

UPPER COOMERA

202 BAILEYS MOUNTAIN ROAD

INFORMATION REQUEST RESPONSE // July 2019

SECTION 1: SUPPORTING INFORMATION

UPS
URBAN PLANNING SERVICES PTY LTD

ABN 23 430 237 339



Reference: 2358
Council Reference: MCU/2018/58

8 July 2019

The Chief Executive Officer
Council of the City of Gold Coast
Attention: Sue Wilkinson
BY EMAIL: mail@goldcoast.qld.gov.au

Dear Sue

RE: RESPONSE TO INFORMATION REQUEST
DEVELOPMENT APPLICATION FOR A DEVELOPMENT PERMIT FOR MATERIAL CHANGE OF USE (IMPACT ASSESSMENT) FOR A RESIDENTIAL CARE FACILITY, RETIREMENT FACILITY AND EDUCATIONAL ESTABLISHMENT (COLLEAGUE TRAINING FACILITY)

SITE: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA
LOT 58 on SP191940

1 Introduction

Urban Planning Services Pty Ltd ('**UPS**') has been engaged by Sandson Pty Ltd (the '**Applicant**') to respond to the Information Request relating to the Development Application seeking the approval of the Council of the City of Gold Coast for a Development Permit for Material Change of Use (Impact Assessment) for a Residential Care Facility, Retirement Facility (permanent residential care units) and Educational Establishment (ancillary Colleague Training Facility) (the **'proposed development'**), at the site located at 202 Baileys Mountain Road, Upper Coomera, properly described as Lot 58 on SP191940 (the **'subject site'**).

Further detail regarding the Information Request is provided below.

1. Council of the City of Gold Coast (Assessment Manager)

The Council of the City of Gold Coast (the '**Council**' or '**CCGC**') Information Request is dated 30 August 2018 and Council's file reference is MCU/2017/58. A copy of the Information Request is provided at **Section 1, Attachment 1**.

The following section of this correspondence responds to all of the information requested by CCGC pursuant to Section 13.2(a) of Part 3 of the Development Assessment Rules, Version 1.1, (the '**DAR**').

This correspondence is also accompanied by supporting documents and additional information, where required, in response to the CCGC Information Request. The volume structure of the supporting documents is as shown below.

Attachment No.	Document
Section 1 – Supporting Information	
1	CCGC Information Request
2	Response to GCCC Information Request Items 9, 10 and 11 prepared by Saunders Havill Group
3	Update to Bushfire Management Report prepared by Eldon Bottcher Architect
4	Revised Stormwater Management Plan prepared by Arcadis
5	Response to Information Request (Transport Planning Items) prepared by Bitzios Consulting
Section 2 – Drawings	
6	Locational Analysis – Established Residential Care Facilities
7	Planning Need Investigation
8	Recreational Linkage Analysis
9	Revised Architectural Drawings prepared by BDA Architects
10	Preliminary Proposed Land Requirement Drawing – Baileys Mountain Road prepared by CCGC
11	Revised Landscape Concept Package including Conceptual Open Space Statement prepared by Saunders Havill Group

As the Development Application was made with Council via electronic lodgement, this Information Request Response is provided via electronic submission, as requested on page 14 of the CCGC Information Request.

2 Council of the City of Gold Coast - Information Request

In accordance with Section 13.2(a) of Part 3 of the DAR, the Applicant has instructed UPS and the Project Team to respond to all of the items raised in the Information Request dated 30 August 2018, issued in relation to the abovementioned Development Application.

Town Planning

2.1 Item 1: Strategic Framework and Zone Code

The current City Plan provisions do not support the proposed level of intensification of the subject site. The subject site is identified within the Strategic framework maps as the following:

- *Strategic framework map 1 - designated urban area - Non-urban area (Investigation area) (not urban area as stated in the submitted planning report – refer to section 3.2.2 City Shape and urban transformation of the Strategic Framework);*
- *Strategic framework map 2 - settlement pattern – Rural residential areas; and*
- *Strategic framework map 4 - greenspace network - Hinterland core habitat.*

The proposed development is considered to be out of sequence and premature development, as a draft amendment to City Plan for the Upper Coomera Investigation Area has not yet completed State interest review phase or been through the statutory public notification. The proposed development presents a significant departure from the current City Plan with a number of conflicts identified.

The application is considered to, among other aspects, conflict with the following statements within the Strategic framework and zone code:

Creating liveable places - Strategic Outcomes:

"Urban activity is contained within the City's urban area."

"Rural residential areas are very low intensity and low-rise environments with a semi-rural landscape character and protected natural features. They are not expanded."

Creating liveable places - Element – Rural residential areas:

"(1) Rural residential areas continue to support the lifestyle and amenity aspirations of residents in a semi-rural or bushland environment on very low intensity lots. They are not part of the urban area.
(2) Rural residential areas protect and enhance bushland, waterways and wetlands, habitat trees and wildlife corridors. They help maintain the city's green frame, particularly on the Hinterland ranges and foothills. These areas may be subject to private conservation agreements.

(3) Rural residential areas maintain their amenity and very low intensity and low-rise living environment. Subdivision is limited to existing rural residential areas. Development does not disrupt local amenity and character. Sustainable eco-villages may be appropriate where landscape character and ecological values are maintained.

Note: Some rural residential areas (conceptually shown on strategic framework map 1) will be investigated for land use opportunities and constraints. ***Until these investigations are undertaken, and any amendments to the City Plan are completed, these areas are to maintain their rural residential character and intent****.'*

Advice note
Please note the Urban neighbourhoods element is not applicable to the assessment of the application as the site is not located within an urban area. As such the uplift provisions to justify the building height do not apply.

Living with nature - Strategic outcomes:

"A comprehensive green space network of natural landscape areas is enhanced, maintained and protected for the nature conservation and recreation needs of the city and enhances the city's powerful image of green, gold and blue."

"Land, freshwater, estuarine and marine ecological processes and other matters of environmental significance are protected and supported through a connected green space network."

"Non-urban land is protected to maintain the extent and diversity of the city's natural and productive rural landscapes and define a hard edge to the city's urban area."

Green space network

"Waterways and riparian areas are protected as natural green space corridors to:
(a) protect vegetation, wildlife habitat and ecological corridors;
(b) protect scenic amenity;
(c) provide continuous public access and parkland corridors for recreation, walking and cycling;
(d) provide visual relief from the built environment and a retreat from developed areas;
(e) provide flood mitigation, flood resilience, drainage and water quality functions;
(f) provide natural and renewable water cycle processes (water health and water quality); and
(g) protect foreshores from erosion and stormwater inflows."

"Development does not erode, and, wherever practicable, contributes to, the expansion of the extent, function and values of the green space network."

"Development facilitates accessible, safe and integrated local open space networks that contribute to sense of place and quality of life."

Nature conservation

"The Gold Coast's biodiversity areas and other matters of environmental significance are conserved, protected, enhanced and managed to maintain a diversity of terrestrial, aquatic and marine species, ecosystems and ecological processes. Poorly protected regional ecosystems and habitat for threatened species, such as koalas, are enhanced."

"Biodiversity areas are fundamental elements of the city's green space network. These areas are conserved to maintain the diversity of terrestrial, aquatic and marine species, ecosystems and ecological processes.

Mapped biodiversity areas include:

(a) core habitats, that are extensive tracts of intact habitat within the hinterland and coastal wetlands areas; support a variety of vegetation associations; provide habitat for diverse fauna populations; and require the highest level of protection;
(b) hinterland to coast critical corridors that link core habitat systems and isolated areas of biodiversity value by retaining existing vegetation and restoring degraded areas to enhance fauna movement between different ecosystems and landscapes; and

(c) substantial remnants of intact areas of vegetation that retain and enhance the diversity, extent and condition of habitat by avoiding impacts that originate from their urban context."

"The city's matters of environmental significance include:

(a) native vegetation of national, state or local significance;
(b) coastal environments, wetlands and waterways;
(c) core habitat areas and substantial remnants;
(d) hinterland to coast critical corridors, including:
  i. Burleigh Heads to Springbrook;
  ii. Springbrook to Wongawallan;
  iii. Southern Moreton Bay to Wongawallan;
  iv. Southern Moreton Bay to Clagiraba;
  v. Currumbin to Cobaki Broadwater (Tweed Shire); and
  vi. Currumbin to Currumbin Valley.
(e) habitat for threatened species, such as koalas.

"In biodiversity areas, matters of environmental significance including vegetation and habitat for native flora and fauna are protected in situ, and degraded areas are restored to improve habitat quality and connectivity."

"Matters of environmental significance in the city's nonurban area are protected from urban encroachment by containing urban activity within the city's urban area."

A safe, well deigned city - Strategic outcomes:

"(1) Areas of landscape character that contribute to the city's unique landscape and built form are identified and protected.

(2) Important elements of urban character and community significance are protected and enhanced to strengthen the sense of identity in local areas and the city"

Element – Landscape character

"The distinctive rural, semi-rural and natural character of the city's river valleys, hinterland settlements, extensive natural landscape areas, rural production areas and rural residential areas provide a clear hard edge to, and natural backdrop setting for, the city's urban area."

Element – Urban design, character and community identity

"Development is cognisant of the function and desired future appearance of each individual area and reinforces or reinterprets the character of that area."

Rural residential zone code

1) The purpose of the Rural residential zone code is to provide for residential development on large lots where local government infrastructure and services may not be provided on the basis that the intensity of residential development is generally dispersed.

2) The purpose of the code will be achieved through the following overall outcomes:

(a) Land uses –

i. support the rural lifestyle and amenity aspirations of residents residing in the semi-rural or bushland environment;
ii. provide low rise, very low intensity residential accommodation such as Dwelling houses, and Short-term accommodation (farm stays);

(b) Character consists of –
i. very low intensity and low rise environments; and

(c) Built form –
i. is very low intensity, low rise and well setback from property boundaries to ensure privacy for adjacent residences and to preserve the very low intensity character of the zone;

The applicant is advised that officers consider there are no relevant matters that have been provided which overcome the conflicts identified above, in addition to other non-compliances with the City Plan.
The applicant is strongly encouraged to place the application on hold, making use of the stopping the current period provisions, or withdraw the application ***until such time that the relevant investigations are complete and included within the City Plan.***

RESPONSE TO ITEM 1:

The introductory paragraphs of Item 1 identify Strategic framework mapping parameters of relevance to the subject site and make reference to the draft amendment to the City Plan prepared by Council in relation to the Upper Coomera Investigation Area which incorporates the subject site. Initially, where referencing the Strategic framework mapping and particularly with reference to Strategic framework map 1 ('SMF1'), the commentary in Item 1 suggests that the Town Planning Report accompanying the Development Application incorrectly references the subject site as being within the urban area identified by SFM1. For the sake of clarification on this point we draw your attention to the summary review of SFM1 at Section 9.1 (page 28) of the Town Planning Report which identifies the subject site as falling within an investigation area, 'adjacent to' rather than within the urban area, pursuant to the mapping characteristics under SFM1.

With this clarification aside, it is noted that Item 1 then moves forward to express the view that the continued delays that have been encountered by Council in progressing with the draft amendment to the City Plan with regard to the Upper Coomera Investigation Area, prompt the need for further consideration in respect to potential 'conflict' with various City Plan provisions set out under the Strategic Framework and the Rural Residential Zone Code.

Accordingly, further consideration in respect of the matters identified under Item 1 is provided below. Initially, however, it is important to draw attention to further matters of relevance to the approach to the proposed development that is apparent within Item 1 of the Information Request and within the 'preamble' set out within the Information Request.

Background

Initially, as noted previously, the subject site falls within an area identified as an Investigation Area under the City Plan, reflecting a long-held aspiration for accommodating urban growth within this area of Upper Coomera, with initial consultation with property owners in the Courtney Drive area having been initiated shortly after commencement of the Gold Coast Planning Scheme in 2003. Prior to this, by way of background, the subject site and the Courtney Drive area was identified within the Urban Residential Preferred Dominant Land Use area identified on Strategic Plan Map 5 and within the Urban Residential R1 area within the Albert Corridor DCP 5 under the provisions of the Albert Shire Planning Scheme 1995. **Figure 1** below presents the location of the subject in the context of these historic planning scheme mapping parameters for reference.

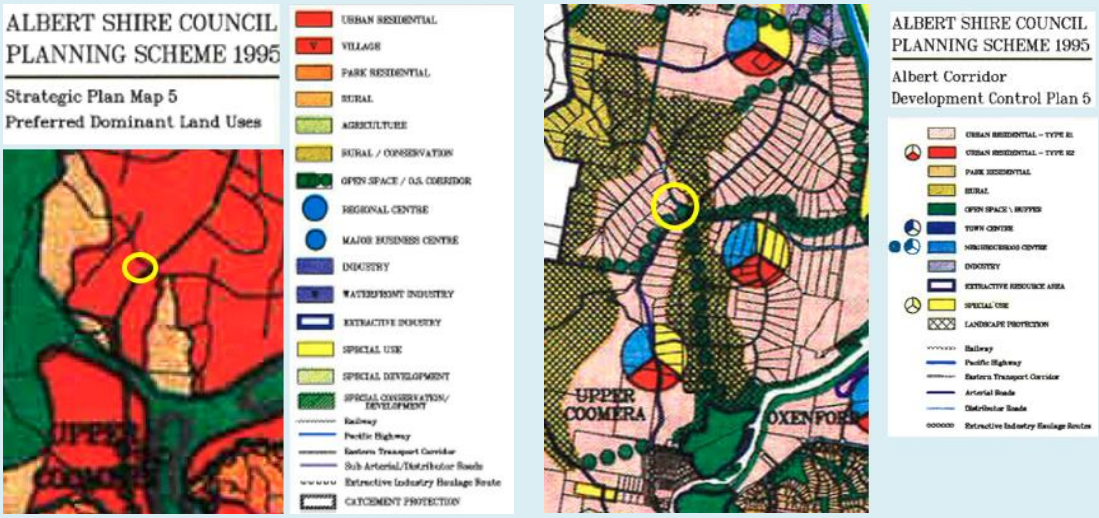


Figure 1: *Historic Planning Scheme Mapping Extracts*

Investigation Area

Of greater relevance, the more recent history relating to this Courtney Drive area of Upper Coomera under the current Gold Coast City Plan, is the Council's resolution to move forward with the incorporation of amendments to the City Plan in specific relation to the Upper Coomera Investigation Area. This intent was later reflected within the Minutes of the Council Meeting of 23 August 2016 and the adopted Committee Recommendation CP16.0817.006, which includes at parts 3 to 5 of the resolution (emphasis added):

RESPONSE TO ITEM 1:

"3. That the Upper Coomera (Courtney Drive) Investigation Area be recommended for inclusion in a future City Plan update to:

a. remove rural residential subdivision opportunity; and

*b. **enable a development application for urban development of this Investigation Area to be lodged and considered prior to a City Plan update for the detailed planning being completed**, where:*

i. development complies with a Council approved comprehensive plan of development for the entire Investigation Area (either Council led detailed planning or a collaborative developer led approach); and

ii. the developer pays the full cost to service the out-of-sequence development, including provision of open space recreation areas.

4. That the Upper Coomera (Courtney Drive) Investigation Area be subject to a detailed planning investigation to inform a future City Plan update, including infrastructure modelling/costing to confirm acceptable servicing costs.

5. That in consultation with the local Councillor, the Planning & Environment Directorate be authorised to carry out targeted community engagement with land owners for the detailed planning of the Upper Coomera (Courtney Drive) Investigation Area."

Essentially, the construct of part 3 of this resolution provides two-fold for:

- the prevention of rural residential subdivision of land in order to limit further fragmentation of land titles so as to better preserve feasibility for bringing forward urban development within the investigation area; and
- to enable a development application for urban development within the investigation area to come forward, subject to due consideration of a comprehensive plan of development for the whole of the investigation area and appropriate provision of associated infrastructure associated with the development proposal.

Whilst we understand that there is some conjecture amongst Council officers in respect of the interpretation of part 3 of this resolution, perhaps some further clarity might be drawn when reading each of these parts of the resolution that relate to the Upper Coomera Investigation Area collectively.

For instance, it is noted that part 3(b)(i) of the resolution provides that a development application for urban development within the Investigation Area may come forward subject to being compliant with a Council approved 'comprehensive plan of development' which is described as being either a collaborative developer led approach, or 'Council led detailed planning'. Part 4 of the resolution then goes on to provide for Council to proceed with 'a detailed planning investigation' to inform the future City Plan update.

Pursuant to parts 4 and 5 of the resolution, we are aware that the Council has proceeded to carry out the 'detailed planning investigation' the outcomes of which were then reported within the Courtney Drive, Upper Coomera Investigation Area, Flora and Fauna Study, prepared by GHD and dated 2017, and the Investigation Areas Programme – Courtney Drive, Upper Coomera, Draft Report dated May 2017. These documents formed the basis of the targeted consultation with land owners in the Investigation Area pursuant to part 5 of Council's resolution of 23 August 2016.

Given that this detailed planning investigation has been carried out by Council pursuant to parts 3 and 4 of the resolution, and the proposed amendments to the City Plan have been informed by this detailed planning investigation, it would be illogical to interpret the resolution to suggest that the Applicant proceed with a full detailed planning investigation which may either duplicate or produce different outcomes to that of the Council's own work and, consequently, would not be supported by the Council where it did not align with the Council's own detailed planning for the Investigation Area.

The Applicant, together with UPS and the Project Team, attended meetings with Council officers during the targeted consultation process on the basis of the Council's detailed planning investigations and proposed City Plan amendments, pursuant to part 5 of the above resolution. Following on from this, a submission in response to the consultation was prepared by UPS and the Project Team on behalf of the Applicant, which was submitted to Council on 7 July 2017. In brief, the Applicant has actively participated in Council's consultation on the detailed planning investigations for this Investigation Area of Upper Coomera pursuant to part 5 of the Council's resolution quoted above.

Significantly, the development proposals for the subject site have been informed through this consultative process, which has also included attendance at a series of pre-lodgement meetings with Council officers held between November 2017 and February 2018.

Through this consultative process, the form and design of the proposed development was resolved to ensure provision for landscape and environmental enhancement of the site, a sympathetic building form and appearance and site layout to accommodate key elements identified through Council's detailed planning investigations for potential future realignment of Baileys Mountain Road and for a substantial contribution to the greenspace network in the eastern area of the site adjoining Yaun Creek and Reserve Road.

RESPONSE TO ITEM 1:

Accordingly, it is logical to conclude that the Development Application has come forward in line with the intent of part 3 of Council's resolution of 23 August 2016.

Information Request and Relevant Matters

Following receipt of Council's Information Request on the Development Application, a meeting was attended with Council's Roger Sharpe, Executive Co-ordinator Planning Assessment, Andrew Powell, then Supervising Planner – Planning Assessment North, and Richard Webber then Senior Planner – Planning Assessment North, on 13 September 2018.

During the course of the meeting discussion centred around the matters raised within the preamble of the Council's Information Request, the status of the forthcoming amendments to the City Plan relating to the Upper Coomera Investigation Area, and the consideration of 'relevant matters' pursuant to section 45(5)(b) of the Planning Act 2016 (the 'PA').

Given the on-going delays being experienced by Council in relation to State review of the forthcoming draft City Plan amendments, and taking account of the nature of the proposed development at the subject site, the outcomes of this meeting were to confirm that the officers' approach to the further assessment of the development application would be to apply consideration to relevant matters to be addressed by the Applicant in response to the Council's Information Request. In addition to the information already provided with the Development Application, which include the Economic Needs Assessment prepared by MacroPlan Dimasi, it was advised that further information should be provided by the Applicant in response to the Information Request to comprise:

- photomontage views to address visual amenity considerations relating to the proposed building height;
- a review of 'planning need' to supplement the Economic Need Assessment, involving:
    - analysis of potential alternative sites that may accommodate the development proposal within the locality of Upper Coomera to demonstrate that the subject site represents a suitable and preferable location for the proposed residential care facility and retirement facility; and
    - consideration of the principle of residential care facilities established in rural residential / fringe locations and other zones throughout the City due to the land area required to support the nature of the operations of the facilities.

Accordingly, additional information and further consideration in respect of these relevant matters is provided within this Information Request, with the detail set out in the response to Items 3 (relevant matters) and 5 (building height) below.

Further, in respect of the consideration of relevant matters, it is noted that the Council's Information Request refers to matters of perceived 'conflict' with the City Plan, thereby adopting the language and approach of the former Sustainable Planning Act 2009 in respect of considering matters of 'conflict' and 'sufficient grounds'. In this regard it is important to note that following on from the commencement of the Planning Act 2016 (the 'PA') and the broader approach to the consideration of 'relevant matters' conferred by section 45(5)(b), recent judgements by the Planning and Environment Court that have emerged since lodging this Development Application offer further guidance in the proper consideration of relevant matters.

In the Planning and Environment Court decision in *Ashvan Investments Unit Trust v Brisbane City Council & Ors [2019] QPEC 16* His Honour Judge Williamson QC highlights the important shift in the assessment and decision framework that is effected under the provisions of the PA compared with that which operated under the Sustainable Planning Act 2009. Key points arising from this decision include:

- that the PA is the first piece of planning legislation operating in Queensland since 1992 that does not dictate how a planning discretion is to be exercised where conflict with an adopted statutory planning control is established (paragraph [50]); and
- the former two-part test applying 'conflict' and 'sufficient grounds' has been dispensed with, such that non-compliance with an assessment benchmark no longer has assumed primacy in the exercise of planning discretion, with the discretion conferred by s.60(3) of the PA admitting of more flexibility for an assessment manager and the Explanatory Notes stating that this is intended to allow a 'balanced decision in the public interest' to be reached based on the merits of an application having regard to established policy and other relevant considerations (paragraph [51]).

Briefly put, the decision of the Court in *Ashvan Investments Unit Trust v Brisbane City Council & Ors* highlights that the deliberate changes to the assessment regime for impact assessable development applications, and the provisions of section 60(3) of the PA confer a power on the assessment manager to exercise a more broad planning discretion in the consideration of relevant matters.

In the Planning and Environment Court decision in *Walters & Ors v Brisbane City Council & Aveo Group Limited [2019] QPEC 3* Her Honour Judge Kefford offers further consideration of relevant matters having regard to s.45 of the PA, with the judgement taking into account relevant matters that included the consideration of need and 'sound town planning principles' which are set out at paragraph [356] of the decision. The 'sound town planning

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principles' identified in the decision include:

- the consideration of need which was found to not be reflected in the City Plan;
- the characteristics of the subject site including its current use;
- opportunities for co-location with an adjoining park;
- forthcoming amendments to the City Plan;
- the ability to establish the use on the site without causing unacceptable impacts on residential amenity; and
- positive planning benefits from the timely provision of the development including creating an enhanced sense of community and a well serviced community.

The findings in these recent decisions resonate with the considerations set out within the Town Planning Report accompanying the Development Application and the further detailed considerations presented within this Information Request Response. In particular, the proposed development satisfies the proper consideration of 'sound town planning principles' having regard to the consideration of:

- demonstrated need for the proposed residential care facility;
- the ability to establish the proposed use on the site without causing unacceptable impacts on residential amenity;
- the provision made in the Development Application for substantial contribution to the greenspace network and rehabilitation along the Yaun Creek corridor;
- the thoughtful approach to site design, extensive landscape enhancement and building form and appearance that is designed to complement the setting of the site and to preserve and enhance the character and amenity of the site and its locality;
- the design of the proposal and suitability of the subject site to accommodate the proposed use whilst also preserving land for potential future road realignment to Baileys Mountain Road in line with the vision of the emerging City Plan proposals for the Upper Coomera Investigation Area; and
- the ability to deliver positive planning benefits such as those summarised above, including the delivery of much needed residential care beds within the rapidly growing community of Upper Coomera, evidenced by the granting of bed licences by the Australian government for the proposed facility, supporting an enhanced sense of community and a well serviced community.

Notwithstanding all of the above relevant factors in the consideration of the proposed development, further brief consideration is also provided as follows in response to provisions of the City Plan identified under Item 1, as set out in **Table 1** below.

Table 1: *Response to City Plan provisions identified under Item 1*

Parameter	Response
Creating liveable places – Strategic Outcomes *Urban activity is contained within the City's urban area* *Rural residential areas are very low intensity and low-rise environments with a semi-rural landscape character and protected natural features*	Further to the considerations set out at Section 9.1 (pages 30-31) of the Town Planning Report in respect of Creating liveable places Strategic Outcomes of the City Plan, additional relevant considerations in respect of the proposed development at the subject site include the following. • Whilst the proposed development comprises of residential care facility and retirement facility, being a land use not specifically identified in the Table of Assessment for the Rural Residential Zone (Table 5.5.21 of the City Plan) it is relevant to note that Overall Outcome 6.2.21.2(2)(a)(vi) of the Rural Residential Zone Code provides that land uses that *'do not directly relate to the semi-rural operation of the zone may be considered'*, nominating a variety of land use examples *"where they do not compromise the amenity and character of the zone"*. • Whilst a residential care facility is not specifically identified amongst the land use examples provided by this Overall Outcome, it is notable that the Overall Outcome uses

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	the words "such as" when putting forward land use examples that span a broad range of activities including Community care centres, Education establishments, Places of worship and Transport depots. The use of the words "such as" makes it clear that this is not intended to be a definitive or finite list but merely provides examples of the form and related scale of land use activities that are anticipated may occur within the zone. • The form and scale of the proposed development is readily comparable and favourable in the context of these broad ranging examples of land use activities which the City Plan contemplates within the Zone. • Importantly, in terms of the amenity and character considerations of this Overall Outcome, the proposed development represents an inobtrusive form of residential use, and the design and scale of the proposed development is comfortably compliant with provisions of the Rural Residential Zone Code relating to setbacks and site cover. • In respect of setbacks, the position of the proposed development provides generous setbacks to site boundaries all of which comply with or exceed the minimum setbacks specified by AO1 of the Zone Code. • In respect of site cover, the proposed development comprises of site cover of 20% being considerably below the site cover parameter of 25% specified by AO2 of the Rural Residential Zone Code. Outside of the building footprint, with the exception of a limited area for the access driveway, the whole of the site is given over to landscaped areas, including public open space corridor, ensuring not only the preservation, but also the enhancement of the amenity and character of its surroundings. • Whilst the proposed development incorporates three storeys, exceeding the building height parameter of two storeys plus a 'partial third storey' that is contemplated by AO4.1 of the Zone Code, the photomontage views provided within the proposed Architectural Drawings located at **Section 2, Attachment 8**, demonstrate that the proposed building height is comfortably accommodated within the subject site whilst preserving the character and amenity of the site. The photomontage images demonstrate that the setting of the site and its surroundings is further enhanced by the extensively landscaped areas provided for within the site. Further, the proposed building height reflects the outcomes resolved through design review and amendments incorporated during the series of pre-

RESPONSE TO ITEM 1:	
	lodgement meetings attended with Council officers between November 2017 and February 2018 prior to lodging the Development Application. • In addition to the selectively identified Strategic outcomes nominated within Item 1 of the Information Request, a broader range of Strategic outcomes are provided by the City Plan in respect of Creating liveable places, including that: *"The Gold Coast's settlement pattern provides housing choice and diverse lifestyle opportunities in mixed use centres and specialist centres, urban neighbourhoods, suburban neighbourhoods, new communities, and rural residential and township areas"*; and that *"Varied building height and form throughout the city reinforces local identity, creates a sense of place and supports housing choice and affordability and the function and desired future appearance of each local area"*. • The context of the subject site, being located at the cusp of the rapidly growing Upper Coomera urban area, with land directly to the east and north of the site contained within the Medium Density Residential Zone and a designated Urban Neighbourhood of the City, is therefore a relevant consideration in respect of the proposed development. In this respect, the proposed development adopts a built form that is well setback from site boundaries, incorporates environmental buffer and rehabilitation to the Yaun Creek corridor, delivers substantial landscape enhancement throughout the site, comfortably complies with the building setback and site cover provisions of the Rural Residential Zone, and adopts an architectural design and palette of external finishes that are sympathetic to its setting. • Accordingly, it is evident that the proposed development delivers outcomes that preserve the character and amenity of the local area, are compatible with the desired future appearance, and delivers a specialist form of housing to meet the demonstrated need for aged care housing, in a high-quality facility with attractively landscaped grounds to support desirable living opportunities and quality of life for those in need of this specialist care. • It is, therefore, logical to conclude that the proposed development satisfies the intent of these Strategic outcomes. Please also refer to the further consideration of these matters provided in response to Item 4 of the Information Request presented below.
Creating liveable places – Element – Rural Residential areas *(1) Rural residential areas continue to support the lifestyle and amenity aspirations of residents in a*	The considerations set out in response to the Strategic outcomes above are again relevant in response to these provisions relating to Rural

RESPONSE TO ITEM 1:

semi-rural or bushland environment on very low intensity lots. They are not part of the urban area. *(2) Rural residential areas protect and enhance bushland, waterways and wetlands, habitat trees and wildlife corridors. They help maintain the city's green frame, particularly on the Hinterland ranges and foothills. These areas may be subject to private conservation agreements.* *(3) Rural residential areas maintain their amenity and very low intensity and low-rise living environment. Subdivision is limited to existing rural residential areas. Development does not disrupt local amenity and character. Sustainable eco-villages may be appropriate where landscape character and ecological values are maintained.* *Note: some rural residential areas (conceptually shown on strategic framework map 1) will be investigated for land use opportunities and constraints. Until these investigations are undertaken, and any amendments to the City Plan are completed, these areas are to maintain their rural residential character and intent.*	Residential areas. In brief: • the proposed development comprises site cover that is below that identified by the Acceptable outcomes of the Rural Residential Zone Code, and is comfortably compliant with building setback provisions of the Code; • the form of development, being an inobtrusive form of residential use, is a readily comparable and favourable form of use when considered in the context of the a broad range of land use activities that are contemplated by the City Plan as occurring within the Rural Residential Zone, which include Education establishments and Transport depots; • the environmental qualities of the site are preserved and enhanced by the extensive landscape enhancement, rehabilitation and open space buffers proposed by the development; • analysis of the proposed development, including photomontage views provided within the proposed Architectural Drawings package located at **Section 2, Attachment 9**, demonstrates that the site and architectural design proposals ensure the preservation and enhancement of local amenity and character; and • the established pattern of residential care facilities throughout the City demonstrates the desirability of the urban fringe setting for such use, where larger unfragmented land parcels are available to accommodate the realistic needs and form of such developments, including the connection with nature which is a vital consideration for the health and well being of residents of such a facility. This established pattern of residential care facilities has gained the consistent support of Council in recognition of these considerations and the ability to accommodate such uses without adverse impact to the character and amenity of their settings. This is evidenced through the Locational Analysis presented at **Section 2, Attachment 6**, which demonstrates a distribution of residential care facilities throughout the city including examples of Council's recent approval of such facilities within the Rural Residential Zone and the Sport and Recreation Zone under the provisions of the City Plan. Additionally, analysis of historical aerial photography presented within this Locational Analysis also identifies that older facilities that are presently embedded within urban neighbourhoods, were originally developed on sites that were at the urban fringe and/or similarly located in comparable zoning to the subject site, with the urban neighbourhoods in

RESPONSE TO ITEM 1:	
	which they are currently located having consolidated around them over time. Refer to further discussions relating to relevant matters that is presented in response to Item 3 below in this regard.
Living with nature – Strategic outcomes *A comprehensive green space network of natural landscape areas is enhanced, maintained and protected for the nature conservation and recreation needs of the city and enhances the city's powerful image of green, gold and blue.* *Land, freshwater, estuarine and marine ecological processes and other matters of environmental significance are protected and supported through a connected green space network.* *Non-urban land is protected to maintain the extent and diversity of the city's natural and productive rural landscapes and define a hard edge to the city's urban area.*	The environmental qualities of the site have been thoroughly assessed through the Ecological Assessment Report and further through the Response to GCCC Information Request Items 9, 10 and 11, prepared by Saunders Havill Group, located at **Section 1, Attachment 2**. The environmental qualities of the subject site are preserved and enhanced by the extensive landscape design, rehabilitation and open space buffers proposed by the development. The outcome is the preservation of approximately 40% of the site in an open space corridor.
Green space network *Waterways and riparian areas are protected as natural green space corridors to:* *(a) protect vegetation, wildlife habitat and ecological corridors;* *(b) protect scenic amenity;* *(c) provide continuous public access and parkland corridors for recreation, walking and cycling;* *(d) provide visual relief from the built environment and a retreat from developed areas;* *(e) provide flood mitigation, flood resilience, drainage and water quality functions;* *(f) provide natural and renewable water cycle processes (water health and water quality); and* *(g) protect foreshores from erosion and stormwater inflows.* *Development does not erode, and, wherever practicable, contributes to, the expansion of the extent, function and values of the green space network.* *Development facilitates accessible, safe and integrated local open space networks that contribute to sense of place and quality of life.*	As set out above, the environmental qualities of the subject site are preserved and enhanced by the extensive landscape design, rehabilitation and open space buffers proposed by the development, which include a continuous corridor along Yaun Creek ranging in width from a minimum of 56.5m to 96.5m. The proposed environmental buffer and open space corridor is informed by detailed ecological assessment. Further the proposed open space corridor represents a significant contribution to the extent, function and values of the green space network in the locality of the subject site.
Nature conservation *The Gold Coast's biodiversity areas and other matters of environmental significance are conserved, protected, enhanced and managed to maintain a diversity of terrestrial, aquatic and marine species, ecosystems and ecological processes. Poorly protected regional ecosystems and habitat for threatened species, such as koalas, are enhanced.* *Biodiversity areas are fundamental elements of the city's green space network. These areas are conserved to maintain the diversity of terrestrial, aquatic and marine species, ecosystems and ecological processes.* *Mapped biodiversity areas include:* *(a) core habitats, that are extensive tracts of intact habitat within the hinterland and coastal wetlands areas; support a variety of vegetation associations; provide habitat for diverse fauna populations; and*	The environmental qualities of the site have been thoroughly assessed through the Ecological Assessment Report and further through the Response to GCCC Information Request Items 9, 10 and 11, prepared by Saunders Havill Group, located at **Section 1, Attachment 2**. The environmental qualities of the subject site are preserved and enhanced by the extensive landscape design, rehabilitation and open space buffers proposed by the development. The outcome is the preservation of approximately 40% of the site in an open space corridor.

RESPONSE TO ITEM 1:	
require the highest level of protection; *(b) hinterland to coast critical corridors that link core habitat systems and isolated areas of biodiversity value by retaining existing vegetation and restoring degraded areas to enhance fauna movement between different ecosystems and landscapes; and* *(c) substantial remnants of intact areas of vegetation that retain and enhance the diversity, extent and condition of habitat by avoiding impacts that originate from their urban context.* *The city's matters of environmental significance include:* *(a) native vegetation of national, state or local significance;* *(b) coastal environments, wetlands and waterways;* *(c) core habitat areas and substantial remnants;* *(d) hinterland to coast critical corridors, including:* *i. Burleigh Heads to Springbrook;* *ii. Springbrook to Wongawallan;* *iii. Southern Moreton Bay to Wongawallan;* *iv. Southern Moreton Bay to Clagiraba;* *v. Currumbin to Cobaki Broadwater (Tweed Shire); and* *vi. Currumbin to Currumbin Valley.* *(e) habitat for threatened species, such as koalas.* *In biodiversity areas, matters of environmental significance including vegetation and habitat for native flora and fauna are protected in situ, and degraded areas are restored to improve habitat quality and connectivity.* *Matters of environmental significance in the city's nonurban area are protected from urban encroachment by containing urban activity within the city's urban area.*	
A safe, well deigned [sic] *city – Strategic outcomes* *1) Areas of landscape character that contribute to the city's unique landscape and built form are identified and protected.* *2) Important elements of urban character and community significance are protected and enhanced to strengthen the sense of identity in local areas and the city*	The proposed development at the subject site does not impact any mapped areas of landscape or community significance having regard to Strategic framework map 4. The proposed development, however, delivers substantial landscape enhancement and a vital residential care facility that will assist in addressing considerable unmet need for this specialised form of housing that offers the opportunity to become an element of community significance in the rapidly growing neighbourhoods of Upper Coomera. The proposed development will enhance and strengthen the sense of identity and community for families in this neighbourhood, thereby delivering positive impacts for both landscape, urban character and community significance for the Upper Coomera locality.
Element – Landscape character *The distinctive rural, semi-rural and natural character of the city's river valleys, hinterland settlements, extensive natural landscape areas, rural production areas and rural residential areas provide a clear hard edge to, and natural backdrop setting for, the city's urban area.*	As discussed previously, and explored further in response to Item 5 below, photomontage views provided within the proposed Architectural Drawings located at **Section 2, Attachment 9**, demonstrate that the proposed development is comfortably accommodated within the subject site whilst preserving the character and amenity of the site and its locality. Further, the proposed development delivers substantial landscape enhancement throughout the subject site, contributing positively to the landscape

RESPONSE TO ITEM 1:

	character of the site and its setting at the edge of the Upper Coomera urban neighbourhoods.
Element – Urban design, character and community identity *Development is cognisant of the function and desired future appearance of each individual area and reinforces or reinterprets the character of that area.*	The overall design and appearance of the site and the proposed development has been informed by thorough analysis of the site and its setting. The landscape qualities and characteristics of the site are highly valued by the Applicant as elements of the utmost importance to the care and well-being of residents of the proposed care facility. The health benefits and quality of life improvements for residents with the ability to connect with nature are well documented and of significant value to the Applicant for this purpose. Accordingly, the proposed development ensures the preservation and enhancement of the landscape quality and character of the site and its setting, and thereby both reinforces and to an extent reinterprets the character of the site through the provision of an open space corridor embracing environmental values and providing pedestrian connectivity and spaces for quiet relaxation and enjoyment of the natural environment. The outcomes of the proposed development are well aligned with the specific outcomes of part 3.8.3.1 of the City Plan relating to 'a safe and well designed city', which in addition to the outcome nominated in Item 1 (shown in the column opposite) also seek that development provides for integration with local green spaces, networks and landscape features such as trees, parks and waterway corridors, and provides for an enhanced local identity and sense of place for various communities of the city whilst respecting important elements of local character and amenity.
Rural residential zone code *1) The purpose of the Rural residential zone code is to provide for residential development on large lots where local government infrastructure and services may not be provided on the basis that the intensity of residential development is generally dispersed.* *2) The purpose of the code will be achieved through the following overall outcomes:* *(a) Land uses –* *i. support the rural lifestyle and amenity aspirations of residents residing in the semi-rural or bushland environment;* *ii. provide low rise, very low intensity residential accommodation such as Dwelling houses, and Short-term accommodation (farm stays);* *(b) Character consists of –* *i. very low intensity and low rise environments; and* *(c) Built form –* *i. is very low intensity, low rise and well setback from property boundaries to ensure privacy for adjacent residences and to*	As set out previously in response to this Item, whilst the proposed development comprises of a Residential Care Facility, being a land use not specifically identified in the Table of Assessment for the Rural Residential Zone (Table 5.5.21 of the City Plan) it is relevant to note that Overall Outcome 6.2.21.2(2)(a)(vi) of the Rural Residential Zone Code provides that land uses that *'do not directly relate to the semi-rural operation of the zone may be considered'*, nominating a variety of land use examples *"where they do not compromise the amenity and character of the zone".* The examples of land use activity identified in this Overall Outcome span a broad range of activities including Community care centres, Education establishments, Places of worship and Transport depots. The form and scale of the proposed development is readily comparable and favourable in the context of these broad ranging examples of land use activities which the City

RESPONSE TO ITEM 1:

preserve the very low intensity character of the zone	Plan contemplates within the Zone. Importantly, in terms of the amenity and character considerations of this Overall Outcome, the proposed development represents an inobtrusive form of residential use, and the design and scale of the proposed development is comfortably compliant with provisions of the Rural Residential Zone Code relating to setbacks and site cover. The proposed development comprises site cover of only 20% of the site, being well below the 25% site cover envisaged by the Zone Code, with the vast majority of the site comprising of landscaped areas to complement the proposed residential care facility use for the enjoyment of residents and providing for rehabilitation of the Yaun Creek corridor to be captured within a substantial open space corridor. Further, analysis of the proposed development, including photomontage views provided within the proposed Architectural Drawings package located at **Section 2, Attachment 9**, demonstrates that the site and architectural design proposals ensure the preservation and enhancement of local amenity and character is preserved by the proposed development.

In conclusion, the proposed development, incorporating the design amendments adopted in response to Council's Information Request, in broad terms responds positively to the range of parameters considered in response to Item 1 as set out in **Table 1** above. Where relevant, further detailed consideration is provided within the response to Items 3, 4 and 5 of this Information Request Response, with regard to the relevant matters for consideration identified through the meeting held with officers on 13 September 2018, as set out previously within the response to this Item.

2.2 Item 2: Changed Application

If the applicant wishes to continue with the current application, the applicant is requested to utilise the 'stopping the current period' provisions within section 32 of the Development Assessment Rules and/or request the applicant's information request response period be extended, in accordance with section 13.1 of the Development Assessment Rules, until such a time that the relevant investigations are complete and included within the City Plan. The applicant is requested to make a changed application, in accordance with section 25 of the Development Assessment Rules, to reflect the major amendments to the City Plan, in relation to the Upper Coomera Area.

RESPONSE TO ITEM 2:

In response to Item 2, given the further discussions and meetings held with officers, as outlined within the response to Item 1 above, extension to the Applicant's information request response period, pursuant to section 13.1 of part 3 of the DAR, has been agreed with Council as suggested in Item 2. Initially, an extension to the information request response period was agreed via email correspondence on 12 and 13 November 2018, with the most recent correspondence confirming agreement to the extension of the Applicant's information request response period being email correspondence with Council's Adam Morris, dated 30 January 2019, confirming extension of the information request response period to 28 August 2019.

2.3 Item 3: Relevant Matters

Investigations

Officers acknowledge the relevant matters identified within the proposed application, however consider these matters to be incomplete and lacking supporting material.

Council have conceptually identified the subject site as an investigation area within the Strategic framework however it is clearly stated that until an investigation is undertaken, and any amendments to the City Plan are completed, investigation areas are to maintain their character and intent.

The applicant has submitted site based investigations and specialist reports to support the proposed application however this supporting material does not consider or assessment [sic] *of the broader context and constraints, of which Council's investigations do.*

The subject investigation, being the Upper Coomera Area, is not complete and amendments have not been made to the City Plan. Thus until such time that this investigation is completed and amendments have been made to the City Plan the subject site is to maintain its rural residential character and intent.

The applicant is requested to identify any other 'relevant matters' pursuant to s45(5)(b) of the Planning Act 2016 that may be applicable in the assessment of this application or provide further supporting information for the relevant matters already identified.

Need

Given the relative sizes of the proposed elements and the ancillary nature of the Educational Establishment, it is fair to describe the proposed development as a Residential Care Facility or nursing home.

Subject to a more detailed scrutiny of the data contained within the Economic Needs Assessment (ENA), it appears that it has demonstrated that there is a market gap between demand for nursing home facilities and their supply, supporting the ENA's conclusion that there is an economic need for the proposed development. However, the ENA has not examined the extent to which appropriately zoned land exists that could accommodate the identified shortfall in supply. This is a major weakness of the ENA, preventing it from drawing a conclusion as to whether there is a planning need for the development to locate on the subject site.

It is noted that the proposed major use (Residential Care Facility) is Code Assessable in many zones: Low Density Residential (subject to criteria); Medium Density Residential; High Density Residential; Centre; Neighbourhood Centre; and Mixed Use (except Fringe Business Precinct). Officers consider that it would be easy to demonstrate that sufficient vacant and/or under-utilised lands were located within these zones within the large Catchment Area defined by the ENA.

It is acknowledged that there is an economic need for another Residential Care Facility to locate within the Catchment Area, but a planning need has not been demonstrated for it to locate on the subject site.

The applicant is requested to demonstrate a planning need, consistent with the Planning and Environment Court's previous determinations. This includes determining whether the proposed use could be located on a vacant or under-utilised site in a more appropriate zone elsewhere in the Catchment Area.

RESPONSE TO ITEM 3:

In response to Item 3 we provide the further considerations as set out below.

Investigations

With regard to the status of investigations relating to the Upper Coomera Investigation Area, as an initial point we refer again to the discussion relating to the Minutes of the Council Meeting of 23 August 2016 and the adopted Committee Recommendation CP16.0817.006 that is addressed at length in response to Item 1 above.

Further, the design of the proposed development incorporating the amendments to the proposals that have been determined through the further engagement with officers in response to the Information Request has accommodated aspects of the forthcoming amendments to the City Plan derived through the detailed planning investigations carried out by the Council in respect of this Investigation Area.

Need

Notwithstanding the effect of the Council's resolution referenced above, further consideration is provided in respect of relevant matters having regard to section 45(5)(b) of the PA, in accordance with the outcomes reached during the meeting attended with Council officers on 13 September 2018, as outlined in response to Item 1 above.

In addition to the information already provided with the Development Application, which include the Economic Needs Assessment prepared by MacroPlan Dimasi, it was advised that further information should be provided by the Applicant in response to the Information Request to comprise:

- photomontage views to address visual amenity considerations relating to the proposed building height, which is addressed within the response to Item 1 and further in response to Item 5 below;
- a review of 'planning need' to supplement the Economic Need Assessment, involving:
    - analysis of potential alternative sites that may accommodate the development proposal within the

RESPONSE TO ITEM 3:

locality of Upper Coomera to demonstrate that the subject site represents a suitable and preferable location for the proposed residential care facility and retirement facility; and

- consideration of the principle of residential care facilities established in rural residential / fringe locations and other zones throughout the City due to the land area required to support the nature of the operations of the facilities.

In response to the considerations relating to planning need, we refer to the graphic analysis provided at **Section 2, Attachment 7**, which presents the results of detailed research to identify potential alternative sites of sufficient area to accommodate the proposed development within the Upper Coomera area, where the sites are located within Zones where a Residential Care Facility is identified as a Code Assessable form of land use. In this respect it is noted that a Residential Care Facility is identified as Code Assessable within the Medium Density Residential Zone; the Centre Zone; the Neighbourhood Centre Zone and the Mixed Use Zone where not in the Fringe Business Precinct. Accordingly, the research into potential alternative sites within the Upper Coomera area to accommodate the proposed development is focussed on land within these zones.

It is initially important to recognise that land within such zones is predominantly fragmented into small parcels which are already developed for residential purposes comprising a mix of densities reflective of the zoning characteristics of the residential neighbourhoods in the locality. Additionally, land within the Centre Zone and Neighbourhood Centre Zone within the locality is already developed or approved for uses supporting the centre function of the zones. Land within the Mixed Use Zone occurring within the Upper Coomera locality is located within the Fringe Business Precinct and as such is not applicable to further consideration.

This analysis has identified seven potential alternative sites in terms of being sites that comprise of sufficient land area and are located within a zone where the proposed Residential Care Facility is a Code Assessable form of development. Further investigation of the status of these sites is presented within the analysis located at **Section 2, Attachment 7**. Further analysis has been carried out on each of these sites, finding that the majority of the sites benefit from existing development approvals for urban development, most of which are presently undergoing construction, whilst a commercial approval for a shopping centre at Reserve Road (Lot 26 on SP191934) is subject of a development approval that incorporates conditions restricting premises from trading at the site prior to December 2019. As the development approval has a currency period extending to 2022 this development is expected to come forward in accordance with the approval in the near future.

Following on from this further analysis, it is evident only three of the seven identified sites remain valid for further consideration, with those being located at: 203 Baileys Mountain Road (Lot 590 on SP218180) located directly opposite the subject site to the north across Baileys Mountain Road; Reserve Road (Lots 35-41 on SP208828) located to the south-east of the subject site across Reserve Road; and 147 Billinghurst Crescent (Lot 109 on RP167138) located adjacent to St Mary's Catholic Church and Assisi Catholic College. Further analysis of each of these sites is presented at **Section 2, Attachment 7**, and as follows.

- **203 Baileys Mountain Road**
  The site at 203 Baileys Mountain Road, located directly opposite the subject site to the north, is described as Lot 590 on SP218180 and comprises an area of 30,940sqm (3.094ha).
  Whilst the site is located within the Medium Density Residential Zone under the provisions of the City Plan, it is relevant to note that it is also heavily impacted by overlay mapping constraints, with the vast majority of the site affected by Environmental Significance Overlay Mapping including Priority Species (State significance, koala habitat and local significance mapping layers) in addition to State Interest Mapping - Regulated Vegetation affecting much of the subject site. These constraints are evident in the previous development approval over the site for attached and detached dwellings (Council's Reference: MCU2701105) which required substantial areas of the site to be given over to environmental corridor and parkland, with the parkland comprising of stormwater management infrastructure.
  It is also noted that an application for Operational Works (Tree Works) was submitted subsequent to the lapsing of the previous development approval described above, however, that application was withdrawn approximately 3 months after lodgement (Council's Reference: OPW201800950).
  Review of the constraint mapping affecting the site and the development application history, summarised above, suggests that the extent of constraints has had an adverse effect on viability with the development approval having been allowed to lapse and the site remaining undeveloped, despite considerable development having come forward on the surrounding Medium Density Residential zoned land.
  Given the extent of these constraints affecting the site at 203 Baileys Mountain Road, it is appropriate to conclude that the subject site, being 202 Baileys Mountain Road, whilst being located directly opposite that land represents a more viable alternative for accommodating the proposed development, with the subject site being considerably less constrained and more suitable to accommodate the proposed development whilst facilitating enhancement of the identified environmental and landscape values of the site.

- **Reserve Road (Lots 35-41 on SP208828)**
  This property is located to the south-east of the subject site across Reserve Road and comprises of a number of fragmented land parcels collectively incorporating an area of 241,260sqm (24.125ha). A large proportion of

RESPONSE TO ITEM 3:

the land is contained within the Rural Zone (part Rural Landscape and Environment Precinct) leaving only part of the land within the Medium Density Residential Zone.

The property is the subject of a previous development approval for attached dwellings, medium density detached dwellings, detached dwellings and reconfiguring a lot (Council's Reference: MCU2700613). The development subject of the approval has been partially implemented, comprising the residential properties at Tian Crescent. Whilst a Permissible Change and Extension to the Relevant Period approval was granted by Council in January 2017, it appears that the balance of the approval has since lapsed.

The property is also substantially affected by Environmental Significance Overlay Mapping (koala habitat) affecting the majority of the site, with only a very limited area of the land within the Medium Density Residential Zone remaining unconstrained.

Again, given the extent of constraints affecting the property and the site comprising of a number of fragmented land parcels, it is appropriate to conclude that the subject site, being 202 Baileys Mountain Road, whilst being located within approximately 200m from that land, represents a more viable alternative for accommodating the proposed development, with the subject site being considerably less constrained and more suitable to accommodate the proposed development whilst facilitating enhancement of the identified environmental and landscape values of the subject site and its setting.

- **147 Billinghurst Crescent**

  The site at 147 Billinghurst Crescent is described as Lot 109 on RP167138 and comprises an area of 31,260sqm (3.126ha). It is located in the Medium Density Residential Zone and immediately adjacent to the grounds of the St Mary's Catholic Church and Assisi Catholic College.

  This property is again substantially affected by Environmental Significance Overlay Mapping including Priority Species (State significant species and koala habitat areas). The property remains heavily vegetated, and whilst it is noted that Operational Works approval for Tree Works was granted over the site in 2015, this was limited to 4 trees only. It is also understood that the site remains in ownership that is linked to the adjacent college and in the event that the environmental constraints of the land could be overcome at some time in the future the land would potentially serve to accommodate future growth needs of the educational establishment.

  In brief, the environmental constraints affecting the property are considerable leading to the logical conclusion that the subject site at 202 Baileys Mountain Road represents a more viable alternative for accommodating the proposed development, with the subject site being considerably less constrained and more suitable to accommodate the proposed development whilst facilitating enhancement of the identified environmental and landscape values of the subject site and its setting

Overall, the detailed analysis of potential alternative sites within the Upper Coomera area provided in the discussion above and the graphic presentation located at **Section 2, Attachment 7**, demonstrate that demand for land within the Upper Coomera locality is considerable, with the rapid growth of the urban residential areas and commercial areas within Upper Coomera having consumed all available land other than the three parcels that are considered in further detail above. The effect of environmental constraints over those parcels, despite being located in the Medium Density Residential Zone, has the effect of significantly limiting their potential to accommodate development that their zoning characteristics might otherwise indicate.

Of further relevance when considering locational opportunities for the proposed development at the subject site is the need for suitably sized properties to accommodate a Residential Care Facility and the associated viability considerations.

To achieve a suitable size of land to accommodate the facility, including the landscaped garden setting that is of significant importance to quality of life considerations for residents of the facility, within the Medium Density Residential Zone would require the acquisition of a large number of fragmented land parcels and demolition of existing dwellings and multiple dwellings that populate the locality. Whilst this would be a challenging proposition even for a conventional medium density residential form of development to viably achieve, the financial returns for a Residential Care Facility simply do not enable such an outcome to be contemplated.

We note that Council has acknowledged these realistic considerations relating to locational requirements, land area and feasibility, when making a decision on 30 April 2018 to grant a development permit for material change of use (superseded planning scheme application) for aged persons accommodation (177 units) comprising of 6 storeys in height at 114 Albion Avenue, Miami, on open space land located within the Sport and Recreation Zone under the provisions of the City Plan, and within the Public Open Space Domain under the Superseded Planning Scheme.

These relevant considerations are further reflected in the distribution of existing residential care facilities throughout the City, with a considerable number of examples of such facilities occupying sites within Rural Residential Zone locations, as demonstrated by the Locational Analysis presented at **Section 2, Attachment 6**. This analysis identifies various existing and approved Residential Care Facilities located within the Rural Residential Zone currently, or where located in zones such as Community Facilities or even in a Medium Density Residential Zone currently, the analysis demonstrates that at the time those facilities were originally developed they came forward on sites which were within a Rural Residential (or Park Residential) area or at the fringe of established

RESPONSE TO ITEM 3:

residential neighbourhoods.

The proposed Residential Care Facility at the subject site, therefore, represents an outcome that reflects a consistent approach by Council in the consideration of suitably located sites to accommodate much needed Residential Care Facilities throughout the City. The Economic Need Assessment prepared by MacroPlan Dimasi, accompanying the Development Application, demonstrates a significant undersupply of residential care accommodation available to serve the growing need for this form of specialised housing, with undersupply of 661 beds at 2018, increasing to an undersupply of 777 beds in 2022. This extent of undersupply is equivalent to five Residential Care Facilities of the size of that proposed at the subject site.

The demonstrable need for the proposed Residential Care Facility is further evidenced by the Australian Government round of approvals for bed licences for aged residential care having earlier in 2019 having recognised this need and awarding bed licences to the Applicant representing 31% of the bed allocations granted for the whole of the Gold Coast.

In conclusion, taking the findings of this further detailed analysis into consideration, together with the factors outlined previously in this Information Request Response, it is logical to conclude that the proper consideration of relevant matters offers clear support for the proposed development at the subject site. This is supported by the key considerations which confirm:

- demonstrated need for the proposed residential care facility;
- the lack of availability of suitably sized and zoned alternative sites;
- the ability to establish the proposed use on the subject site without causing unacceptable impacts on residential amenity;
- the provision made in the Development Application for substantial contribution to the greenspace network and rehabilitation along the Yaun Creek corridor;
- the thoughtful approach to site design, extensive landscape enhancement and building form and appearance that is designed to complement the setting of the site and to preserve and enhance the character and amenity of the site and its locality;
- the ability to deliver the proposed development whilst preserving and enhancing the environmental values of the subject site;
- the design of the proposal and suitability of the subject site to accommodate the proposal whilst also preserving land for potential future road realignment to Baileys Mountain Road in line with the vision of the emerging City Plan proposals for the Upper Coomera Investigation Area; and
- the ability to deliver positive planning benefits such as those summarised above, including the delivery of much needed residential care beds within the rapidly growing community of Upper Coomera, evidenced by the granting of bed licences by the Australian government for the proposed facility, supporting an enhanced sense of community and a well serviced community.

Giving due consideration to these factors it is appropriate to conclude that relevant matters are evident to support the granting of approval to the proposed development at the subject site.

2.4 Item 4: Scale and intensity of the use

The proposed built form, height, design and layout is not considered to maintain the existing amenity of the surrounding area nor support or complement the rural residential character. Officers have concerns with the proposed height, scale and intensity of the development not achieved the indented [sic] *current and future character of the area. The applicant is requested to reduce the building height, scale and intensity of the building form to achieve a more appropriate low rise residential scale consistent with that sought by the zone code outcomes.*

RESPONSE TO ITEM 4:

Considerations set out in response to the matters raised in Item 1 of the Information Request are again relevant in response to Item 4. The relevant matters for consideration in response to Item 4 are reiterated as follows.

It is first important to acknowledge the Overall Outcomes of the Rural Residential Zone Code, including Overall Outcome 6.2.21.2(2)(a)(vi) of the Rural Residential Zone Code clarifies that land uses that *'do not directly relate to the semi-rural operation of the zone may be considered'* for development within the Zone *"where they do not compromise the amenity and character of the zone"*. This Overall Outcome goes on to clarify that a variety of land use activities are contemplated, stating that uses may be considered *"such as Garden centres, Veterinary services, Community care centres, Community uses, Education establishments, Places of worship, Environmental facilities and Tourist attractions, Emergency services and Transport depot"*.

When identifying potential uses that *"do not directly relate to the semi-rural operation of the zone"* it is important to take heed that the Overall Outcome specifically uses the words *"such as"*. This is a clear expression that the land use activities then put forward within the Overall Outcome are not intended to represent a definitive list such that only those uses may be contemplated, but rather that these are examples of land use activities and

RESPONSE TO ITEM 4:

that other land use activities may be contemplated subject to demonstrating that they do not compromise the amenity and character of the zone.

Accordingly, taking account of the broad range of land use examples suggested by Overall Outcome 6.2.21.2(2)(a)(vi), with activities including Community care centres, Education establishments, Places of worship and Transport depots, it is reasonable to assert that a Residential Care Facility represents a readily comparable and favourable use in the context of these broad ranging examples.

In terms of amenity and character considerations of this Overall Outcome, the proposed development represents an inobtrusive form of residential use, and the design and scale of the proposed development is comfortably compliant with provisions of the Rural Residential Zone Code relating to setbacks and site cover.

The Town Planning Report accompanying the Development Application identifies that the position of the proposed development provides generous setbacks to site boundaries all of which comply with or exceed the minimum setbacks specified by AO1 of the Zone Code. The revised Architectural Drawings provided at **Section 2, Attachment 8**, have incorporated a shift in the position of the proposed building in response to other items raised in the Information Request and informed by the various meetings and engagement with Council officers following receipt of the Information Request.

The repositioned building maintains compliance with the setback parameters of the Rural Residential Zone, set out under Acceptable Outcome AO1 which represents the 'deemed to comply' provisions for setbacks within the Zone. AO1 nominates minimum setbacks as set out in **Table 2** below, with the setbacks of the proposed development nominated in the column adjacent. This analysis demonstrates that the siting of the proposed development is positioned comfortably within the subject site, incorporating building setbacks that are significantly greater than those contemplated by the Acceptable Outcome, within which substantial landscape enhancement is delivered. It is, therefore, appropriate to conclude that the setbacks of the development:

- provide privacy to adjacent dwellings;
- allow access around the building;
- importantly contribute positively to the semi-rural streetscape character; and
- allow for on-site car parking; pursuant to the provisions of the related Performance Outcome PO1.

Table 2: *Rural Residential Zone – Building Setback Parameters [Acceptable Outcome AO1]*

Boundary	Minimum Setback Parameter	Proposed Setback [Minimum]
Front	6m	**COMPLIES** Baileys Mountain Road: 15.5m Reserve Road / Old Coach Road: 79.5m
Side and Rear	3m	**COMPLIES** North-West Boundary: 29m South-West Boundary: 6m

Further, having regard to the site cover parameters for the Rural Residential Zone, the proposed development comprises of site cover of 20% being considerably below the site cover parameter of 25% specified by AO2 of the Rural Residential Zone Code. Performance Outcome PO2 specifies that site cover is *'low to protect the rural residential character"* nominating site cover of 25% as the 'deemed to comply' parameter to satisfy the intent of this Performance Outcome.

Outside of the building footprint, with the exception of a limited area for the access driveway, the whole of the subject site is given over to landscaped areas, including public open space corridor, ensuring not only the preservation, but also the enhancement of the amenity and character of the site and its surroundings.

Whilst the proposed development incorporates three storeys, exceeding the building height parameter of two storeys plus a 'partial third storey' that is contemplated by AO4.1 of the Zone Code, the photomontage views provided within the proposed Architectural Drawings located at **Section 2, Attachment 9**, demonstrate that the proposed building height is comfortably accommodated within the subject site whilst preserving the character and amenity of the site and its setting. The photomontage images demonstrate that the setting of the site and its surroundings is further enhanced by the extensively landscaped areas provided within the site by the proposed development. Further, the proposed building height reflects the outcomes resolved through design review and amendments incorporated during the series of pre-lodgement meetings attended with Council officers between November 2017 and February 2018 prior to lodging the Development Application.

As also set out previously in response to Item 1, the Strategic outcomes of the City Plan in respect of Creating liveable places, include the provision that: *"The Gold Coast's settlement pattern provides housing choice and diverse*

RESPONSE TO ITEM 4:

lifestyle opportunities in mixed use centres and specialist centres, urban neighbourhoods, suburban neighbourhoods, new communities, and rural residential and township areas"; and that *"Varied building height and form throughout the city reinforces local identity, creates a sense of place and supports housing choice and affordability and the function and desired future appearance of each local area".*

It is, no doubt, the reasonably applied consideration of such matters that has informed the Council's approach to providing support for residential [aged] care facilities within similar rural residential and other zone locations throughout the City, as evidenced in the discussion in response to Item 2 above, and the Locational Analysis set out at **Section 2, Attachment 6**.

The context of the subject site is that it is located at the cusp of the rapidly growing neighbourhood of Upper Coomera, where the analysis in response to Item 2 above clarifies that the growth in this locality has consumed the extent of suitable zoned land for urban activity. The subject site is positioned directly adjacent to land to the east and north of the site that is contained within the Medium Density Residential Zone and a designated Urban Neighbourhood of the City. This contextual context is a relevant matter for consideration in respect of the proposed development at the subject site. In this respect, the proposed development adopts a built form that is well setback from site boundaries, incorporates environmental buffer and rehabilitation to the Yaun Creek corridor, delivers substantial landscape enhancement throughout the site, comfortably complies with the building setback and site cover provisions of the Rural Residential Zone, and adopts an architectural design and palette of external finishes that are sympathetic to its setting.

Accordingly, it is evident that the proposed development delivers outcomes that preserve and enhance the character and amenity of the local area and are compatible with the desired future appearance of the locality.

2.5 Item 5: Building height

The proposed 3 storey (13m) building height is inconsistent with the area's low-rise character. It is requested that the building height be reviewed to provide a low-rise building in order to maintain the intended character of the area in accordance with:

- *Specific Outcome 3 (3.3.7 Element – Rural residential)*
- *Specific Outcome 1 (3.8.3 Element – Urban design, character and community identity)*
- *Overall outcome 2(a)(ii), 2(b)(i) and 2(c)(i) of the Rural residential zone code.*
- *Performance criteria 4 of the Rural residential zone*
- *Performance criteria 3(a) of the Multiple Dwelling Code*
- *.Additionally, large vegetated buffers must be maintained to soften and screen the building.*

In accordance with above provisions, the applicant is requested to demonstrate how the proposed height is considered to achieve the envisioned urban character of the local area being low rise and low intensity.

Advice note:
The Urban neighbourhoods element is not applicable to the assessment of the application as the site is not located within an urban area. As such the uplift provisions to justify the building height is not applicable.

RESPONSE TO ITEM 5:

In response to Item 5 it is initially relevant to reflect upon the design review engagement carried out with Council officers through a series of pre-lodgement meetings held in relation to the proposed development at the subject site between November 2017 and February 2018, as touched on previously in response to Item 1. Through this consultative process revisions to the design and appearance of the proposed development were incorporated in response to the constructive feedback provided through these meetings, resulting in the form of the proposal incorporating three storeys and the sympathetic selection of external materials and finishes of the proposed development. These elements were resolved and presented during the meeting held on 19 February 2018 where they were welcomed by officers.

Further to this, additional photomontage views have been prepared to accompany this Information Request Response in line with outcomes resolved during the meeting attended with officers on 13 September 2018. The location for views was identified and confirmed through clarification with officers following the meeting and the views from these agreed locations are presented within the proposed Architectural Drawings package located at **Section 2, Attachment 9**.

The photomontage views demonstrate that the proposed development, with the substantial site setbacks and extensive landscape enhancement proposed, is visually screened such as to not be visible in views from Old Coach Road and Reserve Road. Glimpses of the proposed building will be visible to a limited extent from Baileys Mountain Road, and this is limited to small areas where there are breaks in existing road corridor vegetation along the frontage of the site, being generally in the location of the Council's potential future realignment of

RESPONSE TO ITEM 5:

Baileys Mountain Road, and where the Council has identified that a traffic speed environment of approximately 70km/h is occurring (refer to Item 18 below). Notwithstanding, the landscape enhancement incorporated in the proposed development will clearly contribute to visual softening to the limited extent of built form that is visible from these locations.

Detailed consideration in respect of relevant considerations of the City Plan referenced in Item 5 is set out previously in response to Items 1 and 4 of the Information Request. In brief, taking account of the relevant considerations set out within this Information Request Response, it is logical to conclude that the form, design and appearance of the proposed development including the proposed site layout and extensive landscape design is such as to ensure that the proposed development does not disrupt local amenity and character and that the proposals incorporate desirable landscape outcomes ensuring that landscape character and ecological values are not simply only maintained but are considerably enhanced. On balance, the proposed development, is positively aligned with the higher order objectives of the City Plan with regard to delivering a specialised form of housing to meet clearly identifiable needs within development of a form and scale that is led by clear objectives for preserving and enhancing the character and amenity of the site and its setting.

2.6 Item 6: Development staging

The proposed development is intended to be constructed over two stages. It is requested that further information/drawings regarding the appearance and treatment of the development (i.e. building elevations, treatment to roof of car parking area etc.) at the completion of the first stage be provided to ensure that acceptable visual amenity is maintained in accordance with PO2 (General development provisions code).

RESPONSE TO ITEM 6:

In response to Item 6, the revised Architectural Drawing package prepared by BDA Architects, located at **Section 2, Attachment 9**, includes additional drawings to clarify the appearance of the proposed development at completion of Stage 1 and subsequently at the completion of Stage 2. The additional drawings provided include Floor Plans showing the components of the development comprising Stages 1 and 2, and identifying provision for a temporary verandah at the north-western edge of the building to be incorporated for Stage 1 whilst this will be removed to make way for completion of Stage 2 of the development.

The additional drawings also provide Elevation drawings and Indicative Perspective views, extracts of which are presented in **Figure 2** below for ease of reference. The indicative perspective views clarify that the form of the development at the completion of Stage 1 achieves desirable architectural quality outcomes and visually pleasing appearance, with the temporary verandah feature incorporated to enhance the built form appearance at the north-western edge of the Stage 1 elements at Levels 1 and 2, whilst the on site car parking element is maintained as a low-rise single storey element incorporating the architectural features and finishes of the overall form and appearance of the development, complemented by the landscaped setting of the building.





Figure 2: *Staging - Indicative Perspectives*

2.7 Item 7: Retaining walls

The applicant is requested to provide details of all retaining walls associated with the development including heights and materials.

RESPONSE TO ITEM 7:

In response to Item 7, the location and height of all retaining walls within the proposed development are identified in the Preliminary Earthworks Plan, Preliminary Earthworks Cross Sections and Preliminary Earthworks Conveyance Channel drawings prepared by Arcadis, located at **Section 1, Attachment 3**.

2.8 Item 8: Works within the Baileys Mountain road realignment

Once the realignment of Baileys Mountain is confirms [sic] *(refer to Transport assessment comments), the applicant is requested to amend plans to remove all embellishments and works associated the development within this area.*

RESPONSE TO ITEM 8:

The potential future realignment of Baileys Mountain Road as referred to in Item 8 has been identified in the drawing provided by Council's Transport and Infrastructure branch, titled Baileys Mountain Road, Coomera – Proposed Land Requirement Lot 58 SP191940, a copy of which is located at **Section 2, Attachment 10**. We note that during the meeting attended with officers on 29 March 2019, it was advised that this potential future land requirement is not required from the Applicant at this stage but may be the subject of a future acquisition proposal by Council. An extract copy of this drawing is presented in **Figure 3** below for ease of reference.



Figure 3: *Extract copy of CCGC Preliminary Future Land Requirement Drawing*

Accordingly, the revised Architectural Drawings prepared by BDA Architects, located at **Section 2, Attachment 9**, have indicatively shown this potential future land requirement, whilst maintaining all components of the proposed development clear of the identified corridor.

Environmental Assessment

2.9 Item 9: Amended site development plans required

The subject site is identified as containing two mapped waterways in accordance with the Environmental Significance Overlay Code. The applicant is proposing to retain and enhance Yaun Creek (stream order 4) crossing through the southern extent of the subject site. However, cumulative impacts to the waterway buffer have not been fully demonstrated. The applicant is proposing to retain the existing dwelling and construct a pedestrian linkage trail within the Yaun Creek buffer area. The submitted bushfire report recommends regular mowing and maintenance of landscaped areas for fire mitigation purposes. The bushfire report does not take into consideration rehabilitation of the Yaun Creek buffer area.

The submitted civil report identifies no proposed alteration or change to the eastern waterway (stream order 2) to facilitate the development. However, Preliminary Earthwork Plans identify cut and fill works to extend to the site's eastern boundary resulting in complete modification of the waterway. Further disturbance is demonstrated through the tree survey plans which identify trees along the banks of the waterway to be removed to facilitate the development. Additional tree clearing is proposed including the removal of four large Moreton Bay Fig trees located within the centre of the subject site.

The subject site currently facilitates a riparian / habitat corridor associated with Yaun Creek and north to the densely vegetated rural area identified as remnant vegetation (medium priority) containing koala habitat and local and state significant species. Previous developments upstream and downstream of the site have secured conservation areas over the Yaun Creek corridor including extended corridors which capture the connecting tributaries from the north facilitating habitat connectivity.

The proposed development does not achieve compliance with performance outcomes PO5 and PO23 of the Environmental Significance Overlay code or demonstrate a development that is consistent with, and contributes to, the purpose of the code. The proposed development does not achieve adequate buffers to the mapped waterways which maintains bank stability and ensures unimpeded movement of fauna along the watercourse. The proposed development does not ensure the protection and enhancement of the ecologically significant areas and associated buffers to be suitably protected in perpetuity.

The proposed development does not achieve the strategic outcomes under Strategic Framework 3.7 Living with nature including specific outcomes under section 3.7.2 Element – Natural Landscape areas, and 3.7.4 Element – Nature conservation.

The applicant is requested to amend the proposed plan of development to demonstrate the following:

(a) Provide adequate buffers to Yaun Creek and the connecting waterway (stream order 2) within the eastern extent of the site in accordance with the Environmental Significance Overlay Code and the Strategic Framework.

(b) Demonstrate that no infrastructure and/or proposed earthworks encroach within the waterway buffer areas.

(c) Demonstrate that no bushfire mitigation zones require impacts to the waterway buffer areas.

RESPONSE TO ITEM 9:

A full response to Item 9 has been prepared by Saunders Havill Group ('SHG') and is located at **Section 1, Attachment 2.** In brief, the response from SHG identifies that:

- revisions to the proposed development which are illustrated in the revised Architectural Drawings located at **Section 2, Attachment 9**, provide for repositioning of the proposed Residential Care Facility building and the ancillary staff training facility accommodated within the existing dwelling on the site;
- the repositioning of the buildings within the site has facilitated increased separation between the Yaun Creek corridor and the proposed development footprint to create a 25m waterway setback/buffer measured from the top of bank of the creek, with the proposed 25m buffer having been determined as appropriate through the environmental assessment of the waterway area and which has been acknowledged by Council's Environmental Assessment team during the meeting attended with officers on 20 May 2019;
- no earthworks or infrastructure are proposed within this waterway buffer area;
- beyond the 25m waterway setback / buffer an additional 6m wide corridor is provided to accommodate the pedestrian / recreational activity linkage through the site, which is considered further in response to Item 23 below, providing an overall open space corridor width of 31m;

RESPONSE TO ITEM 9:

- the proposed Rehabilitation Management Plan provided in response to Item 10 below provides for rehabilitation incorporating rainforest species selected from the relevant remnant vegetation categories and reflecting the evolved character of the waterway;
- consultation with Eldon Bottcher Architect in relation to the Bushfire Management Report has confirmed that no bushfire setback to the proposed development is required in this area and this is reflected in the update to the Bushfire Management Report located at **Section 1, Attachment 3**;
- the proposed rehabilitation measures within this corridor will protect the significant areas that were confirmed through ecological assessment, being remnant/priority vegetation, create unimpeded movement for fauna along the waterway, further stabilisation of the banks of the waterway, and maintain water quality, thereby enhancing connectivity to the Yaun Creek corridor both upstream and downstream;
- the mapped north-eastern watercourse which runs along Baileys Mountain Road comprises of a modified drainage channel entering a man-made dam in the eastern area of the subject site, with fauna movement compromised by the lack of a true riparian corridor in this location and the dominance of exotic or weed species;
- earthworks which are necessary in this area of the site to provide access from Baileys Mountain Road will not remove any significant riparian vegetation and it is further relevant to note that this areas falls within the potential future road realignment / land requirement identified by the Council as presented in **Figure 3** above.

Overall, the response to Item 9 provided by SHG concludes that the proposed development satisfies the provisions of PO5 (Wetlands and Watercourses) and PO23 (Tenure, Ownership and Management Arrangements) of the Environmental Significance Overlay Code, and further that the strategic outcomes under Strategic Framework 3.7 (Living with nature) including specific outcomes under section 3.7.2 (Natural Landscape areas) and 3.7.4 (Nature Conservation) are satisfied by the proposed development. The proposed development achieves these outcomes through such measures as retaining and improving the natural areas on the site to perform essential functions such as conservation of biodiversity and priority vegetation areas, scenic amenity and other green space values.

2.10 Item 10: Rehabilitation Management Plan required

The applicant is requested to provide a rehabilitation management plan for the watercourse buffer areas to be dedicated as open space.

The rehabilitation management plan must be prepared in accordance with:

(a) City Plan Policy 6.8 Environmental Management Plans
(b) South East Queensland Ecological Restoration Framework 2012.
(c) SC6.11 City Plan policy – Land development guidelines

The rehabilitation management plan must contain the following information (as applicable):

(d) Details of proposed rehabilitation work including areas requiring Assisted Natural Regeneration, Reconstruction, and Fabrication.
(e) Details of proposed staging of works.
(f) Details of proposed rehabilitation works including proposed species and planting palette. The proposed planting palette is to include species consistent with Regional Ecosystems 12.3.11 and 12.11.24.
(g) Planting modules to demonstrate planting densities.
(h) All weeding works required, including a full list of known weeds on site and how each weed can be adequately managed.
(i) The required ongoing management/maintenance regimes, including:
  i. All plantings to be subject to a 12 month establishment period;
  ii. Plans indicating maintenance areas/zones;
  i. Schedules of works including frequency and tasks;
  ii. Allocation of labour and resources to perform tasks;
  iii. Nomination of key performance indicators/criteria for monitoring purposes (eg. All revegetation areas minimum 90% weed free, etc);
  iv. Time allocated to perform various tasks (eg. top up mulch, pruning, topdressing, etc);
  v. Defects liability for materials such as replacement of dead plant species of equivalent species and vigour to achieve 90% success rate;
  vi. Coordination of services such as irrigation repair or civil infrastructure maintenance (such as stormwater) that may impact on the landscape establishment and maintenance periods;
  vii. Management of bushfire hazard (only where appropriate);
  viii. Management of domestic farm/feral animals (if appropriate);

ix. Tree management procedures;
x. Management and maintenance regimes for sediment and erosion control devices, and irrigation;
xi. Proposed future need for infrastructure, including public facilities; and
xii. Management and control of declared plants and recognised environmental weeds.

RESPONSE TO ITEM 10:

In response to Item 10, a Concept Rehabilitation Plan has been prepared by SHG and is located at **Section 1, Attachment 2**. As noted in the full response to Items 9, 10 and 11 prepared by SHG, the Concept Rehabilitation Plan has been prepared in accordance with the guidelines and policies nominated in Item 10, providing for rehabilitation that will enhance the existing vegetation values and provide for extensive weed management where required.

2.11 Item 11: Amended tree retention / removal survey plan and arborist report

The applicant is request [sic] *to amend Plans 4.1 and 4.2 Tree Retention removal Plan – Baileys Mountain Road, Upper Coomera, Issue C, dated 31 July 2018 prepared by Saunders havill group, to show the following:*

(a) Identify trees to be retained incorporated within the waterway buffer areas to be dedicated as public open space.

(b) Identify trees to be retained over the balance of the site incorporated within the development layout.

(c) Include a supporting Arborist Report for trees to be retained at the interface of site works and/or located in close proximity to proposed buildings. The report is to be prepared by a qualified Arborist with a minimum Australian Qualification Framework (AQF) Level 5 in Arboriculture and include the following information:

i. All tree management procedures within the report are to be in accordance with the Australian Standard AS4970 - 2009 Protection of trees on development sites;
ii. An appraisal of the health and vigour of the retained trees, including stage of growth, predicted gross morphology, crown framework and extent of root system;
iii. Tree site plan of suitable scale to proposed development layout plans indicating all required Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) for the retained trees.
iv. Details of all proposed vegetation works (including proposed clearing or retention works) to ensure the survival, ongoing health and vigour of retained vegetation (given proximity to buildings and areas where works are to be undertaken) including any necessary reductions (crown, thinning, root truncations) to accommodate footings and foundations, and protective devices (protective fences, root curtains/barriers) to minimise construction impacts.

RESPONSE TO ITEM 11:

A full response to Item 11 is provided by SHG and is located at **Section 1, Attachment 2**, including an amended Tree Retention and Removal Plan identifying trees to be retained within the waterway buffer / public open space areas and through the balance area of the subject site. Where tree removal is proposed within the footprint of the development or in relation to the proposed vehicular access to the site, SHG have confirmed that these are introduced or planted species and are not of significant or riparian value.

Engineering and Hydraulic

2.12 Item 12: Hydraulics and water quality Assessment

City officers have reviewed the stormwater report, titled "Site Based Stormwater Management Plan, Revision 02" dated 26 July 2018 prepare by Arcadis Australia Pacific Pty Ltd., submitted in support of the application. The applicant is requested to submit a revised report addressing the following issues:

(a) The building at the north-eastern corner appears to encroach in to the existing natural channel and the batters at the north-eastern boundary of the development appear to be too steep and the channel design / modification does not appear to comply with the design of an open channel. The applicant is requested to demonstrate that all the channels modified / designed as part of the current proposal comply with the requirements of a channel design as per the LDG and QUDM. Provide a number of sections along the length of the channel demonstrating compliant design.
(b) The afflux results claimed to be presented in Table 9-3 & Table 9-4 does not include the afflux information. The applicant is requested to include the information and demonstrate that the proposal will not increase the water level and velocity external to the site.

(c) Time of concentration for pre development catchment E (Ref: Table 7-2) has been considered as 5 minutes. We request the applicant to provide all assumptions and method calculate such short time of concentration for existing catchment. We envisage that considering the pre development / existing case catchment characteristics the time of concentration will be much longer than 5 minutes.

(d) Include the XP-Rafts parameters in the report

(e) Demonstrate that the bioretention basin design complies with the design requirements of City Plan – Land Development Guidelines. Please be advised that the LDG has not suggested different design criteria for privately owned and managed bioretention system. The design is required to be compliant with the LDG

(f) Provide adequate information on the boulder wall proposed as part of the bioretention basin. Be advised that Council do not accept any wall higher than 0.8m if that wall form part of the bioretention basin.

(g) Identify the maintenance access, to the bioretention basin, on plan and provide section. Demonstrate that the access design complies with Land Development guidelines

(h) Include pre and post development hydrographs at the lawful point of discharges demonstrating peak flow rates have been maintained for all events up to and including 100year ARI storms.

(i) Submit all modelling files for Council's review. Based on model parameter review, Council may issue Clarification request

RESPONSE TO ITEM 12:

A full response to Item 12 has been prepared by Arcadis, including a revised Site Based Stormwater Management Plan which incorporates amendments in response to the matters identified within Item 12 above in addition to reflecting the amendments to the proposed site layout reflected in the revised Architectural Drawings prepared by BDA Architects. The full response prepared by Arcadis, together with the revised Site Based Stormwater Management Plan, is provided at **Section 1, Attachment 4**.

Transport Planning

2.13 Item 13

To comply with Part 3-Strategic Framework, section 3.6 Improving Transport outcomes- section 3.6.4 Element- Transport system efficiency-section 3.6.4.1(4) Specific outcomes, the applicant is requested to demonstrate that the proposed development does not compromise the function of the existing transport corridor through the site connecting to the existing roundabout (RAB) at Old Coach Road/Reserve Road. The City's Local Government Infrastructure Plan (LGIP) shows upgrade of this intersection is scheduled for 2026. Advice received from the City's Transport and Traffic Branch shows Baileys Mountain Road realigned through the site connecting into the above mentioned RAB. The submitted impact analysis, p.10 of 55, dated 26 July 2018 prepared by BDA, shows a 20m wide road reserve extending through the site to the roundabout which appears to be on a slightly different alignment to the drawing City's Transport and Traffic Branch have provided. The applicant is requested to update plans accordingly.

It is recommended a meeting be organised with relevant stakeholders to discuss this item.

RESPONSE TO ITEM 13:

As noted in the response to Item 8 above, details of the potential future land requirement relating to realignment of Baileys Mountain Road have been provided by Council's Transport and Infrastructure branch, as reflected in **Figure 3** above. The revised Architectural Drawings located at **Section 2, Attachment 9**, have incorporated the details of this potential future land requirement and ensure that all components of the proposed development have been maintained clear of this area.

2.14 Item 14:

To assist in demonstrating compliance with PO1 of the Transport code, the applicant is requested to further justify the proposed supply of car parking residents and visitors [sic]. *The applicant proposes 8 resident spaces for the low care units and 44 visitor car parking spaces. Based on the traffic consultant's response, this appears to be based on the experience of the operator. In this regard, please provide some car parking survey data from existing similar retirement and residential care facilities under the same ownership to justify the proposed car parking supply.*

RESPONSE TO ITEM 14:

A full response to Item 14 is provided within the Response to Council's Request for Further Information prepared by Bitzios Consulting, located at **Section 2, Attachment 5**, which provides a summary explanation of the car parking provision associated with the Applicant's existing residential care facility, known as the Paradise Lakes

RESPONSE TO ITEM 14:

Care Centre, Runaway Bay. Having undertaken this further review, Bitzios conclude that the findings validate the proposed car parking rates adopted in the Traffic Impact Assessment accompanying the Development Application.

2.15 Item 15:

To assist in demonstrating compliance with AO2 of the Transport code, the applicant is requested to remove the automatic sliding gate from the visitor car park. Alternatively, should the applicant wish to retain the gate, demonstrate how visitors will access the car parking area. It would be preferable to have the gate open during visiting hours or otherwise provide an intercom system linked to the administration area to provide access for visitors.

RESPONSE TO ITEM 15:

In response to Item 15, as set out in the response prepared by Bitzios Consulting, located at **Section 1, Attachment 5**, the automatic sliding gate provided to the visitor car park has been retained within the revised Architectural Drawings located at **Section 2, Attachment 9**, however, as suggested within Item 15 above, it is proposed that the gate will remain open during visiting hours.

2.16 Item 16:

To assist in demonstrating compliance with PO5 and PO6 of the Transport code, the applicant is requested to demonstrate why a MRV is the largest design service vehicle. The main servicing requirements would be food and laundering services. It would be helpful if the applicant could provide letters from suppliers advising of their design vehicles. If the applicant proposes to maintain the MRV requirement, then a limiting condition will be applied.

RESPONSE TO ITEM 16:

Response to Item 16 is provided by Bitzios Consulting, located at **Section 1, Attachment 5**, which identifies examples of the servicing requirements of the proposed Residential Care Facility which are informed by consultation with the Applicant in respect of their existing care facility operations. The outcome of this review has confirmed that the largest service vehicles required in respect of the proposed development will be an MRV (8.8m) and RCV (10.2m), and a condition on the development is anticipated to reflect this.

2.17 Item 17:

The applicant has indicated that AO8 and AO9 of the Transport code are not applicable. This is not the case. To comply with AO8, new and existing educational establishments require integration of an off road public passenger transport facility. The application seeks approval for an educational establishment. The applicant is requested to provide justification against PO8 to address this matter.

RESPONSE TO ITEM 17:

In response to Item 17 it is important to clarify that the 'education establishment' component of the proposed development is limited to 'Education Establishment (Staff Training Facility)' which will be ancillary to the Residential Care Facility function of the development. It is proposed to retain and relocate the existing residential dwelling located on the subject site, which will be repurposed to provide for staff training activities in a space that is separated from the residential care activities.

It is anticipated that the ancillary nature of this use will be reflected in conditions on the development to provide Council with further assurance in this respect. This is also noted within the response prepared by Bitzios Consulting located at **Section 1, Attachment 5**.

2.18 Item 18:

To assist in demonstrating compliance with AO25.1 of the Transport code as proposed, the applicant is requested to update the proposed drawing set as follows:

(a) Dimension all car parking and vehicle facilities to show compliance with AS2890.1, AS2890.2 and AS2890.6.

(b) Submit a longitudinal section drawing along the full extent of ramp from Baileys Mountain Road entry to the furthest extent travelled by service vehicles showing compliance with the grade and transition requirements of AS2890.2.

(c) Show a minimum of 3.5m vertical clearance into the undercroft car parking area to ensure suitable clearance to access the proposed SRV bay. All ceiling mounted services are to be located above this height.

(d) Provide a longitudinal section along Baileys Mountain Road showing sight distance in both directions designed based on a 80km/hr (111m sight distance). Council has survey data from 8-14 May 2018 on Baileys Mountain Road between Old Coach Road and Courtney drive showing 85th percentile speed up to 76km/hr. This is required to comply with Figure 3.2, Note 4 of AS2890.1-2004.

RESPONSE TO ITEM 18:

A full response to Item 18 has been prepared by Bitzios Consulting and is located at **Section 1, Attachment 5**. In brief, the response provided by Bitzios clarifies that:

a) the revised Architectural Drawings located at **Section 2, Attachment 9**, have been updated to incorporate the dimensions as requested;
b) a longitudinal section has been prepared by Bitzios Consulting as requested, who have also confirmed that the proposed access driveway and service vehicle travel path is compliant with the grades stipulated by AS2890.2;
c) the revised Architectural Drawings include annotation to clarify the clearance height of 3.5m is provided above the ambulance bay as requested; and
d) longitudinal section drawings of Baileys Mountain Road have been prepared by Arcadis and are provided at Appendix B of the Response to Information Request prepared by Bitzios, and assessment of required sight distances relative to the identified speed profile of the road has confirmed that compliance is achieved with the requirements of AS2890.1 at the proposed site access location, subject to only minor trimming of overgrown vegetation within the road reserve.

Landscape Assessment

2.19 Item 19: Planter boxes

Where trees are to be planted within planter boxes, these must have a minimum area of 6 square metres; the applicant is requested to ensure the plans demonstrate this is the case in this development.

RESPONSE TO ITEM 19:

A full response to Item 19 is provided within the revised Landscape Concept Package prepared by Saunders Havill Group ('SHG') located at **Section 2, Attachment 11**, which clarifies that all planting areas proposed to support trees within the revised landscape plans have been designed to achieve a minimum area of 6sqm in accordance with the requirements of Item 19.

2.1 Item 20: Landscape internal garden bed design considerations

The applicant is requested to provide clarification on the following items concerning the development's landscape planting.

The Statement of Landscape Intent indicates areas of tree, shrub and screen planting within garden beds in between internal handstand. The applicant has not provided sufficient information of how these dense planting areas will be successful as visually demonstrated on plans. The applicant is requested to demonstrate on amended landscape and architectural plans to how the landscape proposal provides appropriate and sufficient design considerations, concerning possible encroachments of services, service boxes and pipework (garage entry beds), soil space (deep rooting) and growing space. The long term success of these planting areas must be demonstrated.

Planting areas where trees are to be planted are requested to possess a minimum surface area of 6 square metres.

RESPONSE TO ITEM 20:

A full response to Item 19 is provided within the revised Landscape Concept Package prepared by SHG, located at **Section 2, Attachment 11**, which includes additional sectional diagrams to clarify the matters raised in the Council's Information Request. Further, as clarified in response to Item 19 above, it has been confirmed that all planter areas within the proposed courtyards that are proposed to accommodate tree planting are designed to provide a surface area of 6sqm.

2.1 Item 21: Bio Retention basin filter media depth

The storm water management plans are requested to be amended to show a filter media depth to allow screening shrub planting (minimum 700mm). A cross-sectional detail must identify the filter media depth (minimum 700mm). Increased

screening shrub planting is required within the southern boundary Bio Basin to provide additional vertical visual and environmental amenity to the adjoining residential property.

RESPONSE TO ITEM 21:

The revised Site Based Stormwater Management Plan prepared by Arcadis, located at **Section 1, Attachment 4**, incorporates the requested filter media depth of 700mm. The 'RFI Response Items' section contained within the revised Landscape Concept Package prepared by SHG clarifies that the proposed filter media depth is suitable to accommodate riparian plant species, details of which will be clarified at operational works phase.

2.1 Item 22: Amended Statement of Landscape Intent

All changes to the site layout which occur as a result of this information request are requested to be reflected in an amended Statement of Landscape Intent.

RESPONSE TO ITEM 22:

As noted previously, a revised Landscape Concept Package has been prepared by SHG in response to the various matters identified in Council's Information Request and reflecting amendments to the proposed development and site layout depicted in the revised Architectural Drawings prepared by BDA Architects, located at **Section 2, Attachment 9**. The revised Landscape Concept Package is located at **Section 2, Attachment 11**.

Open Space Assessment

2.2 Item 23: Trunk Park Infrastructure

In accordance with the Local Government Infrastructure Plan (LGIP) as contained in the City Plan (v5) the subject site triggers the LGIP for Trunk Park Infrastructure being:

- *LL_046 - Old Coach Linkage 4 - Land & Embellishment for Recreation Linkage – 4,889 m²*

The Environmental significance overlay code seeks to protect matters of environmental significance and is consistent with and contributes to the objectives of the Nature Conservation Strategy. Areas within the subject site triggered by the Environmental significance overlay have not been identified for protection through dedication to Council as public open space.

Having regard to item 9 of this request, the applicant is be requested [sic] *to amend all relevant plans to show an area to be dedicated as public open space for conservation purposes. A recreation linkage is to be provided external to the area to be dedicated for conservation purposes. This area can be offset for recreation (Figure 2).*



Figure 1: Environmental significance overlay mapping.



Figure 2: LL_046 - Old Coach Linkage 4 - Land & Embellishment for Recreation Linkage – 4,889 m²

RESPONSE TO ITEM 23:

In response to Item 23, the design and layout of the proposed development has been revised as shown in the proposed Architectural Drawings prepared by BDA Architects, located at **Section 2, Attachment 9**. The revised site design has provided for repositioning of the proposed Residential Care Facility within the subject site, in addition to relocating the existing residential dwelling which is proposed to accommodate the ancillary staff training facility associated with the proposed main use of the site.

The revised proposals for the site provide for a substantial open space corridor extending along the eastern edge of the site encompassing the Yaun Creek corridor and adjacent to the street frontage of Reserve Road and Old Coach Road. The extent of the proposed open space corridor is considerably greater than the extent of the corridor nominated by the LGIP mapping reflected in Figure 2 of Item 23 above. The extent of the corridor provided by the proposed development is reflected in drawing 3.5 of the revised Architectural Drawings, an extract of which is presented in **Figure 4** below for ease of reference.

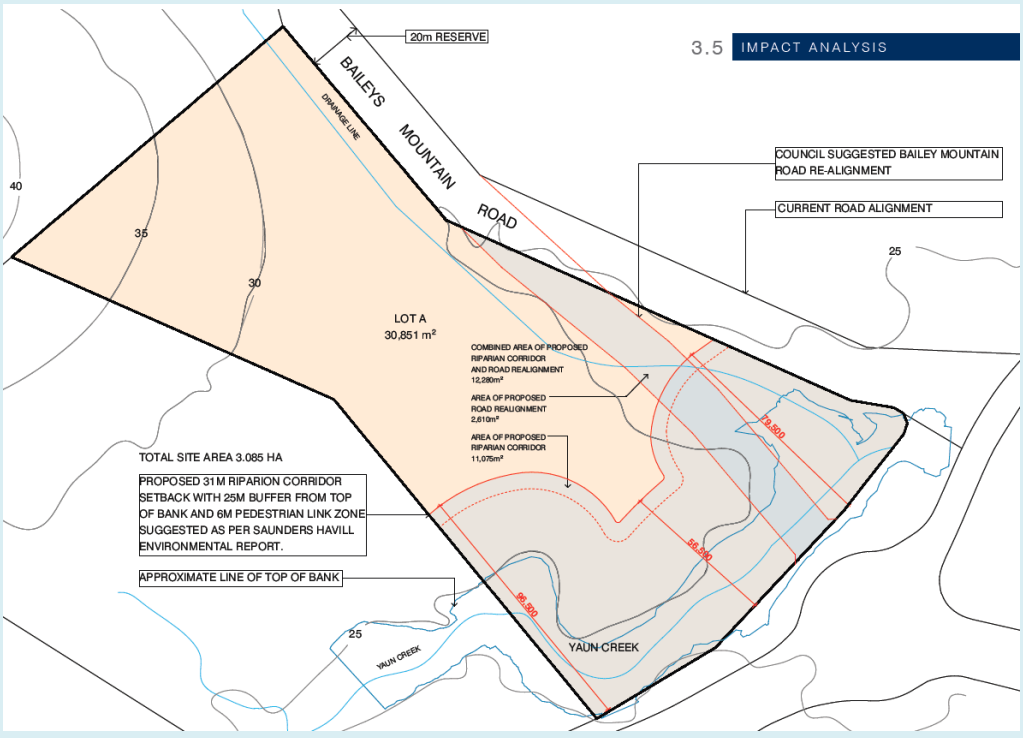


Figure 4: *Impact Analysis Diagram identifying proposed Open Space Corridor Widths*

RESPONSE TO ITEM 23:

The analysis diagram identifies that the proposed open space corridor will incorporate a minimum width of 56.5m, increasing to a width of 79.5m in the northern area of the corridor and further to a width of 96.5m in the south-eastern area of the corridor. The corridor comprises an overall area of 11,075sqm being significantly greater than the area 4,889sqm area nominated in the title block to Figure 2 of Item 23 above.

To further put this in context to the corridor widths anticipated by the LGIP overlay mapping relating to the subject site and the corridor extending north-east along Old Coach Road, an extract copy of the Council's on-line mapping search results identifying a measurement of the width of the corridor within this eastern area of the subject site is presented in **Figure 5** below. This shows a measurement of approximately 33m is identified in the width of the corridor where it is located within the subject site.

Additionally, when reviewing the Draft Concept Plan for the Upper Coomera Investigation Area that is referenced in response to Item 1 above, we note that the greenspace network is identified as providing for 'conservation or open space' purposes comprising land within 30m from the watercourse.

The open space corridor provided by the proposed development, therefore, represents a substantial corridor, exceeding the expectations of these various planning considerations, offers significant opportunity for preservation and enhancement of environmental and landscape values of the site and its setting and provides for the creation of a desirable pedestrian linkage within the site.

Further analysis of this planned linkage corridor, including existing park linkage dedication that has occurred along this route extending to the north-east of the subject site along Old Coach Road is presented within the Recreational Linkage Analysis located at **Section 2, Attachment 8**. This research indicates a broadly consistent width of the linkage extending along the corridor, albeit that where park land has been dedicated it largely comprises of preserved vegetated watercourse features or stormwater management infrastructure, with the extent of 'recreational' linkage apparent along the route being limited to pedestrian footpath within a narrow corridor at the edge of the parkland or within the adjacent road reserves.



Figure 5: *Extract Copy of City Plan Interactive Mapping Search*

In the case of the proposed development, as set out within the proposed Architectural Drawings and within the revised Landscape Concept Package prepared by SHG, located at **Section 2, Attachment 11**, the extensive public open space corridor provided for by the proposed development incorporates a 25m wide waterway buffer area, measured from the top of bank of the Yaun Creek corridor, within which substantial rehabilitation is proposed as set out in the Concept Rehabilitation Plan prepared by SHG and located at **Section 1, Attachment 2**.

The waterway buffer corridor provided by the proposed development includes land at the eastern side of the creek corridor, adjacent to Reserve Road and Old Coach Road, where this is available within the subject site. In this respect we note that in part, the eastern edge of the Yaun Creek corridor directly abuts retaining wall structure to the Reserve Road carriageway. This is depicted in the photograph presented in **Figure 6** below, that is contained within the Ecological Assessment Report accompanying the Development Application.

RESPONSE TO ITEM 23:



Figure 6: *Yaun Creek corridor within Subject Site and abutment to Reserve Road carriageway*

Beyond the 25m waterway buffer corridor, a pedestrian linkage comprising a width of 6m is proposed, affording the potential to provide a linkage from the road reserve of Baileys Mountain Road through the eastern edge of the site reflective of the intent of the mapping identified in Item 23 above. The proposed linkage corridor is designed to accommodate a 2.2m wide pathway set amidst a landscaped zone at either side of the pathway. The landscaped pedestrian corridor comprises appropriate width to incorporate provision for seating and intermittent exercise equipment along the route. These design outcomes for the pedestrian corridor are reflected within the revised Landscape Concept Package prepared by SHG which has taken account of the guidance provided by Part 4.4.4 of the City Plan, including the embellishments identified as minimum standards at Table 4.4-10. Review of this Table reveals that requirements to be provided within a Recreation Linkage are as follows:

- Fitness Equipment (2 items grouped per 200m as required);
- Garden Beds;
- Paths;
- Seats (1);
- Turf; and
- Trees.

The design of the proposed pedestrian linkage corridor as shown in the revised Landscape Concept Package prepared by SHG has incorporated all of these requirements. We that additional requirements may be incorporated where identified as appropriate (such as bollards, gates and signage) at the time of operational works applications.

Whilst we acknowledge the suggestions from officers during meetings in respect of the Council's Information Request, that a minimum corridor width of approximately 15m should be provided for the recreational linkage through the site, detailed analysis of the attributes of the established linkage corridor extending along Old Coach Road to the north-east of the subject site has been undertaken to assist with determining the characteristics of this planned corridor, which has been delivered through the development of these areas to the north-east.

The findings of this analysis are presented graphically at **Section 2, Attachment 8**, where the analysis of aerial photography, site visit photographs and approved plans of development demonstrate that where land has been dedicated along this corridor it comprises predominantly of stormwater infrastructure or preserved waterway corridor, with a very limited extent of linkage for recreational purposes achieved by incorporation of pedestrian footpath between the edge of the park and adjacent road reserve. It is also noted that the corridor is disrupted at 49-51 Old Coach Road where development approvals have provided for retention of an existing dwelling in this location. It is also noted that the lapsed development approval relating to the land at 203 Baileys Mountain Road had also provided for the corridor to accommodate stormwater management infrastructure consistent with the pattern and outcomes of various development along the route. We have also noted that conditions of development approvals along this corridor have provided scope for trunk infrastructure offsets for those developments, despite the park area dedication comprising of stormwater and drainage functions with limited pedestrian pathway corridors adjacent.

By comparison, the proposed development at the subject site offers a significant improvement in the context of the park corridor that Council has accepted along the full extent of the route of this mapped infrastructure. The

RESPONSE TO ITEM 23:

proposed open space corridor affords considerable waterway buffer which is enhanced by the proposed rehabilitation plans, together with a high quality pedestrian corridor that benefits from separation from vehicular traffic and a tranquil environment created by the preserved waterway buffer area and the attractively landscaped grounds of the proposed Residential Care Facility.

Accordingly, taking account of this detailed analysis and the relevant factors set out above, it is logical to conclude that the pedestrian linkage area incorporated within the considerable open space corridor proposed by the development, represents a considerable advancement beyond the form and character of park dedication accepted by Council along the balance area of the corridor and delivers positively against the relevant City Plan parameters for the corridor.

2.3 Item 24: Submit a Statement of Landscape Intent/Open Space Management Statement

(a) The applicant is requested to submit a Statement of Landscape Intent (SLI)/ Open Space Management Statement (OSMS) to include the following:

i. Detail all areas to be dedicated as public open space for the following park types:
- *Conservation buffer to the mapped waterways adjacent to Baileys Mountain Road and Reserve Road;*
- *Recreation Linkage (identified on Council's LGIP as Old Coach Linkage 4);*

ii. Demonstrate compliance of the recreation linkage with the Desired Standards of Service of Part 4 Local Government Infrastructure Plan of the City Plan;

iii. Demonstrate how the conservation buffer and recreation linkage are integrated within the adjacent development footprint;

iv. Include cross sectional elevations showing the grades of batter and associated heights at the interface with the development;

v. Provide landscape treatment detail including embellishments (pathways) for all areas of public open space;

vi. Include conceptual rehabilitation methodologies for the conservation buffer;

vii. Provide maintenance access detail (bollards, gates and fencing) to all areas of public open space; and

viii. The SLI/OSMS is to be prepared in accordance with the following City Plan Policies:

A. A SC6.11 – Land Development Guidelines; and

B. B SC6.12 – Landscape Work.

RESPONSE TO ITEM 24:

A full response to Item 24 is provided within the revised Landscape Concept Package prepared by SHG, located at **Section 2, Attachment 11**, which clarifies that proposed open space corridor incorporates:

- a conservation buffer of 25m measured from top of bank of the Yaun Creek corridor is provided pursuant to environmental assessment as set out in response to Item 9 above;
- recreational linkage is incorporated within the proposed open space corridor, incorporating embellishments pursuant to part 4.4.4 of the City Plan;
- the conservation buffer and recreation linkage integrate positively with the proposed development, with the pedestrian linkage corridor benefitting from separation from vehicular traffic and the tranquil environment created by the rehabilitated waterway corridor and the attractively landscaped grounds of the proposed development, with the boundaries between private and public space delineated by landscape elements and bollard features;
- additional cross section drawings are provided, as requested, identifying interface with the development;
- proposed landscape treatments and embellishments, including seating nodes and fitness equipment node in addition to the pathway requirement identified in Item 24 are positively addressed; and
- a Concept Rehabilitation Plan has been prepared by SHG and is provided at **Section 1, Attachment 2.**

In brief, the revised Landscape Concept Package addresses the various matters for consideration raised under Item 24 with the intent that a detailed open space management plan is anticipated to be prepared in response to conditions on the proposed development and incorporating the proposals set out within the Concept Rehabilitation Management Plan.

2.4 Item 25: Amended plans

(a) The applicant is requested to amend all relevant plans to show two separate park lots to be dedicated as public open space to Council being:

i. Conservation (Non-trunk);

ii. Recreation linkage (Trunk infrastructure).

(b) Provide area (m2) for each park type.

Advisory note
Buffer widths and areas are to be determined through the Ecological Assessment Report and Environmental Planning information request.

RESPONSE TO ITEM 25:

In response to Item 25, all relevant plans of the proposed development have been amended to incorporate the revisions arising through response to the various matters set out within the Information Request. This includes the revised Architectural Drawings located at **Section 2, Attachment 9**, which incorporates identification of the area of the proposed open space corridor within the Impact Analysis drawing (Drawing 3.5) with the boundaries of the open space corridor identified in the proposed site Masterplan (Drawing 7.1).

Additional detail clarifying the individual areas of the riparian corridor (conservation park) and the Pedestrian (recreational) linkage is also provided in the drawing prepared by BDA Architects presented in **Figure 7** below.

The detail presented within this drawing identifies that a total open space corridor area of 11,075sqm is provided by the proposed development, incorporating: 10,098sqm for riparian corridor (conservation purposes); and 977sqm for pedestrian linkage.

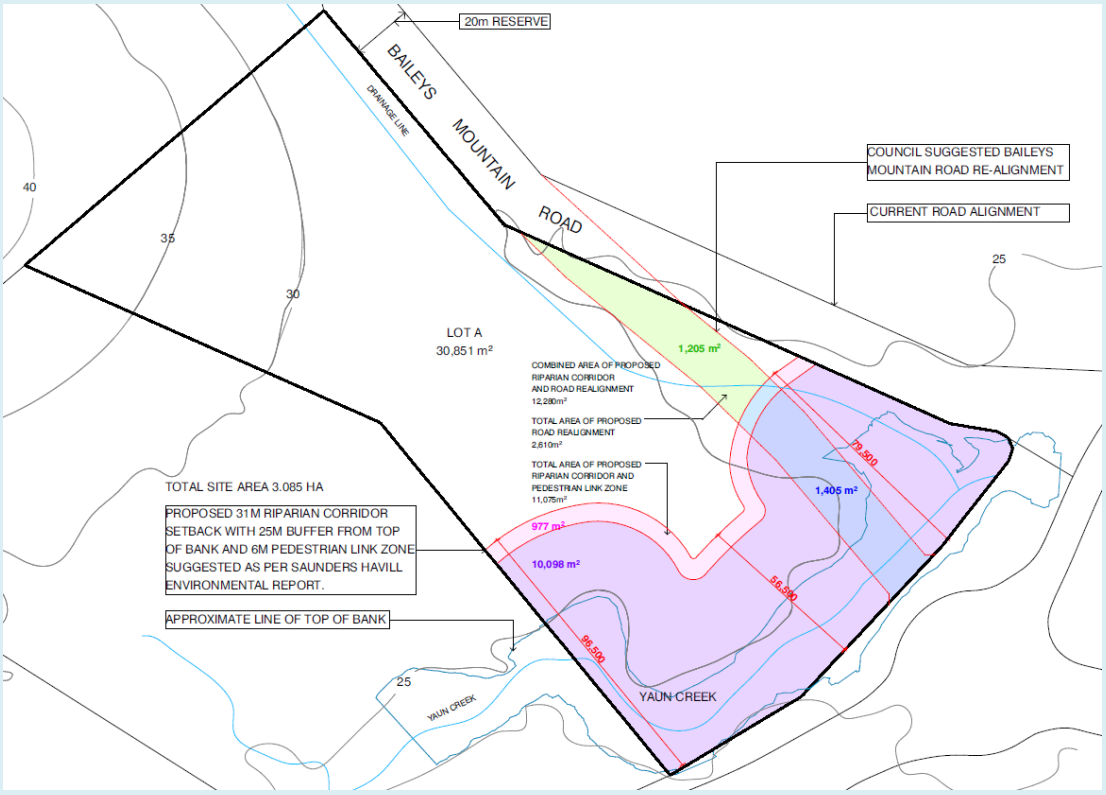


Figure 7: *Areas Drawing prepared by BDA Architects*

3 Conclusion

UPS, together with the Project Team, has provided a full response to the information requested. It is noted that the matters raised have been considered and addressed by the relevant expert consultant in the project team for this Development Application.

Therefore, in accordance with s.13.2(a) of the DAR, Council is advised that the enclosed documentation represents a complete response to all of the information requested and, on this basis, is respectfully requested to proceed with the assessment of the development application.

Pursuant to Part 4 of the DAR, public notification will be carried out following submission of this Information Request Response, and separate notice of intention to commence public notification will be provided to Council under separate cover.

Should you have any questions or wish to discuss any of the above matters further, please do not hesitate to contact our Leanne Croft on 07 5570 4994 or by email.

Yours Faithfully



Michael Falk
Director
Urban Planning Services Pty Ltd
Office Telephone: (07) 5570 4994
Email: mfalk@urbanps.com.au

ATTACHMENT 1
CCGC Information Request



URBAN PLANNING SERVICES PTY LTD

Date: 30 August 2018
Contact: Richard Webber
Location: City Development
Telephone: 07 55828680
Your reference: 202 Baileys Mountain Road
Our reference: MCU/2018/58

CITY OF GOLDCOAST.

Sandson Pty Ltd
C/- Urban Planning Services Pty Ltd
PO BOX 2091
SUREFERS PARADISE QLD 4217

Dear Sir/Madam

Information Request

I refer to the development application lodged by:
Sandson Pty Ltd

in relation to development of land/premises described as:
Lot 58 SP191940 – 202 Baileys Mountain Road, Upper Coomera QLD 4209

Council of the City of Gold Coast (Council) officers have reviewed the development application and supporting information and determined that further information is required to properly assess the application.

Pursuant to sections 13.2 and 13.3 of the Development Assessment Rules under the *Planning Act 2016*, the applicant may respond to this information request by giving to the assessing authority:

1 all of the information requested below; or
2 part of the information requested below; or
3 part of the information requested below together with a notice advising the assessing authority that it must proceed with the assessment of the application; or
4 a notice stating that none of the information requested below will be provided; or
5 a notice stating that none of the information requested below will be provided together with a notice advising the assessing authority that it must proceed with the assessment of the application.

You are advised that pursuant to section 13.1 of the Development Assessment Rules, the period for the applicant to respond to this information request is three (3) months of the date of this letter.

If no response is provided or only part of the information is provided to this request within the three (3) month period, Council will continue its assessment of the application based on the information submitted.

It would be in the applicant's best interest to address all of the information requested.

Please note that the provision of sufficient information to properly assess an application is a

requirement for a favourable decision.

Information Request

Preamble

The proposal provides clear non-compliances with the City Plan. The site is located in the Rural residential zone which seeks to '*provide low rise, very low intensity residential accommodation such as Dwelling houses and …farm stays…'.* The proposed development significantly conflicts with the Strategic Framework and the Overall Outcomes of the Rural Residential zone. Furthermore, the development is not of a scale or intensity that is akin to the surrounding area, nor does it appear to sufficiently protect adjoining amenity and future character of the area.

When assessing an application, the assessment benchmarks of the City Plan are to have significant weight in development assessment and ultimately play a determinative role in development assessment. When the proposal does not meet the assessment benchmarks, there is a need for compelling relevant matters to be presented in order to outweigh the non-compliance.

The applicant has requested that Council support the application despite the non-compliances based on other 'relevant matters', which, broadly speaking, relate to the investigations currently being undertaken by Council, the anticipated need and the site based investigations conducted by the applicant.

Officers do not currently consider the other relevant matters are sufficient to outweigh the non-compliances with the City Plan.

Given the severity of these concerns and the impact they could have on the officer's recommendation, the applicant is advised to attempt to address the Town Planning concerns before proceeding to address the other items contained within this Information Request.

Town Planning

1 Strategic framework and zone code

The current City Plan provisions do not support the proposed level of intensification of the subject site. The subject site is identified within the Strategic framework maps as the following:

- Strategic framework map 1 - designated urban area - Non-urban area (Investigation area) (not urban area as stated in the submitted planning report – refer to section 3.2.2 City Shape and urban transformation of the Strategic Framework);
- Strategic framework map 2 - settlement pattern – Rural residential areas; and
- Strategic framework map 4 - greenspace network - Hinterland core habitat.

The proposed development is considered to be out of sequence and premature development, as a draft amendment to City Plan for the Upper Coomera Investigation Area has not yet completed State interest review phase or been through the statutory public notification. The proposed development presents a significant departure from the current City Plan with a number of conflicts identified.

The application is considered to, among other aspects, conflict with the following statements within the Strategic framework and zone code:

Creating liveable places - Strategic Outcomes:

"Urban activity is contained within the City's urban area."

"Rural residential areas are very low intensity and low-rise environments with a semi-rural landscape character and protected natural features. They are not expanded.."

Creating liveable places - Element – Rural residential areas:

"(1) Rural residential areas continue to support the lifestyle and amenity aspirations of residents in a semi-rural or bushland environment on very low intensity lots. They are not part of the urban area.

(2) Rural residential areas protect and enhance bushland, waterways and wetlands, habitat trees and wildlife corridors. They help maintain the city's green frame, particularly on the Hinterland ranges and foothills. These areas may be subject to private conservation agreements.

(3) Rural residential areas maintain their amenity and very low intensity and low-rise living environment. Subdivision is limited to existing rural residential areas. Development does not disrupt local amenity and character. Sustainable eco-villages may be appropriate where landscape character and ecological values are maintained.

Note: Some rural residential areas (conceptually shown on strategic framework map 1) will be investigated for land use opportunities and constraints. ***Until these investigations are undertaken, and any amendments to the City Plan are completed, these areas are to maintain their rural residential character and intent.'***

Advice note

Please note the Urban neighbourhoods element is not applicable to the assessment of the application as the site is not located within an urban area. As such the uplift provisions to justify the building height do not apply.

Living with nature - Strategic outcomes:

"A comprehensive green space network of natural landscape areas is enhanced, maintained and protected for the nature conservation and recreation needs of the city and enhances the city's powerful image of green, gold and blue."

"Land, freshwater, estuarine and marine ecological processes and other matters of environmental significance are protected and supported through a connected green space network."

"Non-urban land is protected to maintain the extent and diversity of the city's natural and productive rural landscapes and define a hard edge to the city's urban area."

Green space network

"Waterways and riparian areas are protected as natural green space corridors to:

- *(a) protect vegetation, wildlife habitat and ecological corridors;*
- *(b) protect scenic amenity;*
- *(c) provide continuous public access and parkland corridors for recreation, walking and cycling;*
- *(d) provide visual relief from the built environment and a retreat from developed areas;*
- *(e) provide flood mitigation, flood resilience, drainage and water quality functions;*
- *(f) provide natural and renewable water cycle processes (water health and water quality); and*
- *(g) protect foreshores from erosion and stormwater inflows."*

"Development does not erode, and, wherever practicable, contributes to, the expansion of the extent, function and values of the green space network."

"Development facilitates accessible, safe and integrated local open space networks that contribute to sense of place and quality of life."

Nature conservation

"The Gold Coast's biodiversity areas and other matters of environmental significance are conserved, protected, enhanced and managed to maintain a diversity of terrestrial, aquatic and marine species, ecosystems and ecological processes. Poorly protected regional ecosystems and habitat for threatened species, such as koalas, are enhanced."

"Biodiversity areas are fundamental elements of the city's green space network. These areas are conserved to maintain the diversity of terrestrial, aquatic and marine species, ecosystems and ecological processes.

Mapped biodiversity areas include:

(a) core habitats, that are extensive tracts of intact habitat within the hinterland and coastal wetlands areas; support a variety of vegetation associations; provide habitat for diverse fauna populations; and require the highest level of protection;

(b) hinterland to coast critical corridors that link core habitat systems and isolated areas of biodiversity value by retaining existing vegetation and restoring degraded areas to enhance fauna movement between different ecosystems and landscapes; and

(c) substantial remnants of intact areas of vegetation that retain and enhance the diversity, extent and condition of habitat by avoiding impacts that originate from their urban context."

"The city's matters of environmental significance include:

(a) native vegetation of national, state or local significance;
(b) coastal environments, wetlands and waterways;
(c) core habitat areas and substantial remnants;
(d) hinterland to coast critical corridors, including:
i. Burleigh Heads to Springbrook;
ii. Springbrook to Wongawallan;
iii. Southern Moreton Bay to Wongawallan;
iv. Southern Moreton Bay to Clagiraba;
v. Currumbin to Cobaki Broadwater (Tweed Shire); and
vi. Currumbin to Currumbin Valley.
(e) habitat for threatened species, such as koalas.

"In biodiversity areas, matters of environmental significance including vegetation and habitat for native flora and fauna are protected in situ, and degraded areas are restored to improve habitat quality and connectivity."

"Matters of environmental significance in the city's nonurban area are protected from urban encroachment by containing urban activity within the city's urban area."

A safe, well deigned city - Strategic outcomes:

"(1) Areas of landscape character that contribute to the city's unique landscape and built form are identified and protected.

(2) Important elements of urban character and community significance are protected and enhanced to strengthen the sense of identity in local areas and the city"

Element – Landscape character

"The distinctive rural, semi-rural and natural character of the city's river valleys, hinterland settlements, extensive natural landscape areas, rural production areas and rural residential areas provide a clear hard edge to, and natural backdrop setting for, the city's urban area."

Element – Urban design, character and community identity

"Development is cognisant of the function and desired future appearance of each individual area and reinforces or reinterprets the character of that area."

Rural residential zone code

(1) The purpose of the Rural residential zone code is to provide for residential development on large lots where local government infrastructure and services may not be provided on the basis that the intensity of residential development is generally dispersed.

(2) The purpose of the code will be achieved through the following overall outcomes:

(a) Land uses –

(i) support the rural lifestyle and amenity aspirations of residents residing in the semi-rural or bushland environment;

(ii) provide low rise, very low intensity residential accommodation such as Dwelling houses, and Short-term accommodation (farm stays);

(b) Character consists of –

(i) very low intensity and low rise environments; and

(c) Built form –

(i) is very low intensity, low rise and well setback from property boundaries to ensure privacy for adjacent residences and to preserve the very low intensity character of the zone;

The applicant is advised that officers consider there are no relevant matters that have been provided which overcome the conflicts identified above, in addition to other non-compliances with the City Plan.

The applicant is strongly encouraged to place the application on hold, making use of the stopping the current period provisions, or withdraw the application **until such time that the relevant investigations are complete and included within the City Plan**.

2 Changed application

If the applicant wishes to continue with the current application, the applicant is requested to utilise the 'stopping the current period' provisions within section 32 of the *Development Assessment Rules* and/or request the applicant's information request response period be extended, in accordance with section 13.1 of the *Development Assessment Rules*, **until such a time that the relevant investigations are complete and included within the City Plan**. The applicant is requested to make a changed application, in accordance with section 25 of the *Development Assessment Rules*, to reflect the major amendments to the City Plan, in relation to the Upper Coomera Area.

3 Relevant matters

Investigations

Officers acknowledge the relevant matters identified within the proposed application, however consider these matters to be incomplete and lacking supporting material.

Council have conceptually identified the subject site as an investigation area within the Strategic framework however it is clearly stated that until an investigation is undertaken, and

any amendments to the City Plan are completed, investigation areas are to maintain their character and intent.

The applicant has submitted site based investigations and specialist reports to support the proposed application however this supporting material does not consider or assessment of the broader context and constraints, of which Council's investigations do.

The subject investigation, being the Upper Coomera Area, is not complete and amendments have not been made to the City Plan. Thus until such time that this investigation is completed and amendments have been made to the City Plan the subject site is to maintain its rural residential character and intent.

The applicant is requested to identify any other 'relevant matters' pursuant to s45(5)(b) of the Planning Act 2016 that may be applicable in the assessment of this application or provide further supporting information for the relevant matters already identified.

Need

Given the relative sizes of the proposed elements and the ancillary nature of the Educational Establishment, it is fair to describe the proposed development as a Residential Care Facility or nursing home.

Subject to a more detailed scrutiny of the data contained within the Economic Needs Assessment (ENA), it appears that it has demonstrated that there is a market gap between demand for nursing home facilities and their supply, supporting the ENA's conclusion that there is an economic need for the proposed development. However, the ENA has not examined the extent to which appropriately zoned land exists that could accommodate the identified shortfall in supply. This is a major weakness of the ENA, preventing it from drawing a conclusion as to whether there is a planning need for the development to locate on the subject site.

It is noted that the proposed major use (Residential Care Facility) is Code Assessable in many zones: Low Density Residential (subject to criteria); Medium Density Residential; High Density Residential; Centre; Neighbourhood Centre; and Mixed Use (except Fringe Business Precinct). Officers consider that it would be easy to demonstrate that sufficient vacant and/or under-utilised lands were located within these zones within the large Catchment Area defined by the ENA.

It is acknowledged that there is an economic need for another Residential Care Facility to locate within the Catchment Area, but a planning need has not been demonstrated for it to locate on the subject site.

The applicant is requested to demonstrate a planning need, consistent with the Planning and Environment Court's previous determinations. This includes determining whether the proposed use could be located on a vacant or under-utilised site in a more appropriate zone elsewhere in the Catchment Area.

4 Scale and intensity of the use

The proposed built form, height, design and layout is not considered to maintain the existing amenity of the surrounding area nor support or complement the rural residential character. Officers have concerns with the proposed height, scale and intensity of the development not achieved the indented current and future character of the area. The applicant is requested to reduce the building height, scale and intensity of the building form to achieve a more appropriate low rise residential scale consistent with that sought by the zone code outcomes.

5 Building height

The proposed 3 storey (13m) building height is inconsistent with the area's low-rise character. It is requested that the building height be reviewed to provide a low-rise building in order to maintain the intended character of the area in accordance with:

- Specific Outcome 3 (3.3.7 Element – Rural residential)

- Specific Outcome 1 (3.8.3 Element – Urban design, character and community identity)
- Overall outcome 2(a)(ii), 2(b)(i) and 2(c)(i) of the Rural residential zone code.
- Performance criteria 4 of the Rural residential zone
- Performance criteria 3(a) of the Multiple Dwelling Code
- .Additionally, large vegetated buffers must be maintained to soften and screen the building.

In accordance with above provisions, the applicant is requested to demonstrate how the proposed height is considered to achieve the envisioned urban character of the local area being low rise and low intensity.

Advice note

The Urban neighbourhoods element is not applicable to the assessment of the application as the site is not located within an urban area. As such the uplift provisions to justify the building height is not applicable.

6 Development staging

The proposed development is intended to be constructed over two stages. It is requested that further information/drawings regarding the appearance and treatment of the development (i.e. building elevations, treatment to roof of car parking area etc.) at the completion of the first stage be provided to ensure that acceptable visual amenity is maintained in accordance with PO2 (General development provisions code).

7 Retaining walls

The applicant is requested to provide details of all retaining walls associated with the development including heights and materials.

8 Works within the Baileys Mountain road realignment

Once the realignment of Baileys Mountain is confirms (refer to Transport assessment comments), the applicant is requested to amend plans to remove all embellishments and works associated the development within this area.

Environmental Assessment

9 Amended site development plans required

The subject site is identified as containing two mapped waterways in accordance with the Environmental Significance Overlay Code. The applicant is proposing to retain and enhance Yaun Creek (stream order 4) crossing through the southern extent of the subject site. However, cumulative impacts to the waterway buffer have not been fully demonstrated. The applicant is proposing to retain the existing dwelling and construct a pedestrian linkage trail within the Yaun Creek buffer area. The submitted bushfire report recommends regular mowing and maintenance of landscaped areas for fire mitigation purposes. The bushfire report does not take into consideration rehabilitation of the Yaun Creek buffer area.

The submitted civil report identifies no proposed alteration or change to the eastern waterway (stream order 2) to facilitate the development. However, Preliminary Earthwork Plans identify cut and fill works to extend to the site's eastern boundary resulting in complete modification of the waterway. Further disturbance is demonstrated through the tree survey plans which identify trees along the banks of the waterway to be removed to facilitate the development. Additional tree clearing is proposed including the removal of four large Moreton Bay Fig trees located within the centre of the subject site.

The subject site currently facilitates a riparian / habitat corridor associated with Yaun Creek and north to the densely vegetated rural area identified as remnant vegetation (medium priority) containing koala habitat and local and state significant species. Previous developments

upstream and downstream of the site have secured conservation areas over the Yaun Creek corridor including extended corridors which capture the connecting tributaries from the north facilitating habitat connectivity.

The proposed development does not achieve compliance with performance outcomes PO5 and PO23 of the Environmental Significance Overlay code or demonstrate a development that is consistent with, and contributes to, the purpose of the code. The proposed development does not achieve adequate buffers to the mapped waterways which maintains bank stability and ensures unimpeded movement of fauna along the watercourse. The proposed development does not ensure the protection and enhancement of the ecologically significant areas and associated buffers to be suitably protected in perpetuity.

The proposed development does not achieve the strategic outcomes under Strategic Framework 3.7 Living with nature including specific outcomes under section 3.7.2 Element – Natural Landscape areas, and 3.7.4 Element – Nature conservation.

The applicant is requested to amend the proposed plan of development to demonstrate the following:

a Provide adequate buffers to Yaun Creek and the connecting waterway (stream order 2) within the eastern extent of the site in accordance with the Environmental Significance Overlay Code and the Strategic Framework.

b Demonstrate that no infrastructure and/or proposed earthworks encroach within the waterway buffer areas.

c Demonstrate that no bushfire mitigation zones require impacts to the waterway buffer areas.

10 Rehabilitation Management Plan required

The applicant is requested to provide a rehabilitation management plan for the watercourse buffer areas to be dedicated as open space.

The rehabilitation management plan must be prepared in accordance with:

a City Plan Policy 6.8 Environmental Management Plans

b South East Queensland Ecological Restoration Framework 2012.

c SC6.11 City Plan policy – Land development guidelines

The rehabilitation management plan must contain the following information (as applicable):

d Details of proposed rehabilitation work including areas requiring Assisted Natural Regeneration, Reconstruction, and Fabrication.

e Details of proposed staging of works.

f Details of proposed rehabilitation works including proposed species and planting palette. The proposed planting palette is to include species consistent with Regional Ecosystems 12.3.11 and 12.11.24.

g Planting modules to demonstrate planting densities.

h All weeding works required, including a full list of known weeds on site and how each weed can be adequately managed.

i The required ongoing management/maintenance regimes, including:

  i All plantings to be subject to a 12 month establishment period;

  ii Plans indicating maintenance areas/zones;

i Schedules of works including frequency and tasks;

ii Allocation of labour and resources to perform tasks;

iii Nomination of key performance indicators/criteria for monitoring purposes (eg. All revegetation areas minimum 90% weed free, etc);

iv Time allocated to perform various tasks (eg. top up mulch, pruning, topdressing, etc);

v Defects liability for materials such as replacement of dead plant species of equivalent species and vigour to achieve 90% success rate;

vi Coordination of services such as irrigation repair or civil infrastructure maintenance (such as stormwater) that may impact on the landscape establishment and maintenance periods;

vii Management of bushfire hazard (only where appropriate);

viii Management of domestic farm/feral animals (if appropriate);

ix Tree management procedures;

x Management and maintenance regimes for sediment and erosion control devices, and irrigation;

xi Proposed future need for infrastructure, including public facilities; and

xii Management and control of declared plants and recognised environmental weeds.

11 Amended tree retention / removal survey plan and arborist report

The applicant is request to amend Plans 4.1 and 4.2 *Tree Retention removal Plan – Baileys Mountain Road, Upper Coomera, Issue C, dated 31 July 2018 prepared by Saunders havill group,* to show the following:

a Identify trees to be retained incorporated within the waterway buffer areas to be dedicated as public open space.

b Identify trees to be retained over the balance of the site incorporated within the development layout.

c Include a supporting Arborist Report for trees to be retained at the interface of site works and/or located in close proximity to proposed buildings. The report is to be prepared by a qualified Arborist with a minimum Australian Qualification Framework (AQF) Level 5 in Arboriculture and include the following information:

i. All tree management procedures within the report are to be in accordance with the Australian Standard AS4970 - 2009 *Protection of trees on development sites*;

ii. An appraisal of the health and vigour of the retained trees, including stage of growth, predicted gross morphology, crown framework and extent of root system;

iii. Tree site plan of suitable scale to proposed development layout plans indicating all required Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) for the retained trees.

iv. Details of all proposed vegetation works (including proposed clearing or retention works) to ensure the survival, ongoing health and vigour of retained vegetation (given proximity to buildings and areas where works are to be undertaken) including any necessary reductions (crown, thinning, root truncations) to accommodate footings and foundations, and protective devices (protective fences, root curtains/barriers) to minimise construction impacts.

Engineering and Hydraulic

12 Hydraulics and water quality Assessment

City officers have reviewed the stormwater report, titled "Site Based Stormwater Management Plan, Revision 02" dated 26 July 2018 prepare by Arcadis Australia Pacific Pty Ltd., submitted in support of the application. The applicant is requested to submit a revised report addressing the following issues:

a. The building at the north-eastern corner appears to encroach in to the existing natural channel and the batters at the north-eastern boundary of the development appear to be too steep and the channel design / modification does not appear to comply with the design of an open channel. The applicant is requested to demonstrate that all the channels modified / designed as part of the current proposal comply with the requirements of a channel design as per the LDG and QUDM. Provide a number of sections along the length of the channel demonstrating compliant design.
b. The afflux results claimed to be presented in Table 9-3 & Table 9-4 does not include the afflux information. The applicant is requested to include the information and demonstrate that the proposal will not increase the water level and velocity external to the site.
c. Time of concentration for pre development catchment E (Ref: Table 7-2) has been considered as 5 minutes. We request the applicant to provide all assumptions and method calculate such short time of concentration for existing catchment. We envisage that considering the pre development / existing case catchment characteristics the time of concentration will be much longer than 5 minutes.
d. Include the XP-Rafts parameters in the report
e. Demonstrate that the bioretention basin design complies with the design requirements of City Plan – Land Development Guidelines. Please be advised that the LDG has not suggested different design criteria for privately owned and managed bioretention system. The design is required to be compliant with the LDG
f. Provide adequate information on the boulder wall proposed as part of the bioretention basin. Be advised that Council do not accept any wall higher than 0.8m if that wall form part of the bioretention basin.
g. Identify the maintenance access, to the bioretention basin, on plan and provide section. Demonstrate that the access design complies with Land Development guidelines
h. Include pre and post development hydrographs at the lawful point of discharges demonstrating peak flow rates have been maintained for all events up to and including 100year ARI storms.
i. Submit all modelling files for Council's review. Based on model parameter review, Council may issue Clarification request

Transport Planning

13 To comply with Part 3- Strategic Framework, section 3.6 Improving Transport outcomes-section 3.6.4 Element- Transport system efficiency-section 3.6.4.1(4) Specific outcomes, the applicant is requested to demonstrate that the proposed development does not compromise the function of the existing transport corridor through the site connecting to the existing roundabout (RAB) at Old Coach Road/Reserve Road. The City's Local Government Infrastructure Plan (LGIP) shows upgrade of this intersection is scheduled for 2026. Advice received from the City's Transport and Traffic Branch shows Baileys Mountain Road realigned through the site connecting into the above mentioned RAB. The submitted impact analysis, p.10 of 55, dated 26 July 2018 prepared by BDA, shows a 20m wide road reserve extending through the site to the roundabout which appears to be on a slightly different alignment to the drawing City's Transport and Traffic Branch have provided. The applicant is requested to update plans accordingly.

It is recommended a meeting be organised with relevant stakeholders to discuss this item.

14 To assist in demonstrating compliance with PO1 of the Transport code, the applicant is requested to further justify the proposed supply of car parking residents and visitors. The applicant proposes 8 resident spaces for the low care units and 44 visitor car parking spaces. Based on the traffic consultant's response, this appears to be based on the experience of the operator. In this regard, please provide some car parking survey data from existing similar retirement and residential care facilities under the same ownership to justify the proposed car parking supply.

15 To assist in demonstrating compliance with AO2 of the Transport code, the applicant is requested to remove the automatic sliding gate from the visitor car park. Alternatively, should the applicant wish to retain the gate, demonstrate how visitors will access the car parking area. It would be preferable to have the gate open during visiting hours or otherwise provide an intercom system linked to the administration area to provide access for visitors.

16 To assist in demonstrating compliance with PO5 and PO6 of the Transport code, the applicant is requested to demonstrate why a MRV is the largest design service vehicle. The main servicing requirements would be food and laundering services. It would be helpful if the applicant could provide letters from suppliers advising of their design vehicles. If the applicant proposes to maintain the MRV requirement, then a limiting condition will be applied.

17 The applicant has indicated that AO8 and AO9 of the Transport code are not applicable. This is not the case. To comply with AO8, new and existing educational establishments require integration of an off road public passenger transport facility. The application seeks approval for an educational establishment. The applicant is requested to provide justification against PO8 to address this matter.

18 To assist in demonstrating compliance with AO25.1 of the Transport code as proposed, the applicant is requested to update the proposed drawing set as follows:

a. Dimension all car parking and vehicle facilities to show compliance with AS2890.1, AS2890.2 and AS2890.6.
b. Submit a longitudinal section drawing along the full extent of ramp from Baileys Mountain Road entry to the furthest extent travelled by service vehicles showing compliance with the grade and transition requirements of AS2890.2.
c. Show a minimum of 3.5m vertical clearance into the undercroft car parking area to ensure suitable clearance to access the proposed SRV bay. All ceiling mounted services are to be located above this height.
d. Provide a longitudinal section along Baileys Mountain Road showing sight distance in both directions designed based on a 80km/hr (111m sight distance). Council has survey data from 8-14 May 2018 on Baileys Mountain Road between Old Coach Road and Courtney drive showing 85th percentile speed up to 76km/hr. This is required to comply with Figure 3.2, Note 4 of AS2890.1-2004.

Landscape Assessment

19 Planter boxes

Where trees are to be planted within planter boxes, these must have a minimum area of 6 square metres; the applicant is requested to ensure the plans demonstrate this is the case in this development.

20 Landscape internal garden bed design considerations

The applicant is requested to provide clarification on the following items concerning the development's landscape planting.

The Statement of Landscape Intent indicates areas of tree, shrub and screen planting within garden beds in between internal handstand. The applicant has not provided sufficient information of how these dense planting areas will be successful as visually demonstrated on

plans. The applicant is requested to demonstrate on amended landscape and architectural plans to how the landscape proposal provides appropriate and sufficient design considerations, concerning possible encroachments of services, service boxes and pipework (garage entry beds), soil space (deep rooting) and growing space. The long term success of these planting areas must be demonstrated.

Planting areas where trees are to be planted are requested to possess a minimum surface area of 6 square metres.

21 Bio Retention basin filter media depth

The storm water management plans are requested to be amended to show a filter media depth to allow screening shrub planting (minimum 700mm). A cross-sectional detail must identify the filter media depth (minimum 700mm). Increased screening shrub planting is required within the southern boundary Bio Basin to provide additional vertical visual and environmental amenity to the adjoining residential property.

22 Amended Statement of Landscape Intent

All changes to the site layout which occur as a result of this information request are requested to be reflected in an amended Statement of Landscape Intent.

Open Space Assessment

23 Trunk Park Infrastructure

In accordance with the Local Government Infrastructure Plan (LGIP) as contained in the City Plan (v5) the subject site triggers the LGIP for Trunk Park Infrastructure being:

- LL_046 - Old Coach Linkage 4 - Land & Embellishment for Recreation Linkage – 4,889 m²

The Environmental significance overlay code seeks to protect matters of environmental significance and is consistent with and contributes to the objectives of the Nature Conservation Strategy. Areas within the subject site triggered by the Environmental significance overlay have not been identified for protection through dedication to Council as public open space.

Having regard to item 9 of this request, the applicant is be requested to amend all relevant plans to show an area to be dedicated as public open space for conservation purposes. A recreation linkage is to be provided external to the area to be dedicated for conservation purposes. This area can be offset for recreation (Figure 2).

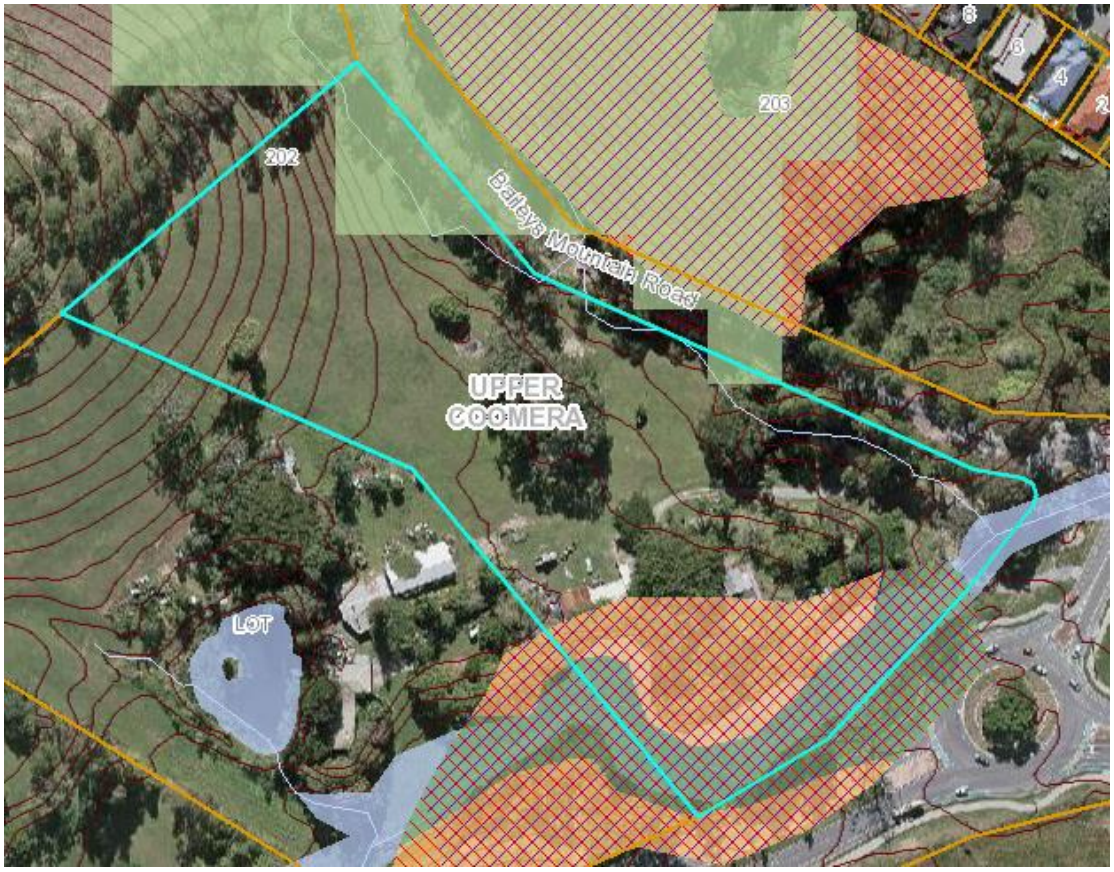


Figure 1: Environmental significance overlay mapping.



Figure 2: LL_046 - Old Coach Linkage 4 - Land & Embellishment for Recreation Linkage – 4,889 m²

24 Submit a Statement of Landscape Intent/Open Space Management Statement

a The applicant is requested to submit a Statement of Landscape Intent (SLI)/ Open Space Management Statement (OSMS) to include the following:

i Detail all areas to be dedicated as public open space for the following park types:

- Conservation buffer to the mapped waterways adjacent to Baileys Mountain Road and Reserve Road;
- Recreation Linkage (identified on Council's LGIP as Old Coach Linkage 4);

ii Demonstrate compliance of the recreation linkage with the Desired Standards of Service of Part 4 Local Government Infrastructure Plan of the City Plan;

iii Demonstrate how the conservation buffer and recreation linkage are integrated within the adjacent development footprint;

iv Include cross sectional elevations showing the grades of batter and associated heights at the interface with the development;

v Provide landscape treatment detail including embellishments (pathways) for all areas of public open space;

vi Include conceptual rehabilitation methodologies for the conservation buffer;

vii Provide maintenance access detail (bollards, gates and fencing) to all areas of public open space; and

viii The SLI/OSMS is to be prepared in accordance with the following City Plan Policies:

A SC6.11 – Land Development Guidelines; and

B SC6.12 – Landscape Work.

25 Amended plans

a The applicant is requested to amend all relevant plans to show two separate park lots to be dedicated as public open space to Council being:

i Conservation (Non-trunk);

ii Recreation linkage (Trunk infrastructure).

b Provide area (m^2) for each park type.

Advisory note
Buffer widths and areas are to be determined through the Ecological Assessment Report and Environmental Planning information request.

As this application was lodged electronically, please direct all future correspondence regarding this application in the required PDF format (ie)

- **Forms** (combine as one single PDF)
- **Supporting documents** (combine as one single PDF)
- **Plans** (combine as one single PDF)
- **Specialist reports** (combine as one single PDF)

The electronic response should be forwarded to mail@goldcoast.qld.gov.au

Contacting us
Should you wish to clarify any issues contained in this letter, please do not hesitate to contact Planning Assessment on 07 5582 8866.

Yours faithfully



Andrew Powell
Supervising Planner
For the Chief Executive Officer
Council of the City of Gold Coast

ATTACHMENT 2

Response to CCGC Information Request Items 9, 10 and 11, prepared by Saunders Havill Group



URBAN PLANNING SERVICES

Memo — Response to GCCC Information Request items 9, 10 and 11

MCU/2018/58
202 Baileys Mountain Road, Upper Coomera
5 July 2019

Job 8781 E

Background

Saunders Havill Group authored the Ecological Assessment Report (dated 31 July 2018) submitted as part of the development. Subsequently, Gold Coast City Council (GCCC) issued an Information Request (IR) on 30 August 2018, which included environmental planning items. This memo provides a response to three of the items — 9, 10 and 11, and accompanies the Urban Planning Services submission which presents the remaining IR responses.

IR item 9

Amended site development plans required

The subject site is identified as containing two mapped waterways in accordance with the Environmental Significance Overlay Code. The applicant is proposing to retain and enhance Yaun Creek (stream order 4) crossing through the southern extent of the subject site. However, cumulative impacts to the waterway buffer have not been fully demonstrated. The applicant is proposing to retain the existing dwelling and construct a pedestrian linkage trail within the Yaun Creek buffer area. The submitted bushfire report recommends regular mowing and maintenance of landscaped areas for fire mitigation purposes. The bushfire report does not take into consideration rehabilitation of the Yaun Creek buffer area.

The submitted civil report identifies no proposed alteration or change to the eastern waterway (stream order 2) to facilitate the development. However, Preliminary Earthwork Plans identify cut and fill works to extend to the site's eastern boundary resulting in complete modification of the waterway. Further disturbance is demonstrated through the tree survey plans which identify trees along the banks of the waterway to be removed to facilitate the

{00417886}

Prepared by
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development. Additional tree clearing is proposed including the removal of four large Moreton Bay Fig trees located within the centre of the subject site.

The subject site currently facilitates a riparian / habitat corridor associated with Yaun Creek and north to the densely vegetated rural area identified as remnant vegetation (medium priority) containing koala habitat and local and state significant species. Previous developments upstream and downstream of the site have secured conservation areas over the Yaun Creek corridor including extended corridors which capture the connecting tributaries from the north facilitating habitat connectivity.

The proposed development does not achieve compliance with performance outcomes PO5 and PO23 of the Environmental Significance Overlay code or demonstrate a development that is consistent with, and contributes to, the purpose of the code. The proposed development does not achieve adequate buffers to the mapped waterways which maintains bank stability and ensures unimpeded movement of fauna along the watercourse. The proposed development does not ensure the protection and enhancement of the ecologically significant areas and associated buffers to be suitably protected in perpetuity.

The proposed development does not achieve the strategic outcomes under Strategic Framework 3.7 Living with nature including specific outcomes under section 3.7.2 Element – Natural Landscape areas, and 3.7.4 Element – Nature conservation.

The applicant is requested to amend the proposed plan of development to demonstrate the following:

a. Provide adequate buffers to Yaun Creek and the connecting waterway (stream order 2) within the eastern extent of the site in accordance with the Environmental Significance Overlay Code and the Strategic Framework.

b. Demonstrate that no infrastructure and/or proposed earthworks encroach within the waterway buffer areas.

***c.** Demonstrate that no bushfire mitigation zones require impacts to the waterway buffer areas.*

Response:

A revision of the proposed site development plan includes shifting the building footprints up the site and further away from Yaun Creek, which allows further corridor widths to be applied along Yuan Creek. Top of bank setbacks have occurred from the 2-year ARI, as suggested by GCCC during the site meeting. Average widths of the setback to Yaun creek is 25m from top of bank (which was acknowledged to be acceptable to Council for environmental setback / buffer purposes during the meeting attended with council officers on 20 May 2019) plus 6m liner connection, and this setback is considered to meet the stipulated setback requirements (between the outer bank and development) for minor watercourses, as described in PO5 – Wetland and Watercourses. No infrastructure and/or proposed earthworks will encroach within this waterway buffer area, and a 6m pedestrian link, will abut the edge of the 25m corridor in some. This has been justified based on the results of the environmental assessment completed for the waterway area.

Through the use of rehabilitation techniques that will be outlined in a Concept Rehabilitation Plan (**Attachment 1**)**,** the Yaun Creek portion of the corridor will be rehabilitated with rainforest species that will reflect the evolved character of the waterway, and thus, no bushfire setback is required within this area. This corridor will protect the significant areas that were confirmed through an ecological assessment (namely the remnant/priority vegetation), create unimpeded movement of fauna along the waterway, further stabilisation of the banks, and maintain water quality. The connectivity to the extensive Yaun Creek corridor upstream and

downstream will be enhanced. Thus, it is considered that PO5 (Wetlands and Watercourses) and PO23 (Tenure, Ownership and Management Arrangements) will be met under this revised proposal. The proposed development also achieves the strategic outcomes under Strategic Framework 3.7 (Living with nature) including specific outcomes under section 3.7.2 Element – Natural Landscape areas, and 3.7.4 Element – Nature conservation. The revised proposal achieves the strategic outcomes by retaining and improving the natural areas on site to perform essential functions such as conservation of biodiversity and priority vegetation areas, scenic amenity and other green space values, and has considered alternative designs and the separation of incompatible activities to minimise the impacts on matters of environmental significance.

The waterway running alongside Bailey's Mountain Road (north-eastern extent of site) provides little in the form a waterway characteristics or riparian vegetation, but better reflects a modified drainage channel which enters into a man-made dam (see Photos 1-4 below). Native fauna movement through this flow path is already compromised through the lack of a true riparian corridor, and the dominance of exotic or weed species. Safe native fauna movement is more likely within the native vegetation area to the north of Mountain Ridge, and within the Yaun Creek corridor. The earthworks and roadworks proposed are necessary within 30m of the mapped minor watercourse, to allow access into the site from Baileys Mountain Road. Importantly, these works will not remove any significant/riparian vegetation, with only the removal of a few native specimens along Baileys Mountain Road (ie. *Acacia, Eucalyptus* and *Corymbi*a specimens), that are not considered riparian species associated with the drainage line but species retained along the boundary. It is noted that this area between Bailey's Mountain Road and the development falls within Council's proposed road corridor, and therefore will be landscaped post-development where possible, which will enhance existing values, and provide some connectivity to the Yaun Creek corridor.








Photos 1-4: North-eastern drainage line, adjacent to Baileys Mountain Rd.

IR item 10

<u>Rehabilitation Management Plan required</u>
The applicant is requested to provide a rehabilitation management plan for the watercourse buffer areas to be dedicated as open space.

The rehabilitation management plan must be prepared in accordance with:

a. City Plan Policy 6.8 Environmental Management Plans

b. South East Queensland Ecological Restoration Framework 2012.

c. SC6.11 City Plan policy – Land development guidelines

The rehabilitation management plan must contain the following information (as applicable):

d. Details of proposed rehabilitation work including areas requiring Assisted Natural Regeneration, Reconstruction, and Fabrication.

e. Details of proposed staging of works.

f. Details of proposed rehabilitation works including proposed species and planting palette. The proposed planting palette is to include species consistent with Regional Ecosystems 12.3.11 and 12.11.24.

g. Planting modules to demonstrate planting densities.

h. All weeding works required, including a full list of known weeds on site and how each weed can be adequately managed.

i. The required ongoing management/maintenance regimes, including:

- *i. All plantings to be subject to a 12 month establishment period;*
- ***ii.*** *Plans indicating maintenance areas/zones;*
- *iii. Schedules of works including frequency and tasks;*
- *iv. Allocation of labour and resources to perform tasks;*

---

v. *Nomination of key performance indicators/criteria for monitoring purposes (eg. All revegetation areas minimum 90% weed free, etc);*

vi. *Time allocated to perform various tasks (eg. top up mulch, pruning, topdressing, etc);*

vii. *Defects liability for materials such as replacement of dead plant species of equivalent species and vigour to achieve 90% success rate;*

viii. *Coordination of services such as irrigation repair or civil infrastructure maintenance (such as stormwater) that may impact on the landscape establishment and maintenance periods;*

ix. *Management of bushfire hazard (only where appropriate);*

x. *Management of domestic farm/feral animals (if appropriate);*

xi. *Tree management procedures;*

xii. *Management and maintenance regimes for sediment and erosion control devices, and irrigation;*

xiii. *Proposed future need for infrastructure, including public facilities; and*

xiv. *Management and control of declared plants and recognised environmental weeds.*

Response:

A Concept Rehabilitation Plan (**Attachment 1**) has been prepared in accordance with the appropriate guidelines and policies listed above. This Plan will highlight the rehabilitation and weed management proposed to occur within the waterway buffer area of Yaun Creek. The rehabilitation will enhance the existing vegetation values, which have been compromised by introduced/weed species and rural residential clearing for access and infrastructure. This will include selection of rainforest species consistent with the evolved character of this waterway, and extensive weed management where required.

IR item 11

<u>Amended tree retention/removal survey plan and arborist report</u>

The applicant is request to amend Plans 4.1 and 4.2 Tree Retention removal Plan – Baileys Mountain Road, Upper Coomera, Issue C, dated 31 July 2018 prepared by Saunders Havill group, to show the following:

a. *Identify trees to be retained incorporated within the waterway buffer areas to be dedicated as public open space.*

b. *Identify trees to be retained over the balance of the site incorporated within the development layout.*

c. *Include a supporting Arborist Report for trees to be retained at the interface of site works and/or located in close proximity to proposed buildings. The report is to be prepared by a qualified Arborist with a minimum Australian Qualification Framework (AQF) Level 5 in Arboriculture and include the following information:*

   i. *All tree management procedures within the report are to be in accordance with the Australian Standard AS4970 - 2009 Protection of trees on development sites;*

   ii. *An appraisal of the health and vigour of the retained trees, including stage of growth, predicted gross morphology, crown framework and extent of root system;*

iii. *Tree site plan of suitable scale to proposed development layout plans indicating all required Tree Protection Zones (TPZ) and Structural Root Zones (SRZ) for the retained trees.*

iv. *Details of all proposed vegetation works (including proposed clearing or retention works) to ensure the survival, ongoing health and vigour of retained vegetation (given proximity to buildings and areas where works are to be undertaken) including any necessary reductions (crown, thinning, root truncations) to accommodate footings and foundations, and protective devices (protective fences, root curtains/barriers) to minimise construction impacts.*

Response:
The Tree Retention/Removal Plan has been amended to reflect the revised site development plan (see **Attachment 2**), and identifies the trees to be retained within the waterway buffer/public open space and the balance of the site (outside the development footprint). Some large fig and mango trees central to the site will be required to be removed, however these are either introduced or planted, and not considered of significant or riparian value.

An Arborist Report will be provided at Operational Works, to support the retention of trees at the interface of site works and/or located in close proximity to proposed buildings.

Attachments

Attachment 1

Concept Rehabilitation Plan

Attachment 2

Revised Tree Retention/Removal Plan

Attachment 1

Concept Rehabilitation Plan

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION MANAGEMENT PLAN

PLAN SET				
SHEET NO.	**TITLE**	**DESCRIPTION**	**ISSUE**	**DATE**
1	8781 E 01 CRMP A	Cover sheet	A	04/07/2019
2	8781 E 02 CRMP A	Rehabilitation Notes - Introduction	A	04/07/2019
2	8781 E 03 CRMP A	Management Zones	A	04/07/2019
4-5	8781 E 04-05 CRMP A	Detail Sheets	A	04/07/2019
6	8781 E 06 CRMP A	Rehabilitation Notes – Site works / Weeds	A	04/07/2019
7	8781 E 07 CRMP A	Rehabilitation Notes – Planting Notes	A	04/07/2019
8	8781 E 08 CRMP A	Planting Species Schedule	A	04/07/2019
9	8781 E 09 RMP A	Rehabilitation Notes – Fauna / Maintenance	A	04/07/2019
10-12	8781 E A01-A03 RMP A	Appendix A - Weed treatment & Removal	A	04/07/2019



saunders havill group
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phone 1300 123 SHG web www.saundershavill.com
surveying town planning urban design environmental management landscape architecture

CLIENT:

SANDSON PTY LTD

DISCLAIMER:

THESE PLANS HAVE BEEN PREPARED FOR THE EXCLUSIVE USE OF THE CLIENT. SAUNDERS HAVILL GROUP CANNOT ACCEPT RESPONSIBILITY FOR ANY USE OF OR RELIANCE UPON THE CONTENTS OF THESE DRAWING BY ANY THIRD PARTY.

CONFIRM ALL DIMENSIONS ON SITE PRIOR TO CONSTRUCTION AND DO NOT SCALE FROM THE DRAWINGS. ALL DIMENSIONS ARE IN MILLIMETRES. ANY DISCREPANCIES SHOULD BE CLARIFIED IN WRITING WITH SAUNDERS HAVILL GROUP PRIOR TO THE COMMENCEMENT OF WORK.

PRIOR TO ANY DEMOLITION, EXCAVATION OR CONSTRUCTION ON SITE, THE RELEVANT AUTHORITY SHOULD BE CONTACTED FOR FURTHER UNDER-GROUND SERVICES AND DETAILED LOCATIONS OF ALL SERVICES.

REFERENCES:

Engineering / layout drawing (Urban Development & Regeneration 2019)

AMENDMENTS:

Issue	Date	Description	Checked
A	4/07/2019	Client Draft	TL

0 10 20 40 60 80 100 m

1:1,500@ A3

PROJECT:

BAILEYS MOUNTAIN ROAD,
UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF:
Rehabilitation Plan
Cover Sheet

DATE:	4/07/2019	CHECKED:	TL
CLIENT REF:	8281	DRAWN:	MC
DRAWING No.:	8781 E 01 CRMP A		

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION MANAGEMENT PLAN - NOTES

BACKGROUND

This Concept Rehabilitation Management Plan (CRMP) has been prepared by Saunders Havill Group (SHG) for Sandson Pty Ltd to satisfy Condition 10 of the Information Request issued by the Council of the City of Gold Coast on 30 August 2018 (Council Ref: MCU/2018/58).

Broadly, the one (1) hectare rehabilitation area encompasses the 25m Yaun Creek buffer zone (from top of bank) at the eastern extent of the project site. Existing elevation in the buffer zone ranges from 22m ASL at Yaun Creek to 28m ASL in the overbank area. The site is mapped as containing Regional Ecosystems (RE) 12.11.24 and 12.3.11. The site has been historically disturbed through vegetation clearing, former access tracks and infrastructure, and non-native/weed species however what remains of remnant vegetation is consistent with RE 12.3.11 and 12.3.1 (mapped downstream). Bushfire management for this site requires that revegetation species only be selected from the Land Zone 3 RE.

The primary objectives of this RMP are to rehabilitate the Yaun Creek buffer zone to a bushland state that is consistent with mapped RE 12.3.11. All plantings are subject to a twelve (12) month establishment period.

REHABILITATION - INTRODUCTION

A substantial amount of rehabilitation research has been conducted and compiled as part of the "South East Queensland Ecological Restoration Framework (SEQERF)" and subsequently endorsed by the majority of South East Queensland councils. Given this, information provided within this CRMP will largely utilize information derived from this framework.

Rehabilitation or "Ecological Restoration" can be described as "the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed" (source: Society for Ecological Restoration International).

A key aspect of ecological restoration is that structure and function are returned to site, improving site stability, and improved habitat for fauna and flora. Structure includes vegetation height and density, canopy cover and appropriate species, as well as habitat features such as fallen logs and site rock. Function refers to the natural and self-sustaining processes occurring within the site including regeneration capacity, succession and cycling of nutrients. Activities required to achieve these objectives may include controlling environmental weeds, re-establishment of wildlife corridors and or stabilisation of creek banks or stormwater devices.

In accordance with the SEQERF, four ecological restoration approaches are generally applicable to rehabilitation works:

- Natural Regeneration
- Assisted Natural Regeneration
- Reconstruction
- Fabrication

It is worth noting as restoration work progresses on a site, ongoing changes to the structure and diversity of the vegetation will become apparent. These changes tend to occur in a cyclical manner, with the initial disturbance to the vegetation (either natural or man-made) being the trigger for changes. It is important to recognize that the vegetation will have to pass through a variety of stages of succession first, often over a period of years.

Disturbance as part of restoration works often has a negative connotation however can often be useful for site restoration. Regeneration of native plant species is stimulated by mimicking natural disturbances. The techniques used will depend on the individual species and vegetation community, as they have evolved to respond to disturbances in different ways. Some examples of these techniques are:

- Control of competing vegetation, especially environmental weeds;
- Controlled burns or burn piles in vegetation communities adapted to fire;
- Soil disturbances such as ripping or raking; and or
- Alterations to hydrology in wetlands to reinstate natural movement.

The SEQERF also highlights that consistent follow up is critical for success of ecological restoration. This ensures that beneficial, permanent changes can occur within the vegetation community benefiting both fauna and flora. In order to be able to confirm these changes are occurring, ongoing site monitoring may also be required.

Ecological restoration is a complicated and evolving field. It requires careful consideration for all ecosystem aspects to try and minimise any unexpected interactions, although is generally accepted that not all can be fully known about each complex ecosystem. Given this, it is necessary to remain flexible throughout this process to adapt to site and natural changes.

REHABILITATION - APPROACHES

ECOLOGICAL RESTORATION APPROACHES	
NATURAL REGENERATION	
Applies:	To relatively large, intact and weed-free areas of native vegetation. Where native plants are healthy and capable of regenerating without human intervention. When native plant seed is stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water. Where the plant community has a high potential for recovery after any short-live disturbance such as a fire or cyclonic winds. When preventative action is all that is required to avert on-going disturbances e.g. erection of fencing to prevent instruction by cattle.
Role of planting:	Planting in such areas can work against the aims of restoration by interfering with natural regeneration.
Goal vegetation community:	The re-establishing plant community will be similar in structure, composition and diversity to the original vegetation.
ASSISTED NATURAL REGENERATION	
Applies:	To natural areas where the native plant community is largely healthy and functioning. When native plant seed is still stored in the soil or will be able to reach the site from nearby natural areas, by birds or other animals, wind or water. Where the natural regeneration processes (seedling germination, root suckering, etc.) are being inhibited by external factors, such as weed invasion, soil compaction, cattle grazing, mechanical slashing, etc. When limited human intervention, such as weed control, minor amelioration of soil conditions, erection of fencing, cessation of slashing, etc. will be enough to trigger the recovery processes through natural regeneration. When the main management issue is weed infestation and/or current land use practices.
Role of planting:	Planting in such areas can work against the aims of restoration by interfering with natural regeneration except where species cannot return to site without direct intervention.
Goal vegetation community:	The re-establishing plant community will be substantially similar in structure, composition and diversity to the original vegetation.
RECONSTRUCTION	
Applies:	Where the site is highly degraded or altered. When the degree of disturbance has been so great and long-standing that the pre-existing native plant community cannot recover by natural means. To sites such as areas of fill, sites affected by stormwater flow, areas that have been drastically cleared, even though there may be a few remaining native trees or shrubs. When a greater degree of human intervention is required, such as weed control, cessation of grazing and/or slashing, amelioration of soil conditions such as importation of soils, drainage works or re-shaping of the landscape.
Role of planting:	Importation of native species to the area is required, either through planting or direct seeding (in some situations). natural regeneration and recruitment is insufficient to initially re-establish the original vegetation. Depending on the prevailing circumstances, the planting of a broad diversity of species from the target ecosystem may be unnecessary and the use of pioneers may be sufficient to re-establish ecological processes.
Goal vegetation community:	The re-establishing planted community should be similar to the original vegetation in structure, composition and diversity.
FABRICATION (TYPE CONVERSION)	
Applies:	Where site conditions have been irreversibly changed. When it is not possible to restore the original native plant community. Where a better-adapted local plant community can be planted that will function within the changed conditions.
	In situations such as the construction of a wetland plant community to mitigate increased urban storm-water run-off.
Role of planting:	Revegetation (planting) is the major component in a fabrication program.
Goal vegetation community:	The re-establishing planted community should be similar to a naturally occurring plant community of the same type (e.g. a constructed freshwater wetland should resemble a natural system in terms of structure, composition and diversity).

Note: Table adapted from Gold Coast City Council's 'Guideline for the preparation of a Rehabilitation Plan'

REHABILITATION - METHODOLOGY

Detailed assessment of site conditions prior to commencement of documentation is essential. As part of most rehabilitation scopes, it is worth considering an appropriate methodology for both compiling documentation and site works. This can be broken down into the following items:

- Site assessment
- Rehabilitation Design Documentation (this plan)
- Site Works
- Maintenance and monitoring

METHODOLOGY – SITE ASSESSMENT

Detailed assessment of site conditions prior to commencement of documentation is essential in the establishment of a site-specific ecological restoration methodology. In accordance with the SEQERF. The following checklist will for part of the site assessment process:

- Describe the history and background of the site
- Describe the soil, drainage, topography and aspect
- Describe the native vegetation on the site and along site boundaries
- Describe the weeds on site
- Describe the vegetation dispersal and structure
- Describe the fauna use onsite
- Describe estimated native regeneration response.

The responses to the above checklist will provide the basis of the proposed restoration approach from Natural Regeneration to Fabrication for each treatment area within this Rehabilitation Plan.

Consideration should be made in the importance of integrating site-specific measures for fauna habitat and movement. With many fauna species having specific habitat requirements, foraging patterns and movement patterns. During the site assessment process, the following provisions should be taken into consideration:

- Fauna movement opportunities via easements, tracts, utility corridors and or infrastructure pathways;
- Diversity and type of fauna and distribution on site;
- Habitat opportunities e.g. Dense foliage, roosting areas, log hollows and potential nesting boxes;
- Fauna disturbance and vicinity of works to significant nesting areas and or fauna movement;
- Distribution of significant specialized food resources e.g. Koala trees; and
- Stage weed removal and or altering of weed control technique if the weeds are currently forming a significant fauna habitat.

For the sake of keeping this CRMP concise, site analysis results are compiled under a separate template, and may or may not be included in this set, however the analysis outcomes derive the Rehabilitation design methodology.

METHODOLOGY – REHABILITATION DESIGN

This documentation has been compiled through processes outlined in the SEQERF, site analysis and previous rehabilitation project experiences. The rehabilitation design—comprising distinct management zones—provides assessment managers, clients and contractors a clear methodology to assist the recovery of an ecosystem(s) that has been degraded, damaged or destroyed.

Rehabilitation zones were identified through detailed site analysis and are described below:

Management Zone 1 – Existing native vegetation on banks and floodplain (Assisted Natural Regeneration)

Existing native trees, shrubs and groundcovers to be protected and retained. Weed management in accordance with Southeast Queensland Ecological Restoration Framework (SEQERF) with aim to encourage natural regeneration, minimise damage to existing vegetation and to protect aquatic/semi-aquatic fauna. In particular, staged treatment of environmental weed trees to occur along banks, with specimens left in situ to provide bank stability and perch sites whilst native vegetation matures.

All bare denuded areas to be appropriately cultivated, topsoiled and jute matting (or equivalent soil stabilisation measure) installed to manufacturer's recommendations.

Infill planting of bare areas using a mixture of trees, shrubs and groundcovers at relative densities of 1:10m^2, 1:5m^2 and 2:1m^2. Shrubs and groundcovers to be planted where absent under existing native canopy trees. Species to be in accordance with RE12.3.11/12.3.1a and to be planted appropriately according to creek bank zones (ie. groundcovers only on lower banks, shrubs and groundcovers only on midbanks etc).

Management Zone 2 – No existing native vegetation on banks and floodplain (Reconstruction)

Weed management in accordance with SEQERF with aim to remove any self-seeding weed species prior to planting, encourage natural regeneration and to protect aquatic/semi-aquatic fauna.

All bare denuded areas to be appropriately cultivated, topsoiled and jute matting (or equivalent soil stabilisation measure) installed to manufacturer's recommendations.

Planting of entire zone using a mixture of trees, shrubs and groundcovers at relative densities of 1:10m^2, 1:5m^2 and 2:1m^2. Species to be in accordance with RE12.3.11/12.3.1a and to be planted appropriately according to creek bank zones.

Management Zone 3 – No existing native vegetation on overbank area (Reconstruction)

Weed management in accordance with SEQERF with aim to remove any self-seeding weed species prior to planting, encourage natural regeneration and to protect aquatic/semi-aquatic fauna. Selected environmental weed trees to left in situ to provide perch sites whilst native vegetation matures.

All bare denuded areas to be appropriately cultivated, topsoiled and blanket mulched (100mm depth).

Planting of entire zone using a mixture of trees, shrubs and groundcovers at relative densities of 1:10m^2, 1:5m^2 and 1:1m^2. Species to be in accordance with RE12.3.11/12.3.1a and to be suitable for the overbank zone.

Management Zone 4 – Conveyance Channel (Reconstruction/Fabrication)

Convenance channel engineering and extent to be confirmed at operational works. Channel to be finalised by civil contractor appropriately prior to rehabilitation works and.

Zone to be treated in accordance with the Landscape Masterplan, including, but not limited to, weed management of entire zone to remove any self-seeding weed species prior to rehabilitation works, and installation of jute matting to manufacturer's recommendations (as required). Planting species to be in accordance with RE12.3.11 and to be planted appropriately according to creek bank zones.

Refer to Rehabilitation Notes for additional details, plant species and densities.

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REFERENCES:
South East Queensland Ecological Restoration Framework (2012)
Guideline for the preparation of a Rehabilitation Plan (GCC)
Council Ref: MCU/2018/58

AMENDMENTS:

Issue	Date	Description	Checked
A	4/07/2019	Client Draft	TL

PROJECT:
BAILEYS MOUNTAIN ROAD,
UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF:
Rehabilitation Plan
Notes

DATE:	4/07/2019	CHECKED:	TL
CLIENT REF.:	8781	DRAWN:	MC
DRAWING No.:	8781 E 02 CRMP A		

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES - MANAGEMENT ZONES



Management Zone 1 – Existing native vegetation on banks and floodplain (Assisted Natural Regeneration)

Existing native trees, shrubs and groundcovers to be protected and retained. Weed management in accordance with Southeast Queensland Ecological Restoration Framework (SEQERF) with aim to encourage natural regeneration, minimise damage to existing vegetation and to protect aquatic/semi-aquatic fauna. In particular, staged treatment of environmental weed trees to occur along banks, with specimens left in situ to provide bank stability and perch sites whilst native vegetation matures.

All bare denuded areas to be appropriately cultivated, topsoiled and jute matting (or equivalent soil stabilisation measure) installed to manufacturer's recommendations.

Infill planting of bare areas using a mixture of trees, shrubs and groundcovers at relative densities of 1:10m^2, 1:5m^2 and 2:1m^2. Shrubs and groundcovers to be planted where absent under existing native canopy trees. Species to be in accordance with RE12.3.11/12.3.1a and to be planted appropriately according to creek bank zones (ie. groundcovers only on lower banks, shrubs and groundcovers only on midbanks etc).

Management Zone 2 – No existing native vegetation on banks and floodplain (Reconstruction)

Weed management in accordance with SEQERF with aim to remove any self-seeding weed species prior to planting, encourage natural regeneration and to protect aquatic/semi-aquatic fauna.

All bare denuded areas to be appropriately cultivated, topsoiled and jute matting (or equivalent soil stabilisation measure) installed to manufacturer's recommendations.

Planting of entire zone using a mixture of trees, shrubs and groundcovers at relative densities of 1:10m^2, 1:5m^2 and 2:1m^2. Species to be in accordance with RE12.3.11/12.3.1a and to be planted appropriately according to creek bank zones.

Management Zone 3 – No existing native vegetation on overbank area (Reconstruction)

Weed management in accordance with SEQERF with aim to remove any self-seeding weed species prior to planting, encourage natural regeneration and to protect aquatic/semi-aquatic fauna. Selected environmental weed trees to left in situ to provide perch sites whilst native vegetation matures.

All bare denuded areas to be appropriately cultivated, topsoiled and blanket mulched (100mm depth).

Planting of entire zone using a mixture of trees, shrubs and groundcovers at relative densities of 1:10m^2, 1:5m^2 and 1:1m^2. Species to be in accordance with RE12.3.11/12.3.1a and to be suitable for the overbank zone.

Management Zone 4 – Conveyance Channel (Reconstruction/Fabrication)

Convenance channel engineering and extent to be confirmed at operational works. Channel to be finalised by civil contractor appropriately prior to rehabilitation works.

Zone to be treated in accordance with the Landscape Masterplan, including, but not limited to, weed management of entire zone to remove any self-seeding weed species prior to rehabilitation works, and installation of jute matting to manufacturer's recommendations (as required).

Planting species to be in accordance with RE12.3.11/12.3.1a and to be planted appropriately according to creek bank zones.

Management Zone 5 – Proposed road reserve (Fabrication)

Weed management to entire zone to remove any self-seeding weed species prior to turfing with Couch grass. Turf to be either reinforced or staked/ pinned through to prevent damage/loss in a flood event.

Refer to Rehabilitation Notes for additional details, plant species and densities.

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REFERENCES:
Engineering / layout drawing (Urban Development & Regeneration 2019)

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PROJECT:
BAILEYS MOUNTAIN ROAD,
UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF:
Management Zones

DATE:	4/07/2019	CHECKED:	TL
CLIENT REF:	8781	DRAWN:	MC
DRAWING No.:	8781 E 03 CRMP A		

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES - DETAIL SHEET 04



LEGEND

- Site boundary
- Rehabilitation area
- Management Zone 1
- Management Zone 2
- Management Zone 3
- Management Zone 4
- Management Zone 5
- Native tree species w/TPZ)
- Non-native tree species w/TPZ
- Design layout
- Stormwater swale invert
- Stormwater basin
- Erosion sediment control catch drain
- Driveway / road / pathway / carpark
- Proposed road reserve
- Design contour
- Existing contour
- Survey

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PROJECT:

BAILEYS MOUNTAIN ROAD,
UPPER COOMERA
LOT 58 ON SP191940

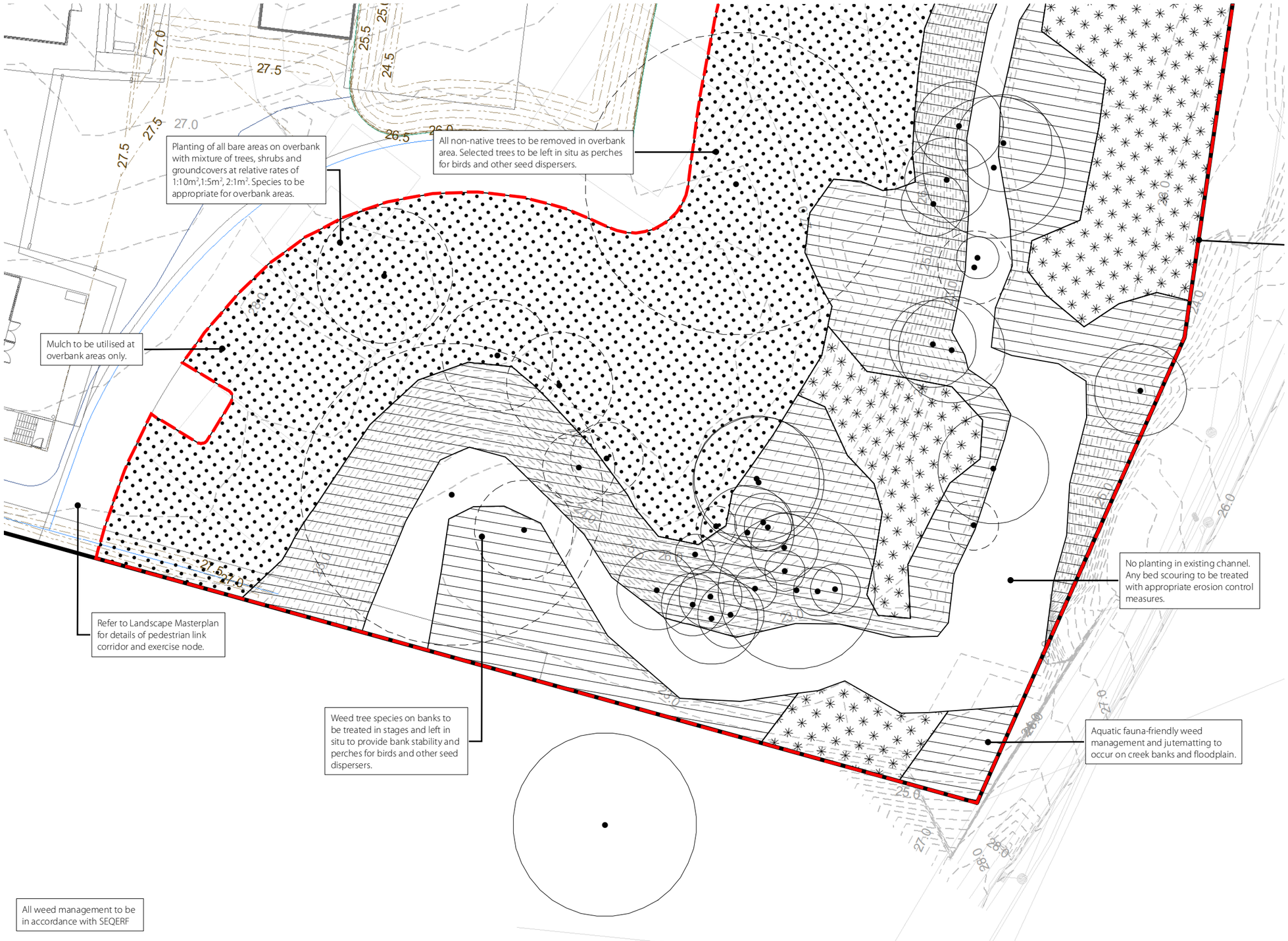
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PLAN OF: Detail Sheet 04

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DRAWING No.:	8781 E 04 CRMP A		

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES - DETAIL SHEET 05



LEGEND

- Site boundary
- Rehabilitation area
- Management Zone 1
- Management Zone 2
- Management Zone 3
- Management Zone 4
- Management Zone 5
- Native tree species w/TPZ)
- Non-native tree species w/TPZ
- Design layout
- Stormwater swale invert
- Stormwater basin
- Erosion sediment control catch drain
- Driveway / road / pathway / carpark
- Proposed road reserve
- Design contour
- Existing contour
- Survey

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PROJECT:
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UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF:
Detail Sheet 05

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BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES

METHODOLOGY – SITE WORKS

Following resolution of the site analysis and management areas as part of rehabilitation design, prioritising site works should be considered. Prior to site works commencing, the site should be secured from degrading impacts such as grazing by stock, unauthorised access and rubbish. Some factors that may require immediate attention include:

- The presence of highly invasive weed species which may disperse further prior to substantial site works commencing
- The presence of weed species which may have a long term impact on ecological communities such as exotic and weed varieties of vines
- Flammable materials (including weed thickets, grasses and vines)
- Damaging and easy access by 4WD, motorbikes and pedestrians into core retained vegetation and ecological restoration areas. This may require installation of temporary fencing if deemed appropriate

Site works can be typically broken down into the following categories:

- Primary Works
- Follow-up Works
- Maintenance Works

Primary Works

Primary works or initial works within the site or a section of the site will commonly involve a sequence of activities such as the control of all groundcover weeds, woody weeds in the understorey and exotic vines prior to the control of weed trees. Primary work has the effect of creating a large degree of disturbance which will stimulate the germination of native and exotic species. Therefore, continuing works should be scheduled shortly after the initial visit to allow for timely control of the newly regenerating weeds. Highly invasive weeds should be treated as a priority during primary work in order to avoid invasion of newly disturbed areas. Some weeds will need to be treated in steps e.g. where areas of weed is being used by nesting birds or where the staged removal of canopy weed trees is required. Techniques used during primary work commonly involve spot spray, cut-scrape paint, cut-paint, scrape-paint, roll-hang and over spraying (source: SEQERF). Refer to Weed Management notes for additional details.

Following completion of weed management, rehabilitation (such as assisted natural regeneration, construction and fabrication planting) can occur in areas unaffected by weed management activities or areas that primary weed management activities have concluded. Refer to Rehabilitation Works notes for additional details.

At the end of primary work, the zone will have been comprehensively and systematically worked, ready for follow-up works.

Follow-up Works

At intervals, which will vary according to the type of weed impacting the site and growing conditions, follow-up work will be necessary. This generally involves the spot-spraying of newly germinating weeds and resprouting sections of woody weeds and vines. It is at this stage that observational visits should be made to the site to determine what progress the vegetation is making, and decide when to implement further follow-up work. A site that receives badly-timed, too frequent or too little follow-up will rapidly experience setbacks, as weed propagules will quickly become established in the newly disturbed areas. Germinating native seedlings may be swamped by weeds or damaged by inexperienced operators thereby exhausting the seed bank. Unless adequate follow-up can be ensured when planning restoration works, there is little point in commencing primary work, as time and resources are consumed with no substantial gain achieved (source: SEQERF).

Maintenance Works

By the maintenance stage, the vegetation community is at a point where native plant species are germinating and establishing, and canopy formation is occurring. Weed density is starting to decrease as the native plants which have been encouraged during the previous restoration works are able to out-compete the weeds. One of the fundamental principles of ecological restoration is that it attempts to create or re-establish an ecosystem that is self-sustaining. Therefore, it is the underlying goal that maintenance will eventually be decreased to a minimum. While this is not always possible, due to factors such as the continual reintroduction of weed propagules to the site from nearby residential areas; unfavourable seasons or weather event; persistent weed species; or global influences such as the enhanced greenhouse effect, it should always be strived for (source: SEQERF).

Maintenance works may include minor ongoing weed management and infill planting depending on site conditions.

METHODOLOGY – WEED NOTES

Weed management typically comprises a major part of rehabilitation site works. Weed management provides the basis of aiding natural regeneration and assisted natural regeneration. It also forms part of the preliminary work required for reconstruction and fabrication scopes.

Weed Management is to be undertaken in accordance with the SEQERF Primary, Follow-up and Maintenance works notes above. Weed management shall encompass all species declared at the commonwealth, state and local level, and any weeds that appear to be invasive at the site.

Critical skills for Weed Management include:

- Knowledge of relevant legislation
- Plant Identification skills
- Knowledge of different weed management techniques

Knowledge of Relevant Legislation

It is expected contractors have a depth of knowledge of relevant legislation to complete site rehabilitation works.

This may include occupational Health and Safety laws as well as environmental and heritage protection legislation. Bush regenerators must comply with the requirements of the Workplace Health and Safety Act 2011 or, when working on Commonwealth lands, the Commonwealth's Occupational Health and Safety (Commonwealth Employment) Act 1991. Contractors should also obtain all relevant permits required under State and Commonwealth legislation (e.g.Nature Conservation Act 1992, Fisheries Act 1994, Vegetation Management Act 1999, Biosecurity Act 2014). Contractors must also be aware of and adhere to cultural heritage protection obligations under the Aboriginal Cultural Heritage Act 2003 and where chemicals are in use, the Agricultural Chemicals Distribution Control Act 1966.

In addition to the above, contractors should also be familiar with local government body requirements (e.g. Pest Management Plans, Local Codes, Policies and Guidelines) and Classifications of weeds. Refer to adjacent schedules for classification of weeds under the Biosecurity Act 2014).

RESTRICTED MATTERS (*BIOSECURITY ACT 2014*)	
Category	**Description**
1	must be reported to an inspector within 24 hours if it is present in, or on, something in your possession or under your control or at a place where you are the occupier, unless an appropriately authorised officer has already been advised or you possess a permit for the restricted matter. Includes red imported fire ants, electric ants, Asian honey bees, and certain animal diseases, aquatic diseases and pathogens.
2	must be reported to an inspector within 24 hours if it is present in, or on, something in your possession or under your control or at a place where you are the occupier, unless an appropriately authorised officer has already been advised or you possess a permit for the restricted matter. includes certain noxious fish, weeds and pest animals
3	You must not distribute this restricted matter. It must not be given as a gift, sold, traded or released into the environment unless the distribution or disposal is authorised in a regulation or under a permit. Deliberate human distribution or disposal contrary to the legislation is a key source of spread into other areas. includes weeds, pest animals and noxious fish
4	You must not move this restricted matter to ensure that it does not spread into other areas of the state. includes specific weeds, pest animals and noxious fish
5	You must not possess or keep this restricted matter under your control. These pests have a high risk of negatively impacting on the environment. You may only keep this restricted matter under a permit of the *Biosecurity Act 2014* or another Act. includes weeds, pest animals and noxious fish
6	You must not feed this category of restricted matter. Feeding this restricted matter may cause their numbers to increase and negatively impact the economy or the environment. Feeding for the purpose of preparing for or undertaking a control program is exempted. Includes invasive animals such as feral deer, foxes, rabbits and wild dogs and noxious fish such as carp, gambusia and tilapia.
7	If you have these noxious fish in your possession you must kill the restricted matter and dispose of the carcass by burying the whole carcass in the ground above the high tide water mark or placing it in a waste disposal receptacle. Includes noxious fish such as carp, weatherloach, climbing perch and gambusia

Plant Identification Skills

Both native and weed species should be identified prior to primary weed removal works and ongoing throughout the follow-up and maintenance periods. This is to maximise natural regeneration and reducing likelihood of accidental weed spraying to native vegetation. Regenerating species to be treated and maintained in a similar manner to newly planted revegetation tubestock. If contractor is unsure of species, advise should be sought by botanist, specialist contractor or confirmed with Queensland Herbarium. Refer to indicative Weed Treatment schedules derived from Queensland Herbarium for an indication of weed species and treatments.

Knowledge of Different Weed Management Techniques

A range of weed management techniques are available to combat varying weed species and scenarios. Refer to adjacent schedules and Appendix A for an indication of weed management techniques.

WEED MANAGEMENT TECHNIQUES	
METHOD	**DESCRIPTION**
Herbicide	**The herbicide weed control techniques described below provide a range of proven methods that can be used on a restoration site.**
Cut - Scrape-Paint	Cut the stem of the plant close to the ground (approximately 1-2cm) ensuring that soil does not come in contact with the cut surface. The cut can be made at a slight angle in order to increase the surface area that is exposed to the chemical. Apply herbicide immediately to the cut stump using poison pot and brush or dripper bottle. Using a knife, scrape the sides of the stump thoroughly to expose the green tissue. Apply herbicide to the scraped stump. The chemical must be applied within 10 seconds of the cut or scrape being made in order for it to be fully effective.
Cut - Paint	Cut the stem of the plant close to ground level. Apply herbicide to the cut stump using poison pot and brush or dripper bottle. This method is best suited to easy-to-treat weeds such as small-leaved privet (Ligustrum sinense), provided that the diameter of the stem at ground level is less than approximately three centimetres. If a glyphosate-/ metsulfuron methyl herbicide mix is being used in the poison pot, a greater range of weeds can be controlled using this method e.g. Easter cassia.
Scrape - Paint	Scrape as much of the stem as possible (one side of the stem) using a knife and apply herbicide to the scrape. Leave a small section of the vine unscraped, and then twist the vine so that the next scrape is made on the opposite side of the stem to the preceding scrape. Continue along the length of the vine, scraping and painting as much of the stem as possible, with scraping to be concentrated along the thicker stems close to the root of the plant. This is the best method to use for madeira vine, as it allows the chemical to translocate to the underground storage organs and aerial tubers which may be hanging in large clusters above head height. This avoids the potential problem of tubers from cut stems left hanging in the trees from dropping to the ground and sprouting. When scraping madeira vine stems a deep scrape is advisable – scrape right through to the fibrous, stringy section of the stem, taking care not to sever the vine. This method is also suitable for treatment of ochna.
Over-spraying	Over-spraying involves the use of knapsacks or power sprayers to treat large expanses of weed such as lantana thickets. The foliage must be covered with herbicide but not to the point of running off the plant. The dead plants remain in place and can be cut down at a later stage. Prior to over-spraying, any weeds that are growing closely around established native plants must be hand removed or treated by cut-scrape-paint.
oll-hang	Vines such as mile-a-minute (Ipomoea cairica) which produce long stolons extending many metres along the surface of the ground, are suited to the roll-hang method. Locate the base of the plant and carefully pull up the runners and roll them up. The resulting roll of vine is then hung in the fork of a tree to dry out as if it is left on the ground it is likely to re-shoot. Where runners are climbing up into a tree they are cut off at head height prior to the runner being rolled up – there is no need to pull cut vines down from trees as this action is likely to damage the tree. The base of the vine is treated using the cutscrape-paint method.
Gouge-paint	This method applies to plant species that have a fleshy underground storage organ, such as the large tuber that is often found at the base of madeira vine. It is also particularly appropriate for the treatment of climbing asparagus (Protasparagus plumosus). If using this technique on climbing asparagus, first cut the stems that are growing into the canopy at head height and also at the base. The fleshy rhizome can then be gouged, or alternatively in the case of climbing asparagus, it may be struck several times firmly with the head of a pair of loppers, allowing the brown outer covering of the crown to peel away exposing the white fleshy inner section of the rhizome for application of herbicide. Gouge out sections of the fleshy base with a knife and apply herbicide using a paint pot and brush or dripper bottle within 10 seconds.

Note: Table adapted from a table in SEQERF

WEED MANAGEMENT TECHNIQUES	
METHOD	**DESCRIPTION**
Basal Barking	This method involves mixing an oil-soluble herbicide in diesel/kerosene and painting or spraying the full circumference of the trunk or stem of the plant from ground level to a height of approximately 45cm. Basal bark application is suitable for thin-barked woody weeds including saplings, regrowth and multi-stemmed shrubs. The method will usually result in the mortality of difficult-to-control woody weeds at any time of the year, provided the bark is not wet or too thick to enable the herbicide to penetrate. The method should not be used in wet weather, adjacent to waterways or in areas where native trees and shrubs are located. The use should be restricted to situations where a weed is particularly difficult to control e.g. cherry guava and where other methods have been unsuccessful.
Splatter Gun	This small gas-powered injector kit is fitted into a knapsack for easy carrying and delivers large droplets in a stream over the weed. The gun is used to deliver a concentrated herbicide (glyphosate or metsulfuron methyl) across large dense expanses of weed. The method is used for species such as lantana (ratio of 1:9 of glyphosate:water). Splatter gun involves spraying strips at one to two metre intervals over the thicket. The herbicide is then translocated throughout the entire plant. The method does not require the whole plant to be covered as in over-spray.
Spot-spraying	A knapsack filled with an appropriate herbicide mix is used by the operator to selectively control environmental weeds. A keen eye and an ability to distinguish between the native and weed species likely to be present, especially at seedling stage, is essential. Marker dye is added to the chemical mix to allow the operator to see what has already been sprayed, thus covering the ground weeds comprehensively and thoroughly Glyphosate and metsulfuron methyl are the main herbicides used for spot-spraying in ecological restoration, together with the addition of a penetrant and/or surfactant and marker dye.
Stem Injection	Large woody weeds such as camphor laurel, coral trees (Erythrina spp, Privet Ligustrum spp) and umbrella trees are generally treated by stem-injection. Holes are drilled at regular intervals around the base of the tree and exposed roots using a drill. A tree injection syringe attached to a small capacity knapsack is used to fill the holes with the herbicide. Stem-injection of trees can also be undertaken using a hatchet to create cuts in a 'brickwork pattern' in trunks of trees for the application of herbicide (known as tree frilling). Frilling is more labour intensive than drilling. The greatest benefit of steminjection is that the trees can be left standing in situ as they die, provided there is no risk to humans or infrastructure from falling limbs. This creates convenient roosts for birds and other animals, and prevents the formation of large amounts of debris on the ground and damage to understorey plants which would result if the trees were to be cut down using a chainsaw.
Wick Wiping	Wick wipers can be manually used with a sponge or wick applicator, attached to a container filled with herbicide or as an attachment towed by a tractor. The manual method can be used to selectively apply herbicide to the leaves of weeds growing in sensitive situations. The hand held container can leak and generally spot spraying would be recommended. The use of a tractor drawn wick wiper is used to control taller growing species such as introduced grasses and to encourage the growth of lower growing species. This method could be used in preparation for planting.
Mechanical	**Mechanical weed control involves the use of powered and non-powered equipment such as brushcutters, chainsaws, slashers, shovels, pruners, saws, etc. These methods are best used in situations where there is a large, uninterrupted stand of weeds.**
Dig and Bag	Dig and remove tuberous/ rhizomatous root systems. Remove roots or whole plant in hard/ compacted soils. Place in suitable container and remove from site, dispose of by deep burial, burn or burial at a land fill, must not place declared weed species in recycling (mulch).
Hand-Pull	Remove totally from ground by hand (human). Perform when soil is moist. Applicable to small infestations or areas of environmental sensitivity (including sensitive watercrouses, when frogs are breeding, or presence of threatened species).
General Mechanical	May involve use of machinery (e.g. brushcutter, chainsaw, slasher, dozer, excavator). Suitable for lage infestations and weed trees. Initially cost-effective, but requires immediate revegetation of site or matting/ mulch application and extensive maintenance periods. Generates excessive soil and vegetation disturbance.

Note: Table adapted from a table in SEQERF

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REFERENCES:
South East Queensland Ecological Restoration Framework (2012)

AMENDMENTS:

Issue	Date	Description	Checked
A	3/07/2019	Client Draft	TL

PROJECT:
BAILEYS MOUNTAIN ROAD,
UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF:
Site & Weed Notes

DATE:	3/07/2019	CHECKED:	TL
CLIENT REF.:	8781	DRAWN:	MC
DRAWING No.:	8781 E 06 CRMP A		

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES - PLANTING

METHODOLOGY – PLANTING NOTES

Primary weed management works, areas requiring infill planting (assisted natural regeneration), and larger scale planting (reconstruction and fabrication) can be undertaken. Prior to installation, the following items should be considered:

- Species selection
- Sourcing plant material
- Timing of planting
- Site preparation
- Planting density
- Planting installation

Species Selection

Species selection is critical in achieving the desired ecological restoration outcomes for rehabilitation sites. Planting is typically derived from:

- Local Regional Ecosystem (RE) descriptions.
- Observed site native vegetation.
- Bioretention guideline requirements.
- Climatic and weather conditions observed on site (frost, salt-spray, etc.
- 'Pioneer' species are useful in site stabilisation and encouraging native regeneration.
- Utilising flowering and fruiting species are useful to attract wildlife and result in introduction of seeds.
- Diverse vegetation layers (trees, shrubs, groundcovers)
- Species availability from seed propagation and or local nurseries

Refer to plant schedule for species and planting densities.

Sourcing Plant Material

There are a number of options for sourcing plant material for revegetation purposes. Propagation from site seed is a good outcome however is often limited by required timing of works. Sourcing planting from local nurseries is the commonly chosen option and has the following benefits:

- Awareness of genetic considerations when collecting seed.
- Experience with breaking dormancy mechanisms in hard to germinate seeds.
- Highly successful propagation techniques.
- Ability to provide high quality stock to order
- Draw on industry resources.

Timing of Planting

The timing of planting should ideally be aligned with the wet season in SEQ (summer and autumn). This minimises the need for intensive watering to establishment planting. Planting between February to May is the most beneficial as it also seeks to avoid intense heat periods of summer. Despite this, it is understood planting may occur at various times within rehabilitation areas due to development timing needs.

Site Preparation

Site or planting preparation includes:

- Fencing to exclude grazing animals and people (if required)
- Pre-spraying of exotic grasses and other weeds to planting areas
- Consideration of source of water for new planting (access tracks, temporary irrigation)
- Arranging delivery of mulch, jute netting and treeguards (if required)
- Treatment of heavily compacted soils by ripping and or application of gypsum
- Soil amelioration as required

Planting Density

Plant density is calculated on a zone by zone basis. This allows planting to cater for various requirements including standard revegetation, infill only requirements such as canopy trees at low densities, as well as dense bioretention plantings as per Bioretention Technical Guidelines. Refer to plant schedule for species and planting densities.

Planting Installation

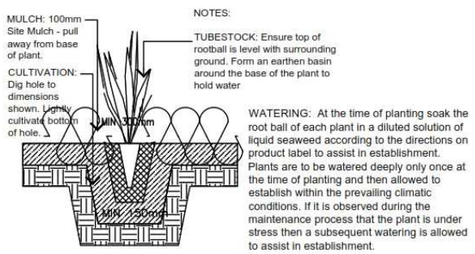
The following outlines the preferred installation methodology for revegetation works within the rehabilitation areas. It has been designed to maximise plant establishment success rates and minimize plant mortality. Revegetation works shall be either undertaken or directly supervised by an experienced and qualified contractor. All works shall be in accordance with the provisions of this CRMP, and local government policies and Australian Standards.

Plant installation methods shall include:

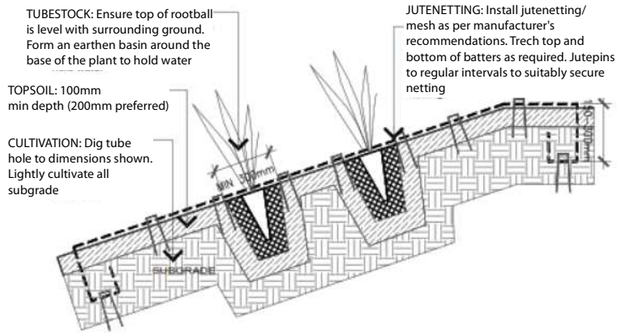
- Plants are to be vigorous, well established, hardened off, consistent with species or variety, free from disease and insect pests, with large root systems and no evidence of having been restricted or damaged. The landscape coordinator has the right to inspect and reject stock prior to planting
- Plants are to be planted immediately after delivery to the planting site.
- Planting is to be undertaken in accordance with the planting module contained within this drawing sheet.
- Excavate planting medium to a depth suitable for the installation of tube or pot specimens. In areas where planting substrate is deemed to be very poor (compacted, nutrient deficient, hydrophobic etc.) and above areas of potential frequent inundation and waterflow, topsoil may be used.
- Pre-water plant hole, if soil is dry, to decrease root stress upon planting and assess the infiltration of water through the soil.
- Incorporate into the planting substrate the appropriate quantity of prepared water crystals or other
- Suitable hydrating product such as Hortex 'Rainsaver' or 'Moisturaid'.
- Place plant into hole and backfill ensuring that the plant is upright and the stem is not covered in any less than 10mm or anymore than 20mm of planting medium.
- Plants are to be watered thoroughly immediately after planting (ensure deep irrigation) and thereafter as required during the construction phase of the development depending on climatic conditions. Creation of a concave hollow around the base of each plant will aid water infiltration to the plant roots.
- A complete, slow release fertiliser is recommended, and is to be administered appropriately during
- planting. Topdressing with slow release fertiliser is preferred to avoid toxic levels of fertiliser
- accumulating in the plant hole around the plant roots.
- To ensure successful establishment, all planting surfaces must be covered in:
    - a 100mm layer of high quality weed-free composted chip mulch (site mulch)- Note: to avoid possiblestem rot in some 'drier' species ensure mulch is 'dished' and not covering plant stem by more than 20mm. Where available, mulch material to be sourced from cleared vegetation material if adequately seasoned, or
    - Suitable individual anchored natural fibre weed mat (jute netting); or
- A long term slow release fertiliser, such as Nutricote or similar product should be used for all plantings after initial plant establishment.
- A minimum 90% survival rate should be achieved.

Typical planting details as below for standard medium mulch installation and jutenetting. Refer to manufacturer's recommendations for detailed jute netting installation including pinning, etc.

Each individual planting location should be spot cultivated to at least 2 times the depth and twice the width of the plant stock size. Refer detail for more specifications:

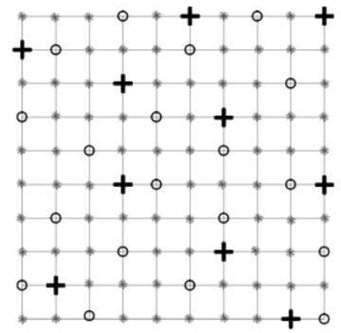


Where evidence of plant damage is occuring, tree guards grow tubes to be installed as required.

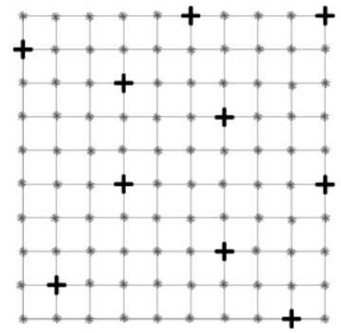


Jute netting mesh to be installed as per manufacturer's recommendations. Indicative detail shown only.

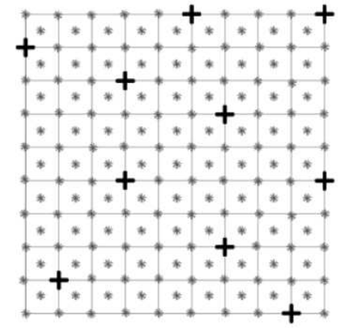
Revegetation planting locations shall be generally set out in accordance with a typical random grid pattern as shown below. Various typical densities shown. Refer to plant schedule for species and planting densities.



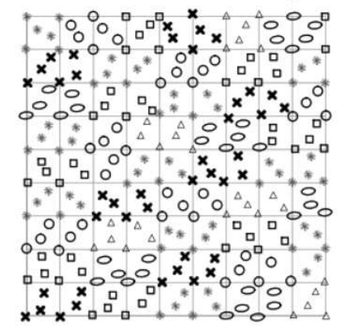
Typical 3 Tiered Revegetation Grid



Typical 2 Tiered Revegetation Grid



Typical 2 Tiered (Dense Groundcovers) Revegetation Grid



Typical Stormwater/ Biobasin Revegetation Grid

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REFERENCES:
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AMENDMENTS:

Issue	Date	Description	Checked
A	3/07/2019	Client Draft	TL

PROJECT:
BAILEYS MOUNTAIN ROAD,
UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF:
Planting Notes

DATE:	3/07/2019	CHECKED:	TL
CLIENT REF:	8781	DRAWN:	MC

DRAWING No.: 8781 E 07 CRMP A

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES - PLANTING SPECIES SCHEDULE

MANAGEMENT ZONE 1 – EXISTING NATIVE VEGETATION ON BANKS AND FLOODPLAIN (ASSISTED NATURAL REGENERATION)

RECOMMENDED SPECIES LIST TOTAL APPROXIMATE AREA = 2,730 m² (Overall minimum density approximately 2 plants per 1 m²)

Notes:
2) Setback trees 3 metres minimum from all property boundaries, sewer and service alignments
3) Distribute plants in groups on site in random arrangement - to be confirmed with super intendant on site
4) Species selected from regional ecosystem 12.3.11/12.3.1a technical descriptions and cross-checked with site species list and Wildnet Online Search (4km radius). As a general rule, 12.3.1a species to be planted along waterway banks, with RE12.3.11 species to be planted on floodplains.
5) Infill planting in this zone only. Final planting quantities to be confirmed by super intendant on site

SCIENTIFIC NAME	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY	QUANTITY REQUIRED
As per Management Zone 2					-
Goodenia rotundifolia @	Star Goodenia				-
Oplismenus aemulus @	Creeping Beard Grass				-
Ottochloa gracillima @	Graceful Grass				-

@ = To be planted in shaded locations

MANAGEMENT ZONE 2 – NO EXISTING NATIVE VEGETATION ON BANKS AND FLOODPLAIN (RECONSTRUCTION)

RECOMMENDED SPECIES LIST TOTAL APPROXIMATE AREA = 2,040 m² (Overall minimum density approximately 2 plants per 1 m²)

Notes:
1) Setback trees 3 metres minimum from all property boundaries, sewer and service alignments
2) Distribute plants in groups on site in random arrangement – to be confirmed with super intendant on site
3) Species selected from regional ecosystem 12.3.11/12.3.1a technical descriptions and cross-checked with site species list and Wildnet Online Search (4km radius). As a general rule, 12.3.1a species to be planted along waterway banks, with RE12.3.11 species to be planted on floodplains)

SCIENTIFIC NAME	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY	QUANTITY REQUIRED
TREES				**1 PER 10 m²**	
Eucalyptus tereticornis	Forest Red Gum	T1			35
*Lophostemon confertus**	Brush Box	T1/T2			13
*Waterhousia floribunda**	Weeping Lily Pily	T1			13
*Jagera pseudorhus**	Foam Bark	T2			13
*Acronychia spp. * / Cryptocarya spp. **		T2			13
*Elaeocarpus obovatus / Grandis**	Quandong	T1			13
*Mallotus philippensis**	Red Kamala	T2			13
*Aphananthe philippinensis**	Rough-leaved Elm	T2			13
Eucalyptus siderophloia	Northern Grey Ironbark	T1			13
Corymbia intermedia	Pink Bloodwood	T1			13
Lophostemon suaveolens &	Swamp Box	T2			13
Allocasuarina littoralis &	Black She-oak	T2			13
Melaleuca quinquenervia &	Broad-leaved Paperbark	T2			13
Macaranga tanarius / Commersonia bartramia	Macaranga / Brown Kurrajong	T2			13
				SUBTOTAL	**204**
SHRUBS				**1 PER 5 m²**	**-**
Glochidion ferdinandi	Cheese Tree	Sml tree / shrub			40
Cupaniopsis anacardioides	Tuckeroo	Sml tree / shrub			40
Alphitonia excelsa	Soap Tree	Sml tree / shrub			40
*Syzygium australe / Acmena smithi**	Lilly Pilly	Sml tree / shrub			40
*Backhousia myrtifolia**	Grey Myrtle	Sml tree / shrub			20
*Ficus coronata**	Sandpaper Fig	Sml tree / shrub			16
*Glochidion sumatranum**	Umbrella Cheese	Sml tree / shrub			16
*Pittosporum revolutum **	Forest Pittosporum	Shub			16
Leptospermum polygalifolium / Melaleuca linariifolia &		Shrub			20
Hibiscus heterophyllus / Trema tomentosa	Native Rosella / Poison Peach	Shrub			40
Dodonaea triquetra	Hop Bush	Shrub			40
Breynia oblongifolia	Coffee Bush	Shrub			40
Alpinia caerulea / Cordyline spp.	Native Ginger	Shrub			40
				SUBTOTAL	**408**
GROUND COVERS				**2 PER 1 m²**	**-**
Lomandra longifolia	Mat Rush	Sedge-like			500
Lomandra hystrix	Creek Mat Rush	Sedge-like			500
Carex appressa	Tall Sedge	Sedge			300
Dianella caerulea	Blue Flax Lily	Sedge-like			300
Themeda triandra	Kangaroo Grass	Grass			250
Cymbopogon refractus	Barbed Wire Grass	Grass			206
Gahnia aspera	Rough Sawsedge	Sedge			250
Juncus usitatus	Common Rush	Rush			150
Fimbristylis dichotoma	Common Fringerush	Sedge			150
Lepidosperma laterale	Variable Sword Sedge	Sedge			150
Geitonoplesium cymosum	Scrambling Lily	Vine			100
				SUBTOTAL	**2,856**
				TOTAL	**4,760**

*= To be planted along watercourse only

MANAGEMENT ZONE 3 – NO EXISTING VEGETATION ON OVERBANK (RECONSTRUCTION)

RECOMMENDED SPECIES LIST TOTAL APPROXIMATE AREA = 2,525 m² (Overall minimum density approximately 1 plants per 1 m²)

Notes:
1) Setback trees 3 metres minimum from all property boundaries, sewer and service alignments
2) Distribute plants in groups on site in random arrangement - to be confirmed with super intendant on site
3) Species selected from regional ecosystem 12.3.11/12.3.1a technical description and cross-checked with site species list and Wildnet Online Search (4km radius)

SCIENTIFIC NAME	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY	QUANTITY REQUIRED
TREES				**1 PER 10 m²**	
Eucalyptus tereticornis	Forest Red Gum	T1			35
Lophostemon confertus	Brush Box	T1			31
Angophora leiocarpa	Smooth-barked Apple	T1			31
Melia azedarach	White Cedar	T1			31
Jagera pseudorhus	Foam Bark	T2			31
Acronychia spp. / Cryptocarya spp.		T2			31
Mallotus philippensis	Red Kamala	T2			31
Macaranga tanarius / Commersonia bartramia	Macaranga / Brown Kurrajong	T2			31
				SUBTOTAL	**252**
SHRUBS				**1 PER 5 m²**	
Glochidion ferdinandi	Cheese Tree	Sml shrub / Tree			73
Cupaniopsis anacardioides	Tuckeroo	Sml tree / shrub			73
Alphitonia excelsa	Soap Tree	Sml shrub / Tree			73
Hibiscus heterophyllus / Trema tomentosa	Native Rosella / Poison Peach	Shrub			73
Dodonaea triquetra	Hop Bush	Shrub			73
Breynia oblongifolia	Coffee Bush	Shrub			73
Alpinia caerulea / Cordyline spp.	Native Ginger	Shrub			73
				SUBTOTAL	**511**
GROUND COVERS				**1 PER 1 m²**	
Lomandra longifolia	Mat Rush	Sedge-like			400
Lomandra hystrix	Creek Mat Rush	Sedge-like			400
Dianella caerulea	Blue Flax Lily	Sedge-like			250
Themeda triandra	Kangaroo Grass	Grass			250
Gahnia aspera	Rough Sawsedge	Sedge			250
Fimbristylis dichotoma	Common Fringerush	Sedge			90
Lepidosperma laterale	Variable Sword Sedge	Sedge			90
Geitonoplesium cymosum	Scrambling Lily	Vine			32
				SUBTOTAL	**1,762**
				TOTAL	**2,525**

MANAGEMENT ZONE 4 – CONVEYANCE CHANNEL (RECONSTRUCTION / FABRICATION)

RECOMMENDED SPECIES LIST TOTAL APPROXIMATE AREA = TBA

Notes:
1) Final engineering and extent to be confirmed at operational works
2) Zone to be treated in accordance with the Landscape Masterplan. Species palette to be consistent with RE 12.3.11

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REFERENCES:
Living with the Environment in the Pine Rivers Shire (Bowden 1999)
Ryan, T.S. (ed.) (2012) Technical Descriptions of Regional Ecosystems of Southeast Queensland, (Queensland Herbarium, Department of Science, Information Technology, Innovation and the Arts: Brisbane)

AMENDMENTS:

Issue	Date	Description	Checked
A	4/07/2019	Client Draft	TL

PROJECT:
BAILEYS MOUNTAIN ROAD, UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF:
Planting species schedule

DATE:	4/07/2019	CHECKED:	TL
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DRAWING No.:	8781 E 08 CRMP A		

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES

METHODOLOGY – FAUNA NOTES

Consideration for fauna habitat and values should be given during rehabilitation site works and should seek to enhance and restore the existing native vegetation areas and promote safe fauna movement throughout the site and into the larger greenspace corridors where possible. It is assumed properties adjacent to the rehabilitation scope of works will undertake individual site analysis, fauna investigations, and implement future measures as required.

As part of these rehabilitation works, basic fauna works will be undertaken. These treatments will primarily involve:

- Fauna Habitat Value and Protection
- Increased fauna habitat value within the rehabilitation areas.

Fauna habitat value and protection

Rehabilitation Areas to include reuse of site fallen hollow logs and site rock to create fauna safe havens and cover from predators for small fauna. This approach coupled with additional revegetation works allows greater fauna security and movement within the rehabilitation areas. Consideration for bushfire requirements should be reviewed to confirm no conflict in both the fauna and rehabilitation approaches. Refer indicative images below.





METHODOLOGY – MAINTENANCE & MONITORING

Maintenance, as with all ecological restoration work, is fundamental in ensuring project success. Maintenance of the planting includes tasks such as:

- Herbicide spraying to control competing weeds.
- Watering while plants are establishing. This is often highly variable and depends on the suite of species planted, weather conditions and time of year when planted. A watering schedule may consist of watering every day for week 1, twice per week for weeks 2-6 and then weekly from weeks 6-12.
- Repair of tree guards if they become damaged.
- Replenishment of mulch.
- Maintaining exclusion fencing; and
- Additional planting if required.

Additional planting may be required to replace plants that do not survive (e.g.to meet survival rate requirements, or to fill gaps), but it may also be necessary to introduce new species at different stages of vegetation succession. An adaptive management approach should be utilised, if one plant species consistently dies on a site, consider using in its place a species that is performing well.

Maintenance is required following installation of the plants, although if maintenance is regular and thorough during the first year, maintenance requirements are likely to taper off significantly in the following years.

The utilisation of benchmark criteria helps to determine rehabilitation success during the maintenance period and assists in prompting when additional maintenance activities are required. Typically accepted benchmarks or performance indicators for dedicated or open space rehabilitation works include:

- Compliance 'On Maintenance' requirements:
  - All required planting completed.
  - 95% plant survival.
  - 99% kill rate of declared environmental weeds.
- Ongoing 'Off Maintenance' requirements:
  - 95% plant survival.
  - Tree guards, stakes and general rubbish removed.
  - No remaining eroded or degraded areas.
  - 98% kill rate of declared environmental weeds.

The desired end-product is a fully-functioning system that can support itself in perpetuity, with minimal maintenance and input required.

Informal monitoring of rehabilitation works is another method of determining ecological restoration success in conjunction with the adjacent benchmarks. Informal monitoring may occur through ongoing site inspections, completion of record sheets and note taking. Notes to be distributed to the rehabilitation team and rectification works completed against notes.

Photo point monitoring is an effective form of informal monitoring that may be used to support note taking, and may be requested during the approval process by the assessment manager. A permanent or semi-permanent photo point can be set up using a star picket marked with fluorescent yellow safety cap or painted timber stakes, so that a photograph may be taken of the site at regular (quarterly) intervals as it is being restored. A time series of photographs from a degraded state prior to the commencement of restoration, through the transition stages and into the maintenance stage will assist in assessing the success of the ecological restoration process. Collected site data and photos should be compiled in a 'master' monitoring report for proper record keeping.

Monitoring of the weed management and revegetation works allows for:

- Review of the pre-established performance indicators for measuring the success of the weed removal and control.
- Ensure level of protection for existing identified native vegetation inclusive of that which has naturally regenerated
- Review the rate of spread or contraction of weed infestation within the control program.
- Monitor the rate of assisted regeneration and revegetation of desirable native species promoted in areas where weeds have been removed.
- Identification of new weed threats or other factors that may be effecting areas designated for rehabilitation.

Monitoring timeframes may involve a series of key milestones:

- Prestart Inspection - On site meeting prior to the initial commencement of work. Typically involves Consultant, Contractor and Assessment Manager to work through rehabilitation areas and clarify any adjustments to scope against approved works.
- Compliance Inspections - At the completion of the Primary Site Works, a compliance inspection meeting will be held with the Consultant, Contractor and Assessment Manager to inspect the works on-site in relation to the approved plans and previously agreed benchmarks performance indicators. Should the rehabilitation be a dedicated asset (open space) to the assessment manager, this inspection is commonly referred to as 'on maintenance'. For dedicated assets, a secondary compliance inspection will be required (off maintenance).
- Ongoing Monitoring Inspections- Informal monitoring to occur on a regular basis as highlighted above. These inspections will generally occur throughout the process, specifically before, during and after relevant compliance inspections.

It is also critical for all parties to understand their responsibilities as part of the overall rehabilitation 'team'.

REHABILITATION TEAM RESPONSIBILITIES	
PARTY	**DESCRIPTION**
Proponent	Ensure all consultants, contractors, sub contractors or others utilizing the area are aware of the Rehabilitation Plan. Appoint appropriate consultants and contractors to undertake works as prescribed on the drawings and conditioned by the Assessment Manager. Provide security via an uncompleted works bond and maintenance bond for the cost of works if required. Cover the costs of all necessary resources to ensure works are completed as per the approved documents.
Consultants	Brief proponent on their requirements in implementing and maintaining works as per the Rehabilitation Plan. Attend pre-start and compliance (on and off maintenance) inspections. Undertake monitoring and reporting to the Assessment Manager as set up by this document. Be available to respond to technical queries to the approved documentation when on-site conditions require changes. Liaise with the Assessment Manager throughout all stages of approval, initial works and maintenance of works.
Assessment Manager	Provide technical expertise via commentary on the approval of documentation. Attend pre-start and compliance (on and off maintenance) inspections. Reduce and release securities held against works at the completion of successful milestone inspections. Be available to respond to technical queries to the approved documentation when on-site conditions require changes. Accept and review maintenance reports as dictated (if required) in this document.
Contractor	Complete works in strict accordance with the documentation. Attend pre-start and compliance (on and off maintenance) inspections. Hold relevant licenses in applicable weed management/ revegetation/ fauna management, any required insurances for scope of works and an understanding of required Laws, Act, Policies and Guidelines. Recommend changes to the documentation when specific experience or on-site conditions require so.

COLOUR KEY TO WORK ITEMS	
	Weed Management
	Soil Preparation and Mulching
	Planting Works
	Watering, Monitoring and Reporting

REHABILITATION WORKS - INDICATIVE SCHEDULE OF WORK ITEMS AND MAINTENANCE SEQUENCING (NOTE MAINTENANCE PERIOD TO BE CONFIRMED BY ASSESSMENT MANAGER)

TIMING	SPRING				SUMMER			AUTUMN			WINTER			SPRING			SUMMER			AUTUMN			WINTER			SPRING			
	PRIMARY WORKS				FOLLOW-UP WORKS			FOLLOW-UP / MAINTENANCE WORKS			MAINTENANCE WORKS			MAINTENANCE WORKS			MAINTENANCE WORKS			MAINTENANCE WORKS			MAINTENANCE WORKS			MAINTENANCE WORKS			
	Month 1	Month 2	Month 3		Month 1	Month 2	Month 3	Month 1	Month 2	Month 3	Month 1	Month 2	Month 3	Month 1	Month 2	Month 3	Month 1	Month 2	Month 3	Month 1	Month 2	Month 3	Month 1	Month 2	Month 3	Month 1	Month 2	Month 3	
WEEK 1	Pre-start meeting Council, Contractor and Superintendent	Establish photo points if required. Weed management - "knockdown spray"	Mulch spreading and Jute-mat installation	MILESTONE: COMPLIANCE / "ON MAINTENANCE"	Watering and Monitoring and reporting (throughout establishment). Photo monitoring as required	Watering and Monitoring and reporting (throughout establishment). Photo monitoring as required	Watering and Monitoring and reporting (throughout establishment). Photo monitoring as required	Watering to replacement plants only.	Watering to replacement plants only.	Monitoring and reporting. Photo monitoring as required	watering to replacement plants only.		Monitoring and reporting. Photo monitoring as required.	Watering to replacement plants only		Monitoring and reporting. Photo monitoring as required.	Watering to replacement plants only		Monitoring and reporting. Photo monitoring as required.	Watering to replacement plants only		Monitoring and reporting. Photo monitoring as required.	Watering to replacement plants only		Monitoring and reporting. Photo monitoring as required.	Mulch - top up depths to 100mm and replace / repair Jutematting as required	Watering to replacement plants only	Monitoring and reporting. Photo monitoring as required.	MILESTONE: COMPLIANCE / "OFF MAINTENANCE"
WEEK 2	Initial weed management works - wood weed removal /"knockdown" spray	Soil Preparation and cultivation	Natural regeneration plants staking for identification		Weed management - "knockdown spray" in mulched areas	Weed management - "knockdown spray" re-apply woody weeds	Weed management - "knockdown spray" in mulched areas	Weed management - rotation "knockdown spray" in mulched areas	Weed management - rotation "knockdown spray" in mulched areas	Weed management - rotation "knockdown spray" in mulched areas	Weed management - rotation "knockdown spray" in mulched areas		Weed management - rotation "knockdown spray" in mulched areas	Weed management - rotation "knockdown spray" in mulched areas		Weed management - rotation "knockdown spray" in mulched areas	Weed management - rotation "knockdown spray" in mulched areas		Weed management - rotation "knockdown spray" in mulched areas	Weed management - rotation "knockdown spray" in mulched areas		Weed management - rotation "knockdown spray" in mulched areas	Weed management - rotation "knockdown spray" in mulched areas		Weed management - rotation "knockdown spray" in mulched areas	Natural regeneration plants - weed management	Weed management - "knockdown spray" re-apply woody weeds	Weed management - "knockdown spray" in mulched areas	
WEEK 3	Weed management works - removal by hand	Soil Preparation and modification	Planting and Watering		Natural regeneration plants - weed management	Replacement of Failed Plants	Replacement of Failed Plants	Natural regeneration plants - weed management	Natural regeneration plants - weed management	Replacement of Failed Plants	Natural regeneration plants - weed management		Trees formative pruning			Replacement of Failed Plants				Natural regeneration plants - weed management		Trees formative pruning				Trees formative pruning	Replacement of Failed Plants	Natural regeneration plants - weed management	
WEEK 4	Weed Management - slashing of maintenance access paths	Mulch - stockpiled on site	Planting and Watering		Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths		Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths		Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths		Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths		Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths		Weed Management - slashing of maintenance access paths	Replacement of Failed Plants	Weed Management - slashing of maintenance access paths	Weed Management - slashing of maintenance access paths	

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REFERENCES:

South East Queensland Ecological Restoration Framework (2012)

AMENDMENTS:

Issue	Date	Description	Checked
A	4/07/2019	Client Draft	TL

PROJECT:

BAILEYS MOUNTAIN ROAD,
UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF: Fauna, Maintenancy & Monitoring Notes

DATE:	4/07/2019	CHECKED:	TL
CLIENT REF:	8781	DRAWN:	MC

DRAWING No.: 8781 E 09 CRMP A

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES - WEED TREATMENT & REMOVAL (1)

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

Rk	Family	Scientific and common names	Sr	R	S	LFS	Non-Chemical Control	Chemical Control
1	Verbenaceae	Lantana camara var. camara (lantana)	10	455	5	S/O	Seedlings: Hand pull	Herbicides must be applied by appropriately qualified / supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered product labels, or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable. Refer to South East Queensland Ecological Restoration Framework for additional guidance.
2	Asteraceae	Baccharis halimifolia (groundsel bush)	10	168	5	S/O	Seedlings: Hand pull	
3	Crassulaceae	Bryophyllum delagoense (mother of millions)	8	38	5	H/O	Hand pull and dispose	
4	Bignoniaceae	Macfadyena unguis-cati (cat's claw creeper)	5	36	5	V/O	Tubers: crown or dig up, bag and remove.	
	Basellaceae	Anredera cordifolia (madeira vine)	8	16	5	V/O	Small Vines & Tubers: Hand pull. Bag and dispose.	
6	Asparagaceae	Asparagus africanus (ornamental asparagus, asparagus fern)	7	26	5	V/O	dig out roots and dispose of at local council landfill site. remove entire crown and underground stem to prevent regrowth	
7	Ulmaceae	Celtis sinensis (Chinese celtis)	8	19	5	T/O	remove when small .hand pull or dig out small seedlings. combine dozing, burning and controlled grazing for large infestations	
8	Lauraceae	Cinnamomum camphora (camphor laurel)	7	25	5	T/O	Seedlings: Hand pull	
9	Anacardiaceae	Schinus terebinthifolius (broad-leaf pepper tree)	6	49	5	T/O	Seedlings: Hand pull	
	Salviniaceae	Salvinia molesta (salvinia)	8	57	5	Ha/F	Mechanical removal of small infestations; Salvinia weevil (Biological control)	
11	Cabombaceae	Cabomba caroliniana (cabomba, fanwort)	4	12	5	Ha/F	Mechanical removal of small infestations	
12	Asteraceae	Chrysanthemoides monilifera subsp. rotundata (bitou bush)	3	23	5	S/OA	N/A	
13	Pontederiaceae	Eichhornia crassipes (water hyacinth)	4	8	5	Ha/OF	Mechanical removal of small infestations	
14	Acanthaceae	Hygrophila costata (Glush weed)	3	7	5	Ha/F	Hand pull smal infestations. Can be controlled by planting competitive native species.	
	Oleaceae	Ligustrum lucidum (tree privet)	5	9	5	T/O	Seedlings: Hand pull	
16	Asteraceae	Sphagneticola trilobata (Singapore daisy)	6	34	5	H/O	Hand pull	
17	Asteraceae	Ageratina adenophora (crofton weed)	6	38	5	H/O	Hand pull and hang to dry.	
18	Verbenaceae	Lantana montevidensis (creeping lantana)	8	62	5	S/O	Fire and/or mechanical control	
19	Fabaceae	Neonotonia wightii (glycine)	5	16	5	H/A	N/A	
	Poaceae	Panicum maximum (green panic and guinea grass)	8	78	5	H/A	Hand or mechanical removal of small infestations	
21	Oleaceae	Ligustrum sinense (Chinese privet)	4	11	5	T/O	Seedlings: Hand pull	
22	Ochnaceae	Ochna serrulata (ochna)	7	33	5	S/O	N/A	
23	Asparagaceae	Asparagus aethiopicus cv. Sprengeri (asparagus ground fern)	5	35	5	H/O	dig out unwanted plants and dispose of at the appropriate council landfill. remove the entire crown of underground stem of plant to prevent regrowth	
24	Poaceae	Sporobolus pyramidalis and S. natalensis (giant rat's tail grasses)	8	72	5	H/U?	Hand or mechanical removal of small infestations	
25	Asteraceae	Ageratina riparia (mistflower)	5	38	5	H/O	Hand pull and hang to dry.	
26	Asclepiadaceae	Araujia sericifera (mothvine)	9	38	4	V/O	Seedlings & Vines: Hand pull. Bag and remove fruit.	
27	Crassulaceae	Bryophyllum daigremontianum x B. delagoense (hybrid mother-of millions)	6	15	5	H/O	Hand pull and dispose	
28	Convolvulaceae	Ipomoea cairica (mile-a-minute)	7	56	4	V/O	Vines & Runners: hand pull, roll up and hand up to dry.	
29	Sapindaceae	Cardiospermum grandiflorum (balloon vine)	7	31	4	V/O	Seedlings & Small Vines: Hand Pull	
30	Asclepiadaceae	Cryptostegia grandiflora (rubber vine)	6	19	4	V/O	Scattereded or medium-density infestations: Where possible, repeated slashing close to ground level is recommended.	
31	Phytolaccaceae	Rivina humilis (baby pepper)	8	61	4	H/O	Hand pull and hang to dry.	
32	Poaceae	Sporobolus africanus (Parramatta grass)	8	48	5	H/U	Hand or mechanical removal of small infestations	
33	Poaceae	Sporobolus fertilis (giant Parramatta grass)	9	27	5	H/U	Hand or mechanical removal of small infestations	
34	Poaceae	Eragrostis curvula (African lovegrass)	7	29	4	H/U	Chipped out before they flower. When chipping out the plant ensure that the tussock crowns are removed, as this will prevent regrowth. If in seed, the stems must be cut and bagged first.	
35	Asteraceae	Gymnocoronis spilanthoides (Senegal tea)	3	4	5	Ha/F	place plant material in a sealed plastic bag, leave in sunlight to rot then burn or dispose of at a council-approved land fill tip	
36	Amaranthaceae	Alternanthera philoxeroides (alligator weed)	1?	3	5	Ha/U	physical removal of plant should not be attempted	
37	Passifloraceae	Passiflora suberosa (cork passionflower)	8	166	4	V/O	N/A	
38	Poaceae	Melinis minutiflora (molasses grass)	5	17	5	H/A	Grazing or mowing	
39	Aristolochiaceae	Aristolochia elegans (Dutchman's pipe)	8	30	4	V/O	Stems: Hand pull; Fruit: Bag and remove.	
40	Convolvulaceae	Ipomoea indica (blue morning glory)	5	24	4	V/O	Vines and Runners: hand pull, roll up and hang to dry.	
41	Mimosaceae	Leucaena leucocephala (leucaena)	6	14	4	ST/A	Small plants: Hand pull or mechanical removal	
42	Poaceae	Brachiaria mutica (para grass)	6	18	4	Ha/A	Grazing	
43	Hydrocharitacea e	Egeria densa (egeria waterweed)	2	7	4	Ha/F	hand pulling, cutting and digging with machines effective	
44	Pinaceae	Pinus elliottii (slash pine)	4	22	4	T/A	Seedlings: Hand pull; Saplings and Trees: cut close to ground or ring-bark	
41	Mimosaceae	Leucaena leucocephala (leucaena)	6	14	4	ST/A	Small plants: Hand pull or mechanical removal	
42	Poaceae	Brachiaria mutica (para grass)	6	18	4	Ha/A	Grazing	
43	Hydrocharitacea e	Egeria densa (egeria waterweed)	2	7	4	Ha/F	hand pulling, cutting and digging with machines effective	
44	Pinaceae	Pinus elliottii (slash pine)	4	22	4	T/A	Seedlings: Hand pull; Saplings and Trees: cut close to ground or ring-bark	
45	Caesalpiniaceae	Senna pendula var. glabrata (Easter cassia)	7	33	4	ST/O	Seedlings: Hand pull	
46	Poaceae	Chloris gayana (Rhodes grass)	9	55	4	H/A	Hand pulling and removal and digging of larger clumps	Herbicides must be applied by appropriately qualified / supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered product labels, or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable. Refer to South East Queensland Ecological Restoration Framework for additional guidance.
47	Crassulaceae	Bryophyllum pinnatum (resurrection plant)	6	17	4	H/O	Hand pull and dispose	
48	Asteraceae	Parthenium hysterophorus (parthenium weed)	6	14	4	H/U	hand pulling of small areas is not recommended	
49	Caprifoliaceae	Lonicera japonica (Japanese honeysuckle)	3	6	4	V/O	Vines and Runners: hand pull, roll up and hang to dry.	
50	Acanthaceae	Thunbergia alata (black eyed susan)	5	22	4	H/O	N/A	
51	Fabaceae	Macroptilium atropurpureum (siratro)	8	39	4	V/A	N/A	
52	Rosaceae	Rubus ellipticus (yellowberry)	4	26	4	S/O	slashing hinders growth, giving some control if plants are slashed before they seed	
53	Colchicaceae	Gloriosa superba (glory lily)	3	26	4	V/O	N/A	
54	Verbenaceae	Phyla canescens (lippia, Condamine couch)	3	4	4	Ha/O	a combined approach of different control methods including chemical and mechanical with land management practices is most effective	
55	Solanaceae	Solanum seaforthianum (Brazilian nightshade)	8	78	4	V/O	Hand pull	
56	Araceae	Pistia stratiotes (water lettuce)	3	8	4	Ha/OF	Mechanical removal of small infestations	
57	Asparagaceae	Asparagus plumosus (asparagus fern)	4	8	4	V/O	Rhizomes: crown and hang to dry.	
58	Commelinaceae	Tradescantia fluminensis (Qld use T. albiflora) (wandering jew)	5	9	4	H/O	N/A	
59	Solanaceae	Cestrum parqui (green cestrum)	6	36	4	S/O	Seedlings: Hand pull	
60	Caesalpiniaceae	Senna septemtrionalis (arsenic bush, was S. floribunda)	6	25	4	S/O	Seedlings: Hand pull	
61	Solanaceae	Solanum mauritianum (wild tobacco tree)	8	30	4	S/O	Seedlings: Hand pull	
62	Apocynaceae	Catharanthus roseus (pink periwinkle)	5	22	4	S/O	Hand pull	
63	Passifloraceae	Passiflora subpeltata (white passion flower)	10	60	4	V/O	Stems: Hand pull	
64	Fabaceae	Desmodium uncinatum (silverleaf desmodium)	5	14	4	H/A	Hand pull or crown and dispose	
65	Poaceae	Melinis repens (red Natal grass)	10	134	4	H/A	Grazing or mowing	
66	Nymphaeaceae	Nymphaea caerulea subsp. zanzibarensis (blue lotus)	4	17	4	Ha/OF	Hand pull small infestations.	
67	Onagraceae	Oenothera drummondii subsp. drummondii (beach evening primrose)	3	17	4	H/O	Hand pull	
68	Tiliaceae	Triumfetta rhomboidea (Chinese burr)	7	44	4	H/U	Hand pull	
69	Haloragaceae	Myriophyllum aquaticum (parrot's feather)	3	15	4	Ha/F	N/A	
70	Passifloraceae	Passiflora foetida (stinking passion flower)	7	50	4	V/O	Hand Pull	
71	Asteraceae	Verbesina encelioides (crownbeard)	7	34	4	H/U	Vines: Hand pull and remove; Runners: Roll up and hang to dry.	
72	Poaceae	Paspalum mandiocanum (broad leaf paspalum)	3	6	4	H/A	N/A	
73	Poaceae	Paspalum dilatatum (paspalum grass)	10	30	4	H/A	Hand pull or dig up	

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REFERENCES:
Queensland Herbarium Invasive Naturalised Plants in South East Queensland

AMENDMENTS:

Issue	Date	Description	Checked
A	3/07/2019	Client Draft	TL

PROJECT:
BAILEYS MOUNTAIN ROAD,
UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF:
Weed Treatment & Removal

DATE:	3/07/2019	CHECKED:	TL
CLIENT REF.:	8781	DRAWN:	MC
DRAWING No.:	8781 E A01 CRMP A		

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES - WEED TREATMENT & REMOVAL (2)

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

Rk	Family	Scientific and common names	Sr	R	S	LFS	Non-Chemical Control	Chemical Control
73	Poaceae	Paspalum dilatatum (paspalum grass)	10	30	4	H/A	Hand pull or dig up	Herbicides must be applied by appropriately qualified / supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered product labels, or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable. Refer to South East Queensland Ecological Restoration Framework for additional guidance.
74	Ruppiaceae	Ruppia maritima (sea tassel)	2	8	4	Ha/F	Hand pull or dig up	
75	Arecaceae	Syagrus romanzoffiana (queen palm)	4?	10	4	T/O	Seedlings: Hand pull or crown; Trees: cut below growing point	
76	Poaceae	Hymenachne amplexicaulis cv. Olive (hymenachne)	1?	1	4	Ha/A	a combined approach of different control methods including mechanical, chemical and biological with land management practices is most effective	
77	Asteraceae	Senecio tamoides (Canary creeper)	3	8	4	V/O	Vines: Hand pull and remove; Runners: Roll up and hang to dry.	
78	Poaceae	Cenchrus ciliaris (buffel grass)	4	15	4	H/A	Hand or mechanical removal of young plants	
79	Acanthaceae	Thunbergia grandiflora (thunbergia, blue thunbergia)	2	3	5?	V/O	N/A	
80	Cactaceae	Opuntia tomentosa (velvet tree pear)	8	46	4	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	
81	Euphorbiaceae	Ricinus communis (castor oil plant)	7	20	4	S/O	Seedlings: Hand pull	
82	Asteraceae	Senecio madagascariensis (fire weed)	6	28	4	H/U	Vines: Hand pull and remove; Runners: Roll up and hang to dry.	
83	Cyperaceae	Cyperus involucratus (African sedge)	6	15	4	Ha/OF	Each has to be dug out with a spade and the entire plant turned over, exposing the root system while making sure all aerial parts of the plant are completely covered.	
84	Asteraceae	Tithonia diversifolia (Mexican sunflower)	5	11	4	H/O	N/A	
85	Poaceae	Setaria sphacelata (South African pigeon grass)	9	41	4	H/A	Hand pull or dig up	
86	Asclepiadaceae	Gomphocarpus physocarpus (balloon cotton bush)	10	132	4	S/OU	Slash in winter and burn cuttings. Wanderer Butterfly can also be used as biological control.	
87	Poaceae	Digitaria didactyla (Queensland blue couch)	9	70	4	H/A	Hand pull or cultivation	
88	Caesalpiniaceae	Gleditsia triacanthos (honey locust)	7	12	4	T/O	For the control of dense infestations on grazing land, burning followed by spot spraying is an economical control method.	
89	Poaceae	Paspalum notatum (bahia grass)	4	10	4	H/A	Hand pull or dig up	
90	Cactaceae	Opuntia monacantha (drooping tree pear, syn. O. vulgaris)	2	3	4	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	
91	Poaceae	Paspalum conjugatum (paspalum grass)	7	38	4	H/A	Cut below crown.	
92	Malpighiaceae	Hiptage benghalensis (hiptage)	3	5	4	S,V/O	Hand pull small infestations.	
93	Solanaceae	Solanum torvum (devil's fig)	6	39	4	S/O	Seedlings: Hand pull	
94	Caesalpiniaceae	Caesalpinia decapetala (thorny poinciana)	4	20	4	S,V/O	Seed-heads: Bag and remove.	
95	Poaceae	Pennisetum alopecuroides (swamp foxtail)	7	29	4	H/O	Hand Pull	
96	Verbenaceae	Duranta erecta (duranta)	6	14	4	ST/O	Shrubs: CS&P (1:1.5)	
97	Brassicaceae	Nasturtium officinale (Qld use Rorippa nasturtium-aquaticum) (watercress)	7	19	4	Ha/FU	Manually grub and destroy.	
98	Polygonaceae	Acetosa sagittata (rambling dock)	4	18	4	V/U	Tubers: Dig up, bag and remove.	
99	Poaceae	Cynodon dactylon (couch, Bahama grass introduced cultivars)	10	45	4	H/OA	Hand pull small infestations, removing all roots or smother with mulch.	
100	Bignoniaceae	Tecoma stans (yellow bells)	4	16	4	ST/O	N/A	
101	Rosaceae	Rhaphiolepis indica (Indian hawthorn)	3	10	4	ST/O	Seedlings: Hand pull	
102	Mimosaceae	Mimosa pudica (common sensitive plant)	4	12	4	S/A	N/A	
103	Commelinaceae	Callisia fragrans (purple succulent)	3	9	4	H/O	N/A	
104	Scrophulariaceae	Paulownia tomentosa (paulownia)	3	5	4	T/AO	Seedlings: Hand pull	
105	Commelinaceae	Tradescantia zebrina (zebrina)	3	12	4	H/O	N/A	
106	Acanthaceae	Ruellia malacosperma (ruellia)	5	16	4	H/O	N/A	
107	Poaceae	Pennisetum clandestinum (kikuyu grass)	4	12	4	H/A	Hand Pull	
108	Liliaceae	Lilium formosanum (Taiwan lily)	5	10	4	H/O	Hand pull or crown and dispose	
109	Asteraceae	Sigesbeckia orientalis (Indian weed)	10	148	4	H/U	Hand pull or cultivation.	
110	Asteraceae	Bidens pilosa (cobbler's pegs)	10	110	4	H/U	Hand pull or cultivation.	
111	Cactaceae	Opuntia stricta (common prickly pear)	7	67	4	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	
112	Poaceae	Eleusine indica (crowsfoot grass)	8	55	4	H/A	Pull and chip. Replant with native couch.	
113	Poaceae	Axonopus compressus (broad leaved carpet grass)	5	23	4	H/AO	Cut stems from roos.	
114	Lamiaceae	Salvia coccinea (red salvia)	9	46	4	H/O	remove small areas by hand or machine	
115	Asteraceae	Ageratum houstonianum (blue billygoat weed)	8	81	4	H/UO	N/A	
116	Myrtaceae	Psidium guajava and P. guineense (yellow guava and West Indes guava)	4	7	4	ST/AO	N/A	
117	Rosaceae	Rubus bellobatus (kittatinny blackberry)	5	22	4	S/O	slashing hinders growth, giving some control if plants are slashed before they seed	
118	Myrtaceae	Eugenia uniflora (Brazilian cherry)	4	19	4	ST/O	N/A	
119	Oleaceae	Olea europaea (olive)	2	6	4?	T/A	Seedlings: Hand pull	
120	Poaceae	Brachiaria decumbens (signal grass)	4	14	4	H/A	Grazing	
121	Fabaceae	Stylosanthes scabra (shrubby stylo)	4	4	4.3?	H/A	N/A	
122	Commelinaceae	Commelina benghalensis (hairy wandering jew)	4	7	4	H/O	Collect and Bag	
123	Poaceae	Pennisetum purpureum (elephant grass)	2	9	4	H/O	Grazing or mechanical removal	
124	Zingiberaceae	Hedychium coronarium (wild ginger)	2	2	4	H/O	Small Plants: Hand pull and dispose	
125	Phytolaccaceae	Phytolacca octandra (inkweed)	10	50	3	H/O	Hand pull or crown	
126	Asclepiadaceae	Asclepias curassavica (red cotton bush)	9	43	3	S/O	Hand pull; Slash	
127	Solanaceae	Lycium ferocissimum (African boxthorn)	1?	5	4.4?	S/O	N/A	
128	Mimosaceae	Prosopis pallida (algaroba)	2	2	4	ST/O	When using mechanical control methods, it is important to remove the bud zone of the root system (about 30 cm below the ground surface). If this is not removed, re-shooting can occur.	
129	Juncaceae	Juncus articulatus (jointed rush)	1	2	4	Ha/FO	Hand pull.	
130	Cactaceae	Opuntia aurantiaca (tiger pear)	1	2	4	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	
131	Poaceae	Arundo donax (giant reed)	1	4	4	H/O	Physical removal of small infestations.	
132	Cactaceae	Opuntia imbricata (rope pear)	1	1	4	H/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	
133	Bignoniaceae	Pyrostegia venusta (flame vine)	1	1	4	V/O	N/A	
134	Poaceae	Cortaderia selloana (pampas grass)	2	1	4	H/O	Small Plants: dig out by hand or machine	
135	Solanaceae	Solanum hispidum (giant devil's fig)	5	23	4	S/O	Hand pull	
136	Agavaceae	Furcraea foetida (Cuban hemp)	3	4	4.3?	S/OA	Dig out by hand or machine	
137	Agavaceae	Furcraea selloa (hemp)	1	2	4?	S/OA	Dig out by hand or machine	
138	Agavaceae	Agave americana (century plant)	4	9	4	S/OA	Dig out by hand or machine	
139	Rutaceae	Murraya paniculata cv. Exotica (murraya)	6	26	4	S/O	Seedlings: Hand pull	
140	Rosaceae	Rubus discolor (R. fruticosus complex, a blakberry)	4	10	4	S/OA	slashing hinders growth, giving some control if plants are slashed before they seed	
141	Brassicaceae	Cakile edentula (American sea rocket)	4	24	4	H/U	Manually grub and destroy.	
142	Balsaminaceae	Impatiens walleriana (balsam)	2	6	4	H/O	N/A	
143	Agavaceae	Agave sisalana (sisal)	2	4	4	S/OA	Dig out by hand or machine	
144	Agavaceae	Agave vivipara var. vivipara (sisal)	2	3	4	S/OA	Dig out by hand or machine	
145	Rosaceae	Prunus munsoniana (wild goose plum)	7	31	4	ST/A	Seedlings: Hand pull	
146	Poaceae	Echinochloa crus-galli (barnyard grass)	6	34	4	H/A	Hand pull or dig out small infestations.	

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surveying town planning urban design environmental management landscape architecture

CLIENT:

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REFERENCES:

Queensland Herbarium Invasive Naturalised Plants in South East Queensland

AMENDMENTS:

Issue	Date	Description	Checked
A	3/07/2019	Client Draft	TL

PROJECT:

BAILEYS MOUNTAIN ROAD,
UPPER COOMERA
LOT 58 ON SP191940

environmental management

PLAN OF:

Weed Treatment & Removal

DATE:	3/07/2019	CHECKED:	TL
CLIENT REF.:	8781	DRAWN:	MC
DRAWING No.:	8781 E A02 CRMP A		

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES - WEED TREATMENT & REMOVAL (3)

QUEENSLAND HERBARIUM INVASIVE NATURALISED PLANTS IN SOUTH EAST QUEENSLAND

Rk	Family	Scientific and common names	Sr	R	S	LFS	Non-Chemical Control	Chemical Control
147	Asteraceae	Solidago canadensis var. scabra (Canadian goldenrod)	7	15	4?	H/O	Hand pull and hang to dry.	Herbicides must be applied by appropriately qualified / supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered product labels, or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable. Refer to South East Queensland Ecological Restoration Framework for additional guidance
148	Fabaceae	Pueraria lobata (kudzu)	3	4	4	V,S/O	Slash; Diminish by shading site	
149	Alismataceae	Sagittaria graminea var. platyphylla (sagittaria arrowhead)	3	7	4	Ha/FO	Physical removal of small infestations.	
150	Nymphaeaceae	Nymphaea mexicana (yellow waterlily)	2	4	4	Ha/OF	Hand pull small infestations.	
151	Poaceae	Phyllostachys aurea (fishpole bamboo)	1	2	4	S/O	N/A	
152	Euphorbiaceae	Jatropha gossypiifolia (cotton-leaf physic nut, bellyache bush)	1	1	4	S/O	Hand pull	
153	Malvaceae	Sida rhombifolia (Paddy`s lucerne)	9	69	4	S/U	Hand pull or dig out.	
154	Poaceae	Themeda quadrivalvis (grader grass)	8	25	4	H/A	Hand pull or dig out small infestations.	
155	Poaceae	Andropogon virginicus (whisky grass)	6	14	4	H/A	Hand pull or dig out small infestations.	
156	Bignoniaceae	Jacaranda mimosifolia (jacaranda)	4	12	3	T/O	Seedlings: Hand pull	
157	Acanthaceae	Justicia betonica (squirreltail)	2	4	4	S/O	Hand pull smal infestations. Can be controlled by planting competitive native species.	
158	Mimosaceae	Acacia boliviana (Bolivian wattle)	1	1	4	T/O	Mechanical or chain removal.	
159	Simaroubaceae	Ailanthus altissima (tree of heaven)	1?	3	4	T/O	Seedlings: Hand pull	
160	Poaceae	Echinochloa colona (awnless barnyard grass)	9	44	3	H/A	Hand or mechanical removal of small infestations	
161	Cyperaceae	Cyperus brevifolius (Mullumbimby couch)	8	53	3	H/O	Each has to be dug out with a spade and the entire plant turned over, exposing the root system while making sure all aerial parts of the plant are completely covered.	
162	Moraceae	Morus alba (white mulberry)	3	10	3	T/O	N/A	
163	Arecaceae	Colocasia esculenta (taro)	3	4	3	H/AO	Hand pull.	
164	Cannaceae	Canna indica (canna lily)	3	9	3	H/O	Dig out entire plant	
165	Buddlejaceae	Buddleja madagascariensis (buddleja)	5	6	3	S,V/O	N/A	
166	Bignoniaceae	Tecoma capensis (Cape honeysuckle)	3	8	4	ST/O	N/A	
167	Cactaceae	Harrisia martinii (harrisia cactus)	2?	4	4	S/O	The use of the biological mealy-bug agent is recommended	
168	Acanthaceae	Thunbergia laurifolia (laurel clock vine)	1	1	4	V/O	N/A	Herbicides must be applied by appropriately qualified / supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered product labels, or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable. Refer to South East Queensland Ecological Restoration Framework for additional guidance
169	Fabaceae	Erythrina crista-galli (cockspur coral tree)	2?	4	4	T/O	N/A	
170	Sapindaceae	Koelreuteria elegans (Chinese rain tree)	1?	1	3.6?	T/O	Seedlings: Hand pull	
171	Zingiberaceae	Hedychium gardnerianum (ginger lily)	1?	3	4	H/O	Small Plants: Hand pull and dispose	
172	Acanthaceae	Hypoestes phyllostachya (polka-dot plant	3	5	4	H/O	Hand pull or crown and dispose	
173	Caprifoliaceae	Sambucus canadensis (American elder)	3	7	3	ST/O	Vines and Runners: hand pull, roll up and hang to dry.	
174	Asteraceae	Conyza sumatrensis (tall fleabane)	9	45	3	H/U	Hand or mechanical removal of small infestations	
175	Fabaceae	Tipuana tipu (tipuana)	2	5	3	T/O	Seedlings: Hand pull	
176	Asteraceae	Tagetes minuta (stinking roger)	8	32	3	H/U	Hand pull and hang to dry.	
177	Caesalpiniaceae	Chamaecrista rotundifolia (round-leaf cassia)	6	14	3	ST/A	Seedlings: Hand pull	
178	Poaceae	Cenchrus echinatus (Mossman river grass)	8	43	3	H/A	Hand or mechanical removal of young plants	
179	Asteraceae	Conyza canadensis (Canadian fleabane)	10	55	3	H/U	Hand or mechanical removal of small infestations	
180	Euphorbiaceae	Euphorbia cyathophora (painted spuge)	8	20	3	H/O	Hand pull	
181	Poaceae	Setaria palmifolia (palm leaf setaria)	5	13	3	H/O	Hand pull or dig up	
182	Euphorbiaceae	Euphorbia heterophylla (milk weed)	5	12	3	H/O?	Hand pull	Herbicides must be applied by appropriately qualified / supervised persons in accordance with the Agricultural Chemicals and Distribution Control Act 1966 at rates identified on registered product labels, or on an Australian Pesticides and Veterinary Medicines Authority (APVMA) issued off-label permit where applicable. Refer to South East Queensland Ecological Restoration Framework for additional guidance
183	Fabaceae	Desmodium intortum (greenleaf desmodium)	4	11	3	H/A	Hand pull or crown and dispose	
184	Poaceae	Pennisetum setaceum (fountain grass)	3	11	3	H/O	Hand Pull	
185	Asteraceae	Conyza bonariensis (flax-leaf fleabane)	7	38	3	H/U	Hand or mechanical removal of small infestations	
186	Solanaceae	Solanum erianthum (a tobacco bush)	7	19	3	S/O	Hand pull	
187	Poaceae	Stenotaphrum secundatum (buffalo grass)	3	23	3	H/AO	Hand or mechanical removal of small infestations	
188	Apocynaceae	Cascabela thevetia (syn. Thevetia peruviana) (yellow oleander)	5	9	3	ST/O	Hand pull small infesttions. Slashing can be used but should be followed up by herbicide application.	
189	Rubiaceae	Coffea arabica (coffee)	3	7	3	ST/A	Saplings: Hand pull	
190	Bignoniaceae	Spathodea campanulata (African tulip tree)	1?	1	3	T/O	N/A	
191	Fabaceae	Macrotyloma axillare (perennial horse gram)	4	12	3	V,H/A	N/A	
192	Iridaceae	Watsonia meriana var. bulbillifera (bulbil watsonia)	2	3	3	H/O	Dig up, bag and remove	
193	Passifloraceae	Passiflora edulis (passion fruit)	6	12	3	V/AO	Hand Pull	
194	Asteraceae	Zinnia peruviana (wild zinnia)	6	33	3	H/O	Seedlings: Hand pull	
195	Dracaenaceae	Sansevieria trifasciata (sansevieria)	2?	7	3	H/O	Hand pull or dig up	
196	Poaceae	Digitaria eriantha (pangola grass)	5	20	3	H/A	Hand pull or cultivation	
197	Rosaceae	Eriobotrya japonica (loquat)	3	5	3	T/O	Seedlings: Hand pull	
198	Cactaceae	Acanthocereus tetragonus (sword pear)	1	1	3	S/O	Biological controls available: cactoblastis cactorum successful. Mechanical control difficult. Fire can be used.	
199	Mimosaceae	Acacia nilotica subsp. indica (prickly acacia)	3	3	4.4?	T/A	Mechanical or chain removal.	
200	Mimosaceae	Acacia farnesiana (mimosa bush)	6	15	3	T/A	Mechanical removal of small plants.	

Explanatory notes.

Sub-region (Sr): Number of the ten sub-regions of the Southeast Queensland bioregion (Young and Dillewaard 1999) within which species recorded (Queensland Herbarium data).
Rec no. (R): Total number of records for species within study area, Queensland Herbarium CORVEG and HERBRECS data.
Scores (S): Based on panel data of invasiveness, 5 (highest) to 3 (moderate). ? indicate doubtful scores.

Life forms (LFS): T-tree (woody plant >5m), ST-small tree (2-5m), S-shrub (woody <2m), H-herb (grasses & forbes), Ha-aquatic herbs.
Source: A-agriculture, O-ornamental and landscaping, F-fish aquarium, U-unintentional introduction and/or contaminant.

Abbreviations: Control Methods

CS&P = cut scrape and paint

S&P = scrape and paint

C&P = cut and paint

F/I = frill or inject stem

Abbreviations: Herbicides

G = Glyphosate, eg. Roundup Biactive, Weedmaster Duo

MM = Metsulfuron methyl, eg, Brushoff

F = Fluroxypyr, eg. Starane

Abbreviations: Herbicide Dilution Rates for High Concentration Applications

GU = Glyphosate undiluted

G1 = 1 part water to 1 part glyhphosate

G1.5 = 1.5 parts water to 1 part glyphosate

G4 = 4 parts water to 1 part glyphosate

Abbreviations: Herbicide Spray Concentrations

G100 = 100mL glyphosate per 10L of water + surfuctant, eg 20mL LI 700 per 10L
G200 = 200mL glyphosate per 10L of water + surfuctant, eg 50mL LI 700 per 10L

G100 + MM = 100mL glyphosate + 1.5g metsulfuron methyl per 10L of water + wetting agent, eg. 2mL Agral per 10L water
G200 + MM = 200mL glyphosate + 1.5g metsulfuron methyl per 10L of water + wetting agent, eg. 2mL Agral per 10L water

MM = 1.5g metsulfuron methyl per 10L water + wetting agent, eg. 2mL Agral per 10L water

F100 = 100mL fluroxypyr per 10L water

F150 = 150mL fluroxypyr per 10L water

Other Abbreviations

= Locally non-indigenous native species

Ref. 1. Big Scrub Rainforest Landcare Group (2008), 'Common Weeds of Subtropical Rainforests of Eastern Australia: A practical manual on their identification and control'

Ref. 2. Department of Primary Industries and Fisheries (QLD), 'Weeds and pest animals and ants'.

Ref. 3. Holland et al. (1996), 'Suburban Weeds', DPI QLD.

Ref 4. Port Stephens Council (NSW), 'Weed Busters'.
Ref 5. Depertment of Primary Industries (NSW), 'Noxious and Environmental Weed Handbook, 3rd Edition'.

Ref 6. Department of Environment and Conservation, 'Florabase', (DEC- WA)

Ref 7. Vitelli, J.S. and Madigan, B.A. and Van Haaren, P.E. and Setter, S. and Logan, P. (2009) Control of the invasive liana, Hiptage benghalensis. Weed Biology and Management, 9 (1). pp. 54-62.

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AMENDMENTS:

Issue	Date	Description	Checked
A	3/07/2019	Client Draft	TL

PROJECT: BAILEYS MOUNTAIN ROAD, UPPER COOMERA LOT 58 ON SP191940

environmental management

PLAN OF: Weed Treatment & Removal

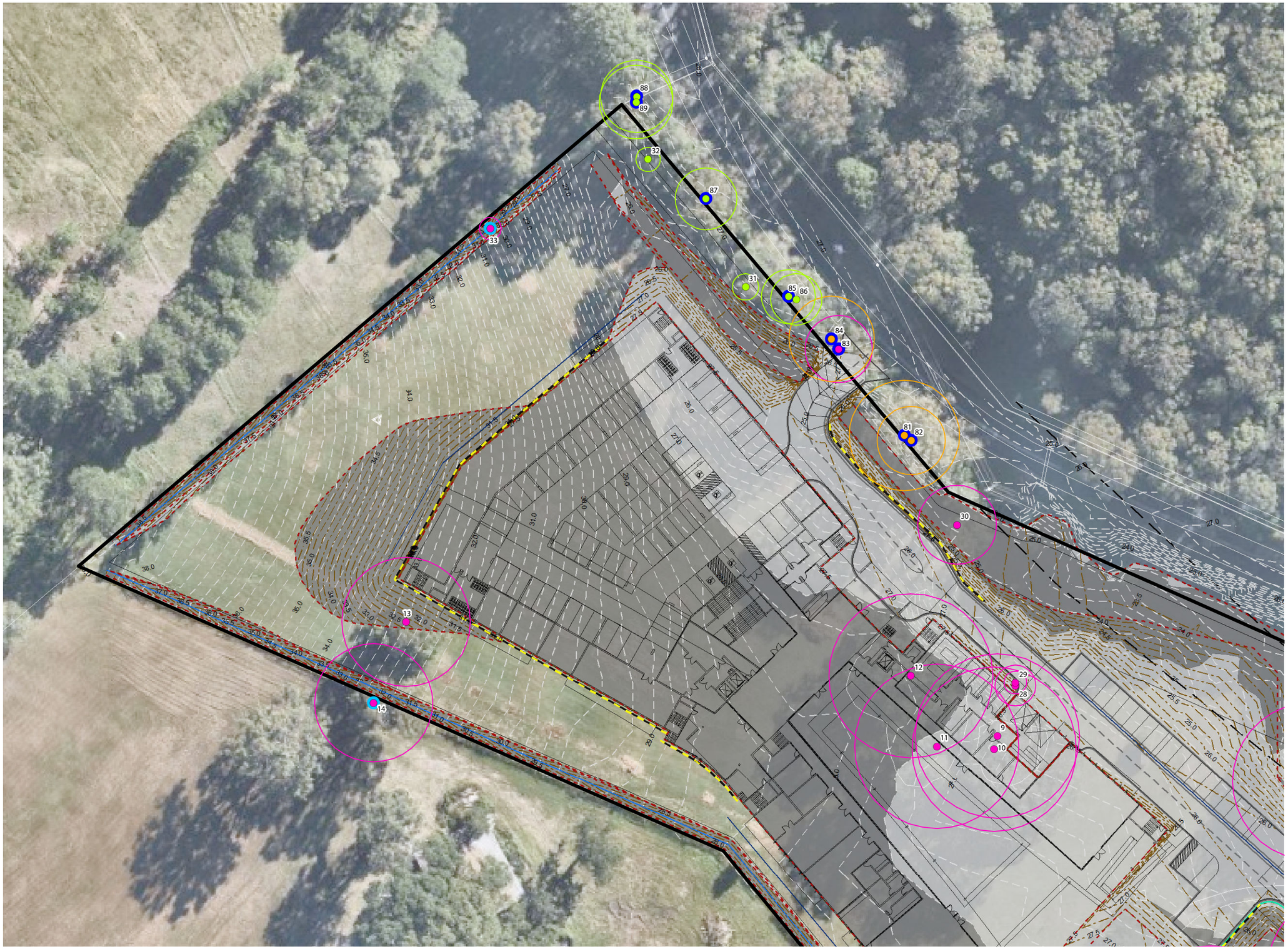
DATE:	3/07/2019	CHECKED:	TL
CLIENT REF:	8781	DRAWN:	MC

DRAWING No.: 8781 E A03 CRMP A

Attachment 2

Revised Tree Retention/Removal Plan

1.1 TREE RETENTION REMOVAL PLAN



NOTES
This plan was prepared as a desktop assessment tool.
The information on this plan is not suitable for any other purpose.
Property dimensions, areas, numbers of lots and contours and other physical features shown have been compiled from existing information and may not have been verified by field survey. These may need verification if the development application is approved and development proceeds, and may change when a full survey is undertaken or in order to comply with development approval conditions. No reliance should be placed on the information on this plan for detailed design or for any financial dealings involving the land. Saunders Havill Group therefore disclaims any liability for any loss or damage whatsoever or howsoever incurred, arising from any party using or relying upon this plan for any purpose other than as a document prepared for the sole purpose of accompanying a development application and which may be subject to alteration beyond the control of the Saunders Havill Group. Unless a development approval states otherwise, this is not an approved plan.

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Aerial Imagery © Nearmap, 2018

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- Site boundary
- Extent of cut
- Extent of fill
- Design layout
- Environmental buffer
- Stormwater swale invert
- Basin
- Erosion sediment control catch drain
- Driveway / road / pathway / carpark
- Potential GCCC road alignment
- Retaining wall
- Earthworks interface / pad
- Design contour
- Existing contour
- Survey

Tree plot (survey accurate)

- Tree to be retained (w/TPZ)
- Tree retention status subject to Arborist report / final civil works design (w/TPZ)
- Tree to be removed (w/TPZ)
- Planted native tree species / non-native tree species

Tree location

- Neighbouring lot
- On boundary

Issue	Date	Description	Drawn	Checked
A	31/07/2018	Preliminary	MC	AH
B	3/07/2019	Preliminary	MC	AH

0 5 10 20 30 m

Transverse Mercator | GDA 1994 | Zone 56 | 1:700 @ A3

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BAILEYS MOUNTAIN ROAD, UPPER COOMERA

ADDRESS/RPD: LOT 58 ON SP191940 *3/07/2019* *8781 E 01 TRRP B*

1.2 TREE RETENTION REMOVAL PLAN



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Tree plot (survey accurate)

- Tree to be retained (w/TPZ)
- Tree retention status subject to Arborist report / final civil works design (w/TPZ)
- Tree to be removed (w/TPZ)
- Planted native tree species / non-native tree species

Tree location

- Neighbouring lot
- On boundary

Issue	Date	Description	Drawn	Checked
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B	3/07/2019	Preliminary	MC	AH

0 5 10 20 30 m

Transverse Mercator | GDA 1994 | Zone 56 | 1:700 @ A3

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BAILEYS MOUNTAIN ROAD, UPPER COOMERA

ADDRESS/RPD: LOT 58 ON SP191940 *3/07/2019* *8781 E 01 TRRP B*

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Tree Schedule - 8781
202 Bailey Mountain Road, Upper Coomera (Sandson Pty Ltd)
03/07/2019

Specimen Details										Canopy Condition Details							Trunk Condition Details					Fauna Details and Habitat Value								
Tree ID	Botanical Name	Common Name	Trunk DBH (mm)	Additional Trunks DBH (mm)	Total DBH (mm) [AS 4970-2009]	Height (m)	Spread (m)	Tree Protection Zone (m)	Structural Root Zone (m)	Canopy Form	Spreading	Thinning	Die-Back	Epicormic Growth	Lopped	Canopy Health	Leaning	Vines	Trunk Damage	Fire Damage	Trunk Health	Scats	Scratches	Hollows	Nest	Termite Nest	Habitat Value	Retention	Additional Notes
1	*Ficus benjamina*	Weeping Fig	1600		1600	20.0	24.0	15.0	4.0	Regular	-	-	-	-	-	Typical	-	Introduced	-	-	Typical	-	-	-	-	-	-	Remove	
2	*Eucalyptus siderophloia*	Grey Ironbark	540		540	22.0	9.0	6.5	2.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
3	*Eucalyptus propinqua*	Small-fruited Grey Gum	650		650	22.0	12.0	7.8	2.8	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	New	-	-	-	-	Retain	
4	*Eucalyptus tereticornis*	Forest Red Gum	580		580	24.0	13.0	7.0	2.6	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	Old	-	-	-	-	Retain	
5	*Eucalyptus siderophloia*	Grey Ironbark	1070		1070	21.0	14.0	12.8	3.4	Regular	-	-	-	-	Lopped	Typical	-	-	Trunk Dmg.	-	Typical	-	-	-	-	-	-	Retain	
6	*Eucalyptus tereticornis*	Forest Red Gum	885		885	24.0	14.0	10.6	3.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	Old	-	-	-	-	Retain	
7	*Mangifera indica*	Mango	1260		1260	18.0	17.0	15.0	3.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
8	*Ficus macrophylla*	Moreton Bay Fig	1200		1200	21.0	18.0	14.4	3.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Remove	
9	*Ficus macrophylla*	Moreton Bay Fig	1580		1580	24.0	25.0	15.0	4.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Remove	
10	*Ficus macrophylla*	Moreton Bay Fig	1610		1610	24.0	30.0	15.0	4.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Remove	
11	*Ficus macrophylla*	Moreton Bay Fig	1350		1350	18.0	16.0	15.0	3.8	One-sided	-	Thinning	Die-back	-	Lopped	Poor	-	Introduced	-	-	Poor	-	-	-	-	-	-	Remove	
12	*Ficus macrophylla*	Moreton Bay Fig	1500		1500	22.0	30.0	15.0	3.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Remove	
13	*Lophostemon suaveolens*	Swamp Box	980		980	19.0	14.0	11.8	3.3	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Remove	fig growing up trunk
14	*Eucalyptus tereticornis*	Forest Red Gum	900		900	16.0	14.0	10.8	3.2	Regular	-	Thinning	Die-back	Epicormic	Lopped	Poor	-	-	-	-	Typical	-	-	-	-	Termites	-	Remove	
15	*Eucalyptus microcorys*	Tallowood	760		760	26.0	14.0	9.1	2.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
16	*Mangifera indica*	Mango	1200		1200	10.0	10.0	14.4	3.6	Regular	-	Thinning	Die-back	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-	Remove	
17	*Mangifera indica*	Mango	255	185	315	10.0	5.0	3.8	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
18	*Podocarpus elatus*	Brown Pink	460		460	12.0	8.0	5.5	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
19	*Corymbia intermedia*	Pink Bloodwood	850		850	17.0	9.0	10.2	3.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
20	*Livistona australis*	Cabbage-tree Palm	225		225	11.0	5.0	2.7	1.8	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
21	*Grevillea robusta*	Silky Oak	380		380	16.0	6.0	4.6	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
22	*Castanospermum australe*	Black Bean	680		680	17.0	9.0	8.2	2.8	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
23	*Brachychiton acerifolius*	Illawara Flame Tree	460		460	19.0	7.0	5.5	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
24	*Grevillea robusta*	Silky Oak	265		265	17.0	5.0	3.2	1.9	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
25	*Ficus rubiginosa*	Rock Fig	310	180, 230, 250, 290, 180	600	14.0	8.0	7.2	2.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
26	*Melicope elleryana*	Pink Doughwood	140	120	184	10.0	5.0	2.2	1.6	Regular	-	-	-	-	-	Typical	Minor	-	-	-	Typical	-	-	-	-	-	-	Retain	
27	*Acacia melanoxylon*	Blackwood	125		125	5.0	3.0	2.0	1.4	Regular	-	-	-	-	-	Typical	Minor	-	-	-	Typical	-	-	-	-	-	-	Remove	
28	*Acacia disparrima*	Hickory Wattle	310		310	15.0	6.0	3.7	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Remove	
29	*Cupaniopsis anacardioides*	Tuckeroo	150	85	172	8.0	5.0	2.1	1.6	Regular	-	-	-	-	-	Typical	Minor	-	-	-	Typical	-	-	-	-	-	-	Remove	
30	*Corymbia intermedia*	Pink Bloodwood	600		600	18.0	8.0	7.2	2.7	Regular	-	-	Die-back	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Remove	
31	*Eucalyptus tereticornis*	Forest Red Gum	200		200	16.0	4.0	2.4	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
32	*Acacia disparrima*	Hickory Wattle	185		185	9.0	4.0	2.2	1.6	One-sided	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
33	*Acacia melanoxylon*	Blackwood	140		140	7.0	3.0	2.0	1.4	Regular	-	-	-	-	-	Typical	Minor	-	-	-	Typical	-	-	-	-	-	-	Remove	
34	*Grevillea robusta*	Silky Oak	430		430	18.0	7.0	5.2	2.3	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Remove	
35	*Ficus obliqua*	Small-leaved Fig	220	185	287	14.0	6.0	3.4	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
36	*Pandanus tectorius*	Pandanas	200	190, 190, 200	390	6.0	6.0	4.7	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
37	*Eucalyptus tereticornis*	Forest Red Gum	480		480	23.0	5.0	5.8	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	

Specimen Details										Canopy Condition Details							Trunk Condition Details					Fauna Details and Habitat Value								
Tree ID	Botanical Name	Common Name	Trunk DBH (mm)	Additional Trunks DBH (mm)	Total DBH (mm) [AS 4970-2009]	Height (m)	Spread (m)	Tree Protection Zone (m)	Structural Root Zone (m)	Canopy Form	Spreading	Thinning	Die-Back	Epicormic Growth	Lopped	Canopy Health	Leaning	Vines	Trunk Damage	Fire Damage	Trunk Health	Scats	Scratches	Hollows	Nest	Termite Nest	Habitat Value	Retention	Additional Notes
38	*Eucalyptus microcorys*	Tallowood	600		600	22.0	8.0	7.2	2.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
39	*Glochidion ferdinandi*	Cheese Tree	280	180	333	14.0	6.0	4.0	2.1	Regular	-	Thinning	Die-back	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
40	*Eucalyptus siderophloia*	Grey Ironbark	365		365	22.0	7.0	4.4	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
41	*Eucalyptus tereticornis*	Forest Red Gum	400		400	21.0	7.0	4.8	2.3	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
42	*Eucalyptus tereticornis*	Forest Red Gum	590		590	23.0	9.0	7.1	2.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
43	*Lophostemon confertus*	Brush Box	300	180	350	17.0	9.0	4.2	2.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
44	*Acacia disparrima*	Hickory Wattle	265		265	14.0	6.0	3.2	1.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
45	*Eucalyptus tereticornis*	Forest Red Gum	175		175	18.0	4.0	2.1	1.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
46	*Waterhousia floribunda*	Weeping Lillipilli	280	120	305	14.0	7.0	3.7	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
47	*Eucalyptus siderophloia*	Grey Ironbark	440		440	24.0	8.0	5.3	2.3	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
48	*Eucalyptus siderophloia*	Grey Ironbark	360		360	19.0	6.0	4.3	2.2	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
49	*Eucalyptus microcorys*	Tallowood	380		380	22.0	7.0	4.6	2.2	Regular	-	-	-	-	-	Typical	Minor	Native	-	-	Typical	-	-	-	-	-	-	Retain	
50	*Eucalyptus microcorys*	Tallowood	460		460	22.0	9.0	5.5	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
51	*Macadamia integrifolia*	Macadamia	160	130	206	7.0	3.0	2.5	1.7	Regular	-	Thinning	Die-back	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
52	*Eucalyptus siderophloia*	Grey Ironbark	205		205	17.0	7.0	2.5	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
53	*Lophostemon confertus*	Brush Box	190	70	202	13.0	6.0	2.4	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
54	*Corymbia intermedia*	Pink Bloodwood	130		130	12.0	2.0	2.0	1.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
55	*Eucalyptus siderophloia*	Grey Ironbark	280		280	19.0	6.0	3.4	1.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
56	*Corymbia intermedia*	Pink Bloodwood	195		195	16.0	5.0	2.3	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
57	*Corymbia intermedia*	Pink Bloodwood	385		385	22.0	7.0	4.6	2.2	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
58	*Corymbia intermedia*	Pink Bloodwood	240		240	15.0	6.0	2.9	1.8	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
59	*Eucalyptus siderophloia*	Grey Ironbark	520		520	22.0	9.0	6.2	2.5	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
60	*Lophostemon confertus*	Brush Box	180		180	13.0	6.0	2.2	1.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
61	*Lophostemon confertus*	Brush Box	275		275	15.0	7.0	3.3	1.9	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
62	*Eucalyptus siderophloia*	Grey Ironbark	380		380	21.0	7.0	4.6	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
63	*Acacia disparrima*	Hickory Wattle	260		260	15.0	3.0	3.1	1.9	Regular	-	Thinning	Die-back	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
64	*Acacia disparrima*	Hickory Wattle	260		260	12.0	4.0	3.1	1.9	Regular	-	Thinning	-	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
65	*Acacia disparrima*	Hickory Wattle	130		130	13.0	2.0	2.0	1.4	Regular	-	-	Die-back	-	-	Poor	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
66	*Eucalyptus microcorys*	Tallowood	330		330	19.0	5.0	4.0	2.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
67	*Grevillea robusta*	Silky Oak	140		140	12.0	2.0	2.0	1.4	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
68	*Jagera pseudorhus*	Foambark	300		300	14.0	7.0	3.6	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
69	*Jagera pseudorhus*	Foambark	270	130	300	13.0	7.0	3.6	2.0	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
70	*Grevillea robusta*	Silky Oak	410		410	22.0	8.0	4.9	2.3	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
71	*Grevillea robusta*	Silky Oak	440		440	22.0	8.0	5.3	2.3	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
72	*Grevillea robusta*	Silky Oak	460		460	22.0	7.0	5.5	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
73	*Macadamia integrifolia*	Macadamia	260	200, 140, 280, 230, 240	562	13.0	7.0	6.7	2.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
74	*Lophostemon confertus*	Brush Box	190		190	16.0	5.0	2.3	1.6	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
75	*Eucalyptus siderophloia*	Grey Ironbark	120		120	11.0	3.0	2.0	1.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
76	*Ficus sp.*	Fig (round leaf)	200		200	16.0	6.0	2.4	1.7	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
77	*Lophostemon confertus*	Brush Box	385		385	16.0	7.0	4.6	2.2	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
78	*Lophostemon confertus*	Brush Box	260		260	16.0	6.0	3.1	1.9	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	

Specimen Details										Canopy Condition Details							Trunk Condition Details					Fauna Details and Habitat Value								
Tree ID	Botanical Name	Common Name	Trunk DBH (mm)	Additional Trunks DBH (mm)	Total DBH (mm) [AS 4970-2009]	Height (m)	Spread (m)	Tree Protection Zone (m)	Structural Root Zone (m)	Canopy Form	Spreading	Thinning	Die-Back	Epicormic Growth	Lopped	Canopy Health	Leaning	Vines	Trunk Damage	Fire Damage	Trunk Health	Scats	Scratches	Hollows	Nest	Termite Nest	Habitat Value	Retention	Additional Notes
79	*Eucalyptus siderophloia*	Grey Ironbark	220	170	278	12.0	5.0	3.3	1.9	Regular	-	-	Die-back	-	-	Poor	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
80	*Eucalyptus siderophloia*	Grey Ironbark	185		185	12.0	4.0	2.2	1.6	Regular	-	-	Die-back	-	Lopped	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
81	*Eucalyptus tereticornis*	Forest Red Gum	840		840	25.0	11.0	10.1	3.1	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Arborist	
82	*Eucalyptus siderophloia*	Grey Ironbark	520		520	19.0	10.0	6.2	2.5	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Arborist	
83	*Eucalyptus tereticornis*	Forest Red Gum	510		510	22.0	9.0	6.1	2.5	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Remove	
84	*Corymbia intermedia*	Pink Bloodwood	650		650	23.0	14.0	7.8	2.8	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Arborist	
85	*Corymbia intermedia*	Pink Bloodwood	300	280	410	17.0	9.0	4.9	2.3	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
86	*Eucalyptus siderophloia*	Grey Ironbark	390		390	22.0	7.0	4.7	2.2	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
87	*Eucalyptus tereticornis*	Forest Red Gum	470		470	23.0	9.0	5.6	2.4	Regular	-	-	-	-	-	Typical	-	-	-	-	Typical	-	-	-	-	-	-	Retain	
88	*Eucalyptus tereticornis*	Forest Red Gum	550		550	23.0	10.0	6.6	2.6	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
89	*Eucalyptus siderophloia*	Grey Ironbark	560		560	23.0	11.0	6.7	2.6	Regular	-	-	-	-	-	Typical	-	Native	-	-	Typical	-	-	-	-	-	-	Retain	
90	*Ficus elastica*	Rubber Fig	1500		1500	22.0	18.0	15.0	3.9	Regular	-	-	-	-	-	Typical	-		-	-	Typical	-	-	-	-	-	-	Retain	

ATTACHMENT 3

Update to Bushfire Management Report prepared by Eldon Bottcher Architect



URBAN PLANNING SERVICES



BUSHFIRE MANAGEMENT REPORT
FM 3812-1
for
SANDSON PTY LTD
at
202 BAILEYS MOUNTAIN ROAD
UPPER COOMERA

PREPARED BY
ELDON BOTTCHER ARCHITECT PTY LTD
145 VARSITY PARADE
VARSITY LAKES
PH 07 55920082
EMAIL bushfires@eb-a.com.au

9/07/2019





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1.13. Slope
1.14. Aspect
1.15. Fuel Type
1.16. Fire History
1.17. Location of Access Tracks
1.18. Location of Fire Breaks
1.19. Location of Existing Fire Fighting Infrastructure
1.20. Historical and Cultural Sites

2. SITE AND HAZARD ASSESSMENT

2.1. Discussion with Responsible Fire Authority
2.2. Vegetation Types
2.3. Potential Bushfire Hazard Rating.
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3.1. Agencies / Persons Responsible
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3.13. Administering Staff

4. FIRE MANAGEMENT ACTION SUMMARY AND SCHEDULE

5. APPENDICES

5.1. Form 15
5.2. Site Plans
5.3. Concept Rehabilitation Notes-Planting Species Schedule Saunders Havill Group
5.4. Supporting Information

6. PROFILES

DISCLAIMER

Experienced fire fighters with extensive knowledge of building have prepared this Report. Their practical knowledge of fire fighting has been backed up by academic study.

However, fire is an element of nature. Small natural occurrences can disastrously affect the outcome of the best planning. Human actions similarly can have disastrous results.

Whilst every care has been taken in the formulation of this management report, there can be no guarantee that even the strictest adherence to its recommendations can guarantee safety of life and property.

The authors of this report accept no responsibility for any damage to life or property caused by fire or any other cause to persons using land or structures, which could in any way be construed to be the subject of this report.

The report has been commissioned as the land falls within an area deemed a fire risk by the local authority.

As such, it must be recognized that structures upon this land and those using the structures could be deemed at risk.

Very Important Note;

This report is valid for the following periods;

a) A time of 5 years from date of preparation.
b) The currency of the legislation referred to in Section 1 Report Brief
c) Changes to any legislation generally that may impact on the report outcomes.
d) Changes to vegetation which may impact on the results of this report
e) Any other changes that may impact on the report in any manner.

THE COPYRIGHT ACT AND MORAL RIGHTS ACT PROTECT THIS REPORT.

IRRESPECTIVE OF THIS REPORT APPEARING ON A COUNCIL PD OR OTHER ONLINE SITE, THERE IS NO PERMISSION IMPLIED OR GIVEN TO ANY PARTY TO DOWN LOAD OR TO USE THIS REPORT IN WHOLE OR IN PART IN ANY MANNER OTHER THAN THAT FOR WHICH IT WAS ORIGINALLY PREPARED.
ANY SUCH USE WILL BE PROSECUTED TO THE FULL EXTENT OF THE LAW.

THIS REPORT RELIES ON THE AS 3959-2009 FOR THE CALCULATION OF CONSTRUCTION LEVELS.
ANY POSSIBLE ERRORS IN THE STANDARD ARE NOT THE RESPONSIBILITY OF THE AUTHOR.

THIS REPORT IS ONLY TO BE USED AND DISTRIBUTED AS A COMPLETE REPORT CONTAINING AS A MINIMUM SECTIONS 1,2,3,4 AND 5 (SECTIONS 5.1 & 5.2)

THIS REPORT IS NOT TO BE AMENDED IN ANY WAY BY ANY PERSONS OTHER THAN THE ORIGINAL AUTHOR.

1 REPORT BRIEF

This Fire Management Report has been written for the benefit of future occupants of this proposed site and developed in accordance with the requirements of;

- The Gold Coast City Council Town Plan,
- SPP 2016.
- Queensland Planning Act 2016
- The National Construction Code and
- Australian Standard AS3959,
- International Fire Safety Engineering Guidelines

The report has been prepared as supporting documentation for a Material Change of Use (Building) Application. The report has been modified from the original to accord with requirements from Gold Coast City Council

1.1. **Address:**
202 Baileys Mountain Road
Upper Coomera

1.2. **Local Authority**
Gold Coast City Council

1.3. **R.P.D.**
Lot 58 on SP191940

1.4. **Site area**
3.087ha

1.5. **Responsible Fire Authority**
Rural Fire Service Queensland via the rural fire brigade for rural fires and QFES for Structural fires.

1.6. **Potential Bushfire Hazard Rating.**
The hazard rating maps prepared for the Council show the ratings on this property ranging from Medium to being in a Bushfire Hazard Buffer Area
The draft risk rating maps prepared for the State Government show the ratings on this property ranging from Medium to being in a Bushfire Hazard Buffer Area

1.7. **Land tenure**
Freehold

1.8. **Adjoining owners are:**
Freehold

1.9. **Current Land Use:**
Rural Residential

1.10. **Fire danger Index**
FDI 40 (nominated by AS 3959-2009)

1.11. **Topography**
Plain on subject site
Undulating under predominate threat vegetation

1.12. **Predominant Wind Direction**
The predominate wind direction is from the South East. In times of severe fire weather, the wind direction will be from the North West. The Topography will create microclimates, which will cause swirling, which will modify the apparent wind direction according to primary direction and velocity

1.13. **Slope**
-4.5degrees under threat vegetation

1.14. **Aspect**
West to South under threat vegetation

1.15. Fuel Type

REGIONAL ECOSYSTEM	VHC	VHC DESCRIPTION	POTENTIAL FUEL LOAD STATE-WIDE BUSHFIRE PRONE AREA MAPPING	PERCENTAGE COVER	EFFECTIVE FUEL LOAD
12.11.24 (12.11.5a)	9.2	Moist to dry eucalypt woodland on Coastal lowlands and ranges.	17.2	100	17.2

1.16. Fire History
There is no evidence of a recent fire event

1.17. Location of Access Tracks
The site is served by a sealed road system

1.18. Location of Fire Breaks
There are no formal firebreaks, Managed vegetation and road systems form effective fire breaks a minimum of 25m wide.

1.19. Location of existing firefighting Infrastructure
The site is served by reticulated water

1.20. Historical and Cultural Sites
There is no evidence of Historical and Cultural sites on the property.

2. SITE AND HAZARD ASSESSMENT

2.1. Discussion with Responsible Fire Authority

The fire management report has not been discussed with the First Officer of the Rural Fire Brigade.

2.2. Vegetation Types

The vegetation type predominate to this site is as scheduled below. Note that under SPP 2016, differing vegetation types are used. This report does not refer to these but does consider draft mapping prepared under different methodology and published by the State Government.

VEGETATION TYPE	STATE PLANNING POLICY 01/03 INDICE	AS 3959 CATEGORY	COMMENTS
Grassy Eucalypt and acacia forest, exotic pine plantations, Cyprus pine forests, wallum heath	6	B	For the purposes of construction level assessment under AS 3959-2009, woodland is the appropriate vegetation type to use due to fuel load.
Orchards, farmlands, kikuyu pastures	2	Low Threat Or G	Note that where grassland is maintained below 100m it is regarded as Low Threat by AS 3959.
Grazed grasslands, slashed grass	2	Low Threat Or G	Note that where grassland is maintained below 100mm it is regarded as Low Threat by AS 3959. State variation (Qld) to Section 3.7.4.0 of Volume 2 Building Code of Australia states that *"The requirements of (a) do not apply when the classified vegetation is Group F rainforest (excluding wet sclerophyll forest types), mangrove communities and grasslands under 300mm high."* This is interpreted as stating that where these communities exist within a Designated Bushfire Prone Area construction in accordance with AS 3959 is not required in relation to this vegetation.

VEGETATION TYPE	STATE PLANNING POLICY 01/03 INDICE	AS 3959 CATEGORY	COMMENTS
Desert lands (sparse fuels) Mowed grasslands	1	Low threat Or G	Note that where grassland is maintained below 100m it is regarded as Low Threat by AS 3959 State variation (Qld) to Section 3.7.4.0 of Volume 2 Building Code of Australia states that *"The requirements of (a) do not apply when the classified vegetation is Group F rainforest (excluding wet sclerophyll forest types), mangrove communities and grasslands under 300mm high."* This is interpreted as stating that where these communities exist within a Designated Bushfire Prone Area construction in accordance with AS 3959 is not required in relation to this vegetation.
Intact Rainforest, mangrove, intact riverine rainforest	0	F	State variation (Qld) to Section 3.7.4.0 of Volume 2 Building Code of Australia states that *"The requirements of (a) do not apply when the classified vegetation is Group F rainforest (excluding wet sclerophyll forest types), mangrove communities and grasslands under 300mm high."* This is interpreted as stating that where these communities exist within a Designated Bushfire Prone Area construction in accordance with AS 3959 is not required in relation to this vegetation.

2.3. Potential Bushfire Hazard Rating.

Site inspection confirms the mapping intent but not the detail.
Predominate vegetation is Medium Hazard and the site is in a Bushfire Hazard Buffer Area (See Appendix 5.3.1 for Fireline Intensity Calculations) .

2.4. Building Construction

All buildings situated within the site are in a Designated Risk Area. There is a requirement that certain Buildings within this area be constructed in accordance with the Building Code of Australia, which refers to either the Australian Standard for Construction in Bushfire Prone Areas or NASH Standard-Steel Framed Construction in Bushfire Areas.
The levels determined effect the types and usage of materials in relation to the type of Bushfire Attack, which may occur as assessed under the Standard. The Level of Bushfire Attack is assessed taking the vegetation types, slope, and distance from vegetation into

account. The most common elements affected are Windows and flyscreening, with some restrictions on cladding and timber types. A comprehensive breakdown is available in either the National Construction Code or the Australian Standard for Construction in Bushfire Prone Areas. Extracts of these documents are not provided due to copyright reasons. Full details can be obtained from your building designer or certifier.

Note that the Building Code of Australia only requires Classes 1,2 and 3 buildings and Class 10a building associated with those buildings to comply with the requirements of AS 3959-2009.

The proposed building does not include any of these classifications and is therefore not required to comply with AS 3959-2009.

2.5. **Ecological Requirements**

There are specific ecological requirements in relation to bushfire management. A proposed rehabilitation plan has been prepared by Saunders Havill Group, with the proposed planting schedule provided as Appendix 5.3 of this document.

3. RISK MANAGEMENT PLAN

3.1. Agencies / Persons Responsible

The responsible Fire Authority is the Rural Fire Service Queensland through the Rural Fire Brigade being responsible for Bush Fires and the Queensland Fire and Emergency Service being responsible for Structural Fires

It is the responsibility of the Owners of the properties to ensure that the relevant measures required by this Management Report are in place prior to inspection by the Council and the Building Certifier and to ensure that those measures are in place prior to the occupation of any buildings, which are the subject of this report. It is the responsibility of Council and Building Certifiers to ensure that relevant measures within their responsibility are in place prior to the issuance of any certification.

3.2. Bushfire Safety Objective

The objective of this report is to minimise potential risk to life and property by protecting the buildings from the effects of bushfire.

3.3. Aims

The aims to achieve this objective are to mitigate the effect of the bushfire attack mechanisms of: -

3.3.1. Radiant Heat
3.3.2. Direct Flame Contact
3.3.3. Wind
3.3.4. Ember Attack
3.3.5. Smoke

3.4. Functional Requirements

The functional requirements to achieve this objective are: -

3.4.1. The provision of safe conditions for fire fighters
3.4.2. The provision of safe conditions for residents
3.4.3. Ensure adequate and safe access to and from the property
3.4.4. Ensure adequate and safe water supply to the property and the establishment of firefighting water reserves
3.4.5. Provide a system of fire breaks and trails to protect the building component
3.4.6. Remove vegetation that is considered dangerous and a hazard in Fire Conditions
3.4.7. To ascertain the required standard of construction of the buildings in accordance with the requirements of the National Construction Code and the Australian Standard for Construction in Bushfire Prone Areas or the provision of a satisfactory alternative solution
3.4.8. Facilitate the return to "normalcy "

3.5. Proposed Fire Fighting Infrastructure

3.5.1. The proposed building will be served by a reliable reticulated water supply.

3.6. Building Construction

Construction is not required to be in accordance with Australian Standard AS 3959 2009 Construction of Buildings in Bush Fire-Prone Areas .

The proposed building does not include any of the required classifications and is therefore not required to comply with AS 3959-2009.

The plans lodged for Building Certification are to be assessed on this basis by the Building Certifier.

A final stage completion certificate (Form 21) issued by the Building Certifier is to be received prior to occupation of the building.

Buildings are not to be occupied until certification is received

Buildings are to be maintained in a manner that protects the integrity of the construction and building elements as outlined in this report

3.7. Street Numbering

Numbering is to be installed in accordance with the current Street Numbering System at time of completion of building.

3.8. Less Flammable Landscaping

Any landscaping within the site is to be Less Flammable, in accordance with the list enclosed as an Appendix at the rear of this Report, rainforest species, or cultivated gardens, and as the proposed rehabilitation planting schedule prepared by Saunders Havill Group and attached as Appendix 5.3 of this document. The proposed schedule is generally in accordance with the schedules noted in Appendices 5.4.9 and 5.4 10, which are provided for guidance only.

3.9. Insurance

Failure to comply with this management report may have a detrimental effect upon the Insurance of the subject Buildings.

3.10. Emergency Response Procedures

3.10.1. In the event of Fire Emergency, assistance is to be obtained by dialling 000

3.10.2. The owner should read thoroughly the brochures contained and those recommended at the rear of this report. They contain valuable information that could assist in the saving of lives and property in a fire event!

3.11. Community Awareness Strategies

3.11.1. Each subsequent owner is to be provided with a copy of this Fire Management report with an alert placed on either Title or Council Rate searches that the Report is in existence and is to be made available to ensuing owners.

3.11.2. The hazard ratings are to be placed on Council Plans and Rate notices.

3.12. Administering Staff

It is the responsibility of the developers and owners to ensure compliance with this Report and the Town Plan, and to ensure that each of the new owners is provided with a copy of this report.

It is the responsibility of the Council and the Building Certifier to ensure that the relevant measures required by this management report are in place prior to the final completion stage inspection of any buildings on any sites which are the subject of this report as noted in Clause 3.1 of this report.

It is the responsibility of the ensuing owners of the properties to maintain the properties in the conditions outlined in this report.

4. FIRE MANAGEMENT ACTION SUMMARY AND SCHEDULE

DEVELOPMENT REQUIREMENTS	BUILDING REQUIREMENTS	MAINTENANCE
	Buildings not required to comply with the Australian Standard for Construction with in Bush Fire Prone Areas due to Building Classification.	Regular mowing and maintenance of the landscaping as set out in this report. Building materials are to be maintained in "as new "condition to preserve the integrity of the relevant materials.

5. APPENDICES

5.1. Form 15
5.2. Site Plans
5.3. Concept Rehabilitation Notes-Planting Species Schedule Saunders Havill Group
5.4. Supporting Information:
5.4.1. Fire line Intensity Calculations
5.4.2. Fuel Load Calculation

Note. These items below are referenced for information purposes only and are not to be construed as being part of the management report
This information is generic and not provided or included within the documentation for approval purposes.
It is only provided for end user knowledge

5.4.3. Prepare. Act. Survive
5.4.4. Rural property Fire Management Guide 2010
5.4.5. Notes for Landholders
5.4.6. Bushfire Action Guide
5.4.7. Bushfire Safety in Urban Fringe Areas
5.4.8. Water + Power -Vital for Fire fighting
5.4.9. Less Flammable Vegetation
5.4.10. Tree selection for Fire-Prone Areas
5.4.11. First Draft (specifying timber in bush fire zones)
5.4.12. External water spray system
5.4.13. Fire Retardant Coating Solutions
5.4.14. Archicentre Bushfire Design Guide
5.4.15. Section 3.8 Sign Types - Fire Trail Signage of the GCCC Natural Areas Management Unit Guidelines (Page 16) Signage
5.4.16. Trail Number and Key Point signage
5.4.17. Bushfire Hydrant detail
5.4.18. Tank detail
5.4.19. Recycled Water for Firefighting
5.4.20. Sample Easement Document
5.4.21. Bushfire Windows and Shutters
5.4.22. A guide to retrofit your home for better protection from a bushfire.
5.4.23. FireFly BAL-FZ System
5.4.24. Extracts from Planning Act 2016 relating to clearing.
5.4.25. Bushfire Planning and Design Certification Scheme Update
5.4.26. SAC Notification Form

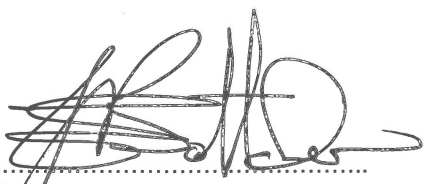
We also recommend that the landholder obtains and reads the following;

5.4.27. Bushfire Hazard Planning in Queensland
5.4.28. Protecting your home against Bushfire
Both available from the Dept. of Local Government and Planning, and

5.4.29. Building in Bushfire Prone Areas
Available from Standards Australia

5.4.30. Fire in Bushland Conservation
Available from the National Heritage Trust

Signed



.....

Eldon Bottcher
Grad. Dip. DBPA (UWS) Dip. Arch. (QIT), Cert. R.F.M. (USQ), F.R.A.I.A., M.A.I.E.S. AIFireE
Architect
BPAD-L3 Practitioner

BPAD
Bushfire
Planning & Design
Accredited Practitioner
Level 3

APPENDIX 5.1
FORM 15

Queensland Government

Department of Housing and Public Works

Form 15—Compliance certificate for building design or specification

Version 4 – July 2017

NOTE: This is to be used for the purposes of section 10 of the *Building Act 1975* and/or section 46 of the *Building Regulation 2006.*

RESTRICTION: A building certifier (class B) can only give a compliance certificate about whether building work complies with the BCA or a provision of the Queensland Development Code (QDC). A building certifier (Class B) can not give a certificate regarding QDC boundary clearance and site cover provisions.

1. Property description

This section need only be completed if details of street address and property description are applicable.

E.g. in the case of (standard/generic) pool design/shell manufacture and/or patio and carport systems this section may not be applicable.

The description must identify all land the subject of the application.

The lot and plan details (e.g. SP/RP) are shown on title documents or a rates notice.

If the plan is not registered by title, provide previous lot and plan details.

Street address (include no., street, suburb/locality and postcode)

202 Baileys Mountain Road Upper Coomera

Postcode

Lot and plan details (attach list if necessary)

Lot 58 on SP191940

In which local government area is the land situated?

Gold Coast City Council

2. Description of component/s certified

Clearly describe the extent of work covered by this certificate, e.g. all structural aspects of the steel roof beams.

Work as required for bushfire mitigation purposes as set out in the Bushfire Management Report prepared by Eldon Bottcher Architect Pty Ltd including assessment of Construction Levels assessed under AS 3959.

3. Basis of certification

Detail the basis for giving the certificate and the extent to which tests, specifications, rules, standards, codes of practice and other publications, were relied upon.

Compliance with the Bushfire Management Report prepared by Eldon Bottcher Architect Pty Ltd

No certification of components covered by The Building Act 1975, The building Code of Australia or AS 3959.

Gold Coast City Council Town Plan Bushfire Management Constraint code.

4. Reference documentation

Clearly identify any relevant documentation, e.g. numbered structural engineering plans.

Bushfire Management Report FM 3812-1

LOCAL GOVERNMENT USE ONLY

Date received		Reference Number/s	

5. Building certifier reference number	**Building certifier reference number**
6. Competent person details A competent person for building work, means a person who is assessed by the building certifier for the work as competent to practice in an aspect of the building and specification design, of the building work because of the individual's skill, experience and qualifications in the aspect. The competent person must also be registered or licensed under a law applying in the State to practice the aspect. If no relevant law requires the individual to be licensed or registered to be able to give the help, the certifier must assess the individual as having appropriate experience, qualifications or skills to be able to give the help. If the chief executive issues any guidelines for assessing a competent person, the building certifier must use the guidelines when assessing the person.	**Name** (in full) Eldon John Bottcher Company name **(if applicable)**: **Eldon Bottcher Architect Pty Ltd** Contact person: **Eldon Bottcher** **Phone no.** (business hours): 07 55920082 **Mobile no.**: 0412434134 **Fax no.**: **Email address** **bushfires@eb-a.com.au** **Postal address** P.O. Box 3606 Robina Town Centre **Postcode** 4230 **Licence or registration number** (if applicable) Reg Architect Qld 1325 FPA Australia BPAD Level 3 practitioner 16935
7. Signature of competent person This certificate must be signed by the individual assessed by the building certifier as competent.	**Signature** **Date**: 9 July 19

The *Building Act 1975* is administered by the Department of Housing and Public Works

APPENDIX 5.2
SITE PLANS

6.4 OVERALL SETBACK PLAN



NOTE: GRAPHICAL REPRESENTATION OF LANDSCAPING ONLY. REFER LANDSCAPE ARCHITECTS REPORT FOR DETAIL.

APPENDIX 5.3
CONCEPT REHABILITATION NOTES
PLANTING SPECIES SCHEDULE
SAUNDERS HAVILL GROUP

BAILEYS MOUNTAIN ROAD, UPPER COOMERA

CONCEPT REHABILITATION NOTES - PLANTING SPECIES SCHEDULE

MANAGEMENT ZONE 1 – EXISTING NATIVE VEGETATION ON BANKS AND FLOODPLAIN (ASSISTED NATURAL REGENERATION)

RECOMMENDED SPECIES LIST TOTAL APPROXIMATE AREA = 2,730 m² (Overall minimum density approximately 2 plants per 1 m²)

Notes:
2) Setback trees 3 metres minimum from all property boundaries, sewer and service alignments
3) Distribute plants in groups on site in random arrangement - to be confirmed with super intendant on site
4) Species selected from regional ecosystem 12.3.11/12.3.1a technical descriptions and cross-checked with site species list and Wildnet Online Search (4km radius). As a general rule, 12.3.1a species to be planted along waterway banks, with RE12.3.11 species to be planted on floodplains.
5) Infill planting in this zone only. Final planting quantities to be confirmed by super intendant on site

SCIENTIFIC NAME	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY	QUANTITY REQUIRED
As per Management Zone 2					
Goodenia rotundifolia @	Star Goodenia				-
Oplismenus aemulus @	Creeping Beard Grass				-
Ottochloa gracillima @	Graceful Grass				-

@ = To be planted in shaded locations

MANAGEMENT ZONE 2 – NO EXISTING NATIVE VEGETATION ON BANKS AND FLOODPLAIN (RECONSTRUCTION)

RECOMMENDED SPECIES LIST TOTAL APPROXIMATE AREA = 2,040 m² (Overall minimum density approximately 2 plants per 1 m²)

Notes:
1) Setback trees 3 metres minimum from all property boundaries, sewer and service alignments
2) Distribute plants in groups on site in random arrangement – to be confirmed with super intendant on site
3) Species selected from regional ecosystem 12.3.11/12.3.1a technical descriptions and cross-checked with site species list and Wildnet Online Search (4km radius). As a general rule, 12.3.1a species to be planted along waterway banks, with RE12.3.11 species to be planted on floodplains)

SCIENTIFIC NAME	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY	QUANTITY REQUIRED
TREES				1 PER 10 m²	
Eucalyptus tereticornis	Forest Red Gum	T1			35
*Lophostemon confertus**	Brush Box	T1/T2			13
*Waterhousia floribunda**	Weeping Lily Pily	T1			13
*Jagera pseudorhus**	Foam Bark	T2			13
*Acronychia spp. * / Cryptocarya spp. **		T2			13
*Elaeocarpus obovatus / Grandis**	Quandong	T1			13
*Mallotus philippensis**	Red Kamala	T2			13
*Aphananthe philippinensis**	Rough-leaved Elm	T2			13
Eucalyptus siderophloia	Northern Grey Ironbark	T1			13
Corymbia intermedia	Pink Bloodwood	T1			13
Lophostemon suaveolens &	Swamp Box	T2			13
Allocasuarina littoralis &	Black She-oak	T2			13
Melaleuca quinquenervia &	Broad-leaved Paperbark	T2			13
Macaranga tanarius / Commersonia bartramia	Macaranga / Brown Kurrajong	T2			13
				SUBTOTAL	204
SHRUBS				1 PER 5 m²	-
Glochidion ferdinandi	Cheese Tree	Sml tree / shrub			40
Cupaniopsis anacardioides	Tuckeroo	Sml tree / shrub			40
Alphitonia excelsa	Soap Tree	Sml tree / shrub			40
*Syzygium australe / Acmena smithi**	Lilly Pilly	Sml tree / shrub			40
*Backhousia myrtifolia**	Grey Myrtle	Sml tree / shrub			20
*Ficus coronata**	Sandpaper Fig	Sml tree / shrub			16
*Glochidion sumatranum**	Umbrella Cheese	Sml tree / shrub			16
*Pittosporum revolutum **	Forest Pittosporum	Shub			16
Leptospermum polygalifolium / Melaleuca linariifolia &		Shrub			20
Hibiscus heterophyllus / Trema tomentosa	Native Rosella / Poison Peach	Shrub			40
Dodonaea triquetra	Hop Bush	Shrub			40
Breynia oblongifolia	Coffee Bush	Shrub			40
Alpinia caerulea / Cordyline spp.	Native Ginger	Shrub			40
				SUBTOTAL	408
GROUND COVERS				2 PER 1 m²	-
Lomandra longifolia	Mat Rush	Sedge-like			500
Lomandra hystrix	Creek Mat Rush	Sedge-like			500
Carex appressa	Tall Sedge	Sedge			300
Dianella caerulea	Blue Flax Lily	Sedge-like			300
Themeda triandra	Kangaroo Grass	Grass			250
Cymbopogon refractus	Barbed Wire Grass	Grass			206
Gahnia aspera	Rough Sawsedge	Sedge			250
Juncus usitatus	Common Rush	Rush			150
Fimbristylis dichotoma	Common Fringerush	Sedge			150
Lepidosperma laterale	Variable Sword Sedge	Sedge			150
Geitonoplesium cymosum	Scrambling Lily	Vine			100
				SUBTOTAL	2,856
				TOTAL	4,760

*= To be planted along watercourse only

MANAGEMENT ZONE 3 – NO EXISTING VEGETATION ON OVERBANK (RECONSTRUCTION)

RECOMMENDED SPECIES LIST TOTAL APPROXIMATE AREA = 2,525 m² (Overall minimum density approximately 1 plants per 1 m²)

Notes:
1) Setback trees 3 metres minimum from all property boundaries, sewer and service alignments
2) Distribute plants in groups on site in random arrangement - to be confirmed with super intendant on site
3) Species selected from regional ecosystem 12.3.11/12.3.1a technical description and cross-checked with site species list and Wildnet Online Search (4km radius)

SCIENTIFIC NAME	COMMON NAME	PLANT FORM	POT SIZE	PLANTING DENSITY	QUANTITY REQUIRED
TREES				1 PER 10 m²	
Eucalyptus tereticornis	Forest Red Gum	T1			35
Lophostemon confertus	Brush Box	T1			31
Angophora leiocarpa	Smooth-barked Apple	T1			31
Melia azedarach	White Cedar	T1			31
Jagera pseudorhus	Foam Bark	T2			31
Acronychia spp. / Cryptocarya spp.		T2			31
Mallotus philippensis	Red Kamala	T2			31
Macaranga tanarius / Commersonia bartramia	Macaranga / Brown Kurrajong	T2			31
				SUBTOTAL	252
SHRUBS				1 PER 5 m²	
Glochidion ferdinandi	Cheese Tree	Sml shrub / Tree			73
Cupaniopsis anacardioides	Tuckeroo	Sml tree / shrub			73
Alphitonia excelsa	Soap Tree	Sml shrub / Tree			73
Hibiscus heterophyllus / Trema tomentosa	Native Rosella / Poison Peach	Shrub			73
Dodonaea triquetra	Hop Bush	Shrub			73
Breynia oblongifolia	Coffee Bush	Shrub			73
Alpinia caerulea / Cordyline spp.	Native Ginger	Shrub			73
				SUBTOTAL	511
GROUND COVERS				1 PER 1 m²	
Lomandra longifolia	Mat Rush	Sedge-like			400
Lomandra hystrix	Creek Mat Rush	Sedge-like			400
Dianella caerulea	Blue Flax Lily	Sedge-like			250
Themeda triandra	Kangaroo Grass	Grass			250
Gahnia aspera	Rough Sawsedge	Sedge			250
Fimbristylis dichotoma	Common Fringerush	Sedge			90
Lepidosperma laterale	Variable Sword Sedge	Sedge			90
Geitonoplesium cymosum	Scrambling Lily	Vine			32
				SUBTOTAL	1,762
				TOTAL	2,525

MANAGEMENT ZONE 4 – CONVEYANCE CHANNEL (RECONSTRUCTION / FABRICATION)

RECOMMENDED SPECIES LIST TOTAL APPROXIMATE AREA = TBA

Notes:
1) Final engineering and extent to be confirmed at operational works
2) Zone to be treated in accordance with the Landscape Masterplan. Species palette to be consistent with RE 12.3.11

saunders havill group
Saunders Havill Group Pty Ltd ABN 24 144 972 949
Brisbane • Emerald • Rockhampton
9 Thompson St Bowen Hills Q 4006
1300 123 SHG www.saundershavill.com
• surveying • town planning • urban design • environmental management • landscape architecture

CLIENT: SANDSON PTY LTD

DISCLAIMER

REFERENCES
Liaising with the Environmental at the Pine Rivers Shire (Brendan 9497)
Ryan, R.S. (ed.) (2013) Technical Descriptions of Regional Ecosystems of Southeast Queensland. (Queensland Herbarium, Department of Science, Information Technology, Innovation and the Arts: Brisbane)

AMENDMENTS

PROJECT: BAILEYS MOUNTAIN ROAD, UPPER COOMERA LOT 58 ON SP191940

environmental management

PLAN OF: Planting species schedule

DATE:	4/07/2019	CHECKED:	TI
CLIENT REF:	8781	DRAWN:	MC
DRAWING NO:	8781 E 08 CRMP A		

APPENDIX 5.4
SUPPORTING INFORMATION

(NOTE: SOME OF THIS INFORMATION IS GENERIC AND NOT INCLUDED FOR APPROVAL PURPOSES. IT IS ONLY PROVIDED FOR END USER KNOWLEDGE)

BUSHFIRE HAZARD ASSESSMENT

ELDON BOTTCHER ARCHITECT PTY LTD
145 VARSITY PARADE
VARSITY LAKES
QLD. 4327
PH 0755920082
E architects@eb-a.com.au

THIS ASSESSMENT IS BASED ON "A NEW METHODOLOGY FOR STATE WIDE MAPPINGOF BUSHFIRE PRONE AREAS IN QUEENSLAND"
CSIRO
JANUARY 2014

PROJECT	**PROPOSED DEVELOPMENT**
SITE ADDRESS	**202 BAILEYS MOUNTAIN ROAD** **UPPER COOMERA**

INPUTS

FFDI	40
TOTAL FUEL LOAD	17.2 tonnes/ha
SLOPE UNDER VEGETATION	4.5 degrees

RESULTS

POTENTIAL FIRE LINE INTENSITY	10008.22 kw/m
HAZARD	MEDIUM
APPROPRIATE MAPPING COLOUR	

RE8	RE8_Label	VHC	VHC_DESC
12.1.1	Casuarina glauca woodland on margins of marine clay plains	28.2	28.2 Woodlands in coastal locations with species such as she-oak or swamp box
12.1.2	Saltpan vegetation including grassland, herbland and sedgeland on marine clay plains	35.4	35.4 Tidal saltmarshes
12.1.3	Mangrove shrubland to low closed forest on marine clay plains and estuaries	35.3	35.3 Shrubland associated with mangroves and tidal saltmarshes
12.11.1	Simple notophyll vine forest often with abundant Archontophoenix cunninghamiana (gully vine forest) on metamorphics ± interbedded volcanics	4.1	4.1 Notophyll and notophyll palm or vine forest
12.11.10	Notophyll vine forest ± Araucaria cunninghamii on metamorphics ± interbedded volcanics	2.1	2.1 Complex to simple, semi-deciduous mesophyll to notophyll vine forest
12.11.11	Araucarian microphyll vine forest on metamorphics ± interbedded volcanics; usually southern half of bioregion	5.1	5.1 Notophyll to microphyll vine forests
12.11.12	Araucarian complex microphyll vine forest on metamorphics ± interbedded volcanics; usually northern half of bioregion	5.1	5.1 Notophyll to microphyll vine forests
12.11.13	Semi-evergreen vine thicket on metamorphics ± interbedded volcanics; usually northern half of bioregion	7.1	7.1 Semi-evergreen to deciduous microphyll vine forest
12.11.14	Eucalyptus crebra, E. tereticornis, Corymbia intermedia woodland on metamorphics ± interbedded volcanics	13.2	13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
12.11.15	Eucalyptus tereticornis, Corymbia intermedia open woodland with Xanthorrhoea johnsonii understorey on serpentinite	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.16	Eucalyptus cloeziana open forest on metamorphics ± interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.11.16x1	Eucalyptus cloeziana ± E. propinqua, E. acmenoides, E. microcorys and E. grandis tall open forest on sedimentary rocks	8.1	8.1 Wet eucalypt tall open forest
12.11.17	Eucalyptus acmenoides or E. portuensis open forest on metamorphics ± interbedded volcanics	9.1	9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges
12.11.18	Eucalyptus moluccana woodland on metamorphics ± interbedded volcanics	13.2	13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
12.11.18a	Eucalyptus moluccana, E. tereticornis and Lophostemon confertus open forest in gullies on metamorphics ± interbedded volcanics	13.1	13.1 Dry to moist eucalypt open forests on undulating metamorphics and granite
12.11.19	Eucalyptus fibrosa subsp. fibrosa woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.2	Eucalyptus saligna or E. grandis, E. microcorys, Lophostemon confertus tall open forest on metamorphics ± interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.11.20	Corymbia intermedia, Lophostemon suaveolens woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.21	Allocasuarina luehmannii, Melaleuca nervosa woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.22	Angophora leiocarpa, Eucalyptus crebra woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.23	Eucalyptus pilularis open forest on coastal metamorphics and interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.11.3	Eucalyptus siderophloia, E. propinqua ± E. microcorys, Lophostemon confertus, Corymbia intermedia, E. acmenoides open forest on metamorphics ± interbedded volcanics	9.1	9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges
12.11.3a	Lophostemon confertus ± Eucalyptus microcorys, E. carnea, E. propinqua, E. major, E. siderophloia woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.3b	Eucalyptus pilularis tall open forest on subcoastal hills and ranges of metamorphics ± interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.11.4	Semi-evergreen vine thicket on metamorphics ± interbedded volcanics	7.1	7.1 Semi-evergreen to deciduous microphyll vine forest
12.11.5	Corymbia citriodora subsp. variegata, Eucalyptus siderophloia, E. major open forest on metamorphics ± interbedded volcanics	10.1	10.1 Spotted gum dominated open forests
12.11.5a	Eucalyptus tindaliae, E. carnea, Corymbia intermedia ± E. siderophloia or E. crebra, Corymbia citriodora subsp. variegata woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.5e	Corymbia citriodora subsp. variegata woodland ± Eucalyptus siderophloia or crebra, E. carnea, E. acmenoides, E. propinqua on metamorphics ± interbedded volcanics	10.2	10.2 Spotted gum dominated woodlands
12.11.5h	Eucalyptus planchoniana woodland to open forest on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.5j	Eucalyptus racemosa subsp. racemosa and/or E. seeana and Corymbia intermedia woodland on metamorphics ± interbedded volcanics	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.11.5k	Corymbia henryi ± Eucalyptus crebra, E. carnea, E. tindaliae, E. fibrosa subsp. fibrosa woodland on metamorphics ± interbedded volcanics	10.2	10.2 Spotted gum dominated woodlands
12.11.6	Corymbia citriodora subsp. variegata, Eucalyptus crebra woodland on metamorphics ± interbedded volcanics	10.2	10.2 Spotted gum dominated woodlands
12.11.7	Eucalyptus crebra woodland on metamorphics ± interbedded volcanics	13.2	13.2 Dry to moist eucalypt woodlands on undulating metamorphics and granite
12.11.8	Eucalyptus melanophloia, E. crebra woodland on metamorphics ± interbedded volcanics	17.2	17.2 Dry woodlands dominated by poplar box, silver-leaved ironbark or White's ironbark on sand or depositional plains
12.11.9	Eucalyptus tereticornis open forest on metamorphics ± interbedded volcanics. Usually higher altitudes	9.1	9.1 Moist to dry eucalypt open forests on coastal lowlands and ranges
12.11.9x1	Eucalyptus montivaga open forest on metamorphics ± interbedded volcanics	8.1	8.1 Wet eucalypt tall open forest
12.12.1	Simple notophyll vine forest usually with abundant Archontophoenix cunninghamiana (gully vine forest) on Mesozoic to Proterozoic igneous rocks	4.1	4.1 Notophyll and notophyll palm or vine forest
12.12.10	Shrubland of rocky peaks on Mesozoic to Proterozoic igneous rocks	29.3	29.3 Heathlands and associated scrubs and shrublands
12.12.11	Eucalyptus portuensis or E. acmenoides, Corymbia trachyphloia subsp. trachyphloia woodland on Mesozoic to Proterozoic igneous rocks	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.12.12	Eucalyptus tereticornis, Corymbia intermedia, E. crebra ± Lophostemon suaveolens woodland on Mesozoic to Proterozoic igneous rocks	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges
12.12.13	Araucarian Complex microphyll to notophyll vine forest on Mesozoic to Proterozoic igneous rocks	2.1	2.1 Complex to simple, semi-deciduous mesophyll to notophyll vine forest
12.12.14	Eucalyptus racemosa subsp. racemosa ± Lophostemon confertus, Syncarpia glomulifera, Eucalyptus acmenoides woodland usually on rocky near coastal areas on Mesozoic to Proterozoic igneous rocks	9.2	9.2 Moist to dry eucalypt woodland on coastal lowlands and ranges

RURAL FIRE SERVICE

Queensland Government

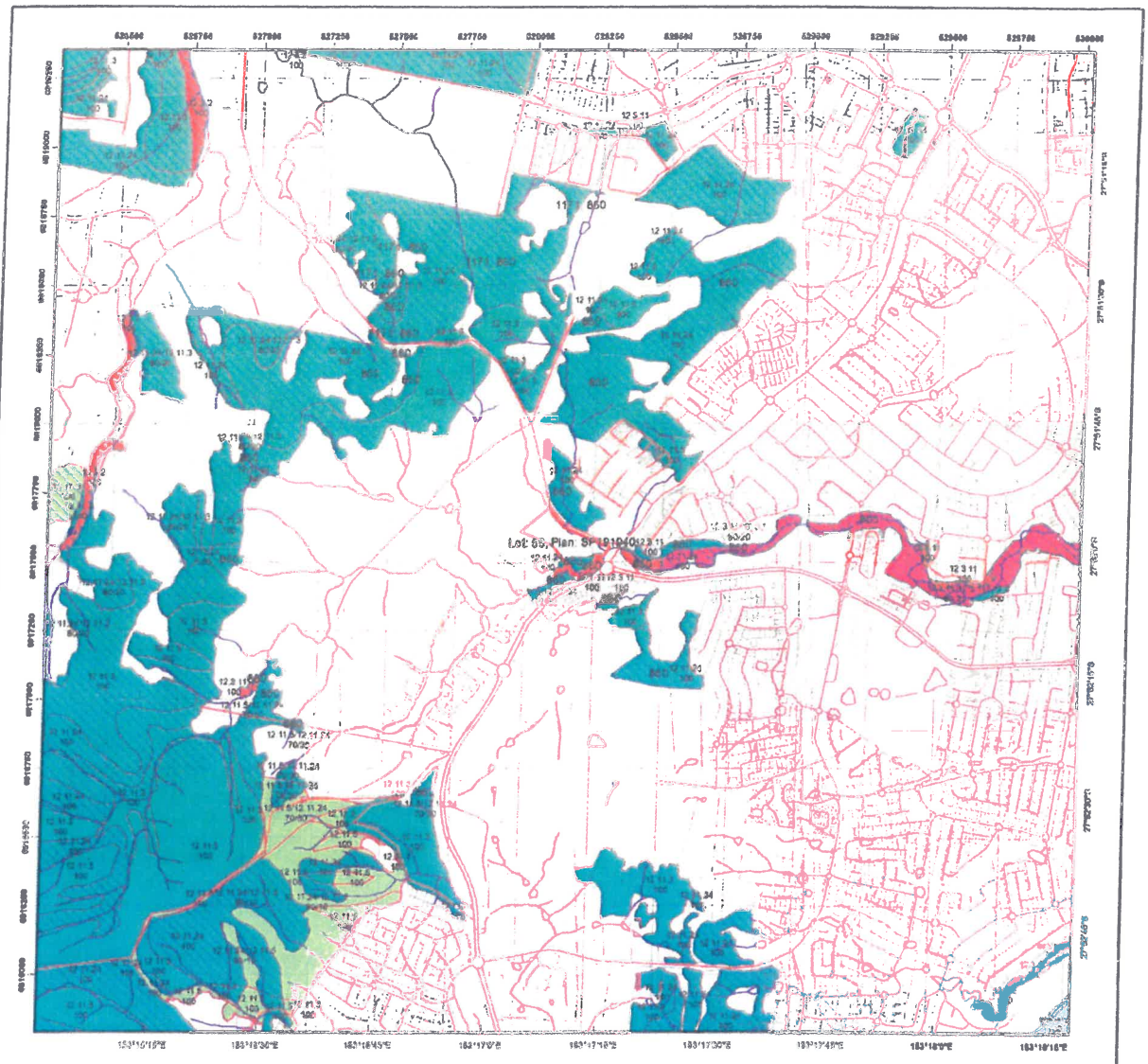
State-wide Bushfire Prone Area Mapping

Vegetation Hazard Class Descriptions and Fuel Characteristics – Jan 2017

Vegetation Hazard Class	Potential Fuel Load (t/ha)						Prone Type [1]		Fuel Continuity[2]	
	Surface	Near Surface	Elevated	Bark	Total (Remnant)	Total (Non-Remnant)	Remnant	Non-Remnant	Remnant	Non- Remnant
1.1 *Complex mesophyll to notophyll vine forests*	2.6	0.0	0.0	0.0	2.6	12.0	3	1	2	1
2.1 *Complex to simple, semi-deciduous mesophyll to notophyll vine forest*	3.5	0.0	0.0	0.0	3.5	12.0	3	1	2	1
3.1 *Notophyll vine forest*	4.5	0.0	0.0	0.0	4.5	12.0	3	1	2	1
3.3 *Notophyll vine thicket*	4.4	0.0	0.0	0.0	4.4	12.0	3	1	2	1
4.1 *Notophyll and notophyll palm or vine forest*	4.5	0.0	0.0	0.0	4.5	12.0	3	1	2	1
5.1 *Notophyll to microphyll vine forests*	3.9	0.0	0.0	0.0	3.9	12.0	3	1	2	1
5.2 *Notophyll to microphyll vine forest with sparse overstorey*	3.9	0.0	0.0	0.0	3.9	12.0	3	1	2	1
5.5 *Sedgeland within Notophyll to microphyll vine forests*	3.9	0.0	0.0	0.0	3.9	12.0	3	1	2	1
6.1 *Montane Notophyll vine forest and microphyll fern forest*	3.9	0.0	0.0	0.0	3.9	12.0	3	1	2	1
6.3 *Montane Notophyll vine thicket and microphyll fern thicket*	3.9	0.0	0.0	0.0	3.9	12.0	3	1	2	1
7.1 *Semi-evergreen to deciduous microphyll vine forest*	6.0	0.0	0.0	0.0	6.0	12.0	3	1	2	1
7.2 *Sparse semi-evergreen to deciduous microphyll vine forest*	6.0	0.0	0.0	0.0	6.0	12.0	3	1	2	1
8.1 *Wet eucalypt tall open forest*	28.0	3.0	2.0	2.0	35.0	35.0	1	1	1	1
8.2 *Wet eucalypt tall woodland*	18.0	3.1	1.7	1.0	23.8	23.8	1	1	1	1
9.1 *Moist to dry eucalypt open forests on coastal lowlands and ranges*	17.5	3.5	2.2	1.0	24.2	24.2	1	1	1	1
9.2 *Moist to dry eucalypt woodland on coastal lowlands and ranges*	11.4	3.5	1.3	1.0	17.2	17.2	1	1	1	1
9.3 *Shrubland within moist to dry eucalypt on coastal lowlands and ranges*	7.8	3.0	1.9	0.0	12.7	12.7	1	1	1	1
10.1 *Spotted gum dominated open forests*	16.3	3.0	1.5	0.0	20.8	20.8	1	1	1	1
10.2 *Spotted gum dominated woodlands*	14.0	3.0	1.0	0.0	18.0	18.0	1	1	1	1
11.2 *Moist to dry eucalypt woodlands on basalt areas*	7.5	4.0	0.5	1.0	13.0	13.0	1	1	1	1
12.1 *Dry eucalypt open forest on sandstone and shallow soils*	15.0	3.5	1.5	1.0	21.0	21.0	1	1	1	1
12.2 *Dry eucalypt woodlands on sandstone and shallow soils*	12.0	2.6	1.8	1.0	17.4	17.4	1	1	1	1
13.1 *Dry to moist eucalypt open forests on undulating metamorphics and granite*	15.9	3.5	1.4	1.0	21.8	21.8	1	1	1	1

[1] Prone Type: 1 = Bushfire Prone, 2 = Grass Fire Prone, 3 = Low Hazard

[2] Fuel Continuity: 1 = Continuous, 2 = Discontinuous



Vegetation Management Supporting Map

Legend

- Lot and Plan
- Category A or B area containing endangered regional ecosystems
- Category A or B area containing of concern regional ecosystems
- Category A or B area that is a least concern regional ecosystem
- Category A or B area under Section 20AH
  These areas are edged in yellow and filled with the remnant RE Status
- Category C area containing endangered regional ecosystems
- Category C area containing of concern regional ecosystems
- Category C area that is a least concern regional ecosystem
- Category C area under Section 20AI
  These areas are edged in purple and filled with the remnant RE Status
- Non Remnant
- Water
- Wetland on the vegetation management wetlands map
- Essential habitat on the essential habitat map
- Essential habitat species record
- Watercourses and drainage features on the vegetation management watercourse and drainage features map
  (Stream order shown as black number against stream where available)
- Roads
- National Parks, State Forest and other reserves
- Cadastral line
  Property boundaries shown are provided as a locational aid only

Queensland Government

LOCALITY DIAGRAM

N

0 140 280 420 560 700 m

This product is projected into:
GDA 1994 MGA Zone 56

Labels for Essential Habitat are centred on the area of enquiry.

Regional ecosystem linework has been compiled at a scale of 1:100 000, except in designated areas where a compilation scale of 1:50 000 is available. Linework should be used as a guide only. The positional accuracy of RE data mapped at a scale of 1:100 000 is +/- 100 metres.

Disclaimer:
While every care is taken to ensure the accuracy of this product, the Department of Natural Resources, Mines and Energy makes no representations or warranties about its accuracy, reliability, completeness or suitability for any particular purpose and disclaims all responsibility and all liability (including without limitation, liability in negligence) for all expenses, losses, damages (including indirect or consequential damage) and costs which you might incur as a result of the product being inaccurate or incomplete in any way and for any reason.

Additional information may be required for the purposes of land clearing or assessment of a regional ecosystem map or PMAV applications. For further information go to the web site: www.dnrme.qld.gov.au or contact the Department of Natural Resources, Mines and Energy.

Digital data for the vegetation management watercourse and drainage feature map, vegetation management wetlands map, essential habitat map and the vegetation management remnant and regional ecosystem map are available from the Queensland Spatial Portal at http://www.information.qld.gov.au/

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12.11.3
100
12.11.3
100
12.11.3
100
860
12.11.5
100
12.11.24
100
860
Lot: 58, Plan: SP191940
12.3.11
100
860
12.3.11/12.3.1
80/20
860
12.11.24
100
860
860
860
860
12.11.24
100
12.3.11
100
12.3.11
100
12.11.5/12.11.24
70/30
860
12.11.3
100
860
12.11.24
100

Queensland Government

Regional ecosystem details for 12.11.24

< Back to search results (https://environment.ehp.qld.gov.au/regional-ecosystems/list/?page=74)

Regional ecosystem	12.11.24
Vegetation Management Act class	Least concern
Biodiversity status	No concern at present
Subregion	3, 1, (2), (4)
Estimated extent[1]	Pre-clearing 28000 ha; Remnant 2015 13000 ha
Extent in reserves	High
Short description	Eucalyptus carnea, E. tindaliae, Corymbia intermedia +/- E. siderophloia or E. crebra woodland on metamorphics +/- interbedded volcanics
Structure category	Sparse
Description	Eucalyptus carnea, E. tindaliae, Corymbia intermedia woodland +/- E. crebra or E. siderophloia, Eucalyptus resinifera, Eucalyptus major, E. helidonica, Angophora woodsiana, C. trachyphloia, E. microcorys, Corymbia citriodora subsp. variegata, C. henryi. Occurs on Palaeozoic and older moderately to strongly deformed and metamorphosed sediments and

	interbedded volcanics usually at altitudes <300 metres. (BVG1M: 9g)
Supplementary description	Ryan, T.S. (ed.) (2012); Bean et al. (1998), H39a
Protected areas	Nerang NP, Springbrook NP, Tamborine NP, D'Aguilar NP, Plunkett CP, Venman Bushland NP, Nerang CP, Buccan CP, Wickham NP, Daisy Hill CP, Springbrook CP, Toohey Forest CP, Pimpama CP
Special values	Habitat for threatened plant species including Sophora fraseri.
Fire management guidelines	SEASON: Summer to winter. INTENSITY: Low to moderate. INTERVAL: 4-25 years. STRATEGY: Aim for 40-60% mosaic burn. Burn with soil moisture and with a spot ignition strategy so that a patchwork of burnt/unburnt country is achieved. ISSUES: The fire regime should maintain a mosaic of grassy and shrubby understoreys. Control of weeds is a major focus of planned burning in most areas. Careful thought should be given to maintaining ground litter and fallen timber habitats by burning only with sufficient soil moisture. Burning should aim to produce fine scale mosaics of unburnt areas. Variability in season and fire intensity is important, as well as spot ignition in cooler or moister periods to encourage mosaics.
Comments	Frequently grades upslope into 12.11.5 (Corymbia citriodora subsp. variegata) or 12.11.25 (C. henryi, E. fibrosa subsp. fibrosa) and downslope into 12.11.27 (E. racemosa/ E. seeana). Previously mapped as 12.11.5a. Lower altitude occurrences are being extensively cleared and fragmented. Caboolture south to the New South Wales border.

[1] Estimated extent is from version 10 pre-clearing and 2015 remnant regional ecosystem mapping. Figures are rounded for simplicity. For more precise estimates, including breakdowns by tenure and other themes see remnant vegetation in Queensland (https://www.qld.gov.au/environment/plants-animals/plants/ecosystems/remnant-vegetation/).

[2] Superseded: Revision of the regional ecosystem classification removed this regional ecosystem code from use in version 10 RE mapping. It is included in the regional ecosystem description database because the RE code may appear in older versions of RE mapping and regulation.

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Last updated 10 April 2017

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Queensland Government (https://www.qld.gov.au/)

6.PROFILES

ELDON BOTTCHER

EDUCATION AND QUALIFICATIONS

Graduate Diploma in Design in Bushfire Prone Areas
University of Western Sydney
Diploma in Architecture
Queensland Institute of Technology
Certificate of Rural Fire Management
University of Southern Queensland
Registered Architect
Queensland
A+ Architect
Australian Institute of Architects
FPA Australia Certified Practitioner (BPAD-Level 3-16935)
Bushfire Planning and Design (BPAD-LEVEL 3), Alternate Solutions & DTS

PROFESSIONAL MEMBERSHIPS

Fellow
Australian Institute of Architects
Member
Australian Institute of Emergency Services
Member
Australian Institute of Engineers Society of Fire Safety
Member
Queensland Environmental Law Association.
Member Board of Experts
Bushfire Building Council of Australia
Associate Member
Institution of Fire Engineers
Corporate Member
Fire Protection Association of Australia

PROFESSIONAL EXPERIENCE

Director
Eldon Bottcher Architect Pty Ltd since 1978
Bushfire Assessment and Planning Consultant since 1998
Group Officer
Albert Rural Fire Brigades Group
Queensland Fire and Rescue Service
Group Officer
Gold Coast Rural Fire Brigades Group
Queensland Fire and Rescue Service
Group Officer
South East Regional Support Group
Queensland Fire and Rescue Service
Planning Officer
Gold Coast Rural Fire Brigades Group
Queensland Fire and Rescue Service
Member Practice Committee AIA Qld Chapter
BBCA representation to Australian Standards Committee FP20 (AS 3959)
Foundation & Life Member
Guanaba Rural Fire Brigade

OTHER BUSHFIRE RELATED COURSES AND TRAINING

I.C.S./AIIMS (40 hr. course) in Incident Command Systems
Certificate 4 (Workplace Training and Assessment)
RFSQ Level 1
RFSQ Level 2 (Officer)
RFSQ Fire Management 1
RFSQ Crew Leader
Certificate II in Public Safety (Firefighting Operations)
Fire Weather 1

BUSHFIRE RELATED AWARDS

National Planning Award
State Planning Award
Planning Institute of Australia
Gold Coast Bushfire Management Strategy
(Co-Initiator and Member of Preparation Committee)

Australian Government
National Medal
Long and Distinguished Service to Fire fighting
Queensland Fire and Rescue Service
Diligent and Ethical Service Medal + Clasp
Service to Fire fighting

Queensland Government
Australia Day Medallion
Services to Rural Fire Fighting
Queensland Government
Year of the Volunteer Medallion
Services to Fire fighting
UDIA
Best Consultancy Team Award in 2007.

SERVICES OFFERED

Bushfire management Reports

Bushfire Safety Engineering

Bushfire Planning and Design

Bushfire Hazard Assessment

Alternative Solutions

Expert Witnessing
(See Planning and Environment Court of Queensland Determination
File No. BD 624 of 2005 sections 28 to 35)

Continuing Professional Development Lectures

Tertiary Education Lectures and Tutorials

Town Planning Bushfire Codes for Local Authorities

Bushfire Burn Planning

General consultancy relating to all aspects of Bushfire

ATTACHMENT 4

Revised Stormwater Management Plan prepared by Arcadis



UPS
URBAN PLANNING SERVICES PTY LTD

Level 1/ 1 Le Boulevard
2 Elkhorn Avenue
Surfers Paradise QLD 4217
Attention: Leanne Croft

Arcadis Australia Pacific Pty Ltd
Level 7, Premion Place
Cnr Queen & High Streets
PO Box 1653
SOUTHPORT QLD 4215
Tel No: +61 7 5532 3933
Fax No: +61 7 5591 4778
arcadis.com

1/07/2019

A0001-10022603-AAL-01

LOT 58 SP191940, 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA DEVELOPMENT – RESPONSE TO GOLD COAST COUNCIL REQUEST FOR FURTHER INFORMATION

Dear Leanne,

We refer to the Information Request issued by Council for the abovementioned development on 30th of August 2018 reference **MCU/2018/58**. Please find below the request for information items (in black font) followed by Arcadis' response (in orange font) relevant to Civil Engineering. In addition to this, there are two attachments to this letter which are the supporting material to the responses.

DA ASSESSMENT

Item 7 – Retaining Walls

The applicant is requested to provide details of all retaining walls associated with the development including heights and materials.

Please refer to amended preliminary earthworks drawings DA-00-101, DA-00-105 & SK005 which include additional details for wall heights and proposed materials for wall construction. These can be found in Attachment 1 of this letter.

Item 12 – Hydraulics and water quality Assessment

City officers have reviewed the stormwater report, titled "Site Based Stormwater Management Plan, Revision 02" dated 26 July 2018 prepare by Arcadis Australia Pacific Pty Ltd., submitted in support of the application. The applicant is requested to submit a revised report addressing the following issues:

a) The building at the north-eastern corner appears to encroach in to the existing natural channel and the batters at the north-eastern boundary of the development appear to be too steep and the channel design / modification does not appear to comply with the design of an open channel. The applicant is requested to demonstrate that all the channels modified / designed as part of the current proposal comply with the requirements of a channel design as per the LDG and QUDM. Provide a number of sections along the length of the channel demonstrating compliant design.

Minor changes to the existing channel have been proposed as shown in Arcadis Drawings DA-00-101, DA-00-105 & SK005 (Attachment 1) and Landscape Architect drawings *8781 CDP C 06*. The proposed 1 in 2 channel batters have been designed in accordance with QUDM, in particular Section 9.5.4 – Table 9.5.3 requires this type of batter to be well planted with deep rooted bank vegetation.

We also note that flow velocity are generally low, in the order of 0.81m/s (1%AEP flows) and unlikely to cause erosion.

b) The afflux results claimed to be presented in Table 9-3 & Table 9-4 does not include the afflux information. The applicant is requested to include the information and demonstrate that the proposal will not increase the water level and velocity external to the site.

Please refer to report F0002-10022603-AAR (Attachment 2) which has the amended tables mentioned above. It is noted that these tables are now Table 10-3 and Table 10-4. It is also noted that the *Afflux* wording in the heading wase was a formatting error for the abovementioned tables. Tables 10-3 & 10-4 headings have been amened. These tables are primarily to demonstrate results internal to the site around the augmented northern channel and to demonstrate the results around the new driveway access and culvert crossing.

Only Table 10-2 should be referred too for Afflux results as result of the development. Table 10-2 shows that there is no Afflux for the 50%, 10% and 1% AEP events.

c) Time of concentration for pre development catchment E (Ref: Table 7-2) has been considered as 5 minutes. We request the applicant to provide all assumptions and method calculate such short time of concentration for existing catchment. We envisage that considering the pre development / existing case catchment characteristics the time of concentration will be much longer than 5 minutes.

It is noted that the Rational Method Calculations (Appendix E of report F0002-10022603-AAR) had the correct time on concentration. The Table 7-2 in revision 02 of F0002-10022603-AAR had a formatting error which showed 5 minutes. Please refer Table 8-2 of report F0002-10022603-AAR revision 03 which has the correct time of concentration values that were used for both the existing and developed scenarios.

d) Include the XP-Rafts parameters in the report.

Please refer to report F0002-10022603-AAR (Attachment 2) Table 9-1 for XP-Rafts parameters.

e) Demonstrate that the bioretention basin design complies with the design requirements of City Plan – Land Development Guidelines. Please be advised that the LDG has not suggested different design criteria for privately owned and managed bioretention system. The design is required to be compliant with the LDG.

The Land Development Guidelines (as a guideline) have been used in conjunction with Water Urban Sensitive Design (WUSD) best practice to inform the design of this private bio-retention basin. In considering site constraints and a preference for naturalised treatment measures (as opposed to proprietary cartridge) the basin has been conceptually designed to ensure it can be constructed and operated to achieve pollutant reduction targets. Importantly, this includes consideration of hydraulic functionality and landscape integrity as well monitoring and maintenance to the satisfaction of the relevant guidelines and

applicants' operational provisions. Further details are provided in report F0002-10022603-AAR (Attachment 2).

f) Provide adequate information on the boulder wall proposed as part of the bioretention basin. Be advised that Council do not accept any wall higher than 0.8m if that wall form part of the bioretention basin.

Please refer to amended preliminary earthworks drawings DA-00-101, DA-00-105 & DA-00-381 which demonstrates retaining walls are not being proposed directly adjacent to bio-retention filter media or the extended detention of the bio-retention area. Report F0002-10022603-AAR (Attachment 2) Appendix B has an amended typical cross section of the proposed basin (DA-00-381).

g) Identify the maintenance access, to the bioretention basin, on plan and provide section. Demonstrate that the access design complies with Land Development guidelines

A maintenance access batter of 1 in 4, in accordance with WSUD Bio-retention Technical Design Guidelines 2014, has been provided into the private basin from the on grade MRV turn around location. Please refer to drawing DA-00-101 & DA-00-305 (Attachment 1 & 2).

h) Include pre and post development hydrographs at the lawful point of discharges demonstrating peak flow rates have been maintained for all events up to and including 100year ARI storms.

Hydrographs are now provided on Appendix I of the amended report F0002-10022603-AAR (Attachment 2).

i) Submit all modelling files for Council's review. Based on model parameter review, Council may issue Clarification request

Model files have been submitted to *mail@goldcoast.qld.gov.au* with the Subject Line "MCU/2018/58 - Information Request Item 12i – Stormwater Modelling Files".

Item 21 – Bio Retention basin filter media depth

The storm water management plans are requested to be amended to show a filter media depth to allow screening shrub planting (minimum 700mm). A cross-sectional detail must identify the filter media depth (minimum 700mm). Increased screening shrub planting is required within the southern boundary Bio Basin to provide additional vertical visual and environmental amenity to the adjoining residential property.

A minimum of 700mm depth of filter media has been provided. As consequence the bio-retention basin will now have a saturated zone. This is to limit the risk of tree roots interfering with the underdrainage. Please refer to report F0002-10022603-AAR (Attachment 2) Section 11 and Appendix B for further details.

Yours sincerely,

Arcadis Australia Pacific Pty Ltd
Ashley Shepherd
Civil Engineer
07 503 4808

ATTATCHMENT 1

AMENDED PRELIMANRY EARTHWORKS PLANS

LEGEND

- EARTHWORKS AREA OF CUT
- EARTHWORKS AREA OF FILL
- 5.0 — PROPOSED SURFACE CONTOURS
- 5.0 — EXISTING SURFACE CONTOURS
- PROPOSED RETAINING WALL
- SWD — EXISTING STORMWATER DRAINAGE
- S — EXISTING SEWERAGE RETICULATION
- W — EXISTING WATER RETICULATION
- R — EXISTING RECYCLED WATER RETICULATION
- oh — EXISTING OVERHEAD ELECTRICAL
- e — EXISTING UNDER GROUND ELECTRICAL
- g — EXISTING GAS RETICULATION
- SITE BOUNDARY
- 31 ENVIRONMENTAL BUFFER

NOTES

1. CONCEPTUAL ONLY AND SUBJECT TO DETAILED DESIGN AND APPROVAL.
2. ALL WORKS TO COMPLY WITH THE DEVELOPMENT APPROVAL CONDITIONS.

590
SP 218180

BAILEYS MOUNTAIN ROAD

OLD COACH ROAD

183
SP 156422

57
SP 214370

RESERVE ROAD

CULVERT CROSSING

REINFORCED CONCRETE BLOCK RETAINING WALL H 1.7

REINFORCED CONCRETE BLOCK RETAINING WALL H 1.5

1 IN 2 BATTER

1 IN 4 BATTER MAX.

1 IN 4 BATTER

1 IN 3 BATTER

STRUCTURAL BASEMENT RETAINING WALL H 0.5M TO 3.5 MAX.

STRUCTURAL BASEMENT RETAINING WALL H 0.5 TO 3.5 MAX.

RL 26.30

RL 27.50

BASE OF BASIN RL 24.25

BOUNDER OR SANDSTONE BLOCK WALL H 0.5 TO 1.5 MAX.

BASE OF BASIN RL 24.55

EXISTING BUILDING TO BE RELOCATED

RELOCATED TRAINING FACILITY RL26.05 (SUSPENDED ABOVE BASIN)

GIVE WAY ROUNDABOUT SIGN

1 DA-00-105

2 DA-00-105

3 DA-00-105

4 DA-00-105

Issue	Description	By	Ckd	RPE	Date
03	EARTHWORKS REVISED	NF	AS		01.07.19
02	REVISED ARCHITECTURAL	NF	AS		25.06.19
01	ORIGINAL ISSUE	NF	AS		26.07.18

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100 on Original

Surveyor: SCHLENCKER SURVYING

Architect: BDA ARCHITECTURE

Filename: Da00101-10022603-gcd-EW.dwg

Client: SANDSON PTY LTD

Status: PRELIMINARY
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Scales: 1:500

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Original Issue Signatures

Drawn: N. FAHEY

Designed: A. SHEPHERD

Project Manager: T. STOCKWELL

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Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

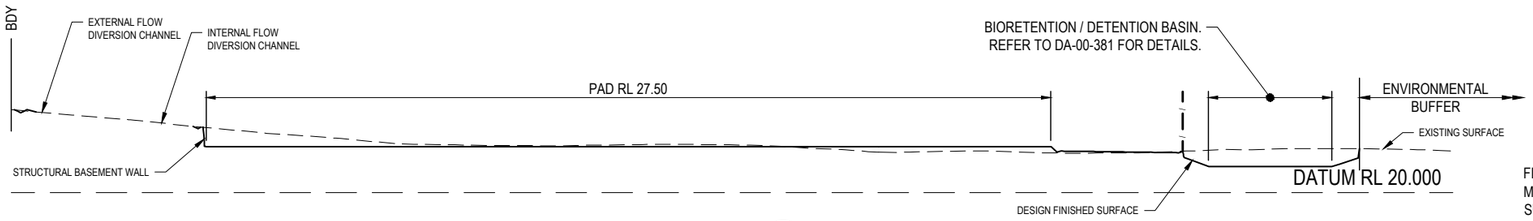
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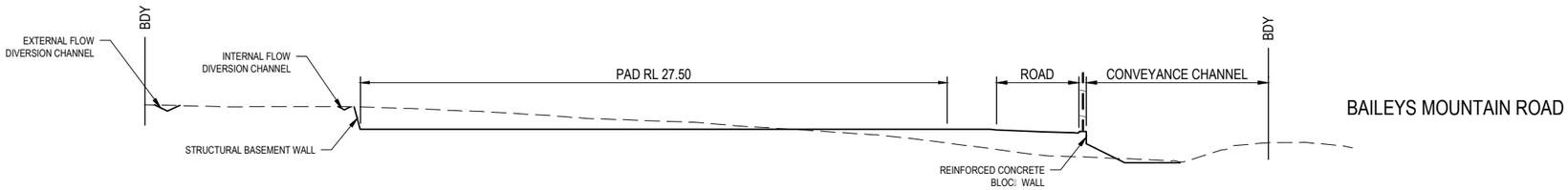
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Drawing No. DA-00-101 — Project No. 10022603 — Issue 03

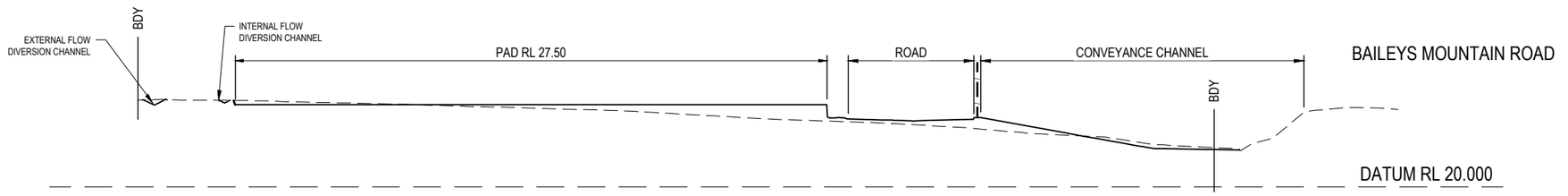
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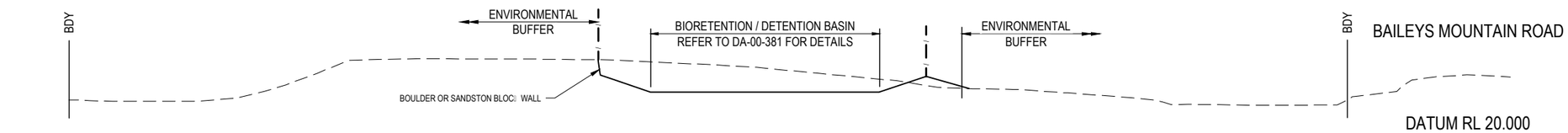
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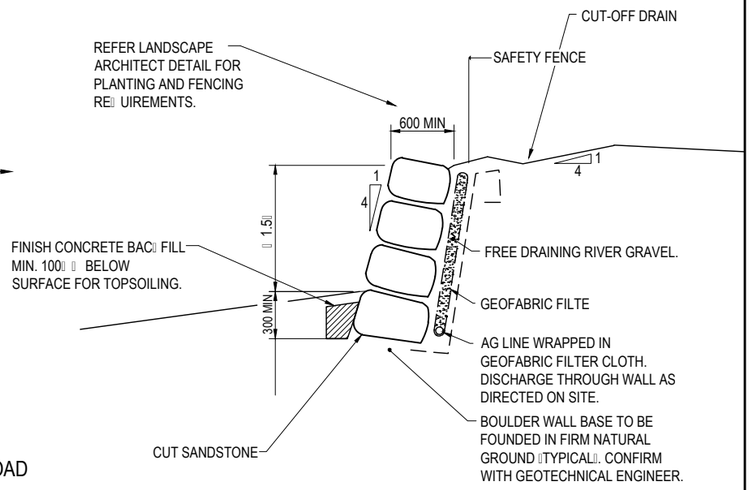
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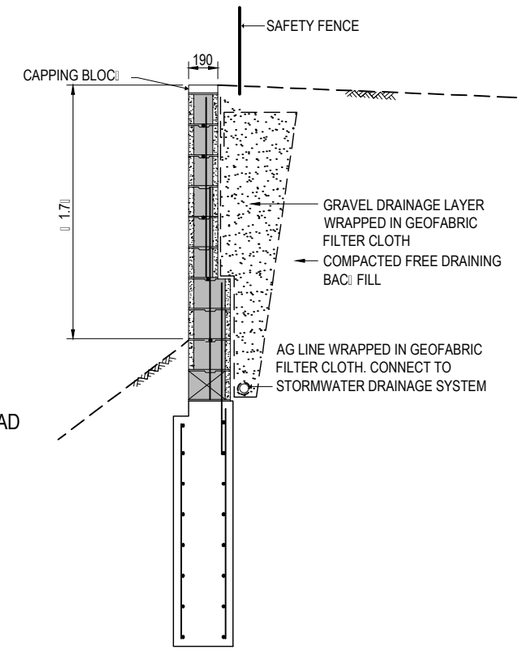


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TYPICAL SECTION CUT SANDSTONE RETAINING WALL

DETAILS TYPICAL ONLY. SUB ECT TO DETAILED DESIGN.



TYPICAL BLOCK WORK RETAINING WALL DETAIL

DETAILS TYPICAL ONLY. SUB ECT TO DETAILED DESIGN.

Issue	Description	By	Ckd	RPE	Date
03	SECTIONS AMENDED	NF	AS		01.07.19
02	SECTIONS AMENDED	NF	AS		25.06.19
01	ORIGINAL ISSUE	NF	AS		26.07.18

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Surveyor: SCHLENC ER SURVYING

Architect: BDA ARCHITECTURE

Filename: Da00101-10022603-gcd-EW.dwg

Client: SANDSON PTY LTD

Status: PRELIMINARY
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Height Datum: AHD

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Drawn: N. FAHEY

Designed: A. SHEPHERD

Project Manager: . STOC WELL

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Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: PRELIMINARY EARTHWOR S CROSS SECTIONS

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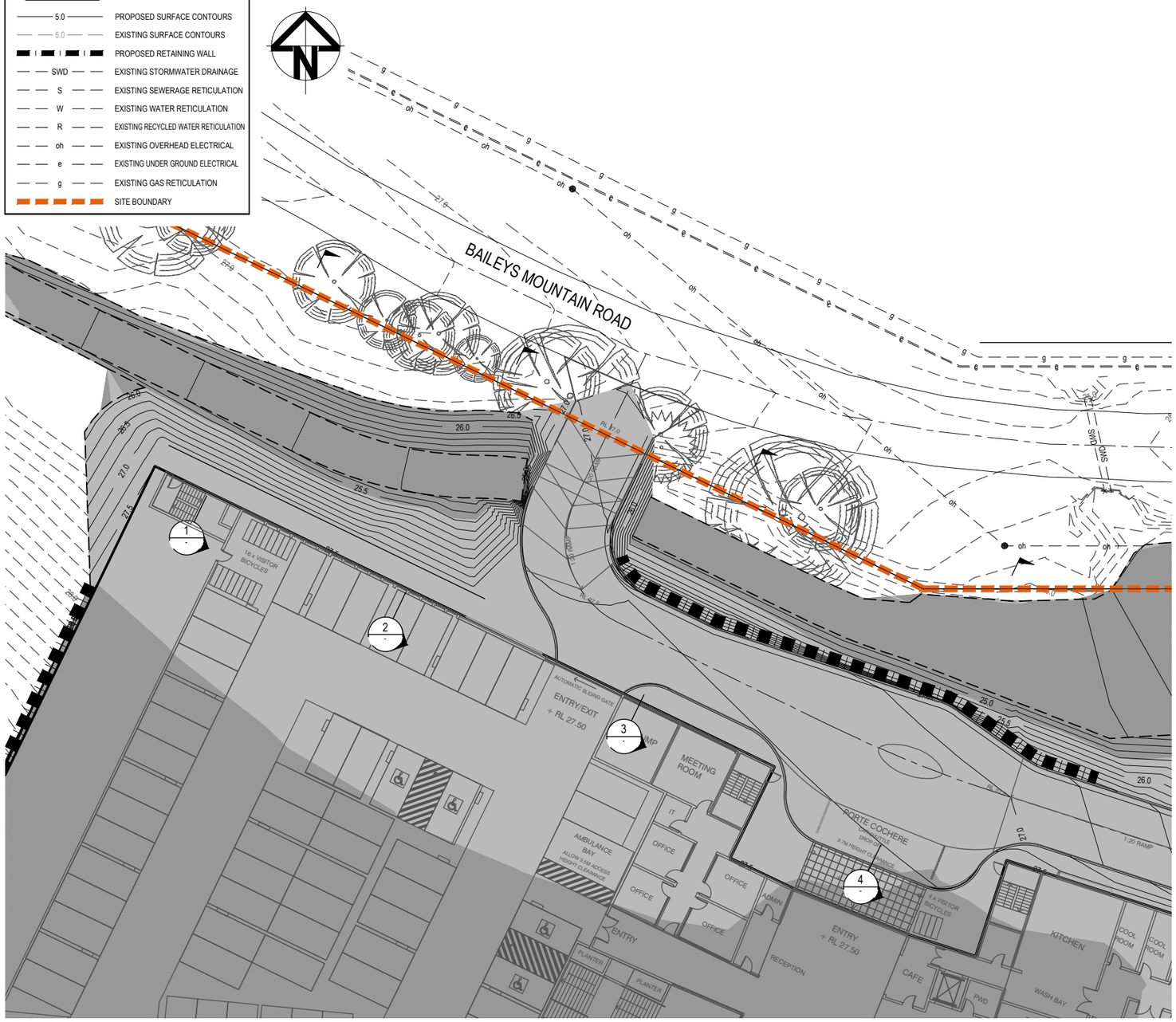
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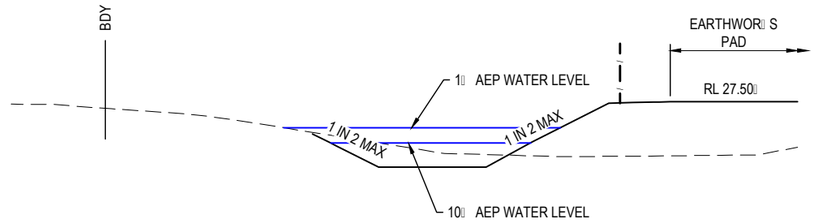
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- EARTHWORKS AREA OF FILL
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- 5.0 — EXISTING SURFACE CONTOURS
- PROPOSED RETAINING WALL
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- oh — EXISTING OVERHEAD ELECTRICAL
- e — EXISTING UNDER GROUND ELECTRICAL
- g — EXISTING GAS RETICULATION
- SITE BOUNDARY

NOTES

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2. ALL WORKS TO COMPLY WITH THE DEVELOPMENT APPROVAL CONDITIONS.

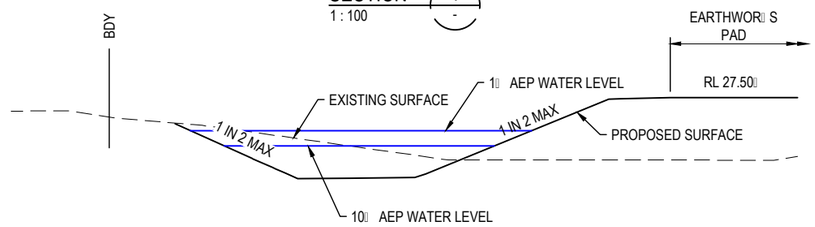


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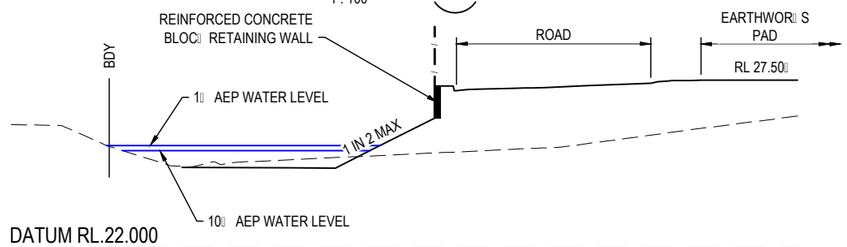
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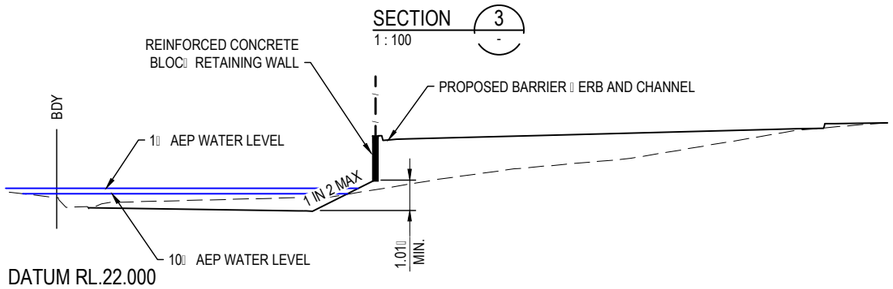
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SECTION 3
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DATUM RL.22.000

SECTION 4
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Issue	Description	By	Ckd	RPEQ	Date
02	SECTIONS AMENDED	NF	AS		01.07.19
01	ORIGINAL ISSUE	NF	AS		25.06.19

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Architect: BDA ARCHITECTURE
Filename: S□ 005-10022603-gcd Conveyance Channel.dwg
Client: SANDSON PTY LTD

Status: PRELIMINARY
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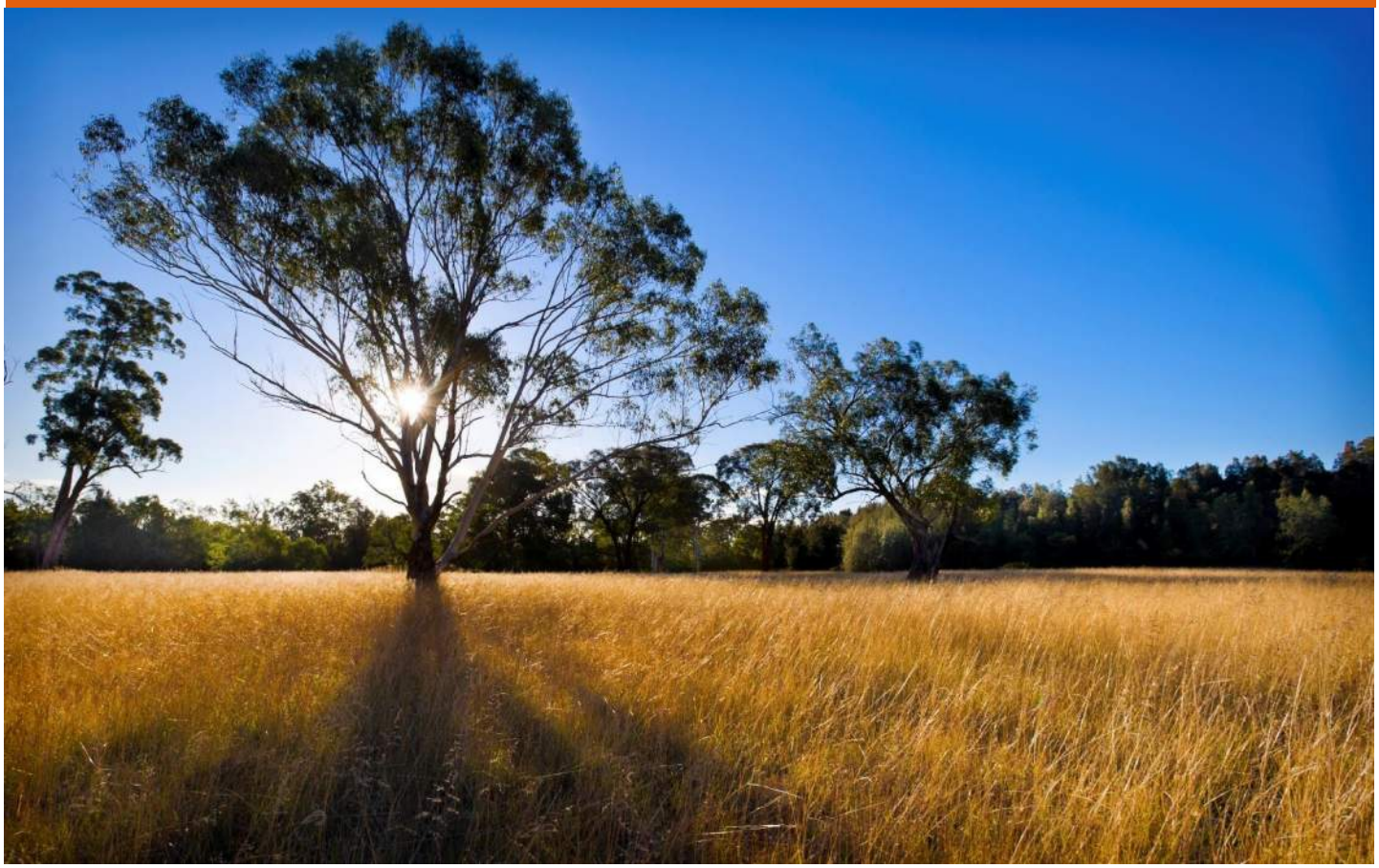
AMENDED STORMWATER MANAGEMENT PLAN

ARCADIS Design & Consultancy for natural and built assets

202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

SITE BASED STORMWATER MANAGEMENT PLAN

01 JULY 2019



Incorporating Hyder

SANDSON PTY LTD
202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

SITE BASED STORMWATER MANAGEMENT PLAN

Author	Ashley Shepherd	
Checker	James Stockwell	
Approver	Darlan Castro RPEQ19918	
Report No	F0002-10022603-AAR	
Date	1/07/2019	
Revision Text	03	

This report has been prepared for Sandson Pty Ltd in accordance with the terms and conditions of appointment for 202 Baileys Mountain Road, Upper Coomera dated June 2018. Arcadis Australia Pacific Pty Limited (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

REVISIONS

Revision	Date	Description	Prepared by	Approved by
01	18/07/2018	Draft Report	AS	JS
02	26/07/2018	Issued for Approval	AS	DC
03	01/07/2019	Issued for Approval	AS	DC

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1 EXECUTIVE SUMMARY

Sandson Pty Ltd has commissioned Arcadis to provide supporting documentation for a development application over the following allotment in Upper Coomera, QLD.

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

This application is to be lodged with City of Gold Coast (CoGC). The proposed development constitutes a development comprising of an aged care facility.

This report demonstrates the proposed development can be constructed and operated in accordance with the Water Sensitive Urban Design (WSUD) Requirements of Council, the South-East Queensland State Planning Policy (SPP 2017), the Queensland Development Code, the Queensland Urban Drainage Manual (QUDM), the Environmental Protection (Water) Policy (2009) and Gold Coast City Plan.

This report has been amended in response to CoGC Request for Information dated 30th August 2018. The following information requests were applicable to this report:

The primary objectives of this Site Based Stormwater Management Plan (SBSMP) are achieved as follows:

Lawful Point of Discharge

The site proposes to discharge to Old Coach Road Culvert System via overland flow, after receiving the necessary quality and quantity treatment. All stormwater will be will be discharged directly via overland flow to existing overland flow paths traversing through the site to the point of discharge, as is the current situation.

External Conveyance

2015 City Plan Flood Overlay Map – 5 indicates that the site is not subject to regional flooding however external catchment flows are conveyed through the site via two existing overland flow path. Yaun Creek traverse the site from south to north along the site's eastern boundary. A overland flow path traverses the site along the northern boundary running west to east joining Yaun Creek just upstream of the Old Coach Road culvert crossing. This report includes hydraulic assessment of these two overland flow paths showing that proposed development will safely convey flows up to the 1% AEP whilst still maintain existing conditions at the site boundary. It is noted that the proposed development complies with Table 8.2.8-6 of the Planning scheme which requires *Homes for the aged, Hospice* to have designated flood level of 0.5% AEP + 400mm of freeboard.

Stormwater Quantity

This report includes stormwater quantity calculations which demonstrate an increase in peak flow rates to the point of discharge from the proposed development if left unattenuated, due to the change in stormwater catchment parameters. A detention basin has been designed to attenuate developed peak flow rates to no greater than existing peak flow rates up to the design 1% AEP. A detention basin of volume 671m³ with a carefully designed outlet system is proposed to be located in the south-eastern corner of the site, external to the overland flow path, to attenuate developed flows to existing peak discharge conditions.

Stormwater Quality

The stormwater quality assessment demonstrates that a specially tailored treatment system will be required in order to meet the pollutant removal targets of CoGC during the operational phase of the proposed development. The proposed treatment system involves the use of a saturated zone bio retention basin with 150m² of filter media area. All the stormwater quality controls detailed in this document are contained within the development site and will remain a private asset. Regular maintenance of the treatment devices must be undertaken to ensure the continuing performance of the stormwater quality treatment train.

Waterway Stability

This has been achieved by complying with Stormwater Quantity objectives for the 63% AEP flow.

Erosion and Sediment Control

Construction phase sediment control devices are to be implemented during construction works in accordance with requirements associated with Type 2 sediment discharge zones, comprising of a vehicle shakedown, sediment fences, sediment basin. It has been recommended during the reshaping of the existing overland flow paths that instream erosion and sediment control measures be adopted.

2 REVISION 03

Revision 03 has been created to respond to an information request from City of Gold Coast dated 30th August 2018 for application MCU/2018/58. The following has been updated in this revision of this report:

- Section 8, 9 and 10 have been updated due to change in catchments as a result of the 31m buffer;
    - Amended developed catchments have been assessed
    - New detention Basin volume was modelled as result of new catchment and offset
    - New developed channel assessed in HEC-RAS to match the shift in development and change in channel
- Formatting error has been amended for the time concentration to reflect the rational method calculations (Appendix E) sheets value;
- XP-rafts parameters have been included in Table 9-1;
- Bio-retention Basin has been amended to allow for deep planting with a minimum filter media depth of 700mm. As a consequence, and in accordance with WUSD, the basin has been changed to a saturated zone bioretention system to limit the risk of tree roots blocking underdrainage pipes;
- Peak Storm Hydrographs for each event have in both existing and developed have been included in Appendix I.

Refer to correspondence in A0001-10022603-AAL-01 for additional detailed responses to Civil items noted in MCU/2018/58.

3 EXISTING SITE CHARACTERISTICS

2.1 SITE DESCRIPTION

The subject site is located at 202 Baileys Mountain Road, Upper Coomera, South-East Queensland, Australia on the following allotment:

- Lot 58 on SP191940 (202 Baileys Mountain Road, Upper Coomera).

The total area of the site is 30,870m².

3.2 LAND USAGE

In its current state the subject site described as 202 Baileys Mountain Road is occupied by a residential dwelling and shed structures.

A site locality plan is located below in Figure 3-1.



Figure 3-1 Site Locality Plan (Aerial Imagery Courtesy of Nearmap)

2.3 EXISTING TOPOGRAPHY

The site topography consists of moderately grading slopes (averaging <4%) with the site generally grading south-east towards both Baileys Mountain Road and Reserve Road. An existing topographic survey can be found in Appendix A.

The highest point of the site is at approximately RL39.0m AHD at the far north-west corner of the site on the northern boundary. The lowest point is approximately RL21.0m AHD located in the south-eastern corner of the site.

4 PROPOSED DEVELOPMENT

It is proposed to deliver a high-rise residential development with the following features;

- Aged Care Suites;
- Retirement Apartments
- Residents Amenities (Café, Kitchens, Library, Treatment Rooms, etc);
- Staff Facilities; and
- Carparking.

The existing dwelling on the site will be repurposed as a staff training facility.

A master plan of the proposed development has been provided in Figure 4-1 below.



Figure 4-1 Development Ground Floor Plan (Courtesy of BDA)

5 STORMWATER MANAGEMENT OBJECTIVES

In accordance with QUDM and The CoGC Planning Scheme 2015 Schedule 6.11: Land Development Guidelines the following objectives are investigated.

Lawful Point of Discharge

Achieve a lawful point of discharge by:

1 The location of the discharge is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received. This will include park, drainage or road reserve, stormwater drainage easement and those locations described in SC6.11.4.4.5.2 of The City of Gold Coast Planning Scheme 2015 Schedule 6.11: Land Development Guidelines.

2 In discharging to that location, the discharge will not cause an actionable nuisance (i.e. a nuisance for which the current or some future neighbouring proprietor may bring an action or claim for damages arising out of the nuisance), or environmental or property damage.

Refer to Section 6 of this report.

Stormwater Quantity

Provide the following:

1. Achievable stormwater quantity control measures for discharge during both the construction and operational phases of development designed in accordance with the Queensland Urban Drainage Manual (QUDM) unless subject to specific requirements of SC6.11 City Plan policy – Land development guidelines;

2. on-site detention systems that are designed to restrict peak outflows for all events up to and including the 1% AEP pre-development conditions.

Refer to Sections 7 and 8 of this report.

Stormwater Quality

Achieve the following minimum reduction in mean annual loads from unmitigated development

1 Gross Pollutants (>5mm) – 90% reduction in mean annual load

2 Total Suspended Solids (TSS) – 80% reduction in mean annual load

3 Total Phosphorous (TP) – 60% reduction in mean annual load

4 Total Nitrogen (TN) – 45% reduction in mean annual load

Refer to Section 11 of this report.

Waterway Stability

Limit the post-developed peak 63% AEP event discharge within the receiving waterway to the pre-development peak 63% AEP event discharge.

This has been addressed as part of the Stormwater Quantity Assessment provided in Sections 7 and 8 of this report.

Frequent Flow

Achieve the following flow Management:

1 Baseflows (in particular winter baseflows) - >=10% of mean annual rainfall volume converted to baseflow (less than baseflow threshold of 0.4l/s/ha.

2 Surface flow - <=20% surface runoff days per annum measured as days where the maximum daily flow rate exceeds the baseflow threshold of 0.4l/s/ha

3 Flow Reduction - >=25% reduction in mean annual runoff volume from unmitigated development.

The site is discharging into an overland flow path that becomes highly urbanised east of the old coach culvert system. It is not foreseen that frequent flow requirements would apply to this site given this observation. It is noted the development proposes to utilise a bio retention system coupled with a detention system to mitigate the runoff effects of a developed site.

Erosion and Sediment Control

Do not release prescribed water contaminants (as defined in the Environmental Protection Act 1994 from the development site, or cause likely release should rainfall occur, unless all reasonable and practicable measures are taken to prevent or minimise the release and concentration of contamination.

This will require, minimising soil exposure and undertaking erosion control, drainage control and sediment control in accordance with the following

1 SC6.11 of this City Plan Policy

2 Relevant Healthy Waterways guidelines and documents

3 Urban Stormwater Planning Guideline (Queensland State Government

5 Best Practice Erosion and Sediment Control (IECA)

Refer to Section 12 of this report.

6 LAWFUL POINT OF DISCHARGE

6.1 EXISTING STORMWATER DRAINAGE

The following existing stormwater mains have been identified adjacent to the development site of the CoGC's asset infrastructure maps and survey (refer Appendix A and Appendix C for further details):

Council Stormwater Infrastructure

From the west to the east on Baileys Mountain Road;

- 2 x DN375 Stormwater mains crossing Baileys Mountain Road, located adjacent to the north-eastern site boundary;
- 2 x 750x1500 Stormwater box culverts crossing Baileys Mountain Road, located adjacent to the south-eastern corner of the site;

From the north to the south on Old Coach Road;

- 5 x 2700x1800 Stormwater box culverts crossing Old Coach Road, located to the east of the site;

From the South to the north on Reserve Road;

- 1 x DN900 stormwater main within the northern verge of Reserve Road;
- 1 x Stormwater manhole located adjacent to the site, within Reserve Road; and
- 10 x Stormwater drainage pits connected to DN375 stormwater mains within Reserve Road.

Site Stormwater Infrastructure

- 2 x DN1300 Reinforced Concrete Pipe (RCP) located beneath the existing driveway of the site;
- 1 x DN1200 RCP located beneath an alternative access driveway to the site off Reserve Road;
- 1 x DN675 Mild Steel (MS) pipe located in the north-eastern corner of the site;
- Natural drainage channel along the northern boundary of the site conveying flows from the north and the east of the site; and
- Natural drainage channel along the eastern boundary of the site that conveys flows from the east and the south that enter the site.

The existing stormwater discharge from the site is identified as discharging into the existing overland flow paths surrounding the site via overland flow before discharging through the box culverts to the east of the site beneath Old Coach Road. Please refer to Appendix A and Appendix B.

6.2 PROPOSED DISCHARGE CHARACTERISTICS AND QUDM TWO PART TEST

In the developed case, the site demonstrates compliance with the QUDM two part test as follows:

The location of the discharge is under the lawful control of the local government or other statutory authority from whom permission to discharge has been received. This will include park, drainage or road reserve, stormwater drainage easement.

The proposed development will demonstrate compliance with QUDM by discharging to the existing lawful point of discharge being the box culvert system beneath Old Coach Road. Runoff generated from the new development area of the site will be captured and processed through the elected stormwater treatment and detention devices prior to discharging to the discharge point. It

is proposed to maintain the same discharge characteristics by discharging it via overland flow for all events through the existing eastern drainage channel on site. Please refer to Figure 6-1 which schematically outlines the proposed drainage regime for the site.

That in discharging in that location, the discharge will not cause an actionable nuisance. In general terms this implies no worsening as a result of discharge.

Sections 7, 8, 9 and 10 of this report provide detailed calculations and discussions illustrating no actionable nuisance anticipated.

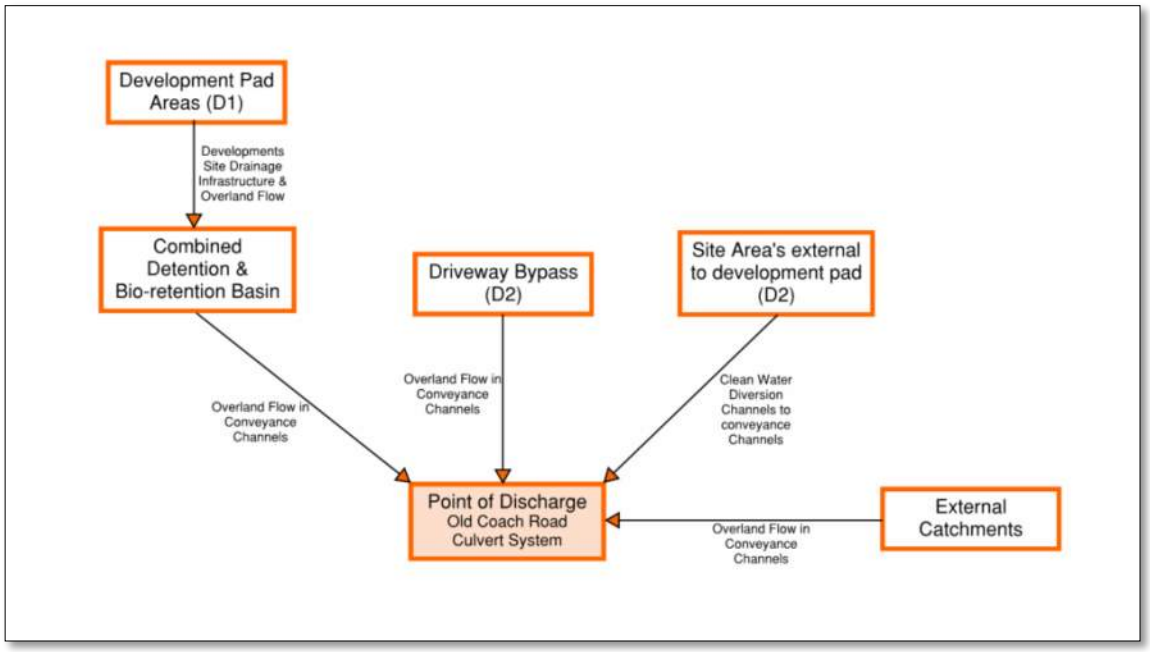


Figure 6-1 Developed Scenario Discharge Schematic

7 FLOODING AND CONVEYANCE MANAGEMENT

7.1 FLOOD MANAGEMENT

2015 City Plan Flood Overlay Map – 5 (refer to Appendix D) indicates that the site is not subject to regional flooding however an overland flow path does convey flow through the site. Please refer to Section 7.2 for more details regarding the conveyance of the channel.

7.2 EXTERNAL CATCHMENTS & CONVEYANCE MANAGEMENT

As noted above in Section 7.1 above the site has been identified as having an overland flow path conveyingI external flows, as seen in Figure 7-1. These existing overland flow paths traverse through the site along the northern and eastern boundaries of the site. These two overland flow paths convey the flow from four external catchments (EXT1, EXT2, EXT4 & EXT4-1, EXT5) (Please refer to Appendix B for extent of each external catchment, catchment details and channel locations).

It is noted that one additional external catchment (EXT 3) discharges through the site from the south. This southern catchment flow is conveyed via sheet flow across the site and is relatively small compared to aforementioned three external catchments. The main overland flow path, the eastern channel, which conveys the majority of the external flow through site is not proposed to be augmented as a part of this development and has been left in its existing natural state. It is proposed to augment the northern overland flow path in some section to accommodate the proposed development. The extent of works in this overland flow path can be seen in Appendix B. A hydraulic assessment will be undertaken in Section 10 of this report.

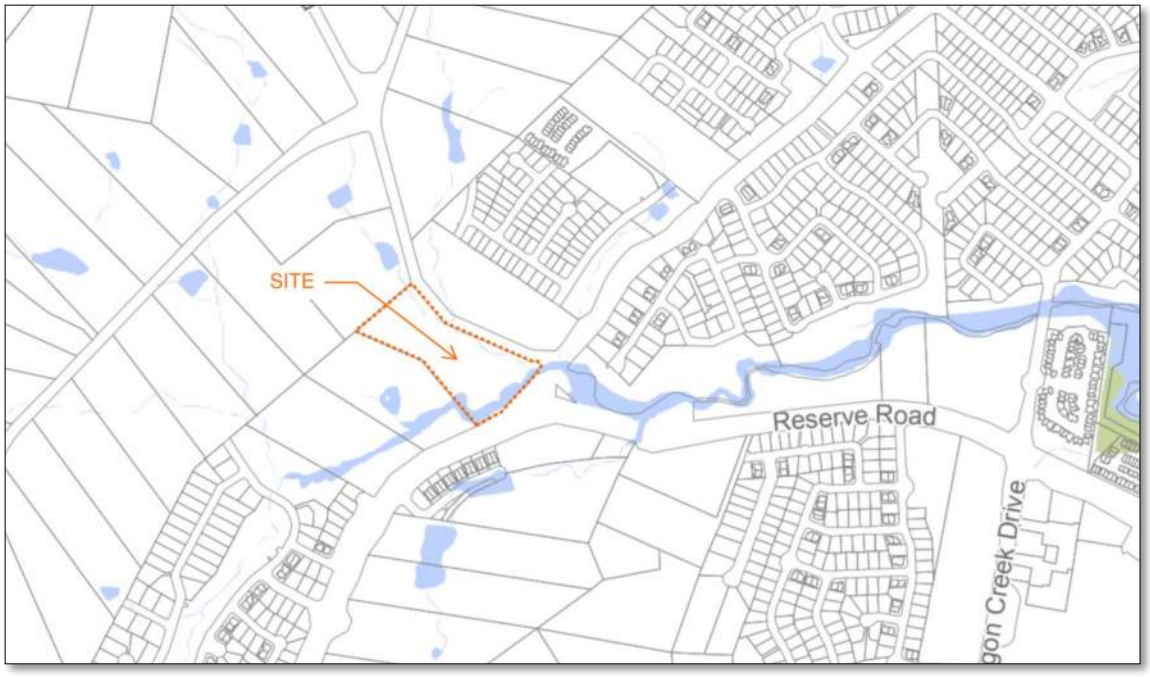


Figure 7-1 Extract from CoGC's Mapping

8 HYDROLOGICAL ASSESSMENT

8.1 TEMPORAL PATTERNS

Intensity Frequency Duration (IFD) data was derived in accordance with CoGC's 'Table 3.5-C Table of Rainfall Maps for Use in Gold Coast City. The data is summarised in Table 8-1 below:

Table 8-1 Site Specific IFD Data

Parameter	Value*
$^{1}I_{2}$	48.86
$^{12}I^{2}$	10.25
$^{72}I^{2}$	3.06
$^{1}I^{50}$	84.38
$^{12}I^{50}$	20.86
$^{72}I^{50}$	6.84
Geographical Factor F2	4.52
Geographical Factor F50	16.96
Map Skewness G	0
Easting	528800
Northing	6917300

8.2 CATCHMENTS

The existing site contains one catchment that drains towards both the northern and eastern boundaries of the site before being channelled via existing overland flow paths on the aforementioned boundaries to the north-eastern corner of the site (point of discharge). The proposed development will maintain the same discharge characteristics. The catchment is shown in the engineering drawings included in Appendix B. External catchments will be assessed in Section 9 of this report to get more accurate flows for the Hydraulic Section of this report. The catchment will be assessed under two cases:

1 **Existing Case (E)** – the site in its existing state consisting of a single detached residential dwelling and Sheds;

2 **Developed (D)** – the site in its post-developed state as per the proposal.

Table 8-2 below summarises the catchment parameters used to assess the existing and developed flows. It is noted that the external catchments will be dealt with in Section 9 of the report.

Table 8-2 Catchment Parameters

CATCHMENT	E	D
Area (ha)	3.087	3.087
Slope (%)	>5%	>5%
Development Category	Rural Residential	Neighbourhood Centre
Impervious (%)	3	65
Coefficient of Runoff (C_{10})	0.7	0.9
Time of Concentration (minutes)	12.67	6.8

8.3 RATIONAL METHOD CALCULATIONS

In the existing and developed case analysis, the time of concentration for all catchment areas has been derived in accordance with Queensland Urban Drainage Manual (refer QUDM Section 4.6).

The coefficient of runoff for the catchment was determined using CoGC City Plan V5, Section SC6.11.4.4.8.

The Rational Method, as prescribed by QUDM Section 4.3, was then used to determine discharge flow rates for each sub-catchment for standard Average Exceedance Probability (AEP's) of 63%, 39%, 18%, 10%, 5%, 2% and 1% years (see Appendix E for the detailed calculation sheets). Table 8-3 below summarises the abovementioned calculations.

Table 8-3 Catchment Flow Rates Calculated Using the Rational Method

Catchment	Peak Flow rate for AEP's (m^3/s)						
	63%	50%	20%	10%	5%	2%	1%
E	0.422	0.562	0752	0.862	1.010	1.251	1.418
D	0.704	0.935	1.246	1.422	1.662	1.984	2.150
Difference	*0.282*	*0.373*	*0.494*	*0.560*	*0.652*	*0.733*	*0.732*

As observed through Rational Method calculations in Table 8-3, for catchments E & D an increase in peak flows is observed for the catchment following the inclusion of the proposed development. This is primarily due to the increase in impervious area. Due to limitations in the Rational Method combined with the size of the catchment, further detailed assessment of catchments E & D will be undertaken to ascertain peak flows and any attenuation requirements. Additionally, the sizing of the external catchments for the site will be undertaken in Section 9.

9 STORMWATER QUANTITY

9.1 OBJECTIVE

Stormwater discharge from the development must be detained to pre-development flow rates for all storm events up to and including the 1% AEP ("no-worsening"). Appropriate stormwater infrastructure for the site is therefore required to ensure that there is no increase in peak discharge flow rates for the downstream receiving infrastructure. On-site detention will be implemented to cater for storm events up to and including the 1% AEP event.

9.2 METHODOLOGY

For the site catchment identified as having the same peak flow rates when developed, a hydrologic model was created using XP-Rafts. The critical storm event was determined via an investigation of storm durations ranging from 5mins to 1080mins. The model was then used to assess on-site and route post-developed runoff through the proposed detention structures to determine the most efficient on-site detention systems which complies with the aforementioned objectives. It was also used to hydrologically route the external flows through the site to check the impact the developed site and basin will have on the longer duration peaks. This model was also used to ascertain the flows for the HEC-RAS model that is discussed in Section 10 of this report.

9.3 MODEL CONDITIONS

Two hydrologic conditions were modelled to appropriately demonstrate the storm water quantity objective:

- **Existing Scenario (E)** – The site in its pre-demolition state consisting of a residential dwelling and rural farms sheds;
- **Mitigated Scenario (D)** – The site is developed as per the proposal inclusive of proposed detention infrastructure.

In performing these scenarios, compliance with the objective of no hydraulic worsening downstream can be made. The site's performance has been assessed at its discharge locations which includes the effects of the upstream or bypass catchments where applicable. This methodology ensures that peak flow concentrations from the upstream catchments are assessed in conjunction with the detained on-site flows, in order to demonstrate 'true' results at the local point of discharge. It is noted that the developed site was split into further sub-catchments to ensure a more accurate representation of the proposed sites discharge regime. Please refer to Figure 6-1 for schematic of drainage regime.

The following catchment details in Table 9-1 were used within XP-Rafts for the purposes of the stormwater quantity assessment and HEC-RAS inflows in Section 7.2.

Table 9-1 XP-Rafts Catchment Details

Scenario	Catchment Name	Area (Ha)	Slope (%)	Manning's N (Pervious; Impervious)	Impervious Fraction (%)
Existing	E	3.087	2.9	0.04; 0.02	3
Developed	D1	1.231	4.1		75
	D2*	1.856	2.9		2
External Catchments	EXT 1	26.675	5.4		15
	EXT 2	7.758	4.9		20
	EXT 3	0.414	8.5		20
	EXT 4	242.844	3.2		15
	EXT 4-1**	2.339	4.39		95
	EXT 5	16.425	5.3		60

*Includes small portion of road/driveway area that will bypass quantity and quality treatment
**Catchment that discharges up and including 10% AEP flows into the site via under road drainage from Reserve Road. Flows in excess of 10% AEP bypass the site as they are conveyed by roadway to a downstream location of the site.

It is further noted that further to Section 8.1, due to the requirement to assess to the 0.5%AEP as the development is aged care, additional temporal patterns were investigated to generate 0.5% AEP flows for the conveyance assessment in Section 10 of this report. For the 63% to 1% AEP events, the XP-rafts Automatic Storm Generator tool with the IFD coefficients from Table 8-1 was used. For the 0.5% AEP event, the XP-rafts Global Storm tool was used. Individual storms were created for each duration of the 0.5% AEP from data generated from CRC-forge. Storm patterns for each of these individual storms were based on the duration of the storm and XP-rafts standard patterns from ARR and Zone 3. The 0.5% AEP event intensity's can be found in Appendix H.

9.4 DETENTION SYSTEM DESIGN

Table 9-2 presents the design details for the proposed onsite detention system which is required to achieve the objective of no post development increase to pre-developed 63% to 1% AEP flow rates at the assessment point for the site. The detention system has been iteratively optimised to ensure peak performance.

Table 9-2 Summary of Proposed Detention Tank Parameters

Parameters	Value
Required Detention Volume*	671m^3
Required Basin Depth**	1.2m
Outlet Orifices***	DN100 orifice @ base of basin
	DN350 @ 0.5m above base of basin
Weir Outlet	2.5m wide weir @ 1.0m above base of basin
Emergency Weir Outlet	3.5m wide weir @ 1.1m above base of basin

*Volume required above 0.3m of extended detention for Bio-retention area
**Basin will have total depth of 1.5m to include 0.3m Bio-retention depth
***It is important that during detailed design appropriate trash screens should be included to potential orifice blockage.

The abovementioned detention system is proposed to be located in the north eastern of the site external to the external catchment overland flow paths. Engineering Drawings in Appendix B should be referred to for further details of the size and positioning of the proposed detention basin.

9.5 MODEL RESULTS

The following results have been captured from the XP-Rafts model as a result of implementing the above detention system. Table 9-3 below summarise the peak flow rates for the critical storm duration across the assessed AEP range at the assessment point for the for the developed site.

Table 9-3 Summary of Peak Local XP-Rafts Hydrologic/Hydraulic Results

Scenario	AEP (%)	63	50	20	10	5	2	1
Existing Scenario (E)	Peak Flow (m³/s)	0.274	0.419	0.595	0.701	0.842	0.939	1.059
Mitigated Scenario (D1 & D2 @ Point of Discharge)	Peak Flow (m³/s)	0.205	0.336	0.510	0.610	0.727	0.801	0.912
	Max Water Detention Depth in Basin (m)*	0.666	0.728	0.8	0.846	0.918	0.975	1.026

* Volume above 0.3m of extended detention for Bio-retention area

9.6 OBJECTIVE DISCUSSION

The above hydraulic investigation and runoff-routing exercise has demonstrated that suitable measures can be included in the design of the proposed development, to ensure that there is no increase in peak discharge being directed off-site to existing infrastructure for 63% AEP events to 1% AEP events. Please refer to Appendix I for peak hydrographs for the development site in isolation for existing and developed scenarios. The regional check indicate that the site will have a negligible effect on the overall drainage regime wider stormwater catchment network that converges on the development site.

9.7 SENSITIVITY CHECK & SAFETY CONSIDERATIONS

A sensitivity check was undertaken for the detention basin if blockage events occurred on the outlet orifices from the tank. This was done by applying 100% blockage on all the orifices and assessing if the weirs could facilitate the flow without surcharging into the building pads of the development. It is noted that the weirs will provide sufficient overflow capacity to convey the water ensure the basin blockage will not inundate the building pads of during a 100% outlet blockage event and prevent surcharge. It is noted that the basin has top level of RL25.75m and the sites building pads are at RL27.5m and RL27.0m, therefore should in the unlikely case the weirs fail there is additional freeboard.

Part of the proposed basin will utilise retaining walls to assist with interface to the required pad levels of the development. It is recommended that the basin be fenced off with barrier fencing and educational signage to mitigate risks of people unintentionally entering the basin. In addition to this and due to the nature of the development being for the elderly it is recommended that design safety report be undertaken prior to detailed design of the basin in accordance with QUDM Section 12.2. This report should examine design, construction and operational risks of the basin once the layout and other details have been finalised at the next phase of the project (i.e. detailed design).

10 CONVEYANCE MANAGEMENT

10.1 MAJOR OVERLAND FLOW PATH (DETAILED HYDRAULIC ASSESSMENT)

10.1.1 OVERVIEW

External catchments are noted to discharge through the site. This section of the report will undertake a hydraulic assessment of the two primary overland flow path that traverse along the eastern and northern boundaries of the site.

10.1.2 OBJECTIVES

This section of the report investigates any changes to hydraulic conditions and mitigation measures required to appropriately manage the conveyance of stormwater via the existing creek and proposed formalised channel.

There are three primary objectives that will be achieved in this assessment:

1. No unacceptable worsening of hydraulic conditions external to the site;

Assessing changes in water level and velocity for potential adverse impacts between existing and developed scenarios.

2. Appropriate design of proposed northern overland flow path including cross drainage structure.

Ensuring the proposed overland flow path and cross drainage structure will safely convey flows through the site whilst providing suitable freeboard to proposed habitable floor levels including allowance for blockage. Modifications to this northern overland flow path are required to suit the development access and footprint provisions.

It is also noted that in accordance with City of Gold Coast City Plan Guidelines Schedule 6 4.5.10, building immunity for an aged care facility has been determined based on QUDM Table 7.3.2 which stipulates 200 year ARI immunity from overland flow.

10.1.3 METHODOLOGY

The U.S. Army Corps of Engineers Hydrologic Engineering Centre River Analysis System (HEC-RAS) Version 4.1 has been used for this exercise. HEC-RAS performs one-dimensional flow calculations using two-dimensional cross sections through the assigned river lines which have been generated using topographic data.

Various geometry models were created for the existing and development cases and the peak flow rates generated by the XP-RAFTS analysis used to determine the effects of the proposed development works.

10.1.4 MODEL PARAMETERS

10.1.4.1 EXISTING MODEL

Topography

- Generated from LiDAR data purchased by Arcadis. Source being State of Queensland (Department of Natural Resources and Mines) 2017.
- Schlencker Survey Digital Terrain Model (DTM).
- A geometric view of the existing case model can be seen in Appendix G.

Structures

- Reserve Road/Old Coach Road Culvert Structure - information has been determined from survey:
    - 3 x 2700x1800 Reinforced Concrete Box Culvert (RCBC);
    - 2x2700x2050 RCBC; and
    - Road Deck – 24m wide, with low point of RL23.08m AHD.
- Internal Site Structures - information has been determined from survey:
    - 1 x 1200 diameter Reinforced Concrete Pipe (RCP) along Yaun Creek;
    - Road Deck – 7m wide, with low point of RL22.75m AHD;
    - 2 x 1300 diameter Reinforced Concrete Pipe (RCP) along Northern Overland flow path; and
    - Road Deck – 3.8m wide, with low point of RL23.54m AHD.

Manning's

- Manning's values have been used as follows, based on recent aerial imagery assessment:
    - 0.1 has been used in densely vegetated areas including trees, typically within higher sections of banks;
    - 0.06 has been used for vegetated areas, where no or sparse trees are present, typically the within the overland flow path banks

10.1.4.2 DEVELOPED MODEL

Topography

- External areas - Generated from LiDAR data provided by Arcadis. Source being State of Queensland (Department of Natural Resources and Mines) 2017;
- Schlencker Survey Digital Terrain Model (DTM);
- Internal Site areas – based on preliminary bulk earthworks design; and
- A geometric view of the developed case model can be seen in Appendix G.

Structures

- Reserve Road/Old Coach Road Culvert Structure - information has been determined from survey:
    - 3 x 2700x1800 RCBC;
    - 2x2700x2050 RCBC; and
    - Road Deck – 24m wide, with low point of RL23.08m AHD.
- Internal Site Structures - information has been determined from survey:
    - 1 x 1200 diameter RCP along Yaun Creek;
    - Road Deck – 7m wide, with low point of RL22.75m AHD;
    - 2 x 1300 diameter RCP along Northern Overland flow path;
    - Road Deck – 3.8m wide, with low point of RL23.54m AHD;
- Internal Site Structures – Proposed Site Access:
    - 2 x 1200x900 RCBC; (Structure modelled with 50% blockage)
    - Road Deck – 10m wide, with low point of RL26.51m AHD;

Manning's

- Manning's values have been used as follows, based on recent aerial imagery assessment and proposed channel modifications:
    - 0.1 has been used in densely vegetated areas including trees, typically within higher sections of banks;
    - 0.06 has been used for vegetated areas, where no or sparse trees are present, typically the within the overland flow path banks

10.1.4.3 FLOW RATES

Tables below summarises the respective catchment node and corresponding HEC-RAS chainage location the flow has been applied. It is noted that the inflow in HEC-RAS is provided approximately 20-50m upstream of its catchment concentration node point which is considered conservative. It is noted that only the critical storm durations were used each Annual Exceedance Period (AEP).

Table 10-1 Flow Rates Used for Hydraulic Assessment

Input Location			Flow Rate (m^3/s)			
River	Cross-Section	Flow Origin Catchments	50% AEP	10% AEP	1% AEP	0.5% AEP*
Existing Scenario						
Baileys	340.92	EXT 2	1.157	1.918	2.782	4.962
Baileys	218.87	EXT 1 &2	4.299	7.225	11.164	18.099
Baileys	190.3	EXT 1 &2	4.299	7.225	11.164	18.099
Baileys	128.65	E -Site, EXT 1 &2	4.693	7.919	12.223	19.687
Reserve Rd (Yaum Creek)	344.25	EXT4 & EXT3	18.985	30.457	45.376	65.625
Reserve Rd (Yaum Creek)	91.26	EXT3, EXT4 & EXT4-1	21.788	35.628	52.69	84.366
Reserve Rd (Yaum Creek)	79.18	E -Site, EXT 1,2,3,4,4-1 & 5	25.107	37.785	55.801	92.819
Reserve Rd (Yaum Creek)	73.17	E -Site, EXT 1,2,3,4,4-1 & 5	25.107	37.785	55.801	92.819
Developed Scenario						
Baileys Rd	337.12	EXT 2	1.157	1.918	2.782	4.962
Baileys Rd	240.03	EXT 1 &2	1.157	1.918	2.782	4.962
Baileys Rd	201.55	EXT 1 &2	4.299	7.225	11.164	18.099
Baileys Rd	127.75	D -Site**, EXT 1 &2	4.693	7.919	12.223	19.687
Reserve Rd (Yaun Creek)	344.25	EXT4 & EXT3	18.985	30.457	45.376	65.625
Reserve Rd (Yaun Creek)	91.26	EXT3, EXT4 & EXT4-1	21.788	35.628	52.69	84.366
Reserve Rd (Yaun Creek)	79.18	D -Site, EXT 1,2,3,4,4-1 & 5	25.107	37.785	55.801	92.819
Reserve Rd (Yaun Creek)	73.17	D -Site, EXT 1,2,3,4,4-1 & 5	25.107	37.785	55.801	92.819

*Flows used for 200year (0.5% AEP) immunity check

**The developed peak flow is lower than the existing peak flow from the site due to the detention basin. Therefore, the existing flow peak flows were retained in the developed for a more consistent/ conservative result.

10.1.4.4 BOUNDARY CONDITIONS

The downstream boundary condition has been adopted in accordance with existing ground levels extracted from survey (Appendix A). The downstream boundary condition in HEC-RAS has been set as a "Normal Depth S=0.0083" to represent existing slope. We note that the model has been extended by approximately 30m downstream of the existing culvert crossing Old Coach Road to minimize the influence of the boundary condition to the site's water level, which are generally controlled by the existing culvert inlet capacity.

Upstream boundary condition has been set as Critical Depth for both overland flow paths.

10.1.4.5 MODEL LIMITATIONS

The following limitations are noted based on the adopted methodology:

- Detailed survey information is limited to a very close proximity to the site;
- Infrastructure under Baileys Mountain Road infrastructure has not been modelled;
- Other storm durations and recurrence intervals have not been assessed if not noted;
- No assessment of blockages to existing cross drainage structures internal to the site and external (Old Coach Road Culverts) to the site;
- No assessment of climate change impact on channel flows.
- No sensitivity assessment with high tailwater conditions;
- External catchments are not fully developed and undetained; and
- Dam is assumed to be full to downstream invert control.

10.1.5 HYDRUALIC RESULTS AND DISCUSSION

10.1.5.1 No Worsening of Conditions on External Properties

Table 10-2 below summarises peak water levels and velocities as well as changes in velocities for cross sections pertaining to external private or public property. Key points are:

- Minimal change in conditions upstream of the site. This is due to runoff been accepted both boundaries with minimal obstructions.
- Generally, a small reduction in water level is noted at the upstream cross-sections of the Norther Channel (Baileys Road). This reduction is caused by the increased efficiency in conveying flows through the site as a result of to the proposed channel.
- There is an isolated instance where the channel velocity increased by 0.58m/s, however in context of the majority results this is deemed negligible. Furthermore the minor increases do not exceed a velocity scour threshold.
- Water Levels have been checked downstream of the Baileys Mountain Road Infrastructure culvert crossings into the site half way along the site northern boundary. Results indicate that water levels in the developed case reduce by approximately 0.5m.
- The Culvert under bailey mountain road near the intersection of Old Coach has not been affected by the proposed works.

The proposed works on-site are therefore not envisaged to cause an impact on upstream or downstream property that could cause real damage

Table 10-2 Afflux Results for Overland flow path for Private Properties

Location Information			Existing		Developed		Change	
Location	Section (Existing)	Section (Developed)	Water Level (RLm)	Velocity (m/s)	Water Level (RLm)	Velocity (m/s)	Water Level (RLm)	Velocity (m/s)
50% AEP								
Upstream – Yaun Creek	344.25	344.25	25.08	0.91	25.08	0.91	0	0
	298.73	298.73	24.31	1.9	24.3	1.93	-0.01	0.03
Upstream - Baileys Road	340.92	337.12	27.64	0.71	27.64	0.74	0	0.03
	317.57	313.78	26.82	0.95	26.82	0.90	0	-0.05
	312.01	308.22	26.51	0.63	26.47	1.08	-0.04	0.45
Baileys Road Culvert Crossing	202.89	191.13	25.21	1.13	24.80	1.45	-0.41	0.32
Downstream	15.92	15.92	22.26	1.37	22.26	1.37	0	0
	3.34	3.34	22.17	1.32	22.17	1.32	0	0
10% AEP								
Upstream - Yaun Creek	344.25	344.25	25.38	1.01	25.38	1.01	0	0
	298.73	298.73	24.53	2.12	24.52	2.13	-0.01	0.01
Upstream - Baileys Road	340.92	337.12	27.71	0.81	27.71	0.81	0	0
	317.57	313.78	26.86	1.12	26.86	1.15	0	0.03
	312.01	308.22	26.57	0.74	26.46	1.83	-0.11	1.03
Baileys Road Culvert Crossing	202.89	191.13	25.3	1.43	24.89	1.79	-0.41	0.36
Downstream	15.92	15.92	22.45	1.69	22.45	1.70	0	0.01
	3.34	3.34	22.37	1.53	22.37	1.53	0	0
1% AEP								
Upstream - Yaun Creek	344.25	344.25	25.68	1.13	25.68	1.13	0	0
	298.73	298.73	24.76	2.32	24.76	2.32	0	0
Upstream - Baileys Road	340.92	337.12	27.75	0.95	27.75	0.96	0	0.01
	317.57	313.78	26.91	1.21	26.91	1.21	0	0
	312.01	308.22	26.63	0.82	26.56	1.32	-0.07	0.50
Baileys Road Culvert Crossing	202.89	191.13	25.37	1.84	25.00	1.15	-0.37	0.21
Downstream	15.92	15.92	22.67	2.07	22.67	2.08	0	0.01
	3.34	3.34	22.6	1.75	22.6	1.75	0	0

10.1.5.2 Proposed Northern Channel

The proposed augmentation to the overland flow path running along the sites northern boundary have been modelled in HEC-RAS to confirm the channel has capacity to safely convey flows through the site. As discussed in Section 10.1.4.2 the works also includes a culvert crossing to a proposed access driveway to the site.

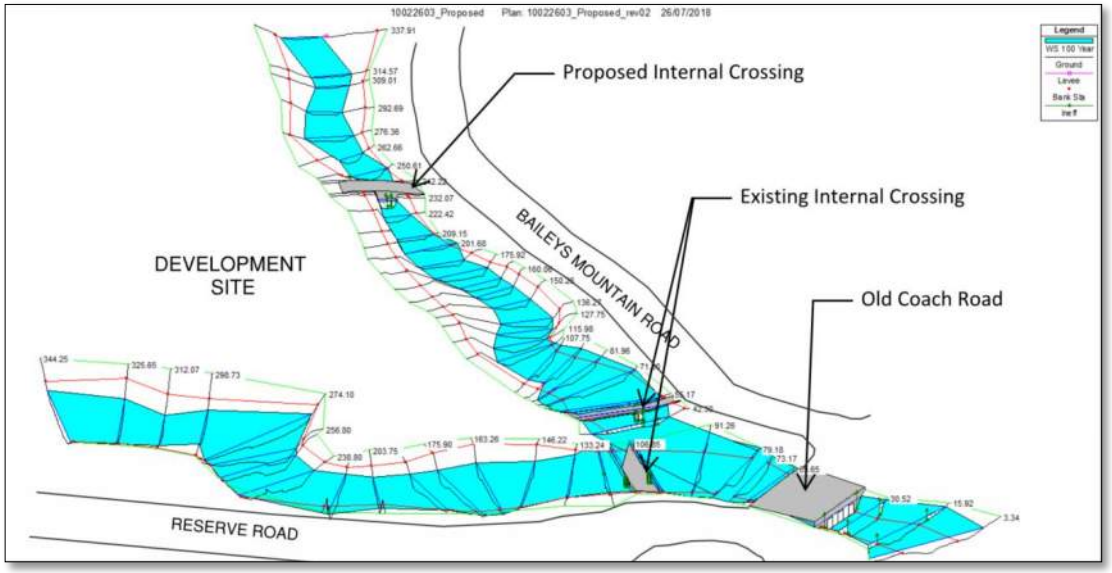


Figure 10-1 - 3D Perspective of Existing and Proposed Overland flow paths

The modelling results indicates that the channel velocities are generally below the scouring threshold for a vegetated channel being generally below 2.0m/s. Refer Table 10-3 below,

Table 10-3 Results for Northern Overland Flow Path (Results also provided in Appendix G)

Reach	Section	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)
42	337.12	1% AEP	2.78	27.34	27.75	27.79	0.024204	0.96	2.91	12.96
42	313.78	1% AEP	2.78	26.59	26.91	26.98	0.055457	1.21	2.31	13.49
42	308.22	1% AEP	2.78	26.31	26.56	26.65	0.062556	1.32	2.11	11.85
42	291.64	1% AEP	2.78	25.78	26.35	26.36	0.002737	0.50	5.61	12.87
42	275.7	1% AEP	2.78	25.37	26.31	26.33	0.001990	0.56	4.97	7.15
42	262.73	1% AEP	2.78	25.02	26.30	26.31	0.000585	0.36	7.74	8.59
42	253.97	1% AEP	2.78	24.78	26.30	26.31	0.000312	0.33	8.53	10.92
42	252.18	1% AEP	2.78	24.76	26.29	26.30	0.001000	0.59	4.73	6.86
42	251.18	Culvert for Proposed New Vehicular Access (2 x 1200x900 RCBC)								
42	240.03	1% AEP	2.78	24.65	25.20	25.68	0.085936	3.07	0.91	7.46
42	223.63	1% AEP	2.78	24.62	25.34	25.37	0.005794	0.81	3.43	8.15
42	214.2	1% AEP	2.78	24.6	25.31	25.33	0.002520	0.51	5.47	11.10
42	209.15	1% AEP	2.78	24.59	25.31	25.32	0.001179	0.38	7.37	14.23
42	201.55	1% AEP	11.16	24.48	25.00	25.21	0.050192	2.05	5.45	12.87
42	191.13	1% AEP	11.16	23.86	24.58	24.65	0.011509	1.15	9.67	18.26
42	180.16	1% AEP	11.16	23.46	24.53	24.57	0.004349	0.93	12.05	15.25
42	168.73	1% AEP	11.16	23.31	24.49	24.52	0.003257	0.84	13.28	15.46
42	160.06	1% AEP	11.16	23.31	24.45	24.49	0.004105	0.91	12.24	14.97
42	150.26	1% AEP	11.16	23.16	24.37	24.43	0.008216	1.15	9.74	14.24
42	136.27	1% AEP	11.16	22.98	24.33	24.36	0.002875	0.77	14.52	17.72
42	127.75	1% AEP	12.22	22.88	24.31	24.34	0.002718	0.77	15.94	18.92
42	115.98	1% AEP	12.22	22.92	24.26	24.30	0.003546	0.85	14.36	17.84
42	107.75	1% AEP	12.22	22.93	24.25	24.27	0.002189	0.69	17.97	22.72
42	95.16	1% AEP	12.22	22.95	24.22	24.25	0.001928	0.65	19.36	25.10
42	88.63	1% AEP	12.22	23.02	24.21	24.23	0.002059	0.65	20.26	33.14
42	81.96	1% AEP	12.22	22.98	24.21	24.22	0.001286	0.53	24.42	35.75
42	71.3	1% AEP	12.22	22.94	24.20	24.21	0.000691	0.43	30.43	37.19
42	55.17	Existing Access Culvert (2 x 1300 diameter RCP)								
42	53.65	1% AEP	22.14	24.17	24.17	24.18	0.002648	0.63	20.48	29.39
42	49.39	1% AEP	22.83	23.69	23.69	24.10	0.037690	2.83	4.32	27.32

The driveway crossing has been assessed for a 1% AEP flows with 50% blockage, with results showing the maximum water level below the road level. As discussed in section 9.1.4.2 the proposed crossing will have 2 x 1200x900 RCBC; Figure 10-1 below shows the 1% AEP channel long section.

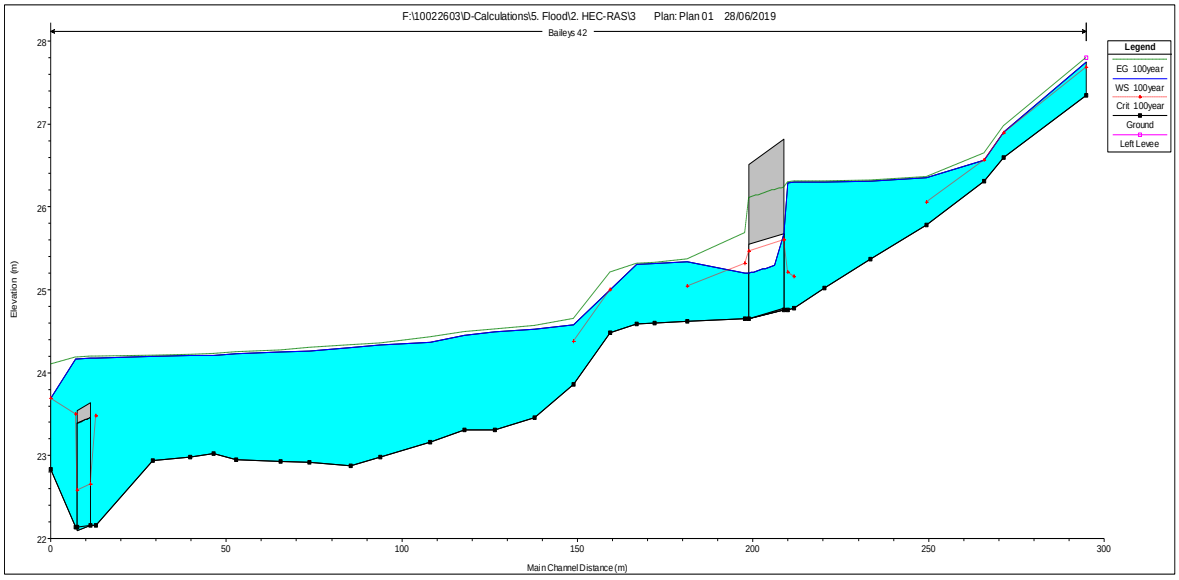


Figure 10-2 – Proposed Channel Long Section *(Results also provided in Appendix G)*

As discussed in Section 10.1.2 freeboard was checked for 0.5% AEP event in accordance with QUDM Table 7.3.2. The results indicate that the water level in this event will reach approximately RL 27.05m AHD at the upstream of the culvert crossing as shown in Table 10-4. The building pad is set at RL27.5m AHD providing a minimum of 450mm of Freeboard.

Water Level was also checked throughout the channel to ensure freeboard is adequate.

Table 10-4 Results for Northern Overland Flow Path at New Vehicle Access Point

River	Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)
Baileys Rd	42	252.18	0.5% AEP	4.96	24.76	27.05
Baileys Rd	42	251.18		Culvert		
Baileys Rd	42	240.03	0.5% AEP	4.96	24.62	25.62

A complete set of results is provided in Appendix G.

10.2 MINOR DIVERSION CHANNELS (MANNING'S CALCULATION)

A Manning's calculation has been undertaken to ascertain the required channel dimensions to divert the site's smaller external catchments that do not enter the site through the two main overland flow paths. Table 10-5 outlines the required diversion channel to divert the flow around the development.

Table 10-5 On-site Clean Water Diversion Channel Parameters for EXT 3 & EXT 2

Parameter	Value
Location	Western & Southern Boundaries
Catchments*	EXT 3 & a portion of EXT 2
Peak 1% AEP Flow from Above Catchment	0.331m³/s
Depth of Channel	0.5m (0.2m Flow Depth + 0.3m Freeboard)
Base Width of Channel	1
Grade of Right Hand bank in Direction of Flow	1 in 2
Grade of Left Hand bank in Direction of Flow	1 in 2
Channel Slope	≈ 10%
Manning's n**	0.07
Max Velocity	1.26m/s
Channel Capacity	0.353m³/s

**Please refer to Appendix B for catchment locations*

***Manning's n was established from Brisbane City Council's Manning's roughness document (https://www.brisbane.qld.gov.au/sites/default/files/ncd_appendixc_part3.pdf)*

Table 10-6 On-site Clean Water Diversion Channel Parameters for D2 Sub Catchment

Parameter	Value
Location	West of Buffer
Catchments*	Sub-Catchment of D2
Peak 1% AEP Flow from Above Catchment	0.035m³/s
Depth of Channel	0.45m (0.15m Flow Depth + 0.3m Freeboard)
Base Width of Channel	0.5
Grade of Right Hand bank in Direction of Flow	1 in 2
Grade of Left Hand bank in Direction of Flow	1 in 2
Channel Slope	≈ 1%
Manning's n**	0.07
Max Velocity	0.31m/s
Channel Capacity	0.038m³/s

**Please refer to Appendix B for catchment locations*

***Manning's n was established from Brisbane City Council's Manning's roughness document (https://www.brisbane.qld.gov.au/sites/default/files/ncd_appendixc_part3.pdf)*

As seen in the above tables, the clean water diversion parameters will have sufficient capacity to convey the onsite clean water past the proposed development pad.

It is noted that some of these channels will have be traversing down steep grade and will require instream velocity treatment to mitigate erosion. During detailed design velocity mitigation measures such as rock lining, proprietary geofabrics and riffle/pools can be used to manage the velocities of these channels once further geotechnical properties of soils are known.

It is highlighted that the predicted 1% AEP velocity is 1.26m/s which do not present immediate concern, however, measures, as mentioned above, will be investigated.

11 OPERATIONAL PHASE STORMWATER QUALITY

11.1 ENVIRONMENTAL VALUES AND WATER QUALITY OBJECTIVES

To prevent degradation of Gold Coast waterways and beaches, ecologically sustainable development principles have been embraced and regulated by the CoGC. Section 6.11.4 Water Sensitive urban design of the City Plan Land Development Guidelines indicates that "The overarching principles which apply to new development on the Gold Coast are:

- Avoid the creation of nuisance flow or hazard problems;
- Protect the quality of surface and ground waters during construction and operation of new development;
- Maintain the natural hydrologic behaviour of catchments;
- Protect existing natural features and ecological processes; and
- Integrate stormwater management infrastructure carefully in the urban and natural landscape."

With these principles in mind, the stormwater management objectives aim to:

- Identify the water quality and quantity objectives and performance criteria;
- Estimate the pollutant and flood storage loads; and
- Detail within the management plan, strategies aimed at achieving the required objectives.

Water quality objectives during both the construction and operational phases of a development are presented within CoGC City Plan– Section 6.11.4 and are detailed in this report.

Water quality parameters and the proposed limits applicable for this development have been selected in accordance with the SPP. The water quality reduction targets stipulated by these guidelines are presented in in Table 11-1 below:

Table 11-1 Water Quality Operational Phase Performance Criteria

Pollutant	Criteria
Total Suspended Solids (TSS)	80%
Total Phosphorus (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants	90%

11.2 PROPOSED STORMWATER TREATMENT DEVICES

WSUD aims to minimise the impact of a development on the natural water cycle by reducing the export of pollutants, sediments and nutrients from the site into the natural watercourse. In order to treat the stormwater runoff from the site, various treatment devices can be used throughout the development area and these concepts can be integrated into the overall design of the road layouts, road cross sections, stormwater layouts and water supply reticulation systems. Stormwater from each development stage will follow a specially designed stormwater quality treatment train prior to discharge from the site, which will ensure compliance with the water quality objectives.

A treatment train has been proposed for the site which comprises of a number of individually designed treatment devices that collectively contribute to the achievement of whole site water quality objectives.

11.2.1 BIO-RENTENTION SYSTEM

A bio-retention area is a vegetated region where runoff is filtered through a filter media layer (e.g. sandy loam) as it percolates downwards to receiving underlying reticulation. Specific vegetation is to be incorporated into the landscaping of bio-retention areas which effectively reduce nutrient loads. Appendix A of Healthy Waterways' WSUD Technical Guidelines for South East Queensland provides guidance on selecting appropriate plant species for systems where plants have a functional role in stormwater treatment, such as the aforementioned bio-retention basins.

A typical example of a bio-retention area in operation with suitable vegetation is presented in Figure 11-1 below. A typical section is also presented in Figure 11-2 with further standard details and maintenance checklist enclosed as Appendix F of this report.



Figure 11-1 Example of Urban Bio-retention Garden Bed (Courtesy of Water by Design

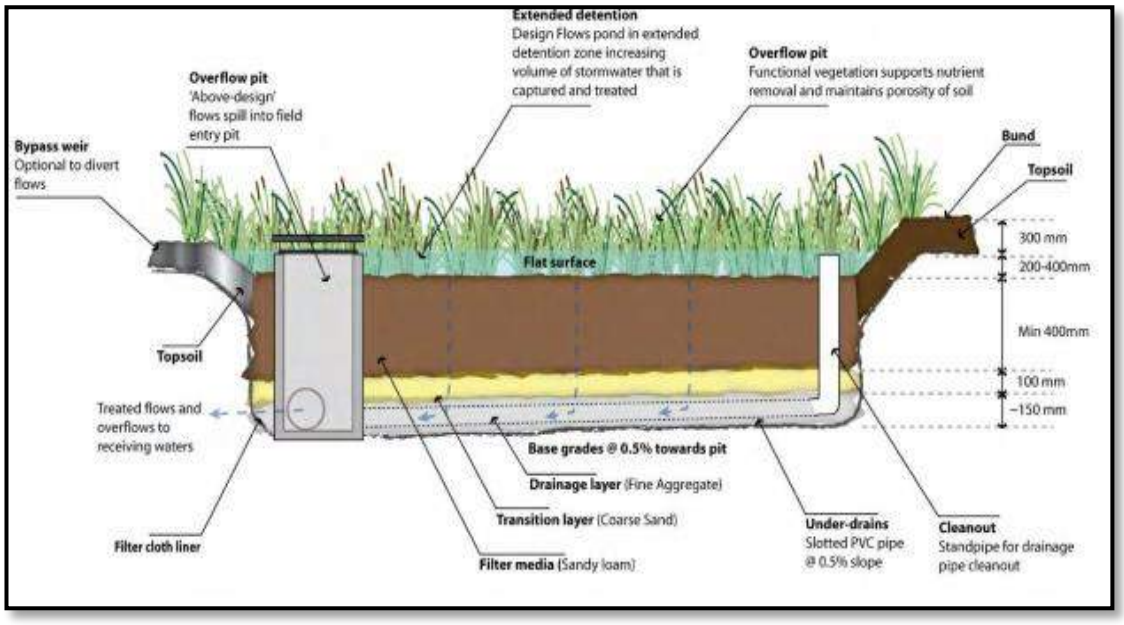


Figure 11-2 Example of Urban Bio-Retention Basin (Courtesy of Water by Design)

11.3 MODELLING OF THE DEVELOPED SITE (MUSIC)

Modelling of the site was undertaken using the 'Model for Urban Stormwater Improvement Conceptualisation (MUSIC)' as promoted by CoGC and the South East Queensland Healthy Waterways Partnership. The development was modelled using the split catchment approach. An appropriate type of land use was applied to all surface types within the developed catchments; where individual treatment devices were assigned the relevant modelling treatment parameters. Consequently, a treatment train was established for each the site, ensuring that water discharging from site adheres to the specified Water Quality Objectives.

Meteorological data for input into MUSIC was obtained from Beenleigh Bowls Station 40406 from the Bureau of Meteorology. Six minute time step rainfall data was obtained for the climate period from 1/1/1990 to 31/12/1999. The catchment parameters of the MUSIC modelling are specified within the South East Queensland Healthy Waterways Partnerships' Water by Design MUSIC Modelling Guidelines for South East Queensland Version 1 (2010), and have been modelled as such.

11.3.1 POLLUTANT SOURCE NODE DETAILS

The pollutant source node parameters input into the MUSIC model were determined using the South East Queensland Healthy Waterways Partnership's Water by Design MUSIC Modelling Guidelines for South East Queensland version 1 (2010), specifically Tables 3.7 and 3.8 for urban residential surface types. It is noted that all base flow parameters for roof surfaces are adopted as 0.00 or N/A. Landscape imperviousness was considered for ground areas to ensure an accurate representation of the pollutant generating areas.

A summary of the source nodes has been provided in Table 11-2 below. It is noted that the treatment area below is only for the proposed development catchment area (D1). The balance of site area (D2) will remain as per its existing conditions and will not be treated for stormwater quality. The small area of the new driveway and emergency exit footpath that is included in catchment D2 has been accounted for as bypass in the music model.

Table 11-2 Summary of MUSIC Source Nodes

MUSIC Source Node	Imperviousness (%)	Area (ha)
Urban Resi – ROOF (D1)	100	0.621
Urban Resi – GROUND (D1)	31	0.487
Urban Resi – ROAD (D1)	100	0.126
Urban Resi - ROAD BYPASS (D2)	100	0.013
Urban Resi – GROUND BYPASS (D2)	100	0.006

11.4 TREATMENT DEVICE DETAILS

Once the site is fully developed, the stormwater run-off from sub-catchments will be collected via a drainage system flowing into the treatment area which is located within the proposed detention basin located east of the new development pad and road. This basin operates offline to the overland flow paths that traverse through the site. It is noted that the proposed bio-retention area will be a saturated zone bio-retention basin. The basin has been modelled accordingly.

The modelling of the Bio retention system has been completed in compliance with the MUSIC Modelling Guidelines Version 1.0 – 2010 & MUSIC Modelling Guidelines November 2018. The Bio Retention treatment requirements are outlined below in Table 11-3.

Table 11-3 Saturated Bio Retention Requirements

Parameter	Bio-retention
Catchment Area (ha) to Basin	1.233
Minimum Filter Media Area (m²)	150
Batter Slope	1:3
Extended Detention Depth (m)	0.3
Minimum Filter Media Depth (m)	0.7
Drainage Layer Depths (m)	0.4
Saturated Hydraulic Conductivity (mm/hour)	200
Filter Media Total Nitrogen (mg/kg)	400
Filter Media Orthophosphate (mg/kg)	30
Sub-Merged Zone (m)	0.35

11.5 MUSIC MODEL LAYOUT AND RESULTS

Appropriate percentage impervious factors have been applied to all nodes according to Architectural layout in Appendix B. A diagrammatic view of the MUSIC model layouts and modelling results is presented in Figure 11-3 below:

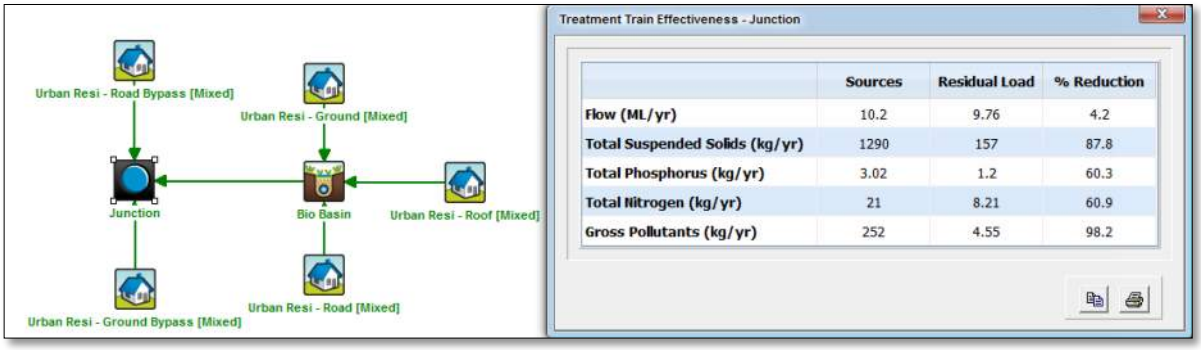


Figure 11-3 Music Model Layout and Results

12 STORMWATER QUALITY CONSTRUCTION PHASE

12.1 WATER QUALITY OBJECTIVES

Table 12-1 Construction Phase Quality Objectives (SPP and CoGC LDG)

Pollutant	Criteria
Drainage Control	Design life and design storm of temporary drainage works: **1.** Disturbed area open for <12 months—1 in 2 ARI; **2.** Disturbed area open for 12-24 months—1 in 5 ARI; **3.** Disturbed area open for > 24 months—1 in 10 ARI;
Erosion Control	**4.** Minimise exposure of disturbed soils at any time; **5.** Avoid or minimise large construction activities in the wet season; **6.** Divert water run-off from undisturbed areas around disturbed areas; and **7.** Use erosion risk ratings to determine appropriate erosion control measures.
Sediment Control	Use soil loss rates to determine appropriate sediment control measures Design storm for sediment control basins should be based on retaining the maximum sediment quantity for the maximum volume of water run-off Site discharge during sediment basin dewatering should not exceed 50 mg/L TSS and pH between 6.5–8.5
Stormwater Drainage / Flow Management	Hydraulics and hydrology—Take all reasonable and practicable measures to minimise significant changes to the natural waterway hydraulics and hydrology from: • peak flow for the one-year and 100-year ARI event (respectively for aquatic ecosystems and flood protection); • run-off frequency and volumes entering receiving waters; and • Uncontrolled release of contaminated stormwater.
Water Quality Outcomes	Stormwater flows from undisturbed and disturbed areas—manage to help protect environmental values Coarse sediment—coarse sediment is retained on site Fine sediment—Site discharge during sediment basin dewatering has a TSS concentration less than 50 mg/L Turbidity—Site discharge during sediment basin dewatering has a turbidity (NTU) less than 10% above receiving waters turbidity— measured immediately upstream of the site Nutrients (N & P)—Nitrogen and phosphorus are managed through sediment control. pH—Site discharge during sediment basin dewatering has a pH range 6.5–8.5 Litter and other waste—Prevent litter/waste entering the site, the stormwater system or watercourses that discharge from the site. Also minimise or sufficiently contain on-site litter and waste production and regularly clear waste bins Hydrocarbons and other contaminants—Hydrocarbons and other contaminants are prevented from entering the stormwater system or internal watercourses that discharge from the site. Wash down water—Wash down water is prevented from entering the stormwater system or internal watercourses that discharge from the site Cations and anions—Cations and anions including aluminium, iron and Sulfate are managed as required under an approved acid Sulfate soil management plan

Table 12-1 provides the construction phase stormwater quality objectives outline by the State Planning Policy. Additional relevant acts, policies and information that may be useful for construction phase planning include:

- Environmental Protection Act (1994);
- Environmental Protection (Water) Policy (2009);

- Queensland Development Code, Sediment and Erosion Control (2010); and
- Best Practice Erosion and Sediment Control for Building and Construction Sites Guidelines (2008).

12.2 EROSION AND SEDIMENT CONTROL PLAN PURPOSE

During the construction phase it shall be the Principal Contractor's responsibility to ensure the objectives of Table 12-1 are achieved.

The following section of this report provides a suggested framework for an Erosion and Sediment Control Plan. This includes recommended actions and responses for specific activities; monitoring and reporting; and construction of specifically designed site-specific sediment basins.

12.3 SPECIFIC ACTIVITIES

12.3.1 EROSION AND SEDIMENT CONTROL OF DISTRIBUTED LAND

During the construction phase it shall be the Principal Contractor's responsibility to ensure the following:

- Diversion of any clean water runoff that may interfere with land disturbance by the use of earth bunds, or other control devices deemed appropriate by a suitable supervisor;
- Reduction of sediment migration from disturbed land parcels by implementing silt fences, sediment basins or other control devices as deemed appropriate by a suitable supervisor;
- Where cut to fill operations produce a spoil it is recommended that the excess material be placed upstream of the excavation location to ensure any sediment runoff is directed back into the trench. Earth bunds or sediment fences may be required to control direction of sediment flow should the spoil be placed on the downstream side of the excavation site;
- Control measures such as a gully pit sediment barrier (see Arcadis drawings attached) shall be installed around inlet pits where required reducing the potential for sediment discharge into the surrounding stormwater system;
- Any sediment deposited from construction vehicles will be swept up and removed; and
- Erosion and sediment control devices may only be removed once disturbed lands which they are protecting are rehabilitated and capable of resisting further erosion.

12.3.2 SPOIL AND STOCKPILE MANAGEMENT

It shall be the Principal Contractor's responsibility to oversee the following controls during the construction phase unless otherwise specified:

- The placement of spoil and stockpile material shall be kept at a maximum distance from stormwater inlets, gutters and stormwater pipes to reduce unnecessary sediment migration into nearby infrastructure;
- Spoil and stockpile material shall be placed in a way that reduces the likelihood of sedimentation, erosion and slippage. Advice from an appropriate project manager/representative shall be sought in this instance;
- Spoil or stockpile material that is deemed a contaminant shall be placed on a designated zone of either fill material, plastic or concrete with the installation of appropriate containment devices. Advice from an appropriate project manager/representative shall be sought in this instance as the resulting control will be highly dependent on the severity of contamination; and

- It shall be the Project Manager's responsibility to foresee and develop appropriate control measures to prevent the impacts of spoil and stockpile material prior to construction activities. Monitoring and reporting shall also be required during the implementation of any given device associated with spoil and stockpile management.

12.3.3 EROSION CONTROL

It shall be the Principal Contractor's responsibility to oversee the following controls during the construction phase:

- Traffic of any type shall be kept away from areas of rehabilitation to promote stabilisation of the zone;
- Where wind and water are acknowledged as potential erosion sources temporary protection shall be installed. Such measures only apply to zones of spoil, stockpile and land disturbance which are unlikely to receive works within a period of 6-8 weeks. Further advice from an appropriate project manager/representative shall be sought in this instance as the resulting control will be highly dependent on the disturbance type and erosion source; and
- Once viable, final landscaping shall be undertaken on applicable zones to increase stability.

12.3.4 PERSONNEL TRAINING

It shall be the Principal Contractor's responsibility to oversee the following training protocols during the construction phase:

- Environmental management and incident reporting is to be included on all site induction courses; and
- All personnel are to receive adequate training in; work place health and safety issues, environmental management, best practice erosion and sediment control practices, incident reporting procedures and where applicable site inspection and maintenance procedures.

12.3.5 MISCELLANEOUS

- It is the Principal Contractor's responsibility to ensure erosion and sediment controls are operated and maintained in an effective operational condition. These structures are not allowed to accumulate sediment volume in excess of 70% sediment storage design capacity as per Section 6 of the Urban Stormwater Quality Planning Guidelines 2010;
- Sediment removed from control measures must be disposed of in a manner approved by the local Council that does not cause pollution and forms part of the Contractor's obligation;
- Any chemicals, fuel or oil stored on site shall be stored under cover in a bounded area or placed sufficiently above ground level to prevent contamination of surface water;
- A waste concrete receptor (disposal area) must be established if significant concreting is to occur on site. The site must be surrounded by perimeter bunds and be clearly signed; and
- A general waste collection area shall be established which is to include appropriate pollutant runoff controls, dependent on the nature of the waste.

12.4 PROJECT PERSONNEL RESPONSIBILITIES

A description of the key personnel involved with implementing the Erosion and Sediment Control Plan are listed in Table 10-12-2. It is recommended that all parties involved attend a pre-construction conference to discuss and clarify all issues associated with sediment and erosion control as well as this plan.

Table 10-12-2 Project Personnel Responsibilities

Project Role	Responsibilities
Superintendent	• Authorisation of this plan; and • Review and monitoring of this plan.
Contractor / Site Manager	• Implementation of this plan; • Monitoring of this plan; • Supervising any activities or requirements required by this plan; • Implementation of this plan; • Supervising any activities or requirements required by this plan; and • Ensuring all personnel are aware of the contractual agreements associated with this plan.
All Personnel	• Ensuring they are aware of the contractual agreements associated with this plan; and • Informing appropriate personnel of any issues that may arise with respect to the desired sediment and erosion control measures.

12.5 MONITORING AND RESPONSIBILITY

12.5.1 ALL PERSONNEL

It is the obligation of all personnel to report any failures in the erosion and sediment control works utilised during the projects life cycle. Any identified errors within the sediment and erosion control system shall be reported in writing to a relevant project manager. A formal inquiry shall be undertaken in accordance with the reported issue as well as the relevant party procedures (i.e. Principal Contractor).

12.5.2 CONTRACTOR/CONTRACTOR'S FOREMAN

It shall be the responsibility of the Contractor and Contractor's Foreman to monitor and report on the erosion and sediment control measures utilised in the construction phase. Inspections are to be undertaken:

- On a daily basis during earthworks, land disturbance, spoil or stockpile activities and rain events;
- Weekly during site inactivity; and
- Within 24 hours prior to expected rainfall and 18 hours prior to intense rainfall events.

The following shall be inspected or reported on:

- Erosion and sediment control devices are in the correct location and are working as defined by this plan;
- Drainage systems both internal and external to the site are operating effectively or to pre-construction efficiencies;
- Spilled material is removed if it can potentially mobilise via stormwater runoff or wind;
- Stabilisation of disturbed land parcels has been undertaken in an effective manner;
- Excess sediment has been removed from erosion and sediment measures appropriately if the device is operation ineffectively or requires decommissioning.; and
- It is understood that repairs, maintenance or reinstallation may be required if any control measures are operating inadequately, or if infrastructure is damaged due to inefficient operation of the outlined measures.

12.5.3 ENVIRONMENTAL REPRESENTATIVE

It shall be the responsibility of the environment representative to periodically inspect and report on the effectiveness of the erosion and sediment controls during the construction phase of the project. Technical advice shall be given to personnel outlying any uncertainty with regards to the; applicability, installation, operation, maintenance, removal or rehabilitation of any sediment and erosion control.

12.6 CONSTRUCTION PHASE SEDIMENT CONTROL DEVICES

As the site has been assessed as on catchments, it is appropriate to approach the assessment of construction phase sediment devices in a similar manner.

In accordance with the Best Practice Erosion and Sediment Control Manual (ICEA 2009) the construction phase catchment has been classified to determine the level of sediment and erosion control techniques required. The site is identified as per Table 4.4.6 (ICEA 2009) to be closest to the Southport locality and therefore attracts an average monthly rainfall depth of 56m to 205mm.

As the extent of soil disturbance is widespread, Type 2 techniques will be used in accordance with Table 4.5.3. This will require control techniques such as a vehicle shakedown at the site entry, sediment fences, sediment basins and check dams. Mulching and turf lining will also be used to help reduce erosion of the site during construction. It would be also be prudent to provide instream treatment for the overland flow paths when they are being reshaped to ensure that during any rain events the channels are adequately protected.

Detailed explanations of the measures can be found in the engineering drawings in Appendix B.

13 ASSET HANDOVER

All the stormwater quantity and quality controls detailed in this document are contained within the development site and will remain an asset of the development's property owner, Body Corporate or similar internal authority.

Regular maintenance of the stormwater quality treatment devices will be undertaken by the body corporate to ensure the continuing performance of the stormwater quality treatment train.

Additional information including standard integration drawings and maintenance requirements can be found in Appendix F.

14 CONCLUSION

This SBSMP has been prepared to provide a design proposal and guide to the stormwater quantity and quality management techniques for the proposed development.

The primary objectives of this Site Based Stormwater Management Plan (SBSMP) are achieved as follows:

Lawful Point of Discharge

The site proposes to discharge to Old Coach Road Culvert System via overland flow, after receiving the necessary quality and quantity treatment. All stormwater will be will be discharged directly via overland flow to existing overland flow paths traversing through the site to the point of discharge, as is the current situation.

External Conveyance

2015 City Plan Flood Overlay Map – 5 indicates that the site is not subject to regional flooding however external catchment flows are conveyed through the site via two existing overland flow path. Yaun Creek traverse the site from south to north along the site's eastern boundary. A overland flow path traverses the site along the northern boundary running west to east joining Yaun Creek just upstream of the Old Coach Road culvert crossing. This report includes hydraulic assessment of these two overland flow paths showing that proposed development will safely convey flows up to the 1% AEP whilst still maintain existing conditions at the site boundary. It is noted that the proposed development complies with Table 8.2.8-6 of the Planning scheme which requires *Homes for the aged, Hospice* to have designated flood level of 0.5% AEP + 400mm of freeboard.

Stormwater Quantity

This report includes stormwater quantity calculations which demonstrate an increase in peak flow rates to the point of discharge from the proposed development if left unattenuated, due to the change in stormwater catchment parameters. A detention basin has been designed to attenuate developed peak flow rates to no greater than existing peak flow rates up to the design 1% AEP. A detention basin of volume 671m³ with a carefully designed outlet system is proposed to be located in the south-eastern corner of the site, external to the overland flow path, to attenuate developed flows to existing peak discharge conditions.

Stormwater Quality

The stormwater quality assessment demonstrates that a specially tailored treatment system will be required in order to meet the pollutant removal targets of CoGC during the operational phase of the proposed development. The proposed treatment system involves the use of a saturated zone bio retention basin with 150m² of filter media area. All the stormwater quality controls detailed in this document are contained within the development site and will remain a private asset. Regular maintenance of the treatment devices must be undertaken to ensure the continuing performance of the stormwater quality treatment train.

Waterway Stability

This has been achieved by complying with Stormwater Quantity objectives for the 63% AEP flow.

Erosion and Sediment Control

Construction phase sediment control devices are to be implemented during construction works in accordance with requirements associated with Type 2 sediment discharge zones, comprising of a vehicle shakedown, sediment fences, sediment basin. It has been recommended during the reshaping of the existing overland flow paths that instream erosion and sediment control measures be adopted.

APPENDIX A

SITE SURVEY



⚠ General Notes

This Plan has been prepared for the Client under specific instructions as per the Job Number & date of this plan. It is suitable for the purposes of Engineering Design only and is not to be used by any other person or corporation or for any other purpose, and is subject to the following limitations:

1) The boundaries shown hereon have been determined from plan dimensions only and not by field survey. No search has been undertaken for Easements or other encumbrances on Title.

2) Services have been located from visible indicators & relevant Authority records. Prior to any demolition, excavation or construction, relevant Authorities should be contacted for the possible location of further services and detailed location of all services.

3) Legend
1. Sewer
2. Water
Potable Water
3. Stormwater
4. O/head Commun
5. U/ground Commun
NBN Commun
6. O/head Fibre Optic
7. U/ground Fibre Optic
8. O/head Electricity
9. U/ground Electricity
10. Gas
11. Top of Bank
12. Toe of Bank

4) These notes form an integral part of this plan and no part of this plan may be reproduced in whole or in part without these notes.

AMENDMENTS

DESCRIPTION	DATE

SCHLENCKER SURVEYING (QLD)
Gold Coast ♦ Brisbane
Consultants in Surveying, Mapping & Development

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Fax: (07) 5573 6755
Mob.: 0413 945 959
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DETAIL & LEVEL SURVEY

Lot 58 on SP191940

GOLD COAST CITY COUNCIL
202 BAILEYS MOUNTAIN ROAD,
UPPER COOMERA.

Level Datum : AHD Derived
Level Origin - PSM 158725 RL 33.689
Contours at 0.5m intervals.

SURVEYED		DATE	
SPR & TB		6/12/2017	
DRAWN	DATE	CHECKED	DATE
KDC	19.12.2017	KWB	20.12.2017
SCALE		DWG. NO.	
1:500		17141-01	

Scale 1:500 @ A1 paper size - Lengths are in Metres.

5 0 5 10 15 20 25 30 35 40 45 50 55 60 65 70

TREE DETAILS


9773


2887


2909


2915


2830


9717


9692


9612


2824


2835

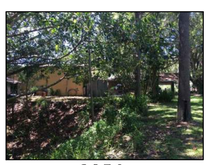

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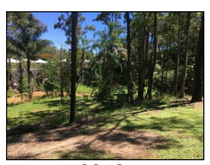

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9633


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2859


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2848

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SURVEYED		DATE	
SPR & TB			6/12/2017
DRAWN	DATE	CHECKED	DATE
KDC	19.12.2017	SPR	.....
SCALE 1:500		DWG. NO. 17141–01	

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APPENDIX B

ENGINEERING DRAWINGS

590
SP 218180

BAILEYS MOUNTAIN ROAD

OLD COACH ROAD

183
SP 156422

E
58
SP 214370

57
SP 214370

RESERVE ROAD

2 x Ø375 RCP

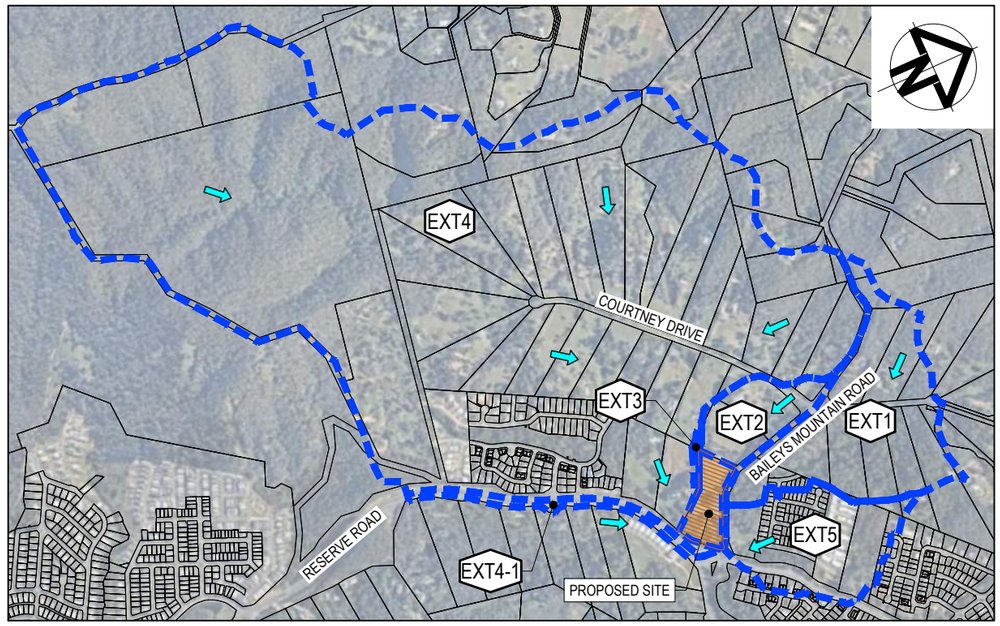
2 x Ø1300 RCP

2 x 1400 x 800 RCBC

Ø675 MS

5 x 2700 x 1800 RCBC

Ø1200 RCP



EXTERNAL CATCHMENT

SCALE : 1 : 10000

NOTES

1. AERIAL IMAGERY COURTESY OF NEARMAP.

CATCHMENT	AREA (ha)	IMPERVIOUSNESS (%)
E	3.087	3
EXT1	26.675	15
EXT2	7.758	20
EXT3	0.414	20
EXT4	242.844	15
EXT4-1	2.339	95
EXT5	16.425	60

LEGEND

- STORMWATER CATCHMENT BOUNDARY
- OVERLAND FLOW DIRECTION
- E1 CATCHMENT LABEL
- 5.0 EXISTING SURFACE CONTOURS
- SWD EXISTING STORMWATER DRAINAGE
- S EXISTING SEWERAGE RETICULATION
- W EXISTING WATER RETICULATION
- R EXISTING RECYCLED WATER RETICULATION
- oh EXISTING OVERHEAD ELECTRICAL
- e EXISTING UNDER GROUND ELECTRICAL
- g EXISTING GAS RETICULATION
- SITE BOUNDARY

Issue	Description	By	Ckd	RPEQ	Date
01	ORIGINAL ISSUE	NF	AS		26.07.18

100% Issue on Original

Scale
0 5 10 20 30 40 50m
1 : 500
0 100 200 400 600 800 1000m
1 : 10000

Surveyor: SCHLENCKER SURVYING

Architect: BDA ARCHITECTURE

Client: SANDSON PTY LTD

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved — R.P.E.Q. No.:

Scales: 1:500 1:10000 — Original Issue Signatures

Original Size: A1

Height Datum: AHD

Grid

Drawn: N. FAHEY

Designed: A. SHEPHERD

Project Manager: J. STOCKWELL

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Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: PRE DEVELOPED STORMWATER CATCHMENT PLAN

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Drawing No. DA-00-301 — Project No. 10022603 — Issue 01

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LEGEND

- STORMWATER CATCHMENT BOUNDARY
- OVERLAND FLOW DIRECTION
- D1 — CATCHMENT LABEL
- INTERNAL FLOW DIVERSION CHANNEL
- EXTERNAL FLOW DIVERSION CHANNEL
- BIORETENTION / DETENTION BASIN
- BIORETENTION FILTRATION AREA
- 5.0 — PROPOSED SURFACE CONTOURS
- 5.0 — EXISTING SURFACE CONTOURS
- PROPOSED RETAINING WALL
- SWD — EXISTING STORMWATER DRAINAGE
- S — EXISTING SEWERAGE RETICULATION
- W — EXISTING WATER RETICULATION
- R — EXISTING RECYCLED WATER RETICULATION
- oh — EXISTING OVERHEAD ELECTRICAL
- e — EXISTING UNDER GROUND ELECTRICAL
- g — EXISTING GAS RETICULATION
- STAGE BOUNDARY
- 31 ENVIRONMENTAL BUFFER

NOTES

1. AERIAL IMAGERY COURTESY OF NEARMAP.
2. PROPOSED INFRASTRUCTURE SUBJECT TO DETAILED DESIGN (OPERATIONAL WORKS), COUNCIL APPROVAL AND BUILDING HYDRAULIC DESIGN.
3. REFER TO DA-00-381 FOR BIORETENTION / DETENTION BASIN DETAILS.

CATCHMENT	AREA (ha)	IMPERVIOUSNESS (%)
D1	1.231	75
D2	1.856	2

POST DEVELOPED STORMWATER QUALITY TABLE

CATCHMENT AREA (ha) TO BASIN	1.233
MINIMUM FILTER MEDIA AREA (m²)	150
BATTER SLOPE	1:3
EXTENDED DETNENTION DEPTH (m)	0.3
MINIMUM FILTER MEDIA DEPTH (m)	0.7
DRAINAGE LAYER DEPTHS (m)	0.4
SATURATED HYDRAULIC CONDUCTIVITY	200
FILTER MEDIA TOTAL NITROGEN (g/kg)	400
FILTER MEDIA ORTHOPHOSPHATE (g/kg)	30
SUB-MERGED ZONE (m)	0.35

590
SP 218180

183
SP 156422

57
SP 214370

BAILEYS MOUNTAIN ROAD

OLD COACH ROAD

RESERVE ROAD

CULVERT CROSSING

2 x Ø375 RCP

2 x Ø1300 RCP

2 (1400) 800 RCBC

5 (2700) 1800 RCBC

Ø675 MS

Ø1200 RCP

3m WIDE 1in4 BASIN ACCESS

D1

D2

DIVERSION CHANNELS. REFER TO STORMWATER MANAGEMENT REPORT FOR DETAILS.

SMALL SUB-CATCHMENT OF D2 (0.05Ha) THAT FLOWS TOWARDS D1. DIVERSION CHANNEL TO THAT DIVERTS IT TO YUAN CREEK. DETAILS OF CHANNEL CAN BE FOUND IN REPORT

TRAINING FACILITY SUSPENDED WITH PIERS ABOVE STORMWATER BASIN. IT IS NOTED THE BIO-RETENTION FILTER MEDIA AREA DOES NOT EXTEND BENEATH SUSPENDED BUILDING.

GIVE WAY ROUNDABOUT AHEAD

FUTS

Issue	Description	By	Ckd	RPEQ	Date
02	RFI RESPONSE	NF	AS		01.07.19
01	ORIGINAL ISSUE	NF	AS		26.07.18

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100mm on Original

Surveyor: SCHLENCKER SURVYING

Architect: BDA ARCHITECTURE

Filename: Da00305-10022603-gcd-PostDevStormWaterCatch.dwg

Client: SANDSON PTY LTD

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved — R.P.E.Q. No.:

Scales	1:500	Original Issue Signatures	
Original Size	A1	Drawn N. FAHEY	
Height Datum	AHD	Designed A. SHEPHERD	
Grid		Project Manager J. STOCKWELL	
		© Copyright reserved	

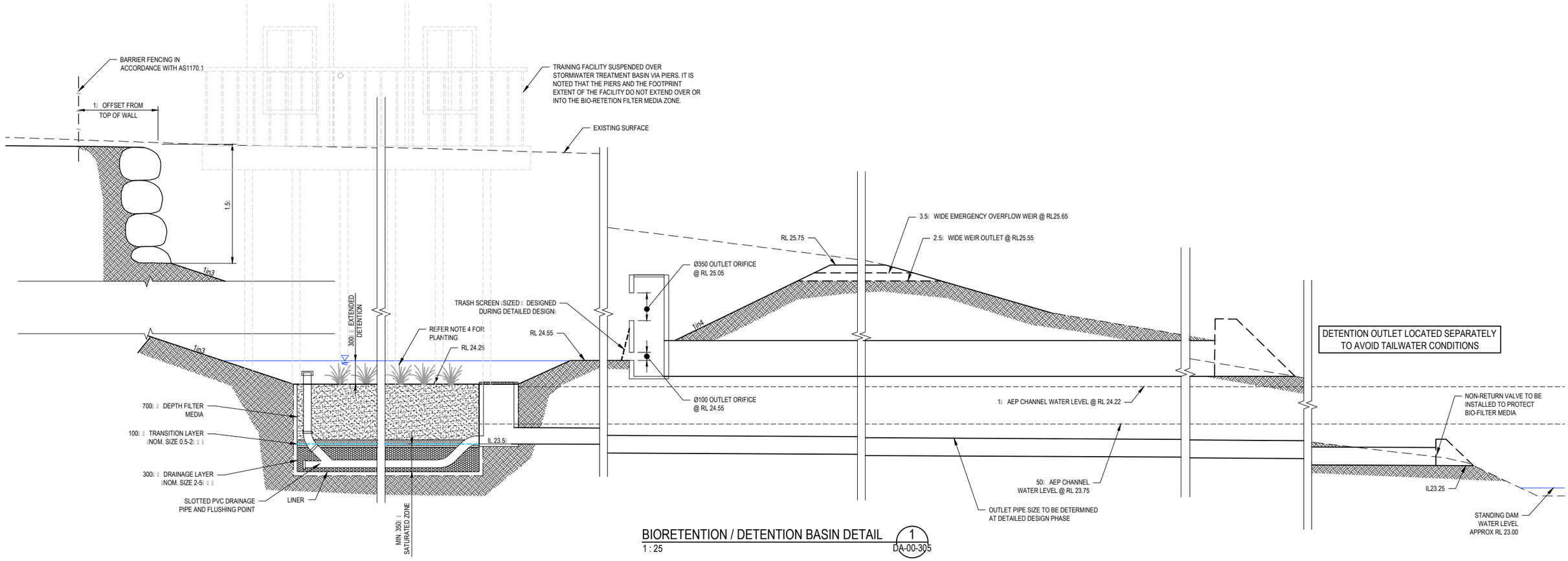
Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: POST DEVELOPED STORMWATER CATCHMENT PLAN

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Drawing No. DA-00-305 — Project No. 10022603 — Issue 02

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BIORETENTION / DETENTION BASIN DETAIL (1 / DA-00-305)
1 : 25

Issue	Description	By	Ckd	RPE	Date
02	ORIGINAL ISSUE	AS	DC		01.07.19
01	ORIGINAL ISSUE	NF	AS		26.07.18

Scale: 0 0.5 1 1.5 2 2.5m — 1 : 25

Surveyor: SCHLENCKER SURVYING

Architect: BDA ARCHITECTURE

Filename: Da00381-10022603-gcd-BasinDetails.dwg

Client: SANDSON PTY LTD

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved | R.P.E. No:

Scales	1:25	Original Issue Signatures	
Original Size	A1	Drawn N. FAHEY	
Height Datum	AHD	Designed A. SHEPHERD	
Grid		Project Manager M. STOCKWELL	
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Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: BIORETENTION / DETENTION BASIN DETAILS

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Drawing No.	Project No.	Issue
DA-00-381	10022603	02

100mm on Original

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LEGEND

- SF — SILT FENCE
- CHEC — SAND BAG CHEC DAM
- CONSTRUCTION ENTRY/EXIT PAD
- SP — SEDIMENT POND
- DIVERSION CHANNEL
- 5.0 — PROPOSED SURFACE CONTOURS
- 5.0 — EXISTING SURFACE CONTOURS
- PROPOSED RETAINING WALL
- SWD — EXISTING STORMWATER DRAINAGE
- S — EXISTING SEWERAGE RETICULATION
- W — EXISTING WATER RETICULATION
- R — EXISTING RECYCLED WATER RETICULATION
- oh — EXISTING OVERHEAD ELECTRICAL
- e — EXISTING UNDER GROUND ELECTRICAL
- g — EXISTING GAS RETICULATION
- SITE BOUNDARY
- 31 ENVIRONMENTAL BUFFER

NOTES

1. AERIAL IMAGERY COURTESY OF NEARMAP.
2. PROPOSED INFRASTRUCTURE SUBJECT TO DETAILED DESIGN OPERATIONAL WORKS, COUNCIL APPROVAL AND BUILDING HYDRAULIC DESIGN.
3. REFER TO DA-00-125 DA-00-126 FOR EROSION SEDIMENT CONTROL DETAILS.
4. SEDIMENT POND SIZING TO BE DETERMINED AT DETAILED DESIGN PHASE.

590
SP 218180

183
SP 156422

57
SP 214370

BAILEYS MOUNTAIN ROAD

OLD COACH ROAD

RESERVE ROAD

WORKS IN OVERLAND FLOW TO BE STABILISED IMMEDIATELY FOLLOWING COMPLETION

CLEAN WATER DIVERSION CHANNELS AROUND SITE

5m SPACING TYP.

GIVE WAY ROUNDABOUT SIGN

Issue	Description	By	Ckd	RPEQ	Date
02	AMENDED FOR RFI	NF	AS		01.07.19
01	ORIGINAL ISSUE	NF	AS		26.07.18

Scale: 0 5 10 20 30 40 50m — 1 : 500

Surveyor: SCHLENCKER SURVYING

Architect: BDA ARCHITECTURE

Filename: Da00121-10022603-gcd-EscPlan.dwg

Client: SANDSON PTY LTD

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved — RPEQ No:

Scales	1:500	Original Issue Signatures	
		Drawn N. FAHEY	
Original Size	A1	Designed A. SHEPHERD	
Height Datum	AHD	Project Manager S. STOCKWELL	
Grid		© Copyright reserved	

Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: CONCEPT EROSION SEDIMENT CONTROL PLAN

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Drawing No.	Project No.	Issue
DA-00-121	10022603	02

100mm on Original

F:10022603\E-CAD\C-Civil\C-Concept\da00121-10022603-gcd-EscPlan.dwg 1/11/2019 3:43 PM V1

SITE ACCESS

1. PRIOR TO THE COMMENCEMENT OF SITE WOR S, THE LOCATION OF THE SITE ACCESS POINT S MUST BE VERIFIED WITH THE RELEVANT REGULATORY AUTHORITY.
2. SITE ACCESS MUST BE RESTRICTED TO THE MINIMUM PRACTICAL NUMBER OF LOCATIONS.
3. SITE EXIT POINTS MUST BE APPROPRIATELY MANAGED TO MINIMISE THE RIS OF SEDIMENT BEING TRAC ED ONTO SEALED, PUBLIC ROADWAYS.
5. INSTALL SEDIMENT FENCING /OR BARRIER FENCING TO CONFINE INGRESS TO EGRESS FROM THE SITE TO STABILISED ACCESS POINTS ONLY.
4. STORMWATER RUNOFF FROM ACCESS ROADS STABILISED ENTRY/EXIT POINTS MUST DRAIN TO AN APPROPRIATE SEDIMENT CONTROL DEVICE.

CONSTRUCTION EXIT - ROC PAD

MATERIALS:

1. ROC : WELL GRADED, HARD, ANGULAR, EROSION RESISTANT ROC , NOMINAL DIAMETER OF 50 TO 75 SMALL DISTURBANCES OR 100 TO 150 LARGE DISTURBANCES. ALL REASONABLE MEASURES MUST BE TA EN TO OBTAIN ROC OF NEAR UNIFORM SIZE.
2. FOOTPATH STABILISING AGGREGATE: 25 TO 50 GRAVEL OR AGGREGATE.
3. GEOTEXTILE FABRIC: HEAVY-DUTY, NEEDLE -PUNCHED, NON-WOVEN FILTER CLOTH BIDIM A24 OR E UIVALENT.

INSTALLATION:

1. CLEAR THE LOCATION OF THE ROC PAD, REMOVING STUMPS, ROOTS OTHER VEGETATION TO PROVIDE A FIRM FOUNDATION SO THAT THE ROC IS NOT PRESSED INTO SOFT GROUND. CLEAR SUFFICIENT WIDTH TO ALLOW PASSAGE OF LARGE VEHICLES, BUT CLEAR ONLY THAT NECESSARY FOR THE EXIT. DO NOT CLEAR AD ACENT AREAS UNTIL THE RE UIRED EROSION SEDIMENT CONTROL DEVICES ARE IN PLACE.
2. IF THE EXPOSED SOIL IS SOFT, PLASTIC OR CLAYEY, PLACE A SUB-BASE OF CRUSHED ROC OR A LAYER OF HEAVY-DUTY FILTER CLOTH TO PROVIDE A FIRM FOUNDATION.
3. PLACE THE ROC PAD FORMING A MINIMUM 200 THIC LAYER OF CLEAN, OPEN-VOID ROC .
4. IF THE ASSOCIATED CONSTRUCTION SITE IS UP-SLOPE OF THE ROC PAD, THUS CAUSING STORMWATER RUNOFF TO FLOW TOWARD THE ROC PAD, THEN FORM A MINIMUM 300 HIGH FLOW CONTROL BERM ACROSS THE ROC PAD TO DIVERT SUCH RUNOFF TO A SUITABLE SEDIMENT TRAP.
5. THE LENGTH OF THE ROC PAD SHOULD BE AT LEAST 15 WHERE PRACTICABLE, AS WIDE AS THE FULL WIDTH OF THE ENTRY OR EXIT AT LEAST 3 . THE ROC PAD SHOULD COMMENCE AT THE EDGE OF THE OFF-SITE SEALED ROAD OR PAVEMENT.
6. FLARE THE END THE ROC PAD WHERE IT MEETS THE PAVEMENT SO THAT THE WHEELS OF TURNING VEHICLES DO NOT TRAVEL OVER UNPROTECTED SOIL.
7. IF THE FOOTPATH IS OPEN TO PEDESTRIAN MOVEMENT, THEN COVER THE COARSE ROC WITH FINE AGGREGATE OR GRAVEL, OR OTHERWISE TA E WHATEVER MEASURES ARE NEEDED TO MA E THE AREA SAFE.

SOIL STOC PILE MANAGEMENT

1. TOPSOIL SHALL BE STRIPPED STOC PILED FOR LATER USE ONSITE.
2. ALL REASONABLE PRACTICABLE MEASURES MUST BE TA EN TO OBTAIN THE MAXIMUM BENEFIT FROM EXISTING TOPSOIL, INCLUDING:
   i. WHERE THE PROPOSED AREA OF SOIL DISTURBANCE DOES NOT EXCEED 2500m², & THE TOPSOIL DOES NOT CONTAIN UNDESIRABLE WEED SEED, THE TOP 100 OF SOIL LOCATED WITHIN AREAS OF PROPOSED SOIL DISTURBANCE INCLUDING STOC PILE AREAS MUST BE STRIPPED STOC PILED SEPARATELY FROM THE REMAINING SOIL.
   ii. WHERE THE PROPOSED AREA OF SOIL DISTURBANCE EXCEEDS 2500m², & THE TOPSOIL DOES NOT CONTAIN UNDESIRABLE WEED SEED, THE TOP 50 OF SOIL MUST BE STRIPPED STOC PILED SEPARATELY FROM THE REMAINING TOPSOIL, SPREAD AS A FINAL SURFACE SOIL.
   iii. IN AREAS WHERE THE TOPSOIL CONTAINS UNDESIRABLE WEED SEED, THE AFFECTED SOIL MUST BE SUITABLY BURIED OR REMOVED FROM THE SITE.
3. STOC PILES OF ERODIBLE MATERIAL THAT HAS THE POTENTIAL TO CAUSE ENVIRONMENTAL HARM IF DISPLACED, MUST BE:
   i. APPROPRIATELY PROTECTED FROM WIND, RAIN, CONCENTRATED SURFACE FLOW EXCESSIVE UP-SLOPE STORMWATER SURFACE FLOWS.
   ii. LOCATED AT LEAST 2M PREFERABLY 5M FROM ANY HAZARDOUS AREA, RETAINED VEGETATION, ROADS CONCENTRATED WATER FLOW.
   iii. LOCATED UP-SLOPE OF AN APPROPRIATE SEDIMENT CONTROL SYSTEM.
   iv. PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER SYNTHETIC, MULCH OR VEGETATIVE IF THE MATERIALS ARE LI ELY TO BE STOC PILED FOR MORE THAN 28 DAYS.
   v. PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER SYNTHETIC, MULCH OR VEGETATIVE IF THE MATERIALS ARE LI ELY TO BE STOC PILED FOR MORE THAN 10 DAYS DURING THOSE MONTHS THAT HAVE A HIGH EROSION RIS .
   vi. PROVIDED WITH AN APPROPRIATE PROTECTIVE COVER SYNTHETIC, MULCH OR VEGETATIVE IF THE MATERIALS ARE LI ELY TO BE STOC PILED FOR MORE THAN 5 DAYS DURING THOSE MONTHS THAT HAVE AN EXTREME EROSION RIS .
4. A SUITABLE FLOW DIVERSION SYSTEM MUST BE ESTABLISHED IMMEDIATELY UP-SLOPE OF A STOC PILE OF ERODIBLE MATERIAL THAT HAS THE POTENTIAL TO CAUSE ENVIRONMENTAL HARM IF DISPLACED, IF THE UP-SLOPE CATCHMENT AREA DRAINING TO THE STOCKPILE EXCEEDS 1500m².

FILTER SOC S-CONCENTRATED FLOW

MATERIALS:

1. SOC S: MINIMUM Ø200mm SYNTHETIC OR BIODEGRADABLE TUBES MANUFACTURED FROM NON-WOVEN OR COMPOSITE FABRIC SUITABLE FOR THE "FILTRATION" OF COURSE SEDIMENT.
2. FILL MATERIALS: STRAW, CANE MULCH, COMPOSTED MATERIAL AS4454, COARSE SAND, OR CLEAN AGGREGATE

INSTALLATION:

1. ENSURE THE SOC S ARE PLACED INDIVIDUALLY OR COLLECTIVELY AS A SINGLE SEDIMENT TRAP SUCH THAT:
   i. LEA AGE AROUND OR UNDER THE SOC S IS MINIMISED
   ii. AD OINING SOC S ARE TIGHTLY BUTTED OR OVERLAPPED AT LEAST 450 .
   iii. THE SURFACE AREA OF POTENTIAL WATER PONDING UP-SLOPE OF EACH SEDIMENT TRAP IS MAXIMISED.
   iv. TO THE MAXIMUM DEGREE PRACTICAL, ALL SEDIMENT-LADEN WATER WILL PASS THROUGH THE FORMED POND BEFORE FLOWING OVER THE DOWN-SLOPE END OF THE SEDIMENT TRAP.

DRAINAGE CONTROL

1. WHEREVER REASONABLE PRACTICABLE, STORMWATER RUNOFF ENTERING THE SITE FROM EXTERNAL AREAS, NON-SEDIMENT LADEN /CLEAN STORMWATER RUNOFF ENTERING A WOR AREA OR AREA OF SOIL DISTURBANCE, MUST BE DIVERTED AROUND OR THROUGH THAT AREA IN A MANNER THAT MINIMISES SOIL EROSION THE CONTAMINATION OF THAT WATER FOR ALL DISCHARGES UP TO THE SPECIFIED DESIGN STORM DISCHARGE.
2. DURING THE CONSTRUCTION PERIOD, ALL REASONABLE PRACTICABLE MEASURES MUST BE IMPLEMENTED TO CONTROL FLOW VELOCITIES IN SUCH A MANNER THAT PREVENTS SOIL EROSION ALONG DRAINAGE PATHS AT THE ENTRANCE EXIT OF ALL DRAINS DRAINAGE PIPES DURING ALL STORMS UP TO THE RELEVANT DESIGN STORM DISCHARGE.
3. TO THE MAXIMUM DEGREE REASONABLE PRACTICABLE, ALL WATERS DISCHARGED DURING THE CONSTRUCTION PHASE MUST DISCHARGE ONTO STABLE LAND, IN A NON-EROSIVE MANNER, AT A LEGAL POINT OF DISCHARGE.
4. DURING THE CONSTRUCTION PERIOD, ROOF WATER MUST BE MANAGED IN A MANNER THAT MINIMISES SOIL EROSION THROUGHOUT THE SITE, SITE WETNESS WITHIN ACTIVE WOR AREAS.

EROSION CONTROL

1. THE APPLICATION OF LI UID-BASED DUST SUPPRESSION MEASURES MUST ENSURE THAT SEDIMENT-LADEN RUNOFF RESULTING FROM SUCH MEASURES DOES NOT CREATE A TRAFFIC OR ENVIRONMENTAL HAZARD.
2. ALL TEMPORARY EARTH BAN S, FLOW DIVERSION SYSTEMS, EMBAN MENTS ASSOCIATED WITH CONSTRUCTED SEDIMENT BASINS MUST BE MACHINE-COMPACTED, SEEDED MULCHED FOR THE PURPOSE OF ESTABLISHING A TEMPORARY VEGETATIVE COVER WITHIN 10 DAYS AFTER GRADING.
3. UNPROTECTED SLOPE LENGTHS MUST NOT EXCEED 80M, OR AN E UIVALENT VERTICAL FALL OF 3M.
4. THE CONSTRUCTION STABILISATION OF EARTH BATTERS STEEPER THAN 6:1 (H:V) MUST BE STAGED SUCH THAT NO MORE THAN 3 VERTICAL-METRES OF ANY BATTER IS EXPOSED TO RAINFALL AT ANY INSTANT.
5. SYNTHETIC REINFORCED EROSION CONTROL MATS BLAN ETS MUST NOT BE PLACED WITHIN, OR AD ACENT TO, RIPARIAN ZONES WATERCOURSES IF SUCH MATERIALS ARE LI ELY TO CAUSE ENVIRONMENTAL HARM TO WILDLIFE OR WILDLIFE HABITATS.
6. A MINIMUM 60 GROUND COVER MUST BE ACHIEVED ON ALL NON-COMPLETED EARTHWOR S EXPOSED TO ACCELERATED SOIL EROSION IF FURTHER CONSTRUCTION ACTIVITIES OR SOIL DISTURBANCES ARE LI ELY TO BE SUSPENDED FOR MORE THAN 30 DAYS DURING THOSE MONTHS WHEN THE EXPECTED RAINFALL IS LESS THAN 30 MINIMUM 70 COVER WITHIN 30 DAYS IF BETWEEN 30 45 MINIMUM 70 COVER WITHIN 20 DAYS IF BETWEEN 45 100 MINIMUM 75 COVER WITHIN 10 DAYS IF BETWEEN 100 225 MINIMUM 80 COVER WITHIN 5 DAYS IF GREATER THAN 225 . ALTERNATIVE TO ABOVE

EROSION CONTROL MAT LINING

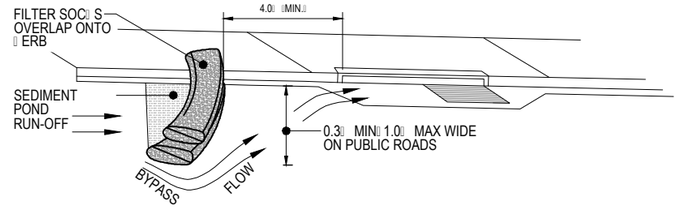
1. EROSION CONTROL MATS MUST BE STORED AWAY FROM DIRECT SUNLIGHT OR COVERED WITH ULTRAVIOLET PROTECTIVE SHEETING UNTIL THE SITE IS READY FOR THEIR INSTALLATION.
2. VEHICLES CONSTRUCTION E UIPMENT MUST NOT BE PERMITTED TO MANEUVER OVER THE MATTING UNLESS IT HAS BEEN COVERED WITH A LAYER OF SOIL OR GRAVEL AT LEAST 150 THIC .
3. IF THE CHANNEL IS TO BE GRASSED, PREPARE A SMOOTH SEED BED OF APPROXIMATELY 75 OF TOPSOIL, SEED, FERTILISE, WATER RA E TO REMOVE ANY REMAINING SURFACE IRREGULARITIES.
4. EXCAVATE A 300 DEEP BY 150 WIDE ANCHOR TRENCH ALONG THE FULL WIDTH OF THE UPSTREAM END OF THE AREA TO BE TREATED.
5. AT LEAST 300 OF THE MAT MUST BE ANCHORED INTO THE TRENCH WITH THE ROLL OF MATTING RESTING ON THE GROUND UP-SLOPE OF THE TRENCH.
6. WHEN SPREADING THE MATS, AVOID STRETCHING THE FABRIC. THE MATS SHOULD REMAIN IN GOOD CONTACT WITH THE SOIL.
7. THE INSTALLATION PROCEDURE MUST ENSURE THAT THE MAT ACHIEVES RETAINS GOOD CONTACT WITH THE SOIL.
8. DAMAGED MATTING MUST BE REPAIRED OR REPLACED.

TURF LINED

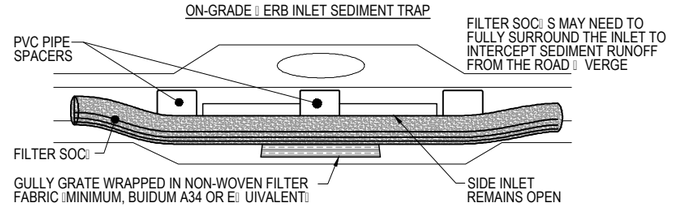
1. TURF SHOULD BE USED WITHIN 12 HOURS OF DELIVERY, OTHERWISE ENSURE THE TURF IS STORED IN CONDITIONS APPROPRIATE FOR THE WEATHER CONDITIONS (e.g. A SHADED AREA).
2. MOISTENING THE TURF AFTER IT IS UNROLLED WILL HELP MAINTAIN ITS VIABILITY.
3. TURF SHOULD BE LAID ON A MINIMUM 75 BED OF ADE UATELY FERTILISED TOPSOIL. RA E THE SOIL SURFACE TO BREA THE CRUST UST BEFORE LAYING THE TURF.
4. DURING THE WARMER MONTHS, LIGHTLY IRRIGATE THE SOIL IMMEDIATELY BEFORE LAYING THE TURF.
5. ENSURE THE TURF IS NOT LAID ON GRAVEL, HEAVILY COMPACTED SOILS, OR SOILS THAT HAVE BEEN RECENTLY TREATED WITH HERBICIDES.
6. ENSURE THE TURF EXTENDS UP THE SIDES OF THE DRAIN AT LEAST 100 ABOVE THE ELEVATION OF THE CHANNEL INVERT, OR AT LEAST TO A SUFFICIENT ELEVATION TO FULLY CONTAIN EXPECTED CHANNEL FLOW.
7. ON CHANNEL GRADIENTS OF 3:1(H:V) OR STEEPER, OR IN SITUATIONS WHERE HIGH FLOW VELOCITIES (i.e. VELOCITY 1.5 /s) ARE LI ELY WITHIN THE FIRST TWO WEE FOLLOWING PLACEMENT, SECURE THE INDIVIDUAL TURF STRIPS WITH WOODEN OR PLASTIC PEGS.
8. ENSURE THAT INTIMATE CONTACT IS ACHIEVED MAINTAINED BETWEEN THE TURF THE SOIL SUCH THAT SEEPAGE FLOW BENEATH THE TURF IS AVOIDED.
9. WATER UNTIL THE SOIL IS WET 100 BELOW THE TURF. THEREAFTER, WATERING SHOULD BE SUFFICIENT TO MAINTAIN PROMOTE HEALTHY GROWTH.

ROC -LINED

1. ALL ROC MUST BE HARD, WEATHER RESISTANT, DURABLE AGAINST DISINTEGRATION UNDER CONDITIONS TO BE MET IN HANDLING, PLACEMENT OPERATION.
2. ALL ROC MUST HAVE ITS GREATEST DIMENSION NOT GREATER THAN 3 TIMES ITS LEAST DIMENSIONS.
3. THE ROC USED IN FORMATION OF THE DRAIN MUST BE EVENLY GRADED WITH 50 BY WEIGHT LARGER THAN THE SPECIFIED NOMINAL ROC SIZE HAVE SUFFICIENT SMALL ROC TO FILL THE VOIDS BETWEEN THE LARGER ROC . DIRT, FINES, SMALLER ROC MUST NOT EXCEED 5 BY WEIGHT.
4. THE DIAMETER OF THE LARGEST ROC SIZE SHOULD BE NO LARGER THAN 1.5 TIMES THE NOMINAL ROC SIZE. SPECIFIC GRAVITY TO BE AT LEAST 2.5.
5. FILTER CLOTH GEOTEXTILE FABRIC: HEAVY-DUTY, NEEDLE-PUNCHED, NON-WOVEN FILTER CLOTH, MINIMUM BIDIM A24 OR E UIVALENT.
6. PRIOR TO PLACEMENT, ALL ROC S MUST BE VISUALLY CHEC ED FOR SIZE, ELONGATION, CRAC S, DETERIORATION OTHER VISIBLE DEFECTS. THE DEGREE THOROUGHNESS OF SUCH CHEC ING MUST BE APPROPRIATE FOR THE POTENTIAL CONSE UENCES ASSOCIATED WITH FAILURE OF THE STRUCTURE OR PURPOSE FOR WHICH THE MATERIAL WILL BE USED.
7. IF A FILTER CLOTH UNDERLAY IS SPECIFIED, PLACE THE FILTER FABRIC DIRECTLY ON THE PREPARED FOUNDATION. IF MORE THAN ONE SHEET OF FILTER CLOTH IS RE UIRED OVER THE AREA, OVERLAP THE EDGE OF EACH SHEET AT LEAST 300 , SECURE ANCHOR PINS AT MINIMUM 1M SPACING ALONG THE OVERLAP.
8. ENSURE THE FILTER CLOTH IS PROTECTED FROM PUNCHING OR TEARING DURING INSTALLATION OF THE FABRIC THE ROC . REPAIR ANY DAMAGE BY REMOVING THE ROC REPLACING WITH ANOTHER PIECE OF FILTER CLOTH OVER THE DAMAGED AREA OVERLAPPING THE EXISTING FABRIC A MINIMUM OF 300 .
9. PLACEMENT OF ROC SHOULD FOLLOW IMMEDIATELY AFTER PLACEMENT OF THE FILTER LAYER. PLACE ROC SO THAT IT FORMS A DENSE, WELL-GRADED MASS OF ROC WITH A MINIMUM OF VOIDS.
10. PLACE ROC LINING TO THE EXTENT DEPTH INDICATED WITHIN THE APPROVED PLANS.
11. ENSURE THE ROC IS PLACED IN AN APPROPRIATE MANNER TO AVOID DISPLACING UNDERLYING MATERIALS OR PLACING UNDUE IMPACT FORCE ON THE BEDDING MATERIALS.
12. ENSURE THE ROC IS PLACED WITH A MINIMUM THIC NESS OF 1.5 TIMES THE NOMINAL ROC SIZE (D50).
13. ENSURE MATERIALS THAT ARE D50 LARGER ARE POSITIONED FLUSH WITH THE TOP SURFACE WITH FACES SHAPES MATCHED TO MINIMISE VOIDS.
14. ENSURE PRO ECTIONS ABOVE OR DEPRESSIONS UNDER THE SPECIFIED TOP SURFACE ARE LESS THAN 20 OF THE ROC LAYER THIC NESS. THE AVERAGE SURFACE PLANE OF THE FINISHED ROC IS DEFINED AS THE PLANE WHERE 50 OF THE TOPS OF ROC S WOULD CONTACT.
15. ENSURE THE COMPLETED CHANNEL HAS SUFFICIENT DEPTH AS SPECIFIED FOR THE TYPE OF CHANNEL MEASURED FROM THE CHANNEL INVERT AVERAGE SURFACE PLANE ALONG CHANNEL INVERT TO THE TOP OF THE EMBAN MENT. THE AVERAGE SURFACE PLANE OF THE FINISHED ROC IS DEFINED AS THE PLANE WHERE 50 OF THE TOPS OF ROC S WOULD CONTACT.
16. TO THE MAXIMUM DEGREE PRACTICABLE, THE MATERIAL BETWEEN LARGER ROC MUST NOT BE LOOSE OR EASILY DISPLACED BY THE EXPECTED FLOW.
17. AFTER PLACEMENT OF THE ROC LINING, ENSURE THE DRAIN HAS A CONSTANT FALL IN THE DESIRED DIRECTION FREE OF OBSTRUCTIONS.

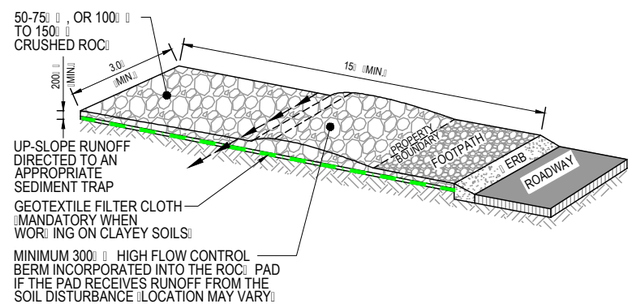


ON-GRADE ERB INLET SEDIMENT TRAP

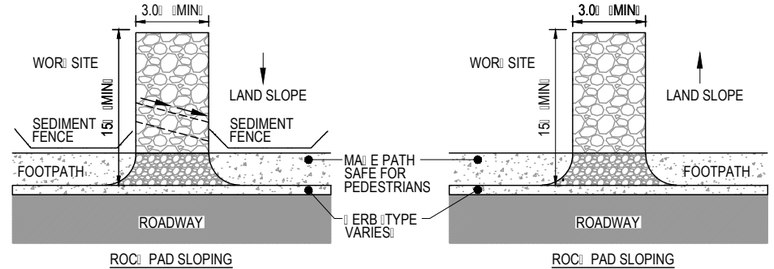


SAG INLET SEDIMENT TRAP

FILTER SOC S - CONCENTRATED FLOWS

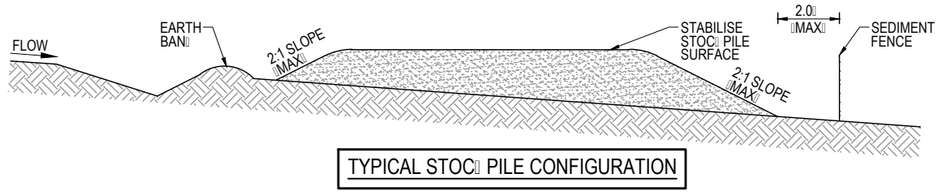


ROC ENTRY/EXIT PAD FOR CONSTRUCTION SITES



CONSTRUCTION EXIT - ROC PAD

CONSTRUCTION SITES ONLY



TYPICAL STOC PILE CONFIGURATION

Issue	Description	B	Ckd	RPE	Date
01	ORIGINAL ISSUE	NF	AS		26.07.18

100 on Original

Scale: NOT TO SCALE

Surveyor: SCHLENC ER SURVYING

Architect: BDA ARCHITECTURE

Filena e: Da00125-10022603-gcd-EscDetails.dwg

Client: SANDSON PTY LTD

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved: R.P.E. No :

Scales: N.T.S.

Original Size: A1

Height Datum: AHD

Grid:

Original Issue Signatures

Drawn: N. FAHEY

Designed: A. SHEPHERD

Project Manager: STOC WELL

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Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: EROSION SEDIMENT CONTROL DETAILS SHEET 1

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Drawing No. DA-00-125 — Project No. 10022603 — Issue 01

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SEDIMENT CONTROL

1. OPTIMUM BENEFIT MUST BE MADE OF EVERY OPPORTUNITY TO TRAP SEDIMENT WITHIN THE WOR SITE, AS CLOSE AS PRACTICABLE TO ITS SOURCE.
2. SEDIMENT TRAPS MUST BE INSTALLED OPERATED TO BOTH COLLECT RETAIN SEDIMENT.
3. THE POTENTIAL SAFETY RIS OF A PROPOSED SEDIMENT TRAP TO SITE WOR ERS THE PUBLIC MUST BE GIVEN APPROPRIATE CONSIDERATION, ESPECIALLY THOSE DEVICES LOCATED WITHIN PUBLICLY ACCESSIBLE AREAS.
4. ALL REASONABLE PRACTICABLE MEASURES MUST BE TA EN TO PREVENT, OR AT LEAST MINIMISE, THE RELEASE OF SEDIMENT FROM THE SITE.
5. SUITABLE ALL-WEATHER MAINTENANCE ACCESS MUST BE PROVIDED TO ALL SEDIMENT CONTROL DEVICES.

SEDIMENT FENCE

1. SEDIMENT FENCE TO BE INSTALLED ALONG A LINE OF CONSTANT GROUND ELEVATION WHEREVER PRACTICAL.
2. BOTH ENDS OF THE SEDIMENT FENCE TO EXTEND UP THE SLOPE AT LEAST 1 .
3. SUPPORT POST TO BE SPACED A MAXIMUM 2 UNLESS THE FENCE IS SUPPORTED BY A TOP WIRE OR MESH BAC ING, IN WHICH CASE 3 MAXIMUM SPACING.
4. FENCE RETURNS SHALL BE INSTALLED AT MAXIMUM 20 SPACING IF FENCE IS INSTALLED ALONG THE CONTOUR, OTHERWISE 5 TO 10 MAXIMUM SPACING DEPENDING ON SLOPE.
5. MINIMUM 4 STAPLES OR TIE WIRES PER STA E.

MATERIALS:

1. FABRIC: POLYPROPYLENE, POLYAMIDE, NYLON, POLYESTER, OR POLYETHYLENE WOVEN OR NON-WOVEN FABRIC, AT LEAST 700 IN WIDTH A MINIMUM UNIT WEIGHT OF 140GSM. ALL FABRICS TO CONTAIN ULTRAVIOLET INHIBITORS STABILISERS TO PROVIDE A MINIMUM OF 6 MONTHS OF USEABLE CONSTRUCTION LIFE ULTRAVIOLET STABILITY EXCEEDING 70 .
2. FABRIC REINFORCEMENTS: WIRE OR STEEL MESH MINIMUM 14-GAUGE WITH A MAXIMUM MESH SPACING OF 200 .
3. SUPPORT POSTS/STA ES: 1500mm² (MIN.) HARDWOOD, 2500mm² (MIN.) SOFTWOOD, OR 1.5kg/m (MIN) STEEL STAR PIC ETS SUITABLE FOR ATTACHING FABRIC.

INSTALLATION OF A SPILL-THROUGH WEIR:

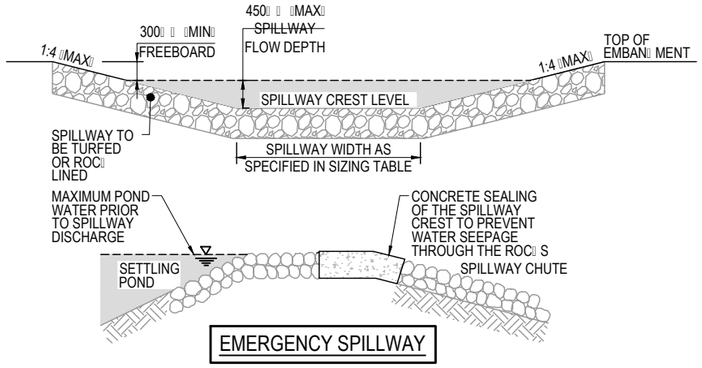
1. LOCATE THE SPILL-THROUGH WEIR SUCH THAT THE WEIR CREST WILL BE LOWER THAN THE GROUND LEVEL AT EACH END OF THE FENCE.
2. ENSURE THE CREST OF THE SPILL-THROUGH WEIR IS AT LEAST 300 ABOVE THE GROUND ELEVATION.
3. SECURELY TIE A HORIZONTAL CROSS MEMBER (WEIR) TO THE SUPPORT POSTS/STA ES EACH SIDE OF THE WEIR. CUT THE FABRIC DOWN THE SIDE OF EACH POST FOLD THE FABRIC OVER THE CROSS MEMBER APPROPRIATELY SECURE THE FABRIC.
4. INSTALL A SUITABLE SPLASH PAD /OR CHUTE IMMEDIATELY DOWN-SLOPE OF THE SPILL-THROUGH WEIR TO CONTROL SOIL EROSION APPROPRIATELY DISCHARGE THE CONCENTRATED FLOW PASSING OVER THE WEIR.

INSTALLATION FABRIC DROP INLET PROTECTION:

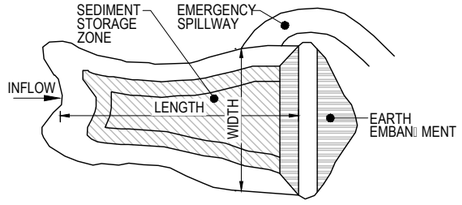
1. ENSURE THAT THE INSTALLATION OF THE SEDIMENT TRAP WILL NOT CAUSE UNDESIRABLE SAFETY OR FLOODING ISSUES.
2. WHERE POSSIBLE, EXCAVATE A 200 200 TRENCH AROUND THE INLET STRUCTURE.
3. SPACE STA ES EVENLY AROUND THE PERIMETER OF THE STORMWATER INLET AT A MAXIMUM 1 SPACING SECURELY DRIVE THEM INTO THE GROUND.
4. WHERE NECESSARY, INSTALL A HORIZONTAL SPILL-THROUGH WEIR TO LIMIT THE MAXIMUM HEIGHT WATER PONDING AROUND THE STRUCTURE.
5. ENSURE THE MAXIMUM POND HEIGHT WILL NOT CAUSE A SAFETY HAZARD, INCLUDING UNDESIRABLE FLOODING OF AN AD ACENT PROPERTY OR ROADWAY. WHEREVER PRACTICAL, THE SPILL-THROUGH WEIR SHOULD BE AT LEAST 300 ABOVE GROUND LEVEL.
6. IF A SPILL THROUGH WEIR IS NOT INSTALLED, THEN FRAME THE TOP OF THE STA ES WITH HORIZONTAL CROSS MEMBERS.
7. CUT FABRIC FROM A CONTINUOUS ROLL TO ELIMINATE OINTS.
8. PLACE THE BOTTOM 300 OF FABRIC IN THE EXCAVATED TRENCH
9. SECURELY FASTEN THE FABRIC TO THE STA ES CROSS MEMBERS AT THE FABRIC OINT, OVERLAP THE FABRIC TO THE NEXT STA E.
10. BAC FILL THE TRENCH WITH AT LEAST 200 OF AGGREGATE OR COMPACTED SOIL. IF A TRENCH CANNOT BE EXCAVATED, LAY THE BOTTOM 300 OF FABRIC EVENLY ON THE GROUND SURFACE COVER WITH A 300 LAYER OF AGGREGATE, NOT EARTH OR SOIL.
11. WHERE RE UIRED, INSTALL A FLOW CONTROL BUND TO MAINTAIN THE SPECIFIED POOL DEPTH CONTROL THE MOVEMENT OF WATER.
12. TA E ALL NECESSARY MEASURES TO MINIMISE THE SAFETY RIS CAUSED BY THE STRUCTURE TO PREVENT UNSAFE ENTRY INTO THE STORMWATER INLET.

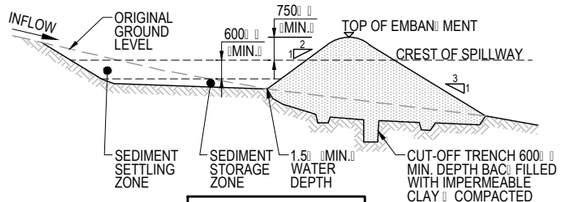
SEDIMENT BASIN

1. REMOVE ALL VEGETATION TOPSOIL FROM UNDER THE DAM WALL FROM WITHIN THE STORAGE AREA.
2. PREPARE THE SITE UNDER THE EMBAN MENT BY RIPPING AT LEAST 100 TO HELP BOND COMPACTED FILL TO THE EXISTING SUBSTRATE.
3. FOR EARTH EMBAN MENT MATERIAL TYPE COMPACTION REFER TO DTMR SPECIFICATION MRTS04 SECTION14.2.6 - WATER RETAINING EMBAN MENTS.
4. CONSTRUCT EMERGENCY SPILLWAY.
5. INSTALL MAR ER POST SHOWING MAXIMUM STORAGE SETTLING ZONE VOLUMES.
6. AS-CONSTRUCTED PLANS MUST BE PREPARED FOR ALL CONSTRUCTED SEDIMENT BASINS ASSOCIATED EMERGENCY SPILLWAYS. SUCH PLANS MUST APPROPRIATELY VERIFY THE BASINS DIMENSIONS, LEVELS VOLUMES, MUST BE SUBMITTED TO THE RELEVANT REGULATORY AUTHORITY WITHIN 14 CALENDAR DAYS OF THE CONSTRUCTION OF EACH BASIN.
7. BASINS SHOULD BE APPROPRIATELY FENCED MAR ED BY WARNING SIGNS IF UNSUPERVISED PUBLIC ACCESS IS LI ELY PUBLIC SAFETY IS AT RIS .

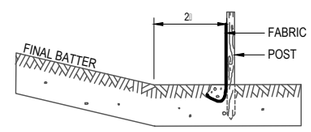


EMERGENCY SPILLWAY

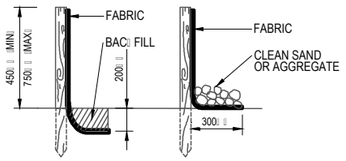




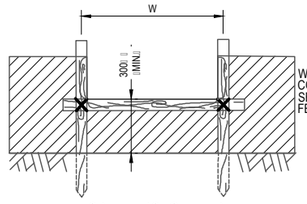
SEDIMENT BASIN



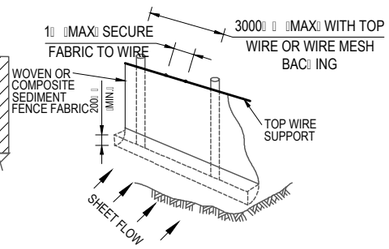
LOCATION OF FENCE RELATIVE TO BASE OF SLOPE



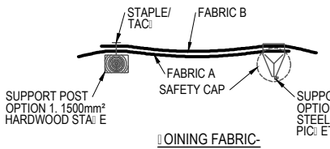
ANCHORING BASE OF FABRIC



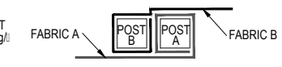
SPILL THROUGH WEIR



INSTALLATION WITH TOP WIRE SUPPORT

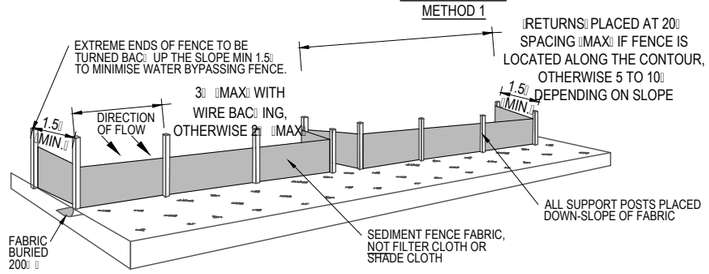


OINING FABRIC- METHOD 2



FABRIC TO FOLD AROUND EACH STA E ONE FULL TURN.
STA E B TO BE DRIVEN TIGHTLY AGAINST STA E A.
THE TOPS OF BOTH STA ES TO BE SECURED WITH WIRE.

OINING FABRIC - METHOD 1



INSTALLATION OF SEDIMENT FENCE

SEDIMENT FENCE

Issue	Description	By	Ckd	RPE	Date
01	ORIGINAL ISSUE	NF	AS		26.07.18

Scale: NOT TO SCALE

Surveyor: SCHLENC ER SURVYING

Architect: BDA ARCHITECTURE

Filename: Da00125-10022603-gcd-EscDetails.dwg

Client: SANDSON PTY LTD

Status: PRELIMINARY
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Approved

R.P.E. No :

Scales	N.T.S.	Original Issue Signatures	
Original Size	A1	Drawn N. FAHEY	
Height Datum	AHD	Designed A. SHEPHERD	
Grid		Project Manager . STOC WELL	
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Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: EROSION SEDIMENT CONTROL DETAILS SHEET 2

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Drawing No.	Project No.	Issue
DA-00-126	10022603	01

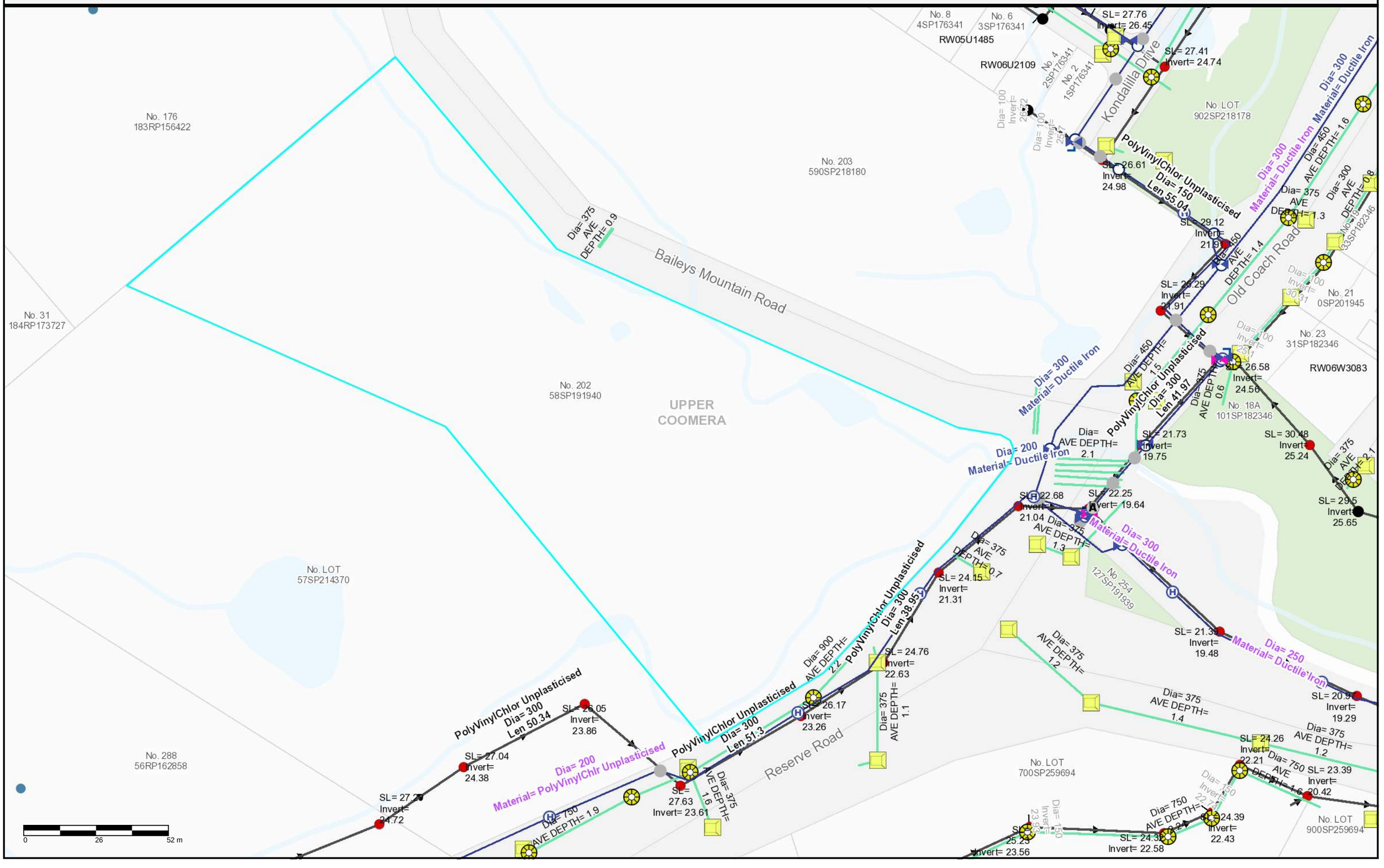
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APPENDIX C

CoGC SIS MAP

L58 SP191940 REF 202 Baileys Mountain Rd



CITY OF GOLDCOAST.

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Legend

Water Valve
- Other
- Altitude Valve
- Air Release
- Pressure Relief Valve
- Service Valve
- Stop Valve
- Major Supply
- Bypass
- Actuated Valve
- Dialysis
- Non-return/Reflux Valve
- Pressure Reducing
- Scour
- DMA Boundary
- Reservoir Zone

Water Hydrant

Water Fitting
- Other
- Cross Link
- End
- Gibault
- Sampling Point
- T - Joint.
- Taper
- Swabbing Chamber

Water Maintenance Hole

Water Pipe Potable

Raw Water Fitting
- Not Categorized
- Raw Endcap Fitting
- Raw Junction Fitting
- Raw Reducer Fitting

Raw Water Valve

Raw Water Main

Drainage Pit
- Other
- Inlet Gully
- Manhole
- Pit
- Roof water Inspection Chamber
- Roof water Outlet to Swale

Drainage Pipe

Sewer Meter

Sewer Fitting
- Other
- End Cap
- Junction
- Taper

Sewer Maintenance Hole
- Other
- Manhole - Public
- Lamphole
- Vacuum Chamber

Sewer Connection

Sewer Connection Length

Sewer Pipe Non Pressure (Gravity)

Sewer Pipe Non Pressure Flow Direction

Sewer Pipe Pressure
- Not Categorised
- Rising or Pressure Main
- Vacuum Main

Sewer Pipe Pressure Flow Direction

On Site Treatment Facility

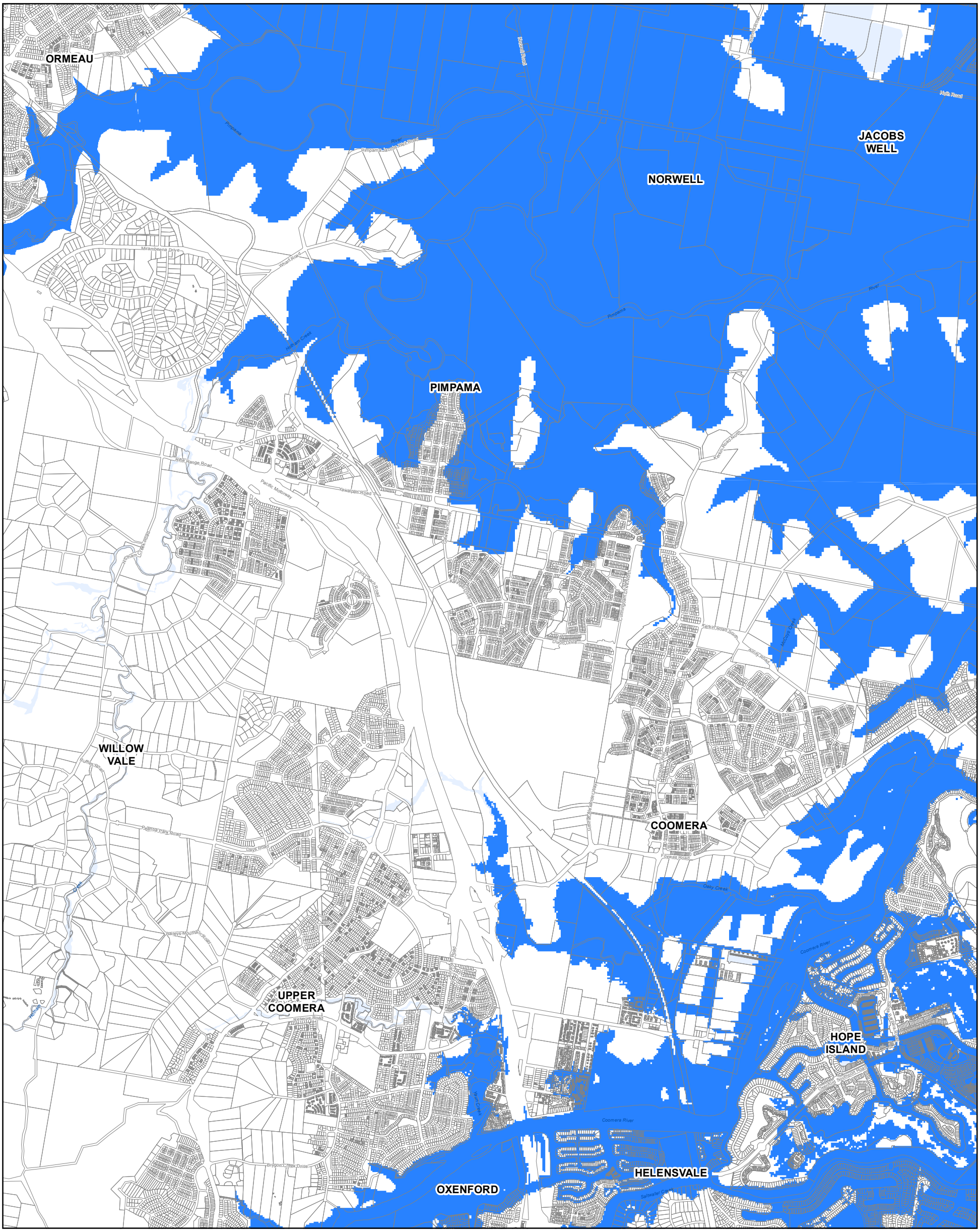
Private Main

Private Pump Station

APPENDIX D

2015 CITY PLAN OVERLAP MAPS

Flood overlay map - map 5

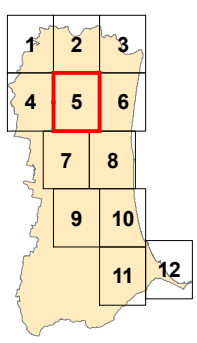


Flood assessment required

Property boundaries

Local government area boundary

Waterway or waterbody



Note:

This flood map does not in itself indicate whether any property has or has not been affected by floods. That conclusion requires separate interpretation or measurement.

Areas of potential flood inundation shown on this map have been compiled from various sources and hydraulic reports available at the date of issue. Whilst some of the inundation areas are based on computer hydraulic modelling of standard floods used for planning purposes, the information used to calibrate such models is usually based on reported flood marks which are often widely spaced and may not have been recorded at a particular flood's peak level.

City Plan

Disclaimer:
© City of Gold Coast, Queensland 2018 or
© State of Queensland 2018. No warranty given in relation to the data (including accuracy, reliability, completeness or suitability) and no liability accepted (including without limitation, liability in negligence) for any loss, damage or costs (including consequential damage) relating to any use of the data. Data must not be used for direct marketing or be used in breach of the privacy laws.

Map version - 4
30 May 2018
Data source:
Flood - CoGC
Waterways - CoGC
Cadastre (Oct 2017) - State

Projection:
MGA94
Zone 56

0 250 500 1,000 m

Approx Scale @ A3 1:37,000

CITY OF GOLDCOAST.

OMF1-5

APPENDIX E

RATIONAL METHOD CALCULATIONS

ARCADIS Design & Consultancy for natural and built assets

EXISTING CATCHMENT 1

DESIGNED BY:	AS
DATE:	20/06/2019
JOB:	202 Baileys Mountain Road
JOB No:	10022603

This spreadsheet provides a summary of the Rational Method Calculations.

TIME OF CONCENTRATION

The time of concentration was determined by as per QUDM Section 4.6

CATCHMENT:	**E**	
CATCHMENT AREA:	**3.078**	**ha**

TOTAL TIME OF CONCENTRATION: 12.67 mins

COEFFICIENT OF RUNOFF

In accordance with QUDM section 4.6 and CoGC Land Development Guidelines SC6.11

Case	Slope (%)	Runoff Coefficient C_{10}	Development Category
1	> 5%	0.7	Rural Residential

Table of Frequency Factors F_y							
A.E.P. (%)	63	39	18	10	5	2	1
Frequency Factor F_y	0.8	0.85	0.95	1	1.05	1.15	1.2

DESIGN RAINFALL

Design rainfall was derived using the GCCC LDGL rainfall isopleth charts

Map 1	$^{2}I_{1}$	=	48.86
Map 2	$^{2}I_{12}$	=	10.25
Map 3	$^{2}I_{72}$	=	3.06
Map 4	$^{50}I_{1}$	=	84.38
Map 5	$^{50}I_{12}$	=	20.86
Map 6	$^{50}I_{72}$	=	6.84

Map 8 Geographical Factor F_2:	=	4.52
Map 9 Geographical Factor F_{50}:	=	16.96
Easting (m)	=	528800
Northing (m)	=	6917300
Map Skewness G:	=	0

DESIGN FLOWS

Design flows were derived using the Rational Method in accordance with QUDM section 4.03

$$Q_y = (2.78 \times 10^{-3}).C_y.{}^{t}I_y.A$$

Where:

Q_y	=	peak flow rate (m^3/s) for Average Exceedence Period (AEP) of y years
C_y	=	runoff coefficient for AEP for y years
A	=	area of catchment
$^{t}I_y$	=	average rainfall intensity (mm/h) for a design duration of t hours and an AEP of y years

Using the information presented above, design flows were calculated and are presented in the following table.

DEVELOPED INTERNAL CATCHMENT			
RATIONAL METHOD FOR CALCULATION OF DISCHARGE QUDM Equation 4.01 - *Q=C.I.A/360*			
AEP	**RAINFALL INTENSITY**	**COEFFICIENT OF RUNOFF**	**DISCHARGE**
%	I (mm/hr)	C	Q (m3/sec)
63	88.1	0.56	**0.422**
39	110.4	0.595	**0.562**
18	132.3	0.665	**0.752**
10	144	0.7	**0.862**
5	160.7	0.735	**1.010**
2	181.8	0.805	**1.251**
1	197.5	0.84	**1.418**

ARCADIS Design & Consultancy for natural and built assets

DEVELOPED CATCHMENT 1

DESIGNED BY:	AS
DATE:	20/06/2019
JOB:	202 Baileys Mountain Road
JOB No:	10022603

This spreadsheet provides a summary of the Rational Method Calculations.

TIME OF CONCENTRATION

The time of concentration was determined by as per QUDM Section 4.6.

CATCHMENT:	**D**	
CATCHMENT AREA:	**3.078**	**ha**

TOTAL TIME OF CONCENTRATION: 6.8 mins

COEFFICIENT OF RUNOFF

In accordance with QUDM section 4.6 and CoGC Land Development Guidelines SC6.11

Case	Slope (%)	Runoff Coefficient C_{10}	Development Category
1	> 5%	0.90	Neighbourhood Centre

Table of Frequency Factors F_y							
A.E.P. (%)	63	39	18	10	5	2	1
Frequency Factor F_y	0.8	0.85	0.95	1	1.05	1.15	1.2

DESIGN RAINFALL

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Map 1	$^{2}I_{1}$	=	48.86
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DEVELOPED INTERNAL CATCHMENT			
RATIONAL METHOD FOR CALCULATION OF DISCHARGE			
QUDM Equation 4.01 - *Q=C.I.A/360*			
AEP	**RAINFALL INTENSITY**	**COEFFICIENT OF RUNOFF**	**DISCHARGE**
%	I (mm/hr)	C	Q (m3/sec)
63	114.4	0.72	**0.704**
39	143	0.765	**0.935**
18	170.4	0.855	**1.246**
10	184.8	0.9	**1.422**
5	205.7	0.945	**1.662**
2	232.1	1	**1.984**
1	251.5	1	**2.150**

APPENDIX F

BIO RETENTION CHECKLIST

BIORETENTION BASIN CONSTRUCTION INSPECTION CHECKLIST

Asset I.D.		Inspected By:	
Site:		Date:	
		Time:	
Constructed By:		Weather:	
		Contact During Visit:	

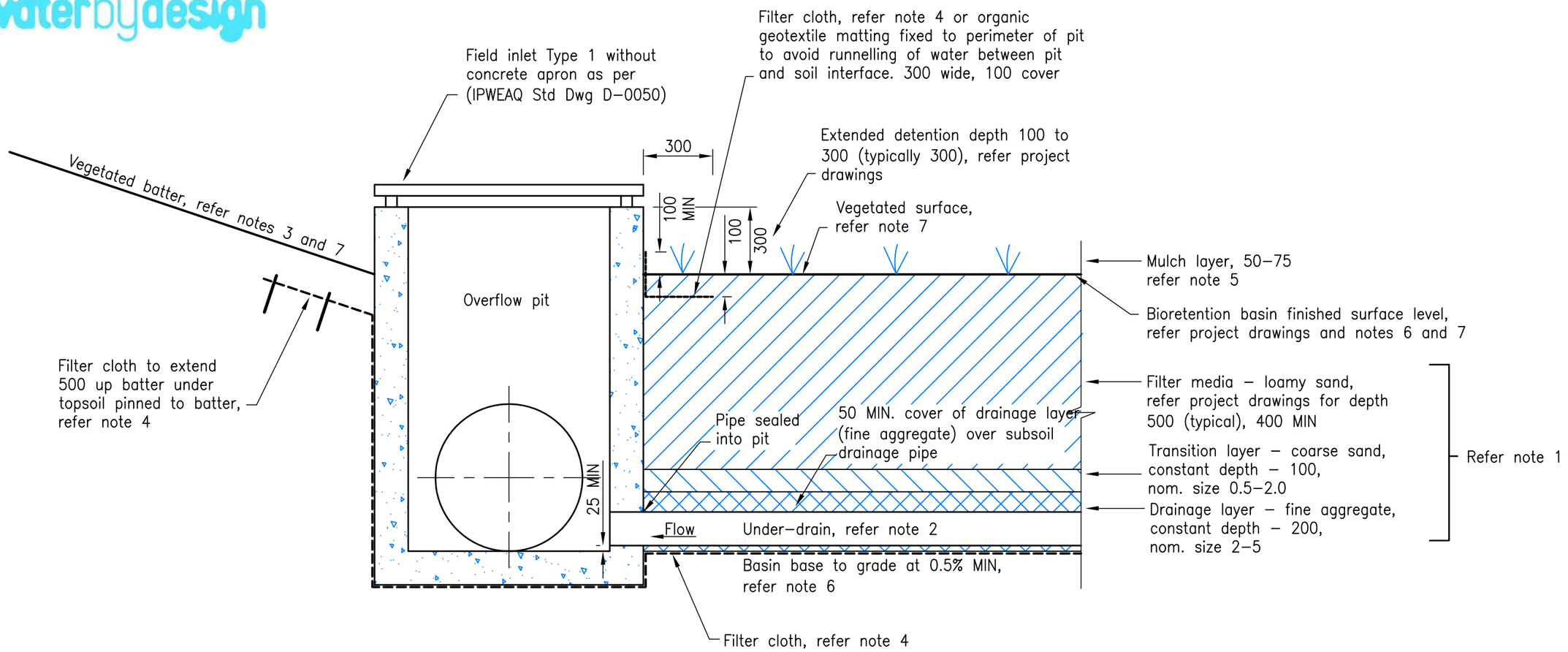
Items inspected	Checked Y	Checked N	Satisfactory Y	Satisfactory N	Items inspected	Checked Y	Checked N	Satisfactory Y	Satisfactory N
DURING CONSTRUCTION & ESTABLISHMENT									
A. FUNCTIONAL INSTALLATION					Structural components				
Preliminary Works					15. Location and configuration of inflow systems as designed				
1. Erosion and sediment control plan adopted					16. Location and levels of overflow pits as designed				
2. Temporary traffic/safety control measures					17. Under-drainage connected to overflow pits as designed				
3. Location same as plans					18. Concrete and reinforcement as designed				
4. Site protection from existing flows					19. Set down to correct level for flush kerbs (streetscape applications only)				
Earthworks and Filter Media					20. Kerb opening width as designed				
5. Bed of basin correct shape and slope									
6. Batter slopes as plans					B. SEDIMENT & EROSION CONTROL (IF REQUIRED)				
7. Dimensions of bioretention area as plans					21. Stabilisation immediately following earthworks and planting of terrestrial landscape around basin				
8. Confirm surrounding soil type with design					22. Silt fences and traffic control in place				
9. Confirm filter media specification in accordance with Step 4					23. Temporary protection layers in place				
9. Provision of liner (if required)									
10. Under-drainage installed as designed					C. OPERATIONAL ESTABLISHMENT				
11. Drainage layer media as designed					24. Temporary protection layers and associated silt removed				
12. Transition layer media as designed (if required)					Vegetation				
14. Extended detention depth as designed					25. Planting as designed (species and densities)				
					26. Weed removal and watering as required				

FINAL INSPECTION									
1. Confirm levels of inlets and outlets					6. Check for uneven settling of banks				
2. Confirm structural element sizes					7. Under-drainage working				
3. Check batter slopes					8. Inflow systems working				
4. Vegetation as designed					9. Maintenance access provided				
5. Bioretention filter media surface flat and free of clogging									

COMMENTS ON INSPECTION
ACTIONS REQUIRED
Inspection officer signature:

BIORETENTION BASIN MAINTENANCE CHECKLIST				
Inspection Frequency:	1 to 6 monthly	Date of Visit:		
Location:				
Description:				
Asset I.D.				
Site Visit by:				
INSPECTION ITEMS:		Y	N	Action Required (details)
Sediment accumulation at inflow points?				
Litter within basin?				
Erosion at inlet or other key structures?				
Traffic damage present?				
Evidence of dumping (e.g. building waste)?				
Vegetation condition satisfactory (density, weeds etc)?				
Watering of vegetation required?				
Replanting required?				
Mowing/slashing required?				
Clogging of drainage points (sediment or debris)?				
Evidence of ponding?				
Damage/vandalism to structures present?				
Surface clogging visible?				
Drainage system inspected?				
Resetting of system required?				
COMMENTS				

BIORETENTION BASIN ASSET TRANSFER CHECKLIST		
Asset I.D.		
Asset Location:		
Construction by:		
'On-maintenance' Period:		
TREATMENT	Y	N
System appears to be working as designed visually?		
No obvious signs of under-performance?		
MAINTENANCE	Y	N
Maintenance plans and indicative maintenance costs provided for each asset?		
Vegetation establishment period completed (2 years)?		
Inspection and maintenance undertaken as per maintenance plan?		
Inspection and maintenance forms provided?		
ASSET INSPECTED FOR DEFECTS AND/OR MAINTENANCE ISSUES AT TIME OF ASSET TRANSFER	Y	N
Sediment accumulation at inflow points?		
Litter within basin?		
Erosion at inlet or other key structures?		
Traffic damage present?		
Evidence of dumping (e.g. building waste)?		
Vegetation condition satisfactory (density, weeds etc)?		
Watering of vegetation required?		
Replanting required?		
Mowing/slashing required?		
Clogging of drainage points (sediment or debris)?		
Evidence of ponding?		
Damage/vandalism to structures present?		
Surface clogging visible?		
Drainage system inspected?		
COMMENTS/ACTIONS REQUIRED FOR ASSET TRANSFER		
ASSET INFORMATION	Y	N
Design Assessment Checklist provided?		
As constructed plans provided?		
Copies of all required permits (both construction and operational) submitted?		
Proprietary information provided (if applicable)?		
Digital files (e.g. drawings, survey, models) provided?		
Asset listed on asset register or database?		



BIORETENTION BASIN OVERFLOW PIT DETAIL

NOTES:

1. Bioretention media specification shall be in accordance with the Facility for Advancing Biofiltration "Guidelines for Soil Filter Media in Bioretention Systems". Bioretention hydraulic conductivity shall be in accordance with the Facility for Advancing Biofiltration 'Practice Note 1: In Situ Measurement of Hydraulic Conductivity". The number of samples to be tested shall be in accordance with the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands (Water by Design).
2. Under–drain: slotted rigid pipe (uPVC or similar to AS 2439.1) or approved equivalent, 0.5% MIN. grade. Refer project drawings for diameter and invert level (Typically ø100–150). Pipe should not be installed with a filter sock surrounding pipe. Under–drainage pipes shall be sealed into pits using grout or other approved watertight seal.
3. Refer to project drawings for vegetated batter slopes (1 in 3 MAX, 1 in 4 typical) and batter topsoil requirements.
4. Filter cloth – non–woven geotextile. Filter cloth not to be placed between any filter layers. Impervious liner may be required subject to soil testing requirements in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
5. Basin finished surface level is top of filter media. Surface to be mulched and planted as per landscape drawings.
6. Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances must be noted on project plans. Invert levels of pits, pipes and base levels must be noted on project drawings.
7. Refer landscape drawings for plant specification. Plant specification and density shall be in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
8. All dimensions are in millimetres unless otherwise noted.

These drawings have been developed in consultation between the participating councils.
BEFORE USE, the user shall confirm that the drawing has been adopted by the appropriate council

Rv.	DATE	REVISIONS
A	13/01/2010	ORIGINAL ISSUE

INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.
STANDARD DRAWINGS

BIORETENTION STANDARD PROFILE
OVERFLOW PIT

DRAWING No.
WSUD–001
Rv. A

NOTES:

1. Bioretention media specification shall be in accordance with the Facility for Advancing Biofiltration "Guidelines for Soil Filter Media in Bioretention Systems". Bioretention hydraulic conductivity shall be in accordance with the Facility for Advancing Biofiltration "Practice Note 1: In Situ Measurement of Hydraulic Conductivity". The number of samples to be tested shall be in accordance with the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design).

2. Under–drain: slotted rigid pipe (uPVC or similar to AS 2439.1) or approved equivalent, 0.5% MIN. grade. Refer project drawings for diameter and invert level (typically Ø100–150). Pipe joins should be glued using plumbing cement. Pipe should not be installed with a filter sock surrounding pipe. Under–drainage pipes shall be sealed into pits using grout or other approved watertight seal.

3. Refer to project drawings for vegetated batter slopes (1 in 3 MAX, 1 in 4 typical) and batter topsoil requirements.

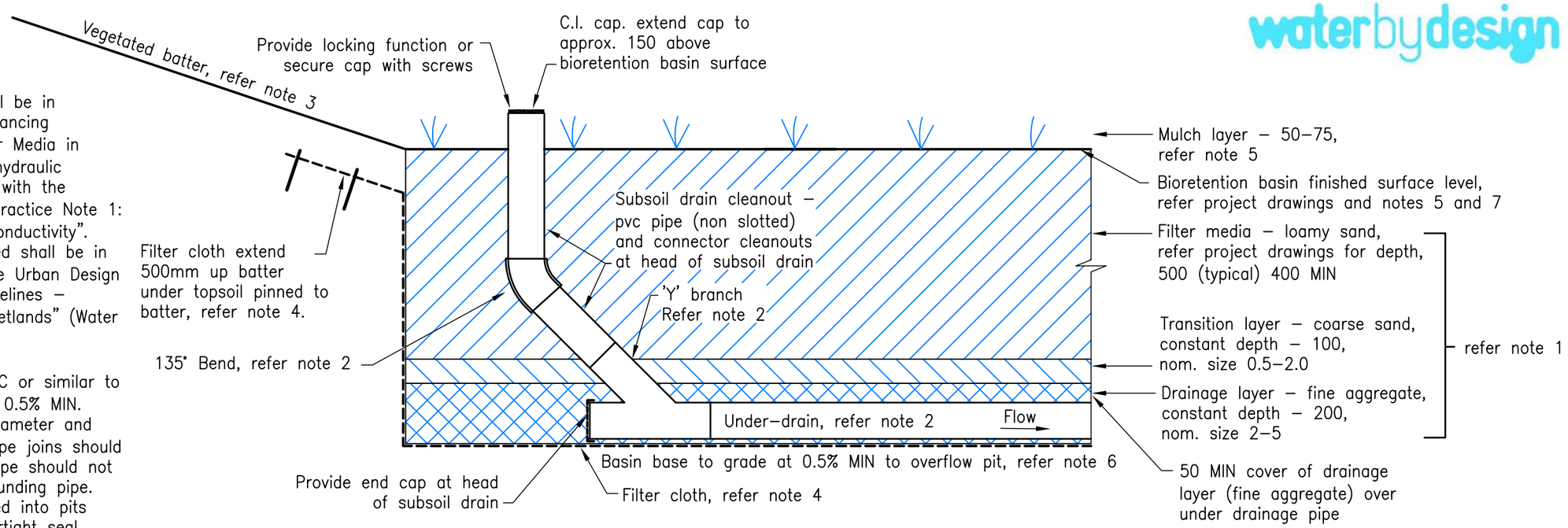
4. Filter cloth – non–woven geotextile. Filter cloth not to be placed between any filter layers. Impervious liner may be required subject to soil testing requirements in accordance with the 'Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).

5. Basin finished surface level is top of filter media. Surface to be mulched and planted as per landscape drawings.

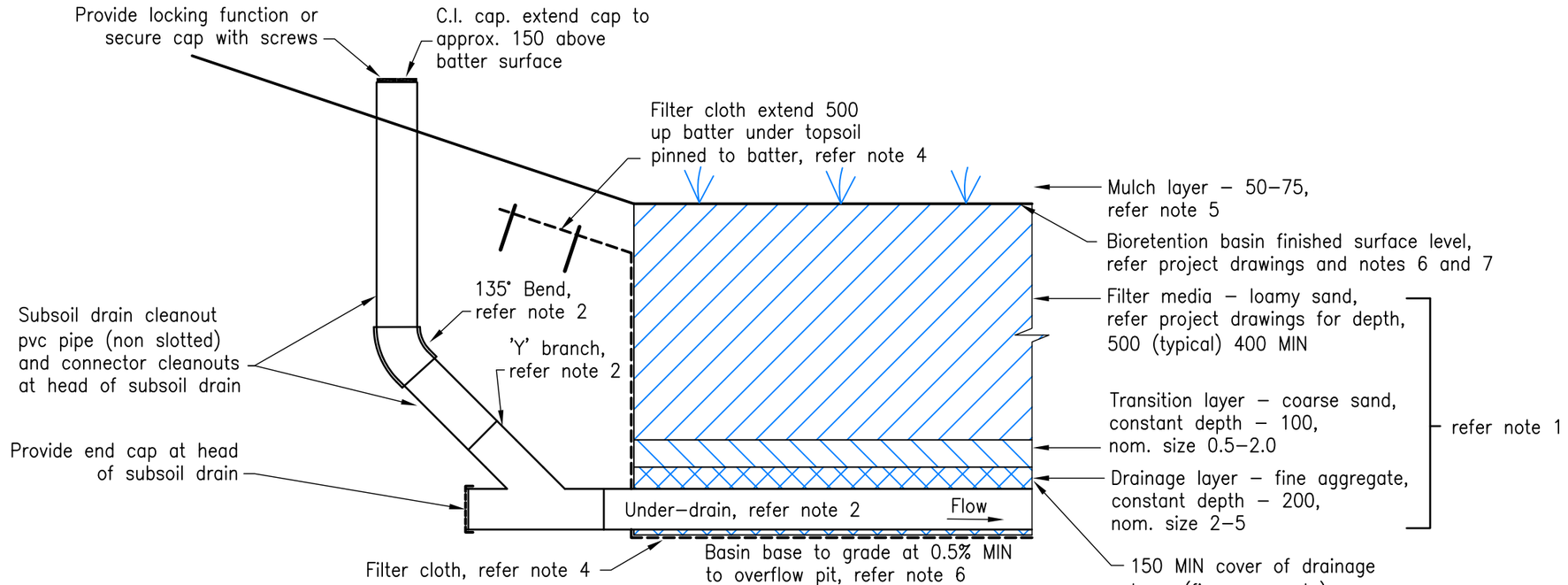
6. Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances must be noted on project plans. Invert levels of pits and pipes and base levels must be shown on project drawings.

7. Refer landscape drawings for plant specification. Plant specification and density shall be in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).

8. All dimensions are in millimetres unless otherwise noted.



BIORETENTION UNDER–DRAIN CLEANOUT – IN BASIN



BIORETENTION UNDER–DRAIN CLEANOUT – IN BATTER

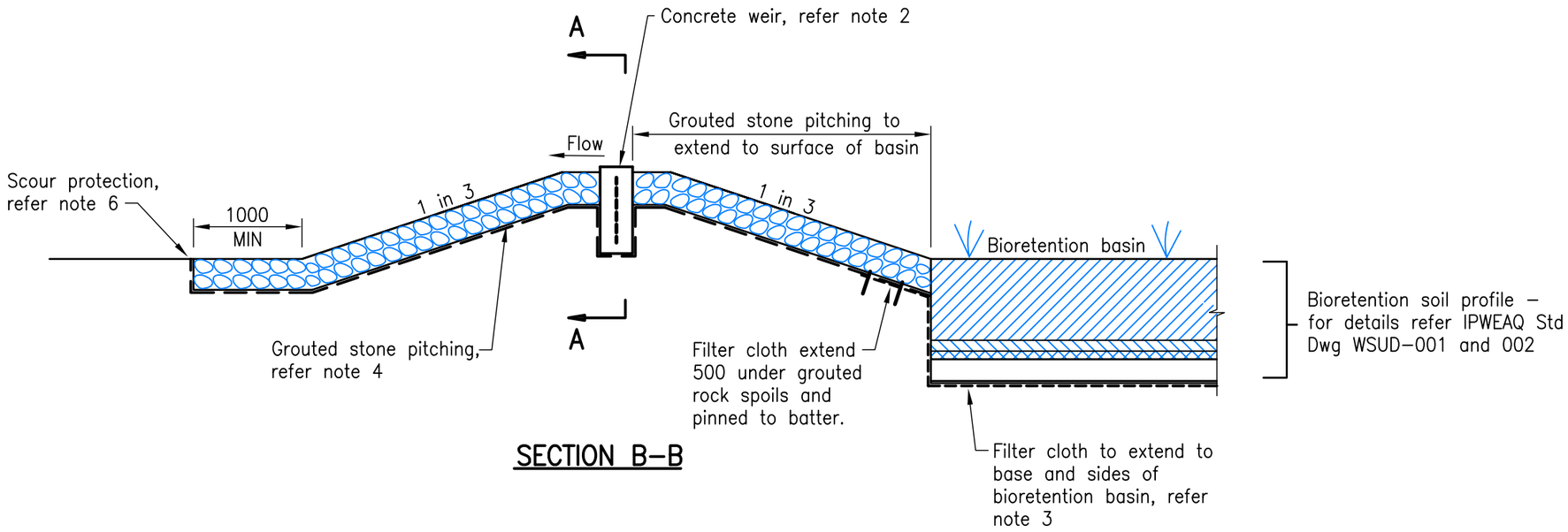
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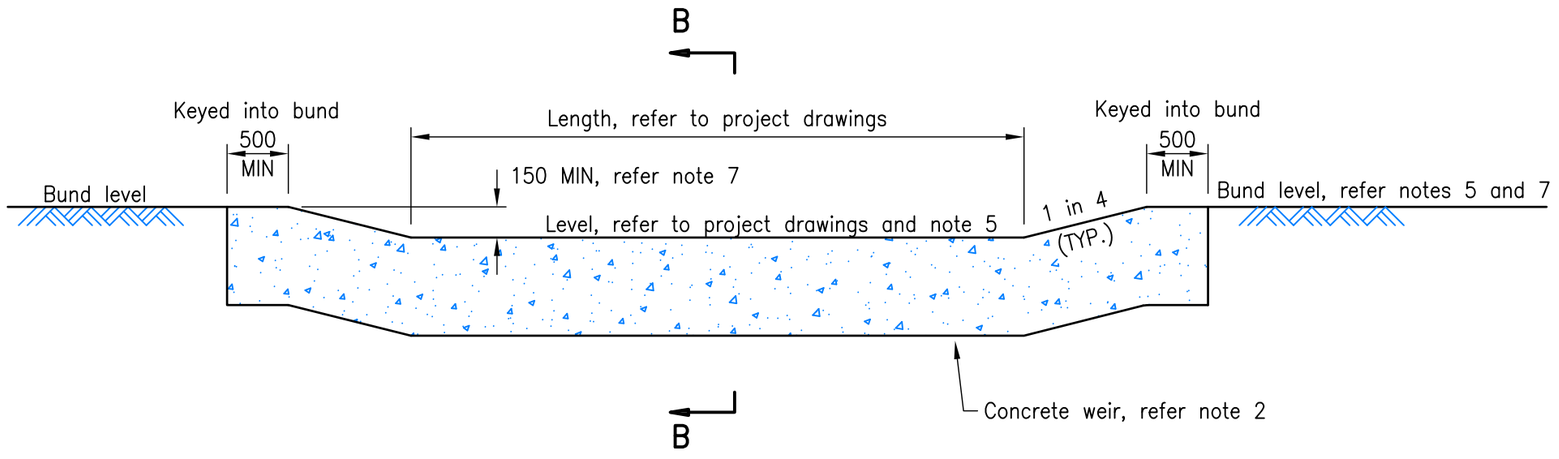
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.
STANDARD DRAWINGS

BIORETENTION STANDARD PROFILE
UNDERDRAIN CLEANOUT

DRAWING No.
WSUD–003
A



SECTION B–B



SECTION A–A

NOTES:

1. Insitu material to be tested and approved by geotechnical engineer prior to weir construction.
2. Concrete weir – 300 wide x 800 high concrete (N32) with SL81 mesh placed centrally.
3. Filter cloth – non–woven geotextile. Filter cloth not to be placed between any filter layers. Impervious liner may be required subject to soil testing requirements in accordance with the "Water Sensitive Urban Design Technical Design Guidelines" (Water by Design).
4. Grouted stone pitching – stones 75–100, 300 thick on filter cloth, refer note 3. Refer landscape drawings and project drawings for plant specification and details. Geotechnical engineer to confirm compaction requirements for bund subsoil. Option to drill 100 cores through to subsoil to provide voids for planting (subject to flow velocities and local government requirements). Refer landscape drawings for planting details.
5. Construction tolerances as documented in the "Water Sensitive Urban Design Construction and Establishment Guidelines – Swales, Bioretention Systems and Wetlands" (Water by Design) must be achieved. Construction tolerances and bund levels must be noted on project plans.
6. For extent and details of scour protection refer to project drawings.
7. Bund level, refer to project drawings for minimum freeboard requirements. Bund levels must be noted on project drawings.
8. All dimensions are in millimetres unless otherwise noted.

These drawings have been developed in consultation between the participating councils.
BEFORE USE, the user shall confirm that the drawing has been adopted by the appropriate council

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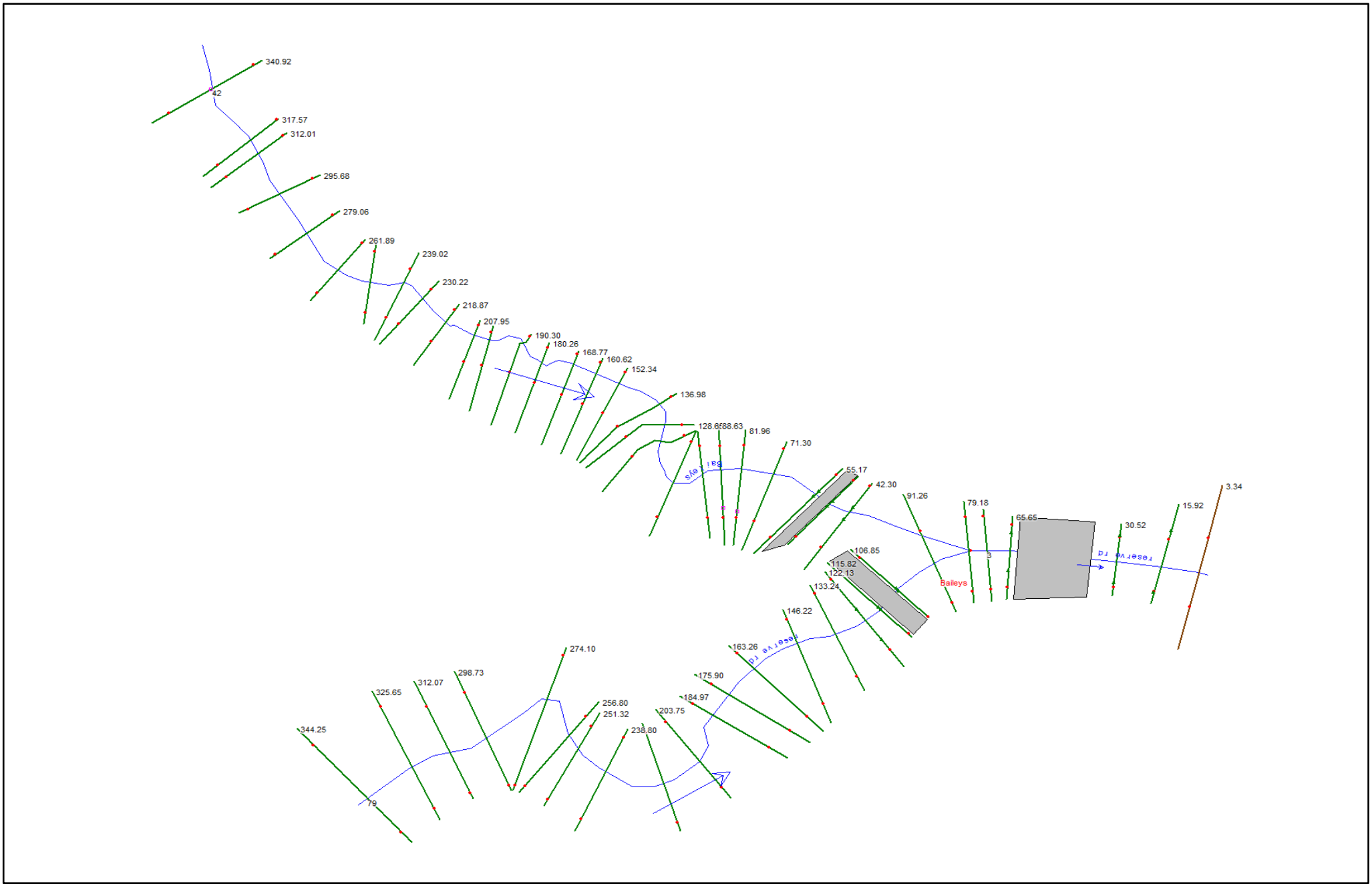
INSTITUTE OF PUBLIC WORKS ENGINEERING AUSTRALIA
QUEENSLAND DIVISION INC.
STANDARD DRAWINGS

BIORETENTION BASIN
WEIR DETAILS

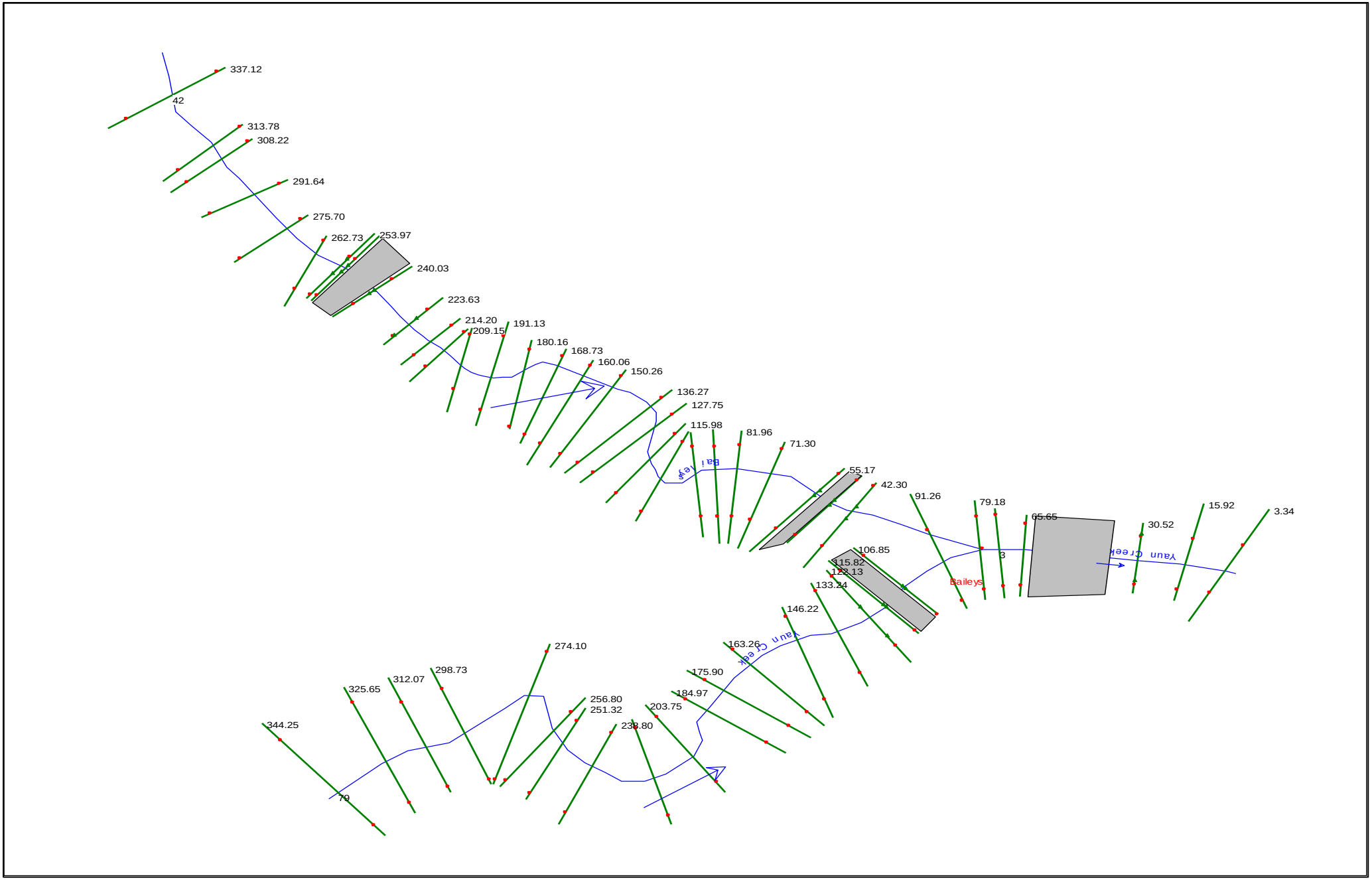
DRAWING No.
WSUD–006
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APPENDIX G

HEC-RAS DATA TABLES & GEOMETRIC VIEW OF MODELS

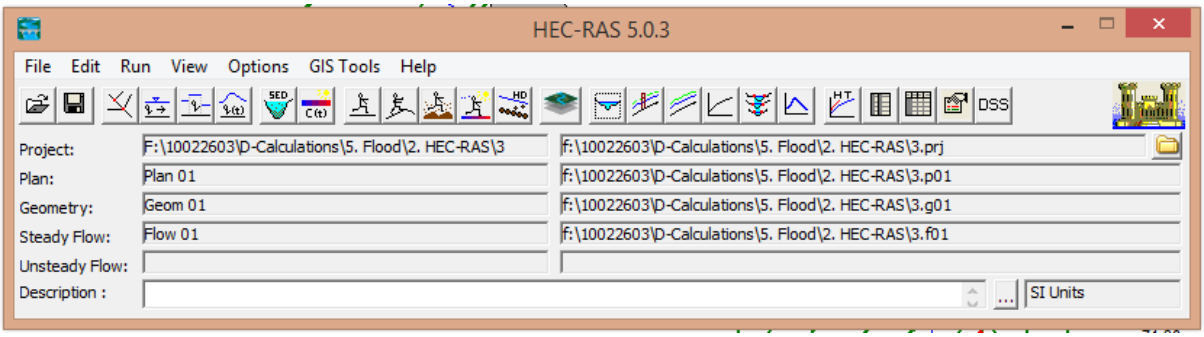


EXISTING CASE GEOMETRIC VIEW OF MODEL

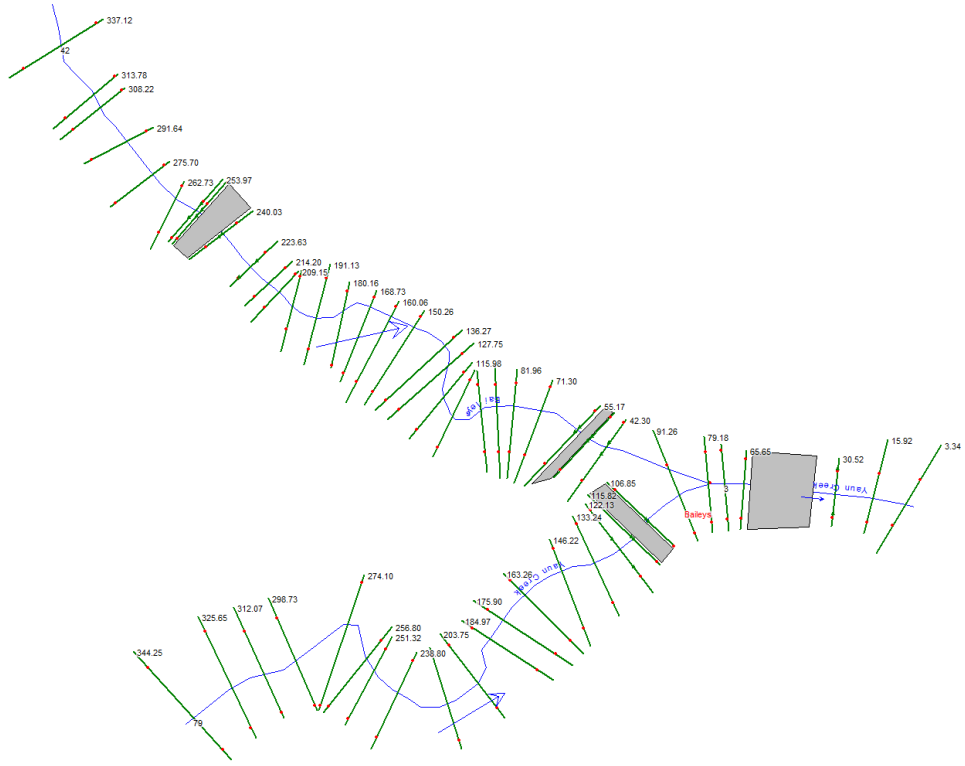


DEVELOPED CASE GEOMETRIC VIEW OF MODEL

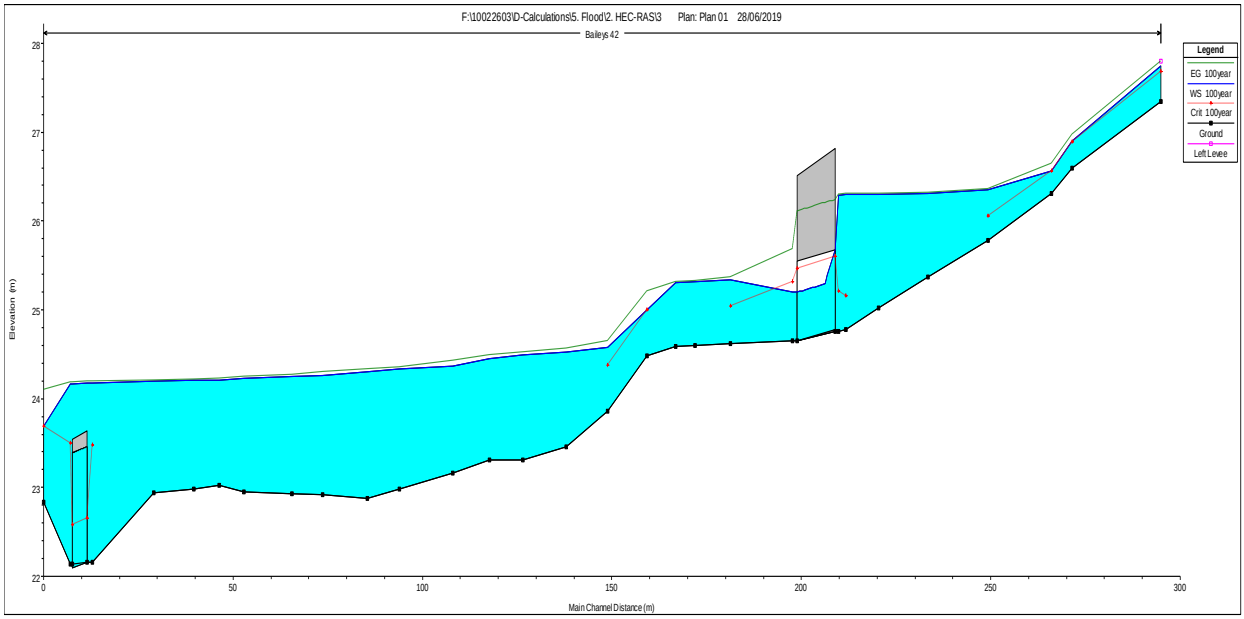
PROPOSED DEVELOPMENT MODEL

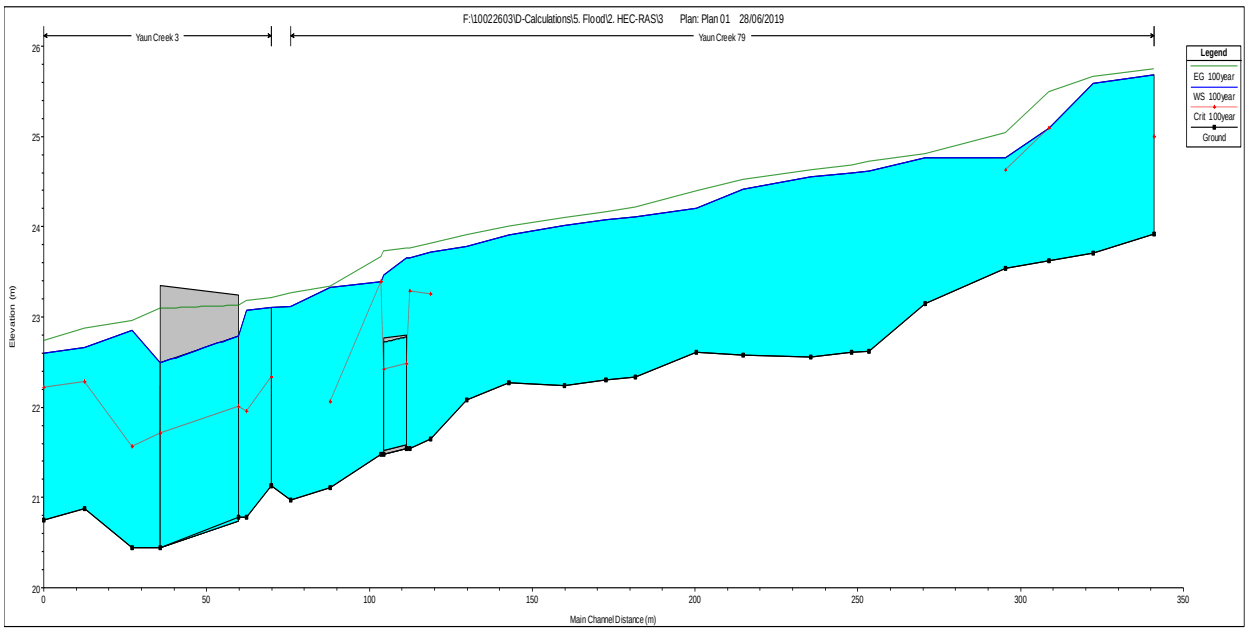


PLAN VIEW



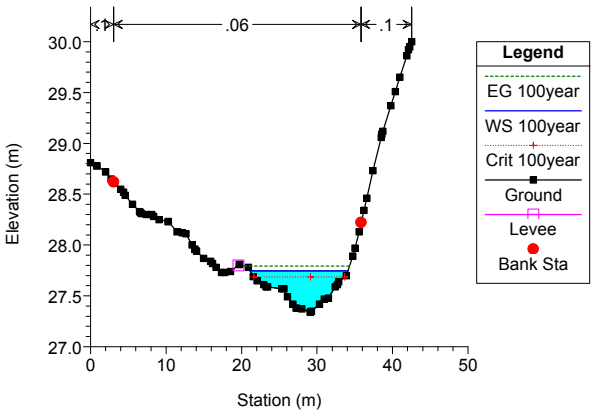
LONG SECTIONS



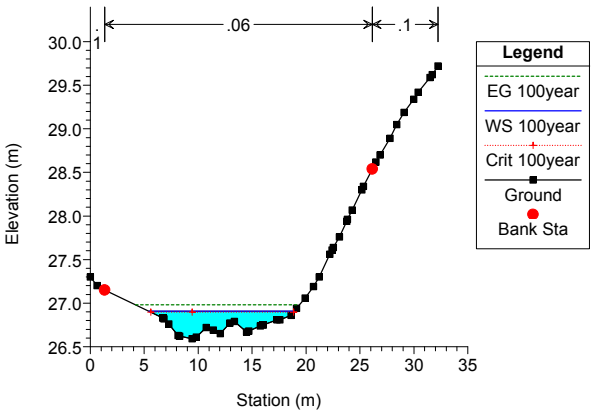


CROSS SECTIONS

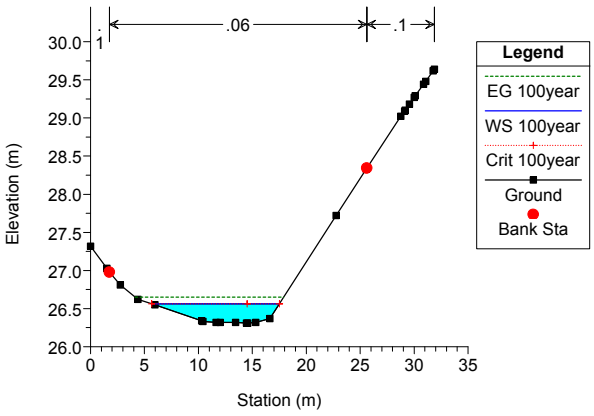
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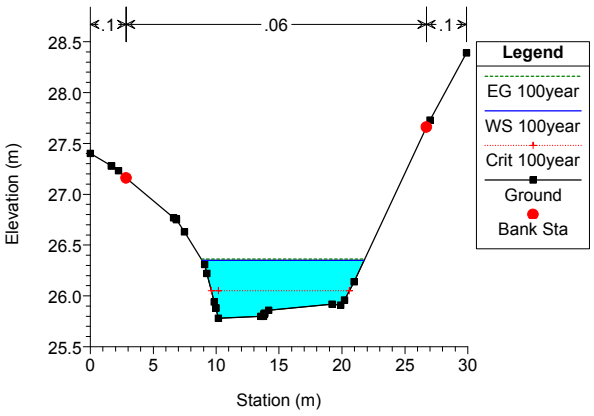
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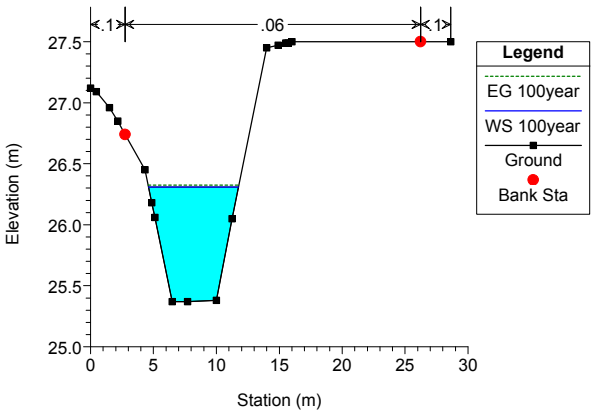
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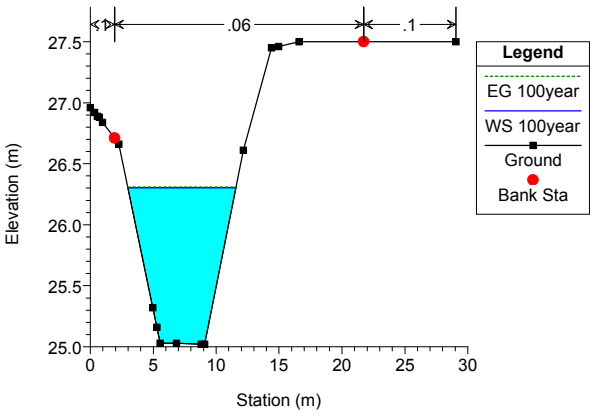
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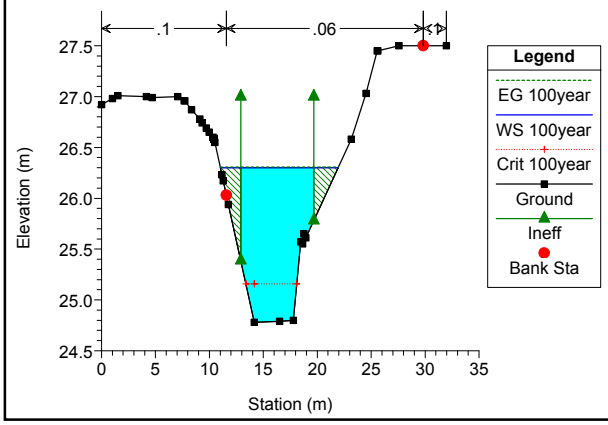
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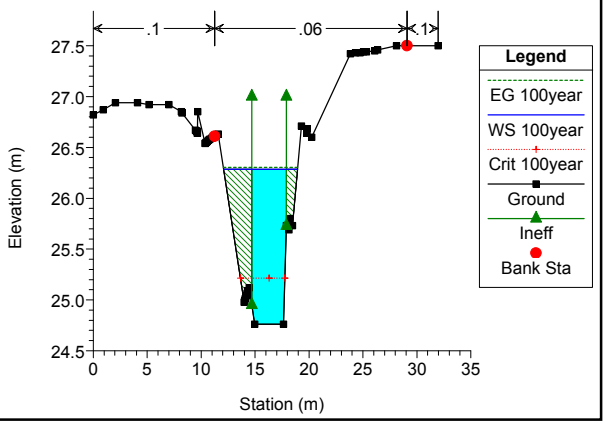
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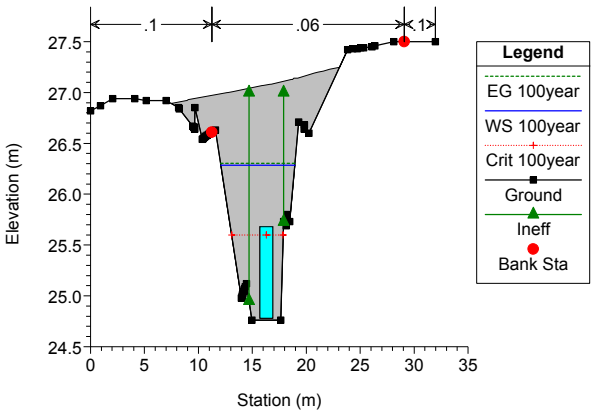
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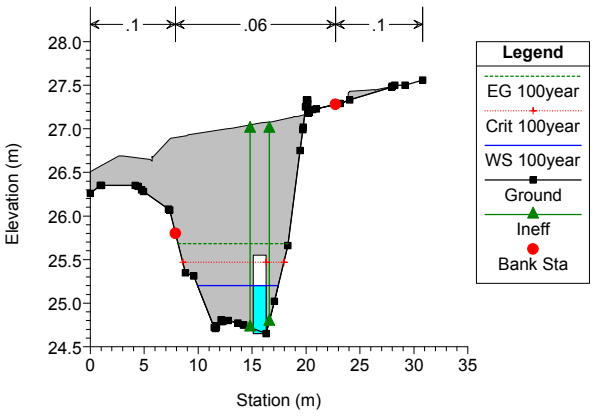
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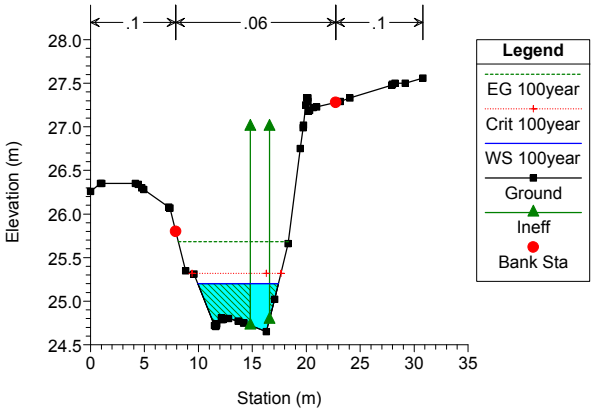
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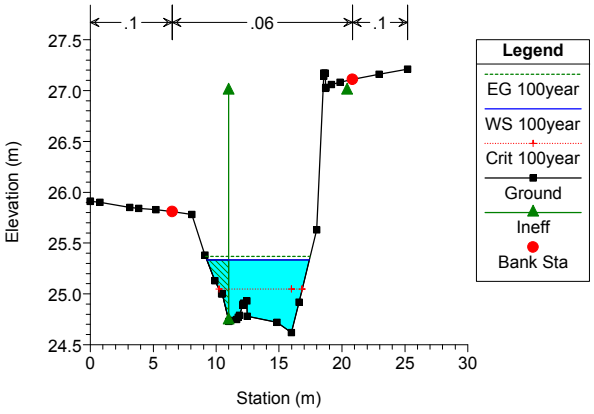
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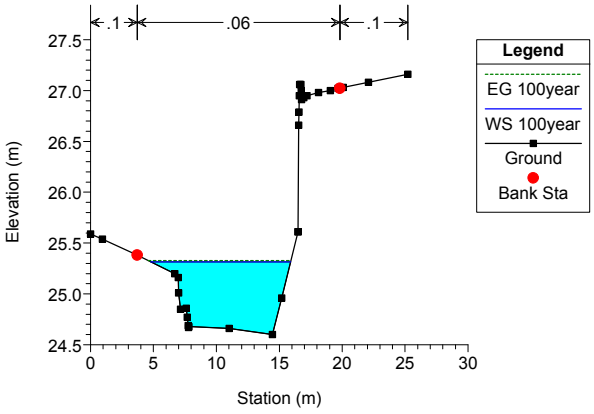
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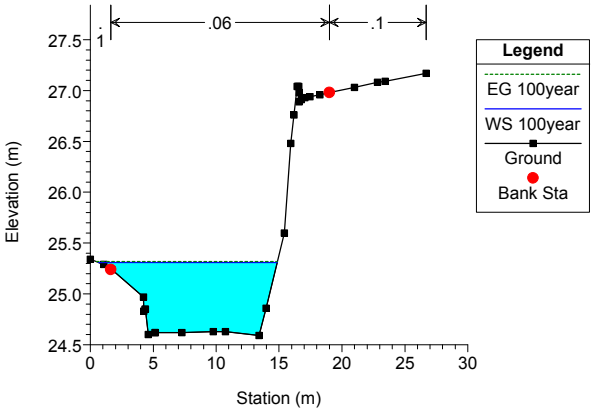
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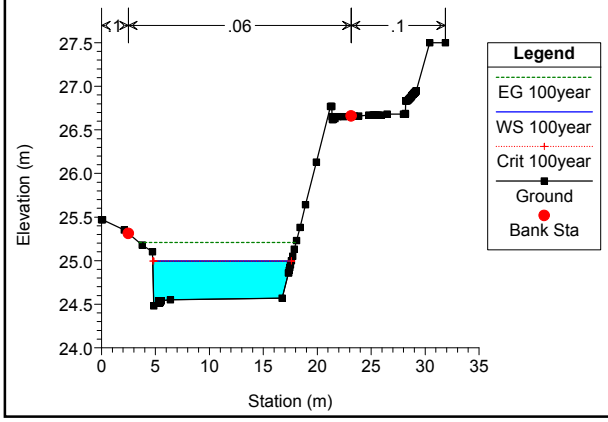
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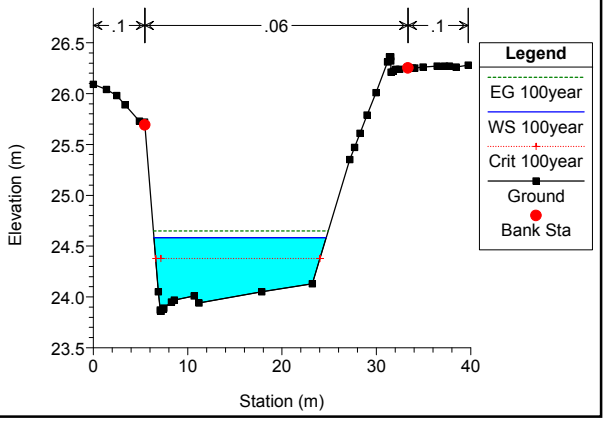
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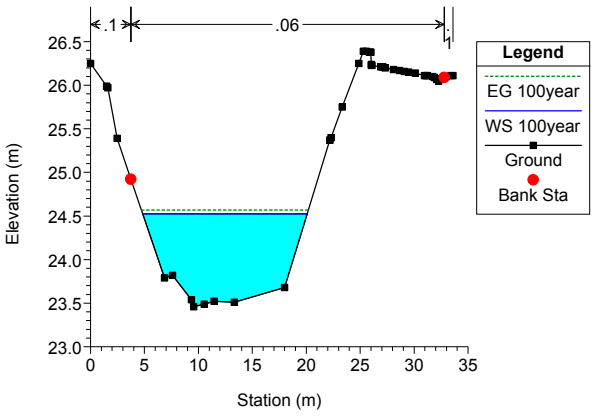
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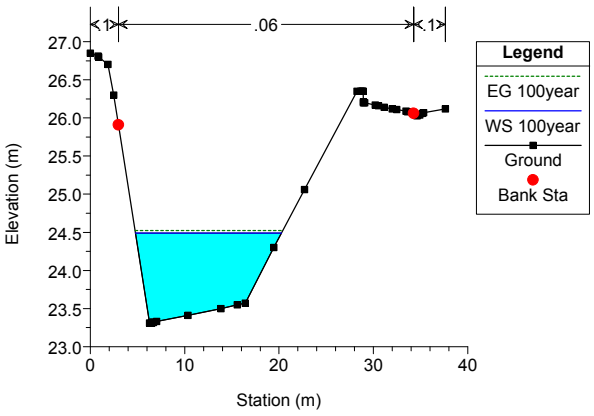
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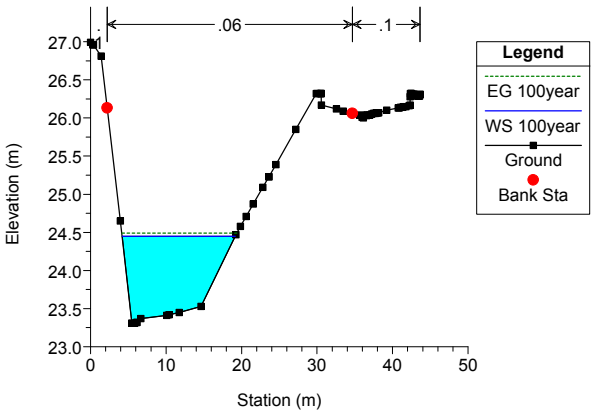
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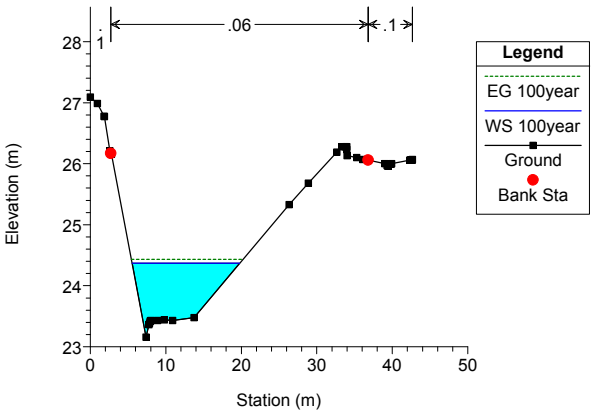
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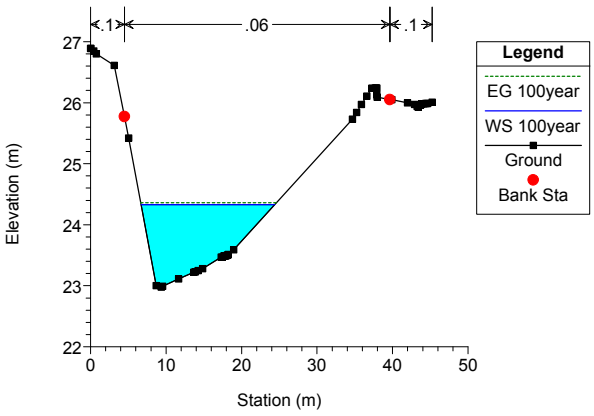
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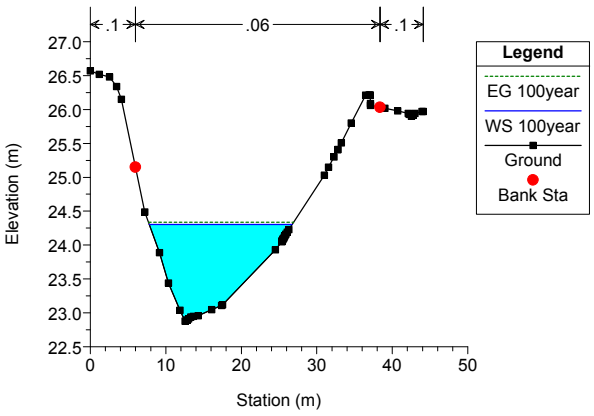
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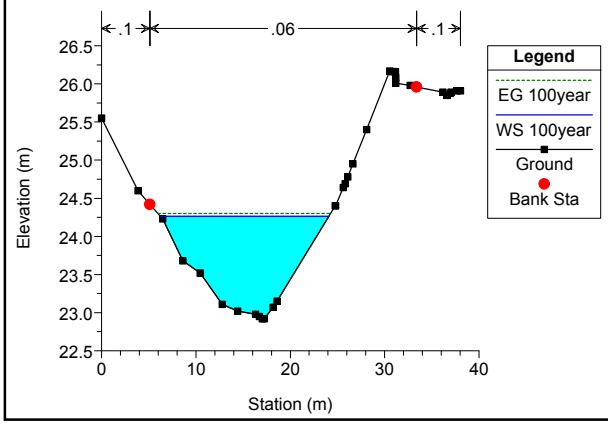
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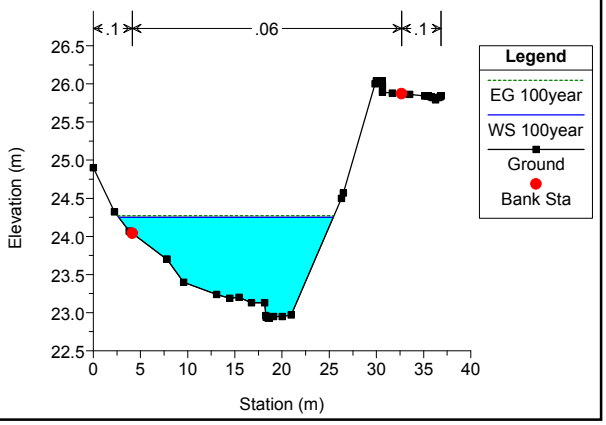
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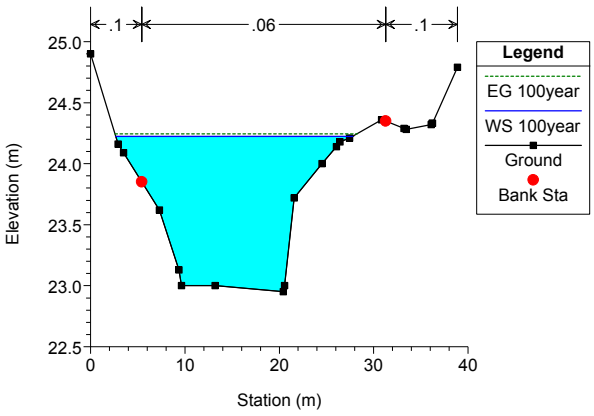
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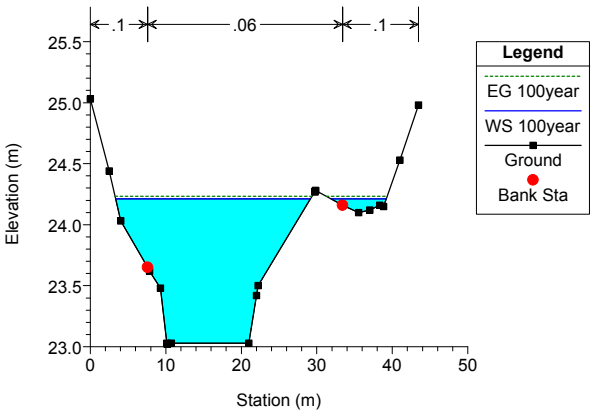
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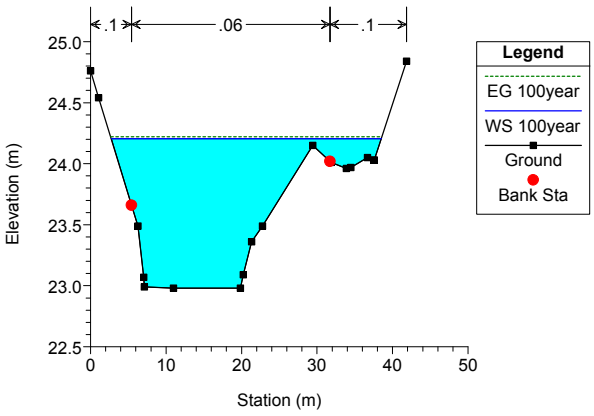
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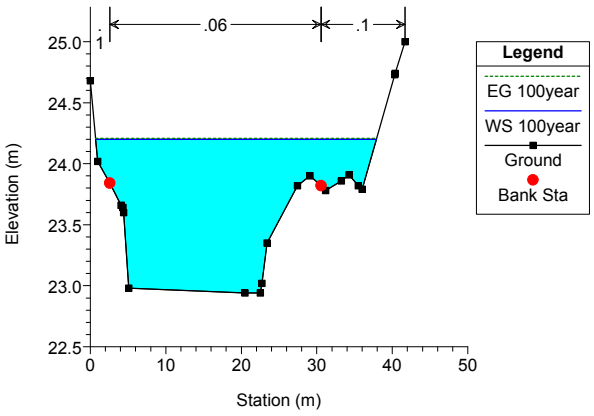
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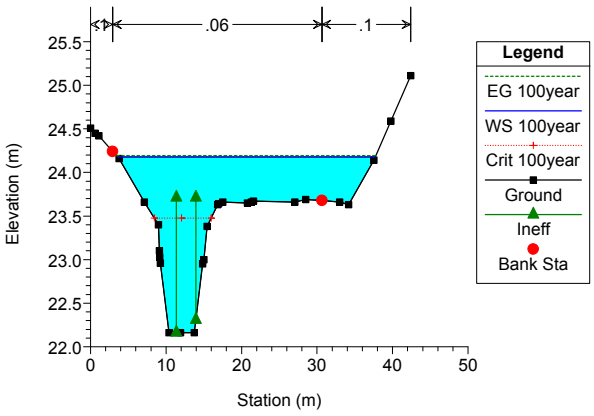
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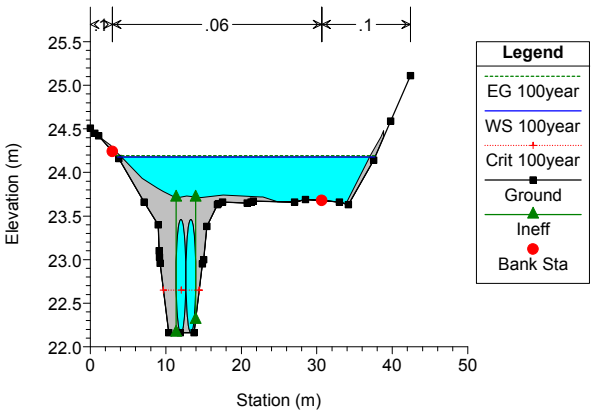
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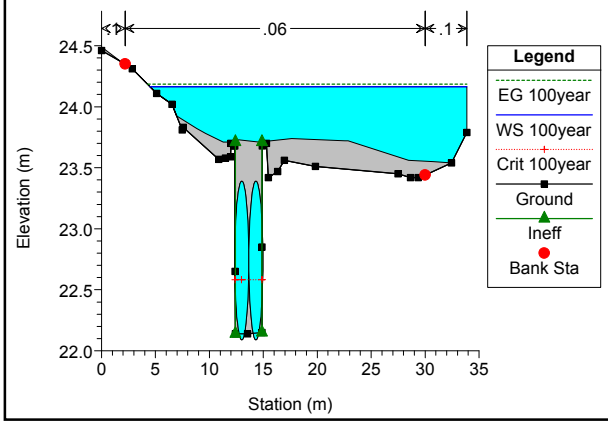
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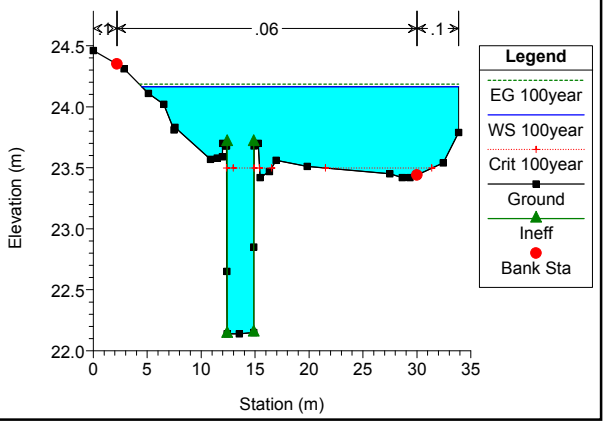
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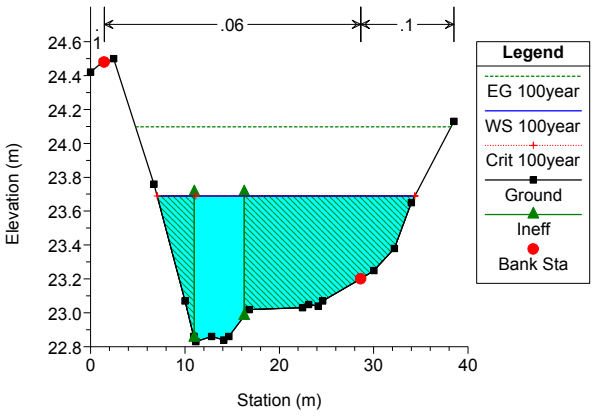
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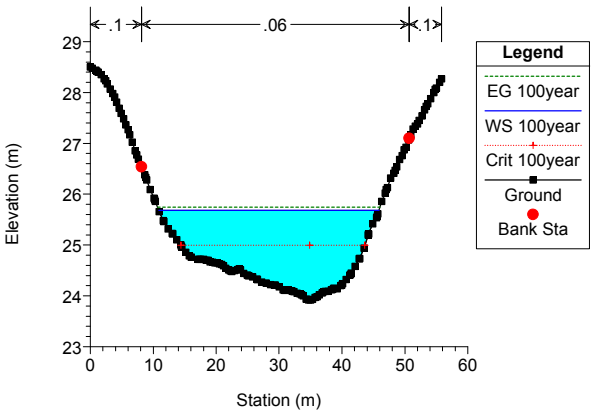
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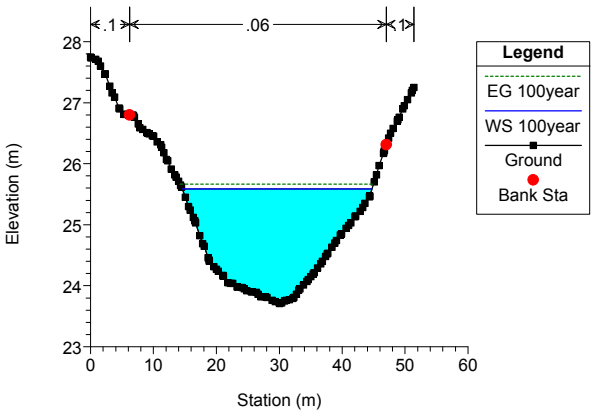
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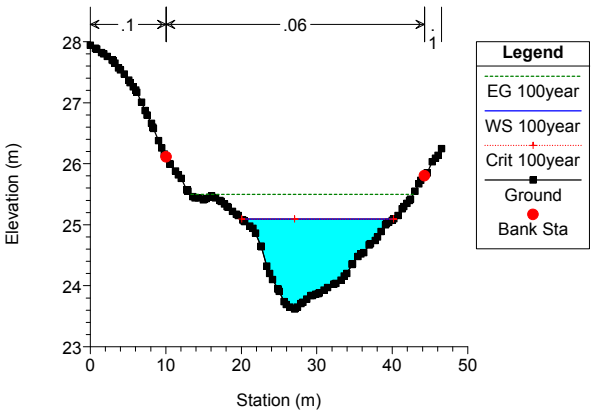
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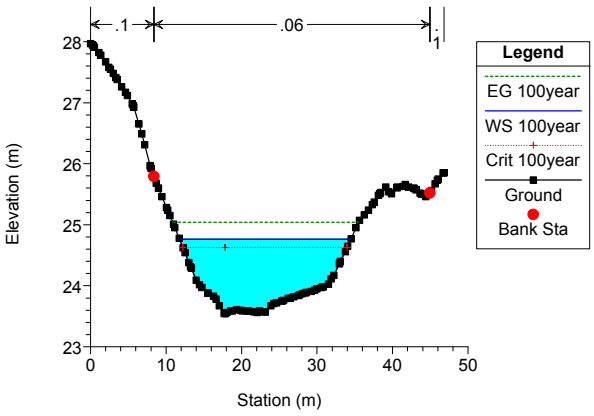
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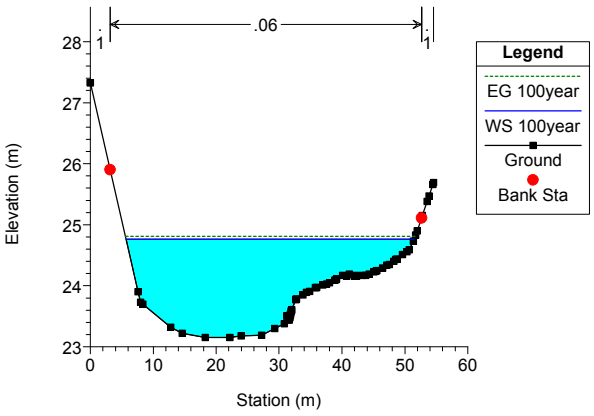
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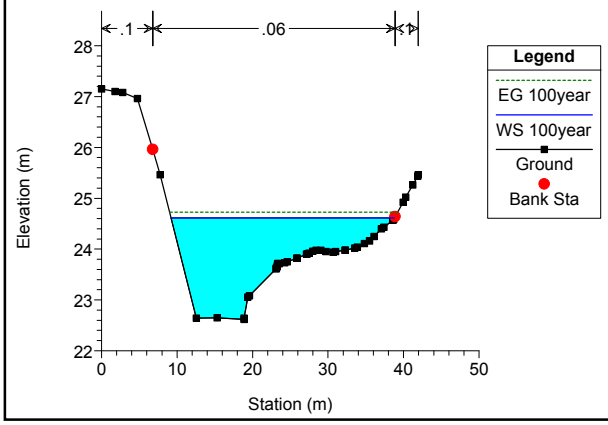
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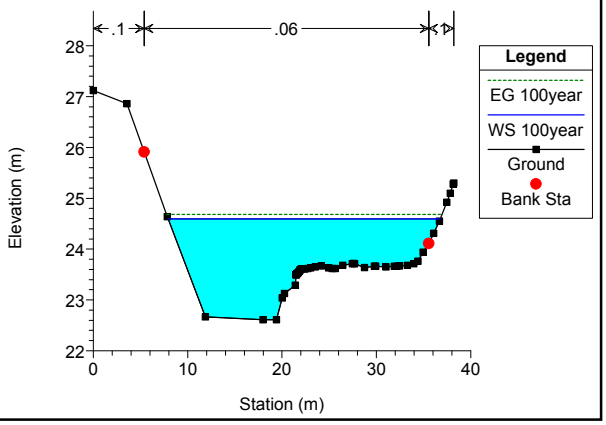
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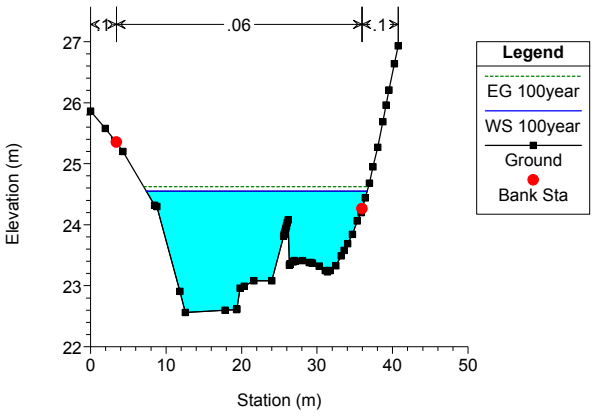
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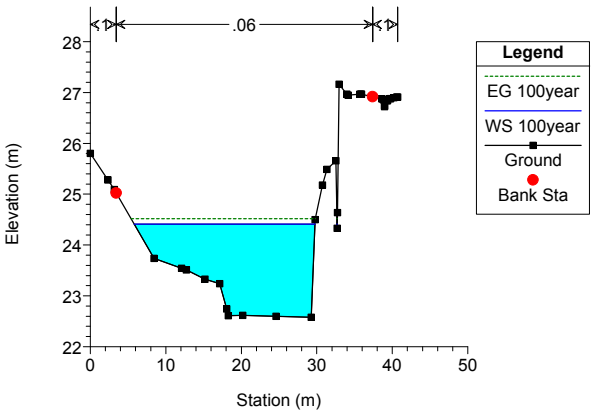
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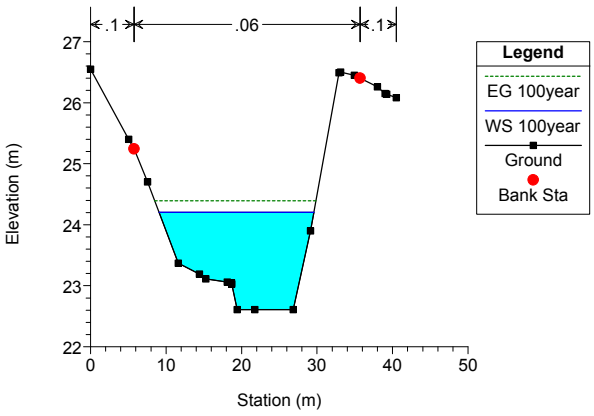
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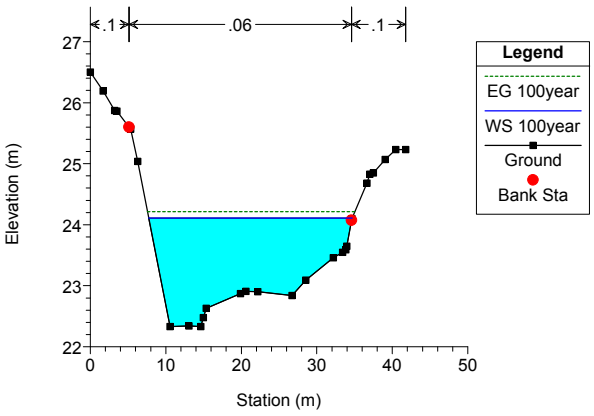
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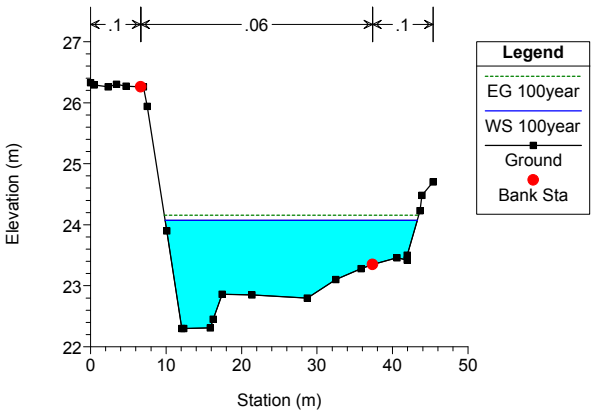
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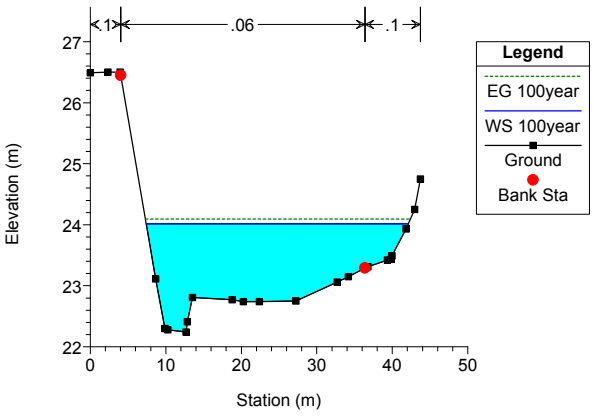
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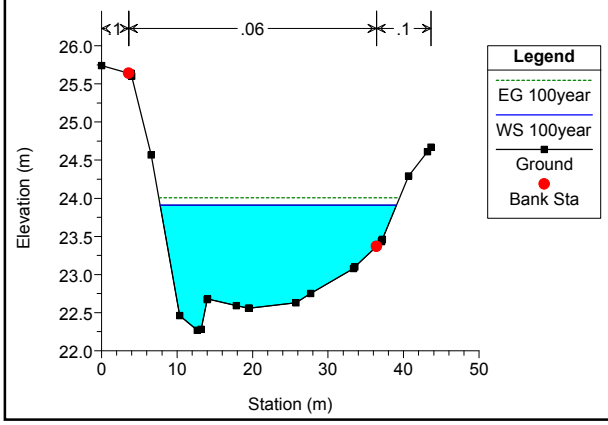
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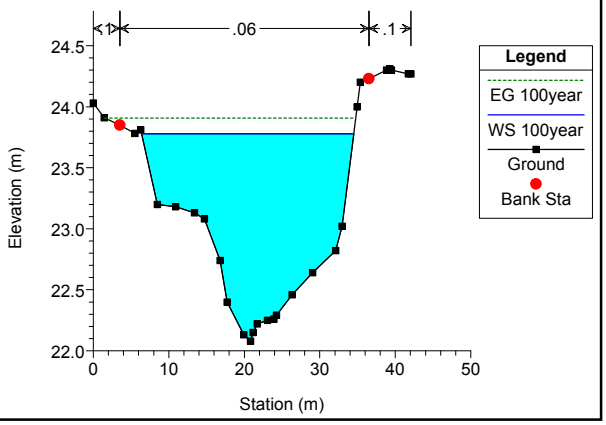
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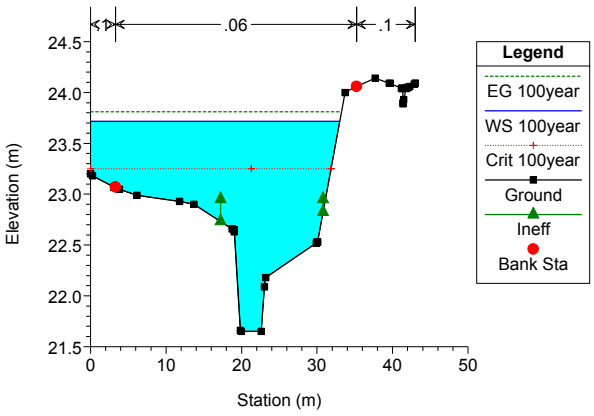
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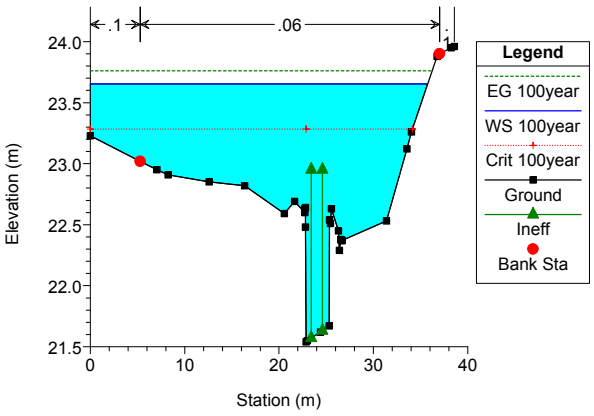
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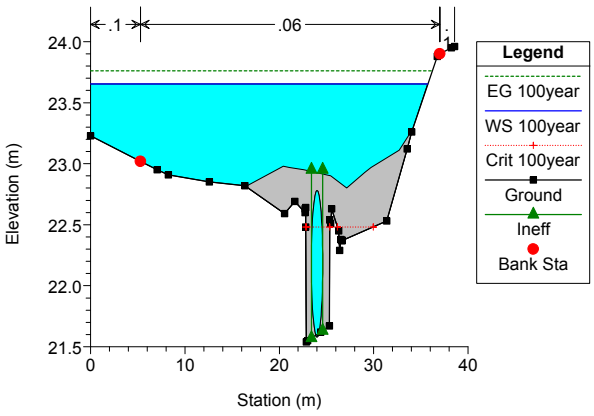
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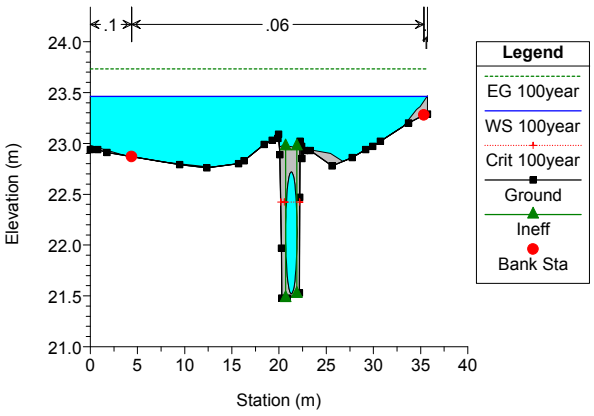
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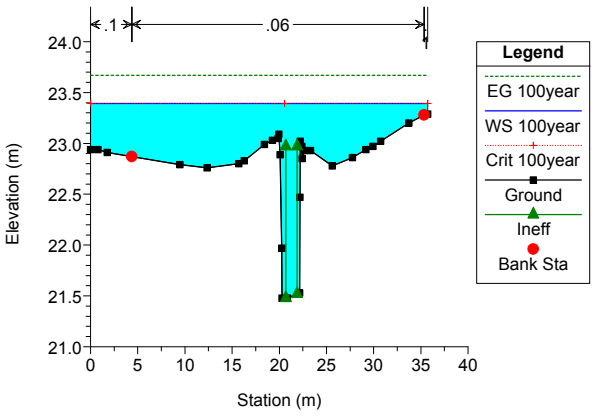
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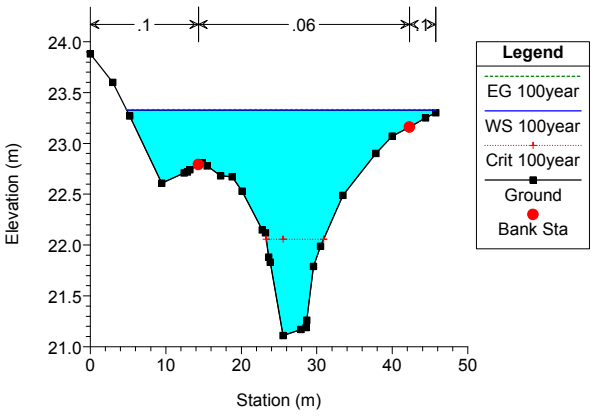
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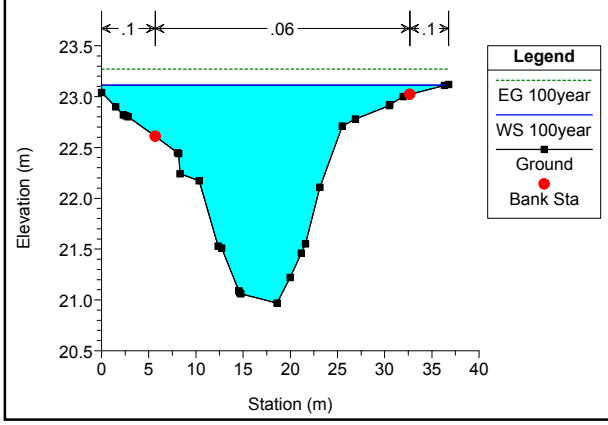
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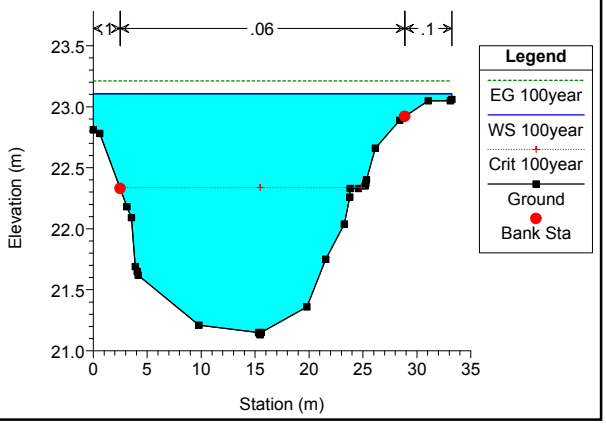
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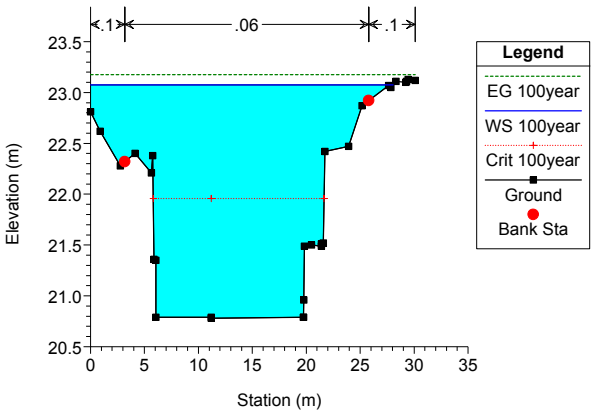
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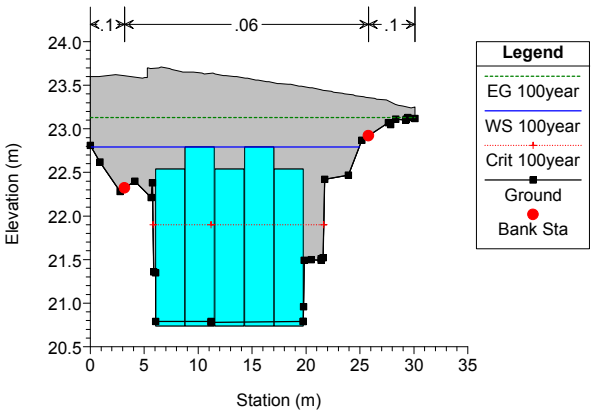
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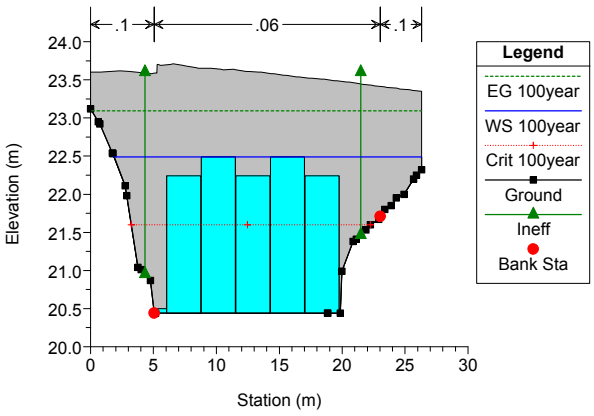
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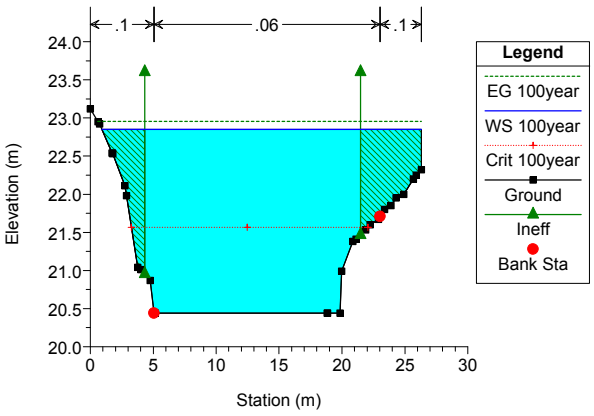
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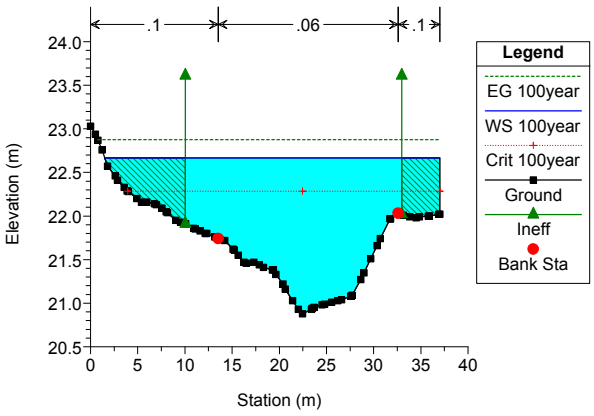
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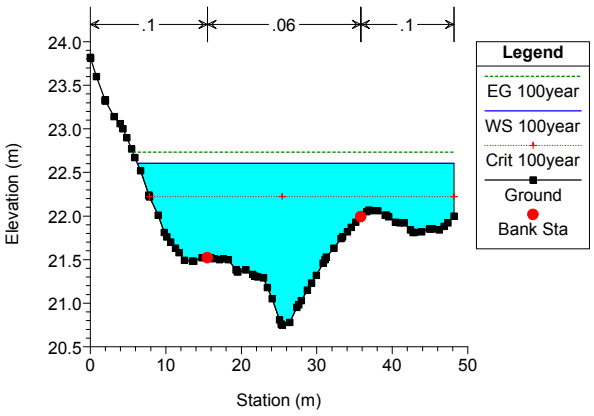
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RESULTS

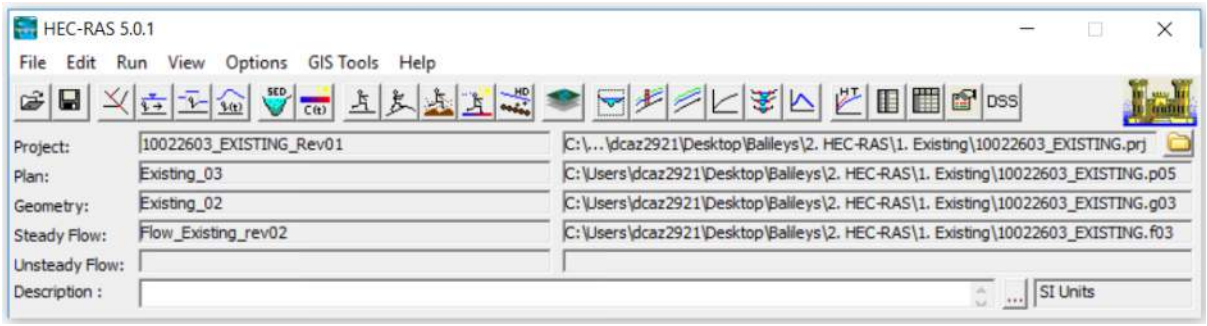
River	Reach	River Station	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
Yaun Creek	79	344.25	2year	18.99	23.92	25.08	24.67	25.13	0.0049	0.91	20.84	30	0.35
Yaun Creek	79	344.25	10year	30.46	23.92	25.38	24.84	25.43	0.004179	1.01	30.06	32.7	0.34
Yaun Creek	79	344.25	100year	45.38	23.92	25.68	24.99	25.74	0.003838	1.13	40.28	35.01	0.34
Yaun Creek	79	344.25	200year	65.62	23.92	25.99	25.18	26.07	0.003845	1.28	51.33	36.87	0.35
Yaun Creek	79	325.65	2year	18.99	23.71	25		25.04	0.004203	0.95	20.07	24.28	0.33
Yaun Creek	79	325.65	10year	30.46	23.71	25.29		25.35	0.004428	1.1	27.64	27.65	0.35
Yaun Creek	79	325.65	100year	45.38	23.71	25.59		25.67	0.004465	1.25	36.28	30.16	0.36
Yaun Creek	79	325.65	200year	65.62	23.71	25.88		25.99	0.004857	1.44	45.59	32.63	0.39
Yaun Creek	79	312.07	2year	18.99	23.62	24.7	24.6	24.91	0.027796	2.03	9.35	14.74	0.81
Yaun Creek	79	312.07	10year	30.46	23.62	24.88	24.83	25.19	0.034819	2.5	12.17	16.6	0.93
Yaun Creek	79	312.07	100year	45.38	23.62	25.09	25.09	25.5	0.039204	2.82	16.1	20.09	1.01
Yaun Creek	79	312.07	200year	65.62	23.62	25.36	25.36	25.81	0.037362	2.98	22.02	24.42	1
Yaun Creek	79	298.73	2year	18.99	23.54	24.3	24.25	24.49	0.033731	1.93	9.83	19.46	0.87
Yaun Creek	79	298.73	10year	30.46	23.54	24.52		24.75	0.027772	2.13	14.29	21.07	0.83
Yaun Creek	79	298.73	100year	45.38	23.54	24.76	24.63	25.04	0.024027	2.32	19.56	22.73	0.8
Yaun Creek	79	298.73	200year	65.62	23.54	25.06	24.85	25.37	0.020148	2.46	26.66	24.78	0.76
Yaun Creek	79	274.1	2year	18.99	23.15	24.2		24.23	0.003909	0.78	24.41	37.59	0.31
Yaun Creek	79	274.1	10year	30.46	23.15	24.47		24.51	0.003459	0.86	35.43	42.81	0.3
Yaun Creek	79	274.1	100year	45.38	23.15	24.76		24.81	0.002962	0.94	48.46	45.79	0.29
Yaun Creek	79	274.1	200year	65.62	23.15	25.11		25.16	0.002543	1.02	64.4	47.72	0.28
Yaun Creek	79	256.8	2year	18.99	22.62	24.04		24.12	0.010193	1.24	15.35	23.75	0.49
Yaun Creek	79	256.8	10year	30.46	22.62	24.32		24.41	0.008762	1.36	22.41	26.86	0.47
Yaun Creek	79	256.8	100year	45.38	22.62	24.61		24.72	0.007777	1.48	30.69	29.59	0.46
Yaun Creek	79	256.8	200year	65.62	22.62	24.95		25.08	0.006449	1.6	41.08	31.44	0.44
Yaun Creek	79	251.32	2year	18.99	22.61	24.02		24.07	0.005612	1	19.07	26.13	0.37
Yaun Creek	79	251.32	10year	30.46	22.61	24.3		24.37	0.005015	1.15	26.61	27.51	0.37
Yaun Creek	79	251.32	100year	45.38	22.61	24.6		24.68	0.004757	1.31	34.89	28.85	0.37
Yaun Creek	79	251.32	200year	65.62	22.61	24.94		25.05	0.00455	1.48	44.96	30.22	0.38
Yaun Creek	79	238.8	2year	18.99	22.56	23.97		24.01	0.003625	0.88	21.67	25.33	0.3
Yaun Creek	79	238.8	10year	30.46	22.56	24.26		24.31	0.003856	1.05	29.07	27.06	0.32
Yaun Creek	79	238.8	100year	45.38	22.56	24.55		24.62	0.00401	1.22	37.36	29.24	0.34
Yaun Creek	79	238.8	200year	65.62	22.56	24.89		24.99	0.004044	1.38	47.79	31.56	0.35
Yaun Creek	79	218.14	2year	18.99	22.58	23.87		23.93	0.004923	1.02	18.62	21.68	0.35
Yaun Creek	79	218.14	10year	30.46	22.58	24.14		24.21	0.00549	1.24	24.48	22.79	0.38
Yaun Creek	79	218.14	100year	45.38	22.58	24.41		24.52	0.006096	1.47	30.9	23.97	0.41
Yaun Creek	79	218.14	200year	65.62	22.58	24.73		24.88	0.00667	1.69	38.92	25.68	0.44
Yaun Creek	79	203.75	2year	18.99	22.61	23.74		23.83	0.008811	1.31	14.48	18.39	0.47
Yaun Creek	79	203.75	10year	30.46	22.61	23.97		24.1	0.010269	1.62	18.82	19.48	0.53
Yaun Creek	79	203.75	100year	45.38	22.61	24.2		24.39	0.011747	1.93	23.48	20.53	0.58
Yaun Creek	79	203.75	200year	65.62	22.61	24.49		24.74	0.01251	2.22	29.51	21.81	0.61
Yaun Creek	79	184.97	2year	18.99	22.33	23.65		23.7	0.004776	0.96	19.79	25.52	0.35
Yaun Creek	79	184.97	10year	30.46	22.33	23.88		23.95	0.005401	1.19	25.64	26.21	0.38
Yaun Creek	79	184.97	100year	45.38	22.33	24.11		24.21	0.006064	1.43	31.82	26.94	0.42
Yaun Creek	79	184.97	200year	65.62	22.33	24.41		24.55	0.006104	1.64	40.11	28.45	0.43
Yaun Creek	79	175.9	2year	18.99	22.3	23.61		23.66	0.004266	0.9	21.72	31.78	0.33
Yaun Creek	79	175.9	10year	30.46	22.3	23.84		23.9	0.004602	1.1	28.98	32.58	0.35
Yaun Creek	79	175.9	100year	45.38	22.3	24.07		24.16	0.005003	1.32	36.66	33.41	0.38
Yaun Creek	79	175.9	200year	65.62	22.3	24.38		24.49	0.00489	1.5	47.06	34.32	0.39
Yaun Creek	79	163.26	2year	18.99	22.24	23.56		23.6	0.003977	0.87	22.42	32.23	0.32
Yaun Creek	79	163.26	10year	30.46	22.24	23.79		23.84	0.00435	1.07	29.71	33.47	0.34
Yaun Creek	79	163.26	100year	45.38	22.24	24.01		24.1	0.004775	1.28	37.49	34.69	0.37
Yaun Creek	79	163.26	200year	65.62	22.24	24.32		24.43	0.004598	1.44	48.48	36.08	0.38
Yaun Creek	79	146.22	2year	18.99	22.27	23.49		23.53	0.004341	0.9	21.12	28.83	0.33
Yaun Creek	79	146.22	10year	30.46	22.27	23.7		23.76	0.005001	1.13	27.27	30.07	0.37
Yaun Creek	79	146.22	100year	45.38	22.27	23.91		24.01	0.005736	1.37	33.76	31.33	0.41
Yaun Creek	79	146.22	200year	65.62	22.27	24.22		24.34	0.005468	1.55	43.75	33.17	0.41
Yaun Creek	79	133.24	2year	18.99	22.08	23.41		23.46	0.006239	1.04	18.34	26.02	0.39
Yaun Creek	79	133.24	10year	30.46	22.08	23.59		23.68	0.00767	1.31	23.28	27.07	0.45
Yaun Creek	79	133.24	100year	45.38	22.08	23.78		23.91	0.009333	1.6	28.32	28.11	0.51
Yaun Creek	79	133.24	200year	65.62	22.08	24.11		24.25	0.008185	1.7	39.16	35.18	0.49
Yaun Creek	79	122.13	2year	18.99	21.65	23.36	22.83	23.4	0.004162	0.87	22.39	32.13	0.32
Yaun Creek	79	122.13	10year	30.46	21.65	23.54	23.09	23.6	0.005279	1.12	28.14	32.57	0.37
Yaun Creek	79	122.13	100year	45.38	21.65	23.71	23.25	23.81	0.006624	1.39	33.8	33	0.43
Yaun Creek	79	122.13	200year	65.62	21.65	24.05	23.43	24.17	0.005895	1.52	45.15	36.24	0.42

Yaun Creek	79	115.82	2year	18.99	21.54	23.33	22.98	23.37	0.005982	0.95	20.78	34.31	0.37
Yaun Creek	79	115.82	10year	30.46	21.54	23.49	23.13	23.57	0.007358	1.2	26.6	35.04	0.42
Yaun Creek	79	115.82	100year	45.38	21.54	23.65	23.29	23.76	0.009094	1.48	32.28	35.74	0.48
Yaun Creek	79	115.82	200year	65.62	21.54	24.01	23.45	24.13	0.006674	1.53	45.48	38.56	0.43
Yaun Creek	79	114.82		Culvert									
Yaun Creek	79	106.85	2year	18.99	21.48	23.13	23.13	23.29	0.056318	1.84	10.82	32.49	0.99
Yaun Creek	79	106.85	10year	30.46	21.48	23.25	23.25	23.47	0.052865	2.11	15.17	34.84	1.01
Yaun Creek	79	106.85	100year	45.38	21.48	23.39	23.39	23.67	0.048013	2.39	20.05	35.71	1
Yaun Creek	79	106.85	200year	65.62	21.48	23.93	23.55	24.09	0.010906	1.77	39.43	35.71	0.53
Yaun Creek	79	91.26	2year	4.3	21.11	22.6	21.67	22.61	0.001005	0.41	10.6	15.27	0.16
Yaun Creek	79	91.26	10year	7.23	21.11	22.94	21.86	22.95	0.000918	0.4	19.05	31.04	0.15
Yaun Creek	79	91.26	100year	11.16	21.11	23.33	22.06	23.33	0.000531	0.38	32.81	40.95	0.12
Yaun Creek	79	91.26	200year	18.1	21.11	24		24.01	0.00022	0.34	62.31	45.77	0.08
Yaun Creek	79	79.18	2year	21.79	20.97	22.41		22.53	0.010556	1.54	14.15	16.15	0.53
Yaun Creek	79	79.18	10year	35.63	20.97	22.67		22.86	0.013974	1.89	18.92	20.67	0.61
Yaun Creek	79	79.18	100year	52.69	20.97	23.11		23.27	0.010355	1.77	31.21	36.38	0.54
Yaun Creek	79	79.18	200year	84.37	20.97	23.85		23.98	0.004257	1.61	58.44	36.76	0.38
Yaun Creek	3	73.17	2year	25.11	21.13	22.39	21.91	22.47	0.006398	1.23	20.5	23.11	0.41
Yaun Creek	3	73.17	10year	37.79	21.13	22.68	22.1	22.78	0.006	1.39	27.41	25.34	0.42
Yaun Creek	3	73.17	100year	55.8	21.13	23.11	22.34	23.21	0.004783	1.45	39.63	33.26	0.39
Yaun Creek	3	73.17	200year	92.82	21.13	23.83		23.95	0.003228	1.57	63.81	33.26	0.34
Yaun Creek	3	65.65	2year	25.11	20.78	22.37	21.51	22.43	0.003376	1.05	23.86	18.95	0.29
Yaun Creek	3	65.65	10year	37.79	20.78	22.65	21.71	22.74	0.004554	1.28	29.98	23.75	0.35
Yaun Creek	3	65.65	100year	55.8	20.78	23.08	21.96	23.18	0.004173	1.42	40.76	28.04	0.35
Yaun Creek	3	65.65	200year	92.82	20.78	23.8	22.51	23.93	0.003378	1.61	62.49	30.1	0.33
Yaun Creek	3	63.15		Culvert									
Yaun Creek	3	30.52	2year	25.11	20.44	22.36	21.1	22.39	0.001109	0.82	31.37	24.16	0.19
Yaun Creek	3	30.52	10year	37.79	20.44	22.59	21.31	22.65	0.001703	1.09	35.26	24.71	0.24
Yaun Creek	3	30.52	100year	55.8	20.44	22.85	21.56	22.95	0.002489	1.43	39.77	25.4	0.3
Yaun Creek	3	30.52	200year	92.82	20.44	23.28	21.98	23.48	0.003934	2.01	47.07	26.32	0.39
Yaun Creek	3	15.92	2year	25.11	20.88	22.26	21.88	22.35	0.007594	1.37	19.31	32.79	0.46
Yaun Creek	3	15.92	10year	37.79	20.88	22.45	22.08	22.59	0.009071	1.7	23.64	34.35	0.51
Yaun Creek	3	15.92	100year	55.8	20.88	22.67	22.28	22.88	0.010769	2.08	28.59	35.49	0.58
Yaun Creek	3	15.92	200year	92.82	20.88	23.01	22.64	23.37	0.013597	2.72	36.43	36.87	0.67
Yaun Creek	3	3.34	2year	25.11	20.75	22.17	21.86	22.25	0.008314	1.32	23.32	40.06	0.47
Yaun Creek	3	3.34	10year	37.79	20.75	22.37	22.03	22.47	0.008301	1.53	31.33	40.93	0.48
Yaun Creek	3	3.34	100year	55.8	20.75	22.6	22.22	22.73	0.0083	1.75	41.06	41.94	0.5
Yaun Creek	3	3.34	200year	92.82	20.75	23	22.49	23.18	0.008305	2.11	58.07	43.86	0.52
Baileys	42	337.12	2year	1.16	27.34	27.64	27.58	27.66	0.024688	0.74	1.57	10.46	0.61
Baileys	42	337.12	10year	1.92	27.34	27.71	27.64	27.74	0.0213	0.81	2.38	12.47	0.59
Baileys	42	337.12	100year	2.78	27.34	27.75	27.69	27.79	0.024204	0.96	2.91	12.96	0.64
Baileys	42	337.12	200year	4.96	27.34	27.77	27.77	27.89	0.054578	1.52	3.26	13.28	0.98
Baileys	42	313.78	2year	1.16	26.59	26.82	26.81	26.87	0.051434	0.9	1.29	11.1	0.84
Baileys	42	313.78	10year	1.92	26.59	26.86	26.86	26.92	0.068443	1.15	1.67	12.31	1
Baileys	42	313.78	100year	2.78	26.59	26.91	26.9	26.98	0.055457	1.21	2.31	13.49	0.93
Baileys	42	313.78	200year	4.96	26.59	27.07		27.12	0.021166	1.03	4.81	17.27	0.62

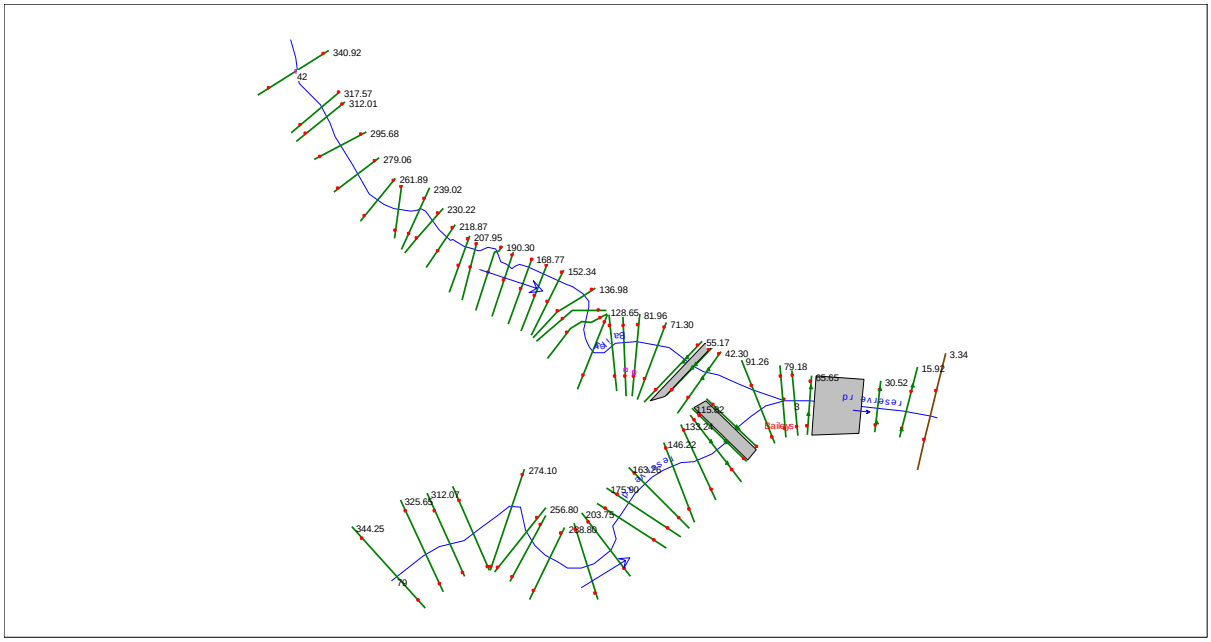
Baileys	42	308.22	2year	1.16	26.31	26.47	26.47	26.52	0.075024	1.08	1.07	9.36	1.02
Baileys	42	308.22	10year	1.92	26.31	26.46	26.51	26.63	0.221084	1.83	1.05	9.29	1.74
Baileys	42	308.22	100year	2.78	26.31	26.56	26.56	26.65	0.062556	1.32	2.11	11.85	1
Baileys	42	308.22	200year	4.96	26.31	27.07		27.09	0.001887	0.49	10.15	18.55	0.21
Baileys	42	291.64	2year	1.16	25.78	26.05	25.96	26.06	0.011598	0.58	2.01	10.94	0.43
Baileys	42	291.64	10year	1.92	25.78	26.08	26.01	26.11	0.019085	0.81	2.36	11.14	0.56
Baileys	42	291.64	100year	2.78	25.78	26.35	26.05	26.36	0.002737	0.5	5.61	12.87	0.24
Baileys	42	291.64	200year	4.96	25.78	27.07		27.07	0.000381	0.29	17.36	20.73	0.1
Baileys	42	275.7	2year	1.16	25.37	25.59	25.59	25.68	0.062629	1.38	0.84	4.32	1
Baileys	42	275.7	10year	1.92	25.37	25.84		25.88	0.011945	0.94	2.04	5.29	0.48
Baileys	42	275.7	100year	2.78	25.37	26.31		26.33	0.00199	0.56	4.97	7.15	0.21
Baileys	42	275.7	200year	4.96	25.37	27.05		27.06	0.000594	0.42	12.04	12.48	0.13
Baileys	42	262.73	2year	1.16	25.02	25.52	25.24	25.53	0.003532	0.53	2.2	5.47	0.26
Baileys	42	262.73	10year	1.92	25.02	25.81		25.83	0.001733	0.48	4.02	6.66	0.2
Baileys	42	262.73	100year	2.78	25.02	26.3		26.31	0.000585	0.36	7.74	8.59	0.12
Baileys	42	262.73	200year	4.96	25.02	27.05		27.06	0.000278	0.32	15.74	13.34	0.09
Baileys	42	253.97	2year	1.16	24.78	25.51	25	25.51	0.000933	0.35	3.34	5.73	0.14
Baileys	42	253.97	10year	1.92	24.78	25.81	25.09	25.81	0.000776	0.37	5.2	7.77	0.13
Baileys	42	253.97	100year	2.78	24.78	26.3	25.16	26.31	0.000312	0.33	8.53	10.92	0.09
Baileys	42	253.97	200year	4.96	24.78	27.05	25.32	27.05	0.000163	0.26	20.83	24.58	0.07
Baileys	42	252.18	2year	1.16	24.76	25.5	25.02	25.51	0.002008	0.52	2.21	4.6	0.2
Baileys	42	252.18	10year	1.92	24.76	25.79	25.12	25.81	0.001839	0.61	3.15	5.68	0.2
Baileys	42	252.18	100year	2.78	24.76	26.29	25.22	26.3	0.001	0.59	4.73	6.86	0.15
Baileys	42	252.18	200year	4.96	24.76	27.05	25.42	27.05	0.000387	0.34	16.21	22.22	0.1
Baileys	42	251.18		Culvert									
Baileys	42	240.03	2year	1.16	24.65	25.2	25.04	25.28	0.01488	1.28	0.9	7.46	0.57
Baileys	42	240.03	10year	1.92	24.65	25.29	25.18	25.46	0.023529	1.8	1.07	7.94	0.74
Baileys	42	240.03	100year	2.78	24.65	25.2	25.32	25.68	0.085936	3.07	0.91	7.46	1.38
Baileys	42	240.03	200year	4.96	24.65	25.62	25.62	26.08	0.036559	3	1.66	9.99	0.99
Baileys	42	223.63	2year	1.16	24.62	25.05	24.91	25.07	0.009443	0.69	1.68	6.62	0.41
Baileys	42	223.63	10year	1.92	24.62	25.19	24.98	25.22	0.007382	0.77	2.5	7.39	0.38
Baileys	42	223.63	100year	2.78	24.62	25.34	25.05	25.37	0.005794	0.81	3.43	8.15	0.35
Baileys	42	223.63	200year	4.96	24.62	25.56	25.18	25.61	0.006224	1.01	4.89	9.19	0.38
Baileys	42	214.2	2year	1.16	24.6	25.01		25.02	0.002959	0.42	2.73	8.3	0.24
Baileys	42	214.2	10year	1.92	24.6	25.16		25.17	0.00249	0.48	3.98	8.62	0.23
Baileys	42	214.2	100year	2.78	24.6	25.31		25.33	0.00252	0.51	5.47	11.1	0.23
Baileys	42	214.2	200year	4.96	24.6	25.54		25.56	0.002364	0.6	8.53	15.5	0.23
Baileys	42	209.15	2year	1.16	24.59	25.01		25.01	0.001475	0.31	3.68	10.36	0.17
Baileys	42	209.15	10year	1.92	24.59	25.16		25.16	0.001414	0.36	5.36	12.06	0.17
Baileys	42	209.15	100year	2.78	24.59	25.31		25.32	0.001179	0.38	7.37	14.23	0.16
Baileys	42	209.15	200year	4.96	24.59	25.54		25.55	0.001193	0.47	10.84	15.31	0.17
Baileys	42	201.55	2year	4.3	24.48	24.8	24.79	24.91	0.053711	1.45	2.96	12.44	0.95
Baileys	42	201.55	10year	7.23	24.48	24.89	24.89	25.05	0.054909	1.79	4.04	12.63	1.01
Baileys	42	201.55	100year	11.16	24.48	25	25	25.21	0.050192	2.05	5.45	12.87	1
Baileys	42	201.55	200year	18.1	24.48	25.17	25.17	25.45	0.046277	2.33	7.76	14.08	1
Baileys	42	191.13	2year	4.3	23.86	24.21	24.21	24.3	0.061413	1.36	3.17	16.71	0.99
Baileys	42	191.13	10year	7.23	23.86	24.37	24.29	24.45	0.023407	1.23	5.89	17.37	0.67
Baileys	42	191.13	100year	11.16	23.86	24.58	24.38	24.65	0.011509	1.15	9.67	18.26	0.51
Baileys	42	191.13	200year	18.1	23.86	24.82	24.51	24.91	0.009123	1.28	14.19	19.26	0.47

Baileys	42	180.16	2year	4.3	23.46	24.09	23.84	24.12	0.005365	0.72	5.97	12.99	0.34
Baileys	42	180.16	10year	7.23	23.46	24.3		24.34	0.00474	0.83	8.75	14.07	0.33
Baileys	42	180.16	100year	11.16	23.46	24.53		24.57	0.004349	0.93	12.05	15.25	0.33
Baileys	42	180.16	200year	18.1	23.46	24.76		24.83	0.005202	1.15	15.77	16.48	0.37
Baileys	42	168.73	2year	4.3	23.31	24.05		24.07	0.003094	0.61	7.09	13.09	0.26
Baileys	42	168.73	10year	7.23	23.31	24.26		24.29	0.003209	0.73	9.91	14.2	0.28
Baileys	42	168.73	100year	11.16	23.31	24.49		24.52	0.003257	0.84	13.28	15.46	0.29
Baileys	42	168.73	200year	18.1	23.31	24.71		24.77	0.004289	1.07	16.88	16.71	0.34
Baileys	42	160.06	2year	4.3	23.31	24.02		24.04	0.004153	0.68	6.35	12.37	0.3
Baileys	42	160.06	10year	7.23	23.31	24.22		24.26	0.004177	0.8	9.01	13.61	0.31
Baileys	42	160.06	100year	11.16	23.31	24.45		24.49	0.004105	0.91	12.24	14.97	0.32
Baileys	42	160.06	200year	18.1	23.31	24.66		24.73	0.005543	1.17	15.5	16.35	0.38
Baileys	42	150.26	2year	4.3	23.16	23.92		23.97	0.01356	1.03	4.18	10.49	0.52
Baileys	42	150.26	10year	7.23	23.16	24.13		24.19	0.01022	1.09	6.62	12.28	0.48
Baileys	42	150.26	100year	11.16	23.16	24.37		24.43	0.008216	1.15	9.74	14.24	0.44
Baileys	42	150.26	200year	18.1	23.16	24.54		24.65	0.011348	1.48	12.27	15.65	0.53
Baileys	42	136.27	2year	4.3	22.98	23.86		23.88	0.003039	0.59	7.23	13.6	0.26
Baileys	42	136.27	10year	7.23	22.98	24.09		24.11	0.002998	0.69	10.48	15.57	0.27
Baileys	42	136.27	100year	11.16	22.98	24.33		24.36	0.002875	0.77	14.52	17.72	0.27
Baileys	42	136.27	200year	18.1	22.98	24.48		24.53	0.004693	1.05	17.24	19.03	0.35
Baileys	42	127.75	2year	4.69	22.88	23.84		23.86	0.002635	0.58	8.12	14.45	0.25
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Baileys	42	127.75	100year	12.22	22.88	24.31		24.34	0.002718	0.77	15.94	18.92	0.27
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Baileys	42	115.98	2year	4.69	22.92	23.8		23.82	0.003826	0.66	7.09	13.62	0.29
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Baileys	42	107.75	2year	4.69	22.93	23.78		23.79	0.00275	0.55	8.52	16.8	0.25
Baileys	42	107.75	10year	7.92	22.93	24		24.02	0.002672	0.63	12.6	19.95	0.25
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Baileys	42	107.75	200year	19.69	22.93	24.32		24.37	0.004372	1.02	19.62	23.41	0.34
Baileys	42	95.16	2year	4.69	22.95	23.75		23.76	0.001559	0.48	9.87	15.74	0.19
Baileys	42	95.16	10year	7.92	22.95	23.97		23.99	0.00188	0.58	13.76	19.82	0.22
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Baileys	42	95.16	200year	19.69	22.95	24.27		24.32	0.004458	0.99	20.45	26.22	0.34
Baileys	42	88.63	2year	4.69	23.02	23.74		23.75	0.002093	0.51	9.32	17.83	0.22
Baileys	42	88.63	10year	7.92	23.02	23.96		23.98	0.002111	0.59	13.67	22.01	0.23
Baileys	42	88.63	100year	12.22	23.02	24.21		24.23	0.002059	0.65	20.26	33.14	0.23
Baileys	42	88.63	200year	19.69	23.02	24.24		24.29	0.00506	1.01	21.06	34.29	0.36
Baileys	42	81.96	2year	4.69	22.98	23.73		23.74	0.001192	0.4	11.69	20.14	0.17
Baileys	42	81.96	10year	7.92	22.98	23.95		23.96	0.001293	0.49	16.45	23.43	0.18
Baileys	42	81.96	100year	12.22	22.98	24.21		24.22	0.001286	0.53	24.42	35.75	0.18
Baileys	42	81.96	200year	19.69	22.98	24.22		24.25	0.003163	0.85	24.88	35.89	0.29
Baileys	42	71.3	2year	4.69	22.94	23.73		23.73	0.000659	0.32	14.88	23.13	0.13
Baileys	42	71.3	10year	7.92	22.94	23.94		23.95	0.000824	0.38	21.15	35.09	0.14
Baileys	42	71.3	100year	12.22	22.94	24.2		24.21	0.000691	0.43	30.43	37.19	0.14
Baileys	42	71.3	200year	19.69	22.94	24.2		24.23	0.001776	0.69	30.53	37.21	0.22
Baileys	42	55.17	2year	4.69	22.16	23.62	22.86	23.7	0.003409	1.24	3.79	9.42	0.33
Baileys	42	55.17	10year	7.92	22.16	23.92	23.14	23.93	0.002199	0.53	15.77	30.64	0.22
Baileys	42	55.17	100year	12.22	22.16	24.18	23.48	24.19	0.001521	0.54	24.23	34.13	0.19
Baileys	42	55.17	200year	19.69	22.16	24.14	23.73	24.18	0.004616	0.92	22.92	33.6	0.34
Baileys	42	53.65		Culvert									
Baileys	42	49.39	2year	4.69	22.14	23.51	22.86	23.61	0.00462	1.39	3.37	15.05	0.38
Baileys	42	49.39	10year	7.92	22.14	23.7	23.16	23.91	0.008516	2.06	3.84	23.97	0.53
Baileys	42	49.39	100year	12.22	22.14	24.17	23.5	24.18	0.002648	0.63	20.48	29.39	0.24
Baileys	42	49.39	200year	19.69	22.14	24.07	23.79	24.14	0.010293	1.17	17.81	28.18	0.46
Baileys	42	42.3	2year	4.69	22.83	23.3	23.3	23.52	0.045931	2.05	2.29	22.03	0.99
Baileys	42	42.3	10year	7.92	22.83	23.48	23.48	23.79	0.042171	2.46	3.22	24.81	1.01
Baileys	42	42.3	100year	12.22	22.83	23.69	23.69	24.1	0.03769	2.83	4.32	27.32	1
Baileys	42	42.3	200year	19.69	22.83	24.06	23.71	24.09	0.002689	0.82	26.69	32.9	0.27

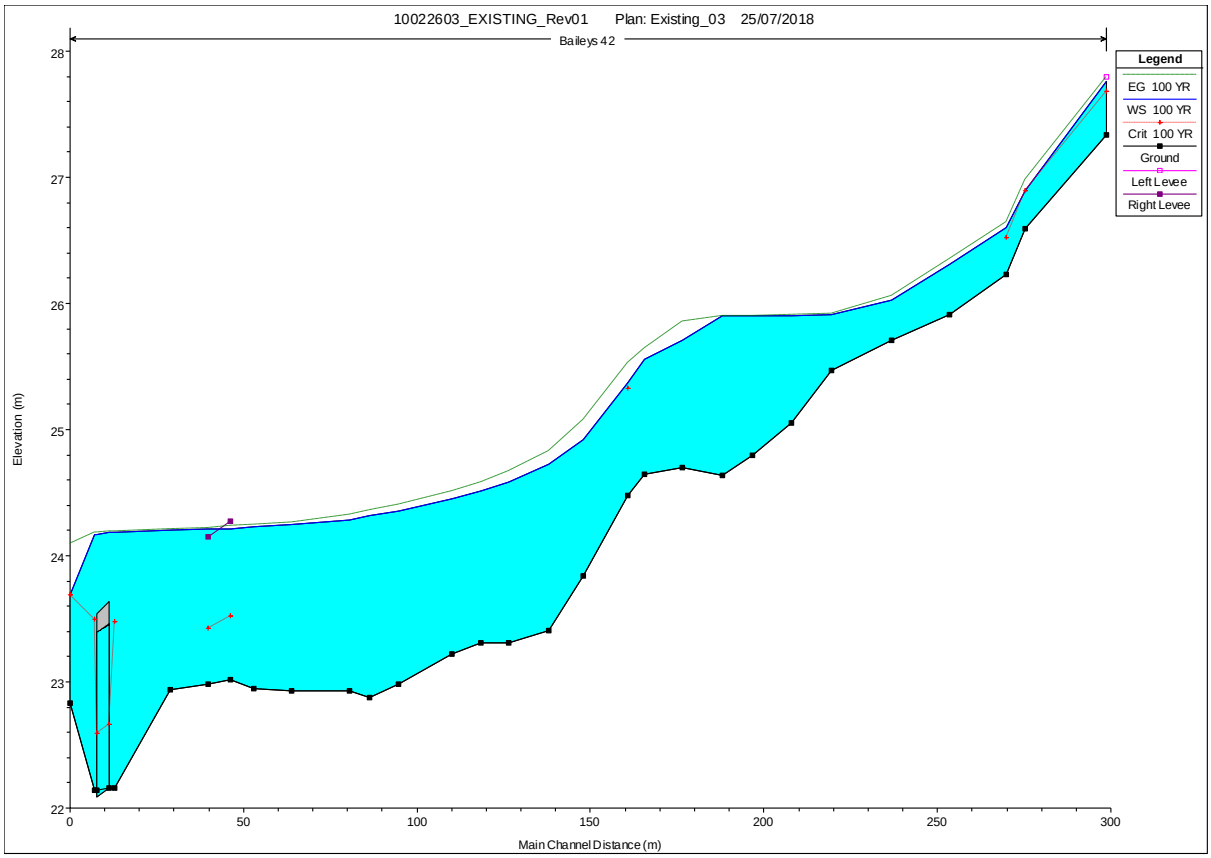
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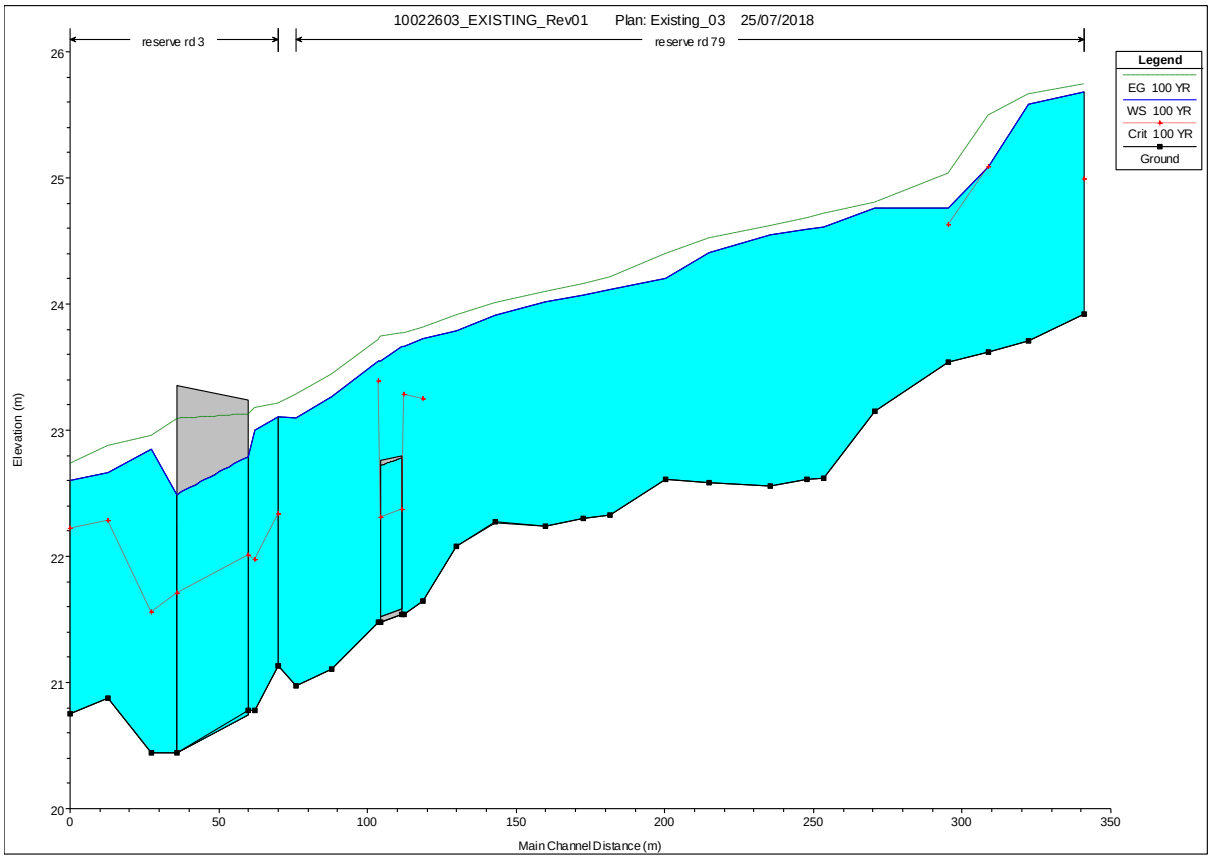


PLAN VIEW



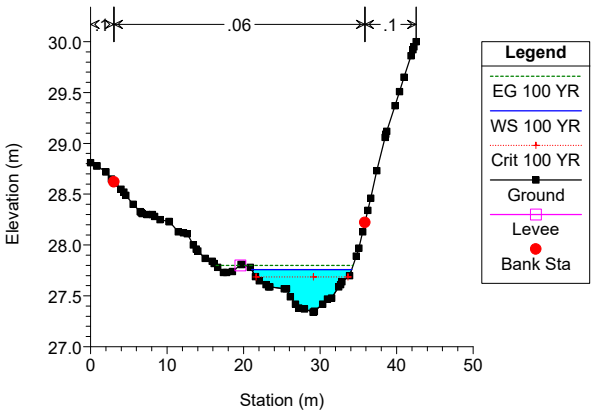
LONG SECTIONS



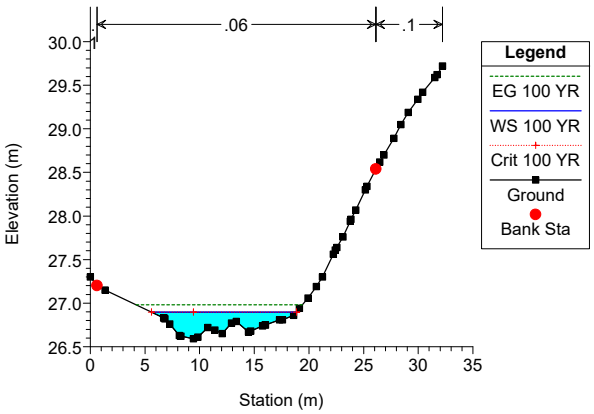


CROSS SECTIONS

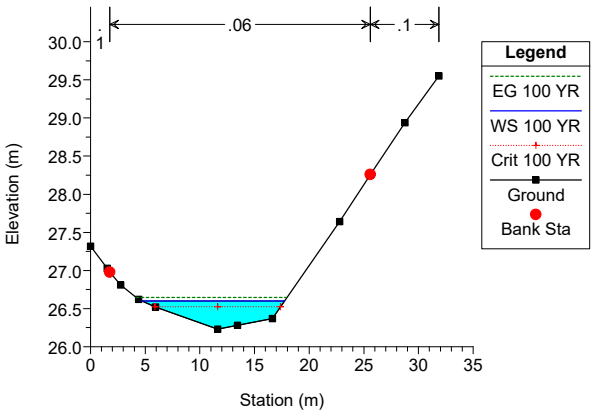
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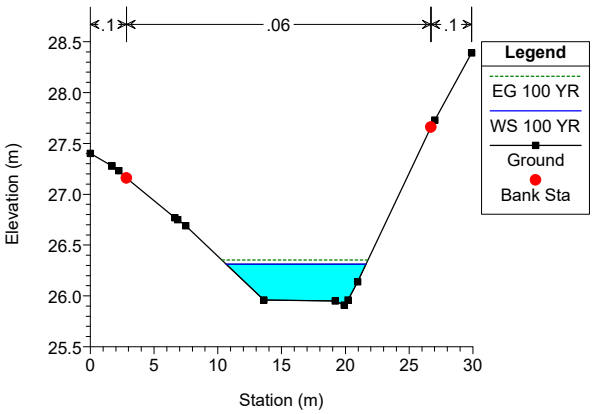
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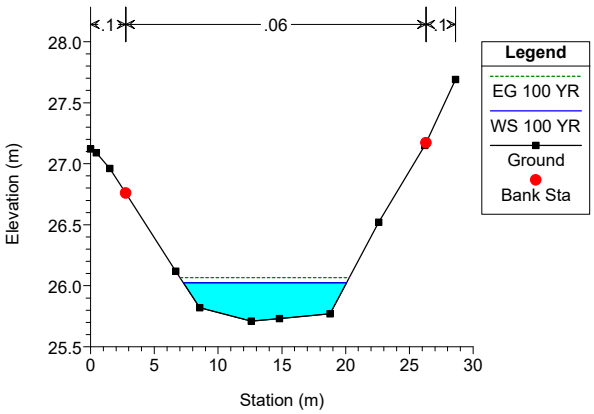
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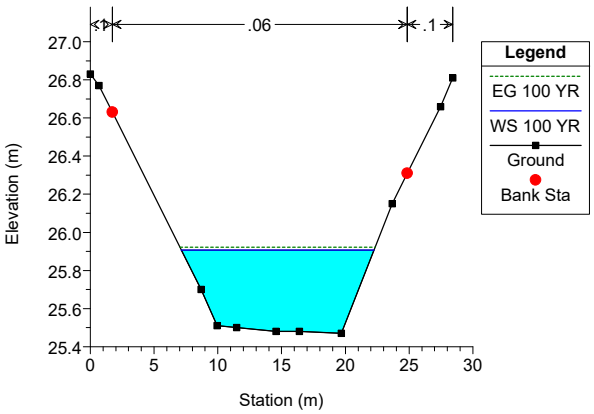
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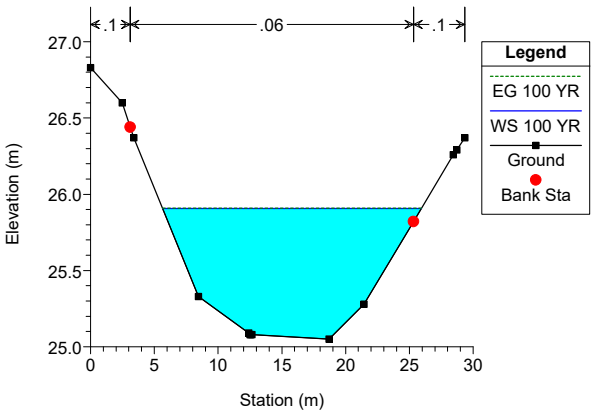
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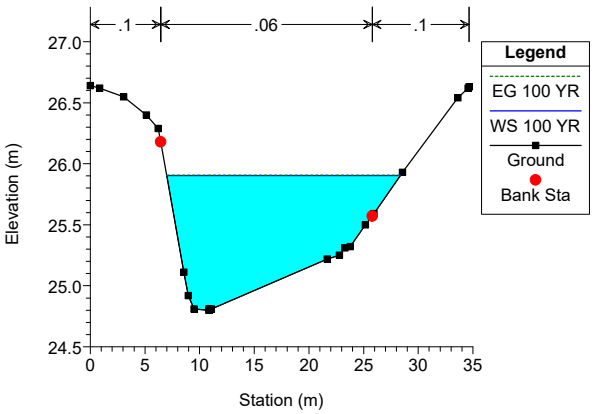
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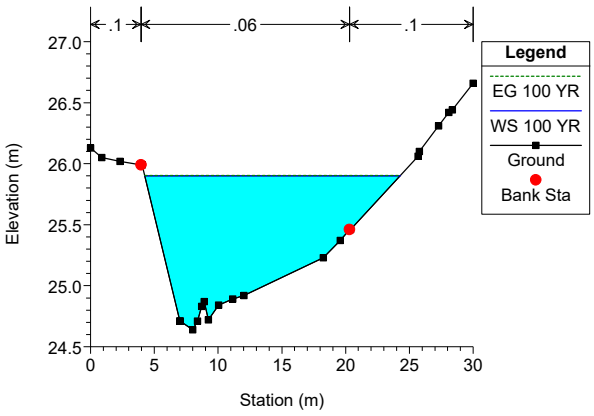
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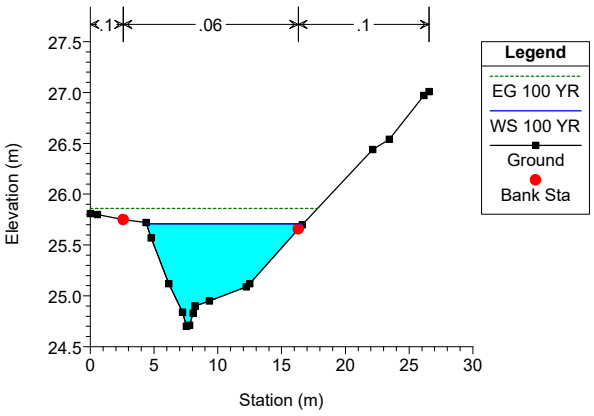
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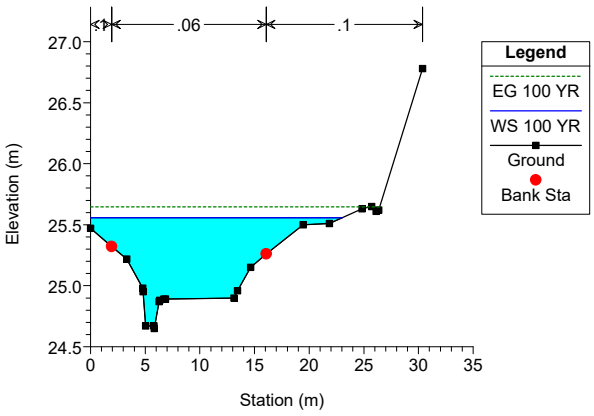
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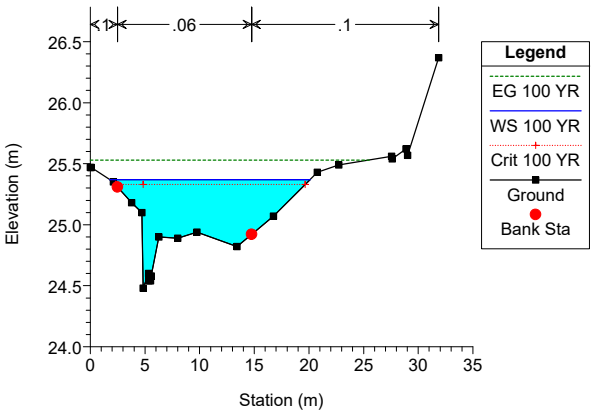
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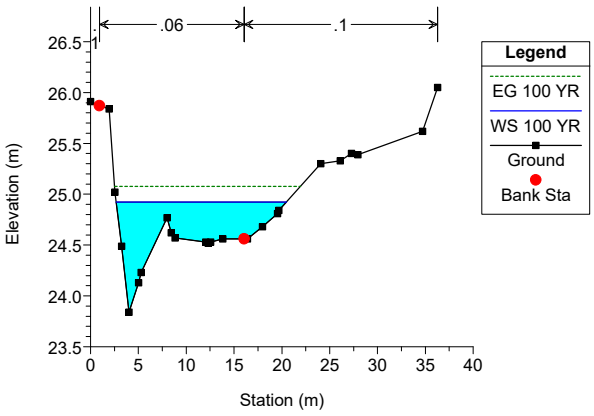
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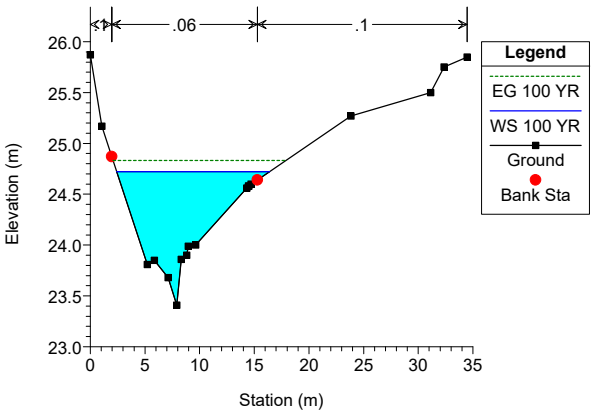
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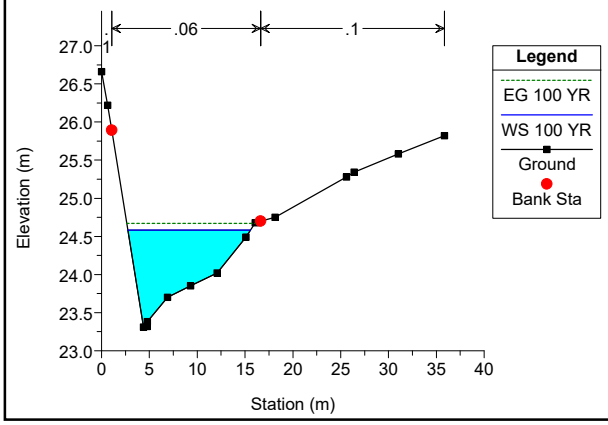
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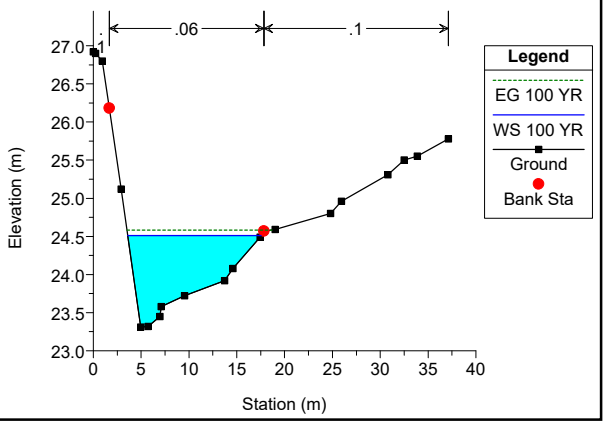
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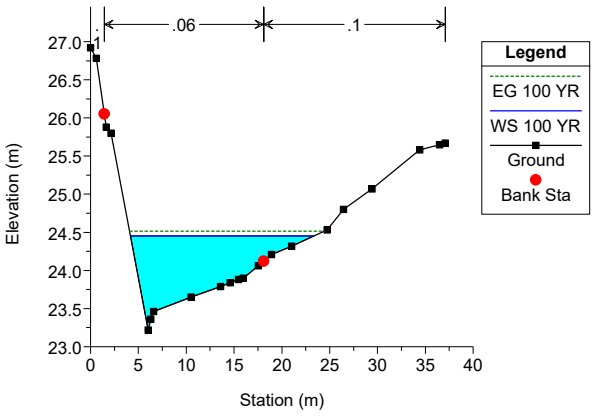
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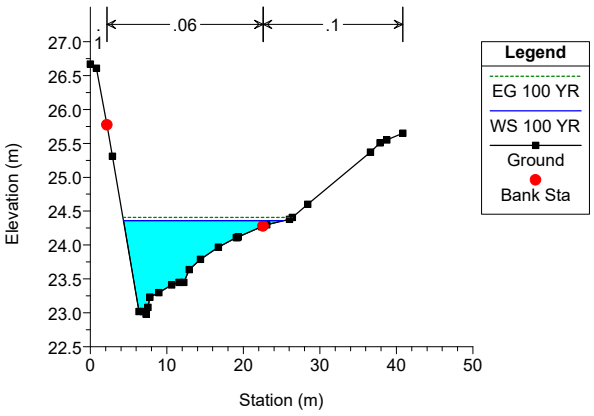
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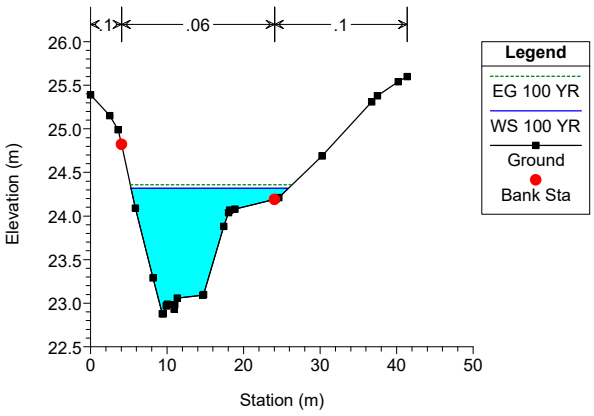
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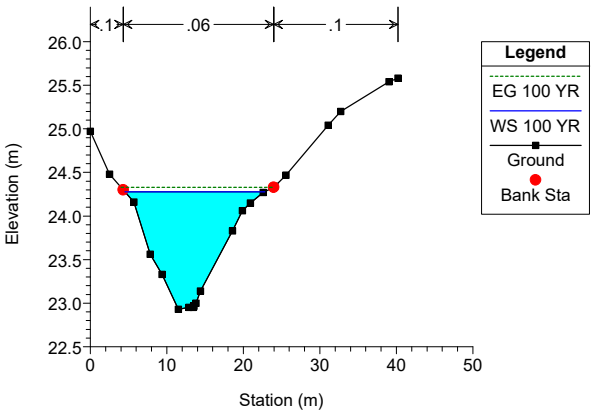
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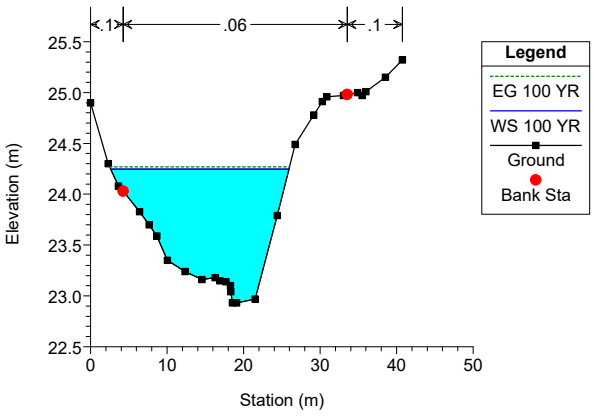
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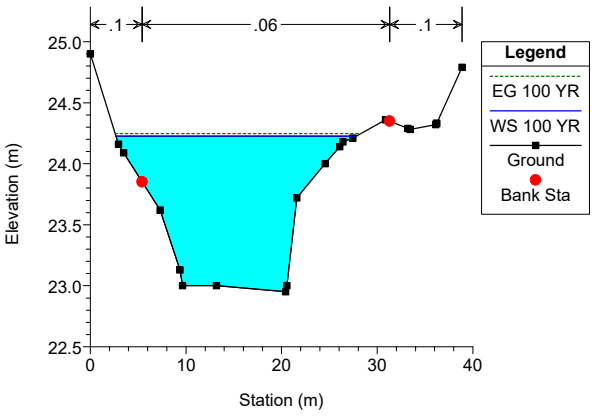
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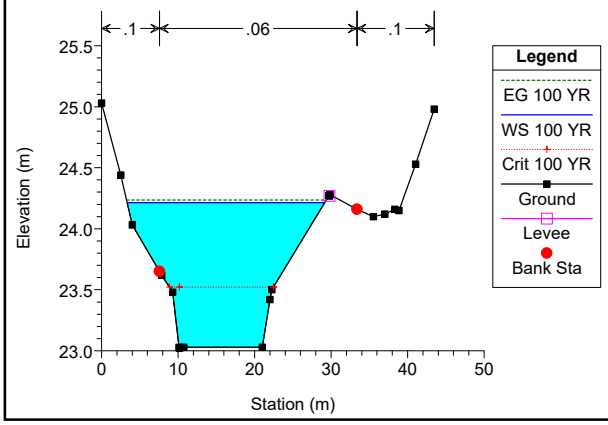
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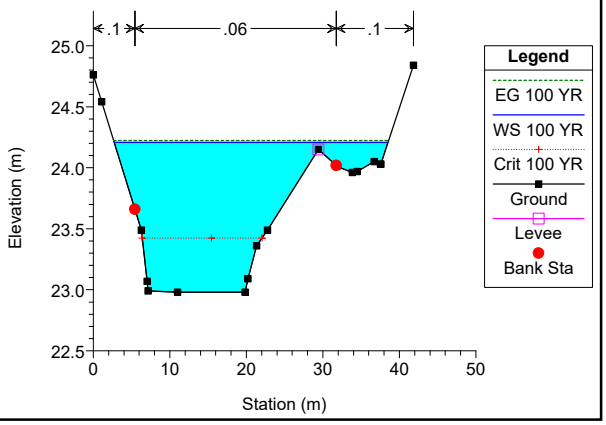
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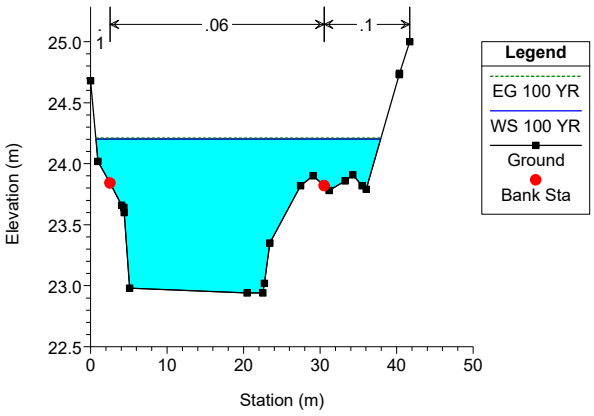
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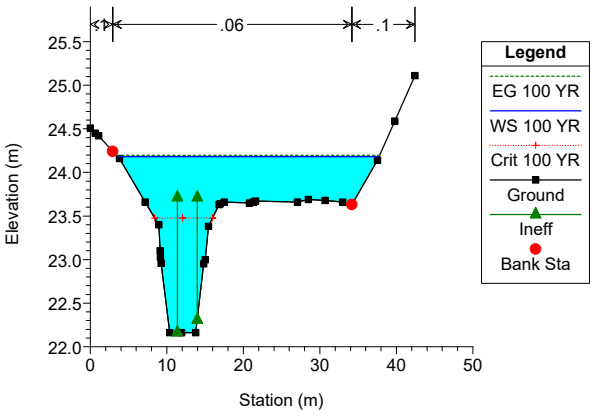
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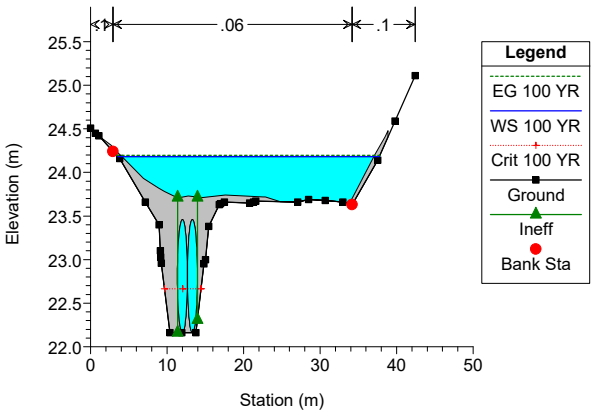
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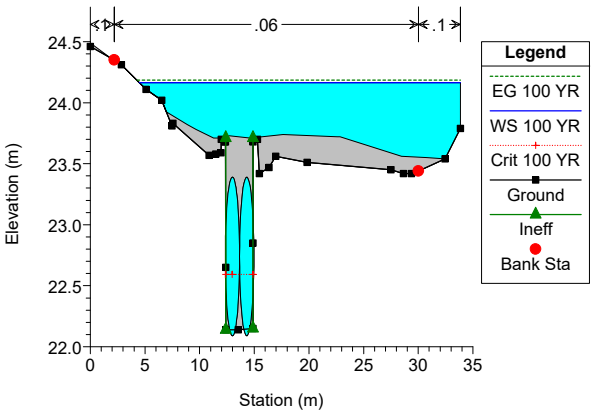
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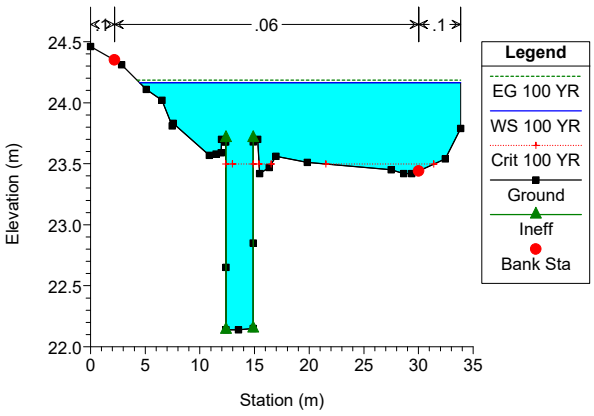
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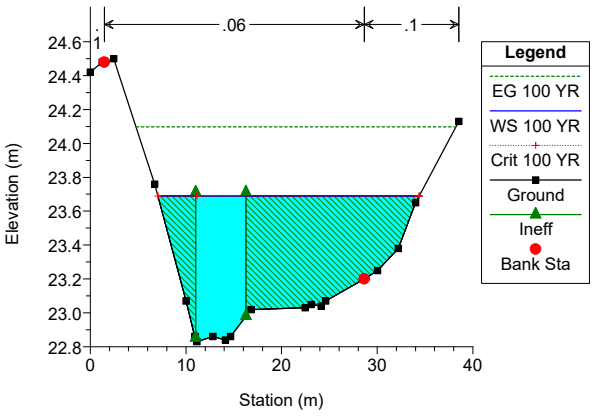
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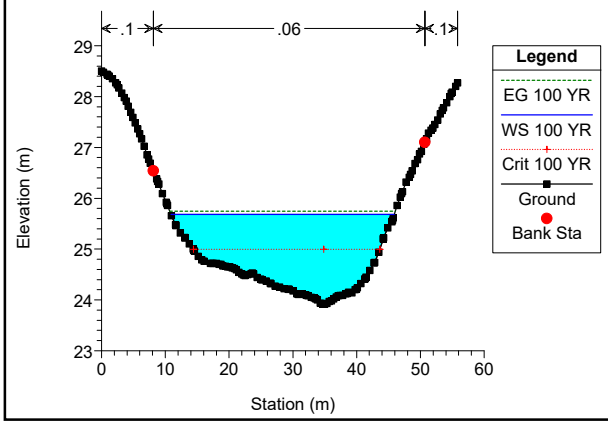
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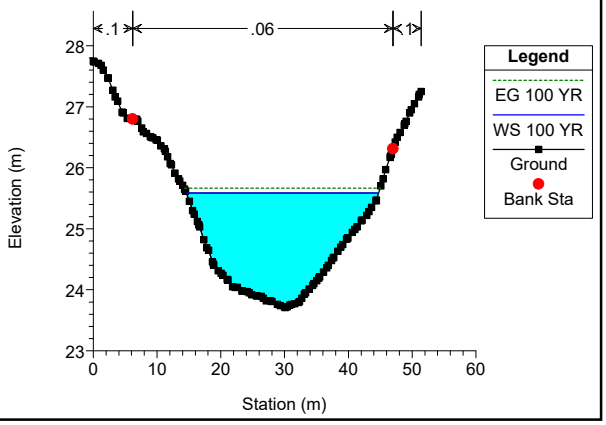
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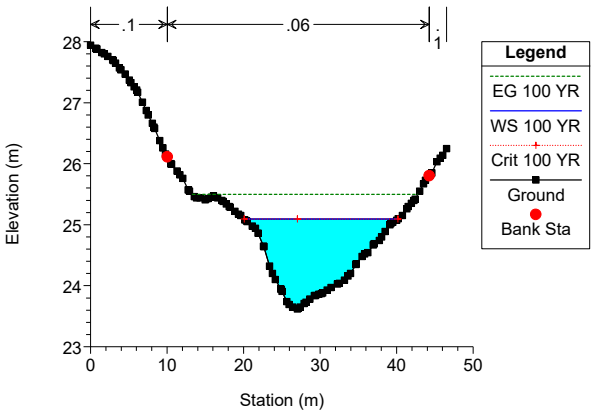
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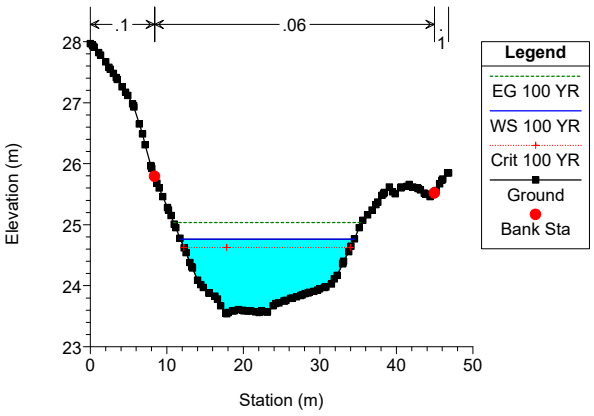
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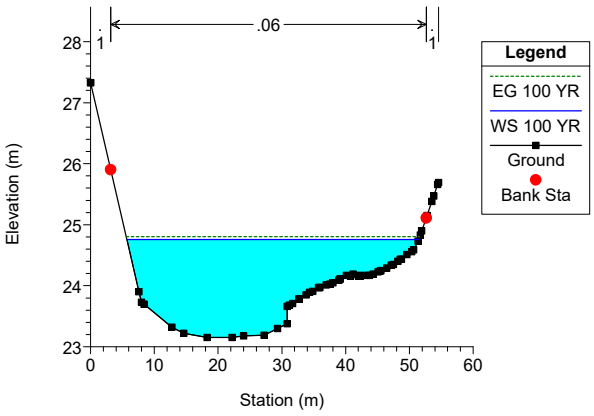
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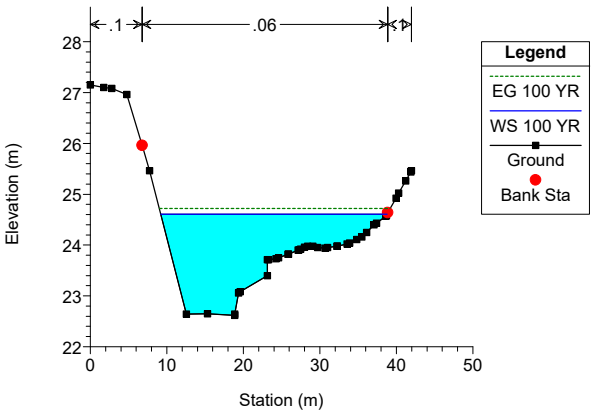
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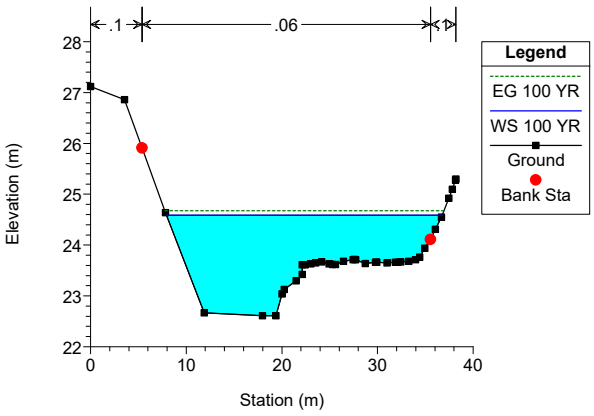
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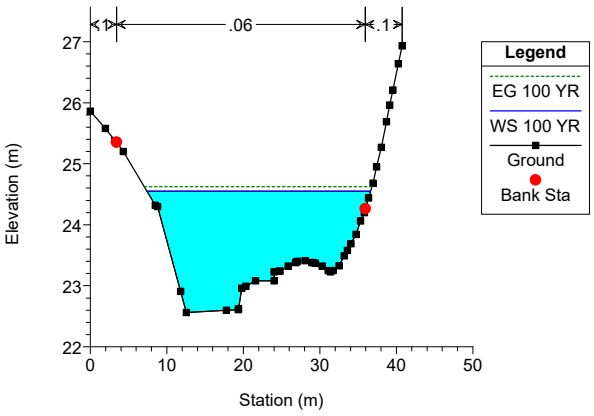
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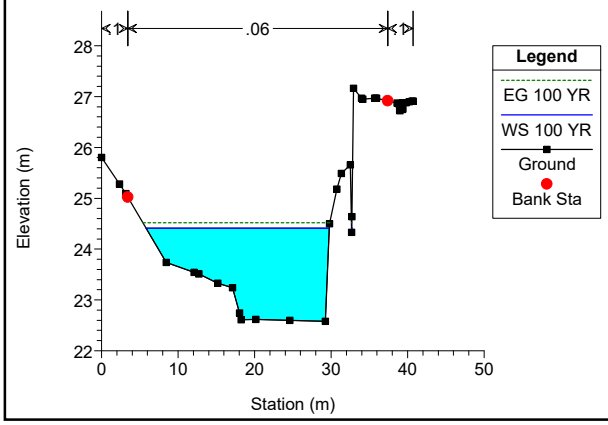
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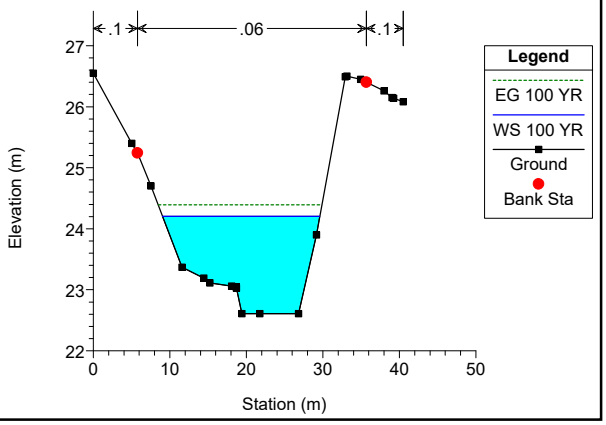
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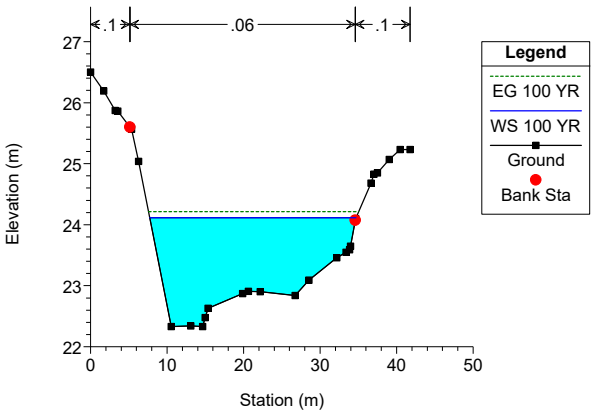
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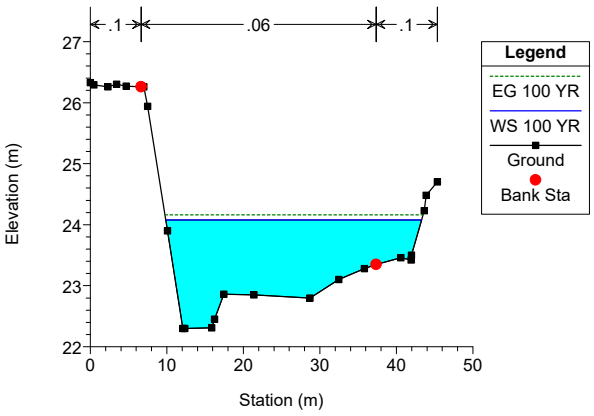
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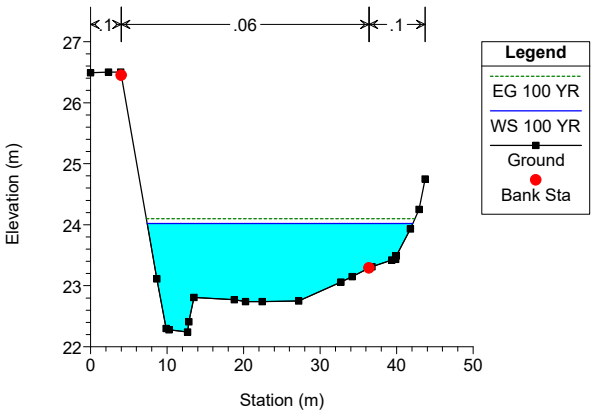
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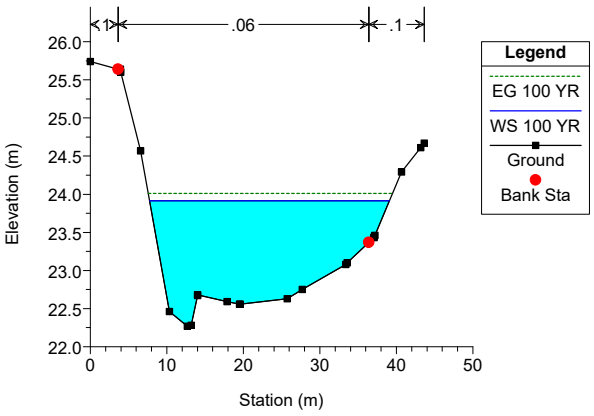
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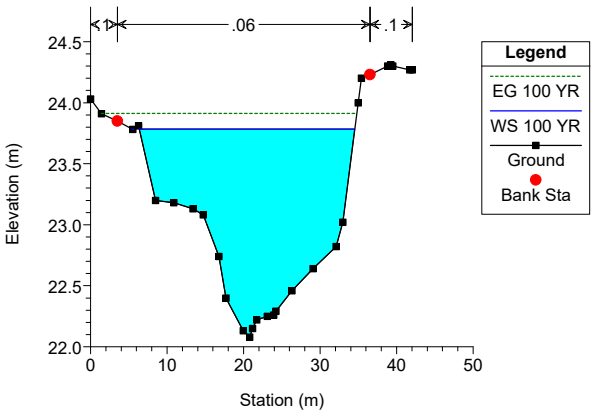
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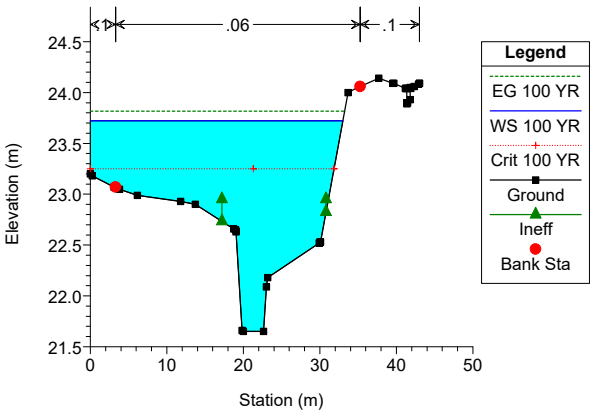
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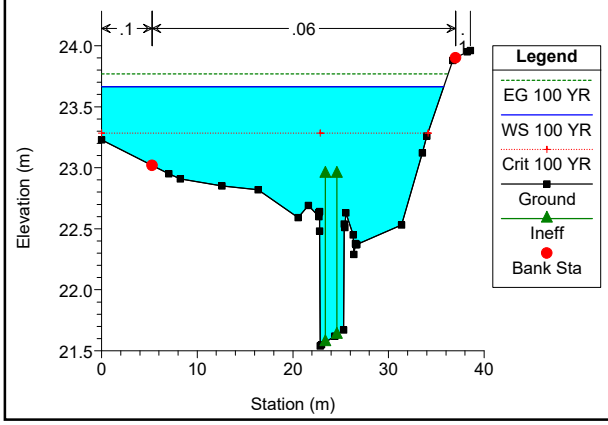
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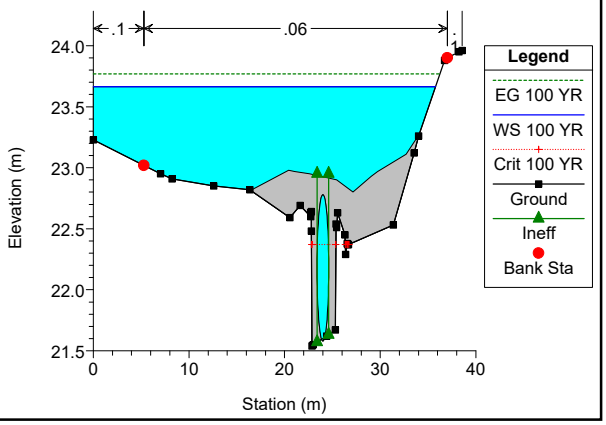
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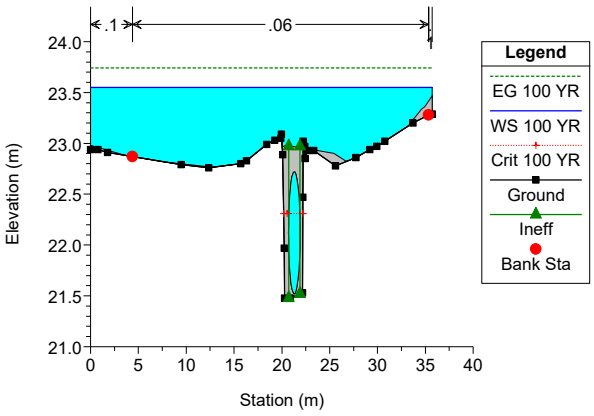
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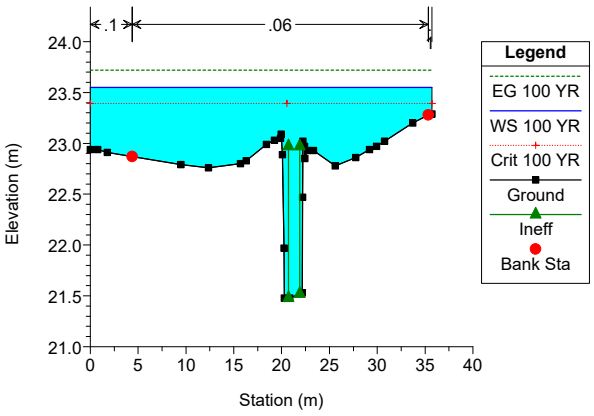
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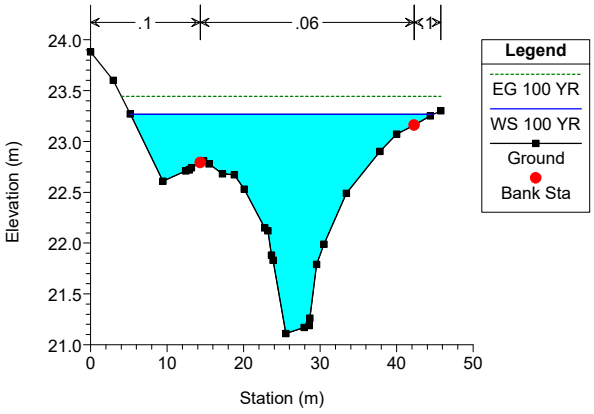
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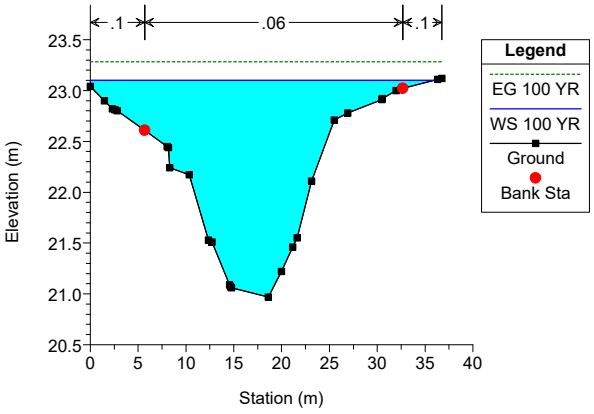
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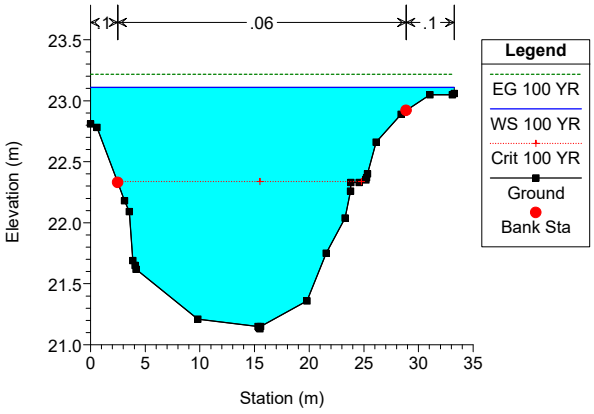
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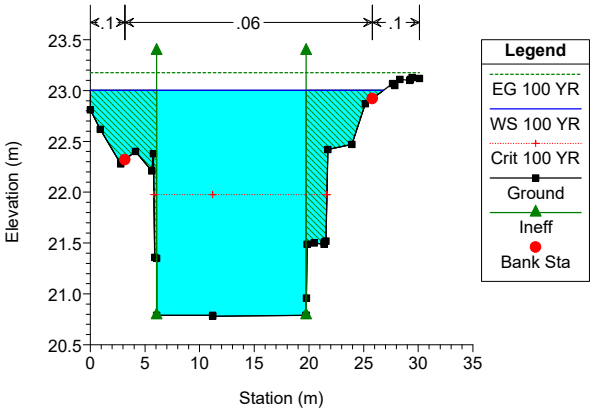
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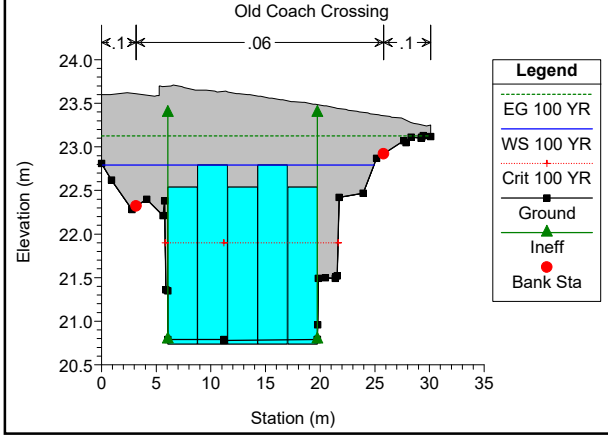


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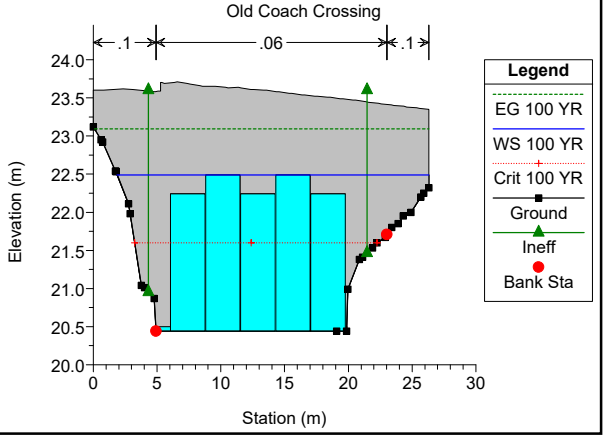
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Old Coach Crossing

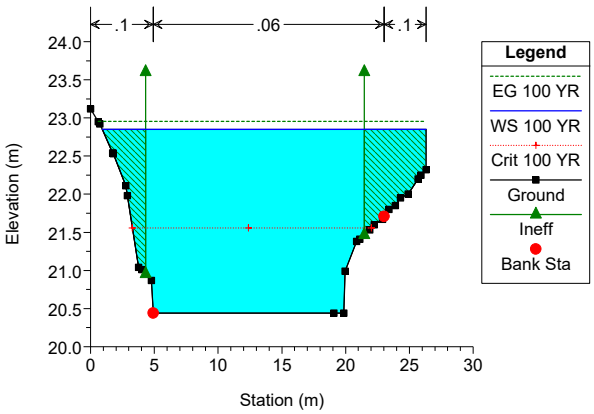


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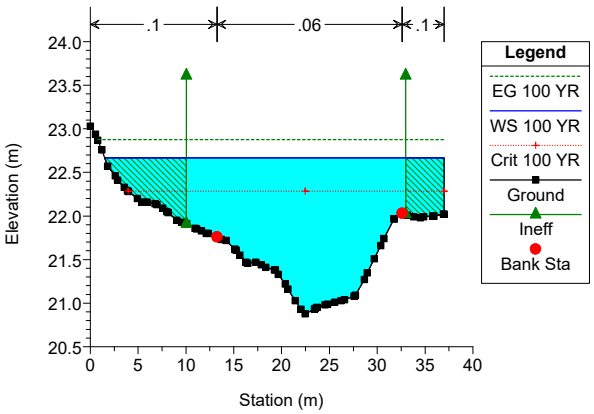
Old Coach Crossing



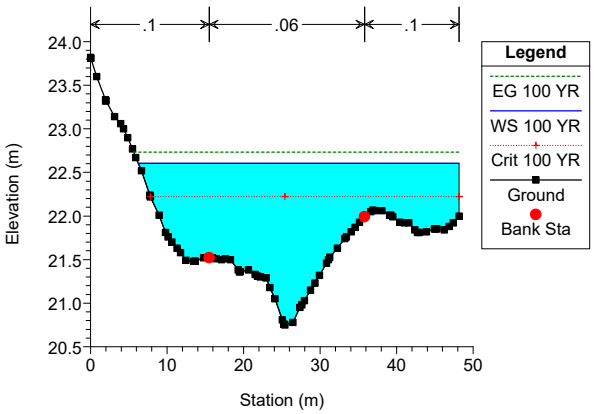
10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



10022603_EXISTING_Rev01 Plan: Existing_03 25/07/2018



RESULTS

River	Reach	River Sta	Profile	Q Total (m3/s)	Min Ch El (m)	W.S. Elev (m)	Crit W.S. (m)	E.G. Elev (m)	E.G. Slope (m/m)	Vel Chnl (m/s)	Flow Area (m2)	Top Width (m)	Froude # Chl
reserve rd	79	344.25	2 YR	18.99	23.92	25.08	24.68	25.13	0.004906	0.91	20.83	30	0.35
reserve rd	79	344.25	10 YR	30.46	23.92	25.38	24.84	25.43	0.004174	1.01	30.07	32.7	0.34
reserve rd	79	344.25	100 YR	45.38	23.92	25.68	24.99	25.74	0.003837	1.13	40.29	35.02	0.34
reserve rd	79	344.25	200 YR	65.62	23.92	25.99	25.17	26.07	0.003844	1.28	51.34	36.87	0.35
reserve rd	79	325.65	2 YR	18.99	23.71	25		25.04	0.004209	0.95	20.05	24.28	0.33
reserve rd	79	325.65	10 YR	30.46	23.71	25.29		25.35	0.004422	1.1	27.65	27.65	0.35
reserve rd	79	325.65	100 YR	45.38	23.71	25.59		25.67	0.004463	1.25	36.29	30.16	0.36
reserve rd	79	325.65	200 YR	65.62	23.71	25.88		25.99	0.004856	1.44	45.59	32.63	0.39
reserve rd	79	312.07	2 YR	18.99	23.62	24.69	24.59	24.91	0.028176	2.04	9.3	14.68	0.82
reserve rd	79	312.07	10 YR	30.46	23.62	24.87	24.83	25.19	0.034901	2.5	12.16	16.6	0.93
reserve rd	79	312.07	100 YR	45.38	23.62	25.09	25.09	25.5	0.03932	2.82	16.08	20.08	1.01
reserve rd	79	312.07	200 YR	65.62	23.62	25.36	25.36	25.81	0.037435	2.98	22.01	24.41	1
reserve rd	79	298.73	2 YR	18.99	23.54	24.31		24.5	0.032236	1.9	9.97	19.53	0.85
reserve rd	79	298.73	10 YR	30.46	23.54	24.53		24.76	0.027444	2.12	14.35	21.09	0.82
reserve rd	79	298.73	100 YR	45.38	23.54	24.76	24.63	25.04	0.024065	2.32	19.55	22.72	0.8
reserve rd	79	298.73	200 YR	65.62	23.54	25.07	24.85	25.37	0.02001	2.46	26.73	24.8	0.76
reserve rd	79	274.1	2 YR	18.99	23.15	24.19		24.22	0.004233	0.8	23.83	37.43	0.32
reserve rd	79	274.1	10 YR	30.46	23.15	24.47		24.5	0.003662	0.87	34.85	42.71	0.31
reserve rd	79	274.1	100 YR	45.38	23.15	24.76		24.8	0.003094	0.95	47.88	45.75	0.3
reserve rd	79	274.1	200 YR	65.62	23.15	25.1		25.16	0.002599	1.02	64.07	47.72	0.28
reserve rd	79	256.8	2 YR	18.99	22.62	24.04		24.11	0.009782	1.22	15.58	23.65	0.48
reserve rd	79	256.8	10 YR	30.46	22.62	24.31		24.41	0.008573	1.35	22.63	26.81	0.47
reserve rd	79	256.8	100 YR	45.38	22.62	24.61		24.72	0.00767	1.47	30.91	29.57	0.46
reserve rd	79	256.8	200 YR	65.62	22.62	24.96		25.08	0.006285	1.59	41.54	31.45	0.43
reserve rd	79	251.32	2 YR	18.99	22.61	24.01		24.07	0.00566	1	19.03	26.09	0.37
reserve rd	79	251.32	10 YR	30.46	22.61	24.3		24.36	0.005055	1.15	26.56	27.48	0.37
reserve rd	79	251.32	100 YR	45.38	22.61	24.59		24.68	0.004779	1.31	34.85	28.83	0.37
reserve rd	79	251.32	200 YR	65.62	22.61	24.94		25.05	0.004494	1.47	45.16	30.23	0.38
reserve rd	79	238.8	2 YR	18.99	22.56	23.97		24.01	0.003219	0.85	22.35	25.57	0.29
reserve rd	79	238.8	10 YR	30.46	22.56	24.25		24.31	0.003452	1.02	29.75	27.05	0.31
reserve rd	79	238.8	100 YR	45.38	22.56	24.55		24.62	0.003655	1.2	38.04	29.23	0.33
reserve rd	79	238.8	200 YR	65.62	22.56	24.9		24.99	0.003683	1.36	48.75	31.61	0.34
reserve rd	79	218.14	2 YR	18.99	22.58	23.87		23.93	0.004893	1.02	18.65	21.68	0.35
reserve rd	79	218.14	10 YR	30.46	22.58	24.14		24.22	0.005469	1.24	24.51	22.79	0.38
reserve rd	79	218.14	100 YR	45.38	22.58	24.41		24.52	0.006084	1.47	30.92	23.97	0.41
reserve rd	79	218.14	200 YR	65.62	22.58	24.75		24.89	0.00653	1.67	39.22	25.75	0.43
reserve rd	79	203.75	2 YR	18.99	22.61	23.74		23.83	0.008712	1.31	14.53	18.41	0.47
reserve rd	79	203.75	10 YR	30.46	22.61	23.97		24.11	0.010193	1.61	18.87	19.49	0.52
reserve rd	79	203.75	100 YR	45.38	22.61	24.21		24.39	0.011698	1.93	23.51	20.54	0.58
reserve rd	79	203.75	200 YR	65.62	22.61	24.51		24.75	0.011924	2.19	29.99	21.92	0.6
reserve rd	79	184.97	2 YR	18.99	22.33	23.66		23.7	0.004684	0.95	19.91	25.54	0.34
reserve rd	79	184.97	10 YR	30.46	22.33	23.88		23.95	0.005337	1.18	25.74	26.22	0.38
reserve rd	79	184.97	100 YR	45.38	22.33	24.11		24.22	0.006025	1.42	31.88	26.95	0.42
reserve rd	79	184.97	200 YR	65.62	22.33	24.44		24.57	0.005728	1.61	40.94	28.6	0.42
reserve rd	79	175.9	2 YR	18.99	22.3	23.62		23.66	0.00416	0.9	21.9	31.8	0.32
reserve rd	79	175.9	10 YR	30.46	22.3	23.84		23.9	0.004536	1.1	29.12	32.6	0.35
reserve rd	79	175.9	100 YR	45.38	22.3	24.08		24.16	0.004965	1.31	36.75	33.42	0.38
reserve rd	79	175.9	200 YR	65.62	22.3	24.41		24.52	0.004556	1.46	48.16	34.39	0.38
reserve rd	79	163.26	2 YR	18.99	22.24	23.57		23.61	0.003854	0.86	22.65	32.28	0.31
reserve rd	79	163.26	10 YR	30.46	22.24	23.79		23.85	0.004273	1.06	29.88	33.5	0.34
reserve rd	79	163.26	100 YR	45.38	22.24	24.02		24.1	0.004731	1.27	37.6	34.71	0.37
reserve rd	79	163.26	200 YR	65.62	22.24	24.36		24.46	0.004235	1.41	49.81	36.19	0.36
reserve rd	79	146.22	2 YR	18.99	22.27	23.5		23.54	0.004153	0.89	21.42	28.89	0.32
reserve rd	79	146.22	10 YR	30.46	22.27	23.71		23.77	0.004878	1.12	27.49	30.11	0.37
reserve rd	79	146.22	100 YR	45.38	22.27	23.92		24.01	0.005662	1.36	33.91	31.35	0.41
reserve rd	79	146.22	200 YR	65.62	22.27	24.27		24.38	0.004913	1.5	45.34	33.45	0.39
reserve rd	79	133.24	2 YR	18.99	22.08	23.42		23.48	0.00584	1.01	18.73	26.11	0.38
reserve rd	79	133.24	10 YR	30.46	22.08	23.61		23.69	0.007373	1.29	23.58	27.14	0.44
reserve rd	79	133.24	100 YR	45.38	22.08	23.78		23.91	0.009243	1.59	28.51	28.37	0.51
reserve rd	79	133.24	200 YR	65.62	22.08	24.17		24.3	0.006862	1.61	41.53	35.32	0.45

reserve rd	79	122.13	2 YR	18.99	21.65	23.38	22.83	23.42	0.003832	0.85	23	32.18	0.31
reserve rd	79	122.13	10 YR	30.46	21.65	23.56	23.09	23.62	0.005022	1.1	28.6	32.6	0.37
reserve rd	79	122.13	100 YR	45.38	21.65	23.72	23.25	23.82	0.006468	1.38	34.06	33.01	0.42
reserve rd	79	122.13	200 YR	65.62	21.65	24.13	23.43	24.23	0.004916	1.43	48.24	42.34	0.39
reserve rd	79	115.82	2 YR	18.99	21.54	23.35	22.98	23.39	0.005354	0.92	21.57	34.41	0.35
reserve rd	79	115.82	10 YR	30.46	21.54	23.51	23.13	23.58	0.006868	1.18	27.22	35.12	0.41
reserve rd	79	115.82	100 YR	45.38	21.54	23.66	23.29	23.77	0.008785	1.47	32.65	35.79	0.47
reserve rd	79	115.82	200 YR	65.62	21.54	24.1	23.45	24.2	0.00534	1.43	48.83	38.56	0.39
reserve rd	79	114.82		Culvert									
reserve rd	79	106.85	2 YR	18.99	21.48	23.18	23.13	23.3	0.034484	1.57	12.74	33.44	0.79
reserve rd	79	106.85	10 YR	30.46	21.48	23.39	23.25	23.52	0.021525	1.6	20.08	35.71	0.67
reserve rd	79	106.85	100 YR	45.38	21.48	23.55	23.39	23.72	0.021321	1.87	25.69	35.71	0.7
reserve rd	79	106.85	200 YR	65.62	21.48	24.04	23.55	24.16	0.008159	1.62	43.07	35.71	0.47
reserve rd	79	91.26	2 YR	21.79	21.11	22.58		22.81	0.027712	2.13	10.25	14.81	0.82
reserve rd	79	91.26	10 YR	35.63	21.11	22.9	22.83	23.12	0.026972	2.13	17.68	30.18	0.81
reserve rd	79	91.26	100 YR	52.69	21.11	23.27		23.44	0.014757	1.91	30.35	39.59	0.63
reserve rd	79	91.26	200 YR	84.37	21.11	23.92		24.06	0.005699	1.69	58.7	45.77	0.43
reserve rd	79	79.18	2 YR	25.11	20.97	22.38		22.55	0.015873	1.85	13.56	15.98	0.64
reserve rd	79	79.18	10 YR	37.79	20.97	22.65		22.87	0.016886	2.05	18.47	20.24	0.67
reserve rd	79	79.18	100 YR	55.8	20.97	23.1		23.28	0.012016	1.89	30.83	35.95	0.58
reserve rd	79	79.18	200 YR	92.82	20.97	23.83		23.99	0.005341	1.79	57.76	36.76	0.42
reserve rd	3	73.17	2 YR	25.11	21.13	22.39	21.91	22.46	0.006622	1.24	20.27	23.04	0.42
reserve rd	3	73.17	10 YR	37.79	21.13	22.68	22.1	22.77	0.006077	1.4	27.27	25.26	0.42
reserve rd	3	73.17	100 YR	55.8	21.13	23.11	22.34	23.22	0.004729	1.45	39.79	33.26	0.38
reserve rd	3	73.17	200 YR	92.82	21.13	23.83		23.95	0.003234	1.57	63.77	33.26	0.34
reserve rd	3	65.65	2 YR	25.11	20.78	22.36	21.49	22.43	0.002673	1.17	21.53	18.6	0.3
reserve rd	3	65.65	10 YR	37.79	20.78	22.62	21.71	22.74	0.003629	1.5	25.11	23.51	0.35
reserve rd	3	65.65	100 YR	55.8	20.78	23	21.98	23.18	0.004226	1.84	30.31	26.82	0.39
reserve rd	3	65.65	200 YR	92.82	20.78	23.8	22.46	23.93	0.003384	1.62	62.45	30.1	0.33
reserve rd	3	63.15		Culvert									
reserve rd	3	30.52	2 YR	25.11	20.44	22.36	21.1	22.39	0.0011	0.81	31.39	24.15	0.19
reserve rd	3	30.52	10 YR	37.79	20.44	22.59	21.31	22.65	0.00169	1.09	35.28	24.7	0.24
reserve rd	3	30.52	100 YR	55.8	20.44	22.85	21.56	22.95	0.002473	1.43	39.79	25.4	0.3
reserve rd	3	30.52	200 YR	92.82	20.44	23.28	21.98	23.48	0.003912	2.01	47.07	26.32	0.39
reserve rd	3	15.92	2 YR	25.11	20.88	22.26	21.88	22.35	0.007578	1.37	19.32	32.8	0.45
reserve rd	3	15.92	10 YR	37.79	20.88	22.45	22.08	22.59	0.009033	1.69	23.65	34.35	0.51
reserve rd	3	15.92	100 YR	55.8	20.88	22.67	22.28	22.88	0.010705	2.07	28.6	35.49	0.57
reserve rd	3	15.92	200 YR	92.82	20.88	23.01	22.64	23.37	0.013483	2.71	36.46	36.88	0.67
reserve rd	3	3.34	2 YR	25.11	20.75	22.17	21.86	22.25	0.008314	1.32	23.32	40.06	0.47
reserve rd	3	3.34	10 YR	37.79	20.75	22.37	22.03	22.47	0.008301	1.53	31.33	40.93	0.48
reserve rd	3	3.34	100 YR	55.8	20.75	22.6	22.22	22.73	0.0083	1.75	41.06	41.94	0.5
reserve rd	3	3.34	200 YR	92.82	20.75	23	22.49	23.18	0.008305	2.11	58.07	43.86	0.52
Baileys	42	340.92	2 YR	1.16	27.34	27.64	27.58	27.67	0.022066	0.71	1.63	10.65	0.58
Baileys	42	340.92	10 YR	1.92	27.34	27.71	27.64	27.74	0.02153	0.81	2.37	12.46	0.59
Baileys	42	340.92	100 YR	2.78	27.34	27.75	27.69	27.8	0.023671	0.95	2.93	12.98	0.64
Baileys	42	340.92	200 YR	4.96	27.34	27.86	27.77	27.92	0.022769	1.01	4.93	19.44	0.64
Baileys	42	317.57	2 YR	1.16	26.59	26.82	26.81	26.86	0.060713	0.95	1.22	10.92	0.91
Baileys	42	317.57	10 YR	1.92	26.59	26.86	26.86	26.92	0.06447	1.12	1.71	12.41	0.97
Baileys	42	317.57	100 YR	2.78	26.59	26.91	26.89	26.98	0.055742	1.21	2.3	13.48	0.93
Baileys	42	317.57	200 YR	4.96	26.59	26.98	26.97	27.09	0.059361	1.48	3.35	15.19	1.01
Baileys	42	314.79*	2 YR	1.16	26.41	26.62	26.62	26.68	0.07175	1.07	1.09	9.29	1
Baileys	42	314.79*	10 YR	1.92	26.41	26.67	26.67	26.75	0.066067	1.21	1.59	10.63	1
Baileys	42	314.79*	100 YR	2.78	26.41	26.72	26.72	26.81	0.064469	1.33	2.09	11.8	1.01
Baileys	42	314.79*	200 YR	4.96	26.41	26.81	26.81	26.93	0.058843	1.52	3.26	14.13	1.01
Baileys	42	312.01	2 YR	1.16	26.23	26.51	26.43	26.53	0.015617	0.63	1.84	11.1	0.49
Baileys	42	312.01	10 YR	1.92	26.23	26.57	26.48	26.6	0.016087	0.74	2.59	12.45	0.52
Baileys	42	312.01	100 YR	2.78	26.23	26.63	26.52	26.67	0.015665	0.82	3.38	13.61	0.53
Baileys	42	312.01	200 YR	4.96	26.23	26.75	26.62	26.8	0.014949	0.98	5.07	15.19	0.54
Baileys	42	307.93*	2 YR	1.16	26.15	26.43		26.45	0.020737	0.7	1.65	10.46	0.56
Baileys	42	307.93*	10 YR	1.92	26.15	26.5		26.53	0.018909	0.8	2.4	11.66	0.56
Baileys	42	307.93*	100 YR	2.78	26.15	26.56		26.6	0.018316	0.89	3.13	12.66	0.57

Baileys	42	307.93*	200 YR	4.96	26.15	26.68		26.73	0.017691	1.05	4.73	14.51	0.59
Baileys	42	303.85*	2 YR	1.16	26.07	26.34		26.37	0.021741	0.74	1.56	9.46	0.58
Baileys	42	303.85*	10 YR	1.92	26.07	26.41		26.45	0.022375	0.87	2.21	10.74	0.61
Baileys	42	303.85*	100 YR	2.78	26.07	26.47		26.52	0.021576	0.96	2.9	11.8	0.62
Baileys	42	303.85*	200 YR	4.96	26.07	26.59		26.65	0.020436	1.12	4.41	13.54	0.63
Baileys	42	299.76*	2 YR	1.16	25.99	26.24		26.27	0.024838	0.79	1.47	8.89	0.62
Baileys	42	299.76*	10 YR	1.92	25.99	26.31		26.35	0.023102	0.9	2.13	9.96	0.62
Baileys	42	299.76*	100 YR	2.78	25.99	26.38		26.43	0.021524	0.99	2.82	10.97	0.62
Baileys	42	299.76*	200 YR	4.96	25.99	26.5		26.57	0.021917	1.18	4.21	12.7	0.65
Baileys	42	295.68	2 YR	1.16	25.91	26.15		26.18	0.021936	0.76	1.53	8.98	0.59
Baileys	42	295.68	10 YR	1.92	25.91	26.24		26.27	0.01549	0.8	2.41	10.1	0.52
Baileys	42	295.68	100 YR	2.78	25.91	26.31		26.35	0.014687	0.88	3.17	10.98	0.52
Baileys	42	295.68	200 YR	4.96	25.91	26.42		26.48	0.018667	1.14	4.36	12.23	0.61
Baileys	42	279.06	2 YR	1.16	25.71	25.97	25.85	25.98	0.007483	0.49	2.38	12.13	0.35
Baileys	42	279.06	10 YR	1.92	25.71	25.98		26.01	0.016091	0.74	2.58	12.32	0.52
Baileys	42	279.06	100 YR	2.78	25.71	26.02		26.07	0.019107	0.89	3.11	12.8	0.58
Baileys	42	279.06	200 YR	4.96	25.71	26.21		26.25	0.010036	0.87	5.67	14.89	0.45
Baileys	42	261.89	2 YR	1.16	25.47	25.59	25.59	25.65	0.099323	1.1	1.05	10.93	1.13
Baileys	42	261.89	10 YR	1.92	25.47	25.73		25.75	0.014095	0.71	2.72	12.71	0.49
Baileys	42	261.89	100 YR	2.78	25.47	25.91		25.92	0.004273	0.53	5.21	15.11	0.29
Baileys	42	261.89	200 YR	4.96	25.47	26.15		26.16	0.002608	0.54	9.24	18.33	0.24
Baileys	42	250.27	2 YR	1.16	25.05	25.56	25.2	25.56	0.000505	0.19	5.99	16.12	0.1
Baileys	42	250.27	10 YR	1.92	25.05	25.73		25.73	0.000436	0.22	8.9	18.16	0.1
Baileys	42	250.27	100 YR	2.78	25.05	25.91		25.91	0.000351	0.23	12.28	20.27	0.09
Baileys	42	250.27	200 YR	4.96	25.05	26.15		26.15	0.000392	0.29	17.5	23.15	0.1
Baileys	42	239.02	2 YR	1.16	24.8	25.56		25.56	0.00018	0.14	8.57	18.02	0.06
Baileys	42	239.02	10 YR	1.92	24.8	25.73		25.73	0.000182	0.16	11.76	19.67	0.07
Baileys	42	239.02	100 YR	2.78	24.8	25.9		25.91	0.00017	0.18	15.39	21.38	0.07
Baileys	42	239.02	200 YR	4.96	24.8	26.14		26.15	0.000226	0.25	20.81	23.82	0.08
Baileys	42	230.22	2 YR	1.16	24.64	25.56		25.56	0.000176	0.14	8.14	16.18	0.06
Baileys	42	230.22	10 YR	1.92	24.64	25.73		25.73	0.000194	0.18	11.04	18.06	0.07
Baileys	42	230.22	100 YR	2.78	24.64	25.9		25.9	0.000191	0.2	14.4	20.03	0.07
Baileys	42	230.22	200 YR	4.96	24.64	26.14		26.14	0.000257	0.27	19.9	26.06	0.08
Baileys	42	218.87	2 YR	4.3	24.7	25.46		25.53	0.017514	1.15	3.75	9.8	0.59
Baileys	42	218.87	10 YR	7.23	24.7	25.59		25.69	0.021358	1.43	5.06	11.08	0.67
Baileys	42	218.87	100 YR	11.16	24.7	25.71		25.86	0.024698	1.72	6.49	12.28	0.75
Baileys	42	218.87	200 YR	18.1	24.7	25.87	25.81	26.09	0.028735	2.06	9.12	17.91	0.83
Baileys	42	207.95	2 YR	4.3	24.65	25.31		25.36	0.013167	0.91	4.73	14.81	0.5
Baileys	42	207.95	10 YR	7.23	24.65	25.43		25.5	0.013381	1.12	6.68	18	0.53
Baileys	42	207.95	100 YR	11.16	24.65	25.56		25.65	0.013548	1.33	9.24	23.04	0.56
Baileys	42	207.95	200 YR	18.1	24.65	25.75		25.86	0.012071	1.52	14.22	26.82	0.55
Baileys	42	202.89	2 YR	4.3	24.48	25.21		25.27	0.022482	1.13	4.13	14.74	0.64
Baileys	42	202.89	10 YR	7.23	24.48	25.3		25.4	0.028051	1.43	5.59	16.7	0.73
Baileys	42	202.89	100 YR	11.16	24.48	25.37	25.33	25.53	0.037249	1.84	6.85	18.35	0.87
Baileys	42	202.89	200 YR	18.1	24.48	25.49	25.47	25.74	0.04405	2.33	9.23	22.66	0.98
Baileys	42	190.3	2 YR	4.3	23.84	24.68	24.68	24.8	0.068001	1.55	2.86	14.26	1.06
Baileys	42	190.3	10 YR	7.23	23.84	24.79	24.78	24.93	0.05192	1.7	4.52	16.4	0.97
Baileys	42	190.3	100 YR	11.16	23.84	24.92		25.08	0.03608	1.79	6.82	17.79	0.86
Baileys	42	190.3	200 YR	18.1	23.84	25.11		25.3	0.027673	1.96	10.4	19.8	0.79

Baileys	42	180.26	2 YR	4.3	23.41	24.37	24.21	24.44	0.017559	1.16	3.69	9.26	0.59
Baileys	42	180.26	10 YR	7.23	23.41	24.54		24.63	0.017453	1.33	5.45	11.21	0.61
Baileys	42	180.26	100 YR	11.16	23.41	24.72		24.83	0.016065	1.46	7.7	14	0.6
Baileys	42	180.26	200 YR	18.1	23.41	24.94		25.08	0.015244	1.71	11.07	17.56	0.62
Baileys	42	168.77	2 YR	4.3	23.31	24.23		24.27	0.011105	0.98	4.4	10.21	0.48
Baileys	42	168.77	10 YR	7.23	23.31	24.4		24.46	0.011478	1.16	6.24	11.51	0.5
Baileys	42	168.77	100 YR	11.16	23.31	24.58		24.67	0.011225	1.31	8.53	12.84	0.51
Baileys	42	168.77	200 YR	18.1	23.31	24.78		24.91	0.013387	1.61	11.34	16.12	0.58
Baileys	42	160.62	2 YR	4.3	23.31	24.15		24.19	0.008943	0.89	4.85	11.08	0.43
Baileys	42	160.62	10 YR	7.23	23.31	24.32		24.38	0.009491	1.06	6.82	12.43	0.46
Baileys	42	160.62	100 YR	11.16	23.31	24.51		24.58	0.009196	1.19	9.36	13.95	0.46
Baileys	42	160.62	200 YR	18.1	23.31	24.7		24.81	0.011051	1.5	12.29	18.56	0.53
Baileys	42	152.34	2 YR	4.3	23.22	24.05		24.1	0.013477	0.95	4.51	12.71	0.51
Baileys	42	152.34	10 YR	7.23	23.22	24.24		24.3	0.009516	1.03	7.1	15.06	0.46
Baileys	42	152.34	100 YR	11.16	23.22	24.45		24.51	0.007278	1.11	10.68	19.17	0.42
Baileys	42	152.34	200 YR	18.1	23.22	24.63		24.72	0.008915	1.4	14.29	21.44	0.48
Baileys	42	136.98	2 YR	4.3	22.98	23.88		23.92	0.010032	0.94	4.58	10.49	0.45
Baileys	42	136.98	10 YR	7.23	22.98	24.11		24.15	0.008746	0.98	7.36	14.27	0.44
Baileys	42	136.98	100 YR	11.16	22.98	24.36		24.41	0.006302	0.96	11.71	20.89	0.38
Baileys	42	136.98	200 YR	18.1	22.98	24.51		24.59	0.008029	1.24	15.15	23.37	0.45
Baileys	42	128.65	2 YR	4.69	22.88	23.85		23.87	0.00339	0.7	6.74	10.76	0.28
Baileys	42	128.65	10 YR	7.92	22.88	24.07		24.1	0.00402	0.86	9.23	12.26	0.32
Baileys	42	128.65	100 YR	12.22	22.88	24.32		24.36	0.004719	0.91	13.62	20.57	0.34
Baileys	42	128.65	200 YR	19.69	22.88	24.45		24.53	0.006987	1.22	16.52	22.48	0.43
Baileys	42	122.71	2 YR	4.69	22.93	23.82		23.85	0.005401	0.78	6	11.6	0.35
Baileys	42	122.71	10 YR	7.92	22.93	24.03		24.08	0.005442	0.91	8.74	13.6	0.36
Baileys	42	122.71	100 YR	12.22	22.93	24.28		24.33	0.005751	0.97	12.55	18.3	0.38
Baileys	42	122.71	200 YR	19.69	22.93	24.38		24.48	0.009999	1.35	14.61	21.09	0.5
Baileys	42	106.21	2 YR	4.69	22.93	23.77		23.79	0.002376	0.52	9.02	17.4	0.23
Baileys	42	106.21	10 YR	7.92	22.93	23.99		24.01	0.002351	0.6	13.22	20.46	0.24
Baileys	42	106.21	100 YR	12.22	22.93	24.25		24.27	0.001946	0.66	18.77	23.32	0.23
Baileys	42	106.21	200 YR	19.69	22.93	24.32		24.37	0.003928	0.98	20.42	23.94	0.33
Baileys	42	95.16	2 YR	4.69	22.95	23.75		23.76	0.001559	0.48	9.87	15.74	0.19
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Baileys	42	95.16	100 YR	12.22	22.95	24.23		24.25	0.00192	0.64	19.4	25.13	0.22
Baileys	42	95.16	200 YR	19.69	22.95	24.27		24.32	0.004415	0.98	20.54	26.32	0.34
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Baileys	42	88.63	10 YR	7.92	23.02	23.96	23.4	23.98	0.00211	0.59	13.68	22.01	0.23
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Baileys	42	81.96	200 YR	19.69	22.98	24.23	23.59	24.26	0.003075	0.84	25.13	35.96	0.29
Baileys	42	71.3	2 YR	4.69	22.94	23.73		23.73	0.000659	0.32	14.88	23.13	0.13
Baileys	42	71.3	10 YR	7.92	22.94	23.94		23.95	0.000823	0.38	21.16	35.09	0.14
Baileys	42	71.3	100 YR	12.22	22.94	24.2		24.21	0.000685	0.43	30.52	37.21	0.14
Baileys	42	71.3	200 YR	19.69	22.94	24.21		24.23	0.001729	0.69	30.81	37.26	0.22
Baileys	42	55.17	2 YR	4.69	22.16	23.62	22.86	23.7	0.003409	1.24	3.79	9.42	0.33
Baileys	42	55.17	10 YR	7.92	22.16	23.92	23.14	23.93	0.00221	0.51	15.8	30.65	0.22
Baileys	42	55.17	100 YR	12.22	22.16	24.18	23.48	24.2	0.001437	0.52	24.36	34.19	0.19
Baileys	42	55.17	200 YR	19.69	22.16	24.15	23.73	24.19	0.004202	0.87	23.37	33.75	0.32
Baileys	42	53.65		Culvert									
Baileys	42	49.39	2 YR	4.69	22.14	23.51	22.86	23.61	0.00462	1.39	3.37	15.05	0.38
Baileys	42	49.39	10 YR	7.92	22.14	23.7	23.16	23.91	0.008516	2.06	3.84	23.97	0.53
Baileys	42	49.39	100 YR	12.22	22.14	24.17	23.5	24.18	0.002648	0.63	20.48	29.39	0.24
Baileys	42	49.39	200 YR	19.69	22.14	24.07	23.79	24.14	0.010329	1.17	17.79	28.17	0.46
Baileys	42	42.3	2 YR	4.69	22.83	23.3	23.3	23.52	0.045931	2.05	2.29	22.03	0.99
Baileys	42	42.3	10 YR	7.92	22.83	23.48	23.48	23.79	0.042171	2.46	3.22	24.81	1.01
Baileys	42	42.3	100 YR	12.22	22.83	23.69	23.69	24.1	0.03769	2.83	4.32	27.32	1
Baileys	42	42.3	200 YR	19.69	22.83	24.06	23.71	24.09	0.002696	0.82	26.66	32.89	0.27

APPENDIX H

0.5% AEP RAINFALL INTENSITIES FROM CRC-FORGE

DESIGN RAINFALL ESTIMATES

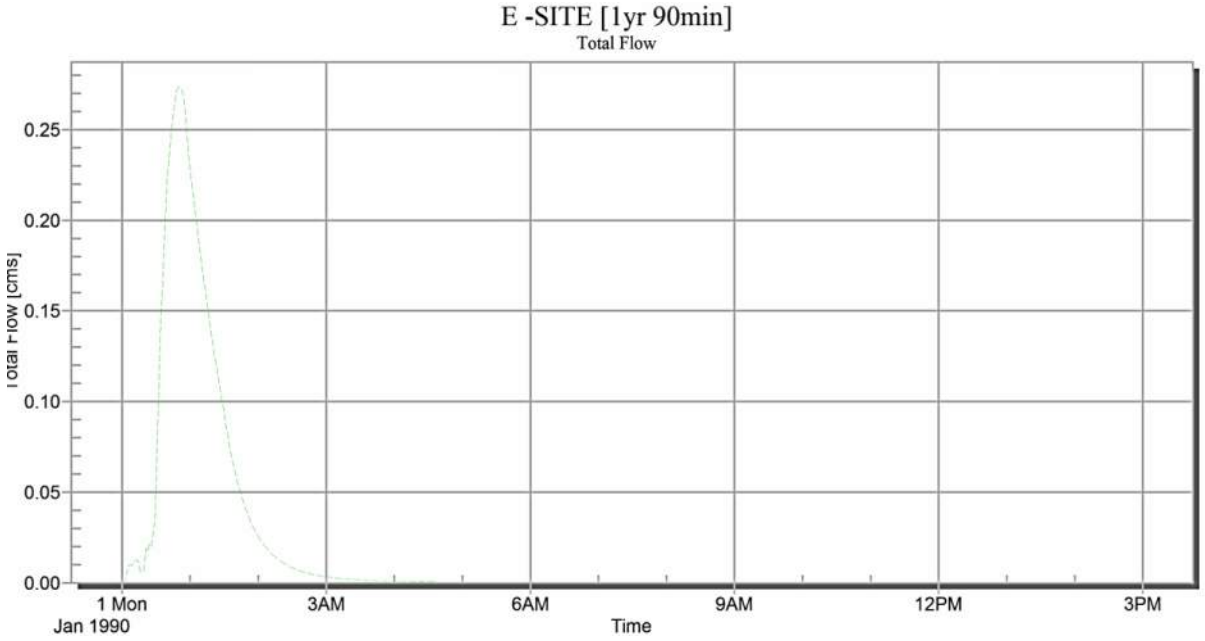
Entries are mm of rainfall per hour.
Row Heading - Duration of event
Column Headings - AEP (1 in X)
Above 24 hours duration and events rarer than AEP (1 in 50) entries are derived from CRCFORGE estimates only.
Other entries have been derived by applying AR&R ratios to the CRCFORGE 24 hour AEP (1 in 50) value.
Areal Reduction Factors (ARFs) have already been applied and are as shown in the companion output file: '* Data Summary.txt'.
Below 24 hours duration the relevant 24 hour ARF has been conservatively applied.

	5	10	20	50	100	200	500	1000	2000
15 min	145.7	161.1	182.4	210.0	237.6	265.9	305.1	336.1	367.8
30 min	104.5	116.0	131.8	152.3	172.3	192.8	221.2	243.7	266.7
1 hour	72.23	80.52	91.78	106.5	120.5	134.8	154.7	170.4	186.5
3 hours	35.91	40.43	46.47	54.42	61.58	68.90	79.06	87.10	95.33
6 hours	22.92	25.97	30.01	35.35	40.00	44.76	51.36	56.57	61.92
12 hours	14.65	16.71	19.41	23.01	26.03	29.13	33.42	36.82	40.30
18 hours	11.66	13.35	15.55	18.50	20.93	23.42	26.87	29.60	32.40
24 hours	9.892	11.35	13.26	15.81	17.89	20.02	22.97	25.30	27.70
48 hours	6.167	7.078	8.266	9.856	11.35	12.98	15.38	17.38	19.59
72 hours	4.514	5.181	6.051	7.215	8.341	9.593	11.44	13.02	14.76
96 hours	3.581	4.111	4.801	5.724	6.624	7.621	9.114	10.38	11.79
120 hours	2.957	3.394	3.964	4.727	5.464	6.280	7.480	8.501	9.627

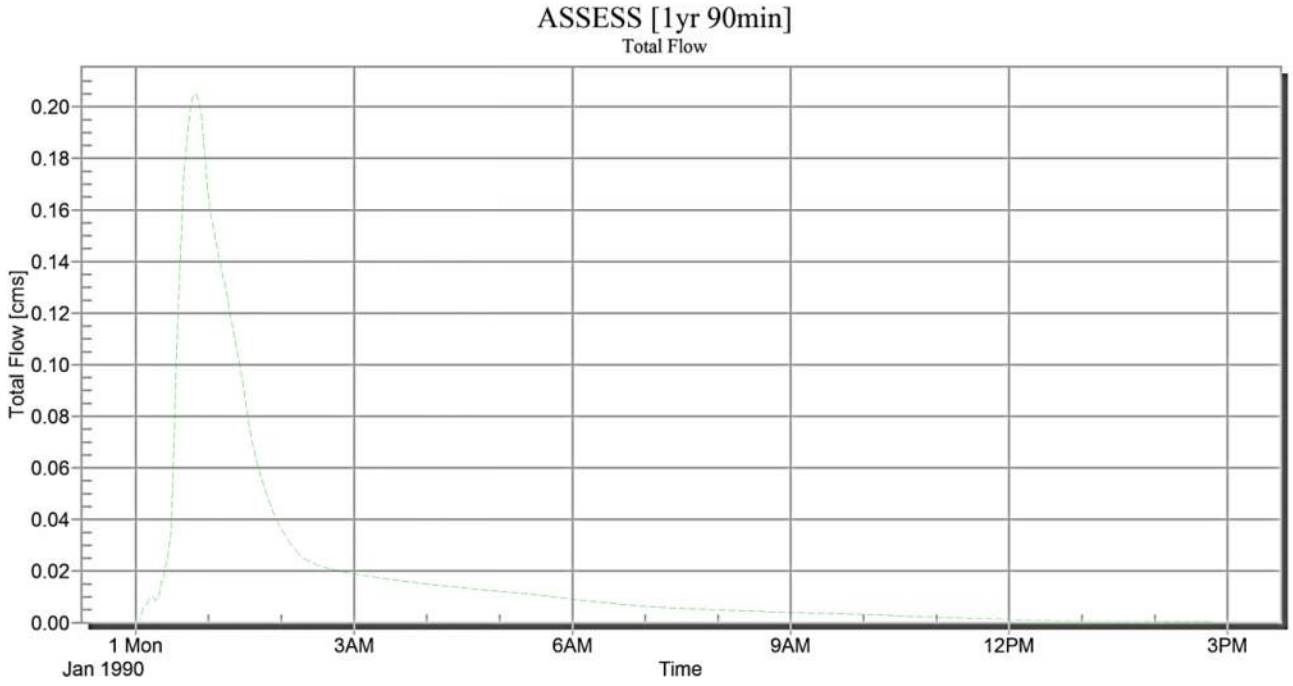
APPENDIX I

HYDROGRAPHS FOR PEAK FLOW RATES FROM DEVELOPMENT EXISTING AND DEVELOPED

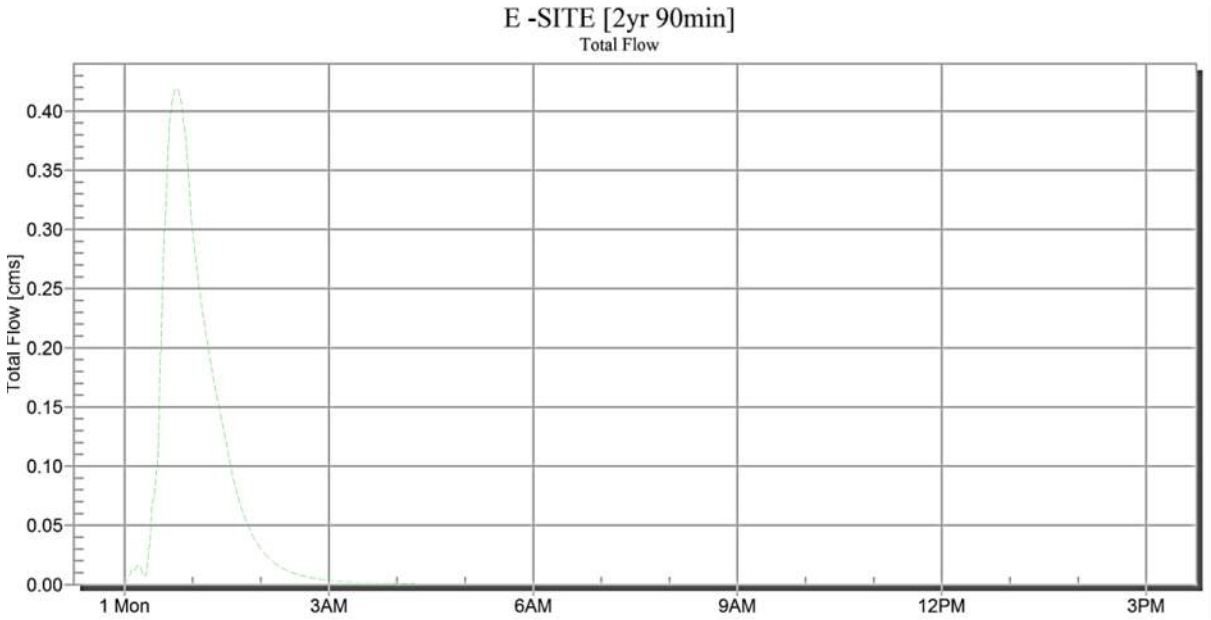
EXISTING PEAK 63% AEP HYDROGRAPH



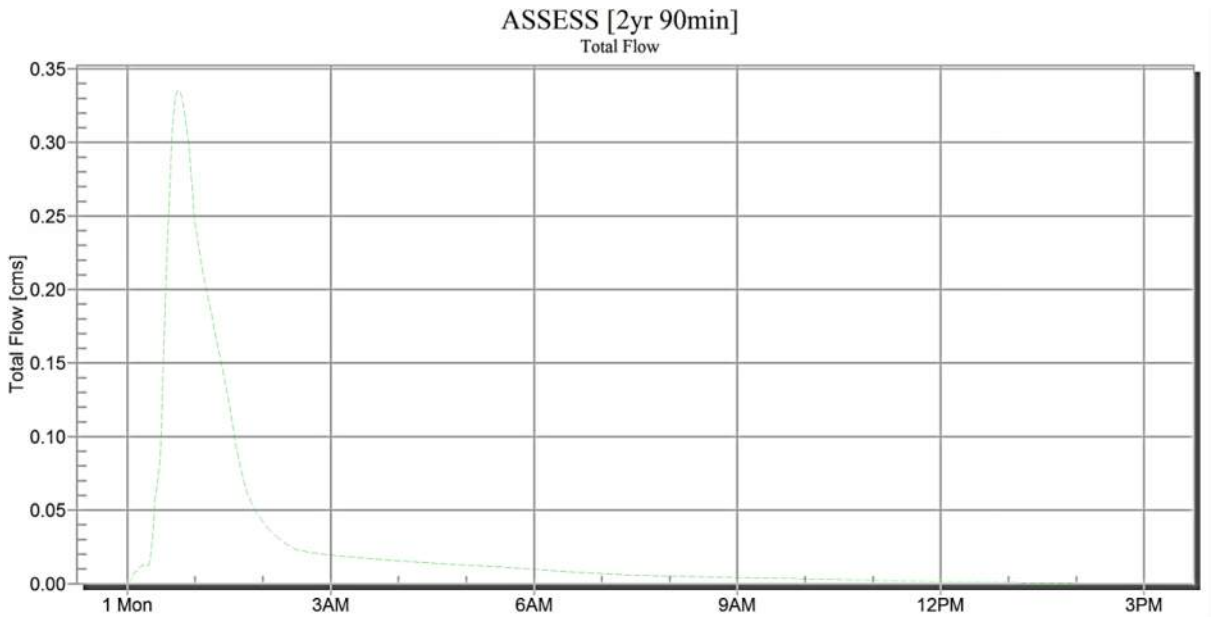
DEVELOPED PEAK 63% AEP HYDROGRAPH



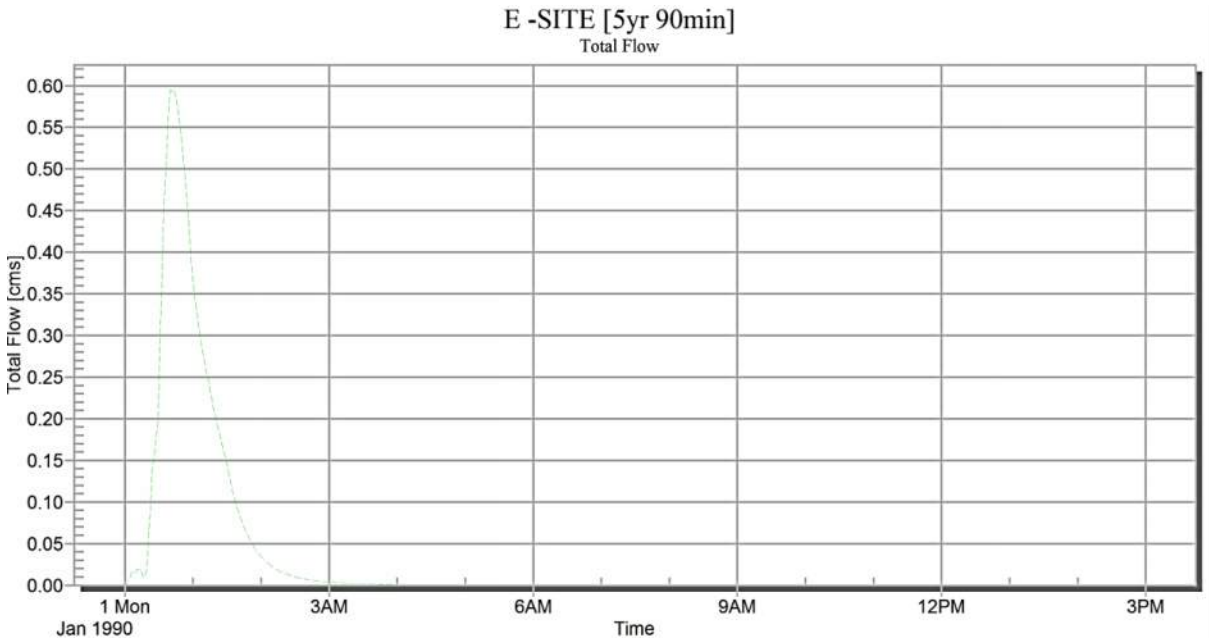
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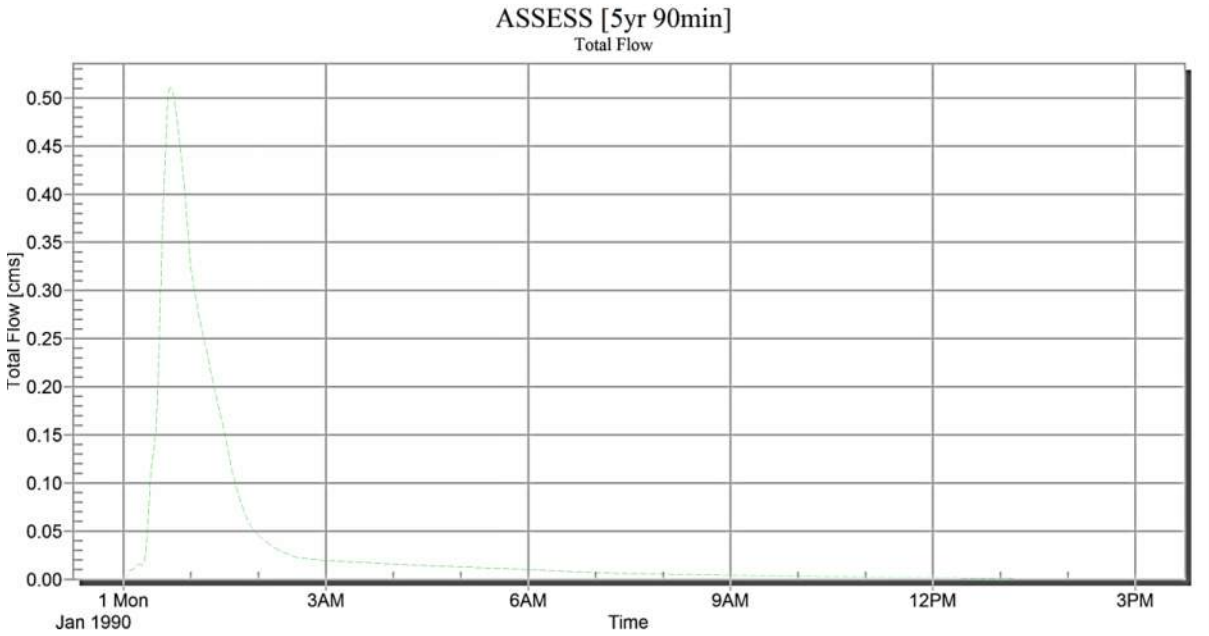
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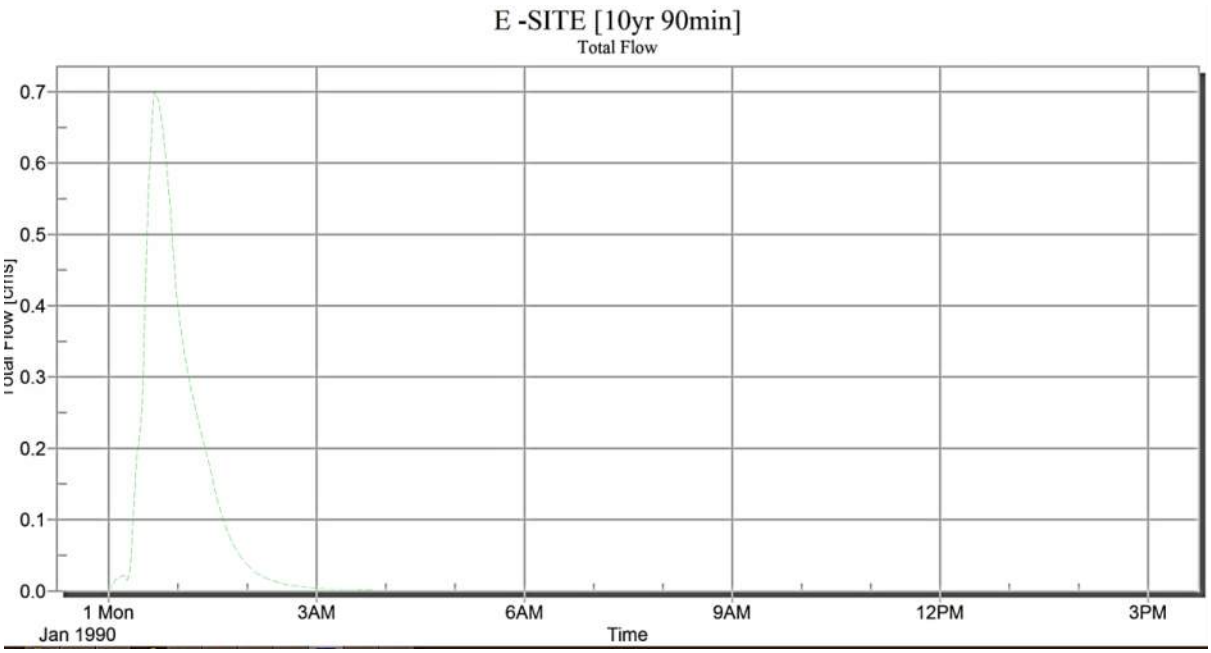
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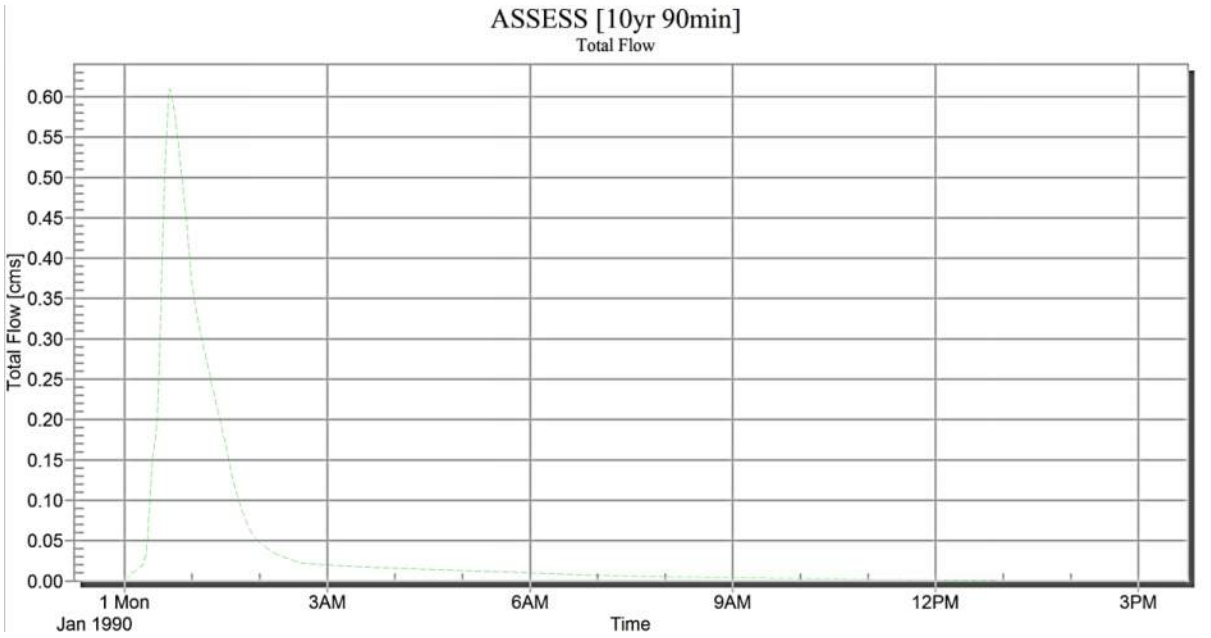
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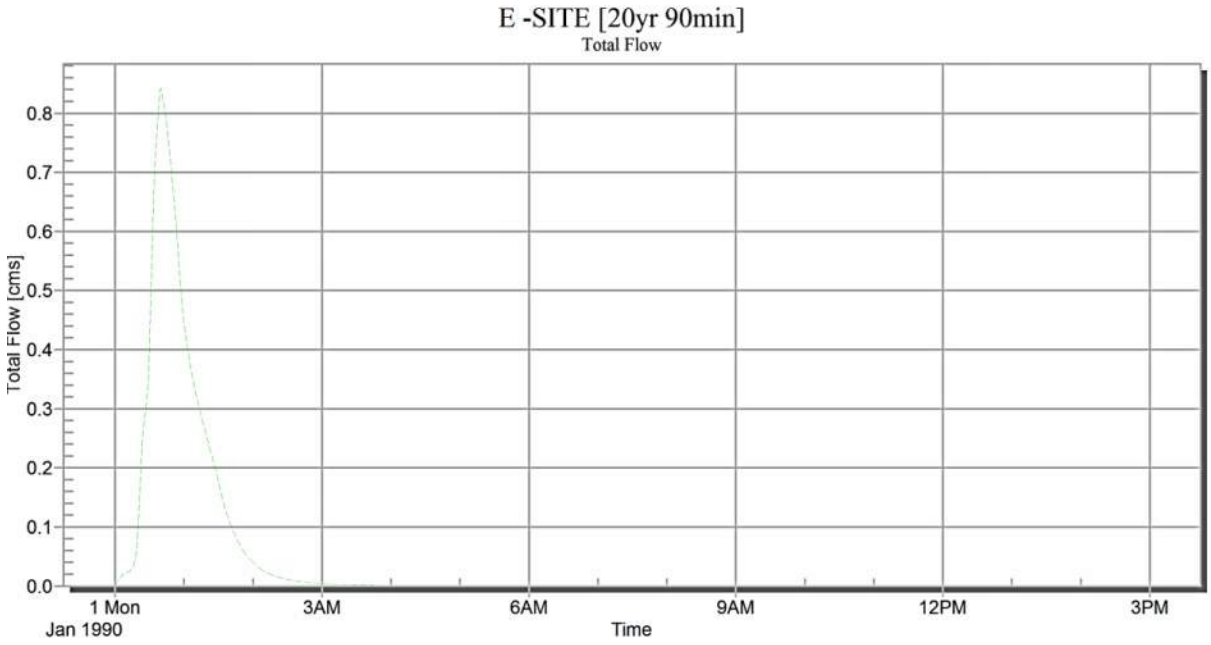
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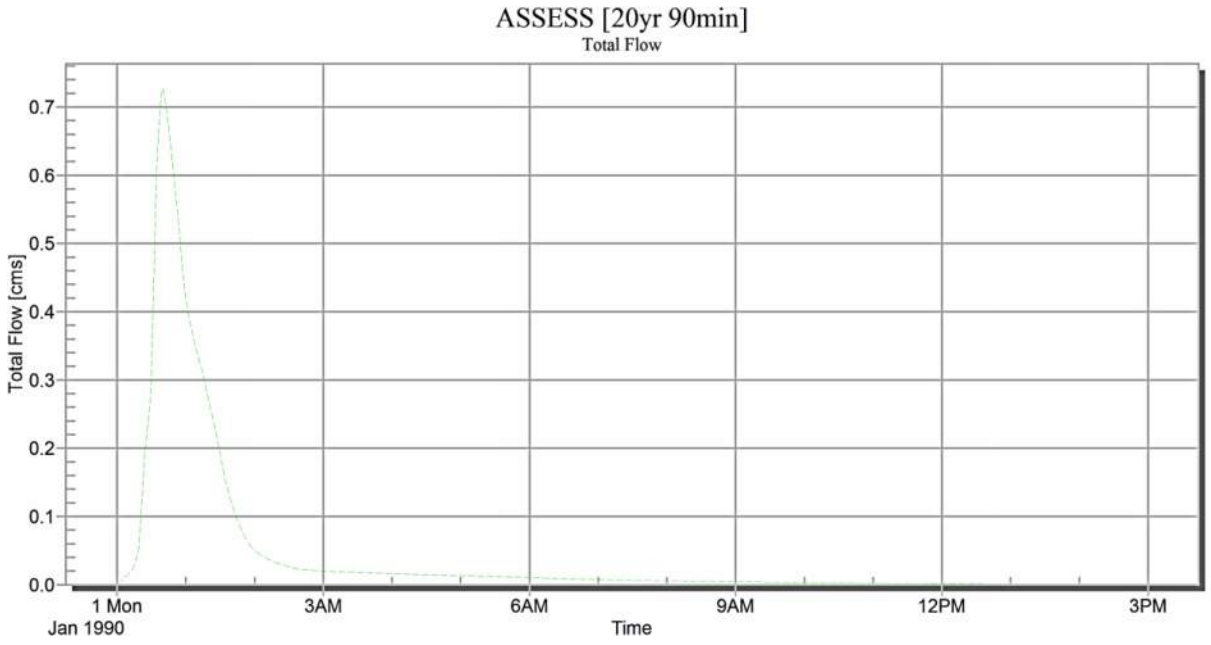
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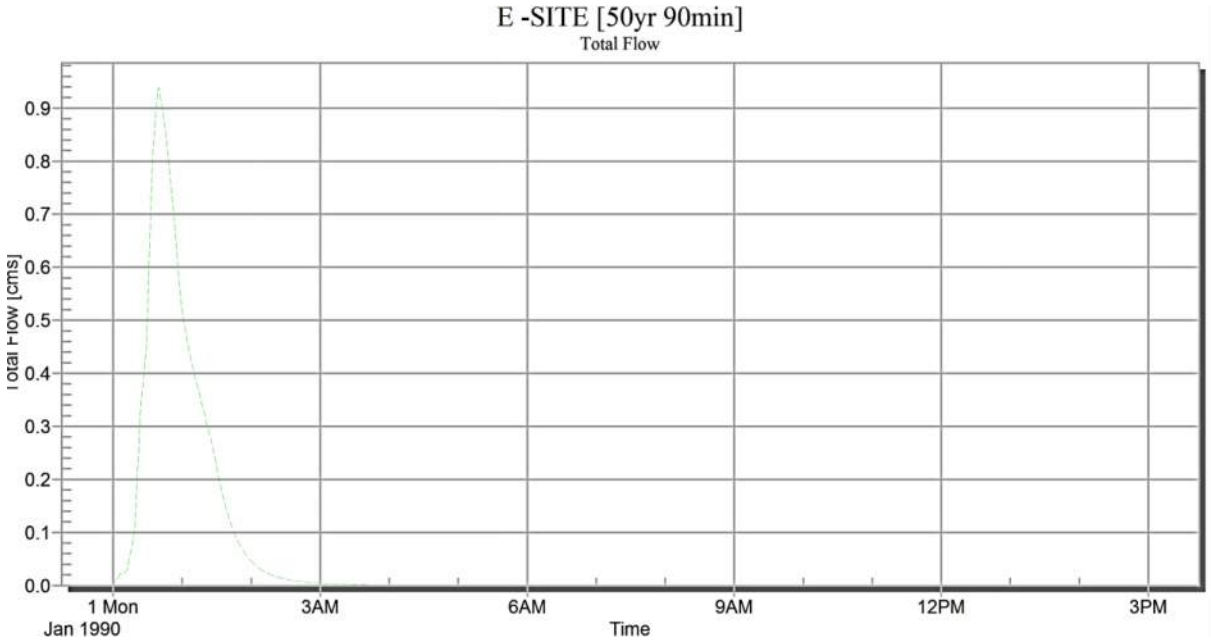
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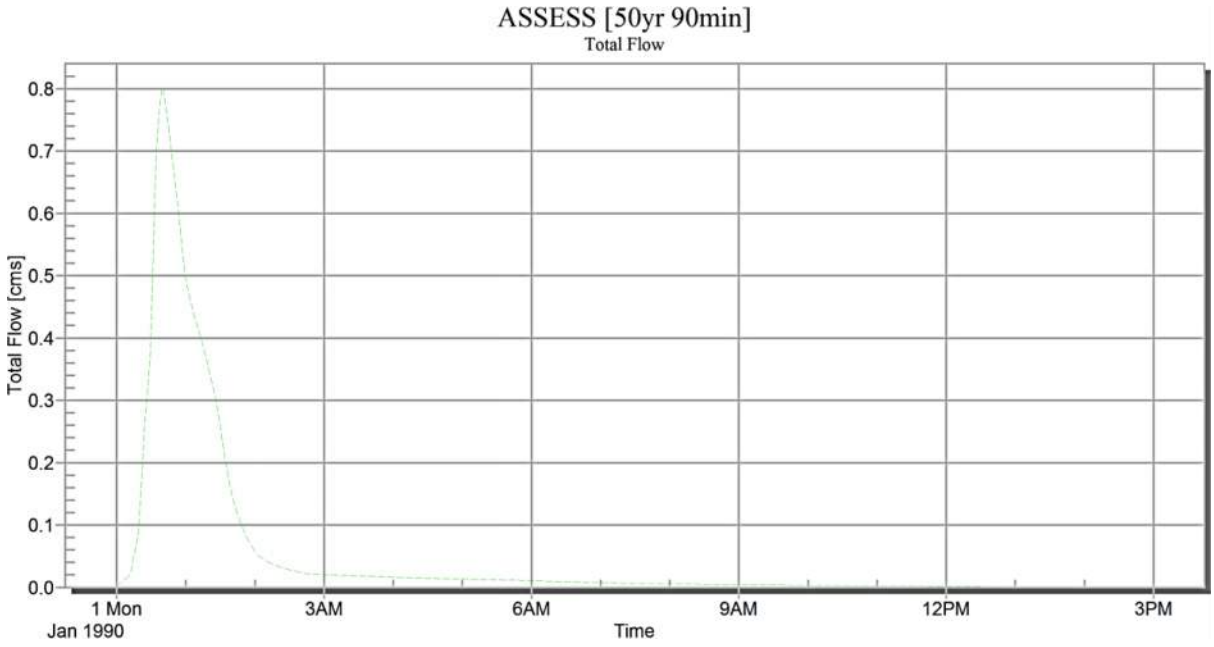
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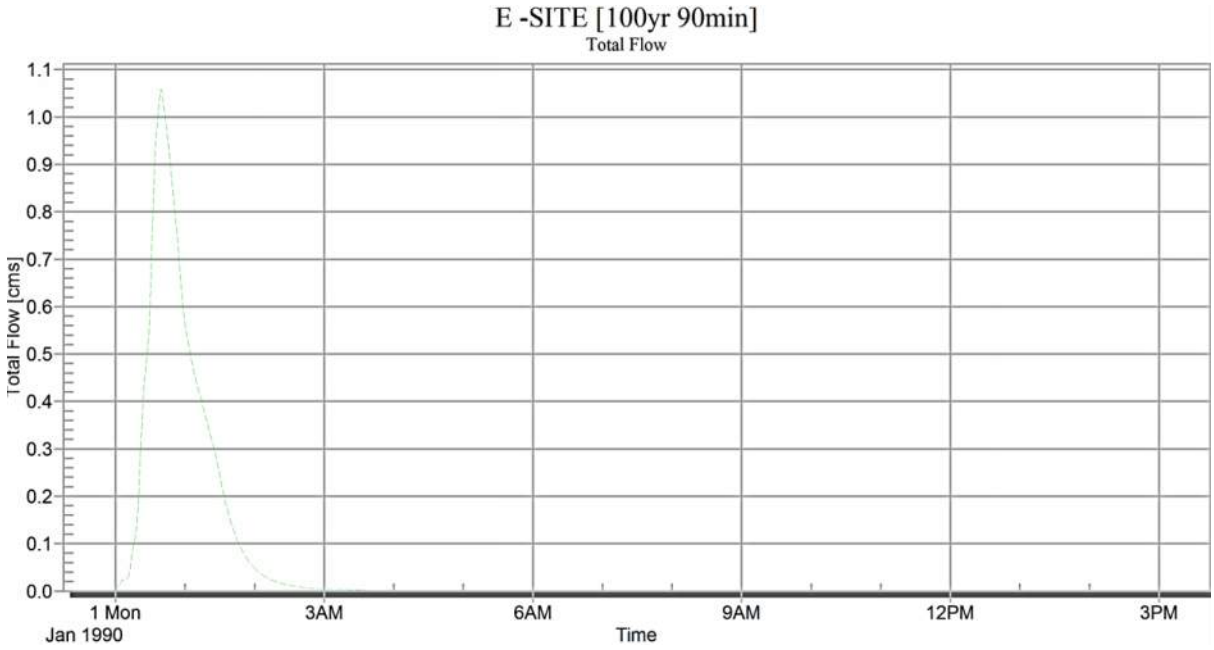
EXISTING PEAK 2% AEP HYDROGRAPH



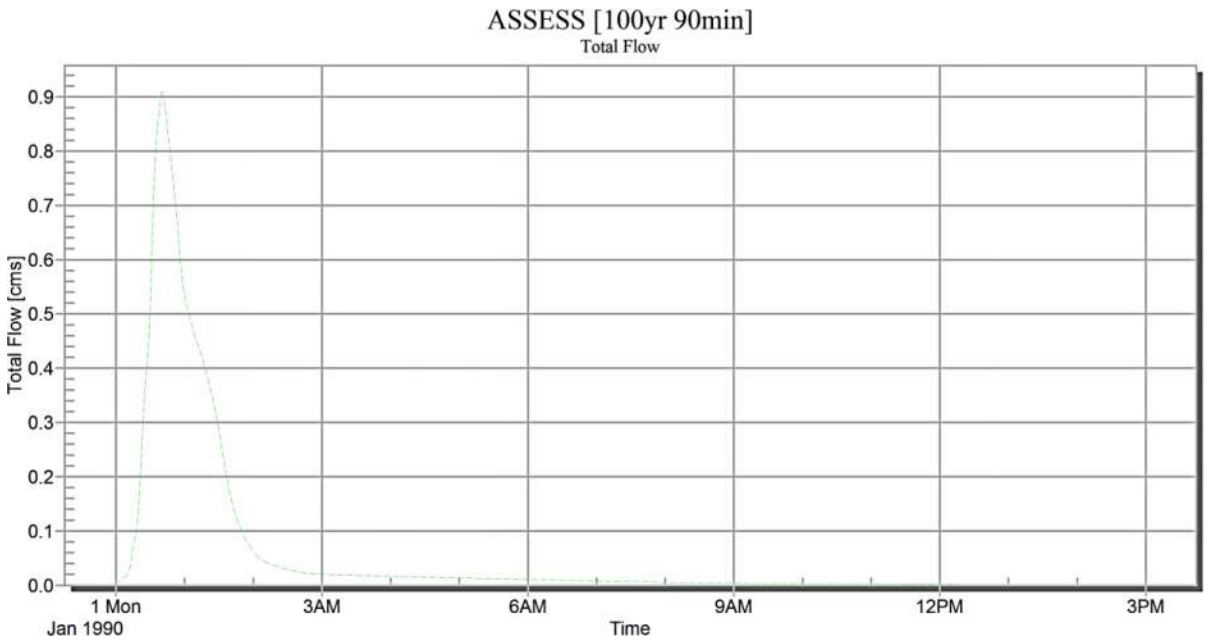
DEVELOPED PEAK 2% AEP HYDROGRAPH



EXISTING PEAK 1% AEP HYDROGRAPH



DEVELOPED PEAK 1% AEP HYDROGRAPH



ATTACHMENT 5

Response to Information Request (Transport Planning Items) prepared by Bitzios Consulting



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Our Reference: P3686.002L
Your Reference: MCU/2018/58

8 July 2019

Sandson Pty Ltd
C/- Urban Planning Services Pty Ltd
PO Box 2091
Surfers Paradise QLD 4217

Attention: Leanne Croft
Sent via email: leanne@urbanps.com.au

Dear Leanne

RE: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA – PROPOSED AGED CARE FACILITY RESPONSE TO COUNCIL'S REQUEST FOR FURTHER INFORMATION

1.0 PURPOSE

Bitzios Consulting was commissioned by Sandson Pty Ltd to prepare a response to the Transport Planning Items in the City of Gold Coast Council's (Council) Request for Further Information (RFI) dated 30 August 2018 in relation to the subject development. This letter specifically responds to Items 13-18 of the RFI.

A copy of the revised development plans is provided in Attachment A.

2.0 RESPONSE TO TRANSPORT PLANNING ITEMS

2.1. Item 13 – Existing Transport Corridor

To comply with Part 3- Strategic Framework, section 3.6 Improving Transport outcomes-section 3.6.4 Element- Transport system efficiency-section 3.6.4.1(4) Specific outcomes, the applicant is requested to demonstrate that the proposed development does not compromise the function of the existing transport corridor through the site connecting to the existing roundabout (RAB) at Old Coach Road/Reserve Road. The City's Local Government Infrastructure Plan (LGIP) shows upgrade of this intersection is scheduled for 2026. Advice received from the City's Transport and Traffic Branch shows Baileys Mountain Road realigned through the site connecting into the above mentioned RAB. The submitted impact analysis, p.10 of 55, dated 26 July 2018 prepared by BDA, shows a 20m wide road reserve extending through the site to the roundabout which appears to be on a slightly different alignment to the drawing City's Transport and Traffic Branch have provided. The applicant is requested to update plans accordingly.

Response:

It is understood that Council supplied the transport corridor connecting Baileys Mountain Road to the existing roundabout at Old Coach Road / Reserve Road and that this does not impact the proposed development layout as shown in the plans provided in Attachment A.

2.2. Item 14 – Car Parking

To assist in demonstrating compliance with PO1 of the Transport code, the applicant is requested to further justify the proposed supply of car parking residents and visitors. The applicant proposes 8 resident spaces for the low care units and 44 visitor car parking spaces. Based on the traffic consultant's response, this appears to be based on the experience of the operator. In this regard, please provide some car parking survey data from existing similar retirement and residential care facilities under the same ownership to justify the proposed car parking supply.

Response:

The applicant has provided information related to the car parking provisions of their existing aged care facility under the same ownership, which is the Paradise Lakes Care Centre (PLCC) in Runaway Bay. This facility provides:

- 48 beds for aged care (no resident car parking spaces)
- 38 on-site car parking spaces allocated as follows:
  - One (1) car parking space reserved for an ambulance
  - One (1) car parking space reserved for the Director of Care
  - One (1) car parking space reserved for the Proprietor
  - One (1) car parking space reserved for the doctor
  - One (1) car parking space reserved for the hairdresser
  - Two (2) 10-minute car parking spaces
  - Seven (7) staff and visitor car parking spaces for the Paradise Lakes Resort (note: this is a separate business for over 50's living containing 185 homes each with a carport)
  - 24 staff and visitor car parking spaces for the PLCC.

The applicant has advised that the maximum number of staff on-site ranges between 16 and 20 for the PLCC, not including on-site managers and staff for the adjoining Paradise Lakes Resort. It is conservatively assumed that:

- On-site managers for the Resort will have their own residence and carport.
- Resort staff will park within their designated car parking spaces and/or on-street (within the development) in proximity to the residences that they are servicing.
- Visitors to the Resort will predominately park on-street (within the development) close to the residence that they are visiting.

Considering the above, the minimum number of visitor car parking spaces likely to be available for the PLCC is conservatively assumed as 4 to 8 spaces (or an equivalent rate of 1 space per 6 to 12 beds), with no parking provided for residents. This provision validates the car parking rates used in Bitzios Consulting's Traffic Impact Assessment (TIA reference: P3686.002R dated 30 July 2018), which were:

- No car parking for the residents of the "high care residential" component.
- 1 space per 3.1 beds for visitors of the "high care residential" component.

The car parking rates in the TIA for the "low care residential" and staff components of the development comply with Council's Transport Code (2016).

2.3. Item 15 – Sliding Gate

To assist in demonstrating compliance with AO2 of the Transport code, the applicant is requested to remove the automatic sliding gate from the visitor car park. Alternatively, should the applicant wish to retain the gate, demonstrate how visitors will access the car parking area. It would be preferable to have the gate open during visiting hours or otherwise provide an intercom system linked to the administration area to provide access for visitors.

Response:

The applicant proposes to retain the security gate. To enable unobstructed access to the car parking area during visiting hours, the gate shall remain open during these hours.

2.4. Item 16 – Servicing

To assist in demonstrating compliance with PO5 and PO6 of the Transport code, the applicant is requested to demonstrate why a MRV is the largest design service vehicle. The main servicing requirements would be food and laundering services. It would be helpful if the applicant could provide letters from suppliers advising of their design vehicles. If the applicant proposes to maintain the MRV requirement, then a limiting condition will be applied.

Response:

The applicant proposes that the site is serviced by an 8.8m Medium Rigid Vehicle (MRV) based on the existing operations of their current facility, being the Paradise Lakes Care Centre (PLCC) in Runaway Bay. It is understood that this vehicle represents a typical MOCO food delivery truck. As the applicant has an existing site that operates with this arrangement and are assumed to have control over the type of service vehicle used for delivery through the delivery contact, the largest service vehicle suitable for the subject site will therefore be an 8.8m MRV and a 10.2m Refuse Collection Vehicle (RCV).

It is recommended that Council impose a condition limiting on-site servicing to a 10.2m RCV or smaller service vehicle.

2.5. Item 17 – Public Transport Facility

The applicant has indicated that AO8 and AO9 of the Transport code are not applicable. This is not the case. To comply with AO8, new and existing educational establishments require integration of an off-road public passenger transport facility. The application seeks approval for an educational establishment. The applicant is requested to provide justification against PO8 to address this matter.

Response:

The educational component of the residential care facility is minor and ancillary to the main purpose of the development. The requirements stipulated in AO8 of Council's Transport Code is targeted towards large educational establishments that would attract significant outside use and would trigger and be capable of providing off-street public transport facilities (e.g. schools, hospitals, etc). Although the subject site has an educational element, this is not the main purpose of the site and is therefore not considered to trigger the requirements outlined in AO8 of the Transport Code.

It is however noted that the development will provide access to shuttle bus services to transport staff and residents within the surrounding area.

2.6. Item 18 – Parking and Access

To assist in demonstrating compliance with AO25.1 of the Transport code as proposed, the applicant is requested to update the proposed drawing set as follows:

a. *Dimension all car parking and vehicle facilities to show compliance with AS2890.1, AS2890.2 and AS2890.6.*
b. *Submit a longitudinal section drawing along the full extent of ramp from Baileys Mountain Road entry to the furthest extent travelled by service vehicles showing compliance with the grade and transition requirements of AS2890.2.*
c. *Show a minimum of 3.5m vertical clearance into the under-croft car parking area to ensure suitable clearance to access the proposed SRV bay. All ceiling mounted services are to be located above this height.*
d. *Provide a longitudinal section along Baileys Mountain Road showing sight distance in both directions designed based on a 80km/hr (111m sight distance). Council has survey data from 8-14 May 2018 on Baileys Mountain Road between Old Coach Road and Courtney drive showing 85th percentile speed up to 76km/hr. This is required to comply with Figure 3.2, Note 4 of AS2890.1-2004.*

Response:

Each item has been responded to in-turn below:

a. Amended development plans provided in Attachment A prepared by BDA Architecture (Drawing 8.12) show the dimensions of all car parking and vehicle facilities, generally in accordance with the requirements of AS2890.1, AS2890.2 and AS2890.6.

b. A longitudinal section drawing along the full extent of the ramp from Baileys Mountain Road to the loading area prepared by Arcadis is provided in Attachment B. To demonstrate the ability for the design service vehicles (i.e. 8.8m MRV and 10.2m RCV) to travel along the full extent of the ramp to the loading area, a vertical swept path assessment has been undertaken. In lieu of detailed information about the undercarriage clearances for the 10.2m RCV, a 150mm clearance has been adopted in-line with the requirements stipulated in AS2890.2 for all classes of service vehicles. This assessment is provided in Attachment C and demonstrates that the design vehicles can complete the travel path (ingress and egress) without undercarriage scraping. It is important to note that the maximum grade for the on-site service vehicle travel path is 1:20, which is well within the maximum allowable grades stipulated by AS2890.2.

c. Amended development plans provided in Attachment A prepared by BDA Architecture (Drawing 8.12) show a 3.5m height clearance above the ambulance bay and the access path.

d. 7-day tube count data was provided by Council for the period between Tuesday 8 May to Monday 14 May 2018. This tube count was positioned approximately 110m to the north of the proposed access location on a straight section of road with minimal speed deterrents. The key results from the tube count data are as follows:

   - The maximum daily 85th percentile speed recorded for northbound traffic was 74km/h.
   - The maximum daily 85th percentile speed recorded for southbound traffic was 77km/h.

   In accordance with Figure 3.2 (Note 4) in Australian Standards AS2890.1, the sight distance requirements for the proposed access location are as follows:

   - the recorded 74km/h speed for northbound traffic requires a sight distance of 97m. This is based on the nearest tabulated speed of 70km/h as the 85th percentile speed is at least 5km/h greater than the posted speed per Note 4.
   - the recorded 77km/h speed for southbound traffic requires a sight distance of 111m. This is based on the nearest tabulated speed of 80km/h as the 85th percentile speed is at least 5km/h greater than the posted speed per Note 4.

Longitudinal sections of Baileys Mountain Road prepared by Arcadis have been used to assess the available sight distance from the access location in accordance with AS2890.1. The sight distances have been measured from a point 1.15m (driver's eye height) to a point 1.15m (approaching vehicle) above the travelled way in accordance with Figure 3.2 (Note 7) in AS2890.1. The following sight distances are achievable when considering the vertical alignment of Baileys Mountain Road:

- Greater than 97m available sight distance looking south from the access location.
- Greater than 111m available sight distance looking north from the access location.

Attachment D illustrates this vertical sight distance assessment.

To assess the available horizontal sight distances, a site inspection was undertaken on 24 June 2019. It was observed that the sight distances north and south along Baileys Mountain Road from the proposed site access location achieve the aforementioned requirements of AS2890.1. Figure 2.1 shows the available sight distances from the proposed access location. A small area of minor vegetation trimming within the road reserve is recommended to improve a driver's view of an approaching vehicle, as shown in Figure 2.1.



Figure 2.1: Available Sight Lines from the Proposed Access Location

3.0 CONCLUDING STATEMENT

I trust that the above information is sufficient to respond to Council's RFI in relation to the traffic engineering and transport planning items and will allow Council to prepare reasonable and relevant conditions of approval.

Yours faithfully



Alex Piggott

Senior Traffic Engineer and Transport Planner

BITZIOS CONSULTING

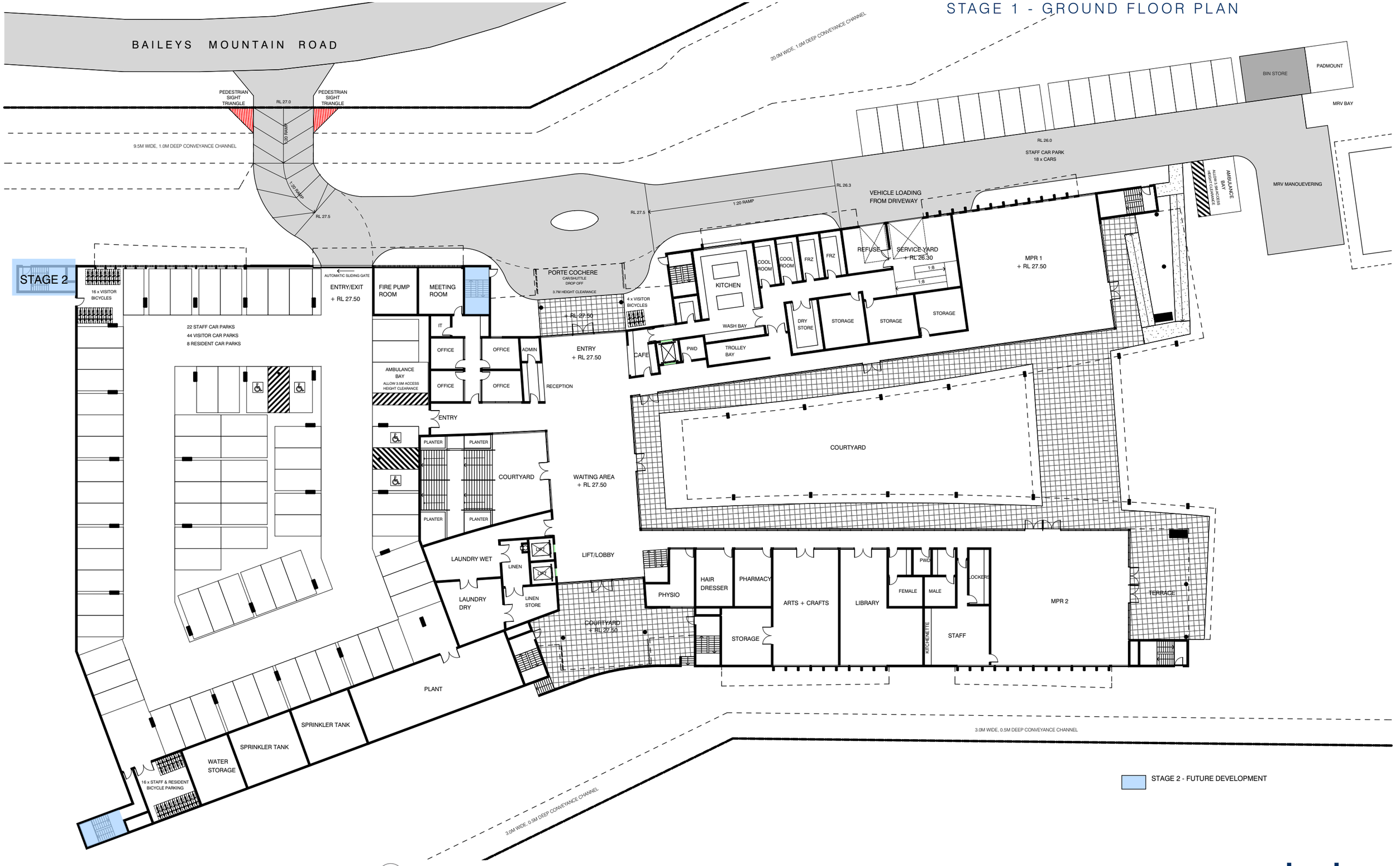
Attachments:
A: Development Plans Prepared by BDA Architecture
B: Longitudinal Section Drawings Prepared by Arcadis
C: Vertical Swept Path Assessment
D: Sight Distance Assessment

ATTACHMENT A

DEVELOPMENT PLANS PREPARED BY BDA

ARCHITECTURE

STAGE 1 - GROUND FLOOR PLAN





STAGE 1
NORTH EAST ELEVATION - 1:400 (A3)



STAGE 2
NORTH EAST ELEVATION - 1:400 (A3)

NOTE: GRAPHICAL REPRESENTATION OF LANDSCAPING ONLY.
REFER LANDSCAPE ARCHITECTS REPORT FOR DETAIL.

CAR & BIKE PARKING



PROPOSED CAR PARKING

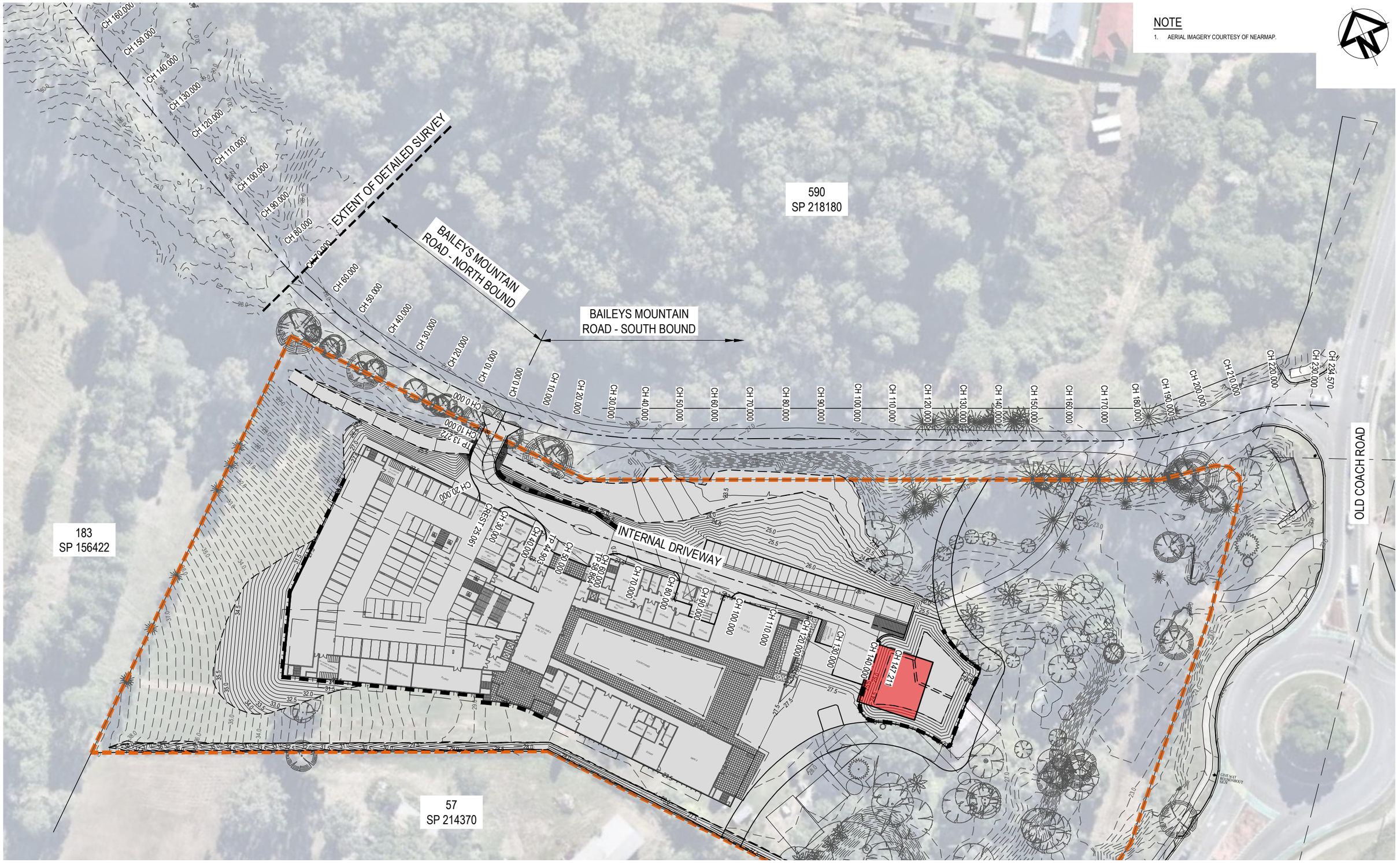
HIGH CARE	REQUIRED	PROVIDED
130 UNITS NO REQUIREMENT	0 Car Parks	0 Car Parks
VISITORS (1 CAR PER 4 UNITS)	33 Car Parks	42 Car Parks
LOW CARE		
8 UNITS (1 CAR PER 1 UNIT)	8 Car Parks	8 Car Parks
VISITORS (1 CAR PER 4 UNITS)	2 Car Parks	2 Car Parks
STAFF (1 CAR PER STAFF)	40 Car Parks	40 Car Parks
TOTAL	**76 Car Parks**	**94 Car Parks**

PROPOSED BIKE PARKING

HIGH CARE	REQUIRED
130 UNITS NO REQUIREMENT	0 Bike Parks
VISITORS (1 BIKE PER 10 UNITS)	13 Bike Parks
LOW CARE	
8 UNITS (1 BIKE PER 2 BEDS)	14 Car Parks
VISITORS (1 BIKE PER 10 UNITS)	1 Bike Park
STAFF (1 BIKE PER 5 STAFF MEMBERS)	8 Bike Parks
TOTAL	**36 Bike Parks**

ATTACHMENT B

LONGITUDINAL SECTION DRAWINGS PREPARED BY ARCADIS



Issue	Description	By	Ckd	RPE	Date
03	ARCHITECTURAL REVISED	NF	AS		25.06.19
02	ARCHITECTURAL REVISED	NF	AS		16.05.19
01	ORIGINAL ISSUE	NF	AS		17.04.19

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Surveyor: SCHLENCKER SURVYING

Architect: BDA ARCHITECTURE

Filename: S:\002-10022603-gcd-VertSightDistances.dwg

Client: SANDSON PTY LTD

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved: R.P.E. No:

Scales: 1:500 | Original Size: A1 | Height Datum: AHD | Grid:

Original Issue Signatures

Drawn: N. FAHEY
Designed: N. FAHEY
Project Manager: A. SHEPHERD
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Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

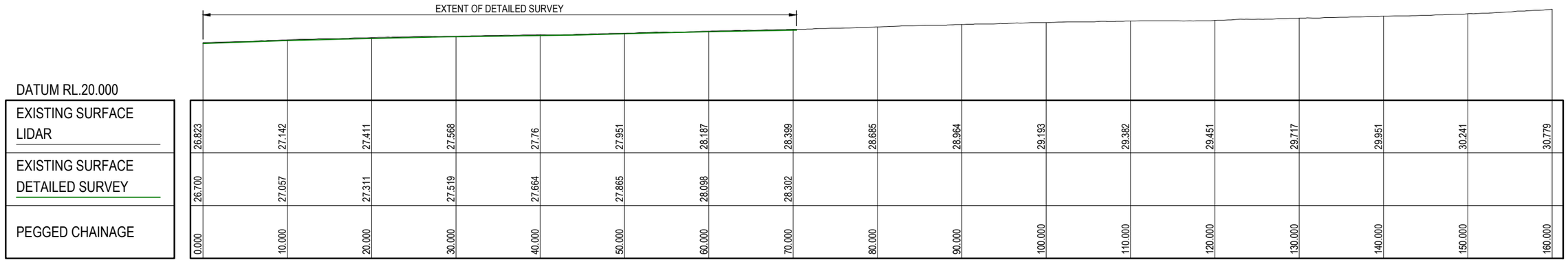
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ARCADIS
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Drawing No.: S:\002 | Project No.: 10022603 | Issue: 03

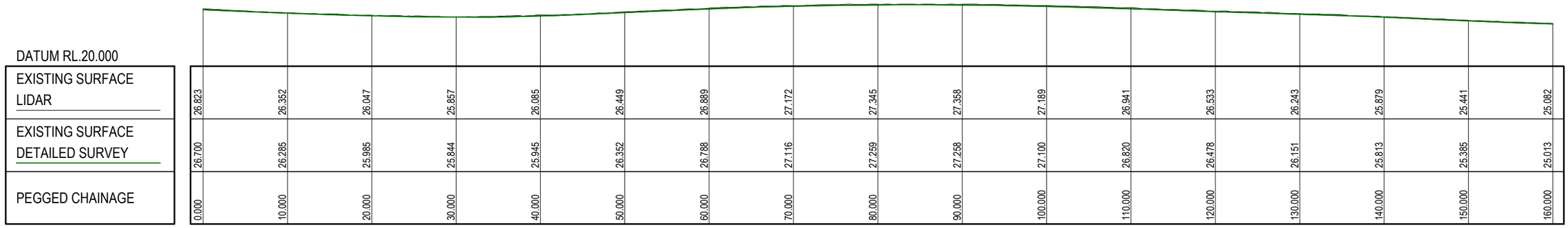
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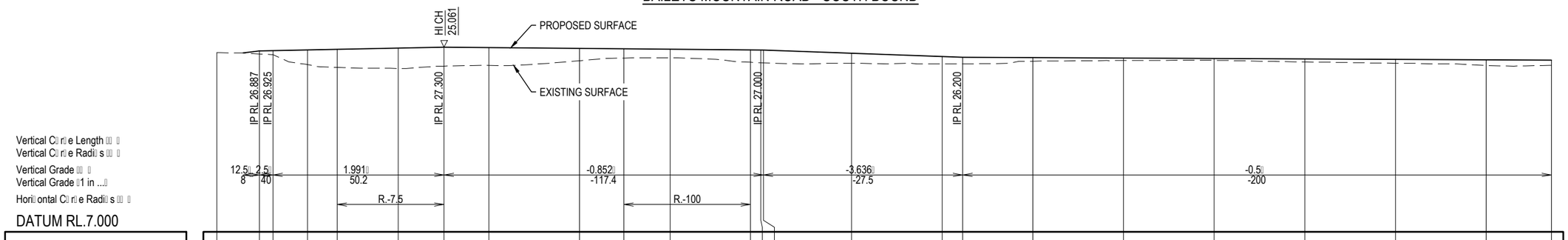
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EXISTING SURFACE DETAILED SURVEY	26.700	27.057	27.311	27.519	27.664	27.865	28.098	28.302														
PEGGED CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000					

BAILEYS MOUNTAIN ROAD - NORTH BOUND



DATUM RL.20.000																						
EXISTING SURFACE LIDAR	26.823	26.352	26.047	25.857	26.085	26.449	26.889	27.172	27.345	27.358	27.189	26.941	26.533	26.243	25.879	25.441	25.082					
EXISTING SURFACE DETAILED SURVEY	26.700	26.285	25.985	25.844	25.945	26.352	26.788	27.116	27.259	27.258	27.100	26.820	26.478	26.151	25.813	25.385	25.013					
PEGGED CHAINAGE	0.000	10.000	20.000	30.000	40.000	50.000	60.000	70.000	80.000	90.000	100.000	110.000	120.000	130.000	140.000	150.000	160.000					

BAILEYS MOUNTAIN ROAD - SOUTH BOUND



DATUM RL.7.000

DESIGN LEVELS ON ROAD CENTRELINE	26.887	26.925	27.000	27.065	27.199	27.300	27.258	27.173	27.131	27.088	27.012	27.002	27.000	26.646	26.283	26.200	26.161	26.111	26.061	26.011	25.961	25.911	25.875
EXISTING SURFACE ON ROAD CENTRELINE	26.700	26.560	26.470	25.384	25.090	24.972	25.225	25.293	25.817	26.110	26.131	25.643	25.592	25.580	25.522	25.473	25.473	25.761	25.841	25.866	25.674	25.531	25.282	25.305
CUT / FILL DEPTH		0.327	0.455	1.616	1.976	2.227	2.075	1.965	1.356	1.021	0.956	1.369	1.410	1.420	1.124	0.809	0.727	0.400	0.271	0.195	0.338	0.430	0.630	0.570
PEGGED CHAINAGE	0.000	4.699	6.199	10.000	13.272	20.000	25.061	30.000	40.000	44.903	50.000	58.864	60.000	60.273	70.000	80.000	82.273	90.000	100.000	110.000	120.000	130.000	140.000	147.211

INTERNAL DRIVEWAY

Issue	Description	By	Ckd	RPE	Date
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02	BAILEYS MOUNTAIN ROAD LONG SECTIONS REVISED	NF	AS		16.05.19
01	ORIGINAL ISSUE	NF	AS		17.04.19

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Architect: BDA ARCHITECTURE

Filename: S:\002-10022603-gcd-VertSightDistances.dwg

Client: SANDSON PTY LTD

Status: PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION

Approved: R.P.E. No:

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		Drawn N. FAHEY	
Original Size	A1	Designed N. FAHEY	
Height Datum	AHD	Project Manager A. SHEPHERD	
Grid		© Copyright reserved	

Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: VERTICAL SIGHT DISTANCE ANALYSIS - LONGITUDINAL SECTIONS

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Drawing No.	Project No.	Issue
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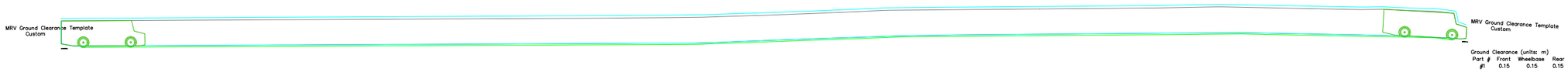
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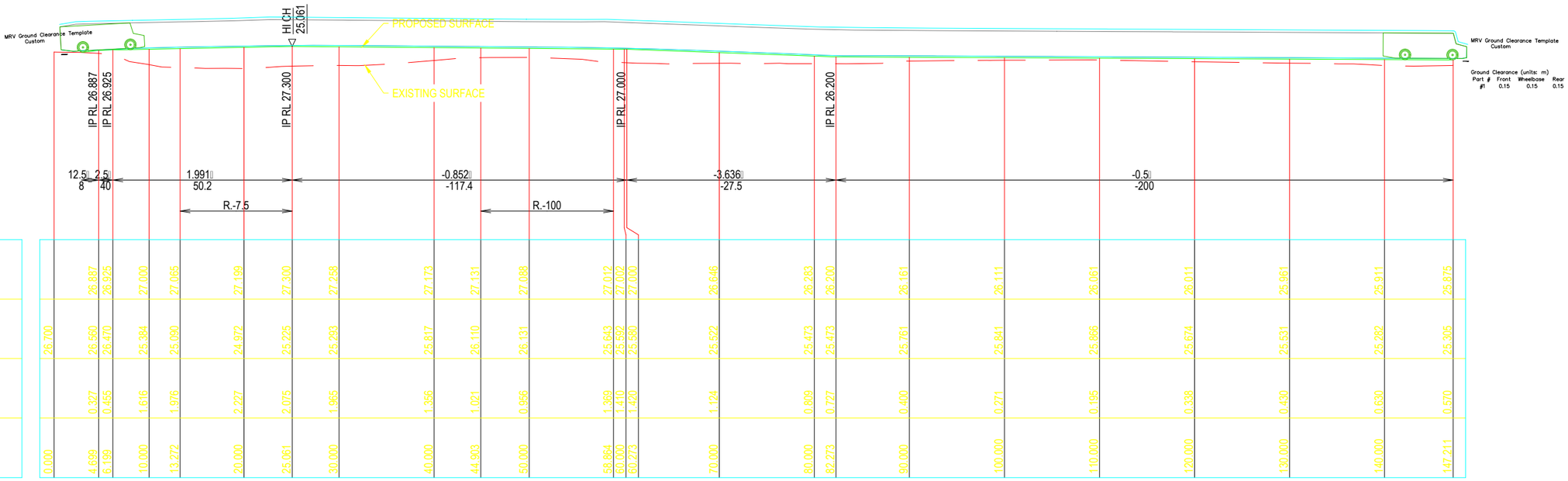
ATTACHMENT C

VERTICAL SWEPT PATH ASSESSMENT

EGRESS



INGRESS



INTERNAL DRIVEWAY

BITZIOS consulting

Issue	REVISIONS Revisions/Descriptions	Drawn	Date
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NOT TO SCALE

Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: VERTICAL SWEPT PATH ASSESSMENT 8.8 MEDIUM RIGID VEHICLE

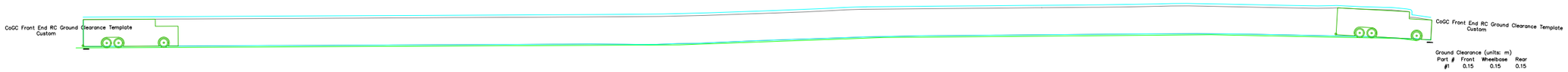
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J.B	J.B	A.P

FOR INFORMATION ONLY

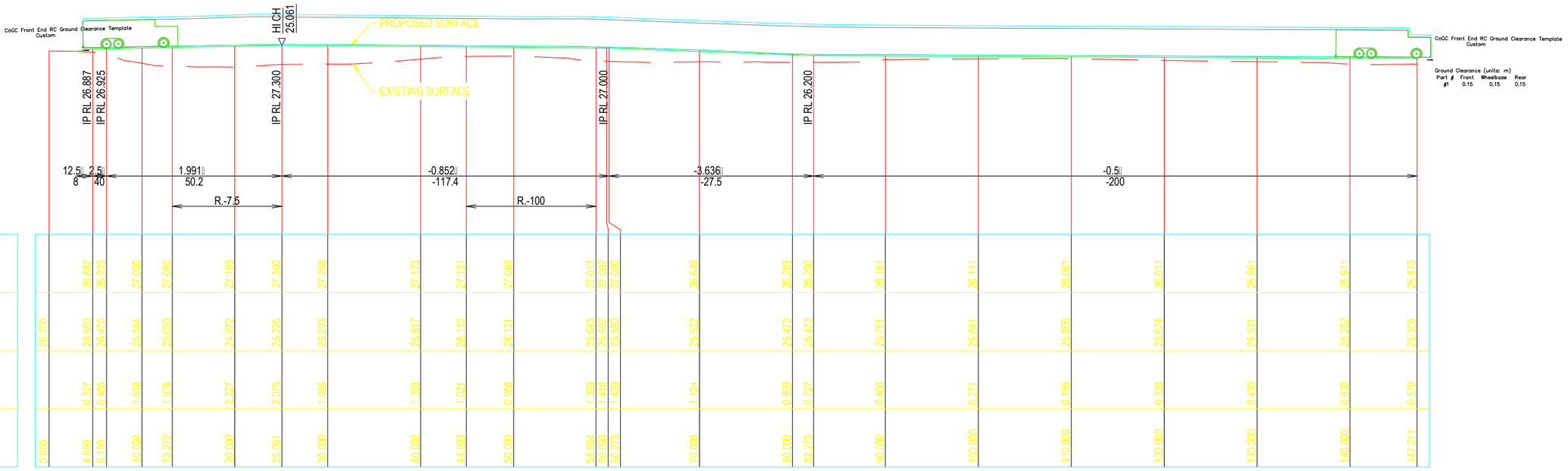
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EGRESS



INGRESS



INTERNAL DRIVEWAY

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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
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NOT TO SCALE

Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: VERTICAL SWEPT PATH ASSESSMENT 10.2 REFUSE COLLECTION VEHICLE

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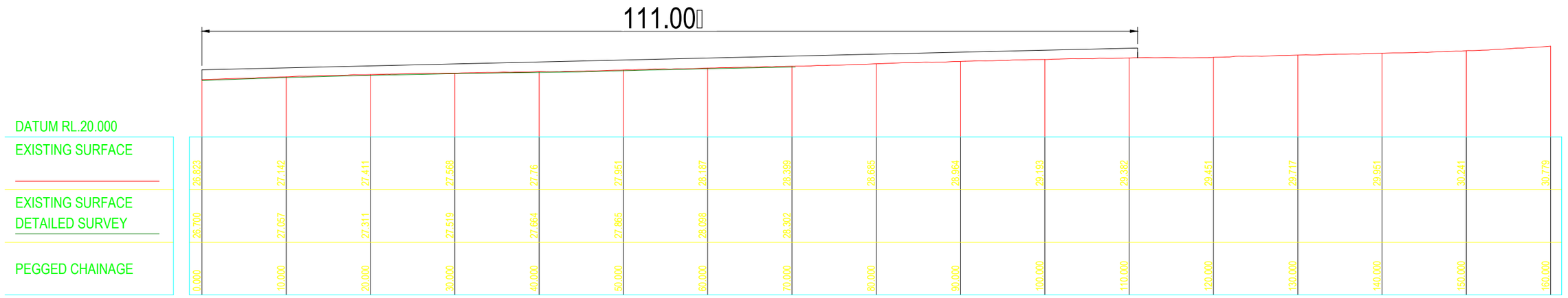
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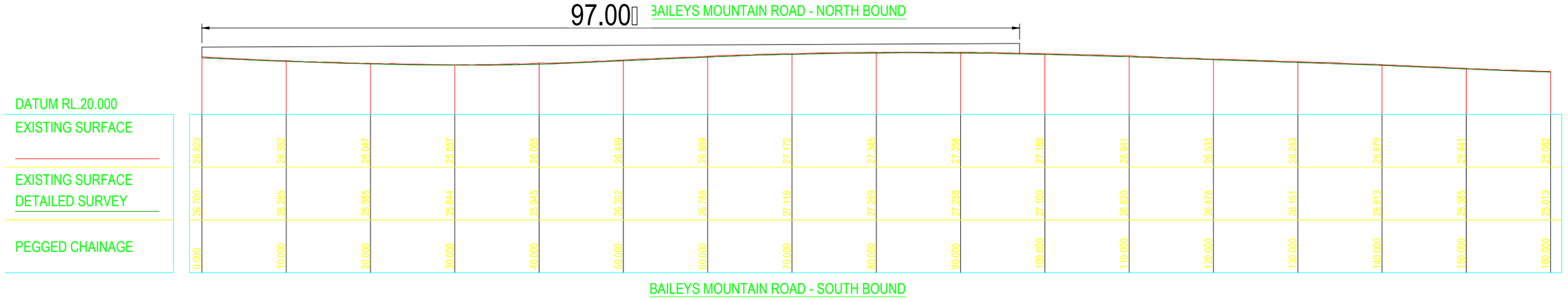
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ATTACHMENT D

SIGHT DISTANCE ASSESSMENT





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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
001	VERTICAL SIGHT LINE ASSESSMENT	J.B	26/06/19

NOT TO SCALE

Project: 202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title: SIGHT DISTANCE ASSESSMENT VERTICAL SIGHT LINES

Design	Drawn	Checked
J.B	J.B	A.P

FOR INFORMATION ONLY

Date: 26/06/2019

Project Number	Sheet Number	Issue
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Issue	REVISIONS Revisions/Descriptions	Drawn	Date
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Project
202 BAILEYS MOUNTAIN ROAD, UPPER COOMERA

Title
SIGHT DISTANCE ASSESSMENT
HORIZONTAL SIGHT LINES

Design	Drawn	Checked
J.B	J.B	A.P

FOR INFORMATION ONLY

Date 26/06/2019

Project Number	Sheet Number	Issue
P3686	2	001



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