

Infrastructure Service Assessment and Concept Design Report

Development of Seniors Living and Aged Care facilities
24 Coronation Road, Congarinni North, NSW

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1 Project Description

1.1 Location

It is proposed to develop a Seniors Living and Aged Care facility at 24 Coronation Road, Congarinni North in northern New South Wales. The site is adjacent to a major tributary of the Nambucca River known as Taylors Arm and adjacent to a wetland.

The location at 24 Coronation Road, Congarinni North, NSW is approximately 1.5km to the west of the town of Macksville. The site can generally be regarded as having a rolling terrain (15% to 17% slope).

1.2 Site Limitations

The development is bound by various restrictions including flood inundation of low-lying ground in extreme events which limits access to the nearest town (Macksville). The impact of the flood inundation including any particular provisions proposed by the development to address the flood impacts are described in a separate report "Flood Emergency Warning Plan – Response and Evacuation" prepared by Meinhardt.

Coronation Road is the sole means of access into the site which will be cut leaving the development isolated during the 100yr ARI event. The flood evacuation report outlines the specific provisions proposed to cater for the extended time of inundation. A permanent Helipad is proposed for the development to allow for emergency access during these extreme flood events.

The development is also bounded by a 70m bushfire buffer to the west of the site and a 59m bushfire buffer to the north with a wetland along the northern boundary.

1.3 Extent of Work

This report discusses the proposed concept road arrangement, develops concept site levels for the aged care facility, communal facilities, building pad levels, provides conceptual sediment and erosion control, and develops a trunk stormwater outfall for each of the main catchments which will convey the stormwater water treatment features, devices and wetlands or water features. The report also provides a preliminary Stormwater Management Plan and assesses proposed infrastructure required to service the site including sewerage, water, and utilities.

2 Earthworks

The main concept of this development was to follow the rolling terrain as much as possible, in following the terrain creates steep grades therefore in order to flatten this out a 12% maximum grade was used. Following the existing landform allowed the site to reduce the amount of cut and or fill across the site. There are two areas where this is not the case, the northern boundary of the lots where the fill was increased to ensure that the lots were above both the Q100 and PMF for the site. The other area where there are significant cuts and fills is in the Helipad, Aged Care Centre and the Sports Centre. These large cuts and fills are to allow for flat areas in this area, however in creating flat lots in the terrain, significantly increases heights of walls in both cut and fill. Please refer sketches **SK7413 to SK7417 in Appendix A** which show cut fill plan, earthworks layouts including spot levels, and typical earthworks cross sections. Typical retaining wall sections are also shown on sketch **SK7440 in Appendix A**.

These are preliminary sketches which will be developed during the detailed design phase. It will be important to ensure that during the construction phase adequate soil erosion control measures are in place.

3 Roadworks and Site Access

3.1 Site Access

The main access to the site is from Coronation Road. A Traffic Impact Assessment has been undertaken by the traffic Consultant, "Traffix Pty Ltd" to assess the main vehicle entry route, traffic generation from the site and to develop internal road design criteria. The results from this report indicate that the entrance to the site satisfies the sight distance requirement., (assuming the current 60km/h zone is extended to the entry). The internal road layout specifies a 11m wide collector road with 6.5m wide internal roads. The sections below will further expand on the internal road design criteria in respect to grades.

3.2 Internal Road Layout and Local Area Traffic Management (LATM)

The proposed internal layout (within the development) consists of 6.0m wide road formation with a 1.5m footpath on either side (9.0m wide road reserve) and access road 5.5m wide with 1.5m footpath (8.5m wide road reserve). The main site access road leading from Coronation Road to the development is proposed as a 11.0m wide collector road with a 2.5m footpath and 1.5m landscape strip on either side (19.0m wide road reserve).

The general layout appears to be satisfactory with some minor modifications to prioritise the internal road network at intersections. Threshold treatment should be applied at all intersections leading off the main collector road. This will improve the identification of the main vehicle route.

All intersections along the collector road should be designed for a 12.5m rigid vehicle. The local road network accessing the Units can be designed around an 8.8m small rigid vehicle (i.e. garbage truck) but checked against the 12.5m rigid vehicle (i.e. furniture removalist truck).

The overall road network is shown in sketches **SK7420 & SK7421** in **Appendix A**

3.3 Vertical Alignment

The longitudinal gradient of all internal roads within the development was limited to a maximum of grade of 12% this was to minimise the cut and fill required across the site and to follow as close as possible to existing contours. Following existing as close as possible with road gradings creates extra sag points and dictates number and location of overland flow paths required as shown on the post-development stormwater catchment plan **SK7436** in **Appendix A**.

The road long sections are shown on sketches **SK7422 to SK7429** in **Appendix A**. The road long sections also nominate the typical cross section for each road which are detailed on sketch **SK7441** in **Appendix A**.

3.4 Road Design Criteria

3.4.1 Intersection Design/LATM

The following minimum design criteria will be applied:

- Collector road intersections to be designed for 12.5m rigid truck;
- Local road intersections to be designed for 8.8m garbage truck; and
- 6.0m minimum radius for all kerb returns.

3.4.2 Road /Access Design

The following minimum design criteria will be applied:

- Critical areas such as access to the Aged Care Facility must be designed to comply with the current Australian Standard "AS1428.1 - Design for access and mobility";
- The low point (sag) at each local road to align with the open space/overland flowpaths to facilitate an unobstructed overland flow path for stormwater; and
- Barrier Kerb is recommended for the collector road and Roll Top Kerb for the internal local road network.

4 Stormwater

4.1 Site Drainage

4.1.1 Catchments

The development sits at the top of a local high point with all catchments flowing northward towards the wetland. Pre- and post-development catchment plans has been developed and are shown in sketches **SK7436 & SK7437** in **Appendix B**. The developed site catchment plan has been separated into 4 main sub-catchments associated with the developed site. Each sub-catchment will collect surface runoff via a series of buried pipes and landscaped swales and/or catch drains and direct the flow to the nominated discharge locations generally nominated on sketch **SK7436** in **Appendix B**.

The stormwater network will incorporate bio-swales located within open space areas for pre-treatment. All development site stormwater runoff will be directed into a water quality treatment train and water feature basins prior to overflowing into the wetlands. Refer to Section 5 for further details and proposed conceptual Stormwater Management Plan for the subject site.

4.1.2 Piped Network

It is proposed to collect site runoff from the units and road system in a series of buried pipes. Kerb inlet pits will be located at critical locations to ensure surface water is collected periodically and safe pedestrian routes are maintained within the development.

4.1.3 Overland Flow

It is proposed to contain the overland flow to follow the local road network. The piped stormwater system will convey the design storm (nominally the 20-year event) with the excess flow above the design storm being restricted to the local road network with the velocity depth ratio being kept below 0.4 (the standard limit for safe pedestrian routes). At this stage of the development, no additional overland swales will be necessary, although this should be revisited periodically throughout the detailed design phase to ensure all overland flow paths are suitable.

4.1.4 Stormwater Design Criteria

The following minimum design criteria will be applied:

- The minimum habitable floor level for all dwellings to be set at the Probable Maximum Flood (PMF) level;
- The buried pipe stormwater collection and distribution to be designed for a nominal 20-year ARI event, in accordance with AS/NZS 3500.3 and Council guidelines;
- Maximum flow in the gutter should be limited to 2.5m wide for all events. Pits to be spaced to maintain maximum flow width during the design event;
- All pipes to be minimum Class 3 load rating;
- Inlet pits to be located clear of pedestrian routes, where feasible;
- Stormwater outlets to be located downstream of the pedestrian path and Bush fire trail, where feasible; and
- All stormwater outlets to be treated with an appropriate outlet erosion protection.

4.2 Water Quality

It is proposed to construct two main water features as part of the development. The proposed water features will be integrated into the water quality treatment train. It is proposed to construct bio retention swales in open space areas within the development to undertake pretreatment of the stormwater at the source. Further treatment devices, including coarse sediment forebays and bio-retention basins will be integrated into the water features across the site to ensure that discharge from the development will comply with the standards required by Council and the EPA prior to entering the adjacent wetland. The water features with the development will be designed in accordance with the principles of modern water quality design and adopting local best practices appropriate to the region.

5 Conceptual Stormwater Management Plan

5.1 Purpose

The purpose of this section is to present a preliminary review of the stormwater quality and quantity controls for the construction and operational phases of the proposed development, including review of strategies that prevent or minimise environmental harm to receiving environments and provide flood immunity to existing and proposed allotments and roads.

The following aspects will be addressed in detailed design:

- Stormwater Quantity – flood modelling to determine detention requirements;
- Control of external catchment flows;
- Stormwater Quality (proposed treatment devices); and
- Maintenance of stormwater quality treatment devices.

5.2 Constraints

Key statutory requirements that provide constraints for the proposed development include:

- The proposed development is not to produce adverse hydraulic impacts on adjacent properties/systems/environments during the construction, maintenance, and operational phases of the development;
- All reasonable and practical measures must be taken to minimise or prevent environmental harm; and
- The site is upstream of existing wetlands which limits options for controlling/diverting stormwater runoff.

5.3 Site Characteristics

The proposed Seniors Living and Aged Care facility can be accommodated on the site at 24 Coronation Drive, Congarinni North NSW without adverse impacts on the surrounding environment. A local area traffic network is proposed so as to separate the main site access and circulation route for access to the Aged Care Facility and Community facilities (collector road) for the local residential areas (local roads)

Stormwater runoff from the site will be collected via a series of buried pipes, overland flowpaths and treated in a range of water treatment devices to reduce nutrient and sediment load. Further water quality polishing will occur in designed water features before discharging into the adjacent wetlands.

5.4 Stormwater Quantity

5.4.1 Lawful Point of Discharge

The lawful point of discharge has been identified as the existing wetlands within the northern boundary of the subject site. Refer to **Appendix B**.

5.4.2 Methodology

A hydrologic model will be set up to include the subject site's contributing sub-catchments. The site has been broken up into a series of sub-catchments to reflect separate watershed areas within it.

5.4.3 Modelling Overview

The following sections analyse pre- and post-development scenarios for determination of peak discharge flows and runoff hydrographs. A detailed hydrologic analysis will be undertaken using XPRAFTS 2018. XPRAFTS is a runoff routing software package which simulates runoff hydrographs at defined points throughout a watershed based on a set of catchment characteristics and specific rainfall events. XPRAFTS will be used in accordance with the XPRAFTS design manual, "Queensland Urban Drainage Manual" (2017) and "Australian Rainfall and Runoff" (2016). Rainfall data will be generated based on data obtained from the Bureau of Meteorology (BOM) website for the site location.

Analyses will be undertaken for AEPs of 50%, 20%, 10%, 5%, 2% and 1% for storm durations of 10, 15, 20, 25, 30, 45, 60, 90, 120 and 180 minutes, using Australian Rainfall and Runoff 2016 IFD data which can be obtained from the Bureau of Meteorology and used to generate ensemble storms in XPRAFTS.

The hydrologic assessment will consider the following scenarios:

- **Pre-Developed Case:** In this scenario the proposed site is in its existing state which is a rural parcel with heavily grassed areas as well as heavily treed areas within the swamp oak forest (wetlands). There is also an existing dwelling located in the south-east region of the parcel with a large shed at the rear. The majority of the site is pervious with the impervious areas being the roof, entry road/driveway and hardstand areas around the existing dwelling. Refer to **Appendix B** for pre-developed catchment layout;
- **Post-Developed Case:** In this scenario the site reflects the proposed layout conditions, consisting of internal roads and allotments with road grades between 0.5% and 12% and lot grades between 0% and 23%. Refer to **Appendix A** for post-developed catchment layouts; and
- **Mitigated Post-Developed Case:** This scenario will be modelled with the same sub-catchment input as the post-developed case with the inclusion of detention basins at each of the main sub-catchment discharge locations within the site sized to attenuate post-developed flows from the proposed development to existing flows from predeveloped case, or less. Refer to **Appendix B** for the post-developed catchment layout.

5.4.4 Model Assumptions

When detailed modelling is undertaken, initial and continuing losses adopted for the XPRAFTS model will be determined based on their suitability to the Macksville region.

5.4.5 Pre-Developed Flows

Existing catchment areas are determined using AutoCAD based on existing surface contours obtained from the Principal's surveyor. Surface conditions will also be considered based on site inspections and aerial imagery (e.g., the tree/ shrub areas). As recommended by XPRAFTS each catchment will then be split into impervious and pervious sub-areas.

Pervious areas discharging from the site consist of the grassed and treed areas and the impervious areas consist of the compacted gravel driveway, roof and hardstand areas, and existing water bodies (dams, ponds, etc.).

The Manning's coefficient typically used for well-grassed areas is 0.035. All impervious areas will be modelled with a Manning's value of 0.015.

Existing sub-catchments consist of Catchment A which discharges to the west, Catchment B which discharges to the north, Catchment C which also flows north but is separated from Catchment B by a ridge, Catchment D which discharges east, and Catchment E which sheet flows north-west. All these sub-catchments make their way eventually to the wetlands to the north. Refer to **Appendix B** for pre-developed catchment layout.

The existing site was divided into sub-catchments based on changes in slope and flow direction which is the recommended approach for inputting data to XPRAFTS.

5.4.6 Post-Developed Flows

Developed catchment areas are input based on the proposed preliminary development layout and proposed site grading (preliminary earthworks).

In the developed case, existing Catchment E will be absorbed into Catchment B, due to the proposed road and allotment gradings and stormwater network alignment, and discharge north rather than north-west. The remaining sub-catchments (A, B, C and D) will discharge to the same locations, however their areas will change based on the road and allotment gradings.

As with the pre-developed model all pervious areas will be modelled with a Manning's value of 0.035 and impervious areas will be modelled with a Manning's value of 0.015. Refer to **Appendix B** for catchment layout.

Due to the increase in impervious areas it is expected that there will be an increase in peak runoff in the post-developed scenario to each discharge point (with the exception of existing Catchment E). Therefore, a detention system will need to be sized to attenuate post-developed flows to pre-developed flows or less at each of the discharge points.

5.4.7 Mitigated Post-Developed Flows

The sub-catchments in the mitigated post-developed scenario will remain the same as the post-developed scenario.

It is proposed that a detention basin will be suitably sized for each discharge location to mitigate any increase in the post-developed flows. The basins will have outlet configurations designed in conjunction with the volume sizing to ensure the mitigation occurs, each with an overflow weir for extreme events to control the direction of any overspill.

Note that for water quality purposes appropriate areas of filter media will be placed in each basin, which will utilise a determined extended detention depth before the outlet configuration comes into effect.

It is assumed that by the time peak flows from a 50% AEP or greater enter the basin the extended detention depth for water quality will already be used and therefore the stage/storage/discharge relationships will be calculated without including the extended detention volume.

Rock scour protection will be incorporated into the discharge point of each basin's outlet as well as level spreaders to eliminate concentrated flows, to ensure that there will be no adverse impact immediately downstream of the basins in the developed case. The terrain at the basin outlets will be graded so that they drain to the wetlands without any ponding.

5.5 Stormwater Quality

5.5.1 Water Quality Objectives

Definable targets for Water Quality Objectives (WQO's) for this project have been reviewed and analysed in the following sections in accordance with (but not limited to) Nambucca Valley Council Design Specifications, regulatory departments and New South Wales Government.

Primary focus is placed on pollutant generation and treatment control during the construction and operational phases of the proposed development.

CONSTRUCTION PHASE

Pollutants typically generated during the construction phase are reproduced in Table 1 on the following page.

Table 1 – Typical Pollutants Generated During Construction Phase

Pollutant	Sources	Priority
Litter	Paper, construction packaging, food packaging, cement bags, off-cuts	High
Sediment	Unprotected exposed soils and stockpiles during earthworks and building works	High
Hydrocarbons	Fuel and oil spills, leaks from construction equipment and temporary carpark areas	High
Toxic materials	Cement slurry, asphalt prime, solvents, cleaning agents, washwaters (e.g. from tile works)	Medium
Acid or Alkaline substances or producing substances	Acid sulfate soils, cement slurry and washwaters	High

The above pollutants shall be monitored and controlled during the construction phase by a combination of appropriate Erosion and Sediment Control (ESC) devices, visual inspections throughout the construction phase by the Superintendent, and Contractor responsibility and liability under the construction contract. Correctly installed devices such as sediment fences, grass filter strips, diversion drains, check dams and inlet sediment barriers will reduce the amount of detached sediment discharging off site. Such devices will also assist in mitigating peak discharge volumes.

OPERATIONAL PHASE

The key pollutants to be targeted for trapping during the operational phase for SUBDIVISIONS category are:

- Litter;
- Sediment;
- Nutrients (N & P);
- Hydrocarbons (including oil & grease); and
- Surfactants (e.g. detergents from car washing).

While there are definable targets for sediment and nutrients (discussed in detail below), there are currently no definable targets for heavy metals. However, as heavy metals are generally attached to sediment, effective control and reduction of sediment loads should consequently assist in the mitigation of heavy metal loads.

At a regional level, definable Water Quality Objectives (WQO's) are listed in Table 2 below:

Table 2 – Water Quality Objectives for Reduction of Key Pollutants

Pollutant Type	Reduction target
Total Suspended Solids (TSS)	80%
Total Phosphorous (TP)	60%
Total Nitrogen (TN)	45%
Gross Pollutants	90%

Therefore, the load-based approach should be adopted as the primary design objective (as a minimum) for managing the quality of urban stormwater.

5.5.2 Analysis & Methodology

A key component in the water quality treatment train will be bio-retention basins containing suitable areas of filter media. The detention basins described in the previous section (Section 5.4) will be utilised for this purpose. The water features described in Section 4.2 will also be incorporated into the treatment train either as additional treatment devices or as an alternative to some of the proposed bio-retention basins.

The developed site will be analysed with each basin's catchment split into road, roof and ground level source nodes discharging to the proposed bio-retention filter media within each detention basin.

Bio-retention swales and buffer strips may also be used for pre-treatment prior to entering each basin. The catchment input areas and impervious value will be the same as those used in the XPRAFTS input.

5.5.3 Pollutant Export Modelling (MUSIC)

Pollutant treatment has been incorporated into the development design to reduce target pollutants leaving the site. The key component is bio-retention basins at key locations in the open space areas. Further details for these devices are listed in the following sections. MUSIC Version 6.3 will be used to quantify and model the pollutant generation characteristics of the proposed development site. Data will be entered into the model in accordance with the Water by Design's "MUSIC Modelling Guidelines version 1.0" (unless noted otherwise), herein referred to as the Guidelines.

Meteorological data (rainfall and evapotranspiration) will be obtained from the Bureau of Meteorology (BOM) website to be input into the MUSIC model.

5.5.4 Treatment Train

BIO-RETENTION SWALES

Bio-retention swales will be incorporated into the treatment train, where space is available, for primary treatment to help remove coarse sediments such as gross pollutants and suspended solids, and nutrients such as phosphorus and nitrogen through the additional filter media below the swales, from runoff prior to entering the bio-retention basins for further treatment.

These swales could be located in the open space and landscaping areas nominated on the master plan.

BUFFER STRIPS

Buffer Strips can also be incorporated into the treatment train, again where space is available, to help remove coarse to medium sediments from runoff prior to entering the bio-retention basins for further treatment.

Buffer Strips could be located in the open space and landscaping areas nominated on the master plan.

BIO-RETENTION BASIN

The proposed detention basins will be constructed with bio-retention filter media at the base for water quality treatment, with a filter media area determined from the MUSIC model output, and an extended detention depth suitable to contain and treat enough runoff to achieve the required pollutant reductions.

The filter media depth will be a minimum of 0.50m to allow appropriate plant species to establish their root systems. The Saturated Hydraulic Conductivity will be adopted from the value supplied in the MUSIC user manual for Sandy Loam, whereas TN Content and Orthophosphate parameters will be entered in accordance with FAWB acceptable ranges. The exfiltration rate of 0mm/hr will be adopted to be conservative.

6 Sewerage

6.1 Sewerage Strategy

The existing township of Macksville is serviced by a gravity sewer network comprising approximately 34 km of reticulation mains and 19 sewage pump stations (June 2020). The sewerage ultimately discharges to the Macksville Sewerage Treatment Plant. The plant is located behind Council's Works Depot in Kelly Close (off Gumma Road) Macksville which is located south of the Nambucca River and east of the new Pacific Highway bypass. The Macksville Sewerage Network is shown in **Figure 1** (Source: Nambucca Valley Council 'PIRMP Macksville Sewerage Treatment Plan and Reticulation System' June 2020) on the next page.

The treatment plant provides secondary sewage treatment comprising extended aeration, catch pond, sludge lagoons, sludge drying beds, and effluent storage lagoon. The treated effluent is discharged from the storage lagoon into the Nambucca River. As advised by Council, the sewer network and treatment plant do not currently have the capacity to accommodate the additional effluent disposal from the subject site. The subject site is outside the designated development area of the town. Two options are presented below for sewer services for the proposed development site.

6.2 External Works

In accordance with the Nambucca Development Control Plan 2010 (DCP 2010) Council will require all the dwellings to be connected to reticulated sewer given the proposed use of the site. As shown in **Figure 1**, the subject site is beyond the limit of the existing sewer reticulated area for the township of Macksville.



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Nambucca Shire Council have indicated that there is not sufficient capacity in the existing sewer network to accommodate the additional flow from the subject site. Two alternative options were discussed with council in two meetings, Friday 7th May 2021 and Wednesday 19th May 2021, and were given “in principle” approval for the following two sewer strategy options:

Option 1. A new Council sewage pumping station provided on the subject site that will pump via a new rising main along Coronation Road, across the Taylors Arm bridge, into Joffre Street, along Tilly Willy Street, south on Matilda Street, east on Boundary Street, then continue east within the existing rising main easement alongside the existing rising main which crosses under the Pacific Highway, and finally discharges into the Macksville Sewage Treatment Plant. This would require pipe jacking or direction drilling to cross the highway, and possible upgrade of the existing treatment plant inlet works. Additional Treatment Plant capacity upgrades would be assessed by Council as it is understood that there is sufficient dry weather capacity, but the plant is currently overloaded during wet weather.

Option 2. (Preferred) Refer to Nambucca Valley Council Notice DA2021/056 of 16 March 2021 council advised that an onsite treatment plant may be considered.

On-site treatment of sewage using a proprietary sewage treatment system, positioned in a location that will not cause amenity issues for residents. Depending on the type of system selected, the sewage will either be treated to a level suitable to be discharged onto appropriate open space areas within the site, or alternatively trucked away from site at the required intervals based on the subject site design flows and the performance specifications of the selected treatment system. If the option to remove treated sewage using trucks is selected the treatment system will be located in an area with suitable truck access and turn-around space.

Onsite treatment has been successful installed in the past, in mining, oil and gas industry, infrastructure and tourism industries, and proven that environmental regulations can be met for recycle and treated effluent. Two products: MAK WATER and HYDROFLUX Epco were approached for this development and both can offer a sustainable treatment solution for the new development. It appears that odour is not a common problem and can be overcome by engineering changes to the plant. It is recommended from the suppliers that the plant be approximately 100m from the residential area. The suppliers can give training and can facilitate the operating and maintenance of the package plants. A class 4 budgetary estimate is about \$1M

Preliminary design flows from the subject site have been determined based on the current layout with a calculated total EP of 958 Equivalent Persons, giving a Peak Wet Weather Flow (PWWF) of 30 L/s. These calculations will be used to size the sewage pump station and rising main (Option 1 above), or to select the appropriate on-site sewage treatment system (Option 2 above). These calculations will be rechecked at the detailed design stage to ensure an adequate design for the final layout.

Refer to **Appendix B** for Option 1 and 2 layouts, and **Appendix C** for on-site sewage treatment system product detailed information.

6.3 Internal Works

Sewer reticulation within the proposed development will be provided in accordance with Council's Water and Sewer Design Specification. An indicative internal gravity sewerage layout for the subject site is shown on sketch drawings **SK7432 to SK7433/2** in **Appendix B**. All sewerage located on site will be privately owned and maintained. The reticulation sewers will either be located along the road frontage of the dwellings or in the rear of lots where the landform falls to the back. This typically occurs where the dwellings are located adjacent to the balance open space areas. In general, all sewer property connections will be located at a depth and invert level to control the sewer for each dwelling.

The proposed site earthworks have been minimised to reflect the existing topography and form. As a result, the subject site will comprise several distinct sewerage catchments. A network of sewage pumping stations and rising mains will deliver sewage to a centralised collection point for either ultimate discharge off-site via the proposed sewage pump station and rising main (Option 1 in Section 6.2 above) or treated on-site then discharged on site or trucked from site (Option 2 in Section 6.2 above).

The number of private sewage pumping stations (SPS) within the subject site will be rationalised to minimise operating and maintenance costs. As part of the detailed design phase of the development, the SPS will be located so that they do not cause amenity issues for residents. All SPS will typically be a fibreglass package pump station system manufactured as a one-piece vessel to minimise potential for any environmental harm and to allow a seamless installation process. Provision for overflow and storage requirements in the pump station design will ensure no run-off to environmental conservation areas of the subject site.

An application for a compliance permit under the NSW Plumbing and Drainage Act 2011 and associated regulations will be submitted to Council for approval prior to commencement of construction of the internal sewer reticulation

works. The final alignment and design of the internal water reticulation will be determined during the detailed design phase for the internal plumbing and drainage.

7 Water Supply

7.1 Water Strategy

The existing township of Macksville is part of the greater Nambucca Shire Council water supply system. Water is sourced from bore fields adjacent to the upper reaches of the Nambucca River north-west of Bowraville. In 2015 an off-river storage facility was constructed on Bowra Creek in the Nambucca Valley north-east of Bowraville to provide additional water storage capacity to meet increasing demand in the shire and to provide water certainty in times of drought. The dam storage is maintained by pumping water from the bore fields during periods of high river flow.

Following water treatment, a network of trunk water mains and booster pump stations delivers potable water to local service reservoirs located in each of the local townships including Macksville. A water system schematic is provided in **Figure 2** (Source: *Nambucca Shire Council (NSC) Drought Management Plan – Final Report October 2004*) below. The existing service reservoirs in Macksville are located west and south of the township and comprise 1.3 ML, 2.9 ML, and 1.8 ML storages (NSC 2004) and service the existing town areas. Council officers have confirmed that the southern 1.8 ML reservoir services South Macksville and the Macksville industrial estate and would not be available to service the subject site, leaving the 1.3 ML and 2.9 ML reservoirs to provide the water supply demands. Council has indicated that the existing water supply will have sufficient capacity to supply the new development. Refer to council's email dated 11 May 2021.

7.2 External Works

Given the proposed use of the subject site and in accordance with the Nambucca Development Control Plan 2010 (DCP 2010) Council will require all the proposed dwellings to be connected to reticulated water. However, the site is located in a rural / primary production area to the west of Macksville and therefore is expected to be outside of the existing water supply service area associated with the township of Macksville. The development site will require a dedicated main to be constructed from an agreed point of water supply within the township of Macksville. The existing residential dwellings on the southern side of the Taylors Arm tributary, between Tilly Willy Creek and Taylors Arm, and located north-west of the township are currently serviced by the water network. It is expected that the water network would be extended across the Taylors Arm bridge via Joffre Street and Coronation Road to the subject site. There is an existing pedestrian footway on the upstream side of the bridge which would provide a service corridor for a new water main across the bridge if required.

It was agreed in consultation with council that a possible 150mm diameter connection point be at the crossing of Sturdee Street and Joffre Street Intersection. It is also recommended that the 100mm diameter main in Joffre Street be upgraded to 150mm diameter. Council will provide the HGL and flow at the tie-in point to design of the works or further network tests need to be done to finalise design parameters for the water

The network analysis prepared as part of detailed design for the subject site will investigate whether additional water infrastructure such as pump station or water booster system will be required to ensure the site can be adequately serviced from the existing network without impact to existing users. This may include providing an onsite storage reservoir to balance supply and fire service requirements given the subject site is located at some distance from the existing Council reservoirs. These additional on-site water facilities would either be managed by Council or privately by on-site management of the facility. Provision of an additional on-site storage would also provide emergency supply should the site become isolated due to an emergency services event.

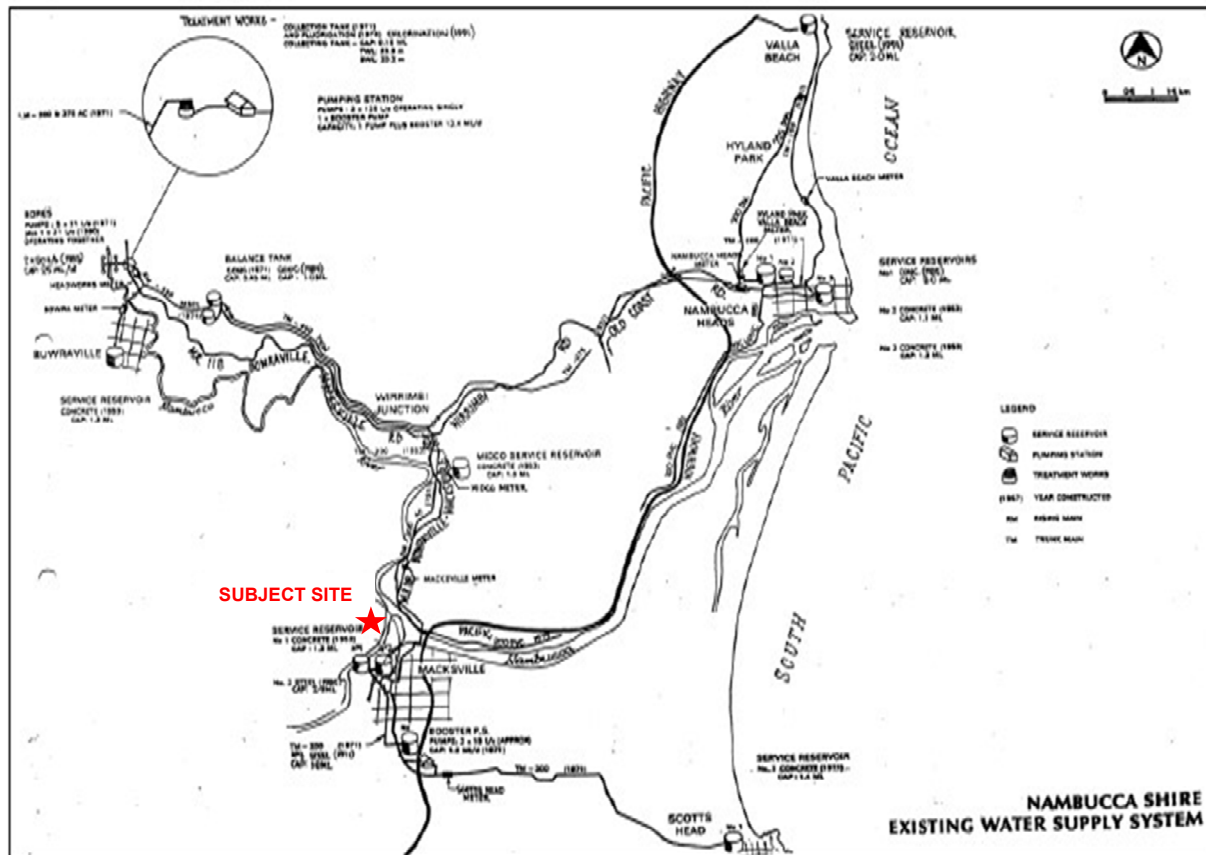


Figure 2 – Nambucca Shire Water Supply Schematic (NTS)

Source: Nambucca Shire Council

'Drought Management Plan – Final Report' October 2004

7.3 Internal Works

Reticulated water services within the proposed development will be provided in accordance with Council's Water and Sewer Design Specification. An indicative internal water reticulation layout for the subject site is shown on sketch drawings **SK7434** and **SK7435** in **Appendix B**. The water reticulation network will be a combined potable water supply and fire service, with most water mains looped and limited dead-end lines. Double headed pillar hydrants and fire hardstand areas will be provided in accordance with relevant Australian Standards, NSW Plumbing and Drainage requirements, and Fire and Emergency Services guidelines throughout the subject site. No on-site water treatment facilities will be required as the site is proposed to be serviced by an extension to Council's existing water supply network comprising treated water.

Detailed design of the water reticulation including water main sizing will be in accordance with an approved water network analysis (including firefighting flow analysis) prepared for the subject site during the detail design phase of the project. This assessment will be based on existing network HGL information provided by Council as part of the external works augmentation.

Preliminary design demand flows from the subject site have been determined based on the current layout with a calculated total ET of 320 Equivalent Tenements, giving a Maximum Hour Flow of 26 L/s. These calculations will be used to size the internal water mains and booster pump if required. Preliminary onsite storage reservoir calculations have been undertaken based on the total EP for the current layout, giving a storage volume of 1,400m³. These calculations will be rechecked at the detailed design stage to ensure an adequate design for the final layout.

Water reticulation construction works will not be carried out within the subject site until the relevant application for a compliance permit under the NSW Plumbing and Drainage Act 2011 and associated regulations has been made and issued by Council for the works. The final alignment and design of the internal water reticulation will be determined during the detailed design phase for the internal plumbing and drainage.

Connection of the subject site to the existing water reticulation network will be via a single bulk water meter located on the property adjacent to the main entry road at the intersection with Coronation Road. The bulk water meter arrangement will be in accordance with Council's standard drawings and guidelines. Internal dwellings and facilities may be individually water metered as required.

8 Utility Services

8.1 Electricity

The subject site is located within the Essential Energy distribution network area in New South Wales. Overhead electrical services are present at the boundary of the site and are available for connection to the proposed development subject to submission of an application for connection. It is proposed that underground electrical reticulation will be provided within the proposed site, including provision of padmount transformers as required, in accordance with the supplier's design requirements. Streetlighting will also be provided in accordance with Australian Standard and Council requirements throughout the development.

8.2 Telecommunications

Provision will be made for NBN telecommunications connection to and throughout the subject site. The existing site is currently connected to the NBN network using fixed wireless technology based on information sourced from the NBN Co website in February 2021. There may be an opportunity as part of the detailed design phase to augment the existing services and plant provision located external to the site subject to discussion and agreement with NBN. Due to the site's location on the periphery of the Macksville township, it is expected that direct augmentation of services to the site by the proponent may be required.

8.3 Gas Supply

Reticulated natural gas is not available in the vicinity of the subject site. The provision of gas to dwellings and facilities located within the proposed development if required will be provided using bottled supply with suitable controls on the location of storage and reticulation in accordance with the relevant building codes.

9 Sediment and Erosion Control

Sediment and erosion control (SEC) for the proposed development will be managed in accordance with Council guidelines and best practice standards. ESC works during construction will be delegated to the civil contractor. Erosion and sediment control devices will be implemented and monitored during the construction and operational phases to comply with the Nambucca Development Control Plan relevant NSW government guidelines. Treatment controls initiated will generally be in accordance with the recommendations of ICEA 'Best Practice Erosion and Sediment Control'.

Conceptual sediment and erosion control management drawings and details for the Pre-start, Construction and Practical Completion phases of earthworks construction for the subject site are shown on sketch drawings SK7442, SK7443, SK7444 and SK7445 in **Appendix B**. These plans are provided for preliminary planning purposes only and a detailed sediment and erosion control management plan for the construction phase will be submitted for approval as part of a Change to Ground Level application for the subject site.

10 Conclusion

The proposed Seniors Living and Aged Care facility can be accommodated on the site at 24 Coronation Drive, Congarinni North NSW without adverse impacts on the surrounding environment. A local area traffic network is proposed so as to separate the main site access and circulation route for access to the Aged Care Facility and Community facilities (collector road) for the local residential areas (local roads).

Stormwater runoff from the site will be collected via a series of buried pipes, overland flowpaths and treated in a range of water treatment devices to reduce nutrient and sediment load. Further water quality polishing will occur in designed water features and bioretention treatment basins before discharging into the adjacent wetlands to prevent any environmental harm. Increased runoff from the developed site will also be mitigated to pre-development levels by the provision of on-site detention.

Sewerage and water supply infrastructure including augmentation of existing Council trunk services external to the site will be undertaken in accordance with Council's Development Control Plan requirements. Other public utility infrastructure including electricity and telecommunications services are available for connection to the subject site.

Best practice sediment and erosion control treatment will be initiated and maintained during the construction and operational phases of the proposed development to mitigate any environmental impacts and effects to the receiving environment in accordance with accepted Council and NSW government guidelines.

Therefore, based on this review of engineering constraints and servicing for the proposed Seniors Living and Aged Care facility including Earthworks, Roadworks and Access, Stormwater Drainage and Management, Sewerage, Water Supply, Erosion and Sediment Control, and provision of Utility Services, there are no civil engineering constraints that would make the subject site unsuitable for the proposed development.

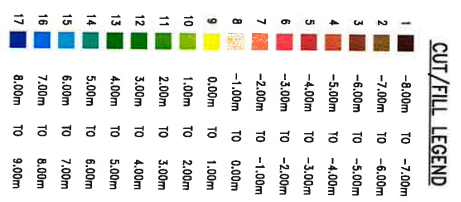
Appendix A – Civil Engineering Sketches

Earthworks

SK7413	EARTHWORKS CUT FILL SHADE PLAN SHEET 1 OF 2
SK7414	EARTHWORKS CUT FILL SHADE PLAN SHEET 2 OF 2
SK7415	EARTHWORKS LAYOUT SHEET 1 OF 2
SK7416	EARTHWORKS LAYOUT SHEET 2 OF 2
SK7417	EARTHWORKS SECTIONS SHEET 1 OF 1
SK7440	TYPICAL RETAINING WALL ARRANGEMENT

Roadworks

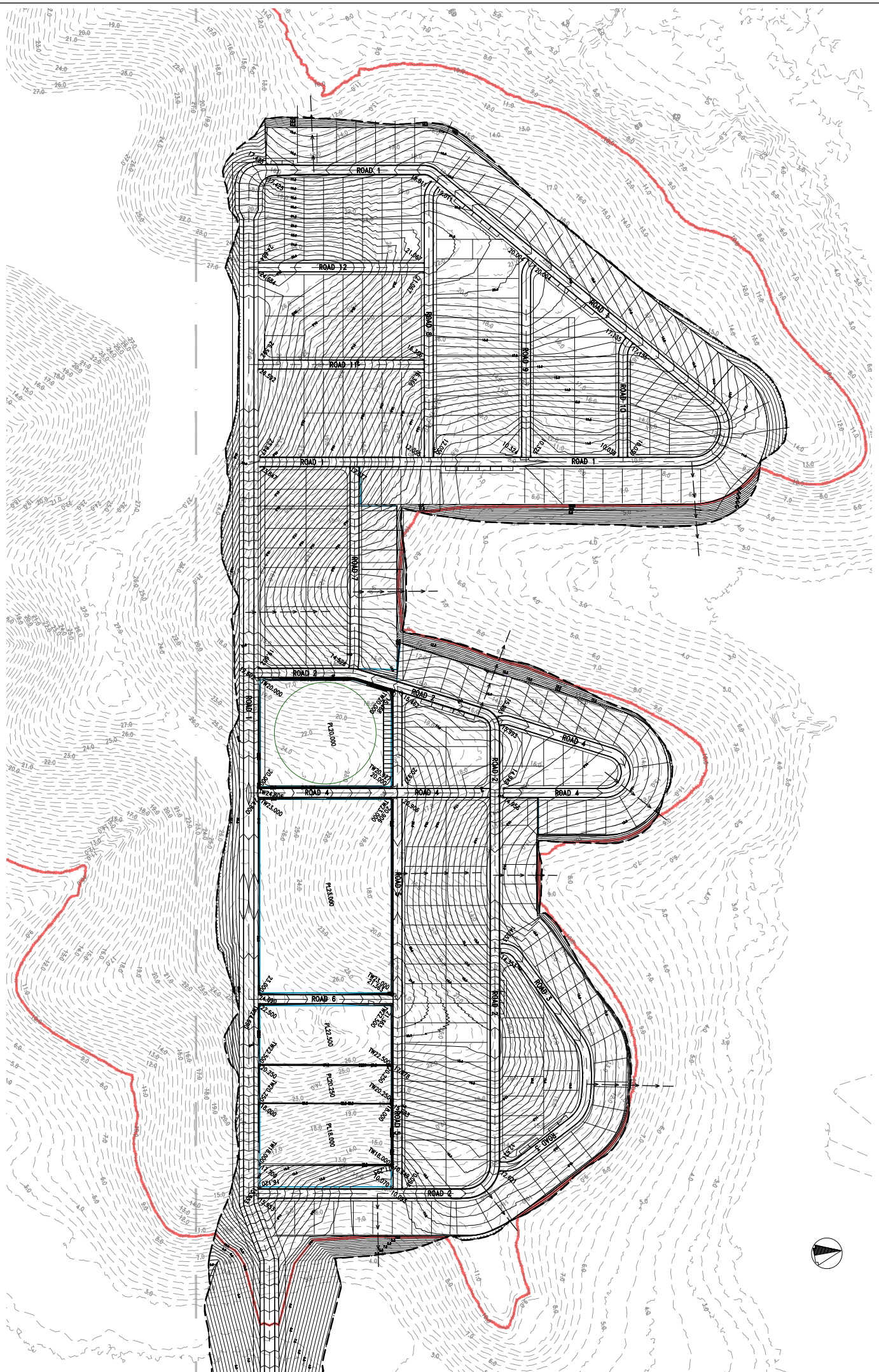
SK7420	ROADWORKS LAYOUT SHEET 1 OF 2
SK7421	ROADWORKS LAYOUT SHEET 2 OF 2
SK7422	ROAD 1 LONGITUDINAL SECTION SHEET 1 OF 3
SK7423	ROAD 1 LONGITUDINAL SECTION SHEET 2 OF 3
SK7424	ROAD 1 LONGITUDINAL SECTION SHEET 3 OF 3
SK7425	ROAD 2 LONGITUDINAL SECTION SHEET 1 OF 1
SK7426	ROADS 3 & 4 LONGITUDINAL SECTIONS SHEET 1 OF 1
SK7427	ROADS 5, 6 & 7 LONGITUDINAL SECTIONS SHEET 1 OF 1
SK7428	ROADS 8, 9 & 10 LONGITUDINAL SECTIONS SHEET 1 OF 1
SK7429	ROADS 11 & 12 LONGITUDINAL SECTIONS SHEET 1 OF 1
SK7441	TYPICAL ROAD CROSS SECTIONS



LEGEND

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| 12 | EXISTING SURFACE CONTOURS |
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| | TOP OF BATTER |
| | TOE OF BATTER |
| | RETAINING WALL |
| 5M | EXISTING STORMWATER |
| 5 | EXISTING SEWER |
| W | EXISTING WATER |
| E | EXISTING ELECTRICAL |
| | EXISTING SWALE DRAIN |
| | PAV' FLOOD LEVEL, RL10.00 LINE |
| | LIMIT OF WORKS |

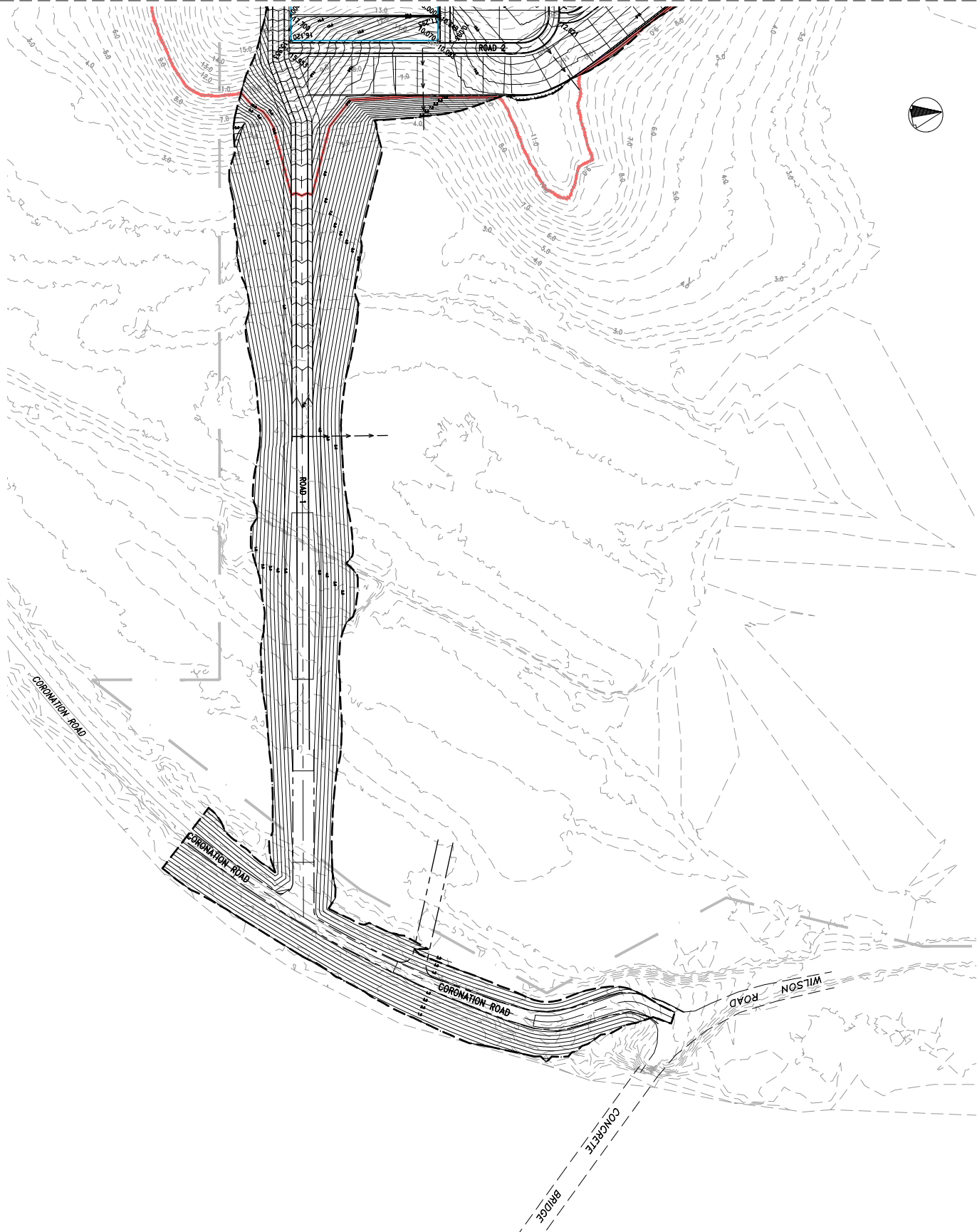
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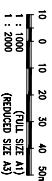
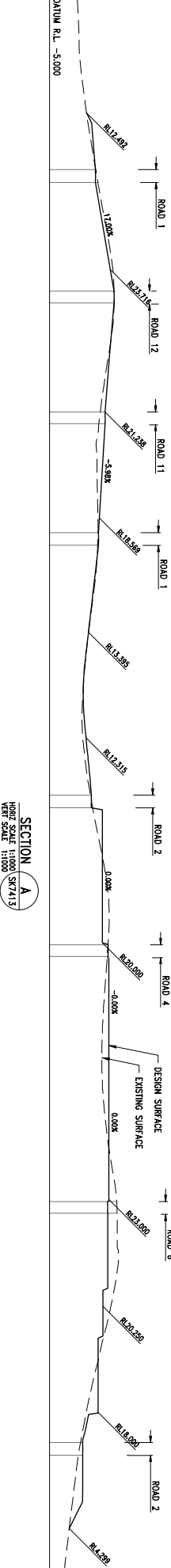
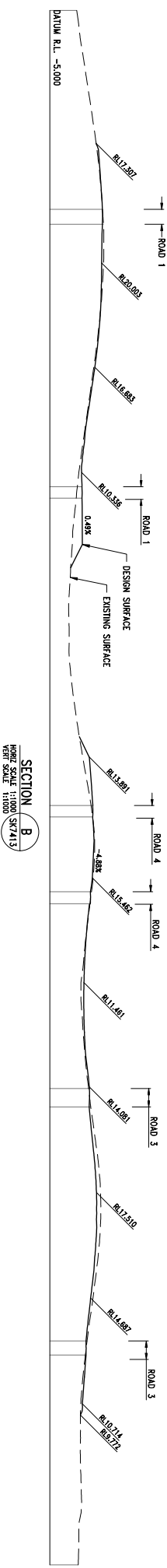
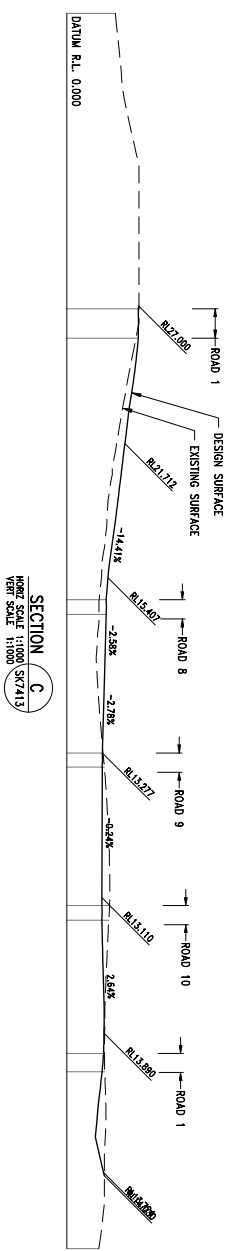
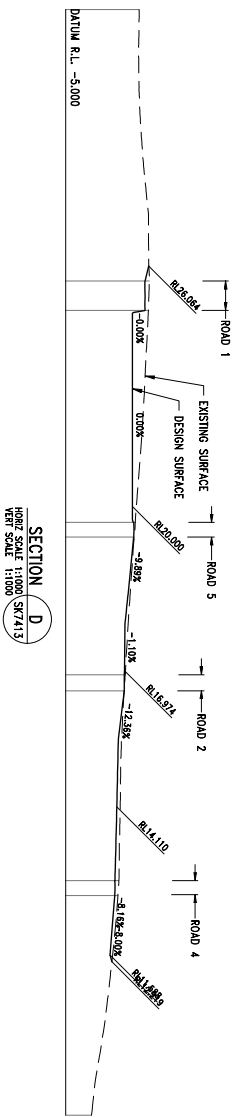
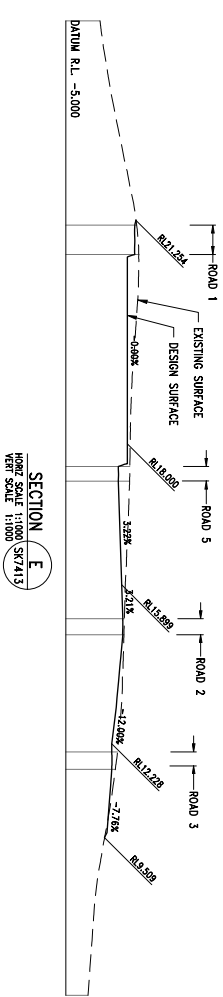
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	EARTHWORKS LAYOUT	DATE	18/12/2020	
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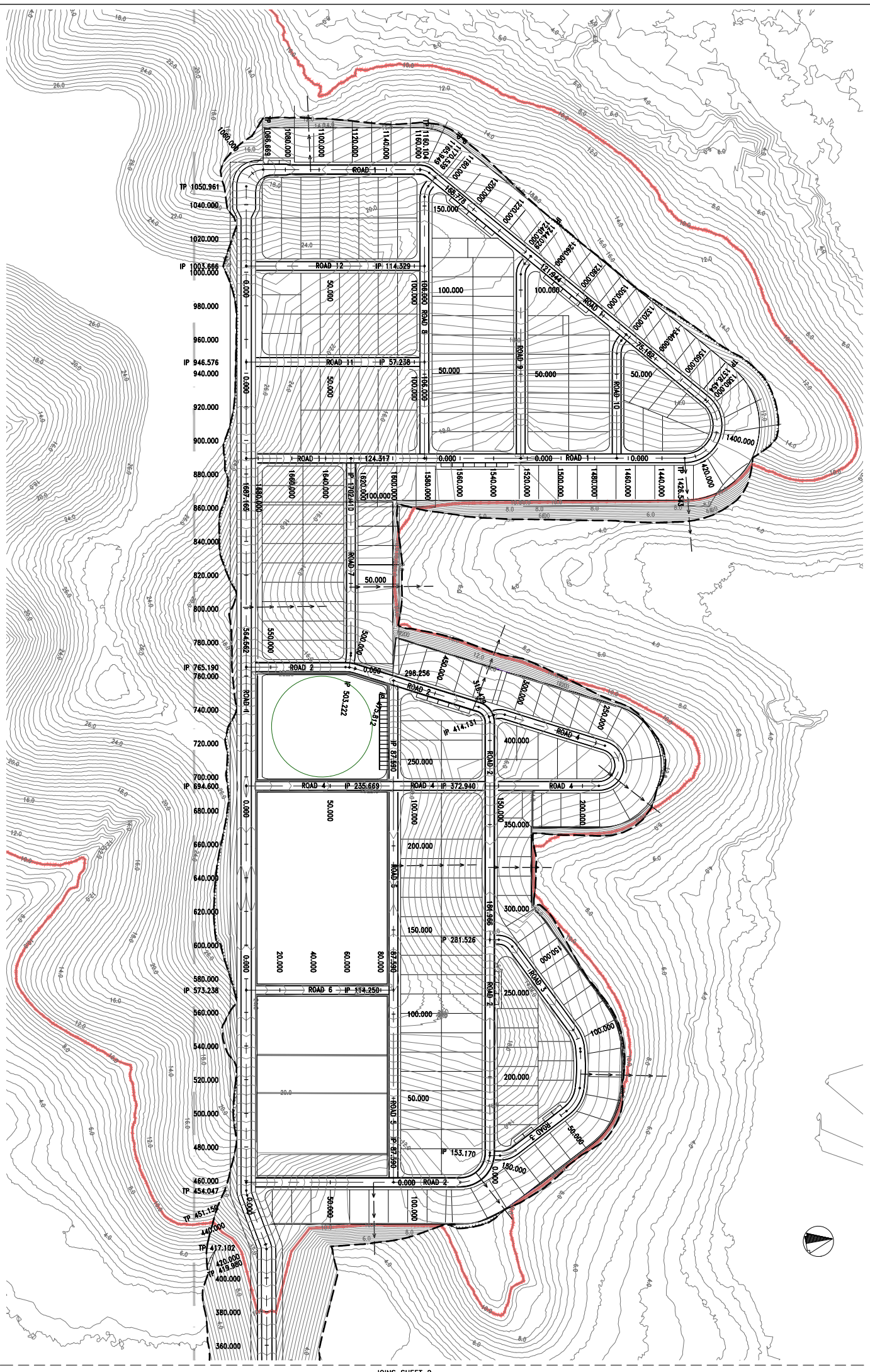
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 - x 10x1 FINISHED SURFACE LEVEL
 - x 10x1.51 TOP OF WALL LEVEL
 - SW — SW — EXISTING STORMWATER
 - S — S — EXISTING SEWER
 - W — W — EXISTING WATER
 - E — E — EXISTING ELECTRICAL
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 - LIMIT OF WORKS
 - PWF FLOOD LEVEL RL10.00 LINE

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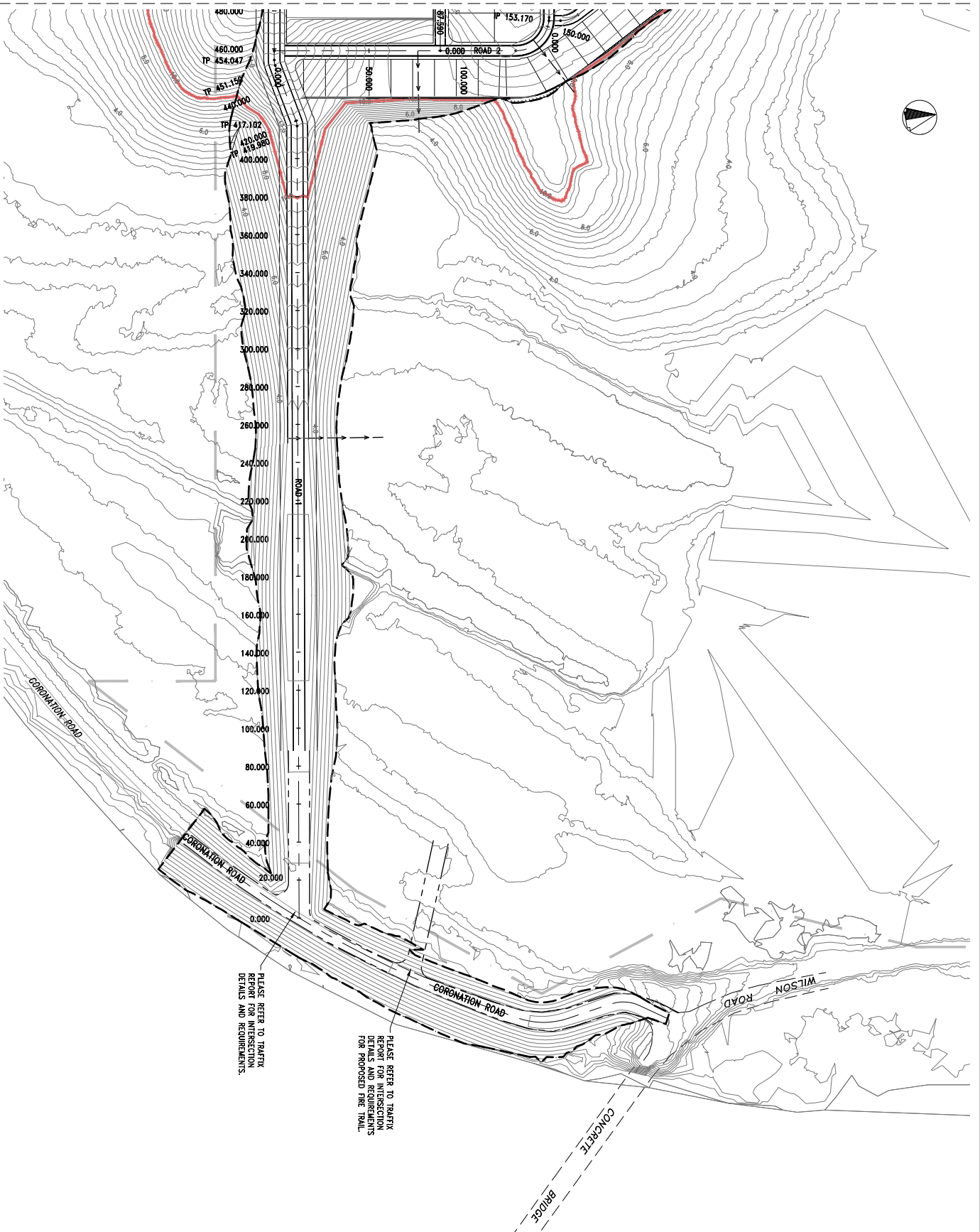


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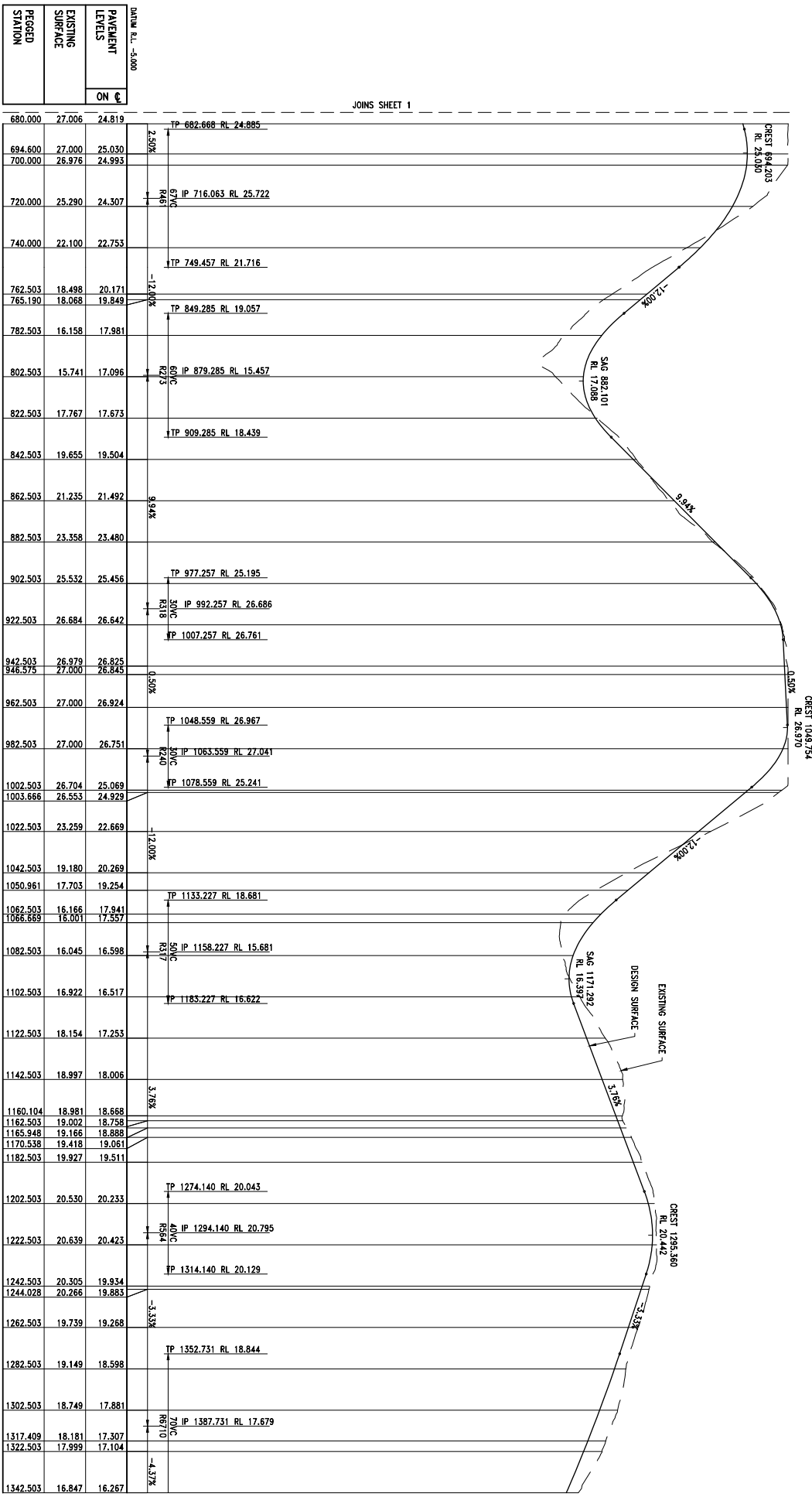
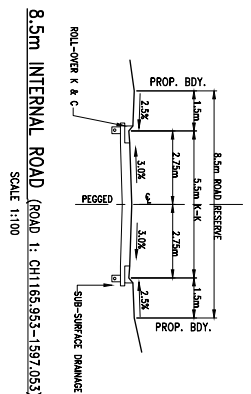
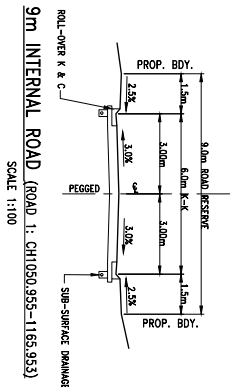
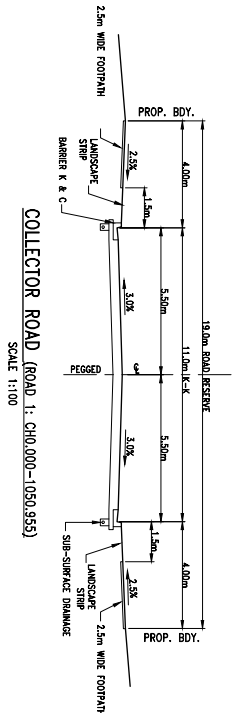
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| —W— —W— | EXISTING WATER |
| —E—X— —E—X— | EXISTING ELECTRICAL |
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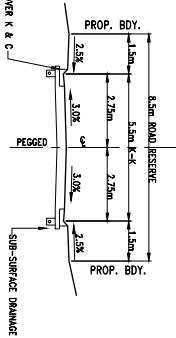
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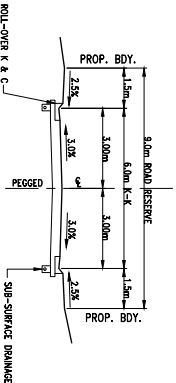
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MEINHARDT		MEINHARDT	



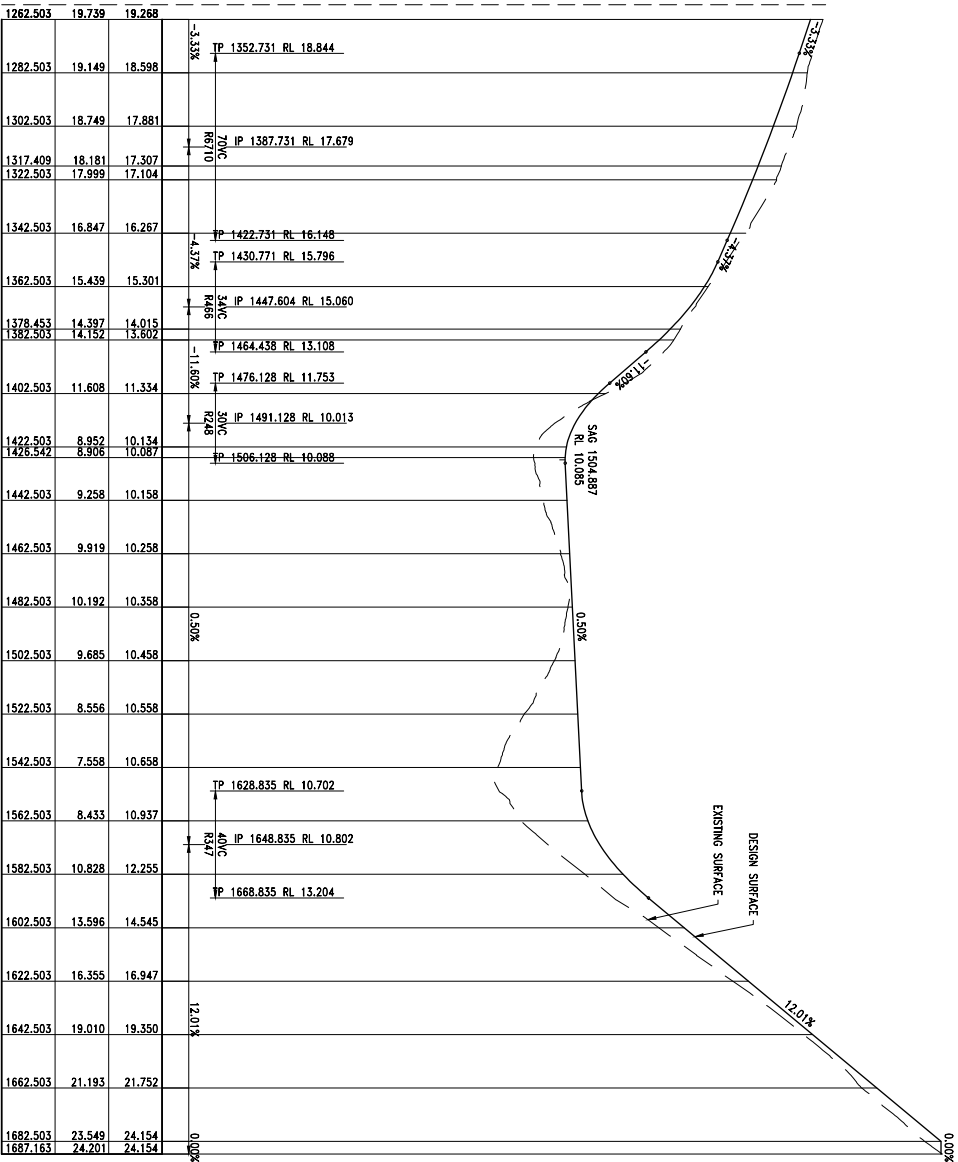


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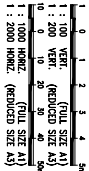


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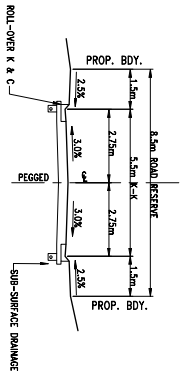
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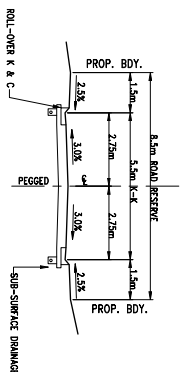


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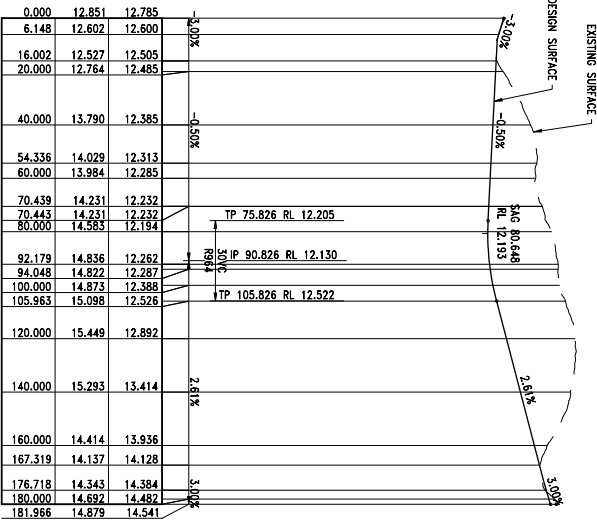
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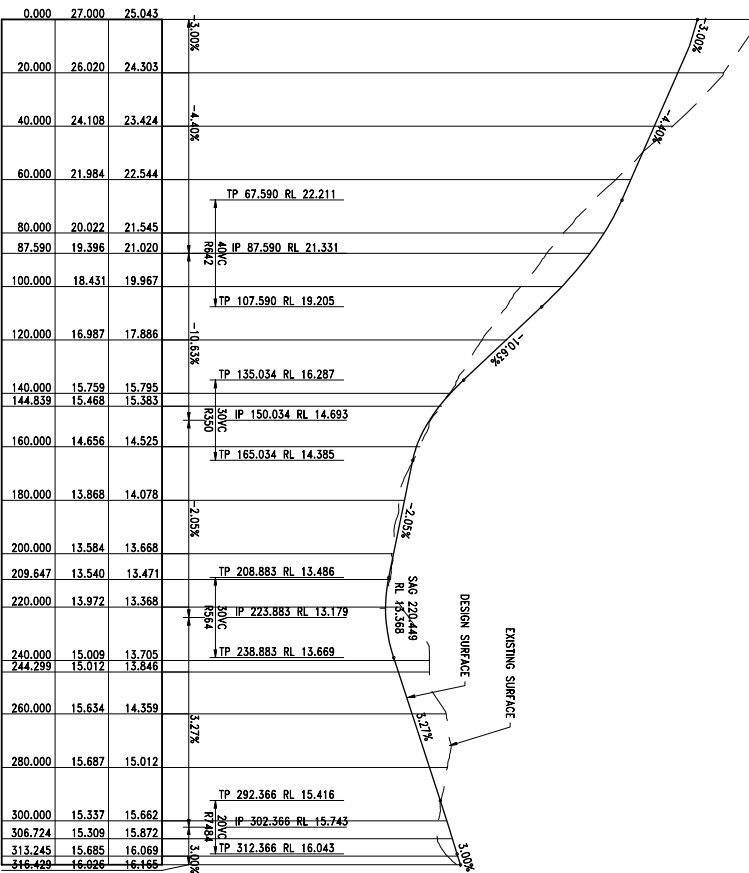
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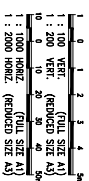
ROAD 3

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ROAD 4



CLIENT

CONGARINI NORTH PTY LTD

PROJECT NO

122896

PROJECT TITLE

24 CORONATION ROAD CONGARINI NORTH

ROAD TITLE

ROAD 3 & 4 LONGITUDINAL SECTIONS

DATE

18/12/2020

MEINHARDT

A.B.N. 29 061 169 871

Bulimba - Level 2, 135 Walker Street, Spring Hill QLD 4000

Gold Coast - Level 1, 34 Thomas Street, Ocean View QLD 4217

1-800-752661

1-407-526611

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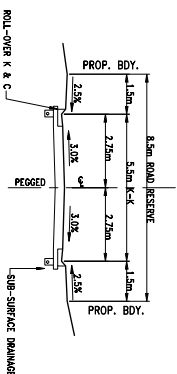
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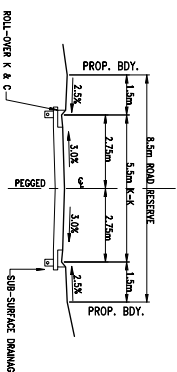
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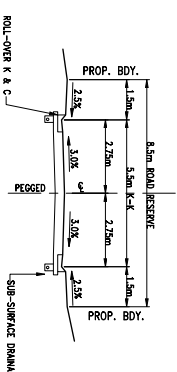
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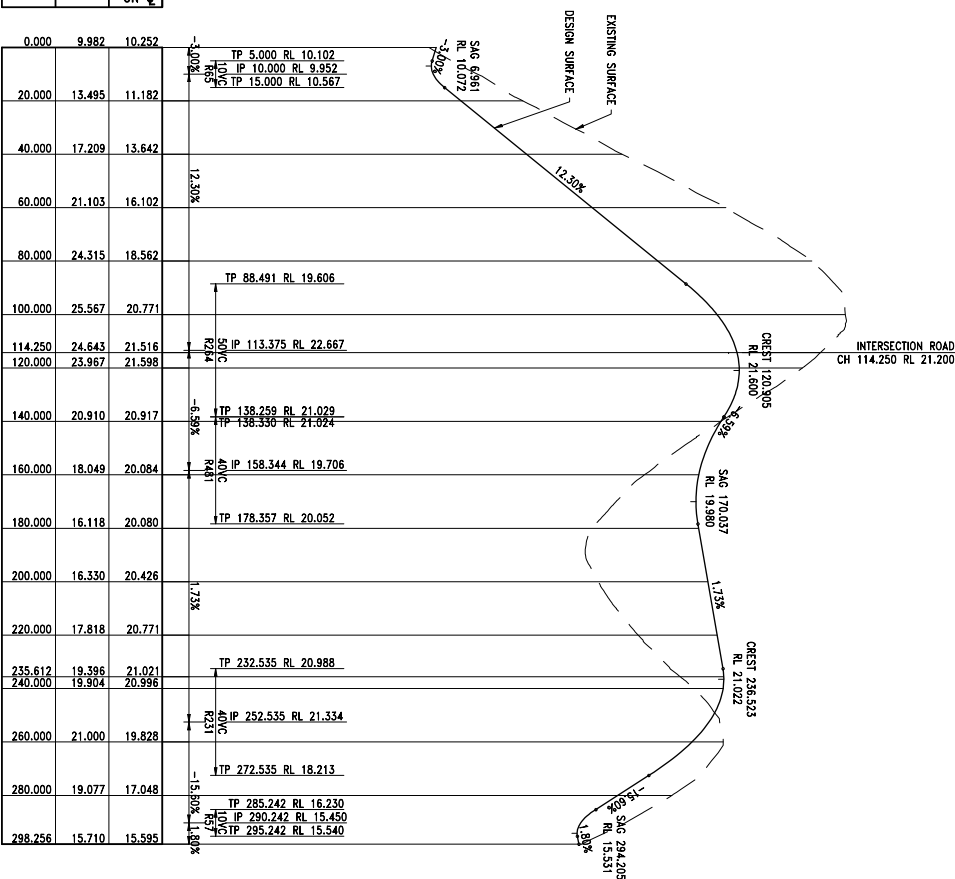
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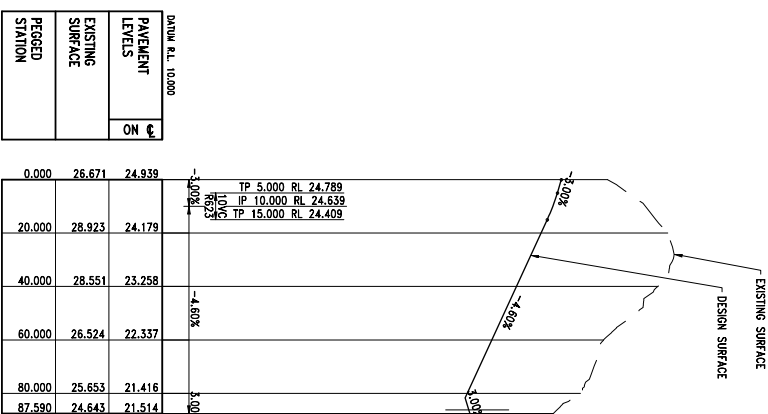


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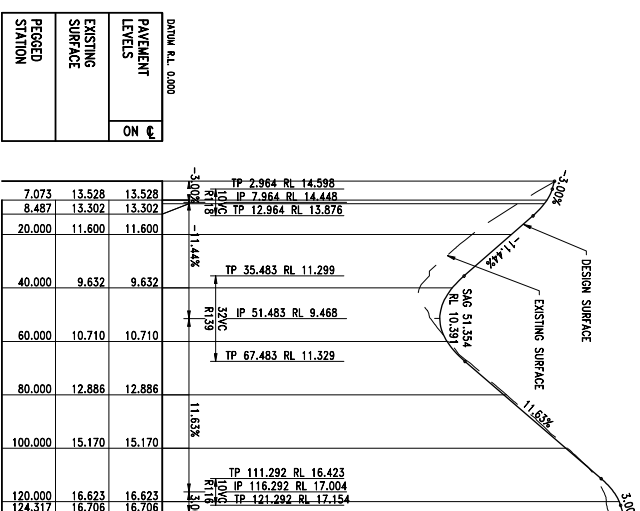
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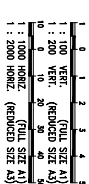
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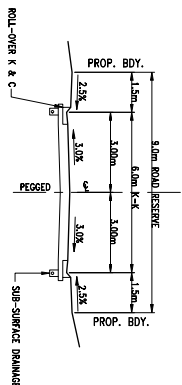
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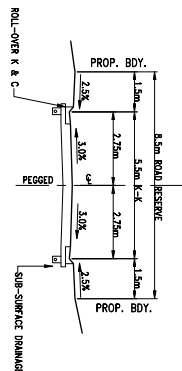


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PROJECT TITLE	24 CORONATION ROAD CONGARINNI NORTH	REV	A
PROJECT TITLE	ROAD 5, 6 & 7 LONGITUDINAL SECTIONS	DATE	18/12/2020
MEINHARDT 18/12/2020		MEINHARDT 18/12/2020	

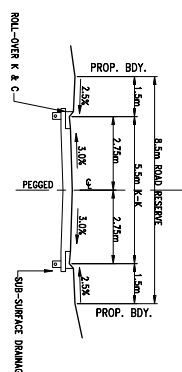




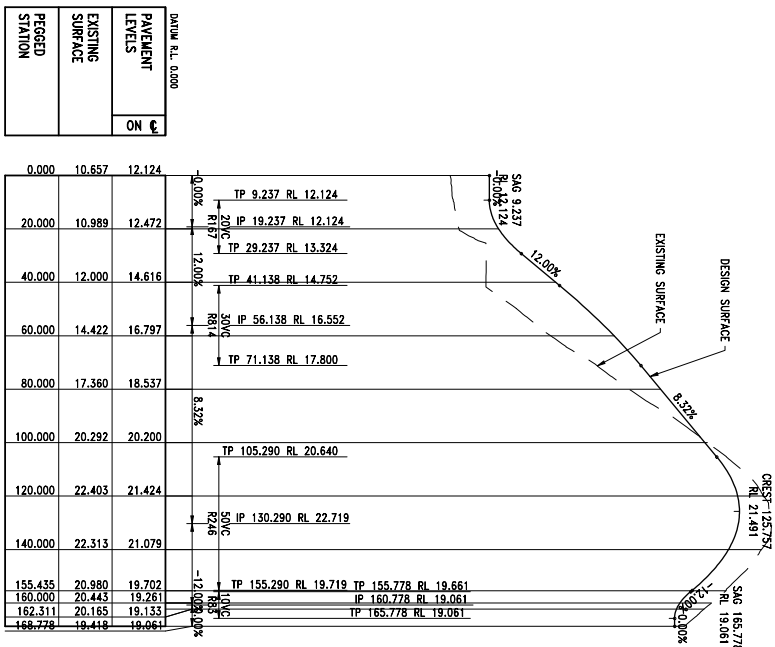
9m INTERNAL ROAD (ROAD 8)
SCALE 1:100



8.5m INTERNAL ROAD (ROAD 9)
SCALE 1:100

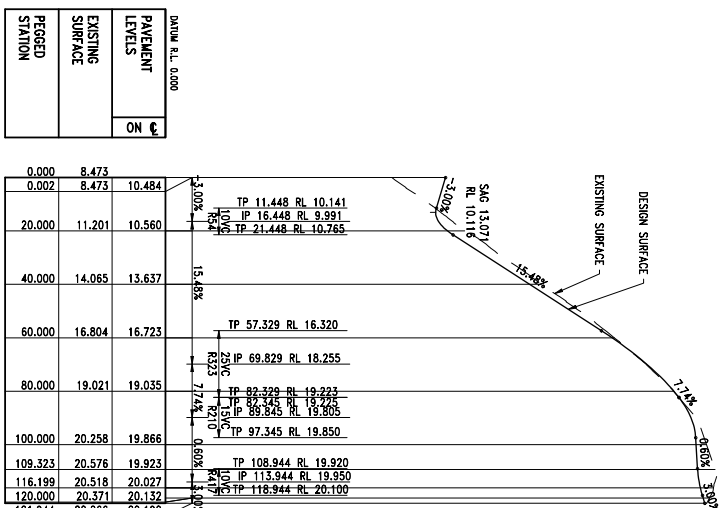


8.5m INTERNAL ROAD (ROAD 10)
SCALE 1:100



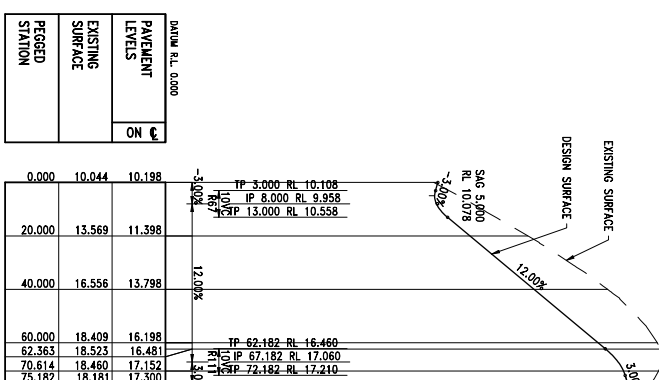
● REFER TO INTERSECTION
DETAIL DRAWINGS

ROAD 8



● REFER TO INTERSECTION
DETAIL DRAWINGS

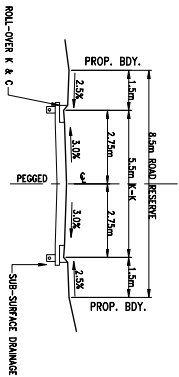
ROAD 9



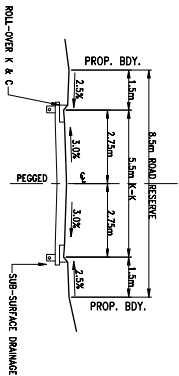
● REFER TO INTERSECTION
DETAIL DRAWINGS

ROAD 10

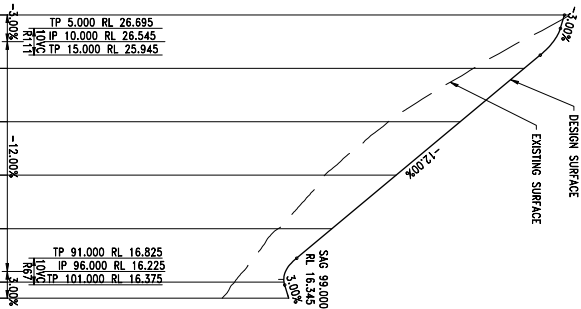
CLIENT		PROJECT NO.	
CONGARINNI NORTH PTY LTD		122896	
PROJECT TITLE		REVISION	
24 CORONATION ROAD CONGARINNI NORTH		SK7428	
DRAWING TITLE		REV	
ROAD 8, 9 & 10 LONGITUDINAL SECTIONS		A	
DATE		18/12/2020	
MEINHARDT		MEINHARDT	
A.B.N. 20 06 198 871		A.B.N. 20 06 198 871	
Bulimba - Level 2, 135 Walker Street, Spring Hill QLD 4000		Bulimba - Level 2, 135 Walker Street, Spring Hill QLD 4000	
Gold Coast - Level 1, 34 Thomas Street, Ormeau QLD 4217		Gold Coast - Level 1, 34 Thomas Street, Ormeau QLD 4217	
Perth - Level 1, 100 Stirling Street, Perth WA 6000		Perth - Level 1, 100 Stirling Street, Perth WA 6000	
T: +61 7 55286471		T: +61 7 55286471	
info@meinhardt.com.au		info@meinhardt.com.au	
www.meinhardt.com.au		www.meinhardt.com.au	
© 2020 MEINHARDT		© 2020 MEINHARDT	
ISO 9001 certified		ISO 9001 certified	



8.5m INTERNAL ROAD (ROAD 11)
SCALE 1:100



8.5m INTERNAL ROAD (ROAD 12)
SCALE 1:100

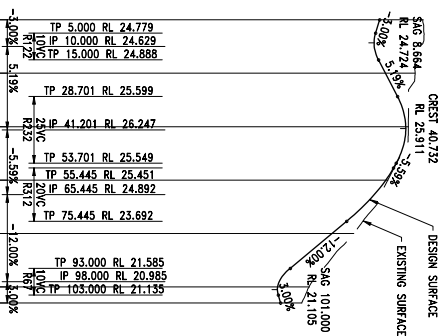


CHANNEL LIP LEVELS	LHS	
	RHS	
PAVEMENT LEVELS	ON	€
EXISTING SURFACE		
PEGGED STATION		

● REFER TO INTERSECTION DETAIL DRAWINGS

0.000	27.000	26.845			
20.000	23.442	25.345	23.442	23.442	
40.000	20.256	22.945	20.256	20.256	
60.000	17.879	20.545	17.879	17.879	
80.000	16.140	18.145	16.140	16.140	
100.000	14.502	16.352	14.502	14.502	
106.000	14.039	16.525			

ROAD 11



CHANNEL LIP LEVELS	LHS	
	RHS	
PAVEMENT LEVELS	ON	€
EXISTING SURFACE		
PEGGED STATION		

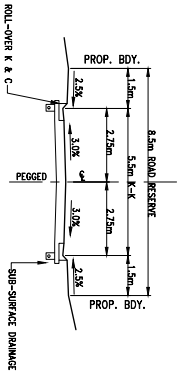
● REFER TO INTERSECTION DETAIL DRAWINGS

0.000	26.553	24.929			
20.000	26.260	25.148	26.260	26.260	
40.000	26.002	25.910	26.002	26.002	
60.000	25.240	25.163	25.240	25.240	
80.000	23.969	23.145	23.969	23.969	
100.000	22.292	21.113	22.292	22.292	
106.000	22.016	21.225			

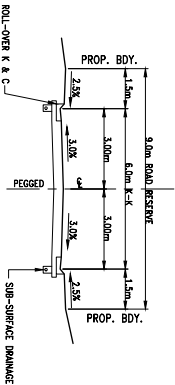
ROAD 12

CLIENT	CONGARINNI NORTH PTY LTD	PROJECT NO.	122896	MEINHARDT A.B.N. 29 06 159 81 Brisbane - Level 2, 135 Walker Street, Spring Hill QLD 4000 Gold Coast - Level 1, 34 Thomas Street, Ocean View QLD 4217 Penrith - Level 2, 255 Bourke Street, NSW 2150 T: +61 7 5558 6411 F: +61 7 5558 6412 info@meinhardt.com www.meinhardt.com
PROJECT TITLE	MAACKSVILLE	SPECIFICATION	SK7429	
DRAWING TITLE	24 CORONATION ROAD CONGARINNI NORTH	REV	A	
	ROAD 11 & 12 LONGITUDINAL SECTIONS	DATE	18/12/2020	

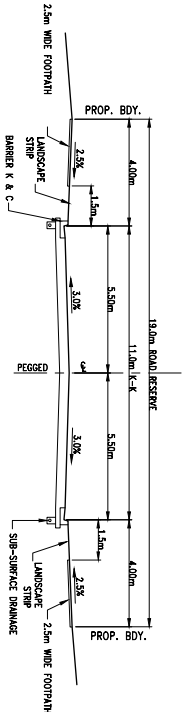
ISO 9001
certified



8.5m INTERNAL ROAD
(ROAD 1: CH1243.45-1674.55, ROAD 3, 4, 5,
6, 7, 9, 10, 11, 12)
SCALE 1:100



9m INTERNAL ROAD
(ROAD 1: CH1128.452-1243.45, CH1574.55-END,
ROAD 2, ROAD 8
SCALE 1:100



COLLECTOR ROAD
(ROAD 1: CH0.000-1128.452)
SCALE 1:100



CLIENT	CONGARINNI NORTH PTY LTD	PROJECT No	122896	MEINHARDT
DRAWN TITLE	IMACKSVILLE	SECTION No	SK7441	
DRAWN TITLE	24 CORONATION ROAD CONGARINNI NRTH	REV	A	
TYPICAL ROAD SECTIONS		DATE	11/02/2021	
A.B.N. 20564 189 91 Bridgeway - Level 2, 105 Wilson Terrace, Spring Hill QLD 4000 Gold Coast - Level 1, 34 Thomas Drive, Ormeau Island QLD 4177 T: +61 7 5558 6417 F: +61 7 5558 6417 Email: info@meinhardt.com.au Website: www.meinhardt.com.au © Copyright				
dices ISO 9001 Certified				

Appendix B – Infrastructure Services & Sediment and Erosion Control Sketches

Stormwater Drainage

SK7430	DRAINAGE LAYOUT SHEET 1 OF 2
SK7431	DRAINAGE LAYOUT SHEET 2 OF 2
SK7437	STORMWATER PRE-DEVELOPMENT CATCHMENT PLAN
SK7436	STORMWATER POST-DEVELOPMENT CATCHMENT PLAN

Sewerage

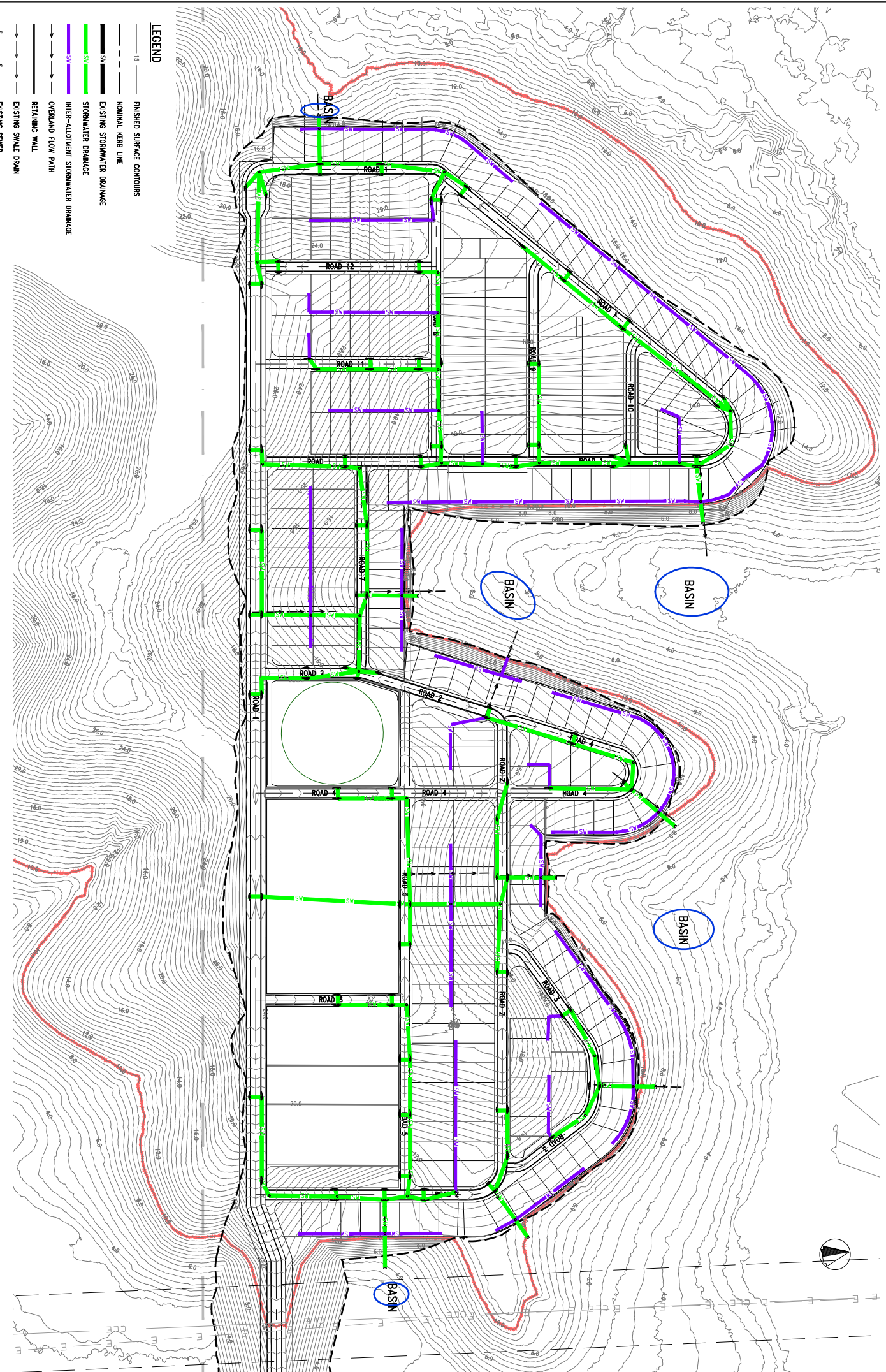
SK7432	SEWERAGE RETICULATION LAYOUT SHEET 1 OF 2
SK7433	SEWERAGE RETICULATION LAYOUT SHEET 2 OF 2

Water Supply

SK7434	WATER RETICULATION LAYOUT SHEET 1 OF 2
SK7435	WATER RETICULATION LAYOUT SHEET 2 OF 2

Sediment and Erosion Control

SK7442	EROSION & SEDIMENT CONTROL MANAGEMENT PLAN – PHASE 1
SK7443	EROSION & SEDIMENT CONTROL MANAGEMENT PLAN – PHASE 2
SK7444	EROSION & SEDIMENT CONTROL MANAGEMENT PLAN – PHASE 3
SK7445	EROSION & SEDIMENT CONTROL – DETAILS & NOTES



LEGEND

- 13 FINISHED SURFACE CONTOURS
- NOMINAL KERB LINE
- EXISTING STORMWATER DRAINAGE
- STORMWATER DRAINAGE
- INTER-ALIGNMENT STORMWATER DRAINAGE
- OVERLAND FLOW PATH
- RETAINING WALL
- EXISTING SHALE DRAIN
- EXISTING SEWER
- EXISTING WATER
- EXISTING ELECTRICAL
- PWF FLOOD LEVEL RL10.00 LINE
- LIMIT OF WORKS

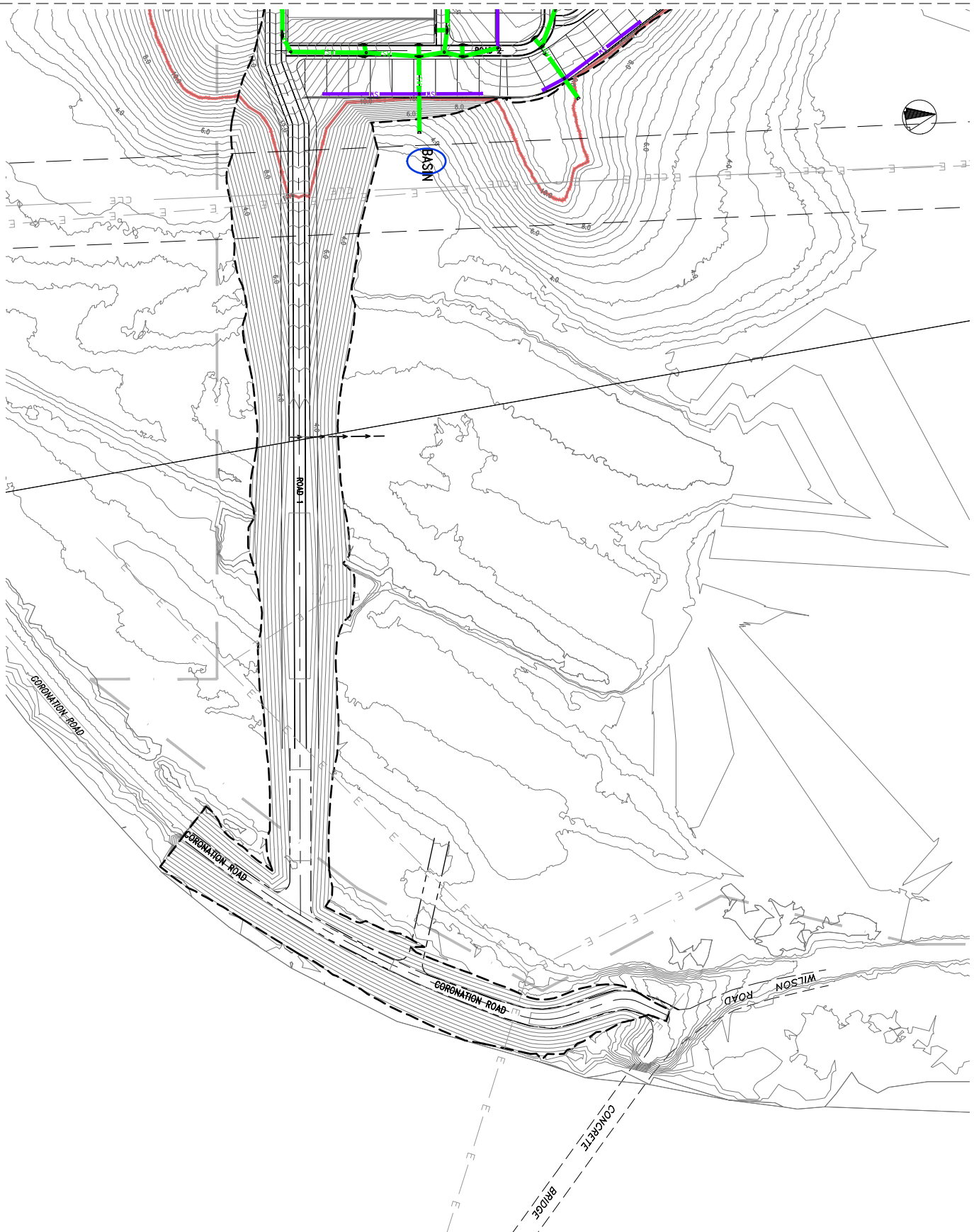
NOTE:
SERVICES LAYOUTS ARE SCHEMATIC
ONLY AND SUBJECT TO DETAILED
DESIGN AND AUTHORITY APPROVALS

NOTE:
BASIN LOCATIONS SHOWN ARE INDICATIVE ONLY
AND SUBJECT TO PREPARATION OF FINAL
SITE-BASED STORMWATER MANAGEMENT PLAN

1 : 1000
1 : 2000
(FULL SIZE A1)
(REDUCED SIZE A0)

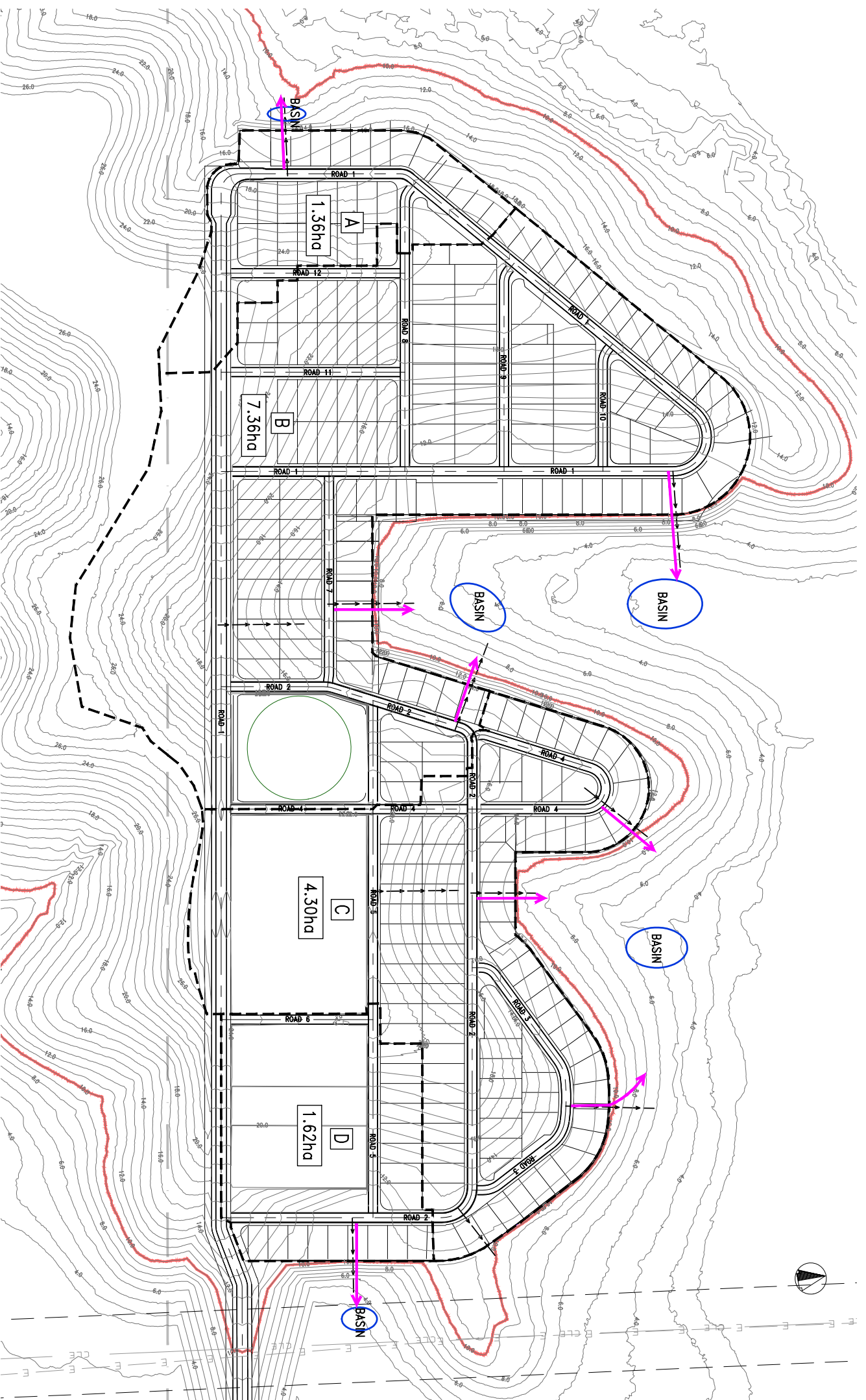
CLIENT	CONGARINI NORTH PTY LTD	PROJECT NO	122886	MEINARDT
JOB TITLE	IMACKSVILLE	SUBTITLE	SK7420	
DRAWN BY	24 CONGARINI ROAD CONGARINI NORTH	REV	A	
DATE	13/01/2020			
A.B.N. 20 064 189 191		Brisbane - Level 2, 35 Wickham Street, Spring Hill QLD 4000		SA 9007 Certified
		Gold Coast - Level 1, 31 Thomas Drive, Chirnside Park QLD 4217		
		Perth - PO Box 2553, Subiaco WA 6008		
		T: +61 7 5558 6111		
		F: +61 7 5558 6111		
		info@meinhardt.com.au		
		www.meinhardt.com.au		

NOTE:
BASIN LOCATIONS SHOWN ARE INDICATIVE ONLY
AND SUBJECT TO PREPARATION OF FINAL
SITE-BASED STORMWATER MANAGEMENT PLAN



1	—	FINISHED SURFACE CONTOURS
2	—	NORMAL KERB LINE
3	—	EXISTING STORMWATER DRAINAGE
4	—	STORMWATER DRAINAGE
5	—	INTER-ALIGNMENT STORMWATER DRAINAGE
6	—	OVERLAND FLOW PATH
7	—	RETAINING WALL
8	—	EXISTING SWALE DRAIN
9	—	EXISTING SLOPE
10	—	EXISTING WATER
11	—	EXISTING ELECTRICAL
12	—	PAV' FLOOD LEVEL, RL10.00 LINE
13	—	LIMIT OF WORKS

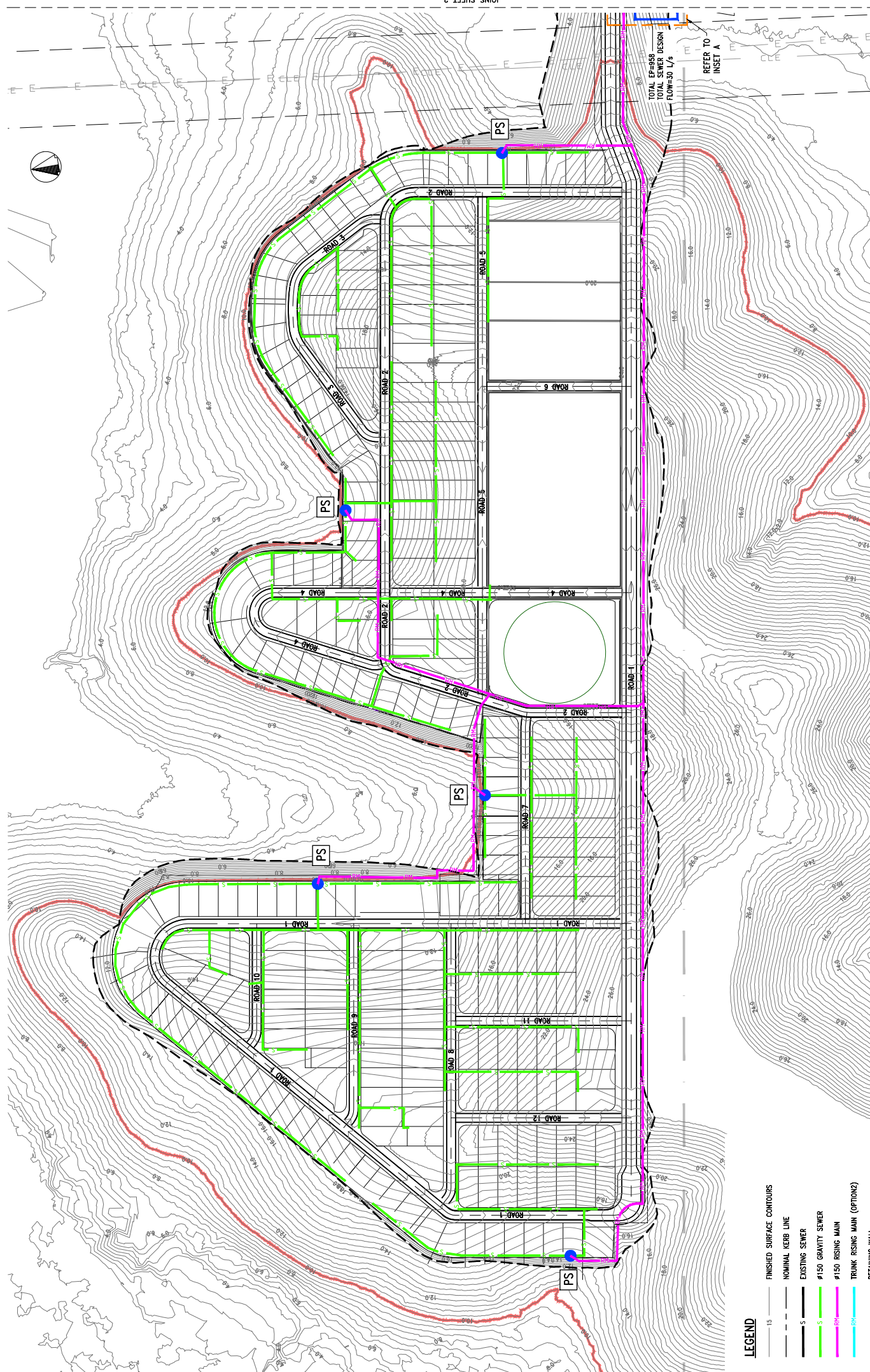
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NOTE:
BASIN LOCATIONS SHOWN ARE INDICATIVE ONLY
AND SUBJECT TO PREPARATION OF FINAL
SITE-BASED STORMWATER MANAGEMENT PLAN

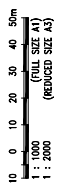
10 0 20 30 40 50m
1 : 3000
(FULL SIZE A1)
(A30000 SITE A3)

CLIENT	CONGARINI NORTH PTY LTD	PROJECT NO	122896	MEINHARDT dics ISO 9001 Certified
JOB TITLE	IMACKSVILLE	SUBTITLE	SK7436	
STORMWATER TITLE	24 CORPORATION ROAD CONGARINI NORTH	REV	B	
STORMWATER POST-DEVELOPMENT	CATCHMENT PLAN	DATE	12/02/2021	
A.B.N. 20 064 189 191		Meinhardt Urban Pty Ltd Brisbane - Level 2, 85 Wickham Terrace, Spring Hill QLD 4000 Gold Coast - Level 1, 31 Thomas Drive, Oorah QLD 4217 Perth - PO Box 253, Subiaco WA 6008 T: +61 7 5528 6111 info@meinhardturban.com meinhardturban.com.au		



NOTE:
SERVICES LAYOUTS ARE SCHEMATIC
ONLY AND SUBJECT TO DETAILED
DESIGN AND AUTHORITY APPROVALS

- LEGEND**
- 15 FINISHED SURFACE CONTOURS
 - NOMINAL KERB LINE
 - EXISTING SEWER
 - 150 GRAVITY SEWER
 - 150 RISING MAIN
 - TRUNK RISING MAIN (OPTIONAL)
 - RETAINING WALL
 - EXISTING STORMWATER
 - EXISTING WATER
 - EXISTING ELECTRICAL
 - PMF FLOOD LEVEL RL 0.00 LINE
 - LIMIT OF WORKS



CONGARINNI NORTH PTY LTD

24 CORONATION ROAD CONGARINNI NRTH
SEWERAGE RETICULATION LAYOUT
SHEET 1 OF 2

MEINHARDT

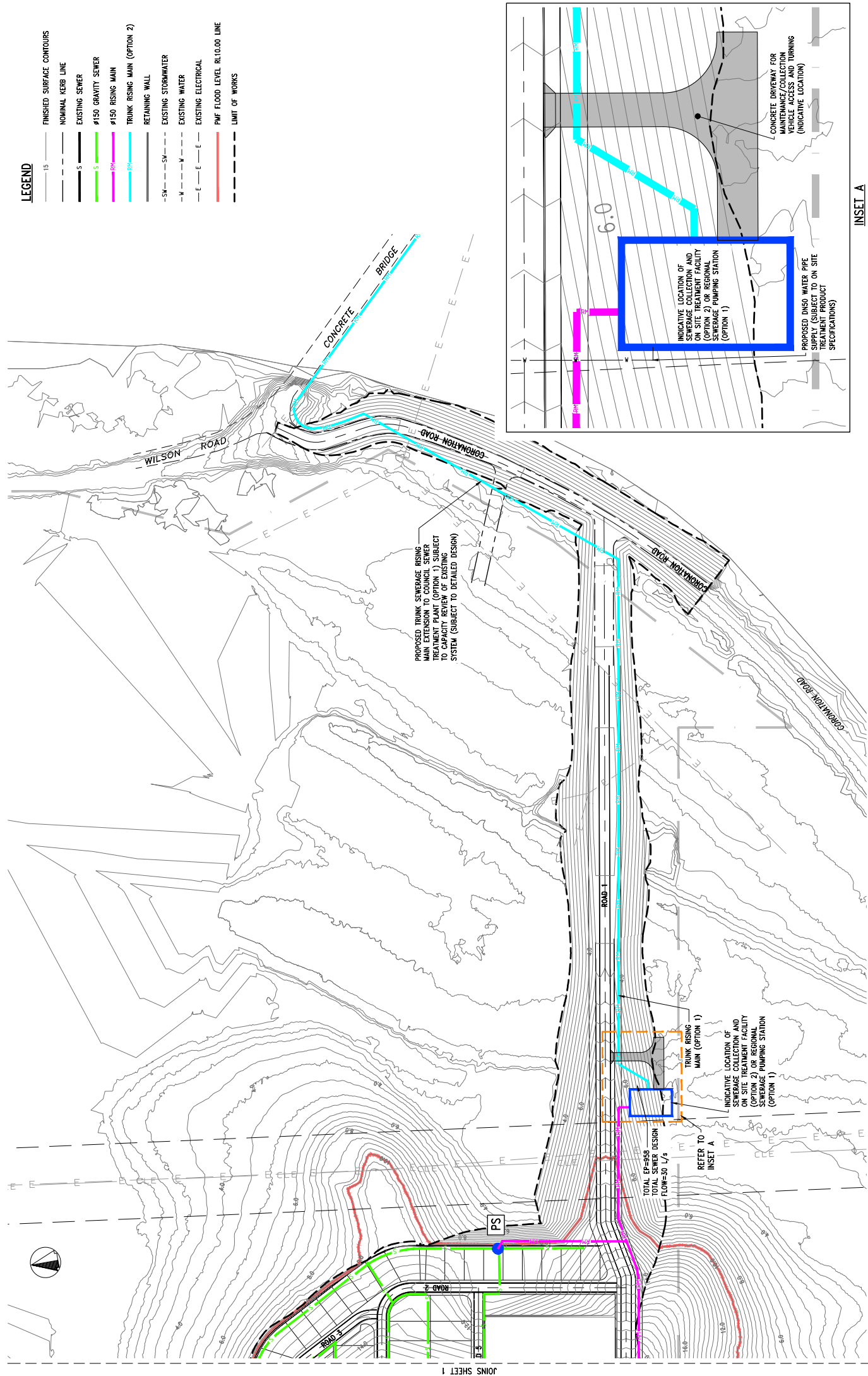
Brishbane - Level 2, 15 Wickham Terrace, Spring Hill QLD 4000
Gold Coast - Level 1, 31 Thomas Drive, Cheriton Island QLD 4217
Perth - Level 1, 100 St Georges Terrace, Perth WA 6000
Sydney - Level 1, 100 St Georges Terrace, Sydney NSW 2000
Melbourne - Level 1, 100 St Georges Terrace, Melbourne VIC 3000
A.B.N. 20 064 189 191
F: +61 7 5528 8411
info@meinhardtgroup.com
www.meinhardtgroup.com

PROJECT No: 122886

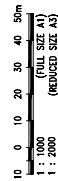
SHEETING: SK7432

REV: C

DATE: 28/05/2021



NOTE: SERVICES LAYOUTS ARE SCHEMATIC ONLY AND SUBJECT TO DETAILED DESIGN AND AUTHORITY APPROVALS



CLIENT	CONGARINNI NORTH PTY LTD	PROJECT NO	128986	<p>MEIN-HARDT</p> <p>Business Level 4 151 Wilson Terrace, Surrey Hills VIC 3129 A/B Tel: 03 9594 1818 Fax: 03 9594 1819</p> <p>Business Level 4 151 Wilson Terrace, Surrey Hills VIC 3129 Gold Coast Level 1 31 Thomas Drive, Carraberrig VIC 4217 Brisbane Corridor 4/94-958 Springwood Road, Springwood QLD 4717 Perth Level 1 2555 Albany Highway, Perth WA 6150 Sydney Level 1 5/538 Pitt St, Sydney NSW 2000 Melbourne Level 1 1/1000 Collins St, Melbourne VIC 3006 Email: info@meinhardt.com www.meinhardt.com © Copyright 2006 Meinhardt Pty Ltd</p>
PROJECT NAME	CONGARINNI NORTH PTY LTD	PROJECT NO	SK7433	
JOB FILE	MACKSVILLE 24 CORONATION ROAD CONGARINNI NORTH SEWERAGE RETICULATION LAYOUT SHEET 2 OF 2	REV	C	
DATE	26/06/2021			


INSET A
SCALE 1:250

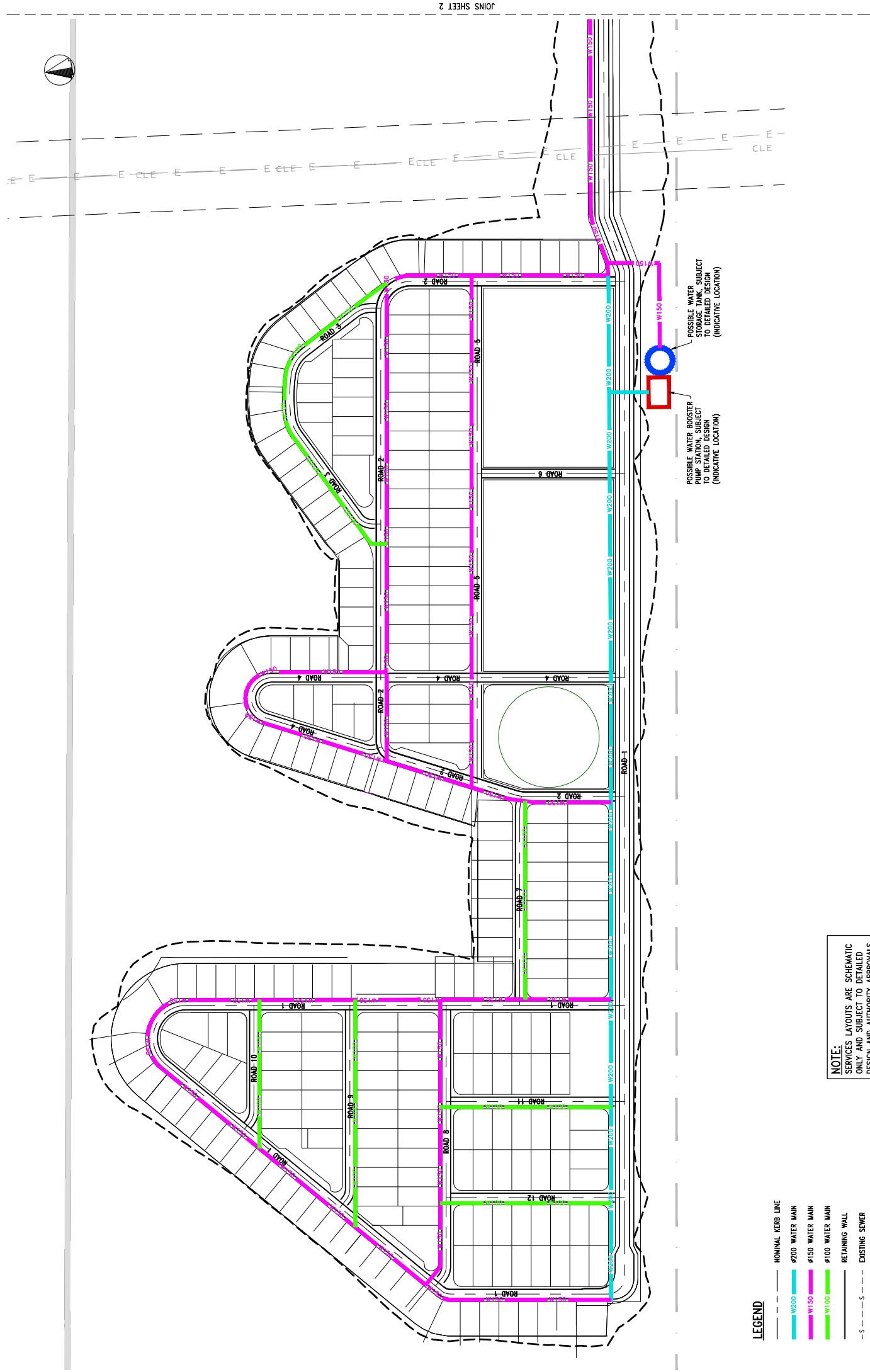


NOT TO SCALE

LEGEND

TRUNK RISING MAIN L=3978m (APPROX.)
(OPTION 1)

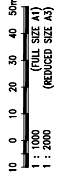
CLIENT	CONGARINNI NORTH PTY LTD			PROJECT No	122896			 ISO 9001 certified dics		
	MACKSVILLE				122896					
	24 CORONATION ROAD CONGARINNI NRTH				SK7433/1					
	SEWERAGE RETICULATION LAYOUT				B					
DRAWN BY	CONGARINNI NORTH PTY LTD			DATE	26/05/2021			Meinhardt Urban Pty Ltd A.B.N. 20 064 189 191 Brisbane - Level 2, 155 Wickham Terrace, Spring Hill QLD 4000 Gold Coast - Level 1, 38 Thomas Drive, Cherwood QLD 4217 Perth - Level 1, 100 Stirling Street, Perth WA 6000 Sydney - Level 1, 100 Stirling Street, Sydney NSW 2000 Melbourne - Level 1, 100 Stirling Street, Melbourne VIC 3000 Adelaide - Level 1, 100 Stirling Street, Adelaide SA 5000 Canberra - Level 1, 100 Stirling Street, Canberra ACT 2600 Hobart - Level 1, 100 Stirling Street, Hobart TAS 7000 Darwin - Level 1, 100 Stirling Street, Darwin NT 0800 Auckland - Level 1, 100 Stirling Street, Auckland NZ 1010 © Copyright		
	MACKSVILLE				26/05/2021					
	24 CORONATION ROAD CONGARINNI NRTH				SK7433/1					
	SEWERAGE RETICULATION LAYOUT				B					



NOTE:
SERVICES LAYOUTS ARE SCHEMATIC
ONLY AND SUBJECT TO DETAILED
DESIGN AND AUTHORITY APPROVALS

LEGEND

- NOMINAL KERB LINE
- W200 WATER MAIN
- W150 WATER MAIN
- W100 WATER MAIN
- RETAINING WALL
- EXISTING SEWER
- EXISTING STORMWATER
- EXISTING WATER
- EXISTING ELECTRICAL
- LIMIT OF WORKS



CONGARINNI NORTH PTY LTD

PROJECT No 122886

DATE 21/05/2021

24 CORONATION ROAD CONGARINNI NRTH

SHEET 1 OF 2

SK7434

REV B

122886

SK7434

B

21/05/2021

MEINHARDT

ISO 9001 certified

Meinhardt Urban Pty Ltd

A.B.N. 20 064 189 191

Brisbane - Level 2, 155 Wickham Terrace, Spring Hill QLD 4000

Gold Coast - Level 1, 38 Thomas Drive, Cheriton Island QLD 4217

Perth - Level 1, 100 St Georges Terrace, Perth WA 6000

Prequal PO Box 2293, Burwood QLD 4155

T +61 7 5528 8411

F +61 7 5528 8411

info@meinhardtgroup.com

www.meinhardtgroup.com

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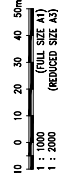
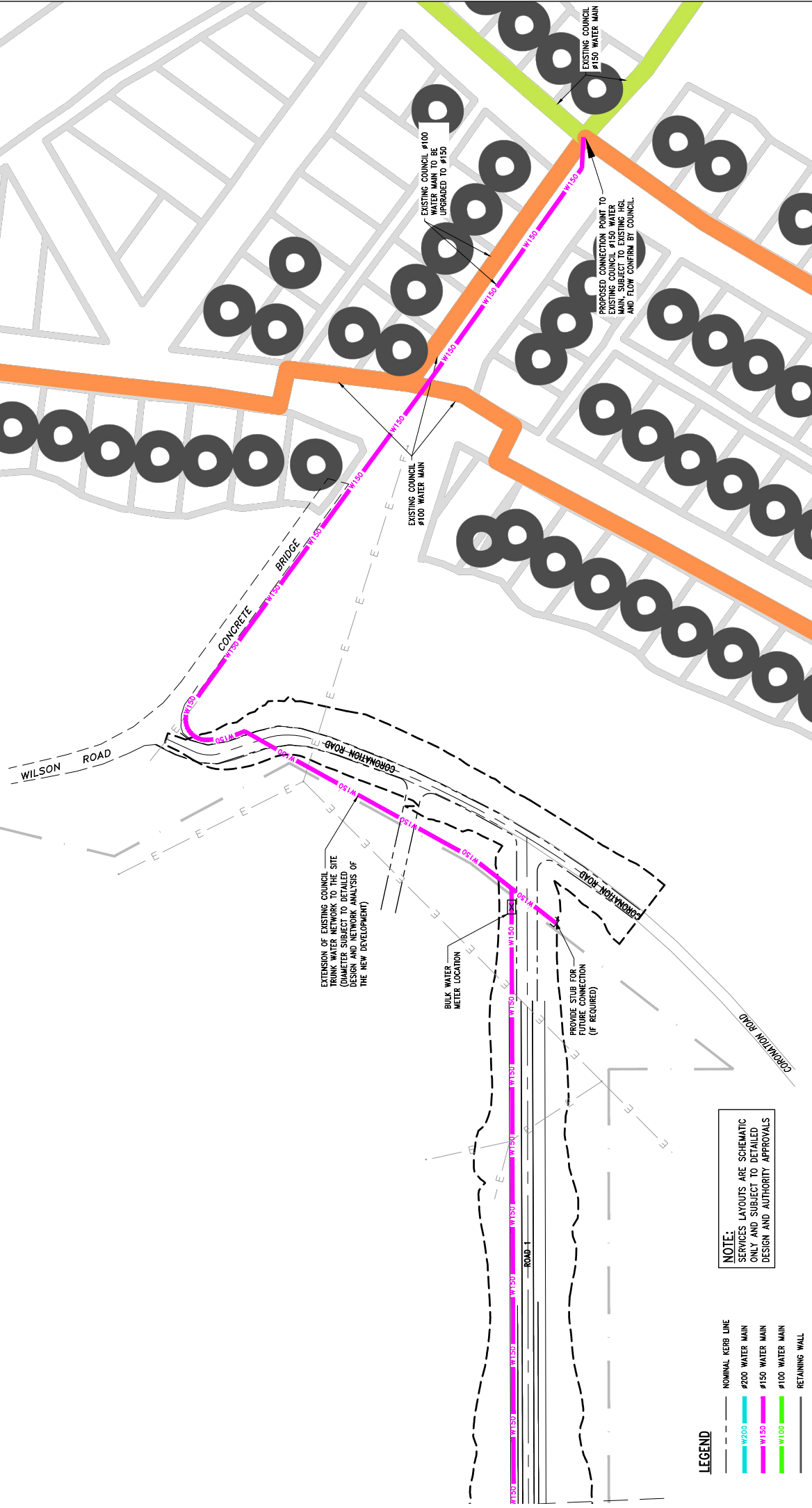
JOINS SHEET 1

LEGEND

- NOMINAL KERB LINE
- W200
- W150
- W100
- RETAINING WALL
- EXISTING SEWER
- EXISTING STORMWATER
- EXISTING WATER
- EXISTING ELECTRICAL
- LIMIT OF WORKS

NOTE:
SERVICES LAYOUTS ARE SCHEMATIC
ONLY AND SUBJECT TO DETAILED
DESIGN AND AUTHORITY APPROVALS

NOTE:
PART OF THIS DRAWING IS REPRODUCED FROM "NAMBUCCA
SHIRE COUNCIL - NAMBUCCA WATER SERVICING STRATEGY,
EXISTING & FUTURE SYSTEM ANALYSIS, DRAFT - MAY 2014,
PROJECT No: 3882, DRAWING EXHIBIT 3C, FILENAME: Ex -03",
WITH INFORMATION ADDED BY MEINHARDT.



ISO 9001 certified

dics

MEINHARDT

Meinhardt Urban Pty Ltd

A.B.N. 20 064 189 191

Brisbane - Level 2, 18 Wickham Terrace, Spring Hill QLD 4000

Gold Coast - Level 1, 38 Thomas Drive, Cherwood QLD 4171

Perth - Level 1, 100 Stirling Street, Perth WA 6000

Payal PO Box 203, Burdport QLD 4153

F: +61 7 5558 9411

E: info@meinhardtgroup.com

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PROJECT No

122886

SHEETING

SK7435

REV

B

DATE

21/05/2021

COUNT

CONGARINNI NORTH PTY LTD

PROJECT TITLE

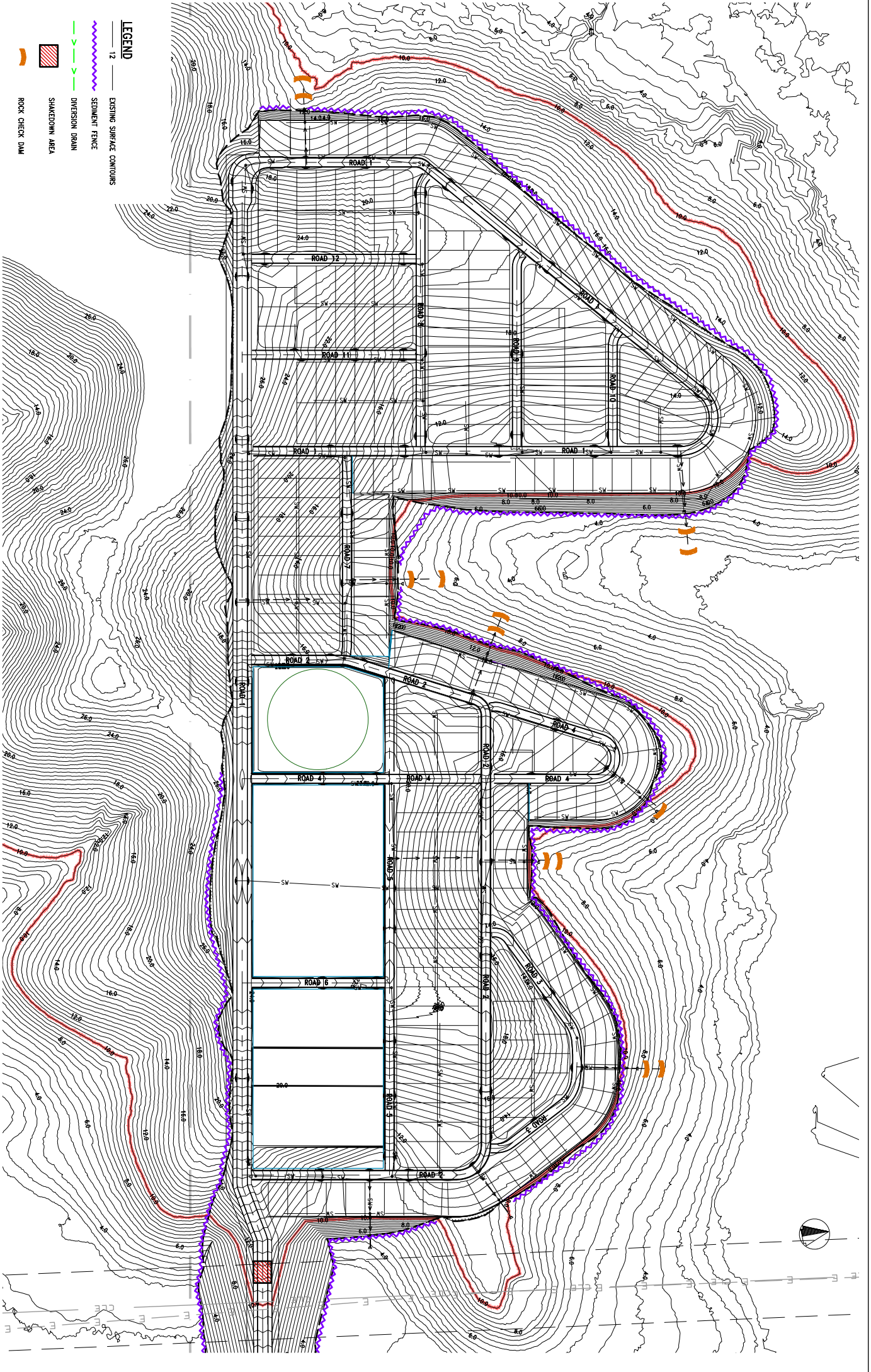
MACKSVILLE

DRAWING TITLE

24 CORONATION ROAD CONGARINNI NRTH

WATER RETICULATION LAYOUT

SHEET 2 OF 2



CONCEPT ONLY

10 0 10 20 30 40 50m
1:1000 (FULL SITE PLAN)
1:2000 (REDUCED SITE PLAN)

CLIENT		PROJECT NO.	
CONGARINI NORTH PTY LTD		122896	
LOCATION		SHEET NO.	
IMACKSVILLE		SK744	
PROJECT TITLE		REV	
24 CORPORATION ROAD CONGARINI NORTH		A	
EROSION & SEDIMENT CONTROL		DATE	
MANAGEMENT PLAN - PHASE 3		18/12/2020	
DRAWN BY		MEINHARDT	
A.E.N. 2004 100 91		A.E.N. 2004 100 91	
BRISBANE - Level 2, 100 William Street, Sydney NSW 1500		BRISBANE - Level 2, 100 William Street, Sydney NSW 1500	
Phone: 02 9250 6177		Phone: 02 9250 6177	
Fax: 02 9250 6177		Fax: 02 9250 6177	
Email: info@meinhart.com.au		Email: info@meinhart.com.au	
www.meinhart.com.au		www.meinhart.com.au	



GENERAL NOTES:

1. THE MEASURES SHOWN ON THE ESC PLANS ARE INDICATIVE ONLY. THE CONTRACTOR SHALL CARRY OUT ALL WORKS IN ACCORDANCE WITH THE CONTRACTORS SEDIMENT AND EROSION CONTROL PLAN. ALL RESPONSIBILITY FOR SEDIMENT AND EROSION CONTROL IS DELEGATED TO THE CONTRACTOR BY THE APPLICANT AND THE LAND OWNERS UNTIL THE ON MAINTENANCE INSPECTION.
2. THE CONTRACTOR AT A MINIMUM IS TO COMPLY WITH HEALTHY WATERWAYS "CONTROLLING STORMWATER POLLUTION ON YOUR BUILDING SITE" AND ALL ASSOCIATED DOCUMENTATION AND CHECKLISTS. SEDIMENT CONTROLS ARE NOT TO BE REMOVED PRIOR TO SATISFACTORY ESTABLISHMENT OF GROUND COVER/Written DIRECTION FROM THE SUPERINTENDENT.
3. ALL FENCING AND Silt FENCING TO BE INSTALLED PRIOR TO FIRE START MEETING.
4. THE CONTRACTOR SHALL PROVIDE AN EROSION AND SEDIMENT CONTROL PLAN FOR APPROVAL BY SUPERINTENDENT PRIOR TO POSSESSION OF SITE BEING GRANTED.
5. ALL COARSE SEDIMENTS ARE TO BE TREATED AND SHALL NOT ENTER THE DOWNSTRREAM INFRASTRUCTURE. THE TARGET FOR THIS IS 50mg/L OF SUSPENDED SOLIDS 90% OF THE TIME.
6. ALL FINE SEDIMENTS (DISPERSE SOLIDS) ARE TO BE TREATED IN TEMPORARY BASINS ON SITE. THE CONTRACTOR MUST TREAT AND RELEASE THE WATER AT COUNCIL STANDARDS, AS SOON AS POSSIBLE AFTER EACH EVENT.
7. ONCE ARBO MULCH IS DEEMED TO BE SUFFICIENTLY ESTABLISHED, Silt FENCES CAN BE REMOVED IF INSTRUCTED BY THE PRINCIPLE.

THE CONTRACTOR MUST INFORM THEMSELVES OF AND COMPLY WITH THE "STATE PLANNING POLICY FOR HEALTHY WATERS".

PHASING NOTES:

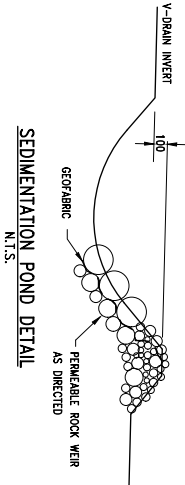
- PHASE 1 – PRIOR TO PRE-START
THE CONTRACTOR WILL BE PAID FOR SCHEDULED QUANTITIES FOR THIS PHASE.
- PHASE 2 – DURING CONSTRUCTION
THIS PHASE IS TO BE IN ACCORDANCE WITH THE CONTRACTOR'S SEDIMENT AND EROSION CONTROL PLAN. THE CONTRACTOR IS TO ENGAGE A STORMWATER QUALITY CONSULTANT TO UNDERTAKE STORMWATER QUALITY AND EVENT MONITORING DURING THE "CONSTRUCTION" PHASE, INCLUDING BUT NOT LIMITED TO REMEDIAL ACTION FOLLOWING EVENT MONITORING RESULTS.
- PHASE 3 – PRACTICAL COMPLETION INSPECTION
THE CONTRACTOR IS TO ENGAGE A STORMWATER QUALITY CONSULTANT TO UNDERTAKE STORMWATER QUALITY AND EVENT MONITORING DURING THE "MAINTENANCE" PHASE, INCLUDING BUT NOT LIMITED TO REMEDIAL ACTION FOLLOWING EVENT MONITORING RESULTS.
- THE CONTRACTOR WILL BE PAID FOR SCHEDULED QUANTITIES FOR THIS PHASE.

STOCKPILE NOTES:

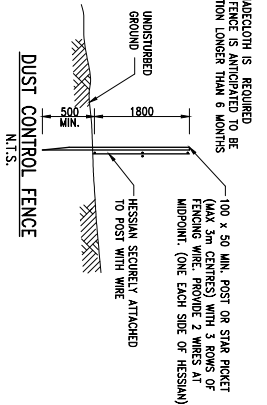
1. ALL STOCKPILES MUST BE SURROUNDED BY A Silt FENCE.
2. STOCKPILES MUST BE COVERED, IF NECESSARY, TO PREVENT DUST OR CONTAMINATION OF WATERS.

STABILISATION NOTES:

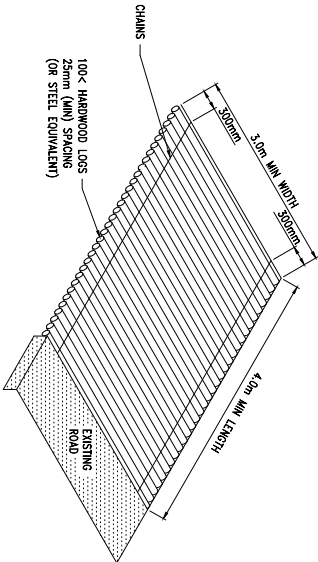
1. TOP SOIL AND SEED MUST BE PLACED ON COMPLETED AREAS WITHIN 7 DAYS OF THAT AREA BEING COMPLETED.
2. HYDROMULCHING MAY BE ORDERED BY THE SUPERINTENDENT.
3. ALL BATTERS GREATER THAN 1 IN 4 TO BE MULCHED WITH ON SITE MULCH.
4. SOX STRIKE MUST OCCUR WITHIN 4 WEEKS. AFTER THIS PERIOD RE-SEEDING MAY BE ORDERED AT THE CONTRACTOR'S COST.



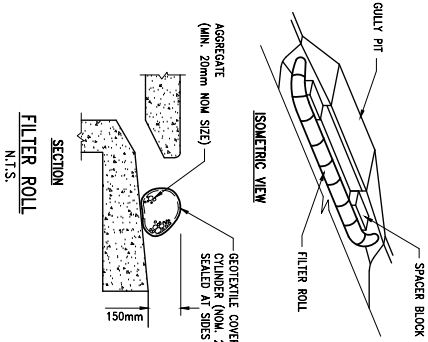
SEDIMENTATION POND DETAIL
N.T.S.



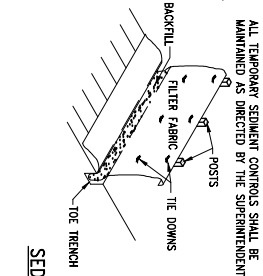
DUST CONTROL FENCE
N.T.S.



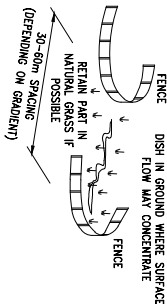
SHAKE - DOWN AREA
N.T.S.



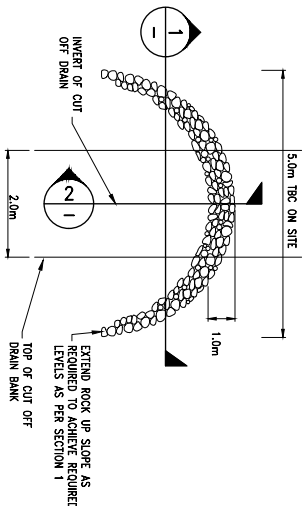
SECTION
FILTER ROLL
N.T.S.



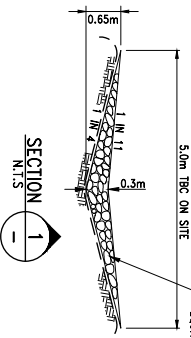
SECTION
SEDIMENT FENCE
N.T.S.



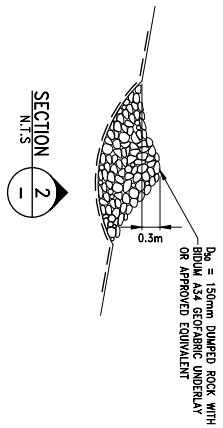
SECTION
STANDARD FIELD INLET CONTROL
N.T.S.



ROCK CHECK DAM DETAIL
N.T.S.



SECTION 1
N.T.S.



SECTION 2
N.T.S.

CLIENT	CONGARINNI NORTH PTY LTD	PROJECT NO	122896	MEINHARDT
SUB TITLE	INACKSVILLE	SECTION NO	SK7445	
DRAWING TITLE	24 CORONATION ROAD CONGARINNI NRTH EROSION & SEDIMENT CONTROL DETAILS & NOTES	REV	A	
DATE	18/12/2020	DATE	18/12/2020	
MEINHARDT				
dices ISO 9001 certified				

Appendix C – Onsite Sewage Treatment Plant Product Information and Operation & Management Plan

C1 - Mak Water

Membrane bioreactor (MBR) complete with:

- Packages sewerage pump station
- Balance tanks
- MBR with nutrient removal, UV hypo recirc and irrigation pump
- Site install + commissioning

Budget \$950k (+/- 30%, TBC with formal quote), ex GST, ex works.

Datasheets attached in Appendix C1

Water Solutions for Infrastructure and Urban Development



Infrastructure and Urban Development Applications

Water and wastewater treatment requirements for infrastructure and urban developments are typically temporary facilities for construction phase, or permanent infrastructure for ongoing operations.

Projects in construction phase often require treatment plants for production of construction and/or potable water, and treatment of contaminated wastewater and/or sewage for onsite reuse or compliant discharge. Projects may also require permanent infrastructure to supply potable/drinking and/or process water, and to treat produced/industrial wastewater and/or sewage for onsite reuse or compliant discharge.

Understanding your water and wastewater treatment options early in the planning process reduces risk by preventing unnecessary delays in your project and maximises the use of your valuable resources. MAK Water works collaboratively with your estimating, engineering and environmental teams to develop smart solutions for every stage of the infrastructure life cycle, to meet your project objectives.

Whether you require construction water or wastewater treatment for a road or tunnel project, demineralised water for a hospital, or recycled wastewater for a heavy vehicle washbay, MAK Water's wide range of plant designs means we can meet all your infrastructure project's water and wastewater treatment requirements.

TRANSPORTATION

- ◆ Roads
- ◆ Tunnels
- ◆ Rail
- ◆ Ports
- ◆ Airports
- ◆ Council facilities

UTILITIES

- ◆ Municipal water and wastewater
- ◆ Power stations
- ◆ Pipeline compressor stations

DEFENCE

- ◆ Defence bases
- ◆ Training areas
- ◆ Temporary construction camps
- ◆ Emergency response

BUILDING SERVICES

- ◆ Hospitals and health facilities
- ◆ Schools and universities
- ◆ Commercial and government buildings and infrastructure
- ◆ Remote communities
- ◆ Correctional facilities



HEALTH, SAFETY AND THE ENVIRONMENT

MAK Water places the Health and Safety of our people, clients and contractors, and care of the Environment as our highest priority.

Smart Infrastructure Expertise

TECHNICAL SUPPORT FOR TENDERS. You need someone that will understand your project, be able to present a number of possible solutions, and respond quickly to requests for quotation to support your bid process. When the project commences, MAK Water provides ongoing technical support to understand your site requirements and provide the best possible solution.

EXPERIENCED. From construction water and wastewater for road and tunnel projects, demineralised water for hospitals and power stations, to potable water and sewage treatment for ports, airports and remote communities, MAK Water has delivered solutions for infrastructure and urban development projects throughout Australia and internationally.

LOW RISK SOLUTION. Equipment reliability is paramount to ensure no interruptions to tight schedules. MAK Water has an established track record of manufacturing fully automated, high quality equipment for maximum reliability.

HIRE SOLUTIONS. We understand that temporary equipment is often required for construction projects or in response to unforeseen circumstances. MAK Water operates an extensive fleet of hire plants that can be rapidly deployed at short notice.

24 HOUR LOCAL SUPPORT. Efficient and professional wastewater, sewage and water treatment support available 24/7 from service teams located in every mainland state in Australia provides total peace of mind and reduces operator involvement with your equipment.



Transportation

With Australia's large continent size and vast distances, continual development of transportation infrastructure is required to link together our remote areas and rapidly growing cities.

For new roads, railways, ports and airports, or the ongoing maintenance of existing infrastructure, water plays an important role in each project.

- ◆ Desalination plants for construction water and potable water supply
- ◆ Clarification plants for heavy metal contaminated ground water seepage in tunnels
- ◆ Filtration plants to remove suspended solids from construction wastewater
- ◆ pH adjustment plants for treatment of construction wastewater
- ◆ Sewage pumping and treatment plants for ports, airports and construction camps
- ◆ Oil water separators and dissolved air flotation plants for wash bays and industrial process wastewater

Building Services

The efficient, safe and compliant delivery of potable water and treatment of wastewater is paramount for commercial or private buildings.

With an extensive product range and expert technical support, you can be confident partnering with MAK Water to provide the best possible solution for your building project.

- ◆ Water softening plants for potable, kitchen or industrial uses
- ◆ Desalination or filtration plants for potable water supply
- ◆ Demineralised water plants for boilers, cooling towers and industrial machinery
- ◆ Ultrafiltration plants for greywater recycling
- ◆ Packaged sewage pumping stations for sewage collection networks
- ◆ Oil water separators and dissolved air flotation plants for trade waste
- ◆ Pumping solutions for potable and fire water
- ◆ Reverse osmosis plants to supply AS/NZS 4187:2014 complaint water for reprocessing of reusable medical devices in hospitals

Defence

The Australian Defence Force plays an important role in defending Australia and its national interests and requires secure and reliable infrastructure to support the activities of over 90,000 personnel across all states and territories.

MAK Water understands that sometimes these solutions require an immediate response and very short delivery timeline. We have experience meeting and exceeding these requirements.

- ◆ Potable water and sewage treatment plants for bases, training facilities and temporary camps
- ◆ Oil water separators and dissolved air flotation plants for vehicle wash bays
- ◆ Packaged sewage pumping stations for sewage collection networks
- ◆ Pumping solutions for potable and fire water
- ◆ Hire of water and wastewater treatment plants for short-term requirements or emergency response

Utilities

Public and private sector utilities own and operate infrastructure to provide valuable water, electricity and gas services to consumers throughout Australia.

When the right technical solution is required, with minimal downtime, you can rely on MAK Water's experienced in-house design and engineering team to deliver a cost-effective and reliable solution.

- ◆ Decentralised potable water and sewage treatment plants for urban developments and remote communities
- ◆ Demineralised water plants for boilers and cooling towers and evaporative water
- ◆ Treatment of compressor station wastewater for discharge
- ◆ Pumping solutions for potable, sewage or fire water

Solutions

BRACKISH WATER REVERSE OSMOSIS

Treat brackish ground, surface or industrial water to achieve potable water quality. Standard process includes pre-treatment, RO desalination and a clean-in-place (CIP) system for membrane cleaning. Add additional treatment steps as required.



SEA WATER REVERSE OSMOSIS

Treat sea water or high salinity ground water to achieve potable water quality. Standard process includes pre-treatment, RO desalination, auto flushing and a clean-in-place (CIP) system for membrane cleaning. Add additional treatment steps as required.



GRAVITY CLARIFICATION

Clean water prior to reuse, or discharge to the sewer or environment to minimise the use of potable water or water supply while protecting users and the environment from contaminants in the waste stream. Compliant with local Council, DEHP, DAFF and OH&S requirements..



WASTEWATER / SEWAGE MOVING BED BIOREACTOR

Treat sewage to achieve Class C effluent for reuse in "low risk" applications, or spray field disposal. Standard process includes screening, biological degradation, clarification and sterilisation. With the optional Class A module, reuse in "medium risk" applications is possible.



WASTEWATER / SEWAGE MEMBRANE BIOREACTOR

Treat sewage to achieve Class A+ effluent for reuse in "high risk" applications. Standard process includes screening, biological degradation, ultrafiltration and sterilisation. Add additional treatment steps, such as enhanced nutrient removal, as required.



WORKSHOPS / WASHBAYS OIL WATER SEPARATOR

Remove free floating hydrocarbons (diesel, hydraulic fluid, oil) and heavier solids from wastewater (prior to discharge) for any wash bay where hydrocarbons are present. Add additional treatment steps for reuse as required.



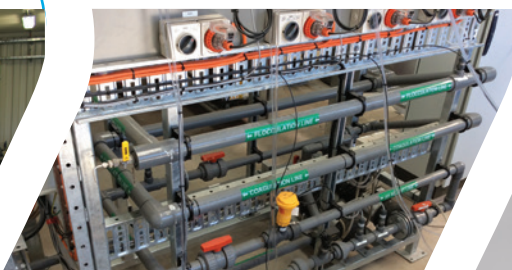
MULTIMEDIA FILTRATION

Treat ground, surface, storm and waste water with suspended solids to achieve potable or process water. Standard process includes auto-backwashing multimedia filtration. Add additional filtration media and other treatment steps, such as sterilisation or pH correction, as required.



DISSOLVED AIR FLOTATION

Counter-current system designed to achieve maximum treatment efficiency in a compact footprint. Removes a variety of contaminants to meet trade waste or reuse requirements.



WATER STERILISATION

Automatically maintain the correct amount of free chlorine in a potable water storage tank, or use ultraviolet sterilisation to disinfect water, in accordance with Australian Drinking Water Guidelines.





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water

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M +56 9 982 12 752

Client Services

MAK Water are packaged plant specialists, providing industrial waste water, sewage and water treatment solutions in Australia and overseas.

For more than 20 years, our solutions have been helping clients achieve cleaner water solutions that are both cost-effective and regulatory compliant.

MAK Water offers customised water management systems, owns a substantial hire fleet, and provides service and maintenance for all types of water and wastewater treatment systems. A wide variety of consumables and chemicals for ongoing system performance and a complete range of standard products are also available.

MAK Water has built a reputation for delivering superior service and high performing systems, enabling clients to reduce operating costs and extend equipment life-cycles.

- ◆ Design
- ◆ Project Management
- ◆ Procurement
- ◆ Manufacturing
- ◆ Installation
- ◆ Commissioning
- ◆ Operation
- ◆ Service and Maintenance
- ◆ Consumables
- ◆ Spare Parts
- ◆ Equipment Hire

PRODUCT DATA SHEET

Membrane Bioreactor (MBR)

water | wastewater | sewage

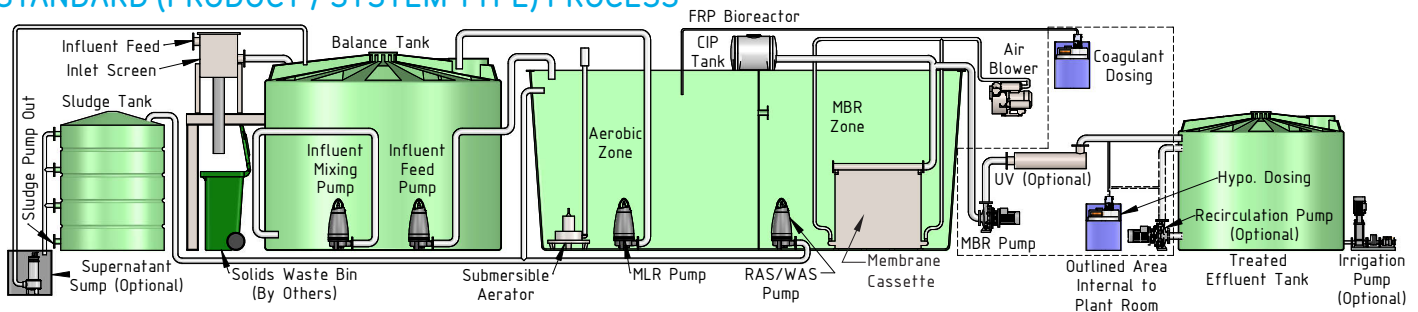


OVERVIEW

MAK Water's Membrane Bioreactor (MBR) type packaged sewage treatment plants are designed to treat domestic strength sewage, to achieve "Class A+" treated effluent, suitable for reuse in "risk category high" applications or for discharge to sensitive environments.

The standard treatment process includes influent screening, balance tank mixing, anoxic & aerobic treatment, flat sheet membrane filtration with air scouring and CIP system, and effluent disinfection (hypochlorite dosing). MAK Water's bioreactors are constructed of corrosion resistant FRP, and are self-contained, modular systems for easy deployment to remote locations.

STANDARD (PRODUCT / SYSTEM TYPE) PROCESS



STANDARD SPECIFICATIONS

Parameter		Units	MBR-020	MBR-045	MBR-060	MBR-075	MBR-155	MBR-225	MBR-315
Treatment capacity (min/max)		m ³ /day	10 / 20	22.5 / 45	30 / 60	37.5 / 75	77.5 / 155	112.5 / 225	157.5 / 315
Balance tank volume (recommended)* ¹		m ³	21	47.1	62.9	78.6	162.4	235.7	330
Treated effluent tank volume (recommended)* ¹		m ³	20	45	60	75	155	225	315
Sludge tank volume		m ³	3.5	9.5	13.5	22.5	32	46	64
Sludge waste volume (max)		m ³ /month	5.3	13.2	17.5	21.9	45.3	65.8	92.1
Irrigation pump duty* ²		m ³ /hr @ 500 kPa	2.5	5.6	7.5	9.4	19.4	28.1	39.4
Screen wash water supply		m ³ /hr @ 500 kPa	1.1	2.2	2.2	2.2	5.5	7.5	11
Ambient temperature (min/max)		°C	1 / 43						
Power supply		-	AC 415V, 3 Phase, 50 Hz (other voltages and frequencies available on request)						
Power consumption	MBR plant	kW	9	19	26	36	42	65	83
	Recirculation pump* ² , * ³		0.75	1.1	1.1	1.5	2.2	3	4
	Irrigation pump* ²		0.75	1.5	2.2	2.2	7.5	7.5	11
Footprint	FRP bioreactor(s) & access platform(s)	m	6 x 3.2	9 x 3.2	12 x 3.2	12 x 3.2	12 x 5.6	12 x 8.8	12 x 12
	Containerised plant room	m	N/A* ⁴						
	Sludge tank(s)	m	Ø1.6	Ø2.6	Ø2.97	Ø3.57	Ø3.95	7.7 x 3.55	8.5 x 3.95

Characteristics	Units	Influent	Effluent
Temperature	°C	15~35	-
pH* ⁵	pH units	7.0~8.5	6.5~8.5
Biological oxygen demand (BOD)* ⁶	mg/L	150~400	<10
Suspended solids (TSS)	mg/L	150~300	<10
Emulsified oil and grease	mg/L	<2.0	-
Free oil & grease	mg/L	<0.1	-
Total nitrogen (T-N)	mg/L	<50	<40 (or <10 mg/L reduction from influent value)
Total phosphorus (T-P)	mg/L	<16	4~12 (variable according to coagulant dose rate)
Total dissolved solids (TDS)	mg/L	<2,000	-
Turbidity	NTU	-	<2 (95%ile)
E.Coli	cfu/100 mL	-	<1
Coliphages	pfu/100 mL	-	<1
Clostridia	cfu/100 mL	-	<1
Free chlorine	mg/L	-	0.2~2
UV dose* ²	mJ/cm ² @ 70% UVT	-	40
Bacteria removal (membrane only)	Log	-	≥4* ⁷
Virus removal (membrane only)	Log	-	≥1* ⁷

*¹ Sold separately, *² Optional equipment, *³ Sizing based on recommend treated effluent tank volume, *⁴ Plant room integral to FRP bioreactor, *⁵ Caustic dosing may be required where influent pH is <7.0, *⁶ Sucrose dosing may be required where ratio of BOD to TKN is ≤5, *⁷ Additional log credits are available with UV and chlorination; consult MAK Water

STANDARD SPECIFICATIONS

✓ = Standard Supply, o = Optional Supply, - = Not Available

Equipment		MBR-020	MBR-045	MBR-060	MBR-075	MBR-155	MBR-225	MBR-315
Automatic inlet screen (2 mm in two dimensions)		✓	✓	✓	✓	✓	✓	✓
Influent mixing pump		✓	✓	✓	✓	✓	✓	✓
Influent feed pump		✓	✓	✓	✓	✓	✓	✓
FRP bioreactor(s) with aluminium access platform(s) & ladder(s)	Aerobic zone with submersible aerator & MLR pump	✓	✓	✓	✓	✓	✓	✓
	MBR zone with flat sheet membranes and submersible RAS/WAS pump	✓	✓	✓	✓	✓	✓	✓
	CIP/membrane flush tank	✓	✓	✓	✓	✓	✓	✓
	Bioreactor roofing (COLORBOND® steel sheeting)	o	o	o	o	o	o	o
Plant room with air conditioning, overhead lighting & GPOs for maintenance	Chemical dosing	Coagulant	✓	✓	✓	✓	✓	✓
		Hypochlorite	✓	✓	✓	✓	✓	✓
		Sucrose	o	o	o	o	o	o
		Caustic	o	o	o	o	o	o
	MBR permeate pump		✓	✓	✓	✓	✓	✓
	Treated effluent tank recirculation pump		o	o	o	o	o	o
	Pressurised UV reactor (non-validated**)		o	o	o	o	o	o
PLC control system with touch screen HMI		✓	✓	✓	✓	✓	✓	✓
Externally mounted MBR air scour blower		✓	✓	✓	✓	✓	✓	✓
Sludge tank with supernatant sampling points & discharge valves		✓	✓	✓	✓	✓	✓	✓
Supernatant sump with submersible pump & level control		o	o	o	o	o	o	o
Irrigation pump with level control & mechanical flow totaliser / flow transmitter		o	o	o	o	o	o	o
Instrumentation	Standard package	✓	✓	✓	✓	✓	✓	✓
	Premium package with ClearAccess™ remote monitoring	o	o	o	o	o	o	o

Instrumentation & Controls		Standard package	Premium package
Level switches	Balance, bioreactor and treated effluent tank	✓	-
	Chemical dosing & sludge tank float level switches	✓	✓
Level transmitters	Balance, bioreactor and treated effluent tank	-	✓
Pressure transmitters	Membrane differential pressure	✓	✓
Pressure switches and gauges		✓	✓
Flow transmitters	Influent feed, MLR and RAS/WAS	✓	✓
	Permeate and irrigation pump (with optional irrigation pump)	-	✓
Flow indicator	Permeate flow	✓	-
Mechanical flow totaliser	Irrigation pump (with optional irrigation pump)	✓	-
Analysers	Aerobic zone dissolved oxygen	✓	✓
	Aerobic zone pH analyser	-	✓
	MBR zone mixed liquor suspended solids	-	✓
	Permeate turbidity	-	✓
	Permeate pH and free chlorine	-	✓
UV intensity sensor (with optional UV steriliser)		-	✓
Variable speed drives	Influent feed pump	-	✓
	Submersible aerator	✓	✓
	MLR pump	-	✓
	RAS/WAS pump	-	✓
	MBR permeate pump	-	✓
ClearAccess™ remote monitoring & control capabilities		-	✓

** Validated systems available on request

MODEL SELECTION

20	Capacity – 20 m³/day
45	Capacity – 45 m³/day
60	Capacity – 60 m³/day
75	Capacity – 75 m³/day
155	Capacity – 155 m³/day
225	Capacity – 225 m³/day
315	Capacity – 315 m³/day
XXX	Capacity – specify m³/day (max)
X	Roofed bioreactor – without
R	Roofed bioreactor – included
X	Dosing systems – standard
C	Dosing systems – custom (specify)
X	Treated effluent tank recirculation pump - without
E	Treated effluent tank recirculation pump - included
X	Pressurised UV reactor – without
U	Pressurised UV reactor – included
X	Supernatant sump – without
S	Supernatant sump – included
X	Irrigation pump – without
I	Irrigation pump – included
X	Standard instrumentation package
P	Premium instrumentation package
C	Custom instrumentation (specify)
X	Specifications – standard
C	Specification – custom

MBR - - - - -

NEED A QUOTE?

COMPLETE THIS TABLE
AND EMAIL TO...

sales@makwater.com.au



Disclaimer: This document has been created with the greatest care and attention, however it is possible that information is either incomplete or out of date. MAK Water is continuously updating and improving its products and services, so please contact us for more detailed or updated specifications. MAK Water will not be held responsible for any errors resulting from the use of the information supplied herein.

PRODUCT DATA SHEET

Packaged Sewage Pump Station (PSPS)

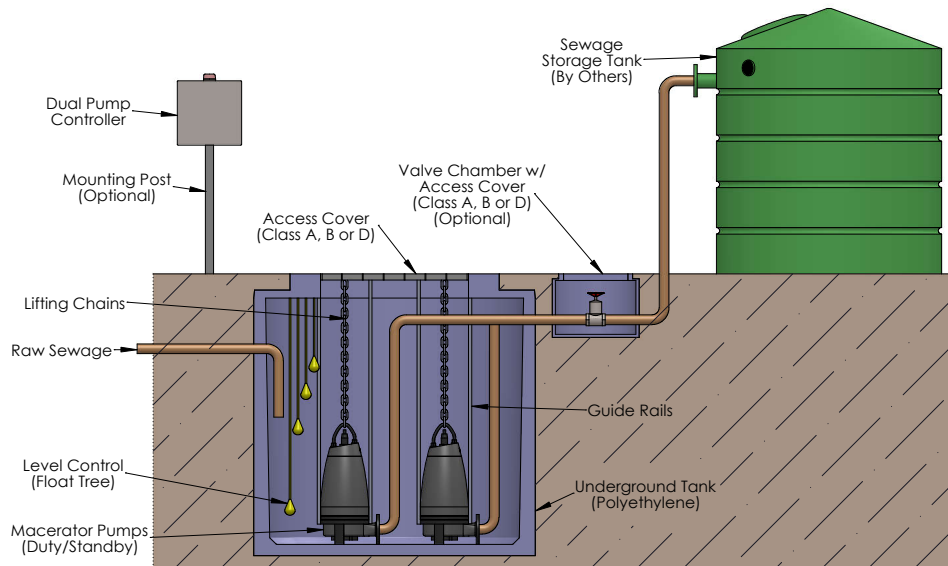
water | wastewater | sewage



OVERVIEW

MAK Water's Packaged Sewage Pump Stations (PSPS) are designed to receive raw domestic strength sewage into a below ground collection tank. The raw sewage is macerated to $\leq 2\text{mm}$ particle size, before discharging to a wastewater treatment plant for treatment. The standard package includes a polyethylene tank with access cover and all required PVC pipework, valves and fittings, dual macerator pumps, lifting chains and guide rails, dual pump controller and float level switches.

A range of common flow rates and tank sizes are provided to suit most wastewater applications. Optional equipment upgrades are available, including tank and access cover materials and a valve chamber; if required.



STANDARD SPECIFICATIONS

Parameter	Units	PSPS-01	PSPS-02	PSPS-03	PSPS-04	PSPS-06	PSPS-09
Pump flow rate* ¹	L/s	1	2	3	4.5	6	9
Pump discharge pressure* ¹	mH ₂ O	18	12.5	14.8	22	18.8	20.5
Tank capacity (nominal)	L	1,200 / 1,800 / 2,780 / 3,150					
Tank dimensions (approx.)	mm	1,200L: Ø1,100 x 1,665(h)					
		1,800L: Ø1,400 x 1,530(h)					
		2,780L: Ø1,400 x 2,150(h)					
		3,150L: Ø1,400 x 2,400(h)					
Tank (and optional valve chamber) access cover	Class A	Pedestrian traffic, nominal load 330 kg					
	Class B* ²	Occasional light vehicle traffic, nominal load 2,670 kg					
	Class D* ²	Slow moving commercial vehicle traffic, nominal load 8,000 kg					
Raw sewage inlet	-	Domestic strength					
Macerated sewage outlet	-	$\leq 2\text{mm}$ particle size					
Ambient design temperature	°C	max. 60					
Power supply	-	AC 415 V, 3 Phase, 50 Hz					
Control panel IP rating	-	IP56 (higher IP rating available on request)					
Pump motor (each)	kW	1.1	1.1	1.7	4.4	4.4	7.4

*¹Nominal flow/pressure, refer to pump curve for duty specific sizing *²Requires concrete support slab

STANDARD INCLUSIONS + OPTIONS

✓ = Standard Supply o = Optional Supply

Equipment		PSPS-01	PSPS-02	PSPS-03	PSPS-04	PSPS-06	PSPS-09
Duel macerator wastewater pumps		✓	✓	✓	✓	✓	✓
Discharge pipework (PVC, Class 12) with isolation and check valve for each pump		✓	✓	✓	✓	✓	✓
Guide rails, lifting chains, nuts and bolts in SS316		✓	✓	✓	✓	✓	✓
Tank materials	PE	✓	✓	✓	✓	✓	✓
	Custom (e.g. FRP, concrete)	o	o	o	o	o	o
Tank access cover	Class A	✓	✓	✓	✓	✓	✓
	Class B	o	o	o	o	o	o
	Class D	o	o	o	o	o	o
Valve chamber	With class A access cover	o	o	o	o	o	o
	With class B access cover	o	o	o	o	o	o
	With class D access cover	o	o	o	o	o	o
Control panel in power coated mild steel, with inner door and removable gland plate	Mains isolator and individual pump isolation	✓	✓	✓	✓	✓	✓
	Circuit breaker protected low voltage control and input circuitry	✓	✓	✓	✓	✓	✓
	Contactor and thermal overload protection of pumps	✓	✓	✓	✓	✓	✓
	Electronic short and overload protection of strobe/buzzer	✓	✓	✓	✓	✓	✓
	Visual and audible alarm, with mute/reset/test button	✓	✓	✓	✓	✓	✓
	Keypad with indicator lights for power on, level alarm, pump run/fault	✓	✓	✓	✓	✓	✓
	Auto/off/manual operation of pumps	✓	✓	✓	✓	✓	✓
	Maximum run timer and auto alternation of pump duty	✓	✓	✓	✓	✓	✓
	Volt free output (VFC) for common fault	✓	✓	✓	✓	✓	✓
	Additional VFC output card (for high/low level & pump run signals)	o	o	o	o	o	o
	Mounting post (HDG)	o	o	o	o	o	o

Instrumentation		Included
Level control float tree	Level switch - start	✓
	Level switch - stop	✓
	Level switch – high alarm	✓
	Level switch – low alarm	✓

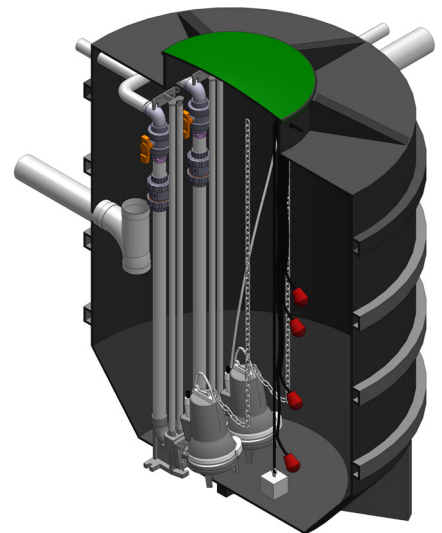
MODEL SELECTION

- 01 1 L/s Pump flow rate
 - 02 2 L/s Pump flow rate
 - 03 3 L/s Pump flow rate
 - 04 4.5 L/s Pump flow rate
 - 06 6 L/s Pump flow rate
 - 09 9 L/s Pump flow rate
 - XX Custom pump flow rate
-
- 1 Tank size - 1,200L
 - 2 Tank size - 1,800L
 - 3 Tank size - 2,780L
 - 4 Tank size - 3,150L
 - C Tank size - custom
-
- X Tank material - PE
 - C Tank material - custom
-
- A Access cover - class A
 - B Access cover - class B
 - D Access cover - class D
-
- X Valve chamber - without
 - A Valve chamber - with class A access cover
 - B Valve chamber - with class B access cover
 - D Valve chamber - with class D access cover
-
- X Additional VFC output card - without
 - E Additional VFC output card - included
-
- X Control panel mounting post - without
 - P Control panel mounting post - included
-
- X Specifications - standard
 - C Specifications - custom

NEED A QUOTE?

COMPLETE THIS TABLE
AND EMAIL TO...

sales@makwater.com.au



Disclaimer: MAK Water is continuously updating and improving its products and services, so please contact us for more detailed information or to confirm specifications. MAK Water takes no responsibility for any errors resulting from the use of information contained within this document.

PSPS _ _ _ _ _ _ _ _ _ _ _ _

SAL-PDS-050 | JUL-2020

C2 - Hydroflux Epco

6.2 Pricing Schedule

6.2.1 Included Items

ITEM	DETAIL	PRICE (\$)
1	1 x 175 m ³ /d MENA Water Packaged Plant MR175 – I (above ground)	\$652,687
2	1 x 175 m ³ /d MENA Water Packaged Plant MR175 – I (inground)	\$439,605
3	1 x Installation & Commissioning	\$226,200
4	Sludge dewatering unit	\$35,000
TOTAL		NA

6.2.2 Optional Items

ITEM	DETAIL	PRICE (\$) EXCL GST
1	Site Attendance (add for Travel & Accommodation expenses)	\$1,200.00
2	None	\$0,000.00

6.3 GST

GST is excluded from this quotation and any prices provided in communications. GST will be added to the value at the appropriate rate.

Datasheets attached in Appendix C2

18th May 2021

Meinhardt Group

Attention: Mihail Trifu
By Email: Mihail.Trifu@meinhardtgroup.com

Re: Nambucca retirement village

Hi Mihail,

On the following pages you will find information for a budget pricing round for your village project sewage treatment plant.

We have put forward two pricings for you to consider. One is for a fully above ground system, considered as tank on slab. This is the MR-I 175. For this system we would provide the mechanical scope with built in plug and play electricals and your team would provide slab etc. The other option is an MR-U 175, with inground tanks constructed by you and a small treatment element above ground.

For sizing purposes I have provided a general arrangement of the MR-I above ground option as both options have the same foot print.

We have priced the installation & commissioning separately if you choose to do your own install.

In terms of compliance, the system will produce A+ quality effluent suitable for sub-surface irrigation as defined in the council guidelines. Irrigation by others. Sludge is dewatered on-site with a bagging system that would produce 50 kg of dewatered sludge per day for offsite disposal in a registered biowaste facility.

We trust this proposal provides you with enough information for this round and look forward to supporting you further as the project progresses.

Best Regards,

Paul Cobbin | General Manager
Hydroflux Epco

2021 PROJECT PROPOSAL



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1 PROPOSAL SUMMARY

This budget proposal is for the design, manufacture and supply of a MENA-Water package MBR treatment solution for the Macksville Retirement Village.

Key Points to our offer include:

- Proven experience in packaged sewage treatment plant design and build
- 200+ references in remote locations across Europe, Middle East and Africa
- High quality fabrication in Dubai using Mitsubishi membranes
- Robust Reliable operation
- Local back up from Hydroflux Epco, with staff based in Sydney
- Potential for remote monitoring via HyConnect service

Clients can be assured that our team provides the highest level of package plant technical expertise within Australia, from design, fabrication, sizing, commissioning and refurbishment.

2 FEATURES AND SPECIFICATIONS

The MENA-Water package MBR plant range provides a number of process and design advantages, these are summarised as follows:

- **Large Installation Base** Over 200+ references across remote locations in Nth Africa, Europe, Middle East and New Zealand
- **Robust Configuration** MENA-Water products are specifically designed for remote location sites typically mine sites, resorts and small rural communities
- **Membrane based** Small footprint with a high treated water quality
- **Modular** Allows simple expansion of the treatment facility
- **Material of Construction** Aluminium/stainless steel clad system

2.1 Specification

The following specification provides some technical data with respect to the system offered. The package plants are built to withstand years of remote service.

- A plant that is considered set and forget, with intermittent attendance from an operator
- Remote telemetry for fault indication and process monitoring can be offered as an option
- Limited routine maintenance
- Duty / Standby pumps and blowers

2.2 Principle of Operation

The MENA-Water MBR package plant is a pre-engineered complete system for wastewater treatment. MBR technology combines biological treatment with membrane filtration, which facilitates high biomass concentration and high effluent quality. With a well proven and compact design, MENA-Water package plant achieves reliable system operation within smallest footprint area and fast realization time. The treated water is suitable for reuse (e.g. irrigation, cleaning or firefighting purposes) or discharge to sensitive water bodies.

The MENA-Water MBR package plant is ideal where requirements call for high quality effluent, economical treatment, rapid availability, adaptable and modular concept, and minimum construction works on site. Due to the automatic operation and possibility for remote monitoring of the plant the required operation and maintenance activities are kept to a minimum.

All main components of the plant are pre-assembled in a robust stainless steel frame container for easy transportation, installation and accessibility.

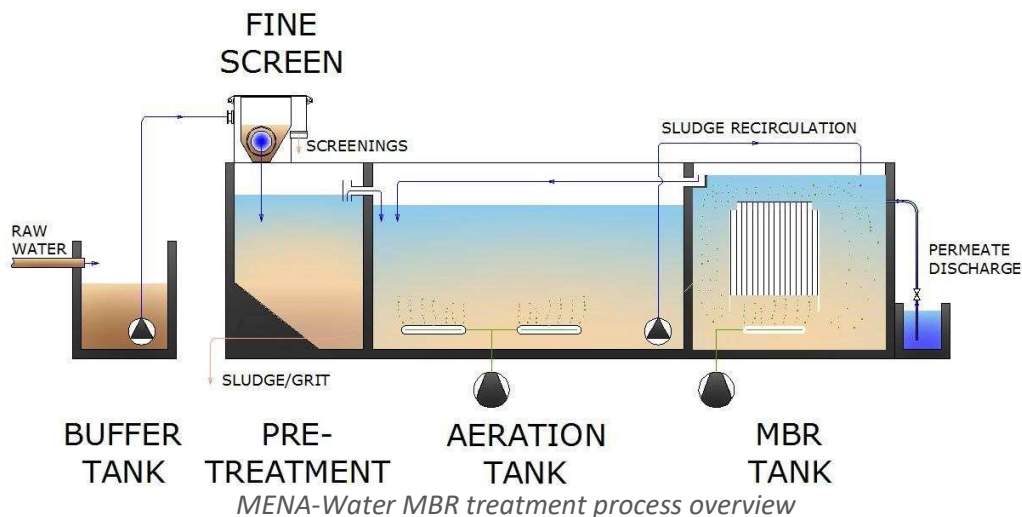
Durability, long life time and high quality of the MBR package plant is ensured by careful selection of components and material. All components are sourced from established western European manufacturers; and engineering, construction and assembly is realized in MENA-Water factory based on German standard. Stainless steel material is used for membrane tank and piping to account for long-time service life. Blowers, permeate pump, instrumentation and control panel are housed in an isolated and ventilated machine & control

compartment within the container. External feeding pumps with interconnection piping need to be fixed on site after placing the container on the foundation.

Equipment inside the package plant housing:

- Pre-treatment equipment consist of inlet strainer, lamella settling system
- Aerated fixed bed reactor
- Aeration tank with respective diffusers for activated sludge process
- Membrane tank incl. membrane modules and air scouring system
- Permeate extraction pump, backwash and chlorine dosing system
- Instrumentation and control equipment, capable for remote monitoring
- Pump for internal sludge recirculation
- Blowers for aeration
- Related piping, valves, appurtenances

The following chart provides a simplified overview for the main MENA-Water MBR treatment process; the respective steps are briefly explained in the chapters below.



2.2.1 Settlement Tank with Pre-Treatment

The raw sewage is first fed to a fine screen to remove depresses and fibrous materials. The screen is sized to the peak flow and has a mesh size of max. 3 mm.

Then screened wastewater flows in the primary settling chamber which has sufficient retention time to settle all grit and heavy sludge (> 1 h).

Grease and fats are retained in the settling chamber by a baffle wall and have to be removed manually by hand rake from time to time (approx. once per week).

2.2.2 Fixed Bed Reactor

Pre-treated wastewater flows to a tank equipped with aerated fixed bed. In this treatment step the key processes for COD removal and nitrification starts. The plant is also capable for intermittent denitrification controlled by the automatic program to achieve nitrogen reduction as required. Via overflow the wastewater transfers by gravity to the anoxic tank.

2.2.3 Anoxic Tank

This tank can serve as anoxic zone for denitrification process, depending on the prevailing effluent requirements. Overflow by gravity to the aeration tank.

2.2.4 Aeration Tank

In the aeration tank fine bubble diffusers and mixers are installed to supply sufficient oxygen for the activated sludge process (pressurized air is fed by the blowers installed inside the container). In the aeration tank sludge concentration is maintained to be in the range of 10 g/l. Biological removal of nitrogen and phosphorous can be achieved by optimized process control of the aeration pattern (controlled cycles of anaerobic / anoxic / aerobic phases). Connected to the aeration tank there is the recirculation chamber with pumps feeding to the MBR filtration chamber.

2.2.5 Membrane Filtration

The water - activated sludge - mixture is pumped to the membrane chamber by recirculation pumps via an additional top strainer. The pumps supply approx. 3 times the filtrate quantity to the membrane chamber; excess fluid flows back into the aeration chamber. In this way, the sludge concentration and level in the membrane chamber is always kept at constant level, i.e. membrane performance is enhanced while activated sludge is maintained in continuous recycling process.

The membrane modules are a physical ultrafiltration system allowing only high quality water to pass through, from the outside to the inside. Scouring aeration is provided to keep the membrane surface always clean. Clear water (permeate) is sucked via permeate pump with a negative pressure ranging from 30 mbar to 300 mbar. Average flux rate through the membrane is designed to be 24 l/(m²h). Normal automatic operation sequences consist of filtration - relaxation - cycles in an approx. interval of 10 min – 2 min, i.e. permeate pump runs for 10 min. and then stops for 2 min. to allow for membrane relaxation.

Suction pressure is continuously monitored via transmitter/manometer. Increase of negative pressure indicates clogging of the membranes and implies requirement for cleaning. Key parameters are continuously measured and linked to the plant control system so the respective measures / warnings are released automatically if necessary.

The permeate pump delivers the filtered water into the permeate tank located on top of the MBR container. From there the clean water overflows via gravity to the treated water tank.

2.2.6 Automatic Backwash and Chemical Cleaning

Approximately every six hours clean water from the permeate tank is used for backwash operation. This means permeate pump stops and permeate flows from permeate tank back to the membrane modules. This regular process is activated automatically and enhances the overall performance of the filtration process.

Furthermore, to prevent fouling phenomenon on the membranes, approx. once per week an extended chemical backwash step ("CIP") is foreseen.

During CIP phase, the backwash operation is performed for approx. 30 min. with chlorine solution.

2.2.7 Chlorine Dosing

A dosing system is foreseen to deliver chlorine solution to the permeate tank. To keep the system disinfected and to prevent re-contamination, chlorine dosing is automatically applied approx. once in two hours for a few minutes, in addition to the dosage during CIP backwash.

2.2.8 Low Flow Operation (ECO-Mode)

An energy saving mode will be automatically activated during low flow times.

The plant operates in normal filtration mode as described above when the water level ranges in certain limits. When the water level falls below low level limit, the plant switches automatically to ECO mode operation; this means no filtration will take place, and sludge recirculation and air scouring will only run intermittent for few minutes in every hour to keep the process stable.

As soon as the water level in the aeration tank exceeds a pre-defined limit, the plant switches back to normal filtration mode again. Depending on the actual prevailing conditions, these settings can be adapted and optimized.

The control of the system is provided through a programmable logic controller (PLC) for automatic operation to minimize the need for operator attendance. Automatic control is implemented by sensors placed in different locations of the plant. However, all components can be operated in manual mode, if required.

Alarm signals for high levels (overflow) in tanks and for faults give warnings to the operator. Furthermore, an online SCADA system can be installed for convenient remote monitoring of the plant.

Characteristics of the built-in control cabinet:

ITEM	VALUE
Mains voltage	400/230 V, 50 Hz
Control voltage	24 V DC
Lamp voltage	24 V DC
Protection class, front	IP 54

The overall system can be connected with internet via data SIM card or Ethernet cable and can be fully controlled and monitored from any smart cell phone or computer. All parameters and operation modus can be monitored, and settings can be as well adjusted.

2.3 Design Data

The following table summarises the capacity of the system:

ITEM	VALUE
Capacity (m ³ /d)	175
BOD5 (mg/L)	250
Total Suspended Solids	200
TKN (mg/L)	50
Fats, oil and grease (mg/L)	50
Total Phosphorous (mg/L)	12
pH	6.5 – 7.3

Please note the following:

- The raw sewage will be of a normal domestic nature with no non-biodegradable substances, industrial wastes or substances poisonous to the plant biomass are to be present in the flow. The domestic sewage shall be within the range set out in the table above. Any kitchen waste must to be pre-treated in an appropriate grease removal system
- The inflow into the plant will be reasonably uniformly spread throughout at least 16 hours of the day. This requirement not applicable if an inlet flow balance tank fitted
- The plant will commence operation on at least 30 to 40% of the ultimate load it is designed and purchased to serve

2.4 Effluent Quality Data

The following table summarises the expected effluent quality (not guaranteed) of the system:

ITEM	MEDIAN VALUE	90%ILE
BOD5	<15 mg/L	<20 mg/L
Ammonia	< 5 mg/L	< 10 mg/L
Total Suspended Solids	<5 mg/L	<10 mg/L
E.Coli	<10 CFU/100mL	<20 CFU/100mL

3 SAMPLE INSTALLATIONS

3.1 Dubai DS 187 Sewage Treatment Plant

4,000 m³/day MBR plant

Tanker receiving station

Sewage from a construction labour camp

High quality treated effluent reused for irrigation

Fully above-ground installation



3.2 Durrat Al Bahrain

2,000 m³/day MBR plant

Constructed in three phases as inflow increased

Sewage from a new residential development constructed on artificial islands

High quality treated effluent reused for irrigation of green area in the development



3.3 Al Mogran Commercial and Residential Complex

1,000 m³/day MBR plant

Sewage from a commercial and residential complex including apartments, offices, hotels, schools and recreational park

High quality treated effluent reused for irrigation in the nearby golf course



4 SCOPE OF SUPPLY

4.1 Hydroflux Scope

4.1.1 Equipment

- Rotary drum screening
- Tankage MR-I option all above ground
 - Enclosed in a 40 Container with stainless steel tanks, chequered top, control room, internal piping generally of stainless steel and ABS
 - Above ground option only:
 - Balance tank
 - Anoxic tank zone
- Tankage MR-U option all inground
 - Construction by others
 - Tank process configuration same as with the I version
- Mixing either tank option
 - Balance tank mixing
 - Anoxic tank mixer (1 off)
- MBR sludge recirculation pumps (2 off, D/S)
- Aeration diffusers, 90mm x 750mm length
- Aeration blowers, side channel type (2 off, D/S)
- MBR Module, PVDF 0.05 micron, Mitsubishi
- MBR Permeate Pump, Self-priming centrifugal (1 off)
- CIP Dosing system with dosing pump, 50L chemical tank
- Internal valving
- Control panel with Siemens S7-1200 PLC and 6" HMI – Hydroflux standard design and specifications
- Flow instrumentation
- Sludge pump, submersible type (1 off)
- Pre-piped and wired

4.1.2 Engineering and Documentation

- Engineering Assistance
- Proposed site layout
- General Assembly Drawing
- Control philosophy, in O&M manual
- P+ID
- Operation + Maintenance manual (1 x electronic)

4.1.3 Delivery and Commissioning

- Delivery to site, unloading by others
- Commissioning and training visit

4.1.4 Warranty

- Twelve (12) months from commissioning or maximum Eighteen (18) months from delivery to site

4.1.5 Specifications

- Please refer to the attached Application of SS which identifies the limits for H₂S and Salinity (among others) as apply for the SS construction
These limits apply for the medium and the operating environment
- Any performance data provided is an estimation and not an express performance guarantee
- The equipment offered is of a proprietary standard design proven in this application around the world and in Australia
- The MENA equipment offered is fabricated in Dubai

4.2 Client Scope

4.2.1 General

- Platforms, stairs and handrails for operation, service and maintenance
- Sludge ponds/long term storage tanks
- Plant fencing and security
- Plant site lighting not included by Hydroflux
- Power supply/transformers

4.2.2 Engineering, installation and other works

- Civil works including inground takes if the U version is preferred
- Crane for off-loading on delivery
- Field wiring and electrical installation works (labour and materials)
- Seed sludge
- Power for construction and commissioning

4.2.3 Specifications

- Comments on Clients Specification

5 OPERATION AND MAINTENANCE

The following summarises the major operation and maintenance activities required for optimum performance of the MBR plant.

5.1 Routine Maintenance

Routine maintenance is restricted to the following:

Daily

- Check operation of pumps
- Check operation of air blowers
- Check membrane air scouring
- Clean membrane unit strainers
- Check permeate flow and visual inspection of permeate (should be free of solid material)
- Check permeate pump suction pressure
- Check MLSS concentration
- Check the amount of chlorine solution (disinfection and CIP dosing system)
- Check for any alarms in the control panel HMI

Weekly

- Check the screens and clean/empty bins if needed
- Remove FOG from settling tank
- Check bubble pattern in aeration tank

Monthly

- Check the submersible pumps
- Check the submersible mixers
- Check for any leakage in pipes and fittings
- Check the dosing system
- Check the control panel for damaged electric components such as fuses, lights etc.
- Check the instrumentation

Quarterly

- Check for sludge accumulation in the membrane module
- Clean pumps, air blowers and electric motors if needed

Six Monthly

- Check air diffusers in aeration tank
- Check the membrane modules

Annually

- Check for any loose or damaged fitting, valve, support
- Check the control panel for any loose wire or component

5.2 Service and Maintenance

Hydroflux staff are expert at service and maintenance of all Hydroflux equipment. Customised service agreements, such as annual inspections, can be tailored to suit client needs.

6 COMMERCIAL

Hydroflux Pty Ltd is a specialist engineering firm that provides wastewater process equipment for the municipal, industrial, mining and commercial markets.

As the exclusive Australian Agent for HUBER Technology, Hydroflux have access to the world's leading solid liquid separation technology. **There are over 1000 Hydroflux Epco installations already across Australasia and Middle East**, within sewage treatment plants, industrial wastewater plants and packaged sewage systems.

This quotation is based on the supply of components and engineering as described herein. Hydroflux has the capacity to undertake complete installation packages should this be preferred. Hydroflux has comprehensive insurance policies including Public liability (\$20M) and professional indemnity (\$10M).

6.1 Proposal Validity

The budget pricing is valid for 60 days from the date of the proposal and has been calculated using an exchange rate of AUD = EURO 0.6127. Ninety per cent of the final value shall be subject to foreign exchange adjustment on the date of the order. Hydroflux Terms of Sale applies to this quotation.

6.2 Pricing Schedule

6.2.1 Included Items

ITEM	DETAIL	PRICE (\$)
1	1 x 175 m ³ /d MENA Water Packaged Plant MR175 – I (above ground)	\$652,687
2	1 x 175 m ³ /d MENA Water Packaged Plant MR175 – I (inground)	\$439,605
3	1 x Installation & Commissioning	\$226,200
4	Sludge dewatering unit	\$35,000
TOTAL		NA

6.2.2 Optional Items

ITEM	DETAIL	PRICE (\$) EXCL GST
1	Site Attendance (add for Travel & Accommodation expenses)	\$1,200.00
2	None	\$0,000.00

6.3 GST

GST is excluded from this quotation and any prices provided in communications. GST will be added to the value at the appropriate rate.

6.4 Payment Terms

The following payment terms apply to this quotation:

- 30% deposit, net 7 days
- 70% on delivery to site, net 7days
- 30 days terms only apply where credit has been approved by Hydroflux (does not apply to the deposit)

6.5 Delivery Period

- Ex-Works delivery shall be twenty (20) weeks from Approval to Manufacture
(Please allow an additional 3 weeks if this period occurs over Christmas / New Year and 4 weeks if this period occurs over August)
- Seafreight, customs clearance & delivery to site shall be eight (8) weeks from ex-works delivery

6.6 Contract Conditions

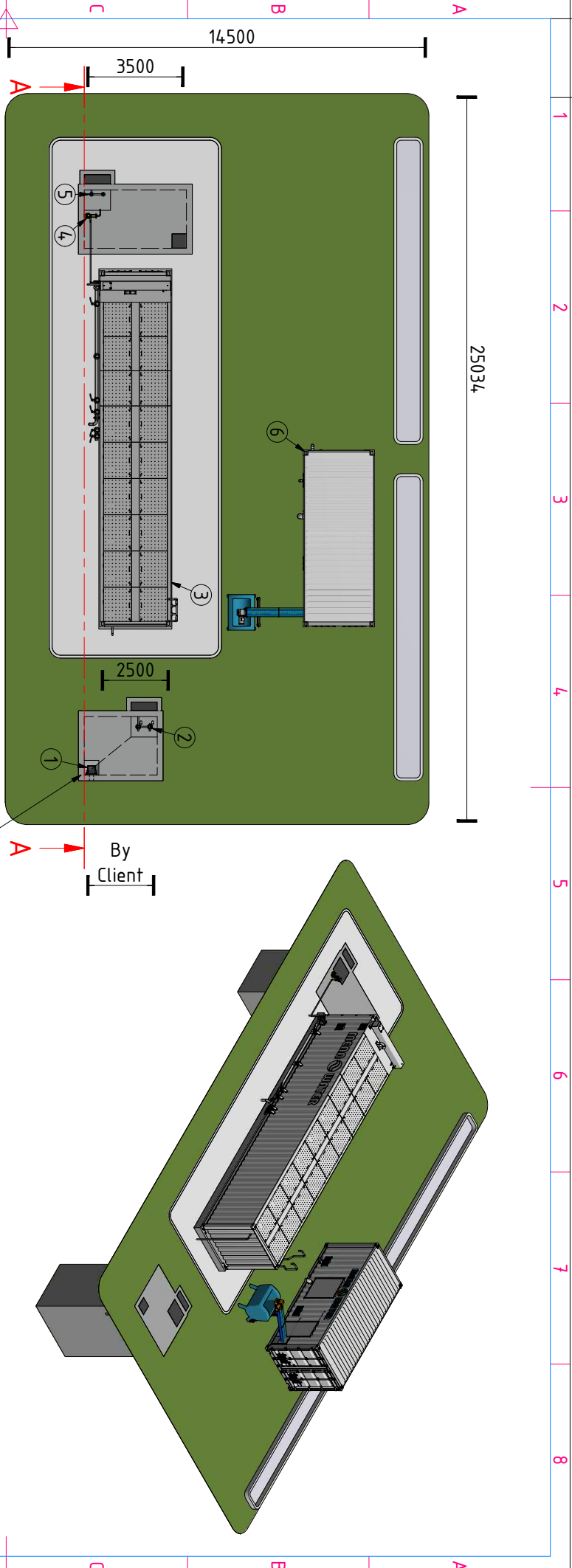
The following conditions apply to this proposal:

- Hydroflux Terms of Sale applies to this proposal, unless otherwise agreed
- No allowance has been made for security and/or retentions for the warranty period. This can be factored into the proposal if required
- No allowance has been made for liquidated damages. This can be factored into the proposal if required
- Consequential or undefined losses or similar are not accepted

7 ATTACHMENTS

The following have been attached to this proposal;

ITEM	REFERENCE	DESCRIPTION
1	HE Installation List	Package plant installations
2	HE-Mena reference	Similar indicative installation



Isometric view
(1 : 160)

6	1	Sludge Dewatering Unit (SDU)	Optional
5	2	Treated Water Discharge Pumps (TWP)	By Client
4	1	Service Water Pump (SP)	By Client
3	1	PACKAGE PLANT MW-MR-150-i	By Client
2	2	Lifting Station Pump (LSP)	By Client
1	1	Basket Screen (BKL) / SCREENING	Optional
Item#ref	Quantity	Title / Name, designation, material, dimension etc.	Article no. / Reference

Equipment List

Designed by:	Drawn by:	Approved by:	Paper Size:	Date:	Scale:
A.G.	C.p.dnyani	A.G.	A3	06-08-2018	N.T.S.
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Title: MW-MR150-I					
Drawing number:			Edition:		
Plant Layout			Sheet:		
PI-MR150-I-GD-(1)			VO 1 / 1		
E-mail: info@mena-water.com ~ Web: www.mena-water.com					



MBR CONTAINER SEWAGE PLANT - DURRAT AL BAHREIN, BAHREIN



Effluent Water for Irrigation

Durrat al Bahrain development are the largest artificial islands in the Kingdom of Bahrain with an area of about 20 million square meters.

For the civil work and the first residents the concept was to transfer the sewage into clean water, usable for construction works and irrigation of green area.

MENA WATER FZC got the contract to build up the treatment plant. Basis is the established package modular plant with MBR technology.

The plant provides bacteria free clean water at smallest foot print area.

The plant is prefabricated as containerized system made of stainless steel. All components are of German origin. The plant is designed as modular, mobile system which is capable to be extended and relocated on demand.

The 1st phase started 2008 for 300 m³/d, in 2009 it was extended for further 600 m³/d and since August 2014 works for further extension to 2000 m³/d were completed.

Project Data

- Capacity 2000 m³/day build in 3 stages
- Tanker Discharge Station
- Fine Screening Pre-Treatment
- Buffer & Treated Water Tanks
- MBR Container Plants
- Sludge Dewatering
- Odor Control



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1300 417 697

EXCLUSIVE AGENTS FOR



A member of the HYDROFLUX Group



ISO 9001 : 2015
ISO 14001: 2015
ISO 31000: 2018
ISO 45001: 2018



PACKAGED PLANT INSTALLATION LIST



ISO 9001 : 2015
ISO 14001: 2015
ISO 31000: 2018
ISO 45001: 2018

HYDROFLUX
epco

Year	Client	Project Name	Equipment Type	No. of Units	Size	Location
2020	Fimali Ltd	St Margarets WTP	Packaged Drinking Water Plant	1	250 KLD	PNG
2020	Newcrest Mining	Lihir STP	Roadtrain Plant, Ro9, QPRESS	4	600 KLD	PNG
2020	Koppens	Saibai STP	RBC Based STP	1	140 KLD	QLD
2020	Koppen	Erub Island STP	RBC Steel	2		QLD
2020	GDFC PNG Ltd	Wabag STP	MENA Water STP	1	600 KLD	PNG
2019	Ok Tedi	Tabubil STP	HUBER Ro9 Spiral Screen	2	Ro9/500/6	PNG
2019	BMA	South Blackwater	Roadtrain Packaged Plant - Welded	1	40	QLD
2019	Ok Tedi	Tabubil STP	HUBER QPRESS	1	Q440 Container	PNG
2018	Burdekin Shire Council	Ayr STP	EpcO Trickling Filter	1		QLD
2018	Ahura Resorts	Ahura Resorts	Roadtrain Packaged Plant - Bolted	2	100W	FIJI
2018	Ok Tedi	Kiunga STP	Roadtrain Packaged Plant - Welded	2	120W	PNG
2017	Niugini Link	Newcrest Lihir Assemblies	Roadtrain Packaged Plant - Welded			PNG
2016	Newcrest Mining	Lihir Island	Welded Rectangular Package Plant	1	140m ³ /day	PNG
2015	Water PNG	Kundiawa	Bolted Package Plant	1	140m ³ /day	PNG
2015	Oilsearch (PNG) Ltd.	Moro Village	Bolted Package Plant	1	140m ³ /day	PNG
2014	Glencore Coal	Oaky Creek	Steel	1	160m ³ /day	QLD
2014	Simmonds & Bristow	Hay Point Mackay	Steel	1	50m ³ /day	QLD
2013	Poruma Island	Poruma Island Torres Strait Community	Steel	1	100m ³ /day	QLD
2012	Newcrest Mining	Lihir Island	Steel	1	600m ³ /day	PNG
2012	Bay Developments	Nebo Junction	Steel	1	150m ³ /day	QLD
2009	Mabuiag Island	Mabuiag Island Torres Strait Community	RBC Steel	1	100m ³ /day	QLD
2009	Warraber Island	Warraber Island Torres Strait Community	RBC Steel	1	75m ³ /day	QLD
2008	Masig Island	Masig Island A678	RBC Steel	1	135m ³ /day	QLD
2006	Oilsearch (PNG) Ltd.	Oilsearch (PNG) Ltd	Bolted steel	1	140m ³ /day	PNG
2006	Wujal Wujal Aboriginal Community	Wujal Wujal Aboriginal Community	RBC Concrete	1	205m ³ /day	QLD
2006	Queensland Nickel	Yabulu Qld	Steel	1	90m ³ /day	QLD
2005	Port Hinchinbrook Resort	Port Hinchinbrook Resort	Steel	1	270m ³ /day	QLD
2003	Island Coop Council	Darnley Island	RBC Steel	1	150m ³ /day	QLD
2002	BHP Mining Ltd.	South Blackwater	Steel	1	45m ³ /day	QLD
2001	Daydream Island Resort	Daydream Island Resort	Steel	1	300m ³ /day	QLD
2001	Coen Township	Coen	Concrete	1	200m ³ /day	NQ
2000	P&O Resorts Ltd.	Lizard Island Resort	Steel	1	70m ³ /day	QLD
2000	Peabody Moura Mining	Peabody Moura Mining	Steel	1	38m ³ /day	QLD
1999	P&O Resorts Ltd.	Bedarra Island Resort	Concrete	1	25m ³ /day	QLD
1999	P&O Resorts Ltd.	Brampton Island Resort	Concrete	1	100m ³ /day	QLD
1999	Palm Island Council	Palm Island	Sewage Treatment Plant	1		QLD
1999	Palm Island Council	Palm Island	Water Treatment Plant	1		QLD

1998	Sun Metal Corp Ltd	Zinc Refinery, Townsville	Welded Steel	1	100m³/day	QLD
1998	South Blackwater Coal Mine	Blackwater	Welded Steel	1	22m³/day	QLD
1998	Pasminco Century Zinc Ltd.	Karumba Port Facility, Karumba	Welded Steel	1	126m³/day	QLD
1998	Bauhinia Shire Council	Springsure Town	Welded Steel	1	250m³/day	QLD
1997	Chevron Petroleum	Bush Camp Plant, Gobe	Steel	1	50m³/day	PNG
1997	Leiner Davis Gelatin	Beaudesert	8400/04/15/FOO	1		QLD
1997	Chevron Petroleum	Main Camp, Gobe	Steel	1	126m³/day	PNG
1995	Heron Island Resort	Heron Island Resort, Gladstone		1	Upgrade	QLD
1995	Placer Pacific Ltd.	Osborne Gold Mine, Chatsworth	Steel	1	100m³/day	QLD
1994	P&O Resorts Ltd.	Silky Oaks Lodge, Mossman	Steel	1	45m³/day	QLD
1992	Raysut Industrial Estate	Raysut, Oman, Middle East	Concrete	1	470m³/day	OMAN
1991	Chevron Petroleum	Mini Refinery, Kutubu	Bolted Steel	1	55m³/day	PNG
1991	Petroleum Dev Oman	Marmul Oilfield, Oman, Middle East	Concrete	1	350m³/day	OMAN
1991	Nizwa Town Council	Nizwa Souq (Markets)	Concrete	1	100m³/day	OMAN
1991	Chevron Petroleum	Moro Airfield #2, Kutubu	Bolted Steel	1	137m³/day	PNG
1991	Chevron Petroleum	Iagifu Ridge #1, Kutubu	Bolted Steel	1	137m³/day	PNG
1991	Chevron Petroleum	Iagifu Ridge #2, Kutubu	Bolted Steel	1	137m³/day	PNG
1991	Chevron Petroleum	Mini Refinery #2, Kutubu	Bolted Steel	1	157m³/day	PNG
1990	Petroleum Dev Oman	Marmul Oilfield, Oman, Middle East	Concrete	1	300m³/day	OMAN
1990	Petroleum Dev Oman	Lekhwaier Oilfield, Oman, Middle East	Concrete	1	130m³/day	OMAN
1990	Petroleum Dev Oman	Fahud Oilfield, Oman, Middle East	Concrete	1	300m³/day	OMAN
1990	Chevron Petroleum	Moro Airfield, Kutubu	Bolted Steel	1	137m³/day	PNG
1990	Mt Isa Mines Ltd	Hilton Mine, Mt Isa	Steel	1	130m³/day	QLD
1989	Sir M McDonald & Partners	Gulf Hotel, Oman, Middle East	Concrete	1	230m³/day	OMAN
1989	ETS Consultants	Hinchinbrook Island Resort, Carwell	Steel	1	35m³/day	QLD
1989	E & P Smith	Glen Aplin Caravan Park	Steel	1	27m³/day	QLD
1988	M E Wrighton & Associates	Heron Island Resort, Gladstone	Concrete	1	175m³/day	QLD
1988	Petroleum Dev Oman	Oman, Middle East	Concrete	1	110m³/day	OMAN
1988	BHP Mining Ltd.	Ok Tedi Mining #8	Bolted Steel	1	900m³/day	PNG
1987	Petroleum Dev Oman	Yibal Oilfield, Oman, Middle East	Concrete	1	110m³/day	OMAN
1986	Petroleum Dev Oman	NIMR Oilfield, Oman, Middle East	Concrete	1	94m³/day	OMAN
1986	McIntyre & Associates Consulting Engineers	QLD Railways Jilalan Depot, Sarina	Steel	1	47m³/day	QLD
1986	Delhi Petroleum Ltd.	Jackson Oilfield, Jackson	Steel	1	45m³/day	QLD
1986	Min Elec & Water	Ghubrah Power Station, Oman	Steel	1	90m³/day	OMAN
1986	GHD Engineers	Horseshoe Bay, Magnetic Island, Townsville	Steel	1	81m³/day	QLD
1986	McIntyre & Associates Consulting Engineers	Toomulla Estate, Townsville	Steel	1	103m³/day	QLD
1986	CSR Energy Division	South Blackwater Mine #3	Steel	1	45m³/day	QLD

1985	Aran Consultants Ltd.	Port Services Authority, Oman, Middle East	Steel	1	110m ³ /day	OMAN
1985	Kilpatrick Green Pty Ltd.	Channel Island Power Station, Darwin	Steel	1	30m ³ /day	NT
1985	Maclean Wade & Partners	Comsteel Ruwolt, Ipswich	Steel	1	54m ³ /day	QLD
1984	Delta Ltd.	Oman Develop Council Building, Oman, Middle East	Steel	1	23m ³ /day	OMAN
1984	Majan Consultants Ltd.	Musandam Dev Council, Oman, Middle East	Concrete	1	260m ³ /day	OMAN
1984	Delta Ltd.	Government Laboratory, Oman	Steel	1	6m ³ /day	OMAN
1983	Malatan Trading & Construction	Malatan Villas, Oman, Middle East	Steel	1	60m ³ /day	OMAN
1983	Delta Ltd.	Bintariq Villas, Oman, Middle East	Steel	1	10m ³ /day	OMAN
1983	Majan Consultants Ltd.	Towell Project, Oman, Middle East	Steel	1	50m ³ /day	OMAN
1982	Bechtel MKO	Ok Tedi Mining	Bolted Steel	1	218m ³ /day	PNG
1982	CSR Energy Division	Boundary Hill Mine, Biloela	Steel	1	68m ³ /day	QLD
1982	Bechtel MKO	Ok Tedi #2	Bolted Steel	1	218m ³ /day	PNG
1982	Queensland Railways	Bluff Trainmans Quarters, Bluff Township #3	Steel	1	79m ³ /day	QLD
1982	MIM Mimets Division	Glenden Township, Glenden	Steel	1	127m ³ /day	QLD
1981	Petroleum Dev Oman	Rima Camp Oman, Middle East	Concrete	1	112m ³ /day	OMAN
1981	Theiss Bros.	South Blackwater Colliery # 2	Steel	1	27.3m ³ /day	QLD
1981	Iwasaki Sangyo Pty Ltd.	Iwasaki Resort, Yeppoon	Steel	1	90m ³ /day	QLD
1981	QLD Alumina	Refinery Plant #2, Gladstone	Concrete	1	454m ³ /day	QLD
1981	CSR Energy Division	Drayton Mine, Muswellbrook	Steel	1	79m ³ /day	NSW
1981	Osborne Constructions Pty Ltd.	Tangalooma Resort, Moreton Island	Steel	1	136.5m ³ /day	QLD
1981	Theiss Dampier Mining	Moura Mine #2, Moura	Steel	1	40m ³ /day	QLD
1980	Crooks Michell Peacock & Stewart Consulting Engineers	QLD Cement & Lime, Gladstone	Steel	1	45.5m ³ /day	QLD
1980	Crooks Michell Peacock & Stewart Consulting Engineers	QLD Cement & Lime, Gladstone	Steel	1	91m ³ /day	QLD
1980	Crooks Michell Peacock & Stewart Consulting Engineers	QLD Cement & Lime, Gladstone	Steel	1	80m ³ /day	QLD
1980	Crooks Michell Peacock & Stewart Consulting Engineers	QLD Cement & Lime, Gladstone	Steel	1	27.3m ³ /day	QLD
1980	Spansteel Ltd.	Nanango Caravan Park	Steel	1	45.5m ³ /day	QLD
1980	Theiss Bros.	Ballamoo Colliery	Steel	1	9m ³ /day	QLD
1979	J Wilson & Partner Consulting Engineers	Resthaven Retirement Village Brookfield	Steel	1	75m ³ /day	QLD
1979	G Burchill & Partners	Tanglewood Estate, Bogangar	Steel	1	45.5m ³ /day	NSW
1979	JJ & M McKellar	McKellar Apartments Cairns	Steel	1	30m ³ /day	QLD
1978	Austral Pacific Fertilisers	#2 Gibson Island	Steel	1	59m ³ /day	QLD
1978	Theiss Bros.	South Blackwater Mine # 1	Steel	1	27.3m ³ /day	QLD
1978	BRF Eng Pty Ltd.	Oakey Creek Mine	Steel	1	168m ³ /day	
1978	Sun Cost Resorts Pty Ltd.	Surfair #2 Mudjimba	Steel	1	114m ³ /day	QLD

1977	Queensland Railways	Bluff Residents Plant	Steel	1	27.3m ³ /day	QLD
1976	Theiss Peabody Mitsui Coal	Moura Mine Plant	Steel	1	91m ³ /day	QLD
1976	QLD Phosphate Ltd.	Monument Township, Duchess	Steel	1	63.7m ³ /day	QLD
1976	Queensland Railways	Bluff Trainmans Quarters	Steel	1	27.3m ³ /day	QLD
1975	Willmore & Randell Pty Ltd.	Wimbledon Heights, Browns Plains	Steel	1	455m ³ /day	QLD
1975	Newhope Collieries Pty Ltd.	Ipswich	Steel	1	16m ³ /day	QLD
1975	AA & VJ Reid.	Helidon Spa, Helidon	Steel	1	45.5m ³ /day	QLD
1975	QLD Department of Works	BP Research Site, Kingaroy	Steel	1	13.7m ³ /day	QLD
1975	Department of Housing & Construction, NT	Kormilda College, Darwin	Steel	1	114m ³ /day	NT
1975	Point Lookout Caravan Park	Stradbroke Island	Steel	1	45.5m ³ /day	QLD
1975	H Dickson Esq.	Boyne River Caravan Park, Gladstone	Steel	1	54.6m ³ /day	QLD
1974	Consolidated Rutile Pty Ltd.	Minsands Caravan Park, Stradbroke Island	Steel	1	27.3m ³ /day	QLD
1974	Tableland Tin Pty Ltd	Tin Dredge Plant, Mt Garnet	Steel	1	2.3m ³ /day	QLD
1974	Sun Cost Resorts Pty Ltd.	Surfair Hotel, Mudjimba	Steel	1	114m ³ /day	QLD
1974	Vickers Scott Pty Ltd.	Foundry Plant, Ipswich	Steel	1	25m ³ /day	QLD
1974	Leighton Contractors Pty Ltd.	Raintree Shopping Centre, Cairns	Steel	1	30m ³ /day	QLD
1973	Brisbane City Council	Cubberla Creek #2	Steel	1	569m ³ /day	QLD
1973	Brisbane City Council	Cubberla Creek #3	Steel	1	569m ³ /day	QLD
1973	Pearce & Fox Pty Ltd	Capalaba Tavern	Steel	1	45.5m ³ /day	QLD
1973	Currambeena Caravan Park	Townsville	Steel	1	173m ³ /day	QLD
1973	Bechtel Pacific Corp.	Hay Point Plant Mackay	Steel	1	19.3m ³ /day	QLD
1973	Weston & Mazza Pty Ltd.	Castle Caravan Park, Bli Bli	Steel	1	45.5m ³ /day	QLD
1973	Toft Bros. Pty Ltd.	Northside Plant, Bundaberg	Steel	1	45.5m ³ /day	QLD
1973	Ralph M. Parsons Co. Pty Ltd.	Greenvale Nickel #3 TVL	Steel	1	27.3m ³ /day	QLD
1973	Ralph M. Parsons Co. Pty Ltd.	Ralph M Parsons Co Pty Ltd	Steel	1	18m ³ /day	QLD
1972	Department of Industrial Development QLD	Maroochydore Industrial Estate	Steel	1	114m ³ /day	QLD
1972	Ralph M. Parsons Co. Pty Ltd.	Greenvale Nickel #1, TVL	Steel	1	136.5m ³ /day	QLD
1972	McIntyre & Associates Consulting Engineers	Townsville Harbour	Steel	1	159m ³ /day	QLD
1972	Ralph M. Parsons Co. Pty Ltd.	Greenvale Nickel #2	Steel	1	182m ³ /day	QLD
1971	Brisbane City Council	Ridgewood Estate	Steel	1	273m ³ /day	QLD
1971	K.N. Crocker Consulting Engineers	Buderim Holiday Village	Steel	1	136.5m ³ /day	QLD
1971	Pine Rivers Shire Council	Ferny Grove Estate	Steel	1	227.5m ³ /day	QLD
1970	Bechtel W.K.E.	Bougainville Island #8	Steel	1	273m ³ /day	PNG

1970	Cardno & Davies Consulting Engineers	Jamboree Heights	Steel	1	136.5m³/day	QLD
1970	Bechtel W.K.E.	Bechtel W.K.E.	Steel	1	273m³/day	PNG
1970	Mt Isa Mines Ltd	Hilton Township	Steel	1	41m³/day	QLD
1970	Bechtel W.K.E.	Bougainville Island # 10	Steel	1	273m³/day	PNG
1970	Bechtel W.K.E.	Bougainville Island # 11	Steel	1	273m³/day	PNG
1970	Duaringa Shire Council	Blackwater Township	Steel	1	227.5m³/day	QLD
1969	Conzinc Riotinto Ltd.	Bougainville Island # 1	Steel	1	273m³/day	PNG
1969	Conzinc Riotinto Ltd.	Bougainville Island # 2	Steel	1	91m³/day	PNG
1969	Conzinc Riotinto Ltd.	Bougainville Island # 3	Steel	1	273m³/day	PNG
1969	Conzinc Riotinto Ltd.	Bougainville Island # 4	Steel	1	273m³/day	PNG
1969	Conzinc Riotinto Ltd.	Bougainville Island # 5	Steel	1	91m³/day	PNG
1969	Conzinc Riotinto Ltd.	Bougainville Island # 6	Steel	1	91m³/day	PNG
1969	Bechtel W.K.E.	Bougainville Island # 7	Steel	1	91m³/day	PNG
1968	Austral Pacific Fertilisers	#1 Gibson Island	Steel	1	27.3m³/day	QLD
1967	Brisbane City Council	Coopers Plains, Brisbane	Steel	1	455m³/day	QLD
1966	Mt Isa Mines Ltd	McArthur River Camp	Steel	1	27.3m³/day	NT
1966	Brisbane City Council	Cubberla Creek, Brisbane	Steel	1	455m³/day	QLD
1966	Co-Ord General's Dept	Fish Market Colmslie	Steel	1	182m³/day	QLD
1965	QLD Alumina	Gladstone #2	Steel	1	227.5m³/day	QLD
1965	Kaiser Engineering & Constructors	Gladstone #3 Refinery	Steel	1	227.5m³/day	QLD
1965	QLD Alumina	Gladstone #4	Steel	1	227.5m³/day	QLD
1965	QLD Alumina	Gladstone #5	Steel	1	227.5m³/day	QLD
1964	QLD Alumina	Gladstone #1	Steel	1	227.5m³/day	QLD