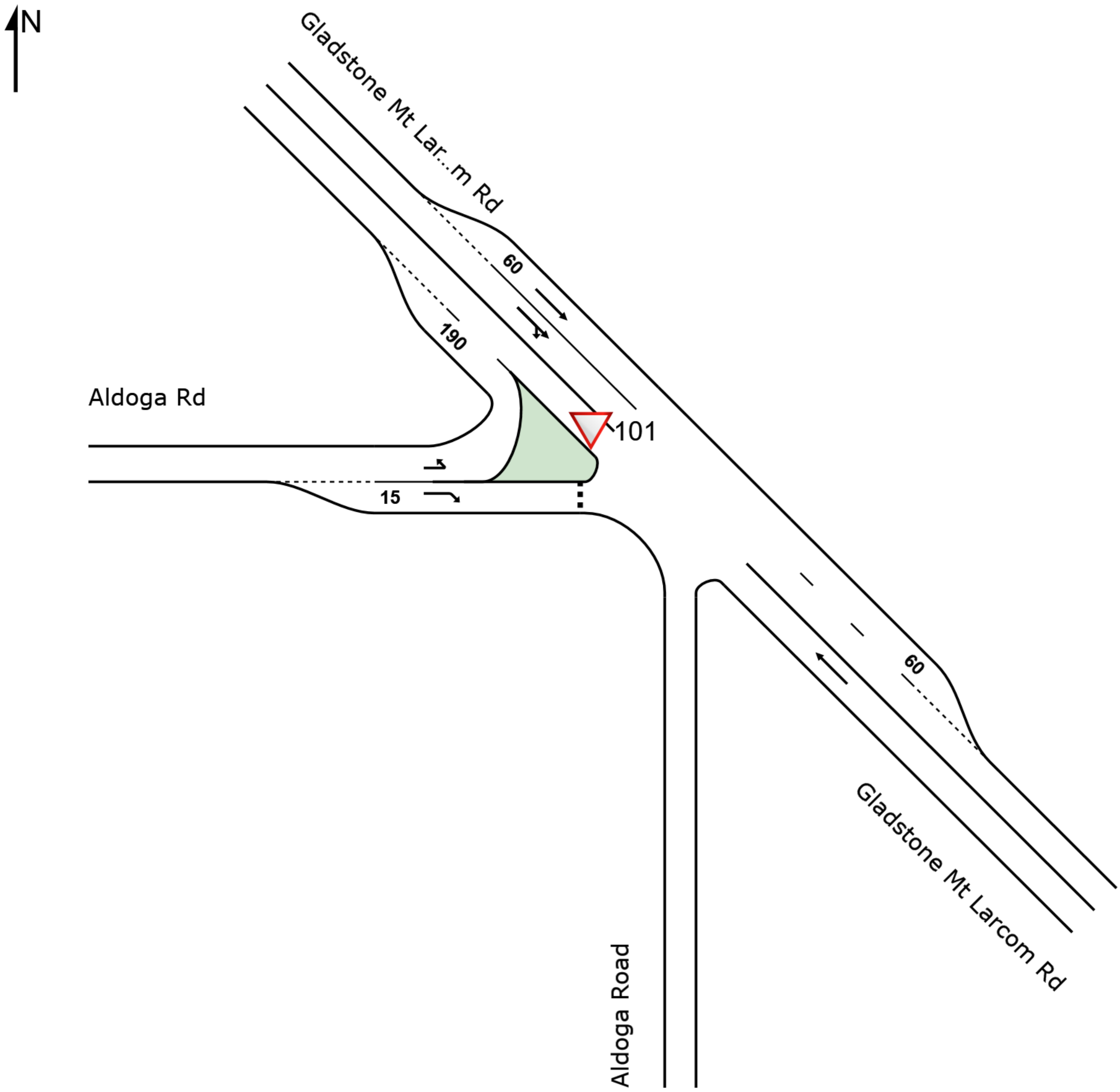
Site: 101 [2025AM - Gladstone Mt Larcom Rd - with development (Site Folder: Bases case 2025 AM - with development)]

Network: 4 [2035AM - Gladstone Mt Larcom Rd - with development - 1.87% (Network Folder: Gladstone Mt Larcom Road - AM)]

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Gladstone Mt Larcom Rd														
5	T1	163	24.8	163	24.8	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		163	24.8	163	24.8	0.096	0.0	NA	0.0	0.0	0.00	0.00	0.00	100.0
NorthWest: Gladstone Mt Larcom Rd														
11	T1	185	15.8	185	15.8	0.079	0.1	LOS A	0.0	0.1	0.02	0.01	0.02	98.3
29a	R1	5	0.0	5	0.0	0.079	5.1	LOS A	0.0	0.1	0.02	0.02	0.02	95.6
Approach		190	15.3	190	15.3	0.079	0.2	NA	0.0	0.1	0.02	0.01	0.02	98.3
West: Aldoga Rd														
10b	L3	4	0.0	4	0.0	0.002	7.1	LOS A	0.0	0.0	0.00	0.58	0.00	54.8
12a	R1	41	28.1	41	28.1	0.078	9.1	LOS A	0.1	1.0	0.52	0.70	0.52	50.5
Approach		44	25.7	44	25.7	0.078	8.9	LOS A	0.1	1.0	0.47	0.69	0.47	50.8
All Vehicles		398	20.4	398	20.4	0.096	1.1	NA	0.1	1.0	0.06	0.08	0.06	89.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance															
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
SouthEast: Gladstone Mt Larcom Rd															
Lane 1	163	24.8	163	24.8	1697	0.096	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	163	24.8	163	24.8		0.096		0.0	NA	0.0	0.0				
NorthWest: Gladstone Mt Larcom Rd															
Lane 1	49	15.8	49	15.8	1787	0.027	34[6]	0.3	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	141	15.2	141	15.2	1781	0.079	100	0.2	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	190	15.3	190	15.3		0.079		0.2	NA	0.0	0.1				
West: Aldoga Rd															
Lane 1	4	0.0	4	0.0	1684	0.002	100	7.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	41	28.1	41	28.1	518	0.078	100	9.1	LOS A	0.1	1.0	Short	15	0.0	NA
Approach	44	25.7	44	25.7		0.078		8.9	LOS A	0.1	1.0				
Intersection	398	20.4	398	20.4		0.096		1.1	NA	0.1	1.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

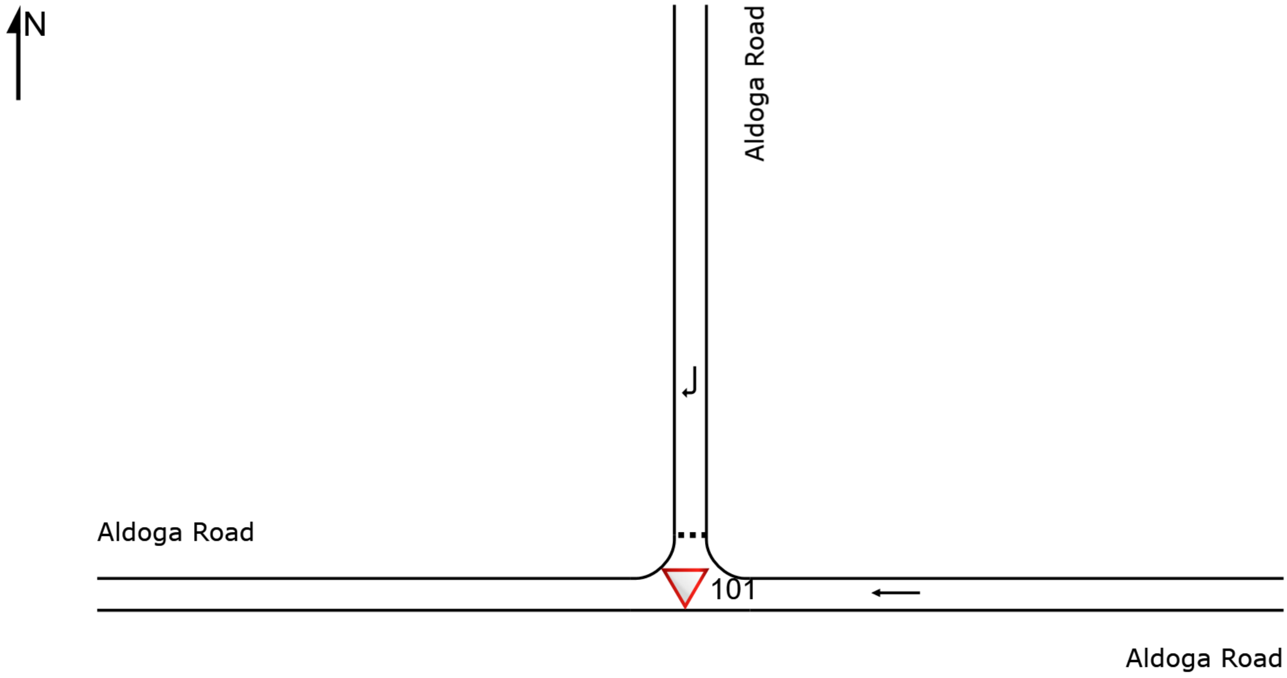
Site: 101 [2025AM - Aldoga Rd - with development (Site Folder: Bases case 2025 AM - with development)]

Network: 4 [2035AM - Gladstone Mt Larcom Rd - with development - 1.87% (Network Folder: Gladstone Mt Larcom Road - AM)]

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Aldoga Road														
5	T1	82	16.9	82	16.9	0.047	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		82	16.9	82	16.9	0.047	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
North: Aldoga Road														
9	R2	5	0.0	5	0.0	0.004	3.1	LOS A	0.0	0.0	0.14	0.54	0.14	42.5
Approach		5	0.0	5	0.0	0.004	3.1	LOS A	0.0	0.0	0.14	0.54	0.14	42.5
All Vehicles		87	15.9	87	15.9	0.047	0.2	NA	0.0	0.0	0.01	0.03	0.01	59.0

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance

	DEMAND FLOWS [Total	HV]	ARRIVAL FLOWS [Total	HV]	Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist]	Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Aldoga Road															
Lane 1	82	16.9	82	16.9	1757	0.047	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Approach	82	16.9	82	16.9		0.047		0.0	NA	0.0	0.0				
North: Aldoga Road															
Lane 1	5	0.0	5	0.0	1349	0.004	100	3.1	LOS A	0.0	0.0	Full	25	0.0	0.0
Approach	5	0.0	5	0.0		0.004		3.1	LOS A	0.0	0.0				
Intersection	87	15.9	87	15.9		0.047		0.2	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116 **Template: New User Report**

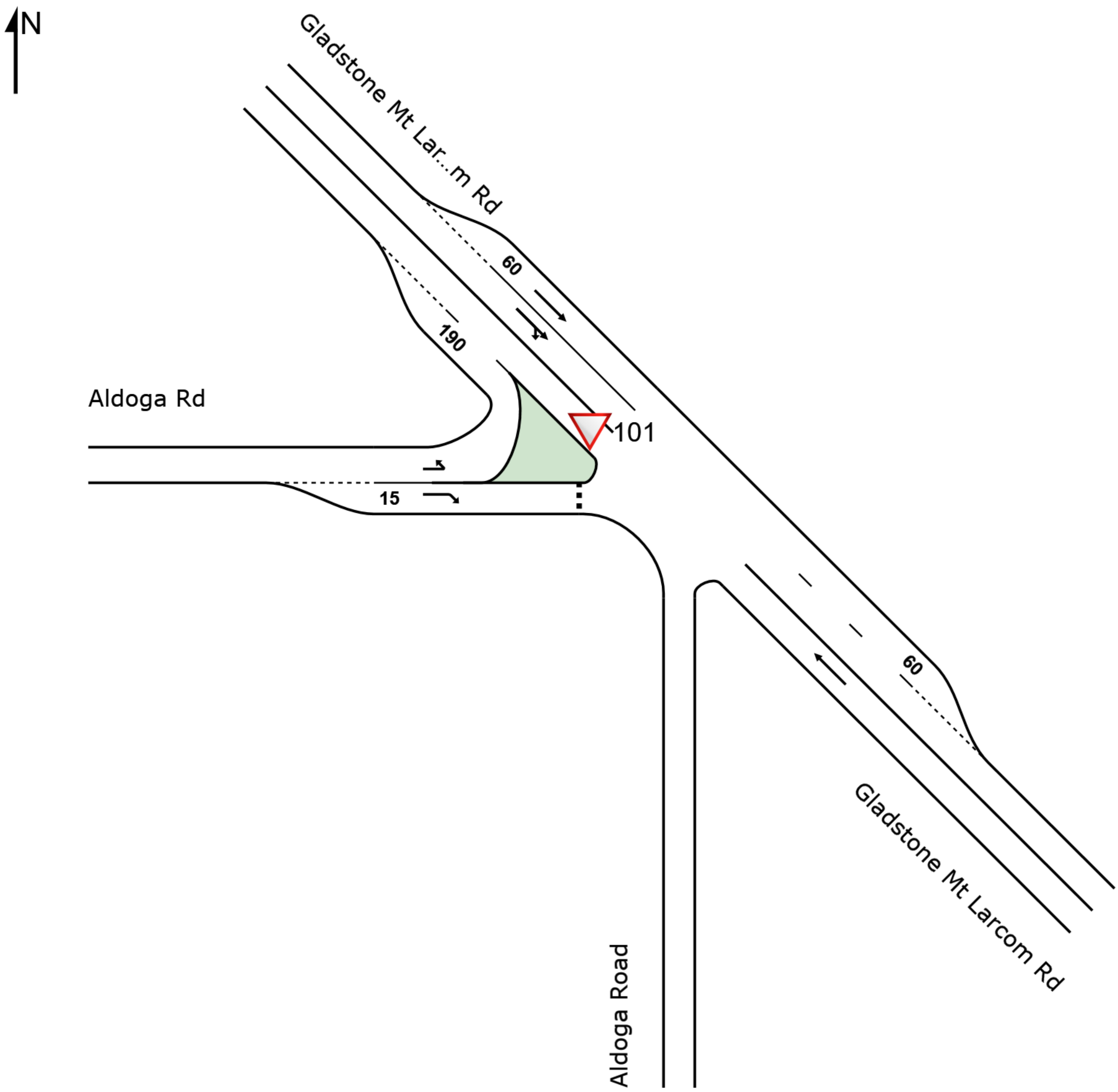
Site: 101 [2025PM - Gladstone Mt Larcom Rd - without development (Site Folder: Base case 2025 PM - without development)]

Network: 5 [2025PM - Gladstone Mt Larcom Rd - without development (Network Folder: Gladstone Mt Larcom Road - PM)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Gladstone Mt Larcom Rd														
5	T1	145	12.3	145	12.3	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		145	12.3	145	12.3	0.080	0.0	NA	0.0	0.0	0.00	0.00	0.00	100.0
NorthWest: Gladstone Mt Larcom Rd														
11	T1	140	16.5	140	16.5	0.060	0.1	LOS A	0.0	0.0	0.01	0.01	0.01	99.1
29a	R1	2	0.0	2	0.0	0.060	5.0	LOS A	0.0	0.0	0.01	0.01	0.01	97.5
Approach		142	16.3	142	16.3	0.060	0.1	NA	0.0	0.0	0.01	0.01	0.01	99.1
West: Aldoga Rd														
10b	L3	5	20.0	5	20.0	0.004	7.3	LOS A	0.0	0.0	0.00	0.56	0.00	54.1
12a	R1	49	10.6	49	10.6	0.075	7.3	LOS A	0.1	0.9	0.45	0.63	0.45	52.2
Approach		55	11.5	55	11.5	0.075	7.3	LOS A	0.1	0.9	0.41	0.62	0.41	52.4
All Vehicles		342	13.8	342	13.8	0.080	1.2	NA	0.1	0.9	0.07	0.10	0.07	86.9

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance															
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
SouthEast: Gladstone Mt Larcom Rd															
Lane 1	145	12.3	145	12.3	1824	0.080	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	145	12.3	145	12.3		0.080		0.0	NA	0.0	0.0				
NorthWest: Gladstone Mt Larcom Rd															
Lane 1	36	16.5	36	16.5	1779	0.020	34[6]	0.3	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	106	16.2	106	16.2	1777	0.060	100	0.1	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	142	16.3	142	16.3		0.060		0.1	NA	0.0	0.0				
West: Aldoga Rd															
Lane 1	5	20.0	5	20.0	1490	0.004	100	7.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	49	10.6	49	10.6	661	0.075	100	7.3	LOS A	0.1	0.9	Short	15	0.0	NA
Approach	55	11.5	55	11.5		0.075		7.3	LOS A	0.1	0.9				
Intersection	342	13.8	342	13.8		0.080		1.2	NA	0.1	0.9				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

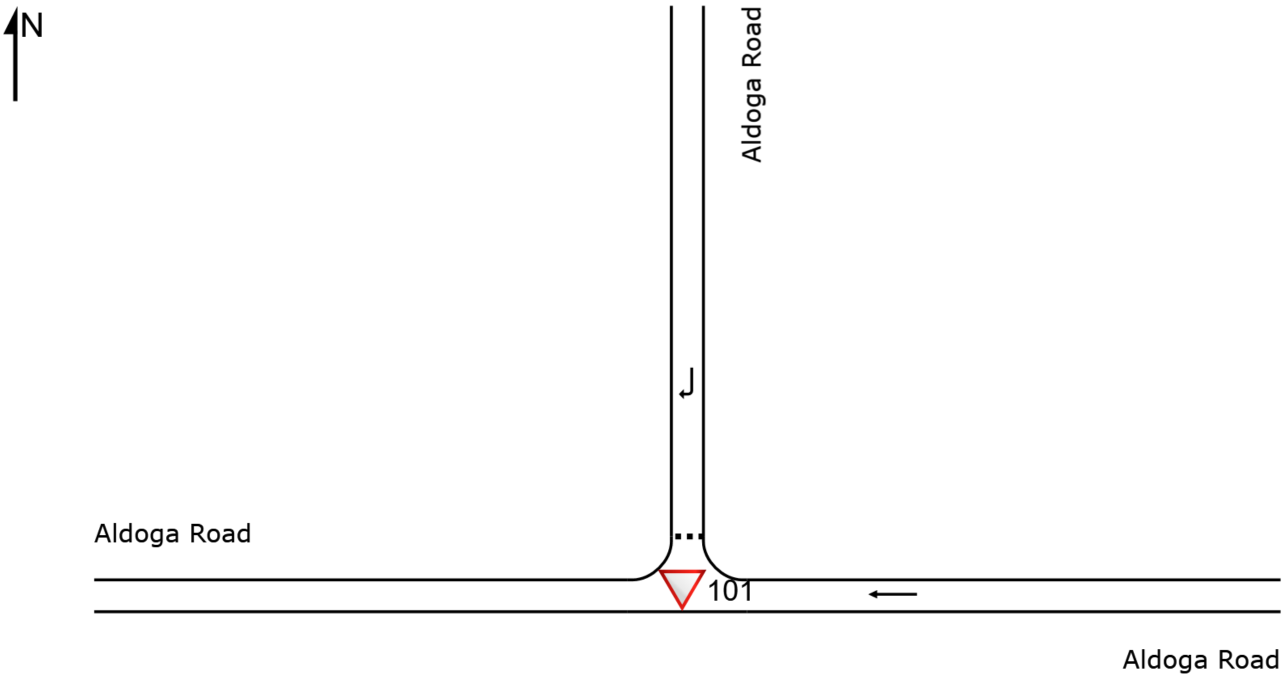
Site: 101 [2025PM - Aldoga Rd - without development (Site Folder: Base case 2025 PM - without development)]

Network: 5 [2025PM - Gladstone Mt Larcom Rd - without development (Network Folder: Gladstone Mt Larcom Road - PM)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Aldoga Road														
5	T1	13	66.7	13	66.7	0.009	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		13	66.7	13	66.7	0.009	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
North: Aldoga Road														
9	R2	2	0.0	2	0.0	0.001	2.9	LOS A	0.0	0.0	0.05	0.55	0.05	42.9
Approach		2	0.0	2	0.0	0.001	2.9	LOS A	0.0	0.0	0.05	0.55	0.05	42.9
All Vehicles		15	57.1	15	57.1	0.009	0.4	NA	0.0	0.0	0.01	0.08	0.01	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance															
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
East: Aldoga Road															
Lane 1	13	66.7	13	66.7	1360	0.009	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Approach	13	66.7	13	66.7		0.009		0.0	NA	0.0	0.0				
North: Aldoga Road															
Lane 1	2	0.0	2	0.0	1423	0.001	100	2.9	LOS A	0.0	0.0	Full	25	0.0	0.0
Approach	2	0.0	2	0.0		0.001		2.9	LOS A	0.0	0.0				
Intersection	15	57.1	15	57.1		0.009		0.4	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116 | **Template: New User Report**

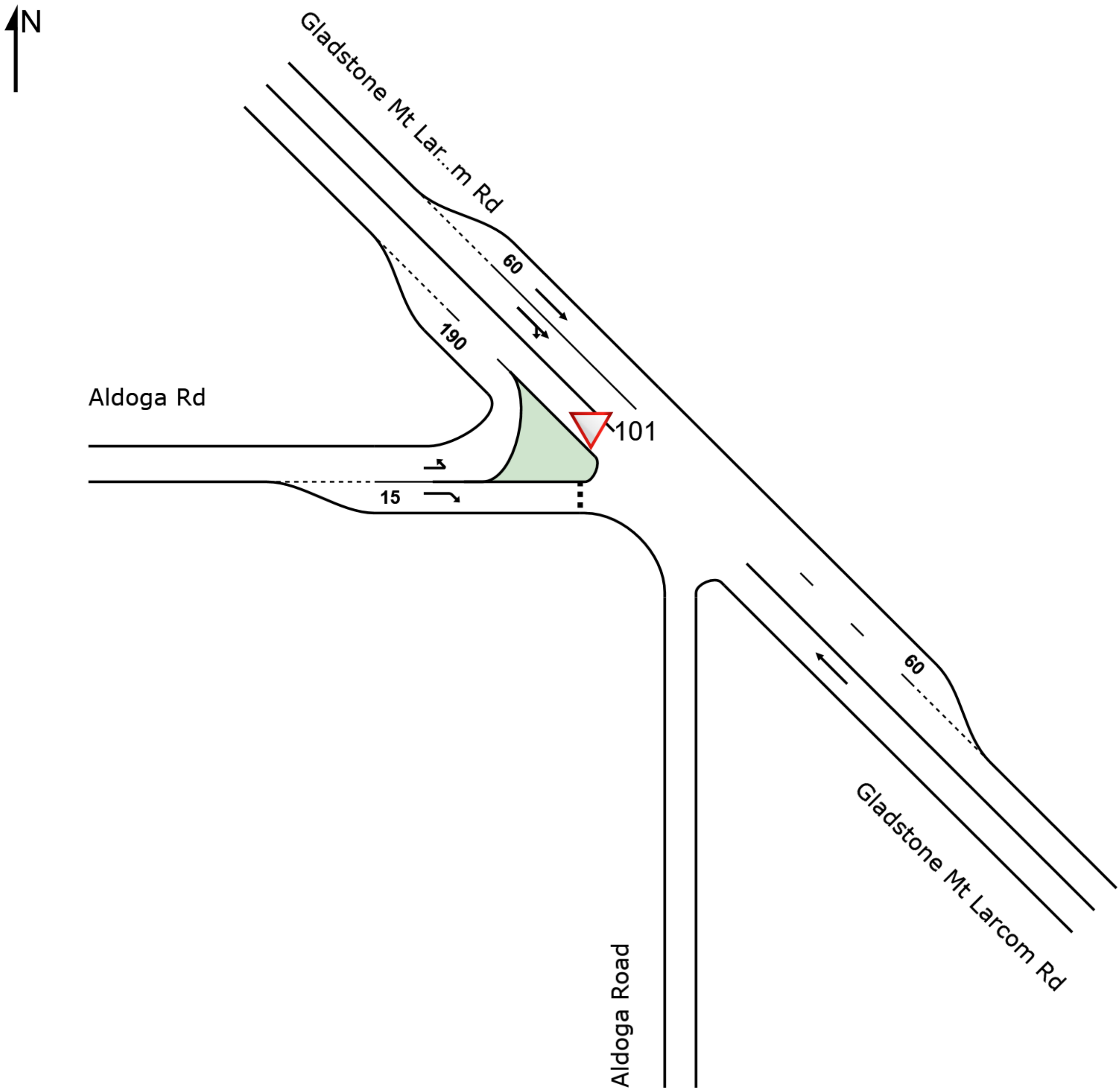
Site: 101 [2025PM - Gladstone Mt Larcom Rd - without development (Site Folder: Base case 2025 PM - without development)]

Network: 9 [2035PM - Gladstone Mt Larcom Rd - without development - 1.87% (Network Folder: Gladstone Mt Larcom Road - PM)]

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Gladstone Mt Larcom Rd														
5	T1	175	12.3	175	12.3	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		175	12.3	175	12.3	0.096	0.0	NA	0.0	0.0	0.00	0.00	0.00	100.0
NorthWest: Gladstone Mt Larcom Rd														
11	T1	168	16.5	168	16.5	0.072	0.1	LOS A	0.0	0.1	0.01	0.01	0.01	99.0
29a	R1	3	0.0	3	0.0	0.072	5.1	LOS A	0.0	0.1	0.01	0.01	0.01	97.5
Approach		171	16.3	171	16.3	0.072	0.2	NA	0.0	0.1	0.01	0.01	0.01	99.0
West: Aldoga Rd														
10b	L3	6	20.0	6	20.0	0.004	7.3	LOS A	0.0	0.0	0.00	0.56	0.00	54.1
12a	R1	60	10.6	60	10.6	0.099	8.0	LOS A	0.2	1.2	0.50	0.68	0.50	51.7
Approach		66	11.5	66	11.5	0.099	8.0	LOS A	0.2	1.2	0.45	0.67	0.45	51.9
All Vehicles		412	13.8	412	13.8	0.099	1.4	NA	0.2	1.2	0.08	0.11	0.08	86.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance															
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
SouthEast: Gladstone Mt Larcom Rd															
Lane 1	175	12.3	175	12.3	1824	0.096	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	175	12.3	175	12.3		0.096		0.0	NA	0.0	0.0				
NorthWest: Gladstone Mt Larcom Rd															
Lane 1	44	16.5	44	16.5	1779	0.025	34[6]	0.3	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	127	16.2	127	16.2	1776	0.072	100	0.1	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	171	16.3	171	16.3		0.072		0.2	NA	0.0	0.1				
West: Aldoga Rd															
Lane 1	6	20.0	6	20.0	1490	0.004	100	7.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	60	10.6	60	10.6	603	0.099	100	8.0	LOS A	0.2	1.2	Short	15	0.0	NA
Approach	66	11.5	66	11.5		0.099		8.0	LOS A	0.2	1.2				
Intersection	412	13.8	412	13.8		0.099		1.4	NA	0.2	1.2				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

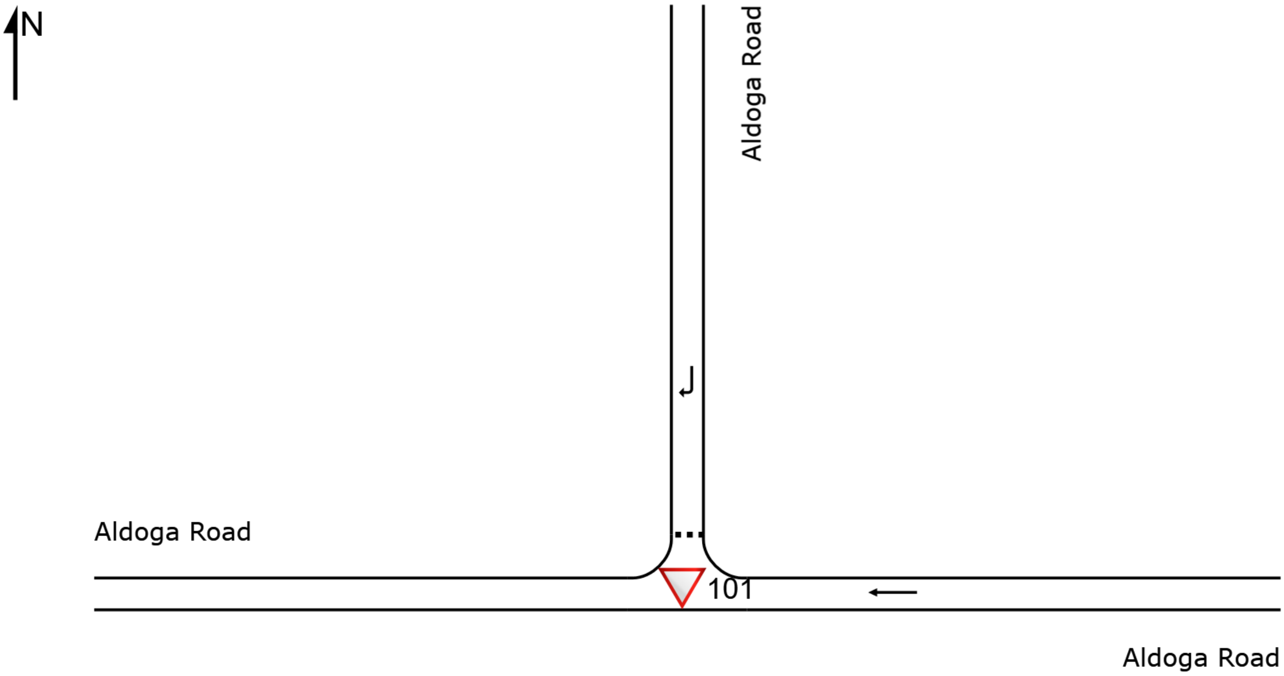
Site: 101 [2025PM - Aldoga Rd - without development (Site Folder: Base case 2025 PM - without development)]

Network: 9 [2035PM - Gladstone Mt Larcom Rd - without development - 1.87% (Network Folder: Gladstone Mt Larcom Road - PM)]

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Aldoga Road														
5	T1	15	66.7	15	66.7	0.011	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		15	66.7	15	66.7	0.011	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
North: Aldoga Road														
9	R2	3	0.0	3	0.0	0.002	2.9	LOS A	0.0	0.0	0.06	0.55	0.06	42.9
Approach		3	0.0	3	0.0	0.002	2.9	LOS A	0.0	0.0	0.06	0.55	0.06	42.9
All Vehicles		18	57.1	18	57.1	0.011	0.4	NA	0.0	0.0	0.01	0.08	0.01	57.7

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance																
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
East: Aldoga Road															
Lane 1	15	66.7	15	66.7	1360	0.011	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Approach	15	66.7	15	66.7		0.011		0.0	NA	0.0	0.0				
North: Aldoga Road															
Lane 1	3	0.0	3	0.0	1419	0.002	100	2.9	LOS A	0.0	0.0	Full	25	0.0	0.0
Approach	3	0.0	3	0.0		0.002		2.9	LOS A	0.0	0.0				
Intersection	18	57.1	18	57.1		0.011		0.4	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Lane LOS values are based on average delay per lane.

Minor Road Approach LOS values are based on average delay for all lanes.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116

Template: New User Report

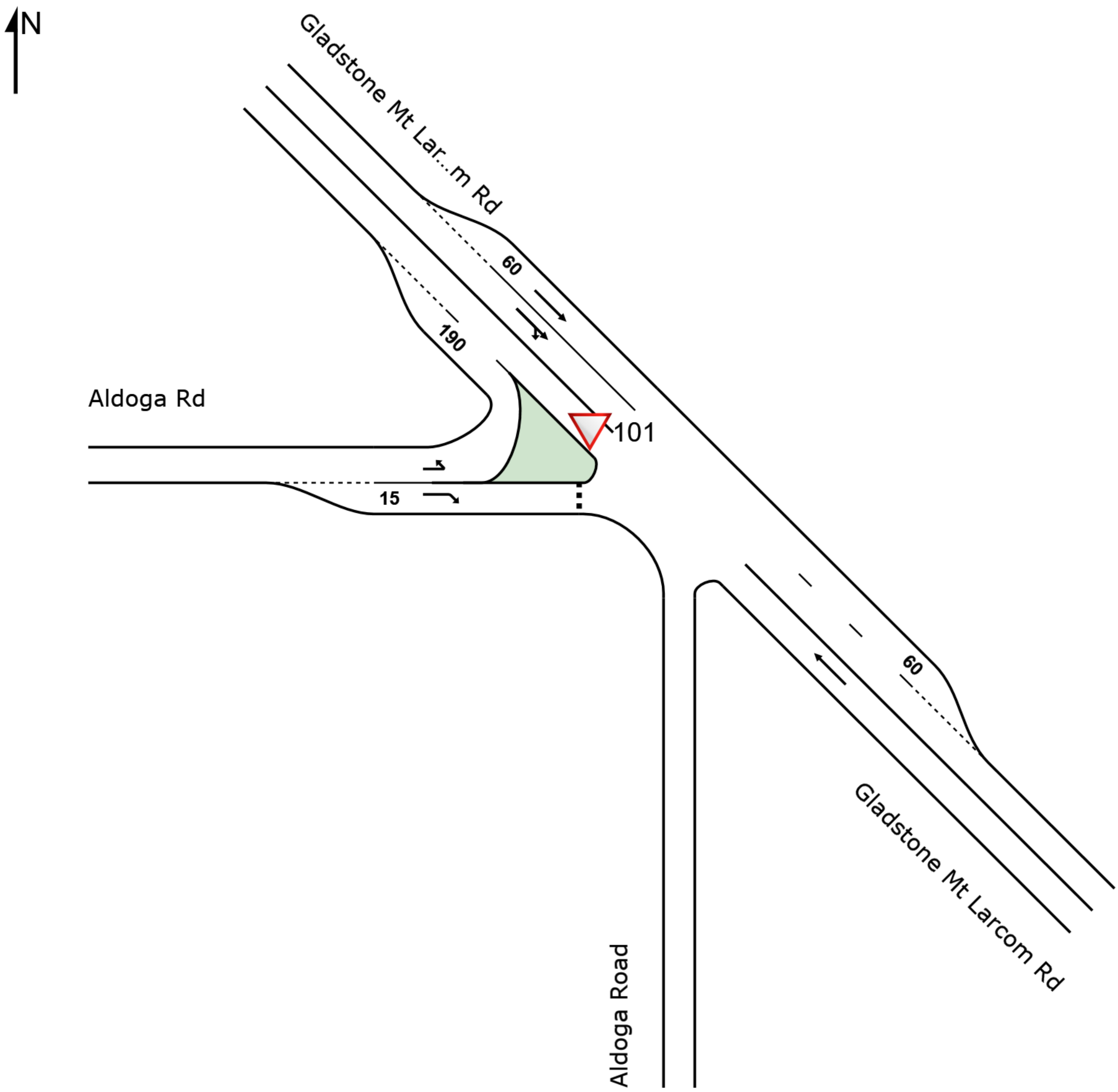
Site: 101 [2025PM - Gladstone Mt Larcom Rd - with development (Site Folder: Base case 2025 PM - with development)]

Network: 7 [2025PM - Gladstone Mt Larcom Rd - with development (Network Folder: Gladstone Mt Larcom Road - PM)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance

Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Gladstone Mt Larcom Rd														
5	T1	145	12.3	145	12.3	0.080	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		145	12.3	145	12.3	0.080	0.0	NA	0.0	0.0	0.00	0.00	0.00	100.0
NorthWest: Gladstone Mt Larcom Rd														
11	T1	140	16.5	140	16.5	0.060	0.1	LOS A	0.0	0.1	0.02	0.02	0.02	98.2
29a	R1	4	0.0	4	0.0	0.060	5.0	LOS A	0.0	0.1	0.02	0.02	0.02	95.3
Approach		144	16.1	144	16.1	0.060	0.2	NA	0.0	0.1	0.02	0.02	0.02	98.1
West: Aldoga Rd														
10b	L3	7	14.3	7	14.3	0.005	7.2	LOS A	0.0	0.0	0.00	0.57	0.00	54.3
12a	R1	73	13.0	73	13.0	0.112	7.5	LOS A	0.2	1.4	0.46	0.65	0.46	52.0
Approach		80	13.2	80	13.2	0.112	7.5	LOS A	0.2	1.4	0.42	0.64	0.42	52.2
All Vehicles		369	14.0	369	14.0	0.112	1.7	NA	0.2	1.4	0.10	0.15	0.10	82.8

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance															
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
SouthEast: Gladstone Mt Larcom Rd															
Lane 1	145	12.3	145	12.3	1824	0.080	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	145	12.3	145	12.3		0.080		0.0	NA	0.0	0.0				
NorthWest: Gladstone Mt Larcom Rd															
Lane 1	37	16.5	37	16.5	1779	0.021	34[6]	0.3	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	107	15.9	107	15.9	1775	0.060	100	0.2	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	144	16.1	144	16.1		0.060		0.2	NA	0.0	0.1				
West: Aldoga Rd															
Lane 1	7	14.3	7	14.3	1541	0.005	100	7.2	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	73	13.0	73	13.0	649	0.112	100	7.5	LOS A	0.2	1.4	Short	15	0.0	NA
Approach	80	13.2	80	13.2		0.112		7.5	LOS A	0.2	1.4				
Intersection	369	14.0	369	14.0		0.112		1.7	NA	0.2	1.4				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

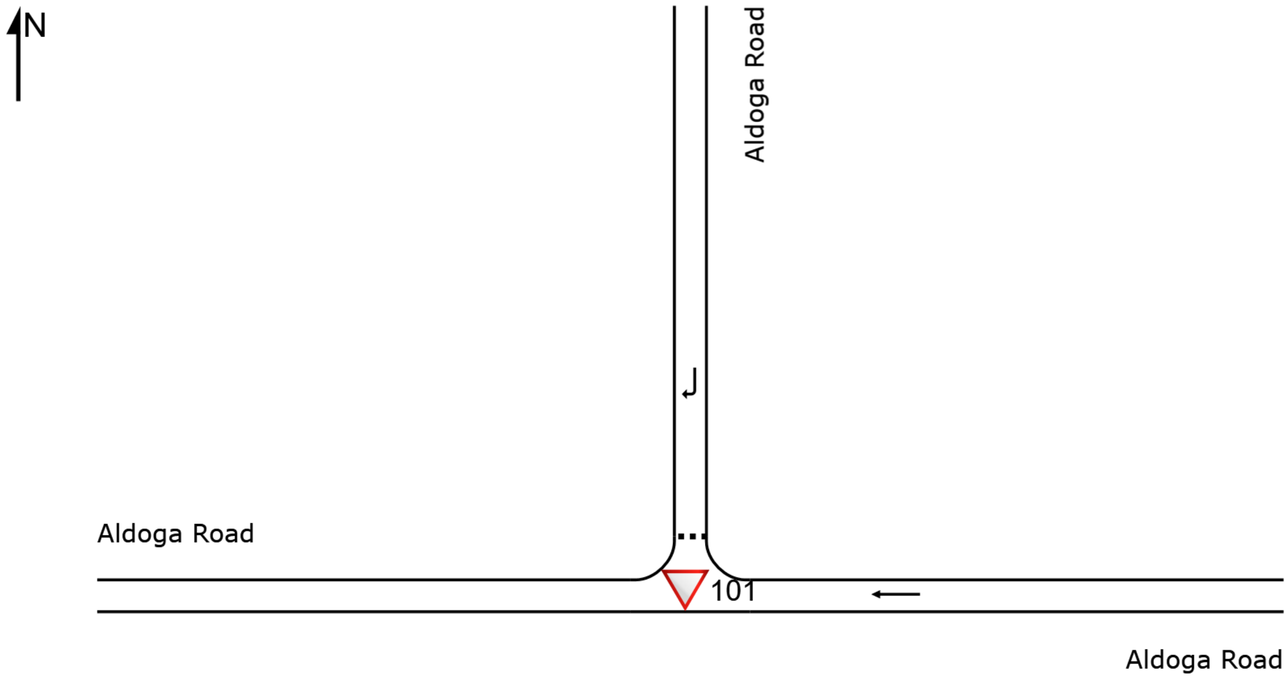
Site: 101 [2025PM - Aldoga Rd - with development (Site Folder: Base case 2025 PM - with development)]

Network: 7 [2025PM - Gladstone Mt Larcom Rd - with development (Network Folder: Gladstone Mt Larcom Road - PM)]

New Site
Site Category: (None)
Give-Way (Two-Way)

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Aldoga Road														
5	T1	36	35.3	36	35.3	0.023	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		36	35.3	36	35.3	0.023	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
North: Aldoga Road														
9	R2	4	0.0	4	0.0	0.003	3.0	LOS A	0.0	0.0	0.09	0.54	0.09	42.8
Approach		4	0.0	4	0.0	0.003	3.0	LOS A	0.0	0.0	0.09	0.54	0.09	42.8
All Vehicles		40	31.6	40	31.6	0.023	0.3	NA	0.0	0.0	0.01	0.06	0.01	58.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance																
	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total	HV]	[Total	HV]						[Veh	Dist]				
	veh/h	%	veh/h	%	veh/h	v/c	%	sec			m		m	%	%
East: Aldoga Road															
Lane 1	36	35.3	36	35.3	1586	0.023	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Approach	36	35.3	36	35.3		0.023		0.0	NA	0.0	0.0				
North: Aldoga Road															
Lane 1	4	0.0	4	0.0	1397	0.003	100	3.0	LOS A	0.0	0.0	Full	25	0.0	0.0
Approach	4	0.0	4	0.0		0.003		3.0	LOS A	0.0	0.0				
Intersection	40	31.6	40	31.6		0.023		0.3	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK SITE

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116

Template: New User Report

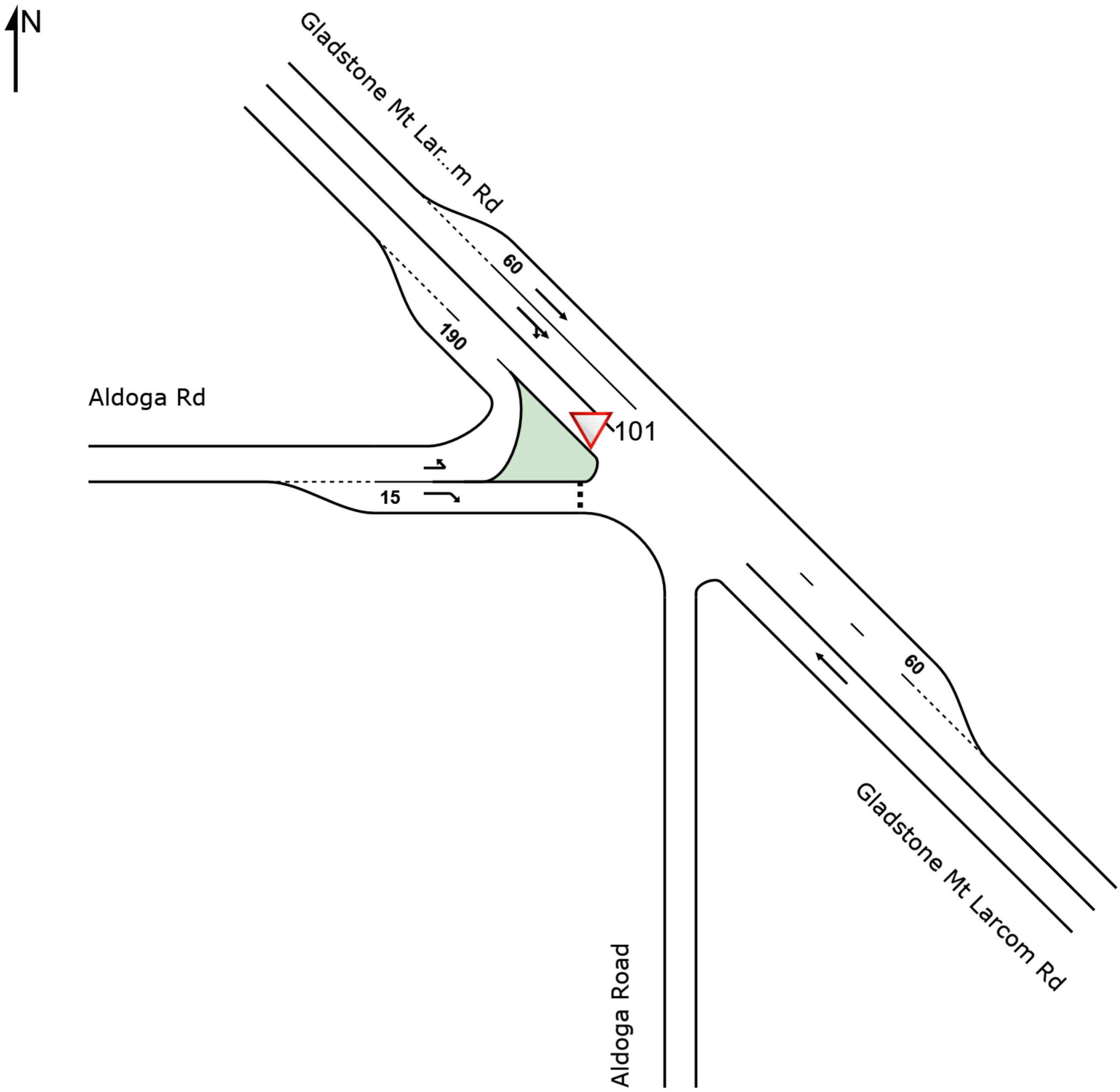
Site: 101 [2025PM - Gladstone Mt Larcom Rd - with development (Site Folder: Base case 2025 PM - with development)]

Network: 8 [2035PM - Gladstone Mt Larcom Rd - with development - 1.87% (Network Folder: Gladstone Mt Larcom Road - PM)]

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
SouthEast: Gladstone Mt Larcom Rd														
5	T1	175	12.3	175	12.3	0.096	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	100.0
Approach		175	12.3	175	12.3	0.096	0.0	NA	0.0	0.0	0.00	0.00	0.00	100.0
NorthWest: Gladstone Mt Larcom Rd														
11	T1	168	16.5	168	16.5	0.073	0.1	LOS A	0.0	0.1	0.02	0.02	0.02	98.2
29a	R1	5	0.0	5	0.0	0.073	5.1	LOS A	0.0	0.1	0.03	0.02	0.03	95.2
Approach		174	16.1	174	16.1	0.073	0.3	NA	0.0	0.1	0.02	0.02	0.02	98.1
West: Aldoga Rd														
10b	L3	9	14.3	9	14.3	0.006	7.3	LOS A	0.0	0.0	0.00	0.57	0.00	54.3
12a	R1	87	13.0	87	13.0	0.148	8.4	LOS A	0.2	1.8	0.51	0.71	0.51	51.4
Approach		96	13.2	96	13.2	0.148	8.3	LOS A	0.2	1.8	0.47	0.69	0.47	51.6
All Vehicles		445	14.0	445	14.0	0.148	1.9	NA	0.2	1.8	0.11	0.16	0.11	82.5

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance

	DEMAND FLOWS		ARRIVAL FLOWS		Cap.	Deg. Satn	Lane Util.	Aver. Delay	Level of Service	AVERAGE BACK OF QUEUE		Lane Config	Lane Length	Cap. Adj.	Prob. Block.
	[Total veh/h	HV] %	[Total veh/h	HV] %	veh/h	v/c	%	sec		[Veh	Dist] m		m	%	%
SouthEast: Gladstone Mt Larcom Rd															
Lane 1	175	12.3	175	12.3	1824	0.096	100	0.0	LOS A	0.0	0.0	Full	500	0.0	0.0
Approach	175	12.3	175	12.3		0.096		0.0	NA	0.0	0.0				
NorthWest: Gladstone Mt Larcom Rd															
Lane 1	44	16.5	44	16.5	1779	0.025	34[6]	0.4	LOS A	0.0	0.0	Short	60	0.0	NA
Lane 2	129	15.9	129	15.9	1773	0.073	100	0.2	LOS A	0.0	0.1	Full	500	0.0	0.0
Approach	174	16.1	174	16.1		0.073		0.3	NA	0.0	0.1				
West: Aldoga Rd															
Lane 1	9	14.3	9	14.3	1541	0.006	100	7.3	LOS A	0.0	0.0	Full	500	0.0	0.0
Lane 2	87	13.0	87	13.0	590	0.148	100	8.4	LOS A	0.2	1.8	Short	15	0.0	NA
Approach	96	13.2	96	13.2		0.148		8.3	LOS A	0.2	1.8				
Intersection	445	14.0	445	14.0		0.148		1.9	NA	0.2	1.8				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

6 Lane under-utilisation due to downstream effects

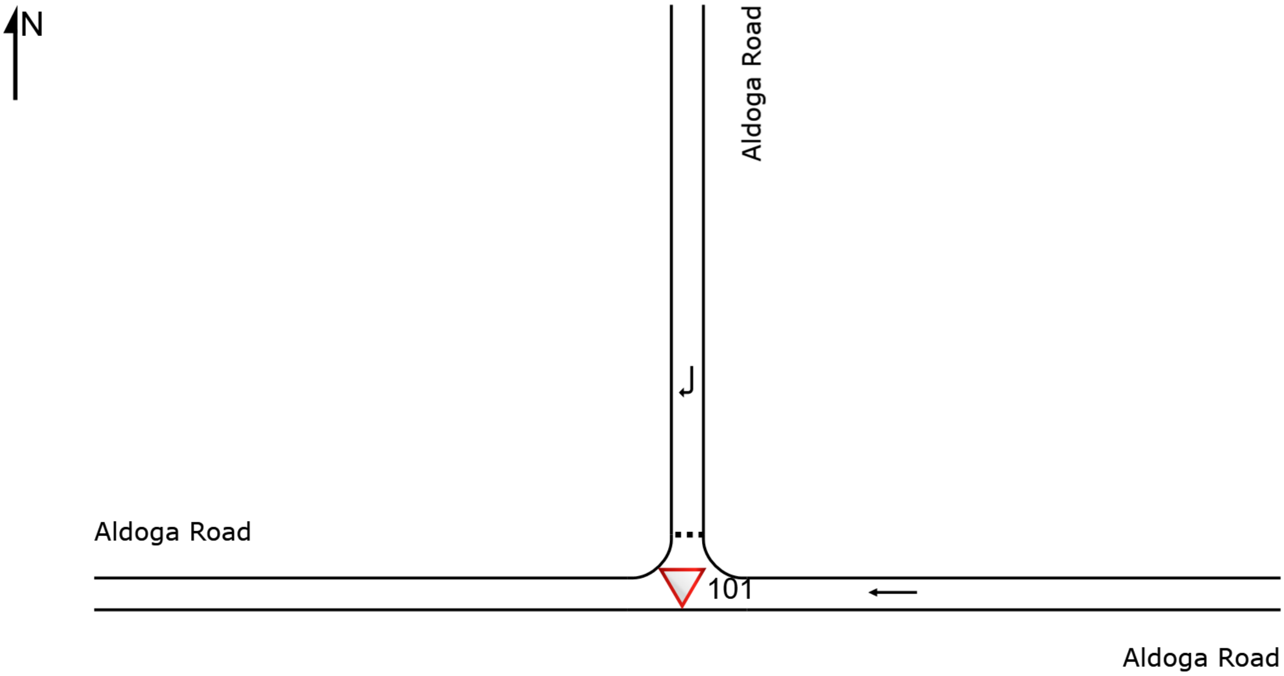
Site: 101 [2025PM - Aldoga Rd - with development (Site Folder: Base case 2025 PM - with development)]

Network: 8 [2035PM - Gladstone Mt Larcom Rd - with development - 1.87% (Network Folder: Gladstone Mt Larcom Road - PM)]

New Site
Site Category: (None)
Give-Way (Two-Way)
Design Life Analysis (Final Year): Results for 10 years

Site Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Vehicle Movement Performance														
Mov ID	Turn	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Deg. Satn v/c	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh. veh	Dist] m	Prop. Que	Effective Stop Rate	Aver. No. Cycles	Aver. Speed km/h
East: Aldoga Road														
5	T1	43	35.3	43	35.3	0.027	0.0	LOS A	0.0	0.0	0.00	0.00	0.00	60.0
Approach		43	35.3	43	35.3	0.027	0.0	NA	0.0	0.0	0.00	0.00	0.00	60.0
North: Aldoga Road														
9	R2	5	0.0	5	0.0	0.004	3.0	LOS A	0.0	0.0	0.10	0.54	0.10	42.7
Approach		5	0.0	5	0.0	0.004	3.0	LOS A	0.0	0.0	0.10	0.54	0.10	42.7
All Vehicles		48	31.6	48	31.6	0.027	0.3	NA	0.0	0.0	0.01	0.06	0.01	58.3

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).

Vehicle movement LOS values are based on average delay per movement.

Minor Road Approach LOS values are based on average delay for all vehicle movements.

NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road movements.

Delay Model: SIDRA Standard (Geometric Delay is included).

Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).

HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

Lane Use and Performance

	DEMAND FLOWS [Total veh/h	HV] %	ARRIVAL FLOWS [Total veh/h	HV] %	Cap. veh/h	Deg. Satn v/c	Lane Util. %	Aver. Delay sec	Level of Service	AVERAGE BACK OF QUEUE [Veh	Dist] m	Lane Config	Lane Length m	Cap. Adj. %	Prob. Block. %
East: Aldoga Road															
Lane 1	43	35.3	43	35.3	1586	0.027	100	0.0	LOS A	0.0	0.0	Full	150	0.0	0.0
Approach	43	35.3	43	35.3		0.027		0.0	NA	0.0	0.0				
North: Aldoga Road															
Lane 1	5	0.0	5	0.0	1388	0.004	100	3.0	LOS A	0.0	0.0	Full	25	0.0	0.0
Approach	5	0.0	5	0.0		0.004		3.0	LOS A	0.0	0.0				
Intersection	48	31.6	48	31.6		0.027		0.3	NA	0.0	0.0				

Site Level of Service (LOS) Method: Delay (SIDRA). Site LOS Method is specified in the Network Data dialog (Network tab).
Lane LOS values are based on average delay per lane.
Minor Road Approach LOS values are based on average delay for all lanes.
NA: Intersection LOS and Major Road Approach LOS values are Not Applicable for two-way sign control since the average delay is not a good LOS measure due to zero delays associated with major road lanes.
Delay Model: SIDRA Standard (Geometric Delay is included).
Gap-Acceptance Capacity: SIDRA Standard (Akçelik M3D).
HV (%) values are calculated for All Movement Classes of All Heavy Vehicle Model Designation.

USER REPORT FOR NETWORK

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116

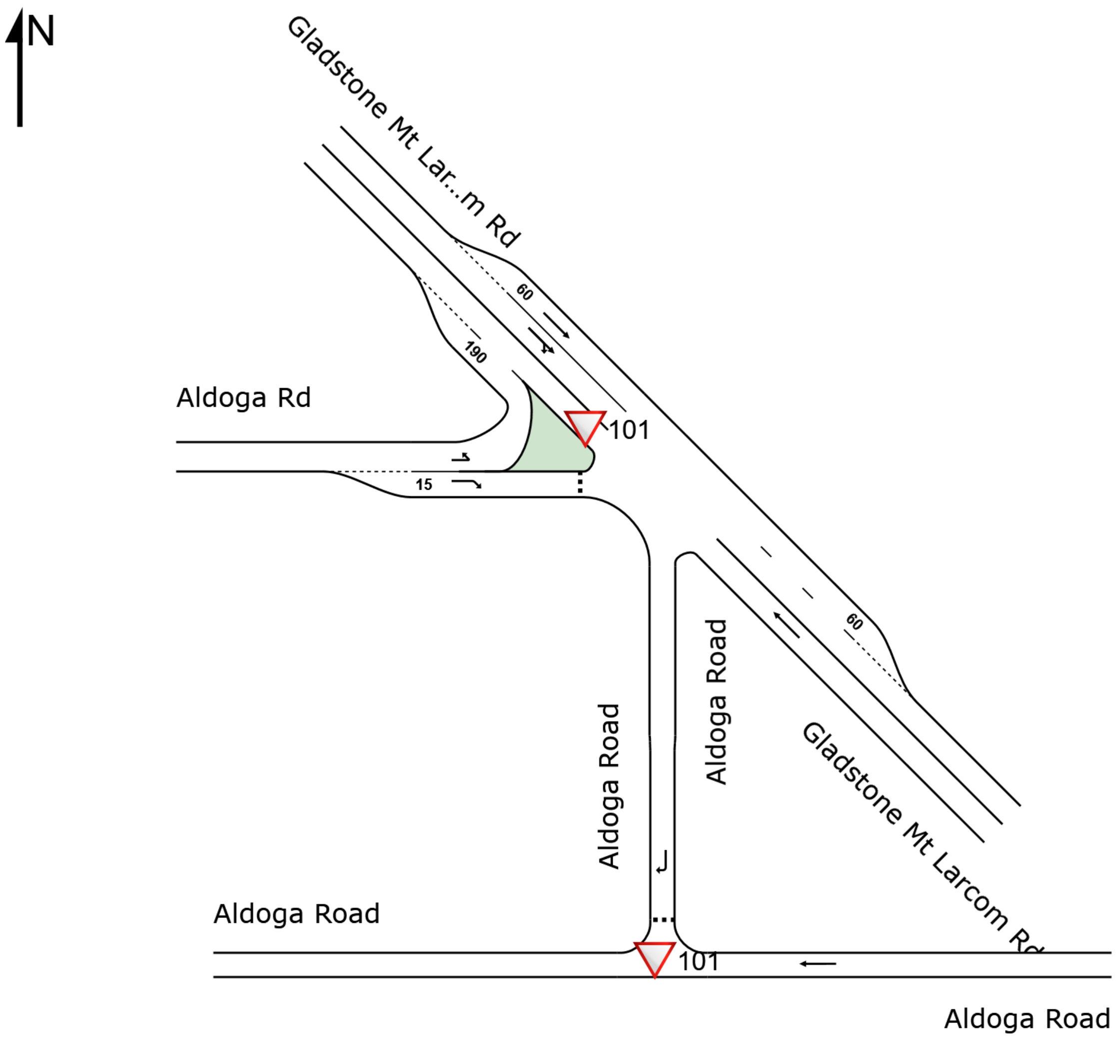
Template: New User Report

Network: N101 [2025AM - Gladstone Mt Larcom Rd - with development (Network Folder: Gladstone Mt Larcom Road - AM)]

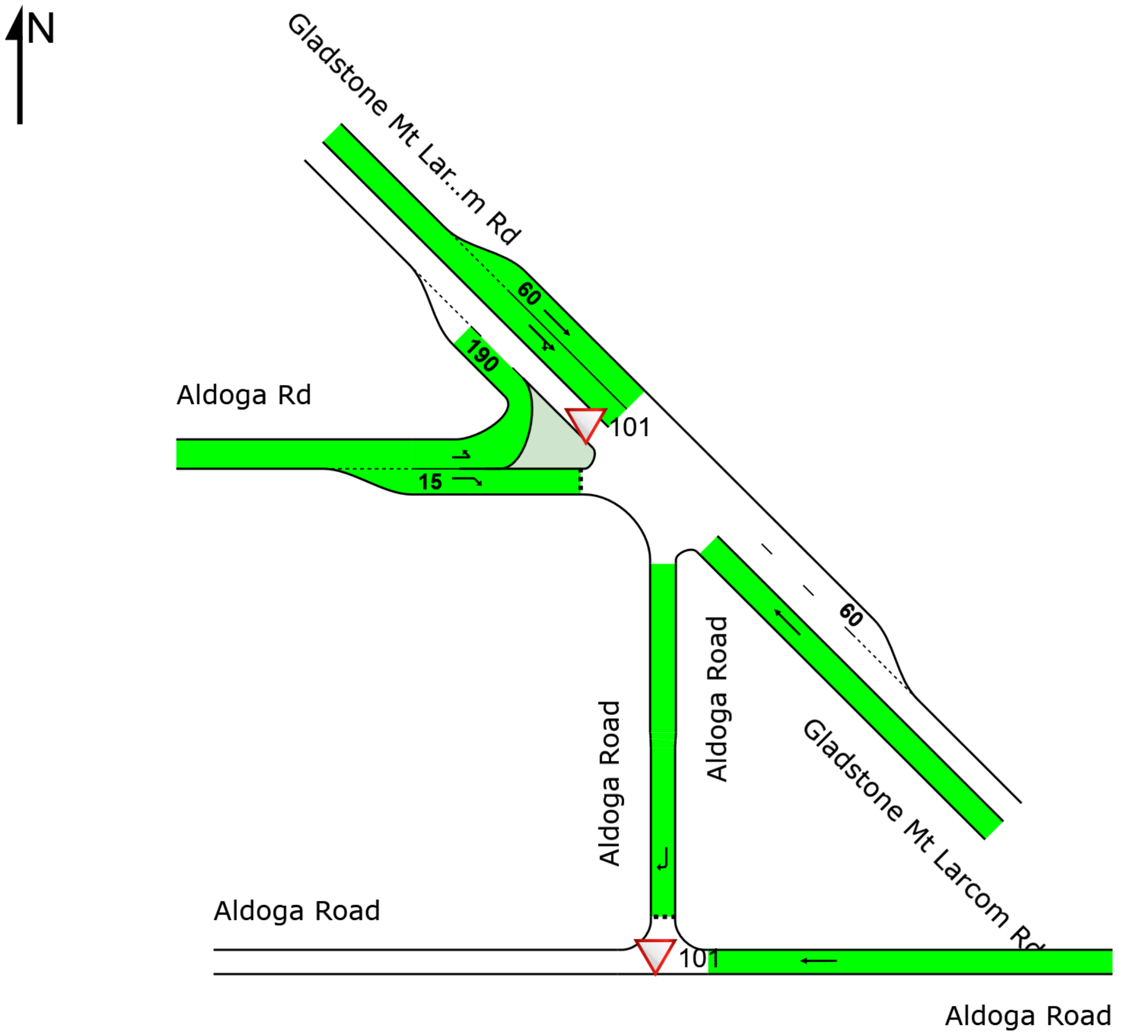
New Network
Network Category: (None)

Network Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



Capacity Reduction



Colour code based on Percentage Capacity Reduction

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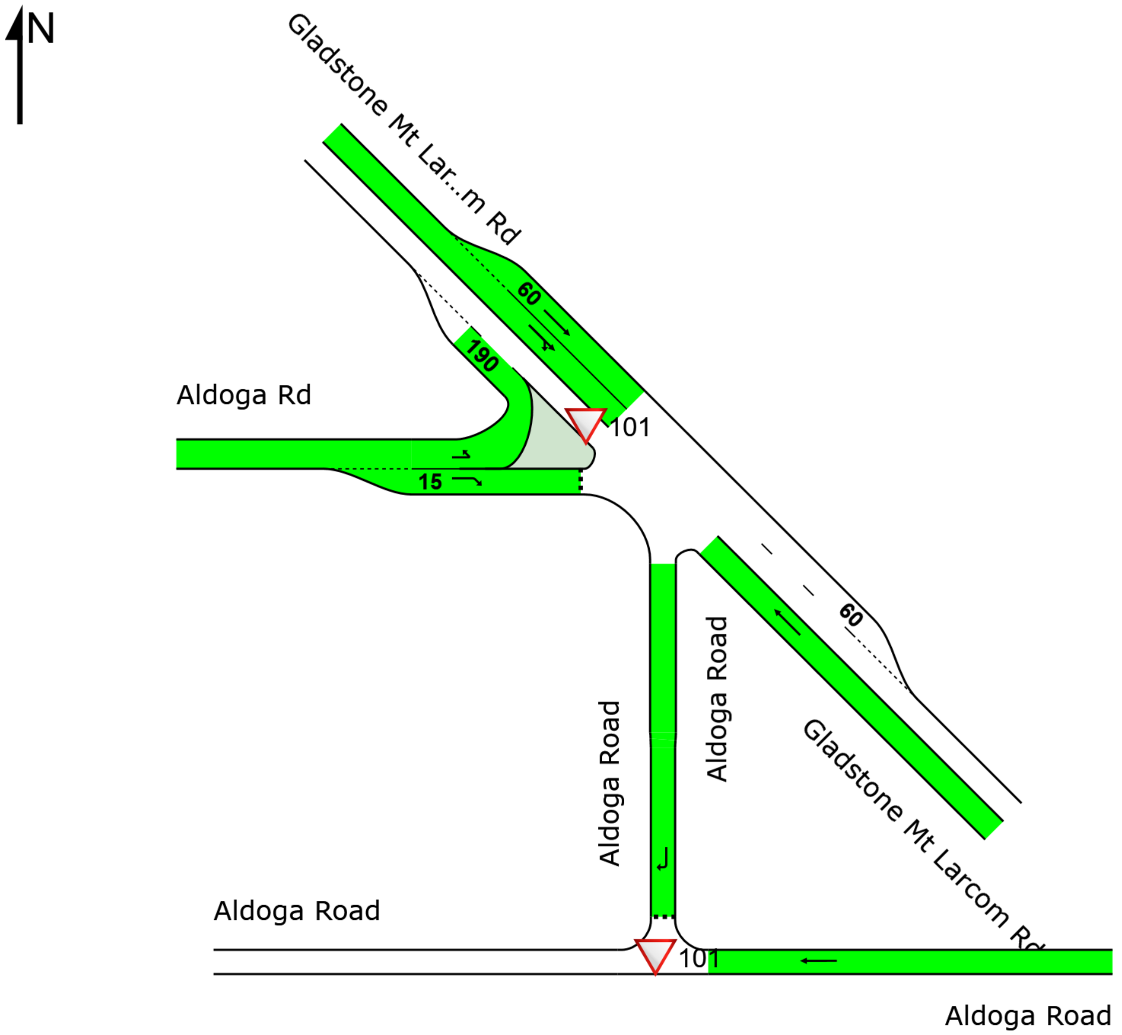
Degree of Saturation



Colour code based on Degree of Saturation

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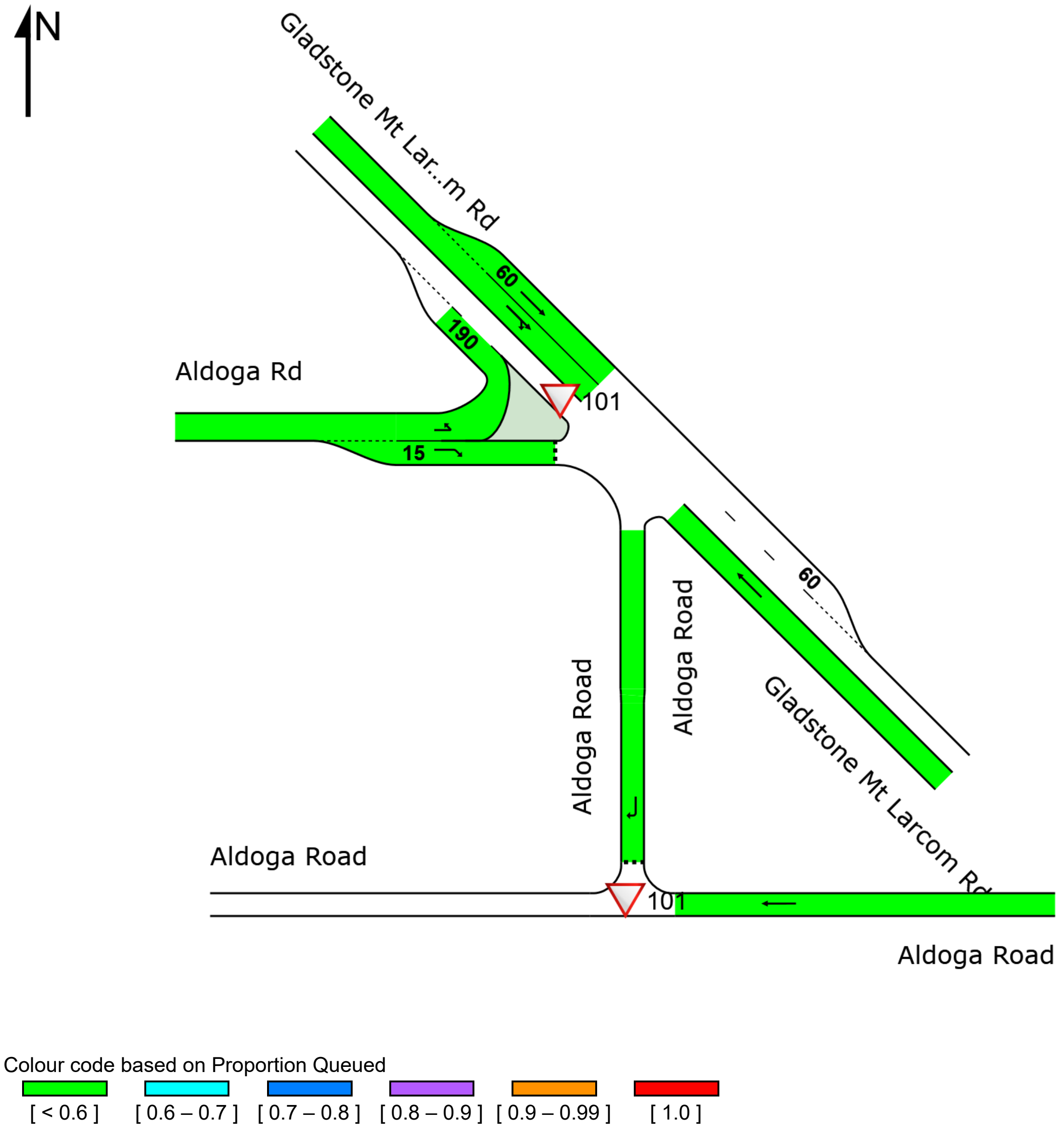
Proportion Queued



USER REPORT FOR NETWORK

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116 **Template: New User Report**

Network: N101 [2025AM - Gladstone Mt Larcom Rd - without development (Network Folder: Gladstone Mt Larcom Road - AM)]

New Network
Network Category: (None)

Network Layout

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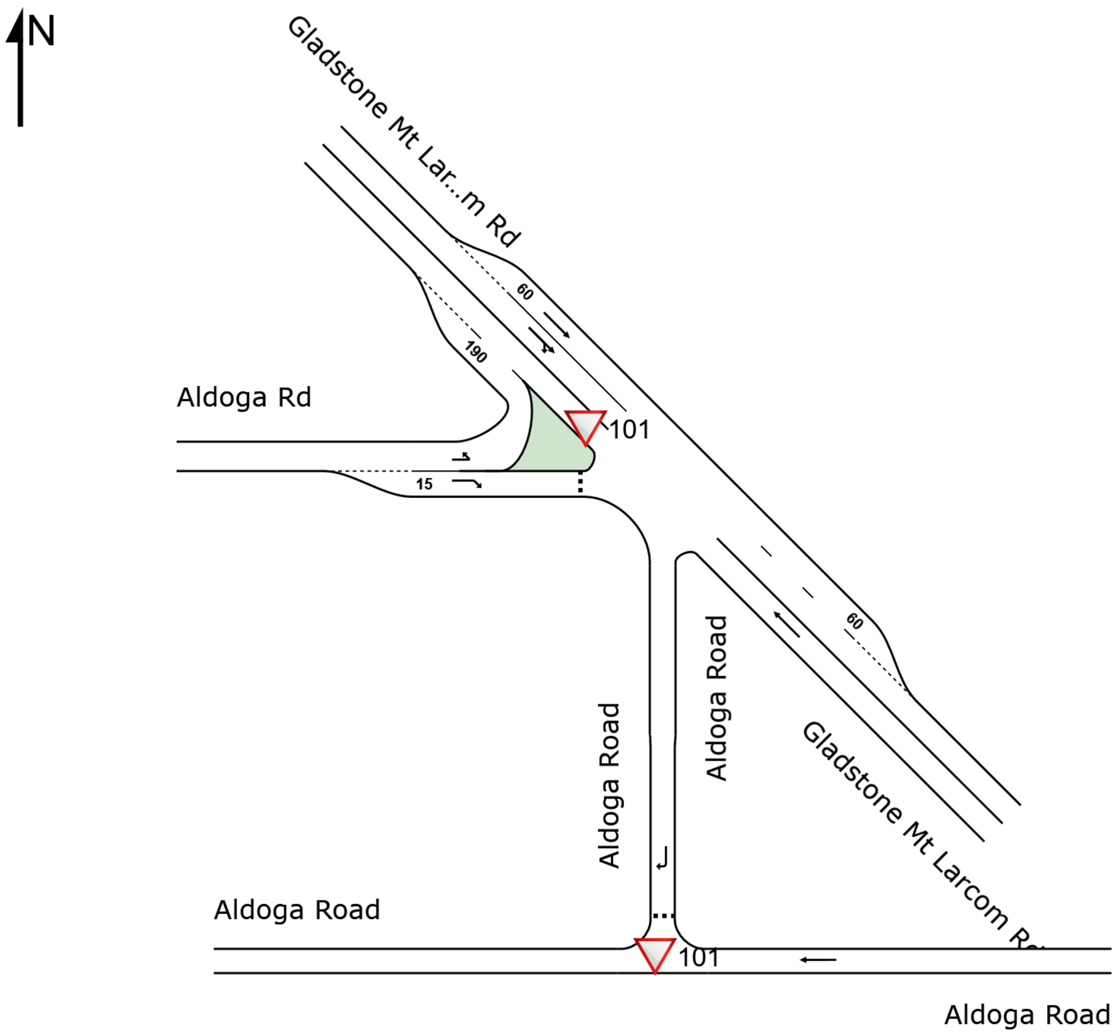

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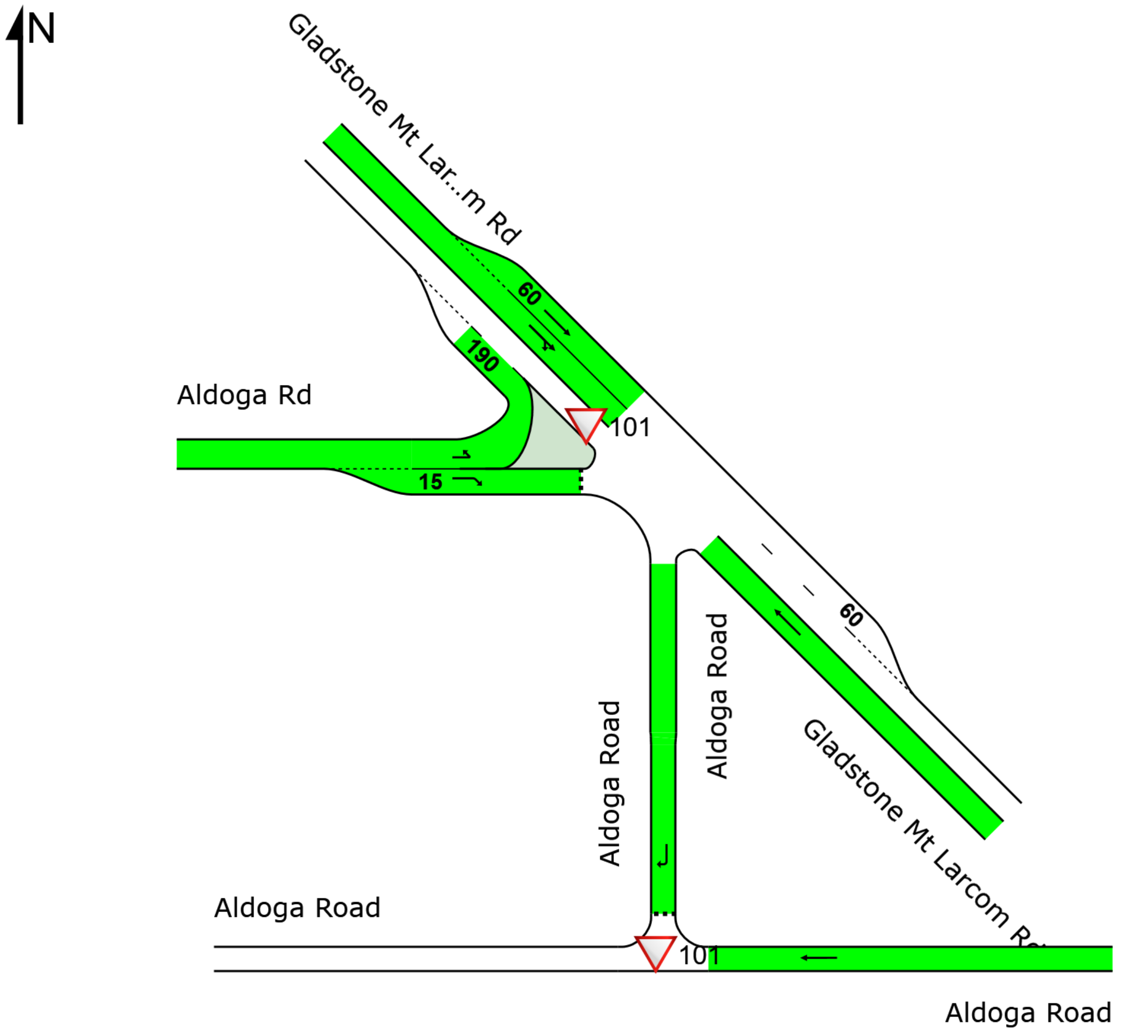

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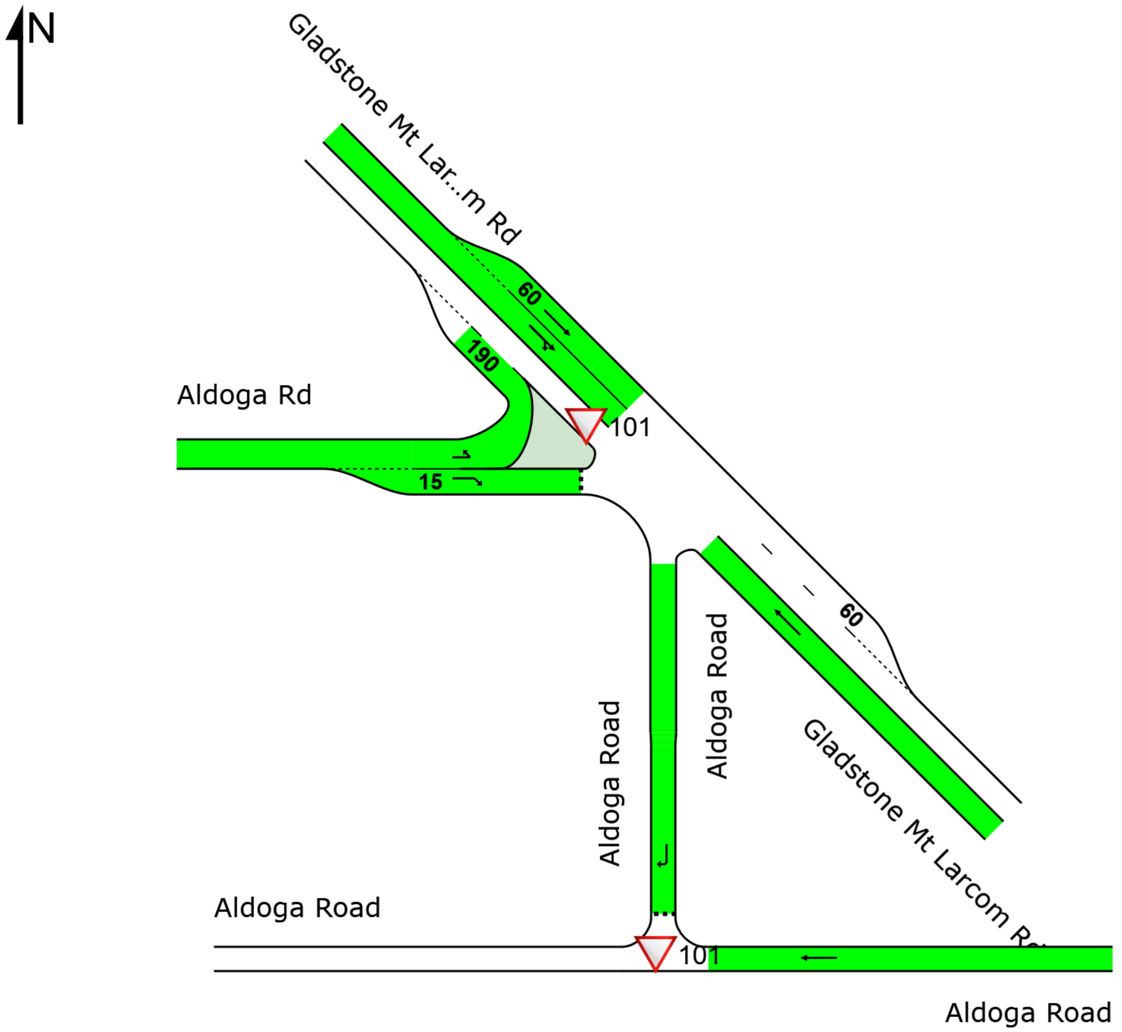
Degree of Saturation



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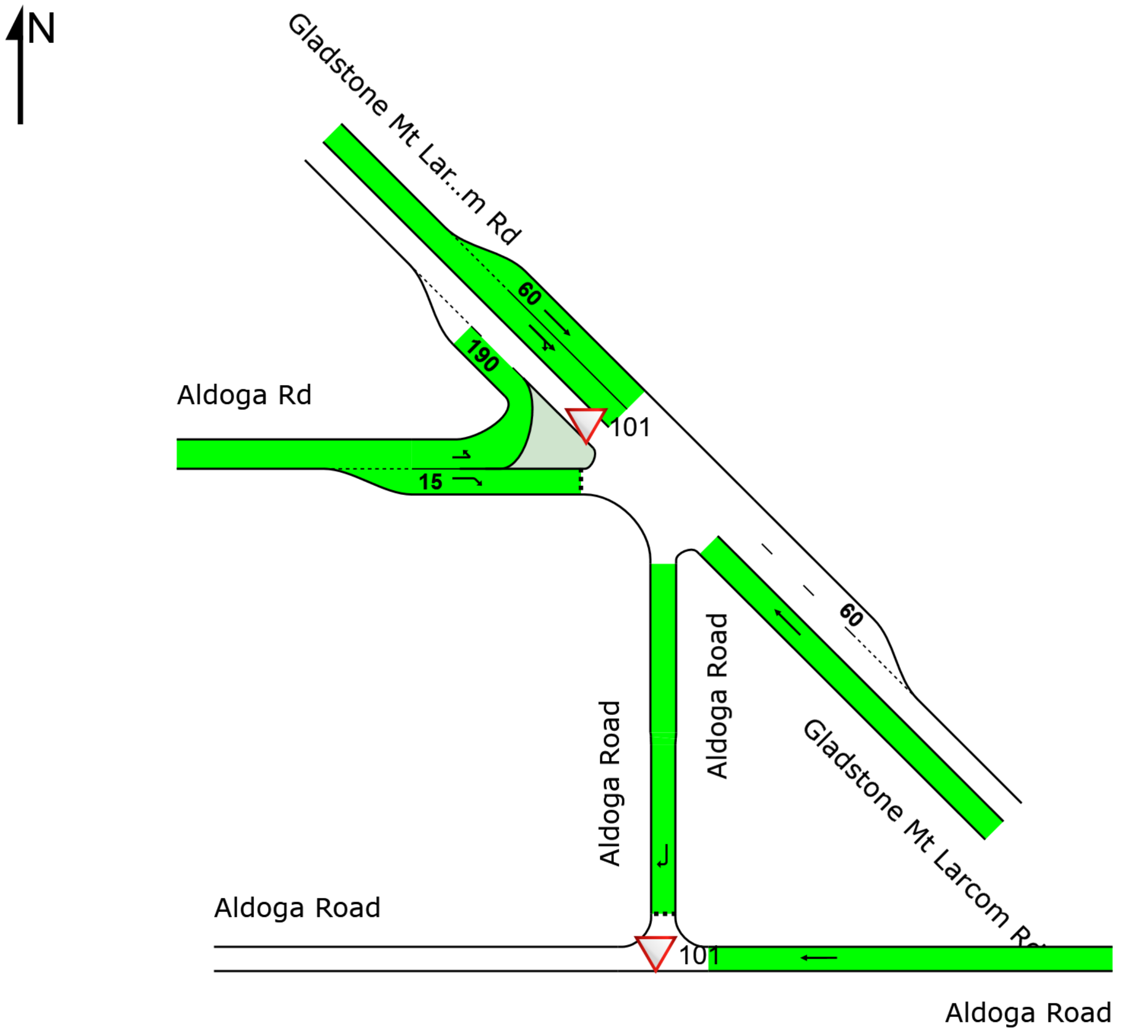
Proportion Queued



Colour code based on Proportion Queued

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USER REPORT FOR NETWORK

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116 **Template: New User Report**

Network: N101 [2025PM - Gladstone Mt Larcom Rd - with development (Network Folder: Gladstone Mt Larcom Road - PM)]

New Network
Network Category: (None)

Network Layout

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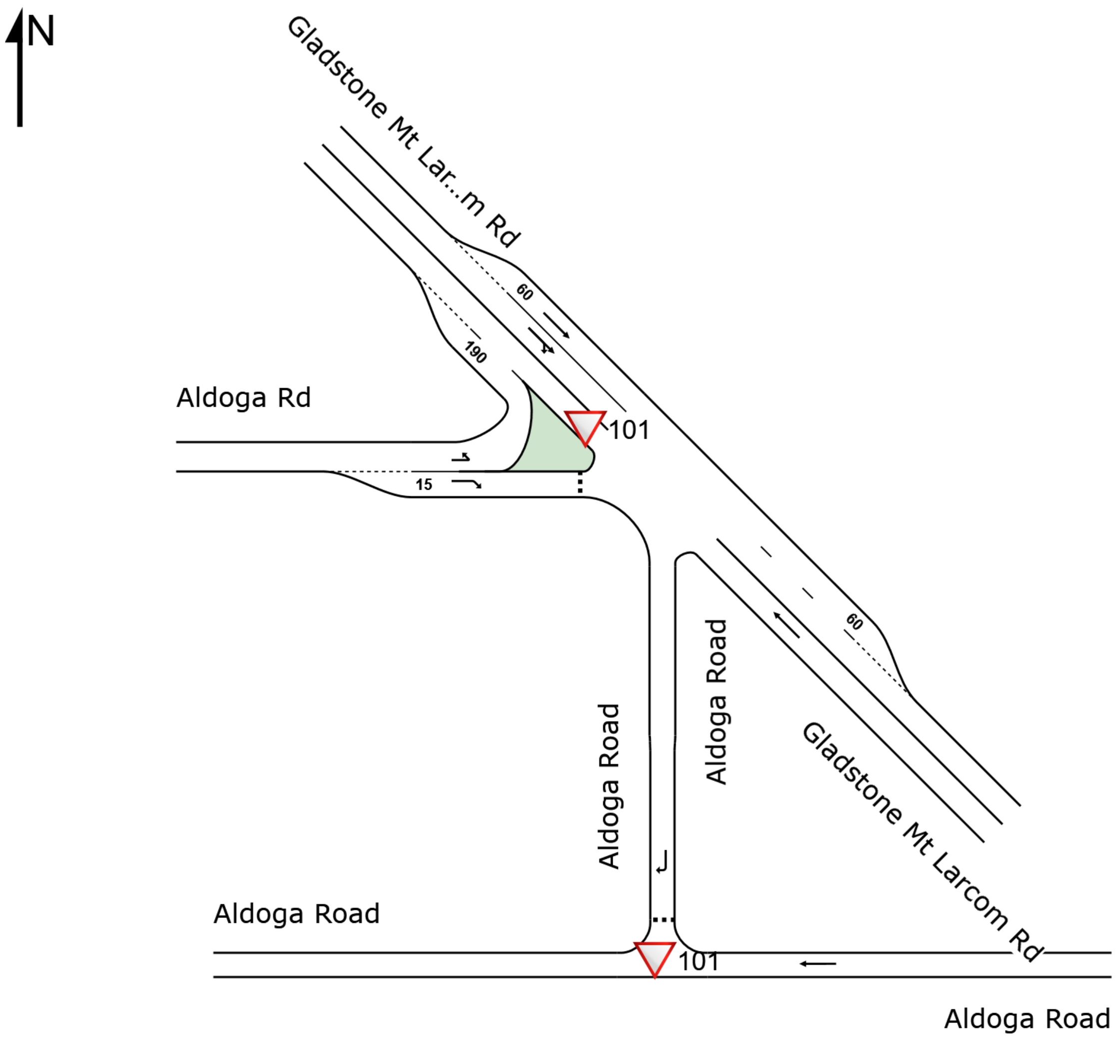

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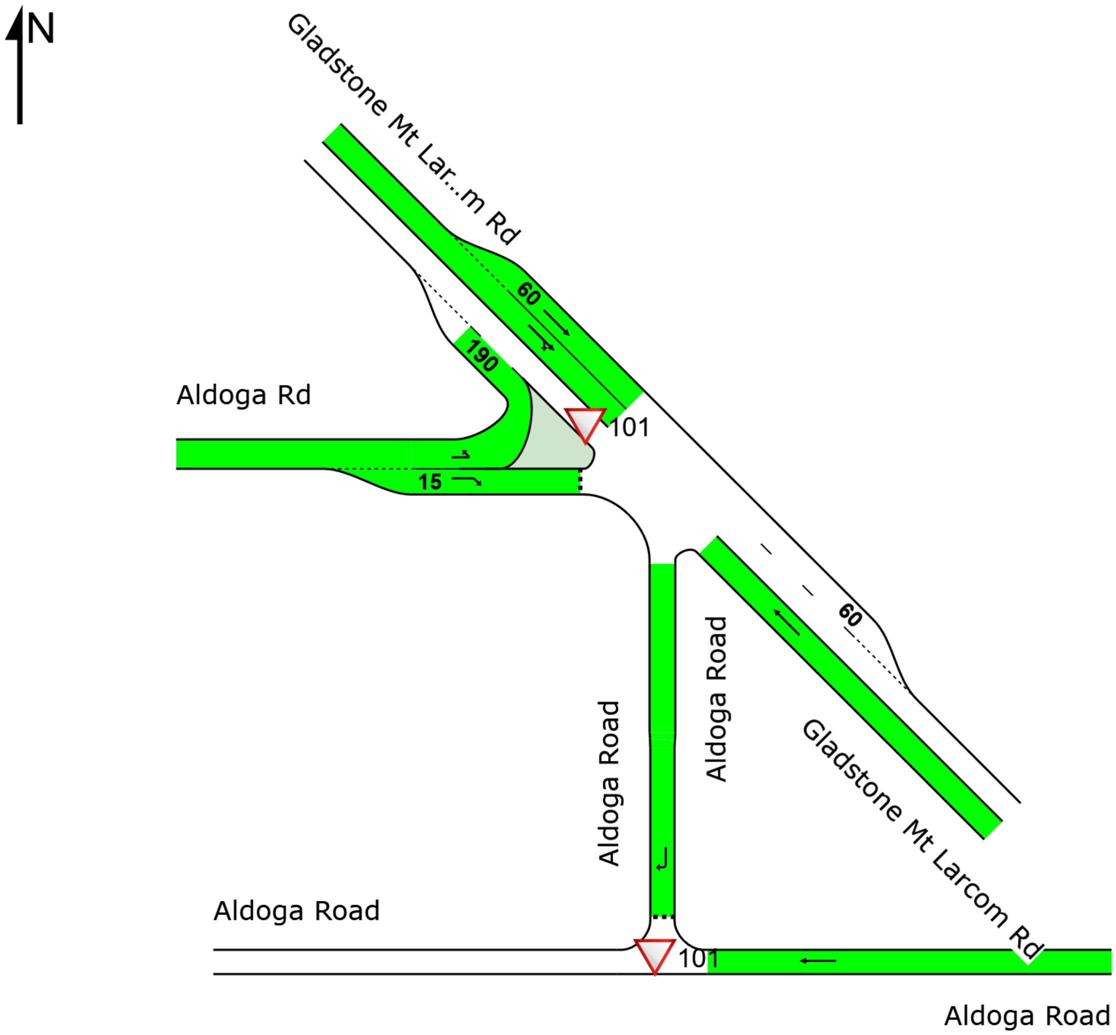

Colour code based on Percentage Capacity Reduction

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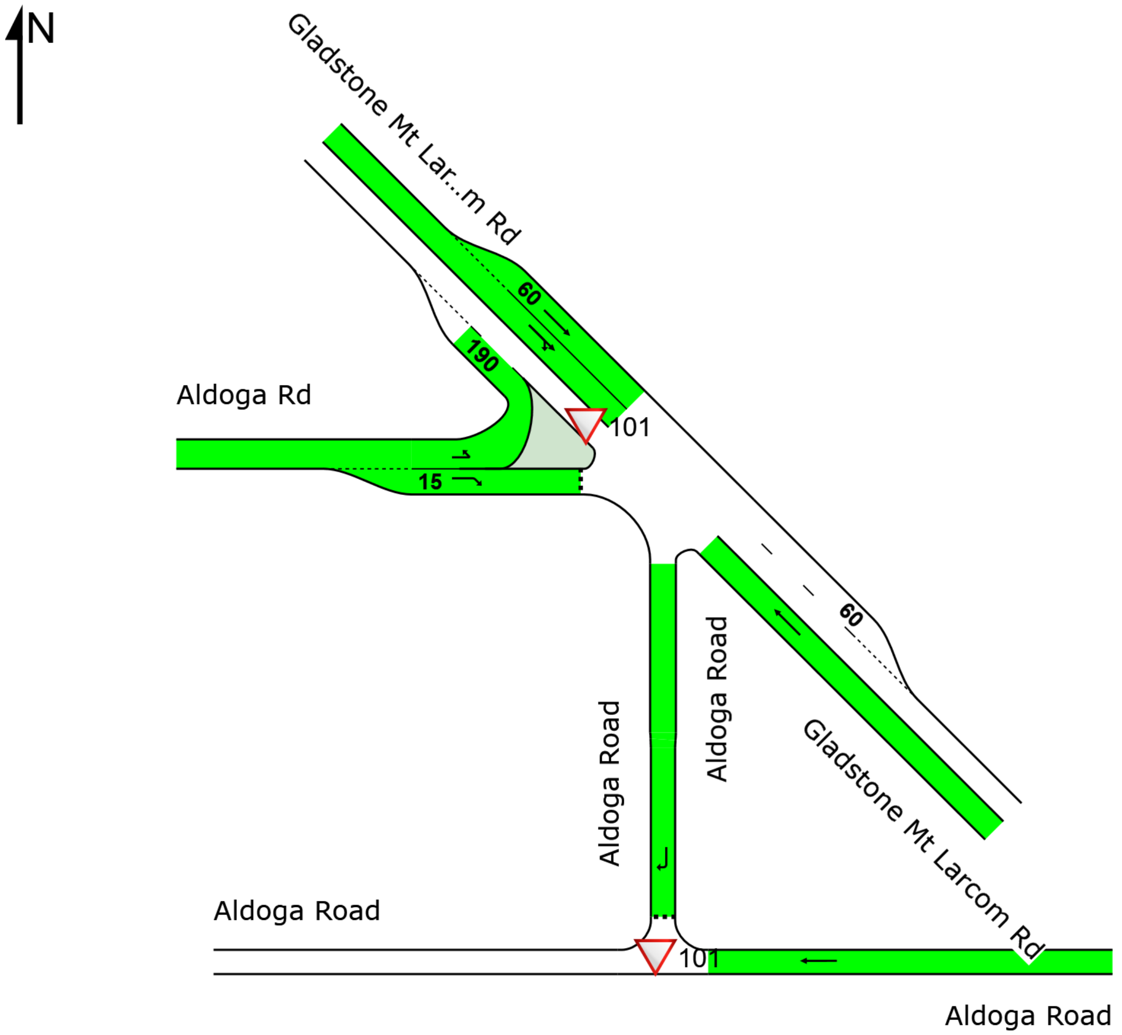
Degree of Saturation



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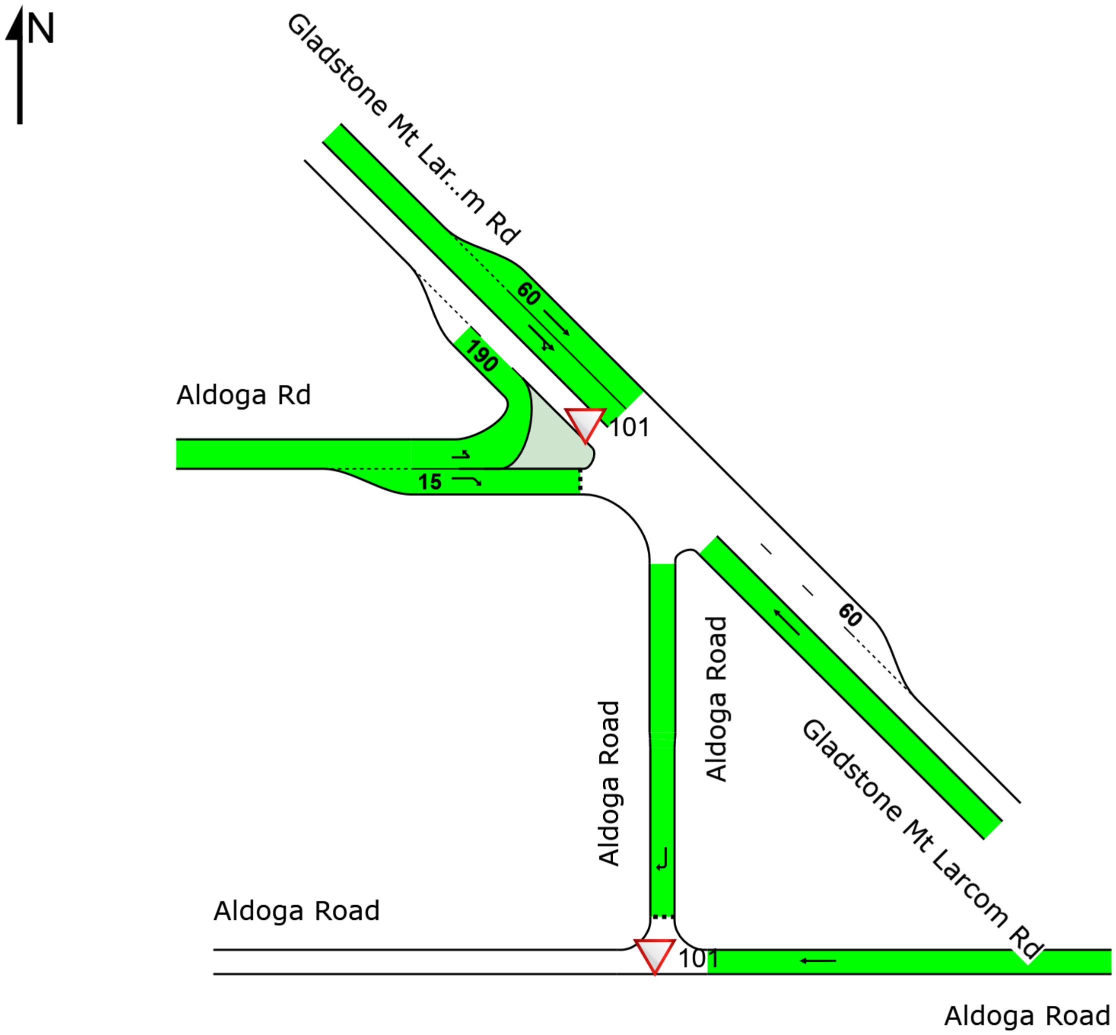
Proportion Queued



Colour code based on Proportion Queued

[< 0.6] [0.6 – 0.7] [0.7 – 0.8] [0.8 – 0.9] [0.9 – 0.99] [1.0]

USER REPORT FOR NETWORK

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116 **Template: New User Report**

Network: N101 [2025PM - Gladstone Mt Larcom Rd - without development (Network Folder: Gladstone Mt Larcom Road - PM)]

New Network
Network Category: (None)

Network Layout

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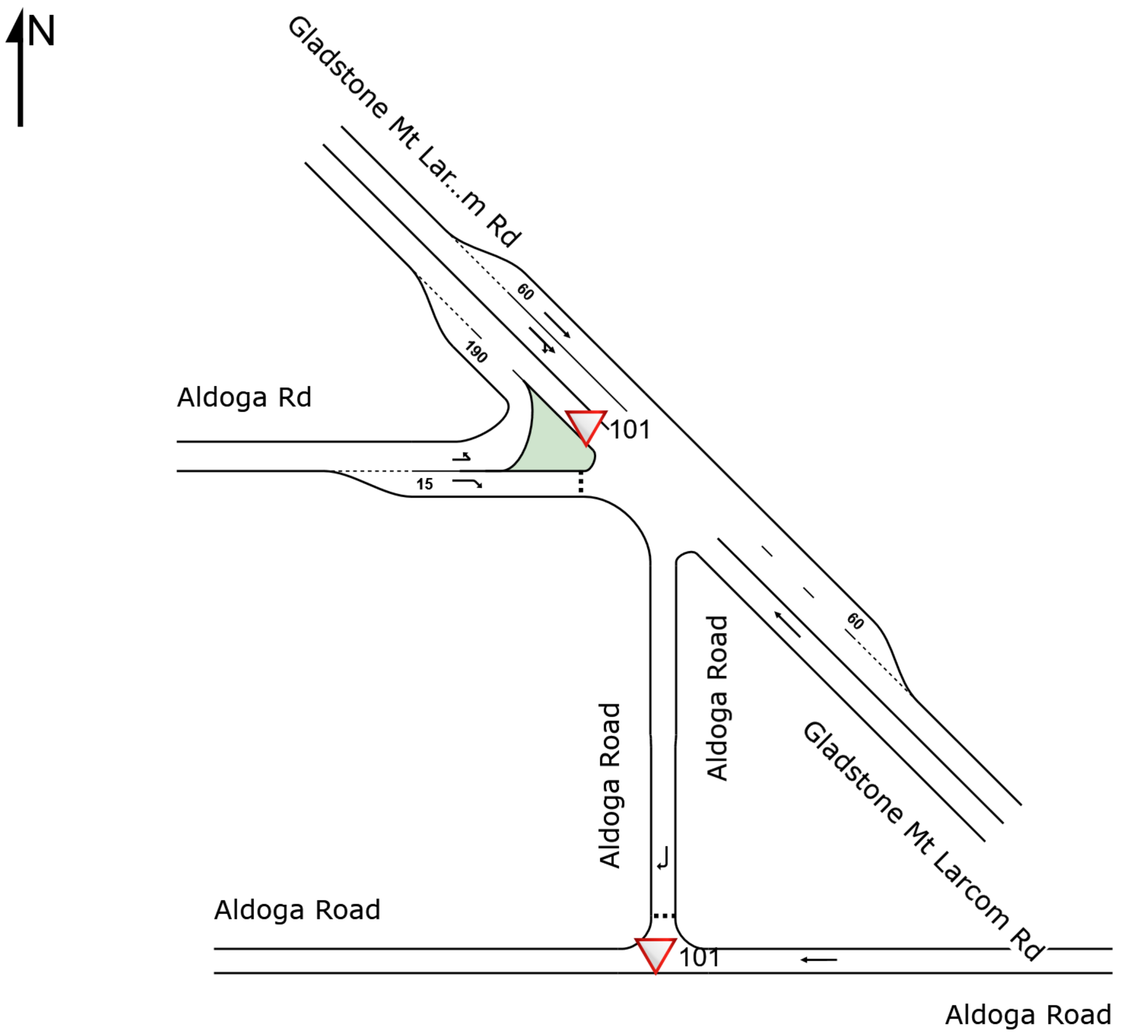
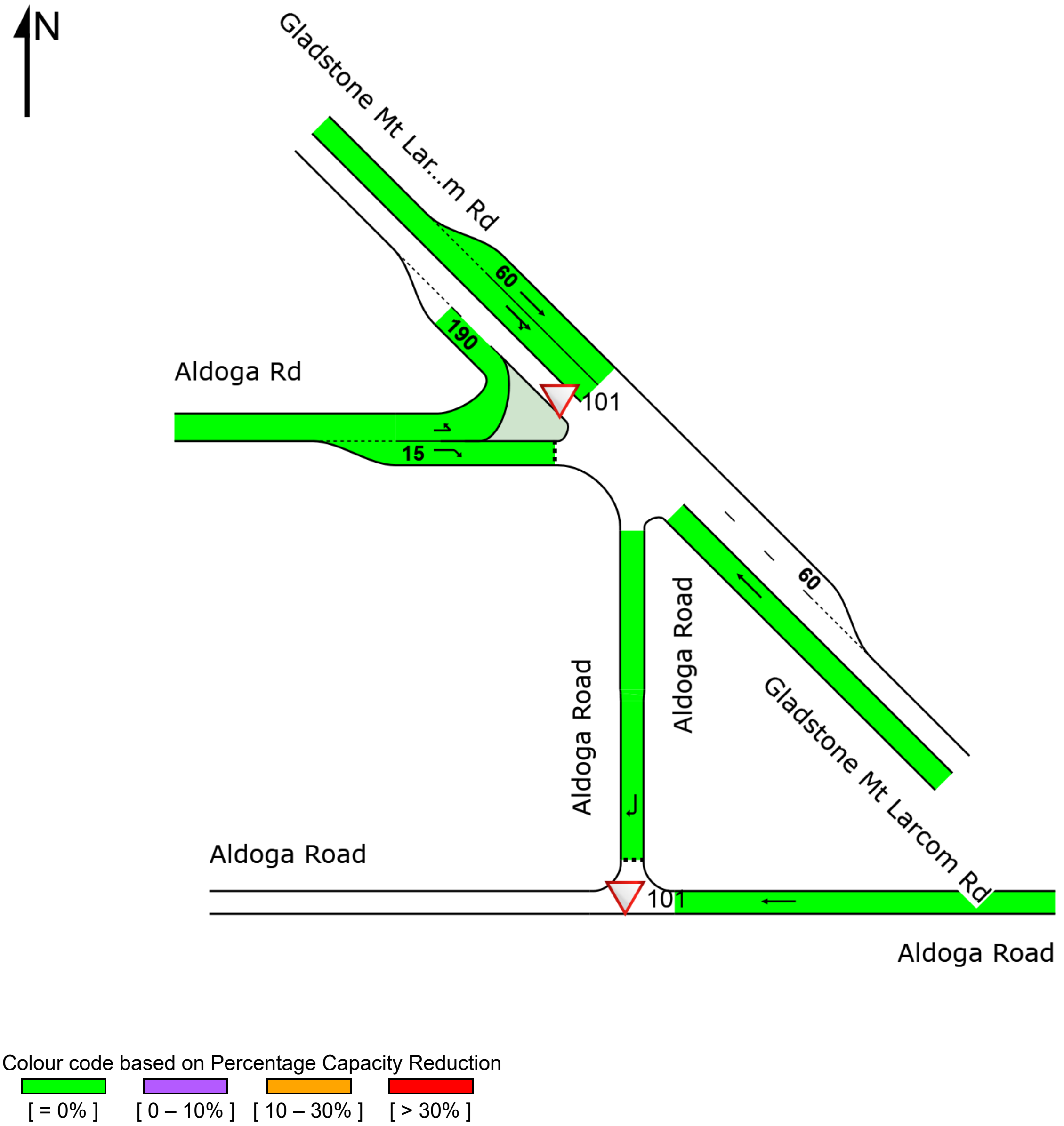
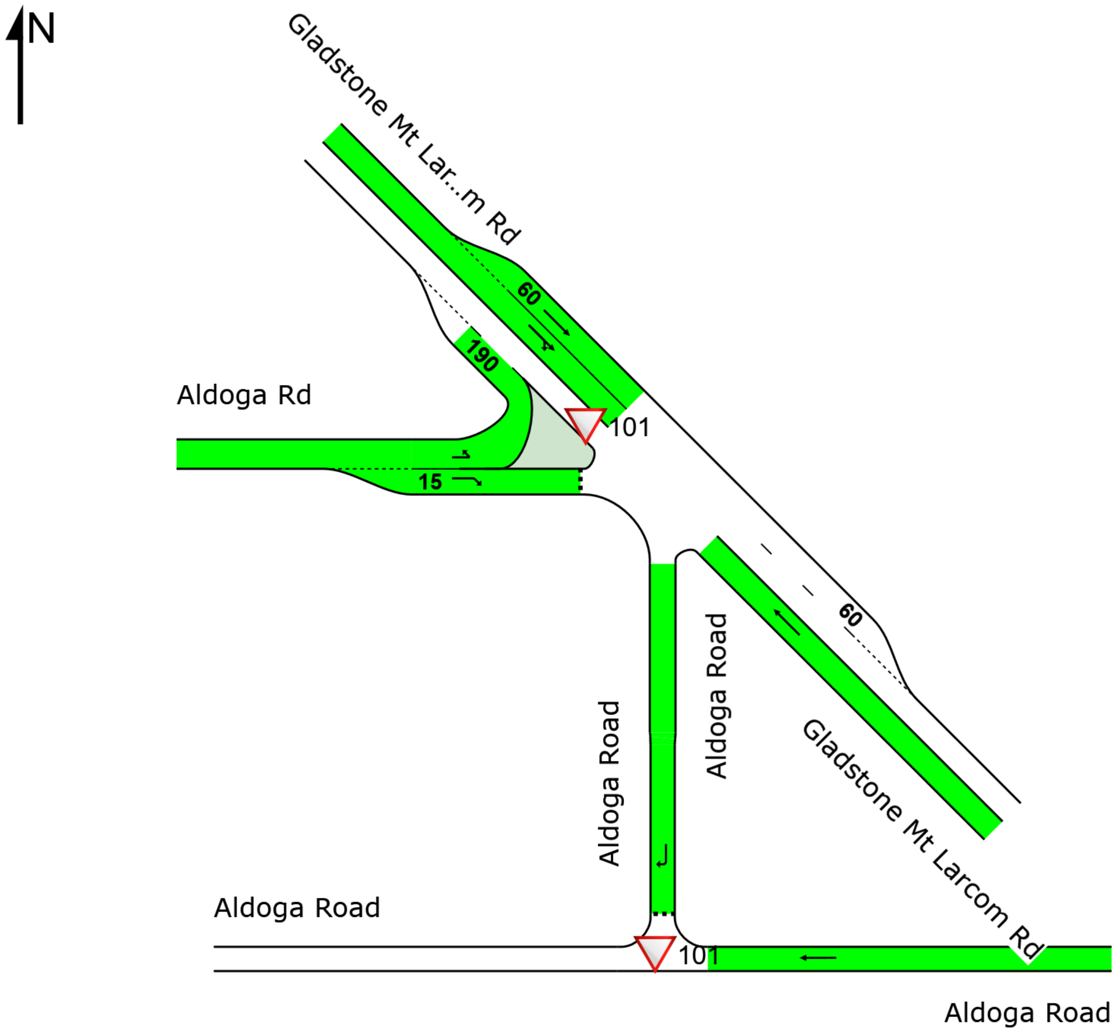


Capacity Reduction



Degree of Saturation



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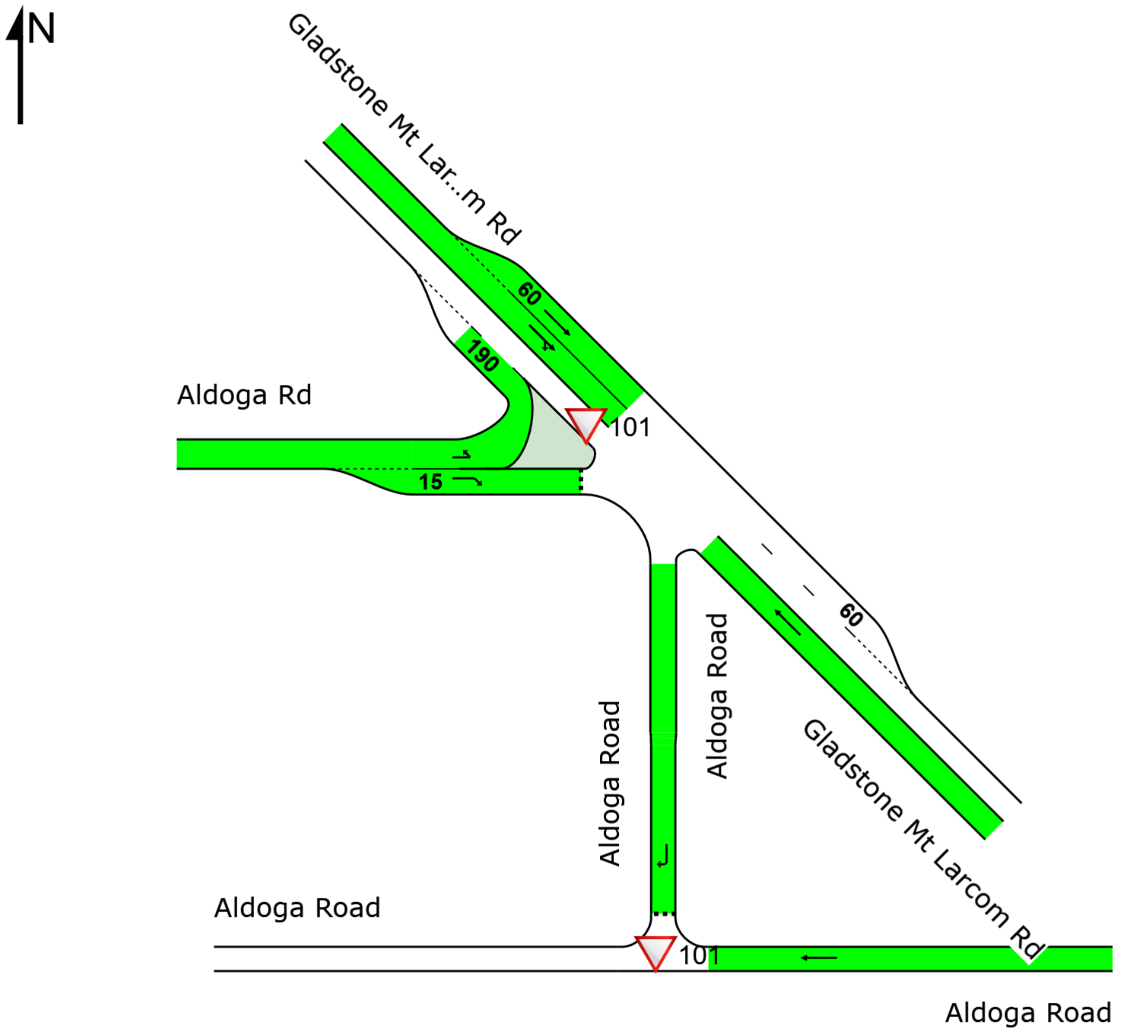
Proportion Queued



Colour code based on Proportion Queued

[< 0.6]   [0.6 – 0.7]   [0.7 – 0.8]   [0.8 – 0.9]   [0.9 – 0.99]   [1.0]

USER REPORT FOR NETWORK

All Movement Classes

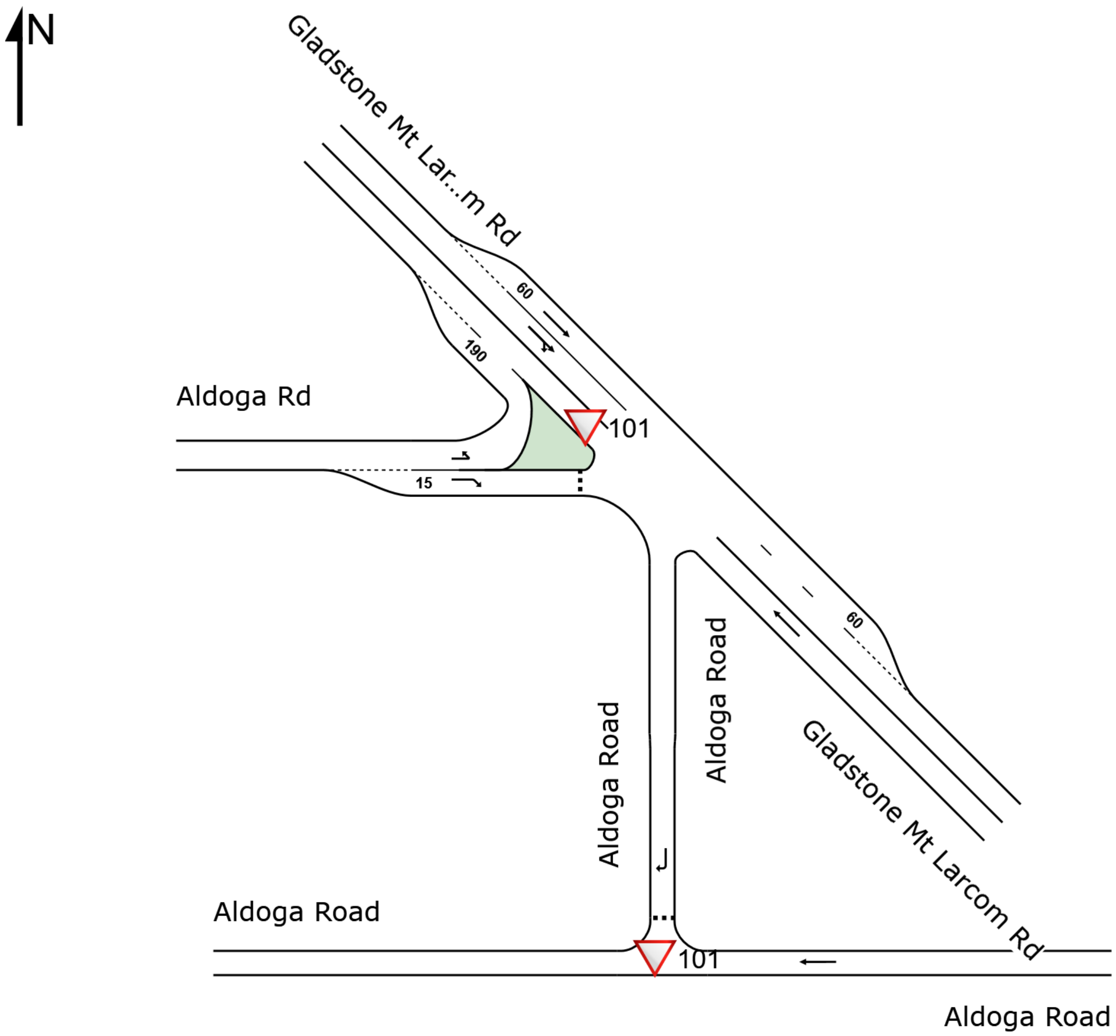
Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116 **Template: New User Report**

Network: N101 [2035AM - Gladstone Mt Larcom Rd - with development - 1.87% (Network Folder: Gladstone Mt Larcom Road - AM)]

New Network
Network Category: (None)
Design Life Analysis (Final Year): Results for 10 years

Network Layout

Layout pictures are schematic functional drawings reflecting input data. They are not design drawings.



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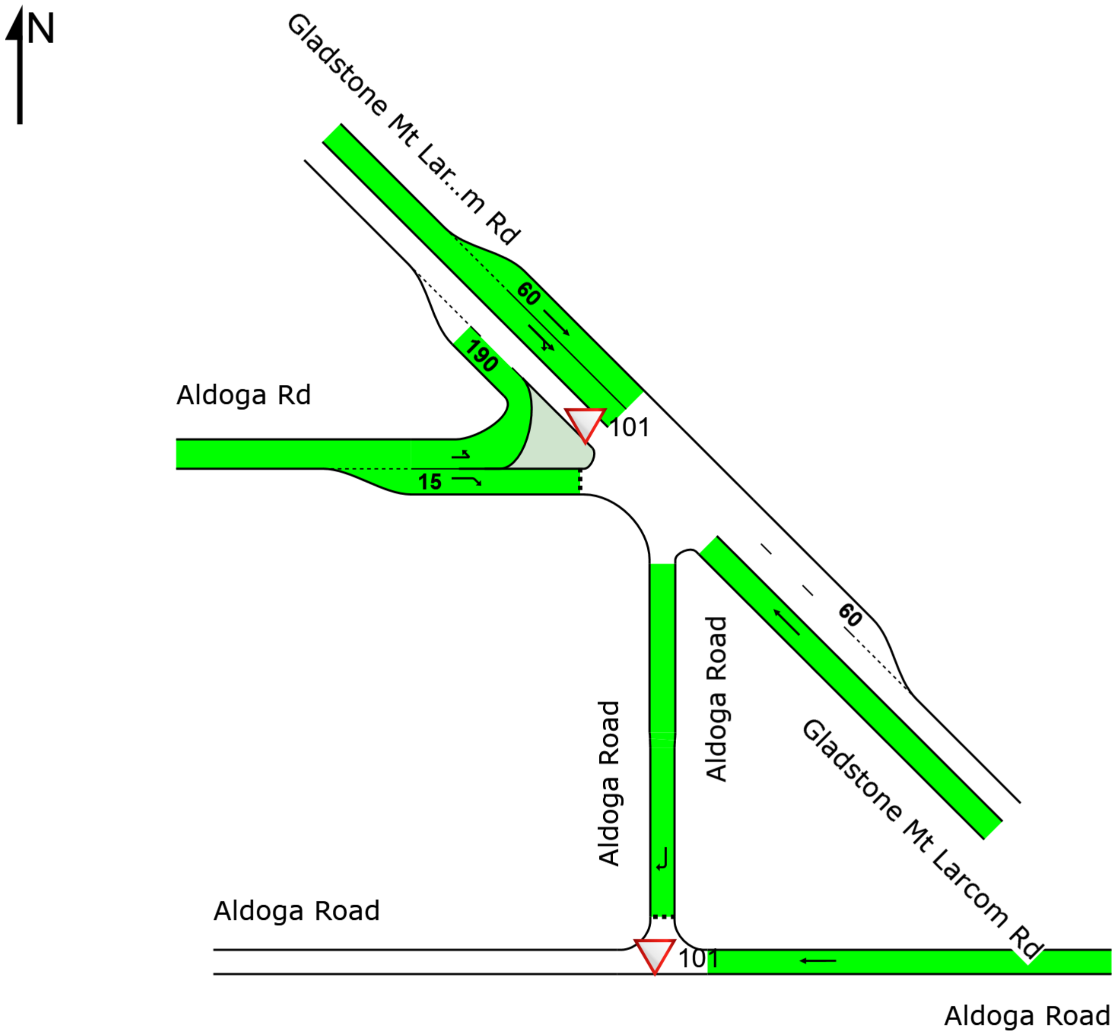
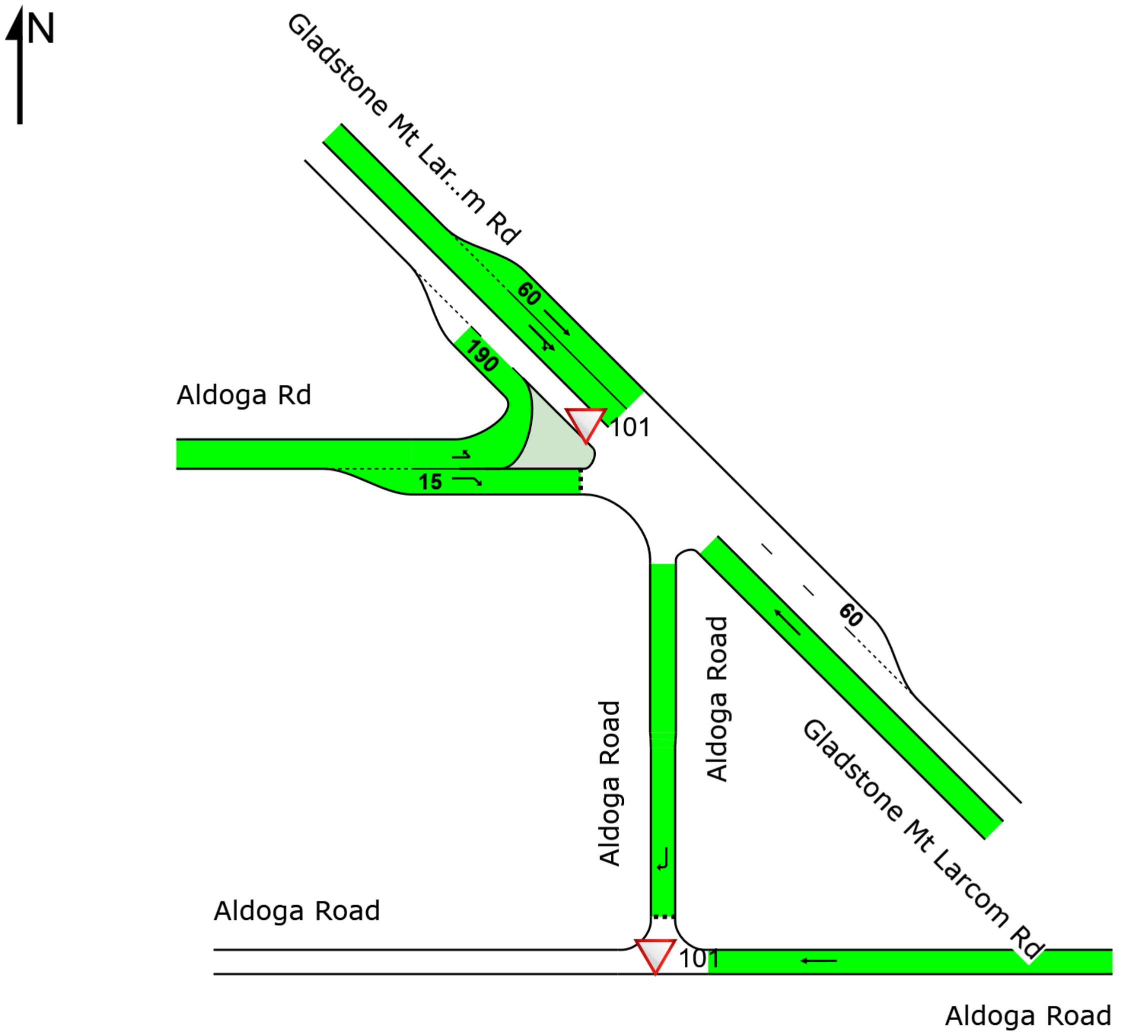


Colour code based on Percentage Capacity Reduction

[= 0%] [0 – 10%] [10 – 30%] [> 30%]

Degree of Saturation



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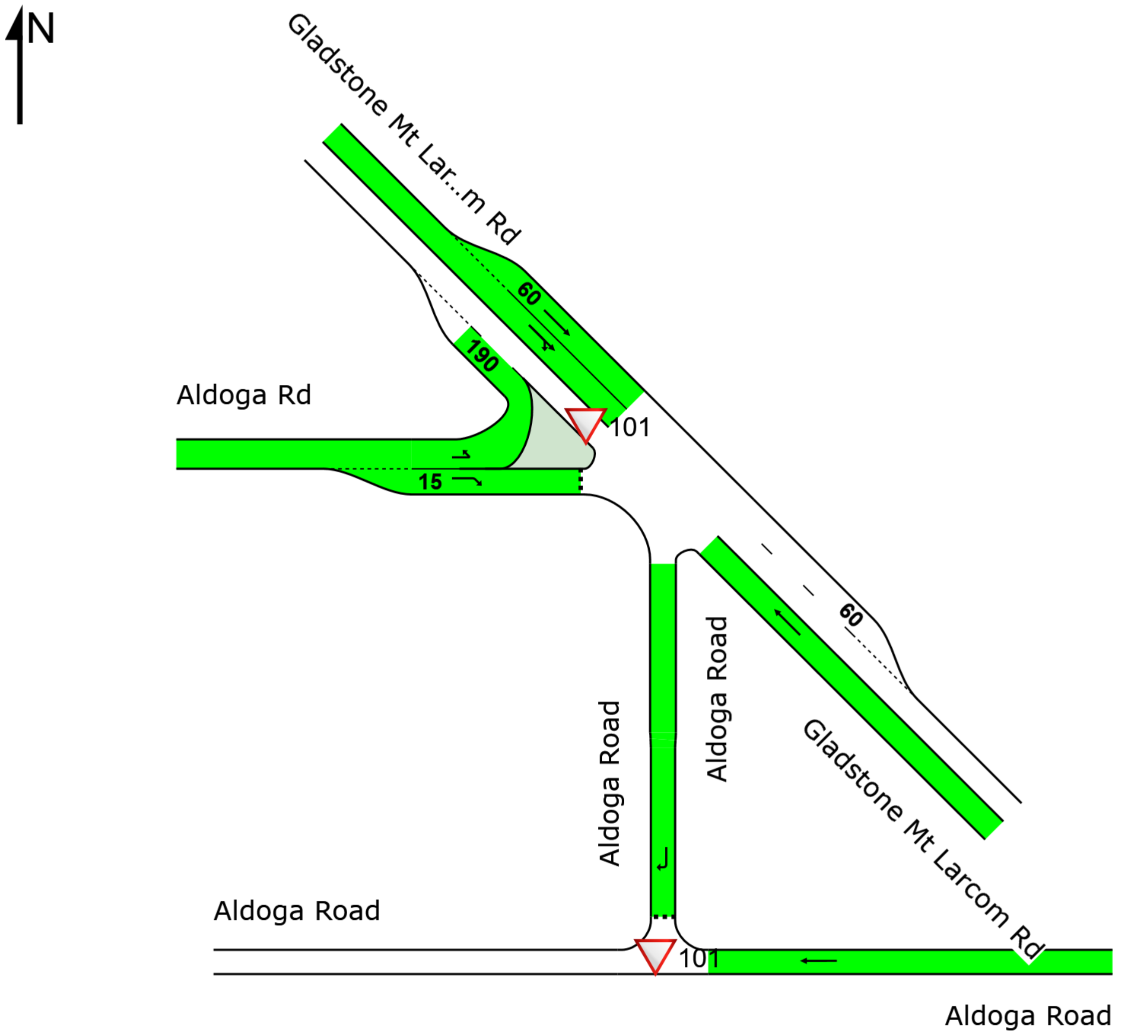

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USER REPORT FOR NETWORK

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116

Template: New User Report

Network: N101 [2035AM - Gladstone Mt Larcom Rd - without development - 1.87% (Network Folder: Gladstone Mt Larcom Road - AM)]

New Network
Network Category: (None)
Design Life Analysis (Final Year): Results for 10 years

Network Layout

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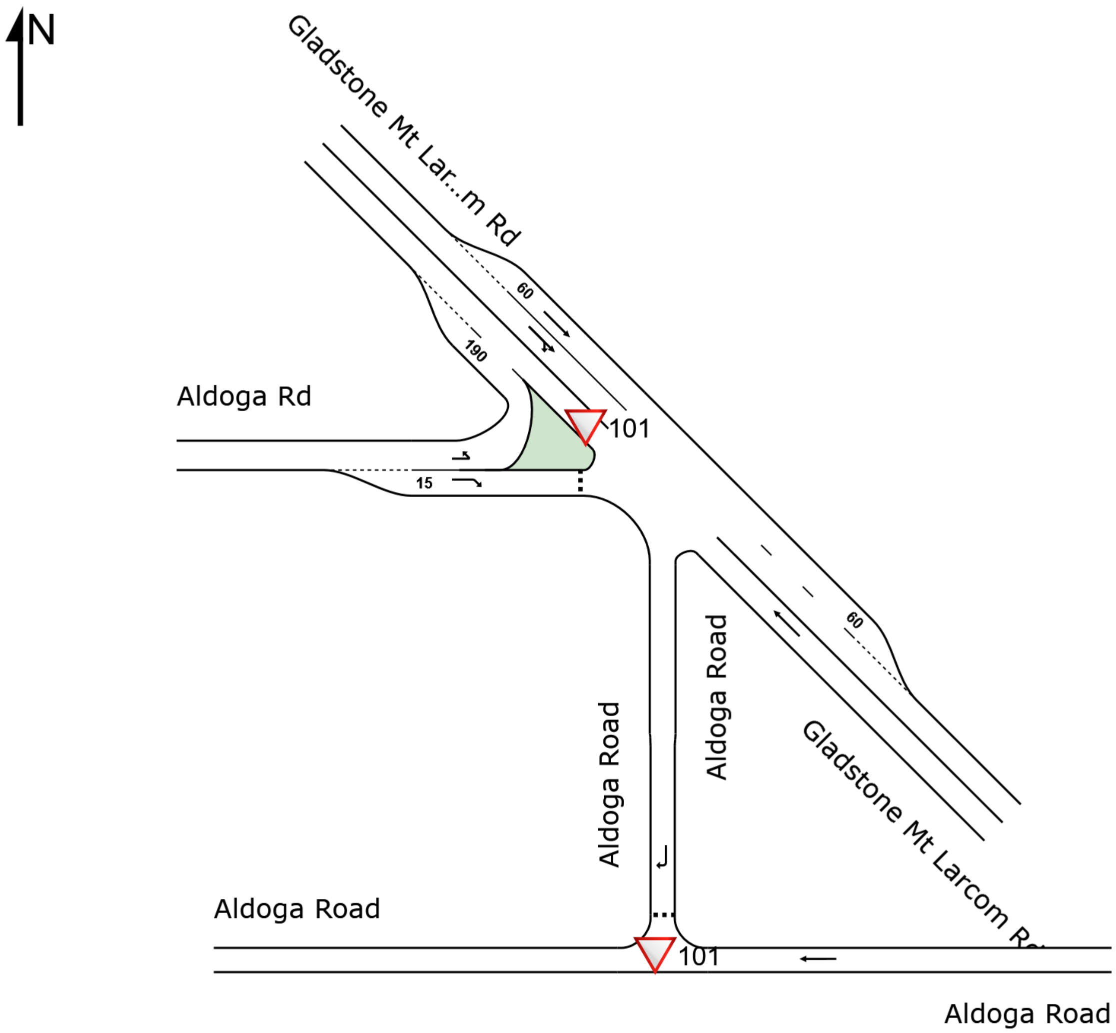

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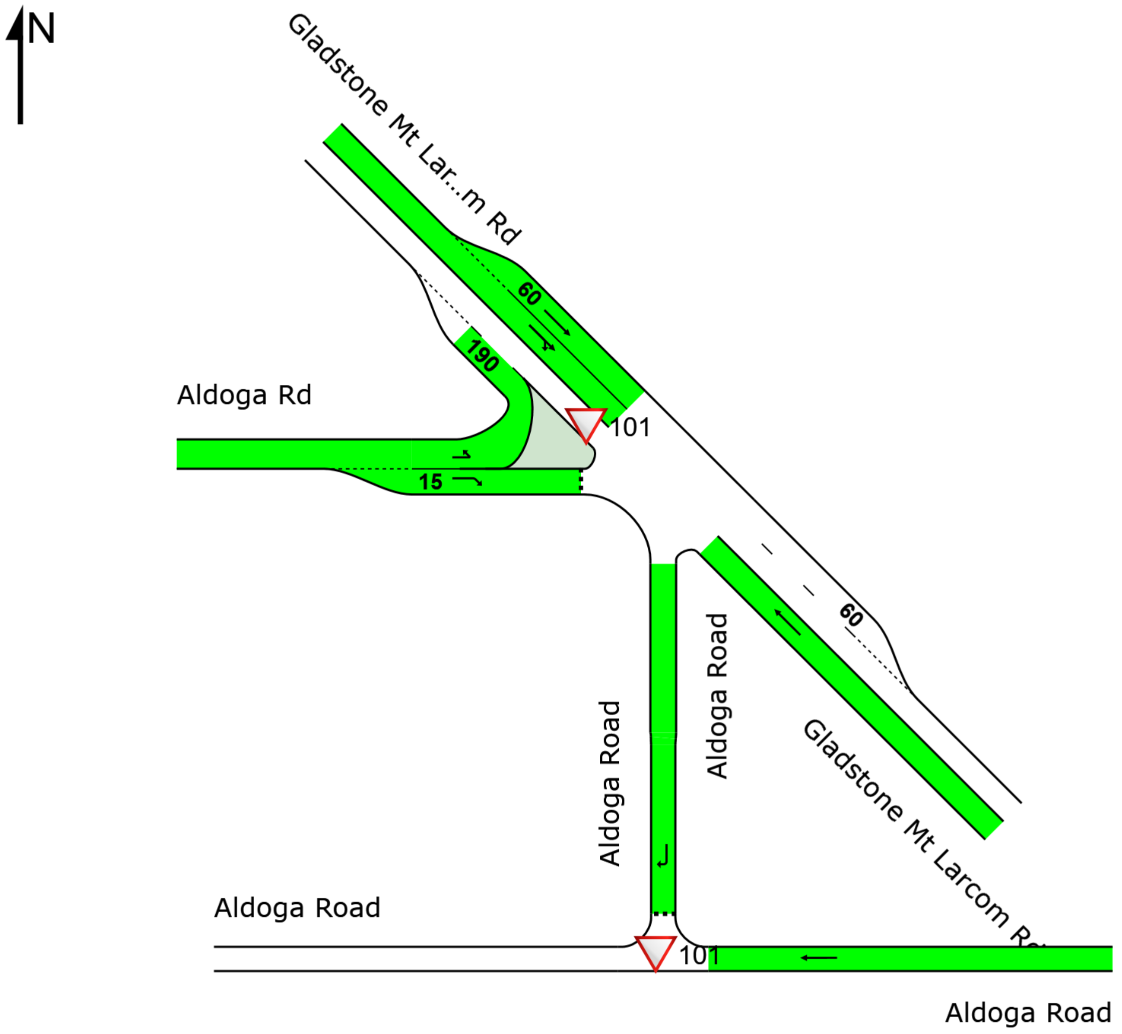

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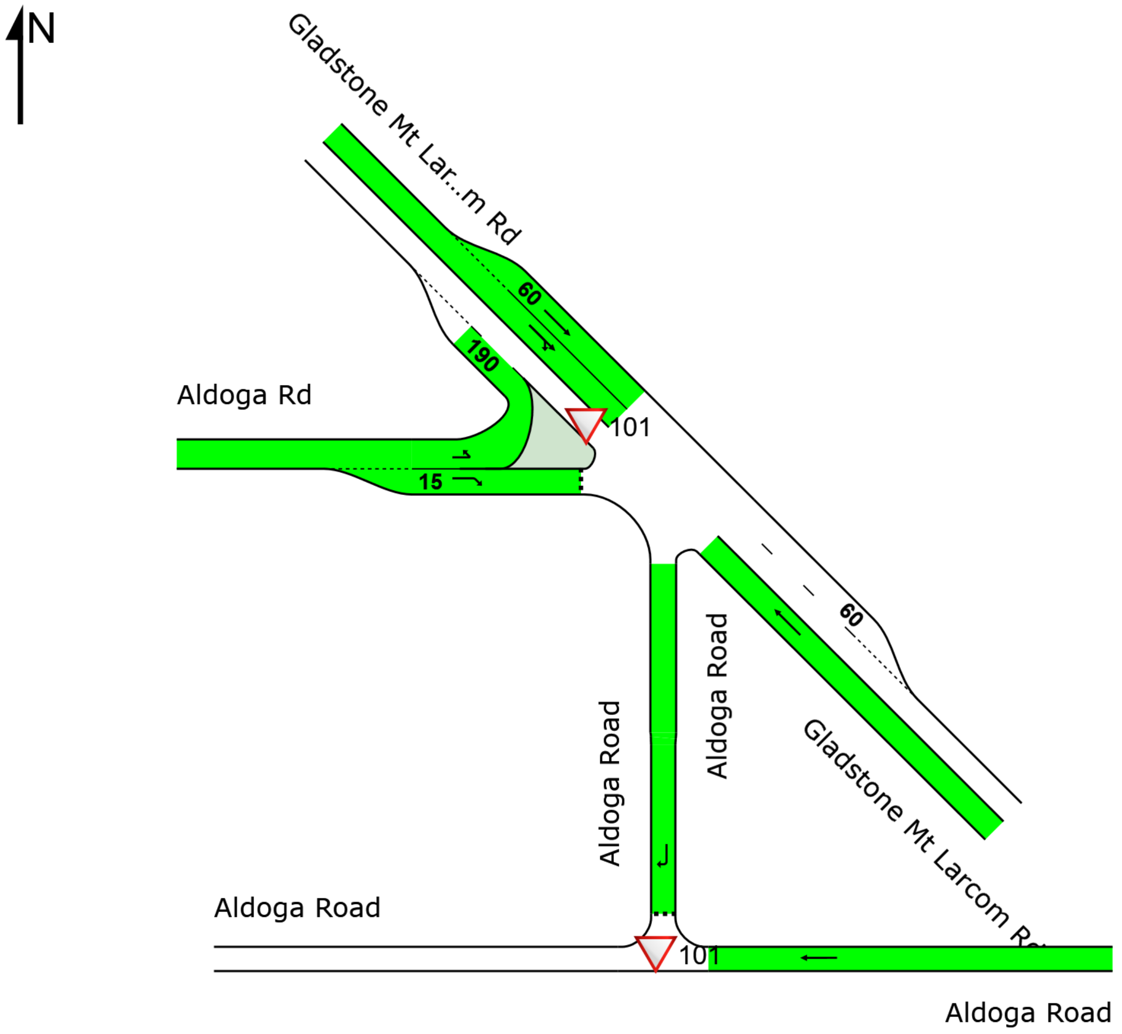

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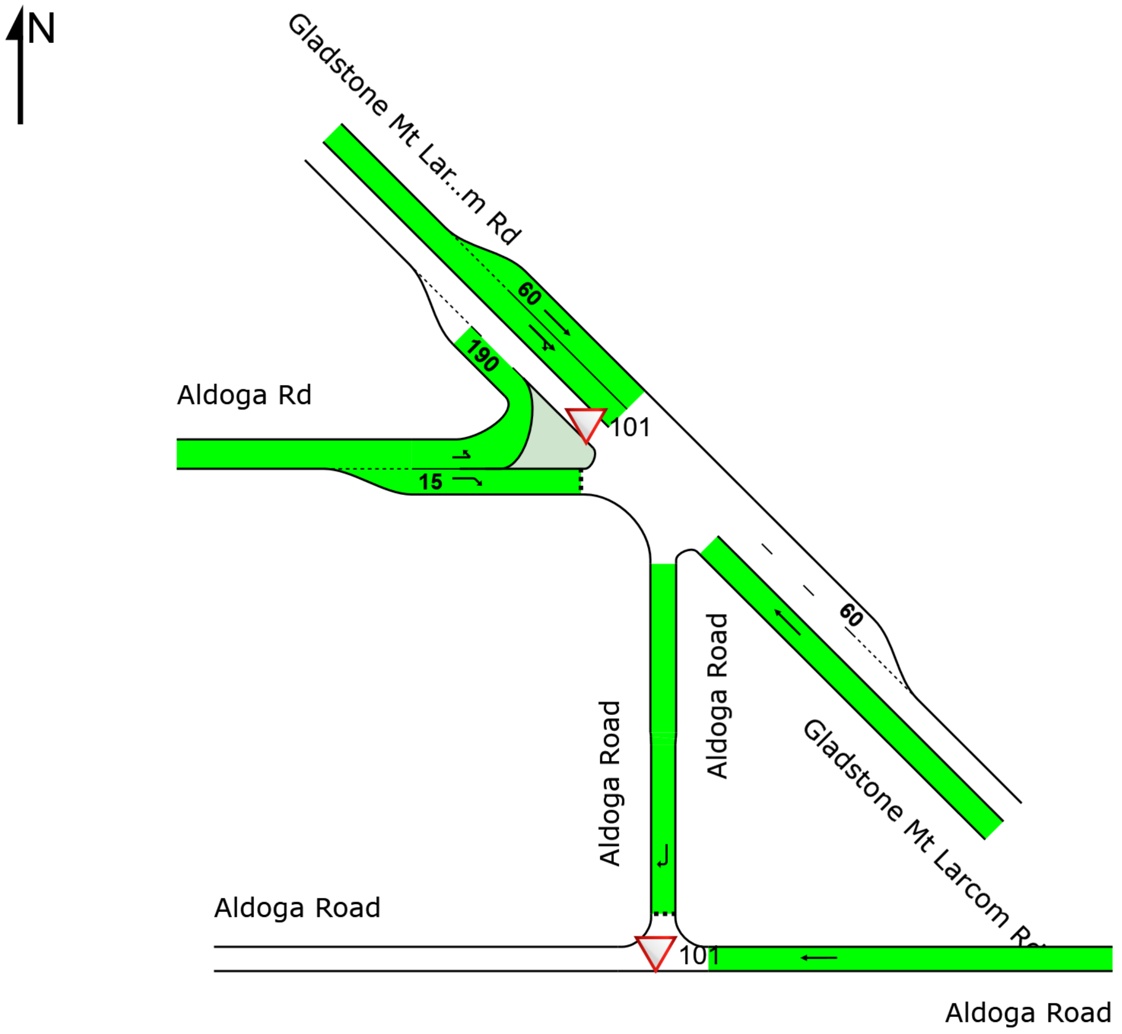

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USER REPORT FOR NETWORK

All Movement Classes

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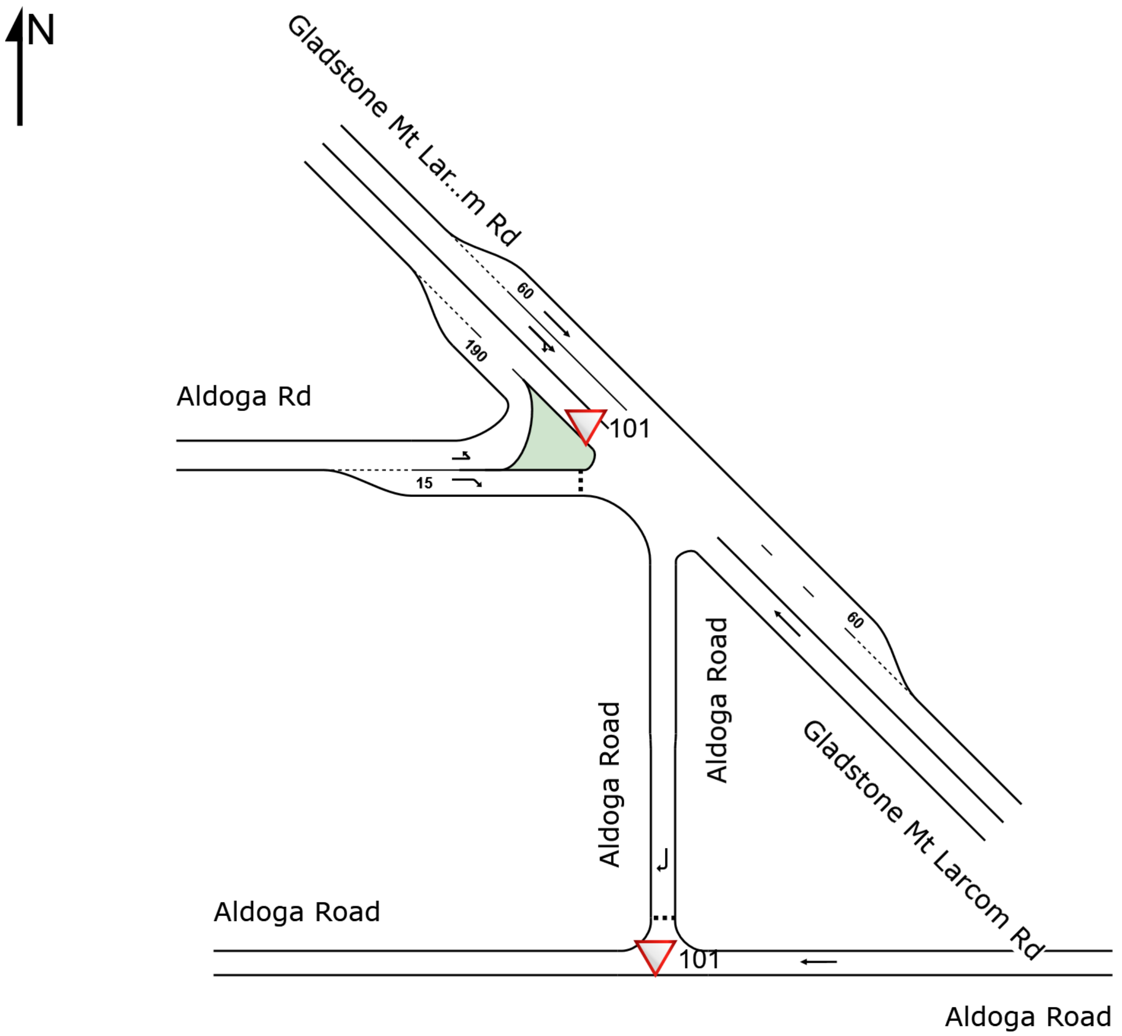

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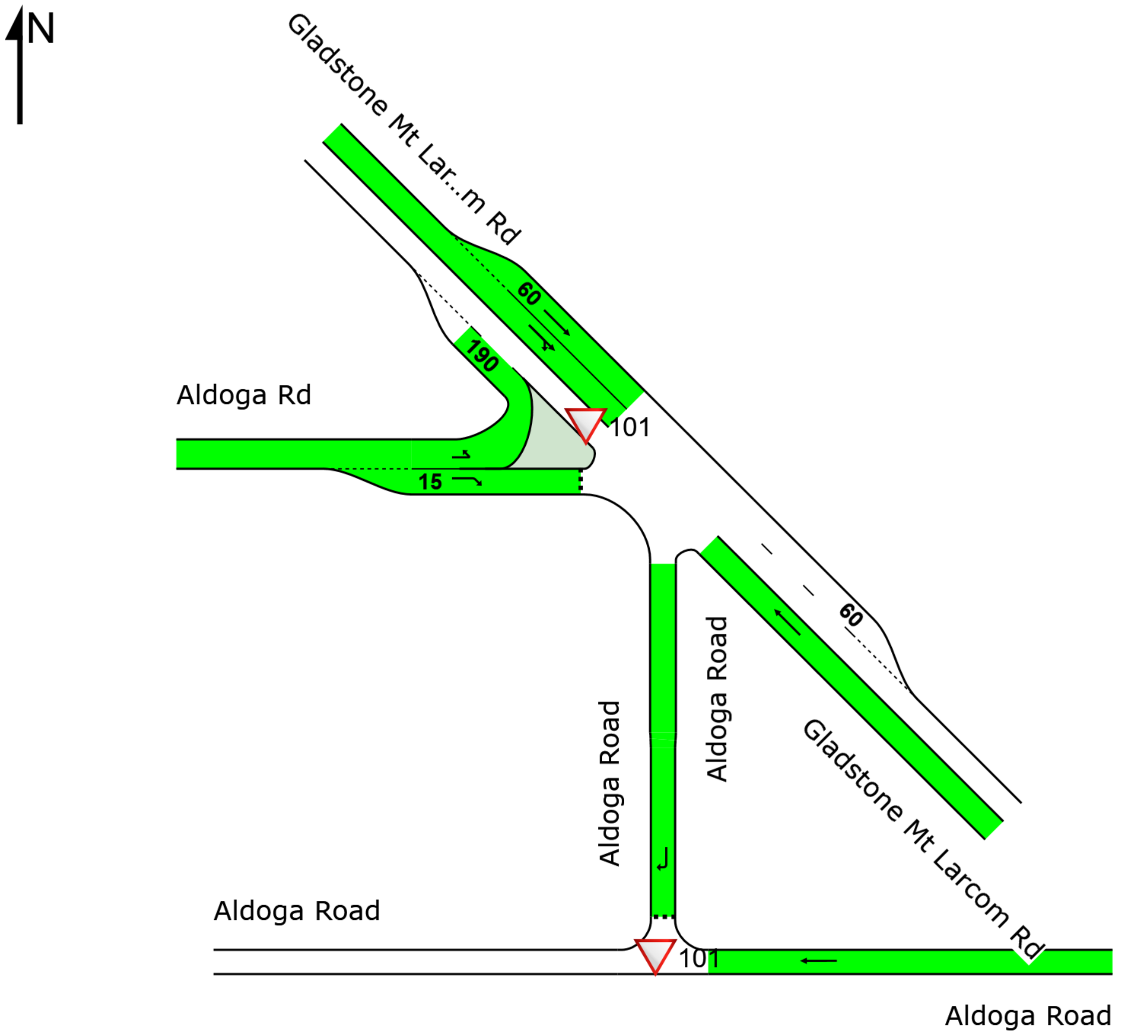

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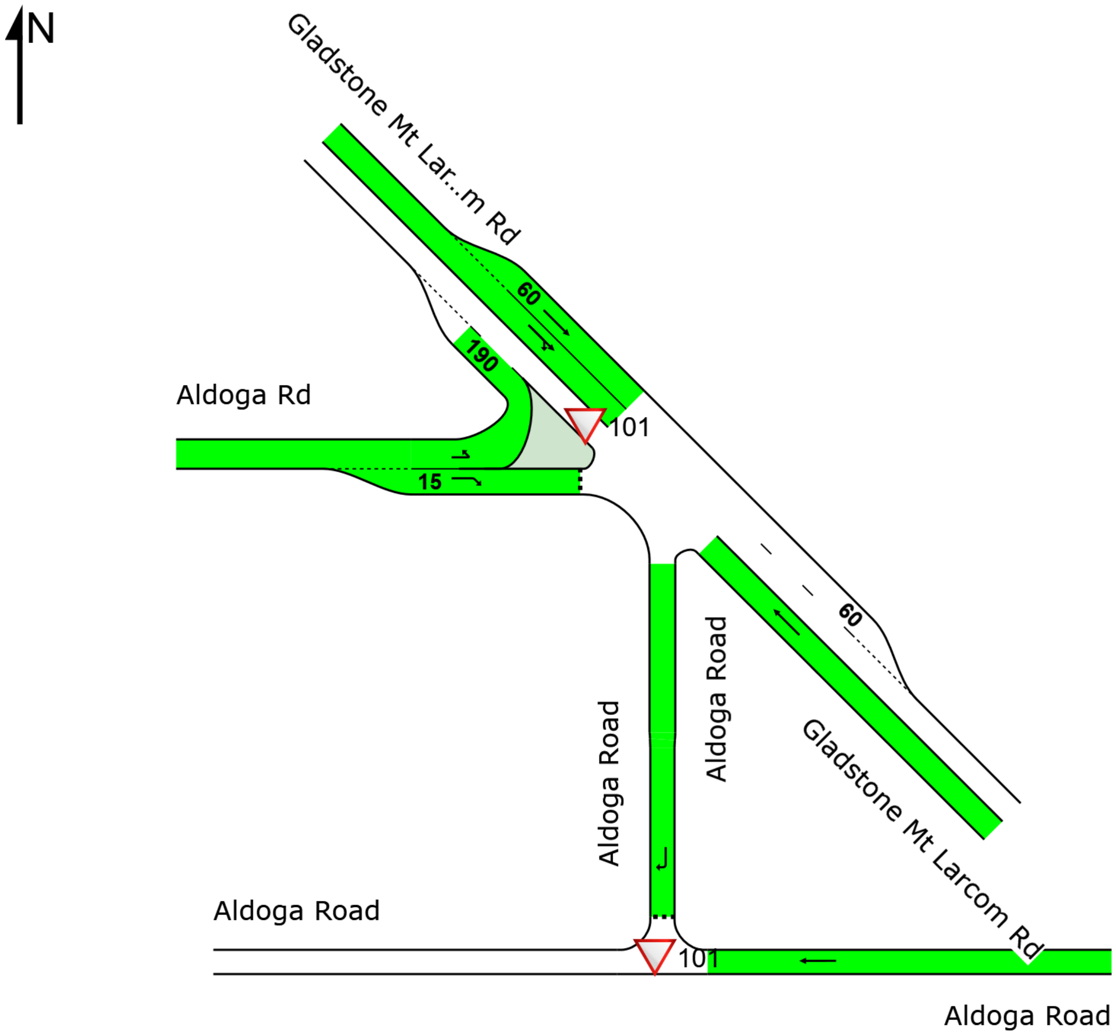

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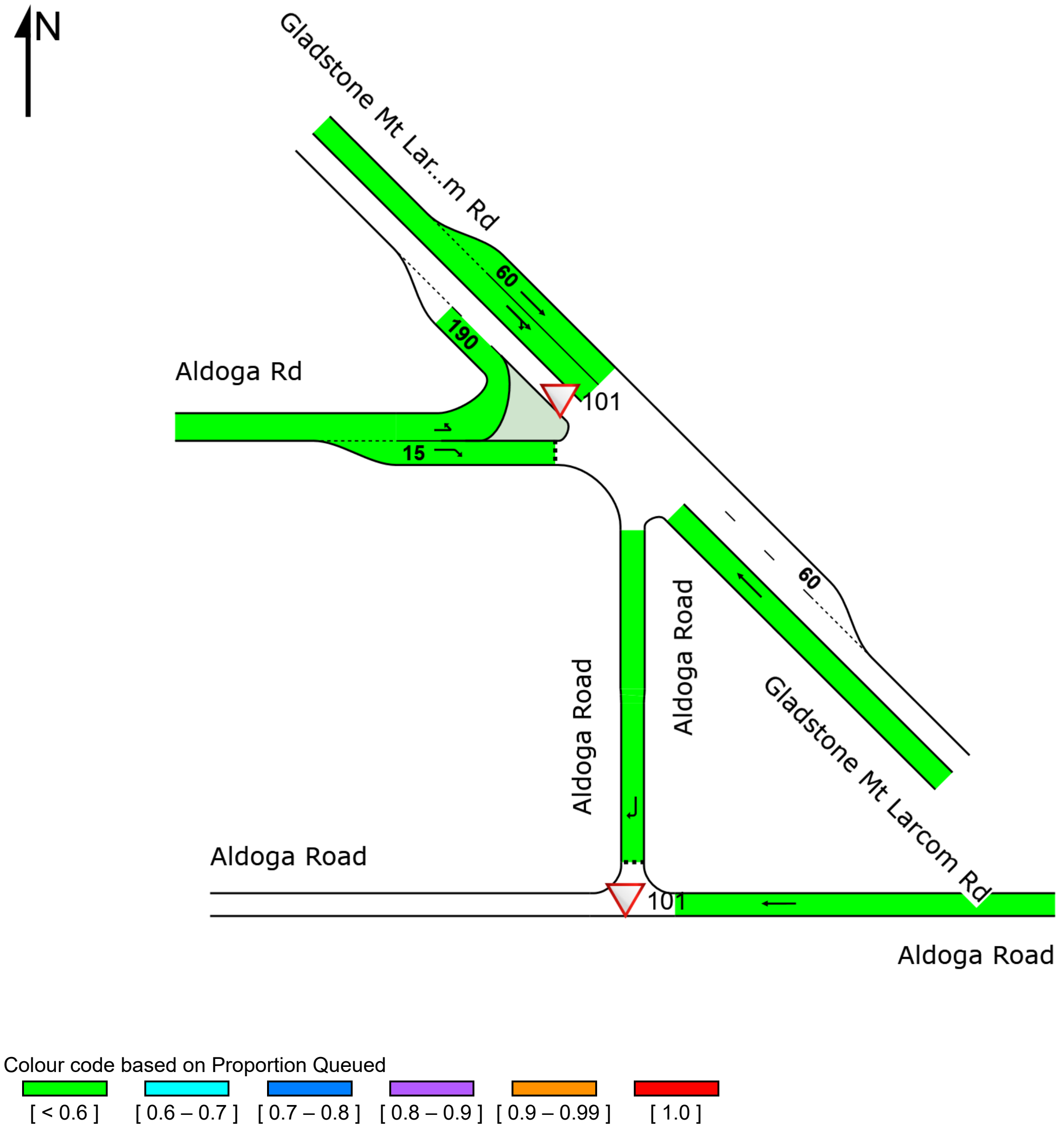
Proportion Queued



USER REPORT FOR NETWORK

All Movement Classes

Project: 30033831 - SIDRA - Gladstone Mt Larcom Road - 20230116 **Template: New User Report**

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New Network
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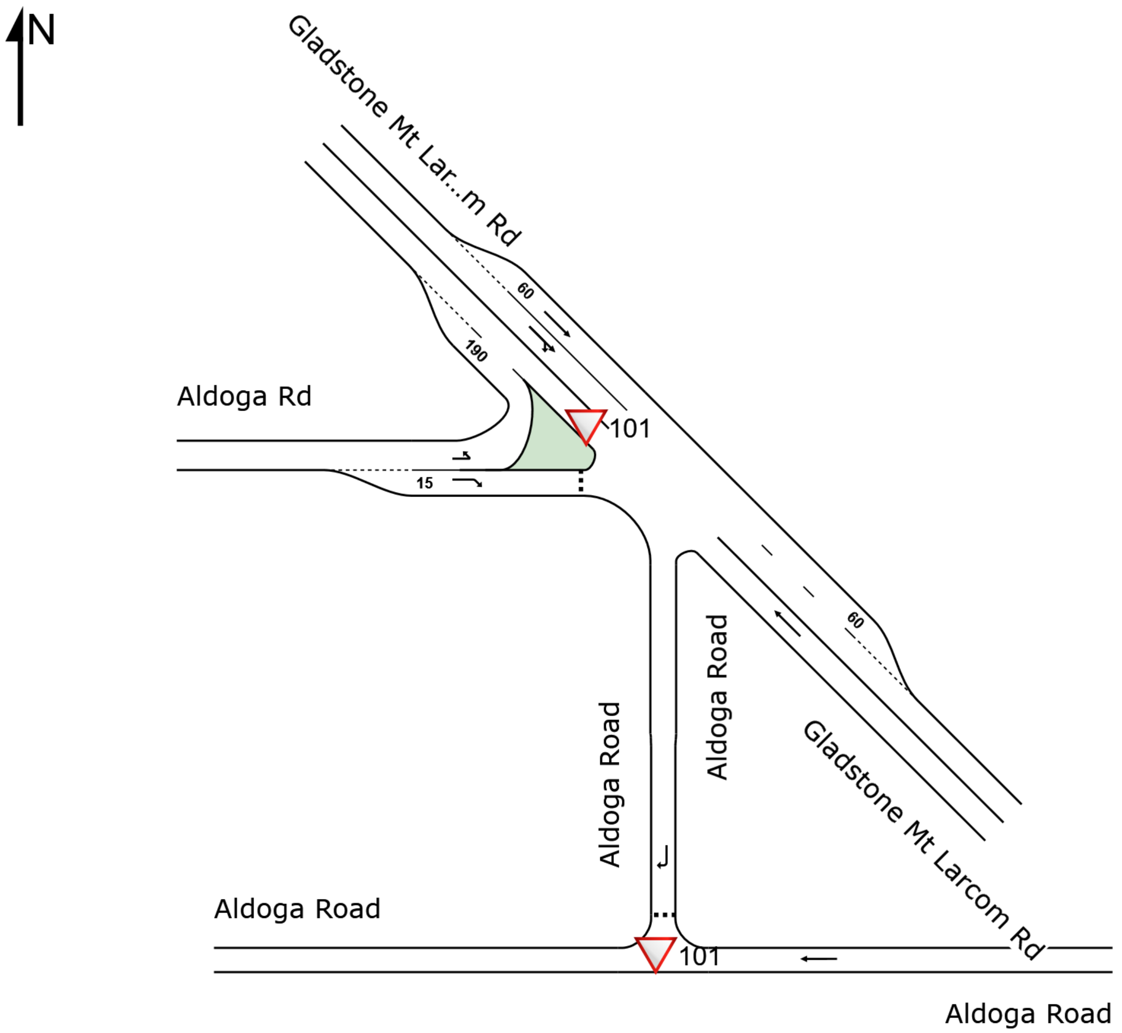

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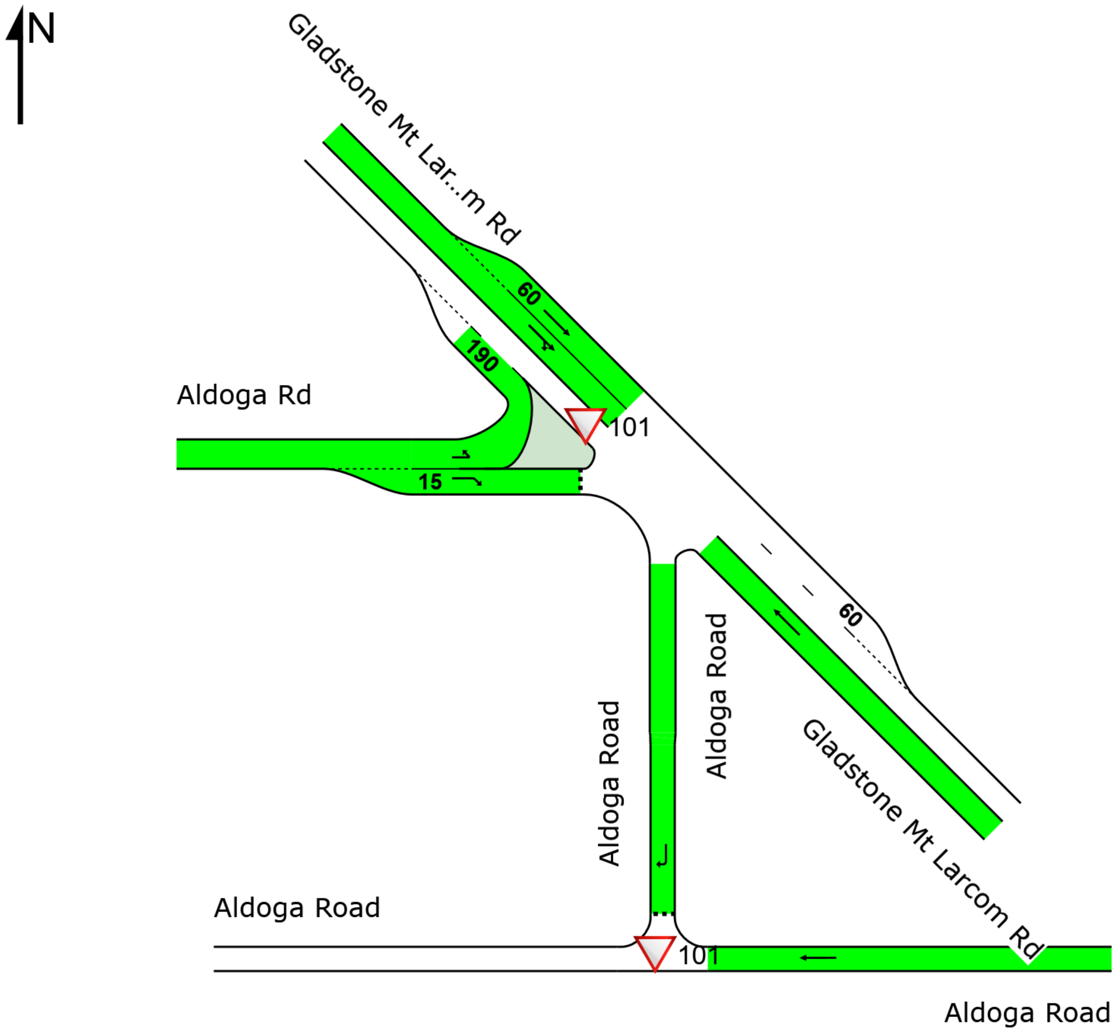

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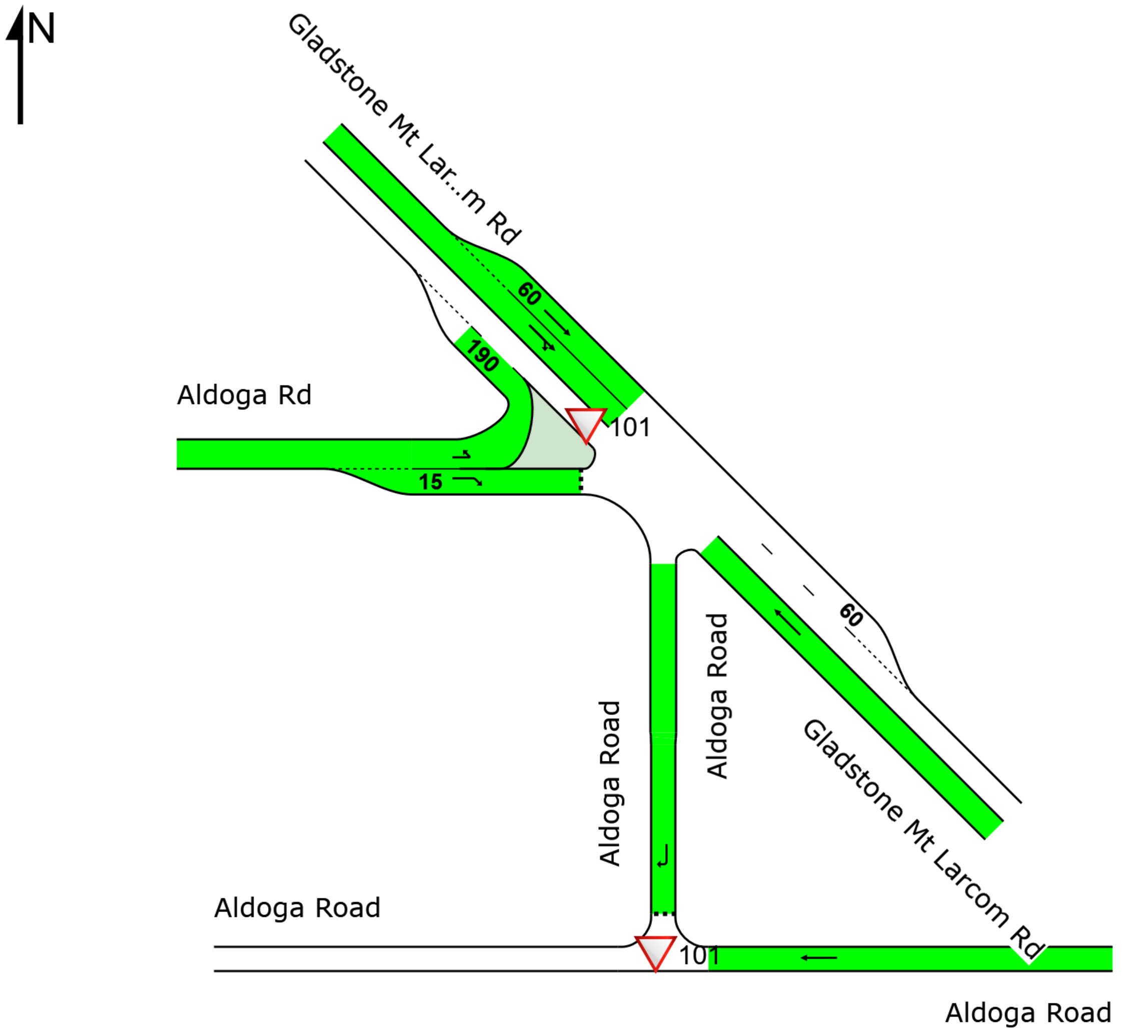

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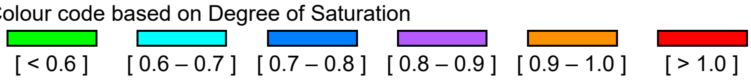

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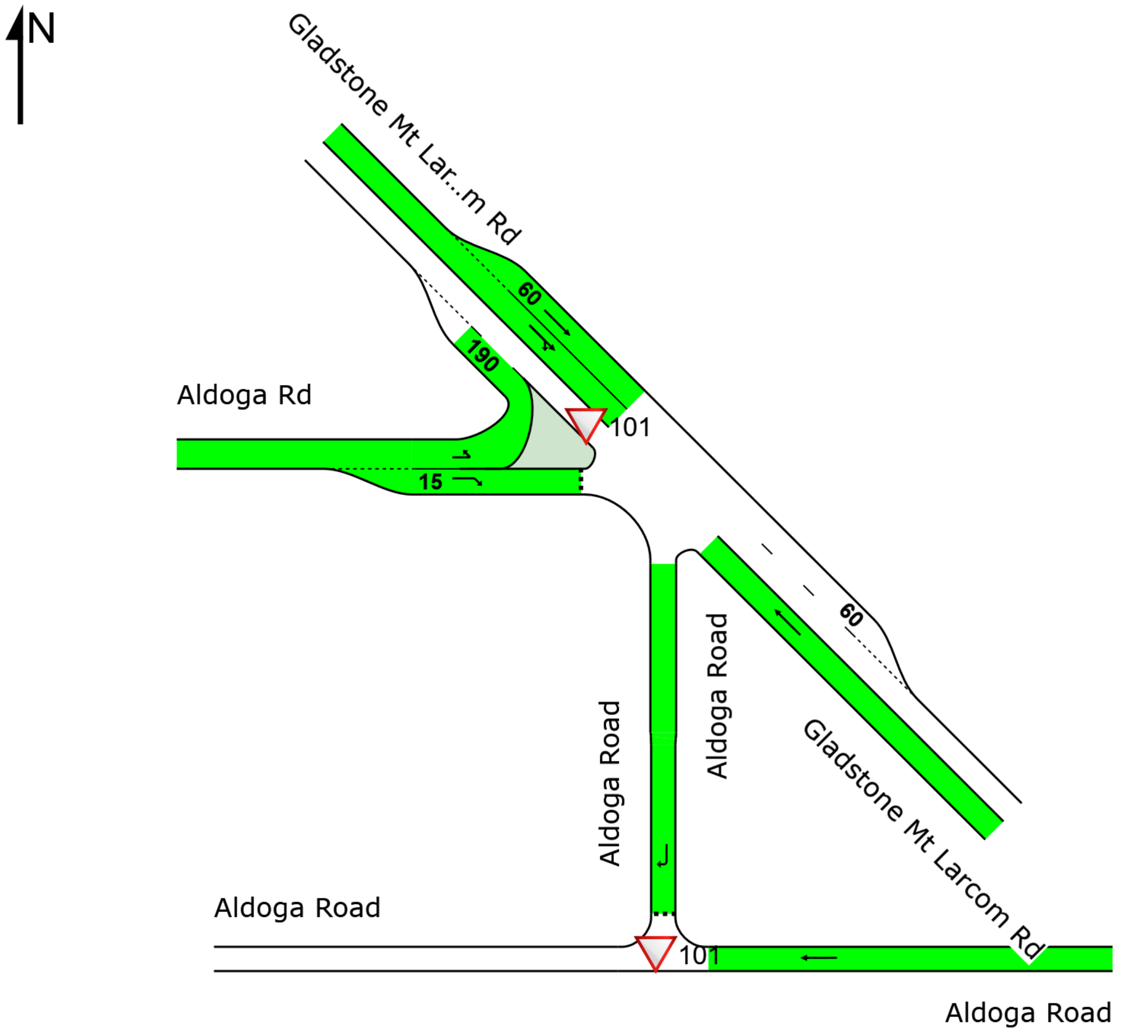

Colour code based on Proportion Queued

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Appendix D

Swept Path Assessment

150 mm ON ORIGINAL

A1

PLOT DATE	TIME
01 Sep 2022	15:50:09

FOR REVIEW

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	01	01.09.2022	SWEPT PATH - EXISTING LAYOUT	30033831-WVR-004	H.S.

TITLE	NAME
DRAFTER	J. ROGERS
DRAFTING CHECK	H. STRACHAN
DESIGNER	
DESIGN CHECK	
PROJECT MANAGER	
PROJECT DIRECTOR	

SCALES AT A1 SIZE DRAWING

SCALE 1:50 — 0.5, 0, 1, 2, 2.5 m

SCALE 1:100 — 1, 0, 1, 2, 3, 4, 5 m

SCALE 1:500 — 5, 0, 10, 20, 25 m

DESIGNER

SMEC

Member of the Surbana Jurong Group

SMEC AUSTRALIA PTY LTD

© ABN 47 065 475 149

LEVEL 6, 480 ST PAULS TERRACE

FORTITUDE VALLEY QLD 4006 AUSTRALIA

SMEC PROJECT No 3002718

CLIENT

PROJECT TITLE GLADSTONE GEM CENTRE TIA

26.0m B-double Swept Path

Gladstone Mt Larcom Road to Aldoga Road

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	TIA	30033831	01

FOR REVIEW

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	01	01.09.2022	SWEPT PATH - EXISTING LAYOUT	30033831-WVR-004	H.S.

PLOT DATE 01 Sep 2022 TIME 15:51:44

TITLE	NAME
DRAFTER	J. ROGERS
DRAFTING CHECK	H. STRACHAN
DESIGNER	
DESIGN CHECK	
PROJECT MANAGER	
PROJECT DIRECTOR	

SCALES AT A1 SIZE DRAWING
SCALE 1:50 0.5 0 1 2 2.5 m
SCALE 1:100 1 0 1 2 3 4 5 m
SCALE 1:500 5 0 10 20 25 m

DESIGNER
SMEC
Member of the Surbana Jurong Group
SMEC AUSTRALIA PTY LTD
© ABN 47 065 475 149
LEVEL 6, 480 ST PAULS TERRACE
FORTITUDE VALLEY QLD 4006 AUSTRALIA
SMEC PROJECT No 3002718

CLIENT

PROJECT TITLE GLADSTONE GEM CENTRE TIA

26.0m B-double Swept Path
Aldoga Road to Gladstone Mt Larcom Road

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	TIA	30033831	01

150 mm ON ORIGINAL
A1

FOR REVIEW

PLOT DATE	TIME
01 Sep 2022	15:52:23

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	01	01.09.2022	SWEPT PATH - EXISTING LAYOUT	30033831-WVR-004	H.S.

TITLE	NAME
DRAFTER	J. ROGERS
DRAFTING CHECK	H. STRACHAN
DESIGNER	
DESIGN CHECK	
PROJECT MANAGER	
PROJECT DIRECTOR	

SCALES AT A1 SIZE DRAWING

SCALE 1:50 — 0.5 0 1 2 2.5 m

SCALE 1:100 — 1 0 1 2 3 4 5 m

SCALE 1:500 — 5 0 10 20 25 m

DESIGNER

SMEC

Member of the Surbana Jurong Group

SMEC AUSTRALIA PTY LTD

© ABN 47 065 475 149

LEVEL 6, 480 ST PAULS TERRACE

FORTITUDE VALLEY QLD 4006 AUSTRALIA

SMEC PROJECT No 3002718

CLIENT

PROJECT TITLE GLADSTONE GEM CENTRE TIA

26.0m B-double Swept Path
Aldoga Road to Euroa Circuit

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	TIA	30033831	01

150 mm ON ORIGINAL

A1

150 mm ON ORIGINAL

A1

FOR REVIEW

PLOT DATE	TIME
01 Sep 2022	15:53:09

EXTERNAL REFERENCE FILES	REV	DATE	AMENDMENT / REVISION DESCRIPTION	WVR No.	APPROVAL
	01	01.09.2022	SWEPT PATH - EXISTING LAYOUT	30033831-WVR-004	H.S.

TITLE	NAME
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PROJECT DIRECTOR	

SCALES AT A1 SIZE DRAWING

SCALE 1:50 — 0.5 0 1 2 2.5 m

SCALE 1:100 — 1 0 1 2 3 4 5 m

SCALE 1:500 — 5 0 10 20 25 m

DESIGNER

SMEC

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SMEC AUSTRALIA PTY LTD

© ABN 47 065 475 149

LEVEL 6, 480 ST PAULS TERRACE

FORTITUDE VALLEY QLD 4006 AUSTRALIA

SMEC PROJECT No 3002718

CLIENT

PROJECT TITLE GLADSTONE GEM CENTRE TIA

26.0m B-double Swept Path
Euroa Circuit to Aldoga Road

SCALE	PHASE	PROJECT / DRAWING No.	REVISION
AS SHOWN	TIA	30033831	01

SMEC
Level 6, 480 St Pauls Terrace
Fortitude Valley QLD 4006
PO Box 2211, Fortitude Valley QLD 4006
Phone: 07 3029 6600
Email: brisbane@smec.com

We're redefining exceptional
Through our specialist expertise, we're challenging boundaries to deliver advanced infrastructure solutions.

www.smec.com

Appendix K SMEC Environmental Desktop Assessment Report

Appendix K Environmental Desktop Assessment Report

1. Desktop Environmental Assessment

This environmental assessment has been prepared in support of a Development Application for a Material Change of Use to establish Special Industry (50MW Hydrogen Test Train – hereafter the 'Proposed Development Area') use on Lot 4 on SP245936 (hereafter the 'Site'). The assessment has also been undertaken to support an Environmental Authority (EA) application for Prescribed Environmentally Relevant Activities (ERA) under the *Environmental Protection Act 1994* (EP Act). The aim of the assessment is to identify the existing environmental values, constraints and potential impacts associated with the Project. This assessment supports the application for an EA, the Department of Environment and Science (DES) requires that the assessment that addresses the following:

- a description of the **Land** environmental values, both onsite and offsite, likely to be affected by the proposed activity
- a description of the **Biodiversity** environmental values, both onsite and offsite, likely to be affected by the proposed activity
- a description of the **Air** environmental values, both onsite and offsite, likely to be affected by the proposed activity
- a description of the **Noise** environmental values, both onsite and offsite, likely to be affected by the proposed activity
- a description of the **Water** environmental values, both onsite and offsite, likely to be affected by the proposed activity
- a description of the **Waste** associated values associated with the proposed activity
- expected sources if impact, relevant to the environmental values above
- description of the risk and likely magnitude of impacts, relevant to the environmental values above
- management practices, relevant to the environmental values above.

1.1 Assessment Methods

The information in this report is based on a high-level desktop assessment of the Study area which encompasses a 2.5 km buffer around the facility. The assessment comprises a review of:

- Queensland Globe mapping portal
- WildNet database (DES)
- *Environment Protection and Biodiversity Conservation Act 1999* (EPBC) Protected Matters Search Tool (Department of Climate Change, Energy, Environment and Water (DCCEEW))
- Development Assessment Mapping System (DAMS) (Department of State Development, Infrastructure, Local Government and Planning (DSDILGP))
- State Planning Policy (SPP) Interactive Mapping System (DSDILGP)
- Regulated Vegetation Management Map (Department of Resources (DoR)
- Aerial imagery available through QLD Globe and NearMap
- Cultural Heritage Database and Register (Department of Seniors, Disability Services and Aboriginal and Torres Strait Island Partnerships (DSDATSIP))
- Environmental Management and Contaminated Land Registers (EMR/CLR)) (DES)Gladstone Regional Council (GRC) online mapping system
- Commonwealth, State and local government statutory instruments, including legislation, policies and guidelines.

1.2 Land

1.2.1 Site location and description

The Site property address is Euroa Circuit, Aldoga, Queensland located on Lot 4 on SP245936 approximately 20 kilometres (km) west of the centre of Gladstone.

1.2.2 Existing land use

The Proposed Development Area is located adjacent to the Gladstone Electrolyser Manufacturing (GEM) Facility (currently under development) within a Special Purpose zone (Figure 1–1), under the GRC Town Planning Scheme. Section 6.2.24.2 of the Gladstone Regional Council (GRC) Planning Scheme states, "*Special uses and works that are owned or operated by federal, state or local government and government entities are accommodated within this zone. These activities include, airports, seaports, rail lines, rail stations, the provision of water supply, sewerage, electricity, gas, telecommunications, transport, drainage and other like services".*

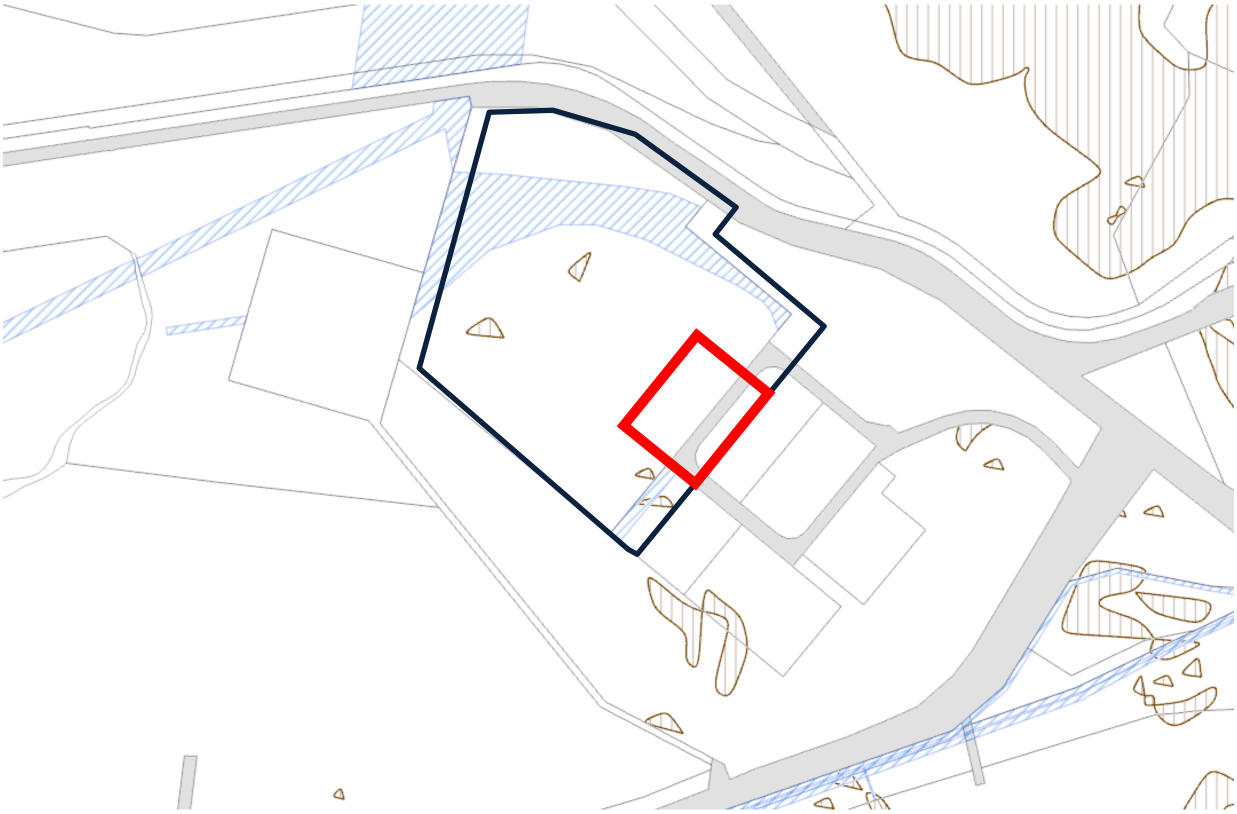
The GRC online mapping tool shows that the surrounding area is a combination of industrial, agricultural, commercial and residential, with only industrial (commercial) and agricultural located within a 2.5 km radius of the proposed site location.

Figure 1–1: Land use zoning surrounding Lot 4 SP245936 + 2.5 km.

1.2.3 Site topography

The Site elevation is approximately 60m. Bulk earth works have been carried out across the central portion of the Site under OPW/54/21, resulting in majority of the Site being relatively flat, with steeper areas in the north-east and southern corners. While most of the land within the Proposed Development Area will be flat, there will be a retaining wall installed towards the northern and north-eastern portions of the boundary. The immediate surrounding land is relatively flat, however steep elevations of up to 300 metres (m) are located within 3 km to the northeast, east and southeast of the Site (refer Figure 1–2), including four small areas within the lot boundary identified as steep land on the Steep Land Overlay Plan from Gladstone Regional Council Planning Scheme (GRCPS) (refer Figure 1–3). This steep land will be flattened as part of the preliminary earthworks.

Figure 1–2: Site topography including contour mapping Lot 4 SP245936 + 2.5 km.



Subject Site

Proposed Development Area

Steep Land

Figure 1–3: Steep land overlay Source: GRCPS

1.2.4 Unexploded ordnance

No areas with substantial potential for unexploded ordnance (UXO) have been identified within the Study area.

1.2.5 Contaminated land

A contaminated land search undertaken on 2 July 2021 concluded that the site is not included on the Environmental Management Register (EMR) or the Contaminated Land Register (CLR).

1.2.6 Acid sulfate soils

The Australian Soil Resource Information System (ASRIS) shows the Site to have 'Extremely Low' and 'Low Probability' of acid sulfate soils (ASS). ASS is unlikely to occur at the Site as ASS generally occurs below 20m Australian height datum (AHD).

1.2.7 Bushfire hazard

The Proposed Development Area is not within a Bushfire Prone Area, as indicated in the GRCPS. Proposed building works will not occur on any areas classified as having medium, high and very high potential bushfire intensity and there is no vegetation present in the Proposed Development Area (Figure 1–4).

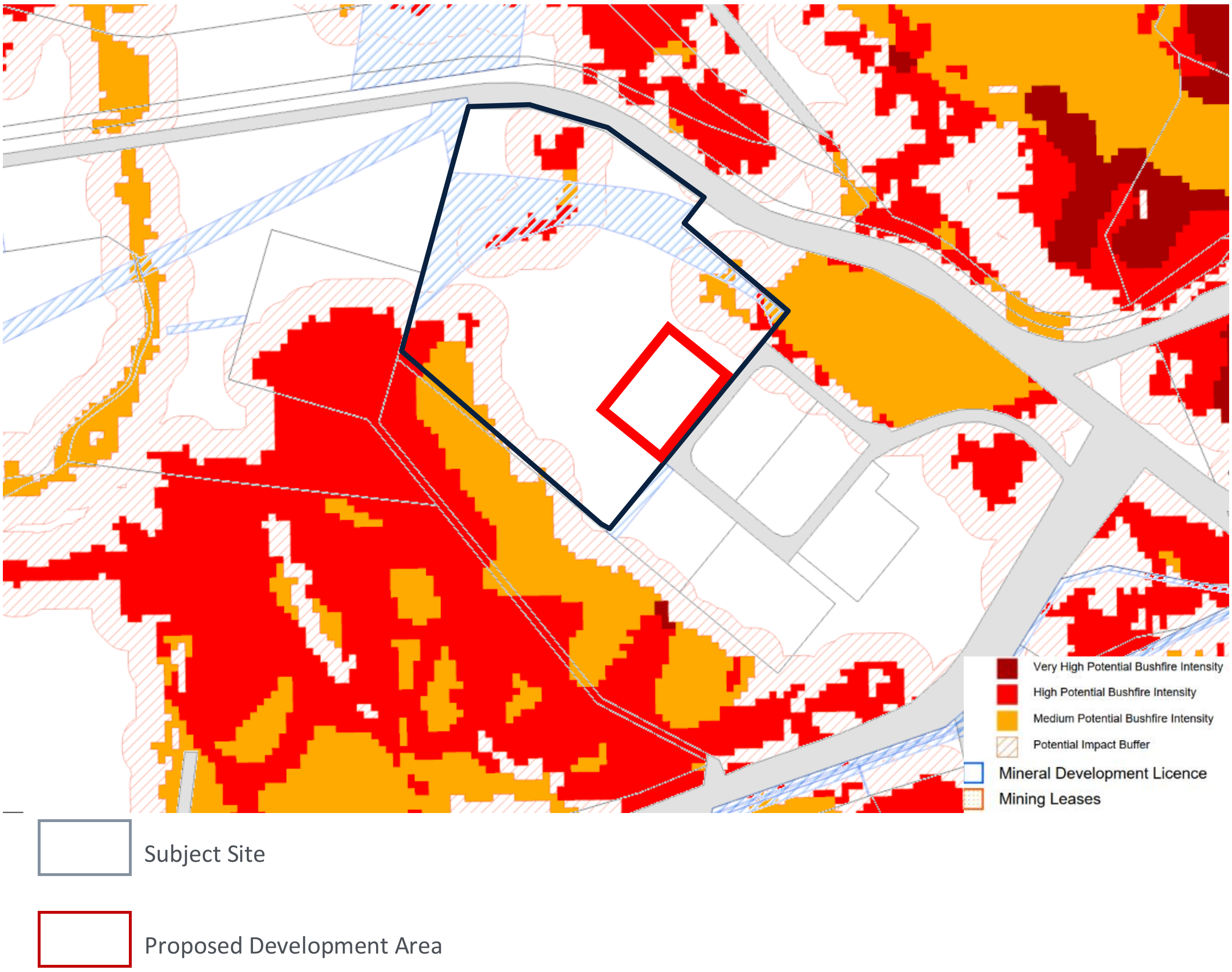


Figure 1–4 – Bushfire Prone Areas Source: GRCPS

1.2.8 Cultural heritage

The Site is located within the Bailai, Gurang, Gooreng Gooreng, Taribelang Bunda People Cultural Heritage party boundary and the first Nations Bailai, Gurang, Gooreng Gooreng, Taribelang Bunda People Aboriginal Corporation RNTBC Cultural Heritage body boundary.

An approved Cultural Heritage Management Plan (CHMP) (Aldoga South Road Extension Project) between the Port Curtis Coral Coast (PCCC) Registered Native Title Claimants and the Minister for Economic Development Queensland covers the Site.

No Cultural Heritage sites included on the Cultural Heritage Database and Register are mapped within the Site boundary, however two sites are mapped approximately 1 km south of the Site and south-east of the Site.

1.2.9 Environmental risk assessment

Risk: Moderate

A moderate risk of impacts to the abovementioned environmental values exists, due to the site being already heavily modified and the proposed design not requiring encroaching on the surrounding existing vegetation.

1.2.10 Land mitigation measures

1.2.10.1 Cultural heritage

Impacts to Cultural Heritage are unlikely as the Site has previously been cleared of vegetation and the proposed works will not occur in or nearby mapped vegetation.

A “Stop Works” procedure in the event of an unexpected Cultural Heritage finding must be developed prior to any ground disturbing or clearing works commencing.

1.2.11 Rehabilitation

Once the Test Train is no longer in operation the site would be rehabilitated back to the pre-development state by removing all equipment associated with the Test Train. A grass cover will then be planted over the site to ensure the site does not result in significant erosion or sediment issues. Given the sites zoning and ownership any further rehabilitation would be subject to the state approval.

1.3 Biodiversity

1.3.1 Flora

1.3.1.1 Threatened Ecological Communities

An EPBC Act Protected Matters Report identified four threatened ecological communities (TECs)that may occur within 2 km of the site. These include:

- Coastal Swamp Oak Forest of New South Wales and Southeast Queensland
- Coolibah – Black Box Woodlands of the Darling Riverine Plains and the Brigalow Belt South Bioregions
- Poplar Box Grassy Woodland on Alluvial Plains
- Weeping Myall Woodlands.

It is unlikely for a TEC to occur at the Site as the Proposed Development Area has previously been cleared of vegetation.

1.3.1.2 Regulated Vegetation

The following Regulated Vegetation occurs within the Site but does not intersect the Proposed Development Area (Figure 1–5 and Figure 1–6):

- Regulated vegetation (intersecting a watercourse) – 1.3 km
- Regulated vegetation (category B) – 1.3 ha
- Regulated vegetation (category C) – 4.19 ha
- Regulated vegetation (category R) – 8.53 ha
- Regulated vegetation (essential habitat) – 8.53 ha

No Regulated Vegetation will be impacted by the development proposed by the application.

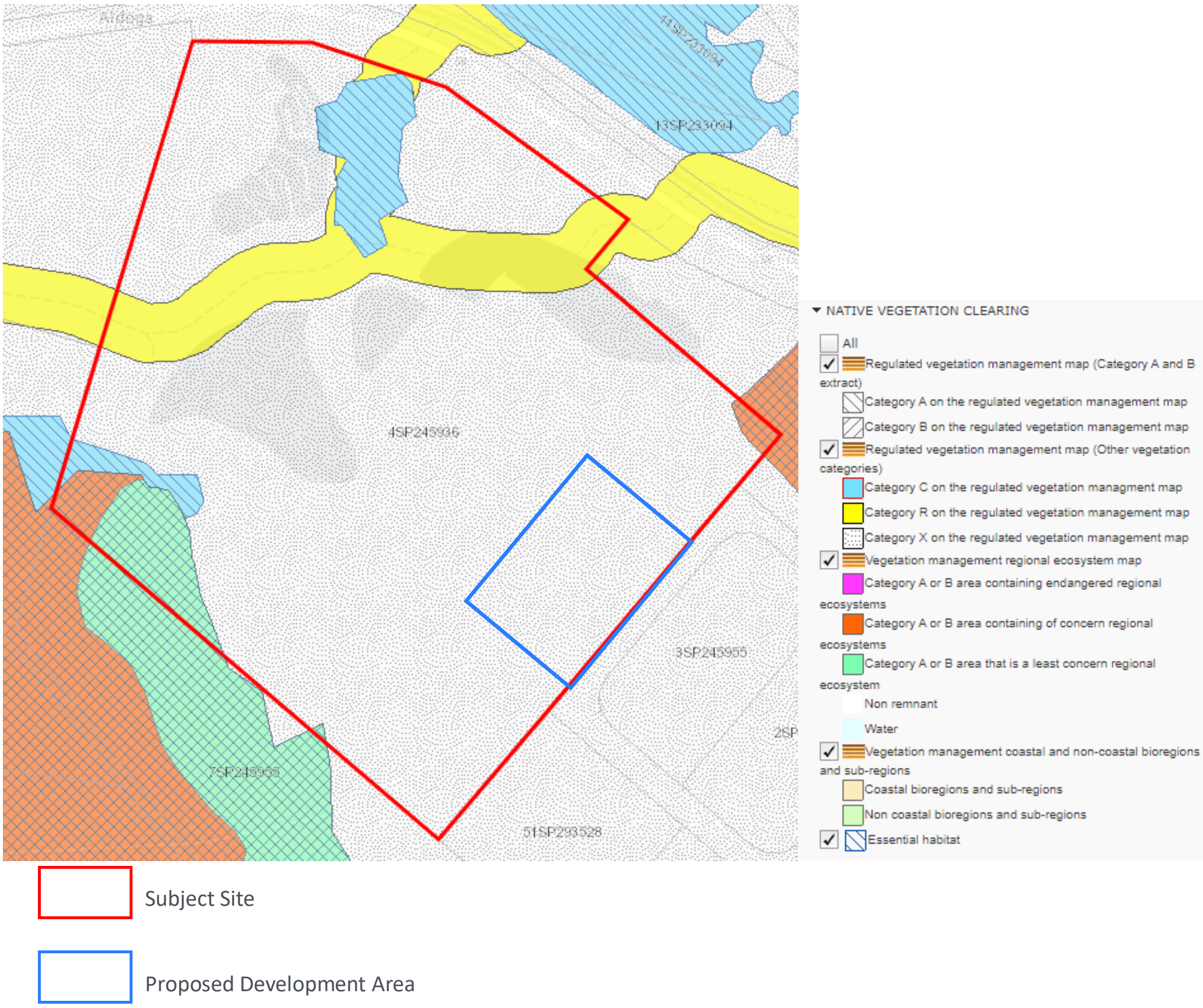


Figure 1–5: MSES Mapping Source: Queensland Globe

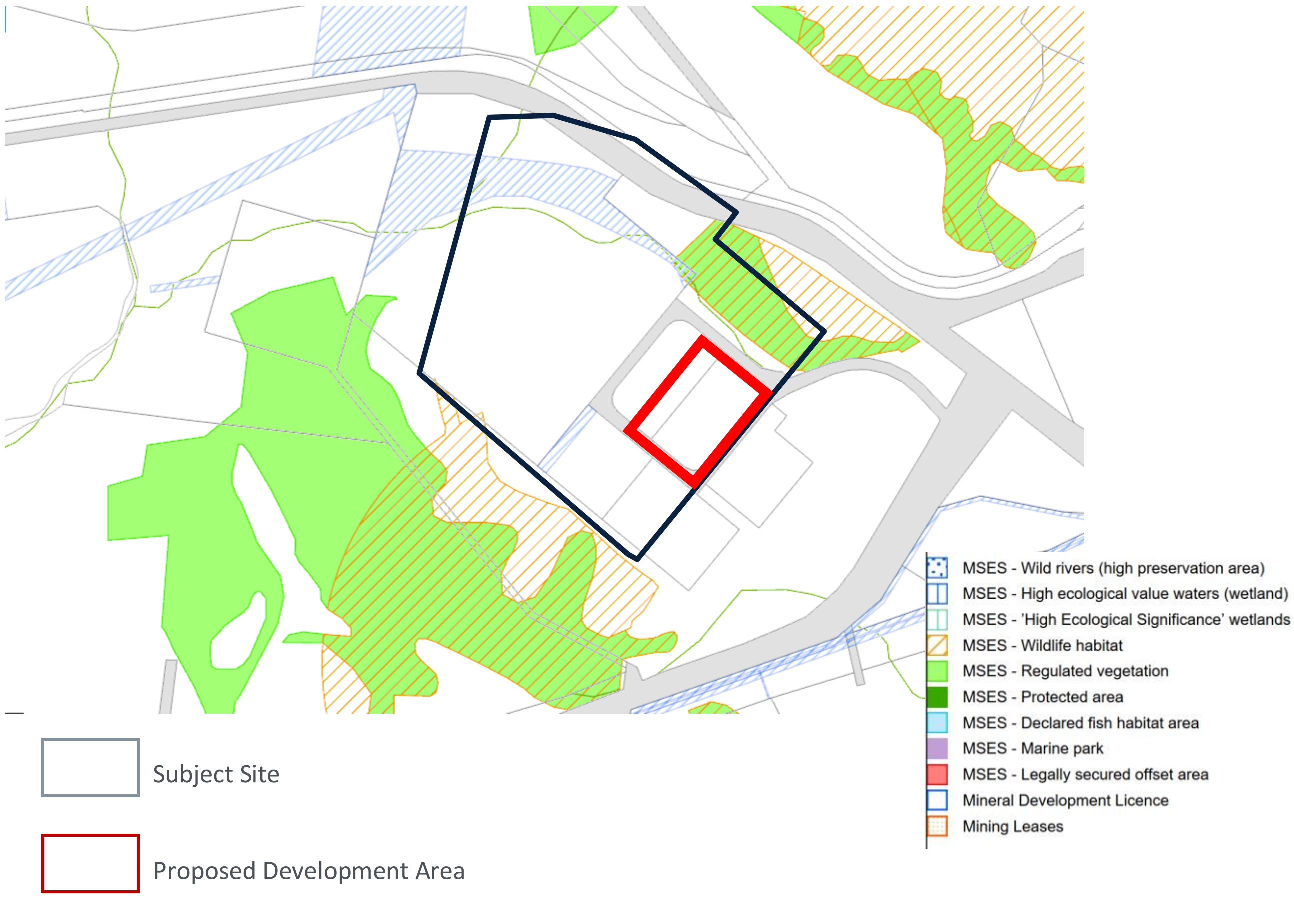


Figure 1–6: Biodiversity overlay Source: GRCPS

1.3.1.3 Conservation Significant Flora

The Protected Matters Search Tool (PMST) report returned ten EPBC-listed threatened flora species as having the potential to occur within 2 km of the Site. While the Site contains areas of remnant vegetation that may provide suitable habitat for conservation significant flora species, it is unlikely for any to occur within the Proposed Development Area as vegetation is absent.

1.3.2 Fauna

1.3.2.1 Wildlife habitat (vulnerable and endangered)

Wildlife habitat (vulnerable and endangered) is mapped within the Site for the following species:

- Squatter pigeon (southern subspecies) (*Geophaps scripta* subsp. *scripta*)
- Central greater glider (*Petauroides armillatus*)
- Powerful owl (*Ninox strenua*)
- Yellow-bellied glider (southern subspecies) (*Petaurus australis* subsp. *australis*).

1.3.2.2 Conservation Significant Fauna

The PMST report returned 23 EPBC-listed threatened fauna species as having potential to occur within 2 km of the Site. Additionally, 16 migratory species (inclusive of threatened species that are listed as migratory) were returned as having potential to occur within 2 km of the Site. While the Site contains areas of remnant vegetation that may provide suitable habitat for conservation significant fauna species, it is unlikely for any to occur within the Proposed Development Area as vegetation is absent.

1.3.3 Biodiversity value mitigation measures

- develop and implement best-practice Site management measures within an EMP Framework
- develop and implement a detailed Soil, Water and Waste Management Strategy
- undertake weed management during and after construction
- avoid the removal of large hollow-bearing trees (if any exist on Site).

1.4 Air

1.4.1 Wind direction

The prevailing winds (Figure 1–7) at this location are:

- >40% of the time between 20 and 30 km/h from the E
- >15% of the time between 20 and 30 km/h from the NE
- >15% of the time between
- <10% of the time between 20 and 30 km/h from the SE.

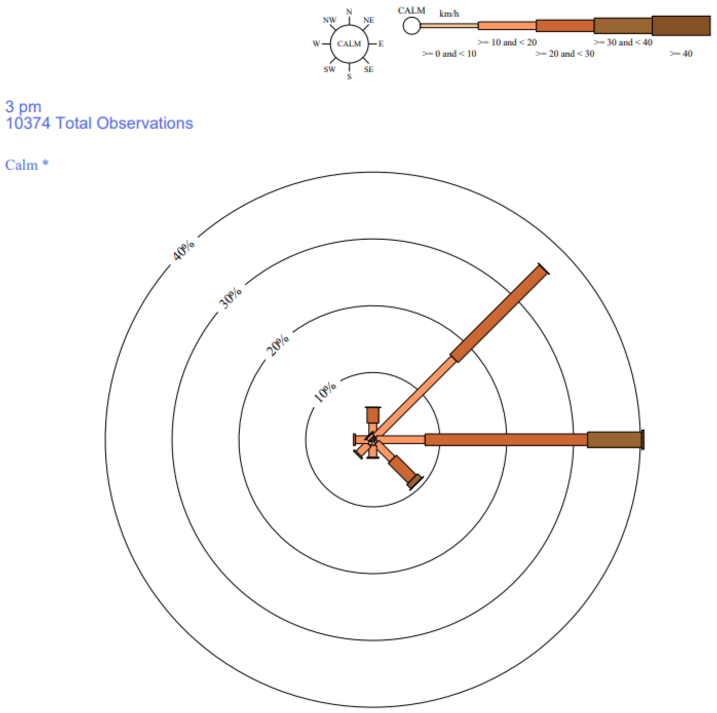


Figure 1–7: Prevailing wind direction

1.4.2 Description of ambient air quality

The Department of Environment and Science (DES) operate the Boat Creek live air quality monitoring station, located in the grounds of the Gladstone Area Water Board's Boat Creek pumping station on the Gladstone Mt Larcom Road, north of Gladstone – approximately 5 km from the proposed site location.

The station records the following parameters:

- Nitrogen dioxide
- Particle PM10
- Particle PM2.5
- Sulphur dioxide
- Visibility
- Humidity
- Temperature
- Wind direction
- Wind speed.

The station is located in the opposite direction to the predominant prevailing winds, which provides a sound ambient air quality baseline location.

Figure 1–8 presents air quality trends from the Gladstone air quality monitoring locations, with results indicating the prevailing condition of "fair". A description of air quality categories is included in Table 1-1.

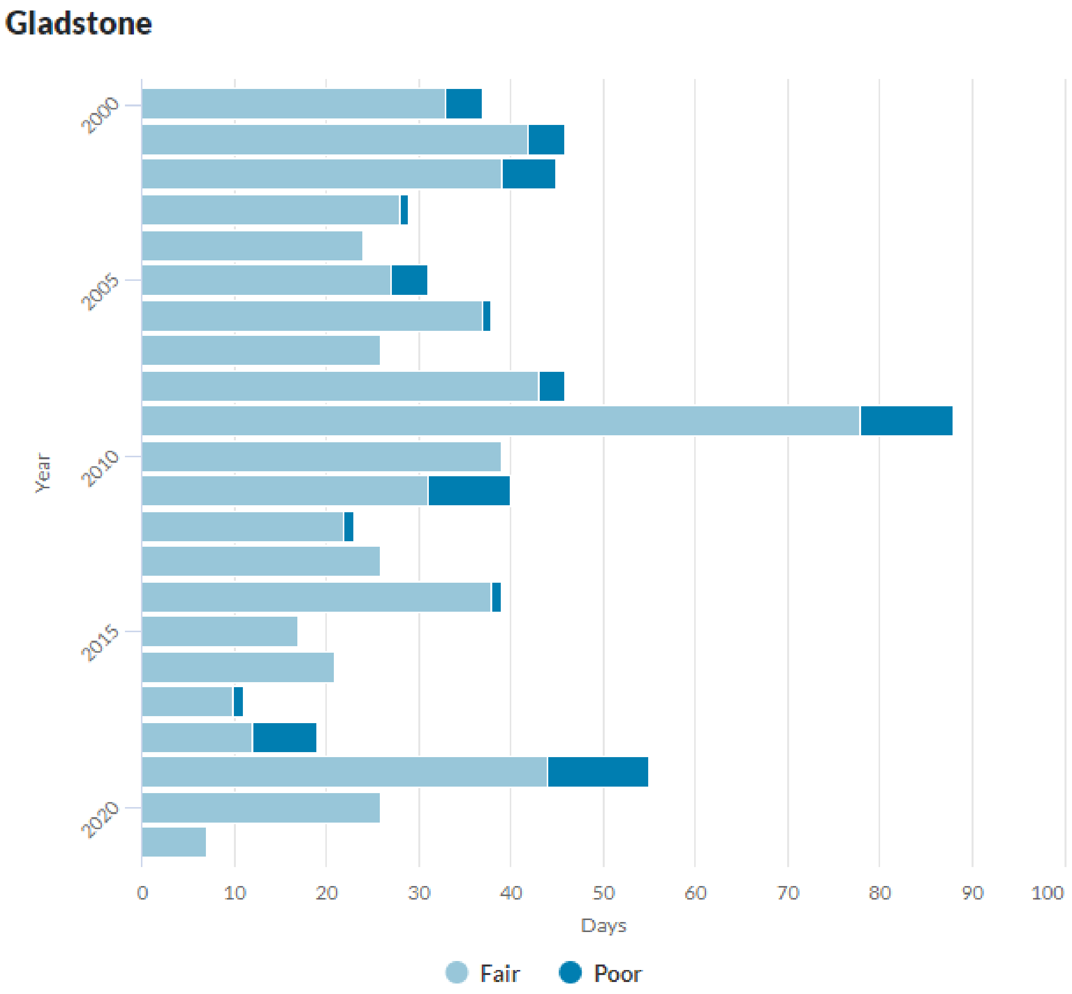


Figure 1–8: Air quality trend (human health) 2000-2021

Table 1-1: Air quality category definitions

Category	Condition threshold
Poor	At least one Air NEPM monitoring station did not meet the air quality objective for one or more pollutants, reflecting high pollution levels.
Fair	All Air NEPM monitoring stations met the air quality objective(s), but at least one station reached half the objective for one or more pollutants.
Good	All Air NEPM monitoring stations were below half the air quality objective(s) for all pollutants, reflecting good air quality.
Objectives	0.065 ppm (parts per million) ozone (8-hour average) 0.08 ppm nitrogen dioxide (1-hour average) 0.10 ppm sulphur dioxide (1-hour average) 9.0 ppm carbon monoxide (8-hour average) 50 µg/m^3 (micrograms per cubic metre) PM_{10} (particles less than 10 micrometres in size) 25 µg/m^3 $PM_{2.5}$ (particles less than 2.5 micrometres in size) 20 km visual distance (1-hour average)

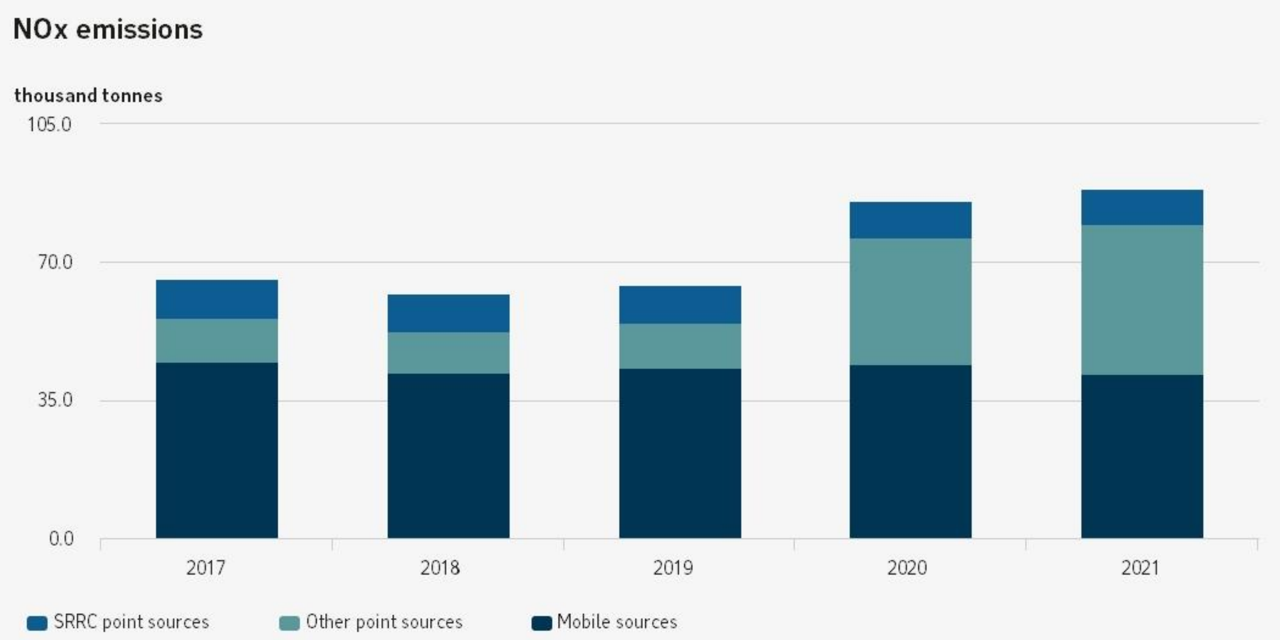
Table note:

Source: Queensland Government Regional Air Quality Trends - https://www.qld.gov.au/environment/management/monitoring/air/air-trends/regional-trends#container-304623

The operation of the Yarwun Alumina Refinery directly to the south of the proposed site location is likely to be the largest influencer of air quality in the immediate surrounding environment. The major air emissions from the refinery operations are:

- greenhouse gases, predominantly from the generation of electricity, combustion of fuel, and the production of aluminium
- sulphur oxides (SOx), mainly at the aluminium and copper smelters and coal and fuel oil fired power stations
- nitrogen oxides (NOx) from burning fossil fuels
- gaseous fluoride emissions from aluminium smelters
- respirable particulate emissions – very fine particles from mining and processing operations and from burning fossil fuels.

Figure 1–9 and Figure 1–10 present 5 years of Nitrogen Oxides and PM10 particulate monitoring from the refinery, with slightly increasing trends appearing.



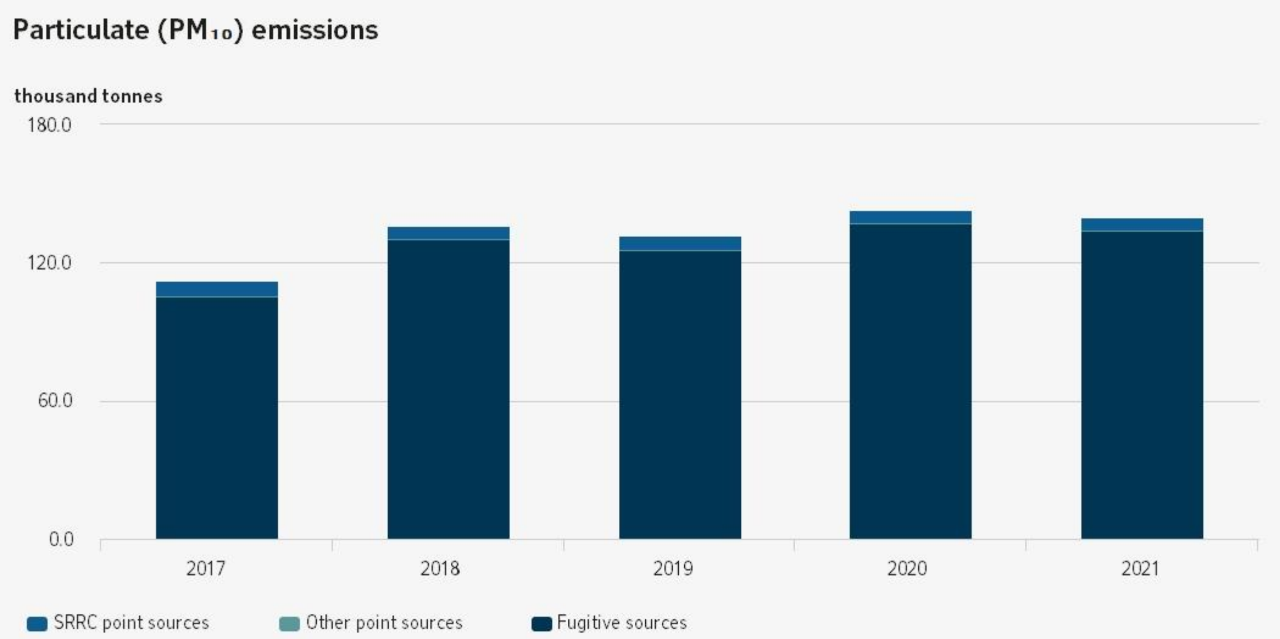
		2017	2018	2019	2020	2021
SRRC point sources	thousand tonnes	10.1	9.5	9.6	9.1	8.7
Other point sources	thousand tonnes	11.0	10.5	11.6	32.1	38.1
Mobile sources	thousand tonnes	44.8	42.1	43.1	44.3	41.7

Notes

1. The increase of NOx from 2019 to 2020 is due to change in calculation method from emissions factors to direct measurement using stack sampling data.

Supplied by © Euroland.com

Figure 1–9: NOx emissions from the Yarwun Alumina Refinery 2017-2021



		2017	2018	2019	2020	2021
SRRC point sources	thousand tonnes	6.4	5.6	5.5	5.4	5.2
Other point sources	thousand tonnes	0.6	0.6	0.6	0.6	0.6
Fugitive sources	thousand tonnes	105.4	130.0	125.5	137.2	133.8

Notes
1. Fugitive sources increased due to a change in calculation methodology, figures for 2017-2020 have been restated.

Supplied by © Euroland.com

Figure 1–10: Particulate emissions from the Yarwun Alumina Refinery 2017-2021

1.4.3 Emissions

The following gases will be utilised during the operation of the water treatment plant, utilities plant and electrolysers and therefore escape into the surrounding atmosphere is possible (Table 1-2).

There will be no discharge to air of contaminants that may cause an adverse effect on any of the environmental values that are to be enhanced or protected under the Environmental Protection (Air) Policy 2019 from the operation of the activity and the Environmental objectives under the Environmental Protection Regulation 2019 for air can be met, therefore no assessment has been undertaken. Evaluating impacts of emissions

Risk: Low

Given the relatively low risk of vapour / gas release during operations and the low toxicity of the gases used the major risk to air quality during operations is through explosion of the storage tanks. Storage and operation of these tanks in accordance with manufacturers recommendations and safety protocols is therefore imperative. Emergency management plans should be developed prior to operation.

Table 1-2: Expected emissions associated with operation

Use	Chemical name	Phase	GHS Classification	ADG Class	Approx. Max Inventory		Largest container size	WHS Reg Schedule 11 Column 4 Placard Quantity		WHS Reg Schedule 15	
								Threshold quantity	Exceed? (Y/N)	Threshold quantity	% of Threshold quantity
Utilities plant	Nitrogen	Vapour	Gases under pressure		20,000 L	4 x 5m³ vessels	5,000 L				
Utilities plant	Compressed Air	Vapour	Gases under pressure: compressed gas		15,000 L	3 x 5³ vessels	5,000 L				
Electrolysers	Hydrogen	Vapour		2.1	18.5 tonnes	18 x Pressure vessels	44,200 L	5,000 L	Y	50 tonnes	37%
	Oxygen	Vapour	Gases under pressure	2.2/5.1	0.62 m3	Piping	0.62 m3			200 tonnes	<1%

1.4.4 Discharges and releases (including unplanned and uncontrolled)

Storage and handling areas for prescribed hazardous chemicals are designed to prevent contact between the prescribed hazardous material and have any discharges or releases

The system is designed to continuously monitor for hydrogen leaks at the electrolysers. The electrolysers are contained in a sea container like structure that has air constantly passing over the electrolysers to ensure any potential small hydrogen gas leaks are vented to atmosphere rather than accumulating inside the container which could cause an explosive atmosphere. Should the hydrogen accumulate, the system will purge the electrolysers with nitrogen and flare the hydrogen to remove the potential of an explosive atmosphere.

Once produced the hydrogen is compressed and stored within vessels, should a leak be detected within vessels the system will automatically send the hydrogen to the high-pressure flare to ensure there is no accumulation of hydrogen which could lead to an explosive atmosphere.

1.4.4.1 Enclosed Ground Flare

Composition of the flare exhaust gas is water vapour only in all cases. The facility will flare as per parameters below:

- continuous = During normal operation
- emergency plant shutdown = 2-3 times per year, ~5 mins
- H2 storage emergency shutdown = 1 per 10 years, max 15 mins.

The estimated volume of exhaust gas from the flare are as follows:

- start-up = 50 kg/hr, lasting 5-10 mins
- continuous = max 1.9 kg/hr
- emergency plant shutdown = 5300 kg/hr of H2, lasting ~5 mins
- H2 storage emergency shutdown = 5000 kg total over 15-minute duration.

The estimated combustion temperature associated with the flare are as follows:

- H2 flame temperature ~1800-2000°C. Final temperature pending vendor selection. Thermal radiation effects fully contained within enclosure.

1.4.5 Odour

No odours are expected to be produced through the construction or operational phases of the plant.

1.4.6 Dust

Impacts during the construction phase of the project may include dust from unstabilised surfaces and vehicle emissions. These will need to be addressed through management practices. Mitigation, along with regular monitoring, will be addressed through a Construction Environmental Management Plan (EMP(C)) and an associated Erosion and Sediment Control Plan.

1.4.7 Air dispersion modelling

Due to the low risk of impact to air during operations, it is proposed that air dispersion modelling is not required.

1.4.8 Air mitigation measures

The following measures will be utilised to reduce ongoing impacts to air values. These include:

- the Project is designed so that it meets the requirements outlined in the EP Act and the *Environmental Protection (Air) Policy 2019*
- an Air Management Plan should be developed as part of the EMP(C), to effectively manage risks to sensitive receptors during all construction and operational works and to comply with the General Environmental Duty (GED) under the EP Act and *Environmental Protection (Air) Policy* 2019

- the Contractor will be required to manage dust generation through the use of dust suppression on areas of exposed earth, minimising the extent and duration of soil exposure, maintaining all revegetated areas until established
- limit vehicle speeds on unsealed surfaces to below 30 km/h. Haul vehicles to always cover loads while moving
- burning of waste of any kind is not to be undertaken at the project site at any time
- if complaints are received, undertake air quality assessments in proximity to sensitive receptors and with respect to the complaint.

1.5 Noise

1.5.1 Environmental values

There are several ecological environmental receptors located within the 2.5 km buffer zone, including an Of Concern Regional Ecosystem (E*ucalyptus tereticornis* and/or Eucalyptus spp. Woodland on alluvial plains (RE 11.3.4)), essential wildlife habitat and several waterways.

The nearest sensitive residential receptor is located approximately 2.4 km to the east of the site, and there are two commercial properties within the 2.5 km buffer zone, including an electrical substation to the north and the Yarwun bauxite processing plant and associated by-product storage facilities immediately to the south (refer Figure 1–11).

1.5.2 Sensitive places

The proposed industrial activity is located in the High Impact Industrial Precinct of the Strategic Development Area (SDA). The Precinct is strategically located away from sensitive receptors. With the exception of vehicle access, the majority of plant items are also located within enclosures which are either partially closed or fully enclosed which will reduce noise emissions externally from the site.

A noise and vibration assessment for operations at the site has not been undertaken. Noting this, a similar assessment has been conducted for the Gibson Island Hydrogen Plant and these indicative levels of plant during construction and operations has been used. Operational activities will be undertaken in two, twelve-hour shifts resulting in 24/7 continuous operation. Day shift will start at 6:00am, and night shift will start at 6:00pm each day. It is estimated that 20 personnel will be onsite at peak during day shift activities.

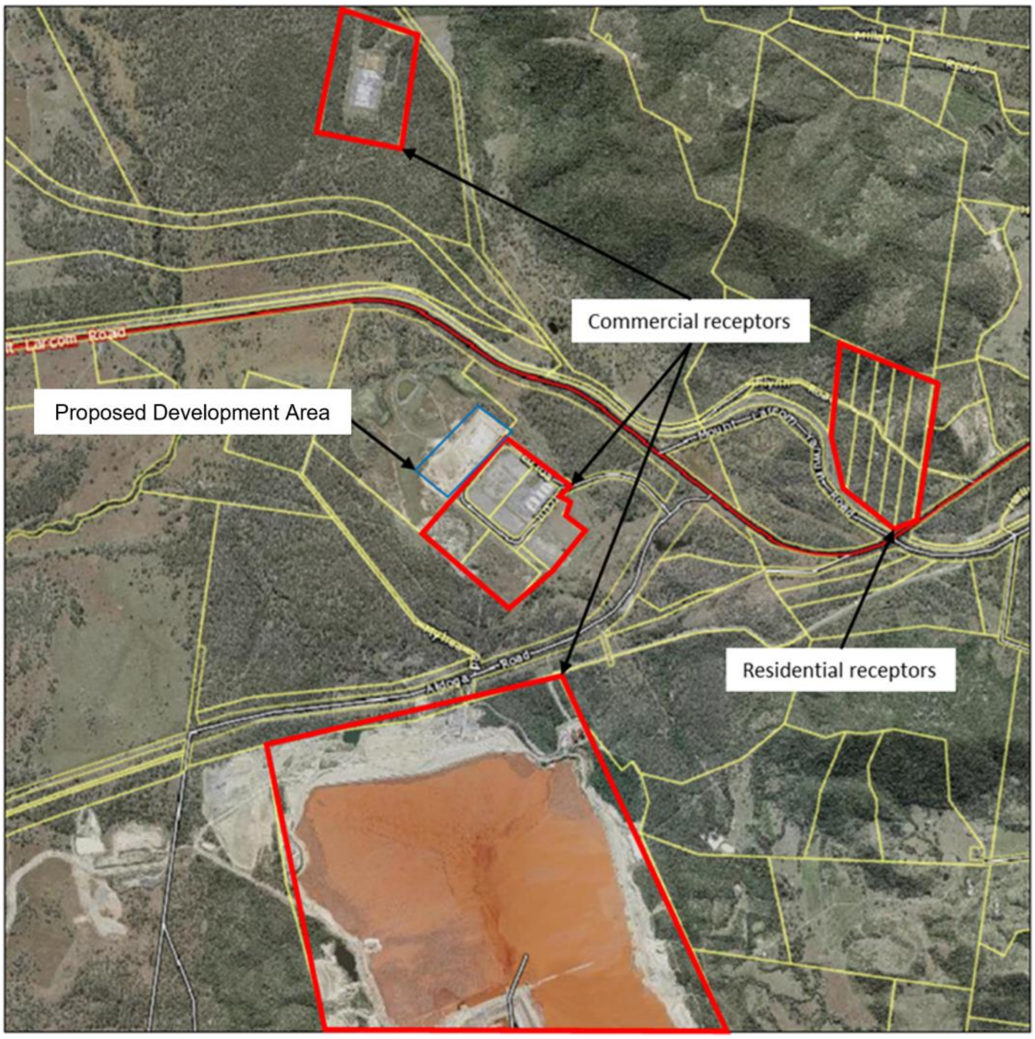


Figure 1–11: Sensitive places surrounding the Proposed Development Area

1.5.3 Noise objectives and criteria

Queensland's EP Act forms part of a legislative framework that regulates noise from domestic, commercial and industrial premises.

Environmental nuisance is defined in the EP Act as unreasonable interference or likely interference with an environmental value caused by, for example, noise. The *Environmental Protection (Noise) Policy* 2019 (Qld) (EPP Noise) identifies the environmental values of the acoustic environment to be protected and enhanced.

By identifying environmental values, the EPP Noise assists in informing whether environmental nuisance under the EP Act has been caused.

The EPP Noise identifies the environmental values of the acoustic environment to be enhanced or protected to achieve the objective of the EP Act; that is, ecologically sustainable development.

The environmental values under the policy are:

- the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and
- the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—
  - sleep
  - study or learn
  - be involved in recreation, including relaxation and conversation.
- the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

Under the policy, a 'sensitive receptor' means: "*An area or place where noise is measured*."

Under the policy, an 'acoustic quality objective' means: "*For a sensitive receptor, means the maximum level of noise that should be experienced in the acoustic environment of the sensitive receptor*."

Acoustic quality objectives for specific sensitive receptors under the policy are stipulated in Schedule 1 of the Environmental Protection (Noise) Policy. Those stipulated in Schedule 1 of the Noise EPP applicable to the Project are presented in Table 1-3.

Table 1-3: Qld Environmental Protection (Noise) Policy 2019 acoustic quality objectives applicable to the Project

Receptor	Time of day	Acoustic quality objectives			Environmental value
		$dBL_{Aeq,1hr}$	$dBL_{A10,1hr}$	$dBL_{A1,1hr}$	
Residence (for outdoors)	Daytime and evening	50	55	65	Health and wellbeing
Residence (for indoors)	Daytime and evening	35	40	45	Health and wellbeing
	Night-time	30	35	40	Health and wellbeing, in relation to ability to sleep
Commercial or retail activity (for indoors)	When the activity is open for business	45	-	-	Health and wellbeing, in relation to the ability to converse

Table note:

- Daytime means 7 am to 6 pm
- Evening means 6 pm to 10 pm
- Night-time means 10 pm to 7 am
- LAeq,1hr means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1-hour period has the same mean square sound pressure of a sound that varies with time
- LA10,1hr means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 10% of a 1-hour period when measured using a fast-standardised response time
- LA1,1hr means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 1-hour period when measured using a fast-standardised response time.

1.5.4 Noise sources

1.5.4.1 Construction

The construction of the site is proposed to occur in three stages:

- Stage 1: site preparation
- Stage 2 and 3: construction and installation of equipment and buildings
- Stage 4: commissioning.

The number of plant and equipment for each staging, with their associated sound power levels are identified in Table 1-4. Plant selections are subject to change once a construction programme has been established by the site contractor. These construction scenarios represent a worst-case assessment based on the preliminary plant proposed for the build. A reassessment may be required if there are significant changes to the construction staging.

Construction noise at the nearest commercial receiver and residential receptor has been predicted with all plant, in each construction stage, operating simultaneously (which would rarely be the case in practice); and assuming that all plant is located at the nearest site boundary closest to the receiver. This represents a worst-case, and therefore conservative, assessment scenario at the receivers.

The predicted noise levels for construction are shown in Table 1-4.

Table 1-4: Source noise levels for proposed construction plant

Plant	Sound power level (dB) for Octave band centre frequency (Hz)							Total, dB(A)
	63	125	250	500	1k	2k	4k	
Dump truck	113	102	106	101	101	102	95	107
Excavator	109	108	108	111	110	107	104	114
Bulldozer	105	114	103	103	110	108	101	113
Loader	115	110	105	106	101	98	92	107
Bitumen trucks	108	97	94	98	99	97	92	103
Asphalt unit	98	106	107	100	105	96	94	104
Compactor	98	106	107	100	105	96	94	107
Scraper	105	114	103	103	110	108	101	113
Water truck	108	97	94	98	99	97	92	103
Curbing unit	106	105	100	100	99	97	90	104
Piling rig	108	107	101	102	101	101	92	106
Backhoe	114	108	106	105	109	111	110	117
Roller (smooth)	115	113	103	101	103	101	97	108
Concrete truck	108	97	94	98	99	97	92	103
Forklift	108	105	102	102	102	99	93	106
Flatbed truck	105	94	91	95	96	94	89	100
Mobile crane	108	107	101	102	101	101	92	106
Hiab truck	105	94	91	95	96	94	89	100
Generator	108	102	85	82	81	76	73	89
Telescopic crane	108	107	101	102	101	101	92	106
Hand tools	93	93	91	84	83	86	88	94

Table note:

Plant sound power levels have been referenced from:

- British Standard BS5228-1:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise; and
- Australian Standards AS2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites.

1.5.4.2 Operation

Table 1-5 presents the source noise levels during operational phases of the proposed plant. Predicted noise emissions have been calculated for the FFI project site operating in isolation. The noise predictions for the FFI site operating in isolation have been presented from modelling conducted for a similar plant in Gibson Island and are regarded as a suitable proxy, given the similarity between projects and absence of any similar plants within proximity.

Table 1-5: Source noise levels for proposed operational plant

Plant	Sound power level (dB) for Octave band centre frequency (Hz)									Total, dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Pumps (100kW, 1600-1800 rpm)	93	94	95	97	97	100	97	93	87	104
Pumps (75kW, 1600-1800 rpm)	93	94	95	97	97	100	97	93	87	103
Pumps (75kW, 3600 rpm)	90	91	92	94	94	97	94	90	84	100
Electrolyser pump	93	94	95	97	97	100	97	93	87	104
Cooling tower	108	111	111	108	105	101	98	95	87	107
Power transformer	80	89	92	87	87	79	72	64	52	86
Distribution transformer	80	89	92	87	87	79	72	64	52	86
Compressor	107	103	108	107	105	108	113	110	103	116
Transformer	80	89	82	87	87	79	72	64	52	86
Condensers	72	77	75	78	74	67	65	57	51	75

Table note:

- power and distribution transformers are only associated with the electrolyser unit substations.

1.5.5 Noise impact assessment

Risk: Low

The proposed industrial activity is located in the High Impact Industrial Precinct of the SDA. The impacts are not considered significant with regard to the magnitude of noise levels above the criteria.

1.5.6 Noise mitigation measures

It is recommended strategies are considered and, where appropriate, outlined in a Construction Management Plan to mitigate potential impacts, such as:

- install site hoardings or boundary barriers prior to construction activities commencing
- orient construction trucks and plant away from sensitive receivers as much as possible to minimise noise impacts
- strategically group plant together to minimise noise impacts from multiple directions

- manage on site vehicle speeds and avoid/minimise using broadband/audible reversing alarms
- strategically locate site ingress and egress points to minimise travel within the site. Maintain site paths to avoid unnecessary noise sources such as from vehicles striking potholes and loose items
- work within the nominated construction hours of work, including start up meetings and closure periods
- utilise lowest noise plant to complete construction works and implement low noise work practices
- locate site buildings, staff access areas and laydown yards to minimise disturbance to the community
- utilise temporary enclosures works and/or works undertaken outside the typical construction hours to shield high noise generating activities
- ensure noise attenuation measures are implemented on fixed and mobile plant such as mufflers and silencers to minimise noise impacts
- turn off plant when not in use and avoid idling when possible
- keep out-of-use plant located away from sensitive receivers
- avoid heavy handling of materials and equipment to prevent sudden noise events
- undertake site inductions for all employees, contractors and subcontractors, with the induction including noise mitigation measures and management actions to be adopted by all site personnel.

1.6 Waters, including wetlands and stormwater management

1.6.1 Site plan

The Proposed Development Area is located alongside the boundary with Euroa Circuit. That part of the lot was previously cleared and subject to some earth movement. There is a gazetted drainage easement in favour of the State on the North and East of the Proposed Development Area, forming man-made basins. Details of the performance of those basins are yet to be confirmed, however previous reports for the site indicate they were constructed for the purpose of controlling sediment discharge from the site. There are no other drainage features within the site and the Proposed Development Area is not affected by flooding.

The site ultimately discharges into Larcom Creek to the northwest. Mapped waterway at the Site are shown in Figure 1–12.

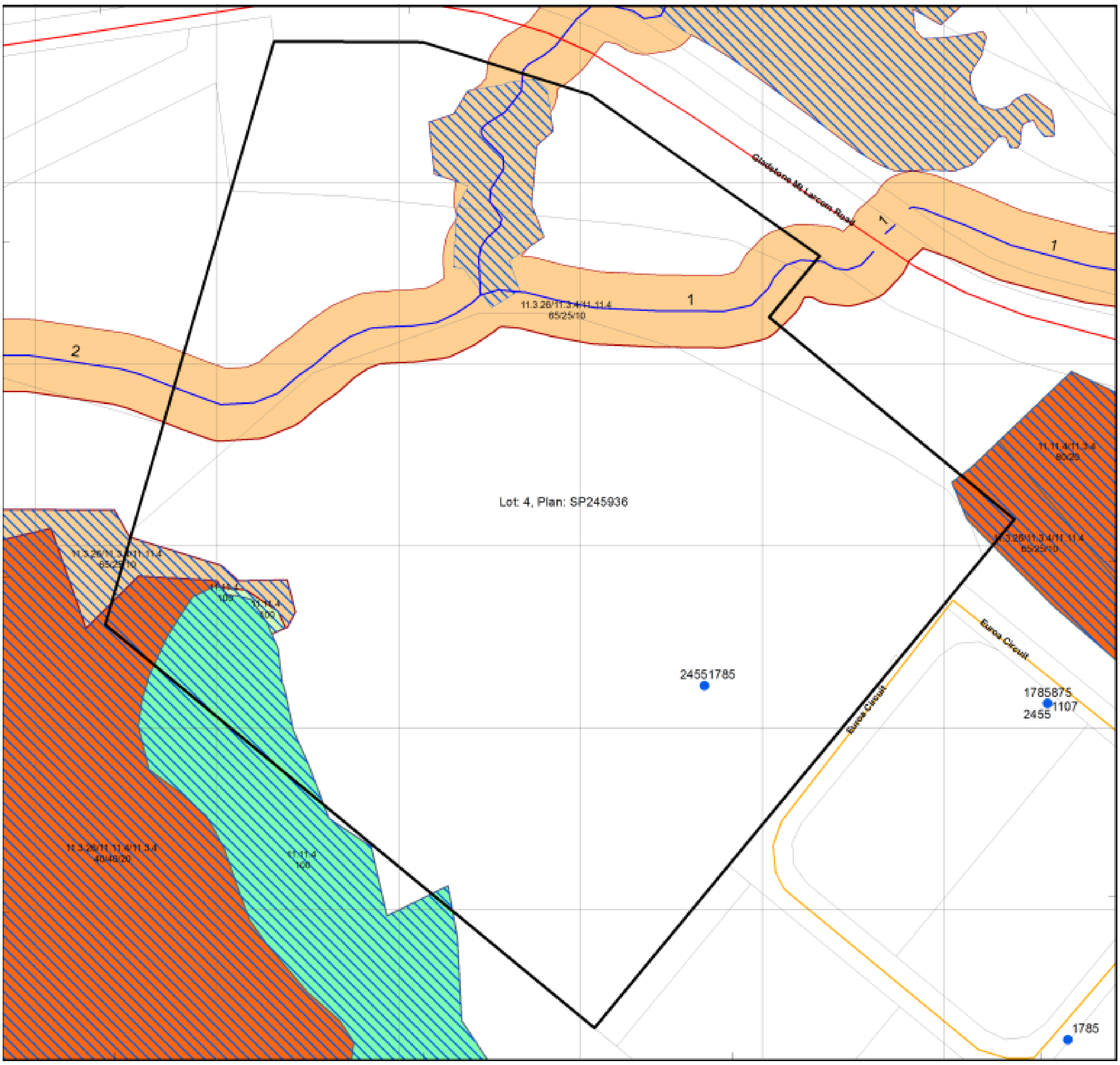


Figure 1–12: Mapped waterways surrounding the project site

1.6.2 Rainfall

Gladstone airport (approximately 23 km from the project site) receives approximately 866mm of annual rainfall, the majority falling between December and March. Table 1-6 outlines the climate statistic for the weather station.

Table 1-6 Climate statistic from Gladstone Airport

Rainfall															
Mean rainfall (mm)	136.4	165.9	118.3	41.2	38.4	39.1	32.4	31.8	27.5	63.3	61.7	103.3	866.5	28	1994 2023
Decile 5 (median) rainfall (mm)	118.6	110.6	63.2	27.4	19.2	18.9	14.6	15.4	16.4	53.2	46.2	88.2	786.3	29	1994 2023
Mean number of days of rain ≥ 1 mm	8.5	8.5	7.2	3.9	3.6	3.8	3.0	2.6	2.8	4.9	4.8	7.1	60.7	28	1994 2023

1.6.3 Flood hazard

Following review of the GRCPS, it has been determined that the site is not located in a flood hazard area (refer Figure 1–13). Therefore, it is considered that a focused flood risk assessment and Flood Management Plan is not required.

Figure 1–13: Flood hazard mapping of the surrounding area

1.6.4 Surface water

Surface waters on site drain to Larcom Creek and eventually to Calliope River, which ultimately empties into the GBR catchment (Fitzroy Region). Table 1-7 from the *Queensland Water Quality Guidelines 2009* outlines the regional guideline values for physio-chemical indicators.

Current water quality conditions within the Calliope River catchment are influenced by a number of anthropogenic activities, including grazing, agriculture, industry and urban-based activities. Based on the extent of catchment clearing and existing land use patterns, the condition of the Calliope River catchment was reported as poor to moderate in the 1992 National Land and Water Audit (C & R Consulting 2005). While the catchment has undergone extensive clearing, with up to 66% of native vegetation removal estimated (Accad et al 2003), one factor influencing the in-stream water quality is the presence of a relatively thin, riparian corridor (predominantly native vegetation) along the entire freshwater length of the Calliope River

Within this area, the Calliope River is characterised by a series of large, deep waterholes. This is supported by the EPA wetland mapping which characterises the reach as a riverine system (i.e., wetlands and refuge habitats contained within the river channel). Similar habitats were identified on Farmer Creek and Larcom Creek. These in-stream freshwater pools provide important habitat for native fish of the area.

Table 1-7: Regional guideline values for physio-chemical indicators

Table 3.2.1a: Regional guideline values for physico-chemical indicators – Central Coast region fresh and estuarine waters

Central region water type	Physico-chemical indicator (see Appendix E) and guideline[9] value (slightly to moderately disturbed systems)															
	Amm N	Oxid N	Org[6] N	Total N	FiltR P	Total P	Chl-a	DO (% sat[5])[1,2,3]		Turb	Secchi	SS	pH[4,5]		Conductivity	Temperat
	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	(µg/L)	lower	upper	(NTU)	(m)	(mg/L)	lower	upper	(µS/cm)	(°C)
Open coastal, midshelf & offshore	See Table 3.2.1b which covers guidelines for these waters, which are within the Great Barrier Reef Marine Park.															Managers need to de their own upper and lower guideline values, us the 80th ar 20th percentiles respective of ecosyst temperatu distributio (ANZECC 2000).
Enclosed coastal	8	3	180	200	6	20	2.0	90	100	6	1.5	15	8.0	8.4	n/a	
Mid-estuarine and tidal canals, constructed estuaries, marinas and boat harbours	10	10	260	300	8	25	4.0	85	100	8[8]	1.0[8]	20[8]	7.0	8.4	n/a	
Upper estuarine	30	15	400	450	10	40	10.0	70	100	25[8]	0.4[8]	25[8]	7.0	8.4	n/a	
Lowland streams[10]	20	60	420	500	20	50	5.0	85	110	50	n/a	10	6.5	8.0	See Appendix G	
Upland streams[10]	10	15	225	250	15	30	n/a	90	110	25	n/a	–	6.5	7.5	See Appendix G	
Freshwater lakes/ reservoirs	10	10	330	350	5	10	5.0	90	110	1–20	nd	nd	6.5	8.0	See Appendix G	
Wetlands [7]	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	nd	

1.6.5 Groundwater

No Groundwater Dependent Ecosystems (GDEs) have been identified within the study area, or in the 2.5 km buffer surrounding the site. It should be noted that extensive groundwater monitoring bores are located immediately to the south of the site (refer to Figure 1–14), further information may be available from these bores. It is recommended that further testing is undertaken to determine the depth of groundwater within the site.

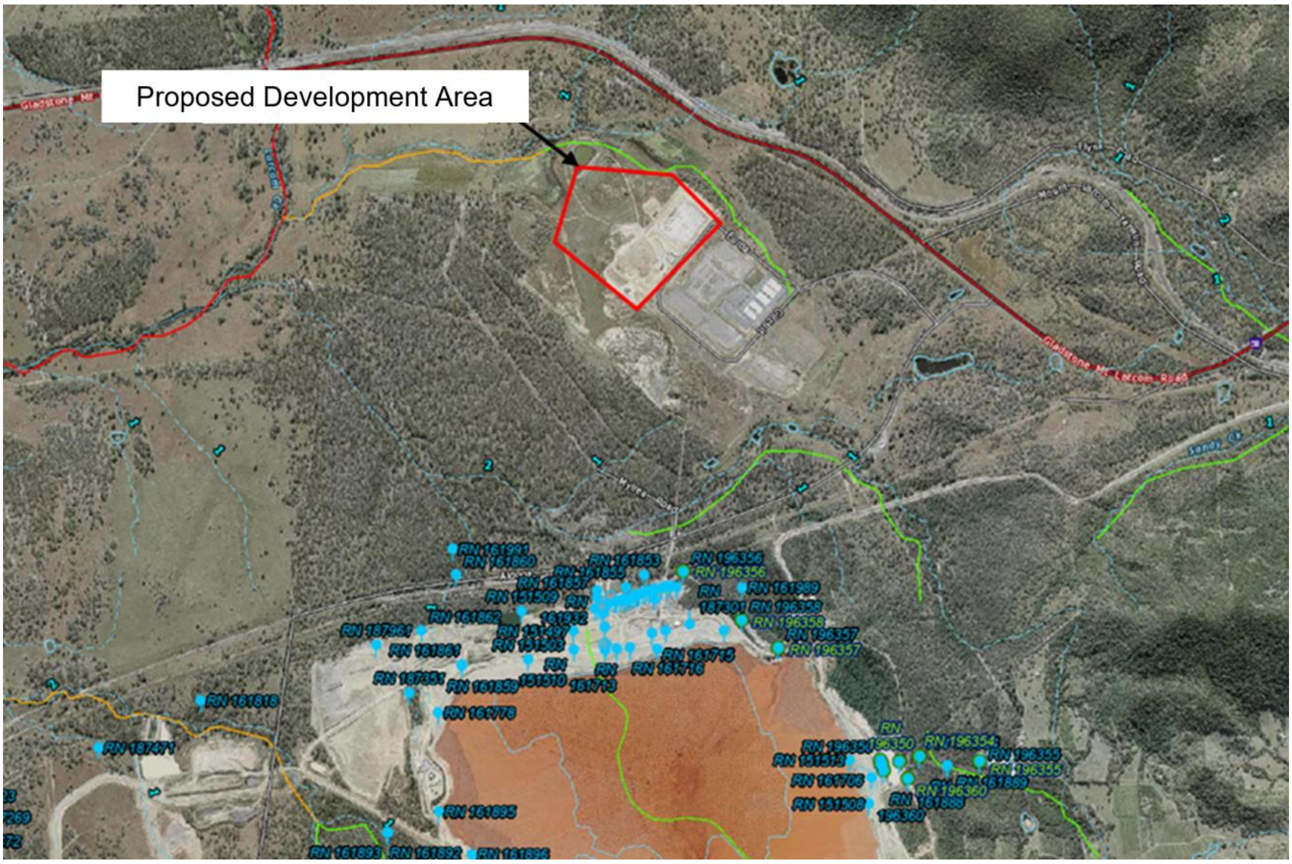


Figure 1–14: Groundwater monitoring locations

1.6.6 Discharges and impacts to groundwater

The proposed development will not have any discharges to groundwater.

1.6.7 Impacts to wetlands

The Queensland Globe Map indicates that there are three Lacustrine wetlands with habitat type artificial/ highly modified wetlands approximately 100m to the north/north-west of the boundary of the Proposed Development Area, this appears to be a mapping error as these are the previously constructed stormwater detention and treatment devices Refer wetland mapping at Figure 1–15.

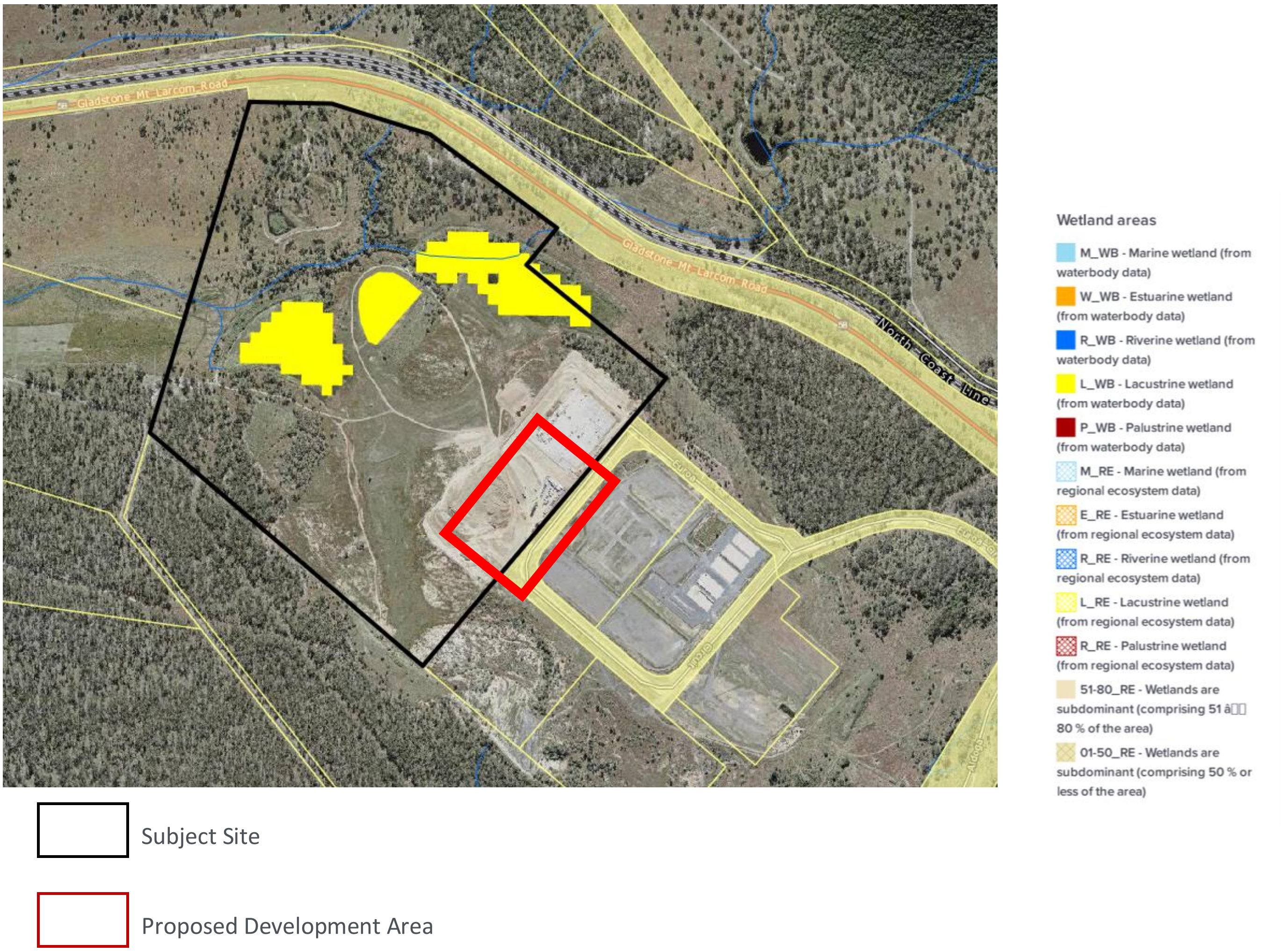


Figure 1–15: Wetlands area Source: Queensland Globe Map

1.6.8 Great Barrier Reef catchment waters

The Calliope River catchment flows directly into the Capricorn and Curtis Coast section of the Great Barrier Reef Marine Park and subsequently have strict management plans and water quality objectives being implemented under Queensland's *Environmental Protection (Water) Policy 2019* and the DES *Industry releases to barrier reef catchments waters.*

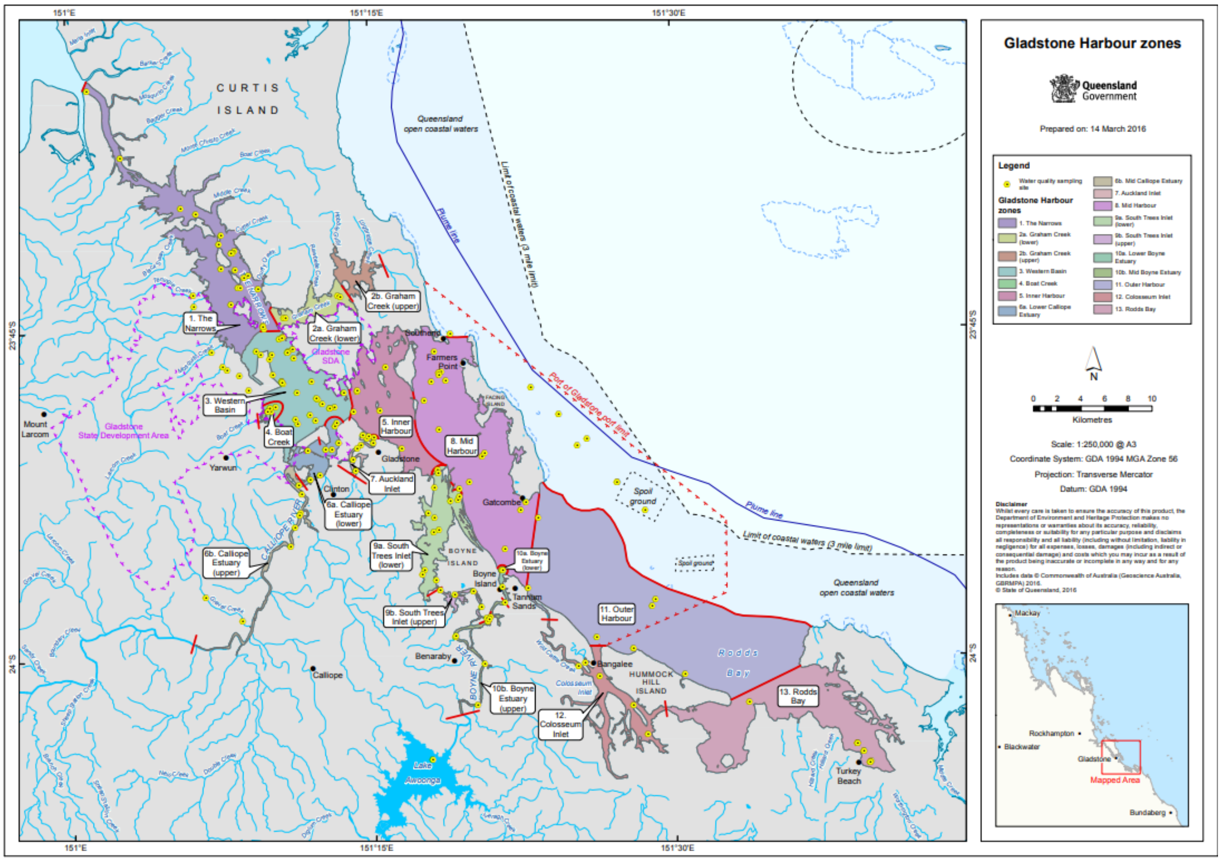


Figure 1–16: Great Barrier Reef catchment waters

1.6.9 Risk assessment

Risk: High

Unnamed tributary (drainage feature as per the *Water Act 2000*) of Larcom Creek runs across the north of the site. Surface waters on site drain to Larcom Creek and eventually to Calliope River. If works are to occur within an unmapped watercourse, a watercourse determination from DRDMW will be required. The design should minimise impacts to overland flows and impacts to surrounding watercourses and unmapped watercourses (e.g., the installation of underground rather than above ground piping where possible).

1.6.10 Water values mitigation measures

- design standards considered as part of the design to include:
  - Environment Protection (Water) Policy 2009
  - Environmental Protection (Water and Wetland Biodiversity) Policy 2019
  - State Planning Policy Code (Water Quality Appendix 2)
  - IECA Best Practice Erosion and Sediment Control document.
- the Project design should achieve the water quality objectives referred to in the Environmental Protection (Water) Policy 2009 and the Calliope River Environmental Values and Water Quality Objectives for any water released from Project infrastructure to surface waters
- MUSIC modelling is undertaken, if appropriate, to inform the requirement and development of any permanent water treatment devices

- erosion and sediment control design for the project should be consistent with IECA BPESC documents, including the development of a conceptual ESCP to guide the Contractor to develop site specific ESCP's during construction
- site-impacted releases to receiving environment to achieve Stormwater Design objectives of the State Planning Policy Appendix 2 at minimum
- baseline surface water monitoring program prior to construction to be undertaken to determine water quality performance criteria to be utilised during construction
- appropriate design for spill containment will be required to be developed based on the appropriate risks level
- develop and implement design measures and construction methods to minimise groundwater inflows into the construction area.

1.6.11 Water management plans

It is recommended strategies are considered and, where appropriate, outlined in a Construction Management Plan to mitigate potential impacts, such as:

- implementation of the following Environmental Management Plans:
    - erosion and Sediment Control Plan
    - surface Water Management Plan.
- a stormwater Management Plan is to be used through the construction and operation of the plant. The Stormwater Management Plan will outline the hydrologic and hydraulic analysis performed to design the stormwater infrastructure to support the new facility in a way that discharges from the drainage network correspond with those that would have occurred under predevelopment conditions. The plan follows the following steps:
    - evaluation of the existing environmental conditions of the site
    - describing the proposed development and its effect on stormwater quality
    - calculating peak flow for pre and post development conditions
    - sizing the detention volumes required to maintain the flow to the pre-development condition
    - identifying potential sources of contaminants and determination of measures for achieving the water quality objective.
- a comprehensive water quality monitoring program shall be undertaken throughout construction, including daily inspections, rainfall triggered monitoring events and testing of water prior to release from sediment basins/devices to ensure compliance with water quality criteria
- site-impacted releases to receiving environment to achieve Stormwater Design objectives of the State Planning Policy Appendix 2 at minimum
- use of a site-specific stormwater management plan (to be finalised as condition of approval of the attached DA application)
- disturbance of the soil shall be planned in a way that minimises the amount of exposed soil at any one time, to avoid concentrating runoff and causing soil erosion and sedimentation
- progressive stabilisation is to be adopted wherever practical to also limit the amount of exposed soil at any one time.

1.7 Waste

1.7.1 Waste storage

Waste will be created during construction and operation. There will be relatively small amounts of waste produced during the construction of the facility, produced from typical excavation, clearing and construction activities.

A Waste Management Plan will be prepared prior to construction which will identify types of wastes/by-products that may be produced during construction, including excavated soils, scrap metal, offcuts of electrical cabling and conduit, some domestic wastes from construction/site offices, sewage and typical construction and demolition wastes and general wastes. There are waste and recycling facilities within the SDA and Gladstone area.

When the facility is operational, the majority of waste produced from the site will originate from the office component of the development. This waste will be stored in a storage facility on site and will be collected by a private collection service.

1.7.2 Wastewater infrastructure

Waste will be created during construction and operation. There will be relatively small amounts of waste produced during the construction of the facility, produced from typical excavation and construction activities.

A Waste Management Plan will be prepared prior to construction which will identify types of wastes/by-products that may be produced during construction, excavated soils, scrap metal, offcuts of electrical cabling and conduit, some domestic wastes from construction/site offices, sewage and typical construction and demolition wastes and general wastes. There are waste and recycling facilities within the SDA and Gladstone area.

When the facility is operational, the majority of waste produced from the site will originate from the office component of the development. This waste will be stored in a storage facility on site and will be collected by a private collection service weekly. Sewage from toilets and kitchen will be generated on a maximum rate of 1.5 m3/d and will be sent to Gladstone Electrolyser Manufacturing facility located at lot 1. The existing treatment plant has the capacity to assimilate this flow. The treated wastewater is reused for irrigation.

Industrial wastewater consists primarily of the reject water from the water treatment, a reverse osmosis (RO) system. The reject contains the solids and salts removed from the water supply (potable water). The key parameters are presented in Table 1-8. The wastewater flow averages 4.5 m^3/h and the plant will operate approximately 20 hours per day. The total of 90 m3/d will be discharged to the existing evaporation pond. Other wastewater streams consist of condensates from the hydrogen production line, the flow is insignificant, and no contaminants are present. Note that the concentration of all parameters listed in the wastewater stream are within Australian drinking water guidelines, except hardness (aesthetic limit of 200 mg/L) and the anti-scalant added for the treatment.

If for any reason the RO system experience issues, such as membranes clogging, the total flow of the wastewater will increase. At the same time, it will become diluted, therefore, the concentration of the listed parameters will decrease during upset conditions.

Every 4 to 6 months the reverse osmosis membranes will require chemical cleaning. Approximately 100 litres of chemicals, including citric acid and sodium hydroxide solutions will be consumed per cleaning. Since these chemicals generally break down quickly and do not pose environmental risks, they will be neutralised (pH adjustment) and discharged to the evaporation pond.

Table 1-8: Wastewater quality parameters

Parameter	Units	Average
Total flow	m^3/d	90
Aluminium total	mg/L	0.177
Alkalinity (total)	mg/L	264
Calcium	mg/L	66
Chloride	mg/L	132
Conductivity	µS/cm	1135
DOC	mg/L	12.36
Hardness total	mg/L	322
Magnesium	mg/L	38
Manganese total	mg/L	0.005

Parameter	Units	Average
Potassium	mg/L	11
pH	-	7.0
Sodium	mg/L	124
Suspended solids	mg/L	15
Sulphate	mg/L	115
Anti-scalant	L/h	0.5

1.7.3 Waste mitigation measures

Maximise waste avoidance, resource recovery, reuse and recycling as established by the waste hierarchy (Qld Waste Management Resource Recovery Strategy). Waste generation can be avoided/ minimised by:

- considering waste generated from the various design options
- calculate bill of quantities appropriately to prevent over ordering of materials (i.e., concrete, steel)
- selecting materials that results in less residual waste.

Where possible, adopt a circular economy framework for project construction materials and products (e.g., less reliance on "virgin product", seek recycled alternative products)

Avoid inappropriate disposal of waste by the following:

- a Waste Management Plan should be developed to manage risks during all construction and operational works
- assign a secure location for storage of re-usable and recyclable materials on-site
- no waste or litter to be burnt on site
- where possible, reuse soil on project site and avoid movement of soil off site. Where soil movement and disposal are required, adhere to regulatory requirements
- hazardous substances will be properly stored and disposed of in accordance with legislative provisions and the EMP(C)
- ensure all regulated wastes are disposed of at an appropriately licensed facility.

2. Desktop Environmental Values Assessment Summary

The environmental values associated with and surrounding the proposed project location are summarised within Table 2-1.

The environmental values that have been assessed include:

A. Soil

B. Land Use

C. Cultural Heritage

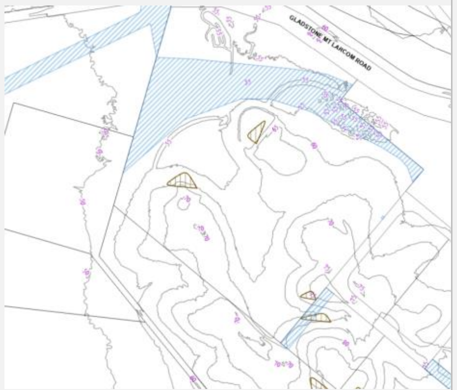
D. Biodiversity (Flora and Fauna)

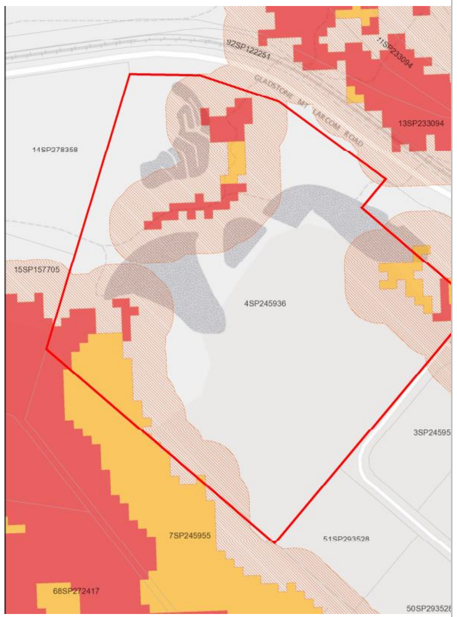
E. Air

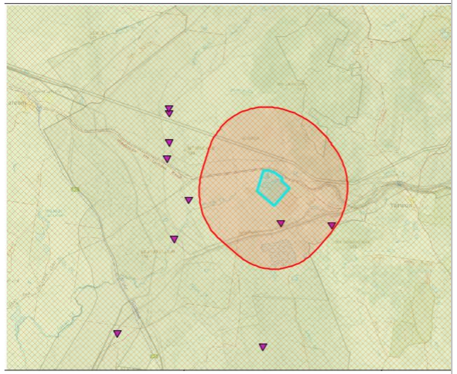
F. Noise and Vibration

G. Water including wetland and stormwater management.

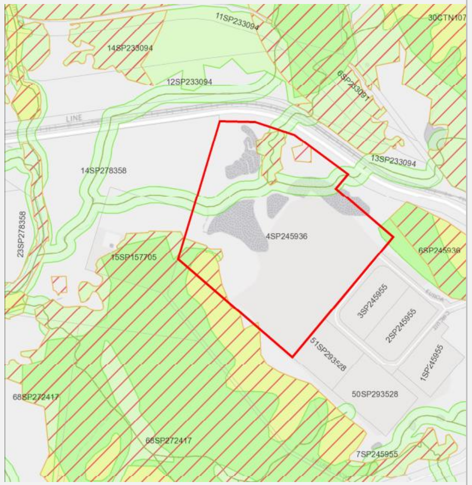
Table 2-1: Desktop environmental values assessment.

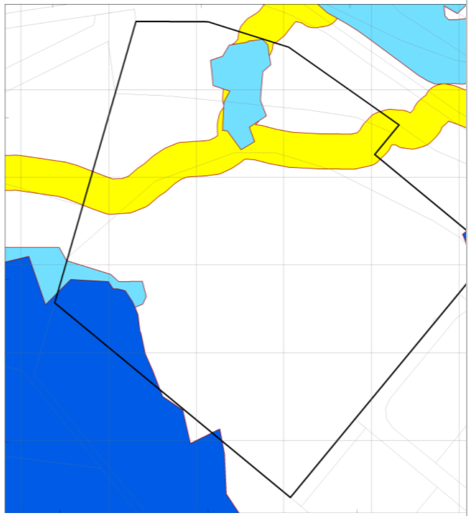
Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
Soil			
N/A	Lot 4 SP245936	A contaminated land search undertaken on 2 July 2021 concluded that the site is not included on the Environmental Management Register (EMR) or the Contaminated Land Register (CLR). Refer to Appendix A.	N/A
N/A	Lot 4 SP245936	The GRCPS does not identify Acid Sulfate Soils on site. The Australian Soil Resource Information System (ASRIS) shows the general vicinity to have Extremely Low and Low Probability of Acid Sulfate Soils	N/A
N/A	Lot 4 SP245936	No areas with substantial potential for UXO have been identified within the Study area.	N/A
	Lot 4 SP245936	Topography	**Risk:** Moderate The Steep Land Overlay plan from the GRCPS indicates that four small areas of steep land are identified within the lot boundary.

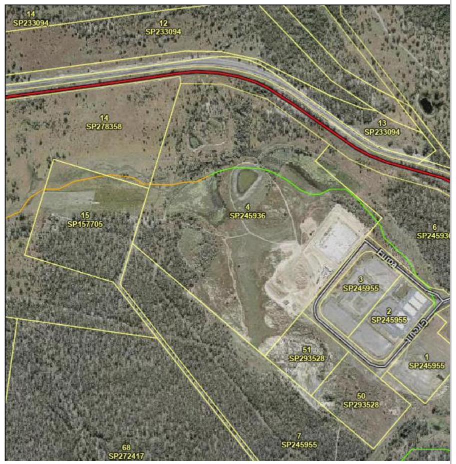
Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
Land Use			
	Lot 4 SP245936 + 2.5 km	The site is located within the Gladstone State Development Area.	**Risk: N/A** As detailed in Section 2.2 of the Gladstone State Development Area Development Scheme (May 2022), the strategic vision for the SDA includes supporting development that aligns with the Queensland Government's strategic priorities for the region, particularly related to the hydrogen industry.
	Lot 4 SP245936 + 2.5 km	Bushfire prone area.	**Risk: Moderate** Design to consider proximity to areas of High, Medium and Potential bushfire intensity areas within the proposed development site. A Bushfire Management Plan will need to be developed.
N/A	N/A	The works are not mapped within a Priority Development Area.	N/A

Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
N/A	N/A	The works are not within a Strategic Environmental Area.	N/A
Cultural heritage			
	Lot 4 SP245936	Aboriginal or Torres Strait Islander cultural heritage site points or polygons or National Heritage Areas (Indigenous values) are not recorded within the site boundaries, however two items of significance labelled as “artefact scatter” are located to the south and south-east, within a 2.5 km buffer zone.	**Risk:** **Low** The Site is located within the Bailai, Gurang, Gooreng Gooreng, Taribelang Bunda People Cultural Heritage party boundary and the first Nations Bailai, Gurang, Gooreng Gooreng, Taribelang Bunda People Aboriginal Corporation RNTBC Cultural Heritage body boundary. An approved CHMP (Aldoga South Road Extension Project) between the Port Curtis Coral Coast (PCCC) Registered Native Title Claimants and the Minister for Economic Development Queensland covers the Site. No Cultural Heritage sites included on the Cultural Heritage Database and Register are mapped within the Site boundary, however two sites are mapped approximately 1 km south of the Site and south-east of the Site. It is recommended that a cultural heritage assessment occur in accordance with the *Aboriginal Cultural Heritage Act 2003* Duty of Care Guidelines and in consultation with the Bailai, Gurang, Gooreng Gooreng, Taribelang Bunda People. A “Stop Works” procedure must be developed prior to any ground disturbing or clearing works commencing.
N/A	Lot 4 SP245936	There are no National or State Heritage places mapped within the Study area.	N/A

Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
Biodiversity (Flora & Fauna)			
	Lot 4 SP245936 + 2.5 km	The works have the potential to impact various Regional Ecosystems (RE) surrounding the unnamed tributary protected under the *Vegetation Management Act 1999* (VM Act), including the following *Of Concern* status RE: • Eucalyptus tereticornis and/or Eucalyptus spp. Woodland on alluvial plains (11.3.4) Note this RE is located within Category B, C and R vegetation.	**Risk:** Moderate • Avoid project design within vegetation protected under the VM Act, in particular RE 11.3.4. • If the RE's are to be impacted, a flora survey will be required during detailed design to confirm there are no Threatened Ecological Communities (TEC's) onsite. • If the Threatened Ecological Community is determined to be present, a referral for impacts to Matters of National Environmental Significance may be required.
N/A	Lot 4 SP245936 + 2.5 km	DCCEEW Protected Matters (EPBC Act)	No EPBC protected matters identified on site.

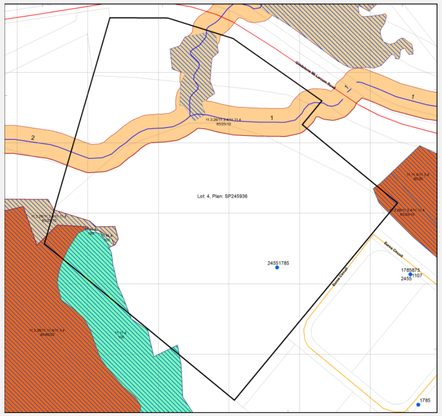
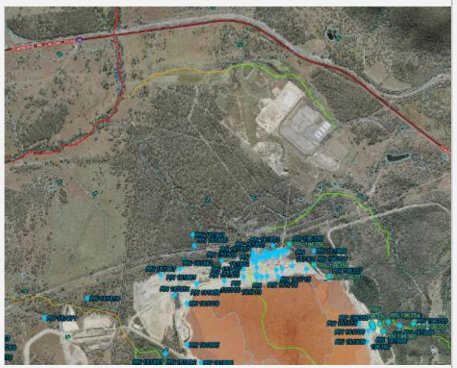
Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
	Lot 4 SP245936 + 2.5 km	The works have the potential to impact on multiple MSES.	**Risk:** Moderate Avoid project design within the following MSES: • MSES - Regulated vegetation (intersecting a watercourse) • MSES - Wildlife habitat (endangered or vulnerable) • MSES - Regulated vegetation (category B) • MSES - Regulated vegetation (category C) • MSES - Regulated vegetation (category R) • MSES - Regulated vegetation (essential habitat) Avoid project design within native vegetation and essential habitat areas where possible. Where avoidance is not possible, a Development Approval for clearing native vegetation under the *Planning Act 2016* may be required.

Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
	Lot 4 SP245936 + 2.5 km	The works have the potential to impact on regulated vegetation on site.	**Risk:** Moderate The following regulated vegetation categories exist on site and must be considered during design: • Category B area (Remnant vegetation) • Category C area (High-value regrowth vegetation) • Category R area (Reef regrowth watercourse vegetation)
Information based on desktop PDF Report. No mapping available.	Lot 4 SP245936 + 2.5 km	Potential for the following threatened species to occur within the study area: • Yellow-bellied glider (*Petaurus australis australia)* - Vulnerable under the *Nature Conservation Act 1992* (NC Act) and the EPBC Act. • Powerful Owl (*Ninox strenua*) – Vulnerable under the NC Act. • Squatter pigeon (southern sub-species) (*Geophaps scripta scripta*) – Vulnerable under the NC Act and the EPBC Act. • Central greater glider (*Petauroides armillatus*) – Endangered under the NC Act and the EPBC Act. • White-throated needletail (*Hirundapus caudacutus*) – Vulnerable under the NC Act and EPBC Act. • *Plantae Equisetopsid a Menyanthace ae Nymphoides indica* – Special Least Concern under the NC Act.	**Risk:** Moderate Avoid project design within native vegetation where possible. Confirm the presence/absence of species protected under the NC Act and EPBC Act by an ecological survey during the detailed design phase.

Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
		• *Plantae Equisetopsid a Orchidaceae Cymbidium canaliculatum* – Special Least Concern under the NC Act.	
	Lot 4 SP245936 + 2.5 km	The works have the potential to impact green (low risk) and amber (moderate risk) waterways for waterway barrier works under the *Fisheries Act 1994*.	**Risk:** **Moderate** Avoid project design within waterways for waterway barrier works under the *Fisheries Act 1994*. Confirm that the works are able to comply with the *Accepted development requirements for operational work that is constructing or raising waterway barrier works (01 October 2018)*. Alternatively, a Development Approval for Operational work that is constructing or raising waterway barrier works will be required. The design is to minimise overland flows and impacts to surrounding waterways.
	Lot 4 SP245936 + 2.5 km	High-risk areas on the Protected Plants Flora Survey Trigger Map are located within the proposed project site.	**Risk:** **Moderate** Avoid project design within native vegetation and high-risk areas mapped within the protected plants flora survey trigger map where possible. Where avoidance is not possible, a Flora Survey in accordance with the Flora Survey Guidelines – Protected Plants is to be undertaken. If protected plants under the NC Act are identified and are likely to be impacted by works, an Impact Management Plan will be required.

Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
N/A	Lot 4 SP245936	No Koala Priority Areas, Koala Habitat Areas or Koala Key Resource Areas are mapped within the Study area.	**Risk:** **Low** Avoid project design within native vegetation where possible. The Study area is not mapped within a koala habitat area. However, should vegetation clearing be proposed, an ecological survey is recommended during detailed design to determine the presence/absence of koalas within the Study area.
N/A	Lot 4 SP245936	No Wetland Protection Areas are mapped within the Study area.	N/A
N/A	Lot 4 SP245936	No Fish Habitat mapped within the Study area.	N/A
N/A	Lot 4 SP245936	No protected areas and forests have been mapped within the site.	N/A
Air			
	Lot 4 SP245936 + 2.5 km	Air quality impacts on sensitive receptors within a 2.5 km radius, including ecological, residential and commercial places.	**Risk:** **Low** It is understood that there will be no discharge of contaminants to air during the operations of the facility. Impacts during the construction phase of the project may include dust from unstabilised surfaces and vehicle emissions. These will need to be addressed through mitigation practices.

Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
Noise and Vibration			
	Lot 4 SP245936 + 2.5 km	Noise and vibration impacts on sensitive receptors within a 2.5 km radius, including ecological, residential and commercial places.	**Risk: Low** The proposed industrial activity is located in the High Impact Industrial Precinct of the SDA. There are several ecological environmental receptors located within the 2.5 km buffer zone, including an *Of Concern* Regional Ecosystem (Eucalyptus tereticornis and/or Eucalyptus spp. Woodland on alluvial plains (11.3.4)), essential wildlife habitat and several waterways. The nearest sensitive residential receptor is located approximately 2.4 km to the east of the site, and there are two commercial properties within the 2.5 km buffer zone, including an electrical substation to the north and the Yarwun bauxite processing plant and associated by-product storage facilities immediately to the south.

Mapping / Diagram	Area	Environmental Value/s	Risk (without controls) and Mitigation Measures
Water			
	Multiple Mapped and Unmapped Watercourses Lot 4 SP245936 + 2.5 km	Works have the potential to impact mapped and unmapped watercourses protected under the *Water Act 2000*.	**Risk: High** Unnamed tributary (drainage feature as per the *Water Act 2000*) of Larcom Creek runs across the north of the site. Surface waters on site drain to Larcom Creek and eventually to Calliope River. If works are to occur within an unmapped watercourse, a watercourse determination from DRDMW will be required. The design should minimise impacts to overland flows and impacts to surrounding watercourses and unmapped watercourses (e.g., the installation of underground rather than above ground piping where possible).
N/A	Lot 4 SP245936 + 2.5 km	Flood Hazard	The proposed site location is not within the flood hazard zone according to GRCPS mapping overlay.
	Lot 4 SP245936 + 2.5 km	Groundwater Dependent Ecosystems (GDEs)	**Risk: Low** No GDEs have been identified within the study area, or in the 2.5 km buffer surrounding the site. It should be noted that extensive groundwater monitoring bores are located immediately to the south of the site – see map – further information may be available from these bores. It is recommended that further testing is undertaken to determine the depth of groundwater within the site.

Appendix A Corporate Risk Matrix

CONSEQUENCE						
LIKELIHOOD		Insignificant (1)	Minor (2)	Moderate (3)	Major (4)	Catastrophic (5)
	Almost certain (5)	Moderate (5)	High (10)	High (15)	Extreme (20)	Extreme (25)
	Likely (4)	Moderate (4)	Moderate (8)	High (12)	High (16)	Extreme (20)
	Possible (3)	Low (3)	Moderate (6)	Moderate (9)	High (12)	High (15)
	Unlikely (2)	Low (2)	Moderate (4)	Moderate (6)	Moderate (8)	High (10)
	Rare (1)	Low (1)	Low (2)	Low (3)	Moderate (4)	Moderate (5)

A brief description of each risk classification and the likely responses is provided below:

- Extreme
  - Represent unacceptable risks primarily critical in nature in terms of consequences (e.g., extensive and long-term environmental harm, permanent sacred site damage, fatality, massive economic impacts) that are effectively considered a possibility through to almost certain to occur. Such risks significantly exceed the risk acceptance threshold and require comprehensive control measures, and additional urgent and immediate attention towards the identification and implementation of measures necessary to reduce the level of risk.
- High
  - Typically relate to significant to critical consequences (e.g., a major amount of environmental or heritage damage, and considerable safety, social or economic impacts) that are inclined to cut across the possible to almost certain likelihood ratings. These are also likely to exceed the risk acceptance threshold and although proactive control measures have been planned or implemented, a very close monitoring regime and additional actions towards achieving further risk reduction is required.
- Moderate
  - As suggested by the classification, medium level risks span a group of risk combinations varying from relatively low consequence / high likelihood to mid-level consequence / likelihood to relatively high consequence / low likelihood scenarios across environmental, social and economic areas. These risks are likely to require active monitoring as they are effectively positioned on the risk acceptance threshold.
- Low
  - These risks are below the risk acceptance threshold and although they may require additional monitoring in certain cases are not considered to require active management. In general, such risks represent relatively low likelihood and low to mid-level consequence scenarios.

Levels of likelihood and the severity for the types of consequences that make up the risk rating determination are defined below:

5. Almost Certain
  - The event is expected to occur in most circumstances (The event is likely to occur once per year).

4. Likely
  - The event will probably occur in most circumstances (The event is likely to occur once every 1 – 2 years).

3. Possible
  - The event might occur at some time (The event is likely to occur once every 2 – 5 years).

2. Unlikely
  - The event could occur at some time (The event is likely to occur once every 5 – 10 years).

1. Rare
  - The event may occur only in exceptional circumstances (The event is unlikely to occur in any 10-year period).

The types of consequences are defined below as part of the risk assessment process:

5. Catastrophic

- Extensive long-term environmental harm and / or harm that is extremely widespread. Impacts unlikely to be reversible within 10 years.
- Widespread / catastrophic detrimental long-term impacts on the environment, which could include extensive pollutant discharges.
- Unsalvageable and permanent damage to sensitive structures or sites of cultural significance or sacred value.

4. Major
- Major or widespread, unplanned environmental impact on or off the site. Significant resources required to respond and rehabilitate.
- Major detrimental long-term impacts on the environment, which could include substantial pollutant discharges.
- Major damage or infringement to sensitive structures or sites of cultural significance or sacred value.

3. Moderate
- Moderate, unplanned environmental impact contained within the site or minor impact that is off the site.
- Considerable damage or infringement to sensitive structures or sites of cultural significance.

2. Minor
- Minor, unplanned localised environmental impact (temporary nature) or discharge contained on-site or with negligible off-site impact.
- Minor repairable damage to important historic structures or sites of cultural significance.

1. Insignificant
- Insignificant environmental impact. Any impacts are contained on-site and short term in nature. No detrimental impact on the environment.
- Insignificant repairable damage to more common structures or sites. No disturbance of historic and / or cultural heritage sites.

Appendix L Operational works permit issued by Gladstone Regional Council (OPW/11/2022)

Contact: Development Services
Our Ref: OPW/11/2022

3 June 2022

Minister for Economic Development Queensland
Mr John Brun
Level 14, 1 William Street
BRISBANE QLD 4001

Dear Sir

DECISION NOTICE
Planning Act 2016 S63

OPW/11/2022 - OPERATIONAL WORKS APPLICATION
ROAD WORK, STORMWATER, DRAINAGE WORK, EARTHWORKS, LANDSCAPING, SIGNAGE & CLEARING VEGETATION
EUROA CIRCUIT ROAD UPGRADE - STAGE 1
EUROA CIRCUIT, ALDOGA QLD 4680

Reference is made to the above development application, which was received by Council on 29 April 2022.

I wish to advise that the application was assessed under Delegated Authority on 03 May 2022 and was approved subject to the conditions as set out in the following Decision Notice.

Should you have any questions or require further clarification in relation to any matters raised in the Decision Notice, please contact Council's Development Services Department on 07 4970 0700.

Yours sincerely

HARobertson

H A ROBERTSON
MANAGER DEVELOPMENT SERVICES

DECISION NOTICE - Operational Works Application - (OPW/11/2022)
Planning Act 2016 S63

Application:	Road work, Stormwater, Drainage work, Earthworks, Landscaping, Signage, Clearing Vegetation Euroa Circuit Road Upgrade - Stage 1
Applicant Name & Address:	Minister for Economic Development Queensland Mr John Brun Level 14, 1 William Street BRISBANE QLD 4001
Owner:	The State of Queensland
Subject Land:	Euroa Circuit, ALDOGA QLD 4680
Application Received:	29 April 2022
Application Decided:	03 June 2022

You are advised that your application is approved, subject to the attached conditions. These *Assessment Manager Conditions for Operational Works* may include conditions imposed by referral agencies and are referenced accordingly.

1. DETAILS OF THE APPROVAL

	Development Permit	Preliminary Approval
• **Associated work** made assessable by the planning scheme: o Operational work - Road work, Stormwater, Drainage work, Earthworks, Landscaping, Signage, Clearing Vegetation Euroa Circuit Road Upgrade - Stage 1	✓	x

2. RELEVANT PERIOD FOR THE APPROVAL

The relevant periods stated in section 85 of the *Planning Act 2016* apply to each aspect of development in this approval, as outlined below:-

✓ 2 years starting the day the approval takes effect.

3. APPROVED PLANS

There are no approved plans and/or documents for this development based on the special condition.

4. APPEAL RIGHTS

Attached is an extract from the *Planning Act 2016* which details your appeal rights and the appeal rights of any submitters regarding this decision.

5. WHEN THE DEVELOPMENT APPROVAL TAKES EFFECT

This development approval takes effect:-

- From the time the decision notice is given, if there is no submitter and the applicant does not appeal the decision to the court.

OR

- If there is a submitter and the applicant does not appeal the decision, the earlier date of either:
  - When the submitter's appeal ends; or
  - The day the last submitter gives the assessment manager written notice that the submitter will not be appealing the decision.

OR

- Subject to the decision of the court, when the appeal is finally decided, if an appeal is made to the court.

This approval will lapse if:-

- for a development approval other than a material change of use or reconfiguration, the development does not substantially start within the relevant period stated in section 2 of this decision notice.

Should you have any queries in relation to this matter, please contact Council's Development Services Department on 07 4970 0700.

Yours sincerely

HARobertson

H A ROBERTSON
MANAGER DEVELOPMENT SERVICES

Attached: **Conditions**
Appeal Rights

GLADSTONE
REGIONAL COUNCIL

ASSESSMENT MANAGER CONDITIONS

Planning Act 2016 S63

DEVELOPMENT APPLICATION NO. OPW/11/2022
OPERATIONAL WORKS

Road work, Stormwater, Drainage work, Earthworks, Landscaping,
Signage & Clearing Vegetaion
Euroa Circuit Road Upgrade - Stage 1

SPECIAL CONDITIONS

1. Prior to arranging a pre-start meeting, the applicant must provide to and have approved by Council, detailed drawings labelled "For Construction" certified by a Registered Professional Engineer of Queensland.

PRIOR TO CONSTRUCTION COMMENCING

2. Prior to commencing construction the applicant must arrange for a "pre-start site meeting" which must be attended by a representative of the Gladstone Regional Council, the Contractor and the Supervising Engineer. All relevant Referral Agencies and other relevant Agencies including Ergon and Telstra shall be invited to attend.

3. Prior to arranging the pre-start site meeting, the applicant must lodge a construction security bond (in the form of cash or a bank guarantee) in the amount of 2.5% of the estimated cost of the construction of the works (or the minimum fee in accordance with Council's Fees and Charges Schedule). The construction security bond must be lodged with Council prior to arranging a pre-start site meeting. The construction security bond is intended to cover action by Council required to provide for people safety, traffic safety, or for the protection of property or the environment where:

   - A condition of this approval is breached; or
   - additional scour protection measures are needed, or the installation and maintenance of erosion and sediment control measures is deficient, or other remediation works to the site are required where it has been left unattended for an unreasonably long period of time; and
   - either the works need to be carried out by Council as a matter of urgency or the works need to be carried out by Council because the applicant has failed to comply with a notice to:
     - remedy a breach of this approval, or
     - provide for people safety, traffic safety, or to provide for the protection of property or the environment within a reasonable period of time.

The cost incurred by Council in actioning the above, will be recovered from the construction security bond.

The construction security bond shall be released when the construction phase works are complete and the works commence the maintenance / performance verification period.

<u>Note:</u> Bonds cannot be accepted without an accompanying signed bonding deed.

4. Prior to arranging the pre-start site meeting, the Applicant must pay a construction fee in accordance with Council's Fees and Charges Schedule.

5. The applicant / developer is to ensure that any existing easements over the site are protected during construction and are able to be accessed at all times.

6. The applicant must ascertain the existence and location of existing services associated with the development, including but not limited to water supply, sewerage, stormwater, gas, electricity and telecommunications services and must protect these services from damage and must rectify any damage or arrange for the rectification works to be carried out by the relevant service authority (at the applicant's expense) immediately the damage occurs.

7. Prior to commencing construction of stormwater drainage, the applicant shall nominate a suitably experienced person in this field to perform the stormwater work. Works shall only be carried out with this nominated person on the site.

8. Prior to works commencing on any existing Council road, the Applicant must forward a copy of a traffic management plan prepared and signed by a Traffic Management Design qualified person with identification card number for all works to be carried out on existing roads showing how traffic will be managed in accordance with the Manual of Uniform Traffic Control Devices. The plan must outline the process delineating the works including Council notification and traffic control device placement plans in the vicinity of the works.

9. Before construction commences, a person or entity must be nominated as the community contact for the construction project to answer concerns of the community and Council (dust, emergency repairs etc).

10. A project sign shall be erected in a prominent location prior to commencement of construction and shall remain for the duration of construction.

    Information on the sign shall identify the project including a brief scope of works, the name of the community contact for the project along with phone numbers and contact details etc. This contact must be available 16 hours each day during the construction period. Other details such as the contractor's, subcontractors' and developer's names may also be included.

    All complaints received by the contact must be recorded including the resulting investigation undertaken, conclusions formed, and actions taken. This information must be available to Gladstone Regional Council or relevant government agency on request, to show that "environmental duty" has been exercised by the contractor, in order to avoid prosecution under the Environmental Protection Act.

SUPERVISION OF WORKS

11. The roadworks, stormwater, earthworks, drainage and any other development works are to be executed under the supervision of a Registered Professional Engineer of Queensland and on completion of such work, the Applicant shall give to the Council, Construction Certificates from such Supervising Engineer, that the work has been constructed in accordance with this operational works permit and good engineering practice.

    Such certificates must include the following information:

a. Company name, address, & contact details.
b. Engineer's name and position in company.
c. Professional registration number (RPEQ) and signature
d. Project name, location and Council reference number
e. Full details of the work performed, including:

   - comprehensive and detailed "As Constructed" plans in AutoCAD and Adobe Acrobat "pdf" format. The plans must be certified by a Registered Surveyor in regards to the accuracy of the information provided (location, line, level etc) and certified by the Supervising Engineer (RPEQ) in regards to compliance with this Operational Works Permit. The applicant / consultants must liaise with Council's Operational Works Officers in regard to the detailed requirements for the electronic data.

   - quality control test results including material property, compaction testing, bitumen prime and seal spray rates, aggregate spread rates, AC compaction testing.

   - a successful (defect free) CCTV report in accordance with the Water Services Association of Australia; including inclination graphs, on all stormwater. CCTV reports are required as part of the "On Maintenance" inspection and as part of the "Off Maintenance" inspection. Council reserves the right to utilise for its own purposes and for sale, the "as constructed" documentation provided.
f. The relevant standards to which a product or installation complies
g. Quality assurance system in place, date of QA manual used and the Council proforma duly completed
h. Any maintenance procedures required for products certified to achieve the design life

12. The Supervising Engineer shall inspect the earthworks, roadworks and stormwater drainage, with the relevant Council officer also invited to attend each inspection, at the stages of construction as set out in the CMDG and at the stages listed below. All works shall be carried out in accordance with this standard and good engineering practice. The supervising consulting engineer shall arrange a time for inspection at the following critical stages.
    a. culvert foundations
    b. stormwater pipes backfilled to top of pipe
    c. subgrade inspection
    d. pre-laying of kerb and channel
    e. pre-seal inspection
    f. commencement of the on-maintenance / verification period
    g. completion of the on-maintenance / verification period

    Quality control documentation including compaction test results for culvert foundations shall be provided to Council prior to inspection by Council's Operational Works officers.

    Quality control documentation including compaction test results and a check survey of the subgrade levels shall be provided to Council prior to the sub-grade inspection.

    Quality control documentation including compaction test results and a check survey of the pre-seal pavement levels shall be provided to Council prior to the pre-seal inspection.

    The supervising engineer must carry out a successful inspection of the works and must certify that the works are ready for inspection prior to inspection by Council's Operational Works officers. A minimum of 24 hours notice (by email or facsimile) is required by Council's Operational Works Officers.

    The Supervising Engineer's inspection certificate and associated quality control documentation must be forwarded to Council prior to the time of the inspection.

Note: Re-inspection by Council's Operational Works Officers may attract a "re-inspection" fee.

13. Council's Operational Works Officers shall be invited to carry out verification inspections at salient phases of construction and may carry out random audit inspections during the course of construction.

14. A maintenance / performance verification security bond must be lodged by the Applicant with Council and prior to the Works being accepted "on maintenance". The Applicant must lodge a maintenance / performance verification security bond (in the form of cash or a bank guarantee) in the amount of 5.0% of the estimated cost of the construction of the works (or the minimum fee in accordance with Council's Fees and Charges Schedule). The maintenance / performance verification security bond is intended to cover:
    a. urgent action required by Council to provide for people safety, traffic safety and for the protection of property and the environment;
    b. installation of additional scour and environmental protection measures and the installation and maintenance of erosion and sediment control measures (where deficient);
    c. rectification of defective work or the construction of new work resulting from design omissions or deficiencies;
    d. rectification of defective work or the construction of new work resulting from construction omissions or deficiencies;
    e. maintenance of the Works;
    f. repair of damage of any nature and howsoever caused to the Works and whether caused by the Developer or any other party (and in particular any party constructing in respect of lands adjoining the Works).

    The maintenance / performance verification security bond shall be held by Council for a minimum period of 12 months. This period will be extended by Council to verify the integrity and performance of the works should actual or potential defects or omissions be identified.

    Note: Bonds cannot be accepted without an accompanying signed bonding deed.

GENERAL CONDITIONS

15. Erosion and sediment control measures are to be implemented generally in accordance with the principles / practices described in the publication:

    IECA Best Practice Erosion & Sediment Control – November 2008.
    International Erosion Control Association (Australasia), Picton NSW.

16. Before construction commences (prior to organising a pre-start meeting) a site specific Erosion and Sediment Control Plan (ESCP) certified by a RPEQ experienced in this type of work must be forwarded to Council for Council's records.

17. An updated ESCP (certified by a RPEQ) is to be provided to Council on request of Council throughout the year and at the end of each calendar month (28th day of each month or immediately prior to this date) from October to May when required, throughout the course of construction.

18. The Supervising Engineer is responsible for ensuring the ESCP is implemented and monitoring tasks outlined in the ESCP are undertaken. Where the ESCP cannot be implemented due to construction methodology the Supervising Engineer is responsible for ensuring that a revised ESCP (certified by a RPEQ) is provided and implemented prior to disturbing the subject area.

19. The ESCP must be monitored by a RPEQ experienced in this type of work throughout the course of the operational works and the RPEQ is to carry out an audit of the ESCP on request of Council. The results of the Council requested audits must be forwarded to Council for their records.

20. The ESCP must include the following non-compliance procedures:

    a) notify Council immediately of any non-compliance;
    b) without delay, notify Council on how and when the non-compliance is to be investigated / managed / dealt with / rectified;
    c) keep Council informed on progress (regular reports);
    d) advise Council when the matter has been resolved.

21. Failure to advise Council and to rectify / deal appropriately and in a timely manner with an issue or occurrence that may result in compliance action by Council. Compliance tools available to Council include but are not limited to:
    a) warnings
    b) penalty infringement notices
    c) statutory / regulatory tools under the Sustainable Planning Act 2009 and the Environmental Protection Act 1994
    d) prosecution (criminal offence)

22. In addition to the installation of environmentally responsible sediment, erosion control, scour protection or other long term stabilisation measures and prior to the works being accepted "on-maintenance", the following environmental protection measures must be installed:
    a) Turfing of footpath (verge / nature strip) - full width (from the back of kerb to property boundary) turfing of all footpaths and associated open space / access areas.
    b) Seeding plus hydromulching of areas disturbed during construction (including allotments). Topsoiling and hydromulching is to be carried out in accordance with the following specification:

    Seeding and hydromulching must be undertaken as separate operations. The system described below aims to protect the soil surface against erosion by wind and water, and forms a protective barrier for the seed. When sufficient rain occurs, the seed will germinate under normal conditions. The ground will have a good protection from dust erosion and light 'rill' erosion should it rain.

    - *Drill seed with seed and fertiliser into the soil surface to be stabilised.*
    - *Immediately follow-up with hydromulchings operation to the rates shown below. Note that mulching rates are 'dry weight' (i.e prior to adding water).*
    - *Prevent or restrict vehicle traffic access to hydromulched areas wherever possible.*
    - *Provide documentary evidence to Council that the site stabilisation has occurred in accordance with the specifications (e.g. certification by Superintendent and/or hyrdomulch contractor, as to nature and extent of stabilisation works undertaken, in particular the mulch application rate(s) used onsite).*
    - *The applicant must achieve a minimum of 70% ground coverage over the total area prior to the works being accepted "off maintenance".*

Minimum Application Rates Kg per 1000 m^2					
Slope Gradient	FLAT		MEDIUM		STEEP
	<5%	5-12%	12-20%	20-50%	>50%

Seed Mix	8	8	8	8	8
Sugar Cane	140	155	175	200	280
Paper	60	67	75	86	120
Flax Blend	40	45	50	60	80
Fertiliser	20	20	20	20	20
Tackifier	3	3	4*	4*	6*
Notes: *1. the rates are 'dry weight', i.e. prior to adding water;* *2. * indicates non-rewettable tackifier must be used.* 3. Flax blend comprises lucerne and linseed. 4. Dye may be used to gauge application coverage %					

Seed Mixes			
	Summer Blend (applications November – February)	Mid Season Blend (applications March/April & September/October)	Winter Blend (applications May-August)
Unhulled green couch (Cynodon dactylon) or Blue couch (Digitaria didactyla)	25%	25%	25%
Hulled green couch (Cynodon dactylon) or Blue couch (Digitaria didactyla)	25%	25%	25%
Japanese millet	30%	15%	N/A
Rye grass	N/A	15%	30%
Carpet grass (Axonopus affinis)	20%	20%	20%

c) Silt fencing of individual allotments - the silt fencing to each allotment is to be independent of the silt fencing to adjoining or other allotments. Silt fencing is to be non woven fabric and installed along the full length of an allotment boundary where surface runoff crosses the boundary and is to return a 6m (minimum) distance along both side boundaries. The removal of silt fencing from one allotment is not to impact on the integrity of the silt fencing associated with adjoining allotments.

23. All disturbed areas are be stabilised to minimise water and wind erosion within 30 days of the disturbance.

24. All roads to be sealed with:

a) a bitumen prime (minimum 2 days curing);
b) application of a single coat bitumen spray seal with 10mm coated aggregate (indicative application rate = $1m^3/120m^2$); and
c) AC surfacing.

25. Flexible pavement design - Subgrade evaluation shall be undertaken in accordance with Austroads publications "Guide to Asset Management Part 5: Pavement Performance" and "Guide to Pavement Technology Part 2: Pavement Structural Design". Investigations are to include both field and laboratory testing.

a) Field Testing

- Visual description of sample including the material type and colour. (Unified Soil Classification system).

- Dynamic Cone Penetrometer test to a depth of 1.0m. (Main Roads Test Method Q114B to provide equivalent CBR results)
- Field moisture content.

b) Laboratory Testing

- Grading of the subgrade material
- Atterberg limits
- 4 Day Soaked CBR testing

A minimum of two soaked CBR tests shall be undertaken on each material type. Testing shall be in accordance with (Main Roads Test Method Q113C). The single point CBR test shall be carried out at Optimum Moisture Content (OMC) and at the density that will occur in service. Test methods shall be in accordance with the latest amendments to AS1289 (or the equivalent Main Roads Method) except in the case of the CBR and DCP tests which shall only be in accordance with Main Roads Methods.

Flexible pavements to be constructed on expansive subgrade material (classified as more expansive than moderately expansive in accordance with Table 5.2 of AUSTROADS Guide To Pavement Technology Part 2: Pavement Structural Design) must include as a minimum:

a) A low-permeability lime stabilised (or equivalent) capping layer for the total width of the roadway and for 1.5m behind the back of kerbs.

b) Shallow subsoil drains (above low permeability capping layer) with “Tideflex” (or equivalent) check valves and caps at all stormwater structures.

The proposed flexible pavement design must be approved by Council’s Operational Works Department prior to the commencement of pavement construction.

26. Any errors in or omissions from the plans and specifications detected during construction may be required by Council to be rectified in accordance with Gladstone Regional Council Design Standards, Reconfiguration Development Permit Conditions or other policies.

27. The Applicant shall be responsible for any alterations to electricity, telecommunications, water mains, sewers and/or any other public utility installations that may be affected by the construction of the roads and/or drainage, or any other works associated with the subdivision.

ASSESSMENT MANAGER’S ADVICE

1. Aboriginal Cultural Heritage: It is strictly the Developer's responsibility to take all reasonable and practicable measures to ensure that the activity does not harm Aboriginal Cultural Heritage in accordance with the *Aboriginal Cultural Heritage Act 2003.*

2. Contaminated Land: It is strictly the Developer’s responsibility to source information regarding contaminated land from the Environmental Protection Agency, Contaminated Lands Section, as Council has not conducted detail studies and does not hold detailed information pertaining to contaminated land.

3. Hours of Work: It is the developer/owner’s responsibility to ensure compliance with *Part 3B, Section 440R* of the *Environmental Protection Act 1994,* which prohibits any construction, building and earthworks activities likely to cause nuisance noise (including the entry and departure of heavy vehicles) between the hours of 6.30pm and 6.30am from Monday to Saturday and at all times on Sundays and Public Holidays.

4. <u>Dust Control:</u> It is the developer/owner's responsibility to ensure compliance with *Part 3B* of the *Environmental Protection Act 1994,* which prohibits unlawful environmental nuisance caused by dust, ash, fumes, light, odour or smoke beyond the boundaries of the property during all stages of the development including earthworks and construction.

5. <u>Sedimentation Control:</u> It is the developer/owner's responsibility to ensure compliance with *Part 3C, Section 440ZG* of the *Environmental Protection Act 1994,* to prevent soil erosion and contamination of the stormwater drainage system and waterways.

6. <u>Noise During Construction and Noise in General:</u> It is the developer/owner's responsibility to ensure compliance with *Part 5A, Section 363C (3)* of the *General Emission Criteria and Part 5A, Section 363c (4)* of the *Noise Emission Criteria* of the *Environmental Protection Act 1994.*

7. <u>General Safety of Public During Construction:</u> It is the principal contractor's responsibility to ensure compliance with *Section 31* of the *Workplace Health and Safety Act 1995. Section 31(1)(c)* states that the principal contractor is obliged on a construction workplace to ensure that work activities at the workplace are safe and without risk of injury or illness to members of the public at or near the workplace**.**

Appendix M Gibson Island Acoustic Report

Gibson Island Project Approvals – Environmental Assessment

Noise Impact Assessment

Fortescue Future Industries

Reference: 521401

Revision: 3

2023-02-10

Bringing ideas to life

Document control record

Document prepared by:

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Client		Fortescue Future Industries				
Client contact		Snyman Van Straaten	**Client reference**		AUS1004C0002-Noise	
Rev	**Date**	**Revision details/status**	**Author**	**Reviewer**	**Verifier** (if required)	**Approver**
0	2022-05-31	First Issue	JL	JA		
1	2022-06-08	First Issue (revised)	JL	JA	JM	GW
2	2022-08-03	Second Issue (Final)	JL		JM	GW
3	2023-02-10	Third Issue (addressing RFI items)	JL			JM
Current revision		**3**				

Approval			
Author signature		Approver signature	
Name	Joshua Loh	Name	Julia Miller
Title	Senior Acoustic Engineer	Title	Manager, Environment and Planning

Contents

Appendices

Figures

Tables

1 Introduction

1.1 Background

Fortescue Future Industries Pty Ltd (FFI) is a global green energy company committed to producing zero-emission energy from renewable sources. The Principal is exploring the development of a number of large-scale renewable projects across Australia. The Gibson Island Project (Project) has been identified as an opportunity to develop a green ammonia hub in Brisbane, Queensland through construction of a hydrogen production facility and refurbishment of an existing gas-based facility of Incitec Fertilizers Pty Limited (IPL) located at 250 and 282 Paringa Road, Murarrie. The Project is currently in its feasibility phase, with a final investment decision scheduled for late 2022.

The Project will make use of renewable energy and water to produce hydrogen through electrolysis which will then be used to produce ammonia for export or domestic sale. The Project aims to produce up to 1,150 tonnes per day (tpd) of ammonia. The Project development will utilise municipal water and power sourced via Power Purchase Agreement to power up to 550 Megawatt (MW) installed electrolysers to produce hydrogen, which will be used to synthesise ammonia.

FFI is responsible for power transmission, water and hydrogen production, on lot 472 on SL8834 (Lot 1). All downstream facilities (including the production of ammonia) shall be designed, constructed and managed by IPL on lot 468 on SL5433 (Lot 2). We note that the boundaries between exiting Lots 472 and 468 will be altered to account for the spatial plant and facilities' needs of each operation. The Project's schematic process flow diagram depicting FFI's scope of works compared to IPL's scope of works has been provided in Figure 1.1.

Aurecon Australasia Pty Ltd (Aurecon) was commissioned by FFI in February 2022 to undertake [a/an air quality/traffic/hydrology (flooding)/noise] impact assessment for the Project.

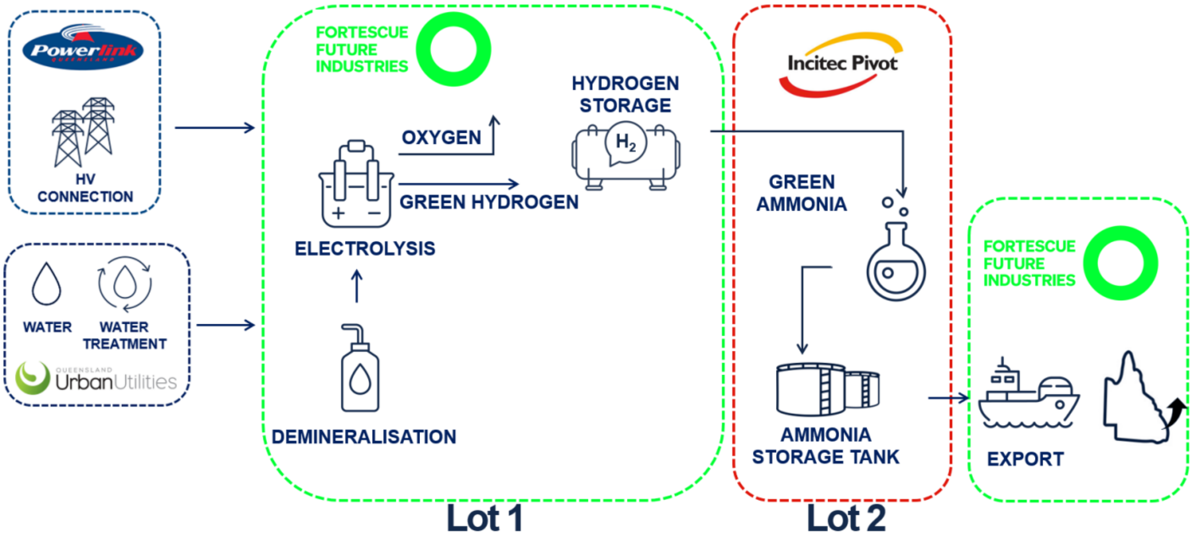


Figure 1.1 Schematic process flow diagram of the "upstream" production of green hydrogen by FFI on "Lot 1" (Lot 472 on SL8834) and subsequent "downstream" production of green ammonia by IPL on "Lot 2" (Lot 468 on SL5433) for export.

1.2 Site location

Gibson Island is located 15 km from the Brisbane central business district (refer Figure 1.2 and Figure 1.3). IPL's Gibson Island Facility currently manufactures nitrogen-based fertiliser products, including ammonia, urea, ammonium sulphate and carbon dioxide using natural gas as the principal feedstock.

Figure 1.2 Gibson Island in the Brisbane River, 15 km northeast of Brisbane CBD.

Figure 1.3 Inset map shows the outline of Lot 472 on SL8834 as the proposed site for FFI's green hydrogen production, adjacent to IPL's Gibson Island Facility in the northeast section of the island.

1.3 Scope and assumptions

The following assumptions and limitations apply to this assessment:

- Each piece of plant runs for the full 30-minute assessment period (i.e. running 100% of the time).
- 3D site and building layouts have been adopted from the current drawings provided via .dxf file.
- Open sources are assumed to be point sources.
- Plant that are enclosed are contained within an industrial building source.
- Equipment does not produce any acoustic characteristics that cause penalties.
- Door openings to buildings have not been included as part of the model.
- Mesh cladding for electrolyser buildings will be assumed as open-air sections.
- Construction plant locations are at the boundary nearest to receivers.

2 Site details

The proposed site is situated on Gibson Island, approximately 9km northeast of the Brisbane central business district (CBD); and is enclosed by Brisbane River on the north and Bulimba Creek on the south. The FFI and IPL sites are collectively considered as a Special Industry (SI) Zone in accordance with the Brisbane City Council (BCC) *Brisbane City Plan 2014* (City Plan). It is surrounded by the following planning scheme zones of significance:

- General Industry, IN3 (refer to the area shaded in purple in Figure 2.1)
- Special purpose utility, SP4 (refer to the area shaded in yellow in Figure 2.1)

The nearest sensitive zone is located approximately 700 m south of the site which is defined as follows:

- Low Density Residential, LDR (refer to the area shaded in pink in Figure 2.1)

Figure 2.1 Planning scheme overlay

The site is primarily affected by ambient noise from existing industrial noise from surrounding operations and local traffic.

The lot designations of the FFI site (lot 472 on SL8834) and IPL site (lot 468 on SL5433) are outlined in yellow and green respectively and is shown in Figure 2.2. The nearest sensitive (commercial and residential) receivers are also indicated in Figure 2.2. While the nearest business operating to the subject site is Hexion Pty Ltd, this land use has the same classification under the Australian Land Use and Management Classification as both the FFI and IPL sites. As such, the nearest commercial receiver is determined to be the Queensland Urban Utilities (QUU) commercial office at 188 Paringa Road, Murarrie, approximately 200m west of the site. The nearest residential receiver is a residential premise at 1 Field Avenue, Hemmant, approximately 730m south of the site. The nearest receivers were determined according to state and local legislation (refer to Section 4).

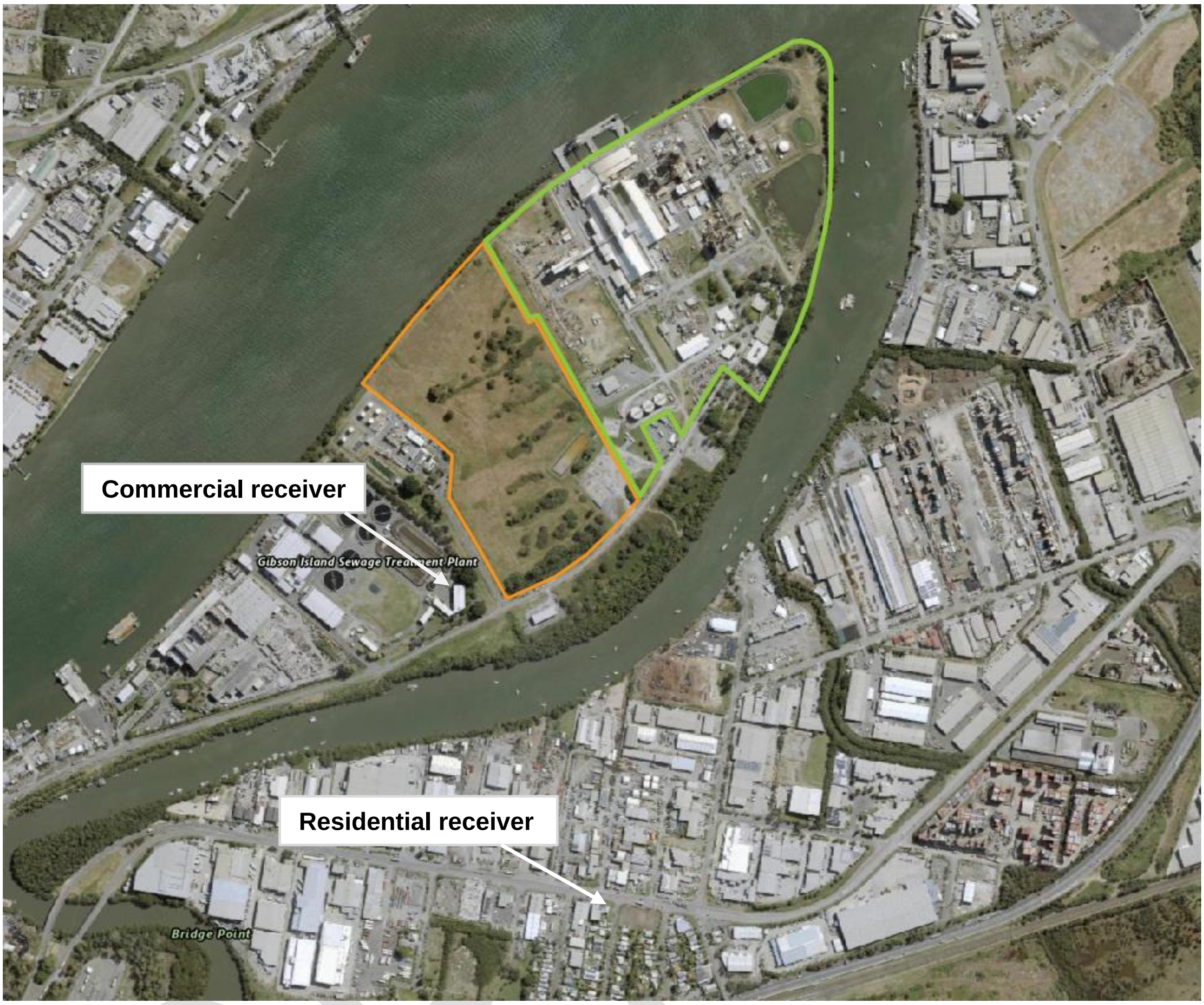


Figure 2.2 Aerial image of lot designations and nearest receivers

3 Noise survey

Demonstrating that the Project can operate without impacting on the noise amenity of the nearest sensitive receptors, uses, and zones (refer to section 4 for the meaning of ‘sensitive receptor,’ ‘sensitive use,’ and ‘sensitive zone’) has been undertaken by selecting noise monitoring locations representative of the emissions from the existing IPL site and the future FFI site and surrounding area, to obtain baseline data in order to predict the noise from construction and operational activities.

Attended and unattended noise monitoring was undertaken at the selected locations around the site to measure ambient noise levels. The monitoring sites were chosen as being representative of the future site location and the surrounding area. The locations of attended and unattended noise monitoring are shown in
Demonstrating that the Project can operate without impacting on the noise amenity of the nearest sensitive receptors, uses, and zones (refer to section 4 for the meaning of ‘sensitive receptor,’ ‘sensitive use,’ and ‘sensitive zone’) has been undertaken by selecting noise monitoring locations representative of the emissions from the existing IPL site and the future FFI site and surrounding area, to obtain baseline data in order to predict the noise from construction and operational activities.

Attended and unattended noise monitoring was undertaken at the selected locations around the site to measure ambient noise levels. The monitoring sites were chosen as being representative of the future site location and the surrounding area. The locations of attended and unattended noise monitoring are shown in Figure 3.1.

As per the methodology described in section 5, calculations of the noise emissions from the Project site have been used to determine representative noise levels that will be experienced at the nearest sensitive receptors, uses, or zones as a result of the Project.

Background noise monitoring was not undertaken directly at the nearest sensitive receptors, uses and zones, due to:

- The polluting influence on the background noise levels from the activities being carried out in the Project site’s surrounding industrial area; along with
- The distances separating the Project site from the nearest sensitive receptors, uses and zones meaning measurements taken at those locations would not be representative of the emissions from the Project site.

3.1 Equipment

The equipment used to conduct the noise monitoring are listed in Table 1. Noise measurements were conducted in accordance with Australian Standard AS 1055 *Acoustics – Description and measurement of environmental noise*. All equipment used to conduct the measurements had current and valid certification through the National Association of Testing Authorities (NATA). The equipment was checked for calibration before and after each set of measurements and no drift was observed.

Table 1: Noise survey equipment list

Equipment	Make	Model	Serial No.
Noise logger (unattended)	ARL	Ngara	878219
Calibrator	Pulsar	Model 105	85217
Sound level meter (attended)	Brüel & Kjær	2250	2653913

Figure 3.1 Noise monitoring locations

3.2 Attended monitoring

The Brüel & Kjær 2250 environmental noise monitor was used to collect attended measurements representing existing noise levels and sources in the area surrounding the site on 17th March 2022 and 25th March 2022. Each monitoring location was attended for a period of 15 minutes. Refer to Figure 3.1 for the noise monitoring locations.

3.3 Unattended monitoring

The ARL Ngara environmental noise monitor was placed adjacent to Paringa Rd to measure ambient noise levels. The monitor was located in a free field position with the microphone approximately 1.5 metres above ground surface level. The noise monitor was set to record noise levels between approximately 1pm on 17th March to 2pm on 20th March 2022. Refer to Figure 3.1 for the noise monitoring location.

3.4 Measurement results

The results of the unattended noise logging are summarised in Table 2. The results have been processed by decibel (dB) average for the measurements taken during the respective time periods. Any periods of inclement weather or extraneous noise are omitted from the measured data prior to determining the results. Refer to Appendix A for the graphical representation of the measured noise levels.

Measurement results from adverse weather conditions that occurred during the measurement period have been removed from the dataset prior to processing. This includes removing measured data from conditions of wind speeds greater than 5 m/s, or rainfall greater than 0.4 mm in an hour period, in accordance with Australian Standard AS 1055 *Acoustics – Description and measurement of environmental noise.*

Table 2: Summary of unattended noise logging

Time Period (time)	$dBL_{Aeq,T}$	dBL_{A10}	RBL (dBL_{A90})
Day (7am – 6pm)	59	62	48
Evening (6pm – 10pm)	57	57	49
Night (10pm – 7am)	55	56	45

Note:

- $L_{Aeq,T}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within the "T" time period has the same mean square sound pressure of a sound that varies with time.
- L_{A10} is the A-weighted sound level just exceeding 10% of the measurement period.
- RBL means the overall single-figure background level representing a noise assessment period (day/evening/night) over a monitoring period.
- L_{A90} is the A-weighted sound level just exceeding 90% of the measurement period.

The attended monitoring results are detailed in Table 3. These levels are the higher of the two days' recorded results measured at each location. The recorded levels at Locations 1 and 2 observed plant noise emanating from the entrance to the FFI site. Location 3, representing noise levels as observed across the Bulimba Creek, found no audible noise from the FFI site. Measured noise levels at Location 3 were attributed to the nearby industrial premises (not the FFI site).

Table 3: Attended noise monitoring results

Location	$dBL_{Aeq,15min}$	$dB\ L_{A10,\ 15min}$	$dB\ L_{A90,\ 15min}$
Location 1	56	59	47
Location 2	62	65	51
Location 3	54	55	47

Note:

- $L_{Aeq,15min}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within the 15-minute time period has the same mean square sound pressure of a sound that varies with time.
- $L_{A10,15min}$ is the A-weighted sound level just exceeding 10% of the measurement period of 15 minutes.
- $L_{A90,15min}$ is the A-weighted sound level just exceeding 90% of the measurement period of 15 minutes.

4 Noise objectives and criteria

4.1 *Environment Protection Act 1994* (Qld)

Queensland's *Environmental Protection Act 1994* (EP Act) forms part of a legislative framework that regulates noise from domestic, commercial and industrial premises.

Environmental nuisance is defined in the EP Act as unreasonable interference or likely interference with an environmental value caused by, for example, noise. The *Environmental Protection (Noise) Policy 2019* (Qld) (EPP Noise) identifies the environmental values of the acoustic environment to be protected and enhanced. By identifying environmental values, the EPP Noise assists in informing whether environmental nuisance under the EP Act has been caused.

The EPP Noise identifies the environmental values of the acoustic environment to be enhanced or protected and to achieve the objective of the EP Act; that is, ecologically sustainable development.

The environmental values under the policy are:

- the qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems; and
- the qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following—
  - sleep;
  - study or learn;
  - be involved in recreation, including relaxation and conversation; and
- the qualities of the acoustic environment that are conducive to protecting the amenity of the community.

Under the policy, a 'sensitive receptor' means:

> *"An area or place where noise is measured."*

Under the policy, an 'acoustic quality objective' means:

> *"For a sensitive receptor, means the maximum level of noise that should be experienced in the acoustic environment of the sensitive receptor."*

Acoustic quality objectives for specific sensitive receptors under the policy are stipulated in Schedule 1 of the Environmental Protection (Noise) Policy. Those stipulated in Schedule 1 of the Noise EPP applicable to the Project are presented in Table 4.

Table 4: Qld *Environmental Protection (Noise) Policy 2019* acoustic quality objectives applicable to the Project

Receptor	Time of day	Acoustic quality objectives			Environmental value
		dB$L_{Aeq,1hr}$	dB$L_{A10,1hr}$	dB$L_{A1,1hr}$	
Residence (for outdoors)	Daytime and evening	50	55	65	Health and wellbeing
Residence (for indoors)	Daytime and evening	35	40	45	Health and wellbeing
	Night-time	30	35	40	Health and wellbeing, in relation to ability to sleep
Commercial or retail activity (for indoors)	When the activity is open for business	45	-	-	Health and wellbeing, in relation to the ability to converse

Note:

- Daytime means 7 a.m. to 6 p.m.
- Evening means 6 p.m. to 10 p.m.
- Night-time means 10 p.m. to 7 a.m.
- $L_{Aeq,1hr}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1 hour period has the same mean square sound pressure of a sound that varies with time
- $L_{A10,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 10% of a 1 hour period when measured using a fast standardised response time.
- $L_{A1,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 1 hour period when measured using a fast standardised response time.

4.2 Brisbane City Council Environmental Noise Criteria

The City Plan provides a framework for managing development in Brisbane in a way that advances the purpose of the *Planning Act 2016* (Qld). The City Plan sets out BCC's intention for future development in the planning scheme area for the next 20 years.

The published method of noise impact assessment for proposed development in Brisbane under the City Plan is the Noise Impact Assessment Planning Scheme Policy (PSP) (v24, effective 27 May 2022), under the City Plan's Schedule 6 (Planning scheme policies), SC6.21 (Noise impact assessment planning scheme policy).

Under the PSP, sensitive receivers are defined as either 'sensitive use' or as a 'sensitive zone' that may be exposed to noise. These are defined as:

> *Sensitive use* means
>
> > *A use that is a: childcare centre, community care centre, community residence, detention facility, dual occupancy, dwelling house, dwelling unit, educational establishment, health care service, hospital, hotel, to the extent the hotel provides accommodation for tourists or travellers, multiple dwelling, relocatable home park, residential care facility, resort complex, retirement facility, rooming accommodation, rural workers' accommodation, short-term accommodation or tourist park.*
>
> *Sensitive zone* means *the following zones and precincts:*
>
> - *All zones in the residential zones category and the centres zones category; Emerging community zone; Mixed use zone; Rural residential zone; and in the Community facilities zone:*
>   - *education purposes zone precinct;*
>   - *health care purposes zone precinct; and*

– *major health care zone precinct.*

The City Plan's Part 9 (Development codes), 9.3 (Use codes), 9.3.12 (Industry code), Table 9.3.12.3.A (Performance outcomes and acceptable outcomes) provides performance outcomes and acceptable outcomes relating to acoustics and development in the Special Industry (SI) Zone in which the Project site lies.

The Performance Outcome (PO) 2 from Table 9.3.12.3.A states:

> *PO2*
>
> *Development complies with the noise (planning) criteria in* [the City Plan's Table 9.3.12.3.E]*, low frequency noise criteria in* [the City Plan's Table 9.3.12.3.F] *and the night-time noise criteria in* [the City Plan's Table 9.3.12.3.G].

There is no correlating acceptable outcome (AO) within the SI Zone.

Sections 4.2.1 to 0 breakdown the assessment requirements in relation to the Project and consider the criteria in relation to the type of noise being assessed.

4.2.1 Onsite activities

To ensure a reasonable acoustic amenity is maintained, the following criteria is applicable for the assessment of onsite activities to sensitive receivers. These noise criteria are applied by BCC in accordance with the noise (planning) criteria in the City Plan's Table 9.3.12.3.E (Table 5).

Table 5: Noise (planning) criteria (taken from the City Plan's Table 9.3.12.3.E)

Criteria location	Intrusive noise criteria	Acoustic amenity criteria		
	Day, evening and night $L_{Aeq,adj,T}$ are not greater than the RBL plus the value in this column for the relevant criteria location, where T equals: • **day – 11hr** • **evening – 4hr** • **night – 9hr**	**Day, evening and night $L_{Aeq,adj,T}$ are not greater than the values in this column for the relevant criteria location, where T equals:** • **day – 11hr** • **evening – 4hr** • **night – 9hr**		
		Day	Evening	Night
Low density residential zone boundary	▪ Day: RBL + 3 dB(A) ▪ Evening: RBL + 3 dB(A) ▪ Night: RBL + 3 dB(A) Based on the RBL from the noise monitoring survey, the criteria for the Project become: ▪ Day: 48 + 3 = **51 dB(A)** ▪ Evening:49 + 3 = **52 dB(A)** ▪ Night: 45 + 3 = **48 dB(A)**	**55 dB(A)**	**45 dB(A)**	**40 dB(A)**

Note:

- $L_{Aeq,adj,T}$ means the adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.
- RBL: Rating background level determined in accordance with the methodology in the Noise impact assessment planning scheme policy.
- dB(A): A-weighted decibels

The night-time noise criteria applied by BCC in accordance with the noise (planning) criteria in the City Plan's Table 9.3.12.3.G are shown in Table 6.

Table 6: Night-time noise criteria (taken from the City Plan's Table 9.3.12.3.G)

Criteria location	Where the existing $L_{Aeq,9hr\ night}$ at the criteria location is:	Average of the highest 15 single L_{Amax} events over a given night (10pm – 7am) period is not greater than the following values at the relevant criteria location:	The absolute highest single L_{Amax} event over a given night (10pm – 7am) period is not greater than the following values at the relevant criteria location:
At the zone boundary of: ▪ Low density residential zone	< 45 dB	50 dB	55 dB
	45 – 60 dB	$L_{Aeq,9hr\ night}$ + 5 dB	$L_{Aeq,9hr\ night}$ + 10 dB
	> 60 dB	65 dB	70 dB

Note:

- LAmax: The A-weighted maximum sound pressure level determined in accordance with the methodology described in the Noise impact assessment planning scheme policy.
- LAeq,9hr: The A-weighted equivalent continuous sound pressure level of the development during the night time period 10pm to 7am, determined in accordance with the methodology described in the Noise impact assessment planning scheme policy.
- Night: 10pm to 7am
- dB(A): A-weighted decibels

Based on the measured noise levels from Section 3, the night-time noise criteria applicable to the Project is shown in Table 7.

Table 7: Night-time noise criteria applicable to the Project

Criteria location	Measured $L_{Aeq,9hr\ night}$	Criteria Average Highest 15 Single L_{Amax} events (night)	Criteria highest single L_{Amax} (night)
At the zone boundary of: ▪ Low density residential zone	**55 dB**	55 + 5 = **60 dBL_{Amax}**	55 + 10 = **65 dBL_{Amax}**

Note:

- LAeq,9hr: The A-weighted equivalent continuous sound pressure level of the development during the night time period 10pm to 7am, determined in accordance with the methodology described in the Noise impact assessment planning scheme policy.
- LAmax: The A-weighted maximum sound pressure level determined in accordance with the methodology described in the Noise impact assessment planning scheme policy.

4.2.2 Low frequency noise criteria

The low-frequency noise criteria applied by BCC in accordance with the noise (planning) criteria in the City Plan's Table 9.3.12.3.F are shown in Table 8.

Table 8: Low frequency noise criteria (taken from Noise Impact Assessment PSP, Table 9.3.12.3.F)

Sensitive use	Low frequency noise criteria , $dBL_{Ceq,T}$		
	Day	Evening	Night
Low density residential zone boundary	65	65	60

Note:
- LCeq,adj,T: The adjusted C-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am-–6pm), 4-hour evening (6pm-–10pm) and 9-hour night (10pm-–7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

5 Noise Calculations

5.1 Methodology

Three dimensional (3D) computational noise modelling of the FFI Project site has been undertaken, with the proposed upgrades to the IPL site to support the Project included in the noise model to consider the cumulative noise emissions from both premises.

In this assessment, the noise emissions from the future upgrades for the IPL site are not assessed; the contributions from the IPL site are only included in the noise model for cumulative assessment with FFI operational noise emissions. It is assumed that the situation modelled is representative of both sites being fully operational. This means, the FFI site is fully constructed and functional, and proposed IPL upgrades have been integrated fully into the existing site. The assessment has utilised 24-hour operation.

Construction noise emissions have been predicted using specialist acoustic software Strutt (version 5.22.05E). Calculations are based on the indicative distance between the boundary of the site and the representative receivers. Construction noise emissions are predicted for the construction staging proposed for the project.

Operational noise emissions have been predicted by developing a three dimensional (3D) computational noise modelling of the FFI Project site, with the proposed upgrades to the IPL site to support the Project included in the noise model to consider the cumulative noise emissions from both premises.

The prediction methodology employed for both operational and construction calculations is the International Standard ISO 9613-2: 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of Calculation implemented using SoundPlan v8.2 acoustics software package.

The calculation methods include geometrical propagation, atmospheric absorption, ground absorption, existing barriers and buildings in the surrounding area and meteorological effects assume downwind noise propagation. Weather conditions are considered in accordance with the prediction methodology where assessment conditions are limited to a wind speed of up to 5 m/s and no rainfall. This represents conditions most conducive to noise propagation in the direction of the receivers.

5.2 Model inputs

The environmental noise modelling parameters and inputs are provided in Table 9.

Table 9: Noise modelling input parameters

Inputs	Details
Prediction methodology	ISO 9613-2:1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General method of calculation
Software Package	Operational: SoundPlan 8.2 Construction: Strutt (version 5.22.05E)
Receivers	The receiver height is modelled at 1.5 m above ground level, 1 m from the centre of the building facade facing or most exposed to the Project site.
Building heights	Building heights were extracted from site plans. Residential and surrounding buildings were assumed as follows: Single storey – 4.5m Double storey – 7m
Modelled terrain	1 m Digital Elevation Model LiDAR – Queensland Government
Facade correction	Facade correction of 2.5 dB as per prediction methodology inclusive of the SoundPlan modelling

Inputs	Details
Ground absorption*	Ground absorption has been modelled as follows: Water: 0 Residential areas: 0.4 Industrial areas: 0.4 Open grass areas: 0.8
Reflection order *	3

* Note: These items are constant coefficient values without associated units.

5.3 Source noise levels

5.3.1 Construction

The construction of the site is proposed to occur in three stages:

- Stage 1: site preparation;
- Stage 2 and 3: construction and installation of equipment and buildings; and
- Stage 4: commissioning.

The number of plant for each staging are listed in Table 10, with their associated sound power levels specified in Table 11. Plant selections are subject to change once a construction programme has been established by the site contractor. These construction scenarios represent a worst-case assessment based on the preliminary plant proposed for the build. A reassessment may be required if there are significant changes to the construction staging.

Table 10: Construction plant for staging

Construction Stage	Equipment type	Estimated quantity
Stage 1: Site preparations	Scrapers	2
	Bulldozers	2
	Loaders	2
	Excavators	1
	Dump trucks	1
	Compactors	1
	Bitumen trucks	1
	Water trucks	1
	Curbing unit	1
	Asphalt unit	1
	Piling rig	1
Stages 2 and 3: Construction and installation of equipment and buildings	Loaders	3
	Excavators	4
	Backhoe	2
	Dump trucks	2
	Water trucks	2
	Compactors	1
	Roller	1
	Concrete trucks	2
	Forklift	1
	Flatbed trucks	5
	Mobile cranes	4
	Hiab trucks	3
	Power generator	1
	Telescopic crane	1
	Piling rig	1
Stage 4: Commissioning	Hand tools	4
	Scissor lifts	2

Table 11: Source noise levels for proposed construction plant

Plant	Sound power level (dB) for Octave band centre frequency (Hz)							Total, dB(A)
	63	125	250	500	1k	2k	4k	
Dump truck	113	102	106	101	101	102	95	107
Excavator	109	108	108	111	110	107	104	114
Bulldozer	105	114	103	103	110	108	101	113
Loader	115	110	105	106	101	98	92	107
Bitumen trucks	108	97	94	98	99	97	92	103
Asphalt unit	106	105	100	100	99	97	90	104
Compactor	98	106	107	100	105	96	94	107
Scraper	105	114	103	103	110	108	101	113
Water truck	108	97	94	98	99	97	92	103
Curbing unit	106	105	100	100	99	97	90	104
Piling rig	108	107	101	102	101	101	92	106
Backhoe	114	108	106	105	109	111	110	117
Roller (smooth)	115	113	103	101	103	101	97	108
Concrete truck	108	97	94	98	99	97	92	103
Forklift	108	105	102	102	102	99	93	106
Flatbed truck	105	94	91	95	96	94	89	100
Mobile crane	108	107	101	102	101	101	92	106
Hiab truck	105	94	91	95	96	94	89	100
Generator	108	102	85	82	81	76	73	89
Telescopic crane	108	107	101	102	101	101	92	106
Hand tools	93	93	91	84	83	86	88	94

Note:

Plant sound power levels have been referenced from:

- *British Standard BS5228-1:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise*; and
- *Australian Standards AS2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites*

5.3.2 Operations

The site generally consists of electrolysis plant and the associated power services to facilitate the process. The majority of plant items are also located within enclosures which are either partially closed or fully enclosed. The plant designation for site sections is summarised in Table 12.

Table 12: Plant designations for FFI site

Section	Plant	Quantity
Water Treatment Package 0224	Pumps (100kW, 1600 – 1800 rpm)	14
Electrolyser Blowdown Treatment Package 0238	Pumps (100kW, 1600 – 1800 rpm)	2
Hydrogen Treatment Package 0312	Pumps (100kW, 1600 – 1800 rpm)	4
Cooling Water System 0232	Cooling tower Pumps (100kW, 1600 – 1800 rpm)	7 4
Chemical Dosing Package 0282	Pumps (100kW, 1600 – 1800 rpm)	12
Effluent Handling Package 0253	Pumps (100kW, 1600 – 1800 rpm)	20
Fire Water System 0872	Pumps (75kW, 1600 – 1800 rpm)	5
Potable Water System	Pumps (75kW, 3600 rpm)	2
Electrolyser Unit Substation A0S01	Power Transformer 275/34.5kV Distribution Transformer 33/6.9kV	1 1
Electrolyser Unit Substation A0S02	Power Transformer 275/34.5kV Distribution Transformer 33/6.9kV	1 1
Electrolyser Unit Substation A0S03	Power Transformer 275/34.5kV Distribution Transformer 33/6.9kV	1 1
Electrolyser Unit Substation A0S04	Power Transformer 275/34.5kV Distribution Transformer 33/6.9kV	1 1
Instrument Air Package 0272	Compressor	4
Nitrogen Package 0273	Pumps (100kW, 1600 – 1800 rpm)	4
Hydrogen Compressor	Compressor Pumps (75kW, 3600 rpm)	4 2
Balance of Plant Substation A0S05	Transformer 3000 kVA	4
Electrolyser Train 1	Electrolyser pumps	22
Electrolyser Train 2	Electrolyser pumps	22
Electrolyser Train 3	Electrolyser pumps	22
Electrolyser Train 4	Electrolyser pumps	22
EHV Switchyard ASYDK1	Transformer 3000 kVA	1
Central Control Room	Condensers (A/C)	3
Reserved space for NPI buildings	Condensers (A/C)	13

The source noise spectrum for the proposed plant, as detailed in Table 12, are listed in Table 13. The listed source noise levels are indicative and subject to change during subsequent design stages where actual loading requirements are confirmed. Where there are changes that would cause an increase in the noise emissions, a reassessment may be required to determine compliance with the noise criteria.

Table 13: Source noise levels for proposed operational plant

Plant	Sound power level (dB) for Octave band centre frequency (Hz)									Total, dB(A)
	31.5	63	125	250	500	1k	2k	4k	8k	
Pumps (100kW, 1600 – 1800 rpm)	93	94	95	97	97	100	97	93	87	104
Pumps (75kW, 1600 – 1800 rpm)	93	94	95	97	97	100	97	93	87	103
Pumps (75kW, 3600 rpm)	90	91	92	94	94	97	94	90	84	100
Electrolyser Pump	93	94	95	97	97	100	97	93	87	104
Cooling tower	108	111	111	108	105	101	98	95	87	107
Power transformer[1]	80	89	92	87	87	79	72	64	52	86
Distribution transformer[1]	80	89	92	87	87	79	72	64	52	86
Compressor	107	103	108	107	105	108	113	110	103	116
Transformer	80	89	92	87	87	79	72	64	52	86
Condensers	72	77	75	78	74	68	65	57	51	75

Note:

- Power and distribution transformers are only associated with the electrolyser unit substations.

All operational noise sources as provided by FFI to be in operation have been included in the model predictions.

5.3.3 Site buildings

Site buildings have been incorporated into the 3D noise model as provided by FFI (in .dxf format) (based on drawing AUSE0001-0000-ME-DAL-0001 dated 21 April 2022).

The majority of proposed plant are either partially enclosed or fully enclosed within an enclosure or building. Enclosures are understood to consist of the following build-up:

- Electrolyser buildings
  - Walls consist of 0.6mm profiled steel sheeting, and
  - Roof consists of 0.6mm profiled steel sheeting | 50mm thick wool insulation | suspended 9mm compressed fibre cement (CFC) sheeting.
- Other enclosures
  - Walls consist of 0.6mm profiled external steel sheeting | 50mm thick insulation of 11 kg/m^3 | 9mm CFC sheeting, and
  - Roof consists of 0.6mm profiled external steel sheeting | 50mm thick wool insulation | suspended 9mm CFC sheeting.

Electrolyser buildings are partially enclosed with the bottom half of the building comprising of meshed cladding for ventilation purposes. Other buildings are understood to be fully enclosed.

6 Predicted construction noise

Construction noise at the nearest commercial receiver and residential receptor has been predicted with all plant, in each construction stage, operating simultaneously (which would rarely be the case in practice); and assuming that all plant is located at the nearest site boundary closest to the receiver. This represents a worst-case, and therefore conservative, assessment scenario at the receivers.

The predicted noise levels for construction are shown in Table 14.

Table 14: Construction noise predicted levels at receivers

Construction Stage	Receiver	Predicted noise level from FFI Construction (dB$L_{Aeq,T}$)
Stage 1: Site preparations	188 Paringa Road (commercial)	64
	1 Field Avenue (residential)	49
Stages 2 and 3: Construction and installation of equipment and buildings	188 Paringa Road (commercial)	63
	1 Field Avenue (residential)	53
Stage 4: Commissioning	188 Paringa Road (commercial)	53
	1 Field Avenue (residential)	39

Note:

- $L_{Aeq,T}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within the “T” time period has the same mean square sound pressure of a sound that varies with time.
- In this assessment, the “T” time period is the same value for all day, evening and night-time periods, as 24-hour construction has been assumed and therefore the results will not vary across time periods.

7 Predicted operational noise

Predicted noise emissions have been calculated for the FFI project site operating in isolation, and with the cumulative emissions from both the FFI and IPL sites, at the nearest commercial receiver and residential receptors. The noise predictions for the FFI site operating in isolation and cumulatively with IPL are detailed in Table 15.

An operational noise emissions contour for the cumulative site (i.e. the FFI site operating cumulatively with IPL) is visually presented in Appendix B. The contour map presents the instantaneous noise emissions from both sites and at the assessed receivers. This represents the cumulative noise emissions for any given period where both sites are simultaneously in operation which is indicative of a worst-case scenario.

Table 15: Typical operations for FFI only and cumulative impacts of FFI and IPL sites

Operational scenario	Receiver	Predicted noise level (dB$L_{Aeq,T}$)
Typical Operations (FFI Only)	188 Paringa Road (commercial)	47
	1 Field Avenue (residential)	38
Cumulative Impact (FFI + IPL)	188 Paringa Road (commercial)	48
	1 Field Avenue (residential)	40

Note:

- $L_{Aeq,T}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within the “T” time period has the same mean square sound pressure of a sound that varies with time.
- In this assessment, the “T” time period is the same value for all day, evening and night-time periods, as 24-hour operations have been assumed and therefore the results will not vary across time periods.

8 Performance against noise objectives and criteria

8.1 EPP Noise

Predicted noise level performance relative to the EPP Noise acoustic quality objectives are provided in Table 16 to Table 20, for construction noise stages and operations, respectively. Predictions are based on a worst-case scenario which is expected to rarely occur in actual practice. If construction staging or site operations change, a reassessment may be required to predict performance against the objectives.

> Note: The predicted $L_{Aeq,1hr}$ result for the acoustic objectives is applicable for comparison against the acoustic objectives, as this value can be predicted via the noise calculations as described in Section 5.

Based on the results, it is anticipated that:

- Stage 1 construction:
  - Meets the acoustic quality objectives for the nearest residence during the day and evening time periods without mitigation.
  - Without the implementation of mitigation measures, the acoustic quality objectives may not be met at the nearest residence during night-time.
  - Without the implementation of mitigation measures, the acoustic quality objectives may not be met at the nearest commercial premise (QUU) during its operational hours (daytime).
- Construction Stages 2 and 3:
  - Without the implementation of mitigation measures, the acoustic quality objectives may not be met at the nearest residence and commercial premise during the daytime, evening and night-time periods.
- Stage 4 construction:
  - Meets the acoustic quality objectives at the nearest commercial premise during its operational hours without mitigation.
  - Without the implementation of mitigation measures, the acoustic quality objectives may not be met at the nearest residence during the daytime, evening and night-time periods.
- FFI’s operations (standalone) and cumulative FFI and IPL operations:
  - Meet the acoustic quality objectives for the nearest residence and commercial premise during all time periods without mitigation.
- FFI and IPL cumulative construction impacts are not anticipated. Each site is anticipated to be aware of, and take into consideration, any neighbouring construction activities in their own construction noise mitigation strategies.

Table 16: EPP Noise acoustic quality objectives and predicted construction noise, Stage 1 (FFI only)

Receptor	Time of day	Acoustic quality objectives	
		Objective $dBL_{Aeq,1hr}$	Result in $L_{Aeq,1hr}$
Residence (for outdoors)	Daytime and evening	50	Daytime: 49 Evening: 49
Residence (for indoors)	Daytime and evening	35	Daytime: 34 Evening: 34
	Night-time	30	34
Commercial or retail activity (for indoors)	When the activity is open for business	45	49

Note:

- Daytime means 7 a.m. to 6 p.m.; Evening means 6 p.m. to 10 p.m.; Night-time means 10 p.m. to 7 a.m.
- $L_{Aeq,1hr}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1 hour period has the same mean square sound pressure of a sound that varies with time
- $L_{A10,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 10% of a 1 hour period when measured using a fast standardised response time.
- $L_{A1,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 1 hour period when measured using a fast standardised response time.
- Noise EPP utilises and outdoor to indoor reduction of 15 dB which has been used to provide indicative indoor levels.
- QUU, at 188 Paringa Road, is understood to be open for business on weekdays (Monday through Friday) from 8 am to 5 pm. For this assessment's purposes, the "Daytime" result has been considered.

Table 17: EPP Noise acoustic quality objectives and predicted construction noise, Stages 2 and 3 (FFI only)

Receptor	Time of day	Acoustic quality objectives	
		Objective $dBL_{Aeq,1hr}$	Result in LAeq,1hr
Residence (for outdoors)	Daytime and evening	50	Daytime: 53 Evening: 53
Residence (for indoors)	Daytime and evening	35	Daytime: 38 Evening: 38
	Night-time	30	38
Commercial or retail activity (for indoors)	When the activity is open for business	45	48

Note:

- Daytime means 7 a.m. to 6 p.m.; Evening means 6 p.m. to 10 p.m.; Night-time means 10 p.m. to 7 a.m.
- $L_{Aeq,1hr}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1 hour period has the same mean square sound pressure of a sound that varies with time
- $L_{A10,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 10% of a 1 hour period when measured using a fast standardised response time.
- $L_{A1,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 1 hour period when measured using a fast standardised response time.
- QUU, at 188 Paringa Road, is understood to be open for business on weekdays (Monday through Friday) from 8 am to 5 pm. For this assessment's purposes, the "Daytime" result has been considered.

Table 18: EPP Noise acoustic quality objectives and predicted construction noise, Stage 4 (FFI only)

Receptor	Time of day	Acoustic quality objectives	
		Objective dB$L_{Aeq,1hr}$	Result in LAeq,1hr
Residence (for outdoors)	Daytime and evening	50	Daytime: 53 Evening: 53
Residence (for indoors)	Daytime and evening	35	Daytime: 38 Evening: 38
	Night-time	30	38
Commercial or retail activity (for indoors)	When the activity is open for business	45	24

Note:

- Daytime means 7 a.m. to 6 p.m.; Evening means 6 p.m. to 10 p.m.; Night-time means 10 p.m. to 7 a.m.
- $L_{Aeq,1hr}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1 hour period has the same mean square sound pressure of a sound that varies with time
- $L_{A10,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 10% of a 1 hour period when measured using a fast standardised response time.
- $L_{A1,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 1 hour period when measured using a fast standardised response time.
- QUU, at 188 Paringa Road, is understood to be open for business on weekdays (Monday through Friday) from 8 am to 5 pm. For this assessment's purposes, the "Daytime" result has been considered.

Table 19: EPP Noise acoustic quality objectives and predicted operational noise (FFI only)

Receptor	Time of day	Acoustic quality objectives	
		Objective dB$L_{Aeq,1hr}$	Result in LAeq,1hr
Residence (for outdoors)	Daytime and evening	50	Daytime: 38 Evening: 38
Residence (for indoors)	Daytime and evening	35	Daytime: 23 Evening: 23
	Night-time	30	23
Commercial or retail activity (for indoors)	When the activity is open for business	45	32

Note:

- Daytime means 7 a.m. to 6 p.m.; Evening means 6 p.m. to 10 p.m.; Night-time means 10 p.m. to 7 a.m.
- $L_{Aeq,1hr}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1 hour period has the same mean square sound pressure of a sound that varies with time
- $L_{A10,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 10% of a 1 hour period when measured using a fast standardised response time.
- $L_{A1,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 1 hour period when measured using a fast standardised response time.
- QUU, at 188 Paringa Road, is understood to be open for business on weekdays (Monday through Friday) from 8 am to 5 pm. For this assessment's purposes, the "Daytime" result has been considered.

Table 20: EPP Noise acoustic quality objectives and predicted operational noise (FFI and IPL cumulatively)

Receptor	Time of day	Acoustic quality objectives	
		Objective $dBL_{Aeq,1hr}$	Result in LAeq,1hr
Residence (for outdoors)	Daytime and evening	50	Daytime: 40 Evening: 40
Residence (for indoors)	Daytime and evening	35	Daytime: 25 Evening: 25
	Night-time	30	25
Commercial or retail activity (for indoors)	When the activity is open for business	45	32

Note:

- Daytime means 7 a.m. to 6 p.m.; Evening means 6 p.m. to 10 p.m.; Night-time means 10 p.m. to 7 a.m.
- $L_{Aeq,1hr}$ means an A-weighted sound pressure level of a continuous steady sound, adjusted for tonal character, that within a 1 hour period has the same mean square sound pressure of a sound that varies with time
- $L_{A10,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 10% of a 1 hour period when measured using a fast standardised response time.
- $L_{A1,1hr}$ means the A-weighted sound pressure level, adjusted for tonal character or impulsiveness, that is exceeded for 1% of a 1 hour period when measured using a fast standardised response time.
- QUU, at 188 Paringa Road, is understood to be open for business on weekdays (Monday through Friday) from 8 am to 5 pm. For this assessment's purposes, the "Daytime" result has been considered.

8.2 City Plan

Predicted noise level performance relative to the City Plan's noise (planning) criteria for intrusive noise, acoustic amenity, night-time noise, and low frequency noise for construction noise stages and operations are provided in Table 21 through Table 37, respectively, in Sections 8.2.1 through 8.2.4; with the exception of night-time criteria, which is available for operational activities only. Operational predictions have been made for FFI alone as well as FFI and IPL cumulative operations. Should construction staging or site operations change, a reassessment may be required to predict performance against the criteria.

Based on the results, it is anticipated that:

- For Stage 1 construction:
  - Intrusive noise criteria are met during daytime and evening periods without mitigation. Without mitigation measures, the criteria may not be met during night-time.
  - Acoustic amenity criteria are met during daytime period without mitigation. Without mitigation measures, the criteria may not be met during the evening and night-time periods.
  - Low frequency noise criteria are met during daytime, evening and night-time periods without mitigation.
- For construction Stages 2 and 3:
  - Without mitigation measures, the intrusive noise criteria may not be met during the daytime, evening or night-time periods.
  - Acoustic amenity criteria are met during the daytime period without mitigation. Without mitigation measures, the criteria may not be met during the evening and night-time periods.
  - Low frequency noise criteria are met during daytime, evening and night-time periods without mitigation.

- For Stage 4 construction:
  - Intrusive noise criteria are met during daytime, evening and night-time periods without mitigation.
  - Acoustic amenity criteria are met during daytime, evening and night-time periods without mitigation.
  - Low frequency noise criteria are met during daytime, evening and night-time periods without mitigation.

- For FFI's operations (standalone) operations:
  - Intrusive noise criteria are met during daytime, evening and night-time periods without mitigation.
  - Acoustic amenity criteria are met during daytime, evening and night-time periods without mitigation.
  - Night-time noise criteria are met without mitigation.
  - Low frequency noise criteria are met during daytime, evening and night-time periods without mitigation.

- For cumulative FFI and IPL operations:
  - Intrusive noise criteria are met during daytime, evening and night-time periods without mitigation.
  - Acoustic amenity criteria are met during daytime, evening and night-time periods without mitigation.
  - Night-time noise criteria are met without mitigation.
  - Low frequency noise criteria are met during daytime, evening and night-time periods without mitigation.
- FFI and IPL cumulative construction impacts are not anticipated. Each site is anticipated to be aware of, and take into consideration, any neighbouring construction activities in their own construction noise mitigation strategies.

8.2.1 Intrusive noise

Table 21: City Plan intrusive noise criteria and predicted construction noise, Stage 1 (FFI only)

Sensitive use	Intrusive Noise Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	51	52	48	49	49	49

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 22: City Plan intrusive noise criteria and predicted construction noise, Stages 2 and 3 (FFI only)

Sensitive use	Intrusive Noise Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	51	52	48	53	53	53

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 23: City Plan intrusive noise criteria and predicted construction noise, Stage 4 (FFI only)

Sensitive use	Intrusive Noise Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	51	52	48	39	39	39

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 24: City Plan intrusive noise criteria and predicted operational noise (FFI only)

Sensitive use	Intrusive Noise Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	51	52	48	38	38	38

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 25: City Plan intrusive noise criteria and predicted operational noise (FFI and IPL cumulatively)

Sensitive use	Intrusive Noise Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	51	52	48	40	40	40

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

8.2.2 Acoustic amenity

Table 26: City Plan acoustic amenity criteria and predicted construction noise, Stage 1 (FFI only)

Sensitive use	Acoustic Amenity Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	55	45	40	49	49	49

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 27: City Plan acoustic amenity criteria and predicted construction noise, Stages 2 and 3 (FFI only)

Sensitive use	Acoustic Amenity Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	55	45	40	53	53	53

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 28: City Plan acoustic amenity criteria and predicted construction noise, Stage 4 (FFI only)

Sensitive use	Acoustic Amenity Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	55	45	40	39	39	39

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 29: City Plan acoustic amenity criteria and predicted operational noise (FFI only)

Sensitive use	Acoustic Amenity Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	55	45	40	38	38	38

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 30: City Plan acoustic amenity criteria and predicted operational noise (FFI and IPL cumulatively)

Sensitive use	Acoustic Amenity Criteria, $dBL_{Aeq,T}$			Result, $dBL_{Aeq,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	55	45	40	40	40	40

Note:
- LAeq,adj,T: The adjusted A-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am–6pm), 4-hour evening (6pm–10pm) and 9-hour night (10pm-7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

8.2.3 Night-time noise

It has been assumed that operational L_{Amax} results would not be significantly different to the L_{Aeq} noise levels, as the operational activities are generally continuous and constant and therefore would not result in intermittent impulsive or short-term noise events. The source noise levels for construction activities are listed in this report in terms of L_{Aeq} noise levels, and therefore L_{Amax} noise levels have not been predicted.

Table 31: City Plan night-time noise criteria and predicted operational noise (FFI only)

Criteria location	Measured LAeq,9hr night	Criteria Average LAmax	Result Average LAmax	Criteria highest single LAmax	Result Highest Single LAmax
At the zone boundary of: ▪ Low density residential zone	55 dB	60 dBLAmax	38 dB	65 dBLAmax	38 dB

Note:
- LAeq,9hr: The A-weighted equivalent continuous sound pressure level of the development during the night time period 10pm to 7am, determined in accordance with the methodology described in the Noise impact assessment planning scheme policy.
- LAmax: The A-weighted maximum sound pressure level determined in accordance with the methodology described in the Noise impact assessment planning scheme policy.

Table 32: City Plan night-time noise criteria and predicted operational noise (FFI and IPL cumulatively)

Criteria location	Measured LAeq,9hr night	Criteria Average LAmax	Result Average LAmax	Criteria highest single LAmax	Result Highest Single LAmax
At the zone boundary of: ▪ Low density residential zone	55 dB	60 dBLAmax	40 dB	65 dBLAmax	40 dB

Note:
- LAeq,9hr: The A-weighted equivalent continuous sound pressure level of the development during the night time period 10pm to 7am, determined in accordance with the methodology described in the Noise impact assessment planning scheme policy.
- LAmax: The A-weighted maximum sound pressure level determined in accordance with the methodology described in the Noise impact assessment planning scheme policy.

8.2.4 Low frequency noise

Table 33: City Plan low frequency noise criteria and predicted construction noise, Stage 1 (FFI only)

Criteria location	Low frequency noise criteria, dBLCeq,T			Result, dBLCeq,adj,T		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	65	65	60	51	51	51

Note:
- LCeq,adj,T: The adjusted C-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am-–6pm), 4-hour evening (6pm-–10pm) and 9-hour night (10pm-–7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 34: City Plan low frequency noise criteria and predicted construction noise, Stages 2 and 3 (FFI only)

Criteria location	Low frequency noise criteria, dBL$_{Ceq,T}$			Result, dBL$_{Ceq,adj,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	65	65	60	55	55	55

Note:

- LCeq,adj,T: The adjusted C-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am-–6pm), 4-hour evening (6pm-–10pm) and 9-hour night (10pm-–7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 35: City Plan low frequency noise criteria and predicted construction noise, Stage 4 (FFI only)

Criteria location	Low frequency noise criteria, dBL$_{Ceq,T}$			Result, dBL$_{Ceq,adj,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	65	65	60	41	41	41

Note:

- LCeq,adj,T: The adjusted C-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am-–6pm), 4-hour evening (6pm-–10pm) and 9-hour night (10pm-–7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 36: City Plan low frequency noise criteria and predicted operational noise (FFI only)

Criteria location	Low frequency noise criteria, dBL$_{Ceq,T}$			Result, dBL$_{Ceq,adj,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	65	65	60	40	40	40

Note:

- LCeq,adj,T: The adjusted C-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am-–6pm), 4-hour evening (6pm-–10pm) and 9-hour night (10pm-–7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

Table 37: City Plan low frequency noise criteria and predicted operational noise (FFI and IPL cumulatively)

Criteria location	Low frequency noise criteria, dBL$_{Ceq,T}$			Result, dBL$_{Ceq,adj,T}$		
	Day	Evening	Night	Day	Evening	Night
Low density residential zone boundary	65	65	60	42	42	42

Note:

- LCeq,adj,T: The adjusted C-weighted equivalent continuous sound pressure level of the development during the time period T, where T is an 11-hour day (7am-–6pm), 4-hour evening (6pm-–10pm) and 9-hour night (10pm-–7am), determined in accordance with the methodology in the Noise impact assessment planning scheme policy.

9 Noise mitigation considerations

Operational activities, both standalone for FFI and cumulatively with IPL, are predicted to meet the relevant acoustic quality objectives and noise criteria without mitigation.

Construction activities may require mitigation in order to meet the following acoustic quality objectives (EPP Noise):

- Stage 1:
  - Nearest residence during the night-time period (10 pm to 7 am).
  - Nearest commercial premise during the daytime period (7 am to 6pm).
- Stages 2 and 3:
  - Nearest residence during the daytime (7 am to 6 pm), evening (6 pm to 10 pm) and night-time (10 pm to 7 am) periods.
  - Nearest commercial premise during the daytime period (7 am to 6pm).
- Stage 4:
  - Nearest residence during the daytime (7 am to 6 pm), evening (6 pm to 10 pm) and night-time (10 pm to 7 am) periods.

Construction activities may require mitigation in order to meet the following noise criteria (City Plan):

- Stage 1:
  - Intrusive noise criteria at the nearest low density residential zone boundary during the night-time period (10 pm to 7 am).
  - Acoustic amenity criteria at the nearest low density residential zone boundary during the evening (6 pm to 10 pm) and night-time periods (10 pm to 7 am).
- Stages 2 and 3:
  - Intrusive noise criteria at the nearest low density residential zone boundary daytime (7 am to 6 pm), evening (6 pm to 10 pm) and night-time (10 pm to 7 am) periods.
  - Acoustic amenity criteria at the nearest low density residential zone boundary during the evening (6 pm to 10 pm) and night-time periods (10 pm to 7 am).

The impacts are not considered significant with regard to the magnitude of noise levels above the criteria. It is recommended strategies are considered and, where appropriate, outlined in a Construction Management Plan (or similar instrument) to mitigate potential impacts; such as:

- Install site hoardings or boundary barriers prior to construction activities commencing;
- Orient construction trucks and plant away from sensitive receivers as much as possible to minimise noise impacts;
- Strategically group plant together to minimise noise impacts from multiple directions;
- Manage on site vehicle speeds and avoid/minimise using broadband/audible reversing alarms;
- Strategically locate site ingress and egress points to minimise travel within the site. Maintain site paths to avoid unnecessary noise sources such as from vehicles striking potholes and loose items;
- Work within the nominated construction hours of work, including start up meetings and closure periods;
- Utilise lowest noise plant to complete construction works and implement low noise work practices;
- Locate site buildings, staff access areas and laydown yards to minimise disturbance to the community;
- Minimise the use of heavily frequented community areas;

- Utilise temporary enclosures works and/or works undertaken outside the typical construction hours to shield high noise generating activities;
- Ensure noise attenuation measures are implemented on fixed and mobile plant such as mufflers and silencers to minimise noise impacts;
- Turn off plant when not in use and avoid idling when possible;
- Keep out-of-use plant located away from sensitive receivers;
- Avoid heavy handling of materials and equipment to prevent sudden noise events; and
- Undertake site inductions for all employees, contractors and subcontractors, with the induction including noise mitigation measures and management actions to be adopted by all site personnel.

10 Conclusion

An environmental noise assessment has been conducted for the proposed FFI Hydrogen plant site located on 250 Paringa Road, Murarrie.

The environmental noise assessment included a desktop noise assessment for the proposed construction staging to build the site, with noise emissions for each construction stage predicted relative to the nearest commercial and residential receivers relative to the site.

A computational noise model of the site was developed and used to predict noise emissions to the nearest commercial and residential receivers. Noise emission predictions were made for typical operations of the FFI site in operation and with the cumulative concurrent operation of the adjacent future / planned upgraded IPL site.

During operational activities, the FFI site operating in isolation and cumulatively with the IPL site is anticipated to meet the acoustic quality objectives under the EPP Noise and noise criteria under the BCC City Plan, without mitigation.

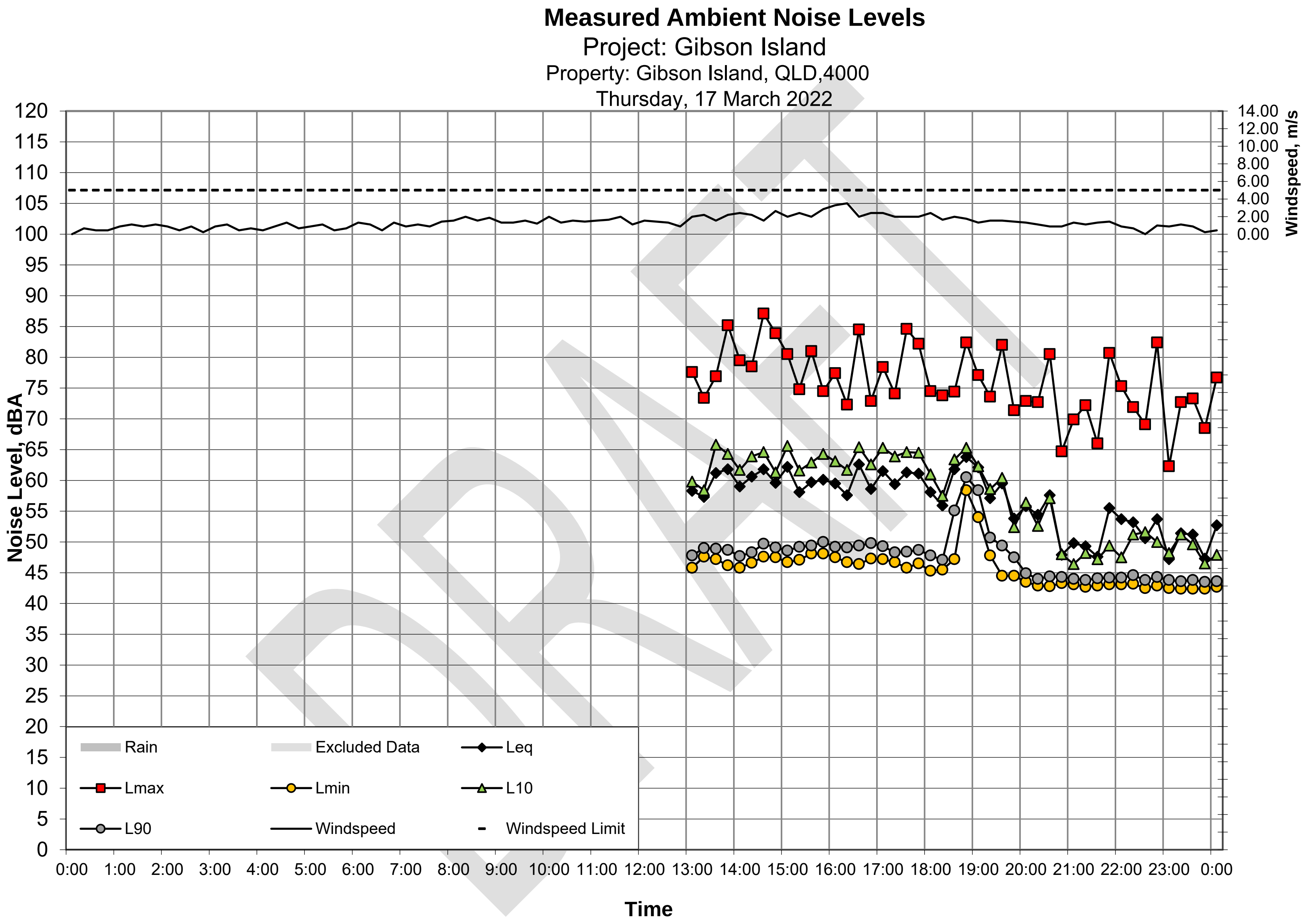
During construction stages, standard construction noise mitigation measures may be required to meet the acoustic quality objectives under the EPP Noise and noise criteria under the BCC City Plan (refer to Section 9 for a detailed objective and criteria breakdown).

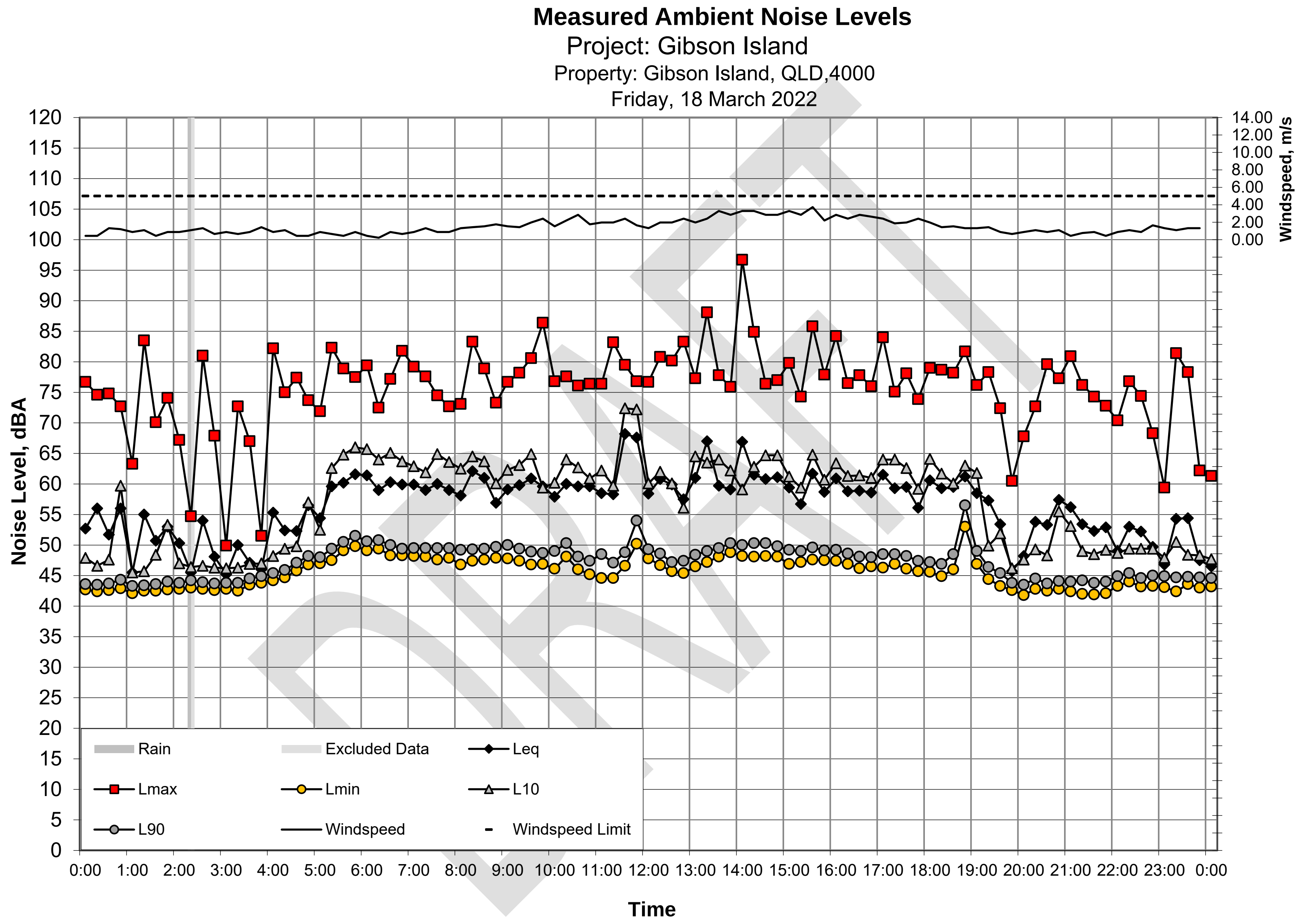
Should construction or operational details change in future design iterations that would cause in increase in the noise emissions, it is recommended that performance against the noise objectives and criteria be again verified based on those changes.

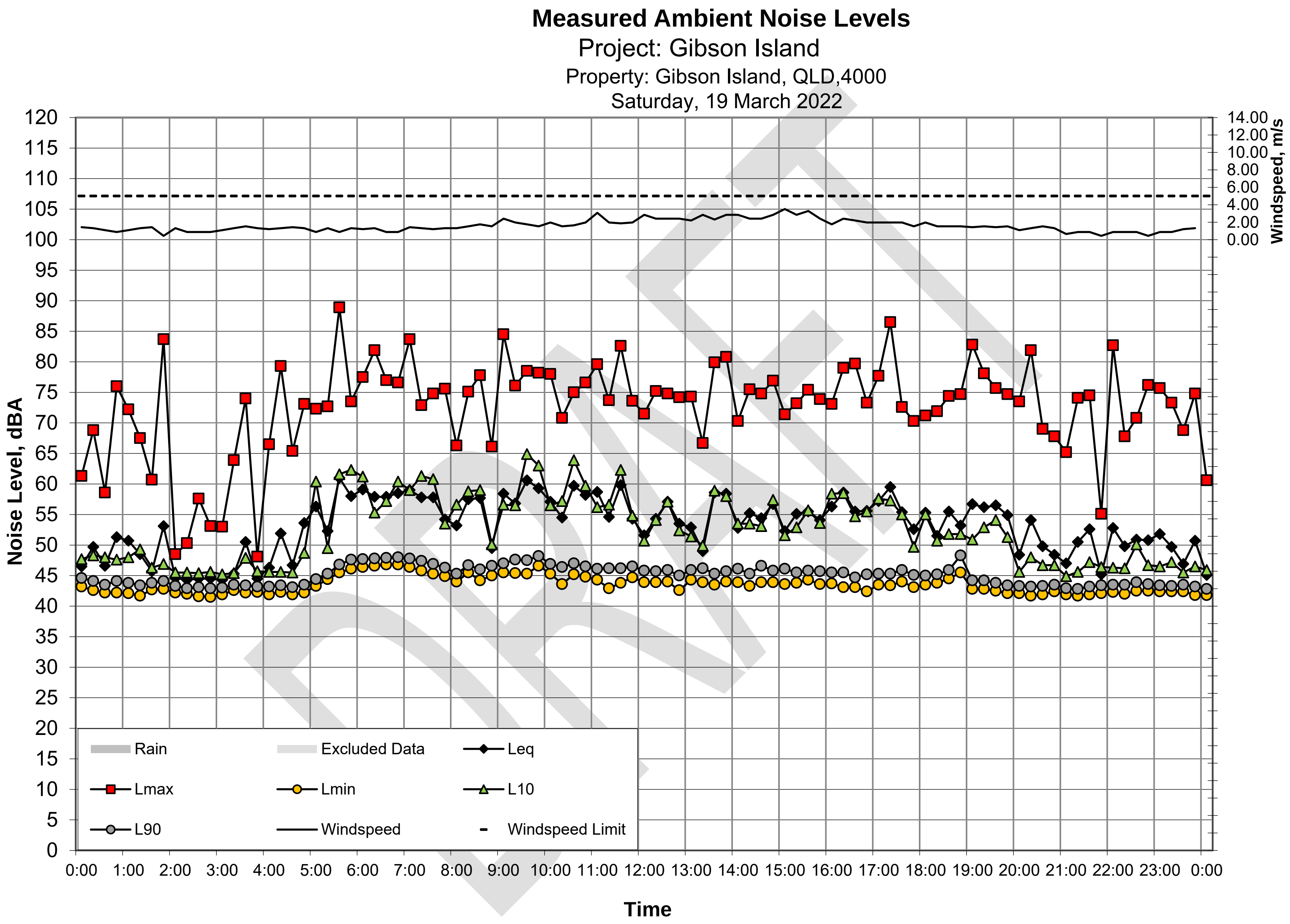
11 References

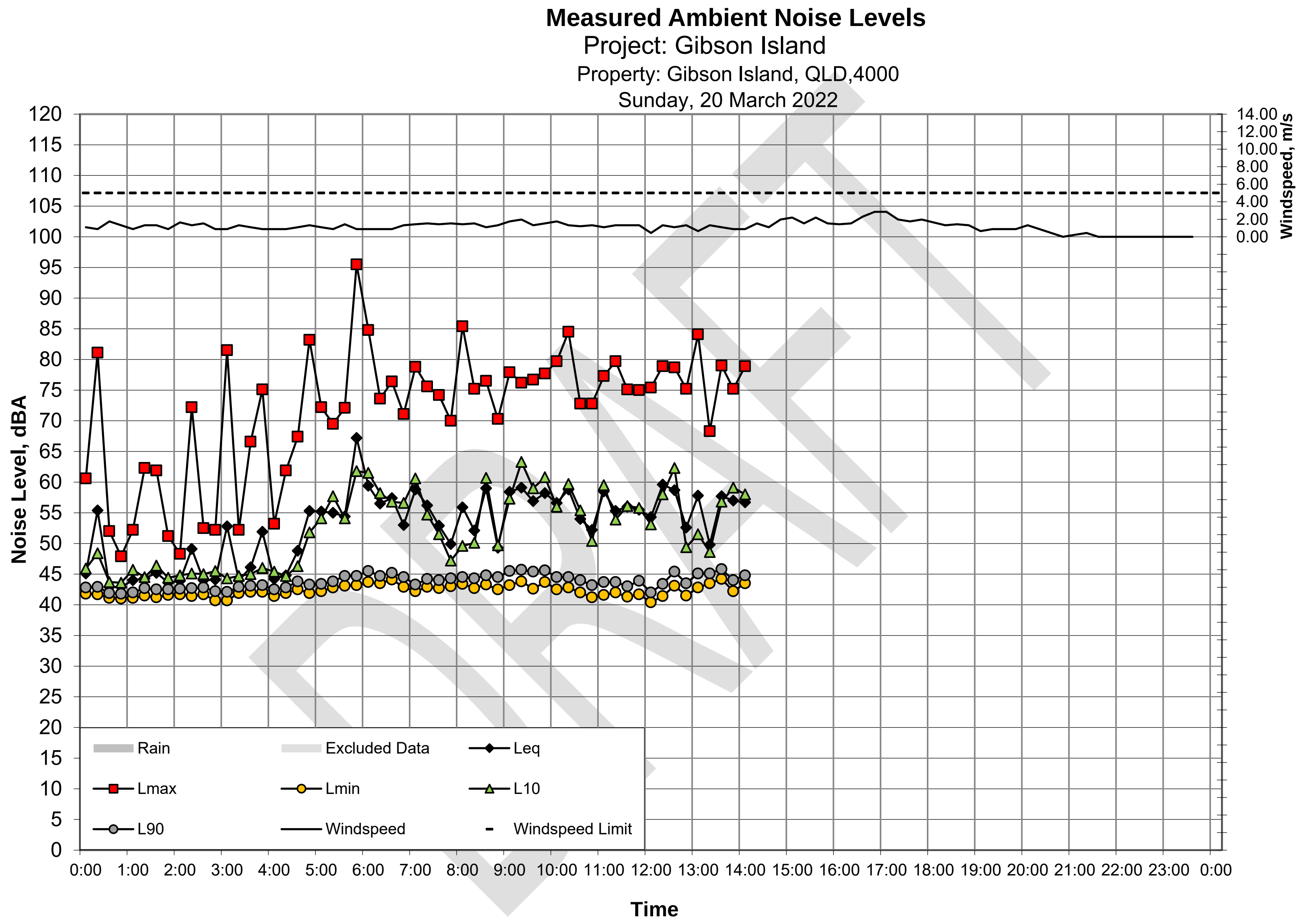
- Queensland *Environmental Protection Act 1994*
- Queensland *Environmental Protection (Noise) Policy 2019*
- Queensland Fact sheet – Noise regulation under the *Environmental Protection Act 1994* (EPP/2021/5675 Version 3.00, 4 April 2022)
- Queensland *Planning Act 2016*
- *Brisbane City Plan 2014* v23.00/2021, effective 10 December 2021
- ISO 9613-2: 1996 Acoustics – Attenuation of sound during propagation outdoors – Part 2: General Method of Calculation
- Australian Standard AS 1055 Acoustics – Description and measurement of environmental noise
- British Standard BS5228-1:2009 + A1:2014 Code of practice for noise and vibration control on construction and open sites – Part 1: Noise
- Australian Standards AS2436-2010 Guide to noise and vibration control on construction, demolition and maintenance sites

Appendix A – Noise monitoring results


Measured Ambient Noise Levels
Project: Gibson Island
Property: Gibson Island, QLD,4000
Thursday, 17 March 2022
Noise Level, dBA
Windspeed, m/s
Time
Rain
Excluded Data
Leq
Lmax
Lmin
L10
L90
Windspeed
Windspeed Limit
DRAFT


Measured Ambient Noise Levels
Project: Gibson Island
Property: Gibson Island, QLD,4000
Friday, 18 March 2022
Noise Level, dBA
Windspeed, m/s
Time
Rain
Excluded Data
Leq
Lmax
Lmin
L10
L90
Windspeed
Windspeed Limit
DRAFT


Measured Ambient Noise Levels
Project: Gibson Island
Property: Gibson Island, QLD,4000
Saturday, 19 March 2022
Noise Level, dBA
Windspeed, m/s
Time
Rain
Excluded Data
Leq
Lmax
Lmin
L10
L90
Windspeed
Windspeed Limit
DRAFT


Measured Ambient Noise Levels
Project: Gibson Island
Property: Gibson Island, QLD,4000
Sunday, 20 March 2022
Noise Level, dBA
Windspeed, m/s
Time
Rain
Excluded Data
Leq
Lmax
Lmin
L10
L90
Windspeed
Windspeed Limit

Appendix B – Operational noise contour map

FFI and IPL Cumulative Operational Noise Contour Map

Noise propagation at 1.5m above ground level

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Bringing ideas to life

Appendix N Gexcon Consequence Modelling

GEXCON

CO600124 – Gladstone Test Train (GTT) and HRS

Preliminary Consequence Results Rev03

Objectives in Preliminary Consequence Assessment

- Provide preliminary consequence modelling results to support the project's Queensland Development Assessment application for land use planning purposes in accordance with Queensland State Code 21 requirements.
- For industrial land use around Gladstone Test Train site, the following performance outcomes stipulated in State Code 21 will apply:
  - **Industrial land use**

    a) The Hazardous Chemical Facility (HCF) does not create dangerous dose to the built environment, and

    b) Individual fatality risk level of $50x10^{-6}$/year

- Based on Ref. 1, the Gladstone Test Train site is located within the Gladstone State Development Area (GSDA). Access to the GSDA is restricted to authorized personnel only and is considered a controlled area. In view of this, the road network around the site may be appropriate to refer to the performance outcomes for industrial land use.

Ref. 1 : https://www.statedevelopment.qld.gov.au/coordinator-general/state-development-areas/current/gladstone-state-development-area

GEXCON

Objectives in Preliminary Consequence Assessment

- The results from preliminary consequence assessment are used to assess potential offsite hazardous impacts using the following performance criteria:
    - The HCF does not create dangerous dose to the built environment

4.4.1 Heat radiation effects

The effects of heat radiation from jet, pool, and flash fires and BLEVEs must be estimated using contemporary techniques as applicable. The preferred format of presenting the results is effect contours overlayed on a map clearly showing the contours relative to the various land use categories.

Areas outside the facility boundary shall not be exposed to heat radiation exceeding 4.7 kW/m^2, except industrial land use which should not exceed 12.6 kW/m^2.

4.4.2 Explosion overpressure

The overpressure effects of vapour cloud explosions, explosive reactions, rapid phase transitions, BLEVEs and accidental detonation of explosives must be estimated using contemporary techniques as applicable. The preferred format of presenting the results is effect contours overlayed on a map clearly showing the contours relative to the various land use categories.

Areas outside the facility boundary shall not be exposed to an overpressure greater than 7kPa, except industrial land use which shall not exceed 14 kPa.

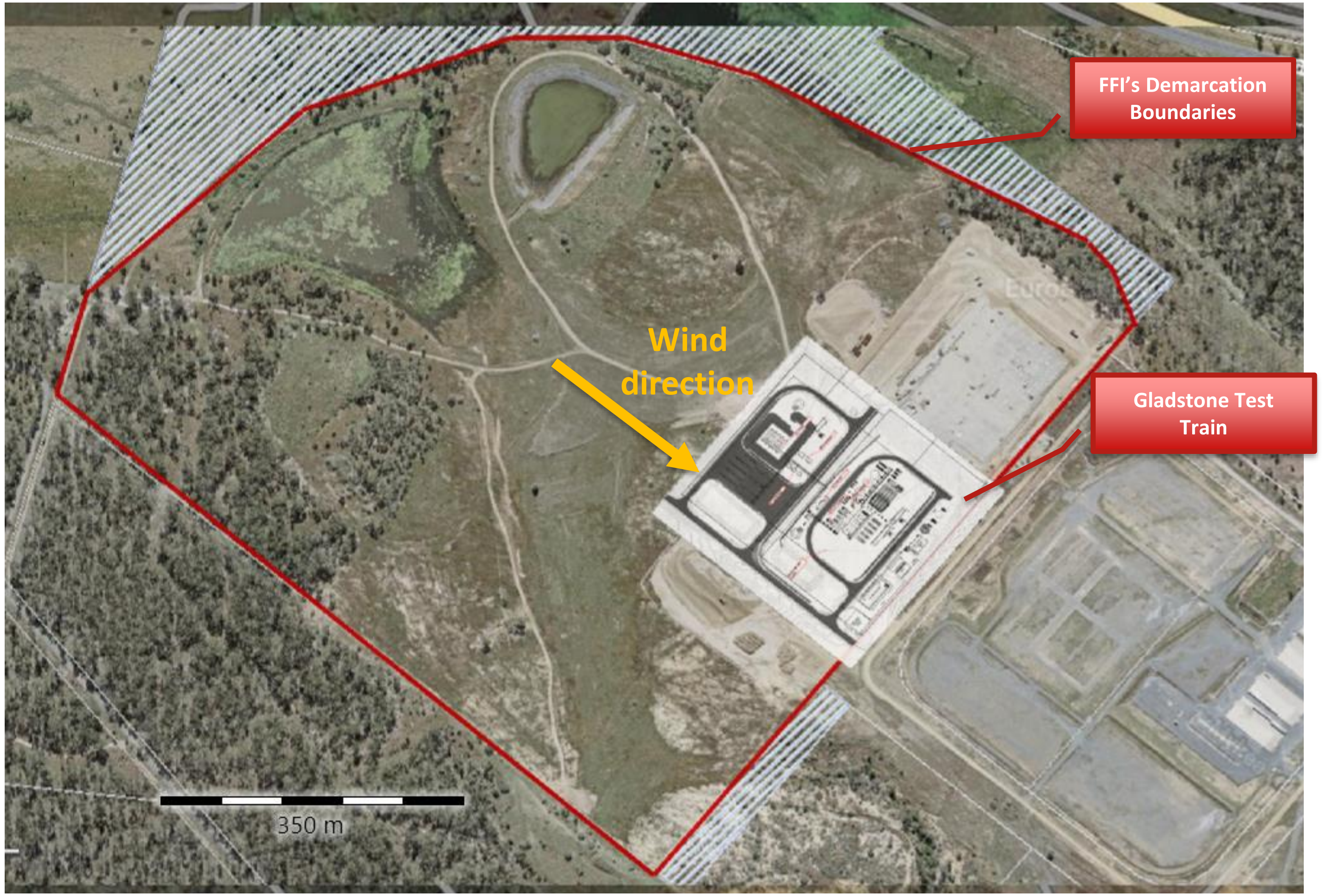
Key Assumptions / Limitations / Exclusions - Preliminary Consequence Assessment

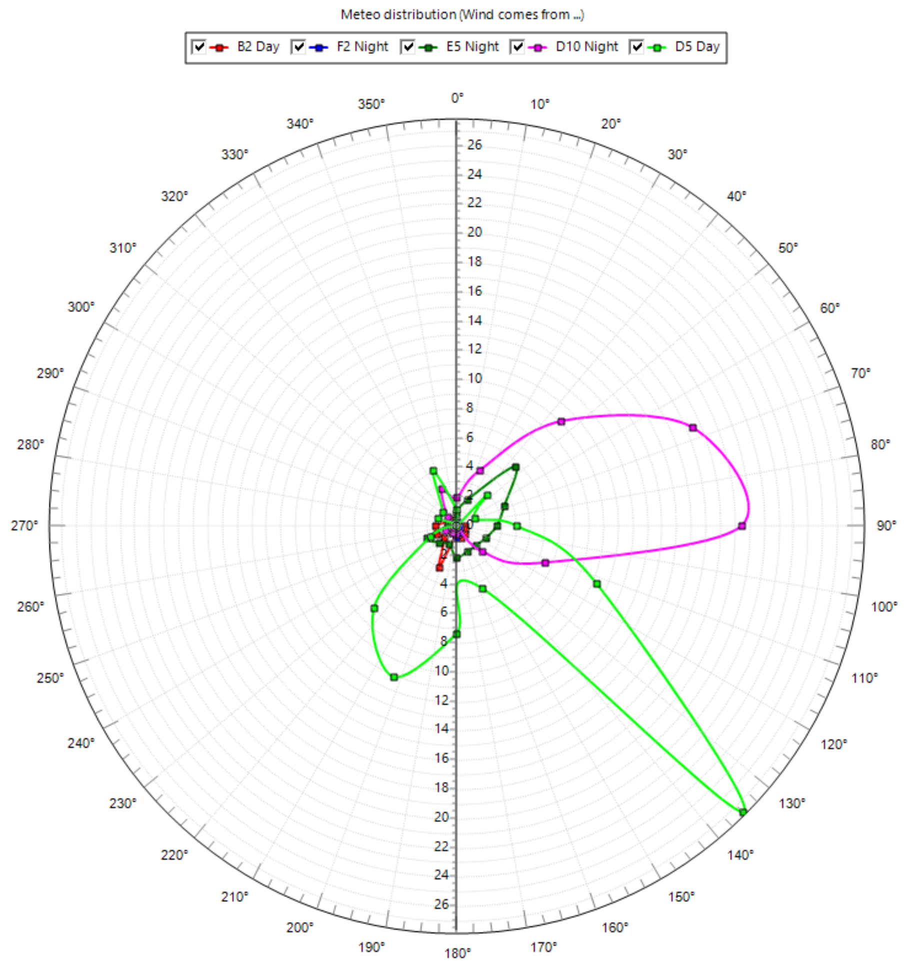
Assumptions / Limitations / Exclusions

- Representative hole sizes have been selected as per NFPA 2 (1% of pipe flow area). Worst-case scenarios assume full bore rupture of selected pipework/tubing;
- This study does not consider consequences for any release scenarios that occur within an enclosure (such as internal explosions caused by leakages inside the compressor container) as 2D analytical modelling does not consider the presence of geometries in the calculation.
- This study is a consequence-based assessment showing the extents of hazards due to releases from representative and worst-case scenarios. Likelihood / frequency calculations are excluded from this study. The results generated in this study, therefore, do not consider any risk values.
- The shielding effect of the blast wall / container wall cannot be modelled using 2D empirical tool. While the blast walls are shown on the layout drawings, the calculated consequence distances do not account for them.
- To accurately model the impact of a blast wall on a high-pressure gas release/fire it would be necessary to use a 3D CFD calculation which considers geometry obstructions in the calculation.

GEXCON

Gladstone Test Train Proposed Site Location





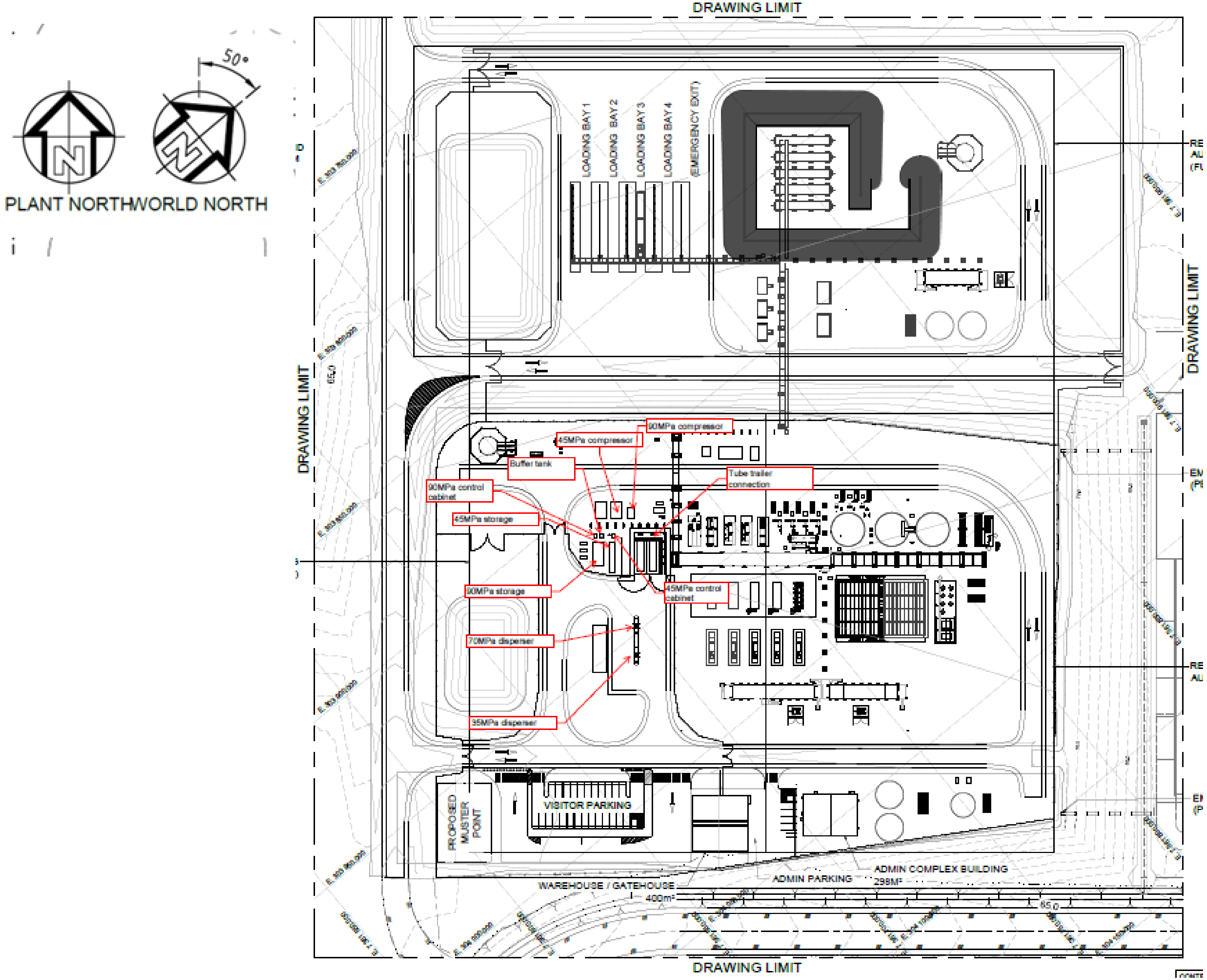
Gladstone Meteorological Data

Key observations:

- Most unfavourable results are found to occur at night with the most stable classes of D, E and F which correspond to neutral, stable and very stable Pasquil Class.
- This is because during night conditions, cooler air near the ground inhibit vertical mixing (turbulence) in the atmosphere. Less mixing with air essentially means less dilution and hence higher level of concentration stays within the plume.
- Only worst case scenarios (or longest distance) are reported.

Proposed Gladstone Test Train Layout (1 / 2)

Proposed Gladstone Test Train Layout (2 / 2)



GEXCON

List of Scenarios Considered for GTT (Latest Layout)

ID Naming Convention	Pressure (barg)	Temperature (C)	Density (kg/m3)	Inventory (kg)	Volume (m3)	Hole Size (mm)
GTT_01.1_Electrolyser H2 side Outlet Line to HP Separator_8mm	**35**	80	2.42	14.33	5.92	**8**
GTT_01.1_Electrolyser H2 side Outlet Line to HP Separator)_80mm	**35**	80	2.42	14.33	5.92	**80**
GTT_01.2_HP Separator (A0311-1VL002)_15mm	**35**	80	2.42	14.33	5.92	**15**
GTT_01.2_HP Separator (A0311-1VL002)_150mm	**35**	80	2.42	14.33	5.92	**150**
GTT_02_H2 / H2O LP Separator (A0311-1VL003)_15mm	**2**	80	0.21	0.08	0.41	**15**
GTT_02_H2 / H2O LP Separator (A0311-1VL003)_150mm	**2**	80	0.21	0.08	0.41	**150**
GTT_03.1_Line to H2 Treatment Package_10mm	**30**	45	2.27	5.6	2.48	**10**
GTT_03.1_Line to H2 Treatment Package_100mm	**30**	45	2.27	5.6	2.48	**100**
GTT_03.2_H2 Treatment Package_10mm	**30**	45	2.27	5.6	2.48	**10**
GTT_03.2_H2 Treatment Package_100mm	**30**	45	2.27	5.6	2.48	**100**
GTT_04_Line to LP Compression Package_10mm	**30**	45	2.27	2.0	0.86	**10**
GTT_04_Line to LP Compression Package_100mm	**30**	45	2.27	2.0	0.86	**100**
GTT_05_LP Compression Package _10mm	**120**	104	7.27	2.6	0.36	**10**
GTT_05_LP Compression Package _100mm	**120**	104	7.27	2.6	0.36	**100**
GTT_06_Line to Storage Container and HP Compresson Package_8mm	**120**	45	8.53	2.83	0.33	**8**
GTT_06_Line to Storage Container and HP Compresson Package_80mm	**120**	45	8.53	2.83	0.33	**80**
GTT_07.1 - GTT_07.5_H2 Cylinder Storage (1 cylinder x 1000 kg) - 5 cylinders in total_8mm	**120**	45	8.53	1000.00	117.19	**8**
GTT_07.1 - GTT_07.5_H2 Cylinder Storage (1 cylinder x 1000 kg) - 5 cylinders in total_80mm	**120**	45	8.53	1000.00	117.19	**80**
GTT_08_HP Compression Package _2.5mm	**350**	104	19.01	6.8	0.36	**2.5**
GTT_08_HP Compression Package _25mm	**350**	104	19.01	6.8	0.36	**25**
GTT_09_Compressed GH2 Line to Tube Trailers_2.5mm	**350**	45	22.16	0.78	0.04	**2.5**
GTT_09_Compressed GH2 Line to Tube Trailers_25mm	**350**	45	22.16	0.78	0.04	**25**
GTT_10_Filling hoses_5mm	**350**	45	22.16	0.2	0.01	**5**
GTT_10_Filling hoses_50mm	**350**	45	22.16	0.2	0.01	**50**
GTT_11.1 - GTT_11.5_Tube Trailers (5 Load Out Bays)_5mm	**350**	45	22.16	800	36.1	**5**
GTT_11.1 - GTT_11.5_Tube Trailers (5 Load Out Bays)_50mm	**350**	45	22.16	800	36.1	**50**

List of Scenarios Considered for HRS

ID Naming Convention	Pressure (barg)	Temperature (C)	Density (kg/m3)	Inventory (kg)	Volume (m3)	Hole Size (mm)
HRS01_3MPa Buffer Storage_3.2mm	**30**	45	2.3206	116.03	50	**3.2**
HRS01_3MPa Buffer Storage_32mm	**30**	45	2.3206	116.03	50	**32**
HRS02_45MPa Compressor _1.9mm	**450**	40	27.62	27.62	1	**1.9**
HRS02_45MPa Compressor _19mm	**450**	40	27.62	27.62	1	**19**
HRS03_45MPa Control Cabinet _1.9mm	**450**	40	27.62	27.62	1	**1.9**
HRS03_45MPa Control Cabinet _19mm	**450**	40	27.62	27.62	1	**19**
HRS04_35MPa Dispenser_1.3mm	**350**	40	22.538	11	0.5	**1.3**
HRS04_35MPa Dispenser_13mm	**350**	40	22.538	11	0.5	**13**
HRS05_Bus located at Dispenser _1mm	**350**	40	22.538	18	0.8	**1**
HRS05_Bus located at Dispenser _10mm	**350**	40	22.538	18	0.8	**10**
HRS06_Tube trailer located at Dispenser _1.9mm	**350**	40	22.538	**500**	22.2	**1.9**
HRS06_Tube trailer located at Dispenser _19mm	**350**	40	22.538	**500**	22.2	**19**
HRS07_45MPa Bulk Storage_1.9mm	**450**	40	27.62	**1000**	36.2	**1.9**
HRS07_45MPa Bulk Storage_19mm	**450**	40	27.62	**1000**	36.2	**19**
HRS08_90MPa Compressor_1.9mm	**900**	40	45.65	45.65	1	**1.9**
HRS08_90MPa Compressor_19mm	**900**	40	45.65	45.65	1	**19**
HRS09_90MPa Control Cabinet _1.9mm	**900**	40	45.65	45.65	1	**1.9**
HRS09_90MPa Control Cabinet _19mm	**900**	40	45.65	45.65	1	**19**
HRS10_90MPa Station Storage (2 bottles)_1.9mm	**900**	40	45.65	45.65	1	**1.9**
HRS10_90MPa Station Storage (2 bottles)_19mm	**900**	40	45.65	45.65	1	**19**
HRS11_70MPa Dispenser_1.3mm	**700**	40	38.47	19.235	0.5	**1.3**
HRS11_70MPa Dispenser_13mm	**700**	40	38.47	19.235	0.5	**13**

Results Summary

Summary of Results – GTT

GEXCON

ID Naming Convention	Pressure (barg)	Temperature (C)	Density (kg/m3)	Inventory (kg)	Volume (m^3)	Hole Size (mm)	Industrial Land Use		
							12.6 kW/m^2 (m)	140 mbar (m)	Maximum Distances past Site Boundary (m)
GTT01.1_Electrolyser H2 side Outlet Line to HP Separator_8mm	**35**	80	2.42	14.33	5.92	**8**	Not Reached	Not Reached	Stays within Site Boundary
GTT01.1_Electrolyser H2 side Outlet Line to HP Separator)_80mm	**35**	80	2.42	14.33	5.92	**80**	41	64	Stays within Site Boundary
GTT01.2_HP Separator (A0311-1VL002)_15mm	**35**	80	2.42	14.33	5.92	**15**	13	34	Stays within Site Boundary
GTT01.2_HP Separator (A0311-1VL002)_150mm	**35**	80	2.42	14.33	5.92	**150**	101	81	Stays within Site Boundary
GTT02_H2 / H2O LP Separator (A0311-1VL003)_15mm	**2**	80	0.21	0.08	0.41	**15**	5	Not Reached	Stays within Site Boundary
GTT02_H2 / H2O LP Separator (A0311-1VL003)_150mm	**2**	80	0.21	0.08	0.41	**150**	38	Not Reached	Stays within Site Boundary
GTT03.1_Line to H2 Treatment Package_10mm	**30**	45	2.27	5.6	2.48	**10**	Not Reached	Not Reached	Stays within Site Boundary
GTT03.1_Line to H2 Treatment Package_100mm	**30**	45	2.27	5.6	2.48	**100**	46	53	Stays within Site Boundary
GTT03.2_H2 Treatment Package_10mm	**30**	45	2.27	5.6	2.48	**10**	8	Not Reached	Stays within Site Boundary
GTT03.2_H2 Treatment Package_100mm	**30**	45	2.27	5.6	2.48	**100**	68	60	Stays within Site Boundary
GTT04_Line to LP Compression Package_10mm	**30**	45	2.27	2.0	0.86	**10**	Not Reached	Not Reached	Stays within Site Boundary
GTT04_Line to LP Compression Package_100mm	**30**	45	2.27	2.0	0.86	**100**	45	27	Stays within Site Boundary
GTT05_LP Compression Package _10mm	**120**	104	7.27	2.6	0.36	**10**	14	34	Stays within Site Boundary
GTT05_LP Compression Package _100mm	**120**	104	7.27	2.6	0.36	**100**	114	Not Reached	Stays within Site Boundary
GTT06_Line to Storage Container and HP Compresson Package_8mm	**120**	45	8.53	2.83	0.33	**8**	Not Reached	25	Stays within Site Boundary
GTT06_Line to Storage Container and HP Compresson Package_80mm	**120**	45	8.53	2.83	0.33	**80**	67	36	Stays within Site Boundary
GTT07.1 - GTT07.5_H2 Cylinder Storage (1 cylinder x 1000 kg) - 5 cylinders in total_8mm	**120**	45	8.53	1000.00	117.19	**8**	13	36	Stays within Site Boundary
GTT07.1 - GTT07.5_H2 Cylinder Storage (1 cylinder x 1000 kg) - 5 cylinders in total_80mm	**120**	45	8.53	1000.00	117.19	**80**	99	176	Stays within Site Boundary
GTT08_HP Compression Package _2.5mm	**350**	104	19.01	6.8	0.36	**2.5**	6	Not Reached	Stays within Site Boundary
GTT08_HP Compression Package _25mm	**350**	104	19.01	6.8	0.36	**25**	50	62	Stays within Site Boundary
GTT09_Compressed GH2 Line to Tube Trailers_2.5mm	**350**	45	22.16	0.78	0.04	**2.5**	Not Reached	Not Reached	Stays within Site Boundary
GTT09_Compressed GH2 Line to Tube Trailers_25mm	**350**	45	22.16	0.78	0.04	**25**	25	Not Reached	Stays within Site Boundary
GTT10_Filling hoses_5mm	**350**	45	22.16	0.2	0.01	**5**	13	13	Stays within Site Boundary
GTT10_Filling hoses_50mm	**350**	45	22.16	0.2	0.01	**50**	97	Not Reached	Stays within Site Boundary
GTT11.1 - GTT11.5_Tube Trailers (5 Load Out Bays)_5mm	**350**	45	22.16	800	36.1	**5**	13	36	Stays within Site Boundary
GTT11.1 - GTT11.5_Tube Trailers (5 Load Out Bays)_50mm	**350**	45	22.16	800	36.1	**50**	100	177	Stays within Site Boundary

Summary of Results – HRS

ID Naming Convention	Pressure (barg)	Temperature (C)	Density (kg/m3)	Inventory (kg)	Volume (m3)	Hole Size (mm)	Industrial Land Use		
							12.6 kW/m^2 (m)	140 mbar (m)	Maximum Distances past Site Boundary (m)
HRS01_3MPa Buffer Storage_3.2mm	**30**	45	2.3206	116.03	50	**3.2**	3	Not Reached	Stays within Site Boundary
HRS01_3MPa Buffer Storage_32mm	**30**	45	2.3206	116.03	50	**32**	24	59	Stays within Site Boundary
HRS02_45MPa Compressor _1.9mm	**450**	40	27.62	27.62	1	**1.9**	6	Not Reached	Stays within Site Boundary
HRS02_45MPa Compressor _19mm	**450**	40	27.62	27.62	1	**19**	46	95	Stays within Site Boundary
HRS03_45MPa Control Cabinet _1.9mm	**450**	40	27.62	27.62	1	**1.9**	6	Not Reached	Stays within Site Boundary
HRS03_45MPa Control Cabinet _19mm	**450**	40	27.62	27.62	1	**19**	37	90	Stays within Site Boundary
HRS04_35MPa Dispenser_1.3mm	**350**	40	22.538	11	0.5	**1.3**	3	Not Reached	Stays within Site Boundary
HRS04_35MPa Dispenser_13mm	**350**	40	22.538	11	0.5	**13**	25	65	Stays within Site Boundary
HRS05_Bus located at Dispenser _1mm	**350**	40	22.538	18	0.8	**1**	3	Not Reached	Stays within Site Boundary
HRS05_Bus located at Dispenser _10mm	**350**	40	22.538	18	0.8	**10**	22	59	Stays within Site Boundary
HRS06_Tube trailer located at Dispenser _1.9mm	**350**	40	22.538	**500**	22.2	**1.9**	5	Not Reached	Stays within Site Boundary
HRS06_Tube trailer located at Dispenser _19mm	**350**	40	22.538	**500**	22.2	**19**	41	103	Stays within Site Boundary
HRS07_45MPa Bulk Storage_1.9mm	**450**	40	27.62	**1000**	36.2	**1.9**	6	Not Reached	Stays within Site Boundary
HRS07_45MPa Bulk Storage_19mm	**450**	40	27.62	**1000**	36.2	**19**	46	107	Stays within Site Boundary
HRS08_90MPa Compressor_1.9mm	**900**	40	45.65	45.65	1	**1.9**	7	Not Reached	Stays within Site Boundary
HRS08_90MPa Compressor_19mm	**900**	40	45.65	45.65	1	**19**	60	108	Stays within Site Boundary
HRS09_90MPa Control Cabinet _1.9mm	**900**	40	45.65	45.65	1	**1.9**	7	Not Reached	Stays within Site Boundary
HRS09_90MPa Control Cabinet _19mm	**900**	40	45.65	45.65	1	**19**	49	110	Stays within Site Boundary
HRS10_90MPa Station Storage (2 bottles)_1.9mm	**900**	40	45.65	45.65	1	**1.9**	7	Not Reached	Stays within Site Boundary
HRS10_90MPa Station Storage (2 bottles)_19mm	**900**	40	45.65	45.65	1	**19**	60	107	Stays within Site Boundary
HRS11_70MPa Dispenser_1.3mm	**700**	40	38.47	19.235	0.5	**1.3**	5	Not Reached	Stays within Site Boundary
HRS11_70MPa Dispenser_13mm	**700**	40	38.47	19.235	0.5	**13**	29	77	Stays within Site Boundary

Consequence Contours

GTT (Latest Layout)

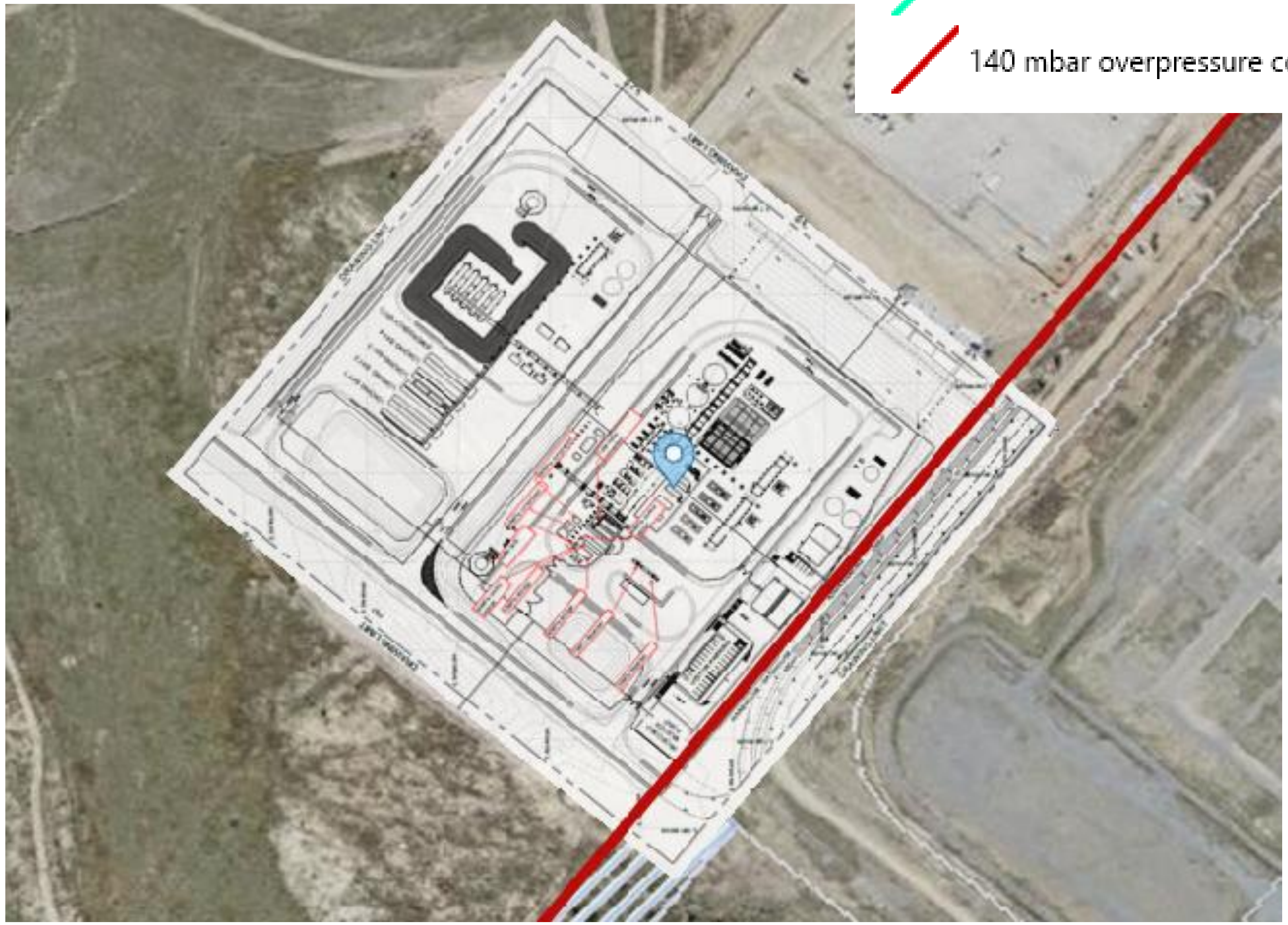
GTT01.1_Electrolyser H2 side Outlet Line to HP Separator

Contours

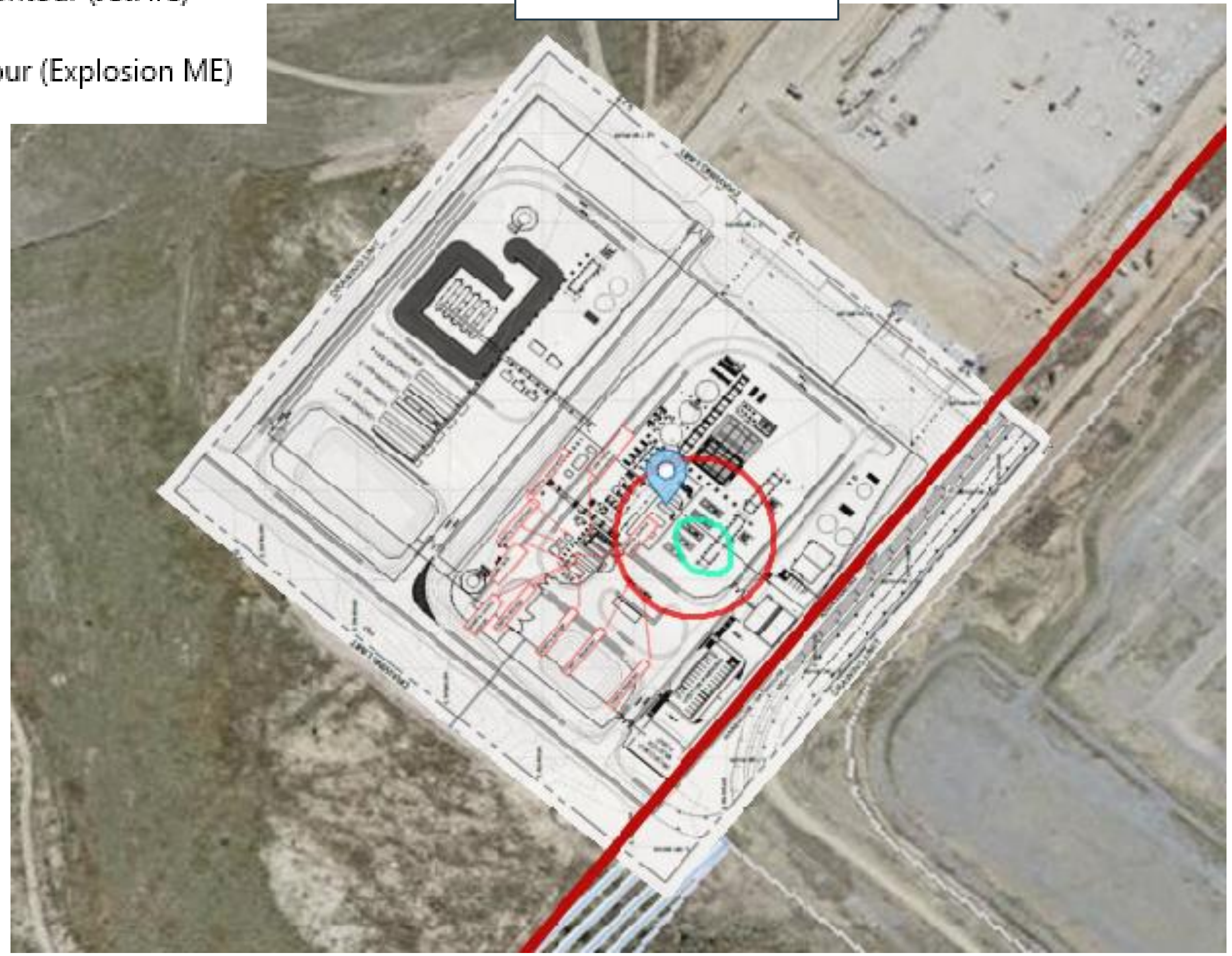
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

8.0mm Hole Size



80mm Hole Size



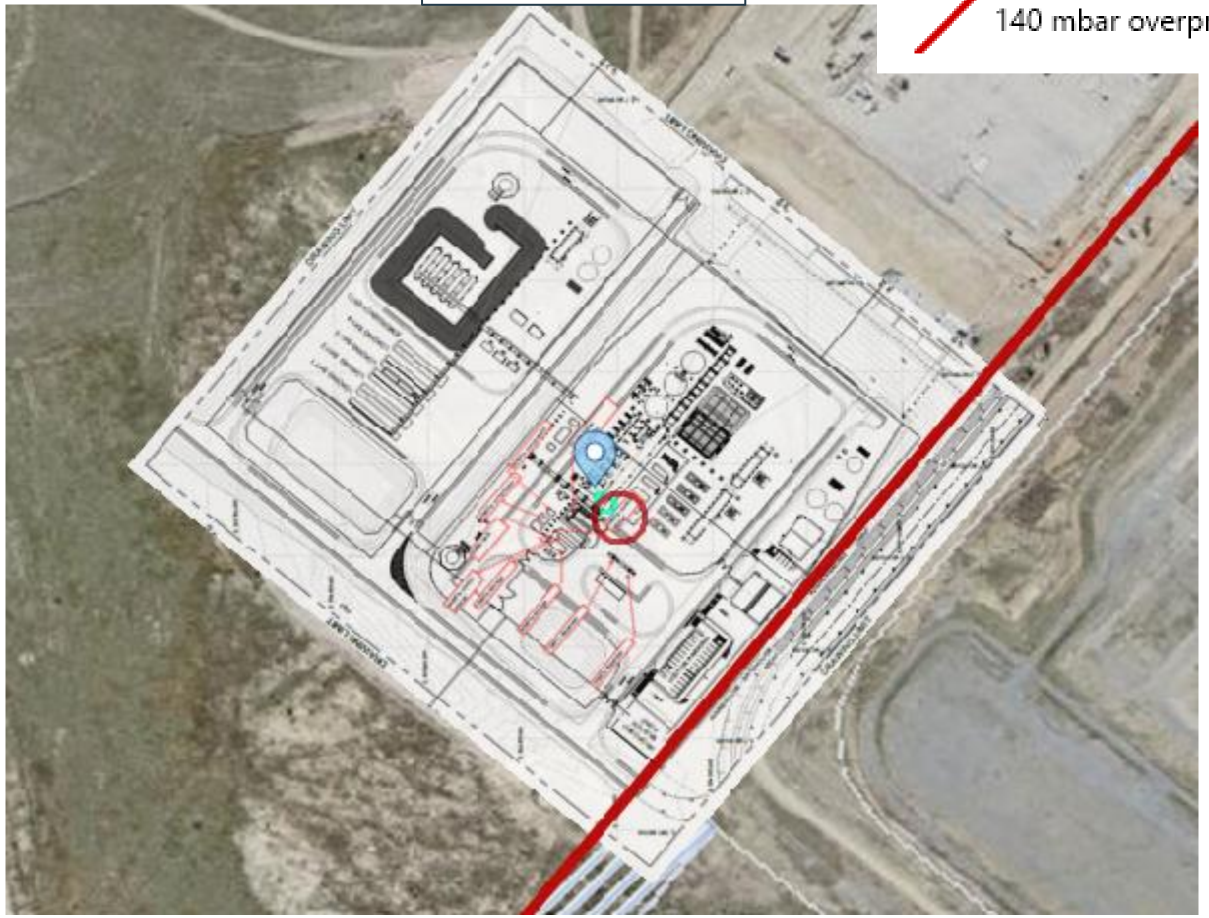
GTT01.2_HP Separator (A0311-1VL002)

Contours

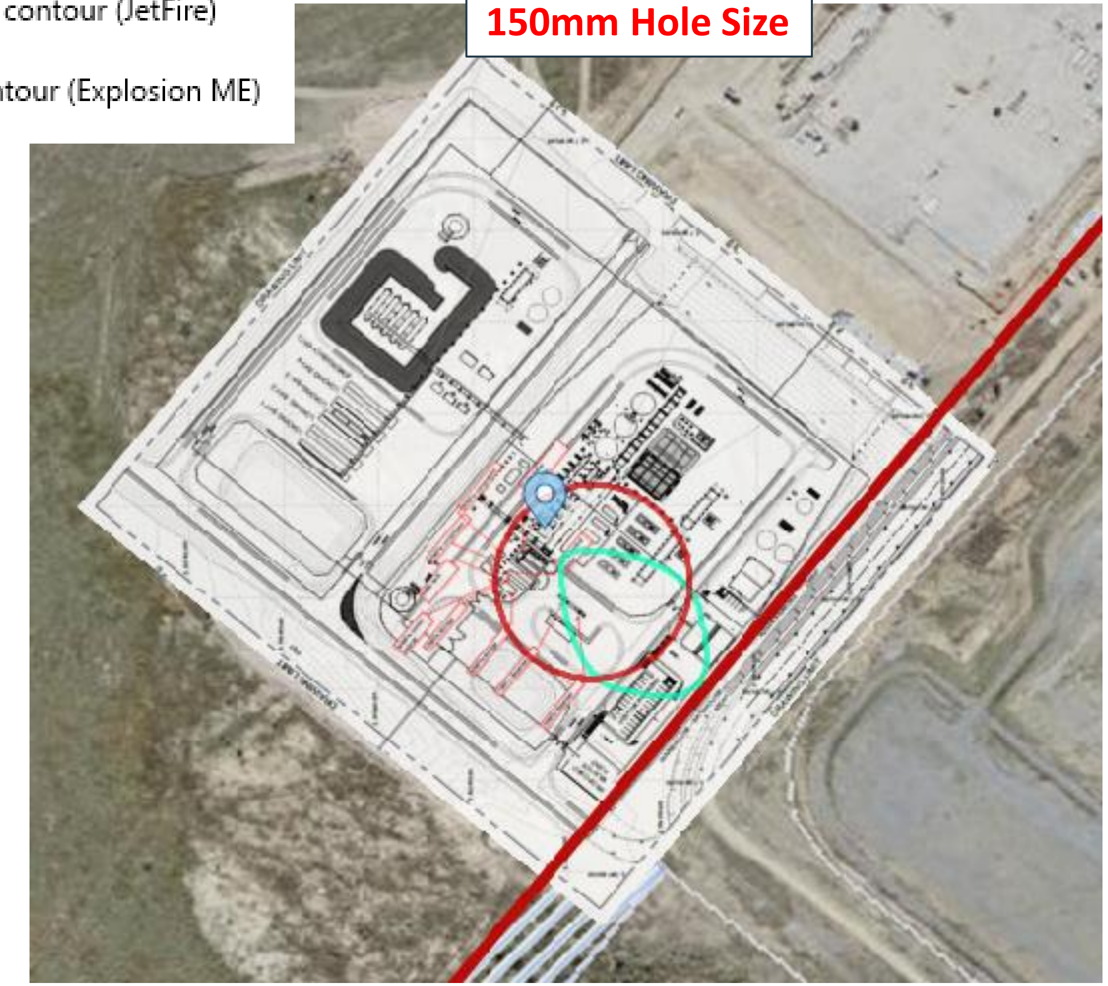
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

15mm Hole Size



150mm Hole Size



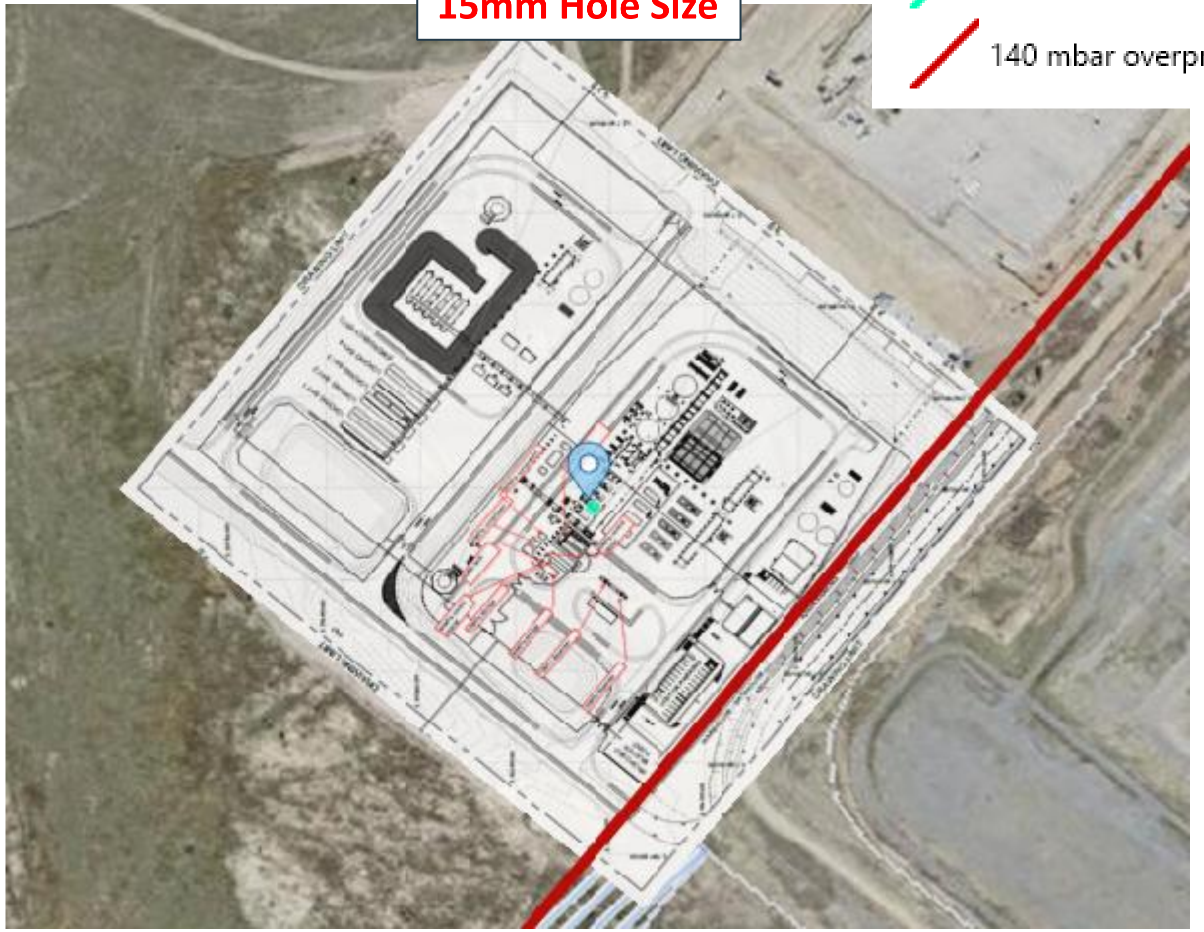
GTT02_H2 / H2O LP Separator (A0311-1VL003)

Contours

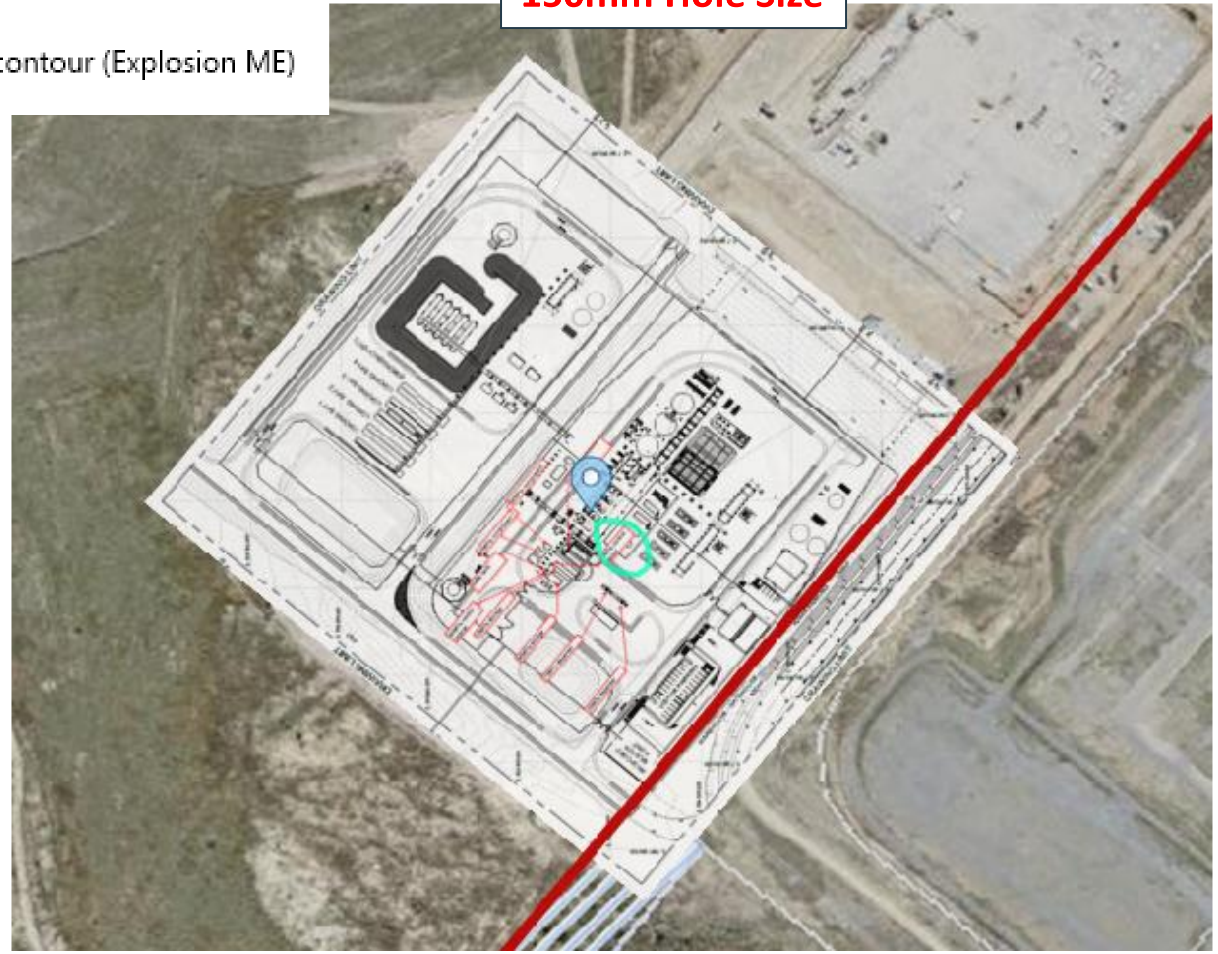
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

15mm Hole Size



150mm Hole Size



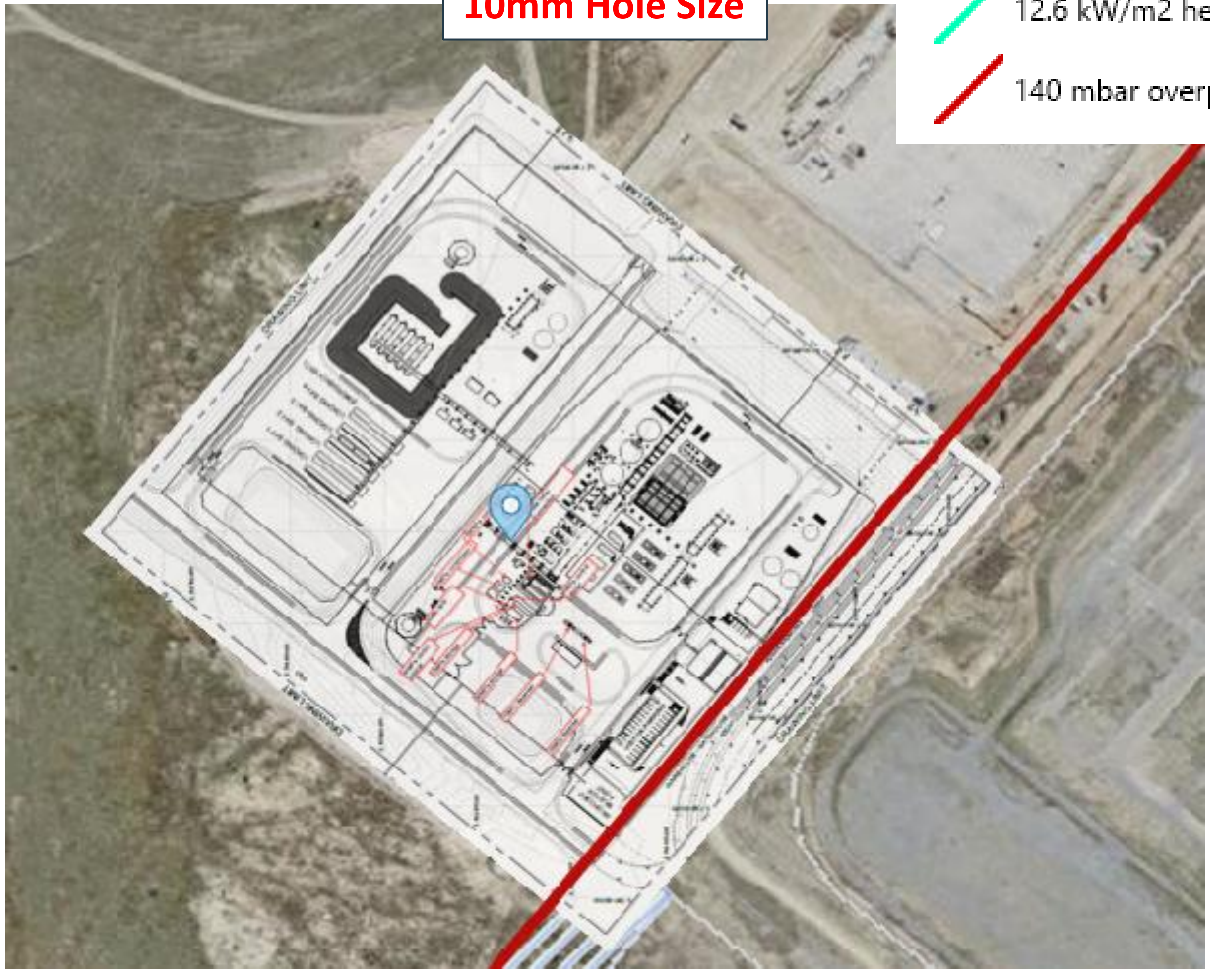
GEXCON

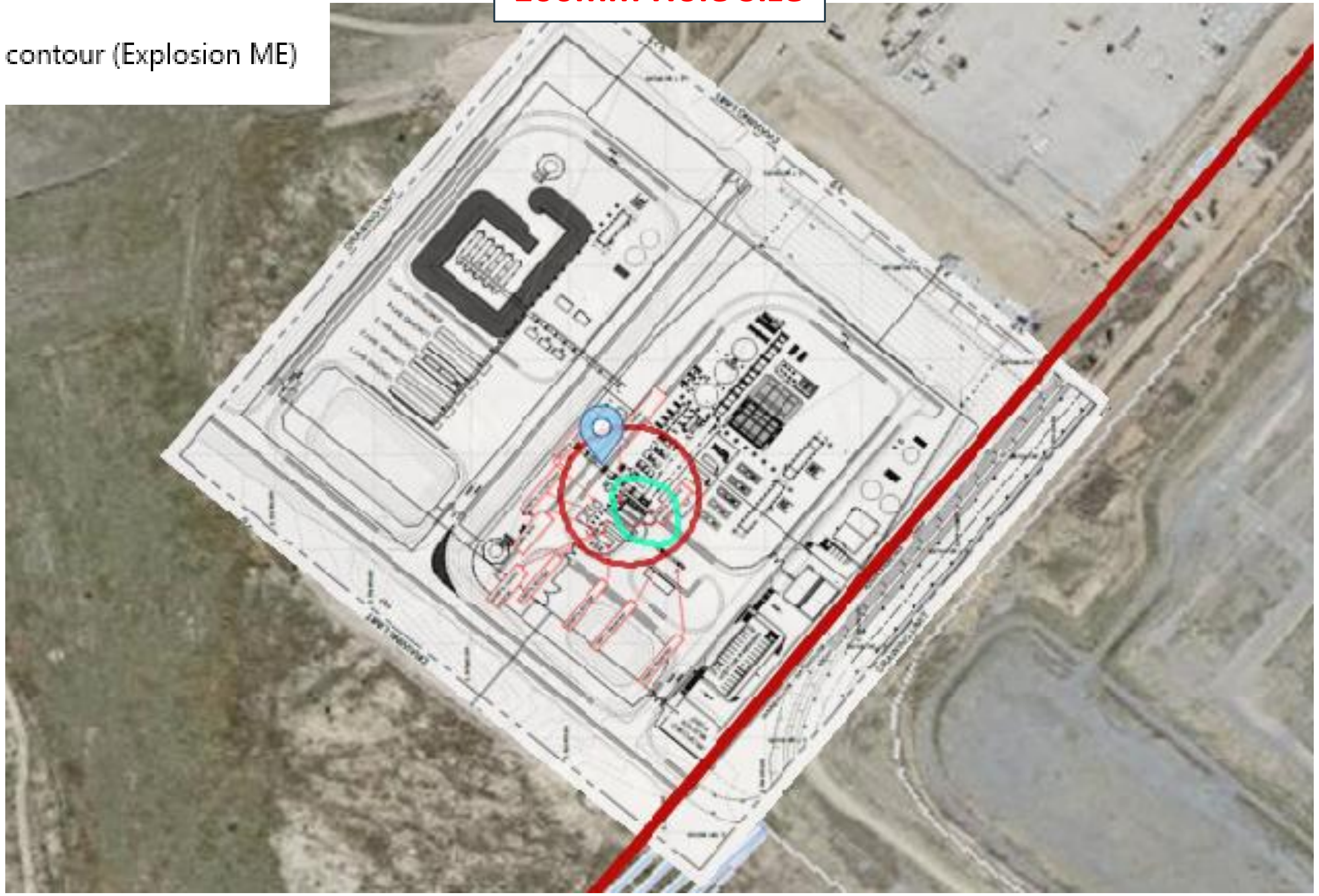
GTT03.1_Line to H2 Treatment Package

Contours

12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)





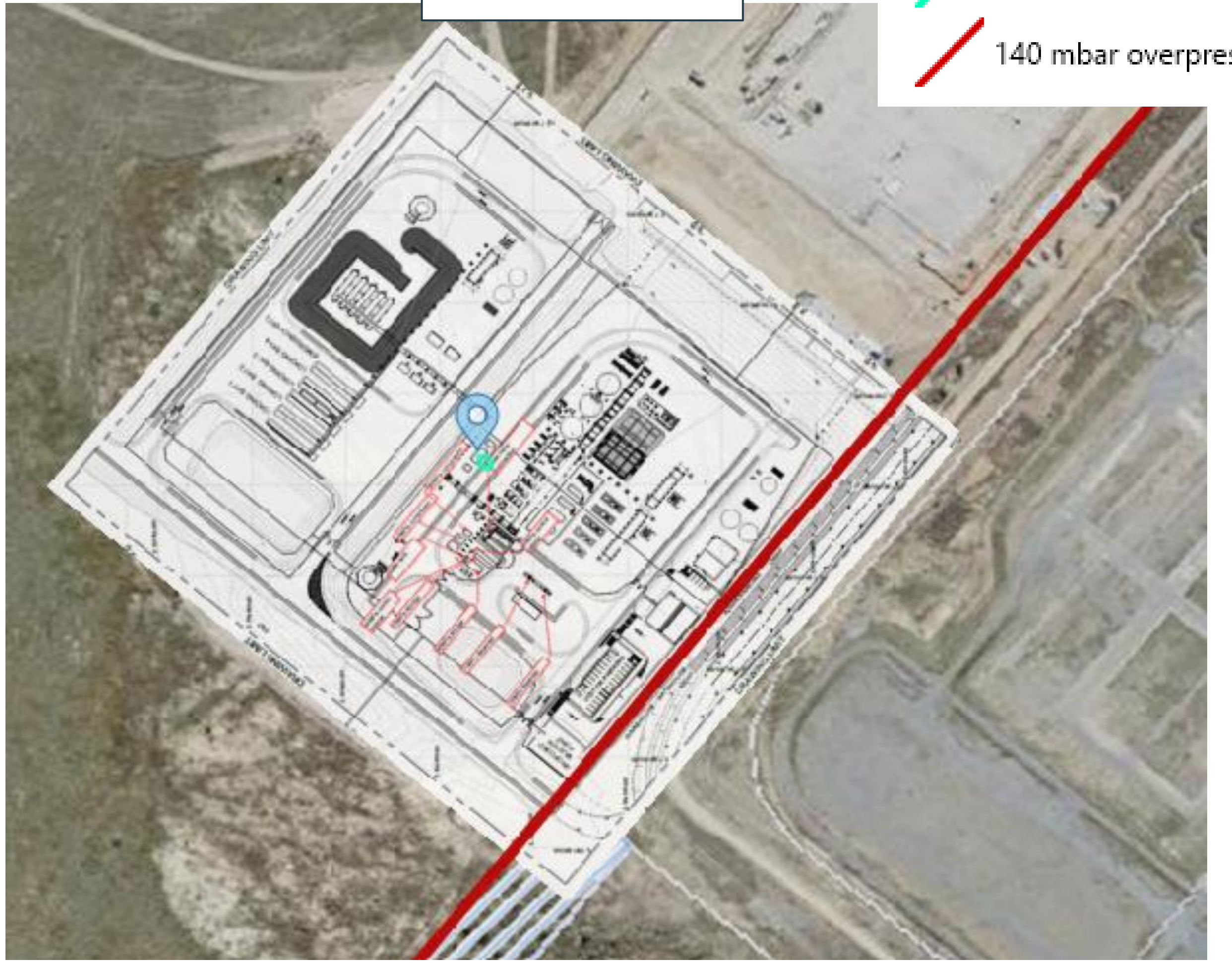
GTT03.2_H2 Treatment Package

Contours

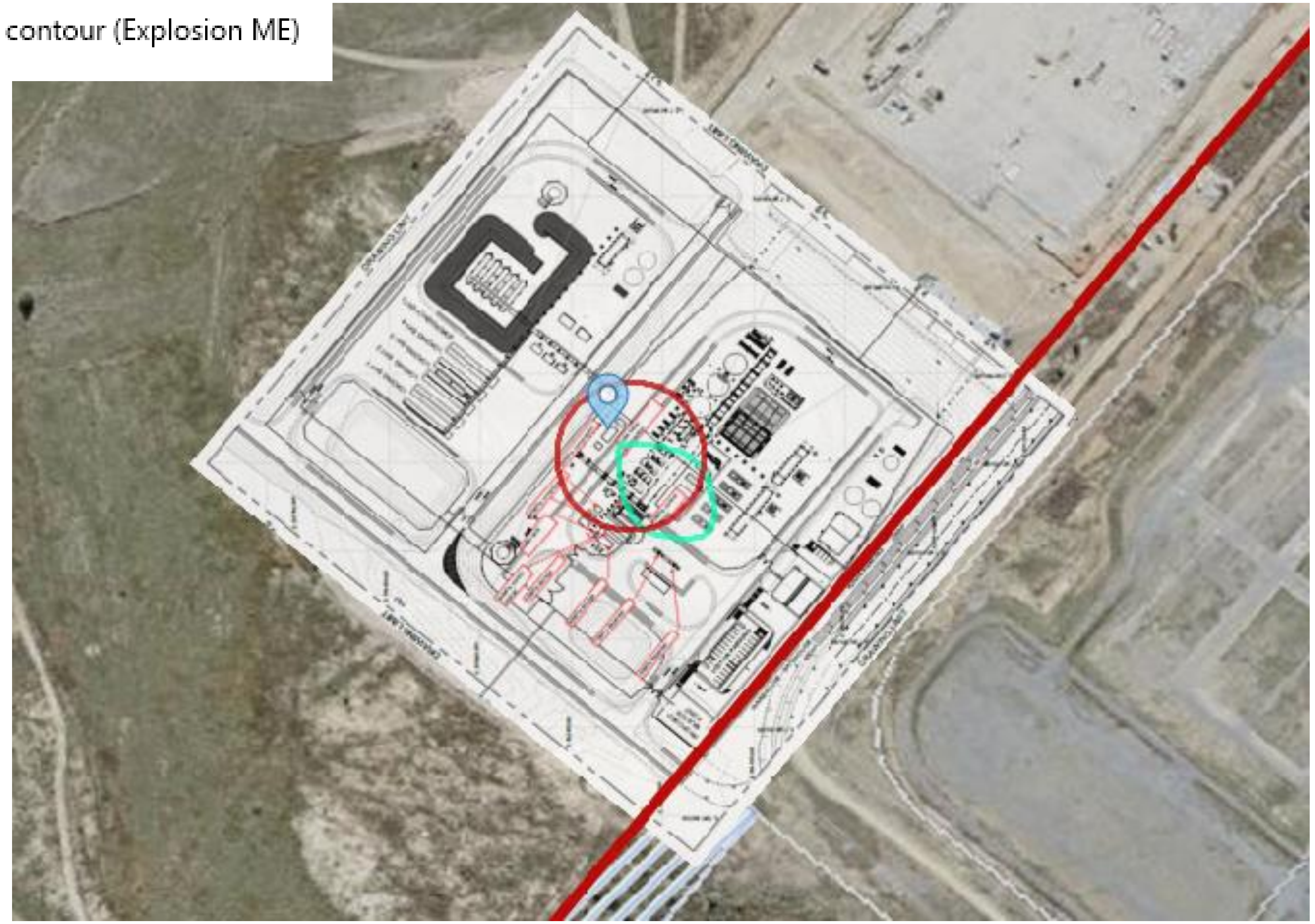
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

10mm Hole Size

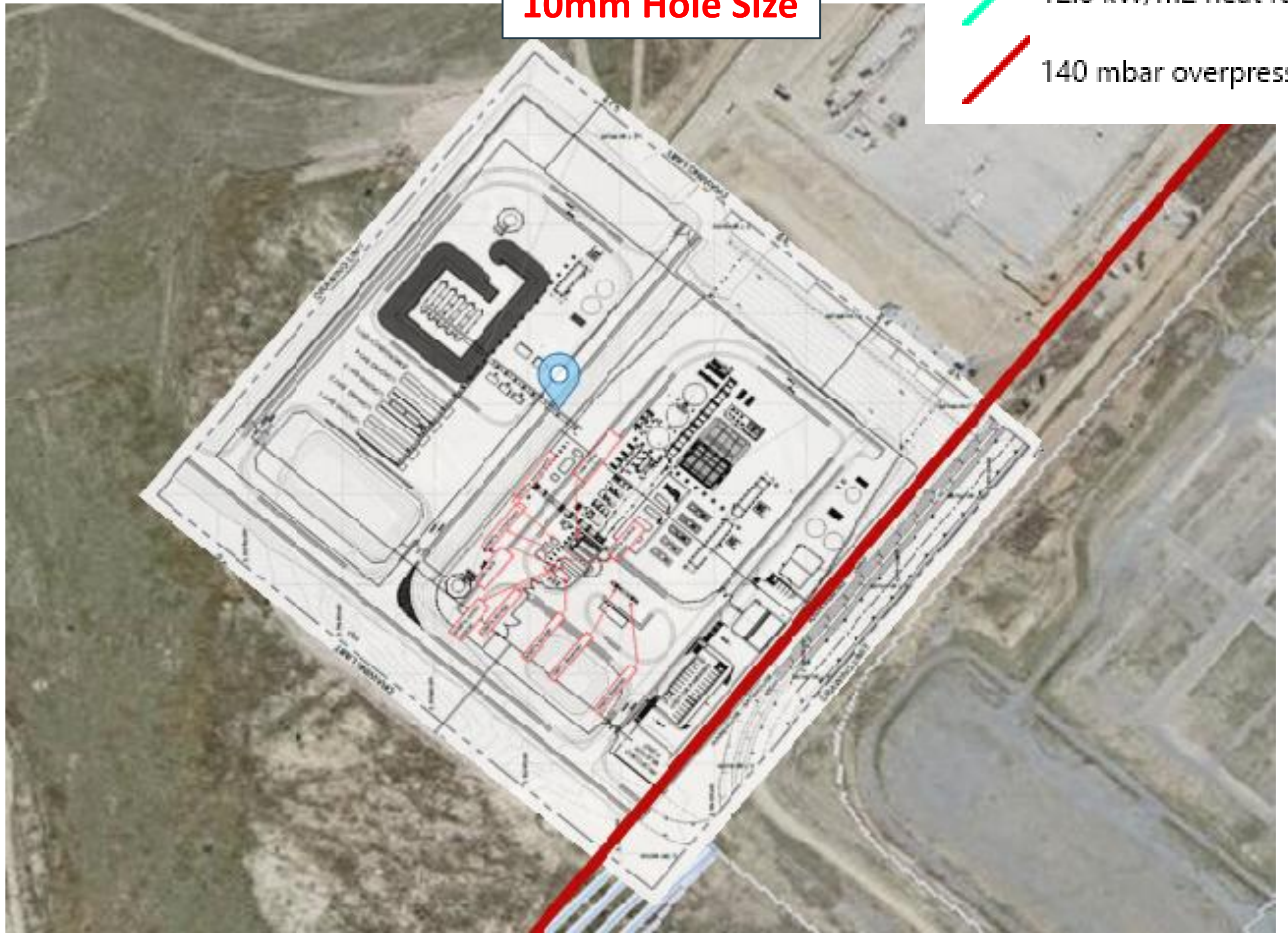


100mm Hole Size



GTT04_Line to LP Compression Package

10mm Hole Size

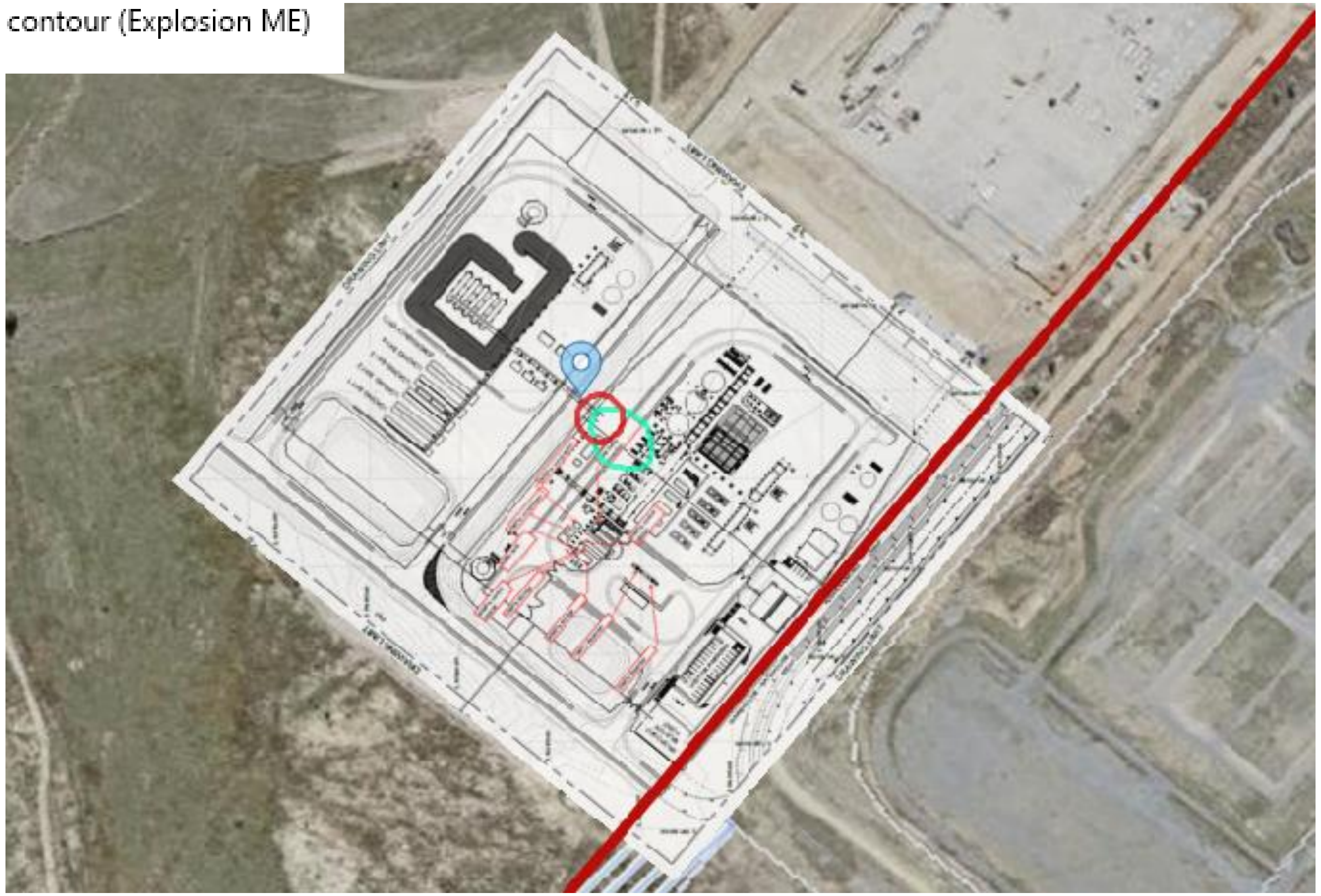


Contours

12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

100mm Hole Size



GEXCON

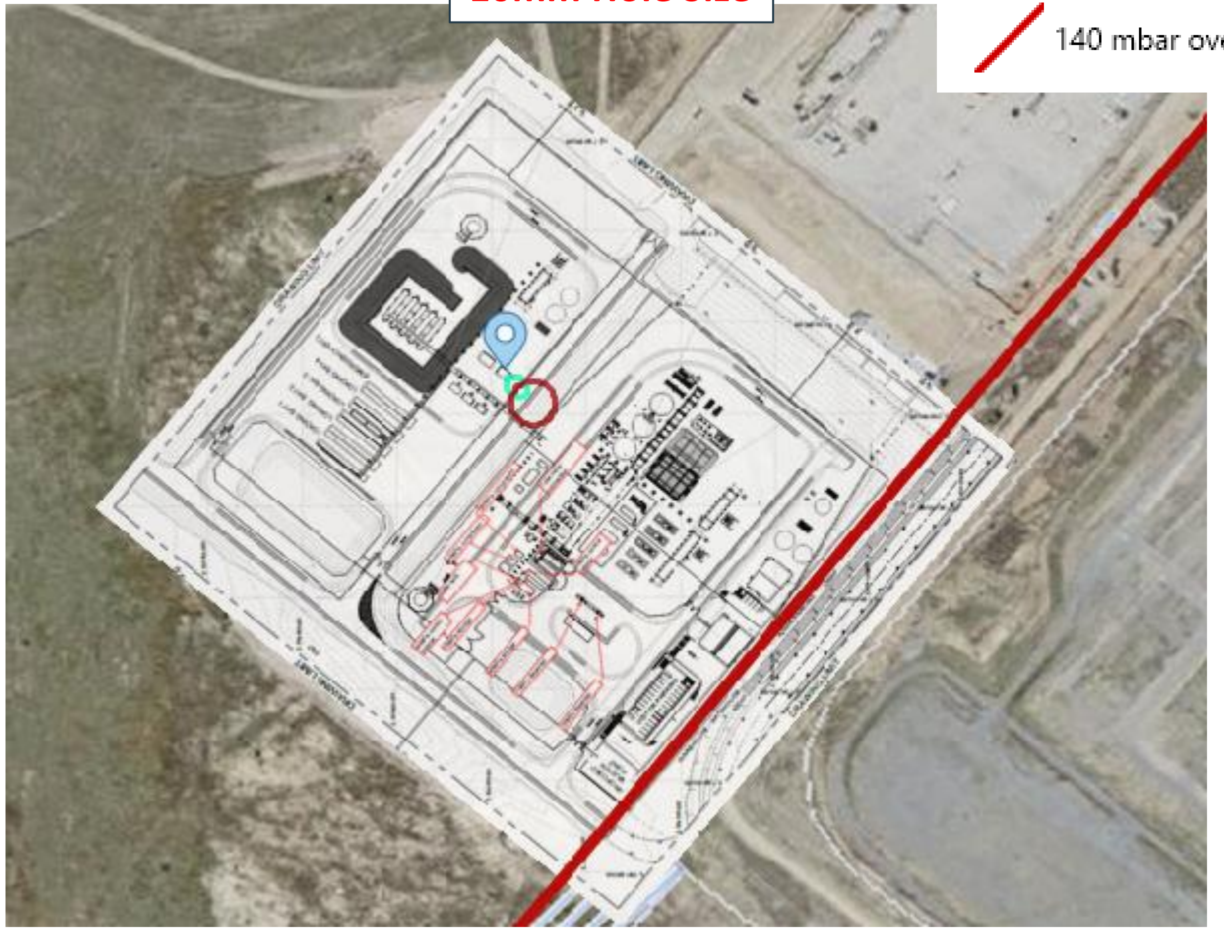
GTT05_LP Compression Package

Contours

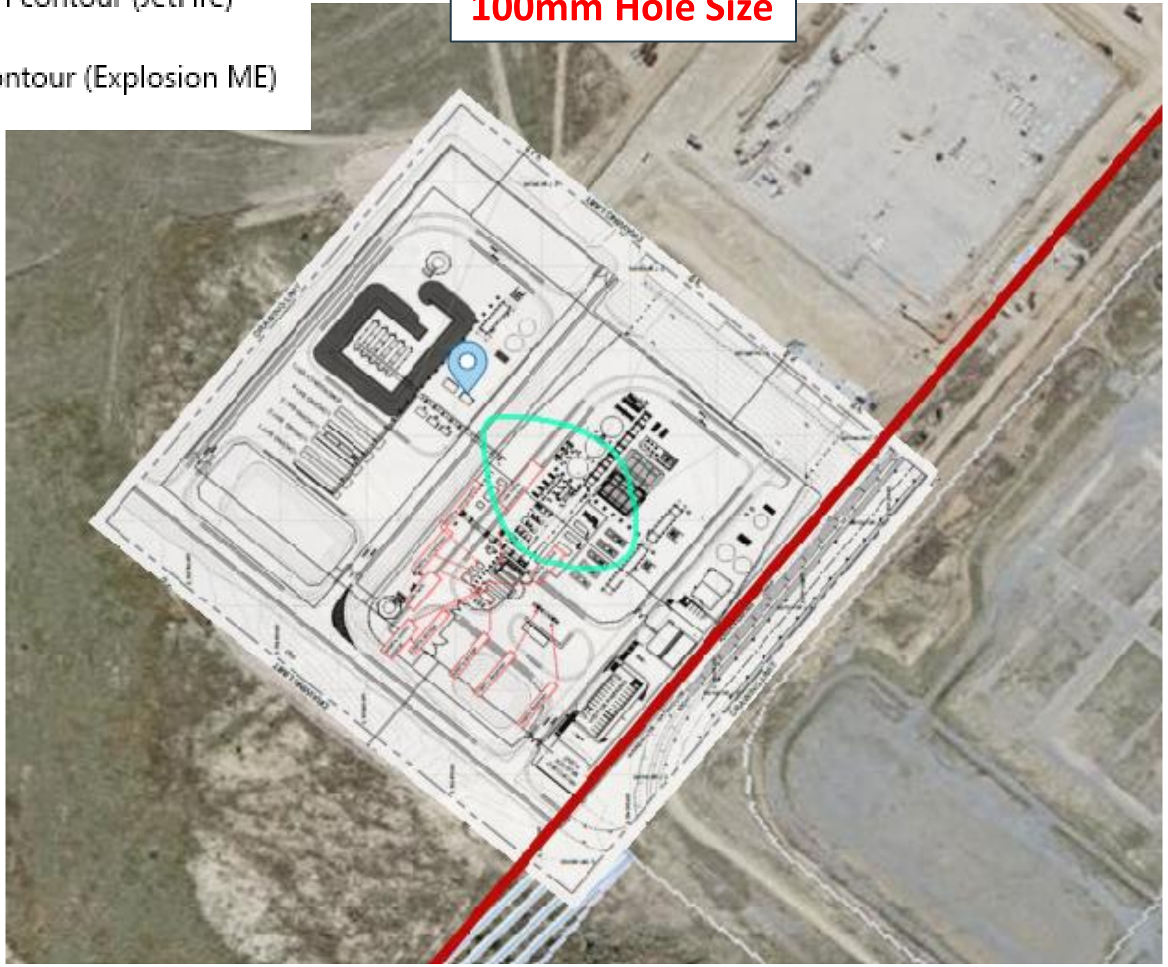
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

10mm Hole Size



100mm Hole Size



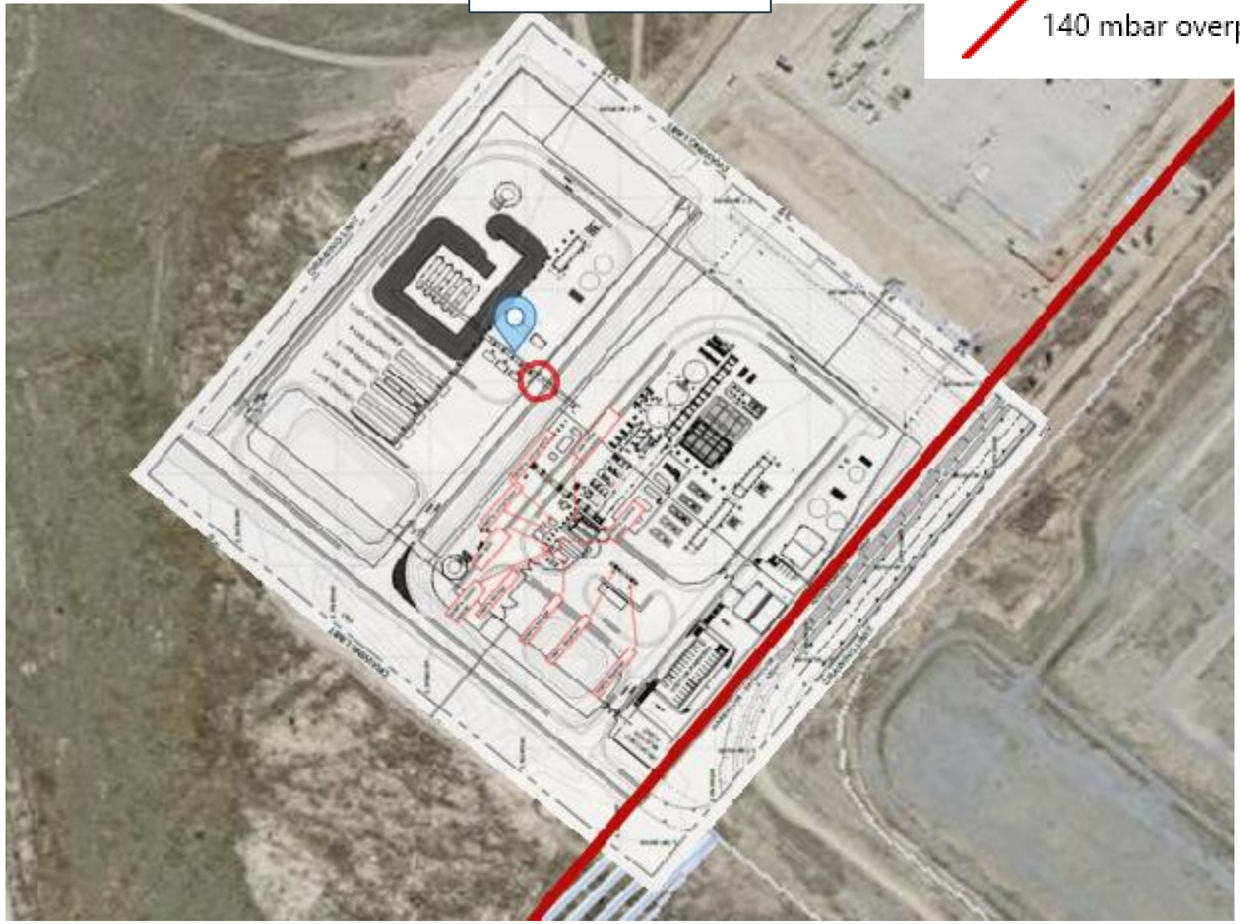
GTT06_Line to Storage Container and HP Compresson Package

Contours

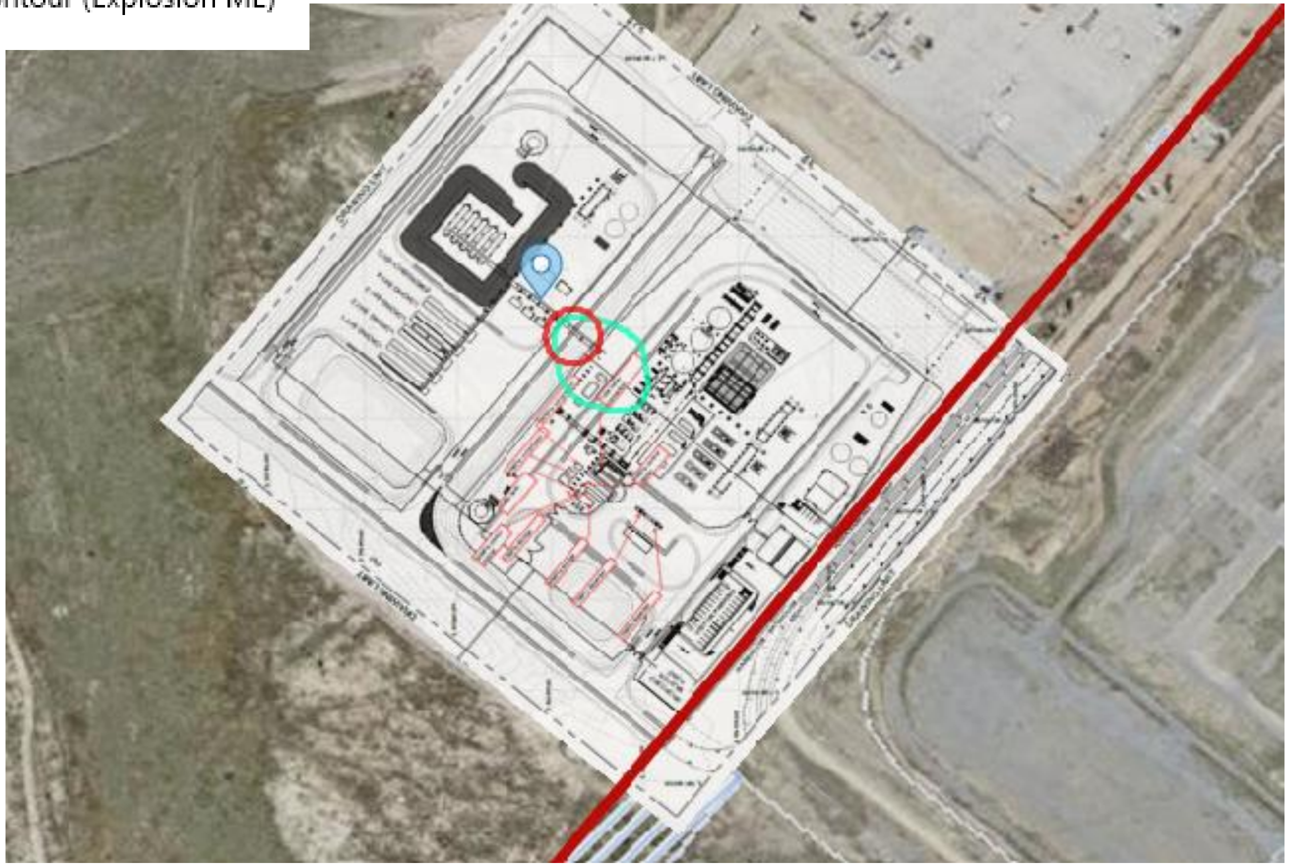
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

8mm Hole Size

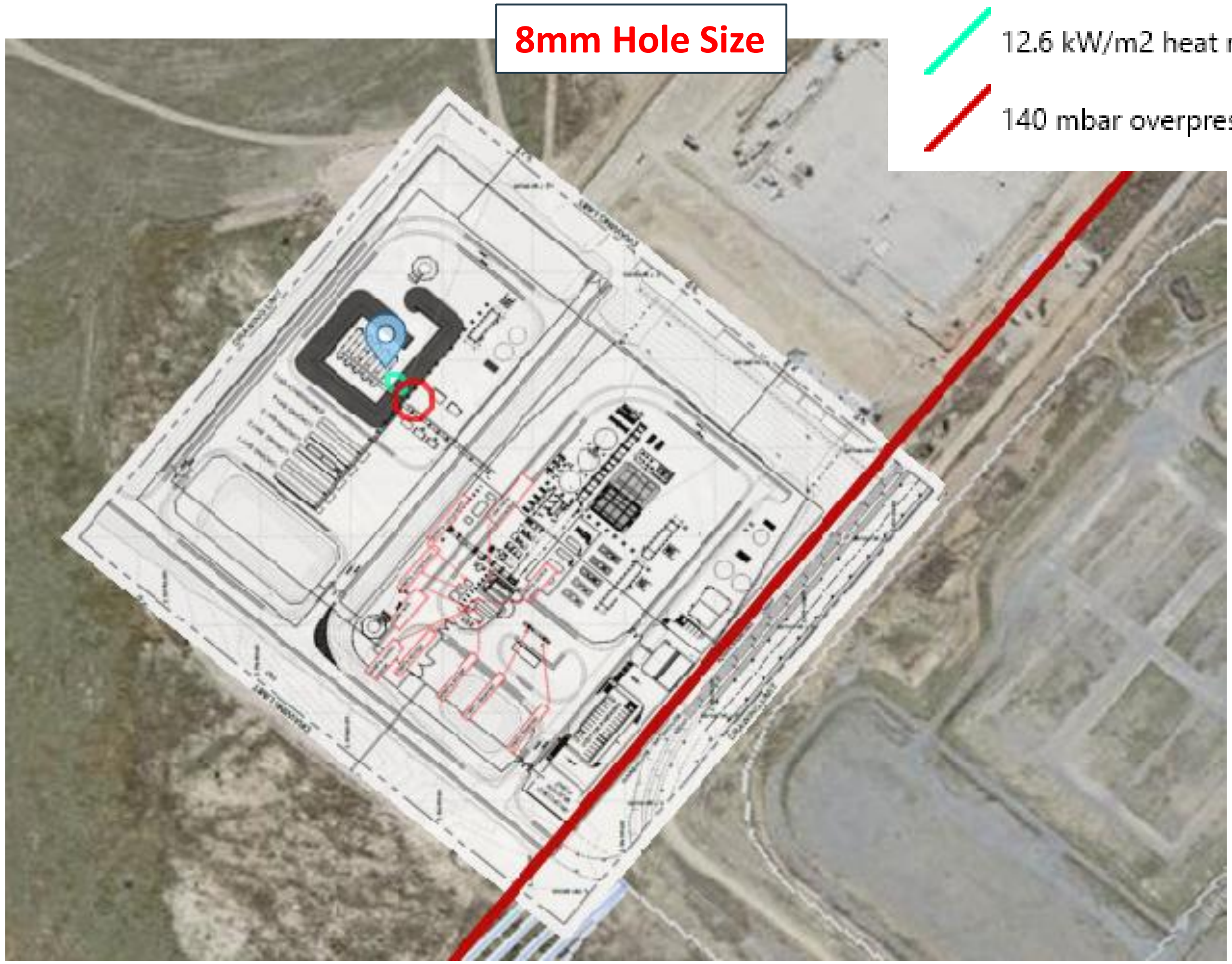


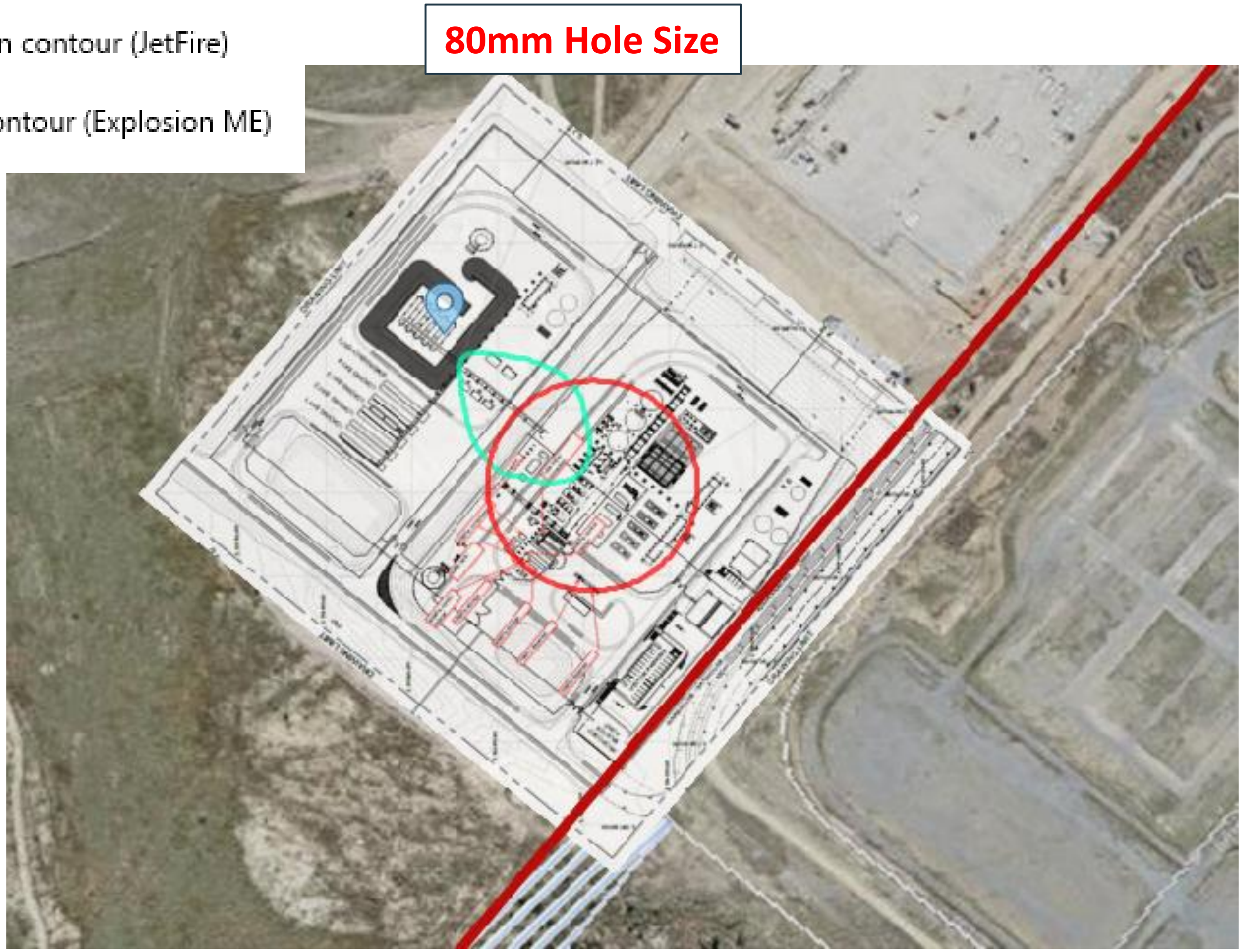
80mm Hole Size



GEXCON

GTT07.1 - GTT07.5_H2 Cylinder Storage (1 cylinder x 1000 kg)





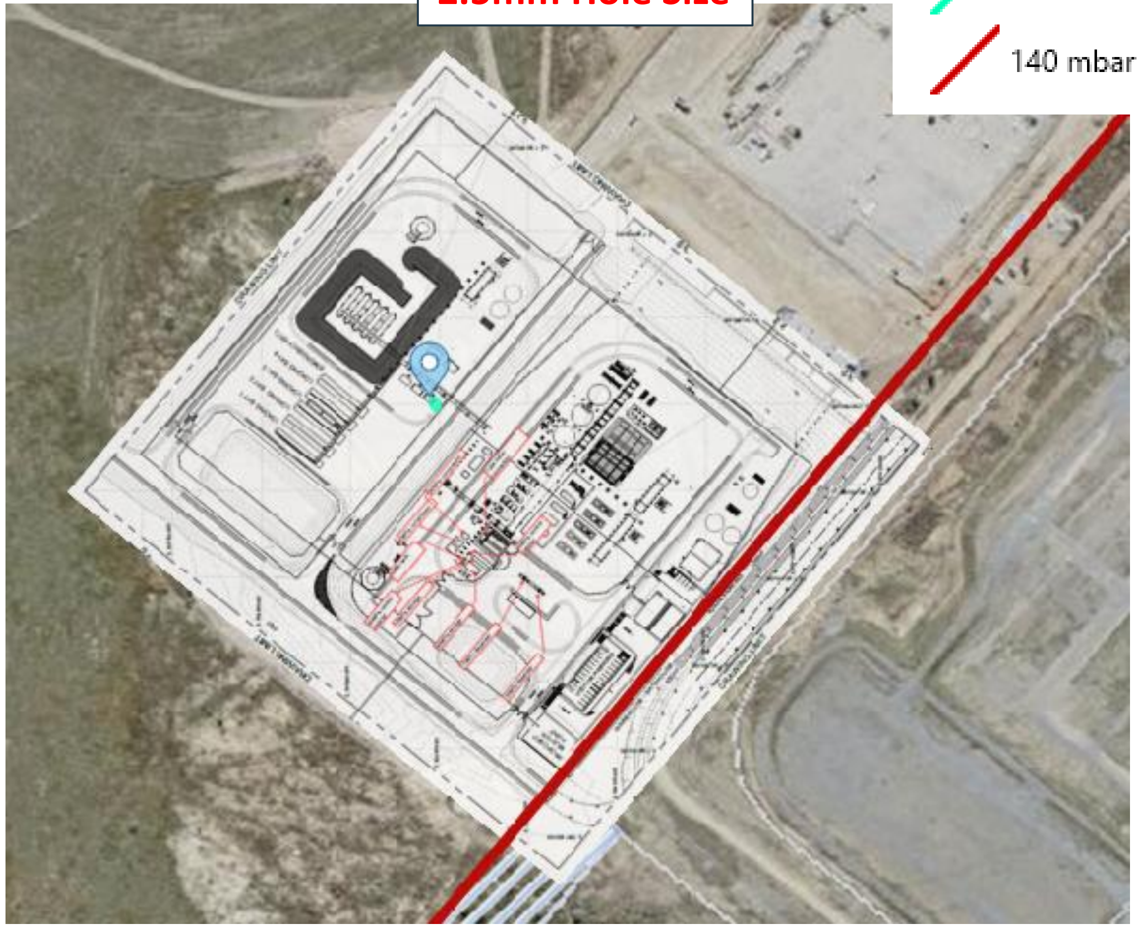
GTT08_HP Compression Package

Contours

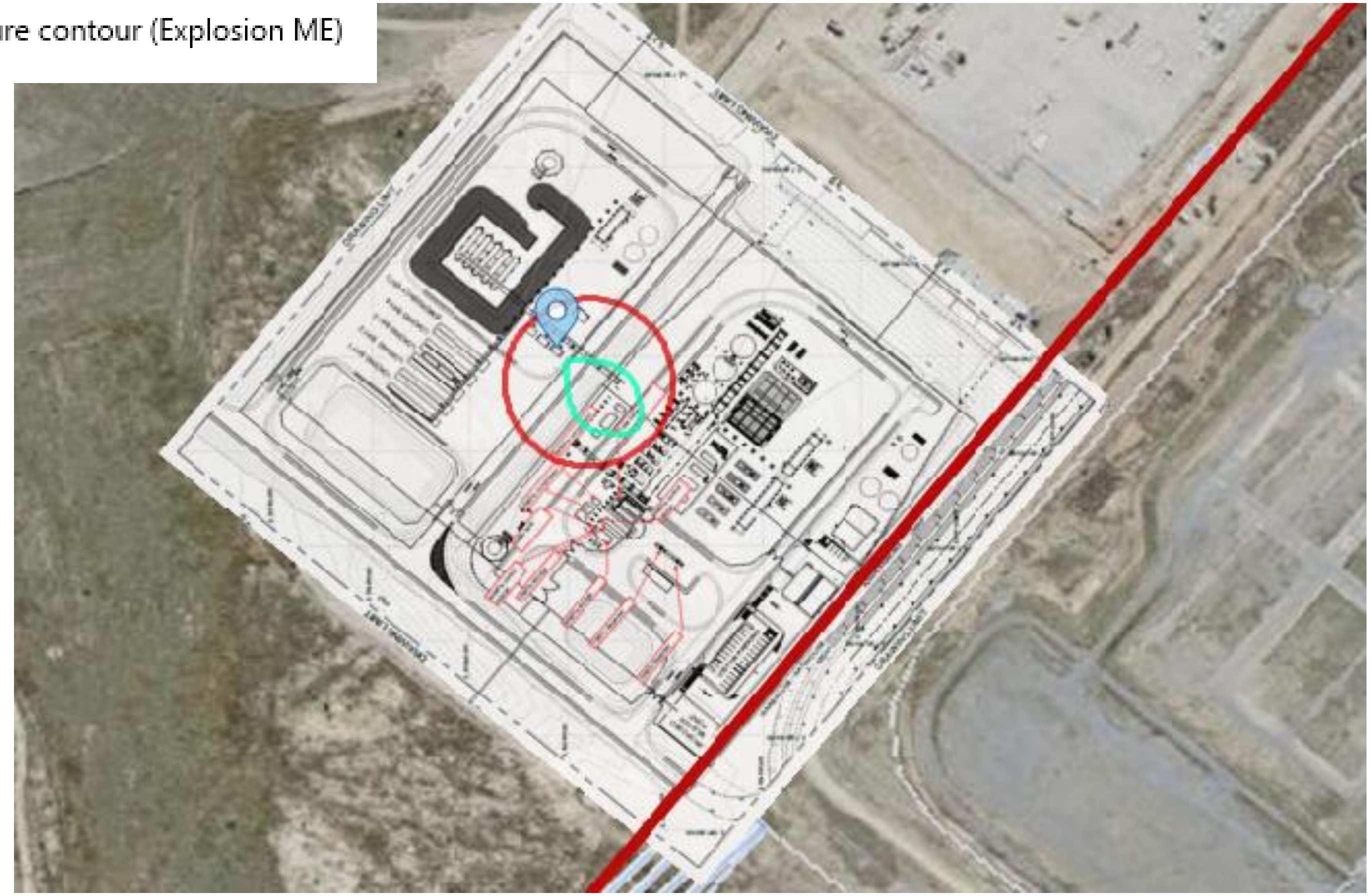
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

2.5mm Hole Size

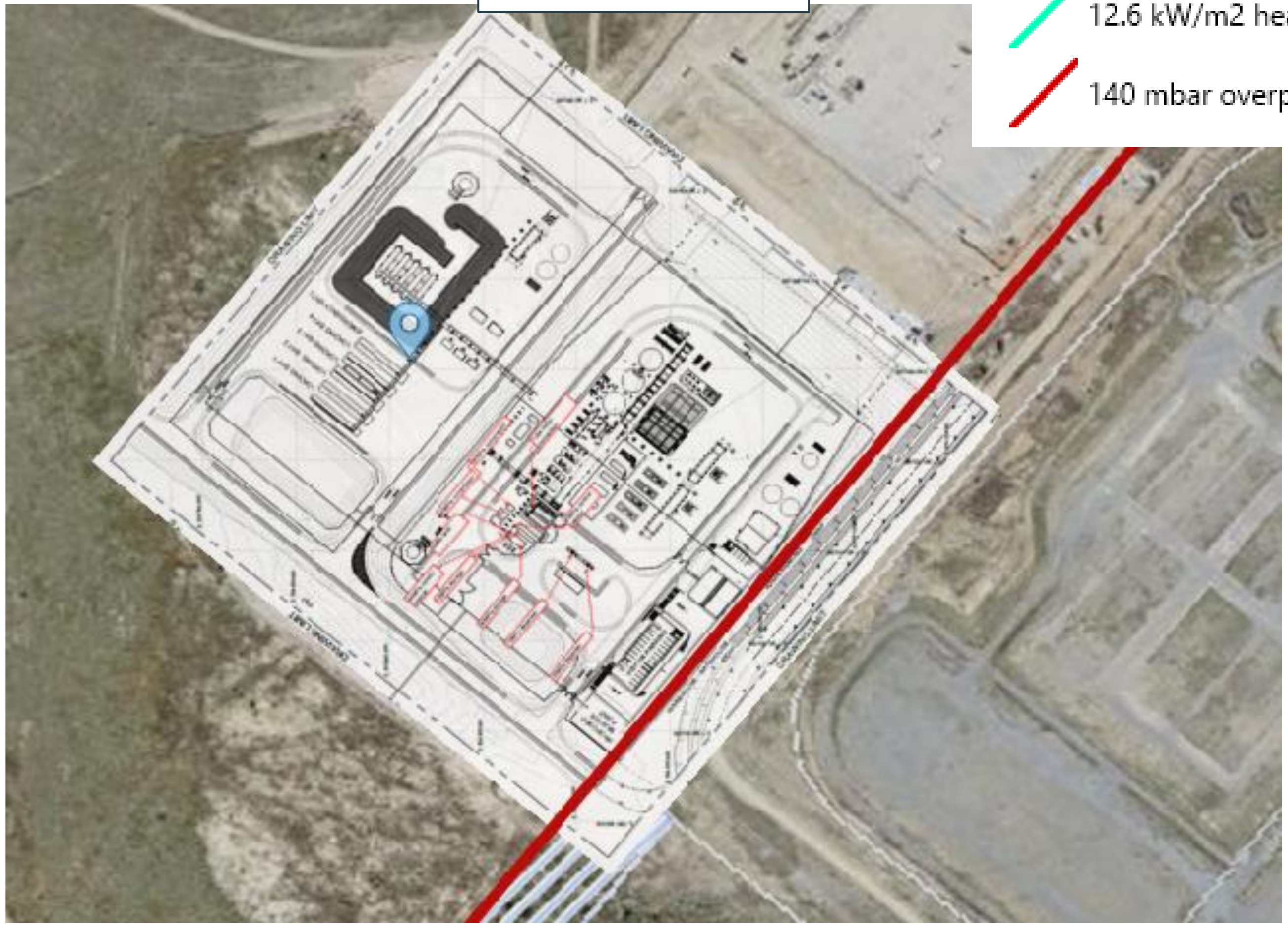


25mm Hole Size



GTT09_Compressed GH2 Line to Tube Trailers

2.5mm Hole Size

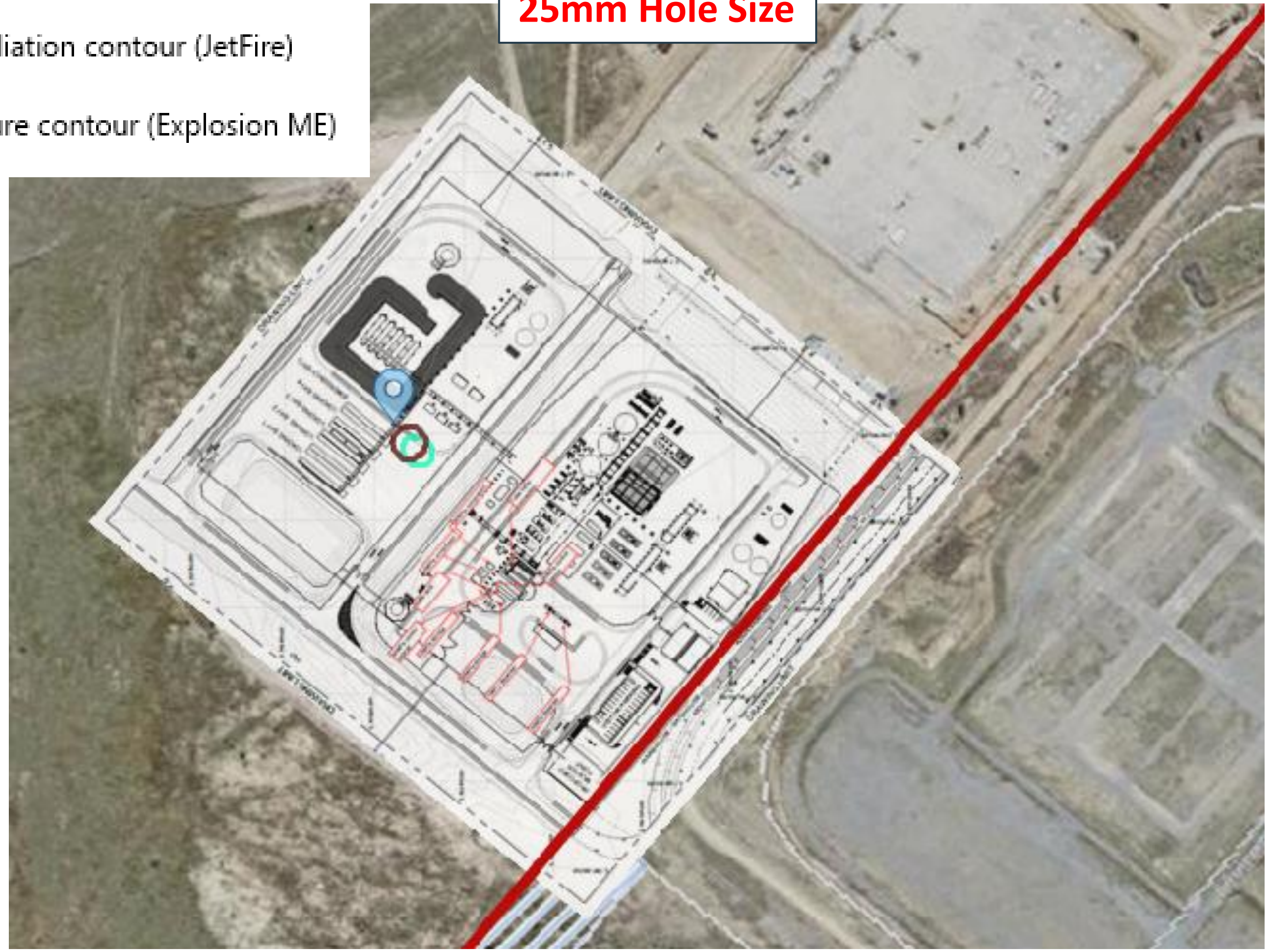


Contours

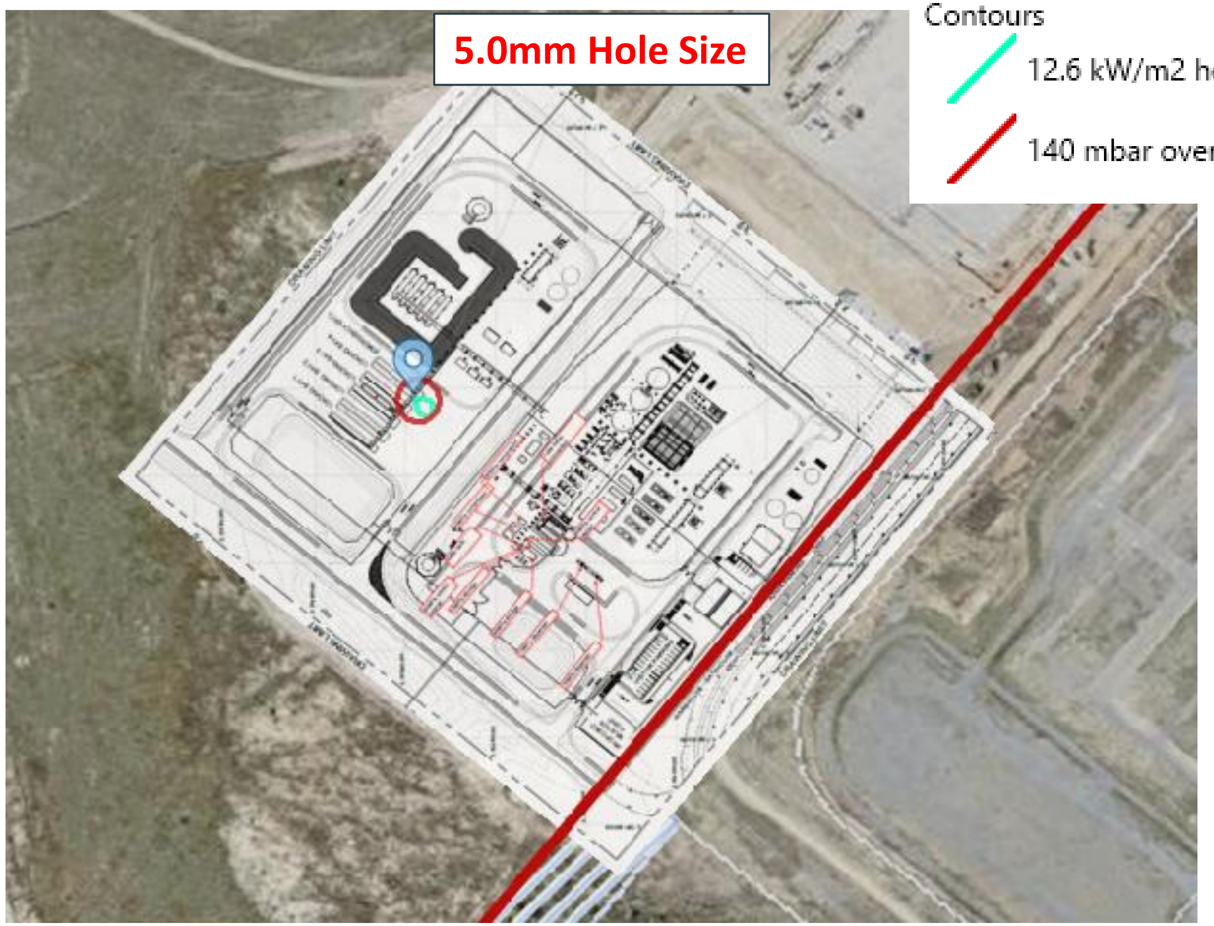
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

25mm Hole Size



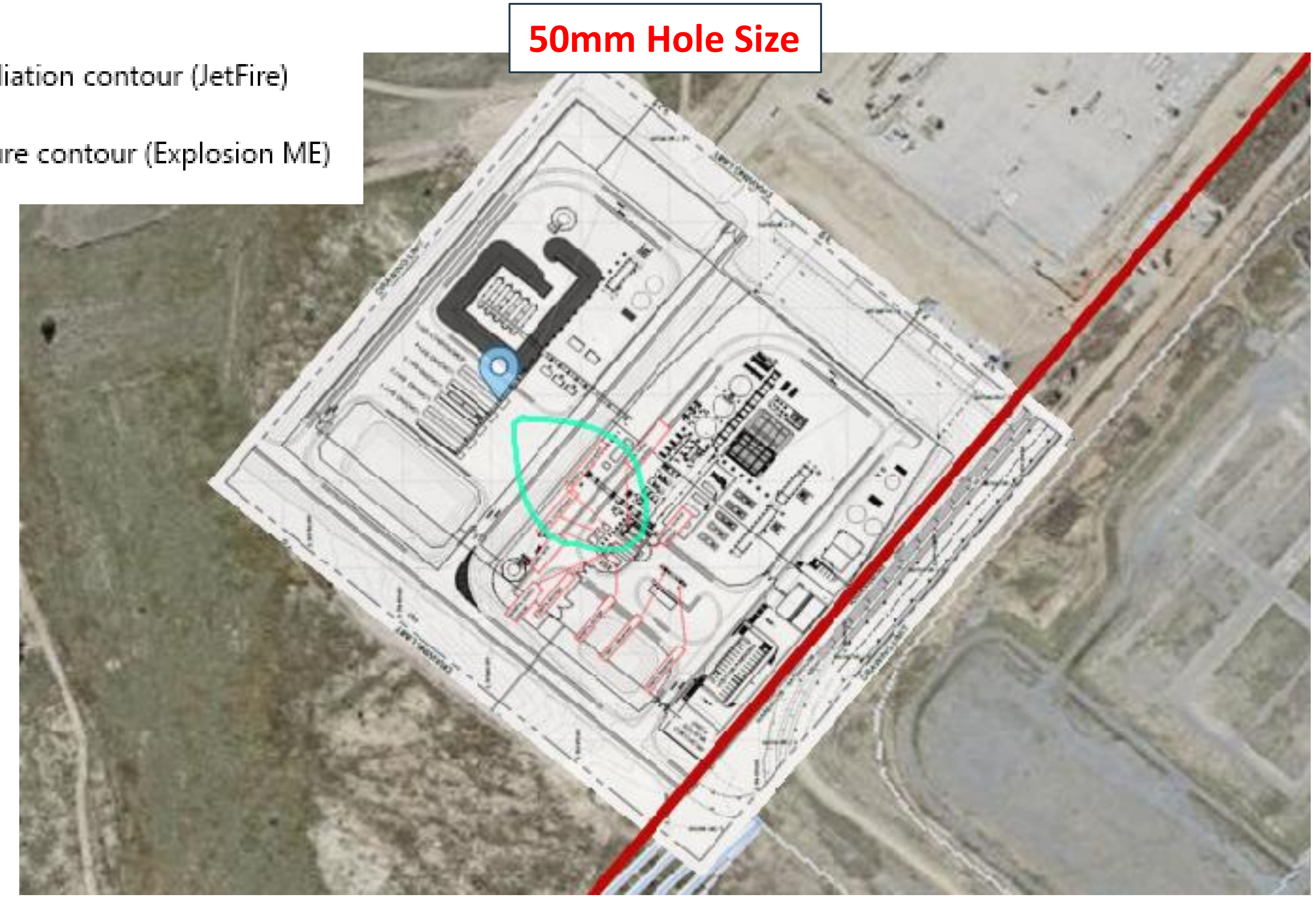
GTT10_Filling hoses



Contours

12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

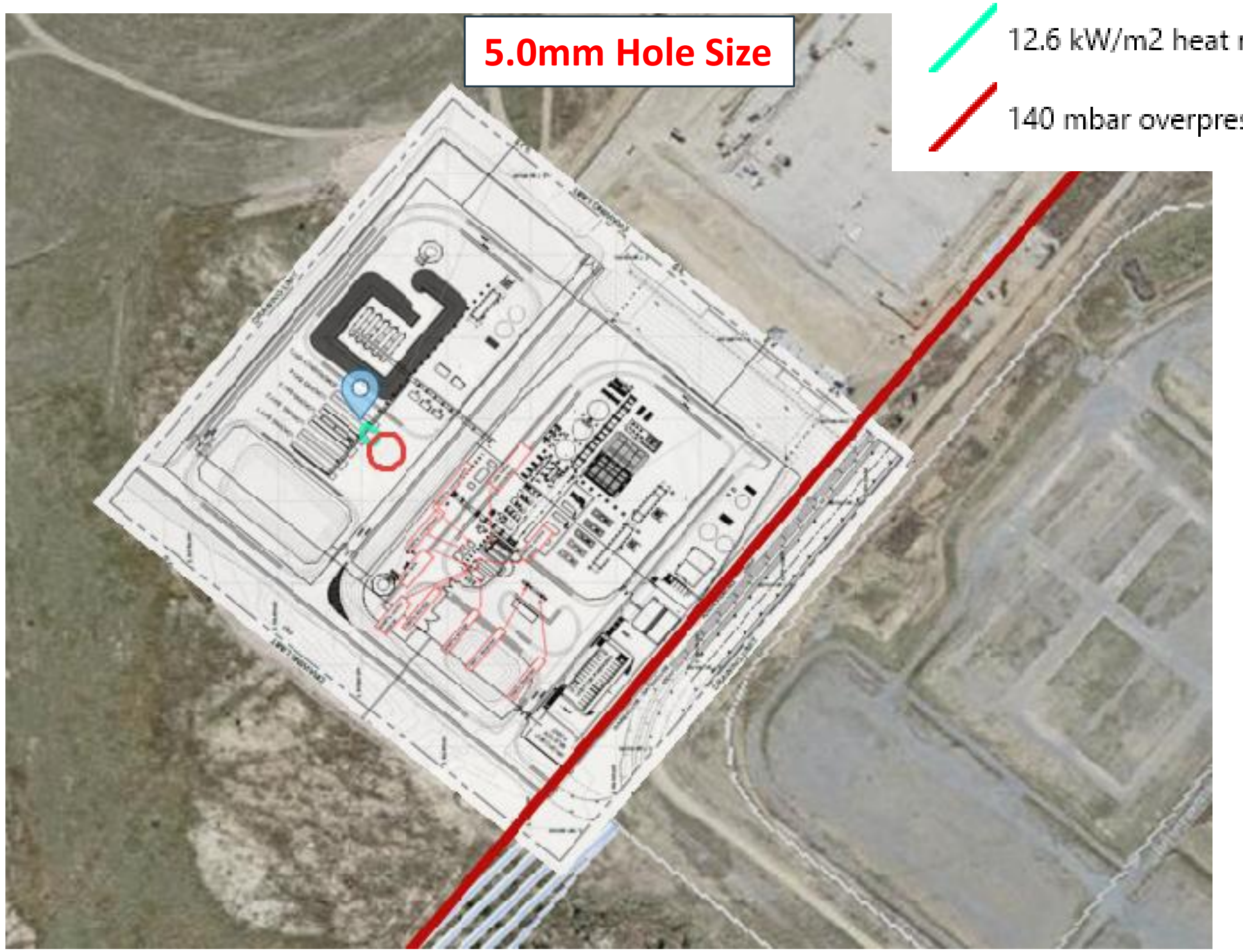


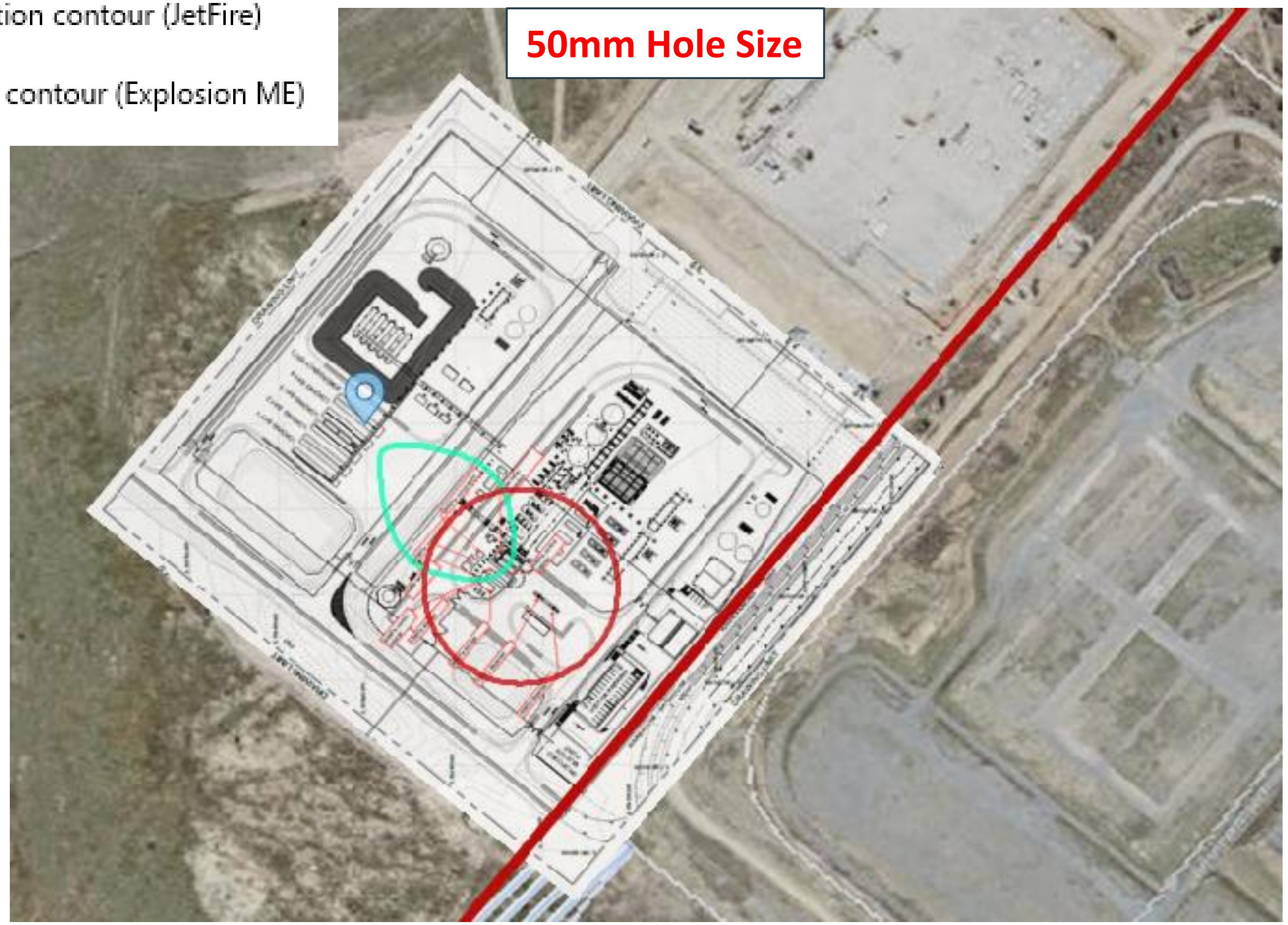
GTT11.1 - GTT11.5_Tube Trailers (5 Load Out Bays)

Contours

12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)





GEXCON

Consequence Contours

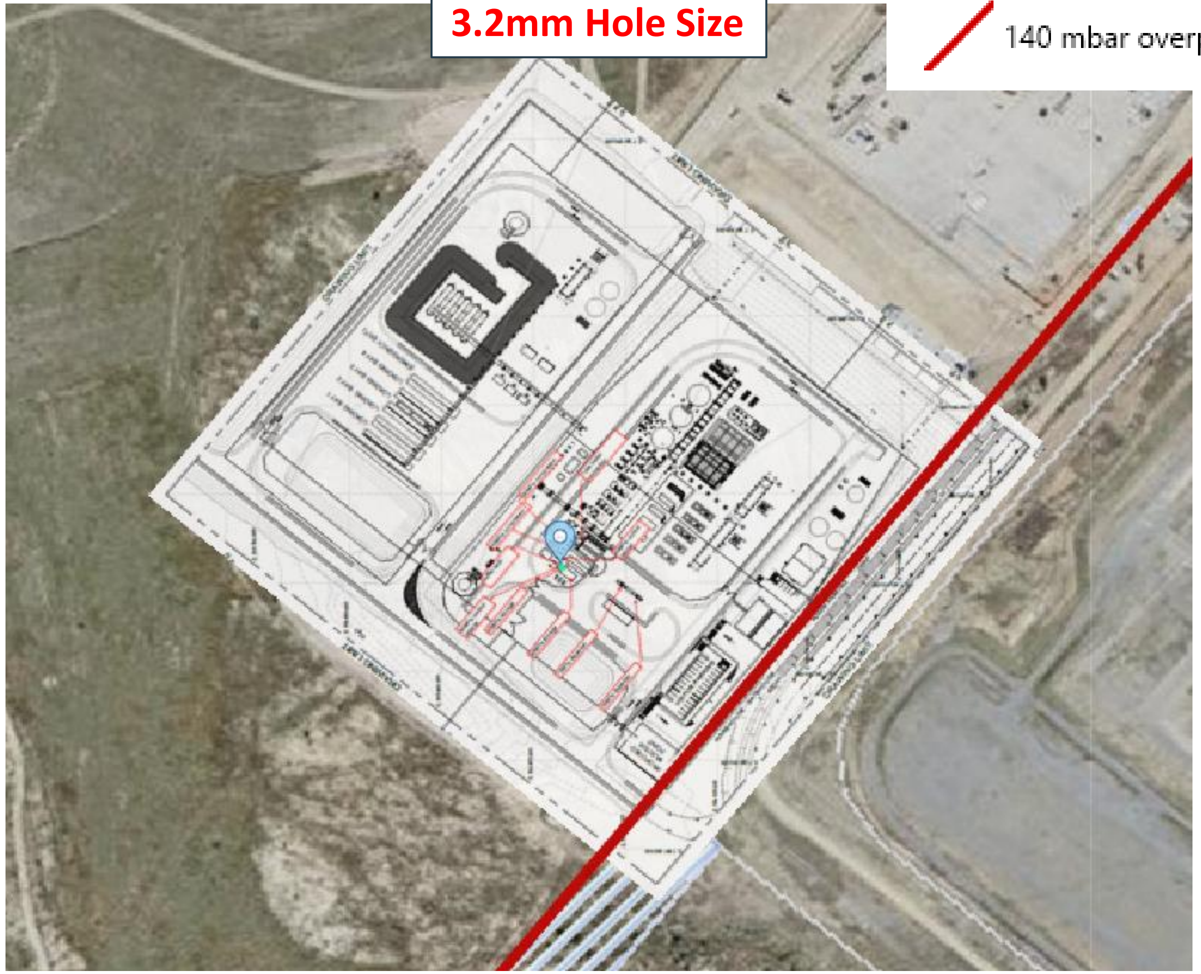
HRS

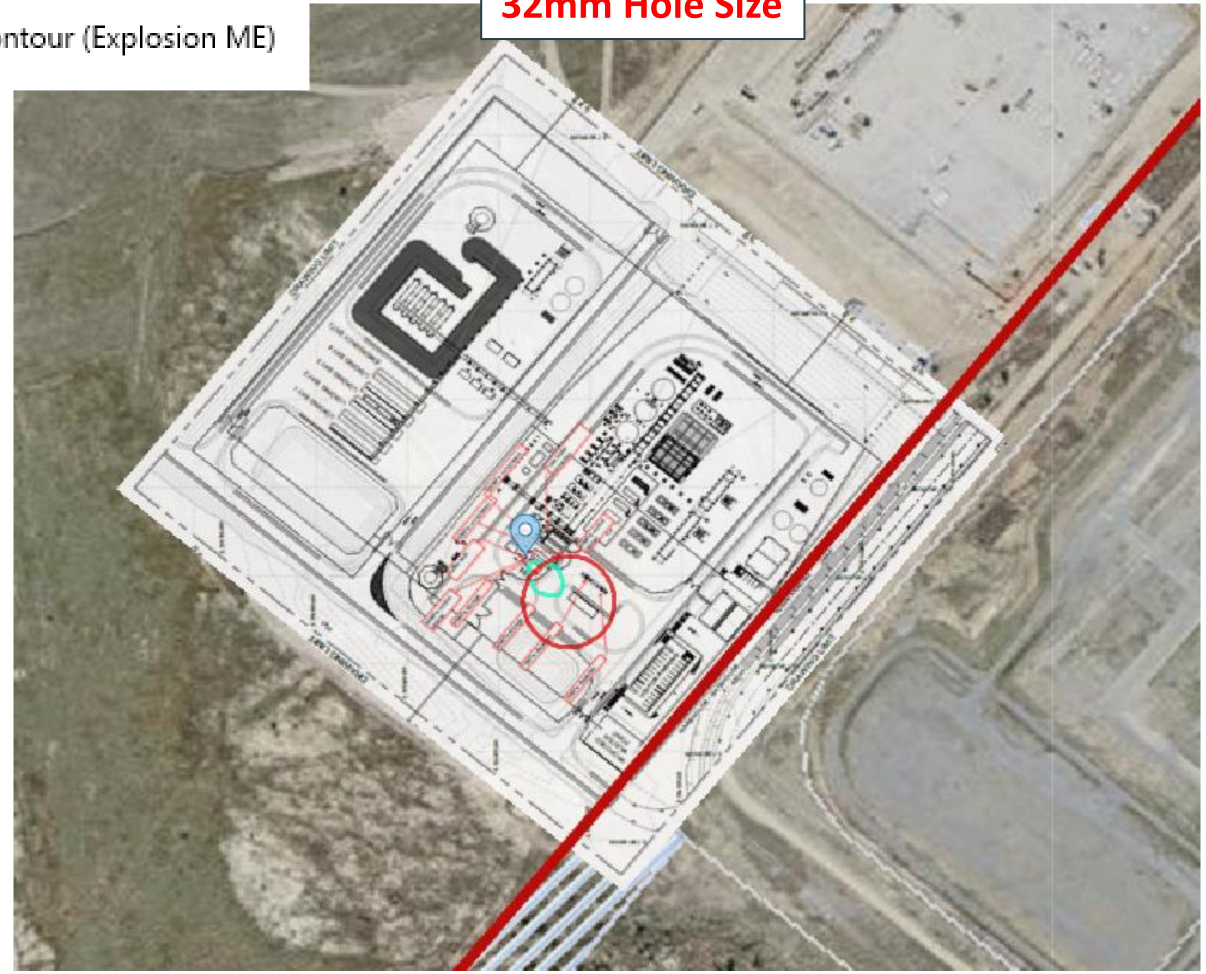
HRS01_3MPa Buffer Storage

Contours

12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)





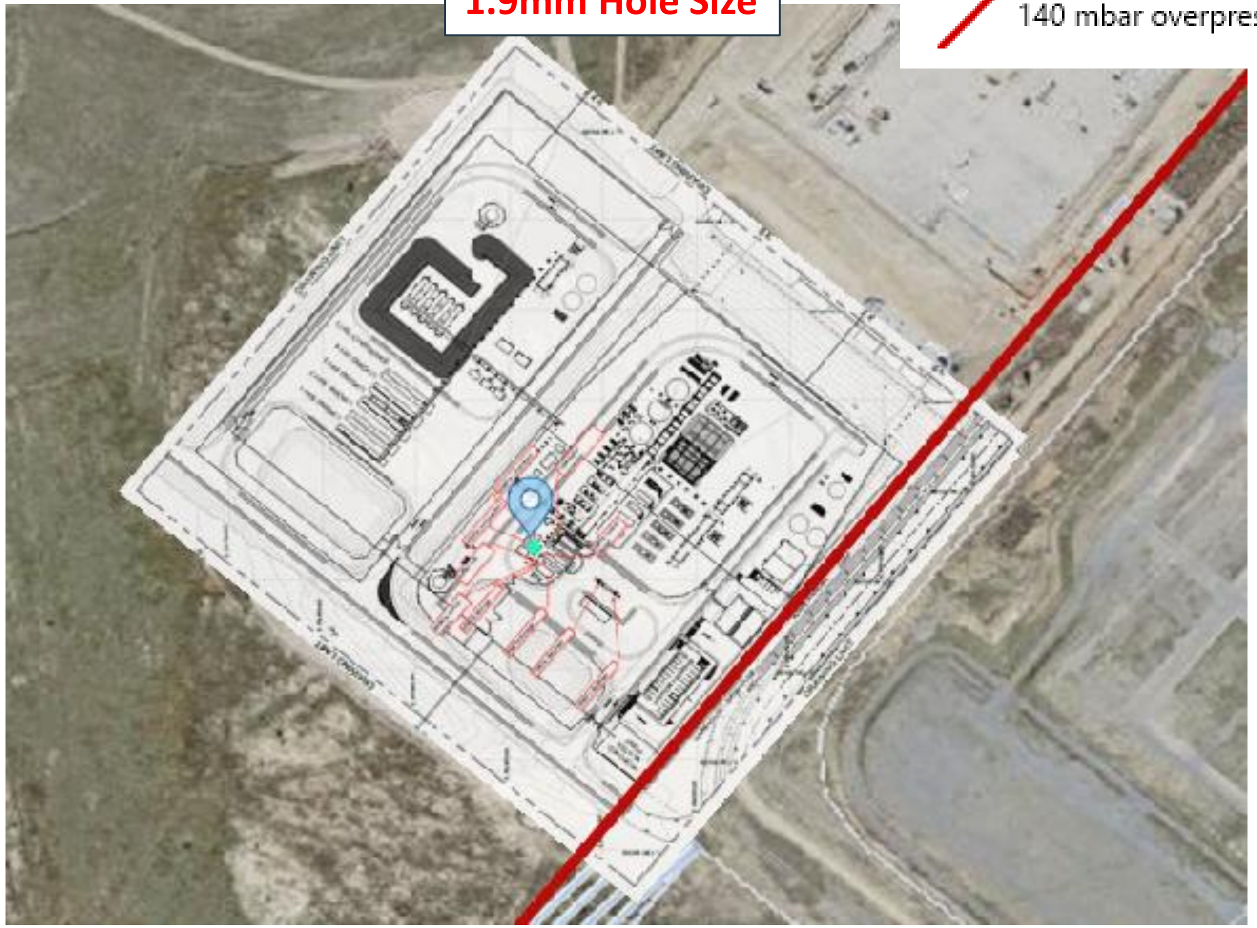
HRS02_45MPa Compressor

Contours

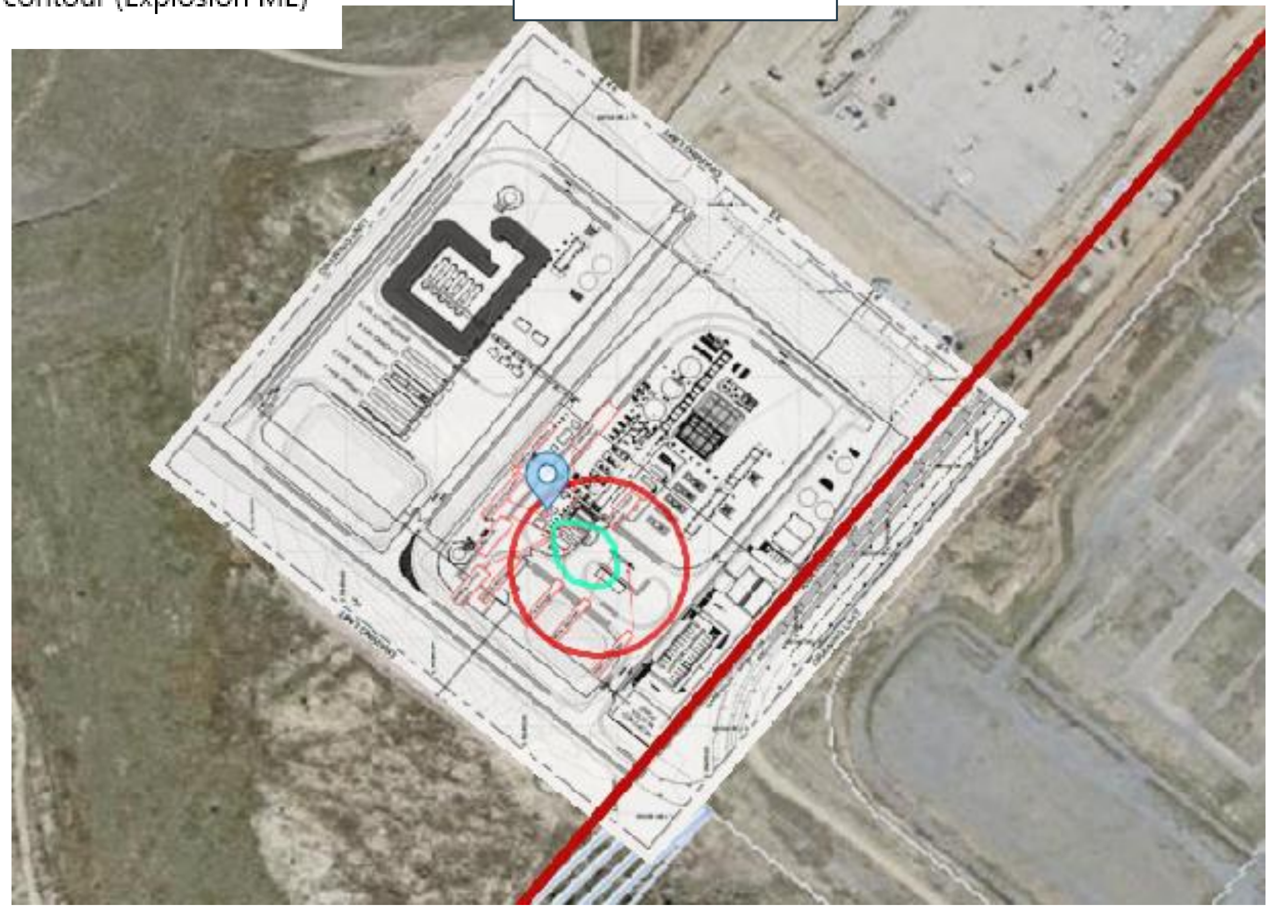
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

1.9mm Hole Size



19mm Hole Size



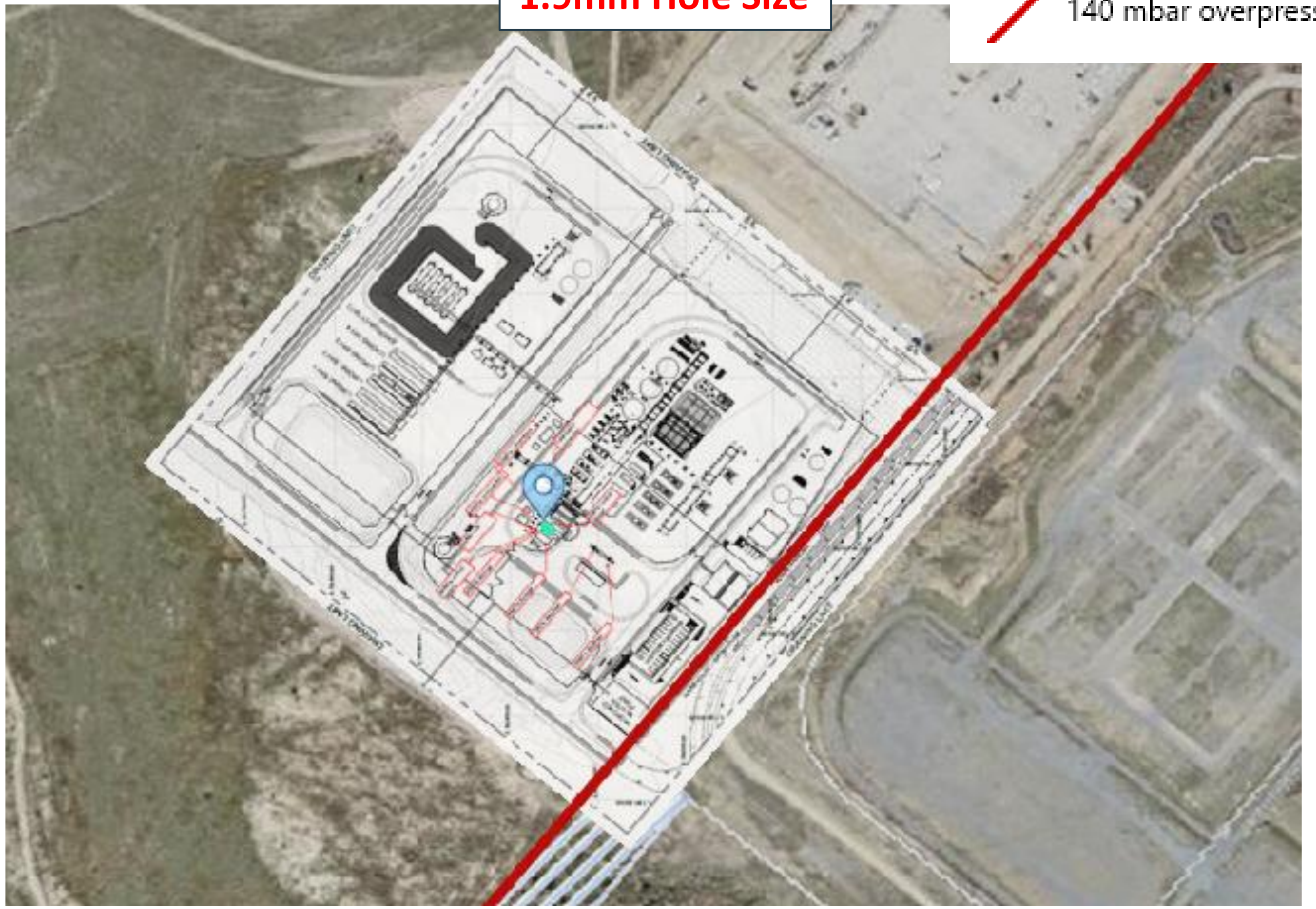
HRS03_45MPa Control Cabinet

Contours

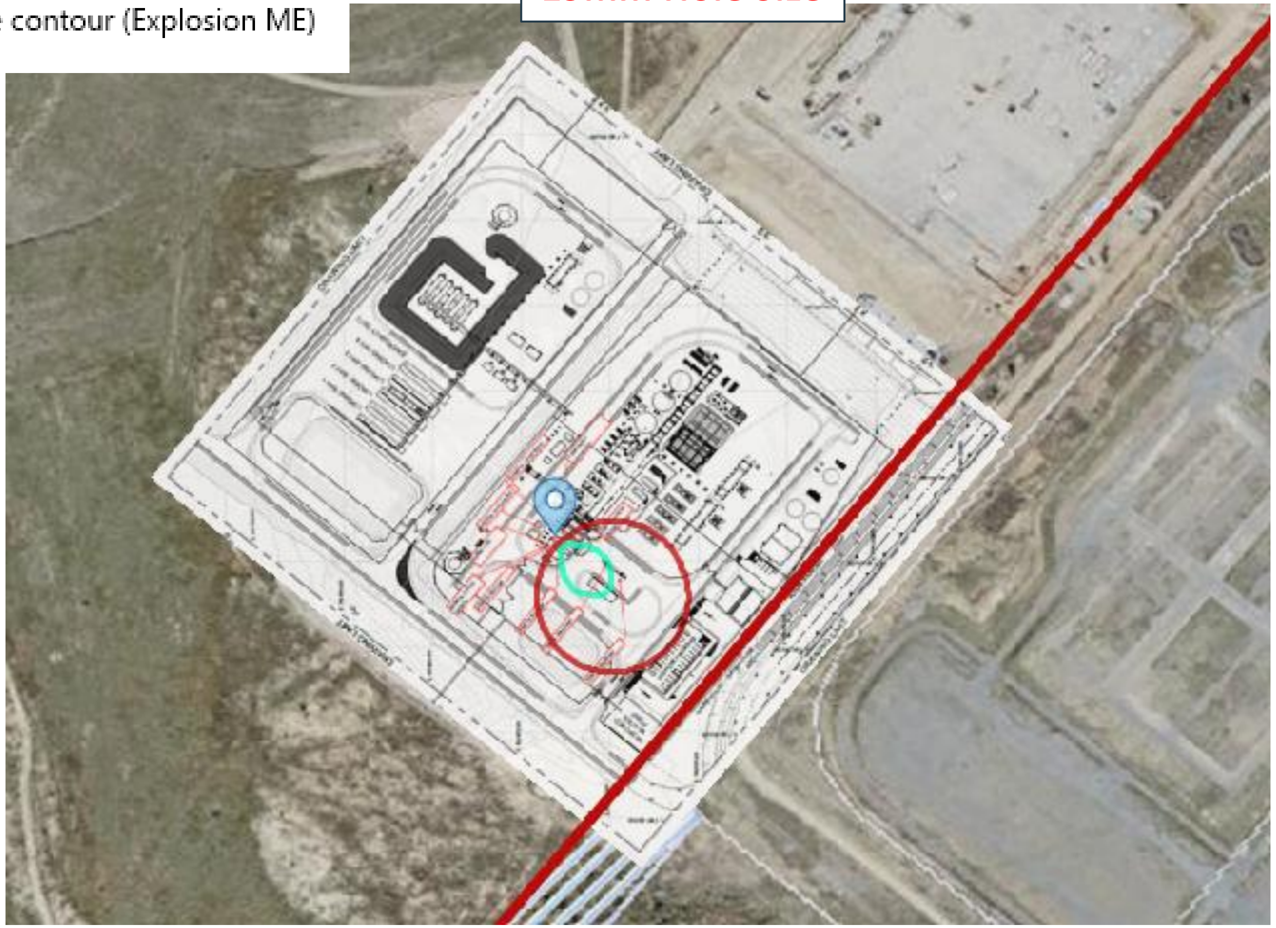
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

1.9mm Hole Size



19mm Hole Size



HRS04_35MPa Dispenser

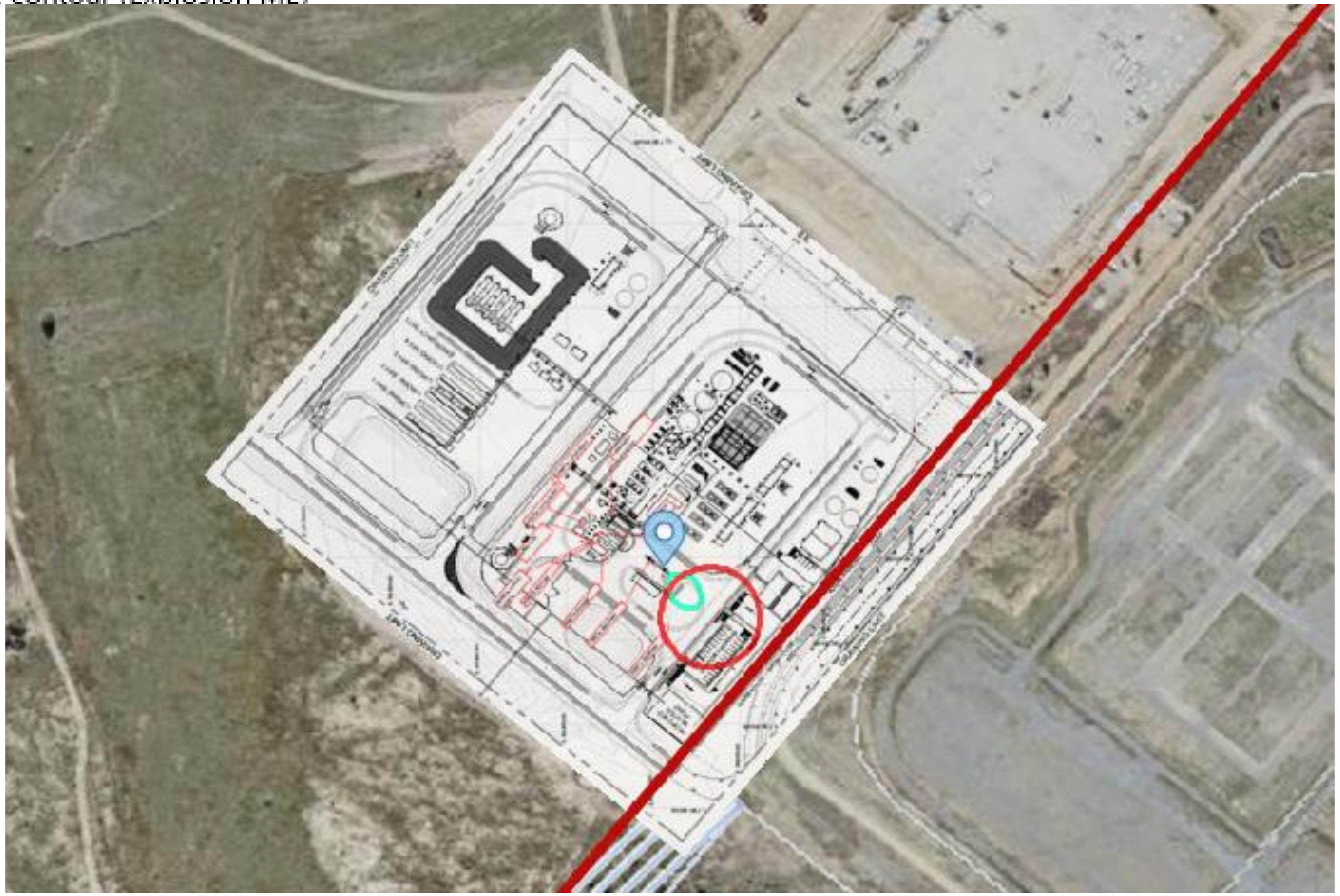
Contours

12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

1.3mm Hole Size

13mm Hole Size



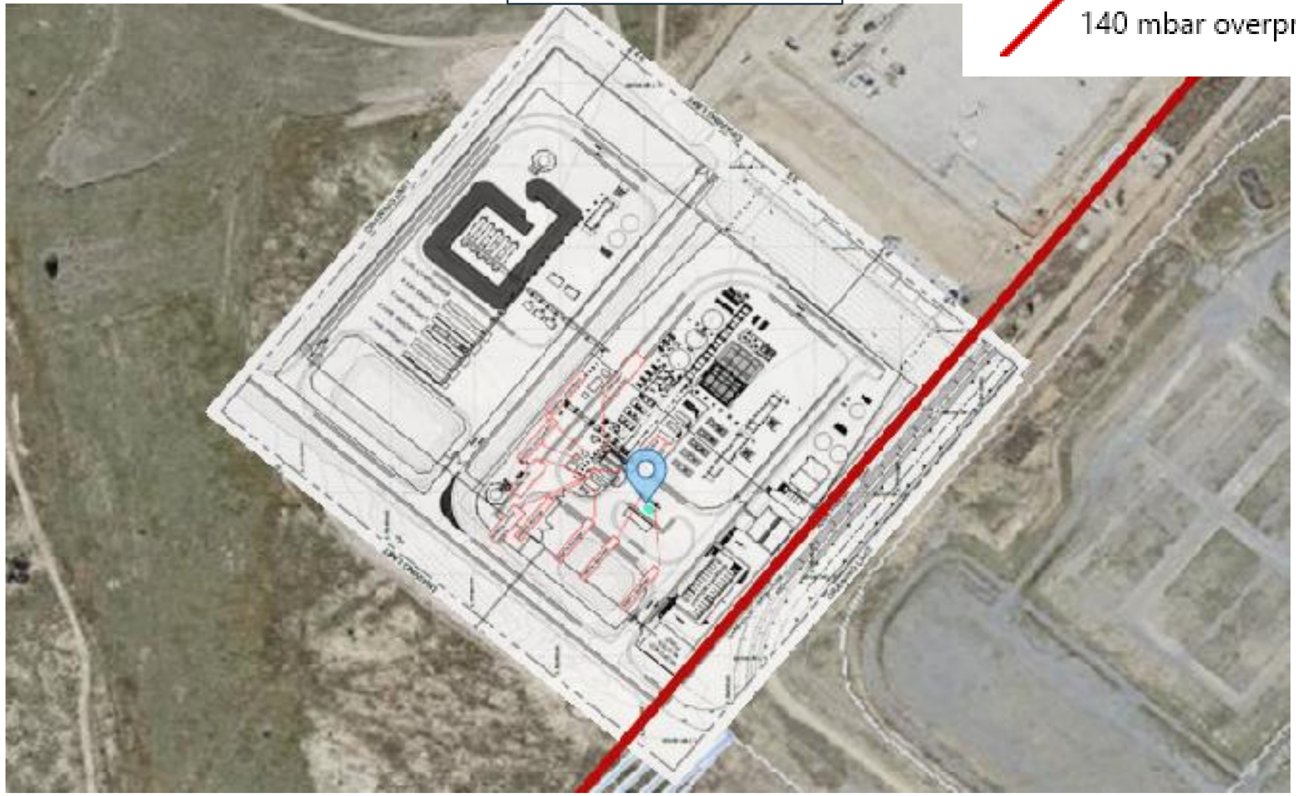
HRS05_Bus located at Dispenser

Contours

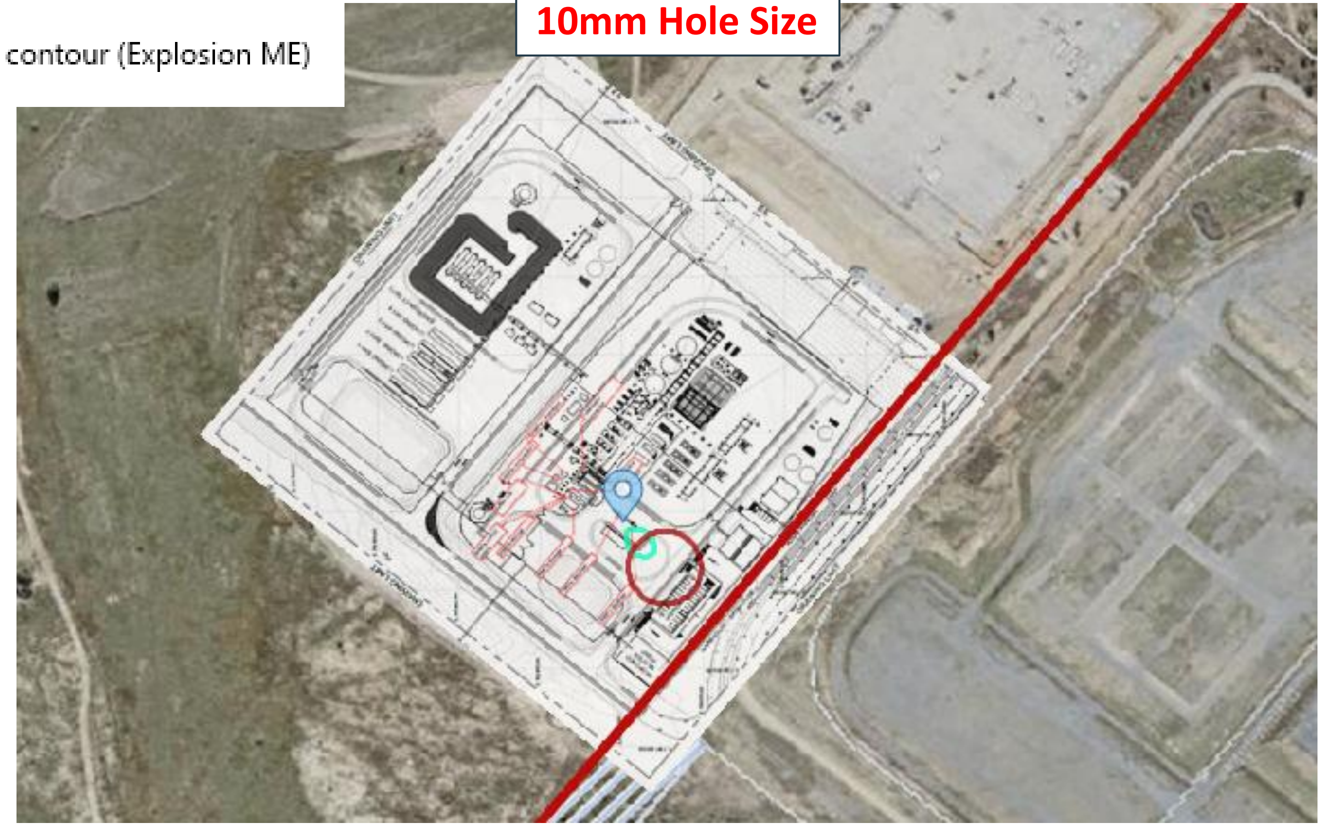
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

1.0mm Hole Size



10mm Hole Size



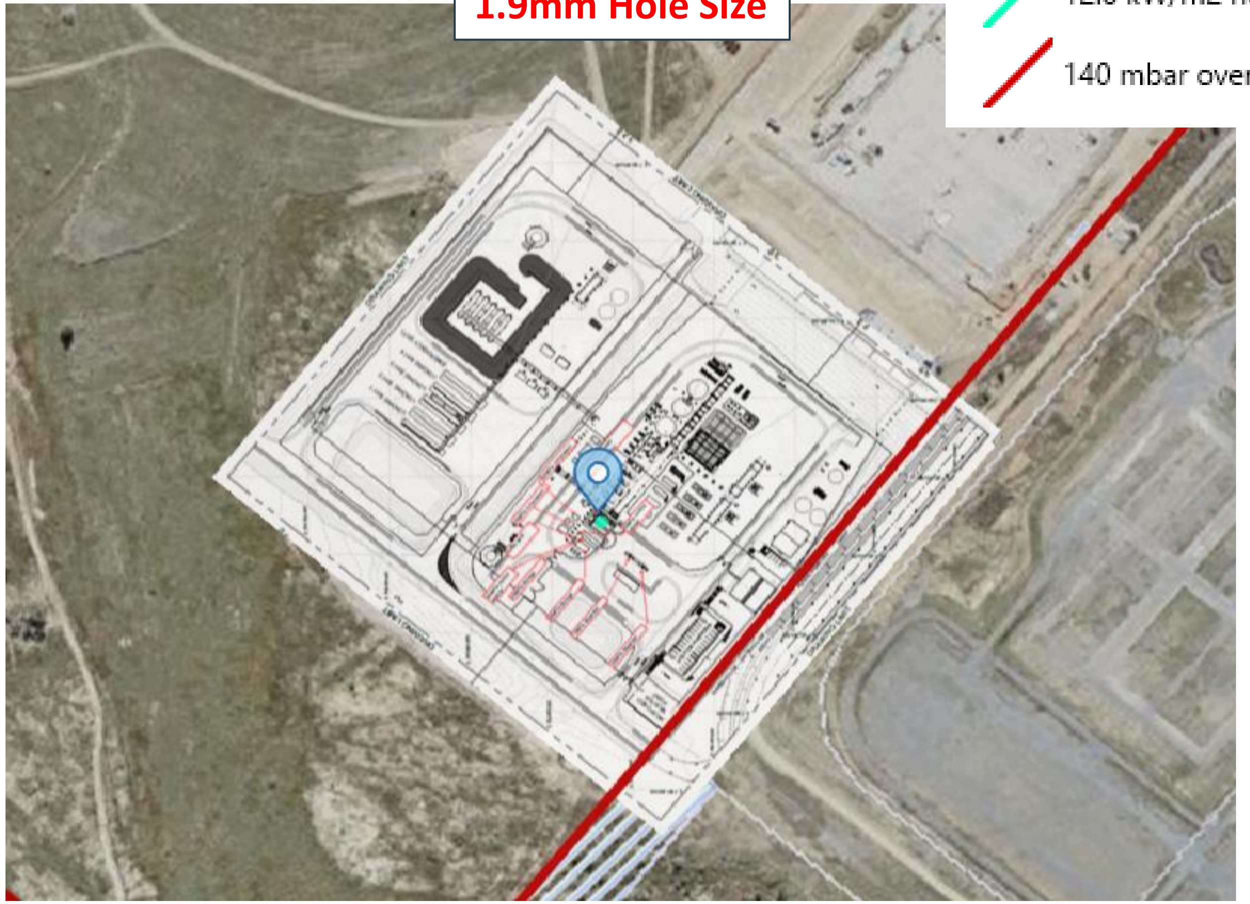
HRS06_Tube trailer located at Dispenser

Contours

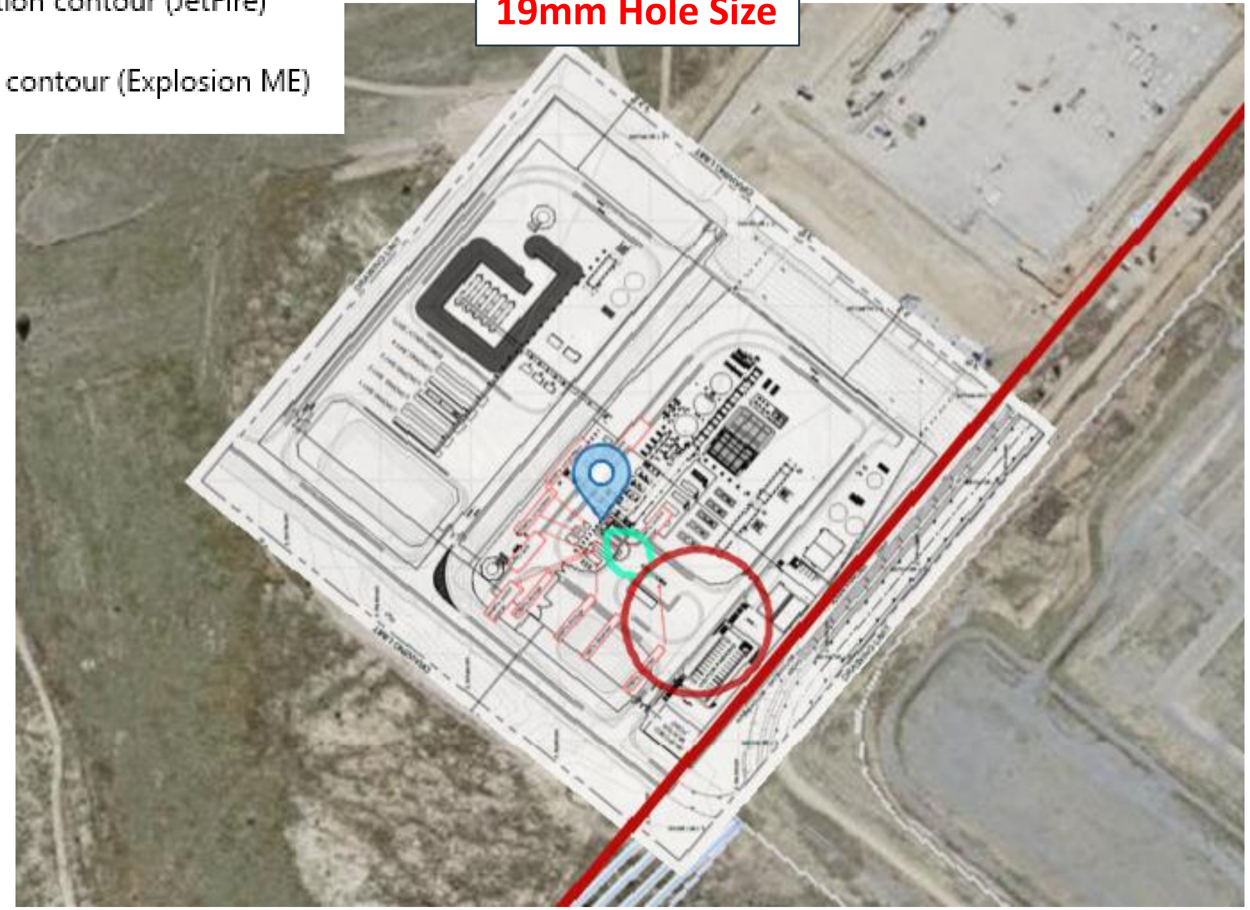
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

1.9mm Hole Size

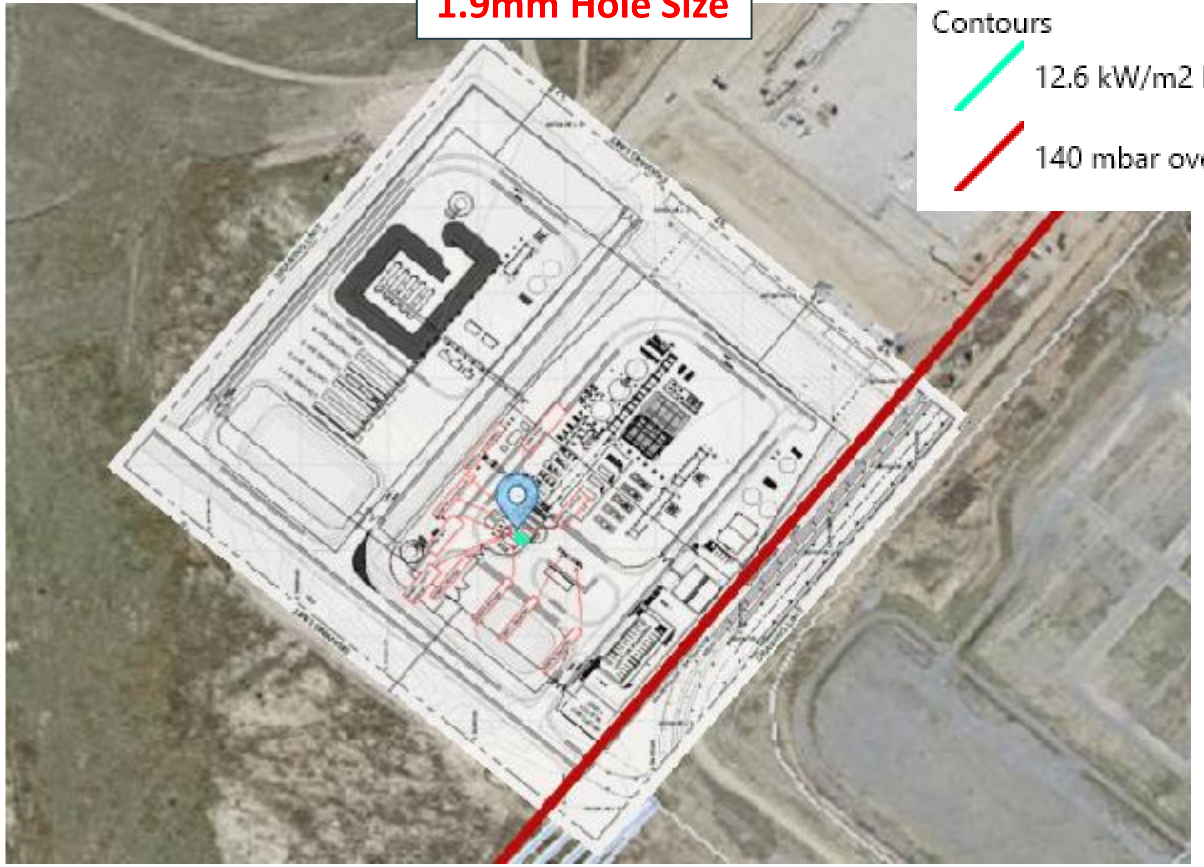


19mm Hole Size



HRS07_45MPa Bulk Storage

1.9mm Hole Size

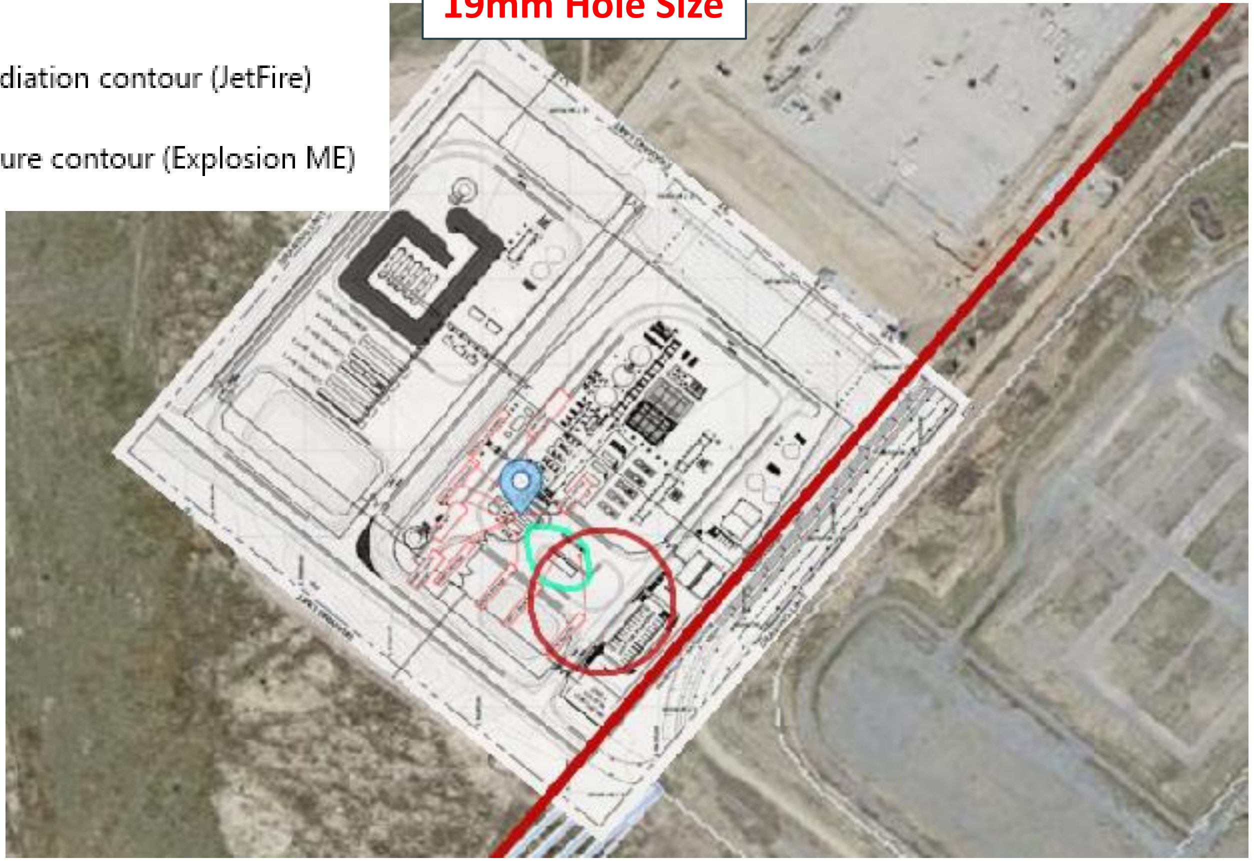


Contours

12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

19mm Hole Size



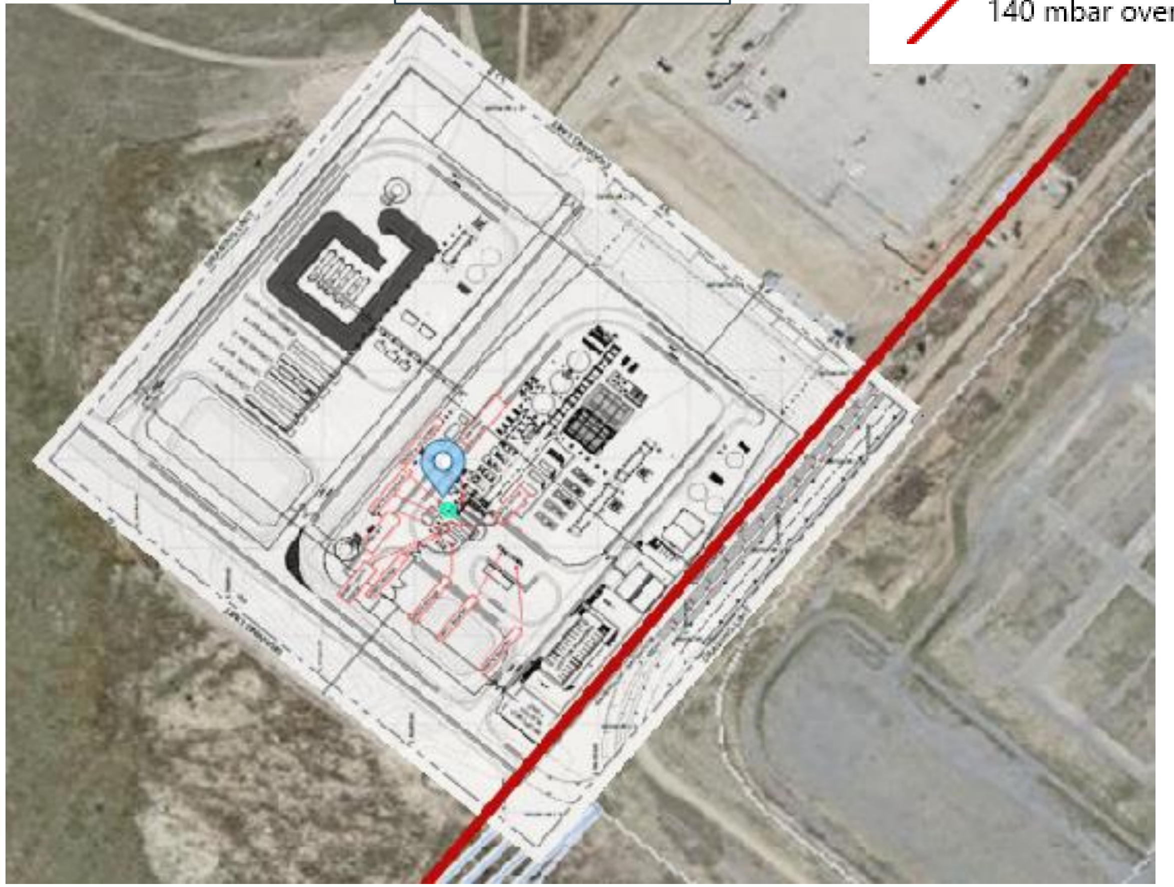
HRS08_90MPa Compressor

Contours

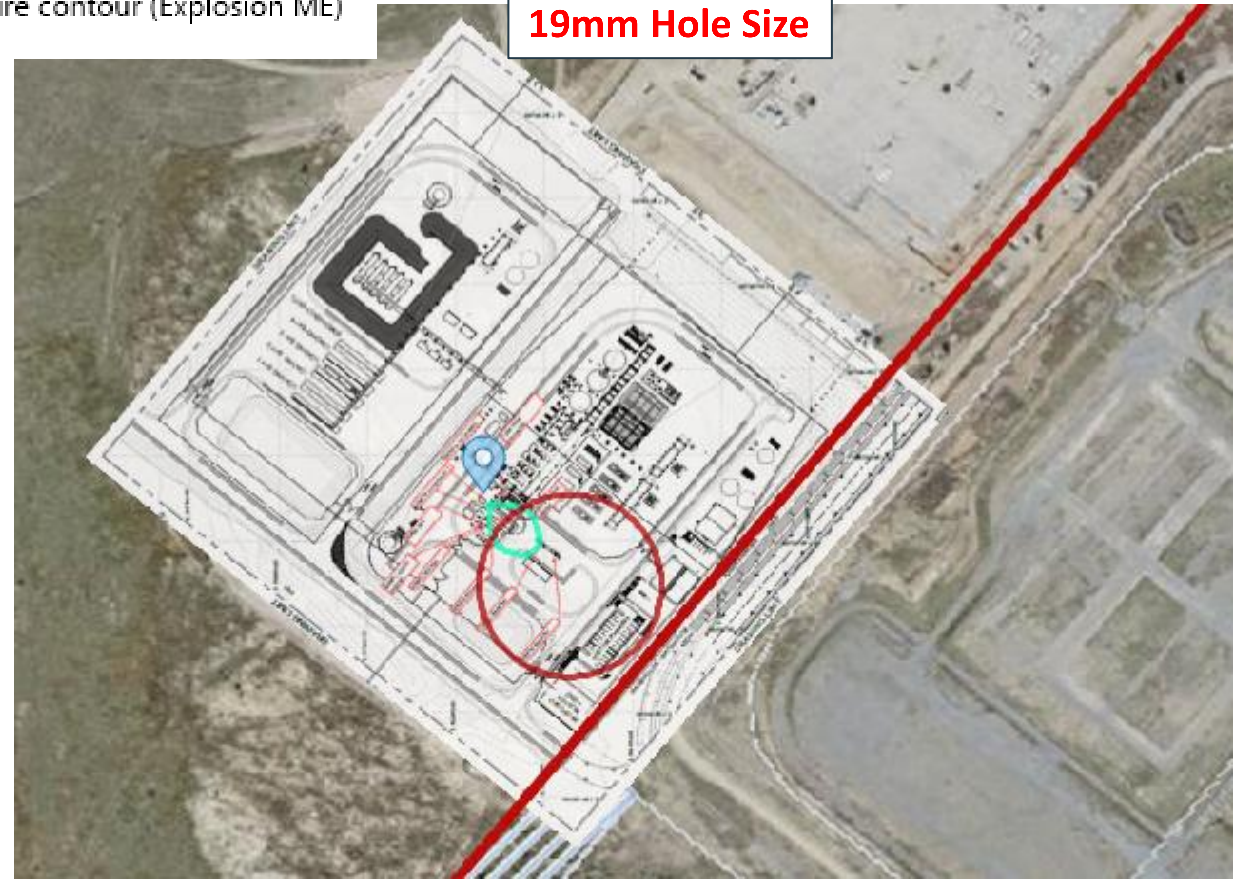
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

1.9mm Hole Size



19mm Hole Size



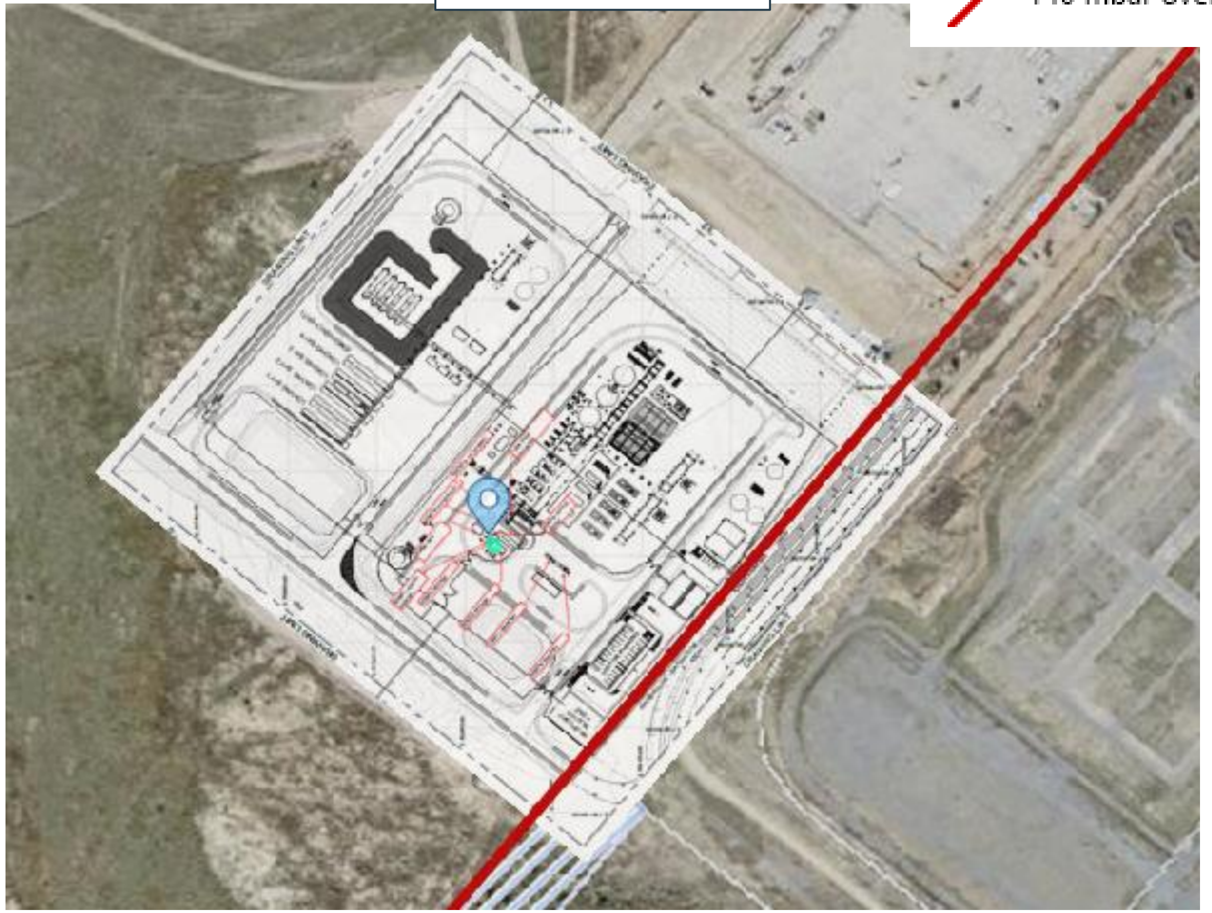
HRS09_90MPa Control Cabinet

Contours

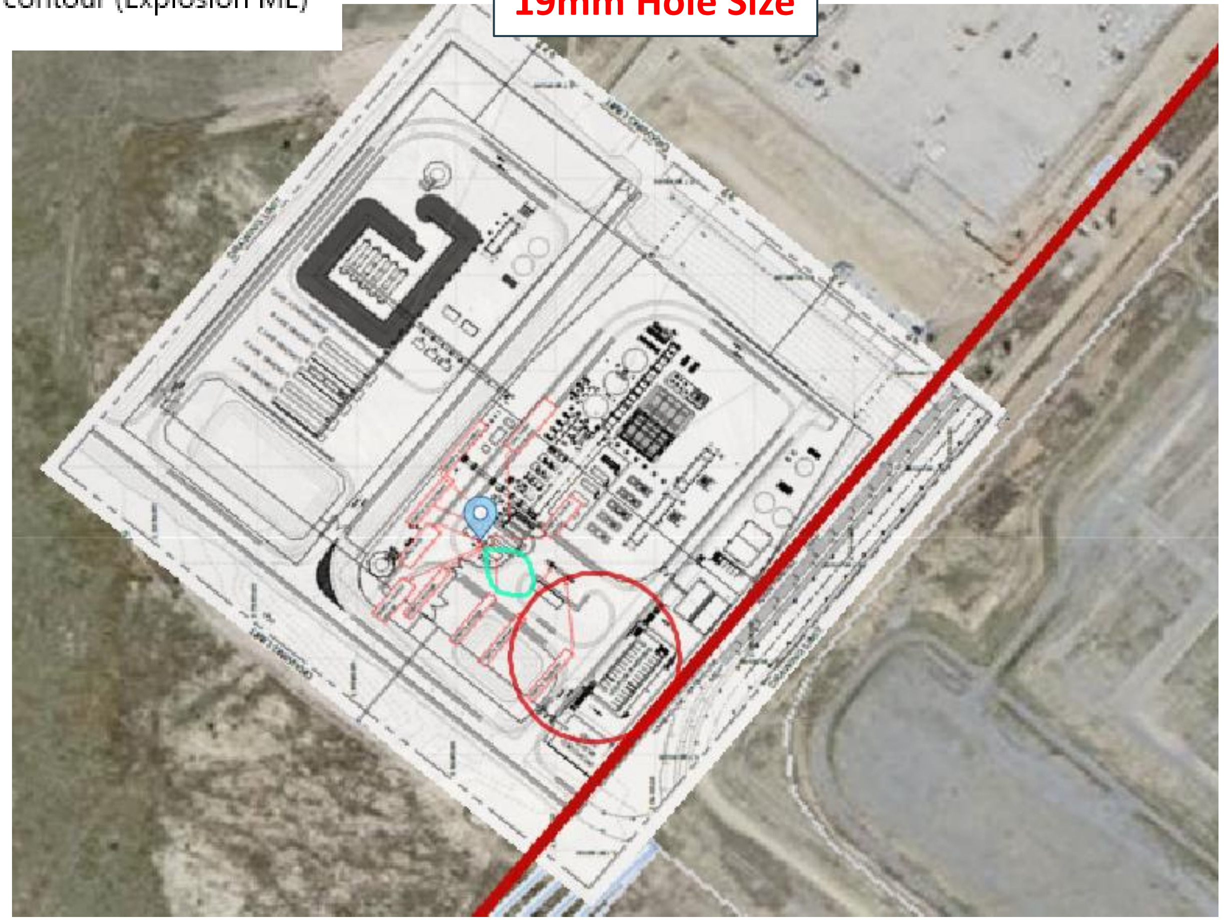
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

1.9mm Hole Size



19mm Hole Size



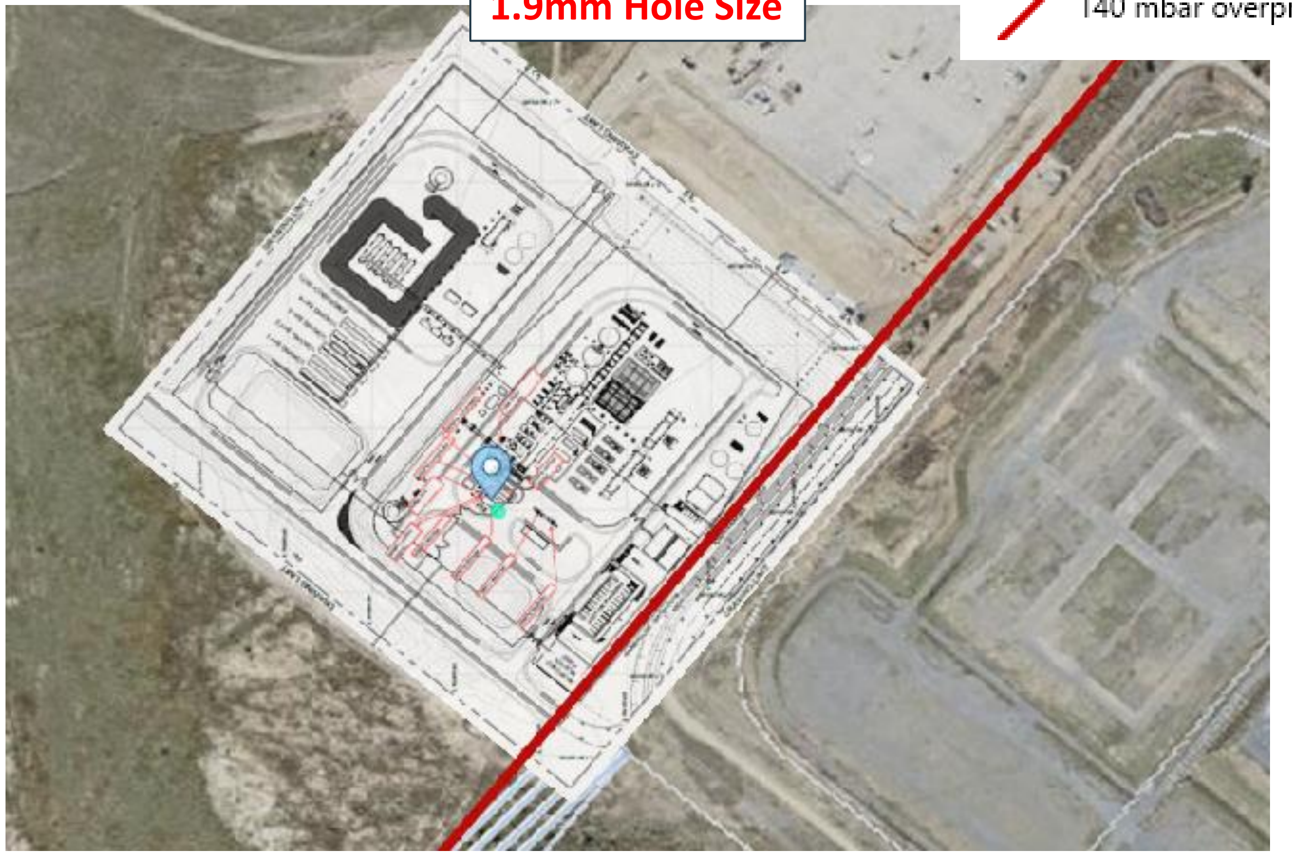
HRS10_90MPa Station Storage

Contours

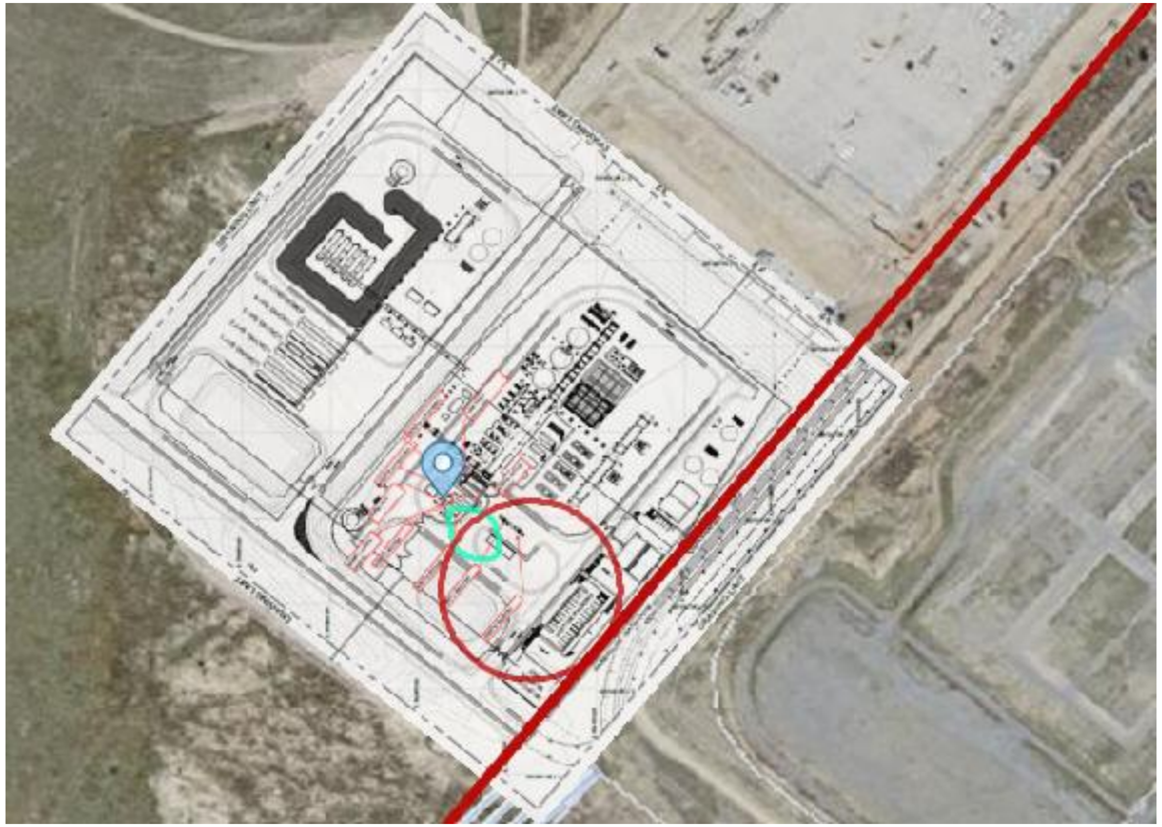
12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)

1.9mm Hole Size



19mm Hole Size

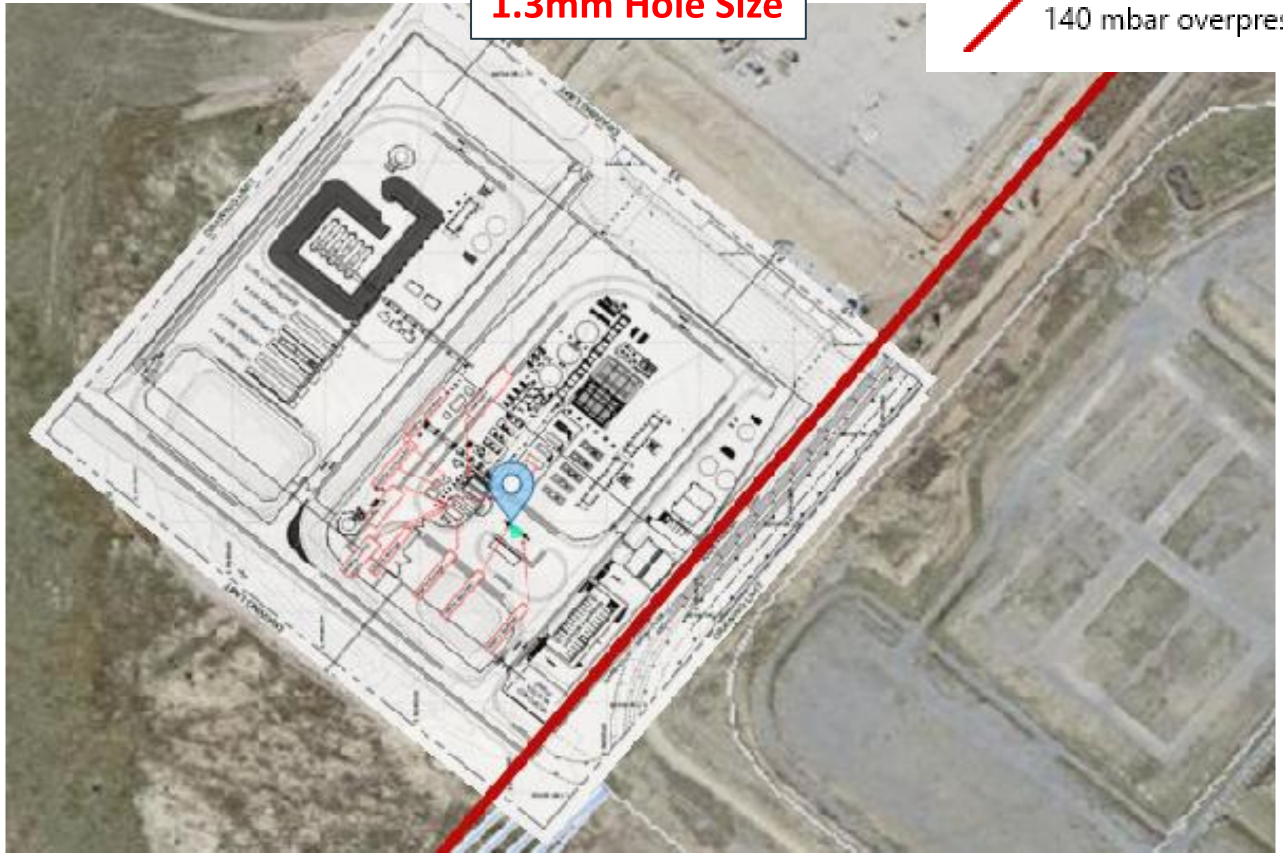


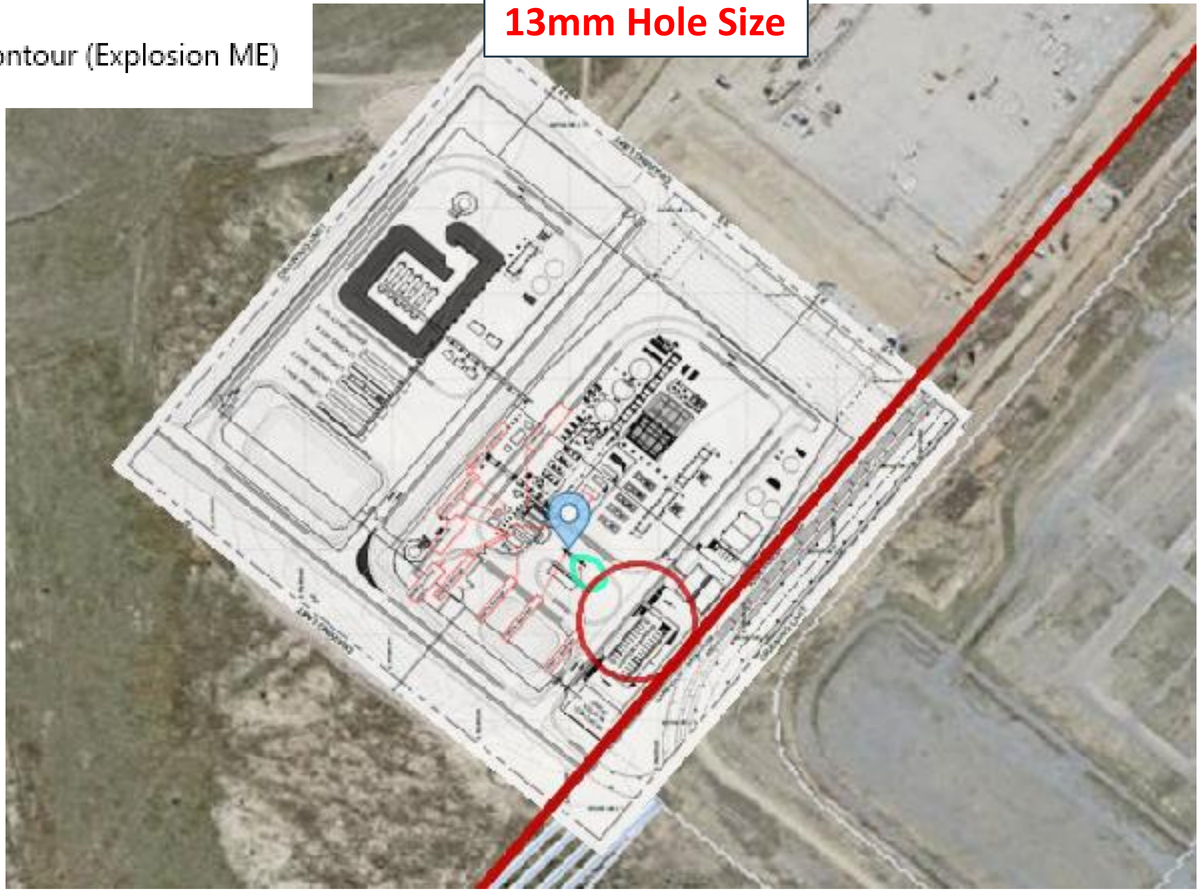
HRS11_70MPa Dispenser

Contours

12.6 kW/m2 heat radiation contour (JetFire)

140 mbar overpressure contour (Explosion ME)





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