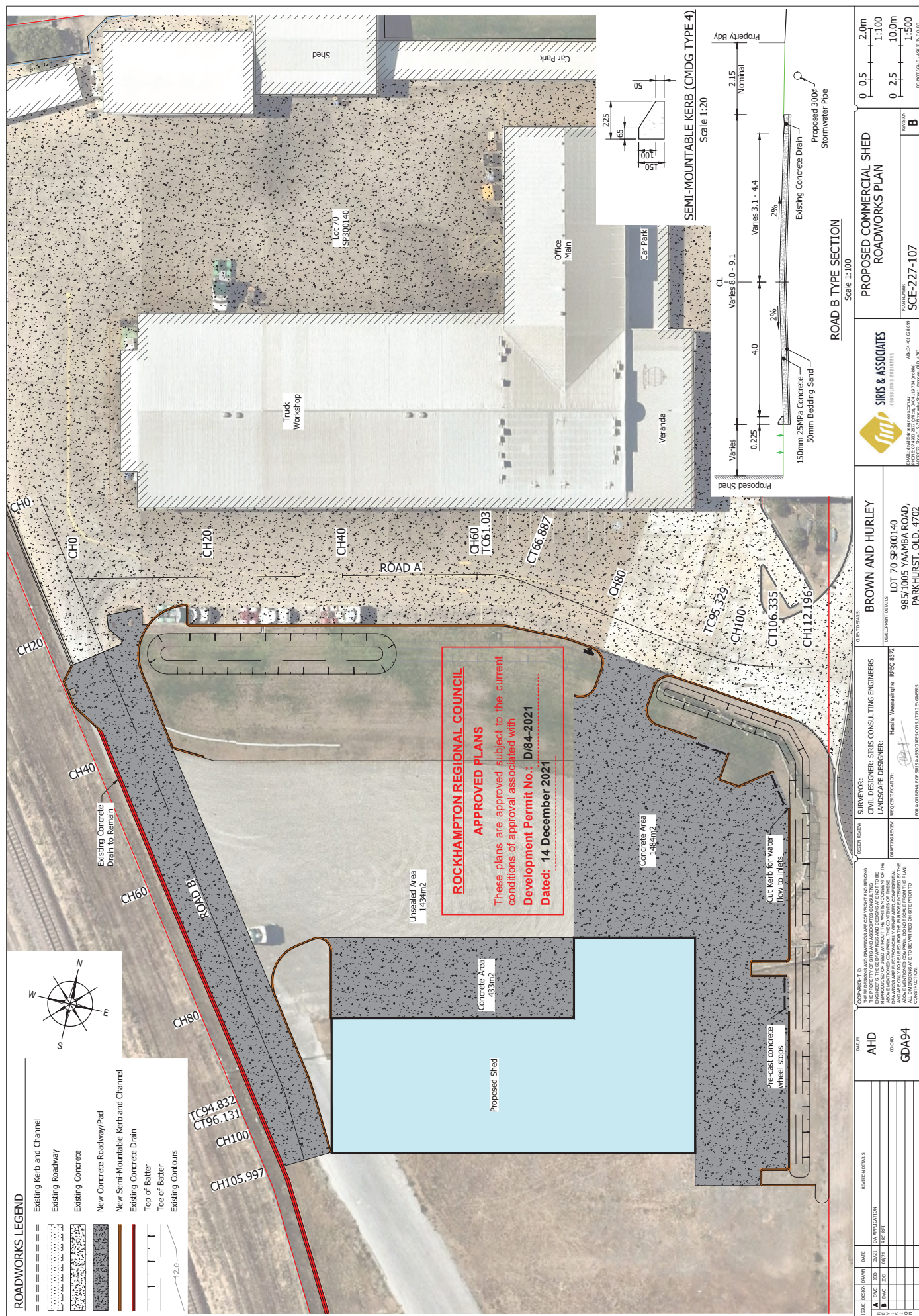
[illegible]



- 5.79 m**

Vehicle dimensions:

Width	W1
Wheel	21.3
Vehicle	21.3
F ₁	0.51
W ₁	3.35
B ₁	1.53

Test parameters:

Look to lock time (seconds)	7
Max wheel turning angle (deg #1)	37.8
Max angle between Segments	70

25.25 m

Vehicle dimensions:

Width	W1	W2
Wheel	26	2.6
Vehicle	2.5	2.5
F ₁	1.4	3.15
W ₁	5.5	10.31
B ₁	3.15	8.24

Test parameters:

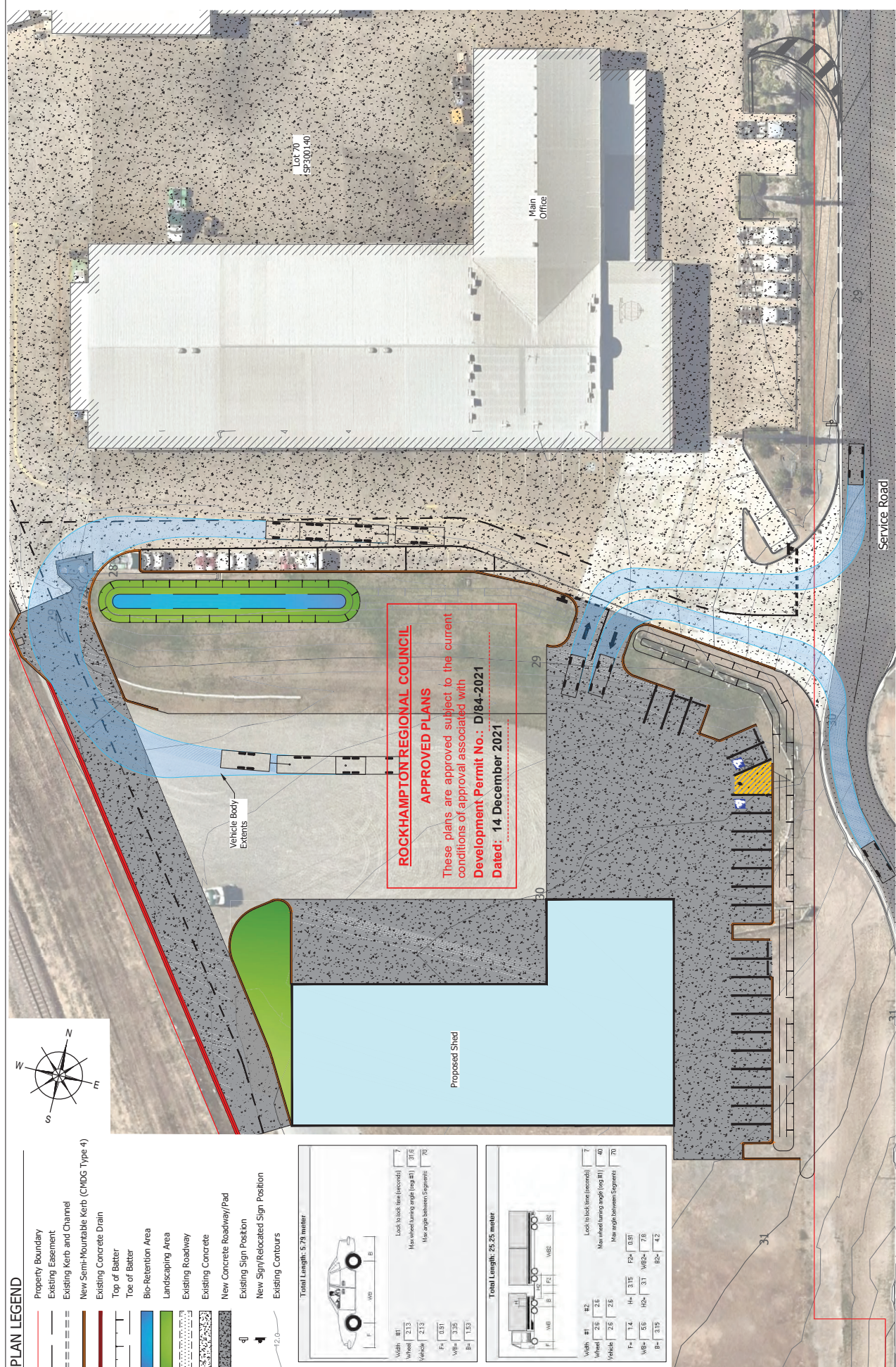
Look to lock time (seconds)	7
Max wheel turning angle (deg #1)	40
Max angle between Segments	70

ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with **Development Permit No.: D184-2021**

Dated: 14 December 2021

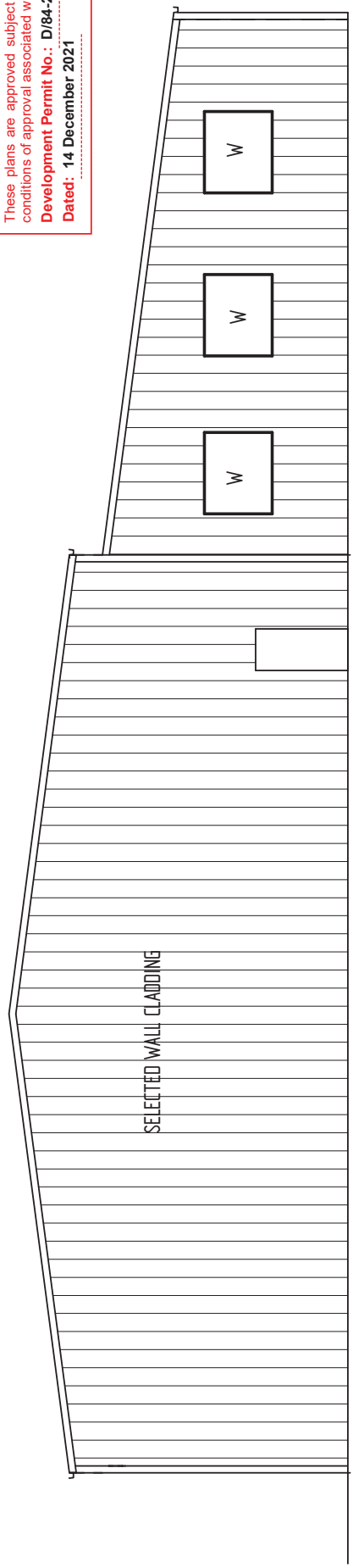


<p>PROPOSED COMMERCIAL SHED VEHICLE TURN PATHS PLAN</p>		<p>DATE: 0 2.5 10.0m 1:500</p> <p>DO NOT SCALE - USE P INQUIRY</p>	
<p>CLIENT DETAILS:</p> <p>BROWN AND HURLEY</p> <p>LOT 70 SP300140 985/1005 YAAMBA ROAD, PARKHURST, QLD. 4702</p>		<p>DATE: 0 2.5 10.0m 1:500</p> <p>DO NOT SCALE - USE P INQUIRY</p>	
<p>DESIGN DETAILS:</p> <p>SURVEYOR: LANDSCAPE DESIGNER:</p> <p>CLIENT REFERENCE:</p>		<p>DATE: 0 2.5 10.0m 1:500</p> <p>DO NOT SCALE - USE P INQUIRY</p>	
<p>PROPOSED COMMERCIAL SHED VEHICLE TURN PATHS PLAN</p>		<p>DATE: 0 2.5 10.0m 1:500</p> <p>DO NOT SCALE - USE P INQUIRY</p>	


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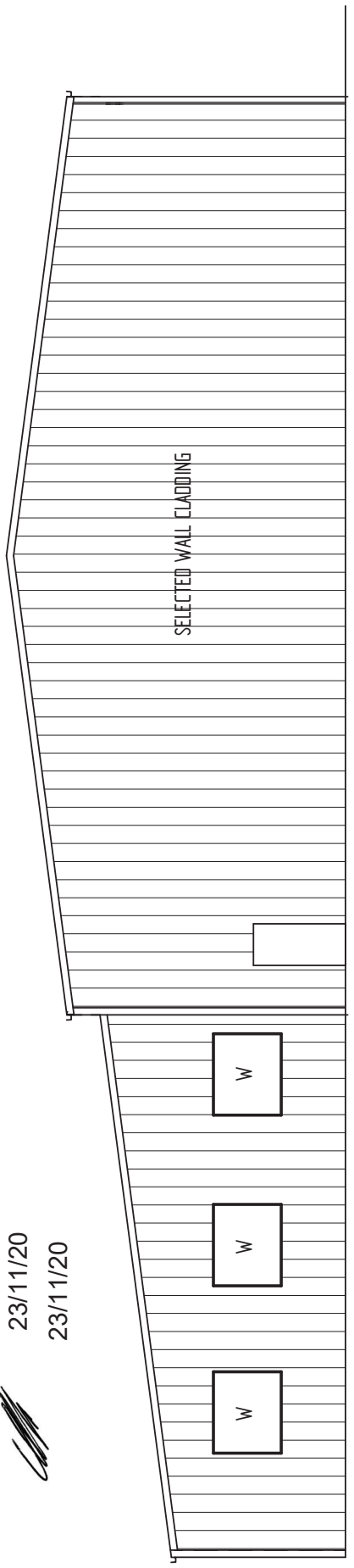
ABC SHEDS GLOBAL PTY LTD			
NAME		DATE	CLIENT
DRAWN		4/03/2019	#1383 BROWN & HURLEY
MODIFIED		16/11/2020	ELEVATION PLAN
CHECKED			
SCALE: 1:270		SHEET 4 OF 6	
		SHEET SIZE: A4	

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/84-2021
Dated: 14 December 2021



PA DOOR
location TBA


23/11/20
23/11/20



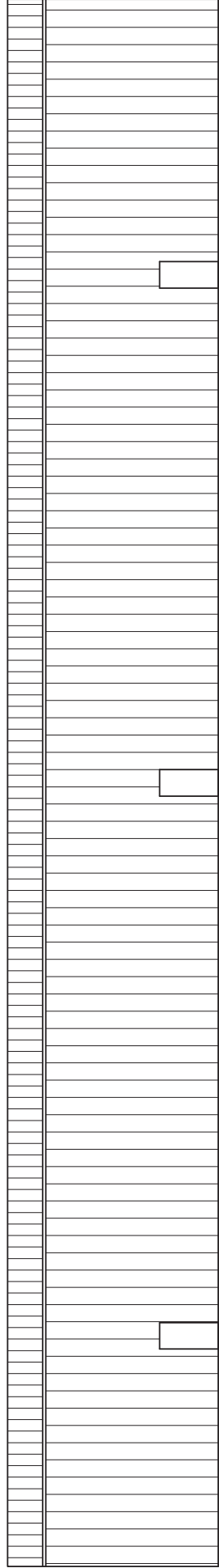
PA DOOR
location TBA

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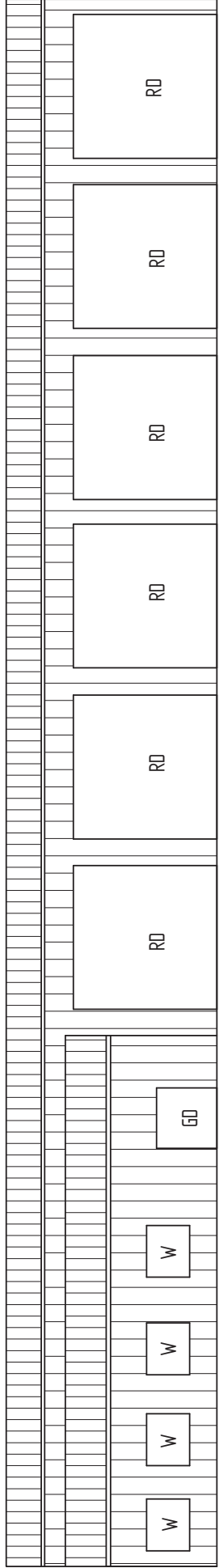
NAME		DATE	CLIENT
DRAWN	JACKSON RENDELL	4/03/2019	#1383 BROWN & HURLEY
MODIFIED	KH	16/11/2020	DRAWING
CHECKED			SIDE ELEVATIONS
SCALE: 1:200		SHEET 5 OF 6	
		SHEET SIZE: A4	

ROCKHAMPTON REGIONAL COUNCIL
APPROVED PLANS
These plans are approved subject to the current conditions of approval associated with
Development Permit No.: D/84-2021
Dated: 14 December 2021

23/11/20
23/11/20



PA D00R location TBA



ROCKHAMPTON REGIONAL COUNCIL

APPROVED PLANS

These plans are approved subject to the current conditions of approval associated with

Development Permit No.: D/84-2021

Dated: 14 December 2021

TECHNICAL MEMORANDUM

To: David Cugola – Siris Consulting Engineers
From: Blake Stephens – OSKA Consulting Group
Date: 23 June 2021
Re: **Assessment of Development Option 1 – 1021 Bruce Highway, Parkhurst.**

The following assessment was undertaken in accordance with the following:

- Siris & Associates Consulting Engineers, Proposed Building Layout 1;
- RRC Planning Scheme Policy; and
- IPWEA Queensland Urban Drainage Manual 2017 (QUDM).

INTRODUCTION

OSKA Consulting Group was engaged to prepare a Technical Memorandum for the Assessment of Development Options – 1021 Bruce Highway, Parkhurst.

For the preparation of the Technical Memorandum, the following engineering services were conducted:

- Review of existing information and studies for the site;
- Hydrologic and hydraulic assessment of the proposed development options;
- Analysis of site development options in regard to proposed stormwater drainage concept, detention and water quality devices; and
- Preparation of Technical Memorandum and associated conceptual drainage measures required for the site based on hydraulic modelling.

SITE DESCRIPTION

The current subject site is described as Lot 70 on SP300140 which is located at 1021 Bruce Highway, Parkhurst. The subject site is bounded by a vacant grassed lot to the south, Bruce Highway North Park to the north, railway to the west, and Yaamba Road to the east.

Based on current aerial imagery (taken 3 May 2020) the subject site consists of a warehouse with a surrounding parking lot on the northern end, grassed areas through the middle and shed with a dirt carpark on the southern end. The site grades to the north at 1.65%, with levels ranging from RL34m AHD along the southern boundary, to RL 27m AHD along the northern site boundary. An aerial image of the site (taken on 3 May 2020) is illustrated in *Figure 1*.



Figure 1: Aerial Image of the site – (Source: Nearmap - Image taken on 3 May 2020)

PROPOSED DEVELOPMENT

The proposed material change of use is for an industrial development which comprises of a proposed shed, gravel area and sealed hardstand area. The extent of proposed development varies for the different options assessed within this Technical Memorandum. This tech memo intends to assess the development option of the proposed development and the required drainage needed.

It is to be noted all site areas were calculated from the drawings prepared and issued by Siris & Associates Consulting Engineers (Proposed Building Layout 1 – Ref. SCE-227-001) included at Attachment A within this tech Memo.

Table 1: Option 1 Site Areas

Option 1	
Existing Impervious Area (Truck workshop and shed and carparks)	1.362 ha
Existing Undisturbed Area on Site	2.212 ha
Proposed Development Envelope	0.72 ha
Total Site Area	3.574 ha

PROPOSED STORMWATER DRAINAGE STRATEGY

It is proposed that all stormwater up to the major event captured within the area of the proposed development are to be diverted to a combined bioretention basin, which will discharge to the associated Lawful Point of Discharge (LPoD); Bruce Highway North Park to the north. The bioretention basin will be combined to contain a detention basin component on top of the bioretention Extended Detention Depth (EDD), thereby allowing stormwater quality treatment of the Q3-month event flow and detaining up to the 1% AEP event flow. The major drainage structure for the detention component are the proposed riser pit structures within the bioretention basin. These riser structures are to be fitted with low flow orifice opening at EDD level and high flows being captured by the riser weirs which will ultimately drain through a consolidated outlet to the LPoD.

In the event of blockage an emergency spillway is engaged and overland flow to the LPOD is required through the existing truck workshop site to the North.

A sag pit along with a swale drain is to be proposed upstream of the development envelope to serve as a drainage relief for all overland flows draining into the proposed development. This stormwater infrastructure can be used as a connection point for future development upstream of the subject site, hence the recommendation at this stage of development. The proposed size of the upstream flows towards the proposed development is to be determined from the proposed *Hydraulic Impact Assessment* (HIA) for the subject site.

DATA

Data which has been sourced or provided, in order to prepare this report for the site, was gathered from the following sources:

- Rainfall and Meteorological 2016 IFD Data by the Australian Bureau of Meteorology;
- LIDAR data for the subject site sourced from Elevation and Depth Foundation Spatial Data (ELVIS), Date Source: 2015, 1m DEM Data;
- Siris & Associates Consulting Engineers, Proposed Building Layout 1;
- Property Boundary for the subject site sourced from QLD Spatial (Accessed on 8 December 2020); and
- Aerial Imagery by Nearmap (Accessed on 8 December 2020).

ADOPTED RAINFALL DATA

Rainfall intensity data has been obtained from the Australian Bureau of Meteorology's 2016 Design IFD Rainfall System. The data has been extracted for the nearest grid cell at Latitude 23.2875(S) and Longitude 150.5125(E). The IFD data and average rainfall intensities used in this Tech Memo are in accordance with the procedures outlined in Geosciences Australia, *Australian Rainfall and Runoff 2016*.

SITE HYDROLOGY

The following sections define the method and parameters utilised within the hydrologic modelling of the subject site area, in order to establish a simulation of the anticipated flow regime, peak discharge and overland flows within the proposed development. The modelling has been undertaken in XPSWMM for both the pre and post-development scenarios, and a Rational Method calculation has been provided for comparison.

The Rational Method (Section 4.3 of the Queensland Urban Drainage Manual - QUDM 2017) is a suitable estimation technique, given its flexibility in its data requirements and is able to produce satisfactory estimates of peak site discharges based on the following data input:

- specific intensity frequency duration (IFD) data;
- length/type of flow path;
- contributing catchment areas; and
- coefficient of discharge.

Note that the hydrologic and hydraulic assessment undertaken is the entire subject site area, which is approximately 3.574 ha. However, in regard to quality assessment, the area accounted for in the water quality assessment is the portion of the subject site undergoing development only.

SITE HYDROLOGY

The pre-development and post-development site have been analyzed as 3 internal catchments, which represents the existing and proposed flow regime. It is deemed that stormwater for the development envelop drains as sheet flow from the site and ultimately drains to Bruce Highway North Park, which represents the Existing Point of Discharge (EPoD) and will be maintained as the proposed development (LPOD). Refer to Attachment B for details of the *Conceptual Stormwater Catchment Plan* (Ref: OSK5480-SK001) prepared by OSKA Consulting Group.

Peak flow rates have been estimated for the adopted storms using design rainfall intensities from the Bureau of Meteorology 2016 IFD Data. The Rational Method ($Q = 2.78 \times 10^{-3}$ CIA) has been used to estimate the required design peak flow rates for the subject site. The difference in peak flow rates for the subject site is presented in *Table 2*, below.

Table 2: Change in Peak Flow Rates Estimation – Rational Method

Annual Exceedance Probability	AEP	39%	10%	5%	1%
Pre Developed Peak Flow Rate (m ³ /s)	Q	0.662	1.218	1.471	2.158
Post Developed Peak Flow Rate (m ³ /s)	Q	0.736	1.354	1.636	2.361
Change in Peak Flow Rate (m³/s)	Q	+0.074	+0.136	+0.165	+0.204

The proposed development has demonstrated via a Rational Method assessment, that an increase in peak flow rates discharging from the site is anticipated due to the proposed development, therefore On-Site Detention (OSD) is deemed required to mitigate flows to predevelopment conditions.

HYDRAULICS MODELLING

To assess the storage and outlet requirements of the proposed detention basin, the industry-standard modelling software XPSWMM has been selected for the hydrologic and hydraulic analysis. The subject areas have been analysed using XPSWMM as sub-catchments based on physical properties by a nodal network. Each node within the programs is defined by impervious and pervious area as well as associated with the nature of the existing site and the proposed development.

The IFD data and average rainfall intensities used in this report are in accordance with the procedures outlined in IEAust, Australian Rainfall and Runoff (AR&R) 2019. Several storm events have been included in the modelling with durations ranging from 10 min to 2 hrs. The Infiltration parameters applied to the model are in accordance with the AR&R 2019 values for the subject site.

Initial Loss (IL) and Continuing Losses (CL) were applied to the XPSWMM modelling, and again these values were varied for the impervious and pervious portions of the catchment. The following loss rates were adopted:

Developed catchment	IL = 1mm	CL = 0mm/hr; and
Undeveloped catchment	IL = 15mm	CL = 1.7mm/hr.

Table 3: Adopted OSD Parameters

Basin ID	OPTION 1
Modelled Basin Base Area	65 m ²
Modelled Basin Top Area	220 m ²
Modelled Basin Height (Including Freeboard)	0.80 m
Consolidated Low Flow Pipe Outlet at Pit Invert Level	300mm RCP @ 1%
Riser Pit	2 x (900mm x 900mm) Top of Riser @ 0.20m above Basin EDD
Orifice within Riser Pit	4 x (200mm x 600mm) rectangular cutout, IL at EDD; i.e. 2 orifice outlet per riser pit structure
Emergency OverFlow Weir:	4.0m wide @ 0.5m above Basin EDD to tie in with ground level.
Approximate 1% AEP Detention Depth (excludes Bioretention Basin EDD)	0.48m

Note: Basin EDD is the start of the detention component within the basin, which is 300mm Extended Detention Depth above the surface of the Bioretention Basin filter component

Modelling Result

Event (AEP)	Site Pre Development Flow Rate (m ³ /s)	Site Post Development Flow Rate (m ³ /s)	Site Mitigated Flow Rate (m ³ /s)	Water Level in Proposed Basin (m)
39%	0.630	0.853	0.588	0.163
18%	0.856	1.047	0.728	0.201
10%	1.005	1.272	0.879	0.304
5%	1.186	1.477	1.019	0.337
2%	1.537	1.747	1.355	0.438
1%	1.764	2.030	1.390	0.480

STORMWATER QUALITY MODELLING

Stormwater Pollutant modelling for the development has been generated using the modelling program 'Model for Urban Stormwater Improvement Conceptualisation' (MUSIC), version 6.3.0, adhering to the prescribed Water by Design MUSIC modelling guidelines Version 1.0, 2010 (WBDMG). A RRC MUSIC Link model template has been utilised in the development of this model. The source nodes for the catchment have been modelled as "Industrial" to reflect the post-development site use, in accordance with MUSIC modelling guidelines Version 1.0, 2010 (WBDMG).

Note that the existing developed area designated has not been included as part of the sites MUSIC assessment, as it is not anticipated to undergo any disturbance as part of the proposed mixed-use industrial development. Therefore, this area is deemed to not require stormwater quality treatment.

Adopted SQID Design Parameters

A Bioretention stormwater quality improvement devices (SQID's) has been modelled to treat stormwater runoff from the site, as it is deemed the most suitable for the proposed site use. The proposed SQID's have been provided for modelling purpose only and is subject to council approval. The Bioretention is designed to pond stormwater allowing it to percolate through a layer of filter media. Runoff passing through the filter media is collected with a perforated pipe discharging to the downstream council's drainage stormwater infrastructure. The Detailed Design of these components is to be included in the CSWMP of the proposed development.

Option 1	
	Area (m ²)
Sealed	3200
Top Landscape	1008.33
RHS Landscape	209.51
Proposed Shed	1259.92
Gravel area	1549.08
Total	7226.84
Total Impervious of new development	6009
Total pervious of new development	1217.84
Total area of developed site	20846.84
Total Impervious of developed site	19629
Fraction Impervious	0.94

Option 1 - Music Modelling		
Catchment	Total Area (ha)	Impervious %
Ground	0.277	55.99
Roof	0.126	100
Road	0.320	100
Total Site	0.723	
Required Bioretention Size	65m ²	

Figure 2: Breakdown of proposed development options

SUBJECT SITE FLOOD LEVELS

The site is subject to creek flood source, in accordance with RRC Flood Overlay Mapping shown in *Figure 2* below. As the site is subject to potential flooding, RRC requires a minimum habitable floor level, to be set ensuring a freeboard of 0.50m above the DFL. The nature of the current flood depth against the proposed development layout and design surface is yet to be determined and will be addressed in the proposed HIA for the site. For further information, refer to RRC Flood Search Property Report for the subject site included as Attachment D in this Tech Memo.

