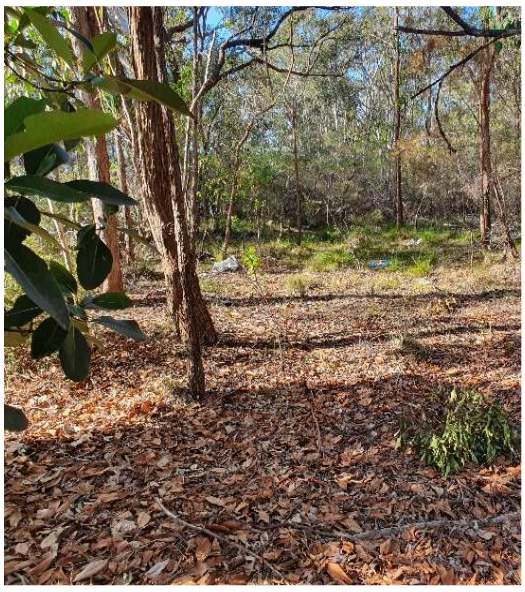
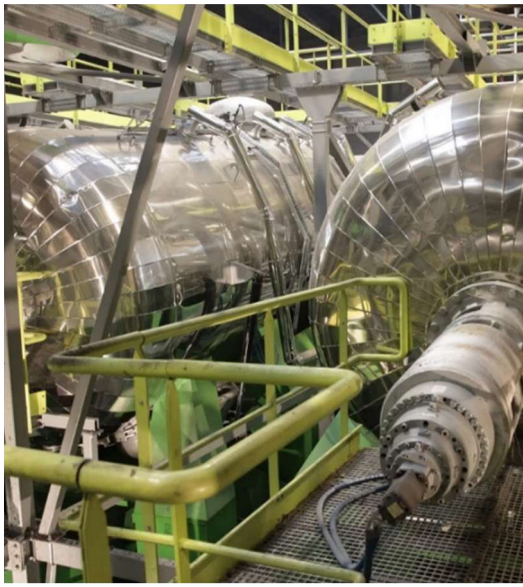
Response to Submissions

West Nowra Resource Recovery Park Stage 2 (SSD-9887)

Bioelektra Australia Pty Ltd

25 October 2021

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Executive summary

Overview

The project involves constructing and operating a resource recovery facility with pre-treatment for mixed municipal waste of up to 130,000 tonnes per year, comprising:

– A waste reception hall
– A processing building for shredding and sterilisation operations using 14 autoclaves to pre-treat and sterilise the waste
– A materials recovery facility for sorting all processed waste minus organic matter separated from autoclave pre-treatment
– A boiler room, transformer hall and liquid petroleum gas (LPG) station supplying utilities and electricity for site operations

The project also includes ancillary infrastructure, including offices, amenities, staff and visitor parking, internal roadways, weighbridges and weighbridge offices, fencing, and a pumping station and firefighting tanks.

The Concept Approval (SSD 7015) included construction and demolition waste processing and an alternative waste treatment/materials recovery facility. However, construction and demolition waste processing is no longer proposed as part of the project. In addition, the waste processing technology proposed by Bioelektra includes sterilisation of waste through autoclaving and materials recovery through various sorting operations.

Other ancillary infrastructure not included as part of the Concept Approval (SSD 7015) but proposed as part of this project includes the boiler room, transformer hall, LPG station and pumping station and firefighting tank.

Subject to approval, the first phase of construction is anticipated to start in 2022 and take about 12 months with an additional 3 months for commissioning.

Approval process and Environmental Impact Statement

The project is permissible with development consent in accordance with the Shoalhaven Local Environmental Plan 2014 (the Shoalhaven LEP). As a result, it is subject to the approval and assessment requirements of Part 4 of the *Environmental Planning and Assessment Act 1979* (EP&A Act). The project is declared State significant development in accordance with State Environmental Planning Policy (State and Regional Development) 2011 (the State and Regional Development SEPP).

An Environmental Impact Statement (EIS) was prepared to support Bioelektra Australia Pty Ltd's (Bioelektra's) application for approval of the project in accordance with the requirements of Part 4 of the EP&A Act. The EIS addressed the environmental assessment requirements of the Secretary of the NSW Department of Planning, Industry and Environment (DPIE) ('the SEARs'), dated February 2021.

The EIS was placed on exhibition by DPIE for a period of 28 days from 15 June 2021 to 12 July 2021. During this period, interested stakeholders and community were able to review the EIS on the DPIE website and make written submissions for consideration in the assessment of the project.

Purpose of this report

This response to submissions (RTS) report was developed in accordance with Appendix C to the *State Significant Development Guidelines - Preparing a Submissions Report* (DPIE 2021) and provides:

– A summary and analysis of the public submissions received during exhibition
– A summary of requests for information received from the DPIE
– A summary of the actions taken during and after exhibition
– Responses to the submissions received including
    - A summary of actions undertaken during and after EIS exhibition including design refinement, further environmental assessment and investigations, development of additional reports and plans

- Responses to the public submissions received, requests for information and engagement activities

Further supporting information and a full set of updated mitigation measures and additional assessment in relation to air quality and water quality are provided in the appendices to this report.

Detailed information on the project background, location, statutory context, strategic need and alternatives is presented in chapters 2 to 6 of the EIS. Assessment of the potential impacts of the project during construction and operation are outlined in EIS chapters 7 to 17.

Overview of submissions

DPIE received a total of 10 submissions on the Major Projects NSW Planning Portal Website according to the following three categories:

– Public authority – 8 submissions
– Organisation – 1 submission
– Public – 1 submission

Public authorities provided comments that were typically grouped under headings for key issues. The responses to the issues are provided by submitter in section 4 of this report. Where relevant, input from specialists is provided to support the responses.

The majority of submissions were regarding ‘the project’ grouping including the project area, physical layout and design, key uses and activities. The main request for further information was regarding traffic and transport including access routes and internal traffic management.

The two main issues identified in the submissions related to economic, environmental and social impacts were water management and contamination. The issues around water management related to management of stormwater during construction, wastewater management, and construction stormwater discharge quality. The main issues associated to contamination related to further site inviestigations and the risk of landfil gas migration.

Mitigation measures

The EIS identified mitigation measures that would be implemented to avoid or minimise the potential impacts of the project.

Following consideration of the issues raised in the submission, additional assessment and further design developments, the mitigation measures have been updated to:

– Modify some mitigation measures to reflect the updates to the stormwater management system and odour control system
– Add commitments in response to issues raised in the submissions
– Incorporate the findings of the construction discharge characterisation assessment

Some new measures have been added, and the wording of some measures has been amended. The full set of updated mitigation measures is provided in Appendix A of this report. This table supersedes the measures presented in the EIS.

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Appendix J	Preliminary firewater plan
Appendix K	Biomass testing and specification
Appendix L	Odour control system design

1. Introduction

1.1 Background

In 2016 Shoalhaven City Council (Council) sought approval for a Concept Proposal for a resource recovery park with a combined capacity of 130,000 tonnes per year (the West Nowra Resource Recovery Park). The Concept Proposal included:

– Stage 1 – clearing of land and provision of basic infrastructure on the nominated site, which would be undertaken by Council or contractors appointed by Council as part of early construction works.
– Stage 2 – construction and operation of a resource recovery park which would be undertaken by an alternative waste technology provider/facility operator, selected through a tendering process to provide the specialised resource recovery facilities.

Council sought Project Approval for Stage 1 as part of the same application.

A staged approach was adopted to enable Stage 1 to commence (subject to planning approval) while a contractor was appointed and the details of Stage 2 were determined via the tendering and design process.

Council received Concept Approval and Stage 1 Project Approval for the West Nowra Resource Recovery Park on 25 August 2016 (application number SSD 7015). The approved Stage 1 works include:

– Demolition of the existing animal shelter
– Site preparation and clearing of the site
– Perimeter, entry/exit and service roads and line marking
– Installation of perimeter/boundary fencing
– Weighbridge and weighbridge office
– Staff and visitor car parking, including line marking
– Detention and sedimentation dams/basins
– Identification of asset protection zones

Council subsequently awarded Bioelektra Australia Pty Ltd (Bioelektra) with the contract for delivery of Stage 2 of the works.

Bioelektra now proposes to construct and operate an integrated resource recovery facility at the site as part of Stage 2 of the West Nowra Resource Recovery Park (the project) and engaged GHD Pty Ltd (GHD) to prepare documentation to support an application for the project in accordance with Part 4 of the *Environmental Planning and Assessment Act 1979* (NSW) (the EP&A Act).

1.2 Project overview

The project involves constructing and operating a resource recovery facility with pre-treatment for mixed municipal waste of up to 130,000 tonnes per year, comprising:

– A waste reception hall
– A processing building for shredding and sterilisation operations using 14 autoclaves to pre-treat and sterilise the waste
– A materials recovery facility for sorting all processed waste minus organic matter separated from autoclave pre-treatment
– A boiler room, transformer hall and liquid petroleum gas (LPG) station supplying utilities and electricity for site operations

The project also includes ancillary infrastructure, including offices, amenities, staff and visitor parking, internal roadways, weighbridges and weighbridge offices, fencing, and a pumping station and firefighting tanks.

The Concept Approval (SSD 7015) included construction and demolition waste processing and an alternative waste treatment/materials recovery facility. However, construction and demolition waste processing is no longer

proposed as part of the project. In addition, the waste processing technology proposed by Bioelektra includes sterilisation of waste through autoclaving and materials recovery through various sorting operations.

Other ancillary infrastructure not included as part of the Concept Approval (SSD 7015) but proposed as part of this project includes the boiler room, transformer hall, LPG station and pumping station and firefighting tank.

Subject to approval, the first phase of construction is anticipated to start in 2022 and take about 12 months with an additional 3 months for commissioning.

1.3 Purpose of this report

This response to submissions (RTS) report was developed in accordance with Appendix C to the *State Significant Development Guidelines - Preparing a Submissions Report* (DPIE 2021) and provides:

– A summary and analysis of the public submissions received during exhibition
– A summary of requests for information received from the NSW Department of Planning Industry and Environment (DPIE)
– A summary of the actions taken during and after exhibition
– Responses to the submissions received including:
    - A summary of actions undertaken during and after Environmental Impact Statement (EIS) exhibition including design refinement, further environmental assessment and investigations, development of additional reports and plans
    - Responses to the public submissions received, requests for information and engagement activities

Further supporting information, a full set of updated mitigation measures and additional assessment in relation to air quality and water quality are provided in the appendices to this report.

Detailed information on the project background, location, statutory context, strategic need and alternatives is presented in chapters 2 to 6 of the EIS. Assessment of the potential impacts of the project during construction and operation are outlined in EIS chapters 7 to 17.

1.4 Previous steps in the assessment

The project is permissible with development consent in accordance with the Shoalhaven Local Environmental Plan 2014 (the Shoalhaven LEP). As a result, it is subject to the approval and assessment requirements of Part 4 of the EP&A Act. The project is declared State significant development in accordance with State Environmental Planning Policy (State and Regional Development) 2011 (the State and Regional Development SEPP).

An EIS was prepared to support Bioelektra's application for approval of the project in accordance with the requirements of Part 4 of the EP&A Act. The EIS addressed the environmental assessment requirements of the Secretary of DPIE ('the SEARs'), dated February 2021.

The EIS was placed on exhibition by DPIE for a period of 28 days from 15 June 2021 to 12 July 2021. During this period, interested stakeholders and community were able to review the EIS on the DPIE website and make written submissions for consideration in the assessment of the project.

2. Analysis of submissions

2.1 Submissions received

During the exhibition period, community and other stakeholders were invited to provide submissions. These submissions were uploaded by DPIE to the Major Projects NSW Planning Portal website. A total of 11 submissions were recorded and a request for information from DPIE was received. A breakdown of the submissions is presented in Table 2.1.

Table 2.1 Breakdown of submissions received

Submitter category	Number of submissions	Type of submitters
Public authority	8	NSW government agencies
Local council	1	Local council
Organisation	1	Utility company
Public	1	Individual/community member

The following information was recorded by DPIE as part of the public submission registration process:

– 2 submissions registered support for the project
– 9 submissions registered a comment on the project
– No submissions registered an objection to the project

2.2 Approach to analysis

For the purpose of the analysis, each submission was reviewed and the key issues summarised and separated into categories and sub-categories. The main groupings for issues were identified as:

– The project
– Procedural matters
– Economic, environmental and social impacts
– Justification and evaluation of the project
– Issues beyond the scope of the project

Each key issue was further broken down into subcategories.

Public authorities provided comments that were typically grouped under headings for key issues. The responses to the issues are provided per submitter in section 4 of this report. Where relevant, input from specialists is provided to support the responses.

2.3 Summary of issues

A breakdown of the key issues raised by submitters is shown in Figure 2.1. The figure shows that the majority of submissions were regarding ‘the project’ grouping including the project area, physical layout and design, key uses and activities. As shown in Figure 2.2, the main request for further information was regarding traffic and transport including access routes and internal traffic management.

The three main issues identified in the submissions associated to economic, environmental and social impacts were water management and contamination as shown in Figure 2.3. The issues around water management related to management of stormwater during construction, wastewater management, and construction stormwater discharge quality. The main issues associated to contamination related to further site inviestigations and the risk of landfil gas migration.

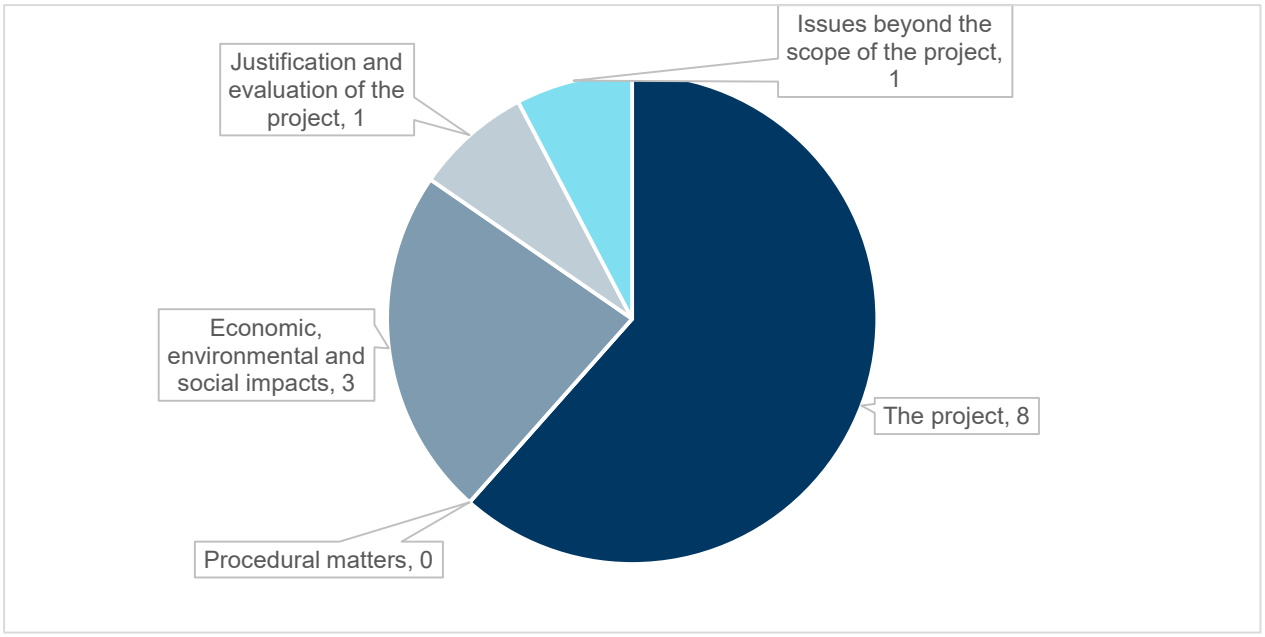


Figure 2.1 Key issue types summary

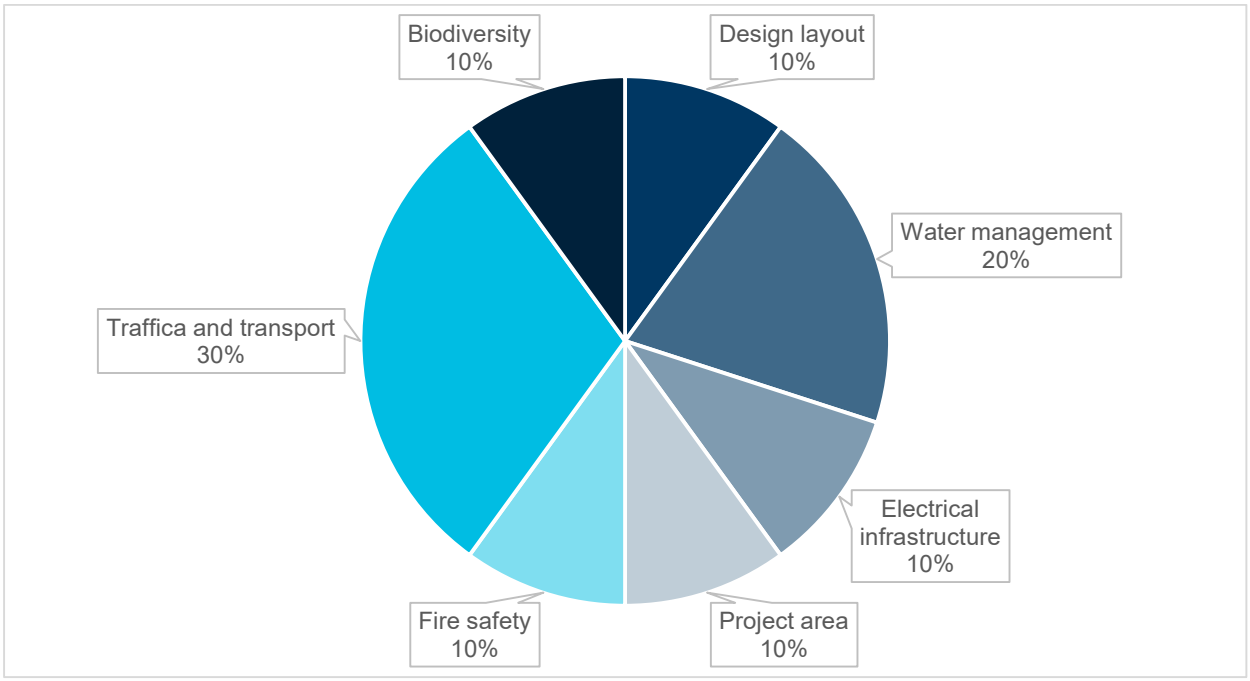


Figure 2.2 Breakdown of project issues

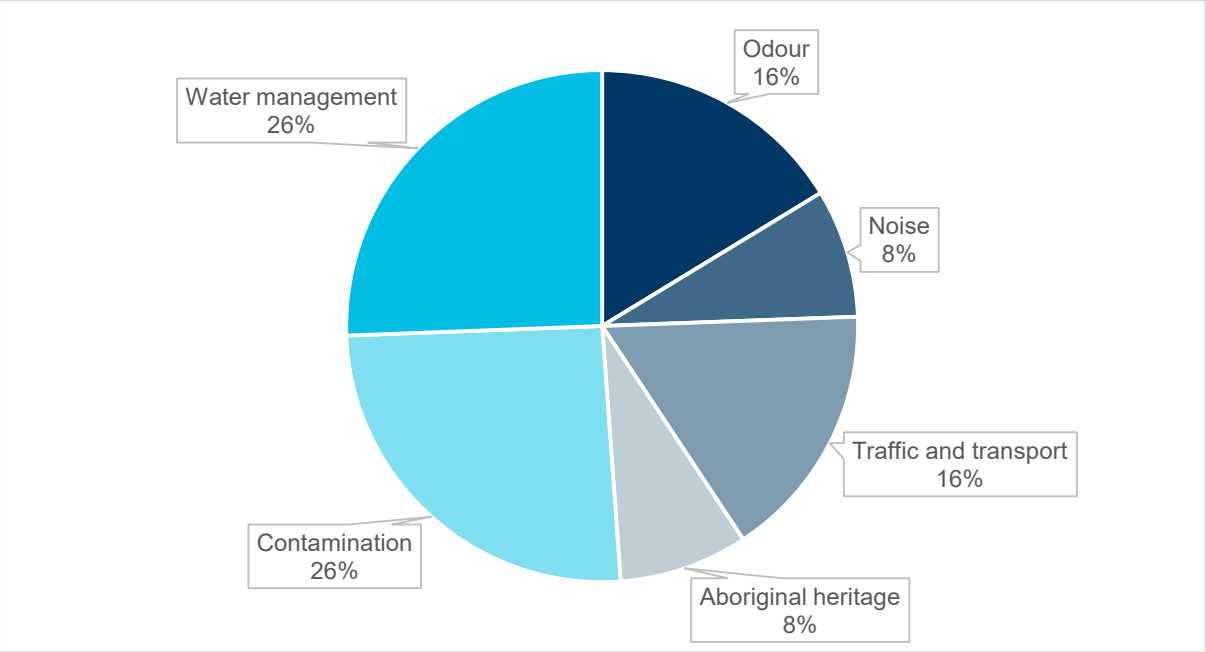


Figure 2.3 Breakdown of environmental impacts

3. Actions taken since exhibition

3.1 Further design development

Since the concept design was developed to support preparation of the EIS, Bioelektra has engaged design consultants to further develop the design for construction of the facility, subject to approvals.

The following detailed design documentation has been developed:

– Civil design drawings including pavement layout and details, stormwater management plan, erosion and sediment control plan, existing basin dewatering plan and bulk earthworks plan.
– Architectural design drawings including elevations, sections, floor plans, and details
– Mechanical drawings including hydraulics plan, mechanical services plan and equipment schedules
– Concept level landscape plan

Selected drawings have been appended to this report in Appendix E to Appendix L to support the responses to submissions.

3.2 Additional environmental assessments

Additional environmental assessment has been undertaken since exhibition of the EIS as follows.

Contamination

Further analysis was undertaken based on additional information provided by Council regarding environmental performance and monitoring at West Nowra Landfill. In line with the proposed mitigation measures for contamination, Council has installed landfill gas monitoring bores at the boundary between the Stage 1 landfill and the project site. Council also provided recent monitoring results for surface gas emissions and building accumulation monitoring. Further discussion and analysis is provided in Section 4.1.1

Air quality

Additional sensitivity analysis was undertaken to address comments relating to odour emissions from the waste reception hall. Additional modelling and analysis is reported in Section 4.2.1 that assesses fugitive emissions from the waste reception hall. The modelling was updated to include the following scenarios:

– Typical project operation
– Poor air extraction operation
– Worst case air extraction operation

Additional information was provided by Bioelektra about the air lock system to prevent odours from leaving the reception hall.

Construction discharge characterisation assessment

A construction phase surface water discharge characterisation assessment was undertaken in response to NSW EPA comments with respect to water management during construction. The assessment was based on the updated stormwater management design. The results and findings, which are provided in Appendix E of this report, include:

– A summary of the design development
– Identification of updated stormwater management measures during construction
– Characterisation of expected construction phased discharges based on the proposed design and recent MUSIC modelling

3.3 Community engagement

The EIS was placed on exhibition for a period of 28 days from 15 June 2021 to 12 July 2021. During the exhibition period, government agencies, key stakeholders and the community were invited to make written submissions. A summary of the engagement activities undertaken during and following the exhibition period are provided in Table 3.1. It is noted that no further calls or email correspondence have been received from the community since the engagement sessions.

Table 3.1 Consultation undertaken since submission of the EIS

Activity	Description
Update to Bioelektra website news feed	The following notifications were issued on the Bioelektra website news feed: – Completion of the public exhibition period on 25 August 2021 – Update on the progress of response to submission on 1 October 2021
Project update on Shoalhaven City Council website	An announcement was published on the Shoalhaven City Council Shoalhaven Resource Recovery Facility newsfeed with notification of – Update on progress of response to submissions on 1 September 2021 – Completion of the public exhibition period on 25 August 2021 – Commencement of the exhibition period on 23 June 2021
Meeting with DPIE	Bioelektra attended a teleconference meeting with DPIE on 10 August 2021 to discuss its submission. The approach to response to submissions was confirmed including additional assessment and level of detail required.

4. Response to submissions

4.1 Shoalhaven City Council

4.1.1 Contamination

Issue

The preliminary site investigation (PSI) specifies the likelihood for the migration of landfill gas onto the site from the neighbouring waste facility as moderate to high. Therefore, it is recommended that a landfill gas risk assessment is undertaken as part of the early design phase for the project. If remediation or management is required to address landfill gas issues, then additional development consent will also be required based on:

– Class (e) remediation of a site affected by hazardous ground gas, and
– Class (m) remediation where a long-term environmental management plan is or will be required

The contamination management measures in Table 12.1 are all deemed adequate and should be included as conditions of consent.

Response

A preliminary site investigation was prepared by GHD to assess the nature and extent of contamination on the site and proposed measures to ensure the site is suitable for its intended use. The methodology and outcomes of the investigation are provided in Appendix L of the EIS. The conceptual site model developed for operation of the site indicated that a potential source-pathway-receptor linkage exists if landfill gas is migrating from the adjacent West Nowra Landfill site.

Landfill gas, if present, may affect site personnel during operation. The possible exposure scenarios include gas accumulation within trenches, service pits and buildings. Gases may also pose an explosion risk in any of these settings. Therefore the likelihood of contamination associated with migration of landfill gases to the site was assessed as moderate to high given the proximity to the landfill.

The landfill operates under an Environment Protection Licence that requires regular monitoring for landfill gas emissions from the surface of the landfill. The monitoring is carried out in a grid pattern across the site and within site buildings. The monitoring measures gas concentrations to identify whether any landfill gas is being released from the surface at unacceptable levels. Recent monitoring of methane (a gas generated by landfilled waste) indicated that all concentrations were lower than the assessment criteria across the surface of the landfill and within buildings located within a distance of 250 metres of the landfill site.

Council implements an active gas extraction system to manage gas generation, where vacuum pressure is applied to collect gas from within the landfilled waste material. The landfill gas collected is utilised to produce renewable energy. In addition, the new landfill cells are lined with an engineered barrier system which minimises the risk of subsurface migration of landfill gas.

It is noted that historical filling at the site west of the project that predated current regulations for landfill design used unlined cells, which presents a potential pathway for subsurface gas migration. Landfill gas used to be recovered from a gas manifold that existed approximately 75 metres west of the site. The manifold was decommissioned in 2015 as it was no longer producing gas in viable quantities for re-use. Although gas production has reduced, concentrations of methane and carbon dioxide associated with the older cells could still exceed the assessment criteria.

Further information has been provided since submission of the EIS, to further characterise the risk of subsurface landfill gas migration to the project site. Council has provided a letter (refer Appendix C) that commits it to installing at least four landfill gas monitoring bores along the boundary between the landfill and the project site. The gas bores will target subsurface gas migration, and will be installed to a maximum depth of 6 metres or the minimum groundwater level with a spacing less than 40 metres as shown in the indicative Figure 4.1 below. The monitoring bores have been installed and monitoring is planned to commence the week of 18 October 2021. Council has

engaged a contractor to undertake monitoring on a monthly basis until a baseline is established, and the monitoring can be reduced to quarterly or every 6 months.

Figure 4.1 Proposed landfill gas monitoring bore layout (Shoalhaven City Council, 2021)

The installation of the boundary gas monitoring bores in line with the recommendations of the preliminary site investigation will address the risk of subsurface landfill gas migration to the project site. Results from the baseline modelling will inform whether current source-pathway-receptor links are complete, and Council will provide ongoing monitoring of potential migration pathways.

It is anticipated that any subsurface landfill gas migration issues will be detected at the proposed monitoring points. Criteria for further action or investigation would align with the NSW EPA (2016) *Landfill Guidelines for Solid Waste Landfills* trigger concentrations.

4.1.2 Noise and vibration

Issue

A noise and vibration impact assessment was prepared by GHD and assessed the construction and operational potential noise impacts, including the cumulative industrial noise level from the resource recovery park and the adjacent landfill. The total industrial noise level at each receiver was calculated to be below the *Noise Policy for Industry* (EPA 2017) (NPfI) recommended amenity noise level. Recommended mitigation measures, as outlined in Table 14.17 of the EIS (GHD 2021), would be implemented as a condition of the consent.

The vibration assessment identified that no adverse vibration impacts or cosmetic damage vibration impacts are anticipated as a result of the project. No specific conditions are recommended in this regard.

Response

The noise impact modelling was based on 24 hour operation of the sorting hall with transfer of output material to the external despatch bins between 6 am and 6 pm. The configuration of the external despatch bins has been

updated as shown in Figure 4.7. Bioelektra is seeking to extend the operational hours of the despatch bins to the overnight period to allow for shut down of the processing and sorting equipment during day shift.

The noise model was updated to include the additional conveyors and updated configuration of the despatch bins operating during the evening/night period, including the following assumptions:

– External conveyors will be designed to be 82 dBA per metre
– For the worst-case scenario 50% of the despatch bins are operating within a 15 minute period
– External despatch bins will be designed to emit a sound power level of no more than $L_{Aeq(15min)}$ 97 dBA or $L_{Aeq(15min)}$ 74 dBA at 5 metres from the edge of the bin. This may require rubber lining on the bottom and edges to reduce impact noise.
– Truck movements within the site and the opening and closing of the roller door to the reception hall do not occur during the evening and night period (consistent with previous modelling assumptions)

The updated results at the two closest receivers (R01 and R02) are summarised in Table 4.1. These assumptions (along with assumptions in the EIS) should be reviewed during detailed design to ensure the project noise trigger levels can be met at the nearest sensitive receivers.

Table 4.1 Updated predicted noise levels at R01 and R02

Address	ID	Predicted L_{Aeq} noise level, dBA		NPfI Trigger Level, dBA		
		Day / EMS	Night	EMS	Day	Night
43 Flatrock road	R01	38	35	38	41	35
41 Flatrock Road	R02	37	34	38	41	35

4.1.3 Odour

Issue

An air quality and odour assessment was prepared by GHD for the project which outlines the air quality dispersion modelling undertaken with the cumulative odour from the proposal and the West Nowra Landfill site considered. No exceedances of the assessment criteria for any pollutant were predicted and no impacts are expected during the operation of the project. Autoclaving pre-treatment of waste is also expected to significantly reduce the potential for odour. The reception hall would be maintained under negative pressure to minimise fugitive emissions. Standard odour and dust conditions would be applicable in this respect.

Response

Acknowledgement of the air quality impact assessment outcomes and proposed mitigation measures is noted. Additional odour modelling was undertaken in response to the DPIE request for information that confirms the modelling results as reported in Section 4.2.1.

4.1.4 Water quality

Issue

All waste received and waste processing activities are to occur within the confines of the building. No waste processing is to occur outside. Waste materials are proposed to be stored indoors or outdoors within enclosed containers, therefore contaminated runoff from waste processing is not anticipated. An LPG station is proposed which shall be appropriately bunded with roofing to prevent stormwater accumulation in the bunded area.

An onsite wastewater package treatment plant is to be provided to manage effluent generated by the staff. The treated effluent from this is be combined with the treated effluent from the process wastewater before removal from the site. Section 68 Approval to Install will be required with approval required prior to the issue of a construction certificate for the development.

Response

The LPG station would be designed in accordance with relevant Australian Standards including bunding and roofing to prevent stormwater accumulating in the LPG station bunded area.

The building internal drainage design is provided in Figure H.9 and Figure H.10 of Appendix H. Further design information has been provided for the wastewater treatment in Appendix D. Section 68 Approval will be sought prior to approval of the construction certificate.

4.1.5 Stormwater

Issue

Constructed wetlands are generally Council's preferred method of treatment provided they meet the necessary targets as set out in Shoalhaven Development Plan 2014 (SDCP 2014) Chapter G2 Sustainable Stormwater Management and Erosion/Sediment Control and Supporting Document 1: Sustainable Stormwater Technical Guidelines. However, the concept plans provided do not demonstrate a legal point of discharge, i.e. Council road reserve or existing watercourse. Further information is required in this regard and is detailed below.

Additional information on the requirement of easements over adjacent land/ or owners consent to allow the weirs for the constructed wetlands to sheet flow over the land should be obtained from the relevant authority.

Response

The design for the stormwater management system has been further developed and additional MUSIC modelling undertaken to characterise the discharge water quality from the treatment system during construction. Further explanation is provided in the construction discharge characterisation assessment provided as Appendix E. The stormwater management system is designed to retain runoff within the site through the use of conservatively sized dams.

The stormwater management plan (refer Appendix A of the characterisation assessment) shows the inlet and outlet locations for the sediment ponds and wetland and location of an additional bioretention basin at the front of the project site. Stormwater drains to the two sediment ponds via a number of inlet culverts.

The sediment ponds would connect in with the wetland via an inlet pipe and overflow weir. During early construction, stormwater discharge would drain to an existing drainage line to underneath the landfill site then to Sandy Creek and on to the Shoalhaven River. Dam 1 overflow would discharge to existing overland flow paths to Cabbage Tree Creek. In the later construction stages, Dam 3 would overflow to the drainage line underneath the landfill site to Sandy Creek.

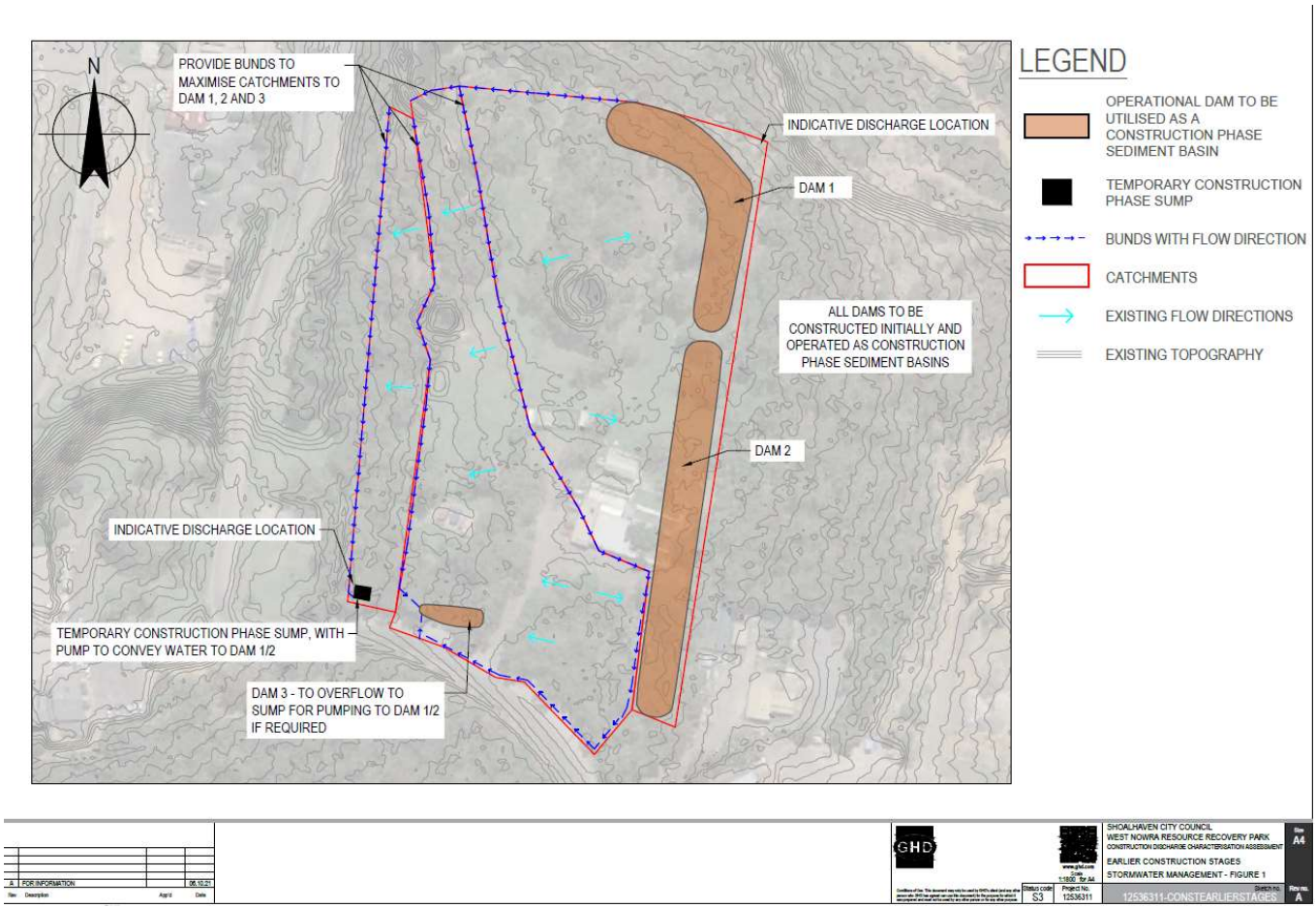


Figure 4.2 Early construction phase stormwater management (GHD 2021)

4.1.6 Earthworks

Issue

A significant portion of the site will be disturbed. The submitted Soils and Water Assessment report (GHD 2021) outlines detailed sediment and erosion controls to be implemented in accordance with The Blue Book. Recommended conditions have been provided below.

Response

A preliminary construction stormwater management plan prepared by van der Meer Consulting (2021) is provided in Appendix E. The plan outlines requirements for diversion drains, sediment control fencing, topsoil management, dust control, signage and other controls in line with the recommended runoff and erosion controls outlined by Council.

Further discussion on the proposed approach to stormwater management during construction is provided in the Construction Discharge Characterisation Assessment (Appendix E). It is expected that sediment and erosion controls would be included in the consent conditions in line with Council recommendations.

The stormwater drainage design would be developed to address Council's urban stormwater drainage design standards and water sensitive urban design requirements.

4.1.7 Access/Manoeuvrability

Issue

The proposed heavy vehicle route is Flatrock Road – Yalwal Road – Kalandar Street – Princes Highway. Given the present congestion and intersection performance, the following alternative heavy vehicle route is proposed: Flatrock Road – Yalwal Road -Albatross Road – Flinders Road – Princes Highway. This reduces the probability of congestion at the intersection of Kalandar Street and The Princes Highway, while still following Council's preferred heavy vehicle route.

An assessment of intersection and turning performance turning right out of Yalwal Rd will be required in addition to a corridor assessment for suitability relative to the existing approved developments and strategic plans along the route to better understand the impacts of this development. This includes but is not limited to:

i) The Mundamia Urban Release Area (URA)

ii) Cabbage Tree Lane URA

iii) HYSA (Hillcrest Yalwal Sub Arterial Road)

iv) Residential developments along Albatross Road and Yalwal Road

v) Industrial subdivision with impacts to Flinders Road

As an alternative to the above, Cabbage Tree lane may also be used as follows: Flatrock Rd – Yalwal Rd – Cabbage Tree Ln – Albatross Rd -Flinders Rd – Princes Hwy. It is to be noted that there may be additional upgrades required along this route particularly at intersections however it could serve as an alternative.

Explanation on the volumes shown in Table 2-2 of the traffic impact assessment was prepared by GHD is required to justify the assertion that an increase of 2% per annum in the paragraphs above the table and the volume shown for Yalwal road (5720 vehicles/day) would yield a 7254 vehicles/day rather than the provided 1652 veh/day.

Response

The per annum background traffic growth rate of 2% used for the EIS was agreed with Council's Transport Engineer per email correspondence in September 2020. This growth rate accounts for the expected increase in traffic associated with proposed land release and development expected in the area. This aligns with the general approach for traffic modelling in the Stage 1 Project Approval.

The current findings of the assessment indicate that the project would not adversely impact on the currently amenity, road safety and operating performance of the surrounding road network. In addition, based on additional information provided since submission of the EIS, the impacts assessed in the EIS are quite conservative, because of the low level of the net traffic impacts (a significant proportion of the overall truck numbers associated with 130,000 tpa of material received is associated with material that is already being delivered to landfill). This is discussed further in Section 4.11.3.

As noted in the Traffic Impact Assessment, a worst case assessment was conservatively assumed for the proposed access route. Alternative access routes may be assessed based on planned intersection upgrades.

There is a typographical error in table 2-2 of the Traffic Impact Assessment for the daily number of vehicles for Yalwah Road, east of Flatrock Road. The corrected value is presented in Table 4.2. The 1,652 vehicle per day figure is the projected 2020 daily vehicle number for Yalwal Road west of Albatross as reported correctly in the mid block assessment in Table 4-5 of the report.

Table 4.2 Amended table 2-2 from Traffic impact assessment (GHD 2021)

Location / survey year	Surveyed traffic volumes			Estimated 2020 volumes		
	AM Peak Hour (8-9 am) (vph)**	PM Peak Hour (4-5 pm) (vph)**	Daily (vpd)^	AM Peak Hour (8-9 am) (vph)**	PM Peak Hour (4-5 pm) (vph)**	Daily (vpd)^
Flatrock Road (peak hour: 2014 / daily: 2008)	46	69	645	52	66	928
Yalwal Road, east of Flatrock (peak hour: 2014 / daily: 2008)	576	599	5,720	731	709	~~1,652~~ **7,112**
Albatross Road (2008)	746	941	9,410	946	1,193	11,700
Kalandar Street (2008)	672	793	6,950	852	1,006	8,641
Princes Highway (2018#)	2,755	3,080	30,800	13,743	15,988	77,252

Notes:
** the daily traffic volume for these roads has been estimated based on the assumption that the peak hour traffic flow is approximately ten percent of the daily traffic volume.*
***(vph) = vehicles per hour.*

^ (vpd) = vehicles per day.

 # Traffic volume viewer 2018 Station ID 07051.

4.1.8 Biodiversity

Issue

It is understood that Stage 1 has been approved, including clearing of all vegetation on site, and that Council will purchase and retire the appropriate number and type of credits. As such no further environmental assessment is required. It is noted as the vegetation clearance has been offset for Stage 1 the BDAR waiver by GHD (TRIM D21/242908) is supported by the South East Branch Biodiversity Conservation Division.

The BDAR waiver (GHD) states that not all vegetation removal approved has been conducted and some vegetation remains onsite. This area is known to provide habitat for threatened fauna species including Squirrel Glider, Eastern Pygmy Possum and Yellow Bellied Glider. As such, the protocols for vegetation removal as detailed in Appendix 3 of the Stage 1 approval still stand and should be applied to any vegetation removal being conducted for the implementation of Stage 2.

Recommended conditions are that vegetation removal must be restricted to that approved for the Stage 1 SSD 7015. Any vegetation onsite that is outside the area approved for clearing for Stage 1 approved works must be protected with exclusion fencing during construction and retained in the long term. The vegetation removal protocols as detailed in Appendix 3 of the Stage 1 approval.

Response

The preliminary construction stormwater management plan (Appendix E) shows that a sediment control fence would be construction around the perimeter of the works area during the construction. A permanent security fence would be installed around the perimeter of the site that would restrict access to the project site. The asset protection zone surrounding the facility would be maintained in accordance with Appendix 4 of *Planning for Bush Fire Protection* (NSW RFS 2019).

4.2 NSW Environment Protection Authority

4.2.1 Air quality

4.2.1.1 Proposed pollution control for the receival hall stack not adequately described or justified

Issue

NSW EPA requested further information regarding the proposed pollution control method including performance and management measures, evaluation of alternative technologies and a detailed description of all aspects of the air emission control system.

Response

Justification for the proposed pollution control technology

The EIS proposed use of carbon filters for pollution control. The pollution control system design has since been further developed. Bioelektra is proposing use of a forced air extraction system with stack dispersion, which has proven application for waste transfer stations. It is considered that the proposed system offers the most practicable, affordable proven odour control technology. The same system is currently in use for operation of the following Veolia Environmental Services (VES) waste transfer stations:

– Clyde Transfer Terminal located at 322 Parramatta Road, Clyde; and
– Banksmeadow Transfer Terminal located at 14 Beauchamp Road, Banksmeadow

A comparison of the facilities is provided in Table 4.3.

Table 4.3 Comparison of reference facilities

	West Nowra Resource Recovery Park – Stage 2	Clyde Transfer Terminal	Banksmeadow Transfer Terminal
Annual putrescible waste throughput	130,000 tonnes	600,000 tonnes	400,000 tonnes
Building ventilation rate	15 air changes per hour	9 air changes per hour	9 air changes per hour
Stack exit velocity	20 m/s	19.1 m/s	20 m/s
Stack height (above ground level)	20.6	21 m	21 m
Stack diameter	2.5 m	2.64 m	2.6 m

The Odour Unit Pty Ltd (TOU) prepared a report in February 2014 to support approval of the Banksmeadow Transfer Terminal. The report detailed the development of the odour control system for the Clyde Transfer Terminal. The transfer building was originally operated using a naturally ventilated system through breezeways in the walls and a large open doorway. The odour control system comprised six individual dust and carbon filter units discharging treated air through short stacks located along the roof of the building. The system was designed with a stack exit velocity of 17.7 m/s as document in a detailed review of the system design by TOU in 2005.

The design review concluded that the flow rate of air from the stacks was highly dependent on the condition of the dust and carbon filters. Excessive pressure losses across blocked dust and carbon filters caused variability in the stack air flow rates. In the worst-case scenario (with six dirty dust filters) it was reported that the total flow rate reduced the bulk air exchange rate from seven air changes to just one air change per hour.

The design review (TOU 2014) indicated that the activated carbon filters, although commonly used for odour control purposes, incur large capital investment and large ongoing operating costs due to very large airflows. Following the design review, dispersion modelling was undertaken by TOU in 2005 and 2006 to support the installation of a single external stack and forced air extraction system (TOU 2014). The modelling showed that the

proposed pollution control system would be compliant with the EPA odour impact assessment criteria. Since installation in 2007, the odour control system has been successfully operating.

Detailed description of all aspects of the air emission control system

The basis of this air emission control system is to draw in a large volume of fresh air of 100 m^3/sec, pass this over the waste stockpiles, then draw this out at the far end of the waste hall with a push pull air system and discharge the diluted air to atmosphere through the waste reception hall stack. The configuration air flow direction of the odour control system is shown in Appendix L.

Fresh air would be drawn into the waste reception hall via eight wall mounted ventilators installed high up on the east wall. Eight axial fans would maintain the required the air flow. These fans would be typically sized to 1000 mm diameter with a 15.0 or 18.5 kW 4 pole motor and five blades to handle 12.5 m^3/sec each at up to 0.4 kPa. Air would typically spread out from a duct or fan opening at a rough angle of 15 degrees so the fans could cover the 35 m width of the building. Louvers or vanes could be fitted to direct the air forwards and downward towards the rear of the waste reception hall. The fans would be supported off the wall with additional steel frames fitted to the wall at the twelve locations.

Fans would be spaced throughout the reception hall based on design discharge velocity. Eight axial fans positioned in the centre of the hall mounted from the ceiling would maintain air flow in a westerly direction. The second set of fans would also be 1000 mm diameter axial type operating at 12.5 m^3/sec each at up to 0.4 kPa similar to the wall mounted fans above.

The waste receival hall would have a total volume of about 22,600 m^3 hence with the total proposed air flow of 100 m^3/sec the air total would be changed nearly every 4 minutes in the hall (15 air changes per hour). The waste receival hall would an average cross velocity of 0.26 m/s which is reasonable for odour control. By comparison dust capture velocities typically range from 0.25 to 1.0 m/s in mild to severe situations.

The air within the building would be drawn into a horizontal plenum 1.8 m high via a twelve louvre grilles 1.2 metre square with adjustable dampers at the western wall of the hall located just under the observation platform. The total air flow would be 100 m^3/s.

The air would be delivered by two back-to-back double entry double width centrifugal fans each with 75 kW drives built into an enlarged centre section of the plenum. The air would exit from the fans vertically to atmosphere via a common 2.5 metre diameter vertical exhaust stack 4 metres above the peak of the roof at 20 m/s allowing further dispersion of the air.

The fan and plenum assembly would be mounted upon a platform approximately three metres from ground level leaving the underside clear for access. The plenum would be constructed from galvanized sheet metal or fridge panel with suitable stiffening. Access would be provided for sampling the air from the exhaust stack.

Design calculations (Appendix L) for the ducts which shows an indicative total resistance in the order of 0.8 kPa at 100 m^3/s for which the fans must be sized. Each fan would have a theoretical consumed power of around 58 kW at the calculated flow and pressure at 70% efficiency.

In addition, to the air extraction system, rapid close roller doors would be installed to further mitigate odour impacts. The waste reception hall would operate with an airlock system to maximise the retention of odours within the building. The roller doors would be activated by motion sensors to minimise opening time and have a well insulated seal. The doors would be fully closed while during unloading activities.

4.2.1.2 Details regarding performance and maintenance procedures for the carbon filters

Issue

Further information on the proposed maintenance of the carbon filters to minimise odour impacts was requested by NSW EPA. The EPA have requested a robust demonstration that the carbon filters can achieve 90% odour reduction and identification of monitoring and maintenance requirements.

Response

The proposed forced air extraction system is considered to be effective when ventilating, capturing and dispersing odour emissions from within a building. The effective of the proposed odour control system in achieving a 90% odour reduction is supported by odour audit results (Veolia 2021, Veolia 2020) for the Clyde Transfer Terminal and Banksmeadow Transfer Terminal.

The performance of odour control and ventilation equipment at Clyde Transfer Terminal is assessed in biannual odour audits. These independent audits include, but are not limited to:

– Smoke testing in the transfer building to assess the effectiveness of the forced air extraction system;
– A review of any odour complaints, and subsequent actions, in the audit period; and,
– A downwind field odour survey in the surrounding area to identify potential odour impacts.

Odour audits undertaken on the 6 May 2021 and 19 November 2020, detected no odorants. The results of the two odour audits indicate that the Terminal complies with the Consent Conditions, which states that odour at the Terminal shall not exceed 2 OU at the nearest receiver. In addition, there were no odour complaints received during the 2020-2021 reporting period. Although odour complaints were received during the reporting period for Banksmeadow Transfer Terminal, it was concluded that the odour control system and other mitigation measures are effective based on the odour audit findings.

The proposed system would be fitted with monitoring equipment measuring the air flow and dilatation ratio in the stack as well as inside the reception hall. This would allow for monitoring and recording of the presence of outgoing odours that remain within the approved odour level before discharge. Data would be recorded in real-time and uploaded to a central monitoring system.

Appropriate safeguards would be in place to maintain ventilation during maintenance works. Maintenance would generally take place on planned maintenance shut down days on weekends or non-delivery days. Maintenance would include regular service of ventilation equipment including electric motors and induction system. There would be two fans operating at 70% capacity so there would be opportunity to conduct regular and emergency maintenance activities while the other fan remains in operation. Having replacement ventilation equipment and key spare parts on-site will minimise shut down risks.

4.2.1.3 Fugitive emissions from the doorway

Issue

NSW EPA requested further sensitivity analysis of the fugitive emissions from the waste reception hall doorway during operation, specifically the impacts on sensitive receiver R11.

Response

In order to provide a response about potential odour emissions from the doorway, GHD has undertaken a review of recent odour audits of the Veolia Clyde Waste Transfer Terminal and Banksmeadow Waste Transfer Terminal which are conducted regularly by The Odour Unit, both of which were referenced in the West Nowra Resource Recovery Park Stage 2 Air Quality Assessment (GHD, 2021).

These audits include smoke testing to determine the effectiveness of the forced air extraction system, including around the truck entry point into the building. Key findings by The Odour Unit include:

– "*The smoke released at this point initially rose gradually moving towards the truck entrance before rising to the roof and moving slowly towards the extraction system. Visible smoke extraction at the overhead capture points was evident during the smoke testing at this point. Any smoke that continued towards the truck entrance was drawn back into the building*" (Clyde Waste Transfer Terminal - TOU, June 2021)
– *No smoke was found to be emanating from the sealed breezeways around the perimeter of the BTT Facility building; The released smoke was found to be well-contained with the BTT Facility building enclosure, suggesting that odour release at ground level is minimal; and The released smoke was found to gradually dissipate over time. This indicates that there is a very good level of air exchange turnover within the BTT Facility building enclosure.* (Banksmeadow Waste Transfer Terminal – TOU, April 2019)

Photos from The Odour Unit's audits during smoke testing are provided below and demonstrate smoke around the doorway of each facility is heading into the building. Based on these audits, GHD can conclude that odours are unlikely to escape from the entry door of the facility with a well operating air extraction system. The entry door should not therefore be included as an odour source under routine operations.

Photo 2.4 – A view of the truck entrance plastic strips during smoke testing on 13 May 2021

Figure 4.3 Photo from TOU (2021)

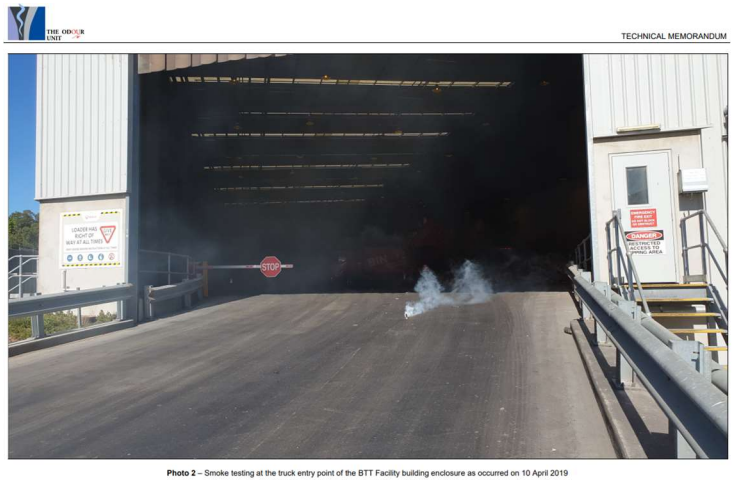


Photo 2 – Smoke testing at the truck entry point of the BTT Facility building enclosure as occurred on 10 April 2019

Figure 4.4 Photo from TOU (2019)

GHD has also reviewed recent odour sampling conducted at the Banksmeadow Waste Transfer Terminal. This report has updated calculated odour emission rate per tonnes of waste on the floor. In the West Nowra Resource Recovery Park Stage 2 Air Quality Assessment (GHD, 2021), an odour emission rate of 152.6 OU.m^3/t/s was adopted for receival hall stack emissions.

Recent sampling[1] by The Odour Unit shows that calculated concentrations are much lower than this, with the last year of odour sampling from the stack being 70 OU.m^3/t/s, a figure less than half assumed in the assessment for Bioelektra.

Based on the above review of smoke testing and odour emission rates, GHD provides the revised modelling results for the following cases:

– **Typical proposal operation** with no odour from doorway – refer Table 4.4
– **Poor air extraction operation** (poorly functioning air extraction system resulting in some air escaping the doorway, with escaped air odour equivalent to 25% of that inside the receival hall) – refer Table 4.5. This was previously provided by GHD in the AQIA.
– **Worst case air extraction operation** (poorly functioning material reception hall air extraction system resulting in some air escaping the doorway, with escaped air odour equivalent to 100% of that inside the receival hall) – refer Table 4.6. This was requested by EPA.

The door would be kept shut if ventilation system was not operating at all to reduce the potential for odour impact.

[1] https://www.veolia.com/anz/sites/g/files/dvc2011/files/document/2020/12/Banksmeadow%20TT%20AEMR%202019-2020.pdf

All scenarios have been assessed using the conservative odour emission rate of 152.6 OU.m^3/t/s as per the original GHD assessment, which is potentially double that of what would be expected of a well-functioning air extraction system can achieve.

Results show than even if the ventilation system is not working efficiently, and some odorous air is escaping from the doorway, predicted odour impacts would comply with the relevant criteria at all receptors.

Table 4.4 Predicted odour concentrations from typical proposal operations

Receptor	Odour assessment criteria (OU)	Predicted 99th percentile odour concentrations (1 second average, OU)				
		Incremental			Cumulative (Bioelektra + current landfill operations)	Cumulative (Bioelektra + proposed stage 4 Landfill Extension)
		All sources except material reception hall (roller doors)	Material reception hall (roller doors) only	Bioelektra incremental		
R01	5	0.4	0.0	0.4	0.8	1.3
R02	5	0.3	0.0	0.3	0.6	0.9
R03	5	0.2	0.0	0.2	0.4	0.5
R04	5	0.2	0.0	0.2	0.3	0.5
R05	5	0.2	0.0	0.2	0.3	0.4
R06	5	0.2	0.0	0.2	0.3	0.4
R07	5	0.2	0.0	0.2	0.3	0.4
R08	5	0.2	0.0	0.2	0.3	0.4
R09	5	1.1	0.0	1.1	1.1	1.1
R10	5	0.8	0.0	0.8	1.2	1.2
R11	5	2.4	0.0	2.4	2.7	3.0
R12	3	2.6	0.0	2.6	2.7	2.8
R13	5	0.1	0.0	0.1	0.3	0.3
R14	5	0.2	0.0	0.2	0.2	0.3

Table 4.5 Predicted odour concentrations from poor air extraction operation

Receptor	Odour assessment criteria (OU)	Predicted 99th percentile odour concentrations (1 second average, OU)				
		Incremental			Cumulative (Bioelektra + current landfill operations)	Cumulative (Bioelektra + proposed stage 4 Landfill Extension)
		All sources except material reception hall (roller doors)	Material reception hall (roller doors) only	Bioelektra incremental		
R01	5	0.4	0.02	0.4	0.9	1.3
R02	5	0.3	0.01	0.3	0.6	0.9
R03	5	0.2	0.01	0.2	0.4	0.5
R04	5	0.2	0.01	0.2	0.3	0.5
R05	5	0.2	0.01	0.2	0.3	0.4
R06	5	0.2	0.01	0.2	0.3	0.4
R07	5	0.2	0.01	0.2	0.3	0.4
R08	5	0.2	0.01	0.2	0.3	0.4

Receptor	Odour assessment criteria (OU)	Predicted 99th percentile odour concentrations (1 second average, OU)				
		Incremental			Cumulative (Bioelektra + current landfill operations)	Cumulative (Bioelektra + proposed stage 4 Landfill Extension)
		All sources except material reception hall (roller doors)	Material reception hall (roller doors) only	Bioelektra incremental		
R09	5	1.1	0.01	1.1	1.1	1.2
R10	5	0.8	0.00	0.8	1.2	1.3
R11	5	2.4	0.62	2.9	3.1	3.3
R12	3	2.6	0.03	2.7	2.7	2.8
R13	5	0.1	0.00	0.2	0.3	0.3
R14	5	0.2	0.01	0.2	0.2	0.3

Table 4.6 Predicted odour concentrations from worst case air extraction operation

Receptor	Odour assessment criteria (OU)	Predicted 99th percentile odour concentrations (1 second average, OU)				
		Incremental			Cumulative (Bioelektra + current landfill operations)	Cumulative (Bioelektra + proposed stage 4 Landfill Extension)
		All sources except material reception hall (roller doors)	Material reception hall (roller doors) only	Bioelektra incremental		
R01	5	0.4	0.07	0.5	0.9	1.3
R02	5	0.3	0.05	0.4	0.7	0.9
R03	5	0.2	0.04	0.3	0.4	0.5
R04	5	0.2	0.03	0.2	0.3	0.5
R05	5	0.2	0.03	0.2	0.3	0.4
R06	5	0.2	0.03	0.2	0.3	0.4
R07	5	0.2	0.02	0.2	0.3	0.4
R08	5	0.2	0.03	0.2	0.4	0.4
R09	5	1.1	0.06	1.1	1.1	1.2
R10	5	0.8	0.02	0.8	1.2	1.3
R11	5	2.4	2.47	4.3	4.6	4.6
R12	3	2.6	0.13	2.7	2.7	2.8
R13	5	0.1	0.02	0.2	0.3	0.4
R14	5	0.2	0.02	0.2	0.2	0.3

4.2.1.4 Contingency measures for odour mitigation

Issue

NSW EPA requests that additional feasible odour mitigation measures or contingency measures to mitigate odour impacts during operation are identified.

Response

The odour control system would be designed with in built contingency including:

– Two horizontal fans to direct airflow from the waste reception hall
– Two variable speed drive (VSD) controlling systems

If one fan or VSD was to fail, the odour control system would have capability to continue to operate. Similarly, replacement ventilation equipment and key spare parts on-site would minimise shut down risks

4.2.2 Water management

4.2.2.1 Justification for the sediment basin sizing

Issue

NSW EPA requested further information relating to the proposed stormwater management system and sediment basin, including:

– more conservative sizing of the sediment basins,
– enhanced erosion measures to minimise disturbance,
– development of a construction water quality monitoring program with a Trigger Action Response Protocol and
– further information on the pre-existing ponds to be dewatered.

Response

Sediment basin sizing

The basin sizing presented in Appendix K of the EIS in the Soils and water assessment, was based on the principles outlined in Managing Urban Stormwater: Soils and Construction (Landcom 2005). Three sediment basins were proposed during construction with a total storage capacity of 403 cubic metres. Since the EIS preparation, further design has been undertaken by Van Der Meer Consulting for the proposed works. This includes the development of a Stormwater Drainage Plan for the operational phase.

As shown in the Construction Stormwater Management Plan (Van der Meer Consulting 2021), a total storage volume of 2,200 cubic metres would be provided. This plan demonstrates how the basins are sufficiently sized to operate as sediment basins under the Blue Book requirements with a design rainfall event that exceeds the 85th percentile 20-day event. The catchment details and basis for the design of the ponds is provided in the preliminary plan attached in Appendix E. The basins are oversized compared to typical erosion and sediment control basin volumes.

Enhanced erosion measures

Further details have been provided for sediment control measures (refer Appendix F) including:

– sediment control fencing and silt traps
– topsoil management requirements
– dust control measures
– signage
– monitoring requirements

Construction water quality monitoring program

Water quality monitoring would be undertaken during construction. In particular, this would inform the Trigger Action Response Protocol (TARP) by providing information both on receiving water quality conditions and the quality of runoff from the disturbed site. The monitoring program including timing and analytes are described in section 3.4 of the Construction Discharge Characterisation Assessment (GHD 2021) attached as Appendix E.

The monitoring location and frequency are provided in Table 4.7.

Table 4.7 Monitoring program

Type	Location	Period	Frequency
Reference	Sandy and Cabbage Tree Creeks – Upstream of inflow from site	From 3 months after project approval until completion of site disturbance activities. .	– Monthly for first three months of sampling – Quarterly thereafter – During overflow from dams/sump
Impact	Cabbage Tree Creek – Downstream of inflow from site		
Impact	Upstream of the culvert under the landfill receiving runoff from the site.		
Site runoff and discharge (if occurring)	Dam 1 and Sump (or Dam 3 in later stages where sump not in place)	From the first runoff event during construction until completion of site disturbance activities	– First three runoff events during construction – Quarterly – When combined dam levels exceed 30 percent of capacity – During overflow from dams/sump

Existing pond dewatering

The Dam Dewatering Plan prepared by Van Der Meer (Refer Appendix G) allows for dewatering the dams based on irrigation to dedicated irrigation areas at a rate that does not result in overland flow. This is based on nominated irrigation areas calculated based on an estimated infiltration rate. The actual application rate would be confirmed on site and adjusted immediately based on identification of any runoff leaving the irrigation area.

On this basis, the dam dewatering is not anticipated to form a risk to downstream water quality. It is not anticipated to introduce any significant additional soil contamination risks compared to that already at the site. This is on the basis that any contamination in the dams is anticipated to be due to sediment mobilisation into the dams from the site itself. Furthermore, the dam water would be sampled and analysed as part of Detailed Site Investigations proposed to be undertaken at the start of the construction stage, as outlined in Section 4.2.3. The objective of this would be to confirm that the water is suitable for dewatering by on-site irrigation.

4.2.2.2 Water discharge during construction

Issue

Further clarification was requested on the stormwater management design for the discharge locations and design. In addition, a surface water discharge characterisation assessment was requested to be provided to support the proposed management approach.

Response

A Construction Discharge Characterisation Assessment (GHD 2021) has been prepared and is included as Appendix G. The assessment outlines the proposed stormwater management approach for the earlier and later construction stages. The discharge locations (if discharge occurs during the works) are shown in the assessment including:

– Earlier construction stages: Sump overflow –To a drainage line conveyed underneath the landfill site then to Sandy Creek and to the Shoalhaven River.
– Earlier and later construction stages: Dam 1 overflow: To local drainage lines to Cabbage Tree Creek, then the Shoalhaven River.
– Later construction stages: Dam 3 overflow: To a drainage line conveyed underneath the landfill site then to Sandy Creek and to the Shoalhaven River.

Based on the large volumes of storage provided and construction staging, the total number of discharges during the 12 month construction period could indicatively be in the range of none to one or two, subject to weather conditions. Furthermore, based on the proposed contamination response and TARP the likelihood of discharge of contaminated water is further reduced.

Therefore, if any discharge occurs it is likely to be that associated with typical construction phase runoff. This could include elevated TSS and turbidity. A low risk flocculant such as gypsum can be used based on longer duration management period which is not anticipated to result in significant downstream water quality impacts.

Notwithstanding the above, full characterisation of potential discharges would be undertaken as soon as is practicable after site disturbance activities have occurred. This allows for more accurate characterisation than achievable before disturbance based on the in-situ collection of samples from disturbed site runoff. This is considered appropriate based on the low predicted frequency and consequence of discharge. The characterisation would be undertaken based on the sampling of the first three runoff events from the site and would be provided to the EPA within 4-6 weeks of the third sampling event.

4.2.3 Contamination

Issue

The EIS provided high level contamination assessment only and has not satisfactorily addressed the SEARs for contamination. In additional it was recommended that an NSW accredited site auditor be engaged to review the additional investigation works.

Response

The SEARs (DPIE 2021) required characterisation of the nature and extent of contamination on the site and a description of proposed management measures. Appendix L of the EIS (GHD 2021) provides a preliminary site investigation. As part of the investigation the following activities were undertaken to assess the extent and nature of contamination at the site:

– Review of site data including information on environmental setting and historical title records and photographs
– Site walkover inspection
– Collection of three surface soil samples as part of the preliminary salinity assessment
– Collection of three fragments of potential asbestos containing material and laboratory analysis for asbestos
– Preparation of a conceptual site model

NSW EPA recommended a detailed site investigation be undertaken to further characterise the nature and extent of contamination at the project site to be overseen by a NSW accredited site auditor.

Bioelektra would undertake the detailed investigation and engage the site auditor to oversee the works as part of the construction phase. Bioelektra expects this requirement to be included as part of the consent conditions. The detailed site investigation would be undertaken prior to commencement of construction works, and would include:

– Review of landfill gas subsurface monitoring data and landfill gas risk assessment per the updated mitigation measures (Appendix B)
– Surface water monitoring as described in the construction discharge characterisation assessment (Appendix E)
– Soil sampling/waste classification per the *Waste Classification Guidelines* (NSW EPA 2014)
– Recommendations for management of any identified contamination to prevent any unacceptable risks to human health or the environment during the construction or operation of the proposed development.

4.3 Water NSW

Issue

The proposal is not located near any WaterNSW land assets or infrastructure, therefore WaterNSW have no particular comments or requirements.

Response

Noted

4.4 Biodiversity and Conservation Division

Issue

A BDAR waiver has been granted by the Biodiversity and Conservation Division and therefore no further comments were provided.

Response

It is noted that the project is supported by the Biodiversity and Conservation Division.

4.5 Transport for NSW/Roads and Maritime Services Division

Issue

Transport for New South Wales (TfNSW) does not believe the development will have a significant impact on the Princes Highway and on this basis, does not object to the development application.

TfNSW does however recommend the applicant consider the use of more productive or PBS vehicles in the future, which would reduce the number of truck trips required for the given freight task.

Response

The findings of the traffic and transport impact assessment in the EIS support the conclusions made by TfNSW.

4.6 Crown Lands

Issue

Crown Lands has no comments for this proposal, and no objections, as no Crown land, roads or waterways are affected by the proposal.

Response

As shown in the Figure 4.3 of the EIS (GHD 2021), the project site does not impact on any Crown Land.

4.7 Heritage NSW – Aboriginal cultural heritage

Issue

The EIS has identified that Stage 2 of the project is not expected to disturb any land not already assessed and approved as part of Stage 1. Heritage NSW support this assessment however we recommend the inclusion of Aboriginal cultural heritage as an environmental issue in Table 18.1 (page 165) along with a management measure requiring the preparation and implementation of an Aboriginal Cultural Heritage Unexpected Finds Procedure. This procedure needs to form part of the Construction Environmental Management Plan for the site and be undertaken in consultation with any Registered Aboriginal Parties.

Response

The construction environmental management plan to be developed for the project would include consideration of Aboriginal cultural heritage in the unexpected finds protocol. This requirement has been included in the updated mitigation measures table in Appendix B.

4.8 Fire and Rescue NSW

Issue

Fire and Rescue NSW reaffirmed their advice that was provided on 26 February 2019 and noted that "Waste facilities present 'special problems of firefighting' that warrant classification as 'special hazards', and consideration of provision for special hazards under Clause E1.10 and E2.3 of the NCC"

Response

The fire safety impact assessment was developed in consultation with Fire and Rescue NSW to meet the *Fire Safety guideline – Fire safety in waste facilities* (Fire and Rescue NSW 2020). The applicability of Clause E1.10 and E2.3 of the NCC to the project is acknowledged in section 1.4 of the Fire and Incident Management Review (GHD 2021).

4.9 Endeavour Energy

Issue

Endeavour Energy notes the presence of low voltage overhead service conductors (not held under easement) in the road frontage that are protected assets under Section 53 'Protection of certain electricity works' of the *Electricity Supply Act 1995* (NSW). A power poles is located within the proposed eastern and western driveway footprints. The encroachment can be rectified with the agreement of the adjoining or benefitting owner.

Response

The buildings and structures on the site maintain adequate safety distances to Endeavour Energy assets. The location and safety distances to power poles would be reviewed as part of the detailed design. The power poles would be relocated such that a minimum clearance distances as required by Endeavour Energy are maintained. An application for the proposed works would be submitted to Endeavour Energy during the detailed design phase.

Issue

Endeavor Energy noted that the carpark should be designed to allow for turning movements, reversing, and safety aspects such as sight distances to both pedestrians and other vehicles.

Response

The carpark has been designed in accordance with user Class 1 in *AS2890.1 Parking Facilities: Off-street car parking* and *AS 2890.2 Parking Facilities: Off street commercial vehicle facilities.* A plan for the carpark showing traffic flow is provided in Table 4.8.

4.10 Public

Issue

Steven Broussos of Greenacre requested whether it would be possible to have a local recycling industry in the resource recovery park.

Response

The project site would not be accessible to the public for recycling activities. Waste received by the project would comprise mixed municipal waste sourced predominantly from the Council waste (red lid bin) collections and other commercial sources.

The West Nowra Recycling and Waste Depot is located adjacent to the project site at 120 Flatrock Road, Mundamia. The adjacent site includes the following services which are available to the public.

– Community Recycling Centre

– Garden Waste drop off
– Buy-back Centre

4.11 Department of Planning, Industry and Environment

4.11.1 Design layout

4.11.1.1 Architectural plans

Issue

The following additional design details were requested to be provided by DPIE:

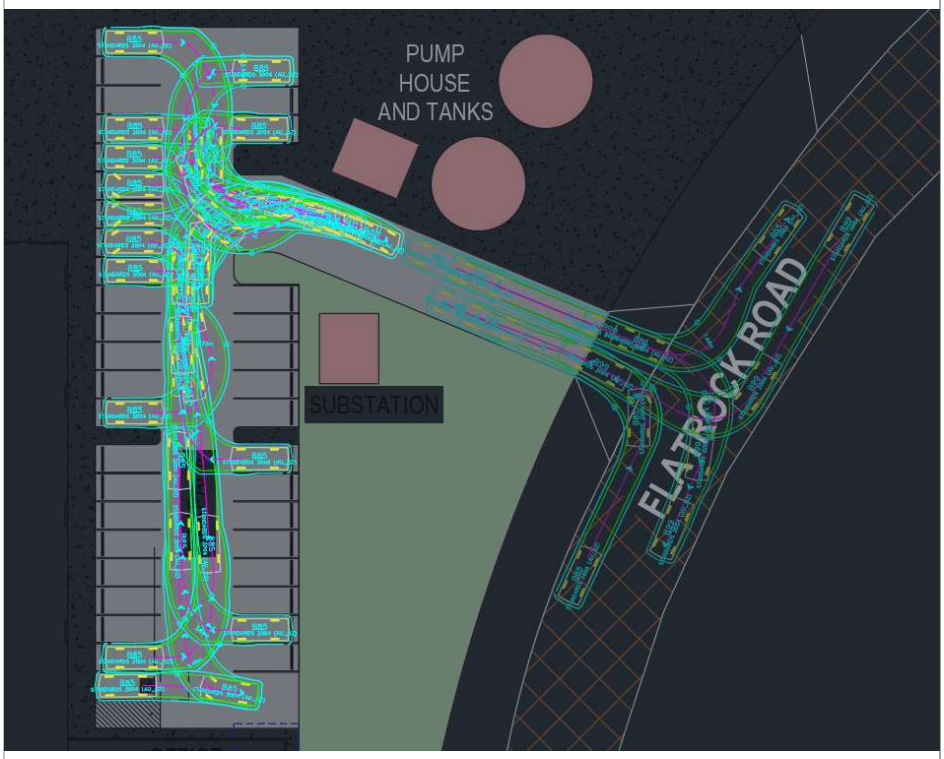
– construction material types for external surfaces
– plans for the roof structure for the covered holding bays
– elevation of the development from the south showing the entire office
– plan for the car park showing traffic flow and parking spaces in accordance with Australian Standard 2890
– location of the proposed solar system
– floor plans
– concept landscaping plan
– site analysis plan
– location of essential services

Response

Since completing the concept level design for the EIS, Bioelektra has progressed the design of the project. Table 4.8 provides references to the relevant plans and design details that address the DPIE comments, all architectural plans have been attached as Appendix H.

Table 4.8 Architectural plans reference

Plans requested by DPIE	Architectural plans reference
Construction material types for external surfaces	Pavement layout and design details have been provided as follows: – Van der Meer Consulting, dated 25 June 2021, Pavement Layout, Drawing No. C301, Revision A (Figure H.1) – Van der Meer Consulting, dated 25 June 2021, Pavement Details, Drawing No. C302, Revision A (Figure H.2) The following pavement types and design profiles are identified in the drawings: – Heavy duty concrete pavement – Vehicular crossing pavement – Fire trail pavement – Carpark pavement – Footpath pavement.
Plans for the roof structure for the covered holding bays	A design detail for the steel roof structure (Figure H.3) for the covered holding bays is provided that shows the type of roof sheeting and connection to the concrete wall panel between the bays that continues up to the underside of the roof sheet.
Elevation of the development from the south showing the entire office	A southern elevation plan that shows the entire office building is shown in: – John R Brogan & Associates, 9 July 2021, Elevations – Sheet 1, DRG No. 30-00-01 AMD No. 1 (Figure H.4)
Plan for the car park showing traffic flow and parking spaces in accordance with Australian Standard 2890	The car park plan with swept paths shown is provided in Figure 4.5. The minimum car park width, length and aisle width are 2.4 m, 5.4 m and 6.2 m respectively in accordance with user Class 1 in *AS2890.1 Parking Facilities: Off-street car parking* and *AS 2890.2 Parking Facilities: Off street commercial vehicle facilities.*

Plans requested by DPIE	Architectural plans reference
	 *Figure 4.5 Car park layout swept path analysis*
Location of the proposed solar system	A proposed panel layout for the roof solar system (1842 panels) is presented in: – Suman, dated 1 December 2020, Panel Layout, Drawing No. 1000-1-XX, Revision A (Figure H.5)
Floor plans	The following floor plans have been provided to address DPIE comments: – Layout showing the location of all proposed plant and equipment in the waste reception hall, sterilisation hall and sorting hall including the conveyors (Figure H.6) – Layout of the waste reception hall that shows the two unloading areas, inspection areas, non-conforming waste temporary storage area, and maximum waste stockpiles dimensions (Figure H.7) – Annotated output material maximum storage volumes (Figure H.8) – Hydraulic services plan showing the leachate management system including locations of pits, bunding, grates and pipes (IGS, 26 August 2021, Drawing No. H100 and H101, Revision 03) – Figure H.9 and Figure H.10 – Mechanical services site plan (IGS, 20 August 2021. Mechanical Services Site Plan, Drawing No. M100, Revision 02, Figure H.11)
Concept landscaping plan	A high level concept landscape plan (John R Brogan & Associates, 17 September 2021, Site Plan, Drawing No.04-00-00 Revision No. T2) shows the proposed planting and vegetated areas (Appendix I).
Site analysis plan	The site layout plan included as Figure 4.2 of the EIS shows the location of the adjoining site buildings and structures and uses for each area are labelled
Location of essential services	The following preliminary plans show the proposed layout of services: – IGS, dated 20 August 2021, Mechanical Services Roof Plan, Drawing No. M120, Revision 02 (Figure H.12,) – IGS, dated 20 August 2021, Electrical Serices Site Plan A, Drawing No.E100, Revision 02 (Figure H.13) – Hydraulic services plan showing the leachate management system including locations of pits, bunding, grates and pipes (IGS, 26 August 2021, Drawing No. H100 and H101, Revision 03) – Figure H.9 and Figure H.10

Plans requested by DPIE	Architectural plans reference
	The three phase overhead conductor from Yalwal Road to the project site is proposed to be augmented and the power infrastructure installed as shown in Figure 4.6.

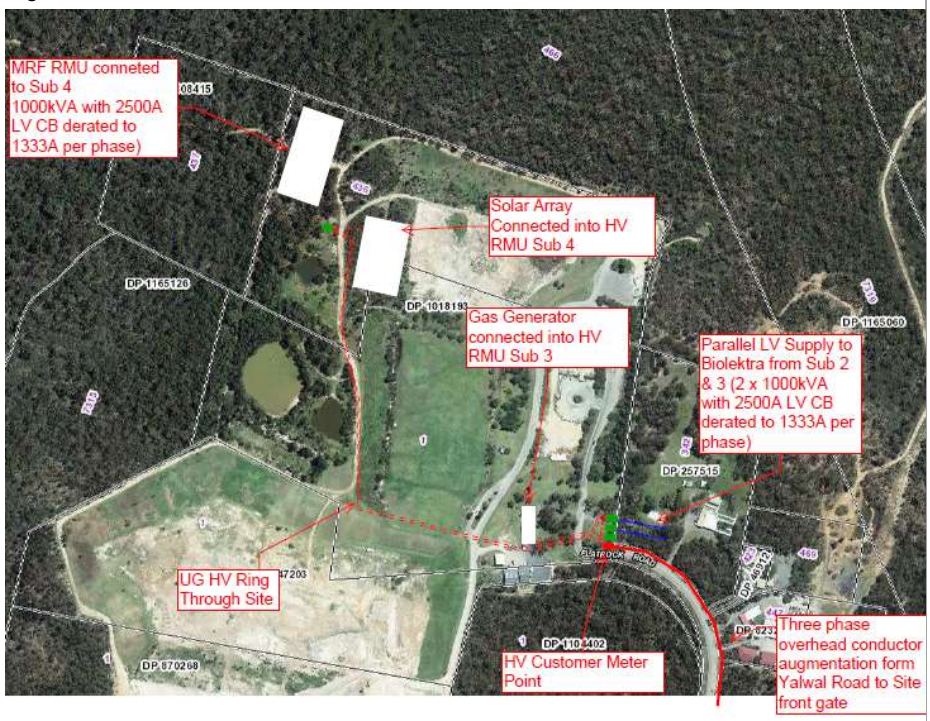


Figure 4.6 Proposed power upgrade works

4.11.1.2 Queuing plan

Issue

DPIE requested a plan that shows how all vehicles generated during construction and operation and awaiting loading, unloading or servicing can be accommodated on the project site to avoid queuing in the street network.

Response

The maximum number of vehicles expected to be onsite would be up to 10 trucks in one hour. The vehicle movements and traffic route around the project site are shown in the site plan (Appendix I) prepared by John R Brogan & Associates (17 September 2021, Drawing No.04-00-00 Revision No. T2). The plan shows that the project site can accommodate more than the maximum number of trucks per hour without queuing on the Flatrock Road.

4.11.1.3 Stormwater Plan

Issue

A detailed stormwater and wastewater plan that shows the proposed stormwater system including nominated discharge points, location of waste water tanks and drainage infrastructure for the pavement areas. In addition further detail is required for the firewater system.

Response

As described in Section 4.2.2 of this report, the stormwater management design has been further progressed since submission of the EIS. The updated stormwater plan (Appendix E) that shows the proposed location of the wetland and sediment pond outlets as well as drainage pipe connections, pits, and rainwater collection tanks. The southern bioretention basin would outlet to an existing culvert under Flatrock Road and the north-eastern wetland

would discharge via an overflow weir to the adjacent lot north of the project to tie in with existing overland flow paths.

An annotated figure detailing the firewater system layout has been provided and attached as Appendix J. The plan shows where hydrants, firewater tanks, sprinklers and wastewater tanks would be located.

4.11.2 Waste Management

4.11.2.1 Feedstock composition

Issue

DPIE requested clarification on the basis for the waste feedstock composition presented in the EIS.

Response

The feedstock composition was based on residual waste morphology for Shoalhaven City Council area based on information collected by Bioelektra for typical waste composition that would be received by the project. The breakdown was provided by Shoalhaven City Council based on waste audit information.

4.11.2.2 Consistency with the NSW Energy from Waste Policy Statement and biomass validation

Issue

DPIE requested further information to demonstrate compliance with the Energy from Waste Policy Statement (NSW EPA 2021) including:

– Details of the proposed Cement Australia and Boral receival facilities and ability to accept the waste and their specifications
– Additional information on the potential contaminants such as halogenated substances contained in the refuse derived fuel (RDF)
– Breakdown of potential contaminants expected to exist in the biomass and RDF based on similar operations/facilities

Response

Chapter 8 of the EIS, addresses consistency of the project with the NSW Energy from Waste Policy Statement (NSW EPA 2021) including proportion of the biomass output stream to be used for off-site energy recovery. The resource recovery criteria indicates that up to 25% by of the residual waste stream received at facilities processing mixed municipal solid waste where a council has a separate collection system for dry recyclables can be used for energy recovery. As shown in the EIS, the pre RDF product stream would comprise 16.3% by weight of the waste stream received at the project site.

An indicative specification for solid recovered fuel has been prepared by Boral which outlines the sampling and testing criteria for acceptance of RDF material including test methods, sampling and reporting requirements. It is noted that the output material generated by the project would be pre RDF material rather than RDF.

Testing of biomass material produced by the Bioelektra plant in Poland which utilises the same sterilisation technology has been undertaken considering the Boral specification. The laboratory test reports and Boral specification are provided in Appendix K. Key findings from the test results are as follows:

– A vortex would be introduced to reduce moisture content and increase calorific value
– The biomass sample elemental characterisation indicates that the biomass mostly contains silicon, aluminium and iron with the remaining mass being carbon-based materials.
– Test results do not indicate the presence of halogenated substances.
– The test results are generally compliant with the specification with the exception of select heavy metals, moisture content, calorific value, chlorine, PCBs and PCPs.

During commissioning of the facility, there would be further testing and trials undertaken to optimise and refine the processing of the biomass to meet required specifications. It is noted that there would be some variability in the biomass composition for the project compared to the samples that were tested from the Poland facility. A comparison of the waste morphology is summarised in Table 4.9. A validation sampling program would be developed for the pre RDF material following confirmation of receiving facility specifications and biomass composition.

Table 4.9 Comparison of waste morphology

Waste stream	Shoalhaven waste morphology (%)	2019 Poland facility waste morphology (%)
Organic waste	60%	35.2%
Paper and cardboard	9%	14.3%
PET	1%	2.2%
PP	1%	1.0%
Other plastics	5%	8.7%
Glass	3.5%	3.0%
Ferrous metal	2.6%	2.3%
Non-ferrous metals	0.3%	0.5%
Textile	3%	21.7%
Wood	2%	
Rubber, leather	2%	
Inert	10.6%	4.1%
Other		7.0%
Total	**100%**	**100%**

4.11.2.3 Biomass handling and storage

Issue

Further detail is required regarding the maximum quantity of biomass to be stored on site at any given time and how it will transferred to holding bays.

Response

The maximum total quantity of biomass to be stored on the project site at any given time would be 397 tonnes. Following further development of the design for the covered holding bays, it is noted that all biomass would be stored in covered bins. Biomass and pre-RDF material would be transferred to the containers via an overhead conveyor belt as shown in Figure 4.7 below.

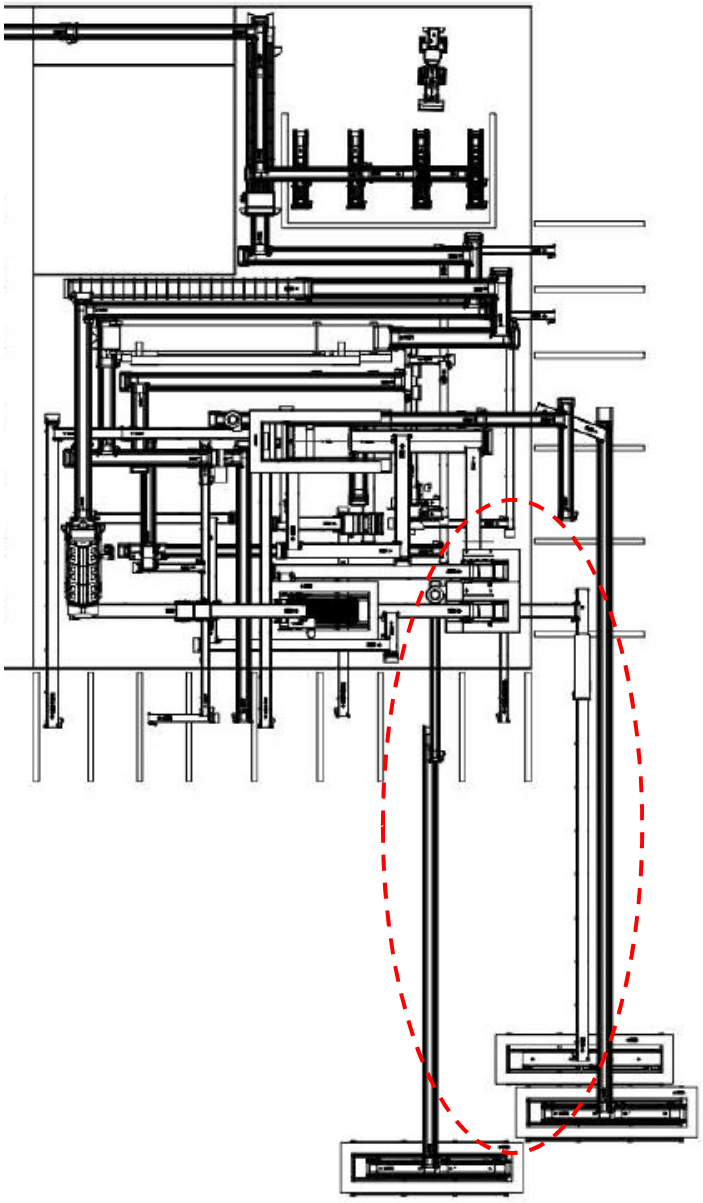


Figure 4.7 Overhead conveyor to covered bins

4.11.2.4 Confirmation of location of receival facilities

Issue

DPIE requests identification of the location of all the proposed receival facilities for the segregated wastes.

Response

The proposed destinations for the output materials is described in chapter 8.3.7 of the EIS. Further detail is provided in Table 4.10. Bioelektra in collaboration with RMIT, the University of Melbourne & Universal Vortex Industries would undertake a Cooperative Research Centres Project which aims to transform waste biomass into hydrogen (H2) fuel and char/inorganic ash for potential exploitation by Cement Australia & the Ash Development Association of Australia in construction.

Table 4.10 Proposed receival facilities

Material	Description	Receival facilities
Pre RDF	Pre RDF would be used for cement kiln feedstock replacing feedstock that may otherwise have been fossil fuel derived.	1. Boral Cement Works, Berrima NSW 2. Cement Australia Geocycle, Dandenong South Victoria
Biomass	Biomass would be received by several entities as a feedstock in the production of brick, masonry type products, cement kiln feedstock and feedstock for hydrogen fuel	1. Boral Cement Works, Berrima NSW 2. Cement Australia Geocycle, Dandenong South Victoria 3. Casafico, Braeside Victoria 4. Ouroborus, South Yarra Victoria 5. Cooperative Research Centres Projects (CRCPX000038)
Plastics (PP and PET)	Plastics would be transferred to plastic manufacturers as feedstock in the production of plastic products	1. Advanced Circular Polymers, Somerton Victoria 2. Polymer Processors, Braeside Victoria
Glass (coloured and mixed)	Recovered glass would be used in the production and manufacture of sustainable building products such as coatings and building blocks	1. Casafico, Braeside Victoria
Ferrous and non-ferrous metals	The recovered metals would be transferred to a metal recyclers	1.Sell & Parker, Nowra NSW
Aggregates	Aggregates would be transferred to SCE for use in the production of recycled construction materials for mining and civil construction applications	1.SCE Recycling, Warrawong NSW
Landfill	Residual waste that cannot be recycled will be transported to landfill for disposal	1.West Nowra Landfill (adjacent site)

4.11.3 Traffic and transport

Issue

Provide a breakdown of the truck types expected to load and unload waste including type and maximum number accessing the project site each day. Provide the basis for how the light and heavy vehicle movements presented in the EIS were estimated.

Response

Operational heavy and light vehicle movements was estimated as part of the Traffic Impact Assessment (Appendix M of the EIS). The proposed additional vehicle movements during peak hour in 2020 and 2030 were estimated in Section 4.8 of the assessment. The light vehicle movements associated to staff were resulting from the number of staff arriving at and departing the project site based on operational hours. The number of heavy vehicles was based on the following:

– Operational hours
– Estimated waste tonnages based on reported kerbside pick up data reported by Shoalhaven City Council in waste audits, the projected tonnages were factored up according to predicted population growth. It was assumed that there would be a gradual ramp up of incoming waste tonnages in the modelled period from 2020 to 2030.
– Average tonne per vehicle was based on 2012/2013 weighbridge data from West Nowra Landfill, as shown in Table 4.11Table 4.11.

Table 4.11 Vehicle types loading

Vehicle type	Truck capacity (tonnes)	Average load (tonnes)
Shoalhaven City Council collection truck	12	9
Semi trailer	22.5	22

Since the EIS was submitted additional information has been provided by Shoalhaven City Council relating to the breakdown of Council collection trucks and waste deliveries attributed to other sources. The updated information has been provided in Table 4.12 for comparison. The updated estimate is based on the total processing capacity limit of 130,000 tonnes per year divided over the number of operating days.

This assumes a constant average over the course of the year. In addition, the proportion of Council collection trucks was estimated to be lower in the updated estimate which results in a lower overall daily vehicle count. The updated estimate sits within the range assessed in the EIS therefore the outcomes of the assessment are still valid. The EIS assessment conservatively estimates a ramp up to the number of deliveries from 2020 to 2030 and a higher proportion of Council collection trucks.

it should be noted that the Council collection trucks would be excluded from the net impacts of the project as these are already included in the existing traffic numbers. The collection trucks would be diverted from the landfill to the project site.

Table 4.12 Breakdown of number of trucks associated to incoming and outgoing deliveries

	Number of vehicles per day		
	2020 (EIS 2021)	2030 (EIS 2021)	Updated estimate
Light vehicle (Council collection trucks)	18	65	19
Heavy vehicles (other suppliers – semi trailer)	12	14	29
Total vehicles per day	29	79	48
Total tonnes per day	187	697	500

4.11.4 Water management

Issue

Confirm how wastewater generated by residual waste from processing would be managed.

Provide a detailed description of the proposed wastewater treatment plant and process.

Response

Residual waste

Residual wastes generated from processing activities would be placed into enclosed bins. Note that the waste material would be dry and sterile and would not include organic fractions that may generate leachate or odour.

Waste water treatment plant

The proposed wastewater treatment plant design documentation prepared by Aerofloat Wastewater Treatment Specialists (2021) has been provided as Appendix D. A description of the wastewater treatment plant infrastructure is provided in chapter 6.2.2 of the EIS.

As identified in section 4.2 of the Soil and Water Assessment (GHD 2021), 7,300 tonnes per year of dirty water would be generated by the project. The proposed design would have a treatment capacity of 20 cubic metres per day which has been sized based on the waste processing capacity and general water use by staff. The wastewater holding tank would have a capacity of 110,000 litres and would be pumped out twice per week.

In the unlikely event that the wastewater treatment plant is not functioning the following inbuilt contingencies would be implemented:

– Duty and standby pumps and blowers for all critical equipment
– Utilisation of the upfront balance tanks and final storage tank that provide 5.5 days of storage capacity in the system is taken offline for emergency repairs

4.11.5 Contamination

Issue

Provide the intended control measures to address potential landfill gas risks during construction and operation, as the PSI has identified the risk to be moderate to high.

Provide details regarding the results of landfill gas monitoring the adjacent landfill to better understand the likelihood of landfill gas migration.

Response

A risk management plan would be developed to address potential landfill gas migration risks during construction and operation. Typical landfill gas mitigation measures that would be considered include:

– Use of gas monitoring devices
– Installation of additional subsurface landfill gas monitoring bores in targeted locations
– Under slab gas vapour barrier
– Gas venting trenches and pipework
– Subsurface cut off wall

Further discussion on characterisation and mitigation measures is provided in Section 4.1.1 of this report. A recent landfill gas surface emissions monitoring report is provided in Appendix C and discussed in Section 4.1.1. The outcomes of recent testing results do not differ from the landfill gas monitoring findings reported in the PSI (GHD 2021). No exceedances of trigger values have been reported for surface emissions or building accumulation monitoring.

5. Limitations

This report: has been prepared by GHD for Bioelektra Australia Pty Ltd and may only be used and relied on by Bioelektra Australia Pty Ltd for the purpose agreed between GHD and Bioelektra Australia Pty Ltd as set out in section 1.3 of this report.

GHD otherwise disclaims responsibility to any person other than Bioelektra Australia Pty Ltd arising in connection with this report. GHD also excludes implied warranties and conditions, to the extent legally permissible.

The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report (refer section(s) 2 to 4 of this report). GHD disclaims liability arising from any of the assumptions being incorrect.

GHD has prepared this report on the basis of information provided by Bioelektra Australia Pty Ltd and others who provided information to GHD (including Government authorities), which GHD has not independently verified or checked beyond the agreed scope of work. GHD does not accept liability in connection with such unverified information, including errors and omissions in the report which were caused by errors or omissions in that information.

6. References

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Standards Australia, 2018. *AS 2890.2 Parking Facilities: Off street commercial vehicle facilities*

The Odour Unit (TOU) 2021. *Clyde Waste Transfer Terminal*, June 2021

The Odour Unit (TOU) 2019. *Banksmeadow Waste Transfer Terminal*, April 2019

The Odour Unit (TOU) 2014. *Banksmeadow Transfer Terminal Odour Emissions and Control*, February 2014

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Van der Meer Consulting, 2021. *Dam Dewatering Plan*, Drawing No. C220, dated 3 September 2021, Revision A

Veolia Environmental Services 2021 *NSW Resource Recovery Annual Environmental Management Report – Clyde Transfer Terminal*

Veolia Environmental Services 2020 *Annual Environmental Management Report – Banksmeadow Transfer Terminal 2019 - 2020*

Appendix A

Submissions register

Table 6.1 Submissions register

Group	Name	Section where issues addressed in submissions report
Councils	Shoalhaven City Council	Section 4.1
Public authorities	NSW Environment Protection Authority	Section 4.2
	WaterNSW	Section 4.3
	Biodiversity and Conservation Division	Section 4.4
	Roads and Maritime Division/ Transport for NSW	Section 4.5
	Crown Lands	Section 4.6
	Heritage NSW – Aboriginal cultural heritage	Section 4.7
	Fire and Rescue NSW	Section 4.8
	Department of Planning Industry and Environment	Section 4.11
Organisations	Endeavour Energy	Section 4.9
Individuals	Mr Steven Broussos	Section 4.10

Appendix B

Updated mitigation measures

Updated Mitigation measures

The updated mitigation measures for the project is provided in Table 6.2. The additional mitigation measures are shown in **red bold** and where a mitigation measure has been removed, it appears as ~~strikethrough~~ text. The mitigation measures are grouped by environmental issue and broken down further by timing; detailed design, pre-construction, construction and operation.

Table 6.2 Summary of environmental management measures

Environmental issue	ID	Management measures	Timing
Construction waste	01	Waste would be managed during construction in accordance with a Construction Waste Management Plan to be developed for the project. The Construction Waste Management Plan would: – adopt the waste hierarchy principles contained in the *Waste Avoidance and Resource Recovery Act 2001* – define the processes, responsibilities and management measures that would be implemented during construction to manage waste – include procedures for the assessment, classification, management and disposal of waste in accordance with the *Waste Classification Guidelines* (NSW EPA 2014b).	Construction
Operational waste	02	Operational waste from site personnel and maintenance activities, would be managed in accordance with the operational environmental management plan for the project. The operational environmental management plan would adopt the waste hierarchy principles contained in the *Waste Avoidance and Resource Recovery Act 2001*.	Operation
	03	All waste received at the site during operation would be managed in accordance with the operational environmental management plan, the site EPL and EPA (2015) *NSW Energy from Waste Policy Statement*. The Operational Environmental Management Plan would include: – An Operational Waste Management Plan – including the quality control, record keeping and waste tracking steps listed in Table 8.8.4 – An Energy from Waste Management Plan to address and manage compliance with the EPA (~~2015~~**2021**) *NSW Energy from Waste Policy Statement*	Operation
Dust management during construction	04	– The proposed selection of construction plant would be reviewed and equipment and dust reduction measures utilised where possible – All spoil stockpiles would be covered where possible – Particulate matter generated from construction activities is typically more prominent during dry and windy conditions. Water suppression would be used during these worst case conditions and when visible plumes of dust are observed to be dispersed from the construction of the project – The frequency of water dust suppression would be increased during worst case dust dispersion meteorological conditions (dry and windy) – The construction site would be maintained and kept clean – Controlled site access would be maintained with use of cattle/shaker grids ~~and wheel wash~~ in order to reduce the tracking of mud off site. – All vehicles transporting spoil or other dispersible material would be appropriately covered to prevent the escape of dust or other material while in transit	Construction

		– A log of all dust complaints received would be compiled and any potential causes of the complaint noted. If a trend in complaints is identified, work methods would be adjusted accordingly to minimise the likelihood of any future complaints – Visual monitoring would be undertaken by site management to ensure that construction works do not generate unacceptably high quantities of dust – Appropriate air quality mitigation measures (as provided above) would be included in the Construction Environment Management Plan	
Air quality during construction	05	– Construction plant and equipment would be properly operated and maintained to minimise excessive exhaust emissions – Appropriate air quality mitigation measures (as provided above) would be included in the Construction Environment Management Plan	Construction
Dust management during operation	06	– All building ventilation dust filters would be regularly checked and maintained and replaced in accordance with manufacturer specifications – Controlled site access would be maintained with vehicle wash down/clean down facilities (wheel wash if necessary) to be established to maintain access roads	Operation
Odour management during operation	07	~~– The activated carbon filter would be regularly checked, maintained and replaced in accordance with manufacturer specifications~~ **– The forced air extraction system and stack dispersion would be monitored at the stack discharge location** – The quantity of putrescible waste stored in the reception hall would be minimised – The reception hall would be kept as clean as possible via regular sweeping and wash down to minimise unnecessary odour emissions – The quantity of waste inside the reception hall would be minimised as much as practicable to prevent unnecessary build-up of waste ~~– Unnecessary opening of the reception hall door would be minimised where possible~~ **Rapid close roller doors would be activated by motion sensors to minimise opening time** – An odour complaint register to record all occurrence of odour complaints would be created – Staff would be informed of the potential odour impacts from the operation of the project and educated on appropriate mitigation measures (as outlined above)	Operation
Energy consumption	08	The project would utilise solar power	Operation
	09	Plant, equipment and vehicles selected for use would be efficient and operational activities would be optimised as far as practicable to minimise energy consumption	Operation
Soil salinity	10	The effects of salinity on foundations would be assessed as part of future geotechnical investigations in accordance with *AS 2159 – 2009 Piling – Design and Installation*	Detailed design
Surface water management	11	All earthworks, filling, building, driveways or other works, would be designed and constructed (including stormwater drainage if necessary) so that at no time, would any ponding of stormwater occur on adjoining land as a result of the project. **Discharge characterisation would be undertaken based on the sampling of the first three runoff events from the site and would be provided to the EPA within 4-6 weeks of the third sampling event.**	Detailed design

	12	Before beginning major works, soil sampling would be undertaken per Landcom (2005) to determine if flocculent will be required to achieve sedimentation.	Construction
Contaminated run off	13	Erosion and sediment control measures would be based on the design principles outlined in *Managing Urban Stormwater: Soils and Construction* (Landcom 2005) including: – Disturbed areas and the period of disturbance would be minimised – Clean run off would be diverted around disturbed areas – **Sediment control fencing would be installed downgradient of disturbed areas** – Disturbed runoff would be collected and managed in sediment ponds.	Construction
	14	– The contractor would prepare a detailed erosion and sediment control plan which would be updated throughout the construction period.	Construction
	15	– Stockpiles of material would be located well away (minimum of five metres from concentrated flow paths) from areas of frequent inundation, any permanent stockpiles would be aligned to water flow and temporarily stabilised with vegetation.	Construction
Off site migration of sediment	16	– Access roads and disturbance activities would be managed with consideration to minimising off-site transport of sediment.	Construction
Contaminated runoff	17	– A stormwater treatment system involving a ~~gross pollutant trap (also capable of capturing hydrocarbons) buffer strip and constructed wetland~~ **bioretention basin** would be adopted to manage water quality in the carpark area.	Operation
Water quality	18	– A water quality monitoring program would be implemented on-site to assess the runoff discharging from the sediment basins with respect to key waste and urbanisation pollutant parameters, to confirm the basis of the water quality risk assessment. Surface water quality will be assessed with consideration of the *Australian and New Zealand Guidelines for Fresh and Marine Water Quality* (ANZECC/ARMCANZ 2000). – Monitoring would take place quarterly during the first year of the operational phase with samples to be taken during a discharge event from the constructed wetland occurring within the facility's operating hours. After the first year of operation, samples would be taken annually.	Operation
Landfill gas	19	– A landfill gas risk assessment would be undertaken as part of the next design phase and the results would be considered for building design elements, such as passive or active gas mitigation measures **or monitoring bores within the project site**, should gas migration from the adjacent landfill site be identified and pose an unacceptable risk. **The risk assessment will consider subsurface landfill gas monitoring results from the monitoring bores installed along the western boundary.**	Detailed design
	20	– Landfill gas would be assessed through the installation of landfill gas monitoring wells installed along the western boundary of the site ~~and also within the facility footprint~~. Gas accumulation monitoring would also be carried out within the existing structure and service pits. The landfill gas monitoring would be carried out over approximately six months to capture high and low pressure conditions.	Detailed design
Contamination	21	– Further targeted contamination assessment **detailed site investigation** would be undertaken prior to construction commencing, **a NSW accredited site auditor would be engaged to oversee the works**.	Pre-construction

	22	– An Unexpected Finds Protocol would be prepared prior to construction commencing to manage previously unidentified occurrences of contamination that may be encountered during construction **including any items of Aboriginal cultural heritage significance**	Pre-construction
	23	– Any imported construction fill materials would be certified virgin excavated natural material or excavated natural material	Construction
Spills/leaks/ incidents	24	– Procedures would be developed to manage the risk of accidental spills and leaks and these would be incorporated in the construction environmental management plan for the project	Construction
	25	– Appropriate bunding and sediment and erosion control measures would be provided for the processing and maintenance areas and LPG station	Operation
	26	– Refuelling procedures and LPG tank filling procedures would be developed to manage the risk of accidental spills and leaks	Operation
	27	– A pollution incident response management plan would be developed and implemented which outlines management procedures for potential contaminants during operation	Operation
Non-conforming waste	28	– Any non-conforming wastes would be managed and disposed of in accordance with the procedure identified in Section 8.4.	Operation
Construction traffic	29	A Construction Traffic Management Plan would be prepared for the project and include: – management and timing of heavy vehicles through West Nowra – management and timing of trucks accessing the site to ensure there is sufficient room within the site to accommodate the vehicles	Construction
Parking and access	30	– Access and parking arrangements would be designed in accordance with AS2890.1 Parking Facilities: Off-street car parking and AS 2890.2 Parking Facilities: Off street commercial vehicle facilities.	Detailed design
	31	During detailed design, the following amendments would be considered: – The addition of a central median at site entry (south of the weighbridge office) to minimise conflicts and vehicles 'cutting the corner'	Detailed design
Operation traffic	32	– All parties would be required to coordinate visits with the office, particularly those that will access the covered holding bays and despatch (east)	Operation
Construction noise	33	– All engine covers would be kept closed while equipment is operating	Construction
	34	– As far as possible, materials dropping heights into or out of trucks would be minimised	Construction
	35	– Vehicles would be kept properly serviced and fitted with appropriate mufflers. The use of exhaust brakes would be eliminated, where practicable	Construction
	36	– Machines found to produce excessive noise compared to industry best practice would be removed from the site or stood down until repairs or modifications can be made	Construction
	37	– To reduce the annoyance associated with reversing alarms, broadband reversing alarms (audible movement alarms) would be used for all site equipment. Satisfactory compliance with occupational health and safety	Construction

		requirements would need to be achieved and a safety risk assessment may need to be undertaken to determine that safety is not compromised.	
	38	– All equipment would be selected to minimise noise emissions. Equipment would be fitted with appropriate silencers and be in good working order. Machines found to produce excessive noise compared to normal industry expectations would be removed from the site or stood down until repairs or modifications can be made.	Construction
	39	– All site workers would be sensitised to the potential for noise impacts on local residents and encouraged to take practical and reasonable measures to minimise the impact during the course of their activities. This would include: • Use of loud radios would be avoided • Shouting and slamming doors would be avoided • Where practical, machines would be operated at low speed or power and switched off when not being used rather than left idling for prolonged periods • Truck drivers would be informed of designated vehicle routes, parking locations and delivery hours • Reversing would be minimised • Dropping materials from height and metal to metal contact on material would be avoided – All equipment engine covers would be kept closed during operation	Construction
	40	– The contractor would provide a community liaison phone number and permanent site contact so that noise complaints can be received and addressed in a timely manner	Construction
	41	– Upon receipt of a noise complaint, monitoring would be undertaken and reported as soon as possible. If exceedances are detected, the situation would be reviewed in order to identify means to attempt to reduce the impact to acceptable levels.	Construction
Operational noise	42	– Should any of the equipment listed in the noise impact assessment have an operating sound power level higher than what has been assumed, further noise modelling would be undertaken during the detailed design stage to ensure the requirements of the *Noise Policy for Industry* (EPA 2017) are met	Detailed design
	43	– The roof of the facility would be constructed of a material with a minimum Rw 30 (a suitable sandwich panel material can be specified in the detailed design phase)	Detailed design/ construction
	44	– The walls of the facility would be constructed of a material with a minimum Rw 45 (such as 150 millimetre thick precast concrete panel)	Detailed design/ construction
	45	– Louvres on the southern façade of the reception hall would be constructed using acoustic louvres with a minimum width of 100 millimetres (e.g. Acran 100 louvres or better)	Detailed design/ construction
	46	– Rooftop ventilation fans would be sufficiently isolated from the structure of the building (mechanically decoupled) so as to not result in structure-borne noise	Detailed design/ construction
	47	– All ventilation fans and exhausts would be designed to have a maximum sound power level of 90 dBA at the exhaust, including (but not limited to): • Reception Hall exhaust fan x ~~1~~**8** • Sorting Hall ventilation fan x ~~8~~ **15**	Detailed design/ construction

		• Boiler flue exhaust x 1 • Dust collector exhaust x 1 • ~~Sorting~~ **Sterilisation** Hall ventilation fan x ~~1~~ **6** – Noise monitoring at the nearest residential receivers would be undertaken at the commencement of operation in accordance with any license conditions	
	48	– The roller doors to the reception hall would be closed, except during the ingress or egress of trucks	Operation
	49	– Where possible, operation of the shredder would be limited to when the roller doors to the reception hall are closed	Operation
	50	– ~~Sorting of material into the external despatch bins on the northern and eastern facades of the facility would be limited to between 7 am and 6 pm Monday to Friday and 8 am to 6 pm on Saturdays~~ **External despatch bins to be designed to emit a sound power level of no more than $L_{Aeq(15min)}$ 97 dBA or $L_{Aeq(15min)}$ 74 dBA at 5 metres from the edge of the bin**.	Operation
	51	The following traffic noise mitigation measures would be incorporated into the Operational Environmental Management Plan: – To reduce potential traffic noise impacts during operation, heavy vehicle movements along Flatrock Road would be limited to 50 kilometres per hour. – Drivers would undergo training to understand the potential noise impacts associated with the truck movements and to ensure only the prescribed haulage route is used to access the site – The use of exhaust brakes would be limited – Mufflers would be used on trucks, where possible	Operation
	52	– Asset protection zones would be provided as described in Section 15.1.3 and maintained in accordance with the asset protection zone requirements outlined in Appendix 4 of *Planning for Bush Fire Protection* (NSW RFS 2019)	Construction and operation
Bush fire protection	53	A site specific Incident Response Management Plan would be developed which would include bushfire prevention measures to be implemented during construction and operation. It would include the following measures: – Actions to be taken where a formal bush fire alert is issued – Emergency and operational protocols to be taken in response to escalation of fire weather conditions – Bush fire suppression equipment available on site and their location – Appropriate storage and maintenance of fuels and other flammable materials on site Notification of the Shoalhaven Fire Control Centre of the dates of construction and any dates during which 'hot works' would to be conducted	Construction and operation
	54	– Any retained vegetation (outside the identified asset protection zone) would be managed in accordance with the Shoalhaven Bush Fire Management Committee (2018) *Bush Fire Risk Management Plan*	Operation
Fire safety	55	– The fire safety system for the project would be refined during detailed design and developed in consultation with FRNSW	Detailed design

	56	– A detailed review and assessment of the project would be undertaken during detailed design to confirm BCA compliance and to identify the requirement for fire detection, automatic fire sprinkler and smoke hazard management systems	Detailed design
	57	– Prior to commencement of operation of the facility, the following would be developed: – An operations plan for stockpile management with a copy to be included within the Emergency Services Information Package – An Incident Response Management Plan for staff and other persons at the facility in the event of fire – An Emergency Services Information Package would be prepared for firefighters in accordance with FRNSW (2019b) *Fire Safety Guideline: Emergency services information package and tactical fire plans*	Operation
LPG tank	58	– The LPG tank and pump would be located a minimum of approximately 30 metres from the site boundary or as required by *AS 1596: The storage and handling of LP Gas*, whichever is the greater distance	Detailed design
	59	– Upon completion of the detailed design and layout of the LPG station, a final PHA would be undertaken to ensure that residual risk levels are acceptable. Options including mounding or undergrounding the LPG tank would be considered if necessary	Detailed design
	60	– A site specific Incident Response Management Plan would be developed covering the site and the LPG station installation. The plan would also make provision for the Jemena Gas pipeline situated approximately 125 metres form the eastern boundary of the site and any risk implications from the gas pipeline rupture relevant to the safety of the site and personnel.	Operation
Proximity to Eastern Gas Pipeline	61	– If required by Jemena, a detailed Safety Management System review under *AS 2885: The Standard for Gas and Liquid Petroleum Pipelines* would be conducted at the detailed design stage and prior to commencement of operations	Detailed design
	62	– Engagement would be undertaken with Jemena throughout design and construction, to ensure that no additional protection or control measures are required by Jemena	Detailed design and construction
	63	– Should there be the need for any significant change to the project footprint or function, details would be provided to Jemena for review	Detailed design and construction
	64	– All work would be in accordance with Jemena's Design and Construction Guidelines (GAS-960-GL-PL-001)	Detailed design and construction
	65	– Jemena would be advised of any proposed horizontal directional drilling within the site and associated risks assessed (as required)	Detailed design and construction
Chemical and spill management	66	– Bulk storage of LPG would be in accordance with *AS 1596:2014: The storage and handling of LP Gas*	Detailed design and operation
	67	– All chemicals would have appropriate labelling, separation where necessary and disposal would be in accordance with Australian Standards	Operation
	68	– A safety data sheet (SDS) register of all chemicals that are located on site would be maintained	Operation
	69	– Appropriate safe work procedures would be implemented for the handling of all chemicals including transfer, storage, spill prevention and clean up requirements	Operation

Fire prevention and protection	70	– A fire protection system would be developed. The fire systems would be integrated into the design and management of the facility in accordance with *AS 2419.1:2017: Fire Hydrant Installations for Buildings* with an emphasis on fire prevention rather than mitigation.	Detailed design
	71	– The fire prevention and management strategies detailed in the NSW Department of Planning (2011d) *Hazardous Industry Planning Advisory Paper No 2 – Fire Safety Study Guidelines* would be considered as part of the detailed design and operation of the facility	Detailed design and operation
Visibility	72	– During construction, the site and surrounds would be maintained in a clean and tidy condition at all times with appropriate bins provided for waste generated on site	Construction
	73	– The building and associated infrastructure would be designed and the colour schemes selected to blend with the existing visual landscape. The building lighting system would be designed to manage light spill	Detailed design
	74	– The vegetation buffer on the west, east and north boundary of the site would be maintained and provide screening to adjacent property users	Operation
Amenity	75	– Ongoing engagement would be undertaken with the local community and other key stakeholders during construction and operation, as discussed in Section 3.4	Construction and operation
	76	– The management measures identified in the relevant chapters of the EIS would be implemented	Construction and operation

Appendix C

Landfill gas data

WEST NOWRA LANDFILL SURFACE GAS EMISSION MONITORING

7th August 2020

Carried out by:

ALS Environmental

4/13 Geary Place (PO Box 3105)

North Nowra

NSW 2541

Contact:
Duncan McIntosh
Phone: (02) 4423 2063
E-mail: nowra.lab@alsglobal.com.au

REPORT ON THE MONITORING OF SURFACE METHANE GAS EMISSIONS AT THE WEST NOWRA LANDFILL

Date of Report: 7th August 2020

Date of Sampling: 6th August 2020

Time of Sampling: 11:00am – 3:00pm

Field Services Team: Duncan McIntosh (ALS Environmental).

Author: Duncan McIntosh, ALS Nowra Laboratory.

Purpose: To determine whether cover materials and/or extraction systems are controlling the emission of gas from the landfill.

Methodology

The concentration of methane gas (in absolute units of ppm or volume/volume when above 10,000 ppm) at the West Nowra landfill was carried out in accordance with EPA Guidelines Solid Waste Landfill 2nd Edition 2016. On the day of sampling the wind speed was below 10 km per hour averaging 4.3km/hr on site. Testing was conducted using a calibrated LaserOne portable gas monitor specifically designed for landfill gas monitoring, refer to calibration certificate for details.

One field technician commenced data collection along transect lines in a grid pattern across the landfill surface at 25-metre spacings using plans supplied by Shoalhaven City Council, as shown on the *West Nowra LF Map*. The location of each grid point was recorded using a Magellan SporTrak GPS, as shown in the *SCC West Nowra Gas Emissions Report August 2020* (Microsoft Excel file). The concentration of methane gas was measured at a height of 5 cm above the ground in areas with intermediate or final cover over the emplaced waste.

The concentration of methane gas was also recorded in any buildings located within a distance of 250 m of the deposited waste, and any depressions or surface fissures away from the sampling grid were also investigated.

Results

The data in the *SCC West Nowra Gas Emissions Report August 2020* show that 205 data readings (in ppm or volume/volume if greater than 10,000ppm) were taken at the West Nowra landfill. Methane gas emissions, all below EPA licence limits (500ppm), were detected by the field services team. Four points with methane readings of greater than 200ppm (but below 500ppm) were

identified as having potential issues in future due to clacks and ruts appearing in the clay surface (GPS coordinates and site images were provided to the Shoalhaven City Council project manager). In addition, methane gas was below EPA licence limits in the buildings located within a distance of 250 m of the site.

West Nowra LF
Methane gas monitoring transects
Legend
G
H
B11
I
J
K
D
E
B4
F
P
O
N
L
B2
B3
WB
B1
C
B
A
10
9
8
7
6
5
4
B14
3
2
1
T
R
Q
B12
B6
B9
B10
B13
B8
B5
S
M
N
200 m
Google Earth
©2016 Google

CERTIFICATION OF CALIBRATION

Issued by: QED Environmental Systems Ltd.

Calibration certificate number 19255 H-01689

Instrument Laser One **Serial number** 19255

Description of the calibration procedure:

The calibration is verified with certified gas bottle. The maximum error of the instrument as specified in the datasheet.

Gas verification from 0-1000ppm CH4

Full scale (ppm)	Gas concentration (ppm)	Response 1 (ppm)	Response 2 (ppm)	Response 3 (ppm)	Average response (ppm)	Maximum error (ppm)	Maximum error (% F.s.)	Maximum error %
1000	2.4	2.4	2.4	2.4	2.40	0.00	0.00	0.00
1000	3.2	3.2	3.3	3.2	3.23	0.10	0.01	0.01
1000	10.3	10.1	10.2	10.2	10.17	0.20	0.02	0.02
1000	107	104	104	104	104.00	3.00	0.30	0.30
1000	1000	990	990	990	990.00	10.00	1.00	1.00

Uncertainty	1.00		%
Max % error	1.00		% FS

Gas verification from 0-100% vol CH4

Full scale (%vol)	Gas concentration (%vol)	Response 1 (%vol)	Response 2 (%vol)	Response 3 (%vol)	Average response (%vol)	Maximum error (%vol)	Maximum error (% F.s.)	Maximum error %
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	1.00	1.00	1.00	1.00	1.00	1.00	10.00	10.00
10.00	2.20	2.10	2.10	2.10	2.10	0.10	1.00	1.00
10.00	5.00	5.00	5.00	5.00	5.00	0.00	0.00	0.00
100.00	15.00	14.90	14.90	14.90	14.90	0.10	0.10	0.10
100.00	50.00	49.60	49.60	49.60	49.60	0.40	0.40	0.40
100.00	100.00	98.60	98.70	98.70	98.67	1.40	1.40	1.40

Uncertainty	10.00		%
Max % error	10.00		% FS

Gas verification from 0-100% CH4 LEL (0-4.4% VOL

Full scale (%vol)	Gas concentration (LEL%)	Response 1 (LEL%)	Response 2 (LEL%)	Response 3 (LEL%)	Average response (%vol)	Maximum error (LEL%)	Maximum error (% F.s.)	Maximum error %
10.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00
10.00	2.00	1.98	1.98	1.98	1.98	0.02	0.20	0.20
100.00	50.00	47.73	47.73	47.73	47.73	2.27	2.27	2.27

Uncertainty	2.27		%
Max % error	2.27		% FS

CERTIFICATION OF CALIBRATION

Issued by: QED Environmental Systems Ltd.

Environmental conditions during calibration

Temperature	22.3	C
Pressure	1008	mBar

Gas bottles used for calibration

Gas	Cylinder number	Expiry date	Gas
Synthetic Air	S1624403EE	19/05/2023	Synthetic Air
3 ppm	143123SG	11/04/2024	CH4
10 ppm	114031SG	11/04/2024	CH4
100 ppm	S1100861	10/04/2024	CH4
1000 ppm	S1100299S	10/04/2024	CH4
1.0 vol	S1198415S	10/04/2024	CH4
2.2% vol	S1720647	29/07/2024	CH4
5% vol	220622	15/01/2022	CH4
15% vol	220594	15/01/2022	CH4
50% vol	232920	08/11/2021	CH4
100% vol	S1260447	05/07/2023	CH4

Calibration results Pass

Next scheduled calibration 06/01/2021

Calibration date 06/01/2020

Calibration done by Laura McBride

CHAIN OF CUSTODY

ALS Environmental

ALS Laboratory: please tick →

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☐ WOLLONGONG 99 Kenny Street Wollongong NSW 2500 Ph: 02 4225 3125 E: portkembla@alsglobal.com

CLIENT: Shoalhaven City Council	TURNAROUND REQUIREMENTS : ☐ Standard TAT (List due date):	FOR LABORATORY USE ONLY (Circle):
OFFICE: Deering Street Ulladulla NSW 2539	(Standard TAT may be longer for some tests e.g. Ultra Trace Organics) ☐ Non Standard or urgent TAT (List due date):	Custody Seal Intact? Yes No N/A
DIVISION: City Services	ALS QUOTE NO.:	Free ice / frozen ice bricks present upon receipt? Yes No N/A
PROJECT: West Nowra Methane Gas		Random Sample Temperature on Receipt: °C
ORDER NUMBER: 15425 14925	AUTHORISED BY: David Hojem	Other comment:
PROJECT MANAGER: David Hojem	CONTACT PH: 02 4429 8928	
SAMPLER: ALS	SAMPLER MOBILE: 0407626331	
Email Reports to: nowra.lab@alsglobal.com		
Email Invoice to: nowra.lab@alsglobal.com		

COC SEQUENCE NUMBER (Circle)

COC: 1 2 3 4 5 6 7

OF: 1 2 3 4 5 6 7

RELINQUISHED BY:	RECEIVED BY:	RELINQUISHED BY:	RECEIVED BY:
DATE/TIME: 6/8/20	DATE/TIME: 6.8.20	DATE/TIME:	DATE/TIME:

COMMENTS/SPECIAL HANDLING/STORAGE OR DISPOSAL: Send Results to:

ALS USE	SAMPLE DETAILS MATRIX: SOLID (S) WATER (W)			CONTAINER INFORMATION		ANALYSIS REQUIRED including SUITES (NB. Suite Codes must be listed to attract suite price) Where Metals are required, specify Total (unfiltered bottle required) or Dissolved (field filtered bottle required).							Additional Information
LAB ID	COUNCIL SAMPLE ID	DATE / TIME SAMPLED	MATRIX	TYPE & PRESERVATIVE (refer to codes below)	TOTAL CONTAINERS PER SAMPLE	Methane							
	West Nowra Landfill	6/8/20 1100			1	✓							Sampled by ALS
				TOTAL									

Environmental Division Wollongong
Work Order Reference
EW2003562

Telephone: 02 4225 3125

Water Container Codes: P = Unpreserved Plastic; N = Nitric Preserved Plastic; ORC = Nitric Preserved ORC; SH = Sodium Hydroxide/Cd Preserved; S = Sodium Hydroxide Preserved Plastic; AG = Amber Glass Unpreserved; AP = Airfreight Unpreserved Plastic
V = VOA Vial HCl Preserved; VB = VOA Vial Sodium Bisulphate Preserved; VS = VOA Vial Sulfuric Preserved; AV = Airfreight Unpreserved Vial SG = Sulfuric Preserved Amber Glass; H = HCl preserved Plastic; HS = HCl preserved Speciation bottle; SP = Sulfu
Z = Zinc Acetate Preserved Bottle; E = EDTA Preserved Bottles; ST = Sterile Bottle; ASS = Plastic Bag for Acid Sulphate Soils; B = Unpreserved Bag.

Shoalhaven City Council

Address all correspondence to: The Chief Executive Officer,
PO Box 42, Nowra NSW 2541 Australia
shoalhaven.nsw.gov.au/contact | 1300 293 111
shoalhaven.nsw.gov.au

Council Reference: 59608E (D21/381935)
Your Reference:

06/09/2021

Bioelektra Australia Pty Ltd
Unit 31, 287 Victoria Road
Rydalmere NSW 2116

By email only: fred@bioelektra.com.au

Attention: Fred Itaoui

Dear Fred

LFG Monitoring Wells – Site Boundary

The DPIE has sought confirmation on whether Council's landfill site at West Nowra is producing landfill gas that may migrate through to the proposed Bioelektra site.

Addressing this concern, Council have placed an order on ENRS Consultants to install at least four landfill gas monitoring wells along the boundary fence line to a maximum depth of 6 metres (or the minimum groundwater level) with spacing no greater than 40 m apart.

The work will commence in the week starting 13 September 2021. Once completed, ENRS will incorporate the monitoring of the gas wells on a monthly basis until a baseline is set, and then reduce the monitoring to quarterly or every 6 months.

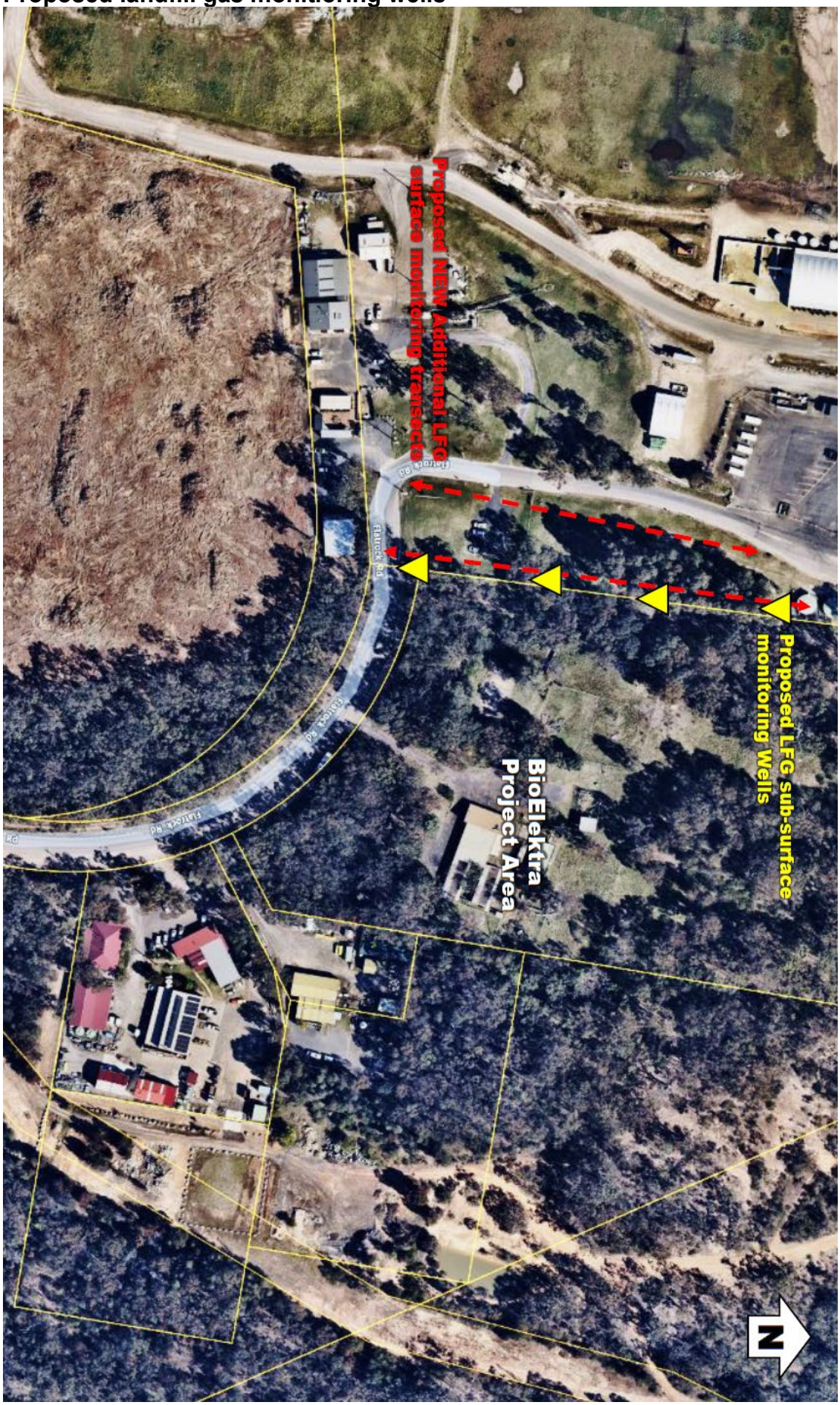
I have attached a figure of the proposed sampling and monitoring well locations.

If you need further information about this matter, please contact David Hojem, City Services on (02) 4429 3406. Please quote Council's reference 59608E (D21/381935).

Yours faithfully

David Hojem
Unit Manager - Waste Services

Proposed landfill gas monitioring wells



Appendix D

Wastewater treatment plant design information

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Unit 1/60 Box Rd
Taren Point NSW 2229

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enquiries@aerofloat.com.au
www.aerofloat.com.au

Aerofloat
WASTEWATER TREATMENT SPECIALISTS

DESIGN DOCUMENT

Bioelektra Shoalhaven Wastewater Treatment Plant

Prepared: 10/08/2021
Version: V01

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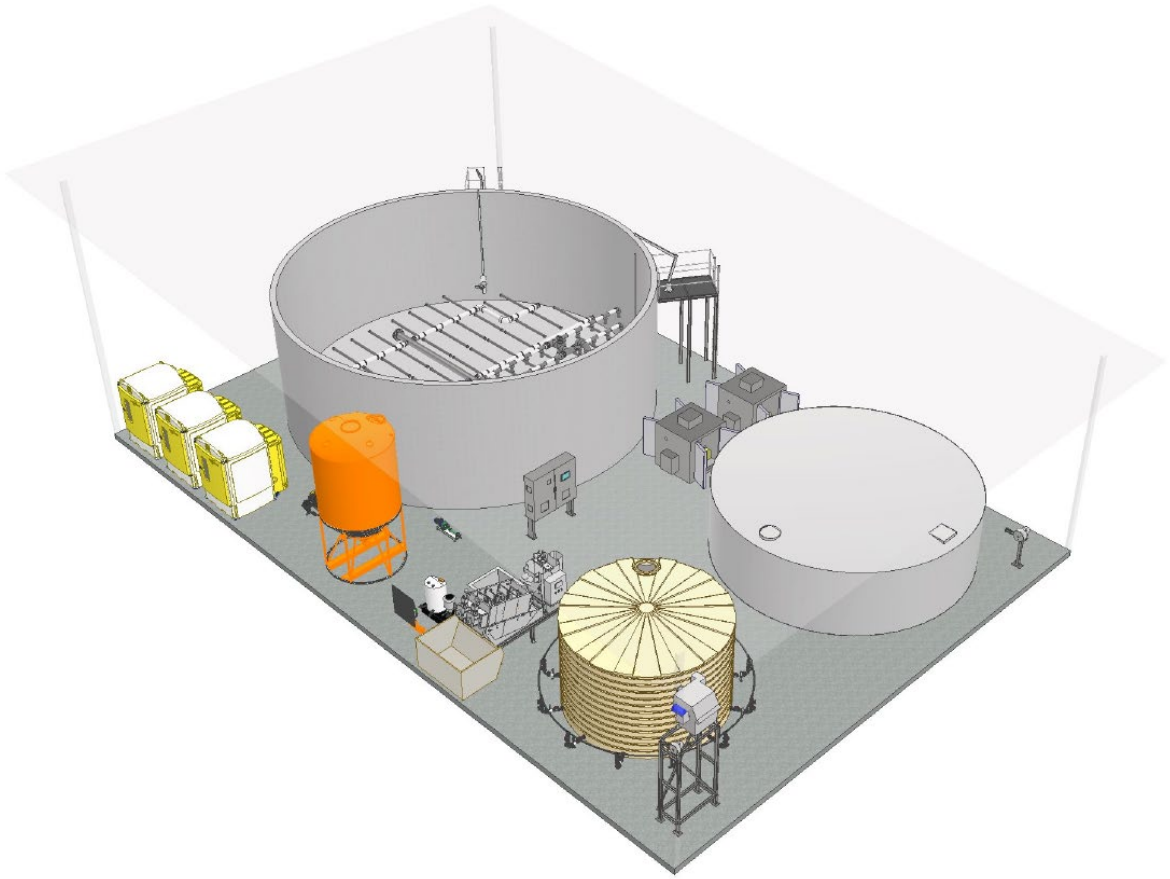
1. SUMMARY

1.1 Aerofloat Wastewater Treatment Plant Proposal Overview

This report has been prepared by Aerofloat to detail the proposed design for the Bioelektra WWTP project. Aerofloat has proposed a robust, considered design that meets the specified requirements and includes additional thought to process issues Aerofloat has experienced through years of Wastewater Treatment Plant (WWTP) design and installation work.

The new wastewater treatment plant will require a covered concrete slab with dimensions 25.5m x 17m. It will include a 12m diameter reinforced concrete Sequencing Batch Reactor, a 46,400L aerated balance tank, a 110,000L aerated effluent tank and a cone bottom sludge tank. The system will be fed process wastewater from Bioelektra's autoclaves, general washdown water and site wastewater from a Septic tank. Both streams of wastewater will be treated in the same treatment process.



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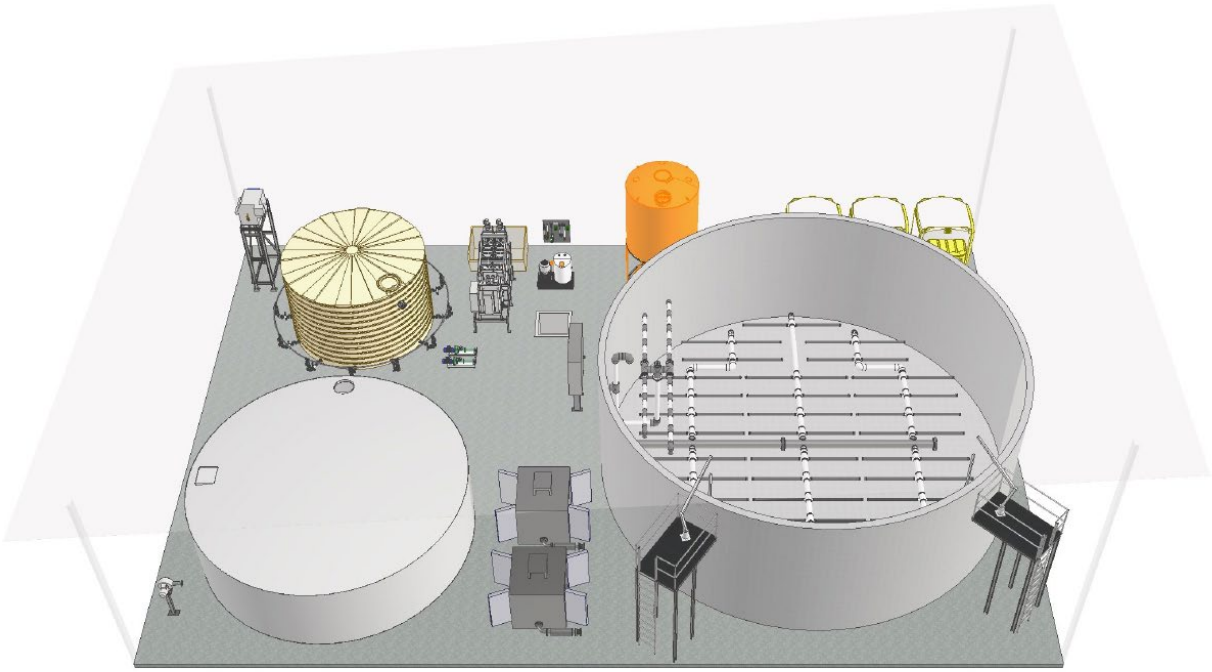
1.1.1 Process Summary

Process wastewater from the Bioelektra facility will pass through a rotary drum screen for the removal of coarse and fine solids. The wastewater from the amenities on site will flow to a septic tank and septic effluent will be pumped directly to the balance tank. From the screen, the wastewater gravitates into a 46,400L polyethylene balance tank for mixing and hydraulic flow balancing, so water can be fed to the SBR at a steady rate over the course of a day. Mixing is achieved in the balance tank through coarse bubble diffused air which is introduced through a proprietary diffuser manifold. The wastewater is then transferred to the Sequencing Batch Bioreactor (SBR) for treatment. This process is explained in detail in section 3.

The SBR works on the mix/aerate/settle/decant cycle. The SBR is designed to have anoxic (mix) and aerobic (aerate) periods to facilitate in the nitrification and denitrification of the effluent, to comply with effluent standards, and to ensure process stability in the SBR. This is further explained in the detailed process description. After the settle phase, treated effluent is decanted from the top of the tank and transferred to a new 110,000L effluent storage tank for disposal.

The SBR will be an above ground reinforced concrete tank and the treated effluent tank will be a plastic lined steel tank. The excess biosolids produced in the SBR will be pumped to the sludge storage tank and then through a screw press for dewatering. The sludge cake is removed from site, and the filtrate is returned to the head of the rotary drum screen.

For further details on the process steps, please refer to the detailed WWTP Process Description.



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1.2 Abbreviations

ACH	Aluminium Chlorohydrate
ADWF	Average Dry Weather Flow
AOR	Actual Oxygen Rate
BOD	Biochemical Oxygen Demand
BWL	Bottom Water Level
CFU	Colony-forming units
DO	Dissolved oxygen
EP	Equivalent Population
EST	Effluent Storage Tank
FBT	Flow Balance Tank
H2O	Water
Hr/hrs	Hour/hours
HMI	Human Machine Interface
kg	Kilograms
kL	kilolitres
kPa	kilopascals
kW	Kilowatts
kWh	Kilowatt hours
L	litres
LL	Low level
m	metres
m2	Square metres
M3	Cubic metres
MCC	Motor control centre
mg	milligrams
MLSS	Mixed liquor suspended solids
mm	millimetres
MPN	Most probable number
N2	Nitrogen
NH3	Ammonia
Nm3	Normal cubic metres
NO3	Nitrate
O2	Oxygen
ORP	Oxygen-reduction potential
P	Phosphorous
PFD	Process Flow Diagram
PLC	Programmable Logic Controller
RAS	Returned Activated Sludge
s	Seconds
SAE	Standard aeration efficiency
SBR	Sequence Batch Reactor
SOR	Standard Oxygen rate
SOTE	Standard Oxygen transfer
SOTR	Standard Oxygen transfer rate
STP	Sewage Treatment Plant
TWL	Top Water Level
uS/cm	MIcrosiemens / centimetre
VENM	Virgin excavated natural material

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2. ABOUT AEROFLOAT

2.1 What We Do

Aerofloat is an Australian owned and operated business that designs, manufactures, and installs sewage and industrial wastewater treatment systems for a range of markets. Aerofloat offers standardized plants or *custom designed solutions* utilising patented Aerofloat technology, as well as other leading-edge products to address a range of wastewater treatment requirements.

Design & engineering

Aerofloat's engineers specialise in wastewater treatment and will either uses standard plants or custom design your wastewater treatment solution based on your requirements. Utilising 3D CAD modelling, proprietary technology and innovative engineering, Aerofloat uses clever designs to address a range of challenges.

Projects

Aerofloat's Australian manufacturing team will manufacture your wastewater treatment systems locally and then install the system onsite to suit your build schedule. Aerofloat has extensive experience working on small and large jobsites.

Aftercare

Aerofloat offers competitive chemical supply contracts, system maintenance packages and ongoing support to prevent downtime and ensure your system is running effectively.

These three pillars form the basis of our company. Aerofloat is able to provide anything from a consultative design service to a complete end to end design, manufacture, install, commission and maintenance project option.

Aerofloat employs 15 people at our headquarters in Taren Point, Sydney where all design and manufacture/assembly of componentry is completed.

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2.2 Why Aerofloat?

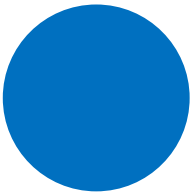
Aerofloat is passionate about providing a unique offering for clients. We strongly believe there are a number of *key differentiators* that put Aerofloat ahead of the standard design and delivery commonly seen.

Design Expertise

Aerofloat prides itself in being able to tackle complex wastewater problems. Working in the wastewater industry since 1973, Aerofloat's staff skills include electrical, chemical, mechanical, process control and environmental engineering. This gives you peace of mind that all your design requirements will be covered.

3D CAD Modelling

Aerofloat uses 3D CAD modelling to design your system and help you visualise the solution prior to manufacturing. Any site challenges are addressed at the design stage and there are no surprises with your system at the time of installation.



In-house Capabilities

Aerofloat will manage the entire process in-house. From 3D CAD modelling and design, to manufacturing, installation, commissioning and ongoing support and maintenance. This provides you with the confidence that Aerofloat is in control for the entire project.

Support Guarantee

Aerofloat prides itself on providing robust and reliable solutions, delivering projects on time and on budget. As an Aerofloat client, you will have access to Aerofloat engineers for ongoing advice and support, ensuring your system will run efficiently long after the system has been installed.

Proprietary Technology

Aerofloat has several patents for its innovative technology and products. Aerofloat has developed clear adaptations of proven techniques and processes to provide the client with unique and maintenance friendly product options. Thoughful design and modern thinking are always at the forefront of Aerofloat designs.

Australian

Aerofloat is an Australian, family-owned company with local manufacturing and engineers. Aerofloat uses the latest manufacturing techniques and cutting-edge design to provide proven solutions.

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2.3 ISO Certification and Risk Management

Aerofloat is certified by the JAS-ANZ accredited group, CPG. It has certification to –

ISO 9001 – Quality Management System

ISO 14001 – Environmental Management System,

ISO 45001 – Occupational Health and Safety.

ISO certification in the three areas represents excellence in the provision of services for design, engineering, consulting, manufacturing, installation, commissioning and aftercare for wastewater and water treatment systems: highlighting Aerofloat's unique offering as a full-service, end-to-end wastewater treatment company.

The Aerofloat Integrated Management System (IMS) enforces a strong risk management culture across the business with: regular internal audits and non-conformance reporting; thorough quality testing programs; design, safety and environmental risk assessments and reviews at various stages of the project life cycle. Aerofloat is happy to provide examples of the above mechanisms if requested by the client.

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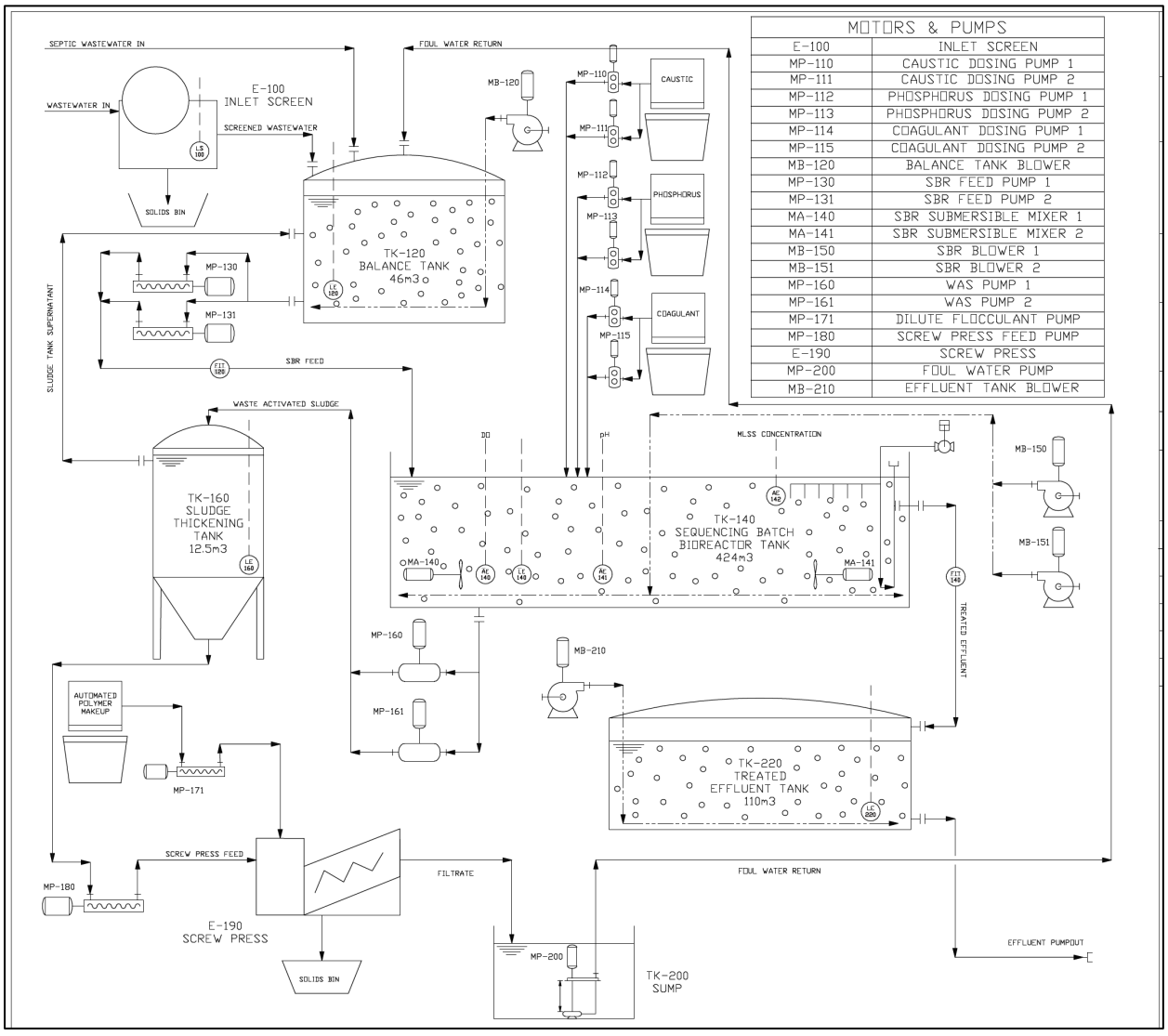
3. DETAILED WWTP PROCESS DESCRIPTION

3.1 Detailed WWTP Process Description

The following section is a description of the proposed WWTP. This description is best read in conjunction with the attached Process Flow Diagram: 292-AF-PFD-001 as well as General Arrangement Drawing images that have been submitted with this design document and other 3D images.



MOTORS & PUMPS	
E-100	INLET SCREEN
MP-110	CAUSTIC DOSING PUMP 1
MP-111	CAUSTIC DOSING PUMP 2
MP-112	PHOSPHORUS DOSING PUMP 1
MP-113	PHOSPHORUS DOSING PUMP 2
MP-114	COAGULANT DOSING PUMP 1
MP-115	COAGULANT DOSING PUMP 2
MB-120	BALANCE TANK BLOWER
MP-130	SBR FEED PUMP 1
MP-131	SBR FEED PUMP 2
MA-140	SBR SUBMERSIBLE MIXER 1
MA-141	SBR SUBMERSIBLE MIXER 2
MB-150	SBR BLOWER 1
MB-151	SBR BLOWER 2
MP-160	WAS PUMP 1
MP-161	WAS PUMP 2
MP-171	DILUTE FLOCCULANT PUMP
MP-180	SCREW PRESS FEED PUMP
E-190	SCREW PRESS
MP-200	FOUL WATER PUMP
MB-210	EFFLUENT TANK BLOWER

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STEP 1
Wastewater Collection & Solids Removal

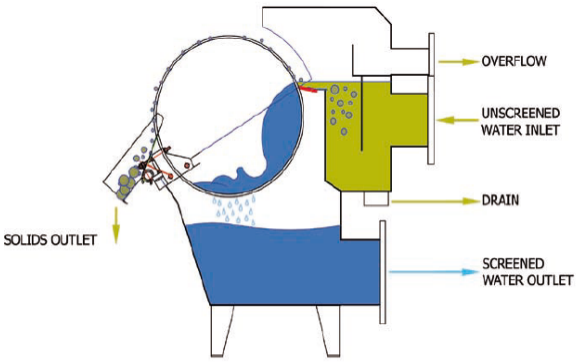
STEP 2
Sequencing Batch Bioreactor

STEP 3
Sludge Dewatering & Effluent Storage

STEP 1

Wastewater Collection & Solids Removal

Process wastewater from the Bioelektra facility will be collected and pumped to the Aerofloat rotating drum screen. Septic water effluent will be pumped separately to the balance tank. The proposed rotating drum screen will be a TORO packaged screen. The following image illustrates the operation of the system.



The balance tank will be a 46,400L polyethylene tank with a proprietary diffuser manifold to introduce coarse bubble air for mixing the tank and prevention of fermentation. The image overleaf shows the proprietary diffuser manifold introducing coarse bubble air into a smaller SBR Aerofloat installation.

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STEP 2

Sequencing Batch Bioreactor (SBR)

Wastewater is fed to the SBR via progressive cavity pumps which will deliver steady flow throughout the course of a day. Flow to the SBR will be monitored by an electromagnetic flow sensor to ensure accurate dosing of coagulant which shall be delivered proportional to the incoming flow. The progressive cavity feed pumps will rotate duty to extend their lifetime and come as standard with protection against overpressure and dry running. The SBR shall be a reinforced concrete tank fitted with 2 x submersible mixers and a manifold of tubular membrane diffusers to facilitate the removal of BOD and TKN in the aerate and mix phase of the SBR cycle. After the aerate and mix phase the SBR will enter a settle phase where the blowers and mixers will turn off, and biosolids will be allowed to settle leaving treated effluent at the top of the tank. When the settle period finishes, the treated effluent will be decanted from the top of the SBR through our Air Lock Syphon (ALS) decanting mechanism. The figure overleaf shows the basic principles of the SBR treatment phases.

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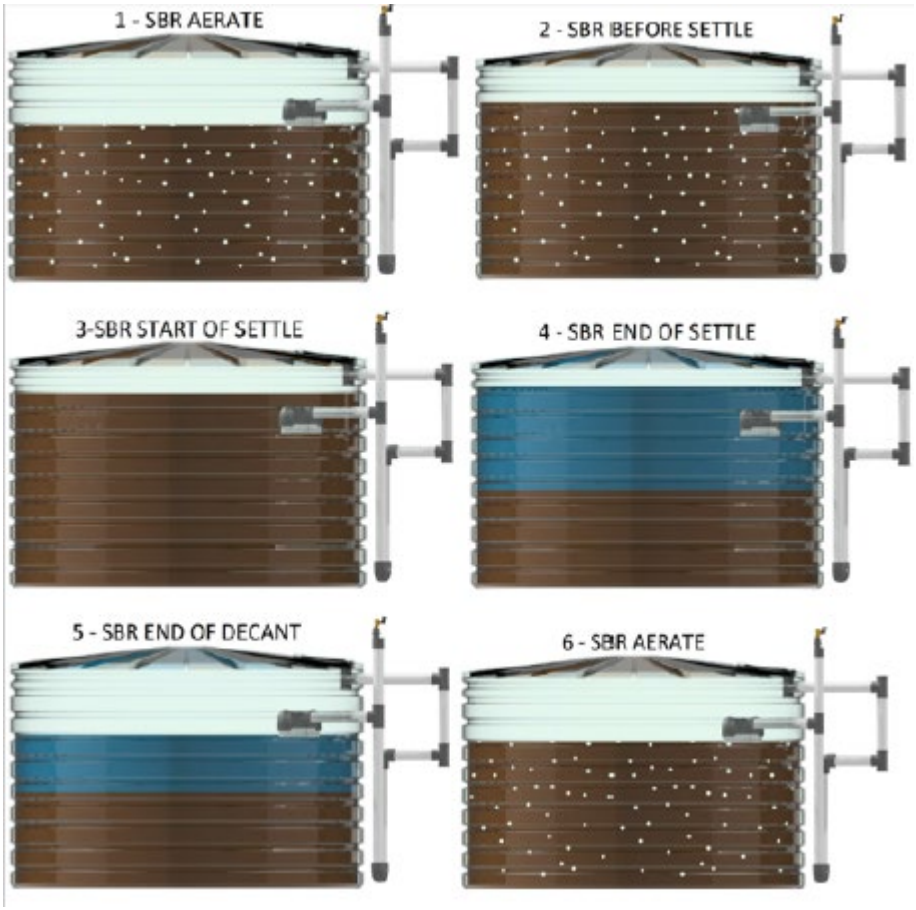

During the design daily flows of 20m3/day, there will be one cycle every 36 hours, allowing the equivalent of 20m3/day to be decanted. The cycle is shown below.

Typical Cycle @ 20m3/day	
Aerate and Mix	34.5 hours
Settle	1.0 hours
Decant	0.5 hours
Total Cycle	36.0 hours

Process equipment will be controlled by measurements from an array of instrumentation that will be installed in the SBR. During the aerate phase, the blowers will be controlled by dissolved oxygen readings taken from two DO sensors in the SBR, this is to ensure adequate oxygen is being delivered to satisfy the requirements of the aerobic respiration occurring in the reactor. During the mix phase, we can ensure optimal denitrification conditions are being achieved through measurements from a redox (reduction/oxidation) potential (ORP) sensor and pH

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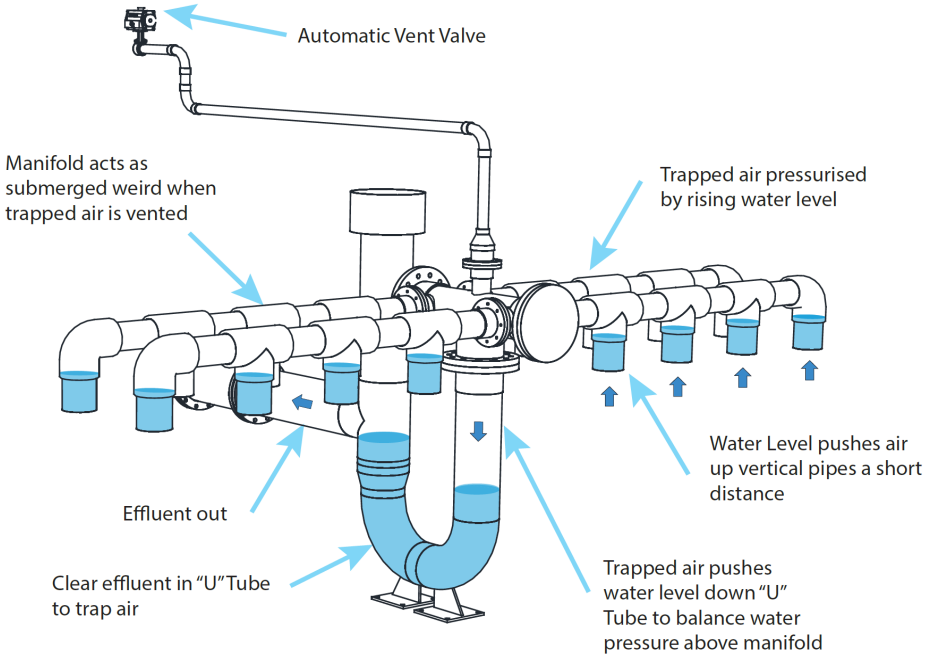
sensor. The reading from the pH sensor will control the caustic pump to ensure pH never gets so low that nitrification/denitrification is inhibited. During the settle and decant phase, the decant can only commence once the MLSS sensor reads a solids concentration below our discharge threshold. This is to ensure we decant clear supernatant every time. All tanks are installed as standard with level monitoring and control capability.

The decant occurs through our ALS decanter which operates as described in the diagram below. During the aerate/mix/settle period of the SBR cycle, an air lock in a submerged weir prevents mixed liquor from exiting the reactor. At the start of the decant phase, the air is vented by an automatic valve, allowing the treated effluent to flow in through the weir and out to the effluent tank. Initially, flow is by gravity and then by syphoning. The syphon is broken when the bottom water level is reached, and this is the end of the decant period.



Optimal pH is maintained by caustic dosing, optimal nutrient levels are maintained by phosphorus addition and optimal settling is maintained by coagulant dosing

Nitrification/Denitrification Process

Reduction of the nitrogen levels is an important process that occurs in the combined aerate and mix phases of the SBR cycle design.

Regular optimal aeration of the SBRs optimises the nitrification process by oxidising the ammonia to nitrate in the presence of dissolved oxygen:

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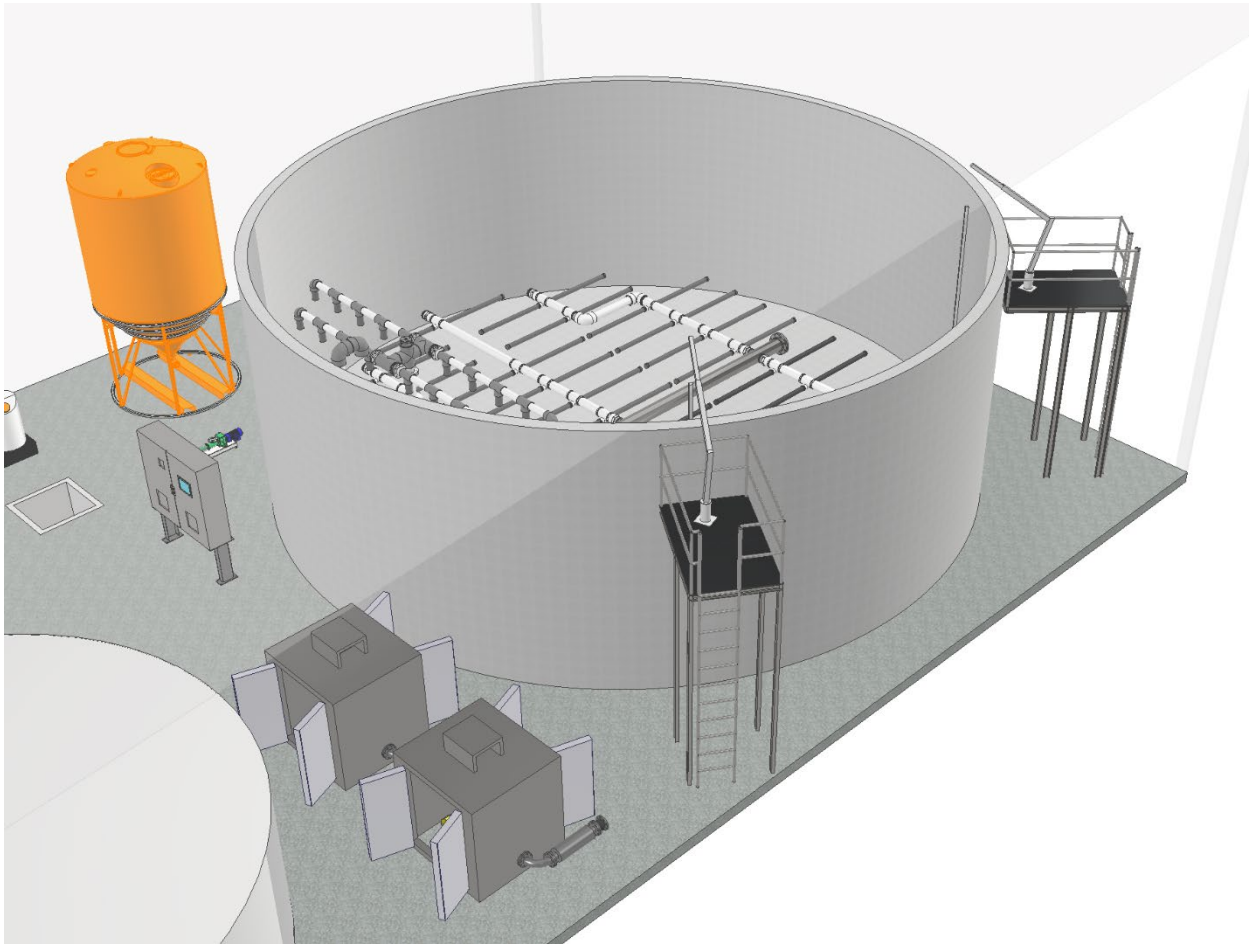
Nitrification: $NH_3 + O_2 \rightarrow NO_3 + H_2O$ (not stoichiometrically balanced)

The denitrification process occurs when the aerators are turned off and the microorganisms use the oxygen in the nitrate molecule formed during nitrification to satisfy their oxygen demand. The biological process reduces the nitrate to nitrogen gas.

Denitrification: $NO_3 \rightarrow N_2 + H_2O$ (not stoichiometrically balanced)



STEP 3

Effluent Storage and Sludge Dewatering

Treated effluent is decanted from the SBR to a new 110,000L storage tank for storage before disposal. The treated effluent tank will be a lined steel tank which will be mixed by a blower. The tank has been sized to give 5 days of storage, so it does not need to be pumped out over the weekend. It also comes as standard with level monitoring to alert operators when it needs to be drained.

The biosolids from the SBRs will be pumped at the end of each decant cycle to a new 12,500L hopper bottom polyethylene sludge tank. The sludge is then pump fed to a screw press to be further dewatered. The cake from the screw press is transferred to the cake bin. The filtrate is returned to the head of the solids and grit separator for retreatment.

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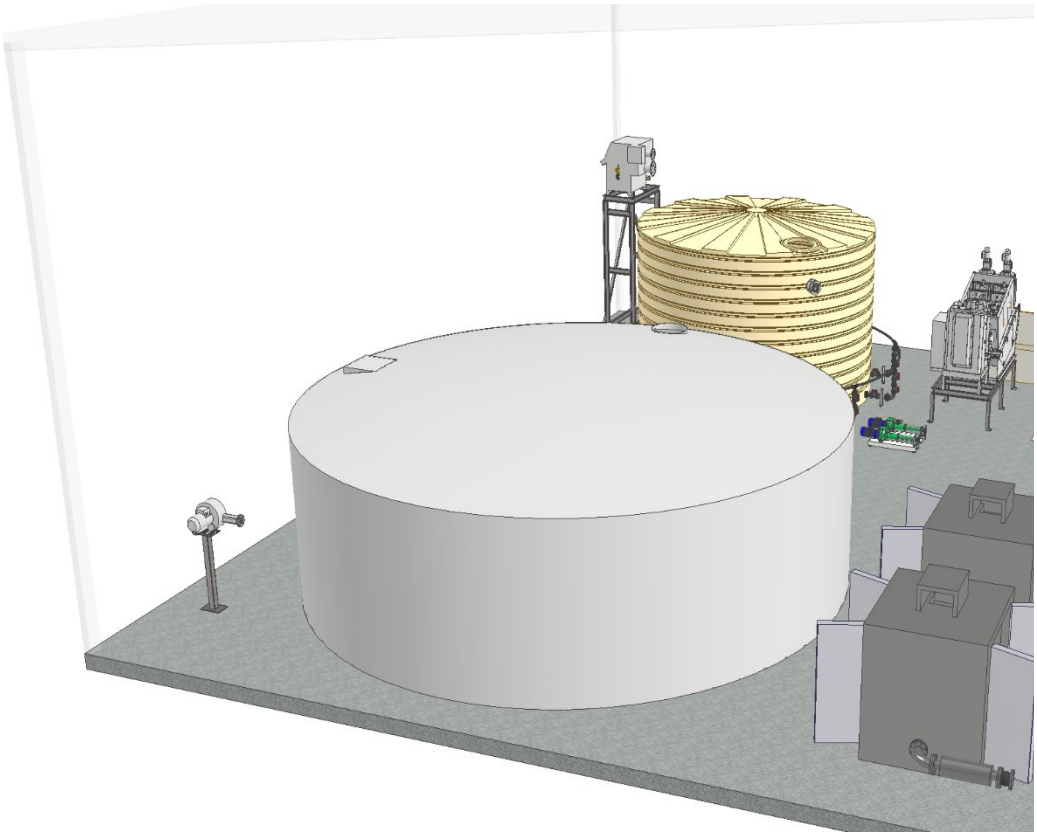
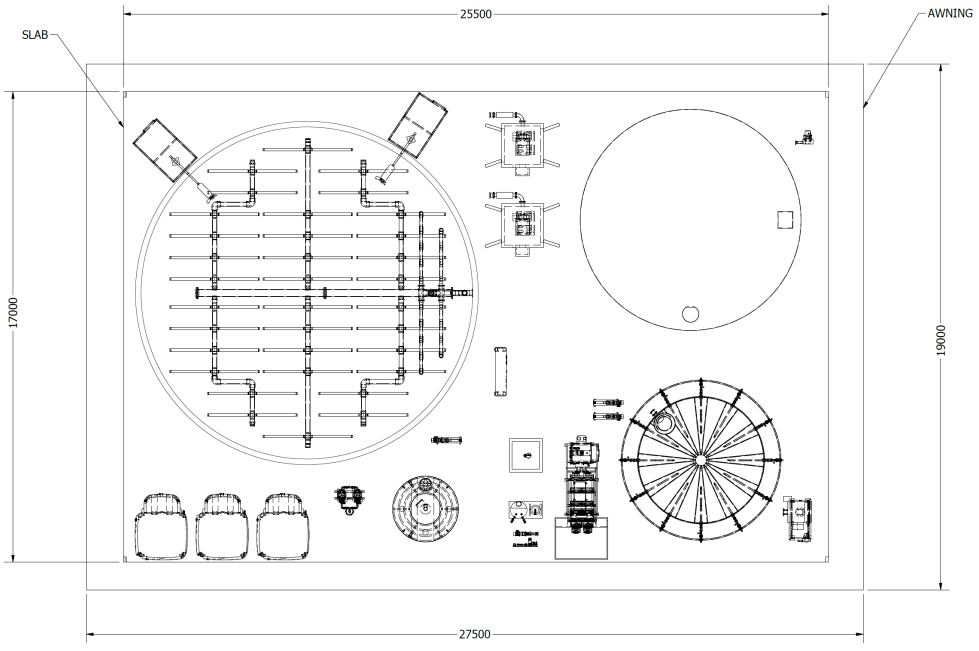


3.2 Plant Awning and Concrete Slab

All process plant and equipment will be housed on a common covered slab.

The slab and awning will be designed and constructed to suit the loads of the plant and equipment, particularly the concrete SBR which requires ground site prep to a minimum of 200kPa. The slab in this concept design measures 17m x 25.5m.



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3.3 Process Control

The entire system will be controlled by an Allen Bradley PLC and fully automated. It will be housed in a stainless steel MCC. The system will feature an Allen Bradley HMI dashboard for operator monitoring and control and EWON 4G remote functionality to enable remote access.

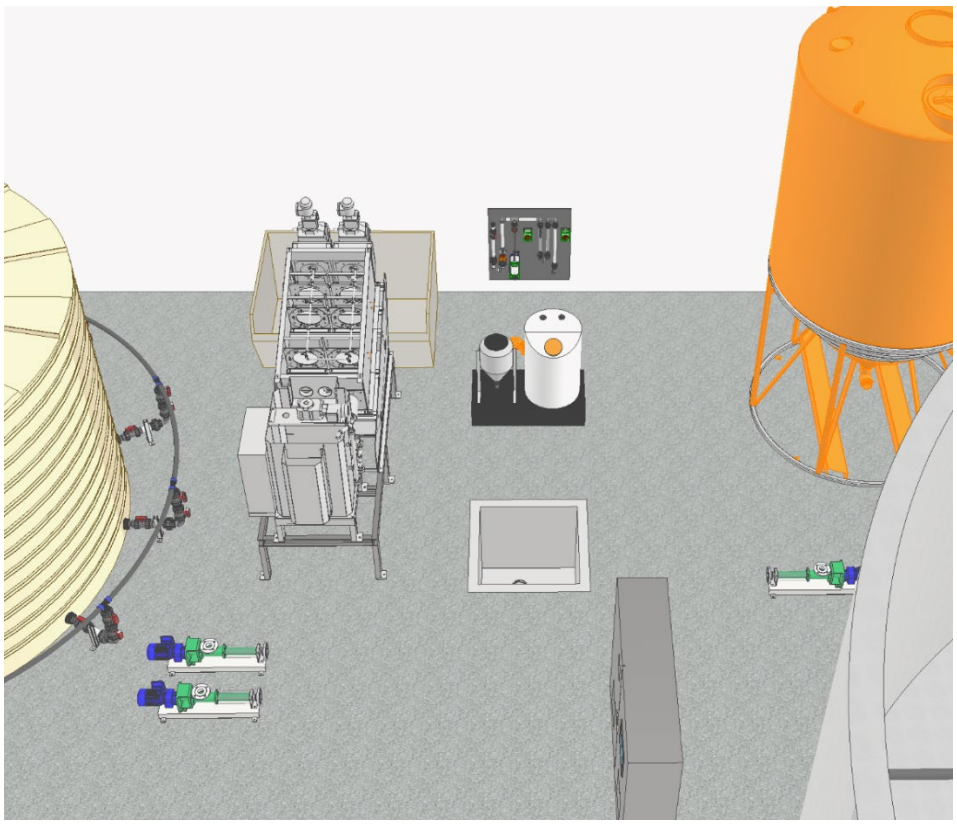
3.4 Odour Control

The integration of aerators in the balance tank, SBR and Effluent Tank addresses potential odour issues which could arise in unmixed, unaerated tanks.

Potential odour issues are overcome by not having raw wastewater sitting in the balance tank, and by ensuring optimal aerobic and anoxic conditions in the SBR through control of equipment by top-of-the-line process instrumentation.

3.5 Sludge Disposal

The biosolids will be pumped from the bottom of the SBR at the end of each decant cycle into the hopper bottom 12,500L sludge tank, where further thickening will occur. The thickened sludge will be pumped and dewatered through the screw press. The sludge skip, chemical IBCs and screenings bin can all be accessed from a common edge of the slab.



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4. BASIS FOR DESIGN & DESIGN CALCULATIONS

4.1 Basis for Design

The predicted design loads are defined in this section.

4.1.1 Wastewater flow

For the WWTP design, flowrate details from the autoclave condensate, boiler, and general site wastewater have been considered as follows:

Condensate flow = 10 m3/day

General wastewater flow (including septic effluent) = 10 m3/day

Total flow = 20 m3/day

If there is a period where the SBR is offline for any reason, the design has been considered to provide a week of wastewater storage in the balance tank and the effluent tank until the operators can get the SBR back online.

4.1.2 Influent quality

The various wastewater streams and quality have also been specified by Bioelektra and are summarised below.

Parameter	Condensate	General	Total	Unit
Flow	10	10	20	**m3/day**
COD Concentration	14000	3000	8500	**mg/l**
COD Load	140	30	170	**kg/day**
BOD Concentration	7000	1200	4100	**mg/l**
BOD Load	70	12	82	**kg/day**
NH3 Concentration	1250	0	625	**mg/l**
NH3 Load	12.5	0	12.5	**kg/day**
Cl + SO4 Concentration	5000	300	2650	**mg/l**
Cl + SO4 Load	50	3	53	**kg/day**
TN Concentation	1500	180	840	**mg/l**
TN Load	15	1.8	16.8	**kg/day**

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4.1.2 Treated Effluent Quality

Given the above influent flow and quality data, the design proposed will meet the effluent specifications listed below. Any variation to the above data may require a process redesign.

Parameter	Expected Value of Treated Effluent
TN 80%ile	< 50mg/L
TP 80%ile	< 1mg/L
BOD 80%ile	< 30 mg/L
TSS 80%ile	< 15 mg/L

4.2 Aerofloat Design Calculations

The following section details the calculations for several key design parameters.

4.2.2 Reactor Sizing

The table below details the sizing calculations for the SBR.

Design Summary - Bioelektra WWTP				
Parameter	**Factor**	**Value**	**Unit**	**Comments**
Average daily flow		20	m3/day	Michael Paca email
Average daily flow		0.8	m3/hr	
BOD concentration		4100.0	mg/l	Michael Paca email
NH3 concentration		625.0	mg/l	Michael Paca email
BOD load (F)		82.0	kg/day	Michael Paca email
NH3 load		12.5	kg/day	Michael Paca email
F/M ratio		0.06	g/g	Allows for nitrogen removal
Mass of microorganisms (M)		1366.7	kg	
MLSS concentration		3.5	kg/m3	
Required tank volume @ BWL		390.5	m3	
Suggest 1 SBR				
SBR BWL		3.5	m	
SBR area		111.6	m2	
Tank diameter		11.9	m	
Actual tank diameter		12.0	m	
Actual tank area		113.1	m2	
Tank volume @ BWL		395.8	m3	
Hydraulic residence time in SBR		19.8	day	

SBR Cycle - Bioelektra WWTP				
Parameter	**Factor**	**Value**	**Unit**	**Comments**
SBR Diameter		12.0	m	
SBR Area		113.1	m2	
SBR BWL		3.5	m	
Cycle Times				

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Design Summary - Bioelektra WWTP				
Parameter	**Factor**	**Value**	**Unit**	**Comments**
Aerate and mix		34.5	hour	
Settle		1.0	hour	
Decant		0.5	hour	
Total cycle time		36.0	hour	
Cycles per day		0.666667	cycle/day	
Time for fill		34.5	hours	
Feed rate to SBR		0.87	m3/hr	
Rise rate		0.01	m/hr	
Total rise in SBR		0.265	m	
SBR TWL		3.77	m	
SBR freeboard		0.6	m	
SBR TOC level		4.37	m	make it 4.4m
Decant volume		30	m3	
Decant rate		60.0	m3/hr	
Decant rate		16.7	L/s	

4.2.3 Aerator Sizing

The following table details aerator sizing for the SBR.

Oxygen Requirements for SBR - Diffused Air - Bioelektra WWTP				
Parameter	**Factor**	**Value**	**Unit**	**Comments**
Peaking factor - not applied to decay	1.25			
Oxygen requirements for synthesis of new cells	0.6	3.08	kg O2/hr	
Oxygen requirements for endogenous decay	0.05	3.42	kg O2/hr	
Oxygen requirements for oxidation of ammonia	4.57	3.57	kg O2/hr	
Total		10.06	kg O2/hr	

SBR Conversion to Standard Conditions - Fine Bubble Aeration - Bioelektra WWTP			
Parameter	**Factor**	**Value**	**Unit**
α		0.6	
β		0.9	
Operating DO		2	mg/L
AOR/SOR		40.7	%
Oxygen transfer required		24.74	kg O2/hr
Airflow per metre of diffuser		7	Nm3/hr
SOTE		7.5%	per m
Headloss across diffuser		0.48	m
Airflow @ BWL			
Depth of diffusers @ BWL		3.4	m
Overall SOTE @ BWL		25.5	%
Required air flow @ BWL		369.2	Nm3/hr
Required air flow @ BWL		6.2	Nm3/min

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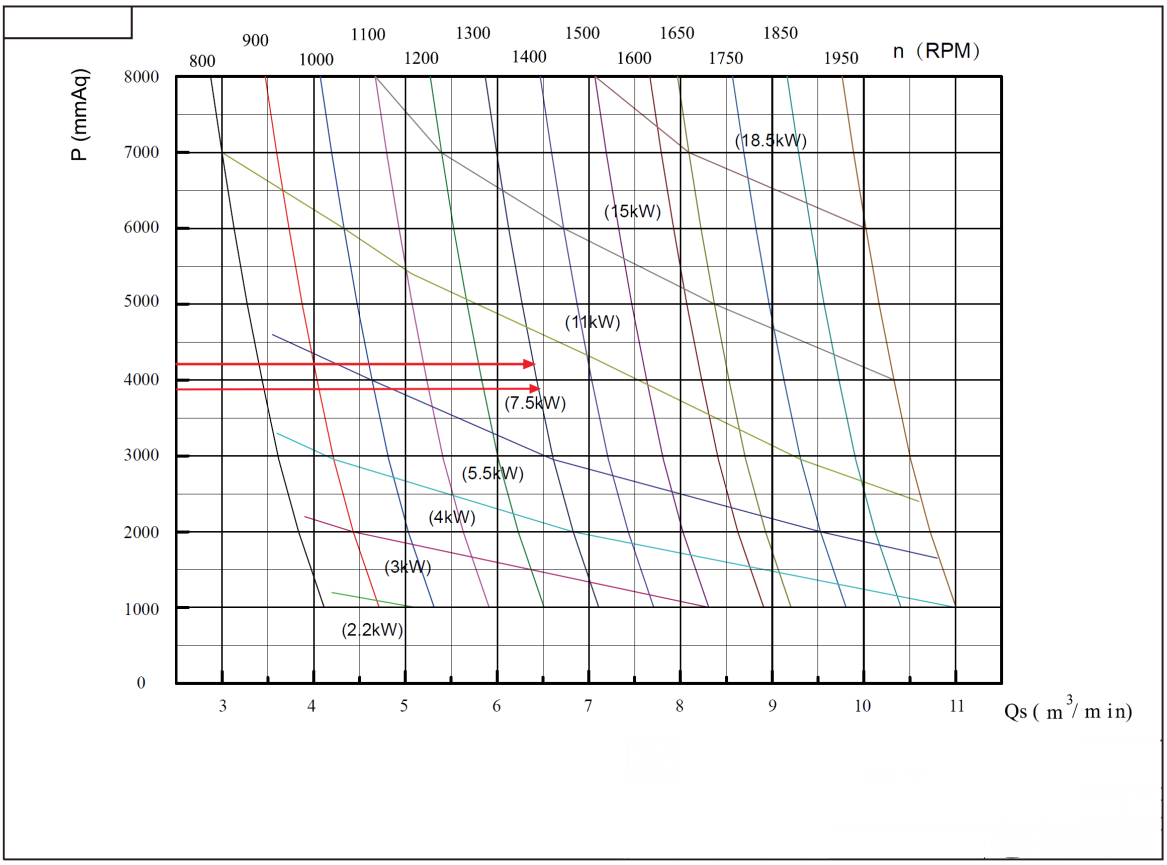
SBR Conversion to Standard Conditions - Fine Bubble Aeration - Bioelektra WWTP			
Parameter	**Factor**	**Value**	**Unit**
Total head requirement of blower @ BWL		3.88	m
Number of diffusers		53	diffusers
Airflow @ TWL			
Depth of diffusers @ TWL		3.65	m
Overall SOTE @ BWL		27.4%	
Required air flow (density taken as 1.2kg/Nm3 at 20C) @ BWL		343.7	Nm3/hr
Required air flow (density taken as 1.2kg/Nm3 at 20C) @ BWL		5.7	Nm3/min
Total head requirement of blower @ BWL		4.13	m
Number of diffusers		49	diffusers



4.2.3 Sludge Production

The following table details the sludge production calculations.

Sludge Production - Bioelektra WWTP			
Parameter	**Value**	**Unit**	**Comments**
Sludge Yield	0.8	g/g	M & E Figure 8-7
BOD Concentration	2877	mg/l	
BOD Load (F)	82	kg/day	
Sludge Produced	65.6	kg/day	

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Sludge Production - Bioelektra WWTP			
Parameter	**Value**	**Unit**	**Comments**
MLSS Concentration	0.35	%	
Daily volume wasted from SBR	18.74	m3/day	
Thickening tank thickens to	2	%	
Volume of thickened sludge to waste	3.28	m3/day	
Supernatant overflow	15.5	m3/day	
WAS pump run time	3.5	hour	
Supernatant flow rate back to balance tank	4.4	m3/hr	for 3.5 hours per day
Weekly sludge make	22.96	m3/week	
STT volume	12.5	m3	
Days of sludge storage	3.8	day	
Operate screw press for 3 hours, twice weekly	6	hour	
Screw press hydraulic loading	3.83	m3/hr	
Screw press mass loading	76.53	kg/hr	
SELECT MDS-302 SCREW PRESS			
Feed flow to screw press	3.83	m3/hr	
Feed dry solids concentration to screw press	2%		
Filter cake mass flowrate	76.53	kg/hr	
Filter cake dry solids concentration	16%		Assumed
Filter cake volume flowrate	0.48	m3/hr	
Weekly filter cake volume	2.87	m3/week	
SELECT CAKE SKIP IN ACCORDANCE WITH CLIENT CAKE STORAGE REQUIREMENTS			
Filtrate flowrate	3.35	m3/hr	for 6 hours per week
Sump pump flow capacity requirement	3.35	m3/hr	

Solids Retention Time - Bioelektra WWTP				
Parameter	**Factor**	**Value**	**Unit**	**Comments**
Sludge make		65.6	kg/day	
Mass of microorganisms		1367	kg	
SRT		20.8	day	

SBR WAS - Bioelektra WWTP				
Parameter	**Factor**	**Value**	**Unit**	**Comments**
Daily volume wasted from SBR		18.74	m3/day	
Select ASM DT50 - max flowrate		6.6	m3/hr	
Capacity reduction factor due to 4m of discharge head		0.8		
Flowrate @ 4m of discharge head		5.28	m3/hr	
WAS pump daily run time		3.5	hour	

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4.3 Ongoing Operational Calculations

4.3.2 Chemical Consumption

Coagulant is used to condition the sludge in the SBR and promote settleability. Caustic Soda is used for pH correction and Phosphorus is used for nutrient addition.

The caustic estimate usage is:

- 15 L/day 30% Caustic

The coagulant estimate usage is:

- 15 L/day of 23% ACH

The Phosphorus estimate usage is:

- 5 L/day of 18.4% DAP

4.3.3 Electrical Consumption

Summarised below is a list of drives with kW and Amps loading. This table only considers Aerofloat's scope of work.

Electrical Demand - Bioelektra WWTP					
Drive	**Qty**	**kW**	**A**	**Total kW**	**Total A**
Rotating Drum Screen	1	0.37	0.78	0.37	0.78
Balance Tank Blower	1	2.20	4.62	2.20	4.62
SBR Feed Pumps	2	0.75	1.58	1.50	3.15
SBR Blowers	2	7.50	15.75	15.00	31.50
Blower Enclosure Fans	2	0.37	0.78	0.74	1.55
SBR Mixers	2	4.00	8.40	8.00	16.80
WAS Pump	2	1.50	3.15	3.00	6.30
Screw Press Feed Pump	1	0.75	1.58	0.75	1.58
Screw Press	1	1.20	2.52	1.20	2.52
Effluent Tank Blower	1	2.20	4.62	2.20	4.62
Total	**15**			**34.96**	**73.42**

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Appendix E

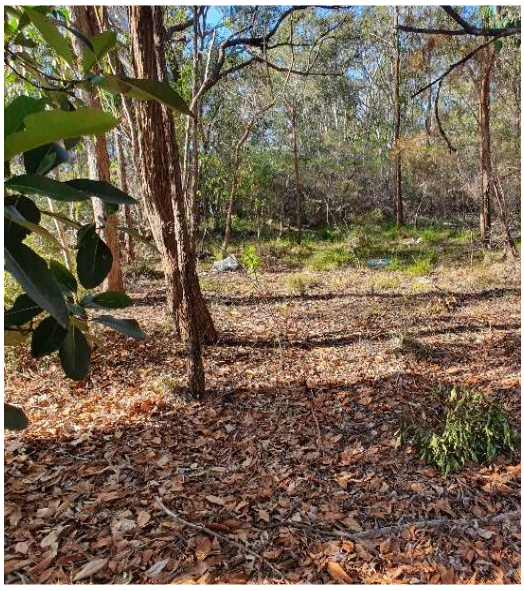
Construction discharge characterisation assessment

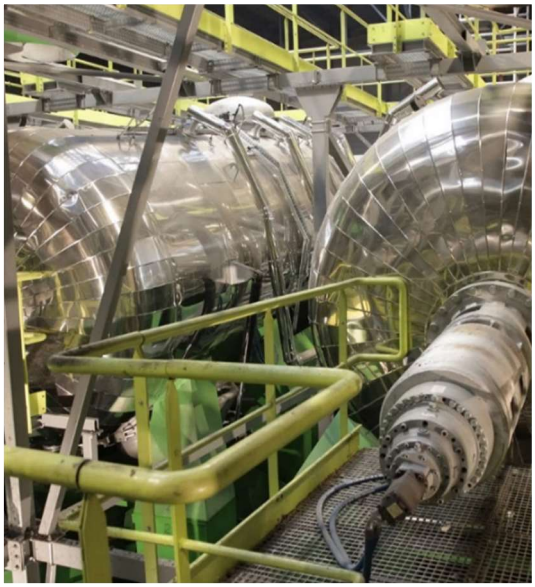
Construction Discharge Characterisation Assessment

West Nowra Resource Recovery Park Stage 2 (SSD-9887)

Bioelektra Australia Pty Ltd

25 October 2021





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Appendix A Relevant Design Documentation

1. Introduction

1.1 Purpose of this report

GHD Pty Ltd (GHD) was engaged by Bioelektra Australia Pty Ltd (Bioelektra) to prepare the Environmental Impact Statement (EIS) for West Nowra Resource Recovery Park Stage 2 (SSD-9887). On 22 July 2021, the NSW Department of Planning Industry and Environment (DPIE) issued submissions identifying key issues based on review of the EIS. This included a submission from the NSW EPA dated 12 July 2021 which contained comments with relation to water during the construction phase.

In parallel to this, since the EIS preparation, further design has been undertaken for the proposed works including the development of a Stormwater Drainage Plan. This plan updates the water management approach outlined in the EIS.

The purpose of this report is to present a construction phase discharge characterisation assessment and in doing so to address the comments of the EPA with respect to water. The report considers the water management measures reflected in the design work which update and provide further detail to the EIS.

This report is structured as follows:

– Section 2 provides background to the report, including the EIS, the design and the EPA comments.
– Section 3 outlines the proposed stormwater management during construction, updated from the EIS based on the design and the EPA comments. It also provides further information as requested by the EPA.
– Section 4 characterises the expected construction phase discharges based on the proposed stormwater management.

1.2 Scope and limitations

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The services undertaken by GHD in connection with preparing this report were limited to those specifically detailed in the report and are subject to the scope limitations set out in the report.

The opinions, conclusions and any recommendations in this report are based on conditions encountered and information reviewed at the date of preparation of the report. GHD has no responsibility or obligation to update this report to account for events or changes occurring subsequent to the date that the report was prepared.

The opinions, conclusions and any recommendations in this report are based on assumptions made by GHD described in this report. GHD disclaims liability arising from any of the assumptions being incorrect.

2. Background

As noted in Section 1, the purpose of this report is to present a construction phase discharge characterisation assessment and in doing so to address the comments of the EPA with respect to water. The report considers the water management measures reflected in the design work which update and provide further detail to the EIS.

Relevant information with relation to the EIS assessment, EPA comments and design development are outlined in the following sections.

2.1 Environmental Impact Statement

The EIS Soils and Water Assessment Report provides background to the proposed works, as well as the background and environmental setting with relation to soils and water.

The assessment included soil and water management measures during construction. The controls were referenced in accordance with *Managing Urban Stormwater: Soils and Construction (Landcom 2005 and DECC, 2008) – 'The Blue Book'*.

This involved the provision of three sediment basins consisting of:

– An existing permanent basin at the north-west of the site
– The then-proposed permanent basin on the eastern side of the site that would then be converted during the operational phase to a constructed wetland.
– A temporary sediment basin in the south-western boundary would also be constructed.

The basins were to be operated as Type F/D basins in accordance with 'The Blue Book'.

A number of other controls were also specified including:

– Swale drains are to be constructed along the site boundaries to intercept and direct sediment laden runoff to the sediment basins.
– Minimisation of disturbed areas and minimising the period of disturbance.
– Diversion of clean runoff around disturbed areas.
– Stockpiles of material to be located well away (minimum of 5 metres from concentrated flow paths) from areas of frequent inundation.

These measures are now updated in response to the EPA comments received (Section 2.2) and through more detailed development through the design process now undertaken (Section 2.3).

2.2 EPA response to submission comments

On 22 July 2021, the DPIE issued submissions identifying key issues based on review of the EIS. This included a submission from the NSW EPA dated 12 July 2021 which contained comments with relation to water during the construction phase. The submission included two sections under the heading "Water" with sub-sections "Sediment basin sizing" and "Water discharge during construction", which are the subject of this report. Comments made in these sections required clarification on some items.

– A comment was made about the sizing criteria for the sediment basins, noting the low to moderate site contamination risk identified in the EIS and the point was made that standard erosion and sediment controls are not appropriate for managing potential water pollution risks associated with contaminated sediments and runoff.
– It was noted that increasing sediment basin sizing and using enhanced erosion and sediment controls (compared to the Blue Book) could be appropriate as a precautionary approach in low contamination risk areas and a minimum requirement in moderate contamination risk areas. It was stated that this could include, for example, use of an 85th percentile storm depth from the Blue Book and "water sensitive" stormwater treatment measures.
– It was recommended that a construction water quality monitoring program is developed with a Trigger Action Response Protocol (TARP) if contaminants are detected at non-trivial levels.

– Further details were requested on how the pre-existing ponds will be dewatered and it was requested that (where relevant) appropriate measures to mitigate any identified impacts are identified.
– It was requested that it is clearly identified where any discharges occur and that the expected frequency and volume of these are estimated. Characterisation of typical and maximum concentrations of non-trivial pollutants was also required along with an impact assessment of proposed discharges consistent with ANZG 2018.
– Where a risk to the receiving environment is identified, it was required that practical measures that could be taken to avoid or minimise pollution based on the surface water discharge characterisation assessment are proposed.

2.3 Design development

Since the EIS preparation, further design has been undertaken by Van Der Meer Consulting for the proposed works. This includes the development of a Stormwater Drainage Plan for the operational phase. This plan:

– Provides more detail on the design water management approach in addition to the EIS.
– Has been developed in tandem with this report and in consideration of the EPA RTS comments (refer Section 2.2).

In particular, the proposed operational stormwater design includes the provision of large operational basins, partially due to their potential use in the construction phase as sediment basins. These are oversized compared to typical erosion and sediment control basin volumes.

The utilisation of these basins during the construction phase is outlined in a Construction Stormwater Management Plan developed for the design. This plan demonstrates how the basins are sufficiently sized to operate as sediment basins under the Blue Book requirements with a design rainfall event that exceeds the 85th percentile 20-day event.

A dam dewatering plan has also been developed by Van Der Meer demonstrating the disposal of dewatering via on-site irrigation. Irrigation areas were calculated and set aside based on an estimated infiltration rate of 36 mm/hour.

The Stormwater Drainage Plan, Construction Stormwater Management Plan and Dam Dewatering Plan are provided in Appendix A.

3. Proposed construction stormwater management

The construction phase water management proposed in the EIS has been updated through the design development, in consideration of the EPA comments received in the response to submissions phase. This is presented in the following sections and is based on the following key principles:

1. Discharge of water in the existing dams via infiltration, not discharge.
2. Enhanced erosion controls and containment of all site runoff from the construction phase, where practicable, in excess of the level of containment typically adopted for erosion and sediment control.
3. Rapid on-site response to contamination encountered.
4. Implementing a TARP including response measures to minimise the likelihood of discharge of contaminated waters.
5. Initial characterisation of site discharges during construction provided in this report based on the lower risk resulting from the above principles.
6. More detailed characterisation of site discharges after the first runoff event during construction based on collected site water quality information and baseline water quality sampling.

3.1 Dam dewatering

The Dam Dewatering Plan prepared by Van Der Meer (Refer Appendix A) allows for dewatering the dams based on irrigation to dedicated irrigation areas at a rate that does not result in overland flow. This is based on nominated irrigation areas calculated based on an estimated infiltration rate. The actual application rate would be confirmed on site and adjusted immediately based on identification of any runoff leaving the irrigation area.

On this basis, the dam dewatering is not anticipated to form a risk to downstream water quality. It is not anticipated to introduce any significant additional soil contamination risks compared to that already at the site. This is on the basis that any contamination in the dams is anticipated to be due to sediment mobilisation into the dams from the site itself. Furthermore, the dam water would be sampled and analysed as part of Detailed Site Investigations proposed to be undertaken at the start of the construction stage, as outlined in Section 4.2.3 of the Response to Submissions Report. The objective of this would be to confirm that the water is suitable for dewatering by on-site irrigation.

3.2 Runoff containment

After bulk earthworks are complete the site would primarily drain to the major operational phase water storages in the east and north-east of the site (refer Appendix A). However, the current landform results in a significant portion of the site draining towards the west, towards the adjacent landfilling activities. Therefore, consideration of construction staging is essential in developing the construction phase stormwater management and is discussed in the following sections.

3.2.1 Later construction stages

When the earthworks have progressed such that the general drainage directions of the final site are achieved the Construction Stormwater Management Plan (refer Appendix A) has confirmed that the site can be conveyed to the proposed operational stage basins, with them being operated as sediment basins during construction and providing capacity for the 20-day 85th percentile design storm event.

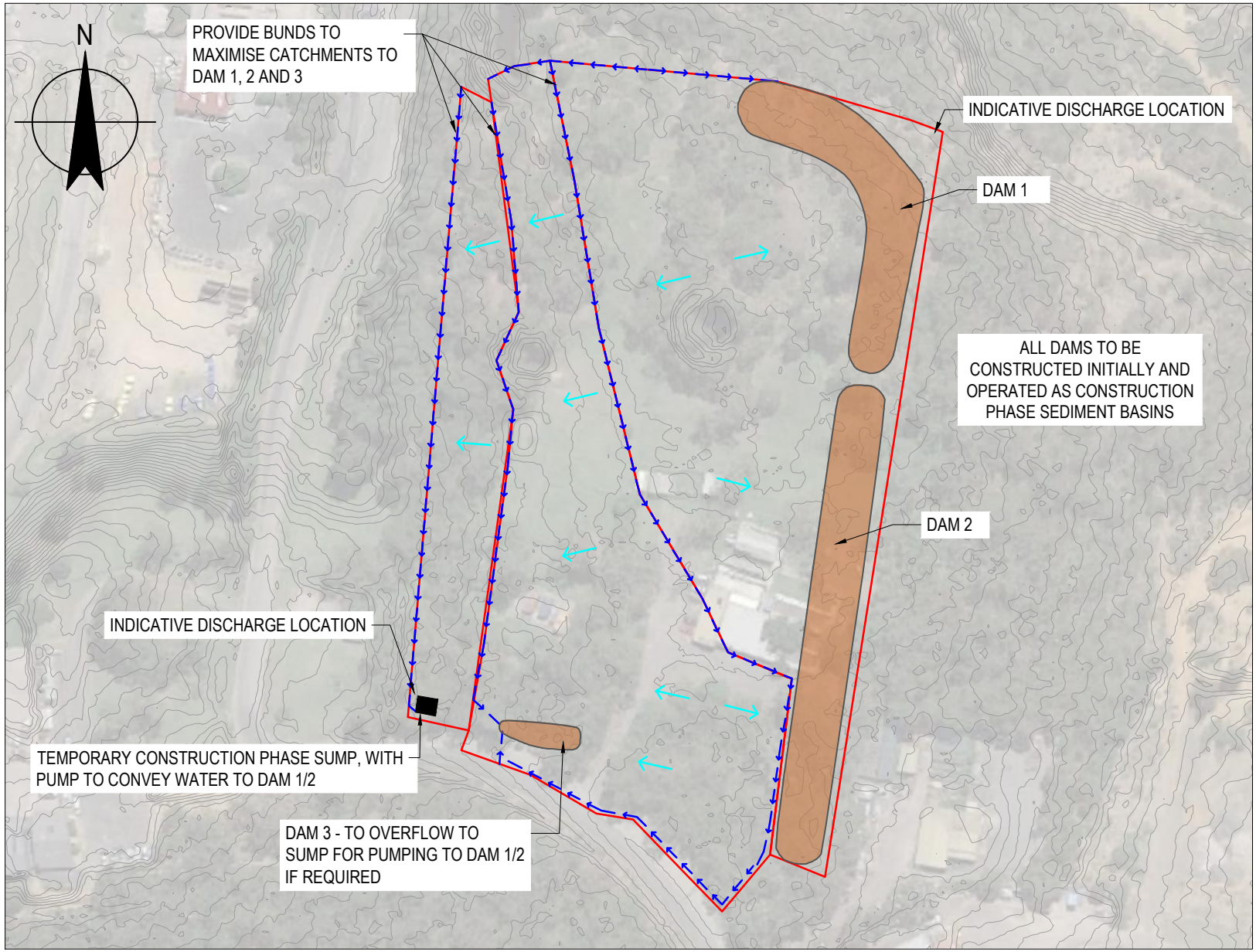
Managing Urban Stormwater Soils and Construction – Volume 2B (DECC 2008) Table 6.2 identifies that overflows for an 85th percentile event would occur 4-6 times per year. However, it should be noted that the nominated management period of 20-days is conservative. That is, significant evaporation or irrigation (within the site extents) disposal of water could be achieved within 20 days. As such, the total number of discharges during the 12 month construction period could indicatively be in the range of none to one or two, though this would be dependent on weather conditions.

3.2.2 Earlier construction stages

There is a period before the excavation works achieve the final proposed drainage directions and are more similar to the existing topography. During these initial construction stages the proposed stormwater management approach is shown on Figure 1 and would be as follows:

– Dams 1, 2 and 3 (identified in Construction Stormwater Management Plan - Appendix A) would be installed as construction phase sediment basins as a first priority at the commencement of works.
– Bunds and drainage lines would be installed to convey as much runoff from site areas as is practicable to Dams 1 and 2.
– For site areas that cannot be drained to Dams 1 and 2 bunds and drainage lines would be installed to drain as much runoff as is practicable to Dam 3.
– Site runoff that cannot be drained to Dam 3 would be conveyed to a temporary sump to be installed and located at the western low point of the existing site topography. Overflow from Dam 3 would be conveyed to the sump.
– A pump would be installed within the sump to convey inflows to Dam 1 or 2. It would be sized to convey the 1 in 10 year 24 hour event, which has been conservatively estimated at approximately 10 litres per second.
– Disturbance of the remaining areas of the site would not commence until the above are provided.

Based on the above configuration the earlier stages of the construction works are anticipated to result in a similar performance with relation to containment as that outlined for the later stages in Section 3.2.1.



LEGEND

- OPERATIONAL DAM TO BE UTILISED AS A CONSTRUCTION PHASE SEDIMENT BASIN
- TEMPORARY CONSTRUCTION PHASE SUMP
- BUNDS WITH FLOW DIRECTION
- CATCHMENTS
- EXISTING FLOW DIRECTIONS
- EXISTING TOPOGRAPHY

Rev	Description	App'd	Date
A	FOR INFORMATION		06.10.21

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Project No. 12536311

SHOALHAVEN CITY COUNCIL
WEST NOWRA RESOURCE RECOVERY PARK
CONSTRUCTION DISCHARGE CHARACTERISATION ASSESSMENT
EARLIER CONSTRUCTION STAGES
STORMWATER MANAGEMENT - FIGURE 1

Size A4

Sketch no. 12536311-CONSTEARLIERSTAGES

Rev no. A

Plot Date: 14 October 2021 - 2:52 PM Plotted by: Kavi Karunaratne File Name: C:\Users\kkarunaratne\GHD\Rod Towner - BioelektraRound2\CADD\12536311-ConstEarlierStages.dwg

3.2.3 Discharge locations

Discharge locations (if discharge occurs during the works) are shown in Appendix A and Figure 1:

– Earlier construction stages: Sump overflow –To a drainage line conveyed underneath the landfill site then to Sandy Creek and to the Shoalhaven River.
– Earlier and later construction stages: Dam 1 overflow: To local drainage lines to Cabbage Tree Creek, then the Shoalhaven River.
– Later construction stages: Dam 3 overflow: To a drainage line conveyed underneath the landfill site then to Sandy Creek and to the Shoalhaven River.

3.3 Contamination response

A key principle of the construction phase stormwater management is the rapid response to the identification of contamination on site that has the potential for the mobilisation of contaminated sediment. This accompanies the runoff containment approach discussed in Section 3.2 as the larger containment volume allows for storage of waters and therefore sufficient time to implement a contamination response in the event of rainfall.

If this is identified, further exposure of the material would cease immediately until a sufficiently low risk method of work is confirmed, such as the provision of stormwater containment bunding over the contaminated area.

As outlined in Section 4.2.3 of the Response to Submissions report, a detailed site investigation (DSI) will be undertaken prior to the commencement of construction works, to characterise the nature and extent of potential contamination at the site. The DSI will include recommendations for management of any identified contamination, including measures to prevent the mobilisation of contaminated sediment or contaminated surface water discharges.

In addition, construction environmental management plans will include an “Unexpected finds protocol” which will describe actions to be undertaken, if any additional contamination is encountered during construction works, to appropriately manage such contamination and prevent the mobilisation of contaminated sediment or contaminated surface water discharges.

3.4 Construction water quality monitoring program

Water quality monitoring would be undertaken during construction. In particular this would inform the TARP (Section 3.5) by providing information both on receiving water quality conditions and the quality of runoff from the disturbed site.

Monitoring would be undertaken as outlined in

Table 1. Final locations would be confirmed during the first sampling round based on where water is available within the downstream waterways. Final dates of quarterly monitoring would be adjusted partially to opportunistically sample during periods of rainfall if practicable. For the reference samples water may not be available dependent on weather and hydrological conditions. In this case pre-construction impact sampling sites can be used to classify background conditions. Impact sites should be located as far above the Shoalhaven River as practicable to avoid sampling backwaters of the river.

The monitoring program would provide information on background water quality prior to construction as well as input on characterising the runoff quality from the site. Monitoring of dams when 50 percent of capacity is exceeded would assist in the implementation of the Trigger Action Response Protocol (TARP) discussed in Section 3.5.

Table 1 Monitoring Program

Type	Location	Period	Frequency
Reference	Sandy and Cabbage Tree Creeks – Upstream of inflow from site	From 3 months after project approval until completion of site disturbance activities. .	– Monthly for first three months of sampling – Quarterly thereafter – During overflow from dams/sump
Impact	Cabbage Tree Creek – Downstream of inflow from site		
Impact	Upstream of the culvert under the landfill receiving runoff from the site.		
Site runoff and discharge (if occurring)	Dam 1 and Sump (or Dam 3 in later stages where sump not in place)	From the first runoff event during construction until completion of site disturbance activities	– First three runoff events during construction – Quarterly – When combined dam levels exceed 30 percent of capacity – During overflow from dams/sump

Analytes have been selected based on contamination assessment undertaken to date, as well as typical construction phase stormwater pollutants. Due to the longer management period for the sediment basins (20-days) a low risk flocculant such as gypsum would be used which is not anticipated to result in significant water quality impacts. Notwithstanding this, potential analytes of concern have been included.

The following would be sampled:

– Field parameters (pH, EC, turbidity)
– Total dissolved solids (TDS), total suspended solids (TSS)
– Major ions (sodium, potassium, magnesium, calcium, chloride, sulfate, alkalinity)
– Metals (As, Cd, Cr, Cu, Ni, Pb, Hg, Zn)
– Nutrients (total nitrogen, NOx, ammonia, TKN, total phosphorus, total reactive phosphorus)
– Pathogens (e. coli, faecal coliforms)
– Hydrocarbons (TRH, BTEX, PAHs, OCPs, OPPs)

Analytes that are consistently below the level of reporting in site runoff for the first three runoff events could be removed from the monitoring program.

The water level in each of the site storages would be observed every day. A marker would be provided showing 50 percent capacity to inform the TARP (refer Section 3.5).

3.5 Trigger Action Response Protocol (TARP)

A TARP would be implemented as outlined in Table 2 to minimise the risk of discharges occurring where concentrations of the site runoff are above receiving background concentrations. A key basis of the TARP is the 20-day management period applied to the dam sizing which allows for time to sample water quality and respond accordingly. The TARP would utilise the site and downstream sampling to be collected as outlined in

Table 1.

The water quality results would be assessed against the relevant default guideline values (DGVs) from the Australia and New Zealand Water Quality Guidelines (ANZG 2018) for 95% species protection of aquatic ecosystems. It is noted that very few applicable DGVs for toxicants have changed in ANZG (2018) from those reported in ANZECC & ARMCANZ (2000).

Additionally, no DGVs for physical and chemical stressors are currently published on the ANZG (2018) website for the applicable drainage division ("Southeast Coast"). As such, the DGVs for physical and chemical stressors from ANZECC & ARMCANZ (2000) (tables 3.3.2 and 3.3.3) will be adopted.

In accordance with ANZG (2018) and ANZECC & ARMCANZ (2000), preliminary site specific guideline values (SSGVs) will also be calculated based on reference site and/or pre construction water quality, when sufficient data exists. SSGVs will be calculated as the 80th percentile of values in the dataset. SSGVs are regarded as preliminary since they will not be based on monthly samples collected over 24 months.

Table 2 Trigger Action Response Protocol

Level	Trigger	Action
1	Combined storage level of dams on site exceeds 30 percent of site storage capacity.	Undertake sampling on the day of occurrence. Do not undertake additional soil disturbance, and cover any disturbance areas or stockpiles where practicable.
2a	Sampling results from Level 1 trigger indicate concentrations are not in excess of the DGVs and/or SSGVs	Add low risk flocculant (e.g. gypsum) and discharge in accordance with the 'Blue Book' procedures.
2b	Sampling results from Level 1 trigger indicate concentrations are in excess of both DGVs and SSGVs AND Dams are still above 50 percent capacity overall.	Initiate offsite tanker disposal to licensed wastewater receiving point within 2 days. Continue until overall dam storage is reduced below 50 percent of capacity.

4. Discharge characterisation

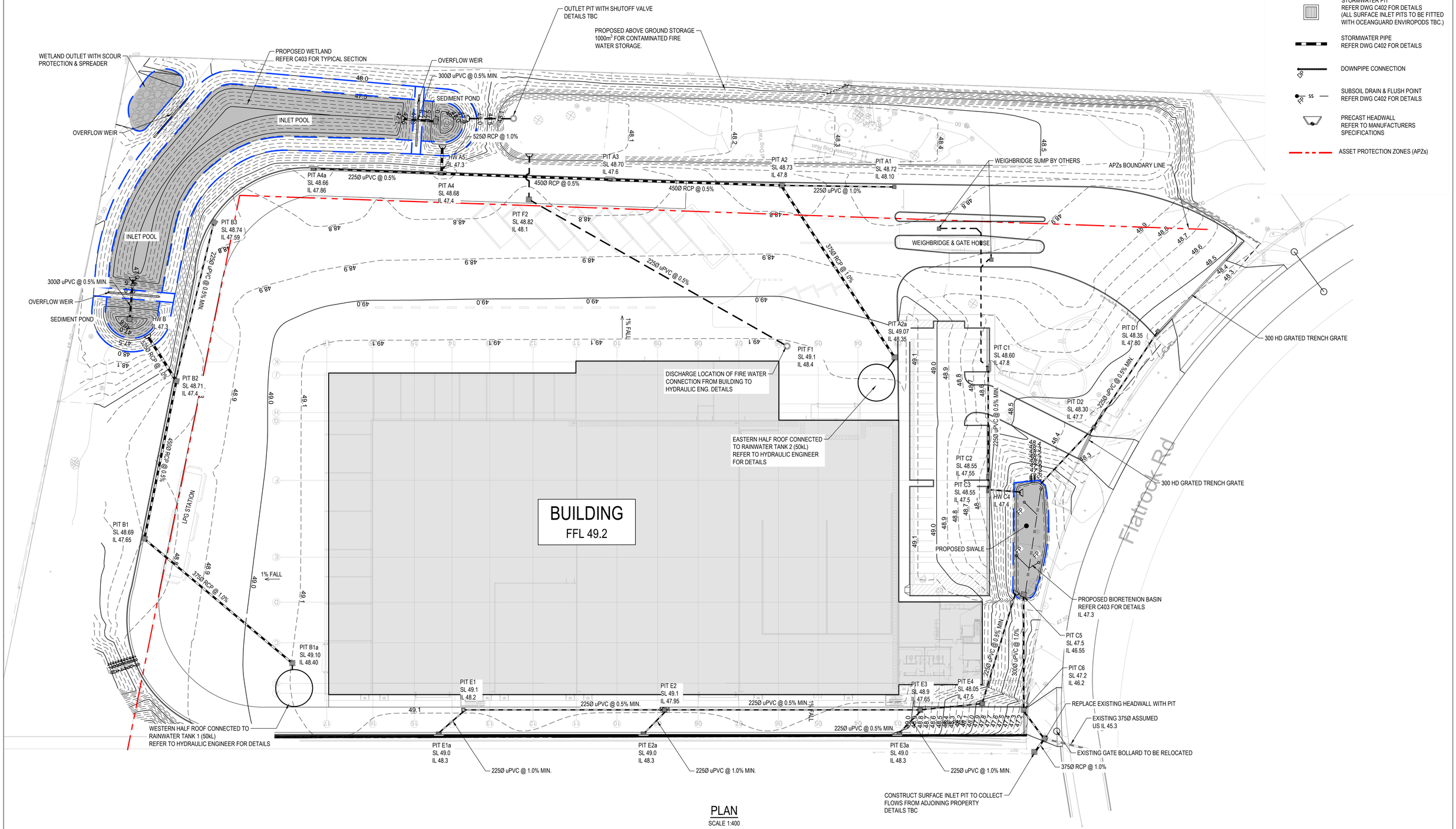
As noted previously, based on the large volumes of storage provided (Section 3.2.1) and construction staging (Section 3.2.2), the total number of discharges during the 12 month construction period could indicatively be in the range of none to one or two, subject to weather conditions. Furthermore, based on the proposed contamination response (3.3) and TARP (3.5) the likelihood of discharge of contaminated water is further reduced.

Therefore, if any discharge occurs it is likely to be that associated with typical construction phase runoff. This could include elevated TSS and turbidity. A low risk flocculant such as gypsum can be used based on longer duration management period which is not anticipated to result in significant downstream water quality impacts.

Notwithstanding the above, full characterisation of potential discharges would be undertaken as soon as is practicable after site disturbance activities have occurred. This allows for more accurate characterisation than achievable before disturbance based on the in-situ collection of samples from disturbed site runoff. This is considered appropriate based on the low predicted frequency and consequence of discharge. The characterisation would be undertaken based on the sampling of the first three runoff events from the site and would be provided to the EPA within 4-6 weeks of the third sampling event.

Appendix A

Relevant Design Documentation



PLAN
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C	AMENDED FIRE STORAGE TO ABOVE GROUND	NT	30.08.21
B	ADDED UNDERGROUND STORAGE	NT	26.08.21
A	PRELIMINARY	RG	20.08.21
No.	REVISION DESCRIPTION	DRAWN	DATE

SCALE BAR
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SCALE 1:400

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CLIENT
Bioelektra AUSTRALIA
YOUR WASTE IS A RESOURCE

ARCHITECT
JOHN R.BROGAN & ASSOCIATES
37 Pitt St, Sydney NSW 2000

PROJECT TITLE
WEST NOWRA RESOURCE RECOVERY FACILITY
120 FLATROCK ROAD, MUNDAMIA NSW 2540

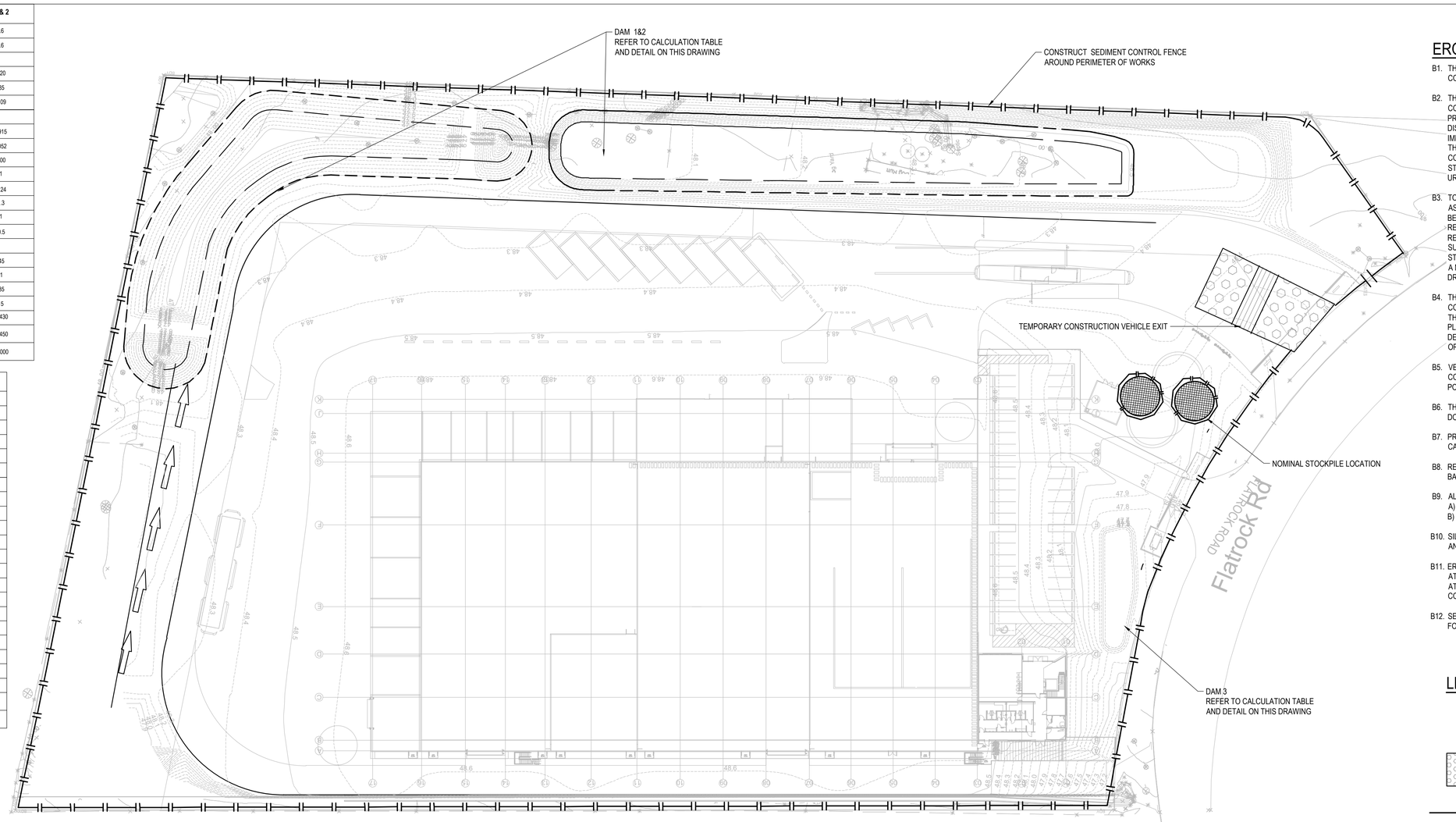
DRAWING TITLE
STORMWATER DRAINAGE PLAN

DRAWING STATUS
APPROVAL ISSUE
NOT TO BE USED FOR CONSTRUCTION

PROJECT LEADER	DESIGNER	SIGNATURE	
AW	NT		
DRAFTSPERSON	SCALE	DATE	SHEET SIZE
RG	AS SHOWN	MAY 2021	A1
JOB No.		DRAWING No.	REVISION
SY212045		C401	C

SITE AREA	DAM 1 & 2
TOTAL CATCHMENT AREA (ha)	2.6
DISTURBED CATCHMENT AREA (ha)	2.6
RAINFALL DATA	
DESIGN RAINFALL DEPTH (days)	20
DESIGN RAINFALL DEPTH (percentile)	85
X-DAY, Y-PERCENTILE RAINFALL EVENT	109
RUSLE FACTORS	
RAINFALL EROSIVITY (R-FACTOR)	2915
SOIL ERODIBILITY (K-FACTOR)	0.052
SLOPEE LENGTH (m)	200
SLOPEE GRADIENT (%)	1
LENGTH/GRADIENT (LS-factor)	0.24
EROSION CONTROL PRACTICE (P-factor)	1.3
GROUND COVER (C-factor)	1
VOLUMETIC RUNOFF COEFFICIENT (5 Yr)	0.5
CALCULATION	
SOIL LOSS (t/ha/yr)	45
SOIL LOSS CLASS	1
SOIL LOSS (m3/ha/yr)	35
SEDIMENT BASIN STORAGE VOLUME, m³	15
SEDIMENT BASIN SETTING VOLUME, m³	1430
TOTAL SEDIMENT BASIN VOLUME REQUIRED, m³	1450
TOTAL SEDIMENT BASIN VOLUME PROVIDED, m³	2000

SITE AREA	DAM 3
TOTAL CATCHMENT AREA (ha)	0.35
DISTURBED CATCHMENT AREA (ha)	0.32
RAINFALL DATA	
DESIGN RAINFALL DEPTH (days)	20
DESIGN RAINFALL DEPTH (percentile)	85
X-DAY, Y-PERCENTILE RAINFALL EVENT	109
RUSLE FACTORS	
RAINFALL EROSIVITY (R-FACTOR)	2915
SOIL ERODIBILITY (K-FACTOR)	0.052
SLOPEE LENGTH (m)	50
SLOPEE GRADIENT (%)	1
LENGTH/GRADIENT (LS-factor)	0.17
EROSION CONTROL PRACTICE (P-factor)	1.3
GROUND COVER (C-factor)	1
VOLUMETIC RUNOFF COEFFICIENT (5 Yr)	0.5
CALCULATION	
SOIL LOSS (t/ha/yr)	45
SOIL LOSS CLASS	1
SOIL LOSS (m3/ha/yr)	35
SEDIMENT BASIN STORAGE VOLUME, m³	1
SEDIMENT BASIN SETTING VOLUME, m³	176
TOTAL SEDIMENT BASIN VOLUME REQUIRED, m³	177
TOTAL SEDIMENT BASIN VOLUME RPROVIDED, m³	200



PLAN
SCALE 1:500

EROSION AND SEDIMENT NOTES

B1. THIS PLAN IS TO BE READ IN CONJUNCTION WITH EROSION AND SEDIMENT CONTROL DETAILS AS SHOWN

B2. THE CONTRACTOR SHALL IMPLEMENT ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES AS NECESSARY AND TO THE SATISFACTION OF COUNCIL PRIOR TO THE COMMENCEMENT OF AND DURING CONSTRUCTION. NO DISTURBANCE TO THE SITE SHALL BE PERMITTED OTHER THAN IN THE IMMEDIATE AREA OF THE WORKS AND NO MATERIAL SHALL BE REMOVED FROM THE SITE WITHOUT COUNCIL'S APPROVAL. ALL EROSION AND SEDIMENT CONTROL DEVICES TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH STANDARDS OUTLINED IN NSW DEPARTMENT OF HOUSING'S "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTIONS".

B3. TOPSOIL SHALL BE STRIPPED AND STOCKPILED OUTSIDE HAZARD AREAS SUCH AS DRAINAGE LINES. THIS TOPSOIL IS TO BE RESPREAD LATER ON AREAS TO BE REVEGETATED AND STABILISED ONLY, (I.E. ALL FOOTPATHS, BATTERS, SITE REGARDING AREAS, BASINS AND CATCHDRAINS). TOPSOIL SHALL NOT BE RESPREAD ON ANY OTHER AREAS UNLESS SPECIFICALLY INSTRUCTED BY THE SUPERINTENDENT. IF THEY ARE TO REMAIN FOR LONGER THAN ONE MONTH STOCKPILES SHALL BE PROTECTED FROM EROSION BY COVERING THEM WITH A MULCH AND HYDROSEEDING AND, IF NECESSARY, BY LOCATING BANKS OR DRAINS DOWNSTREAM OF A STOCKPILE TO RETARD SILT LADEN RUNOFF.

B4. THE CONTRACTOR SHALL REGULARLY MAINTAIN ALL EROSION AND SEDIMENT CONTROL DEVICES AND REMOVE ACCUMULATED SILT FROM DEVICES SUCH THAT NO MORE THAN 60% OF THEIR CAPACITY IS LOST. ALL THE SILT IS TO BE PLACED OUTSIDE THE LIMIT OF WORKS. THE PERIOD FOR MAINTAINING THESE DEVICES SHALL BE AT LEAST UNTIL ALL DISTURBED AREAS ARE REVEGETATED OR AS DIRECTED BY THE SUPERINTENDENT OR COUNCIL.

B5. VEHICULAR TRAFFIC SHALL BE CONTROLLED DURING CONSTRUCTION CONFINING ACCESS WHERE POSSIBLE TO NOMINATED STABILISED ACCESS POINTS.

B6. THE CONTRACTOR SHALL IMPLEMENT DUST CONTROL BY REGULAR WETTING DOWN (BUT NOT SATURATING) DISTURBED AREA.

B7. PROVIDE AND MAINTAIN SILT TRAPS AROUND ALL SURFACE INLET PITS UNTIL CATCHMENTS ARE REVEGETATED OR PAVED.

B8. REVEGETATE ALL TRENCHES IMMEDIATELY UPON COMPLETION OF BACKFILLING.

B9. ALL DRAINAGE PIPE INLETS TO BE CAPPED UNTIL :
A) DOWNPIPES CONNECTED
B) PITS CONSTRUCTED AND PROTECTED WITH SILT BARRIER

B10. SILT FENCE MAINTENANCE INSPECTION TO BE CARRIED OUT EVERY 3 MONTHS AND AFTER EACH RAINFALL EVENT.

B11. EROSION & SEDIMENT CONTROL SIGNAGE AVAILABLE FROM COUNCIL MUST BE ATTACHED TO THE MOST PROMINENT AVAILABLE STRUCTURE AND BE VISIBLE AT ALL TIMES WHEN ENTERING THE SITE FOR THE DURATION OF CONSTRUCTION.

B12. SEDIMENT CONTROLS ARE TO BE CHECKED IN THE 24 HOURS PRIOR TO ANY FORECAST RAIN EVENT IN EXCESS OF 20mm.

LEGEND

-STORMWATER SEDIMENT TRAPS AT ALL PROPOSED PIT INLETS

-TEMPORARY CONSTRUCTION VEHICLE EXIT

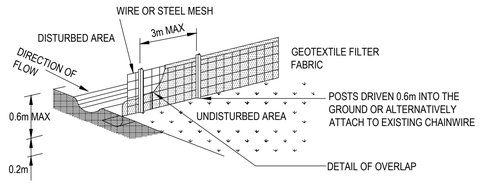
- SEDIMENT CONTROL FENCE

-DIVERSION DRAIN

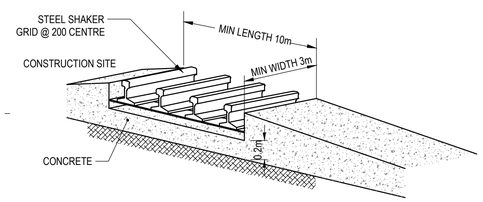
-STOCKPILE AREA

-TEMPORARY SEDIMENT BASIN/DAM

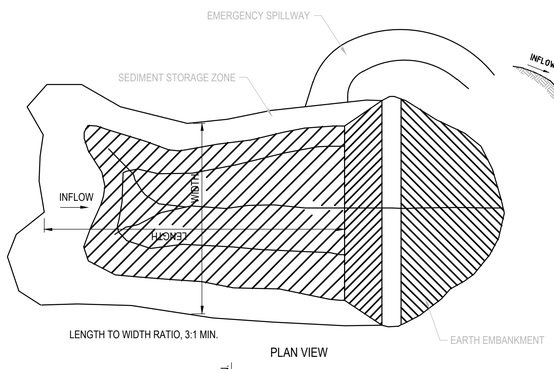
DRAINAGE AREA 0.6 ha. MAX. SLOPE GRADIENT 1:2 MAX.
SLOPE LENGTH 60 m MAX.



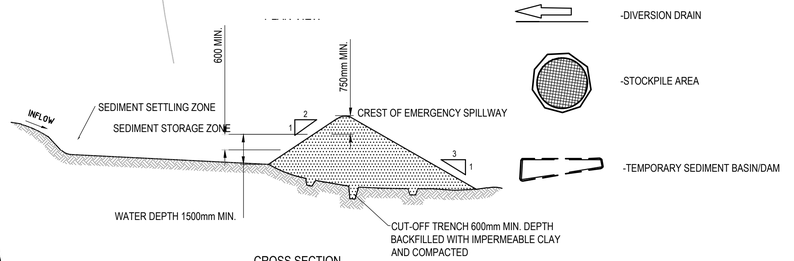
SEDIMENT CONTROL FENCE
N.T.S.



TEMPORARY CONSTRUCTION VEHICLE EXIT
N.T.S.



PLAN VIEW



CROSS SECTION
TYPICAL EARTH BASIN - WET

CONSTRUCTION NOTES:
1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT OFF TRENCH UNDER THE CENTRELINE OF THE EMBANKMENT 500mm DEEP AND 1200mm WIDE EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS TO 95% STANDARD DENSITY.
4. SELECT FILL ACCORDING THAT IS FREE FROM ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING AT LEAST 100mm DEEP TO HELP BOND COMPACTED FILL TO EXISTING SUBSTRATE.
6. SPREAD FILL IN 100mm TO 150mm LAYERS AND COMPACT AT OPTIMUM MOISTURE CONTENT.
7. FORM BATTER GRADES AT 2:1 UPSTREAM AND 3:1 DOWNSTREAM.
8. CONSTRUCT THE EMERGENCY SPILLWAY.
9. REHABILITATE STRUCTURE IN ACCORDANCE WITH THE ENGINEERING PLANS AND SPECIFICATIONS.

REVISIONS:

No.	REVISION DESCRIPTION	DRAWN	DATE
E	AMENDED AS PER COMMENTS	RG	03.09.21
D	AMENDED AS PER COMMENTS FROM DPI	RG	13.07.21
C	FOR APPROVAL	RG	09.06.21
B	PRELIMINARY	RG	08.06.21
A	PRELIMINARY	RG	31.05.21

SCALE BAR
0 10 20 30 40m
SCALE 1:400

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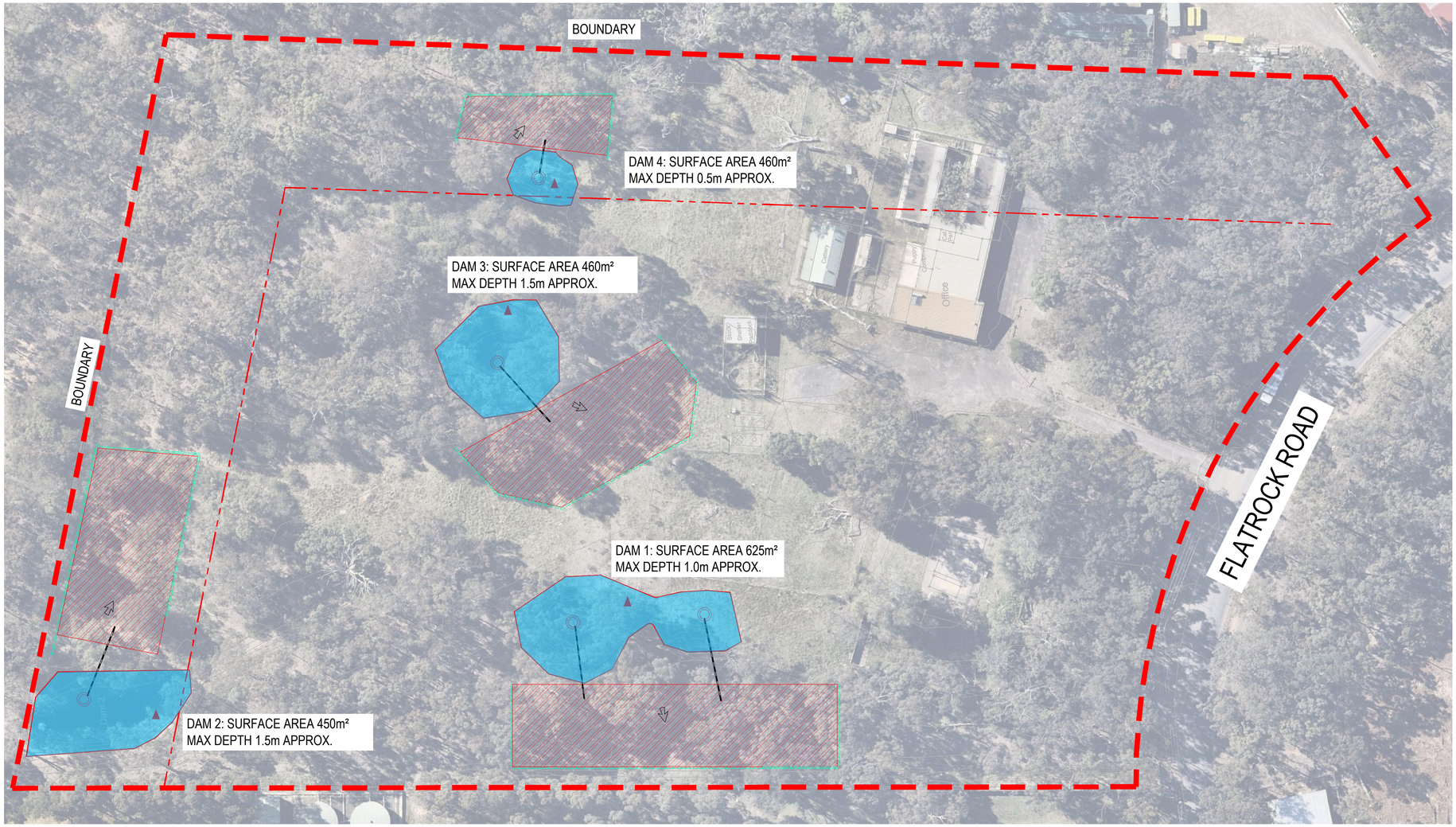
PROJECT TITLE
WEST NOWRA RESOURCE RECOVERY FACILITY
120 FLATROCK ROAD, MUNDAMIA NSW 2540

DRAWING TITLE
CONSTRUCTION STORMWATER MANAGEMENT PLAN

DRAWING STATUS
APPROVAL ISSUE
NOT TO BE USED FOR CONSTRUCTION

PROJECT LEADER	DESIGNER	SIGNATURE		
AW	NT			
DRAFTSPERSON	SCALE	DATE	SHEET SIZE	
RG	AS SHOWN	MAY 2021	A1	
JOB No.		DRAWING No.	REVISION	
SY212045		C210	E	



PLAN

SCALE N.T.S.

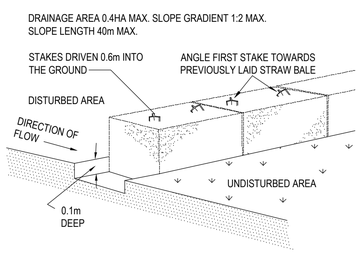
LEGEND

- PUMP INLET WITH SCREEN TO PREVENT REMOVAL OF FAUNA FROM THE DAM
- PUMP LINE TO THE BOTTOM OF DAM
- ASSET PROTECTION ZONES (APZs)
- SITE BOUNDARY
- DAM
- POTENTIAL SPRAY IRRIGATION OVER AREA
- STRAW BALE BARRIERS REFER TO DETAILS
- SLOPE

DAM DEWATERING NOTES

1. METHOD OF DEWATERING AND FATE OF WATER
DURING THE DEWATERING PROCESS, WATER WILL BECOME TURBID AS SEDIMENTS ARE EXPOSED AND DISTURBED BY MACHINERY. WATER SHOULD BE IRRIGATED OVERLAND AND ALLOWED TO INFILTRATE THE SOIL. DEWATERING SHOULD OCCUR BEFORE VEGETATION IS REMOVED FROM THE IRRIGATION LAND. WATER FROM THE DAM CAN BE PUMPED FOR DUST SUPPRESSION, AS LONG AS THE FINAL MUDDY WATER IS IRRIGATED OVER A GRASSED AREA AND DOES NOT ENTER THE DOWNSTREAM WATERWAY. PUMPED WATER SHOULD BE RELEASED AT A RATE ALLOWING INFILTRATION INTO THE SOIL WITH MINIMAL OVERLAND FLOW (ESTIMATED RATE 36MM /HR). SATURATION OF THE SOIL MAY OCCUR IN PATCHES AND IRRIGATION SHOULD BE ADJUSTED ACCORDINGLY. SEDIMENT CONTROLS SHOULD BE IN PLACE TO FILTER WATER FROM ANY EXCESS OVERLAND FLOW. IT MAY TAKE 3-4 DAYS OF PUMPING TO REMOVE MOST OF THE FREE-STANDING WATER (OR MORE IF GROUND BECOMES SATURATED), AND AN EXTRA DAY OF PUMPING FOR MUDDY WATER. FAUNA RESCUE WOULD OCCUR ON THIS FINAL DAY. FOLLOWING THESE INSTRUCTIONS SHOULD RESULT IN MOST OF THE WATER REMAINING ON THE PROPERTY. AN UPSLOPE DIVERSION BUND MAY BE NEEDED TO DEFLECT FLOWS AROUND THE DAM TO MINIMISE REFILLING WITH RAINWATER.
2. DAM DECOMMISSIONING WORK METHOD PROCEDURE; AND SEDIMENT AND EROSION CONTROL
SEE DRAWING C210 PLUS RECOMMENDATION ON THIS PLAN.
3. APPROPRIATE PERMIT APPLICATION
THE REMOVAL OF THESE DAMS IS PART OF APPLICATION. IF THE DAM IS LICENSED WITH DPI WATER THEY REQUIRE NOTIFICATION OF DAM DECOMMISSIONING TO REMOVE IT FROM THE REGISTER.
Website:www.water.nsw.gov.au/Water-licensing/Applications/default.aspx;Email: water.enquiries@dpi.nsw.gov.au; Phone: 1800 353 104.
4. PRESENCE OF FAUNA (TERRESTRIAL AND AQUATIC) AND ACTION PLAN FOR ANY SPECIES DETECTED. DURING DEWATERING, AN AQUATIC ECOLOGIST SHOULD BE ON SITE TO HANDLE AQUATIC FAUNA. THIS WOULD ONLY BE PERFORM ED BY A PERSON WITH THE FOLLOWING LICENSES/APPROVALS: SECTION 37 FISHERIES MANAGEMENT ACT 1994 (FOR FISH); SECTION 120 – GENERAL LICENSE NATIONAL PARKS AND WILDLIFE ACT 1974 (FOR TURTLES, FROGS, WETLAND BIRDS) (M AY NOT BE REQUIRED IF THE DA CONDITIONS SPECIFY AN AQUATIC ECOLOGIST IS TO BE INVOLVED); AND AN ANIMAL RESEARCH AUTHORITY (ISSUED BY THE SECRETARY'S ANIMAL CARE & ETHIC COMMITTEE). THE LIKELY AQUATIC FAUNA HANDLING PROCEDURES ARE: NOTICE: THE AQUATIC ECOLOGIST IS TO NOTIFY DPI FISHERIES OF THE ACTIVITY 48 HOURS PRIOR TO FISH RELOCATION (UNLESS AN AGREEMENT IS IN PLACE), INCLUDING LOCATIONS OF DEWATERED AND RELOCATION SITES
(SEE REGIONAL OFFICE CONTACTS www.dpi.nsw.gov.au/aboutus/about/office). FISHERIES REQUIRE PERMITS TO BE CARRIED BY THE LICENSED ECOLOGIST; WHO SHOULD ALSO DISPLAY A SIGN CLEARLY SHOWING LICENCE NUMBER (IF WORKING IN PUBLIC AREAS, ESPECIALLY WHEN RELEASING FAUNA TO LOCAL CREEK).
i. PLANNING: THE DEWATERING SCHEDULE SHOULD ALLOW TIME FOR FISH RESCUE, ESPECIALLY DURING THE FINAL 0.3 – 0.5 M WATER DEPTH (TO BE ADVISED BY AQUATIC ECOLOGIST). FAUNA SHOULD BE CAPTURED IN ONE DAY, SO PUMPS NEED TO BE OF AN ADEQUATE SIZE AND PLACED IN AN AREA FREE FROM MUD AND DEBRIS (E.G. INSIDE EXCAVATOR BUCKET OR SCREENED SUMP PIT). IF WETLAND BIRDS ARE OBSERVED NESTING, OR YOUNG BIRDS ARE USING THE DAM, ADVISE THE AQUATIC ECOLOGIST IMMEDIATELY FOR ADVICE. DEPENDING ON SPECIES AND AGE, BIRDS M AY BE ABLE TO RELOCATE THEMSELVES. CHICKS WILL NEED TEMPORARY REFUGE DURING DEWATERING; OR WORKS M AY NEED TO BE POSTPONED.
iii. CAPTURE: FISH ARE TO BE COLLECTED BY HAND NETS DURING THE FINAL DAY OF DEWATERING. THIS IS M OST EFFECTIVE WHEN THE WATER IS <0.3 M DEEP. DISSOLVED OXYGEN CONCENTRATION WILL DROP RAPIDLY AS WATER VOLUME DECREASES, ESPECIALLY IN WARM WATER OR IF LOTS OF FISH ARE PRESENT. LARGER BODIED FISH SHOULD BE TARGETED FIRST. WETLAND BIRDS WILL SCAVENGE FOR SMALL FISH IN THE SHALLOWS (E.G. GAMBUSIA). MOST SMALL FAUNA WILL LIKELY REMAIN UNCAPTURED IN THE DAM UNTIL THE WATER BECOMES VERY SHALLOW (ESPECIALLY EELS AND TURTLES). EELS ARE BEST CAPTURED BY LARGE HAND NETS WHEN THE WATER IS <0.3 M DEEP. WHEN THE WATER IS EXTREMELY LOW, TURTLES AND FISH M AY HEAD TOWARDS THE INTAKE PUMP (PLACED IN DEEPEST PART). THIS AREA SHOULD BE MONITORED TO INTERCEPT FAUNA (E.G. STAND IN WATER NEXT TO INTAKE). TURTLES WILL BURROW INTO MUD AND MAY REQUIRE OBSERVATION AND RESCUE THE FOLLOWING MORNING, BUT CAN ALSO MOVE THEMSELVES TO SUITABLE NEARBY HABITAT IF AN ESCAPE RAM P IS GRADED. FOR SAFETY, AT LEAST TWO PEOPLE ARE REQUIRED WHEN WADING AND HANDLING HEAVY TUBS OF WATER/FISH UP BANKS (EXCAVATOR CAN DIG ACCESS STEPS/RAMP).
iv. RELOCATE: NATIVE FISH HEALTHY ENOUGH FOR RELOCATION ARE TO BE CONTAINED AND TRANSPORTED IN AN AERATED TUB/BUCKET/TANK TO AN APPROPRIATE DAM/LAKE/WATERHOLE/CREEK. DP I FISHERIES ADVISE THAT THE HOST LOCATION SHOULD BE LARGE ENOUGH TO ACCOMMODATE ADDITIONAL FISH, ESPECIALLY PREDATORY EELS. ADDITIONAL RELEASE SITES M AY BE NEEDED. DO NOT OVERSTOCK TUBS OR LEAVE IN DIRECT SUN FOR EXTENDED PERIODS. AERATION CAN BE PROVIDED BY BATTERY AQUARIUM PUMPS OR MANUAL TURBULENCE IF ONLY STORED FOR A SHORT PERIOD. TURTLES CAN BE TRANSPORTED IN A SHADED TUB WITH A WET HESSIAN BAG PLACED INSIDE FOR MOISTURE AND SUPPORT DURING TRANSPORT. TADPOLES CAN BE TRANSPORTED IN SMALL BUCKETS.
v.RELEASE: WATER FROM THE RECEIVING WATERBODY SHOULD BE MIXED SLOWLY OVER 5 - 10 MINUTES WITH THE TANK WATER TO ALLOW FISH TO ACCLIMATISE TO THE NEW WATER QUALITY. CARE SHOULD BE TAKEN WHEN RELEASING FAUNA NOT TO ALSO TRANSFER WEEDS OR INVASIVE SPECIES (E.G. CARP EGGS AND GAMBUSIA). TRANSFER ANIMALS VIA HAND NETS, RATHER THAN TIPPING THE TUB WITH WATER. EELS CAN BE RELEASED ON LAND A FEW METRES FROM EDGE AND POINTED TOWARDS THE WATER.
vi. PESTS: EXOTIC FISH (E.G. CARP, GAMBUSIA, GOLDFISH, REDFIN PERCH, SPOTTED LIVEBEARER) ARE TO BE INTERCEPTED, EUTHANISED AND DISPOSED OF IN ACCORDANCE WITH THE ECOLOGIST'S ANIMAL RESEARCH AUTHORITY (ISSUED BY THE SECRETARY'S ANIMAL CARE & ETHIC COMMITTEE). EXOTIC TRACHEMYS SCRIPTA (RED-EARED SLIDER TURTLE) ARE TO BE CONTAINED HUMANLY AND OEH IMMEDIATELY NOTIFIED (ENVIRONMENT LINE - 131 555). THEY WILL COLLECT THE LIVE TURTLE FROM THE ECOLOGIST.
vii. POST-DEWATERING: AN ESCAPE RAMP SHOULD BE GRADED TO ALLOW TRAPPED FAUNA TO ESCAPE OVERNIGHT. SEDIMENT SHOULD BE LEFT UP TO TWO NIGHTS TO ALLOW HIDDEN FAUNA TO EMERGE, UNLESS THE ECOLOGIST CONFIRMS THERE ARE NO FAUNA REMAINING (SITE SPECIFIC ASSESSMENT). EARTHWORKS STAFF SHOULD NOTIFY THE APPOINTED AQUATIC ECOLOGIST IF STRANDED FISH OR TURTLES ARE OBSERVED POST-DEWATERING.
5.TIMELINE FOR EACH DAM

DAY 1	DAY 2-6 (OR LONGER)	DAY 7	DAY 8-9	ON GOING
INSTALL BUNDS TO DIVERT OVERLAND FLOW. INSTALL EROSION CONTROLS (E.G. SILT FENCE, HAY BALES AND/OR GEOTEXTILE FABRIC) AND PREPARE PUMP THE PUMP INTAKE HEAD IS BEST POSITIONED ON A FLOATING DEVICE ABOVE THE DEEPEST PART OF DAM AND HELD IN POSITION WITH ROPES SPANNING THE DAM. IT IS DIFFICULT TO MOVE THE PIPE WHEN THE WATER IS LOW, SO IT'S EASIEST TO INSTALL WHEN DAM IS FULL. TEST DISCHARGE AND DIVERSION TO ENSURE NO EROSION/SEDIMENTATION OCCURS DOWNSTREAM.AVOID DISTURBING VEGETATION (GRASS) IN AREAS WHERE WATER WILL TRAVEL. NOTIFY AQUATIC ECOLOGIST.	PUMP WATER AND IRRIGATE OVERLAND AT A RATE THAT ALLOWS INFILTRATION TO THE SOIL. CHECK SEDIMENT CONTROLS IF SOIL BECOMES SATURATED BY IRRIGATION AND GENERATES SURFACE RUNOFF. ADJUST PUMPING RATE TO SLOW RUNOFF. UPDATE AQUATIC ECOLOGIST.	DURING FINAL 0.3m OF DEWATERING ALLOW AQUATIC ECOLOGIST TO RESCUE FAUNA IN ONE DAY. WATER WILL BECOME TURBID AS LEVELS FALL AND WHEN ECOLOGISTS WADE OVER MUDDY BOTTOM . THIS WATER SHOULD BE DISCHARGED AWAY FROM DRAINAGE LINES. TO ALLOW RAPID FAUNA RESCUE, PUMP INLET NEEDS TO BE LARGE ENOUGH TO SUCK SEDIMENT (E.G. 4 - 6 INCH). EARTHWORKS MACHINERY CAN PUSH SEDIMENT ACROSS THE DAM TO ASSIST FINAL FAUNA CAPTURE (ADJUSTED TO SUIT CONDITIONS AND ECOLOGIST'S INSTRUCTIONS). PARTIALLY REMOVE WALL TO PREVENT RE-FILLING. STABILISE IF NEEDED. GRADE RAMP FOR OVERNIGHT ESCAPE FOR FAUNA HIDDEN IN BOTTOM SEDIMENT.	CLEAR SURROUNDING VEGETATION. LEAVE ESCAPE RAMP FOR FAUNA TRAPPED OVERNIGHT (TWO NIGHTS).	REMOVE SEDIMENT, BREACH DAM WALL, AND COMMENCE RECONSTRUCTION



STRAW BALE SEDIMENT FILTER

REVISIONS:

No.	REVISION DESCRIPTION	DRAWN	DATE
A	ISSUE FOR APPROVAL	RG	03.09.21

SCALE BAR
0 10 20 30 40m
SCALE 1:400

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ARCHITECT
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37 Pitt St, Sydney NSW 2000

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WEST NOWRA RESOURCE RECOVERY FACILITY
120 FLATROCK ROAD, MUNDAMIA NSW 2540

DRAWING TITLE
DAM DEWATERING PLAN

DRAWING STATUS
APPROVAL ISSUE
NOT TO BE USED FOR CONSTRUCTION

PROJECT LEADER	DESIGNER	SIGNATURE	
AW	NT		
DRAFTSPERSON	SCALE	DATE	SHEET SIZE
RG	AS SHOWN	MAY 2021	A1
JOB No.		DRAWING No.	REVISION
SY212045		C220	A

ghd.com

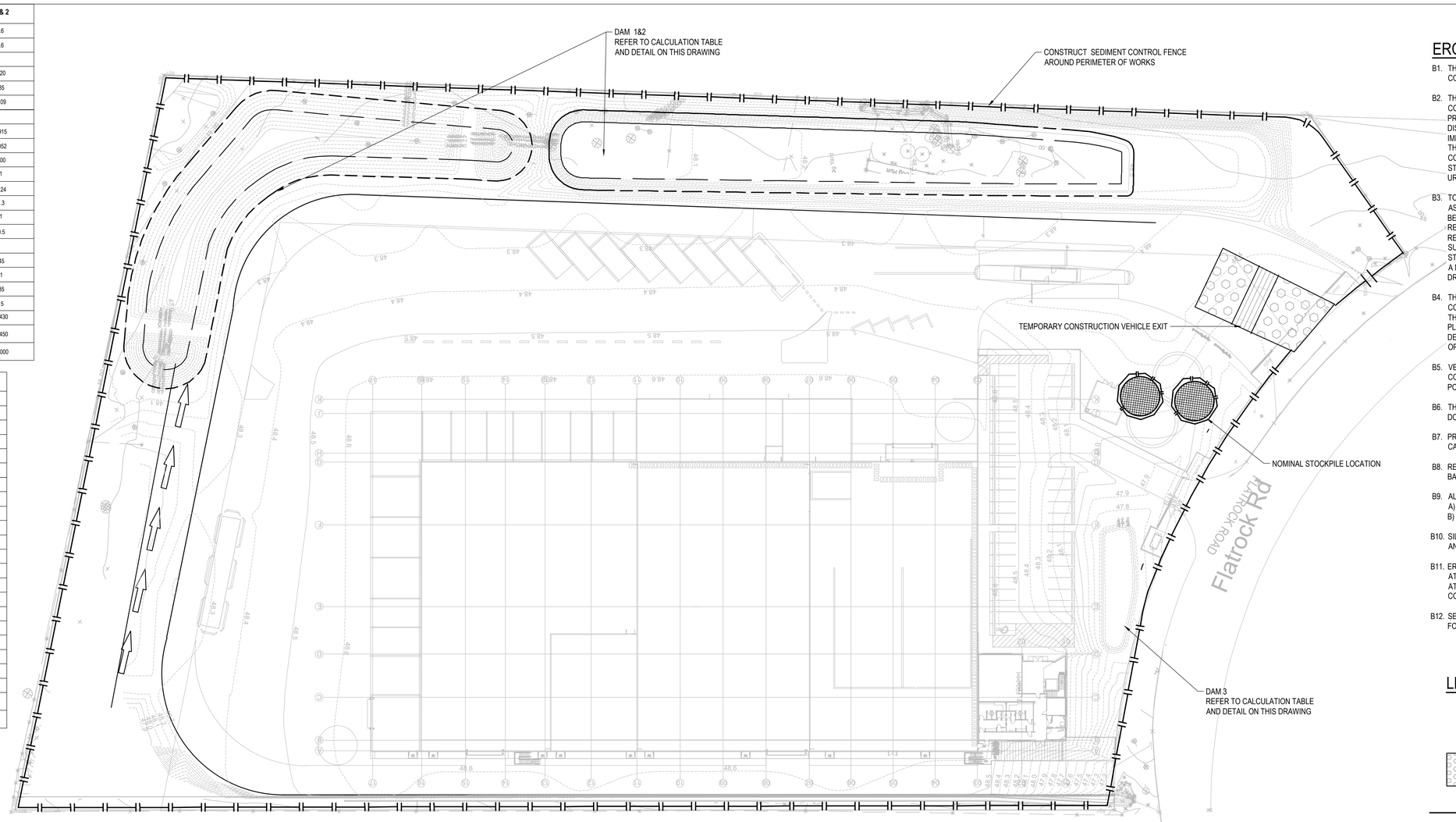
The Power of Commitment

Appendix F

Preliminary erosion and sediment control plan

SITE AREA	DAM 1 & 2
TOTAL CATCHMENT AREA (ha)	2.6
DISTURBED CATCHMENT AREA (ha)	2.6
RAINFALL DATA	
DESIGN RAINFALL DEPTH (days)	20
DESIGN RAINFALL DEPTH (percentile)	85
X-DAY, Y-PERCENTILE RAINFALL EVENT	109
RUSLE FACTORS	
RAINFALL EROSIVITY (R-FACTOR)	2915
SOIL ERODIBILITY (K-FACTOR)	0.052
SLOPEE LENGTH (m)	200
SLOPEE GRADIENT (%)	1
LENGTH/GRADIENT (LS-factor)	0.24
EROSION CONTROL PRACTICE (P-factor)	1.3
GROUND COVER (C-factor)	1
VOLUMETIC RUNOFF COEFFICIENT (5 Yr)	0.5
CALCULATION	
SOIL LOSS (t/ha/yr)	45
SOIL LOSS CLASS	1
SOIL LOSS (m3/ha/yr)	35
SEDIMENT BASIN STORAGE VOLUME, m³	15
SEDIMENT BASIN SETTING VOLUME, m³	1430
TOTAL SEDIMENT BASIN VOLUME REQUIRED, m³	1450
TOTAL SEDIMENT BASIN VOLUME PROVIDED, m³	2000

SITE AREA	DAM 3
TOTAL CATCHMENT AREA (ha)	0.35
DISTURBED CATCHMENT AREA (ha)	0.32
RAINFALL DATA	
DESIGN RAINFALL DEPTH (days)	20
DESIGN RAINFALL DEPTH (percentile)	85
X-DAY, Y-PERCENTILE RAINFALL EVENT	109
RUSLE FACTORS	
RAINFALL EROSIVITY (R-FACTOR)	2915
SOIL ERODIBILITY (K-FACTOR)	0.052
SLOPEE LENGTH (m)	50
SLOPEE GRADIENT (%)	1
LENGTH/GRADIENT (LS-factor)	0.17
EROSION CONTROL PRACTICE (P-factor)	1.3
GROUND COVER (C-factor)	1
VOLUMETIC RUNOFF COEFFICIENT (5 Yr)	0.5
CALCULATION	
SOIL LOSS (t/ha/yr)	45
SOIL LOSS CLASS	1
SOIL LOSS (m3/ha/yr)	35
SEDIMENT BASIN STORAGE VOLUME, m³	1
SEDIMENT BASIN SETTING VOLUME, m³	176
TOTAL SEDIMENT BASIN VOLUME REQUIRED, m³	177
TOTAL SEDIMENT BASIN VOLUME RPROVIDED, m³	200



PLAN
SCALE 1:500

EROSION AND SEDIMENT NOTES

B1. THIS PLAN IS TO BE READ IN CONJUNCTION WITH EROSION AND SEDIMENT CONTROL DETAILS AS SHOWN

B2. THE CONTRACTOR SHALL IMPLEMENT ALL SOIL EROSION AND SEDIMENT CONTROL MEASURES AS NECESSARY AND TO THE SATISFACTION OF COUNCIL PRIOR TO THE COMMENCEMENT OF AND DURING CONSTRUCTION. NO DISTURBANCE TO THE SITE SHALL BE PERMITTED OTHER THAN IN THE IMMEDIATE AREA OF THE WORKS AND NO MATERIAL SHALL BE REMOVED FROM THE SITE WITHOUT COUNCIL'S APPROVAL. ALL EROSION AND SEDIMENT CONTROL DEVICES TO BE INSTALLED AND MAINTAINED IN ACCORDANCE WITH STANDARDS OUTLINED IN NSW DEPARTMENT OF HOUSING'S "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTIONS".

B3. TOPSOIL SHALL BE STRIPPED AND STOCKPILED OUTSIDE HAZARD AREAS SUCH AS DRAINAGE LINES. THIS TOPSOIL IS TO BE RESPREAD LATER ON AREAS TO BE REVEGETATED AND STABILISED ONLY, (I.E. ALL FOOTPATHS, BATTERS, SITE REGARDING AREAS, BASINS AND CATCHDRAINS). TOPSOIL SHALL NOT BE RESPREAD ON ANY OTHER AREAS UNLESS SPECIFICALLY INSTRUCTED BY THE SUPERINTENDENT. IF THEY ARE TO REMAIN FOR LONGER THAN ONE MONTH STOCKPILES SHALL BE PROTECTED FROM EROSION BY COVERING THEM WITH A MULCH AND HYDROSEEDING AND, IF NECESSARY, BY LOCATING BANKS OR DRAINS DOWNSTREAM OF A STOCKPILE TO RETARD SILT LADEN RUNOFF.

B4. THE CONTRACTOR SHALL REGULARLY MAINTAIN ALL EROSION AND SEDIMENT CONTROL DEVICES AND REMOVE ACCUMULATED SILT FROM DEVICES SUCH THAT NO MORE THAN 60% OF THEIR CAPACITY IS LOST. ALL THE SILT IS TO BE PLACED OUTSIDE THE LIMIT OF WORKS. THE PERIOD FOR MAINTAINING THESE DEVICES SHALL BE AT LEAST UNTIL ALL DISTURBED AREAS ARE REVEGETATED OR AS DIRECTED BY THE SUPERINTENDENT OR COUNCIL.

B5. VEHICULAR TRAFFIC SHALL BE CONTROLLED DURING CONSTRUCTION CONFINING ACCESS WHERE POSSIBLE TO NOMINATED STABILISED ACCESS POINTS.

B6. THE CONTRACTOR SHALL IMPLEMENT DUST CONTROL BY REGULAR WETTING DOWN (BUT NOT SATURATING) DISTURBED AREA.

B7. PROVIDE AND MAINTAIN SILT TRAPS AROUND ALL SURFACE INLET PITS UNTIL CATCHMENTS ARE REVEGETATED OR PAVED.

B8. REVEGETATE ALL TRENCHES IMMEDIATELY UPON COMPLETION OF BACKFILLING.

B9. ALL DRAINAGE PIPE INLETS TO BE CAPPED UNTIL :
A) DOWNPIPES CONNECTED
B) PITS CONSTRUCTED AND PROTECTED WITH SILT BARRIER

B10. SILT FENCE MAINTENANCE INSPECTION TO BE CARRIED OUT EVERY 3 MONTHS AND AFTER EACH RAINFALL EVENT.

B11. EROSION & SEDIMENT CONTROL SIGNAGE AVAILABLE FROM COUNCIL MUST BE ATTACHED TO THE MOST PROMINENT AVAILABLE STRUCTURE AND BE VISIBLE AT ALL TIMES WHEN ENTERING THE SITE FOR THE DURATION OF CONSTRUCTION.

B12. SEDIMENT CONTROLS ARE TO BE CHECKED IN THE 24 HOURS PRIOR TO ANY FORECAST RAIN EVENT IN EXCESS OF 20mm.

LEGEND

-STORMWATER SEDIMENT TRAPS AT ALL PROPOSED PIT INLETS

-TEMPORARY CONSTRUCTION VEHICLE EXIT

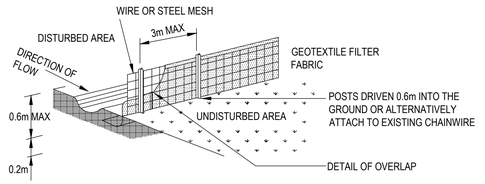
- SEDIMENT CONTROL FENCE

-DIVERSION DRAIN

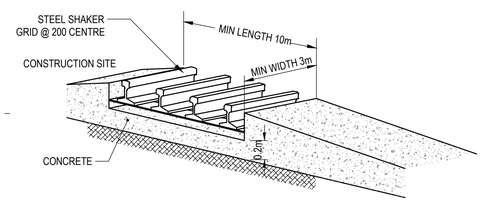
-STOCKPILE AREA

-TEMPORARY SEDIMENT BASIN/DAM

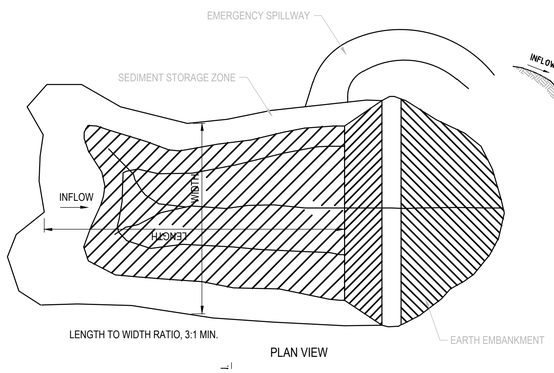
DRAINAGE AREA 0.6 ha. MAX. SLOPE GRADIENT 1:2 MAX.
SLOPE LENGTH 60 m MAX.



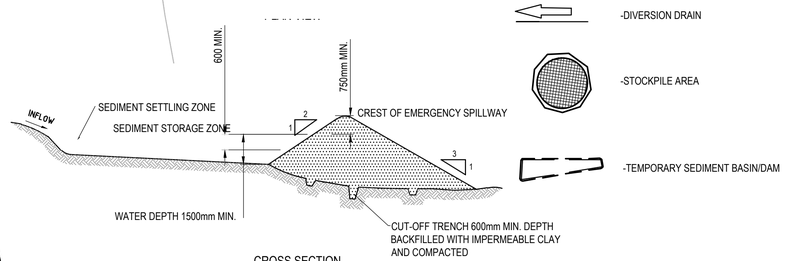
SEDIMENT CONTROL FENCE
N.T.S.



TEMPORARY CONSTRUCTION VEHICLE EXIT
N.T.S.



PLAN VIEW



CROSS SECTION
TYPICAL EARTH BASIN - WET

CONSTRUCTION NOTES:
1. REMOVE ALL VEGETATION AND TOPSOIL FROM UNDER THE DAM WALL AND FROM WITHIN THE STORAGE AREA.
2. CONSTRUCT A CUT OFF TRENCH UNDER THE CENTRELINE OF THE EMBANKMENT 500mm DEEP AND 1200mm WIDE EXTENDING TO A POINT ON THE GULLY WALL LEVEL WITH THE RISER CREST.
3. MAINTAIN THE TRENCH FREE OF WATER AND RECOMPACT THE MATERIALS TO 95% STANDARD DENSITY.
4. SELECT FILL ACCORDING THAT IS FREE FROM ROOTS, WOOD, ROCK, LARGE STONE OR FOREIGN MATERIAL.
5. PREPARE THE SITE UNDER THE EMBANKMENT BY RIPPING AT LEAST 100mm DEEP TO HELP BOND COMPACTED FILL TO EXISTING SUBSTRATE.
6. SPREAD FILL IN 100mm TO 150mm LAYERS AND COMPACT AT OPTIMUM MOISTURE CONTENT.
7. FORM BATTER GRADES AT 2:1 UPSTREAM AND 3:1 DOWNSTREAM.
8. CONSTRUCT THE EMERGENCY SPILLWAY.
9. REHABILITATE STRUCTURE IN ACCORDANCE WITH THE ENGINEERING PLANS AND SPECIFICATIONS.

REVISIONS:

No.	REVISION DESCRIPTION	DRAWN	DATE
E	AMENDED AS PER COMMENTS	RG	03.09.21
D	AMENDED AS PER COMMENTS FROM DPI	RG	13.07.21
C	FOR APPROVAL	RG	09.06.21
B	PRELIMINARY	RG	08.06.21
A	PRELIMINARY	RG	31.05.21

SCALE BAR
0 10 20 30 40m
SCALE 1:400

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WEST NOWRA RESOURCE RECOVERY FACILITY
120 FLATROCK ROAD, MUNDAMIA NSW 2540

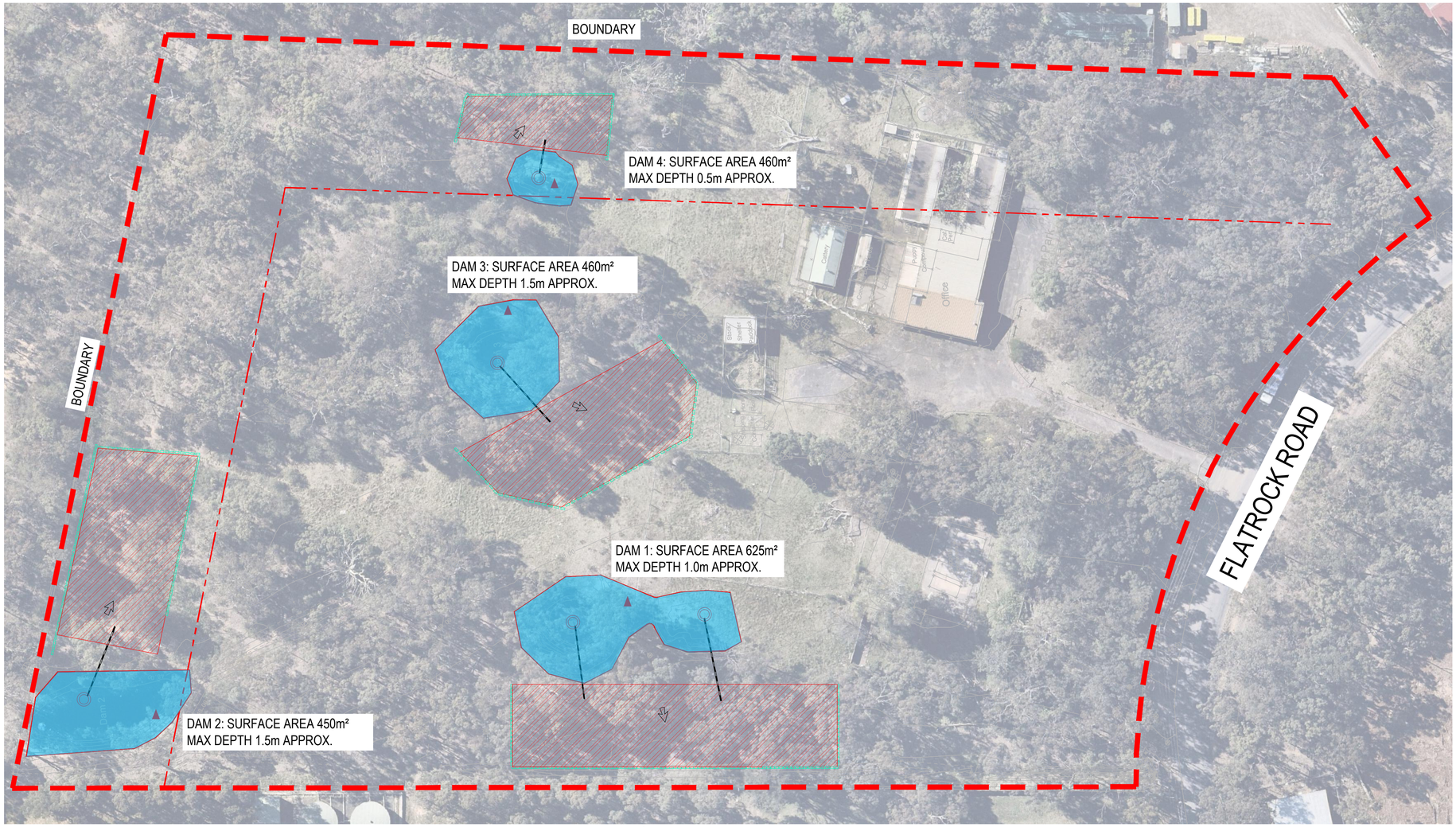
DRAWING TITLE
CONSTRUCTION STORMWATER MANAGEMENT PLAN

DRAWING STATUS
APPROVAL ISSUE
NOT TO BE USED FOR CONSTRUCTION

PROJECT LEADER	DESIGNER	SIGNATURE		
AW	NT			
DRAFTSPERSON	SCALE	DATE	SHEET SIZE	
RG	AS SHOWN	MAY 2021	A1	
JOB No.		DRAWING No.	REVISION	
SY212045		C210	E	

Appendix G

Dewatering plan



PLAN

SCALE N.T.S.

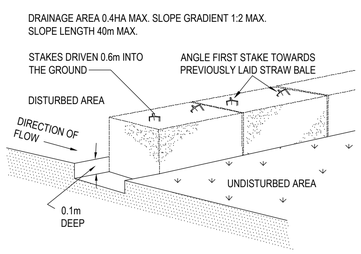
LEGEND

- PUMP INLET WITH SCREEN TO PREVENT REMOVAL OF FAUNA FROM THE DAM
- PUMP LINE TO THE BOTTOM OF DAM
- ASSET PROTECTION ZONES (APZs)
- SITE BOUNDARY
- DAM
- POTENTIAL SPRAY IRRIGATION OVER AREA
- STRAW BALE BARRIERS REFER TO DETAILS
- SLOPE

DAM DEWATERING NOTES

1. METHOD OF DEWATERING AND FATE OF WATER
DURING THE DEWATERING PROCESS, WATER WILL BECOME TURBID AS SEDIMENTS ARE EXPOSED AND DISTURBED BY MACHINERY. WATER SHOULD BE IRRIGATED OVERLAND AND ALLOWED TO INFILTRATE THE SOIL. DEWATERING SHOULD OCCUR BEFORE VEGETATION IS REMOVED FROM THE IRRIGATION LAND. WATER FROM THE DAM CAN BE PUMPED FOR DUST SUPPRESSION, AS LONG AS THE FINAL MUDDY WATER IS IRRIGATED OVER A GRASSED AREA AND DOES NOT ENTER THE DOWNSTREAM WATERWAY. PUMPED WATER SHOULD BE RELEASED AT A RATE ALLOWING INFILTRATION INTO THE SOIL WITH MINIMAL OVERLAND FLOW (ESTIMATED RATE 36MM /HR). SATURATION OF THE SOIL MAY OCCUR IN PATCHES AND IRRIGATION SHOULD BE ADJUSTED ACCORDINGLY. SEDIMENT CONTROLS SHOULD BE IN PLACE TO FILTER WATER FROM ANY EXCESS OVERLAND FLOW. IT MAY TAKE 3-4 DAYS OF PUMPING TO REMOVE MOST OF THE FREE-STANDING WATER (OR MORE IF GROUND BECOMES SATURATED), AND AN EXTRA DAY OF PUMPING FOR MUDDY WATER. FAUNA RESCUE WOULD OCCUR ON THIS FINAL DAY. FOLLOWING THESE INSTRUCTIONS SHOULD RESULT IN MOST OF THE WATER REMAINING ON THE PROPERTY. AN UPSLOPE DIVERSION BUND MAY BE NEEDED TO DEFLECT FLOWS AROUND THE DAM TO MINIMISE REFILLING WITH RAINWATER.
2. DAM DECOMMISSIONING WORK METHOD PROCEDURE; AND SEDIMENT AND EROSION CONTROL
SEE DRAWING C210 PLUS RECOMMENDATION ON THIS PLAN.
3. APPROPRIATE PERMIT APPLICATION
THE REMOVAL OF THESE DAMS IS PART OF APPLICATION. IF THE DAM IS LICENSED WITH DPI WATER THEY REQUIRE NOTIFICATION OF DAM DECOMMISSIONING TO REMOVE IT FROM THE REGISTER.
Website:www.water.nsw.gov.au/Water-licensing/Applications/default.aspx;Email: water.enquiries@dpi.nsw.gov.au; Phone: 1800 353 104.
4. PRESENCE OF FAUNA (TERRESTRIAL AND AQUATIC) AND ACTION PLAN FOR ANY SPECIES DETECTED. DURING DEWATERING, AN AQUATIC ECOLOGIST SHOULD BE ON SITE TO HANDLE AQUATIC FAUNA. THIS WOULD ONLY BE PERFORM ED BY A PERSON WITH THE FOLLOWING LICENSES/APPROVALS: SECTION 37 FISHERIES MANAGEMENT ACT 1994 (FOR FISH); SECTION 120 – GENERAL LICENSE NATIONAL PARKS AND WILDLIFE ACT 1974 (FOR TURTLES, FROGS, WETLAND BIRDS) (M AY NOT BE REQUIRED IF THE DA CONDITIONS SPECIFY AN AQUATIC ECOLOGIST IS TO BE INVOLVED); AND AN ANIMAL RESEARCH AUTHORITY (ISSUED BY THE SECRETARY'S ANIMAL CARE & ETHIC COMMITTEE). THE LIKELY AQUATIC FAUNA HANDLING PROCEDURES ARE: NOTICE: THE AQUATIC ECOLOGIST IS TO NOTIFY DPI FISHERIES OF THE ACTIVITY 48 HOURS PRIOR TO FISH RELOCATION (UNLESS AN AGREEMENT IS IN PLACE), INCLUDING LOCATIONS OF DEWATERED AND RELOCATION SITES
(SEE REGIONAL OFFICE CONTACTS www.dpi.nsw.gov.au/aboutus/about/office). FISHERIES REQUIRE PERMITS TO BE CARRIED BY THE LICENSED ECOLOGIST; WHO SHOULD ALSO DISPLAY A SIGN CLEARLY SHOWING LICENCE NUMBER (IF WORKING IN PUBLIC AREAS, ESPECIALLY WHEN RELEASING FAUNA TO LOCAL CREEK).
i. PLANNING: THE DEWATERING SCHEDULE SHOULD ALLOW TIME FOR FISH RESCUE, ESPECIALLY DURING THE FINAL 0.3 – 0.5 M WATER DEPTH (TO BE ADVISED BY AQUATIC ECOLOGIST). FAUNA SHOULD BE CAPTURED IN ONE DAY, SO PUMPS NEED TO BE OF AN ADEQUATE SIZE AND PLACED IN AN AREA FREE FROM MUD AND DEBRIS (E.G. INSIDE EXCAVATOR BUCKET OR SCREENED SUMP PIT). IF WETLAND BIRDS ARE OBSERVED NESTING, OR YOUNG BIRDS ARE USING THE DAM, ADVISE THE AQUATIC ECOLOGIST IMMEDIATELY FOR ADVICE. DEPENDING ON SPECIES AND AGE, BIRDS M AY BE ABLE TO RELOCATE THEMSELVES. CHICKS WILL NEED TEMPORARY REFUGE DURING DEWATERING; OR WORKS M AY NEED TO BE POSTPONED.
iii. CAPTURE: FISH ARE TO BE COLLECTED BY HAND NETS DURING THE FINAL DAY OF DEWATERING. THIS IS M OST EFFECTIVE WHEN THE WATER IS <0.3 M DEEP. DISSOLVED OXYGEN CONCENTRATION WILL DROP RAPIDLY AS WATER VOLUME DECREASES, ESPECIALLY IN WARM WATER OR IF LOTS OF FISH ARE PRESENT. LARGER BODIED FISH SHOULD BE TARGETED FIRST. WETLAND BIRDS WILL SCAVENGE FOR SMALL FISH IN THE SHALLOWS (E.G. GAMBUSIA). MOST SMALL FAUNA WILL LIKELY REMAIN UNCAPTURED IN THE DAM UNTIL THE WATER BECOMES VERY SHALLOW (ESPECIALLY EELS AND TURTLES). EELS ARE BEST CAPTURED BY LARGE HAND NETS WHEN THE WATER IS <0.3 M DEEP. WHEN THE WATER IS EXTREMELY LOW, TURTLES AND FISH M AY HEAD TOWARDS THE INTAKE PUMP (PLACED IN DEEPEST PART). THIS AREA SHOULD BE MONITORED TO INTERCEPT FAUNA (E.G. STAND IN WATER NEXT TO INTAKE). TURTLES WILL BURROW INTO MUD AND MAY REQUIRE OBSERVATION AND RESCUE THE FOLLOWING MORNING, BUT CAN ALSO MOVE THEMSELVES TO SUITABLE NEARBY HABITAT IF AN ESCAPE RAM P IS GRADED. FOR SAFETY, AT LEAST TWO PEOPLE ARE REQUIRED WHEN WADING AND HANDLING HEAVY TUBS OF WATER/FISH UP BANKS (EXCAVATOR CAN DIG ACCESS STEPS/RAMP).
iv. RELOCATE: NATIVE FISH HEALTHY ENOUGH FOR RELOCATION ARE TO BE CONTAINED AND TRANSPORTED IN AN AERATED TUB/BUCKET/TANK TO AN APPROPRIATE DAM/LAKE/WATERHOLE/CREEK. DP I FISHERIES ADVISE THAT THE HOST LOCATION SHOULD BE LARGE ENOUGH TO ACCOMMODATE ADDITIONAL FISH, ESPECIALLY PREDATORY EELS. ADDITIONAL RELEASE SITES M AY BE NEEDED. DO NOT OVERSTOCK TUBS OR LEAVE IN DIRECT SUN FOR EXTENDED PERIODS. AERATION CAN BE PROVIDED BY BATTERY AQUARIUM PUMPS OR MANUAL TURBULENCE IF ONLY STORED FOR A SHORT PERIOD. TURTLES CAN BE TRANSPORTED IN A SHADED TUB WITH A WET HESSIAN BAG PLACED INSIDE FOR MOISTURE AND SUPPORT DURING TRANSPORT. TADPOLES CAN BE TRANSPORTED IN SMALL BUCKETS.
v.RELEASE: WATER FROM THE RECEIVING WATERBODY SHOULD BE MIXED SLOWLY OVER 5 - 10 MINUTES WITH THE TANK WATER TO ALLOW FISH TO ACCLIMATISE TO THE NEW WATER QUALITY. CARE SHOULD BE TAKEN WHEN RELEASING FAUNA NOT TO ALSO TRANSFER WEEDS OR INVASIVE SPECIES (E.G. CARP EGGS AND GAMBUSIA). TRANSFER ANIMALS VIA HAND NETS, RATHER THAN TIPPING THE TUB WITH WATER. EELS CAN BE RELEASED ON LAND A FEW METRES FROM EDGE AND POINTED TOWARDS THE WATER.
vi. PESTS: EXOTIC FISH (E.G. CARP, GAMBUSIA, GOLDFISH, REDFIN PERCH, SPOTTED LIVEBEARER) ARE TO BE INTERCEPTED, EUTHANISED AND DISPOSED OF IN ACCORDANCE WITH THE ECOLOGIST'S ANIMAL RESEARCH AUTHORITY (ISSUED BY THE SECRETARY'S ANIMAL CARE & ETHIC COMMITTEE). EXOTIC TRACHEMYS SCRIPTA (RED-EARED SLIDER TURTLE) ARE TO BE CONTAINED HUMANLY AND OEH IMMEDIATELY NOTIFIED (ENVIRONMENT LINE - 131 555). THEY WILL COLLECT THE LIVE TURTLE FROM THE ECOLOGIST.
vii. POST-DEWATERING: AN ESCAPE RAMP SHOULD BE GRADED TO ALLOW TRAPPED FAUNA TO ESCAPE OVERNIGHT. SEDIMENT SHOULD BE LEFT UP TO TWO NIGHTS TO ALLOW HIDDEN FAUNA TO EMERGE, UNLESS THE ECOLOGIST CONFIRMS THERE ARE NO FAUNA REMAINING (SITE SPECIFIC ASSESSMENT). EARTHWORKS STAFF SHOULD NOTIFY THE APPOINTED AQUATIC ECOLOGIST IF STRANDED FISH OR TURTLES ARE OBSERVED POST-DEWATERING.
5.TIMELINE FOR EACH DAM

DAY 1	DAY 2-6 (OR LONGER)	DAY 7	DAY 8-9	ON GOING
INSTALL BUNDS TO DIVERT OVERLAND FLOW. INSTALL EROSION CONTROLS (E.G. SILT FENCE, HAY BALES AND/OR GEOTEXTILE FABRIC) AND PREPARE PUMP THE PUMP INTAKE HEAD IS BEST POSITIONED ON A FLOATING DEVICE ABOVE THE DEEPEST PART OF DAM AND HELD IN POSITION WITH ROPES SPANNING THE DAM. IT IS DIFFICULT TO MOVE THE PIPE WHEN THE WATER IS LOW, SO IT'S EASIEST TO INSTALL WHEN DAM IS FULL. TEST DISCHARGE AND DIVERSION TO ENSURE NO EROSION/SEDIMENTATION OCCURS DOWNSTREAM.AVOID DISTURBING VEGETATION (GRASS) IN AREAS WHERE WATER WILL TRAVEL. NOTIFY AQUATIC ECOLOGIST.	PUMP WATER AND IRRIGATE OVERLAND AT A RATE THAT ALLOWS INFILTRATION TO THE SOIL. CHECK SEDIMENT CONTROLS IF SOIL BECOMES SATURATED BY IRRIGATION AND GENERATES SURFACE RUNOFF. ADJUST PUMPING RATE TO SLOW RUNOFF. UPDATE AQUATIC ECOLOGIST.	DURING FINAL 0.3m OF DEWATERING ALLOW AQUATIC ECOLOGIST TO RESCUE FAUNA IN ONE DAY. WATER WILL BECOME TURBID AS LEVELS FALL AND WHEN ECOLOGISTS WADE OVER MUDDY BOTTOM . THIS WATER SHOULD BE DISCHARGED AWAY FROM DRAINAGE LINES. TO ALLOW RAPID FAUNA RESCUE, PUMP INLET NEEDS TO BE LARGE ENOUGH TO SUCK SEDIMENT (E.G. 4 - 6 INCH). EARTHWORKS MACHINERY CAN PUSH SEDIMENT ACROSS THE DAM TO ASSIST FINAL FAUNA CAPTURE (ADJUSTED TO SUIT CONDITIONS AND ECOLOGIST'S INSTRUCTIONS). PARTIALLY REMOVE WALL TO PREVENT RE-FILLING. STABILISE IF NEEDED. GRADE RAMP FOR OVERNIGHT ESCAPE FOR FAUNA HIDDEN IN BOTTOM SEDIMENT.	CLEAR SURROUNDING VEGETATION. LEAVE ESCAPE RAMP FOR FAUNA TRAPPED OVERNIGHT (TWO NIGHTS).	REMOVE SEDIMENT, BREACH DAM WALL, AND COMMENCE RECONSTRUCTION



STRAW BALE SEDIMENT FILTER

REVISIONS:

No.	REVISION DESCRIPTION	DRAWN	DATE
A	ISSUE FOR APPROVAL	RG	03.09.21

SCALE BAR
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SCALE 1:400

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PROJECT TITLE
WEST NOWRA RESOURCE RECOVERY FACILITY
120 FLATROCK ROAD, MUNDAMIA NSW 2540

DRAWING TITLE
DAM DEWATERING PLAN

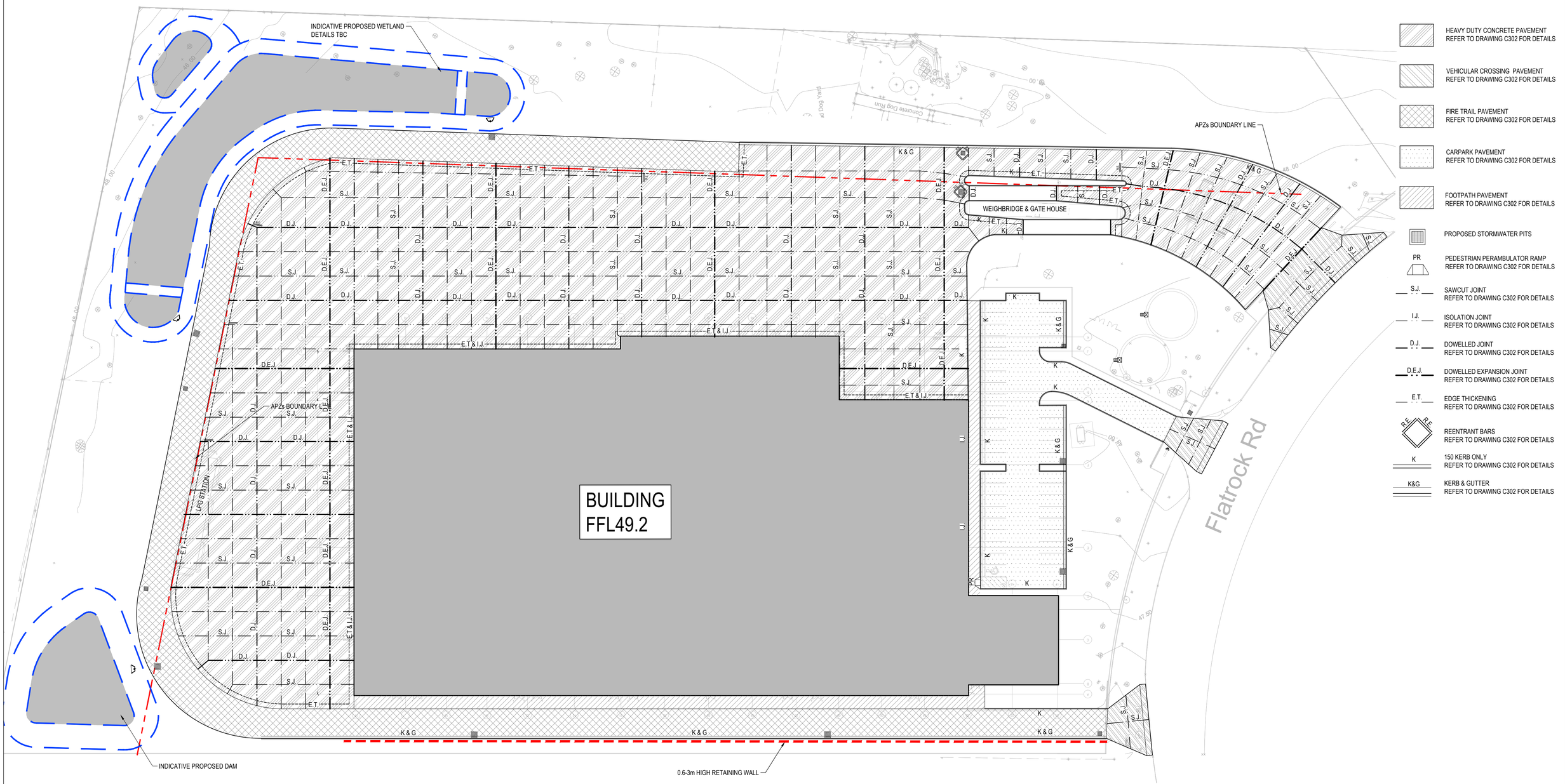
DRAWING STATUS
APPROVAL ISSUE
NOT TO BE USED FOR CONSTRUCTION

PROJECT LEADER	DESIGNER	SIGNATURE	
AW	NT		
DRAFTSPERSON	SCALE	DATE	SHEET SIZE
RG	AS SHOWN	MAY 2021	A1
JOB No.		DRAWING No.	REVISION
SY212045		C220	A

Appendix H

Architectural plans

Figure H.1



PLAN
SCALE 1:400

REVISIONS:

No.	REVISION DESCRIPTION	DRAWN	DATE
A	FOR APPROVAL	RG	25.06.21

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SCALE 1:400

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CLIENT
Bioelektra AUSTRALIA
YOUR WASTE IS A RESOURCE

ARCHITECT
JOHN R.BROGAN & ASSOCIATES
37 Pitt St, Sydney NSW 2000

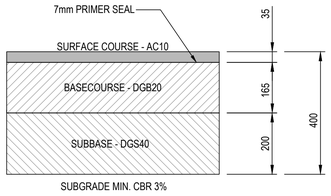
PROJECT TITLE
WEST NOWRA RESOURCE RECOVERY FACILITY
120 FLATROCK ROAD, MUNDAMIA NSW 2540

DRAWING TITLE
PAVEMENT LAYOUT

DRAWING STATUS
APPROVAL ISSUE
NOT TO BE USED FOR CONSTRUCTION

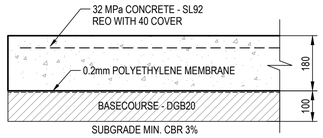
PROJECT LEADER	DESIGNER	SIGNATURE	
AW	NT		
DRAFTSPERSON	SCALE	DATE	SHEET SIZE
RG	AS SHOWN	MAY 2021	A1
JOB No.		DRAWING No.	REVISION
SY212045		C301	A

Figure H.2



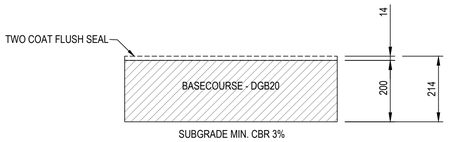
CARPARK PAVEMENT

SCALE 1:10



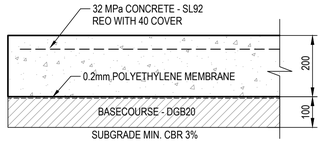
HEAVY DUTY RIGID PAVEMENT

SCALE 1:10



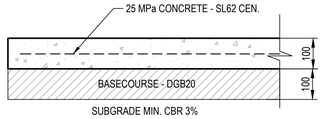
FIRE TRAIL PAVEMENT

SCALE 1:10



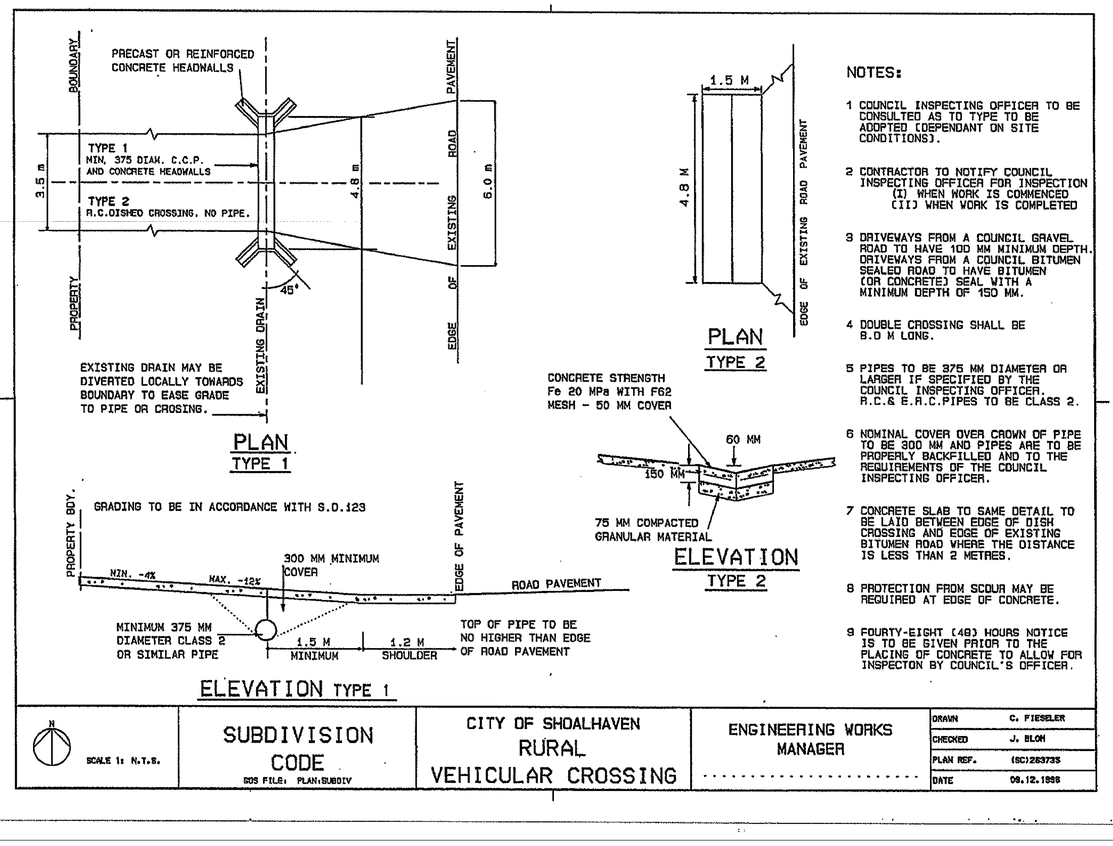
VEHICULAR CROSSING PAVEMENT

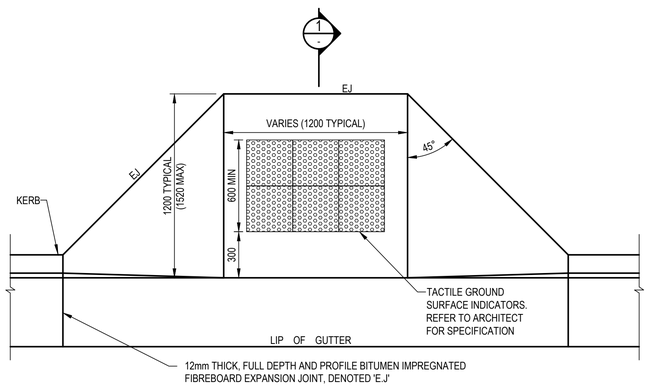
SCALE 1:10



FOOTPATH PAVEMENT

SCALE 1:10

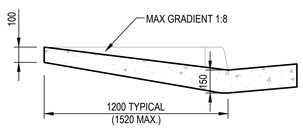




PLAN

PEDESTRIAN PERAMBULATOR RAMP DETAIL

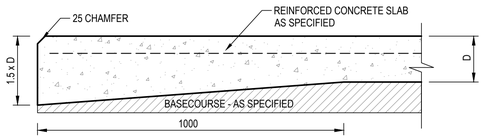
SCALE 1:20



SECTION 1

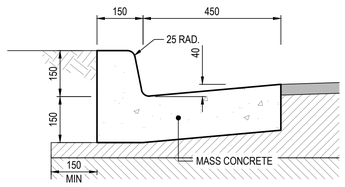
NOTE

THE RAMP SHALL BE LOCATED ON THE PROLONGATION OF THE LINE OF THE PAVED FOOTWAY OR AS DIRECTED.



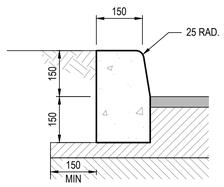
TYPICAL RIGID PAVEMENT
EDGE THICKENING

NTS



KERB AND GUTTER (K&G)

SCALE 1:10



150 KERB ONLY (K)

SCALE 1:10

REVISIONS:			
A	FOR APPROVAL	RG	25.06.21
No.	REVISION DESCRIPTION	DRAWN	DATE

SCALE BAR

0 .1 .2 .3 .4 .5m 1m

SCALE 1:10

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CLIENT: Bioelektra AUSTRALIA — YOUR WASTE IS A RESOURCE

ARCHITECT: JOHN R.BROGAN & ASSOCIATES
37 Pitt St, Sydney NSW 2000

PROJECT TITLE: WEST NOWRA RESOURCE RECOVERY FACILITY
120 FLATROCK ROAD, MUNDAMIA NSW 2540

DRAWING TITLE: PAVEMENT DETAILS

DRAWING STATUS: **APPROVAL ISSUE**
NOT TO BE USED FOR CONSTRUCTION

PROJECT LEADER	DESIGNER	SIGNATURE	
AW	NT		
DRAFTSPERSON	SCALE	DATE	SHEET SIZE
RG	AS SHOWN	MAY 2021	A1
JOB No.		DRAWING No.	REVISION
SY212045		C302	A

Figure H.3

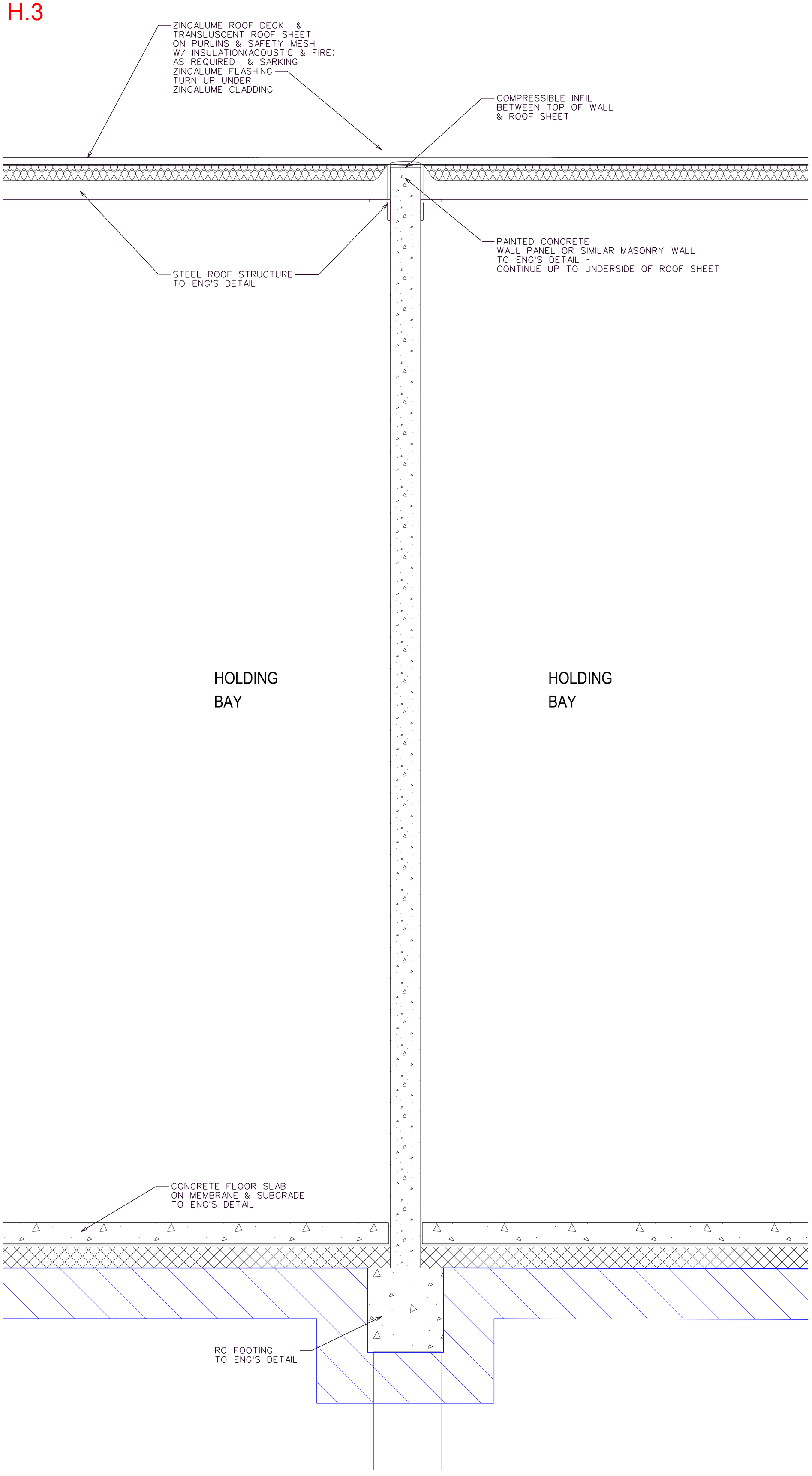
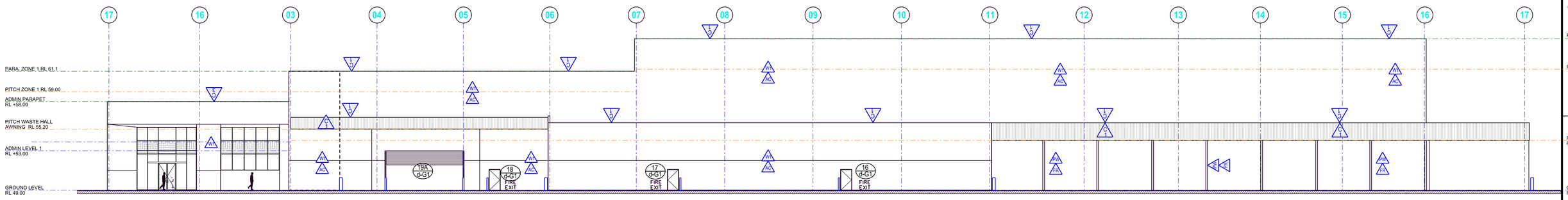
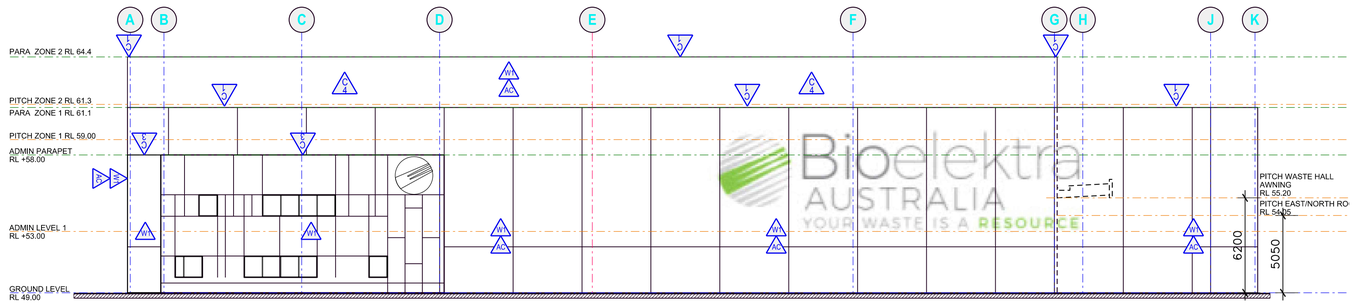

ZINCALUME ROOF DECK &
TRANSLUSCENT ROOF SHEET
ON PURLINS & SAFETY MESH
W/ INSULATION(ACOUSTIC & FIRE)
AS REQUIRED & SARKING
ZINCALUME FLASHING
TURN UP UNDER
ZINCALUME CLADDING
COMPRESSIBLE INFIL
BETWEEN TOP OF WALL
& ROOF SHEET
PAINTED CONCRETE
WALL PANEL OR SIMILAR MASONRY WALL
TO ENG'S DETAIL -
CONTINUE UP TO UNDERSIDE OF ROOF SHEET
STEEL ROOF STRUCTURE
TO ENG'S DETAIL
HOLDING
BAY
HOLDING
BAY
CONCRETE FLOOR SLAB
ON MEMBRANE & SUBGRADE
TO ENG'S DETAIL
RC FOOTING
TO ENG'S DETAIL

Figure H.4



02 / - ELEVATION - EAST
SITE



01 / - ELEVATION - SOUTH
FLATROCK ROAD

Bioelektra AUSTRALIA
YOUR WASTE IS A RESOURCE

WEST NOWRA RESOURCE RECOVERY PARK
RECORD OF SERVICES

SERVICE/DISCIPLINE	DATE RCV'D	REVISION
ARCHITECTURAL	CURRENT	-
STRUCTURAL	TBA	-
CIVIL	TBA	-
MACHINES/EQUIPMENT	TBA	-
-	-	-
ELECTRICAL LAYOUT	TBA	-
LIGHTING LAYOUT		
- SITE/CAR PARK	TBA	-
- PROCESSING PLANT	TBA	-
MECHANICAL LAYOUT		
- PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
HYDRAULIC LAYOUT	TBA	-
SIPHONIC LAYOUT	TBA	-
FIRE SERVICES		
- PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
SURVEY (82-2017A)	24.05.21	-
BRIEF	FEB 2021	B
CONCEPT	17.05.21	A
LANDSCAPE	TBA	-

SERVICE COORDINATION NOTE:

ROOF TRIM FINISHES

- BG — BOX GUTTER MIN 800Wx1500 COLORBOND ON SPANDEK SUPPORTED @ 600 CTRS 50x50x5 EA W/EJs. ALLOW FOR MAINTENANCE FOOTRAFFIC ALONG ENTIRE LENGTH
- 1/1 — CLADDING/CAPPING - PARAPET & AWNING FASCIA - COLORBOND (FINISH TBC)
- 1/2 — CAPPING - RIDGE COLORBOND (FINISH TBC)
- 1/3 — CAPPING - ADMINISTRATION COLORBOND (FINISH TBC)
- 1/4 — VERTICAL CLADDING TO INSIDE FACE OF PARPETS/ ROOF SHEET PROFILE (FINISH TBC), TO CANOPIES WHERE FACE IS < 300 HIGH USE C'BOND FLASHING

WALL & BARRIER TYPES LEGEND

W1 — W1 OPTION:
- RC PANEL WALL & NON-LOAD BEARING PIR (REFRIGERATION) PANEL

MATERIAL: RC PANEL WALL TO 3000mm ABOVE FFL WITH NON-LOAD BEARING INSULATED WALL PANEL (PIR) ABOVE ON STEEL STRUCTURE TO EXTEND TO PARAPET HEIGHT
EXTERNAL FACE FINISH: GROUND TO 3000mm HIGH - RC PANEL
COLOUR: TBC
EXTERNAL FACE FINISH: FROM 3000mm HIGH TO TOP OF PARAPET - PIR PANEL
COLOUR: PRE FINISHED COLORBOND COLOUR: TBC
PIR NOTES: INSULATED WALL PANEL (PIR) TO BE SEALED AT THE TOP TO PROVIDE CONTINUOUS INSULATION AS REQUIRED BY SECTION J. INSULATED PANEL TO HAVE FM APPROVAL FOR UNLIMITED HEIGHT UNDER FM-4880 & FM-4881 OR PASS THE FULL SCALE FACADE FIRE TEST AS DEFINDED BY AS-5113. NO EPS BASED CORE PRODUCTS ARE TO BE USED. INSULATED PANEL THICKNESS TO ACHIEVE MIN. AVERAGE R-VALUE AS REQUIRED BY SECTION J REPORT FOR THE RELEVANT CLIMATE ZONE.

OR

W1 OPTION:
- LOAD BEARING RC PANEL WALL

MATERIAL: LOAD BEARING RC PANEL WALL TO STRUCTURAL ENG'S DETAIL (RB AS NOTED)
EXTERNAL FACE FINISH: PAINT DULUX 'ACRA-TEX' TEXTURE OR 'ACRA-SHIELD' COATING AS NOTED
COLOUR: TBC

W1R — W1R - AS FOR W1 - REMOVABLE
MATERIAL: WALL TYPE AS FOR W1 BUT REMOVABLE (IN SEGMENTS - TBC) NOMINAL 8000 WIDE BY 6000 HIGH - TBC PROVIDE LIFTING EYES FOR CONTROLED REMOVAL

PW — PW - TYPE PUSH WALL
MATERIAL: RC PANEL PUSH WALL TO MANUF. SPECS RELOCATABLE AS NEEDED-PROVIDE LIFTING EYES FOR FOR MOVING

AC — W1 - TYPE WALL WITH ACOUSTIC RATING OF Rw30

FR — W1 - TYPE WALL WITH FIRE RATING OF --/--/-- (TBC)

RP — RP - NON-LOAD BEARING PIR (REFRIGERATION) PANEL
MATERIAL: NOM 100-150mm NON-LOAD BEARING INSULATED WALL PANEL (PIR) ON STEEL STRUCTURE
FINISH: FFL TO FULL HEIGHT, BOTH SIDES
COLOUR: PRE FINISHED COLORBOND COLOUR: TBC

F1 — F1 - EXTERNAL PERIMETER CWM SECURITY FENCE 2000H
MATERIAL: 2400 CWM FENCE
2000 HIGH HEAVY DUTY 3.15mm GAUGE CHAIN WIRE MESH 50 x 50 APERTURE
2 No.* ROWS BARBED WIRE ABOVE - DOUBLE STRANDS TWISTED IN "IOWA" PATTERN @ 200 CTRS
FINISH: GAL MESH AND POSTS & UNPAINTED

F2 — F2 - EXTERNAL SPEAR TOP SECURITY FENCE 2000/2400H
MATERIAL: 2400 SPEAR TOP SECURITY PANEL FENCE
2000 MIN. FRAME HEIGHT
FINISH: POWDERCOAT, COLOUR - TBC

VB — VB - STEEL VEHICLE BARRIER
MATERIAL: 'ARMCO' VEHICLE BARRIER

WALL TYPES LEGEND

P1 — P1 - NON FIRE-RATED PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm.
NON-FIRE RATED 64mm X 35mm STUDS AT MAX.600mm SPACINGS.
ONE LAYER OF 10mm THK.PLASTERBOARD EACH SIDE.

MR — MR - AS FOR P1 BUT MR PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm, NON-FIRE RATED:
MOISTURE RESISTANT
AS FOR P1 EXCEPT MOISTURE RESISTANT PLASTERBOARD ON 'WET' SIDE

FR — FR - AS FOR P1 BUT FIRE-RATED PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm, FIRE RATED, FRL60/60/60
64mm X 35mm STUDS AT MAX.600mm SPACINGS.
ONE LAYER OF 16mm THK."FIRESTOP" PLASTERBOARD EACH SIDE.

AC — AC - AS FOR P1 BUT ACOUSTIC INSULATION PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm TO ACHIEVE ACOUSTIC REQUIREMENT OF:
- Rw45 MINIMUM TO OFFICES
- Rw50 MINIMUM TO MEETING ROOMS
- Rw55 TO COMMON WALL OF PROCESSING BUILDING

NOT FOR CONSTRUCTION
THE INTENT OF THIS DRAWING IS TO CONVEY THE DESIGN CONCEPT ALL AREAS, DIMENSIONS, LEVELS & DETAILS SUBJECT TO CONFIRMATION BY WAY OF DISCUSSION WITH AUTHORITIES & DESIGN DEVELOPMENT.

NO.	AMENDMENT	DATE	NO.	AMENDMENT	DATE
0	PRELIMINARY ISSUE	05.07.21			
1	PRELIMINARY ISSUE	09.07.21			

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Verify dimensions from site and refer any discrepancies to Architects for clarification.

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BIOELEKTRA AUSTRALIA

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A.B.N. 93 003 284 759

WEST NOWRA RESOURCE RECOVERY PARK
120 FLATROCK ROAD
MUNDAMIA NSW 2540

ELEVATIONS - SHEET 1

SCALE : 1:200
DATE : MAY 21
PROJ. NO. 1467
DRG. NO. 30-00-01
AMD NO. 1

CAD REF : Microstation V8i SS5 PROPOSED BIOELEKTRA, W NOWRA, N.S.W. 1467- PLOTTED 09-July-2021
300mm on original A1

Figure H.5

LIGHT WEIGHT SOLAR PANEL LAYOUT DETAILS	
DC SIZE	1030kW
PANELS	(2576) SUNMAN EARC 400W
PANEL WEIGHT	7KG PER PANEL
INSTALLED WEIGHT	3.8KG/M^2
DESIGN	1.GLASS FREE DESIGN 2.NO LIGHT POLLUTION 3.ANTI GLARE 4.LIGHT WEIGHT DESIGN WILL SIGNIFICANTLY REDUCE STRUCTURAL STEEL AND CONSTRUCTION COST
ROOF TYPE	PREFERRED/ASSUMED KLIP LOK(CONCEALED CLIP ROOFING SYSTEM)

1842 PANELS

784 PANELS

SORTING HALL

BOILER ROOM

OSTAND AREA

48.00

47.00

Rev	REVISION	DATE	BY
A	FOR PROPOSAL	1/12/2020	EN

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ADDRESS : SUITE 901 / LEVEL 9, 153 WALKER STREET
NORTH SYDNEY, NSW, 2060
PHONE : (02) 1300 090 187

PROJECT:
SHOALHAVEN MUNICIPAL SOLID WASTE FACILITY

DRAWING:
PANEL LAYOUT

Address:
NO. STREET NAME
SUBURB STATE POST
AUSTRALIA
LATITUDE, LONGITUDE

PROPOSAL

SCALE @ A3	1:XXX	DRAWN	EN
PROJECT NO	XXXXX	DESIGNED	
DRAWING NO	1000-1-XX	CHECKED	
REVISION	A	CONTACT	02 8021 6018

Figure H.6

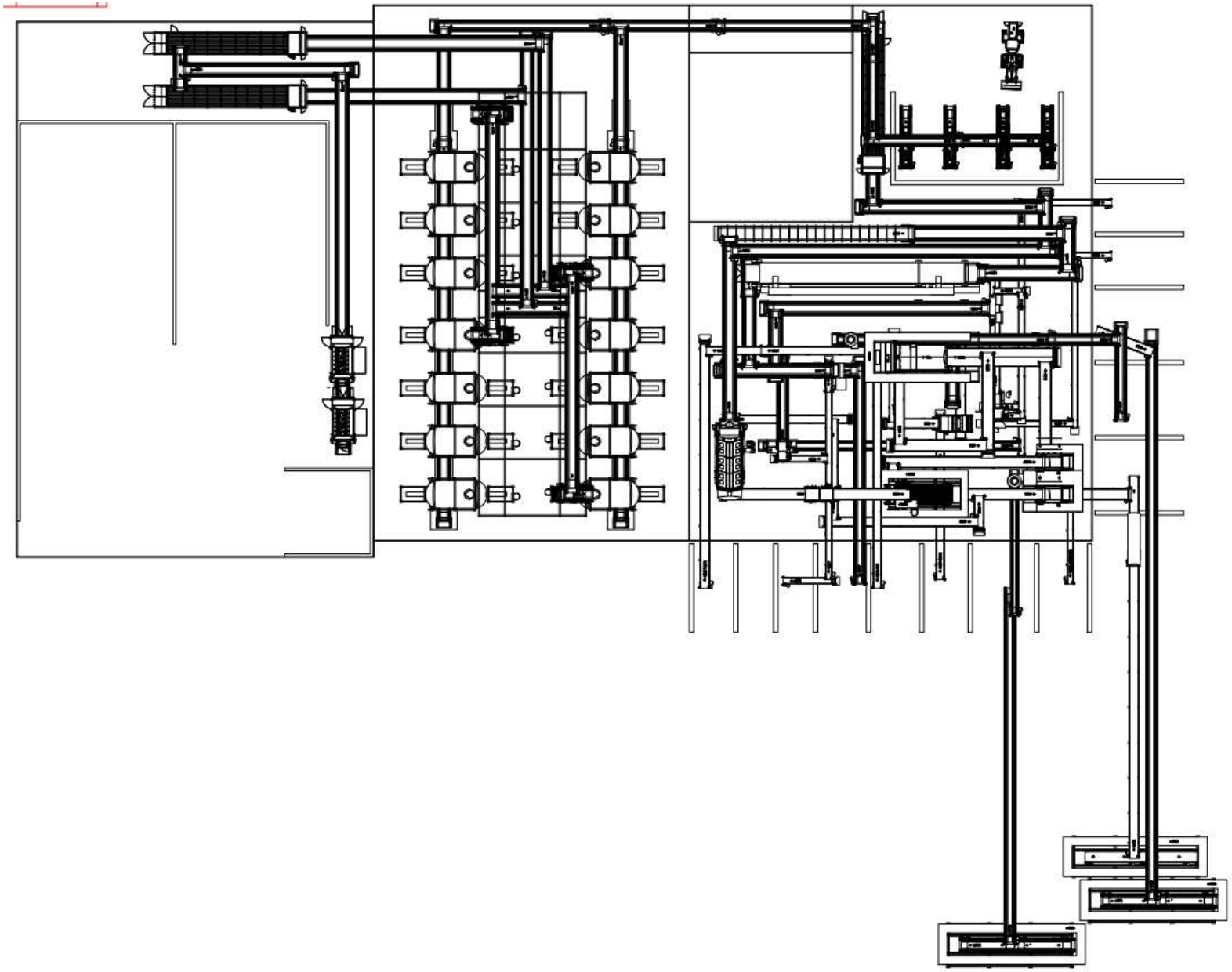
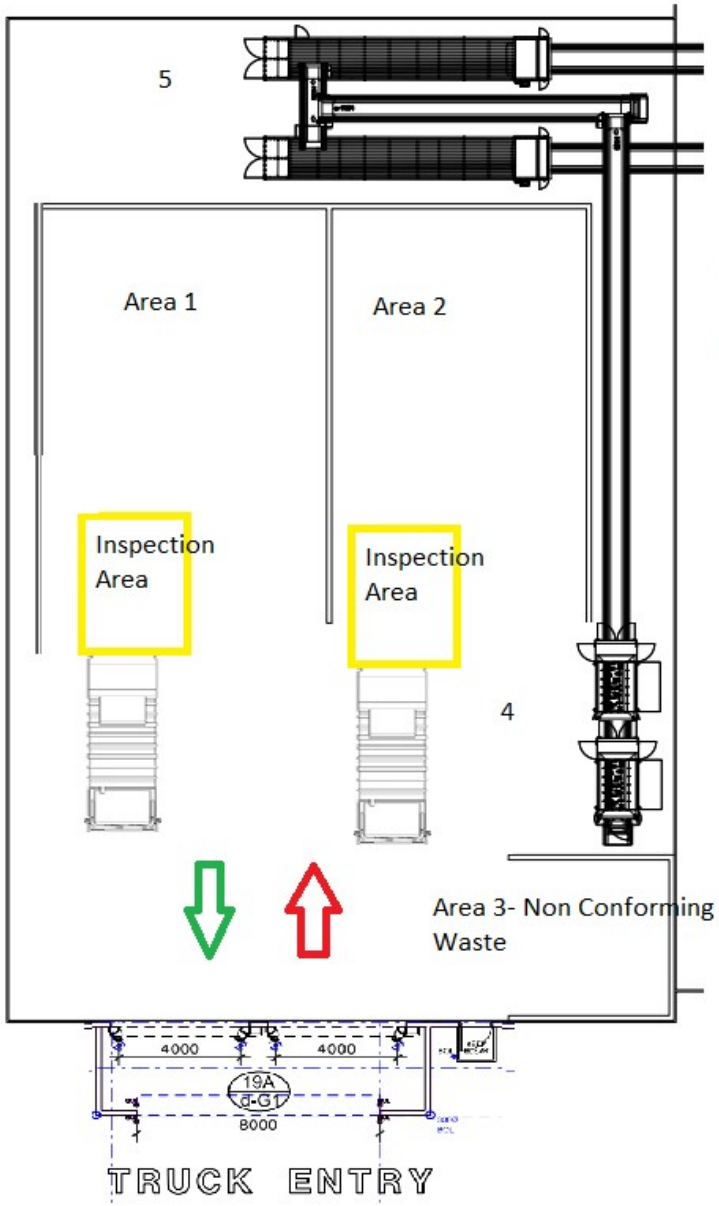
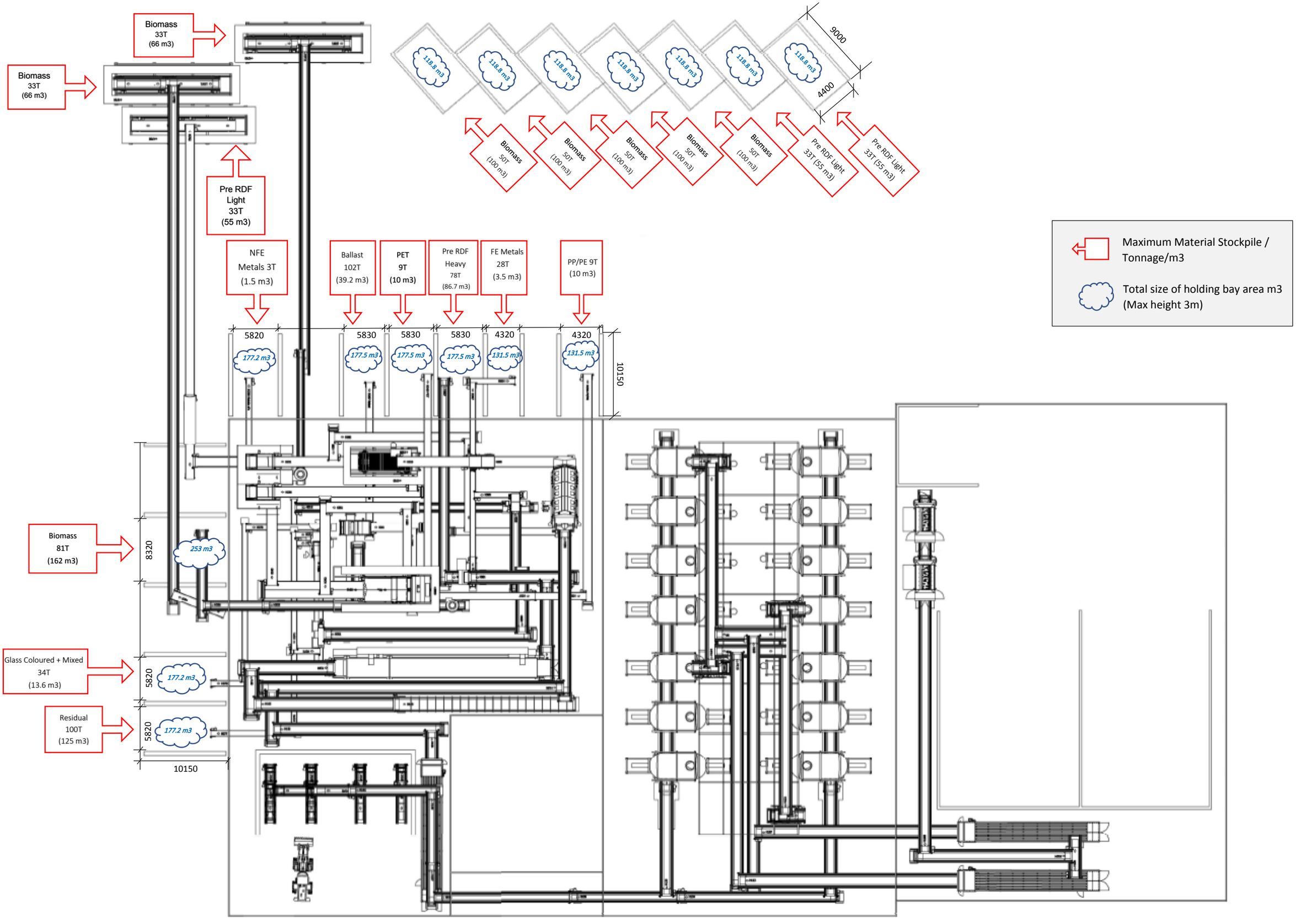


Figure H.7



1. Mixed waste (610 tonne) 2.6 m high ~ 750 m3 (Mixed weight density of 0.8 t/ m3)
2. Mixed waste (790 tonne) 2.6 m high ~ 1,000 m3 (Mixed weight density of 0.8 t/ m3)
3. Storage of non-conforming wastes (200 tonne) 2.6 m high ~250 m3
4. Shredders (x2)
5. Moving floor bunkers (x2)

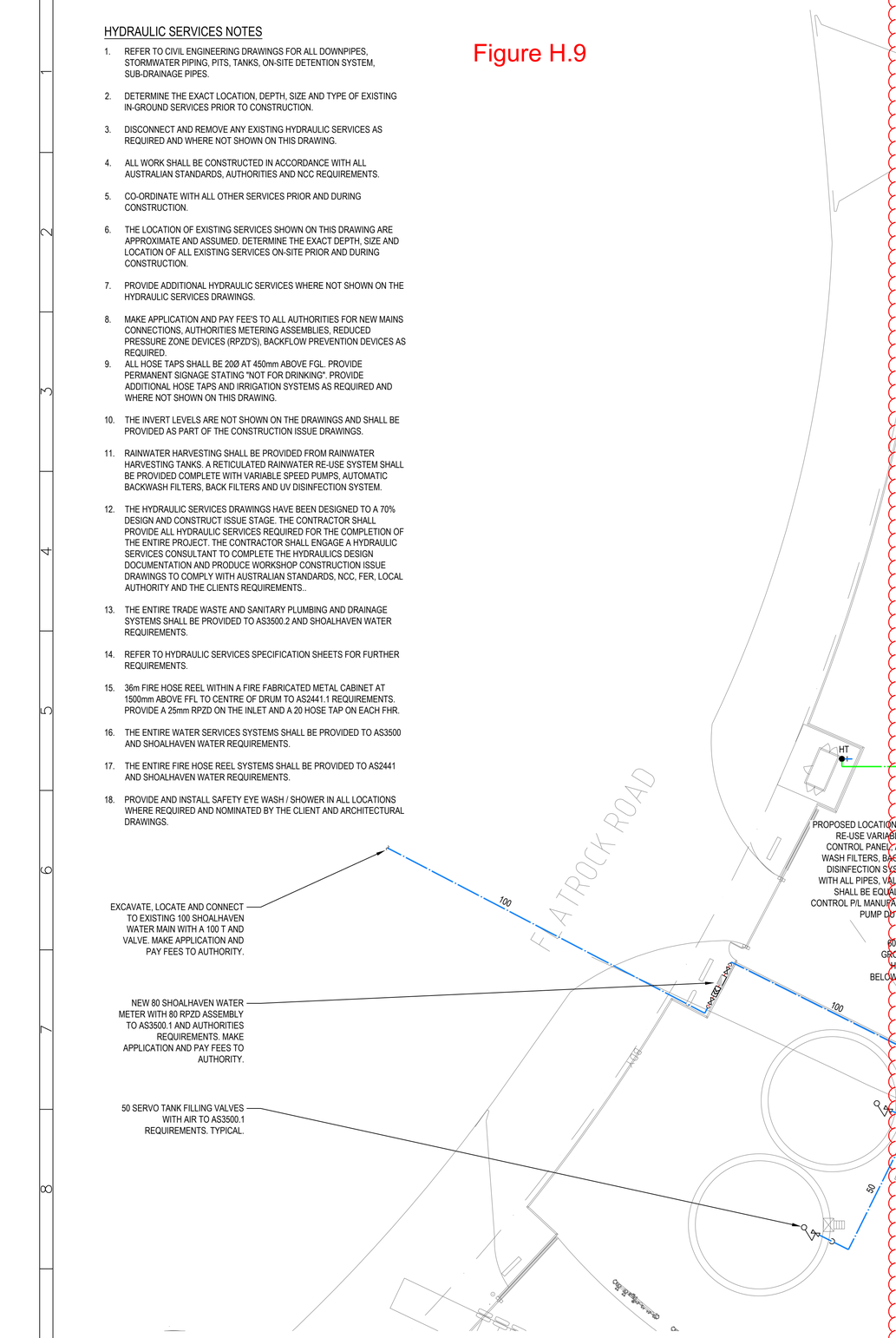
Figure H.8

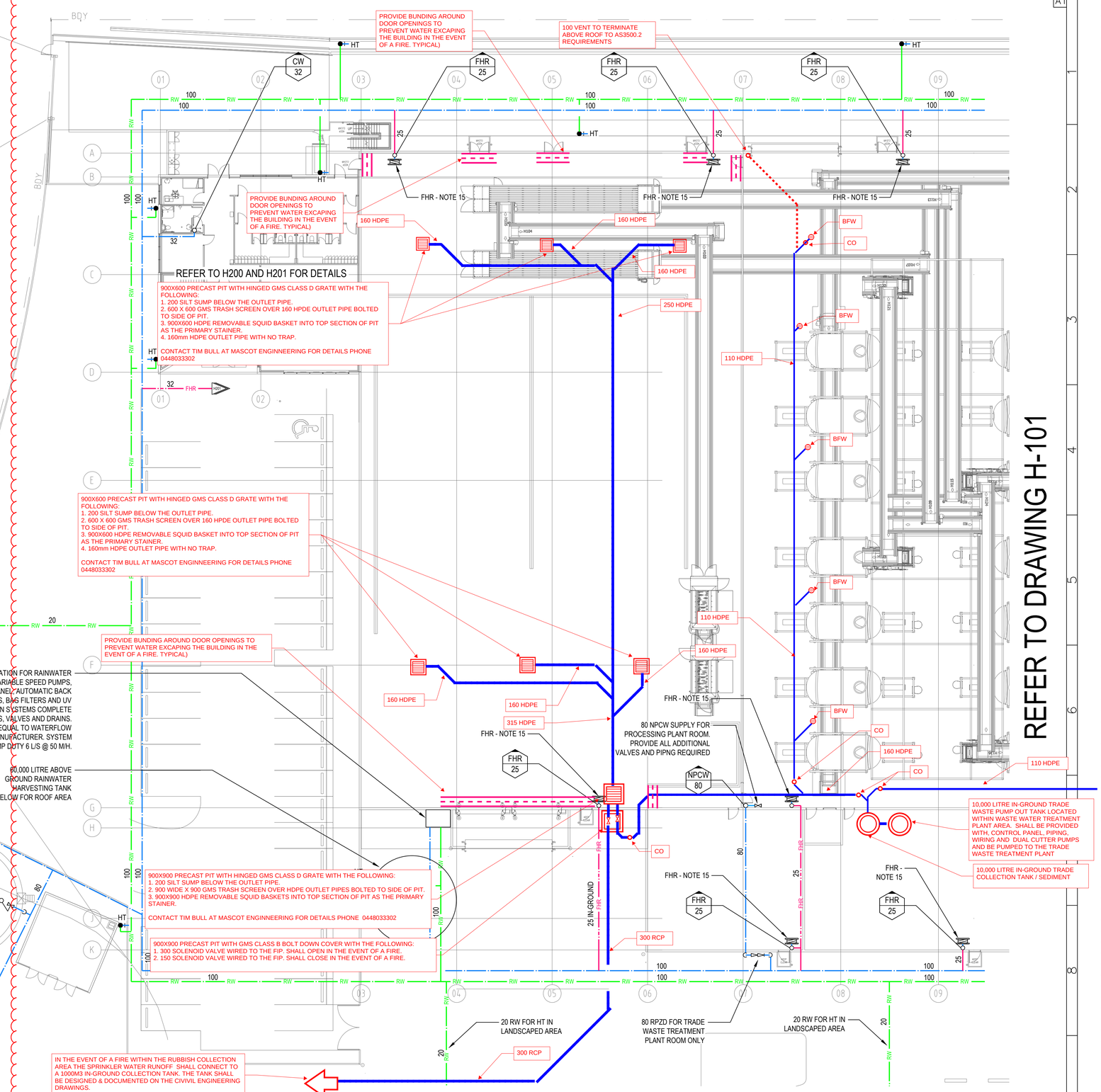

Biomass
33T
(66 m3)
Biomass
33T
(66 m3)
Pre RDF
Light
33T
(55 m3)
NFE
Metals 3T
(1.5 m3)
Ballast
102T
(39.2 m3)
PET
9T
(10 m3)
Pre RDF
Heavy
78T
(86.7 m3)
FE Metals
28T
(3.5 m3)
PP/PE 9T
(10 m3)
118.8 m3
9000
4400
Biomass
50T
(100 m3)
Pre RDF Light
33T (55 m3)
5820
5830
4320
177.2 m3
177.5 m3
131.5 m3
10150
Biomass
81T
(162 m3)
253 m3
8320
Glass Coloured + Mixed
34T
(13.6 m3)
Residual
100T
(125 m3)
Maximum Material Stockpile / Tonnage/m3
Total size of holding bay area m3 (Max height 3m)

HYDRAULIC SERVICES NOTES

1. REFER TO CIVIL ENGINEERING DRAWINGS FOR ALL DOWNPIPES, STORMWATER PIPING, PITS, TANKS, ON-SITE DETENTION SYSTEM, SUB-DRAINAGE PIPES.
2. DETERMINE THE EXACT LOCATION, DEPTH, SIZE AND TYPE OF EXISTING IN-GROUND SERVICES PRIOR TO CONSTRUCTION.
3. DISCONNECT AND REMOVE ANY EXISTING HYDRAULIC SERVICES AS REQUIRED AND WHERE NOT SHOWN ON THIS DRAWING.
4. ALL WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH ALL AUSTRALIAN STANDARDS, AUTHORITIES AND NCC REQUIREMENTS.
5. CO-ORDINATE WITH ALL OTHER SERVICES PRIOR AND DURING CONSTRUCTION.
6. THE LOCATION OF EXISTING SERVICES SHOWN ON THIS DRAWING ARE APPROXIMATE AND ASSUMED. DETERMINE THE EXACT DEPTH, SIZE AND LOCATION OF ALL EXISTING SERVICES ON-SITE PRIOR AND DURING CONSTRUCTION.
7. PROVIDE ADDITIONAL HYDRAULIC SERVICES WHERE NOT SHOWN ON THE HYDRAULIC SERVICES DRAWINGS.
8. MAKE APPLICATION AND PAY FEE'S TO ALL AUTHORITIES FOR NEW MAINS CONNECTIONS, AUTHORITIES METERING ASSEMBLIES, REDUCED PRESSURE ZONE DEVICES (RPZD'S), BACKFLOW PREVENTION DEVICES AS REQUIRED.
9. ALL HOSE TAPS SHALL BE 20Ø AT 450mm ABOVE FGL. PROVIDE PERMANENT SIGNAGE STATING "NOT FOR DRINKING". PROVIDE ADDITIONAL HOSE TAPS AND IRRIGATION SYSTEMS AS REQUIRED AND WHERE NOT SHOWN ON THIS DRAWING.
10. THE INVERT LEVELS ARE NOT SHOWN ON THE DRAWINGS AND SHALL BE PROVIDED AS PART OF THE CONSTRUCTION ISSUE DRAWINGS.
11. RAINWATER HARVESTING SHALL BE PROVIDED FROM RAINWATER HARVESTING TANKS. A RETICULATED RAINWATER RE-USE SYSTEM SHALL BE PROVIDED COMPLETE WITH VARIABLE SPEED PUMPS, AUTOMATIC BACKWASH FILTERS, BACK FILTERS AND UV DISINFECTION SYSTEM.
12. THE HYDRAULIC SERVICES DRAWINGS HAVE BEEN DESIGNED TO A 70% DESIGN AND CONSTRUCT ISSUE STAGE. THE CONTRACTOR SHALL PROVIDE ALL HYDRAULIC SERVICES REQUIRED FOR THE COMPLETION OF THE ENTIRE PROJECT. THE CONTRACTOR SHALL ENGAGE A HYDRAULIC SERVICES CONSULTANT TO COMPLETE THE HYDRAULICS DESIGN DOCUMENTATION AND PRODUCE WORKSHOP CONSTRUCTION ISSUE DRAWINGS TO COMPLY WITH AUSTRALIAN STANDARDS, NCC, FER, LOCAL AUTHORITY AND THE CLIENTS REQUIREMENTS..
13. THE ENTIRE TRADE WASTE AND SANITARY PLUMBING AND DRAINAGE SYSTEMS SHALL BE PROVIDED TO AS3500.2 AND SHOALHAVEN WATER REQUIREMENTS.
14. REFER TO HYDRAULIC SERVICES SPECIFICATION SHEETS FOR FURTHER REQUIREMENTS.
15. 36m FIRE HOSE REEL WITHIN A FIRE FABRICATED METAL CABINET AT 1500mm ABOVE FFL TO CENTRE OF DRUM TO AS2441.1 REQUIREMENTS. PROVIDE A 25mm RPZD ON THE INLET AND A 20 HOSE TAP ON EACH FHR.
16. THE ENTIRE WATER SERVICES SYSTEMS SHALL BE PROVIDED TO AS3500 AND SHOALHAVEN WATER REQUIREMENTS.
17. THE ENTIRE FIRE HOSE REEL SYSTEMS SHALL BE PROVIDED TO AS2441 AND SHOALHAVEN WATER REQUIREMENTS.
18. PROVIDE AND INSTALL SAFETY EYE WASH / SHOWER IN ALL LOCATIONS WHERE REQUIRED AND NOMINATED BY THE CLIENT AND ARCHITECTURAL DRAWINGS.

Figure H.9





AMENDMENTS/REVISIONS				AMENDMENTS/REVISIONS			
Rev	Description	Initials	Date	Rev	Description	Initials	Date
01	PRELIMINARY ISSUE	JC	13.08.21				
02	70% D & C TENDER ISSUE	JC	20.08.21				
03	DRAINAGE SYSTEMS ADDED	JC	26-08-21				

CLIENT: Bioelektra AUSTRALIA — WHERE WASTE IS A RESOURCE

ARCHITECT: JOHN R BROGAN & ASSOCIATES PTY. LIMITED — ARCHITECTS, PLANNERS & COMMERCIAL INTERIOR DESIGNERS — EST 1927 — 37 PITT ST, SYDNEY NSW 2000 — PH: (02) 9 221 2833 FAX: (02) 9 251 4741 — EMAIL: jrb@brogans.com.au — A.B.N. 93 003 284 759

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PROJECT: WEST NOWRA RESOURCE RECOVERY PARK
120 FLATROCK ROAD
MUNDAMIA NSW 2540

DRAWING TITLE: HYDRAULIC SERVICES
GROUND FLOOR SOUTH

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWN	DESIGNED	CHECKED	SCALE (AT FULL SIZE)	DATE
SD	JC	MC	1:200 @ A1	Aug-21

PROJECT No.	DRAWING No.	REVISION
EN-N21_099	H100	03

REFER TO DRAWING H-100

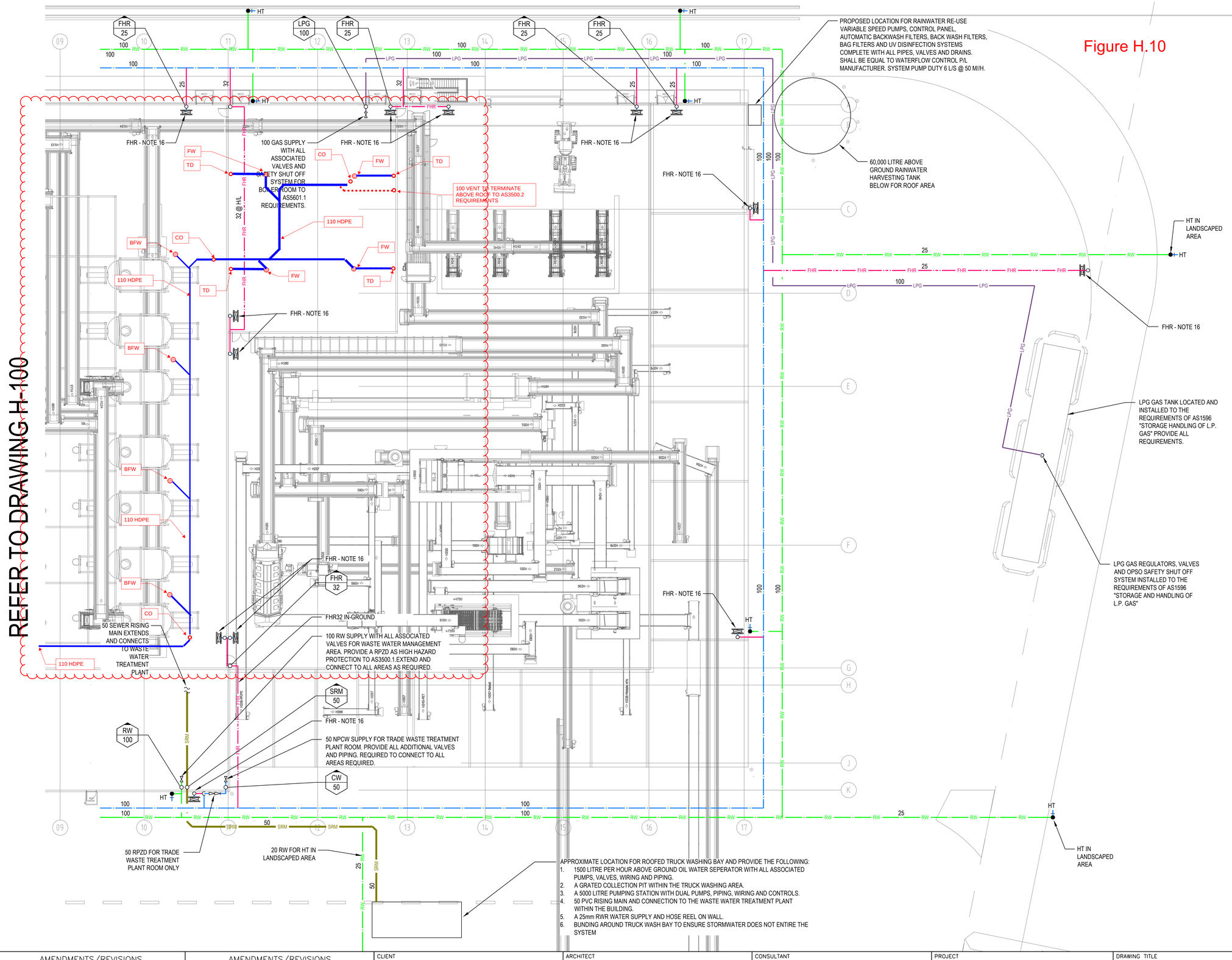

Figure H.10

HYDRAULIC SERVICES NOTES

1. REFER TO CIVIL ENGINEERING DRAWINGS FOR ALL DOWNPIPES, STORMWATER PIPING, PITS, TANKS, ON-SITE DETENTION SYSTEM, SUB-DRAINAGE PIPES.
2. DETERMINE THE EXACT LOCATION, DEPTH, SIZE AND TYPE OF EXISTING IN-GROUND SERVICES PRIOR TO CONSTRUCTION.
3. DISCONNECT AND REMOVE ANY EXISTING HYDRAULIC SERVICES AS REQUIRED AND WHERE NOT SHOWN ON THIS DRAWING.
4. ALL WORK SHALL BE CONSTRUCTED IN ACCORDANCE WITH ALL AUSTRALIAN STANDARDS, AUTHORITIES AND NCC REQUIREMENTS.
5. CO-ORDINATE WITH ALL OTHER SERVICES PRIOR AND DURING CONSTRUCTION.
6. THE LOCATION OF EXISTING SERVICES SHOWN ON THIS DRAWING ARE APPROXIMATE AND ASSUMED. DETERMINE THE EXACT DEPTH, SIZE AND LOCATION OF ALL EXISTING SERVICES ON-SITE PRIOR AND DURING CONSTRUCTION.
7. PROVIDE ADDITIONAL HYDRAULIC SERVICES WHERE NOT SHOWN ON THE HYDRAULIC SERVICES DRAWINGS.
8. MAKE APPLICATION AND PAY FEE'S TO ALL AUTHORITIES FOR NEW MAINS CONNECTIONS, AUTHORITIES METERING ASSEMBLIES, REDUCED PRESSURE ZONE DEVICES (RPZD'S), BACKFLOW PREVENTION DEVICES AS REQUIRED.
9. ALL HOSE TAPS SHALL BE 200 AT 450mm ABOVE FGL. PROVIDE PERMANENT SIGNAGE STATING "NOT FOR DRINKING". PROVIDE ADDITIONAL HOSE TAPS AND IRRIGATION SYSTEMS AS REQUIRED AND WHERE NOT SHOWN ON THIS DRAWING.
10. THE INVERT LEVELS ARE NOT SHOWN ON THE DRAWINGS AND SHALL BE PROVIDED AS PART OF THE CONSTRUCTION ISSUE DRAWINGS.
11. RAINWATER HARVESTING SHALL BE PROVIDED FROM RAINWATER HARVESTING TANKS. A RETICULATED RAINWATER RE-USE SYSTEM SHALL BE PROVIDED COMPLETE WITH VARIABLE SPEED PUMPS, AUTOMATIC BACKWASH FILTERS, BACK FILTERS AND UV DISINFECTION SYSTEM.
12. THE ENTIRE TRADE WASTE AND SANITARY PLUMBING AND DRAINAGE SYSTEMS SHALL BE PROVIDED TO AS3500.2 AND SHOALHAVEN WATER REQUIREMENTS.
13. REFER TO HYDRAULIC SERVICES SPECIFICATION SHEETS FOR FURTHER REQUIREMENTS.
14. REFER TO FIRE SERVICES DRAWINGS FOR THE DESIGN AND DOCUMENTATION OF THE FIRE HYDRANT SERVICE. SYDNEY WATER PRESSURE AND FLOW STATEMENT DATED 09-07-2021 CONFIRMS A MINIMUM PRESSURE OF 52 METERS FOR FIRE HOSE REEL PROTECTION. WATER BOOSTER PUMPS ARE NOT REQUIRED.
15. THE HYDRAULIC SERVICES DRAWINGS HAVE BEEN DESIGNED TO A 70% DESIGN AND CONSTRUCT ISSUE STAGE. THE CONTRACTOR SHALL PROVIDE ALL HYDRAULIC SERVICES REQUIRED FOR THE COMPLETION OF THE ENTIRE PROJECT. THE CONTRACTOR SHALL ENGAGE A HYDRAULIC SERVICES CONSULTANT TO COMPLETE THE HYDRAULICS DESIGN DOCUMENTATION AND PRODUCE WORKSHOP CONSTRUCTION ISSUE DRAWINGS TO COMPLY WITH AUSTRALIAN STANDARDS, NCC, FER, LOCAL AUTHORITY AND THE CLIENTS REQUIREMENTS.
16. 36m FIRE HOSE REEL WITHIN A FIRE FABRICATED METAL CABINET AT 1500mm ABOVE FFL TO CENTRE OF DRUM TO AS2441.1 REQUIREMENTS. PROVIDE A 25mm RPZD ON THE INLET.
17. THE ENTIRE WATER SERVICES SYSTEMS SHALL BE PROVIDED TO AS3500 AND SHOALHAVEN WATER REQUIREMENTS.
18. THE ENTIRE FIRE HOSE REEL SYSTEMS SHALL BE PROVIDED TO AS2441 AND SHOALHAVEN WATER REQUIREMENTS.
19. THE ENTIRE LP GAS SYSTEMS SHALL BE PROVIDED TO AS5601 AND AS1596 REQUIREMENTS.
20. PROVIDE AND INSTALL SAFETY EYE WASH / SHOWER IN ALL LOCATIONS WHERE REQUIRED AND NOMINATED BY THE CLIENT AND ARCHITECTURAL DRAWINGS.

AMENDMENTS/REVISIONS

Rev	Description	Initials	Date
01	PRELIMINARY ISSUE	JC	13.08.21
02	70% D & C TENDER ISSUE	JC	20.08.21
03	DRAINAGE SYSTEMS ADDED	JC	26-08-21

AMENDMENTS/REVISIONS

Rev	Description	Initials	Date

CLIENT
Bioelektra AUSTRALIA
WHERE WASTE IS A RESOURCE

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PROJECT
WEST NOWRA RESOURCE RECOVERY PARK
120 FLATROCK ROAD
MUNDAMIA NSW 2540

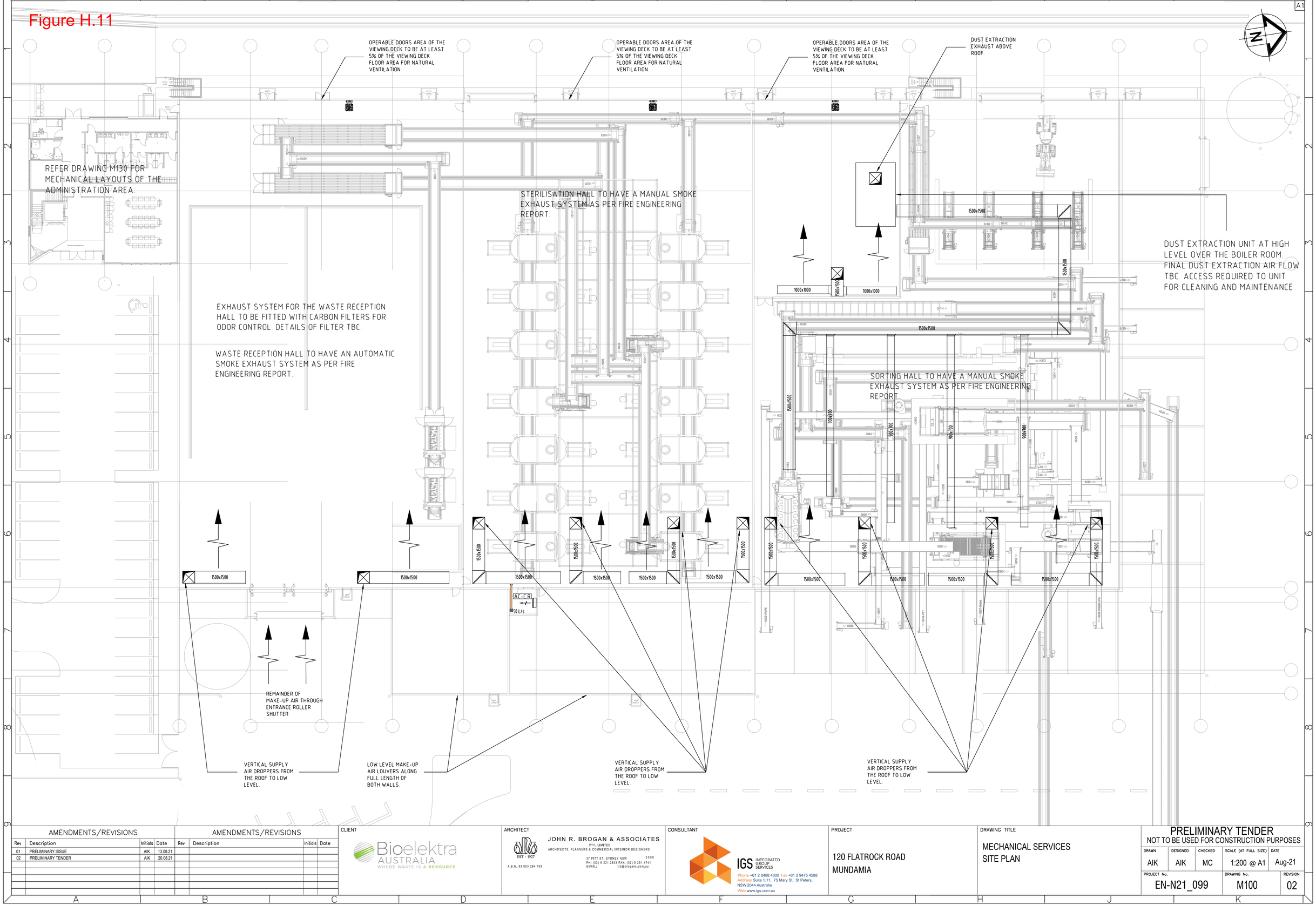
DRAWING TITLE
HYDRAULIC SERVICES
GROUND FLOOR NORTH

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWN	DESIGNED	CHECKED	SCALE (AT FULL SIZE)	DATE
SD	JC	MC	1:200 @ A1	Aug-21

PROJECT No.	DRAWING No.	REVISION
EN-N21_099	H101	03

Figure H.11



AMENDMENTS/REVISIONS

Rev	Description	Initials	Date
01	PRELIMINARY ISSUE	AIK	13.08.21
02	PRELIMINARY TENDER	AIK	20.08.21

AMENDMENTS/REVISIONS

Rev	Description	Initials	Date

CLIENT

Bioelektra AUSTRALIA
WHERE WASTE IS A RESOURCE

ARCHITECT

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PROJECT

120 FLATROCK ROAD
MUNDAMIA

DRAWING TITLE

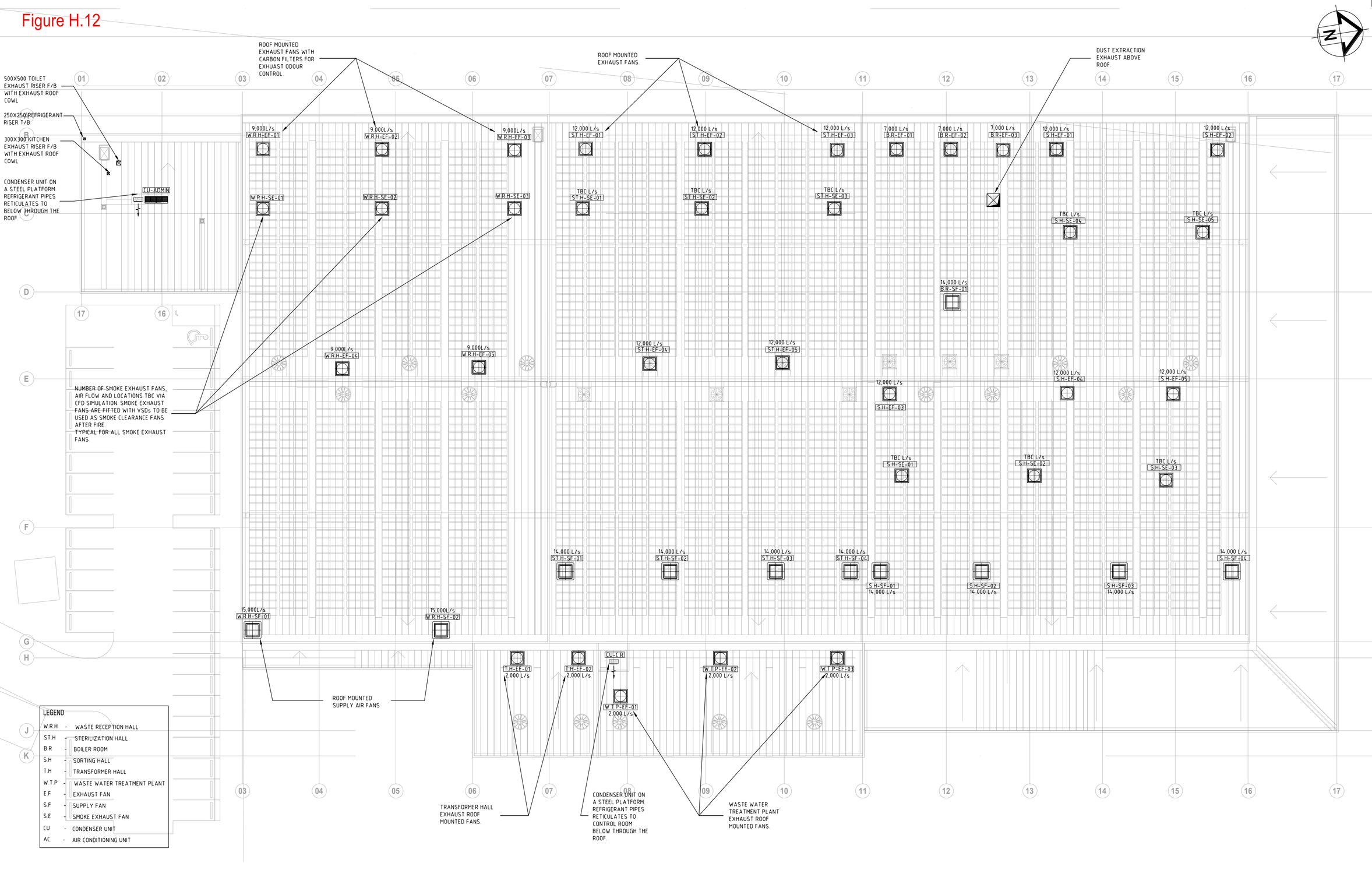
MECHANICAL SERVICES
SITE PLAN

PRELIMINARY TENDER
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWN	DESIGNED	CHECKED	SCALE (AT FULL SIZE)	DATE
AIK	AIK	MC	1:200 @ A1	Aug-21

PROJECT No.	DRAWING No.	REVISION
EN-N21_099	M100	02

Figure H.12



LEGEND

W.R.H	-	WASTE RECEPTION HALL
ST.H	-	STERILIZATION HALL
B.R	-	BOILER ROOM
S.H	-	SORTING HALL
T.H	-	TRANSFORMER HALL
W.T.P	-	WASTE WATER TREATMENT PLANT
E.F	-	EXHAUST FAN
S.F	-	SUPPLY FAN
S.E	-	SMOKE EXHAUST FAN
CU	-	CONDENSER UNIT
AC	-	AIR CONDITIONING UNIT

AMENDMENTS/REVISIONS

Rev	Description	Initials	Date
01	PRELIMINARY ISSUE	AIK	13.08.21
02	PRELIMINARY TENDER	AIK	20.08.21

AMENDMENTS/REVISIONS

Rev	Description	Initials	Date

CLIENT
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PROJECT
120 FLATROCK ROAD
MUNDAMIA

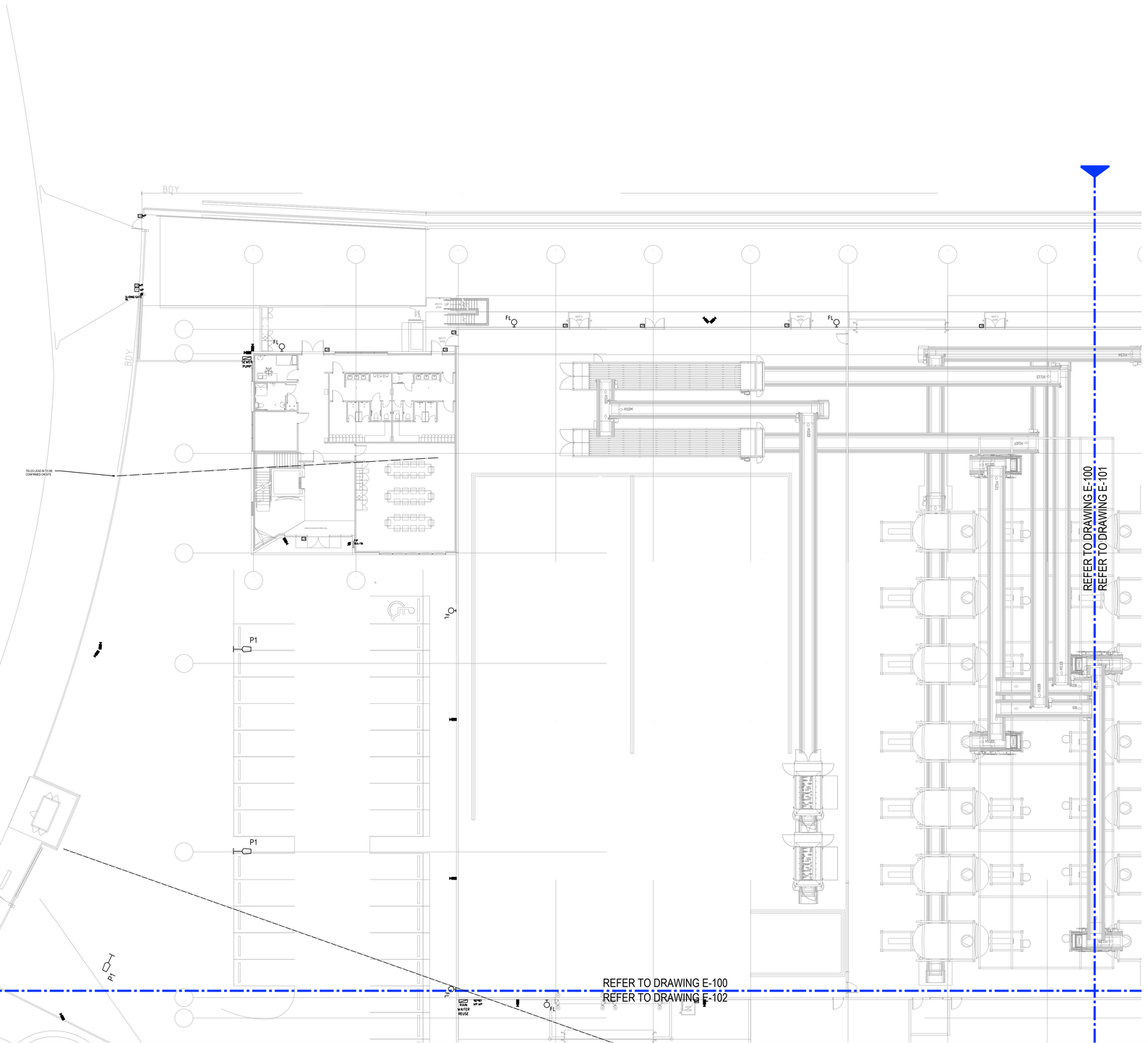
DRAWING TITLE
MECHANICAL SERVICES
ROOF PLAN

PRELIMINARY TENDER
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWN	DESIGNED	CHECKED	SCALE (AT FULL SIZE)	DATE
AIK	AIK	MC	1:200 @ A1	Aug-21

PROJECT No.	DRAWING No.	REVISION
EN-N21_099	M120	02

Figure H.13



AMENDMENTS/REVISIONS				AMENDMENTS/REVISIONS			
Rev	Description	Initials	Date	Rev	Description	Initials	Date
01	PRELIMINARY ISSUE	HP	13.08.21				
02	PRELIMINARY TENDER ISSUE	HP	20.08.21				

CLIENT
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PROJECT
120 FLATROCK ROAD
MUNDAMIA

DRAWING TITLE
ELECTRICAL SERVICES
SITE PLAN A

PRELIMINARY
NOT TO BE USED FOR CONSTRUCTION PURPOSES

DRAWN	DESIGNED	CHECKED	SCALE (AT FULL SIZE)	DATE
HP	HP	MC	1:200 @ A1	Aug-21

PROJECT No.	DRAWING No.	REVISION
EN-N21_099	E100	02

Appendix I

Concept landscaping design

GENERAL NOTES:

- ALLOW FOR STATUTORY & WAYFINDING SIGNS (INCLUDING LIGHTING)

- SITE STORMWATER TO CIVIL ENGINEER'S DESIGN

WEST NOWRA RESOURCE RECOVERY PARK
RECORD OF SERVICES

SERVICE/DISCIPLINE	DATE RCVD	REVISION
ARCHITECTURAL	CURRENT	-
STRUCTURAL	TBA	-
CIVIL	15.09.21	PRELIM
MACHINES/EQUIPMENT	TBA	-
-	-	-
ELECTRICAL LAYOUT	TBA	-
LIGHTING LAYOUT		
- SITE/CAR PARK	TBA	-
- PROCESSING PLANT	TBA	-
MECHANICAL LAYOUT		
- PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
HYDRAULIC LAYOUT	TBA	-
SIPHONIC LAYOUT	TBA	-
FIRE SERVICES		
- PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
SURVEY (82-2017A)	24.05.21	-
BRIEF	FEB. 2021	BDY
CONCEPT	17.05.21	A
LANDSCAPE	TBA	-

SERVICE COORDINATION NOTE:

WALL & BARRIER TYPES LEGEND

W1 OPTION
RC PANEL WALL & NON-LOAD BEARING PIR (RETRO)RATION PANEL
MATERIAL: RC PANEL WALL TO 3000mm ABOVE FFL WITH NON-LOAD BEARING INSULATED WALL PANEL UPON ARCHITEN STEEL STRUCTURE TO EXTEND TO PARAPET HEIGHT
EXTERNAL FACE FINISH: GROUND TO 3000mm HIGH - RC PANEL
COLOUR: TBC
EXTERNAL FACE FINISH: FROM 3000mm HIGH TO TOP OF PARAPET - PIR PANEL
COLOUR: PRE FINISHED COLORBOND COLOUR-TBC
PIR NOTES: INSULATED WALL PANEL (PIR) TO BE SEALED AT THE TOP OF CONCRETE WALL AND SHALL BE SECURED TO SECTION 2 INSULATED PANEL TO HAVE FM APPROVAL FOR UNLIMITED HEIGHT UNDER FM-4880 & FM-4881 OR PASS THE FULL SCALE FACADE FIRE TEST AS DEFINED BY AS-5113. NO EPS BASED CORE PRODUCTS ARE TO BE USED INSULATED PANEL THICKNESS TO ACHIEVE MIN. AVERAGE R VALUE AS REQUIRED BY SECTION J REPORT FOR THE RELEVANT CLIMATE ZONE.

OR

W1 OPTION
- LOAD BEARING RC PANEL WALL
MATERIAL: LOAD BEARING RC PANEL WALL TO STRUCTURAL ENG'S DETAIL (TBC) AS NOTED
EXTERNAL FACE FINISH: PAINT DULUX 'NOVA-TEX' TEXTURE OR 'NOVA-SHIELD' COATING AS NOTED
COLOUR: TBC

W1R - AS W1 BUT REMOVABLE
MATERIAL: WALL TYPE AS FOR W1 REMOVABLE IN SEGMENTS - TBC! NOMINAL 8000 WIDE BY 6000 HIGH - TBC

PW - TYPE PUSH WALL
MATERIAL: RC PANEL PUSH WALL TO MANUF. SPECS

W1 - TYPE WALL WITH ACOUSTIC RATING OF Rw30

W1 - TYPE WALL WITH FIRE RATING OF -/-/- (TBC!)

W1 - TYPE WALL WITH 2 HOUR FRL

RP - NON-LOAD BEARING PIR (RETRO)RATION PANEL
MATERIAL: NOM 100-150mm NON-LOAD BEARING INSULATED WALL PANEL UPRO ON STEEL STRUCTURE
FINISH: FFL TO FULL HEIGHT, BOTH SIDES
COLOUR: PRE FINISHED COLORBOND COLOUR-TBC

F1 - EXTERNAL PERIMETER SECURITY FENCE 2000H
MATERIAL: 2400 CMW FENCE
2000 HIGH HEAVY DUTY 3.5mm GAUGE CHAIN WIRE MESH
2 No. TOP RAILS
2 No. BOTTOM RAILS, WIRE ABOVE - FIVE - DOUBLE STRANDS TWISTED IN "DENY" PATTERN @ 200 CTRS
FINISH: GAL MESH AND POSTS & UNPAINTED

F2 - EXTERNAL SPEAR TOP SECURITY FENCE 2000/2400H
MATERIAL: 2400 SPEAR TOP SECURITY PANEL FENCE
2000 MIN. FENCE HEIGHT
FINISH: POWDERCOAT, COLOUR - TBC

F3 - 1200 HIGH POOL FENCE
MATERIAL: 1200mm HIGH ARC WELDW POOL FENCE
FINISH: GALVANISED OR BLACK POWDERCOAT

VB - STEEL VEHICLE BARRIER
MATERIAL: TRACO VEHICLE BARRIER

DRAWING LEGEND

- 01 / G-01 — DOOR NUMBER
- 18 / W-L1 — WINDOW NUMBER
- 03 / L-L1 — LOUVRE NUMBER
- COL 037 — COLUMN NUMBER
- W1 — WALL TYPE
- FF-FC 2400 — CEILING HEIGHT
- SFL 12.225 — STRUCTURAL FLOOR LEVEL
- FFL 12.325 — FINISHED FLOOR LEVEL
- BURNISHED FINISH (FAL/BN) ASHFORD FORMULA — SPECIFIED FLOOR FINISH

EQUIPMENT PLAN:

DWG No: 53-591015-0001-00-0

DATE RECEIVED: 06.08.21

SITE LEGEND

- BOL — BOLLARD - 140ø
- XXXØ BOL — BOLLARD - 300ø
- HEAVY DUTY PAVEMENT TO CIVIL ENGINEER'S DETAIL
- VEHICULAR PAVEMENT TO CIVIL ENGINEER'S DETAIL
- LANDSCAPE - FUTURE DETAIL TO BE DEVELOPED BY LANDSCAPE ARCHITECT

100mm on original A1

CIVIL PLAN & FILTER EQUIPMENT OVERLAYED FOR REFERENCE- COORDINATION TBC REFER TO ENG'S DRAWINGS FOR FULL DETAIL

DESIGN & CONSTRUCT TENDER ISSUE

NO.	AMENDMENT	DATE	NO.	AMENDMENT	DATE
0	PRELIMINARY ISSUE	24.05.21			
1	PRELIMINARY ISSUE	08.06.21			
2	PRELIMINARY ISSUE	17.08.21			
3	PRELIMINARY ISSUE	17.08.21			
[1]	DESIGN & CONSTRUCT TENDER ISSUE	20.08.21			
[2]	DESIGN & CONSTRUCT TENDER ISSUE	17.09.21			

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CLIENT
BIOELEKTRA AUSTRALIA
Bioelektra AUSTRALIA
YOUR WASTE IS A RESOURCE

JOHN R. BROGAN & ASSOCIATES
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WEST NOWRA RESOURCE RECOVERY PARK
120 FLATROCK ROAD
MUNDAMIA NSW 2540

SITE PLAN

SCALE : 1:350
DATE : MAY 21

PROJ. NO. 1467
DRG. NO. 04-00-00
AMD NO. T2

CAD REF.: PROPOSED BIOELEKTRA AT NOWRA N.S.W. 1467 PC17.dgn 17-September-2021 Microstation V8i SS5

Appendix J

Preliminary firewater plan

WEST NOWRA RESOURCE RECOVERY PARK
RECORD OF SERVICES

SERVICE/DISCIPLINE	DATE RCV'D	REVISION
ARCHITECTURAL	CURRENT	-
STRUCTURAL	TBA	-
CIVIL	TBA	-
MACHINES/EQUIPMENT	TBA	-
-	-	--
ELECTRICAL LAYOUT	TBA	-
LIGHTING LAYOUT		
- SITE/CAR PARK	TBA	-
- PROCESSING PLANT	TBA	-
MECHANICAL LAYOUT		
- PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
HYDRAULIC LAYOUT	TBA	-
SIPHONIC LAYOUT	TBA	-
FIRE SERVICES		
- PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
SURVEY (82-2017A)	24.05.21	-
BRIEF	FEB 2021	B
CONCEPT	17.05.21	A
LANDSCAPE	TBA	-

SERVICE COORDINATION NOTE:

approximate Septic tank and holding tank arrangement to pick up domestic sewer on ground/1st floor. Irrigation to discharge as per AS1547 on site sewer management as well as council/water authority requirements. Civil engineer to advise on irrigation discharge due to surrounding storm water systems.

We recommend 600mm x 300mm half round gutter with 150mm downpipes at 6m centres.

AS Per the GHD report dated February 2021 the report states that 50 tonnes of LPG storage is required. This equals 2,450,000MJ of storage. Client to advise if this is adequate storage. LPG tank to meet requirements of AS1596, minimum 20m away form the building.

Fire service equipment is to be minimum 10m away from the substation

2 x combined hydrant and sprinkler tanks. tanks to have a capacity of 600Kl each (as per GHD fire incident and management review), To be revised once the BCA report is finalised. tank to be 10m high and 9m diameter, this will get us 600Kl of effective capacity

Hard stand area to be kept free, if the road is 2-way we require a 10m wide hard stand area.

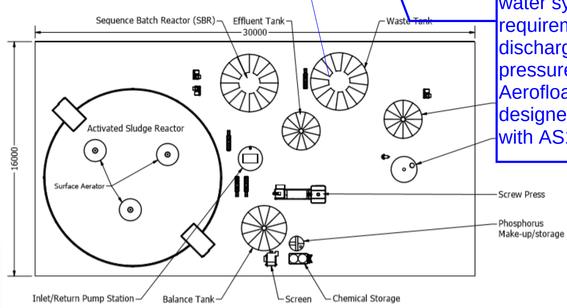
Fire sprinkler and hydrant booster assembly to be 6m(W) x 1m(D) x 1.5m(H) to included DCDV 1m clear distance required in front of the booster at all times not to be further than 8m from the road where the truck will be parked on arrival. to include large bore suction connection.

Combined fire sprinkler and hydrant pump room size to be 10m x 5m x 2.2m(H) 2 x hydrant pumps and 2x sprinkler pumps. 3 x sprinkler alarm valves required.

150mm underground fire service reticulating around the building

All external Dual headed fire hydrants are to be protected by a 4hour rated fire wall. Bollards are required on all external fire hydrants for protection.

Waste water treatment plant to be 16m(W) x 30m(L) as per Aerofloat design drawings. Civil engineer to coordinate with the client and Aerofloat. Leachate treatment System to be designed to AS1547-2012 on site sewer waste water system, and local water authority/council requirements. Treated waste water will need to discharge to external landscaped areas via a pressure dosing irrigation system as stated in Aerofloat report, the irrigation system needs to be designed by the civil engineer and must comply with AS1547-2012



3.6 LPG Station

An LPG tank of 50 tonnes capacity will be located adjacent to the perimeter road and will meet potentially hazardous area classification requirements. Gas reticulation will be provided to the Boiler Room. The LP Gas installation will comply with the requirements of AS 1596

KEY

- = FIRE RATED
- = INSULATED
- = ACOUSTIC
- = INSULATED & ACOUSTIC

NOT FOR CONSTRUCTION

THE INTENT OF THIS DRAWING IS TO CONVEY THE DESIGN CONCEPT, ALL AREAS, DIMENSIONS, LEVELS & DETAILS SUBJECT TO CONFIRMATION BY WAY OF DISCUSSION WITH AUTHORITIES & DESIGN DEVELOPMENT.

NO.	AMENDMENT	DATE	NO.	AMENDMENT	DATE
0	PRELIMINARY ISSUE	24.05.21			

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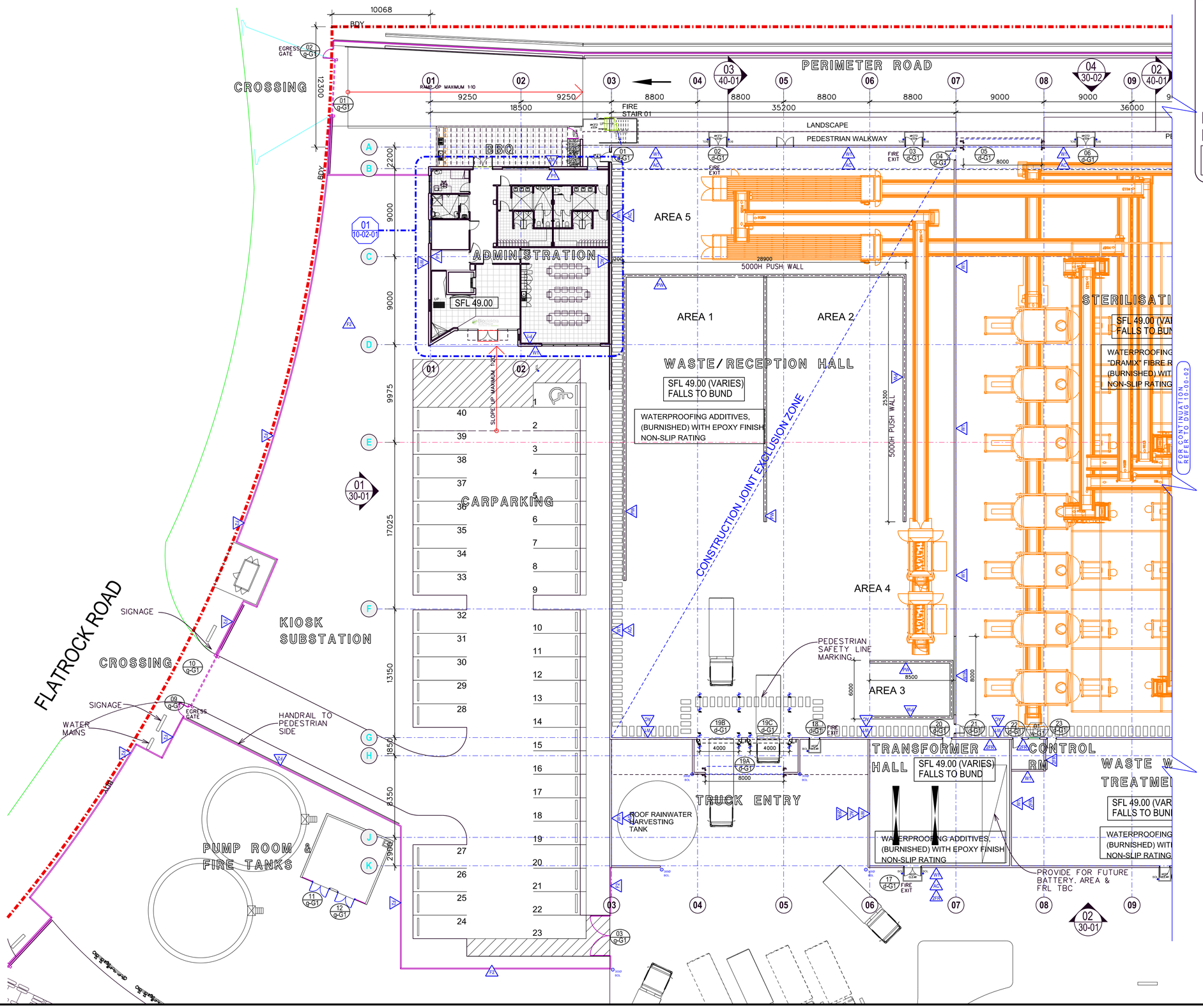
WEST NOWRA RESOURCE RECOVERY PARK
120 FLATROCK ROAD
MUNDAMIA NSW 2540

SITE PLAN

SCALE : 1:500
DATE : MAY 21
PROJ. NO. 1467
DRG. NO. 04-00-00
AMD NO. 0

CAD REF : Microstation V8i SS5 PROPOSED BIOELEKTRA AT NOWRA, N.S.W. 1467. PLOTTED : 27-May-2021



DRAWING LEGEND

- 01 / d-G1 — DOOR NUMBER
- 18 / w-L1 — WINDOW NUMBER
- 03 / L-L1 — LOUVRE NUMBER
- COL 037 — COLUMN NUMBER
- W1 — WALL TYPE
- FF-FC 2400 — CEILING HEIGHT
- SFL 12.225 — STRUCTURAL FLOOR LEVEL
- FFL 12.325 — FINISHED FLOOR LEVEL
- BURNISHED FINISH (FAL/BN) ASHFORD FORMULA — SPECIFIED FLOOR FINISH

WALL & BARRIER TYPES LEGEND

W1 — W1 OPTION:
- RC PANEL WALL & NON-LOAD BEARING PIR (REFRIGERATION) PANEL
MATERIAL: RC PANEL WALL TO 3000mm ABOVE FFL WITH NON-LOAD BEARING INSULATED WALL PANEL (PIR) ABOVE ON STEEL STRUCTURE TO EXTEND TO PARAPET HEIGHT
EXTERNAL FACE FINISH: GROUND TO 3000mm HIGH - RC PANEL
COLOUR: TBC
EXTERNAL FACE FINISH: FROM 3000mm HIGH TO TOP OF PARAPET - PIR PANEL
COLOUR: PRE FINISHED COLORBOND COLOUR: TBC
PIR NOTES: INSULATED WALL PANEL (PIR) TO BE SEALED AT THE TOP TO PROVIDE CONTINUOUS INSULATION AS REQUIRED BY SECTION J. INSULATED PANEL TO HAVE FM APPROVAL FOR UNLIMITED HEIGHT UNDER FM-4880 & FM-4881 OR PASS THE FULL SCALE FACADE FIRE TEST AS DEFINDED BY AS-5113, NO EPS BASED CORE PRODUCTS ARE TO BE USED. INSULATED PANEL THICKNESS TO ACHIEVE MIN. AVERAGE R-VALUE AS REQUIRED BY SECTION J REPORT FOR THE RELEVANT CLIMATE ZONE.
NOTE: EXTERNAL RC WALL PANELS TO BE INWARD COLLAPSING

OR

W1 OPTION:
- LOAD BEARING RC PANEL WALL
MATERIAL: LOAD BEARING RC PANEL WALL TO STRUCTURAL ENG'S DETAIL (RB AS NOTED)
EXTERNAL FACE FINISH: PAINT DULUX 'ACRA-TEX' TEXTURE OR 'ACRA-SHIELD' COATING AS NOTED
COLOUR: TBC
NOTE: EXTERNAL RC WALL PANELS TO BE INWARD COLLAPSING

W1R — W1R - AS FOR W1 - REMOVABLE
MATERIAL: WALL TYPE AS FOR W1, BUT REMOVABLE (IN SEGMENTS - TBC) NOMINAL 8000 WIDE BY 6000 HIGH - TBC PROVIDE LIFTING EYES FOR CONTROLED REMOVAL

PW — PW - TYPE PUSH WALL
MATERIAL: RC PANEL PUSH WALL TO MANUF. SPECS RELOCATABLE AS NEEDED-PROVIDE LIFTING EYES FOR FOR MOVING

AC — W1 - TYPE WALL WITH ACOUSTIC RATING OF Rw30

FR — W1 - TYPE WALL WITH FIRE RATING OF --/--/-- (TBC)

RP — RP - NON-LOAD BEARING PIR (REFRIGERATION) PANEL
MATERIAL: NOM 100-150mm NON-LOAD BEARING INSULATED WALL PANEL (PIR) ON STEEL STRUCTURE
FINISH: FFL TO FULL HEIGHT, BOTH SIDES
COLOUR: PRE FINISHED COLORBOND COLOUR: TBC

F1 — F1 - EXTERNAL PERIMETER CHW SECURITY FENCE 2000H
MATERIAL: 2400 CHW FENCE
2000 HIGH HEAVY DUTY 3.15mm GAUGE CHAIN WIRE MESH
50 x 50 APERTURE
2 No.+ ROWS BARBED WIRE ABOVE - DOUBLE STRANDS TWISTED IN "NOWA" PATTERN @ 200 CTRS
FINISH: GAL MESH AND POSTS & UNPAINTED

F2 — F2 - EXTERNAL SPEAR TOP SECURITY FENCE 2000/2400H
MATERIAL: 2400 SPEAR TOP SECURITY PANEL FENCE
2000 MIN. FRAME HEIGHT
FINISH: POWDERCOAT, COLOUR - TBC

VB — VB - STEEL VEHICLE BARRIER
MATERIAL: 'ARMCO' VEHICLE BARRIER

WALL TYPES LEGEND

P1 — P1 - NON FIRE-RATED PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm.
NON-FIRE RATED 64mm X 55mm STUDS AT MAX.600mm SPACINGS.
ONE LAYER OF 10mm THK. PLASTERBOARD EACH SIDE

MR — MR - AS FOR P1 BUT MR PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm, NON-FIRE RATED:
MOISTURE RESISTANT
AS FOR P1 EXCEPT MOISTURE RESISTANT PLASTERBOARD ON 'WET' SIDE

FR — FR - AS FOR P1 BUT FIRE-RATED PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm, FIRE RATED, FRL60/60/60
64mm X 55mm STUDS AT MAX.600mm SPACINGS.
ONE LAYER OF 16mm THK."FIRESTOP" PLASTERBOARD EACH SIDE.

AC — AC - AS FOR P1 BUT ACOUSTIC INSULATION PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm TO ACHIEVE ACOUSTIC REQUIREMENT OF:
- Rw45 MINIMUM TO OFFICES
- Rw50 MINIMUM TO METING ROOMS
- Rw55 TO COMMON WALL OF PROCESSING BUILDING

WEST NOWRA RESOURCE RECOVERY PARK RECORD OF SERVICES

SERVICE/DISCIPLINE	DATE RCV'D	REVISION
ARCHITECTURAL	CURRENT	-
STRUCTURAL	TBA	-
CIVIL	TBA	-
MACHINES/EQUIPMENT	TBA	-
ELECTRICAL LAYOUT	TBA	-
LIGHTING LAYOUT - SITE/CAR PARK	TBA	-
- PROCESSING PLANT	TBA	-
MECHANICAL LAYOUT - PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
HYDRAULIC LAYOUT	TBA	-
SIPHONIC LAYOUT	TBA	-
FIRE SERVICES - PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
SURVEY (82-2017A)	24.05.21	-
BRIEF	FEB 2021	B
CONCEPT	17.05.21	A
LANDSCAPE	TBA	-
SERVICE COORDINATION NOTE:		

EQUIPMENT PLAN:

DWG No: **53-591015-0001-00-0**

DATE RECEIVED: **06.08.21**

DESIGN & CONSTRUCT TENDER ISSUE

NO.	AMENDMENT	DATE
0	PRELIMINARY ISSUE	03.06.21
1	PRELIMINARY ISSUE	08.06.21
2	PRELIMINARY ISSUE	11.06.21
3	PRELIMINARY ISSUE	18.01.21
4	PRELIMINARY ISSUE	25.06.21
5	PRELIMINARY ISSUE	05.07.21
6	PRELIMINARY ISSUE	09.07.21
7	DESIGN & CONSTRUCT TENDER ISSUE	20.08.21

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Bioelektra AUSTRALIA
YOUR WASTE IS A RESOURCE

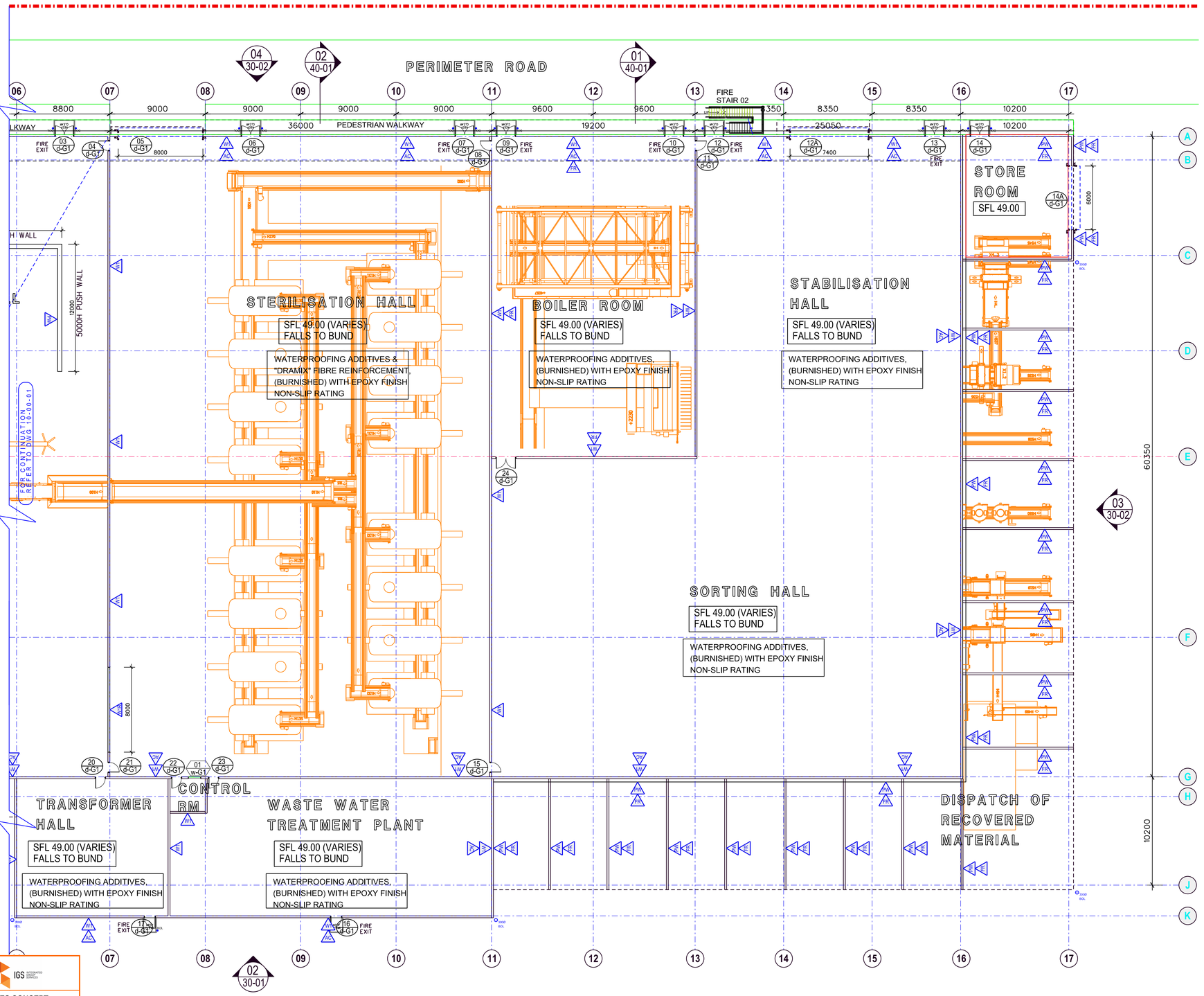
JOHN R. BROGAN & ASSOCIATES
PTY. LIMITED
ARCHITECTS, PLANNERS & COMMERCIAL INTERIOR DESIGNERS
EST · 1927
A.B.N. 93 003 284 759
37 PITT ST. SYDNEY NSW 2000
PH: (02) 9 221 2833 FAX: (02) 9 251 4741
EMAIL: jrb@brogans.com.au

WEST NOWRA RESOURCE RECOVERY PARK
120 FLATROCK ROAD
MUNDAMIA NSW 2540

PLAN - GROUND - SOUTH

SCALE : 1:200
DATE : MAY 21
PROJ. NO. 1467
DRG. NO. 10-00-01
AMD NO. T1

CAD REF.: Microstation V8i SS5 PROPOSED BIOELEKTRA, W NOWRA, N.S.W. 1467- PLOTTED 23-August-2021
100mm on original A1



DRAWING LEGEND

- 01 / d-G1 — DOOR NUMBER
- 18 / w-L1 — WINDOW NUMBER
- 03 / L-L1 — LOUVRE NUMBER
- COL 037 — COLUMN NUMBER
- W1 — WALL TYPE
- FF-FC 2400 — CEILING HEIGHT
- SFL 12.225 — STRUCTURAL FLOOR LEVEL
- FFL 12.325 — FINISHED FLOOR LEVEL
- BURNISHED FINISH (FAL/BN) ASHFORD FORMULA — SPECIFIED FLOOR FINISH

WALL & BARRIER TYPES LEGEND

W1 OPTION:
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MATERIAL: RC PANEL WALL TO 3000mm ABOVE FFL WITH NON-LOAD BEARING INSULATED WALL PANEL (PIR) ABOVE ON STEEL STRUCTURE TO EXTEND TO PARAPET HEIGHT
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OR

W1 OPTION:
- LOAD BEARING RC PANEL WALL

MATERIAL: LOAD BEARING RC PANEL WALL TO STRUCTURAL ENG'S DETAIL (RB AS NOTED)
EXTERNAL FACE FINISH: PAINT DULUX 'ACRA-TEX' TEXTURE OR 'ACRA-SHIELD' COATING AS NOTED
COLOUR: TBC

W1R - AS FOR W1 - REMOVABLE
MATERIAL: WALL TYPE AS FOR W1, BUT REMOVABLE (IN SEGMENTS - TBC) NOMINAL 8000 WIDE BY 6000 HIGH - TBC PROVIDE LIFTING EYES FOR CONTROLED REMOVAL

PW - TYPE PUSH WALL
MATERIAL: RC PANEL PUSH WALL TO MANUF SPECS RELOCATABLE AS NEEDED-PROVIDE LIFTING EYES FOR FOR MOVING

AC - W1 - TYPE WALL WITH ACOUSTIC RATING OF Rw30

FR - W1 - TYPE WALL WITH FIRE RATING OF -/-/-/- (TBC)

RP - NON-LOAD BEARING PIR (REFRIGERATION) PANEL
MATERIAL: NOM 100-150mm NON-LOAD BEARING INSULATED WALL PANEL (PIR) ON STEEL STRUCTURE
FINISH: FFL TO FULL HEIGHT, BOTH SIDES
COLOUR: PRE FINISHED COLORBOND COLOUR: TBC

F1 - EXTERNAL PERIMETER CWM SECURITY FENCE 2000H
MATERIAL: 2400 CWM FENCE 2000 HIGH HEAVY DUTY 3.15mm GAUGE CHAIN WIRE MESH 50 x 50 APERTURE 2 No.'r ROWS BARBED WIRE ABOVE - DOUBLE STRANDS TWISTED IN "NOMA" PATTERN @ 200 CTRS
FINISH: GAL MESH AND POSTS & UNPAINTED

F2 - EXTERNAL SPEAR TOP SECURITY FENCE 2000/2400H
MATERIAL: 2400 SPEAR TOP SECURITY PANEL FENCE 2000 MIN. FRAME HEIGHT
FINISH: POWDERCOAT, COLOUR - TBC

VB - STEEL VEHICLE BARRIER
MATERIAL: 'ARMCO' VEHICLE BARRIER

WALL TYPES LEGEND

P1 - NON FIRE-RATED PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm. NON-FIRE RATED 64mm X .55mm STUDS AT MAX. 600mm SPACINGS. ONE LAYER OF 10mm THK. PLASTERBOARD EACH SIDE

MR - AS FOR P1 BUT MR PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm, NON-FIRE RATED: MOISTURE RESISTANT AS FOR P1 EXCEPT MOISTURE RESISTANT PLASTERBOARD ON 'WET' SIDE

FR - AS FOR P1 BUT FIRE-RATED PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm, FIRE RATED, FRL60/60/60 64mm X .55mm STUDS AT MAX. SPACINGS. ONE LAYER OF 16mm THK."FIRESTOP" PLASTERBOARD EACH SIDE.

AC - AS FOR P1 BUT ACOUSTIC INSULATION PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm TO ACHIEVE ACOUSTIC REQUIREMENT OF:
- Rw45 MINIMUM TO OFFICES
- Rw50 MINIMUM TO MEETING ROOMS
- Rw55 TO COMMON WALL OF PROCESSING BUILDING

WEST NOWRA RESOURCE RECOVERY PARK RECORD OF SERVICES

SERVICE/DISCIPLINE	DATE RCV'D	REVISION
ARCHITECTURAL	CURRENT	-
STRUCTURAL	TBA	-
CIVIL	TBA	-
MACHINES/EQUIPMENT	TBA	-
ELECTRICAL LAYOUT	TBA	-
LIGHTING LAYOUT		
- SITE/CAR PARK	TBA	-
- PROCESSING PLANT	TBA	-
MECHANICAL LAYOUT		
- PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
HYDRAULIC LAYOUT	TBA	-
SIPHONIC LAYOUT	TBA	-
FIRE SERVICES		
- PROCESSING PLANT	TBA	-
- ADMINISTRATION	TBA	-
SURVEY (82-2017A)	24.05.21	-
BRIEF	FEB 2021	B
CONCEPT	17.05.21	A
LANDSCAPE	TBA	-

SERVICE COORDINATION NOTE:

NOT FOR CONSTRUCTION

THE INTENT OF THIS DRAWING IS TO CONVEY THE DESIGN CONCEPT, ALL AREAS, DIMENSIONS, LEVELS & DETAILS SUBJECT TO CONFIRMATION BY WAY OF DISCUSSION WITH AUTHORITIES & DESIGN DEVELOPMENT.

IGS INTEGRATED GROUP SERVICES

SERVICES CONCEPT

ISSUED FOR REVIEW

BY: AIK (MECH)

DATE: 10/06/21

NO.	AMENDMENT	DATE	NO.	AMENDMENT	DATE
0	PRELIMINARY ISSUE	03.06.21			
1	PRELIMINARY ISSUE	08.06.21			
2	PRELIMINARY ISSUE	11.06.21			
3	PRELIMINARY ISSUE	25.06.21			
4	PRELIMINARY ISSUE	05.07.21			
5	PRELIMINARY ISSUE	09.07.21			

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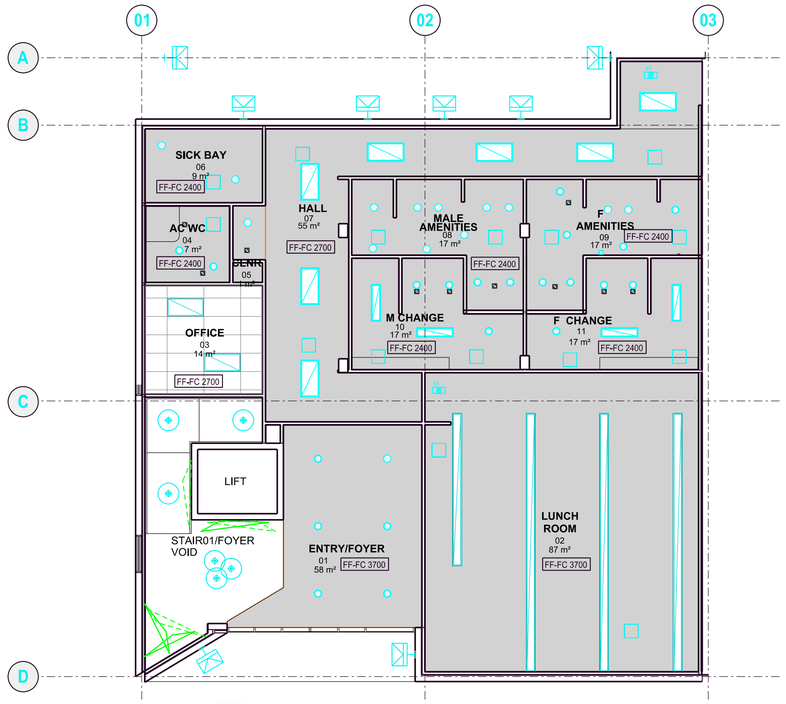
EMAIL: jrb@brogans.com.au

WEST NOWRA RESOURCE RECOVERY PARK
120 FLATROCK ROAD
MUNDAMIA NSW 2540

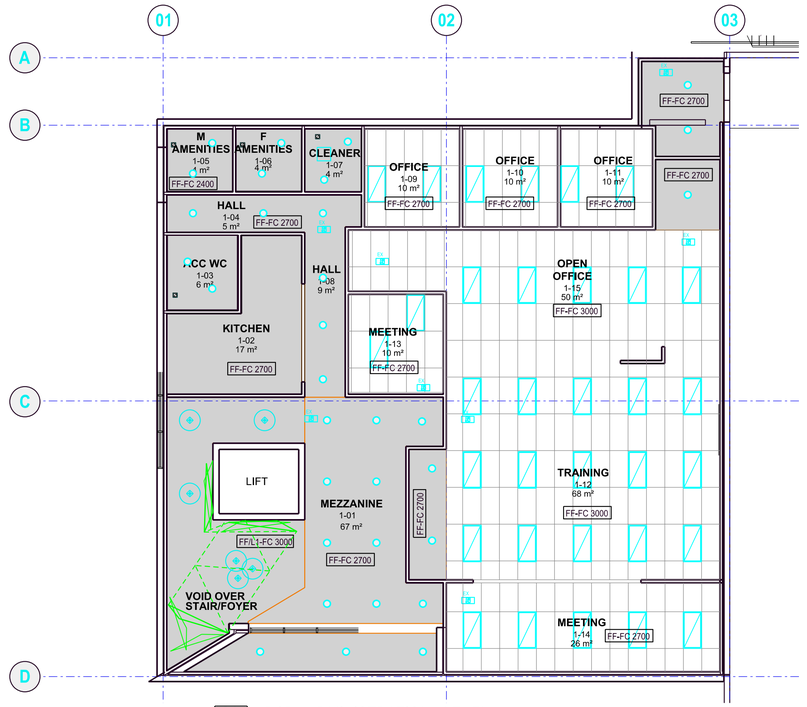
PLAN - GROUND - NORTH

SCALE : 1:200
DATE : MAY 21
PROJ. NO. 1467
DRG. NO. 10-00-02
AMD NO. 5

CAD REF : Microstation V8i SS5 PROPOSED BIOELEKTRA W NOWRA, N.S.W. 1467- PLOTTED 09-July-2021
100mm on original A1



03 - RCP - ADMINISTRATION - GROUND
SCALE 1:100



04 - RCP - ADMINISTRATION - LEVEL 1
SCALE 1:100

ADMINISTRATION FINISHES LEGEND

FLOOR FINISHES

- FT1 — FLOOR TILES - FRONT OF HOUSE: FINISH: 600x600 PORCELAIN - TBC COLOUR: TBC CONFIRM MIN R10 SLIP RESISTANCE WITH SUPPLIER
- FT2 — FLOOR TILES - BACK OF HOUSE: FINISH: 600x600 PORCELAIN - TBC COLOUR: TBC CONFIRM MIN R10 SLIP RESISTANCE WITH SUPPLIER
- FT3 — FLOOR TILES - WET AREAS: FINISH: 300x300 PORCELAIN - TBC COLOUR: TBC CONFIRM MIN R10 SLIP RESISTANCE WITH SUPPLIER
- PT1 — PAVING/OUTDOOR TILES - OUTDOOR BBQ AREA: FINISH: 300x300 TYPE - TBC COLOUR: TBC CONFIRM MIN R10 SLIP RESISTANCE WITH SUPPLIER
- VT1 — FLOOR VINYL - NON WET AREAS FINISH: ARMSTRONG - TBC COLOUR: TBC
- CT1 — CARPET TILES FINISH: ONTERA - TBC COLOUR: TBC
- TGSI — TACTILE GROUND SURFACE INDICATOR COLOUR: CONTRASTING TO FLOOR COLOUR

WALL FINISHES

- CV — COVING FINISH: 100mm HIGH COVING TO MATCH FLOOR VINYL. USE COVE FILLETS WHERE AVAILABLE BY MANUF. COLOR: REFER FLOOR VINYL NOTE: WALL VINYL MUST BE HEAT-WELD JOIN WITH FLOOR VINYL AT JUNCTION. OVERLAPPING OF VINYL IS NOT PERMITTED.
- WT — WALL TILES FINISH: JOHNSON 300x100mm CERAMIC WALL TILE COLOUR: GLOSS WHITE - TBC
- WA — WALL ACRYLIC SPLASHBACK FINISH: VISTELLE HIGH GLOSS ACRYLIC SPLASHBACK PANEL CUT TO SIZE COLOUR: SALT (WHITE)
- TP1 — TOILET PARTITION FINISH: LAMINEX 13mm MULTIPURPOSE COMPACT LAMINATE COLOUR: TBC

NOTES:

ADMINISTRATION CEILING LEGEND

- FB — FLUSH PLASTERBOARD CEILING FINISH: PAINTED PLASTERBOARD COLOUR: DULUX SHADE 'WHITE'
- CT1 — SUSPENDED ACOUSTIC CEILING TILES SYSTEM FINISH: 600 X 1200 TILE IN EXPOSED GRID COLOUR: WHITE
- AP — CEILING ACCESS PANEL
- FF-FC 2400 — CEILING HEIGHT
- LED FLUSH MOUNTED LIGHT
- LED FLUSH MOUNTED STRIP LIGHT
- LED FLUSH MOUNTED DOWNLIGHT
- PENDANT LIGHT
- EMERGENCY EXIT LIGHT
- LED AREA WALL MOUNTED
- SUPPLY AIR DIFFUSER
- EXHAUST AIR GRILLE

SERVICES NOTE:
FOR ELECTRICAL & MECHANICAL SERVICES REFER TO ENGINEER'S DESIGN

WALL & BARRIER TYPES LEGEND

W1 — OPTION:
- RC PANEL WALL & NON-LOAD BEARING PIR (REFRIGERATION) PANEL
MATERIAL: RC PANEL WALL TO 3000mm ABOVE FFL WITH NON-LOAD BEARING INSULATED WALL PANEL (PIR) ABOVE ON STEEL STRUCTURE TO EXTEND TO PARAPET HEIGHT
EXTERNAL FACE FINISH: GROUND TO 3000mm HIGH - RC PANEL
COLOUR: TBC
EXTERNAL FACE FINISH: FROM 3000mm HIGH TO TOP OF PARAPET - PIR PANEL
COLOUR: PRE FINISHED COLORBOND COLOUR: TBC
PIR NOTES: INSULATED WALL PANEL (PIR) TO BE SEALED AT THE TOP TO PROVIDE CONTINUOUS INSULATION AS REQUIRED BY SECTION J INSULATED PANEL TO HAVE FM APPROVAL FOR UNLIMITED HEIGHT UNDER FM-4880 & FM-4881 OR PASS THE FULL SCALE FACADE FIRE TEST AS DEFINDED BY AS-5113, NO EPS BASED CORE PRODUCTS ARE TO BE USED. INSULATED PANEL THICKNESS TO ACHIEVE MIN. AVERAGE R-VALUE AS REQUIRD BY SECTION J REPORT FOR THE RELEVANT CLIMATE ZONE.

OR

W1 — OPTION:
- LOAD BEARING RC PANEL WALL
MATERIAL: LOAD BEARING RC PANEL WALL TO STRUCTURAL ENG'S DETAIL (NB AS NOTED)
EXTERNAL FACE FINISH: PAINT DULUX 'ACRA-TEX' TEXTURE OR 'ACRA-SHIELD' COATING AS NOTED
COLOUR: TBC

W1R — W1R - AS FOR W1 - REMOVABLE
MATERIAL: WALL TYPE AS FOR W1 REMOVABLE (IN SEGMENTS - TBC) NOMINAL 8000 WIDE BY 6000 HIGH - TBC

PW — PW - TYPE PUSH WALL
MATERIAL: RC PANEL PUSH WALL TO MANUF. SPECS

AC — W1 - TYPE WALL WITH ACOUSTIC RATING OF Rw30

FR — W1 - TYPE WALL WITH FIRE RATING OF --/--/-- (TBC)

RP — RP - NON-LOAD BEARING PIR (REFRIGERATION) PANEL
MATERIAL: NOM 100-150mm NON-LOAD BEARING INSULATED WALL PANEL (PIR) ON STEEL STRUCTURE
FINISH: FFL TO FULL HEIGHT, BOTH SIDES
COLOUR: PRE FINISHED COLORBOND COLOUR: TBC

F1 — F1 - EXTERNAL PERIMETER SECURITY FENCE 2000H
MATERIAL: 2400 CMW FENCE 2000 HIGH HEAVY DUTY 3.15mm GAUGE CHAIN WIRE MESH 50 x 50 APERTURE 2 No.• ROWS BARBED WIRE ABOVE - DOUBLE STRANDS TWISTED IN "KNAV" PATTERN @ 200 CTRS
FINISH: GAL MESH AND POSTS & UNPAINTED

F2 — F2 - EXTERNAL SPEAR TOP SECURITY FENCE 2000/2400H
MATERIAL: 2400 SPEAR TOP SECURITY PANEL FENCE 2000 MIN. FRAME HEIGHT
FINISH: POWDERCOAT, COLOUR - TBC

VB — VB - STEEL VEHICLE BARRIER
MATERIAL: 'ARMCO' VEHICLE BARRIER

WALL TYPES LEGEND

P1 — P1 - NON FIRE-RATED PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm. NON-FIRE RATED 64mm X 55mm STUDS AT MAX. 600mm SPACINGS. ONE LAYER OF 10mm THK. PLASTERBOARD EACH SIDE

MR — MR - AS FOR P1 BUT MR PB WALL UP TO 3700 HIGH
WALL HEIGHT NOT TO EXCEED 3700mm, NON-FIRE RATED: MOISTURE RESISTANT AS FOR P1 EXCEPT MOISTURE RESISTANT PLASTERBOARD ON 'WET' SIDE

FR — FR - AS FOR P1 BUT FIRE-RATED PB WALL UP TO 3700 HIGH
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AC — AC - AS FOR P1 BUT ACOUSTIC INSULATION PB WALL UP TO 3700 HIGH
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- Rw45 MINIMUM TO OFFICES
- Rw50 MINIMUM TO MEETING ROOMS
- Rw55 TO COMMON WALL OF PROCESSING BUILDING

DRAWING LEGEND

- 01 / d-G1 — DOOR NUMBER
- 18 / w-L1 — WINDOW NUMBER
- 03 / L-L1 — LOUVRE NUMBER
- COLUMN NUMBER
- W1 — WALL TYPE
- FF-FC 2400 — CEILING HEIGHT
- SFL 12.225 — STRUCTURAL FLOOR LEVEL
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WEST NOWRA RESOURCE RECOVERY PARK RECORD OF SERVICES

SERVICE/DISCIPLINE	DATE RCVD	REVISION
ARCHITECTURAL	CURRENT	-
STRUCTURAL	TBA	-
CIVIL	TBA	-
MACHINES/EQUIPMENT	TBA	-
-	-	-
ELECTRICAL LAYOUT	TBA	-
LIGHTING LAYOUT - SITE/CAR PARK	TBA	-
- PROCESSING PLANT	TBA	-
MECHANICAL LAYOUT - PROCESSING PLANT	TBA	-
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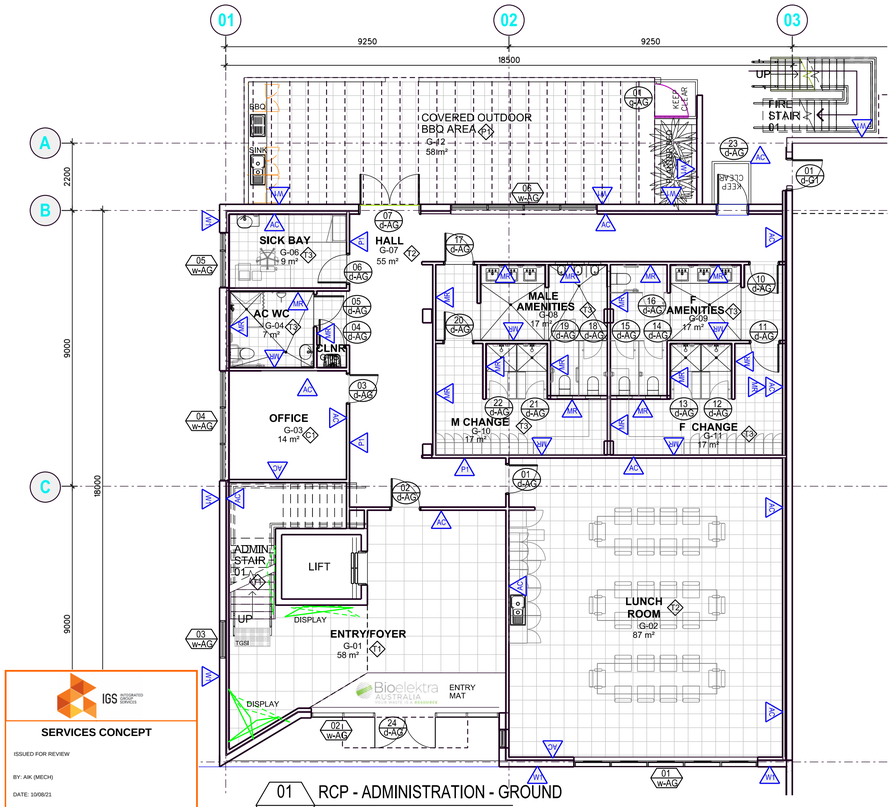
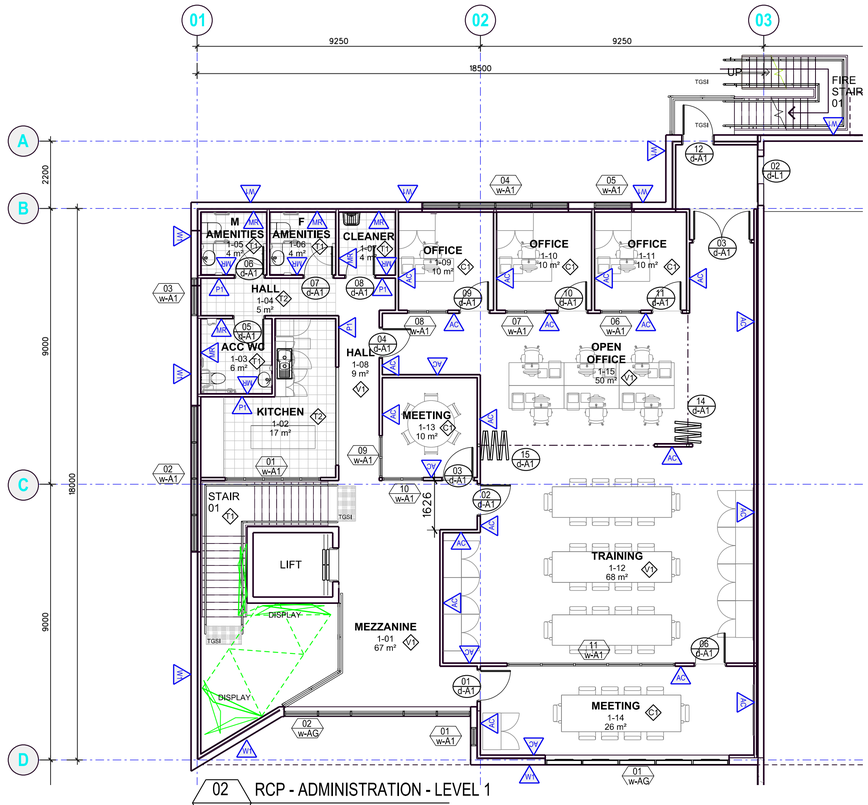
SURVEY (82-2017A)	24.05.21	-
BRIEF	FEB. 2021	B
CONCEPT	17.05.21	A
LANDSCAPE	TBA	-
SERVICE COORDINATION NOTE:		



01 - RCP - ADMINISTRATION - GROUND
SCALE 1:100



02 - RCP - ADMINISTRATION - LEVEL 1
SCALE 1:100

SERVICES CONCEPT
ISSUED FOR REVIEW
BY: AIK (MECH)
DATE: 10/08/21

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1	PRELIMINARY ISSUE	09.07.21

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EMAIL: jrb@brogans.com.au
A.B.N. 93 003 284 759

WEST NOWRA RESOURCE RECOVERY PARK
120 FLATROCK ROAD
MUNDAMIA NSW 2540

PLANS - ADMINISTRATION - GROUND, LEVEL 1 & RCP's

SCALE : 1:200
DATE : MAY 21

PROJ. NO. 1467
DRG. NO. 10-02-01
AMD NO. 1

CAD REF : Microstation V8i SS5 PROPOSED BIOELEKTRA W NOWRA, N.S.W. 1467- PLOTTED 09-July-2021

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Appendix K

Biomass testing and specification

Appendix 1 – Specification for Solid Recovered Fuel

1. Specification

The following specification forms the basis for which SRF is to be supplied to Boral. These details are subject to change to ensure compliance to regulatory requirements and the achievement of the optimum outcomes in the processing and use of SRF as agreed between the Parties.

1.1. The Supplier is responsible for sampling and testing SRF in accordance with the requirements of this Agreement.

1.2. The Supplier shall ensure appropriate regulatory approved procedures are developed, implemented and certified with the aim of qualifying the supply of SRF to Boral and assuring that SRF meets the following requirements:

- Iodine, pharmaceutical, pesticide and biocide products in any formulation except as a constituent of another material and at levels, which are minimised as far as is reasonably practical;
- Exclusion of radioactive, nuclear, hospital and clinical waste; and
- Exclusion of explosive materials including propellants and cartridges.

1.3. The Supplier shall ensure that the results for each monthly composite sample of SRF delivered under this agreement as sampled in accordance with Appendix 2, Paragraph 2 - Sampling and tested in accordance with Appendix 2, Paragraph 1 – Test Methods complies with the Specification in Table 1. – SRF Specification

1.4. The Supplier must ensure that any testing of samples required under this agreement is undertaken by analytical laboratories accredited by the National Association of testing Authorities (***NATA***) or equivalent for such testing.

Table 1. SRF Specification

Parameter[1,2]	**Specification**
Gross Calorific Value (MJ/kg)	⩾15.0
Ash	⩽15.0% m/m
Moisture (as H_2O)	⩽15.0% m/m
Chlorine (as Cl)	⩽0.2% m/m
Total Fluorine, Bromine, Iodine (as F, Br, I)	⩽0.2% m/m
Sulphur (as S)	⩽1.0% m/m
Particle size	⩽ 50 mm in any direction with >95% passing 35mm. No dimension to be >50mm.
K_2O (%)	1.0

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Parameter[1,2]	Specification
Na_2O (%)	0.5
Mercury (Hg) (mg/kg)	⩽1.2
Cadmium (Cd) (mg/kg)	⩽20
Thallium (Tl) (mg/kg)	⩽20
Total Group II metals (mg/kg) Cadmium (Cd) + Thallium (Tl)	⩽30
Copper (mg/kg)	⩽500
Lead (mg/kg)	⩽1000
Total Group III metals (mg/kg) Antimony (Sb) + Arsenic (As) + Cobalt (Co) + Copper (Cu) + Chromium (Cr) + Lead (Pb) + Manganese (Mn) + Nickel (Ni) + Vanadium (V)	⩽3000
PCB's (Polychlorinated biphenyls)	<10mg/kg
PCP's (Phencyclidines)	<100mg/kg

[1]*All parameters to be reported on an as received basis*

1.5. The Supplier is permitted for just two (2) of the gross calorific value or moisture results in any of the twelve (12) consecutive monthly composite samples to be outside the values specified in Table 1. SRF Specification but any such result must comply with the following limits:

- Gross calorific value ⩾ 12.0 MJ/kg
- Moisture (as H20) ⩽ 20.0% (m/m)

1.6. In the event that ongoing non-compliance or inconsistency occurs throughout the duration of this agreement, the parties agree to use best endeavours to work together to resolve the inconsistencies and reduce variability in the quality of the Goods delivered.

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Appendix 2 – Quality Assurance for Solid Recovered Fuel

The following information forms the basis for which testing, sampling and reporting of SRF is to be conducted for products supplied to Boral. These details are subject to change to ensure compliance to regulatory requirements and the achievement of the optimum outcomes in the processing and use of SRF as agreed between the Parties.

1. Test Methods

1.1. The Supplier shall ensure that the test methods in the Table 2 – Test Methods below are conducted in accordance with relevant Australian and International standards and used to demonstrate compliance with the Specification:

Table 2 – Test Methods

Parameter	Test Method
Gross and Net Calorific Value	EN 15400:2011
Moisture content	EN 15414:2010
Chlorine	EN 15408:2011
Sulphur	EN 15408:2011
Nitrogen	EN 15407:2011
Carbon Content	EN 15407:2011
Biomass	EN 15440:2011
Ash	EN 15403:2011
K_2O, Na_2O	EN 15410:2011
Particle Size	EN 15412-1:2011
Metals – Mercury, cadmium, thallium, copper, lead, Total Group II metals, Total Group III metals	EN 15411:2011

1.2. The Supplier shall agree in writing with Boral any changes to the test methods and procedures for testing and sampling SRF as specified in this Appendix 2 – Quality Assurance for Refuse Derived Fuel.

1.3. The Supplier shall ensure that testing of all parameters in Table 2 – Test Methods is undertaken according to the requirements and by a laboratory certified to NATA for the test procedures specified above. This requirement does not apply to samples tested as per Paragraph 2.5 and 2.6 below.

1.4. The Supplier acknowledges that Boral have the right to perform visual inspection of the material being delivered as well as monitor samples of that material at any time prior to acceptance of the Goods.

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2. Sampling

2.1 Prior to the commencement of the OPP the Supplier will be required to conduct sampling of each type of Goods to determine the characterisation of the fuel for composition and variability to ensure conformance with the Appendix 1 – Specification for Solid Recovered Fuel.

2.2 Twenty (20) Composite Samples will be collected and analysed for all parameters specified in Appendix 1 – Table 1 – Specification to establish a baseline (characterisation) data set. A ***Composite Sample*** is defined as a sample that combines four (4) discrete sub-samples of equal size into a single sample for the purpose of analysis.

2.3 The sampling will be conducted in accordance with EN14780:2011 *"Solid Biofuels – Methods for sample preparation."*

2.4 The Supplier must undertake a routine sampling process as follows;

(a) Every month, two (2) Composite Samples (one primary and one duplicate sample) will be collected from the Goods prior to despatch.

(b) Sample will be taken from a belt conveyor, falling stream or truck.

(c) The monthly samples must be taken from a batch, truckload or stockpile that has not been previously sampled, for the purpose of assessing compliance with the Appendix 1 – Specification for Solid Recovered Fuel. Every Composite Samples will be sealed and labelled. All samples collected during a month will be sent to an independent NATA accredited laboratory. The samples will be prepared with consideration for the guidance provided in EN14780:2011 "Biofuels – Methods for sample preparation". The primary Composite Sample will be tested for all parameters specified in Appendix 2 – Table 2 Test Methods using the corresponding test methods (or equivalent as agreed with Boral). The duplicate Composite Sample will l be retained as a reference for a period of three (3) months stored in a correctly labelled and suitably sealed container.

2.5 The Supplier shall ensure that the particle size analysis test is carried out at least weekly using a representative composite sample made up from the samples taken during that week and shall provide the test result to Boral by the next working day.

2.6 The Supplier shall conduct daily monitoring for CV, chlorine and moisture prior to delivery to Boral. The results from this monitoring will be available to Boral upon request and must be maintained in accordance with the Supplier's agreed QA/QC system.

2.7 The Supplier shall agree with Boral on the details for final procedures of sampling and testing SRF as part of Supplier's QA/QC system.

3. Reporting

3.1. The Supplier shall ensure that tests for all parameters in Appendix 1 Table 1 – SRF Specification are carried out on each monthly composite sample of SRF using the test methods define in Paragraph 1 – Test Methods. The Supplier shall provide Boral in writing with the individual monthly composite sample results within 21 days of the collection of the last sample within the month.

3.2. The Supplier shall provide written notification to Boral of any exceedances of the limits provided in Table 1 as soon as reasonably practicable. If an exceedance is reported for any material that has already been received by Boral from the Supplier, Boral will review

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the causes of the exceedance with the Supplier with a view to the Supplier making changes to prevent further exceedances.

3.3. Any dispute as to the quality or specification of the SRF which cannot be amicably resolved between the Supplier and Boral within 60 days either party may refer such dispute for determination by an Expert agreed between the parties. Such person shall act as expert and not arbitrator and make such determination within 20 days of his appointment and his determination shall be final and binding on both parties. The expert shall determine the issue of costs, which shall also bind the parties.

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Appendix 3 – Operational Requirements

The below Operational Requirements will be reviewed in accordance with the timeframes agreed in Part B Paragraph 9 - Operational Management Meetings.

At the commencement of the Agreement, any items without agreed specifications listed will be confirmed between the parties for the commencement of the OPP. Throughout the OPP and beyond, these operational requirements can be reviewed for compliance and suitability to the requirements of Boral. Where necessary, the below agreed specifications can be amended, as agreed between the parties, to reflect the optimal operational requirements of the operation during the OPP and beyond.

Any changes agreed in the below format will constitute an amendment to the specifications in the Agreement and will be applicable unless revised and agreed between the parties.

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Operational Management Meeting

Date:			
Location:			
Supplier Name:			
Attendees:			
Status:	On Track	At Risk	Non-compliant

Item	Criteria	Agreed Specification	Status Supplier	Status Boral	Comments or amendments agreed to specifications.
1	**Delivery and Packaging as per Part B paragraph 1.3**				
1.2	Delivery frequency and timing SRF				
1.4	SRF Packaging compliance	Loose delivered			
1.5	Delays	Nil			
2	**Product volume as per Part B paragraph 1.1**				
2.2	Quantity delivered as per weighbridge data SRF per month	Tonnes			
2.3	DIFOT	100%			

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Item	Criteria	Agreed Specification	Status Supplier	Status Boral	Comments or amendments agreed to specifications.
3	**Invoicing and Payment**				
3.1	Invoicing on time	100%	O	O	
3.2	PIFOT	30 days EOM	O	O	
4	**Testing Methods**				
4.1	Gross and Net Calorific Value	EN 15400:2011	O	O	
4.2	Moisture content	EN 15414:2010	O	O	
4.3	Chlorine	EN 15408:2011	O	O	
4.4	Sulphur	EN 15408:2011	O	O	
4.5	Nitrogen	EN 15407:2011	O	O	
4.6	Carbon Content	EN 15407:2011	O	O	
4.7	Biomass	EN 15440:2011	O	O	
4.8	Ash	EN 15403:2011	O	O	
4.9	K_2O, Na_2O	EN 15410:2011	O	O	
4.10	Particle Size	EN 15412-1:2011	O	O	
4.11	Metals – Mercury, cadmium, thallium, copper, lead, Total Group II metals, Total Group III metals	EN 15411:2011	O	O	
6	**Sampling – SRF -** In accordance with EN15442:2011 *"Solid Recovered Fuels – Methods of sampling"*				
6.1	Frequency	On a monthly basis	O	O	
6.2	Batch size	Two (2) Composite Samples	O	O	

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Item	Criteria	Agreed Specification	Status Supplier	Status Boral	Comments or amendments agreed to specifications.
6.3	Method	Two Composite Samples as per EN14780:2011 *"Solid Biofuels – Methods for sample preparation"*. The primary Composite Sample will be tested for all parameters The duplicate Composite Sample will be retained as reference for 3 months.	O	O	
6.4	Daily Monitoring	CV Chlorine Moisture	O	O	
8	**Specification – SRF as per Appendix 3**				
8.1	Gross Calorific Value (MJ/kg)	⩾15.0	O	O	
8.2	Ash	⩽15.0% m/m	O	O	
8.3	Moisture (as H_2O)	⩽15.0% m/m	O	O	
8.4	Chlorine (as Cl)	⩽0.2% m/m	O	O	
8.5	Total Fluorine, Bromine, Iodine (as F, Br, I)	⩽0.2% m/m	O	O	
8.6	Sulphur (as S)	⩽1.0% m/m	O	O	
8.7	Particle size	⩽ 50 mm in any direction	O	O	

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Item	Criteria	Agreed Specification	Status Supplier	Status Boral	Comments or amendments agreed to specifications.
		with >95% passing 35mm. No dimension to be >50mm.			
8.9	K_2O (%)	1.0	O	O	
8.10	Na_2O (%)	0.5	O	O	
8.11	Mercury (Hg) (mg/kg)	≤1.2	O	O	
8.12	Cadmium (Cd) (mg/kg)	≤20	O	O	
8.13	Thallium (Tl) (mg/kg)	≤20	O	O	
8.14	Total Group II metals (mg/kg) Cadmium (Cd) + Thallium (Tl)	≤30	O	O	
8.15	Copper (mg/kg)	≤500	O	O	
8.16	Lead (mg/kg)	≤1000	O	O	
8.17	Total Group III metals (mg/kg) Antimony (Sb) + Arsenic (As) + Cobalt (Co) + Copper (Cu) + Chromium (Cr) + Lead (Pb) + Manganese (Mn) + Nickel (Ni) + Vanadium (V)	≤3000	O	O	
8.18	PCB's (Polychlorinated biphenyls)	<10mg/kg	O	O	
8.19	PCP's (Phencyclidines)	<100mg/kg	O	O	
9	**Other**				
			O	O	

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Item	Criteria	Agreed Specification	Status Supplier	Status Boral	Comments or amendments agreed to specifications.
			O	O	
			O	O	
			O	O	
			O	O	
			O	O	

Signed as acceptance of the above information

Name	Company	Date	Signature
	Boral		
	<Vendor>		

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Biomass Sample elemental Characterisation

Contacts:

RMIT: Dr Ylias Sabri.

WD-XRF – elemental/oxides analysis

As a first characterisation, the sample was characterised for its elemental contents using Wavelength Dispersive X-ray Fluorescence (WD-XRF) which was conducted on a Bruker S4 pioneer X-ray spectrometer. The data obtained is shown in Table 1 below. It can be observed that the sample mostly contains Si, Al and Fe with the remaining mass being carbon-based materials.

Table 1: XRF data showing elemental analysis of biomass when considered in both elemental and oxide forms.

Formula	Concentration Before Vortex	Concentration after Vortex
Mg	0.14%	0.61%
Al	6.91%	9.18%
Si	9.40%	16.07%
P	0.10%	0.12%
S	0.01%	0.09%
Cl	0.07%	0.19%
K	0.12%	0.24%
Ca	0.80%	1.37%
Ti	1.22%	1.31%
Cr	0.01%	0.02%
Mn	0.13%	0.08%
Fe	8.05%	5.43%
Ni	0.01%	0.01%
Cu	0.02%	0.01%
Zn	0.01%	0.02%
Ga	0.01%	0.00%
Rb	0.00%	0.00%
Sr	0.05%	0.06%
Y	0.03%	0.03%
Zr	0.20%	0.17%
Total	27.33%	35.57%

It should be noted that the absence of an element in the table above (except for carbon) indicates its absence in the sample. Furthermore, carbon and lighter elements are not reported by XRF analysis thus the amount of each element in the whole biomass sample is expected to be significantly lower than what is reported in the table when considering the organic matter in the sample. That is, the chlorine (Cl) content (highlighted) is much lower than the 0.07% and 0.19% reported before

and after vortex processing, respectively. A more accurate Cl content can be obtained by using other standard analytical methods.

Thermogravimetric (TGA) analysis (burnable material versus ash content)

The thermogravimetric (TGA) analysis clearly shows that there is more than 60% of burnable material in the biomass, most of which would be hydrocarbons (organics). TGA analysis was performed under air atmosphere, the results of which are shown in Figure 1 below. It was found that ~60% of the sample had decomposed from the sample when under air atmosphere with 39% of the sample having remained even after a heat treatment of 850°C.

The derivative line (blue line with right axis) shows the temperatures at which the main mass loss has occurred. It can be observed that a significant mass loss occurs between 300 and 500°C that refer to hydrocarbons of different sizes being oxidized to gaseous species.

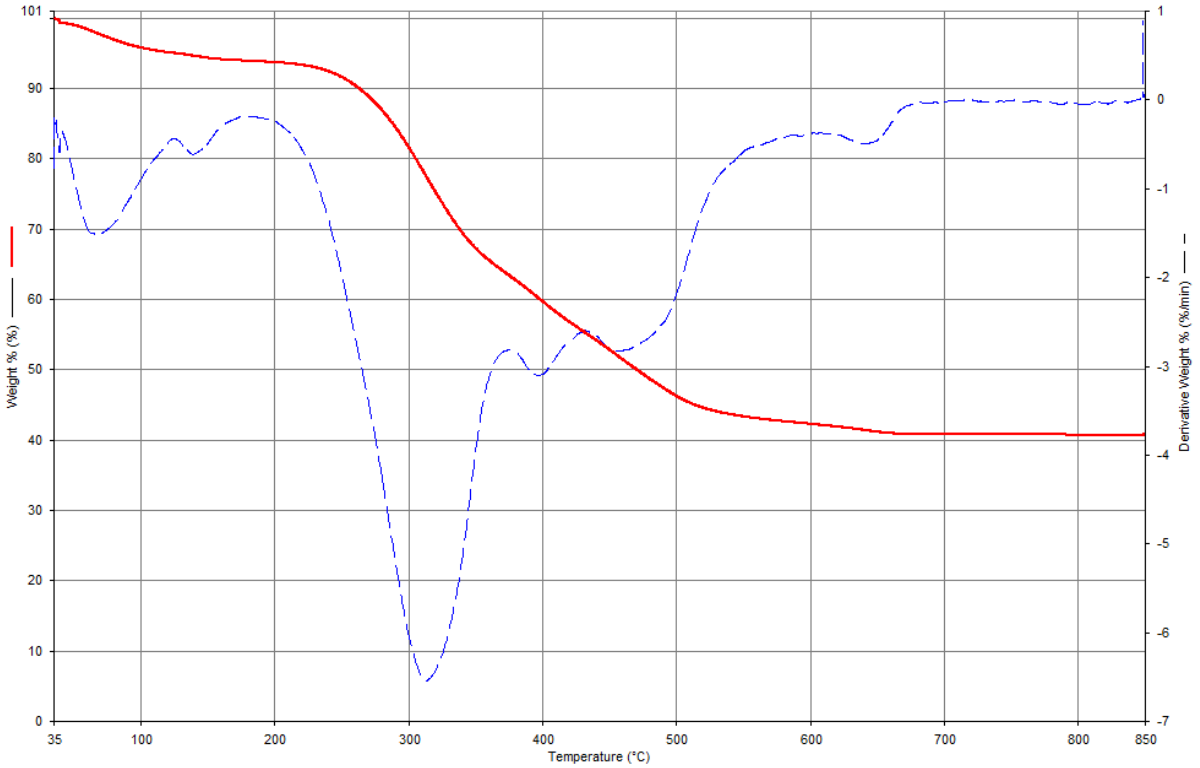

Figure 1: TGA analysis of the ground biomass material under air.

Conclusive remarks

The Cl content in the Biomass was found to be around 0.07 and 0.19% before and after vortex processing. It is recommended that further analytical methods be used to obtain a more accurate Cl level in the solid biomass material however XRF data presented here give a ballpark figure and it is expected that the real Cl levels be lower than what is reported here given that XRF does not account for the low molecular weight elements.

Biomass Sample Characterisation

Contacts:

RMIT: Dr Ylias Sabri.

UoM: Professor Priyan Mendis and Dr Massoud Sofi

On behalf of:

Bioelektra Australia Pty Ltd

1. Executive Summary

The objective of this work was to characterise the biomass sample provided by UoM. The biomass sample had little background information regarding its chemical composition. These quick tests are just to provide an idea of the contents present in the sample provided. Some of these preliminary tests and other prescribed tests should be considered in future in order to get a better understanding of the sample composition. A summary of the results is presented in the table 1 below.

Table 1: Summary of the results presented in this report

Specified Chemical or other attribute	Units	Concentration
Mercury	mg/kg	0
Cadmium	mg/kg	26
Lead	mg/kg	0
Arsenic	mg/kg	0
Chromium	mg/kg	13
Copper	mg/kg	2
Nickel	mg/kg	1
Selenium	mg/kg	0
Zinc	mg/kg	0
Other metals	mg/kg	2111
Na	mg/kg	36
Mg	mg/kg	26
Al	mg/kg	46
Si	mg/kg	273
P	mg/kg	29
S	mg/kg	42
Cl	mg/kg	89
K	mg/kg	122
Ca	mg/kg	1044
Ti	mg/kg	21

Mn	mg/kg	44
Fe	mg/kg	336
Zn	mg/kg	19
Br	mg/kg	1
Rb	mg/kg	0
Sr	mg/kg	8
Nb	mg/kg	1
Moisture content (%)	%	11
Non-decomposed solid	%	31
decomposed solid (Air, 750°C)	%	69
Crystalline substances	Yes/no	yes
pH in H_2O	pH	9.17*
Electrical conductivity (EC)	mS/cm	3.66*
Calorimetric Value	MJ/kg	12.864

* pH and conductivity were determined by dissolving 0.5g of solid in 25mL of water followed by measurements due to the nature of the sample.

1.1 Optical Characterisation

The optical image of the sample provided is shown in Figure 1.

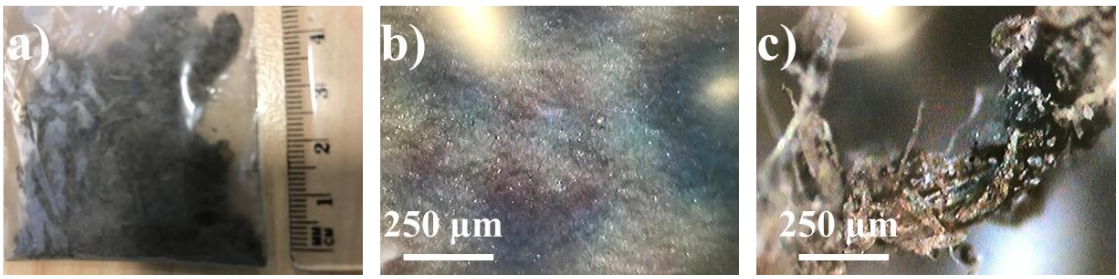

Figure 1: Optical microscope image of a) biomass sample in plastic bag, b) white paper and c) higher magnification of the biomass material on paper.

1.2 WD-XRF – elemental/oxides analysis

As a first characterisation, the sample was characterised for it's elemental contents using Wavelength Dispersive X-ray Fluorescence (WD-XRF) which was conducted on a Bruker S4 pioneer X-ray spectrometer. The data obtained is shown in Table 2 below. It can be observed that the sample mostly contains Si, Ca and Fe with the remaining mass being carbon based materials.

Table 2: XRF data showing elemental analysis of biomass when considered in both elemental and oxide forms.

Formula	Oxide Formula	Z	Concentration
Na	Na_2O	11	0.36%
Mg	MgO	12	0.26%
Al	Al_2O_3	13	0.46%
Si	SiO_2	14	2.73%
P	P_2O_5	15	0.29%
S	SO_3	16	0.42%
Cl	K_2O	17	0.89%
K	CaO	19	1.22%
Ca	TiO_2	20	10.44%
Ti	Cr_2O_3	22	0.21%
Cr	MnO	24	0.13%
Mn	Fe_2O_3	25	0.44%
Fe	NiO	26	3.36%
Ni	CuO	28	0.01%
Cu	ZnO	29	0.02%
Zn	Rb_2O	30	0.19%
Br	SrO	35	0.01%
Rb	Nb_2O_5	37	0.00%
Sr	BaO	38	0.08%
Nb	PbO	41	0.01%

It should be noted that the absence of an elements in the table above (except for carbon) indicates its absence in the sample.

1.3 GC-MS – Organic compound separation

Gas chromatography–mass spectrometry (GC-MS) was performed to identify different substances within the test sample. GC-MS was performed on a CP-3800 Saturn 2200 GC-MS with a polar column operated at 250°C. The column was an Agilent HR-GC column (DB-VRX) with a 30m length, 0.25mm diameter and 1.4µm wall thickness. The sample was first digested in dichloromethane (DCM) and separately in hexane. The GC-MS data for both solvents are shown in Figures 2 and 3, respectively. The data shows that the substances that are dissolved in each solvent have high retention times and so are expected to be of high molecular weights. There were over 14 of such substances observed in the data. The identity of each substance will require further analysis and are not conclusive in this preliminary characterisation phase.

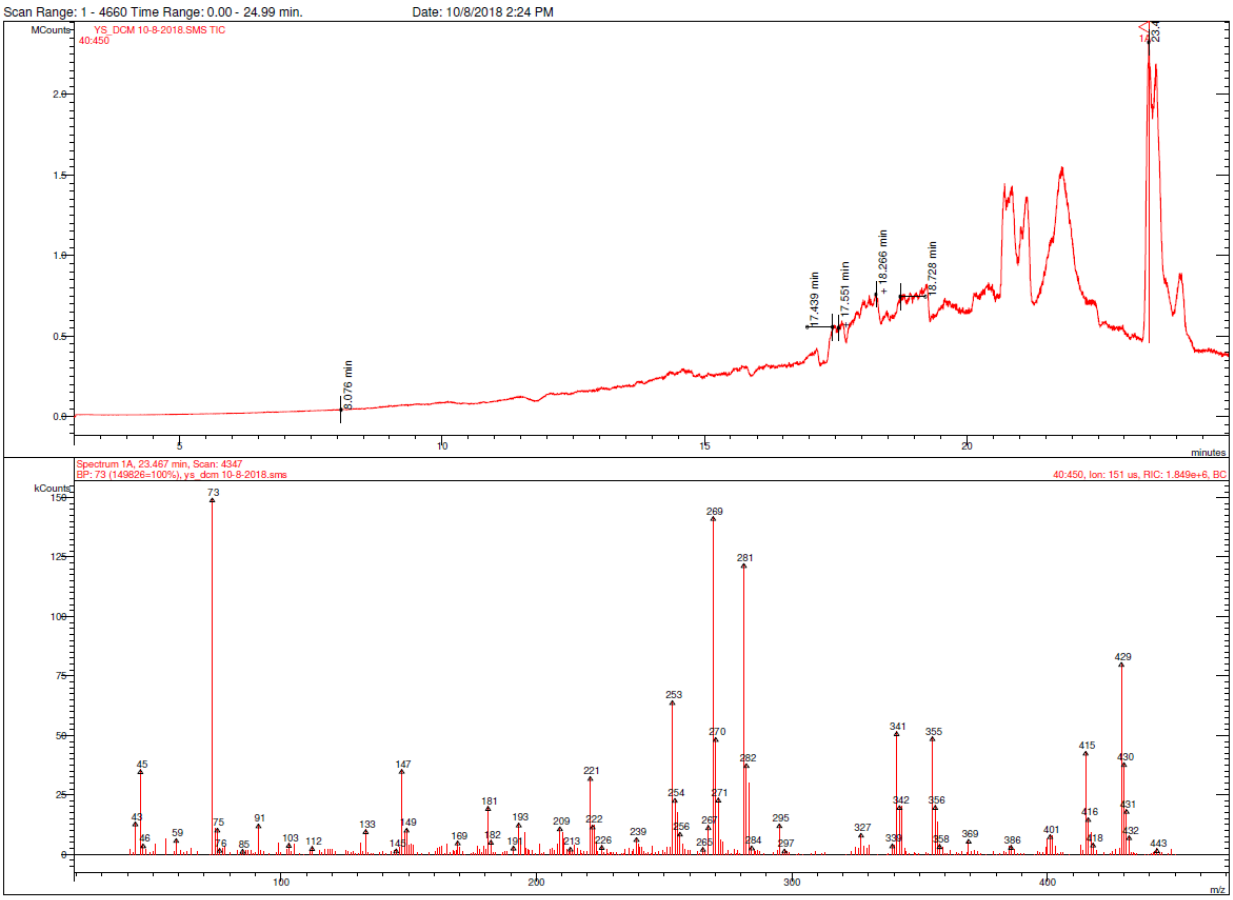

Figure 2: GC-MS of sample dissolved in DCM. The GC chromatogram is shown in the top panel and mass spectroscopy for one sample is shown in the bottom panel.

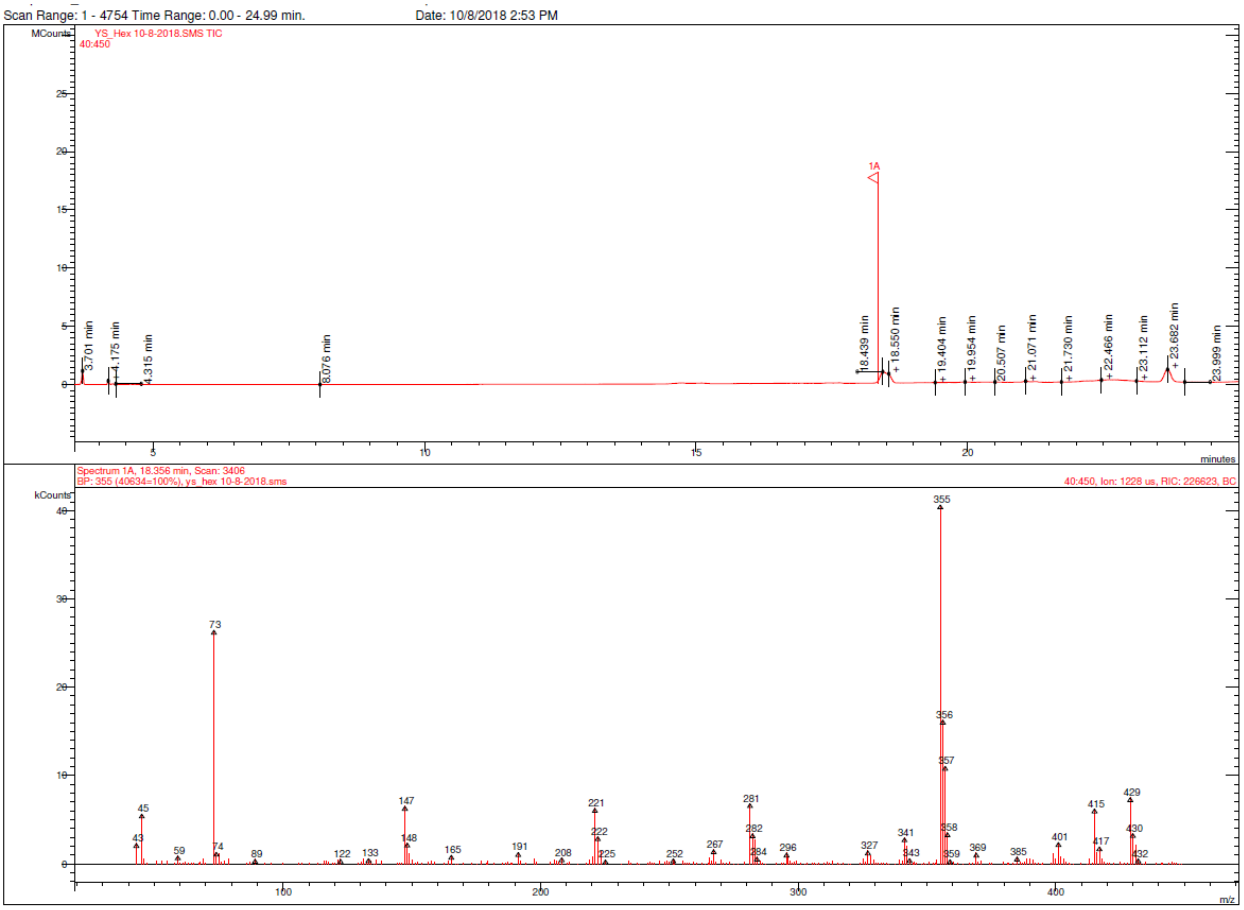

Figure 3: GC-MS of sample dissolved in hexane. The GC chromatogram is shown in the top panel and mass spectroscopy for one sample is shown in the bottom panel.

1.4 Moisture content through heat and Fourier-transform infrared spectroscopy (FTIR)

The presence of Moisture content confirmed through FTIR technique while the moisture content was determined by placing 0.766g of the sample at 105°C for 24 hours and observing the mass difference therein. Figure 4 shows the FTIR spectra of the sample where a big moisture peak observed at 3500-3300 cm^{-1} is attributed to moisture. The peaks at the lower wavenumbers represent substances with other functional groups. A library search is required to confirm these functional groups. For example, the peaks at 1020-1220 cm^{-1} could be attributed to alkyl amines whereas the strong peak at 1026 cm^{-1} can be attributed to C-O functional groups. The strong peak at 1420 cm^{-1} could be attributed to alkanes. Further library research and analysis is required to confirm the presence of other functional groups.

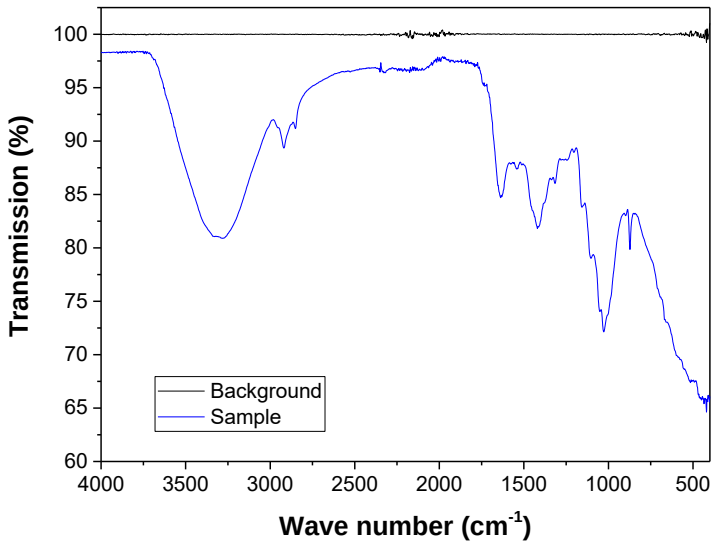

Figure 4: ATR-FTIR spectra of the sample provided.

Once the presence of moisture was confirmed, the quantity of moisture was measure by heating the sample and observing the mass difference. The data from the experiment is shown in Table 3. Assuming all mass lost was due to moisture (accepted in usual biomass moisture tests), then the moisture content of the sample is observed to be 11.0%.

Table 3: mass difference of sample through heating at 105°C over 24 hour period.

Sample	Mass (mg)	Mass of moisture (mg)	% moisture
Crucible	31303.0		
Crucible + sample before heating	32068.5		
Crucible + sample after heating	31984.0	84.5	11.0

1.5 Sample degradation through heat and thermal gravimetric analysis analysis (TGA)

It is expected that most organic and volatile substances would decompose at high temperatures. Therefore the sample provided was heated to 750°C for 10 hours in air in order to observe the amount of material that would left behind after such intense sintering process. The data is presented in Table 4 below. It is observed that 61% of the material is decomposable while the rest 39% was stable even after intense heat treatments.

Table 4: mass difference of sample through intense heating at 750°C over a 10 hour period.

Sample	Mass (mg)	Mass of material	% of material decomposed

		decomposed (mg)	
Crucible	31303.0		
Crucible + sample before heating	31752.8		
Crucible + sample after heating (3h)	31478.2	175.2	61.0
Crucible + sample after heating (10h)	31478.2	0	0

In order to find out the content of material that would degrade and leave the sample in the absence of oxygen, TGA analysis was performed under nitrogen atmosphere, the results of which are shown in Figure 5 below. It was found that similar amounts of sample had left the sample when under nitrogen atmosphere as when under air atmosphere with 39% of the sample having remained even after a heat treatment of 850°C.

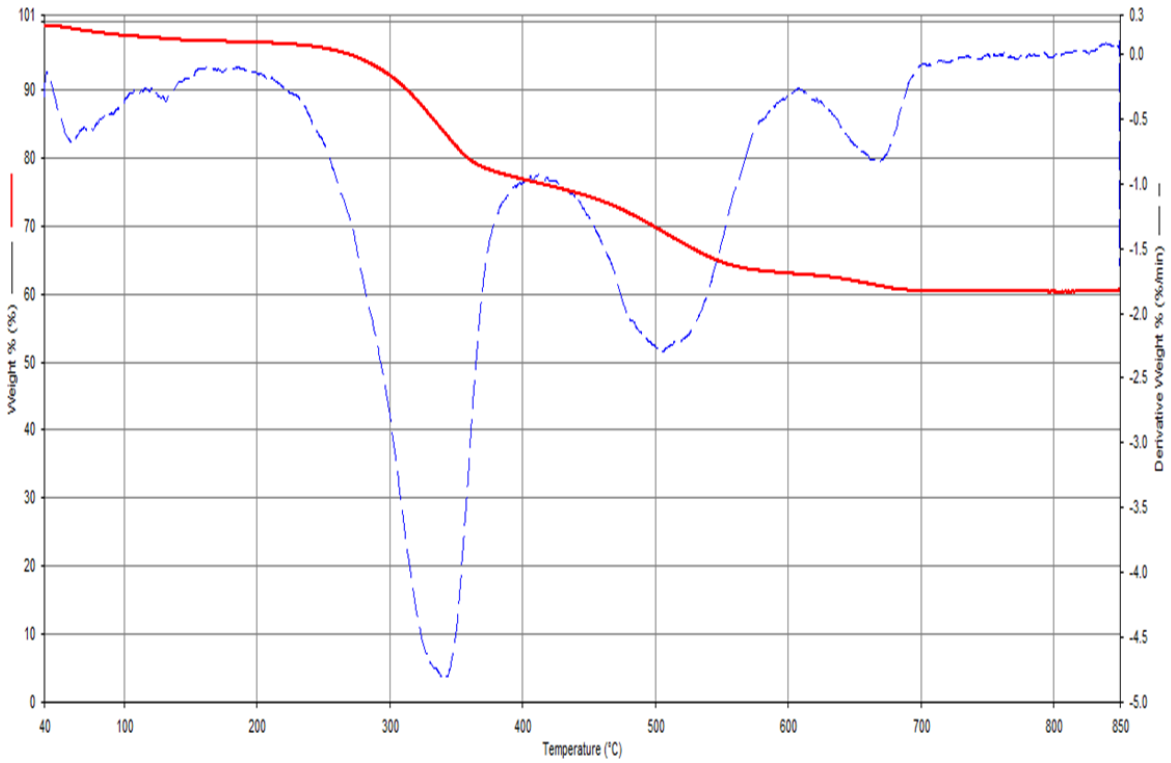

Figure 5: TGA analysis of the "as is" biomass material under nitrogen gas.

The derivative line (blue line with right axis) shows the temperatures at which the main mass loss has occurred. It can be observed that a significant mass loss occurs between 300 and 500°C.

In order to obtain a better understanding of the amount of material that decompose off the material, the sample was ground up to fine particles. It was observed that the

moisture content contributed to the sticking of the finer particles. The ground sample was then analysed by TGA under both N_2 gas and air. The results are presented in Figures 6 and 7, respectively.

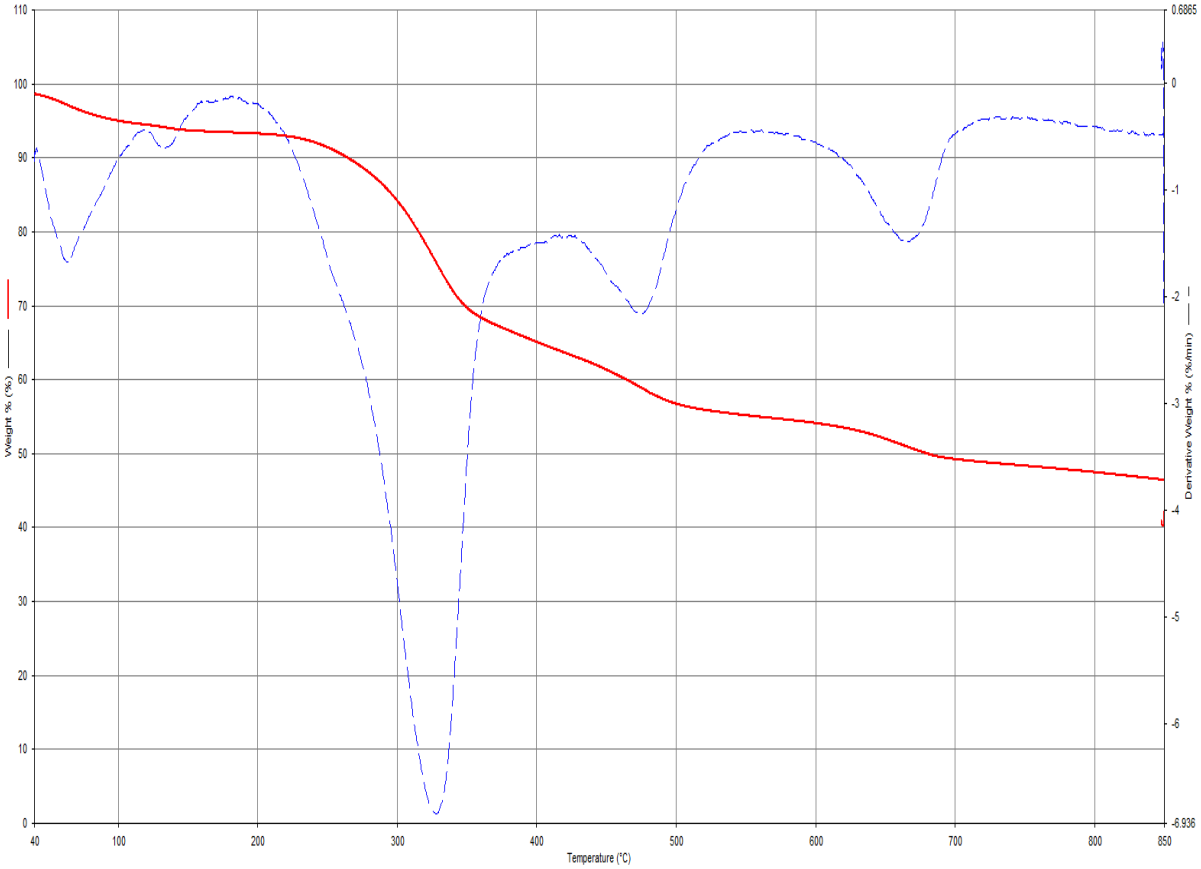

Figure 6: TGA analysis of the ground biomass material under nitrogen gas.

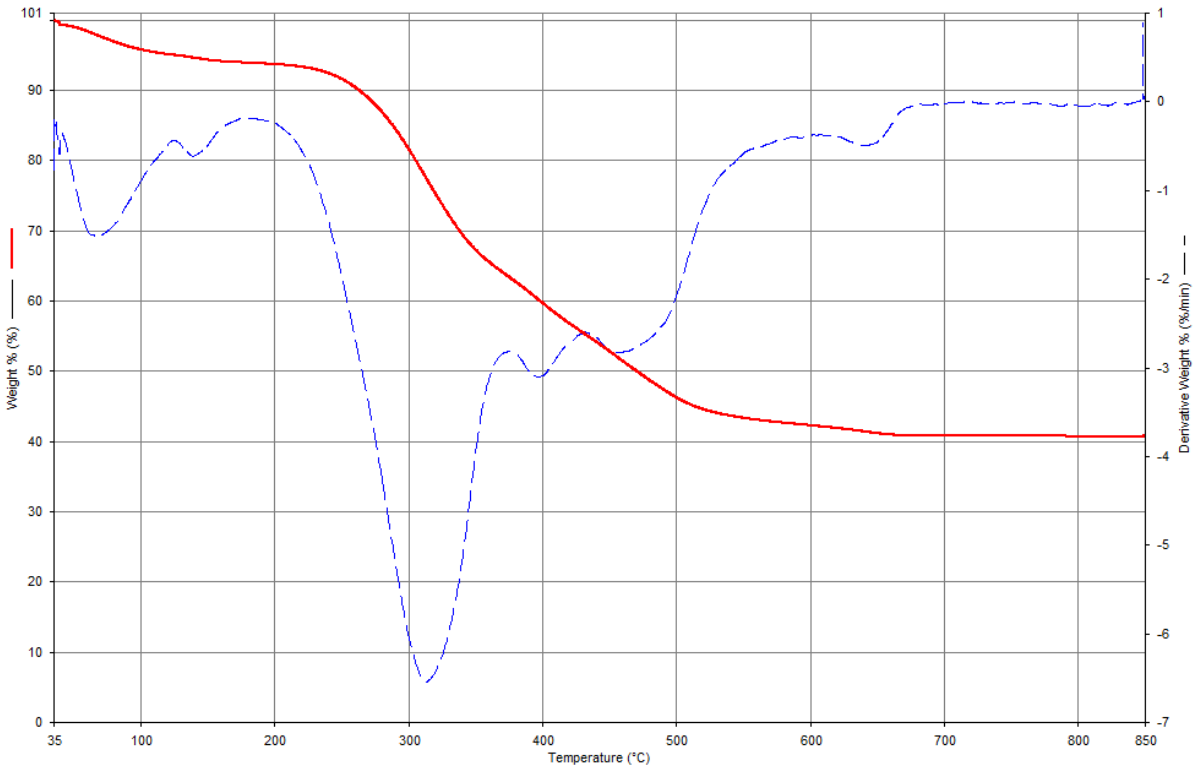

Figure 7: TGA analysis of the ground biomass material under air.

1.6 Crystal components presence in the sample with X-ray diffraction (XRD)

In order to determine if any crystalline material are present in the "as is" sample, it was characterised by XRD using the Bruker D4 Endeavour system. The data is shown in Figure 8 below. It can be observed that crystalline substances are present in the material. A quick library search showed the presence of CaO, Fe_2O_3 and $Ca_4Fe_9O_{17}$. There are additional crystalline substances present however a thorough analysis is required to determine their identity.

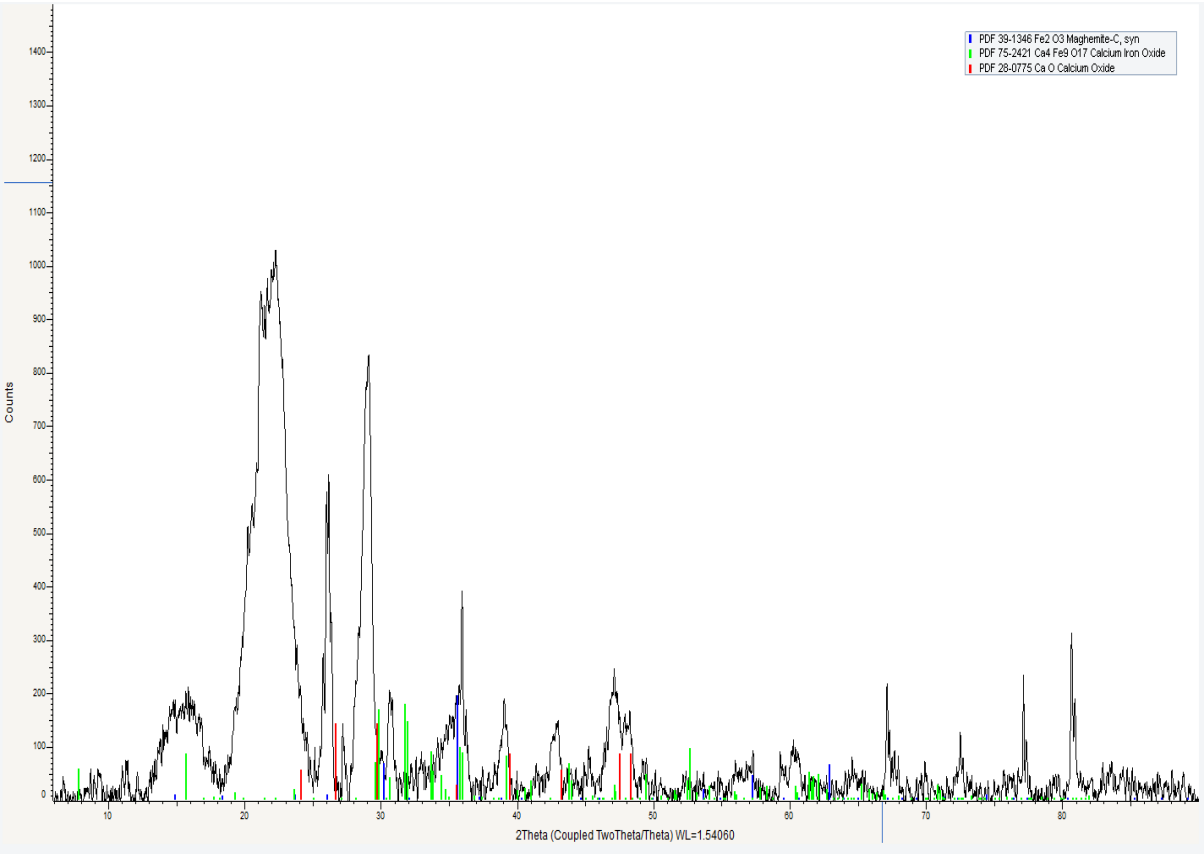

Figure 7: XRD analysis of the biomass material.

1.7 Proportion of dissolvable solids in aqua regia

In order to determine how much metals actually leach out of the sample, 195mg of the sample was dissolved in aqua regia solution (1:3 volume ratio of concentrated acids of HNO_3:HCl) for a 24 hour period. The concentration of each metal dissolved in the mixed acid is shown in Table 5 below.

Table 5: MPAES when digesting 195mg of sample in aqua regia for a 24 hour period.

Formula	Concentration Wt%	Formula	Concentration Wt%
Se	0.09	U	0.17
Zn	0.07	Tl	0.00

Cd	0.06	Th	0.00
V	0.01	Pb	0.05
Ca	0.54	U	0.08
Ag	0.01	Tl	0.04
Fe	0.16	K	0.08
Ba	0.01	Mo	0.02
Ni	0.02	Mg	0.08
Cu	0.02	Mn	0.32
Ni	0.01	Cr	0.03
As	0.28	Mg	0.07
Sb	0.25	Al	0.26
Be	0.00	Na	0.05
Co	0.04	Hg	0.00

1.8 Calorimetric value

Calorimetry is performed with a calorimeter to measure the heat evolved from the sample when undergoing combustion reaction. Approximately 0.53g of the sample was combusted a calorimetric value of 12.8643 MJ/kg was obtained.

2. Further tests under way

It is suggested that the following tests be considered to further confirm the data presented and/or obtain more information from the sample.

CHNS analysis will provide that amount of C, H, N, S in the sample

TOC analysis will provide the total organic carbon in the sample

ICP-MS will provide quantitative analysis of the sample for a variety of different elements.

These are only some of the techniques that are prescribed to further understand the matrix of the unknown sample.

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LABORATORY OF FUELS AND ACTIVATED CARBONS

AB 081

RAPORT OF TESTING No: 378/LP/2016

Client:	Bioelektra Group Spółka Akcyjna, ul. Książęca 15, 00-498 Warszawa
Number of a contract/order:	ZR/ZL/12/2016 from 18.03.2016
Description and number of sample:	RDF "light" fraction, waste code 19 12 10, daily sample, sample No. LP/337/16.
Date of sample delivery:	25.03.2016
Date of testing performance:	30.03– 19.04.2016

Test name	Symbol	Unit	Value	Uncertainty ±
Total moisture content CEN/TS 15414-1:2010	M_{ar}	%	**34,3**	**0,3**
Moisture content air-dried basis PN-EN 15414-3:2011	M_{ad}	%	**3,9**	**0,2**
Ash content in dry basis[1)] PN-EN 15403:2011	A_{db}	%	**31,0**	**0,4**
Volatile matter content in dry basis PN-EN 15402:2011	V_d	%	**60,4**	**0,7**
Gross calorific value in dry basis PN-EN 15400:2011	$q_{v,gr,d}$	J/g	**16156**	**183**
Net calorific value in as received basis PN-EN 15400:2011	$q_{p,net,ar}$	J/g	**9048**	**188**
Total sulphur content in dry basis PN-EN 15408:2011	$w_{S,d}$	%	**0,65**	**0,08**
Total carbon content in dry basis PN-EN 15407:2011	C_d	%	**39,3**	**0,6**
Total hydrogen content in dry basis PN-EN 15407:2011	H_d	%	**5,14**	**0,14**
Nitrogen content in dry basis PN-EN 15407:2011	N_d	%	**1,19**	**0,09**
Bulk density in received basis * PN-EN 15103:2010	BD_{ar}	[kg/m^3]	**240**	
Bulk density in dry basis * PN-EN 15103:2010	BD_d	[kg/m^3]	**160**	

[1)] Determination of ash content was carried out in temperature 550°C.

Test name	Symbol	Unit	Value	Uncertainty ±
Moisture content air-dried basis Q/LP/18/A:2011	W^a	%	**4,0**	**0,1**
Chlorine content air-dried basis Q/LP/24/A:2011	Cl^a	%	**1,028**	**0,072**
Chlorine content in dry basis Q/LP/24/A:2011	Cl^d	%	**1,071**	**0,072**
Fluorine content air-dried basis * PN-82/G-04543	F^a	%	**0,007**	

*** Determination not currently defined in the scope of accreditation.**

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Test name		Symbol	Unit	Value	Uncertainty ±
Ash chemical composition [2)] Q/LP/65/A:2014	Silicone dioxide content	SiO_2	%	**39,82**	**1,10**
	Dialuminium trioxide content	Al_2O_3	%	**9,89**	**0,19**
	Diiron trioxide content	Fe_2O_3	%	**3,39**	**0,19**
	Calcium oxide content	CaO	%	**19,01**	**1,30**
	Magnesium oxide content	MgO	%	**2,25**	**0,10**
	Tetraphosphorus dekaoxide	$P_4O_{10}(P_2O_5)$	%	**1,55**	**0,09**
	Sulphur trioxide content	SO_3	%	**4,25**	**0,09**
	Trimanganesse tetraoxide content	Mn_3O_4	%	**0,15**	**0,02**
	Titanium dioxide content	TiO_2	%	**1,01**	**0,04**
	Barium oxide content	BaO	%	**0,15**	**0,01**
	Strontium oxide content	SrO	%	**0,10**	**0,01**
	Disodium oxide content	Na_2O	%	**4,35**	**0,09**
	Dipotassium oxide content	K_2O	%	**2,46**	**0,11**

Test name			Symbol	Unit	Value	Uncertainty ±
Ash fusion temperature *[2)] CEN/TS 15404:2006	Oxydising atmosphere	Shrinking temperature	ST	°C	**1160**	
		Deformation temperature	DT	°C	**1170**	
		Hemisphere temperature	HT	°C	**1180**	
		Flow temperature	FT	°C	**1190**	
	Half-reduction atmosphere	Shrinking temperature	ST	°C	**1100**	
		Deformation temperature	DT	°C	**1130**	
		Hemisphere temperature	HT	°C	**1160**	
		Flow temperature	FT	°C	**1180**	

*** Determination not currently defined in the scope of accreditation.**

[2)] Ashing of the test piece was performed in the Laboratory of Fuels and Activated Carbons in the temperature of 550°C.

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Number of a contract/order:	ZR/ZL/12/2016 from 18.03.2016
Description and number of sample:	RDF "light" fraction, waste code 19 12 10, daily sample, sample No. LP/337/16.
Date of sample delivery:	25.03.2016
Date of testing performance:	30.03– 19.04.2016

Test name		Symbol	Unit	Value	Uncertainty ±
Trace elements in dry basis * Q/LP/66/A:2014	Arsenic content	As	mg/kg	**5,28**	
	Cadmium content	Cd	mg/kg	**1,27**	
	Cobalt content	Co	mg/kg	**7,02**	
	Chrome content	Cr	mg/kg	**113**	
	Copper content	Cu	mg/kg	**64,9**	
	Manganese content	Mn	mg/kg	**337**	
	Molybdenum content	Mo	mg/kg	**3,85**	
	Nickel content	Ni	mg/kg	**33,9**	
	Lead content	Pb	mg/kg	**18,0**	
	Antimony content	Sb	mg/kg	**11,4**	
	Vanadium content	V	mg/kg	**14,6**	
	Zinc content	Zn	mg/kg	**419**	
Trace elements in dry basis Q/LP/54/A:2011	Mercury content	Hg	mg/kg	**0,263**	**0,042**

*** Determination not currently defined in the scope of accreditation.**

Reproducibility of individual parameters testing results is consistent with requirements of standards and procedures according to which these parameters are determined. Extended uncertainty of the test is estimated for confidence level 0.95. Measurement uncertainty does not include a component on the sampling process.

The comments about the sampling:
Sampling place: Zakład Mechaniczno-Cieplnego Przetwarzania Odpadów w Różankach.
Sampling protocol No. 2 from sample collection. Sampling in accordance with PN-EN 15442:2011 and PN-EN 15445:2011 (according to research training conducted by IChPW in 14th of July 2015). Sampling date: since 21th to 22th of March 2016.
Sampling protocol No. 6 from sample collection. Orderer did not provide information about sampling method.
Sampling date: since 23th to 24th of March 2016.

Other comments: Sample delivered in two bags. Averaging (equalization) of sample from 2 bags was conducted in Laboratory of Fuels and Activated Carbons, IChPW.

Presented results of tests are related only to testing objects mentioned in the Report. The Report cannot be copied in another way than as a whole without written permission of the Laboratory.

Verified by:
Instytut Chemicznej Przeróbki Węgla
Centrum Badań Laboratoryjnych
20.04.2016 Giesa
Z-ca Kierownika Laboratorium
Nina Bątorek-Giesa
(name, date, signature)

Authorized by:
Instytut Chemicznej Przeróbki Węgla
Centrum Badań Laboratoryjnych
20.4.16
Kierownik Laboratorium
dr **Łukasz Smędowski**
(name, date, signature)

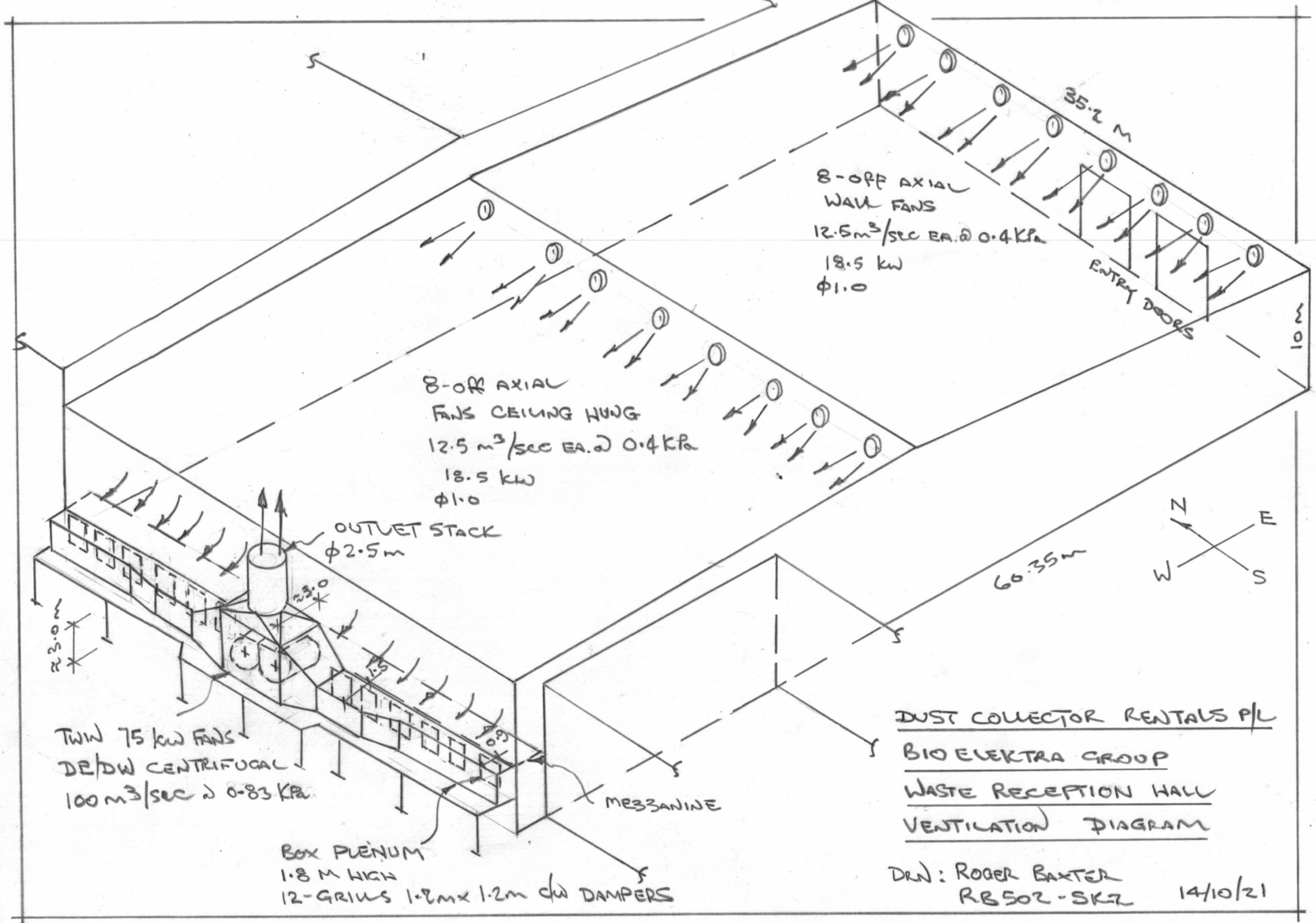
Bioelektra Group Rozanki Plant Poland

Waste morphology 2019

Fraction Type	Average % 2019
Aluminium	0.52%
Ferrous metals	2.30%
Polypropylene (PP)	1.03%
PET	2.20%
Glass	2.99%
Organic fraction	35.23%
Paper and carton	14.30%
Textiles & rubber, hygienic items, solid flammable (wood)	21.65%
Minerals (stone, sand)	4.10%
Non-recyclable plastics (films, foils)	8.68%
Other	7.00%
TOTAL	100.00%

Appendix L

Odour control system design



DUST COLLECTOR RENTALS P/L

BIO ELEKTRA GROUP

WASTE RECEPTION HALL

VENTILATION DIAGRAM

DRN: ROGER BAXTER
RB502-SK2 14/10/21

EXHAUST SYSTEM CALCULATION

Site: Dust Collector Rentals Bioelektra | **System:** | **Date: 14.10.21**

									Length of Duct in Metres					Resistence mm wg					Resistence mm wg	
Duct No			Duct Size	Equal Round Duct	Duct Area m^2	Air Vol Ltrs/sec		Velocity m/sec	Straight Runs	No Elbows	No Entries	Equiv Length	Total Length	Formula per m	Of Run	One VP	Entry Loss VP	Hood Suct VP	Hood Suct	Static Press	Gov Press
1		Air Grill																		10.0	10.0
2		Outside box plennum right	1800x900	1400	1.5394	25000		16.24	9.0	1	0	47.0	56.0	0.1529	8.6	16.1	0.5	1.5	24.2031	32.8	42.8
3		Inner box plennum right	1800x1500	1800	2.5447	50000		19.65	8.0	1	1	79.0	87.0	0.1616	14.1					14.1	56.8
4		Air Grill																		10.0	
5		Outside box plennum left	1800x900	1400	1.5394	25000		16.24	9.0	1	0	47.0	56.0	0.1529	8.6	16.1	0.5	1.5	24.2031	32.8	
6		Inner box plennum left	1800x1500	1800	2.5447	50000		19.65	8.0	1	1	79.0	87.0	0.1616	14.1					14.1	
7		Fans 2 off				100000															
8		Discharge Stack		2500	4.9087	100000		20.37	8.0	0	0	0.0	8.0	0.1160	0.9					0.9	57.8
9		Allowance																		25.0	82.8
		Fan duty 2 x 50000 l/sec @ 83mm Wg																			
		Consumed power 58Kw @70% efficiency																			

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