JACKSON
ENVIRONMENT AND PLANNING
STRATEGY | INFRASTRUCTURE | COMPLIANCE | PROCUREMENT

19th October 2021

Brett Nudd
Manager Regional Operations
Locked Bag 5022
Parramatta
NSW 2124 Australia

Dear Mr Nudd,

Re: Concurrence and Referral (CNR) CNR-24666 application 10.2021.364.1 at 45 Wallum Place Byron Bay NSW 2481.

On behalf of Byron Shire Council, Jackson Environment and Planning are pleased to provide you with a response to your letters dated 6th August 2021 (DOC21/578253-27) and 10th August 2021 (DOC21/578253-29). Our responses are compiled in a summary table with supporting information included in the attachments.

We trust that this will address the questions that EPA raised in its letters. Should you have any questions or require further clarifications regarding these responses or the attached information, please feel free to contact us via the NSW Planning Portal communications tool.

Yours sincerely,

Angus Johnston B.Eng. (Hons), Masters Environmental Management (UNSW)
Principal Consultant
Jackson Environment and Planning Pty Ltd
Suite 102, Level 1, 25-29 Berry Street
North Sydney NSW 2060

Enclosures:
Attachment 1 – Table of Responses
Attachment 2 – Construction Soil and Water Plan (MPC)
Attachment 3 – Acid Sulfate Soil Management Plan
Attachment 4 – Operational Road Traffic Noise Assessment
Attachment 5 – Updated EIS Section 11.3.6
Attachment 6 – Letter from Trinity Consulting
Attachment 7 – Letters from Suppliers (Bekon and 2G)

Attachment 1 – Table of Responses

Issue	No.	EPA Comment	Response / How Addressed
EPA Letter (DOC21/578253-27) Dated 6 August 2021			
Acid Sulphate Soils (ASS)	1	1. The Applicant is asked to provide details of the acid sulphate soil neutralisation treatment methodology, which should include, at a minimum: a) location and size of the neutralisation area footprint b) details of the lined treatment pad (composition, thickness (mm), in situ hydraulic conductivity) (mm/sec)) c) preliminary designs for leachate management infrastructure (bunds, collection pits, drains, storage tanks) d) water treatment measures e) management measures to avoid and minimise discharges (e.g., disposal to sewer at the adjacent Byron Bay Sewage Treatment Plant or at a licensed facility).	It is expected that screw pile foundations will be used. This will reduce bulk excavations at depth and the likelihood that any ASS or acidic groundwater will need to be treated. If ASS is found during excavation, it will be treated within a designated treatment pad area. Leachate and/or runoff from rainfall will be captured in a lined basin and pumped out to a mobile tanker for disposal to a suitably licenced facility. The ASS treatment pad size and location, including retention on site of a 100yr storm event is noted in the updated construction soil and water management plan (CSWMP) prepared by MPC (Attachment 2). The Acid sulphate Soil Management Plan (ASSMP) (Attachment 3) has been updated by Douglas Partners to provide details of the treatment methodology. Any contaminated water will be captured and retained on-site, pumped out and disposed of to a suitably licensed facility.
		2. If discharges are still required, a water pollution impact assessment is required to inform licensing considerations consistent with s45 POEO Act (see below under stormwater discharges).	If treatment of ASS is required during bulk excavations, then stormwater runoff and leachate captured during this treatment will be pumped out for disposal to a suitably licensed facility. No discharge to the environment/adjacent ground surfaces will be required during bulk excavation and treatment of ASS.
Stormwater Discharges	2	1. The Applicant is asked to provide details of mitigation measures to avoid and minimise discharges. The considerations may include but not be limited to:	Details of mitigation measures to avoid discharges are provided in the updated ASSMP and CSWMP. Any contaminated water retained on-site will be pumped out and disposed to a suitably licensed facility.

Issue	No.	EPA Comment	Response / How Addressed
		a) at-source controls to prevent or reduce pollutants from entering stormwater runoff (e.g. removal of highly contaminated material for off-site disposal, bunding) b) enhanced erosion and sediment controls c) options to avoid contaminated stormwater discharges (e.g., disposal to sewer at the adjacent Byron Bay Sewage Treatment Plant, offsite disposal at a licensed facility, reuse where it is safe and practical to do so) d) increased sizing of sediment basins where practicable.	Details have been provided for retention and control of up to and including the 100yr storm event on site via a basin with an adequately sized perimeter bund. All runoff captured during bulk earthworks and ASS treatment will be pumped out for disposal to a suitably licensed facility. As stated in the EIS, an Unexpected Finds Protocol will be included in the CEMP prepared for the project in the event any contaminated soil material is found that is not ASS, or ASS which is also contaminated (e.g. with hydrocarbons). This material would be removed, contained, and disposed of to a facility licensed to accept it.
		2. If construction stage stormwater discharges are unavoidable following further consideration of mitigation measures, a water pollution impact assessment commensurate with the potential risk and consistent with the national Water Quality Guidelines will be required to inform licensing considerations consistent with Section 45 of the Protection of Environment Operations Act 1997. The Assessment must at a minimum: a) predict the expected frequency and volume of discharges b) characterise the quality of any discharges in terms of the concentrations of all pollutants present at non-trivial levels c) assess the potential impacts of the proposed discharges on the environmental values of the receiving waterways consistent with the Australian and New Zealand Guidelines for Fresh and Marine Water Quality (ANZG, 2018) for high conservation/ecological value ecosystems d) demonstrate that all practical and reasonable measures to avoid or minimise water pollution are considered and implemented e) propose appropriate discharge criteria based on the potential water quality impacts and the practical measures available to minimise pollution (e.g. treatment performance).	Due to the controls proposed, the risk that contaminated stormwater will be discharged to adjacent sensitive environments is insignificant. Our rationale is: • The highest risk of contamination occurs during cut and fill • The cut to fill phase is expected to take no more than 2 weeks • Groundwater is at 1.4m (Bore 8) and 1.1m (Bore 11) below ground surface, while most of the excavation will be <1m • Cut >1m occurs mainly adjacent to existing STP infrastructure, which is on ground at a higher RL due to previous construction and fill and, therefore, is highly unlikely to encounter groundwater • Rainfall runoff and leachate collected during ASS treatment, and any contaminated groundwater collected during cut and fill, will be pumped out for disposal to a suitably licensed facility. • Upon completion of cut and fill phase, and after all necessary treatment of ASS is complete, the

Issue	No.	EPA Comment	Response / How Addressed
			construction site will retain the perimeter bunding along with the ability to retain the 100yr storm event. Minimal areas of soil will be exposed since most of the footprint will be covered with pavement or foundations. At this point, the possibility of contaminated water retained onsite is insignificant. Only then will water retained onsite be tested and discharged per standard Blue Book water quality requirements.
Leachate Management	3	1. The Applicant is requested to provide details on how any leachate generated onsite will be managed during operation s.	Refer to section 2.4.9 of the EIS. Leachate (also known as percolate) from both aerobic and anaerobic processes can be stored in the percolate tank (600 m^3 capacity). The process is designed for zero liquid discharge, however, in the unlikely event that excess leachate is generated by the process, it will be pumped out from the percolate storge tank and treated at a suitably licensed facility. All waste will be enclosed in a shed/tunnel or covered by a roof so rainfall will not generate leachate. Leachate generated in the receival hall (seepage from delivered materials) will be contained in the hall by bunding, collected in the receival hall pump sump, and reused in the process. In the unlikely event of a fire, firewater will be contained in the receival hall and pumped out and treated at a suitably licensed facility. By design, the Receival Hall does not drain to the external stormwater sump.
Operational Road Traffic Noise	4	1. The Applicant is requested to provide details to address the potential for night time impacts from road traffic noise on Wallum Place.	Council is not seeking to have any part of the operations (including vehicle movements) occur before 7am or after 5pm. No light or heavy vehicle movements relating to the BEF will occur prior 7 am or after 5pm. If desired by EPA, this condition can be clarified in the General Terms of Approval.
		2. The Applicant is requested to review the traffic volumes, on Wallum Place on sections either side of Gallagher Street and	Data has been obtained on traffic volumes for Wallum Place below Gallagher Street. Waves have updated the operational

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		Porter Street together, with the times of use of Wallum Place and the operational road traffic noise assessment updated accordingly.	road traffic noise assessment with this additional data (see Attachment 4, Section 6.2). The increase in traffic noise remains less than 2 dB.
Construction Noise Assessment	5	1. The Applicant is requested to review and update the construction noise assessment to address the disparity between truck numbers in the NIA and EIS and the comments on the operational road traffic noise assessment.	The truck numbers and related assessment in the NIA are correct. Section 11.3.6. of the EIS has been updated and is attached (see Attachment 5).
		2. The Applicant is requested to review and amend the management and mitigation of construction noise to include further investigation of reasonable and feasible mitigation measures (where details are not known, a conceptual assessment would be sufficient) to satisfy the ICNG.	All construction will occur during standard daytime hours. The construction NML exceedances are short-term, small (i.e., ≤ 3dB at a very few receivers) and represent a minor noise impact on the community. The standard mitigation measures proposed during the construction phase are the reasonable and feasible measures required for this project as per the guidance in the ICNG given the minor NML exceedances. As stated in the EIS, noise levels are well below 75 dB LAeq,15m at any receivers. Therefore, no receivers are predicted to be highly noise affected as per the ICNG. However, it should be noted that the following mitigation will also be implemented: • Noise mitigation measures will be discussed on-site with construction workers over pre-start toolbox. • Prior to and during construction, outreach to potentially impacted residents will be undertaken to clearly explain the duration and noise level of the works. • If there are complaints concerning noise once construction has started, the issue will be discussed with the foreman and plant operators, the source of the potentially offending noise identified, and other reasonable and feasible options for mitigation identified

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			and implemented (e.g., potential respite or alternating/modified equipment usage). • A copy of the complaints register will be kept on site.
EPA Letter (DOC21/578253-29) Dated 10 August 2021			
Air Quality Impact Assessment (AQIA)	1	The proponent should confirm that peak to mean ratios were used in the modelling.	We confirm that peak to mean ratios were used in the modelling.
	2	EPA requests the proponent provides information regarding the risk of odour emissions from the building when doors are open, including how these will be managed if they become problematic once operational.	Maintaining negative pressure relies on the doors staying closed except when vehicles move through them. Fast acting roller doors will open and close in <20 seconds, opening and closing when a truck enters and then again when it leaves. At capacity, the BEF will receive an average of 8 trucks per day. Most of the output product will be dispatched in bulk from the site by back-haul on the trucks that deliver shredded garden organics (2 trucks per day). Allowing for some transfers between the Receival Hall and the former Biosolids Storage Area we expect the door to open and close up to 40 times per day, which is 5 times per hour. It will therefore be open for <2 min each hour and never outside of operating hours. In the highly unlikely event that odour emissions become problematic, we will: 1) install an industrial air curtain; and 2) increase the number of air changes per hour in the receival hall. If the increased airflow through the biofilter causes odour issues we will implement the biofilter contingency measures already proposed in Table 6.5 of the EIS.
	3	EPA requests the proponent clarifies whether the flowrate to the biofilter used in the AQIA includes air flow from the aerobic tunnels. If the odour emission rate is increased, the assessment should be revised.	The flowrate to the biofilter used in the AQIA includes air flow from the aerobic tunnels. Air for the tunnels comes from the Receival Hall and is factored into the 3 air changes

Issue	No.	EPA Comment	Response / How Addressed
			per hour, so it doesn't increase the overall flowrate to the biofilter. There is no need to revise the assessment.
	4	The EPA request the proponent to provide further information on the design of the process including clarification on how purged air is managed and/or treated. Where purged air is not proposed to be treated, the AQIA should be revised.	The purged air is not released untreated. It is displaced and managed across 4 phases as follows: 1) As feed to the Combined Heat and Power gas engine; 2) Flaring; 3) Directly to the Biofilter; and 4) Into the Receival Hall and then into the Biofilter, when vessel doors are opened during the normal process. The quantity of gas going to the biofilter and flare is very small (insignificant) and, therefore, does not need to be included as additional exhaust air (from the flare and biofilter) in the dispersion modelling. To confirm this is the case we have provided expected air flow duration and volumes at each phase in a letter from Trinity Consulting (see Attachment 6).
	5	The EPA request the proponent to provide discussion, and if necessary, assessment, of odour emissions from the product storage area of the proposed plant.	Odour emissions will be significantly reduced in what is presently the existing biosolids storage shed. This is because dewatered biosolids will no longer be stored in this area, and will be replaced with screened compost that emits far less odour. The expected reduced emissions rate was included in the modelling of odour from the STP (as explained Section 6.3.3 of EIS) and is therefore shown in the assessment of cumulative emissions. For additional detail on the contribution of the biosolids storage area to cumulative emissions see letter from Trinity Consulting (Attachment 6).
	6	The EPA requests the proponent to provide supporting evidence, such as a manufacturer's specification report and performance guarantee, or test certificates to:	Evoheat has supplied a letter confirming that the CHP will comply with the limits included in Schedule 4 of the *Protection of the Environment Operations (Clean Air) Regulation 2010* subject to the 2G TA-004 specifications for the biogas. Bekon has supplied a letter

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		a. Transparently and robustly demonstrate that the parameters used to characterise the emissions from the CHP unit are representative of the proposal; and b. Demonstrate that the CHP unit emissions will comply with limits included in Schedule 4 of the Protection of the Environment Operations (Clean Air) Regulation 2010.	confirming the biogas will meet the 2G TA-004 specifications (Attachment 7). The wrong emission limits were used from Schedule 4 in the original analysis. Trinity consulting has updated their modelling using the correct limits and the facility is still compliant with all applicable legislation (see Attachment 6).

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Attachment 2 – Construction Soil and Water Plan (MPC)

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NORTH

EXISTING STP

MATCH LINE A

BASIN No.2 (WET BASIN)

PLAN AREA	≈65m²
SETTLING ZONE	≈43m³
STORAGE ZONE	≈21m³
BASIN VOLUME	≈64m³ (NOTE 1)
STORAGE VOLUME	≈56m³ (NOTE 2)

NOTE 1: STORAGE FOR THE 5-DAY 80TH PERCENTILE RAIN EVENT + SEDIMENT STORAGE

NOTE 2: STORAGE FOR THE 1% AEP RAIN EVENT, ABOVE THE SEDIMENT STORAGE ZONE

LEACHATE DAM DURING ACID-SULPHATE EARTHWORKS PHASE. PUMP-OUT SYSTEM TO CONTAINMENT TRUCKS. DETAILS TBC AT CC DESIGN STAGE.

WATER DISCHARGED VIA THE PUMP-OUT LINE TO CONTAINMENT TRUCKS FOR DISPOSAL AT A SUITABLY LICENSED FACILITY.

EXISTING STP TANK

EXISTING STP TANK

ACCESS CREST IN ROAD

EXISTING ACCESS TRACK

PUMP AND BACK-FLOW PREVENTION VALVE, TO BE DESIGNED BY A HYDRAULIC ENGINEER.

BASIN

WATER PUMP-OUT LINE, TO BE DESIGNED BY A HYDRAULIC ENGINEER

TEMPORARY DIVERSION SWALE

EXTENT OF 1% AEP TEMPORARY STORAGE. SURFACE AREA = 400m². SURFACE RL = 0.105m ABOVE TOP OF BASIN No.1 EMBANKMENT. STORED WATER CONTAINED BY PERIMETER EMBANKMENT. FULL DETAILS TBC AT CC DESIGN STAGE.

TEMPORARY DIVERSION SWALE

EXTENT OF 1% AEP TEMPORARY STORAGE. SURFACE AREA = 180m². SURFACE RL = 0.106m ABOVE TOP OF BASIN No.2 EMBANKMENT. STORED WATER CONTAINED BY PERIMETER EMBANKMENT. FULL DETAILS TBC AT CC DESIGN STAGE.

TEMPORARY EARTHWORKS EMBANKMENT & DIVERSION SWALE

PUMP AND BACK-FLOW PREVENTION VALVE, TO BE DESIGNED BY A HYDRAULIC ENGINEER.

BASIN

CLAY EMBANKMENT CONTAINMENT BUND, WITH SURFACE TREATMENT AS SPECIFIED IN THE ACID-SULPHATE MANAGEMENT PLAN

BUNDED ACID SULPHATE NEUTRALISATION PAD WITH SURFACE TREATMENT AS SPECIFIED IN THE ACID-SULPHATE MANAGEMENT PLAN. PLAN AREA = 500m² (10m x 50m)

CONTROLLED ENTRY / EXIT TO NEUTRALIZATION PAD FOR EARTHWORKS PLANT

TEMPORARY DIVERSION SWALE

TEMPORARY EARTHWORKS EMBANKMENT & DIVERSION SWALE

ADMIN BUILDING

BASIN No.1 (WET BASIN)

PLAN AREA	≈134m²
SETTLING ZONE	≈90m³
STORAGE ZONE	≈45m³
BASIN VOLUME	≈134m³ (NOTE 1)
STORAGE VOLUME	≈117m³ (NOTE 2)

NOTE 1: STORAGE FOR THE 5-DAY 80TH PERCENTILE RAIN EVENT + SEDIMENT STORAGE

NOTE 2: STORAGE FOR THE 1% AEP RAIN EVENT, ABOVE THE SEDIMENT STORAGE ZONE

LEACHATE DAM DURING ACID-SULPHATE EARTHWORKS PHASE. PUMP-OUT SYSTEM TO CONTAINMENT TRUCKS. DETAILS TBC AT CC DESIGN STAGE.

SURFACE FALL DIRECTION WITHIN THE ACID-SULPHATE NEUTRALIZATION PAD. 2% CROSS-FALL 1% LONGITUDINAL FALL TOWARDS THE LEACHATE DAM

STABILIZED LEACHATE SWALE WITH SURFACE TREATMENT AS SPECIFIED IN THE ACID SULPHATE MANAMENT PLAN

TEMPORARY ACCESS ROAD, EARTHWORKS EMBANKMENT AND DIVERSION SWALE

PUMP AND BACK-FLOW PREVENTION VALVE, TO BE DESIGNED BY A HYDRAULIC ENGINEER

BASIN No.3 (WET BASIN)

PLAN AREA	≈105m²
SETTLING ZONE	≈70m³
STORAGE ZONE	≈35m³
BASIN VOLUME	≈105m³ (NOTE 1)
STORAGE VOLUME	≈91m³ (NOTE 2)

NOTE 1: STORAGE FOR THE 5-DAY 80TH PERCENTILE RAIN EVENT + SEDIMENT STORAGE

NOTE 2: STORAGE FOR THE 1% AEP RAIN EVENT, ABOVE THE SEDIMENT STORAGE ZONE

LEACHATE DAM DURING ACID-SULPHATE EARTHWORKS PHASE. PUMP-OUT SYSTEM TO CONTAINMENT TRUCKS. DETAILS TBC AT CC DESIGN STAGE.

EXTENT OF 1% AEP TEMPORARY STORAGE. SURFACE AREA = 290m². SURFACE RL = 0.111m ABOVE TOP OF BASIN No.3 EMBANKMENT. STORED WATER CONTAINED BY PERIMETER EMBANKMENT. FULL DETAILS TBC AT CC DESIGN STAGE.

BASIN

NOTE
BASINS TO BE PUMPED OUT TO CONTAINMENT TRUCKS AND REMOVED TO A SUITABLE LICENSED FACILITY.
DISCHARGED WATER MUST ALSO BE COMPLIANT WITH THE TARGET CRITERIA SPECIFIED IN THE ACID SULPHATE SOIL MANAGEMENT PLAN REPORT BY DOUGLAS PARTNERS: No.200486.02

REFER EARTH BASIN DETAIL SD6-4 FOR ALL TEMPORARY BASINS.
CONTRACTOR IS TO ADJUST THE BASIN SIZE AND SHAPE AS REQUIRED TO SUIT THE STATED BASIN VOLUMES AND SPECIFIED DETAILS. BATTER SHOWN INDICATIVELY ONLY

5 0 5 10 15
Horizontal Scale 1:250 (A1)
1:500 (A3)

PLANS TO BE PRINTED IN COLOUR

SOIL AND WATER MANAGEMENT PLAN SHEET 1

SCALE 1:250

SEDIMENTATION, EROSION CONTROL AND STORMWATER MANAGEMENT NOTES
1. REFER TO DRAWING C19 FOR NOTES AND LEGEND

ISSUE	REASON FOR ISSUE	DATE
6	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	15.10.2021
5	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	13.08.2021
4	ISSUED FOR COUNCIL APPROVAL - ESCP ADDED TO DA SET	21.05.2021
3	ISSUED FOR COUNCIL APPROVAL - DEVELOPMENT APPLICATION	10.05.2021
2	ISSUED FOR REVIEW AT 90%	30.04.2021
1	ISSUED FOR REVIEW AT 50%	28.04.2021
0	ISSUED FOR REVIEW AT 30%	20.04.2021

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CLIENT
BYRON SHIRE COUNCIL

TITLE
SOIL AND WATER MANAGEMENT PLAN
ACID SULPHATE MNGT - SHEET 1

PROJECT
BYRON BAY BIO-ENERGY FACILITY
45 WALLUM PLACE
BYRON BAY NSW

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
T.R.	B.C.	19	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	190178	C15	6

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

NOTE
BASINS TO BE PUMPED OUT TO CONTAINMENT TRUCKS AND REMOVED TO A SUITABLE LICENSED FACILITY.
DISCHARGED WATER MUST ALSO BE COMPLIANT WITH THE TARGET CRITERIA SPECIFIED IN THE ACID SULPHATE SOIL MANAGEMENT PLAN REPORT BY DOUGLAS PARTNERS: No.200486.02

REFER EARTH BASIN DETAIL SD6-4 FOR ALL TEMPORARY BASINS.
CONTRACTOR IS TO ADJUST THE BASIN SIZE AND SHAPE AS REQUIRED TO SUIT THE STATED BASIN VOLUMES AND SPECIFIED DETAILS. BATTER SHOWN INDICATIVELY ONLY

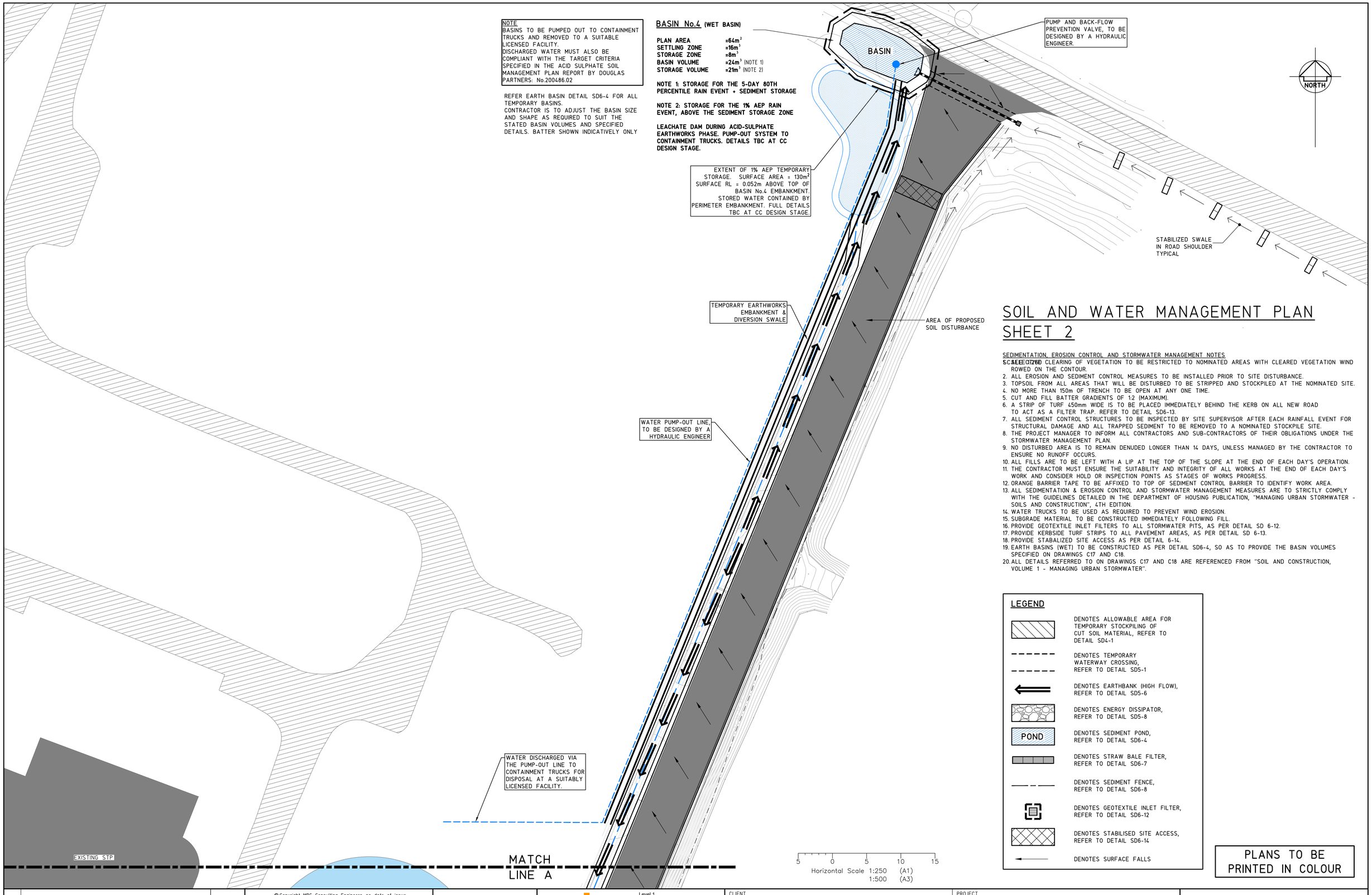
BASIN No.4 (WET BASIN)

PLAN AREA	**=64m²**
SETTLING ZONE	**=16m³**
STORAGE ZONE	**=8m³**
BASIN VOLUME	**=24m³** (NOTE 1)
STORAGE VOLUME	**=21m³** (NOTE 2)

NOTE 1: STORAGE FOR THE 5-DAY 80TH PERCENTILE RAIN EVENT + SEDIMENT STORAGE

NOTE 2: STORAGE FOR THE 1% AEP RAIN EVENT, ABOVE THE SEDIMENT STORAGE ZONE

LEACHATE DAM DURING ACID-SULPHATE EARTHWORKS PHASE. PUMP-OUT SYSTEM TO CONTAINMENT TRUCKS. DETAILS TBC AT CC DESIGN STAGE.



SOIL AND WATER MANAGEMENT PLAN SHEET 2

SEDIMENTATION, EROSION CONTROL AND STORMWATER MANAGEMENT NOTES

1. SCALE CLEARING OF VEGETATION TO BE RESTRICTED TO NOMINATED AREAS WITH CLEARED VEGETATION WINDROWED ON THE CONTOUR.
2. ALL EROSION AND SEDIMENT CONTROL MEASURES TO BE INSTALLED PRIOR TO SITE DISTURBANCE.
3. TOPSOIL FROM ALL AREAS THAT WILL BE DISTURBED TO BE STRIPPED AND STOCKPILED AT THE NOMINATED SITE.
4. NO MORE THAN 150m OF TRENCH TO BE OPEN AT ANY ONE TIME.
5. CUT AND FILL BATTER GRADIENTS OF 1:2 (MAXIMUM).
6. A STRIP OF TURF 450mm WIDE IS TO BE PLACED IMMEDIATELY BEHIND THE KERB ON ALL NEW ROAD TO ACT AS A FILTER TRAP. REFER TO DETAIL SD6-13.
7. ALL SEDIMENT CONTROL STRUCTURES TO BE INSPECTED BY SITE SUPERVISOR AFTER EACH RAINFALL EVENT FOR STRUCTURAL DAMAGE AND ALL TRAPPED SEDIMENT TO BE REMOVED TO A NOMINATED STOCKPILE SITE.
8. THE PROJECT MANAGER TO INFORM ALL CONTRACTORS AND SUB-CONTRACTORS OF THEIR OBLIGATIONS UNDER THE STORMWATER MANAGEMENT PLAN.
9. NO DISTURBED AREA IS TO REMAIN DENUDED LONGER THAN 14 DAYS, UNLESS MANAGED BY THE CONTRACTOR TO ENSURE NO RUNOFF OCCURS.
10. ALL FILLS ARE TO BE LEFT WITH A LIP AT THE TOP OF THE SLOPE AT THE END OF EACH DAY'S OPERATION.
11. THE CONTRACTOR MUST ENSURE THE SUITABILITY AND INTEGRITY OF ALL WORKS AT THE END OF EACH DAY'S WORK AND CONSIDER HOLD OR INSPECTION POINTS AS STAGES OF WORKS PROGRESS.
12. ORANGE BARRIER TAPE TO BE AFFIXED TO TOP OF SEDIMENT CONTROL BARRIER TO IDENTIFY WORK AREA.
13. ALL SEDIMENTATION & EROSION CONTROL AND STORMWATER MANAGEMENT MEASURES ARE TO STRICTLY COMPLY WITH THE GUIDELINES DETAILED IN THE DEPARTMENT OF HOUSING PUBLICATION, "MANAGING URBAN STORMWATER - SOILS AND CONSTRUCTION", 4TH EDITION.
14. WATER TRUCKS TO BE USED AS REQUIRED TO PREVENT WIND EROSION.
15. SUBGRADE MATERIAL TO BE CONSTRUCTED IMMEDIATELY FOLLOWING FILL.
16. PROVIDE GEOTEXTILE INLET FILTERS TO ALL STORMWATER PITS, AS PER DETAIL SD 6-12.
17. PROVIDE KERBSIDE TURF STRIPS TO ALL PAVEMENT AREAS, AS PER DETAIL SD 6-13.
18. PROVIDE STABALIZED SITE ACCESS AS PER DETAIL 6-14.
19. EARTH BASINS (WET) TO BE CONSTRUCTED AS PER DETAIL SD6-4, SO AS TO PROVIDE THE BASIN VOLUMES SPECIFIED ON DRAWINGS C17 AND C18.
20. ALL DETAILS REFERRED TO ON DRAWINGS C17 AND C18 ARE REFERENCED FROM "SOIL AND CONSTRUCTION, VOLUME 1 - MANAGING URBAN STORMWATER".

LEGEND

- DENOTES ALLOWABLE AREA FOR TEMPORARY STOCKPILING OF CUT SOIL MATERIAL, REFER TO DETAIL SD4-1
- DENOTES TEMPORARY WATERWAY CROSSING, REFER TO DETAIL SD5-1
- DENOTES EARTHBANK (HIGH FLOW), REFER TO DETAIL SD5-6
- DENOTES ENERGY DISSIPATOR, REFER TO DETAIL SD5-8
- POND — DENOTES SEDIMENT POND, REFER TO DETAIL SD6-4
- DENOTES STRAW BALE FILTER, REFER TO DETAIL SD6-7
- DENOTES SEDIMENT FENCE, REFER TO DETAIL SD6-8
- DENOTES GEOTEXTILE INLET FILTER, REFER TO DETAIL SD6-12
- DENOTES STABILISED SITE ACCESS, REFER TO DETAIL SD6-14
- DENOTES SURFACE FALLS

PLANS TO BE PRINTED IN COLOUR

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CLIENT
BYRON SHIRE COUNCIL

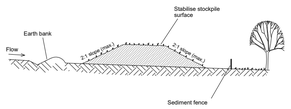
TITLE
SOIL AND WATER MANAGEMENT PLAN
ACID SULPHATE MNGT - SHEET 2

PROJECT
BYRON BAY BIO-ENERGY FACILITY
45 WALLUM PLACE
BYRON BAY NSW

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
T.R.	B.C.	19	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	190178	C16	6

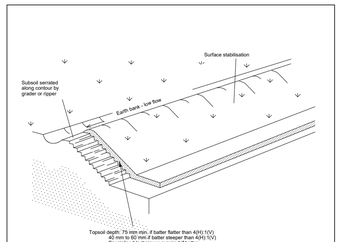
FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm



Construction Notes

1. Place stockpiles more than 2 (preferably 5) metres from existing vegetation, concentrated water flow, roads and hazard areas.
2. Construct on the contour as low, flat, elongated mounds.
3. Where there is sufficient area, topsoil stockpiles shall be less than 2 metres in height.
4. Where they are to be in place for more than 10 days, stabilise following the approved ESCP or SWMP to reduce the C-factor to less than 0.10.
5. Construct earth banks (Standard Drawing 5-5) on the upslope side to divert water around stockpiles and sediment fences (Standard Drawing 6-8) 1 to 2 metres downslope.

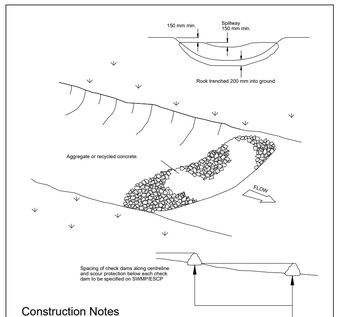
STOCKPILES SD 4-1



Construction Notes

1. Scarify the ground surface along the line of the contour to a depth of 50 mm to 100 mm to break up any hardsetting surfaces and to provide a good bond between the respread material and subsoil.
2. Add soil ameliorants as required by the ESCP or SWMP.
3. Rip to a depth of 300 mm if compacted layers occur.
4. Where possible, replace topsoil to a depth of 40 to 60 mm on lands where the slope exceeds 4(H):1(V) and to at least 75 mm on lower gradients.

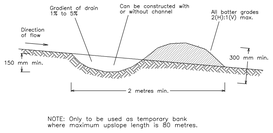
REPLACING TOPSOIL SD 4-2



Construction Notes

1. Check dams can be built with various materials, including rocks, logs, sandbags and straw bales. The maintenance program should ensure their integrity is retained, especially where constructed with straw bales. In the case of bales, this might require their replacement each two to four months.
2. Trench the check dam 200 mm into the ground across its whole width. Where rock is used, fill the trenches to at least 100 mm above the ground surface to reduce the risk of undercutting.
3. Normally, their maximum height should not exceed 600 mm above the gully floor. The centre should act as a spillway, being at least 150 mm lower than the outer edges.
4. Space the dams so the toe of the upstream dam is level with the spillway of the next downstream dam.

ROCK CHECK DAM SD 5-4

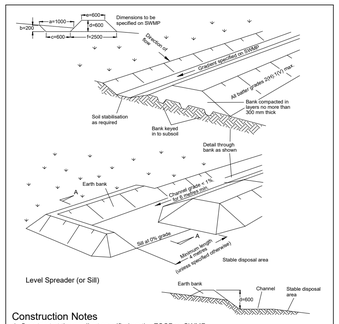


NOTE: Only to be used as temporary bank where maximum upslope length is 80 metres.

Construction Notes

1. Build with gradients between 1 percent and 5 percent.
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V shaped.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction.

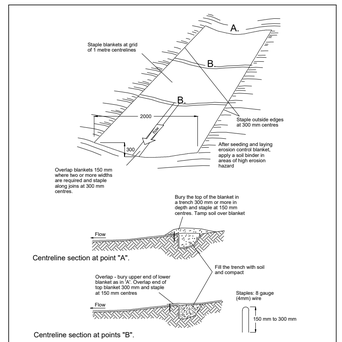
EARTH BANK (LOW FLOW) SD 5-5



Construction Notes

1. Construct at the gradient specified on the ESCP or SWMP, normally between 1 and 5 percent
2. Avoid removing trees and shrubs if possible - work around them.
3. Ensure the structures are free of projections or other irregularities that could impede water flow.
4. Build the drains with circular, parabolic or trapezoidal cross sections, not V-shaped, at the dimensions shown on the SWMP.
5. Ensure the banks are properly compacted to prevent failure.
6. Complete permanent or temporary stabilisation within 10 days of construction following Table 5.2 in Landcom (2004).
7. Where discharging to erodible lands, ensure they outlet through a properly constructed level spreader.
8. Construct the level spreader at the gradient specified on the ESCP or SWMP, normally less than 1 percent or level.
9. Where possible, ensure they discharge waters onto either stabilised or undisturbed disposal sites within the same subcatchment area from which the water originated. Approval might be required to discharge into other subcatchments.

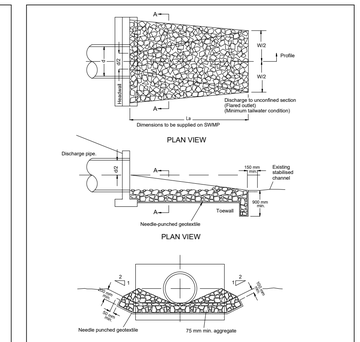
EARTH BANK (HIGH FLOWS) SD 5-6



Construction Notes

1. Remove any rocks, clods, sticks or grass from the surface before laying matting
2. Ensure that topsoil is at least 75 mm deep.
3. Complete fertilising and seeding before laying the matting.
4. Ensure fabric will be continuously in contact with the soil by grading the surface carefully first.
5. Lay the fabric in "shingle-fashion", with the end of each upstream roll overlapping those downstream. Ensure each roll is anchored properly at its upslope end.
6. Ensure that the full width of flow in the channel is covered by the matting up to the design storm event, usually in the 10-year ARI time of concentration storm event.
7. Divert water from the structure until vegetation is stabilised properly.

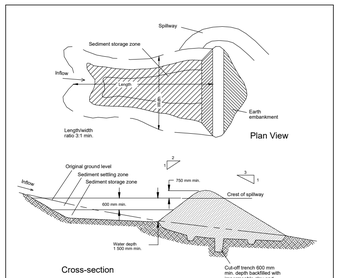
RECP : CONCENTRATED FLOW SD 5-7



Construction Notes

1. Compact the subgrade fill to the density of the surrounding undisturbed material.
2. Prepare a smooth, even foundation for the structure that will ensure that the needle-punched geotextile does not sustain serious damage when covered with rock.
3. Should any minor damage to the geotextile occur, repair it before spreading any aggregate. For repairs, patch one piece of fabric over the damage, making sure that all joints and patches overlap more than 300 mm.
4. Lay rock following the drawing, according to Table 5.2 of Landcom (2004) and with a minimum diameter of 75 mm.
5. Ensure that any concrete or riprap used for the energy dissipater or the outlet protection conforms to the grading limits specified on the SWMP.

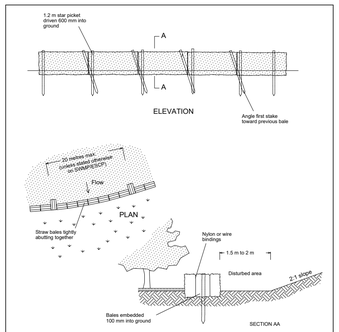
ENERGY DISSIPATER SD 5-8



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 500 mm deep and 1,200 mm wide along the centreline of the embankment extending to a point on the gully wall level with the riser crest.
3. Maintain the trench free of water and recompact the materials with equipment as specified in the SWMP to 95 per cent Standard Proctor Density.
4. Select fill following the SWMP that is free of roots, wood, rock, large stone or foreign material.
5. Prepare the site under the embankment by ripping to at least 100 mm to help bond compacted fill to the existing substrate.
6. Spread the fill in 100 mm to 150 mm layers and compact it at optimum moisture content following the SWMP.
7. Construct the emergency spillway.
8. Rehabilitate the structure following the SWMP.

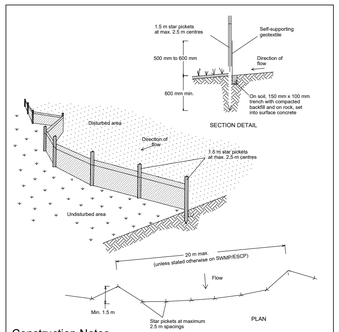
EARTH BASIN - WET SD 6-4
(APPLIES TO 'TYPE D' AND 'TYPE F' SOILS ONLY)



Construction Notes

1. Construct the straw bale filter as close as possible to being parallel to the contours of the site.
2. Place bales lengthwise in a row with ends tightly abutting. Use straw to fill any gaps between bales. Straws are to be placed parallel to ground.
3. Ensure that the maximum height of the filter is one bale.
4. Embed each bale in the ground 75 mm to 100 mm and anchor with two 1.2 metre star pickets or stakes. Angle the first star picket or stake in each bale towards the previously laid bale. Drive them 600 mm into the ground and, if possible, flush with the top of the bales. Where star pickets are used and they protrude above the bales, ensure they are fitted with safety caps.
5. Where a straw bale filter is constructed downslope from a disturbed batter, ensure the bales are placed 1 to 2 metres downslope from the toe.
6. Establish a maintenance program that ensures the integrity of the bales is retained - they could require replacement each two to four months.

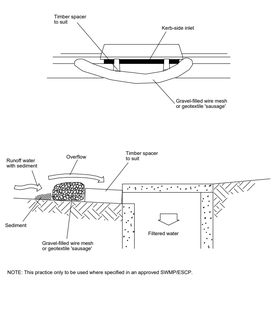
STRAW BALE FILTER SD 6-7



Construction Notes

1. Construct sediment fences as close as possible to being parallel to the contours of the site, but with small returns as shown in the drawing to limit the catchment area of any one section. The catchment area should be small enough to limit water flow if concentrated at one point to 50 litres per second in the design storm event, usually the 10-year event.
2. Cut a 150-mm deep trench along the upslope line of the fence for the bottom of the fabric to be entrenched.
3. Drive 1.5 metre long star pickets into ground at 2.5 metre intervals (max) at the downslope edge of the trench. Ensure any star pickets are fitted with safety caps.
4. Fix self-supporting geotextile to the upslope side of the posts ensuring it goes to the base of the trench. Fix the geotextile with wire ties or as recommended by the manufacturer. Only use geotextile specifically produced for sediment fencing. The use of shade cloth for this purpose is not satisfactory.
5. Join sections of fabric at a support post with a 150-mm overlap.
6. Backfill the trench over the base of the fabric and compact it thoroughly over the geotextile.

SEDIMENT FENCE SD 6-8

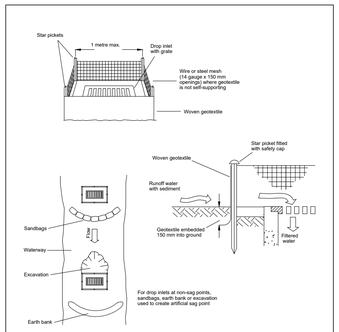


NOTE: This practice only to be used where specified in an approved SWMP/ESCP.

Construction Notes

1. Install fliters to kerb inlets only at sag points.
2. Fabricate a sleeve made from geotextile or wire mesh longer than the length of the inlet pit and fill it with 25 mm to 50 mm gravel.
3. Form an elliptical cross-section about 150 mm high x 400 mm wide.
4. Place the filter at the opening leaving at least a 100-mm space between it and the kerb inlet. Maintain the opening with spacer blocks.
5. Form a seal with the kerb to prevent sediment bypassing the filter.
6. Sandbags filled with gravel can substitute for the mesh or geotextile providing they are placed so that they firmly abut each other and sediment-laden waters cannot pass between.

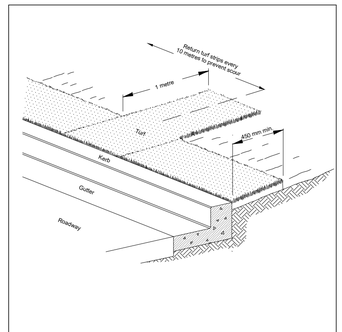
MESH AND GRAVEL INLET FILTER SD 6-11



Construction Notes

1. Fabricate a sediment barrier made from geotextile or straw bales.
2. Follow Standard Drawing 6-8 for installation procedures for the straw bales or geofabric. Reduce the picket spacing to 1 metre centres.
3. In waterways, artificial sag points can be created with sandbags or earth banks as shown in the drawing.
4. Do not cover the inlet with geotextile unless the design is adequate to allow for all waters to bypass it.

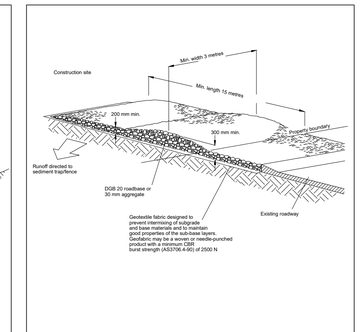
GEOTEXTILE INLET FILTER SD 6-12



Construction Notes

1. Install a 450 mm minimum wide roll of turf on the footpath next to the kerb and at the same level as the top of the kerb.
2. Lay 1.4 metre long turf strips normal to the kerb every 10 metres.
3. Rehabilitate disturbed soil behind the turf strip following the ESCP/SWMP.

KERBSIDE TURF STRIP SD 6-13



Construction Notes

1. Strip the topsoil, level the site and compact the subgrade.
2. Cover the area with needle-punched geotextile.
3. Construct a 200 mm thick pad over the geotextile using road base or 30 mm aggregate.
4. Ensure the structure is at least 15 metres long or to building alignment and at least 3 metres wide.
5. Where a sediment fence joins onto the stabilised access, construct a hump in the stabilised access to divert water to the sediment fence

STABILISED SITE ACCESS SD 6-14

SOIL AND WATER MANAGEMENT DETAILS

EROSION AND SEDIMENTATION CONTROL NOTES:
The following notes may not be relevant to each development.

GENERAL

1 ESCP refers to Erosion and Sediment Control Plan or a Soil and Water Management Plan (SWMP).
2 ESC refers to erosion and sediment control.
3 Sediment, includes, but is not limited to, clay, silt, sand, gravel, soil, mud, cement, and ceramic waste.
4 Any reference to the Blue Book refers to Managing Urban Stormwater – Soils and Construction. Landcom, 2004.
5 Any reference to the IECA White Books (2008) refers to IECA 2008. Best Practice Erosion and Sediment Control. Books 1–6.International Erosion Control Association (Australasia). Picton NSW.
6 Any material deposited in any conservation area from works associated with the development shall be removed immediately by measures involving minimal ground and/or vegetation disturbance and no machinery, or following directions by Council and/or within a timeframe advised by Council.

THE ESCP

7 The ESCP and its associated ESC measures shall be constantly monitored, reviewed, and modified as required to correct deficiencies. Council has the right to direct changes if, in its opinion, the measures that are proposed or have been installed are inadequate to prevent pollution.
8 Prior to any activities onsite, the responsible person(s) is to be nominated. The responsible person(s) shall be responsible for the ESC measures onsite. The name, address and 24 hour contact details of the person(s) shall be provided to Council in writing. Council shall be advised within 48 hours of any changes to the responsible person(s), or their contact details, in writing.
9 At least 14 days before the natural surface is disturbed in any new stage, the contractor shall submit to the Certifier, a plan showing ESC measures for that Stage. The degree of design detail shall be based on the disturbed area.
10 At any time during construction, the ESC measures onsite shall be appropriate for the area of disturbance and its characteristics including soils (in accordance with those required for the site as per DCP).
11 The implementation of the ESCP shall be supervised by personnel with appropriate qualifications and/or experience in ESC on construction sites.
12 The approved ESCP shall be available on-site for inspection by Council officers while work activities are occurring.
13 The approved ESCP shall be up to date and show a timeline of installation, maintenance and removal of ESC measures.
14 All ESC measures shall be appropriate for the Sediment Type(s) of the soils onsite, in accordance with the Blue Book, IECA White Books or other current recognised industry standard for ESC for Australian conditions.
15 Adequate site data, including soil data from a NATA approved Laboratory, shall be obtained to allow the preparation of an appropriate ESCP, and allow the selection, design and specification of required ESC measures.
16 All works shall be carried out in accordance with the approved ESCP (as amended from time to time) unless circumstances arise where:
 a) compliance with the ESCP would increase the potential for environmental harm; or
 b) circumstances change during construction and those circumstances could not have been foreseen; or
 c) Council determines that unacceptable off-site sedimentation is occurring as a result of a land-disturbing activity. In either case, the person(s) responsible may be required to take additional, or alternative protective action, and/or undertake reasonable restoration works within the timeframe specified by the Council.
17 Additional ESC measures shall be implemented, and a revised ESCP submitted for approval to the certifier (within five business days of any such amendments) in the event that:
 a) there is a high probability that serious or material environmental harm may occur as a result of sediment leaving the site; or
 b) the implemented works fail to achieve Council's water quality objectives specified in these conditions; or
 c) site conditions significantly change; or
 d) site inspections indicate that the implemented works are failing to achieve the 'objective' of the ESCP.
18 A copy of any amended ESCP shall be forwarded to an appropriate Council Officer, within five business days of any such amendments.

SITE ESTABLISHMENT INCLUDING CLEARING AND MULCHING

19 No land clearing shall be undertaken unless preceded by the installation of adequate drainage and sediment control measures, unless such clearing is required for the purpose of installing such measures, in which case, only the minimum clearing required to install such measures shall occur.
20 Bulk tree clearing and grubbing of the site shall be immediately followed by specified temporary erosion control measures (e.g. temporary grassing or mulching) prior to commencement of each stage of construction works.
21 Trees and vegetation cleared from the site shall be mulched onsite within 7 days of clearing.
22 Appropriate measures shall be undertaken to control any dust originating due to the mulching of vegetation onsite.
23 All office facilities and operational activities shall be located such that any effluent, including wash-down water, can be totally contained and treated within the site.
24 All reasonable and practicable measures shall be taken to ensure stormwater runoff from access roads and stabilised entry/exit systems, drains to an appropriate sediment control device.
25 Site exit points shall be appropriately managed to minimise the risk of sediment being tracked onto sealed, public roadways.
26 Stormwater runoff from access roads and stabilised entry/exit points shall drain to an appropriate sediment control device.
27 The Applicant shall ensure an adequate supply of ESC, and appropriate pollution clean-up materials are available on-site at all times.
28 All temporary earth banks, flow diversion systems, and sediment basin embankments shall be machine-compacted, seeded and mulched within ten (10) days of formation for the purpose of establishing a vegetative cover, or lined appropriately.
29 Sediment deposited off site as a result of on-site activities shall be collected and the area cleaned/rehabilitated as soon as reasonable and practicable.
30 Concrete waste and chemical products, including petroleum and oil-based products, shall be prevented from entering any internal or external water body, or any external drainage system, excluding those on-site water bodies specifically designed to contain and/or treat such material. Appropriate measures shall be installed to trap these materials onsite.
31 Brick, tile or masonry cutting shall be carried out on a pervious surface (e.g. grass or open soil) and in such a manner that any resulting sediment-laden runoff is prevented from discharging into a gutter, drain or water. Appropriate measures shall be installed to trap these materials onsite.
32 Newly sealed hard-stand areas (e.g. roads, driveways and car parks) shall be swept thoroughly as soon as practicable after sealing/surfacing to minimise the risk of components of the surfacing compound entering stormwater drains.
33 Stockpiles of erodible material shall be provided with an appropriate protective cover (synthetic or organic) if the materials are likely to be stockpiled for more than 10 days.
34 Stockpiles, temporary or permanent, shall not be located in areas identified as no-go zones (including, but not limited to, restricted access areas, buffer zones, or areas of non-disturbance) on the ESCP.
35 No more than 150m of a stormwater, sewer line or other service trench shall to be open at any one time.
36 Site spoil shall be lawfully disposed of in a manner that does not result in ongoing soil erosion or environmental harm.
37 Wherever reasonable and practicable, stormwater runoff entering the site from external areas, and non-sediment laden (clean) stormwater runoff entering a work area or area of soil disturbance, shall be diverted around or through that area in a manner that minimises soil erosion and the contamination of that water for all discharges up to the specified design storm discharge.

SITE MANAGEMENT INCLUDING DUST

38 Priority shall be given to the prevention, or at least the minimisation, of soil erosion, rather than the trapping of displaced sediment. Such a clause shall not reduce the responsibility to apply and maintain, at all times, all necessary ESC measures.
39 Measures used to control wind erosion shall be appropriate for the location and prevent soil erosion at all times, including working hours, out of hours, weekends, public holidays and during any other shutdown periods.
40 The application of liquid or chemical-based dust suppression measures shall ensure that sediment-laden runoff resulting from such measures does not create a traffic or environmental hazard.
41 All cut and fill earth batters less than 3m in elevation shall be topsoiled, and grass seeded/hydromulched within 10 days of completion of grading in consultation with Council.
42 Once cut/fill operations have been finalised in a section, all disturbed areas that are not being worked on shall be stabilised in accordance with the times in the Blue Book.
43 All reasonable and practicable measures shall be taken to prevent, or at least minimise, the release of sediment from the site.
44 Suitable all-weather maintenance access shall be provided to all sediment control devices.
45 Sediment control devices, other than sediment basins, shall be de-silted and made fully operational as soon as reasonable and practicable after a sediment-producing event, whether natural or artificial, if the device's sediment retention capacity falls below 75% of its design retention capacity.
46 All erosion and sediment control measures, including drainage control measures, shall be maintained in proper working order at all times during their operational lives.
47 Washing/flushing of sealed roadways shall only occur where sweeping has failed to remove sufficient sediment and there is a compelling need to remove the remaining sediment (e.g. for safety reasons). In such circumstances, all reasonable and practicable sediment control measures shall be used to prevent, or at least minimise, the release of sediment into receiving waters. Only those measures that will not cause safety and property flooding issues shall be employed. Sediment removed from roadways shall be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.
48 Sediment removed from sediment traps and places of sediment deposition shall be disposed of in a lawful manner that does not cause ongoing soil erosion or environmental harm.

SEDIMENT BASINS – INSTALLATION, MAINTENANCE AND REMOVAL INCLUDING SEDIMENT TRAPS

49 As-Constructed plans shall be prepared for all constructed Sediment Basins and associated emergency spillways. Such plans shall verify the basin's dimensions, levels and volumes comply with the approved design drawings. These plans may be requested by the Certifier or Council.
50 Sediment basins shall be constructed and fully operational prior to any other soil disturbance in their catchment.
51 Install an internal gated valve, or similar, in any outlet pipe once pipes installed, or install a sacrificial pipe from basin through wall to external outlet point. The valve shall be connected to a riser made from slotted pipe in the basin. The valve may be opened once captured water meets water quality requirements. The final setup for temporary internal outlet structures to be confirmed prior to construction with Council. This setup will enable discharge of treated water from site without need for pumping.
52 A sediment storage level marker post shall be with a cross member set just below the top of the sediment storage zone (as specified on the approved ESCP). At least a 75mm wide post shall be firmly set into the basin floor.
53 The Site Manager shall obtain the relevant approvals from the relevant organisations to discharge treated water from any existing basins. Organisations may include, but not be limited to, Hunter Water, and Council.
54 Where more than one stage is to be developed at one time, or before the preceding stage is complete, the sediment basin(s) for these stages shall have sufficient capacity to cater for all area directed to the basin(s).
55 Prior to any forecast weather event likely to result in runoff, any basins/traps shall be dewatered to provide sufficient capacity to capture sediment laden water from the site.
56 Sufficient quantities of chemicals/agents to treat captured water shall be placed such that water entering the basin mixes with the chemical/agents and is carried into the basin to speed up clarification.
57 Any basin shall be dewatered within the X-day rainfall depth used to calculate the capacity of the basin, after a rainfall event.
58 Sufficient quantities of chemicals/agents to treat turbid water shall be securely stored on-site to provide for at least three complete treatments of all basins requiring chemically treatment onsite.

SEDIMENT BASINS – INSTALLATION, MAINTENANCE AND REMOVAL INCLUDING SEDIMENT TRAPS CONT'D

59 Prior to the controlled discharge (e.g. de-watering activities) from excavations and/or sediment basins, the water quality objectives shall be achieved as specified in the Acid Sulphate Soil Management Plan prepared by Douglas Partners (Project 200486.02)
60 The Development Approval may require testing of additional water quality elements prior to discharge. E.g. heavy metals.
61 A sample of the released treated water shall be kept onsite in a clear container with the sample date recorded on it.
62 Water quality samples shall be taken at a depth no less than 200mm below the water surface of the basin.
63 No Aluminium based products may be used treat captured water onsite without the prior written permission from an appropriate Council Officer. The applicant shall have a demonstrated ability to use such products correctly and without environmental harm prior to any approval.
64 The chemical/agent used in Type D and Type F basins to treat captured water captured in the basin shall be applied in concentrations sufficient to achieve Council's water quality objectives within the X-day rainfall depth used to calculate the capacity of the basin, after a rainfall event.
65 All Manufacturers' Instructions shall be followed for any chemicals/agents used onsite, except where approved by the Responsible Person or an appropriate Council Officer.
66 The Applicant shall ensure that on each occasion a Type F or Type D basin was not de-watered prior to being surcharged by a following rainfall event, a report is presented to an appropriate Council officer within 5 days identifying the circumstances and proposed amendments, if any, to the basin's operating procedures.
67 Settled sediment shall be removed as soon as reasonable and practicable from any sediment basin if:
 a) it is anticipated that the next storm event is likely to cause sediment to settle above the basin's sediment storage zone; or
 b) the elevation of settled sediment is above the top of the basin's sediment storage zone; or
 c) the elevation of settled sediment is above the basins sediment marker line.
68 Scour protection measures placed on sediment basin emergency spillways shall appropriately protect the spillway chute and its side batters from scour, and shall extend a minimum of 3m beyond the downstream toe of the basin's embankment.
69 Suitable all-weather maintenance access shall be provided to all sediment control devices.
70 Materials, whether liquid or solid, removed from any ESC measures during maintenance or decommissioning, shall be disposed of in a manner that does not cause ongoing soil erosion or environmental harm.
71 All sediment basins shall remain fully operational at all times until the basin's design catchment achieves 70% ground cover or surface stabilisation acceptable to Council.
72 The ESC measures installed during the decommissioning and rehabilitation of a sediment basin shall comply with same standards specified for the normal construction works.
73 A sediment basin shall not be decommissioned until all up-slope site stabilisation measures have been implemented and are appropriately working to control soil erosion and sediment runoff..
74 Immediately prior to the construction of the permanent stormwater treatment device, appropriate flow bypass conditions shall be established to prevent sediment-laden water entering the device.

REVEGETATION/STABILISATION

75 Temporary Stabilisation may be attained using vegetation, non rewettable soil polymers, or pneumatically applied erosion controls.
76 All cut and fill earth batters less than 3m in elevation shall be topsoiled, and grass seeded/hydromulched within 10 days of completion of grading in consultation with Council.
77 Once cut/fill operations have been finalised in a section, all disturbed areas that are not being worked on shall be stabilised in accordance with time lines in the Blue Book.
78 The LMCC Seed mix shall be used unless stated on the ESCP/SWMP.
79 The pH level of topsoil shall be appropriate to enable establishment and growth of specified vegetation prior to initiating the establishment of vegetation.
80 Non rewettable binder shall be used in all hydromulch/hydroseed/polymer mixes on slopes or works adjacent to a water course.
81 Soil ameliorants shall be added to the soil in accordance with an approved Landscape Plan, Vegetation Management Plan, and/or soil analysis.
82 Surface soil density, compaction and surface roughness shall be adjusted prior to seeding/planting in accordance with an approved Landscape Plan, Vegetation Management Plan, and/or soil analysis.
83 Procedures for initiating a site shutdown, whether programmed or un-programmed, shall incorporate revegetation of all soil disturbances unless otherwise approved by Council. The stabilisation works shall not rely upon the longevity of non-vegetated erosion control blankets, or temporary soil binders.

SITE MONITORING AND MAINTENANCE

84 The Applicant shall ensure that appropriate procedures and suitably qualified personnel are engaged to plan and conduct site inspections and water quality monitoring throughout the construction and maintenance phase.
85 All ESC measures shall be inspected and any maintenance undertaken immediately:
 a) at least daily (when work is occurring on-site); and
 b) at least weekly (when work is not occurring on-site); and
 c) within 24hrs of expected rainfall; and
 d) within 18hrs of a rainfall event that causes runoff on the site.
86 Written records shall be kept onsite of ESC monitoring and maintenance activities conducted during the construction and maintenance periods, and be available to Council officers on request.
87 All environmentally relevant incidents shall be recorded in a field log that shall remain accessible to all relevant regulatory authorities.
88 All water quality data, including dates of rainfall, dates of testing, testing results and dates of water release, shall be kept in an on-site register. The register is to be maintained up to date for the duration of the approved works and be available on-site for inspection by [insert name of regulatory authority] on request.
89 At nominated instream water monitoring sites, a minimum of 3 water samples shall be taken and analysed, and the average result used to determine quality.

INSTREAM WORKS

90 All instream works (including in or adjacent to watercourses natural or manmade, flowing or not) shall be carried out in accordance with the IECA White Books.

NOT FOR CONSTRUCTION

ISSUE	REASON FOR ISSUE	DATE
6	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	15.10.2021
5	ISSUED FOR COUNCIL APPROVAL - ESCP DETAILS AMENDED	13.08.2021
4	ISSUED FOR COUNCIL APPROVAL - ESCP ADDED TO DA SET	21.05.2021
3	ISSUED FOR COUNCIL APPROVAL - DEVELOPMENT APPLICATION	10.05.2021
2	ISSUED FOR REVIEW AT 90%	30.04.2021
1	ISSUED FOR REVIEW AT 50%	28.04.2021
0	ISSUED FOR REVIEW AT 30%	20.04.2021

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CLIENT
BYRON SHIRE COUNCIL

TITLE
SOIL AND WATER MANAGEMENT DETAILS

PROJECT
BYRON BAY BIO-ENERGY FACILITY
45 WALLUM PLACE
BYRON BAY NSW

DO NOT SCALE DRAWING

DRAWN	ENGINEER	No in SET	SHEET
T.R.	B.C.	19	A1
SCALES	JOB No	DRAWING No	ISSUE
AS SHOWN	190178	C17	6

FULL SIZE ON ORIGINAL 0 1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 cm

Project: Byron Bay Bioenergy Facility
Job No: 190178
Subject: Soil and Water Management Plan - storage volumes for 1% AEP storm events
Date: 15.10.2021

1% AEP Rainfall Event - On-site temporary stormwater storage volumes

Basin / Catchment No.	Area (ha)	tc (mins)	Rainfall intensity, I, mm/hr	C_{10}	FFy	Q (peak) m^3 / s	Storage Volume m^3
1	0.438	5	282	0.95	1.2	0.391	117
2	0.21	5	282	0.95	1.2	0.188	56
3	0.341	5	282	0.95	1.2	0.305	91
4	0.078	5	282	0.95	1.2	0.070	21

Notes.

1. Volumes calculated are based on containing 100% of the rainfall on site. No flows will be released to the downstream catchment.
2. The 1% AEP storage volumes exceed the volume of the "settling zone" for each basin. In the 1% AEP event the stored water will extend beyond the plan footprint of the individual basins, but will still be contained by the perimeter embankment around the site.

SWMP Commentary, Standard Calculation

Note: These "Standard Calculation" spreadsheets relate only to low erosion hazard lands as identified in figure 4.6 where the designer chooses to not use the RUSLE to size sediment basins. The more "Detailed Calculation" spreadsheets should be used on high erosion hazard lands as identified by figure 4.6 or where the designer chooses to run the RUSLE in calculations.

1. Site Data Sheet

Site name: **Byron Bay Bio Energy Plant**

Site location: **Byron Bay Sewer Treatment facility**

Precinct: **Byron Bay, NSW**

Description of site: **Bio Energy Plant, hardstand, access road and car park**

Site area	Site						Remarks
	1	2	3	4			
Total catchment area (ha)	0.438	0.21	0.341	0.078			
Disturbed catchment area (ha)	0.438	0.1	0.341	0.078			

Soil analysis

Soil landscape	Sloping Site - Silty Clay Soils						DIPNR mapping (if relevant)
Soil Texture Group	Type F	Type F	Type F	Type F			Sections 6.3.3(c), (d) and (e)

Rainfall data

Design rainfall depth (days)	5	5	5	5			See Sections 6.3.4 (d) and (e)
Design rainfall depth (percentile)	80	80	80	80			See Sections 6.3.4 (f) and (g)
x-day, y-percentile rainfall event	48.5	48.5	48.5	48.5			See Section 6.3.4 (h)
Rainfall intensity: 2-year, 6-hour storm	13	13	13	13			See IFD chart for the site
Rainfall erosivity (R-factor)	3660	3660	3660	3660			Automatic calculation from above data

Comments: 80th percentile rainfall depth allows for period of soil disturbance for up to 6 months with sensitive downstream catchment.

2. Storm Flow Calculations

Peak flow is given by the Rational Formula:

$$Qy = 0.00278 \times C_{10} \times F_Y \times I_{y,\,tc} \times A$$

where:
- Q_y is peak flow rate (m^3/sec) of average recurrence interval (ARI) of "Y" years
- C_{10} is the runoff coefficient (dimensionless) for ARI of 10 years. Rural runoff coefficients are given in Volume 2, figure 5 of Pilgrim (1998), while urban runoff coefficients are given in Volume 1, Book VIII, figure 1.13 of Pilgrim (1998) and construction runoff coefficients are given in Appendix F
- F_y is a frequency factor for "Y" years. Rural values are given in Volume 1, Book IV, Table 1.1 of Pilgrim (1998) while urban coefficients are given in Volume 1, Book VIII, Table 1.6 of Pilgrim (1998)
- A is the catchment area in hectares (ha)
- $I_{y,\,tc}$ is the average rainfall intensity (mm/hr) for an ARI of "Y" years and a design duration of "tc" (minutes or hours)

Time of concentration (t_c) = $0.76 \times (A/100)^{0.38}$ hrs (Volume 1, Book IV of Pilgrim, 1998)

Note: For urban catchments the time of concentration should be determined by more precise calculations or reduced by a factor of 50 per cent.

Peak flow calculations, 1

Site	A (ha)	tc (mins)	Rainfall intensity, I, mm/hr						C_{10}
			$1_{yr,tc}$	$5_{yr,tc}$	$10_{yr,tc}$	$20_{yr,tc}$	$50_{yr,tc}$	$100_{yr,tc}$	
1	0.438	6	75	117	130	147	170	187	0.95
2	0.21	4	75	117	130	147	170	187	0.95
3	0.341	5	75	117	130	147	170	187	0.95
4	0.078	3	75	117	130	147	170	187	0.95

Peak flow calculations, 2

ARI yrs	Frequency factor (F_y)	Peak flows						Comment
		1	2	3	4			
		(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m^3/s)	(m3/s)	
$1_{yr,\,tc}$	0.8	0.069	0.033	0.054	0.012			
$5_{yr,\,tc}$	0.95	0.129	0.062	0.100	0.023			
$10_{yr,\,tc}$	1	0.150	0.072	0.117	0.027			
$20_{yr,\,tc}$	1.05	0.179	0.086	0.139	0.032			
$50_{yr,\,tc}$	1.15	0.226	0.108	0.176	0.040			
$100_{yr,\,tc}$	1.2	0.260	0.124	0.202	0.046			

4. Volume of Sediment Basins, *Type D* and *Type F* Soils

Basin volume = settling zone volume + sediment storage zone volume

Settling Zone Volume

The settling zone volume for *Type F* and *Type D* soils is calculated to provide capacity to contain all runoff expected from up to the y-percentile rainfall event. The volume of the basin's settling zone (V) can be determined as a function of the basin's surface area and depth to allow for particles to settle and can be determined by the following equation:

$$V = 10 \times C_v \times A \times R_{y\text{-}\%ile,\ x\text{-}day} \ (m^3)$$

where:

10 = a unit conversion factor

C_v = the volumetric runoff coefficient defined as that portion of rainfall that runs off as stormwater over the x-day period

R = is the x-day total rainfall depth (mm) that is not exceeded in y percent of rainfall events. (See Sections 6.3.4(d), (e), (f), (g) and (h)).

A = total catchment area (ha)

Sediment Storage Zone Volume

In the standard calculation, the sediment storage zone is 50 percent of the setting zone. However, designers can work to capture the 2-month soil loss as calculated by the RUSLE (Section 6.3.4(i)(ii)), in which case the "Detailed Calculation" spreadsheets should be used.

Total Basin Volume

Site	C_v	R x-day y-%ile	Total catchment area (ha)	Settling zone volume (m^3)	Sediment storage volume (m^3)	Total basin volume (m^3)
1	0.42	48.5	0.438	89.2206	45	133.8309
2	0.42	48.5	0.21	42.777	21	64.1655
3	0.42	48.5	0.341	69.4617	35	104.19255
4	0.42	48.5	0.078	15.8886	8	23.8329

Attachment 3 – Acid Sulfate Soil Management Plan

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Geotechnics | Environment | Groundwater

Integrated Practical Solutions

Report on
Acid Sulfate Soil Management Plan

Proposed Bioenergy Facility
45 Wallum Place, Byron Bay

Prepared for
Skala Australasia Pty Ltd

Project 200486.02
October 2021

Douglas Partners
Geotechnics / Environment / Groundwater

Document History

Document details

Project No.	200486.02	Document No.	00.R.001 Skala
Document title	Report on Acid Sulfate Soil Management Plan Proposed Bioenergy Facility		
Site address	45 Wallum Place, Byron Bay		
Report prepared for	Skala Australasia Pty Ltd		
File name	200486.02.00.R.001 Skala		

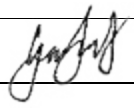
Document status and review

Status	Prepared by	Reviewed by	Date issued
Revision 0	Gary Samuels	Andrew Middleton	1 June 2021
Revision 1	Gary Samuels		30 August 2021
Revision 2	Gary Samuels		8 October 2021

Distribution of copies

Status	Electronic	Paper	Issued to
Revision 0			Simon, Skala Australia Pty Ltd
Revision 1			Angus Johnston, Jackon Environmental and Planning
			Erik Larson, Jackson Environmental and Planning

The undersigned, on behalf of Douglas Partners Pty Ltd, confirm that this document and all attached drawings, logs and test results have been checked and reviewed for errors, omissions and inaccuracies.

	Signature	Date
Author		8 October 2021
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Report on Acid Sulfate Soil Management Plan
Proposed Bioenergy Facility
45 Wallum Place, Byron Bay

1. Introduction

This report presents the results of an acid sulfate soil management plan (ASSMP) prepared by Douglas Partners Pty Ltd (DP) for the proposed Bioenergy Facility at 45 Wallum Place, Byron Bay. The investigation was carried out at the request of Jackson Environment and Planning Pty Ltd (project environmental consultant) in accordance with DP's email fee proposal dated 19 May 2021.

The proposed development will be located adjacent to the existing Byron Bay Sewerage Treatment Plant (BBSTP). The development will include proven enclosed anaerobic digestion technologies, including up to six tunnel digestors, some of which may also have the capability to aerobically compost the organic wastes received. Other major components of the BEF will include:

- A site administration building with offices, control room, education room and staff/visitors amenities;
- Enclosed waste receival hall, including product dispatch area, under negative pressure and including fast open and close roller doors;
- A biofilter for treatment of air from the enclosed waste receival hall and tunnels;
- Flexible biogas storage tank;
- Concrete percolate storage tank;
- Biogas treatment system; and
- Combined heat and power (CHP) system (250kW) and flare.

It is understood that cut and fill of up to 2 m may occur across the site. It is further understood that no water will be discharged from site but will be collected on site in a series of HDPE lined dams which are to be pumped out to a containment trucks and removed to a suitably licenced facility, as required.

Douglas Partners Pty Ltd has previously carried out a preliminary geotechnical investigation and acid sulfate soil assessment of this site and these results are provided in a report titled '*Report on Preliminary Geotechnical Investigation and Acid Sulfate Soil Assessment, Proposed Bioenergy Facility, 45 Wallum Place, Byron Bay',* Project 20486.00 dated March 2021. The borehole logs and site plan from the previous investigation are appended to this report for reference. Issues relating to site description, regional geology and acid sulfate soil map information, and recommendations are described in the above report and as such this acid sulfate soil management plan (ASSMP) must be read in conjunction with this previous report. Further, this report must also be read in conjunction with the notes 'About this Report' in Appendix A.

The results of the above referenced investigation indicated that the site contained ASS within proposed excavation depths and therefore an ASSMP was required.

2. Previous Field Work Results

The subsurface conditions encountered at each bore are given in detail on the borehole logs in Appendix C. These must be read in conjunction with, the notes '*About this Report'* and other explanatory notes provided in Appendix A, which define the sampling methods, soil and rock descriptions and symbols and abbreviations used in its preparation.

The subsurface conditions encountered at the bore are summarised in Table 1 and shown graphically as Figure 1.

In summary, the ground conditions encountered in the bores comprised uncontrolled fill over alluvial firm to stiff silt then medium dense sand to borehole termination depths. The fill was varied from appearing poorly compacted to well compacted, and in the absence of any compaction control documentation, the fill encountered on site must be deemed 'uncontrolled fill'. Some cobbles were noted in the fill in part.

Table 1: Summary of Subsurface Conditions

Bore	Strata/Depth Range[i]			
	Uncontrolled Fill Silt/Sand/Clay/Gravel Mix	Sandy Silt - firm to stiff	Sand – medium dense (or denser)	Groundwater
1	0.0 – 1.2	1.2 – 1.9	1.9 – 3.0	2.5
2	0.0 – 1.2[ii]	-	-	NE
3	0.0 – 1.45	-	1.45 – 5.0	NE
4	0.0 – 0.9	0.9 – 1.5	-	NE
6	0.0 – 1.2	-	1.2 – 6.0	0.85
7	0.0 – 1.4[ii]	-	-	NE
8	0.0 – 1.6	-	1.6 – 6.0	1.4
9	0.0 – 2.4	-	2.4 – 6.4	2.9
10	0.0 – 1.9	1.9 – 2.4	2.4 – 6.0	2.1
11	0.0 – 1.4	-	1.4 – 6.0	1.1
12	0.0 – 0.4	-	0.4 – 6.0	0.95
13	0.0 – 1.5	-	1.5 – 3.45	1.25
15	0.0 – 1.2	-	1.2 – 1.5	1.3

Note i) All above depths were measured from existing site level at the time of the investigation
ii) TC Bit refusal on obstruction in fill
iii) NE – Not Encountered with drilled depth limit.

Groundwater was encountered in Bores 1, 6, and 8 to 14 at the depths indicated above in Table 1. The site is affected by tidal action so variations in groundwater levels should be expected. Further, groundwater depths are affected by climatic conditions, surface and subsurface drainage conditions and human influences, and will therefore vary with time.

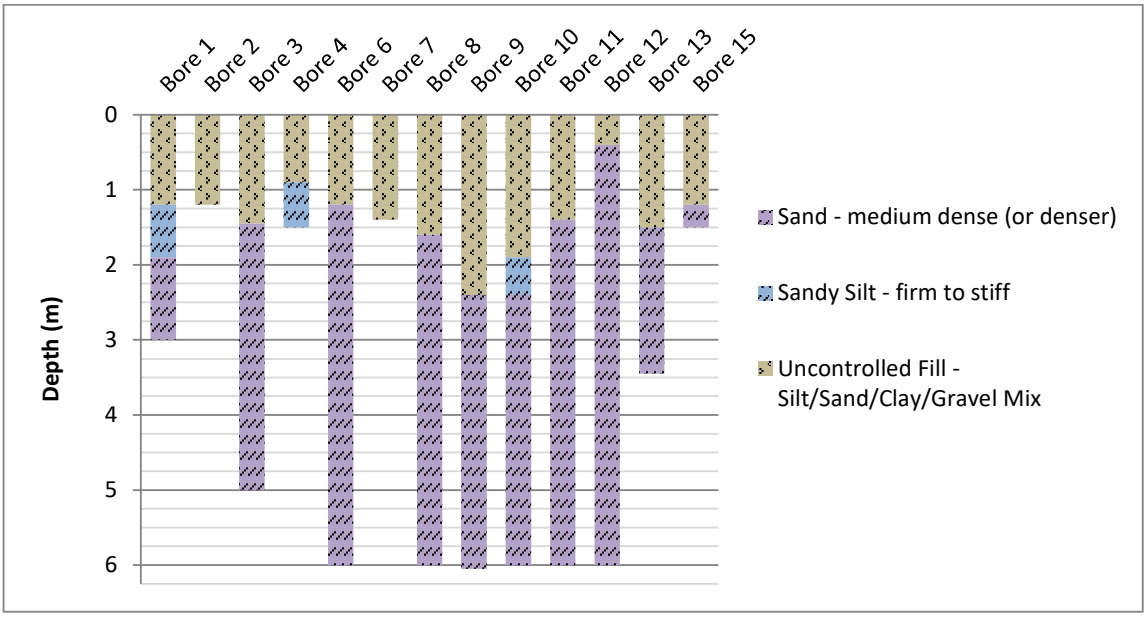


Figure 1: Graphical Summary of Subsurface Conditions

3. Previous Laboratory Testing

In order to assess the presence or otherwise of ASS, field screening and chemical laboratory tests for ASS were carried out as per ASSMAC guidelines 1998 (NSW). In total, 16 samples recovered from the bores were screened by measurement of pH after the addition of distilled water (pH_F) and peroxide (pH_{FOX}).

Based on the results of the screening tests and visual inspection of the samples, eight samples were submitted for more rigorous Chromium Suite analytical testing. Results of the screening tests (pH_F and pH_{FOX}) and Chromium Suite tests are presented in Table 2 in Appendix D, along with the detailed laboratory report sheets. It should be noted that Chromium Suite Testing was conducted on the predominant soil types encountered during the investigation.

4. ASS Management Plan

The existing fill and natural soil at the site contain levels of potential acidity that will require treatment if disturbed during development.

4.1 Risk Categorisation

All excavations in the soils on this site are to be considered as disturbance of PASS and are to be managed accordingly. For the purpose of this assessment, it is expected that greater than 1000 t of PASS will be disturbed.

On the basis, the proposed development would be classified as requiring a Category H to VH (high to very high) level of treatment due to the anticipated relatively small quantity of PASS disturbance expected (≥1000 t) and the maximum potential acidity identified (S_{Cr} of 0.03 %S). Category H to VH sites require neutralisation, monitoring, and bunding of all excavated PASS, as well as management of water during site works.

4.2 Management Strategy – Neutralisation

All materials to be excavated on site have the potential to contain PASS and will require neutralisation. Neutralisation aims to mitigate or manage the generation of acid from pyritic materials in the soil by minimising their oxidation when exposed to aerobic conditions. Neutralisation is best achieved by addition of powdered agricultural lime (ag lime) and sufficient mixing to form a homogeneous mixture.

Where neutralisation is to be undertaken, the process must be managed in a controlled environment such as a bunded and lined treatment pad with perimeter drainage constructed to control runoff, and a sump for the collection of water. This enables collection and treatment of any acidic leachate formed during the soil drying and liming process. As treatment pads are typically constructed in open site areas, any stormwater runoff must be contained within the bunded area.

It should be noted that saturated soil cannot be neutralised effectively with lime, particularly when the soil is cohesive, i.e. contains a large percentage of silt or clay sized particles. The lime and soil must be well mixed for neutralisation to occur, and the mixing process is not effective when the soil is wet and ‘sticky’. The material should be dried, then mixed with lime by way of tyning.

All water draining from the spoil after excavation should be considered as potentially acidic and shall be contained within a controlled area such as a bunded treatment pad. Any rainwater or groundwater entering excavations should also be considered potentially acidic and be contained within the treatment pad. All water captured and leachate generated from the treatment pad will be collected in the proposed site dams and pumped out to a containment trucks and removed to a suitably licenced facility, as required.

4.3 Neutralisation Planning

Soil treatment must be pre-planned and appropriate treatment pads constructed before any excavation work is commenced on-site. Sufficient surplus materials (e.g. lime, clay, geo-synthetic liners) should be available onsite when excavations are planned in the event that unexpected PASS is disturbed. Allowances must be made to ensure sufficient space is available on site for the construction of treatment pads. Treatment pad design and the location of leachate collection sumps must be confirmed prior to the commencement of excavation works.

Groundwater seepage was observed in Bores 1, 6 and 8 to 14 at depth below existing site level at the time of the investigation of between 0.85 and 2.9 m depths. As such, adequate provision and preparation should be made prior to commencing construction to store any groundwater encountered during excavation works. It is understood water containment will be undertaken using dams lined with HDPE liners. Ponded water will need to be placed in the containment dams.

4.4 Neutralising Materials

Agricultural lime (ag lime) should be used as the preferred neutralisation material for the management of PASS as it is usually the cheapest and most readily available product. Ag lime is calcium carbonate, typically made from limestone that has been finely ground and sieved into a fine powder. It is mildly alkaline (pH between 8.5 and 9.0) with a low solubility and does not require any specialised PPE during handling or application.

The ag lime should be at least 95% purity or better (i.e. NV>95) where NV is the neutralising value, a term used to rate the neutralising value of a specific material relative to pure material. Ag lime is typically sold with an NV of 95%- 98%. Lime with an NV less than 95% is available at a reduced cost, however if lime with a lower NV is used, then liming rates must be increased by a factor of 100/NV.

Due to its low solubility, ag lime is not suitable for the neutralisation of leachate or acid impacted water which would require a fast reacting, more soluble product. The most suitable material for neutralising leachate, stockpile drainage, ponding water or groundwater seepage removed from excavations is sodium bicarbonate ($NaHCO_3$). Volumes of dosage are not known at this time. Initial broad casting of sodium bicarbonate is recommended with testing thereafter. Additional dosage to be considered upon results of testing.

4.5 Neutralisation Rate

An approximate neutralisation rate per dry tonne of excavated soil has been calculated based on *'worst case'* scenario for the soils encountered during the and required 8 kg of Ag-lime per dry tonne of disturbed soil or allowing for 'bulking up', of approximately 1.5 tonnes/m^3 'loose' in stockpile, 12 kg/m^3 to be mixed for neutralisation. This rate has been calculated based upon the observed soil lithology and the acid generating potential of the soil. Potential exists for soils at the site to contain a much greater acid generating capacity than that encountered, as well as variation in soil lithologies and depths. A safety factor of 1.5 has been included in the calculation and is considered sufficient to account for this variability.

4.6 Neutralisation Procedure

Neutralisation of PASS shall be carried out as follows, whether within the existing site boundary or at an alternative location:

- Prepare a treatment pad/ stockpile area of appropriate size to accommodate the expected volume of soil requiring treatment. The pad shall be prepared on relatively level or gently sloping ground to minimise the risk of any potential instability issues, with a fall towards a drainage sump.
- where the subgrade soils are other than low permeability clays, the surface of the pad should be lined with selected approved compacted clay (at least two layers to a combined compacted thickness of 0.5 m) or a geosynthetic liner. Where the subgrade soils comprise low permeability clay, no clay or geosynthetic lining will be required. A hydraulic conductivity of 1 x 10^{-8} mm/sec is recommended as a minimum for the material comprising the pad surface.

- A guard layer of fine ag lime shall be applied over the treatment pad to neutralise downward seepage. The guard layer shall be applied at a rate of approximately 5 kg ag lime per m^2 of surface area for every 1 m height of stockpiled soil.
- Excavated PASS material is to be spread over the prepared treatment pad in layers with an average thickness between 0.2 m and 0.3 m with a 1 m wide perimeter between the toe of the stockpiled PASS and the containment bund or drain. Care is to be taken when spreading the first layer of PASS material to ensure the guard layer remains intact.
- Allow sufficient time for the PASS material to dry prior to application of ag lime.
- Apply ag lime to the stockpiled PASS material at the overall liming rate of 8 kg Ag Lime per dry tonne or 12 kg/m^3 ('loose') of disturbed soil (Table 4) and tyne to ensure thorough mixing.
- Validation testing of treated PASS to confirm the target criteria have been met prior to spreading the next layer for treatment.
- continue the spreading/liming/harrowing/verification testing cycle until excavation is finished.
- bund off, and excavate a circumference drain to collect and localise leachate. The drain and inner bund slopes should be covered with a layer of fine lime applied to neutralise any possible leachate migrating from the stockpiled material.
- when testing indicates that lime neutralisation is complete, remove the stockpiled soil from the liming/neutralisation pad.

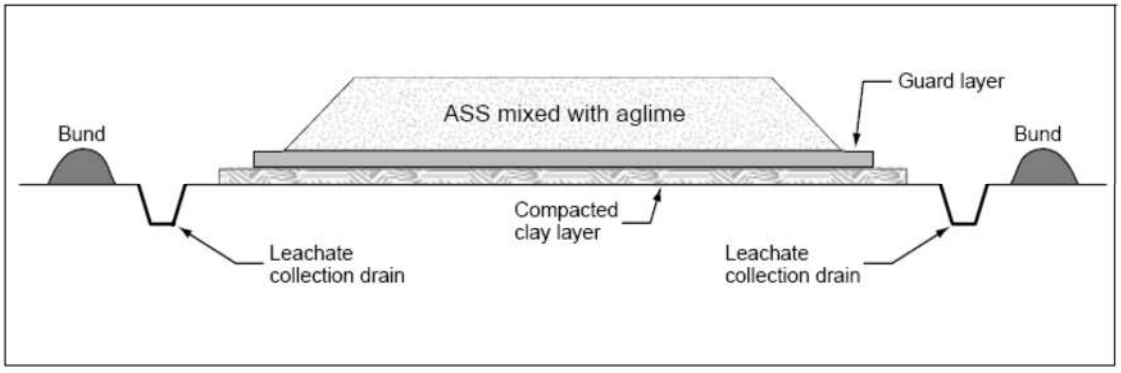


Figure 2: Schematic cross section of treatment pad

Allowances should be made during construction planning to resume sufficient land to allow for these liming pads. Leachate collection location, lining and construction should be similarly pre-planned.

4.7 Validation Testing

Category V to VH treatment levels require validation testing of the soil and drainage waters after the addition of lime to determine the effectiveness of treatment and to reduce the risk of acidic water being discharged to local water bodies. Soil and water contained within the treatment bunds shall not be removed until the target values listed in Table 3 have been achieved.

Validation samples shall be collected and tested for chromium suite testing, at a frequency of approximately one sample per batch of treated soil, or as a minimum, one sample per 250 m^3 of disturbed material. Sample collection must be performed by appropriately qualified and skilled personnel.

Additional layers of soil must not be added to the bunded stockpile for treatment until the underlying layers have been validated and analytical results meet the target criteria (Table 3). Chromium suite analysis requires a minimum of four to five working days and sufficient time should be allowed for completion of analysis.

The pH of all ponded drainage water around the confines of the treatment bunds must be measured daily. Results should be assessed against the target criteria (Table 3).

Table 3: Target Criteria for Neutralised Soil and Water

Test	Component	Target Level
Monitoring of water (refer also to Section 4.9)(i)	pH	7.0 < pH < 8.4
	Turbidity	To comply with values determined in consultation with the Authority (BLEP and EPA)
	Ammonia, Dissolved Metals, Aluminium (Al) and Iron (Fe)	Established local water quality data prior to site disturbance and ensure that these values are not exceeded
	Dissolved Oxygen	To comply with values determined in consultation with the Authority (EPA) or 80 – 110% Saturation
	Total Phosphorous	25µg/L
	Total Nitrogen	350 µg/L
	Suspended Soils	<40µg/L
	Electrical Conductivity	125-2200 µS/cm
Field screening of soil	pH_F	$5.5 < pH_F \leq 8.5$
Acid based accounting of soil (sPOCAS or chromium suite test method)	Existing + potential acidity	Zero or negative
	pH_{KCl}	$pH_{KCl} \geq 8.5$
	TAA	Zero
	TPA/S_{cr}	Zero

Note i) Daily water testing to include – pH; EC, DO and Turbidity
Weekly water testing to include – suspended solids, dissolved metals, ammonia, total nitrogen and total phosphorous

4.8 Treatment of Excavations and Swale Drains

The base of all excavations and surface of all swale drains, regardless of depth, should be thoroughly treated with lime if steel, concrete or other materials are to be installed. Ag lime is to be applied by spreading a fine layer over the base of the excavation and surface of all swale drains and lightly raking

to ensure an even distribution. An application rate of 5 kg/m^2 is recommended. Re-liming of swale drains with Ag lime, as described above, should be undertaken after every rain event.

Any groundwater that collects in excavations may require neutralisation with sodium bicarbonate to increase the pH to within the target range (Table 3) additional monitoring of aluminium and iron concentrations.

4.9 Control of Water Discharge

As discussed, there will be no water discharge from site. All on site water will be contained in HDPE lined dams where water will be pumped into containment tanks for removal to a suitably licenced facility for discharge. All excavations and soil stockpiles are to be bunded and drained accordingly such that the water drains to a containment dams.

4.10 Training and Induction

Training and induction sessions should be conducted for all contractors and staff involved in the excavation, transport or handling of soil at the site. Sessions should be designed to ensure staff are made aware of the relevant provisions within this ASSMP, their responsibilities, the classification and separation of all excavated material and most importantly, the health and safety requirements required when handling neutralising materials on site.

4.11 Management Practices

Current best practice management systems should be adopted by the contractor and complete records of all testing and treatment should be maintained. Such records should be made available to Newland Developers or their consulting engineers, as required.

4.12 Emergency Response Procedures

ASS-related construction activities may have potential to cause environmental harm, potential environmental harm, or an environmental nuisance (environmental incident). In order to mitigate the impacts of environmental harm or nuisance, all personnel require an awareness of the appropriate emergency response procedure. Some recommended emergency response procedures are summarised in Table 4.

All personnel have a duty of care to notify any incident involving environmental harm, potential environmental harm, or environmental nuisance, immediately to their supervisor. The Principal Contractors Environmental Representative and the Principal Contractors Project Manager shall be verbally advised as soon as possible following environmental incidents, and a written report should be provided within either 24 hours (major incident[1]) or 48 hours (minor incident[2]).

Table 4: Proposed Emergency Response Procedures

Construction Activity	Potential Environmental Threat	Emergency Response Procedure
Open excavation or pit	Flooding (with seepage) of open excavation or pit causing adjacent groundwater levels to fall. This can lead to generation of potential acid leachate and acid impacted water once the excavation is drained.	• Inform site foreman and project manager/ environmental officer. • Determine the pH of water within excavation. • If required, treat water to correct pH within excavation. • Drain excavation/ pit to tanks/ ponds for water quality assessment prior to discharge.
Stockpiling and Neutralisation of PASS material	Stockpile washes or slips outside of bunded treatment pad. Breach in stockpile containment bund.	• Inform site foreman and project manager/ environmental officer. • Estimate volume of uncontained material. • Close breach(es) in bund(s). • Assess and correct pH in adjacent watercourse (if any). • Recover soil and place within a bunded area/ treatment pad. • Over-excavate contaminated area to 0.2 m depth. • Apply and mix ag lime at rate of 12 kg/dry tonne in area of breach.

5. Limitations

Douglas Partners Pty Ltd (DP) has prepared this report for the proposed Bioenergy Facility at 45 Wallum Place, Byron Bay. The work was carried out under Douglas Partners Pty Ltd '*Conditions of Engagement*'. This report is provided for the exclusive use of Skala Australasia Pty Ltd for the specific project and purpose as described in the report. It should not be used by or relied upon for other projects or purposes on the same or other site or by a third party. Any party so relying upon this report beyond its exclusive use and purpose as stated above, and without the express written consent of DP, does so entirely at its own risk and without recourse to DP for any loss or damage. In preparing this report DP has necessarily relied upon information provided by the client and/or their agents.

[1] A 'major incident' is an incident that will have direct impact on the safe operation of the site or health of local water bodies. This would also include any uncontrolled releases into the canal, e.g. discharge of hazardous materials into a stormwater drain.

[2] A 'minor incident' is an incident that does not have a direct impact on the safe operation of the site or on the health of local water bodies, e.g. diesel or hydraulic fluid spills which are easily contained within the site compound, damage to vegetation, or injuries to wildlife.

The results provided in the report are indicative of the sub-surface conditions on the site only at the specific sampling and/or testing locations, and then only to the depths investigated and at the time the work was carried out. Sub-surface conditions can change abruptly due to variable geological processes and also as a result of human influences. Such changes may occur after DP's field testing has been completed.

DP's advice is based upon the conditions encountered during this investigation. The accuracy of the advice provided by DP in this report may be affected by undetected variations in ground conditions across the site between and beyond the sampling and/or testing locations. The advice may also be limited by budget constraints imposed by others or by site accessibility.

The assessment of atypical safety hazards arising from this advice is restricted to the geotechnical components set out in this report and based on known project conditions and stated design advice and assumptions. While some recommendations for safe controls may be provided, detailed 'safety in design' assessment is outside the current scope of this report and requires additional project data and assessment.

This report must be read in conjunction with all of the attached and should be kept in its entirety without separation of individual pages or sections. DP cannot be held responsible for interpretations or conclusions made by others unless they are supported by an expressed statement, interpretation, outcome or conclusion stated in this report.

This report, or sections from this report, should not be used as part of a specification for a project, without review and agreement by DP. This is because this report has been written as advice and opinion rather than instructions for construction.

6. References

Acid Sulfate Soil Management Advisory Committee, "Acid Sulfate Soil Manual," New South Wales, August 1998.

Australian and New Zealand Environment Conservation Council (ANZECC), "Water Quality Guidelines", Version –October 2000.

Douglas Partners Pty Ltd

Appendix A

About This Report
Soil Descriptions
Symbols and Abbreviations

About this Report

Douglas Partners

Introduction

These notes have been provided to amplify DP's report in regard to classification methods, field procedures and the comments section. Not all are necessarily relevant to all reports.

DP's reports are based on information gained from limited subsurface excavations and sampling, supplemented by knowledge of local geology and experience. For this reason, they must be regarded as interpretive rather than factual documents, limited to some extent by the scope of information on which they rely.

Copyright

Borehole and Test Pit Logs

The borehole and test pit logs presented in this report are an engineering and/or geological interpretation of the subsurface conditions, and their reliability will depend to some extent on frequency of sampling and the method of drilling or excavation. Ideally, continuous undisturbed sampling or core drilling will provide the most reliable assessment, but this is not always practicable or possible to justify on economic grounds. In any case the boreholes and test pits represent only a very small sample of the total subsurface profile.

Interpretation of the information and its application to design and construction should therefore take into account the spacing of boreholes or pits, the frequency of sampling, and the possibility of other than 'straight line' variations between the test locations.

Groundwater

Where groundwater levels are measured in boreholes there are several potential problems, namely:

- In low permeability soils groundwater may enter the hole very slowly or perhaps not at all during the time the hole is left open;
- A localised, perched water table may lead to an erroneous indication of the true water table;
- Water table levels will vary from time to time with seasons or recent weather changes. They may not be the same at the time of construction as are indicated in the report; and
- The use of water or mud as a drilling fluid will mask any groundwater inflow. Water has to be blown out of the hole and drilling mud must first be washed out of the hole if water measurements are to be made.

More reliable measurements can be made by installing standpipes which are read at intervals over several days, or perhaps weeks for low permeability soils. Piezometers, sealed in a particular stratum, may be advisable in low permeability soils or where there may be interference from a perched water table.

Reports

The report has been prepared by qualified personnel, is based on the information obtained from field and laboratory testing, and has been undertaken to current engineering standards of interpretation and analysis. Where the report has been prepared for a specific design proposal, the information and interpretation may not be relevant if the design proposal is changed. If this happens, DP will be pleased to review the report and the sufficiency of the investigation work.

Every care is taken with the report as it relates to interpretation of subsurface conditions, discussion of geotechnical and environmental aspects, and recommendations or suggestions for design and construction. However, DP cannot always anticipate or assume responsibility for:

- Unexpected variations in ground conditions. The potential for this will depend partly on borehole or pit spacing and sampling frequency;
- Changes in policy or interpretations of policy by statutory authorities; or
- The actions of contractors responding to commercial pressures.

If these occur, DP will be pleased to assist with investigations or advice to resolve the matter.

About this Report

Site Anomalies

In the event that conditions encountered on site during construction appear to vary from those which were expected from the information contained in the report, DP requests that it be immediately notified. Most problems are much more readily resolved when conditions are exposed rather than at some later stage, well after the event.

Information for Contractual Purposes

Where information obtained from this report is provided for tendering purposes, it is recommended that all information, including the written report and discussion, be made available. In circumstances where the discussion or comments section is not relevant to the contractual situation, it may be appropriate to prepare a specially edited document. DP would be pleased to assist in this regard and/or to make additional report copies available for contract purposes at a nominal charge.

Site Inspection

The company will always be pleased to provide engineering inspection services for geotechnical and environmental aspects of work to which this report is related. This could range from a site visit to confirm that conditions exposed are as expected, to full time engineering presence on site.

Description and Classification Methods

The methods of description and classification of soils and rocks used in this report are generally based on Australian Standard AS1726:2017, Geotechnical Site Investigations. In general, the descriptions include strength or density, colour, structure, soil or rock type and inclusions.

Soil Types

Soil types are described according to the predominant particle size, qualified by the grading of other particles present:

Type	Particle size (mm)
Boulder	>200
Cobble	63 - 200
Gravel	2.36 - 63
Sand	0.075 - 2.36
Silt	0.002 - 0.075
Clay	<0.002

The sand and gravel sizes can be further subdivided as follows:

Type	Particle size (mm)
Coarse gravel	19 - 63
Medium gravel	6.7 - 19
Fine gravel	2.36 – 6.7
Coarse sand	0.6 - 2.36
Medium sand	0.21 - 0.6
Fine sand	0.075 - 0.21

Definitions of grading terms used are:

- Well graded - a good representation of all particle sizes
- Poorly graded - an excess or deficiency of particular sizes within the specified range
- Uniformly graded - an excess of a particular particle size
- Gap graded - a deficiency of a particular particle size with the range

The proportions of secondary constituents of soils are described as follows:

In fine grained soils (>35% fines)

Term	Proportion of sand or gravel	Example
And	Specify	Clay (60%) and Sand (40%)
Adjective	>30%	Sandy Clay
With	15 – 30%	Clay with sand
Trace	0 - 15%	Clay with trace sand

In coarse grained soils (>65% coarse)
- with clays or silts

Term	Proportion of fines	Example
And	Specify	Sand (70%) and Clay (30%)
Adjective	>12%	Clayey Sand
With	5 - 12%	Sand with clay
Trace	0 - 5%	Sand with trace clay

In coarse grained soils (>65% coarse)
- with coarser fraction

Term	Proportion of coarser fraction	Example
And	Specify	Sand (60%) and Gravel (40%)
Adjective	>30%	Gravelly Sand
With	15 - 30%	Sand with gravel
Trace	0 - 15%	Sand with trace gravel

The presence of cobbles and boulders shall be specifically noted by beginning the description with ‘Mix of Soil and Cobbles/Boulders’ with the word order indicating the dominant first and the proportion of cobbles and boulders described together.

Soil Descriptions

Cohesive Soils

Cohesive soils, such as clays, are classified on the basis of undrained shear strength. The strength may be measured by laboratory testing, or estimated by field tests or engineering examination. The strength terms are defined as follows:

Description	Abbreviation	Undrained shear strength (kPa)
Very soft	VS	<12
Soft	S	12 - 25
Firm	F	25 - 50
Stiff	St	50 - 100
Very stiff	VSt	100 - 200
Hard	H	>200
Friable	Fr	-

Cohesionless Soils

Cohesionless soils, such as clean sands, are classified on the basis of relative density, generally from the results of standard penetration tests (SPT), cone penetration tests (CPT) or dynamic penetrometers (PSP). The relative density terms are given below:

Relative Density	Abbreviation	Density Index (%)
Very loose	VL	<15
Loose	L	15-35
Medium dense	MD	35-65
Dense	D	65-85
Very dense	VD	>85

Soil Origin

It is often difficult to accurately determine the origin of a soil. Soils can generally be classified as:

- Residual soil - derived from in-situ weathering of the underlying rock;
- Extremely weathered material – formed from in-situ weathering of geological formations. Has soil strength but retains the structure or fabric of the parent rock;
- Alluvial soil – deposited by streams and rivers;
- Estuarine soil – deposited in coastal estuaries;
- Marine soil – deposited in a marine environment;
- Lacustrine soil – deposited in freshwater lakes;
- Aeolian soil – carried and deposited by wind;
- Colluvial soil – soil and rock debris transported down slopes by gravity;
- Topsoil – mantle of surface soil, often with high levels of organic material.
- Fill – any material which has been moved by man.

Moisture Condition – Coarse Grained Soils

For coarse grained soils the moisture condition should be described by appearance and feel using the following terms:

- Dry (D) Non-cohesive and free-running.
- Moist (M) Soil feels cool, darkened in colour.
  Soil tends to stick together.
  Sand forms weak ball but breaks easily.
- Wet (W) Soil feels cool, darkened in colour.
  Soil tends to stick together, free water forms when handling.

Moisture Condition – Fine Grained Soils

For fine grained soils the assessment of moisture content is relative to their plastic limit or liquid limit, as follows:

- ‘Moist, dry of plastic limit’ or ‘w <PL’ (i.e. hard and friable or powdery).
- ‘Moist, near plastic limit’ or ‘w ≈ PL (i.e. soil can be moulded at moisture content approximately equal to the plastic limit).
- ‘Moist, wet of plastic limit’ or ‘w >PL’ (i.e. soils usually weakened and free water forms on the hands when handling).
- ‘Wet’ or ‘w ≈LL’ (i.e. near the liquid limit).
- ‘Wet’ or ‘w >LL’ (i.e. wet of the liquid limit).

Symbols & Abbreviations

Introduction

These notes summarise abbreviations commonly used on borehole logs and test pit reports.

Drilling or Excavation Methods

C	Core drilling
R	Rotary drilling
SFA	Spiral flight augers
NMLC	Diamond core - 52 mm dia
NQ	Diamond core - 47 mm dia
HQ	Diamond core - 63 mm dia
PQ	Diamond core - 81 mm dia

Water

▷	Water seep
▽	Water level

Sampling and Testing

A	Auger sample
B	Bulk sample
D	Disturbed sample
E	Environmental sample
U_{50}	Undisturbed tube sample (50mm)
W	Water sample
pp	Pocket penetrometer (kPa)
PID	Photo ionisation detector
PL	Point load strength Is(50) MPa
S	Standard Penetration Test
V	Shear vane (kPa)

Description of Defects in Rock

The abbreviated descriptions of the defects should be in the following order: Depth, Type, Orientation, Coating, Shape, Roughness and Other. Drilling and handling breaks are not usually included on the logs.

Defect Type

B	Bedding plane
Cs	Clay seam
Cv	Cleavage
Cz	Crushed zone
Ds	Decomposed seam
F	Fault
J	Joint
Lam	Lamination
Pt	Parting
Sz	Sheared Zone
V	Vein

Orientation

The inclination of defects is always measured from the perpendicular to the core axis.

h	horizontal
v	vertical
sh	sub-horizontal
sv	sub-vertical

Coating or Infilling Term

cln	clean
co	coating
he	healed
inf	infilled
stn	stained
ti	tight
vn	veneer

Coating Descriptor

ca	calcite
cbs	carbonaceous
cly	clay
fe	iron oxide
mn	manganese
slt	silty

Shape

cu	curved
ir	irregular
pl	planar
st	stepped
un	undulating

Roughness

po	polished
ro	rough
sl	slickensided
sm	smooth
vr	very rough

Other

fg	fragmented
bnd	band
qtz	quartz

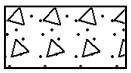
Symbols & Abbreviations

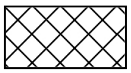
Graphic Symbols for Soil and Rock

General

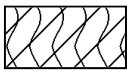

Asphalt

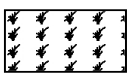

Road base

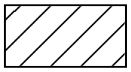

Concrete

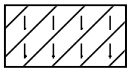

Filling

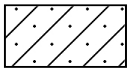
Soils


Topsoil

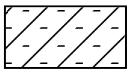

Peat

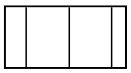

Clay

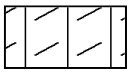

Silty clay

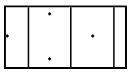

Sandy clay

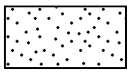

Gravelly clay

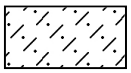

Shaly clay

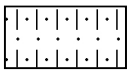

Silt


Clayey silt


Sandy silt

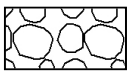

Sand

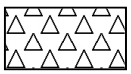

Clayey sand


Silty sand


Gravel

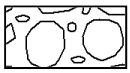

Sandy gravel


Cobbles, boulders

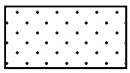

Talus

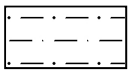
Sedimentary Rocks

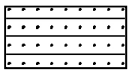

Boulder conglomerate

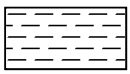

Conglomerate


Conglomeratic sandstone

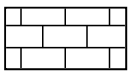

Sandstone


Siltstone

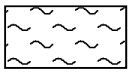

Laminite

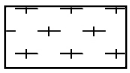

Mudstone, claystone, shale

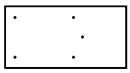

Coal


Limestone

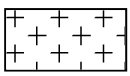
Metamorphic Rocks

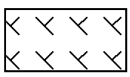

Slate, phyllite, schist

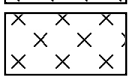

Gneiss

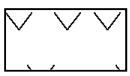

Quartzite

Igneous Rocks


Granite


Dolerite, basalt, andesite

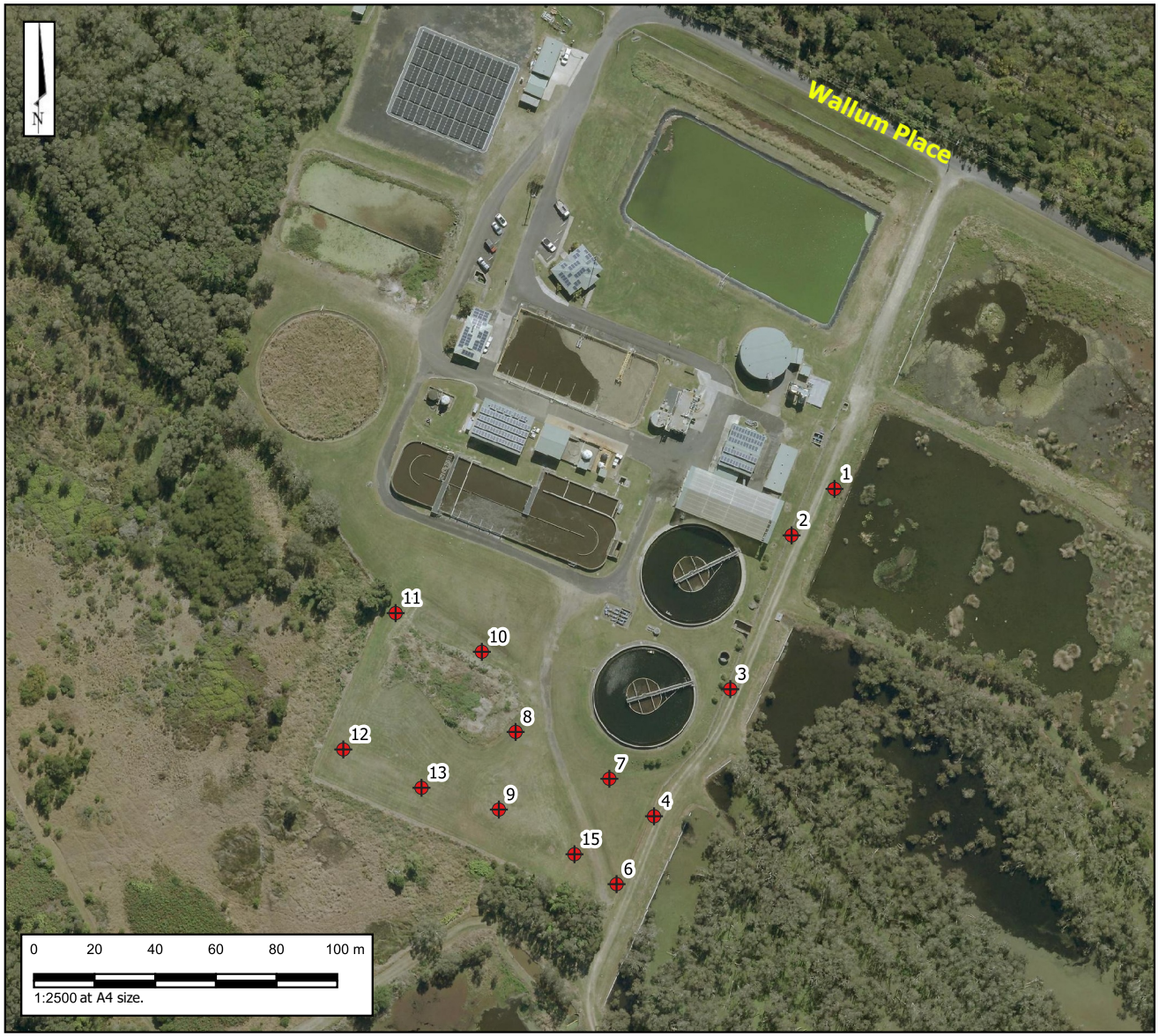

Dacite, epidote

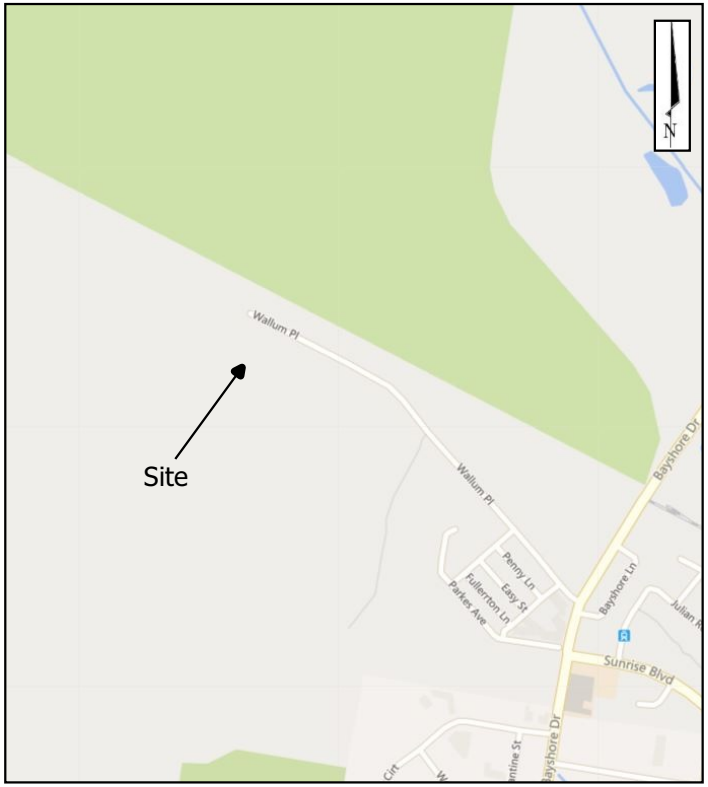

Tuff, breccia


Porphyry

Appendix B

Drawing 1 – Site and Test Location Plan





Site Locality

Legend:

Approximate borehole location and number

Image adapted from Metromap dated 24 August 2020.
Site locatlity not to scale.

Douglas Partners Geotechnics / Environment / Groundwater	CLIENT: Skala Australasia Pty Ltd OFFICE: Gold Coast DATE: March 2021	**Site and Test Location Plan** **Proposed Bioenergy Facility** **45 Wallum Place, Byron Bay**	PROJECT No: 200486.00 DRAWING No: 1 REVISION: 0

Appendix C

Borehole Logs (Bores 1 to 4 and 6 to 15)

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.7057 AHD
EASTING: 556369.269
NORTHING: 6833172.4898
DIP/AZIMUTH: 90°/--

BORE No: 1
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Clayey SAND with gravel (SC/SW): fine to coarse grained, brown, low to medium plasticity clay, with fine to medium subangular gravel, moist, appeared poorly compacted		E	0.0				
					0.1				
					0.2				
				B	0.4				
				E	0.5				
					0.7				
				E	0.9				
	1.0				1.0				
	1.2	Sandy SILT (ML): low plasticity, black, fine to medium sand, moist, estimated stiff, alluvial		E	1.2				
					1.3				
	1.9	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, moist, estimated medium dense, alluvial		E	1.9				
					2.0				
	2.2	SAND (SP): fine to medium grained, pale grey, trace low plasticity silt, moist, estimated medium dense, alluvial							
	2.4	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, wet, estimated medium dense, alluvial						▼	
	3.0	Bore discontinued at 3.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 2.5m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.852 AHD
EASTING: 556355.06
NORTHING: 6833157.32
DIP/AZIMUTH: 90°/--

BORE No: 2
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, brown, fine to coarse sand, with fine to medium subangular gravel,, moist, appeared poorly to well compacted		E	0.0–0.1				
				E	0.4–0.5				
	0.9	FILL Sandy CLAY (CI): medium plasticity, black, brown and grey, fine to medium sand, trace fine to medium subangular gravel, moist, hard		E	0.9–1.0				
	1.1	FILL Sandy GRAVEL (GW): fine to coarse grained, blue-grey, fine to medium subangular sand, with low plasticity silt, moist, appeared well compacted							
	1.2	Bore discontinued at 1.2m depth - Refusal on obstruction. Limit of Investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.889 AHD
EASTING: 556334.61
NORTHING: 6833106.94
DIP/AZIMUTH: 90°/--

BORE No: 3
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, red, fine to coarse sand, with fine to medium subangular gravel, moist, appeared poorly to moderately compacted		E	0.0				
					0.1				
					0.2				
				B	0.4				
				E	0.5				
					0.6				
	0.8	FILL CLAY (CI-CH): medium to high plasticity, red, trace fine sand, moist, appeared moderately compacted		E	0.8				
					0.9				
		- trace fine to medium subangular gravel		E	1.3				
	1.45				1.4				
	1.5	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, moist, estimated medium dense, alluvial							
		Bore discontinued at 1.5m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
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BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.170 AHD
EASTING: 556309.27
NORTHING: 6833065.38
DIP/AZIMUTH: 90°/--

BORE No: 4
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI-CH): medium to high plasticity, red-brown, fine to medium sand, with fine to medium subangular gravel, moist, appeared poorly compacted		E	0.0				
					0.1				
				D	0.2				
				E	0.4				
					0.5				
					0.8				
	0.9			E	0.9				
		Sandy SILT (ML): low plasticity, black, fine to medium sand, moist, very stiff, alluvial		E	1.0				
					1.2				
				D	1.4				
	1.5			E	1.5				
		Bore discontinued at 1.5m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 4.832 AHD
EASTING: 556296.82
NORTHING: 6833043.17
DIP/AZIMUTH: 90°/--

BORE No: 6
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, red and brown, fine to medium sand, trace fine to medium subangular gravel, moist, appeared well compacted		E	0.0–0.1				
				D	0.3–0.4				
	0.5	FILL Sandy SILT (ML: low plasticity, black, fine to medium sand, moist, stiff		E	0.5–0.6				
				D					
	1.2	SAND (SP): fine to medium, poorly grained, pale grey, trace low plasticity silt, wet, medium dense		E	1.2–1.3				
	1.7	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, wet, medium dense, alluvial		S	1.5–1.95		3,4,9 N = 13		
				S	3.0–3.45		4,12,15 N = 27		
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.85m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

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BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.639 AHD
EASTING: 556294.61
NORTHING: 6833077.75
DIP/AZIMUTH: 90°/--

BORE No: 7
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
		FILL Sandy CLAY (CI): medium plasticity, red-brown, fine to coarse sand, trace fine to medium subangular gravel, moist, appeared poorly to well compacted		E	0.0				
					0.1				
					0.2				
				B	0.4				
				E	0.5				
					0.7				
					0.9				
				E	1.0				
				E	1.3				
	1.4	Bore discontinued at 1.4m depth - Refusal on obstruction. Limit of Investigation			1.4				

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: No free groundwater observed

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.657 AHD
EASTING: 556263.79
NORTHING: 6833093.27
DIP/AZIMUTH: 90°/--

BORE No: 8
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, red-brown, fine to medium sand, with fine to medium subangular gravel, appeared poorly to well compacted		E	0.0–0.1				
				E	0.4–0.5				
				E	0.9–1.0				
	1.2	FILL Sandy CLAY (CI-CH): medium to high plasticity, red-brown, fine to coarse sand, trace fine to medium subangular gravel, moist, very stiff		E	1.2–1.3				
	1.6	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, wet, medium dense, alluvial		S	1.5–1.95		4,4,4 N = 8	▽	
				S	3.0–3.45		10,13,16 N = 29		
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater measured in well at 1.4m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 6.505 AHD
EASTING: 556258.14
NORTHING: 6833067.83
DIP/AZIMUTH: 90°/--

BORE No: 9
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL/ CLAY (CI): medium plasticity, red-brow with fine to medium sand, trace fine to medium subangular gravel, moist, appeared poorly to well compacted		E	0.0–0.1				
				E	0.4–0.5				
				E	0.9–1.0				
	1.3	FILL Sandy CLAY (CI-CH): medium to high plasticity, red and orange-grey, fine to medium sand, trace fine subangular gravel, moist, appeared well compacted		E	1.3–1.4				
				S	1.5		2,8,10 N = 18		
				E	1.9–1.95				
	2.4	Silty SAND (SM): fine to medium grained, well graded, black, low plasticity silt, moist, medium dense, alluvial		E	2.4–2.5				
				D	2.7			▼	
	3.2	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, moist, medium dense, alluvial		S	3.0–3.45		5,4,5 N = 9		
				S	4.5–4.95		8,12,16 N = 28		
				S	6.0		3, 20, 30/100mm		
	6.4	Bore discontinued at 6.4m depth - Limit of investigation			6.4				

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 2.9m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 6.396 AHD
EASTING: 556252.79
NORTHING: 6833119.61
DIP/AZIMUTH: 90°/--

BORE No: 10
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0			E	0.0 – 0.1				
	0.3	FILL Silty SAND (SM): fine to medium grained, well graded, brown, low plasticity silt, trace fine subangular gravel, moist, medium dense		E	0.3 – 0.4				
		FILL Gravelly SAND (SW/SM): fine to medium grained, pale brown, fine to medium subangular gravel, with low plasticity silt, moist, appeared well compacted		E	0.9 – 1.0				
	1.4	FILL Sandy CLAY (CI): medium plasticity, dark grey, fine to coarse sand, trace fine to medium subangular gravel, moist, appeared well compacted		E	1.4 – 1.5				
				S			1,1,1 N = 2		
	1.9	Sandy SILT (ML): low plasticity, black, fine to medium sand, estimated firm, alluvial		E	1.9 – 2.0			▼	
	2.4	Silty SAND (SM): fine to medium grained, dark grey and brown, low plasticity silt, wet, medium dense, alluvial		E	2.4 – 2.5				
				S	3.0		3,8,15 N = 23		
	3.4	SAND (SP): fine to medium grained, pale grey, trace low plasticity silt, wet, medium dense, alluvial			3.45				
	4.0	Silty SAND (SM): fine to medium grained, dark brown, low plasticity silt, wet, medium dense, alluvial		S	4.5		5,10,15 N = 25		
					4.95				
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 2.1m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.029 AHD
EASTING: 556224.42
NORTHING: 6833132.44
DIP/AZIMUTH: 90°/--

BORE No: 11
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
		FILL Silty SAND (SM): fine to coarse grained, dark brown, low plasticity silt, trace fine subangular gravel, moist, appeared poorly compacted		E	0.0 0.1				
		- trace cobbles		E	0.4 0.5				
				E	0.9 1.0			▽	
	1.4	Silty SAND (SM): fine to medium grained, well graded, dark brown to black, low plasticity silt, wet, medium dense		E	1.4 1.5				
				S			1,5,11 N = 16		
				E	1.9 1.95 2.0				
				S	3.0		3,8,12 N = 20		
					3.45				
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater measured at 1.10m in monitoring well

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 4.531 AHD
EASTING: 556206.97
NORTHING: 6833087.79
DIP/AZIMUTH: 90°/--

BORE No: 12
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, red, fine to medium sand, trace fine to medium subangular gravel, moist, appeared poorly to moderately compacted		E	0.0 – 0.1				
	0.4	Silty SAND (SM): fine to coarse grained, dark brown, low plasticity silt, moist, loose		E	0.4 – 0.5				
				D	0.8				
	0.9	SAND (SP): fine to coarse grained, pale grey, wet, medium dense, alluvial		E	0.9 – 1.0			▼	
	1.4	Silty SAND (SM): fine to medium grained, dark brown to black, low plasticity silt, moist, medium dense, alluvial		S	1.5 – 1.95		5,10,15 N = 25		
		- very dense		S	3.0 – 3.25		17, 30/100mm		
		- trace fine to medium subrounded gravel							
	6.0	Bore discontinued at 6.0m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 0.95m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.057 AHD
EASTING: 556232.68
NORTHING: 6833075.09
DIP/AZIMUTH: 90°/--

BORE No: 13
PROJECT No: 200486.00
DATE: 8/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Silty SAND (SM): fine to medium, well graded, dark brown, low plasticity silt, moist, appeared poorly compacted		E	0.0 – 0.1				
				E	0.4 – 0.5				
				E	0.9 – 1.0				
	1.2	FILL Sandy CLAY with gravel (CI): medium plasticity, dark grey, fine to coarse sand, fine to coarse subangular gravel, wet, appeared well compacted		E	1.2 – 1.3				
	1.5	SAND (SP): fine to coarse grained, pale grey, wet, medium dense, alluvial		S	1.45		5,9,11 N = 20	▽	
				E	1.5 – 1.6				
	2.2	Silty SAND (SM): fine to medium grained, dark brown-grey, low plasticity silt, wet, medium dense, allivial							
				S	3.0		6,13,17 N = 30		
	3.45	Bore discontinued at 3.45m depth - Limit of investigation			3.45				

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater measured at 1.25m in monitoring well

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

BOREHOLE LOG

CLIENT: Jackson Environment and Planning
PROJECT: Proposed Bioenergy Facility
LOCATION: 45 Wallum Place, Byron Bay

SURFACE LEVEL: 5.003 AHD
EASTING: 556282.99
NORTHING: 6833053.05
DIP/AZIMUTH: 90°/--

BORE No: 15
PROJECT No: 200486.00
DATE: 9/2/2021
SHEET 1 OF 1

RL	Depth (m)	Description of Strata	Graphic Log	Sampling & In Situ Testing: Type	Depth	Sample	Results & Comments	Water	Dynamic Penetrometer Test (blows per 100mm)
	0.0	FILL Sandy CLAY (CI): medium plasticity, red-brown, fine to medium sand, trace fine to medium subangular gravel, moist, appeared poorly compacted		E	0.0 - 0.2				
	0.4	FILL Sandy SILT (ML): low plasticity, black, fine to medium sand, moist, appeared poorly to moderately compacted		B, E	0.4 - 0.6				
	1.0			E	0.9 - 1.0				
	1.2	SAND (SP): fine to medium grained, pale grey, trace low plasticity silt, wet, estimated medium dense, alluvial		E	1.2 - 1.3			▼	
	1.5	Bore discontinued at 1.5m depth - Limit of investigation							

RIG: Ute Mounted Christie Rig **DRILLER:** Geo-Serve **LOGGED:** JW **CASING:** Uncased

TYPE OF BORING: Auger

WATER OBSERVATIONS: Groundwater observed at 1.3m depth

REMARKS: Surface level recorded by hand held DGPS

☐ Sand Penetrometer AS1289.6.3.3
☒ Cone Penetrometer AS1289.6.3.2

SAMPLING & IN SITU TESTING LEGEND

A	Auger sample	G	Gas sample	PID	Photo ionisation detector (ppm)
B	Bulk sample	P	Piston sample	PL(A)	Point load axial test Is(50) (MPa)
BLK	Block sample	U_x	Tube sample (x mm dia.)	PL(D)	Point load diametral test Is(50) (MPa)
C	Core drilling	W	Water sample	pp	Pocket penetrometer (kPa)
D	Disturbed sample	▷	Water seep	S	Standard penetration test
E	Environmental sample	▼	Water level	V	Shear vane (kPa)

Douglas Partners
Geotechnics / Environment / Groundwater

Appendix D

Table 2 – Summary of ASS Test Results
Laboratory Test Results

Table 4: Summary of ASS Screening and Chromium Suite Test Results

Depth (m)	Sample Description	Field Screening Test Results				Chromium Suite Test Results (%S)				
		pH_F	pH_{FOx}	ΔpH	Reaction (0,1,2,3) F	pH_{KCl}	Chromium Reducible Sulfur (S_{CR})	Total Actual Acidity (TAA)	Retained Acidity (S_{NAS})	Existing plus potential Acidity
Bore 1										
0.25	Fill	5.5	2.9	2.6	3	-	-	-	-	-
0.75	Fill	5.7	2.8	2.9	3	-	-	-	-	-
1.25	Sandy Silt	6.0	1.9	4.1	3	-	-	-	-	-
1.75	Sandy Silt	5.9	2.5	3.3	3	-	-	-	-	-
Bore 6										
0.50	Fill	5.4	3.5	1.9	1	4.4	0.013	0.08	0.05	0.14
1.0	Fill	4.9	2.5	2.1	3	4.0	0.021	0.16	<0.02	0.18
1.5	Sand	5.6	2.3	3.3	3	5.4	0.019	<0.02		<0.02
2.0	Silty Sand	5.6	2.3	3.3	3	5.4	0.019	<0.02	-	0.03
Bore 11										
0.50	Fill	5.5	2.6	2.9	3	5.1	0.017	0.03	-	0.04
1.0	Fill	4.7	2.2	2.5	3	4.5	0.013	0.08	-	0.10
1.50	Silty Sand	6.7	2.9	3.8	3	7.5	0.052	<0.02	-	<0.02
2.00	Silty Sand	6.6	3.0	3.6	3	6.4	0.049	<0.02	-	0.05
Bore 12										
0.25	Fill	4.7	3.1	1.6	3	-	-	-	-	-
0.75	Silty Sand	4.7	2.2	2.5	3	-	-	-	-	-
1.25	Sand	4.9	3.1	1.8	1	-	-	-	-	-
1.75	Silty Sand	6.0	2.4	3.6	3	-	-	-	-	-

Notes: (i) – 1 - denotes slight effervescence;
2 - denotes moderate reaction;
3 – denotes vigorous reaction;
4 – denotes very strong effervescence accompanied by escape of gas/heat;
F – indicates a bubbly/frothy reaction (organics).

(ii) Highlighted cell denotes level of existing plus potential acidity above threshold level of 0.03%S.

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2103696**	Page	: 1 of 6
Client	: **DOUGLAS PARTNERS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR GARY SAMUELS	Contact	: John Pickering
Address	: 439 MONTAGUE ROAD WEST END QLD, AUSTRALIA 4101	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 5568 8900	Telephone	: +61 7 3552 8634
Project	: 200486.00	Date Samples Received	: 10-Feb-2021 23:50
Order number	: ----	Date Analysis Commenced	: 18-Feb-2021
C-O-C number	: ----	Issue Date	: 18-Feb-2021 17:35
Sampler	: JESSE WOTTON		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 32		
No. of samples analysed	: 16		

This report supersedes any previous report(s) with this reference. Results apply to the sample(s) as submitted, unless the sampling was conducted by ALS. This document shall not be reproduced, except in full.

This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

Additional information pertinent to this report will be found in the following separate attachments: Quality Control Report, QA/QC Compliance Assessment to assist with Quality Review and Sample Receipt Notification.

Signatories

This document has been electronically signed by the authorized signatories below. Electronic signing is carried out in compliance with procedures specified in 21 CFR Part 11.

Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
~ = Indicates an estimated value.

- ASS: EA037 (Rapid Field and F(ox) screening): pH F(ox) Reaction Rate: 1 - Slight; 2 - Moderate; 3 - Strong; 4 - Extreme
- EA037 ASS Field Screening: NATA accreditation does not cover performance of this service.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	1/0.25	1/0.75	1/1.25	1/1.75	6/0.5
			Sampling date / time	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00
Compound	CAS Number	LOR	Unit	EB2103696-001	EB2103696-003	EB2103696-005	EB2103696-007	EB2103696-010
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	**5.5**	**5.7**	**6.0**	**5.9**	**5.4**
pH (Fox)	----	0.1	pH Unit	**2.9**	**2.8**	**1.9**	**2.5**	**3.5**
Reaction Rate	----	1	-	**3**	**3**	**3**	**3**	**1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	6/1.0	6/1.5	6/2.0	11/0.5	11/1.0
			Sampling date / time	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	08-Feb-2021 00:00	08-Feb-2021 00:00
Compound	CAS Number	LOR	Unit	EB2103696-012	EB2103696-014	EB2103696-016	EB2103696-018	EB2103696-020
				Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	**4.9**	**5.6**	**5.6**	**5.5**	**4.7**
pH (Fox)	----	0.1	pH Unit	**2.5**	**2.3**	**2.3**	**2.6**	**2.2**
Reaction Rate	----	1	-	**3**	**3**	**3**	**3**	**3**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	11/1.5	11/2.0	12/0.25	12/0.75	12/1.25
				Sampling date / time	08-Feb-2021 00:00	08-Feb-2021 00:00	08-Feb-2021 00:00	08-Feb-2021 00:00	08-Feb-2021 00:00
Compound	CAS Number	LOR	Unit		EB2103696-022	EB2103696-024	EB2103696-025	EB2103696-027	EB2103696-029
					Result	Result	Result	Result	Result
EA037: Ass Field Screening Analysis									
pH (F)	----	0.1	pH Unit		**6.7**	**6.6**	**4.7**	**4.7**	**4.9**
pH (Fox)	----	0.1	pH Unit		**2.9**	**3.0**	**3.1**	**2.2**	**3.1**
Reaction Rate	----	1	-		**3**	**3**	**3**	**3**	**1**

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	12/1.75	----	-----	----	-----
			Sampling date / time	08-Feb-2021 00:00	----	----	----	----
Compound	CAS Number	LOR	Unit	EB2103696-031	--------	--------	--------	--------
				Result	----	----	----	----
EA037: Ass Field Screening Analysis								
pH (F)	----	0.1	pH Unit	**6.0**	----	----	----	----
pH (Fox)	----	0.1	pH Unit	**2.4**	----	----	----	----
Reaction Rate	----	1	-	**3**	----	----	----	----

ALS Environmental

CERTIFICATE OF ANALYSIS

Work Order	: **EB2105562**	Page	: 1 of 4
Client	: **DOUGLAS PARTNERS PTY LTD**	Laboratory	: Environmental Division Brisbane
Contact	: MR GARY SAMUELS	Contact	: John Pickering
Address	: 439 MONTAGUE ROAD WEST END QLD, AUSTRALIA 4101	Address	: 2 Byth Street Stafford QLD Australia 4053
Telephone	: +61 07 5568 8900	Telephone	: +61 7 3552 8634
Project	: 200486.00	Date Samples Received	: 25-Feb-2021 11:14
Order number	: ----	Date Analysis Commenced	: 08-Mar-2021
C-O-C number	: ----	Issue Date	: 08-Mar-2021 12:56
Sampler	: JESSE WOTTON		
Site	: ----		
Quote number	: EN/222		
No. of samples received	: 8		
No. of samples analysed	: 8		

ilac-MRA NATA
Accreditation No. 825
Accredited for compliance with
ISO/IEC 17025 - Testing

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This Certificate of Analysis contains the following information:

- General Comments
- Analytical Results

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Signatories

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Signatories	*Position*	*Accreditation Category*
Ben Felgendrejeris	Senior Acid Sulfate Soil Chemist	Brisbane Acid Sulphate Soils, Stafford, QLD

General Comments

The analytical procedures used by ALS have been developed from established internationally recognised procedures such as those published by the USEPA, APHA, AS and NEPM. In house developed procedures are fully validated and are often at the client request.

Where moisture determination has been performed, results are reported on a dry weight basis.

Where a reported less than (<) result is higher than the LOR, this may be due to primary sample extract/digestate dilution and/or insufficient sample for analysis.

Where the LOR of a reported result differs from standard LOR, this may be due to high moisture content, insufficient sample (reduced weight employed) or matrix interference.

When sampling time information is not provided by the client, sampling dates are shown without a time component. In these instances, the time component has been assumed by the laboratory for processing purposes.

Where a result is required to meet compliance limits the associated uncertainty must be considered. Refer to the ALS Contact for details.

Key : CAS Number = CAS registry number from database maintained by Chemical Abstracts Services. The Chemical Abstracts Service is a division of the American Chemical Society.
LOR = Limit of reporting
^ = This result is computed from individual analyte detections at or above the level of reporting
ø = ALS is not NATA accredited for these tests.
~ = Indicates an estimated value.

- ASS: EA033 (CRS Suite): Liming rate is calculated and reported on a dry weight basis assuming use of fine agricultural lime (CaCO3) and using a safety factor of 1.5 to allow for non-homogeneous mixing and poor reactivity of lime. For conversion of Liming Rate from 'kg/t dry weight' to 'kg/m3 in-situ soil', multiply 'reported results' x 'wet bulk density of soil in t/m3'.
- ASS: EA033 (CRS Suite): Laboratory determinations of ANC needs to be corroborated by effectiveness of the measured ANC in relation to incubation ANC. Unless corroborated, the results of ANC testing should be discounted when determining Net Acidity for comparison with action criteria, or for the determination of the acidity hazard and required liming amounts.

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)				Sample ID	6/1.0 EB2103696_012	6/1.5 EB2103696_014	6/2.0 EB2103696_016	6/0.5 EB2103696_010	11/1.0 EB2103696_020
				Sampling date / time	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00
Compound	CAS Number	LOR	Unit		EB2105562-001	EB2105562-002	EB2105562-003	EB2105562-004	EB2105562-005
					Result	Result	Result	Result	Result
EA033-A: Actual Acidity									
pH KCl (23A)	----	0.1	pH Unit		4.0	5.0	5.4	4.4	4.5
Titratable Actual Acidity (23F)	----	2	mole H+ / t		98	3	5	53	53
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S		0.16	<0.02	<0.02	0.08	0.08
EA033-B: Potential Acidity									
Chromium Reducible Sulfur (22B)	----	0.005	% S		0.021	0.014	0.019	0.013	0.013
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t		13	<10	12	<10	<10
EA033-D: Retained Acidity									
KCl Extractable Sulfur (23Ce)	----	0.02	% S		<0.02	----	----	<0.02	----
HCl Extractable Sulfur (20Be)	----	0.02	% S		<0.02	----	----	0.02	----
Net Acid Soluble Sulfur (20Je)	----	0.02	% S		<0.02	----	----	0.05	----
acidity - Net Acid Soluble Sulfur (a-20J)	----	10	mole H+ / t		<10	----	----	23	----
sulfidic - Net Acid Soluble Sulfur (s-20J)	----	0.02	% pyrite S		<0.02	----	----	0.04	----
EA033-E: Acid Base Accounting									
ANC Fineness Factor	----	0.5	-		1.5	1.5	1.5	1.5	1.5
Net Acidity (sulfur units)	----	0.02	% S		0.18	<0.02	0.03	0.14	0.10
Net Acidity (acidity units)	----	10	mole H+ / t		112	12	17	84	61
Liming Rate	----	1	kg CaCO3/t		8	<1	1	6	4
Net Acidity excluding ANC (sulfur units)	----	0.02	% S		0.18	<0.02	0.03	0.14	0.10
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t		112	12	17	84	61
Liming Rate excluding ANC	----	1	kg CaCO3/t		8	<1	1	6	4

Analytical Results

Sub-Matrix: SOIL (Matrix: SOIL)			Sample ID	11/1.5 EB2103696_022	11/2.0 EB2103696_024	11/0.5 EB2103696_018	----	----
			Sampling date / time	09-Feb-2021 00:00	09-Feb-2021 00:00	09-Feb-2021 00:00	----	----
Compound	CAS Number	LOR	Unit	EB2105562-006	EB2105562-007	EB2105562-008	--------	--------
				Result	Result	Result	----	----
EA033-A: Actual Acidity								
pH KCl (23A)	----	0.1	pH Unit	**7.5**	**6.4**	**5.1**	**----**	**----**
Titratable Actual Acidity (23F)	----	2	mole H+ / t	<2	<2	**17**	**----**	**----**
sulfidic - Titratable Actual Acidity (s-23F)	----	0.02	% pyrite S	<0.02	<0.02	**0.03**	**----**	**----**
EA033-B: Potential Acidity								
Chromium Reducible Sulfur (22B)	----	0.005	% S	**0.052**	**0.049**	**0.017**	**----**	**----**
acidity - Chromium Reducible Sulfur (a-22B)	----	10	mole H+ / t	**33**	**31**	**10**	**----**	**----**
EA033-C: Acid Neutralising Capacity								
Acid Neutralising Capacity (19A2)	----	0.01	% CaCO3	**1.04**	**----**	**----**	**----**	**----**
acidity - Acid Neutralising Capacity (a-19A2)	----	10	mole H+ / t	**208**	**----**	**----**	**----**	**----**
sulfidic - Acid Neutralising Capacity (s-19A2)	----	0.01	% pyrite S	**0.33**	**----**	**----**	**----**	**----**
EA033-E: Acid Base Accounting								
ANC Fineness Factor	----	0.5	-	**1.5**	**1.5**	**1.5**	**----**	**----**
Net Acidity (sulfur units)	----	0.02	% S	<0.02	**0.05**	**0.04**	**----**	**----**
Net Acidity (acidity units)	----	10	mole H+ / t	<10	**31**	**27**	**----**	**----**
Liming Rate	----	1	kg CaCO3/t	<1	**2**	**2**	**----**	**----**
Net Acidity excluding ANC (sulfur units)	----	0.02	% S	**0.05**	**0.05**	**0.04**	**----**	**----**
Net Acidity excluding ANC (acidity units)	----	10	mole H+ / t	**33**	**31**	**27**	**----**	**----**
Liming Rate excluding ANC	----	1	kg CaCO3/t	**2**	**2**	**2**	**----**	**----**

Attachment 4 – Operational Road Traffic Noise Assessment

Noise & Vibration Impact Assessment

Byron Bay Bioenergy Facility (BEF)

45 Wallum Place, Byron Bay, NSW

01 October 2021
Document No. 60.00860.01 RPT1R4.DOCX

Skala Australasia Pty Ltd
c/o Jackson Environment and Planning Pty Ltd
Suite 102, Level 1, 25 - 29 Berry Street
North Sydney
NSW 2060

Noise & Vibration Impact Assessment

Byron Bay Bioenergy Facility (BEF)

45 Wallum Place, Byron Bay, NSW

Prepared by:

Waves Acoustic Consulting Pty Ltd

Level 7, 1 York Street, Sydney, NSW 2000
ABN 80 610 696 449

T: +61 2 7900 5548
E: info@wavesconsulting.com.au
W: www.wavesconsulting.com.au

TABLE OF CONTENTS

APPENDIX A: Graphical Noise Logger Data

1 Introduction

1.1 Background

Skala Australasia Pty Ltd (the client) on behalf of Byron Bay Council is seeking approval for the development of a Bioenergy Facility (BEF) adjacent to the Byron Bay Sewage Treatment Plant (BBSTP) at 45 Wallum Place, Byron Bay (Lot 2/DP706286). The proposed BEF will use biosolids from the BBSTP, in conjunction with other organic waste materials, to produce energy for use within the BBSTP and exported to the grid. The proposal aims to receive up to 28,000 tonnes of organic (carbon based) waste material for processing each year.

The proposed development will provide a fully enclosed organics recycling and bioenergy facility for organic waste materials such as food, garden organics and biosolids. The facility will allow unloading of these materials and dispatch of recycled organic products by high-capacity trucks in an enclosed controlled environment.

The development will allow for bulk deliveries of organic wastes and bulk dispatch of product. There will be no public drop-off or pick-up facilities. It includes an access road with wheel wash, a shaker rack, weighbridge and separate lane for access around the weighbridge. The access will be separate to the existing BBSTP access road.

The development will include proven enclosed anaerobic digestion technologies, including up to six (6) tunnel digestors, some of which may also have the capability to also aerobically compost the organic wastes received.

Other major components of the BEF will include:

- A site administration building with offices, control room, education room and staff/visitor amenities.
- Enclosed waste receival hall, including product dispatch area, under negative pressure and including fast open and close roller doors.
- A biofilter for treatment of air from the enclosed waste receival hall and tunnels.
- Flexible biogas storage tank.
- Concrete percolate storage tank.
- Biogas treatment system.
- Combined heat and power (CHP) system (250kW) and flare.

The Secretary's Environmental Assessment Requirements (SEARs) have been provided for the development. The SEARs issued on 03 August 2020 request that a Noise and Vibration Impact Assessment is prepared as part of the Environmental Impact Statement and Development Application process. The SEARs (1471) identify the following general requirements for noise and vibration:

- Background noise assessment at all nearby noise sensitive receivers.
- Operational noise modelling and assessment in accordance with the NSW Noise Policy for Industry (NPI) to include spectral / octave band data of proposed plant, noise modification factors and weather impacts on noise propagation.
- Operational traffic noise analysis in accordance with the NSW Road Noise Policy (RNP).
- Operational vibration modelling and analysis in accordance with the EPAs NSW Assessing Vibration: A Technical Guidelines (2006).
- Construction Noise and Vibration Assessment in accordance with the Interim Construction Noise Guideline (ICNG).

Waves Acoustic Consulting Pty Ltd (Waves Consulting) has been engaged by Skala Australasia (through Jackson Environment and Planning Pty Ltd) to prepare a Noise and Vibration Impact Assessment (NVIA) to demonstrate the noise and vibration impacts associated with the project. This report presents the results of the assessment and forms part of the Environmental Impact Statement (EIS) for the proposal.

This report has been prepared to inform Byron Bay Council, the EPA and the DIPE and all relevant stakeholders. The aim of the report is to assess the potential noise and vibration impacts of the proposed development on any nearby sensitive receivers and has been prepared in accordance with the guidelines outlined in Section 1.2.

1.2 Relevant Guidelines

Noise from the operation of the proposal has been assessed in accordance with the NSW Noise Policy for Industry (NPI) 2017.

Noise from additional traffic movements on the local road network has been assessed in accordance with the NSW Road Noise Policy (RNP), NSW EPA 2011.

Vibration from the operation and construction of the proposal has been assessed in accordance with Assessing Vibration: a technical guideline (DEC 2006).

Construction Noise Impacts have been assessed in accordance with the NSW Interim Construction Noise Guideline (ICNG).

2 Development Description

2.1 Overview of the Development Site

The proposed development will involve the construction and operation of a best practice Bioenergy Facility (BEF) receiving organic waste materials from households and businesses in the Byron and neighbouring local government areas. The facility will be enclosed and operate under negative pressure to ensure all emissions from the process are treated before release. Biogas will be collected and consumed onsite to generate electricity. No biogas will be exported from the site.

A site plan providing an overview of the proposed development and operations are given in Figure 1 and Figure 2. Key operational features of the development within the 0.8ha footprint includes:

- A Receival Hall.
- Four Anaerobic Digestion Tunnels with gas storage.
- Three Aerobic Composting Tunnels.
- A Biofilter.
- A Percolate Storage Tank with sand filter.
- A Combined Heat and Power (CHP) unit with gas treatment and flare.
- Office and education facilities.
- A car park to assist in traffic flow on the site.

An additional approximately 4,000 m^2 is occupied by the main access road, a perimeter access road, and a weighbridge. The existing STP biosolids storage area will be repurposed to store products from the BEF. An operational overview of the functional areas of the site is provided below.

Operations include:

- Vehicles enter the site from Wallum Place via the weighbridge and enter the Receival Area through the designated entry fast open and close door on the north eastern corner of the building.
- Separate internal bays are provided, with the front of the bay for tipping, spreading and identification of any hazardous materials (eg gas bottles, batteries, paints, chemicals and asbestos) or any other in-organic contamination (eg plastic, metal, and glass).
- Separate bays are provided for:
  a. Food waste and mixed garden and food organics (FOGO).
  b. Dewatered biosolids and shredded garden organics.
  c. Coppice crops and dewatered Fats, Oils and Grease (FOG).
- FOG will be delivered in a dewatered state from a separate licenced facility.
- Shredded garden organics or other high carbon absorbent organic materials will be spread in bays designated for temporarily storing organic materials that are wet and/or high in nitrogen.
- Any hazardous materials (eg gas bottles, batteries, paints, chemicals) are moved and stored in the existing STP chemical storage area.
- If required, specialised decontamination equipment will be installed and operated in the receival area.
- Vehicles then exit the Receival Area through the designated exit fast open and close door and proceed over a shaker grid and wheel wash.

Figure 1. Overall Site Layout and Proposed Vehicle Entry

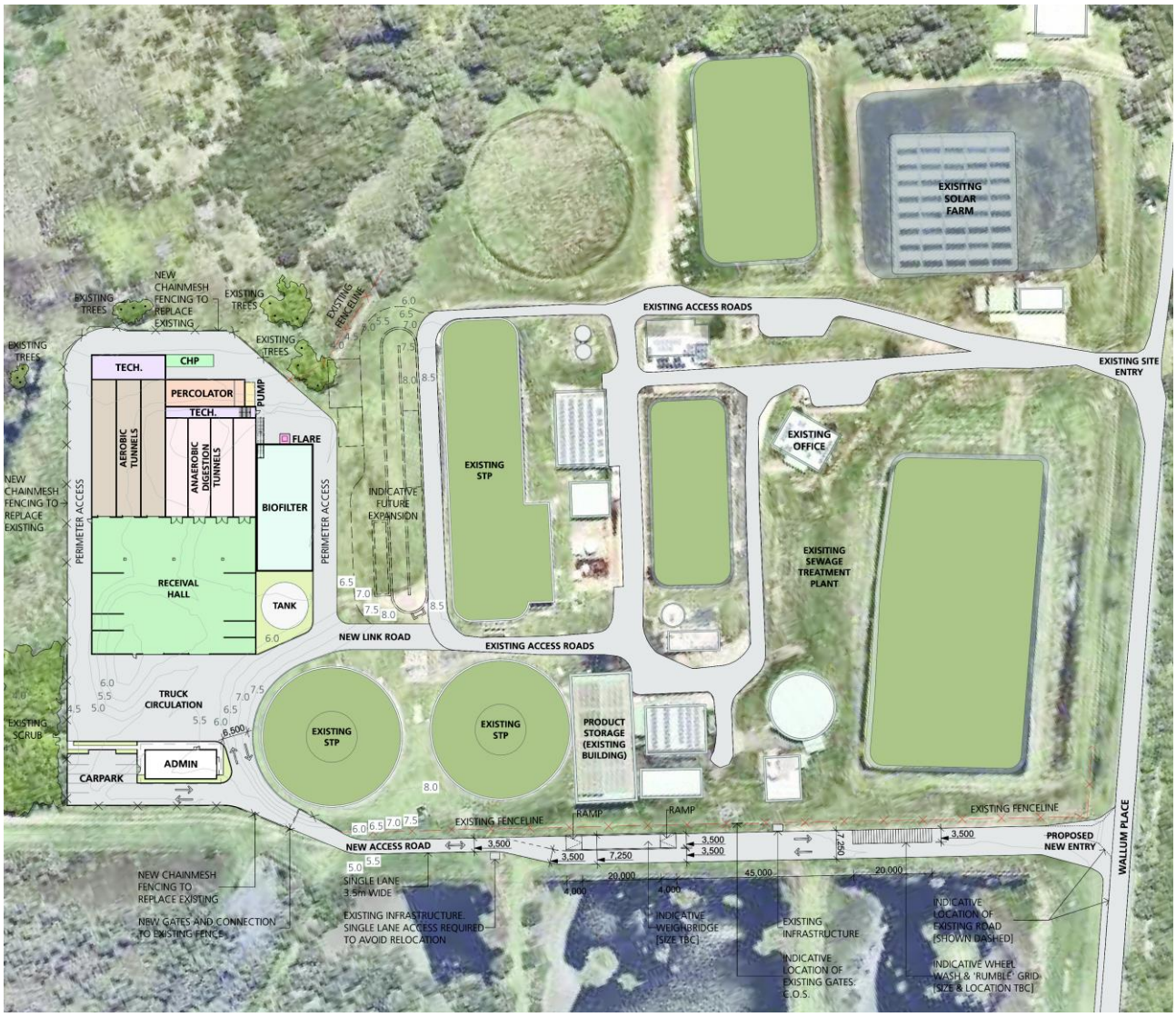
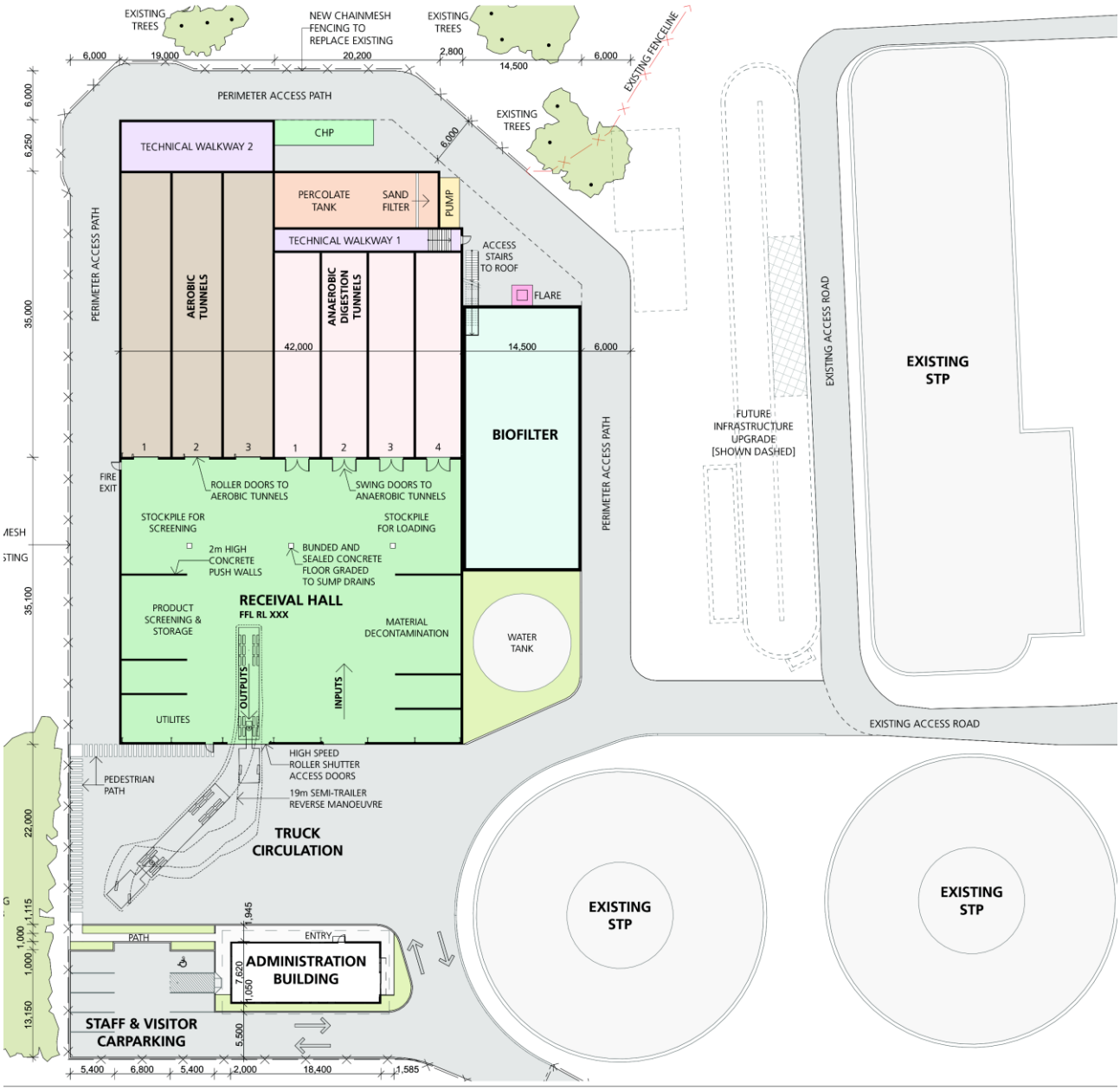


Figure 2. Detailed Building Plan



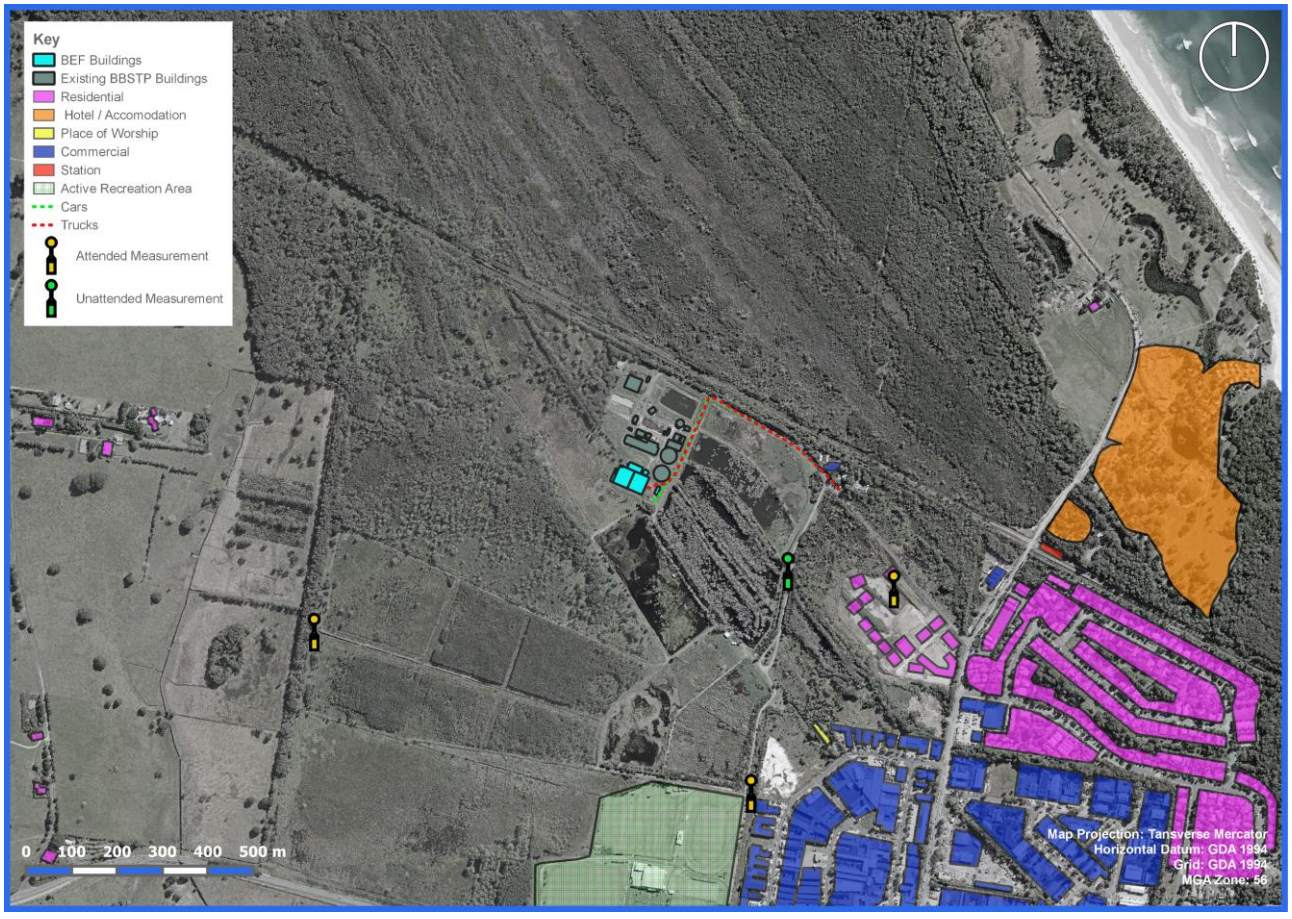
The main operational noise and vibration sources from the proposed facility will include:

- External:
  a. Offsite vehicle movements on the nearby road network.
  b. Onsite vehicle movements ie mainly delivery trucks.
  c. Mechanical services to operate the facility.
  d. Power Generation (CHP) and the gas flare.
- Internal
  a. Material processing / screening / sorting.
  b. Vehicle movements to load and manoeuvre materials ie loaders and material handlers.

2.2 Overview of the Surrounding Area

Figure 3 below illustrates the proposed Bioenergy Facility (BEF) site which is located inside the existing Byron Bay Sewage Treatment Plant (BBSTP) site at 45 Wallum Place, Byron Bay (Lot 2/DP706286). This figure also shows the proximity of the nearest noise sensitive receivers in the surrounding area. Figure 3 also shows key features labelled including the noise monitoring locations used for this assessment.

Figure 3. Site Location, Surrounding Area & Noise Logging Location



Aerial photography courtesy of NSW Imagery

Table 1 below also describes the relative proximity of the nearest noise sensitive receivers to the proposed site.

Table 1. Nearest Noise Sensitive Receivers to the BEF Site

Receiver Type	Description	Distance (m)	Direction
Commercial	Byron Bay Herb Nursery	360	East
	The Sun Bistro, 61 Bayshore Drive	740	East
	Centennial Cct, Commercial Zone	635	South East
Active Recreation	Byron Regional Sporting and Cultural Complex, 249 Ewingsdale Road	600	South
Residential	Gallagher Street	440	East
	Parkes Avenue	515	South East
	Porter Street	640	South East
	Sunrise Boulevard	780	South East
	Bayshore Lane	780	South East
	Julian Rock Drive	870	South East
	Belongil Crescent	870	South East
	10 Quarry Lane	1450	South West
	25 Quarry Lane	1410	South West
	35 Quarry Lane	1360	South West
	106 Quarry Lane	1230	West
	108 Quarry Lane	1100	West
	110 Quary Lane	1000	West
	146 Bayshore Drive	1000	North East
Hotels / Temporary Accommodation	Elements of Byron, 144 Bayshore Drive	940	East
	Bayshore Bungalows, 112 Bayshore Drive	840	East
Place of Worship	East Gate Community Church	625	South East

2.3 Operational Activities / Equipment

Table 2 provides the proposed operational activities and equipment for the site which have been used in this assessment (data provided by Jackson Environment and Planning).

Table 2. Proposed Outdoor Operational Activities and Equipment

Location	Description	Sound Power Level L_W (dB re 1pW)
Receival Hall	Air Desulphurisation Fan	56
Digestion Tunnels	High Performance Fan 1	100
	High Performance Fan 2	100
	High Performance Fan 2	100
	Exhaust Fan	115
	Acid Washer	72
	Biofilter Fan	95
	Digestate Mixer	107
	Fermenter Supply Fan	105
Bio Gas Storage	Air Blower	86
	Circulation Fan	88
Technical Walkway	Wall Fan	83
Pump Room	Exhaust Fan	105
	Spray Pump	88
	Wall Fan	78
	Sanitiser Pump	73
CHP	CHP 1	93
Gas Flare	Flare	92
Administration Building	Air Conditioning	63
	Exhaust Fans	78

Table 3 provides the (estimated) overall and octave band sound pressure levels (reverberant) for the proposed indoor equipment associated with the Receival Hall at the site. These levels have been based on the Waves Consulting noise database for similar equipment and activities.

Table 3. Estimated Reverberant Sound Pressure Level of the Proposed Indoor Equipment Inside the Receival Hall

Description	Overall L_{Aeq} (dB re 20 µPa)	Octave Band Centre Frequency (Hz) L_{eq} (dB re 20 µPa)							
		63	125	250	500	1000	2000	4000	8000
Forus Electrical Shredder SKALA 1500 Conveyor Terra Select Screen Front End Loader	101	92	93	93	92	92	92	91	91

Note: 1. The reverberant noise levels are dominated by the electrical shredder which has an overall sound power level of 117 dB L_{WA} and a relatively flat broadband spectrum.

2.4 Operational Hours

The proposed operational hours were provided by Jackson Environment and Planning and are summarised in Table 4.

Table 4. Summary of Operational Hours

Operational Activity	Hours
Opening hours (staffed)	Monday to Friday. 0700 to 1700 hrs Saturday. 0800 to 1300 hrs
Heavy truck deliveries	Monday to Friday. 0700 to 1700 hrs Saturday. 0800 to 1300 hrs
Materials handling (internal)	Monday to Friday. 0700 to 1700 hrs Saturday. 0800 to 1300 hrs
Mechanical services / power generation	24 hrs / 7 days a week
Light vehicle deliveries	24 hrs / 7 days a week

2.5 Operational Traffic Generation

The proposed traffic movements for receival / removal of material at the site were provided by Jackson Environment and Planning. The maximum future operation of the site is estimated to generate up to 8 heavy vehicle trips per day. In addition, the site may also generate up to five (5) light vehicles movements from staff and visitors attend during a normal working day.

Vehicles accessing and egressing the site will travel to and from the nearby Pacific Highway via Ewingsdale Road, Bayshore Drive and finally via Wallum Place (main site access road).

2.6 Potential Operational Noise Impacts

Potential noise impacts from operation of the proposed development which will be assessed in this report include:

- Noise emission from the fixed noise sources associated with the development to any nearby sensitive receivers ie mechanical services and processing activities noise emission through the facade of the buildings.
- Noise emission from vehicle movements on site to any nearby sensitive receivers ie delivery trucks.
- Additional noise emission from vehicle movements on the adjacent roads to any nearby sensitive receivers.

2.7 Construction Equipment / Activities

The proposed construction equipment for the development have been provided by Jackson Environment and Planning. Table 5 illustrates the anticipated construction activities / plant items proposed during the construction works at the site.

Table 5. Proposed Construction Plant Information and Sound Power Levels L_{WA}

Construction Item	Estimated Sound Power Level L_{WA} (dB re 1pW)	No. of Days	Construction Scenario
Small Excavator	105	35	Services reticulation and detailed excavation
Large Excavator	118	30	Bulk earth works
Bob Cat	105	35	Services reticulation and detailed excavation
Water Truck	105	20	Road construction & bulk earth works
Grader	114	15	Site side services reticulation and detailed excavation
Scraper	114	20	Road construction & bulk earthworks
Compactor	106	20	Road construction & bulk earthworks
Paver	112	10	Road construction
Crane	110	90	Primary vertical steel construction, roofing, tunnel construction
Diesel Generator	110	20	Only needed until power to site established

The overall time period for construction is anticipated to be no more than 10 months.

2.8 Potential Construction Noise Impacts

Potential noise impacts from construction of the proposed development which will be assessed in this report include:

- Noise emission from construction activities and vehicle movements on site to any nearby sensitive receivers ie delivery trucks, bulldozers, loaders and excavators.
- Additional noise emission from construction vehicle movements on the adjacent roads to any nearby sensitive receivers.

2.9 Potential Construction & Operational Vibration Impacts

The offset distances (in all directions) between any vibrationally intensive equipment and any residential receivers is large (> 300 m). The potential for vibration impacts at residential receivers due to the construction or operation of the development are effectively nil. No further consideration of vibration impacts at residential receivers is given in this assessment as a result.

However, the smallest offset distance between any vibration intensive equipment and the existing STP buildings is approximately 20 m. Therefore, the potential for vibration impacts due to construction vibration at the existing STP buildings will be assessed in this report.

3 Noise Measurements

3.1 Unattended Noise Monitoring

To characterise the existing acoustic environment in the area, a survey of environmental noise levels was conducted from Thursday 28 January to Tuesday 08 February 2021. The noise logger was installed adjacent to the closest residential properties on Gallagher Road, Byron Bay, NSW (see Figure 3).

The logger location was selected with consideration of other noise sources which may have influenced the measurements, security issues for the equipment and access permission from residents and landowners.

Instrumentation for the survey comprised a Svan 977 Type 1 Sound Level Meter and Logger (Serial No. 45730) fitted with an environmental windshield. The noise logger was programmed to continuously record the ambient noise levels. The sample time interval was set at 15 minutes with a Fast (125 ms) time weighting function. Calibration of the logger was checked prior to and after the measurements. Drift in calibration did not exceed ±0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates.

The measured noise data has been filtered to remove erroneous data and any data measured during adverse weather conditions following review of historical weather reports from the Bureau of Meteorology (BOM) Cape Byron station (nearest weather station).

Daily graphs for the noise logger are attached in Appendix A. The graphs represent each 24-hour period of the L_{AF1}, L_{AF10} and L_{AF90} together with the L_{Aeq} levels for the corresponding 15-minute periods, as well as relevant weather data.

3.2 Unattended Noise Monitoring Results

To define the applicable environmental criteria at nearby noise sensitive receivers the measured data has been processed in accordance with the time periods stipulated by the EPA NSW Noise Policy for Industry (NPI). Table 6 details the background and ambient noise levels recorded during the NSW NPI daytime, evening and night-time assessment periods.

Table 6. Measured Noise Levels Corresponding to NSW NPI Assessment Periods

Date	L_{AF90} Background Noise Levels			L_{Aeq} Ambient Noise Levels		
	Day	Evening	Night	Day	Evening	Night
Thursday, 28 January 2021	-	41	44	-	53	55
Friday, 29 January 2021	39	40	44	49	52	55
Saturday, 30 January 2021	38	40	42	48	50	55
Sunday, 31 January 2021	38	39	44	48	51	55
Monday, 1 February 2021	40	39	45	49	51	56
Tuesday, 2 February 2021	-	41	44	-	60	53
Wednesday, 3 February 2021	43	41	46	49	63	57
Thursday, 4 February 2021	41	40	46	58	58	56
Friday, 5 February 2021	41	42	44	49	55	55
Saturday, 6 February 2021	40	41	44	50	54	54
Sunday, 7 February 2021	39	40	-	48	52	-
Monday, 8 February 2021	-	-	-	-	-	-
Tuesday, 9 February 2021	-	-	-	-	-	-
RBL	**40**	**40**	**44**	**-**	**-**	**-**
Log Ave	**-**	**-**	**-**	**51**	**57**	**55**
Total Valid Periods	**9**	**11**	**10**	**9**	**11**	**10**
Total Invalid Periods	**4**	**1**	**2**	**4**	**1**	**2**
Total Periods	**13**	**12**	**12**	**13**	**12**	**12**

Note 1. For Monday to Saturday, Daytime 0700 to 1800 hrs, Evening 1800 to 2200 hrs, Night-time 2200 to 0700 hrs.
For Sundays and Public Holidays, Daytime 0800 to 1800 hrs, Evening 1800 to 2200 hrs, Night-time 2200 to 0800 hrs.
Note 2. The RBL noise level is representative of the *median background sound level* (in the absence of the source under consideration), or simply the background level.
Note 3. The L_{Aeq} is essentially the *average sound level*. It is defined as the steady sound level that contains the same amount of acoustical energy as a given time-varying sound of the same duration.

The environmental noise in the area is typically dominated by local flora and fauna, road traffic on the surrounding local roads and distant commercial / industrial hum. The noise characteristics and trend in the noise data as shown in Appendix A are typical of those found in suburban areas.

3.3 Attended Noise Measurements

Attended measurements of ambient noise were taken at several representative locations on 08 February 2021. These have been used to determine the various noise sources that influence the existing noise environment. During each measurement, the observer noted the various noise sources and the contributing noise level.

At each location, the attended measurements were performed for up to 15 minutes using a calibrated Svan 977 Type 1 Sound Level Meter and Logger (Serial No. 45730) fitted with an environmental windshield. Wind speeds were less than 5 m/s and all measurements were performed at a height of 1.5 metres above ground level.

Calibration of the logger was checked prior to and after the measurements. Drift in calibration did not exceed ±0.5 dB. All equipment carried appropriate and current NATA (or manufacturer) calibration certificates. The noise environment at each of the attended monitoring locations is described in Table 7.

Table 7. Attended Noise Monitoring Results

Measurement Location	Measured Noise Levels (dB re 20 µPa)			Character of the Ambient Noise
	L_{Aeq}	L_{AFMax}	L_{AF90}	
Adjacent to the residential dwellings on Quarry Lane	47	67	44	Dominated by flora and fauna noise with distant local road traffic noise and occasional aircraft noise events.
Adjacent to the residential dwellings on Gallagher Road	46	57	44	Dominated by flora and fauna noise with distant local road traffic noise and commercial / industrial hum and occasional aircraft noise events.
Adjacent to the Byron Regional Sporting and Cultural Complex	48	67	42	Dominated by flora and fauna noise and local road traffic noise with distant commercial / industrial hum and occasional aircraft noise events.

The environmental noise in the area is typically dominated by local flora and fauna, road traffic on the surrounding local roads and distant commercial / industrial hum. The noise characteristics and the overall noise levels are typical of those found in suburban areas.

4 Operational Noise Assessment Guidelines

4.1 NSW Noise Policy for Industry (NPI)

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the NSW Environment Protection Authority (EPA).

The EPA oversees the NSW Noise Policy for Industry (NPI) 2017 which provides a framework and process for deriving noise trigger levels. The NPI replaced the Industrial Noise Policy (INP) at the end of October 2017.

The NPI sets out the procedure to determine the *project noise trigger levels* relevant to a particular industrial development. The project noise trigger level applies to existing noise-sensitive receivers; however, it may also be used in strategic planning processes for proposed land uses.

If it is predicted that the development is likely to cause the project noise trigger level to be exceeded at existing noise-sensitive receivers, management measures are required to reduce the predicted noise level.

4.1.1 Project Noise Trigger Level - Introduction

The project noise trigger level provides a benchmark or objective for assessing a proposal or site. It is not intended for use as a mandatory requirement. The project noise trigger level is a level that, if exceeded, would indicate a potential noise impact on the community, and so *trigger* a management response; for example, further investigation of mitigation measures.

The project noise trigger level, feasible and reasonable mitigation, and consideration of residual noise impacts are used together to assess noise impact and manage the noise from a proposal or site. It is the combination of these elements that is designed to ensure that acceptable noise outcomes are determined by decision makers.

The trigger level is tailored for each specific circumstance to take into account a range of factors that may affect the level of impact, including:

- Background noise environment.
- Time of day of the activity.
- Character of the noise.
- Type of receiver and nature of the area.

The scientific literature indicates that both the increase in noise level above background levels (that is, intrusiveness of a source), as well as the absolute level of noise are important factors in how a community will respond to noise from industrial sources. The project noise trigger level established in the NPI addresses each of these components of noise impact.

The project noise trigger level is the lower (that is, the more stringent) value of the *project intrusiveness noise level* and the *project amenity noise level*. The project intrusiveness noise level aims to protect against significant changes in noise levels, whilst the project amenity noise level seeks to protect against cumulative noise impacts from industry and maintain amenity for particular land uses.

Applying the most stringent requirement as the project noise trigger level ensures that both intrusive noise is limited and amenity is protected and that no single industry can unacceptably change the noise level of an area. Typically, the intrusiveness level will inform the project noise trigger level in areas with little industry (and/or ambient noise levels), whereas the amenity level will inform the project noise trigger level in areas with higher existing background noise levels. Intrusive noise levels are only applied to residential receivers (residences). For other receiver types only the amenity levels apply.

4.1.2 Project Intrusiveness Noise Level

The intrusiveness of an industrial noise source may generally be considered acceptable if the level of noise from the source (represented by the L_{Aeq} descriptor), measured over a 15-minute period, does not exceed the background noise level by more than 5 dB when beyond a minimum threshold. This intrusiveness noise level seeks to limit the degree of change a new noise source introduces to an existing environment.

The project intrusiveness noise level is determined as follows:

$L_{Aeq,15min}$ = rating background noise level + 5 dB

where:

- $L_{Aeq,15m}$ - represents the equivalent continuous (energy average) A-weighted sound pressure level of the source over 15 minutes.
- Rating Background Noise Level (RBL) - represents the background level to be used for assessment purposes, as determined by the methodology in Factsheets A & B of the NPI.

Intrusiveness noise levels are not used directly as regulatory limits. They are used in combination with the amenity noise level to assess the potential impact of noise, assess reasonable and feasible mitigation options and subsequently determine achievable noise requirements.

Minimum Project Intrusiveness Noise Levels

The NPI applies minimum RBLs to any project. These result in minimum intrusiveness noise levels as follows:

Table 8. Minimum RBLs and Project Intrusiveness Noise Levels

Time of Day	Minimum RBL (dB)	Minimum Project Intrusiveness Noise Level $L_{Aeq,15min}$ (dB)
Day	35	40
Evening	30	35
Night	30	35

4.1.3 Project Amenity Noise Level

To limit continuing increases in noise levels from application of the intrusiveness level alone, the ambient noise level within an area from all industrial noise sources combined should remain below the recommended amenity noise levels specified in Table 9 where feasible and reasonable.

The recommended amenity noise levels will protect against noise impacts such as speech interference, community annoyance and some sleep disturbance. The *recommended amenity noise levels* represent the objective for total industrial noise at a receiver location, whereas the *project amenity noise level* represents the objective for noise from a single industrial development at a receiver location.

To ensure that industrial noise levels (existing plus new) remain within the recommended amenity noise levels for an area, a project amenity noise level applies for each new source of industrial noise as follows:

Project amenity noise level = recommended amenity noise level (from Table 9) minus 5 dB

Table 9. Recommended Amenity Noise Level as per Table 2.2 of the NPI

Receiver Type	Noise Amenity Area	Time of Day	Recommended Amenity Noise Level $L_{Aeq,period}$ (dB)
Residential	Rural	Day	50
		Evening	45
		Night	40
	Suburban	Day	55
		Evening	45
		Night	40
	Urban	Day	60
		Evening	50
		Night	45
Hotels, motels, caretakers quarters, holiday accommodation, permanent resident caravan parks	See column 4	See column 4	5 dB above the recommended amenity noise level for a residence for the relevant noise amenity area and time of day
School classroom – internal	All	Noisiest 1-hour period when in use	35
Hospital ward internal external	 All All	 Noisiest 1-hour Noisiest 1-hour	 35 50
Place of worship – internal	All	When in use	40
Area specifically reserved for passive recreation (eg national park)	All	When in use	50
Active recreation area (eg school playground, golf course)	All	When in use	55
Commercial premises	All	When in use	65
Industrial premises	All	When in use	70
Industrial interface (applicable only to residential noise amenity areas)	All	All	Add 5 dB to recommended noise amenity area

4.1.4 Recommended Amenity Noise Level – Residential Receiver Classification

Residential receivers must have the area type defined in order to select the applicable recommended amenity noise level. Table 10 below illustrates how the NPI classifies the rural, suburban and urban noise amenity area categories.

Table 10. Residential Receiver Category as per Table 2.3 of the NPI

Receiver Category	Typical Planning Zone	Typical Background Noise Levels (RBL)			Description
		Day	Eve	Night	
Rural residential	RU1, RU2, RU4, R5, E4	<40	<35	<30	**Rural** – an area with an acoustical environment that is dominated by natural sounds, having little or no road traffic noise and generally characterised by low background noise levels. Settlement patterns would be typically sparse. Note: Where background noise levels are higher than those presented in column 3 due to existing industry or intensive agricultural activities, the selection of a higher noise amenity area should be considered.
Suburban residential	RU5, RU6, R2, R3, E2, E3	<45	<40	<35	**Suburban** – an area that has local traffic with characteristically intermittent traffic flows or with some limited commerce or industry. This area often has the following characteristic: evening ambient noise levels defined by the natural environment and human activity.
Urban residential	R1, R4, B1, B3, B4	>45	>40	>35	**Urban** – an area with an acoustical environment that: ▪ is dominated by 'urban hum' or industrial source noise, where urban hum means the aggregate sound of many unidentifiable, mostly traffic and/or industrial related sound sources ▪ has through-traffic with characteristically heavy and ▪ continuous traffic flows during peak periods ▪ is near commercial districts o**r** industrial districts ▪ has any combination of the above

For this development the *suburban* classification will apply to the residential receivers when defining the recommended amenity noise level.

4.1.5 Recommended Amenity Noise Level – Existing Background Noise Corrections

The recommended amenity noise level applicable to residential receivers can be changed in the following circumstances:

- When existing traffic noise levels are dominant, are 10 dB above the recommended noise amenity level and are unlikely to decrease, then the project amenity noise levels become the $L_{Aeq,period(traffic)}$ – 15 dB.
- At industrial / residential interfaces where a project seeks to make minor changes to an existing development. In this case, the recommended amenity noise levels can be increased by 5 dB in the region that is in close proximity to existing industrial premises and that extends out to a point where the existing industrial noise from the source has fallen by 5 dB or an area defined in a planning instrument.
- As per the information given in Table 10 for residential receivers in the rural category.

In this case, no amenity noise level adjustments are applicable so they will not be applied to this assessment.

4.1.6 Recommended Amenity Noise Level - Time Period Correction

The L_{Aeq} is determined over a 15-minute period for the project intrusiveness noise level and over an assessment period (day, evening and night) for the project amenity noise level. This leads to the situation where, because of the different averaging periods, the same numerical value does not necessarily represent the same amount of noise heard by a person for different time periods. To standardise the time periods for the intrusiveness and amenity noise levels, the NPI assumes the following conversion:

$L_{Aeq,15min} = L_{Aeq,period} + 3$ dB

(unless robust evidence is provided for an alternative approach for the particular project being considered)

4.1.7 Maximum Noise Level Assessment - Sleep Disturbance

The potential for sleep disturbance from maximum noise level events from premises during the night-time period needs to be considered. Sleep disturbance is considered to be both awakenings and disturbance to sleep stages.

Where the subject development / premises night-time noise levels at a residential location exceed:

- $L_{Aeq,15min}$ 40 dB or the prevailing RBL plus 5 dB, whichever is the greater.

and/or

- L_{AFmax} 52 dB or the prevailing RBL plus 15 dB, whichever is the greater.

a detailed maximum noise level event assessment should be undertaken.

The detailed assessment should cover the maximum noise level, the extent to which the maximum noise level exceeds the rating background noise level, and the number of times this happens during the night-time period.

Other factors that may be important in assessing the extent of impacts on sleep include:

- How often high noise events will occur.
- The distribution of likely events across the night-time period and the existing ambient maximum events in the absence of the subject development.
- Whether there are times of day when there is a clear change in the noise environment (such as during early-morning shoulder periods).
- Current scientific literature available at the time of the assessment regarding the impact of maximum noise level events at night.

Maximum noise level event assessments should be based on the L_{AFmax} descriptor on an event basis under *fast* time response. The detailed assessment should consider all feasible and reasonable noise mitigation measures with a goal of achieving the above trigger levels.

4.1.8 NPI Project Noise Trigger Levels (PNTL)

Having defined the area type, the processed results of the unattended noise monitoring have been used to determine project noise trigger levels. The intrusive and amenity noise levels for nearby noise-sensitive receivers are presented in Table 11. These criteria are nominated for the purpose of assessing potential noise impacts from the onsite sources of noise associated with the proposed development.

For each assessment period, the lower (ie the more stringent) of the amenity or intrusive trigger levels are adopted (if applicable), as marked in **bold**, as the project noise trigger levels (PNTL).

Table 11. NPI Project Noise Trigger Levels

Receiver	Time of Day	RANL[1] $L_{Aeq,period}$	Measured RBL[2] $L_{AF90,15min}$	Project Noise Trigger Levels		
				Intrusive $L_{Aeq,15min}$	Amenity $L_{Aeq,15min}$	Sleep Disturbance $L_{Aeq,15min}$
Suburban Residential	Day	55	40	**45**	53	-
	Evening	45	40	45	**43**	-
	Night	40	40[3]	45	**38**	**45**
Hotel / Temporary Accommodation[4]	Day	60	40	**45**	58	-
	Evening	50	40	**45**	48	-
	Night	45	40[3]	45	**43**	**45**
Place of Worship	When in use	50[5]	-	-	**48**	-
Active Recreation	When in use	55	-	-	**53**	-
Commercial	When in use	65	-	-	**63**	-
Industrial	When in use	70	-	-	**68**	-

Note 1. RANL = Recommended Amenity Noise Level for residences in Rural areas.
Note 2. RBL = Rating Background Level.
Note 3. RBL in the night-time measured to be higher than the daytime and evening time due to flora and fauna noise (typically cicadas at this time of year). For this assessment the RBL in the night-time has been decreased by 4 dB to match the lowest noise levels measured during the day and evening periods as per the guidance in the NSW NPI.
Note 4. Applicable to the temporary accommodation receivers at Elements of Byron and the Bayshore Bungalows.
Note 5. External noise level criteria used for this assessment by assuming a conservative outside to inside conversion factor of 10 dB, as per industry best practise.

4.2 NSW Road Noise Policy (RNP)

Responsibility for the control of noise emissions in New South Wales is vested in Local Government and the NSW Environment Protection Authority (EPA). The EPA oversees the Road Noise Policy (RNP, January 2011) which provides a framework and process for deriving traffic noise criteria. The RNP criteria applicable to this development are given in Table 12 below.

Where the existing noise levels due to traffic already exceed the assessment criteria given in Table 12 then the RNP requires that the total traffic noise level increase should be limited to 2 dB for situations where additional traffic is generated on existing roads by changes to land use developments.

Table 12. RNP Road Traffic Noise Criteria for Residential Land Uses.

Road Category	Type of Project / Land Use	External Assessment Criteria (dB re 20 µPa)	
		$L_{Aeq,15hr}$ (Day)	$L_{Aeq,9hr}$ (Night)
Freeway / arterial / sub-arterial roads	Existing residences affected by additional traffic on existing freeways / arterial / sub-arterial roads generated by land use developments	55	50
Local Roads	Existing residences affected by additional traffic on existing load roads generated by land use developments	55[1]	50[1]

Note: 1. LAeq(1hour) for local roads

5 Operational Noise Modelling

5.1 Noise Model Details

Noise modelling of the site was undertaken using SoundPLAN v7.4 modelling software.

The noise model was constructed from a combination of aerial photography, existing ground topography and design masterplans for the development. The local terrain, design of the development, receiver buildings and structures have been digitised in the noise model to develop a three-dimensional representation of the operations of the development and surrounding environment. The parameters in Table 13 were defined in the noise model to calculate noise levels at sensitive receivers.

Table 13. Noise Model Parameters

Variable	Parameter
Calculation Standard	CONCAWE
Topography	Surrounding Area – 1 m resolution
Ground Absorption	0.75 (mainly soft vegetation surrounding the site) and 0.5 (surrounding most residential and commercial receivers)
Receiver Height	4.0 m (mainly first storey residential receivers)

5.2 Noise Enhancing Meteorological Conditions

Noise model predictions were performed using the noise enhancing meteorological conditions given in the NSW Noise Policy for Industry (NPI).

The noise enhancing meteorological conditions used in this assessment are given in Table 14 below. For all conditions the worst-case wind direction (source to receiver) for each receiver was assessed.

Table 14. Noise Enhancing Meteorological Conditions Used in the Noise Assessment

Period	Meteorological Parameters
Day / Evening	Stability categories A-D with light winds up to 3 m/s at 10 m AGL
Night	Stability category F with winds up to 2 m/s at 10 m AGL

Note 1. AGL = Above Ground Level.
Note 2. Stability categories are based on the Pasquill–Gifford stability classification scheme.
Note 3. Worst-case stability category D taken for Day / Evening periods.

This provides a conservative prediction of the potential noise impacts from the development at the surrounding sensitive receivers.

5.3 Operational Scenarios

With reference to Section 2.4 the proposed operational scenarios can be summarised as per Table 15 below.

Table 15. Proposed Operational Scenarios

Time of Day	Description of Operational Noise Sources in Worst-Case 15-minute Period
Day (0700 to 1800 hrs)	**Deliveries / Truck Movements** – Up to two (2) B-Doubles / Semi articulated trucks moving throughout the site. Full load (ie max engine revs) operation for 50% of the time **Materials Handling / Stockpiling** – Receival Hall with all facades and openings CLOSED. Electrical shredder, loader, screen and conveyor assumed to operate 100% of the time in any worst-case 15-minute period. **Mechanical Services** – All mechanical equipment operating at full load. **Staff Vehicles** – Staff cars entering and exiting the site during normal work hours.
Evening (1800 to 2200 hrs)	**Mechanical Services** – All mechanical equipment operating at full load.
Night-time (2200 to 0700 hrs)	**Mechanical Services** – All mechanical equipment operating at full load.

5.4 Fixed Operational Noise Source Levels

The simulated worst-case fixed operational noise sources include:

- Processing activities inside the new buildings comprise:
  a. Internal reverberant sound pressure levels as per Table 3 occur for up to 100% of the time in the Receival Hall building.
  b. All doors are CLOSED during processing activities. The doors are only opened to accept deliveries or removal of waste. All processing activities will cease when doors are open.
  c. The minimum sound insulation performance of the building facade is assumed to be at least 25 dB R_w. This is a conservative assumption based on the 1 mm corrugated steel facade construction of the Receival Hall. The Digestion Tunnel buildings are heavy duty concrete constructions with a facade performance greater than 50 dB R_w.
- Mechanical services plant associated with the site operates 24 hrs a day 7 days a week with nominal Sound Power Levels as given in Table 2 above.

Detailed mechanical services design is not currently available for the site. Based on the information available all mechanical services plant items are located inside buildings with the exception of CHP1, Gas Flare, Pump Room and the plant associated with the administration building. Mechanical services plant located inside buildings (typically the technical corridor building) is not acoustically treated and has an average Sound Power Level of 103.8 dB L_w. Noise from internal plant will propagate through the external facade of the building (minimum 25 dB R_w) and will be attenuated accordingly. This assumption should be reviewed by a suitably qualified acoustic consultant during the detailed design of the building to ensure compliance with the criteria.

5.5 Mobile Operational Noise Source Levels

Delivery vehicles were modelled entering the site from Wallum Place and then moving around the site as per the site roads shown in Figure 1 to Figure 3. For a worst-case noise assessment, the loudest vehicle has been assessed which is the B-Double truck with a typical Sound Power Level of 106 dB L_{WA}. Delivery trucks were assumed to operate at full load (ie max engine revs) for 50% of the time while manoeuvring around the site.

5.6 Corrections for Annoying Noise Characteristics

Where a noise source contains certain characteristics, such as tonality, intermittency, irregularity or dominant low-frequency content, there is evidence to suggest that it can cause greater annoyance than other noise at the same noise level. On the other hand, some sources may cause less annoyance where only a single event occurs for a limited duration.

The NPI identifies correction factors for annoying noise characteristics which must be applied to the predicted noise levels before assessing against the PNTLs. All of the noise sources in this report have been assessed, based on the noise data available, for annoying noise characteristics. The proposed operational noise sources are generally broadband in nature and have not demonstrated any annoying characteristics as per the definitions in Fact Sheet C of the NPI.

6 Predicted Operational Noise Impacts

6.1 Predicted Operational Noise Impacts – NPI

Noise modelling of the fixed and mobile noise sources has been used to predict the noise emissions from the typical operation of the facility to the surrounding sensitive receivers with no mitigation.

A selection of the predicted worst-case operational noise levels due to onsite noise sources with the recommended mechanical noise control measures are summarised and compared against the NPI project noise trigger levels in Table 16 below.

Table 16. Predicted Operational Noise Levels Compared to PNTLs

Location	Worst-Case $L_{Aeq,15m}$			PNTLs Exceedance $L_{Aeq,15m}$			$L_{Aeq,15m}$ Sleep Disturbance
	Day	Eve	Night	Day	Eve	Night	
Residential				**45**	**43**	**38**	**45**
Gallagher Street	42	23	23	0	0	0	0
Parkes Avenue	39	<20	<20	0	0	0	0
Porter Street	40	21	21	0	0	0	0
Sunrise Boulevard	36	<20	<20	0	0	0	0
Bayshore Lane	38	<20	<20	0	0	0	0
Julian Rock Drive	34	<20	<20	0	0	0	0
Belongil Crescent	35	<20	<20	0	0	0	0
10 Quarry Lane	24	<20	<20	0	0	0	0
25 Quarry Lane	25	<20	<20	0	0	0	0
35 Quarry Lane	24	<20	<20	0	0	0	0
106 Quarry Lane	27	<20	<20	0	0	0	0
108 Quarry Lane	29	<20	<20	0	0	0	0
110 Quary Lane	30	<20	<20	0	0	0	0
146 Bayshore Drive	35	<20	<20	0	0	0	0
Hotel / Temporary Accommodation				**45**	**45**	**43**	**45**
Elements of Byron	34	<20	<20	0	0	0	0
Bayshore Bungalows	35	<20	<20	0	0	0	0
Places Worship				**48**	**48**	**48**	**-**
East Gate Community Church	39	<20	<20	0	0	0	0
Active Recreation				**53**	**53**	**-**	**-**
Byron Regional Sporting and Cultural Complex	36	<20	<20	0	0	-	-
Commercial				**63**	**63**	**63**	
Byron Bay Herb Nursery	63	30	30	0	0	0	-
Other Commercial	<40	<30	<30	0	0	0	-

The results from Table 16 demonstrate that the noise emissions from the site to the surrounding environment (with the recommended mechanical noise control measures) are low. The proposed development satisfies the PNTLs at all nearby residential receivers.

Table 16 also demonstrates that the potential for noise impacts during the night-time which have potential for sleep disturbance events are nil. The sleep disturbance PNTLs are satisfied as result.

The PNTLs at all nearby places of worship, active recreational and commercial receivers are also satisfied.

We note that the mechanical services noise control measures are based on the assumptions given in Section 5.3. The final mechanical services noise levels should be reviewed by a suitably qualified acoustic consultant during the detailed design of the building.

6.2 Predicted Operational Noise Impacts – RNP

Any vehicles associated with the development will travel along Wallum Place (sub-arterial road) and Bayshore Drive (sub-arterial road) before connecting with Ewingsdale Road (arterial road). The majority of the traffic travelling along Wallum Place does not travel to the BEF site, instead the majority of the traffic moves to the Habitat Shopping and Lifestyle Precinct accessed via Porter Street and Gallagher Street off Wallum Place. No additional traffic is expected along Porter or Gallagher Street as a result of the development.

Comparing the applicable RNP criteria from Table 12 to the measured noise levels in the area (see Table 7) we find that the RNP criteria are already likely to be exceeded. Further study of the existing traffic volumes on Wallum Place and Bayshore Drive confirms that the RNP criteria (for arterial and sub-arterial roads) are already exceeded at the closest residential receivers. Based on this, the allowable increase in noise due to traffic from the proposed site must not exceed 2 dB as per the RNP requirements.

To calculate the traffic noise impacts generated by the operation of the development the existing road traffic volumes for Wallum Place and Bayshore Drive (nearest impacted roads) are required. Existing traffic data for Wallum Place and Bayshore Drive was supplied via the traffic assessment report by Rytenskild Traffic Engineering and from the security gate cameras at the existing Byron Bay Sewage Treatment Plant (BBSTP).

The increase in traffic volumes due to proposed operation of the site are taken from Section 2.5. Table 17 summarises the predicted increase in noise levels on the nearest affected roads due to the traffic generated by the proposed development site.

Table 17. Summary of Traffic Noise Increases on Surrounding Roads (from available traffic data)

Road	Existing Traffic		Increase in Traffic (due to site)		Increase in Noise Levels dB
	Volume per Day	Percentage Heavy Vehicles %	Volume per Day	Percentage Heavy Vehicles %	
Wallum Place (between Bayshore Drive and Porter Street)	4,300[1]	10[2]	4326	10	0.1
Porter Street	2448[3]	10	2448	10	0.0
Wallum Place (between Porter Street and Gallagher Drive	2072	10	2098	11	0.3
Gallagher Drive	1632[4]	10	1632	10	0.0
Wallum Place (between Gallagher Place and the BEF site)	220[5]	12	246	17	1.4
Bayshore Drive	27,500[1]	10[2]	27526	10	<0.1

Note:
1. As per Rytenskild report peak hourly data with a conservative x10 factor to convert to estimated daily volumes.
2. Conservative estimate based on traffic mix observations during site survey.
3. Estimated 60% of traffic which enters the Habitat Shopping and Lifestyle Precinct routes from Wallum Place onto Porter Street.
4. Estimated 40% of traffic which enters the Habitat Shopping and Lifestyle Precinct routes from Wallum Place onto Gallagher Street.
5. Traffic data averaged from 1 week of security camera footage at the existing Byron Bay Sewage Treatment Plant (BBSTP).

Table 17 shows that the proposed development does not generate traffic noise increases above the 2 dB on any nearby road. The RNP criteria are satisfied as a result.

7 Construction Noise & Vibration Assessment Guidelines

People are typically more tolerant to noise and vibration during the construction phase of proposals than during normal operation. This response results from recognition that the construction emissions are of a temporary nature – especially if the most noise-intensive construction impacts occur during the less sensitive daytime period. For these reasons, acceptable noise and vibration levels are normally higher during construction than during operations.

Construction often requires the use of heavy machinery which can generate high noise and vibration levels at nearby buildings and receivers. For some equipment, there is limited opportunity to mitigate the noise and vibration levels in a cost-effective manner and hence the potential impacts should be minimised by using feasible and reasonable management techniques.

At any particular location, the potential impacts can vary greatly depending on factors such as the relative proximity of sensitive receivers, the overall duration of the construction works, the intensity of the noise and vibration levels, the time at which the construction works are undertaken, and the character of the noise or vibration emissions.

7.1 Construction Hours

For this project the construction works would be undertaken in accordance with the Interim Construction Noise Guideline (DECCW 2009) and would typically occur during the standard working hours between:

- 0700 to 1800 hrs Monday to Friday.
- 0800 to 1300 hrs on Saturdays.

There will be no construction works on Sundays or public holidays.

Where Out-of-Hours Works (OOHWs) are required (for emergency works, oversized equipment delivery, etc) they would be subject to separate approval on a case-by-case basis.

7.2 Noise Management Levels for Construction Activities

The ICNG requires proposal specific Noise Management Levels (NMLs) to be established for noise affected receivers. In the event construction noise levels are predicted to be above the NMLs, all feasible and reasonable work practices are investigated to minimise noise emissions.

Having investigated all feasible and reasonable work practices, if construction noise levels are still predicted to exceed the NMLs then the potential noise impacts would be managed via site specific construction noise management plans, to be prepared in the detailed design phase.

The ICNG provides an approach for determining $L_{Aeq,15min}$ NMLs at residential receivers by applying the measured $L_{AF90,15min}$ rating background noise levels (RBL), as described in Table 18.

Table 18. Determination of NMLs for Residential Receivers

Time of Day	NML $L_{Aeq,15min}$	Time of Day
Standard hours Monday to Friday 0700 to 1800 hrs Saturday 0800 to 1300 hrs No work on Sundays or public holidays	RBL + 10 dB	The **noise affected level** represents the point above which there may be some community reaction to noise. Where the predicted or measured $L_{Aeq,15min}$ is greater than the noise affected level, the proponent should apply all feasible and reasonable work practises to meet the noise affected level. The proponent should also inform all potentially impacted residents of the nature of works to be carried out, the expected noise levels and duration, as well as contact details.
	≥ 75 dB (Highly Noise Affected)	The **highly noise affected level** represents the point above which there may be strong community reaction to noise. Where noise is above this level, the relevant authority (consent, determining or regulatory) may require respite periods by restructuring the hours that the very noisy activities can occur, taking into account: ▪ Times identified by the community when they are less sensitive to noise (such as before and after school for works near schools or mid-morning or mid-afternoon for works near residences. ▪ If the community is prepared to accept a longer period of construction in exchange for restrictions on construction times.
Outside recommended hours	RBL + 5 dB	A strong justification would typically be required for works outside the recommended standard hours. The proponent should apply all feasible and reasonable work practices to meet the noise affected level. Where all feasible and reasonable practises have been applied and noise is more than 5 dB above the noise affected level, the proponent should negotiate with the community.

Note 1: Noise levels apply at the property boundary that is most exposed to construction noise, and at a height of 1.5 m above ground level. If the property boundary is more than 30 m from the residence, the location for measuring or predicting noise levels is at the most noise-affected point within 30 m of the residence. Noise levels may be higher at upper floors of the noise affected residence.

Note 2: The RBL is the overall single-figure background noise level measured in each relevant assessment period (during or outside the recommended standard hours). The term RBL is described in detail in the NSW Noise Policy for Industry (NPI).

Adopting the measured background noise levels in Table 6 the NMLs derived for the proposal are detailed in Table 19. In addition, Table 19 includes the applicable fixed NMLs for the other noise sensitive receivers which are potentially affected by construction on the site.

Table 19. Construction NMLs for Residential Receivers

Receiver	Time of Day	Construction NMLs $L_{Aeq,15min}$ (dB)		
		Standard Hours	Out-of-Hours	Highly Noise Affected
Residential	Day	50	45	75
	Evening	N/A	45	75
	Night-time	N/A	45[1]	75
Place of Worship[2]	Day	55	55	75
	Evening	N/A	55	75
	Night-time	N/A	55	75
Active Recreation	Day	65	65	75
	Evening	N/A	65	75
	Night-time	N/A	65	75
Commercial	Day	65	65	75
	Evening	N/A	65	75
	Night-time	N/A	65	75

Note: 1.RBL in the night-time measured to be higher than the daytime and evening time due to flora and fauna noise (typically cicadas at this time of year). For this assessment the RBL in the night-time has been decreased by 4 dB to match the lowest noise levels measured during the day and evening periods as per the guidance in the NSW NPI.
2. External noise level criteria used for this assessment by assuming a conservative outside to inside conversion factor of 10 dB, as per industry best practise.

Where construction would be undertaken during the night-time period the potential for sleep disturbance should be assessed. However, this project will not conduct any construction works during the night-time period. Therefore, construction related sleep disturbance impacts will be nil and considered no further in this assessment.

7.3 Construction Traffic Noise

When trucks and other vehicles are operating within the boundaries of the various construction sites, road vehicle noise contributions are included in the overall predicted $L_{Aeq,15min}$ construction site noise emissions and then compared against the NMLs. When construction related traffic moves onto the public road network a different noise assessment methodology is appropriate, as vehicle movements would be regarded as 'additional road traffic' rather than as part of the construction site.

The ICNG does not provide specific guidance in relation to acceptable noise levels associated with construction traffic. For assessment purposes, guidance is taken from the RNP; however, it is noted that these are taken as noise goals only and are not mandatory.

One of the objectives of the RNP is to apply relevant permissible noise increase criteria to protect sensitive receivers against excessive decreases in amenity as the result of a proposal. In assessing feasible and reasonable mitigation measures, an increase of up to 2 dB represents a minor impact that is considered barely perceptible to the average person.

On this basis, construction traffic NMLs set at 2 dB above the existing road traffic noise levels during the daytime and night-time periods are considered appropriate to identify the onset of potential noise impacts. For any increase of more than 2 dB then consideration should be given to applying feasible and reasonable noise mitigation measures to reduce the noise impacts and preserve acoustic amenity.

7.4 Construction Vibration

This section presents the benchmarks used to assess vibration impacts due to the construction works. The criteria discussed below are non-mandatory. Instead they are goals / targets that should be sought to be achieved through the application of all feasible and reasonable mitigation measures. Where all feasible and reasonable measures have been applied and vibration values are still beyond the maximum value, the operator would need to negotiate directly with the affected stakeholders[1].

We note that the offset distances (in all directions) between any vibrationally intensive equipment and any residential receivers is large (> 300 m). Therefore, the potential for vibration impacts due to the construction activities are effectively nil. All vibration criteria with respect to cosmetic damage to buildings and human comfort impacts will be satisfied at all residential receivers. Residential receivers will not be considered further in this assessment as a result.

However, existing STP buildings are located within 20 m of the construction site, so may have potential for vibration impacts due to the construction activities. This assessment will consider the existing STP buildings for potential vibration impacts.

Ground vibration impacts for buildings near construction sites may be defined by five (5) categories for this development, in increasing order of subjective intensity:

- **Ground Borne Noise:** vibration which travels through the ground and into building structures. The vibrating building structures generate airborne noise inside the rooms.
- **Human Comfort** (*Nuisance*): perceptible vibration in which building occupants are inconvenienced or disturbed.
- **Cosmetic Damage**: vibration where the building surfaces begin to show cosmetic cracks.
- **Building Damage**: long or short-term vibration in which the integrity of a building or structure itself is placed at risk.

The following subsections provide a brief review of applicable Standards and vibration criteria for the minimisation of nuisance and building risk. The criteria are applicable in the z-axis (vertical direction) and vibration levels shall be appropriately weighted for this axis[1].

7.4.1 Ground Borne Noise

Ground-borne noise occurs when energy associated with vibration intensive activity causes surfaces within a room to vibrate. The energy is then imparted into the air within the room and can result in audible noise (dependent upon ambient background noise levels and the level of airborne noise intrusion associated with nearby construction activities).

Based on the guidance given in the NSW DECCW Interim Construction Noise Guidelines (ICNG) the following noise management levels for ground borne noise have been adopted for the project.

Table 20. Ground Borne Noise Targets

Receiver Type	Ground Borne Noise Management Level L_{Aeq} (dB re 20 µPa)
STP Offices	55

Note: 1. Time weighting for ground borne noise should be set to *Slow* (1s)

[1] As per NSW DECCWs Assessing Vibration - A Technical Guideline.

7.4.2 Human Comfort

Vibration related to human perception and annoyance is assessed as three (3) separate vibration types; intermittent[2] vibration, impulsive vibration and continuous vibration.

Vibration targets founded on ISO and Australian Standards will be adopted for this assessment. The applicable human comfort vibration goals for continuous, intermittent and impulsive vibration sources are provided in Table 21 below.

For continuous or impulsive vibration, the targets are expressed in terms of the RMS vibration velocity level in mm/s, measured in the most sensitive direction (z-axis). For intermittent vibration (typical of construction activities such as rock breakers, piling, excavators and the like) the fourth-power Vibration Dose Value (VDV) is adopted as an improved metric. The VDV is more sensitive to peaks in vibration and also includes weightings to account for the variation in human sensitivity to vibration with frequency.

Table 21. Summary of the Vibration Level Targets for Human Comfort

Location	Time period	Vibration Type	Preferred values	Maximum values
STP Offices	All hours	Continuous	0.4 mm/s RMS	0.8 mm/s RMS
		Impulsive	13.0 mm/s RMS	26.0 mm/s RMS
		Intermittent	0.4 $m/s^{1.75}$ VDV	0.8 $m/s^{1.75}$ VDV

The DECCW vibration guideline notes the following in relation to the preferred and maximum vibration levels:

> *There is a low probability of adverse comment or disturbance to building occupants at vibration values below the preferred values. Activities should be designed to meet the preferred values where an area is not already exposed to vibration. Where all feasible and reasonable measures have been applied, values up to the maximum value may be used if they can be justified. For values beyond the maximum value, the operator should negotiate directly with the affected community. Situations exist where vibration above the preferred values can be acceptable, particularly for temporary disturbances and infrequent events of short-term duration.*
>
> *In circumstances where work is short-term, feasible and reasonable mitigation measures have been applied, and the project has a demonstrated high level of social worth and broad community benefits, then higher vibration values (above the maximum) may apply. In such cases, best management practices should be used to reduce values as far as practicable, and a comprehensive community consultation program should be instituted.*

[2] The term 'intermittent' is used to collectively refer to impulsive or short term events, including vehicle pass-bys, pile driving or hammering.

7.4.3 Cosmetic Damage

Typical structural vibration limits are designed to minimise the risk of cosmetic damage (ie surface cracks). The vibration limits for cosmetic damage are set well below vibration levels that have potential to cause structural damage. Australian Standard AS 2187: Part 2 recommends the frequency dependent guideline values and assessment methods given in BS 7385 Part 2 as they "are applicable to Australian conditions".

The Standard sets guide values for building vibration based on the lowest vibration levels above which damage has been credibly demonstrated. These levels are judged to give a minimum risk of vibration-induced damage, where minimal risk for a named effect is usually taken as a 95% probability of no effect.

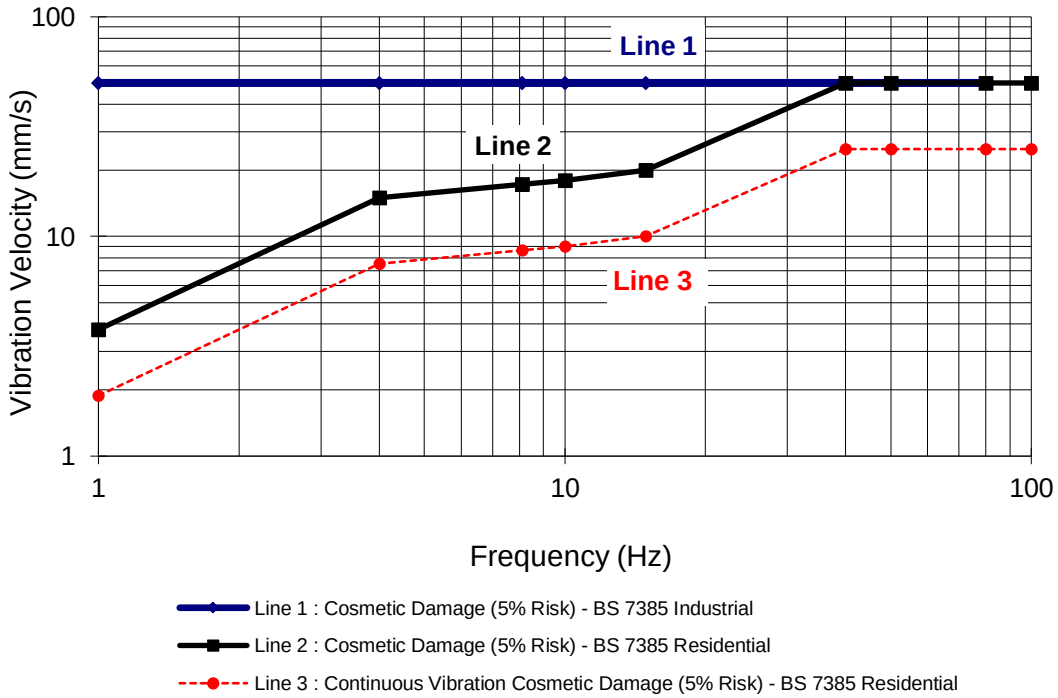
Sources of vibration that are considered in the standard include demolition, blasting (carried out during mineral extraction or construction excavation), piling, ground treatments (eg compaction), construction equipment, tunnelling, road and rail traffic and industrial machinery.

The recommended limits (target values) for transient vibration to ensure minimal risk of cosmetic damage to residential and industrial buildings are presented numerically in Table 22 and Figure 4 below.

Table 22. Transient Vibration Guide Values - Minimal Risk of Cosmetic Damage

Line	Type of Building	Peak Component Particle Velocity in Frequency Range of Predominant Pulse	
		4 Hz to 15 Hz	15 Hz and Above
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	
2	Unreinforced or light framed structures Residential or light commercial type buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

Figure 4. Graph of Transient Vibration Guide Values for Cosmetic Damage



The Standard goes on to state that cosmetic damage is possible at vibration magnitudes which are greater than twice those given in Table 22 and damage to a building structure may occur at values greater than four times the tabulated values.

Fatigue considerations are also addressed in the Standard and it is concluded that unless calculation indicates that the magnitude and number of load reversals is significant (in respect of the fatigue life of building materials) then the guide values in Table 22 should not be reduced for fatigue considerations.

In order to assess the likelihood of cosmetic damage due to vibration, AS 2187 specifies that vibration measured should be undertaken at the base of the building and the highest of the orthogonal vibration components (transverse, longitudinal and vertical directions) should be compared with the guidance curves presented in Figure 4.

7.4.4 General Vibration Screening Criterion

The Standard states that the guide values in Table 22 relate predominantly to transient vibration which does not give rise to resonant responses in structures and low-rise buildings.

Where the dynamic loading caused by continuous vibration may give rise to dynamic magnification due to resonance, especially at the lower frequencies where lower guide values apply, then the guide values in Table 22 may need to be reduced by up to 50%. Rockbreaking / hammering and sheet piling activities are considered to have the potential to cause dynamic loading in some structures and it is therefore appropriate to reduce the transient values by 50%.

For construction activities involving intermittent vibration sources such as rockbreakers, piling rigs, vibratory rollers, excavators and the like, the predominant vibration energy occurs at frequencies greater than 4 Hz (and usually in the 10 Hz to 100 Hz range). On this basis, a conservative vibration damage screening level per receiver type is given below:

- Reinforced or framed structures: 25.0 mm/s.
- Unreinforced or light framed structures: 7.5 mm/s.

At locations where the predicted and/or measured vibration levels are greater than shown above (peak component particle velocity) monitoring should be performed during construction. At these locations, a more detailed analysis of the building structure, vibration source, dominant frequencies and dynamic characteristics of the structure would be undertaken to determine the applicable safe vibration level.

The nearest STP buildings are all concrete reinforced buildings, which means the most applicable screening criterion for cosmetic building damage is **25.0 mm/s**.

8 Construction Noise Modelling

The same noise model as described in Section 5 (operation noise model) was used as the basis of the construction noise model with the necessary modifications to the noise sources (ie construction activities) and construction scenarios.

8.1 Construction Scenarios & Noise Sources

The proposed construction equipment for the development have been provided by Jackson Environment and Planning. Table 23 illustrates the anticipated construction activities / plant items proposed during the construction works at the site.

Table 23. Proposed Construction Plant Information and Sound Power Levels L_{WA}

Construction Item	Estimated Sound Power Level L_{WA} (dB re 1pW)	No. of Days	Construction Scenario
Small Excavator	105	35	Services reticulation and detailed excavation
Large Excavator	118	30	Bulk earth works
Bob Cat	105	35	Services reticulation and detailed excavation
Water Truck	105	20	Road construction & bulk earth works
Grader	114	15	Site side services reticulation and detailed excavation
Scraper	114	20	Road construction & bulk earthworks
Compactor	106	20	Road construction & bulk earthworks
Paver	112	10	Road construction
Crane	110	90	Primary vertical steel construction, roofing, tunnel construction
Diesel Generator	110	20	Only needed until power to site established

The overall time period for construction is anticipated to be no more than 10 months.

The ICNG recommends that the realistic worst-case or conservative noise levels from the source should be predicted for assessment locations representing the most noise-exposed residences or other sensitive land uses. For most construction activities, it is expected that the construction noise levels would frequently be lower than predicted as the intensity of use and location of the construction equipment will vary throughout the site and throughout the day.

To simulate a realistic worst-case construction scenario the model will assume that all equipment is present on site and that each piece of equipment is operating at full load for 50% of the time.

8.2 Construction Traffic Volumes

The proposed construction traffic movements were provided by Jackson Environment and Planning and are summarised in Table 24.

Table 24. Summary of Construction Traffic Volumes

Type of Vehicle	Total Vehicles per Day
Semi-Trailer (19 m)	4

9 Predicted Construction Noise Impacts

The following section details the assessment of potential airborne noise impacts associated with the construction of the proposal. Construction noise goals have been determined based on the relevant government guidelines and industry standards. Potential noise levels have been predicted at sensitive receivers for the proposed construction activities and where levels are above the goals, feasible and reasonable impact mitigation measures are considered.

9.1 Construction Noise Impacts from Onsite Noise Sources

The typical $L_{Aeq,15m}$ noise levels at the surrounding noise sensitive receivers are provided in Table 25 and are representative of the 'noisiest' construction periods allowing for the simultaneous operation of noise intensive construction equipment.

Table 25. Predicted Construction Noise Levels

Location	Worst-Case $L_{Aeq,15m}$			NMLs Exceedance $L_{Aeq,15m}$		
	Day	Eve	Night	Day	Eve	Night
Residential				**50**	**45**	**45**
Gallagher Street	53	0	0	**3**	0	0
Parkes Avenue	52	0	0	**3**	0	0
Porter Street	51	0	0	**1**	0	0
Sunrise Boulevard	50	0	0	0	0	0
Bayshore Lane	52	0	0	**2**	0	0
Julian Rock Drive	47	0	0	0	0	0
Belongil Crescent	48	0	0	0	0	0
10 Quarry Lane	42	0	0	0	0	0
25 Quarry Lane	43	0	0	0	0	0
35 Quarry Lane	43	0	0	0	0	0
106 Quarry Lane	44	0	0	0	0	0
108 Quarry Lane	45	0	0	0	0	0
110 Quary Lane	46	0	0	0	0	0
146 Bayshore Drive	48	0	0	0	0	0
Hotel / Temporary Accommodation				**45**	**45**	**43**
Elements of Byron	46	0	0	0	0	0
Bayshore Bungalows	48	0	0	0	0	0
Places Worship				**55**	**55**	**55**
East Gate Community Church	53	0	0	0	0	0
Active Recreation				**65**	**65**	**65**
Byron Regional Sporting and Cultural Complex	50	0	0	0	0	-
Commercial				**65**	**65**	**65**
Byron Bay Herb Nursery	69	0	0	**4**	0	0
Other Commercial	<50	0	0	0	0	0

During standard construction hours minor exceedances of the NMLs (< 4 dB) are predicted at the closest residential and commercial receivers surrounding the site. These small NML exceedances do not trigger the need for specialist noise control measures; however, the construction contractor should develop a Construction Noise and Vibration Management Plan which implements the ICNG standard mitigation measures as described in Section 9.1.1 below.

This assessment has only considered construction activities inside standard construction hours. Where this is not possible then any OOHWs would be subject to separate approval on a case-by-case basis.

Noise levels are not predicted to exceed 75 dB $L_{Aeq,15m}$ at any receivers. Therefore, no receivers are found to be highly noise affected as per the ICNG.

9.1.1 Standard Mitigation Measures

When construction noise levels are predicted to exceed the NMLs the ICNG recommends that construction noise mitigation measures should be considered, where reasonable and feasible. Standard construction noise mitigation measures include the following:

- Avoiding the coincidence of noisy plant working simultaneously close together would result in reduced noise emissions.
- Equipment which is used intermittently is to be shut down when not in use.
- Where possible, equipment with directional noise emissions should be oriented away from sensitive receivers.
- Regular compliance checks on the noise emissions of all plant and machinery used for the proposal would indicate whether noise emissions from plant items were higher than predicted. This also identifies defective silencing equipment on the items of plant.
- Non-tonal, background noise adjustment reversing alarms (ie ‘Smart’ alarms) should be used on all items of plants and heavy vehicles used for construction.

9.2 Construction Noise Impacts from Construction Traffic

To calculate the traffic noise impacts generated by the construction of the development the existing road traffic volumes for Wallum Place and Bayshore Drive (nearest impacted roads) are required. Existing traffic data for Wallum Place and Bayshore Drive was supplied via the traffic assessment report by Rytenskild Traffic Engineering and from the security gate cameras at the existing Byron Bay Sewage Treatment Plant (BBSTP). The increase in traffic volumes due to proposed construction are provided in Table 24.

Table 26 summarises the predicted increase in noise levels on Wallum Place and Bayshore Drive due to the construction traffic generated by the proposed development site.

Table 26. Summary of Construction Traffic Noise Increases on Surrounding Roads (from available traffic data)

Road	Existing Traffic		Increase in Traffic (due to site)		Increase in Noise Levels dB
	Volume per Day	Percentage Heavy Vehicles %	Volume per Day	Percentage Heavy Vehicles %	
Wallum Place (between Bayshore Drive and Porter Street)	4,300[1]	10[2]	4,308	10	<0.1
Porter Street	2,448[3]	10	2,448	10	0.0
Wallum Place (between Porter Street and Gallagher Drive	2,072	10	2,080	11	0.2
Gallagher Drive	1,632[4]	10	1,632	10	0.0
Wallum Place (between Gallagher Place and the BEF site)	220[5]	12	228	15	0.7
Bayshore Drive	27,500[1]	10[2]	27,508	10	<0.1

Note: 1. As per Rytenskild report peak hourly data with a conservative x10 factor to convert to estimated daily volumes.
2. Conservative estimate based on traffic mix observations during site survey.
3. Estimated 60% of traffic which enters the Habitat Shopping and Lifestyle Precinct routes from Wallum Place onto Porter Street.
4. Estimated 40% of traffic which enters the Habitat Shopping and Lifestyle Precinct routes from Wallum Place onto Gallagher Street.
5. Traffic data averaged from 1 week of security camera footage at the existing Byron Bay Sewage Treatment Plant (BBSTP).

Table 26 shows that the proposed development generates negligible additional traffic noise. The RNP 2 dB increase criteria are satisfied as a result.

9.3 Construction Vibration Impacts – At Existing STP Buildings

9.3.1 Ground Borne Noise & Human Comfort

The construction scenarios provided Table 23 shows that no vibrationally intensive equipment is proposed during the construction works. The closest STP buildings with offices / permanent staff are approximately 100 m from the proposed construction works. At this distance, no exceedances of the Ground Borne Noise or the Human Comfort targets are predicted. No remedial measures are required as a result.

9.3.2 Cosmetic Damage

The nearest STP buildings (which are unoccupied) are all concrete reinforced buildings. This means the most applicable screening criterion for cosmetic building damage is 25.0 mm/s. The construction scenarios provided in Table 23 shows that equipment with the highest potential to generate vibration is the large excavator. If this equipment is used with a hydraulic hammer (ie as a rock breaker) the minimum offset distance to the existing STP buildings should be no less than 10 m. At distances of 10 m or greater the risk of cosmetic damage to the STP buildings is low.

If the large excavator (with a hydraulic hammer) must be used within 10 m of an STP building, then continuous vibration monitoring should be performed during construction.

10 Conclusion

Waves Consulting has conducted a noise and vibration impact assessment of the proposed development at 45 Wallum Place, Byron Bay, NSW. The proposal seeks to add to the existing industrial site and create a Bioenergy Facility (BEF). This assessment has investigated the worst-case noise emissions associated with the construction and operation of the facility.

This assessment has demonstrated that the predicted noise emissions from the site to the surrounding environment are low. The proposed development satisfies the Project Noise Trigger Levels (PNTLs) of the NSW Noise Policy for Industry (NPI) during all time periods at all nearby noise-sensitive receivers. However, we recommend that the final mechanical services noise levels are reviewed by a suitably qualified acoustic consultant during the detailed design of the building to ensure the environmental noise levels comply with the criteria.

The sleep disturbance impacts from the operational noise events generated by the site were investigated in this assessment. The proposed development satisfies the sleep disturbance trigger levels at all nearby sensitive receivers.

The existing traffic noise levels on the nearby affected roads already likely exceed the RNP criteria. Therefore, all new traffic noise increases must satisfy the RNP 2 dB increase criteria. Table 17 of this assessment shows that the proposed development does not generate traffic noise increases above the 2 dB on any nearby road. The NSW Road Noise Policy (RNP) criteria are satisfied as a result.

The construction noise impacts have been assessed in accordance with the NSW Interim Construction Noise Guidelines (ICNG). During standard construction hours minor exceedances of the NMLs are predicted at the closest residential receivers. No receivers were found to be 'highly noise affected' as per the ICNG. Standard noise mitigation measures are recommended for the construction phase as a result.

Construction traffic noise levels must satisfy the RNP 2 dB increase criteria. Table 26 of this assessment shows that the construction traffic generates negligible additional traffic noise. The NSW Road Noise Policy (RNP) criteria are satisfied as a result.

The offset distances (in all directions) between the vibrationally intensive equipment and any residential receivers is large (> 300 m). The potential for vibration impacts at residential receivers due to the construction or operation of the development are effectively nil.

The closest STP buildings with offices / permanent staff are approximately 100 m from the proposed construction works. At this distance, no exceedances of the Ground Borne Noise or the Human Comfort targets are predicted.

The nearest STP buildings (which are unoccupied) are all concrete reinforced buildings. This means the most applicable screening criterion for cosmetic building damage is 25.0 mm/s. The construction scenarios provided in Table 23 shows that equipment with the highest potential to generate vibration is the large excavator. If this equipment is used with a hydraulic hammer (ie as a rock breaker) the minimum offset distance to the existing STP buildings should be no less than 10 m. At distances of 10 m or greater the risk of cosmetic damage to the STP buildings is low.

If the large excavator (with a hydraulic hammer) must be used within 10 m of an STP building, then continuous vibration monitoring should be performed during construction.

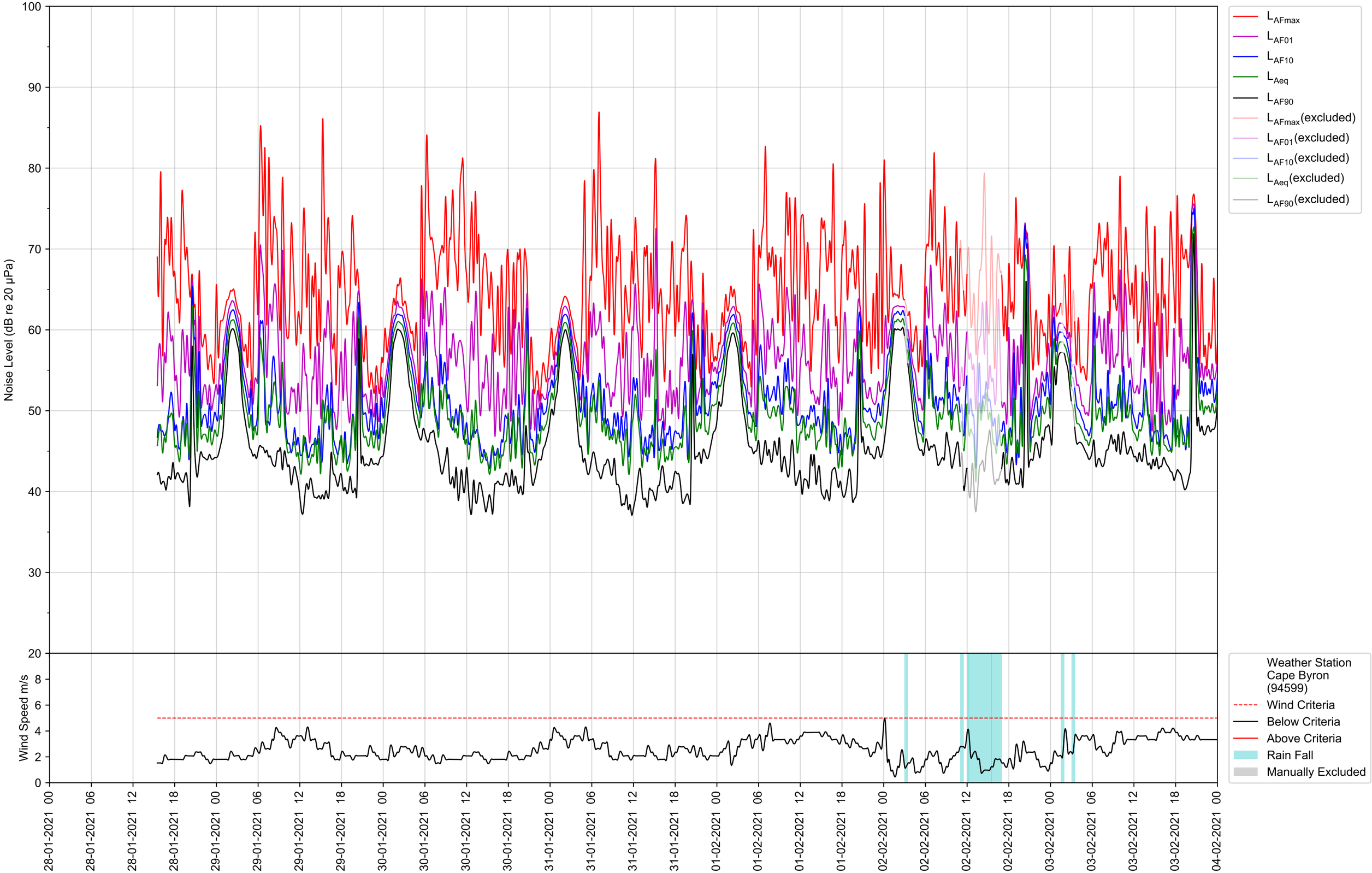
It is concluded that the proposed Bioenergy Facility (BEF) is a complying development with respect to noise and vibration impacts and is therefore suitable for construction and operation.

APPENDIX A:
GRAPHICAL NOISE LOGGER DATA

Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
Week 1: 28-01-2021 to 04-02-2021

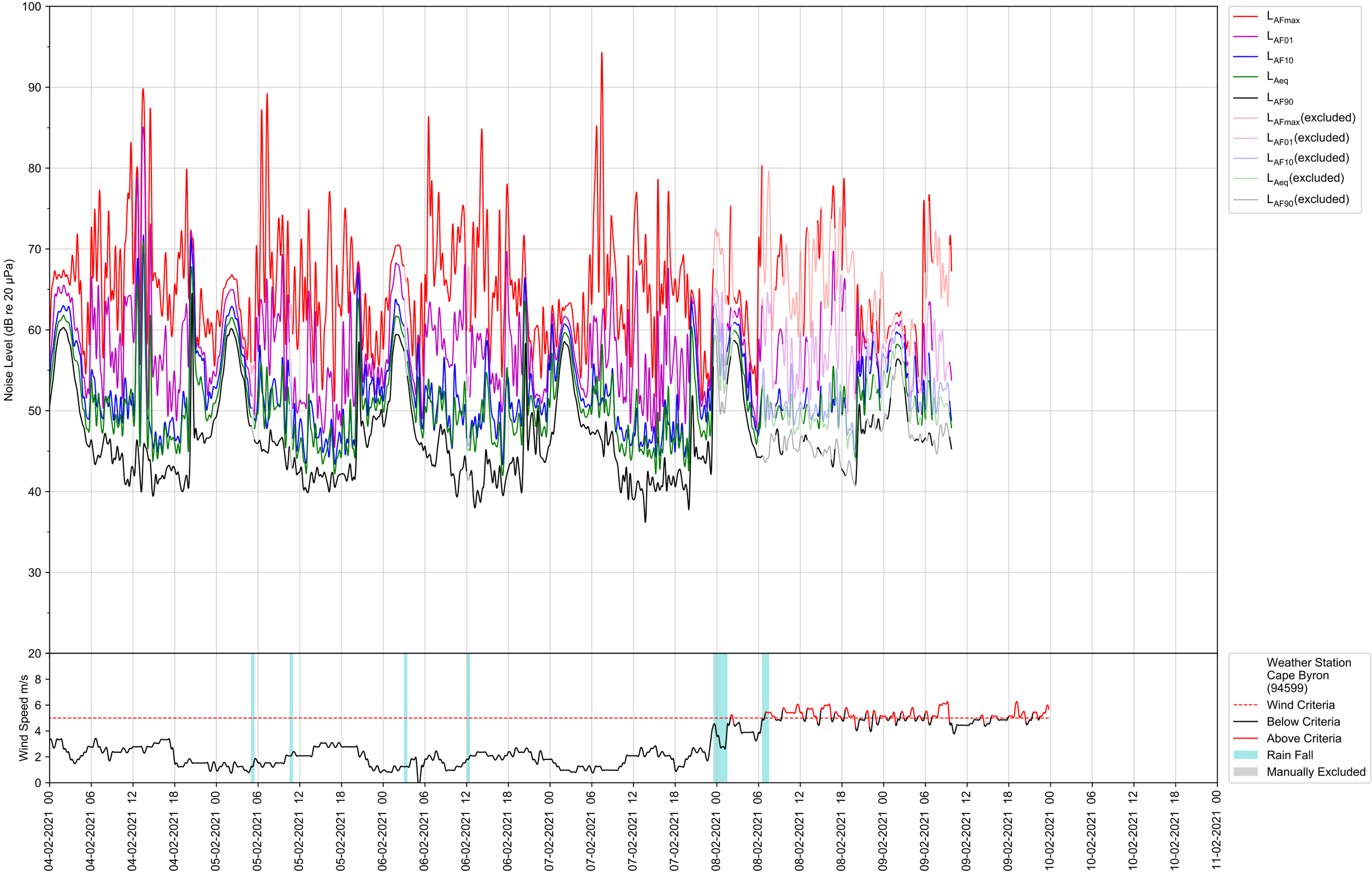
Waves CONSULTING



Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

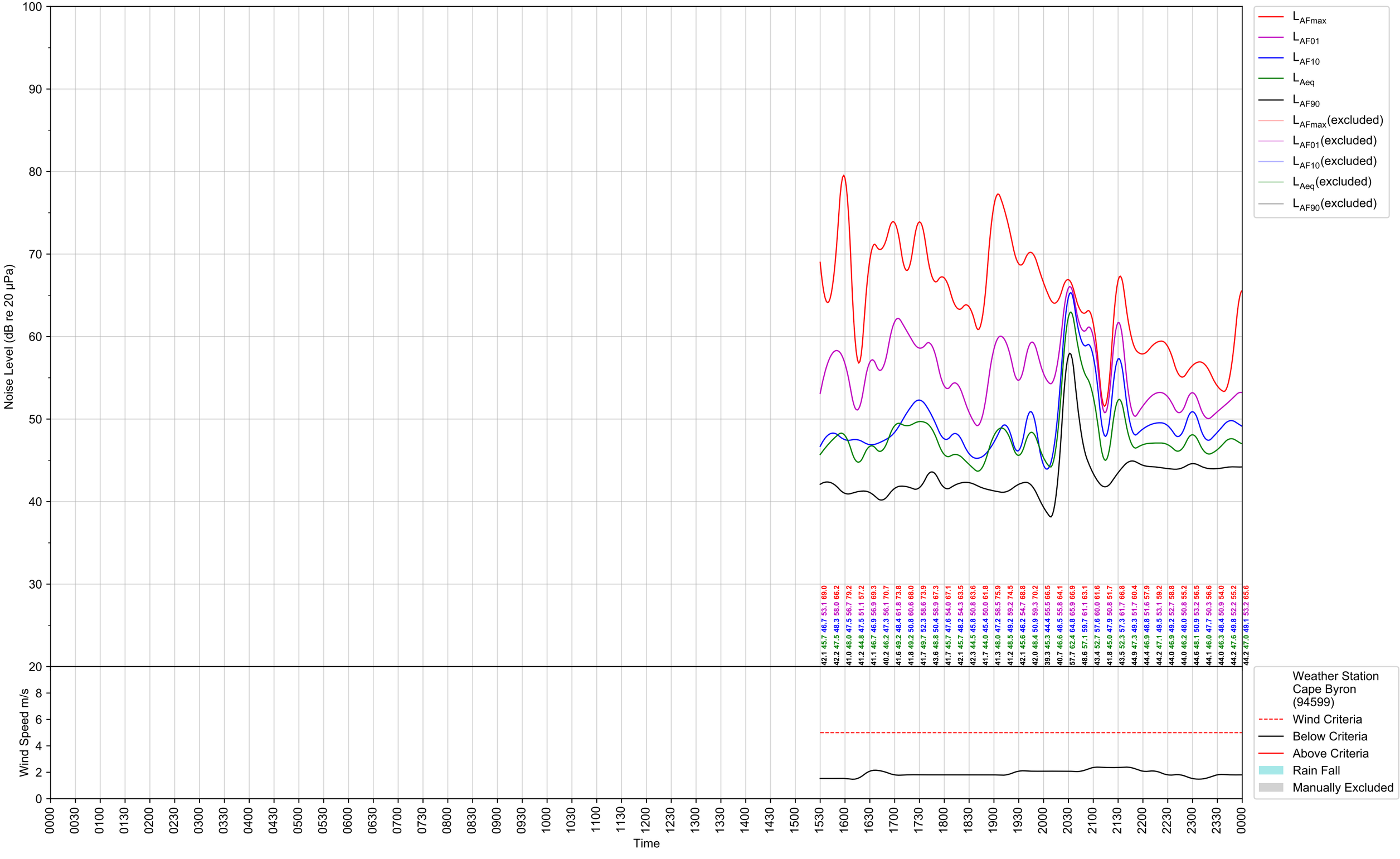
Graphical Noise Logger Data
Week 2: 04-02-2021 to 11-02-2021

Waves CONSULTING



Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

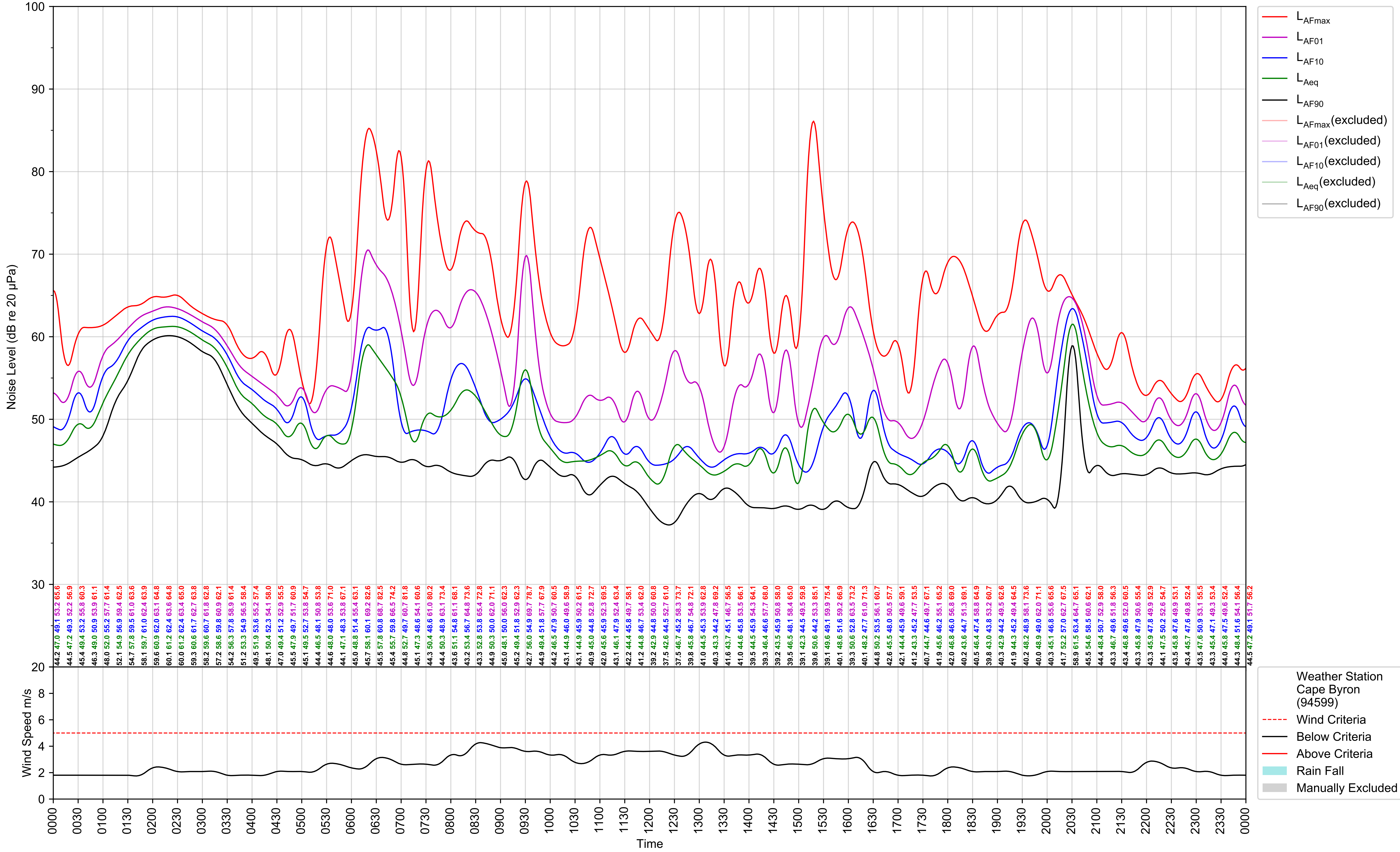
Graphical Noise Logger Data
Date: Thursday 28 January 2021



Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
Date: Friday 29 January 2021

WAVES CONSULTING



Project:	Byron Bay BEF
Project Number:	60.00860.01
Equipment:	Svan 977
Serial Number:	45730
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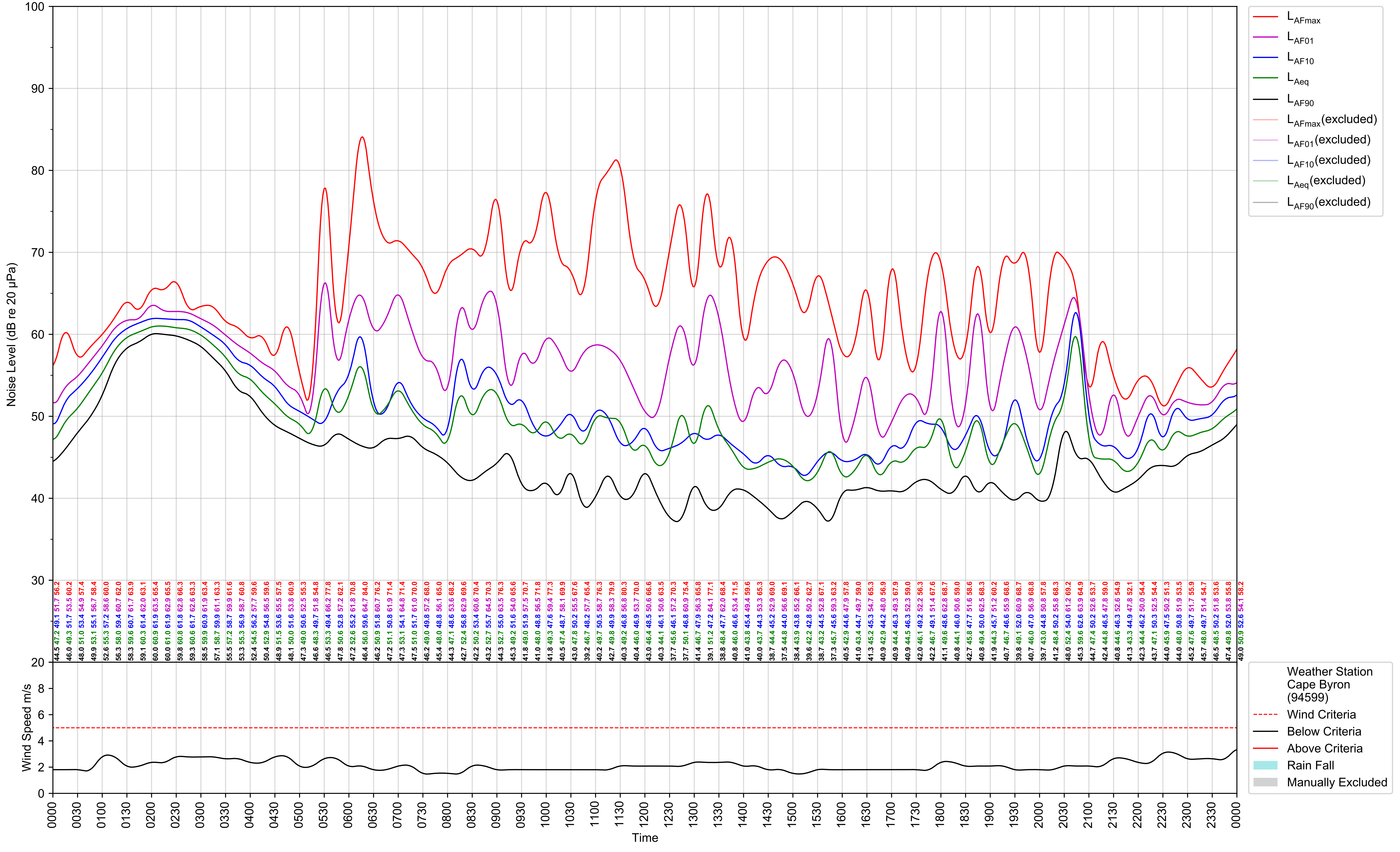
Post Calibration:	-0.04 dB
Location:	Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
Date: Saturday 30 January 2021

Waves CONSULTING



Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
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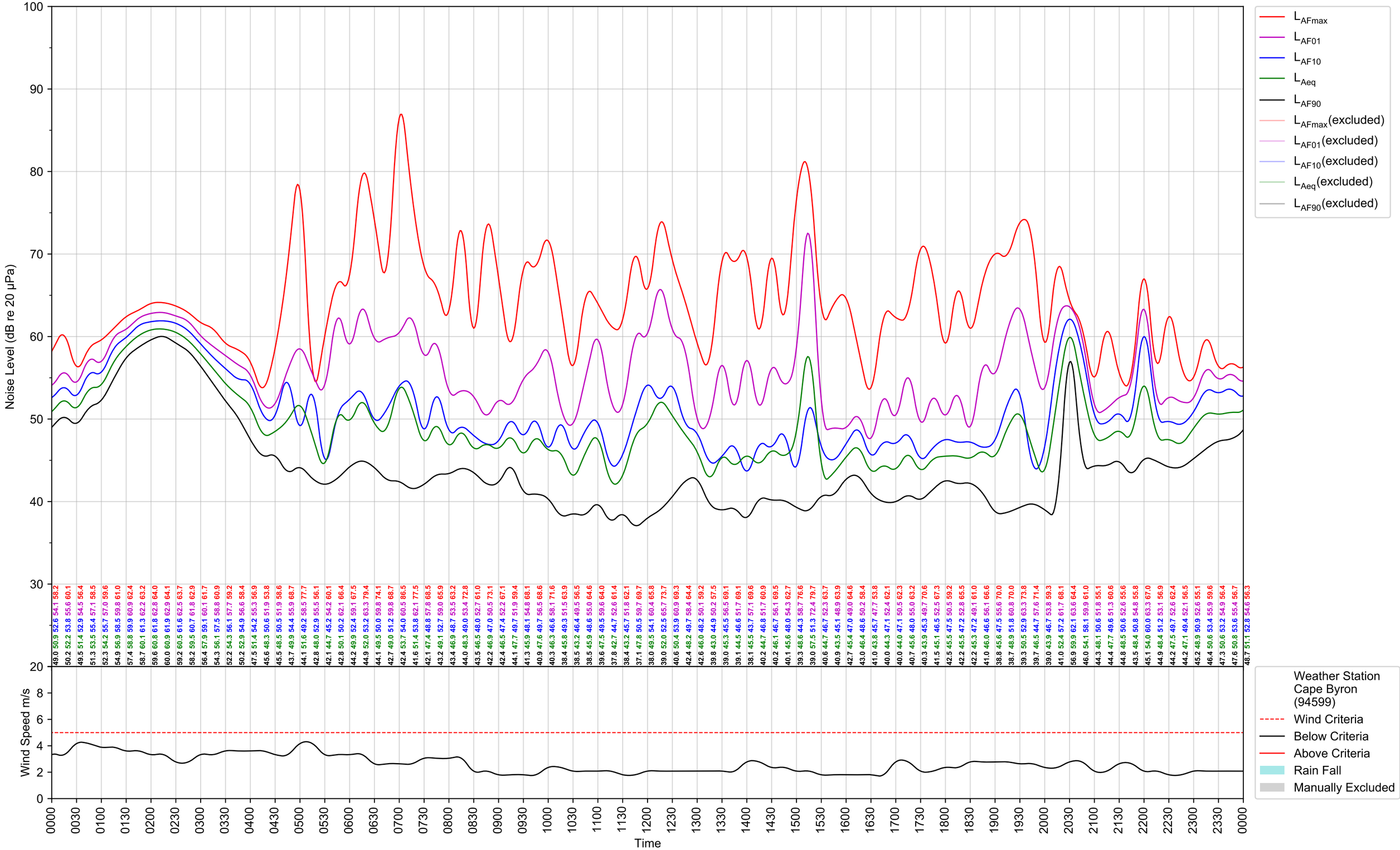
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
Date: Sunday 31 January 2021



Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
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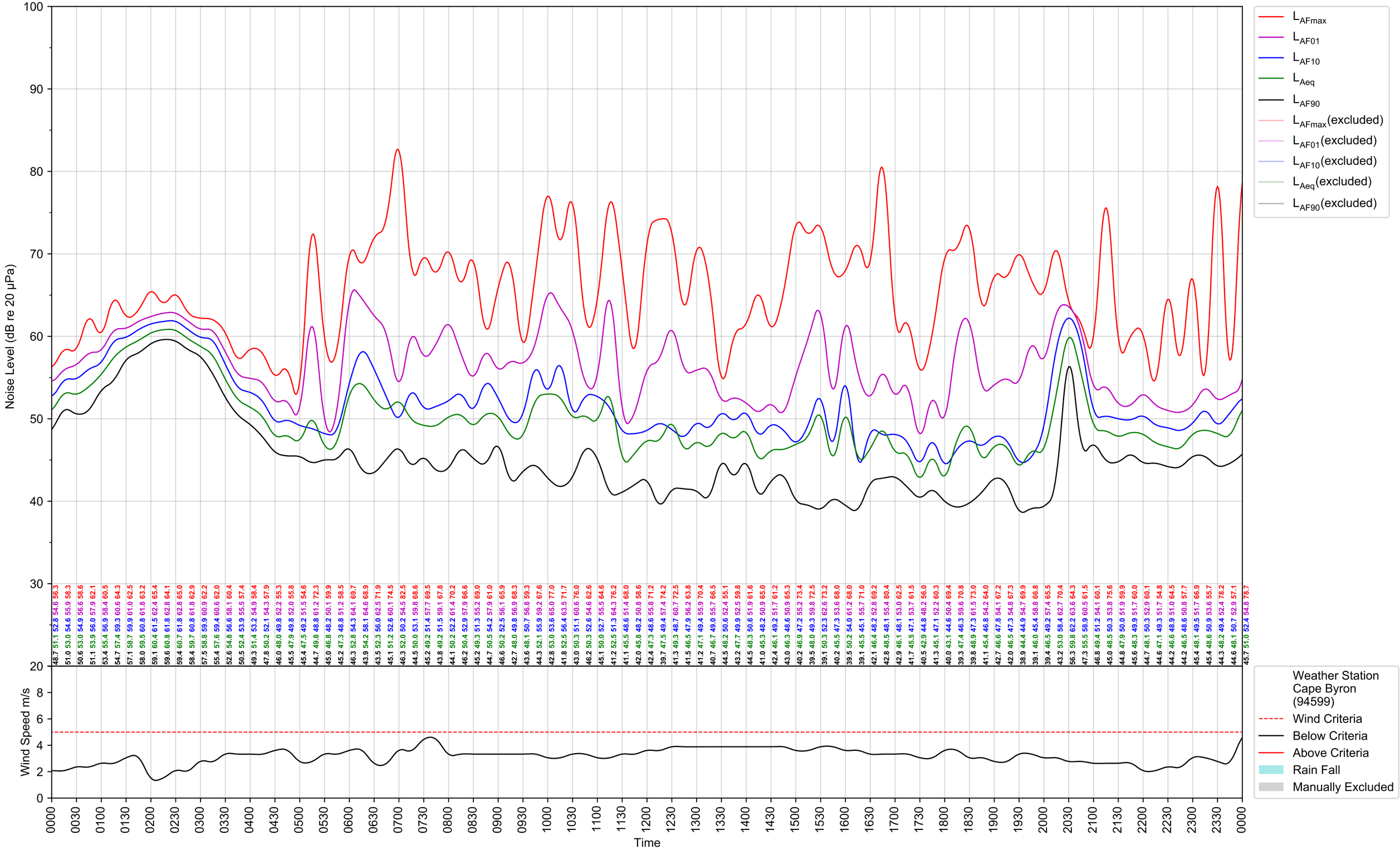
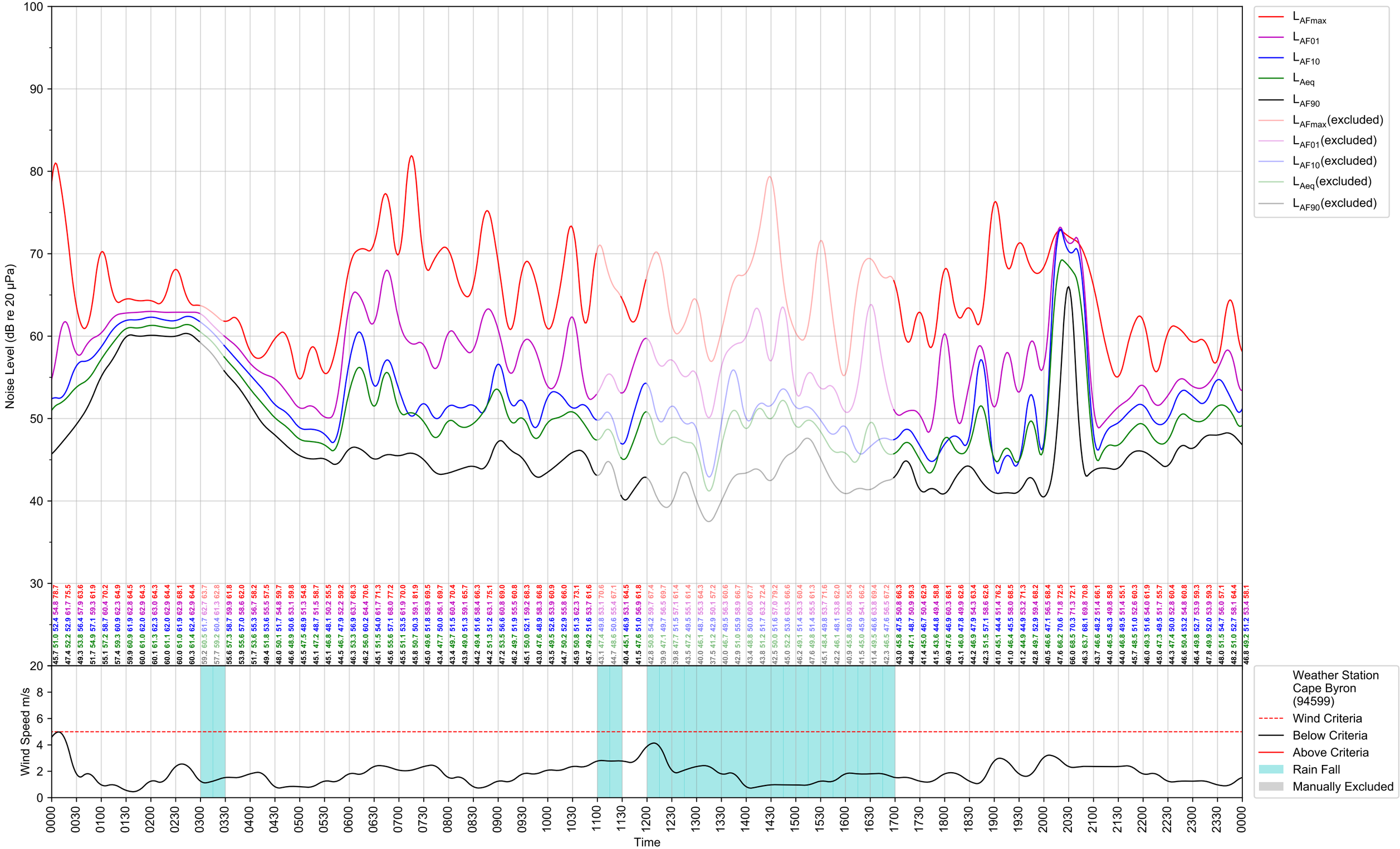


Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
Date: Tuesday 02 February 2021



Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
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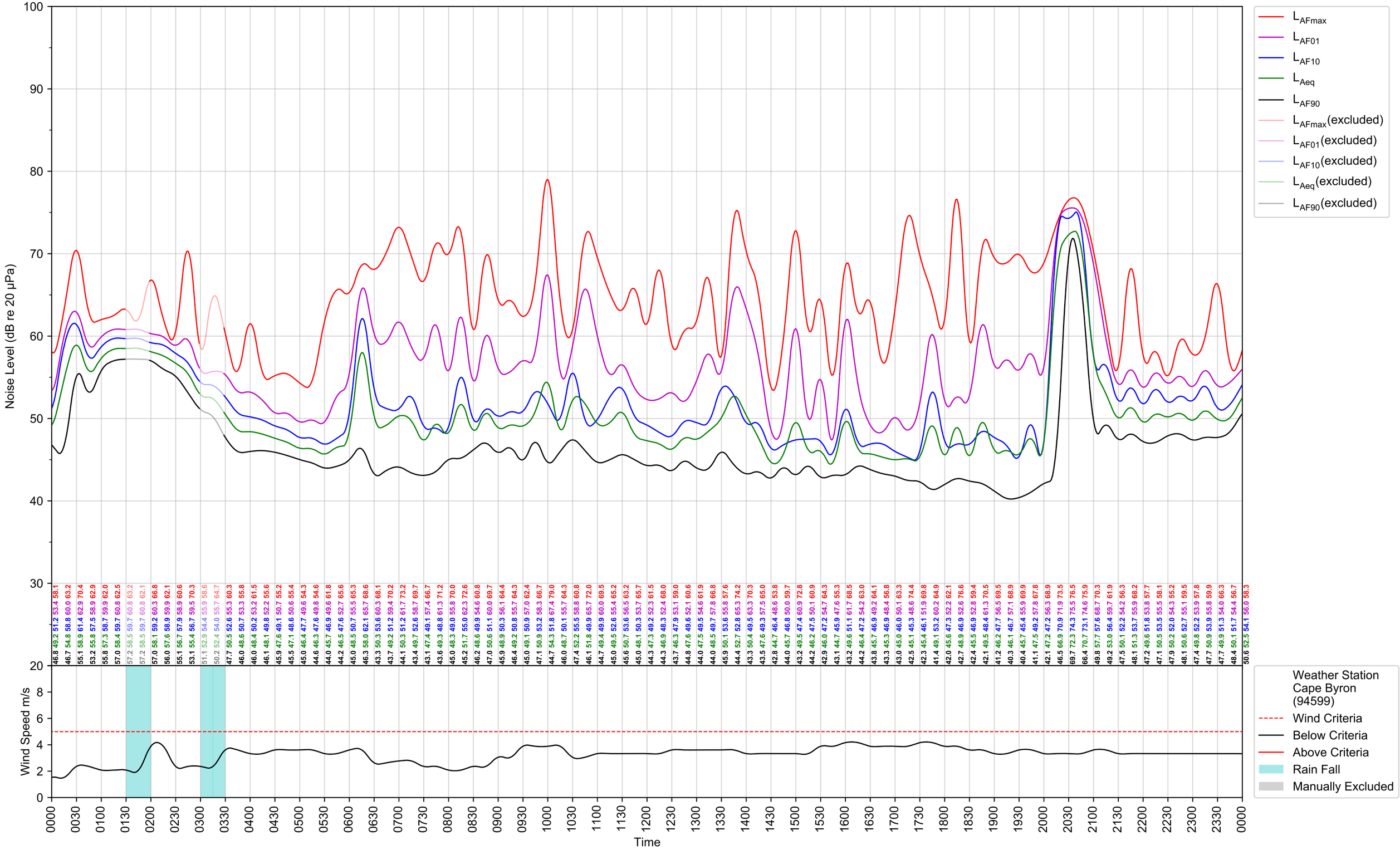
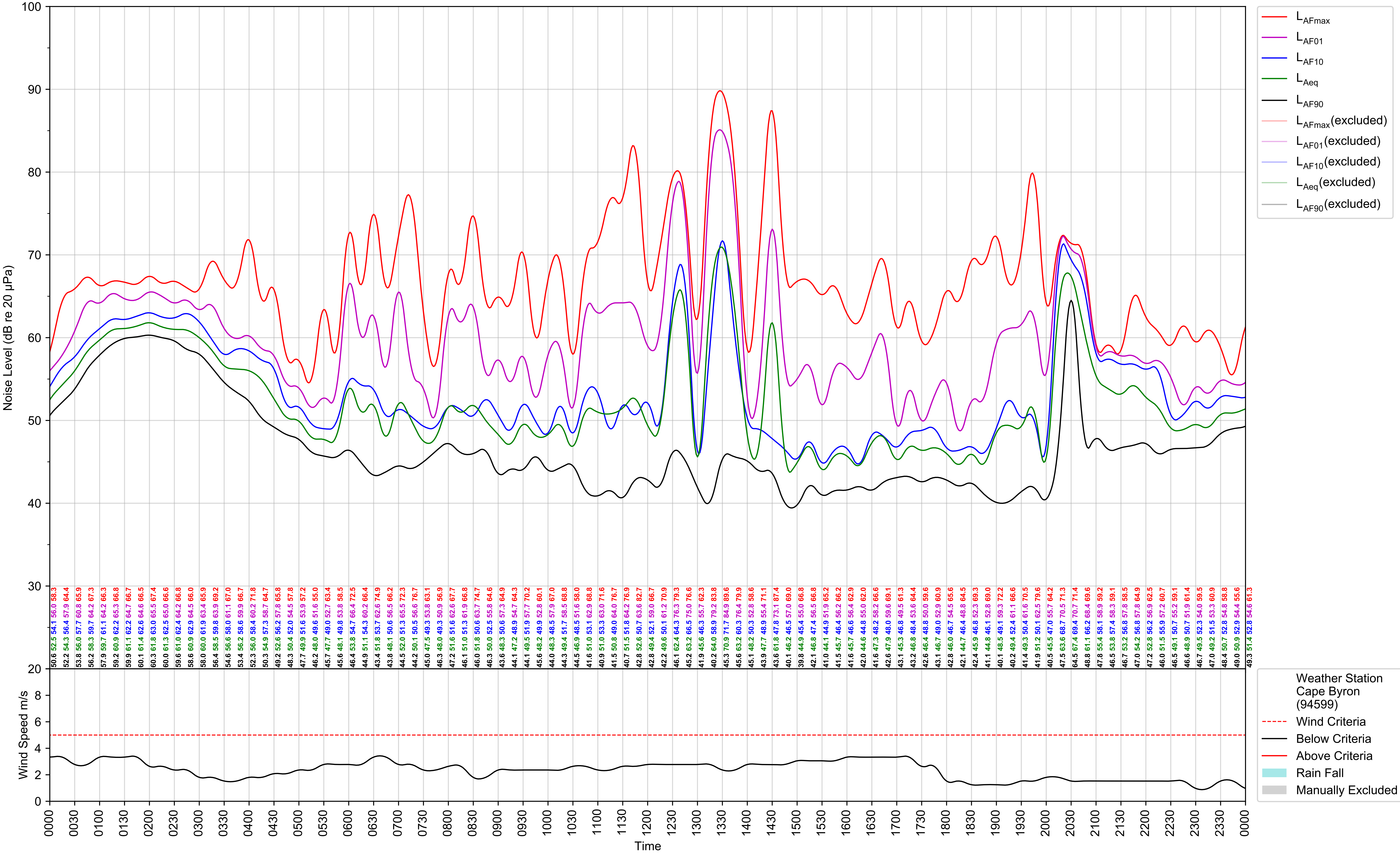


Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

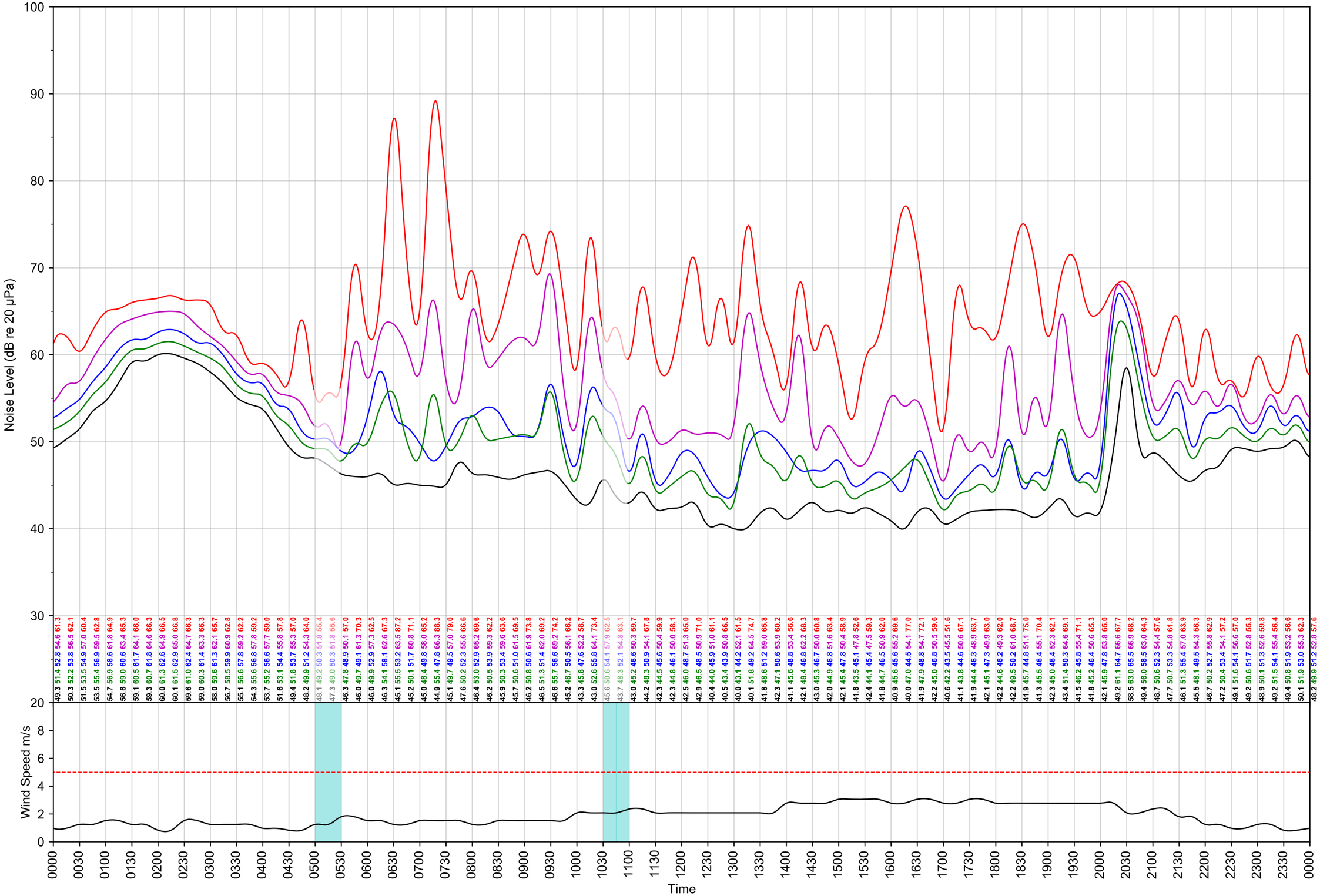
Graphical Noise Logger Data
Date: Thursday 04 February 2021

WAVES CONSULTING



Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
Date: Friday 05 February 2021



Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
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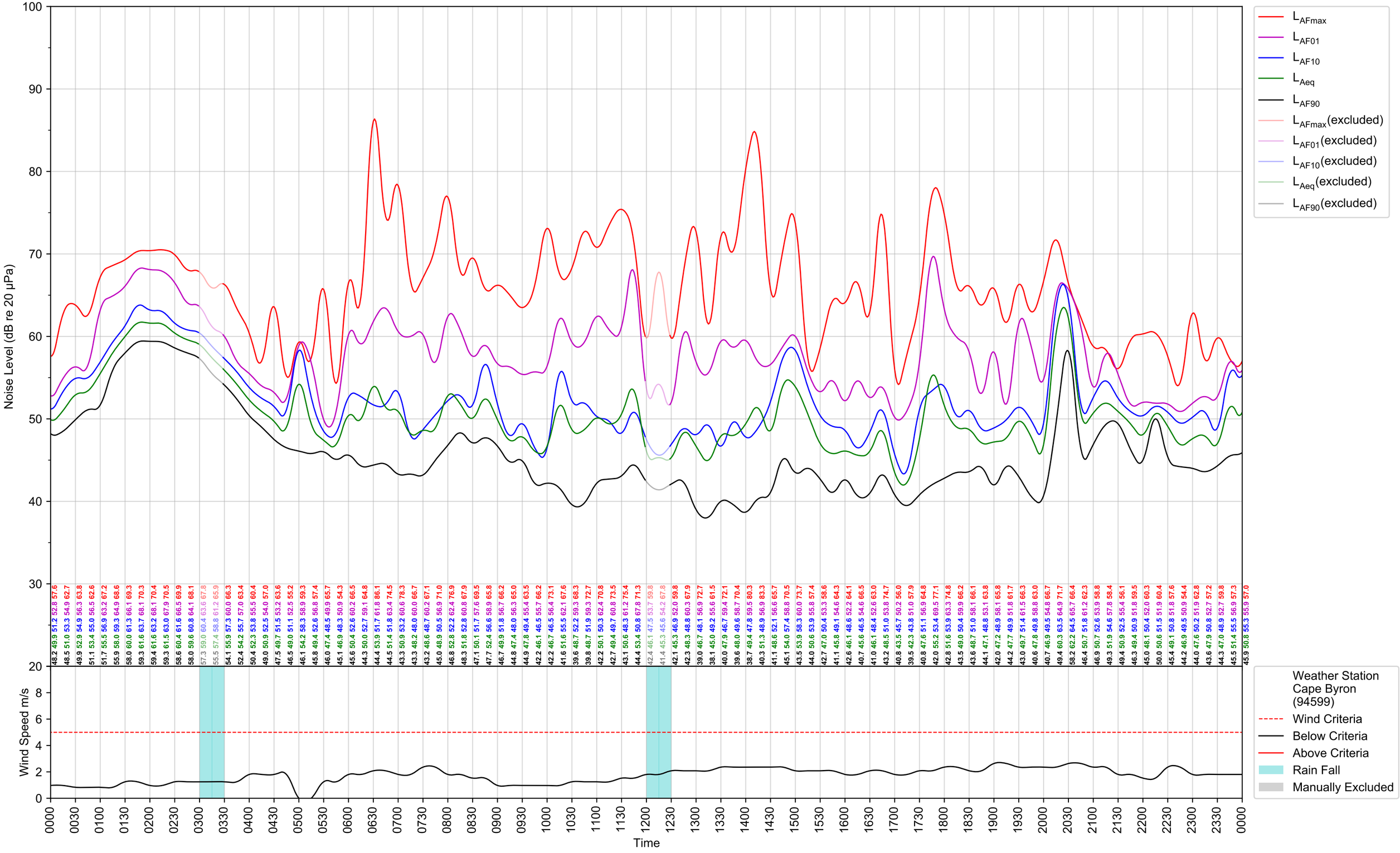
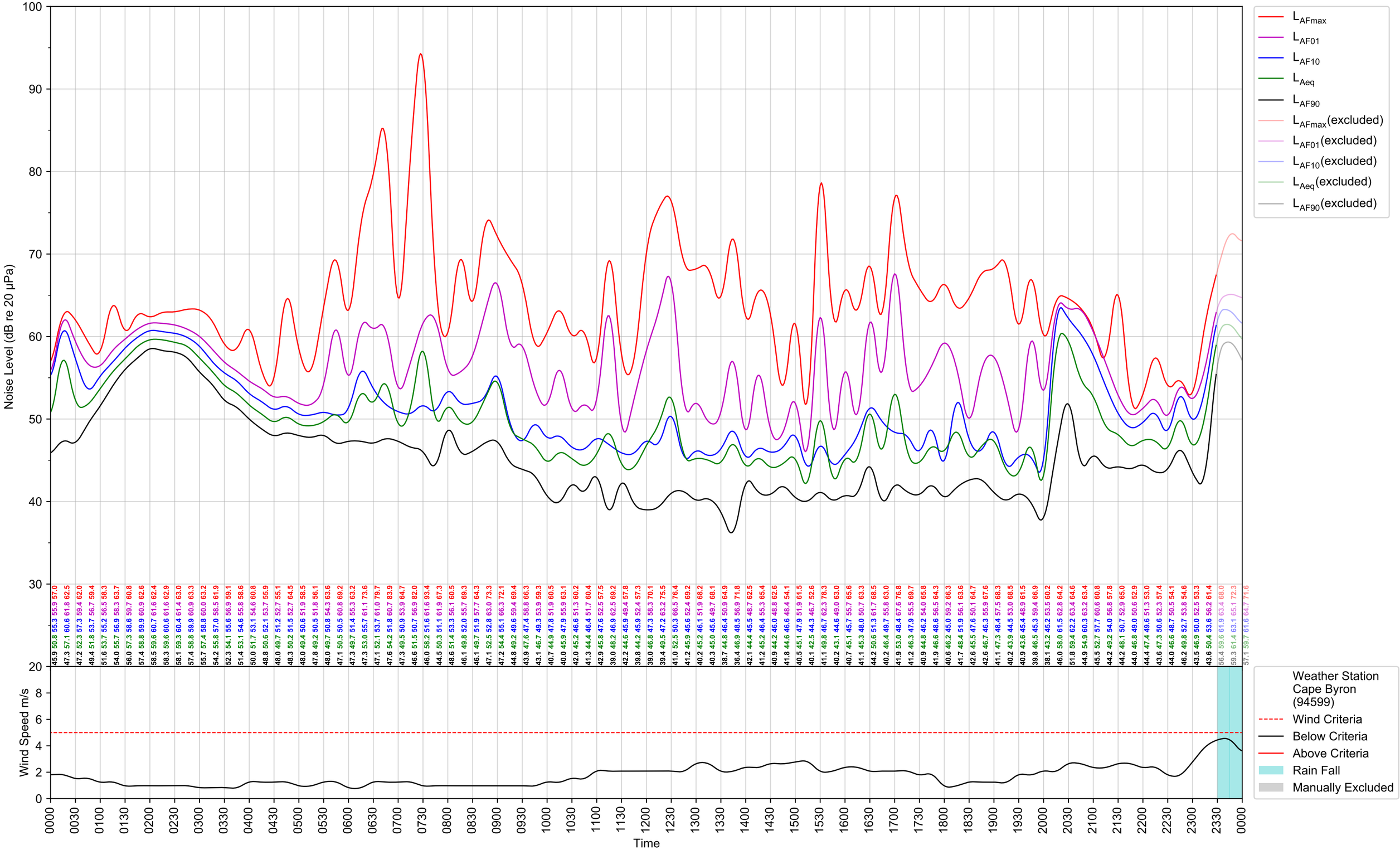


Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
Date: Sunday 07 February 2021



Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
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Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
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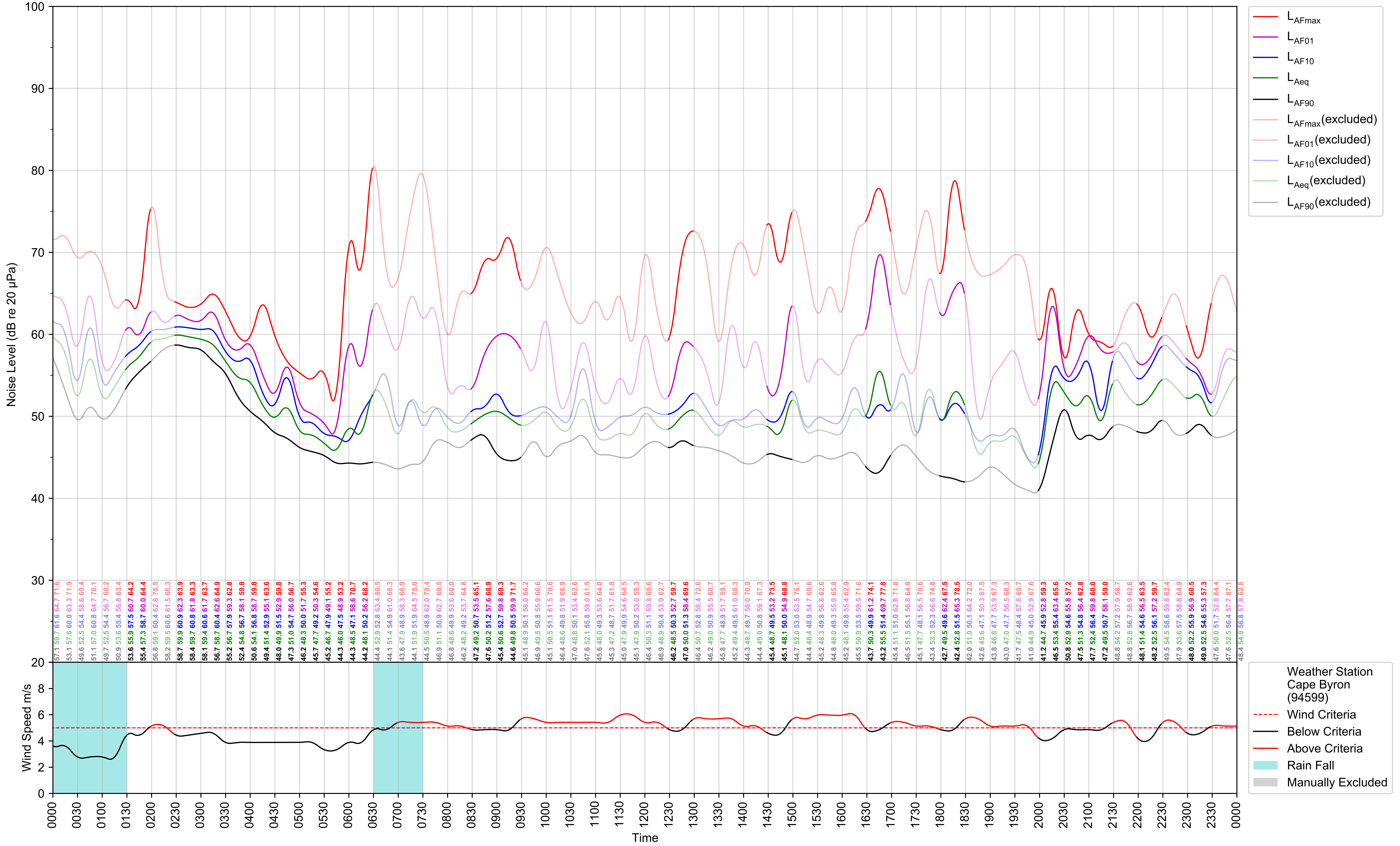
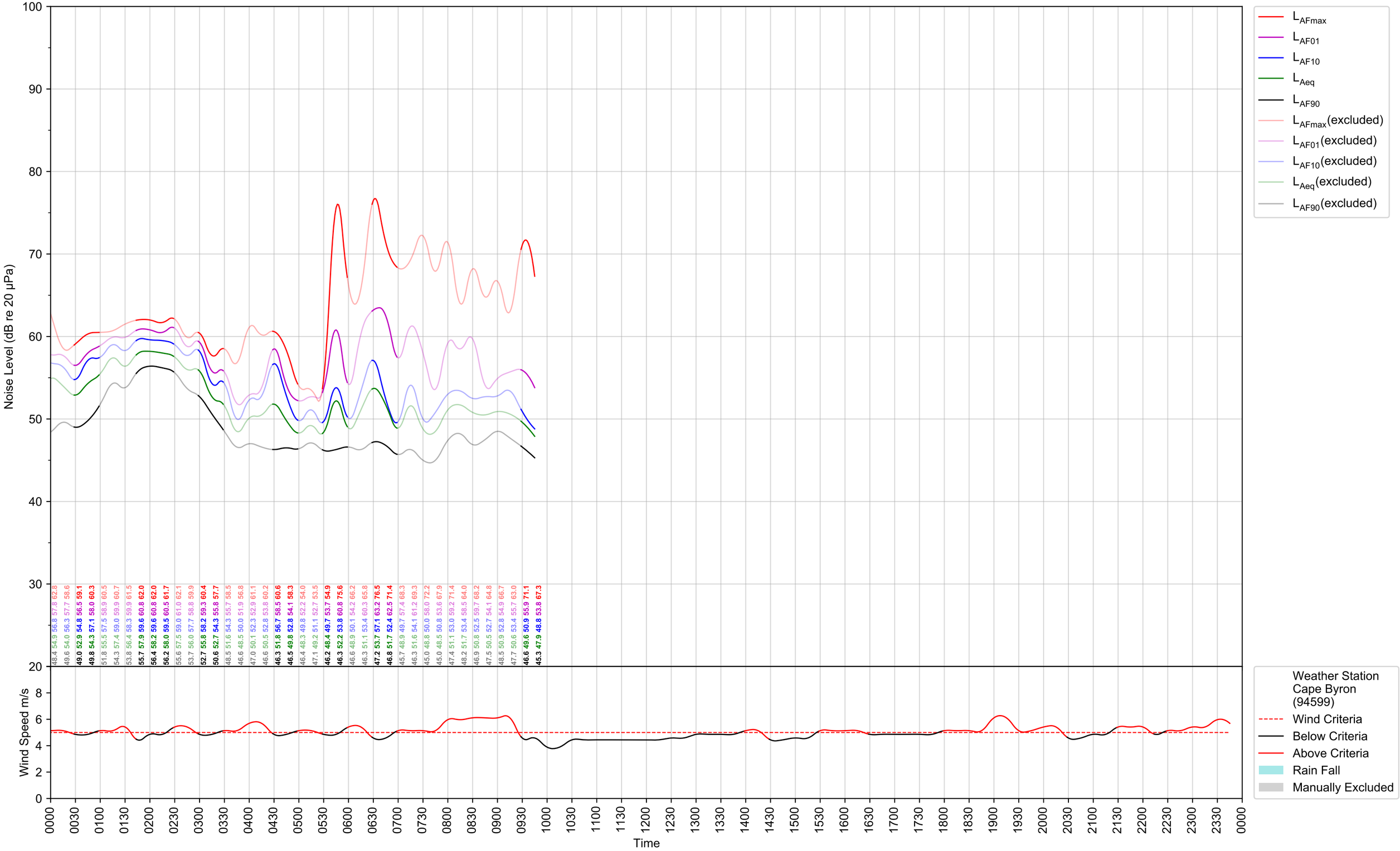


Project: Byron Bay BEF
Project Number: 60.00860.01
Equipment: Svan 977
Serial Number: 45730
Pre Calibration: -0.04 dB
Post Calibration: -0.04 dB
Location: Adjacent to Gallagher Street, Byron Bay

Graphical Noise Logger Data
Date: Tuesday 09 February 2021



Attachment 5 – EIS Section 11.3.6

Ewingsdale Road to accommodate future growth of the region. The 10-year design horizon for the Wallum Place and Bayshore Drive intersection indicated the intersection would continue to operate at current Levels of Service.

The analysis indicates that the projected increase in traffic activity as a consequence of the development proposal will not have any unacceptable traffic implications in terms of road network capacity. However, the study notes that the upgrades proposed for Ewingsdale Road in the Cardno report should be implemented prior to the 2028 design horizon to ensure the road network continues to operate at an acceptable Level of Service.

11.3.4. Parking Assessment

As per the Byron Shire Council's Development Control Plan 2014, the proposed development is required to accommodate five (5) off-street parking spaces. The development has allowed for seven (7) off-street parking spaces, including one disabled space. All parking spaces have been designed in accordance with the relevant Australian Standard (AS2890.1).

Truck parking on site is available through the circulation aisles which have been specifically designed to enable passing of 19 m articulated vehicles. The volume of parking within the circulation aisles is in excess of the parking requirements of the available trucks servicing the site. In addition, the Receival Hall of the facility has sufficient space in the central area of the warehouse to accommodate two 19 m articulated vehicles – the maximum number on site at any one time.

11.3.5. Pedestrian/Cycling Infrastructure

Bayshore Drive is a local, unclassified road which is primarily used to provide vehicular and pedestrian access to frontage properties. Kerbside parking is generally permitted along both sides of the road, subject to signposted restrictions.

A new Bike Plan has been developed by BSC in 2019 that provides a contemporary approach to bicycle network planning, design and promotion that reflects the current situation and also aligns with the future direction of Byron Shire.

The proposed Bioenergy facility (BEF) will result in a net increase of approximately 10 trucks per day, with a maximum of 2 trucks on-site at any given time. When compared to the traffic surveys undertaken at the Bayshore Drive/Wallum Place intersection and at the Ewingsdale Road/Bayshore Drive intersection, this additional movements represents a net increase of less than 1% of the traffic movements along Bayshore Drive and Ewingsdale Road.

As such, that level of traffic is statistically insignificant to warrant for any additional upgrades to the planned pedestrian/cycle infrastructure outlined within the Byron Shire Bike Plan.

11.3.6. Construction Impacts

Construction is expected to be undertaken over a period of 10 months. An average of 6-8 truck movements per day (including all deliveries of equipment and materials) are expected during construction of the proposed facility. These movements will primarily be related to delivery of materials and movements on-site for a short-term period. Some light vehicles for construction workers travelling to and from the Site are also expected. Overall, the traffic volumes associated with construction of the BEF are expected to be lower than the operational traffic volumes. Therefore, construction traffic is unlikely to impact the surrounding road network.

Attachment 6 – Letter from Trinity Consulting

Date: 1 October 2021

Ref: 217402.0006.L01V01

To: Angus Johnston

Company: Jackson Environment and Planning

Author: Samuel Wong

Subject: Proposed Bioenergy Facility – Air Quality, Response to NSW EPA Information Request

Pages: 1 of 3

Dear Angus,

This report letter provides an air quality response to the NSW EPA information request issued on 10 August 2021 regarding the proposed Byron Bay Bioenergy Facility. A copy of each air quality item is provided below, followed by a response. The request relates to the air quality impact assessment (AQIA) completed by Trinity Consultants on 26 April 2021 (ref: 217402.0006report02).

The proponent should confirm that peak to mean ratios were used in the modelling

It is confirmed that a peak-to-mean ratio of 2.3 has been adopted. This is based on the NSW approved modelling methods guideline, which specifies an upper ratio of 2.3 for wake-affected point sources and area sources.

EPA requests the proponent provides information regarding the risk of odour emissions from the building when doors are open, including how these will be managed if they become problematic once operational.

The risk of odour emissions from roller doors opening is expected to be minimal given the following information:

- Doors will be open for less than 2 minutes every hour during operating hours (i.e. 5 times per hour, less than 20 seconds per event (opening/closing).
- Doors will remain closed outside of operating hours.

If odour emissions become an issue, the following measures would be implemented:

- Installation of an industrial air curtain.
- Increase the number of air changes per hour in the receival hall. It is noted that should the increased airflow through the biofilter cause subsequent odour issues, biofilter contingency measures already proposed in Table 6.5 of the EIS will be implemented.

EPA requests the proponent clarifies whether the flowrate to the biofilter used in the AQIA includes air flow from the aerobic tunnels. If the odour emission rate is increased, the assessment should be revised.

It is confirmed that air flow to the biofilter used in the AQIA includes air flow from the aerobic tunnels. Air for the tunnels comes from the Receival Hall and is factored into the 3 air changes per hour considered in the modelling (see Section 6.2.1 of the AQIA), so tunnel air flow doesn't increase the overall flowrate to the biofilter. On this basis, the odour emission rate is as per the original AQIA and no further assessment is necessary.

The EPA request the proponent to provide further information on the design of the process including clarification on how purged air is managed and/or treated. Where purged air is not proposed to be treated, the AQIA should be revised.

All purged air is either directed to the CHP, biofilter or flare. No purged air is released untreated. **Table 1** presents a summary of the air flow processes during each stage of a batch process, and identifies the direction of the air flow.

Table 1: Air Flow Details

Stage	Fermenter Operation	Door status	Process status	Air flow directed to:	Duration (days)	Air flow volume
1	Filling fermenter	Open	None	From front to end of the Fermenter to the Biofilter	4h	3000 m³/h
2	Start-up operation (heating)	Closed	Aerobic	Biofilter	1	100 m³/h
3	Start Fermentation	Closed	Anaerobic	Biofilter	1	80 m³/h
4	Fermenting	Closed	Anaerobic	Gas storage then CHP	20	25,000 - 30,000 m³ over 20 days
5	Shut down phase 1	Closed	Fresh air flushing	Gas storage then CHP	1h	600m³/h
6	Shut down phase 2	Closed	Fresh air flushing	Flare	1h	600m³/h
7	Shut down phase 3	Closed	Aerobic	Biofilter	6h	800m³/h
8	Emptying fermenter	Open	None	From front to end of the Fermenter to the Biofilter	4h	3000m³/h

With regards to flaring, this is expected to occur for 1 hour per batch (6 week process) using a very small quantity of gas (600 m^3/hr or 0.17 m^3/s). Air quality impacts associated with flaring such a small quantity of gas over a short period every 6 weeks are expected to be minimal.

The EPA request the proponent to provide discussion, and if necessary, assessment, of odour emissions from the product storage area of the proposed plant.

The AQIA has included the product storage area of the proposed plant (identified as Stabilised Compost) in the air dispersion modelling. This was incorporated into the modelling of the existing WWTP scenario (see Figure 7.2 of the AQIA), and subsequently, included in the cumulative impacts. An odour emission factor of 1.0 OU/m^2/s was adopted. This is based on historical odour sampling by Trinity Consultants of compost windrows of various ages and conditions (e.g. fresh, pre-turned, post-turned) (noting that the product that is stored will be stabilised compost having lower odour potential).

It should be noted that the total odour emissions from the product storage area is 207 OUV/s (1 OU/m^2/s x 207 m^2 modelled area). This is a small proportion of the total odour emissions from the proposed facility (3% of total estimated 6357 OUV/s, including the biofilter). Whether the product storage area is modelled in the proposed BEF scenario or not will have minimal difference to outcomes for this scenario. Furthermore, the cumulative odour scenario (existing WWTP + proposed BEF) will remain unchanged.

The EPA requests the proponent to provide supporting evidence, such as a manufacturer's specification report and performance guarantee, or test certificates to: a. Transparently and robustly demonstrate that the parameters used to characterise the emissions from the CHP unit

are representative of the proposal; and b. Demonstrate that the CHP unit emissions will comply with limits included in Schedule 4 of the Protection of the Environment Operations (Clean Air) Regulation 2010.

The key parameters for characterising emission from the CHP are copied below in **Table 2** from the AQIA (Table 7.1).

Table 2: CHP Emission Parameters

Source ID	Height (m)	Exit Velocity (m/s)	Diameter (m)	Temperature (°K)
CHP	15.0	20	1	453.15

As noted in the AQIA, the above parameters are based on data provide by the supplier, Bekon. It is acknowledged that Proof of Performance may be required to confirm the inputs and outcomes of the assessment.

With regards to the Schedule 4 emission limits of the Protection of the Environment Operations (Clean Air) Regulation 2010 for stationary reciprocating internal combustion engines, Evoheat have supplied a letter confirming compliance with the limits, subject to the 2G TA-004 specifications for the biogas. Furthermore, Bekon have supplied a letter confirming the biogas will meet the 2G TA-004 specifications.

The original modelling is noted to have considered a modelled 100 mg/m^3 concentration for NO_x compared to a Schedule 4 limit of 450 mg/m^3.

With the modelled 100 mg/m^3 emission concentration, the maximum predicted NO_2 concentrations at the site boundary were 34 µg/m^3 (1-hour) and 0.8 µg/m^3 (annual average) (as shown in Table 8.1 of the AQIA). Where this is increased to the limit of 450 mg/m^3, the corresponding boundary predictions are 153 µg/m^3 (1-hour) and 3.6 µg/m^3 (annual average). These concentrations are well below the ambient air quality criteria of 246 µg/m^3 (1-hour) and 62 µg/m^3 (annual average). It is further noted that the NO_2 predictions assumes a 100% NO_x to NO_2 conversion, and therefore, NO_2 results are highly conservative.

On this basis, even if the CHP unit were to emit up to the emission limit, compliance would still be expected.

Yours faithfully

Trinity Consultants Australia

Samuel Wong
Environmental Manager

Attachment 7 – Letters from Evoheat and Bekon

BEKON

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20.09.2021

RE: Byron Bay Bioenergy Facility, 45 Wallum Place, Byron Bay, NSW.
CHP Emissions

Dear Sirs,

thank you for your interest in the Bekon Dry Fermentation Plant for installation at the proposed Byron Bay Bioenergy Facility. I understand that the NSW Environment Protection Authority (EPA) has sought a performance guarantee in relation to the emissions from the CHP, and this has been provided by the intended suppliers of the CHP, which is 2G.

We can confirm that the Bekon Dry Fermentation Plant, with suitable pre-treatment systems installed, can generate an input biogas that meets the 2G-TA004 Gas Instruction requirements. A competent operator who maintains our plant and equipment will meet these requirements. Should the project proceed, we will supply the necessary pre-treatment equipment for gas cooling and desulphurisation to meet the input gas requirements. Our facility design has taken into account the wastes to be processed.

In the past we have successfully delivered some Biogas-CHP projects together with 2G. In all cases the input biogas requirements and regulated CHP emissions limits were met during operation of the plants. Reference facilities where our plant has been combined with 2G Agenitor CHP include:

1. Biowaste treatment facility Dresden (Germany) 2016
2. Biowaste treatment facility KEWU Krauchtal (Switzerland) 2016
3. Biowaste treatment facility Dessau (Germany) 2019

Attachments: Statement of 2G to CHP Emissions from 13.09.2021.

Best regards

BEKON

Hans-Peter Erhard