SEATA

Deconstructing the world's problems
into profitable carbon-negative solutions

Statement of Environmental Effects (SEE)

SEATA Clean Energy & Carbon Sequestration Research & Development Centre

"SEATA R&D Centre"

Glen Innes NSW

Sustainable Energy & Agricultural Technologies Australasia
(SEATA Group)

December 2021

Document control

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Document Revision Status

Author	Revision number	Details	Date
SEATA	Rev0	SEE accompanying DA to GISC	17 December 2021

ABN 87628218342, ACN: 628218342

This document has been prepared on the basis of the information available at the time of writing for the purposes and objectives of this document. SEATA Holdings Pty Ltd reserves the right to make alterations to all project documentation as may be required following feedback from Glen Innes Severn Council and relevant agencies (including NSW EPA) for the project during assessment.

Declaration

Submission of Statement of Environmental Effects (SEE)

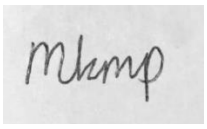
Prepared under the *Environmental Planning and Assessment Act 1979,* including relevant matters for environmental planning and assessment under Section 4.15(1).

SEE Prepared by	Craig Bagnall	Madeline Pratt
Qualifications	BE(Env)(Hons), CEnvP(IA Specialist)	BEnvSci/BMarSci&Mgmt
Position	Director, Environment and Regulatory (SEATA Group)	Graduate Environmental Consultant, CEM
In respect of	**SEATA Clean Energy & Carbon Sequestration Research & Development Centre "SEATA R&D Centre" Glen Innes NSW**	
Project Application	SEATA R&D Centre	
Applicant Name	SEATA Holdings Pty Ltd (Trading as "SEATA Group") (ACN 628218342)	
Applicant Address	Suite 1, Level 1, 160 Pacific Highway Charlestown, PO Box 313, Charlestown 2290	
Land to be developed	Part Lot 3, DP 1193185, 448 West Furracabad Road, Glen Innes NSW.	
	The proposed project involves site preparation, construction and operation of a small (<1ha) R&D centre for staged campaign-based testing of SEATA's pilot scale technology (Research & Development Scale Model, RDSM) over an initial three year trial period as described herein. The project is located approximately 14km southwest of Glen Innes, NSW.	

A Statement of Environmental Effects is presented / attached herein.

I certify that I have prepared the contents of this Statement of Environmental Effects and to the best of my knowledge, it is true in all material particulars and does not, by its presentation or omission of information, materially mislead. I understand that this document may be returned to me if information is found to be missing or inadequate as deemed by regulatory review.

Signature
Name: Craig Bagnall
Date: 17/12/2021



Signature
Name: Madeline Pratt
Date: 17/12/2021

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APPENDICES

Glossary

ANZBIG	Australian New Zealand Biochar Industry Group
APZ	Asset Protection Zone
BAT	Best Available Techniques
BAL	Bushfire Attack Level
BCA	Building Code of Australia
BPL	Bushfire Prone Land
BREF	Best Available Techniques Reference Document
CCUS	Carbon Capture, Utilisation and Storage
CDR	Carbon Dioxide Removal
CO_{2e}	Carbon Dioxide (CO_2) equivalent
DA	Development Application
DCP 2014	Development Control Plan (Glen Innes Severn Council)
DPI	Department of Primary Industries (NSW)
DPIE	Department of Planning, Industry and Environment
EfW	Energy from Waste
ENM	Excavated Natural Material
EP&A	Environmental Protection & Assessment Act, 1979
EPA	Environmental Protection Agency (*NSW, unless otherwise specified*)
EPL	Environmental Protection Licence
ERA	Environmental Risk Assessment
ENM	Excavated Natural Material
ESCP	Erosion Sediment Control Plan
FTE	Full-time Equivalent
GHG	Greenhouse Gas Emission
GISC	Glen Innes Severn Council
HAZOP	Hazard and Operability Study
IED	European Industrial Emissions Directive (IED)
INS	Invasive Native Scrub
IPCC	Intergovernmental Panel on Climate Change
LCA	Life Cycle Assessment
LEP 2012	Local Environmental Plan (Glen Innes Severn Council)
LGA	Local Government Area

LLS	Local Land Services
NATA	National Association of Testing Authorities
NETs	Negative Emissions Technologies
NCC	National Construction Council
NSW	New South Wales
PAHs	Polycyclic Aromatic Hydrocarbons
PM	Particulate Matter
PNTL	Project Noise Trigger Level (*Has considered project intrusiveness and project amenity noise*)
POEO	Protection of the Environment and Operations
POP	Persistent Organic Pollutant
PVP	Property Vegetation Plan
R&D	Research and Development
RDSM	Research and Development Scale Model
RBL	Rating Background Level (*In accordance with NSW Noise Policy*)
REZ	Renewable Energy Zones (NSW)
RFS	Rural Fire Services
RRO	Resource Recovery Order
SEATA	Sustainable Energy and Agricultural Technologies Australasia (SEATA Holdings Pty Ltd)
SEE / SoEE	Statement of Environmental Effects (This Document)
SEPP	State Environmental Planning Policy
Tpa	Tonnes per annum
VENM	Virgin Excavated Natural Material
VOC	Volatile Organic Carbon
VTOC	Volatile Total Organic Carbon
WMP	Waste Management Plan

Executive Summary

Background:

SEATA Holdings Pty Ltd, trading as SEATA Group ("SEATA"), is a proudly Australian company developing an advanced thermal treatment technology designed to economically deconstruct wasted biomass and other carbonaceous resources into valuable commodities at scale in an environmentally friendly manner, with significant carbon sequestration.

The development of ***Negative Emissions Technologies (NETs)*** to remove excess CO_2 from the atmosphere, also known as ***'drawdown'***, is expected to play a critical role in meeting the challenge of climate change. Conversion of sustainably sourced/wasted biomass resources into biochar, a solid form of sequestered carbon, is recognised by the International Panel on Climate Change (IPCC, 2018) as one of the key NETS urgently required to provide long-term sequestration toward the target of **Net Zero emissions by 2050**. Biochar has also emerged globally as a beneficial resource to many key sectors of the economy including regenerative agriculture, roads, concrete, steel, water treatment/filtration and emerging 'carbon-tech' applications. Historically, production of biochar economically *at scale* has been technically hindered, holding back achievement of its otherwise significant potential.

SEATA technology represents an important "step change" toward **genuine *circular* economy** with ongoing, cyclic recovery of valuable resources available through two key outputs – a **very clean syngas** and **solid carbon (biochar)**. Clean syngas undiluted with air (full of nitrogen) avoids the need for further costly gas 'clean-up', facilitating economic recovery of a range of valuable commodities from syngas, including low cost **carbon-*negative* hydrogen**, or for direct use as renewable bioenergy (**Figures (ii-iii)**).

As a result, SEATA technology has the potential to assist both of the critical tasks required to address climate change, and in a commercially viable manner – (1) **reducing emissions** via transition to hydrogen and/or renewable bioenergy, and (2) **removal** of excess CO_2 already in the atmosphere through production of biochar, as illustrated in **Figure (ii)**. The economic **scalability** and **uniquely high thermal efficiency** design of the technology has the potential to make it one of the most significant emerging NETs, as these factors have been critical limitations for conventional biochar bioenergy technologies.

Figure (i): SEATA technology can aid transition from linear to circular economy. *Unlike conventional linear "single-use" waste to energy (combustion), SEATA technology is designed to economically recover both solid carbon and gases as valuable resources – the "building blocks" for circular economy.*

Figure (ii): Terrestrial Carbon Cycles with Long Term CO2 Removal & Utilisation via SEATA Technology

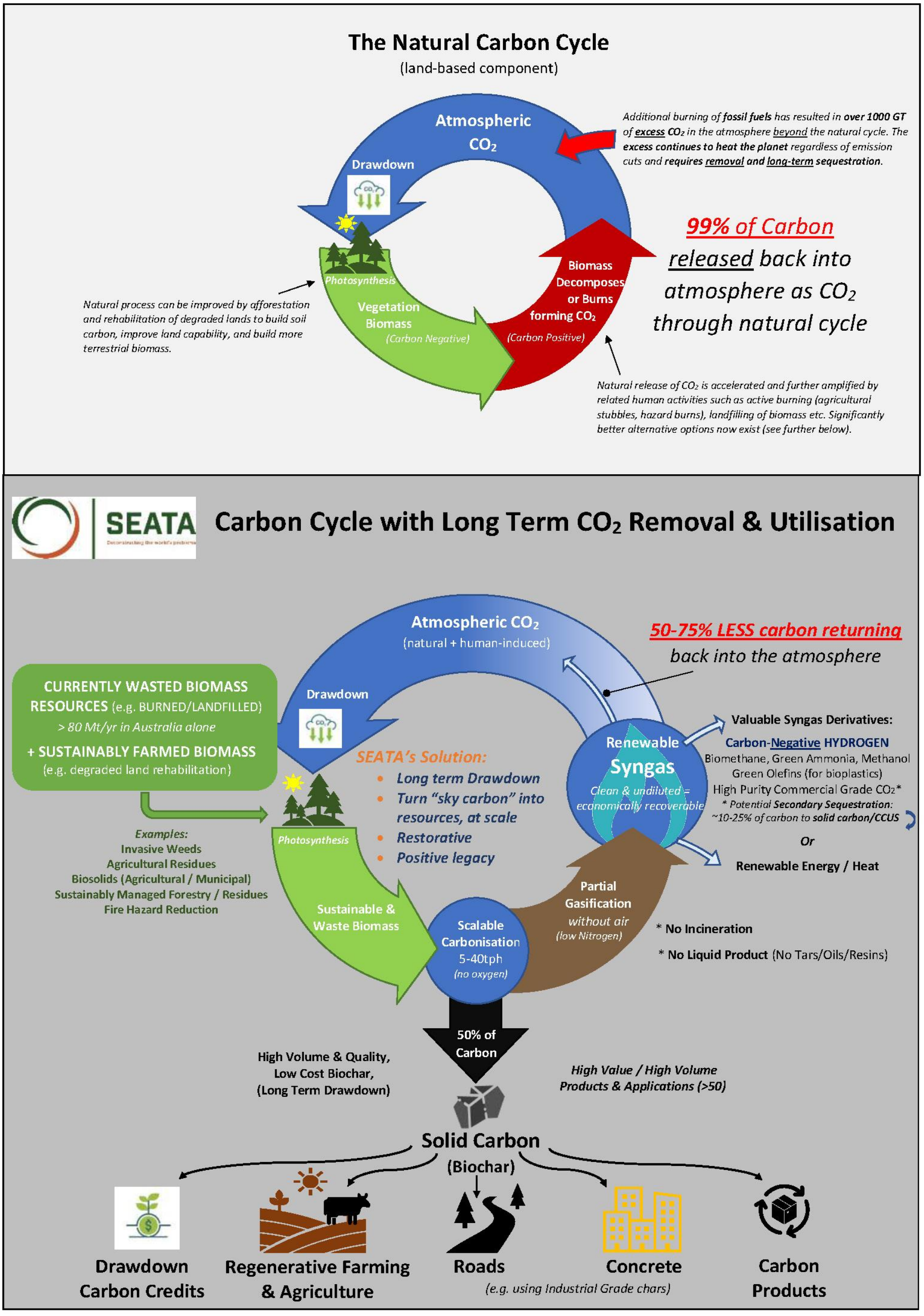
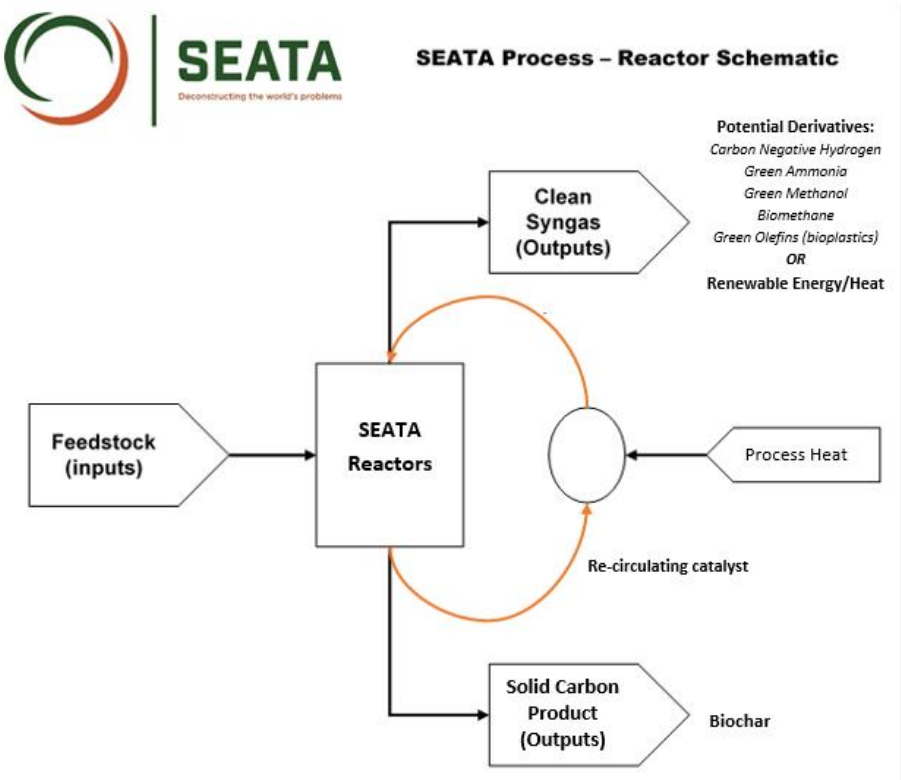


Plate (i): SEATA Pilot System - ***Research & Development Scale Model (RDSM):*** Capacity 200-300 kg/hr.

Figure (iii): High Level Schematic of SEATA Process ***(further details/PFD provided in Section 2)***



The Project:

Following successful design, development and initial testing at *'bench'* scale (batch processing), SEATA has constructed a continuous-operation ***Research & Development Scale Model (RDSM)*** for pilot field trials, as shown in **Plate (i)**. The RDSM is designed to provide R&D data to assist design for later commercial scale up elsewhere, and includes emission control via both afterburner and wet scrubber. Comprehensive testing and monitoring are proposed to confirm Proof of Performance and to provide data for bankable feasibility for deployment at scale elsewhere. A ***'walk before run',*** risk-based approach has been conservatively adopted for the project right from commencement and has been the basis of all forward consultation to date.

This *Statement of Environmental Effects (SEE)* introduces and assesses the proposed project to establish a small R&D centre for non-commercial trials to demonstrate SEATA's pilot scale RDSM technology, using only natural clean feedstocks and standard fuels - three initial priority feedstock target groups (including their blending) are outlined in **Tables (i)** and **(ii)** and detailed in Section 4. **Up to approximately a dozen green rural jobs (FTE)** will be created during operations. An initial three year trial is proposed, which may seek extension if successful. This report describes the proposed project, the process undertaken to identify key environmental and planning issues, outcomes of engagement to date with the community and stakeholders, and the proposed assessment and management of key aspects identified required for formal Development Application (DA) to Glen Innes Severn Council (GISC).

The proposed project site is part of a rural property located at Furracabad approximately 10km from Glen Innes in NSW, as shown on **Figures (iv)-(vi)**. The property is owned by SEATA director and inventor John Winter, whose family have farmed the property for five generations. Glen Innes is a focal point for renewable energy in NSW as part of the **New England Renewable Energy Zone (REZ)**, with established commercial solar and wind energy projects, and expanding interest in storage technologies and bioenergy. SEATA technology is consistent with the objectives set out for the REZ, and with the *NSW Climate Change Policy Framework,* including the associated *Net Zero Plan 2020-2030* and supporting *Net Zero Industry Innovation Program.* The project has considered the objectives and requirements of relevant federal, state, and local planning legislation and Environmental Planning Instruments and supporting policies and guidelines, including as applicable regionally, as detailed in Sections 1.4 and 5.

The trials aim to demonstrate the technology under continuous run conditions, characterise inputs (feedstocks) and outputs (syngas, biochar, emission controls), and provide performance data for subsequent analysis for potential commercial scale deployment elsewhere. Staged detailed testing will be developed in consultation with EPA (refer **Table (ii)** and **Section 7)**. **As an R&D project, energy recovery is not proposed**, with syngas afterburned and discharged into the atmosphere, or recycled as feedstock to other processing steps. Biochar will be appropriately stored until characterisation confirms it meets requirements for use including application to land (proposed agricultural and/or industrial options as appropriate) - anticipated to be regulated under conditions of a secondary related approval required from EPA (Resource Recovery Order and Exemption). Whilst not expected to be required, **redundancy options have also been conservatively considered** should proposed uses of biochar *not* be feasible within an appropriate period (e.g. 6 months of R&D period completion) to minimise risk of legacy issues. Whilst small scale project, the regulatory framework is complex and hence a detailed SEE.

The project is summarised in Tables (i) and (ii) further below and detailed within **Section 4**. The proposed development is illustrated in **Figures (v) and (vi)** below. Key figures within this report are consolidated in **Appendix 1**. The project Environmental Risk Assessment, key identified aspects and monitoring are discussed in **Section 7**. A completed GISC DA Checklist is provided in **Appendix 2**.

Proposed Approval Pathway (Statutory and Regulatory Context):

The project has considered relevant statutory legislation and regulatory frameworks at Commonwealth, State, Regional and Local planning levels as outlined in **Section 1.4** and detailed in **Section 5**. The project is expected to be assessed as ***Integrated Development*** in accordance with s4.46 in Part 4 Division 4.8 of the *NSW Environmental Planning & Assessment Act (EP&A Act),* due to requirements for an ***Environmental Protection Licence (EPL)*** from NSW EPA under the *NSW Protection of the Environment Operations Act (POEO Act)*, with triggers under Schedule 1 of the POEO Act including ***thermal treatment***. Related approvals also include staged ***Resource Recovery Orders & Exemptions*** from EPA under the *POEO (Waste) Regulations* firstly to recover, receive, store and process (vial thermal treatment) proposed feedstocks (*'Resource Recovery Wastes');* and secondly to apply biochar to land after successful characterisation. **Glen Innes Severn Council (GISC) is the determining consent authority** under Part 4, Division 4.2 Cl 4.5(d) and Divisions 4.3 (Development Requiring Consent) and Division 4.8 (Integrated Development) of the EP&A Act (refer Section **5.2.3**). This Statement of Environmental Effects is prepared to address Part 4.15 (1) (Matters of Consideration) of the Act.

The project is designed to be consistent with permissible activities within RU1 zoned land (Rural Primary Production) as a *Resource Recovery Centre* (noting R&D) under the GISC Local Environment Plan (LEP), and to meet GISC Development Control Plan (DCP) requirements. The project is not located within Bush Fire Prone Land (as mapped on the DPIE Planning Portal as at 1 October 2020 per GISC Development Consent Checklist requirements), as such a *Bushfire Authority* has not been expected required. Notwithstanding this, context to RFS Guidelines for Planning for Bushfire Protection has conservatively been considered in project design. The project does not trigger *Designated Development* and is below thresholds for *Regionally (and State) Significant Development* under the NSW EP&A Act, as detailed in **Section 5**. Compliance with the GISC DA checklist is provided in **Appendix 2**.

Based on pre-lodgement discussions to date, there may be potentially for conditional requirements with an EPL for the project to be considered which require **staged** RRO approval, such as follows:

- An EPL condition requiring an RRO & Exemption approval from EPA authorising initial **recovery/generation, receipt, storage and processing of the proposed feedstocks** for R&D trials using SEATA's thermal treatment technology, issued concurrently with the EPL and development consent (effectively allowing thermal trials to commence).
- An EPL condition requiring an RRO & Exemption approval from EPA allowing **temporary storage of biochar produced** by the trials, and **application to land** once suitably characterised in accordance with EPA's Guidelines for Application to Land. It is expected that this would be undertaken on a **per feedstock basis**, which is also conservatively proposed to be staged.
- Conservative redundancy options are also available and provided for biochar product (including a worst case scenario of co-firing in a power station) which could be conditioned if required.
- The above approach allows biochar to be produced and then characterised for an appropriate application in an effective staged manner, without risk of waste legacy.

Note: As an initial 3-year approval sought for a non-commercial R&D facility, relevant **exemptions** are sought under provisions of s88 (5) of the POEO Act (1997) and Cl92 of Part 9 of the POEO (Waste) Regulations 2014, including but not necessarily limited to contributions/fees/levies, as outlined and justified in **Section 5**. The project does **not propose to recover energy**, however due to objectives of providing proof of performance for future commercial sites (elsewhere) for such, relevant policies have been considered in project scoping, including the most recent *NSW Waste to Energy Infrastructure Plan* 2021.

Accordingly, in summary the key relevant approvals sought for the project under an Integrated Assessment approval pathway are expected to include:

- **Development Consent** from GISC (integrated consent) and related approvals / certificates for construction
- **Environmental Protection Licence** (EPL) from NSW EPA, consistent with above. EPA to confirm if a licence for Scheduled Development Work (e.g. construction phase) is required.
- **Staged Resource Recovery Orders (RRO) and Exemptions** from NSW EPA as noted above and detailed further within this document, commencing with Invasive Woody Weeds (Invasive Native Scrub "INS"). RRO's to address recovery through to thermal treatment and production/stockpiling of biochar through trials ahead of characterisation for fit for purpose use (under Exemption). Staged conditional Exemptions for stockpiling, supply and use/application of biochar, subject to successful biochar characterisation demonstrating fit for purpose where proposed for land applications.
- **Biosecurity Permit** from NSW DPI for relevant feedstocks if/as required, issued under the NSW Biosecurity Act 2015;
- **Approval from Essential Energy** (under NSW Electricity Supply Act) for proposed construction of structures (sheds) on the site in relation their rural 11kV powerline and associated easement requirements (noting all structures have been located outside the 10m easement required by Essential Energy).
- **Section 68 approval** from GISC (Local Government Act) for formal approval of continued use of the existing septic/transpiration system.

The proposed R&D trials have the potential to provide substantial **social, economic and environmental benefits** ('triple bottom line') through commercial application when proven. SEATA will continue to proactively engage with Council, EPA and the community in a transparent and genuine manner throughout testing, and is proud to be part of the local community in Glen Innes. SEATA looks forward to GISC and agency assessment of the DA to facilitate commencement of proposed testing as soon as possible.

Figure (iv): Regional Context of proposed SEATA R&D project site located near Glen Innes NSW

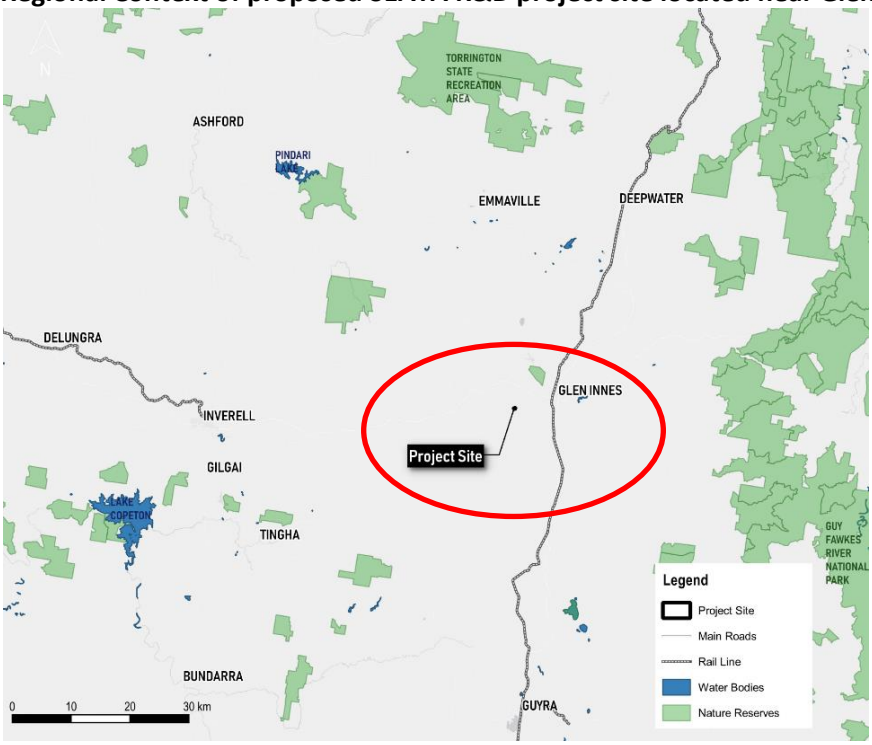


Figure (v): Proposed Project Site (Application Area), including access – SEATA R&D Centre, Glen Innes

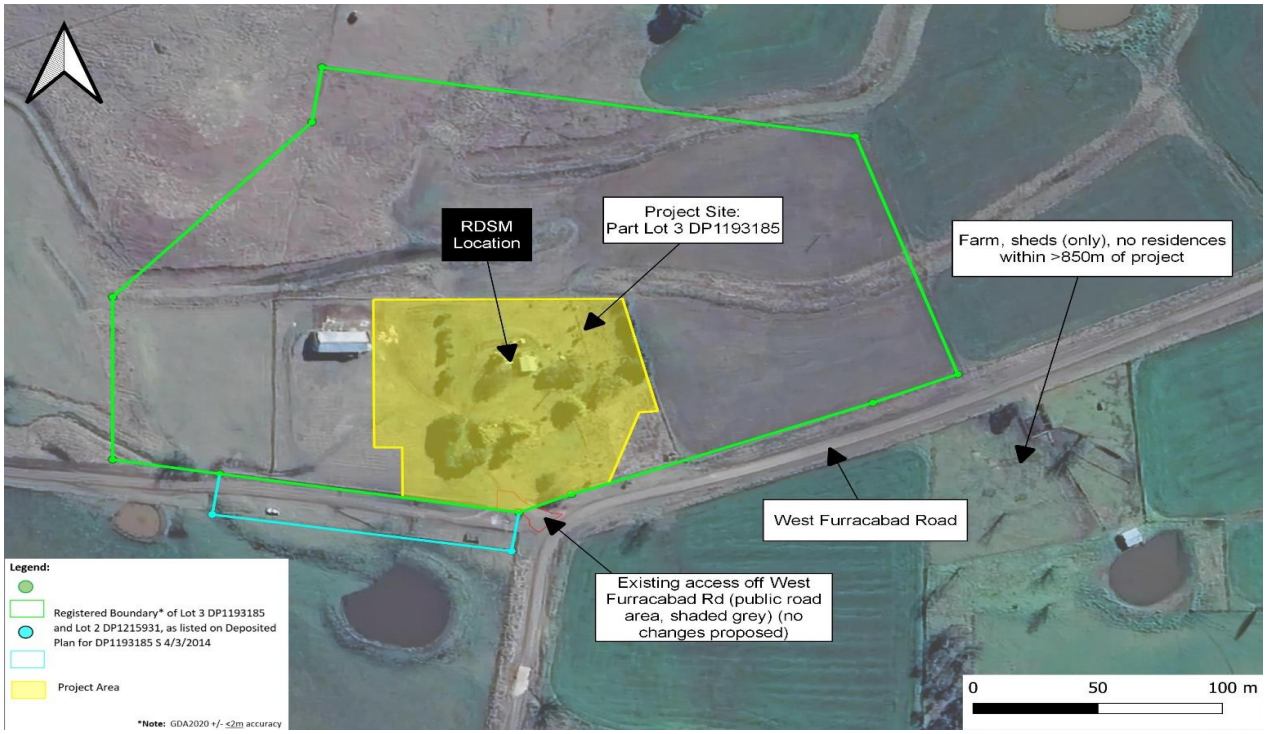


Figure (vi): Proximity to nearest rural neighbours (>850m)

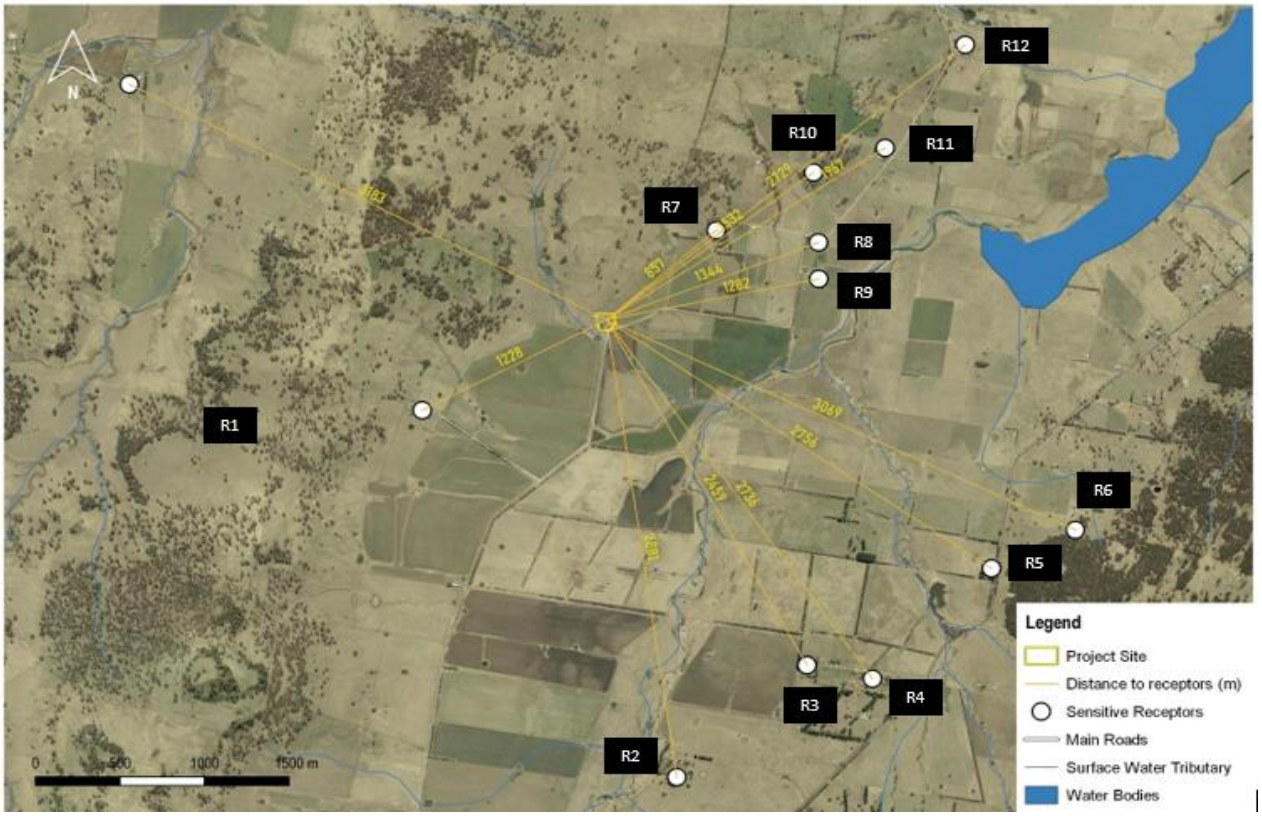


Figure (vii): Proposed SEATA R&D Centre, Glen Innes NSW

Table (i): Summary of Proposed Development (refer **Section 4** for details)

Aspect	Proposed Development	Clarifying Comments
Project Name	**SEATA Clean Energy and Carbon Sequestration Research & Development Centre** ***('SEATA R&D Centre')***	**Key Purpose and Objectives:** • Establish a small research & development centre to trial SEATA's pilot scale RDSM technology in order to demonstrate and characterise its potential for low emissions clean energy and carbon sequestration to assist the battle against climate change. • Only clean biomass and standard fuel feedstocks proposed (see below). • Provide representative data for potential future commercial scale up (elsewhere). • Detailed testing program to be developed in consultation with regulators and key stakeholders.
Proponent	**SEATA Holdings Pty Ltd**, trading as **SEATA Group** ("SEATA") Suite 1, Level 1, 160 Pacific Highway Charlestown NSW 2290 PO Box 313, Charlestown NSW 2290	
Project Location *(Land to be Developed)*	• **Part Lot 3, DP 1193185*** • 448 West Furracabad Road, Glen Innes NSW 2370 • **Land Owner**: John Winter (SEATA Director). See **Appendix 3** for Land Owner consent	• Refer Project Application Area in **Figure (v)** and **Appendix 1**, includes existing access from West Furracabad Road. Based on a registered/deposited plan, SEATA expects that only the registered plan boundary only Part Lot 3 DP1193185 applies to the project area including existing access. Cadastral errors have been identified and confirmed by the registered surveyor who prepared an approved Registered Plan for Lot 3 DP1193185 as detailed in **Section 3**. • SEATA Holdings P/L will utilise the land under agreement with the landowner, SEATA Director John Winter.
Zoning **Bushfire Prone Land**	Zone **RU1 (Primary Production)**, GISC LEP Lot 3 DP1193185 **not** shown as Bushfire Prone Land (BPL) on the NSW Planning Portal website mapping.	• Understood proposed R&D trial is consistent with existing permissible activities for RU1 under the GISC LEP. Pre-lodgement consultation indicated the development could be expected to be classified under Council's LEP permissible activities in RU1 potentially as a *Resource Recovery Facility*. • BAL Assessment Report not triggered. • Pre-lodgement consultation undertaken with Council and RFS. • Project Environmental Risk Assessment conservatively still considered typical aspects for BAL risk assessment, and considered both external bushfire approach as well as internal risk of fire starting onsite. Adherence to APZ management requirements and additional recommendations from RFS during consultation have been adopted.
Approval Period Sought	**Three (3) years** (active R&D operations/processing)	• Initial three (3) year RDSM active research testing period sought. Additional 6 month *biochar storage* allowance (post testing) is sought following completion of RDSM trials approval period to allow for final characterisation of biochar produced near the end of the active 3 year R&D trial period, prior to biochar use (e.g. land application under a RRO & Exemption). • If proved successful, extension to the approval may be sought separately at such time (with appropriate application for such).
Consent Authority **Development Type**	**Glen Innes Severn Council (GISC)** **Integrated Development** s4.46 (former s91) of EP& Act 1979, requiring both Development Consent from Council (triggered ***Local Development*** under the GISC LEP) and related approvals from NSW EPA, notably an *Environmental Protection Licence (EPL)* and *Resource Recovery Order (RRO) and Exemption*.	• Understood within RU1 zoning Council may potentially assess as a *Resource Recovery Facility*. • Includes s68 approval (Local Govt Act) for continued use of existing septic system (i.e. septic tank, rainwater tank, and transpiration area connected to Shed 1 seek approval for continued use of existing amenities, noting no significant change in people/loading). • Does not trigger *Designated Development* under Schedule 3 of EP&A Regulations (2000). • Requires EPL from NSW EPA as *Scheduled Activities* listed under Schedule 1 of POEO Act (including *thermal treatment*), and secondary Resource Recovery Order (RRO) & Exemption approval, and potentially NSW DPI for a *Biosecurity Permit* under the NSW Biosecurity Act 2015. General Terms of Approval (GTA's) from EPA and NSW DPI are requested accordingly. • Council DA checklist assessed; no other agencies considered triggered. Non-designated. • Premises based EPL anticipated, noting non-commercial R&D focus and temporary nature. EPL to cover *Scheduled Development Works* if EPA deems necessary, and expected to include conditional requirements for related RRO & Exemption approvals (as above). • As an initial 3-year, non-commercial Research and Development (R&D) project located outside the *Waste Regulated Area*, appropriate Exemptions are sought including via RRO and Exemption process (firstly for recovery, receipt, handling& storage, processing of waste as proposed by SEATA; and secondly later application of biochar to land once suitably characterised); waste levy exemption, and licencing exemption for generators of recovered feedstocks proposed for R&D trials (managed under RRO & Exemption process). • Pre-lodgement consultation has been undertaken with EPA (Armidale, Sydney). • Non-commercial R&D project with no proposed recovery of energy. = not trigger *NSW Energy From Waste Policy.* Exemption provisions under s88(5) of POEO Act and Cl 91-93 of POEO (Waste) Regulations are sought, including provisions to exclude waste levy liability and associated requirements. As noted above specific RRO & Exemption approval is sought. • Given project objectives to demonstrate technology for later commercial scale (i.e. provide a pilot scale reference), monitoring and testing requirements of the *NSW Energy from Waste Policy* and associated *Eligible Waste Fuel Guidelines* will be considered as relevant during development of the detailed testing program in consultation with EPA.

Aspect	Proposed Development	Clarifying Comments
Summary of Key Related Approvals Required	• **Development Consent** (GISC) • **S68 Approval** (onsite septic system) (GISC) • **Environmental Protection Licence (EPL)** (NSW EPA) • **Resource Recovery Order & Exemptions** (NSW EPA) • **Biosecurity Permit** (if required by NSW DPI)	• See Integrated Approval framework above and detailed in Section 5. S68 approval sought for continued/re-purposed use of the existing septic system associated with former house on the site (demolished c2013). • EPL to cover Scheduled Development Work if EPA deems so required. Conditions expected to cross-reference RRO & Exemption requirement. • RRO & Exemption anticipated in 2 parts – RRO & Exemption to cover generator (feedstocks), receipt, storage and processing of feedstocks using thermal treatment (RDSM trials), and secondly for biochar storage and Application to Land. The latter requires characterisation after thermal treatment is first undertaken, and subsequently could be conditioned separately to aspects for generator and processing. • *Biosecurity Permit* if required from NSWDPI under the NSW Biosecurity Act 2015 (refer Sections 5.2.3 and 7.5.2 for details). • General Terms of Approval (GTA's) from EPA and NSW DPI are requested accordingly.
Operational Employment Generation	• Total of approximately **10-15 Full Time Equivalent** (FTE) during active campaign testing comprised of teams on rotating shifts (see comments). • **Typically <5 operational personnel onsite at any one time**. • Reduced staffing in between testing campaigns as a non-commercial R&D project.	• Typically would comprise of operational testing teams of two to three staff on rotating shifts of approximately 8-12hrs during active testing, plus associated management/SEATA team personnel. • Typically < 5 operational personnel onsite at any one time which is consistent with loadings from the former household present on the same land on the existing septic system installed for a former house on the site (no longer present). Accordingly, no significant change to water use or loading of existing septic system which has continued to function without issue.
Estimated Capital Investment Value (Project CAPEX)	• Total estimated **Capital Investment Value (CIV) ~$354,000 incl GST**. Excludes existing RDSM plant. SEATA expects OPEX expenditure to be significantly higher than CAPEX due primarily to plant labour (jobs) and detailed lab analyses for R&D testing. • Staged trialling OPEX costs are dependent on final scope and testing for Stage 2 (detailed mass balance testing in consultation with EPA) and Stage 3 (remaining proposed feedstocks over the 3 year approval period).	• The project is below both State and Regional Significant Project economic thresholds (CIV). • Capital Investment Value (CIV) is <u>below</u> the *Regional Significant Projects* threshold of $5M. • Estimated CIV/CAPEX project value is for establishment of the centre as described herein. **Excludes** asset value of SEATA's self-funded design and construction of the RDSM pilot scale system already undertaken, and previous bench scale system/testing, and all OPEX. • Refer supporting ***Cost Estimate Report*** prepared for the project as appended to this SEE.
Hours of Operation	• **Campaign-based (intermittent) testing** throughout three year R&D trialling period. • **Continuous operation during testing campaigns** (24hrs/7 days) – RDSM and supporting staff and equipment. • **Daytime heavy vehicle deliveries only** (7am-6pm weekdays, 8am-1pm Saturdays), and intermittent, no evening/night deliveries. Note: Deliveries will be coordinated outside school bus time (8am) as far as reasonably practicable.	• Campaign based testing typically related to testing of each approved feedstock type. • Site layout arranged specifically to minimise loading activity during continuous testing (expected short duration and will be minimised at night time typically <5 minutes during active loading). • Light vehicle movements on shift change, timed to avoid morning school bus wherever practicable. No evening/night-time heavy vehicle movements (daytime weekdays and Saturday morning only). Weekends avoided where practicable.

Summary of Key Project Components and Activities	Key aspects of the proposed Project involves:
	• **Re-purposing of one existing farm shed (Shed 1)** initially as an office/control room.
	• **Proposed new Sheds 2, Shed 3 and an initial noise enclosure shed 'Shed' 4** (consistent with rural character).
	• **Establishment of all-weather unsealed work pad** around RDSM, including small daily working stockpile area (bunded bays, covered/tarped).
	• **SEATA RDSM Trials (operational R&D)** as detailed in **Section 4:**
	  ○ **Campaign-based trials** – per feedstocks basis. Duration also determined by scope/length of detailed testing required by EPA for each feedstock. Specialist assessments (air, noise) will conservatively assess both assumed campaign basis (e.g. six months active in twelve) and worst case continuous run (annual).
	  ○ **Processing Rate**: Existing RDSM feed rate max **200-300 kg/hr** (typical <250 kg/hr).
	  ▪ Supporting specialist air quality assessment will include at **max 300 kg/hr**
	  ○ **Total annual throughput (processing volume):** is dependent on duration of campaign-based trials and associated testing requirements.
	  ▪ Conservative max throughput <**3,000 tonnes per annum (tpa)** of feedstock processed is sought for the project.
	  ▪ For relative context, max theoretical processing potential (<u>non-campaign-</u>based continuous operation) at <u>300</u> kg/hr continuously (non-campaign based) is <2,700 tpa, and at 250 kg/hr (continuous, non campaign-based) is <2200 tpa. Accordingly, for campaign-based testing with typical max rates of 250 kg/hr, throughput is likely to remain under <2000 tpa.
		• Refer Section 4 for details or the Proposed Project.
		• See also comments under *Feedstocks* and *Product Outputs* further below.
		• Annual processing volumes noted are upper maximums with very conservative assumptions (e.g. 100% utilisation and the upper maximum feed rates).
		• Proposed re-purposing of Existing Shed 1 and proposed new Sheds 2 and 3 under mixed building Class 7b/8 of the National Construction Code. Proposed acoustic enclosure ('Shed'4) anticipated to be Class 8. Potential future use of Shed 1 as the noise enclosure shed if control room relocated to Shed 3 (option will be included in noise assessment accordingly).
		• Suitability of biochar produced by the project for Application to Land sought under a Resource Recovery Order and Exemption required from EPA. This approach allows characterisation of biochar produced by trials in consultation with EPA ahead of 'fit for purpose' use such as agricultural soils trials and/or industrial applications (e.g. roads, concrete, etc) as appropriate.
		• Pending suitable characterisations biochar is currently proposed for use in R&D trials for **agricultural and/or industrial applications.**
		• **Biochar volumes produced by the project are expected to have sufficient available applications without presenting onsite legacy risk as outlined below, noting redundancy options provided if required (not expected).** SEATA has engaged with potential users for both agricultural applications (including broadacre trials), industrial applications (e.g. roads, concrete) and agricultural trials, as well as other potential industrial 'carbontech' applications (e.g. battery storage, activated carbon filtration). Letters of support are provided in Appendix 4. The information below provides some context to capacity of those trial applications in comparison to production from proposed R&D trials:
		  ○ **Agricultural trials** typically use biochar at rates up to 2t/ha (i.e. **20-200 t BC per 100 ha of trial areas**). If suitably characterised as expected given the clean feedstocks, there are ample farms available to consume significant volumes of biochar, including but not limited to SEATA Director John Winter's surrounding farm which will be first to be trialled (via conditional RRO Exemption approval sought). NSW DPI has also been consulted regarding potential assistance in agricultural trials with SEATA, including the local DPI research station.

Aspect	Proposed Development	Clarifying Comments
	○ Total resulting **biochar production of up to 1000 tonnes per annum is sought for the project.** ▪ Again is dependent on duration of campaign-based trials, with biochar product typically representing up to around 1/3 of infeed by total mass. ▪ Accordingly, for campaign-based throughputs of <2,000 tpa (see above) biochar production of **<700 tpa** could be expected. • **Proposed internal all weather unsealed access, light vehicle parking** • **Receipt and temporary storage of trial feedstock and ancillary processing materials** (e.g catalyst, fuel, scrubber chemicals) used in trials. • **Temporary storage of biochar product** prior to conditionally approved use (application to land) following satisfactory characterisation. • **Storage and disposal of relatively small quantity of expected inert waste (base salts) from emission control system wet scrubber** (expected **<20kL/yr** – about the size of a rainwater tank). • **Continued/re-purposed use of existing septic system** (no significant change in use with typically <5 personnel onsite at any time). • **New vegetation plantings** (tree screening). • **No permanent dwellings** (existing or proposed). BASIX does not apply to this project. **If required, a caravan (or similar)** may be used to protect personnel with temporary shelter from inclement weather (e.g. very cold/windy winter nights).	○ **Road trials** have the potential to use **30-300 t of biochar per km of road @10% biochar** content (wearing course and road-base stabilisation, the latter the largest), and potentially can be increased to 30% biochar (~900t biochar per km road) pending cost. There is already demand interstate for biochar for fully commercialised applications in roads. ○ Potential 'carbontech' trials are being scoped, including graphitic biochar for thermal battery storage which requires up to 5t per day by April 2022 (**~1800 tpa**), increasing up to 50t per day by early 2024 (**~18,000 tpa**). ○ ➔ *As such, even a relatively small amount of **industrial trials alone** (eg roads/cycleways and potentially battery storage) has potential to consume **all** the biochar produced from the project*. Biochar is currently a supply-limited commodity nationally (and globally). • Clarification is also sought from EPA as to requirements for *potential* for biochar to be used outside NSW (for example there is significant demand for biochar in roads interstate). • Redundancy commitments for alternative offsite use/appropriate disposal if required (e.g. co-firing in a power station) available to minimise legacy risk (not expected but conservatively included).
R&D Equipment to Be Used	• SEATA pilot scale ***Research & Development Scale Models (RDSM)*** **and associated support equipment** (e.g. blower, generator, air compressor) **–** refer **Plate (i)** and **Section 4** for further system details. • RDSM uses a combined catalysed slow pyrolysis and partial gasification system employing chemical looping. Includes wet scrubber emission control system. • Feedstock and biochar handling/loading typically undertaken using existing John Deer tractor (low noise performance tractor). Refer Section 4 for details. • Safe temporary storage of biochar product in sealed 205L drums (inert gas seal e.g nitrogen/argon) prior to fully cooling before potential transfer to 1000L bulka bags, before approved use as required (e.g. land application per RRO compliance testing). • Safe storage of small volumes (e.g drums and cylinders, no large tanks) of supporting fuels and chemicals including LPG, diesel, chemical solutions for wet scrubber (e.g. using suitable reagent for the relevant feedstock/processing characteristics (typically alkali reagents e.g. hydrated lime, sodium hydroxide or other as suitable). See Section 4 for details.	• Includes emission pollution control (wet scrubber using suitable reagent for the relevant feedstock/processing characteristics (typically alkali reagents e.g. hydrated lime, sodium hydroxide or other as suitable, producing inert base salts which will be characterised for appropriate disposal). • Proposed new sheds will be in accordance with GISC DCP and Building Code of Australia (BCA) requirements as relevant.
R&D Trial Feedstocks	Natural, uncontaminated feedstocks and standard fuel (coal) as outlined below. **Three initial target types/groups of feedstocks are proposed (including blending and co-processing) as follows. Specific staged testing is clarified further separately in Table (ii):** 1. **Source-separated uncontaminated biomass**, including ***'non-putrescible vegetative waste from agriculture, silviculture or horticulture'*** and ***'wood waste'*** pre-defined as *general solid waste* under the POEO (Waste) Regulations 2014 (Cl49, Part3 Div1), ***and/or*** **biomass meeting definitions of *Eligible Waste Fuels*** (as per s3 *NSW Energy from Waste Policy* and Part 4 of the *NSW Eligible Waste Fuels Guidelines*), and native biomaterial (e.g. woody weeds, energy biomass). **Initial R&D trials on biomass feedstocks will be prioritised as follows:** **a) Invasive Woody Weeds (Invasive Native Scrub) / Waste Native Biomaterial** – removed under existing legal approvals held by suppliers (and currently commonly open burned / wasted). **This is the first priority target for R&D trial, conditionally approved as such if required.**	• Energy recovery from waste is **not** proposed by this R&D project (characterisation only, with syngas after-burnt or recycled as feedstock to other processing steps). Accordingly, NSW *Energy From Waste Policy, Eligible Waste Fuels Guidelines,* and *NSW Energy From Waste Infrastructure Plan* are not applicable. Notwithstanding this, due to objectives of providing *Proof of Concept* reference for future commercial scale up, SEATA has proposed selected feedstocks and detailed monitoring which has considered the NSW EfW Policy framework. • Whilst SEATA technology has potential to treat nearly all carbonaceous feedstocks, pre-lodgement consultation with EPA recommended narrowing earlier broad lists of potential feedstocks. Accordingly, three target types/groups proposed. • The NSW Energy from Waste (EfW) Policy defines the following feedstocks proposed for R&E testing as ***Eligible Waste Fuels,*** which are considered by EPA to pose low risk of harm to people or the environment due to their origin, composition and consistency. These can be thermally treated under a RRO and Exemption approval from EPA: ○ *Biomass from agriculture* ○ *Forestry & sawmilling residues* ○ *Uncontaminated wood waste* • **Invasive Native Scrub (INS)** lawfully supplied under existing legal approvals in NSW held by the owner/supplier of the INS e.g. existing *Property Vegetation Plans (PVP)*. **Currently INS is typically being cleared, windrowed and open-burned** direct to the atmosphere. Resource recovery and sequestration with biochar via SEATA technology is considered a **significant improvement in environmental outcomes** than the currently approved management of this otherwise burned and polluting wasted resource. • **Biosolids** are listed under Table 4 of the NSW EfW Policy as a ***separated waste stream*** which can be ***"used only in a process to produce char for land application"*** *as a non-eligible waste fuel* <when associated with a project proposing energy recovery>. R&D

Aspect	Proposed Development	Clarifying Comments
	b) Subsequent staged biomass trials (subject to external funding) include, but are not limited to, **agricultural biomass and crop residues** (including from NSW DPI research field trials to rehabilitate degraded lands with energy biomass crops), and **forestry and saw milling biomass residues** (including **bushfire hazard reduction material**). **Section 4.6** of this SEE provides further information. 2. **Biosolids** (including municipal and agricultural). Only municipal grades suitable for direct application to land under current EPA guidelines. Agricultural biosolids will require a conditional RRO & Exemption approval with supporting additional information (which can be condition of approval). 3. **Coal** (a '*Standard Fuel* under NSW regulatory instruments). Thermal and coking coal. 4. **Co-Processing/Blending** – primarily of the above such as *biosolids + biomass (INS etc)*, and *coal + biomass (INS etc)*, or various biomass blends, but potentially also including minor addition of trace minerals (e.g. clay, iron) and potentially nutrients (phosphorus, nitrogen if needed) to create custom biochars (e.g. trial biofertilisers to match soil constraints). Following initial INS trials, the order of trialling subsequent feedstocks (biosolids, coal and remaining types of source-separated biomass) may alter as needed. Biosolids are currently expected to be the second trial. If required, source-separated biomass listed above could be conditionally approved in a staged manner, with INS initially until demonstrated successful prior to other biomass and beyond, in order to facilitate accelerated approval.	demonstration of safe and sustainable thermal treatment technology such as SEATA could provide a potential pathway to better resource recovery options for biosolids with improved environmental outcomes. ○ Biosolids classified as suitable for **direct application to land in NSW to EPA guidelines** will be tested (i.e.. ***Unrestricted Use*** and ***Restricted Use 1&2***). ○ No wet biosolids (slurries) – 'filter cakes' only - typically biosolids <80% moisture are proposed/suitable for RDSM treatment, handling and storage. • **Coal** is a ***Standard Fuel*** in NSW under the POEO (Clean Air) Regulations. Standard Fuels do not need to meet the same requirements / criteria as Eligible Waste Fuels, but still require approval for use **when energy recovery is proposed**. R&D testing will identify the technology's potential for lower emission energy (e.g. hydrogen from coal), with solid carbon sequestration (compared to conventional incineration of coal with toxic ash waste). • Under proposed condition of approval for RRO & Exemption secondary approval requirement, any staged R&D trials proposing agricultural biosolids would be pre-consulted with EPA and suitably characterised prior to commencement, allowing further source-specific information requirements to be identified and assessed by EPA at such time. • **No treated/engineered/ contaminated feedstocks, no plastic-based feedstocks.** • Proposed feedstocks groups #1) and #2) are pre-defined **as *General Solid Waste (non-putrescible)*** under clause 49 in Part 3 Division 1 of the POEO Act, as further defined under Schedule 1 of the Act, as is suitable for recovery by a *Resource Recovery Facility* (refer Section 5.3 discussion of POEO Act, licencing and integrated approval). • **Monitoring requirements** under the NSW EfW policy and related Eligible Waste Fuel Guidelines will be **considered in development of detailed testing program** in consultation with EPA due to potential future use of data in commercial energy recovery. This has important context to biosolids as it is not currently classified as an Eligible Waste Fuel in NSW (EPA updates the lists periodically based on current evidence from R&D such as that proposed). • Trial feedstocks will typically be delivered for each campaign in appropriate containers (e,g bulka bags or similar, ~1m^3/1 tonne per bag) and typically stored safely undercover (e.g. in proposed storage sheds). Smaller daily working volumes will be kept under cover (e.g tarped) in a dedicated area near to RDSM to minimise loading needs and duration, particularly beneficial during night operations.
Products / Outputs	• Gas and Solid carbon products only. *No liquid products*: no tars or resins, no bio-oils. Only relatively small volumes of slurry (expected inert base salts) from wet scrubber emissions control for disposal. • Gas Products: **syngas** comprised primarily of hydrogen (H_2), CO, CO_2 and biomethane. Syngas to be characterised and afterburned, no recovery at pilot R&D scale proposed. • Solid Carbon Product: Biochar (functional carbon). See expected production values earlier above.	• **No proposed energy recovery** at R&D scale (product characterisation only for potential future recovery in commercial scale systems elsewhere). • Specifically designed to avoid liquid products (superheated to gas), avoiding odours and problematic residues/wastes to be managed. • Syngas to be characterised (tests). The gas produced by the project will be after burnt and discharged to the atmosphere or used as feedstock to other processing steps (including process control) • Solid product (biochar) produced requires RRO & Exemption approval from EPA for production, storage and application to land. • Storage of biochar in drums (205L) with inert gas seal (e.g. nitrogen/argon) to prevent oxidation until fully cooled, before transfer to 1000L bulka bags prior to use. Temporary storage onsite until successfully characterised for proposed uses (e.g. application to land). Redundancy options for use in co-firing for power or disposal only if required (not expected). • See related notes earlier above under *Summary of Key Project Components* including potential trial uses and volumes for biochar produced by the project.
Research & Development Testing	• Proposed ("walk before run") ***Technology Testing Program*** to align with staged feedstock testing – summarised in **Table (ii)** separately below. Summary concept for each feedstock is: ○ **Stage 1 = Short initial 'screening level' test** on 1 feedstock to ensure system functional and ready for detailed testing (in Stage 2): ▪ Proximate & Ultimate Analysis on Feed and Biochar ▪ Targeted manual gas samples for lab analysis (high level screening suite) ○ **Stage 2 –Detailed testing on the three priority target feedstocks** (INS native biomaterial, biosolids and coal) ▪ Detailed testing developed in consultation with EPA (mass balance) ○ **Stage 3** – remaining approved biomass feedstocks trials as per above. Tests may move straight into detailed testing (or both). • ***Detailed Testing Program*** to be developed by emissions expert in consultation with NSW EPA, aimed at mass balance for infeed and solid and gas products, including wet scrubber waste materials. • Negligible fugitive emissions expected during start-up and shutdown. • Supporting Air Quality Assessment to be prepared by air quality expert in accordance with EPA assessment requirements (TBC) prior to operations.	• Staged initial testing via "walk before run" approach provides regulatory and investor confidence in the RDSM system performance prior to commencing longer and more detailed (expensive) testing to follow (Stage 2). • Whilst not technically required (no energy recovery proposed), due to proposed objectives to provide data for future commercial scale up, the ***Technology Testing Program*** will consider relevant monitoring and testing requirements of the NSW Energy from Waste Policy Statement and Eligible Waste Fuels Guidelines, including real time analysers as relevant.

Aspect	Proposed Development	Clarifying Comments

Summary of Expected Effects	• **Key aspects** identified via **consultation** and ***Environmental Risk Assessment*** were **noise, air quality/GHG, visual, waste** (e.g. wet scrubber, biochar product).
	  ○ Risk minimisation and mitigation controls identified.
	  ○ Specialist assessments for noise and air quality proposed to confirm currently adopted management measures appropriate. Air quality will also consider net GHG due to syngas flaring at pilot scale (not recovered for energy), balanced against sequestration by biochar. No other specialist aspects required.
	  ○ Nearest rural residence >0.85 km (residence R7 to northeast, obscured views through distant trees). Direct line of sight to residence R1 >1.2km to southwest.
	  ○ Near neighbours R1 and R9 consulted and inspected RDSM in H1 20121. No significant concerns raised, request to time shift changes to avoid school bus times on West Furracabad Rd will be adopted. R7 has pre-existing limitations for engagement with the Lot 3 land-owner, and will be notified by GISC during DA process.
	• No significant Impacts (including cumulative) predicted.
	• *Statement of Commitments* provided.
	• Refer Section 7 for details.
		• Supporting Environmental Risk Assessment identified key supporting information required (air, noise). Due to project design and location these are proposed as desktop assessments for noise and air quality prepared by suitably qualified expert consultants (SEATA can provide further details to Council and EPA as required). Should these indicate any concerns further assessment would be undertaken (not expected to be required).
		• Project on existing disturbed farmland, no remnant native vegetation, no significant vegetation clearing required or proposed (e.g. 2 non-native trees to be removed for proposed Shed 3 and the all-weather loop surface). Surface works to establish all weather unsealed work pad and all-weather loop access will involve shallow topsoil strip only (reused as topsoil dressing on existing grassed / farm areas).
		• No significant odour or dust generated by the development. Very low levels of particulate due to design and emissions control (wet scrubber).
		• Performance confirmed by monitoring during R&D testing.
		• No significant light (enclosed afterburner) site lighting structured to minimise potential directional lighting toward distant residences (e.g orientation of pad lighting).
		• No significant change or impact to heavy vehicle traffic on West Furracabad Road warranting further detailed assessment, no works within public road reserve proposed (no change to existing site access from West Furracabad Road, sufficient for project needs).

Documents Supplied with this SEE Document	• **Statement of Environmental Effects (SEE) (this document)** • **Environmental Risk Assessment** • **Design Drawings (Existing Shed 1, Proposed Sheds 2, 3)** • **Site Plan** • **Erosion and Sediment Control Plan (ESCP)** • **Project Cost Estimate Report** • **Waste Management Plan** • **Advertisement/Notification Plans**	• ESCP proposed as a design plan (**FigureFigure** 7.5) appropriate for this scale of development, addressing management of disturbed areas (internal all weather unsealed access, parking and workpad) and diversion of clean water as per the Blue Book. • Environmental Risk Assessment included consideration of bushfire aspects.

Further Supporting Environmental Information to be Supplied
 	
(additional to that supplied herein)
	• **Specialist Assessments**:
	  ○ Air Quality
	  ○ Noise
		• Noise and air quality specialist reports to be undertaken in accordance with EPA/GISC environmental assessment requirements prior to operations.
		• Noting the substantial risk management controls in place for these aspects (refer Environmental Risk Assessment in **Appendix 5**), specialist reports are proposed as conservative desktop modelling assessments (in accordance with relevant guidelines) using conservative adopted inputs and criteria to assess likelihood of compliance at the sensitive receptors (which are notably >850m). Further detailed assessment is triggered if recommended by the specialist.

Table (ii): Summary of Proposed Staged R&D Feedstock Trials and Testing Program *(Note: refer Section 7.4 for full details)*

R&D Staging	Summary Description	Feedstock(s)	Expected Duration	Proposed Testing	Objectives / Comments
Stage 1	**Preliminary Continuous Run Trial for first targeted feedstock** *(system function)*	**First Targeted Feedstock: Invasive Woody Weeds (INS) / waste native biomaterial (source-separated biomass feedstock)** *Screening tests may also be considered for the following before commencing Stage 2 tests for those:* • *Biosolids* • *Coal (Standard Fuel)* • *Blending / Co-processing* (e.g. INS + biosolids, INS + coal, customised mineralised chars to match soil constraints for potential farm trials)	• **1-5 Days per feedstock,** • Commencing with short duration and building (eg 4hrs-12hrs, 24hrs+)	**Screening level testing** (only) as follows: • **Proximate and Ultimate Analysis** on Biochar (solid) • **Grab Sampling of syngas for screening level analyses** (e.g. Tedlar Bags)	• Provide investor and regulator confidence in RDSM continuous run operation in order to progress to more detailed, lengthy and costly testing in Stage 2. • Following initial INS trials in both Stage 1 and Stage 2 below, **the order of all subsequent feedstocks** after INS (biosolids, coal and remaining types of source-separated biomass) **may alter as needed**. Currently, biosolids are expected to be the second trial. • Forestry residues may include from bushfire hazard reduction.
Stage 2	**Detailed Testing of initial targeted feedstocks** *(mass balance)*	Anticipated to be undertaken as follows (order may change after the first feedstock if/as necessary): • ***INS / waste native biomaterial (first priority trial)*** • *Biosolids* • *Forestry/Saw Milling residues/ bushfire hazard reduction material* • *Standard Fuel (Coal)* • *Blending / Co-processing* – for example biosolids + biomass (INS and/or forestry residues etc as above); Coal + biomass (INS and/or Forestry residues etc as above); customised mineralised chars to match farm soil constraints for broadacre trials.	• **Up to two (2) weeks OR** as per EPA requirements for detailed testing (refer *Proposed Testing* column)	• **Detailed Testing Program** to be developed by emissions expert & SEATA in consultation with EPA and relevant stakeholders. • Expected to include **system mass balance** with characterisation of feedstocks, syngas, solid char and scrubber material at minimum. • **Automated continuous monitoring of temperature, pressure and flow**. • **Periodic attended continuous gas sampling and analysis** as relevant to required sampling period (e.g. CO, CO_2, NO_x, O_2). SO_x will also be undertaken for high sulphur feedstock (eg coal). • Undertaken generally in accordance with relevant testing and monitoring requirements of the *NSW Energy from Waste Policy* and *Eligible Waste Fuel Guidelines,* as relevant to these R&D trials, and other relevant methods and guidelines as required by EPA (including but not limited to the *EPA Approved Methods for Sampling and Analysis of Air Pollutants in NSW* as applicable). • Duration of testing sufficient to satisfy above objectives as *Proof of Performance* reference.	• Formal *Proof of Performance* and validation of technology performance during continuous run. • Regulatory confidence in SEATA technology, potential use of pilot as a local reference plant for later commercial scale up (elsewhere) on those feedstocks. Notwithstanding this, as a non-commercial R&D system automated continuous monitoring systems are limited to temperature, pressure and flow (not practicable or viable for gas monitoring), but noting high accuracy attended continuous gas sampling will be undertaken by a suitably qualified expert. • Whilst not technically triggering requirement for compliance with the *NSW Energy From Waste Policy* or *Eligible Waste Fuel Guidelines* (as energy recovery is not proposed), use of POP data as a reference for future commercial scale deployment encourages compliance. SEATA will work closely with EPA to determine an appropriate detailed testing program accordingly. • Pending various factors including approval conditions and funding, select feedstocks conditionally approved for Stage 3 may be opportunistically elevated into Stage 2 in consultation with EPA. E.g. NSWDPI biomass crops etc.
Stage 3	**Progressive Detailed Tests of remaining approved feedstocks** during 3 year R&D period *(pending funding)*	*Other remaining source separated biomass feedstocks as per Table (i)* and detailed in **Section 4.6** of the SEE. e.g. biomass supplied from NSWDPI Biomass Crops trials (among others), for ongoing R&D trials throughout the proposed 3 year R&D centre approval period. Further outlined in Section 4.	**As above** (detailed testing period established in consultation with EPA). Screening tests first if needed, per Stage 1.	• As above (detailed testing requirements established in consultation with EPA)	• Intention is to separate initial targeted INS and forestry milling residues in Stage 1 & 2 from other ongoing clean biomass feedstocks in Table (i) that will continue to be progressively tested during the 3 year approval period. Accordingly, Stage 3 can be conditionally approved if required in order to facilitate accelerated approval. • **Note**: NSWDPI biomass crops expected available mid-2022.

Overview of SEATA Technology – How is it Different?

Firstly, SEATA's thermal treatment technology is **not incineration/combustion**. It also has important positive differences to conventional full gasification and pyrolysis technologies as outlined in **Tables (iii) and (iv) below,** which provide a high-level comparison of the environmental and economic design benefits of SEATA technology to those conventional technologies.

SEATA uses a combined process of **catalysed slow pyrolysis and partial gasification using chemical looping** to deconstruct carbon-based feedstocks using pseudo-direct heat transfer and fluidized bed technology. SEATA's approach is deliberately designed to generate high quality clean syngas (not diluted with atmospheric nitrogen, allowing further recovery of many valuable derivatives or use direct in gas engines for energy without significant clean-up); and high quality solid chars without problematic liquid products (no tars, bio-oils and resins) that are produced by many other technologies. This means the outputs become *genuine valuable commodities rather than waste emissions*.

The unique process has a **very high thermal efficiency** resulting in a system offering genuine economies of scale (not just modular). Significantly lower capital and operating costs result from a reactor footprint approximately 10 times smaller than that required by conventional *pyrolysis* technologies for the same throughput, and typically smaller than conventional *air-blown gasifiers* too. SEATA's treatment process can be tailored to produce proportionate volumes of biochar to suit specific objectives (i.e. adjustable), thereby sequestering the optimal proportion of the carbon in the feedstock into solid biochar.

The process is based on direct heat transfer using hot solids. This method has the advantage of supplying heat in-directly from the heat source but directly to the feedstock, therefore creating pseudo direct heat transfer, without dilution of the syngas with nitrogen or carbon dioxide from combustion. Scale-up of the pyrolysis reactor is only limited by mechanical design of the mixing system in this case. Many examples of large-scale solids mixing techniques can be applied.

The SEATA first stage pyrolysis reactor is mechanically fluidized / agitated to achieve **good mixing, even temperature, good residence time control** and avoid blockages. A key difference with the SEATA technology is the **secondary gasification** of the oils and tars that are evolved from pyrolysis in a separate reactor vessel which is also heated with hot solids catalyst (destroying toxins such as dioxins and furans) and then rapidly cooled to avoid reformation of those toxins. This is designed to result in no significant toxic gas emissions or problematic odours, nor residual oils and tarry waste compounds requiring disposal.

Through the use of chemical looping principles, all **spent combustion gases from process heating are kept separate to the pyrolysis gases**, thereby **minimising the volume of off-gas that needs to be handled, and resulting in a high quality product syngas**.

Unlike many earlier generation technologies, **significant external heating is not required**. **Syngas compression and storage allows the plant to operate auto-thermally, requiring no external fuel supply once up to temperature** (only used at start-up). Syngas can be used to heat the fluid bed with the excess available for process heating or power generation. The syngas from this process is of high quality – similar to town gas that was generated from coal and distributed to houses in Australia until the 1970's after which natural gas and LPG became readily available.

The **final off-gas is wet scrubbed** to remove particulate matter and water-soluble components. A caustic solution can be used in the wet scrubber to capture NOx and SOx along with H_2O_2 for capture of volatile metal such as Hg (if present), and/or hydrated lime to capture halogens if present and convert it into inert base salts (e.g. $CaCl_2$). All other metals report with the biochar due to the low temperature

operation of stage one. This is **an advantage over high temperature operations like incineration or gasification, which needs to deal with substantial metals in the off-gas stream**.

The technology **does not require large amounts of process input water (no cooling required),** only relatively small volumes for emissions control make-up water (wet scrubber, to make up for evaporative losses). The **catalyst media is in a continuous recycling loop**, with some make-up required periodically, and is present in minimal amounts in the final biochar.

In comparison to pyrolysis technologies, the SEATA process is most applicable for genuine large-scale processing of carbon-based wastes, including commercial scale production of biochar and high calorific syngas from dedicated bioenergy plants.

The technology also has significant potential in future (once proven on clean feedstocks) to be deployed elsewhere to test its potential to manage a wide range of other problematic carbon-based feedstocks confronting modern society, including end of life waste plastics and ocean plastics among others. For clarity, **those types feedstocks are neither proposed nor permissible at SEATA's R&D site in Glen Innes**, which is targeted specifically only for natural uncontaminated feedstocks and standard fuels as outlined earlier in Table (i).

Further information on the technology is available on request. Note: Detailed process design information relevant to patent-protected IP is available on a *confidential basis,* typically under confidentiality agreement/NDA. SEATA is happy to discuss further on request.

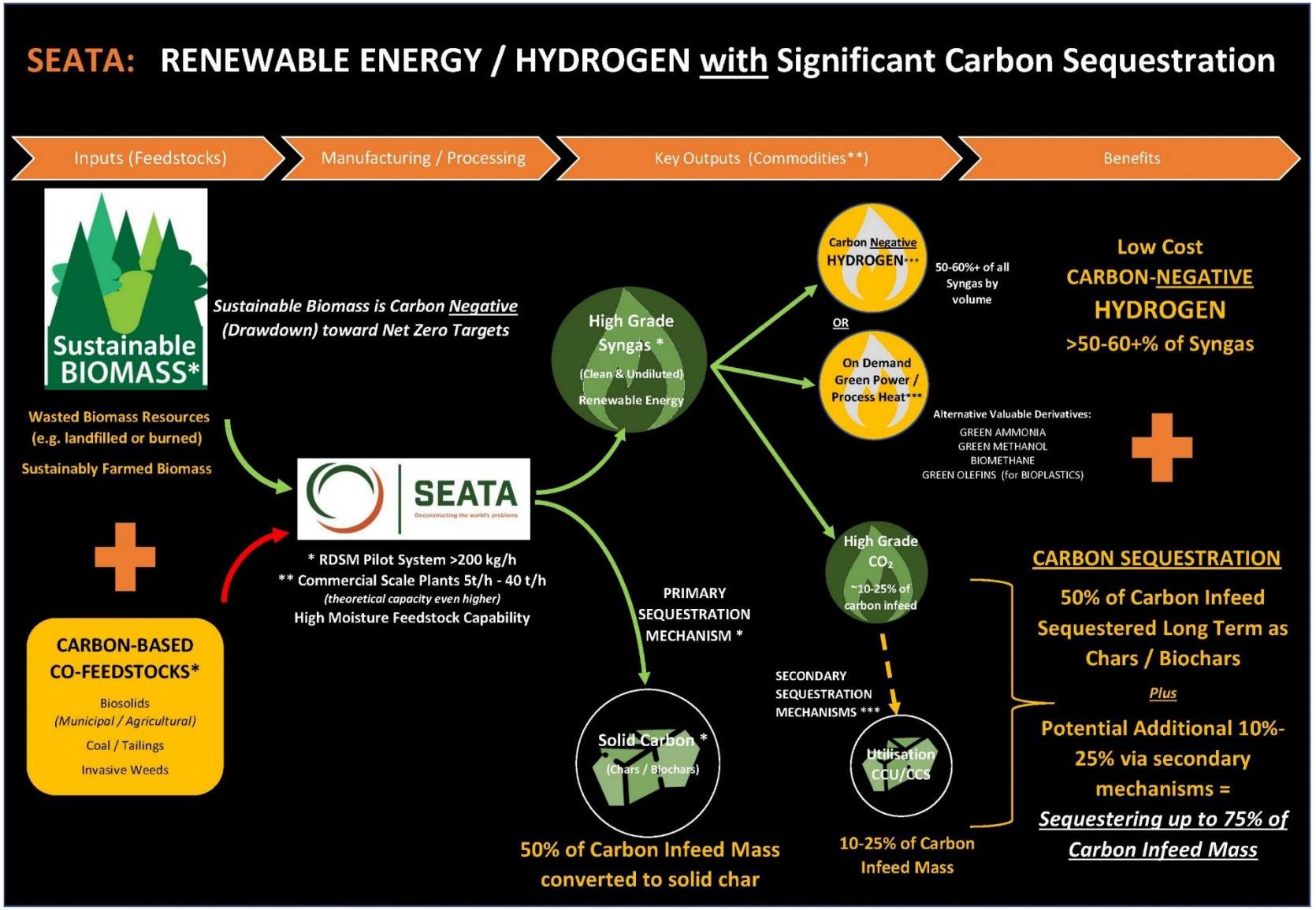
Table (iii): High level Comparison of **Environmental Performance** Design Factors between SEATA and some Conventional Thermal Treatments

ENVIRONMENTAL PERFORMANCE Design Factors	**Incineration** *(combustion, excess oxygen)*	**Conventional Air-blown Gasification** *(partial oxidation)* *(air-blown= high N_2)*	**Conventional Pyrolysis** *(low/no Oxygen)*	**SEATA Catalysed Pyrolysis & Partial Gasification via chemical looping** *(indirect O_2 transfer from air, low N_2 in syngas)*
Off-gas volume to be treated	**Very high**	**High**	**Moderate**	**Low** *(not directly airblown (air is 78% N_2), therefore up to 78% less volume)*
General Environmental Performance	**Lowest**	**Lower** key advantage over combustion is lower NOx formation	**Better** (if bio-oils are dealt with correctly)	**Higher** benefits of pyrolysis and gasification combined, hence only clean syngas and biochar produced
Linear / Circular Economy *(Resource Recovery)*	**Linear, Poorest LCA** single use of resources	**Linear, Poor LCA** syngas linear due to dilution with N_2, marginal resource recovery as charcoal	**Circular** syngas linear due to tar contamination, some resource recovery as biochar, bio-oils difficult to process / limited uses	**Circular** syngas derivatives possible due to the high concentration of H_2 and CO plus functional biochar resource, with no bio-oils generated – all converted to useful syngas
Dispatchable Energy	**No** – heat must be used immediately via steam cycle (base load)	**No** – heat must be used immediately via steam cycle (base load)	**Yes** – via syngas storage and bio-oils, but multiple units required to scale with, no increase in thermal efficiency.	**Yes** – via syngas storage and derivative of syngas, e.g, H_2 Much higher thermal efficiency (particularly at scale) = net energy *producer*
GHG Emissions (incl CO_2)	Very High	High	Low to carbon **negative**	carbon **negative** energy
Carbon Abatement / Sequestration	**None** all carbon infeed is converted to CO_2	**Low** 10% Carbon in feed converted to charcoal, remainder to CO_2	**High** ~50% Carbon in feed reports to solid char	**High** ~50% Carbon in feed reports to solid char, *plus* potential future recovery of carbon in syngas (e.g. high grade CO_2 into CCUS, total removal potential increases to over 75%+)
Hydrogen *(Economic Recovery)*	**No**	**No** Not economic in air blown systems due to being highly diluted with N_2	**Yes**, but difficult due to contamination of the syngas with tars and oils, i.e., further processing required	**Yes,** Low cost, easy to separate Carbon **Negative** Hydrogen
Harmful Pollutant Emissions *(Particulates, Heavy Metals, VOC's, POPs, NOx, Dioxins & Furans)*	**Highest** Off-gas requires significant treatment	**Moderate** Lower off-gas volume to treat than incineration but still large, lower NOx	**Moderate** Low off-gas volume to treat, syngas still contains tars, dioxins and furans. Hence specially designed combustion systems required to destroy tars, dioxins & furans.	**Low** All syngas generated by the process is pre-cleaned at high temperature in the presence of a catalyst to destroy residual tars & halogenated compounds (second reactor), then wet quenched / scrubbed to remove soluble components and avoid reformation of dioxins and furans. Clean product syngas capable of economic recovery for derivatives, or for lower emission combustion without post-treatment (similar to natural gas or LPG for example)
Emission Control Systems (ECS)	**Critically Dependent** on Pollution Controls Multiple additives required to scrub pollutants, generating further waste streams for disposal, plus large unit operation to treat the high gas volume	**Highly Dependent** on Pollution Controls (Similar to incineration, but lower gas volume to treat and lower NOx)	**Highly Dependent** on Pollution Controls Syngas requires further pre-combustion cleaning before use. ECS requirements scale dependent. Complicated with halides and dioxins and furans.	**Low Dependency** Pollutants are dealt with as part of the process, e.g., alkali metals remain with the biochar; tars and oils destroyed (deconstructed), syngas is wet scrubbed; so the resulting syngas is clean & ready for use. Downstream users of syngas do not require additional ECS.
Water Usage	**High** Evaporative cooling and make-up water for the steam system	**High** (Same as incinerators)	**Low** Water consumed for capture of bio-oils and indirect cooling	**Low** Make-up water for wet quench / scrubber only
Problematic Liquid Produced (Oils, Tars, Resins, Water)	**Yes** Boiler blow-down brine and evaporative cooling system purge water plus scrubber water (if a wet system is utilised)	**Yes** Up & down draft gasifiers generate tars plus spent scrubber water	**Yes** Alot of tar and oil by-products, reported beneficial wood vinegar, plus scrubber water	**No** All oils and tars destroyed. Only a small purge of water from the quench / scrubber to manage solids accumulation. This can be further evaporated to form a solid if required
Bottom & Fly Ash for Disposal *(Potentially Toxic Solid Waste)*	**Significant** Ash dam required, portion of the ash is super-fine	**High** Ash dam required	**No Ash** Ash remains with the biochar	**No Ash** Ash remains with the biochar, metals bound / not bioavailable.

Table (iv): High level Comparison of **Economic Performance** Design Factors between SEATA and some Conventional Thermal Treatments

ECONOMIC PERFORMANCE Design Factors	**Incineration*** *(full combustion, high excess oxygen)*	**Conventional Air-blown Gasification** *(partial oxidation) (air-blown, high N_2)*	**Conventional Pyrolysis** *(low/no oxygen)*	**SEATA Catalysed Pyrolysis & Partial Gasification via chemical looping** *(indirect O_2 transfer from air, low N_2 in syngas)*
Economic Scalability & Throughput	**High** (>100's tph per module)	**Moderate** (10's tph per module)	**Low** (~1 tph per module)	**High** (5-40 tph per module current designs, with >100 tph possible in the future)
Target Application	Large Scale, centralised	Med scale centralised	Small scale decentralised	**Flexible small to large scale, central or decentral**
Energy Efficiency *(thermal energy available for other processes, i.e., generation of electricity)*	**Moderate** (50-60%), Using Rankine cycle	**Moderate** (40-65%) Two-stage combustion, plus Rankine cycle	**Moderate** (60%), **with C capture** High parasitic heat losses, only ~1/3 of the input energy available for combustion as syngas, syngas can use in combined cycle gas engines after further cleaning	**High** (70-80%), **with C capture** Lower heat losses due to scale of operation, higher process intensity, high proportion of clean syngas (~2/3 of the input feed) that is ready for use in gas engines, therefore combined cycle power generation possible
Technology Readiness	**Mature**, proven at scale	**Mature**, proven at scale	**Maturing**, proven at small scale	**Emerging** (TRL 6)
Parasitic Load Losses	**Moderate**	**Moderate**	**Moderate**	**Low**
Feedstock Moisture Content Capability *(Technical)*	**High**	**Moderate** Typically, 10-20%, max 50% feedstock pre-drying required	**Low** feedstock pre-drying to 10-20% required, as all heat transfer is indirect	**High** Typically, 20-30%, but can handle up to 70-80%, however net output energy is lowered
Linear Economy Vs Circular Economy	**Linear**	**Linear**	**Circular** (biochar & liquids, syngas for immediate energy only)	**Circular** (Full Potential) (biochar and storable syngas for derivatives/products OR energy on demand)
Feedstock Compatibility / Flexibility	**High**	**Moderate** Limited feedstocks and particle sizing is important	**Moderate**	**High** Good flexibility / versatility
Primary Reaction Temperature in commercial systems	**High** 800-1450°C	**Moderate** 750—1000°C (airblown)	**Low** 350-700°C	**Low** 350-700°C (primary reactor), all syngas from primary reactor treated to 850°C to achieve complete thermal decomposition of all volatile tars and oils.
Atmosphere	Air	Partial Air	Low /No Oxygen	Low Oxygen (O_2 supplied via chemical looping
Pressure (bar)	1	1-10	1	1 (and can be designed in future to be pressurised)
Stoichiometric Ratio	>1	<1	0	0 – 0.2
Principle Outputs (Products) ***Products:***	**Heat & Combustion Products only**	**Lean Syngas**	**Char + Liquids + Rich Syngas (dirty)**	**Char + Rich Syngas (clean)**
Gases:	Combustion Products Only *(No Syngas)*	Combustible Lean Syngas	Combustible Rich Syngas	Clean Rich Syngas = economically recoverable products or energy, including energy on demand
Liquids:	No liquid products (*scrubber waste only)*	0-20% Liquid product, *(plus scrubber waste)*	Liquids (products & waste), *(plus scrubber waste)*	No problematic liquid products *(minor scrubber waste only)*
Solids:	High ash waste, No targeted products	Low char, High Ash waste (char <10% of feed by mass)	High quality but expensive biochar (~30% of feed by mass)	Low-cost, high-quality biochar (15-35% of feed by mass)
Principle Gas Components	**CO_2 and H_2O,** O_2, N_2 + Other gases e.g., SO_x, NO_x, etc.	**CO and H_2**, **N_2**, **CO_2**, CH_4, H_2O, + Other minor gases	**CO and H_2,** + hydrocarbons, H_2O, CO_2, CH_4 + Other minor gases including nitrogen compounds, dioxins and furans	**High purity H_2, CO,** CO_2 No hydrocarbons dioxins & furans H_2 content >50% by volume.
By-Products / Waste *(throughput inefficiencies)*	Toxic bottom ash or slag to dispose, High volumes scrubber waste	Toxic Bottom Ash to dispose, High volumes scrubber waste	Tars, resins, oils, pyrolysis water (plus, syngas scrubber waste)	Minimal inert scrubber waste only. No Ash/Liquids (no tars, resins, oils)
CAPEX	**High** Due to extensive off-gas scrubbing requirements	**Moderate** Scalable with moderate off-gas cleaning requirements	**High** Due to limited reactor scale-up, requiring multiple units to achieve scale of operation	**Low to Moderate** Good scalability and low gas cleaning duty
OPEX	**Moderate** High cost for gas scrubbing reagents and disposal of the resulting waste streams	**Moderate**	**High** High maintenance and high number of operating personnel	**Low**

Figure (vii): Future Potential Capability for SEATA Technology once proven by R&D - Carbon Negative Hydrogen with Carbon Capture and Utilisation



** Proposed for testing & characterisation at SEATA Glen Innes R&D Centre*
Note: Other feedstock capabilities are not proposed in the DA for Glen Innes.

**** Syngas for R&D Testing in SEATA Glen Innes DA will be characterized for feasibility analysis for future commercial recovery (no energy recovery, no H_2 or derivatives proposed, syngas flared)*
**** Potential syngas commodities recovery (including renewable energy/heat, hydrogen or further CO_2 capture and utilization) is not proposed at SEATA's Glen Innes R&D Centre Location.*

Statement of Commitments

SEATA is dedicated to leaving a positive legacy through application of the technology. Following pre-lodgment community and stakeholder consultation to date, SEATA makes the following key commitments outlined below in Table (iii).

Table (iii): Statement of Key Commitments

Key Aspect[1]	Commitment to minimization, mitigation and control	Details
General	• SEATA will carry out the proposed development in accordance with the DA documents and Statement of Commitments. • Operations and Monitoring will be undertaken in accordance with the requirements of Development Consent and Environmental Protection Licence (EPL) granted for the development. • Proposed application of biochar to land would be undertaken in accordance with conditions of approval issued a subsequent Resource Recovery Order & Exemption issued by EPA. • An initial trial basis as pilot R&D (three years) consistent with 'walk before run' commitments to prove the pilot technology performance. If proven successful, an extension will be sought. • Project Environmental Management Representative (EMR) to manage environmental compliance and assist community or council/agency enquires during the project. • SEATA will establish and maintain the Asset Protection Zone (APZ) nominated for the project described in this document.	Sections 4-6, Appendix 5.
Operations / Hours	• Campaign-based operational R&D testing • When operating, will be continuous RDSM unit and supporting equipment (24/7). • Loading activities brief and intermittent (typically two hourly, site layout designed specifically to shorten loading activity). • Three year trial basis as pilot R&D after which, if successful an extension may be sought. • No heavy vehicle deliveries (trucks) at night.	Section 4
Feedstocks	Proposed feedstocks: 1. **Source separated biomass**, focused on "*non-putrescible vegetative waste from agriculture, silviculture or horticulture"* and untreated "*wood waste"* as pre-defined as general solid waste under the POEO (Waste) Regulations 2014 (Cl49, Part3 Div1) and/or as Eligible Waste Fuels under the NSW Energy From Waste Policy and *Eligible Waste Fuel Guidelines including*. a. **Priority first trial = Invasive Woody Weeds (Invasive Native Scrub (INS) / waste native biomaterial** b. No treated, painted or engineered timber wood wastes. No plastic-based / contaminated wastes. **2. Standard Fuel (coal)** 3. **Biosolids classed as suitable for application to land**, meeting EPA Biosolids Guidelines and existing RRO & Exemption 2014.	Section 4, Appendix 5

Key Aspect[1]	Commitment to minimization, mitigation and control	Details
	• Blending and co-processing of the above, including pre and post treatments for custom biochars to address targeted conditions/constraints (e.g. trace minerals) for separate trials. • All feedstocks sourced from within NSW (no interstate transfer). • ***Statement of Origin*** document (or similar) required from suppliers of all vegetative biomass feedstock, covering entire supply pathway including details of QA/QC processes to control risk of contamination and details if/of any potential history of sprays, treatments or fertilisers applied. These will be provided to EPA prior to being received and processed by SEATA at the R&D trial site as part of conditions of approval (e.g. to inform conditional RRO approval). • NATA accredited laboratories will be used to analyse feedstock for chemical characterization, and for mass balance tests during trials.	
Noise	• Specialist noise assessment report to be undertaken for DA to inform management and mitigation controls. • Noisy equipment to be housed in noise-insulated enclosure (blower, generator, air compressor). • Blower fitted with exhaust noise reduction fittings if practicable. • Use of mobile machinery minimized during operations (site layout to minimize duration of tractor loading/unloading) • Campaign-based R&D trials • Daytime deliveries only by heavy vehicles (7am-6pm Mon-Fri, 8am-1pm Sat) and intermittent (heavy vehicles), with deliveries coordinated outside school bus time (8am) as far as reasonably practicable. • RDSM unit has no significant noise components (runs quietly, low velocity enclosed afterburner system). • Whilst not expected, additional controls (e.g. directional sound barriers in character with rural surrounds) can be considered if required to further minimize noise.	Section 6.1.2, Appendix 5, 8.
Air Quality	• Staged detailed testing program to be developed in consultation with EPA as condition of approval. • No contaminated feedstocks / plastic-based feeds (Section 4.4). • Appropriate emission control equipment including a wet scrubber used in all testing as appropriate. • Engineering design intends to manage halogens using an alkali-based wet scrubber, producing small amounts of inert solid base salts (e.g. $CaCl_2$). • Temperature and start up conditions will be regulated by a clean-burning auxiliary support fuel (i.e. process plant will be brought up to operating temperature (secondary reactor >750 °C) using clean support fuel such as LPG). • Emissions from combustion of the clean-burning auxiliary support fuel will burn significantly cleaner than the residual waste fuel. • Exhaust emissions that occur from on-site generators and site traffic will meet the minimum for sale standards in	Section 6.1.1, Appendices 5, Annexure 10.

Key Aspect[1]	Commitment to minimization, mitigation and control	Details
	Australia and are unlikely to have a significant impact on local air quality.	

Management of Solid Outputs and Wastes
 	
(solid biochar product, scrubber wastes, and general solid waste / rubbish)
	• Biochar will be suitably characterised in accordance with:
	  ○ NSWEPA Guidelines on RROs & Exemptions for Land Application of Waste Materials as a Fertiliser or Soil Amendment (primary reference).
	  ○ ANZ Biochar Industry Group (ANZBIG) *Code of Practice* (Feed Grade, Standard Grade, and Industrial Grade).
	  ○ Staged testing program to be developed in consultation with EPA for the project. Proposed initial short trial with Proximate and Ultimate analysis, followed by comprehensive testing program during longer campaign trials including full mass balance requirements (see also air quality above).
	  ○ Conditions of EPA approval for Resource Recovery Order & exemption (expected to align with the above).
	• Biochar safely stored (e.g. 205L drums with inert gas seal (e.g. Nitrogen/Argon) to prevent oxidation until fully cooled, then may be transferred to bulka bags for mass storage until requirements met for use (e.g. EPA RRO conditions met allowing land application).
	• Once characterized suitable, biochar will be used in separate trials such as in agriculture or industrial applications (e.g. roads and construction, carbontech). Redundancy options will be executed if biochar cannot be used as planned/appropriate within 6 months after the approved trials period (3yrs), to ensure no long term legacy storage risk onsite (i.e. disposed of appropriately).
	• Scrubber Waste characterized in accordance with detailed testing program developed in consultation with EPA. Scrubber waste volumes minimal (<20kL/yr) and designed to produce inert salts (potential valuable product or will be disposed of appropriately in accordance with EPA Waste Classification requirements).
	• All solid waste to be managed in accordance with a Waste Management Plan to be established for the project. General municipal solid waste generated by personnel collected, recycled where possible, and residual disposed of appropriately to the GISC landfill as appropriate.
		Sections 4, 5, 6, Appendices 5, 9, Annexure 10.

Visual	• Distant sensitive receptors (>850m to nearest rural residence). • Enclosed gas afterburner (negligible light, no side light visible). • Night lighting / shed lighting kept to minimum, site layout designed/orientated specifically to minimize potential for light toward nearest rural residences. • Vegetation screening plantings (primarily western/south side). • Sheds appropriate to surrounding rural character.	Sections 4.7, 6 Appendices 5, 1.
Traffic	• Approximately one delivery by heavy vehicles per fortnight (no significant difference to heavy vehicle movements on West Furracabad Rd for existing farming activities in the district. Additionally, trucks already deliver fortnightly to the existing property).	Section 6.1.3, Appendices 5, 1.

Key Aspect[1]	Commitment to minimization, mitigation and control	Details
	• Onsite storage capacity optimized to minimize delivery needs • No heavy vehicle truck deliveries/movements at night time. • Timing of shift change/vehicle movements will avoid conflicting with morning school bus movements on West Furracabad Rd wherever practicable. • No night time heavy vehicle deliveries.	
Bushfire Protection	• Hazardous Area Review around RDSM <2m, no flammable materials stored within this area. RDSM surrounded by unsealed all weather working pad (gravel / crushed rock) well beyond 6m. • A dedicated 22.5kL rainwater tank on proposed Shed 2 or 3 will be reserved for firefighting as per RFS requirements. Project water requirements from other existing and proposed tanks. • RFS-compliant couplings to be fitted on appropriate rainwater tanks on Shed 2 and 3. • Metal fencing (e.g. 'Colourbond' or similar) to surround a dedicated rainwater tank for firefighting on proposed Shed 2, to help protect from fire approach as recommended by RFS. • Asset Protection Zone (APZ) established around project workpad (active testing area) – grass will be maintained to a minimum of 100mm within APZ beyond the workpad area. Trees within property perimeter maintained per RFS Bushfire Protection Guidelines and Essential Energy powerline requirements. • Additional emergency access to water can also be provided if needed via another existing 22.5kL rainwater tank associated with a farm shed located immediately west adjacent the project area, and 15ML of farm dams and licenced borewater available on the broader farm also owned by John Winter if required (redundancy).	Section 6.1.3, Appendices 5, 7, 8, 6, and 1.
Infrastructure	• Location of permanent structures (proposed sheds) designed in consultation with Essential Energy. • Powerline Safety Markers will be installed on overhead powerlines crossing the internal all weather access.	Section 4, Appendix 5
Decommissioning & Rehabilitation	• In the event that trials are unsuccessful, the RDSM will either be upgraded or decommissioned and redeployed elsewhere if necessary.	Section 7, Appendix 5

Notes: [1] Key Aspects were identified through consultation and via Environmental Risk Assessment as detailed in Section 6, 7 and Appendix 4.

[2.] RDSM tailored to tested feedstock as required within committed performance requirements and outcomes described above and within approved process description of an approved development application.

1. INTRODUCTION

1.1 Document Purpose and Overview

This document has been prepared to:

- Present a Statement of Environmental Effects (SEE) assessing those matters required by Section 4.15 (1) of the Environmental Planning & Assessment Act 1979 (EP&A Act) relevant to the proposed Development Application (DA) for the Project described herein and detailed in Section 4. The SEE should be read in conjunction with all related supporting information and plans appended to the SEE and as submitted with the DA;
- Provide a formal description and assessment of the proposed project;
- Describe the process for identification and management of environmental and planning issues;
- Document stakeholder identification, engagement and feedback undertaken to date, including Glen Innes Severn Council ("Council"), surrounding neighbours and related government agencies including the NSW Environmental Protection Authority ("EPA");
- Describe the proposed assessment pathway and documentation for the Development Application
- Describe the relevant planning framework and strategic planning considerations;
- Justify the project, including alternatives options considered;
- Describe the assessment approach for this Statement of Environmental Effects (SEE), including where further specialist assessment will be undertaken.
- Seek clarification from GISC, EPA and relevant stakeholders (notably Essential Energy) as to the adequacy and permissibility of the proposed site layout (particularly proposed sheds) and seek environmental assessment requirements for specialist reports for noise and air quality to be provided. This seeks to minimise further required modifications to the site layout and project design which influence those assessments, and assist final assessment and determination.

1.2 Applicant

- **SEATA Holdings Pty Ltd**, trading as SEATA Group ("SEATA")

SEATA is a proudly Australian company registered and based in Charlestown in Newcastle NSW, with direct connection to Glen Innes via founding director John Winter - a 5th generation farmer and respected process engineer from the Furracabad area of Glen Innes. John originally invented the technology to help farmers improve their degraded soils economically at the same time as significantly aiding the fight against climate change. John is also the land owner of the rural property where the proposed development for the SEATA R&D Centre is to be located. Land owner consent is provided in **Appendix 3**.

1.3 Consent Authority

Glen Innes Severn Council (GISC, or 'Council') is the consent authority for the proposed development ('Council DA'), noting assessment requirement as *Integrated Development* with related approvals from other agencies (including EPA). Further detailed related discussion is provided in **Section 5.1** to **5.3**.

1.4 Background

SEATA developing an advanced thermal treatment technology designed to economically deconstruct wasted biomass (often open burned or landfilled) and other carbonaceous resources into valuable commodities at scale in an environmentally friendly manner, with significant carbon sequestration.

SEATA technology represents an important "step change" toward **genuine *circular* economy** with ongoing, cyclic recovery of valuable resources available through two key outputs – a **very clean syngas** and **solid carbon (biochar)**. Clean syngas undiluted with air (full of nitrogen) avoids the need for further costly gas 'clean-up', facilitating economic recovery of a range of valuable commodities from syngas, including low cost **carbon-*negative* hydrogen**, or for direct use as renewable bioenergy.

As a result, SEATA technology has the potential to assist both of the critical tasks required to address climate change, and in a commercially viable manner – (1) **reducing emissions** via transition to hydrogen and/or renewable bioenergy, and (2) **removal** of excess CO_2 already in the atmosphere through production of biochar. The economic **scalability** and **uniquely high thermal efficiency** design of the technology has the potential to make it one of the most significant emerging **Negative Emissions Technologies (NETs)**, as these factors have been critical limitations for conventional biochar bioenergy technologies to date.

1.5 The Project and Key Objectives

Following successful design, development and testing at 'bench' scale (batch processing), SEATA has constructed a continuous-operation ***Research & Development Scale Model (RDSM)*** for pilot field trials, as shown in **Plate 1.1**. The RDSM is designed to provide R&D data to assist design of commercial scale up and includes emission control via wet scrubber. Comprehensive testing and monitoring are proposed to confirm Proof of Performance and to provide data for bankable feasibility for deployment at scale. A 'walk before run', risk-based approach has been conservatively adopted for the project right from commencement and has been the basis of all forward consultation with regulators and the community.

This *Statement of Environmental Effects* introduces and assesses the proposed project to establish a small R&D centre for non-commercial trials to demonstrate SEATA's pilot scale RDSM technology, using only natural uncontaminated feedstocks and standard fuels.

Three initial priority feedstock targets and blending/co-processing are detailed in **Section 4**. **Up to approximately a dozen green rural jobs (FTE)** will be created during operations. This report describes the proposed project, the process undertaken to identify key environmental and planning issues, outcomes of engagement to date with the community and stakeholders, and the proposed assessment and management of key aspects identified required for formal Development Application (DA) to Glen Innes Severn Council (GISC).

The proposed project site is part of a rural property located at Furracabad approximately 10km from Glen Innes in NSW. Regional context of the proposed project site is shown in **Figure 1.1**. The property is owned by SEATA director and inventor John Winter, whose family have farmed the property for five generations. Glen Innes is a focal point for renewable energy in NSW as part of the **New England Renewable Energy Zone (REZ)**, with established commercial solar and wind energy projects, and expanding interest in storage technologies and bioenergy. SEATA technology is consistent with the objectives set out for the REZ, and with the *NSW Climate Change Policy Framework,* including the associated *Net Zero Plan 2020-2030* and supporting *Net Zero Industry Innovation Program.* The project has considered the objectives and requirements of relevant federal, state, and local planning legislation and Environmental Planning Instruments and supporting policies and guidelines, including as applicable regionally, as detailed in **Sections 1.4** and **5**.

The proposed R&D project trials aim to:

- **Demonstrate the potential for low emissions energy and carbon capture and utilisation, using combined catalysed pyrolysis and partial gasification thermal treatment system.**
- **Demonstrate the technology under continuous run conditions;**
- **Characterise inputs (feedstocks) and outputs (syngas, biochar, emission controls); and**
- **Provide proof of performance data for subsequent analysis for potential commercial scale deployment elsewhere**.

SEATA is committed to **sustainability** and **positive legacy**. The technology is designed to be:

  - Energy efficient;
  - Climate friendly/positive;
  - Economically feasible and viable;
  - Environmentally friendly (air, soil, water and waste);
  - Socially responsible.

Consistent with communication to all stakeholders engaged to date, SEATA has proposed a conservative "walk before run" approach through a progressive, staged trials program to provide both regulatory and investor confidence.

In the event we are able to demonstrate the veracity of our technology, and claims made in respect of its performance, subsequent commercialisation of the technology has the potential to deliver an immense economic, social and environmental benefit to the Australian economy and to our community.

Staged detailed testing will be developed in consultation with EPA to achieve this, as discussed in **Sections 4 and 7**. Full details and figures detailing the project are provided in **Sections 3 and 4**, and **Appendices 1 and 6**.

1.6 Strategic Context

This section is included to provide a brief summary and introduction to the strategic environmental planning and regulatory framework the project has been considered and designed to comply with to assist assessment for approval. Detailed discussion of the proposed project's alignment with federal, state, regional and local environmental planning legislation, policies and guidelines is provided in **Section 5** of this report.

Compliance with Commonwealth and State legislation applicable to the project is discussed in detailed in **Section 5**. Some of the key statutory and regulatory frameworks are listed below (see Section 5 for full details of all applicable):

- NSW Environmental Planning & Assessment Act (1979) and Regulations (2000)
- POEO Act 1997 and Regulations (2000)
- POEO (Waste) Regulations 2014
- POEO (Clean Air) Regulations 2010
- Waste Avoidance and Resource Recovery (WARR) Act 2001
- Local Government Act 1993
- Rural Fires Act 1997
- Local Land Services Act 2013 (as amended 2017)

- Biosecurity Act 2015
- State Environmental Planning Policies (SEPPs)
    - SEPP (Koala Habitat Protection) 2021 (and by inference 2020)
    - SEPP 33 Hazardous and Offensive Development
- GISC Local Environment Plan (LEP) and Development Control Plan (DCP), including important context to the RFS Guidelines for Bushfire Protection

Including important context too;

    - RFS Guidelines for Bushfire Protection (2019)
    - RFS Standards for Asset Protection Zones
    - National Construction Code, (NCC)
    - Relevant existing Resource Recovery Orders (RRO) & Exemptions (see further below)
    - *Note: Relevant Australian Standards are listed within those guidelines*

In relation to **state, regional and local** planning and regulatory **frameworks**, **policies and guidelines** potentially relevant to the project, in summary the proposed project has been developed to be consistent with the objectives and requirements of the following (as clarified further in **Section 5)**:

- *New England Renewable Energy Zone (REZ)*
- *NSW Climate Change Policy Framework*
- *NSW Net Zero Plan Stage 1 (2020-2030)* and supporting *NSW Net Zero Industry and Innovation Program*
- *NSW Energy from Waste Infrastructure Plan (2021)*
- *New England Northwest Regional Plan (2036)*
- *NSW 20 Year Vision for Regional NSW*
- *Northern New England High Country Regional Economic Development Strategy (2018-2022)*
- *State Environmental Planning Policy (SEPP) 33*
- *GISC Local Environment Plan (LEP) 2012* and *Development Control Plan (DCP) 2014*
- *GISC Local Strategic Planning Statement (2020)*
- *Planning for Bushfire Protection (RFS, 2019)* (as applicable, including consideration of re-purposing of existing farm sheds for the project purposes)
- *NSW Waste from Energy Policy Statement (June 2021),* (whilst not technically applicable as no energy recovery proposed, conservatively considered for monitoring and testing as relevant for future projects)
- *NSW Eligible Waste Fuels Guidelines (EPA, 2016)* – as above
- *NSW Guidelines on Resource Recovery Orders and Exemptions – for Application of Waste Materials to Land as a Fertiliser Amendment or Soil Ameliorant (EPA, 2017)* – as applicable for biochar produced by the project to ensure suitable for future (separate) application to land (e.g. in both agricultural and/or industrial applications).
- *NSW Waste Classification Guidelines (EPA, Nov 2014)*, as applicable to storage, handling and disposal of small amounts of slurry waste from the RDSM wet scrubber (emission control equipment).
- *Biosolids Order and Biosolids Exemption* (NSWEPA, 2014)
- *NSW Excavated Natural Material (ENM) Order & Exemption (NSW EPA, 2014)*
- *Environmental Guidelines: Use and Disposal of Biosolids Products* (NSWEPA

Plate 1.1: SEATA Pilot System - ***Research & Development Scale Model (RDSM)***

Processing capacity 200-300 kg/hr (typical max 250 kg/hr).

Figure 1.1: Regional Context

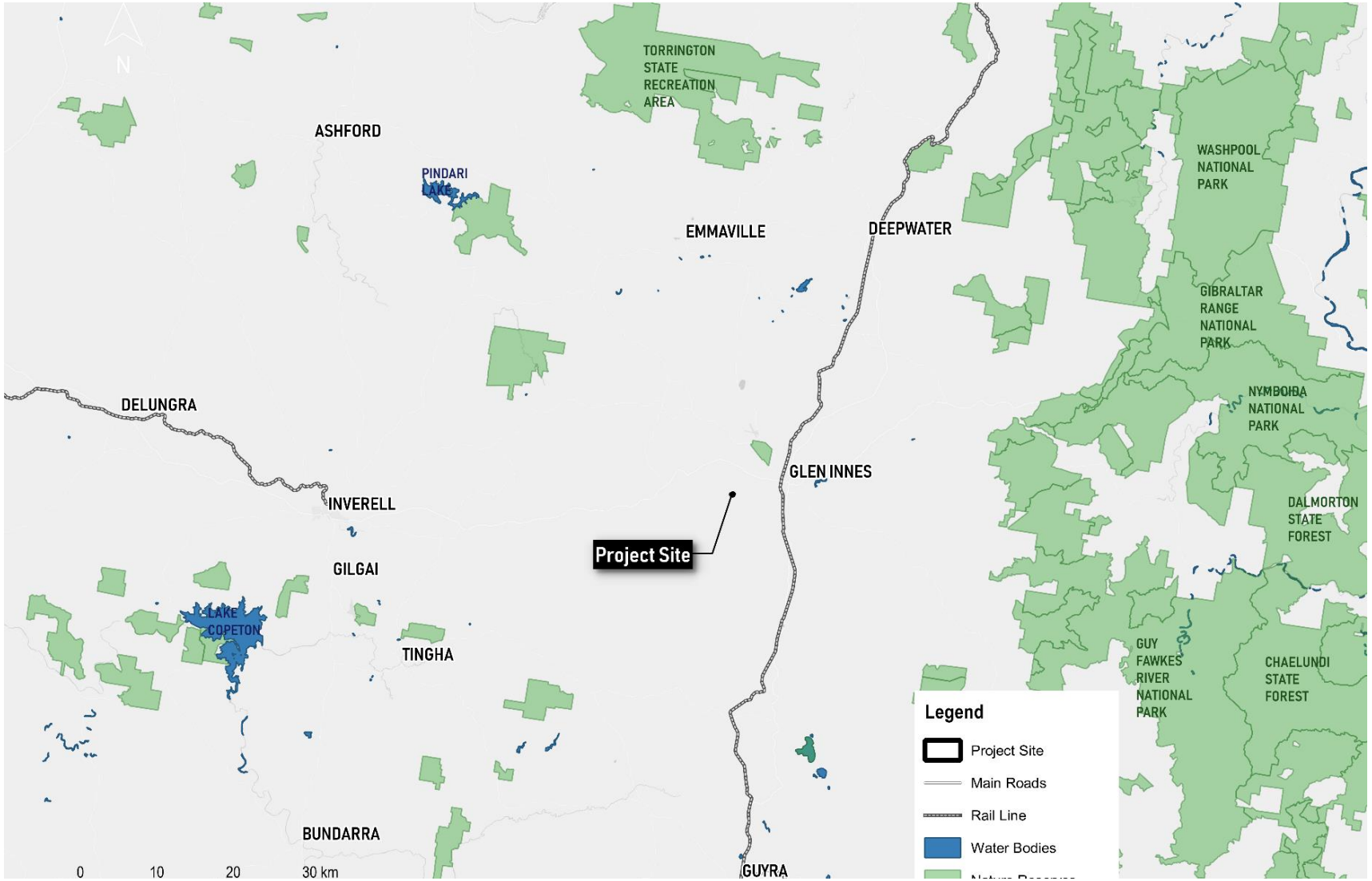
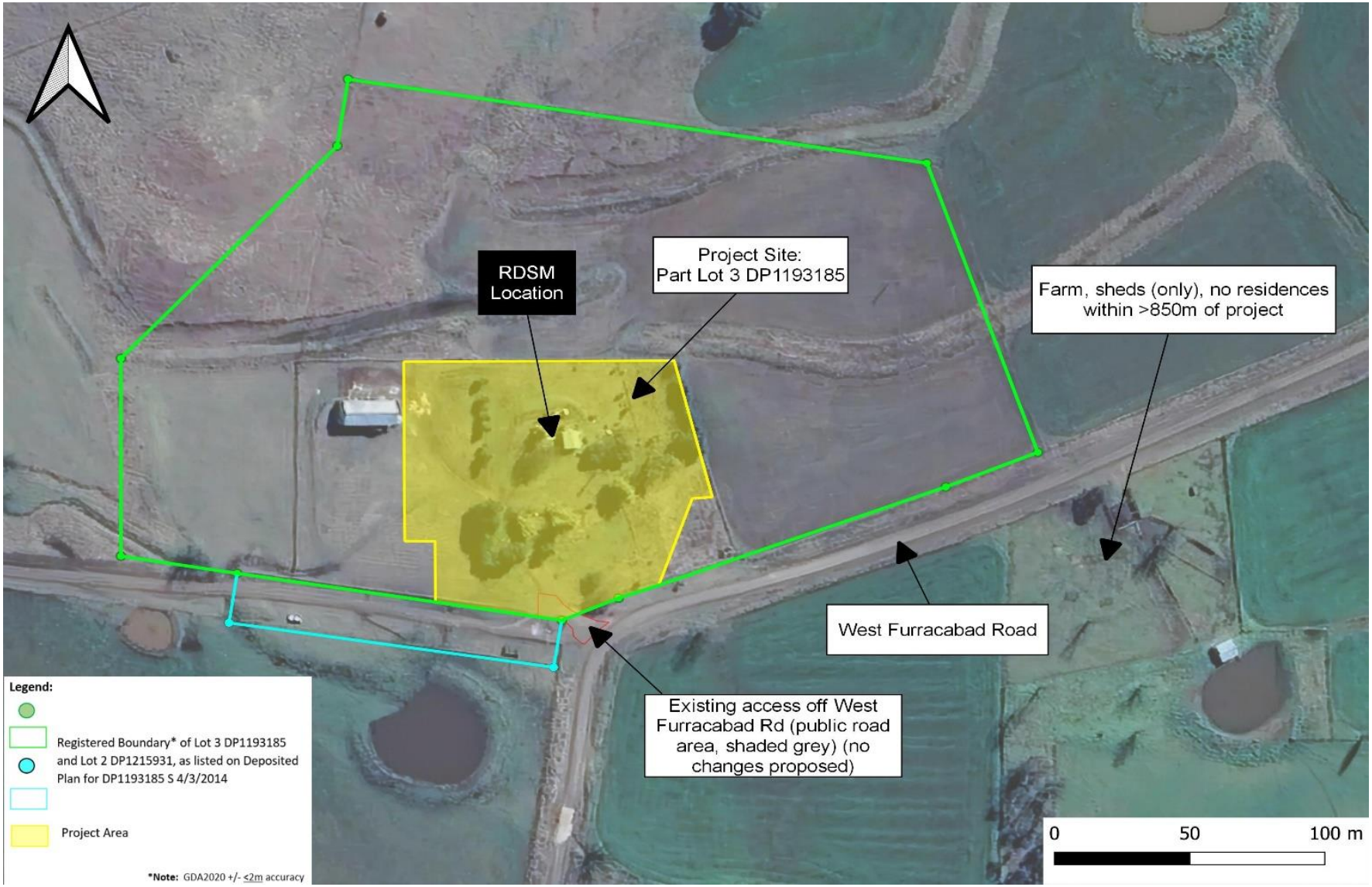


Figure 1.2: Proposed Project Site (Application Area), including access – SEATA R&D Centre, Glen Innes



2. Technology Background

2.1 Conventional Pyrolysis Technologies

Conventional pyrolysis reactor design **typically uses two main modes of heat transfer** to provide the energy for thermo-chemical conversion: direct, in-direct (or a combination of both).

- **In-direct heating** - relies on metallic heat transfer surfaces, which is the limiting factor for scale-up of this type of equipment, resulting in multiple units operating in parallel to achieve reasonable plant through-put. This results in high capital cost, high maintenance cost, high operating cost and low thermal efficiency. Examples of this type of equipment are rotary kilns, drum kilns, retorts (fixed bed), auger, ablative and vacuum reactors. Some novel indirect heating methods include electrical (radiant and/or conduction), plasma, microwave and solar energy. These methods typically require cheap electricity and an inert carrier gas. Furthermore, these complex heating methods have high operational and capital cost which, at best, increase directly proportionate to scale.
- **Direct heat transfer** - typically achieved by either using hot spent combustion gases or using recirculation of an inert gas (usually syngas).
    - Using hot spent combustion gases causes significant dilution of the syngas with carbon dioxide and nitrogen, resulting in a very low calorific syngas that has limited uses because once cooled down it does not have sufficient fuel value for self-combustion. Air blown gasification has the same issue.
    - Using recirculation of syngas has the disadvantage of the off-gas cleaning system needing to be much larger to handle the extra recirculating gas volume and the gas must be re-compressed. In addition, the pyrolysis off-gas (raw syngas) must be wet scrubbed (cooled) to condense and remove the tars and oils.

Therefore, the recycle gas must be re-compressed and re-heated from about 80˚C to +800˚C on each cycle, resulting in low thermal efficiency and high operating cost. In addition, the recirculating syngas must be re-heated using an indirect heat-exchanger, resulting in higher capital cost. High gas flow through the pyrolysis reactor decreases the yield of biochar. Examples of this technology are fixed bed retorts, multi-hearth furnaces, fluid beds and entrained flow reactors.

2.2 SEATA Technology

The technology represents a step change in the potential to economically manage various waste streams in a sustainable and environmentally friendly manner.

Firstly, SEATA's thermal treatment technology is **not incineration/combustion**. It also has important positive differences to conventional full gasification and pyrolysis technologies as outlined in **Tables 2.1 and 2.2,** which provide a high-level comparison of the environmental and economic design benefits of SEATA technology to those conventional technologies.

SEATA uses a combined process of **catalysed pyrolysis and partial gasification using chemical looping** to deconstruct carbon-based feedstocks using **pseudo-direct heat transfer** and **fluidized bed** technology. SEATA's approach is deliberately designed to generate high quality rich **clean syngas** (which is **not diluted with atmospheric nitrogen**, allowing economic recovery of many valuable derivatives, or use direct in gas engines for energy without significant clean-up); **and high quality solid chars without**

problematic liquid products (no tars, bio-oils and resins) that are produced by many other technologies. This means the outputs become genuine valuable commodities rather than waste emissions.

The unique process has a **very high thermal efficiency** resulting in a system offering genuine economies of scale (not just modular). Significantly lower capital and operating costs result from a reactor footprint approximately 10 times smaller than that required by conventional *pyrolysis* technologies for the same throughput, and typically smaller than conventional *air-blown gasifiers* too. SEATA's treatment process can be tailored to produce proportionate volumes of biochar to suit specific objectives (i.e. adjustable), thereby sequestering the optimal proportion of the carbon in the feedstock into solid biochar.

The process is based on **direct heat transfer using hot solids**. This method has the advantage of supplying heat in-directly from the heat source but directly to the feedstock, therefore creating pseudo direct heat transfer, without dilution of the syngas with nitrogen or carbon dioxide from combustion. Scale-up of the pyrolysis reactor is only limited by mechanical design of the mixing system in this case. Many examples of large-scale solids mixing techniques can be applied.

The SEATA first stage pyrolysis reactor is mechanically fluidized / agitated to achieve **good mixing, even temperature, good residence time control** and avoid blockages. A key difference with the SEATA technology is the **secondary gasification** of the oils and tars that are evolved from pyrolysis in a separate reactor vessel which is also heated with hot solids catalyst (destroying toxins such as dioxins and furans) and then rapidly cooled to avoid reformation of those toxins. This is designed to result in no significant toxic gas emissions or problematic odours, nor residual oils and tarry waste compounds requiring disposal.

Through the use of chemical looping principles, all **spent combustion gases from process heating are kept separate to the pyrolysis gases**, thereby **minimising the volume of off-gas that needs to be handled, and resulting in a high quality product syngas**.

Unlike many earlier generation technologies, **significant external heating is not required**. **Syngas compression and storage allows the plant to operate auto-thermally, requiring no external fuel supply once up to temperature** (only used at start-up). Syngas can be used to heat the fluid bed with the excess available for process heating or power generation. The syngas from this process is of high quality – similar to town gas that was generated from coal and distributed to houses in Australia until the 1970's after which natural gas and LPG became readily available.

The **final off-gas is wet scrubbed** to remove particulate matter and water-soluble components. A caustic solution can be used in the wet scrubber to capture NOx and SOx along with H_2O_2 for capture of volatile metal such as Hg (if present), and/or hydrated lime to capture halogens if present and convert it into inert base salts (e.g. $CaCl_2$). All other metals report with the biochar due to the low temperature operation of stage one. This is **an advantage over high temperature operations like incineration or gasification, which needs to deal with substantial metals in the off-gas stream**.

The technology **does not require large amounts of process input water (no cooling required),** only relatively small volumes for emissions control make-up water (wet scrubber, to make up for evaporative losses). The **catalyst media is in a continuous recycling loop**, with some make-up required periodically, and is present in minimal amounts in the final biochar.

In comparison to pyrolysis technologies, the SEATA process is most applicable for genuine large-scale processing of carbon-based wastes, including commercial scale production of biochar and high calorific syngas from dedicated bioenergy plants.

The technology also has significant potential in future (once proven on clean feedstocks) to be deployed elsewhere to test its potential to manage a wide range of other problematic carbon-based feedstocks confronting modern society, including end of life waste plastics and ocean plastics among others. For clarity, **those types of feedstocks are neither proposed nor permissible at SEATA's R&D site in Glen Innes**, which is targeted specifically only for natural uncontaminated feedstocks and standard fuels as outlined earlier in **Table (i)**.

To date SEATA has undertaken several bench scales tests of various feedstocks on a **batch-fed** basis ("bench-scale" system). Following successful results, SEATA has self-funded construction of a continuous-feed pilot scale system (the **RDSM** or Research and Development Scale Model) which we are confident can be scaled to commercial and industrial size following the completion of successful testing. Construction has been completed and was entirely self-funded to date.

Further information on the technology is available on request. Note: Detailed process design information relevant to patent-protected IP is available on a *confidential basis,* typically under confidentiality agreement/NDA. SEATA is happy to discuss further on request.

Table 2.1: High level Comparison of **Environmental Performance** Design Factors between SEATA and some Conventional Thermal Treatments

ENVIRONMENTAL PERFORMANCE Design Factors	**Incineration** *(combustion, excess oxygen)*	**Conventional Air-blown Gasification** *(partial oxidation)* *(air-blown= high N_2)*	**Conventional Pyrolysis** *(low/no Oxygen)*	**SEATA Catalysed Pyrolysis & Partial Gasification via chemical looping** *(indirect O_2 transfer from air, low N_2 in syngas)*
Off-gas volume to be treated	**Very high**	**High**	**Moderate**	**Low** *(not directly airblown (air is 78% N_2), therefore up to 78% less volume)*
General Environmental Performance	**Lowest**	**Lower** key advantage over combustion is lower NOx formation	**Better** (if bio-oils are dealt with correctly)	**Higher** benefits of pyrolysis and gasification combined, hence only clean syngas and biochar produced
Linear / Circular Economy *(Resource Recovery)*	**Linear, Poorest LCA** single use of resources	**Linear, Poor LCA** syngas linear due to dilution with N_2, marginal resource recovery as charcoal	**Circular** syngas linear due to tar contamination, some resource recovery as biochar, bio-oils difficult to process / limited uses	**Circular** syngas derivatives possible due to the high concentration of H_2 and CO plus functional biochar resource, with no bio-oils generated – all converted to useful syngas
Dispatchable Energy	**No** – heat must be used immediately via steam cycle (base load)	**No** – heat must be used immediately via steam cycle (base load)	**Yes** – via syngas storage and bio-oils, but multiple units required to scale with, no increase in thermal efficiency.	**Yes** – via syngas storage and derivative of syngas, e.g, H_2 Much higher thermal efficiency (particularly at scale) = net energy *producer*
GHG Emissions (incl CO_2)	Very High	High	Low to carbon **negative**	carbon **negative** energy
Carbon Abatement / Sequestration	**None** all carbon infeed is converted to CO_2	**Low** 10% Carbon in feed converted to charcoal, remainder to CO_2	**High** ~50% Carbon in feed reports to solid char	**High** ~50% Carbon in feed reports to solid char, *plus* potential future recovery of carbon in syngas (e.g. high grade CO_2 into CCUS, total removal potential increases to over 75%+)
Hydrogen *(Economic Recovery)*	**No**	**No** Not economic in air blown systems due to being highly diluted with N_2	**Yes**, but difficult due to contamination of the syngas with tars and oils, i.e., further processing required	**Yes,** Low cost, easy to separate Carbon **Negative** Hydrogen
Harmful Pollutant Emissions *(Particulates, Heavy Metals, VOC's, POPs, NOx, Dioxins & Furans)*	**Highest** Off-gas requires significant treatment	**Moderate** Lower off-gas volume to treat than incineration but still large, lower NOx	**Moderate** Low off-gas volume to treat, syngas still contains tars, dioxins and furans. Hence specially designed combustion systems required to destroy tars, dioxins & furans.	**Low** All syngas generated by the process is pre-cleaned at high temperature in the presence of a catalyst to destroy residual tars & halogenated compounds (second reactor), then wet quenched / scrubbed to remove soluble components and avoid reformation of dioxins and furans. Clean product syngas capable of economic recovery for derivatives, or for lower emission combustion without post-treatment (similar to natural gas or LPG for example)
Emission Control Systems (ECS)	**Critically Dependent** on Pollution Controls Multiple additives required to scrub pollutants, generating further waste streams for disposal, plus large unit operation to treat the high gas volume	**Highly Dependent** on Pollution Controls (Similar to incineration, but lower gas volume to treat and lower NOx)	**Highly Dependent** on Pollution Controls Syngas requires further pre-combustion cleaning before use. ECS requirements scale dependent. Complicated with halides and dioxins and furans.	**Low Dependency** Pollutants are dealt with as part of the process, e.g., alkali metals remain with the biochar; tars and oils destroyed (deconstructed), syngas is wet scrubbed; so the resulting syngas is clean & ready for use. Downstream users of syngas do not require additional ECS.
Water Usage	**High** Evaporative cooling and make-up water for the steam system	**High** (Same as incinerators)	**Low** Water consumed for capture of bio-oils and indirect cooling	**Low** Make-up water for wet quench / scrubber only
Problematic Liquid Produced (Oils, Tars, Resins, Water)	**Yes** Boiler blow-down brine and evaporative cooling system purge water plus scrubber water (if a wet system is utilised)	**Yes** Up & down draft gasifiers generate tars plus spent scrubber water	**Yes** Alot of tar and oil by-products, reported beneficial wood vinegar, plus scrubber water	**No** All oils and tars destroyed. Only a small purge of water from the quench / scrubber to manage solids accumulation. This can be further evaporated to form a solid if required
Bottom & Fly Ash for Disposal *(Potentially Toxic Solid Waste)*	**Significant** Ash dam required, portion of the ash is super-fine	**High** Ash dam required	**No Ash** Ash remains with the biochar	**No Ash** Ash remains with the biochar, metals bound / not bioavailable.

Table 2.2: High level Comparison of **Economic Performance** Design Factors between SEATA and some Conventional Thermal Treatments

ECONOMIC PERFORMANCE Design Factors	**Incineration*** *(full combustion, high excess oxygen)*	**Conventional Air-blown Gasification** *(partial oxidation) (air-blown, high N_2)*	**Conventional Pyrolysis** *(low/no oxygen)*	**SEATA Catalysed Pyrolysis & Partial Gasification via chemical looping** *(indirect O_2 transfer from air, low N_2 in syngas)*
Economic Scalability & Throughput	**High** (>100's tph per module)	**Moderate** (10's tph per module)	**Low** (~1 tph per module)	**High** (5-40 tph per module current designs, with >100 tph possible in the future)
Target Application	Large Scale, centralised	Med scale centralised	Small scale decentralised	**Flexible small to large scale, central or decentral**
Energy Efficiency *(thermal energy available for other processes, i.e., generation of electricity)*	**Moderate** (50-60%), Using Rankine cycle	**Moderate** (40-65%) Two-stage combustion, plus Rankine cycle	**Moderate** (60%), **with C capture** High parasitic heat losses, only ~1/3 of the input energy available for combustion as syngas, syngas can use in combined cycle gas engines after further cleaning	**High** (70-80%), **with C capture** Lower heat losses due to scale of operation, higher process intensity, high proportion of clean syngas (~2/3 of the input feed) that is ready for use in gas engines, therefore combined cycle power generation possible
Technology Readiness	**Mature**, proven at scale	**Mature**, proven at scale	**Maturing**, proven at small scale	**Emerging** (TRL 6)
Parasitic Load Losses	**Moderate**	**Moderate**	**Moderate**	**Low**
Feedstock Moisture Content Capability *(Technical)*	**High**	**Moderate** Typically, 10-20%, max 50% feedstock pre-drying required	**Low** feedstock pre-drying to 10-20% required, as all heat transfer is indirect	**High** Typically, 20-30%, but can handle up to 70-80%, however net output energy is lowered
Linear Economy Vs Circular Economy	**Linear**	**Linear**	**Circular** (biochar & liquids, syngas for immediate energy only)	**Circular** (Full Potential) (biochar and storable syngas for derivatives/products OR energy on demand)
Feedstock Compatibility / Flexibility	**High**	**Moderate** Limited feedstocks and particle sizing is important	**Moderate**	**High** Good flexibility / versatility
Primary Reaction Temperature in commercial systems	**High** 800-1450°C	**Moderate** 750—1000°C (airblown)	**Low** 350-700°C	**Low** 350-700°C (primary reactor), all syngas from primary reactor treated to 850°C to achieve complete thermal decomposition of all volatile tars and oils.
Atmosphere	Air	Partial Air	Low /No Oxygen	Low Oxygen (O_2 supplied via chemical looping
Pressure (bar)	1	1-10	1	1 (and can be designed in future to be pressurised)
Stoichiometric Ratio	>1	<1	0	0 – 0.2
Principle Outputs (Products) ***Products:***	**Heat & Combustion Products only**	**Lean Syngas**	**Char + Liquids + Rich Syngas (dirty)**	**Char + Rich Syngas (clean)**
Gases:	Combustion Products Only *(No Syngas)*	Combustible Lean Syngas	Combustible Rich Syngas	Clean Rich Syngas = economically recoverable products or energy, including energy on demand
Liquids:	No liquid products *(scrubber waste only)*	0-20% Liquid product, *(plus scrubber waste)*	Liquids (products & waste), *(plus scrubber waste)*	No problematic liquid products *(minor scrubber waste only)*
Solids:	High ash waste, No targeted products	Low char, High Ash waste (char <10% of feed by mass)	High quality but expensive biochar (~30% of feed by mass)	Low-cost, high-quality biochar (15-35% of feed by mass)
Principle Gas Components	**CO_2 and H_2O,** O_2, N_2 + Other gases e.g., SO_x, NO_x, etc.	**CO and H_2**, **N_2**, **CO_2**, CH_4, H_2O, + Other minor gases	**CO and H_2,** + hydrocarbons, H_2O, CO_2, CH_4 + Other minor gases including nitrogen compounds, dioxins and furans	**High purity H_2, CO,** CO_2 No hydrocarbons dioxins & furans H_2 content >50% by volume.
By-Products / Waste *(throughput inefficiencies)*	Toxic bottom ash or slag to dispose, High volumes scrubber waste	Toxic Bottom Ash to dispose, High volumes scrubber waste	Tars, resins, oils, pyrolysis water (plus, syngas scrubber waste)	Minimal inert scrubber waste only. No Ash/Liquids (no tars, resins, oils)
CAPEX	**High** Due to extensive off-gas scrubbing requirements	**Moderate** Scalable with moderate off-gas cleaning requirements	**High** Due to limited reactor scale-up, requiring multiple units to achieve scale of operation	**Low to Moderate** Good scalability and low gas cleaning duty
OPEX	**Moderate** High cost for gas scrubbing reagents and disposal of the resulting waste streams	**Moderate**	**High** High maintenance and high number of operating personnel	**Low**

2.3 SEATA Process Description

The SEATA pyrolysis deconstruction process has been developed to overcome a number of issues and limitations with existing technologies. The process can handle variability in feedstocks and operate over a wide range of conditions. Various components of the process are common in both dedicated bioenergy plants as outlined below. Our unique two stage process utilising a common fluid bed, with high levels of achievable scalability currently enjoys the protection of an existing Australian and New Zealand registered patent, licensed to SEATA and separately is the subject of patent pending status in respect of significant further innovation developed.

SEATA's **two stage** process, which is described in further detail below and illustrated in **Figure 2.1** and **Figure 2.2**, becomes a critical feature for future treatment plants capable of safe thermal desorption and deconstruction of other potential problematic carbonaceous feedstocks which would be trialled **elsewhere** at an appropriate industrial location under separate approvals. These include safe processing of halogenated feedstocks (e.g. plastics, PFAS), whilst ensuring toxins such as dioxins and furans are safely deconstructed prior to rapid quenching to prevent reformation. Through the use of chemical looping principles, all spent combustion from process heating is kept **separate** to the treatment gases, thereby **minimising the volume of off-gas that needs to be handled**. This also allows more unit operation steps to be applied to the treatment off-gas handling system, if need be, at lower cost.

The SEATA process is based on direct heat transfer using hot solids. Typically, a free flowing sand-like material is heated separately and then mixed together with the feedstock in the pyrolysis reactor. i.e., sand like materials that are recirculated between a fluid bed at elevated temperature (~950˚C) and the pyrolysis unit operating at an exit temperature of about 500˚C to 700˚C. This method has the advantage of supplying heat in-directly from the heat source (but directly to the feedstock) **without dilution of the off-gas that emanates from the feedstock** with the products of combustion. Scale-up of the pyrolysis reactor is only limited by mechanical design of the mixing system in this case.

Recycle of the spent sand can be achieved using special elevators or pneumatic transfer that does not require the sand to be cooled down. Waste energy from re-heating of the sand is used to dry the incoming feedstock which **maximises the thermal efficiency and limits the quantity of off gas that requires treatment.**

The SEATA pyrolysis reactor is mechanically fluidized / agitated to achieve good mixing, even temperature, good residence time control and avoid blockages. A key point of difference with the SEATA technology is the **secondary gasification** of the residual devolatilised that are evolved from pyrolysis in a separate vessel which is also heated with hot sand and destruction of any other toxins such as dioxins and furans which are then rapidly cooled to avoid reformation (of those toxins). This results in no toxic gas emissions to deal with nor "bad" odours.

The **final off-gas is wet scrubbed to remove particulate matter and any water-soluble components.**

Refer **Section 2.2** above for more information on the technology design.

Figure 2.1: High Level Overview of SEATA's Conceptual Process for Thermal Deconstruction of Carbon-Based Materials

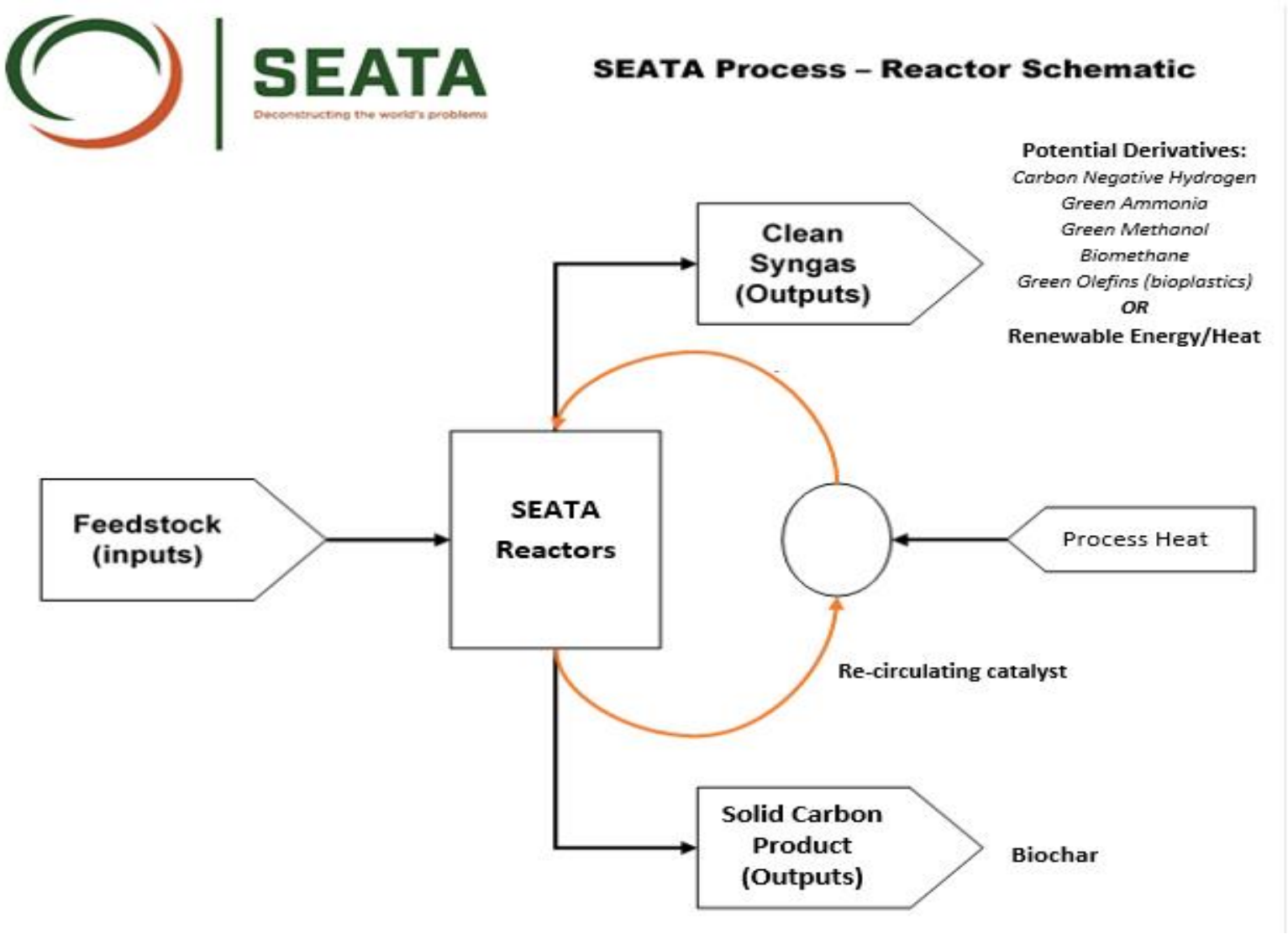


Figure 2.2: SEATA RDSM - Process Block Flow Diagram

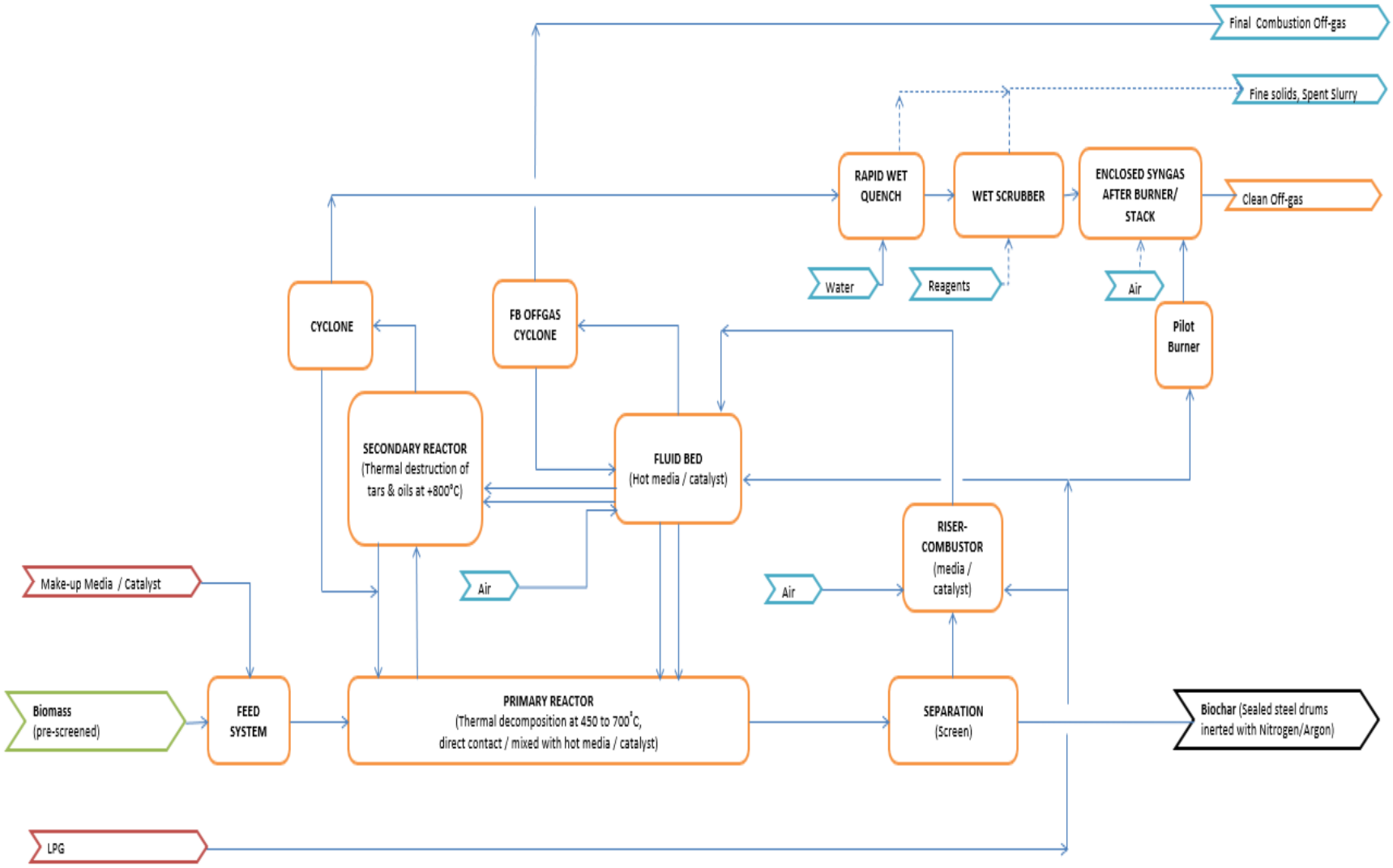
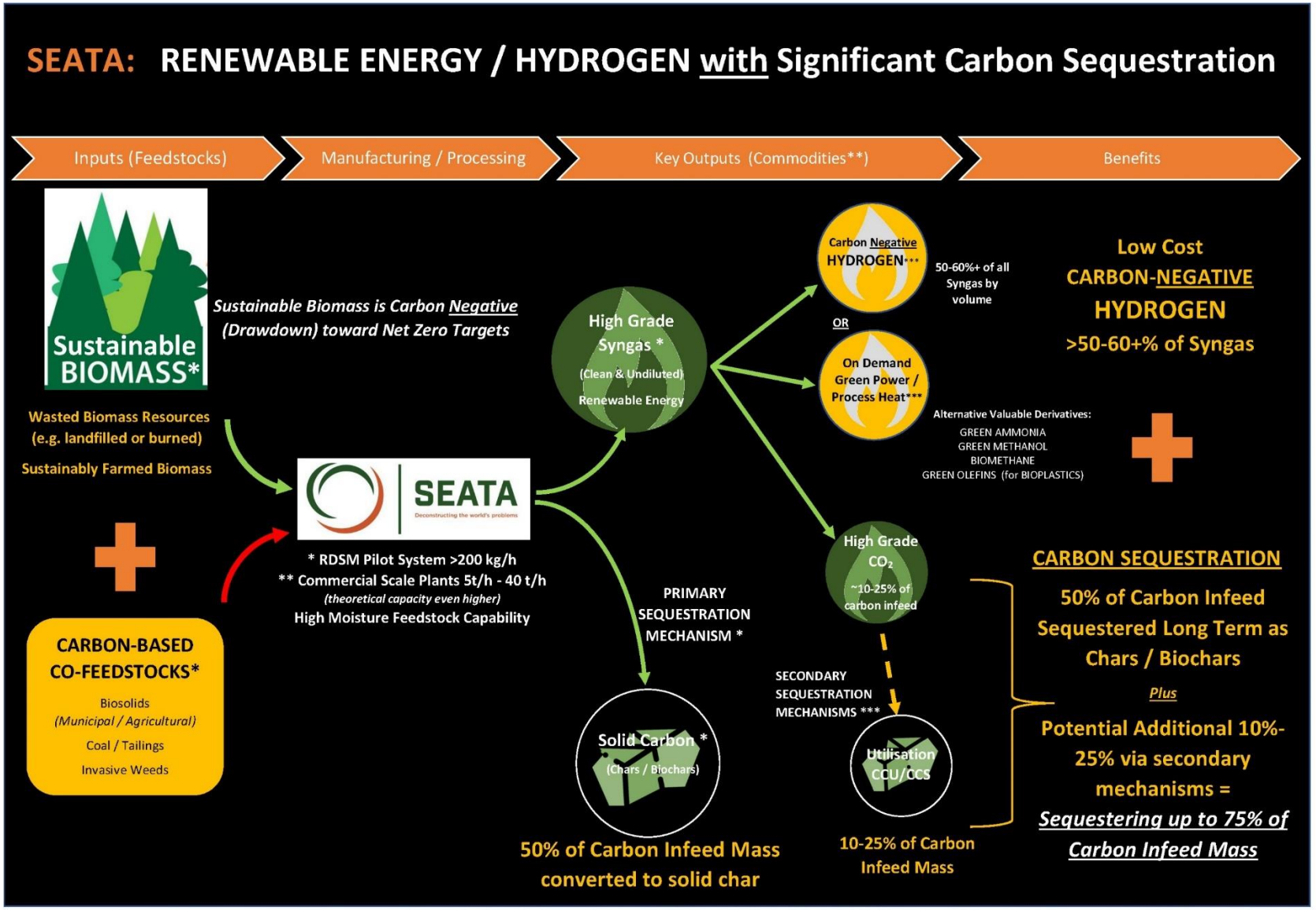


Figure 2.3: Future Potential Capability for SEATA Technology once proven by R&D - Carbon Negative Hydrogen with Carbon Capture and Utilisation



** Proposed for testing & characterisation at SEATA Glen Innes R&D Centre*
Note: Other feedstock capabilities are not proposed in the DA for Glen Innes.

**** Syngas for R&D Testing in SEATA Glen Innes DA will be characterized for feasibility analysis for future commercial recovery (no energy recovery, no H_2 or derivatives proposed, syngas flared)*
**** Potential syngas commodities recovery (including renewable energy/heat, hydrogen or further CO_2 capture and utilization) is not proposed at SEATA's Glen Innes R&D Centre Location.*

2.4 Further Advantages of SEATA's Patented Technology

Tables 2.1 and **2.2** (**Section 2.2**) provide a summary of the economic and environmental performance of SEATA technology compared to conventional incineration (full combustion), air blown gasification, and conventional pyrolysis technologies.

A further indicative comparison of features and limitations of other thermal treatment technologies (including anaerobic digestion and high temperature gasification) is also presented in **Table 2.3** below.

Some of the key advantages of SEATA technology include:

- **Consistent product quality** - Steady state control of process conditions, temperature, residence time with no "hot or cold spots".
- **Able to process a wide range of feedstock types and sizes** without significant risk of plugging gas flows or blockage.
- **Easy start-up and shutdown** (no adverse consequences if the plant needs to be stopped suddenly, e.g. oil and tar condensation in pipe work)
- **Simple / easy to maintain process equipment**
- **Standard materials of construction (MOC) used,** i.e., refractory lined carbon steel (no exotic metals, etc.)
- **Use catalytic materials to assist pyrolysis and lower emissions**
- **Safe operation, simple process control and negligible fugitive emissions**.

Note: Whilst not directly relevant to the proposed DA, which is for only uncontaminated feedstocks, the technology has also been designed to safely handle feedstocks contaminated with **halide** elements, which are converted into insoluble salts in the wet scrubber and separated for dedicated disposal. Accordingly, even though proposed feedstocks avoid contamination, conservatively the system is designed to safely manage such contaminants if present (i.e., another level of design risk management and redundancy).

Table 2.3: Indicative comparison of features of various thermal/bioenergy technologies

Incineration	Gasification (Low temp)	Gasification (high temp / plasma arc)	Anaerobic Digestion	Standard Pyrolysis	SEATA Catalysed Pyrolysis & Partial Gasification
• Harmful Pollutant Emissions requiring further treatment (including dioxins and furans) • High GHG • Toxic Ash Disposal • Visible Emissions, Higher Particulate • Poor Public Perception • Low electrical Efficiency • Majority of energy converted to heat (combustion) • No Carbon Abatement / Sequestration • Supply fuel typically required to sustain process • Linear Economy, Poor LCA	• Potential Pollutant Emissions • Toxic Ash Disposal • Limited Feedstocks • Small Scale • Decomposition of waste to energy-rich fuel • Limited carbon abatement (highly contaminated char) • High cost for feedstock preparation	• Expensive • Low efficiency • Limited Unit Scale • High Parasitic Load (losses) • Low Emissions • Low GHG • High temperature required • Heavy Metals volatilised • No carbon abatement • No recovery of useful metals	• Slow – large volume relative to output energy • Small Scale • Limited feedstocks – suited to high moisture content feedstocks • Temperature control is critical • Final sludge often needs further treatment • Biogas contains corrosive and toxic sulfur compounds. i.e. H_2S, that needs removal before use	• High volume of oils and tars • Diluted Syngas • Limited / Small Scale • Incomplete waste conversion • High Parasitic load (loss) • Low efficiency • Can operate from low to high temperature	• **No oils and tars** • **Clean Syngas** ready for commercial use (low nitrogen) • **Scalable** design (economies of scale) • **Standard MOC** (Materials of Construction) • **High thermal efficiency** • Syngas processable to **hydrogen,** ammonia, methanol or other valuable derivatives. • **High quality and customised biochar** • **Circular Economy** • **Significant carbon sequestration** (drawdown)

3. Existing Site and Surrounds

3.1 Project Site Details & Land Ownership

The project site is located on a rural property at 448 West Furracabad near Glen Innes NSW, owned by SEATA director and technology inventor John Winter. John's family have owned and run the farm for five generations, primarily for cattle, improved pasture and fodder production. The site is located approximately 14 kilometres by road from the town centre of Glen Innes and lies within the Glen Innes Severn Council LGA.

The broader farm is approximately 178 hectares in total size, however only a small portion in the very south eastern part of the farm (**< 1 hectare**) is proposed for the project site, located just north of West Furracabad Road within **part** of **Lot 3 DP1193185**. The registered boundary for Lot 3 (as per Registered Plans) prepared by surveyor Jim Noad are shown on **Figure 3.4**, which clarifies context to erroneous cadastral data. The site is identified in **Table 3.1** and illustrated on **Figures 3.1-3.3**. Photos of the site are provided in **Section 3.4**. A letter providing land owner's consent for the project proposed by SEATA Group is provided in **Appendix 3**. Site information was gathered from the **NSW Planning Portal** eSpatial Viewer (1/10/2021) as noted on and required by GISC on their DA checklist. Details of the existing site and surrounds are presented through the remainder of **Section 3** and within **Section 7** as relevant to specific environmental aspects.

Table 3.1: Site Details

Address	**448 West Furracabad Road, Glen Innes NSW**	*Note: If using Google Maps the address does not correctly illustrate address location.*
Lot / DP Identifier	**Part Lot 3, DP1193185** (refer **Figure 3.3**)	* Notes: 1. Cadastral data layers for Lot 3 are erroneous. Correct boundary as per approved Registered Plan for Lot 3 is illustrated on **Figure 3.4**. 2. Septic/water tanks and associated transpiration trench originally associated with the former house on the site and connected to existing Shed 1 requires s68 Approval under LG Act from GISC.
LGA	**Glen Innes Severn Council (GISC)**	
Land Ownership	**John David Winter**	John is a founding director of SEATA. Landowner's consent is provided in **Appendix 3.** John will lease the project site to SEATA for proposed operations under separate private agreement.
Land Zoning	**RU1, Glen Innes LEP 2012**	RU1 objectives and permissible activities indicates the proposed project complies with GISC requirements. Further details of RU1 zoning and its objectives is provided in **Section 5** *(Regulatory Framework).*
Bushfire Prone Land	Not listed as Bushfire Prone Land (BFPL) on NSW Planning Portal online mapping search as at 1/10/2021.	Whilst not technically required, relevant aspects of a BAL risk assessment were still conservatively considered within the Environmental Risk Assessment for the project. RFS and GISC pre-lodgement discussions provided initial feedback on key bushfire management considerations for project design.

Figure 3.1: Regional Locality

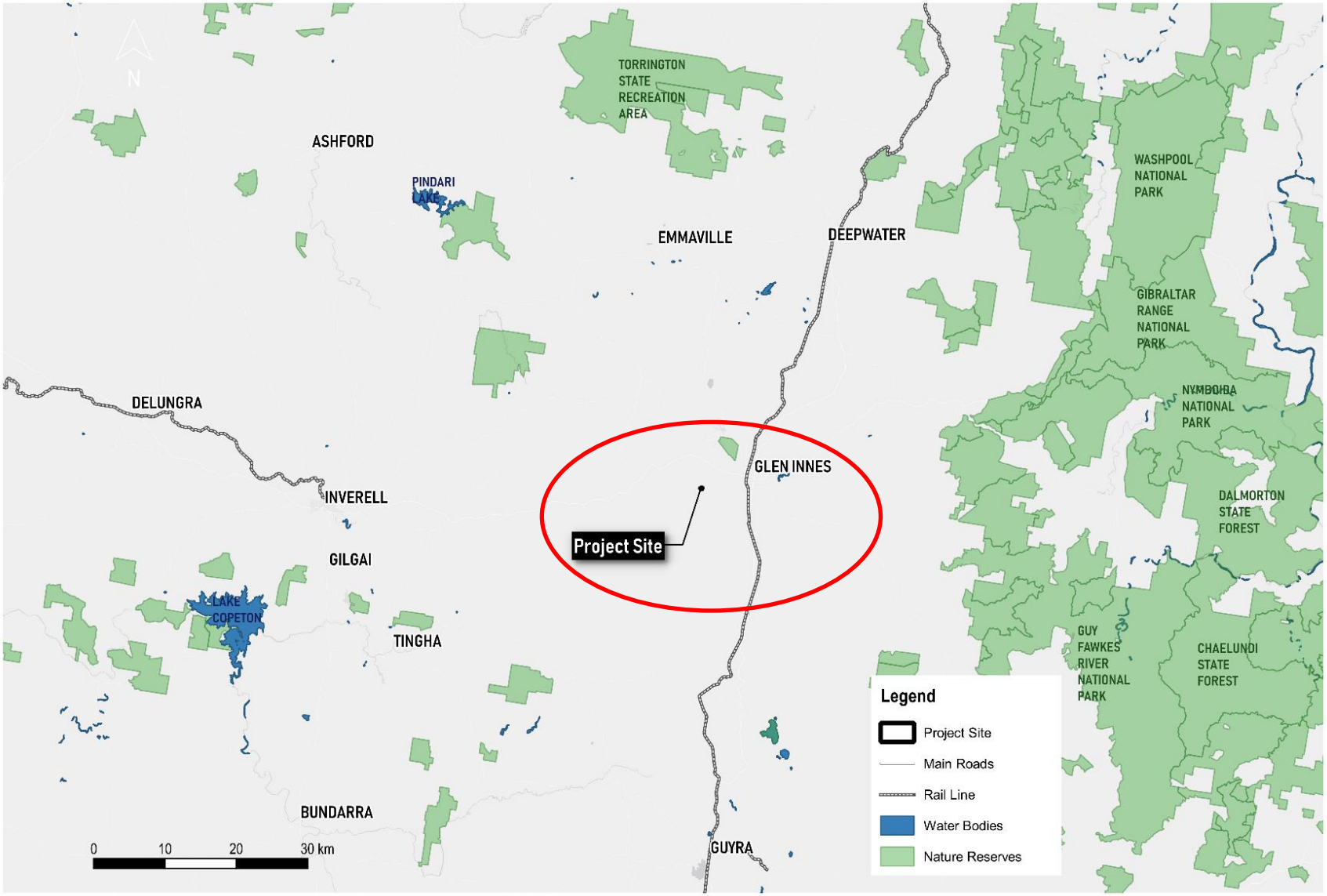


Figure 3.2: Project Locality and Proximity to Neighbouring Rural Residences (Dwellings)

Note: *Closest residence R7 is >850m northeast of the project site. Properties to the east and northeast are partially or completely obscured from distant views to the project site. Direct line of site to R1 (>1200m) will be partially obscured by existing and proposed vegetative screening.*

Figure 3.3: Project Site (including access) off Furracabad Road, Glen Innes

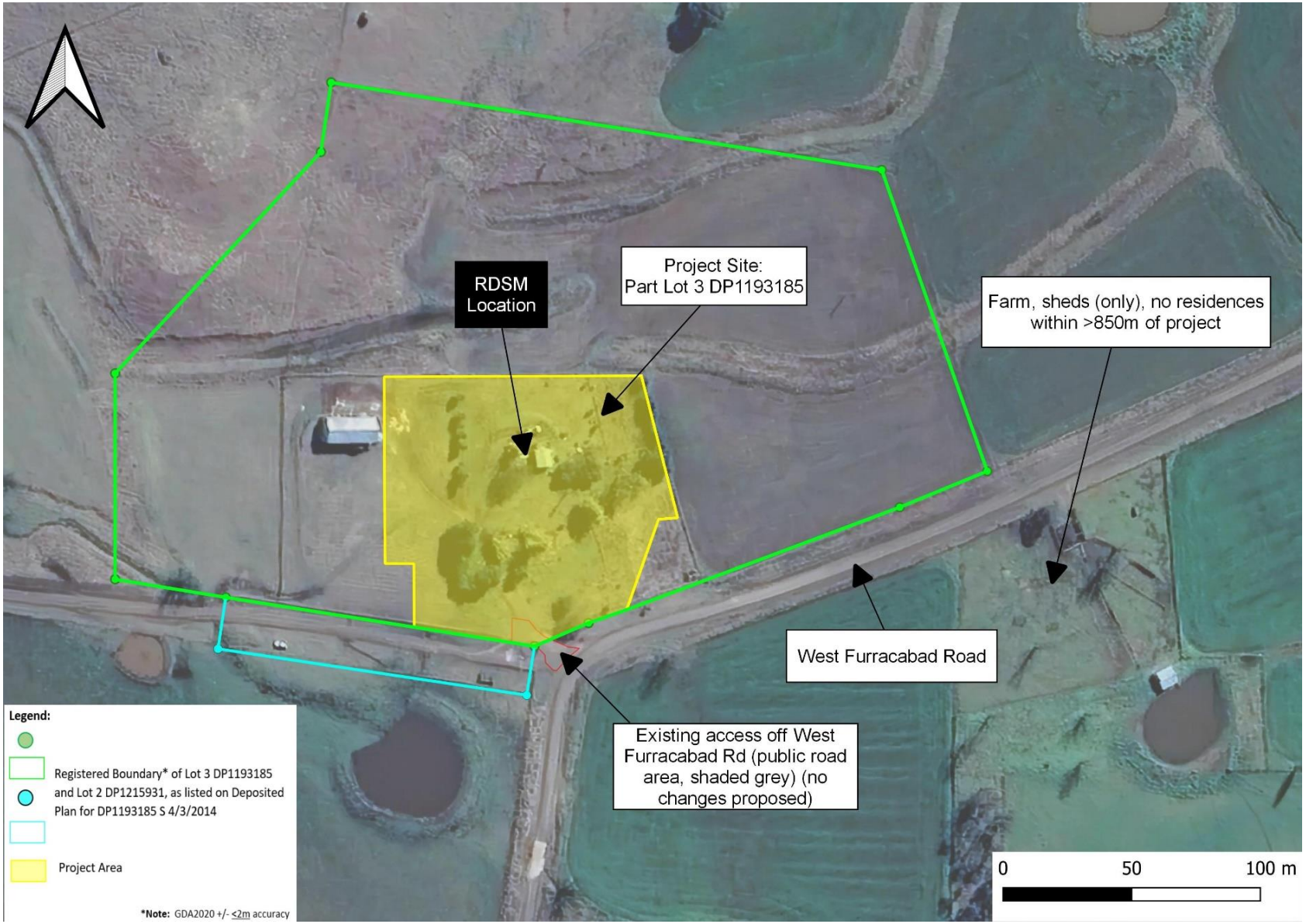
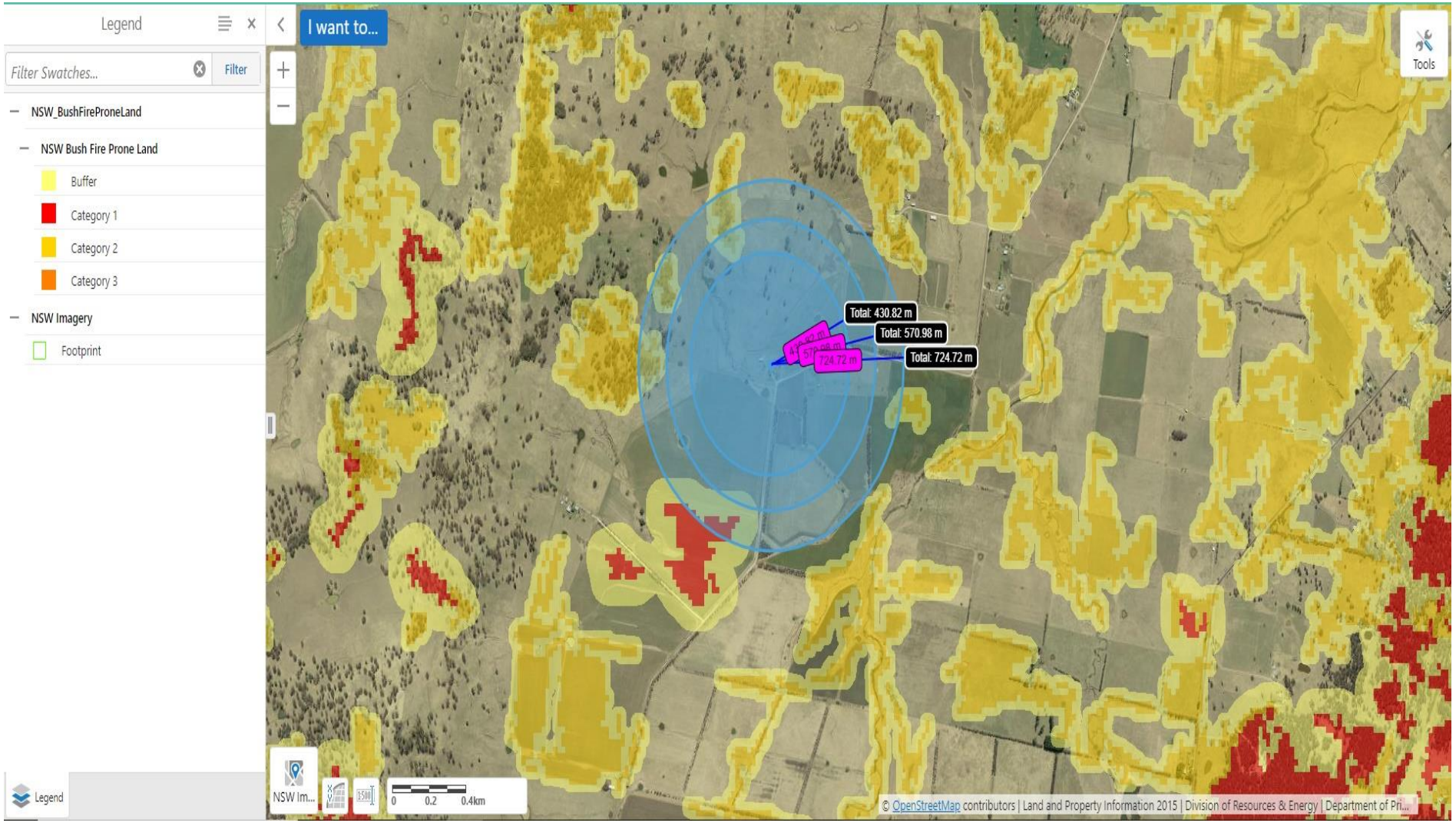


Figure 3.4: Lot Boundary Cadastral Error Clarification (correct registered boundary shown in red)

Figure 3.5: Project Site without boundary shown (existing boundary fencing evident in aerial photo)

Figure 3.6: NSW Bushfire Prone Land (NSW Govt SEED & e-spatial viewer as at 1 October 2021). Closest BFP land by this database is >430m from project site.



3.2 Proximity to Neighbouring Rural Residences (Dwellings)

Proximity of the project site to neighbouring rural residences (sensitive receptors) is illustrated in **Figure 3.2**. The closest residences (dwellings) *with line-of-sight* are **>1.2km (R1)** and **>2.4km (R2)** respectively, as also shown in the photos of **Plates 3.1 and 3.2**.

The nearest neighbouring residence/dwelling *by distance* (R7) is just over 850m northeast of the project site, located beyond a rising natural hill with partially obscured, distant line of sight to the project site.

The nearest access road into to neighbouring properties is located immediately adjacent the project site, accessed from West Furracabad Rd west to residence R1.

3.3 Site Description and Existing Land Uses

The project site and surrounding properties are zoned RU1 and are rural properties used for agricultural purposes, predominantly cattle and fodder production.

Regular cropping is not undertaken on the project site, nor typically on neighbouring properties within approximately 4-5km. The project site is not zoned Bushfire Prone Land according to online mapping via the NSW Planning Portal (as at 1 October 2021).

The site has historically been cleared for rural grazing purposes, however, stands of non-native trees and vegetation screening are located within the project site. Areas toward the southern site boundary have existing vegetative screening. The site is entirely enclosed within an area bound by existing farm fencing. A former farmhouse was situated toward the southern end of the site between approximately 1906 and 2013.

The site has relatively gentle sloping grades generally northeast to southwest, rising up from road frontage with no defined natural drainage lines within the project site. A level area exists on the north side of existing Shed 1 in a small existing cutting and embankment (refer figures in **Section 4**).

A minor drainage line in previously cleared farmland is located nearby offsite to the southwest (Strahler 1st order) feeding to a nearby dam. The surround landscape is gentle to flat slopes to the southeast through southwest, with steeper hills located to the north and northwest, and mild undulating slopes to the northeast.

Ephemeral upper tributaries (1st and second Strahler order) to Furracabad Creek (downstream) are located southwest of the site, and feeding to the closest 3rd order section over 800m away to the south.

3.4 Climate

Glen Innes is located on the New England Tablelands in northern NSW at an elevation of 1062m AHD. The Region sits on the Great Dividing Range and receives relatively high, reliable rainfall. Glen Innes has one of Australia's coldest climates outside of the Snowy Mountains and Tasmania and experiences cold winters with regular frosts and occasional snowfalls, and mild to warm summers. Average temperatures typically range from around 6°C min to 26 °C max. The highest recorded temperature was 37.0 °C on 4 January 2014, and coldest −12.8 °C on 8 July 2002. Rainfall is generally heaviest in late spring, influenced by uplift around surrounding mountains during that period producing more frequent storms.

In context to the proposed project **wind and rainfall** are of primary interest and are outlined below.

Rainfall in Glen Innes is typically reliable and consistent, averaging around **850mm annually**, with over 1000mm of rain in a wet year and **>600mm in a dry year** (10th percentile). Three (3) Australian Bureau

of Meteorology (BOM) stations are/were located within 10km of the project site (in different directions), including:

- **Glen Innes Airport**, BOM Station ID 56243, 1996-current (**25 years**).
- **Glen Innes Agricultural Research Station**, BOM Station ID# 056013, 1910-current (**111 years**), 9am wind only (not 3pm)
- **Glen Innes Post Office** (**closed in 2012**), BOM Station ID# , 1881-2012 (**131 years**).

By July 2021 over **640mm** had fallen to date at the Airport BOM station, on track for a **'wet year'**, with the highest daily rainfall (87.2mm) and monthly rainfall (230.8mm) both falling in March. A summary of rainfall statistics for all three BOM stations is provided in **Table 3.2 and Table 3.3** below. Detailed climate statistics for the Airport BOM station is provided in **Appendix 8**.

Table 3.2: Annual Rainfall Statistics for all records to date (three BOM Stations)

Rainfall Statistic	Years Records	Average (Mean)	Median (50^{th} %ile)	Dry Year (10th %ile)	Wet Year (90th %ile)	# Rain Days >1mm	# Rain Days >10mm	# Rain Days >25mm
Glen Innes Airport	25	**869.2**	879.0	**648.2**	**1116.0**	77.7	**29.4**	**8.4**
Glen Innes Post Office *(Closed 2012)*	131	**858.5**	842.6	**634.8**	**1094.0**	79.9	**27.9**	**7.7**
Glen Innes Ag Research Station	111	**837.3**	842.2	**603.6**	**1048.7**	81.9	**27.6**	**7.6**

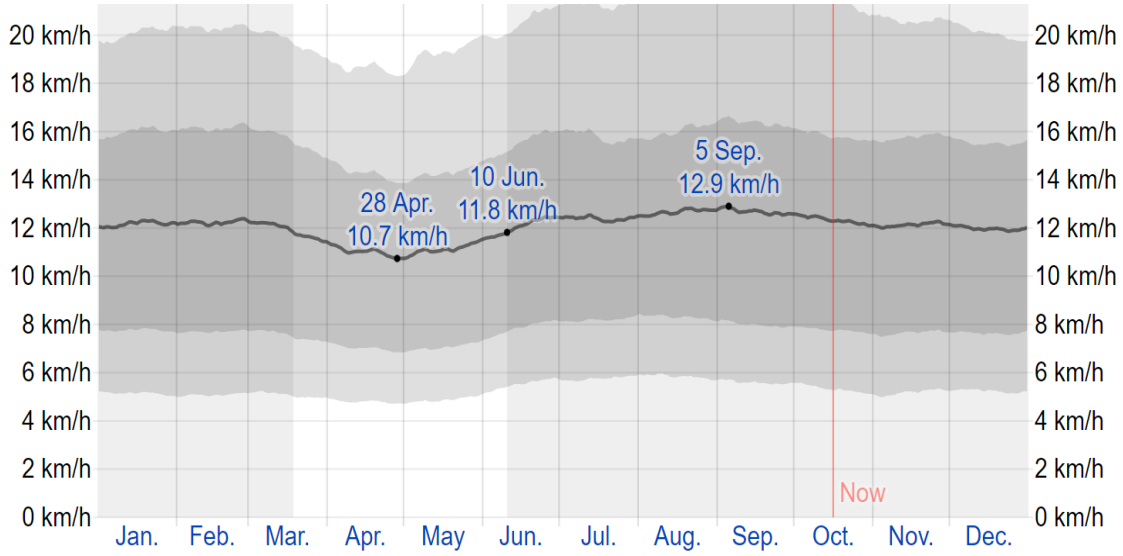
Table 3.3: Monthly Rainfall statistics for the Airport BOM Station (1996-2021):

Statistic	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Mean	98.9	85.5	86.3	49.3	44.7	55.2	46.7	48.7	55.5	78.5	114.8	111.2
Median	77.4	85.8	58.2	44.8	38.6	43.6	38.5	37.2	44.3	76.8	97.0	105.2
Highest Daily	*98.4*	*64.0*	*91.2*	*88.6*	*121.4*	*63.2*	*83.2*	*59.4*	*72.4*	*96.6*	*87.4*	*92.2*

Winds:

The average hourly **wind speed** in Glen Innes is generally consistent with mild seasonal variation over the course of the year as illustrated in **Figure 3.7** below, with annual and monthly average wind speeds under 13 km/hr. The consistent and reliable wind regime in the region has facilitated the development of a strong wind energy industry as part of the New England Renewable Energy Zone (REZ).

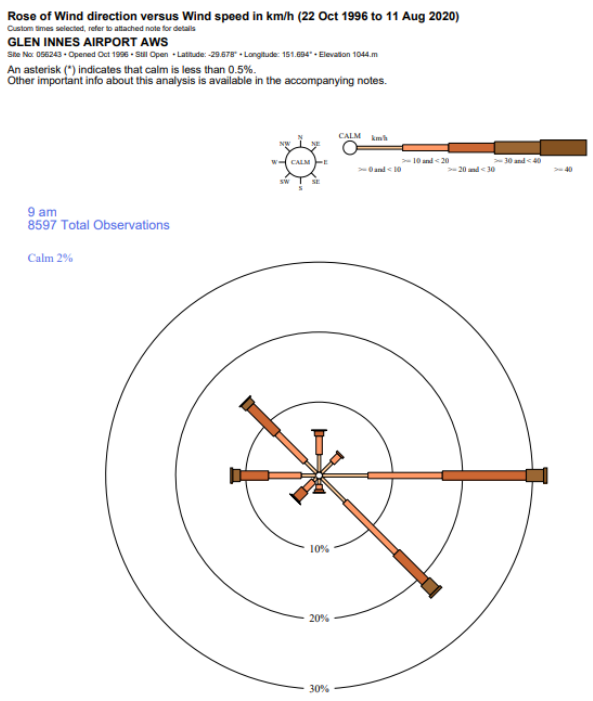
Figure 3.7: Average Wind Speed, Glen Innes NSW

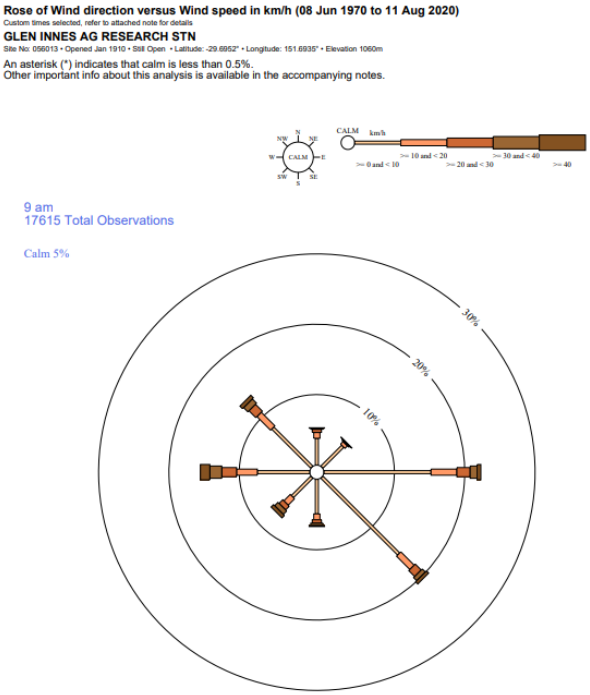


The average of mean hourly wind speeds (dark gray line), with 25th to 75th and 10th to 90th percentile bands.

Windroses graphically depicting **wind direction and speed** for annual 9am and 3pm data from the Glen Innes Airport, Post Office and Agricultural Research Station BOM Stations are provided in **Figure 3.8 to Figure 3.10 Figure 3.12**. Detailed wind roses for **monthly** 9am and 3pm data for the Airport are provided in **Appendix 8.** For context, the closest sensitive receptors are located to the **northeast** (R7, >850m), **southwest** (R1, over 1.2km) and **east** of the project site (R8, R9, >1.2km), as illustrated on **Figure 3.2**.

Figure 3.8: Annual Windroses (9am) for Glen Innes Airport, Ag Research Station, and Post Office





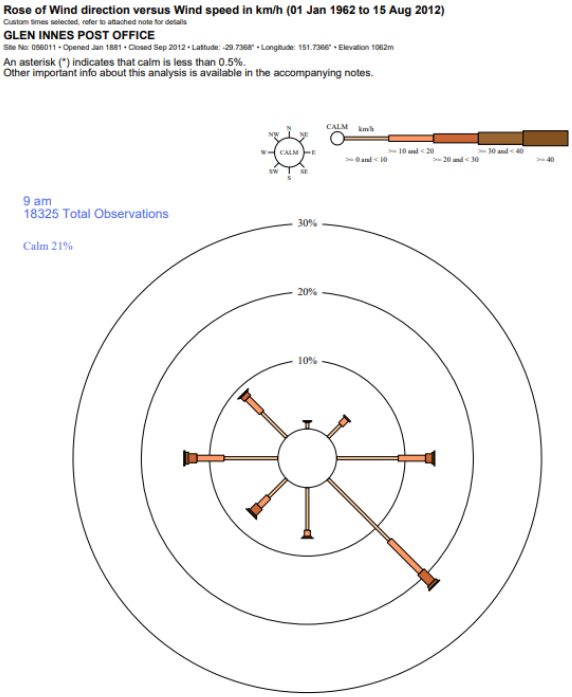


Figure 3.9: Annual Windroses (3pm) for Glen Innes Airport and Post Office BOM Stations

Note: 3pm data is not recorded at Glen Innes Agricultural Research Station BOM Station

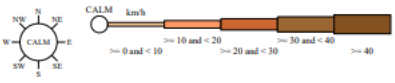
Rose of Wind direction versus Wind speed in km/h (22 Oct 1996 to 11 Aug 2020)

Custom times selected, refer to attached note for details

GLEN INNES AIRPORT AWS

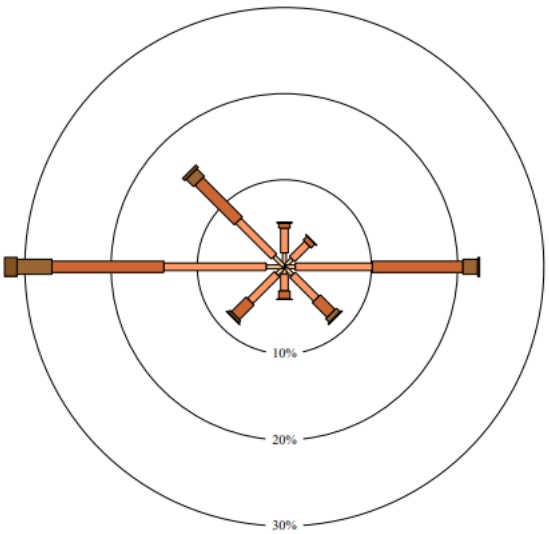
Site No: 056243 • Opened Oct 1996 • Still Open • Latitude: -29.678° • Longitude: 151.694° • Elevation 1044.m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



3 pm
8603 Total Observations

Calm *



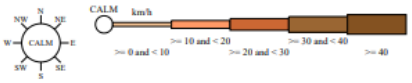
Rose of Wind direction versus Wind speed in km/h (01 Jan 1962 to 15 Aug 2012)

Custom times selected, refer to attached note for details

GLEN INNES POST OFFICE

Site No: 056011 • Opened Jan 1881 • Closed Sep 2012 • Latitude: -29.7368° • Longitude: 151.7366° • Elevation 1062m

An asterisk (*) indicates that calm is less than 0.5%.
Other important info about this analysis is available in the accompanying notes.



3 pm
18214 Total Observations

Calm 5%

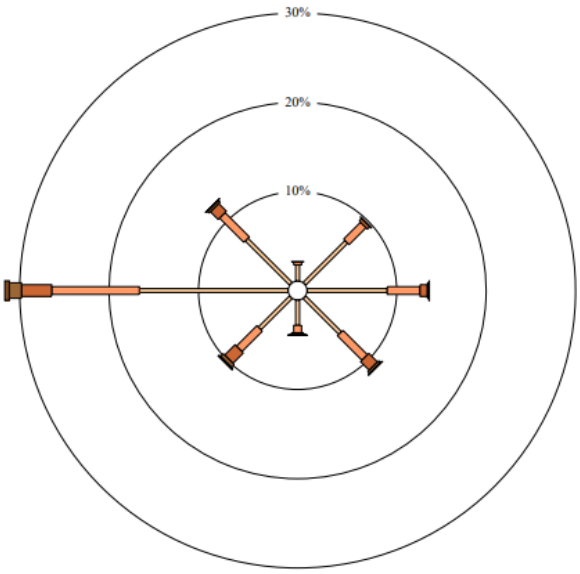
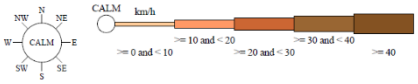


Figure 3.10: Seasonal Monthly Windroses (9am and 3pm) at Glen Innes Airport BOM Station (1996-current)



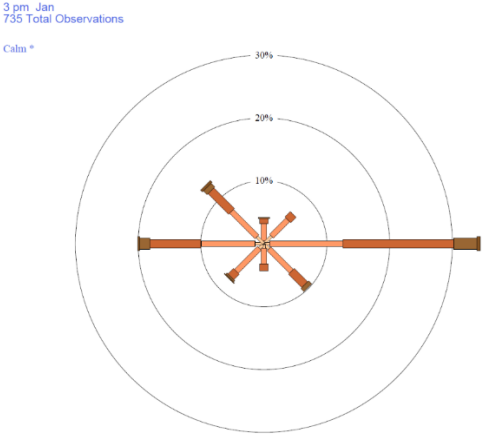
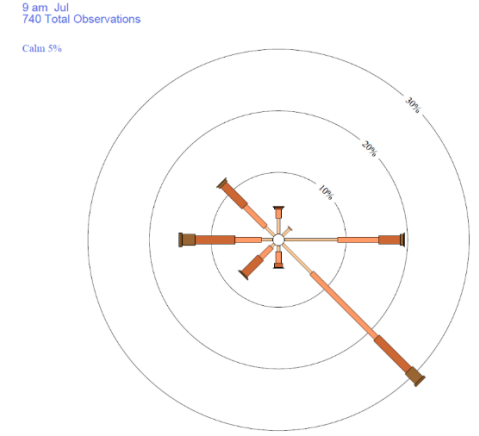
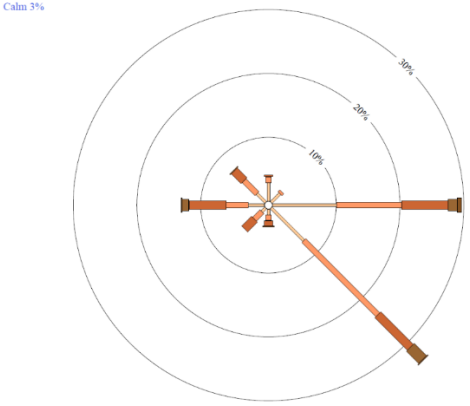
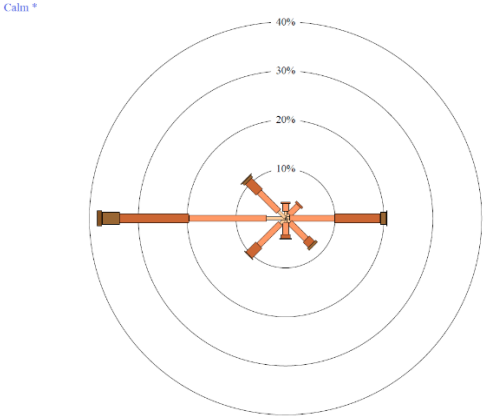
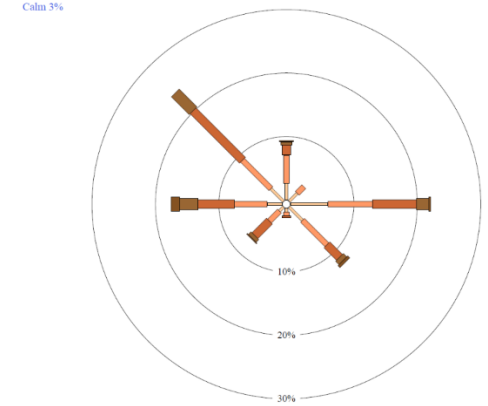
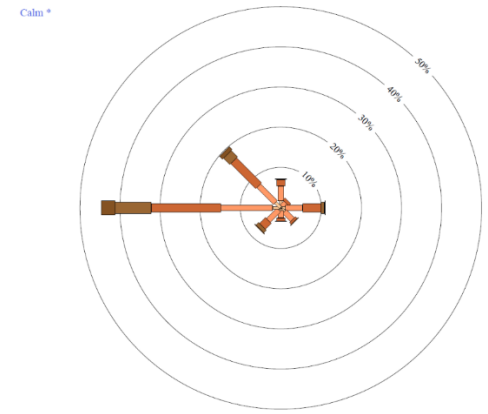
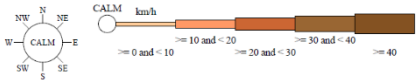
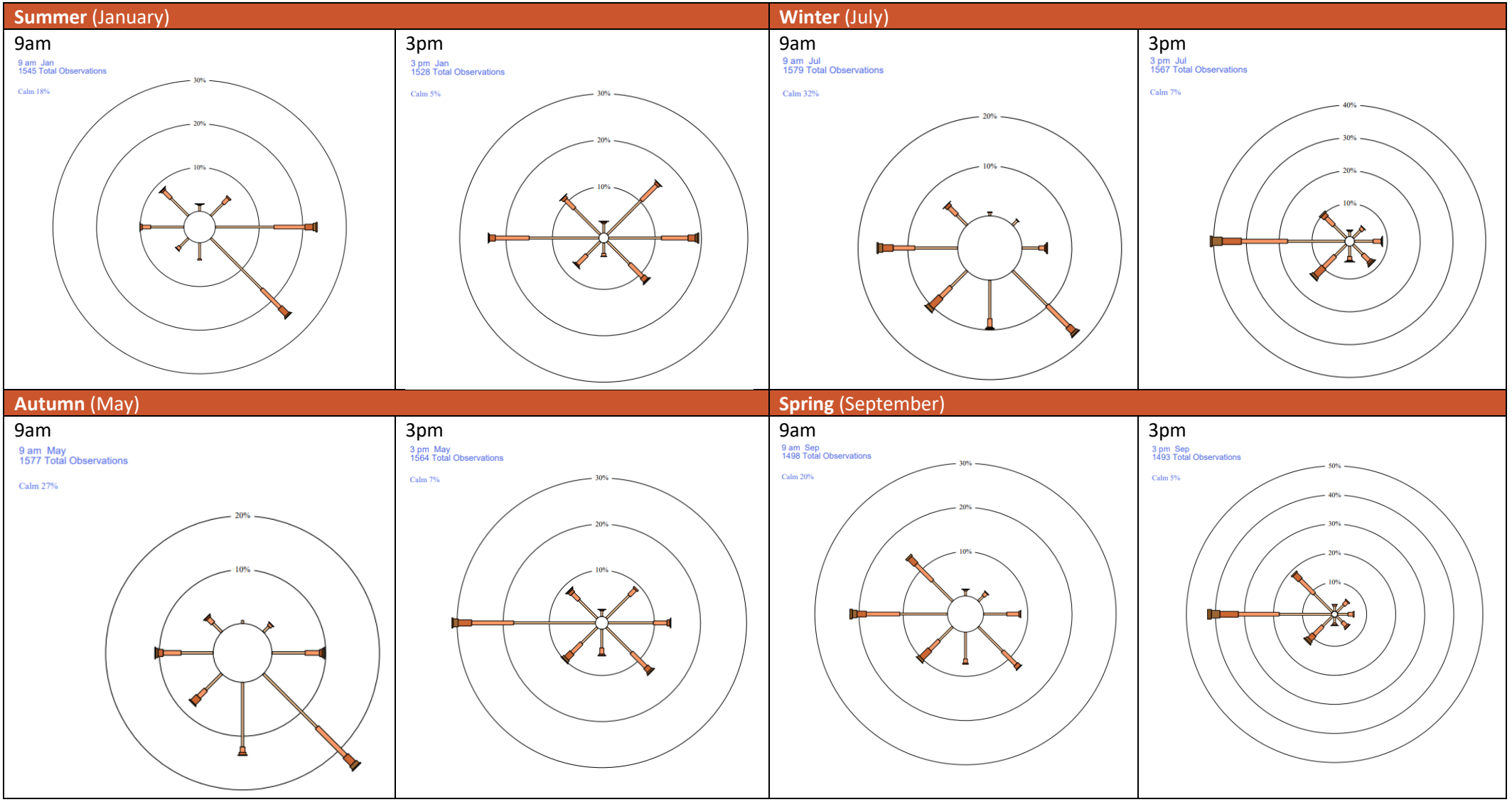
Summer (January)		**Winter** (July)	
9am	3pm	9am	3pm
			
Autumn (May)		**Spring** (September)	
9am	3pm	9am	3pm
			

Figure 3.11: Seasonal Monthly Windroses (9am and 3pm) at Glen Innes Post Office BOM Station (1881-2012)





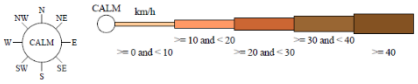
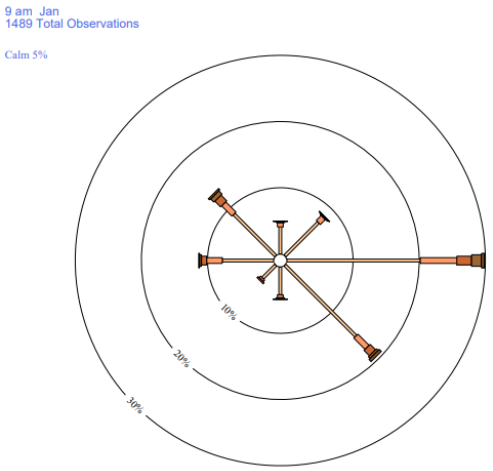
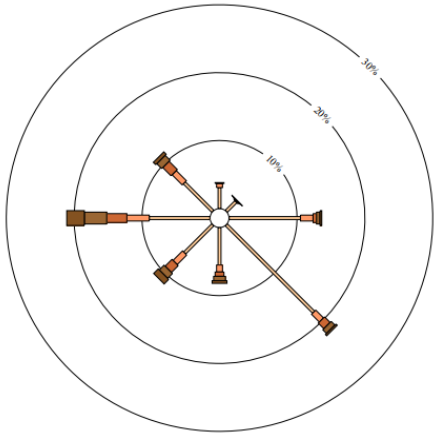
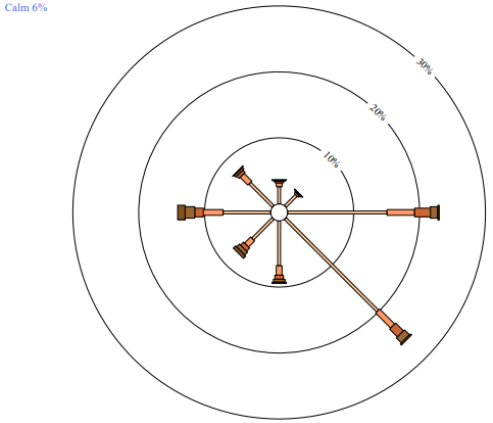
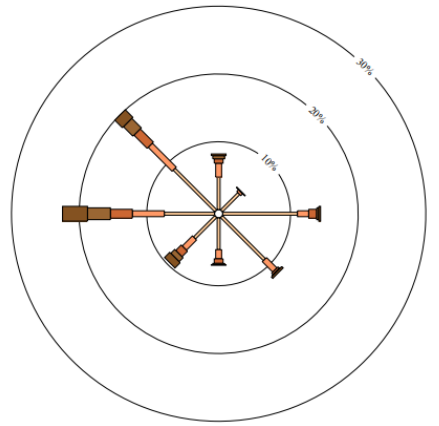


Figure 3.12: Seasonal Monthly Windroses (9am only) at Glen Innes Agricultural Research Station BOM Station (1910-Current)

Summer (January)		**Winter** (July)	
9am	3pm	9am	3pm
	N/A		N/A
Autumn (May)		**Spring** (September)	
9am	3pm	9am	3pm
	N/A		N/A

3.5 Existing Site Improvements and Farm Infrastructure

There are some previously existing improvements on the project site as outlined below which are associated with the farm as outlined below and illustrated in **Plates 3.1-3.2** and shown on **Figure 4.1**:

- **One (1) Farm shed** (**Shed 1)** - a fully enclosable, insulated colourbond steel shed on concrete slab, including a single internal toilet in the southwest corner of the shed. The shed has single phase mains power from an above ground powerline located nearby southeast of the shed. Refer **Plate 3.2** below and detailed design drawings in **Appendix 6.** The shed has primarily been utilised for:
    - General storage, including small mobile equipment
    - Relatively small mobile diesel generator providing 3 phase power located on extended slab area outside Shed 1.
- For clarity, an existing farm Hay Shed is located immediately adjacent the western boundary of the project site (i.e. within Lot 3 but *not* within the project area). Typically used for general farming purposes including hay and machinery storage. Associated with the shed is a 22,500 L rainwater tank (polytank). Whilst not proposed, in case of unexpected emergency the tank can also provide even further additional backup access to firewater, if required.
- **<20 kL in-ground concrete rainwater tank** (linked to nearby existing farm Shed 1)
- **~22 m^3 (22 kL) in-ground concrete septic tank** (linked to amenities in nearby existing farm Shed 1, originally utilised for domestic use by a former dwelling on the project site). See notes below.
- **Pipeline access to a licenced groundwater bore located elsewhere on the farm (90WA832525) via a tap and pipeline.** Only for emergency backup access to firewater if needed during extended drought, rainwater tanks are primary water supply onsite.
- **Two small "garden sheds"**
- **Gated unsealed all weather access/egress.** Less than 100m of existing unsealed all weather access at natural grade, receiving occasional heavy vehicles (including semi-trailers / B-doubles) for farm deliveries. Existing farm deliveries are approximately fortnightly to monthly basis depending on farm seasonal requirements.
- **Fencing** – an existing fence extends beyond the entire project site such that it is fully enclosed and gated (various fencing types).
- **Footings and slab remnants** of the historical family farmhouse which was demolished in ~2013 following a fire. The house was originally constructed in c1906 (*J.Winter pers.comm)*, and was located northeast of the current gate entry and south existing farm Shed 1 (refer **Figure 4.1**).
- For clarity, the SEATA RDSM and bench scale unit are mobile units which have been transported from the Hunter Valley to the project site to allow final instrumentation and monitoring equipment to be installed ahead of formal approval to conduct the proposed R&D activities.

The site has existing **rainwater** and **septic sewer** services that were associated with the historical farmhouse, which continue to be utilised by amenities in existing farm Shed 1. Single phase mains power is currently available within the existing farm shed.

As noted above, further details of key existing structures on the site are provided in **Appendix 6,** as required by GISC standard DA requirements (detailed drawings of existing Shed 1).

Plate 3.1: Existing access to the proposed trial site from West Furracabad Road

Above: Looking NE along existing fencing fronting West Furracabad Road.
Below: Looking north at entry gate into the project site. Existing vegetative screening and fencing in background.

Above: Looking south toward West Furracabad Road from within the existing site access.
Below: Close-up of existing crushed rock/gravel all weather access from entry gate.

Plate 3.2: Existing Farm Sheds on the Proposed Trial Site (Shed 1) and immediately adjacent

	
Above: Existing colourbond farm shed (***Shed 1***) on concrete slab floor, farm tractor RHS. The shed is approximately 6m x 7m x 2.7m high to eaves. Refer **Appendix 6** for detailed drawings. A toilet feeds to a nearby concrete septic tank southeast of the shed. Water comes from an inground concrete water tank southeast of the shed, and fed by the shed roof (refer **Figure 4.1**). Existing John Deer 6330 high performance tractor RHS used for various farm operations including loading/unloading hay.	**Above:** Looking southwest at an existing hayshed on Lot 3, immediately adjacent to but **beyond** the project area (outside the western boundary). The ~40 year old steel shed is ~18.5m long, 9.5m wide and 4.5m high at low gutter (6m at apex of pitch roof). Concrete slab floor, walls on three sides (one partial/doored on southern side). ~22.5kL rainwater polytank, fire hose and pump on eastern side currently used for farm operations and whilst not proposed to be required for the project, has potential to provide additional *emergency* water access if ever required.

Plate 3.3: Example views from site boundaries toward neighbouring properties to south and west

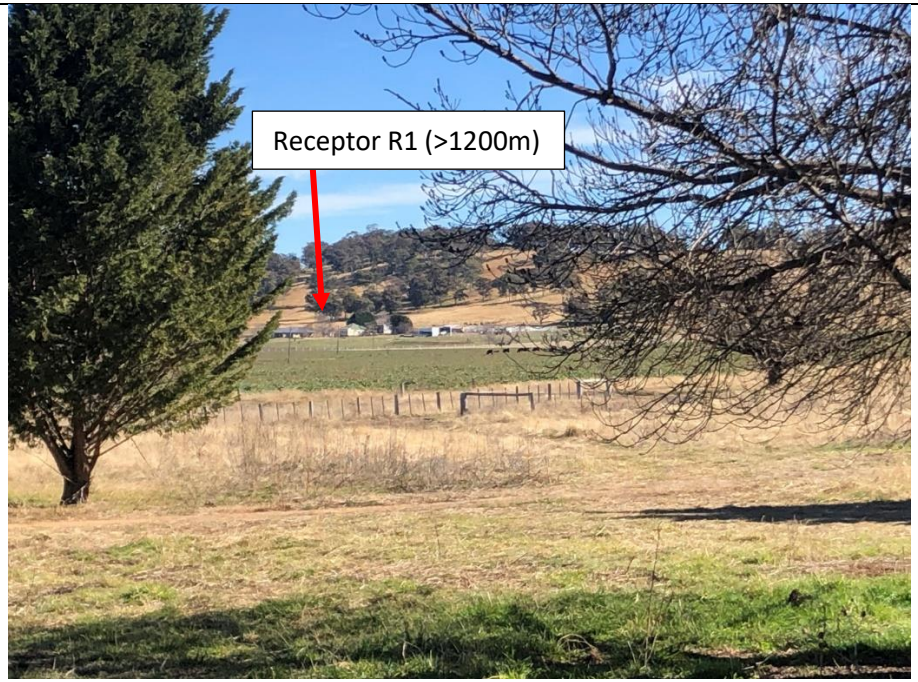
	
Above: Looking south to southeast from entry access to project site (behind) toward distant rural residences R2-R6 (>2.4km). Farm shed (only) in foreground near tree.	**Above:** Looking West/WSW from western boundary of Lot 3 (project site) toward direct line of sight neighbour **R1** >1200m (Lot 36, DP3191). Note: Vegetation screening is located behind where photo taken (refer Section 4).

Plate 3.3: Example views on eastern side of project site

Left Top: Looking west along West Furracabad Road toward project site on RHS (behind white fence and tree screen). Note hill RHS for reference.

Left: Panoramic from west through north to east taken from West Furracabad Road. Project site on LHS (behind trees), note hill in centre. Receptor R7 located >850m north east of project site on RHS within trees (obscured distant views to site).

Plate 3.4: Existing Services (Non-Farm Infrastructure) – Essential Energy Powerline

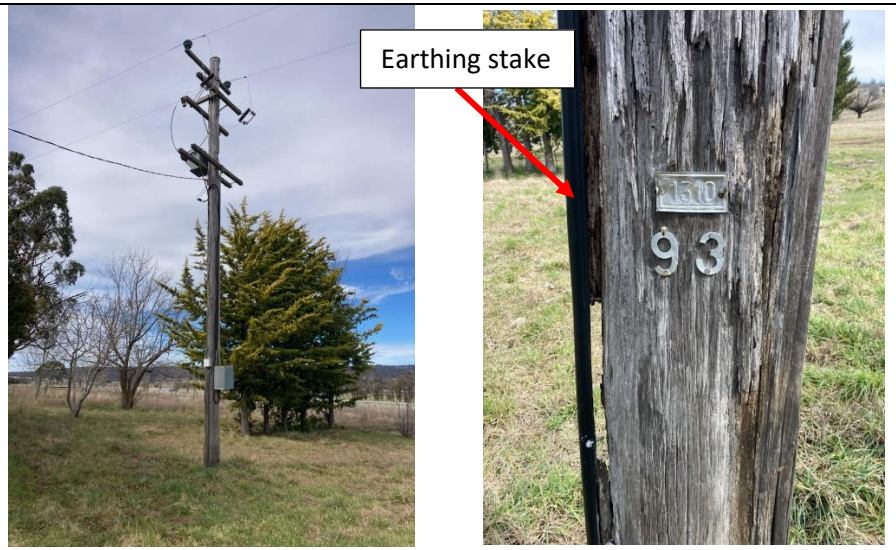
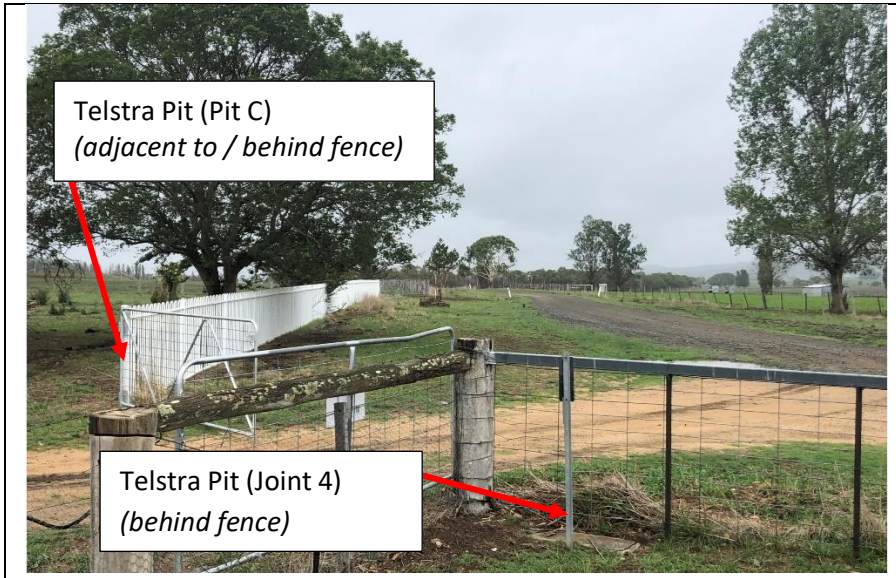
<table>
<tr>
<td>  </td>
<td> 
</td>
</tr>
<tr>
<td>Above: Looking south at powerline/pole owned by Essential Energy located southwest of Shed 1 (existing farm shed visible on RHS of photo). The above ground powerline alignment crosses the property in a NE/SW direction, only one pole is located within the project site (part lot 3), another pole is located within lot 3 beyond the project site to the northeast. Single phase power is provided to Shed 1 (RHS). Refer Figure 3.15 (Existing Services Infrastructure). <u>Note:</u> colourbond fence and existing tree screen (toward West Furracabad Rd) visible in foreground.</td>
<td>Above: Essential Energy powerline pole (including connection to Shed 1) (LHS) and earthing stake at foot of pole (RHS). Refer Figure 3.14 – Existing Services Infrastructure. For clarity, no significant construction or project works are proposed in vicinity of the powerline except vehicle access to the site (passes under the powerline) and vegetation maintenance of trees near the powerline in accordance with RFS bushfire prevention management requirements).</td>
</tr>
</table>

Plate 3.5: Existing Services (Non-Farm Infrastructure) – Telstra Buried Phone Line



Above: Looking <u>east</u> at Telstra Service Pit and marker (Joint 4) of buried phone line (copper cable) near site entry off West Furracabad Rd. (Refer **Figure 3.15**– Existing Services Infrastructure). For clarity, **no surface disturbance works are proposed by the project in the vicinity of the Telstra Line.**

Above: (RHS) Looking <u>west</u> at Telstra Service Pit (Joint 4) and marker of buried phone line near the site entry off West Furracabad Rd. The Telstra line runs across the southern portion of the project site generally east-west (parallel to West Furracabad Road), before turning southward at Joint 4

Plate 3.6: Other Existing farm infrastructure near existing farm shed (*Shed 1)*.

<table>
<tr>
<td>  </td>
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  </td>
</tr>
<tr>
<td>Above: Looking south at an existing garden shed on remnant concrete slab associated with the former rural farmhouse (c1906 to c2013), southeast of existing shed (Shed 1). Access and entry gate in background.</td>
<td>Above: Existing in ground concrete tanks, including septic tank (below) and rainwater tank (above), connected to the nearby farm shed (Shed 1) with toilet amenities. The septic system feeds under the access road to an inground transpiration pit area nearby west of the entry access (see Figure 3.15).</td>
</tr>
</table>

3.6 Non-Farm Infrastructure – Power and Communications Services

Services locations checks were undertaken with the *Dial Before You Dig* service for 448 West Furracabad Road, resulting service reports are attached in **Appendix 12**. An Essential Energy low voltage powerline and Telstra buried phone line were reported both situated toward the southern end of the property south of the primary project site within Lot 3 as shown on **Figure 3.13** to **Figure 3.15**.

Low Voltage Overhead Powerline:

A low voltage 11kV rural powerline owned by Essential Energy crosses the property from NE to SW, with one pole located within the project boundary, as shown in **Figure 3.14** and **Plate 3.4**. A single-phase low voltage connection is provided from the pole to existing farm Shed 1.

For clarity, no significant project works (surface disturbance etc) is proposed near the power pole, and following consultation with Essential Energy, all proposed structures have been located >10m from the powerline as per their design requirements. An existing site access crosses under the powerline and vegetation maintenance works are conducted periodically to maintain existing vegetation in accordance with fire prevention and management requirements.

A search was conducted on 'Look Up and Live' which provided locations of powerlines, poles and identified a 5m exclusion zone outside of the powerlines as shown below in **Figure 3.13**. Further consultation with Essential Energy identified a 10m design setback/easement requirement for all substantial structures, which has been considered for the proposed project layout detailed in Section 4.

Existing vegetation within the exclusion zone and within 15m of the powerline is associated with the 5th generation farm. Essential Energy's *'Plan Before You Plant'* guidelines have been considered regarding the location of further proposed additional plantings (screening), with additional plantings not proposed within 15m of the overhead powerline, as shown in **Figure 4.2**.

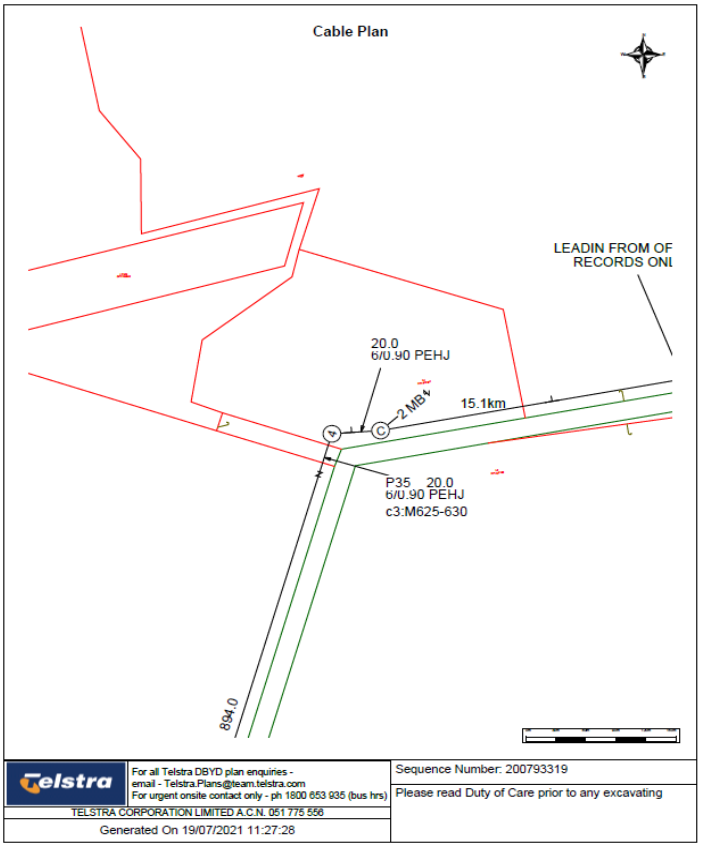
Figure 3.13: Essential Energy Powerline, Poles and Exclusion Zone (Look Up and Live)

Communications:

A buried Telstra copper phone line runs generally east-west across the southern portion of the property, adjacent the existing fence line before turning southward, and includes two pits (jointing pit 4, and pit C) as shown in **Figure 3.14, Figure 3.15** and **Plate 3.5**. No optic fibre services were identified in the vicinity of the project site.

As detailed in Section 4, **no surface disturbance works are currently proposed by the project in the vicinity of the Telstra Line**. Notwithstanding this, the Environmental Risk Assessment (Appendix 5) prudently includes appropriate control measures should any future maintenance works (driveway etc) ever be required in the vicinity of the Telstra Line (e.g. professional cable location, hand excavation near mapped location until located, no deep excavation (>200mm) near cable).

Figure 3.14: Existing Services (Non-Farm Infrastructure) – Power & Telecommunications



Note: Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied cannot be guaranteed as property boundaries, depth and other natural landscape features may change over time, and accordingly the plans are ***indicative only.***

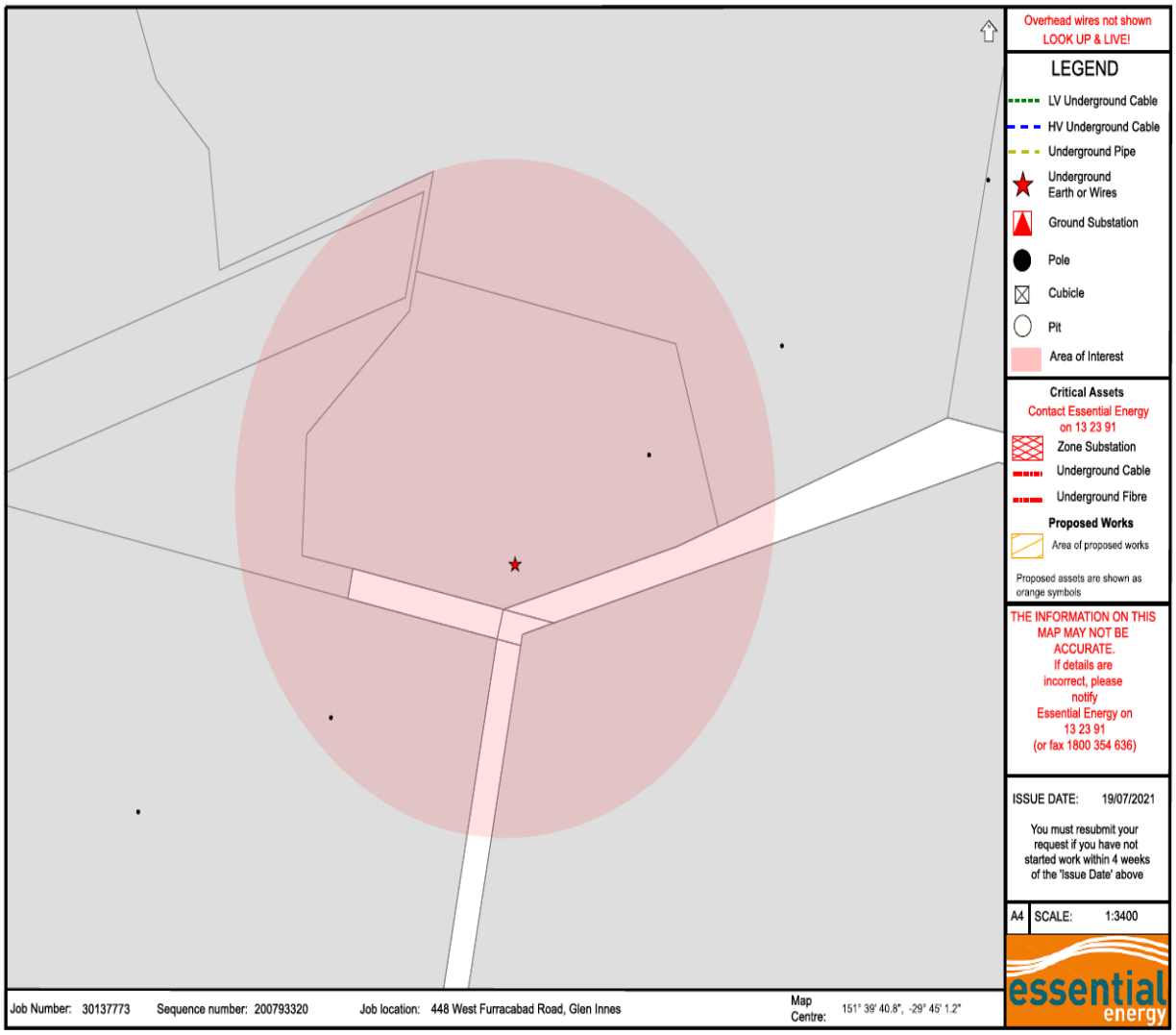
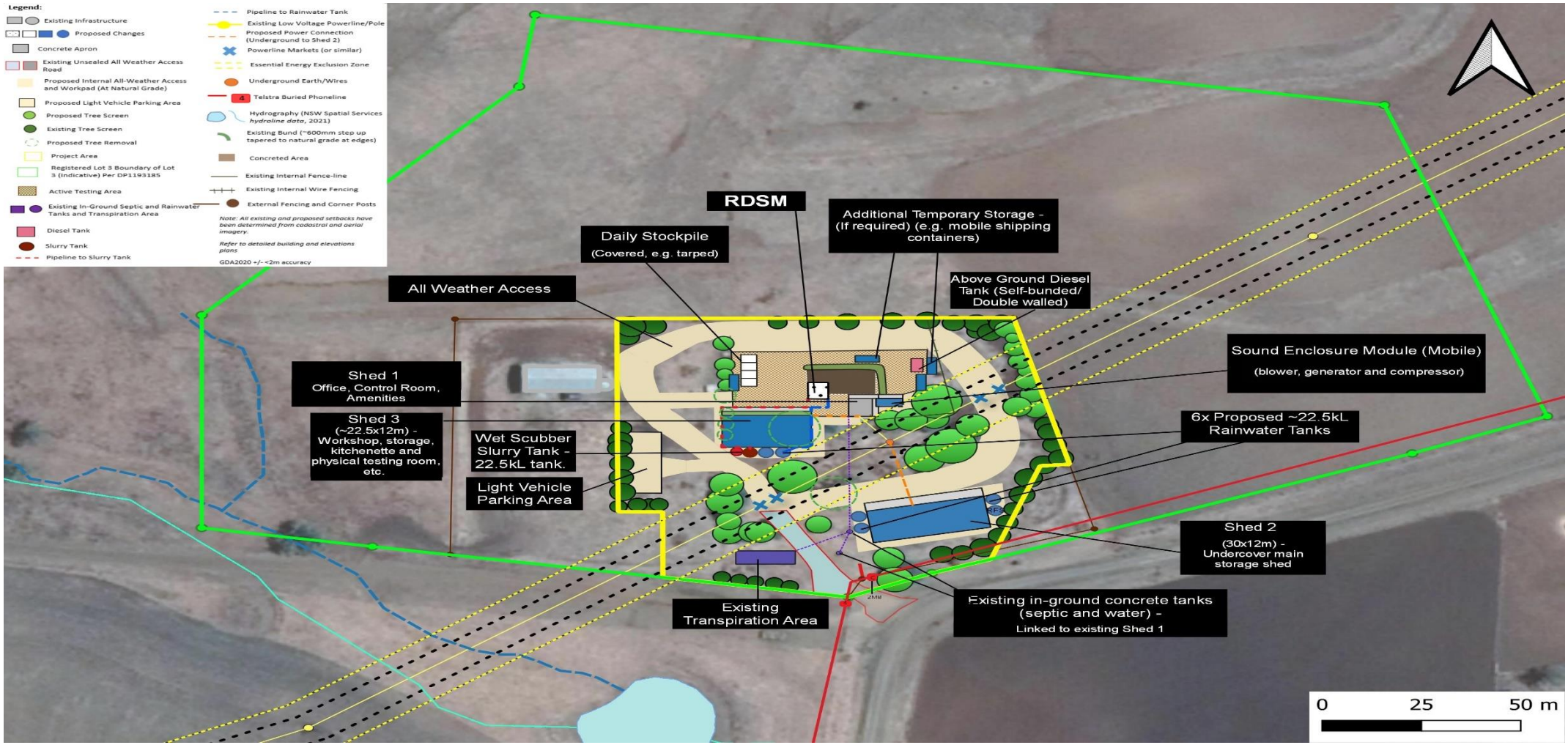

Overhead wires not shown
LOOK UP & LIVE!
LEGEND
LV Underground Cable
HV Underground Cable
Underground Pipe
Underground Earth or Wires
Ground Substation
Pole
Cubicle
Pit
Area of Interest
Critical Assets
Contact Essential Energy on 13 23 91
Zone Substation
Underground Cable
Underground Fibre
Proposed Works
Area of proposed works
Proposed assets are shown as orange symbols
THE INFORMATION ON THIS MAP MAY NOT BE ACCURATE.
If details are incorrect, please notify Essential Energy on 13 23 91
(or fax 1800 354 636)
ISSUE DATE: 19/07/2021
You must resubmit your request if you have not started work within 4 weeks of the 'Issue Date' above
A4
SCALE: 1:3400
essential energy
Job Number: 30137773
Sequence number: 200793320
Job location: 448 West Furracabad Road, Glen Innes
Map Centre: 151° 39' 40.8", -29° 45' 1.2"

Figure 3.15: Existing Services (Power and Telecommunications) including SEATA'S Proposed R&D Centre (described in Section 4).



*<u>Note:</u> Position indicative. Further clarification on location is required. Due to the nature of Telstra underground plant and the age of some cables and records, it is impossible to ascertain the precise location of all Telstra plant from Telstra's plans. The accuracy and/or completeness of the information supplied cannot be guaranteed as property boundaries, depth and other natural landscape features may change over time, and accordingly the plans are **<u>indicative only.</u>***

4. Proposed Project

4.1 Project Description and Overview

In summary, the proposed project relates to the development and operation of a small Research & Development (R&D) Centre to trial SEATA's pilot scale technology on a range of clean feedstocks over three year R&D period. Key components of the project, are summarised below and detailed further throughout **Section 4.** Key components are illustrated on the ***Site Plan*** (refer **Appendix 6** and **Figure 4.1**):

- **Site Preparation works** associated with earthworks to establish unsealed areas and pads.
- **Construction** of proposed sheds and establishment of supporting ancillary equipment
- **Operational R&D testing** of the small pilot scale RDSM technology via progressive campaign-based trials, with associated supporting activities.

Core aspects of the above project components are outlined further below and in **Table 4.1**, with further details described and assessed throughout **Sections 4** and **7** of this SEE and the supporting plans and appendices (including detailed plans and drawings in **Appendix 6**, and the project ERA in **Appendix 5**). Post-project considerations and actions/commitments are discussed in **Sections 4.12** and **7.5.8**.

Site Preparation:

- Preparatory earthworks including shallow topsoil stripping (typically <200mm) to assist establishment of all-weather/unsealed areas (refer *Site Plan*) including shed pads;
- Establishment of shed pads (including concerted areas/aprons) and all weather access/unsealed areas, including the Active Testing Area and light vehicle parking area. Locally available VENM (preferred) or ENM will be used (refer Sections 4.10 ,5.2.4, 7.4.4 and Appendix 5 for further details, including permissible use of VENM and ENM).
- Removal of several non-native trees (2 x large trees >10m in height, 4 x smaller trees <5m), and removal of groundcover to established unsealed areas as illustrated on the detailed *Site Plan (*see also Section 7.5.1*)*.
- Planting of vegetation for visual screening purposes (refer Section 4.11)
- Establishment of appropriate erosion and sediment controls (refer Section 7.4.4 and Appendices 1,6 and 5 for further details).
- Establishment of *builder's waste storage area* (skip bins etc) ready for construction (refer Site Plan, Section 7.4.5 and supporting *Waste Management Plan (WMP)*.

Construction Of Proposed Sheds & Establishment of Ancillary Equipment Ahead of Operations:

- Construction/establishment of the following: *(refer details in Section 4.9)*
  - Two (2) Proposed Sheds (*Shed 2* and *Shed 3*) with associated fit-out, including lighting
  - Connection of mains power to Shed 3 and Shed 2 (the latter expected to be underground trench installation, in consultation with Essential Energy).
  - A relocatable *Sound Enclosure Module* to house key ancillary equipment required for RDSM operation (e.g. diesel power air blower, generator and air compressor).
  - Four (4) proposed *Shipping Containers* (Mobile)
- Establishment of *six (6) rainwater tanks* associated with proposed sheds
- Re-purposing of an existing farm shed (**Shed 1**) and associated existing amenities (septic system)

- Establishment of RDSM and all associated monitoring and operational equipment ready for continuous run testing (including repurposing of Shed 1 for monitoring and control).
- Establishment of the active testing area, and all required ancillary areas and equipment for operations, including:
    - *Daily Working Stockpile* area
    - *Above ground diesel fuel storage and associated equipment*, including supplying diesel equipment located in the *Sound Enclosure Module*.
- Establishment of a dedicated *Slurry Tank* to collect waste from the Wet Scrubber (Emissions Control System).
- Minimisation, recycling and management of construction waste as per the project WMP (refer Section 7.4.5)
- All other supporting environmental management as per Section 7.

Operations:

- RDSM testing and associated supporting activities for an initial 3-year period using clean feedstocks (further outlined below and detailed in Section 4.6).
- Receipt, storage and use (thermal treatment) of clean feedstocks associated with testing
- Operation of key ancillary equipment including, but not necessarily limited to, the following:
    - Diesel power air blower, generator, and air compressor, housed in an insulated and relocatable *Sound Enclosure Module*.
    - Performance tractor for material loading/unloading
    - Light vehicles
- Associated Supporting Activities including supply, storage and use of diesel fuels, chemicals and other materials required for operations (refer Section 7.5.7 for materials used/stored including management of potentially hazardous materials).
- Temporary stockpiling (and characterisation) of biochar produced by the RDSM, prior to sending offsite to end users.
- Minimisation, recycling and management of operational waste (including disposal of wet scrubber slurry waste) as per the project WMP (refer Section 7.4.5);
- Grounds maintenance (APZ requirements to maintain grasses <100mm within APZ etc, refer Section 7.5.4)
- All supporting environmental management as per Section 7 and Appendix 5.

SEATA's small pilot scale system, the skid-mounted ***Research and Development Scale Model (RDSM),*** is illustrated in **Plate 4.1** below. The technology uses a unique combined form of catalysed pyrolysis and partial gasification, providing the benefits of both technologies whilst avoid key limitations of each. Key technology aspects to achieve this are detailed in **Sections 2 and 7.3**. Notably, by retaining up to half the carbon of infeed material into solid biochar via the first stage pyrolysis reactor, and not requiring *air* to oxidise the secondary gasification process (air is around 78% nitrogen and only 20% oxygen), both the *volume* and the *quality* of air emissions is very significantly improved by design. This is designed to reduce the risk of (otherwise) potentially harmful emissions whilst optimising opportunities for greenhouse gas reduction and Carbon Capture for Utilisation and Storage (CCUS) through a rich clean syngas (designed to be economically recoverable, including food & medical grade CO_2). The RDSM was invented by SEATA's founding director and renowned process engineer John Winter and built at a professional engineering workshop in Kurri Kurri NSW owned by fellow SEATA directors James Jordan

and Jim McFarlane, before being transferred to the project site near Glen Innes (owned by John) to undertake final instrumentation and monitoring system additions (PLC etc) for operational testing proposed by the current DA. SEATA is now seeking approval from Council and related agencies (notably NSW EPA) to prepare and develop the site to undertake small scale research and development trials as described throughout **Section 4** and **7**.

Proposed operational testing seeks to undertake an initial three (3) year trial of the small pilot scale *Research & Development Scale Model (RDSM)* of SEATA technology. The trials will produce and characterise measurable **syngas** and **biochar** processed from clean, natural feedstocks and standard fuels (outlined further in **Section 4.6**) for detailed analysis of inputs and outputs to verify the process concept and scalability under continuous run conditions, as required for commercial scale deployment. Feedstock trials would be undertaken on a **campaign basis**. **A summary of the proposed project is outlined in Table 4.1 below.**

The proposed project is located on Part Lot 3, DP1193185 at 448 West Furracabad Road Glen Innes, within an existing disturbed area historically cleared for farming (existing 5th generation farm). No significant clearing is proposed, with targeted removal of several **non-native** trees to allow establishment of proposed Shed 3 and the Active Testing Area.

As an R&D project, energy recovery at small scale is not viable nor proposed. The primary aim is to characterise the syngas and biochar/char products and demonstrate continuous run capabilities for a small-scale pilot to assist design of commercial scale-up in future projects on dedicated commercial sites elsewhere. Accordingly, syngas produced by the project will be afterburned and discharged to the atmosphere or used as feedstock to other processing steps (including process control).

Biochar produced will be temporarily stored and characterised for each feedstock campaign to ensure fit for purpose for end users separate to this project. End use applications are proposed to be conditionally controlled under a RRO & Exemption approval process with EPA**.** Biochar is expected to be used either in **land application** (e.g. broadacre soil trials on John Winter's surrounding farm and other suitable farms), **stockfeed** (premium grade biochar only per ANZBIG Code of Practice classifications), **and/or** other **industrial** applications and demonstrations (e.g. roads). Conservatively, in combination with potential soil applications, the **industrial applications (alone) exceed the biochar supply capacity of this small scale R&D project**, **hence minimising potential for waste legacy risk** (refer letter of support in **Appendix 4** from a key industrial user seeking around 35 times (35x) the project production capacity). Whilst not expected to be required, **further redundancy options** are also available such as co-firing in a power station (or even disposal) if required to ensure no onsite legacy risk.

The project site is over 850m from the nearest neighbouring rural residence (dwelling at R7 to the northwest), and over 1.2km from direct line of site rural residence R1 located southwest of the project site as illustrated in **Section 3** of this SEE. Principal noise sources from the project are associated with ancillary equipment and activities includes a low pressure air blower (used only circulate catalyst on a separate system to the reactors), a diesel generator for three-phase power, and an air compressor (used intermittently and of screw drive type (less noisy than reciprocating drive compressors); and ancillary activities associated with loading/unloading (via low-noise performance tractor) used intermittently during active RDSM operation. The RDSM itself runs relatively quietly, noting an enclosed afterburner and significantly lower gas volumes discharged as the system is not air-blown unlike many conventional gasifiers (refer Section 2 and 7.4.1).

SEATA's **RDSM** pilot technology is relatively small and has potential for relocating (skid mounted, with demountable stack) yet still includes world-leading process design and includes emissions control technology (wet scrubber system and thermal oxidiser afterburner, as detailed in **Section 7**).

Project consultation is detailed in **Section 6**. Based on discussions to date, a proposed project has been designed to be consistent with the objectives and requirements of the RU1 rural zoning of the site and permissible legislation, policies and guidelines, including stakeholder requirements for Essential Energy who own the low voltage powerline that traverses the project site .

Plate 4.1: SEATA's skid-mounted R&D pilot system – known as the ***RDSM* (*Research and Development Scale Model*).** Current unit processing capacity ranges 200-300 kg/hr.

Table 4.1: Summary of Proposed Development (refer **Sections 4.2 onward** for further details)

Aspect	Proposed Development	Clarifying Comments
Project Name	**SEATA Clean Energy and Carbon Sequestration Research & Development Centre** ***('SEATA R&D Centre')***	**Key Purpose and Objectives:** • Establish a small research & development centre to trial SEATA's pilot scale RDSM technology in order to demonstrate and characterise its potential for low emissions clean energy and carbon sequestration to assist the battle against climate change. • Only clean biomass and standard fuel feedstocks proposed (see below). • Provide representative data for potential future commercial scale up (elsewhere). • Detailed testing program to be developed in consultation with regulators and key stakeholders.
Proponent	**SEATA Holdings Pty Ltd**, trading as **SEATA Group** ("SEATA") Suite 1, Level 1, 160 Pacific Highway Charlestown NSW 2290 PO Box 313, Charlestown NSW 2290	
Project Location *(Land to be Developed)*	• **Part Lot 3, DP 1193185*** • 448 West Furracabad Road, Glen Innes NSW 2370 • **Land Owner**: John Winter (SEATA Director). See **Appendix 3** for Land Owner consent	• Refer Project Application Area in **Figure (v)** and **Appendix 1**, includes existing access from West Furracabad Road. Based on a registered/deposited plan, SEATA expects that only the registered plan boundary only Part Lot 3 DP1193185 applies to the project area including existing access. Cadastral errors have been identified and confirmed by the registered surveyor who prepared an approved Registered Plan for Lot 3 DP1193185 as detailed in **Section 3**. • SEATA Holdings P/L will utilise the land under agreement with the landowner, SEATA Director John Winter.
Zoning **Bushfire Prone Land**	Zone **RU1 (Primary Production)**, GISC LEP Lot 3 DP1193185 **not** shown as Bushfire Prone Land (BPL) on the NSW Planning Portal website mapping.	• Understood proposed R&D trial is consistent with existing permissible activities for RU1 under the GISC LEP. Pre-lodgement consultation indicated the development could be expected to be classified under Council's LEP permissible activities in RU1 potentially as a *Resource Recovery Facility*. • BAL Assessment Report not triggered. • Pre-lodgement consultation undertaken with Council and RFS. • Project Environmental Risk Assessment conservatively still considered typical aspects for BAL risk assessment, and considered both external bushfire approach as well as internal risk of fire starting onsite. Adherence to APZ management requirements and additional recommendations from RFS during consultation have been adopted.
Approval Period Sought	**Three (3) years** (active R&D operations/processing)	• Initial three (3) year RDSM active research testing period sought. Additional 6 month *biochar storage* allowance (post testing) is sought following completion of RDSM trials approval period to allow for final characterisation of biochar produced near the end of the active 3 year R&D trial period, prior to biochar use (e.g. land application under a RRO & Exemption). • If proved successful, extension to the approval may be sought separately at such time (with appropriate application for such).
Consent Authority **Development Type**	**Glen Innes Severn Council (GISC)** **Integrated Development** s4.46 (former s91) of EP& Act 1979, requiring both Development Consent from Council (triggered ***Local Development*** under the GISC LEP) and related approvals from NSW EPA, notably an *Environmental Protection Licence (EPL)* and *Resource Recovery Order (RRO) and Exemption*.	• Understood within RU1 zoning Council may potentially assess as a *Resource Recovery Facility*. • Includes s68 approval (Local Govt Act) for continued use of existing septic system (i.e. septic tank, rainwater tank, and transpiration area connected to Shed 1 seek approval for continued use of existing amenities, noting no significant change in people/loading). • Does not trigger *Designated Development* under Schedule 3 of EP&A Regulations (2000). • Requires EPL from NSW EPA as *Scheduled Activities* listed under Schedule 1 of POEO Act (including *thermal treatment*), and secondary Resource Recovery Order (RRO) & Exemption approval, and potentially NSW DPI for a *Biosecurity Permit* under the NSW Biosecurity Act 2015. General Terms of Approval (GTA's) from EPA and NSW DPI are requested accordingly. • Council DA checklist assessed; no other agencies considered triggered. Non-designated. • Premises based EPL anticipated, noting non-commercial R&D focus and temporary nature. EPL to cover *Scheduled Development Works* if EPA deems necessary, and expected to include conditional requirements for related RRO & Exemption approvals (as above). • As an initial 3-year, non-commercial Research and Development (R&D) project located outside the *Waste Regulated Area*, appropriate Exemptions are sought including via RRO and Exemption process (firstly for recovery, receipt, handling& storage, processing of waste as proposed by SEATA; and secondly later application of biochar to land once suitably characterised); waste levy exemption, and licencing exemption for generators of recovered feedstocks proposed for R&D trials (managed under RRO & Exemption process). • Pre-lodgement consultation has been undertaken with EPA (Armidale, Sydney). • Non-commercial R&D project with no proposed recovery of energy. = not trigger *NSW Energy From Waste Policy.* Exemption provisions under s88(5) of POEO Act and Cl 91-93 of POEO (Waste) Regulations are sought, including provisions to exclude waste levy liability and associated requirements. As noted above specific RRO & Exemption approval is sought. • Given project objectives to demonstrate technology for later commercial scale (i.e. provide a pilot scale reference), monitoring and testing requirements of the *NSW Energy from Waste Policy* and associated *Eligible Waste Fuel Guidelines* will be considered as relevant during development of the detailed testing program in consultation with EPA.

Aspect	Proposed Development	Clarifying Comments
Summary of Key Related Approvals Required	• **Development Consent** (GISC) • **S68 Approval** (onsite septic system) (GISC) • **Environmental Protection Licence (EPL)** (NSW EPA) • **Resource Recovery Order & Exemptions** (NSW EPA) • **Biosecurity Permit** (if required by NSW DPI)	• See Integrated Approval framework above and detailed in Section 5. S68 approval sought for continued/re-purposed use of the existing septic system associated with former house on the site (demolished c2013). • EPL to cover Scheduled Development Work if EPA deems so required. Conditions expected to cross-reference RRO & Exemption requirement. • RRO & Exemption anticipated in 2 parts – RRO & Exemption to cover generator (feedstocks), receipt, storage and processing of feedstocks using thermal treatment (RDSM trials), and secondly for biochar storage and Application to Land. The latter requires characterisation after thermal treatment is first undertaken, and subsequently could be conditioned separately to aspects for generator and processing. • *Biosecurity Permit* if required from NSWDPI under the NSW Biosecurity Act 2015 (refer Sections 5.2.3 and 7.5.2 for details). • General Terms of Approval (GTA's) from EPA and NSW DPI are requested accordingly.
Operational Employment Generation	• Total of approximately **10-15 Full Time Equivalent** (FTE) during active campaign testing comprised of teams on rotating shifts (see comments). • **Typically <5 operational personnel onsite at any one time**. • Reduced staffing in between testing campaigns as a non-commercial R&D project.	• Typically would comprise of operational testing teams of two to three staff on rotating shifts of approximately 8-12hrs during active testing, plus associated management/SEATA team personnel. • Typically < 5 operational personnel onsite at any one time which is consistent with loadings from the former household present on the same land on the existing septic system installed for a former house on the site (no longer present). Accordingly, no significant change to water use or loading of existing septic system which has continued to function without issue.
Estimated Capital Investment Value (Project CAPEX)	• Total estimated **Capital Investment Value (CIV) ~$354,000 incl GST**. Excludes existing RDSM plant. SEATA expects OPEX expenditure to be significantly higher than CAPEX due primarily to plant labour (jobs) and detailed lab analyses for R&D testing. • Staged trialling OPEX costs are dependent on final scope and testing for Stage 2 (detailed mass balance testing in consultation with EPA) and Stage 3 (remaining proposed feedstocks over the 3 year approval period).	• The project is below both State and Regional Significant Project economic thresholds (CIV). • Capital Investment Value (CIV) is <u>below</u> the *Regional Significant Projects* threshold of $5M. • Estimated CIV/CAPEX project value is for establishment of the centre as described herein. **Excludes** asset value of SEATA's self-funded design and construction of the RDSM pilot scale system already undertaken, and previous bench scale system/testing, and all OPEX. • Refer supporting ***Cost Estimate Report*** prepared for the project as appended to this SEE.
Hours of Operation	• **Campaign-based (intermittent) testing** throughout three year R&D trialling period. • **Continuous operation during testing campaigns** (24hrs/7 days) – RDSM and supporting staff and equipment. • **Daytime heavy vehicle deliveries only** (7am-6pm weekdays, 8am-1pm Saturdays), and intermittent, no evening/night deliveries. Note: Deliveries will be coordinated outside school bus time (8am) as far as reasonably practicable.	• Campaign based testing typically related to testing of each approved feedstock type. • Site layout arranged specifically to minimise loading activity during continuous testing (expected short duration, and will be minimised at night time typically <5 minutes during active loading). • Light vehicle movements on shift change, timed to avoid morning school bus wherever practicable. No evening/night-time heavy vehicle movements (daytime weekdays and Saturday morning only). Weekends avoided where practicable.

Summary of Key Project Components and Activities	Key aspects of the proposed Project involves:
	• **Re-purposing of one existing farm shed (Shed 1)** initially as an office/control room.
	• **Proposed new Sheds 2, Shed 3 and an initial noise enclosure shed 'Shed' 4** (consistent with rural character).
	• **Establishment of all-weather unsealed work pad** around RDSM, including small daily working stockpile area (bunded bays, covered/tarped).
	• **SEATA RDSM Trials (operational R&D)** as detailed in **Section 4:**
	  ○ **Campaign-based trials** – per feedstocks basis. Duration also determined by scope/length of detailed testing required by EPA for each feedstock. Specialist assessments (air, noise) will conservatively assess both assumed campaign basis (e.g. six months active in twelve) and worst case continuous run (annual).
	  ○ **Processing Rate**: Existing RDSM feed rate max **200-300 kg/hr** (typical <250 kg/hr).
	  ▪ Supporting specialist air quality assessment will include at **max 300 kg/hr**
	  ○ **Total annual throughput (processing volume):** is dependent on duration of campaign-based trials and associated testing requirements.
	  ▪ Conservative max throughput <**3,000 tonnes per annum (tpa)** of feedstock processed is sought for the project.
	  ▪ For relative context, max theoretical processing potential (<u>non-campaign-</u>based continuous operation) at <u>300</u> kg/hr continuously (non-campaign based) is <2,700 tpa, and at 250 kg/hr (continuous, non campaign-based) is <2200 tpa. Accordingly, for campaign-based testing with typical max rates of 250 kg/hr, throughput is likely to remain under <2000 tpa.
		• Refer Section 4 for details or the Proposed Project.
		• See also comments under *Feedstocks* and *Product Outputs* further below.
		• Annual processing volumes noted are upper maximums with very conservative assumptions (e.g. 100% utilisation and the upper maximum feed rates).
		• Proposed re-purposing of Existing Shed 1 and proposed new Sheds 2 and 3 under mixed building Class 7b/8 of the National Construction Code. Proposed acoustic enclosure ('Shed'4) anticipated to be Class 8. Potential future use of Shed 1 as the noise enclosure shed if control room relocated to Shed 3 (option will be included in noise assessment accordingly).
		• Suitability of biochar produced by the project for Application to Land sought under a Resource Recovery Order and Exemption required from EPA. This approach allows characterisation of biochar produced by trials in consultation with EPA ahead of 'fit for purpose' use such as agricultural soils trials and/or industrial applications (e.g. roads, concrete, etc) as appropriate.
		• Pending suitable characterisations biochar is currently proposed for use in R&D trials for **agricultural and/or industrial applications.**
		• **Biochar volumes produced by the project are expected to have sufficient available applications without presenting onsite legacy risk as outlined below, noting redundancy options provided if required (not expected).** SEATA has engaged with potential users for both agricultural applications (including broadacre trials), industrial applications (e.g. roads, concrete) and agricultural trials, as well as other potential industrial 'carbontech' applications (e.g. battery storage, activated carbon filtration). Letters of support are provided in Appendix 4. The information below provides some context to capacity of those trial applications in comparison to production from proposed R&D trials:
		  ○ **Agricultural trials** typically use biochar at rates up to 2t/ha (i.e. **20-200 t BC per 100 ha of trial areas**). If suitably characterised as expected given the clean feedstocks, there are ample farms available to consume significant volumes of biochar, including but not limited to SEATA Director John Winter's surrounding farm which will be first to be trialled (via conditional RRO Exemption approval sought). NSW DPI has also been consulted regarding potential assistance in agricultural trials with SEATA, including the local DPI research station.

Aspect	Proposed Development	Clarifying Comments
	○ Total resulting **biochar production of up to 1000 tonnes per annum is sought for the project.** ▪ Again is dependent on duration of campaign-based trials, with biochar product typically representing up to around 1/3 of infeed by total mass. ▪ Accordingly, for campaign-based throughputs of <2,000 tpa (see above) biochar production of **<700 tpa** could be expected. • **Proposed internal all weather unsealed access, light vehicle parking** • **Receipt and temporary storage of trial feedstock and ancillary processing materials** (e.g catalyst, fuel, scrubber chemicals) used in trials. • **Temporary storage of biochar product** prior to conditionally approved use (application to land) following satisfactory characterisation. • **Storage and disposal of relatively small quantity of expected inert waste (base salts) from emission control system wet scrubber** (expected **<20kL/yr** – about the size of a rainwater tank). • **Continued/re-purposed use of existing septic system** (no significant change in use with typically <5 personnel onsite at any time). • **New vegetation plantings** (tree screening). • **No permanent dwellings** (existing or proposed). BASIX does not apply to this project. **If required, a caravan (or similar)** may be used to protect personnel with temporary shelter from inclement weather (e.g. very cold/windy winter nights).	○ **Road trials** have the potential to use **30-300 t of biochar per km of road @10% biochar** content (wearing course and road-base stabilisation, the latter the largest), and potentially can be increased to 30% biochar (~900t biochar per km road) pending cost. There is already demand interstate for biochar for fully commercialised applications in roads. ○ Potential 'carbontech' trials are being scoped, including graphitic biochar for thermal battery storage which requires up to 5t per day by April 2022 (**~1800 tpa**), increasing up to 50t per day by early 2024 (**~18,000 tpa**). ○ ➔ *As such, even a relatively small amount of **industrial trials alone** (eg roads/cycleways and potentially battery storage) has potential to consume **all** the biochar produced from the project*. Biochar is currently a supply-limited commodity nationally (and globally). • Clarification is also sought from EPA as to requirements for *potential* for biochar to be used outside NSW (for example there is significant demand for biochar in roads interstate). • Redundancy commitments for alternative offsite use/appropriate disposal if required (e.g. co-firing in a power station) available to minimise legacy risk (not expected but conservatively included).
R&D Equipment to Be Used	• SEATA pilot scale ***Research & Development Scale Models (RDSM)*** **and associated support equipment** (e.g. blower, generator, air compressor) **–** refer **Plate (i)** and **Section 4** for further system details. • RDSM uses a combined catalysed slow pyrolysis and partial gasification system employing chemical looping. Includes wet scrubber emission control system. • Feedstock and biochar handling/loading typically undertaken using existing John Deer tractor (low noise performance tractor). Refer Section 4 for details. • Safe temporary storage of biochar product in sealed 205L drums (inert gas seal e.g nitrogen/argon) prior to fully cooling before potential transfer to 1000L bulka bags, before approved use as required (e.g. land application per RRO compliance testing). • Safe storage of small volumes (e.g drums and cylinders, no large tanks) of supporting fuels and chemicals including LPG, diesel, chemical solutions for wet scrubber (e.g. using suitable reagent for the relevant feedstock/processing characteristics (typically alkali reagents e.g. hydrated lime, sodium hydroxide or other as suitable). See Section 4 for details.	• Includes emission pollution control (wet scrubber using suitable reagent for the relevant feedstock/processing characteristics (typically alkali reagents e.g. hydrated lime, sodium hydroxide or other as suitable, producing inert base salts which will be characterised for appropriate disposal). • Proposed new sheds will be in accordance with GISC DCP and Building Code of Australia (BCA) requirements as relevant.
R&D Trial Feedstocks	Natural, uncontaminated feedstocks and standard fuel (coal) as outlined below. **Three initial target types/groups of feedstock are proposed, including blending and co-processing as follows. Specific staged testing is clarified further separately in Table (ii):** 5. **Source-separated uncontaminated biomass**, including ***'non-putrescible vegetative waste from agriculture, silviculture or horticulture'*** and ***'wood waste'*** pre-defined as *general solid waste* under the POEO (Waste) Regulations 2014 (Cl49, Part3 Div1), ***and/or*** **biomass meeting definitions of *Eligible Waste Fuels*** (as per s3 *NSW Energy from Waste Policy* and Part 4 of the *NSW Eligible Waste Fuels Guidelines*), and native biomaterial (e.g. woody weeds, biomass crops). **Initial R&D trials on biomass feedstocks will be prioritised as follows:** **a) Invasive Woody Weeds (Invasive Native Scrub) / Waste Native Biomaterial** – removed under existing legal approvals held by suppliers (and currently commonly open burned / wasted). **This is the first priority target for R&D trial, conditionally approved as such if required.**	• Energy recovery from waste is **not** proposed by this R&D project (characterisation only, with syngas after-burnt or recycled as feedstock to other processing steps). Accordingly, NSW *Energy From Waste Policy, Eligible Waste Fuels Guidelines,* and *NSW Energy From Waste Infrastructure Plan* are not applicable. Notwithstanding this, due to objectives of providing *Proof of Concept* reference for future commercial scale up, SEATA has proposed selected feedstocks and detailed monitoring which has considered the NSW EfW Policy framework. • Whilst SEATA technology has potential to treat nearly all carbonaceous feedstocks, pre-lodgement consultation with EPA recommended narrowing earlier broad lists of potential feedstocks. Accordingly, three target types/groups proposed. • The NSW Energy from Waste (EfW) Policy defines the following feedstocks proposed for R&E testing as ***Eligible Waste Fuels,*** which are considered by EPA to pose low risk of harm to people or the environment due to their origin, composition and consistency. These can be thermally treated under a RRO and Exemption approval from EPA: ○ *Biomass from agriculture* ○ *Forestry & sawmilling residues* ○ *Uncontaminated wood waste* • **Invasive Native Scrub (INS)** lawfully supplied under existing legal approvals in NSW held by the owner/supplier of the INS e.g. existing *Property Vegetation Plans (PVP)*. **Currently INS is typically cleared, windrowed and open-burned** direct to the atmosphere. Resource recovery and sequestration with biochar via SEATA technology is considered a **significant improvement in environmental outcomes** than the currently approved management of this otherwise burned and polluting wasted resource. • **Biosolids** are listed under Table 4 of the NSW EfW Policy as a ***separated waste stream*** which can be ***"used only in a process to produce char for land application"*** *as a non-eligible waste fuel* <when associated with a project proposing energy recovery>. R&D

Aspect	Proposed Development	Clarifying Comments
	b) Subsequent staged biomass trials (subject to external funding) include, but are not limited to, **agricultural biomass and crop residues** (including from NSW DPI research field trials to rehabilitate degraded lands with energy biomass crops), and **forestry and saw milling biomass residues** (including **bushfire hazard reduction material**). **Section 4.6** of this SEE provides further information. 6. **Biosolids** (including municipal and agricultural). Only municipal grades suitable for direct application to land under current EPA guidelines. Agricultural biosolids will require a conditional RRO & Exemption approval with supporting additional information (which can be condition of approval). 7. **Coal** (a '*Standard Fuel* under NSW regulatory instruments). Thermal and coking coal. 8. **Co-Processing/Blending** – primarily of the above such as *biosolids + biomass (INS etc)*, and *coal + biomass (INS etc)*, or various biomass blends, but potentially also including minor addition of trace minerals (e.g. clay, iron) and potentially nutrients (phosphorus, nitrogen if needed) to create custom biochars (e.g. trial biofertilisers to match soil constraints). Following initial INS trials, the order of trialling subsequent feedstocks (biosolids, coal and remaining types of source-separated biomass) may alter as needed. Biosolids are currently expected to be the second trial. If required, source-separated biomass listed above could be conditionally approved in a staged manner, with INS initially until demonstrated successful prior to other biomass and beyond, in order to facilitate accelerated approval.	demonstration of safe and sustainable thermal treatment technology such as SEATA could provide a potential pathway to better resource recovery options for biosolids with improved environmental outcomes. ○ Biosolids classified as suitable for **direct application to land in NSW to EPA guidelines** will be tested (ie. ***Unrestricted Use*** and ***Restricted Use 1&2***). ○ No wet biosolids (slurries) – 'filter cakes' only - typically biosolids <80% moisture are proposed/suitable for RDSM treatment, handling and storage. • **Coal** is a ***Standard Fuel*** in NSW under the POEO (Clean Air) Regulations. Standard Fuels do not need to meet the same requirements / criteria as Eligible Waste Fuels, but still require approval for use **when energy recovery is proposed**. R&D testing will identify the technology's potential for lower emission energy (e.g. hydrogen from coal), with solid carbon sequestration (compared to conventional incineration of coal with toxic ash waste). • Under proposed condition of approval for RRO & Exemption secondary approval requirement, any staged R&D trials proposing agricultural biosolids would be pre-consulted with EPA and suitably characterised prior to commencement, allowing further source-specific information requirements to be identified and assessed by EPA at such time. • **No treated/engineered/ contaminated feedstocks, no plastic-based feedstocks.** • Proposed feedstocks groups #1) and #2) are pre-defined **as *General Solid Waste (non-putrescible)*** under clause 49 in Part 3 Division 1 of the POEO Act, as further defined under Schedule 1 of the Act, as is suitable for recovery by a *Resource Recovery Facility* (refer Section 5.3 discussion of POEO Act, licencing and integrated approval). • **Monitoring requirements** under the NSW EfW policy and related Eligible Waste Fuel Guidelines will be **considered in development of detailed testing program** in consultation with EPA due to potential future use of data in commercial energy recovery. This has important context to biosolids as it is not currently classified as an Eligible Waste Fuel in NSW (EPA updates the lists periodically based on current evidence from R&D such as that proposed). • Trial feedstocks will typically be delivered for each campaign in appropriate containers (e,g bulka bags or similar, ~1m³/1 tonne per bag) and typically stored safely undercover (e.g. in proposed storage sheds). Smaller daily working volumes will be kept under cover (e.g tarped) in a dedicated area near to RDSM to minimise loading needs and duration, particularly beneficial during night operations.
Products / Outputs	• Gas and Solid carbon products only. *No liquid products*: no tars or resins, no bio-oils. Only relatively small volumes of slurry (expected inert base salts) from wet scrubber emissions control for disposal. • Gas Products: **syngas** comprised primarily of hydrogen (H_2), CO, CO_2 and biomethane. Syngas to be characterised and afterburned, no recovery at pilot R&D scale proposed. • Solid Carbon Product: Biochar (functional carbon). See expected production values earlier above.	• **No proposed energy recovery** at R&D scale (product characterisation only for potential future recovery in commercial scale systems elsewhere). • Specifically designed to avoid liquid products (superheated to gas), avoiding odours and problematic residues/wastes to be managed. • Syngas to be characterised (tests). The gas produced by the project will be after burnt and discharged to the atmosphere or used as feedstock to other processing steps (including process control) • Solid product (biochar) produced requires RRO & Exemption approval from EPA for production, storage and application to land. • Storage of biochar in drums (205L) with inert gas seal (e.g. nitrogen/argon) to prevent oxidation until fully cooled, before transfer to 1000L bulka bags prior to use. Temporary storage onsite until successfully characterised for proposed uses (e.g. application to land). Redundancy options for use in co-firing for power or disposal only if required (not expected). • See related notes earlier above under *Summary of Key Project Components* including potential trial uses and volumes for biochar produced by the project.
Research & Development Testing	• Proposed ("walk before run") ***Technology Testing Program*** to align with staged feedstock testing – summarised in **Table (ii)** separately below. Summary concept for each feedstock is: ○ **Stage 1 = Short initial 'screening level' test** on 1 feedstock to ensure system functional and ready for detailed testing (in Stage 2): ▪ Proximate & Ultimate Analysis on Feed and Biochar only ▪ Targeted manual gas samples for lab analysis (screening suite) ○ **Stage 2 –Detailed testing on the three priority target feedstocks** (INS native biomaterial, biosolids and coal) ▪ Detailed testing developed in consultation with EPA (mass balance) ○ **Stage 3** – remaining approved biomass feedstocks trials as per above. Tests may move straight into detailed testing (or both). • ***Detailed Testing Program*** to be developed by emissions expert in consultation with NSW EPA, aimed at mass balance for infeed and solid and gas products, including wet scrubber waste materials. • Negligible fugitive emissions expected during start-up and shutdown. • Supporting Air Quality Assessment to be prepared by air quality expert in accordance with EPA assessment requirements (TBC) prior to operations.	• Staged initial testing via "walk before run" approach provides regulatory and investor confidence in the RDSM system performance prior to commencing longer and more detailed (expensive) testing to follow (Stage 2). • Whilst not technically required (no energy recovery proposed), due to proposed objectives to provide data for future commercial scale up, the ***Technology Testing Program*** will consider relevant monitoring and testing requirements of the NSW Energy from Waste Policy Statement and Eligible Waste Fuels Guidelines, including real time analysers as relevant.

Aspect	Proposed Development	Clarifying Comments

Summary of Expected Effects	• **Key aspects** identified via **consultation** and ***Environmental Risk Assessment*** were **noise, air quality/GHG, visual, waste** (e.g. wet scrubber, biochar product).
	  ○ Risk minimisation and mitigation controls identified.
	  ○ Specialist assessments for noise and air quality proposed to confirm currently adopted management measures appropriate. Air quality will also consider net GHG due to syngas flaring at pilot scale (not recovered for energy), balanced against sequestration by biochar. No other specialist aspects required.
	  ○ Nearest rural residence >0.85 km (residence R7 to northeast, obscured views through distant trees). Direct line of sight to residence R1 >1.2km to southwest.
	  ○ Near neighbours R1 and R9 consulted and inspected RDSM in H1 20121. No significant concerns raised, request to time shift changes to avoid school bus times on West Furracabad Rd will be adopted. R7 has pre-existing limitations for engagement with the Lot 3 land-owner, and will be notified by GISC during DA process.
	• No significant Impacts (including cumulative) predicted.
	• *Statement of Commitments* provided.
	• Refer Section 7 for details.
		• Supporting Environmental Risk Assessment identified key supporting information required (air, noise). Due to project design and location these are proposed as desktop assessments for noise and air quality prepared by suitably qualified expert consultants (SEATA can provide further details to Council and EPA as required). Should these indicate any concerns further assessment would be undertaken (not expected to be required).
		• Project on existing disturbed farmland, no remnant native vegetation, no significant vegetation clearing required or proposed (e.g. 2 non-native trees to be removed for proposed Shed 3 and the all-weather loop surface). Surface works to establish all weather unsealed work pad and all-weather loop access will involve shallow topsoil strip only (reused as topsoil dressing on existing grassed / farm areas).
		• No significant odour or dust generated by the development. Very low levels of particulate due to design and emissions control (wet scrubber).
		• Performance confirmed by monitoring during R&D testing.
		• No significant light (enclosed afterburner) site lighting structured to minimise potential directional lighting toward distant residences (e.g orientation of pad lighting).
		• No significant change or impact to heavy vehicle traffic on West Furracabad Road warranting further detailed assessment, no works within public road reserve proposed (no change to existing site access from West Furracabad Road, sufficient for project needs).

Documents Supplied with this SEE Document	• **Statement of Environmental Effects (SEE) (this document)** • **Environmental Risk Assessment** • **Design Drawings (Existing Shed 1, Proposed Sheds 2, 3)** • **Site Plan** • **Erosion and Sediment Control Plan (ESCP)** • **Project Cost Estimate Report** • **Waste Management Plan** • **Advertisement/Notification Plans**	• ESCP proposed as a design plan (**Figure 7.5**) appropriate for this scale of development, addressing management of disturbed areas (internal all weather unsealed access, parking and workpad) and diversion of clean water as per the Blue Book. • Environmental Risk Assessment included consideration of bushfire aspects.

Further Supporting Environmental Information to be Supplied
 	
(additional to that supplied herein)
	• **Specialist Assessments**:
	  ○ Air Quality
	  ○ Noise
		• Noise and air quality specialist reports to be undertaken in accordance with EPA/GISC environmental assessment requirements prior to operational commencement.
		• Noting the substantial risk management controls in place for these aspects (refer Environmental Risk Assessment in **Appendix 5**), specialist reports are proposed as conservative desktop modelling assessments (in accordance with relevant guidelines) using conservative adopted inputs and criteria to assess likelihood of compliance at the sensitive receptors (which are notably >850m). Further detailed assessment is triggered if recommended by the specialist.

Figure 4.1: Proposed Site Layout for R&D Trials

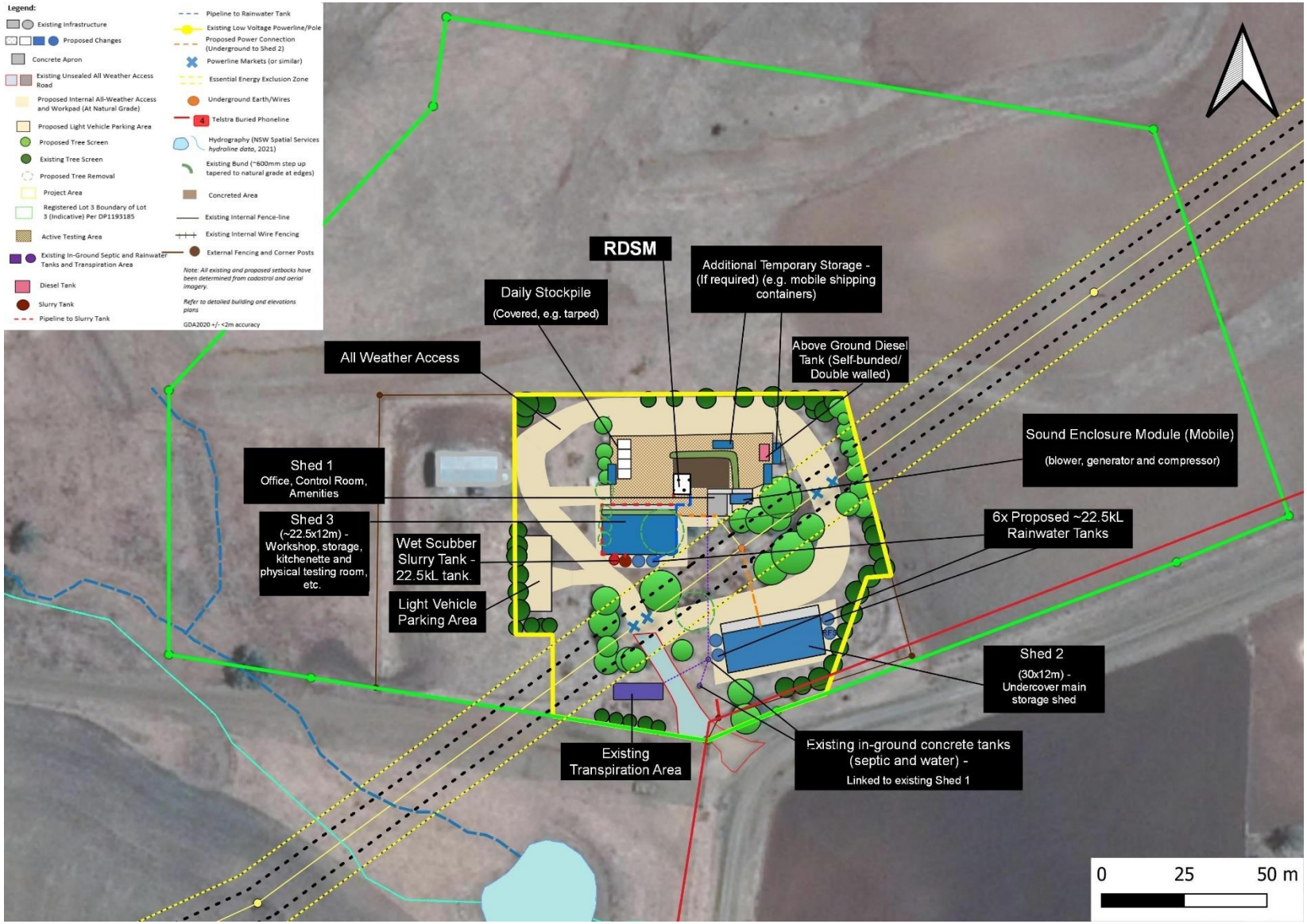


Figure 4.2: Detailed Site Plan – Proposed Project *(refer Appendix 6 for full details, including a second version with broader view to full Lot 3 boundaries)*

Figure 4.3: **Erosion & Sediment Control Plan** *(<u>Note</u>: See Appendices 1 and 6 for version with broader extended view showing existing clean water diversion)*

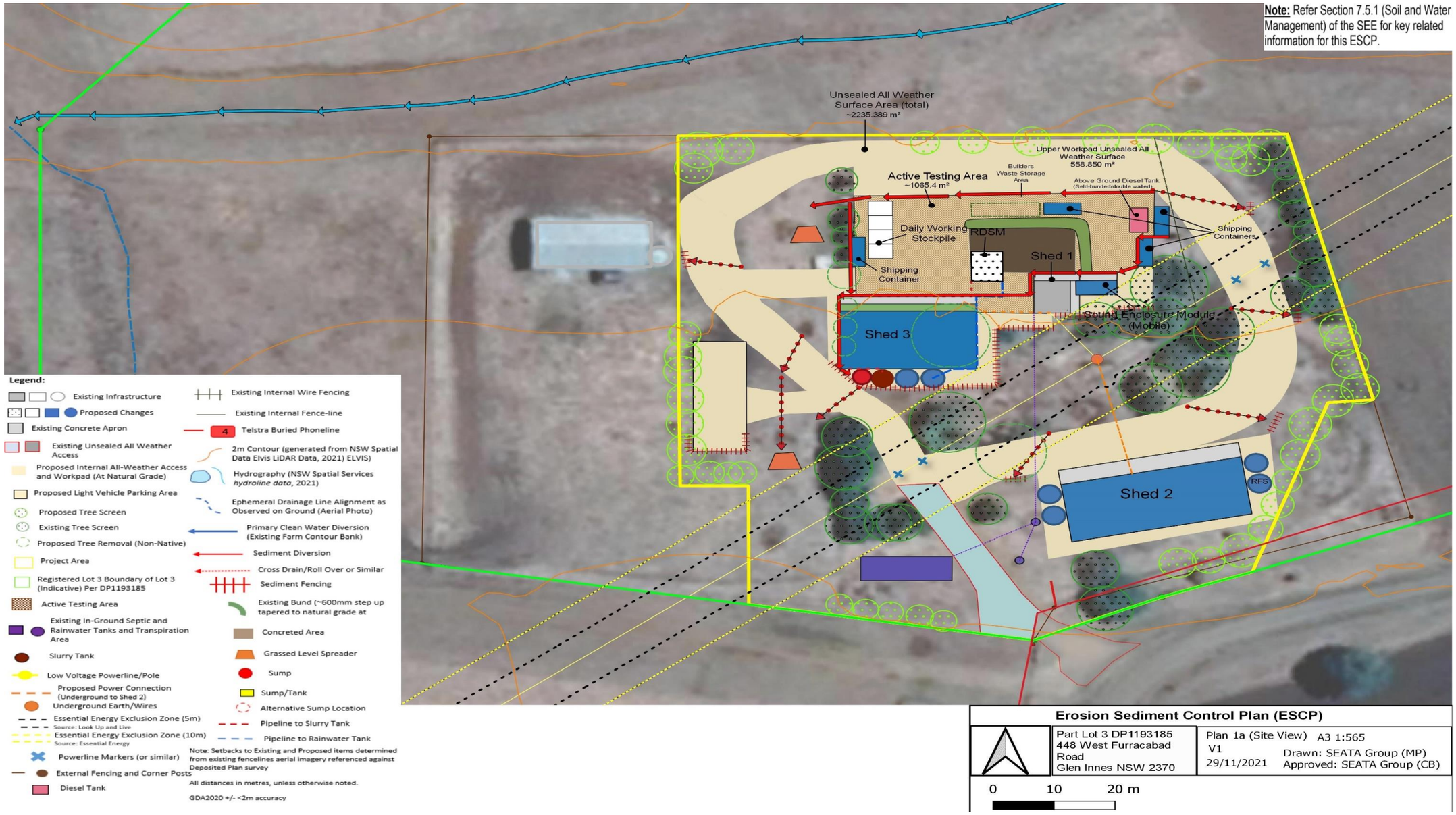


Plate 4.2: RDSM control and field research

	
Above: The RDSM will be run via PLC linked to a control and monitoring room in a nearby site shed.	**Above:** Chars will be physically analysed during trial research onsite. Comprehensive analyses for a detailed sampling program will be undertaken offsite by NATA certified laboratories.

Plate 4.3: RDSM control and field research

Above: A low-noise high performance tractor (the farm's existing John Deer 6330 or similar) will be used for loading and unloading feedstock and char product materials and general duties. The active working area (project pad) has been laid out to minimise vehicle movement requirements, particularly at night.

Above: Char produced by the RDSM will be transferred into 205L steel drums or similar and safely sealed with inert gas (e.g. nitrogen/argon) to prevent oxidation until fully cooled. **Note**: SEATA process results in no/extremely low volatile content in char - once cooled has negligible risk of 'sponcom' fire compared to coal, charcoals etc. Temporary drum storage (200L) may be transferred to bulka bag storage (1000L) once fully cooled (typically within a few days), before transport for final use. Bulka bags will be effectively isolated/sealed to minimise potential for dust during storage and transport etc (e.g. duffle top bulka bags or covered bags etc).

Plate 4.4: Proposed RDSM control and Primary Feedstock and Product Storage Sheds

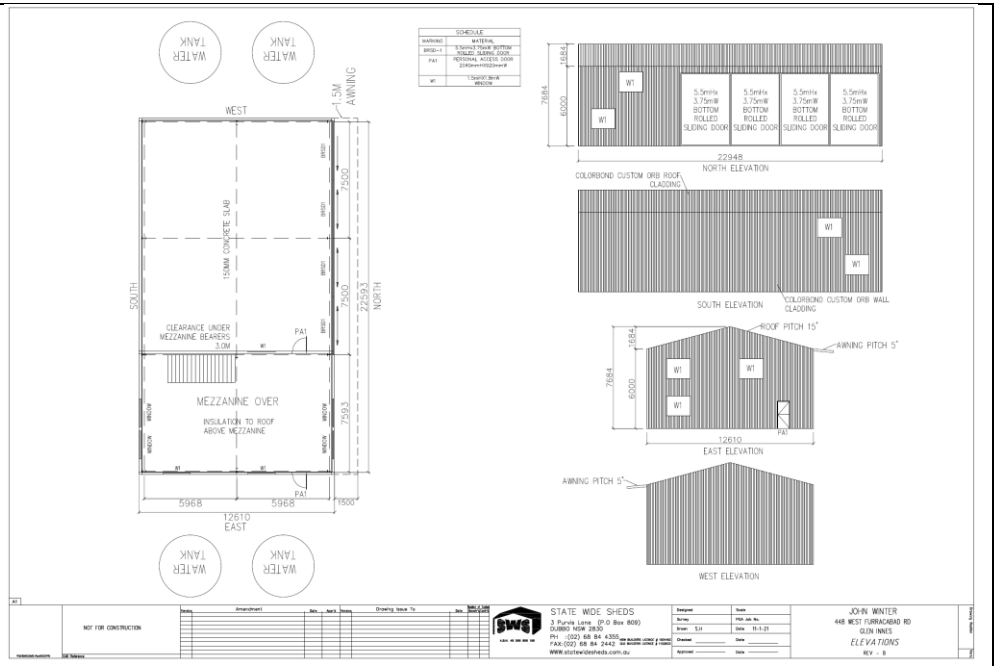
	
Above: Existing colourbond steel farm shed (**Shed 1**) with toilet & amenities connected to existing septic and rainwater in-ground tanks located nearby to southeast (refer **Figure 4.2**). Proposed for operational RDSM monitoring and control, administration staffing, crib room and amenities.	**Above:** Design drawings for proposed Shed 3 to be located nearby southwest of Shed 1. Refer **Appendix 6** for detailed drawings of proposed Sheds 2 and 3. Similar colours to the existing Shed 1 are expected to be proposed, matching the surrounding rural character.

Plate 4.5: Existing vegetation screening (LHS) and Views on western side of proposed laydown area (RHS)

<table>
<tr>
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<tr>
<td>Above: Looking east within Lot 3 at existing tree screen (small exotic conifers) near proposed workpad area and RDSM (viewed from western side). Approximately four of these small existing non-native trees will need to be removed for proposed Shed 3 and pad access areas as shown on the site plan.</td>
<td>Above: Looking south from the northeast corner of project site. Unsealed all weather workpad proposed in this area as shown on Figure 4.1.

Below: View westward from NE corner of Lot 3/project site across northern end of the proposed workpad/laydown area (existing hay shed in background, not a part of the project area).</td>
</tr>
</table>

Plate 4.6: Example of key ancillary equipment proposed to support the RDSM trial – to be housed in the proposed Sound Enclosure

	
Above: Skid mounted mobile diesel generator proposed to provide the required 3 phase power for RDSM component operation. The system is rated to 20kVA but only ~5kVA is required, so is expected to 'idle, minimising noise and fuel. Diesel fuel stored separately (per HAZOPS) in dedicated bunded area. Required only at R&D scale, for future commercial systems (beyond RDSM) energy recovery from syngas production would likely power such components. The generator will be located within a dedicated ventilated sound enclosure to minimise noise, along with equipment such as the blower and air compressor.	**Above:** Skid mounted low pressure air blower/compressor (integrated diesel powered) used to circulate recycled catalyst for the RDSM during active trial tests (air is not used within the reactor). Where practicable the blower will have a muffler system fitted and will be located within a dedicated ventilated acoustic enclosure (proposed sound enclosure), along with other noise generating equipment such as the generator and air compressor..

4.2 Experienced Project Team

The project team is highly experienced in a diverse range of fields including process and chemical engineering, complex industrial design and fabrication, commercial law, capital raising and intellectual property management, commercial valuation, power and communications, and environmental assessment, management and approvals.

The technology design, construction and operations team is led by renowned process engineer John Winter, supported by manufacturing design leads Jim McFarlane and James Jordan. John will be the overall project lead for proposed R&D testing (noting he is also the landowner and lives on the neighbouring property). John will be supported by a project team of appropriate technical hands employed SEATA. The experience of the SEATA board is further detailed in **Section 8.3**.

4.3 Benefits to the Glen Innes Region and Beyond

- **Support for regional "green" jobs in an emerging sustainable industry.**
- **Support into the local business community**
- **Supporting positive action on climate change** and rehabilitation of agricultural land in a region that has suffered some of the worst effects of this in recent times.
- Enhances Glen Innes position as the home of sustainable and renewable energy technologies.
- The research pilot trial is being pursued as a collaborative approach with industry and government partners.
- Demonstration and proof of concept of SEATA technology will enable triple bottom line assessment of economic, social and environmental benefits that have potentially global significance.
- Supports GISC 2019 motion declaring a climate emergency and commitment to a more sustainable future.

4.4 Alternative Options Considered

SEATA has developed the technology over a decade and the proposed project over a number of years. Following successful preliminary batch process results at bench scale, SEATA directors decided to self-fund design and construction of the pilot scale RDSM. Options to trial the technology as a ***mobile*** system (non premises based EPL) have been considered and previously proposed to prospective project partners/clients (including wastewater, defence and others) but were not considered feasible due to cost and/or regulatory complexity risk for emerging pilot scale advanced thermal treatment technologies in NSW.

Following consultation and engagement with regulators and stakeholders, a **premises-based** approach was preferred, and the self-funded development of a R&D trial site was determined as most appropriate. Whilst considered *technically achievable* in a safe and environmentally friendly manner by design, options to trial anything other than clean, uncontaminated natural feedstocks (such as plastics and other contaminated feedstocks) were dropped from consideration due to regulatory risk and non-permissible zoning at the project site (as noted elsewhere in this SoEE these would be considered for testing elsewhere at an appropriate industrial site).

The proposed project site in Glen Innes provides a number of logistical, technical, geographical, financial, environmental, community, policy and regulatory benefits over alternative sites considered in other locations, including Newcastle/lower Hunter. The site provides a genuinely more feasible option, making it the most preferred option currently available to SEATA within NSW.

As climate change, linear economy and waste now significantly challenges the world (noting the *'climate crisis'*), a *"Do Nothing"* option is understandably not considered appropriate for this promising technology.

4.5 Proposed Project Timeframes

- SEATA seeks to commence research and development testing **as soon as possible in Q1 2022.**
- Related approvals to allow commencement (e.g. s68 Approval for septic system, EPL and RRO & Exemption approvals for generation, receipt, storage and processing of first feedstock) are sought concurrently with DA approval.
- The proposed detailed testing program will be developed in consultation with EPA and council prior to commencing Stage 2 (detailed testing) and is expected as a condition of approval. Detailed mass balance analysis is proposed to be included. It is envisaged development of the program with EPA can commence concurrently with DA assessment to align project timelines.
- It is envisaged that site preparation works for RDSM testing will take approximately **2-4 weeks.**
- R&D Trials will be undertaken on a campaign basis over the proposed initial three year approval period as detailed in the project description.

4.6 Proposed Feedstocks, Staging and Management

*Note: Regulatory aspects for all proposed feedstocks, including context to progressive Resource Recovery Orders (RRO) & Exemptions approvals sought from EPA on a staged basis, are detailed in **Section 5**.*

For clarity, only lawfully obtained feedstocks (particularly vegetation) will be accepted by SEATA for R&D testing. This will be controlled through:

- Development approvals only for permissible feedstocks proposed under this SEE; and
- Specific information required from any party supplying material to SEATA for R&D testing as outlined in this SEE (including a signed *Statement of Origin* document or similar).

During consultation with all stakeholders, SEATA has committed to a conservative "walk before run" approach to testing the technology. This has included:

- **only permissible uncontaminated "clean" natural feedstocks and standard fuel (coal) to be tested at this R&D Centre** as further described in **Section 4.6.1** below.
- **Staged progressive testing of each proposed feedstock (campaign based R&D trials),** spread across the three year R&D trial period. The progressive approach will facilitate easier assessment by regulators and improved confidence in investment funding for each trial. **Stages 1-3** have been proposed as detailed further in **Section 0** (including **Table 4.5** summarising staged testing).
- The staged approach allows (and requires) **conditional secondary approvals**, ***RRO & Exemptions*** and ***Biosecurity Permits*** (as relevant), to be sought from EPA and NSW DPI respectively on a progressive basis. This allows further detailed information for each feedstock to be progressively provided to regulators to their satisfaction prior to final approval to commence testing. This also allows specific applications for each biochar produced to be identified that matches the quality of the biochar (e.g. for agricultural or industrial application).

Notwithstanding this, it is noted that **regulatory planning permissibility for all proposed feedstocks proposed is addressed in full in this SEE**, as detailed in **Section 5**. This seeks to enable development consent and EPL to be granted with conditions for progressive staged secondary approvals thereafter, as illustrated in the figure shown in **Section 5.1**.

To allow initial/preliminary assessment of the first proposed feedstock to be tested (Invasive Native Scrub / native biomaterial), **Appendix 14** provides information typically required by EPA for RRO & Exemptions and Eligible Waste Fuels, and bench test results for INS will be provided to EPA in separate confidential Annexure A. As noted above and detailed in **Section 5.4**, a two-step RRO& Exemption process is proposed as follows.

Proposed two step RRO & Exemption process for each feedstock test campaign:

- **1)** RRO & Exemption granted for **resource recovery, thermal processing, feedstock and biochar characterisation, and temporary storage of biochar until results confirm fit for intended purpose**.
- **2)** RRO & Exemption for **biochar application to land** (if/where relevant). This will utilise the characterisation data from Step 1 across all testing, as discussed in Section 7.4.

Further information can be supplied if/as required in consultation with EPA in both steps.

4.6.1 Proposed Feedstocks

As noted earlier in this SEE, following feedback from EPA and in line with SEATA's commitments to *'walk before run'*, a progressive **three stage R&D testing program** will be undertaken across three Stages as summarised in **Table 4.5** in **Section 0**, using feedstocks described further below. **Stages 1** will commence with the first feedstock – *Invasive scrub (INS) / waste native biomaterial*.

Proposed feedstocks in **Stage 1 and 2** are outlined below in **Table 4.2**. Further permissible feedstocks (subject to adequate further detailed information in secondary RRO & Exemption approvals) for potential trials in **Stage 3** are listed in **Table 4.3**. Consideration of **higher order use** and **circular economy** in resource recovery for proposed feedstocks are discussed further in **Section 4.6.4**.

As discussed in **Section 5.2.3** even though energy recovery is not being proposed (as an R&D project), where practicable the project will be undertaken generally in accordance with the *NSW Eligible Waste Fuels Guidelines* and requirements of EPA for RRO & Exemptions (noting practical limitations in automated continuous monitoring). These also include specific feedstock-based requirements including the following:

- Applications to use ***agricultural biomass*** will include information regarding sprays and fertilisers applied to crops or material, and any potential impacts of spray drift. *Note: Invasive woody weeds (INS) comes from natural re-colonised (invaded) areas, therefore sprays and/or fertilisers are not expected to be associated with its origins.*
- Applications to use ***uncontaminated wood waste*** will include information about quality control and assurance processes throughout the supply chain that addresses contamination and control of the waste stream.
- Applications to use ***forestry and sawmilling residues*** will include information about sprays or treatment that the waste would have been subject to, including fire retardants.
- Applications to use ***source separated green waste*** will include information about the supply pathway of green waste, and quality control and assurance processes in the supply chain that addresses contamination and control of the waste stream.

SEATA will require a ***Statement of Origin*** document (or similar) from suppliers of all vegetative biomass feedstock that covers the **entire supply pathway**, including details of QA/QC processes in the supply chain to control risk of contamination, including details of any potential history of sprays or fertilisers applied to the biomass, or treatments (e.g. fire retardants). These will be provided to EPA prior to being received and

processed by SEATA at the R&D trial site as part of conditions of approval (e.g. to inform conditional RRO approval). NATA accredited laboratories will be used to analyse feedstock for chemical characterisation as part of mass balance testing during R&D trials.

Each of the following feedstocks in Table 4.2 below will be sought in a staged approach with appropriate RRO & Exemption information supplied to EPA at such time, as a condition of approval. As noted below this commences with INS native biomaterial.

Table 4.2: Proposed Initial Target Feedstocks (Stage 1)

Stage 1 and 2: Priority Target Feedstocks	Clarifying Comments
Stage 1: INS / Waste Native Biomaterial	
1. Clean source separated natural biomass, specifically targeting INS (Invasive Native Scrub 'Woody Weeds') / waste native biomaterial).	• **INS native biomaterial is the first priority target for R&D trial** • **INS or 'Woody weeds' declared invasive in NSW** a major problem in the central west where it is **currently cleared and open burned to the atmosphere control it**. Pyrolysis could potentially provide a significant environmental improvement avoiding CO_2 from burning, sequestering carbon and providing beneficial carbon back to the soil. • As per permissible regulatory definitions in **Section 5**. • Refer information LLS fact sheet on INS in **Appendix 10**, and relevant to Eligible Waste Fuel / RRO & Exemption Guidelines provided in **Appendix 14** • **Biosecurity Permit** sought from NSWDPI as applicable for this and any/all relevant feedstocks in Stages 1-3.
Stage 2 Feedstocks *(in addition to detailed testing of INS native biomaterial also in Stage 2):*	
• **Municipal Biosolids** classified suitable for land application in Agriculture to NSW EPA Standards	• ***Unrestricted Use*** **and** ***Restricted Use 1&2*** are suitable for direct application to Agricultural Land as per the NSW EPA Biosolids Guidelines and Biosolids Resource Recovery Order and Exemption requirements (2014). Refer **Table 4.2.** • Only appropriately stabilised biosolids filter cakes with <70-80% moisture may be received and stored (e.g. mechanically dewatered filter cakes). No liquid sludges. • As per permissible regulatory definitions in **Section 5,** noting biosolids is currently a *non-eligible waste fuel* (but not proposed for energy recovery). R&D trial as a permissible recoverable waste. • See also *Biosecurity Permit* as per INS above.
• **Forestry and Sawmill Residues / Native Biomaterial**	• Direct from source, no processed/treated timber • Clean wood waste residuals and milling offcuts and mill sawdust • Bushfire hazard reduction biomaterial • Prioritised from plantation forests areas wherever possible.

	• As per permissible regulatory definitions in **Section 5**.
• **Coal**	• Regulated as a 'Standard Fuel' in NSW. The trial will help demonstrate SEATA's technology potential to harness energy value of coal through gasification with significantly lower CO_2 emissions (and potentially negative emissions). • Both thermal and coking coals are envisaged to be trialled.
• **Co-processing and Blending**	• Co-processing / blending of the above e.g., Coal and INS, Biosolids and INS. • Co-processing facilitates energy balance and customised biochar considerations to suit soil needs (higher quality biochar), and potentially provides carbon neutral or negative operation. • Blending can also involve minor addition of small amounts of targeted minerals (e.g., clay, zeolites, lime) and potentially nutrients (phosphorus, nitrogen, if needed) in the R&D feed to develop tailored higher value products to address specific soil constraints.

Each of the following feedstocks in Table 4.3 below will be sought in a staged approach with appropriate RRO & Exemption information supplied to EPA at such time, as a condition of approval.

Table 4.3: Stage 3 – Progressive Additional Biomass Feedstocks (Remainder of 3 Year R&D Period)

Stage 3) Proposed feedstocks for progressive testing during remainder of 3 year R&D Period	Clarifying Comments
Note: The majority[3] of the following feedstocks below have been collectively described in this SEE as 'Source-separated uncontaminated biomass' *as further specified in the clarifying comments.* *(only potential exception is agricultural biosolids).*	• *Source-separated uncontaminated biomass,* ***including*** ***'non-putrescible vegetative waste from agriculture, silviculture or horticulture'*** *and* ***'wood waste'*** *pre-defined as general solid waste under the POEO (Waste) Regulations 2014 (Cl49, Part3 Div1)*,* ***and/or biomass meeting definitions of Eligible Waste Fuels*** *(as per s3 NSW Energy from Waste Policy and Part 4 of the NSW Eligible Waste Fuels Guidelines), and native biomaterial (e.g. woody weeds, biomass crops etc)****.*** • *As per permissible regulatory definitions in* ***Section 5****.* • ***Biosecurity Permit*** *sought from NSWDPI as applicable for any/all relevant feedstocks in Stages 1-3.* ** Note: Feedstocks pre-defined* ***as General Solid Waste (non-putrescible)*** *under clause 49 in Part 3 Division 1 of the POEO Act, as further defined under Schedule 1 of the Act, are thereby recoverable for processing by a* ***Resource Recovery Facility*** *(refer* ***Section 5.3)****.*
Agricultural and Horticultural crop stubbles / waste residues	For example (but not limited to) the following. Further detailed information would be required and supplied as part of staged RRO & Exemptions with EPA: • Wheat straw, Rice straw • Sugar cane bagasse

Stage 3) Proposed feedstocks for progressive testing during remainder of 3 year R&D Period	Clarifying Comments
	• Cotton trash. • Nut shells (macadamia, hazelnuts etc) • Other permissible wasted crop stubbles/residues as may be identified and approved by EPA RRO & Exemption during the project period. • As per NSW Energy from Waste Policy / Eligible Waste Fuel Guidelines • As per permissible regulatory definitions in **Section 5**.
Dedicated Biomass Crops (e.g., NSW DPI native species trials in Glen Innes)	• In 2018 NSW DPI commenced R&D trial cropping of **native species for energy crops** (e.g. Blue Mallee) at multiple sites in NSW. A trial site was established in Glen Innes in 2020. • would welcome assisting NSW DPI trials for these when ready. SEATA is liaising regularly with NSWDPI including assisting on a committee for bioenergy in NSW. • Other appropriately controlled non-native clean biomass may also be considered for trials, such as bana grass (e.g. sterile/non-proliferating species grown for mine rehabilitation etc). • A letter of support from the program's manager Dr Fabiano Ximenes of NSW DPI is provided in **Appendix 4**. • As per permissible regulatory definitions in **Section 5**.
Natural Biomass / native biomaterial from bushfire clean-up, hazard reduction, fuel load reduction	• Significant and ongoing problem in wake of last year's record-breaking fires, including in Glen Innes • Potentially improved solution compared to alternatives such as windrow burning. • Not proposed for electricity generation. • As per permissible regulatory definitions in **Section 5**.
Natural biomass / native biomaterial from lawful clearing in NSW (e.g. powerlines maintenance to prevent bushfires, roads projects, mining).	• Provide alternative beneficial use of approved / lawful clearing of native vegetation for new projects and maintenance on existing projects/infrastructure (typically where offset programs are in place). E.g. roadworks, mining, powerline supply and maintenance. • Preference given to *surplus* biomass to site needs/capacity. • Not proposed for electricity generation. • As per permissible regulatory definitions in **Section 5**.
Untreated (raw) timber pallets	• As per NSW Energy from Waste Policy / Eligible Waste Fuel Guidelines • No painted pallets • No treated or engineered timbers

Stage 3) Proposed feedstocks for progressive testing during remainder of 3 year R&D Period	Clarifying Comments
	• Any processing requirements TBC with EPA via further RRO & Exemption approval (e.g., de-nailing). • As per permissible regulatory definitions in **Section 5**.
Source separated commercial green waste	• Only un-contaminated green waste direct from source and controlled, if/where amendable to EPA. • As per permissible regulatory definitions in **Section 5,** including NSW Eligible Waste Fuel Guidelines. • For example, garden organics from arborist operations, commercial gardening operations etc. This includes materials such as branches, grass, leaves, plant trimmings, tree stumps and bark. • Does not include: greenwaste extracted from mixed waste streams, such as construction and demolition waste; material from clean up of illegal dumping.
Source separated Urban Green waste (municipal collected – 'green lid bin' etc)	• Following successful earlier stage trials, if EPA amendable potential initial targeted trials of municipal green waste from targeted low-contamination LGA's. • For example, garden organics council garden waste kerbside collections and public drop-off collections as per the NSW EPA *Eligible Waste Fuel Guidelines*. This includes materials such as branches, grass, leaves, plant trimmings, tree stumps and bark. • As per NSW Energy from Waste Policy / Eligible Waste Fuel Guidelines • As per permissible regulatory definitions in **Section 5**.
Agricultural Biosolids	• For example, Poultry litter, dewatered piggery sludges (<80% moisture) and dewatered digestate from Anaerobic Digestion. These are problematic wastes seeking a beneficial reuse/application. • Potentially dewatered feedlot manures (intensive ag). • Filter cakes only (dewatered to <80% moisture, e.g. mechanically). • No liquid sludges. • Will be informed by successful initial testing of municipal biosolids in Stage 1 & 2. • As per permissible regulatory definitions in **Section 5**.
Blending (including of the above and/or with Stage 1a feedstocks)	• Blending facilitates energy balance and customised biochar considerations, and for feedstocks such as biosolids and coal assists in lower emissions energy (potentially negative emissions (Scope 1)) • Blending can also involve minor addition of small amounts of targeted minerals in the R&D feed to develop higher value tailored

Stage 3) Proposed feedstocks for progressive testing during remainder of 3 year R&D Period	Clarifying Comments
	products such as fertiliser biochars, or biochars to address specific soil constraints such as acidic soils (e.g., via hydrated lime).
Other clean source-separated natural biomass sources which may arise for R&D testing	These would be identified in consultation with EPA and Council at such time and could be managed by conditional secondary approval requirement (e.g., only where to EPA and GISC satisfaction). As per permissible regulatory definitions in **Section 5**.

Notes:

*1. Pending various factors including project timing, approval conditions and funding among others, select feedstocks conditionally approved for **Stage 3** may be opportunistically elevated into **Stage 2** in consultation with EPA. E.g. NSWDPI biomass crops etc.*

2. Agricultural biosolids does not fall under this category. It falls under Biosolids (along with municipal biosolids) as the three types/groups of target feedstocks.

3. Should any of the above not be deemed amenable for testing they may be dropped from the proposed program in order to avoid delayed approval of the remaining target feedstocks for trial, or potentially replaced in consultation with EPA. Whilst considered permissible for consent as detailed in Section 5, any further detailed information and assessment required (e.g. for RRO & Exemption) is sought to be provided under conditional approval in order not to delay approval of priority Stage 1.

Table 4.4: NSW EPA Classification of Biosolids for Land Application (NSW EPA Biosolids Guidelines)

TABLE 3-6

Classification of Biosolids Products

Biosolids Classification	Allowable Land Application Use	Minimum Quality Grades	
		Contaminant Grade	Stabilisation Grade
Unrestricted Use	i) Home lawns and gardens. ii) Public contact sites. iii) Urban landscaping. iv) Agriculture. v) Forestry. vi) Soil and site rehabilitation. vii) Landfill disposal. viii)Surface land disposal[2].	A	A
Restricted Use 1	i) Public contact sites. ii) Urban landscaping. iii) Agriculture. iv) Forestry. v) Soil and site rehabilitation. vi) Landfill disposal. vii) Surface land disposal[2].	B	A
Restricted Use 2	i) Agriculture. ii) Forestry. iii) Soil and site rehabilitation. iv) Landfill disposal. v) Surface land disposal[2].	C	B
Restricted Use 3	i) Forestry. ii) Soil and site rehabilitation. iv) Landfill disposal. iv) Surface land disposal[2]	D	B
Not Suitable For Use	i) Landfill disposal. ii) Surface land disposal[2].	E[1]	C[1]

Notes:
1. Biosolids products which are not contaminant or stabilisation graded are automatically classified Not Suitable For Use.
2. To be applied within the boundaries of sewage treatment plant site.

3. Biosolids are classified as Not Suitable for Use and released in accordance with that classification.
4. Approval for release is secured from the EPA.

Apart from the four exceptions listed above, releasing biosolids from a sewage treatment plant or EPA approved off-site storage facility (see below) is only permitted at the completion of the classification process and in accordance with the biosolids classification achieved (section 3.5).

Under no circumstance shall beneficial land application, distribution, or sale of biosolids products be permitted until classification is complete.

4.6.2 Staged Feedstock Trials and Testing

Table 4.5 below summarises the staged testing of feedstocks and associated monitoring program discussed further in **Section 7.4.7 (Monitoring)**.

Testing will be undertaken in a progressive and logical approach commencing in **Stage 1** with a **preliminary "screening" trial** (ultimate/proximate, and targeted gas testing) on the first feedstock to confirm system functionality and readiness for detailed testing. Successful testing in Stage 1 will be subsequently followed by a ***Detailed Testing Program*** (**Stage 2**) over a longer period, which is expected to include mass balance of inputs (feedstock) and outputs (solid biochar, gases, and emissions control liquid waste slurry), as summarised in **Table 4.5** below and discussed further in **Section 7.4.7** (Monitoring), including context to suitable parameters required to demonstrate ***Best Available Technology (BAT)*** considerations required by EPA. The objective of the **detailed testing program** will be to achieve defendable, reliable and repeatable results to validate the technology, its scalability and performance and inform regulatory approval processes going forward to commercialisation.

The Detailed Testing Program will be developed by a leading air quality expert in consultation with the NSW EPA, and in accordance with an EPL issued for the project. A proposed *Testwork Matrix* will support the proposed ***Detailed Testing Program*** to be developed in consultation with EPA. The matrix will detail test runs to address key variables of interest such as temperature, residence time, and emission control details (wet scrubber reagent etc) among others. Whilst energy recovery is not proposed, the testing program will (where practicable) still be undertaken generally in accordance with the requirements of NSWEPA including under the NSW Energy from Waste Policy framework (2015), including the *Eligible Waste Fuels Guidelines* (2016).

The technology has been specifically designed to achieve world-leading emissions performance as detailed in **Section 2**, including many design measures to avoid or minimise generation of particulates, organic and nitrogen-based pollutants, and other air quality pollutants as further discussed in **Section 7.4.1**. In addition, the pilot scale RDSM conservatively includes a substantial **emissions control system** including a wet-scrubber and thermal oxidiser afterburner discussed in **Section 4.8**. The RDSM has been developed specifically to undertake genuine **continuous** run system and process testing at pilot scale to confirm the technical performance for commercial and industrial scale application. The RDSM is designed to process up to 200kg/hr at continuous feed on up to a 24/7 basis.

Testing of solid biochar product will be undertaken in accordance with the NSWEPA *Guidelines for RRO Exemptions – For Land Application of Waste Materials as a Fertiliser or Soil Amendment* (2018, refer **Appendix 10**), and generally in accordance with (and exceeding) the *ANZ Biochar Industry Group Code of Practice (2020, refer **Appendix 9**)*, and any additional project-specific requirements conditioned by NSW EPA under EPL or secondary approvals for the project.

Testing and monitoring is further discussed in **Section 7.4.7**.

Table 4.5: Summary of Proposed Stages 1-3 Feedstock R&D Trials and Testing Program

R&D Staging	Summary Description	Feedstock(s)	Expected Duration	Proposed Testing	Objectives / Comments
Stage 1	**Preliminary Continuous Run Trial for first targeted feedstock** *(system function)*	**First Targeted Feedstock: Invasive Woody Weeds (INS) / waste native biomaterial (source-separated biomass feedstock)** *Screening tests may also be considered for the following before commencing Stage 2 tests for those:* • *Biosolids* • *Coal (Standard Fuel)* • *Blending / Co-processing* (e.g. INS + biosolids, INS + coal, customised mineralised chars to match soil constraints for potential farm trials)	• **1-5 Days per feedstock,** • Commencing with short duration and building (eg 4hrs-12hrs, 24hrs+)	**Screening level testing** (only) as follows: • **Proximate and Ultimate Analysis** on Biochar (solid) • **Grab Sampling of syngas for screening level analyses** (e.g. Tedlar Bags)	• Provide investor and regulator confidence in RDSM continuous run operation in order to progress to more detailed, lengthy and costly testing in Stage 2. • Following initial INS trials in both Stage 1 and Stage 2 below, **the order of all subsequent feedstocks** after INS (biosolids, coal and remaining types of source-separated biomass) **may alter as needed**. Currently, biosolids are expected to be the second trial. • Forestry residues may include from bushfire hazard reduction.
Stage 2	**Detailed Testing of initial targeted feedstocks** *(mass balance)*	Anticipated to be undertaken as follows (order may change after the first feedstock if/as necessary): • ***INS / waste native biomaterial (first priority trial)*** • *Biosolids* • *Standard Fuel (Coal)* • *Blending / Co-processing* – for example biosolids + biomass (INS and/or forestry residues etc as above); Coal + biomass (INS and/or Forestry residues etc as above); customised mineralised chars to match farm soil constraints for broadacre trials.	• **Up to two (2) weeks OR** as per EPA requirements for detailed testing (refer *Proposed Testing* column)	• **Detailed Testing Program** to be developed by emissions expert & SEATA in consultation with EPA and relevant stakeholders. • Expected to include **system mass balance** with characterisation of feedstocks, syngas, solid char and scrubber material at minimum. • **Automated continuous monitoring of temperature, pressure and flow**. • **Periodic attended continuous gas sampling and analysis** as relevant to required sampling period (e.g. CO, CO_2, NO_x, O_2). SO_x will also be undertaken for high sulphur feedstock (eg coal). • Undertaken generally in accordance with relevant testing and monitoring requirements of the *NSW Energy from Waste Policy* and *Eligible Waste Fuel Guidelines,* as relevant to these R&D trials, and other relevant methods and guidelines as required by EPA (including but not limited to the *EPA Approved Methods for Sampling and Analysis of Air Pollutants in NSW* as applicable). • Duration of testing sufficient to satisfy above objectives as *Proof of Performance* reference.	• Formal *Proof of Performance* and validation of technology performance during continuous run. • Regulatory confidence in SEATA technology, potential use of pilot as a local reference plant for later commercial scale up (elsewhere) on those feedstocks. Notwithstanding this, as a non-commercial R&D system automated continuous monitoring systems are limited to temperature, pressure and flow (not practicable or viable for gas monitoring), but noting high accuracy attended continuous gas sampling will be undertaken by a suitably qualified expert. • Whilst not technically triggering requirement for compliance with the *NSW Energy From Waste Policy* or *Eligible Waste Fuel Guidelines* (as energy recovery is not proposed), use of POP data as a reference for future commercial scale deployment encourages compliance. SEATA will work closely with EPA to determine an appropriate detailed testing program accordingly. • Pending various factors including approval conditions and funding, select feedstocks conditionally approved for Stage 3 may be opportunistically elevated into Stage 2 in consultation with EPA. E.g. NSWDPI biomass crops etc.
Stage 3	**Progressive Detailed Tests of remaining approved feedstocks** during 3 year R&D period *(pending funding)*	*Other remaining source separated biomass feedstocks as per Table (i)* and detailed in **Section 4.6** of the SEE. e.g. biomass supplied from NSWDPI Biomass Crops trials (among others), for ongoing R&D trials throughout the proposed 3 year R&D centre approval period. Further outlined in Section 4.6.	**As above** (detailed testing period established in consultation with EPA). Screening tests first if needed, per Stage 1.	• As above (detailed testing requirements established in consultation with EPA)	• Intention is to separate initial targeted biomass in Stage 1 from other ongoing clean biomass feedstocks which will continue to be progressively tested during the 3 year approval period. Accordingly, Stage 3 can be <u>conditionally</u> approved if required in order to facilitate accelerated approval. • **<u>Note</u>**: NSWDPI biomass crops expected available mid-2022.

4.6.3 Feedstock Management

Feedstocks used for trials will be:

- **Pre-processed before arrival onsite** at the SEATA R&D Centre to the required physical specifications for thermal processing (e.g. chipping to required size, pre-drying for biosolids to required maximum moisture content etc).
- **All feedstocks will have a completed and signed *Statement of Origin* certificate** provided by the supplier prior to delivery and receipt by SEATA, meeting EPA RRO & Exemption requirements for such as detailed elsewhere in this SEE.
- **Typically delivered in bulk** (e.g. B double truck) with covered loads as appropriate for the feed, **or suitably containerised** (e.g. bulk bags).
- **Deliveries will be directed to covered bulk storage area** (e.g. proposed Shed 2) for receival and will be separately stored undercover as appropriate. Proposed sheds have been designed with doors for full enclosure capability, particularly to protect in higher winds (whilst avoided where practicable, on windy days additional measures for deliveries may also be considered such as covering of internal stored stockpiles if necessary, e.g tarps). The orientation of proposed Shed 2 also assists with expected seasonal wind directions, and faces away from the public road and neighbouring properties.
- **Feedstocks required for daily R&D testing** will be transferred during daytime hours to the *Daily Working Stockpile Area* located near the RDSM and covered (e.g. by tarp or similar). This provides a very short loading distance to the RDSM and significantly minimises loading times/duration (equipment use) during continuous campaign trials.
- **Feedstocks will be weighed** to suitable accuracy prior to loading into the RDSM hopper for processing, typically in a suitable tared vessel (which also facilitates hopper loading).
- **The workpad around the RDSM, Daily Stockpile and Active Testing Area will be regularly swept and maintained.**

Other aspects relating to feedstock management and specific environmental planning considerations have also been considered and assessed by the Environmental Risk Assessment (**Appendix 5**) and discussed throughout **Section 7**.

4.6.4 Bench Test Results

Prior to the design and manufacture of the pilot scale SEATA RDSM, a batch process unit ("bench" scale) was constructed using the same technology design and controls at smaller scale. Results of bench scale testing of various materials provided confidence in the technology design principles to facilitate RDSM design and construction by SEATA.

Initial bench/batch scale testing has been successfully undertaken on:

- **Invasive Native Scrub (INS)** and **coal** with proximate and ultimate analysis of the feed and biochar. Note: Process conditions for that specific test were focused on *steam gasification* at 750°C with dual fluid bed configuration, rather than a focus on sequestration/char production (the technology can be preferentially set to optimise gas and/or solid phase product). Sample 20/550 is INS feed as received. Sample 20/608 is char from steam gasification at 750°C. Ash content was higher as a result of testing the inclusion of zeolite as part of the Heat & Mass Transfer (HMT) media which could not be magnetically separated (non-zeolite ash levels of around 5% would otherwise be expected).
- **Eucalypt woodchip** with an indicative Mass & Energy Balance (MEB) prepared by process engineer John Winter (elemental balance including metals).
- Results for the above will be provided to GISC and EPA separately in confidential supporting **Annexure A**.
- Whilst not related specifically to this project using clean feedstocks, bench testing on other materials (including PFAS-contaminated soils, GAC, PAC and biosolids) has also undertaken. Further information can be provided to EPA/GISC on request (noting commercial sensitivity/confidentiality).

The intention of the proposed project for small scale R&D testing using the continuous RDSM unit is to undertake campaign-based staged testing and monitoring (initial screening tests followed by detailed testing with full mass balance analyses) to provide comprehensive data for detailed assessment. Extensive technology design and project controls are in place to support and justify this as assessed in this SEE (refer **Section 2** and **Appendix 5**). Testing will commence on clean feed INS native biomaterial, progressively followed by other proposed feedstocks. Whilst not expected to be necessary, the staged approval and R&D approach also allows progressive regulation if/as required. Accordingly, further detailed information from the *bench scale unit* is not expected to be required prior to commencing small scale RDSM testing via the proposed project (which may otherwise be required for a larger commercial scale / non R&D focused project).

4.7 Resource Recovery Context - Higher Order Use and Circular Economy

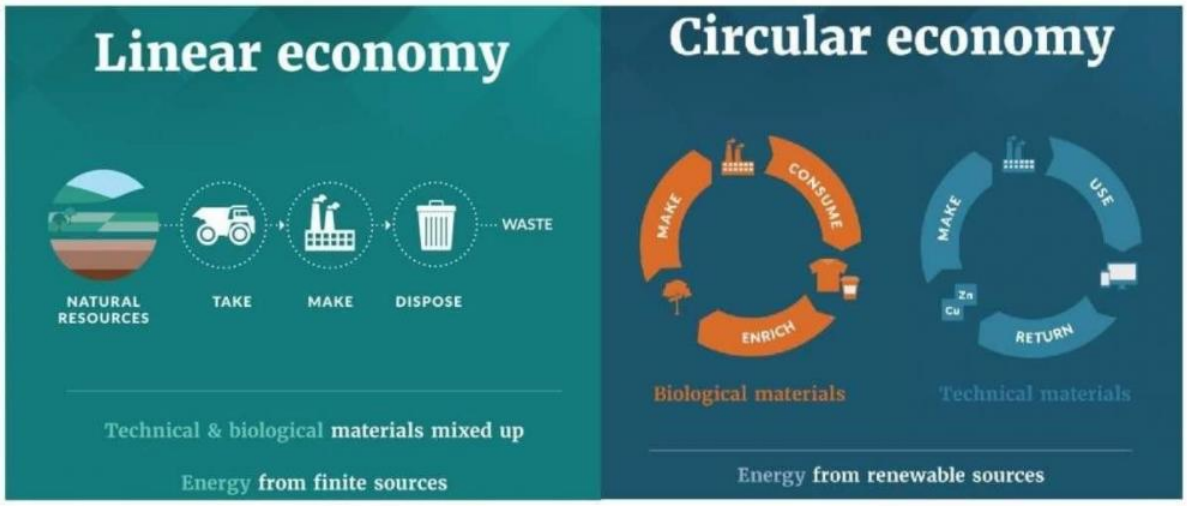
Higher order use, circular economy and resource recovery principles of the Waste Hierarchy are key elements of the *NSW Energy from Waste Policy*, further detailed in **Section 5.2.4**.

The current *linear* model of many modern economies has been attributed to **half of global CO_2 emissions** (World Economic Forum, 2020). Conversely, a *circular economy* model strives to be 'restorative and regenerative by design' **(Figure 4.4),** based upon three key principles (Ellen MacArthur Foundation, 2021):

- Design out waste and pollution
- Keep products and materials
- Regenerate natural systems.

As previously detailed in **Section 2**, SEATA's technology has the potential to provide an opportunity to support all three key principles of a circular economy.

Figure 4.4: Comparison between Linear and Circular Economy

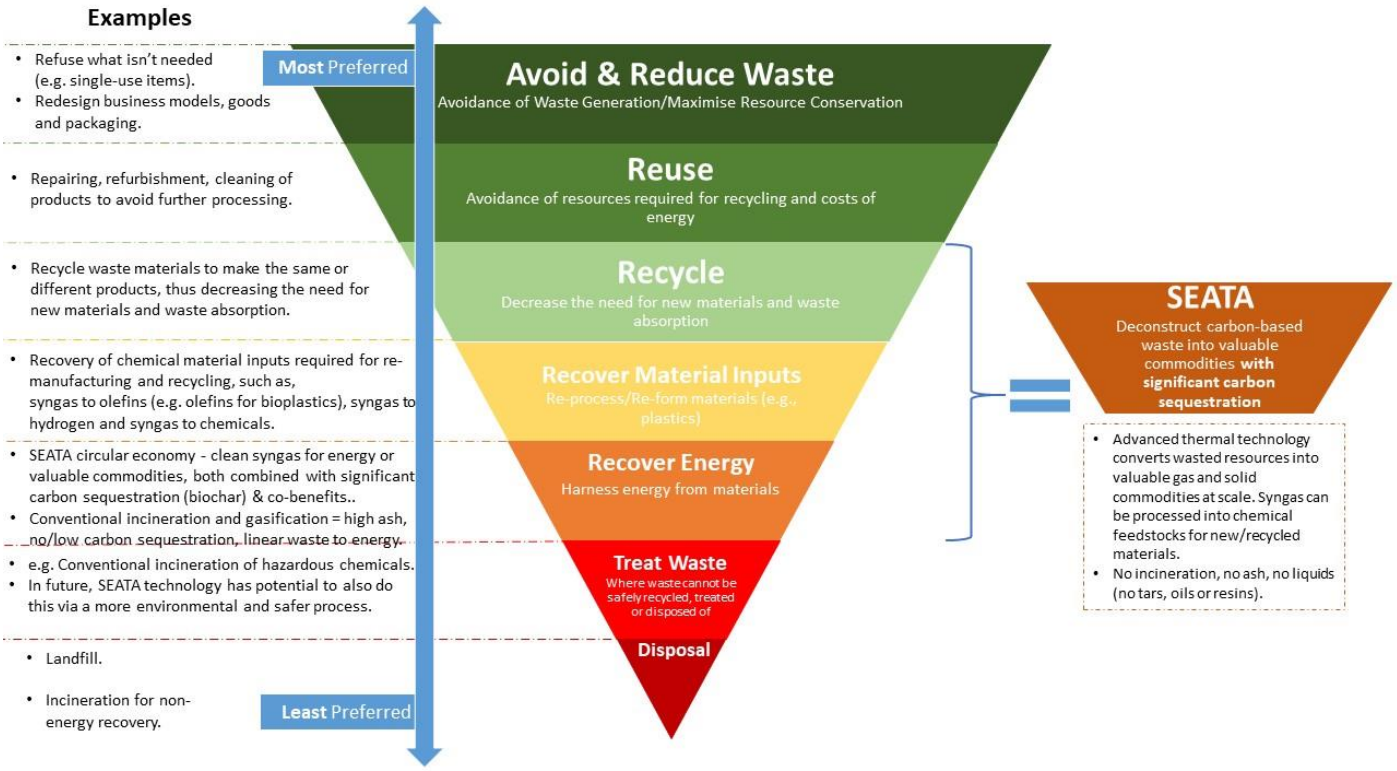


Picture source: https://www.datadriveninvestor.com/

SEATA technology represents a **step-change away from conventional linear thermal treatment such as incineration, toward genuine circular economy** using thermal treatment. SEATA's technology is designed to deconstruct problematic carbonaceous wastes whilst recreating new valuable commodities (both solid and gases) that could assist in regenerating natural systems (e.g. beneficial biochar for application to land, syngas that can be turned into hydrogen and ammonia for fertilisers etc), not just offering linear waste to energy alone. The positive and genuine **circular** aspects of SEATA technology has the potential to be **complementary** to existing recycling and material recovery systems, decreasing the need for new materials and generation of waste for disposal. Accordingly, it presents **a new option higher on the waste hierarchy** as illustrated in **Figure 4.5** below.

With climate change now representing the biggest environmental and economic challenge of the modern world, SEATA's unique new technology to provide significant carbon sequestration whilst also recovering economically recoverable syngas for valuable derivatives or energy/heat at scale (not just offering only linear waste to energy alone), can be considered to be of very high order use of resources. Successful R&D demonstration of the technology through this project is an important step in delivering this potential.

Figure 4.5: SEATA Technology and the Waste Hierarchy



The feedstocks proposed for staged R&D testing are currently being wasted in many various manners (including open burned direct to the atmosphere in certain cases such as INS, agricultural stubbles, bushfire hazard reduction and weed management). These represent a significant opportunity for higher order use and avoidance of waste and GHG emissions. Demonstrating higher order use is a key element required in all secondary RRO & Exemption approvals required for each feedstock proposed for staged testing.

Table 4.6 below provides discussion of these aspects on the initial target feedstocks in Stages 1 and 2. It is also noted that the focus of this project is for non-commercial **research and development** purposes to assess the technology's economic potential for future deployment at commercial scale elsewhere. This is an important consideration in terms of feedstocks proposed for testing compared to an ongoing commercial project.

Table 4.6: Typical Current Management and Higher Order Use Considerations of Initial Proposed Feedstocks

Feedstocks	Current Management and Consideration of Higher Order Use
Invasive Native Scrub (INS) Native Biomaterial	At present, INS is commonly being managed through clearing and **open burning** which has maximum climatic impact through release of carbon dioxide emissions direct to the atmosphere. This carbon and associated trace elements and nutrients are also lost to the soil. Instead, pyrolysis could potentially improve the environmental impact of INS management by avoiding a significant portion of CO2 from direct burning, sequestering up to half the carbon into biochar and providing it beneficially back into the soil, or otherwise used in multiple industrial applications if appropriate. To date, no other higher order use has materialised commercially at scale in the central west where INS is so problematic. Complementary options such as essential oils or timber (typically small scale to date) are not precluded through SEATA's proposed R&D pilot scale testing.
Biosolids (including municipal biosolids classified suitable for land application to NSW EPA standards)	Recycling of wastewater biosolids through application to land has been used to improve nutrient availability and soil conditions, enhancing vegetative growth (US EPA, 2000). However, increasing scrutiny by regulators (nationally and globally) regarding emerging contaminants potentially challenge the industry. Direct application to land also results in GHG emissions such as nitrous oxide (among others) from organic biodegradation. Thermal treatment by pyrolysis and gasification has the potential to significantly reduce these threats while recovering useful products (either for agricultural uses or industrial applications such as roads or concrete and others). SEATA's technology has been designed to deconstruct organic materials (including pathogens and many emerging organic contaminants), whilst retaining beneficial nutrients such as carbon, nitrogen and phosphorus, and reducing bioavailability of metals.
Coal (Standard Fuel)	Coal is primarily used as regulated *standard fuel* for direct combustion and electricity generation in NSW (refer **Section 5**), and is a major factor in release of greenhouse gases globally. R&D testing with SEATA technology will assess potential to recover syngas from coal for valuable derivatives (including hydrogen among others) whilst leaving a significant portion of the carbon in solid form instead of entering the atmosphere.

4.8 Emission Control System (Wet Scrubber and Afterburner)

Sections 2 and **7.4.1** provide detailed system design information and controls to avoid and minimise air quality pollutants emitted from the system, including additional emissions controls on the RDSM.

As an R&D project, syngas from the project is primarily for **characterisation** purposes and is **not** proposed to be recovered to generate energy/power. Following pre-treatment of off-gas through the wet scrubber system, final gas for atmospheric release (noting only in this R&D project – at commercial scale is mainly valuable syngas for recovery) is proposed to be **after-burnt** or recycled as feedstock to other processing steps if/where required.

A dedicated **thermal oxidiser** (**after burner**) stack is included in the RDSM design (safety feature required by HAZOPs too) which includes an **enclosed** syngas afterburner which burns syngas at >800°C for >2s deep within the stack system with a relatively low velocity discharge (no exposed flame, no significant light and directed vertically from top of stack at ~7-9m in height).

Section 2.2 and **2.3** of this document provide further information regarding the process control and wet scrubber, and further discussion is provided in **Section 7.4.1** (Air Quality) and **7.4.7** (Monitoring). Regulatory requirements under the POEO (Clean Air) Regulations and where these are met by the project/technology are also provided in **Section 5.2.3**.

4.9 Existing and Proposed Sheds

4.9.1 Re-Purposing of Existing Farm Shed (Shed 1)

An existing farm shed identified as **Shed 1** (**Figure 4.1** and **Figure 4.2**) within the project boundary is proposed for repurposing for the project (i.e. change of use from farm use to project support uses as outlined below). For clarity there is another hay shed beyond the project boundary nearby within Lot 3 that will not form part of the project which was not deemed suitable for re-purposing for the project, however it is noted that there is potential for the rainwater tank to be used for emergency use only if required, beyond the water tanks already identified for the project noted elsewhere below.

Shed 1

Shed 1 is located within the Active Testing Area below the bund, east of the RDSM and outside the 10m easement requirements of the low voltage 11kV powerline owned by Essential Energy, which provides power to the shed via an existing overhead connection (**Figure 4.1** and **Figure 4.2**). Shed 1 is an insulated conventional steel farm shed (see **Appendix 6** for detailed drawings), with steel Colourbond cladding, inclusive of 25mm insulation, concrete floor, and concrete apron 150mm thick.

As previously mentioned in **Section 3.1**, the shed is connected to an existing inground rainwater tank, septic tank and transpiration area that was originally associated with the former farmhouse at the site (which burned down c2013) and has been successfully used without issue. The existing toilet in Shed 1 will provide the amenities for the small number of project staff onsite (typically <5 at any one time, consistent with the historical use of the system (i.e. no change)). There is a pre-existing single phase mains power from an above ground powerline that is nearby southeast of the shed. For the proposed project the shed will be repurposed for:

- System operational control and monitoring of the RDSM
- General storage, including small mobile equipment

As detailed in Section 5, Shed 1 will be classified under the NCC as a Mixed Class 7b/8.

4.9.2 Proposed Sheds and Specifications

Shed 2 (Primary Storage Shed)

Shed 2 is proposed to be located south of the Active Testing Area, south of the proposed all weather access loop and well outside the 10m easement requirements of the low voltage 11kV powerline owned by Essential Energy **(Figure 4.1** and **Figure 4.2**). The shed is intended to provide a key storage area for feedstocks and biochar product stored separately in four (4) bays of the proposed shed. As detailed in Section 5, Shed 2 is expected to be classified under the NCC as a Mixed Class 7b/8.

The shed will be commercially designed, supplied and constructed to relevant standards as fit for purpose, on an unsealed pad also meeting supplier design specifications. Underground power is proposed to be connected to the shed from the onsite low voltage (11kV) powerline. Four associated rainwater tanks (22.5kL) will receive runoff from the shed, with one of the tanks dedicated/reserved solely for firefighting purposes. A concrete apron will front the northern side of the shed. Shed detailed design drawings and proposed materials are provided in **Appendix 6**.

Statement of Specifications – Shed 2:

- **30 x 12 x 6m** totally enclosed shed, complete with structural steelwork, purlins and girts for assembly.
- Shed 2 is designed to the following specifications
    - *Region: A*
    - *Terrain Category: 2.0*
    - *Importance Level: 2*

This shed will be clad using BlueScope Lysaght .47 TCT (.42 BMT) **Colorbond®** Custom Orb on the roof and 47 TCT (.42 BMT) Colorbond ® Custom Orb on the walls. BlueScope Lysaght Building Products roof sheeting are currently the only roll forming Company to have published test data that complies with AS 1562.1 1992 & the Building Code of Australia.

The gutters will be Sheerline slotted Colorbond ®, the barges will also be in Colorbond ®.

This shed will have:

- Four 7.5m bays with the 30m back-side wall and both 12m end walls clad;
- There will be eight 5.8mH x 3.75mW bottom rolled sliding doors across the front side. These doors will be double tracked and will be “concertinaed”, allowing two full bays to be open at any one time;
- One 2040H x 920W personal access door has been allowed for (location to be determined), and;
- Ausmesh safety mesh to the underside of the roof on all bays.

The shed will be fabricated from:

- 310UB40 universal beam (hot-dipped galvanised) main columns;
- 200UB22 universal beam (hot dipped galvanised) end wall columns;
- Trusses will be fully fabricated parallel chord with webbing. The chords will be 65 x 3.0mm “Duragal” SHS and 35 x 2.0mm Duragal SHS webbing;
- The roof purlins will be SZ20019 in the end bays and SZ 20015 in the middle bay with bridging:
- Side wall girts will be SZ20015 with bridging, and;
- End wall girts will be SZ15015 with bridging.

The shed floor will have a 30m x 15m x 150mm slab (including a 3m apron across the front side of the shed), with one layer of SL82 mesh.

Site level +/- 5mm and pad compacted to 98% (i.e. roll and water to compact shed pad)

Concrete foundations at 25MPa. Pier sizes 450mm and up to 2000mm deep.

Shed 3:

Shed 3 is proposed to be located on the southern side of RDSM and the Active Testing Area, and outside the 10m easement requirements of the low voltage 11kV powerline owned by Essential Energy (**Figure 4.1** and **Figure 4.2**). Shed 3 will provide a workshop, general storage area in the central and western end, and a split mezzanine on the eastern end with a kitchenette and meeting room upstairs, and a room downstairs used for biochar physical testing and RDSM trial operations. As detailed in Section 5, Shed 2 is expected to be classified under the NCC as a Mixed Class 7b/8.

The shed will be commercially designed, supplied and constructed to relevant standards as fit for purpose, on an unsealed pad also meeting supplier design specifications. At least two 22.5kL associated rainwater tanks (22.5kL) will receive runoff from the shed which will be used for the kitchenette and onsite water usage. Power will be relayed from the existing connection at nearby Shed 1 (which connects to the nearby pole).

Shed 3 will be a commercially supplied shed (from a commercial supplier, designed to relevant standards and fit for purpose). Shed 3 will contain three (3) bays and feature a concrete apron, complete with a concrete beam on the surround. A detailed copy of Shed 3 is provided in Appendix 6. Additionally, Shed 3 is classified under the NCC as a Mixed Class 7b/8.

Statement of Specifications – Shed 3

- **22.5 x 12 x 6m** totally enclosed shed with a mezzanine in the eastern end bay, complete with structural steelwork, purlins and girts for assembly.
- This shed is designed to the following specifications
    - *Region: A*
    - *Terrain Category: 2.0*
    - *Importance Level: 2*

This shed will be clad using BlueScope Lysaght .47 TCT (.42 BMT) Colorbond® Custom Orb on the roof and 47 TCT (.42 BMT) Colorbond ® Custom Orb on the walls. BlueScope Lysaght Building Products roof sheeting has no equivalent and are currently the only roll forming Company to have published test data that complies with AS 1562.1 1992 & the Building Code of Australia.

The gutters will be Sheerline slotted Colorbond ®, the barges will also be in Colorbond ®.

This shed will have:

- Three 7.5m bays with the 22.5m back-side wall and both 12m end walls clad;
- A 22.5 x 1.5m canter-levered awning off the front side;
- The eastern7.5m end bay will have the front side clad and a full-height wall separating it from the adjacent middle bay;
- The remaining two bays will have four 5.65mH x 3.75mW bottom rolled sliding doors across the front side. These doors will be double tracked and will be “concertinaed” across the front of the enclosed bay to allow for both 7.5m bays to be opened at once;
- A mezzanine floor in the eastern end bay with 3m clearance under the bearers;
- Two 2040H x 920W personal access doors leading from the under-side of the mezzanine floor;
- 1800mm wide set of heavy duty stairs with hand rails either side and a balustrade around the stair well. The treads will be checker plate with non-slip nosing and enclosed risers;

- The mezzanine will have 17mm “yellow tongue” particle board flooring;
- Allowance has been made for seven 1500H x 1800W windows with screens (no reveals);
- Insulation to the underside of the roof of the mezzanine bay only, and;
- Ausmesh safety mesh to the underside of the roof on all bays.

The shed will be fabricated from:

- 310UB40 universal beam (hot-dipped galvanised) main columns;
- 200UB22 universal beam (hot dipped galvanised) end wall columns;
- 200UB18 canter levered awning rafters;
- Trusses will be fully fabricated parallel chord with webbing. The chords will be 65 x 3.0mm “Duragal” SHS and 35 x 2.0mm Duragal SHS webbing;
- The roof purlins will be SZ20019 in the end bays and SZ 20015 in the middle bay with bridging:
- Side wall girts will be SZ20015 with bridging, and;
- End wall girts will be SZ15015 with bridging;

The mezzanine will be fabricated from:

- 360UB57 universal beam (hot dipped galvanised) bearers;
- C25025 floor joists @ 450mm spacings, with bridging, and;
- Engineered to 3KPa live office loading (engineer’s structural drawings supplied).

The shed floor will be 22.5m x 15m x 150mm slab (including a 3m apron across the front side of the shed), with one layer of SL82 mesh.

Site level +/- 5mm and pad compacted to 98% (i.e. roll and water to compact shed pad).

Concrete foundations at 25MPa. Pier sizes 450mm and up to 2000mm deep.

4.9.3 Proposed Sound Enclosure Module and other Mobile Shipping Containers

In accordance with the risk-based approach to avoid and minimise potential impacts for the project (refer **Appendix 5**), as a conservative measure a mobile sound enclosure is proposed to house key noise-generating equipment, notably the **diesel air blower, 3-phase generator and air compressor** which are ancillary to RDSM operation (see Plates 4.6). In combination with all other controls identified in the Environmental Risk Assessment, this *source control* is targeted particularly at mitigating night-time operations, noting the continuous operation of equipment during testing campaigns.

- The proposed sound enclosure is intended to be located east of Shed 1 as illustrated on **Figure 4.1, Figure 4.2** and **Plate 3.7 below.**
- The enclosure location will be at least 10.1m from the Essential Energy power line to ensure setback compliance (as identified during consultation with Essential Energy). Accordingly, the south eastern corner of the enclosure has been shaped to ensure setback is maintained as shown on the Site Plan.
- As a further conservative measure, the ventilated sound enclosure will have **targeted insulated lining.** 60mm Stratocell fire retarding insulation is proposed to be used (refer details in **Appendix 18** and further discussion in **Section 7.4.2.1**). Acoustic attenuation performance will be reviewed by the specialist environmental noise report (refer Section 7.4.2.1).. The design is expected to be Class 8 of the NCC and will be compliant with relevant codes and standards requirements, and will be ventilated and with appropriate fire schedule design to accommodate relevant safety/HAZOPs requirements.

Plate 3.7. Proposed Location of Sound Enclosure

Shipping Containers

- **Four (4)** shipping containers are proposed within the project area.
- As per the Codes SEPP as outlined in **Section 5.2.3,** two (2) shipping containers can be used on any zoned land *for any purpose* in accordance with the SEPP without development consent.
- As noted in **Section 5.2.5**, Council DCP requirements specify shipping containers within RU1 zoned lands are for *agricultural* purposes, and multiple containers (>1) requires consent.
- Accordingly, the remaining two proposed shipping containers require development consent and will be reserved for agricultural use by the landowner. Subsequently, they will primarily serve as acoustic barriers for the project.
- Proposed shipping containers will be compliant with the GISC DCP, including 50m setback distance from the Lot 3 boundary, painted with a **neutral colour** (i.e. green, beige or brown) consistent with the surrounding rural character, and consistent with required controls in Chapter 11 Section 11.4 of the GISC DCP 2014.
- Proposed containers have been located to provide acoustic dampening toward distant "line of sight" receptor R1 (>1200m southwest), nearest receptor R7 (>850m northeast) and other receptors east of the site including R9, R8, to reduce directional noise particularly at night.
- Proposed locations are illustrated on the **Site Plan** (refer **Figure 4.2** and Appendices 1 and 6)
- The containers are readily relocatable to adapt to noise management needs if/as required.

4.10 Traffic and Transport

- **Daytime heavy vehicle deliveries only** (7am-6pm Mon-Fri, and 8am-1pm Sat).
- **No heavy vehicle deliveries to/from the site will occur at night**.
- Deliveries and shift changeover will be coordinated outside school bus time (8am) as far as reasonably practicable.
- Bulk material deliveries and pickup typically by heavy vehicle (e.g. B-double or semi-trailer).
- Substantial onsite storage has been proposed (as per **Section 4.9** above) to minimise delivery & retrieval requirements and maintain traffic on West Furracabad Road similar or better to existing use. By design this has *avoided daily deliveries* that would otherwise be required.

- Subsequently, **fortnightly** heavy vehicle deliveries are anticipated to be required during active campaign testing to supply feedstock and materials, and retrieve biochar and reuse containers. This is considered likely below or similar to existing regular use of West Furracabad Road by heavy vehicles servicing the surrounding district.
- Pilot testing of other conventional technologies (e.g. it is understood that recent ARENA-funded pilot testing of biosolids gasification involved progressive testing over a one to two week total campaign). This further supports SEATA's assumption that proposed fortnightly deliveries to supply continuous feed for the project in each campaign is considered likely to be conservative and to remain reasonably consistent with existing rural use of the road.
- The existing unsealed road entry into the project site currently receives semi-trailer deliveries of hay when required, and is considered suitable for proposed project use without surface upgrade (i.e. only *internal* site works are proposed, no surface works proposed within the public road verge/access), as illustrated on the Site Plan in **Figure 4.2** and in **Appendices 1 and 6**. The existing farm gate on the fenced property may be widened if required to facilitate ease of use for proposed regular operations.
- An internal all-weather access will extend from the existing entry to form a loop around the RDSM (proposed active testing area, Sheds 1-4, daily working stockpile area). Topsoil will be stripped to <200mm and the all-weather access established using locally sourced suitable grade VENM/ENM (with signed declaration as required by the NSW VENM RRO & Exemption 2014, refer **Section 5.2.3**).
- A small all weather surface carpark (approximately 200m^2) is proposed for light vehicles of staff and visitors, which will be located away from the active working area as illustrated on **Figures 4.1 and 4.2**.
- Generally, vehicle movements onsite will be structured in efforts to minimise noise. Further details on feedstock delivery and management is provided in **Section 4.6**. Assessment of potential impacts associated with project traffic and transport is provided in Section 7.5.5.

4.11 Lighting and Tree Screening (Visual Amenity)

- Visual amenity and associated risk controls have been specifically considered in the project *Environmental Risk Assessment* (refer **Appendix 5** for details).
- Only conventional farm shed lighting will be required (no floodlighting), and will only be used during periods of active testing (campaign basis). It is expected the lights would be similar to other farm shed lighting used elsewhere in the district.
- Proposed shed lights would be mounted in appropriate positions for safe working and minimal side lighting effect, with lights pointed downward and, if/where practicable directed away from distant residences.
- An *enclosed* afterburner (thermal oxidiser) is proposed for the RDSM, with no naked external flames and no/negligible visible side light (stack directed vertically).
- All additional tree plantings will be setback >15m from the Essential Energy low voltage powerline as identified in consultation with Essential Energy, as illustrated on the **Site Plan** (refer Appendix 6).

- Tree screens will be of suitable species meeting GISC requirements (and Essential Energy where relevant), and maintained in accordance with RFS guidelines (Planning for Bushfire Protection 2019) and Essential Energy guideline requirements.
- In addition to the existing visual tree screening onsite, proposed additional tree plantings have been considered in the project layout as shown on **Figure 4.1**. In combination with existing vegetation screening which is quite effective (also aided by the location of proposed Sheds 2 and 3 to minimise visibility of the RDSM from West Furracabad Road as the closest publicly visible area), the combined screening effects have been designed to minimise potential impact on visual amenity beyond the site.
- The nearest rural residences are located at significant distance from the site (**>850m** to R7 with filtered / partially obscured views through vegetation and sloping fields), and **>1.2km** to R1 with distant views partially obscured by existing vegetation and location of proposed Shed 3).

Section 7.4.2.2 of this SEE provides assessment of the project design and proposed control measures to mitigate potential impact. **Section 3** also provides photos with example views of the existing environment. Refer **Section 6** for stakeholder consultation and feedback. Asset Protection Zone (APZ) establishment and associated vegetation management requirements are discussed separately in **Sections 5** and **7**.

4.12 Post-Trial Commitments

In accordance with preliminary discussions with Council and EPA, SEATA is committed to successful demonstration of the technology through an initial trial period of three (3) years. Following completion of the trial the results will be reviewed and a range of options considered in consultation with Council and EPA. These are identified and further discussed in **Section 7.5.8**.

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5. Statutory & Regulatory Context (Planning Considerations & Regulatory Framework)

The proposed project will be assessed in consideration of the applicable statutory planning instruments (Commonwealth, State and Local), as well as associated planning and environmental regulation frameworks. The following section provides an outline of SEATA's understanding of the project in the context of this. It is noted that this document has been prepared for environmental planning purposes. Work, Health and Safety (WHS) aspects in context to environmental planning are noted where relevant.

5.1 Proposed Approval Pathway

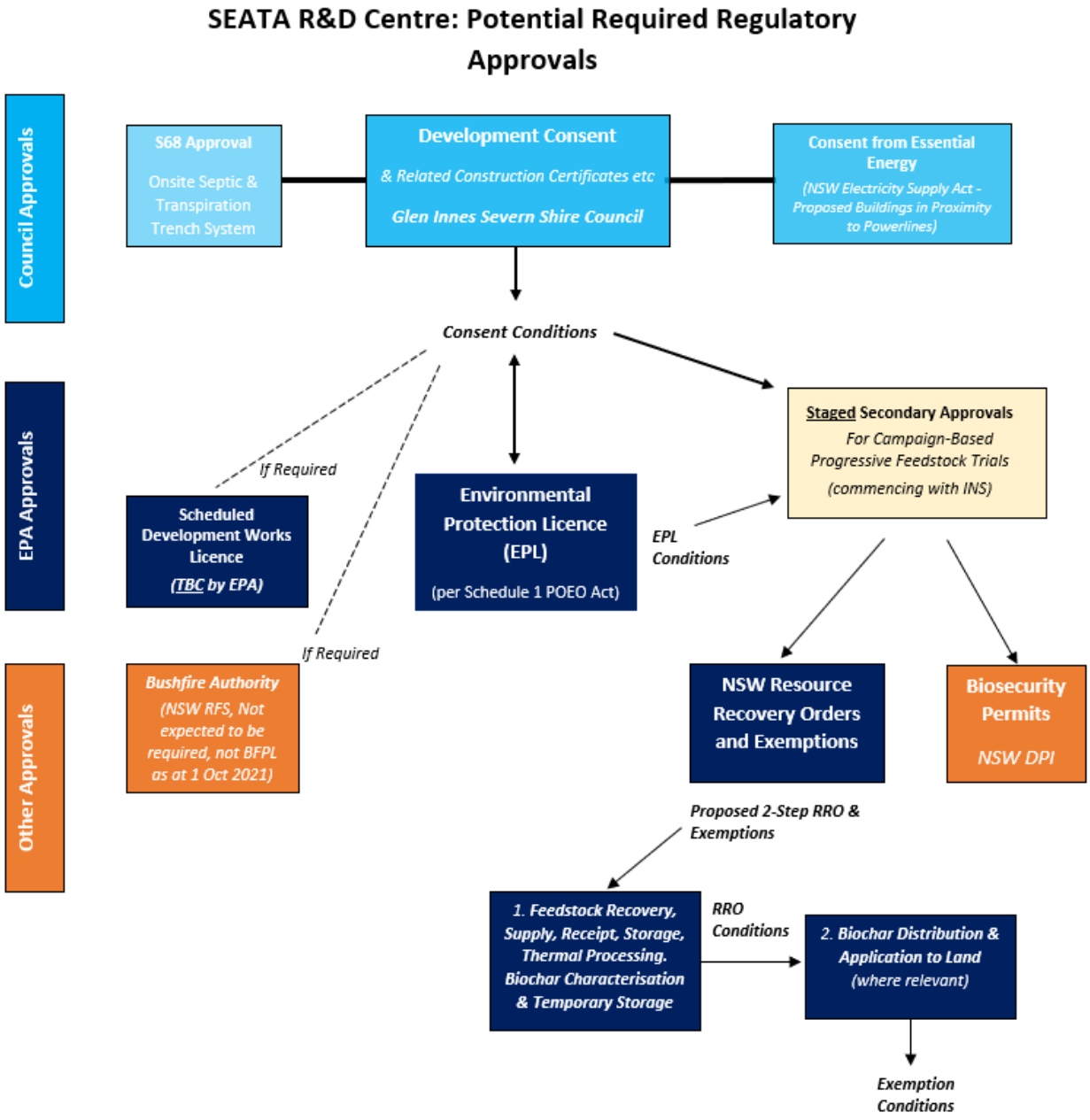
Planning approval pathways in NSW are identified by the NSW Department of Planning, Industry and Environment (DPIE). The project triggers the ***Integrated Development*** pathway under **s4.46** of the NSW Environmental Planning and Assessment Act (EPA Act, 1979, as amended) and the GISC Local Environment Plan (LEP), requiring Development Consent from Glen Innes Severn Council (GISC) (local development) and following General Terms of Approval from NSW EPA in relation to an Environmental Protection Licence (EPL) and related Resource Recovery Order & Exemption approvals under the POEO Act and POEO (Waste) Regulations, as detailed in **Sections 5.3 – 5.5**. Biosecurity Permits are expected to be required from NSWDPI under the NSW Biosecurity Act (2015) for relevant feedstocks being progressively trialled. These and other related approvals potentially required for the project are illustrated in **Figure 5.1**.

The project is not considered *Designated Development* under Schedule 3 of the EP&A Regulations (2000) as outlined further below. The project is not considered to be Regionally or State Significant Development under the State & Regional Development SEPP (Schedules 1 and 2).

As noted above, **GISC is expected to be the determining consent authority** for the Development Application under **Part 4, Division 4.2 Cl 4.5(d)** and **Divisions 4.3 (Development Requiring Consent) and Division 4.8 (Integrated Development)** of the *NSW Environmental Planning & Assessment Act, 1979* (as amended – refer Section **5.2.3**). This Statement of Environmental Effects is prepared to address **Part 4.15 (1) (Matters of Consideration)** of the Act.

The proposed R&D trial processing of the nominated (clean) feedstock wastes using SEATA's RDSM pilot thermal treatment technology will require a dedicated RRO and Exemption from NSWEPA to be considered (as well as separate future application of biochar produced if/where applied to land) which is proposed as a staged process. A number of *existing* RRO & Exemptions in NSW relating to recoverable clean feedstocks have at partial relevance/potential application to the project which will be considered by regulators to ensure consistency where relevant. Accordingly, for completeness those potentially relevant RRO's and Exemptions have been presented and discussed further in **Section 5.2.3** in context of the proposed project.

Figure 5.1: Potential Regulatory Approvals Required for the Proposed SEATA R&D Centre



5.2 Relevant Legislation, Policy and Guidelines

The following section provides an overview of the primary legislation, policies and plans considered relevant to the proposed facility. For clarity and completeness, **Appendix 2** provides commentary against the GISC DA Checklist in regards to all legislation listed for consideration and identifies those that are not considered relevant or applicable (e.g. NSW Fisheries Act etc).

For clarity and completeness, the following legislation listed under the GISC DA checklist are **not considered to be relevant** to the project (**not applicable**):

- *Fisheries Management Act 1994*
- *Heritage Act 1977*

- *Mine Subsidence Compensation Act 1961*
- *Threatened Species Conservation Act (1995, as amended)*

5.2.1 International Frameworks, Policies and Guidelines

International frameworks and legislation relevant to the proposed project is outlined below.

The Paris Agreement (International Treaty on Climate Change), 2016

The Paris Agreement is a legally binding international treaty on climate change, which came into force on the 4 November 2016, in efforts to deal with climate change and it's adverse impacts by substantially reducing global greenhouse gas emissions and limiting global temperature increase in this century to 2 degrees Celsius while pursuing means to limit the increase even further to 1.5 degrees.

The Australian Federal Government committed to an emissions target of a 26-28% reduction by 2030 compared to 2005 levels, and more recently formally adopted a policy of **Net Zero by 2050** ahead of COP 26 (2021). Demonstration of SEATA technology by this project has potential to support the Federal Government's targets and obligations to emissions reduction by 2030 and 2050.

United Nations Sustainable Development Goals (SDGs) – Agenda 2030 (2015)

At the core of Agenda 2030 (adopted in September 2015) are the United Nations *Sustainable Development Goals (UN SGDs)*, which feature 17 individual goals, all interconnected through various targets. The SDGs recognise that ending poverty and other deprivations must be interlinked with strategies that improve health and education, reduce inequality, and spur economic growth – all while tackling climate change and working to preserve our oceans and forests. Business' play a key role in the delivery and achievability of the SDGs, and they are now considered by a number of organizations and councils in their sustainability reporting. **Figure 5.2** below illustrates the SDGs that SEATA technology has the potential to contribute toward due to the production of biochar, circular economy, and renewable bioenergy. Potential beneficial impacts of the project upon climate change, greenhouse gas emissions and sustainability are addressed in **Section 7.4.3**.

Figure 5.2: Potential Contribution of SEATA Technology toward UN SDGs

EU Industrial Emissions Directive (IED), Best Available Techniques (BAT) & Best Available Techniques Reference Documents (BREF)

The NSW Energy from Waste (EfW) Policy requires applications to be designed in accordance with international best available techniques (BAT), as defined by the ***European Industrial Emissions Directive (IED)*** and relevant BAT Reference Documents (BREF). Stringent standards for the following are set by both the IED and BREF's for:

- Air quality
- Health impacts
- Energy recovery
- Resource efficiency
- Operational controls.

The standards have been previously described as equal to or more stringent than the air quality standards established in the NSW *Protection of the Environment Operations (POEO) Act 1997* and associated *POEO (Clean Air) Regulations*, as amended. Notwithstanding this, it is noted the recent update of the NSW Energy from Waste Policy (2021) set tighter emissions standards which meet the majority of the BREF standards. Given the importance of these documents placed by regulators, detailed discussion is provided below, and further outlined in **Section 7.4**.

Key IED/BAT/BREF documents considered by the project where applicable and relevant include:

- **European Industrial Emissions Directive (IED 2010/75/EU)** - of the European Parliament and Council of 24 November 2010 on *industrial emissions (integrated pollution prevention and control));*
- **BAT Conclusions - Waste Incineration (2019)** - *EU Commission Implementing Decision 2019/2010 12 Nov 2019 establishing **Best Available Techniques (BAT) Conclusions**, Under Directive 2010/75/EU of the European Parliament and Council, **For Waste Incineration**.*
    - This document establishes a primary reference for appropriate emissions levels associated with Best Available Techniques for normal operations (provided in the document Annexure), for approval (permit) conditions for waste incineration installations.
    - The document includes best practice values for BAT-Associated Emission Levels (BAT-AELs) for emissions to air and water, and BAT- Associated Energy Efficiency Levels (BAT-AEELs), and expected monitoring requirements for applicable commercial scale plants.
    - The BAT Conclusions are applicable to incineration activities which:
        - Process >3 tonnes per hour of non-hazardous waste
        - Process > 10 tonnes per day of hazardous waste.
    - SEATA's proposed R&D scale project is **below** the above thresholds and as such technically it is not applicable. Notwithstanding this, where practicable the document will be considered in context to objectives of Proof of Performance for potential future commercial scale-up, noting limitations of scale in some specific cases as outlined further in Section 7.4.
- **BREF Waste Incineration (2019)** - *EU JRC Science for Policy Report - Best Available Techniques (BAT) Reference Document for **Waste Incineration** (Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control)*;
    - Detailed supporting reference document to the BAT Conclusions document (above).
    - This BREF covers the incineration or co-incineration of waste, including municipal waste, other **non-hazardous waste, sewage sludge**, hazardous waste and clinical waste.

- This BREF, besides conventional incineration combustion processes, **also describes pyrolysis and gasification** processes.
- In addition to the thermal treatment stage, this BREF also covers:
  - the reception, handling and storage of waste;
  - some waste pre-treatment techniques along with their influence on the ensuing incineration process;
  - emissions to air and applied techniques for flue-gas cleaning;
  - applied techniques for the treatment of incinerator bottom ashes and the recovery of useful materials from bottom ashes;
  - emissions to water and the treatment of waste water originating from wet flue-gas cleaning or from bottom ash treatment;
  - the recovery of energy from the incineration process.

- **BAT Conclusions – Large Combustion Plants (2017)** - *EU Commission Implementing Decision 2017/1442 31 July 2017 establishing **Best Available Techniques (BAT) Conclusions**, Under Directive 2010/75/EU of the European Parliament and Council, **For Large Combustion Plants**.*
  - This document establishes a primary reference for appropriate emissions levels associated with Best Available Techniques for normal operations (provided in the document Annexure), for approval (permit) conditions for large combustion plants (e.g. power stations).
  - The document includes best practice values for BAT-Associated Emission Levels (BAT-AELs) for emissions to air and water, and BAT- Associated Energy Efficiency Levels (BAT-AEELs), and expected monitoring requirements for applicable commercial scale plants.
  - The BAT Conclusions are applicable to:
    - Combustion of fuels in installations with rated thermal input ≥ 50MW
    - Gasification of coal or other fuels in installations of total rated thermal input ≥20MW
    - Disposal or recovery of waste in co-incineration plants for non-hazardous waste with a capacity > 3 tonnes per hour or for hazardous waste > 10 tonnes per day.
    - Where combustion plants are defined as *" any technical apparatus in which fuels are oxidised in order to use the <u>heat</u> thus generated".* As outlined in Section 2, SEATA technology is unique in that syngas is not oxidised specifically for heat and energy as the primary objective (but is possible), unlike conventional combustion plants (e.g conventional biomass combustion boilers). It is capable of true circular economy not just simple linear waste to energy.
  - The BAT Conclusions are not applicable to:
    - mixed municipal waste (not applicable to SEATA's project).
    - flaring (this R&D project will flare via an afterburner)
    - gasification projects where the syngas is <u>not</u> directly used for combustion or for refining of gas (not applicable to SEATA's current R&D project. Future applications have potential to recover clean syngas for products/derivatives, or be used for energy - the former would not be applicable to this BAT in such case).
    - Disposal or recovery of waste in waste incineration plants (as defined in Article 3(40) of the IED), or co-incineration plants except where biomass is used.
  - SEATA's proposed R&D scale project is **below** the above thresholds and as such technically it is not applicable. Notwithstanding this, where practicable the document will be considered in context to objectives of Proof of Performance for potential future commercial scale-up, noting limitations of scale in some specific cases as outlined further in Section 7.4.

- **BREF Large Combustion Plants (2017)** – *EU JRC Science For Policy Report – Best Available Techniques (BAT) Reference Document for **Large Combustion Plants** (Industrial Emissions Directive 2010/75/EU (Integrated Pollution Prevention and Control)*
    - Detailed supporting reference document to the BAT conclusions document (above).
    - This BREF covers combustion installations with a rated thermal input >50MW. Plants <50MW are also discussed where technically relevant in regards to modular installation to over 50MW.
    - All conventional power plants used for mechanical power and heat generation are covered (e.g. boilers, combined heat and power plants, district heating). Industrial combustion installations are covered where they use conventional fuel (e.g. coal, lignite, biomass, peat, liquid and gaseous fuels including hydrogen and biogas), and the use of waste as a secondary fuel.

      ***Note:** Whilst not directly applicable at small scale in the short term, once proven SEATA technology is designed to economically scale as would be applicable to this BREF.*

5.2.2 Commonwealth Legislation

The ***Environment Protection and Biodiversity Conservation (EPBC) Act*** is not expected to be triggered by the proposed project (including no triggering of *Matters of National Environmental Significance* (MNES), which requires approval of the Commonwealth Minister under Part 9 of the EPBC Act.

Section 0 of this document provides details for local planning context and proposed sheds for the project to the ***National Construction Code*** (NCC 2019) and ***Building Code of Australia (BCA).***

5.2.3 State Legislation

New South Wales (NSW) legislation triggered by the proposed project is outlined below.

***Environmental Planning and Assessment (EP&A) Act 1979**, as amended by the NSW Environmental Planning and Assessment Amendment Act 2017*

The Environmental Planning and Assessment Act (EP&A Act) and associated Regulations sets out the laws under which planning in NSW takes place. Part 3 of the Act gives effect to *Environmental Planning Instruments* (i.e., SEPPs and LEPs) to provide the structure for assessment of environmental planning impact and development approvals in NSW. The main parts of the EP&A Act that relate to development assessment and approval are **Part 4** (Development Assessment) and Part 5 (Environmental Assessment). Schedule 3 of the EP&A Regulations defines *Designated Development* for specific types/scales/locations of projects (including sensitive areas) and/or those with potential for significant environmental impact.

Development consent to carry out the proposed project activities is triggered under associated Environmental Planning Instruments including the *Glen Innes Severn Local Environment Plan* (LEP). The project does **not** trigger *Designated Development* as listed under Schedule 3. The project both directly and indirectly supports objectives related to the EP&A Act, including the following:

a) *To **promote the social and economic welfare of the community and a better environment** by the proper management, development, and conservation of the State's natural and other resources*

b) *To facilitate Ecologically Sustainable Development (ESD) by integrating relevant economic, environmental, and social considerations in decision-making about environmental planning and assessment*

c) ***To protect the environment**, including the conservation of threatened and other species of native animals and plants, ecological communities, and their habitats.*

EP&A Regulations (2000) as amended

Schedule 3 of the EP&A Regulations (2000) identifies and regulates significant activities which are considered to have potential for high impact (likely to generate pollution). These are prescribed as *Designated Development* and require a detailed Environmental Impact Statement (EIS) to be prepared.

As a non-commercial, small scale, research and development (R&D) pilot project which is expected to have a low potential risk of impact (see Section 6), and where the dominant purpose is not waste *disposal* but rather characterisation for potential future resource recovery applications, and where SEATA considers that the project does not trigger any clause listed in Schedule 3 Part 1*,* **the project is not considered to be *Designated Development*** and a detailed EIS is not required. A Statement of Environmental Effects (SEE) will accompany the Development Application as outlined elsewhere*.*

For clarity, particularly in regards to **Clause 32 (Waste Management Facilities or Works)** of Schedule 3 (see further below) it is noted that:

- Waste **disposal** is **not** the primary purpose. Quite the opposite, research to characterise the *potential* of the technology for *future* commercial deployment for resource recovery, circular economy applications and climate change benefits are the primary purposes – noting a specific Resource Recovery Order & Exemption approval is sought for the project. Accordingly, clause 32 (1 a) is not considered applicable.
- SEATA technology is deliberately designed as **not** a form of ***incineration*** ("*burning or thermally oxidising solids, liquids or gases"*) as defined in Part 4 of Schedule 3. Accordingly, 32 (1 a) is again not considered applicable.
- **<5,000 tonnes** per annum of organic material will be processed for the proposed campaign-based R&D trials. Accordingly, clause 32(1c) is not considered applicable; and
- The project is not located on or within proximity to any of the triggers listed in Clause 32(1d). Accordingly, Clause 32 1(d) is also not considered applicable.
- the primary purpose of the project is not waste disposal in regards to **exemption** provisions under 32(2a) for treatment of sludge (e.g. biosolids). Accordingly, the project application to those feedstocks is considered exempt and Clause 32 is not considered triggered/applicable.

No other clauses in Part 1 of Schedule 3 could potentially apply to the project.

Based on all the above, it is therefore proposed that the project does not trigger Clause 32 and is **not** deemed *designated development*.

Schedule 3, Part 1 (Designated Development): Clause 32 (Waste Management Facilities or Works)

***(1)** Waste management facilities or works that **store, treat**, purify or dispose of waste or sort, **process, recycle, recover, use or reuse material** from waste **AND**--*

*(a) that **dispose** (by landfilling, **incinerating**, storing, placing or other means) of solid or liquid waste-*

(i) that includes any substance classified in the Australian Dangerous Goods Code or medical, cytotoxic or quarantine waste, or

(ii) that comprises more than 100,000 tonnes of "clean fill" (such as soil, sand, gravel, bricks or other excavated or hard material) in a manner that, in the opinion of the consent authority, is likely to cause significant impacts on drainage or flooding, or

(iii) that comprises more than 1,000 tonnes per year of sludge or effluent, or

(iv) that comprises more than 200 tonnes per year of other waste material, or

*c) that purify, **recover, reprocess or process more than 5,000 tonnes per year** of solid or liquid organic materials, or*

(d) that are located--

(i) in or within 100 metres of a natural waterbody, wetland, coastal dune field or environmentally sensitive area, or

(ii) in an area of high watertable, highly permeable soils, acid sulphate, sodic or saline soils, or

(iii) within a drinking water catchment, or

(iv) within a catchment of an estuary where the entrance to the sea is intermittently open, or

(v) on a floodplain, or

(vi) within 500 metres of a residential zone or 250 metres of a dwelling not associated with the development and, in the opinion of the consent authority, having regard to topography and local meteorological conditions, are likely to significantly affect the amenity of the neighbourhood by reason of noise, visual impacts, air pollution (including odour, smoke, fumes or dust), vermin or traffic.

(2) This clause does not apply to--

(a) development comprising or involving any use of sludge** or effluent **if--

***(i) the dominant purpose is not waste disposal,** and*

(ii) the development is carried out in a location other than one listed in subclause (1)(d), above, or

Protection of the Environment Operations Act 1997 as amended

The *Protection of the Environment Operations (POEO) Act*, *1997 (as amended),* is a fundamental piece of legislation governed by the NSW EPA which aims to achieve the protection, restoration and enhance the quality of the NSW environment. **Schedule 1** of the Act defines ***scheduled activities*** for which an Environmental Protection Licence (EPL) is required (including for mobile and premise-based licences) as outlined further below. Detailed discussion of key aspects of the Act as relevant to the proposed project are discussed in **Sections 5.3 to 5.5**.

The key legislative instruments for the regulation of waste in NSW are the POEO Act and the POEO (Waste) Regulation 2014 (Waste Regulation). Both contain provisions for the management, storage, transport, processing, recovery and disposal of waste.

The land application of waste (as defined in the POEO Act) may trigger various regulatory requirements, such as the need to hold an Environment Protection Licence and to pay a waste levy. The EPA has the power to give exemptions from certain regulatory requirements that would otherwise apply to the land application of a material that is produced wholly or partly from waste. The types of exemptions relating to resources recovered from waste (referred to as *'resource recovery wastes'* in the Waste Regulations) are specified in

clause 92 of the Waste Regulation. They include the re-use of wastes that are: applied to land; used as fuel; or are used in connection with a *process of thermal treatment*.

Section 43 of the POEO Act and **Schedule 1** of the Act are expected to trigger the proposed project to require an **Environmental Protection Licence (EPL)** from EPA for the following:

- ***Section 43(a):*** *Authorise the carrying out of* ***scheduled development work*** *at any premises, as required under section 47 of the Act.*
- ***Section 43(b):*** *Authorise the carrying out of* ***scheduled activities*** *at any premises as required under Section 48 of the Act,*

The specific activities under Schedule 1 for which an EPL is potentially required are detailed further in **Section 5.3 - 5.4**.

Protection of the Environment Operations (Waste) Regulations 2014, as amended 2019

The **Protection of the Environment Operations (Waste) Regulations** allows the NSW EPA to protect human health and the environment and provides a standard for a modern and fair waste industry. The regulations include thresholds for environmental protection licenses and outlines the waste levy system including where applicable.

The objectives of this regulation include the following: *(**bold** font indicates as may be relevant to the proposed project)*

- *Provides for the contributions to be paid by the occupiers of scheduled waste facilities for each tonne of waste received at the facility or generated in a particular area*
- ***Exempts certain occupiers or types of waste from these contributions***
- *Allows rebates to be claimed in relation to certain types of waste*
- *Providers for certain reporting and record-keeping requirements in relation to* ***scheduled*** *waste facilities and scheduled landfill sites*
- ***Exempts*** *certain waste streams from the full waste tracking and record keeping requirements*
- *Makes requirements relating to the transport of waste to interstate destinations*
- ***Allows the EPA to issue exemptions from certain provisions of the Act and Regulations***
- *Allows the EPA to approve the immobilisation of contaminants in waste: and*
- ***Makes It an offence to apply, or to cause or permit the application of residue waste to land that is used for the purpose of growing vegetation subject to any exemptions.***

The EPA has the power to give exemptions from certain regulatory requirements that would otherwise apply to the land application of a material that is produced wholly or partly from waste. The types of exemptions relating to resources recovered from waste (referred to as 'resource recovery wastes' in the Waste Regulations) are specified in clause 92 of the Waste Regulation. They include the re-use of wastes that are: applied to land; used as fuel; or are ***used in connection with a process of thermal treatment***.

Under the provisions of the Waste Regulation, the EPA issues two documents: Resource Recovery Orders (**RRO**) and resource recovery Exemptions (**Exemptions**). These documents focus on different parts of the waste re-use supply chain and are released as a package. The subject of an Order and Exemption is called a 'resource recovery waste' in the Waste Regulation and this refers to the specific resource recovered from waste.

RRO contain the conditions that **generators and processors** of waste must meet to legally supply the resource recovery waste material for land application. These conditions may include material specifications,

processing specifications, record-keeping, reporting and other requirements. All Orders are made under clause 93 of the Waste Regulation. **Exemptions** contain the conditions that **consumers** must meet to use resource recovery waste for application to land as a fertiliser or a soil amendment. These conditions may include requirements regarding how to reuse or apply the waste, as well as record-keeping, reporting and other requirements. All Exemptions are made under clauses 91 and 92 of the Waste Regulation. It is expected that RRO would be required for the integrated approval to receive feedstocks and operate the RDSM for the project. The Exemption could form conditional approval within an EPL issued for the project where biochar is to be satisfactorily characterised in accordance with specific related EPA guidelines (see further below) prior to proposed application to land (both as agricultural use (soils) or industrial use such as in roads).

The Regulations are applicable to the proposed project including (but not limited to) a Resource recovery Order and Exemption which will be sought from the EPA, as detailed further in **Sections 5.3-5.5**.

POEO (Clean Air) Regulations 2010, as amended 2021

The Protection of the Environment Operations (Clean Air) Regulation contains provisions to regulate emissions from the following:

- Wood heaters (wood is a significant source of particulate pollution in parts of NSW)
- Fires (including open burning and bushfires)
- **Motor vehicles and fuels**
- **Industry**

Additionally, the regulation also:

- Provides for the certification of domestic solid fuel heaters
- **Controls burning** generally by imposing an obligation to prevent or minimise emissions by prohibiting the burning of certain articles and requiring approval for certain fires/incinerators
- Requires the fitting of anti-pollution devices to certain motor vehicles and prescribes an offence of emitting excessive air impurities
- Imposes certain requirements and standards on the supply of petrol
- **Prescribes standards for certain groups of plant and premises to regulate industry's air impurity emissions**, and
- Imposes requirements on the control, storage and transport of volatile liquid organics.

The Regulation standards apply to the emissions of specified air impurities from activities and plant on commercial, agricultural and industrial premises, when discharged to the atmosphere through a vent, stack or similar discharge point.

It is also noted that the related NSW *Eligible Waste Fuel Guidelines (for energy recovery facilities)*, requires that facilities proposing to use eligible waste fuels must meet the relevant emissions standard established in the POEO (Clean Air) Regulations.

- **Division 2** in **Part 5** of the Regulations specifies ***standards for scheduled premises*** which importantly classifies *"General Groupings of activities and plant"*, commonly referred to as *Emission Standard Groups.* Cl32 effectively classifies **Group 6** as *any activity commenced to be carried on, or equipment operated, on or after 1 September 2005, as a result of an application for an environment protection licence made on or after 1 September 2005*. Accordingly, as a scheduled activity requiring an EPL aa scheduled premises (see related discussion elsewhere in Section 5), emissions standards required for **Group 6** can be considered **applicable to the proposed project**.

- **Division 4** in Part 5 of the Regulations provides operational standards specifically for ***Group 6 treatment plants***, including thermal treatment plants and flares, as are applicable to the proposed project. Clauses 49-52 specifies plant operation and emission control requirements as outlined in the table below.
- **Division 5** in part 5 addresses other ***miscellaneous requirements*** for emission points, start-up and shut-down periods, and smoke among other aspects.
- **Schedule 2** of the Regulations specifies ***minimum emissions standards*** for schedule premises for afterburners and other thermal treatment plant, with specific criteria for *Group 6*. Notwithstanding this, NSW EPA periodically updates supporting policies and guidelines with reference to the Regulations which may impose more stringent requirements (for example the *NSW Energy from Waste Policy* and related *Eligible Waste Fuels* guidelines). For example, these typically require compliance with Group 6 emissions criteria, nominate when *Best Available Technology (BAT)* is required, and more recently (June 2021) also included more stringent emissions criteria as discussed further in **Section 7.4.1**.
- **Schedule 3** sets additional ***industry-specific standards*** for **fourteen categories of scheduled premises** primarily associated with major industries. The proposed project is not relevant to those.

The industry-specific and general standards include for ***non-standard fuels*** for emissions of the following air impurities: volatile organic compounds, Type 1 and Type 2 substances, cadmium and mercury as identified further in **Section 7**. The Regulation specifies a standard for dioxin and furans if *precursors* to dioxin or furan formation are present in a non-standard fuel.
The proposed R&D trials will test uncontaminated feedstocks that are not expected to contain significant risk of precursors to dioxin formation, notably *chlorinated* compounds. Nor is full combustion proposed.

POEO (General) Regulations 2009, as amended 2021

The Regulation is relevant to any premises that burns biomaterial **to generate electricity** using native forest biomaterial, which is addressed in **Part 3, Clauses 125 – 128** of the Regulation (*previously Clauses 96 to 98 of POEO (General) 2009*). Although not technically applicable to SEATA's proposed R&D operations (energy recovery/electricity generation is not proposed), the Regulation has still been conservatively considered in context of future commercial applications.

Native forest bio-material can **only** be utilized **for electricity generation** if it is:

- **Invasive Native Species** (INS) cleared in accordance with existing *Property Vegetation Plans (PVPs)* originally issued under the *Native Vegetation Act 2003,* or an *Invasive Native Species Order* under the *Native Vegetation Regulation 2013* (both of which continue to be recognized under superseding legislation);
- **Pulp wood logs and heads and off-cuts** from clearing carried out in accordance with a Private Native Forestry Property Vegetation Plan (PNF PVP) or forestry operations carried out in accordance with an Integrated Forestry Operations Approval (IFOA) under the Forestry Act 2012
- Trees cleared because of **thinning** carried out in accordance with a *Private Native Forestry Property Vegetation Plan* or an *Integrated Forestry Operations Approval*.

INS will be provided under existing legal approvals (including existing PVP approvals as applicable), as discussed throughout this document and **Appendix 13 – Eligible Waste Fuel Details – Invasive Native Scrub.**

Additionally, it is noted that **no engineered timbers** (e.g. timber treated with formaldehyde) will be utilized. Only clean feedstocks only will be trialed.

Table 5.1: Summary of key requirements for Group 6 scheduled premises, POEO (Clean Air) Regulations

Clause	Summary of Requirement	Context to Proposed Project RDSM
49	*Flaring must be operated in a way that a flame is present at all times while air impurities are required to be treated.*	• Enclosed afterburner with air to combust post-scrubbed gas (refer **Figure 2.2**), unless otherwise recycled as feedstock to other processing steps if/where required. • All gas released (emissions) will be combusted via the enclosed afterburner (thermal oxidiser) with flame present at all times.
	(b) either or both of the following requirements relating to the operation of any such plant are complied with— *(i) the requirements in clauses 50 and 51,* *(ii) the requirements in clause 52*	*See below.*
50	***Residence Time*** *(1) An afterburner other than one with catalytic control system, must be operated such that the time between an air impurity entering and exiting is* *a) >2 seconds if originating from material containing any principal toxic air pollutant* *b) **> 0.3 seconds** in any other case*	• Uncontaminated feedstocks (**Section 4.6**) • Residence time from afterburner in SEATA RDSM will be >0.3 seconds at minimum, and will seek >2s.
	(2) Entry and exit time to be calculated by: *a) **Using volumetric flow rate** for the air impurity, determined as per TM-2 or CEM-6; and* ***b) Using a 1 hour rolling averaging period***	• *A 1hr rolling average of volumetric flowrate as per these referenced methods will be included in R&D detailed testing proposed for the project.*
51	***Combustion Temperature*** *(1) An afterburner, other than one that employs a catalytic control system, must operate such that the temperature for combustion is* *a) >980°C if originating from material containing any principal toxic air pollutant; or* ***b) >760°C in any other case***	• Uncontaminated feedstocks (**Section 4.6**). • Temperature from secondary reactor maintained >760°C (typically > 800°C, see **Figure 2.2, Section 2.3**). • Wet scrubber prior to flaring • Treated gas combusted within enclosed afterburner at >760°C
	*(3) Temperature for combustion to be determined in accordance with TM-2 using a **1 hour rolling averaging** period.*	• *A 1hr rolling average of temperature for afterburned gas will be included in R&D detailed testing proposed for the project.*
52	*Group 6 treatment plant (other than flares) must be operated in such a way that destruction efficiency of the plant is* *a) >99.9999% if the air impurity originates from material containing any principal toxic air pollutant* ***b) >99.99% in any other case***	• *(b) would apply in regards to clean feedstocks used, however noting flaring/afterburning is applied at this R&D pilot scale.* • *Destruction Efficiency will be determined via R&D testing (part of the R&D purpose of the project).*
	Destruction Efficiency (DE, %) to be calculated by: *DE= [1-(MW_{out}/MW_{in})] x 100, where:* *MWout = mass emission rate in exhaust emissions prior to release to atmosphere using 1 hour rolling average* *MWin = mass feed rate of the air impurity in a waste feedstream using a 1 hour rolling averaging period.*	

*Under Part 5 of the Regulations **principal toxic air pollutant** means any one or more of the following elements, compounds or classes of compounds:*
(a) acrolein, (b) acrylonitrile, (c) alpha chlorinated toluenes and benzoyl chloride, (d) arsenic and arsenic compounds, (e) benzene, (f) beryllium and beryllium compounds, (g) 1,3-butadiene, (h) cadmium and cadmium compounds, (i) chromium VI compounds, (j) 1,2-dichloroethane (ethylene dichloride), (k) dioxins or furans, (l) epichlorohydrin, (m) ethylene oxide, (n) formaldehyde, (o) hydrogen cyanide, (p) MDI (diphenylmethane diisocyanate), (q) nickel and nickel compounds, (r) PAH, as benzo[a]pyrene equivalent, (s) pentachlorophenol, (t) phosgene, (u) propylene oxide, (v) TDI (toluene-2,4-diisocyanate and toluene-2, 6-diisocyanate), (w) trichloroethylene, (x) vinyl chloride

Waste Avoidance and Resource Recovery Act 2001 (WaRR Act)

The purpose of the Waste Avoidance and Resource Recovery Act 2001 (WaRR Act) is to promote the avoidance of waste and resource recovery to achieve a continuous reduction in waste generation. The Act supports the development of a state-wide Waste Strategy and encourages producer responsibility for the life cycle of a product through the introduction of a scheme.

The objectives of this Act potentially relevant to the project include the following:

- ***To encourage the most efficient use of resources and to reduce environmental harm in accordance with the principles of ecologically sustainable development,***
- *To ensure that* ***resource management options*** *are* ***considered against a hierarchy of the following order:***
    - ***(i) avoidance of unnecessary resource consumption,***
    - ***(ii) resource recovery (including reuse, reprocessing, recycling, and energy recovery),***
    - ***(iii) disposal,***
- *To provide for the* ***continual reduction in waste generation,***
- *To minimise the consumption of natural resources and the final disposal of waste by* ***encouraging*** *the avoidance of waste and the* ***reuse and recycling of waste****,*
- *To assist in the achievement of the* ***objectives of the Protection of the Environment Operations Act 1997.***

Whilst this act is most notable for the introduction of Container Deposit Scheme in NSW, the act also provides EPA with a range of functions that include (but are not limited to):

- *to develop, implement or coordinate resource efficiency and waste reduction and management in regions, industry sectors and material types*, in order to facilitate objectives of the POEO Act, notably sustainability.
- *to assist local communities to enter into arrangements for regionally-based secondary resource recovery from waste,*
- *to research and develop waste reduction and resource efficiency infrastructure, technologies and systems*.

SEATA's proposed project R&D Centre and trials are consistent with and assist in supporting the above objectives, particularly in relation to encouraging efficient use of resources to reduce environmental harm, principles of Ecologically Sustainable Development (ESD), and providing continual reduction in waste generation and recovery of resources in an environmentally friendly fashion, with significant co-benefits for climate change and regenerative agriculture (soils).

Local Government Act 1993

Section 68 of the Local Government Act, 1993 specifies a variety of activities which require approvals from Council, which are often additional to the standard Development Application (DA) requirements. Activities related to water supply, sewerage and stormwater drainage works require a Section 68 approval.

SEATA seeks approval from GISC for the continued use of the existing septic system from the former house at the project site. No significant change in loading of the system is proposed (typically <5 personnel onsite at any one time, similar to that of the former house serviced by the existing septic system).

Water Management Act (2000) and Water Management General Regulations (2018), as amended

The objectives of this Act provide for the sustainable and integrated management of the water sources of the State for the benefit of both present and future generations. Extraction and use of surface and ground water resources in NSW are subsequently regulated by the Act and supporting Regulations. This includes (but is not limited to) granting of basic water rights, licencing of water take, regulation of activities within or near water resources, and provision of declared water catchment management areas and *Water Sharing Plans* (outlined further below).

Basic Landholder Rights are designated under the Act for:

1. *Domestic and Stock Rights* – surface and ground water can take water for domestic household purposes or stock water.
2. *Harvestable Rights* (dams) – allows most rural landholders to collect and store runoff in dams up to a certain size (typically <10% of the average regional rainfall in Central & Eastern land division). Dams for pollution control (eg. ESC basins) are typically excluded under provisions of the Act.
3. *Native Title Rights* – allows native title holders to use water for various non-commercial uses.

The following sections of the Act also require related approvals (if applicable), including as part of integrated development:

WMA Requirements	**Purpose**	**Context to Project** (if applicable)
Section 89 *(Water Use Approvals)*	Water used for particular purposes at a specific location e.g. construction dewatering or irrigation. A water use approval is required to use water on land for all purposes except when exercising basic landholder rights. However this has not conventionally been applied to rainwater roof harvest.	**Not applicable.** *Only water used is rainwater from roof harvest.* *Rainwater from proposed shed rooves is proposed to be used for staff amenities, fire water (one dedicated tank), and emissions control on the RDSM (make up water to quenching/wet scrubber system).* *Note: The project is also for R&D (not commercial, and an initial 3 year approval).*
Section 90 *(Water Management Works Approvals)*	Water supply works, drainage works and flood works.	**Not Applicable** *No water supply works (including bores or dams) required or proposed.*
Section 91 *(Activity Approvals)*	*Controlled Activity Approvals* ('waterfront land'); and *Aquifer Interference Approvals*	**Not Applicable** *No works proposed within 40m of defined creek.* *No proposed use of or impact to/from groundwater. No bores or deep excavations proposed.*

The project site is located within a region with seven (7) Water Sharing Plans – five (5) relate to Groundwater resources and two (2) to surface water (***NSW Border Rivers Unregulated Rivers Water Sources (2012)*** *and the* ***NSW Border Rivers Regulated Water Sources (2021)***), which includes the ***Glen Innes Water Source.*** Both plans address 6 Environmental, 6 Economic, 6 Aboriginal cultural and 6 Social cultural objectives.

The technology process itself does not require operational water supply, however **emissions control** (wet scrubber) requires make-up water to replace evaporated water content (occurs when very hot gas passes through the scrubber solution). This is expected to be around 500L/day and will be supplied from 22.5kL rainwater tanks with proposed Shed 3, noting each tank can supply ~45 days worth of water, which is expected to be longer than each feedstock campaign trial). Redundancy is provided via additional tanks on Shed 2 and ability to purchase water (external water supply truck) if/as required.

One of the 22.5kL rainwater tanks on proposed Shed 2 will be reserved for firefighting activities as per RFS requirements (to be fenced and RFS couplings fitted per RFS requirements).

Other rainwater tanks for the project, including the existing underground concrete rainwater tank associated with Shed 1 – detailed in **Section 3**) will provide water for staff amenities. Water usage will be similar to that of the average family household due to the small number of staff, noting that additional rainwater capacity is being provided through additional rainwater tanks for proposed Shed 2 (4 tanks, 1 reserved for firefighting) and Shed 3 (2 tanks). Additionally, whilst not proposed or expected to be required, it is noted that in the unexpected event of an emergency, further backup and redundancy is also available via three nearby sources - an existing 22.5kL rainwater tank on an existing farm shed located immediately adjacent to the project site within Lot 3 DP1193185 (<100m from the RDSM), a groundwater bore (see below) and a farm dam on nearby Lot 1 DP1193185 (all same land owner as the project site).

For context and completeness, the GISC DCP (2014) requires minimum size of 22,000L (20kL) tanks to be installed with proposed sheds. The project has proposed minimum 22.5kL sized rainwater tanks accordingly.

For clarity, on 3rd April 2014 a **Water Access Licence (WAL No 90WA832525)** was issued for adjacent Lot 1 DP 1193185 (also owned by John Winter) for the purpose of bore construction works. Basic domestic and stock rights under the Act provide the owner to use the water for household and stock use as noted above. For clarity**, access to water from this bore water is not proposed** for the project on Lot 3, but has been noted as readily available **in case of emergency**.

Accordingly, water security is not expected to be an issue for the project.

Rural Fires Act 1997, and Rural Fires Regulation (2013), as amended

The Rural Fires Act and supporting Regulations empowers the NSW Rural Fire Service (RFS), defines its functions and makes provision for the prevention, mitigation and suppression of rural fires. The Act was amended in 2002 (in concert with the EP&A Act) with respect to Bushfire Prone Lands (BFPL), bush fire hazards and emergencies.

The objectives of the Act provide prevention, mitigation, and suppression of bush and other fires in LGAs and other parts of the State that constitute as *Rural Fire Districts*, and coordinate bushfire fighting and prevention, in addition with the protection of persons from injury death and property from damaged that arise from fires, as well as environmental protection. Certain activities are required to be conducted in regards to ecologically sustainable development as described in the POEO Administration Act, 1991, as amended

The *Planning for Bushfire Guidelines* (PFBP, RFS 2019 - see **Section 5.2.4**) refers to the Act. The guidelines also require that a ***bush fire safety authority*** (approval) under Section 100B of the Act is required for residential and rural subdivision and Special Fire Protection Purpose (SFPP developments) on BFPL such as schools and hospitals. As none of these are applicable to the project it does not trigger Section 100B of the Act.

Roads Act 1993

The management framework of roads in NSW is outlined in the *Road Act 1993.* Works or activities in a public reserve, public roadway or footpath require consent under Section 138 of the Act.

Consent under ***Section 138*** of the Act is **not** expected to be required for the proposed project as development will not occur on a public road (no works required or proposed to West Furracabad Road, all proposed works are within the project site). For clarity, it is also noted that there are no culverts or footpaths crossing the entry to the site.

Biodiversity Conservation Act 2016

The Biodiversity Conservation Act 2016 (BC Act) replaced the Threatened Species Conservation Act 1995 (TSC Act) in 2017. The purpose of the BC Act is to maintain a healthy, productive and resilient environment for the greatest well-being of the community, now and into the future, consistent with the principles of ecologically sustainable development. In summary, the BC Act provides:

- A new framework for managing native vegetation clearing
- An enhanced and strategic approach to private land conservation and threatened species conservation
- An expanded biodiversity offsetting scheme

Established under Part 7 of the Act, the NSW ***Biodiversity Values (BV) Map*** identifies land with high biodiversity value that is particularly sensitive to impacts from development and clearing. The map forms part of the Biodiversity Offsets Scheme threshold, which is one of the triggers for determining whether the Biodiversity Offset Scheme (BOS) applies to a clearing or development proposal. The BV map is relevant for local developments under Part 4 of the EPA & A Act which is not SSD or complying development (i.e. is applicable to this project, if BV land is affected – refer **Section 7.5**).

Note: The act also has relation to the Local Land Services (LLS) Act (2013) which also regulates management and clearing of native vegetation in context of biomass feedstocks such as INS (discussed separately further below).

National Parks and Wildlife Act 1974

The *National Parks and Wildlife Act 1974 (NPW Act)* administers the State's care, control and management of all historic sites, national parks, nature reserves. As well as the provision for the protection and recording of Aboriginal objects in NSW. The Act also protects Aboriginal objects and requires a permit to harm an object. The Act also provides that an individual or organisation who exercises *due diligence* in determining that their activities will *not* harm Aboriginal objects has a defence against prosecution under the Act (refer Section 5.2.4 for discussion on the *NSW Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW (the 'Due Diligence Code'*). The project site has no relevance to national parks or nature reserves. Context for historic and Aboriginal and Cultural Heritage is provided in Section 7 of this SEE, include risk-based screening undertaken generally in accordance with the Due Diligence Code (refer Appendix 5).

Local Land Services Act *(2013, as amended 2017)*

The Local Land Services Act provides a **regulatory framework for the management of native vegetation in NSW**. The Act established the ***Local Land Service (LLS)***, and repealed the *Rural Lands Protection Act 1998*, the *Rural Lands Protection Amendment Act 2008* and the *Catchment Management Authorities Act 2003*. The Act paved the way for eleven (11) regional Local Land Services organisations to commence from 2014. The Act is

support by the LLS Regulations (2014, as amended). The legislation makes NSW the only state where publicly-funded *biosecurity, natural resources management and agricultural advisory services* are provided by a single organisation. The LLS were formed from (previous) Catchment Management Authorities, Livestock Health and Pest Authorities and some advisory services of the NSW Department of Primary Industries.

The LLS Act aims to ensure natural resources are managed in accordance with the *principles of Ecologically Sustainable Development (ESD)* as described in section 6(2) of Protection of the Environment Administration Act 1991) in the social, economic, and environmental interests of the State. **The LLS Act was amended on 25 August 2017 regarding native vegetation land management and clearance in rural areas**, **replacing the *Native Vegetation Act 2003*, as part of the NSW Government's new framework for the conservation of biodiversity.** Existing approvals issued under the original *Native Vegetation Act,* including ***Property Vegetation Plans (PVP),*** continue to apply and be recognised under the new legislation. The LLS provides management framework of local land services, including programs and advisory services relating to agricultural production, biosecurity, natural resource management (including management of native vegetation, weeds, and pests) and emergency management.

The ***Native Vegetation Regulatory Map*** identifies land regulated under the land management framework for land clearing, and categorises land into **excluded**, **exempt** and **regulated** land to determine native vegetation management options for landholders. Some vegetation management needs approval and some do not. The project site is **not** identified as being located within *regulated* or *excluded* land and does not require further approval from LLS for associated **onsite** targeted clearing proposed (refer **Section 7**). See also related discussion of ***Biodiversity Value Mapping*** in Section 7.5.1.

In regards to biomass feedstock supply for R&D testing, **only lawfully cleared/obtained material will be accepted by SEATA for R&D testing** (for example, under *existing* Property Vegetation Plans (PVP) held by suppliers or other lawful approvals held by suppliers of biomass feedstock for the project), as would also be relevant to proposed EPL exemptions and Resource Recovery Order & Exemptions to cover the generators of biomass waste used in the R&D project.

NSW Biosecurity Act 2015 and Regulations (2017)

The *Biosecurity Act 2015* (Biosecurity Act) and supporting Regulations (2017) provides statutory framework for the management of biosecurity risks from diseases, pests (plants and animal) and contaminants which have the potential to cause harm to the environment, people and the economy. The Biosecurity Act aims to reduce risks by: preventing the entry of diseases, pests and contaminants into NSW; identifying, containing and eradicating new entries; and minimising potential impacts through appropriate management. The Biosecurity Act has provisions in place for: conferring a power, function or right; or imposing an obligation for the prevention of the introduction, or control or eradication of invasive pests (such as weeds and animals, pests) which threaten ecosystems, habitats or species.

Under the Biosecurity Act, Local Control Authorities such as local councils may appoint authorised officers to enforce weed management and provide direction on complying with obligations under the Biosecurity Act.

Section 22 in Part 3 of the Act establishes a ***general biosecurity duty*** when handling and managing all forms of weeds as follows:

> *"Any person who deals with biosecurity matter or a carrier and who knows, or ought reasonably to know, the biosecurity risk posed or likely to be posed by the biosecurity matter, carrier or dealing has **a biosecurity duty to ensure that, so far as is reasonably practicable, the biosecurity risk is prevented, eliminated or minimised**."*

This includes application to the *supply and movement* of invasive native scrub (INS) as is applicable to this project and has been considered in project design and risk assessment. Accordingly, staged ***Biosecurity Permits*** under the Act are sought from NSW DPI allowing proposed activities involving invasives (and any other aspect of the project deemed requiring such from NSW DPI), which is subsequently sought under the Integrated approval process for the project as relevant, noting the supporting risk-based assessment and controls as noted further below and herein. Detailed information requirements would be provided on a staged basis similar to that proposed for RRO &Exemptions, including for the first proposed feedstock to be trialled (INS native biomaterial), which will be provided during the assessment period.

There is a general obligation on people to be aware of their surroundings and take action to prevent the introduction and spread of pests, diseases, weeds and contaminants. *Regional Strategic Weed Management Plans* and regional weed coordinators are also established under this Act (refer related discussion in Section 5.2.4 where this has been considered in context to the project).

For clarity and completeness, it is noted that **exotic weeds** occurring in NSW (i.e. species originally from overseas) are **not proposed to be trialled** in this R&D project. Only Invasive Native Scrub (Invasive woody weeds) and biosolids all originating from in NSW are proposed, with appropriate biosecurity controls (for all feedstocks) considered and included as detailed in **Section 7** and **Appendix 5**.

Electricity Supply Act 1995

The Act sets out the powers and duties of electricity network operators and retailers in NSW. The objectives of the act are to:

- Promote the **efficient** and **environmentally responsible** production and **use of electricity** and to **deliver a safe and reliable supply of electricity**, and
- Confer on network operators such powers as are necessary to enable them to construct, operate, repair, and maintain their electricity works, and
- **Promote** and **encourage the safety of persons and property** in relation to the **generation, transmission, distribution and use of electricity**, and
- Ensure that any significant disruption to the supply of electricity in an emergency is managed effectively.

The Act provides powers to Essential Energy to approve permanent structures in vicinity to its powerlines as part of integrated assessment by GISC. The Act has been considered due to the locations of proposed sheds in context to proximity to an existing overhead 11kV powerline owned by Essential Energy and an associated exclusion zone. Subsequently, Essential Energy has been consulted as per **Section 6.**

Additionally, the Act provides powers for bushfire prevention and authorises Essential Energy to enter the property and undertake the work on the powerline and poles in the interest of public safety.

Dangerous Goods (Road and Rail Transport) Act 2008

The purpose of this Act is to regulate the transport of dangerous goods by road and rail to promote public safety and protect property and the environment. The Act has been considered due to the transportation of goods to and from the site. **Section 7** details the types of materials stored at the site, as per the ADG Code (further outlined below).

Australian Dangerous Goods Code (2020)

The Australian Code for the Transport of Dangerous Goods by Road & Rail (ADG Code) sets out the consistent technical requirements for transporting dangerous goods overland (i.e. via road and/or rail). Additionally, the code provides consistent technical requirements. The ADG Code should be read in conjunction with relevant state or territory law. The ADG Code adopts the structure, format, definitions, and concepts of the United Nations Recommendations on the Transport of Dangerous Goods Model Regulations while retaining some Australian specific provisions. It also incorporates additional provisions for the transport of infectious substances.

The ADG Code lists provisions applicable to the transport of dangerous goods including:

- classification;
- packaging and performance testing;
- use of bulk containers, IBCs, freight containers and unit loads;
- marking and placarding;
- vehicle requirements;
- segregation and stowage;
- transfer of bulk dangerous goods;
- documentation;
- safety equipment;
- procedures during transport emergencies; and
- the dangerous goods list with UN numbers.

The ADG Code has been considered for all materials used/stored/produced by the project, including production, storage and transportation of biochar which may be *potentially* be classed as a dangerous good where not properly produced and will be managed accordingly (refer Section 7 for details).

Note: Whilst the ADG Code is a national code, for ease of reference it has been presented in this section directly alongside the NSW state legislation (above) which is directly relevant to it.

5.2.4 State & Regional Policies and Guidelines

5.2.4.1 State Environmental Planning Policies (SEPPs)

State Environmental Planning Policies (SEPPs) are statutory Environmental Planning Instruments legally recognised by the EPA&A Act 1979 which help guide consistent and appropriate development throughout the state. SEPPs potentially relevant to the project are outlined below.

State Environmental Planning Policy (SEPP) – State & Regional Development (2011)

Schedules 1 to 7 of the above SEPP identify thresholds for types of activities which are deemed to be Regional Significant Development (RSD) or State Significant Development (SSD), typically based on type, size, potential for impact/sensitivity and level of capital investment.

DPIE is typically the determining body for SSD projects on behalf of the Minister. Councils typically initially assess RSD which are then determined by a *Regional Planning Panel*. Regional development includes:

- development with a capital investment value (CIV) over $30 million
- development with a CIV over $5 million which is:
    - council related

- lodged by or on behalf of the Crown (State of NSW)
- private infrastructure and community facilities
- eco-tourist facilities.

- extractive industries, waste facilities and marinas that are designated development
- certain coastal subdivisions
- development with a CIV between $10 million and $30 million which is referred to the Planning Panel by the applicant after 120 days.

The proposed project is of small scale below the triggers for both state and regionally significant development as described in Schedules 1-7 of the SEPP. This includes Schedule 1 (SSD) Clause 23 (Waste & Resource Management Facilities), and Schedule 7 (Regionally Significant Development) including Clause 5a (the project is <$5M for waste management and resource recovery facilities) and Clause 7(c) – the project is not considered *designated development* as a waste management facility or works (see EP&A Regulations (2000) earlier above).

State Environmental Planning Policy (SEPP) No. 33 – Hazardous and Offensive Development

State Environmental Planning Policy No. 33 (SEPP 33) applies to any development proposals which may be a potentially hazardous industry or a potentially offensive industry, as defined by the policy's definition.

The aims of SEPP 33 relevant to proposed facility, are as follows:

a) Amend the definitions of hazardous and offensive industries were used in environmental planning instruments

b) Render ineffective a render ineffective a provision of any environmental planning instrument that prohibits development for the purpose of a storage facility on the ground that the facility is hazardous or offensive if it is not a hazardous or offensive storage establishment as defined in this Policy, and

c) To require development consent for hazardous or offensive development proposed to be carried out in the Western Division, and

d) To ensure that in determining whether a development is a hazardous or offensive industry, any measures proposed to be employed to reduce the impact of the development are taken into account, and

e) To ensure that in considering any application to carry out potentially hazardous or offensive development, the consent authority has sufficient information to assess whether the development is hazardous or offensive and to impose conditions to reduce or minimise any adverse impact, and

f) To require the advertising of applications to carry out any such development.

SEPP 33 is relevant to SEATA's proposed RDSM facility as certain activities may involve the handling, storing, and processing of chemicals, fuels, and raw materials during associated operational activities. As detailed in the supplied Environmental Risk Assessment, initial screening of likely hazardous materials used/stored for the development (and quantities) has demonstrated **these will be below the thresholds to be considered a Hazardous/Offensive development**. Therefore, the proposed project is **not** considered hazardous or offensive industry under SEPP 33.

Notwithstanding this, hazards and risks associated with potential hazardous materials used/stored for the development have been conservatively considered in Section 7.4 and Appendix 5 – Environmental Risk Assessment.

State Environmental Planning Policy (SEPP) No. 55 – Remediation of Land

SEPP 55 introduces state-wide planning controls for the remediation of contaminated land. The policy states that land must not be developed if it is unsuitable for a proposed use because it is contaminated. If the land is unsuitable, remediation must take place before the land is developed. The policy makes remediation permissible across the State, defines when consent is required, requires all remediation to comply with standards, ensures land is investigated if contamination is suspected, and requires councils to be notified of all remediation proposals.

The property in which project activities will be undertaken is not identified as being contaminated and SEPP 55 is not considered to apply.

State Environmental Planning Policy (SEPP) Koala Habitat Protection (2021)

The State Environmental Planning Policy (Koala Habitat Protection) 2021 ("*Koala SEPP 2021"*) commenced on 17 March 2021. The Koala SEPP 2021 aims to encourage the conservation and management of areas of natural vegetation that provide habitat for koalas to support a permanent free-living population over their present range and reverse the current trend of koala population decline.

The principles of the Koala SEPP 2021 are to:

- Help reverse the decline of koala populations by ensuring koala habitat is properly considered during the development assessment process.
- Provide a process for councils to strategically manage koala habitat through the development of koala plans of management.

Koala SEPP **2021** also reinstates the policy framework of the SEPP Koala Habitat Protection **2019** to 83 specified Local Government Areas (LGA) in NSW, and Koala SEPP 2020 to applicable rural LGAs. In the Glen Innes LGA for land zone *RU1 Primary Production* (as relevant to the proposed project) the Koala SEPP **2020** continues to apply.

The Koala SEPP is triggered when a Development Application is lodged upon land that is:

- Located within a LGA where the SEPP applies (refer to Schedule 1 of the SEPP),
- Over 1 hectare in size, and
- Has been mapped within the ***Koala Development Application Map.***

The *Koala Development Application Map (Koala DA Map)* identifies land which is likely to:

- Contain the koala tree species listed in the SEPP for that area,
- Be capable of sustaining koalas, and
- Be where koalas are likely to be present.

Assessment against the SEPP then applies only if the land is:

- 1 hectare or more,
- Does not have an approved KPoM applying to it, and
- Is wholly or partially captured by the Koala DA Map

Site Investigation Area (SIA) mapping is also held by Councils and DPIE to identify suitable survey areas for surveying *Core Koala Habitat* when preparing a *Koala Plan of Management (KPoM)*.

If applicable, development applications need to address matters outlined under Part 3 of the Draft Guideline as part of the proposal to council. The Guideline criteria is split into two pathways: Tier 1 and Tier 2

development. **Tier 1** is for development that will have **little or no impact on koalas or koala habitat**, and therefore **does not require the input of a suitably qualified person such as an ecologist**. Tier 2 is for development that will have an impact on koalas or koala habitat and requires a Koala Assessment Report to be prepared by a suitably qualified person. The Tier 1 process is for development which can be demonstrated to have low or no direct impact on koalas or koala habitat as follows:

1. indirect impacts that will *not result in clearing of native vegetation within koala habitat*
2. the development is *below the Biodiversity Offsets Scheme threshold under the BC Act*
3. there is *no native vegetation removal*
4. the *development footprint will not impede movement between koala habitat*
5. *adequate mitigation measures* such as those listed in Table 1 of the Koala Habitat Protection Guideline (2019) are implemented as necessary.

If the development cannot meet all criteria above, then it exceeds a low level of impact on koalas and/or koala habitat and the Tier 2 process is triggered.

In regard to the proposed project:

- Glen Innes Severn LGA is a council area included in Schedule 1 of the SEPP, and falls within the ***Northern Tablelands Koala Management Area (KMA 4)*** established for the NSW Koala Strategy (covering an area from south of Scone to north of Tenterfield and encapsulation many LGAs).
- **The project area (within Part Lot 3) is <1ha in size.**
- No native tree or shrub vegetation is proposed to be removed as part of the development. Two *non-*native trees will be cleared to make way for proposed Shed 3 and the access loop surface past proposed Shed 2.
- Koala Food Trees as outlined in Schedule 2 of the SEPP are not known to be located upon the site.
- The development is below the Biodiversity Offsets Scheme threshold under the BC Act.
- In addition to the Tier 1 assessment criteria, it is important to note that:
    - as the subject land forms part of 5th generation cleared farmland with minimal tree corridors in the surrounding area, it is highly unlikely Koalas would utilise the site.
    - Whilst noting it is not a formal regulatory instrument, review of the ***NSW Koala Habitat Information Database*** (DPIE 2021), which DPIE states as providing *"the best available state-wide spatial data on koala habitat, likelihood, koala preferred trees and koala sightings for NSW"* found no recorded sightings at or near to the project site.

In accordance with the SEPP and associated guidelines, the proposed development is considered to meet Tier 1 provisions and further input from a qualified ecologist or preparation of Koala Plan of Management is **not** considered to be required.

State Environmental Planning Policy (Exempt and Complying Development Codes) 2008

This Policy (commonly referred to as the ***"Codes SEPP"***) aims to provide streamlined assessment processes for **development that complies with specified development standards** by:

a) *providing exempt and complying development codes* that have State-wide application, and
b) identifying, in the *exempt development codes*, types of development that are of minimal environmental impact that may be carried out *without the need for development consent*, and
c) identifying, in the *complying development codes*, types of complying development that *may be carried out in accordance with a complying development certificate* as defined in the Act, and
d) enabling the progressive extension of the types of development in this Policy, and

e) providing transitional arrangements for the introduction of the State-wide codes, including the amendment of other environmental planning instruments.

Development Standards are prescribed by the Codes SEPP for exempt and complying development as applicable to regulate how development is lawfully undertaken to appropriate standards without requiring development consent.

The following are potentially of relevance to the project site (existing and/or proposed infrastructure), under **Part 2** of the Codes SEPP (Division 1 unless otherwise specified) :

- **Division 1**, Subdivision 16 – ***Farm* buildings** (other than stock holding yards, grain silos and grain bunkers)
- Subdivision 32 and 33 – **Rainwater tanks** (above ground and underground respectively)
- Subdivision 36B – **Shipping containers** and portable offices (temporary installation and use of up to two containers as per the Development Standards specifications also allowing commercial and industrial purposes). This provision will be adopted for two of the four proposed shipping containers on the site, with the remaining two containers requiring development consent.
- Subdivision 9 – Cabanas, cubby houses, ferneries, **garden sheds**, gazebos and greenhouses.
- Subdivision 18 - **Fences** (certain rural zones including RU1 – can apply for replacement/installation of fences).
- **Division 2** (**advertising and signage**) – allows signage to be erected (e.g. on a proposed Shed) which complies with the prescribed Development Standards, as per the relevant sub-division type.
- **Division 3** (**Temporary Uses and Structures**) – has potential to apply to the relocatable *Sound Enclosure Module*.
- See also related note below regarding Subdivision 14 (**earthworks**) and Subdivision 21AA (**Fuel Tanks and Gas Storage**).

The Codes SEPP applies to the existing sheds on the site currently dedicated (only) to **farming** use. However, proposed re-purposing of existing **Shed 1** to a **non-farm** use for the project does **not** fall under the provisions of the Codes SEPP. Accordingly, Development Consent from GISC and associated related approvals is required, with related change in shed use *classification* under the National Construction Code (NCC) due to change in purpose and activity, as outlined elsewhere in **Section 5.2.5**.

Existing rainwater tanks (including the existing underground concrete rainwater tank), garden sheds fall under the Code SEPP. Proposed new rainwater tanks and up to two (2) shipping containers for any purpose in any zoning can also have potential to fall under the Code SEPP. Accordingly, existing and proposed rainwater tanks and two of the four proposed shipping containers are sought to be approved under the Codes SEPP.

It is noted that under Subdivision 14 and Subdivision 21AA of the Codes SEPP also allows certain ***earthworks*** and ***fuel & gas storage*** to be undertaken on a site as exempt or complying development, however the proposed activities do not meet the required criteria in the Development Standards associated with those provisions (e.g. >150m^2 for earthworks, and >2ha property size for fuel and gas storage), and therefore requires Development Consent.

If/where the provisions of the Codes SEPP do not apply, a development application for the activity can be made to the relevant consent authority.

Land Management (Native Vegetation) Code 2018

The Land Management (Native Vegetation) Code 2018 ('the Code') applies to all rural lands throughout NSW and provides directions on what native vegetation can and cannot be cleared, how much clearing is permitted and under what circumstances. The level of activity permitted depends on the impact of the proposed activity. Before any activity commences, notification to Local Land Services is required.

There are **five parts of the Code** which facilitate different types of land management and clearing activities, which are listed as follows:

- **Invasive Native Species –** Enables the removal of invasive species that have reached unnatural densities and dominate an area.
- **Pasture Expansion** – Enables the removal of woody native vegetation by uniform or mosaic thinning to promote native pastures and increase farm efficiency and productivity.
- **Continuing use** - Enables the continuation of lawful land management activities that have been in place between 1990 and 25 August, 2017
- **Equity** - Enables the removal of paddock trees, compromised native groundcover, and native vegetation from small areas and regulated rural land
- **Farm plan -** Enables the removal of paddock tree areas and clearing regulated rural land in exchange for set aside areas containing remnant vegetation, or set aside areas where revegetation will be required.

For low impact land management activities, landholders are required to notify Local Land Services prior to clearing. Activities that have a high risk of adversely impacting on the environment require certification by Local Land Services prior to any clearing activities. Clearing under the Code is not permitted for some categories of land, including coastal wetlands, old growth forests, littoral rainforests, core koala habitat and critically endangered ecological communities.

The Code is indirectly related to the project in regards to permissible clearing of native biomaterial under the five parts of the code, including Invasive Native Scrub (INS) if/as relevant. Whilst SEATA will not directly clear these feedstocks, **only lawfully obtained feedstocks (as confirmed by suppliers) will be accepted by SEATA**.

State Environmental Planning Policy (Infrastructure) 2007

This Policy provides a consistent planning regime for infrastructure and the provision of services across NSW, along with providing for consultation with relevant public authorities during the assessment process.

Although considered, **Clause 34** of the SEPP is not applicable as the project is not considered electricity generating works.

State Environmental Planning Policy (Primary Production and Rural Development) 2019

Although, the project site is zoned as RU1 and the policy has been considered, it is considered *not applicable* as the proposed activities for the project are not directly related to primary production, aquaculture activities, nor is the site a part of State significant agricultural land.

5.2.4.2 Other Relevant NSW State Policies and Guidelines

NSW Climate Change Policy Framework

The NSW Climate Change Policy Framework outlines the NSW Government's long-term objectives to achieve net-zero emissions by 2050 and to increase the resilience of NSW to climate change.

The Framework also displays the Governments commitment to seeking and supporting opportunities in the advanced energy sector, to assist in global climate change adaptation outcomes. In which the Government will seek and support opportunities to grow these emerging industries in NSW.

As further outlined elsewhere in this document, the proposed project will assist both the NSW Governments Net-Zero Emissions target by 2050, particularly including demonstrating the potential for economic drawdown at scale critically required to reduce impacts of climate change, as well as aspects relating to improving *resilience* across multiple sectors.

NSW Net Zero Plan Stage 1: 2020 – 2030

The purpose of the NSW Government's Net Zero Plan is to provide confidence to the NSW community and their families that challenges that climate change presents can be solved. The plan seeks to **reduce emissions by 35% by 2030** and achieve **net zero by 2050**. The plan intends to create almost 2400 jobs and attract $11.6 billion in investment, two thirds (2/3) of which is targeted toward **rural and regional** areas in NSW.

The **four Net-Zero priorities** outlined in the Plan are as follows:

1. *Drive uptake of proven emissions reduction technologies that grow the economy, create new jobs or reduce the cost of living.*
2. *Empower consumers and businesses to make sustainable choices*
3. *Invest in the next wave of emissions reduction innovation to ensure economic prosperity from decarbonisation beyond 2030*
4. *Ensure the NSW Government leads by example***.**

The proposed project aims to assist in achieving the four Net-Zero priorities outlined in the Plan, as bolded above. As outlined in **Table 4.1** the proposed project will create new jobs and drive the uptake of emissions reduction technologies. Additionally, businesses, particularly agricultural will potentially be able to manage their INS waste in a more sustainable manner with lower GHG emissions.

The ***NSW Net Zero Industry and Innovation Program*** ('NSW Net Zero Program') is part of the NSW Net Zero Plan Stage 1 and was released in March 2021. The program aims to *"drive a clean industrial revolution"* and has **three focus areas**:

1. **Clean Technology Innovation** (including priority areas of **energy systems**, **land and primary industries**, and **power fuels** including **hydrogen.** This includes a **decarbonisation innovation hub**)
2. **New Low Carbon Industry Foundations** (including enabling low emissions infrastructure through development of Clean Manufacturing Precincts (CMPs) and **Hydrogen Hubs** in NSW)
3. **High Emitting Industries** (deployment of **low emissions technologies** to reduce emissions in these industries)

The **six (6) Strategic Principles** underpinning the program are:

(i) ***Reduce*** *carbon emissions in ways that support economic growth*

(ii) ***Position*** *NSW as a leader in clean technology*
(iii) ***Lay foundations*** *for new low carbon industries*
(iv) ***Realise*** *opportunities to reduce carbon emissions in the short-term*
(v) ***Attract*** *investment into NSW* (particularly for employment and exports in regional NSW)
(vi) ***Align*** *the Program with other NSW Government Policies.*

SEATA technology has the potential to significantly and positively contribute to many of the above priorities, principles and objectives. Approval of the R&D trials to demonstrate the technology will facilitate the emergence of the technology to meet those priorities and objectives.

NSW Renewable Energy Zones (REZ)

The NSW Government's Electricity Strategy and Electricity Infrastructure Roadmap established a plan to deliver the State's first five Renewable Energy Zones (REZ), which includes the **New England** region, where the project is located. The Strategy builds upon the NSW Transmission Infrastructure Strategy and supports the implementation of the Australian Energy Market Operator's Integrated System Plan.

Renewable Energy Zones (REZs) combine renewable energy generation (i.e. wind and solar), storage such as batteries, and high-voltage poles and wires to deliver energy to the homes, businesses and industries that need it. The connection of multiple generators and storage in the same location, REZs capitalise on economies of scale to deliver cheap, reliable, and clean electricity for homes and businesses in NSW.

The benefits of Renewable Energy Zones for the NSW region, are as follows:

- **More reliable energy from significant amounts of new energy supply**
- Energy bill savings from reduced wholesale electricity costs
- **Emissions reduction from a cleaner energy sector**
- Community partnership from strategic planning and best practice engagement and benefit sharing.

The New England region, in which the project activities are being undertaken on are considered a priority location for REZs as these locations benefit from exceptional energy resources including wind, solar and hydro and are relatively close to existing grid infrastructure. REZs typically have reduced environmental, heritage and land use constraints, and benefit from existing investment interest from the private sector (Source: NSW Government, 2021).

SEATA's technology supports emissions reduction from a cleaner energy sector. As noted above, the New England region presents a diverse array of energy resources. SEATA's technology could potentially add to the diversification of energy resources, which supports the resilience of the energy sector.

NSW Regional Plans / New England Northwest Regional Plan (2036)

In 2017, DPIE finalised a suite of Regional Plans for the entire state setting out the framework, vision and direction for strategic planning and land use, established in consultation with other government agencies, councils, industry and local communities to deliver priority actions under Regional Plans.

The New England Northwest Regional Plan (2036) establishes the 20 year vision for the region as *"Nationally valued landscapes and strong, successful communities from the Great Dividing Range to the rich black soil plains"*. The plan sets the following regionally focused goals:

- Strong and dynamic regional economy
- Healthy environment and pristine waterways
- Strong Infrastructure and transport networks for a connected future

- Attractive and thriving communities.

SEATA's proposed project has the potential to assist the above goals associated with environmental, economic and community benefits, including attracting rural 'green' jobs in emerging clean technology.

NSW 20 Year Economic Vision for Regional NSW (2018)

The 20-Year Economic Vision for Regional NSW, released in 2018, sets out the Government's priorities and plans to achieve long-term social and economic success for regional communities across the state. The 2018 Vision was recently "refreshed" in response to the changed economic landscape and opportunities that have emerged in regional NSW following the drought, bushfires, flood and COVID-19 pandemic.

The Vision guides regional investment (including the Regional Growth Fund) to create employment and also attract people to live in regional NSW. Five (5) investment priorities are set under the refreshed Vision, importantly including ***"Secure sustainable access to water and energy"*** as relevant to the proposed project.

The New England and Northwest Region has been identified under the refreshed Vision to accelerate economic recovery through investment in the **New England Renewable Energy Zone (REZ)** and investments to support **agriculture, mining**, freight and **manufacturing** industries. SEATA's technology and proposed project to demonstrate its potential commercial applications align with these intentions under the Vision.

NSW Regional Economic Development Strategies (REDS)

The NSW Government assisted local councils across NSW to collaboratively establish 37 Regional Economic Development Strategies (REDS) for specified Functional Economic Regions (FERs). REDs set out a vision for the Region, and articulate a framework of strategies and actions identified that are crucial to achieving the vision. The ***Northern New England High Country Regional Economic Development Strategy (2018-2022)*** was developed by a collective of three local councils (including GISC) and the communities and stakeholders. The document sets out a long-term economic vision and associated core strategies for the FER encompassing the Glen Innes Severn, Tenterfeld Shire and Southern Downs Regional Council Local Government Areas (LGAs). The Strategy is based on *industry specialisations* that leverage the Region's key relative strengths and competitive advantage ('endowments'), including its climate, location, productive **agricultural** land, transport infrastructure, **renewable energy** resources, tourism assets, and local institutions, to guide investment and actions. **Three core strategies** established to achieve the Vision for the region include:

1) Improve connectivity as a foundation for growth
2) Support and grow key sectors
3) Attract new business and residents to the region.

Opportunities to support these core strategies identified eight areas, including the following two relevant to the project as outlined below:

- **Facilitate growth of renewable energy** production
- **Support productivity improvements in agriculture** and related manufacturing
- **Upgrade road infrastructure** (biochar has proposed industrial application in roads)
- **Support niche manufacturing** (SEATA technology development and potential use of syngas for input gases to manufacturing when commercialised in future).

NSW Biodiversity Strategy

The NSW Biodiversity Strategy introduces the principle of shared responsibility for protecting biodiversity:

> *'Government, industry and the people of NSW working together to protect the economy, environment and community from the negative impacts of animal and plant pests, diseases and weeds for the benefit of the people of NSW.'*

The strategy is supported by the *NSW Invasive Species Plan* as noted below.

The strategy has potential context to the project in respect to INS and general biosecurity duty. The R&D potential of SEATA's proposed project to demonstrate a climate-positive, economically effective and scalable solution for the management of INS is consistent with the principles of shared responsibility to assist in protection from negative impacts of INS for the benefit of the people of NSW. If proved successful, the project could likely indicate potential for beneficial management of other problematic weeds in the future (under separate approval), potentially including regional *priority weeds* not included in the scope of this project.

NSW Invasive Species Plan

The Plan supports the *NSW Biosecurity Strategy* and identifies key goals and deliverables to help prevent new incursions, eliminate or contain existing populations and effectively manage already widespread invasive species. Its scope includes weeds, and vertebrate and invertebrate pests in terrestrial, freshwater and marine environments.

Contents include:

- Impacts of invasive species
- Principles of invasive species management
- Roles and responsibilities in invasive species management in NSW
- Prioritisation and risk assessment
- NSW legislation and invasive species management
- Key deliverables
- Implementing the NSW Invasive Species Plan

The document has potential context to the project in respect to INS and general biosecurity duty, including prevention of incursions. The project R&D potential to demonstrate a climate-positive, economically effective and scalable solution for the management of INS is consistent with the goals of the plan to assist in containment and elimination of invasive species.

Northern Tablelands Regional Strategic Weed Management Plan (2017-2022)

The Plan outlines the strategic direction for management of priority weeds, **environmental and agricultural weeds** across the *Northern Tablelands Local Land Services Area* geographical region, complementing the NSW Invasive Species Plan. The Plan is made under the Local Lands Services Act (2013) to closely link the Northern Tablelands LLS region as the weeds coordinating body, and under the Biosecurity Act 2015 in relation to enforceable biosecurity matters (weed management). The plan adopts a risk-based framework for the assessment and prioritisation of weed management, identifying ***priority weeds*** (high risk) for management in the region including many exotic species.

The strategy recognises that *weed management is essential to the sustainable management of natural resources, the economy, the environment, human health, agricultural sustainability and amenity that requires*

a "tenure neutral" integrated approach between government (National, State and Local) and the community, as provided for in the Biosecurity Act 2015.

SEATA's proposed R&D project has potential to demonstrate a climate-positive, economically effective and scalable solution for INS (including circular economy for effective use of INS as potential *natural resource),* and is consistent with a neutral (& potentially positive) tenure integrated approach for managing INS.

Northern Rivers Regional Biodiversity Management Plan (NR RBMP)

The NR-RBMP (the plan) constitutes the national regional recovery plan under the *Environment Protection and Biodiversity Conservation Act* 1999 for threatened species and ecological communities principally distributed in the Northern Rivers Region of NSW, including parts of the GISC LGA. The Plan sets out an overall strategy for the conservation and restoration of biodiversity in the Region, helping to strategically guide both development and conservation efforts within the region. The Plan is part of an Australian Government-funded pilot to trial the integration of regional recovery and threat abatement planning. It provides a regional approach to the delivery of recovery actions necessary to ensure the long-term viability of threatened species and ecological communities in the Region.

The proposed project area is located to the west beyond the scope boundary of the NR-RBMP, and accordingly is not applicable. Presented for context and completeness.

Environmental Guidelines: Use and Disposal of Biosolids Products (NSWEPA, 2000)

Commonly referred to as the *"EPA Biosolids Guidelines"*, these strive to assist planners, designers, and operators of sewerage systems and those involved with the processing and end-use of biosolids, by establishing requirements for the **beneficial use and disposal of biosolid products to land in NSW**.

The specific objectives of the guidelines, that are applicable to the project include the following (bold font indicates as relevant to the proposed facility):

- *Encourage beneficial use of biosolids of acceptable quality, where safe and practicable, and to establish requirements for disposal.*
- *Ensure that the statutory requirements of regulatory authorities such as the NSW EPA, NSW Health Department, NSW Agriculture, State Forests, Department of Urban Affairs and Planning, Department of Public Works and Services, and Department of Land and Water Conservation are adequately specified.*
- *Develop a set of clear guidelines in one document which includes the requirements from state government agencies to assist regulators, producers and the biosolids industry to meet their statutory obligations.*
- *Encourage best management practices to ensure the development of sustainable cost-effective biosolids management strategies by sewerage operators, re-processors, appliers, and end-users.*
- ***Set contaminant acceptance limits and stabilisation requirements which give adequate protection to the environment, human health and animal health and agricultural products, whilst providing realistic and practical avenues for the utilisation or disposal of biosolids products.***
- ***Ensure that monitoring, reporting, and auditing systems are adequate in terms of acceptable risks.***

The guidelines are relevant to the proposed project in relation to the classification of biosolids proposed to be received and treated by the SEATA RDSM. **Only biosolids that the EPA already deems fit for direct application to land in NSW are proposed to be tested**, which meet classifications of ***"Unrestricted Use"*** and ***"Restricted Use (Classes 1 and 2)".***

NSW Resource Recovery Orders (RRO) and Exemptions

Resource Recovery Orders (RRO) and Exemptions are introduced earlier above (refer POEO Act and POEO (Waste) Regulations) and these approvals will play an important role in the project. A number of existing Resource Recovery Orders (RRO) and Exemptions issued by NSWEPA since 2014 under the POEO (Waste) Regulations may apply **in part** to the project as outlined below. This would likely be in context to providing *consistency* in the recovery aspects of those RRO's for the same feedstocks, as relevant to the project. The following sub-sections below are included for context to the recovery aspects of each of these feeds as relevant to the project. However the **proposed thermal treatment** of feedstocks will require project-specific application (as also will relevant Exemptions for proposed uses of biochar produced from these feedstocks in *application to land* including agricultural and/or industrial uses such as roads). Thermal treatment is also discussed in regards to the *POEO Act* (Schedule 1 for EPL licencing requirements), *NSW Energy From Waste Policy* and *NSW Eligible Waste Fuels Guidelines* separately earlier above, noting that no energy recovery is proposed in this R&D project. Subsequently, **project specific RRO's & Exemption is expected for the project.**

As noted elsewhere, a **staged approach** to feedstocks trials and associated RRO & Exemptions is proposed to simplify the project and approvals, starting primarily with **Invasive woody weeds (INS)**. **Appendix 14** provides initial information to EPA on INS in regards to typical requirements for RRO & Exemptions as noted in the NSW *Eligible Waste Fuel Guidelines*.

Biosolids Order and Biosolids Exemption (NSWEPA, 2014)

The **Biosolids Order (2014)** and **Exemption** (2014) was issued under clauses 91-93 of the **Protection of Environment Operations (Waste) Regulations (POEO Waste Regulation, 2014)** by the NSW Environmental Protection Agency (EPA), forms one of the existing approved ***Resource Recovery Order (RRO) and Exemptions*** issued by EPA under the Regulations to date, as detailed further separately in **Section 5.5**.

The **Biosolids Order** issued under Clause 93 of the Regulations applies to biosolids, (i.e., sewage sludge) and any person who *supplies* biosolids that have been generated, processed, or recovered by the person.

The **Biosolids Exemption (2014**) issued under clauses 91 and 92 exempts a *consumer* of biosolids from certain requirements under the POEO Act 1997 and the Waste Regulation in relation to the application of that waste to land, provided the consumer complies with the conditions of this exemption. The exemption should be read in conjunction with the corresponding Biosolids Order (2014).

Both the NSW EPA Biosolids Order and Exemption are applicable to the project (at least partially) as it is intended that biosolids will be received, stored, processed, and biochar produced from biosolids applied to land (either for agricultural or industrial (e.g. roads) trials depending on the classification results of the biochar to be undertaken in consultation with EPA (refer **Section 4.6**). Only municipal biosolids already classified as suitable for land under the Biosolids Guidelines and meeting the RRO and Exemption Order to EPA required standards are proposed to be used for the project (i.e. ***Unrestricted Use*** and ***Restricted Use* 1 and 2**). Whilst the above recovery aspects are applicable, **processing specifically via *thermal treatment* is not applicable under the existing general order and exemption for biosolids** (2014) and will need to be addressed under the dedicated RRO & Exemption sought for the project. It is anticipated that a project specific RRO & Exemption will be consistent with the overlapping aspects of the existing general RRO & Exemption for biosolids 2014 as/where applicable.

NSW Manure Order & Exemption (NSW EPA, 2014)

This RRO and Exemption applies to non-human biosolids (including agricultural biosolids from animals including "any mixture" of animal biosolids and biodegradable bedding such as straw or sawdust), and application of manure to land as a soil amendment.

The exemption is issued by the EPA under Clauses 91 and 92 of the POEO (Waste) Regulation and exempts a consumer from certain requirements under the POEO Act and the Waste Regulation regarding application of manures to land, provided the consumer complies with the conditions of the exemption.

The Manure RRO & Exemption is expected to have relevance to **Stage 3** of the project where agricultural biosolids may be sought for staged trials for thermal processing (refer **Section 4.6**). A project-specific RRO & Exemption Order will be required to also allow thermal processing and use of biochar.

NSW Bulk Agricultural Crop Waste Order & Exemption (NSWEPA, 2014)

The order is applicable to bulk agricultural crop waste meaning *non-putrescible organic residues left behind following crop harvest*. These include *fibres, roots, stalks, stubble, leaves, and seed pods*. The order states it is not necessarily applicable to the supply of bulk agricultural crop waste to a consumer for land application at a premises for which consumers hold a licence under the POEO Act that authorises the carrying out of the scheduled activities on the premises under Clause 39 'Waste Disposal (Application to Land)' or Clause 40 'Waste Disposal (Thermal Treatment)' of Schedule 1 of the POEO Act.

Suppliers of bulk agricultural crop waste must meet the requirements imposed under the order.

The Bulk Agricultural Crop Waste (BACW) RRO & Exemption is expected to have relevance to the project particularly in **Stages 2 and 3** where agricultural crop residues are sought for staged thermal processing R&D trials (refer **Section 4.6**). A project-specific RRO & Exemption Order to allow thermal processing is required which is expected to consider consistency with relevant components of the existing BACW RRO (2014). i.e. relevant steps prior to thermal processing.

NSW Mulch Order & Exemption (NSW EPA, 2016)

This RRO and Exemption applies to mulch defined as ***plant material shredded and/or screened to a preferred particle size grading for particular applications*.** The Order applies as relevant to any person who supplies mulch that has been generated, processed or recovered by the person. Mulch, by virtue of the nature and source of the plant material, *must pose minimal risk of the presence of physical and chemical contaminants**.

** Where there is a significant risk of the presence of physical and chemical contaminants in plant material, such as from **kerbside** waste collections, this waste stream must be assessed against and comply with the conditions of 'the pasteurised garden organics order 2016'.*

Mulch may include urban wood residues and forestry and sawmill residues and provides specific definitions for these. Mulch does not include plant material from kerbside waste collections. The Order includes conditions for suppliers of mulch to ensure that

- mulch does **not** contain asbestos, engineered wood products, preservative treated or coated wood residues, or physical contaminants, including but not limited to glass, metal, rigid plastics, flexible plastics, or polystyrene.
- mulch is ready for land application
- mulch does not contain any weed, disease or pest if being supplied to a consumer for land application in an environmentally sensitive area.

- Requires suppliers to prepare *Risk Management Protocols* and undertake specific actions that minimise risk of harm to the environment and management of weeds, diseases and pests, including (but not limited to) the sourcing of material and processing to mulch (location, time, details of any potential weed, disease or pest present etc).
- Undertake record keeping requirements and notifications to consumers including compliance with risk management protocol requirements.

The original 'raw mulch exemption' which commenced on 24 November 2014 was revoked from 25 July 2016. The current exemption from EPA exempts each consumer from the following provisions of the POEO Act and the Waste Regulation in relation to actual or intended application of *mulch to land as a soil amendment*:

- Section 48 of the POEO Act in respect of the scheduled activities described in clauses 39 and 42 of Schedule 1 of the POEO Act;
- Part 4 of the Waste Regulation;
- section 88 of the POEO Act; and
- clause 109 and 110 of the Waste Regulation.

The order and exemption state they do not apply in circumstances where mulch is received at a premises for which a consumer holds a licence under the POEO Act that authorises the carrying out of the scheduled activities on the premises under clause 39 'waste disposal (application to land)' or clause 40 'waste disposal (thermal treatment)' of Schedule 1 of the POEO Act. The exemption includes a number of conditions required to be met by providers and users of mulch, notably including meeting material requirements and ensuring leachate does not migrate, and users cannot undertake further processing of mulch (without additional approval).

The Mulch RRO & Exemption has potential for relevance (or partial in relation to urban wood residues) to the project particularly in **Stages 2 and 3** where feedstocks that fall under the above definitions may be sought for staged thermal processing R&D trials (refer **Section 4.6**). This includes where relevant source feeds have been chipped to suitable size for thermal processing. A project-specific RRO & Exemption Order to allow thermal processing is required which is expected to consider consistency with relevant components of the existing BACW RRO (2014). i.e. relevant steps prior to thermal processing.

NSW Biomass Ash Order & Exemption (NSW EPA, 2014)

This RRO and Exemption applies to ash generated from the ***burning*** *of biomass waste from agriculture, forestry and sawmilling residues, uncontaminated wood waste and/or organic residues from virgin paper pulp activities*. The Order applies to suppliers of ash that has been generated, processed or recovered by that supplier, but does not apply to supply of ash to a consumer for land application at a premises where the consumer holds a licence under the POEO Act that authorises the carrying out of the scheduled activities on the premises under clause 39 'waste disposal (application to land)' or clause 40 'waste disposal (thermal treatment)' of Schedule 1 of the POEO Act.

The Order prescribes a number of requirements on ash generators including *Sampling and Testing Requirements, Notifications, and Record keeping and reporting requirements.* Sampling requirements including prescribed sampling densities for *characterisation* and *routine* sampling for continuous or batch systems (e.g. routine sampling of *"5 composite samples from every 1000 tonnes (or part thereof) processed or 5 compositive samples per year (whichever is the lesser)"; and chemical and other requirements*.

The characteristics of biochar made from **pyrolysis** (no/low oxygen environment) differs from those of ash from fully oxidised **combustion** burning of biomass. **Section 2** of this document includes a table comparing

conventional pyrolysis, gasification and incineration/combustion to SEATA technology's catalysed pyrolysis and partial gasification, and there are substantial volumes of literature on biochars (over 14,000 scientific papers) including summary (meta) analyses of the science to date over the last two decades.

This RRO & Exemption is not considered directly relevant to the project (as no combustion/incineration and no ash produced), however may have potential relevant aspects for biochars not destined for land application (e.g carbontech trials). It is note that the criteria listed for combustion ashes in the Order are not considered relevant to those for biochars.

NSW Pasteurised Garden Organics Order & Exemption (NSW EPA, 2016)

This RRO and Exemption applies to pasteurised garden organics defined as *mulch and/or garden organics that have undergone the process of pasteurisation as a minimum*.

This RRO is related to the Mulch Order (2016) which requires that certain materials such as **kerbside greenwaste** need to be assessed in accordance with the conditions of the *Pasteurised Garden Organics Order* 2016. This includes general conditions, specific sampling requirements, test methods, record keeping and reporting conditions. This also requires ensuring that glass, metal and rigid plastics >2mm in size are <0.05% by dry weight, and light, flexible or film plastics >5mm in size are <0.05% by dry weight, and that garden organics must not contain asbestos, engineered wood products or preservative treated or coated wood residues. The order also requires that pasteurisation is required via a process to *significantly reduce the numbers of plant and animal pathogens and plant propagules*.

This RRO has potential to be relevant to the project in **Stage 3** should council kerbside greenwaste be deemed permissible for R&D trials (under staged RRO approval refer **Section 4.6**). Source separated greenwastes (including council kerbside greenwaste) is considered an ***Eligible Waste Fuel*** by NSWEPA only **when it is used** in a thermal process **to produce char** (such as pyrolysis) for land application. See *NSW Eligible Waste Fuels Guidelines* further below for details.

NSW Excavated Natural Material (ENM) Order & Exemption (NSW EPA, 2014)

1) VENM:

Virgin Excavated Natural Material (VENM) is defined within the Protection of the Environment Operations Act 1997 (POEO Act) as *natural material (such as clay, gravel, sand, soil or rock fines) that*:

- has been excavated or quarried from areas that are not contaminated with manufactured chemicals, or with process residues, as a result of industrial, commercial, mining or agricultural activities; and
- does not contain any sulfidic ores or soils or any other waste
- and includes Excavated Natural Material (ENM) that meets such criteria for virgin excavated natural material as may be approved for the time being pursuant to an EPA Gazettal notice (e.g. a Resource Recovery Order and Exemption).

VENM is a waste that has been pre-classified as general solid waste (non-putrescible). In summary, VENM is uncontaminated and chemically stable soil (e.g. not acid sulfate soil) that exists in its natural undisturbed state. Any disturbance of the soil or contamination from past or previous land uses, removes the possibility of a VENM classification.

If the above definition for VENM is met and the excavated material has been properly classified, it can be reused on or offsite without chemical testing and without an EPA Licence. Natural material that does **not**

comply with the requirements of **Virgin** Excavated Natural Material (VENM) may be suitable for classification as Excavated Natural Material (ENM) as outlined further below.

The EPA provides a template certificate to assist generators, transporters and/or receivers of VENM to have confidence that a range of relevant factors have been considered in the classification of excavated material as VENM. The template certificate can be completed by the generator of the excavated waste by addressing the required questions. Generators of VENM can consider options for the re-use VENM on or off-site, subject to required government approvals, before deciding to dispose of it. The Codes SEPP 2008 (see earlier above) allows certain earthworks to be undertaken on a site as exempt or complying development. If the provisions of the Codes SEPP do not apply, a development application for the earthworks can be made to the relevant consent authority. To provide regulatory clarity, the project Development Application seeks to allow VENM (or ENM if required as outlined below) to be used for proposed earthworks at the site.

2) ENM:

Excavated Natural Material (ENM) is classified in accordance with the NSW EPA *Excavated Natural Material Order 2014* and can be applied to land in accordance with the NSW EPA *Excavated Natural Material Exemption 2014.*

ENM must be chemically and physically analysed in accordance with the requirements of the Order, and is defined as: *"naturally occurring rock and soil (including but not limited to materials such as sandstone, shale, clay and soil)* that has:

a) Been excavated from the ground, and
b) Contains at least 98% (by weight) natural material, and
c) Does not meet the definition of Virgin Excavated Natural Material in the Act.

Excavated Natural Material does not include:

- material located in a hotspot;
- that has been processed;
- or that contains asbestos,
- Acid Sulfate Soils (ASS), Potential Acid Sulfate Soils (PASS) or sulfidic ores."

ENM can be applied to land as engineering fill or used in earthworks compliant under the order.

The POEO requirements for VENM and/or the ENM RRO and Exemption (2014) have potential to apply to the project in regards to material used for earthworks including all weather access, light vehicle parking, working pad and preparations for proposed sheds for the project. VENM is currently proposed to be used for these works wherever possible. Where VENM is not available/used, any ENM used for the proposed works will be required to comply with the Order. See also related comments under the *Codes SEPP (2008)*.

NSW Energy from Waste Policy Statement (June 2021)

Under the NSW Energy from Waste (EfW) Policy Statement, the EPA recognises the recovery of energy and resources from the thermal processing of waste as having the potential to deliver positive outcomes for the community and the environment as part of an integrated waste management strategy. Energy from waste can be a valid pathway for residual waste where:

- further material recovery through reuse, reprocessing or recycling is not financially sustainable or technically achievable
- community acceptance to operate such a process has been obtained.

The Policy is relevant to facilities proposing to **thermally treat waste or waste-derived materials for energy recovery purposes** via combustion (incineration), thermal oxidation, **thermal** or plasma **gasification**, **pyrolysis and torrefaction**. Where these produce a gas for subsequent use or combustion elsewhere (e.g., syngas), downstream facilities which combust syngas are also subject to the Policy framework.

Two key policy objectives are enshrined in the NSW waste legislation. Firstly, the POEO Act sets the framework to ensure that *human health and the environment* are protected from the inappropriate use of waste. Secondly, the WaRR Act aims to ensure that *consideration of resource management options* occurs in accordance with the *Waste Hierarchy* to achieve highest order us and recovery of resources.

In the case that waste cannot be avoided, or products reused, then various recovery technologies are available to maximise resource efficiency and increase the sustainability of communities, businesses, and industries. The EPA applies the following key overarching principles to waste avoidance and recovery:

- ***Higher value resource recovery outcomes are maximised***
- ***Air quality and human health are protected***
- ***'Mass burn' disposal outcomes are avoided***
- ***Scope is provided for industry innovation.***

The **EfW Policy categorises** wastes for energy recovery into two categories: **eligible waste fuels and non-eligible waste fuels**. *Eligible Waste Fuels* are considered by the EPA to pose a low risk of harm to human health and the environment due to their origin, composition and consistency.

Section 3 of the policy classes the following wastes as **eligible waste fuels**:

1. **Biomass from agriculture**
2. **Forestry & sawmilling residues**
3. **Uncontaminated wood waste**
4. Recovered waste oil
5. Organic residues from virgin paper pulp activities
6. Landfill gas and biogas
7. **Source-separated green waste (used only in processes to produce char)**
8. tyres (used only in approved cement kilns).

Items 1-3 and 7 shown in **bold** above **have relevance to the proposed feedstocks** for trials as detailed in **Section 4**.

Furthermore, the EfW Policy states:

*"**Eligible waste fuels may be thermally treated** using a range of treatment technologies, **provided a resource recovery order and exemption has been granted by the EPA**. The origin, composition and consistency of these wastes must ensure that emissions from thermal treatment will be known and consistent over time."*

Facilities proposing to use eligible waste fuels must meet the following criteria:

- Ability to demonstrate to the EPA that the proposed waste consistently meets the definition of an EPA-approved eligible waste fuel
- Confirm there are no practical, higher order reuse opportunities for the waste
- Fully characterise the waste and/or undertake proof performance
- Meet the relevant emission standards as set out in the Protection of the Environment Operations (Clean Air) Regulation 2010.

No energy recovery is proposed by this R&D trial project at Glen Innes. Accordingly, the NSW Energy From Waste Policy is not directly applicable. Notwithstanding this, given the project objectives to characterise technology performance as a potential pilot reference plant for future commercial scale applications if successful, key relevant aspects of the policy have still been considered in the following ways:

- **Highest order use** of wasted resources materials and targeting waste feedstocks that present opportunities for environmental, social and economic lift of otherwise wasted resources (e.g. burned or landfilled biomass)
- Use of **world-leading "best available technology" (BAT)** developed by SEATA (refer **Section 5.2.1** and **Section 2**)
- Staged **detailed monitoring and testing** generally in accordance with the Policy and the NSW *Eligible Waste Fuel Guidelines* (and indeed well beyond those as noted in Section 4.8), in consultation with the NSW EPA.

The above is important for future deployment of SEATA technology at scale as the NSW EPA EfW Policy requires the following for **all facilities proposing to recover energy** from waste:

"To ensure emissions are adequately mitigated, ***facilities proposing to recover energy from waste will need to meet current international best practice techniques, particularly regarding:***

- *process design and control*
- *emission control equipment design and control*
- *emission monitoring with real-time feedback to the controls of the process.*

Additionally to the above, facilities that recover energy from **non-**eligible waste fuels **must also** meet current **international best practice techniques (BAT)** for:

- arrangements for the receipt of waste
- management of residues from the energy recovery process.

and

- use **technologies that are proven**, well understood and **capable of handling the expected variability** and type of waste feedstock. This must be **demonstrated through reference to fully operational plants using the same technologies and treating like waste streams** in other similar jurisdictions.
- meet the technical, thermal efficiency and resource recovery criteria in Section 4 of the Policy.
- These facilities **must be able to demonstrate that they will be using current international best practice techniques** (under definition of *Energy Recovery Facility* processing non-eligible waste fuels)

The above is important for future commercial deployment of SEATA technology at scale for non-eligible waste fuels, including **biosolids**. Accordingly, this R&D project seeks to demonstrate and prove the technology (*Proof of Performance)* for later commercial scale deployment.

International best practice techniques are described in the European industrial Emissions Directive (IED) and associated ***B****est Available Technology* ***Ref****erence (****BREF****)* documents as referenced by NSW EPA and used in many OECD countries, as detailed separately In **Section 5.2.1**.

In **June 2021** the NSW EfW Policy was updated to address recommendations of a detailed review undertaken by the NSW Chief Scientist and Engineer (Nov 2020). Notably these recommendations included (but was not limited to) the following of direct relevance to this project:

- **Recommendations (1-3) - regarding regulatory requirements and** *(tightening of)* **air quality emissions limits following an independent review of best practice -** the revised EfW Policy subsequently included detailed emissions criteria. This included recommended changes for HF, mercury, cadmium and thallium, and total heavy. These aspects will be considered for the R&D trials.
- **Recommendation 7 -** ***"a pathway is established to enable asset and process innovations to be tested and trialled"***. (*This) "recognises the pace of innovation in technology, products and services; matched by a strong public and investor appetite to align energy, water and resource efficiency. It proposes that assessment and compliance requirements be commensurate with the level and impact of the proposed innovation. Any innovation must align with NSW policies relating to waste, decarbonisation and the circular economy".* The proposed R&D trials by SEATA are consistent with the above recommendation.

NSW Eligible Waste Fuels Guidelines (EPA, 2016)

The Eligible Waste Fuels Guidelines (2016) is to be read in conjunction with the NSW Energy from Waste Policy Statement. The guidelines describe the process for eligible fuels from waste for recovery of energy projects. The guidelines include (but are not limited to) detailed monitoring and testing requirements required by the EPA for projects recovering energy from waste in NSW, including eligible waste fuel feedstock characterisation as well as emissions/outputs.

As noted above **the proposed project is *not* proposing to recover energy**, so the NSW Energy from Waste Policy and the related Eligible Waste Fuel Guidelines are not directly applicable. However, given the project objectives to characterise technology performance as a potential pilot reference plant for future commercial scale applications if successful, key relevant aspects of the policy have still been prudently considered. A staged detailed testing program will be developed for the project (applicable to the detailed testing phase following initial preliminary testing phase) in consultation with EPA as outlined in Section 4 and in the Statement of Commitments.

As noted earlier above, the following feedstocks proposed for the project are pre-classified as ***eligible waste fuels***:

1. **Biomass from agriculture**
2. **Forestry & sawmilling residues**
3. **Uncontaminated wood waste**
4. **Source-separated green waste (used only in processes to produce char)**

These are each outlined separately further below. The guidelines also specify the following requirements when proposing these Eligible Waste Fuels:

- *"Applications to use **agricultural biomass** must include information regarding sprays and fertilisers applied to crops or material, and any potential impacts of spray drift".* It is noted that for Invasive Woody Weeds (Invasive Native Scrub 'INS'), due to the nature of its origin the potential for sprays or fertilisers to be associated is considered very unlikely. This will be further confirmed by Statements of Origin required from suppliers for R&D trials as outlined below.
- *"Applications to use **uncontaminated wood waste** must include information about quality control and assurance processes throughout the supply chain that addresses contamination and control of the waste stream".*
- *"Applications to use **forestry and sawmilling residues** must include information about sprays or treatment that the waste would have been subject to, including fire retardants".*

- *"Applications to use **source separated green waste** must include information about the supply pathway of green waste, and quality control and assurance processes in the supply chain that addresses contamination and control of the waste stream".*

SEATA will require a ***Statement of Origin*** document (or similar) from suppliers of all vegetative biomass feedstock that covers the entire supply pathway to provide the above information, including details of QA/QC processes in the supply chain to control risk of contamination, including details of any potential history of sprays or fertilisers applied to the biomass, or treatments. These will be provided to EPA prior to being received and processed by SEATA at the R&D trial site as part of conditions of approval (e.g. to inform conditional RRO approval). NATA accredited laboratories will be used to analyse feedstock for chemical characterisation as part of mass balance testing during R&D trials.

1. Biomass from Agriculture:

This is defined as ***weeds, plant or crop residues that are free of any physical contaminants, produced directly from agricultural practices; for example, non-putrescible natural organic fibrous materials and organic residues from harvest activities***. These residues may include fibres, roots, stalks, stubble, leaves, seed pods, nut shells and some waste from agricultural processing such as cotton and cane trash.

The EPA notes that this material *may contain pesticide or herbicide residues*. The risks presented by these residues will be assessed as part of the resource recovery order and exemption application.

This definition excludes:

- waste material from processing dairy products or beverages
- waste from the production of food, and
- dead animals, animal parts, pelts, manure and animal bedding, e.g. cage and barn poultry litter.

2. Forestry and Sawmilling Residues (including Native Forest Biomaterial)

These are defined as ***uncontaminated, organic fibrous wood residues and natural wood wastes that result from forestry and sawmilling operations such as, heads, tree thinnings, sawmill sawdust, shavings, chips, bark and other offcuts.***

Sawmilling operations are the primary processing of round wood into non-round wood products such as planks, boards, beams and other cut and processed wood products. Forestry and sawmill residue materials must be demonstrated to have *no risk of contamination*; for example, there must be no presence of treated, preserved, lacquered, glued, laminated or coated timber or wood products.

Native forest biomaterial is specifically prohibited from use for electricity generation in accordance with the POEO (General) Regulation 2009. The Regulation exempts some native forest residues from forestry operations authorised by a private native forestry property vegetation plan, integrated forestry operations approval or an invasive native species order. These include:

- Invasive native species cleared in accordance with property vegetation plans that have been approved under the Native Vegetation Act 2003 or an invasive native species order under the Native Vegetation Regulation 2013;

- Pulp wood logs and heads and off-cuts from clearing carried out in accordance with a private native forestry property vegetation plan or forestry operations carried out in accordance with an integrated forestry operations approval under the Forestry Act 2012;
- Trees cleared as a result of thinning carried out in accordance with a private native forestry property vegetation plan or an integrated forestry operations approval.

SEATA is committed to sustainable environmental management of otherwise wasted biomass resources (including those already being open burned). Only lawfully sourced biomass will be accepted, with preference given to material from plantation forestry.

3. Uncontaminated Wood Waste:

This is defined as ***wood waste that is generated in primary and secondary manufacturing processes at facilities with demonstrated quality control over the uncontaminated wood waste stream***.

Uncontaminated wood waste includes pre-consumer manufacturing and processing waste materials such as off-cuts, saw dust, wood shavings, untreated packaging crates, untreated pallets and engineered timbers made with urea formaldehyde or phenol formaldehyde resins only. For clarity, whilst the other sources are included in this project, engineered timbers are **not** proposed in this project.

Demonstrated control refers to both the generation and collection of the waste material. The facility must have robust quality assurance and/or quality control (QA/QC) procedures, a well-controlled chain of custody for the raw materials, generation of waste and collection systems. Facilities with control of their waste stream must also have comprehensive knowledge and control of the sources of waste, the original input materials, as well as knowledge and control of potential contaminants.

As noted above, SEATA will require Statement of Origin for all material suppliers for R&D testing.

Uncontaminated wood waste excludes:

- post-consumer waste
- wood waste extracted from mixed waste streams, such as construction and demolition waste
- anything defined as a source separated green waste
- treated timber
- painted or coated wood and most engineered wood products.

Uncontaminated wood waste does not include wood waste recovered from highly variable streams, such as mixed municipal solid waste or construction and demolition waste, due to their potential to contain a large number of chemical and physical contaminants over time. These are not proposed for this project.

'Treated timber' means wood treated with water, solvent and/or oil-borne preservatives. This includes but is not limited to copper chromium arsenic (CCA), light organic solvent preservative (LOSP), creosote and envelope treatments for preservation, insecticides and fungal treatments. These are not proposed for this project.

4. Source Separated Green Waste:

These are defined as Garden vegetation and plant materials that are segregated at the point of generation and collected as a separate material stream for processing; for example, garden organics from arborist operations, commercial gardening operations, council garden waste kerbside collections and public drop-off collections. This includes materials such as branches, grass, leaves, plant trimmings, tree stumps and bark.

Source separated green waste does not include:

- green waste extracted from mixed waste streams, such as construction and demolition waste
- material from the clean-up of illegal dumping
- material classified as agricultural biomass or uncontaminated wood waste.

Source separated green waste is an eligible waste fuel only when it is used in a thermal process to produce char (such as pyrolysis) for land application. Char materials produced from mixed waste streams will not be eligible for land application.

Proponents wanting to use source separated green waste in a thermal process must demonstrate robust QA/QC procedures, ensuring that the green waste is uncontaminated with physical contaminants such as significant plastics and treated, painted or coated timbers.

NSW Energy from Waste Infrastructure Plan (2021):

This Infrastructure Plan guides strategic planning for future thermal energy waste facilities to ensure infrastructure is in areas that best address the state's waste management needs until 2041, and where it maximises efficiencies for waste innovation, management and energy recovery. However, it is emphasised that energy will not be recovered as part of R&D trials nor is SEATA's technology conventional waste to energy. Nevertheless, the plan is still considered. The following principles have been identified by the NSW Government are:

1. Improve certainty to communities and industry around acceptable locations and facilities
2. Adhere to the precautionary principle where there is a greater risk of harm to human health due to proximity to high population areas (now and in the future), and in areas where there are regular exceedances to air quality standards from existing sources
3. Maximise efficiencies in infrastructures, waste management, innovation and energy recovery.

NSW Waste Classification Guidelines (for disposal) (EPA, Nov 2014)

The Guidelines aim to assist waste generators classify waste production utilising a step-by-step process. Additionally, the following classes of waste are defined in Clause 49 of Schedule 1 of the Protection of the Environment Operations Act 1997 (POEO Act). Schedule 1 Activities have been outlined further separately in this Section, including consideration of Clause 49 of Schedule 1.

The Guidelines are applicable to SEATA's RDSM facility due to the production of waste from the wet scrubber emission control system (slurry waste), which will be characterised in accordance with these Guidelines for handling and disposal requirements.

NSW Waste and Sustainable Materials Strategy 2041 (EPA, 2021):

The NSW Waste Avoidance and Resource Recovery Act 2001 commits the NSW Government to refreshing and updating its waste strategy every five years – to review and continually improve the state's policies and

targets for waste reduction and landfill diversion. This strategy succeeds the previous Waste Avoidance and Resource Recovery Strategy 2014–2021.

The Strategy focuses on the environmental benefits and economic opportunities in how waste is managed. In 2019 NSW agreed to a set of targets as a part of the ***National Waste Policy Action Plan***, which have now been included as **NSW targets as follows**:

- Reduce total waste generated by 10% per person by 2030
- **Have an 80% average recovery rate from all waste streams by 2030**
- **Significantly increase the use of recycled content by governments and industry**
- Phase out **problematic and unnecessary plastics** by 2035
- **Halve the amount of organic waste sent to landfill by 2030.**

Furthermore, the Strategy takes note in that global action is shifting towards a **circular economy**. Rather than the traditional linear economy, which takes a *'take, make, dispose'* approach. Moreover, the strategy recognises the challenges that lie ahead regarding the lack of space that NSW has to deal with residual waste, the contribution of waste and materials to carbon emissions, the damage to the environment and the pressures of the recycling system.

As outlined elsewhere in this document, SEATA technology has the potential to be able to contribute significantly to circular economy initiatives whilst also dealing with the potential challenges to the waste industry that lie ahead.

NSW Plastics Action Plan (2021)

The NSW Plastics Action Plan (2021) is complementary to the Waste and Sustainable Materials Strategy 2041. Although, SEATA's technology has capacity to thermally treat plastics, plastic-based feedstocks will not be trialled at the site. The Action Plan has been included for completeness. SEATA believes our technology will be consistent with the objectives 2-6 of the plan (see below) should it be successful and able to be deployed elsewhere in future to trial plastic feedstocks.

The Plastics Action Plan aims to:

1. Introduce new legislation to reduce harmful plastics
2. **Accelerate** the transition to better plastic products
3. **Support innovation**
4. **Tackle** cigarette butt litter
5. **Reduce the risk** of nurdles (small pellets used to manufacture plastic products) entering the environment
6. **Support** plastic research.

The actions were design to assist in achieving the following targets:

- **Phase out problematic and unnecessary plastics by 2025**
- Reduce the total waste generated by 10% per person by 2030
- **Achieve an average 80% recovery rate** of resources from all waste streams by 2030
- **Significantly increase the use of recycled content** by government and industry
- Reduce plastic litter items by 30% by 2025
- Reduce the overall litter by 60% by 2030
- **Triple the plastics recycling rate** by 2030.

Planning for Bushfire Protection Guidelines (RFS, 2019)

Mapping of Bushfire Prone Land (BFPL) on the Project Site and surrounding areas (**Figure 3.6)** as provided by the NSW Planning Portal (eSpatial and SEED) as at 1st October 2021 does not currently identify the project site as BFPL. Notwithstanding this, the project has conservatively considered, where practicable, prudent bushfire planning and management as outlined below. Noting the above and the outcomes of the environmental risk assessment (refer Section 7), a bushfire assessment report has not been deemed necessary or proposed.

As mentioned above, the project site is not considered BPFL. However, the aims and objective of the Planning for Bushfire Protection (PFBP, Rual Fire Service 2019) have been considered as follows:

- Afford buildings and their occupants protection from exposure to a bush fire
- Provide for a defendable space to be located around buildings
- Provide appropriate separation between a hazard and buildings which, in combination with other measures, prevent the likely fire spread to buildings
- Ensure that appropriate operational access and egress for emergency service personnel and occupants is available
- Provide for ongoing management and maintenance of BPMs; and
- Ensure that utility services are adequate to meet the needs of firefighters.

Section 8.3 of the PFBP Guidelines addresses ***"Other Non-Residential Development",*** including *Buildings of* ***Class 5 to 8*** *under the National Construction Code* (NCC) (section 8.3.1), and *Commercial and Industrial Development* (s8.3.10). Importantly, it is noted that the proposed R&D purposes of this project including the associated sheds are for **non-commercial** R&D purposes.

Class 5 to 8 Buildings:

The proposed sheds for the project fall under mixed Class 7b/8 or Class 8 of the NCC (refer **Section 5.2.5**). Additionally, the NCC requires that buildings on BFPL are compliant with the code (the NCC does not provide bushfire specific performance requirements for buildings classified as **Class 5** to **8**). As noted earlier, the project and all buildings are **not** located on BFPL, notwithstanding this the provisions have been conservatively considered.

AS3959 and the NASH Standard are not considered as a set of Deemed to Satisfy provisions, however compliance with AS3959 and the NASH Standard must be considered whilst meeting the PBP aims and objectives. Although bush fire is not captured for **Class 5 – 8 buildings**, the following objectives have been applied regarding access, water supply and services, and emergency and evacuation planning:

- To provide safe access to/from the public road system for firefighters providing property protection during a bush fire and for occupant egress for evacuation;
- To provide suitable emergency and evacuated (and relocation arrangements for occupants of the development;
- To provide adequate services of water for the protection of buildings during and after the passage of bushfire, and to locate gas and electricity so as not to contribute to the risk of fire to a building; and
- Provide for the storage of hazardous materials away from the hazard wherever possible.

Section 8.3.10 of the PBP Guide states that *commercial and industrial development* on BFPL (EP&A Act s.4.14) includes projects where the manager's residence is included in the proposal. For clarity, the owners & manager's residence is **not** located within the project site (no dwellings proposed), and as previously identified the site is not technically commercial development (R&D purposes) and is not located on BFPL. It

is also noted that section 8.3.10 cross references to relevant provisions of Chapter 7 (residential) of the PBP Guidelines (2019) as may be applicable. Again, whilst not technically relevant these have also been conservatively reviewed and considered in the project design where practicable.

Asset Protection Zone (APZ)

As the property is not classified as BFPL, technically an APZ is **not required**. However, where practicable SEATA is intending to maintain >20m APZ between proposed sheds and external potential bushfire hazard as outlined in Section 7.

NSW RFS User Guideline – Bushfire Attack Level Risk Assessment (BAL) (2012)

The NSW Department on Planning, Industry and Environment (DPIE) and the NSW Rural Fire Service (RFS) have collaborated to introduce a system that helps regulate development on bushfire prone land whilst maintaining a rigorous assessment regime for managing bushfire risk. The standards have been designed so that complying development is not allowed on *high-risk* bushfire prone land (BAL Attack Level 40).

The system applies only to Bushfire Prone Land (BPL) and includes detailed certification processes in regards to compliance requirements for certain BPL developments with *AS 3959-2009 Construction of buildings in bushfire-prone land* and other applicable development standards. The guidelines for BAL risk assessment provide heads of consideration for undertaking risk-based assessments to determine the BAL for proposed development within Bushfire Prone Lands.

Whilst the project is **not located within BPL** (refer **Section 3**), as part of the project's conservative approach SEATA has undertaken pre-lodgement consultation with both GISC and RFS, reviewed the RFS BAL user guidelines and RFS Guidelines for Planning for Bushfire Protection (see earlier above), and considered key aspects as may be relevant to the project for inclusion within the project Environmental Risk Assessment outlined in **Section 6** and provided in **Appendix 5**.

NSW Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW

The *NSW Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW ('Due Diligence Code')* established in 2010 provides a process whereby a reasonable determination can be made as to whether or not Aboriginal objects will be harmed by an activity, whether further investigation is warranted and whether the activity requires an AHIP application. The code can be used by individuals or organisations who are contemplating undertaking activities which have potential to harm Aboriginal objects. Consideration of the potential impacts of development on Aboriginal heritage is a key part of the environmental impact assessment process under the NSW EP&A Act. The standards in the code can be used or adapted by proponents to inform the initial assessment of the environmental impacts of an activity on Aboriginal heritage. Consultation with the Aboriginal community is not a formal requirement of the due diligence process. However, proponents can consider undertaking consultation if it will assist in informing decision-making. An environmental impact assessment which meets all of the requirements of this code will satisfy the due diligence test.

Section 8 of the Code establishes a five (5) step due diligence process. In relation to this project Steps 1 (ground disturbance triggered), 2a and 2b are of key significance.

> *"If after completing **steps 2a and 2b** it is reasonable to conclude that there are no known Aboriginal objects or a low probability of objects occurring in the area of the proposed activity, you can proceed with caution without applying for an AHIP".*

The Due Diligence Code has been considered for the project as detailed in Section 7.5.3.

NSW Policy for Industry (NSW EPA) 2017

The NSW Policy for Industry, 2017 succeeds the NSW Industrial Noise Policy, 2000. The Policy balances the need for economic activity with the community's desire to minimise intrusive noise. It sets assessment noise levels, consistent methods, and best practice measures to manage industrial noise, and is based on the latest scientific research regarding noise health effects.

Noise from **scheduled premises** licenced under Schedule 1 of the POEO Act (i.e. EPL as relevant for this project) are regulated under the Policy. The policy is specifically designed for large industrial developments, however it also has information and principals *"that may be useful for assessing and controlling noise from smaller premises"*, including in rural areas zoned RU1 as applicable to this project. The policy is designed to ensure that potential noise impacts associated with relevant projects are managed effectively, and provides a framework and criteria for the consistent assessment of the impact and control of noise from relevant developments. The policy does not apply to regulation of *construction* noise (refer separately below), occupational noise (WHS) or transport noise.

The Policy provides guidance for setting:

- clear noise levels against which noise impacts are evaluated,
- procedures for predicting noise impact
- strategies and options that can be used to reduce noise impacts
- a process that guides how to set achievable noise limits in development consents and
- licences by considering noise impacts within the economic, social and environmental
- context of industrial developments.

The Policy provides for establishment of **Project Noise Trigger Levels (PNTL)** which are the **lower** of:

- ***Intrusiveness Noise Level*** – limiting the extent to which a noise source can exceed **background levels plus a 5 dB minimum threshold**; or.
- ***Amenity Noise Level*** – providing an overall noise-level cap for different land uses (via assessment of **cumulative** noise levels).

Different PNTL apply based on time of day (daytime, evening or night), existing background levels and type of sensitive land use potentially affected.

To determine the Intrusiveness Noise Level (INL) **projects can measure or adopt a minimum** background level nominated in the policy for each period (day/evening/night), adopted as the ***Rating Background Noise Level*** (RBNL), then add 5 dB to establish the relevant INL for each period.

Amenity Noise Level (ANL) values are provided by Table 2.2 of the policy for relevant receiving environments, the project-specific ANL is then determined as that value minus 5dB except where there is low likelihood of *multiple* industrial noise sources being located in an area (as is relevant to the proposed R&D project). The policy also sets a process for assessing potential for sleep disturbance. If either of two screening levels provided in the policy are exceeded, detailed assessment of maximum noise level events is required.

In some rural situations, the RBL may be the same for the day, evening and night. In these cases, it is recognised that excursions of noise above the project intrusiveness noise level during the day would not usually have the same impact as they would during the evening or night. This is due to the more sensitive nature of activities likely to be disturbed at night (for example, sleep and relaxation).

The policy provides guidance for both manual calculations (small/simple project) and more detailed assessment (modelling) accounting for distance and any applicable noise shielding, and conservatively assumed noise-enhancing conditions (e.g inversions, wind conditions), noise emission characteristics (tone, intermittency, frequency etc).

The policy also provides guidance for ***feasible and reasonable measures*** to reduce noise to achieve the project noise trigger level using either **1) source controls** (better technology, mitigation or management practices), **2) transmission controls** (interception barriers), or **3) receiver controls** (mitigation). It is not mandatory to achieve the project noise trigger levels, but proponents must provide justification if they cannot be met to alternatively establish *Best Achievable Noise Levels*.

Project noise is discussed and assessed further in **Section 7.4.2.1**.

NSW Interim Construction Noise Guidelines (2009) & Draft Construction Noise Guidelines (2020)

The Interim Construction Noise Guideline was established in 2009 and guides appropriate licence conditions and guidance to councils approving local construction projects. New Draft Noise Construction Guidelines (2020) are currently under review (public exhibition completed). The new guidelines also include recommended standard construction hours of 7am-6pm weekdays and 8am-1pm Saturdays, for which the proposed project is also consistent.

Until finalised, the Interim Construction Noise Guidelines (2009) are applicable.

The main objectives of the Guideline are as follows:

- Promote a clear understanding of ways to identify and minimise noise from construction works
- Focus on applying all 'feasible' and 'reasonable' work practices to minimise construction noise impacts
- Encourage construction to be undertaken only during the recommended standard hours, unless approval is given for works that cannot be undertaken during these hours
- Streamline the assessment and approval stages and reduce time spent dealing with complaints at the project implementation stage
- Provide flexibility in selecting site-specific feasible and reasonable work practices to minimise noise impacts.

The policy has relevance to the project for site establishment and construction aspects (e.g. earthworks and shed construction). Refer Section 7 and Appendix 5.

NSW Guidelines for the Burning of Biomaterial: Record-keeping Requirements for Electricity Generating Facilities (NSW EPA 2013)

The guidelines require that the occupier of the premises is required to undertake record keeping requirements under the Regulation if:

- There is electricity generating works on the premises (as defined in the Regulation); and
- Bio-material of any kind is burnt in the electricity generating work.

As previously noted, SEATA's proposed R&D Centre will not be recovering energy at this stage, therefore it is not technically applicable. However, records will still be maintained in accordance with the Guidelines, where practicable.

- Records will be kept for 4 years
- Records will be kept from the time that biomaterial feedstock is on site
- Records will make clear of the categories the fuel belongs too
- Records to be kept in English and in a manner that allows the summary of information for a reporting period to be verified by an authorized EPA officer or any independent auditor.

Technical Framework: Assessment and management of odour framework from stationary sources in NSW (DECC 2006):

The Framework derives a review of international practice and attempts to consider all aspects of odour assessment, management and regulation. Including:

- An outline of the relevant NSW legislation
- A discussion of the roles and responsibilities of various NSW government agencies, local government, proponents and operators
- Application of odour ground-level concentration and odour assessment criteria
- Guidance on the issues and approaches in odour assessment
- Guidance on aspects of odour management
- Technical support material (published in an accompanying booklet).

The Framework is for industry, odour specialists, consent authorities and environmental regulators and aims to provide the necessary tools to effectively assess and manage impacts of activities that emit odour. Those who are responsible for implementing the framework include:

- **Proponents, operators** and odour specialists, through consideration of odour issues at the planning stage of the project and through the location, construction and operation of the activity to ensure that odour prevention and minimisation measures are implemented to avoid odour impacts, and
- Consent authorities and environmental regulators, including local councils, the Department of Planning (DoP) and the EPA, who act as determining authorities and as regulators of environmental impacts. Their role is to provide adequate regulation of odour to preserve amenity and ensure compliance with conditions of consent and environment protection licence conditions.

Odour has been considered in the *Environmental Risk Assessment* (refer **Section 7** and **Appendix 5**) and given the extensive controls in place (including elimination of problematic odorous liquids such tars, resins and bio-oils experienced by conventional technologies), is not expected to be of any significance for the project.

5.2.5 Local Planning Controls, Policies and Guidelines

GISC Local Environment Plan (LEP) 2012

Local Environmental Plans (LEPs) are legal environmental planning instruments which guide council planning decisions for all Local Government Areas (LGA's) in NSW. They allow councils to regulate the ways in which land is used through zoning and development consents.

The project is located within the Glen Innes Severn Council (GISC) LGA. The site is currently zoned as **RU1** (Primary Production) under the *GISC Local Environmental Plan (2012).*

The aims of the LEP are as follows (bold font indicates as relevant to the proposed facility):

1) Aims to make local environmental planning provisions for land in Glen Innes Severn in accordance with the relevant standard environmental planning instrument under section 33A of the *Environmental Planning and Assessment Act (1979).*
2) **a) to encourage the proper management,** development and conservation **of natural and human resources** in Glen Innes Severn by protecting, **enhancing** and conserving the following:
   (i) **land of significance to agricultural production**
   (ii) **timber, minerals, soil, water and other natural resources**
   (iii) areas of significance for nature conservation
   (iv) areas of high scenic or recreational value
   (v) landscapes, places and buildings of archaeological or heritage significance, including aboriginal relic and places
   (vi) communities and settlements.

   b) to facilitate growth and development that:
   i) minimises the cost to the community of fragmented and isolated development of rural land, and
   ii) facilitates the efficient and effective delivery of amenities and services, and
   iii) **facilitates stimulation of demand for a range of residential, enterprise and employment opportunities and promotes agricultural diversity, and**
   iv) maximises the efficient use of existing infrastructure.

The **objectives of RU1 zone** are as follows:

- **To encourage sustainable primary industry production by maintaining and enhancing the natural resource base**
- **To encourage diversity in in primary industry enterprises and systems appropriate for the area**
- To **minimise conflict** between land uses within this zone and land uses within adjoining zones.

The facility is not considered likely to increase the demand or public services for amenities. No works are proposed on crown land (entry to the site from West Furracabad Road), and no significant change to heavy vehicle activity on West Furracabad Road is proposed (i.e. consistent with existing use), as detailed in **Sections 4 and 7**.

Permitted with Consent:

"Backpackers accommodation; Bed and breakfast accommodation; Building identification signs; Business identification signs; Cellar door premises; Dual occupancies (attached); Dwelling houses; Extractive industries; Farm buildings; Farm stay accommodation; Funeral homes; Group homes; Home industries; Intensive livestock agriculture; Intensive plant agriculture; Kiosks; Landscaping material supplies; Open cut mining; Plant nurseries; Restaurants or cafes; Rural supplies; Rural workers' dwellings; Timber yards; Turf farming; ***Any other development not specified in item 2 (Permitted Without Consent) or 4 (Prohibited) of the LEP"***.

Consultation with GISC has indicated that the project would be considered as a ***Resource Recovery Facility,*** which would be permissible as development not specified in item 2 or 4. Accordingly, the proposed project is considered permitted with consent within this zone.

LEP Considerations:

The following considerations have been made in accordance with the Glen Innes Severn Council LEP 2012 provisions:

GISC LEP 2012 PART 4: PRINCIPLE DEVELOPMENT STANDARDS	COMMENTARY
4.1 Minimum Subdivision Lot Size	Not applicable to this development. No subdivision proposed. SEATA is leasing part of Lot 3 DP1193185 from the landowner.
4.1AA Minimum subdivision lot size for community title schemes	Not applicable to this development
4.1A Minimum subdivision lot size for strata plan schemes in certain rural, residential and environmental zones	Not applicable to this development
4.1B Minimum subdivision lot size for certain split zones	Not applicable to this development
4.1C Boundary changes between lots in Zone RU1	Not applicable to this development
4.2 Rural Subdivision	Not applicable to this development
4.2A Erection of dwelling houses and dual occupancies (attached) on land in certain rural, residential, and environmental protection zones	Not applicable to this development
4.2B Erection of rural workers' dwellings	Not applicable to this development
4.3 Building Height	*Not applicable (Not adopted by GISC into LEP)*
4.4 Floor Space Ratio	*Not applicable (Not adopted by GISC into LEP)*
4.5 Calculation of floor space ratio and site area	*Not applicable (Not adopted by GISC into LEP)*
4.6 Exceptions to development standards	Not applicable to this development
PART 5: MISCELLANEOUS PROVISIONS	**COMMENTARY**
5.1 Relevant acquisition authority	Not applicable to this development
5.2 Classification and reclassification of public land	Not applicable to this development
5.3 Development near zone boundaries	Not applicable to this development
5.4 Controls relating to miscellaneous permissible uses	Not applicable to this development
5.5 Controls relating to secondary dwellings on land in a rural zone	*Not applicable (Not adopted by GISC into LEP)*
5.6 Architectural roof features	*Not applicable (Not adopted by GISC into LEP)*
5.7 Development below mean high water mark	*Not applicable to GISC LEP*
5.8 Conversion of fire alarms	Not applicable to this development
5.9, 5.9AA (Repealed)	-
5.10 Heritage conservation	Not applicable to this development – refer Section 7.5.3.1 for details. Site not identified as a *Heritage Conservation Area* on GISC *LEP Heritage Map*.
5.11 Bush fire hazard reduction	Bushfire hazard reduction onsite as per RFS guidelines. Refer Section 3,4 and 7 and RFS BFBP Guidelines discussion in **Section 5.2.4**.
5.12 Infrastructure development and use of existing buildings of the Crown	Not applicable to this development
5.13 Eco-tourist facilities	Not applicable to this development
5.14 Siding Spring Observatory – maintaining dark sky	*Not applicable (Not adopted by GISC into LEP*
5.15 Defence communications facility	*Not applicable (Not adopted by GISC into LEP*
5.16 Subdivision of, or dwellings on, land in certain rural, residential or environment protection zones	Not applicable to this development

5.17 Artificial waterbodies in environmentally sensitive areas in areas of operation of irrigation corporations	Not applicable to this development
5.18 Intensive livestock agriculture	Not applicable to this development
5.19 Pond-based, tank-based and oyster aquaculture	Not applicable to this development
5.20 Standards that cannot be used to refuse consent – playing and performing music	Not applicable to this development
5.21 Flood Planning	Not applicable to this development
5.2.2 Special flood considerations	Not applicable to this development
PART 6: URBAN RELEASE AREAS	**COMMENTARY**
6.1 – 6.4	Not applicable to this development
PART 7: LOCAL PROVISIONS	**COMMENTARY**
7.1 Flood planning	Not applicable to this development – land is not located within a flood zone
7.2 Drinking water catchments	Not applicable to this development. (as per GISC *Drinking Water Map*)
7.3 Essential services **Development consent must not be granted to development unless the consent authority is satisfied that any of the following services that are essential for the development are available or that adequate arrangements have been made to make them available when required—** **(a) the supply of water,** **(b) the supply of electricity,** **(c) the disposal and management of sewage,** **(d) stormwater drainage or on-site conservation,** **(e) suitable road access.**	*Refer Sections 4, Section 7, ESCP (Appendix 6)* The proposed development has adequate arrangements in place for the supply of the following: (a) The supply of rain water from existing and proposed tanks. Whilst not proposed emergency supply from other sources is also available only if required (e.g. 15ML dam on adjacent lot of same landowner). (b) Supply of electricity from low voltage mains power already connected to site via Shed 1 (to proposed Shed 3), and new underground connection to proposed Shed 2. (c) The disposal and management of sewage via existing onsite septic tank and transpiration trench system, with similar or lower loading the historic loading (ie no significant change), however requiring s68 approval from GISC. (d) As a rural site all drainage is proposed to be managed on site (refer ESCP). (e) Stable road access is via West Furracabad Road with no significant advsere impact expected, and noting the road is being progressively sealed by GISC.
7.4 Airspace operations	Not applicable to this development (outside airspace operations zone).
7.5 Development in areas subject to aircraft noise	Not applicable to this development.
7.6 Location of sex services premises	Not applicable to this development.

GISC Development Control Plan (DCP) 2014

The GISC DCP 2014 is used in conjunction with the GISC LEP 2012. If conflicts arise, the LEP 2012 takes precedence. The DCP is provides additional information regarding design and planning considerations that

must be accounted for as a part of the DA assessment. Additionally, the Building Code of Australia (BCA) applies for all building construction works takes precedence of any other control identified in the GISC DCP (2014).

A checklist has been supplied in **Appendix 2** that identifies aspects of the GISC DCP 2014 and whether the proposed RDSMs facilities complies with each aspect, in addition with where in the development application certain aspects have been addressed.

Chapter 2.3 of the DCP (2014) requires two levels of public consultation be undertaken, **notification** and **advertising**. Adjoining landowners and those potentially affected by the development will be notified and consider the following issues:

- Views to, from the land
- Privacy and amenity
- Noise, odour, dust, light spill, or other polluting emissions
- Proposed hours of use for the development
- The position of the development in relation to site boundaries.

A Notification Plan can be provided in support of the SEE if required.

In addition to the LEP requirements for RU1, Chapter 4 of the DCP also establishes the **following aims and objectives for all development on RU1 land** *(bold font indicates as directly relevant to the proposed facility, italics as indirectly relevant noting subsequent agricultural trials using biochar produced)*.

- *To enhance the character of the rural areas*
- **To encourage the use of existing or potentially productive land for agricultural purposes**
- To reduce potential for rural land use conflict
- To protect old-growth, significant hollow-bearing trees, and conservation significant vegetation through recognition of their ecological value and scarcity in the landscape
- *To improve the ecological function of riparian areas within the landscape*
- *To improve the stability of the bed and banks of waterways through the management of riparian vegetation.*

The project also has potential to *in-directly* influence other objectives of RU1 in a positive way through enhancement of rural soils during subsequent biochar trials (numerous studies globally over two decades have demonstrated it's potential to enhance soil organic carbon and plant growth (ground cover) and reduce nutrient runoff into waterways).

GISC Local Strategic Planning Statement (2020)

In accordance with Clause 3.9 of the *Environmental Planning and Assessment Act 1979* (EP&A Act) the Local Strategic Planning Statement (LSPS) (2020) synchronises and builds upon planning work from Council's other plans, studies and strategies (i.e., the GISC LEP 2012, GISC DCP 2014 and the GISC Land Use Strategy). The LSPS gives effect to the New England North West Regional Plan, implementing the directions and actions at a local level.

Four themes establishing the community's vision for the GISC LGA, which include (bold font indicates as relevant to the proposed facility):

- **Sustainable Environment and Protected Heritage**

- A Renewed Economy and Authentic Place
- A Thriving and Vibrant Community
- Strong and Connected Infrastructure

Within these themes exist 10 planning priorities. The proposed facility could potentially directly and indirectly help achieve the following planning priorities, as outlined in the Planning Statement.

- **Planning Priority 2: "Encourage diversification in agriculture, horticulture and agribusiness to grow these sectors and respond to domestic and international opportunities."** The production of biochar could assist in soil remediation, in addition with the removal of INS.
- **Planning Priority 9: "Adapt to natural hazards and climate change."** Planned activities occurring at the proposed facility intend to sequester/draw down carbon dioxide emissions from the atmosphere, which will assist in achieving Net Zero 2050 commitments and potentially become an important piece of negative emissions technology.
- **Planning Priority 10: "Promote and support renewable energy production opportunities."** Although there is no energy recovery proposed at present, there may be potential opportunities in the future for energy production, at a larger scale.

GISC Development Application Checklist (2021)

A completed version of the GISC Development Application Checklist is provided in **Appendix 2**, with commentary in regards to the proposed project.

GISC Waste Management Plan (2018) (guidance note)

GISC requires all Development Applications to complete and submit applicable sections of the *GISC Waste Management Plan (2018)*. Accordingly, completed relevant sections of the GISC Waste Management Plan (2018) is provided in **Appendix 16**.

Guidelines for Bushfire Attack Level (BAL) Risk Assessment (2020)

The Guidelines for the Bushfire Attack Level (BAL) Risk Assessment (2020) refers to Codes SEPP (Exempt and Complying Development Codes) 2008 (the Codes SEPP) amendment that has designed the development standards to ensure the following:

- Complying development is not allowed on *high-risk* bush fire prone land (i.e. BAL (Bushfire Attack Level) 40 or BAL Flame Zone);
- Only a suitably qualified consultant or local council can endorse the BAL under PBP (2006)
- Once the BAL assessment certificate is issued, the council or accredited certifier must certify that the proposal complex with AS 3959-2009 Construction of buildings in bushfire-prone land and other applicable development standards.

As noted within this document, the project site is **not** listed as Bushfire Prone Land. Notwithstanding this, SEATA has conservatively considered bushfire risk and common aspects of RFS Guidelines for bushfire management (refer Section 5.2.3) and BAL risk assessment in the project risk assessment.

***Note**: See also related RFS guidelines for bushfire management in **Section 5.2.3** as referenced by GISC.*

Context to the National Construction Code (NCC 2019)

GISC requires proposed buildings (including sheds) to be compliant with the National Construction Code (NCC). The NCC is a uniform set of technical provisions for the design, construction and performance of buildings and plumbing and drainage systems throughout Australia. It is published and maintained by the Australian Building Codes Board, on behalf and in collaboration with the Australian Government and each State and Territory Government.

The NCC is comprised of the:

- ***Building Code of Australia (BCA)***, being Volumes One and Two (given effect through the *Environmental Planning and Assessment Act 1979*)
- ***Plumbing Code of Australia***, being Volume Three (given effect through the Plumbing and Drainage Act 2011).

Building **classification** is a process for understanding risks in a building or part, according to its use. It must be correctly undertaken to achieve NCC aims as appropriate to each building in each circumstance. Classification includes (but is not limited to) consideration of **occupancy, use and size**.

Classifications are categorised as *"Class 1"* through to *"Class 10"*. Some classifications also have sub classifications, referred to by a letter after the number (e.g. Class 1a). Class 2 to 9 buildings are mostly covered by Volume One of the NCC and Class 1 and 10 buildings are mostly covered by Volume Two of the NCC. Volume Three of the NCC, the Plumbing Code of Australia, refers to all building classifications. A building may have parts that have different uses. In most cases, each of these parts must be assessed for classification separately to determine overall applicable classification(s). A building (or part of a building) which has more than one use can be assigned more than one classification (*mixed use*).

The NCC defines the following classes potentially relevant to the project:

- **Class 7 Buildings** - The NCC states that there are three basic types of Class 7 buildings, first (7a) is a carpark, **second (7b) is a building used for storage**. The third (7c) is a building used for the display of goods or produce for sale by wholesale.
- **Class 8 buildings** - are process-type buildings that include a *building in which the production, assembling, altering, repairing, packing, finishing, or cleaning of goods or produce for sale takes place*.
- **Class 10 Buildings** - are *non-habitable* buildings such as sheds, carports and garages. Class 10a type buildings are typically used where a Class 7 or 8 would not be otherwise applicable. The NCC includes definitions of *farm buildings* and *farm sheds* which are certain Class 7 or 8 buildings used for *farming purposes*. NCC examples also state that (for any building purpose, not just farming) "*if people are likely to be employed to stack materials/produce in a storage building or remove materials/produce from a storage building then a classification of Class 7b may be appropriate".*
- **Mixed Use Buildings** – can have mixed uses with multiple classifications. For a building to have its own classification, every part must be separately classified. However, where a part has a different purpose and is not >10% of the floor area of the storey it is on then it may be considered ancillary to its major use.

Volume 1 of the NCC also sets structural integrity provisions via ***importance levels*** to buildings which relate to potential consequences in the event of a building failure. The higher the level, the greater consequences there could be to person or public. The NSS provides for four levels of building importance, which in summary are described as:

Level 1 Buildings with a low degree of hazard to life and other property in case of failure

Level 2 **Default level – buildings not assigned levels 1, 3 or 4**

Level 3 Buildings designed to contain a large number of people

Level 4 Buildings essential to post-disaster recovery or hazardous materials facilities

Further definition of each of the above is provided within Volume 1.

Building importance **Level 2 is applicable to this project**.

In addition to the above, proposed sheds will be required to be appropriate in regards to ***wind classification rating*** (considering wind region, terrain category, shielding factor and topography factors) as applicable for the Glen Innes region. Based on discussions with suppliers to date SEATA understands that **Wind Region A (normal), Terrain Category 2 (TC2)** open terrain will be appropriate.

Existing farm shed 1 is intended to be re-purposed. The proposed use of Shed 1 is **not** considered *farm buildings* or *farm sheds* as defined by the NCC, as the sheds will not be utilised for *farming* activities (i.e. cultivating propagating plants, maintaining animals or a combination of both). Contemporary approval of existing Shed 1 will apply to the NCC including the Plumbing Code of Australia regarding its toilet amenities and associated septic system, which is sought under Section 68 of the *Local Government Act*, 1993 as part of the integrated development application.

The NCC is applicable to the project in regard to **existing and proposed sheds (Sheds 1-4) as follows:**

- **All** existing and proposed sheds are **non-habitable**. No dwellings are involved with the project.
- **Proposed Shed 2 (4 bays)** for non-farm uses associated with the R&D trials (primarily as dedicated storage shed for separated feedstocks and biochar product) is required to be consistent with **Class 7b** of the NCC at minimum. It is expected to be constructed to meet **Class 7b/8**.
- **Proposed re-purposing of existing Shed 1 and Proposed new Shed 3** involve *mixed usage* (>10% of floor area). **Shed 3** is proposed as a workshop, maintenance, parts storage shed with a dedicated physical testing room and mezzanine crib room/meeting area above at one end. **Shed 1** will be used for process control, initial crib room, as detailed in Section 4). Accordingly, **Sheds 1 and 3** are expected to be consistent with a **mixed building Class 7b/8** under the NCC. Non-storage activities in Sheds 1 and 3 are detailed in Section 4, and may include process control monitoring, product screening and testing activities proposed (microscopic analysis of biochar etc) are not considered to be of a nature to present significant fire hazard).
- **Proposed 'Shed 4' (acoustic enclosure)** is expected to be consistent with **Class 8** of the NCC due to *potential* for fire due to contents (though noting well ventilated, hazard controlled and considered low risk).
- The sheds will comply with the relevant required fire code requirements of the NCC as applicable.
- Note: Whilst the project is *not* located within Bushfire Prone Land, SEATA has conservatively engaged with RFS and Council, and where practicable has considered potentially relevant aspects of the *RFS Guidelines for Bushfire Protection* (2019) for the above building classes under the NCC as detailed elsewhere in Section 5 and in **Appendix 7**.

In summary, the sheds associated with the project will be classified either mixed Class 7b/8 or Class 8.

Part A2 of the NCC states that **compliance with the code is achieved by complying with**:

1. The **Governing Requirements** of the NCC

2. The **Performance Requirements** (as relevant to the building classification being assessed)

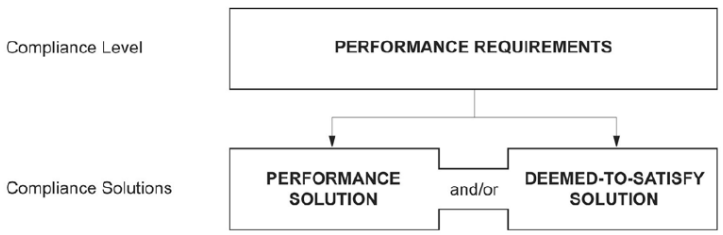
Governing Requirements contain requirements about how the Performance Requirements must be met.

Performance Requirements outline the minimum necessary standards different buildings or building elements must attain. The Performance Requirements are the only NCC technical provisions that must be satisfied. A solution may be partly a ***Performance Solution*** and partly a ***Deemed-to-Satisfy Solution***. However, no matter what method is chosen, building proponents need to always meet the Performance Requirements of the NCC.

Performance Requirements are satisfied by any one of the following:

a) ***Performance Solution*** (compliance with all relevant *Performance Requirements (via prescribed Assessment Methods) OR the solution is at least equivalent to the Deemed to Satisfy Provisions*)
b) ***Deemed-to-Satisfy Solution*** (prescribed by the code)
c) ***A combination of both*** a) and b) above

Figure 1: NCC compliance option structure



"Expert Judgement" is one of the accepted Assessment Methods for both *Performance Solutions* and *Deemed-to-Satisfy* solutions. Following project approval, a *Principle Certifying Authority (PCA)* is expected to be required to confirm compliance as relevant to any specific approval requirements by GISC.

5.3 Integrated Development (including Environmental Protection Licencing)

Certain development applications require approval (such as a permit or license) from a NSW Government agency (other approval bodies) before a determination can be made by the local council as the consent authority. Section 4.46 (formerly s91) of the NSW Environmental Planning & Assessment Act (EP&A Act) defines the requirements for ***Integrated Development*** where both development consent under the EP&A Act and **one or more related approvals** under related legislation are also required from state government agencies. Councils refer development applications to the necessary approval body so that there is an integrated assessment of the proposal and request General Terms of Approval (GTA's).

In addition to Development Consent requirements under the EP&A Act, the key legislative instruments for the regulation of waste and resource recovery in NSW are the **Protection of the Environment Operations Act (POEO Act, 1997)** and the **POEO (Waste) Regulations 2014 (Waste Regulation)**. Both contain provisions for the management, storage, transport, processing, recovery and disposal of waste. The NSW Biosecurity Act (2015) also has context to this project for related ***Biosecurity Permit*** approvals from the NSW Department of Primary Industries (NSW DPI) as detailed in Section 5.2.3.

The project is expected to trigger requirement for an **Environmental Protection Licence (EPL)** from the NSW EPA as a *Scheduled Activity* defined under Schedule 1 of the POEO Act, and subsequently the project presents

as *Integrated Development* under Section 4.46 of the EP&A Act. Pre-lodgement discussions with EPA indicated that **premises-based** licencing is likely to be preferred for the project at this point due to potential complexities (and inherent delay) presented by mobile licencing options. These could be potentially explored in future once the technology is established and proven.

The following clauses of Part 1 (Premises Based Activities) in **Schedule 1** of the POEO Act **have *potential* to apply to the project** in terms of defined Scheduled Activity relevant to proposed operations. Each of these clauses are then discussed in detail further below:

- Clause **40 Waste Disposal (Thermal Treatment)**, processing >200t per year (expected to be exceeded by the project). This is the key condition expected to apply for an EPL; and
- Clause **34 Resource Recovery** of general waste other than for recovery of energy, however activity threshold criteria is not expected to be exceeded (i.e Cl 34 may not then apply);
- Clause **42 Waste Storage**, including biosolids (triggered but noting exclusion provisions where a RRO & Exemption approval is issued, as proposed for the project (i.e Cl42 may not then apply).
- Clause **39 Waste Disposal (application to land)**, in regards to application of waste from offsite (>200 tonnes in total) to land during the project duration. Clarification from EPS is sought where a Resource Recovery Order & Exemption is issued, as proposed for the project. See further below.

Notwithstanding the above, **Clause 92 (2b)** in **Part 9** of the POEO (Waste) Regulations (2014) also provides EPA with authority to **grant exemptions** (under Clause 91) in relation to an activity, including in regards to:

- **Requirements for licencing** (EPL) of *scheduled activities* and *scheduled development works* typically required under s47-49 of the POEO Act 1997;
- the **provisions of Schedule 1** of the POEO Act, either in total or as they apply to an activity.
- **Tracking and reporting requirements** under Part 4 of the POEO (Waste) Regulations.

Accordingly, see related discussion for ***Resource Recovery Orders and Exemptions*** further below.

Pre-lodgement consultation with GISC indicates that development consent (EP&A Act) for the project located within and consistent with **RU1 zoning** may be considered as a ***Resource Recovery Facility***. In regards to integrated approval and licensing under the POEO Act 1997 and POEO(Waste) Regulations 2014, resource recovery is regulated as follows:

- S34 (1) ***Resource Recovery*** of Schedule 1 of the POEO Act provides for recovery of ***general solid waste*** (excluding hazardous, restricted solid waste, liquid or special waste) from offsite and its processing other than for recovery of energy. The project will include forms of general solid waste (non-putrescible) as defined and outlined further below. The project is for R&D purposes only, commercial energy recovery is not proposed. The project is located outside the "*Regulated Area*". Activity thresholds listed for Cl34 outside the Regulated Area are >2,500 t (or m^3) of waste onsite at any one time, or processing waste of >12,000 t/yr. These thresholds are **not** proposed to be exceeded by the project. Accordingly, **Cl34 is not expected to be triggered/apply**.
- A ***Scheduled Waste Facility*** is defined under of the POEO (Waste) Regulations (2014, Part 1 Cl3) as a facility that is required to be licensed under the POEO Act (1997) because it is used for the ***storage, treatment, processing***, sorting or disposal of **waste** (note: refer related Cl40 of Schedule 1 POEO Act below in regards to definitions of *thermal processing*), where waste also includes *any* ***processed****, recycled, re-used or* ***recovered*** *substance produced wholly or partly from waste* ***that is intended to***

be applied to land, or used as a fuel. Accordingly, for licencing purposes under the POEO Act and POEO (Waste) Regulations, the premises has the potential to be interpreted as a *Scheduled Waste Facility,* however also noting the project is for R&D purposes as noted below. There is directly related context in regards to the project location being outside the *Regulated Area* and for *Resource Recovery and Exemption* (including in context of exemption from the waste levy, noting outside the Regulated Levy Area). Notwithstanding this, as a non-commercial R&D pilot scale project, clarification is sought from EPA that contributions or levies are **not** applicable/exempted for the proposed project.

The proposed feedstocks[1] for the project are consistent with pre-classified provisions (see below) as ***General Solid Waste (non-putrescible)*** under clause 49 in Part 3 Division 1 of the POEO Act, as further defined under Schedule 1 of the POEO Act:

- ***Non-putrescible vegetative waste from agriculture, silviculture or horticulture***
- ***Wood waste****
- ***Biosolids*** *categorised as unrestricted use or restricted use 1,2 or 3 in accordance with the criteria set out in the Biosolids Guidelines (EPA, 2000).*

  * "*Wood waste - means* ***sawdust, timber offcuts****, wooden crates, wooden packaging, wooden pallets,* ***wood shavings and similar materials****, and includes* ***any mixture*** *of those materials, but* ***does not*** *include wood treated with chemicals such as copper chrome arsenate (CCA), high temperature creosote (HTC), pigmented emulsified creosote (PEC) and light organic solvent preservative (LOSP)".*

  For clarity, no treated timbers are proposed to be processed for this R&D project (clean natural and uncontaminated materials only).

[1] *Proposed feedstocks with the exception of coal which is defined as a Standard Fuel (not a waste) under separate regulatory instruments.*

The definition of ***'thermal treatment'*** under Schedule 1 includes the **processing of wastes** via **pyrolysis and gasification,** as is proposed for this project.

- Clause ***40(1) (Waste Disposal – thermal treatment)*** in Schedule 1 of the POEO Act provides for thermal treatment of general waste from offsite and its processing by thermal treatment. The project proposes to process **>200 tonnes** of feedstock per year and triggers this clause accordingly.

Clause 42 (Waste Storage) regulates the receipt of waste from offsite and storing (including storage for transfer) of waste. Exclusion provisions under the clause for *wood waste* do not apply due to more than one feedstock being stored onsite for the project. Other exclusions under Cl42 3b) are triggered where a *Resource Recovery Order and Exemption* approval applies under Part 9 of the POEO (Waste) Regulations 2014, as intended to apply for this project, as further detailed below.

Clause 39 Waste disposal (application to land) regulates application of waste from offsite to land by *spraying, spreading, depositing, ploughing, injecting or mixing into the land* (among others). A scheduled activity licence is required where >200 tonnes (total) of waste is to be applied for projects outside the Regulated Area. Exemptions from certain regulatory requirements that would otherwise apply to the land application of a material that is produced wholly or partly from waste can be granted by EPA. The types of exemptions relating to resources recovered from waste (referred to as ***'resource recovery wastes'*** in the Waste Regulations) are specified in **clause 92** of the Waste Regulation, and include the ***re-use of wastes that***

are applied to land; used as fuel; or are used in connection with a process of thermal treatment. Accordingly, the following will be sought:

- ***Resource Recovery Order (RRO) and Exemption*** conditional approval from EPA is concurrently sought for the project under **Part 9 of the POEO (Waste) Regulations 2014** to

    a) Firstly to **recover, receive/store, and process** the nominated waste feedstocks (including temporary storage of biochar produced); and then

    b) Secondly, to **apply biochar produced from thermal treatment to land.** This would require successful characterisation of biochar as fit for purpose (expected condition of approval), in accordance with the *EPA Guidelines on Resource Recovery Orders and Exemptions for Land Application of Waste Materials as a Fertilisers or Soil Amendment* (2017).

- The above proposed conditional approach to RRO & Exemptions sought is currently expected to initially cover the *generator* (provider of feedstock) and *processor* (SEATA) in step (a); and the subsequent *consumer* (users of biochar for application to land) in step (b) once the biochar produced from each feedstock trial is demonstrated as being fit for purpose.

- As part of the ANZ Biochar Industry Group, SEATA has participated in ongoing discussions with EPA (Resource Recovery & Innovation, Sydney) to progress the potential production and use of biochar for application to land in NSW under RRO & Exemption. This includes in the context of the national ANZBIG Code of Practice (refer **Appendix 9**) and additional specific requirements for NSW EPA (refer **Appendix 10**), both of which SEATA intends to comply with as a demonstration project for NSW.

As a **non-commercial R&D** project and as a project located outside the *Regulated Area* which is seeking an RRO & Exemption approval from EPA (including recovery, receipt and processing of the proposed wasted resource feedstocks, and subsequent application of biochar produced to land), SEATA seeks clarification from EPA that:

- NSW Waste Levy contributions (e.g. s88 of the Act) will **not** be applicable to the project, as can be made under exemption provisions available via **s88 5b and 5c** and **cl92 (2)** of the POEO Waste Regulations (see earlier above).
- Providers (generators) of the recovered biomass feedstocks required specifically for this project (in particular farmers providing INS), would **not** be subjected to separate/additional tracking, reporting and/or licencing requirements to do so, as can also be exempted by EPA under provisions of Cl92 (2) of the POEO (Waste) Regulations.

As a potential Scheduled Activity for the purposes of an EPL, clarification is sought from EPA if an EPL will be applied and if so if it will also be required to also cover ***Scheduled Development Work*** for activities associated with preparation of the site and the RDSM for operational testing as the scheduled activities.

Refer also related discussion for integrated approval from NSW DPI for ***Biosecurity Permits*** under the in NSW Biosecurity Act (2015) detailed in Section 5.2.3.

5.4 Resource Recovery Order (RRO) and Exemption

"Soils are an invaluable natural resource. They play a pivotal role in maintaining a healthy environment and biodiversity, and are fundamental to the growth and prosperity of the New South Wales economy. The EPA encourages the recovery of resources from waste to be used as a fertiliser and or soil amendment where this is beneficial and poses minimal

> ***risk of harm to the environment or human health."*** NSW EPA Guidelines for Resource Recovery Orders and Exemptions for Application of Waste to land as Fertiliser or Soil Amendment (2017).

Resource Recovery Orders (RRO) and Exemptions are granted by the NSW Environmental Protection Agency (EPA) under the *Environment Operations (Waste) Regulation* 2014 (2014 Waste Regulation). RROs are made under **clause 93** of the 2014 Waste Regulation and Exemptions are made under **clauses 91** and **92** of the regulation. Additionally, development consent (as applicable) and permission from the owner and occupier of the place where waste will be reused is required.

RROs and Exemptions are required if generators and/or processors of waste intend to apply waste to land (e.g., soil amendment or 'fill'), reuse it as fuel, or use in connection with a thermal treatment. Waste must be genuine, fit-for-purpose, and cause no harm to the environment or human health.

RROs are issued under the conditions that *generators and processors* of waste must meet to **supply** the waste material for the purposes described. **Exemptions** contain the conditions which *consumers* must meet to **use** waste for the purposes described.

A number of existing RRO's and Exemptions for organic wastes relevant to project have been issued in NSW relating to their recovery and use, as outlined individually elsewhere in Section 5, however the processing of these wastes via ***thermal treatment*** has typically not been part of those existing RRO's and exemptions. Accordingly, it is expected that relevant aspects from the existing **RRO's** regarding recovery and transport for processing may still be applicable, however proposed thermal **processing** and subsequent use of biochar in application to land (various forms, including industrial) will require a project RRO and Exemption to be approved. As noted elsewhere, logical separation of recovery through to processing from subsequent use of biochar in application to land is proposed through staged conditional approval. i.e. biochar produced by the project cannot be applied to land until suitably characterised. This is also supported by the staged approval approach for campaign-based feedstock trials, which also controls the amount of biochar being produced.

SEATA has provided a risk-based approach that provides redundancy in the case that char is unsuitable for proposed land use. Such that there is no expected risk of a stranded product with no final purpose or application ('legacy risk'). Biochar produced by SEATA's specifically designed system is expected to be of suitable quality and **fit for purpose** for proposed applications, with redundancy provided for non-soil applications as follows:

a) **Land application:** Biochar application to land, e.g., spread on the owner's farm and other participant farms in trials to be expected undertaken in consultation with partners.

b) **Industrial:** used in trials/demonstration for roads and concrete or carbontech applications.

c) **Energy/Landfill:** In the unexpected case are not fully deployed in the above, they would be sent to a power station for co-firing as with any other fuel, or appropriately disposed of or characterised and sent to landfill.

Related parts of **Section 5** (including **Section 5.3** above) provide further discussion on **proposed staging of RRO & Exemptions sought from EPA**. As noted in those sections, SEATA seeks conditional staged approval that allows for the production, characterisation and temporary storage of biochar for such purposes prior to approved appropriate use including application to land. Biochar land use (demonstration trials) at other locations are not (and cannot be) the subject of this DA sought by SEATA. Notwithstanding this, **each staged RRO & E approval would provide details on the proposed biochar application/use for each campaign-based feedstock tested in consultation with EPA, and is sought as a condition of approval**. Related aspects including higher order use of resources and consideration of the waste hierarchy is also provided in **Section**

4. A similar consent condition requiring staged approvals of associated ***Biosecurity Permits*** from NSW DPI is also sought (refer discussion under NSW Biosecurity Act in **Section 5.2.3**).

5.5 Industry Code of Practice (ANZ Biochar Industry Group, 2021)

An industry Code of Practice has been developed by the ANZ Biochar Industry Group (ANZBIG, 2021) which encourages sustainable production of biochar and its end-use applications (refer **Appendix 9**). Development of the Code of Practice over the last few years was informed by (and expanded upon) existing established international guidance such as the International Biochar Initiative (IBI) Biochar Standard, and the European Biochar Certificate (EBC) Guidelines for the production, processing and sale of biochar. The Code is a live document and is expect to be regularly updated, as is done with those international guidelines.

The Code of Practice (COP) establishes three primary classifications of biochar based on its production quality and intended use, namely ***Industrial, Standard*** and ***Feed Grade*** biochars, with sub-classifications in each. The Code is a minimum national benchmark and **acknowledges the need to undertake additional state-based requirements** to meet relevant statutory obligations where produced and used. The Code has been considered for the proposed R&D activities for the project which include production, classification and use of biochar. Accordingly the project intends to meet and *exceed* the Code in regards to undertaking additional requirements specifically required in NSW (e.g. specific monitoring and testing required by the NSW EPA in accordance with relevant guidelines including those for RRO & Exemptions.

6. Stakeholder Identification and Consultation

Stakeholder identification was undertaken via:

- Substantial site family history/knowledge - John Winter's family are 5th generation owners of the land
- Review of cadastral information
- Review of aerial imagery
- Engagement with nearest rural residences at R1 (direct line of sight) and R9 (see note below regarding nearest receptor by distance R7), as outlined in **Table 6.1**.
- Review of project description and key regulatory aspects (refer **Section 5**)
- Pre-lodgement meetings and engagement with council (refer **Table 6.1**)
- Project Environmental Risk Assessment (ERA) (**Appendix 5**, **Section 7**)
- Search of environmental spatial information databases (NSW Government spatial portals including SEED, AHIMs, etc), refer **Section 7**.
- Infrastructure and services search (Dial Before You Dig, refer **Appendix 12**)
- Constraints mapping (GIS) of environmental and built environment – also used to developed draft proposed site layouts (and Site Plans) for stakeholder engagement.

Table 6.1 summarises key stakeholder engagement and consultation undertaken specifically for the project to date, including with Glen Innes Severn Council (GISC) which began late in 2019 before project development was understandably impacted and delayed by the arrival of Covid 19 in 2020-21. A site inspection by senior representatives from GISC was undertaken in April 2021.

Consultation with NSW EPA regarding the technology first commenced in early 2019 regarding the technology's capability primarily in relation to potential for safe management of emerging contaminants (including engaging the (then) DoEE at federal level too). Those discussions resulted in a number of different units within EPA involved. In October 2019, concepts for establishing pilot trials began ahead of project-specific consultation which commenced in 2020 (Armidale office) which have progressed through into 2021, including with the *Resource Recovery and Innovation* unit based in Sydney.

Copies of key correspondence with Essential Energy regarding the low voltage overhead powerline traversing the project site and required setbacks and design of the site layout is provided in **Appendix 17**. It is noted that following the final consultation the site was reconfigured to the satisfy the full >10m setback each side of the powerline for all proposed structures, as requested by Essential Energy. Subsequently, it is envisaged that the site layout as submitted is permissible.

Whilst the site has been mapped as not being located within Bushfire Prone Land (BFPL), RFS was still conservatively consulted and the *Planning for Bushfire Protection Guidelines 2019* considered and accommodated where practicable (refer **Section 7.5.4** and checklist against the guidelines in **Appendix 7**).

SEATA has also undertaken preliminary phone consultation with NSW DPI, Local Land Services (Northern Tablelands) and New England Weeds Authority regarding biosecurity management for the project and *Biosecurity Permits*. This has informed appropriate management controls identified in the project Environmental Risk Assessment and detailed in **Section 7.5.2**.

SEATA has also engaged with Dr Fabiano Ximenes and Dr Lukas van Zwieten of NSW Department of Primary Industries (DPI) (refer letters of support in **Appendix 4**) regarding testing DPI trials of native biomass crops used to rehabilitate marginal lands (including trials nearby in Glen Innes as well as other locations), and for

biochar trials and applications *separate* to the proposed project but supported by it through supply of biochar (once characterised suitable and fit for purpose and approved under a RRO & Exemption approval from EPA). Further consultation with DPI will also be undertaken prior to commencement to address *Biosecurity Permit* requirements if/as applicable for each feedstock.

Rural residences **R1** and **R9** located in close proximity to the project attended a site inspection of the RDSM in February 2021 to introduce the technology and the proposed project, and proposed measures to address common issues of interest such as visual, air quality and noise. Pre-existing limitations for engagement between nearest rural residence R7 and the land-owner of the project site will require R7 to be consulted via formal notification from GISC during the DA process. Project design and layout has carefully considered relevant potential impacts for R7 (and all nearby rural residences) via risk-based design, as outlined in Sections 4, 7 and the project ERA (refer **Appendix 5**).

In addition to **project-specific** consultation, it is also noted that SEATA has undertaken broader general engagement regarding the technology, including at State and Federal government levels with both department/agency and ministerial representatives (e.g. meetings with Angus Taylor 26/3/21, Mathew Kean 3/2/21 etc). General consultation typically involved additional applications of the technology for various feedstocks or purposes beyond those proposed for the SEATA R&D Centre, including applications not proposed in this project DA. (e.g. cleaning up PFAS contamination). SEATA has also lodged registration of interest with the *NSW Net Zero Industry and Innovations Program* (Low Carbon Industry Foundations) and is active in the emerging hydrogen economy through engagement with groups such as the *Hunter Hydrogen Technology Cluster (New H2)*. SEATA is in discussions with a number of universities regarding various applications of the technology from circular economy to applications of the products. This includes Southern Cross University (SCU) in Lismore who have expressed interest in trialling permissible biomass feedstocks (including agricultural) .

SEATA has also undertaken engagement with groups in NSW such as climate thinktank *Beyond Zero Emissions (BZE)* to provide awareness of this emerging technology, and with industry bodies such as *Water Research Australia (WRA)*. SEATA is also an active member of industry and research bodies, including a partner of the *ARC Training Centre for Transforming Australia's Biosolids Resource* and the *ANZ Biochar Industry Group (ANZBIG)* among others.

Consultation is a continuous and ongoing process beyond DA submission and will continue prior to determination and throughout project establishment and operations in line with SEATA's intentions to leave a positive legacy in the places it operates. Further information on all consultation undertaken to date can be provided upon request if required.

Table 6.1: Project Specific Stakeholder Identification and Consultation Undertaken to Date. *Note: Covid 19 resulted in delayed project advancement during 2020-21.*

Stakeholder Category	Representative	Date	Purpose of Meeting	Comments / Outcomes
Glen Innes Severn Council	Town Planner (GISC Directorate of Development, Planning & Regulatory Services) (K.Taminiau)	13/12/2019, 18/12/2019	Initial Phone contact introduction, follow up email 18/12/2019	Introduction to SEATA and the project, ahead of a consultation meeting to discuss the proposed project.
	Town Planner and Director of Development, Planning & Regulatory Services (K.Taminiau, G.Price)	20/12/2019	In-person Meeting at GISC, introduction to SEATA, the technology and potential project, initial project scoping information & figures	Preliminary general feedback, including context for permissibility within RU1 zoning and potential assessment as a *Resource Recovery Facility*.
	Director of Infrastructure Services (K.Appleby)	20/12/2019	In-person Meeting at GISC, introduction to SEATA, the technology and potential project, SEATA enquiry to site records held by Council (former dwelling records etc)	General awareness of technology. GISC mentioned potential synergistic projects in the region including hydrogen storage technologies.
		28/1/2020	Phone & email discussion with K.Appleby regarding technology potential for biosolids and waste management	Awareness of industrial options for biochar and potential feeds for RDSM, including biosolids and other non-clean feeds (at other industrial locations in future elsewhere).
	2020-21 Covid 19 (project development delayed/on hold)			
	Town Planner (GISC Directorate of Development, Planning & Regulatory Services) (K.Taminiau)	4/2/2021	Phone discussion regarding RFS guidelines for planning for bushfire protection	• Whilst the site is not currently mapped bushfire prone land (BFPL), mapping is under review statewide following the black summer bushfires of 2019-2020. • Conservative approach to consider RFS Guidelines for Planning for Bushfire Protection where reasonably practicable, including APZ and consideration of fire/bushfire in the supporting Environmental Risk Assessment. • SoEE and ERA documents provide detailed consideration accordingly.
		26/3/2021	Phone update from GISC on project site records	• References to a dwelling entitlement located (2010/11), no other records. • Project will seek approval for re-purposing of existing shed(s)
		30/11/21	Phone update following powerline consultation with Essential Energy and site layout and scope revisions	• Project SEE and DA now imminent for submission. Awaiting letters of support.
	Director of Infrastructure Services (K.Appleby), Director of Development, Planning & Regulatory Services (G.Price), Director of Corporate and Community Services (A.Watt).	2/2/21	Meeting at GISC with KA to introduce John Winter in person, opportunities for support, and invitation to inspect the site.	Site inspection to be organized in coming months, potential opportunities for government (State and local) support identified.
		12/4/2021	Site visit by senior management representatives from GISC	• Introduction to proposed project site and the RDSM technology. • Council awareness of technology and DA under preparation, and potential application of the technology to multiple problematic wastes for local government.
		30/11/21	Phone update following powerline consultation with Essential Energy and site layout and scope revisions	• Project SEE and DA now imminent for submission. Awaiting letters of support..KA on leave during December.

Stakeholder Category	Representative		Date	Purpose of Meeting	Comments / Outcomes
NSW Rural Fire Service (RFS)	Development Assessment & Planning Officer – Planning & Environment Services (North) (P.Creenaune)		Feb 2021	Initial phone consultation and project introduction. Notified not mapped as BFPL but engagement conservatively undertaken for best practice management suggestions.	Suggestion that the dedicated rainwater tank for firefighting be surrounded by a metal fence to isolate from fire approach, and RFS couplings be installed. Adopted accordingly. Further engagement not expected at time due to BFPL mapping but offered by RFS if considered appropriate.
Surrounding residential neighbours	**R9 (owner)**		2/2/2021	Meeting at project site (CB, JW) to introduce the project, key aspects and proposed controls including noise/visual/air quality, and see the RDSM itself.	• No concerns raised during or following site meeting.
	R1 (owners)		2/2/2021	Meeting at project site (CB, JW) to introduce the project, key aspects and proposed controls including noise/visual/air quality (noting that whilst R1 is distant (>1200m) it has direct line of sight.	• Requested shift changeover and deliveries undertaken outside morning school bus time (8am). • No significant concerns regarding noise • No further concerns raised during or following site meeting.
Infrastructure Services Agencies	**Dial Before You Dig – Telstra / Essential Energy**	DBYD automated/ centralised request system	19/7/2021	DBYD search request for services locations	• Assets found for Telstra (buried) and Essential Energy (low voltage overhead) for project consideration in design and management. • Site Plans updated to illustrate built infrastructure assets • No excavation works planned near Telstra line, no further consultation
	Essential Energy	EE *'Look Up and Live'* Website	30/9/2021	Review of Essential Energy asset exclusion zones	• EE *Look up and Live* website referenced for *"powerline safety guidelines, including powerline exclusion zones"*. • Site Plans updated with 5m exclusion zones each side of powerline as shown on EE website interactive spatial mapping.
		M. White, Senior Conveyancing Officer	11-12/10/2021	Phone call to EE enquiries line referred to conveyancing team for consultation. Followed by emails to EE 11/10 and 12/10 regarding the low voltage overhead powerline traversing the project site on Lot 3 DP1193185.	• Request for consultation and review of proposed project and layout in respect of the powerline. Figure provided illustrating exclusion zone as per EE Look up and Live website.
		M.White, Senior Conveyancing Officer	26/10/21	Email from EE (MW) advising if wish to build closer than 10m to the powerline a report by a Level 3 Accredited Service Provider (designing Electrician) is required showing a clearing distance of 2.1m (horizontally and vertically) is maintained under blowout conditions from the closest conductor to the closest part of the shed.	• Level 3 Service Provider consulted (T.Freeney, Gosling Electrical) to assess blowout safety distances and prepare the report. Updated site layout including slight relocation of Shed 3 and full relocation of Sound Enclosure out of easement, and 5m exclusion zone from EE 'Look up and Live" website. • Report provided by Tony via email 27/10/21 to Essential Energy (Melinda White and Damian Munday).
		D.Munday, Land & Route Team Leader	27/10/2021	Email correspondence between Damian Munday and Tony Freeney (Gosling Electrical, Level 3 Service Provider) enquiring if there is a reason why 10m setback could not be complied with. SEATA (CB) phone call to Damian to introduce project, Damian requested additional information regarding building	• Email from Tony Freeney 27/10/21 providing NERA model and computed results for the blowout advising no real electrical clearance or safety issues. • Email from SEATA (CB) 27/10/21 providing project context and usage of all proposed and existing sheds, and design constraints to further setback.

Stakeholder Category	Representative		Date	Purpose of Meeting	Comments / Outcomes
				usage and constraints why 10m setback not able to be easily complied with.	
		A.Wauchope, Land & Route Team Leader	15/11/2021	Email from A.Wauchope of Essential Energy with attached letter (dated 12/11/21) advising unable to approve part of the proposal due to non-compliance with *ISSC 20 Guideline for the Management of Activities within Electricity Easements and Close to Infrastructure,* including safety setbacks.	• Copy of guideline sourced from EE, project site layout was then re-designed to ensure compliant with >10m setback each side of the powerline to proposed structures, notably Shed 3 and the Sound Enclosure Module (the latter also clarified as a relocatable mobile enclosure).
			16-17/11/2021	Phone call from SEATA (SF, power lead) to introduce project to A.Wauchope & discuss response given specialist advice. Advised project layout revision would be considered.	
		D.Munday, Land & Route Team Leader	14/12/2021	Email from D.Munday to T.Freeney (Gosling Electrical) confirming Shed 3 must be located outside the clearance area as advised due to extended use by people (ISSC 20 s7.3.1). EE also advised a 5.0m setback from the nearest conductor under maximum blowout conditions could be allowed for the proposed sound enclosure module (prev Shed 4) as a non-habitable type building (ISSC 20 s 7.2.6).	• Site Plan updated further to re-establish potential corner of Sound Enclosure Module just within the 10m setback area, but beyond the 5m setback.
NSW Government Agencies	**EPA Armidale Office** *(local office to project)*	**R.Scrivener** *(Head Regional Operations Unit – Regulatory Operations)*	20/12/2019	Brief informal introduction at EPA Armidale to SEATA and CB as contact for proposed project under development at Glen Innes (further information in new year).	Risk-based approach and consultation with EPA Sydney to date noted. Further written information to follow in 2020.
			27/4/2020;	Phone discussion to update EPA on progress with SEATA's proposed project in Glen Innes, including initial proposed feedstock target groups. General discussion regarding scope and key aspects.	Group 6 emission limits for POEO (Clean Air) regulations likely to apply (pending review of proposed project). Scoping needs to identify what want to do and where, and what is considered the preferred approval pathway. General email address for EPA Armidale office provided.
			1/2/21 *(and related phone call 28/1/21)*	Meeting at EPA Armidale office, preliminary site plans and location plans for discussion	NSW Energy from Waste Policy consideration. Testing will need to consider all outputs including waste (eg scrubber waste). Concept of conditional approval that RRO & E to be in place before biochar can leave site.
			W.E. 16/4/21	Discussions with EPA to update project scoping	Assessment likely as integrated approval pathway. Bench scale (batch testing) results included with DA Principles of the NSW Energy from Waste Policy considered (but no energy recovery proposed, not technically applicable) Conditional approval context to RRO & Exemptions
			15/10/21	Pre-lodgment discussion for project, including final modifications to site layout etc.	Updated email addresses provided/noted. Final consultations for powerline in progress (Essential Energy).

Stakeholder Category	Representative		Date	Purpose of Meeting	Comments / Outcomes
			1/12/21	Update on DA lodgment and revised approach given delays due to powerline consultation.	Project SEE and DA now imminent for submission. Revised strategy regarding specialist assessment scoped post submission. Awaiting letters of support. KA on leave during December.
	EPA Sydney	**General** *(multiple parties attending from EPA concerned with PFAS and other applications)* **E. Benker** *(Hazardous Waste Mobile Licencing),* ***C.Ford*** *&* ***P.Brown*** *Strategic Regulation PFAS Unit.,* ***J.Klepetko*** *(Hazardous Materials Unit)* **,** ***J.Beyer-Robson,*** ***J.Ireland*** *(various units). OEH Contaminants & Risk Team (K.Osborne) also attended.*	1/3/2019 (Mtg) 26/2/2019 (email) *22/1/2019 (phone call with P.Brown)*	Introduction to the technology initial in context of thermal treatment of contamination (nominally PFAS) and options for licencing and regulatory approval pathways.	Provision of Technical Briefing Note on SEATA technology to EPA. EPA recommended risk-based focus and supportive of *walk-before run* strategy to de-risk pilot trials to justify EPL (including for mobile licencing if pursued). AT this stage options for testing elsewhere on Commonwealth land were being pursued which did not eventuate.
		Dr H. Prifti *(Unit Head Resource Recovery Innovation)*	4/11/2019 *(meeting also included other reps from earlier meetings)*	Meeting at EPA Sydney Office (Goulburn St) - SEATA Update on project development including context to wastewater sector/biosolids and potential trials, including concept for R&D site inside NSW.	Consultation on potential SEATA R&D trial site for biosolids, INS and potentially coal. Need for risk-based approach to enable EPL. SEATA to update when project scoped further.
			9/3/2020	Meeting in person (EPA Paramatta) to introduce NPS-Carboncor based in WA who commercially use biochar in industrial applications (functional carbon for roads and concrete and other building materials), and are interested in trials and commercial operations in NSW.	Introduction to use of biochar in roads via commercialized operator (Carboncor NPS) in WA/SA/NT looking at potential synergies in NSW. Confirmation by EPA that biochar in roads deemed *application to land* (ie industrial applications like roads and concrete still fall under RRO & Exemption process/guidelines for application to land)

Stakeholder Category	Representative		Date	Purpose of Meeting	Comments / Outcomes
			9/12/21	Update on DA lodgment and revised approach given delays due to powerline consultation, including specialist assessments as further confirmation and to be scoped following SEE submission..	Staff changes in the Resource Recovery and Innovation team, Ingrid and Julie on secondment elsewhere. Helen will coordinate new contacts within her team when it arrives.
		Dr J.Cattle *(A/Unit Head Hazardous Risk Monitoring Management and Advice, formerly A/Head Resource Recovery & Innovation)*	15/6/2020	Biochar Update, general discussion on RRO & Exemption process for biochar application to land and new draft ANZBIG Code of Practice..	Understanding of EPA focus points for RRO & Exemptions and content to "bridging" requirements to the draft national ANZBIG COP. General discussion of SEATA development strategy and staged approach. Coordination of EPA team (I.Errington and D.Medaris) for SEATA project consultation.
			1/12/2020	Zoom meeting with EPA (J.Cattle) regarding ANZBIG draft Code of Practice for biochar.and NSW-specific requirements from EPA (consultation led by CB)..	
			23/3/2021	Email from SEATA (CB) requesting meeting for proposed SEATA Project at Glen Innes, requesting representatives from emissions/air quality and resource recovery & innovation/waste to energy, and advising meeting held with EPA Armidale.	
			29/03/2021	MS Teams Meeting - Brief overview/intro, consultation and feedback to date, key potential issues, risk management and monitoring. EPA initial comments and feedback.	
		Ingrid Errington *Senior Project Officer, &* **Debbie Medaris**, *Resource Recovery & Innovation Unit*	29/03/2021	Brief overview/intro, consultation and feedback to date, key potential issues, risk management and monitoring. EPA initial comments and feedback.	• Staging of feedstocks would reduce regulatory assessment complexity and timing compared to many feedstocks requiring approval at once. Prioritisation of feedstocks recommended. • Premises based licencing (EPL) to be pursued, no precedence for mobile based and RRO &E yet. • Staged RRO & Exemptions
	Department of Primary Industries	**Dr F. Ximenes** *Senior Research Scientist (Forest Sci/NSW Dept of Primary Industries)*	Ongoing 2019-2021	• NSW DPI Biomass Crops R&D Trials, including at the DPI Glen Innes Research Station • DPI Bioenergy Stakeholder Working Group	Potential for trial by SEATA technology. Refer letter of support of such in **Appendix 4**. Participation in DPI stakeholder working group.
		Dr Lukas van Zwieten	Ongoing 2019-2021 (	Dr Van Zwieten runs the research station at Wollongbar in northern NSW and the longest continuing field trials of biochar in the world	.General support for the project and biochar technology development in NSW. Potential for assistance in agricultural trials with biochar produced by SEATA technology. Refer letter of Support in **Appendix 4**.
		N.Dixon, Invasive Species Office, NSW	14/12/21	Initial consultation on the project and biosecurity aspects and proposed approach, and *Biosecurity Permits*.	Suggestion for cleaning of delivery trucks at source eg via air compressor (Leave Clean, Arrive Clean). Adopted accordingly. DPI, LLS and NE Weed Authority work closely with each other.

Stakeholder Category	Representative		Date	Purpose of Meeting	Comments / Outcomes
		Priority Weeds Coordinator			
	Local Land Services *(Northern Tablelands)*	**C. Cowley,** Team Leader Sustainable Agriculture & Plant Biosecurity	W.E. 10/12/21	Initial consultation on the project and biosecurity aspects and proposed approach, and *Biosecurity Permits*.	Property Biosecurity Plans/Procedures Staff will be in contact to provide referral to the LLS Regional Weeds Coordinator (B.Brown),
		P.Perkins, Agricultural Support Officer	14/12/21	Referred to SEATA from team leader to discussion project and provide contacts with LLS.	Email provided 14/12 with LLS contact details including team leader, Regional Weeds Coordinator (B.Brown).
		B.Brown, Regional Weeds Coordinator, Senior Land Services Officer	15/12/21	Initial consultation on the project, general proposed feeds and biosecurity aspects, proposed controls, and *Biosecurity Permits*. This includes invitation for periodic site biosecurity inspections and advice from LLS	Discussion of proposed feeds and controls generally supportive, encouraged source control for vehicle hygiene in addition to arrival/ delivery. Invitation extended to inspect the site and RDSM in Q1 2022.
	New England Weeds Authority	**T.McIntyre,** Biosecurity Officer **M. Vitaly,** Regional Weeds Coordinator – Glen Innes	14/12/21	Initial phone consultation on the project, its biosecurity aspects and proposed controls, and *Biosecurity Permits*. This includes invitation for periodic site biosecurity inspections by LLS which will be extended to the NE WA reps too.	Request for notification of relevant biomass feedstocks being brought in (species) for their awareness. Adopted in controls accordingly. General agreement on biosecurity control including input from NE Weed Authority. Potential (separate) future opportunities for the technology to assist weed management in NSW. Invitation extended to inspect the site and RDSM in Q1 2022, LLS interested in attending..
	Rural Fire Service (RFS)	**P.Creenaune** *(Development Assessment & Planning Officer, Planning & Environment Services (North))*	WE. 12/2/21	Phone discussion following referral from GISC to introduce the project. Preliminary discussion and recommendation (ahead of SEE submission) to include metal fencing around dedicated firefighting tank and RFS couplings.	• Metal fencing and RFS couplings committed to around dedicated firewater tank. • Premises based licencing (EPL) to be pursued, no precedence for mobile based and RRO &E yet. Staged RRO & Exemptions

7. Key Environmental Issues, Proposed Assessment & Management

7.1 Identification of Environmental Issues

The identification and management of key potential environmental, social and economic issues for the project has been informed by (and based on) consideration of:

- The existing environmental context of the Project Site and surrounding locality;
- The legislative framework applicable to the Project (see Section 5);
- A broad brush project Environmental Risk Assessment (see Section 7.2 and **Appendix 5**)
- Safety risk assessment (HAZOP Study) undertaken for the project which helped inform relative components of the Environmental Risk assessment (e.g. flammable sources, emissions control, safe working area etc);
- The outcomes of pre-lodgement consultation undertaken to date with government agencies and other relevant stakeholders; and
- Technical and environmental experience of the SEATA project team.

A summary of key potential issues identified for the project is provided in **Section 6.3**. Additional specialist studies identified by the environmental risk assessment and proposed to be undertaken to support the DA are outlined in **Section 6.4**.

It is also noted that related discussion of the project context to certain environmental aspects (including related planning regulations) is provided in **Sections 4 and 5**, and these should also be read in combination with information presented in this section.

7.2 Environmental Risk Assessment

An Environmental Risk Assessment was undertaken to provide direction and context for the various components associated with the project and identify key controls. The outcomes gained in terms of risk ratings and recommended controls have guided project scoping and development.

The primary objectives of the Environmental Risk Assessment included:

- Identifying those issues relating to the Project that represent potential risk to the environment or people;
- Determination of the consequence of the issue occurring;
- Determination of the likelihood of the issue occurring;
- Assessment of the risk by determining the probability (likelihood) and consequence (effect) of each hazard/impact; and
- Assisting in setting the level of assessment required to address each identified risk.

In accordance with DPIE Guidelines for preparation of Scoping Reports (July 2021), factors considered in assessing potential environmental issues for projects should include consideration of:

- ***Scale*** of the impact (Severity, geographical extent, duration)
- ***Nature*** of the Impact (direct, indirect, cumulative impacts)
- ***Sensitivity*** of the receiving environment (vulnerability, value, regulations and guidance)

A qualitative risk assessment methodology was developed and undertaken generally in accordance with the requirements of Australian Standard AS/NZS 31000 (2009) to provide a consistent and reliable approach to

the identification and assessment of potential environmental issues related to the project. Identified issues were assessed in light of existing mitigation measures and management strategies for the project. Where an individual risk was considered unacceptable with existing controls, or where a knowledge gap was identified, additional mitigation measures and/or management responses (proposed controls) were nominated, including the requirement for any additional specialist studies. A risk matrix was used to determine the consequence and likelihood of potential events to evaluate the subsequent risk level (risk rank) generally in accordance with AS/NZS 31000.

Heads of consideration (potential issues / categories of assessment matters) considered in the risk assessment (whether applicable or not) included:

- Air Quality
- Access/Traffic
- Amenity (Noise, Odour, Visual, Vibration)
- Cumulative Effects
- Social (Community, Culture, Surroundings)
- Erosion/sedimentation
- Bushfire
- Waste
- Biodiversity (Flora and Fauna, conservation, natural heritage)
- Heritage (Aboriginal & Cultural / Historic/European)
- Climate Change / Greenhouse Gas
- Surface Water (including water security, quality, hydrology/flooding)
- Groundwater
- Water Management
- Built Environment (Surface Infrastructure, public and private land, design quality)
- Community and Public Safety
- Decommissioning and Rehabilitation
- Soil and land use (capability, stability)
- Land Contamination
- Hazardous and Dangerous Goods

Key aspects identified by the **Environmental Risk Assessment (ERA)** for the proposed project are summarised in **Section 7.3** and detailed further in **Section 7.4. A full copy of the ERA Report and attached detailed risk register (including all existing controls identified)** is provided in **Appendix 5**. The register appended to the ERA report should be consulted for detailed descriptions of the control measures proposed to address key environmental aspects discussed in Section 7 of this SEE, in addition to the summaries provided herein.

The ERA identified:

- **Nil** (0) Extreme or Major risks
- **One (1)** Moderate Risk
- **Ten (10)** Minor Risks; and
- **And Twenty-Nine (29)** Low Risks**.** Each of these/above with identified existing controls.

In addition to existing controls nominated for the project, where appropriate the project Environmental Risk Assessment identified *proposed additional controls.* These included (but were not limited to) undertaking further desktop studies by experts for **Air Quality** and **Environmental Noise** to confirm that the identified noise mitigation measures would be appropriate, as discussed in **Section 7.4**.

7.3 Technology Design to Avoid or Minimise Key Potential Risks

A summary of key environmental aspects is discussed below in **Section 7.4 and 7.5** and further detailed in the Environmental Risk Assessment (ERA) in **Appendix 5**, with detailed controls described in the **Risk Register** also appended to the ERA report. SEATA's technology is designed to have a higher general environmental performance in comparison to conventional incineration, gasifier, and pyrolysis technologies, as detailed earlier in **Section 2** and compared in **Table 2.1** *(replicated further below)***,**

Some key features of note in technology design for pollution avoidance and minimisation include the following (see Section 2 and 7.4 for further details):

- **Up to half the carbon content of the feed is converted into solid form** (long term stable biochar) in the first reactor, thereby reducing potential to generate particulate and organic pollutants in the subsequent gasification reactor by the same proportion;
- **Minimising off gas volume** by up to 78% through avoiding use of air-blown oxidation in the gasification reactor (air is 78% nitrogen);
- **Deconstruction of organic gases (including Persistent Organic Pollutants (POP's))** in the second reactor at higher temperatures, followed by rapid quenching to avoid reformation.
- **No problematic liquids** produced by reaction (no tars, oils or resins) – commonly associated with odour and contaminants.
- **Emission control system** safely includes a **wet scrubber** (using suitable reagent for the relevant feedstock and processing characteristics - typically alkali reagents e.g. hydrated lime, sodium hydroxide or other as suitable, producing inert solid base salts), and conservatively followed by an **enclosed afterburner (thermal oxidiser)** prior to discharge. The wet scrubber will assist in managing potential harmful pollutant emissions if present (including halogenated and volatile metal compounds) as a control/mitigation measure.
- **High contact and uniform mixing** during pyrolysis due to technology design (in combination with other process factors and project design for clean uncontaminated feedstocks, is expected to result in high quality solid carbon outputs (biochar).
- **Proposed comprehensive testing and monitoring program** to characterise and confirm feeds, solid char, scrubber waste, product gases and treated emissions.

The above is a high-level limited summary only of some of notable design aspects. Further details are identified in the *Risk Register* of the ERA (refer **Appendix 5**) and in **Section 2** of this SEE. Relevant environmental aspects and controls are summarised in **Error! Reference source not found.** further below, and detailed throughout the remainder of **Section 7**.

Below: Replication of Table 2.1 from Section 2 - High level Comparison of Environmental Performance Design Factors between SEATA and some Conventional Thermal Treatments

ENVIRONMENTAL PERFORMANCE Design Factors	**Incineration** *(combustion, excess oxygen)*	**Conventional Air-blown Gasification** *(partial oxidation)* *(air-blown= high N_2)*	**Conventional Pyrolysis** *(low/no Oxygen)*	**SEATA Catalysed Pyrolysis & Partial Gasification via chemical looping** *(indirect O_2 transfer from air, low N_2 in syngas)*
Off-gas volume to be treated	**Very high**	**High**	**Moderate**	**Low** *(not directly airblown (air is 78% N_2), therefore up to 78% less volume)*
General Environmental Performance	**Lowest**	**Lower** key advantage over combustion is lower NOx formation	**Better** (if bio-oils are dealt with correctly)	**Higher** benefits of pyrolysis and gasification combined, hence only clean syngas and biochar produced
Linear / Circular Economy *(Resource Recovery)*	**Linear, Poorest LCA** single use of resources	**Linear, Poor LCA** syngas linear due to dilution with N_2, marginal resource recovery as charcoal	**Circular** syngas linear due to tar contamination, some resource recovery as biochar, bio-oils difficult to process / limited uses	**Circular** syngas derivatives possible due to the high concentration of H_2 and CO plus functional biochar resource, with no bio-oils generated – all converted to useful syngas
Dispatchable Energy	**No** – heat must be used immediately via steam cycle (base load)	**No** – heat must be used immediately via steam cycle (base load)	**Yes** – via syngas storage and bio-oils, but multiple units required to scale with, no increase in thermal efficiency.	**Yes** – via syngas storage and derivative of syngas, e.g, H_2 Much higher thermal efficiency (particularly at scale) = net energy *producer*
GHG Emissions (incl CO_2)	Very High	High	Low to carbon **negative**	carbon **negative** energy
Carbon Abatement / Sequestration	**None** all carbon infeed is converted to CO_2	**Low** 10% Carbon in feed converted to charcoal, remainder to CO_2	**High** ~50% Carbon in feed reports to solid char	**High** ~50% Carbon in feed reports to solid char, *plus* potential future recovery of carbon in syngas (e.g. high grade CO_2 into CCUS, total removal potential increases to over 75%+)
Hydrogen *(Economic Recovery)*	**No**	**No** Not economic in air blown systems due to being highly diluted with N_2	**Yes**, but difficult due to contamination of the syngas with tars and oils, i.e., further processing required	**Yes,** Low cost, easy to separate Carbon **Negative** Hydrogen
Harmful Pollutant Emissions *(Particulates, Heavy Metals, VOC's, POPs, NOx, Dioxins & Furans)*	**Highest** Off-gas requires significant treatment	**Moderate** Lower off-gas volume to treat than incineration but still large, lower NOx	**Moderate** Low off-gas volume to treat, syngas still contains tars, dioxins and furans. Hence specially designed combustion systems required to destroy tars, dioxins & furans.	**Low** All syngas generated by the process is pre-cleaned at high temperature in the presence of a catalyst to destroy residual tars & halogenated compounds (second reactor), then wet quenched / scrubbed to remove soluble components and avoid reformation of dioxins and furans. Clean product syngas capable of economic recovery for derivatives, or for lower emission combustion without post-treatment (similar to natural gas or LPG for example)
Emission Control Systems (ECS)	**Critically Dependent** on Pollution Controls Multiple additives required to scrub pollutants, generating further waste streams for disposal, plus large unit operation to treat the high gas volume	**Highly Dependent** on Pollution Controls (Similar to incineration, but lower gas volume to treat and lower NOx)	**Highly Dependent** on Pollution Controls Syngas requires further pre-combustion cleaning before use. ECS requirements scale dependent. Complicated with halides and dioxins and furans.	**Low Dependency** Pollutants are dealt with as part of the process, e.g., alkali metals remain with the biochar; tars and oils destroyed (deconstructed), syngas is wet scrubbed; so the resulting syngas is clean & ready for use. Downstream users of syngas do not require additional ECS.
Water Usage	**High** Evaporative cooling and make-up water for the steam system	**High** (Same as incinerators)	**Low** Water consumed for capture of bio-oils and indirect cooling	**Low** Make-up water for wet quench / scrubber only
Problematic Liquid Produced (Oils, Tars, Resins, Water)	**Yes** Boiler blow-down brine and evaporative cooling system purge water plus scrubber water (if a wet system is utilised)	**Yes** Up & down draft gasifiers generate tars plus spent scrubber water	**Yes** Alot of tar and oil by-products, reported beneficial wood vinegar, plus scrubber water	**No** All oils and tars destroyed. Only a small purge of water from the quench / scrubber to manage solids accumulation. This can be further evaporated to form a solid if required
Bottom & Fly Ash for Disposal *(Potentially Toxic Solid Waste)*	**Significant** Ash dam required, portion of the ash is super-fine	**High** Ash dam required	**No Ash** Ash remains with the biochar	**No Ash** Ash remains with the biochar, metals bound / not bioavailable.

7.4 Key Environmental Aspects, Impacts and Management

The following sections identify key environmental aspects, impacts assessment and proposed approach to manage and control potential risks identified, as derived from the project *Environmental Risk Assessment* detailed in **Section 7.2** and **Appendix 5**.

7.4.1 Air Quality

*Detailed discussion of aspects directly related to air quality and emissions are provided in **Sections 2** (Technology Background), **Section 4** (Proposed Project), **Section 5** (Regulatory Context including Best Available Technology, NSW Energy from Waste Policy and POEO Clean Air Regulations), and **Section 7.4.7** (Monitoring, including detailed discussion in context to criteria including BAT-AELs). To avoid duplication, these should be referenced in combination with information presented within this Section.*

SEATA has undertaken a conservative and risk-based approach to project and technology design specifically to provide best practice air quality management for thermal treatment technologies, as outlined earlier in this document including in **Sections 2, 4 and 7.1-7.3** above.

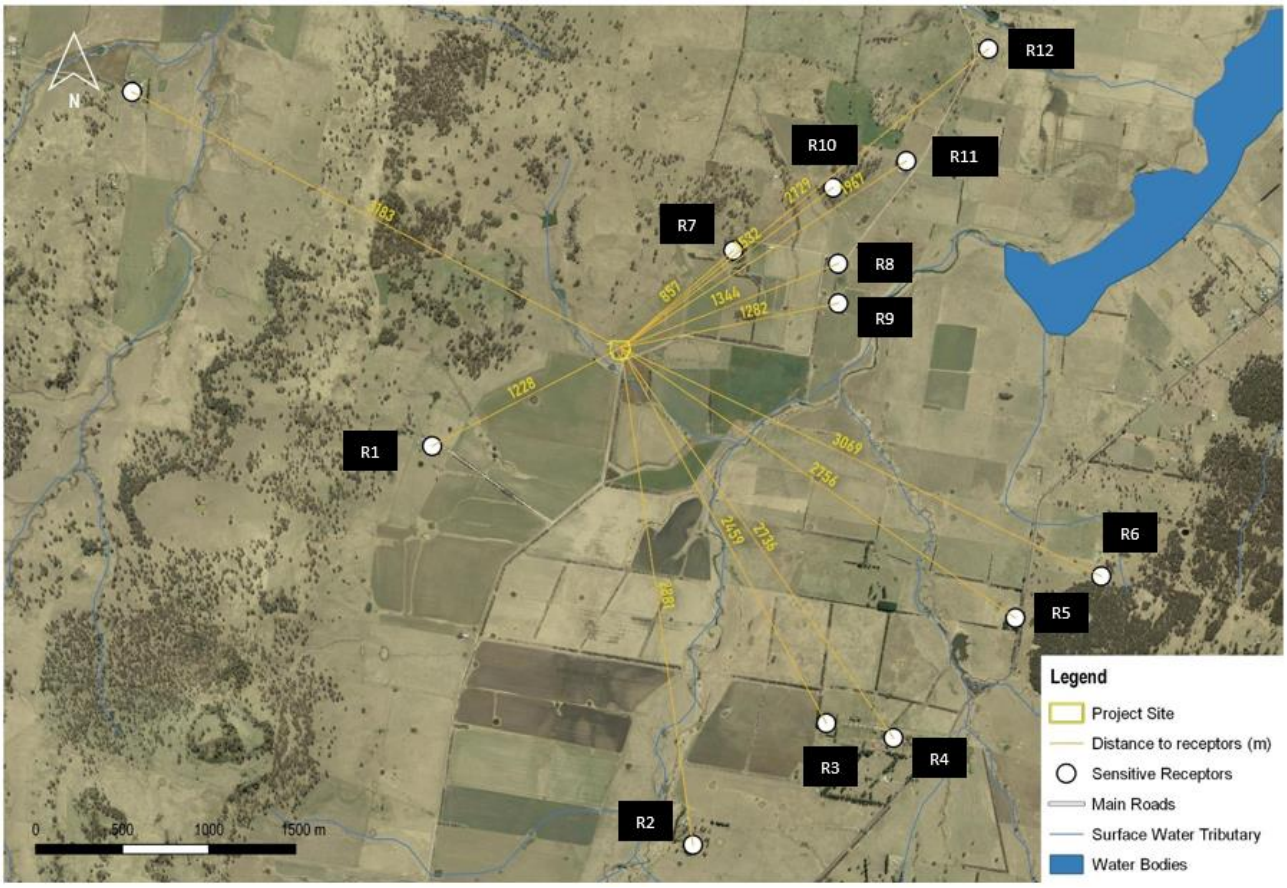
Project activities and potential associated risks regarding air quality during site preparation, construction and operational R&D testing have been detailed in the Environmental Risk Assessment (**Appendix 5**), including identified existing and proposed controls and mitigation measures. These are discussed further below.

Existing Environment & Proximity to Sensitive Receptors:

As detailed in **Section 3** and illustrated on the figure below, the project site is distant to the nearest sensitive receptors located in surrounding rural farmland, with over >850m to nearest rural residence at R7, and >1200m to the second nearest at R1, as illustrated in the figure below.

Existing activities influencing dust and air quality in the surrounding area include cattle grazing and fodder production, and traffic on the (currently) unsealed West Furracabad Road including heavy vehicles associated with cattle farming. It is understood that dedicated dust monitoring (suspended or deposited) is not currently undertaken in the surrounding area. Dust is primarily affected by seasonal rainfall and farming activities, with better groundcover after rainfalls providing conditions less conducive to dust generation from open fields. West Furracabad Road is being progressively sealed by GISC with allocated government funding, with approximately 2.5km completed to date from the highway intersection. It is understood GISC intends to seal the remainder in near future following drainage rectification works. Subsequently the road will be sealed to and beyond the SEATA project site.

Figure 7.7.1: Project Locality and Proximity to Neighbouring Rural Residences (Dwellings)



Note: *Closest residence R7 is >850m northeast of the project site. Properties to the east and northeast are partially or completely obscured from distant views to the project site. Direct line of site to R1 (>1200m) will be partially obscured by existing and proposed vegetative screening.*

Climatic conditions influencing air quality and dispersion (or lack of) are presented in **Section 3**, including seasonal and daily morning/afternoon wind speed and direction, and rainfall (among others). Winds come the east and southeast predominantly in summer and autumn and winter mornings, and northwest to west in winter afternoons and in spring. Accordingly, during proposed project commencement in early 2022 through to winter, winds are expected to be predominantly directed **away** from nearest sensitive receptors, including both R7 and R1. During winter afternoons through until summer dominant northwest winds are also directed away from nearest sensitive receptors (the closest to the southeast being >2.5km away), with westerly winds potentially towards R9. Southwest winds are uncommon year round (typically <10%), which is toward nearest receptor R7 located >850m from the site.

Wind speeds are reasonably consistent and reliable throughout the year, a factor in the significant adoption of wind energy projects in the region as part of the New England Renewable Energy Zone (REZ). As shown in the wind roses in Section 3, the strongest winds typically come from the southeast and northwest, both away from sensitive receptors. Calm conditions occur 3-5% of readings in autumn, spring and winter respectively.

Glen Innes typically has reliable and consistent rainfall, generally higher in winter and spring, averaging over 850mm annually, with over 600m in a dry year (10th percentile) and over 1000mm in a wet year (90th percentile). Glen Innes is currently experiencing a wet year and La Nina conditions are expected to continue during potential project commencement in 2022.

Potential Project Emissions to Air:

Key aspects of the project identified (including by the project ERA) as potentially generating particulate (dust) or other emissions to air, included (but not limited to) the following key sources:

- Site preparation and construction (e.g. topsoil stripping and establishment of all weather access and pads)
- Vehicles (light and heavy) using unsealed areas (currently including West Furracabad Road, although noting it is being progressively sealed by GISC) during all project stages
- Exhausts from vehicles and supporting equipment (e.g. air blower, generator and air compressor), which are typically required to meet relevant emissions standards requirements applicable in NSW.
- R&D Operations including loading/unloading, stockpile management and thermal treatment via RDSM (including discharge following emission control treatment by wet scrubber and afterburner).

As a key focus of the technology design and this SEE, detailed discussion regarding avoidance and minimisation of key air quality pollutants of concern (POC) for thermal treatment technologies is provided in **Section 2, 5** and monitoring in **Section 7.4.6.** The technology has been specifically designed to exceed performance of conventional and current *Best Available Technologies (BAT)* for these aspects. Detailed discussion on important regulatory context for BAT is provided in **Sections 5 and 7.4.7**.

Based on the technology design and the very conservative risk based approach to the project, the following typical Pollutants of Concern (POC) in thermal treatment systems are commonly problematic for conventional combustion/incineration in particular (refer **Section 2**), and are **not** expected to be problematic in SEATA emissions as outlined in **Table 7.1** below, which will be confirmed by staged testing and monitoring.

Table 7.1: Common EPA Pollutants of Concern (POC) in Thermal Treatment Systems and Project Context

EPA Analyte / Parameter (POC)	Context to SEATA Technology / This Project and Expected Fate of Contaminants *(**Note**: refer **Section 2** for further details)*
Particulate Matter (PM), Dust/Smoke *(PM_{10} and $PM_{2.5}$, Total Particulate)*	• Technology design significantly reduces particulate/dust potential compared to conventional thermal combustion as **up to 50% of carbon in feedstock reports to solid biochar** (i.e. **= up to 50% less carbon in gas phase** into secondary gasifier reactor). The (low) gas volumes pass through a cyclone (removal of large PM) and subsequently treated via rapid quenching and a wet scrubber (and then thermal oxidiser), expected to remove majority of remaining particulate. This will be confirmed by R&D testing and monitoring. • See also *'Halogenated Compounds'* below (halogens such as Cl are key to many POPs). • High temperature secondary reactor (gasifier) >800°C to deconstruct potential pollutants if present (including but not limited to VOC's, POP's, PAHs, hydrocarbons and other organics (e.g. UPOPs, PBDE, PCB etc), followed by rapid quenching to minimise risk of reformation, and subsequent treatment by both wet scrubber and afterburner (thermal oxidiser) prior to stack release (refer separately below and see Block PFD). • Whilst not expected to be necessary, system conservatively includes additional afterburner (thermal oxidiser) to treat post-scrubbing gases to >800°C for at least 2 seconds as per current regulatory requirements. Note: low gas volume by design (see *Nitrogen* below) significantly reduces size of afterburner required for SEATA technology compared to conventional technologies.
Gaseous/vaporous Organic Compounds *(expressed as volatile & total organic carbon (VOC or VTOC)*	
Hydrocarbons *(HC, short and long chain),* **Polycyclic Aromatic Hydrocarbons** *(PAHs)*	
Persistent Organic Pollutants (POPs) & Unintended POPs (UPOPs) • Dioxins and Furans • Polychlorinated Dibenzodioxins and furans (PCDD/F) • PCDD/F + Dioxin-like PCB's • UPOP's, PBDE, PCB	
Halogenated Compounds and Acid Gases *(e.g. Cl/Br/F, acid gases Hydrogen Chloride (HCl), Hydrogen Fluoride (HF))*	• *Avoidance:* Clean uncontaminated natural feedstocks (no plastic-based feeds) are proposed, and accordingly halogen content is expected to be relatively low. Notwithstanding this, the technology has been designed to be able to treat and control these in future applications (elsewhere, not at the Glen Innes SEATA R&D Centre). • *Control:* Wet scrubber treatment of gases produced (suitable reagents tailored as appropriate to feedstock and processing characteristics, typically alkali reagents (e.g.

EPA Analyte / Parameter (POC)	Context to SEATA Technology / This Project and Expected Fate of Contaminants *(**Note**: refer **Section 2** for further details)*
	hydrated lime, sodium hydroxide or other as suitable). Capture of scrubber slurry to dedicated tank (22.5kL) for characterisation and appropriate disposal (expected disposal <20kL/yr - less than the size of a rainwater tank). Detailed monitoring program to confirm effectiveness of controls and low residual emissions concentrations.
Oxides & Compounds of Nitrogen *(NO_x, N_2O, Ammonia NH_3)*	• SEATA partial gasification process is not directly air-blown (unlike conventional technologies), which is expected to result in **up to ~78% less offgas volume requiring treatment** compared to conventional gasification or combustion (as nitrogen is majority component of air, typically 78%). • Subsequently the formation of problematic nitrogen compounds and oxides in offgas is reduced by the same proportion, and the majority of gas produced is valuable syngas instead of emissions, significantly reducing treatment volume and size/cost of emission control equipment. • Further, technology expected to see around >30% of nitrogen content in the feedstock to report primarily to the biochar during the first reactor pyrolysis, and around >30% in gas phase to report as ammonia to the wet scrubber for removal, subsequently reducing potential NOx content in discharge gas emissions.
Carbon Monoxide & Dioxide (CO, CO_2)	• The richer, cleaner syngas produced undiluted with atmospheric nitrogen (see Nitrogen above) enables economically scalable recovery of valuable constituents (including potential recovery of food-grade CO_2/CO. • The rich undiluted syngas also has potential to support emerging *secondary* long term sequestration opportunities (e.g. carbon mineralisation), potentially realising >75% sequestration of infeed carbon content. This would provide both environmentally and economically beneficial Carbon Capture Utilisation & Storage (CCUS) – genuine circular economy. • Up to half the carbon in feedstock is retained in solid biochar, reducing the amount of carbon available to form CO and CO_2 in gas emissions by the same proportion.
Heavy Metals (HM's) including volatile heavy metals such as Hg, Cd/Th, As, Cr, and all Type 1 and Type 2 substances as regulated under POEO Act.	• *Avoidance:* See under *Nitrogen* above regarding significantly lower offgas treatment volumes requiring control and treatment (see below). No contaminated feedstocks high in volatile metals are proposed (noting biosolids proposed for treatment are high grade biosolids suitable for direct application to land as detailed in Section 4.6). The majority of any heavy metals which may be present are expected to be in low concentrations and non-volatile, with the majority remaining in solid phase (1st reactor) where they are typically bound in biochar (and not bioavailable, Joseph et al 2021). Subsequently the amount of HM's reporting to gas phase is expected to be low. • *Control:* Wet scrubber treatment of off gases (suitable reagents tailored as appropriate to feedstock and processing characteristics). Capture of scrubber slurry to dedicated tank (22.5kL) for characterisation and appropriate disposal. Detailed monitoring program to confirm effectiveness of controls and low residual emissions concentrations.
Sulphur Compounds and Oxides (notably H_2S, SO_2)	• *Avoidance:* See *Nitrogen* above regarding significantly lower offgas treatment volumes requiring control and treatment. Many biomass feedstocks are expected to be relatively low in sulphur content. Higher sulphur content feedstocks (e.g. coal) will be appropriately monitored to confirm control and treatment effectiveness. • *Control:* Wet scrubber treatment of off gases (suitable reagents tailored as appropriate to feedstock and processing characteristics). Capture of scrubber slurry to dedicated tank (22.5kL) for characterisation and appropriate disposal. Detailed monitoring program to confirm effectiveness of controls and low residual emissions concentrations.

Emissions Risk Mitigation and Management – Technology & Project Design:

As noted above and earlier in **Section 2**, the technology design has the potential to provide a 'step change' in thermal treatment with potentially substantially lower problematic emissions. **Figure 2.2** in **Section 2.3** provides a process block flow diagram describing the technology. Multiple technology and project design risk factors (from avoidance measures through to engineering controls) have been central in minimising risk to air quality. These have been identified and considered by the project Environmental Risk Assessment (see **Appendix 5**). Further to those listed in the table earlier above, these controls include:

- **SEATA's partial gasification process component is not airblown**, which is expected to result in up to ~78% less offgas volume requiring treatment compared to conventional gasification or combustion (as nitrogen is majority component of air, typically 78%). Subsequently the majority of gas produced is valuable syngas instead of emissions, significantly reducing treatment volume and size/cost of emission control equipment. This produces a richer, cleaner syngas that enables economic recovery of valuable constituents.
- Technology design also significantly reduces particulate/dust potential compared to conventional thermal combustion as up to 50% of carbon in feedstock reports to solid biochar (i.e. up to 50% less carbon in gas product to secondary gasifier reactor). The (low) gas volumes pass through a cyclone (removal of large PM) and subsequently treated via a wet scrubber, expected to remove majority of remaining particulate (to be confirmed by R&D testing and monitoring).
- SEATA process designed to provide very uniform and consistent output quality for syngas and biochar (best practice reactor design to optimise heat transfer for temperature uniformity ensuring consistent, even quality product - known temperatures for known residence time. Catalysed pseudo-direct heat transfer and fluid bed reactor design).
- Whilst the process is unique from conventional pyrolysis & gasification, many of the component parts are well proven.
- Continuous run RDSM process to steady state conditions further promotes consistency (syngas, char)
- Start-up and shut down occurrences will be infrequent (campaign based continuous process), minimising potential for associated variance in emissions. Easy start-up and shut-down (no adverse consequences if the plant needs to be stopped suddenly, e.g. oil and tar condensation in pipe work)
- High temperature secondary reactor (gasifier) >800°C to deconstruct potential pollutants including but not limited to VOC's, POP's (dioxins, furans etc), PAHs, hydrocarbons and other organics (e.g. UPOPs, PBDE, PCB etc), followed by rapid quenching to minimise risk of reformation, and subsequent treatment by both wet scrubber and afterburner (thermal oxidiser) prior to stack release in RDSM (refer block flow diagram for the process in **Section 2**).
- Wet scrubber treatment of gases produced (suitable reagents tailored as appropriate to feedstock and processing characteristics, typically alkali reagents (e.g. hydrated lime, sodium hydroxide or other as suitable). Capture of scrubber slurry to dedicated tank (22.5kL) for characterisation and appropriate disposal (expected disposal <20kL/yr - less than the size of a rainwater tank).
- Whilst not expected to be necessary, system conservatively includes additional afterburner (thermal oxidiser) to treat post-scrubbing gases to >800°C for at least 2 seconds as per current regulatory requirements. Note: low gas volume by design (see above) significantly reduces size of afterburner required for SEATA technology compared to conventional technologies.
- Only clean/non-contaminated feedstocks proposed at SEATA Glen Innes R&D Centre. No plastic-based high halogen content or contaminated feedstocks are proposed (refer **Section 4.6**). First proposed feedstock is Invasive Native Scrub (INS, 'Woody Weeds'), a feedstock from areas not expected to have been treated with sprays (pesticides or herbicides). Chipped to suit feed design and has relatively lower fines content (lower dust potential during loading and processing).
- Targeted initial INS and biosolids feedstocks are considered low potential for loading dust generation at RDSM hopper. For example, mechanically dewatered biosolid filter cakes can be loaded direct to the RDSM without need for further intensive pre-drying as typically required by other technologies, significantly minimising potential for dust (conventional systems typically require <20% moisture limits, requiring significant pre-drying, often resulting in dusty feedstocks).
- Even though not expected to be an issue for this project as proposed, design considerations have prudently considered management of halogens and acid gases that is critical for other future potential applications of the technology (not at this Glen Innes R&D Centre) to process halogenated/contaminated materials. As per various controls above, halogen gases are designed to report to wet scrubber for alkali-based reagent removal (designed to produce inert solid base salts).
- A 'clean-burning' auxiliary support fuel (LPG) will be used to regulate temperature and start-up conditions. For clarity, diesel is not proposed for this.
- Deliberately staged project design ('walk before run' approach), including short preliminary runs before longer detailed trials, staged feedstocks commencing on cleanest natural feed.

- Significant distance to nearest potential sensitive receptors (>850m to nearest rural residence, next closest >1200m) in low density area.
- Staged R&D project in consultation with EPA and GISC (progressively tested on various feedstocks), with initial three year approval. Whilst not expected, the potential for any unpredicted impacts if occurred would be expected to be small and temporary.
- Dedicated HAZOP study undertaken for safe RDSM testing
- Periodic attended continuous sampling for NOx, CO, CO_2, O_2 (at minimum), and SO_x if trialling potentially higher sulphur content feedstocks (i.e. coal). Detailed sampling and monitoring program to be developed in consultation with EPA.
- Diesel powered 3-phase generator, air blower and compressor housed in dedicated ventilated sound enclosure (minimises noise but also expected to reduce particulate to surrounds).
- No energy recovery proposed by project, NSW Energy from Waste Policy and Eligible Fuels Guidelines conservatively considered (for R&D objective to demonstrate technology for future commercial scale up) but not technically applicable Emissions to comply with POEO Clean Air Regulations (Group 6) at minimum. R&D results will also compare against international Best Available Techniques (BAT) Reference documents and latest NSW EfW Policy Criteria that would be applicable for commercial scale up. (Refer Sections 5 and 7.4.7 for further details).
- Able to process a wide range of feedstock types and sizes without significant risk of plugging gas flows or blockage. Simple / easy to maintain process equipment
- Preliminary bench scale technology (batch processing) successfully tested to inform pilot scale continuous RDSM design.
- Staff inductions include environmental training and awareness

Assessment of Potential Impacts:

Further to the above, risk aspects and scenarios associated with project components with potential to impact air quality (including in human health), from site establishment and construction through to operations (Active R&D testing) were considered by the project ***Environmental Risk Assessment*** as documented in the Risk Register which should be referenced in full for details (see **Appendix 5**). In summary:

- General project activities including minor site preparation/earthworks and other operations (excluding RDSM thermal treatment), with the identified existing controls and mitigation measures, was considered **low** risk (Risk Score = 5).
- The operation of other ancillary equipment onsite (e.g. diesel powered equipment such as 3-phase generator, air blower, compressor, loading tractor, light vehicles), with the identified existing controls and mitigation measures, was considered to be **low** risk (Risk Score = 5).
- **Active RDSM Trials** - The design and operation of the RDSM plant and associated equipment for thermal treatment trials, with existing and proposed control/mitigation measures, was considered to be a **minor** risk (Risk Score = 9).

Accordingly, given context to earlier discussion above and related context in this SEE (including proposed monitoring), the proposed R&D project has been designed and controlled to minimise emissions and potential effects on air quality, and is not expected to have significant impact.

Notwithstanding this, the above assessment and risk assessment (Appendix 5) will be further confirmed by a proposed specialist air quality assessment prepared in consultation with GISC and EPA prior to commencement. The specialist Air Quality Impact Assessment (AQIA) will be prepared by a suitably qualified expert consultant prior to commencement of operations, including, but not limited to consideration of the typical target analytes commonly assessed in NSW for thermal treatment technologies (refer **Table 7.1**). The assessment will also potentially include consideration of the following (to be determined in consultation with EPA):

- Pre-treatment Requirements

- Start up / Shut-down conditions
- Mass Balance & Energy Balance *(note – as an R&D project this will be as relevant accordingly)*
- Fate of Contaminants

Due to the extensive technology and project design risk management measures in place, a dedicated human health risk assessment was not deemed necessary for the project. This will also be considered by the specialist air quality assessment in its review and recommendations.

7.4.2 Amenity (Noise, Visual, Odour)

7.4.2.1 Environmental Noise

Existing Environment:

As noted in the Section 3 and above in Section 7.4.1, the project is located in a rural setting with the nearest residence located over 850m to the northeast of the project site (R7), and the nearest residence with direct line of site located over 1200m to the west-south-west (R7). Noise levels in the surrounding rural area (particularly at night time) are expected to be low. Conservative minimum rating background levels (RBL) and typical RBL's for RU1 rural residential land are provided by the *NSW Noise Policy for Industry*.

Section 5.2.4 of this SEE outlines NSW noise regulations applicable to site establishment and construction, as separate to operations. The guidance of the *NSW Noise Policy for Industry* is expected to be considered for proposed project operations. In the absence of available background levels data from monitoring, the policy provides conservative minimum assumed *Rating Background Levels* (RBL) and for RU1 Rural Residential areas as shown in **Table 7.2**. Context of these available assumed levels for proposed noise assessment is provided separately further below.

It is also noted that under the *NSW Noise Policy for Industry*, a detailed noise level event assessment is automatically triggered for any project where *night time* noise levels at a residential location exceed either:

a) $LA_{eq,15min}$ 40 dB(A) or the prevailing RBL plus 5 dB, whichever is the greater, and/or
b) L_{AFmax} 52 dB(A) or the prevailing RBL plus 15 dB, whichever is the greater

Table 7.2: Minimum Assumed Rating Background Noise Levels and Typical RBL's for RU1 Rural Residential under the *EPA Noise Policy for Industry*[2].
Note: to be further assessed[2] by proposed specialist noise assessment (refer discussion further below)

Period[1]	Minimum Assumed *Rating Background Level (RBL)* For any project / location dB[A]	Typical Existing Background Noise Levels *(RBL) for RU1 Rural Residential*[2] dB[A]
Day	35	<40
Evening	30	<35
Night	30	<30

Notes:

1. Daytime is defined as 7am – 6pm Mon-Sat, or 8am-6pm on Sundays and Public Holidays. Evening is defined as 6pm-10pm, and Night is defined as the remaining periods. Shoulder periods may also be assessed under the Policy if/where applicable.

2. Typical RBL for RU1 Rural Residential as per Table 2.3 of the Policy used to help identify recommended Amenity Noise Levels provided in Table 2.2 of the Policy. Rural areas are typically an acoustical environment 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. Where background noise levels are higher than those presented, the selection of a higher noise amenity area can be considered.

Noise Emissions:

Key noise emissions from the *operation* for the project are associated with:

- The principal expected source of noise from the project site is associated with operation of ancillary equipment for the RDSM during campaign-based continuous active testing (diesel air blower, 3-phase generator and air compressor. Refer dedicated control measures below.
- RDSM loading/unloading activities (hopper, product, stockpiles) and associated tractor operation. Daily working stockpile located close to RDSM enables short loading duration (particularly at night).
- Feedstock deliveries and product loading involving heavy vehicles and loading equipment, which will be undertaken during daytime only.
- RDSM operation (active testing), on campaign basis (staged feedstocks campaigns). Expected to be much quieter than other noise sources above.

Key noise emissions during site establishment and construction have also been considered in the Environmental Risk Assessment as detailed in **Appendix 5**, and are primarily associated with temporary earthworks and shed construction.

A **Project Noise Trigger Level (PNTL)** will be developed for the project by a suitably qualified noise specialist in consultation with EPA and GISC as noted further below and in Section 7.4.6. This will be undertaken in accordance with the methods approved under the *NSW Noise Policy for Industry* (and the *Interim Construction Noise Guidelines* as relevant). The process is proposed to involve an initial screening desktop noise assessment using conservative assumptions with adopted RBL and Project Intrusiveness Noise and Amenity Levels, along with conservative assumed equipment Sound Power Levels (L_w) and climatic/noise-enhancing conditions, with further detailed assessment triggered if subsequently required/recommended.

The above process and PNTL is expected to be undertaken in accordance with the *NSW Noise Policy for Industry* (refer Section 5.2.4) and scoped in consultation with EPA during SEE review. Environmental assessment requirements for this approach are sought from EPA accordingly.

Table 7.3: Minimum Assumed Background Noise Levels for RU1 available under the *EPA Noise Policy for Industry (to be further assessed and confirmed by proposed specialist noise assessment)*

Period[2]	Minimum Assumed *Rating Background Level (RBL)* *(any project / location)* dB[A]	Corresponding Minimum *Assumed Project Intrusiveness Noise Level* $L_{Aeq,15\ min}$ dB[A]	Typical Existing Background Noise Levels *(RBL for RU1 Rural Residential[3])* dB[A]	Corresponding Project Intrusiveness Level for Typical RU1 Rural Residential[3] $L_{Aeq,\ 15min}$ dB[A]	Recommended Amenity Noise Levels for RU1 Rural Residential[1] L_{Aeq} dB[A]	Potential Noise Level Event Trigger $L_{Aeq,\ 15\ min}$, dB[A]
Day	35	**40**	<40	**<45**	**50**	NA
Evening	30	**35**	<35	**<40**	**45**	NA
Night	30	**35**	<30	**<35**	**40**	**40**

Project and System Design, Risk Mitigation and Management Measures for Control of Environmental Noise:

Project design has considered initial feasible and reasonable measures to reduce noise using a combination of both ***source control*** (*better technology*, *mitigation or management practices)* and ***transmission control*** *(Interception barriers*) as detailed below. Controls at receptors are considered are not expected or currently proposed.

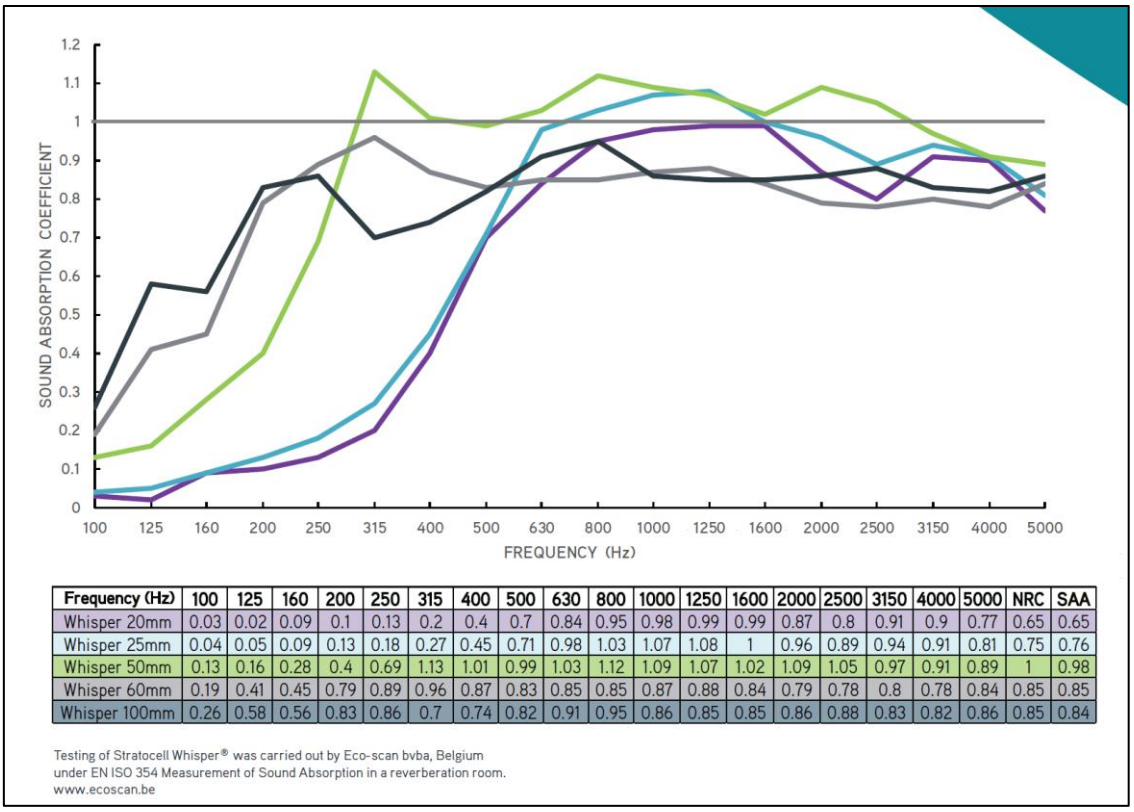
- **Principal noise sources** – ancillary equipment (diesel air blower, generator and air compressor). Whilst campaign based, RDSM testing will require continuous operation of the ancillary equipment Conservative noise minimisation measures have been adopted accordingly. These include:
    - *Equipment change or modification* - lower noise air compressor acquired (screw drive system instead of noisier reciprocating drive), oversized generator to run at lower/idle speeds).
    - Blower, generator and compressor housed in a dedicated relocatable ***Sound Enclosure Module*** as shown on the **Site Plan** (refer **Figure 4.2**).
        - Targeted lining of the enclosure with noise attenuating insulation - Stratocell Whisper noise insulation (refer figure below and details in **Appendix 18**), which is expected to provide significant attenuation.
        - Ventilation of the enclosure for appropriate safety and high air exchange
        - The module is proposed to be located within the Active Testing Area in proximity to the RDSM east of Shed 1. Whilst not expected to be necessary given the conservative control measures, the enclosure has potential for relocation if required.

Other noise risk avoidance and minimisation measures identified by the project ERA included:

- Daytime deliveries for heavy vehicles (no night deliveries).
- RDSM runs relatively quietly by improved design – by avoiding an air-blown system up to 78% reduction in off gas volume is achieved compared to conventional systems, resulting in *smaller and quieter* gasification processing and emissions control systems.
- Loading/unloading (feedtsock, product) are expected to be the primary notable process noise assocaited with RDSM operation.

- Relatively small particle sizing (typically <40mm) of feedstocks minimises hopper loading noise. Project is conservatively commencing with biomass (INS native biomaterial) which is relatively lighter/less dense for less noise.
- Targeted lining of sound absorbing insulation in dedicated Sound Enclosure
- Dedicated sound enclosure will be mobile unit (potentially relocatable as/if necessary).
- Air compressor used intermittently and recently upgraded to lower noise screw drive system (rather than noisier reciprocating drive).
- Other ancillary noise sources associated with trials are temporary/intermittent and minimised (eg hopper loading, minimised by daily working stockpiles located close to RDSM for short vehicle movements).
- Diesel generator expected to run near idle speed (oversized 20kVA rating used to supply ~5kVA);
- Lower noise emitting high performance tractor, and used intermittently during campaign-based feedstock trials (e.g. hopper loading).
- Strategic placement of shipping containers to intercept directional noise toward distant receptors.
- No significant source of vibration.
- Ensure plant and equipment is well maintained and not making excessive noise.
- Turn off machinery when not in use.
- Minimise operating equipment simultaneously where practicable.
- Orientate directional noise emitting equipment away from receivers where practicable.
- Staff inductions include environmental training and awareness
- Staff and contractor PPE in appropriate areas (ear protection)

Figure 7.7.2: Sound Absorbing Insulation used in Sound Enclosure *(ISO 354 Standard – refer figure footnote)*



Frequency (Hz)	100	125	160	200	250	315	400	500	630	800	1000	1250	1600	2000	2500	3150	4000	5000	NRC	SAA
Whisper 20mm	0.03	0.02	0.09	0.1	0.13	0.2	0.4	0.7	0.84	0.95	0.98	0.99	0.99	0.87	0.8	0.91	0.9	0.77	0.65	0.65
Whisper 25mm	0.04	0.05	0.09	0.13	0.18	0.27	0.45	0.71	0.98	1.03	1.07	1.08	1	0.96	0.89	0.94	0.91	0.81	0.75	0.76
Whisper 50mm	0.13	0.16	0.28	0.4	0.69	1.13	1.01	0.99	1.03	1.12	1.09	1.07	1.02	1.09	1.05	0.97	0.91	0.89	1	0.98
Whisper 60mm	0.19	0.41	0.45	0.79	0.89	0.96	0.87	0.83	0.85	0.85	0.87	0.88	0.84	0.79	0.78	0.8	0.78	0.84	0.85	0.85
Whisper 100mm	0.26	0.58	0.56	0.83	0.86	0.7	0.74	0.82	0.91	0.95	0.86	0.85	0.85	0.86	0.88	0.83	0.82	0.86	0.85	0.84

Testing of Stratocell Whisper® was carried out by Eco-scan bvba, Belgium
under EN ISO 354 Measurement of Sound Absorption in a reverberation room.
www.ecoscan.be

Impact Assessment

As noted above, the proposed R&D project has been designed to minimise effect on environmental noise and amenity. The potential for noise generation and associated impacts (including cumulative) during site preparation, construction and R&D testing operations has also been considered in the project Environmental Risk Assessment. With the identified risk control measures in place, the potential for significant impact from noise was considered **minor** (Risk Score = 8).

Subsequently, with the identified project design aspects, controls and management measures in place, the project is not expected to have significant noise impact at sensitive receptors (rural residences), which are notably located over 850m from the project site.

Notwithstanding this, the ERA conservatively recommended that a desktop noise assessment be undertaken by a suitably qualified specialist to further confirm the effectiveness of all proposed noise mitigation prior to commencement, as noted earlier above and also outlined in **Section7.4.6**. This will be undertaken in accordance with the *NSW Noise Policy for Industry* and scoped in consultation with GISC and EPA. Environmental assessment requirements are sought from EPA and GISC accordingly.

7.4.2.2 Visual Amenity

As detailed in **Section 3** and **7.4.1** above, the project site is distant to the nearest sensitive receptors (>850m to nearest rural residence), with partially or fully obscured views due to distance, natural and built form and existing vegetation within the landscape and around residences.

The RDSM includes an **enclosed** syngas afterburner (negligible light, no side light visible). Active night-lighting will be kept to the minimum required for operations and safety requirements. The site layout and positioning of conventional shed lighting has been designed and orientated to minimise direct line to distant receptors wherever practicable. Shed lighting will be directed/faced downward onto the pad (refer **Figure 4.2**). Lighting will only be used during or preparing for periods of active testing (campaign basis).

The installation of proposed sheds will be appropriate to the surrounding rural character (no intrusive colour/materials), as detailed in **Section 4**. Additional proposed visual screening (i.e. tree planting or other temporary measures) is shown on the Site Plan, including measures to address removal of small non-native conifers (<5m high) to make way for proposed Shed 2. Durable native species which enhance the local ecology and complement the rural character of the surrounding landscape will be prioritised for plantings. The positioning of proposed sheds will also assist in obscuring views of the RDSM from the public road and to distant neighbour R1 (**>1200m** WSW). With controls in place, it is expected that the prominence of the project will be low.

Accordingly, the proposed R&D project has been designed to minimise effect on visual amenity and is not expected to have significant visual impact.

Plate 7.1: Example view looking northeast at proposed project site from **~70m** beyond western project boundary (in direct line of sight from receptor R1, located **>1200m** west southwest of the project site)

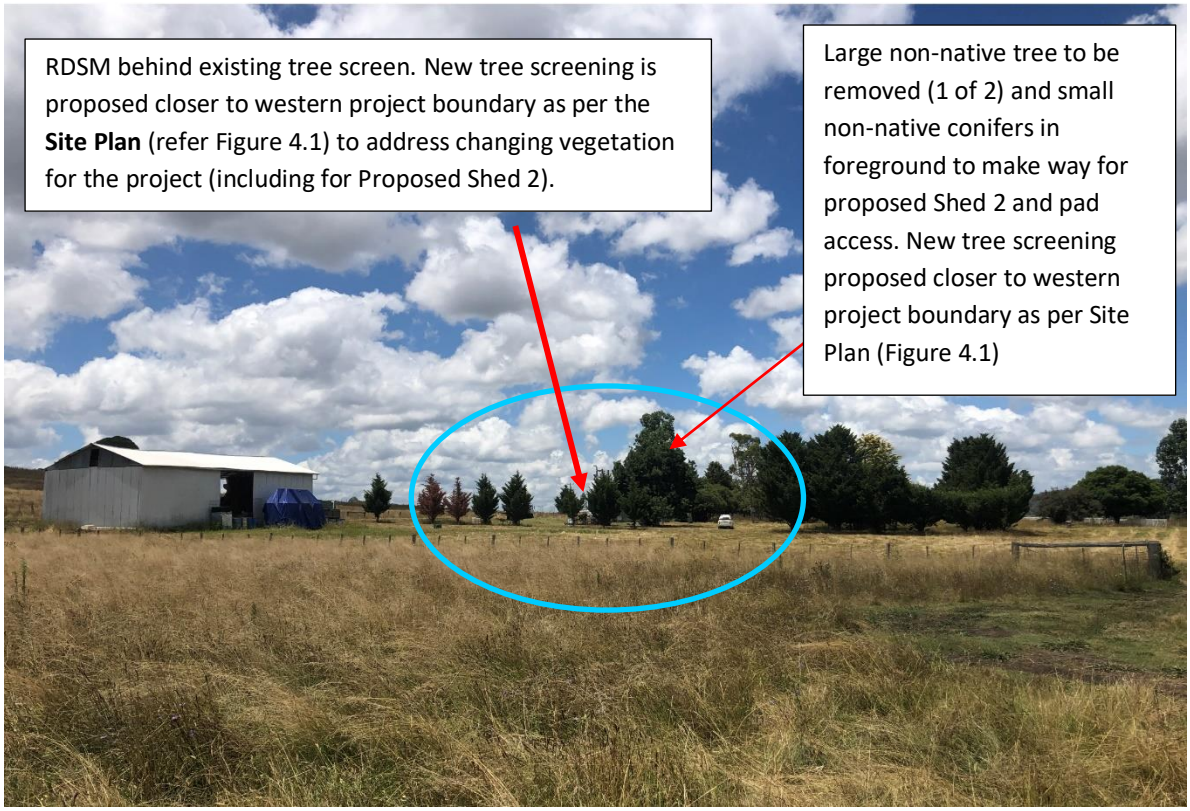


Figure 4.2: ***(Replicated from Section 4)*** **– Detailed Site Plan** (refer Section 4 and **Appendix 6** for details)
Note: Location of proposed visual screening shown ***dark*** *green (existing screening light green). Proposed removal of existing trees (all non-native) shown as dotted light green.*

7.4.2.3 Odour

Section 2 of the SEE provides detailed discussion on the technology design to avoid problematic organic liquids and gas emissions, including elimination of tars, resins and bio-oils common with conventional pyrolysis systems that are not produced at all by SEATA technology. The secondary gasification reactor deconstructs all organic emissions at elevated temperatures, with rapid quenching to avoid reformation followed by additional emission controls via wet scrubbing and afterburner (thermal oxidiser). Solid biochar when activated has the potential to be used as a pseudo activated carbon to adsorb organic gases and odours (i.e. biochar can be used as an odour *control*).

The transportation, storage and thermal processing of feedstocks (e.g. Coal, INS and stabilised biosolids) releasing odour emissions has also been considered in the Environmental Risk Assessment (**Appendix 5**). Notably, as detailed in Section 4.6 the only biosolids proposed are only those already treated and stabilised to a level ready for direct application to land such that odour is not problematic (as noted in the EPA Biosolids Guidelines). Conservative redundancy options also exist if required, such that with the identified existing controls and mitigation measures in place, the risk of odour problems are considered **low** (Risk Score = 3-5).

Accordingly, the proposed R&D project has been designed to avoid or minimise odour and is not expected to have significant odour impact.

7.4.3 Climate Change, Greenhouse Gas Emissions & Sustainability

Current Context and Project Need:

Climate change is now widely recognised as the most pressing environmental and socio-economic challenge of our time. Greenhouse Gases (GHG) including carbon dioxide (CO_2), methane (CH_4) and nitrous oxide (N_2O) are among the key contributors to global warming causing climate change (among other indirect/precursor gases), with differing *persistence* (duration) and *potency* (warming potential) in the atmosphere. Humanity has increased atmospheric CO_2 alone by over 45% since the pre-industrial period, and it can persist for 300 to 1000 years (NASA). The critical need to prevent global warming reaching 1.5°C by 2100 by reducing CO_{2e} emissions is the core focus of the Paris Agreement now signed by over 190 countries including Australia, as detailed in **Section 5.2.1**.

Further, a recent report by the World Meteorological Organisation (2020) warned the 1.5°C limit may be exceeded by the planet for the first time by 2024 (the Paris threshold is measured over a 30-year average, with every year above 1.5℃ taking the world closer to exceeding the limit). The world is not on track for achieving the target and is **currently tracking toward 3.2°C** (UNEP Emissions Gap Report, 2019), with the latest international pledges to reduce this further (at COP26 in 2021) predicted by a recent addendum to the UN Emissions Gap Report in 2021 to still result in **2.5°C to 2.7°C.** The addendum also found that:

> "*even considering the recent updated pledges for 2030,* ***annual global GHG emissions would need to be roughly halved by 2030*** *to become consistent with a 1.5°C least-cost pathway".*

With some reports indicating shortfalls of over 32 billion tonnes (32 Gt) of CO_2 reduction by 2030 to maintain levels on target for 1.5°C (and 15 Gt to stay below 2°C), ***removal*** of CO_2 already present in the atmosphere is becoming ever more critical in combination with significant efforts in ***emissions reduction***.

SEATA technology has been designed to provide economically scalable production of **biochar** as a readily deployable ***Negative Emissions Technology (NET)*** to **remove** existing carbon dioxide in the atmosphere built up over two centuries of industrialisation (commonly referred to as ***Carbon Dioxide Removal***, or ***CDR***).

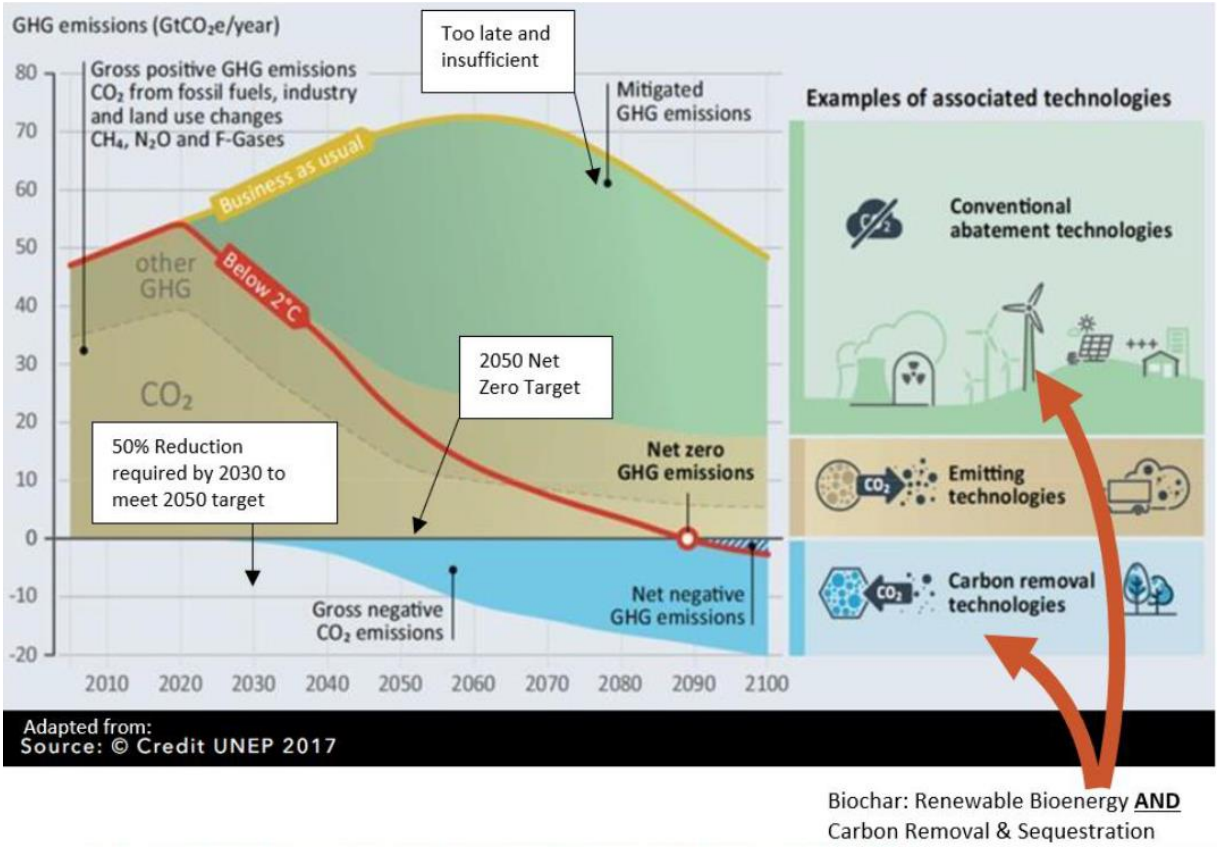
Biochar was one of several critical NETs identified by the Intergovernmental Panel on Climate Change (IPCC) as urgently required to help limit warming to 1.5°C by 2100 (IPCC, 2018). Technologies which produce biochar (CDR) and can *also* provide renewable bioenergy and/or other valuable derivatives (via syngas) have potential to contribute to both of these key objectives, as illustrated in **Figure 7.3.**

Additionally, SEATA technology also has potential to concurrently ***reduce emissions*** of CO_2 through:

- avoiding biomass waste currently being open burned (combusted), landfilled or biodegrading into greenhouse gases, and preferentially diverting it into beneficial use instead; and
- production of a clean rich syngas capable of further processing into multiple high value products, potentially displacing virgin materials (assisting genuine circular economy); and/or
- potential secondary sequestration of high-grade CO_2 via emerging CCUS applications, and /or
- provision of sustainable renewable energy.

The proposed project seeks to demonstrate and evaluate SEATA technology's potential not only for CDR via biochar, but also to produce syngas capable of directly providing renewable energy and/or providing the basis for valuable derivatives in emerging green commodities such as **hydrogen** (avoiding, displacing or reducing existing CO_2 emissions). Accordingly, the technology potential will be evaluated for its potential to positively contribute to **both** of the two critical elements required to address climate change - **emissions reduction** and carbon dioxide **removal.** The pathways for this are illustrated in **Figure 7.4.**

Figure 7.3: The role of both Emissions Reduction and Carbon Dioxide Removal (CDR) via NETs



In 2019 Glen Innes Severn Council joined a growing number of local government organisations around Australia and the world by declaring a ***climate emergency*** and committing to a more **sustainable** future. Following decades of research, the now well documented benefits of biochar (including meta analyses by Joseph et al 2021) demonstrate how it can play an important role in assisting all three components of the **'triple bottom line' of sustainability** (**environment, economic, social**), and provide carbon sequestration and assist other NETs such as soil carbon to mitigate climate change. Biochar production can also assist governments and the community toward meeting many of the seventeen (17) international **Sustainable Development Goals (SDG's)** established by the **United Nations**, as illustrated in **Figure 5.2** and previously discussed in **Section 5.2.1.**

Technology Potential to Enable Additional Secondary Sequestration:

The proposed R&D project will characterise syngas produced to confirm its potential for **high grade CO_2 production**, which has potential to provide secondary opportunities for both short and long-term recycling and sequestration by:

a) diverting CO_2 into existing markets such as food and beverage industries or medical uses among others (essentially short term recycling, as CO_2 still returns to the atmosphere without significant permanence of removal);

b) diverting CO2 into emerging technologies for **Carbon Capture Utilisation & Storage (CCUS)** which offer **long term sequestration**, such as carbon mineralisation / enhanced weathering, among others.

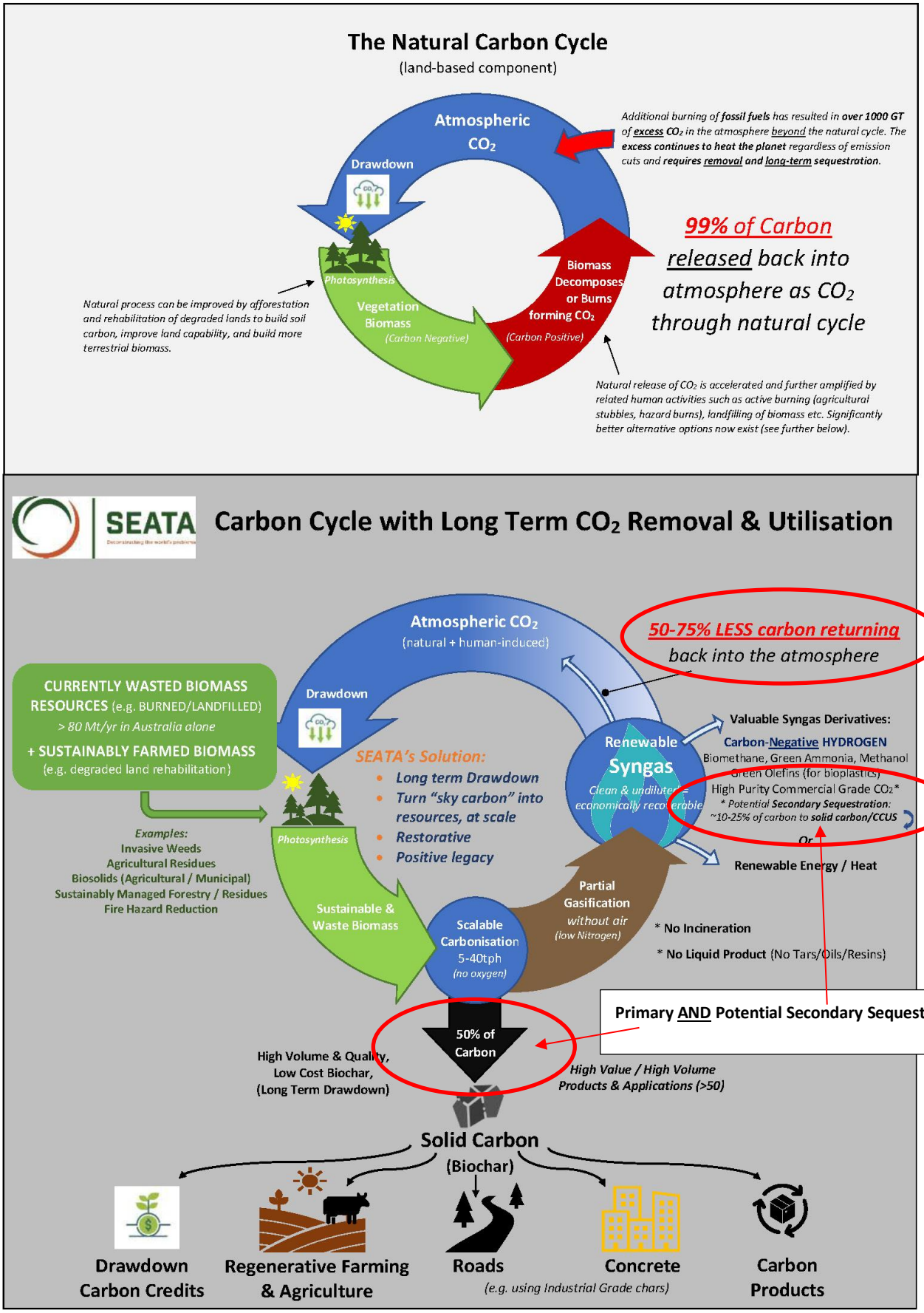
As illustrated in **Figure 7.4** above, These opportunities could result in the technology potentially providing both primary sequestration (up to 50% of carbon in feedstock turned into long term stable solid **biochar**), **and** secondary sequestration (10-25% of carbon *or more* in syngas turned into high grade CO_2 for CCUS), **resulting in potential total carbon removal of up to 75% or more**.

Other potentially climate-mitigating aspects of the project:

Further to the aspects above, the project offers additional potential climate benefits by reducing or avoiding GHG emissions by providing an alternative to current practices for feedstocks. For example:

- Invasive Native Scrub (and a number of agricultural crop stubbles) is currently windrowed and open-burned by farmers and land managers, releasing large amounts of CO_2 direct into the atmosphere.
- Other forms of vegetative feedstocks proposed for trialling by the project typically comprise part of the natural terrestrial carbon cycle where >98% of carbon is biodegraded back into the atmosphere. SEATA technology seeks to intercept and capture substantial portions of the carbon into long term stable biochar for beneficial reuse. Importantly, currently wasted biomass and sustainably farmed sources of biomass are targeted, including from NSW DPI research trials of rapid growing *native* biomass that can be grown on marginal land (i.e. non-competing with food crops) to remove CO_2 from the atmosphere whilst regenerating degraded soils in a positive upward cycle.
- Biosolids in Australia are commonly directly applied to land (e.g. in agriculture and land rehabilitation). Depending on soils and methods used, natural biodegradation processes can release nitrous oxide (N_2O), carbon dioxide (CO_2) back to the atmosphere. In cases where biosolids are sent to landfill it also generates methane (CH_4).
- Coal is currently combusted in power stations and is a primary source of CO_2 emissions globally leading to climate change. The technology provides the potential to harness energy from coal and significantly reduce CO_2 emissions and being scalable has the potential to be deployed rapidly to assist the global transition to cleaner and lower emission methods of energy production.

Figure 7.4: Terrestrial Carbon Cycles with Long Term CO2 Removal & Utilisation via SEATA Technology



***Project Emissions**:*

Technology design aspects that reduce Greenhouse Gas (GHG) emissions (both direct and indirect GHG's, including CO_2, N_2O, NO_x and CH_4) are discussed in **Section 7.4.1** and **Section 2**. These primarily centre around significant reduction in carbon reporting to the gas phase (due to capture as solid biochar), and significant reduction in oxides of nitrogen as the secondary gasification reactor is not directly air-blown (noting air is 78% nitrogen).

Notwithstanding the above, the technology and the proposed project will still produce carbon emissions during the process which need to be considered and balanced against the above. These include, but are not necessarily limited to:

- **Afterburning of syngas** required at pilot R&D scale (no energy recovery proposed), resulting in direct emissions, but noting the significant design and emissions control measures to reduce these noted in **Section 7.4.1** and **Section 2**.
- **Exhausts and fuel use (diesel)** by vehicles and ancillary equipment (generators, blower, compressor etc) usage associated with the operation.
- **'Upstream' emissions** involved in the recovery and transport of the feedstock to the SEATA R&D Centre for trials.

These are considered in context of the project capacity to sequester carbon at pilot RDSM scale **(i.e. up to 50% of the carbon in feedstock reports to biochar),** and to the importance of the research to future scale up noted above. These aspects, along with the small scale, temporary and R&D nature of the project, were considered in the potential for *impact* from greenhouse gases toward climate change assessed by the project environmental risk assessment, which currently identified this as low risk. Notwithstanding, this will be further considered in the support air quality specialist assessment discussed further below. This includes a detailed ***Life Cycle Assessment (LCA)*** intended to be undertaken using the results from the R&D trials after completion of the project in order to quantify the net benefits of the technology.

Accordingly, the proposed R&D project has been designed to both avoid and minimise GHG emissions and maximise carbon removal (negative emissions). The project will demonstrate production of biochar which supports the UN SDGs and will demonstrate potential for scalable CDR at a critical time of need, also supporting GISC's declaration of a climate emergency and the need for sustainability. Accordingly, the project has potential to have significant **benefits** to the environment, social/community and the economy.

7.4.4 Soil and Water Management

Soils and Surface Water:

The project site is characterised by generally gentle slopes trending NNE to SSW, of grades typically 1-2% and on average 4%. The upslope catchment beyond the project site is significantly grassed and the grades gradually steepen into hills of surrounding farmland. As introduced in Section 3, there are no formed creeks, watercourses or drainage lines located within the project site. The nearest watercourse is an ephemeral 2nd Order (Strahler) upper tributary to Furracabad Creek located southwest of the project site (refer Site Plan and ESCP in Appendix 6). The next confluence (3rd Order) is over 800m south of the project site. A farm dam is located on the ephemeral 2nd order drainage line nearby southwest of the project site.

Soil type mapping to the Australian Soil Classification (ASC) indicates Vertisols and Hydrosols in the surrounding area, with moderate inherent soil fertility. Black earth basaltic origin soils are known onsite. Soil hydrologic group mapping (on NSW *e-Spade*) indicates Type C and D soils in the surrounding area with slow

infiltration. For completeness, the site is not mapped as *Potential Acid Sulphate Soils (PASS)* on the NSW SEED database (a requirement for the Codes SEPP exempt development standards for the existing underground rainwater tank onsite).

The project site is located within a region with seven (7) Water Sharing Plans – five (5) relate to Groundwater resources and two (2) to surface water (***NSW Border Rivers Unregulated Rivers Water Sources (2012)*** *and the* ***NSW Border Rivers Regulated Water Sources (2021)***), which includes the ***Glen Innes Water Source.*** Both plans address six (6) objectives each for Environmental, Economic, Aboriginal and Social cultural objectives.

The RDSM pilot plant itself does not require operational water supply, however **emissions control** (rapid quenching and wet scrubber) requires make-up water to replace evaporated water content when very hot gas passes through the quenching and scrubber solutions. This is expected to be 300-500 L/day during operations (noting campaign based testing), and will be supplied from two 22.5kL rainwater tanks with proposed Shed 3, noting **each tank can supply ~45 days worth of process water**, **which is expected to be longer than each feedstock campaign trial**). Redundancy is provided via additional tanks on Shed 2 and ability to purchase water (external water supply truck) if/as required. One of the 22.5kL rainwater tanks on proposed Shed 2 will be reserved for firefighting activities as per RFS requirements (to be fenced and RFS couplings fitted per RFS requirements).

Other rainwater tanks for the project, including the existing underground concrete rainwater tank associated with Shed 1 – detailed in **Section 3**) will provide water for staff amenities. Water usage will be similar to that of the average family household due to the small number of staff, noting that additional rainwater capacity is being provided through additional rainwater tanks for proposed Shed 2 (4 tanks, 1 reserved for firefighting) and Shed 3 (2 tanks). Additionally, whilst not proposed or expected to be required, it is noted that in the unexpected event of an emergency, further backup and redundancy is also available via three nearby sources - an existing 22.5kL rainwater tank on an existing farm shed located immediately adjacent to the project site within Lot 3 DP1193185 (<100m from the RDSM), a groundwater bore (see below) and a farm dam on nearby Lot 1 DP1193185 (all same land owner as the project site).

For clarity, on 3rd April 2014 a **Water Access Licence (WAL No 90WA832525)** was issued for adjacent Lot 1 DP 1193185 (also owned by John Winter) for the purpose of bore construction works. Basic domestic and stock rights under the Act provide the owner to use the water for household and stock use as noted above. For clarity**, access to water from this bore water is not proposed** for the project on Lot 3, but has been noted as readily available **in case of emergency**.

Accordingly, water security is not expected to be an issue for the project.

The project's potential to impact soil and water is primarily related to surface disturbance during site preparation and construction activities including topsoil stripping (<200mm) and earthworks to establish the all weather access loop and pad areas, primarily in regards to erosion and sediment control. Potential to impact surface water during *operations* (RDSM trials) is primarily related to surface runoff from the established unsealed areas (erosion and sediment control), including the Active Testing Area. Potential risks and controls/mitigation measures in regards to surface water, groundwater and soil management were considered in the *Environmental Risk Assessment (ERA)* in **Appendix 5**.

The ERA identified **eight (8)** potential risk aspects associated with soil and water. With the identified controls in place, six of the risk aspects were expected to be **minor** and unlikely to occur (or lower). The highest risk identified was of moderate consequence and considered unlikely to occur given the controls in place. The other two project activities considered to be minor or moderate consequences (respectively) included

stormwater runoff during operations; and the transport, use and storage of potentially hazardous materials (including diesel fuel). Full details of the risks and controls identified are provided in **Appendix 5**.

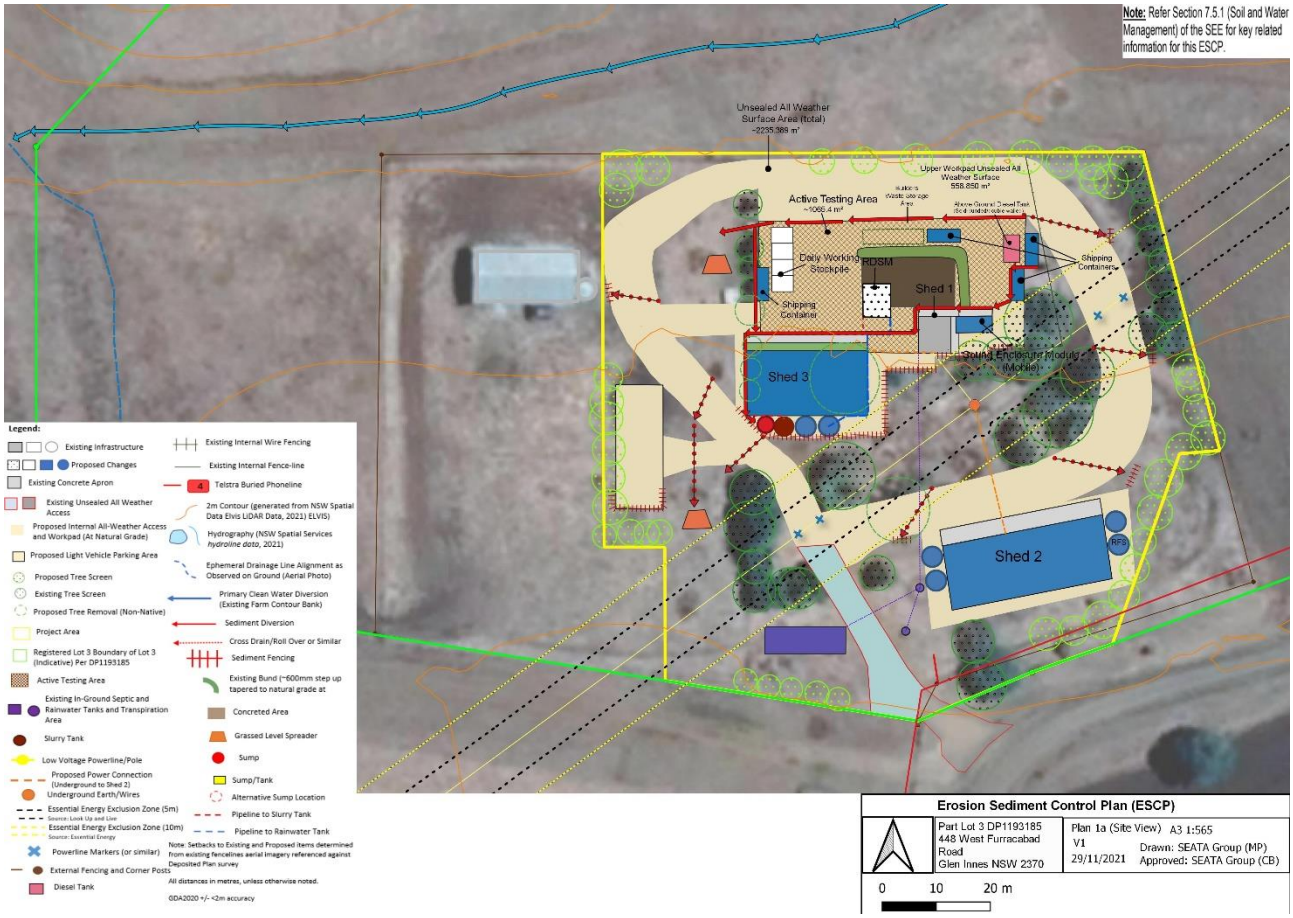
Erosion & Sediment Control Measures:

An **existing substantial clean water diversion** (contour bank) associated with farming on the surrounding property intercepts the vast majority of runoff from upslope of the project site and delivers it westward into a grassed drainage line west of the project site, which feeds southward into the ephemeral upper tributary (Strahler 2nd Order) of *Furracabad Creek,* including the small farm dam on the adjacent property as shown on **Figure 7.5**.

An ***Erosion Sediment Control Plan (ESCP)*** has been prepared for the site (**Figure 7.5** and in detail in **Appendix 1**) which is proportionate to the relatively small size of the project area (<1ha) and minor context of disturbance within the project area proposed. The ESCP will address appropriate management and controls for establishment and maintenance of the internal all weather unsealed access, parking, shed areas and active test area work pad (expected as summary figure format for minor projects combined with management summary descriptions in the SEE, noting the disturbance footprint is below threshold to require a sediment basin and the site has pre-existing clean water diversion controls associated with farming that would typically be designed in a more detailed ESCP document for larger projects).

The largest disturbance areas (workpad and Active Testing Area) are less than the 2500 m^2 threshold to require Type 1 ESC measures (sediment basin) in accordance with the *Blue Book*. Type 3 sediment controls are considered appropriate as shown on the ESCP. A dirty water diversion drain has been included upslope of the Active Testing Area to drain sediment-laden runoff from the upper workpad safely to grassed areas for controlled release as shown on the ESCP. The Active Testing Area will be regularly swept and runoff from within the area directed to a dedicated sump prior to controlled release to grassed areas. Water in the sump will be tested during each campaign (i.e. for each feedstock) to confirm suitable for release as is currently expected given the many controls in place in the ERA. Whilst not expected to be needed, if required unsuitable water can be transferred into the adjacent slurry tank for appropriate disposal. The unsealed aggregate all weather vehicle access loop will include appropriate type 3 ESC measures including cross drains/roll-overs, sediment fencing and level spreaders or similar for controlled release to grassed/vegetated areas as shown on **Figure 7.5** and in **Appendix 1**.

Figure 7.5: Erosion Sediment Control Plan (ESCP) for within the Project Area *(see also Appendix 1 for further details)*



Groundwater:

The Glen Innes Water Source contains five (5) Water Sharing Plans related to **groundwater**. Which includes:

- *NSW Border Rivers Alluvial Groundwater Sources, 2020*
- *NSW Great Artesian Basin Groundwater Sources 2020*
- *NSW Great Artesian Basin Shallow Groundwater Sources 2020*
- *NSW Murray-Darling Basin Fractured Rock Groundwater Sources 2020*
- *NSW Murray-Darling Basin Porous Rock Groundwater Sources 2020*

The project does not propose to extract or use groundwater. For clarity, there is an existing registered bore located within the broader farm owned by John Winter (same DP) which has *potential* to provide water if required only in an emergency situation if a number of other sources ran out/unavailable, including other emergency water also available from a 15ML dam on the broader farm too).

As noted earlier above, the project site is located on volcanic soils at the foothills/upper reaches of ephemeral tributaries of Furracabad Creek, >800m from 3rd order sections of Furracabad Creek and distant of alluvials associated with the creek. There are no significant discharges to groundwater proposed. The only potential contributions are at surface associated with conventional stormwater management undertaken as described in the section and the ESCP, and an existing septic tank and near-surface transpiration trench system installed by a licensed plumber. That system is located >800m from 3rd order tributary of Furracabad Creek and well distant of alluvial soils, and approximately 60m from upper ephemeral drainage line tributaries of 2nd order.

Accordingly, the Project is not expected to have any significant impacts on groundwater.

7.4.5 Waste Production and Management

Waste Generation and Management:

As detailed in **Section 2**, the technology has been designed to minimise waste streams and maximise recovery of valuable components of the feedstock. Solid and liquid wastes from the project are discussed below. Air emissions are addressed in detail separately earlier above in **Section 7.4.1**. It is also noted that characterisation and management of 'waste' feedstocks (as required in accordance with RRO & Exemption approval requirements), is detailed in **Section 5.2.3** and **5.2.4,** and will form part of the mass balance detailed testing and monitoring program discussed in **Section 7.4.7**.

- **Liquid Products and Wastes** will primarily occur from:
    - **Liquid products** from the RDSM have been specifically avoided/eliminated by design (no oils, tars or resins which can be problematic in conventional technologies, e.g. odour) as detailed in **Section 2**.
    - **Wet Scrubber Waste** - The only liquid waste expected from the RDSM is a waste slurry produced from the wet scrubber emissions control equipment, which is expected to be predominantly inert base salts. The slurry will be pumped to a dedicated holding tank (refer Site Plan in Section 4 and Appendix 6), tested at least once in each feedstock campaign, and managed/disposed of in accordance with the *NSW Waste Classification Guidelines*.
    - **Liquid waste from Staff Amenities** will be managed through the existing septic and transpiration trench system as detailed in **Section 4**, noting the project staffing levels (typically < 5 onsite at any one time) is consistent with historical loading of the system which has/continues to operate successfully without issue.
- **Solid Products and Wastes** will primarily be associated with:
    - **Biochar product** is discussed separately further below.
    - **Other solid wastes** are primarily associated with materials used in the process (e.g. containers for wet scrubber reagents etc), which are detailed in **Section 7.5.7** and within a dedicated ***Waste Management Plan (WMP)*** prepared for the project outlined below.

A ***Waste Management Plan (WMP)*** has been produced in accordance with the GISC Waste Management Plan Template (2018). The Waste Management Plan for the SEATA R&D Facility is provided in **Appendix 16.** The WMP outlines how the management of spent containers in which key materials (identified in **Table 7.**) are managed.

The generation and management of solid, liquid and gaseous waste streams during site preparation, construction and campaign based operations (R&D testing) was also considered in the project ***Environmental Risk Assessment*** (ERA) in **Appendix 5,** including other related aspects such as transport, storage and processing of 'waste' feedstocks, among others.

Accordingly, the Project is not expected to have any significant impacts as a result of liquid and solid waste management.

Biochar Production:

As a small-scale R&D project, the primary aim is to *characterise* the solid biochar and syngas produced, and demonstrate continuous run capabilities to assist design of commercial scale-up in future projects on dedicated commercial sites elsewhere. Subsequently, syngas produced by the project will be afterburned, monitored and discharged to the atmosphere or used as feedstock to other processing steps (including process control). Air quality aspects associated with this are discussed in **Section 7.4.1**, and monitoring in **Section 7.4.7**. **Section 4** provides more detail on feed stocks and biochar production, including related resource recovery considerations for circular economy and ***higher order use*** of materials is discussed in **Section 4.6.4**.

A conservative approach to managing **biochar** production and use has been undertaken which has sought to identify multiple potential applications/uses (well beyond project generation capacity), to minimise potential risk of 'waste legacy'. The conservative approach has **included high volume industrial uses**, and whilst not expected to be required also included **redundancy measures** (worst case scenario management). This aims to ensure biochar produced is *fit-for-purpose,* and has a *permissible* market applications (refer **Sections 5.2.3 and 5.2.4**).

Biochar produced from the RDSM will be tested and characterised in accordance with the detailed testing program to be developed in consultation with NSW EPA (refer **Section 7.4.7)** , including requirements for associated RRO & Exemption approvals for progressive testing of feedstocks (refer **Section 5.4** for details), and the *ANZBIG Code of Practice* which classifies biochar for industrial, standard (e.g. soils) or feed grade purposes (refer **Appendix 9**). Testing will confirm the ***fit-for-purpose*** suitability of biochar for each feedstock trialled, which would subsequently make it available for appropriate use elsewhere by others (e.g. agricultural or industrial applications/trials separate to this project as noted in Section 4.1). For transparency and completeness, these options include potential land application trials on John Winter's surrounding farm which would be undertaken as a separate but related exercise and conditionally controlled by the stepped RRO & Exemption approval process with EPA**.** Alternative biochar uses are also available and will be considered as relevant (pending suitable biochar characterisation and funding) as outlined further below. Whilst not expected to be required, further redundancy options are also available such as co-firing in a power station (or even disposal) if required to ensure no onsite legacy risk.

Biochar volumes produced by the project are expected to have sufficient available applications as outlined below (i.e. demand exceed project supply). SEATA has engaged with potential users for agricultural applications (including broadacre trials), industrial applications (e.g. roads, concrete), as well as other potential industrial *'carbontech'* applications (e.g. battery storage, activated carbon filtration). The information below provides some context to capacity of those trial applications in comparison to production from proposed R&D trials:

- **Agricultural trials** typically now use biochar ranging from 200kg/ha up to 2-3t/ha (i.e. 20-200 tonnes of biochar per 100 ha of trial areas). If suitably characterised from clean feedstocks (as expected), it is anticipated there are ample farms available to consume significant volumes of biochar, including but not limited to SEATA Director John Winter's surrounding farm which will be first to be trialled (via conditional RRO Exemption approval sought). NSW DPI has also been consulted regarding potential assistance in agricultural trials with SEATA, including the local DPI research station.
- **Road trials** have the potential to use **30-300 t of biochar per km of road @10% biochar** content (wearing course and road-base stabilisation, the latter the largest), and potentially can be increased to 30% biochar (~900t biochar per km road) pending biochar cost. There is already demand interstate for biochar for fully commercialised applications in roads. **Appendix 4** includes a letter from an

industrial user of biochar who is seeking to source around **35,000 t** of biochar in 2022, some **35-50 times larger than the likely biochar production from this R&D project**. The company has also indicated in discussions with SEATA that it is still economic to transport biochar interstate if required.

- Potential 'carbontech' trials are being scoped, including graphitic biochar for thermal battery storage which requires up to 5t per day by April 2022 (**~1800 tpa**), increasing up to 50t per day by early 2024 (**~18,000 tpa**).
- ➔ *As such, even a relatively small amount of **industrial trials alone** (e.g. roads) has potential to consume **all** the biochar produced from the project*. Biochar is currently a supply-limited commodity nationally (and globally).
- **Post-R&D trials considerations:**
  - As the project will be producing biochar for a period of three (3) years, in order to allow time for the final product to be characterised and RRO approval sorted for use, a period of **six (6) months** following completion of all trials (i.e. 3 years + 6 months) is sought to have the biochar suitably dedicated to an appropriate use offsite.
  - Whilst not expected to be required, should all options above fail to materialise, a '**worst case' redundancy measure** will be adopted to send the biochar for co-firing in a power station (or other appropriate disposal in consultation with EPA and GISC) at such time.

Accordingly, given the options for biochar identified and redundancies available, and the staged approach and small-scale nature of the project, the proposed R&D centre is not expected to present any significant waste legacy risk in regards to biochar produced.

7.4.6 Specialist Studies

As detailed earlier above, whilst the risks associated with noise and air quality aspects for the project were ranked of *minor* risk with the existing controls identified, the following specialist studies were conservatively recommended to confirm the risk controls and impact assessments for these aspects. Whilst these may typically be provided concurrent with SEE submission, given that the proposed layout of the project site has been revised multiple times during consultation with other stakeholders to date (which influences these assessments) and noting the impact on project timing, the SEATA Board has requested these assessments be scoped in consultation with EPA and GISC during/following DA submission and satisfactorily completed prior to commencement of operations.

- **Air Quality Impact Assessment** - Section 7.4.1 of this SEE provides context for a proposed AQIA to be undertaken prior to commencement of operations. Noting the detailed technology design factors presented, and risk management controls in place, it is proposed the study will be appropriately undertaken as a desktop modelling study, prepared in accordance with environmental assessment requirements accordingly sought from EPA and GISC. The intended consultants for the Air Quality Assessment are respected emissions experts, and it is noted that the detailed *Technology Testing Program* for the proposed R&D trials is also proposed to be developed by the air quality experts, in consultation with the EPA and GISC.

- **Noise Impact Assessment** – as outlined in **Section 7.4.2.1,** whilst acknowledging the detailed project design and risk management controls identified, the ERA conservatively recommended that a desktop noise assessment be undertaken prior to commencement by a suitably qualified specialist to further confirm the effectiveness of identified controls. The study will be prepared in accordance with environmental assessment requirements sought from EPA & GISC. The study will be prepared by a suitably qualified and recognised noise expert. A conservative desktop modelling assessment is

proposed to be undertaken generally in accordance with the *NSW Noise Policy for Industry*, using conservative assumptions and inputs. Should further detailed assessment be required this would be identified by the specialist.

7.4.7 Monitoring

Air Emissions Monitoring

As introduced earlier in **Section 0**, a staged approach to R&D trials and related monitoring is proposed as outlined in **Table 7.4** below. This is consistent with the conservative development strategy of *"walk before run"* and the risk-based approach to the project.

A **Detailed Testing Program** for Stage 2 is proposed to be developed in consultation with EPA and prepared by a suitably qualified expert. The objective of the **detailed testing program** will be to achieve defendable and reliable results to validate the technology, its scalability and performance and inform regulatory approval processes going forward for commercialisation. Identification of all relevant assessment criteria are expected to be confirmed by the specialist Air Quality Assessment noted earlier in Section 7. The detailed testing program is expected to include full mass balance characterisation of feedstock, gases and solid (char) products, and fate of contaminants to emissions control (e.g. wet scrubber waste).

As energy recovery is not proposed or applicable at R&D scale, **regulatory compliance** for the R&D proposed project is expected to be **assessed against the** emissions and monitoring criteria of relevant schedules of the current **NSW POEO (Clean Air) Regulations**. Relevant monitoring and assessment requirements for the proposed feedstocks and controls would be undertaken as per EPA approval requirements for the project.

Whilst the *NSW Energy from Waste Policy* (June 2021) does not technically apply to the project (as no energy recovery proposed at this R&D pilot scale), comparison of results to the ***emissions standards for energy recovery facilities*** of the policy is proposed to be undertaken for context to assess potential as *Proof of Performance* (POP) testing as a reference site for potential future commercial scale deployments elsewhere where energy recovery may be involved (pending application of the technology for renewable energy and/or circular recovery of gas products). This will include consideration of the following as typically referred to by NSW EPA (and by other EPAs such as Victorian EPA) for ***Best Available Technolgies (BAT)*** and associated best practice **emissions criteria**:

- **European Industrial Emissions Directive (IED 2010/75/EU)** - of the European Parliament and Council November 2010 on *industrial emissions (integrated pollution prevention and control)).* In addition to **emissions criteria specified in the annexures to IED**, see also related implementing decisions below establishing *Best Available Technologies (BAT)* and associated performance criteria as noted below;
- **Commission Implementing Decisions (EU)** establishing the ***Best Available Techniques (BAT) Conclusions*** under the IED, for:
    - ***Waste Incineration*** notified under Commission Implementing Decision (EU) 2019/2010 of 12 November 2019 (***'BAT Conclusions Waste Incineration 2019'***).
    - ***Large Combustion Plants (Biomass)*** notified under Commission Implementing Decision (EU) 2017/1442 of 31 July 2017 ***('BAT Conclusions Large Combustion Plants (Biomass) 2017')***;
    - **NOTE:** The IED states that the **BAT Conclusions apply to** disposal of non-hazardous wastes (in waste incineration or co-incineration plants) with **capacity exceeding 3 tonnes per hour** (approximately ten (10) times larger than the SEATA RDSM). Whilst this does not technically apply to the pilot scale RDSM, these criteria will still be considered in context of future commercial scale deployment.

- ***Best Available Techniques (BAT) - Associated Emissions Levels (BAT-AEL's),*** emissions criteria specified within each of the above BAT Conclusions (and BREF's) as relevant for the technology. Refer tables further below.

- **European Waste Incineration BAT Reference Document (BREF) 2019** - European Commission Integrated Pollution Prevention and Control Reference Document on Best Available Techniques for Waste Incineration *(commonly referred to as the **'Waste Incineration BREF 2019')***.
- **BREF *Large Combustion Plants* 2017** if/as applicable –BREF Large Combustion also includes BAT specifically for **gasification** which can be considered in addition to full combustion as outlined in **Table 7.3** below. These will be further assessed by the specialist air quality assessment.

Whilst relevant practicable aspects will be considered, detailed automated continuous monitoring systems used at commercial and industrial scale under BAT which are highly expensive (e.g. continuous automated monitoring systems, including for mercury and acid gases) are considered unviable and inappropriate for R&D scale. Accurate alternative testing via **continuous attended survey sampling and accurate lab analysis** will be scoped in detail with EPA for the ***Detailed Testing Program***.

Accordingly, ,it is anticipated that air emissions monitoring will be undertaken and assessed as indicatively outlined in Table 7.4, Table 7.5 and Table 7.6 below. Monitoring details and criteria will be further assessed and confirmed by the specialist air quality assessment for the DA, and determined in consultation with EPA during development of the **Detailed Testing Program**. Test methods and conditions will be as per NSWEPA requirements and expected to be generally consistent with the specified requirements in related Schedules of the POEO Clean Air Regulations 2021 (including Schedule 5) and current *Standard Methods* set by the NSWEPA. The results of detailed monitoring for the R&D project will also seek to determine thermal efficiency, removal efficiency (RE) and Destruction Efficiency (DE) for SEATA technology where practicable for relevant analytes where present (RE and DE would be more targeted in other separate future trials elsewhere for industrial feedstocks, not proposed in the current project).

Biochar Quality Monitoring (solid product):

Biochar characterisation and monitoring for each feedstock campaign will address requirements for required *Resource Recovery Orders and Exemptions* (conditioned by EPL) and will exceed the minimum requirements of the ANZ Biochar industry Group *Code of Practice* (2020), as discussed further in Section 0

Water Quality Monitoring:

Water quality will be monitored in the stormwater sump located near Shed 3 which receives runoff from the Active Testing Area (refer Erosion Sediment Control Plan (ESCP) and Section 7.4.4 for details). Water quality will be sampled **at least once for each feedstock trialled** to confirm design expectations that water quality is suitable for conventional ESC management and release. Whilst not expected, should water not be able to be maintained suitable (including treatment with activated biochar carbon if necessary), it will be transferred into the adjacent slurry tank (wet scrubber waste tank) for appropriate disposal.

Noise Monitoring

Due to the extensive efforts and controls undertaken to mitigate noise from the project discussed in **Section 7.4.2.1** and the project ERA, which will also be confirmed by proposed specialist noise assessment as noted earlier above, environmental noise monitoring is not warranted for the project. Notwithstanding this, should unexpected issues arise during operations, an attended survey (or similar appropriate measures) would be considered in consultation with GISC and EPA at such time.

Monitoring inspections for other relevant aspects (e.g. biosecurity) are detailed elsewhere in **Section 7**.

Table 7.4: Summary of Proposed Stages 1-3 Feedstock R&D Trials and Testing Program

R&D Staging	Summary Description	Feedstock(s)	Expected Duration	Proposed Testing	Objectives / Comments
Stage 1	**Preliminary Continuous Run Trial for first targeted feedstock** *(system function)*	**First Targeted Feedstock: Invasive Woody Weeds (INS) / waste native biomaterial (source-separated biomass feedstock)** *Screening tests may also be considered for the following before commencing Stage 2 tests for those:* • *Biosolids* • *Coal (Standard Fuel)* • *Blending / Co-processing* (e.g. INS + biosolids, INS + coal, customised mineralised chars to match soil constraints for potential farm trials)	• **1-5 Days per feedstock,** • Commencing with short duration and building (eg 4hrs-12hrs, 24hrs+)	**Screening level testing** (only) as follows: • **Proximate and Ultimate Analysis** on Biochar (solid) • **Grab Sampling of syngas for screening level analyses** (e.g. Tedlar Bags)	• Provide investor and regulator confidence in RDSM continuous run operation in order to progress to more detailed, lengthy and costly testing in Stage 2. • Following initial INS trials in both Stage 1 and Stage 2 below, **the order of all subsequent feedstocks** after INS (biosolids, coal and remaining types of source-separated biomass) **may alter as needed**. Currently, biosolids are expected to be the second trial. • Forestry residues may include from bushfire hazard reduction.
Stage 2	**Detailed Testing of initial targeted feedstocks** *(mass balance)*	Anticipated to be undertaken as follows (order may change after the first feedstock if/as necessary): • ***INS / waste native biomaterial (first priority trial)*** • *Biosolids* • *Forestry/Saw Milling residues/ bushfire hazard reduction material* • *Standard Fuel (Coal)* • *Blending / Co-processing* – for example biosolids + biomass (INS and/or forestry residues etc as above); Coal + biomass (INS and/or Forestry residues etc as above); customised mineralised chars to match farm soil constraints for broadacre trials.	• **Up to two (2) weeks OR** as per EPA requirements for detailed testing (refer *Proposed Testing* column)	• **Detailed Testing Program** to be developed by emissions expert & SEATA in consultation with EPA and relevant stakeholders. • Expected to include **system mass balance** with characterisation of feedstocks, syngas, solid char and scrubber material at minimum. • **Automated continuous monitoring of temperature, pressure and flow**. • **Periodic attended continuous gas sampling and analysis** as relevant to required sampling period (e.g. CO, CO_2, NO_x, O_2). SO_x will also be undertaken for high sulphur feedstock (eg coal). • Undertaken generally in accordance with relevant testing and monitoring requirements of the *NSW Energy from Waste Policy* and *Eligible Waste Fuel Guidelines,* as relevant to these R&D trials, and other relevant methods and guidelines as required by EPA (including but not limited to the *EPA Approved Methods for Sampling and Analysis of Air Pollutants in NSW* as applicable). • Duration of testing sufficient to satisfy above objectives as *Proof of Performance* reference.	• Formal *Proof of Performance* and validation of technology performance during continuous run. • Regulatory confidence in SEATA technology, potential use of pilot as a local reference plant for later commercial scale up (elsewhere) on those feedstocks. Notwithstanding this, as a non-commercial R&D system automated continuous monitoring systems are limited to temperature, pressure and flow (not practicable or viable for gas monitoring), but noting high accuracy attended continuous gas sampling will be undertaken by a suitably qualified expert. • Whilst not technically triggering requirement for compliance with the *NSW Energy From Waste Policy* or *Eligible Waste Fuel Guidelines* (as energy recovery is not proposed), use of POP data as a reference for future commercial scale deployment encourages compliance. SEATA will work closely with EPA to determine an appropriate detailed testing program accordingly. • Pending various factors including approval conditions and funding, select feedstocks conditionally approved for Stage 3 may be opportunistically elevated into Stage 2 in consultation with EPA. E.g. NSWDPI biomass crops etc.
Stage 3	**Progressive Detailed Tests of remaining approved feedstocks** during 3 year R&D period *(pending funding)*	*Other remaining source separated biomass feedstocks as per Table (i)* and detailed in **Section 4.6** of the SEE. e.g. biomass supplied from NSWDPI Biomass Crops trials (among others), for ongoing R&D trials throughout the proposed 3 year R&D centre approval period. Further outlined in Section 4.	**As above** (detailed testing period established in consultation with EPA). Screening tests first if needed, per Stage 1.	• As above (detailed testing requirements established in consultation with EPA)	• Intention is to separate initial targeted INS and forestry milling residues in Stage 1 & 2 from other ongoing clean biomass feedstocks in Table (i) that will continue to be progressively tested during the 3 year approval period. Accordingly, Stage 3 can be <u>conditionally</u> approved if required in order to facilitate accelerated approval. • **<u>Note</u>**: NSWDPI biomass crops expected available mid-2022.

Table 7.5: Process Monitoring Requirements - NSWEPA Energy From Waste Policy June 2021, NSW POEO (Clean Air) Regulations 2021 and Proposed Monitoring for SEATA R&D.

Analyte / Parameter	Units	Monitoring Frequency (NSW EfW Policy / POEO)	Proposed Monitoring for this project
Process Monitoring:			
Temperature	**°C**	**Continuous**	**Automated Continuous**
Oxygen content	**%**	**Continuous**	**Attended Continuous Sampling ***
Moisture content	**%**	**Continuous**	**Automated Continuous**
Pressure	**MPa**	**Continuous**	**Automated Continuous**
Emissions Monitoring:			
Smoke	*As noted*	-	*See solid particles*
Solid Particles (total) *(Total Suspended Particulate, TSP, 'Dust')*	mg/m^3	**Continuous**	**Attended Continuous Sampling**
"Type 1 and 2 Substances" in aggregate[2]	mg/m^3	Every 3 months	Determined in consultation with EPA
Mercury (Hg)	mg/m^3	Every three months	As above
Cadmium and Thallium (total)	mg/m^3	Every three months	As above
Dioxins and Furans	**Ng/m³**	Every 3 months for first 12 months, twice per year thereafter-	As above
Polychlorinated Dibenzodioxins and furans (PCDD/F)	**Ng/m³**	As above	As above
PCDD/F + Dioxin-like PCB's	**Ng/m³**	As above	As above
SO_2	mg/m^3	**Continuous**	**Attended Continuous Sampling** (high S feeds only)
NOx (as NO_2 equivalent)	mg/m^3	**Continuous**	**Attended Continuous Sampling**
Nitrous Oxide (N2O)	mg/m^3	**Continuous or as otherwise agreed with EPA[2]**	**Attended Continuous Sampling**
CO	mg/m^3	**Continuous**	**Attended Continuous Sampling**
HCl	mg/m^3	**Continuous**	**Attended Continuous Sampling**
HF (equivalent) *Any compound containing Fluorine, as total Fluoride*	mg/m^3	**Continuous or as otherwise agreed with EPA[2]**	**Attended Continuous Sampling or as otherwise agreed with EPA[2]**
VOC's[9] (TOC)	mg/m^3	Determined in consultation with EPA	Determined in consultation with EPA
Ammonia	mg/m^3	**Continuous or as otherwise agreed with EPA[2]**	**Attended Continuous Sampling or as otherwise agreed with EPA[2]**
PAH	mg/m^3	Every 3 months for first 12 months, twice per year thereafter-	Determined in consultation with EPA

**** Above: Attended Continuous Sampling** = attended continuous gas sampling for required sampling averaging period for corresponding emission criteria, undertaken by a suitably qualified expert with high accuracy laboratory analysis of sample, in accordance with EPA Approved Methods and/or as determined in consultation with EPA specifically for this project as part of the proposed Detailed Testing Program.*

Table 7.6: Draft Summary of Potential Emissions Assessment Criteria: NSW POEO (Clean Air) Regulations (C.A.R) - *Group 6* 2021 (compliance criteria); and current best practice criteria for energy recovery plants (NSW EfW Policy 2021), EU Industrial Emissions Directive (IED); BAT Conclusions and Best Available Techniques -Associated Emission Levels (BAT-AELs) for Waste Incineration and Large Combustion Plants (Biomass)). Table in progress and levels to be confirmed. See related footnotes below.

Analyte / Parameter	Units	One Hour Average Criteria								24 Hour (Daily) Average Criteria								
		NSW EfW Policy[1]	Clean Air Reg *(Sch 2/4 Group 6[7,8])* *Plant and Flares[8]*	Clean Air Regs *(Sch3 Group6)* *Electricity Generation*	EU IED[11]	BAT CONCLUSIONS – *Waste Incineration* 2019[18] BAT-AELs	BREF – Waste Incineration 2019 BAT-AELs[12] *(lower-upper)*	BAT CONCLUSIONS – *Large Combustion Plants (Biomass)* 2017 BAT-AELs	BREF - Large Combustion Plants (Gasification) BAT-AELs[12] *(lower-upper)*	EfW Policy[1]	Clean Air Reg *(Sch 2/4 Group 6[7,8])* *Plant[7,8] and Flares[8]*	Clean Air Reg *(Sch3 Group6)* *Electricity Generation*	EU IED[11]	BAT CONCLUSIONS – *Waste Incineration* 2019 BAT-AELs	BREF – Waste Incineration 2019 BAT-AELs[12] *(lower-upper)*	BAT CONCLUSIONS – *Large Combustion Plants (Biomass)* 2017[19] BAT-AELs	BREF - Large Combustion Plants (Gasification) BAT-AELs[12] *(lower-upper)*	
Smoke	*As noted*	*NS (see TSP)*	***20% opacity[5]*** ***No visible[6]***	***20% opacity[5,7]***	*NS (see TSP)*	*mercury*	*NS (see TSP)*		*NS (See TSP)*	*NS*	*NS*	*NS*	*NS (see TSP)*		*NS (see TSP)*		*NS (see TSP)*	
Solid Particles (total) *(Total Suspended Particulate, TSP, 'Dust')*	mg/m³	*20*	**50[3]** ***(36)***	**50[9]** ***(36)***	*30*		*NS*	2 - 10	*3-16 (Coal)[17]*	*NS*	**NS**	**NS**	*10*	*< 2 - 5*	*<2-5*	*2-10*	*2-5 annual avg (Coal)[17]*	
"Type 1 and 2 Substances" in aggregate[2]	mg/m³	*0.30*	***1[3,7]***	**NS**	*See below*		*See below*			*NS*	***NS***	**NS**	*NS*		*NS*			
9 Metal Aggregate *(Sb + As + Pb + Cr + Co + Cu + Mn + Ni + V)*	mg/m³	*See above*	***See above***	***See above***	*0.5*	*0.01 – 0.03*	*0.01 – 0.30[13]*			*See above*	*See above*	**NS**	*NS*		*NS*			
Mercury (Hg)	mg/m³	*0.04*	***0.2[3,7]***	**NS**	*<0.005 - 0.02[13]*	*< 5 – 20*	*< 0.015 - 0.035*			*NS*	**NS**	**NS**	*NS*	*< 5 - 20*	*<0.005 - 0.02[13]* *(0.001 - 0.01[14] as Annual Avg)*	*<0.001 – 0.003*	*<1 -3 (annual avg)*	
Cadmium and Thallium (total)	mg/m³	*0.02*	***0.2[3,7]*** ***(Cd only)***	**NS**	*0.05*	*0.005 – 0.002*	*0.05 - 0.02[13]* *(Cd only)*			*NS*	**NS**	**NS**	*NS*		*NS*			
Dioxins and Furans	**Ng/m³**	*0.1*	***0.1[3,7]***	**NS**	*NS*		*NS*			*0.1*	***0.1[3,7]***		*0.1*		*See below*			
Polychlorinated Dibenzodioxins and furans (PCDD/F)	**Ng/m³**	*See above*	***See above***	**NS**	*NS*		*0.01 – 0.04[13]*	<0.01 – 0.03 (NG i-TEQ/NM3)		*See above*	***See above***		*See above*	*0.01*	*0.02 – 0.04[13]* *0.01 – 0.06[14]* *(and 0.06 Annual Avg)*	*<0.01 – 0.03[22]*		
PCDD/F + Dioxin-like PCB's	**Ng/m³**	*NS*	**NS**	**NS**	*NS*	*0.01*	*0.02 – 0.06[13]*			*NS*	**NS**		*NS*	*0.03*	*0.04 – 0.06[13]* *0.01 – 0.08[14]*			
SO_2	mg/m³	*100*	**NS**	**NS**	*200*		*NS*		*30-175 (biomass)[16]*	**100**	**NS**	**NS**	*50*	*5 – 30*	*5-30*	*30-175 (biomass)[16]* *& 15-70 annual avg*	*80-200 (coal)[17],*	
NOx (as NO_2 equivalent)	mg/m³	*250*	***350 500 AT***	**70/90[10]**	*400**		*NS*		*50-150 (Coal)[17]*	*250*	**NS**	**NS**	*200*	*50 - 120*	*50-120*	*50-15 (biomass)[16]*	*80-200 (coal)[17]* *1-35*	

Analyte / Parameter	Units	One Hour Average Criteria								24 Hour (Daily) Average Criteria								
		NSW EfW Policy[1]	Clean Air Reg (*Sch 2/4 Group 6[7,8]*) *Plant and Flares[8]*	Clean Air Regs (*Sch3 Group6*) *Electricity Generation*	EU IED[11]	BAT CONCLUSIONS – *Waste Incineration* 2019[18] BAT-AELs	BREF – Waste Incineration 2019 BAT-AELs[12] *(lower-upper)*	BAT CONCLUSIONS – *Large Combustion Plants (Biomass)* 2017 BAT-AELs	BREF - Large Combustion Plants (Gasification) BAT-AELs[12] *(lower-upper)*	EfW Policy[1]	Clean Air Reg (*Sch 2/4 Group 6[7,8]*) *Plant[7,8] and Flares[8]*	Clean Air Reg (*Sch3 Group6*) *Electricity Generation*	EU IED[11]	BAT CONCLUSIONS – *Waste Incineration* 2019 BAT-AELs	BREF – Waste Incineration 2019 BAT-AELs[12] *(lower-upper)*	BAT CONCLUSIONS – *Large Combustion Plants (Biomass)* 2017[19] BAT-AELs	BREF - Large Combustion Plants (Gasification) BAT-AELs[12] *(lower-upper)*	
Ammonia (NH_3)	mg/m³	*NS*	**NS**	**NS**	*NS*		*NS*		*3-10*	***5***	**NS**	**NS**	*NS*	*2 - 10*	*2-10[15]*	*<3 – 10 (annual avg or Avg over sample period)*	*3-15* (annual avg)*	
CO	mg/m³	*80*	***125[3,7]***	**NS**	*NS*		*NS*			*80*	***125[3,7]***	**NS**	*50*	*10 – 50*	*10-50*	*<30-250 (biomass)[16]*	*<30-140 (coal)[17]*	
HCl	mg/m³	*50*	**100[3]**	**100[3]**	*60*		*NS*		*1-12 (biomass)[16]*	*NS*	**NS**	**NS**	*10*	*< 2 – 6*	*<2-6*		*1-6 (coal)[17]* *1-12 (biomass)[16]*	
HF (equivalent) *Any compound containing Fluorine, as total Fluoride*	mg/m³	*4*	**NS**	**NS**	*4*	*<1*	*<1*	*<1*	*<1*	*NS*	**50[7]**	**NS**	*1*	*<1*	*<1*	*NS*	*1-3 (coal)[17]*	
VOC's[9] (VTOC)	mg/m³	*20*	***20[3], 40[4,7]***		*20*		*NS*			*NS*	***NS***		*10*	*< 3 -10*	*<3 - 10*	*0.5 – 10 (yr. avg. <0.1 – 5)[22]*		

The EfW Policy criteria may apply for future commercial scale deployment of SEATA technology where energy recovery would be proposed, however are not technically applicable to the current RDSM scale proposed project. These criteria are typically more stringent than the standard minimum emissions criteria for Group 6 scheduled premises thermal treatment plants under Schedule 2 of the NSW POEO (Clean Air) Regulations 2010 which apply to the RDSM at minimum.

***NS** = Not Specified, **N/A** = Not Applicable*

*[A] or the minimum sampling period specified in the relevant test method, **whichever is the greater***

*[1] NSW Energy from Waste Policy (June 2021), typically more stringent than POEO (Clean Air) Regulations**. Concentration reference conditions** expressed at dry, 273K, 101.kPA and **11%** oxygen conditions (Note that the Clean Air Regulations only apply 11% O_2 to dioxins and furans, other air impurities typically at 7% or 3% O_2).*

*[2] As defined by the POEO (Clean Air) Regulations 2010. Accordingly, **Type 1 includes** Sb, As, Pb, Hg or any compound containing one or more of these elements. **Type 2 includes** Be, Cr, Co, Mn, Ni, Se, Sn, Va or any compound containing one or more of these elements.*

*[3] For air impurities that originate from material **containing** any principal toxic air pollutant (with VOCs as n-propane equivalent), including (but not limited to) from any activity or plant, including using a non-standard fuel for electricity generation.*

*[4] For air impurities that originate from material that **do not** contain any principal toxic air pollutant (with VOCs as n-propane equivalent)*

[5] Schedule 2 specifies smoke to meet Ringlemann 1 or 20% Opacity for afterburners and other thermal treatment plant. For electricity generating activities using a Standard Fuel or a non-standard fuel Ringlemann 3 or 60% opacity only in approved circumstances may also apply.

[6] Schedule 2 specifies smoke for any flares to have no visible emission other than for a total period of no more than 5 minutes in any 2 hours.

*[7] Schedule 2 also specifies emissions criteria for **specific plant and activities** including **Electricity Generation** from "any activity or plant using a liquid of solid **Standard Fuel** or a **non-standard fuel**" (i.e. the latter includes **an Eligible Waste Fuel** for recovery of energy). Schedule 4 (General Standards of Concentration) also regulates all other **General Activities and Plant ("any activity or plant")**. This includes criteria for Fluorine (F_2) and any compound containing fluorine, as Total Fluoride (HF equivalent).*

[8] Relevant criteria as listed in Schedules 2 and 4 of the POEO (Clean Air) Regulations 2010, as amended 2021

[9] Electricity generation using a non-standard fuel (i.e. eligible waste fuel)

[10] Any turbine operating on a gas / other than gas with electricity generation system capacity of ≥ 10MW/30MW.

*[11] European Union Industrial Emissions Directive (IED) 2010/75/EU – Air Emissions **Limit Values** (as detailed in IED Annexures, typically daily limit values)**.***

*[12] EU Commission Implementing Decision 2019/2010 12 Nov 2019 establishing **Best Available Techniques (BAT)** Conclusions, Under Directive 2010/75/EU of the European Parliament and Council, **For Waste Incineration (EU Commission for WI, 2019).***

[13] BAT-AEL's criteria set as the average over the sample period. Metals (Cd+Tl, Hg, Sb+As+Pb+Cr+Co+Cu+Mn+Ni+V) have sampling periods of minimum 30 minutes and maximum 8 hours. Dioxins and Furans have a sampling period of a minimum of 6 hours and maximum of 8 hours. Hg measurement taken from continuous measurements.*

*[14] Long Term Averaging Period for Mercury – Hg long-term sampling period of 2-4 weeks**

[15] The lower end of BAT-AEL range for ammonia may not be achievable when incinerating waste with a high nitrogen content. The higher end of BAT-AEL range is applicable for NOx where SCR (selective catalytic reduction) is not applicable.

[16] *BAT-AEL for air emissions for Large Combustion Plants burning biomass operating at variable loads <100MW. For other plants ammonia upper limit is 10 mg/Nm^3 (Ref: BAT Conclusions for Large Combustion Plants, 2017)*

[17] *BAT-AEL for NOx air emissions for Large Combustion Plants burning coal, criteria varies for plant size above or below 100MW total rated thermal input (Ref: BAT Conclusions for Large Combustion Plants, 2017)*

[18] *Average over the sampling period – Average value of three consecutive measurements of at least 30 minutes each. (Note: For any parameter where, due to sampling or analytical limitations, 30-minute measurement is inappropriate, a suitable sampling period is employed. For PCDD/F, a sampling period of 6 to 8 hours is used.*

[19] *Average over a period of 24 hours of valid hourly averages obtained by continuous measurements*

[20] *EU Commission Implementing Decision 2017/1442 of 31 July 2017 establishing best available techniques (BAT) conclusions, under Directive 2010/75/EU of the European Parliament and of the Council, for Large Combustion Plants.*

[21] *BAT-associated emission levels (BAT-AELs) for emissions to air from the combustion of solid biomass for New Plants operating at <100MWth.*

[22] *BAT-associated emission levels (BAT-AELs) for PCDD/F and TVOC emissions to air from the co-incineration of waste with **biomass**, peat, coal and/or lignite.*

** Note: Long term criteria for dioxins are less stringent than short term criteria in Table 7 of the EU Commission for WI, 2019, and appears averaging periods have been inadvertently switched in the table (Todoroski Air Sciences, 2020).*

7.5 Other Environmental Issues, Assessment & Management

A summary of other environmental aspects and issues considered for the project is provided in the following sections. These aspects and issues (and the current proposed approach to assess and control), were also considered in the project Environmental Risk Assessment (refer **Appendix 5**).

7.5.1 Flora and Fauna / Biodiversity

The Project site is located on 5th generation farmland (grazing property) that has been historically cleared with predominantly non-native trees and shrub vegetation remaining. The entirety of Lot 3 DP1193185 and surrounds is not mapped as *Regulated Land* under the ***NSW Native Vegetation Regulatory Map*** (as at 1 October 2021) as shown in **Figure 7.6** below, and not identified as protected land of Biodiversity Value shown on the NSW ***Biodiversity Values Map*** (BV Map) as shown on **Figure 7.7** below. No threatened fauna species records have been registered at or in close proximity to the site (refer **Figure 7.8**). Whilst the project site and surrounding area is located in a region falling under a *Koala Plan of Management (KPOM)*, the project site is under 1ha and extensively cleared with little native trees which is not proposed to be cleared as noted above and does not trigger further assessment (refer **Section 5.2** for further detailed discussion).

Potential risks to biodiversity, flora and fauna has been considered by the Environmental Risk Assessment (ERA) undertaken for the project. Associated risks and controls/mitigation measures are detailed in **Appendix 5**. The primary activity associated with potential risk to flora and fauna identified was targeted clearing as apart of minor site preparation and construction activities. With the identified controls in place, the maximum reasonable consequence of the project activities is expected to be **low** risk (Risk Score = 5). Accordingly, no significant impact is expected for this aspect.

Figure 7.6: NSW Native Vegetation Regulatory Map (as at 1 October 2021) *Note: Orange = Regulated Land.*

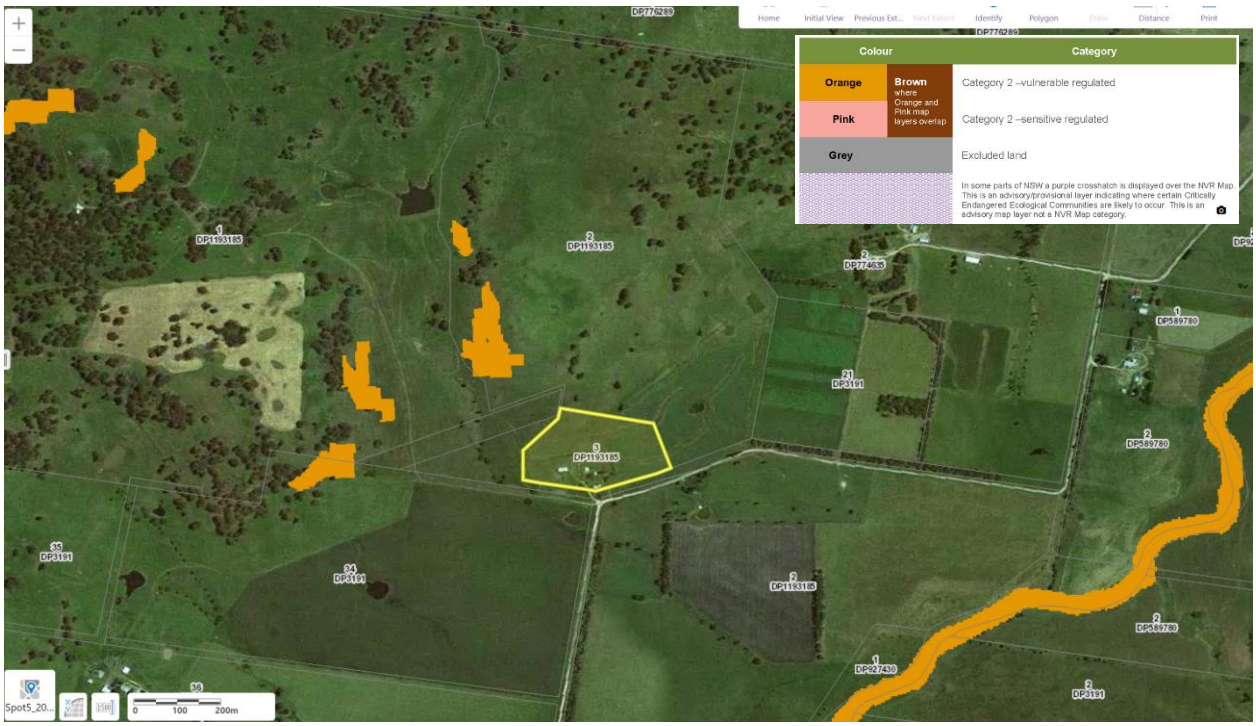


Figure 7.7: NSW Biodiversity Values Map (BV Map) *Note: minor cadastral misalignment in Lot 3 as detailed in Section 3 (but immaterial to BV result)*.

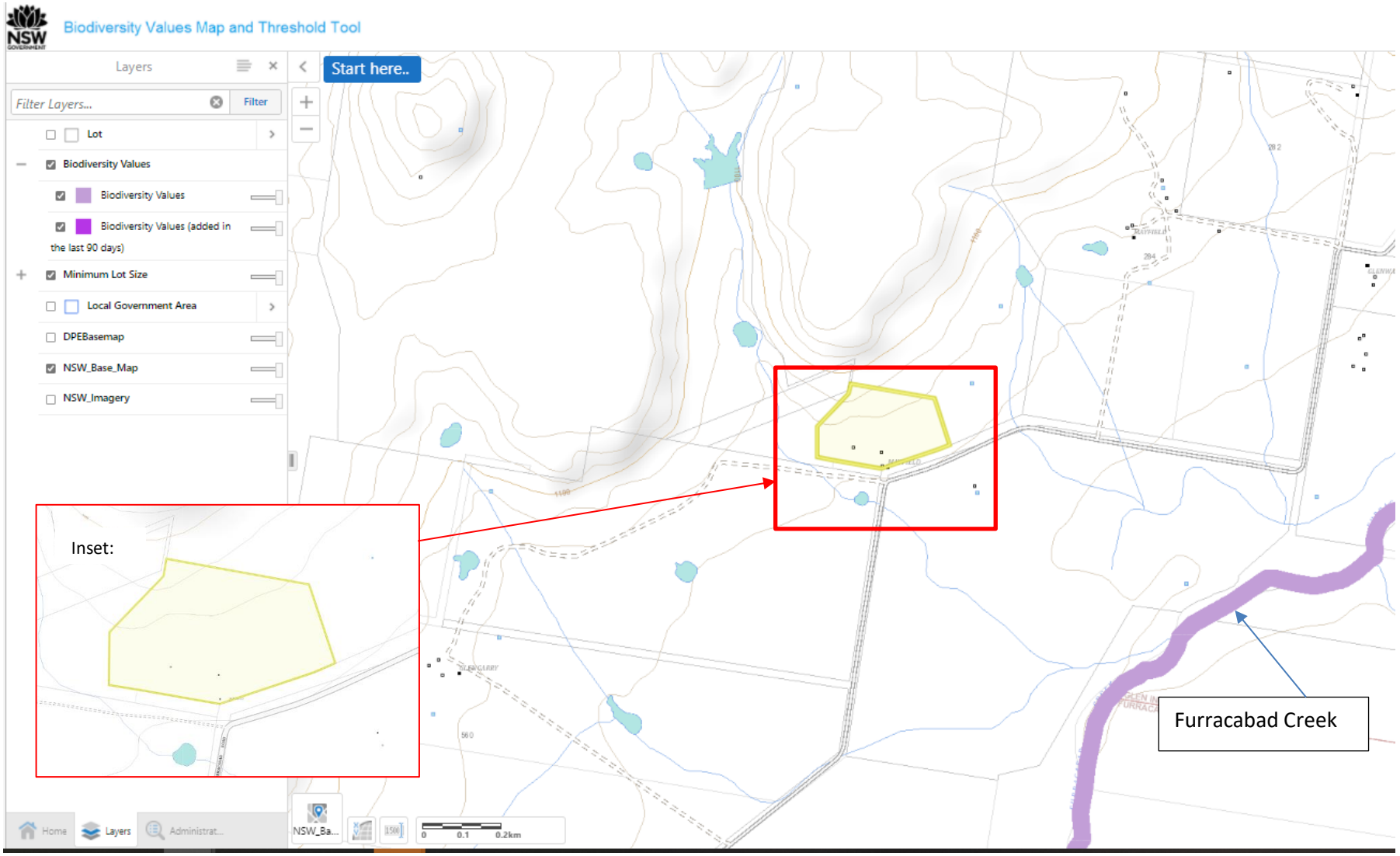
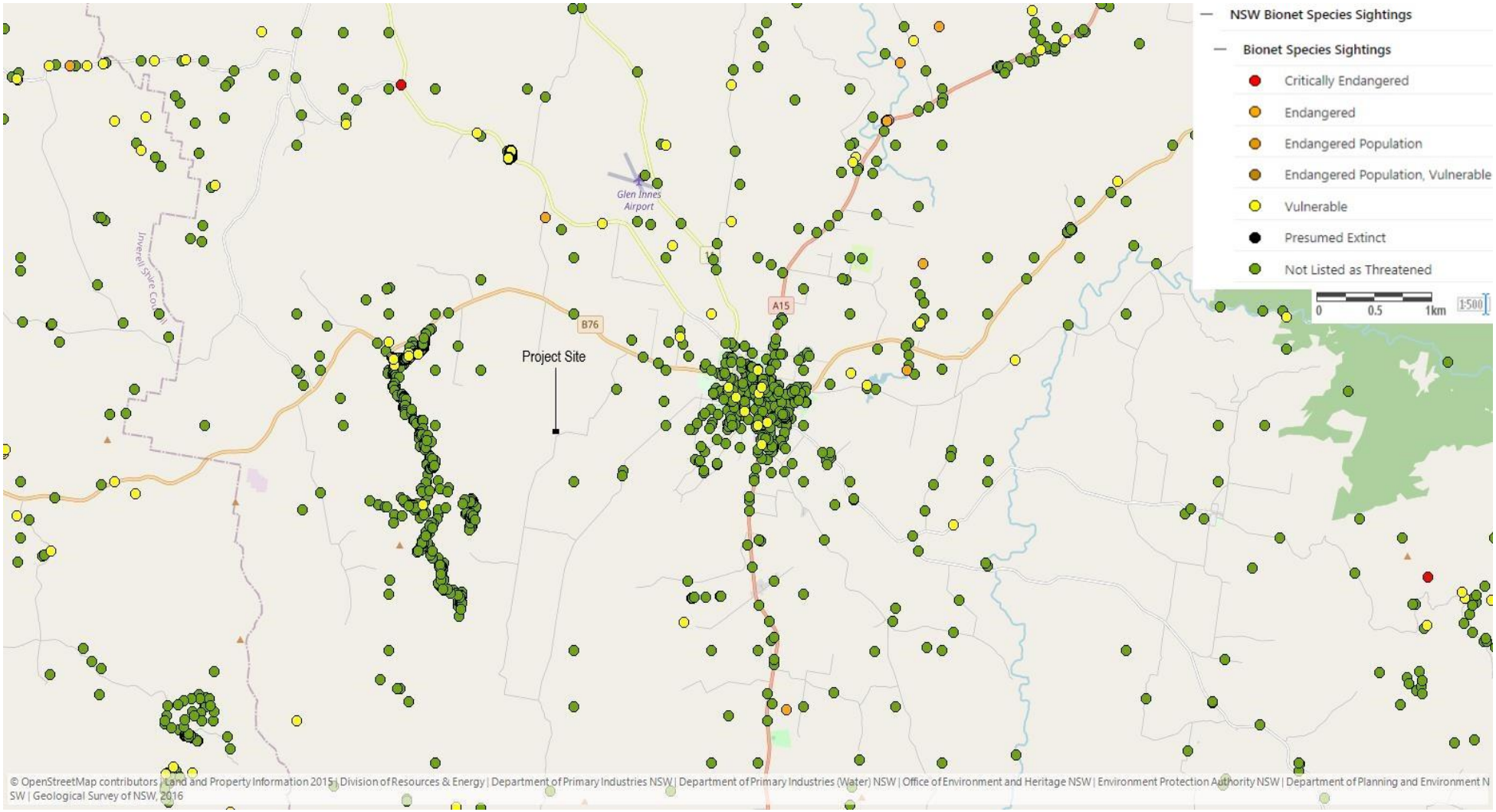


Figure 7.8: Threatened Species records data (fauna) (Source: NSW DPIE SEED Portal, Nov 2021)



7.5.2 Biosecurity

Biosecurity for relevant aspects of the proposed R&D trials have been prudently considered and risk assessed for the R&D project. Biosecurity aspects are potentially associated primarily with **transfer/delivery/storage and processing** of certain feedstocks. In particular, **municipal biosolids** and various relevant types of **vegetative biomass** for campaign-based trials of each feedstock (e.g. Invasive Native Scrub (INS), source separate greenwaste etc as detailed in **Section 4.6**). Accordingly, control and mitigation measures to manage potential biosecurity risk aspects have been considered in the Environmental Risk Assessment (ERA). The Risk Register appended to the ERA includes a detailed list of controls identified for the project (refer **Appendix 5**).

Proposed feedstocks are detailed in **Section 4.6**. **Identified biosecurity controls are presented in Table 7.7 further below**. It is also noted that:

- All R&D feedstocks will be sourced only from within NSW (no interstate movement of waste) with a signed *Statement of Origin* supplied to SEATA providing full Chain of Custody and QA/QC details.
- All feedstocks for staged campaign-based R&D testing will be regulated and controlled under specific requirements of staged ***RRO & Exemption*** approvals from NSW EPA and ***Biosecurity Permit*** where relevant from NSW Department of Primary Industries (refer *NSW Biosecurity Act* in **Section 5.2.3**).
- All feedstocks (including INS and biosolids) will be thermally treated through the RDSM as soon as practicable during each feedstock testing campaign.
- The LLS Regional Weeds Officer will be notified of relevant vegetation species where practicable for each campaign trial ahead of commencement (as provided in **Appendix 14** for INS).
- Municipal biosolids proposed for the project will only be those already treated and stabilised for pathogens and classified suitable for direct land application in NSW in accordance with EPA biosolids guidelines (refer **Section 4.6**) and is currently commonly transported long distance to agricultural and mine rehabilitation applications.

For the first proposed feedstock trials (*Invasive Native Scrub (INS) native biomaterial)*, the initial related approvals are sought in parallel with Development Consent & EPL to enable testing operations to commence as soon as practicable, acknowledging additional supplementary information is likely to be required and will be provided to NSW EPA and NSW DPI accordingly (this SEE is focused on providing information suitable for permissibility at planning-level to approve development consent). There are approximately 40 native invasive species in NSW, of which ~32 are listed in the Central West and Western catchments in NSW where initial INS feedstocks are proposed to be sourced from (Cobar and Dubbo areas primarily). Approval is sought to be able to process any/all of these species, with final actual species tested identified and recorded during each feedstock campaign (and notified to the LLS Regional Weeds Office as noted above). **Appendix 14** provides further supporting information for INS, including ***species lists***.

With the identified controls in place the risk is expected to be **minor** (risk rating = 8). No significant impact is expected for this aspect. Feedstock management (including aspects relevant to biosecurity) is also discussed in **Section 4.6**.

Table 7.7: Biosecurity Controls identified through Environmental Risk Assessment and consultation

Aspect	Biosecurity Controls
	Source Control & Regulatory Permitting
Source Control & Regulatory Permitting	• INS pre-processed at source/supplier minimises seed transfer at source (vegetation cleared, raked, windrowed, collected, chipped, sized, before loading)
	• SEATA will liaise with suppliers transporting INS to be undertaken with appropriate biosecurity measures/vehicle hygiene. These may include (but not be limited to): ○ prior to loading and movement vehicles free of soil and vegetative matter as reasonably practicable (this will include use of compressed air cleaning). ***"Leave Clean, Arrive Clean"*** **principles adopted.** ○ vehicle inspection before/after loading, ○ Suitably covered/contained loads to help prevent seeds and other live plant material escape.
	• Signed Statement of Origin required from all feedstock suppliers will include Chain of Custody for full supply chain and biosecurity measures undertaken.
	• NSW-based feedstocks only, no transfer from interstate.
	• Biosecurity Permit requirements (NSW Biosecurity Act 2015) confirmed/obtained for relevant vegetation-based and biosolids feedstock ahead of each campaign trial (secondary approval, as also are RRO & Exemptions from EPA).
	• Consultation with NSW DPI, LLS (Northern Tablelands), and New England Weeds Authority during development and project operations, including development of ***site Biosecurity Procedures.***
	• Notify LLS Regional Weeds Coordinator and New England Weed Authority Bisoecurity Officer of relevant vegetation species being delivered to site where practicable for each feedstock campaign prior to commencement.
	• Biosolids provided by suppliers in accordance with NSW EPA biosolids guidelines (and any project-specific conditions of an RRO & Exemption sought from EPA for the project).
	• Biosolids (Unrestricted or Restricted Use 1 and 2 class biosolids suitable for direct application to land, which have pathogen Stabilisation grades A or B).
	• Adherence to conditions of approval (including EPA RRO & Exemption & Biosecurity Permit requirements as applicable)
	• All works to be undertaken in accordance with ***site Biosecurity Control Procedures*** to document and manage all control measures, monitoring and record keeping measures described herein.
	Onsite Controls (Delivery, Storage & Processing / Cleaning / Training & Awareness)
Onsite Controls (Delivery, Receipt, & Storage)	• **Vehicle hygiene** All feedstock suppliers requested to have delivery vehicles contact and use the Glen Innes Truckwash on arriving in Glen Innes and prior to arriving at site for feedstock delivery. (National Truckwash System code=TGLT)
	• Delivery vehicles inspected on arrival, if seeds observed on tyres control measures to be followed as per Biosecurity Control Procedures (including air cleaning via compressor/blower).
	• Delivery records maintained onsite (e.g. Visitor Register signed by delivery driver (records of date/time/Rego # or company/purpose))
	• Feedstocks inspected on receipt, and stored separately and under cover (particularly INS). If high flowering/seeding observed even more focus with cover/isolation/transfer before RDSM treatment and supplier notified to address next load at source where practicable.
	• Proposed storage sheds 2 and 3 are full enclosable (e.g. in very windy conditions)
	• Dedicated storage areas (including for INS & biosolids), covered to minimise incursion by wind.
	• Consistent storage areas used wherever practicable, appropriately separated from other materials.

Aspect	Biosecurity Controls
	• Consistent onsite delivery system/methods as far as reasonably practicable (reduced risk of variation)
	• Biosolids received as stabilised dewatered 'filter cake' only for storage (no liquid sludges, typical max 70-80% moisture).
Onsite Controls (Processing)	• RDSM trials undertaken as soon as practicable to minimise storage period.
	• Campaign based R&D testing program - staged for each feedstock provides control of what is onsite/when, requiring staged RRO & Exemption approvals / Biosecurity Permits as applicable. Three year project approval.
	• INS and biosolids feedstocks thermally treated to destroy seeds/pathogens via the RDSM
	• SEATA equipment used to transfer INS to RDSM/daily stockpile area (e.g. tractor bucket, tyres etc) inspected and cleaned, particularly before/after INS and biosolids feedstock campaigns. Cleaned within Active Testing Area (controlled runoff area).
	• Project site is 5th generation cleared/disturbed farmland with no significant remnant native vegetation. Surrounding APZ grasses maintained to <100mm.
	• Unsealed active testing area maintained around RDSM (no vegetation or soil for seeds to establish on). Surrounding farm grassed areas within APZ slashed routinely to <100mm per RFS guidelines (see bushfire above).
Onsite Controls (Cleaning, Training & Awareness)	• Appropriately inducted and aware staff (including handling & OH&S requirements etc). Where possible coordinated with input from Regional Weeds Coordinator.
	• Cleanout (eg sweeping) of INS storage areas to ensure collected INS and biosolids residue material is separated and destroyed (RDSM thermal treatment). Material not to be composted or used as mulch onsite etc.
	• Inspection and cleaning of equipment used to transfer INS to RDSM/daily stockpile area (e.g. tractor bucket, tyres etc), particularly before/after INS and biosolids feedstock campaigns. Cleaned within Active Testing Area (controlled runoff area).
	• Runoff from the active testing area all reports to a central sump area which will be inspected and managed if/as required.
	• Appropriate PPE during weed control as relevant/applicable (e.g. herbicide use)
Monitoring Inspection & Response Measures	
Monitoring Inspection & Response Measures	• Routine inspections by Site Manager/EMR or nominated representative to monitor higher risk areas: areas surrounding bulk and daily stockpile storage of INS, all weather access and pad areas/bare ground, sump collection from Active Testing Area, stormwater discharge areas from ESC runoff (including downslope of Active Testing Area). Inspections particularly prior to commencement of each relevant vegetation feedstock campaign trial.
	• Prompt control measures if INS weed propagule observed (including control/removal before plant goes to seed wherever possible). If herbicide control measure undertaken, avoid application near drainage areas and during plant dormancy periods where practicable (other measures required) and do so in accordance with regulatory requirements and manufacturers recommendations. Record significant application of Herbicides/Pesticides (date, chemical used, location, volume, any repeat application etc).
	• LLS Regional Weeds Coordinator and New England Tableland Biosecurity Officer (or their representative) invited for periodic inspections & biosecurity recommendations.
	• Prompt control measures if INS weed propagule observed (including control/removal before plant goes to seed wherever possible). If herbicide control measure undertaken, avoid application near drainage areas and during plant dormancy periods where practicable (other measures required) and do so in accordance with regulatory requirements and manufacturers recommendations. Record significant application of Herbicides/Pesticides (date, chemical used, location, volume, any repeat application etc).

7.5.3 Heritage, Social and Economic

7.5.3.1 Heritage (Indigenous and Non-Indigenous/Historic)

Aboriginal & Cultural Heritage

As the project involves surface disturbance, consideration for the potential for an Aboriginal object to be located on the project site or harmed has considered the *Due Diligence Code of Practice for the Protection of Aboriginal Objects in NSW* ('Due Diligence Code', refer Section 5.2.4). A risk-based approach considering the process of the code was undertaken as summarised below, including as part of the Environmental Risk Assessment for the project (identified controls are presented in the Risk Register of the ERA in **Appendix 5**).

- Proposed project activities with potential to disturb the ground were identified and considered for the project as detailed throughout this SEE and the supporting ERA.
- A search of the NSW *Aboriginal Heritage Cultural Management System (**AHIMS**)* database on 12 January 2021 indicated that there are **no Aboriginal or cultural heritage sites recorded or declared on the property or within a 1,000m buffer**.
- **Sensitive landscape features** for the presence of Aboriginal objects were considered as per the Due Diligence Code. **The site is not located on or in near proximity to:**
    - a ridge top or headland, in proximity to a cliff face, cave or rock shelter, sand dune systems, or within 200m of a wetland, swamp, lagoon, tidal waters, waterholes, rivers, lakes, or streams. Furracabad Creek (>3rd order) is located >800m south of the site, with only an ephemeral upper drainage line (2nd order tributary) located approximately 50m downstream near the site, with no formed/recognised watercourses or drainage lines on the project site itself).
- **The project site and its soils have been extensively disturbed through previous agricultural practices** (5th generation farm).
- The process has considered if any information is available from previous investigations, reports, management plans, assessments or surveys specifically relating to the project site and Aboriginal and cultural heritage (none known).
- **Proposed ground disturbance has been minimised to that required for project**. The majority of surface disturbance is associated with relatively shallow topsoil strip (<200mm).
- Notwithstanding the above, prudent measures to proceed with care and caution as per the Due Diligence Code have also been considered. Site inductions and environmental awareness will include context to Aboriginal and Cultural heritage. Whilst not expected, should an Aboriginal object be uncovered during the project, works would immediately cease and appropriate notifications undertaken with regulators and relevant Aboriginal stakeholders.

Accordingly, it is considered reasonable to conclude that there are no known Aboriginal objects or a low probability of objects occurring in the area of the proposed project site. The potential risk of the project to impact Aboriginal and cultural heritage is considered low. In accordance with the process of the Due Diligence Code the project can continue (with care and caution) without requirement for further assessment or an *Aboriginal Heritage Impact Permit (AHIP)*. Accordingly, the project is not considered to require further reporting/assessment or approvals under the NPWS Act.

Historic Heritage

The site is not listed on heritage registers at local (GISC), state or federal level. The site is not identified as a *Heritage Conservation Area* on the GISC *LEP Heritage Map*. There are no existing significant structures of on the project site older than 1990, aside from footings of the former farmhouse which burned down c2013.

Potential risks to both Heritage (Indigenous and Non-Indigenous/Historic) have also been considered by the project Environmental Risk Assessment (ERA). Associated risks and controls/mitigation measures are detailed **(Appendix 5)**. The primary activities associated with potential risk to heritage identified were associated with site preparation works (surface disturbance) and general project operation (including site preparation and campaign-based operation). With the identified controls in place, the maximum reasonable consequence of the project activities is expected to be of **low** risk (Risk Score = 3 – 5).

Further assessment is not considered required nor proposed due to the low potential for indigenous or historical archaeological remains to be present. Accordingly, no significant impact is expected for this aspect.

7.5.3.2 Human Health and Related WHS Aspects

Consideration of human health aspects for a thermal treatment technology such as SEATA's are primarily associated with:

a) Design, control and management to minimise **emissions** from the project, particularly for **air quality** (both for onsite works and surrounding sensitive receptors beyond the site), as detailed in Section 7.4.1), and

b) Design, control and management of the ***production, storage and handling of biochar*** (primarily to minimise *personnel* risk to localised inhalable dust and fine particulate).

c) The small scale, nature, location and duration of the proposed R&D project.

These aspects have been considered by the project Environmental Risk Assessment (refer **Appendix 5** for details). In regards to public safety, the site is fully fenced with lockable gate access and safety warning signage. Production of biochar via conventional thermal treatment in known to potentially contain dust/fine particulates (PM_{10}, $PM_{2.5}$) which can cause respiratory irritations. A HAZOPs assessment was undertaken for the technology for safe operation which considered operator safety. Significant design controls to avoid or minimise particulates and other key pollutants of concern in air quality emissions are a key benefit of the technology as detailed in **Section 2** and **Section 7.4.1.** In regards to site access and public safety, the site is fully fenced with locked gate access and safety warning signage, and during active operations (campaign based testing) is continuously attended.

With the significant technology design and operational controls/mitigation measures in place, including those detailed in the Environmental Risk Assessment (**Appendix 5**), the risk is deemed **low** (Risk Score = 5). Accordingly, no significant impact to human health (including onsite workers) is expected and a detailed human health risk assessment was not required for this R&D project. Notwithstanding this, the data generated through R&D trials will provide information that would be required for detailed human health risk assessment for implementation of the technology at commercial scale for long term projects. Context to human health considerations will also be further reviewed by the proposed air quality assessment discussed in Sections 7.4.1 and 7.4.6.

7.5.3.3 Community, Social & Economic Aspects

Community, social and economic aspects are an integral part of the development assessment process. The proposed establishment of the SEATA R&D Centre on the site is anticipated to have an ongoing positive social and economic benefit to the Glen Innes area and the broader community, and if demonstrated successful, the technology has significant potential for much broader benefits (particularly for regional areas). If employed at scale the technology has even broader potential for significant to address some of the most pressing socio-economic problems faced by the world (climate change, genuine transition to circular economy and reduced single use of many resources, and in future, plastics among many others), all in an economically, safe and environmentally friendly manner. Successful demonstration of the technology through the proposed R&D project would improve intergenerational equity through its beneficial contribution to Australia's climate change and greenhouse gas minimisation efforts, specifically:

- Demonstrated capacity to **reduce** greenhouse gas **emissions** (at scale) required to meet Australia's and potentially international climate commitments;
- Demonstrated capacity to **remove and sequester existing carbon in the atmosphere** for beneficial reuse through scalable production of biochar;
- Assist in the transition towards **cleaner renewable energy**, including economic production of **(potentially carbon-*negative*) hydrogen**.

The proposed R&D testing and characterisation of SEATA's pilot RDSM system at Glen Innes NSW has the potential to provide a step-change in environmentally-friendly thermal treatment systems compared to conventional incineration, gasification and pyrolysis technologies. Successful R&D to demonstrate the production of biochar for economically scalable commercial and industrial applications in the near future, would contribute toward the world's critical goal of Net Zero by 2050 and reducing global warming by 1.5 degrees by 2100. Successful demonstration has potential social benefits (green rural jobs), environmental benefits (climate, soils, circular economy among many others) and economic benefits (*profitable* regenerative drawdown and various valuable gas and solid commodities) at regional, state, and potentially much larger scale, all using currently wasted resources or sustainably sourced materials.

Community, social and public safety aspects have also been considered regarding general project activities (including site preparation, construction and campaign-based operation). Existing controls/mitigation measures have been considered by the Environmental Risk Assessment (**Appendix 5)**. With the described controls in place, the consequence of the project activity is expected to be of **low** risk (Risk Score = 5).

Accordingly, no significant negative impact is expected for this aspect. Indeed, if proven successful by the project, there is potentially significant community and social *benefits* of the technology.

7.5.4 Fire/Bushfire

The project site is not located on land mapped on the NSW Planning Portal (required reference by GISC) as Bushfire Prone Land (BFPL) as at 1 October 2021. Notwithstanding this, the potential for onsite fire and offsite bushfire approach has conservatively been considered. Further, the *NSW Fire Safety Guidelines* (Fire and Rescue NSW, 2020) and the Victorian *Guidelines for the Management and Storage of Combustible Recyclable and Waste Materials* (EPA Victoria, 2021) have been considered where practicable in regards to best practice management of stockpiled flammable materials. SEATA will endeavour to store materials at the *lowest practicable quantities* required for proposed R&D testing.

The potential for fire originating off site to encroach on the development, if not adequately controlled was considered in the Environmental Risk Assessment. With the identified control and mitigation measures in place (refer **Appendix 5**), for a maximum reasonable consequence to occur the project activity was categorised as having **moderate** risk (Risk Score = 9). Onsite activities with potential for ignition/fire include the storage and use of flammable chemicals, fuels (including diesel) and product biochar with potential for ignition, and associated RDSM thermal treatment (full HAZOPs assessment including safe hot working area review undertaken). With the identified control measures in place, the ERA considered the risk from storage and use of flammable chemicals and fuels to be **low** (Risk Score = 5). Additionally, the risk from fire originating from onsite operational activities (e.g. RDSM thermal treatment) if not adequately controlled, has been deemed by the ERA as **moderate** risk (Risk Score = 9), with the existing controls and mitigation measures in place (including full HAZOPS and hazardous/hotwork area review completed). Recommended additional controls were also identified and will be undertaken (refer **Appendix 5**).

The following text considers the establishment of an APZ and the application of grassland deeming provisions, where practicable. For Sheds 1, 3 and 4 an APZ of 50m extending into other parts of Lot 3 (entirely owned by SEATA director John Winter, who is also a member of the Glen Innes RFS brigade) can also be maintained if required. APZ of 50m require no further assessment under the PBP Guidelines. West Furracabad Road forms a fire break immediately south of the project site, with the nearest potential external bushfire approach from private property on the other side of the road (refer Site Plan). Additionally, unsealed aggregate (all weather access/workpad) surrounds the northern sides of Sheds 1, 3 and 4, and the unsealed all weather access loop also reduces the risk of these assets being impacted by external bushfire threat, damage to the building asset from intense radiant heat, and ember attack. Additionally, the predominant vegetation at the project site and surrounds is grassland. Grassland deeming provisions have been considered where practicable and outlined in **Table 7.** below. Additionally, controls and mitigation measures related to bushfire and external threats have been identified in the Environmental Risk Assessment (**Appendix 5**).

Table 7.8: Grassland Deeming Provisions from the Planning for Bushfire Protection Guidelines - 2019

Bushfire Protection Measure	Grassland Deeming Provisions	How is this Achieved?
Asset Protection Zone (APZ)	• Limited to a maximum of 15 degrees downslope	• Site is << 15 degrees. • Site is relatively gentle, generally north to south (slopes typically 1-2%, ~4% on average). Upslope catchment grades gradually become steeper (see Site Plan).
	• Minimum APZ of 20m is provided between the building and the hazard;	• An APZ >20 has been provided between the sheds and external hazard (noting context to Shed 2 and West Furracabad Rd to the south as noted earlier above).
	• The APZ is wholly within the boundaries of the development site;	• APZ for all sheds is within the project site excluding Shed 2, although >20m is provided to the nearest hazard (being some 30_m to private rural property on the south side of West Furracabad Road). See above.

Bushfire Protection Measure	Grassland Deeming Provisions	How is this Achieved?
	• The APZ is maintained as a mown area with grass heights less than 100mm.	• **SEATA** has committed to maintaining a grass height below 100mm (e.g slashed or grazed), as identified in Table (iii) Statement of Commitments.
Construction	• Construction in accordance with BAL-12.5 of A 3959 and **Section 7.5** of PBP - 2019	• Sarking in existing Shed 1 is consistent with these standards (non-combustible). • Sarking for proposed sheds 2,3 and 4 will be consistent with these standards (non-combustible). • Materials used to construct existing and proposed Sheds 1-3 are outlined in **Appendix 6.** • Any new fencing (within 6m of the project site) will be made from combustible material • In regards to operations, an enclosed afterburner will be used for gases from the RDSM.
Access	• Comply with the property access provisions in **Table 5.3b** (PBP - 2019)	• Existing all weather access historically provides regular farm access for B-double deliveries (40t). Proposed all weather access for the project will provide for fully loaded firefighting vehicles (up to 23 tonnes). • Property can be fully accessible to RFS 24/7.
Water Supply	• Comply with the water supply provisions **in Table 7.4a** (PBP - 2019)	• Metal fencing (e.g. 'Colourbond' or similar) around the dedicated rainwater tank (polytank) to assist protection from fire approach as recommended by RFS during consultation. • Installation of **RFS coupling** to existing and proposed tanks as recommended by RFS during consultation. Proposed additional (surplus) supply via another 22.5kL polytank associated with proposed Shed 2 and 3.
Landscaping	• Comply with the relevant Standards for APZs in **Appendix 4** of the PBP - 2019, noting that other vegetation bush fire hazards cannot be present if these provisions are to apply.	• An APZ >20m is intended to be maintained between assets wherever practicable, as described above.

7.5.5 Access, Traffic and Transport

Existing Environment and Context to Proposed Project:

Detailed related discussion is also provided in **Section 4.10** (refer for details).

Existing traffic conditions on West Furracabad Road are associated with the surrounding agricultural community and practices undertaken in the local area, dominated by grazing and fodder production as noted in Section 3. This also includes one of the region's larger cattle stations located several kilometres south of the project site off West Furracabad Road. Heavy vehicle use is primarily associated with trucks servicing farms (particularly cattle/hay trucks) which regularly use the road, and other vehicles such as the daily school bus. Light vehicle use is primarily associated with rural residences and farm support in the surrounding area.

Plate 7.5.1: Heavy Vehicle carrying cattle on West Furracabad Road (April 2021)

West Furracabad Road is currently unsealed and recently progressively sealing has begun by GISC following allocation of government funding. The first 2.5km has already been sealed from the highway intersection, with the rest expected to follow once drainage rectification works are undertaken. Subsequently, the road to the SEATA R&D Centre is expected to be progressively (and ultimately completely) sealed during the project period. This will have positive change effects to current road conditions and dust generation.

The access into the project site within the public road verge into the site is currently successfully used by heavy vehicle deliveries to the farm and given the commitment below to maintain typically fortnightly deliveries no works/changes are considered required or proposed for the project (only internal works).

Project Use, Proposed Management and Mitigation:

As an R&D project (not-long term commercial project), the project has been designed such that heavy vehicle deliveries will remain generally consistent with existing practices, typically requiring 1-2 deliveries per

fortnight (not daily deliveries as would be required for commercial operation). Onsite storage has been considered accordingly to achieve this.

The proposed project activities (including minor site preparation and campaign-based RDSM operation) have been considered and associated risks, existing and proposed controls/mitigation measures have been detailed in the project Environmental Risk Assessment **(**refer **Appendix 5** for details**)**. With these design and management measures in place the project was considered as **low** risk (Risk Score = 5). Accordingly, no significant adverse impact is expected for this aspect.

7.5.6 Other Infrastructure & Services (Non-Project Built Environment)

Existing services and infrastructure on the project site are identified in detail in **Section 3,** identified by services checks (Dial Before You Dig – refer **Appendix 12**) and five generations of family site knowledge by the owner, John Winter. These include a Telstra buried copper phone line near the southern boundary of the project site, and a low voltage overhead powerline owned by Essential Energy that traverses across centre of the site from NE to SW as shown on the **Site Plan**.

Project activities including site preparation, construction and campaign-based operations have been considered in regards to Infrastructure/Services by the project Environmental Risk Assessment, and through feedback from detailed stakeholder consultation undertaken with Essential Energy for the low voltage overhead powerline in particular.

Telstra Buried Copper Phone Line:

No significant soil disturbance is proposed in the vicinity of the buried Telstra phone line (see related comments in **Section 3.6**. Accordingly, there is no expected impact to the phone line. Whilst not expected to be necessary, should any unplanned earthworks arise in future in close proximity to the phone line conservative control measures have prudently been considered in the project ERA to protect the asset.

Essential Energy Low Voltage Overhead Powerline:

Under the NSW Electricity Supply Act, Essential Energy requires consultation and their consent for substantial structures to be erected in proximity to overhead powerlines. Following consultation with Essential Energy (including detailed technical assessment for original proposed layouts), the proposed site layout was re-configured to ensure that **all proposed structures have been located outside the 10m setback requirement each side of the powerline**, as illustrated on the project **Site Plan**. Proposed plantings for screenings/landscaping have also been setback >15m from the powerline as per stakeholder design requirements. Accordingly, the site layout submitted is expected to be permissible when referred by GISC to Essential Energy for assessment and approval.

Associated risks and existing controls/mitigation are further detailed in the Environmental Risk Assessment (**Appendix 5**). It is expected that with controls/mitigation measures in place that the project activity is expected to be of **low** risk (Risk Score = 5). Accordingly, no significant impact is expected for this aspect.

7.5.7 Hazardous Materials

The storage, handling and use of flammable and potentially hazardous materials for the project are detailed in **Table 7.** below which has informed *Preliminary Hazard Assessment (PHA)* requirements undertaken for the project (refer Section 5 for discussion on SEPP33 requirements). These aspects have been considered in the project Environmental Risk Assessment, with identified risks aspects and existing controls/mitigation measures detailed in the risk register for the ERA (refer **Appendix 5**).

Table 7. indicates that proposed materials stored onsite are below the minimum quantities for PHA screening. The only potential exception is for biochar product in context of generic biochar potential for spontaneous combustion, however noting SEATA biochar is produced differently (as detailed in **Section 2**) and substantially controlled following production such that residual risk is not considered sufficient to warrant further hazard assessment. Biochar produced by SEATA technology is designed and expected to contain low volatile organic content, and is stored in steel drums sealed with inert gas (nitrogen or argon) to avoid oxidation. It is left to cool (for at least four days) before being considered for transfer into sealed bulk storage bags (e.g. duffle topped bulka bags or similar) in which the char is moistened with water, additionally controlling dust impacts. Biochar is not stored in large stockpiles and not for extended periods. It is also noted that large stockpiles of coal are permissible and widely undertaken in NSW which contain far more elevated levels of organic volatiles than biochar. Accordingly, in addition to the findings of the ERA and the extensive experience of the project team lead John Winter, no significant risk is considered applicable to this aspect of the project.

The management of the spent containers in which these key materials are stored in are addressed in the project *Waste Management Plan (WMP)* (refer **Appendix 16**).

Table 7.9: ***Preliminary Screening for the Typical Types and Quantity of Materials Stored (including flammable and potential hazardous materials)***

Materials Stored	Quantity (maximum onsite at any one time)	Storage	Purpose	Class (ADG)	Threshold Quantities[1]	Above Threshold Quantities
GASES						
LPG	8 x 45kg Cylinders (360kg)	Above ground, supported in pallet frame, located outside 6m from plant on down-hill side to comply with zone 2 conditions.	Start-up of plant	2.1 (LPG above ground)	10 tonne or 16m³ (as per Table 3)	No
Nitrogen	15 x G size - 7.2 Nm³ - pressurised cylinders (108 Nm³)	Cylinders supplied in a pallet frame, manifolded together	Inert purging / shut-down of plant	2.2	Excluded from risk screening	n/a
Industrial (pressurised) gas	Miscellaneous, various size (≤100kg pressurised or liquified)	compressed gas cylinders on pallet(s) stored in outside	Welding / Instrument calibrations	2.1 (Flammable)	100kg pressurised (refer Figure 6 if greater) 500kg liquefied (refer Figure 7 if greater)	No
				2.3 (Toxic)	100kg[2]	No
Product (RDSM Output)	Syngas (n/a)	None *(see purpose column)*	(after burnt and discharged to atmosphere or compressed and used as feedstock to other processing steps)	2.1	100kg pressurised (refer Figure 6 if greater) 500kg liquefied (refer Figure 7 if greater)	n/a
LIQUIDS						
Diesel	~ 2000 L	2 x 1000 L Diesel Storage Tanks (double walled / self-bunded).	Fuel supply to 3-phase generator, air blower and air compressor	3PGIII	5 tonne	No
Sodium Hydroxide (50% solution)	2 tonnes	IBC/HDPE drums	RDSM Wet Scrubber - air emissions control (reagents)	8PGII	25 tonne	No
Hydrogen Peroxide	1 tonne	205L PP Drums	RDSM Wet Scrubber - air emissions control (reagents)	5.1	5 tonnes	No
Phosphoric Acid	1 tonne	205L PP Drums	Biochar post-treatments (activation)	8PGIII	50 tonnes	No
DGA (diglycolamine)	~ 8 tonnes	205L PP Drums	Stored for potential testing/use in Syngas Treatment (amine absorption of CO_2 / H_2S)	8PGIII	50 tonnes	No
SOLIDS						
Source separated uncontaminated biomass (staged feed per Section 4.6)[2,3] • *First feedstock: Invasive Native Scrub – INS native biomaterial*	<100 tonnes	Bulk deliveries into covered storage. E.g. Shed 2. Stored as per conditions of RRO & Exemption sought from EPA. INS tarp-covered even when in shed (wind protection).	Targeted Initial Feedstocks[3] (RDSM Inputs) for R&D Trials. Staged trialling, INS first.	n/a	n/a	n/a
Biosolids (municipal biosolids Unrestricted and Restricted Class 1 and 2)	<100 tonnes	As above, stored separately to other feedstock stockpiles		n/a	n/a	n/a
Coal (sub-bituminous)	<100 tonnes	As above, stored separately to other feedstock stockpiles		n/a	n/a	n/a
Biochar Product (RDSM Output)	<40 tonnes	205L Steel Drums (inert gas seal) for min 4 days, then transferred to 1 t Bulk Bags until transported off site.	RDSM Outputs from R&D trials.	4.2 (substance liable to spontaneous combustion)[4]	1 tonne[4]	Yes, but controlled[4]
Hydrated Lime (dry powder)	1 tonne (pallet)	25kg bags	RDSM Wet Scrubber - air emissions control (reagents)	n/a	n/a	n/a
Magnesium Oxide (dry powder)	1 tonne (pallet)	25kg bags	RDSM Wet Scrubber - air emissions control (reagents)	n/a	n/a	n/a
Urea (prilled granules)	1 tonne (pallet)	25kg bags	RDSM Wet Scrubber - air emissions control (reagents)	n/a	n/a	n/a
Ilmenite	~10 tonnes	205L Steel Drums or bulk bags on pallets	RDSM Catalyst	n/a	n/a	n/a
Zeolite	~2 tonnes	1t Bulka bags	RDSM Catalyst	n/a	n/a	n/a

[1] *Hazardous materials to remain within permissible quantities under the ADG - may vary if required.*

[2] The threshold quantity for ADG Class 2.3 (Toxic) is 100kg, unless:

- anhydrous ammonia (5 tonne)
- Chlorine and sulfur dioxide, stored as liquefier gas in containers <100kg (1 tonne)
- Chlorine and sulfur dioxide, stored as liquefier gas in containers >100kg (2.5 tonne)

[3] Other feedstocks as per SEE Section 4.6 to be considered via staged approval. Due to staged approval and campaign based testing it is unlikely that all above listed feedstocks (biomass, biosolids and coal) would be stored onsite at the same time at the maximum quantities listed. INS potentially followed by plantation forestry residues and sawmill waste including bushfire hazard reduction biomaterial material).

[3] Wood chips are referred to as *"fire risk substances"* in the ADG, which have transport restrictions (i.e. cannot be transported with explosives or some Class 5 materials) – but not listed as a Dangerous Good in its own right.

[4] Charcoals, AC and some biochars typically fall under ADG Code classification Division 4.2 *"Substances liable to spontaneous combustion Substances which are liable to spontaneous heating under normal conditions encountered in transport, or to heating up in contact with air, and being then liable to catch fire"*. It is noted that spon com potential for biochar is mainly due to either a) not sufficiently cooled after production, or (b) high VOC content. SEATA biochar is sand cooled and then allowed to cool min 4 days in a sealed drum (inert gas seal), and low volatile content due to process design to be confirmed by testing. Refer Environmental Risk Assessment for further details.

7.5.8 Post Project Considerations / Decommissioning

The Project site is owned by SEATA Director John Winter, who has had direct input into the site layout design so that it could be suitable for him post-operations if required. This has been reflected in the Owner's Consent provided in **Appendix 3**.

In accordance with preliminary discussions with Council and EPA, SEATA is committed to successful demonstration of the technology through an initial trial period of three (3) years. Following completion of the trial the results will be reviewed and a range of options considered in consultation with Council and EPA. Such options could include:

- If the trial is successful, potentially extending the approval period and/or any relevant components as appropriate
- Relocation of the RDSM and relevant trial equipment
- Decommissioning of relevant components of the trial site not required post-trial by the land-owner. As noted in the land-owners consent in **Appendix 3**, usable infrastructure and equipment are expected to be retained where practicable, including (but not necessarily limited to) sheds, tanks, all weather access areas, amenities etc. Remaining non-usable aspects not required by the land-owner would be relocated from the project site and residual areas appropriately rehabilitated if/as necessary. This is consistent with SEATA's aims to leave a *positive* legacy where we operate.

Further, the proposed project design has had a strong focus on providing a conservative approach to managing biochar production and potential uses (not associated with this project), identifying multiple applications including industrial uses, supported by redundancy measures if required (worst case scenario management) to minimise waste legacy risk. i.e. ensuring biochar has a *fit-for-purpose* and permissible 'home to go to', as detailed in **Section 7.4.5 and Section 5**. **Appendix 4** includes a letter from a single industrial user of biochar who is seeking to source around 35,000 t of biochar in 2022, some 35-50 times larger than the likely biochar production from this R&D project, noting they have also noted in discussions with SEATA that it is still economic to transport biochar interstate if required too.

Decommissioning related aspects were also included in the project environmental risk assessment (refer **Appendix 5**). Given the identified controls/mitigation measures in place, and the agreement with the land owner, the project legacy risk associated with is expected to be of **low** risk (Risk Score = 5). Accordingly, no significant impact is expected for this aspect.

7.5.9 Consideration of Potential Cumulative Impacts

The project site is located in a rural setting distant to neighbouring dwellings (nearest is R7 at >850m), and no other significant new development is known to be currently proposed adjacent to or in near proximity to the proposed project site at this time.

The project has conservatively considered the potential for cumulative impacts as part of project site selection and layout (avoidance), and project design and control (minimisation). The following factors were key in considering cumulative impacts:

- Consultation with and feedback from stakeholders, surrounding neighbours and sensitive receptors where practicable to provide input to project scoping and design
- Rural site location selected for the project
- Significant distances to potential sensitive receptors (rural residences >850m).

- Lack of other similar projects in local proximity to the project
- Risk based approach to project design, assessment and control of potential impacts
- Mitigation measures for key aspects identified by project Environmental Risk Assessment (e.g. noise, air quality and visual), including proposed additional specialist assessments for noise and air quality to confirm such.
- Scale, location, and duration of the project (small scale, rural, non-commercial initial 3-yearR&D project only proposing 'clean' natural feedstocks).
- Selection of feedstocks that are suitably approved (consideration of potential *upstream* impacts).
- Characterisation of (and approval required for) appropriate "fit-for-purpose" use of biochar produced by the trials (consideration of potential *downstream* impacts).

Subsequently, the risk of potential significant cumulative impacts from the proposed project is considered to be low. In regards to air quality and noise this will also be further confirmed by the proposed specialist assessments.

8. Project Management

8.1 Project Timing

- SEATA seeks to commence research and development testing **as soon as possible in Q1 2022.**
- Related approvals to allow commencement (e.g. s68 Approval for septic system, EPL and staged RRO & Exemption approvals for generation, receipt, storage and processing of first feedstock) are sought concurrently, noting further information is expected to be required for the RRO & Exemption in consultation with EPA.
- The proposed comprehensive detailed testing program will be developed in consultation with EPA and council prior to commencing Stage 2 (detailed testing phase) and is expected as a condition of approval. Detailed mass balance analysis is proposed to be undertaken. It is envisaged development of the program with EPA can commence concurrently with DA assessment to align project timelines.
- It is envisaged that site preparation works will take approximately **2-4 weeks.**
- R&D Trials will be undertaken on a campaign basis over the proposed initial three year approval period as detailed in the project description.

8.2 SEATA Key Contacts for DA

Craig Bagnall
Director, Environment & Regulatory
E: craig.bagnall@seatagroup.com.au
M: 0408 1142 242

John Winter
Director, Engineering
E: john.winter@seatagroup.com.au
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8.3 Project Team Experience - SEATA Board of Directors

A summary of the SEATA project team's background and substantial relevant experience to this project is provided below. Further details (including Curricula Vitae if required) can be provided upon request.

John Winter

John is a renowned chemical engineer within excess of 25 years' experience, and the inventor of the patented SEATA deconstruction process. The current principal of Round Hill Engineering, John holds a Bachelor of Engineering in Chemical Engineering from the University of Newcastle (1995) (Honours).

John has previously been employed as a Process Engineer leading development of Austpac Resources' previously on the ERMS process to roast and magnetically separate Ilmenite. Since graduating in 1995, he has been intimately involved with the development of beneficiation technology, including high and low temperature fluid bed roasting, coal gasification, hydrochloric acid leaching, acid regeneration processes and metallisation of iron streams. John, conceived the concept and technically advised on the process parameters for the design and construction of a fluid bed iron sand roasting plant at New Zealand Steel's Glenbrook steel mill near Auckland. John coordinated the commissioning and initial operation of the 2.5 tph plant.

John is also co-inventor of the patented Beneficiated Titania Slag (BTS) process, inventor of the Continuous Leach Process (patented) and Processing of Metal Chloride Solutions (patents pending), which includes a novel method for the reduction of iron.

John will be the **project team lead** for the project including all R&D testing.

Robert Faraday-Bensley

Rob is an experienced commercial solicitor who has owned and operated his own firm, Bilbie Faraday Harrison, for the past 16 years after earlier stints with national firms Thomson Geer, Sparke Helmore and Kerman and Co in London. Rob is also a current director and majority owner of a café business with turnover exceeding $1.5 million per annum, part owner of a gold mining exploration company and Chairman of a not for profit incorporated association. Rob is an accredited nominated advisor to the National Stock Exchange Limited, an experienced board member, with particular experience in capital raising, ASX listings in Australia and AIM listings in the United Kingdom.

Robert Tew

A past Chairman of the Newcastle Knights Rugby League Football club, Rob has owned and operated his own property valuation business, Tew Property Valuation Services for the past 15 years. Rob is also a successful property developer, mentor to many up and coming professionals and athletes, and an active member of various industry bodies. Rob has also led the preparation of the *Cost Estimate Report* for this project.

Craig Bagnall

Craig leads SEATA's environmental monitoring, licencing and approvals programs and is an environmental engineer with over 25 years experience working primarily in mining, industrial and waste sectors. He holds advanced Impact Assessment accreditation as a Certified Environmental Practitioner (CEnvP). Craig's career commenced in contaminated site assessment, air and water quality monitoring and impact assessment, and mine rehabilitation, followed by the NSW Waste Boards coordinating state and regional waste programs. For the last 17 years he has worked in national and multi-national consultancies. Craig is an active member of the Advisory Board to the Australian and New Zealand Biochar Industry Group (ANZBIG) and has been involved in ANZBIG's engagement with NSW EPA regarding RRO & Exemptions for use of biochar in land applications. Craig has experience as lead consultant for environmental assessments required for State Significant Developments (SSD) in primary and secondary approvals, as well as minor project approvals (REF, water licencing etc). He has been endorsed by NSW government as a lead consultant for Extraction Plans, and by the Commonwealth Department of Environment and Energy as an independent auditor under the EPBC Act for underground mining. Craig leads a local environmental consultancy based in Newcastle (Catalyst Environmental Management) providing general environmental management advice and specialist technical advice in surface water monitoring and management for which he has been an Expert Witness to the NSW Land and Environment Court. In the community, Craig also served for a decade as a director of a volunteer medical charity, the Hunter & Northern Kidney Association (HANKA).

Jim McFarlane

With over 45 years of experience in the sheet metal manufacturing industry, including 38 years as CEO of his own company which at one point employed in excess of 100 staff including chemical and civil engineers, Jim brings a wealth of knowledge and experience to the SEATA board of directors. Jim has a particular interest in metal fabrication 3D design and in effective, efficient methods of manufacturing steel products. Jim and his team have manufactured the first SEATA plant to the highest of standards and it is proposed will manufacture further plants in the future.

Scott Fairbairn

Scott is an experienced company director in both the public and private sector, incorporating general management Business Development responsibilities. He is highly skilled in the sectors of energy, renewables & infrastructure sectors & their implementation, negotiation, financial management, operations management and in implementing continuous improvement measures throughout the above business disciplines. Scott has a broad understanding of the various energy & utility markets within Australia; this is based on his tenure of working alongside solving some of their pain points previously. He understands these sectors constraints & drivers both from external and internal influences.

Scott has experience previously in establishing a couple of greenfield business ventures in the power generation space, where he undertook & managed these ventures including all financial, operational, sales and reporting mechanism to a board.

With long standing work history & experience in the energy and renewables fields, Scott brings a wealth of knowledge and industry connections to the SEATA board of directors.

Scott is also involved as the one of the chairs of Hunternet Energy & Mining forum for the past 5 years where he has organized key note speakers and chaired meetings of up to 100 members.

Lastly Scott has had a personal involvement with two local charities in the Hunter over the last 10 years; The Neo Natal Children' unit at Newcastle's John Hunter Hospital & the Hunters Westpac Rescue helicopter. This involvement was to establishing an annually golf charity event in collaboration with two local Hunter based charities / causes, where Scott was one of the initial founders to raise the profile of these much needed organizations. These funds raised were raised for the Neo natal Intensive care unit at John Hunter Hospital, in parallel partnership with the Hunter's Westpac Rescue Helicopter. Over a 10 year period a sum of around $ 380,000 has been donated between both these charities

James Jordan

James has a diploma in Marketing Management and an advanced commerce certificate, and has spent 22 years in finance management, holding a Cert IV in Finance as well as being an accredited mortgage broker. As the founder of Whiz Engineering in concert with Jim McFarlane, James has overseen prototype projects for Newcastle University which involved full design and fabrication, development of specialist trailers for open cut mine blasting consumables, and many similar projects with a variety of industry applications.

9. Additional Supporting Documentation

9.1 Waste Management Plan (WMP)

A Waste Management Plan (WMP) has been produced in accordance with the GISC Waste Management Plan Template (2018). The Waste Management Plan for the SEATA R&D Facility is provided in **Appendix 16**.

9.2 Specialist Assessments

Whilst the risks associated with noise and air quality aspects of the project were ranked of *minor* risk with the existing technology and project design controls identified, specialist studies were conservatively recommended by the project Environmental Risk Assessment to confirm the identified controls and impact assessment for these aspects. Whilst these may typically be provided concurrent with SEE submission, given that the proposed layout of the project site has been revised multiple times during consultation with other stakeholders to date (which influences these assessments), and noting the impact on project timing, the SEATA Board has requested these assessments be scoped in consultation with EPA and GISC during/following DA submission and satisfactorily completed prior to commencement of operations.

The proposed approach for these assessments is further discussed in **Section 7.4.6** and should be referenced for full details.

9.3 Further Post-Approval Documentation Expected to be Required under Conditional Integrated Approvals Issued for the Project

The following information/documentation is expected to be conditionally required by the integrated approval when issued for the project:

- **Detailed Testing Program** to be developed in consultation with EPA, to be developed prior to formal commencement of Stage 2 detailed testing program (refer Section 4).
- **Requirements for staged Resource Recovery Order & Exemption** specifically in relation to later proposed application to land of biochar (requiring characterisation to EPA satisfaction of biochar fit for intended purpose(s)). It is noted that RRO & Exemption for recovery, receipt/storage and processing of the proposed feedstocks would be expected as part of the integrated approval to allow testing to be undertaken.
- **Pollution Incident Response Management Plan (PIRMP)**, required by all EPL's issued in NSW.

9.4 Project Cost Estimation Report

A project *Cost Estimation Report* has been prepared in accordance with GISC s94A contribution requirements, Part E, Schedule 2 for projects <$500,000. Please refer to **Appendix 15** for details. The report was prepared by SEATA Chairman Rob Tew and representatives. Rob is an experienced valuer as noted in **Section 8.3**.

9.5 Political Donations and Gifts Disclosure

Under Section 10.4 of the Environmental Planning and Assessment Act 1979, a person making a planning application to a council is required to disclose the political donations and gifts made by any person with a financial interest in application within the required preceding period before the application is made and ending when the application is determined, including:

a) all reportable political donations made to any local councillor;
b) all gifts made to any local councillor or employee of the council.

SEATA Holdings Pty Ltd has <u>not</u> made any relevant political donations or gifts.

Glen Innes Severn Council requires a dedicated form to be completed and submitted in regards to declarations of political donations or gifts with all DA's. A signed completed copy of the ***GISC Political Disclosure Form*** is provided in **Appendix 11**.

9.6 Other Information Available on Request

Other relevant supporting documentation available on request if required:

- Curriculum Vitaes (detailed experience) for SEATA Board of Directors, including process engineer John Winter who will be the Project Team lead for proposed testing.
- Further technical and process information on request (confidential information such as that relating to IP may require NDA)

10. Project Justification & Concluding Comments

This Statement of Environmental Effects (SEE) accompanies a Development Application for the proposed development and operation of the ***SEATA R&D Centre*** at 448 West Furracabad Rd Glen Innes NSW. The project will enable small pilot scale demonstration of SEATA technology to evaluate potentially significant benefits for future deployment at commercial scale elsewhere, most importantly including for climate change mitigation. Climate change is now widely recognised as the world's most significant environmental, economic and social challenge. SEATA technology has been designed to provide economically scalable production of **biochar** produced from biomass as a readily deployable ***Negative Emissions Technology (NET)*** to remove existing carbon dioxide in the atmosphere that has built up over two centuries of industrialisation. The process is commonly referred to as ***Carbon Dioxide Removal***, or ***CDR***. Biochar was one of several critical NETs identified by the Intergovernmental Panel on Climate Change (IPCC) as being urgently required to help limit warming to 1.5°C by 2100 (IPCC, 2018), a case made even more urgent by the planet currently tracking toward >3°C by 2100. Biochar can also enhance other key NET's such as soil carbon, and contributes to multiple goals of the *UN Sustainability Development Goals (SDGs,* refer Section 5.2.1).

The proposed project seeks to demonstrate SEATA technology's potential not only for CDR via biochar, but also to produce a rich, clean syngas capable of directly providing renewable energy and/or providing the basis for valuable derivatives in emerging green commodities such as **hydrogen** (avoiding, displacing or reducing existing CO_2 emissions, and providing genuine circular economy. Accordingly, the technology will be evaluated for its potential to positively contribute to **both** of the two critical elements required to address climate change - **emissions reduction** and carbon dioxide **removal.** The pathways for this are clarified further and illustrated in **Section 7.4.3.**

Based on pre-lodgement consultation the project is expected to be considered a ***Resource Recovery Facility*** by Glen Innes Severn Council (GISC), which is **permissible with consent** within the **RU1 Primary Production Zone** of the ***GISC Local Environment Plan (LEP, 2012)***. The project is considered consistent with the LEP's objectives of the RU1 zoning as detailed in **Section 5.2.5**, including providing a permissible land use that encourages sustainable primary industry and potentially enhances the resource base (via biochar and providing a valuable use of agricultural waste biomass), and encourages diversity in primary industry enterprises of the area. The project is also consistent with the objectives of the ***GISC Local Strategic Planning Statement (2020),*** notably **Planning Priority #2** *(Encourage diversification in agriculture, horticulture and agribusiness to grow these sectors and respond to domestic and international opportunities),* **Planning Priority #9** *(Adapt to natural hazards and climate change)* **and Planning Priority #10** *(Promote and support renewable energy production opportunities).*The proposal will not adversely affect demand for public services or facilities and will have minimal negative impact on the environment. The proposal is also considered generally consistent with the objectives for RU1 under the ***GISC Development Control Plan (DCP, 2014)*.**

Whilst the project is only for small scale R&D testing, the regulatory framework for all thermal treatment systems in NSW is complex, including for innovation R&D. **Section 5** of this SEE presents a detailed consideration of potentially relevant local, state, commonwealth (and targeted international) regulatory and policy frameworks to demonstrate **planning and licencing permissibility** to assist assessment by GISC, EPA and relevant agencies. This includes assessment against other relevant Environmental Planning Instruments including relevant ***State Environmental Planning Policies (SEPP)***. Examples of key legislation, regulatory and policy frameworks considered by the project are summarised in **Section 1.6** (refer Section 5 for full details of all applicable legislation).

This SEE has assessed specific matters required under Section 4.15 (1) of the EP&A Act for environmental planning approval, as detailed in Sections 4 through 9. SEATA has carefully designed the project for proposed RDSM testing at Glen Innes. The proposed staged ('walk before run') approach for R&D testing has considered and provided *regulatory permissibility* for the proposed feedstocks across the three year R&D period, whilst providing a pathway (via conditional approval) to provide additional feedstock-specific detailed information required for related secondary approvals (notably progressive Resource Recovery Orders and Exemptions) on a progressive basis.

Both the technology design and the project design have been **risk-based** to support environmental assessment and regulatory approvals (including EPL), as detailed in the dedicated project *Environmental Risk Assessment* (**Appendix 5**) which identified, assessed, and controlled potential risks. Where necessary, mitigation measures are proposed to minimise these potential impacts and reduce potential risk associated with the development. The risk assessment included consideration of the small **scale, nature** and **duration** of the project (that being, a pilot-scale, non-commercial, initial three year R&D facility, utilising only clean uncontaminated biomass feedstocks and standard fuels, undertaken on a campaign basis in a staged and progressive manner in consultation with regulators). Whilst the risk with existing technology and project design controls in place for **noise** and **air** quality were ranked as minor, specialist studies were conservatively recommended to confirm the identified controls and impact assessment for these aspects. Whilst these may typically be provided concurrent with SEE submission, given that the proposed layout of the project site has been revised multiple times during consultation with other stakeholders to date (which influences these assessments) and noting the impact on project timing, the SEATA Board has requested these assessments be scoped in consultation with EPA and GISC during/following DA submission and satisfactorily completed prior to commencement of operations. The proposed conservative desktop approach for these is outlined in **Section 7.4.6**.

This SEE has addressed the matters required under Section 4.15 (1) of the EP&A Act to facilitate assessment of potential impacts arising from the proposal for environmental planning approval. These include those matters assessed in detail throughout Sections 4 to 9 of this SEE. Additionally, the following key findings are made:

- The proposal has considered the provisions of relevant legislation and *Environmental Planning Instruments* including at (but not limited to) key state and local levels and is considered permissible with conditions (as proposed);
- The project is located within the ***New England Renewable Energy Zone (REZ)*** and is consistent with key environmental planning policies and strategies as detailed in Section 5 of this SEE, and is expected to generate up to a dozen direct local 'green' jobs in rural NSW during operations, (excluding construction).
- The technology and the project design for the proposed SEATA R&D Centre has been risk-based and respects both the natural environment and neighbouring rural residences. The SEE was informed by a project *Environmental Risk Assessment* (**Appendix 5**).
- Successful R&D testing has the potential to provide a step-change in environmentally friendly thermal treatment systems compared to conventional incineration/combustion, gasification and pyrolysis technologies, as detailed in Section 2.
- Successful R&D to demonstrate the production of biochar for economically scalable commercial and industrial applications has potential to contribute toward critical goals of Net Zero by 2050 and restricting global warming to 1.5 degrees by 2100.

- Identification and assessment of potential **environmental, social and economic impacts (positive and negative)** has been considered and undertaken within the SEE, noting the small scale, nature and duration of the R&D project;
- Risk mitigation measures have been adopted or proposed where appropriate to minimise identified potential impacts and reduce potential risk associated with the development.
- The project is consistent with the principles of *Ecologically Sustainable Development (ESD)* and is considered to have positive benefits for intergenerational equity.

SEATA has (and will continue to) proactively engage with Council, EPA, other agencies and the community in a transparent and genuine manner throughout and beyond testing, and is proud to be part of the local community in Glen Innes and the New England Renewable Energy Zone.

Given the merit and permissibility of the project design, and the absence of any significant adverse environmental impacts, the DA is considered to be in the public's interest and worthy support by Council, EPA and relevant agencies as part of the integrated consent. SEATA looks forward to assessment of the proposed project as soon as possible to facilitate commencement of proposed testing as soon as possible in Q1 2022.

11. References

Australian Business Licence and Information Service (ABLIS). (2021). Biosecurity Permit – New South Wales. *https://ablis.business.gov.au/service/nsw/biosecurity-permit/39967*

Australian New Zealand Biochar Industry Group (ANZBIG). (2021). Code of Practice for the Sustainable Production and Use of Biochar in Australia and New Zealand. https://anzbig.org/resources/

Department of Environment, Climate Change & Water (NSW). (2010). *Due Diligence Code of Practice for the Protection of Aboriginal Objects in New South Wales*. https://www.environment.nsw.gov.au/~/media/A567FCA5C9BA450B9E14F90D04464101.ashx

DPI (NSW). (2019). *Innovative Research of Woody Biomass Crops for Bioenergy in NSW.* https://www.dpi.nsw.gov.au/about-us/media-centre/releases/2019/innovative-research-on-woody-biomass-crops-for-bioenergy-in-nsw

DPIE (NSW). (2021). Complying Development. https://www.planning.nsw.gov.au/Assess-and-Regulate/Development-Assessment/Planning-Approval-Pathways/Complying-development

DPIE (NSW). (2021). Transitional Native Vegetation Regulatory Map. https://www.environment.nsw.gov.au/topics/animals-and-plants/biodiversity/native-vegetation-regulatory-map

Food and Agricultural Organisation. (2010). *CSBP Draft Provisional Standard for Sustainable Production of Agricultural Biomass* Council on Sustainable Biomass Production (CSBP) (fao.org)

Ellen McArthur Foundation. (2021). What is a circular economy? https://ellenmacarthurfoundation.org/topics/circular-economy-introduction/overview

EPA Victoria. (2021). Management and storage of combustible recyclable and waste materials – guideline. https://www.epa.vic.gov.au/about-epa/publications/1667-3

Jessop, P. (2009). Management burning of invasive native scrub: techniques. https://www.dpi.nsw.gov.au/__data/assets/pdf_file/0009/276660/Management-burning-of-invasive-native-scrub-techniques.pdf

Joseph, S. et al. (2021). *How biochar works, and when it doesn't: A review of mechanisms controlling soil and plant responses to biochar.* GCB Bioenergy. 13(11). 1731-1764.

Local Land Services (NSW). (2014). Managing invasive native scrub to rehabilitate native pastures and open woodlands. A Best Management Practice Guide for the Central West and Western Regions. https://www.lls.nsw.gov.au/__data/assets/pdf_file/0007/685222/managing-invasive-native-scrub.pdf

NSW Energy. (2020). Renewable Energy Zones. Renewable Energy Zones | Energy NSW

United States Environmental Protection Agency. (2000). Biosolids Technology Fact Sheet Land Application of Biosolids.
https://www3.epa.gov/npdes/pubs/land_application.pdf#:~:text=Biosolids are primarily organic materials produced during wastewater, organic matter. This is known as land application.

World Economic Forum. (2021). *Circular Economy and Material Value Chains.*
https://www.weforum.org/projects/circular-economy/

International Frameworks, Policies and Guidelines

See **Section 5.2.1** for details

Commonwealth Legislation

See **Section 5.2.2** for details

State Legislation (NSW)

See **Section 5.2.3** for details

Key references are provided below:

Protection of the Environment Operations Act, 1997 (as amended)
http://classic.austlii.edu.au/au/legis/nsw/consol_act/poteoa1997455/

Protection of the Environment Operations (Waste) Regulations 2014, as amended 2019
http://www5.austlii.edu.au/au/legis/nsw/consol_reg/poteor2014609/

Protection of the Environment Operations (Clean Air) Regulations 2010, as amended 2021
https://legislation.nsw.gov.au/view/pdf/asmade/sl-2010-428

Protection of the Environment Operations (General) Regulations 2009, as amended 2021
https://legislation.nsw.gov.au/view/pdf/asmade/sl-2021-486

Waste Avoidance and Resource Recovery Act 2001 (WaRR Act)
https://legislation.nsw.gov.au/view/whole/html/inforce/current/act-2001-058

Biosecurity Act 2015
https://legislation.nsw.gov.au/view/html/inforce/current/act-2015-024

Biosecurity Regulation 2017
https://legislation.nsw.gov.au/view/pdf/asmade/sl-2017-232

State & Regional Policies and Guidelines

See **Section 5.2.4** for details

Other Relevant NSW State Policies and Guidelines:

See **Section 5.2.4** for details

Key references are provided below:

EPA (NSW). (2021). NSW Energy from Waste Policy Statement. https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/21p2938-energy-from-waste-policy-statement.pdf

EPA (NSW). (2016). Eligible Waste Fuels Guidelines. https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/waste-fuels-guide-160756.pdf?la=en&hash=76F8B271430AE5115C8E4F9431E7025F9FDBEFC0

Local Land Services. (2017). Northern Tablelands Regional Strategic Weed Management Plan 2017 – 2022. https://northerntablelands.lls.nsw.gov.au/__data/assets/pdf_file/0007/722869/NT-RegionalWeedMgmtPlan-WEB-June17.pdf

Fire and Rescue NSW. (2020). *Fire Safety Guidelines: Community Safety Directorate.* https://www.fire.nsw.gov.au/gallery/files/pdf/guidelines/guidelines_fire_safety_in_waste_facilities.pdf

NSW Resource Recovery Orders (RRO) and Exemptions:

NSW EPA. (2014). The Biosolids Order. https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/rro14-biosolids.pdf?la=en&hash=D84DE61708C87F4CF333F25CDF6CD3DC0367145C

NSW EPA. (2014). The Biosolids Exemption. https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/rre14-biosolids.pdf?la=en&hash=B6CC5AFA02AF2539CF8DB8AC8B461042355F7F2B

NSW EPA. (2014). The Manure Order https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/rro14-manure.pdf?la=en&hash=47D54AFB68EB0917AECA9FFF56099E735E86748A

NSW EPA. (2014). The Manure Exemption https://www.epa.nsw.gov.au/~/media/EPA/Corporate%20Site/resources/waste/rre14-manure.ashx

NSW EPA. (2014). The Bulk Agricultural Crop Waste Order https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/rro14-agricultural-crop-waste.pdf?la=en&hash=2B779B3125CF798844D08DB5012D6A89B7E10772

NSW EPA. (2014). The Bulk Agricultural Crop Waste Exemption https://www.epa.nsw.gov.au/-/media/3F3155BCFE174DBB9201025C7CE4964A.ashx?la=en

NSW EPA. (2014). The Ash from Burning Biomass Exemption https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/rre14-biomass-ash.pdf?la=en&hash=90BDD318C79AAB027C21C51A3F5F16425ADA399B

NSW EPA. (2014). The Ash from Burning Biomass Order https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/waste/rro14-biomass-ash.pdf?la=en&hash=AE82D45BAE988437AD8751B7D027A6AC74D059C7

NSW EPA. (2016). The Pasteurised Garden Organics Order
https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/wastegrants/rro16-garden-organics.pdf

NSW EPA. (2016). The Pasteurised Garden Organics Exemption
https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/wastegrants/rre16-garden-organics.pdf

NSW EPA. (2016). The Pasteurised Garden Organics Exemption
https://www.epa.nsw.gov.au/-/media/epa/corporate-site/resources/wastegrants/rre16-garden-organics.pdf

Local Planning Controls, Policies and Guidelines

See **Section 5.2.5** for details

Key references are provided below:

National Construction Code (NCC). (2019). Building Code of Australia (Volume 1 – 3).
https://ncc.abcb.gov.au/

Appendix 1:

Consolidated Figures

(used in body of this report)

Appendix 2:

Completed GISC Forms and Checklists

(e.g. DA, DCP, s68)

Appendix 3:

Land Owner's Consent

Appendix 4:

Letters of Support

Appendix 5:

Environmental Risk Assessment

Appendix 6:

Detailed Drawings of Existing & Proposed Buildings

Appendix 7:

Compliance Summary with

RFS Guidelines – Planning for Bushfire Protection

Appendix 8:

Climate Data

Appendix 9:

Industry Code of Practice

ANZ Biochar Industry Group (ANZBIG, 2021)

(Biochar Production, Characterisation & Certification Grades)

Appendix 10:

Relevant Guidelines & Fact Sheets

(e.g. NSW EPA, NSW DPI (INS))

Appendix 11:

Political Donations Disclosure Form

Appendix 12:

Existing Services Infrastructure (Dial Before You Dig Reports)

Appendix 14:

Eligible Waste Fuel Details for First Proposed Trials (Invasive Native Scrub)

Appendix 15:

Project Cost Estimate Report

Appendix 16:

Waste Management Plan

Appendix 17:

Consultation - Essential Energy

Appendix 18:

Sound Enclosure Module - Acoustic Insulation