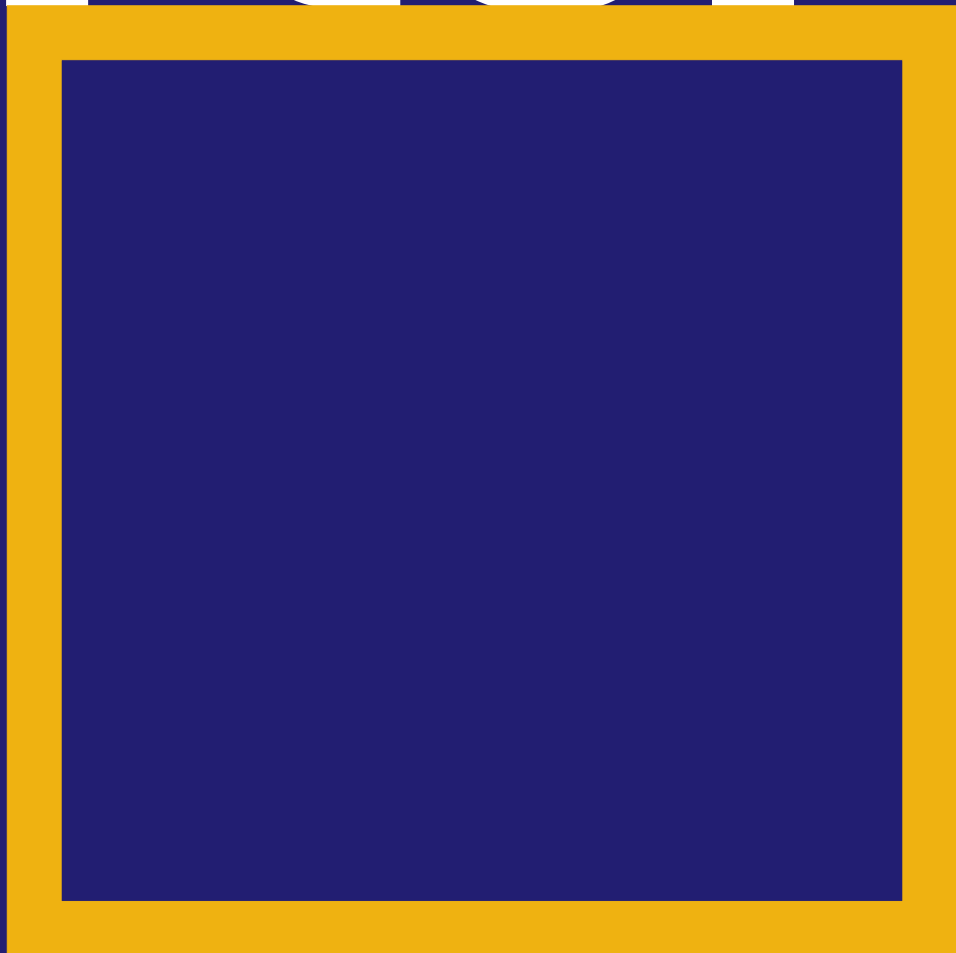


ENGINEERING
SERVICING REPORT

WANDENA ROAD, MUCHEA
(MUC02)

Porter



REPORT PREPARED FOR

SWAN INDUSTRIAL DEVELOPMENT PTY LTD

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1.0 INTRODUCTION

Porter Consulting Engineers (PCE) have been engaged by Swan Industrial Developments Pty Ltd to prepare a servicing report for a proposed industrial development in Muchea, within the Shire of Chittering. The Site is approximately 50km north of the Perth CBD and is bound by Wandena Road to the east, agricultural pastoral land to the north and south and Great Northern Highway to the west, as shown in **Figure 1**. A concept subdivisional layout is presented in **Attachment 1**.



Figure 1: Subject Site (bound in blue)

2.0 PLANNING

A draft structure plan for the Muchea Industrial Park¹ has been prepared which seeks to update the Muchea Employment Node Structure Plan². The Muchea Industrial Park is at the northern terminus of NorthLink, and the intersection of Brand Highway and Great Northern Highway.

The Site is located at the southern boundary of the Muchea Industrial Park Structure Plan and straddles Precinct 2 and 4. **Attachment 2** illustrates the structure plan map for the industrial park.

2.1 Landform

The Site is approximately³ 83.01 hectares in area. Much of the site is free of vegetation, however, the Structure Plan notes there are clusters of Reagan Complex native vegetation associated with an endangered Carnaby Cockatoo feeding area within lots 202 and 203 by Wandena Road.

¹ *Muchea Industrial Park Structure Plan, Draft*, October 2020

² Western Australian Planning Commission, *Muchea Employment Node Structure Plan*, Final report, August 2011

³ Nearmap, *Nearmap*, viewed 24 April 2020, <<http://maps.au.nearmap.com/>>

It is understood that a formal extractive materials quarry (clay) is located within lots 202 and 203 and is being progressively filled with sorted demolition waste material under the operation of approvals (W5912/201/1) toward rehabilitating the former extraction pit.

A feature survey of the site was not available, therefore based on readily available contour information online⁴, the Site rises from approximately 61m AHD by Great Northern Highway to 100m AHD at Wandena Road, with the eastern half of the site at a nominal 10% gradient.

Based on the Perth Metropolitan Region Environmental Geology Series⁵ mapping for Muchea, the expected soils are noted below and illustrated in **Figure 2**:

- To the western portion of the Site:
 - M_{gs1}: Pebbly Silt-strong brown, silt with common fine to occasionally coarse grained, sub-rounded laterite, quartz, heavily weathered granite pebbles, some fine to medium-grained quartz sand, of alluvium origin. The equivalent unit being Guildford Formation (Q_{pa}).
- To the eastern portion of the Site,
 - S₅: Sand-very pale brown, medium to coarse-grained, well sorted, little fines, sub-angular to rounded quartz and feldspar, of colluvial origin.
 - M_{sg}: Sandy Silt-strong brown, firm friable, dispersive in part, occasional pebbly horizons with little matrix containing quartzite, quartz, granite, laterite, of colluvial origin.
- And within the eastern portions of the Site pockets of,
 - ST₁: Siltstone-white, thinly bedded, well laminated, fine-grained, some large ferruginous concretions and laminae, occasionally micaceous. The equivalent unit being Leederville Formation (K_{lb}).

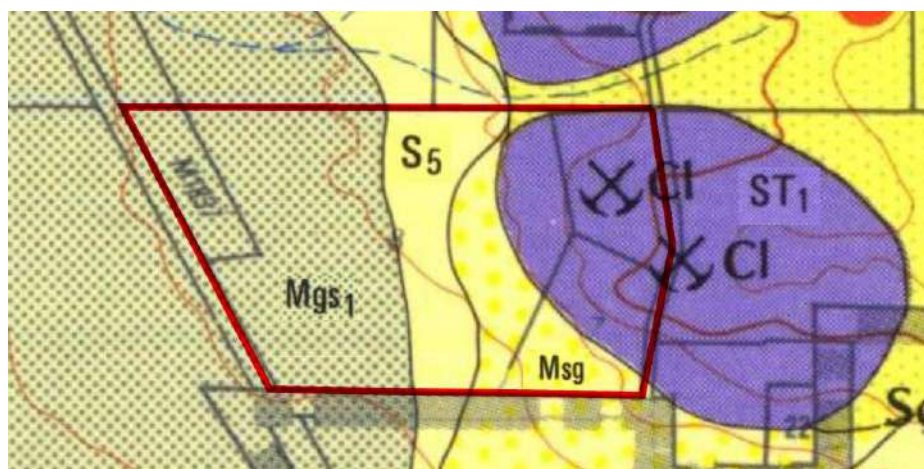


Figure 2: Geology mapping (the Site bound in red)

A geotechnical investigation⁶ across the site noted ground conditions generally comprising of gravelly soils to a depth of up to 1m underlain by clay, sand, and gravelly soils, with Siltstone encountered at a depth of 2m to a few test pits within the eastern portion of the site.

⁴ Water Corporation ESINET, *ESINET*, viewed 24 April 2020, <esinet.watercorporation.com.au>

⁵ Gozzard J. R. 1982 *Muchea Sheet 2034 I and part 2124 IV*, Perth Metropolitan Region, Environmental Geology Series, Geological Survey of Western Australia.

⁶ Douglas Partners, *Report on Preliminary Geotechnical Investigation Lot 202 & 203 Wandena Road and 204 & 205 Great Northern Highway, Muchea, WA* (Revision 0, 12 October 2020)

As noted in the Local Water Management Strategy⁷, temporary surface saturation in the lower parts of the site may be present as infiltration may be impeded by the low-permeability soils. The geotechnical investigation noted permeability rates ranging from 0.05-8.6 m/day.

Based on the online Perth Groundwater Atlas mapping⁸, the 50m groundwater contour line intersects the site, with the inferred water levels across the site being approximately 48m to 53m AHD. However, it is noted that the site is on the outer fringe of available mapping contours.

The Department of Water and Environmental Regulation⁹ (DWER) has two bores within the Site (61609196, 61609197) which note that the recorded groundwater was 12m to 16m below the surface, which is generally consistent with online Atlas mapping.

Groundwater monitoring¹⁰ has been undertaken as part of the rehabilitation of the clay extraction pit with sorted demolition rubble, which noted groundwater levels ranging from 75m to 85m AHD from three monitoring wells and 64m AHD from another monitoring well.

The LWMS noted that bore sampling results indicated no potential or actual ASS in the groundwater, and therefore no ASS management is expected to be required during the construction works.

A search of the Contaminated Sites Database¹¹ indicated that there are no known recorded contamination within the Site.

3.0 SERVICING

3.1 Demolition

Based on historical aerial imagery, the farms and quarry within the Site were established sometime in the late 1960's and early 1970's. Consideration should be had that there may be asbestos containing construction materials within the building. A hazardous materials assessment should be undertaken to determine if hazardous materials are present and should be removed appropriately prior to any demolition works.

3.2 Earthworks

The geotechnical investigation notes that where clayey soils are encountered at depths between 0.5m to 1m, the site will have a classification of Class S in accordance with AS 2870-2001. For locations that have fill (generally the north-eastern part of the site), this should be considered Class P in the absence of any certification from those controlling the placement of fill.

⁷ Bayley Environmental Services, *Lots 202 & 202 Wandena Road and Lots 204 & 205 Great Northern Highway Chittering Local Water Management Strategy* (draft, 2 February 2021)

⁸ Department of Water and Environmental Regulations, *Perth Groundwater Map*, viewed 24 April 2020, <
<https://www.water.wa.gov.au/maps-and-data/maps/perth-groundwater-atlas>>

⁹ Department of Water and Environmental Regulation, *Water Information Reporting*, viewed 24 April 2020, <
<http://wir.water.wa.gov.au/Pages/Water-Information-Reporting.aspx>>

¹⁰ Bowman & Associates Pty Ltd, *Groundwater monitoring report, lot 202 & 203, Wandena Road, Muchea*, December 2016

¹¹ Department of Water and Environmental Regulation, *Contaminated Sites Database*, viewed 24 April 2020, <
<https://www.der.wa.gov.au/your-environment/contaminated-sites>>

To achieve a Class A site classification, the investigation notes that 1.8m of non-reactive soils (e.g. sandy soils) would be required over reactive clay, which would generally require the placement of 1m of granular non-reactive fill. Reference should be made to the geotechnical investigation and LWMS during the subdivisional detailed design phase and built-form design works to inform site preparation requirements.

In general terms, earthworks during the subdivisional works will be undertaken to satisfy the requirements of the roadworks, road drainage, and limited earthworks within lots to provide appropriate grades/access. Isolated 'pad' earthworks and leveling are expected to be undertaken as part of the built-form works for individual lots to facilitate proposed structures, hardstands, lot drainage, and the on-site wastewater management disposal systems.

Typically for industrial development, level, and near-flat levels lots or 'pads' are desired as it offers the greatest flexibility. The IPWEA subdivisional guidelines¹² note that the maximum grade across industrial lots shall not exceed 6.67% (one in 15). The western half of the site has natural surface grades up to 3%, whereby the eastern portion is relatively steep with grades up to approximately 10%.

3.3 Roadworks

The draft Structure Plan for the Muchea Industrial Park notes Restricted Access Vehicle category 10 (RAV10) roads being Great Northern Highway and a proposed District Loop Road intersecting the site at approximately the midpoint and continuing to Great Northern Highway as shown in **Figure 3**.

Porter Consulting Engineers has prepared a separate Traffic Impact Statement (TIS) which assesses the anticipated traffic generation and movements for the development, and review road and intersection requirements. Reference should be made to the TIS which will discuss the road requirements in greater detail.

Consideration should be made to have the intersection by lots 36 and 41 wholly contained within the site boundary, so that at the time of constructing this intersection it is not encumbered with the need to obtain approval from the neighbouring land owner to the south, to access their land. A slight adjustment to the Road 7 boundary line northwards would resolve this.

¹² Institute of Public Works Engineering Australasia, *Local Government Guidelines for Subdivisional Development*, November 2017 (Edition 2.3)

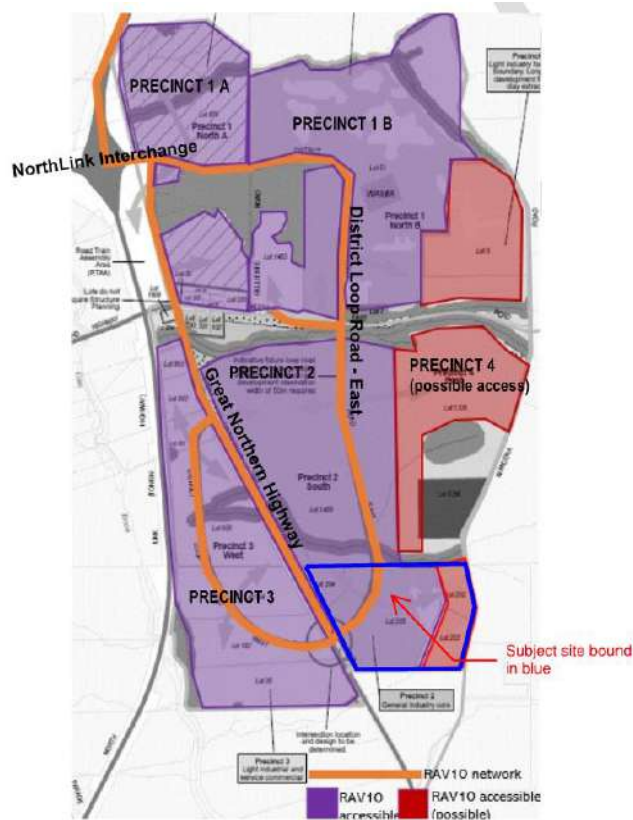


Figure 3: Proposed RAV10 network

3.4 Stormwater Drainage

Lot Drainage

The LWMS notes that runoff from roofs, paved surfaces, and hardstand areas within private lots from storms up to 1-year ARI 1-hour duration (about 15mm) will be retained and infiltrated within each lot by soakwells, basins or swales, and/or landscaping areas and will be subject to detailed designs for each individual lot.

The in-lot drainage structures, detention basins/ bioretention swales will be sized to capture and detain the runoff from roofs, paved surfaces, and hardstand areas from critical storms up to the 100-year ARI. Overflows from the lot basin/swales will egress into roadside swales, either directly or via drainage easements (nominally 10m wide) for those lots that do not have a downstream road frontage. Swales or bunding may be created within the easements as necessary to direct overflows, and would be constructed as part of the subdivisional works.

Internal Road Drainage

As noted in the LWAMS, Runoff from proposed road reserves up to the 1-year ARI 1-hour storm will be retained and infiltrated in roadside swales. The swales will be constructed with low internal weir/check dams at set heights to capture the 1-year ARI, 1-hour storm.

Road runoff from larger storms will overtop the internal weir/check dams and flow along the swales to the western boundary, where it will enter the roadside drains and culverts under Great Northern Highway, at rates and flows no greater than the pre-development. The LWMS tabulates the expected 100-year flows from the road reserves. As post-development flows will be limited to pre-development, the existing culverts by Great Northern Highway will have sufficient capacity.

Attachment 3 illustrates the drainage concept, lot drainage examples and conceptual roadside swales from the LWMS.

3.5 Electrical

There are existing high voltage overhead powerline along the eastern verge of Great Northern Highway and also an overhead line intersecting the Site in an east-west direction. It is expected that this HV east-west line will need to be relocated into proposed road reserves as part of the subdivisional works so as not to constrain development of individual lots. Consideration should also be made to arranging a Western Power Feasibility Study to investigate options for this line and also provide an estimated cost for the relocation works.

At the north-west corner of the site there is a fenced compound that appears to be a possible HV capacitor bank or line protection kit which is contained within its own small lot and separate from the development. It is expected that this compound is required to remain.

Based on the Western Power Network Capacity Mapping Tool¹³, capacity is forecast at 25-30 MVA capacity in 2021 and drops to 20-25 MVA in 2036. Although there appears to be sufficient capacity in the network beyond 2021, the feasibility for the Site can only be confirmed with a more detailed assessment. This is usually undertaken by Western Power when a Feasibility Study is requested or via a Design Information Package during the detailed design phase.

3.6 Communications

There are existing Telstra assets in Great Northern Highway, with cabling that serves the various farm buildings and assets located in the eastern verge of Wandena Road.

Based on the NBN Rollout-map¹⁴, NBN Fixed Wireless technology was forecast to be available to the area from June 2020 to service the development.

3.7 Gas

As noted in the Structure Plan, there is no existing gas infrastructure in the area. In the vicinity of Muchea, the Dampier to Bunbury natural gas pipeline lies to the west of Brand Highway. There are no current plans to extend gas infrastructure to the Structure Plan area.

Should a gas supply be required, a pressure-reducing station connection from the Dampier to Bunbury natural gas pipeline would be required with an estimated cost of \$1 to \$1.5 million plus the costs to bring reticulated gas to the development.

¹³ Western Power, *Network Capacity Mapping Tool*, viewed 24 April 2020, < <https://westernpower.com.au/industry/calculators-tools/network-capacity-mapping-tool/> >

¹⁴ NBN, *Rollout-map*, viewed 24 April 2020, < <https://www.nbnco.com.au/learn/rollout-map> >

3.8 Wastewater

As noted in the Structure Plan, the majority of Muchea Industrial Park, including the proposed development area lies within a sewerage sensitive area due to its location within the Swan-Canning River estuary catchment.

There is currently no reticulated wastewater networks in the immediate area, with the nearest Water Corporation sewer infrastructure located some 6km to the south. The Corporation does not have current plans to expand the network.

The geotechnical investigation considered the site suitable for on-site disposal of effluent produced by secondary treatment systems. Localised filling and recontouring during the built-form works may be required to some individual lots to facilitate on-site effluent disposal systems.

The Government Sewerage Policy¹⁵ outlines acceptable standards for alternative wastewater disposal, mainly through the use of Aerobic Treatment Units (ATU's) for secondary treatment systems with nutrient removal. The Policy notes that lot sizes within sewerage sensitive areas are to be a minimum one hectare in size. The concept plan for the proposed development satisfies this minimum lot area.

The arrangement of the wastewater disposal system will be guided by the *Government Sewerage Policy*. All on-site wastewater treatment systems require the provision of adequate nutrient removal capability, clearance to groundwater, and ongoing maintenance by lot owners, to ensure they are working correctly and providing the necessary level of treatment before discharging wastewater to the local environment. All systems should meet the requirements of the Shire and Department of Health (DoH) as part of the approvals and monitoring process.

Industrial operators are expected to manage their own trade waste by either onsite or offsite disposal. The suitability of on-site disposal will depend on hazardous materials onsite, the risks posed, and likely failure mode of the primary containment, and pathways to downstream environments.

3.9 Water

There is currently no reticulated water supply network in the immediate area, with the Water Corporation's nearest scheme water infrastructure located approximately 7.2km to the south, at the intersection of Great Northern Highway and North Avenue in Bullsbrook. The Corporation does not have current plans to expand the network. Water supply to existing properties in the area comes from groundwater and rainwater harvesting.

The Structure Plan¹⁶ notes "*Groundwater resources for reticulated water supply for the Shire are either fully allocated or approaching full allocation, although, there is a limited local groundwater allowance through private companies and options for the purchase of water entitlements outside the industrial park. The surficial aquifer in the Eclipse Hill subarea, located east of Great Northern Highway and Old Gingin Road, has approximately 1.9 GL of unallocated volume per annum (as of October 2018).*

¹⁵ Western Australian Planning Commission, 2019, *Government Sewerage Policy*, Western Australia Planning Commission, Perth

¹⁶ *Muchea Industrial Park Structure Plan, Draft for Stakeholders Review*, December 2019

Without a water allocation for public drinking water purposes, the most efficient and cost-effective way to deliver a reticulated water supply to the industrial park is via water trading with a third party who has a suitable existing licence, or the ability to obtain a suitable allocation amount through trading. Under the current Rights in Water and Irrigation Act 1914, landholders who hold water allocation licences in fully allocated areas can trade or transfer all or part of their allocation, provided water policy requirements can be met. Trades and agreements can only take place within the same water resource (i.e. same groundwater sub-area and aquifer or same surface water area).

Two water service providers have begun the process of gaining approval to provide a reticulated service in the industrial park from groundwater as the supply source. As of late 2019, the most advanced is in development by Aqua Ferre, which includes construction of a water treatment facility on Lot 2 Reserve Road as part of a proposed 250 lot residential development. Aqua Ferra is applying for a Water Service Provider Licence from the Economic Regulation Authority. The project proposes drawing water from the Leederville Aquifer, with treatment to meet drinking water quality guidelines. The successful provider will be the one that can offer the best outcome for the developers and secure an allocation from DWER and a water services operating licence from the ERA”.

Porter Consulting Engineers has made contact with the two water service providers identified (Aqua Ferra Pty Ltd trading as Muchea Water and Chittering Valley Irrigators Pty Ltd) with their contact details noted in **Attachment 4**.

During a telephone discussion with Aqua Ferra¹⁷, it was reported that they have secured a licence as of February 2020 to supply potable water to the Muchea Employment Node, with a recently installed portion of the network within Precinct 1 expected to become live in May 2020. The water supply network is being designed and installed in accordance with the Water Corporation’s standards. Aqua Ferra indicated that the proposed development area is likely to be serviceable however this will be confirmed when estimated water demands are provided to them. It is understood discussions with Aqua Ferra and the Developer are ongoing.

An estimate of the water demand is presented in **Table 1**. Three water demand estimates have been derived, one estimate is based on a similar industrial development which utilised 4.0 kL/Ha/day, yielding an estimated demand of 97,400kL per annum. Another estimate has been prepared to be consistent with the Water Corporation’s design standard DS50 which is based on 14.967 kL/Ha/day, yielding a significantly higher demand of 364,300kL per annum. As noted in the LWMS, the Shire of Chittering Town Planning Scheme No.6 limits wastewater generation in industrial zones to 5,400 litres per hectare per day, and assuming all potable water used will ultimately become wastewater this yields a demand of 131,403 KL per annum. All three estimate values should be forwarded to the Water Provider for consideration to service the development.

Additional water demand allowances should be made for irrigation of landscape planting and swales, assuming the DWER default rate of 4,500 KL/Ha/year, typically to occur for one or two years during the plant establishment phase.

¹⁷ Mr P. Fogharty 2002, pers. Comm, 7 April)

Table 1: Estimated Water Demand

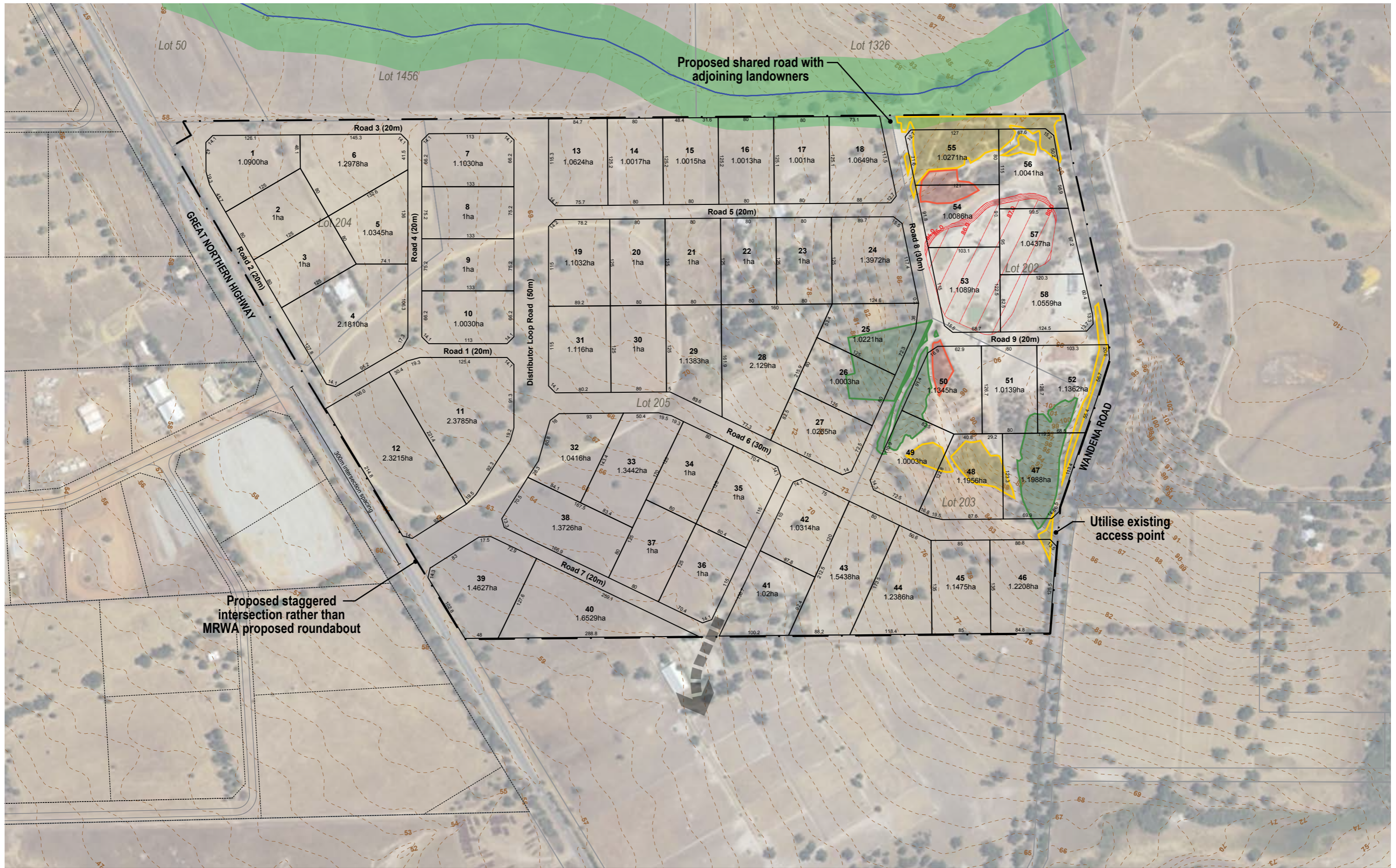
Stage	Gross Area Ha	Approx Net Area (after deduction of roads and drainage reserve) Ha (Refer Note 1)		Estimated Water Demand (kL/per annum) Per Area (Refer Note 2 & 3)	Comparative Water Corp Design Standard (kL per annum) (Refer note 4)	Shire of Chittering Town Planning Scheme No.6 (kl/per annum) (Refer note 5)	Comments on Land Use
Full extent of the development, 38 lots proposed, as per Element drawing 19-545 A, 9 February 2021	79.5	67	97,400	364,300	131,403	Assumed Industry - general, light, rural and service (40%); Builders storage yard (10%); community purpose(1%); garden centre/plant nursery(2%); landscape supplies(1%); motor vehicle repair (2%); roadhouse (1%); showroom (3%); storage/warehouse (10%); transport depot (30%)	
Assumptions:							
1. Net area represents total area of industrial lots. An area of approximately 2Ha has been assumed for drainage easements which is consistent with the extent of easements shown in the LWMS.							
2. Demand based on study done by GHD for Karratha Gap Ridge Industrial Estate, which is anticipated to have similar industry types and uses.							
3. Estimated demand for both sewer and water supply =4.0 kL/Ha/day							
4. Note comparative Water Corporation design standard (DS50) = 14,967 kL/Ha/day							
5. As noted in the LWMS, Shire of Chittering Town Planning Scheme No.6 limits wastewater generation in industrial zones to 5,400 L/Ha/ day. Calculation noted above is based on assuming all potable water used will ultimately become wastewater.							
6. Additional water demand allowances should be made for irrigation of landscape planting and swales, assuming the DWER default rate of 4,500 KL/Ha/year, typically to occur for one or two years during the plant establishment phase.							

4.0 CONCLUSION

Based on the information reviewed, there does not appear to be any factor that would prevent the proposed industrial development. However, this high level servicing report notes a number of issues that require further consideration and investigations these include but are not limited to:

- i. Resolve the planning matters including traffic related matters raised in Porter Consulting Engineers Traffic Impact Assessment.
- ii. A feature survey including surrounding roads to inform ongoing planning, design, and investigations.
- iii. A Hazardous Materials investigation for the possible presence of hazardous materials within the existing structures for demolition.
- iv. Provide an estimated water demand for the development and initiate early discussions with Aqua Ferra to facilitate a secure water supply and allocation.
- v. A Western Power Feasibility Study to confirm the electrical servicing to the site and also consideration for the relocation of the east-west line. Western Power typically charge \$5,000 plus GST for feasibility studies.
- vi. Seek to have the intersection by lot 36 and 41 wholly within the site boundary. A slight adjustment to the Road 7 boundary line northwards would resolve this.

ATTACHMENT 1 – Concept Subdivisional Layout Plan



Concept Plan

Lots 202-203 Wandena Road & Lots 204-205 Great Northern Highway, Muchea

Date: 9 February 2021

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19-545

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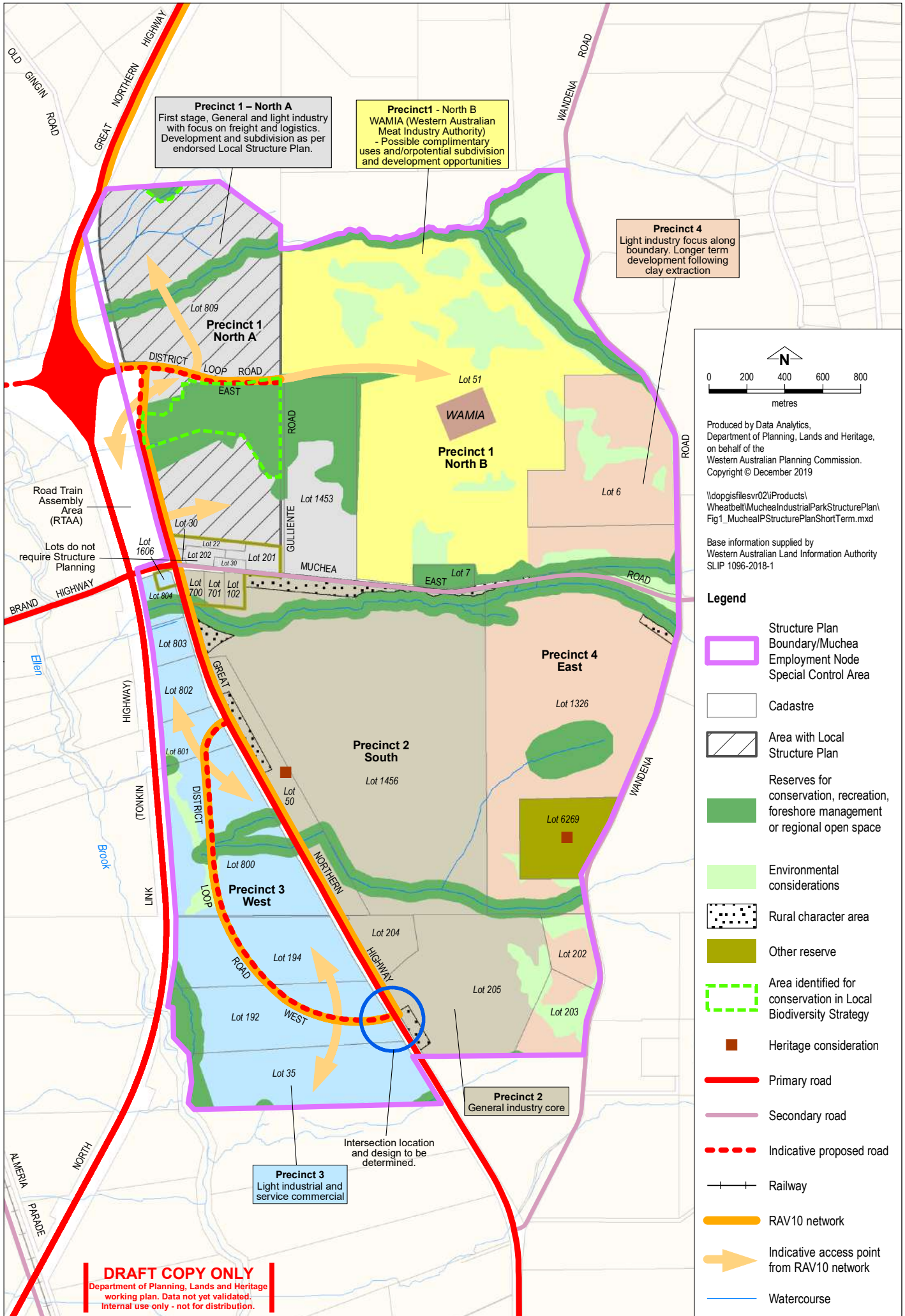
Staff: MR LC

Checked: MR



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Department of Planning, Lands and Heritage
working plan. Data not yet validated.
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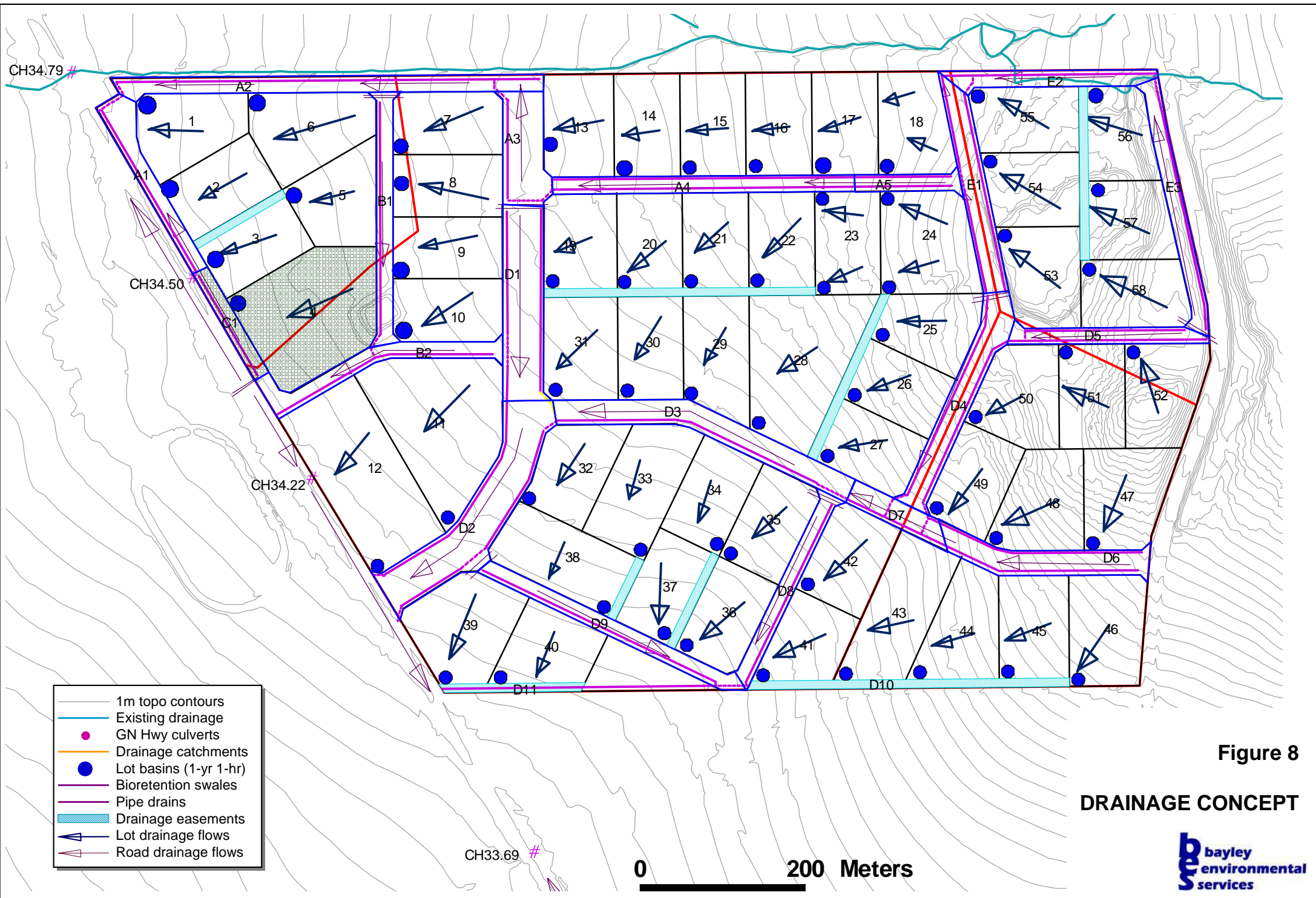
ATTACHMENT 3 – Drainage Concept Plan and Lot Drainage Examples

- Drainage concept¹⁸
- Lot drainage example¹⁹
- Conceptual roadside swale profile²⁰

¹⁸ Extract from LWMS

¹⁹ Extract from LWMS

²⁰ Extract from LWMS



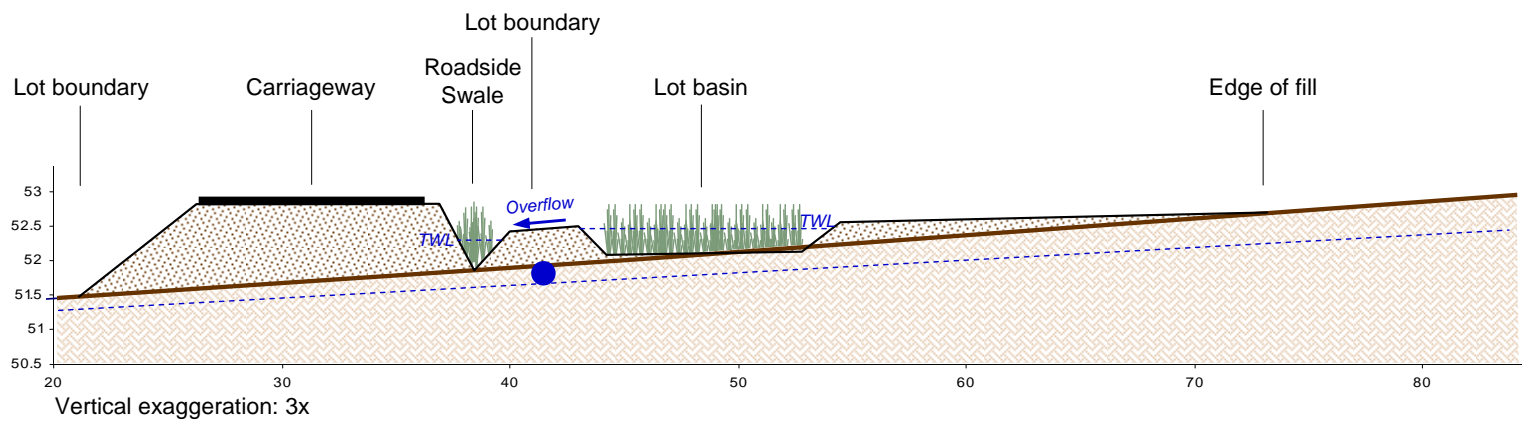
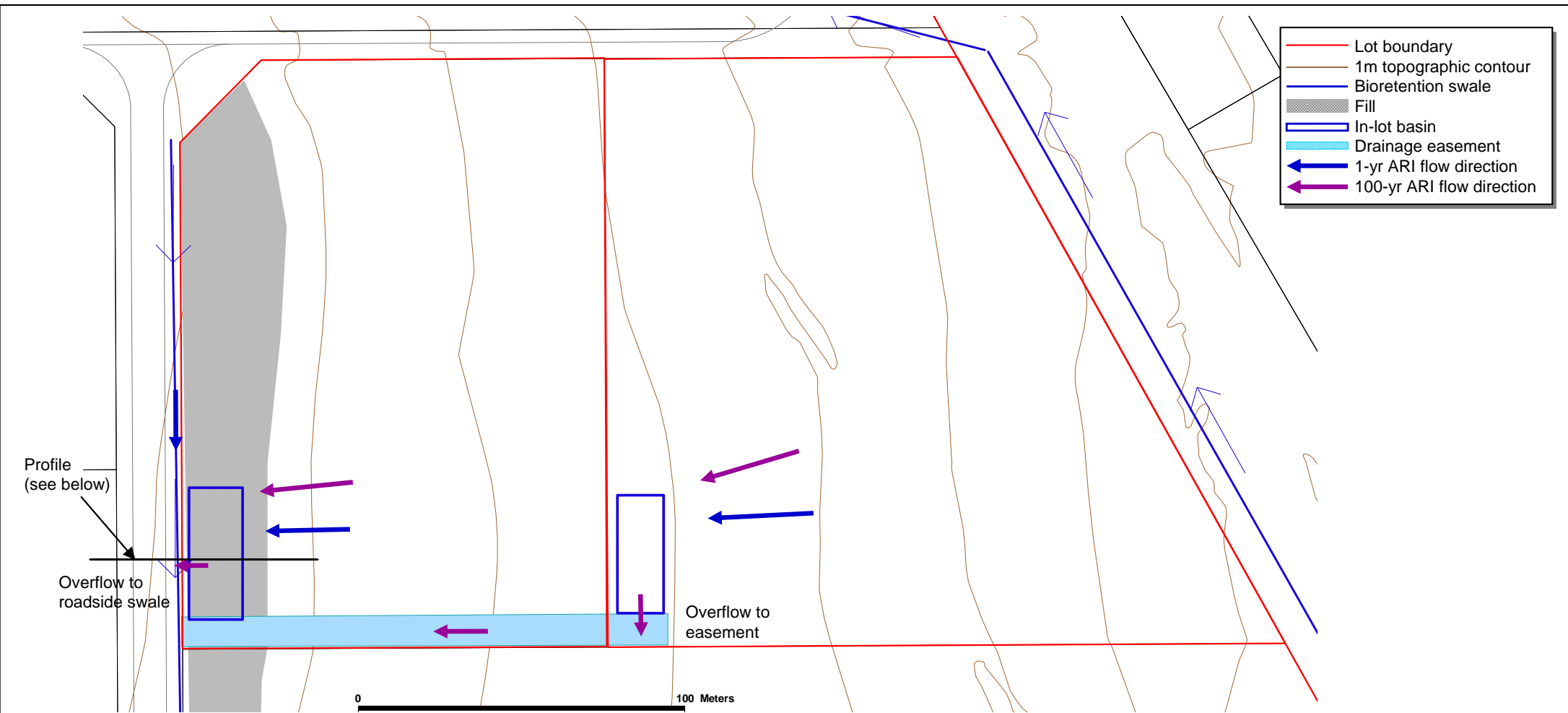


Figure 9
LOT DRAINAGE EXAMPLES

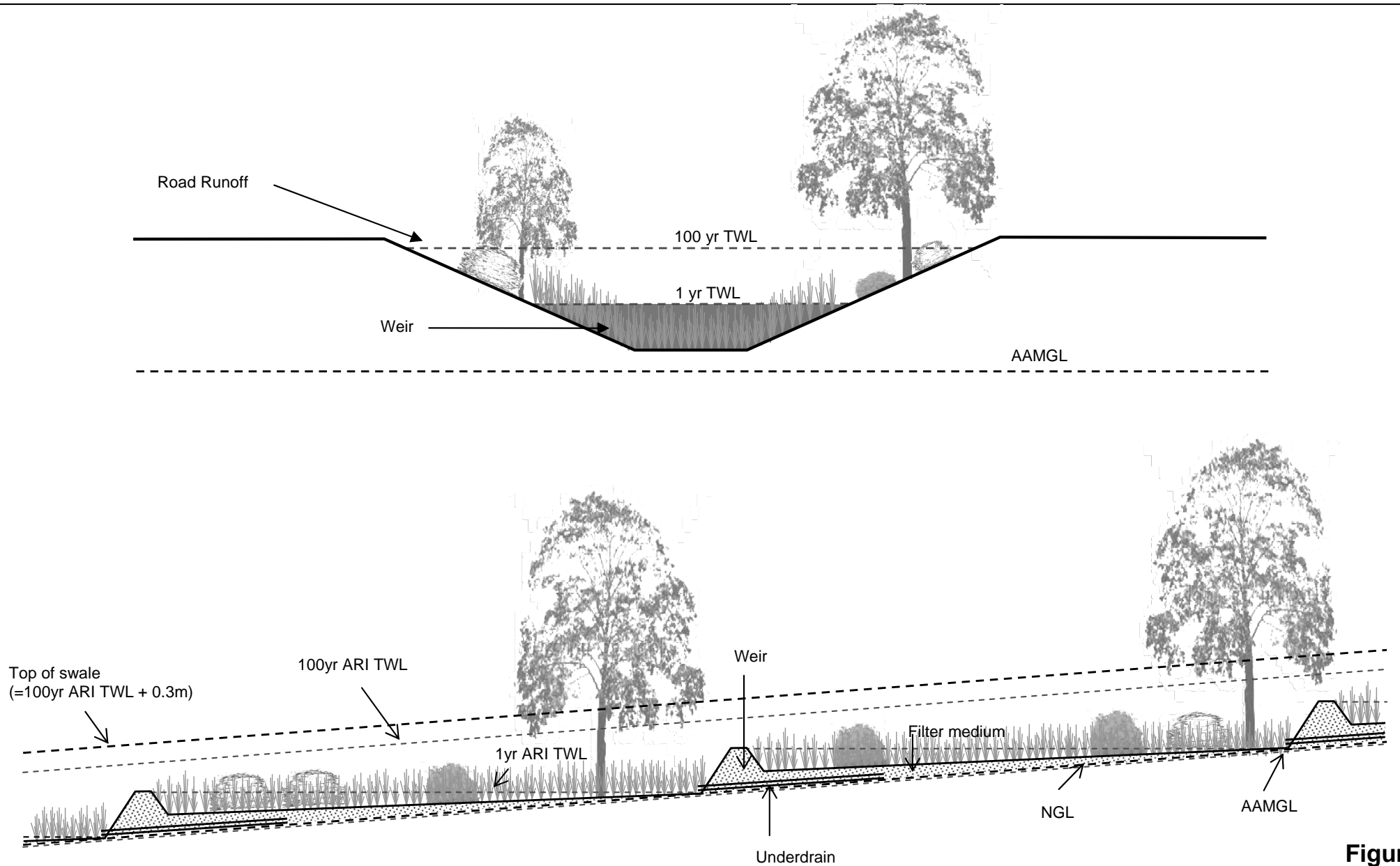


Figure 10

CONCEPTUAL SWALE PROFILES

ATTACHMENT 4 – Water Service Provider Contact Details

Business Name:	Aqua Ferra Pty Ltd trading as Muchea Water
Contact Person:	Peter Fogharty
Email:	pf@pendulumgroup.com.au
Phone/Mobile:	0411 120 519

Business Name:	Chittering Valley Irrigators Pty Ltd
Contact Person:	Clint O'Neil
Email:	coneil@bigpond.com
Phone/Mobile:	(08) 9571 8058



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