

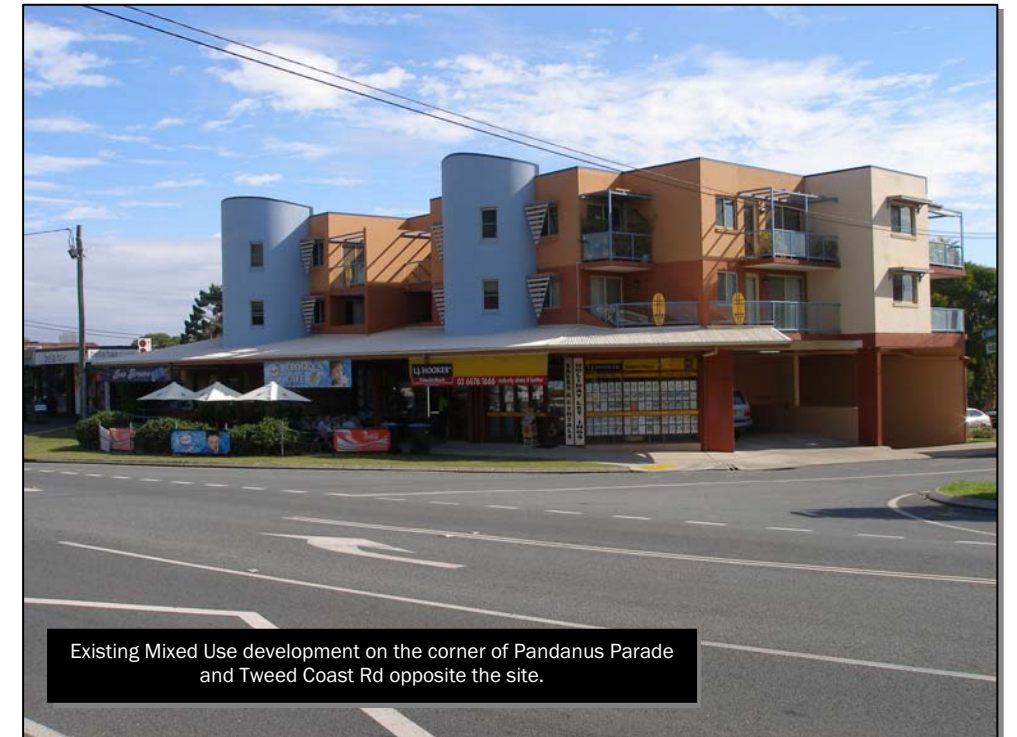
Appendix

B

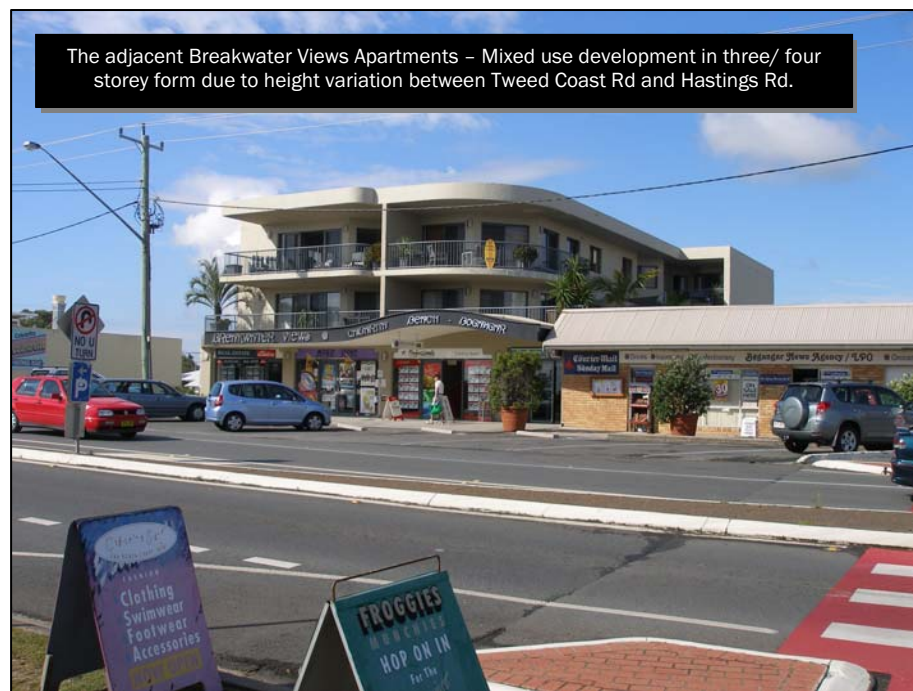
Photo Plates



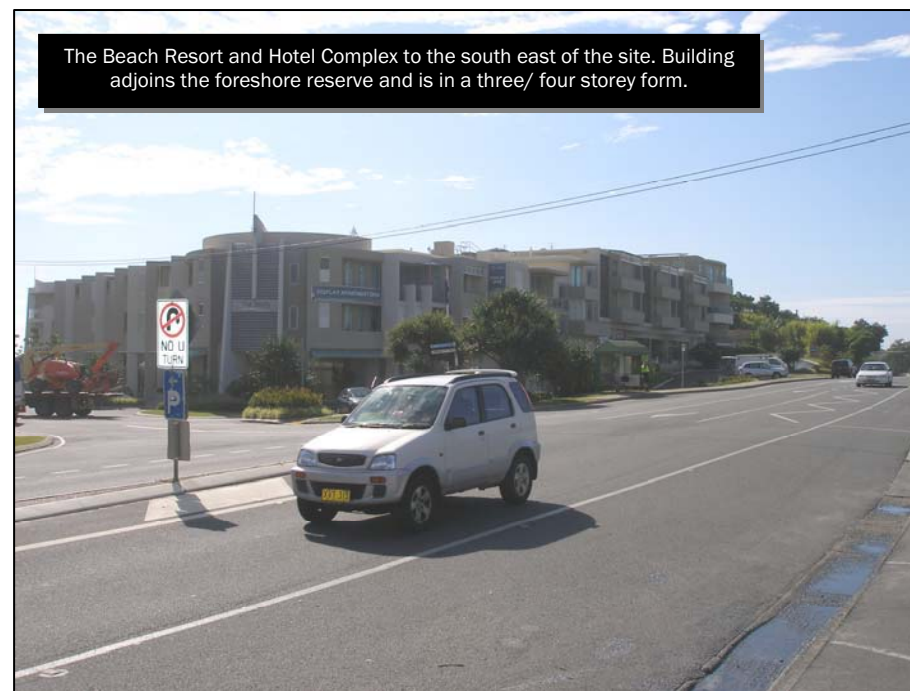
The subject site as seen from Tweed Coast Road – Existing development comprises newsagency, service station and workshop and motel with café.



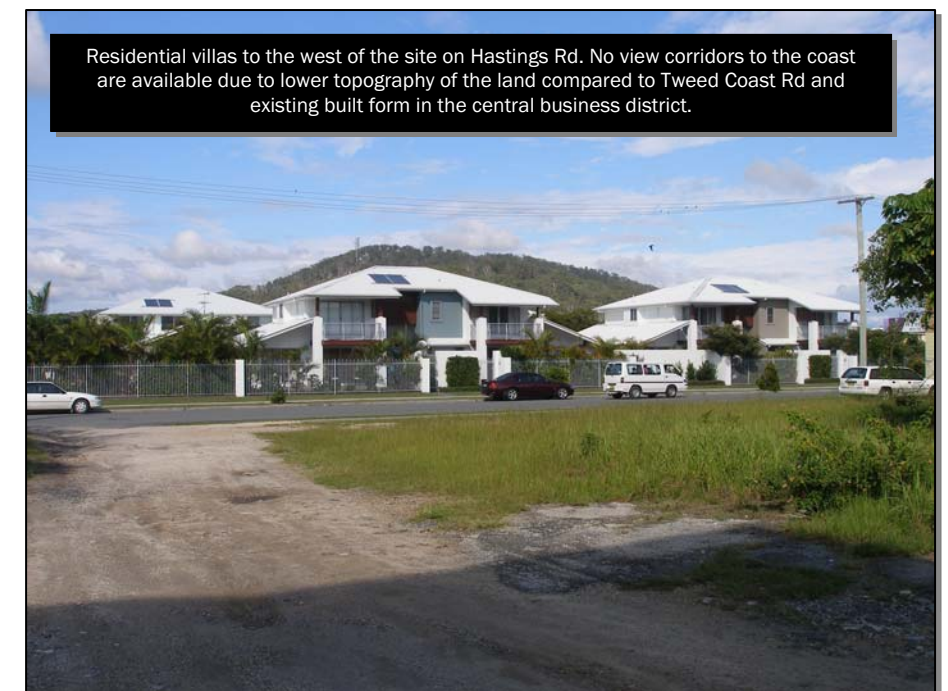
Existing Mixed Use development on the corner of Pandanus Parade and Tweed Coast Rd opposite the site.



The adjacent Breakwater Views Apartments – Mixed use development in three/ four storey form due to height variation between Tweed Coast Rd and Hastings Rd.



The Beach Resort and Hotel Complex to the south east of the site. Building adjoins the foreshore reserve and is in a three/ four storey form.



Residential villas to the west of the site on Hastings Rd. No view corridors to the coast are available due to lower topography of the land compared to Tweed Coast Rd and existing built form in the central business district.

Appendix

C

SEPP No.1 Objection

State Environmental Planning Policy No.1 provides for the mechanism by which variation to 'statutory' development standards can be both assessed and supported.

Relevantly, the policy provides for the following:-

Clause 3 of the policy states, inter alia:

"3. This policy provides flexibility in the application of planning controls operating by virtue of development standards in circumstances where strict compliance with those standards would, in any particular case, be unreasonable or unnecessary or tend to hinder the attainment of the objects specified in Section 5(a)(i) and (ii) of the Act."

The specified objects of the **Environmental Planning and Assessment Act, 1979** state inter alia:-

"to encourage:

- (i) the proper management, development and conservation of natural and man-made resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment,*
- (ii) the promotion and co-ordination of the orderly and economic use and development of land".*

Clause 6 of the policy states, inter alia:-

"6. Where development could, but for any development standard, be carried out under the Act (either with or without the necessity for consent under the Act being obtained therefore) the person intending to carry out that development may make a development application in respect of that development, supported by a written objection that compliance with that development standard is unreasonable or unnecessary in the circumstances of the case, and specifying the grounds of that objection".

Section 79C(1)(a)(ii) of the Act provides for the requirement that the consent authority must take into account any draft environmental planning instrument that has been placed on exhibition of which it has been notified. In this regard, the SEPP 1 Policy has been prepared and exhibited.

It is pertinent to note that Draft Amendment No. 1 states that a SEPP No. 1 Objection must include:

- (a) a written objection that compliance with the development standard is unreasonable or unnecessary in the circumstances of the case, and which specifies the grounds of the objection, and*
- (b) evidence which demonstrates that the development will be consistent with any express aims or objectives of any environmental planning instrument (including this policy) applying to the development.*

Accordingly, this objection pursuant to SEPP No.1 is made with regard to the adopted and draft versions of SEPP No.1. The objection is in respect of the planning standard identified within Clause 16 of the Tweed Local Environmental Plan 2000, specifically seeking variance to the three (3) storey development standard prescribed for the site.

Clause 7 of SEPP 1 provides the discretion and power to a consent authority to support SEPP No. 1 Objections and grant development consent. This clause states inter alia:-

"7. Where the consent authority is satisfied that the objection is well founded and is also of the opinion that granting of consent to that development application is consistent with the aims of this Policy as set out in Clause 34, it may, with the concurrence of the Director, grant consent to that development application notwithstanding the development standard the subject of the objection referred to in Clause 6."

Accordingly, the applicant seeks the support of the Shire Council in respect of the **SEPP No. 1 Objection** set out herein and requests that the **Development Application** be approved, notwithstanding non-compliance with the standard prescribed within Clause 16 of the Tweed Local Environmental Plan 2000.

EXTENT OF STATUTORY VARIATION

Within Appendix A of this document are diagrams depicting the horizontal extent of the building that can be statutorily defined as 4 storeys. Council's attention is drawn to Sections A, B and D which depict the natural ground line. The upper level units 20 - 23, the western component of Units 1 - 6 and 10 - 12 are considered to be four storey components. Specifically the four storey components of the development relates to where the land steps down from Tweed Coast Road to Hastings Road. Earthworks and retaining over the past 40 years have altered the natural landform in this area, and in some instance this step down relates to the specific location of retaining walls and the like.

The area of encroachment largely relates to the upper level of residential apartments to the rear of those fronting Tweed Coast Road.

This represents approximately one third of the buildings external length on the total southern elevation which is defined as four stories. Justification for the variation sought is discussed later in this submission.

Please refer to the submitted drawings prepared by Rice Daubney Architects.

ASSESSMENT OF APPLICATION FOR VARIATION

The appropriate manner of dealing with a SEPP 1 objection is found in the judgment of Lloyd J in *Winten Property Group Limited v North Sydney Council* (2001) NSWLEC 46, where a number of questions are posed. These are addressed below.

DEVELOPMENT STANDARD

The first question in *Winten* asks whether the subject planning control is a development standard.

The relevant controls are set out in Clause 16 of the Tweed Local Environmental Plan 2000 which states, inter alia:-

16 Height of buildings

(1) Objective

- ***to ensure that the height and scale of development is appropriate to its location, surrounding development and the environmental characteristics of the land.***
- (2) Consent must not be granted to the erection of a building which exceeds the maximum height or number of storeys indicated on the Height of Buildings map in respect of the land to which the application relates.***
- (3) If an application for development consent made to the consent authority prior to the commencement of Tweed Local Environmental Plan 2000 (Amendment No 46) is not determined by the consent authority before that date:***

- (a) the amendments made to Schedule 1 to this plan by Tweed Local Environmental Plan 2000 (Amendment No 46) do not apply to the determination of the application, and
- (b) the application is to be determined under this plan as if those amendments had not been made (that is, having regard to the definitions of **height** in relation to a building and **storey** in force under this plan immediately before that commencement).

Unlike many other development standards, the objective supporting the prescribed requirements of Clause 16 are defined and outlined above in bold type.

The control in relation to number of storeys is clearly a development standard.

OBJECTIVES OF THE STANDARD

The second question in **Winten** asks what is the underlying object or purpose of the standard.

The matters relating to the objectives of a Planning Standard are the most fundamental element to the proper consideration of a SEPP No. 1 Objection. The importance in this regard was identified by the NSW Land & Environment Court by Justice Talbot (Lavender View Regency Pty Ltd – v – North Sydney Council, unreported) in which he states, inter alia:-

“When considering an objection made pursuant to SEPP 1, it has been well established that it is necessary to have regard to a number of matters. Firstly, the aim and objective of the development standard must be understood. Once that has been appreciated, the effect of the non-compliance upon the purpose of the development standard needs to be assessed. The assessment takes account of whether the aim and objective will be achieved notwithstanding that the standard will not be complied with. In other words, it is not the standard itself that is important, but rather it is the purpose which it is designed to achieve. The circumstance of the case that renders the imposition of a development standard unreasonable or unnecessary is that the development will nevertheless meet the identified planning purposes of the standard”.

“the purpose of the standard may be determined from the planning instrument or from an examination of the planning considerations which led to its formulation”.

JUSTIFICATION FOR VARIATION OF THE STANDARD AND MATTERS FOR CONSIDERATION

The objective providing foundation for the three (3) storey height limit affecting the subject site states, inter alia:-

- **to ensure that the height and scale of development is appropriate to its location, surrounding development and the environmental characteristics of the land.**

As discussed above and confirmed by judgments supported by the Land & Environment Court, the ability of a proposal to attain the objective of the standard and its intent are fundamental to the appropriateness of applying the standard in the first instance. We note therefore that the variation requested is done so with particular reference to the content and wording of the objective to the standard. Accordingly, we have broken down the request for variation in to three (3) specific headings, each of which is identified within the objective proper.

An analysis in this context has been carried out as follows:-

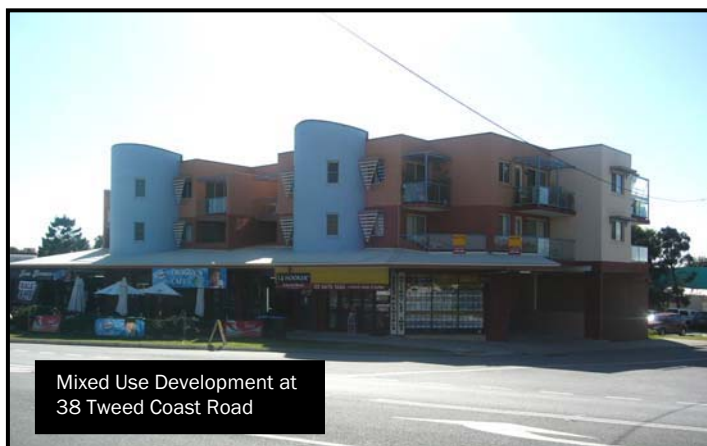
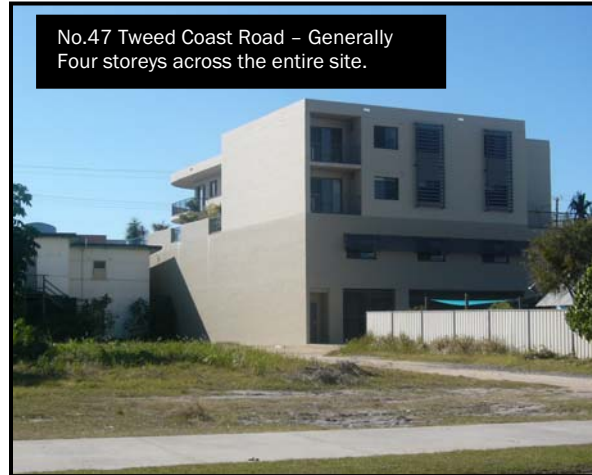
Is the development appropriate to its location and surrounding development??

It is contended that the development responds in the positive in relation to this question. In this regard, the key elements to consider are defined as follows:-

1. What is the character of the locality;
2. What elements form or shape development in the locality;
3. Will the development appear out of character with surrounding development; and
4. Will the development translate into excessive or avoidable impacts?

With reference to the above objective, it is noted that the site is located within the 3(b) General Business Zone, in which the objectives of the zone encourage mixed use development with residential and tourist accommodation above ground floor commercial development. The site is also nominated under DCP 2007 Section B19 Bogangar/ Cabarita Beach Locality Plan and again the objectives governing the site indicate mixed use development as a suitable form of development.

Development within the locality is mixed with older sites being redeveloped in a manner consistent with Council's planning controls. Recent proposals which have been completed include the Cabarita Resort redevelopment (which incorporated elements of four (4) stories), the adjacent Breakwater Views Building at 47 Tweed Coast Road (which provided for four stories), and the Mixed Use residential/ commercial development at 38 Tweed Coast Road (which also incorporated four stories). Whilst the form of each of these developments varies, it is important to note that Council has acknowledged that the slope within the area is such that strict compliance is not only difficult, but given the form of existing developments, would also be out of character with the surrounding built form.



The future character of the area will largely be dictated by both the continued development of mixed use forms, however in terms of scale, the future character will be more likely defined by the provisions of DCP 2007 – Section B19 which encourages mixed use development in the Tweed Coast road and the Hastings Road

Precinct. It is anticipated as additional sites along Tweed Coast Road are being developed, they will be designed with street level shop fronts with two levels of residential units above (as proposed here), with car parking in one or more levels at the lower level. Given the narrow strip available before the land drops off towards Hastings Road, it is not a stretch to assert that all new developments along Tweed Coast Road will continue to provide for four storey components.

Other matters of note in relation to the suitability of the development within the character of the area and importantly its impact upon surrounding residents and buildings alike, are as follows:-

1. Compliance has been demonstrated with the requirements of Section B19 of DCP 2007 relating to the interface for the development with adjacent public areas;

2. The proposal physically presents as a compliant three (3) storey form to Tweed Coast Road and Hastings Road;
3. The fourth storey elements of the development will not be visible from public land and therefore difficult to depict or visualise, let alone be nominated as an area of non compliance;
4. The bulk of the building is one that includes substantial vertical articulation as the building steps down the site.

Cabarita Hotel Redevelopment – comprises 4 storey elements due to topography.



5. Recently approved and constructed buildings within Cabarita and elsewhere along the Tweed Coast incorporate a form of three (3) storeys or more. The latter has a significant bearing on the character of the area as it currently stands and can only lead to the conclusion that the proposal, with its minor 4 storey elements, will not be inconsistent with the current or future character of the locality.
6. The topography of Cabarita Beach is such that the areas to the rear and back towards the western fringe of the village, will not have any impacts imposed upon them in respect of view loss, visual obstruction (particularly as removal of the rear upper level units would only result in their replacement by the front upper level units.
7. The offending section of the building relates to the upper level units overlooking the central residential courtyard. These units do not have any impact upon surrounding properties nor do they add to any adverse imposition on the Hastings Road (given their setback) or Tweed Coast Road frontages, rather they will act so as to assist in implementing and facilitating a vibrant and active addition to the Cabarita CBD area by way of permanent residents who are able to interact with both proposed and existing commercial enterprises. The latter is a particularly important element as it represents a clear and direct consistency with the objectives of the Cabarita DCP, the urban consolidation policies of the State Government and the wishes of the Cabarita Business community.

Is the proposal appropriate to the environmental characteristics of the land?

The form of the proposed development and indeed the introduction of the four (4) storey element is directly related to the slope of the land. In this regard, the proposed site falls away sharply from Tweed Coast Road towards Hastings Road. This area is to be utilised as a basement car park. The narrow depth from Tweed Coast Road to the rear drop off point renders this fact as effectively unavoidable.

The basement could be pushed further into the ground and therefore the building lowered to ensure a greater degree of compliance with the height controls, however this will result in further problems as the shop fronts would not be level with the street frontage of Tweed Coast Road and the facilitation of a large 'supermarket' floor plate would be Impossible. In particular the design of the development is to encourage pedestrian interaction, and any step down from the footpath into the commercial tenancies would result in problems of compliance with the Building Code of Australia and the Disability Discrimination Act, let alone a practical implementation of the streetscape and vibrancy objectives of the DCP.

In terms of the urban or built environment the proposed fourth storey does not adversely impact upon surrounding residents to the west in Hastings Road from overshadowing, loss of sea views, privacy or amenity. This is in part due to the topographical characteristics of the site and adjacent properties in Tweed Coast Road and the spatial separation afforded between the development and these properties by Hastings Road. Furthermore the height of the residential units opposite the site in Hastings Road are two storey in nature and at present have no access to ocean views or the like to the east.

CONSISTENCY WITH AIMS OF SEPP1

The third question in Winten asks whether compliance with the development standard is consistent with the aims of SEPP 1. The aims state:

'This policy provides flexibility in the application of planning controls operating by virtue of development standards in circumstances where strict compliance with those standards would, in any particular case, be unreasonable and unnecessary or tend to hinder the attainment of the objects specified in section 5(a)(i) and (ii) of the Act.'

This question also asks does compliance with the development standard tend to hinder the attainment of the objects specified in s 5(a)(i) and (ii) of the EPA Act. These objects state:

The objects of this Act are:

- to encourage - the proper management, development and conservation of natural and artificial resources, including agricultural land, natural areas, forests, minerals, water, cities, towns and villages for the purpose of promoting the social and economic welfare of the community and a better environment;
- the promotion and coordination of the orderly and economic use and development of land.

It is submitted the proposal will have a positive social and economic impact upon the community, and will not generate deleterious impacts upon natural areas, waterways and the environment. The proposal will result in the orderly and economic development of a property which is currently best described as an underutilised commercial land. It is also submitted the development will make a positive contribution to Hasting Road, whilst the shopping opportunities to be provided (eg major supermarket, specialty retail stores etc) will cater for the retail needs of the local Cabarita Beach/ Bogangar community, and the wider population along the Tweed Coast.

Importantly the proposed variation sought will not seek a dangerous precedent nor compromise the intent of Council's planning controls having regard to the adjacent building at 47 Tweed Coast Road, the Beach Resort opposite the site, and the recent approval for a mixed use development on the corner of Tweed Coast Road and Rosewood Avenue (See DA06/0800), each of which were importantly related to the topography of the site and an intent to facilitate a revitalisation of the Cabarita CBD area.

It is concluded that strict compliance with the development standard is unreasonable and unnecessary in this instance and a variation under State Environmental Planning Policy No.1 to the height limit is warranted.

• • • • •

Appendix

D

Preliminary Geotechnical

Appendix

E

Stormwater Assessment / Traffic Assessment and Infrastructure Report

WA STOCKWELL PTY LTD

ENGINEERING IMPACT ASSESSMENT

FOR PROPOSED MIXED USE DEVELOPMENT

TWEED COAST ROAD

CABARITA NSW

OPUS QANTEC McWILLIAM



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DECEMBER 2007

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APPENDIX A

STORMWATER MANAGEMENT PLAN



1. INTRODUCTION

WA Stockwell Pty Ltd has commissioned OPUS QANTEC McWILLIAM to prepare a report on the engineering impacts of a mixed use development at Tweed Coast Road, Cabarita. This assessment forms part of a Development Application prepared by others and is to be read in conjunction with that application.

The assessment addresses the following issues:

- Traffic, parking & access
- Earthworks and Erosion Control
- Stormwater Drainage Management including Erosion Control & Water Quality
- Water & Sewer Demand requirements

2. PROPERTY DESCRIPTION

The property description is Lots 20 - 23 on DP 31208, Tweed Coast Road and Lots 184 - 187 on DP 259164 and 191 - 194 on DP 259164, Hastings Road in the Shire of Tweed. The total site area is approximately 5487m².

3. DEVELOPMENT LOCATION

The site is located between Hastings Road and Tweed Coast Road, Cabarita. The locality is shown in Figure 1.0. The location is bounded by Hastings Road to the west, Tweed Coast Road to the east, Banksia Avenue to the south and Rosewood Avenue to the north.

4. EXISTING SITE FEATURES

Most of the site grades in the west direction towards Hastings Road. The developed buildings on Lots 20 – 23 grade to gully pits within Tweed Coast Road. Levels range from approximately RL 7.50 AHD along the frontage of Lots 20-23 to RL 3.44 AHD along the frontage of Lots 191 – 194. For Lots 184 – 187 the levels are approximately RL 4.0 AHD at the rear and grade to approximately RL 3.0 at the frontage.

Lots 191 – 194 of DP 259164 are vacant and have frontage to Hastings Road. Within these Lots there is scattered vegetation and grass cover. There is an existing 4m wide gravel driveway that enters into Lot 194 and extends to the rear. It varies in width from Lot 194 to Lot 191. At the rear of the Lots 191 - 194 is a 3m wide right of carriageway. Lots 20 - 23 of DP 31208 are developed and have frontage to Tweed Coast Road. Lot 20 has a highset 1 & 2 storey brick & rendered building with a 6m wide concrete driveway. The buildings are known as Cabarita Beach House Motel and Rusty's Pizzas. Access is via a 5m stencilled concrete driveway. Lot 21 and 22 has a 2 storey brick building and is known as Cabarita Beach Servo. Access is via two bitumen driveways approximately 8m wide. On the frontage of Cabarita Beach Servo is parking for two cars which has a limit of two hours. Lot 23 has a fibrous cement & brick building and is known as Bogangar Newsagency. There are 9 car parks on the frontage of the Bogangar Newsagency. Lots 184 - 187

on DP 259164 are vacant and have frontage to Hastings Road. The site has grass cover throughout and has a 3m wide right of carriageway at the rear of the property. Tweed Coast Road and Hastings Road both have gully pits within (ie 100m) the frontage of the Lots for stormwater drainage. The site is indicated in Photo Plate 1. The existing features are shown on Figure 2.0.



PHOTO PLATE 1

SITE - Source: Google Earth

5. DESCRIPTION OF PROPOSAL

The proposal is a mixed use development and will incorporate a supermarket, retail stores, kiosk stores and residential units. The proposed development comprises of a basement level, mezzanine level, ground level and 2 upper levels. The basement has a total number of 93 car parks of which 37 are designated for the residential units. The mezzanine level contains 79 car parks and the ground level 42. The ground level has speciality retail stores with a combined floor area of 1008m², kiosks with a total floor area of 72m² and a supermarket with a floor area of 2394m². The first and second level is above the supermarket and speciality stores. These levels contain 23 residential units. There are currently 5 different types of units within these two levels. Type A unit is a two bedroom double story unit. There are 7 type A units. Type A1 unit is a two bedroom double story unit. There are 2 type A1 units. Type B unit is a single story two bedroom unit and there are two, one on each floor. Type B1 unit is a single story two bedroom unit and there are four, two on each

floor. Type C unit is a single story two bedroom unit and there are eight, four on each floor. The proposed development layout is shown on Figure 3.0.

6. TRAFFIC, PARKING AND ACCESS

6.1 EXISTING TRAFFIC ENVIRONMENT

6.1.1 ROAD NETWORK AND HIERARCHY

Tweed Coast Road is classified as an Urban Arterial and Hastings Road is classified as an Urban Collector, as defined in Tweed Shire Local Traffic Data Counts. Hastings Road runs parallel with Tweed Coast Road and the site has frontage to both roads. Hastings Road intersects with Tweed Coast Road via a roundabout south of the site. There are four streets that link Tweed Coast Road and Hastings Road. They are Tamarind Avenue, Rosewood Avenue, Banksia Avenue and Towners Avenue. The closest linking roads to the site are Rosewood Avenue and Banksia Avenue located north and south. Banksia Avenue is classified as an Urban Local road and Rosewood Avenue is an Urban Distributor by Tweed Council. Both Banksia and Rosewood Avenue are two lane bitumen sealed roads. Rosewood Avenue to the west becomes Clothiers Creek Road and has access to the highway. Figure 4.0 illustrates the road network.

6.1.2 EXISTING ROAD GEOMETRY

Hastings Road is a two-lane bitumen sealed road approximately 12m wide with kerb and gutter. The designated speed is 50 kph. On the frontage of Lots 191 – 194, Hastings Road grades to the northern and southern direction. A high point in front of Lot 192 (RL 3.22 AHD) grades north to RL 3.21 AHD (in frontage of Lot 191) and grades south to RL 3.06 (in frontage of Lot 194). On the frontage of Lots 184 – 187, Hastings Road grades to the north from RL 2.83 AHD (in the front of Lot 187) to RL 2.50 AHD (in the front of Lot 184).

Tweed Coast Road is a two-lane bitumen sealed road approximately 18m wide with kerb and gutter. The designated speed of Tweed Coast Road is 50 kph where the site is located. On the frontage of the site Tweed Coast Road has a shoulder which enables cars to park for a limited 2 hours. In front of Lot 23 there is angle car parking for 9 cars. An open concrete dish drain exists between the shoulder and the angled 9 car parking. A pedestrian crossing exists between Lots 22 and 23. A designated right turn exists in front of Lots 20 -23 to have access to Palm Avenue. Vehicular access to the site across Tweed Coast Road (travelling in the south bound direction) is restricted. Access is gained only from travelling north bound. On the frontage of Lots 20 – 23, Tweed Coast Road grades to the north from RL 7.38 AHD (in the front of Lot 23) to RL 7.09 AHD (in the front of Lot 20). Photo Plate 2 shows the view of Hastings Road frontage to Lots 191 - 194, Photo Plate 3 shows the view of Hastings Road frontage to Lots 184 – 187 and Photo Plate 4 shows the view of Tweed Coast Road frontage to Lots 20 – 23.



PHOTO PLATE 2
HASTINGS ROAD FRONTAGE
(LOTS 191 – 194)



PHOTO PLATE 3
HASTINGS ROAD FRONTAGE
(LOTS 184 – 187)



PHOTO PLATE 4
TWEED COAST ROAD FRONTAGE
(LOTS 20 – 23)

6.1.3 EXISTING TRAFFIC VOLUMES

Traffic data listed in the Tweed Shire Council Website for Hastings Road south of Rosewood Avenue is summarised in Table 6.1.3.(i) below. Similarly data obtained from Tweed Shire Council Website for Tweed Coast Road at the intersection of Barclay Drive and Coronation Avenue (the two closest data counts near the site) can be seen in table 6.1.3. (ii) and 6.1.3(iii). Rosewood Avenue and Banksia Avenue will both influence traffic volumes for the proposed mixed development. The existing traffic volumes can be seen in table 6.1.3 (iv) and table 6.1.3 (v)

Table 6.1.3.(i) - Tweed Shire Council Traffic Volumes – Hastings Road

Date	Volume (vpd)
9/08/2006	932
24/03/2004	716
23/10/1998	810

Table 6.1.3.(ii) - Tweed Shire Council Traffic Volumes – Tweed Coast Road off Barclay Drive

Date	Volume (vpd)
2/01/2007	9036
9/03/2006	9088
4/01/2006	9464

Table 6.1.3.(iii) - Tweed Shire Council Traffic Volumes – Tweed Coast Road off Coronation Avenue

Date	Volume (vpd)
17/05/2006	3893
18/04/2004	3421
13/02/2003	2773

Table 6.1.3.(iv) - Tweed Shire Council Traffic Volumes – Rosewood Avenue

Date	Volume (vpd)
16/08/2006	2608
24/03/2004	3216
3/03/2003	1868

Table 6.1.3.(v) - Tweed Shire Council Traffic Volumes – Banksia Avenue

Date	Volume (vpd)
3/11/2005	755
17/03/2003	1195

6.1.4 EXISTING ACCESS

Access to Lots 191 - 194 is via a 4m wide driveway located on the frontage of Lot 194. There is no direct access off Lots 184 – 187. Access to Lot 20 is via a 5m wide concrete driveway. Access to Lots 21 and 22 is via two 8m wide bitumen driveways. There are no access driveways to Lot 23 however there is angle car parking at the frontage for 9 cars.

A 3m wide right of carriageway exists on the site. The carriageway provides access to Lots 189 (DP 259164), 190 (DP 259164), 5 (DP 1102016) and 2 (DP 772172).

6.1.5 EXISTING PUBLIC TRANSPORT

There is a bus stop located within walking distance (ie 10m) to the site. The bus stop is located south of Lot 23 on Tweed Coast Road. There is a bus stop on both sides of Tweed Coast Road directly opposite each other. The bus route runs from Tweed Heads to Pottsville Waters. A bus arrives and departs every hour in either direction.

6.1.6 EXISTING PEDESTRIAN ACCESS

A pedestrian access exists in front of Lot 23. It is the only crossing on the Tweed Coast Road within the main Cabarita business district.

6.2 PROPOSED TRAFFIC ENVIRONMENT

6.2.1 TRAFFIC GENERATION

The proposed development is expected to generate the following amount of annual average vehicles per day (vpd) based on Section 3.6.1 of the Guide to Traffic Generating Development (RTA, 2002) and Table 7.1 Tweed Road Road Contribution Plan No 4.

Table 6.2.1 - Traffic generation – RTA

Component	Quantity	Daily Rate	Hourly Rate	TRAFFIC GENERATION	
				Daily vehicles (vpd)	Peak hourly (vph)
Supermarket	2403.89m ²	1.475	0.147	3545.7	353.3
Speciality Retails/ Kiosks	1080.07m ²	0.555	0.107	599.3	115.5
Total (includes a multi-purpose trip reduction rate)	25%			2487	249
Component	Quantity	Daily Rate	Hourly Rate	TRAFFIC GENERATION	
				Daily vehicles (vpd)	Peak hourly (vph)
Proposed Units	23 Units	4	0.4	92	9.2
Total				92	9.2
Mixed Used Development Total				3408	384.2

Table 6.2.2 - Traffic generation – Tweed Road Contribution Plan Table 7.1

Component	Quantity	Daily Rate	Hourly Rate (10% of daily)	Modification Factor	TRAFFIC GENERATION	
					Daily vehicles (vpd)	Peak hourly (vph)
Supermarket/ Speciality Retails/ Kiosks	3483.96m ²	200 + 0.8(A)	20 + 0.08(A)	0.38	1135	114
Proposed Units	23 Units	3.9	0.39		90	9
Mixed Used Development Total					1225	123

The values in Table 6.2.2 can be applied to regional traffic for the purpose of calculating contributions whilst those in Table 6.2.1 are for localised impacts. There is clearly a significant difference between the two tables and we consider the localised impacts to be conservative.

6.2.2 PROPOSED ACCESS

Proposed access to the site will be from Hastings Road in three locations. The first access driveway will enter under the supermarket. This access will utilise the existing driveway located on Lot 194. It is proposed that the driveway will be used by delivery vehicles. The minimum design standard for this access driveway is required to be in accordance to Figure 3.1 of AS 2890.2:2002 Parking Facilities. This detail would be provided as part of the driveway application. Turning templates were used to evaluate the turning paths of heavy rigid vehicles. A minimum of 300mm is specified for manoeuvring clearances within a service bay. A heavy rigid vehicle 12.5m in length did meet the required minimum 300mm clearance for turning manoeuvres within the site (Refer Figure 5.0). The minimum height required for heavy rigid vehicles to enter into the loading bay is 4.5m as specified by AS 2890.2:2002. The minimum height for cars is 2.3m.

The second driveway will enter and grade up to the proposed 79 car parks on the mezzanine level. The third driveway will access the proposed 42 car parks. The entry is located on the frontage of Lot 187. The driveway will enable vehicular circulation. The minimum design standard for these access driveways is required to be in accordance to Table 3.2 of AS 2890.1:2004 Parking Facilities.

The minimum sight distance required under the Design Specification D1 is 40m in a 50 kph speed environment. The minimum desirable sight distance recommended in Figure 3.3 of AS 2890.2:2002 Parking Facilities is 69m. The minimum Stopping Sight Distance (SSD) is 45m. From the OPUS QANTEC McWILLIAM site visit in November 2007 it was determined that for the first driveway the sight distance is greater than 100m to the left and approximately 93m to the right. The sight distance for the second driveway the left is greater than 100m and approximately 70m to the right. The sight distance for the third driveway is approximately 50m to the left and greater than 100m to the right. Further sight distance to the left for the third driveway would be achieved by the trimming back of existing vegetation on the verge. The proposed driveway locations comply with the Tweed Shire Design specification and the Australian Standard AS 2890.1 and 2890.2 for sight distance in both directions.

Vehicles using the 3m wide right of carriageway as mentioned in section 6.1.4 currently use the existing 4m gravel driveway on Lot 194. Access to Lots 189 and 190 can use the proposed easement on Lot 187, which is the entrance for the proposed 47 car parks. For Lot 2 (DP 772172) access can be obtained from Tweed Coast Road. Access fro Lot 5 (DP 1102016) can be obtained from a bitumen driveway on DP 831562. Shared permission must be granted to use this right of carriageway.

Access to the basement car park will not be approved by Council unless the design level is 500mm above the 100 year design flood level, Development of flood liable land – Section A3 (DCP A3). The adopted design flood level for the Bogangar area is 3.4m AHD. We have

assessed two possible options to prevent flooding into the basement car park. The first option is to install a hydraulic flood door that will rise up to a height of RL 3.9m AHD. The second option is to continue grading the 1:8 ramp from the basement car park to RL 3.9m AHD. Prior to Hastings Road being inundated via a 100 year flood event, centre management would have to empty the vehicles out of the basement car park. Water in the basement will discharge via the proposed sump pump. The proposed protection is illustrated in Figure 7.0.

6.2.3 CONSTRUCTION TRAFFIC

During the construction phase, heavy vehicle traffic could be expected. This would comprise of earthmoving equipment, construction plant and builder's vehicles. Excavation of material for the basement is required for the proposed development on Lots 191 – 194 and 20 - 23. The area to be excavated has a surface of approximately RL 3.62m AHD. The basement will have a finished level of RL 1.8m AHD. The average depth of excavation will be approximately 2.13m over an area of approximately 4000m². Based on the approximately 8520m³ (solid volume) of cut material required to be exported, a bulking factor of 20% and a 20m³ capacity truck, approximately 1022 vehicle trips (two-way) would be required.

Impacts resulting from the traffic generated by construction would be mitigated by the location of the site in close proximity to the main road Tweed Coast Road. Contributions toward the impacts on pavement life as a result of exportation of cut material would be levied from the proposed development under Section 94 Plan No. 4 Tweed Road Contribution Plan.

6.2.4 PARKING

Tweed Shire Council Development Control Plan Section A2 Table 4.9 specifies the required number of car spaces for a given development. For our calculations we have classified the elements of the development as follows:

Table 6.1 – Required Parking

*** HRV – Heavy Rigid Vehicle**

Development	Quantity	Rate	ESD Reduction ref sect 2.4.1 of DCP S A- 2	No. of car parks required	No. HRV parks required	No. Bicycle spaces required
shops	3484 m ²	4.4/100m ² Staff 1/100m ² HRV 1/1500m ² Bicycle 2/ first 100m ² after 1/200m ²	0.8	122.6 27.9	2	19
Residential Units	23 Units	1.5 per 2 bedroom unit 1 / 4 units visitors Bicycle 2/Unit (class 2 AS 2890.1)		34.5 5.8		46
Total spaces required (rounded up)				191	2	65

We calculated that the residential units require 40 car parks and public parking for the retail stores 151 car parks after allowing for a 20% reduction as stated in Tweed Council DCP section A -2 Part 2.4.1. We calculate the total number of car parking spaces required is 191. The proposed development has provision for 37 secure residential car spaces for the units and a total of 177 car spaces for public/customer parking giving a total of 214. Twenty-two of the residential parking spaces are in the form of Tandem parking for 11 Units. This leaves 15 spaces for 12 units which is at least one space / unit and the potential for 3 visitor parks. We consider this arrangement is satisfactory. Visitor parking is proposed within the general public parking and outside the secure area. This also is a reasonable arrangement in a mixed use development where designated reserved visitor space would be difficult to control.

Two heavy rigid vehicle (HRV) spaces are required for the shops. There are two on-site HRV loading bays provided.

A total of 65 bicycle parks are required by Tweed Shire Council for the mixed use development. This exceeds the recommendations in Table 10.1 of Austroads Guide to Traffic Engineering Practice Part 14 Bicycles. We have calculated the number of spaces required under that Guide as 17 for the shops and 8 for the residential component. We are of the opinion this represents a more reasonable number.

Parking for the development satisfies Tweed Shire Council parking requirements.

6.2.5 TRAFFIC IMPACTS AND MITGATING MEASURES

Traffic volumes on Hastings Road, Rosewood Avenue and Banksia Avenue are detailed in table 6.2.5 below. Tweed Shire Council traffic counts shown on Figure 4.0 indicates that the dominate traffic flow is to the north (Rosewood Avenue and Tweed Coast Road). The proportion of traffic counts to the north of the site was compared to the proportion of traffic counts to the south of the site. Traffic from the site will be split 70% to the north and 30% to the south on Hastings Road. Traffic distribution on Rosewood Avenue and Banksia Avenue assumes traffic will split left, right or continue straight on Hastings Road. Traffic flow from the development is illustrated in Figure 4.0.

Table 6.2.5 – Traffic for mixed use development

	Existing AADT	Traffic Distribution (Peak Hour)	Traffic Distribution (AADT)	Traffic distribution from site (%)	Increased AADT
Hastings Rd	932	308	3077	100	4009
Rosewood Ave	2608	173	1723	56	4331
Banksia Ave	1195	74	739	24	1934
Tweed Coast Rd (South of Cabarita)	6900 (Table 2.4 of Tweed Road Development Strategy)	182	1816	59	8716

Hastings Road is classified as an Access Street. The indicative maximum traffic volume of Hastings Road from Design Specification D1 is 8,000 vehicles per day. The current traffic on Hastings Road based on Tweed Shire Council traffic volumes is 932 vehicles per day. This is approximately 11.65% of the functional road capacity. The proposed mixed development will increase Hastings Road traffic to 4009 vpd. This is an increased road functional capacity of approximately 50.11%. The expected impact of 3077 additional vehicles per day on Hastings Road is not significant in contrast to the design capacity of 8000 vehicles per day and can be considered as part of ultimate growth. This is within Council's specified functional capacity.

Rosewood Avenue is classified as an Urban Distributor. The indicative maximum traffic volume of Rosewood Avenue from Design Specification D1 is 7,000 vehicles per day. The current traffic on Rosewood Avenue based on Tweed Shire Council traffic volumes is 2608 vehicles per day. This is approximately 37.25% of the functional road capacity. The proposed mixed use development will increase Rosewood Avenue traffic to 4331 vpd. This is 61.87% of the functional capacity. The expected impact of 1723 additional vehicles per day on Rosewood Avenue is within the design capacity and is within Councils specified functional capacity.

Banksia Avenue is classified as an Access Street. The indicative maximum traffic volume of Banksia Avenue from Design Specification D1 is 3,000 vehicles per day. The current traffic on Banksia Avenue based on Tweed Shire Council traffic volumes on 03/11/2005 is 755 vehicles per day. We have used Tweed Shire Council traffic counts from the 17/03/2003 (1195 vehicles per day) as a conservative evaluation. This is approximately 39.83% of the functional road capacity. The proposed mixed use development will increase Banksia Avenue traffic to 1934 vpd. This is approximately 64.46% of the functional road capacity. The expected impact of 739 additional vehicles per day on Banksia Avenue can be considered as part of ultimate growth and will cater for the mixed use development.

7. EARTHWORKS AND EROSION CONTROL

7.1 EARTHWORKS

7.1.1 PROPOSED EARTHWORKS

Earthworks will primarily involve excavating Lots 191 – 194 and 20 – 23 to achieve the design basement levels. Works on Lots 184 – 187 will involve regrading to achieve the car park design levels. In addition, unsuitable materials (if present) will be removed and replaced as compacted fill. Approximately 8520m³ (solid volume) of cut material will be excavated to achieve the basement level design of RL 1.8m AHD.

7.2 EROSION CONTROL

7.2.1 EXISTING SITE

The existing site has part grass cover and part development. The subject site is relatively flat on the frontage of Hastings Road with a slight gradient towards the west. For the first 10m into the property frontage of Lots 20 – 23 the site grades steeply from RL 7.38 AHD to RL 4.39 AHD.

7.2.2 PROPOSED EROSION CONTROL

A number of measures or best management practices (BMP) should be implemented to reduce soil erosion and achieve discharge water quality in compliance with Tweed Shire Council Design Specification D7 Stormwater Quality.

The best management practices should be implemented according to the Department of Housing Manual 'Managing Urban Stormwater, Soils and Construction' (2004). These measures include hay bales, silt fencing and diversion channels which should be placed in accordance with the proposed management plan during both the construction and re-vegetation phases. Disturbed areas should generally be controlled to drain to these water features. It is good practice to divert upstream stormwater flow from undisturbed areas by use of diversion channels to limit the amount of stormwater flowing onto disturbed areas.

The approved design indicates that approximately 0.54 ha of disturbed area would be created by clearing and re-grading of the site. Design Specification D7 indicates that for disturbed areas of less than 1.0ha, provision of silt fencing or other sediment traps/barriers is satisfactory treatment and a sediment basin is not required. Figure 6.0 and Appendix A shows the erosion control measures for the proposed development.

7.2.3 IMPACT OF EROSION CONTROL

The implementation and maintenance of erosion control measures will result in manageable impacts on the downstream water system. The impact of transported sediment would be ameliorated by utilising the proposed sediment barriers.

8. DRAINAGE

8.1 EXISTING DRAINAGE

For Lots 185 – 188 stormwater drains to the kerb in Hastings Road. A gully pit exists on the frontage of the Lots and stormwater discharges into a 375mm diameter stormwater pipe. A stormwater pipe from Tweed Coast Road goes through the property boundary of Lots 184 and 185 to Hastings Road. For Lots 191 – 194 stormwater drains via an inlet pit (300mm diameter pipe) into a 375mm diameter pipe in Hastings Road. Stormwater also discharges from Lots 191 – 194 into the kerb of Hastings Road and into gully pits located north and south of the site. For the development on Lots 20 – 23 stormwater discharges to the kerb and into a gully pit located on the frontage of Lot 20. This gully pit drains via a 375mm diameter pipe through Lots 184 and 185 into Hastings Road. Existing drainage is shown in Figure 2.0.

Drainage calculations for the site catchment have been carried out using the Rational Method as described in the Queensland Urban Drainage Manual, Tweed Shire Design Specification D5 and Australian Rainfall & Runoff (1987).

The total area for the proposed building development is approximately 4024m² (Lots 20 – 23 and 191 – 194) and the total on ground parking area is approximately 1463m² (Lots 184 – 187). About 70% of Lots 20 – 23 and 191 – 194 are currently impervious area attributable to existing concrete slabs. For Lots 184 – 187 the vacant site is 100% is pervious. The existing runoff conditions for various recurrence interval storms are presented below in Tables 8.1.1 and 8.1.2. The time of concentration in accordance with Queensland Urban Drainage Manual (QUDM) is 15 minutes.

Table 8.1.1 - Existing Stormwater Runoff Rates – Lots 20 – 23 and 191 – 194

Storm ARI.	f _i	C ₁₀	I _{15 minute} (mm/hr)	A (ha)	Q (L/s)
5 yr	0.7	0.84	130.15	0.4024	116
100 yr	0.7	0.84	204.92	0.4024	231

Table 8.1.2 - Existing Stormwater Runoff Rates – Lots 184 - 187

Storm ARI.	f _i	C ₁₀	I _{15 minute} (mm/hr)	A (ha)	Q (L/s)
5 yr	0	0.7	130.15	0.1463	35
100 yr	0	0.7	204.92	0.1463	70

8.2 PROPOSED DRAINAGE NETWORK

The proposed 42 car parks on Lots 184 – 187 are graded such that surface drainage is intercepted by inlet pits and discharged via a piped system into a gully pit located in Hastings Road. The proposed drainage system can be seen in Figure 7.0.

The proposed building development will increase the impervious area from 70% to 95% and the proposed car parking development will increase the impervious area from 0% to 97%. The calculations presented in tables 8.2.1 and 8.2.2 are based on a 5 minute time of concentration.

Table 8.2.1 Proposed Stormwater Runoff Rates – Proposed Buildings

Storm ARI.	f_i	C_{10}	$I_{5 \text{ minute}}$ (mm/hr)	A (ha)	Q (L/s)
5 yr	0.95	0.89	198.97	0.4024	188
100 yr	0.95	0.89	306.48	0.4024	366

Table 8.2.2 Proposed Stormwater Runoff Rates – Proposed Car Park

Storm ARI.	f_i	C_{10}	$I_{5 \text{ minute}}$ (mm/hr)	A (ha)	Q (L/s)
5 yr	0.97	0.894	198.97	0.1463	69
100 yr	0.97	0.894	306.48	0.1463	134

Drainage calculations have been carried out using the Rational Method as described in (ARR) 1987. The proposed building will increase runoff from the site by approximately 63% for a 100 year storm event and the proposed 42 car park will increase runoff by approximately 52%. The increase in stormwater for the 42 car parks will be mitigated by conveying the runoff via underground piping to a gully pit in Hastings Road. The existing downstream drainage in front of Lot 185 has been calculated to produce approximately 250 L/s of stormwater for a 5 year ARI. The increase in stormwater from the proposed development will increase the stormwater runoff to approximately 356 L/s. The 450 diameter pipe has the capacity to convey the increased runoff from the mixed development. Stormwater for the proposed buildings and car park can be mitigated by diverting runoff to gully pits in Tweed Coast Road and Hastings road as described in Figure 7.0.

We conclude that the proposed development can drain to a legal point of discharge at various locations.

9. STORMWATER QUALITY

9.1 OPERATIONAL PHASE – TREATMENT

Tweed Council specify deemed to comply stormwater treatment requirements in Tweed Shire Council Design Specification D7 – Stormwater Quality. Where Roof Water is not mixed with surface runoff no pollution control device is required. A proprietary Gross Pollutant Trap, such as a

Humeceptor or equivalent may be suitable for treatment of runoff from the site for a 3 month ARI storm event as required by Tweed Shire Council Design Specification D7. For pollutants generated from exposed catchments, the deemed to comply requirements from Design Specification D7 is 11m³ storage volume per impervious hectare for a proprietary treatment device. This consists of 9m³ storage for sediments and 2m³ storage for oil and grease per impervious hectare. The performance of the device would achieve the performance criteria set by Tweed Shire Council, specified in the Tweed Urban Stormwater Quality Management Plan (2000). The required proprietary device sizing is given in Table 9.1.

Basement car parks are required to provide 0.5m³ combined oil and sediment storage/1000m² of covered pavement with a minimum requirement of 0.75m³. We recommend this oil and grit arrestor be designed in accordance with AS3500.3:2003 Plumbing and Drainage Code. It should be incorporated into the basement sump drainage with the discharge pumped to Tweed Coast Road gully pit.

A treatment device such as a corrugated plate interceptor is also required for the carwash bay. The waste from this device should be discharged to sewer as trade waste.

The proposed stormwater treatment layout is shown on Figure 7.0.

Table 9.1 - Proposed Stormwater Treatment

Area (m ²)	Sediment Storage Requirement (m ³)	Oil Storage Requirement (m ³)	Suitable Humeceptor Model
1463	1.31	0.29	STC 3

10. WATER RETICULATION

10.1 EXISTING WATER RETICULATION

An existing 100mm diameter water main is located on the frontage of the site on both Tweed Coast Road and Hastings Road. Figure 2.0 shows the existing water reticulation.

10.2 PROPOSED WATER RETICULATION

Tweed Shire Councils Design Specification D11 contains peak daily and instantaneous demands to be used as a guide for assessing the design demands for development projects. Tweed Shire Council Revenue Policy Fees and Charges 2007/2008 indicate that the peak daily demand for shops is 0.002ET per square metre, 0.015ET per square metre for food/takeaway stores and 0.6ET per dwelling for a 2 bedroom unit. The proposed water demand for the development is shown in Table 11.2 below.

Using Tweed Shire Council Design Specification D11

1 EP (Equivalent People) = 850 litres/day Peak Daily Demand

1 ET (Equivalent Tenement) = 3.2 EP

1ET = 2.72 kL/day Peak
= 0.15L/s Instantaneous

Table 11.2 - Water Reticulation Demands

Component	Quantity	No ET
Speciality Stores	1008.4m ²	2.01
Supermarket	2403.89m ²	4.80
Kiosks	71.67m ²	1.07
Residential units	23 Units	13.8
Total		21.68

We calculate the Peak Daily Water Demand for the proposed mixed development is expected to generate 58.96 kL/day. The instantaneous peak demand is expected to generate 3.25 L/s. Telephone conversation with Tweed Shire Council on December 2007 has indicated that connection to the 100mm diameter water main in Tweed Coast Road has sufficient capacity to service the mixed development. Figure 8.0 and Figure 9.0 illustrates the proposed water services.

11. WASTEWATER

11.1 EXISTING SEWER RETICULATION

A 150mm diameter gravity sewer main exists within the 3m wide carriage way (DP 259164).

NSW Public Works Department's Manual of Practice Sewer Design provides the calculations for determination of sewer loads. PWD calculations specify 4 people per Equivalent Tenement (ET). Tweed Shire Council's Revenue Policy Fees and Charges 2007/2008 specify 3.2 people per ET. The demand for the service station is 0.9 ET per lane, 0.048 ET per room for motels, 0.048ET/m² of gross floor area for fast-food and 0.006ET/m² of gross floor area for commercial businesses. Calculations were performed using PWD methods and Tweed Shire Council data. Table 11.1 summarises the existing sewer demands. Refer Figure 2.0 for existing services plan.

From Tweed Shire Council Design Guide D12 – Sewerage Systems.

1 EP (Equivalent People) = 240 litres/day (Average Dry Weather Flow)

1 ET (Equivalent Tenement) = 3.2 EP

1ET = 768 L/day

Table 11.1 Waste water generation – Existing wastewater

Component	Quantity	No ET
Service station	2 Lanes	1.8
Cabarita beach house motel	10 Bedrooms	4.5
Rusty's Pizza	Approx 40m ²	1.92
Newsagency	Approx 200m ²	1.2
Total		9.42

We estimate the Existing Development Flow as

ET (Council) = 9.42

ET (PWD) = 7.53

Average Dry Weather Flow = 0.083 L/s

Peak Dry Weather Flow = 0.685 L/s

Peak Wet Weather Flow = 0.859 L/s

We have allowed provision for 3 connections and a storm allowance of 0.174 L/s.

11.2 PROPOSED WASTEWATER RETICULATION

The demand for shops is 0.003 ET/m² of gross floor area and 0.048 ET/m² of gross floor area for food/takeaway stores and 0.75ET per dwelling for a 2 bedroom unit. Calculations were performed using PWD methods and Tweed Shire Council data. Table 11.1 summarises the proposed sewer demands.

Table 11.1 - Waste water generation – Proposed wastewater

Component	Quantity	No ET
Speciality Stores	1008.4m ²	3.02
Supermarket	2403.89m ²	7.21
Kiosks	71.67m ²	3.44
Residential units	23 Units	17.25
Total		30.92

We estimate the Proposed Development Flow as

ET (Council) = 30.92

ET (PWD) = 24.73

Average Dry Weather Flow = 0.272 L/s

Peak Dry Weather Flow = 1.191 L/s

Peak Wet Weather Flow = 1.249 L/s

We have provided for a storm allowance of 0.058 L/s as there is one connection point.

11.3 WASTEWATER IMPACTS AND MITIGATING MEASURES

Sewers located on private property must be located in an easement of minimum width three meters (D12). The buildings on Lots 20 – 23 and 191 – 194 are proposed to be developed over the existing 150mm diameter sewer. The sewer depth within the site ranges from approximately 1.82m to 1.0m below the surface level. The depth of excavation proposed for the basement within the existing sewer easement is approximately 2m below the surface level. This will impact the existing sewers. There are two possible options to mitigate this impact.

The first option is that the sewer line be removed and manholes (MH) BBK/2 and BBK/3 remain. By removing the sewer line to make provision for the proposed building, three Lots will be disconnected (Lot 5 DP 1102016, Lot 1 DP 831562 and Lot 3 DP 831562). For these Lots to have a sewer connection it is proposed that the sewer gravity line to the south from MH BBA/10 be extended to MH BBK/3. Permission is required for works outside private property and relevant authorisation is needed for the sewer extension. The mixed development will connect into existing MH BBK/2. Figure 8.0 illustrates the proposed sewer for option 1.

The second option is to redirect the sewage line along the boundary of Lot 194 and into the 150mm diameter pipe in Hastings Road. This option would require an extra two manholes. The complexity with this option is that there is water, electrical and stormwater pipes existing in Hastings Street. The sewer pipe has the potential to clash with these underground services. The mixed development will connect into existing MH BBK/2. Figure 9.0 illustrates the proposed sewer for option 2.

The development will result in an increase of 0.390 L/s in Peak Wet Weather Flow. This is effectively less than 1 ET. The increase in sewer generation will not impact on the existing reticulated system. A Section 64 contribution may be payable for the increase to mitigate Regional impacts.

Telephone conversation with Tweed Shire Council December 2007 has indicated that the sewer connection (Line BK) for the proposed building can connect into the 150mm gravity main and that there is sufficient capacity to cater for the proposed development. We recommend that option one be the preferred solution for the mixed development.

12. CONCLUSIONS

- The development will increase traffic movements. The existing road system is sufficient to cater for the development.
- Access for the driveways in River Street comply with the Tweed Shire Design Specification and the Australian Standard AS 2890.1 and 2890.2.
- Earthworks are graded such that drainage will flow into the existing gully pits located on Hastings Road and Tweed Coast Road. The potential impacts of the earthworks for the proposed development will be mitigated by the implementation of the proposed erosion control measures.
- Potential adverse stormwater pollution from the proposed development can be mitigated by introduction of stormwater treatment devices.
- The proposed water reticulation will connect into both the existing 100mm diameter water main in Tweed Coast Road. Water demand will increase under the proposed development. This additional demand is to be supplied by the existing water reticulation network. Council has advised there is sufficient capacity.
- The existing sewer can be diverted into the existing 150mm diameter gravity sewer at MH BBK/3.
- The proprietary treatment devices proposed for the mixed use development will convey oil and sediment on site. The treatment devices comply with Tweed Shire Councils specification for stormwater quality runoff.
- Access has been provided for Lots 188 - 190 that currently utilise the 3m wide right of carriageway at the rear of Lots 191 to 194.

13. REFERENCES

NEVILLE JONES & ASSOCIATES PTY LTD AND AUSTRALIAN WATER ENGINEERING (1992)	Queensland Urban Drainage Manual. Volume 1: Text.
NSW DEPARTMENT OF HOUSING (1998)	Managing Urban Stormwater – Soils and Construction.
ROADS & TRAFFIC AUTHORITY NSW (2002)	Guide to Traffic Generating Developments.
STANDARDS AUSTRALIA (2003)	AS 3500.3.2 National Plumbing and Drainage. Stormwater Drainage
STANDARDS AUSTRALIA (2004)	AS 2890.1 Parking Facilities Part 1: Off Street Parking.
STANDARDS AUSTRALIA (2004)	AS 2890.1 Commercial Parking Facilities Part 2: Off Street Parking.
TWEED SHIRE COUNCIL (2000)	Tweed Urban Stormwater Quality Management Plan.
TWEED SHIRE COUNCIL (1999)	Development Control Plan No. 1 Site Access and Parking Code.
TWEED SHIRE COUNCIL (2003)	Development Design Specifications D1, D7, D11, D5
TWEED SHIRE COUNCIL (2004)	Development Control Plan No. 16 Subdivision Manual
INSTITUTE OF ENGINEERS AUSTRALIA (1987)	Australian Rainfall and Runoff – A guide to Flood Estimation

Report Prepared By

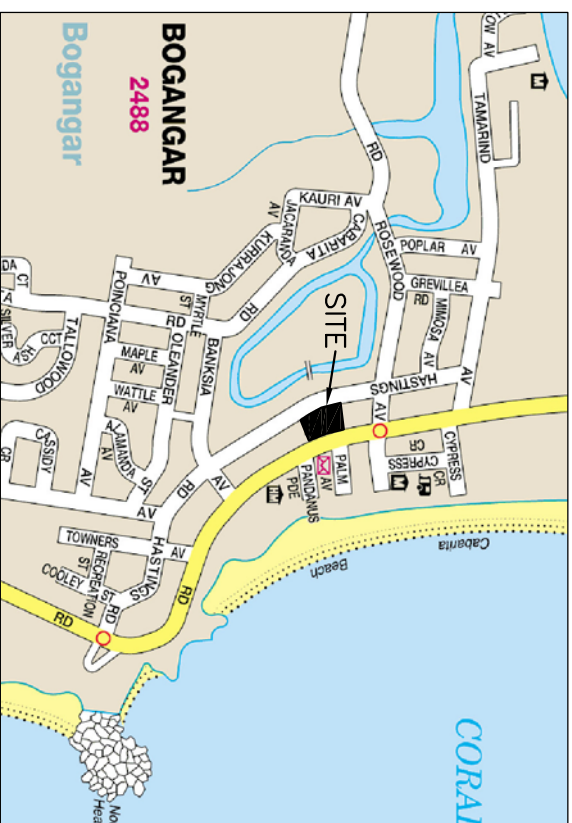
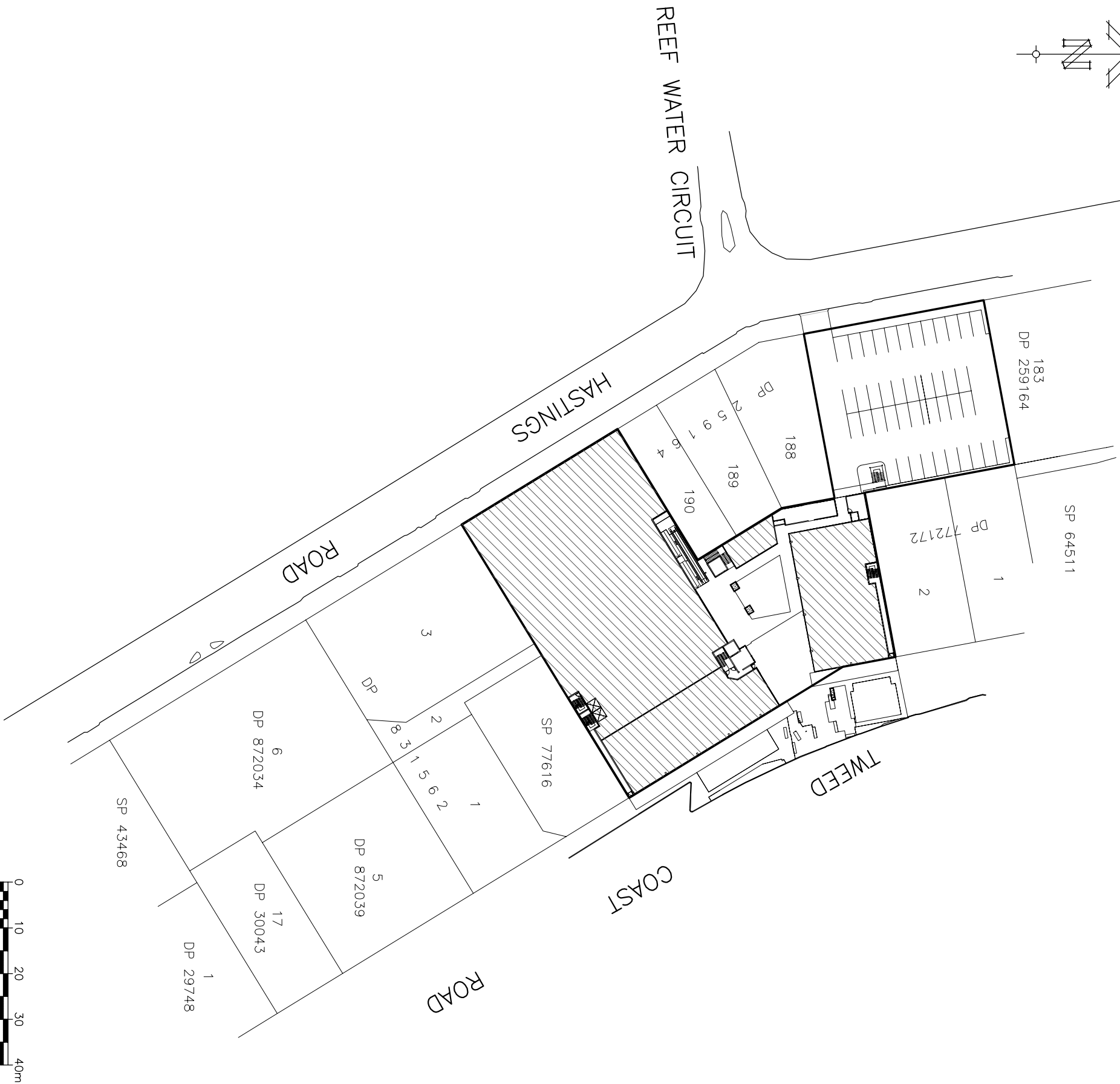
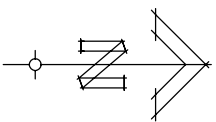
Approved for Issue

BRENDEN SCHWARZ
Engineer

MARTIN FINDLATER
Branch Manager
RPEQ 1969



FIGURES



LOCALITY PLAN
NOT TO SCALE

WA STOCKWELL PTY LTD
ENGINEERING IMPACT ASSESSMENT
TWEED COAST ROAD
CABARITA, NSW
FIGURE NO. 1.0
LOCALITY & SITE PLAN

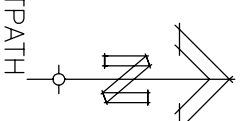
OPUS QANTEC McWILLIAM






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LEGEND



- | | |
|---|----------------------------|
| 2.0' _____ | EXISTING CONTOURS |
|  | EXISTING BUILDINGS |
|  | EXISTING BITUMEN DRIVEWAY, |
|  | EXISTING GARDEN BED |
| 369 | SPOT LEVELS |
| ____ _ | DRAINAGE EASEMENT |
| ____ - ____ | EXISTING POWER LINE |
| ____ SW ____ | EXISTING STORMWATER |
| ____ W ____ | EXISTING WATER |
| ____ S ____ | EXISTING SEWER |
| SLO | SEWER INSPECTION OPENING |
| FUEL SAV | SEWER AIR VENT |
| WMM | WATER STOP VALVE |
| FH | FIRE HYDRANT |
| EPP | ELECTRICITY POWER POLE |
| TPIT | TELSTRA PIT |

OPEN CONCRETE

WA STOCKWELL PTY LTD

ENGINEERING IMPACT ASSESSMENT

TWEED COAST ROAD
CABARITA, NSW

FIGURE No. 2.0

EXISTING FEATURES PLAN

OPUS QANTEC McWILLIAM



A.B.N. 79 086 342 065

1/10 Rivendell

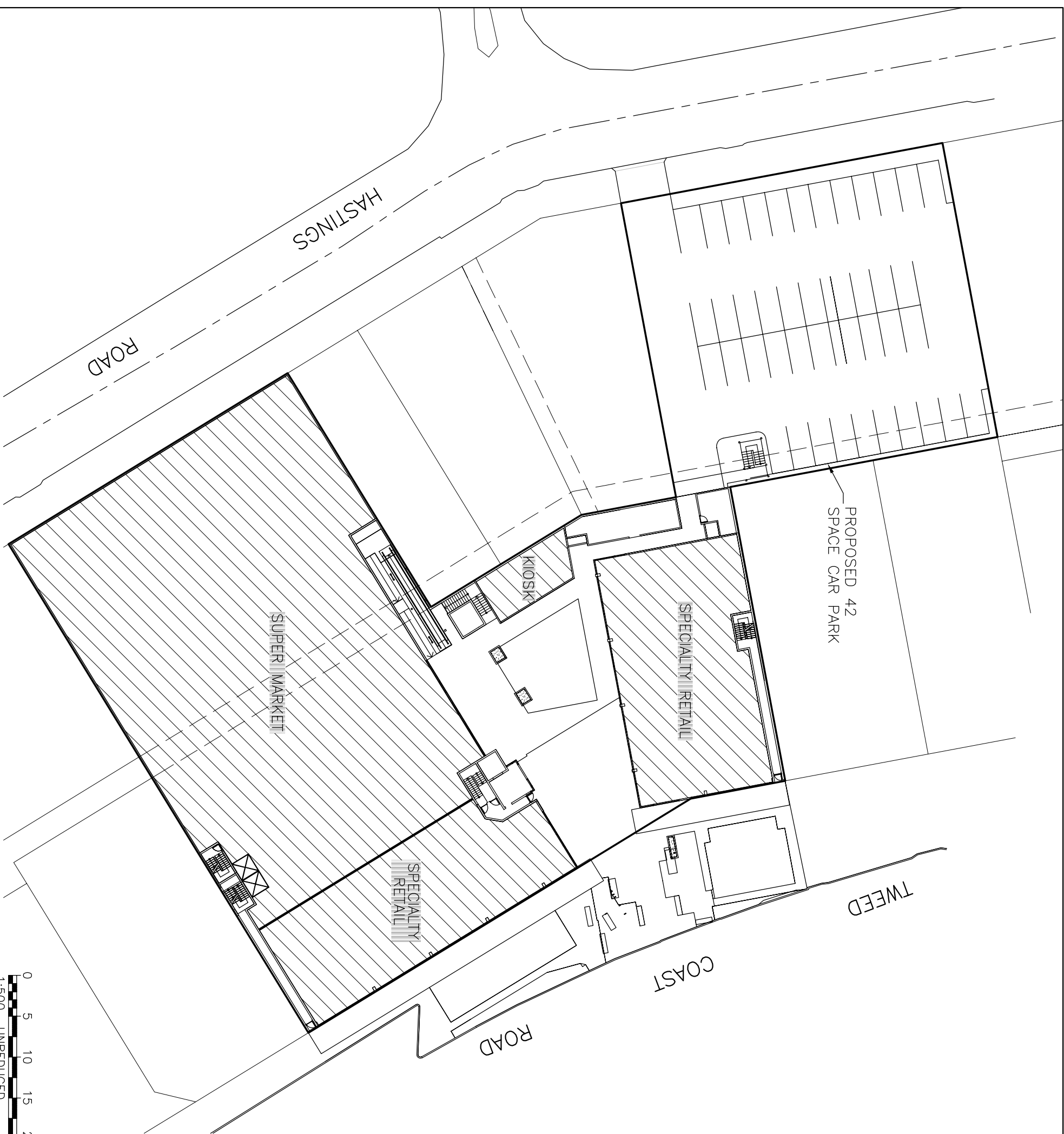
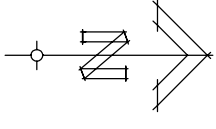
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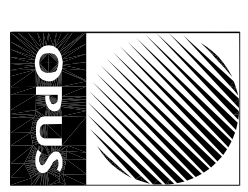


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ENGINEERING IMPACT ASSESSMENT
TWEED COAST ROAD
CABARITA, NSW

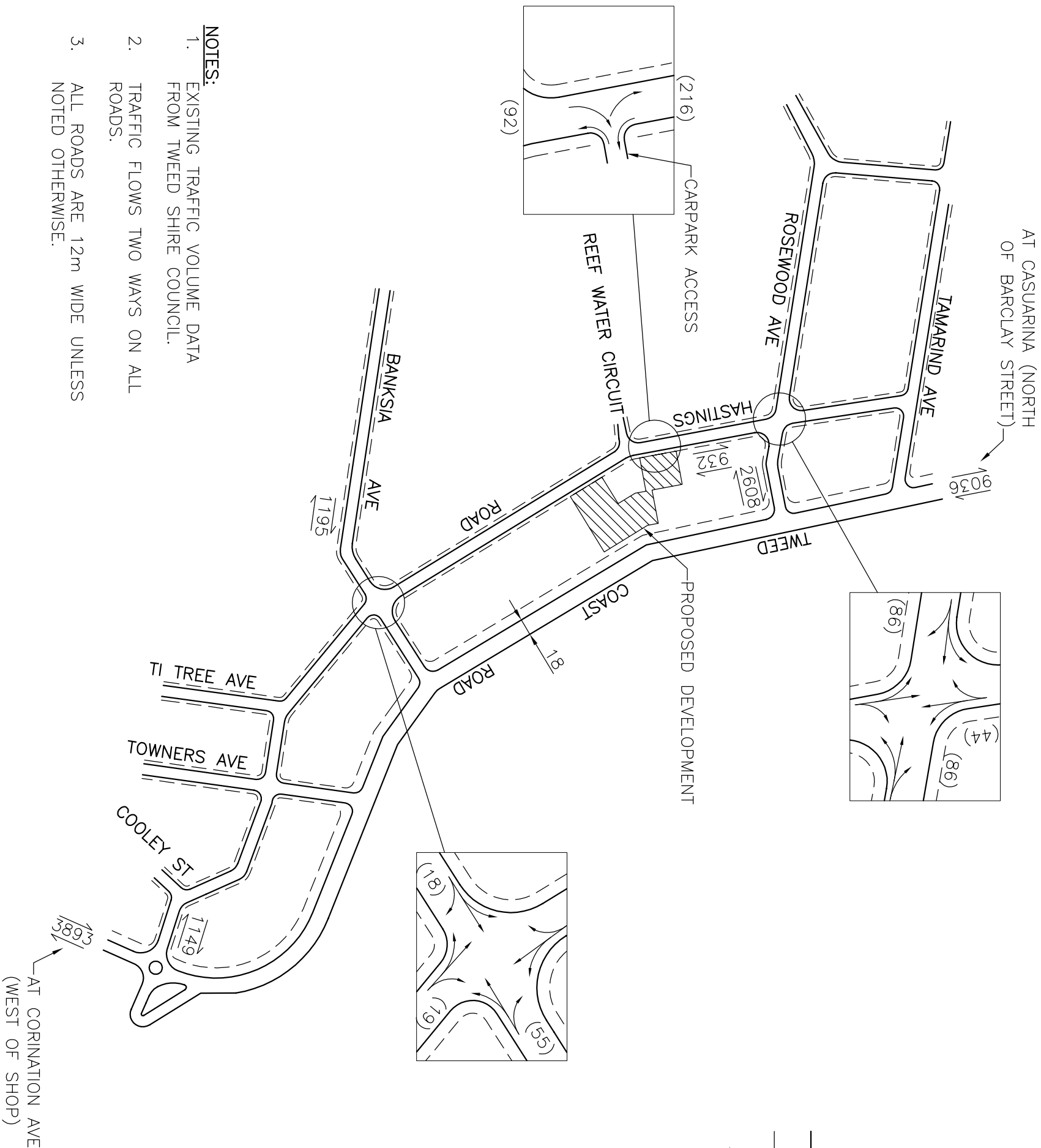
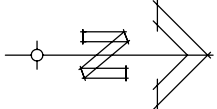
FIGURE No. 3.0

PROPOSED DEVELOPMENT PLAN

OPUS QANTEC McWILLIAM



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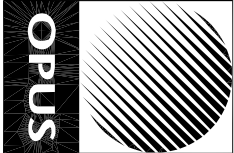
TWEED COAST ROAD

CABARITA, NSW

FIGURE No. 4.0

TRAFFIC PLAN

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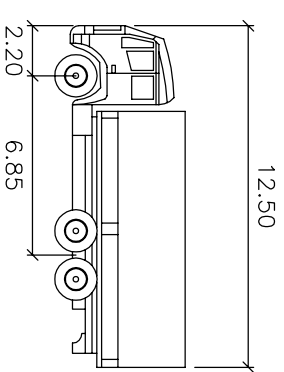
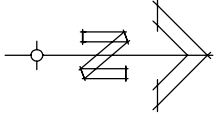
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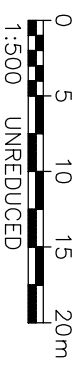
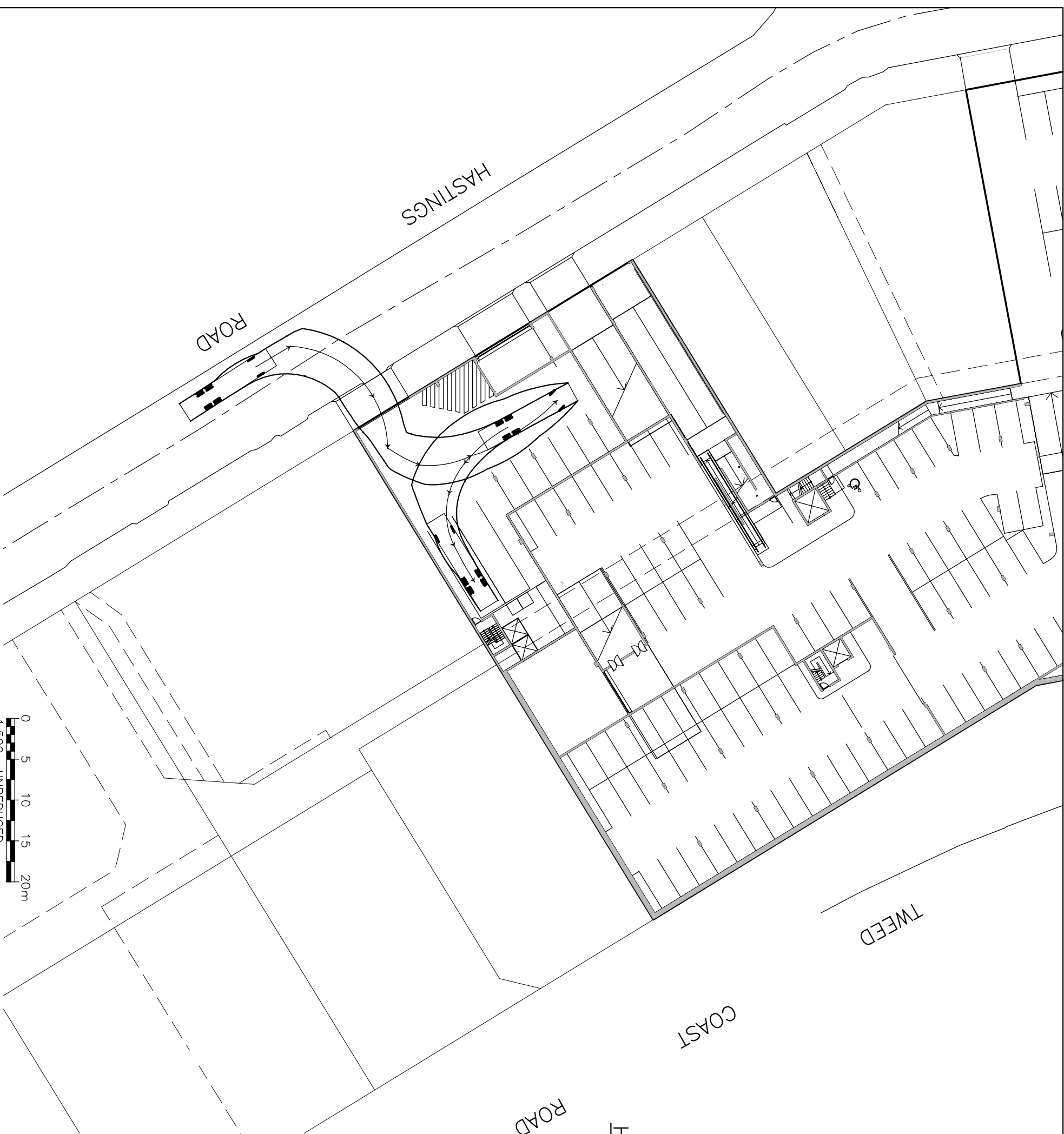
E-Mail: tweedheads@opusqmcw.com.au



SU TRUCK	parameters
Width	: 2.50
Track	: 2.50
Lock to Lock Time	: 6.00
Steering Angle	: 36.60

HEAVY RIGID VEHICLE PROFILE

NOT TO SCALE



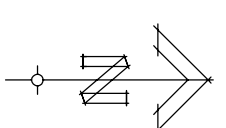
WA STOCKWELL PTY LTD
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TWEED COAST ROAD
CABARITA, NSW

FIGURE No. 5.0

HEAVY RIGID VEHICLE
OFF STREET ACCESS



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LEGEND

- 2.0 ——— EXISTING CONTOURS
- — — DRAINAGE EASEMENT
- SW ——— PROPOSED STORMWATER
- SF ——— SILT FENCE
- HAY BALES

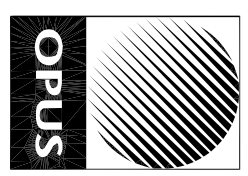
OPEN CONCRETE DRAIN

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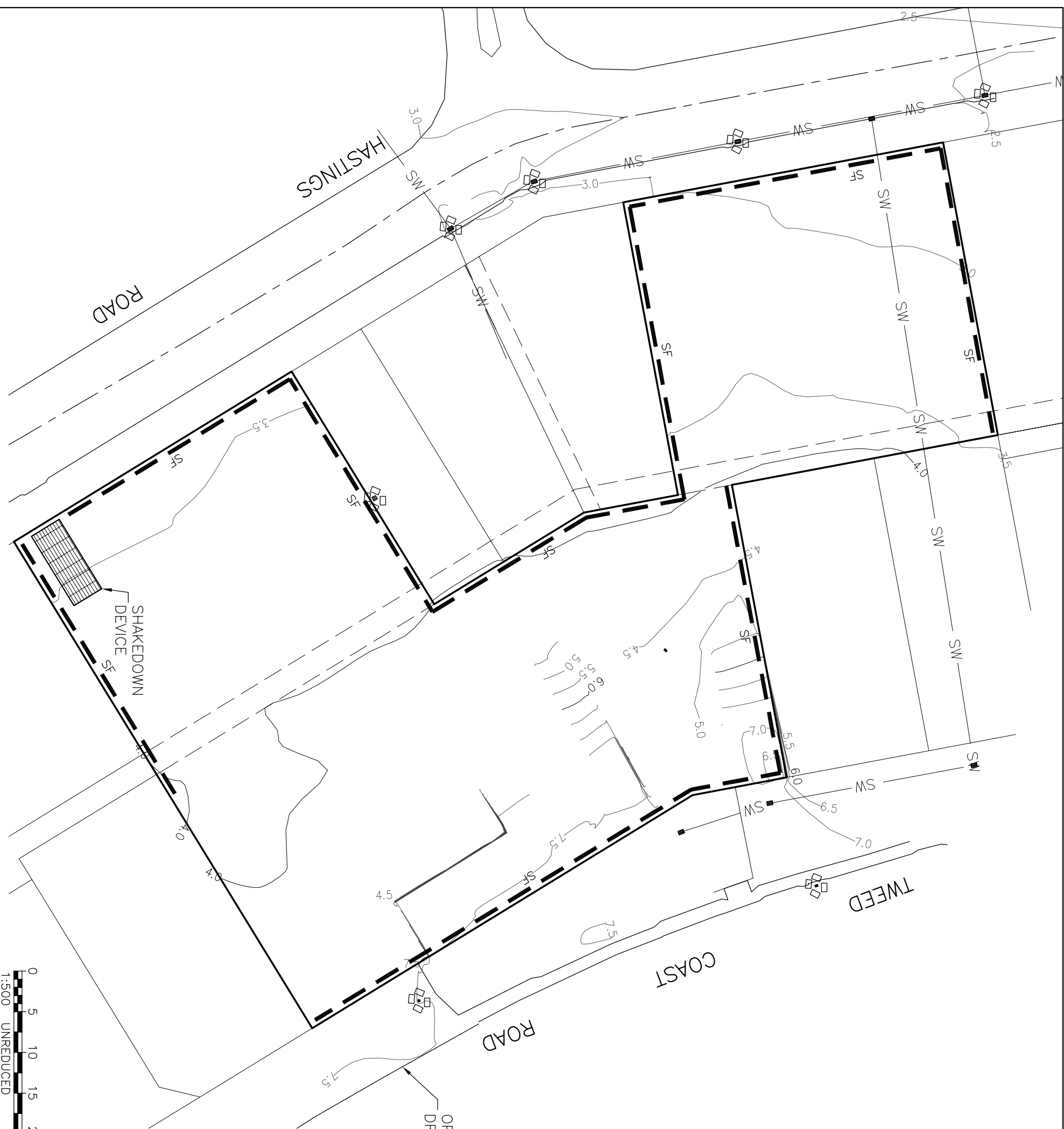
FIGURE No. 6.0

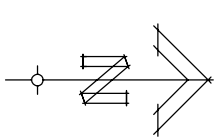
EARTHWORKS & EROSION CONTROL PLAN

OPUS QANTEC McWILLIAM



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LEGEND

- DRAINAGE EASEMENT
- SW — PROPOSED CARPARK DRAINAGE
- ↖ WATER FLOW

OPEN DRAINAGE GRATE

OPEN DRAINAGE GRATE



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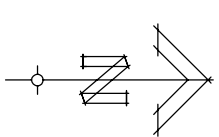
FIGURE No. 7.0

POLLUTION CONTROL PLAN

OPUS QANTEC McWILLIAM

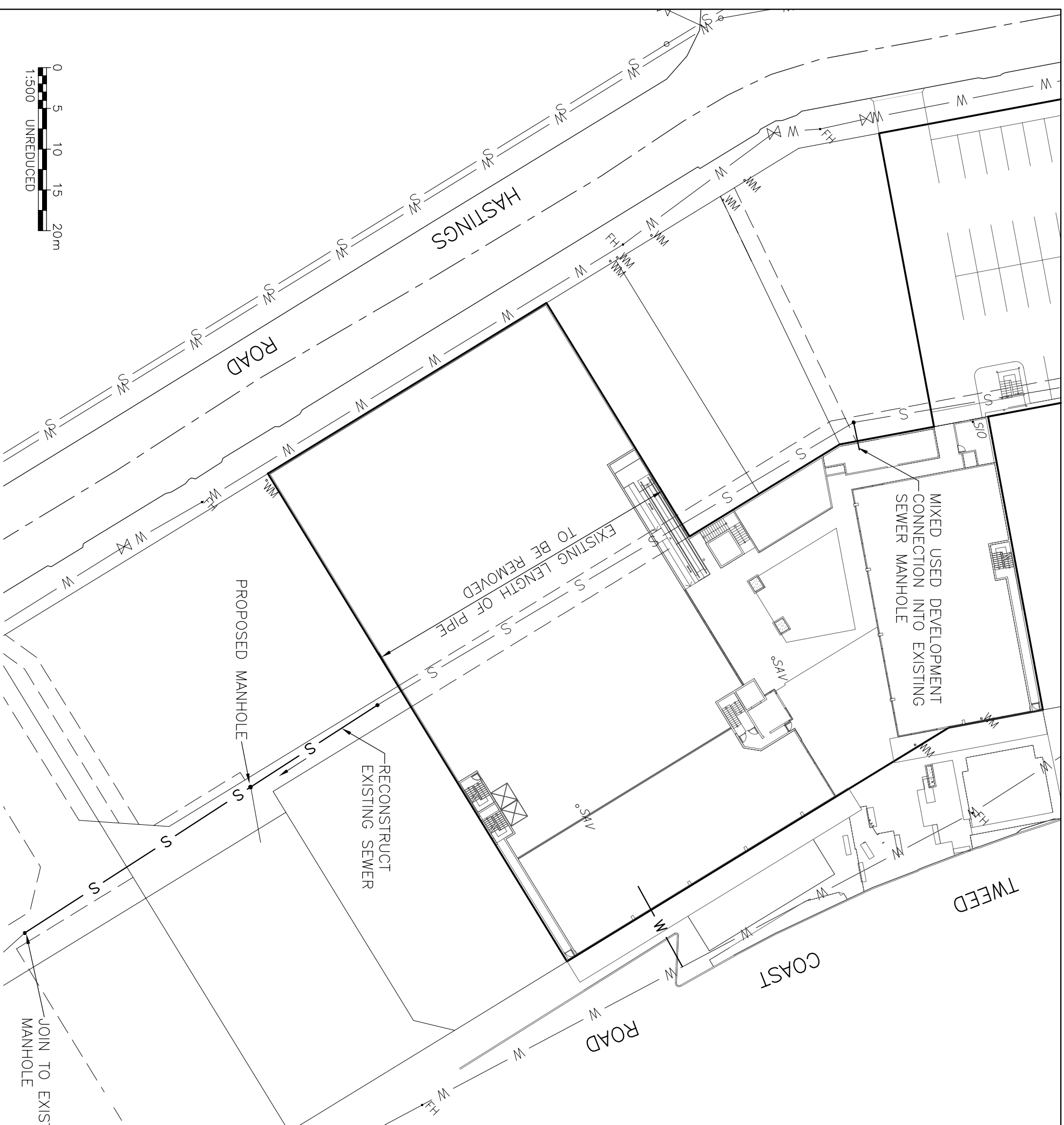


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LEGEND

- DRAINAGE EASEMENT
- S — EXISTING SEWER
- W — EXISTING WATER
- S — PROPOSED SEWER
- W — PROPOSED WATER



WA STOCKWELL PTY LTD
ENGINEERING IMPACT ASSESSMENT

TWEED COAST ROAD
CABARITA, NSW

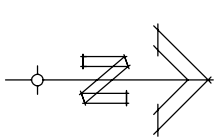
FIGURE No. 8.0

PROPOSED SEWER/WATER RETICULATION
OPTION 1

OPUS QANTEC McWILLIAM

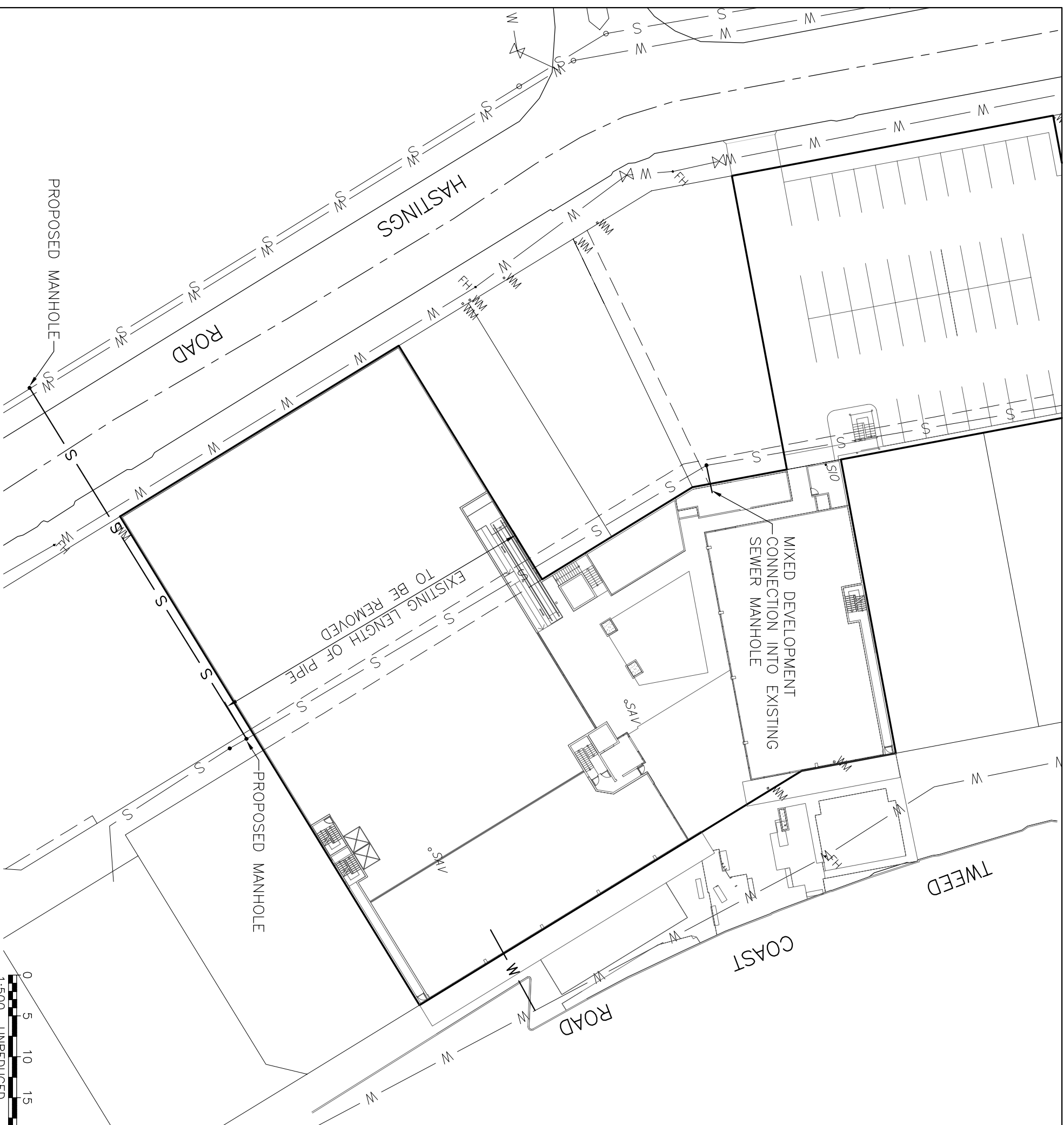


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LEGEND

- DRAINAGE EASEMENT
- S — EXISTING SEWER
- W — EXISTING WATER
- S — PROPOSED SEWER
- W — PROPOSED WATER



WA STOCKWELL PTY LTD
ENGINEERING IMPACT ASSESSMENT
TWEED COAST ROAD
CABARITA, NSW

FIGURE No. 9.0

PROPOSED SEWER/WATER RETICULATION
OPTION 2

OPUS QANTEC McWILLIAM

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APPENDIX A

WA STOCKWELL PTY LTD

STORMWATER MANAGEMENT PLAN

FOR PROPOSED MIXED USE DEVELOPMENT TWEED COAST ROAD CABARITA NSW

SOIL AND WATER MANAGEMENT PLAN

THE SOIL & WATER MANAGEMENT PLAN

1. This plan is to be read in conjunction with:
 - i) the engineering plans, and
 - ii) any other plans or written instructions that may be issued and relating to development at the subject site.
2. Contractors shall ensure that all soil and water management works are:
 - i) located as shown in the drawings, specification and Management Plan
 - ii) constructed in accordance with the:
 - Tweed Shire Council – Development Design Specification D7 – Stormwater Quality (Annexure A).
 - NSW Department of Housing - Soil and Water Management for Urban Development.
3. The Contractor shall nominate a competent person to inspect erosion control structures, complete the site diaries and ensure the Soil and Water Management Plan is implemented.
4. The person nominated to implement the plan shall keep a copy on site.

OBJECTIVES

- To prevent sediment erosion being transported from the site by wind and water.

LAND DISTURBANCE

5. Other than for essential thinning of plant growth, land disturbance shall be limited to that necessary for implementation of the plans of works. Ideally, lands shall not be disturbed beyond five metres from the edge of any essential construction activity as shown on the engineering plans, other than in access zones. Such zones shall be clearly identified with barrier mesh or “silt” fencing or similar materials. The location of “silt” fences should be determined on site and may vary in position to best conserve the existing vegetation and protect downstream



areas. The contractor shall ensure regular watering of exposed surfaces to minimise wind erosion.

6. Where practical, thinning of plant growth in the development should be by hand or approved small machine. Small branches, leaf litter and other residues shall be retained as mulch.
7. Generally, works shall be undertaken in the following sequence:
 - i) where possible, divert clean water likely to run onto lands to be disturbed
 - ii) install sediment control works
 - iii) strip and stockpile topsoil
 - iv) undertake site development works in accordance with the engineering plans
 - v) rehabilitate the site
 - vi) remove soil and water management works.
8. Any temporary culverts or causeways to be installed across drainage reserves should be constructed only in areas of minimal erosion hazard. Such areas should be defined in consultation with the engineer.

EROSION CONTROL

9. The maximum water velocity in the design storm event in earth based waterways should be in accordance with Table 1.

TABLE 1

MAXIMUM FLOW VELOCITIES (m/sec) IN EARTH BASED WATERWAYS *

GROUND COVER	VELOCITY (m/sec)
Mat or sward forming grasses with Enkamat ® or other UV stabilised mesh.	2.4
Kikuyu Grass.	1.9
Jute mesh (bitumen sprayed).	1.7
Couch grass, Rhodes grass, other sward forming grasses.	1.4
Other improved perennials.	0.9
Biodegradable blankets.	0.7
Tussock grasses.	0.5
Bare soil.	0.3

- This table assumes slope gradients of less than 10 percent and, other than for base soil, good (ie. >80%) ground cover.



10. During road works, temporary crossbanks (bunds constructed with earth, straw bales or sandbags) should be constructed to limit slope length, where possible in accordance with Table 2.

TABLE 2

RECOMMENDED MAXIMUM SPACING BETWEEN CROSS DRAINS ON HAUL ROADS

SLOPE	MAXIMUM SPACING (metres)
0 to 7%	NN
7 to 10%	70
10 to 13%	32
13 to 16%	15
>16%	NR

NN – not necessary

NR – construction of haul roads not recommended.

11. Outlets from erosion or sediment control devices should be to stable disposal areas.

12. Earth batters should be:

- i) constructed with a maximum gradient of 2(H):1(V)
- ii) properly topsoiled, seeded and mulched within two weeks from completion of works.

A recommended listing of plant species is:

Spring/Summer sowing:

Couch, hulled
Couch, unhulled
Regal Ryegrass
Japanese Millet
Carpet Grass
Haifa White Clover
Redquin Red Clover

Autumn/Winter sowings:

Couch, hulled
Couch, unhulled
Regal Ryegrass
Prairie Grass
Ryecorn/Oats
Haifa White Clover
Crimson Clover

The contractor is to nominate the mixture and application rates to be used to achieve the specified coverage. An approved grass mixture for seeding should contain Broad leaf Paspalm 30%, Carpet Grass 30% and Oats/Rye Grass 30%. The contractor shall provide a list of suitable native bush and tree species where required by the drawings.

13. The contractor should stage works and implement construction techniques to minimise the length of exposure to disturbed surfaces; topsoil and grass within two weeks of completion. Temporary rehabilitation should be undertaken on disturbed areas where works have stopped and soils are expected to remain exposed for more than two weeks before either works continue or permanent



rehabilitation is undertaken. If vegetative means are used, the following species mix is recommended:

Autumn/Winter sowing

Oats/ryecorn @ 20kg/ha

Japanese millet @ 10kg/ha

Spring/Summer sowing

Japanese millet @ 20 kg/ha

Oats/ryecorn @ 10 kg/ha

Alternatively, the contractor shall submit a substitute mix for approval.

14. On lands where rehabilitation to native plants is not essential, fertilisers/ameliorants should include:

- i) dolomite on topsoils at a rate of 2 kilograms per tonne of soil to raise the pH to be more conducive to growth of exotic species, particularly in waterways and other areas of high soil erosion hazard,
- ii) Grower 11 (or equivalent) at 250 kilograms per hectare and trace elements according to manufacturers instructions at sowing, and
- iii) Nitram (or equivalent) at 100 kilograms per hectare in the following Spring;

SEDIMENT CONTROL

15. Sediment retarding basins and sediment traps shall be constructed to contain the minimum storage specified on the engineering drawings.

16. Existing dams to be retained as sediment retarding basins are shown on the drawings.

17. "Silt" fences or straw bale sediment traps should be placed at regular intervals immediately downslope of all unprotected disturbed lands.

- "Silt" fences, straw bale barriers, etc., should rarely be placed along the contour, as water will run to a low point in large storm events and the structure may fail. "Silt" fences should be placed with small returns at about five to thirty metres, creating a series of small sediment traps in line. This system has the added benefit of avoiding concentrated flows.

18. Sediment barriers (eg. sandbags or straw bales) should be located upstream of stormwater inlet pits prior to the road surface being paved. These barriers should be reinstalled after completion of paving if there are disturbed or bare areas nearby likely to contribute sediment to the road surface.



DUST CONTROL

Control Measures

19. The potential dust problems due to construction activities are to be ameliorated through the implementation of dust control measures. These measures are given in the table below.

FREQUENCY	CONTROL MEASURES
General operational practices	<ul style="list-style-type: none">• Track-walked slopes• Surface rehabilitation• Limitation of topsoil stripping to current work areas• Stabilisation of stockpiles• Application of woodchip, mulching, organic matting or bitumen emulsions• Speed restriction for site vehicles• Roadways designated and maintained for site vehicles• Watering system utilised during rock face operations
Event based measures (upon identification of dust problem)	<ul style="list-style-type: none">• Ensure operational practices are being carried out.• Watering of disturbed surfaces• Covering of disturbed areas and stockpiles awaiting vegetation growth• Provide screens around earthworks areas

Operational Times

20. The operational control measures are to be implemented at all times during site works. These times would depend on the contractor performing the works. Event based measures may be required outside of the operational times of the site upon identification of a dust problem.

Wind Conditions

21. During dry conditions with high winds a watering truck should be present on site during works.

Dust Monitoring

22. Monitoring of the dust emissions is to be carried out by visual inspection by the contractor.

Water Sources

23. Potable water from existing council mains is to be used for dust suppression. Alternatively water from sediment basins may be used when available.



CONSTRUCTION SEQUENCE

24. Works on the development should be carried out in the following sequence:

- i) construction of sediment basin/trap
- ii) installation of barrier fencing and “silt” fencing
- iii) construct roadworks.

MAINTENANCE

25. The contractor shall:

- i) regularly maintain all soil and water management devices, including removal of accumulated sediment or trash, to ensure that more than 60 percent of the design capacity remains in the settling zone.
- ii) dispose of any sediment removed in areas where further pollution to downslope lands and waterways is unlikely.

INSPECTION

26. Inspections shall be undertaken:

- i) during any storm event that threatens to exceed the available capacity in sediment and pollution storage structures
- ii) after any storm that has caused runoff
- iii) daily, during hot or dry weather when grass cover is less than 100% on vegetated areas
- iv) weekly (on Fridays) as a matter of site routine for all site work practices
- v) before site closure or any other time when it might be otherwise unattended for more than twelve hours
- vi) testing as specified in the water quality monitoring program shall be carried out in accordance with the nominated schedule
- vii) signed, completed test results and inspection report shall be kept on site and made available on request to the engineer, Council officers and relevant authorities.

Installation

27. The contractor shall ensure a diary or record is kept documenting site work practices such as:

- i) dates of installation and removal of site work practices
- ii) repair of any damage to site work practices
- iii) rainfall depths, durations and times
- iv) storage capacity available in pollution control structures
- v) condition of site work practice structures and stabilised surfaces
- vi) time, date, volume and type of any additions of flocculants
- vii) estimates of water volumes discharged
- viii) estimates of pollutant volumes removed
- ix) water quality test results.



Program

28.

- i) Inspect catch drains, earth banks, table drains, and drop-down structures and clean as required.
- ii) Remove any stockpiled material or sediment that has encroached within two metres of a surface drain.
- iii) Restore any low spots in banks and drains to their original height and compact.
- iv) Where necessary, construct extra catch drains that help separate on-site dirty waters from other waters.
- v) Install any new erosion and sediment control measures that have become necessary since previous inspections because of severe storms or progress in the site's development.
- vi) Check to ensure that banks, channels and waterways are operating within the safe limits for their surface condition by noting any evidence of scour.
- vii) Ensure that any construction work at the site since the previous inspection has not diverted sediment and water away from any site work practice.

WATER QUALITY MONITORING PROGRAM

29. The contractor is to undertake a water quality monitoring and testing program to comply with the Department of Housing Guidelines and Clean Waters Act and Tweed Shire Council Design Specification D7 as tabulated below.

i) Monitoring

Parameter	Frequency	Reporting
Suspended Solids, Non Filterable Residue (NFR)	Monthly or during discharge event (defined as >25mm in any 24 hour period).	as per 26. Non complying test results are to be notified within 24 hours to Council officers.
pH	<ul style="list-style-type: none">if in acid sulfate soils risk area, daily or during controlled discharge event.in areas with no identified acid sulfate risk, monthly and during controlled discharge event from sedimentation basins.	as per 26 Non comply test results are to be notified immediately to Council's Environmental & Health Services Unit.
Total P, Total N	3 monthly	as per 26

ii) Response to Monitoring, Non Compliance with ESCP, Amelioration Measures

Indicator	Response	Comments
pH too low <6.5	<ul style="list-style-type: none">If possible stop discharge and store runoff on site.Respond in accordance with approved acid sulfate management plan or if no plan then:-<ul style="list-style-type: none">Lime dose as per Acid Sulfate Soil Manual (Assmac), restore to acceptable pH before further discharge.Notify Council's Environmental & Health Services Unit of non compliant discharge	Reporting as per 29 (i).



Indicator	Response	Comments
	(within 24 hours).	
pH to high >8.5	<ul style="list-style-type: none"> • If possible stop discharge and store runoff on site. • Dilute with other water until pH in acceptable range. • Re-test for compliance before further discharge. 	
Suspended Solids (NFR) >50mg/litre	<p>Identify if non compliance is due to storm event greater than design storm of control devices. If so accept non compliance. If not then:-</p> <ul style="list-style-type: none"> • If possible stop discharge and store runoff on site. • Use flocculation agents to lower NFR or • Pump contaminated water over grassed filter strips or buffer areas to lower NFR. • Identify (by inspection and/or analysis) if non compliance is due to damage or ineffectiveness of erosion and sediment control devices. Repair or redesign/replace if necessary (or required by Council) to ensure future compliance. 	Non compliance may occur, by design, in >3 month (deemed to be 40% of the ARI one year event).