YANCOAL
兖煤澳大利亚有限公司

Stratford Mining Complex Annual Review

2021

STRATFORDCOAL
Part of the Yancoal Australia Group

STRATFORD MINING COMPLEX

ANNUAL REVIEW 2021

Reporting Period: 1st January 2021 to 31st December 2021

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Annual Review Title Block

Name of operation	Stratford Mining Complex
Name of operator	Yancoal Australia Ltd
Development consent/ project approval #	SSD-4966 (Stratford Extension Project)
Name of holder of Development consent/ project approval #	Stratford Coal Pty Limited
Mining Lease #	ML1360, ML1409, ML1447, ML1521, ML1528, ML1538, ML1577, ML1733, ML1787
Name of holding of mining lease	Gloucester Coal Ltd/CIM Stratford Pty Ltd/Stratford Coal Pty Ltd
Water licence #	WAL 41534, WAL 41535, WAL 41536, WAL 41537, WAL 41538
Name of holder of water licence	Gloucester Coal Ltd/CIM Stratford Pty Ltd/Stratford Coal Pty Ltd
MOP/ RMP start date	1st January 2021
MOP/ RMP end date	31st December 2023
Annual Review start date	1st January 2021
Annual Review end date	31st December 2021

I, John Cullen, certify this audit report is true and accurate record of the compliance status of Stratford Coal Mine for the period of 1st January 2021 to 31st December 2021 and that I am authorised to make this statement on behalf of Yancoal.

Note.

The Annual Review is an 'environmental audit' for the purposes of section 122B(2) of the Environmental Planning and Assessment Act 1979. Section 122E provides that a person must not include false or misleading information (or provide information for inclusion in) an audit report produced to the Minister in connection with an environmental audit if the person knows that the information is false or misleading in a material respect. The maximum penalty is, in the case of a corporation, $1 million and for an individual, $250,000.

The Crimes Act 1900 contains other offences relating to false and misleading information: section 192G (Intention to defraud by false or misleading statement—maximum penalty 5 years imprisonment); sections 307A, 307B and 307C (False or misleading applications/information/documents—maximum penalty 2 years imprisonment or $22,000, or both).

Name of authorised reporting officer	*Mr John Cullen*
Title of authorised reporting officer	*Operations Manager – Stratford Coal*
Signature of authorised reporting officer	
Date	31 March 2022

1.0 Statement of Compliance

This Stratford Mining Complex (SMC) Annual Review has been prepared in accordance with Development Consent SSD-4966 Schedule 5 Condition 4 for the Stratford Extension Project (SEP) for the period 1 January 2021 to 31 December 2021. This report is also prepared in accordance with the annual reporting requirements for Mining Leases ML1360, ML1409, ML1447, ML1521, ML1528, ML1538, ML1577, ML 1733 and ML1787.

Table 1.1 provides a statement of compliance against SCPL's relevant approvals. A summary of the non-compliances with Development Consent SSD-4966 and the Mining Leases during the reporting period are included in **Table 1.2.**

Table 1.1- Statement of Compliance

Were all conditions of the relevant approval(s) complied with?	
SSD-4966	No (refer to Table 1.2)
ML1360, ML1409, ML1447, ML1521, ML1528, ML1538, ML1577, ML 1733, ML1787	No (refer to Table 1.2)

Table 1.2- Summary of Non-Compliances

Condition #	**Condition Description/Non-Compliance**	**Compliance Status/Risk**	**Comment**	**Section addressed**
SSD-4966 – Stratford Extension Project				
SSD-4966 Schedule 3 Condition 32 and Blast Management Plan	11/02/2021 Level 2A blast fume - did not leave site	Low	Level 2A blast fume from STR065_02_RL160 blast. Blast fume risk assessment determined risk of blast fume as possible, and unlikely to leave site based on environmental conditions.	6.6
SSD-4966 Schedule 3 Condition 27, Water Management Plan and EPL 5161 Condition L1.1	20/03/2021 Uncontrolled discharge of mine related water from three SMC sediment dams and three disturbed area dams reporting to Avondale Creek.	Medium	Reported in accordance with SSD-4966 and PIRMP. Spills occurred on Saturday 20 March 2021 at SMC as a result of a significant rainfall event exceeding design capacity.	7.3
SSD-4966 Schedule 3 Condition 27, Water Management Plan and EPL 5161 Condition L1.1 and O5.3	20/03/2021 Breach of the Roseville Link Haul Road culvert crossing over Avondale Creek at the SMC, which occurred on Saturday 20 March 2021 during a significant rainfall event.	Medium	Reported in accordance with SSD-4966 and PIRMP. Breach occurred on Saturday 20 March 2021 during a significant rainfall event.	7.3

Condition #	Condition Description/Non-Compliance	Compliance Status/Risk	Comment	Section addressed
SSD-4966 Schedule 3 Condition 23, Air Quality Management Plan Section 7.2 HVAS and EPL 5161 - M2.2 Air Monitoring Requirements	23/12/2021 Less than required PM10 monitoring undertaken as per EPL 5161 - M2.2 Air Monitoring Requirements at HVAS unit-Point 13.	Administrative	Monitoring unit failed to operate on a single prescribed day resulting in less than required samples.	6.3
Mining Leases				
ML 1360 Condition 9	20/03/2021 As reported above Schedule 3 Condition 27 and EPL 5161 Condition O5.3 Uncontrolled discharge of mine related water from three SMC sediment dams and three disturbed area dams reporting to Avondale Creek.	Medium	Reported in accordance with SSD-4966 and PIRMP.	7.3
ML 1360 Condition 9	20/03/2021 As reported above Schedule 3 Condition 27 and EPL 5161 Condition O5.3. Breach of the Roseville Link Haul Road culvert crossing over Avondale Creek.	Medium	Reported in accordance with SSD-4966 and PIRMP.	7.3
EPL 5161				
EPL 5161 Condition M2.3	29/06/2021 Less than required Conductivity monitoring undertaken as per M2.3 Water Monitoring Requirements at Point 5. Continuous monitoring required and only four of twelve months were analysed during the reporting period. (30-Jun-2020 to 07-Mar-2021)	Administrative	No adverse effects would be anticipated resulting from the non-compliance. Monthly/Event monitoring was undertaken at Point 5 during the reporting period which included conductivity sampling. On four out of the twelve monitoring events Point 5 had no flow. Data was obtained for the eight monitoring events when flow was recorded.	7.3
EPL 5161 O6.12 Noise Operating Conditions	29/06/2021 Annual noise testing program of mobile equipment not undertaken as per O6.12 Noise Operating Conditions.	Administrative	An annual sound power testing program of mobile equipment was undertaken during the previous reporting period in January 2020. Monthly attended noise compliance monitoring has been conducted during the 2020/21 EPL reporting period and noise emissions contributions from the Stratford Coal operations have been compliant. 2022 Monitoring was conducted in September 2022.	6.7

Table 1.3 – Compliance Status Categories

Risk Level	Colour Code	Description
High	Non-Compliant	Non-compliance with potential for significant environmental consequences, regardless of the likelihood of occurrence
Medium	Non-Compliant	Non-compliance with potential for serious environmental consequences, but is unlikely to occur; or potential for moderate environmental consequences, but is likely to occur
Low	Non-Compliant	Non-compliance with potential for moderate environmental consequences, but is unlikely to occur; or potential for low environmental consequences, but is likely to occur
Administrative non-compliance	Non-Compliant	Non-compliance which does not result in any risk of environmental harm

2.0 Introduction

The Stratford Mining Complex (SMC) is located in the Gloucester Basin approximately 100km north of Newcastle in New South Wales. Refer **Figure 1** (**Appendix 1**).

Stratford Coal Pty Ltd (SCPL), a wholly owned subsidiary of Yancoal Australia Limited (YAL), is the owner and operator of the SMC.

The SMC encompasses an area of approximately 1,580 hectares (ha) of cleared former grazing land (owned by SCPL) located to the east of The Bucketts Way, between the villages of Stratford and Craven. Refer **Figure 1** (**Appendix 1**). Development Consent was originally approved for the Stratford Coal Mine by the then NSW Minister for Planning on 19 December 1994. Mining Lease (ML) 1360 was subsequently granted by the then NSW Minister for Mineral Resources on 21 December 1994 with production commencing in June 1995.

The SMC consists of an open-cut mine which utilises truck and excavator mining methods to produce run of mine (ROM) coal. ROM coal is processed at the Coal Handling and Processing Plant (CHPP) and transported via train on the North Coast Railway to the Port of Newcastle for distribution to the export market.

Mining activities approved under the former Stratford Coal Mine (DA 23-98/99) and Bowens Road North (DA 39-02-01) Development Consents were suspended in mid-2014. However, ROM coal from the Duralie Coal Mine (DCM) (also owned by YAL) was continued to be processed at the SMC CHPP and transported to the Port of Newcastle for distribution to the export market.

Development Consent SSD-4966 was granted by the then NSW Planning Assessment Commission (PAC), as delegate for the Minister for Planning, for the SEP on 29 May 2015. The SEP provides for the continuation and extension of operations at the SMC, including the mining of three new open cut areas.

Mining activities approved under the SEP Development Consent (SSD-4966) were commenced on 4 April 2018.

A Modification to SSD-4966 (MOD 2) was approved by the Director, Resource Assessments as delegate of the Minister for Planning and Public Spaces on 13 January 2020. The modification sought approval to allow for water stored within the SMC water management system to be available to the Mid Coast Council (as a public authority) for the benefit of local services and other potential public purpose water needs.

This Annual Review (AR) has been prepared in accordance with Schedule 5, Condition 4 of SSD-4966.

This report is also prepared in accordance with the annual reporting requirements for the Mining Leases held by SCPL and in accordance with the Department of Planning, Industry and Environment (DPE) Annual Review Guidelines (October 2015).

The AR describes the environmental performance, pollution control and rehabilitation activities at the SMC for the period 1 January 2021 to 31 December 2021. As required by SSD-4966, comparisons of environmental monitoring results have been made against relevant statutory requirements/performance criteria, monitoring results of previous years and relevant predictions of Environmental Assessments. This AR also reports on any non-compliances, trends in monitoring data and any discrepancies between the predicted and actual impacts of the development. Environmental management activities planned for the next 12 months are also discussed.

2.1 Mine Contacts

The SMC is an owner operated mine site by SCPL Site personnel responsible for mining, CHPP, rehabilitation and environmental issues at the end of the reporting period were;

Position	Name	Contact
Operations Manager, Stratford & Duralie Operations	Mr John Cullen	02 6538 4210
Senior Environment & Community Advisor	Mr Thomas Kirkwood	02 6538 4208
CHPP Superintendent	Mr Bruce Robinson	02 6538 4235

3.0 Approvals

3.1 Status of Leases, Licences and Approvals

The SMC operates in accordance with the approvals provided in **Table 3.1**.

Table 3.1 – Stratford Mining Complex - Leases, Licences and Approvals

Description	Date of Grant	Duration of Approval	Comment
NSW Development Consents			
Stratford Extension Project Development Consent SSD-4966	29 May 2015	31 December 2025 (mining operations)	• Action commenced on 4 April 2018. • MOD 2 granted 13/01/2020
Mining Leases and Exploration Licences			
ML 1360	21 December 1994 (renewed 21 December 2015)	21 December 2036	Variation of Conditions dated 22 June 2018

ML 1409	7 January 1997	7 January 2039	Renewed 7 March 2018 Variation of Conditions dated 8 October 2018
ML 1447	1 April 1999	1 April 2020	Renewal lodged 13 Mar 2019.
ML 1521	24 September 2002	24 September 2023	Variation of Conditions dated 8 October 2018
ML 1528	20 January 2003	20 January 2024	
ML 1538	25 June 2003	25 June 2024	
ML 1577	1 March 2006	1 March 2027	Variation of Conditions dated 8 October 2018
ML 1733	8 April 2016	8 April 2037	Variation of Conditions dated 19 February 2018
ML 1787	5 June 2019	5 June 2040	
A311	17 September 1982	28 November 2017	Renewal lodged 27/11/2017
A315	27 December 1982	28 November 2017	Renewal lodged 27/11/2017
EL 6904	9 October 2007	9 October 2017	Renewal lodged 09/10/2017
Environment Protection Licences			
Environment Protection Licence (EPL) 5161	1 July 2000	Until the licence is surrendered, or revoked.	As modified by subsequent variations (refer to EPA website).
Commonwealth Approvals			
Commonwealth Approval (EPBC 2011/6176)	29 January 2016	30 November 2030	Commencement of Action 04/04/2018
Water Licences			
Water Access Licences (WAL 41534, WAL 41535, WAL 41536, WAL 41537, WAL 41538)	Various	Perpetuity	Groundwater extraction – open cut dewatering.
Groundwater bore licences – various	Various	Perpetuity	Groundwater monitoring
Water Access Licences (WAL 19536, WAL 19514, WAL 19540)	Various	Perpetuity	Avon River Water Source

Environmental Management Plans

Environmental Management Plans (EMPs) have been prepared and approved for the SMC. The current versions approved by DPE are available on the Stratford Coal website.

- Environmental Management Strategy (revised). Approved 21 January 2022.

- Air Quality Management Plan (revised). Approved 21 January 2022.
- Biodiversity Management Plan (revised). Approved 19 October 2018.
- Blast Management Plan (revised). Approved 21 January 2022
- Heritage Management Plan. Approved 17 October 2018.
- Life of Mine Rejects Disposal Plan (revised), October 2018.
- Noise Management Plan (revised). Approved 17 June 2019.
- Water Management Plan (revised). Approved 18 October 2021.
- Mining Operations and Rehabilitation Management Plan (MOP) (revised). Approval 23 July 2021.
- Pollution Incident Response Management Plan (revised), April 2021.
- Squirrel Glider Management Plan (revised). Approved 19 October 2018.
- Transport Monitoring Program. Approved 8 March 2018.

3.2 Amendments to Approvals/Licences during the Reporting Period

There were no amendments to approvals or licences during the reporting period.

Environmental Management Plans

A new Mining Operations Plan and Rehabilitation Management Plan (MOP) was been prepared and lodged with the Resources Regulator on 20 January 2021. The new MOP was approved on 23 July 2021.

The SMC (SEP) Water Management Plan was revised and approved on 18 October 2021.

The SMC SEP Environmental Management Strategy, Air Quality Management Plan and Blast Management Plan were updated and approved on 21 January 2022.

The Pollution Incident Response Management Plan (PIRMP) was revised following Annual PIRMP Audit 2021. Further revised following incidents triggering PIRMP in March 2021.

4.0 Operations Summary

A summary of operations (Production), during the preceding and current reporting period as well as a forward forecast for the next reporting period is provided below in **Table 4.1**.

Table 4.1 - Production Summary

Material	Approved limit (specify source)	Previous reporting period	This reporting period	Next reporting period
Waste Rock/ Overburden (BCM)	N/A	7,451,307	6,858,546	5,350,316
ROM Coal (tonnes)	2.6 million tonnes per annum	990,747	1,279,889	1,368,401
Codisposal Reject (tonnes)	N/A	486,143	514,092	616,882
Saleable product Coal (tonnes)	N/A (Process limit of 5.6 million tonnes per annum)	533,662	835,129	751,519

Total saleable product coal for the 12-month reporting period was 835,129 tonnes. 6,858,546 BCM of waste rock/overburden was mined from Stratford East, BRN, Roseville West and Avon North pits during the reporting period.

Saleable coal production by month for the reporting period is listed in **Table 4.2** below.

Table 4.2: Product Coal Produced by Month (Tonnes)

MONTH	Coking Coal	Thermal Coal	Total Product Coal
January 2021	11,091	21,131	32,222
February 2021	5,605	7,015	12,620
March 2021	13,900	22,338	36,238
April 2021	13,859	17,877	31,736
May 2021	11,600	33,865	45,465
June 2021	8,436	95,055	103,491
July 2021	24,030	51,609	75,639
August 2021	24,531	71,209	95,740
September 2021	24,149	47,031	71,180
October 2021	47,514	89,818	137,332
November 2021	51,219	95,738	146,957
December 2021	9,836	36,673	46,509
Total Annual	**245,770**	**589,359**	**835,129**

4.1 Exploration

Exploration activities occur in the Mining Lease and Exploration Lease areas within, and external to, the open cut footprints and is used to investigate aspects such as geological features, seam structure and coal/overburden characteristics as input to detailed mine planning and feasibility studies.

An SMC Group ML Annual Exploration Report 2021 has been prepared and lodged for the period 21/12/2020 to 20/12/2021. Furthermore, Annual Exploration Reports and Community Consultation Reports have been prepared and lodged for Auth 311, Auth 315 and EL 6904.

The main exploration related activities during the 2020 – 2021 reporting period was the commencement of mine closure studies and drilling of water monitoring bores. Other works included flying LiDAR survey over Stratford, mining studies and updating of JORC resource and reserve reporting.

The five water monitoring bores were installed in the monitoring period, however at the time of reporting drill hole data had not been finalised. A total of 263m were drilled for these five holes.

Hydrological studies (including ground water and surface water studies), forming part of the mine closure studies are still ongoing. LiDAR survey was flown over the mining leases at Stratford and some surrounding areas, with the survey over the Stratford mining leases covering approximately 30 sq km.

No further exploration drilling is currently planned at Stratford.

Continuation of mine closure studies including tenements management strategies will be ongoing into the 2021-2022 reporting period, including ongoing hydrological/hydrogeological studies and final void studies.

Ongoing community consultation and environmental activities will continue.

4.2 Estimated Mine Life

SSD-4966 provides approval for activities described in the SEP Environmental Impact Statement (EIS 2012) and includes:

- 11 years of mining;
- Up to 2.6 Mtpa ROM coal;
- 3 new open cut mining areas; and
- Use of existing CHPP and infrastructure.

Schedule 2, Condition 5 of SSD-4966 permits the carrying out of mining operations on the site until 31 December 2025.

The MOP describes the mining and rehabilitation activities to be undertaken onsite during the MOP term. A new MOP was prepared for the term 1 January 2021 to 31 December 2023 and was lodged with the Resources Regulator on 20 January 2021 and approval granted on 23 July 2021.

4.3 Mining

SMC consists of an open-cut mine which utilises truck and excavator mining methods to produce ROM coal. ROM coal is processed at the CHPP and transported via train on the North Coast Railway to the Port of Newcastle for distribution to the export market.

Mining activities approved under the former Stratford Coal Mine and Bowens Road North Development Consents were suspended in mid-2014. However, ROM coal from the Duralie Coal Mine (DCM) was continued to be processed at the SMC CHPP and transported to the Port of Newcastle for distribution to the export market.

The following key activities were undertaken during the reporting period:

- Mining continued in the Avon North, BRN Open Cut and the Roseville West Open Cut within the existing footprints;
- Mining in the Stratford East Open Cut advanced to the south with further development of the waste emplacement, water division systems and haul road network; and
- Reprocessing of coal from the Western Co-disposal area continued during the reporting period.

Mining operations are permitted 7 days per week. Operational time restrictions apply as prescribed in SSD-4966. During the reporting period SCPL complied with the approved operating hours.

The mining activities proposed for the next reporting period are described in the MOP.

Surface facilities at the mine and current mine development and rehabilitation as at 31 December 2021 are indicated within **Figure 4 (Appendix 1).**

4.3.1 Mining Equipment and Method

The mining and rehabilitation equipment currently in use at the DCM up until 31 December 2021 is listed in **Table 4.3** provided below.

Table 4.3: Current Mining Equipment

Item	Description	Number
Stratford Coal Pty Ltd		
Excavator	Hitachi 2600-6	2
Excavator	Caterpillar 349L	1
Excavator	Liebherr 994B	1
Haul Trucks	Cat 785C	11
Haul Trucks - Emeco	Cat 789C	3
Track Dozer	Caterpillar D10T-2	5
Drill	Epiroc	2
Grader	Caterpillar 18M3	2
Water Cart - Emeco	Caterpillar 777F	2
Water Cart - Emeco	Caterpillar 773F	1
Service Cart - Emeco	Caterpillar 775G	1
Service Cart - Emeco	Mack Metroliner	1
Front End Loader	Caterpillar 988H	1
Front End Loader	Komatsu WA 900-3	1
Front End Loader	Caterpillar 938K	1
Ancillary Mobile Plant	Various	-

Ditchfield Contracting		
Excavator	Komatsu PC1250	1
Excavator	Cat 349, 336	2
Haul Trucks	Volvo A45	1
Track Dozer	Cat D11	1
Water Cart	Volvo A40	1

The mining sequence is summarised below and is conducted in accordance with the approved MOP and supporting approvals including relevant EMPs (refer Section 3.0) as required. The mining sequence generally occurs in the following manner:

- A vegetation clearance and ground disturbance plan is prepared. This included fauna/flora assessments and cultural heritage surveys.
- A sedimentation control plan is prepared for the area to be disturbed.
- Delineation of the proposed disturbance area is undertaken.
- Water infrastructure and sedimentation controls are implemented.
- Tree clearing is limited to the minimum required for ongoing operations and undertaken ahead of the advancing workings.
- Topsoil is removed in accordance with a topsoil stripping plan.
- Overburden removal is undertaken by a hydraulic excavator. Generally, the first one to five metres of subsoil/overburden is ripped and/or free-dug. Deeper overburden requires blasting prior to excavation.
- Overburden waste material is deposited either in out-of-pit waste emplacements or backfilled into mining voids.
- Following waste emplacement, shaping to the approved final landform is undertaken in preparation for rehabilitation works.

4.4 Coal Handling and Beneficiation

4.4.1 CHPP Throughput and Rejects Management

Coal is processed in a 600 tonnes per hour (tph) coal handling and processing plant (CHPP) with coarse coal (i.e. 50mm down to 1mm) treated using dense medium cyclones (50mm to 1.5mm) and “teeter bed” separator/spirals (1.5mm to 0.4mm) and fine coal using floatation (0.4mm to <0.1mm). The CHPP operates on a two shift, 5 days per week basis. Feed to the CHPP is by front end loader based on blending of coal plies from the ROM stockpile. The essential elements of the CHPP and their design capacities are as follows:

ROM coal processing	5.6 Mtpa maximum
CHPP feed rate	600 tph
Product coal	3.3 Mtpa
Train load out rate	3,000 tph

Reclaimed previously emplaced CHPP reject material was also used as feed for the CHPP, as an addition to SMC and DCM ROM coals during the reporting period.

4.4.2 Coal Stockpile Capacity (ROM & Product)

ROM coal stockpile capacity	150,000 t

Product coal stockpile capacity 400,000 t

4.4.3 Product Transport

All saleable (product) coal is transported from site by rail. A total of 148 export trains were loaded during the reporting period. Schedule 2, Condition 8 of SSD-4966 permits a maximum of 6 laden trains per day and no more than 2 laden trains during night-time hours to be dispatched. SCPL were compliant during the reporting period with regard to export trains.

A summary of product coal transported during the reporting period is provided below in **Table 4.4.** It is noted that the total coal transported from site is marginally higher than that produced at the SMC due to changes in stockpile volumes (see **Table 4.2**). Records of the export train movements are provided in **Appendix 8** and are also available on the Stratford Coal website.

Table 4.4: Export Train Coal Transported by Month

MONTH	Product Coal Transported (Tonnes)
January 2021	53,874
February 2021	17,953
March 2021	29,930
April 2021	11,972
May 2021	35,916
June 2021	47,888
July 2021	99,937
August 2021	101,762
September 2021	125,706
October 2021	83,804
November 2021	143,664
December 2021	130,031
Total Annual	**882,437**

4.4.4 CHPP Reject Management

Reject material produced at the SMC CHPP is disposed of in accordance with the SMC Life of Mine Rejects Disposal Plan (RDP 2018). Reference should be made to the RDP for a detailed description of reject management at the SMC. Details of management measures undertaken at SMC are found in Section 7.3 of the SMC Surface Water Management Plan (SWMP).

In general, the coarse and fine reject materials are pumped via pipeline from the CHPP to the Stratford Main pit where they are deposited in locations below the simulated final void ground water levels. Monitoring results for the CHPP rejects are included in **Section 6.12**.

4.5 Waste Management and Recycling

A fully accredited waste contractor was engaged during the reporting period to manage all waste streams from the Stratford Operations. This contract includes general waste and recycling, scrap metal, hydrocarbons including waste grease and oil and hazardous waste.

The waste management contractor provides monthly reporting on all waste streams disposed from the SMC. The monthly reports also provide details of recycling achieved and hazardous substances. The waste management contractor undertakes routine inspections of waste disposal facilities to identify any management actions required.

4.5.1 Sewerage Treatment and Disposal

Sewage treatment at the mine site consists of:

- A “Bio-Treat” tank system located at the main site office. The system works on the combined principles of primary settlement and aerobic treatment. Treated effluent is then discharged via a spray system into a grassed area near the office
- A similar primary treatment and aeration system located at the CHPP. Treated effluent is pumped onto a vegetated area south of the CHPP incorporating the CHPP noise bund;
- A septic tank system for treatment of sewage from the Training Building. Treated effluent is discharged via a spray system into a grassed area near the main site office.
- An active aeration system for treatment of sewage from the bath-house complex. Secondary stage treated effluent is discharged via the spray irrigation system servicing the main office building;
- A one (1) man septic tank system and transpiration trench located at the Rail Load-out Bin.

These sewage treatment facilities are registered with MidCoast Council and serviced on a quarterly basis by a qualified contractor.

EPL 5161 specifies various operational and monitoring requirements. These requirements have been complied with during the reporting period.

4.5.2 Fuel, Oil and Grease Management and Disposal

Fuel (diesel) at the mine site is stored within a fuel handling facility (adjacent to the workshop). An “Acknowledgement of Notification of Hazardous Chemicals on Premises” (Acknowledgement Number NDG 030521 was held for this facility during the reporting period.

No incidents or reportable spills related to this facility occurred during the reporting period.

The fuel bay contains two (2) 110,000 litre above ground diesel Transtanks. A concrete bund surrounds the tanks. Rainfall and any spilt fuel within the bunded area is directed to a collection sump from where it is pumped to a reclaimer system located in the lube bay and passed through an oil water separator.

The CHPP area has two above ground tanks containing chemical reagents, a 10,000 litre tank contains diesel and a 20,000 litre tank contains a frother, “Metfroth”.

Bulk oil is stored within a bunded area at the workshop. Used engine oils (lubricating oils) and hydraulic oils are recovered during plant and vehicle servicing in the workshop and in the field.

Within the workshop area, a separate bunded area holds an 18,000 litre waste oil tank and oil/grease drums. The lube bay is fitted with a silt trap and oil separator. A wash pad facility also contains a silt trap. Waste oil is removed from site by a contractor for subsequent recycling off-site on a regular basis.

Oil for gearboxes and lubrication at the CHPP is stored in drums in a concrete bunded area. Used oil filters and hydraulic hoses are stored within bins and removed from site by a suitably licensed contractor.

4.5.3 Rubbish Disposal

All domestic rubbish (e.g. food scraps, paper etc.) are deposited in industrial rubbish bins which are periodically emptied by a waste contractor for subsequent disposal.

Scrap metal at the CHPP and workshop is collected and placed in bins that have been provided by a scrap metal merchant. The merchant collects the scrap metal following inspection by the waste contractor.

Paper and cardboard is collected for recycling from the workshop, CHPP and main office building. Mixed recycling bins are located at the main office. All contractors are responsible for the collection and removal of their own rubbish.

4.5.4 Waste Minimisation and Performance

The waste management contractor provides monthly reporting on all waste streams disposed from the SMC. The monthly reports also provide details of recycling achieved and hazardous substances.

A review of the effectiveness of waste minimisation and management measures is provided below, including a comparison against results of previous years and assessment of any trends over time. During the reporting period the volume of waste generated at the SMC increased. This was due to increased oily water disposal which was captured on heavy vehicle hard stands during rain events in 2021.

The main waste stream increases were hazardous recycled waste and mixed-solid waste.

During the reporting period the SMC recycled 88.8% of the total waste generated. This is consistent with previous reporting periods.

4.6 Hazardous and Explosive Materials Management

Hazardous materials are stored and used in accordance with relevant safety data sheets (SDS). SDS's are kept in a file inside the First Aid Room and are available from an online database on the company intranet.

Bulk explosive area approved for storage within an explosives compound at site.

All hazardous waste is appropriately disposed of by a fully accredited waste contractor and waste tracking certificates are supplied to SCPL.

4.6.1 Status of Hazardous Chemical Notification

An "Acknowledgement of Notification of Hazardous Chemicals on Premises" (Acknowledgement Number NDG 030521) issued by SafeWork NSW is held by Stratford Coal Pty Ltd. This Acknowledgement addresses:

- Above Ground Tanks (diesel)
- Above Ground Tank (combustible liquids)
- Above Ground Tank (ammonium nitrate)
- Above Ground Tank (ammonium nitrate emulsion)
- External magazine (detonators and boosters)
- Above-ground tank (oxidising liquid)

5.0 Actions Required from Previous Annual Review

DPE provided notification on 1 July 2021 that the SMC Annual Review 2020 satisfies the reporting requirements of the development consent (SSD-4966) and the Department's Annual Review guidelines. Recommendations were made for future Annual Reviews and are listed in **Table 5.1** below.

Table 5.1 – Actions Required from Previous Annual Review

Action Required	Where Addressed in Report
Section 4.5 Waste Management and Recycling – a review of effectiveness of waste minimisation and management measures, including a comparison against results of previous years and assessment of any trends over time	**Section 4.5.4** provides a review of the effectiveness of waste minimisation and management measures. Comment is made on comparison against results of previous years and assessment of any trends over time.
Section 6 Environmental Performance – a review of the results of environmental monitoring conducted during the reporting period, including noise, air quality, surface water quality, groundwater quality and levels, which includes – • a comparison to previous years' results to identify trends in environmental performance over the life of the development • a comparison to relevant predictions made in the Environmental Impact Statement and any discrepancies analysed	**Section 6.3.3.5 – Air Quality** Analysis of Data Trends and comparison with EA Predictions **Section 6.7.3** - **Noise** Analysis of Data Trends and Comparison with EA Predictions **Section 7.3.3 – Surface Water** Analysis of Data Trends and Comparison with EA Predictions **Section 7.4.3 - Groundwater** Analysis of Data Trends and Comparison with EA Predictions
Section 8.3 Rehabilitation Monitoring – status of the implementation, or otherwise, of recommendations on rehabilitation and maintenance activities made in the Stratford Mining Complex Rehabilitation Monitoring Report (Kleinfelder Australia, 2020).	**Section 8.3.2 - Table 8.3** – Status of Implementation of Rehabilitation Recommendations

The Resources Regulator did not provide any further response following the submission of the SMC Annual Review 2020. No further amendments or actions have been requested.

6.0 Environmental Performance

6.1 Review of Environmental Performance

A brief review of environmental performance in relation to Environment Protection License (EPL) 5161, together with SSD-4966 Development Consent conditions, is provided below. This performance is further discussed in the sections on environmental management activities and environmental monitoring.

6.1.1 Development Consent Conditions SSD-4966

SCPL commenced the approved activities in accordance with the conditions of SSD-4966 on 4 April 2018 which was last modified (Mod 2) on 13 January 2020.

Prior to the commencement of SSD-4966, SCPL operated in accordance with DA 23-98/99 for the Stratford Coal Mine and DA 39-02-01 for the BRN Open Cut. These consents have now been surrendered.

Development Consent conditions which were met during this reporting period are described in the following sections. These include administrative and reporting conditions, environmental management and monitoring conditions, community engagement and rehabilitation. Environmental monitoring data was regularly reported as required by the development consent and associated environmental management plans (EMPs).

EMPs required in accordance with the conditions of SSD-4966 have been prepared and continued to be implemented during the reporting period. A Mining Operations Plan and Rehabilitation Management Plan was prepared for the SEP and approved by the Secretary for DRG on 9 March 2018 in advance of operations commencing. Since this time, three revisions of the MOP have been approved by the Resources Regulator on the 11 January 2019, 16 July 2019 and 23 July 2021.

An Independent Environmental Audit (IEA) of the SMC was conducted in December 2020 by Ken Holmes of Barnett & May. The purpose of the audit was to review compliance over the audit period 2018-2020 with the conditions and obligations of the SMC environmental licences, approvals and management plans. The findings and recommendations of the IEA are discussed in Section 10 of this report.

A summary of compliance is included in **Section 1** and **Table 1.2.**

6.1.2 EPA Environment Protection Licence 5161

SCPL continues to operate in accordance with the conditions of EPL 5161. A summary of compliance is included in **Section 1, Table 1.2.** Refer to EPL 5161 Annual Return 2021 for further details.

- All monitoring has generally been carried out in accordance with licence conditions.
- Records of environmental monitoring activities have been kept.
- A record of environmental and pollution complaints has been maintained.
- Dust suppression measures are in place. Dust monitoring to date (dust deposition gauges, high volume (PM10) air samplers and real-time TEOM monitoring) shows that current dust suppression systems are effective and dust levels are generally below the conditions of consent limits. Monitoring results during the reporting period have demonstrated compliance of the SMC with the air quality management criteria.
- One HVAS sampling event failed to run on 23 December 2022, resulting in less than required PM10 monitoring undertaken as per EPL 5161 - M2.2 Air Monitoring Requirements at HVAS unit-Point 13.
- Monthly noise compliance monitoring during the reporting period continued to demonstrate compliance with noise criteria.
- Six (6) sediment dam spills occurred during the reporting period. Spills from SD12, SD17, SD16, DAD13, DAD14 and DAD19 were recorded on 20 March 2021.
- A Pollution Incident Response Management Plan (PIRMP) was maintained and is available on the Stratford Coal website.
- An Annual Return was prepared for EPL 5161.
- Two reportable environmental incidents relating to water discharge occurred at the SMC during the reporting period (further information is included in **Table 1.2** and **Section 11**).

6.2 Meteorological Monitoring

A meteorological station (i.e., weather station) is operated at the mine site as required by SSD-4966. The location of the meteorological station and the two inversion monitoring towers is shown on **Figure 3 (Appendix 1).**

6.2.1 Rainfall

Table 6.1 provided below summarises the rainfall record obtained from the site Weather Station rain gauge. Graphical representation of the historical average and monthly recorded rainfall during the reporting period is provided in **Appendix 2**.

Table 6.1: Stratford Mine - Monthly Rainfall Records

MONTH	YEAR				Stratford District
	2021		2020		Average
	Monthly Total (mm)	No. of Rain Days/Month[1,2]	Monthly Total (mm)	No. of Rain Days/Month[1,2]	1908-2007
January	167.8	15	81.8	11	113.7
February	174.4	19	355	19	114.8
March	433.2	16	128.2	17	129.3
April	56.2	5	15.6	7	78.2
May	41.6	10	48.4	6	71.6
June	88.6	13	55.6	6	69.4
July	36.8	8	88.0	7	52.7
August	23	4	34.2	5	47.1
September	61.2	10	29	3	50.5
October	92.6	14	69.2	8	65.5
November	211.2	18	37.8	8	82.7
December	111.2	16	226.8	19	102.2
Total	**1497.8**	**148**	**1169.6**	**116**	**977.7**

Notes:

1. No. of Rain Days/Month - the number of days in the month on which rain fell
2. When tipping bucket rain gauge data used, a "rain day" by definition requires a minimum recording of >0.20mm comprising dew, heavy fog or light rain (or a combination thereof.

The 2021 calendar year rainfall total was higher than the long-term district average and the 2020 calendar year rainfall total. Eight of the twelve months in 2021 exceeded their respective long-term average.

6.2.2 Wind Speed and Direction

Table 6.2 below indicates the monthly average and maximum wind speeds and dominant wind directions for the period January 2021 to December 2021, inclusive. The graphical representation of the daily average and maximum wind speeds recorded and monthly wind roses for each month during this period are provided in **Appendix 2**.

Table 6.2: Monthly Average and Maximum Wind Speeds and Dominant Wind Directions by Month

MONTH	AVERAGE WIND SPEED (k/hr)	MAXIMUM WIND SPEED RECORDED	DOMINANT WIND DIRECTIONS
January 2021	9.1	35.4	N
February 2021	8.6	36.6	SSW
March 2021	7.7	54.0	SSW
April 2021	5.9	42.5	NNE

MONTH	AVERAGE WIND SPEED (k/hr)	MAXIMUM WIND SPEED RECORDED	DOMINANT WIND DIRECTIONS
May 2021	6.6	38.9	SSW & NNE
June 2021	6.7	42.4	NNE
July 2021	8.4	57.6	NNE
August 2021	7.8	50.7	NNE
September 2021	9.0	41.4	NNE & S-SSW
October 2021	9.4	65.3	NNE
November 2021	9.8	50.6	SSW
December 2021	8.7	51.7	S

6.2.3 Temperature

Table 6.3 summarises monthly air temperatures. The graphical representation of the daily minimum, average and maximum atmospheric temperatures recorded for each month is provided in **Appendix 2**.

Table 6.3: Monthly Minimum, Average and Maximum Air Temperatures

MONTH	MINIMUM AIR TEMP RECORDED (deg C)	AVERAGE AIR TEMP (deg C)	MAXIMUM AIR TEMP RECORDED (deg C)
January 2021	9.7	21.6	36.4
February 2021	13.5	21.0	32.4
March 2021	10.4	19.6	33.6
April 2021	2.7	15.6	29.8
May 2021	-0.7	13.2	25.5
June 2021	-1.6	10.2	20.8
July 2021	-1.8	10.0	26.0
August 2021	-1	12.3	28.4
September 2021	0.9	14.4	30.9
October 2021	5.1	17.6	33.2
November 2021	7.6	18.7	30.3
December 2021	10	20.8	35.4

6.3 Air Quality

6.3.1 Air Quality Control Procedures

SMC has an approved Air Quality Management Plan (AQMP) that establishes a dust management strategy which:

- Identifies air quality criteria;
- Outlines proactive and responsive dust management and control measures;
- Establishes dust management protocols;
- Formulates an air quality monitoring programme;
- Establishes data assessment protocols; and
- Details reporting and review requirements.

The following dust control procedures are used during mining operations to control dust emissions from wind erosion on exposed areas and dust generated from mining, handling and processing activities:

- Minimising topsoil stripping operations ahead of the pre-strip to minimise the area of exposed ground;
- Progressive rehabilitation including prompt reshaping, topsoiling and revegetation;
- Watering of haul roads and other trafficked areas;
- Watering dig faces prior to and during digging;
- Fitting drills with dust suppression equipment including aprons and sprays;
- Regular maintenance of hauls roads and minor roads;
- Modifying operations during adverse weather conditions;
- Watering of disturbed areas at the end of shift to help mitigate any potential dust generation when the mine is not operating (as necessary);
- Real-time monitoring with alarm triggers set to enable implementation of reactive dust control management measures;
- A predictive meteorological forecasting system to enable implementation of proactive dust control management measures; and
- Vehicle speed restriction to 60 kilometres per hour.

At the CHPP, potential dust emission sources are controlled by water sprays at a number of locations:

- Run of Mine (ROM) Coal Bin;
- Crusher Station;
- Stamler Feeder/Breaker;
- Product Coal Stockpile (overhead sprays on the conveyor); and
- Train load out.

Sprays are automated in most instances by a solenoid connected to the weight of material on the conveyor belt. Sprays at the ROM Bin, Crusher Station and Stamler operate when 50t/hr of material is on the belts.

The product coal stockpile sprays are located on the overhead conveyor system. A wind speed/direction device provides information to a computer located in the CHPP control room that can electrically activate solenoids valves. The valves open and close in a programmed cycle that alternatively activates sprinkler heads above the stockpile. The dust suppression system operates when the wind speed exceeds 5m/s for >30 seconds.

6.3.2 Air Quality Monitoring and Criteria

SCPL monitors air quality (dust) surrounding the mine site by means of a network of seven (7) static dust fallout gauges, five (5) high volume PM10 air samplers, two real-time dust monitors (TEOM) and a meteorological monitoring station (i.e. weather station). The locations of these monitoring sites are shown on **Figure 3 (Appendix 1).**

Monthly dust deposition levels are measured so that dust deposition rates in g/m2/month can be determined at or near seven (7) residences that surround the mine site. The annual average condition of consent limit for dust deposition is 4.0g/m2/month.

The high-volume air samplers (HVAS) (PM10), are located near Stratford Village and Craven Village and are also located to the north and south of the operations. The HVAS results are also used for total suspended particulate (TSP) estimation.

HVAS sampling is undertaken over a 24 hour 6 day week cycle in accordance with AS 2724.3. The consent criteria for PM10 air quality is an annual average limit of 30ug/m3/day cumulative impact and a 24-hour average limit of 50ug/m3/day incremental impact.

Two Tapered Element Oscillating Microbalance (TEOM) analysers measuring PM10 and PM2.5 are used to continuously measure particulate matter. The TEOMs are located in close proximity to Stratford village and Craven village. Real-time air quality monitoring data is used to identify when ambient PM10 levels in the surrounding environment are elevated and require contingency action. Real-time response triggers have been established and are designed to provide a system to warn operations personnel (via SMS) when dust levels are approaching a relevant criterion and to require management/control actions to mitigate potential impacts.

6.3.3 Review of Air Quality Monitoring Results & Performance

6.3.3.1 Dust Deposition Gauges

Table 6.4 shows the dust deposition results for seven (7) dust deposition gauges and annual averages at the end of the reporting period (December 2021).

Table 6.4: Dust Deposition Gauge Results

	D5	D6	D7	D8	D9	D10	D11
January 2021	0.3	0.5	0.3	1.5	0.3	0.5	2.2
February 2021	0.3	0.2	0.4	4.7	0.5	0.5	0.5
March 2021	0.8	0.4	1.0	$5.7^{I,V}$	0.4	0.8	2.7
April 2021	0.2	0.1	0.1	$4.0^{I,V,S}$	0.1	0.1	0.1
May 2021	0.1	0.2	0.2	2.4	0.4	0.2	0.3
June 2021	0.1	0.2	0.2	0.6	0.2	0.1	0.1
July 2021	0.2	0.5	0.4	1.1	0.7	0.3	0.3
August 2021	0.6	0.7	0.2	1.9	2.9	0.2	0.4
September 2021	0.4	0.6	0.3	1.1	0.4	0.5	0.3
October 2021	0.7	0.9	0.5	1.5	1.0	0.5	1.6
November 2021	0.6	0.8	0.4	2.8	0.6	0.8	0.8
December 2021	0.6	0.8	0.6	0.7	1.5	0.6	0.5
Annual Average	**0.4**	**0.5**	**0.4**	**1.8**	**0.8**	**0.4**	**0.8**

Notes/excluded results, Visual Description Guide:
D=Dirt: Subhedral to euhedral crystalline grains including fine sand, clay and other fine mineral particulates.
C=Coal: Black sharp angled grains with glossy conchoidal fractures or dull with cellular feature.
I=Insects: Whole insects e.g. spiders, ants, moths or outer parts of insects including wings, legs and exoskeletons.
S=Polysaccharide Slime: Slimy gelatinous material including decomposed soft body parts of insects and vegetation.
V=Vegetation: Plant debris and algae including trichomes, decomposed organic matter and particulates showing characteristic cellular structures.
B=Bird droppings: The most common contamination.
O=Other contaminants not included above.

Dust levels recorded had an average value of 0.7 g/m2/month (contaminated results not counted). Elevated values were at times affected by various degrees of contamination from insects, bird droppings, vegetation (seeds/grasses) and algae. Gauges deemed contaminated during the reporting period were D8 in March 2021 and April 2021.

6.3.3.2 High Volume (PM10) Air Samplers

HVAS PM_{10} monitoring results show that all monitoring locations (in terms of monitored days) did not exceed the National Environmental Protection Measure (NEPM) of 50ug/m^3/day, listed under

Condition 19, Schedule 3 of the Project Approval. **Figure 3-3 (Appendix 3)** shows the recorded PM10 24hr results across the five HVAS monitoring sites during the reporting period. It is noted that Stratford HVAS (H—Vol1) failed to operate on the scheduled run date 23 December 2021.

The HVAS annual rolling averages remained low and fluctuations generally reflect changes in meteorological conditions throughout the year, i.e. rainfall and wind (**refer Figure 3-4 Appendix 3**).

6.3.3.3 High Volume (TSP) Air Calculation

A site-specific correlation between TSP and PM10 concentrations was developed by SCPL, based on co-located HVAS measuring PM10 and TSP as per the AQMP. From the monitoring, approximately 45% of TSP was PM10, which compares well with the relationship developed by the NSW Minerals Council for the Hunter Valley (NSW Minerals Council, 2000), which found that approximately 40% of TSP is PM10.

Figure 3-5 (Appendix 3) shows the Total Suspended Particulate estimates across the five HVAS during the reporting period. The Development Consent Criteria of 90ug/m3 was not exceeded during the reporting period.

The HVAS monitoring results are generally similar to those reported in previous ARs and align with predictions made in the EIS (2012) that particulate levels (PM10 and TSP) would not exceed relevant air quality criteria at any residence.

6.3.3.4 TEOM (PM10) Monitoring

Two TEOM dust analysers measuring PM10 and PM2.5 are used to continuously measure particulate matter and provide a management tool for operations to guide proactive and reactive mitigation measures. The TEOMs are located in close proximity to Stratford village and Craven village. Real-time air quality monitoring data is used to identify when ambient PM10 levels in the surrounding environment are elevated and require contingency action. Real-time response triggers have been established and are designed to provide a system to warn operation personnel (via SMS) when dust levels are approaching a relevant criterion and to require management/control actions to mitigate potential impacts.

The Stratford Village TEOM was installed in June 2013 and the Craven Village TEOM was installed and began operation in August 2018. The annual average PM10 for the Stratford TEOM from 1 January 2021 to 31 December 2021 is 9.4ug/m3. The annual average PM10 for the Craven TEOM from 1 January 2021 to 31 December 2021 is 6.0ug/m3. The 24 hour average results for the reporting period and graphical representation of the rolling annual average of PM10 results are provided in **Appendix 3.**

The TEOM results are generally consistent with those measured by the HVAS units. The TEOM results continue to be utilised as a management tool for operations to determine proactive and reactive dust controls.

A register was maintained of any trigger alarms from the TEOM system to record the response implemented by SCPL. Alarms during the reporting period primarily resulted from either external events such as wind or system faults such as erroneous recorded values. The real-time dust monitoring response register for the reporting period is provided in **Appendix 3**.

6.3.3.5 Analysis of Data Trends and comparison with EA Predictions

Table 6.5 presents the annual average dust deposition levels at the end of the reporting period (December 2021) along with the previous five years. The 2021 reporting period annual average dust deposition levels are within the range of results recorded in the previous five years at all sites. All 2021 annual averages are well below the performance criteria. Graphical representation of dust gauge results and annual rolling averages are provided in **Appendix 3**.

Table 6.5: Annual Average Dust Deposition Gauge Results

Reporting Period	Total Insoluble Solids (g/m^2/month)						
	D5	D6	D7	D8	D9	D10	D11
Criteria	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**	**4.0**
2016	0.8	1.0	0.6	0.8	0.5	0.5	0.8
2017	0.6	1.2	0.6	0.6	0.4	0.5	0.9
2018	0.8	1.1	0.9	0.8	1.1	0.7	1.2
2019	1.1	1.2	0.9	1.3	1.0	1.2	1.7
2020	0.6	1.1	1.2	1.0	0.8	1.1	0.9
2021	0.4	0.5	0.4	1.8	0.8	0.4	0.8

The dust deposition monitoring results are similar to results presented in previous reports and align with predictions made in the Stratford Extension Project EIS (2012) that dust deposition levels would not exceed relevant air quality criteria at any private residence.

Table 6.6 presents the reporting period (December 2021) HVAS PM_{10} annual averages along with the previous five years.

Table 6.6: Annual Rolling Average HVAS (PM_{10}) Results

Reporting Period	PM10 (µg/m3)				
	Stratford	Craven	Ellis	Clarke	Glen Road*
Criteria	**30**	**30**	**30**	**30**	**30**
2016	7.7	7.4	11.0	7.0	NA
2017	8.3	7.6	12.8	7.2	NA
2018	8.3	9.2	14.9	9.7	NA
2019**	16.1	15.7	24.6	16.1	30.7
2020	8.6	8.7	9.8	8.3	10.5
2021	6.2	6.0	6.3	5.8	8.0

*Glen Road added to monitoring program late 2019

**High results recorded due to extraordinary bushfire events during 2019

Annual averages for all sampling locations were well below the 30 µg/m3/day criterion set under the Project Approval. The HVAS rolling averages decreased over the 12-month period but are consistent with previous years (excluding 2019 where widespread bushfires caused elevated results).

Results of HVAS monitoring are in concurrence with the EIS (2012), which predicts the annual average PM10 criteria of 30µg/m3 will not be exceeded at any private receiver and that project only 24 hour PM10 concentrations will not be above the 50 µg/m3 assessment criteria at any privately owned receiver. The HVAS annual rolling averages reduced to near background levels following exclusion of bushfire affected results. HVAS results remain low and fluctuations generally reflect changes in meteorological conditions throughout the year, i.e. rainfall and wind.

6.3.4 Air Quality Complaints

One (1) complaint related to air quality was received during the reporting period. SCPL continues to implement measures to reduce the impacts to air quality far as reasonably practicable. A full detailed complaints list is provided in **Appendix 7**.

6.4 Biodiversity Management

In accordance with Condition 33, Schedule 3 of SSD-4966, SCPL is required to implement the Biodiversity Offset Strategy and achieve the broad completion criteria to the satisfaction of the Secretary of the DPE. The management of biodiversity at the SMC in both the Mining Lease areas and the Biodiversity Areas is undertaken in accordance with the approved Biodiversity Management Plan (BMP).

The Stratford Mining Complex Annual Biodiversity Report 2021 provides a review of the effectiveness of measures in the Biodiversity Management Plan (BMP) for the annual year ending 31 December 2021 in accordance with Section 8.2.1 of the BMP. The scope of the report includes the biodiversity management activities across the Mining Lease areas, the Biodiversity Offset Areas and the Biodiversity Enhancement Area.

In accordance with the BMP, the Stratford Mining Complex Annual Biodiversity Report 2021 is included in **Appendix 9**. A summary of the main biodiversity activities and conclusions are provided in the subsections below.

6.4.1 Vegetation Clearance Report

Vegetation clearance is undertaken in accordance with the BMP Section 4.1 Vegetation Clearance Protocol. Prior to any clearance operations being undertaken a Clearing Plan is prepared, and pre-clearance surveys are undertaken.

During the 2021 reporting period, vegetation clearance was undertaken in advance of mining operations in the following areas:

- Avon North Open Cut Stage 3 Extension
- Stratford East Open Cut Stage 3
- Stratford East Open Cut Stage 3 Haul Road Extension
- Roseville to BRN Haul Road

The area of disturbance at the end of 2021 is shown in the **Figure 4 (Appendix 1).**

Information obtained during the preparation of the Clearing Plans and the vegetation clearance activities (i.e. habitat features, hollows cleared and fauna observed) is used to determine the requirements for nest box replacement in the Biodiversity Offset and Enhancement Areas.

During the 2021 reporting period a total of four (4) habitat features all of which were identified to be glider suitable tree hollows.

Section 4.1.4 of the BMP requires salvaged material from vegetation clearance activities to be used for habitat enhancement within the rehabilitation, Biodiversity Offset areas and Biodiversity Enhancement Areas. Habitat features such as trunks, logs, large rocks, branches, stumps and roots are salvaged and relocated where practicable.

The areas cleared in advance of mining in 2021 were a mixture of previously cleared pasture and medium density woodland with habitat material available for salvage. In these areas, the cleared vegetation was managed as follows:

- Suitable trees and stumps were salvaged and stockpiled adjacent to the Stratford East Open Cut Area for reuse

6.4.2 Managing Access, Fencing, Gates and Signage

Managing access, fencing, gates and signage is undertaken in accordance with the BMP Section 5.1 and 5.2.

The implementation of the BMP management measures commenced in April 2020. The BMP requires works to be undertaken to exclude livestock and control access to the Biodiversity Offset areas and Biodiversity Enhancement Areas.

During the reporting period, mapping of fencing and access tracks has been completed to assist with ongoing management of the Biodiversity Areas. During the reporting period the removal of redundant fencing has continued and maintenance of existing fencing has been undertaken as required. Access tracks have continued to be maintained.

Livestock have been excluded from the Biodiversity Areas. Livestock will only be permitted in the Biodiversity Areas for 'crash grazing' programs in preparation for revegetation activities in accordance with the BMP.

The installation of signage was completed in 2018. All key points of access to the Biodiversity Areas were identified and had signage erected.

6.4.3 Revegetation Management

Seed Collection & Propagation

Seed collection and propagation is undertaken in accordance with the BMP Sections 4.1.5 and 5.3.

Revegetation in the BMP Revegetation Areas (BMP Management Zone A) will occur via seed and tube-stock. Local endemic (adapted) species are preferentially be used where a seed supply is available, however consideration will be given to the use of a high-quality seed sourced further from the site as required.

In preparation for revegetation works each year, SCPL has prepared a scope and schedule for the revegetation works to be implemented. The total volume of seed required was calculated based on the floral listings for the target communities in the BMP appendices.

Kleinfelder, Cumberland Seeds, Hunter Indigenous and Riverdene Nursery have been engaged to assist in the propagation of native plant species with tube-stock grown under controlled nursery conditions and delivered to site as required for revegetation works in the next reporting period.

Revegetation & Regeneration

Revegetation management is undertaken in accordance with the BMP Section 5.3 Revegetation Programme.

The aim of revegetation is to establish a range of habitat niches including native canopy, and understorey. The Revegetation Area (Management Zone A) in the Biodiversity Areas will be revegetated to substantially increase the area of native vegetation in the area and maximise habitat diversity and a range of successional stages.

During 2019 SCPL prepared a scope and schedule for the revegetation works to be implemented in the Biodiversity Areas. Kleinfelder have been engaged to assist with both the site planning and implementation of the revegetation works. The site planning included:

- Mapping of the priority revegetation areas completed in 2020.
- Calculation of seed and tube-stock requirements based on the indicative lists of flora species in the BMP appendices.

Furthermore, a scope and schedule for the revegetation works to be implemented 2022 has been prepared during the second half of 2021. The proposed revegetation schedule for the Biodiversity Areas in 2021 is included in Annual Biodiversity Report (**Appendix 9**).

The Autumn 2021 revegetation work was divided into four tubestock planting areas; Wenham Cox Rd Amenity Screen, Rogerson Property, Offsets Area 4 – Johnson/Foreman Properties and Offset Area 3 – Colinda Property.

The next round of tube-stock planting is scheduled to commence in April 2022. Details of the 2022 revegetation works will be included in the next annual biodiversity report.

Monitoring

Vegetation Monitoring commenced in 2019 to assess the effectiveness of revegetation in the Revegetation Area (Management Zone A) and to assess the natural regeneration in the Existing Remnant Vegetation Area (Management Zone B). The data gathered in 2019 will serve as a baseline to assess the success of the revegetation efforts for future reporting periods.

Vegetation monitoring was undertaken again in February 2021. Habitat and vegetation monitoring is discussed in Section 11 of the Annual Biodiversity Report **(Appendix 9**). Habitat and vegetation condition monitoring will continue to be undertaken annually to quantitatively measure the change in habitat and vegetation condition over time and to inform any ongoing maintenance requirements.

6.4.4 Weed Control and Monitoring

Weed control is undertaken in accordance with the BMP Sections 4.4 and 5.6. The weed control program aims to manage weeds to minimise their impact on native flora and fauna.

A contractor is engaged at the SMC to undertake weed management activities on an ongoing basis. Weed management during summer 2020/21 was continued following above average rainfall in December 2020. Following a flood event in March 2021 weed spraying re-commenced and continued through autumn. Weed spraying commenced again during November 2021 and will continue through autumn 2022. The weed control activities in 2021 continued to target areas of known weed infestation. The key species targeted included blackberry, lantana, privet, wild tobacco and Giant Parramatta grass.

Weeds mapping is proposed to be undertaken during the next reporting period to assist in setting future management priorities and developing on-ground actions for weed control.

Weeds monitoring to evaluate the effectiveness of control measures is undertaken in conjunction with the annual vegetation monitoring and is documented in Annual Biodiversity Report.

6.4.5 Feral Animal Control and Monitoring

Feral animal control is undertaken in accordance with the BMP Section 4.5 and Section 5.7. The objective of feral animal control program is to manage feral animals to minimise their impact on native flora and fauna in the Biodiversity Offset and Biodiversity Enhancement Areas or the impact on agricultural production in other surrounding areas.

MDP Vertebrate Pest Management has been engaged by SCPL since 2016 to implement wild dog and fox control programs across property owned by SCPL including both the Stratford & Duralie Mining Leases and the Stratford & Duralie Biodiversity Offset Areas. During the reporting period, one wild dog control program was undertaken between 4 October 2021 to 5 November 2021. The program was productive and successful with a total of 6 wild dogs and 3 foxes trapped over the 31-Day control program.

The program is showing positive results of reducing the impacts of wild dogs and foxes within the area to the native animals and reducing the impact of livestock attacks to the surrounding agricultural properties.

6.4.6 Bushfire Management

Bushfire management is undertaken in accordance with the BMP Sections 4.7 and 5.9. The objective of bushfire management in the Biodiversity Areas is to prevent impacts from unplanned bushfire and to use fire to promote biodiversity.

Monitoring of fuel loads to evaluate bushfire risk and guide bushfire hazard reduction activities is undertaken in conjunction with the annual vegetation monitoring and was conducted in March 2021. Bushfire risk has continued to be mitigated through the maintenance of access tracks and fire breaks. Additionally, fuel loads have been reduced during 2021 by slashing where required in the Mining Leases and Biodiversity Areas. During 2021 no hazard reduction burning has been undertaken. Following the revegetation works, the aim is to exclude fire from the offset areas for at least 5 years to allow for tubestock and seedlings to establish.

Schedule 3 Condition 51 of SSD-4966 requires the SCPL to assist the Rural Fire Service and emergency services as much as possible if there is a fire in the surrounding area. Due to the ongoing drought conditions in 2019/20, water supplies for firefighting were very limited and presented significant challenges for the NSW Rural Fire Service. During November 2019, SCPL informed the RFS of the availability and location of water sources at both the Stratford Mining Complex and the Duralie Mine site which could be accessed for fire fighting purposes.

Section 4.7 of the BMP states SCPL will:

- ensure that the development is suitably equipped to respond to any fires on site; and
- assist the Rural Fire Service (RFS), emergency services and National Parks and Wildlife Service as much as possible if there is a fire in the surrounding area

6.4.7 Nest Box Program

Nest box management is undertaken in accordance with the BMP Section 5.10. Nest boxes will be installed to provide habitat opportunities in the short to medium-term for a number of arboreal fauna species including the Squirrel Glider.

The nest box programme consists of two main components to replace any tree hollows cleared prior to mining activities:

- Suitable nest boxes for the Squirrel Glider will be installed at a ratio of least 3:1 for each tree hollow cleared suitable for the Squirrel Glider.
- For tree hollows that provide habitat to arboreal fauna species (other than the Squirrel Glider), nest boxes will be installed at a minimum ratio of 1:1 (i.e. one nest box of appropriate size to replace one hollow of similar size and properties).

A summary of the vegetation cleared including habitat features and tree hollows is included in **Appendix 9**.

Nest boxes are installed within the Biodiversity Offset Area and Biodiversity Enhancement Area in Existing Remnant Vegetation (Management Zone B) as well as the Revegetation Area (Management Zone A).

The installation of nest boxes has occurred over four periods with the most recent installation in February and March 2021. During the reporting period 101 new nest boxes were installed in the Biodiversity Areas for additional habitat enhancement. Eighty-three (83) nest boxes targeting Squirrel Glider (Petaurus norfolcensis) and eighteen (18) nest boxes targeting a variety of hollow-dependent fauna were installed in February and March 2021.

In accordance with Section 5.10 of the BMP, nest boxes will be monitored by suitably qualified personnel with quarterly inspections during the first year followed by annual inspections in spring. Quarterly monitoring of the nest box program was undertaken in February, May and July 2021. Monitoring reports are included in the Annual Biodiversity Report.

Nest boxes will continue to be installed in accordance with the BMP.

6.4.8 Squirrel Glider Management Plan

The management of Squirrel Glider populations is undertaken in accordance with the Squirrel Glider Management Plan (SQMP). The SGMP has been prepared to facilitate the management of squirrel glider populations at the SMC, Biodiversity Enhancement Areas and Biodiversity Offset Areas.

Squirrel glider management programs which have commenced include:

- definition of the squirrel glider colonies (SQMP Section 4.1)
- identification of the squirrel glider home ranges (SQMP 4.2)
- tree hollow census within the home ranges (SQMP Section 7.1)
- nest box program (SQMP Section 7.2) in conjunction with BMP nest box program
- Squirrel Glider vegetation pathways (SQMP Section 8.1) in conjunction with BMP revegetation
- Squirrel Glider population monitoring (SQMP Section 10.1) in conjunction with BMP fauna monitoring.

Squirrel Glider Colonies and Home Range

Kleinfelder was engaged to undertake an initial targeted Squirrel Glider survey to confirm the location of Squirrel Glider colonies within the potential habitat in the vicinity of the SMC Biodiversity Areas. The initial surveys were undertaken during November to December 2018 and the results are provided in the Initial Squirrel Glider survey as part of Stratford Coal's Squirrel Glider Management Plan (SCPL, 2018c). Squirrel gliders were identified at five locations out of the 37 locations surveyed.

Kleinfelder was engaged to undertake a radio tracking program to determine the squirrel glider home ranges. Two radio tracking programs were conducted between January and April 2019 and between July and September 2019. The 2019 tracking programs consisted of trapping of the squirrel glider, fitting radio tracking collars and two (2) radio tracking program conducted over 80 nights total. A total of thirty-six (36) squirrel gliders were captured during the program, nineteen (19) squirrel gliders were fitted with radio collars and sufficient data points were obtained to allow home range estimates for 13 gliders.

This information will be used to guide the ongoing management of squirrel glider populations within the SMC Biodiversity Offset Areas and Biodiversity Enhancement Areas. This information will also define the study area for further programs including the census of suitable tree hollows, food resources surveys and habitat enhancement including nest box installations.

Tree Hollow Census

Condition 38(b), Schedule 3 of SSD-4966 requires a census of suitable tree hollows in home ranges and offset areas suitable for squirrel gliders. A tree hollow census was undertaken within the home ranges identified by the radio tracking program described above to identify hollow bearing trees suitable for use as den sites by the squirrel glider.

The hollow-bearing tree census identified and mapped 480 hollow-bearing trees which contained a combined total of 648 hollows. Attributes of available hollows and known den hollows were compared to investigate the hollow preferences of squirrel gliders.

Direct comparison of the density of hollow-bearing trees recorded in the biodiversity enhancement and offsets areas to vegetation community benchmark data for the relevant vegetation type shows that the two major vegetation communities at the SMC were found to contain significantly lower densities of hollow-bearing trees. Information provided in this report can be used to identify areas best suited for nest box installation.

6.4.9 Biodiversity Offset Monitoring and Reporting

The Biodiversity Offset monitoring program is prescribed in the BMP Section 7. The program aims to monitor and report on the effectiveness of the BMP management measures and progress against the detailed performance and completion criteria.

The Stratford Mining Complex Annual Biodiversity Report 2021 provides a review of the effectiveness of measures in the Biodiversity Management Plan (BMP) for the annual year ending 31 December 2021 in accordance with Section 8.2.1 of the BMP and is included in **Appendix 9**. The annual report includes the results of the monitoring for:

- Habitat and Vegetation monitoring, including visual and photo monitoring;
- Fauna monitoring program
- Effectiveness of weed control;
- Effectiveness of feral animal control;
- Nest box monitoring program.

Habitat and Vegetation Monitoring

Habitat and vegetation condition monitoring is undertaken to quantitatively measure the change in habitat and vegetation condition over time. The visual monitoring and photo monitoring programs are

undertaken concurrently with the vegetation monitoring to provide additional information on the change of the Biodiversity Areas over time and inform maintenance requirements.

Vegetation Monitoring commenced in 2019 to assess the effectiveness of revegetation in the Revegetation Area (Management Zone A) and to assess the natural regeneration in the Existing Remnant Vegetation Area (Management Zone B). The data gathered in 2019 serves as a baseline to assess the success of the revegetation efforts and progress against the project specific performance and completion criteria. This survey was undertaken prior to the revegetation works commencing in the Biodiversity Offset areas.

Vegetation monitoring was undertaken again in March 2021. Habitat and vegetation condition monitoring will continue to be undertaken annually to quantitatively measure the change in habitat and vegetation condition over time and to inform any ongoing maintenance requirements.

In summary, the monitoring results show good progress has been made with the successful introduction of many target species in areas that have been replanted. The increased rainfall that has continued to be experienced since this survey was undertaken will contribute to good growth for the older rehabilitation and improve survival for the newer planted areas.”

Fauna Monitoring

Monitoring of fauna usage within the Biodiversity Areas is conducted every three years to document the fauna species response to improvement in vegetation and habitat in the Biodiversity Areas and assess the performance in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity, species richness and abundance.

The first round of fauna monitoring was completed by AMBS Ecology and Heritage within the SMC Biodiversity Offset areas and Biodiversity Enhancement Area during September and October 2019. A total of 167 species of vertebrate were recorded including twenty-two (22) species listed as either threatened or migratory on the schedules of the Biodiversity Conservation Act 2016 (BC Act) and/or Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act).

The fauna surveys suggest the SMC Offset and Biodiversity Enhancement Areas provide habitat for a range of native vertebrate fauna, including birds, mammals, reptiles and frogs. Two of the threatened species recorded, the Black-chinned Honeyeater and Red-legged Pademelon, have not previously been recorded at SMC. Further detail of monitoring results can be found in **Appendix 9**.

6.4.10 Long Term Security and Conservation Bond

Long-term Security

In accordance with Condition 36, Schedule 3 of Development Consent SSD-4966, SCPL is required to make suitable arrangements for the long-term security of the Stratford Extension Project Biodiversity Offset Area. SCPL has pursued the mechanisms available under section 88E(3) of the NSW Conveyancing Act, 1919, namely:

- Registration of a Positive Covenant under section 88E(3) of the NSW Conveyancing Act, 1919; and
- Registration of a Restriction on the Use of Land by a Prescribed Authority under section 88E(3) of the NSW Conveyancing Act, 1919.

Public Positive Covenants and Restrictions on the Use of Land for the Biodiversity Offsets have been registered on title with NSW Land and Property Information (LPI) in October 2019. Copies of the

executed Positive Covenants and notice of registration of the instruments was included in the 2019 SMC Annual Biodiversity Report.

Conservation Bond

In accordance with Condition 40, Schedule 3 of Development Consent SSD-4966, SCPL is required to lodge a Conservation Bond with the DP&E which covers the cost of implementing the Biodiversity Offset Strategy detailed in the BMP.

The conservation bond calculation was prepared by Kleinfelder and a verification of the costs was undertaken by Rider Levett Bucknall. The conservation bond calculation was submitted in January 2019 and subsequently approved by DP&E on 15 January 2019.

The Conservation Bond in the form of a bank guarantee was executed and lodged with DP&E on 8 February 2019.

6.4.11 Bowens Road North Biodiversity Offset Strategy

SSD-4966 Schedule 3 Condition 41 requires the ongoing implementation of the Bowens Road North Offset Strategy.

The BRN Offset Area is adjacent to the Duralie Coal Mine Biodiversity Offset and is managed under the approved Duralie Coal Mine Biodiversity Management Plan (Duralie BMP).

The Duralie Coal Mine Annual Biodiversity Report contains a review of the environmental performance and progress against the requirements of the Duralie BMP covering the biodiversity offset area including the BRN component. Refer to the Duralie Coal Mine Annual Reviews.

6.5 Bioremediation

Operations at the SMC are conducted with the aim of minimising the potential for land contamination. The management of hydrocarbon contaminated soils is detailed in the SMC PIRMP. SMC has previously operated an onsite bioremediation area for hydrocarbon contaminated soil where biological degradation of hydrocarbons is used to reduce the hydrocarbon concentration in the soil to an acceptable level.

Since recommencing mining operations at the SMC, the bioremediation facility has not been reconstructed. Any hydrocarbon contaminated material is recovered and stored for disposal offsite by the licenced waste contractor engaged at SMC.

6.6 Blasting

6.6.1 Blast Criteria and Control Procedures

Blasting at the SCM is conducted in accordance with Conditions 9-15, Schedule 3 of SSD-4966, respective EPL conditions and the approved Blast Management Plan (BLMP).

The BLMP establishes a blast management strategy which:

- Identifies blasting criteria;
- Outlines blast management and control measures;
- Establishes blast management protocols;

- Formulates a blast monitoring programme;
- Details reporting and review requirements.

EPL 5161 condition L3 and Schedule 3, Condition 9 of SSD-4966 states that overpressure caused by blasting at monitored locations may exceed 115 dB(L) for no more than 5% of blasts during the 12 month reporting period and must not exceed 120 dB(L) at any time. Similarly, ground vibration at monitored locations caused by blasting may exceed a peak particle velocity of 5 mm/s for no more than 5% of blasts during the 12 month reporting period and not exceed 10 mm/s.

In accordance with SSD-4966, a dedicated blasting hotline (02 6538 4253) is available to provide current scheduled blasting times for the SMC. Persons living within two (2) kilometres of an active or approved operational area may also request advice of scheduled blasting activities. Notification of blasting is provided to emergency authorities and neighbouring landowners approximately twenty-four (24) hours prior to each blast.

The permitted blasting hours and frequency are prescribed in SSD-4966. Blasting is permitted between 9am and 5pm on Monday to Saturday only. Additionally, a maximum of 1 blast per day is permitted on site and an annual average of 3 blasts per week. A total of 74 blasts were undertaken on site during 2021. SCPL were compliant with the permitted blast hours and frequencies specified under SSD-4966 during the reporting period. The results of blast monitoring undertaken are provided in **Appendix 5**.

Blasting activities are designed and managed in accordance with the BLMP.

6.6.2 Review of Blast Monitoring Results & Performance

Blasting activities during the reporting period were undertaken within the Bowens Road North Open Cut, Avon North Open Cut, Roseville West Open Cut and the Stratford East Open Cut.

The locations of blast monitoring units are shown on **Figure 3 (Appendix 1**). Blast monitors are located at the following residences:

- Isaac Property (mine owned) (south-west of blasting);
- Ex-Judge Property (mine owned) (west);
- Atkins Property (mine owned) (north-west);
- Greenwood Property (south); and
- Clarke Property (mine owned) (east).

Monitoring is undertaken at the Clarke property due to restrictions with monitoring at the next closest residence on privately-owned land. Enviro Strata Consulting (ESC) has been previously engaged to undertake an independent assessment of blasting results and prepare a model to extrapolate the overpressure and ground vibration levels at private residences where monitoring is not possible.

Blast monitoring is also undertaken at Aboriginal heritage site CTS-1 when blasting is within 1km.

Airblast overpressure and ground vibration results for all blasts undertaken during the reporting period are provided in **Appendix 5** and summarised below.

Overpressure Results

There were no exceedances of the overpressure criteria of 120 dBL during the reporting period. There was one exceedance of the 115 dBL overpressure criteria. SSD-4966 allows 5% of the total number of blasts over a period of 12 months to exceed 115 dBL.

Vibration Results

During the reporting period, there were no blasts where ground vibration exceeded 5 mm/s.

Fume Results

The level of blast fume generation is monitored for each blast by the shotfirer as described in the BLMP. During the reporting period, there was one (1) occasion of blast fume being recorded on 11 February 2021 (2a Fume Rating). As per the approved BLMP (Section 7.1.1), SCPL do not require to notify the relevant regulatory authorities including EPA or DPE as below reportable blast fume rating.

The EIS (2012) provides predictions on blast emissions for various residential receivers. The blasting predictions indicate that blasting emissions would generally comply with airblast criteria of 115 dBL and ground vibration of 5 mm/s at nearby private receivers. During the reporting period, predicted blast emissions were generally consistent with measured values.

6.6.3 Property Inspections and Investigations

In accordance with the Development Consent Schedule 3 Conditions 12 landowners within 2 kilometres of blasting may request a property inspection to establish the baseline condition of a building. Additionally, in accordance with Condition 13 if a landowner claims damage has been caused to a building as a result of blasting they may request a property investigation.

Prior to recommencing blasting activities at the SMC, SCPL notified all relevant landowners of their rights in accordance with the Development Consent.

During the reporting period no further building inspections were requested. Building inspections have previously been undertaken by Bill Jordon as a suitably qualified, experienced and independent person to undertake the building condition inspections.

Building condition inspections will continue to be undertaken on request.

No requests have been received by SCPL for a property investigation due to claims of damage resulting from blasting activities.

6.6.4 Blasting Complaints

Four (4) blast related complaints were received during the reporting period. Follow up investigations identified that all blasting activities were deemed to be compliant during the reporting period. SCPL continues to implement measures to reduce the impacts of blasting activities as far as reasonably practicable. A full list of complaints received, including responses by SCPL is provided in **Appendix 7.**

6.7 Noise

6.7.1 Noise Criteria and Control Procedures

SMC has an approved Noise Management Plan (NMP) that establishes a noise management strategy which:

- Identifies noise criteria;
- Outlines proactive and responsive noise management and control measures;
- Formulates a noise monitoring program;
- Establishes data assessment protocols; and
- Details reporting and review requirements.

Noise emissions from the SMC are managed in accordance with the criteria and procedures described in the NMP. DCPL implements measures to ensure noise from the SMC is managed to approved levels, through a combination of the following:

- ensuring best management practices are implemented and reviewed;
- implementing noise controls to reduce noise from the source and attenuate noise transmission; and
- if necessary, implementing measures to control noise at receivers following a review of monitoring data.

The SMC noise monitoring program comprises attended noise surveys, real-time noise monitoring, rail noise monitoring, meteorological monitoring and sound power testing. The results of compliance attended monitoring are used to assess compliance with relevant noise impact assessment criteria in SSD-4966 and the NMP. Real-time noise monitoring results are used for ongoing performance assessment and will assist in the implementation of pre-emptive management actions to avoid potential non-compliances.

SCPL undertakes monthly attended noise monitoring surveys in accordance with the NMP in order to determine the status of compliance with noise limits provided in SSD-4966 and the EPL.

The Sentinex real-time noise (RTN) monitors are used as a management tool for operations to measure mine contribution noise emissions and implement management controls as outlined under the approved NMP. Sentinex RTN monitors are located near Stratford Village and Craven Village.

6.7.2 Review of Attended Noise Monitoring Results & Performance

The summary results of the attended noise surveys undertaken during the reporting period are provided in **Appendix 6**. Noise monitoring locations are shown on **Figure 3 (Appendix 1).** The full Noise Survey Reports are available at the Stratford Coal website (www.stratfordcoal.com.au).

Operator-attended operational noise monitoring was conducted on a monthly basis at ten locations in January through to December 2021.

All noise performance assessments of day, evening and night operational noise emissions found SMC to be compliant with the relevant criteria, contained within SSD-4966 and EPL 5161, at all attended monitoring locations.

6.7.3 Analysis of Data Trends and Comparison with EA Predictions

The SEP EIS 2012 provides predictions on mine contributed noise emissions for various operational years. In terms of the nine monitoring locations ("Atkins", "Clarke", "Wadland", "Hall", "141 Deards Lane", "Lowrey", "Pryce-Jones", "Van der Drift" and "Greenwood") predicted mine contributed noise emissions were consistent with measured values for all locations.

Results of quarterly noise monitoring during 2016 to 2021 has shown mine contribution to be generally inaudible.

6.7.4 Real Time Noise Monitoring System

A real-time noise (RTN) monitoring system is described in the NMP. Real-time monitoring is used as a management tool to assist SCPL to take proactive management actions and implement additional noise mitigation measures to avoid potential non-compliances. A Sentinex RTN monitor is located near Craven Village and a second Sentinex unit is located near Stratford Village.

Noise investigation triggers have been established in the NMP which send alarms when noise emissions are approaching levels which may exceed the noise criteria at privately-owned receivers. Details of any RTN alarms and the operational responses implemented by SCPL are recorded in the RTN Response Register (**Appendix 6**).

In general noise alarms during the reporting period related to abnormal meteorological conditions, environmental and traffic noise from the Bucketts Way. The SMC noise contribution was often audible, however not the dominant noise source. The RTN response register details the response actions taken by SCPL.

To address any noise alarms regardless of abnormal meteorological conditions such as inversions, SCPL continue to implement the management measures described in the NMP. Additionally, SCPL implement operational management measures in accordance with the real-time noise monitoring response protocol described in the NMP Section 7.3.4.

6.7.5 Noise Prediction and Forecasting System

A noise and meteorological forecasting system is implemented at the SMC to predict meteorological conditions for the coming day to determine, one day in advance, where the risk of noise-enhancing meteorological conditions may occur (e.g. based on wind speed, direction and atmospheric stability).

Predictive noise and meteorological forecasting information is provided at the start of every operational shift to inform the need for any control of the locations of major mobile equipment (i.e. to maintain compliance with Development Consent SSD-4966 noise criteria). The predictive meteorological forecasting system operates in conjunction with the real-time monitoring system, providing an alert for the appropriate personnel to review the real-time data and manage the intensity of activities for that day, increase controls (e.g. gear restriction) or limit activity to various areas of the site.

6.7.6 Rail Noise Monitoring

The Stratford export train is required to be approved to operate on the NSW rail network in accordance with the noise limits specified in ARTC's EPL 3142, as per Condition 5(d), Schedule 3 of SSD-4966. ARTC have recently received a variation to EPL 3142 which has amended conditions relating

to the operation of rolling stock. Previously only the rail infrastructure operator was required to hold an EPL. The changes now require the rolling stock operators to also hold an EPL for the operation of rolling stock. PN are the operator of the Stratford export train and have confirmed the Stratford locomotives are listed in locomotives class register approved to operate on the NSW rail network.

The NMP requires rail noise monitoring to be undertaken along the North Coast railway on a quarterly basis at the existing Wards River and Craven village monitoring points.

Rail noise monitoring is reported against rail noise criteria described in Section 4 of the NMP. Rail operations aim to progressively reduce noise levels to the goals of 65dB(A)Leq, (daytime from 7am – 10pm), 60dB(A)Leq (night-time from 10pm –7am) and 85dB(A) (24hr) max pass-by noise, at one metre from the façade of affected residential properties. This is consistent with the criteria in the ARTC EPL noise limits.

Rail noise monitoring was conducted during the May 2021, September 2021 and December 2021 Noise Surveys when export trains were operating. Rail noise survey results are included in the Noise Survey reports which are available at the Stratford Coal website. Attended noise measurements were conducted at two locations; TN1 (Craven) and TN2 (Wards River Village).

During the reporting period for all rail noise monitoring undertaken, the maximum SMC rail pass-by noise levels complied with the noise goal of 85 dBA at all monitoring locations, excluding the sounding of horns on approach to level crossings.

6.7.7 Mobile Plant Noise Assessments

Sound power testing is undertaken in accordance with the NMP. The indicative mine fleet at the SMC is provided in the Stratford Extension Project Noise Impact Assessment (EIS 2012 Appendix C). The NIA provides the overall A-weighted and Linear Sound Power Levels (SWLs) for each item of plant and equipment proposed to be used at the SMC.

The current mining fleet is shown in Section 4.3.1 of this report. The SMC fleet of mobile plant are assessed annually against the target SWLs.

Sound power testing of existing of plant and equipment at the SMC was undertaken by SLR during September 2021. A summary of the results from the sound power testing is included below.

Most of the plant and equipment tested conformed to the target SMC sound power levels.

- All excavators conformed with the A weighted and Linear SWL targets with the exception of CAT 349 (ID 285) exceeding the Linear SWL target.
- Two CAT 785s (ID 110, 116) and one CAT 777 (ID 503) exceed the static SWLs. One CAT 785 (ID 110) exceeded the target SWLs under dynamic test conditions by a negligible 1 dB.
- CAT D10T dozers (ID 215, 216, 217) exceeded the A weighted SWL target when in second gear reverse operation. CAT D10Ts (ID 215, 216) exceeded the Linear SWL target under static conditions.
- Komatsu WA900 ROM Loader (ID 401) exceeded both the A weighted and Linear SWL targets under both static and dynamic test conditions.
- Drill 51 exceeded both the A weighted and Linear SWL targets.
- The results of the items of plant measured in 2020 compared 2021 showed to be consistent with only some minor changes between some items of plant.

Notwithstanding, given that the current equipment fleet in use at SMC is considerably less than those predicted in the EIS 2012 the overall sound power level from SMC is likely to be less than 136 dBA.

SMC have established an Exceedance Action Tracker based on mobile plant exceedances recorded during the 2021 sound power level testing. The action tracker outlines actions taken in order to rectify exceedances and assist in reducing measured SWLs to target levels. The Exceedance Action Tracker is provided in **Appendix 6.**

6.7.8 Noise Complaints

Twelve (12) noise related complaints were received during the reporting period. SCPL continue to implement management and mitigation measures for noise. The complaints list is provided in **Appendix 7**.

6.8 Landscape and Visual Screening

A visual assessment of the SMC was undertaken for the EIS 2012. The overall visual impacts of the development are generally considered to be low to moderate during operations and very low to low following final rehabilitation. Views of the SMC from the surrounding area are generally screened by topography and vegetation, except for some areas to the north and west (EIS 2012). However, some local impacts will occur and undertakings such as the following have been, and will continue to be, adopted to lessen these impacts:

- Minimising (where possible) disturbance to native vegetation, especially where such vegetation is providing visual screening;
- Progressive rehabilitation will be undertaken in order to reduce the contrast between the SMC landforms and the surrounding environment;
- Ensuring out of pit emplacement design produces a landform which integrates with the adjoining natural landform;
- The biodiversity offset strategy for the SMC includes measures such as revegetation of cleared areas; and
- Tree plantings/revegetation will progressively limit potential views of the SMC from some viewpoint locations (e.g. Bucketts Way, Glen Road, Wenham Cox Rd).

Consistent with the Development Consent visual screening has been undertaken as necessary for the maintenance of satisfactory visual amenity. The rehabilitation principles and objectives at the SMC are included in the Development Consent and described in the SMC Mining Operations & Rehabilitation Management Plan. This includes requirements for landscaping and visual screening to ensure the final landforms are visually consistent with the surrounding environment and Gloucester Valley landform. The rehabilitation will be generally consistent with the proposed rehabilitation strategy described in the EIS 2012

No visual amenity related complaints were received during the reporting period.

6.9 Lighting Emissions

Schedule 3, condition 50 of SSD-4966 requires SCPL implement all reasonable and feasible measures to minimise the visual and off-site lighting impacts of the development. Additionally, SCPL is required to ensure that all external lighting associated with the development complies with Australian Standard AS4282 (INT) 1997 – Control of Obtrusive Effects of Outdoor Lighting or its latest version.

An independent lighting assessment of the SMC was undertaken in 2019. The independent lighting assessment found that the external lighting was not complainant with the Australian Standard unless

setup correctly. The 2019 Lighting Compliance Report recommended SCPL produce an operational guideline on portable lighting systems set ups to ensure the lighting is used in the correct manner to meet the requirements of the Australian Standard.

The independent lighting assessment also recommended that training of the procedure be rolled out for SMC staff to detail how to set up portable lighting systems to be in compliance with the Australian Standard, whilst also meeting operational requirements. It was also recommended for legacy lighting issues on fixed structures that a replacement with LED lighting takes place. During the reporting period SCPL has develop a procedure for setting up mobile lighting systems and implemented training for operators.

Four (4) lighting related complaints were received during the reporting period. A full list of complaints received, including responses by SCPL is provided in **Appendix 7.**

6.10 Cultural and Natural Heritage Conservation

Cultural and natural heritage at the SMC is managed in accordance with the approved Heritage Management Plan (HMP). The purpose of the HMP is to ensure that the development does not cause any direct or indirect impact on identified Aboriginal or Non-Aboriginal heritage sites located outside the approved disturbance area of the development on the site. The HMP has also been prepared to manage potential impacts on items of heritage significance at the SMC in the vicinity of the surface development.

The HMP establishes measures for the management of known and previously unrecorded heritage sites including:

- Protocols for the involvement of the local Aboriginal community;
- Recording and surface collection of heritage sites;
- Removal of scarred trees;
- Fencing and signage of heritage sites outside the disturbance area;
- Protocol for managing previously unrecorded heritage sites;
- Curation of aboriginal artefacts; and
- Monitoring of heritage sites

Archaeological surveys have been conducted over the life of the SMC and most recently for the EIS 2012. A detailed description of each site, is included in Kayandel Archaeological Services (Kayandel) (2012).

As a result of previous assessments and archaeological survey works, 17 sites have been identified within the SMC (Kayandel, 2012). **Table 6.7** includes a description of the proposed impact on known Aboriginal heritage sites at the SMC and the status of the heritage sites at the end of the reporting period.

Table 6.7: Aboriginal Heritage Sites at the SMC

Site Code	Site Type	Proposed Impact	Status of Management
OS-1	Open Artefact Scatter	No (outside disturbance area)	Extant, Not disturbed
OS-2	Open Artefact Scatter	No (outside disturbance area)	Not disturbed. Inspection by FLALC did not locate this artefact. (Refer to AMBS 2018 Report).

Site Code	Site Type	Proposed Impact	Status of Management
OS-3	Open Artefact Scatter	Yes	Salvaged by FLALC. Archaeological survey of the approximate 20m2 area could not locate this artefact. It was determined after 20 minutes that the area was considered as having been sufficiently salvaged. (Refer to AMBS 2018 Report).
OS-4	Open Artefact Scatter	Yes	Salvaged by FLALC. Archaeological survey of the approximate 20m2 area could not locate this artefact. It was determined after 20 minutes that the area was considered as having been sufficiently salvaged. (Refer to AMBS 2018 Report).
OS-5	Open Artefact Scatter	Yes	Salvaged by FLALC. Archaeological survey of the approximate 20m2 area could not locate this artefact. It was determined after 20 minutes that the area was considered as having been sufficiently salvaged. (Refer to AMBS 2019 Report).
ST-1	Scarred Tree	No (outside disturbance area)	Extant, Not disturbed
ST-2	Scarred Tree	Yes	Relocated locally following advice from FLALC (Refer to AMBS 2019 Report).
ST-3	Scarred Tree	No (outside disturbance area)	Extant Not disturbed. This scarred tree has been fenced and signed as per the HMP.
ST-4	Scarred Tree	Yes	Extant, Not disturbed. Site inspected by FLALC. Archaeological survey identified this scarred tree. It was determined that fencing and signage should be established around the tree to ensure that it is not impacted by the proposed works.
IF-1	Isolated Find	Yes	Salvaged by FLALC. Archaeological survey of the approximate 20m2 area could not locate this artefact. It was determined after 20 minutes that the area was considered as having been sufficiently salvaged. (Refer to AMBS 2018 Report).
IF-2	Isolated Find	Yes	Salvaged by FLALC. Archaeological survey of the approximate 20m2 area could not locate this artefact. It was determined after 20 minutes that the area was considered as having been sufficiently salvaged. (Refer to AMBS 2018 Report).
IF-3	Isolated Find	Yes	Salvaged by FLALC. Archaeological survey of the approximate 20m2 area could not locate this artefact. It was determined after 20 minutes that the area was considered as having been sufficiently salvaged. (Refer to AMBS 2020 Report).
IF-4	Isolated Find	Yes	Salvaged by FLALC. Archaeological survey of the approximate 20m2 area could not locate this artefact. It was determined after 20 minutes that the area was considered as having been sufficiently salvaged. (Refer to AMBS 2020 Report).
IF-5	Isolated Find	No (outside disturbance area)	Extant, Not disturbed
PAD-1	PAD	No (outside disturbance area)	Extant, Not disturbed
PAD-2	PAD	No (outside disturbance area)	Extant, Not disturbed
CTS-1	Cultural/ Traditional Site	No (outside disturbance area)	Extant. Access restricted. Establishment and operation of the blast monitoring site between CTS-1 and Stratford East Pit for blasts within 1km.

There was no unapproved or unplanned disturbance of any heritage sites during the reporting period.
No previously unidentified heritage sites were identified during the reporting period.

6.11 PAF Material Management and Spontaneous Combustion

An assessment of the geochemical characteristics of the waste rock material associated with the development of the SEP is provided in the Geochemistry Assessment (EIS 2012 Appendix L) prepared by EGi (2012). The Geochemistry Assessment (EGi, 2012) concluded that the waste rock materials generated from three of the four SMC open cut mining areas are likely to be NAF The acid base accounting test work indicates that the Stratford East Open Cut waste rock materials would be expected to be generally potentially acid forming (PAF), with some potentially acid forming – low capacity (PAF-LC) and NAF materials also expected to be present (EIS Appendix L).

PAF material is managed in accordance with Section 7.2 of the SMC Surface Water Management Plan. PAF waste rock material is segregated and selectively handled and then placed in either in-pit (below the predicted final water table recovery level) or out-of-pit engineered PAF waste cells. PAF waste rock material would be encapsulated within constructed containment cells and capped with a low permeability layer when placed in out-of-pit waste rock emplacements (EIS Appendix L).

During operations, limestone is placed on the open pit floor and interim waste rock in-pit and out-of-pit waste rock emplacement lifts/faces where PAF material is present, to minimise the generation of acid rock drainage.

SCPL monitors the water quality of contained water storages (i.e. pH and solute concentrations) as part of the existing surface water monitoring program. If in the event acid rock drainage is identified through the surface water monitoring program, specific acid rock drainage controls will be implemented. Refer to the surface water monitoring results in Section 7.2.2 of this report.

During the reporting period PAF materials have been appropriately management to minimise the potential for any short-term or long-term effects of acid rock drainage.

Any incidences of spontaneous combustion at the SMC are managed in accordance with a Spontaneous Combustion Management Procedure. Management and mitigation practices generally involve reducing the interaction of potentially reactive materials with water and oxygen by appropriate dumping practices, profiling and capping any materials likely to heat and reducing the time coal faces are exposed prior to mining.

There have been very few occurrences of spontaneous combustion on the Stratford site during the 20 years of operation. During the reporting period there were no spontaneous combustion events on site or observed heating in any stockpiles.

6.12 CHPP Reject Management

Reject material produced at the Stratford CHPP is disposed of in accordance with the SMC Life of Mine Rejects Disposal Plan (RDP 2018).

The Development Consent SSD-4966 Table 8 prescribes the performance criteria for CHPP rejects. Reference should be made to the RDP for a detailed description of reject management at the SMC. In general the rejects, both coarse and fine fractions, are pumped via pipeline from the CHPP to the Stratford Main pit where they are deposited below final void ground water levels.

Rejects at the SMC have been previously characterised as being PAF and the EIS 2012 geochemical assessment report concluded that implementation of appropriate management measures would be required to manage potential ARD impacts associated with the existing and proposed co-disposed

CHPP rejects. Rejects management measures include placement into the Stratford Main Pit where they are inundated with water to prevent significant pyrite oxidation and acid generation in the long term, with monitoring of water quality undertaken during operations and provision for lime (calcium hydroxide - Ca[OH]2) dosing and limestone (calcium carbonate - CaCO3) treatment as required.

Reject placement in the Stratford Main Pit for the reporting period involved sub-aqueous deposition only, eliminating the use of reject beaches. Hence, no liming of the exposed reject beach was undertaken during the reporting period. Lime dosing of the reject stream was continued.

Monitoring of the reject beach material in previous reporting periods was undertaken on a monthly basis until the beach was completely inundated. No further monitoring was required during the reporting period.

Water quality monitoring in the Main Pit is undertaken monthly, refer to the results in Section 7 Water Management. The management measures implemented have successfully controlled the formation of acid conditions in the Stratford Main Pit, with recorded pH circum neutral.

6.13 Agricultural Report

An Agricultural Assessment for the SMC was undertaken for the Stratford EIS (2012). Contemporary land use in the vicinity of the SMC is dominated by mining operations, agricultural production (primarily grazing for beef production) and remnant vegetation generally located along ridgelines, along watercourses and in isolated patches within the cleared landscape which includes nature reserves and national park. Settlements are located at Stratford Village and Craven Village.

The Agricultural Land Use Rehabilitation Objective for the SMC is to establish a minimum of 300 hectares of land with Class 4 agricultural suitability. Class 4 Agricultural Suitability is land suitable for grazing but not for cultivation. Rehabilitation progress is discussed further in Section 8.

Rural Land Capability

The Rural Land Capability classification system is used to determine the various classes of rural land on the basis of the capability of the land to remain stable under particular uses. Land is allocated to one of eight classes, with emphasis on the erosion hazards in the use of the land. The pre-mining Rural Land Capability near the SMC ranged from Class IV to Class VIII, with the major factors in determining the classes being slope and soil stability in water.

The rehabilitated flat areas on the Stratford Waste Emplacement were allocated Class IV. Other rehabilitated areas (e.g. batters) on the Stratford Waste Emplacement and the Northern Waste Emplacement were allocated to Class V due to slope angle. The flat areas on the Stratford Waste Emplacement were observed to have similar, and in some cases better, soil conditions than that observed in the “natural” soil profiles under pasture on the SMC site.

Agricultural Suitability

The Agricultural Suitability system is used to classify land in terms of its suitability for general agricultural use. Agricultural land is classified by evaluating biophysical, social and economic factors that may constrain the use of land for agriculture. The pre-mining SMC site ranged from Class 4 to Class 5. Soil limitations included various combinations of the following factors: erosion hazards associated with steep slopes, shallowness, dispersion, acidity, nutrient deficiencies and compaction (EIS 2012).

The rehabilitated areas on the existing SMC waste rock emplacements were allocated by McKenzie Soil Management (2012) to Class 4.

Class 4 Agricultural Suitability is defined as (NSW Agriculture, 2002):

Land suitable for grazing but not for cultivation. Agriculture is based on native pastures and improved pastures established using minimum tillage techniques. Production may be seasonally high but the overall production level is low as a result of major environmental constraints.

Agricultural lands on and surrounding the SMC including SCPL owned land and agricultural rehabilitation continues to be managed for agricultural production. SCPL implements a property management strategy which includes grazing & pasture management and weed and pest control measures. The majority of agricultural lands are grazed under agistment/lease contracts.

There have been no changes to the agricultural land suitability during the reporting period.

7.0 Water Management

Water management is undertaken in accordance with the approved Water Management Plan (WMP) and sub-components of the plan including surface water, groundwater and site water balance required under SSD-4966. The local and regional hydrological setting along with the baseline data is provided in the WMP.

The main objectives of the water management system on-site are:

- protect the integrity of local and regional water resources;
- operate such that there is no uncontrolled overflow of contained water storages;
- maintain separation between runoff from areas undisturbed by mining and water generated within active mining areas; and
- provide a reliable source of water to meet the requirements of the DCM.

The main principles of the water management system on-site are to:

- Minimise the generation of mine related water and divert clean water around disturbed areas;
- Minimise storage requirements by maximising re-use of mine related water;
- Remove potential impacts on downstream water resources by provision of secure containment on site and disposal by irrigation re-use;
- Implement a fail-safe system, whereby under extreme events in excess of design capacity, mine related waters would spill to the mine pit and not to the clean water catchments; and
- Not allow sediment laden water having an elevated suspended solids concentration to be discharged off site.

SCPL has investigated options for the beneficial reuse of mine water however continue to maintain zero discharge of mine water from site. The mine water balance at SMC is managed predominantly through the irrigation of excess water on rehabilitated pasture and storage within on site containment facilities. Where possible all clean water is diverted offsite.

7.1 Water Supply and Demand

The SMC water management system operates under a surplus water balance, with a trend for increasing water storage on-site over time. The majority of water used on-site is in the CHPP and

recovery of water for re-use in the CHPP (i.e., recycling of CHPP process waters) is the largest component of the overall supply system

The principal water losses in the water system are:

- Water applied to land by means of irrigation;
- Water used for dust suppression;
- Evaporation from the Mine Water storages; and
- Water consumed in the CHPP.

The principal water losses in the CHPP water circuit are:

- Loss of water to co-disposal material (water locked up in rejects, pumped to main pit); and
- Water retained in product coal and railed off site.

Contained water storages at the SMC include:

- Stratford Main Pit which acts as both the CHPP rejects co-disposal area and contained water storage at the SMC, with an estimated capacity of 15,983ML at December 2021;
- Stratford East Dam which is located on the eastern boundary of the ML and has a capacity of up to approximately 2,872 ML;
- Return Water Dam which has a capacity of approximately 551 ML and receives water by pumping from other contained water storages to supply the CHPP. The Return Water Dam also receives local runoff from the adjacent western co-disposal area; and
- Parkers Pit void is located south-east of the CHPP and west of Avondale Creek. Parkers Pit has an estimated capacity of 106 ML.

The main water supply on-site for the CHPP is the Return Water Dam (RWD), located to the north of the Industrial Area. The RWD is one of three permanent mine water storages on-site. Water used by the CHPP is drawn from the RWD and comprises water pumped from the co-disposal facility, pit produced water and water from specific sediment dams. Water is also pumped directly from the Stratford Main Pit to the RWD to balance the CHPP water demand.

The SMC open cut voids also provide significant additional on-site containment capacity if required for water storage. Mine water may be transferred between the open cut pits and the mine water storages as required for operations.

Site water balance modelling has concluded that water storage capacity on site, would be sufficient to accommodate the water storage demands and disposal of CHPP reject material within the Main Pit until at least 2025. The annual water balance review with contemporary observations of the mine water management storages throughout the reporting period have confirmed that the EIS water balance modelling remains valid and consistent with observations on site. The annual water balance review is further described in **Section 7.2.**

Surface Water Licencing

The SMC is located within the mapped extent of the Avon River Water Source under the Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009. SMC is a water surplus site and no extraction of surface water from any unregulated stream is proposed for the SMC.

Groundwater Licencing

The groundwater systems within which the SMC lies, specifically relate to:

- Gloucester Basin Water Source (i.e. porous rock aquifer) under the Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.
- Avon River Water Source (i.e. alluvial aquifers) under the Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009.

SCPL currently holds several WALs in the Gloucester Basin Groundwater Source, for a total of 1,476 share components under the Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016, to account for direct and indirect take of groundwater from the porous rock aquifer.

7.2 Site Water Balance Review

The site water balance model for the SMC was developed by Gilbert & Associates in 2012 as part of the Stratford Extension Project EIS Surface Water Assessment (Gilbert & Associates, 2012). The site water balance model of the SCM water management system has been developed to simulate the behaviour of the water management system to the end of the approved mine life, i.e. 2025. More recently, the SMC water balance model was updated during 2018 as part of the Water Management Plan prior to commencement of mining for the SEP (refer WMP Appendix 1 Site Water Balance, Attachment A Site Water Balance Model 2018-2022). Since this time, the SMC water balance model has been updated annually.

A review of the site water balance is undertaken annually and captures all inflows and outflows from the water management system. The water which accumulates in the open pits through rainfall or groundwater seepage is measured at the point of dewatering. An independent Annual Water Balance Review (Hydro Engineering & Consulting, 2021) for the SCM was conducted for the 2021 calendar year and a summary is provided below.

Contained Water Storages

A water balance analysis review of the Stratford Main Pit, Stratford East Dam and RWD water balance 2021 (HEC, 2021) is as follows: Figures are based on SMC Balance Review for the 2021 calendar year.

Table 7.1: Summary Water Balance – Mine Water Storages 2021

Inflows (mL/pa)

Rainfall runoff	2,409
Pumped from open cut pits	1,222
Pumped from other storages	983
Groundwater	0
Rejects Water	2,354
Seepage	11
Total Inflow	**6,979**

Outflows (mL/pa)

Evaporation	858
CHPP Supply	2,340
Haul Road Dust Suppression (Truckfill)	146
Pumped to Other Storages	1,990
Irrigation	0
Entrained in Rejects	183
Seepage†	82
Total Outflow	**5,599**

INFLOW - OUTFLOW	**1,380**

Start of 2021 year total storage volume	15,167
End of 2021 year total storage volume	16,335
Change in Storage	**1,169**

A notable increase in stored water volume for Stratford Main Pit, Stratford East Dam and RWD was observed during 2021, mainly as a result of significant rainfall runoff inflow.

At the commencement of the reporting period, the Main Pit, Stratford East Dam and Return Water Dam contained a combined 15,167 ML (stored water only).

At the completion of the reporting period the Main Pit, Stratford East Dam and Return Water Dam contained a combined 16,335 ML (stored water only).

No mine water was disposed directly to watercourses during the reporting period.

Open Cut Pits and Waste Emplacements

A mine pit water balance analysis was undertaken for the BRNOC, RWOC, ANOC and SEOC using data recorded during 2021 to assess the relative contributions of surface water and groundwater sources to mine inflows (i.e. the relative contribution of rainfall runoff versus groundwater seepage into the pit).

Bowens Road North Open Cut

Active mining of BRNOC occurred in early 2021, with a total of 162 ML pumped during the year to the Stratford Main Pit and 209 ML to RWOC However following the major rainfall event in late March, mining ceased and BRNOC was thereafter used as a water storage. Pumped water transfer from RWOC to BRNOC occurred from October, with estimated volumes (provided by SCPL) scaled up in order to achieve a better fit between predicted and recorded stored water volumes in RWOC. An estimated volume of 550 ML was transferred from RWOC.

Based on the modelled predictions, the BRNOC was estimated to have a stored water volume of approximately 1,274 ML at the end of the reporting period.

Roseville West Open Cut

Active mining and dewatering of RWOC continued during early 2021 with a total of 110 ML pumped to the RWD. However following the major rainfall event in late March, mining ceased and RWOC was thereafter used as a water storage. Pumped water transfer to the RWOC commenced in early April from BRNOC (until early July) and the Stratford Main Pit (until late May). A volume of 209 ML was transferred from BRNOC based on flow meter readings. The volume transferred from the Stratford Main Pit was estimated from pump hours run and was scaled up in order to achieve a better fit between predicted and recorded stored water volumes in RWOC and the Stratford Main Pit. An estimated volume of 1,990 ML was transferred from the Stratford Main Pit to RWOC. An estimated volume of 550 ML was transferred from RWOC to BRNOC from early October.

The volume of groundwater simulated reporting to RWOC in 2021 was 152 ML which is lower than the SEP EIS prediction of 174 ML (Heritage Computing, 2012). Based on the modelled predictions, the RWOC was estimated to have a stored water volume of approximately 2,045 ML at the end of

the reporting period, while a volume of 1,900 ML as at 23 December is based on a recorded water level on that date and pit level-volume characteristics.

Avon North Open Cut

Active mining and dewatering of ANOC continued during 2021 with a total of 597 ML pumped to the Stratford Main Pit based on flow meter readings. The volume of groundwater assumed reporting to the ANOC in 2021 was 82.6 ML which is equal to the SEP EIS prediction (Heritage Computing, 2012). Based on the modelled predictions, the ANOC was estimated to have a stored water volume of approximately 128 ML at the end of the reporting period.

Stratford East Open Cut

Active mining and dewatering of SEOC continued during 2021 with a total of 369 ML pumped to the Stratford Main Pit based on flow meter readings. The volume of groundwater assumed reporting to the SEOC in 2021 was 43.7 ML as per SEP EIS predictions (Heritage Computing, 2012). Based on the modelled predictions, the SEOC was estimated to have a stored water volume of approximately 169 ML at the end of the reporting period.

Table 7.2 provides a summary of water stored at the beginning and end of 2021, as well as inflows to and outflows from the four open cut pits and the Stratford waste rock emplacement both individually and as a whole.

Table 7.2: Summary Water Balance – Open Cuts 2021

Component	BRNOC (ML)	RWOC (ML)	ANOC (ML)	SEOC (ML)	Stratford Waste Emplacement (ML)	TOTAL (ML)
Start of Year Stored Water Volume	450	2	80	5	5,377	5,914
End of Year Stored Water Volume	1,274	2,045	128	169	5,665	9,281
Change in Stored Water Volume	824	2,043	48	164	288	3,367
Inflows						
Rainfall Runoff	630	386	572	498	215*	2,301
Groundwater (Predicted)	0	152	82.6	43.7	-	278
Groundwater (Estimated)	0	174	82.6	43.7	-	300
Seepage†	-	-	-	-	82.0	82.0
Pump from Other Storages	567	2,204	-	-	-	2,771
TOTAL	1,197	2,764	655	542	297	5,455
Outflows						
Evaporation	0.7	55.6	9.5	8.3	-	74.1
Seepage†	-	-	-	-	11.1	11.1
Pumped to Other Storages	371	644	597	370	-	1,982
TOTAL	372	700	606	378	11.1	2,067

INFLOW - OUTFLOW	825	2,064	49	164	286	3,388

Groundwater Licencing

SCPL holds existing groundwater licences for dewatering issued by the NSW DPE Water that allow for the dewatering requirements from the open cut pits. The estimated groundwater inflows at the SMC during 2018 where are below the annual extraction limits as shown in **Table 7.3.**

Table 7.3: Water Take

Water Licence	Operation	Entitlement*	Estimated 2021 Take (ML)Total
WAL 41534 (20BL169400)	Stratford Main Pit, ANOC, SEOC	500MLextraction.	126
WAL 41535 (20BL169101)	Stratford (Roseville) Pit	20ML extraction.	0
WAL 41536 (20BL169102)	Roseville Extended and West Pit	315MLextraction.	152
WAL 41538 (20BL169103)	Bowens Road North Pit	410ML extraction.	0
WAL 41537 (20BL169104)	Parkers Pit	186MLextraction.	0

7.3 Surface Water

7.3.1 Surface Water Management

Surface water management is managed in accordance with the SWMP, Appendix 2 of the WMP. The SWMP outlines the procedures and strategies for surface water management at the SMC to ensure compliance with SSD-4966. The SWMP includes the management of clean water and mine related water as outlined below. Mine related water comprises both mine water and sediment laden/turbid water. The local and regional hydrological setting along with the baseline data is provided in the SWMP.

7.3.1.1 Erosion and Sediment Control

The primary objectives of the erosion and sediment control strategy at the SMC are to:

- minimise and control soil erosion and sediment generation in areas disturbed by ongoing mining and construction activities; and
- minimise the potential for mine related activities to lower the water quality (particularly in terms of total suspended solids content) of downstream local watercourses.

Control strategies for soil erosion and sediment migration for the SMC include:

- Maximum separation of runoff from disturbed and undisturbed areas.
- Construction of sediment dams downstream of disturbed areas to contain runoff up to specified design criteria (refer Design Criteria below).
- Subsequent priority use of these waters in SMC related activities and/or natural controlled release to substantial buffer zones in a manner that minimises the potential for change to downstream turbidity.
- Selective use of benign flocculants such as gypsum to assist in the settlement of suspended solids

if required.
- Construction of surface drains to facilitate the efficient transport of surface runoff.
- Construction of silt fences downslope of disturbed sites.
- Rapid and progressive stabilisation of disturbed surfaces.

SMC operate a network of sediment control structures to control sediment laden runoff from disturbed areas and active mining areas. All sediment control structures at the SMC were reviewed during 2018 following the approval of the SMP with maintenance or upgrades undertaken in accordance with the SWMP as required. In 2021, where required in areas of approved for mining activities, new sediment control structures were constructed.

The design criteria for sediment control structures is prescribed in the SWMP Erosion and Sediment Control Strategy. Sediment control structures (i.e. sediment dams and disturbed area dams) are designed to spill if a rainfall event exceeds the specific design criteria for the structure. Where the discharge occurs solely as a result of rainfall in excess of the design criteria this is not considered a non-compliance. It should be noted that at all times pumping (where possible) of sediment dams in order to prevent or limit the amount of spilling water was undertaken. Prioritisation of pumping operations also took into account the likely quality of spilling water when a dam was considered vulnerable to spilling. The quality of water collecting within sediment dam is managed (where practicable) to minimise suspended sediment load.'

All sediment dams are inspected/monitored on a minimum quarterly basis or following receipt of sufficient rain whereby such dams have the potential to spill. Maintenance activities are undertaken on sediment dams as required. Sediment dams are cleaned out when the storage volume is reduced by sediment deposition (i.e. when 30% of storage volume is lost to sediment build up) and inspected after major rainfall events. Silt fences are cleaned out and/or repaired to maintain their effectiveness.

During the reporting period there were three sediment dam spills. Spills from SD12, SD17 and SD16 were recorded on 20 March 2021. The three dam spills were in accordance with design criteria following 260mm of rainfall in the 48hrs prior. Water quality sampling was undertaken at the time of the spill and the incident reported to regulators as required.

In addition to dedicated sediment dams, clean water is directed around disturbed areas (where practicable) using diversion drains/bunds in order to minimise sediment laden water. Areas under rehabilitation are stabilised by structural controls such as bench drains and contour banks (as required), to break up effective slope length exposed to erosion. Final slopes will generally not exceed 14 degrees in order to limit the potential for erosion and sediment generation.

Inspection of diversion structures and sediment control dams occurred during and following heavy rainfall events. The water management system control structures remained effective.

7.3.1.2 Clean Water Management

The key principle of clean water management is the segregation of clean water from mine/dirty water by the construction of diversion drains around disturbed areas, thereby minimising the quantity of dirty water generated.

Surface water controls aim to prevent clean runoff water from entering the open cut mining, overburden dumping areas, rejects disposal areas and infrastructure areas where practicable. The main clean water management structures are:

- Diversion drains/bunds on the western side of Stratford site and Roseville West Open Cut,

designed to divert clean water runoff around disturbed areas;

- Diversion drain around the eastern side of the Avon North Open Cut;
- Diversion drain around the eastern side of the Stratford East Open cut and Stratford East Dam;
- Flood control embankments around the open cut voids which are designed to reduce the likelihood of floodwaters within Avondale Creek and tributaries entering either pit;
    - A 1:100yr ARI flood control bund around the north of the Stratford Main Pit
    - A 1:100yr ARI flood control bund around the northern end of the former Roseville Extension Pit and Roseville West Pit;
    - A 1:100yr ARI flood control bund around the south-western end of the Bowens Road North Pit
    - A 1:100yr ARI flood control bund around the southern end of the Avon North Pit;
- A culvert under the BRN haul road to allow for clean water runoff into Avondale Creek;
- Culverts under the haul road crossing of Avondale Creek and tributaries including Main Haul Road, BRN Haul Rd and Roseville Link Haul Road which allows Avondale Creek to flow through the site;
- Various runoff control drains/bunds about disturbed areas and overburden dumps designed to divert clean water runoff around active mine areas.

During 2018 the Avondale Creek flood model was revised to incorporate the water control structures for Avon North. The revised flood model provided the basis for the design of the Avon North clean water drain, Avon North and Main Pit flood bunds and the BRN Haul Road culvert upgrade. The Avondale Creek flood model was revised again during 2020 to incorporate the Stratford East water management structures including the clean water diversion drain.

Water management control structures for the Stratford East Open Cut were completed during the reporting period.

Inspections of diversion structures were undertaken during and after rainfall events of >50mm/day or a minimum of every 6 months. Remedial and maintenance works were completed as required within the diversion drains and dams during the reporting period.

7.3.1.3 Mine Related Water Management

Mine related water management refers to the control, collection and re-use of water which may have become contaminated by mining operations and associated activities. This water comprises mine water and sediment laden/turbid water. Mine water is water that has come into contact with mining activities. Sediment laden/turbid water has come into contact with disturbed areas but predominantly not core mining areas. Mine waters are typically characterised by higher salinity and on occasion lower pH. Sediment laden waters are characterised by elevated suspended solids and elevated turbidity.

The main objectives of the mine related water control facilities are:

- Segregation of clean water from mine related water, to minimise the quantities of mine related water to be managed;
- Onsite storage and reuse of mine related water (washing coal);
- On site storage to prevent escape to Avondale Creek and Dog Trap Creek; and

The principal sources of mine related water are:

a) Mine Water

- Incident rainfall
- Groundwater seeping into mining pits;

- Rainfall induced runoff and seepage from active sections of the overburden dump; and
- Rainfall induced runoff from the Industrial Area.

b) Sediment Laden Water

- Rainfall induced runoff from roads;
- Rainfall induced runoff from areas stripped of topsoil (typically exposing clays); and
- Rainfall induced runoff from areas yet to adequately vegetate within sediment dam catchments.

Mine related water uses and losses are:

- Co-disposal material (water locked up in rejects, lost as seepage or evaporation);
- Evaporation and seepage losses from water storages;
- Haul road dust suppression;
- Water retained in product coal and railed off site; and
- Stored water applied to land via irrigation.

During the reporting period there were two (2) mine water related incidents. There was a single instance where spills from mine water storage dams occurred during the reporting period, spills from DAD13, DAD14 and DAD19 were recorded on 20 March 2021. There was one (1) uncontrolled discharge of mine water during the reporting period, a breach of the Rosevillle link Haul Road culvert crossing over Avondale Creek. Details regarding the mine water related incidents are included in **Section 1, Table 1.2**. The two incidents occurring on 20 March 2021 were deemed to trigger the PIRMP and were reported to the relevant authorities in accordance with the PIRMP and POEO Act. One of the surface water incidents related to three breaches of containment bunds following a significant rainfall event. The uncontrolled discharge of mine related water incident was due to a breach of the Roseville Link Haul Road culvert crossing over Avondale Creek at the SMC, which also occurred on Saturday 20 March 2021 during a significant rainfall event. On all occasions, actions were taken to reduce the volume of any water discharged via pumping and repairing bunds/drains. Remediation actions were implemented as soon as practicable to ensure no further breach of containment bunds.

The main permanent mine related water storages on site are the Stratford Main Pit, RWD, SED and Parkers Pit. The locations of mine and sediment laden water storage areas are shown in **Figure 3** (**Appendix 1**).

Due to accumulated water being in excess to site needs, management in past years has focused on maximising water use/loss. The future need to discharge waters from the SMC is expected to be limited due to the availability of the Stratford Main Pit for water storage and long-term storage within the final voids following the completion of open cut mining.

7.3.2 Surface Water Monitoring & Performance

SCPL monitors surface water quality on and surrounding the mine site by sampling from a series of selected locations. These locations comprise both streams and water storage structures. A meteorological monitoring station (i.e. weather station) provides site rainfall data. The locations of these monitoring sites are shown on **Figure 3** (**Appendix 1**).

Surface water monitoring is conducted in accordance with the approved SWMP and EPL 5161.

Surface water is sampled and analysed on a weekly, monthly, event basis or following a sediment dam spill.

Water sampling is not undertaken in no-flow conditions. Collected waters are analysed for a suite of physical and chemical parameters. Results are compared with the performance indicators and measures described in the SWMP Section 9 (WMP Appendix B).

The routine surface water monitoring sites at the SMC are described in **Table 7.4**

Table 7.4: Routine Surface Water Monitoring Sites

SITE	AREA	PROPERTY	HYDROLOGICAL LOCATION
W1	Wenham Cox Road	GLENAVON	Avon River upstream of the mine (i.e. upstream of junction with Dog Trap Creek)
W2	Marengo	BIGNALL	Avon River downstream of the mine (i.e. downstream of junction with Dog Trap Creek)
W3	Dog Trap Creek	Ex-ELLIS/SCM	Upstream Dog Trap Creek (above junction with Avondale Creek)
W3A	Dog Trap Creek	Ex-ELLIS/SCM	Upstream Dog Trap Creek (above junction with Avondale Creek) and Upstream of BRN Operations.
W4	Dog Trap Creek	Ex-ATKINS/SCM	Dog Trap Creek downstream of junction with Avondale Creek and upstream of Avon River.
W5	Wenham Cox Road	SMC	Avondale Creek downstream of mine and upstream of junction with Dog Trap Creek
W6	Parkers Road	SMC	Upstream of Mine on Avondale Creek
W8	Bowens Road	SMC	Avondale Creek in the centre of operations
W9	Glen Road	SMC	Upper Avondale Creek
W10	Lemon Tree Creek - Bowens Road	SMC	"Lemon Tree" Creek upstream of Avondale Creek junction.
W11	Dog Trap Creek	Ex-Ellis	Dog Trap Creek upstream of Avon North operations.

7.3.2.1 Review of Local Streams Monitoring Results

Reference should be made to accompanying data tables provided in **Appendix 4**.

Assessment of Performance Indicators

The surface water monitoring results are used to assess the SMC against the performance indicators and performance measures as detailed in Section 9 Table 12 of the SWMP. If data analysis indicates a performance indicator has been exceeded or is likely to be exceeded, an assessment will be made against the performance measure. If a performance measure is considered to have been exceeded, the Contingency Plan will be implemented (SWMP Section 10). If data analysis indicates that the performance measure has not been exceeded, SCPL will continue to monitor.

Table 7.5 provides a summary of surface water analysis of the monitoring data to assess against the surface water performance indicators and measures outlined in Table 12 of the SWMP.

Table 7.5: Summary of Surface Water Monitoring Results – 2021 Reporting Period

		Long Term Mean	Standard Deviation	12 Month Mean 2021
W4	pH	7.0	0.5	7.1
	EC	580	385	377
	Sulphate	38	60	21
	Iron	0.9	0.8	2.1
W3	pH	7.0	0.4	7.1
	EC	419	207	283
	Sulphate	12	11	12
	Iron	1.0	1.2	1.4
W1	pH	7.1	0.4	7.2
	EC	324	184	266
	Sulphate	10	9	11
	Iron	1.9	2.9	2.9
W11	pH	6.8	0.2	6.8
	EC	264	92	226
	Sulphate	13	5	11
	Iron	0.9	1.0	0.9
W6	pH	6.7	0.6	6.5
	EC	676	726	160
	Sulphate	23	96	5
	Iron	1.6	1.7	3.2
W9	pH	6.7	0.7	6.4
	EC	183	228	104
	Sulphate	6	5	7
	Iron	2.3	1.3	2.8

Assessment of the Performance Indicators and Performance outcomes are presented in **Table 7.6.**

Table 7.6: Surface Water Monitoring Performance Outcomes – 2021 Reporting Period

Performance Measure	Specific Performance Indicators	Data Analysis to Assess against Performance Indicators	Monitoring			Cascading Trigger Levels	Assessment of Performance Indicator and Performance Measure	Relevant Management and Contingency Measures
			Sites	Parameters	Frequency			
No impact on water quality in Avondale Creek as a result of the SMC	Greater than negligible decline in water quality at W4 or W3	Select water quality data analysed annually (as part of Annual Review: - The mean and standard deviation for each water quality parameter at W4 and W3 will be calculated from the long-term monitoring data. - The mean and standard deviation for each water quality parameter at upstream control sites (W1, W11, W6 and W9) will be calculated from the long-term monitoring data.	W4 (and W3) W1, W11, W6 and W9	EC, pH, SO_4, Iron	Monthly/Event	**Low Risk (Negligible) Outcome:** The 12 month mean is within the long-term data 'mean plus 1.5 standard deviation', and the same trigger has not been exceeded at an upstream control site. **Moderate Risk Trigger:** The 12 month mean exceeds the long term data 'mean plus 1.5 standard deviation', and the same trigger has not been exceeded at an upstream control site. **High Risk Trigger:** The 12 month mean exceeds the long term data 'mean plus 2 standard deviation', and the same trigger has not been exceeded at an upstream control site.	Analysis of the monitoring data indicates no statistically significant change in the quality of water at W4 and W3 compared to the long-term data. The 12 month mean for all water quality parameters did not exceed the long-term data mean plus 1.5 standard deviation. Additionally, a similar trend was observed at the reference sites. No further requirement for assessment of Performance Measure.	Continue monitoring as per SWMP.

7.3.2.2 Review of Mine Water Monitoring Results

Mine Water Storages

The management of mine related water is described in **Section 7.3.1.3** of this report. The monitoring program for the water management system is described in the SWMP Section 8.2.

The performance measure and performance indicator for the mine water storages (SWMP Table 12) states "No discharge of mine affected water to downstream surface waters" indicated by "Modelled forward risk of spill from Stratford Main Pit is negligible".

The risk of a contained water storage overflow (i.e. spill) from the SMC was evaluated as part of the site water balance review. No spills were simulated during the water balance review, which is consistent with the EIS site water balance (Gilbert and Associates, 2012). Subject to adherence with the operational protocols (including storage of water in active mine pits if required) and other assumptions inherent in the water balance modelling, the implied spill risk from the Stratford Main Pit (i.e. to Avondale Creek) is less than 1%.

During the reporting period there were two (2) mine water related incidents. Details regarding the mine water related incidents are included in **Section 1 Table 1.2.**

Table 7.7 provides a summary of Stratford mine water storage surface water analysis. The full results are included in **Appendix 4.**

Table 7.7: Summary of Mine Water Storage and Open Cut Monitoring Results – 2021

	pH		EC (µS/cm)		TSS (mg/L)	
Site	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
Stratford Main Pit	7.3 – 8.3	7.9	2860 - 3490	3245	<5 - 50	11
Stratford East Dam	8.1 – 8.8	8.4	743 - 882	782	<5 - 7	5
Return Water Dam	8.0 – 8.4	8.2	2750 - 4000	3347	NA	NA
Parkers Pit	6.9 – 8.3	7.5	611 - 2880	2135	<5 - 143	47
Roseville West Pit	7.8 – 8.3	8.0	2120 - 3250	2913	<5 - 22	10
Stratford East Pit	5.8 – 8.3	7.3	2210 - 3990	3286	<5 - 207	34
Avon North Pit	7.7 – 8.1	8.0	1550 - 3020	2268	<5 - 138	25

NA = Not applicable

Sediment Dams

The management of sediment dams is described in **Section 7.3.1.1** of this report. The monitoring program for the water management system is described in the SWMP Section 8.2. Monitoring of sediment dams was undertaken on a monthly and rain event basis as required in the SWMP.

During the reporting period there were six spills from sediment dams and disturbed area dams. Spills from SD12, SD17, SD16, DAD13, DAD14 and DAD19 were recorded on 20 March 2021 This was in accordance with the specified design criteria following a significant rainfall event. Refer to **Section 1**.

Table 7.8 - Summary of Sediment Dam/Disturbed Area Dam Monitoring Results – 2021

	pH		EC (µS/cm)		TSS (mg/L)	
Site	**Range**	**Average**	**Range**	**Average**	**Range**	**Average**
SD12	7.3 – 8.1	7.8	410 - 509	452	<5 - 15	6
SD15	6.3 – 7.7	7.2	2490 - 3680	3325	<5 - 19	7
SD16	6.5 – 9.0	7.5	30 - 203	145	7 - 87	44
SD17	7..5 – 8.8	8.2	965 - 2240	1869	<5 - 44	11
DAD4	7.8 – 8.6	8.2	1610 - 2590	1985	<5 - 34	11
DAD10	7.5 – 8.3	7.9	788 - 1190	909	<5 - 28	10
DAD13	7.1 – 8.5	7.8	289 - 1420	1031	6 - 175	37
DAD14	7.4 – 8.0	7.7	382 - 2320	1318	5 - 196	49
DAD19	6.4 – 7.9	7.2	64 - 458	268	<5 - 518	160
DAD20	8.1 – 8.3	8.1	2580 - 3750	3297	<5 - 47	16

7.3.3 Analysis Data Trends & Comparison with EA Predictions

7.3.3.1 Local Streams Monitoring

As shown in **Table 7.4,** the monitoring results during the reporting period did not exceed any of the performance indicators or measures. Results of surface water monitoring during the reporting period are consistent with previous year's monitoring results are in concurrence with the EIS 2012 that concluded "mining operations at the SMC would not jeopardise local or regional water quality".

During the reporting period the Gloucester region experienced increased rainfall following on from the severe drought conditions during 2019. This is reflected in the monitoring results.

7.3.3.2 Mine Water Monitoring

The simulated water quality for the SMC water management system was prepared for the EIS 2012 including a salinity balance. Mine water pH has remained generally near neutral or slightly alkaline for the life of the project. The Stratford Main Pit EC trend has been generally consistent with the simulated EC.

7.3.4 Biological Monitoring

As part of SMC's environmental monitoring program, Invertebrate Identification Australasia was commissioned to conduct biological (aquatic ecology – macroinvertebrates) monitoring of the streams near the SMC. Biological monitoring has been conducted each year since the start of mining operations.

Monitoring during this reporting period was conducted in September 2021 and involved sampling from six sites. For the September survey a total of 38 families of aquatic macroinvertebrates were

recorded. This represents a sustained increase in aquatic conditions over the last twelve months across all sites. The report summaries are provided below.

The September 2021 report concluded that;

> *"the current survey indicates that there are no adverse impacts on the Avon River and its tributaries that are associated with the Stratford Mine complex and its operations. This is due to the results showing consistent values and patterns for sites within and below the mining area compared with sites outside or upstream (control sites) of the area of the mining operation" (Invertebrate Identification Australasia 2021).*

Biological monitoring reports to date have not indicated any significant adverse effects on the aquatic ecosystem as a result of the mine's operations as per predictions made in the environmental assessments.

7.3.5 Irrigation Management

The SMC operates under a continual stored water surplus. The Development Consent conditions precludes the disposal of mine water offsite and SMC operates as a zero-discharge site. Irrigation of mine water is approved under SSD-4966 and irrigation is management in accordance with Section 7.10 of the SWMP. Irrigation only occurs on rehabilitated or topsoiled areas from which runoff reports to contained water storages, or open pits.

A centre-pivot irrigator is installed on the Stratford rehabilitated waste emplacement. However, no irrigation of water from the Stratford East Dam or any other mine water storages occurred during the reporting period.

When irrigation is being undertaken this is governed by soil moisture, with irrigation suspended during wet weather or in periods following rain until soil moisture levels fall to levels low enough such that irrigation would not lead to direct runoff. Runoff from irrigation areas is directed to the Stratford East Dam. Water monitoring results for the Stratford East Dam is found in **Table 7.7.**

7.4 Groundwater

7.4.1 Groundwater Management

A Groundwater Management Plan (GWMP) (WMP Appendix 3) has been prepared to control potential impacts on local and regional groundwater resources and includes a monitoring program to validate and review the groundwater model predictions.

The groundwater systems within which the SMC lies, specifically relate to:

- Gloucester Basin Water Source (i.e. porous rock aquifer) under the Water Sharing Plan for the North Coast Fractured and Porous Rock Groundwater Sources 2016.
- Avon River Water Source (i.e. alluvial aquifers) under the Water Sharing Plan for the Lower North Coast Unregulated and Alluvial Water Sources 2009.

Groundwater characteristics of the mine have been studied prior to and over the life of the SMC and for the SEP EIS. A hydrogeological characterisation of the Gloucester Basin is included in the GWMP.

The main aquifers in the Gloucester Basin are associated with the coal seams which are intersected by faults that compartmentalise groundwater flow. Groundwater is located predominantly within coal seams in the SMC area, with recharge occurring from overlying alluvium and regolith. The direction of groundwater flow is from the south-east to the north-west, and the main groundwater discharge zones are Avondale and Dog Trap Creeks, Avondale Swamp and Avon River. Further detail is included in the GWMP.

The water table approaches ground surface in the swampy northwest corner of the basin. The colluvium functions as the principal recharge to the basin. Groundwater is generally saline, highly mineralised water with slight to high acidic pH and is generally unsuitable for domestic consumption or irrigation. Baseline groundwater quality data is also included in the GWMP.

Groundwater resources within the project area were utilised in the early stages of the Stratford Project, as required, to provide make-up water for the CHPP. Since the mine start-up period, water has not been in deficit and no groundwater harvesting has occurred.

Locally there is little reliance on groundwater bores as a source of water, as agricultural enterprises predominantly rely on surface water sources which are more abundant and generally better quality. There are no high priority groundwater dependent ecosystems (GDEs) identified within the WSP as occurring in the vicinity of the SMC.

Groundwater seepage to the SMC mining areas (open cut pits and voids) is actively dewatered to the mine water storage area as required to facilitate mining activities. Groundwater may also be stored in the inactive open cut pits.

7.4.2 Groundwater Monitoring Results & Performance

The SMC groundwater monitoring program includes:

- groundwater inflows to the open cut mining areas (where measurable from pumping records);
- alluvial and porous rock groundwater levels and quality;
- representative private groundwater bores (e.g. Stratford Village bores).

Further detail on the groundwater monitoring program is included in the GWMP Section 7. The network of monitoring bores will be used to monitor the potential impacts on aquifers, groundwater levels and quality in the vicinity of the SMC. The general location of these bores is shown on **Figure 3 (Appendix 1).**

The groundwater monitoring network includes:

- Stratford Village Bores
- Stratford Project Bores (GW Series)
- Roseville Series Bores (RB Series)
- BRN Series Bores (MW Series)
- Stratford Extension Project Bores (F Series)

Stratford Village Bores

Monitoring of the Stratford Village bores, during the reporting period, was undertaken in April 2021 and October 2021. SCPL Germon and Bagnall bores are sampled monthly in accordance with the approved WMP. Full results are included in **Appendix 4**. Sampling is not undertaken at the Stratford

village bores when access can't be gain through the landholder. Sampling of the Stratford Village bores was limited during the reporting period due to Covid-19 restrictions.

Sampling to date shows no significant changes in groundwater level or quality and no evidence of impacts from mining operations. The groundwater quality is highly variable, with better quality generally in the shallower bores such as Smith. It is understood that these bores are relatively shallow, and given the lower elevations of the sites are tapping into the shallower alluvial aquifers, as opposed to the deeper groundwater.

Results show that there has been no significant difference in depth to standing water level for the bores gauged to date.

Stratford Project Bores (GW Series)

Monitoring of the GW bores was undertaken on a 6-monthly basis in line with the approved GWMP. Monitoring is undertaken for both groundwater depth and water quality. The locations of these bores are shown on **Figure 3 (Appendix 1)**. Full analytical results are also shown in **Appendix 4**.

A summary of monitoring results for the Stratford Project GW bores is provided in **Table 7.9**.

Table 7.9: Bores Monitored in Relation to the Stratford Project – 2021

Site	Average Depth to Water (m)	Average pH	Average EC (uS/cm)	Average Na (mg/l)	Average Cl (mg/l)	Average Fe (mg/l)	Average SO4 (mg/l)
GW1	14.79*	4.9*	1110*	722*	269*	16.1*	143*
GW2	11.61	6.6	4840	484	1385	27.8	30
GW3	2.22	7.1	3950	546	486	134.4	1230
GW4	0.81	6.7	13600	2120	4690	4.8	94
GW5	3.37	7.2	8460	1350	2750	13.4	283
GW7	3.51	6.5	1481	215	395	18.4	<1
GW8	Dry						
BRWN1	0.46	5.9	4945	933	1285	6.87	402

Notes: *One sample only in average calculation

Monitoring for the GW series bores during the reporting period has indicated (when compared to historic data):

- water table levels across all bores were comparable to the previous reporting periods;
- average pH units recorded were similar to historical results across the data set with neutral pH at all bores except GW1 which had an acidic pH as well as BRWN1 also showing a slightly acidic pH. This is consistent with baseline data;
- electrical conductivities were generally similar to the historical results;
- water quality parameters had similar average levels to the previous period results and baseline data; and
- GW1 was dry during the August sampling period and GW8 was dry during both the April 2021 and the August 2021 sampling periods.

Roseville Pit Bores (RB Series)

The RB series monitoring is undertaken on a quarterly basis for depth to water quality. The locations of these bores are shown on **Figure 3** (**Appendix 1**).

Monitoring results for the Roseville groundwater bores are provided in **Table 7.10** below with full analytical results within **Appendix 4**.

Table 7.10: Bores Monitored in Relation to Roseville Pit – 2021

Bore	Average DTW metres	Average pH	Average EC uS/cm	Average SO4 mg/l	Average Na mg/l	Average Cl mg/l
RB1	4.35	6.8	10925	34	1633	3648
RB2	3.84	6.8	9513	138	1583	3110
RB3	**	**	**	**	**	**

Notes: **No sample

Monitoring data recorded during the reporting period indicated:

- prevailing high water table near Avondale creek – particularly for RB1 and RB2;
- neutral pH at RB1 and RB2; this is consistent with historic monitoring results;
- electrical conductivity is consistent with historical data. Average electrical conductivity readings for RB1 and RB2 bores were similar to those of previous reporting periods.
- water quality parameters had similar average levels to the previous period results and baseline data; and
- RB3 was dry during the February, August and November 2021 monitoring events and inaccessible in May 2021.

Bowens Road North Pit Bores (MW Series)

Monitoring results for the BRN groundwater bores are provided in **Table 7.11** below with full analytical results within **Appendix 4**.

Table 7.11 - Bores Monitored in Relation to Bowens Road North Pit

Bore	Average Depth to Water (metres)	Average pH	Average EC (uS/cm)	Average SO4 (mg/l)
MW3	**	**	**	**
MW4	**	**	**	**
MW6	7.84	6.3	230	11
MW7	9.02*	6.1*	2400*	258*
MW8	**	**	**	**
MW11	9.37	7.0	1027	24
MW12	3.39	6.6	716	17
Griffin	1.59	7.8	2205	2

Notes: *One sample only in average calculation

** Unable to retrieve sample due to dry bore

Monitoring data recorded during the reporting period indicated:

- depth to water measurement generally indicated a similar water table relative to results from previous reporting periods;
- pH results were neutral across all sampled bores. Results were consistent with historical data;
- electrical conductivity was consistent with historical data and comparable with those in the previous reporting period; and
- water quality parameters had similar average levels to the previous period results and baseline data;

MW3, MW4 and MW8 were dry and unable to be sampled during the reporting period.

Assessment of Performance Indicators

Groundwater monitoring results are assessed against Performance Indicators and Measures as described Section 8 and Table 10 of the GWMP (2021). If data analysis indicates a performance indicator has been exceeded or is likely to be exceeded, an assessment will be made against the performance measure. If a performance measure is determined to have been exceeded, the Contingency Plan will be implemented. Monitoring data for the reporting period assessed against the performance measures and indicators is shown in **Table 7.12** below:

7.4.3 Analysis Data Trends and Comparison with EA Predictions

Groundwater monitoring data from the Stratford Project bores during the reporting period demonstrates no significant or measurable change in water table level or groundwater quality that could be attributed to the mining activities across the SMC. These results concur with predictions made in the EIS 2012 and the Groundwater Assessment 2012 that negligible impact on groundwater levels or quality, from mining in the long term is likely. Localised groundwater drawdown is consistent with EIS 2012 predictions.

Groundwater monitoring data from the Roseville Pit Bores during the reporting period demonstrates no significant or measurable change in water table level or groundwater quality that could be attributed to the mining activities across the SMC. These results concur with predictions made in the EIS 2012 and the Groundwater Assessment 2012 that negligible impact on groundwater levels or quality, from mining in the long term is likely.

Groundwater monitoring data from the BRN Pit Bores during the reporting period demonstrates no significant or measurable change in water table level or groundwater quality that could be attributed to the mining activities across the SMC. These results concur with predictions made in the EIS 2012 and the Groundwater Assessment 2012 that negligible impact on groundwater levels or quality, from mining in the long term is likely. Localised groundwater drawdown is consistent with EIS 2012 predictions.

Table 7.12: Groundwater Monitoring Performance Outcomes – 2021 Reporting Period

Performance Measure	Specific Performance Indicators	Data Analysis to Assess against Performance Indicators	Monitoring			Cascading Trigger Levels	Assessment of Performance Indicator and Performance Measure	Relevant Management and Contingency Measures
			Sites	Parameters	Frequency			
No more than a negligible impact on water levels in groundwater bores on privately-owned land as a result of the SMC.	No groundwater related notification received	If a notification is received, an investigation will be conducted to determine if the SMC has resulted in a greater than negligible change in water levels in the Stratford Village bores.	NA	Notification	When received	Notification Received. Investigation (monitoring) confirms that the SMC has resulted in a greater than negligible change in water levels in the Stratford Village bores (refer below). **Low Risk (Negligible) Outcome**: No more than two successive monthly readings at MW12 or SCPL bore are below the P20 groundwater level (116.8 mAHD and 114.8m AHD, respectively). **Moderate Risk Trigger:** More than two successive monthly readings at MW12 or SCPL bore are below the P20 groundwater level (116.8 mAHD and 114.8m AHD, respectively) and the equivalent P20 historical groundwater levels have not been exceeded at other shallow control sites (e.g. dry conditions or other anthropogenic changes are not prevalent). **High Risk Trigger:** More than two successive monthly readings at MW12 and SCPL bore are below the P5 groundwater level (116.3 mAHD and 114.4m AHD, respectively) and the equivalent P5 historical groundwater levels have not been exceeded at control sites (e.g. dry conditions or other anthropogenic changes are not prevalent).	No notifications received. Analysis of the monitoring data indicates no statistically significant change in water levels at MW12 and SCPL bores. A similar trend was observed in the reference sites. No further requirement for assessment of Performance Measure.	Continue monitoring
	No significant decline in groundwater level at MW12 (Mine Site) or SCPL Bore (Stratford Village).	An investigation will be conducted to determine if the SMC has resulted in a greater than negligible change in water levels in the Stratford Village bores.	MW12 (Control Site: MW11) SCPL Bore (Control Sites: Germon & Bagnall)	Groundwater level	Monthly (MW12, MW11 & SCPL Bore) Monthly (Germon & Bagnall)			

Table 7.12 (cont'd): Groundwater Monitoring Performance Outcomes – 2021 Reporting Period

Performance Measure	Specific Performance Indicators	Data Analysis to Assess against Performance Indicators	Monitoring			Cascading Trigger Levels	Assessment of Performance Indicator and Performance Measure	Relevant Management and Contingency Measures
			Sites	Parameters	Frequency			
No impact on regional groundwater quality that reduces the beneficial use as a result of the SMC.	No lowering of the beneficial use category (based on groundwater quality) at a groundwater production bore as a result of the SMC.	Each bore to be assigned a beneficial use category based on EC (refer Table 8 of GWMP). If data analysis indicates the performance indicator has been exceeded, the performance measure will be assessed to determine if there has been a reduction in regional groundwater quality that has lowered the beneficial use.	SCPL Bore (Control Sites: Germon & Bagnall)	EC (field)	Monthly	**Low Risk (Negligible) Outcome**: No more than two successive monthly readings at the SCPL bore are outside the applicable beneficial use category range based on EC. **Moderate Risk Trigger**: More than two successive monthly readings at the SCPL bore are outside the applicable beneficial use category range (based on EC) and the equivalent beneficial use categories at the control sites have not been lowered. **High Risk Trigger:** More than two successive monthly readings at the SCPL bore are outside the applicable beneficial use category range (based on EC) and the equivalent beneficial use categories at the control sites have also been lowered.	Beneficial use categories (SWMP Section 5.1.3 Table 8): SCPL bore - 3 Irrigation Germon - 3 Irrigation Bagnall - 2 Marginal Potable Analysis of the monitoring data indicates three (3) successive monthly readings at the SCPL bore are outside the applicable beneficial use category range based on EC (i.e. 3 Irrigation). Average results at SCPL Bore during the reporting period show a marginal change in average EC slightly greater than 7,800µS/cm upper level for irrigation beneficial use category (i.e. 4 Saline). Change is not significant. No results are available for comparison at either of the control sites as both bores are now disused. No significant change identified at any other monitoring bores. No evidence of a reduction in regional groundwater quality that has lowered the beneficial use.	Continue monitoring at SCPL Bore. Update GWMP and establish replacement control sites for Baganll and Germon.

7.4.4 Groundwater Inflows to Open Cut Mining Operations

Groundwater seepage inflows to mining voids is directed and collected in pit sumps along with rainfall and surface water runoff and seepage through backfilled pit areas. Water levels and water quality analysis of the pit sumps is undertaken on a monthly basis. The volumes of water extracted from the pit sumps is recorded where practicable.

The water quality monitoring results for the open cut pits during the reporting period is included in **Section 7.3.2.2** of this report.

A site water balance review is undertaken on an annual basis to monitor the status of inflows (including groundwater inflows to open pits), storage and consumption. The site water balance review includes an assessment of the measured groundwater inflows (groundwater take) compared to the predicted/modelled groundwater inflow. This is also compared to the groundwater licence extraction entitlements. A summary of the 2021 site water balance review is included in **Section 7.1.2** of this report.

The measured groundwater inflows at the SMC during 2021 where well below the annual licenced extraction limits and also remain below the predicted/modelled groundwater inflow rates.

7.4.5 Groundwater Model Review and Validation

A numerical groundwater model developed by Heritage Computing (2012) as part of the groundwater assessment for the SEP, was used to simulate the potential impacts of the SMC on the local aquifer systems and to estimate the potential quantity of groundwater inflow to the open pits. A summary of the potential impacts on local groundwater aquifers, surface water resources (e.g. Avon River, Dog Trap Creek and Avondale Creek) and on existing groundwater users is presented in the GWMP.

The numerical groundwater model is used as a management tool for the validation and review of the predicted groundwater impacts throughout the life of the SMC. The numerical groundwater model is review and recalibrated if required every 3 years.

The GWMP states in the event that actual groundwater drawdown levels exceed the predicted groundwater drawdown levels over the life of the SMC, the groundwater model will be further refined using any new data available to characterise the aquifer systems and determine the extent of impact on groundwater systems.

During the previous reporting period SLR were engaged to prepare a recalibration and validation of the groundwater model. The groundwater model was updated to reflect the historic and future mine progression and any additional changes to the mine landform since the initial modelling was undertaken by Heritage Computing in 2012. The model timing was extended to December 2024 with model packages updated to reflect the groundwater stress changes during the whole model period. A post closure groundwater modelling was conducted to understand the hydraulic dynamic between the final voids and the groundwater system and to simulate the final groundwater levels across the site for the with and removed Stratford East Dam scenarios. A summary of conclusions is presented below;

Based on the groundwater modelling, it is predicted that:

- The total pit inflows are ranging between 0.46 ML/day and 0.99 ML/day during the project

open cut operations (2021 - 2024);

- there is a negligible difference in groundwater take from Stratford East and Avon North final voids to the hardrock aquifer for both with and removed Stratford East Dam scenarios;
- Stratford East final void groundwater outflow to the hardrock aquifer is predicted to be about 0.02 ML/day (7 ML/year) at equilibrium and the groundwater inflow from the rehabilitated spoils into the final void is negligible;
- Avon North final void is predicted 0.17 ML/day (62 ML/year) of the groundwater outflow to the hardrock aquifer at equilibrium and no groundwater take from alluvium;
- both Stratford East and Avon North final voids present as a water source to the groundwater during the recovery period;
- up to 0.04 ML/day (15 ML/year) reduction in leakage from Stratford East Dam area to the hardrock aquifer, during the first 5 years recovery. This reduction in leakage then reduces to zero after 20 years recovery, which means that there is no additional leakage due to Stratford East Dam;
- Even though the final voids present as groundwater source, there is negligible change in groundwater quality as a result of post-mining in the long-term.

SCPL is currently developing the detailed mine closure planning in accordance with the Rehabilitation Management Plan, which includes refinement of the final landforms and other closure strategies. Following this, further updates to both the post-mining groundwater model and site water balance will be required.

8.0 Rehabilitation

Rehabilitation at the SMC is undertaken in accordance with the approved MOP (MOP 2021) required under the Mining Lease conditions and SSD-4966 conditions. A MOP was prepared for the commencement of the SEP during 2018. The MOP was approved by the Secretary for DRG on 9 March 2018 in advance of operations commencing. An amendment to the MOP was prepared and approved by DRG on 11 January 2019 to include Stratford East Open Cut and a second amendment to the MOP was prepared and approved by DRG on 16 July 2019 to include the recommencement of mining in the Roseville West Pit.

A new MOP was prepared and was lodged with the Resources Regulator on 20 January 2021, for the term from January 2021 to December 2023. The Resources Regulator requested additional information to be included in the new MOP. The MOP was updated to address theses requests and was approved on 23 July 2021.

To inform this new MOP, a rehabilitation and mine closure risk assessment was undertaken on 27 October 2020. The outcomes from the risk assessment are incorporated into this new MOP.

The MOP is available on the Stratford Coal website.

During the next reporting period, SCPL will prepare a new Rehabilitation Management Plan (RMP) consistent with the requirements of the Resources Regulator Operational Rehabilitation Reform. The new RMP will incorporate a Mine Closure Plan for the SMC consistent with the Mine Closure Planning Program described in Section 10 of the MOP.

Schedule 3, Condition 53 of SSD-4966 specifies the SMC post mining land use and rehabilitation objectives which are reproduced in **Table 8.1** below.

Table 8.1: Rehabilitation Objectives

Feature	Objective
Mine site (as a whole)	Safe, stable and non-polluting Constructed landforms drain to the natural environment Minimise visual impact of final landforms as far as is reasonable and feasible and be sympathetic to the original Gloucester valley landform
Final voids	Minimise the size and depth of final voids so far as is reasonable and feasible Minimise the drainage catchment of final voids so far as is reasonable and feasible Minimise high wall instability risk so far as is reasonable and feasible The size and depth of final voids must be designed having regard to their function as long-term groundwater sinks, to maximise groundwater flows across back-filled pits to the void and to not be a source of saline groundwater for aquifers and streams Designed and constructed to ensure adequate freeboard to ensure no spillage under any foreseeable conditions Minimise risk of flood interaction for all flood events up to and including the Probable Maximum Flood
Surface infrastructure	To be decommissioned and removed, unless the Deputy Secretary Resources & Energy agrees otherwise

Agricultural land	Establish a minimum of 300 hectares of land with Class 4 agricultural suitability
Other land	Restore ecosystem function, including maintaining or establishing self-sustaining ecosystems comprising: a wildlife corridor (shown as Biodiversity Enhancement Area in the figure in Appendix 8); local native plant species; and a landform consistent with the surrounding environment
Stratford and Glen heritage railway corridors	Road and transmission alignments to avoid heritage railway corridors Rehabilitation activities to avoid or minimise impacts
Community	Ensure public safety, with an emphasis on final voids Minimise the adverse socio-economic effects associated with mine closure

A summary of the rehabilitation objectives, performance indicators and completion criteria relevant to the SMC rehabilitation domains is provided in the MOP. Plan 4 in the MOP shows the conceptual final landform, relevant primary domains and secondary rehabilitation domains.

8.1 Buildings and Infrastructure

Buildings and infrastructure at the SMC have been utilised during the life of the operations, the infrastructure areas are currently active.

The existing infrastructure and services at the SMC will continue to be utilised throughout the life of the mining operations.

No buildings or infrastructure were constructed or demolished during the reporting period. No decommissioning of infrastructure is scheduled during the next reporting period. Building and infrastructure decommissioning is further addressed in the Section 8.6 Mine Closure.

8.2 Rehabilitation of Disturbed Land

Rehabilitation of disturbed areas is undertaken progressively and concurrently with ongoing mining operations. Rehabilitation planning, management and implementation is described in the MOP. The overburden dump is rehabilitated in progressive increments to the final landform so the area of disturbed land is minimised and disturbed water catchment areas are reduced. Stage plans for the SMC rehabilitation are provided in the MOP Plans 3A, 3B and 3C.

Mining and rehabilitation activities follow the general progression below:

- Vegetation is cleared ahead of mine progression. Details are included in the Annual Biodiversity Report included in **Appendix 9**;
- Topsoil is removed ahead of the advancing pit or overburden dump and recovered for rehabilitation;
- Overburden and coal extraction is undertaken:
- Bulk shaping of waste emplacements, drainage works, ground preparation and topsoil placement; and
- Planting of rehabilitation areas following all preparation works (areas to be rehabilitated will

comprise a combination of native forest/woodland and pasture with scattered trees as described in the MOP).

The SMC rehabilitation progress is generally in accordance with the planned activities described in the SMC MOP Plan 3A – Mining and Rehabilitation Year 1 (1 January 2021 – 31 December 2021). The MOP makes provision for a total of 279 hectares of rehabilitated area by December 2021.

During the reporting period new disturbance areas were associated with the Stratford East Open Cut advancing to the south. Refer to the area calculations in **Table 8.2**.

The current (December 2021) total SMC mine footprint area is 740 hectares including 481 hectares of active disturbed area. The total rehabilitation area is 259 hectares (including 31 hectares of landform establishment).

Table 8.2 presents a summary of the rehabilitation undertaken at the SMC site up to the current reporting period. The current mining areas and rehabilitation as of 31 December 2021 are shown in **Figure 4**, provided in **Appendix 1**.

Table 8.2 – Rehabilitation Status

Mine area type	Previous RP (actual hectares)	Current RP (actual hectares)	Next RP (forecast hectares)
Total Mining Lease	1580	1580	1580
Total mine footprint (Total Primary Domains)	724	740	740
Total active disturbance (Primary Domains less rehabilitation)	465	481	467
Land being prepared for rehab (Landform Establishment)	31.8	31.8	45
Land under active rehabilitation (Growth Medium Development)	0	0	0
Completed rehabilitation (Ecosystem Establishment & Sustainability)	227.7	227.7	227.7

Note: The rehabilitation and disturbance boundaries have been realigned and the areas recalculated. This includes the disturbance of previously rehabilitated land.

8.2.1 Rehabilitation Resources

Topsoil resources are managed in accordance with the MOP Section 3.3.4. Vegetation clearance activities are described in Section 6.5.1 of this report. A total area of 16 hectares were cleared in advance on mining activities during the reporting period. Following the clearance of vegetation all available topsoil is stripped and recovered. Topsoil resources are placed directly on rehabilitation areas if available or relocated to stockpiles for future use.

The site topsoil balance is updated annually to track the recovery and usage of topsoil and to ensure adequate resources are available for rehabilitation of disturbed areas at the SMC. The latest topsoil balance was updated in December 2021. At December 2021, an estimated 401,578 cubic metres of topsoil was held in various stockpiles at the SMC. This would provide for rehabilitation of

approximately 401 hectares to the nominal topsoil depth of 100mm. The current area of disturbance which will require topsoil (i.e. not including final void areas (estimated 138ha) or permanent water bodies (estimated 32ha)) is 326 hectares. Hence, the SMC currently holds sufficient topsoil resources to complete all rehabilitation works.

The SMC topsoil balance will be updated again during the next reporting period.

8.2.2 Rehabilitation Maintenance

Recommendations for maintenance activities on rehabilitated land have been included in the rehabilitation monitoring reports, refer to **Section 8.3**.

During the reporting period maintenance activities focussed on the improvement of pasture rehabilitation across the Stratford waste emplacement and included slashing and the removal of woody acacia regrowth. Slashing was also undertaken on the rehabilitated Codam pasture area. Weed control has been undertaken across all rehabilitation areas targeting lantana, blackberry, wild tobacco and Giant Parramatta grass.

Recommendations to undertake additional tubestock planting in targeted areas of the native rehabilitation to improve biodiversity and stem density as stated in **Section 8.3** are scheduled for the next reporting period.

8.3 Rehabilitation Monitoring

Monitoring of the SMC rehabilitation areas is described in Section 8 of the MOP. Rehabilitation is monitored on a regular basis to ensure vegetation is establishing in the rehabilitation areas and to determine the need for any maintenance and/or contingency measures (e.g. supplementary plantings, weed or erosion control). The monitoring also aims to demonstrate the effectiveness of the rehabilitation techniques and track the progression towards achieving the performance and completion criteria.

The annual rehabilitation monitoring program includes the areas designated for the post-mining land uses (Secondary Domains) of Native Vegetation (Woodland/Open Forest) and Agricultural Pursuits (Pasture/Scattered Trees).

Visual Monitoring

Rehabilitation monitoring includes a visual assessment:

- monitoring of soil erosion status and the effectiveness of erosion control methods;
- assessing germination success and vegetation establishment (diversity and abundance);
- usage of habitat enhancement features;
- the presence of weeds or feral animals; and
- mine landform runoff water quality.

The visual monitoring provides an early identification of areas requiring remedial planting or other maintenance works to maintain rehabilitation progress. The rehabilitation reports provide a list of maintenance recommendations predominantly relating to erosion control, weeds control and vegetation management and enhancement.

Ecosystem Function Analysis

The assessment of rehabilitation quality and ecosystem value is conducted via the use Ecosystem Function analysis (EFA). EFA aims to measure the progression of rehabilitation towards self- sustaining ecosystems. EFA has been incorporated into the overall SMC rehabilitation monitoring program to provide an assessment of landscape functionality.

EFA Analogue Transects have been established in proximal areas to represent the varying landscapes (i.e. slopes and aspects) and target communities planned for each rehabilitation area.

In December 2013 a fixed transect-based Landscape Function Analysis (LFA), Vegetation Dynamics and Habitat Complexity monitoring program was established across the SMC Rehabilitation areas. As rehabilitation progresses, additional EFA Revegetation Transects will be established at the SMC in each of the rehabilitation domain areas.

The rehabilitation transects were assessed again in June 2021 as part of the eighth annual round of monitoring in accordance with Section 8 of the MOP. Conclusions and general recommendations from the 2021 Stratford Mining Complex Rehabilitation Monitoring Report (Kleinfelder, 2021) (**Appendix 11**) follows;

"The 2021 monitoring of the native flora rehabilitation areas show mixed results. Areas where revegetation has been successful appear to have a combination of the factors in their favour. They appear to have good topsoil cover, have been seeded with a good mix of overstory, midstory and shrub species, and often have a favourable southerly or eastern aspect. These include the Stratford Woodland 1996/97 rehabilitation and the Bowens Road North 2006-08 rehabilitation, especially the northern area represented by Transect T25 this year's monitoring and T24 from the 2020 monitoring. These areas most closely resemble the analogue site in terms of the biophysical processes (LFA indices) with good litter production and subsequent nutrient cycling. These areas also show some natural recruitment with seedlings of different species and strata evident, as well as species such as Trema tomentosa introduced by fauna. The establishment of overstory species in these areas facilitates the self-recruitment due to the suppression of the exotic groundcovers that are prevalent on the SMC. As stated in Section 4.1.7 T36 above, the early seeding and/or planting of a high diversity of species is the preferred method of revegetation, although the ability to seed into bare topsoil and good timing with rainfall after the seeding ensures the best result possible."

"Area with less successful native revegetation such as the Roseville Waste Emplacements and the Bowens Road North 2011 and 2014 rehabilitation areas appear to have less topsoil (or it has eroded as in the area represented by T31), or a less favourable westerly or exposed aspect with higher rates of evaporation. These areas suffer from considerable dieback of native flora that had been initially established, and in the case of the BRN 2011 and the RWE northern mound revegetation areas, dense exotic groundcover has prevented any self-recruitment of the native species that are present. The RWE southern mound did have an area of successful revegetation on the western side of the emplacement, but as with the top section surrounding T18, this has suffered dieback, both natural from senescing Acacias and from a presumed inability to retain water – as evidence by the Eucalyptus dieback. The low infiltration index score on the T18 transect suggests that water is unable to penetrate the soil, rather than draining away, combined with a high evaporation rate, may be the main reason for the dieback. The planting program methodology will employ ripping to break up the soil surface, which will increase infiltration into the "subsoil" of the waste emplacement. These areas have had a least one attempt at additional planting of overstory tubestock with limited success, although the RWE northern

mound does have some survival of these plants – these were the measured overstory individuals in the T21 monitoring. Additionally for the RWE, where the groundcover is mainly native grasses, some minor self-recruitment was observed."

"SMC environmental staff have been aware these issues and the combination of the 2022 planting program and weed control works will serve to improve the native flora rehabilitation in these areas."

"General recommendations that have been made in previous reports include the consideration of environmental or cool season burns to reduce the grassy biomass and weeds and stimulate the native species. With the implementation of the planting program, burns will be not a suitable management tool until such time as the tubestock matures and is able to survive any fires, and/or wit the cessation of active mining operations."

"The installation of nest boxes has been suggested for the BRN 2006-08 rehabilitation and the Stratford Woodland 1996/97 rehabilitation areas in previous reports. However, with the active mining operations still ongoing at Avon North Pit and the Stratford East Extension, these areas have become isolated from other native vegetation, and nest boxes for arboreal mammals is not suitable. However, nest boxes for birds are a consideration as these areas do have individual trees of sufficient size to support larger boxes."

"Pasture rehabilitation areas are progressing satisfactorily and are currently supporting grazing. As stated in Section 4.2.1 T33 the analogue transect is beginning to resemble woodland rehabilitation with a many self-recruited overstory seedlings observed. It is recommended that the analogue site be relocated further into the current paddock, away from paddock trees, or if this proves not feasible to another paddock entirely. The pasture rehabilitation areas do not require any remedial action at this stage, with ongoing pasture management from the current lessees the only requirement." (Kleinfelder Australia, 2021):

The outcomes and recommendations from the rehabilitation monitoring will guide the future rehabilitation efforts and maintenance works.

Fauna Monitoring

Fauna usage of the native woodland/forest rehabilitation areas is monitored and documented over time. Fauna surveys are conducted to assess the success of the rehabilitation and revegetation activities in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity, species richness and abundance. Fauna monitoring is undertaken every three years and was last undertaken during 2019.

During 2019 AMBS Ecology & Heritage (AMBS) was engaged to undertake a fauna survey within the SMC native rehabilitation areas to assess the success of the rehabilitation areas in providing habitat for a range of vertebrate fauna. The results are provided in the *SMC Fauna Surveys of the Mine Rehabilitation Areas, February 2019* (AMBS, 2019). An extracted summary is provided below.

"Targeted fauna surveys were undertaken at eight sites. Six sites within the Stratford Offset Areas and two sites within the Biodiversity Enhancement Area. Field surveys occurred during two weeks, from 23 to 27 September 2019 and 28 October to 2 November 2019. At each site survey techniques included pitfall traps, funnel traps, Elliott A traps, harp traps, ultrasonic call recording, spotlighting, diurnal bird surveys and reptile searches. In addition, targeted frog surveys were undertaken at four water sources, one located in the Biodiversity Enhancement Area and three in the Biodiversity Offset

Area. Opportunistic observations of signs of fauna were noted throughout the field survey period, including during transit between surveys sites.

A total of 167 species of vertebrate were recorded, comprising 11 frogs, 16 reptiles, 97 birds and 43 mammals, most of which were native. Six introduced species were recorded during the surveys, including the Red Fox (Vulpes vulpes), Feral Cat (Felis catus), Black Rat (Rattus rattus), European Rabbit (Oryctolagus cuniculus), European Brown Hare (Lepus europaeus) and Cattle (Bos taurus). This is a reasonable diversity of fauna considering extreme drought conditions throughout the year and the relatively short length of the survey.

Twenty-two of the species detected are listed as threatened or migratory on the schedules of the BC Act and/or EPBC Act, including:

- *White-bellied Sea-eagle (Haliaeetus leucogaster)*
- *Dusky Woodswallow (Artamus cyanopterus cyanopterus)*
- *Black-chinned Honeyeater (eastern subspecies) (Melithreptus gularis gularis)*
- *Black-faced Monarch (Monarcha melanopsis)*
- *Spectacled Monarch (Symposiachrus trivirgatus)*
- *Varied Sittella (Daphoenositta chrysoptera)*
- *Grey-crowned Babbler (eastern subspecies) (Pomatostomus temporalis temporalis)*
- *Black-necked Stork (Ephippiorhynchus asiaticus)*
- *Little Lorikeet (Glossopsitta pusilla)*
- *Yellow-bellied Sheathtail-bat (Saccolaimus flaviventris)*
- *Little Bent-winged Bat (Miniopterus australis)*
- *Large Bent-winged Bat (Miniopterus orianae oceanensis)*
- *Eastern Coastal Free-tailed Bat (Micronomus norfolkensis)*
- *Large-eared Pied Bat (Chalinolobus dwyeri)*
- *Southern Myotis (Myotis macropus)*
- *Greater Broad-nosed Bat (Scoteanax rueppellii)*
- *Brush-tailed Phascogale (Phascogale tapoatafa)*
- *Red-legged Pademelon (Thylogale stigmatica)*
- *Yellow-bellied Glider (Petaurus australis)*
- *Squirrel Glider (Petaurus norfolcensis)*
- *Koala (Phascolarctos cinereus)*
- *New Holland Mouse (Pseudomys novaehollandiae)*

The fauna surveys suggest the Stratford Offset and Biodiversity Enhancement Areas provide habitat for a range of native vertebrate fauna, including birds, mammals, reptiles and frogs. Two of the threatened species recorded, the Black-chinned Honeyeater and Red-legged Pademelon, have not previously been recorded at the Stratford Mining Complex."

8.3.1 Threats to Rehabilitation Completion

The SMC MOP Section 6 establishes the performance indicators and completion criteria for the rehabilitation of the SMC. The SMC MOP Section 9 includes a description of intervention and adaptive

management for threats to achieving the rehabilitation completion criteria. SCPL has successfully undertaken rehabilitation activities at the SMC since 1997 with the results of rehabilitation monitoring continuing to inform the effectiveness of rehabilitation methods and requirements for contingency measures.

The 2012 ERA (SP Solutions, 2012) and the 2020 Rehabilitation Risk Assessment (CKC, 2020) (MOP Section 3.1) identified potential issues and risks associated with rehabilitation and mine closure at the SMC. These risks/threats to rehabilitation are outlined in the rehabilitation trigger, action, response plan in the MOP Table 12 (Section 9.2) along with actions that will be undertaken to mitigate these risks

8.3.2 Status of Rehabilitation Recommendations

During the 2021 reporting period the *Stratford Mining Complex Rehabilitation Monitoring Report* (Kleinfelder, 2021) identified a list of recommendations to the previously rehabilitated areas. Status of the implementation of the recommendations on rehabilitation and maintenance activities is provided in **Table 8.3**.

Table 8.3 – Status of Implementation of Rehabilitation Recommendations

Native Flora Rehabilitation	**Recommendations**	**Status of Implementation**
Bowens Road North 2014	• Determine if the remaining area is of sufficient size to re-establish monitoring transect/s	• Area determined to not be of sufficient size to re-establish transects.
Bowens Road North 2011	• Investigate the relative feasibility of various revegetation methods, including slashing, ecological burns flowed by seeding or installation of tubestock	• Slashing and installation of tubestock to be completed in Autumn 2022. Approximately 3720 trees and shrubs to be planted in Bowens Road North areas.
Roseville Waste Emplacement 2005	• Implement a tubestock planting program with canopy and “missing” shrub species to improve biodiversity and density.	• Slashing and installation of tubestock to be completed in Autumn 2022. Approximately 3280 trees and shrubs to be planted in Roseville Waste Emplacement areas.
Bowens Road North 2006- 08	• Implement a tubestock/seeding planting program with canopy and “missing” shrub species to improve biodiversity and density. • For monitoring purposes, treating the area represented by T24 and T25 separately from the southern BRN area.	• Slashing and installation of tubestock to be completed in Autumn 2022. Approximately 3720 trees and shrubs to be planted in Bowens Road North areas.
Stratford Woodland Rehabilitation 1996/97	• Continue with periodic and regular control of woody weeds that have potential to hinder revegetation effort – i.e., Lantana camara, and Solanum mauritianum.	• Weed control program has continued in 2021.
Pasture Rehabilitation	**Recommendations**	**Status of Implementation**
Stratford Waste Emplacement Pasture	• Continue monitoring as per consent conditions until such time as sign off and relinquishment process completed Instigate normal pasture weed	• Slashing of Stratford Waste Emplacement and continuation of the Stratford weed control program continued during 2021.

Native Flora Rehabilitation	Recommendations	Status of Implementation
	management practices – suppression of native colonisers (e.g. Acacias) and pasture weeds (e.g. Cirsium vulgare).	

8.4 Rehabilitation Trials and Research

SCPL has extensive experience in both native woodland/forest revegetation and agricultural pasture rehabilitation, with successful rehabilitation areas completed over the past 20 years at both the Stratford and Duralie mine sites. Learnings from the rehabilitation works undertaken onsite to date along with industry best practice guidelines are employed in the methodology for new rehabilitation areas.

Rehabilitation trials have been also undertaken in the Duralie Coal Mine Biodiversity Offset Areas. These trials have provided learnings and methods for the rehabilitation and biodiversity offset work at SMC.

8.5 Rehabilitation Targets

The rehabilitation targets are specified in the new MOP for the term 2021 to 2023. The SMC MOP Plan 3A - Mining and Rehabilitation Year 1 (2021) rehabilitation target is a cumulative total of 279 hectares of rehabilitation.

Rehabilitation of approximately 45 hectares of BRNOC and Roseville West Pit areas immediately north-west and south of the Stratford Main Pit and an area in the northern extent of the Stratford East Open Cut is scheduled be undertaken in the next reporting period in accordance with the MOP Plan 3A.

8.6 Development of the Final Rehabilitation Plan

8.6.1 Mine Closure Planning

Rehabilitation strategies are provided in the Environmental Assessments for the SMC. Rehabilitation will be generally consistent with the proposed rehabilitation strategy as depicted in SSD-4966.

The SMC MOP (Section 10) includes a mine closure planning program, which includes a schedule of all technical and/or environmental assessments that will be required to undertake final rehabilitation and closure of the SMC. The technical assessments identified in the Mine Closure Planning Program include the risk mitigation measures and risk reduction strategies identified in the 2012 ERA and in the 2020 rehabilitation risk assessment (MOP Section 3.1). The planning program is designed to inform the preparation of a detailed Mine Closure Plan, which will be prepared in future RMP terms prior to mine closure.

The Mine Closure Plan includes final rehabilitation measures for all areas including infrastructure areas, water management areas, waste emplacements, rejects facilities, final voids and biodiversity offsets.

Assessments and studies included in the Mine Closure Planning Program commenced during the reporting period and will continue to be developed in the next MOP term and subsequent RMP terms.

During the next reporting period, SCPL will prepare a new Rehabilitation Management Plan (RMP) consistent with the requirements of the Resources Regulator Operational Rehabilitation Reform. The new RMP will incorporate a Mine Closure Plan for the SMC consistent with the Mine Closure Planning Program described in Section 8 of the MOP.

8.6.2 Final Landform Designs

The proposed final landforms for the SMC would include a combination of pasture and native woodland rehabilitation consistent with the surrounding environment. This would also include final voids and wildlife corridors.

The rehabilitation objectives for the final landforms requires final landform designs which sustain the intended land use for the post-mining domain(s). Final landforms are to be consistent with and complement the topography of the surrounding region to minimize the visual prominence of the final landforms in the postmining landscape. Final landforms are to incorporate design relief patterns and principles consistent with natural drainage.

SCPL have continued to develop the detailed final landform designs consistent with the conceptual rehabilitation strategy in the EIS 2012 and rehabilitation objectives in the Development Consent. The MOP also includes detail regarding the rehabilitation implementation requirements and the conceptual final rehabilitated landform for the SMC.

The NSW Resources Regulator completed a second TAP inspection regarding landform establishment at the SMC on 16 June 2021. The assessment focused on how the final approved landform is being established to achieve sustainable rehabilitation outcomes

The Resources Regulator provided a summary of observations and recommendations on 8 July 2021. The recommendations will be addressed in the mine closure risk assessment during the next reporting period and included in the preparation of the new Rehabilitation Management Plan and DCM Closure Plan.

8.6.3 Final Void Management

At the completion of mining, the SMC final landform will include partially backfilled final voids located at the Roseville West Extension Pit, Avon North Open Cut and Stratford East Open Cut. The rehabilitation objectives for these final voids are to:

- Minimise the catchment area of the final voids.
- Ensure the final voids are stable and non-polluting.
- Leave the void surrounds safe (for humans and stock).

The management of final voids for the SEP is described in the EIS 2012 rehabilitation strategy and has been included in the SEP MOP. The mine closure planning program includes several components relating to water management and final voids including:

- Review the site water balance to ensure the balance incorporates the final landform design, surface water inflows and outflows to/from final voids.
- Review the site groundwater model to ensure the model is consistent with the final landform design.
- Review the post-mining drainage design to ensure comparable drainage density to local natural landforms.
- Review the medium to long term water quality predictions of the final voids against available monitoring data to determine the need for additional/alternate management.

8.6.4 Water Management

The rehabilitation and post-mining water management strategy is described in the EIS 2012.

Site Water Balance

A site water balance has been prepared for the SEP EIS by a suitably qualified and experienced person (Gilbert & Associates, 2012). A revised post-mining site water balance will be undertaken to reflect the refined final landform and final void designs, including all surface water inflows and outflows.

Water Infrastructure

All water management infrastructure including sediment dams, Disturbed Area Dams (including the Return Water Dam) and temporary diversion drains not required in the final landform will be decommissioned and rehabilitated in accordance with the rehabilitation objectives for the Water Management domain and Infrastructure Area domain. A strategy will be developed to guide the decommissioning of the relevant dams and is anticipated to include:

- a register/list of the dams to be decommissioned and removed;
- proposed staging or scheduling for decommissioning;
- procedures for decommissioning, including details of where the dam water will be transferred to, where sediments will be disposed of (i.e. within a final void, or at a licensed off-site facility) and embankment re-profiling requirements; and
- rehabilitation requirements (including revegetation species).

The Stratford East Dam will be retained in the final landform. A review will be undertaken, by a suitably qualified and experienced person, of the future approval requirements for the Stratford East Dam which would include an assessment of the dam's catchment and harvestable rights, and potential future uses for either agriculture, use by a public authority or environmental benefit.

8.6.5 Rehabilitation Resources

Topsoil resources are managed in accordance with the MOP Section 3.3.4. To ensure suitable and adequate topsoil resources are available for final rehabilitation, a site topsoil balance is undertaken annually and the volume compared to the total remaining disturbed area requiring rehabilitation.

Annual reporting of the site soil balance and rehabilitation performance is provided in Section 8.2 of this report.

Topsoil stripping will continue during the next period associated with development of the Stratford East Open Cut. Soil resources will either be directly placed on available rehabilitation areas or placed within dedicated soil stockpiles. The site topsoil balance will be updated once soil stripping and placement activities are complete.

8.6.6 Stratford Main Pit & Reject Emplacement Rehabilitation

The Stratford Main Pit continues to be used for the disposal of reject material and is now envisaged that the Main Pit will effectively be filled with waste material and rejects over the life of the operation. Rehabilitation concepts for the Stratford Main Pit include profiling the backfilled pit to free-draining landforms, capping the reject material and topsoiling for revegetation with endemic woodland/open forest species.

The overall rehabilitation objective for the Stratford Main Pit is to create and landform which is safe, stable and non-polluting. The final landform would drain to the natural environment and minimise visual impact as far as is reasonable and feasible and be sympathetic to the original Gloucester valley landform.

To achieve the final landform in the Stratford Main Pit the void will be backfilled with co-disposed reject material and overburden spoil. The Main Pit will also be used for water storage during the life of the operation. Xenith have investigated concepts of how to undertake these activities safely and document the intended approach.

The proposed Stratford Main Pit Rehabilitation methodology includes strategies and assessments for:

- Waste emplacement and scheduling;
- Rejects emplacement and scheduling;
- Geotechnical analysis of slope stability and factors of safety during backfilling;
- Assessing reject characterisation and settling densities;
- Pit dewatering and inert material capping;
- Site water balance review; and
- Development of stage plans to achieve final landform.

9.0 Community Relations

SCPL is committed to a policy of regular liaison with the local community and strives to maintain positive relationships with stakeholders. SCPL's community objectives aim to:

- Ensure employees and contractors are informed about SCPL's policies and are made aware of their environmental and community responsibilities in relation to SCPL's activities;
- Inform the community of SCPL's activities and consult with the community in an open and honest fashion in relation to SCPL's projects; and

- Address complaints/conflicts and consult to achieve mutually acceptable outcomes.

Dissemination of information to the local community and relevant agencies regarding SCPL, its progress and environmental management performance will be achieved via the following communication and reporting mechanisms.

- Community Consultative Committee
- Stratford Coal Website
- Stratford Coal Mine Annual Review
- Community Information and Complaints Line

9.1 Community Engagement Activities

Yancoal Australia Ltd is committed to making a positive contribution in the areas in which it operates. To help facilitate this commitment Stratford Coal Pty Ltd have established the Community Support Program to provide assistance to local initiatives within the local area in which they operate. The aim of the Community Support Program is to help benefit a diverse range of community needs such as education, environment, health, infrastructure projects, arts, leisure and cultural heritage.

The Stratford Coal Community Support Program has granted over $767,000 since commencing in 2010 and during 2021 a total of $84,000 in grants was approved. The community groups to receive grants in 2021 were:

Community Support Program 2021 Recipients	Project Description
Stroud Neighbourhood Children's Cooperative	Installation of Safety Fencing, Essential Drainage and Landscaping
Gloucester Pre-School Incorporated	Community Supported Playgroup
Gloucester Country Club	Stratford Coal Super Sevens Golf Competition 2021
Stratford Public School	Stratford Public School iPads for Students
Stratford Public School P & C	School Uniforms and Student Activities
Barrington Public School	Barrington Public School Multilit Program
Booral Rural Fire Brigade	Booral RFS Media Wall - Interactive Training and Engagement
Stroud Cricket Club	Cricket Pitch Upgrade and Transition for Sports
MidCoast Science & Engineering Challenge Committee	MidCoast Science & Engineering Challenge and Discovery Days 2021
Gloucester Agricultural, Horticultural & Pastoral Assoc.	Gloucester Show 2021 - Educational & Interactive Activities for the Younger Show Audience
Stroud Community Lodge Inc	High Care Beds for residents at Stroud Community Lodge

Community Support Program 2021 Recipients	Project Description
St Joseph's Primary School	Safe School Access - Fencing and gate improvements. Playground seating.
Worimi First People Aboriginal Corporation	Cultural Weaving Workshops
Stroud Road Community Hall & Progress Assoc	Stroud Road Spring "Bash 'n Bang" 2021
Stroud Public School P&C Association	Stroud Public School Laptops for Students
Gloucester Public School P & C Assoc	New Seating in Peace Park
Individual Ability Support Inc	Construction of Nest Boxes for Stratford Coal Biodiversity Areas
Stroud Rodeo Association	2021 Stroud Rodeo and Campdraft - Major Sponsor
Stroud & District Country Club	Stroud Country Club Family Fun Day and Mini Golf Day
Gloucester Mountain Man Tri-Challenge Inc.	2021 Gloucester Mountain Man Tri Challenge - 30th Year
Stroud Show Association	2021 Stroud Show - Major Sponsor

Stratford Coal Pty Ltd have also continued their commitment to education and training in the Gloucester region through Stratford Coal's Education Support Program, providing much needed funding for the next generation of young students. The Education Support Program is managed by an independent committee and the funds distributed by MidCoast Council. In 2021, $22,500 has been allocated in funding to help support local students and businesses in university degrees, TAFE courses and apprenticeships.

Since the commencement of mining in 1995, Stratford Coal has contributed more than $795,700 to locally based community and training initiatives via the Education Support Program. During that time, the funding has support over 200 tertiary students, 138 apprentices and 65 businesses.

Yancoal and Stratford Coal have continued their partnerships with:

- The Clontarf Foundation -Chatham Academy
- QLD University of Technology
- Westpac Rescue Helicopter.

9.2 Community Consultative Committee

The Stratford Coal Community Consultative Committee (CCC) was established in 1995 and operates under the guidance of the NSW DPE. Meetings were held quarterly during 2021 and provide a forum for open discussion between the community, Council, the Company and other stakeholders on issues relating to the mine's operations, environmental performance and community engagement.

The Community Consultative Committee (CCC) for the SMC is currently comprised of:

- An independent Chairperson;
- Five (5) local community representatives;
- Two (2) local government representatives (MidCoast Council); and
- Two (2) SCPL representatives.

The CCC was formed in accordance with Schedule 5, Condition 6 of SSD-4966. The CCC operates in such a manner as to satisfy the *Community Consultative Committees Guidelines for State Significant Projects* (Department of Planning, 2016) and to the satisfaction of the Secretary of the DPE.

During the reporting period, quarterly meetings were held in February, May, August and November 2022. Items raised and/or discussed during these CCC meetings include but are not limited to:

- Environmental monitoring, including air quality, noise, surface water and groundwater;
- weeds, pest and pasture management, including wild dog control
- community complaints and measures to mitigate ongoing impacts from blasting and lighting
- broader community engagement and community enhancement contributions to Council and allocation thereof
- progress at the mine and the Stratford Extension Project including proposed road closures
- coking/thermal coal production ratios
- Rehabilitation progress
- Biodiversity offset management strategy
- Successful Nest Box Program
- Yancoal land management, including rural leased lands
- Post mining land use and mine closure planning
- Progress on draft water reuse between Stratford Mine and MidCoast Council
- Covid-19 Site response

A site inspection was conducted following the November 2021 CCC meeting. Due to Covid-19 restrictions only four CCC members participated in the inspection. Areas inspected included Stratford East, Stratford Main Pit, Avon North and BRN as viewed from the top of the Stratford rehabilitation area.

An Annual Report for the Stratford Coal CCC was prepared by the Chair and submitted to DPE on 23 February 2022 (**Appendix 7**).

9.3 Environmental Complaints

SCPL manages complaints received at the SMC in accordance with the protocol established in the Environmental Management Strategy (EMS). SCPL aims to address all complaints/conflicts and consult to achieve mutually acceptable outcomes.

Complaints may be received in any form. SCPL operates a dedicated community information and complaints hotline (1300 658 239) 24 hours per day. The number is advertised within the Sensis White Pages Directory (Newcastle), a local telephone directory (Pink Pages) and in the local newspapers (Gloucester Advocate) on a six-monthly basis.

Complaints (by category) received by SMC over the last 5 reporting years are shown in **Table 9.1**:

Table 9.1 – Community Complaints Summary

Complaint Category	2017	2018	2019	2020	2021
Noise	1	4	1	28	12
Blasting	0	0	4	6	4
Air Quality	1	0	0	2	1
Water	0	0	0	0	0
Lighting	0	0	0	6	4
Visual	0	0	0	0	0
Train	0	0	0	0	0
Other	0	0	0	1	0
Total Complaints	**2**	**4**	**5**	**43**	**19***

*Note some complaints included multiple categories

A summary of complaints received during 2021 is below:

- The total number of complaints received during the reporting period was nineteen (19) with the total number of complainants being six (6).
- Complaints were related to noise, blasting, lighting and air quality.
- The total number of complaints decreased during the reporting period.

During the 2021 reporting period the SMC continued full scale operations. Operations at SCPL includes mining operations 7 days per week and typically between the hours of 6:30am am 1:00am, albeit there is no evening/night shift on weekends. The total number of complaints received during 2021 decreased from the previous reporting but were still higher than the years prior to resuming full scale operations.

The total number of complaints received during 2021 is similar to the number of complaints received when Stratford was last at full scale operations in 2013. SCPL continues to implement mitigation measures described in the EMPs and identify improvements to reduce the overall level of offsite emissions/impacts. SCPL continues to engage with complainants to achieve mutually acceptable outcomes.

A full complaints listing is provided in **Appendix 7** and includes details of SCPL's responses to complaints. A summary of complaints by category is provided in the relevant sections of the report.

9.3.1 Liaison and Complaint Resolution

SCPL aims to inform the community of its activities and consult with the community in an open and honest fashion and address complaints/conflicts and consult to achieve mutually acceptable outcomes.

In accordance with the conditions of SSD-4966, SCPL is required to establish and maintain a complaint handling and response procedure. SCPL operates a system to receive, handle, respond to and record complaints or information requests relating to operation of the SMC which is described in the EMS.

SCPL operates dedicated community information hotline (1300 658 239) 24 hours per day. The number is advertised within the Sensis White Pages Directory (Newcastle), a local telephone directory (Pink Pages) and in the local newspapers (Gloucester Advocate and Dungog Chronicle) on a six-monthly basis.

Designated SCPL staff, when notified of a complaint, determines an appropriate response on the basis of the nature of the complaint during business hours. This may involve a site visit/inspection, liaison with personnel on site by telephone or other appropriate action. After business hours, all complaints and operations are reviewed as soon as practicable by the open cut examiner and responded to by SCPL staff during business hours.

All complaints received and responses taken in relation to each complaint are recorded in a Complaints Register. The Complaints Register is tabled at each Community Consultative Committee meeting for the period covered since the last Committee meeting and is included in **Appendix 7**. The complaints register is also made available on the Stratford Coal website.

9.4 Employment Status and Demography

At the end of the reporting period (i.e. December 2021), the total number of FTE (staff/employees/contractors) employed at the SMC was 124, including 109 SCPL employees and 25 Ditchfield contractors. During the reporting period 2 environmental representatives were employed and shared with the nearby Duralie Coal Mine.

In addition to direct permanent employment at the mine, on the basis of a conservative employment multiplier of one mine site job generating one job within the general community, up to 124 (full time equivalent) jobs are expected to have been provided in supporting services. On the basis of a review of employees' living location, 55% of mine employees currently resided within the greater local area (defined as being bounded by Stroud, Gloucester and Dungog).

9.5 Employee Environmental Awareness Training

SCPL recognises the importance of establishing, developing and maintaining a risk-aware, trained, and competent workforce at its operations to ensure a high standard of environment and community management.

SCPL environment & community management objectives include:

- ensuring employees and contractors are informed about SCPL's policies and are made aware of their environmental and community responsibilities in relation to SCPL's activities;
- providing all employees/contractors with the knowledge, skills and equipment necessary to meet their environmental obligations; and
- promoting an awareness and concern for good environmental management amongst all employees/contractors.

New employees and contractors working at site are provided with information on environmental and community issues as part of Stratford Coal induction training which is updated periodically. This includes elements such as the Pollution Incident Response Management Plan and reporting obligations of personnel and the management of environmental incidents. Ongoing environmental awareness training is also undertaken with staff and employees periodically.

During the reporting period employee and contractor training included presentations on:

- General environmental management, approvals and awareness – Training was undertaken during 2021 with all employees and contractors at the Stratford operations. This included information on environmental management including presentation to crews on the Pollution Incident Response Management Plan and on-site waste management.
- Toolbox Talks regarding: lighting management, water management, noise management and blast management.

10.0 Independent Environmental Audit

An Independent Environmental Audit (IEA) was not required during the reporting period. The previous IEA of the SMC was conducted in December 2020 by Ken Holmes of Barnett & May, in accordance with SSD-4966 Schedule 5, Conditions 9 and 10. The purpose of the audit was to review compliance over the audit period 2018-2020 with the conditions and obligations of the SMC environmental licences, approvals and management plans. This was the first IEA undertaken in accordance with SSD-4966.

The SMC 2020 Independent Environmental Audit (Barnett & May, 2020) was submitted to DPE on 2 March 2021 and is available on the Stratford Coal website.

The IEA 2020 presents a summary of compliance with the SMC statutory requirements. Non-compliances identified during the site inspection, interviews and document reviews are recorded in detail in the Compliance Registers in the IEA 2020 Appendix A. Recommendations have been made by the lead auditor to address all identified Non-Compliances. The IEA 2020 identified a total of 23 non-compliances and associated recommendations (18 Administrative, 3 Low and 2 Medium).

The key findings/recommendations in the IEA related to the following matters:

- Water management;
- Air quality;
- Incident reporting;
- Additional information in the Annual Reports/Reviews;
- Management Plan revisions.

SCPL's responses to the recommendations contained in the IEA 2020 Report and a status update of SPL's progress against the recommendations are included in **Appendix 10** of this report.

11.0 Incidents and Non-Compliance

Activities at the SMC continue to be carried out in accordance with Development Consent SSD-4966 for the SEP. Additionally, activities at the SMC are undertaken in accordance with EPL 5161 and the SMC Mining Leases.

A protocol for managing incidents and non-compliances is included in the SMC Environmental Management Strategy (EMS).

A statement of compliance is included in Section 1 of this report. During the reporting period there was a total of five (5) incident/non-compliances in accordance with SSD-4966 at the SMC. A summary of the non-compliances with Development Consent SSD-4966 during the reporting period are included in **Table 1.2**. Compliance recommendations identified in the IEA 2020 are referred to separately in **Section 10** and **Appendix 10** of this report.

All incidents/non-compliances at the SMC are reported and recorded in Yancoal's compliance management system Intelex. The severity of the incident will determine the level of investigation required. The reporting of incidents to regulators is conducted in accordance with the EMS, Condition 7, Schedule 5 of SSD-4966 and the POEO Act and PIRMP where applicable.

Three of the incidents recorded in **Table 1.2** were ranked as low risk or administrative. One of the incidents were ranked as low risk and two of the incidents recorded in **Table 1.2** was ranked as medium risk and was determined to have triggered the POEO Act and the PIRMP.

- 20/03/2021 - Breach of the Roseville Link Haul Road culvert crossing over Avondale Creek at the SMC, which occurred on Saturday 20 March 2021 during a significant rainfall event.
- 20/03/2021 - Uncontrolled discharge of mine related water from three SMC sediment dams and three disturbed area dams reporting to Avondale Creek.

The above incidents were notified to the relevant authorities immediately and written incident reports were submitted within 7 days in accordance with SSD-4966 and the PIRMP.

12.0 Activities Proposed in the Next AR Period

SCPL will continue mining operations in accordance with Development Consent SSD-4966 for the Stratford Extension Project during 2022.

The following environmental targets have been set for the next 12 months:

- Mining and progressive rehabilitation activities will be implemented in accordance with the timing in stage plans in the SMC MOP.
- Review and, if necessary, update the Environmental Management Plans to the satisfaction of the Secretary of DPE to ensure suitable management plans are in place for the SEP;
- Continue developing the detailed Mine Closure Plans in accordance with the mine closure planning schedule in the MOP for the SMC.
- Progress biodiversity offset works in accordance with the BMP including full implementation of the revegetation works.
- Continue to meet the environmental management, monitoring and reporting requirements in accordance with the Development Consents conditions.
- Maintain low level of complaints and non-compliances.

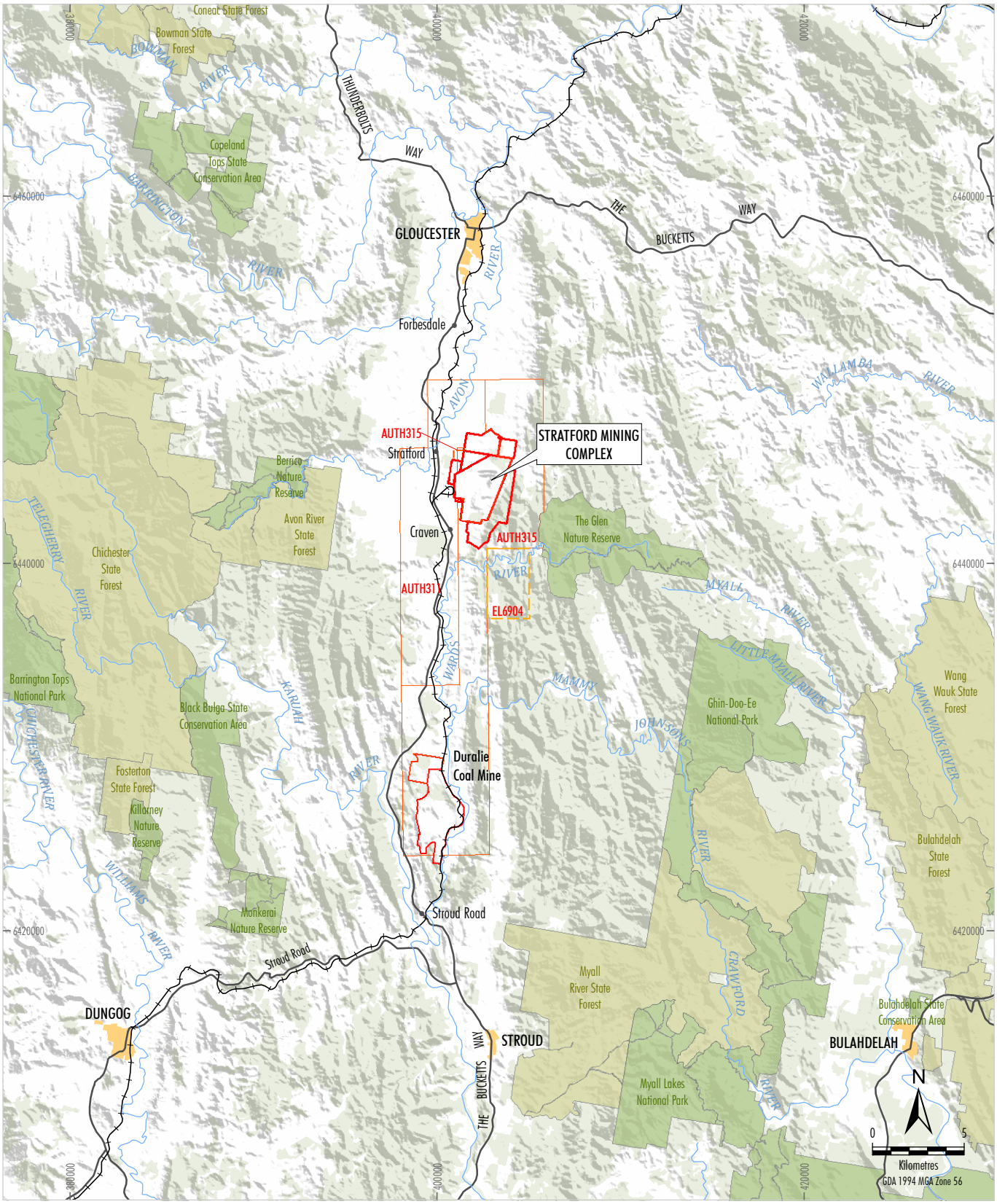
13.0 References

- Barnett & May (2020). SMC 2020 Independent Environmental Audit
- Duralie Coal Pty Ltd (2018). Duralie Coal Mine Biodiversity Management Plan.
- Gilbert and Associates (2012). Stratford Extension Project Surface Water Assessment for Stratford Coal Pty Ltd, Gloucester.
- Heritage Computing (2012). A Hydrogeological Assessment in Support of the Stratford Coal Project Environmental Impact Statement.
- Invertebrate Identification Australasia (2021). Biological Monitoring of the Stratford Mining Complex for Stratford Coal Pty Ltd, Gloucester.
- Kayandel Archaeological Services (2012). Stratford Extension Project Aboriginal Cultural Heritage Assessment.
- Kleinfelder Australia Pty Ltd (2021). 2021 Stratford Rehabilitation Monitoring Report.
- Resource Strategies (2001a). Bowens Road North Project Environmental Impact Statement
- Stratford Coal Pty Ltd (2018). Stratford Mining Complex (Stratford Extension Project) Biodiversity Management Plan
- Stratford Coal Pty Ltd (2018a). Stratford Mining Complex (Stratford Extension Project) Heritage Management Plan
- Stratford Coal Pty Ltd (2018b). Stratford Mining Complex (Stratford Extension Project) Life of Mine Rejects Disposal Plan
- Stratford Coal Pty Ltd (2018c). Stratford Mining Complex (Stratford Extension Project) Squirrel Glider Management Plan

- Stratford Coal Pty Ltd (2019). Stratford Mining Complex (Stratford Extension Project) Noise Management Plan
- Stratford Coal Pty Ltd (2021) Stratford Mining Complex Mining Operations Plan and Rehabilitation Management Plan
- Stratford Coal Pty Ltd (2021a). Stratford Mining Complex (Stratford Extension Project) Air Quality Management Plan
- Stratford Coal Pty Ltd (2021b). Stratford Mining Complex (Stratford Extension Project) Water Management Plan
- Stratford Coal Pty Ltd (2021c) Stratford Coal Mine Pollution Incident Response Management Plan
- Stratford Coal Pty Ltd (2021d). Stratford Mining Complex (Stratford Extension Project) Blast Management Plan
- Stratford Coal Pty Ltd (2021e). Stratford Mining Complex Annual Biodiversity Report 2021
- Stratford Coal Pty Ltd (2010) Stratford Coal Mine July 2010 Modification Environmental Assessment
- Stratford Coal Pty Ltd (2012) Stratford Extension Project Environmental Impact Statement

APPENDIX 1

Regional Location
Site General Arrangement
Environmental Monitoring Locations
Mining and Rehabilitated Areas



YAN-17-10_MP2019 MRCF_205A

LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary*
- Exploration Licence Boundary
- NSW State Forest
- National Park, Nature Reserve or State Conservation Area

**MLA1 is a proposed future Mining Lease Application (MLA) area and has not yet been lodged.*

Source: Geoscience Australia (2006); Yancoal (2019); NSW Department of Planning & Environment (2017)

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STRATFORD EXTENSION PROJECT

Regional Location

Figure 1

YAN-20-31 SAR 2021_202A

LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary*
- Electricity Transmission Line
- Approximate Extent of Existing/Approved Surface Development
- Conceptual Up-Catchment Diversion

**MLA1 is a proposed future Mining Lease Application (MLA) area and has not yet been lodged.*

 # Not yet Constructed

Source: Orthophoto - Yancoal (2021); NSW Department of Planning & Environment (2017)

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Approved General Arrangement

Figure 2

YAN-20-31 SAR 2021_203A

LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary*
- Electricity Transmission Line
- Approximate Extent of Existing/Approved Surface Development
- Conceptual Up-Catchment Diversion

**MLA1 is a proposed future Mining Lease Application (MLA) area and has not yet been lodged.*

 # Not yet Constructed

Monitoring Sites

- Groundwater Monitoring Site
- Surface Water Quality Monitoring Site
- Meteorological Station
- Static Dust Gauge
- High Volume Air Sampler
- Noise Monitoring Site
- Real-time Noise Monitoring Site
- Blast Monitoring Site
- TEOM Monitoring Site
- Macroinvertebrate Monitoring Site
- Future Groundwater Monitoring Site

Source: Orthophoto - Yancoal (2021); NSW Department of Planning & Environment (2017)

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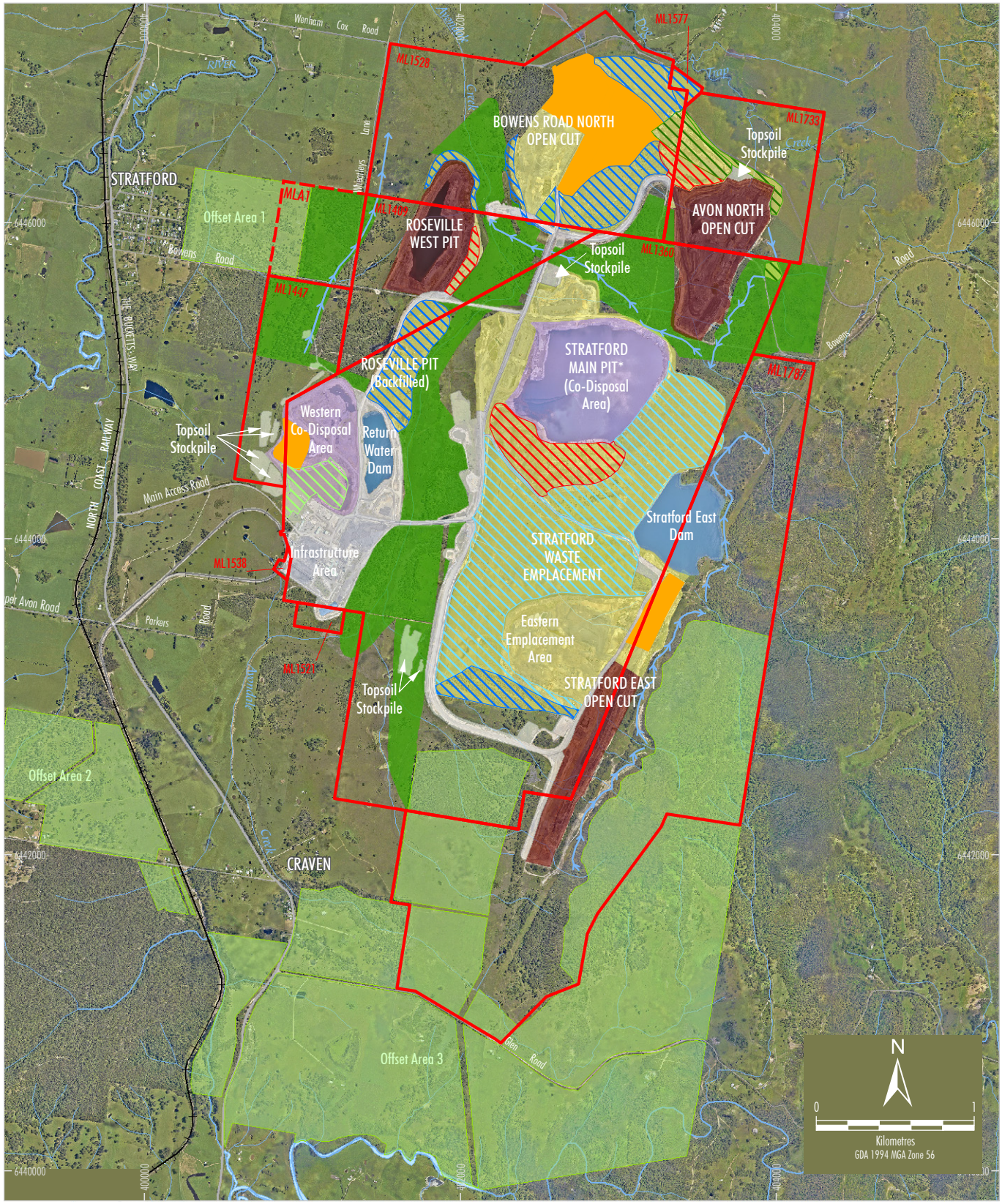
STRATFORD MINING COMPLEX 2021 ANNUAL REVIEW

Environmental Monitoring Sites

Figure 3



YAN-20-31 SAR 2021_201B

LEGEND

- Mining Lease Boundary
- Mining Lease Application Boundary
- Electricity Transmission Line
- Surface Contour (5 m interval)
- Up-catchment Diversion

Relevant Primary Domain

- Infrastructure Area (1)
- Water Management Area (2)
- Waste Emplacement (3)
- CHPP Rejects Material Management (4)
- Open Cut Pit (5)
- Biodiversity Enhancement Area/ Biodiversity Offset Area (6)

Rehabilitation Phase

- Landform Establishment
- Ecosystem and Land Use Establishment - Pasture/Scattered Trees
- Ecosystem and Land Use Establishment - Woodland/Open Forest
- Ecosystem and Land Use Sustainability - Pasture/Scattered Trees
- Ecosystem and Land Use Sustainability - Woodland/Open Forest

2022 Activities

- Proposed Rehabilitation Area 2022

* Stratford Main Pit is used as both a Water Management Area and CHPP Rejects Material Management Area

Source: Orthophoto - Google Earth CNES/Airbus (2020); NSW Department of Planning & Environment (2017)

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STRATFORD MINING COMPLEX 2021 ANNUAL REVIEW

Mining and Rehabilitation Areas 2021

Figure 4

APPENDIX 2

Meteorological Monitoring

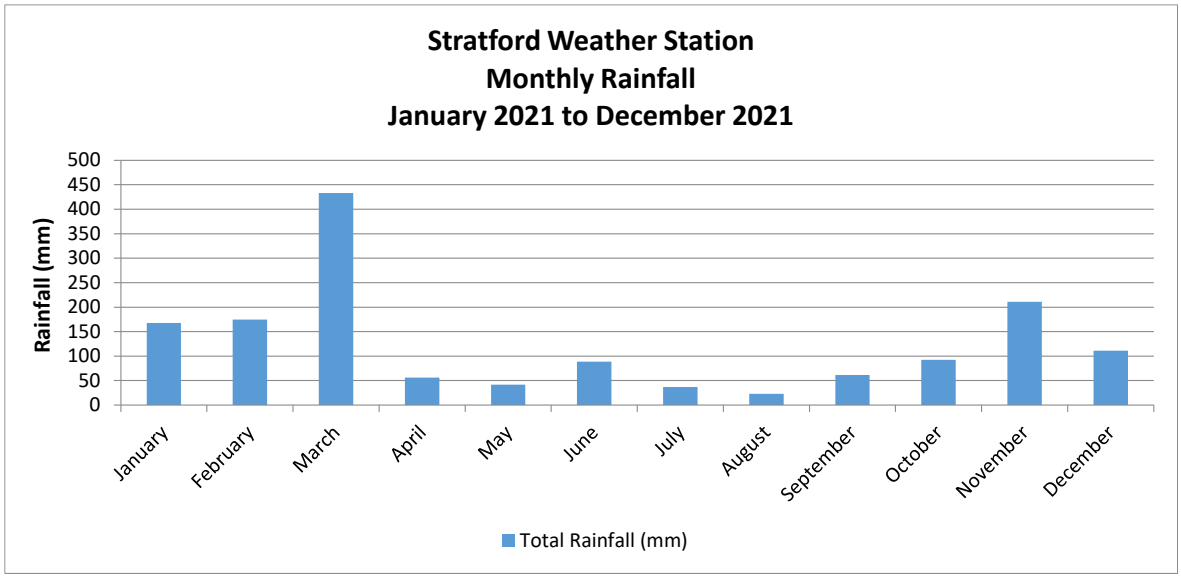


Figure 3-1: Monthly Recorded Rainfall during the Reporting Period

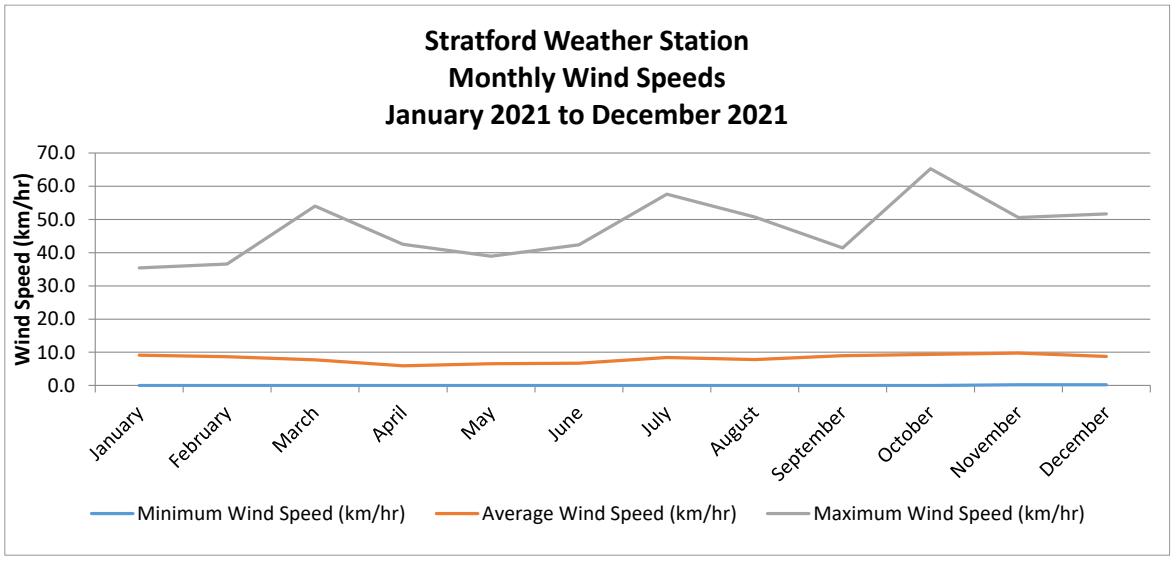


Figure 3-2: Minimum, Maximum and Average Wind Speeds during the Reporting Period

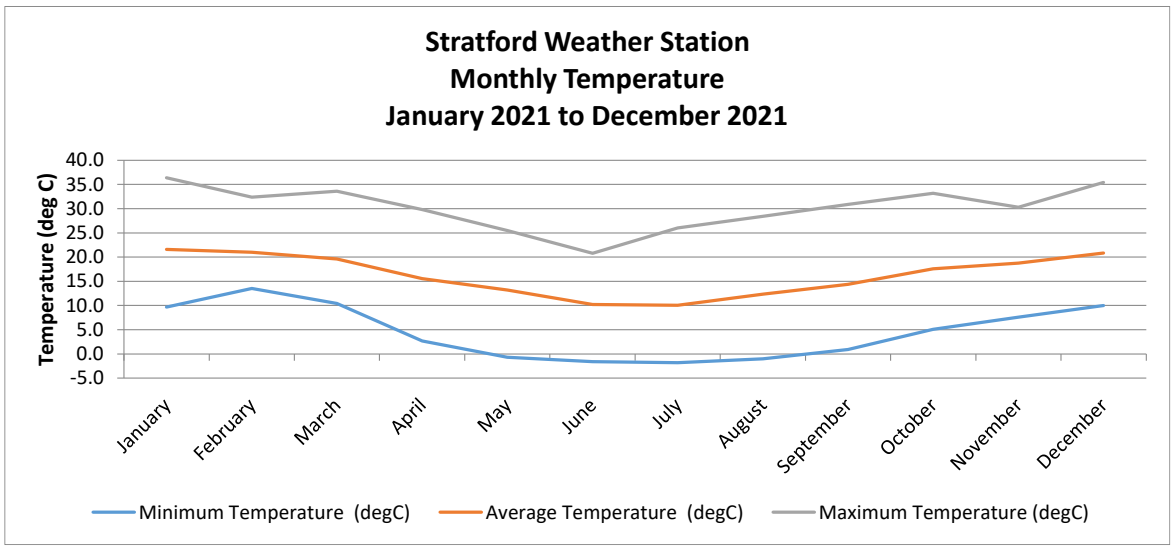
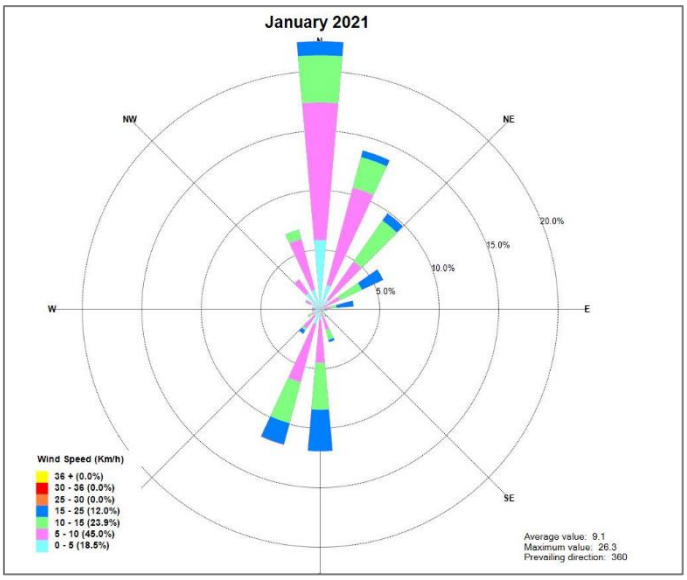
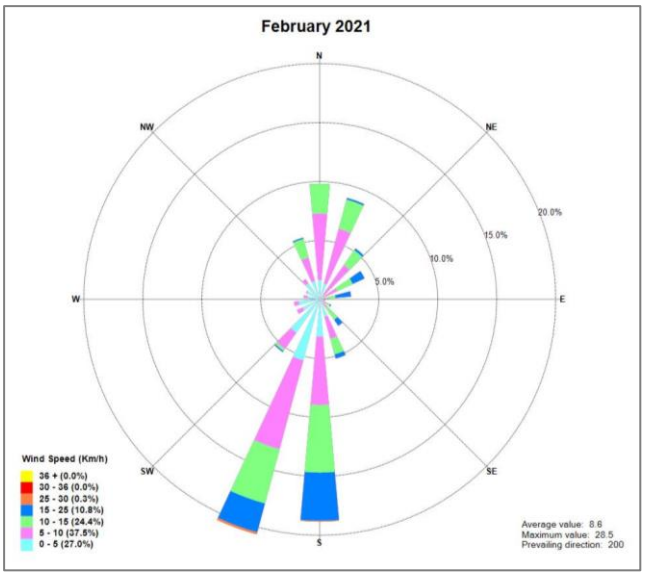
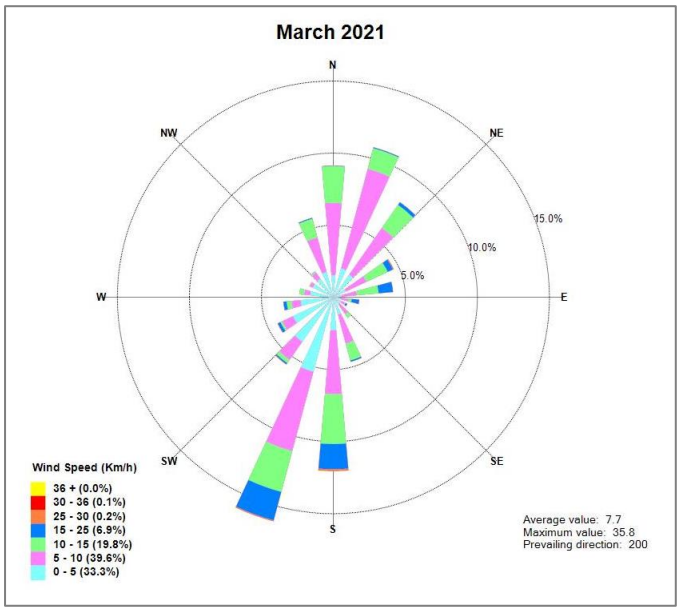


Figure 3-3: Minimum, Maximum and Average Temperatures during the Reporting Period







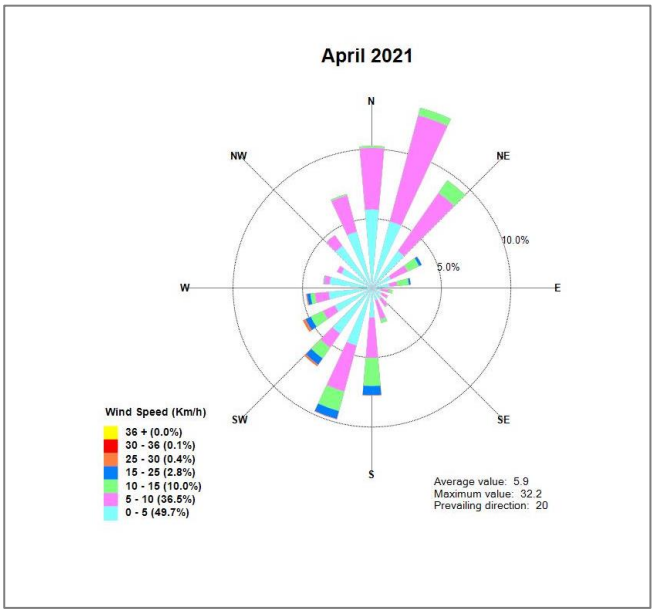
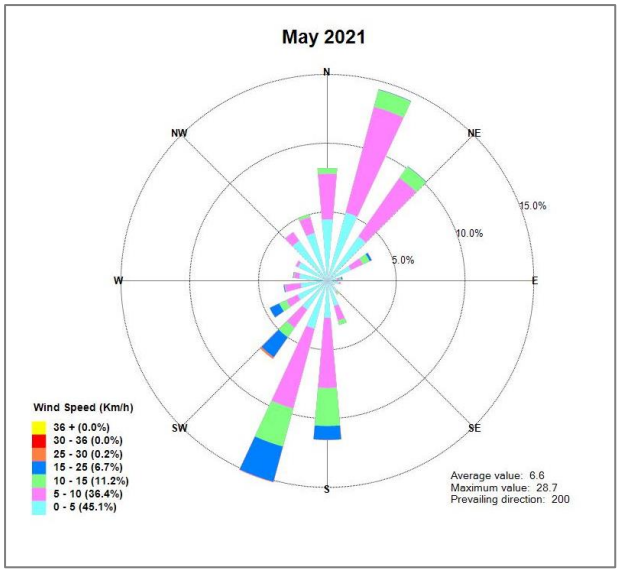
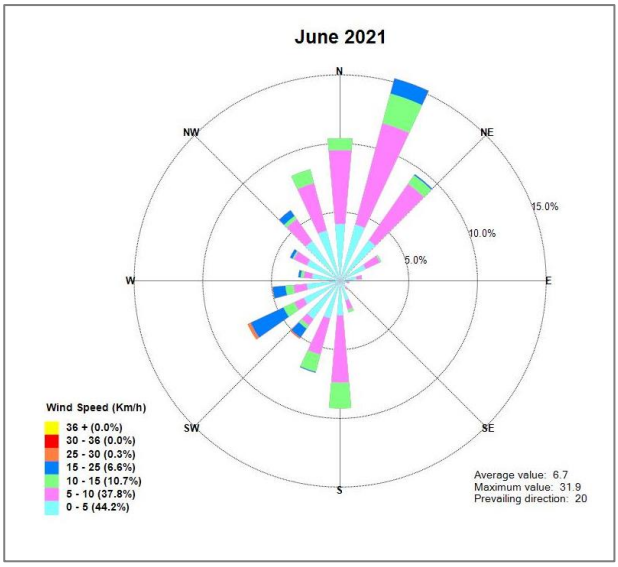
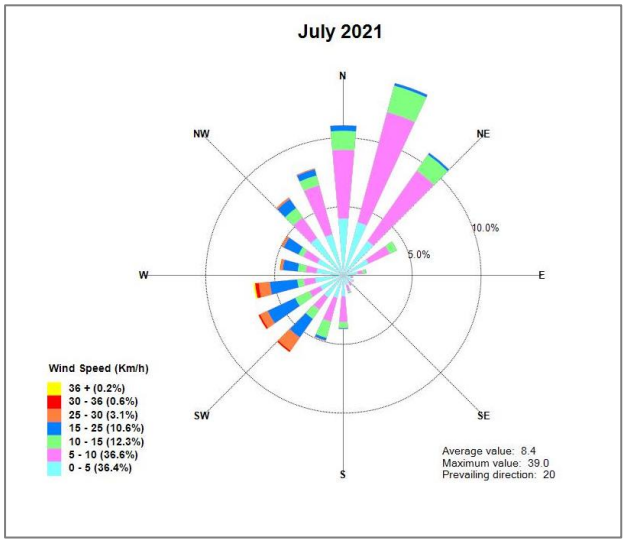


Figure 3-4: Monthly Windroses Displaying Wind Direction and Speed Frequencies during the Reporting Period







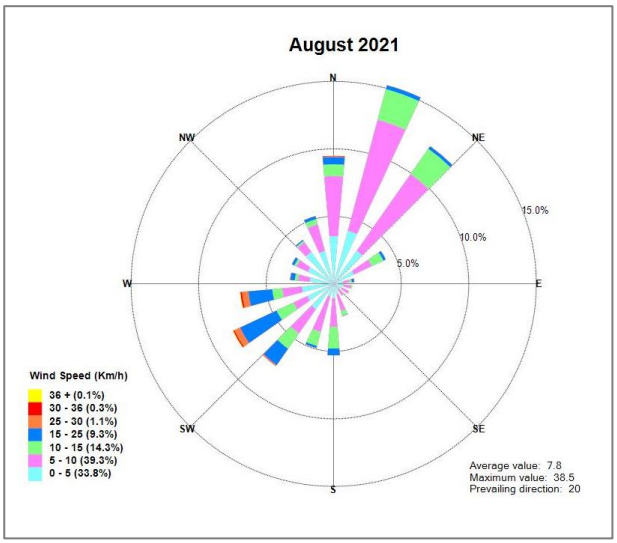
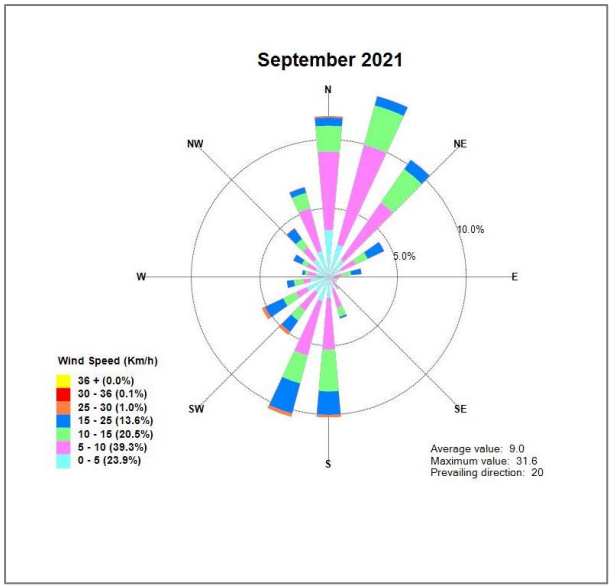
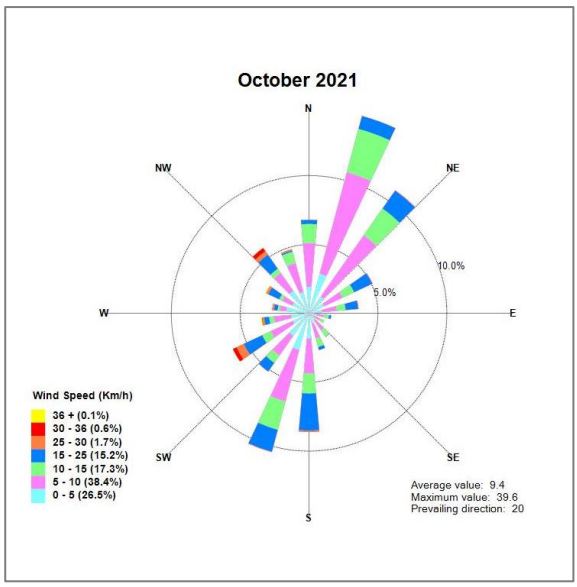
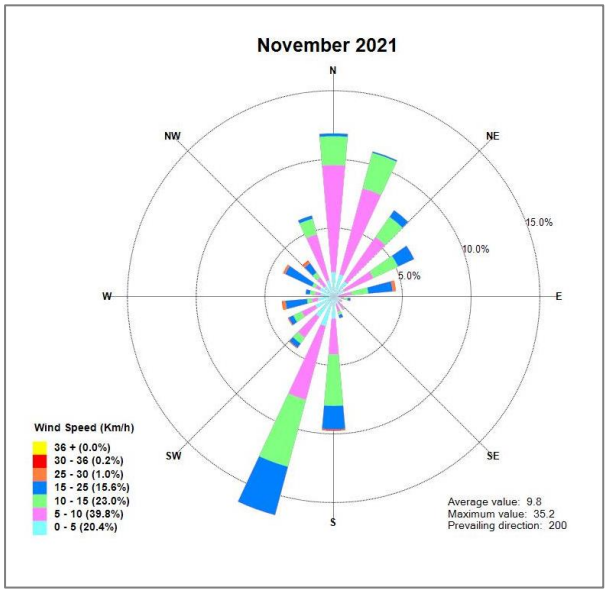


Figure 3-4 (Continued): Monthly Windroses Displaying Wind Direction and Speed Frequencies during the Reporting Period







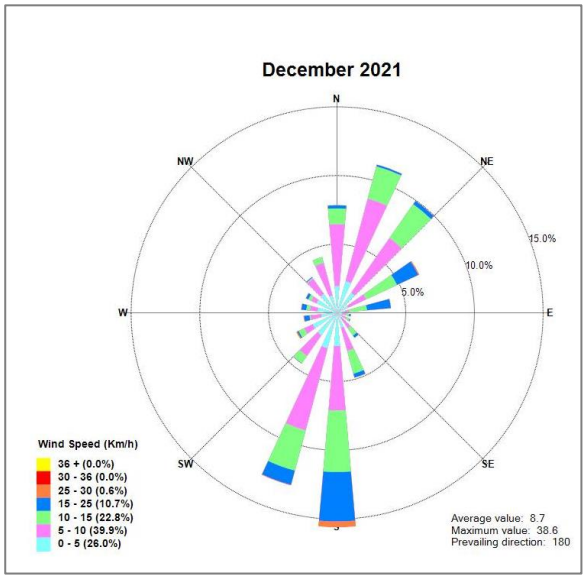


Figure 3-4 (Continued): Monthly Windroses Displaying Wind Direction and Speed Frequencies during the Reporting Period

APPENDIX 3

Air Quality Monitoring

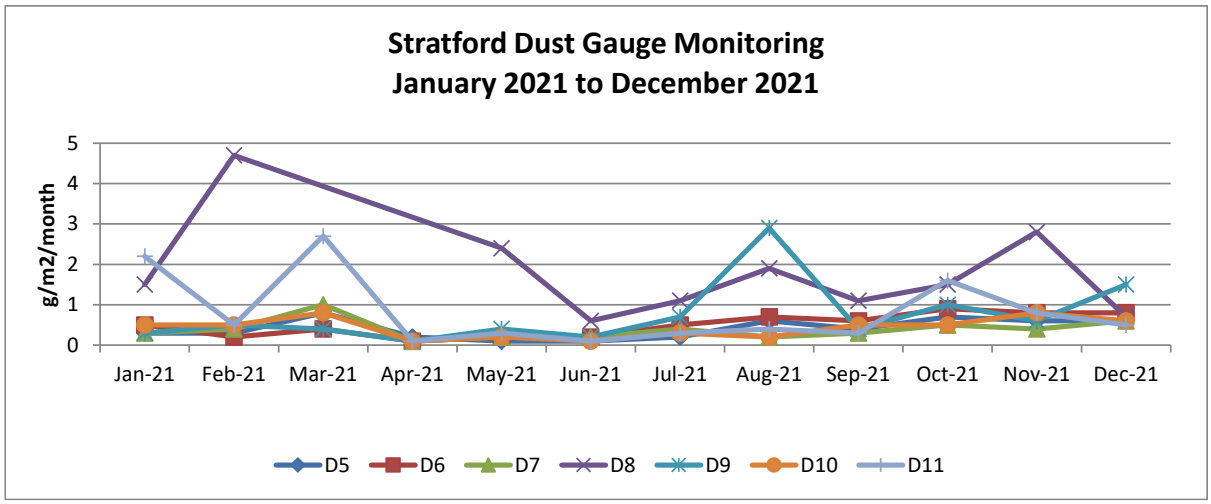


Figure 3-1: **Depositional Dust Monitoring Results from January 2021 to December 2021**

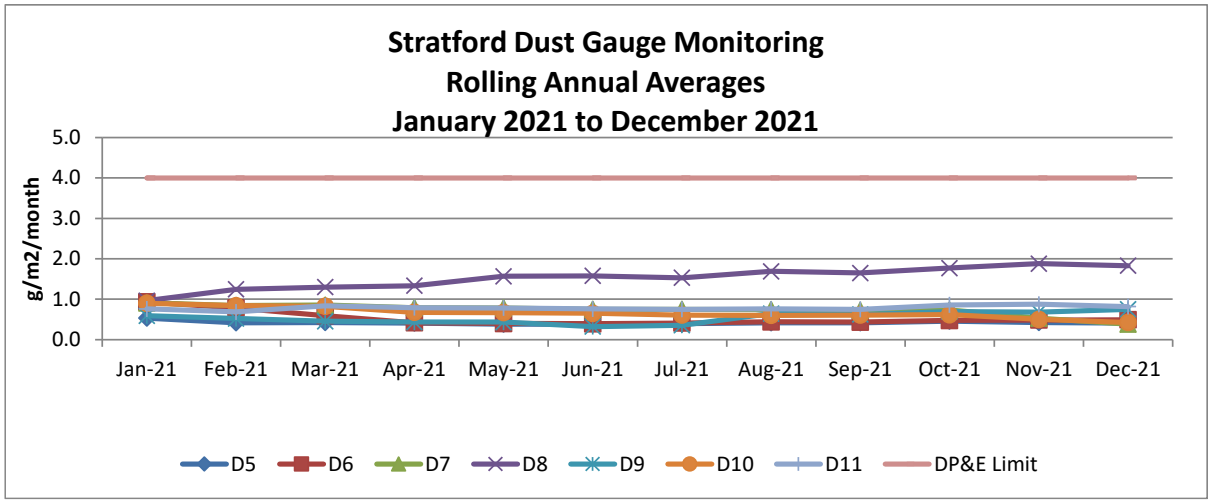


Figure 3-2: Depositional Dust Annual Averages from January 2021 to December 2021

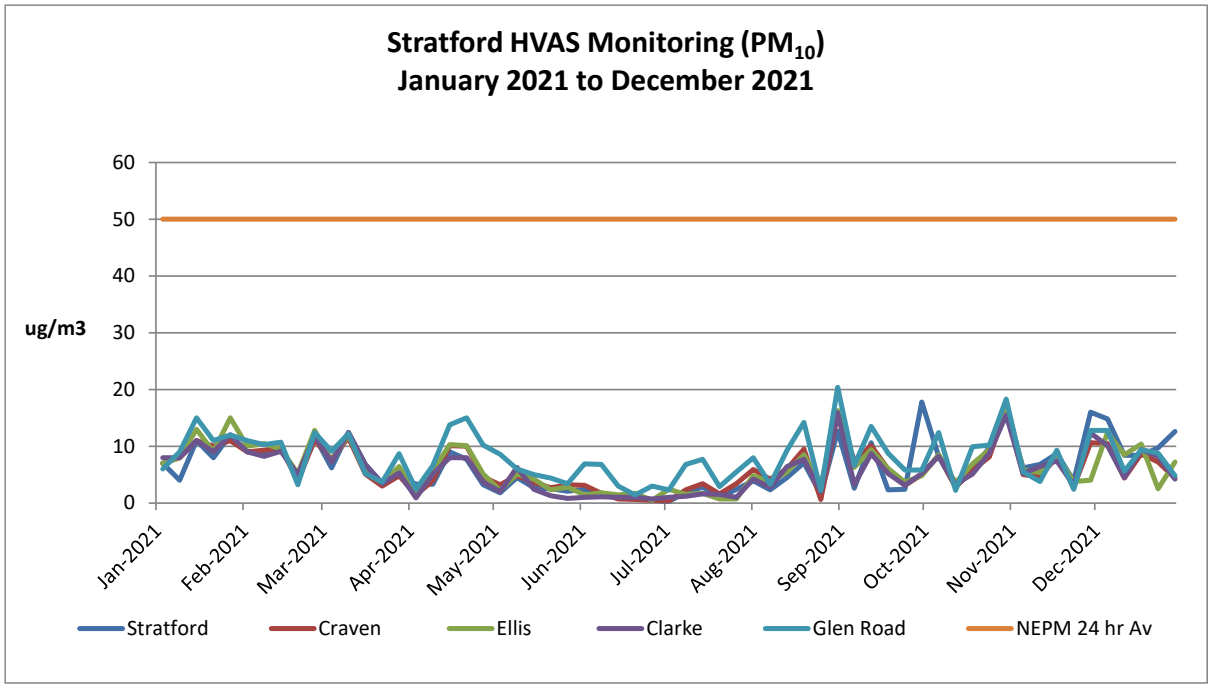


Figure 3-3: High Volume Air Sampler (HVAS) PM_{10} Results

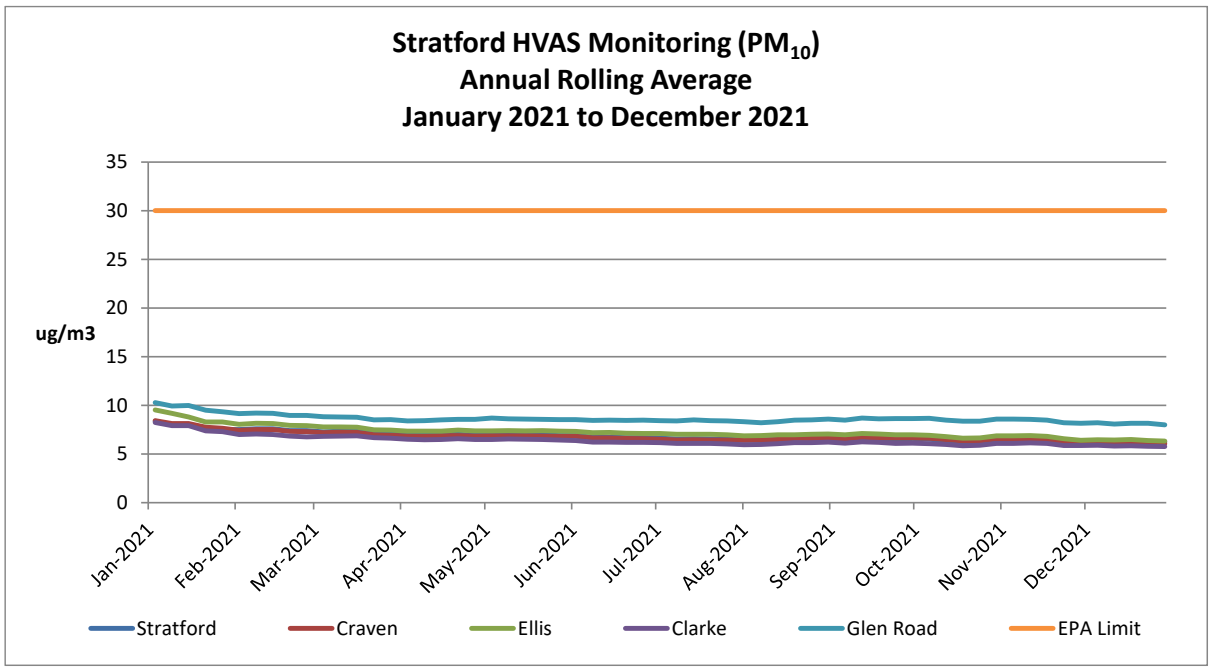


Figure 3-4: HVAS PM_{10} Rolling Annual Average Results

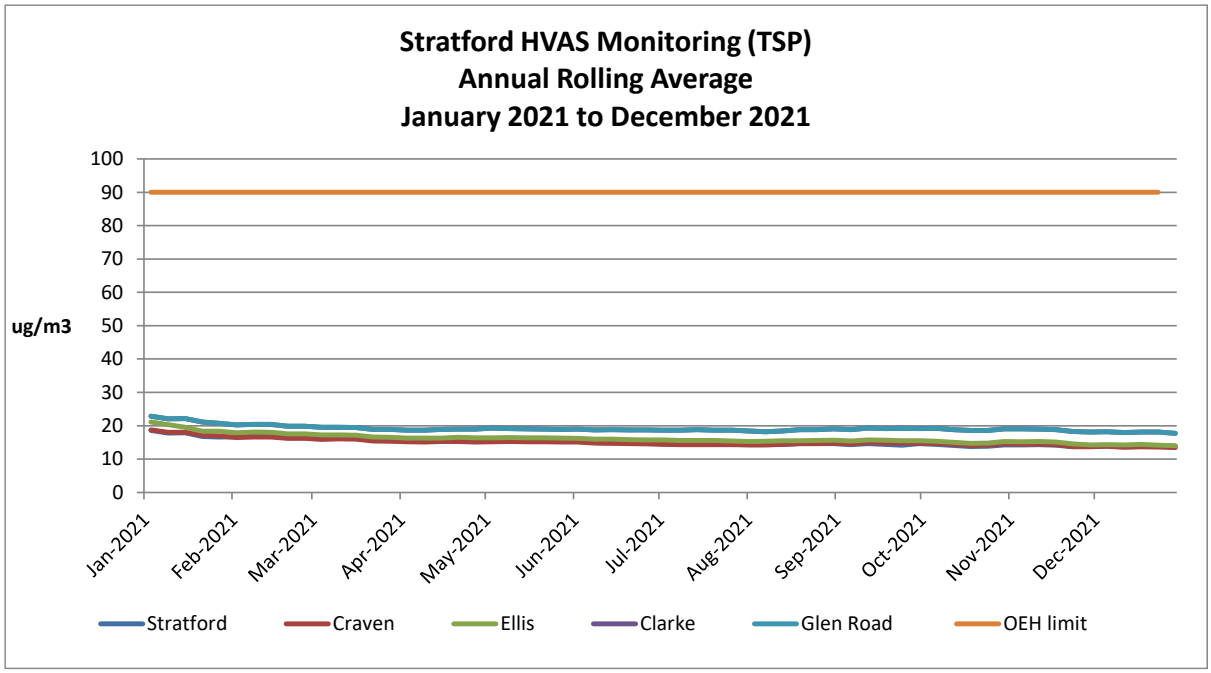


Figure 3-5: HVAS Total Suspended Particulates (TSP) Results

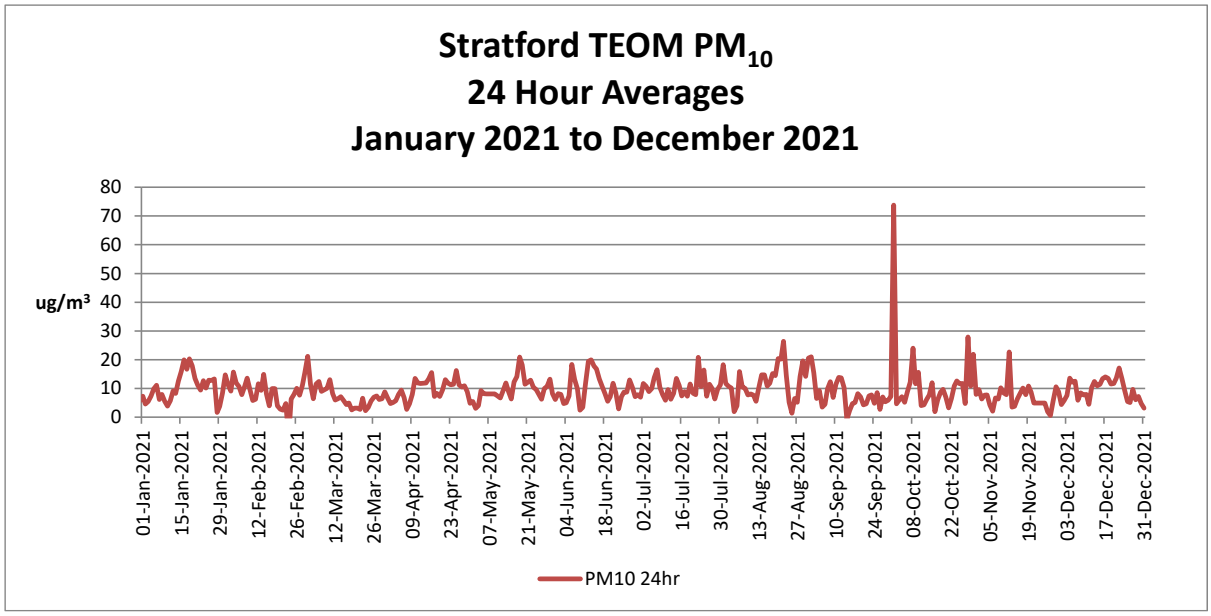


Figure 3-6: Stratford TEOM Real Time Dust Monitoring (PM_{10}) Results during the Reporting Period

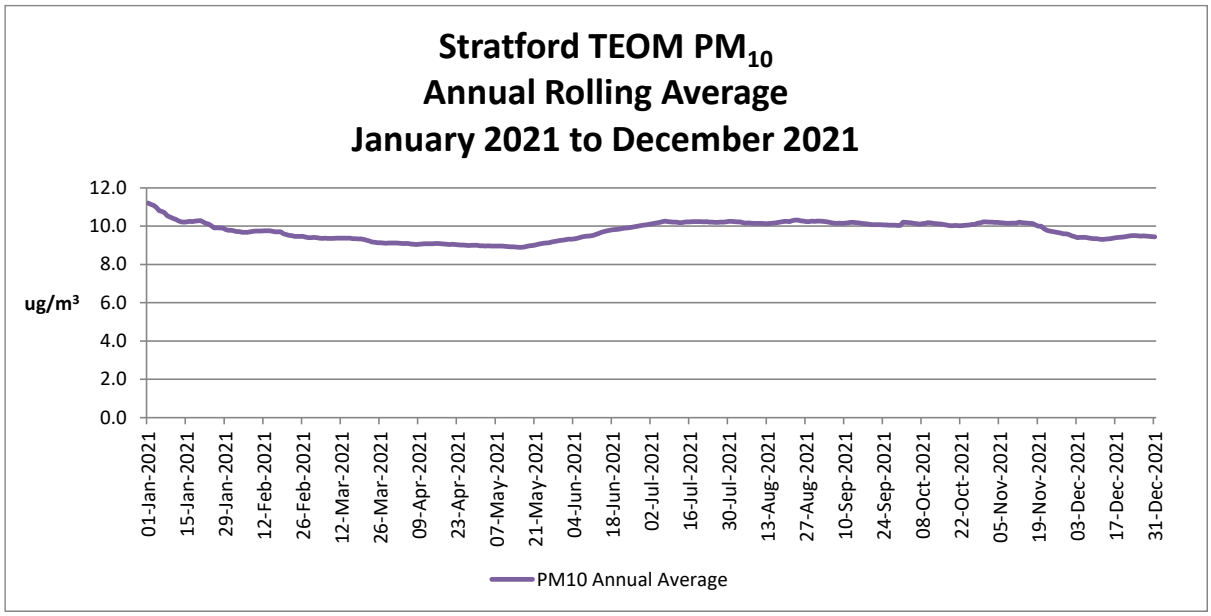


Figure 3-7: Rolling Annual Average Stratford TEOM (PM_{10}) Results during the Reporting Period

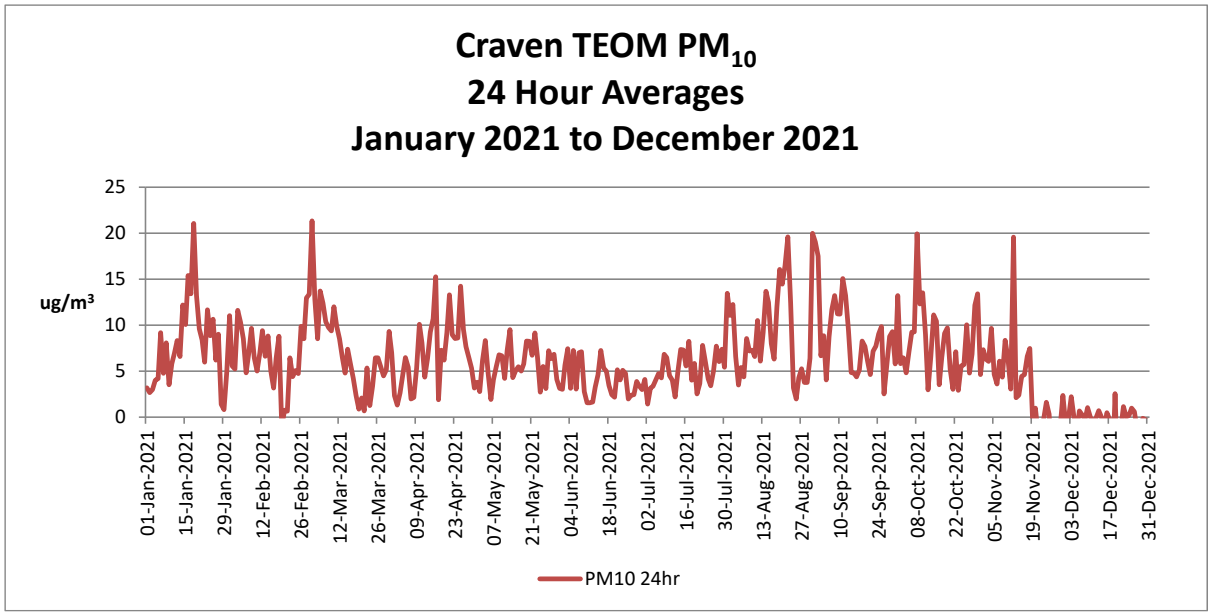


Figure 3-8: Craven TEOM Real Time Dust Monitoring (PM_{10}) Results during the Reporting Period

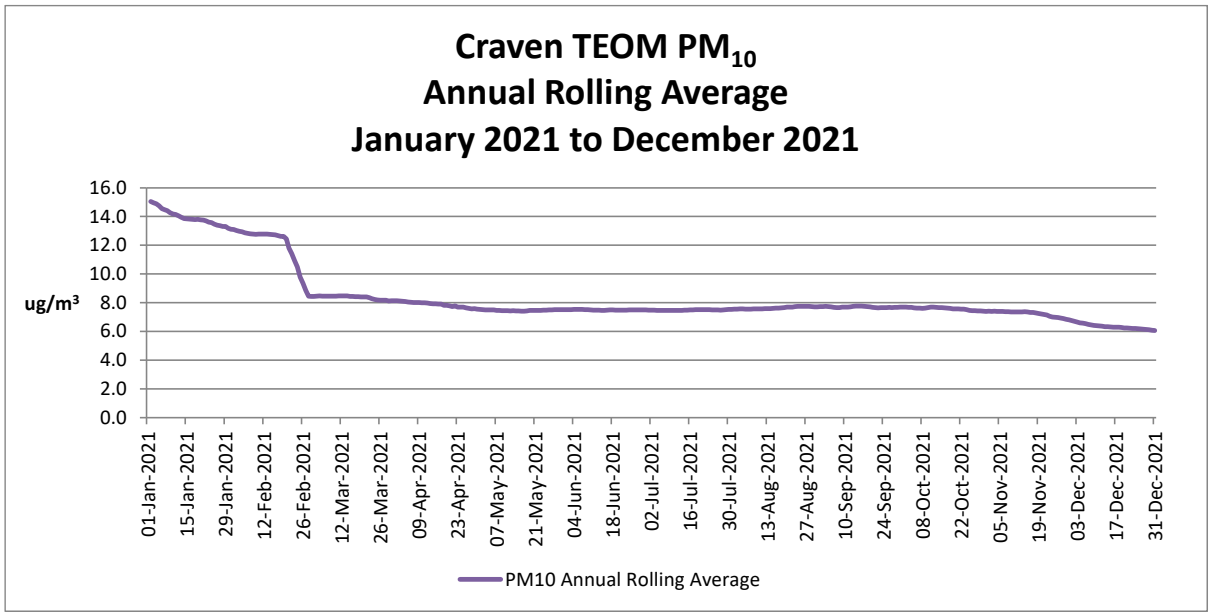


Figure 3-9: Rolling Annual Average Craven TEOM (PM_{10}) Results during the Reporting Period

SCPL Real-Time Dust Monitoring Response Register
Stratford Village TEOM

Alarm		Validate Data	Source Identification	Management Strategy	Review
Alarm Date/Time	**What Performance Indicator has been exceeded?**	**Assess potential for influence of extreme activities or irregular events non-mine related.**	**Visually assess if excessive dust being generated and identify source?**	**Management measure taken, i.e. Additional mitigation measures applied or ceasing of**	**Review of real-time data to determine whether the management strategy**
2021-02-23,03:44:53	PM10>100=-133.3 Lo	Erroneous negative value	N/A	N/A	N/A
2021-06-06,17:48:13	PM10>100=185.1 Hi	Slight 2m/s Southerly wind at time of alert. No mining operations undertaken on Sunday 6/6/2021. SCPL unlikely source of dust.	N/A	N/A	N/A
2021-07-24,13:21:04	PM10>100=115.4 Hi	Moderate 4m/s Westerly wind, gusting up to 10m/s at time of alert. SCPL unlikely source of dust.	N/A	N/A	N/A
2021-08-06,21:05:19	PM10>100=126.9 Hi	Slight Northerly wind conditions at time of alarm. No mining operations conducted at the time of alert.	N/A	N/A	N/A
2021-08-20,13:34:30	PM10>100=156.2 Hi	Moderate 4m/s Northerly wind conditions at time of alarm. No dust reported to be leaving site. Wind direction indicates SMC unlikely	N/A	N/A	N/A
2021-08-22,07:59:27	DMC24=25.31M/ug Hi	No operations at SCPL on Sunday 22/8/2021. Slight Northerly winds at time of alert. SMC unlikely source	N/A	N/A	N/A
2021-08-22,09:01:25	PM10>25=25.0 Hi	No operations at SCPL on Sunday 22/8/2021. Slight Northerly winds at time of alert. SMC unlikely source	N/A	N/A	N/A
2021-10-01,22:57:28	PM10>100=1371.6 Hi	Erroneous value of 1371.6 recorded consecutively for 30 minutes, expected to be an insect or other contaminate in monitoring instrument. This caused high average readings for approximately 24hrs.	N/A	N/A	N/A
2021-10-01,23:00:10	DMC24=73.84M/ug Hi		N/A	N/A	N/A
2021-10-01,23:03:36	PM10>25=27.0 Hi		N/A	N/A	N/A
2021-10-02,02:19:01	PM10>45=72.1 Hi		N/A	N/A	N/A
2021-10-08,21:59:28	DMC24=25.05M/ug Hi	No operations at SCPL on at 21:59 on Friday 8/10/2021. Slight Northerly winds at time of alert. SMC unlikely source	N/A	N/A	N/A
2021-10-28,00:34:01	PM10>100=134.3 Hi	Calibration and filter changes. Zero filter put on overnight for calibration.	N/A	N/A	N/A
2021-10-28,09:28:39	PM10>100=390.0 Hi				
2021-10-28,16:58:38	DMC24=25.74M/ug Hi				
2021-10-28,20:06:52	PM10>25=25.0 Hi				

APPENDIX 4

Surface Water and Groundwater Monitoring

Surface waters

W1 **Upstream Avon River**
(Wenhams Cox Road - Glenavon)

DATE	EVENT	Flow	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Steady flow, brown, clear	7.34	221	24.8	26.9	152	44	58	12	33	10	6	<0.001	0.103	1.44	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.7	0.08
17-Feb-21	Monthly	Fast flow, brown, turbid	7.2	134	19.9	66.2	166	48	30	16	25	5	3	0.002	0.059	2.76	0.001	<0.0001	0.002	<0.05	<0.0001	0.002	1	0.12
15-Mar-21	Event	Steady flow, brown, slightly turbid	7.64	238	19.8	58.4	180	52	47	9	37	10	6	<0.001	0.093	2.43	0.001	<0.0001	0.001	<0.05	<0.0001	0.001	0.8	0.09
18-Apr-21	Event	Fast flow, brown, turbid	7.24	179	16	76.4	174	66	41	6	27	6	4	<0.001	0.06	3.54	0.001	<0.0001	0.001	<0.05	<0.0001	0.002	1.2	0.12
31-May-21	Monthly	Steady flow, brown, clear	7.24	310	13.8	10.7	200	12	59	12	59	17	8	<0.001	0.105	2.41	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.3	0.03
20-Jun-21	Event	Steady flow, brown, slightly turbid	7.21	270	13.2	33.6	179	37	91	13	51	14	7	<0.001	0.189	3.76	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.1
29-Jul-21	Monthly	Steady flow, clear, clear	7.31	298	13.4	9.2	154	5	65	16	65	15	8	<0.001	0.093	2.04	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.3	0.01
31-Aug-21	Monthly	Slow flow, clear, light brown	7.12	431	12.3	9.4	254	<5	81	3	76	17	10	<0.001	0.195	2.46	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.4	0.02
30-Sep-21	Monthly	Slow flow, clear, clear	7.2	424	17.6	8.7	236	<5	71	9	90	21	11	<0.001	0.23	2.33	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.3	0.03
11-Oct-21	Event	Steady flow, slightly turbid, light brown	7.08	402	16.8	13.4	276	<5	77	10	84	14	9	<0.001	0.324	2.9	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.5	0.05
12-Nov-21	Monthly	Fast flow, turbid, brown	6.98	147.3	22.4	24.6	234	228	24	<10	24	5	3	0.004	0.131	5.39	0.002	<0.0001	0.002	<0.05	<0.0001	0.006	2.4	0.26
8-Dec-21	Event	Steady flow, turbid, brown	7.24	133.3	21.3	91.2	194	67	37	<10	16	5	3	0.003	0.061	2.99	<0.001	<0.0001	0.002	<0.05	<0.0001	0.002	1.6	0.19

W2 **Downstream Avon River**
(Marengo - Bignall)

DATE	Event	Flow	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Steady flow, brown	7.09	275	24.7	24.6	192	31	54	13	43	12	7	0.002	0.141	2.24	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	1	0.14
17-Feb-21	Monthly	Steady flow, light brown, slightly turbid	6.98	153	22	59.8	149	34	28	3	28	5	4	0.002	0.06	3.18	0.002	<0.0001	0.002	<0.05	<0.0001	0.002	1.2	0.11
15-Mar-21	Event	Slow flow, brown, slightly turbid	7.18	248	20.2	40.7	162	38	49	8	37	10	7	<0.001	0.107	2.62	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.1	0.2
18-Apr-21	Event	Steady flow, brown, turbid	7.18	256	16.5	60	211	39	53	17	37	10	7	<0.001	0.062	3.18	0.002	<0.0001	0.001	<0.05	<0.0001	0.001	0.9	0.14
31-May-21	Monthly	Slow flow, very light brown, clear	7.17	328	14.4	11.1	189	6	66	12	64	17	8	<0.001	0.116	2.09	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.7	0.03
20-Jun-21	Event	Steady flow, brown, slightly turbid	7.1	271	13.5	34.1	190	62	66	16	52	12	7	<0.001	0.306	2.91	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.9	0.19
29-Jul-21	Monthly	Steady flow, clear, clear	7.2	305	11.1	12.1	163	<5	62	16	65	15	8	<0.001	0.104	2.22	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.5	0.03
31-Aug-21	Monthly	Slow flow, clear, very light brown	7.27	465	14.1	6	280	<5	81	22	73	18	11	<0.001	0.183	0.99	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.4	0.02
30-Sep-21	Monthly	Slow flow, clear, light brown	7.22	510	19.3	7.9	272	<5	85	24	100	24	12	<0.001	0.337	1.93	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.4	0.03
11-Oct-21	Event	Steady flow, clear, light brown	7.23	584	17.3	6.9	351	<5	69	26	128	18	12	<0.001	0.24	1.21	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.4	0.03
12-Nov-21	Monthly	Steady flow, turbid, brown	7.07	303.7	24.4	158	273	77	46	8	53	10	7	0.002	0.212	5.93	0.003	<0.0001	0.002	<0.05	<0.0001	0.004	1.6	0.18
8-Dec-21	Event	Steady flow, turbid, brown	7.08	159.6	21.2	113	200	76	42	<10	19	6	4	0.004	0.084	3.41	0.001	<0.0001	0.002	<0.05	<0.0001	0.002	2.1	0.3

W3 **Upstream Dog Trap Creek**
(Dog Trap Creek - Ellis)

DATE	Event	Flow	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Steady flow, brown	7.01	257	25.2	17.7	184	12	49	18	38	9	6	0.001	0.245	1.61	0.003	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.1	0.25
17-Feb-21	Monthly	Fast flow, light brown	7.15	225	21.3	11.2	168	<5	50	9	37	8	6	<0.001	0.088	1.37	0.002	<0.0001	0.001	<0.05	<0.0001	<0.001	1.2	0.14
15-Mar-21	Event	Slow flow, clear	7.08	276	21.5	6.3	188	<5	46	10	42	8	7	0.002	0.114	0.94	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.16
18-Apr-21	Event	Steady flow, slightly turbid, brown	7.11	200	17.3	19.2	152	14	49	8	30	8	5	<0.001	0.071	1.25	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.8	0.17
31-May-21	Monthly	Steady flow, clear	7	329	17.3	13.1	217	14	56	14	66	13	7	<0.001	0.454	1.4	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.3	0.07
20-Jun-21	Event	Steady flow, brown, slightly turbid	6.97	146	13.3	32.4	150	49	42	10	29	8	4	<0.001	0.251	2.68	<0.001	<0.0001	0.002	<0.05	<0.0001	<0.001	1.4	0.32
29-Jul-21	Monthly	Steady flow, clear, clear	7.19	307	14.3	6.5	215	5	51	19	67	12	8	<0.001	0.372	1	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.2	0.04
31-Aug-21	Monthly	Slow flow, clear, very light brown	7.08	388	15.7	4	238	<5	69	14	68	13	8	<0.001	0.232	0.98	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.3	0.03
30-Sep-21	Monthly	Slow flow, clear, light brown	7.17	398	19.9	4.4	226	<5	68	13	83	16	11	<0.001	0.269	0.87	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.3	0.04
11-Oct-21	Event	Trickle flow, clear, clear	7.25	400	16.3	3.4	252	<5	72	12	82	13	9	<0.001	0.24	0.76	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.3	0.03
12-Nov-21	Monthly	Fast flow, slightly turbid, brown	6.82	204.9	23.0	42.5	192	18	30	9	34	7	5	0.002	0.103	2.26	0.002	<0.0001	0.002	<0.05	<0.0001	0.001	1.5	0.15
8-Dec-21	Event	Fast flow, slightly turbid, brown	7.16	266.8	21.7	21.3	183	10	62	9	30	9	6	0.002	0.133	1.86	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.3	0.34

W3A **Upstream Dog Trap Creek**

(Dog Trap Creek - Ellis)

DATE	Event	Flow	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Steady flow, brown	7.00	236	24.7	17	162	14	51	12	36	9	6	<0.001	0.14	1.76	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.08
17-Feb-21	Monthly	Steady flow, light brown	7.03	218	22	12	160	<5	45	9	36	8	6	<0.001	0.097	1.39	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.9	0.04
15-Mar-21	Event	Slow flow, clear	6.95	254	21.6	7.4	180	<5	52	8	39	8	6	<0.001	0.154	1.02	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.4	0.04
18-Apr-21	Event	Steady flow, slightly turbid, brown	6.96	196	18.4	19.1	152	15	48	9	29	7	5	<0.001	0.099	1.15	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.05
31-May-21	Monthly	Steady flow, clear	6.61	251	17.8	14.9	164	6	42	11	43	9	5	<0.001	1.12	3.55	0.004	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.2	0.02
20-Jun-21	Event	Steady flow, brown, slightly turbid	6.93	146	13.6	44.2	149	36	41	10	29	6	4	<0.001	0.3	2.88	0.003	<0.0001	0.001	<0.05	<0.0001	0.001	1.4	0.32
30-Jul-21	Monhtly	Slow flow, clear, clear	6.73	246	12.1	16.5	138	6	42	17	54	9	6	<0.001	0.8	2.77	0.003	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.2	0.02
31-Aug-21	Monthly	Trickle flow, clear, very light brown	6.51	279	16.4	18.8	180	<5	48	12	47	9	6	<0.001	1.08	2.67	0.003	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.2	<0.01
30-Sep-21	Monthly	Trickle flow, clear, light brown	6.56	279	20.7	13.9	156	<5	48	12	58	11	7	<0.001	1.03	1.58	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.2	<0.01
11-Oct-21	Event	brown	6.59	284	15.7	20	166	8	55	10	58	9	6	<0.001	1.23	2.76	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.2	<0.01
12-Nov-21	Monthly	Fast flow, slightly turbid, brown	6.85	190.6	24.7	42.3	183	11	30	9	32	7	5	0.002	0.08	2.01	0.001	<0.0001	0.002	<0.05	<0.0001	<0.001	1.2	0.09
8-Dec-21	Event	brown	7.06	239.9	22.5	18.1	168	6	63	10	28	8	5	0.001	0.128	1.4	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.06

W4 **Avondale Creek - Downstream of Dog Trap Creek**

(Avondale Swamp - Atkins)

DATE	Event	FLOW	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Steady flow, brown	7.08	273	24.6	27.5	184	25	54	11	42	12	7	<0.001	0.141	2.26	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.9	0.14
17-Feb-21	Monthly	dy flow, light brown, slightly tu	6.87	262	23.1	42.4	226	14	36	16	49	7	8	0.001	0.059	2.87	0.002	0.0001	0.002	<0.05	<0.0001	<0.001	1.4	0.16
15-Mar-21	Event	slightly turbid	7.19	296	19.6	18.3	184	<5	49	9	44	9	10	<0.001	0.166	1.33	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.1	0.2
18-Apr-21	Event	brown	7.24	351	NR	29.3	246	20	73	34	42	13	12	<0.001	0.064	1.52	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.1	0.17
31-May-21	Monthly	brown, clear	7.28	483	13.4	15.6	282	12	89	25	88	17	14	<0.001	0.334	1.42	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.9	0.08
20-Jun-21	Event	Steady flow, brown, clear	6.99	268	13.6	59.7	192	58	60	16	52	14	7	<0.001	0.316	3	<0.001	<0.0001	0.001	<0.05	<0.0001	0.002	2	0.18
29-Jul-21	Monthly	Trickle flow, clear, clear	7.19	380	10.6	19.4	253	9	57	26	85	13	10	<0.001	0.244	1.47	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.8	0.06
31-Aug-21	Monthly	brown	7.26	423	12.7	4.5	258	<5	83	13	70	18	11	<0.001	0.168	1.03	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.3	<0.01
30-Sep-21	Monthly	Trickle flow, clear, brown	7.17	617	18.4	7	342	<5	92	61	112	31	19	<0.001	0.452	1.1	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.4	0.03
11-Oct-21	Event	brown	7.22	588	16.9	6.4	352	<5	70	21	130	17	12	<0.001	0.206	1.13	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.5	0.03
12-Nov-21	Monthly	Steady flow, turbid, brown	7.18	313.2	23.1	167	266	79	42	8	55	9	6	0.002	0.196	5.57	0.003	<0.0001	0.003	<0.05	<0.0001	0.003	1.7	0.18
8-Dec-21	Event	Slow flow, turbid, brown	6.92	265.6	23	54.8	241	22	56	7	36	8	7	0.003	0.099	2.73	0.002	<0.0001	0.002	<0.05	<0.0001	0.001	2.2	0.27

W5 **Downstream of Mine - Upstream of Avondale Swamp**

(Wenhams Cox Road - SCPL)

DATE	Event	FLOW	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Steady flow, brown	6.95	579	24.8	39.4	426	10	58	148	50	21	20	<0.001	0.843	2.34	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	3.6	0.09
17-Feb-21	Monthly	Fast flow, brown, slightly turbid	6.81	256	20.9	40.6	240	8	32	15	51	6	8	0.001	0.054	3.40	0.001	0.0001	0.003	<0.05	<0.0001	<0.001	1.5	0.14
15-Mar-21	Event	turbid	7.25	538	21.1	18.3	412	<5	102	94	53	19	21	<0.001	1.28	2.21	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.5	0.09
20-Mar-21	Event	Fast flow, brown, turbid	7.2	102	NR	145	167	108	16	8	12	3	3	0.002	0.031	4.05	<0.001	<0.0001	0.002	<0.05	<0.0001	0.002	0.9	0.09
21-Mar-21	Event	turbid	6.85	103	NR	93.6	188	60	12	9	14	3	3	0.002	0.034	2.9	0.001	<0.0001	0.002	0.09	<0.0001	0.002	0.7	0.08
22-Mar-21	Event	Brown, slightly turbid	6.74	114	21.8	112	154	66	14	10	12	2	2	0.002	0.027	3.15	0.001	<0.0001	0.005	<0.05	<0.0001	0.002	0.8	0.09
23-Mar-21	Event	Brown, slightly turbid	6.91	164	21.3	69.4	163	51	22	19	19	5	5	0.002	0.042	2.43	<0.001	<0.0001	0.002	<0.05	0.0001	0.001	0.9	0.07
24-Mar-21	Event	turbid	6.77	173	24.1	53	199	20	22	20	19	4	5	0.001	0.035	1.89	<0.001	<0.0001	<0.001	<0.05	0.0031	<0.001	1	0.1
25-Mar-21	Event	Fast flow, brown, clear	6.84	206	23.5	37.7	151	24	32	33	23	8	8	<0.001	0.083	1.76	<0.001	<0.0001	0.001	<0.05	<0.0001	<0.001	0.8	0.1
26-Mar-21	Event	Fast flow, brown, clear	7.04	270	26	26.4	216	14	39	45	27	11	10	<0.001	0.086	1.66	<0.001	<0.0001	0.002	0.09	<0.0001	<0.001	1.1	0.09
18-Apr-21	Event	turbid	7.34	649	17.5	26.4	448	14	80	150	54	25	23	<0.001	0.255	1.16	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.3	0.06
31-May-21	Monthly	Trickle flow, brown, clear	7.47	562	16.6	11.7	330	<5	108	63	85	22	21	<0.001	1.22	1.11	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.7	0.02
20-Jun-21	Event	turbid	6.93	438	13.3	40	352	24	52	107	48	18	15	<0.001	0.264	1.14	<0.001	<0.0001	<0.001	<0.05	<0.0001	0.001	1	0.08
29-Jul-21	Monthly	Steady flow, clear, clear	7.46	723	15.1	11.8	503	6	50	217	94	32	26	<0.001	0.32	0.82	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.5	0.02
31-Aug-21	Monthly	No flow																						
30-Sep-21	Monthly	Trickle flow, clear, light brown	6.98	1310	25.5	14.2	804	<5	59	391	172	60	46	<0.001	6.78	1.42	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.4	0.02
11-Oct-21	Event	very light brown	7.03	959	18.4	23	640	9	86	139	171	30	30	<0.001	7.05	2.25	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.03
12-Nov-21	Monthly	brown	6.56	486	24.2	83.3	375	28	13	75	76	11	12	0.002	0.206	3.67	0.001	<0.0001	0.003	<0.05	<0.0001	0.002	1.5	0.14
8-Dec-21	Event	Steady flow, turbid, brown	7.19	466	21.9	41.2	298	13	72	63	39	13	12	0.002	0.116	2.82	<0.001	<0.0001	0.001	<0.05	<0.0001	<0.001	1.2	0.1

W6 **Upstream of Mine on Avondale Creek**
(Parkers Road - SCPL)

DATE	Event	FLOW	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Slow flow, brown	6.29	134	23.7	267.0	346	89	13	12	22	3	3	0.004	0.144	8.34	0.002	<0.0001	0.008	<0.05	<0.0001	0.005	1.7	0.26
17-Feb-21	Monthly	Steady flow, brown, slightly turbid	6.52	128	25.7	56.3	147	16	17	<10	26	3	3	0.004	0.029	3.14	0.002	0.0001	0.003	<0.05	<0.0001	0.001	1.8	0.22
15-Mar-21	Event	Steady flow, brown, turbid	6.6	223	20.9	60.1	196	17	18	1	45	5	7	0.002	0.044	2.95	0.001	<0.0001	0.002	<0.05	<0.0001	0.001	1.4	0.17
20-Mar-21	Event	Fast flow, brown, slightly turbid	6.57	53	NR	34.3	103	21	12	<1	6	1	2	0.004	0.015	2.11	0.001	<0.0001	0.002	<0.05	<0.0001	0.001	0.9	0.28
21-Mar-21	Event	Fast flow, brown, slightly turbid	6.68	62	NR	29.3	98	19	12	<1	8	2	2	0.004	0.01	1.23	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1	0.48
22-Mar-21	Event	Brown, slightly turbid	6.61	73	21.7	49.7	118	20	11	<1	9	2	2	0.002	0.008	1.12	<0.001	<0.0001	<0.001	<0.05	0.0003	<0.001	1	0.24
23-Mar-21	Event	Brown, slightly turbid	6.68	133	21.4	72.6	146	49	18	13	14	4	4	0.001	0.175	2.7	0.001	<0.0001	0.002	<0.05	<0.0001	0.001	0.8	0.1
24-Mar-21	Event	Fast flow, brown, slightly turbid	6.59	95	24.7	45.3	153	16	16	<1	12	2	3	0.003	0.02	2.24	<0.001	<0.0001	0.001	<0.05	<0.0001	<0.001	1.3	0.26
25-Mar-21	Event	Steady flow, brown, clear	6.63	110	26.1	57.7	163	30	23	<1	18	4	4	0.002	0.105	3.3	0.001	<0.0001	0.003	<0.05	<0.0001	0.001	1.3	0.31
26-Mar-21	Event	Steady flow, brown, slightly turbid	6.71	124	26.3	60.4	180	24	30	<1	19	4	4	0.002	0.033	4.07	<0.001	<0.0001	0.003	<0.05	<0.0001	0.002	1.2	0.24
18-Apr-21	Event	Steady flow, brown, slightly turbid	6.60	236	14.2	58.2	220	25	18	<1	52	5	6	0.002	0.044	2.9	<0.001	<0.0001	0.004	<0.05	<0.0001	0.001	1.3	0.18
31-May-21	Monthly	No flow																						
20-Jun-21	Event	Steady flow, brown, slightly turbid	5.72	146	13.2	62.9	177	42	14	3	41	4	3	<0.001	0.049	2.06	<0.001	<0.0001	0.002	<0.05	<0.0001	0.001	1.1	0.23
29-Jul-21	Monthly	Water present - Stagnant. No flow																						
31-Aug-21	Monthly	No flow																						
30-Sep-21	Monthly	No flow																						
11-Oct-21	Event	Trickle flow, slightly turbid, brown	6.79	378	17.2	36.5	304	24	48	14	87	10	10	0.001	0.675	3.49	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.2	0.19
12-Nov-21	Monthly	Steady flow, turbid, brown	6.50	192	25.8	83.2	250	17	10	<10	39	3	4	0.003	0.032	3.12	0.001	<0.0001	0.003	<0.05	<0.0001	0.002	1.7	0.15
8-Dec-21	Event	Steady flow, turbid, brown	6.68	318	20.2	94.0	278	36	38	<10	60	6	7	0.004	0.04	4.89	<0.001	<0.0001	0.003	<0.05	<0.0001	0.002	2.2	0.41

W8

DATE	Event	FLOW	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Slow flow, brown	6.75	422	22.5	46	334	27	69	82	39	13	16	0.001	2.3	5.32	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.6	0.21
17-Feb-21	Monthly	Fast flow, light brown, slightly turbi	6.66	250	23.1	41	245	10	32	8	49	5	8	0.002	0.073	3.65	0.001	<0.0001	0.002	<0.05	<0.0001	<0.001	1.8	0.16
15-Mar-21	Event	turbid	6.94	522	22.7	36.2	400	16	136	82	48	16	23	<0.001	3.8	6.84	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.4	0.22
20-Mar-21	Event	Fast flow, brown, slightly turbid	8.29	1110	NR	92.3	787	66	321	303	33	68	60	0.001	0.082	1.8	<0.001	<0.0001	0.001	<0.05	<0.0001	0.002	1	0.04
21-Mar-21	Event	Fast flow, brown, turbid	6.16	93	NR	136	142	97	7	10	12	2	2	0.002	0.03	3.17	<0.001	<0.0001	0.002	<0.05	<0.0001	0.002	0.8	0.09
22-Mar-21	Event	Brown, slightly turbid	6.49	76	21.8	104	140	51	8	<1	9	2	2	0.002	0.028	3.19	<0.001	<0.0001	0.004	<0.05	<0.0001	0.002	0.7	0.13
23-Mar-21	Event	Brown, slightly turbid	6.67	94	21.4	54.2	142	31	13	<1	14	3	3	0.002	0.022	2.71	0.001	<0.0001	0.002	<0.05	<0.0001	0.001	1.3	0.33
24-Mar-21	Event	Fast flow, brown, slightly turbid	6.58	147	24.9	56	175	23	17	15	16	4	4	0.001	0.11	2.19	<0.001	<0.0001	0.001	<0.05	<0.0001	<0.001	1	0.13
25-Mar-21	Event	Steady flow, brown, clear	6.64	153	25.3	44.9	168	28	28	21	17	6	7	<0.001	0.421	1.98	0.001	<0.0001	0.001	<0.05	<0.0001	<0.001	1	0.16
26-Mar-21	Event	Steady flow, brown, slightly turbid	6.68	166	25.8	44.4	183	42	32	20	19	6	6	0.001	1.16	4.22	0.002	<0.0001	0.001	<0.05	<0.0001	0.001	1.3	0.23
18-Apr-21	Event	Steady flow, clear, brown	7.16	599	16.3	6.8	392	16	144	70	53	21	26	<0.001	1.74	1.54	0.002	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.6	0.23
31-May-21	Monthly	No Flow																						
20-Jun-21	Event	Steady flow, brown, slightly turbid	7.38	471	13.3	5.3	294	12	100	55	70	18	17	<0.001	0.092	0.56	<0.001	0.0004	<0.001	<0.05	<0.0001	<0.001	0.6	0.06
29-Jul-21	Monthly	Trickle flow, clear, clear	7.04	509	14.6	6	352	<5	48	78	106	14	16	<0.001	0.421	0.86	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.7	0.02
31-Aug-21	Monthly	brown	7.03	928	15.8	7.2	606	<5	85	160	136	34	33	<0.001	1.92	1.39	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.01
30-Sep-21	Monthly	No flow																						
11-Oct-21	Event	brown	6.81	789	17.5	11.4	507	6	37	109	152	19	22	<0.001	2.72	2.06	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.09
12-Nov-21	Monthly	Steady flow, turbid, brown	6.25	441.3	23.9	87.5	381	24	8	44	78	7	9	0.002	0.199	3.45	<0.001	<0.0001	0.003	<0.05	<0.0001	0.002	1.5	0.17
8-Dec-21	Event	Steady flow, slightly turbid, brown	6.87	380	19.4	20.7	260	10	69	38	40	8	11	0.002	0.15	3.63	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.5	0.18

W9 **Upper Avondale Creek**
(Off Glen Road - SCPL)

DATE	Event	FLOW	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Steady flow, brown	6.14	83	24.1	56.9	152	14	8	3	14	2	2	0.002	0.083	2.68	<0.001	<0.0001	0.002	<0.05	<0.0001	0.001	1.5	0.1
17-Feb-21	Monthly	Slow flow, brown, slightly turbid	6.25	69	23.3	64.2	220	9	13	<10	10	2	2	0.003	0.05	2.94	<0.001	0.0001	0.003	<0.05	<0.0001	<0.001	2.2	0.19
15-Mar-21	Event	Slow flow, brown, slightly turbid	6.52	123	18.2	38.7	151	9	20	<10	19	3	3	0.002	0.043	2.72	<0.001	<0.0001	0.003	<0.05	<0.0001	<0.001	1	0.08
18-Apr-21	Event	Slow flow, brown, slightly turbid	6.71	120	16.9	52	156	22	32	3	19	4	4	<0.001	0.083	3.83	<0.001	<0.0001	0.003	<0.05	<0.0001	<0.001	1	0.09
31-May-21	Monthly	No flow																						
20-Jun-21	Event	Steady flow, brown, slightly turbid	6.54	54	13.2	50.1	118	20	15	<1	11	2	1	<0.001	0.028	2.03	<0.001	<0.0001	0.001	<0.05	<0.0001	<0.001	1.1	0.1
30-Jul-21	Monthly	No flow																						
31-Aug-21	Monthly	No flow																						
30-Sep-21	Monthly	Trickle flow, slightly turbid, brown	6.34	229	22.1	54.9	198	15	13	11	59	10	7	0.001	0.404	1.56	<0.001	<0.0001	0.003	<0.05	<0.0001	<0.001	0.4	0.03
11-Oct-21	Event	Slow flow, turbid, brown	5.87	71	16.8	64.8	197	16	9	3	14	1	1	0.002	0.132	2.64	<0.001	<0.0001	0.002	<0.05	<0.0001	0.002	2	0.13
12-Nov-21	Monthly	Steady flow, slightly turbid, brown	6.58	52.1	26.3	82.9	222	14	12	<10	11	2	2	0.003	0.047	3.36	<0.001	<0.0001	0.004	<0.05	<0.0001	0.001	1.8	0.11
08-Dec-21	Event	Steady flow, turbid, brown	6.82	134.6	24.6	56.9	188	16	41	<10	16	5	4	0.002	0.087	3.46	<0.001	<0.0001	0.003	<0.05	<0.0001	0.001	1.5	0.1

W10 **Lemon Tree Creek**

(Off Bowens Road - SCPL)

DATE	Event	FLOW	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Steady flow, brown	7.06	127	24.7	38.1	164	18	22	<1	22	4	3	<0.001	0.026	1.59	0.001	<0.0001	<0.001	<0.05	<0.0001	0.001	1.2	0.05
17-Feb-21	Monthly	Steady flow, light brown	7.18	174	22.4	29.3	178	<5	26	6	35	4	4	<0.001	0.014	1.15	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.6	0.04
15-Mar-21	Event	Slow flow, brown, slightly turbid	6.96	284	20.6	29.1	230	<5	39	7	51	9	7	<0.001	0.028	1.31	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.04
18-Apr-21	Event	Slow flow, brown, slightly turbid	7.07	267	17.7	33.5	203	13	42	10	46	10	6	<0.001	0.024	1.09	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.6	0.03
31-May-21	Monthly	Trickle flow, clear	6.84	1160	14.8	1.7	654	<5	115	100	265	59	28	<0.001	0.137	0.24	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.2	<0.01
20-Jun-21	Event	Steady flow, brown, slightly turbid	6.92	114	13.4	61.1	170	27	34	12	22	5	3	<0.001	0.022	1.77	<0.001	0.0001	0.001	<0.05	<0.0001	0.003	1.3	0.06
29-Jul-21	Monthly	Trickle flow, clear	7.16	607	13.9	7.2	390	<5	75	52	142	29	14	<0.001	0.015	0.26	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.3	<0.01
31-Aug-21	Monthly	Trickle flow, clear, very light brown	6.65	1470	13.5	3.5	902	<5	151	130	327	71	36	<0.001	0.241	0.58	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.2	0.02
30-Sep-21	Monthly	No flow																						
11-Oct-21	Event	Trickle flow, clear, clear	6.88	1730	15.9	4.8	1070	<5	168	165	373	75	37	<0.001	0.257	0.56	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.2	<0.01
12-Nov-21	Monthly	Slow flow, slightly turbid, brown	6.99	188.5	26.5	101	270	22	30	5	32	8	4	0.001	0.028	2.81	0.001	<0.0001	0.002	<0.05	<0.0001	0.003	1.5	0.06
8-Dec-21	Event	Slow flow, turbid, brown	7.32	202.9	24	53.4	185	14	40	<1	30	6	4	<0.001	0.024	2.05	<0.001	<0.0001	0.001	<0.05	<0.0001	0.002	0.7	0.05

W11

DATE	Event	FLOW	pH	Cond. (uS/cm)	Temp °C	Turbidity (NTU)	TDS (mg/L)	TSS (mg/L)	Alkalinity (mg/L)	Sulphate (mg/L)	Chloride (mg/L)	Calcium (mg/L)	Mg (mg/L)	Copper (mg/L)	Mn (mg/L)	Iron (filt.) (mg/L)	Arsenic (mg/L)	Cd (mg/L)	Cr (mg/L)	Boron (mg/L)	Mercury (mg/L)	Lead (mg/L)	Tot. N (mg/L)	Tot. P (mg/L)
29-Jan-21	Event	Steady flow, brown	7.04	207	25	17.5	158	6	47	9	31	8	5	<0.001	0.03	1.23	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.7	0.06
17-Feb-21	Monthly	Steady flow, light brown	7.05	214	21.8	12.1	167	<5	48	9	36	8	5	<0.001	0.016	0.92	0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.3	0.05
15-Mar-21	Event	Slow flow, clear	6.98	250	20.9	12	159	<5	45	8	37	9	7	<0.001	0.021	0.9	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.4	0.04
18-Apr-21	Event	Steady flow, slightly turbid, brown	6.92	194	18.4	18	142	14	48	8	28	8	5	<0.001	0.018	0.82	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.4	0.03
31-May-21	Monthly	Trickle flow, clear	6.62	271	17.3	0.9	170	<5	50	11	53	13	7	<0.001	0.027	0.09	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	1.1	<0.01
20-Jun-21	Event	Steady flow, brown, slightly turbid	6.88	135	13.4	34.9	135	26	41	9	27	9	3	<0.001	0.052	1.38	<0.001	<0.0001	0.001	<0.05	<0.0001	<0.001	1	0.09
30-Jul-21	Monthly	Slow flow, clear, clear	6.57	251	13.7	2	158	6	45	18	52	10	7	<0.001	0.014	0.1	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	<0.1	<0.01
31-Aug-21	Monthly	Trickle flow, clear, clear	6.42	308	15.9	1.1	202	<5	48	14	55	11	7	<0.001	0.013	0.08	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	<0.1	<0.01
30-Sep-21	Monthly	No flow																						
11-Oct-21	Event	No flow																						
12-Nov-21	Monthly	Nil flow, clear, brown	6.86	209.8	24	37.2	197	14	31	11	34	8	5	0.002	0.027	2.1	0.001	<0.0001	0.002	<0.05	<0.0001	<0.001	1	0.08
08-Dec-21	Event	eady flow, slightly turbid, light brow	7.02	219	23.3	25.7	157	12	59	8	25	7	5	0.001	0.02	1.31	<0.001	<0.0001	<0.001	<0.05	<0.0001	<0.001	0.8	0.07

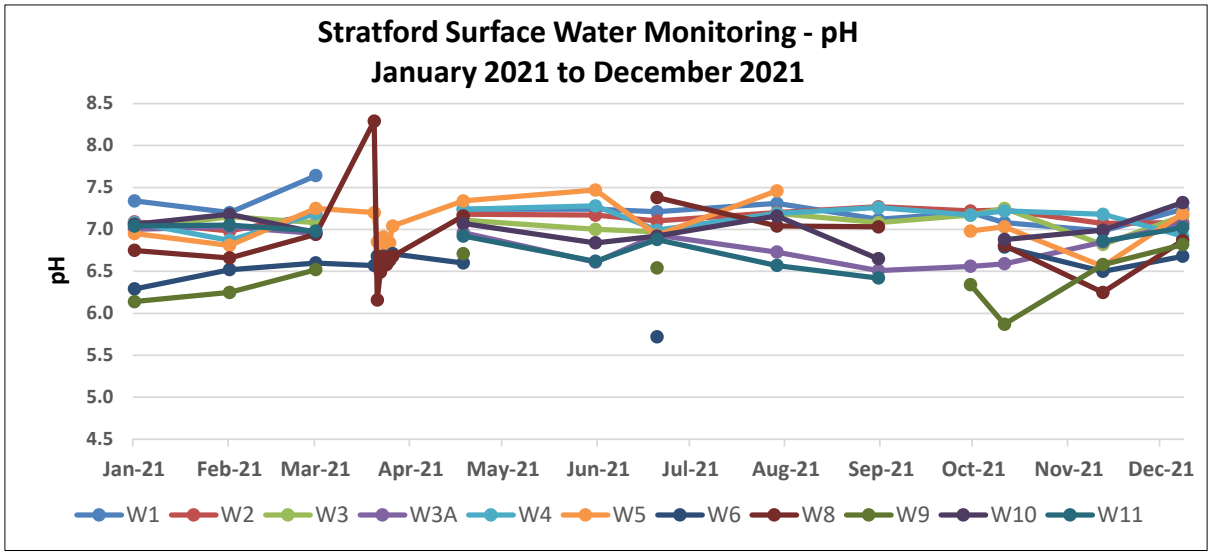


Figure 5-1: Surface Water Monitoring Results - pH

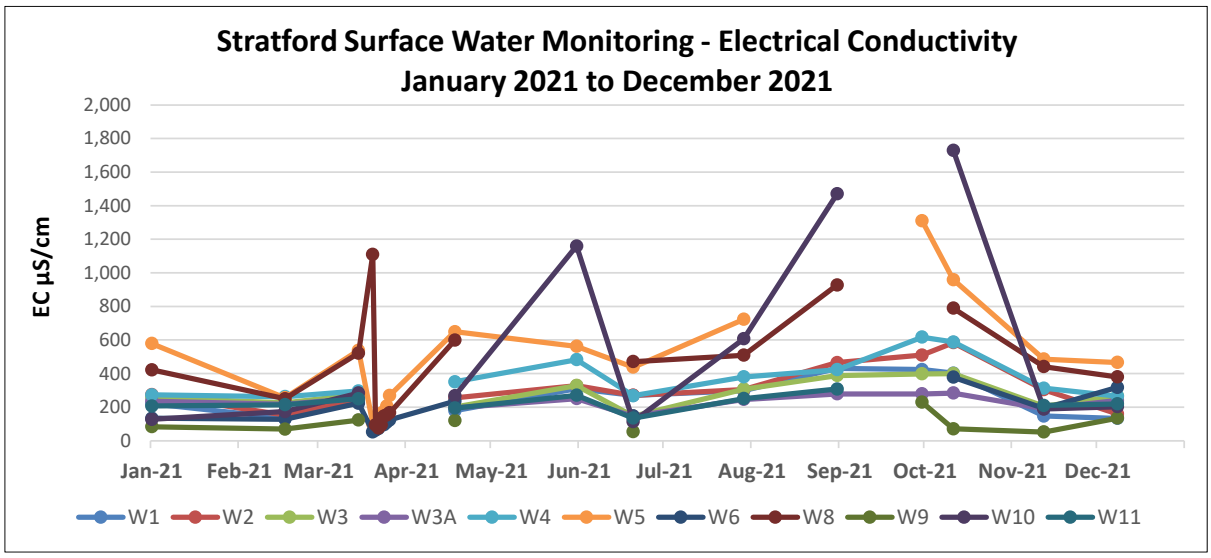


Figure 5-2: Surface Water Monitoring Results - Electrical Conductivity

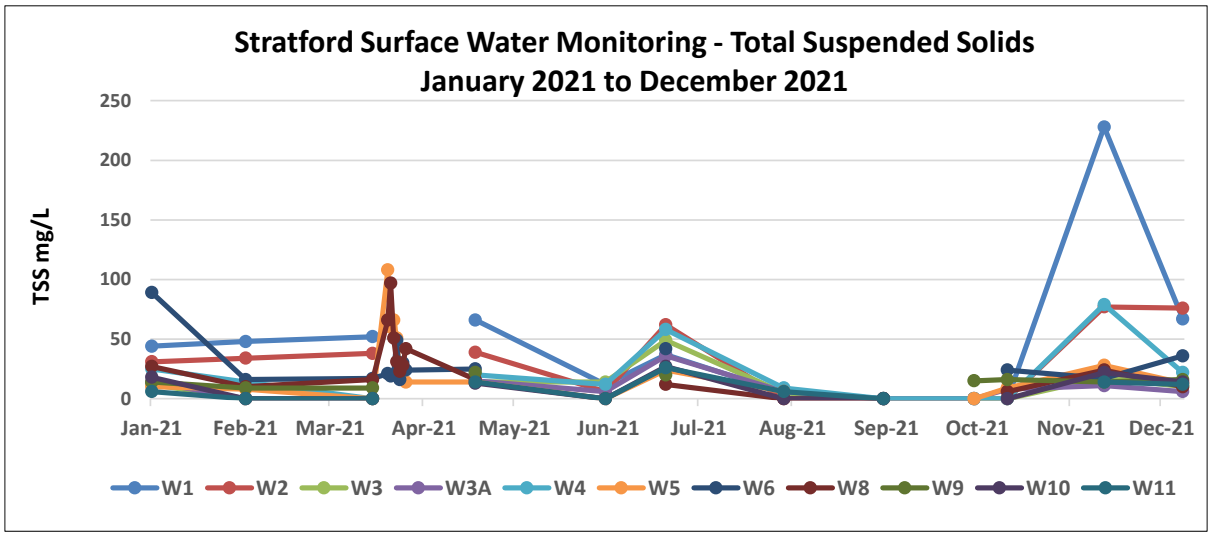


Figure 5-3: Surface Water Monitoring Results - Total Suspended Solids

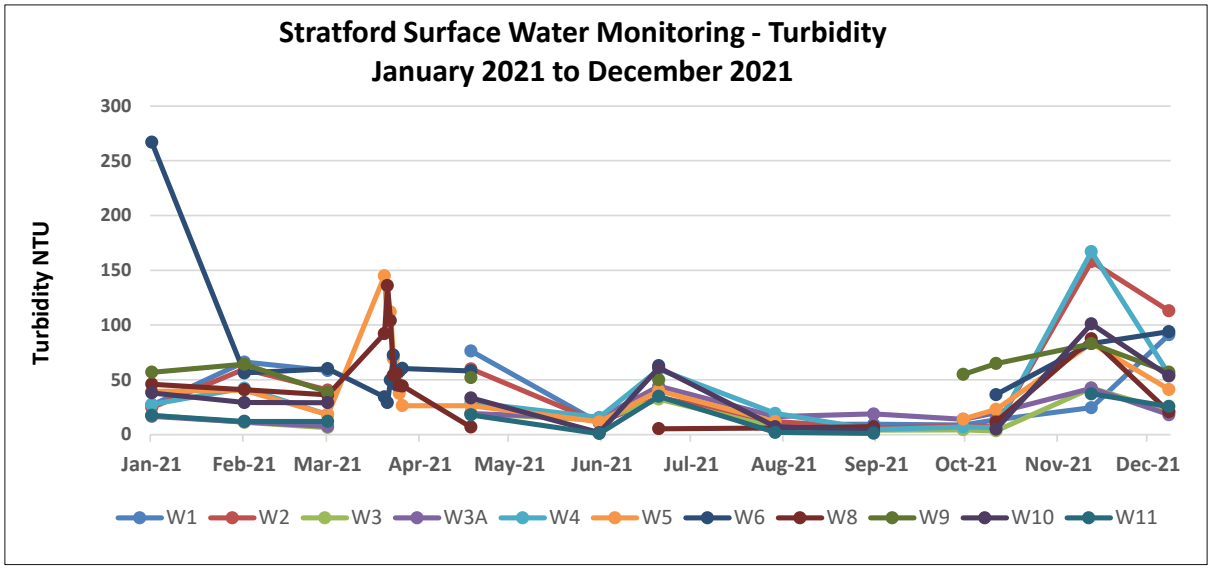


Figure 5-4: Surface Water Monitoring Results - Turbidity

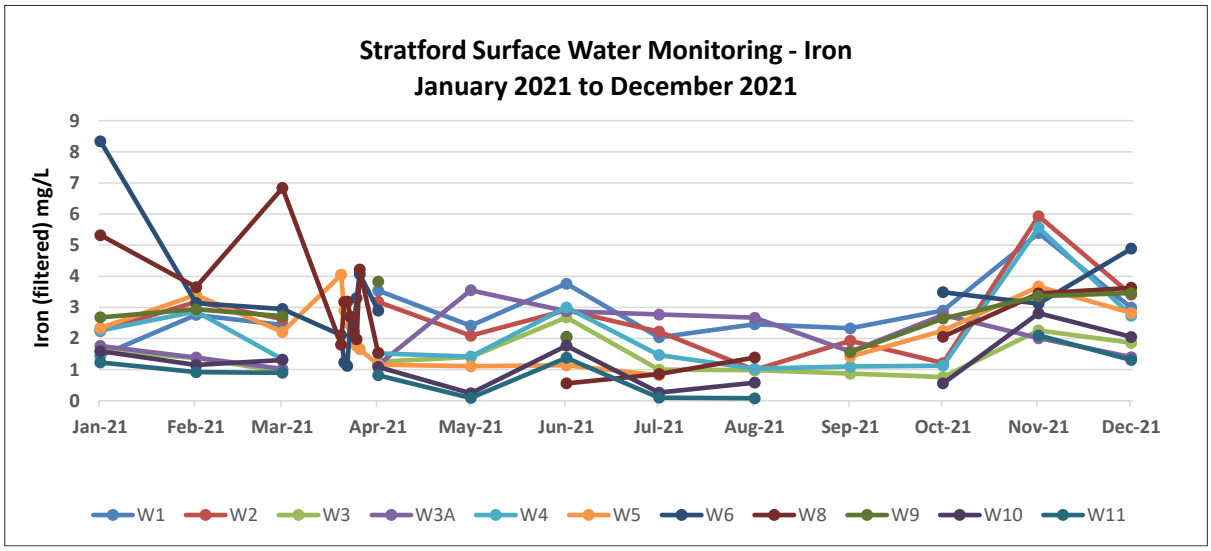


Figure 5-5: Surface Water Monitoring Results - Iron

Summary of Results – Mine Water Storage Monitoring Points

Site	Roseville West Pit		BRW (Parkers) Pit	
Parameter	**Range**	**Average**	**Range**	**Average**
pH	7.8 to 8.3	8	6.9 to 8.3	7.5
EC	2120 to 3250	2913	611 to 2880	2135
ORP	47 to 141	94	4 to 134	73
Acidity	3 to 7	4	4 to 18	12
Aluminium	0.01 to 0.22	0.09	0.04 to 2.96	0.6
Sulphate	296 to 1250	1000	217 to 1340	826
Sodium	235 to 402	340	39 to 291	195
Calcium	131 to 325	250	51 to 270	208
Chloride	196 to 470	341	23 to 309	193
Iron	0.12 to 0.22	0.17	0.08 to 2.31	0.7
Zinc	0.010 to 0.020	0.016	0.007 to 0.151	0.1
Magnesium	52 to 111	93	23 to 108	82
Manganese	0.007 to 0.202	0.081	0.178 to 2.0	0.9
Site	**RWD (Return Water Dam)**		**ESD (Stratford East Dam)**	
Parameter	**Range**	**Average**	**Range**	**Average**
pH	8.0 to 8.4	8.2	8.1 to 8.8	8.4
EC	2750 to 4000	3347	743 to 882	782
ORP	-66 to 160	61	54 to 12	87
Acidity	NA	NA	1 to 2	1.2
Aluminium	NA	NA	0.02 to 0.09	0.04
Sulphate	NA	NA	55 to 82	65
Sodium	NA	NA	93 to 10	104
Calcium	NA	NA	22 to 30	24
Chloride	NA	NA	114 to 168	126
Iron	NA	NA	0.05 to 0.0	0.07
Zinc	NA	NA	0.005 to 0.005	0.005
Magnesium	NA	NA	20 to 24	21
Manganese	NA	NA	0.01 to 0.03	0.02
Site	**Stratford Main Pit**		**Stratford East Pit**	
Parameter	**Range**	**Average**	**Range**	**Average**
pH	7.3 to 8.3	7.9	5.8 to 8.3	7.3
EC	2860 to 3490	3245	2210 to 3990	3286
ORP	64 to 159	100	35 to 161	99
Acidity	1 to 10	5	5 to 28	14
Aluminium	0.01 to 0.43	0.07	0.02 to 32.8	3.4
Sulphate	1160 to 1570	1316	807 to 1830	1211
Sodium	293 to 375	337	163 to 3690	311
Calcium	260 to 371	301	232 to 441	355
Chloride	296 to 419	348	72 to 505	356
Iron	0.05 to 0.38	0.08	0.1 to 112	12
Zinc	0.005 to 0.013	0.006	0.005 to 2.080	0.286
Magnesium	95 to 140	117	60 to 123	84
Manganese	0.03 to 0.231	0.103	0.201 to 6.960	2.266

Site	Avon North Pit	
Parameter	**Range**	**Average**
pH	7.7 to 8.1	8
EC	1550 to 3020	2268
ORP	37 to 141	92
Acidity	3 to 7	5
Aluminium	0.2 to 1.12	0.2
Sulphate	119 to 568	211
Sodium	219 to 438	335
Calcium	69 to 211	125
Chloride	158 to 566	378
Iron	0.06 to 0.94	0.3
Zinc	0.006 to 0.013	0.009
Magnesium	24 to 80	40
Manganese	0.017 to 0.186	0.07

Groundwaters

GW Series Groundwater Monitoring Bores

Bore ID	Date	Depth to Water from top of collar	Well Depth	DtoW below ground	pH	EC	Na	Cl	Fe(filt)	SO4	TDS	Ca	Mg	ORP	Temp
		m	m	m		uS/cm	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mV	°C
GW1	15-Apr-21	14.79	16.42	13.89	4.85	1110	722	269	16.1	143	866	51	123	282	24
	25-Aug-21	DRY													
	Averages	**14.79**			**4.85**	**1110**	**722**	**269**	**16.1**	**143**					
GW2	15-Apr-21	11.88	17.03	10.68	6.53	4650	175	1350	33.1	30	2820	6	24	18	25
	25-Aug-21	11.34	17.03	10.14	6.64	5030	793	1420	22.5	30	2990	51	127	-29	20
	Averages	**11.61**			**6.585**	**4840**	**484**	**1385**	**27.8**	**30**					
GW3	15-Apr-21	2.56	6.38	1.66	7.04	3540	520	525	76.8	959	2710	103	154	175	22
	25-Aug-21	1.88	6.38	0.98	7.09	4360	571	446	192	1500	3320	142	209	18	16
	Averages	**2.22**			**7.065**	**3950**	**545.5**	**485.5**	**134.4**	**1229.5**					
GW4	15-Apr-21	0.72	5.97	0.02	6.69	12900	2050	4260	4.17	86	8340	277	340	136	20.4
	25-Aug-21	0.89	5.97	0.19	6.71	14300	2190	5120	5.46	102	9930	301	346	112	15.1
	Averages	**0.81**			**6.7**	**13600**	**2120**	**4690**	**4.815**	**94**					
GW5	15-Apr-21	3.47	8.55	2.47	7.34	7990	1300	2500	11.9	275	5050	132	195	-8	26.2
	25-Aug-21	3.26	8.55	2.26	7.1	8930	1400	3000	14.8	290	5900	141	213	-7	18.2
	Averages	**3.37**			**7.22**	**8460**	**1350**	**2750**	**13.35**	**282.5**					
GW7	15-Apr-21	3.63	8.28	2.88	6.62	881	148	201	22	<1	662	15	18	34	21.8
	25-Aug-21	3.38	8.28	2.63	6.42	2080	281	588	14.8	<1	1290	34	47	-28	17.6
	Averages	**3.51**			**6.52**	**1480.5**	**214.5**	**394.5**	**18.4**	**<1**					
GW8	15-Apr-21	Dry	11.75												
	25-Aug-21	Dry													
	Averages														

Bore ID	Date	Depth	Bore Volume	Volume Purged	pH	EC	ORP	SO4	Na	Cl	Iron	TDS	Ca	Mg	Temp
		m	L	L		uS/cm	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	°C
BRWN1	15-Apr-21	0.36	7.13	9	5.91	4460	157	379	866	1180	7.56	2800	26	48	26.0
	25-Aug-21	0.55	6.76	9	5.96	5430	130	425	1000	1390	6.18	3270	39	63	15.0
	Averages	**0.46**			**5.935**	**4945**	**143.5**	**402**	**933**	**1285**					

Bore Id	DATE	Depth to Water Level	Corrected DTWL	pH	EC	ORP	Fe	Na	Cl	SO4	TDS	Mg	Ca
		m	m		µS/cm	mV	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
RB1	26-Feb-21	4.84	4.24	6.75	10800	-30	10.6	1680	3390	37	7460	280	319
	27-May-21	4.33	3.73	6.93	11000	82	8.56	1610	3390	34	7240	257	281
	25-Aug-21	4.17	3.57	6.71	10800	-25	9.83	1580	3880	29	7600	252	286
	30-Nov-21	4.05	3.45	6.86	11100	15	9.52	1660	3930	36	7930	270	333
	Averages	**4.35**		**6.81**	**10925**			**1633**	**3648**	**34**			
RB2	26-Feb-21	3.94	2.84	6.94	9590	77	0.51	1590	2880	136	6280	200	220
	27-May-21	No Access											
	25-Aug-21	4.96	3.86	6.75	8850	75	0.83	1530	3090	138	5990	180	185
	30-Nov-21	2.61	1.51	6.7	10100	126	0.2	1630	3360	139	6760	208	237
	Averages	**3.84**		**6.80**	**9513**			**1583**	**3110**	**138**			
RB3	26-Feb-21	Dry											
	27-May-21	No access											
	25-Aug-21	Dry											
	30-Nov-21	Dry											
	Averages												

Bowens Road North Groundwater Monitoring Bores

Bore Id	DATE	Depth to Water Level	Corrected DTWL	Bore Volume	Volume Purged	pH	EC	ORP	Ca	Fe	Pb	Mg	Mn	P	K	Na	Bicarbonate (as CaCO3)	Cl	SO4	Zn
		m	m	L	L		µS/cm	mv	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L	mg/L
MW3	25-Feb-21	Dry																		
	27-May-21	Too low to sample																		
	27-Aug-21	Dry																		
	23-Nov-21	Dry																		
MW4	25-Feb-21	Dry																		
	27-May-21	Dry																		
	27-Aug-21	Dry																		
	23-Nov-21	Dry																		
MW6	25-Feb-21	5.61	5.11	8.60	22.0	6.11	206	62	3	2.67	0.008	3	0.162	0.49	<1	38	45	28	<10	0.026
	27-May-21	8.59	8.09	2.76	9.0	6.27	260	76	4	6.47	0.006	4	0.185	0.34	1	42	71	29	14	0.029
	27-Aug-21	8.82	8.32	2.31	6.9	6.37	260	51	6	7.67	0.009	5	0.19	0.33	1	42	60	37	16	0.05
	23-Nov-21	8.32	7.82	16.30	37.0	6.24	192	133	3	26.3	0.033	3	0.334	1.16	<1	34	54	26	4	0.155
MW7	25-Feb-21	Dry																		
	27-May-21	9.52	9.02	2.46	5.5	6.08	2400	49	41	16	<0.001	70	1.99	0.26	6	342	126	618	258	0.039
	27-Aug-21	Dry																		
	23-Nov-21	Dry - Too low to sample																		
MW8	25-Feb-21	Dry																		
	27-May-21	Too low to sample																		
	27-Aug-21	Dry																		
	23-Nov-21	Dry - Too low to sample																		
MW11	20-Jan-21	9.79	9.29			7.09	1300													
	25-Feb-21	9.73	9.23	31.80	96.0	7.13	1180	-25	75	0.58	<0.001	13	0.089	0.05	2	165	357	229	16	0.008
	29-Mar-21	9.14	8.64			7.09	141.4													
	23-Apr-21	9.55	9.05			7.13	977.8													
	27-May-21	9.58	9.08	32.18	98.0	7.05	1030	65	60	0.94	<0.001	10	0.119	0.07	3	137	328	156	25	0.016
	23-Jun-21	9.63	9.13			6.98	1083													
	21-Jul-21	8.98	8.48			6.96	1142													
	27-Aug-21	8.97	8.47	33.38	102.0	7.03	1060	-40	69	0.72	<0.001	11	0.093	0.06	2	142	282	168	26	<0.005
	22-Sep-21	9.52	9.02			6.85	1124													
	22-Oct-21	9.47	8.97			7.1	1196													
	23-Nov-21	9.42	8.92	32.49	100.0	6.96	987	-1	71	0.83	<0.001	11	0.093	0.06	2	146	288	157	28	0.014
	22-Dec-21	8.66	8.16			6.95	1106													
MW12	20-Jan-21	6.00	5.50			6.55	857.7													
	25-Feb-21	3.22	2.72	11.30	35.0	6.58	654	6	19	1.26	0.002	14	0.891	0.05	3	84	86	148	22	<0.005
	29-Mar-21	3.20	2.70			6.32	1694													
	23-Apr-21	3.29	2.79			6.53	931.2													
	27-May-21	3.33	2.83	11.17	35.0	6.56	619	71	20	1.35	0.002	13	0.834	0.09	4	83	108	127	18	0.016
	23-Jun-21	3.23	2.73			6.59	572.1													
	21-Jul-21	2.85	2.35			6.63	592.4													
	27-Aug-21	2.82	2.32	12.11	38.0	6.8	521	109	17	1.28	0.002	11	0.549	0.04	3	65	95	96	17	0.008
	22-Sep-21	3.36	2.86			6.64	554													
	22-Oct-21	3.36	2.86			6.77	577.6													
	23-Nov-21	3.15	2.65	11.46	36.0	6.68	484	86	16	2.3	0.003	12	0.676	0.05	3	68	102	95	12	0.014
	22-Dec-21	2.86	2.36			6.69	530													
GRIFFIN	25-Feb-21	1.95	1.55			7.83	2340	142	19	4.67	<0.001	9	0.04	0.69	2	485	575	561	<1	0.026
	27-May-21	1.52	1.12			7.72	2040	81	18	1.8	<0.001	8	0.034	0.27	3	394	414	418	1	0.006
	27-Aug-21	1.38	0.98			7.75	2160	62	22	0.95	<0.001	9	0.028	0.1	2	418	461	485	<1	0.008
	23-Nov-21	1.50	1.10			7.8	2280	79	28	2.03	<0.001	11	0.029	0.19	2	500	536	501	4	0.008

Stratford Groundwater Monitoring Bores

Bore Id	DATE	Depth to water m	pH	EC µS/cm	ORP mv	Temp mg/L	Ca mg/L	Fe mg/L	Mg mg/L	Mn mg/L	Pb mg/L	P mg/L	K mg/L	Na mg/L	Cl mg/L	SO4 mg/L	Bicarbonate as CaCO3 mg/L	Zn mg/L	TDS mg/L
Bagnell (Stratford Shop)	20-Jan-21																		
	25-Feb-21																		
	29-Mar-21																		
	23-Apr-21																		
	27-May-21																		
	23-Jun-21																		
	21-Jul-21																		
	27-Aug-21																		
	22-Sep-21																		
	22-Oct-21																		
	23-Nov-21																		
	22-Dec-21																		
Ex-Bramley	21-Apr-21	7.45	7.17	1980															
	22-Oct-21	7.41	7.51	1800	39	19	106	0.53	27	0.114	<0.001	2.99	14	232	453	1	279	0.01	1090
Ex-Butler/McDonald	21-Apr-21	No access																	
	22-Oct-21	No access																	
Fardell (ex Horner)	21-Apr-21	No access																	
	22-Oct-21	No access																	
Forbes	21-Apr-21	No access																	
	22-Oct-21	No access																	
Germon	20-Jan-21	No access																	
	25-Feb-21	No access																	
	29-Mar-21	No access																	
	23-Apr-21	No access																	
	27-May-21	No access																	
	23-Jun-21	No access																	
	21-Jul-21	No access																	
	27-Aug-21	No access																	
	22-Sep-21	No access																	
	22-Oct-21	No access																	
	22-Oct-21	No access																	
	23-Nov-21	No access																	
	22-Dec-21	No access																	
Hooker	21-Apr-21	No access																	
	22-Oct-21	No access																	
Mitchell	21-Apr-21	No access																	
	22-Oct-21	No access																	
Glew	21-Apr-21	No access																	
	22-Oct-21	No access																	
Smith	21-Apr-21	No access																	
	22-Oct-21	No access																	
SCPL Bore, Wood St	20-Jan-21	11.30	6.76	7980															
	25-Feb-21	11.25	6.69	7610															
	29-Mar-21	11.28	6.31	7040															
	23-Apr-21	11.24	6.63	8280															
	27-May-21	11.24	6.6	7550															
	23-Jun-21	11.25	6.64	7710															
	21-Jul-21	11.20	6.65	8600															
	27-Aug-21	11.22	6.64	8630															
	22-Sep-21	11.23	6.55	8430															
	22-Oct-21	11.24	6.71	7660	-25	20.9	258	3.11	195	0.504	0.022	0.06	9	1160	2190	170	680	0.04	4880
	23-Nov-21	11.23	6.63	8560															
	22-Dec-21	11.25	6.74	8380															

APPENDIX 5

Blast Monitoring Results

Shot #	Location	Date	Time	Isaac (B1) 7432		Ex-Judge (B2) 7441		Atkins (B6) 7434		Greenwood 7422		Clarke (B5) (Mine-owned) 7433 (previously 7377)		Bagnall (Extrapolated result)		Powerline Monitor Result		PPV CTS-1 (Extrapolated Result)		Overpressure Site Exceedance [1]	Overpressure "Cumulative Exceedance" [1]	Ground Vibration Site Exceedance [1]	Ground Vibration "Cumulative Exceedance" [1]	Monitored Blasts[1]	Fume Rating	Observations
			24hr	mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL	mm/s	dBL	%		%				
AN164	Avon North	Friday, 8 January 2021	12:38:00	<0.24	<114	<0.24	<114	0.24	97.8	<0.24	<114	0.45	111.6	0.31	107.7					0.00%	0	0.0%	0	1	Nil	
RVL324	Roseville West	Tuesday, 12 January 2021	13:08:00	0.45	96.5	0.31	108.0	0.27	108.4	<0.24	<114	<0.24	<114	<0.24	<114					0.00%	0	0.0%	0	2	Nil	
STR060	Stratford East	Wednesday, 13 January 2021	9:44:00	0.26	86.0	<0.24	<114	<0.24	<114	0.48	107.4	0.68	85.8	0.65	85.3	**4.31**	**118.8**	**2.32**	**113.92**	0.00%	0	0.0%	0	3	Nil	
STR061	Stratford East	Thursday, 14 January 2021	14:35:00	0.28	82.5	<0.24	<114	<0.24	<114	0.35	102.0	0.72	93.1	0.68	92.5	**8.89**	**119.3**	**3.74**	**112.49**	0.00%	0	0.0%	0	4	Nil	
STR063	Stratford East	Friday, 15 January 2021	12:37:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.30	82.2	0.29	81.7	**0.81**	**113.9**	**0.47**	**109.62**	0.00%	0	0.0%	0	5	Nil	
RVL352	Roseville West	Monday, 18 January 2021	13:05:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114					0.00%	0	0.0%	0	6	Nil	
RVL326	Roseville West	Wednesday, 20 January 2021	13:11:00	0.28	98.8	<0.24	<114	0.28	103.9	<0.24	<114	<0.24	<114	<0.24	<114					0.00%	0	0.0%	0	7	Nil	
AN166	Avon North	Thursday, 21 January 2021	12:52:00	0.25	82.3	0.33	86.5	0.39	92.8	<0.24	<114	1.65	108.5	1.05	103.7					0.00%	0	0.0%	0	8	Nil	
STR058	Stratford East	Thursday, 28 January 2021	12:43:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.26	79.4	0.25	78.9	**2.27**	**110.6**	**1.29**	**106.17**	0.00%	0	0.0%	0	9	Nil	
RVL327	Roseville West	Tuesday, 2 February 2021	13:13:00	0.31	90.3	0.34	97.8	0.28	95.3	<0.24	<114	0.26	91.4	0.22	89.5					0.00%	0	0.0%	0	10	Nil	
AN169	Avon North	Friday, 5 February 2021	12:42:00	0.27	82.3	0.33	83.0	<0.24	<114	<0.24	<114	1.34	110.0	0.87	105.4					0.00%	0	0.0%	0	11	Nil	
RVL328	Roseville West	Tuesday, 9 February 2021	13:13:00	0.25	97.1	0.26	101.1	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114					0.00%	0	0.0%	0	12	Nil	
STR065	Stratford East	Thursday, 11 February 2021	12:44:00	0.24	85.8	0.26	86.5	<0.24	<114	0.47	109.5	0.41	82.9	0.39	82.4	**2.21**	**111.9**	**1.33**	**107.91**	0.00%	0	0.0%	0	13	2A	
RVL329	Roseville West	Tuesday, 16 February 2021	13:25:00	0.35	96.3	0.40	104.6	0.28	92.8	<0.24	<114	0.25	85.4	0.21	83.5					0.00%	0	0.0%	0	14	Nil	
STR067	Stratford East	Thursday, 18 February 2021	12:56:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.44	79.4	0.41	78.7	**21.80**	**123.7**	**0.83**	**104.20**	0.00%	0	0.0%	0	15	Nil	
AN170	Avon North	Monday, 1 March 2021	12:43:00	0.29	82.3	0.27	83.0	0.27	89.3	<0.24	<114	1.08	106.4	0.73	102.3					0.00%	0	0.0%	0	16	Nil	
STR066	Stratford East	Friday, 5 March 2021	12:35:00	0.31	82.3	0.27	83.0	<0.24	<114	0.75	108.9	0.41	91.4	0.39	91.0	**2.75**	**114.6**	**1.74**	**111.00**	0.00%	0	0.0%	0	17	Nil	
AN172	Avon North	Tuesday, 9 March 2021	12:45:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.73	112.4	0.50	108.4					0.00%	0	0.0%	0	18	Nil	
AN174	Avon North	Friday, 26 March 2021	12:46:00	0.31	85.8	0.25	96.1	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114					0.00%	0	0.0%	0	19	Nil	
STR068	Stratford East	Thursday, 1 April 2021	12:40:00	0.24	93.2	0.26	86.5	<0.24	<114	0.38	102.1	0.54	87.3	0.51	86.7	**5.28**	**142.7**	**2.87**	**137.90**	0.00%	0	0.0%	0	20	Nil	
BRN_01	BRN	Tuesday, 13 April 2021	12:40:00	<0.24	<114	0.32	92.6	0.79	91.2	<0.24	<114	0.44	100.6	0.35	98.3					0.00%	0	0.0%	0	21	Nil	
AN175	Avon North	Wednesday, 14 April 2021	12:37:00	0.03	82.3	0.28	83.0	<0.24	<114	0.48	106.6	1.16	112.2	0.80	108.2					0.00%	0	0.0%	0	22	Nil	
BRN_02	BRN	Friday, 16 April 2021	12:34:00	<0.24	<114	0.35	91.0	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114					0.00%	0	0.0%	0	23	Nil	
STR069	Stratford East	Tuesday, 20 April 2021	16:28:00	0.37	82.3	0.29	83.0	<0.24	<114	0.85	107.7	0.64	79.4	0.61	78.9	**<0.24**	**<114**	**<0.24**	**<114**	0.00%	0	0.0%	0	24	Nil	
AN173	Avon North	Friday, 23 April 2021	12:41:00	0.24	90.3	0.24	93.9	<0.24	<114	<0.24	<114	0.68	111.1	0.48	107.4					0.00%	0	0.0%	0	25	Nil	
STR072	Stratford East	Monday, 26 April 2021	12:36:00	<0.24	<114	<0.24	<114	<0.24	<114	0.51	102.9	0.39	82.9	0.37	82.4	**6.08**	**118.4**	**2.38**	**114.20**	0.00%	0	0.0%	0	26	Nil	
STR070	Stratford East	Thursday, 29 April 2021	12:41:00	0.28	82.3	0.26	83.0	<0.24	<114	0.75	110.6	0.71	82.9	0.68	82.4	**4.79**	**112.3**	**2.78**	**108.00**	0.00%	0	0.0%	0	27	Nil	
AN177	Avon North	Tuesday, 4 May 2021	12:39:00	0.25	100.4	0.44	83.0	0.32	100.8	<0.24	<114	1.63	110.6	1.18	107.2					0.00%	0	0.0%	0	28	Nil	
AN176	Avon North	Thursday, 6 May 2021	12:50:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.51	106.4	0.34	102.1					0.00%	0	0.0%	0	29	Nil	
AN181	Avon North	Thursday, 13 May 2021	12:34:00	0.23	93.2	0.28	97.0	0.25	92.8	<0.24	<114	0.67	117.1	0.47	113.4					0.00%	0	0.0%	0	30	Nil	
STR064	Stratford East	Tuesday, 18 May 2021	12:42:00	0.43	85.8	0.37	83.0	<0.24	<114	0.83	109.1	0.54	85.4	0.52	84.9	**3.20**	**113.5**	**1.94**	**109.60**	0.00%	0	0.0%	0	31	Nil	
STR073	Stratford East	Friday, 21 May 2021	12:46:00	0.23	95.4	<0.24	<114	<0.24	<114	0.42	107.7	<0.24	<114	<0.24	<114	**1.46**	**111.7**	**0.92**	**108.10**	0.00%	0	0.0%	0	32	Nil	
AN180	Avon North	Friday, 28 May 2021	12:32:00	0.27	82.3	<0.24	<114	<0.24	<114	<0.24	<114	1.22	114.8	0.87	111.3					0.00%	0	0.0%	0	33	Nil	
STR074	Stratford East	Thursday, 3 June 2021	12:42:00	<0.24	<114	<0.24	<114	<0.24	<114	0.38	110.6	0.36	79.4	0.34	78.9	**<0.24**	**<114**	**<0.24**	**<114**	0.00%	0	0.0%	0	34	Nil	
STR075	Stratford East	Tuesday, 8 June 2021	12:34:00	<0.24	<114	0.27	83.0	<0.24	<114	0.43	112.6	0.30	79.4	0.29	79.0	**44.37**	**132.5**	**1.70**	**98.20**	0.00%	0	0.0%	0	35	Nil	
AN188	Avon North	Friday, 18 June 2021	12:43:00	0.22	82.3	0.25	92.6	0.29	92.8	<0.24	<114	1.19	118.6	0.76	113.8					0.00%	0	0.0%	0	36	Nil	
AN185	Avon North	Tuesday, 29 June 2021	12:42:00	0.23	88.3	0.31	91.0	0.26	96.3	<0.24	<114	1.23	106.4	0.87	102.8					0.00%	0	0.0%	0	37	Nil	
STR076	Stratford East	Tuesday, 6 July 2021	12:45:00	0.33	76.3	<0.24	<114	<0.24	<114	0.60	102.1	0.48	79.4	0.46	78.9	1.34	122.7	**0.10**	**95.75**	0.00%	0	0.0%	0	38	Nil	
AN191	Avon North	Thursday, 8 July 2021	12:35:00	0.24	96.3	0.31	83.0	<0.24	<114	<0.24	<114	0.24	96.3	0.17	92.5					0.00%	0	0.0%	0	39	Nil	
STR077	Stratford East	Thursday, 15 July 2021	12:42:00	<0.24	<114	<0.24	<114	<0.24	<114	0.96	116.3	0.62	82.9	0.59	82.4	4.22	123.8	**0.26**	**94.56**	2.50%	1	0.0%	0	40	Nil	
STR078	Stratford East	Friday, 16 July 2021	12:39:00	<0.24	<114	<0.24	<114	<0.24	<114	0.38	108.1	0.48	100.2	0.45	99.6	7.68	118.2	**3.43**	**109.75**	2.44%	1	0.0%	0	41	Nil	
AN194	Avon North	Monday, 19 July 2021	12:38:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.31	107.7	0.21	103.7					2.38%	1	0.0%	0	42	Nil	
STR079	Stratford East	Tuesday, 20 July 2021	12:38:00	<0.24	<114	0.28	83.0	<0.24	<114	0.51	99.8	<0.24	<114	<0.24	<114	0.93	124.7	**0.08**	**98.32**	2.33%	1	0.0%	0	43	Nil	
STR080	Stratford East	Friday, 23 July 2021	12:39:00	0.31	94.3	0.25	83.0	<0.24	<114	0.78	105.5	0.50	82.9	0.48	82.5	7.66	116.3	**0.28**	**81.45**	2.27%	1	0.0%	0	44	Nil	
AN195	Avon North	Tuesday, 27 July 2021	12:39:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114					2.22%	1	0.0%	0	45	Nil	
AN193	Avon North	Monday, 2 August 2021	12:46:00	0.24	82.3	0.25	99.9	0.27	96.3	<0.24	<114	0.58	111.2	0.40	107.3					2.17%	1	0.0%	0	46	Nil	
STR081	Stratford East	Thursday, 5 August 2021	12:35:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.40	91.4	0.38	90.8	4.25	111.9	**1.59**	**101.59**	2.13%	1	0.0%	0	47	Nil	
AN197	Avon North	Friday, 13 August 2021	12:44:00	0.28	82.3	0.39	83.0	<0.24	<114	<0.24	<114	1.53	108.9	1.07	105.1					2.08%	1	0.0%	0	48	Nil	
AN198	Avon North	Wednesday, 18 August 2021	12:32:00	0.23	82.3	0.26	95.0	0.30	107.6	<0.24	<114	1.19	109.3	1.19	109.3					2.04%	1	0.0%	0	49	Nil	
AN161	Avon North	Thursday, 19 August 2021	12:37:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	1.20	112.6	0.75	107.7					2.00%	1	0.0%	0	50	Nil	
STR082	Stratford East	Wednesday, 25 August 2021	14:39:00	0.24	82.3	0.25	89.0	<0.24	<114	0.36	104.0	0.41	94.2	0.39	93.6	3.24	116.4	**1.55**	**108.65**	1.96%	1	0.0%	0	51	Nil	
AN200	Avon North	Friday, 27 August 2021	12:41:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.81	115.0	0.51	110.2					1.92%	1	0.0%	0	52	Nil	
AN202	Avon North	Monday, 30 August 2021	12:41:00	0.29	88.3	0.25	92.6	0.27	98.1	<0.24	<114	1.21	114.9	0.88	111.5					1.89%	1	0.0%	0	53	Nil	
AN204	Avon North	Friday, 3 September 2021	12:31:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	1.47	110.5	0.91	105.5					1.85%	1	0.0%	0	54	Nil	
AN205	Avon North	Wednesday, 8 September 2021	12:42:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.92	110.3	0.65	106.6					1.82%	1	0.0%	0	55	Nil	
AN207	Avon North	Tuesday, 14 September 2021	12:33:00	0.34	90.3	0.34	83.0	0.40	102.3	<0.24	<114	1.38	113.0	1.38	113.0					1.79%	1	0.0%	0	56	Nil	
AN208	Avon North	Wednesday, 15 September 2021	13:31:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	0.24	104.5	0.17	100.6					1.75%	1	0.0%	0	57	Nil	
AN209	Avon North	Friday, 17 September 2021	12:37:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	1.00	110.7	0.68	106.6					1.72%	1	0.0%	0	58	Nil	
STR084	Stratford East	Friday, 24 September 2021	12:42:00	<0.24	<114	0.29	83.0	<0.24	<114	0.52	105.8	0.64	92.4	0.61	91.9	32.35	124.9	**8.28**	**110.60**	1.69%	1	0.0%	0	59	Nil	
STR086	Stratford East	Friday, 1 October 2021	10:36:00	<0.24	<114	0.25	83.0	<0.24	<114	0.44	102.5	0.46	88.9	0.43	88.3	8.25	116.3	**4.94**	**110.92**	1.67%	1	0.0%	0	60	Nil	
AN206	Avon North	Friday, 8 October 2021	12:49:00	0.30	82.3	0.34	83.0	0.41	107.3	<0.24	<114	1.32	114.9	0.88	110.6					1.64%	1	0.0%	0	61	Nil	
STR087	Stratford East	Monday, 18 October 2021	12:37:00	0.28	82.3	0.28	93.9	<0.24	<114	0.41	95.7	0.63	85.4	0.60	84.9	3.24	116.4	**1.01**	**104.12**	1.61%	1	0.0%	0	62	Nil	
STR088	Stratford East	Tuesday, 19 October 2021	12:38:00	0.26	82.3	0.31	83.0	<0.24	<114	0.48	92.6	0.47	95.6	0.45	95.1	1.49	112.6	**0.27**	**94.67**	1.59%	1	0.0%	0	63	Nil	
AN210	Avon North	Monday, 25 October 2021	12:43:00	<0.24	<114	0.27	83.0	0.26	95.3	<0.24	<114	0.81	110.5	0.55	106.5					1.56%	1	0.0%	0	64	Nil	
AN212	Avon North	Wednesday, 3 November 2021	12:39:00	0.27	103.5	0.37	83.0	<0.24	<114	<0.24	<114	1.79	110.3	1.23	106.4					1.54%	1	0.0%	0	65	Nil	
STR089	Stratford East	Monday, 8 November 2021	12:37:00	<0.24	<114	<0.24	<114	<0.24	<114	0.44	94.8	0.45	87.3	0.42	86.7	2.56	112.3	**1.57**	**107.19**	1.52%	1	0.0%	0	66	Nil	
AN215	Avon North	Wednesday, 10 November 2021	12:48:00	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114					1.49%	1	0.0%	0	67	Nil	
AN217	Avon North	Friday, 19 November 2021	12:50:00	0.32	82.3	0.47	83.0	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114					1.47%	1	0.0%	0	68	Nil	
AN217B	Avon North	Wednesday, 1 December 2021	12:35:00	0.28	85.8	0.43	83.0	0.38	98.1	<0.24	<114	1.12	109.9	0.78	106.1					1.45%	1	0.0%	0	69	Nil	
STR091	Stratford East	Friday, 3 December 2021	12:44:00	<0.24	<114	0.24	83.0	<0.24	<114	0.26	100.8	<0.24	<114	<0.24	<114	4.14	113.8	**3.99**	**113.42**	1.43%	1	0.0%	0	70	Nil	
AN214	Avon North	Thursday, 9 December 2021	10:18:00	<0.24	<114	0.34	86.5	0.28	91.2	<0.24	<114	<0.24	<114	<0.24	<114					1.41%	1	0.0%	0	71	Nil	
STR090	Stratford East	Tuesday, 14 December 2021	12:44:00	<0.24	<114	<0.24	<114	<0.24	<114	0.34	102.9	<0.24	<114	<0.24	<114	2.03	108.1	**0.12**	**78.82**	1.39%	1	0.0%	0	72	Nil	
AN225	Avon North	Friday, 17 December 2021	12:33:00	0.26	76.3	0.27	83.0	<0.24	<114	<0.24	<114	<0.24	<114	<0.24	<114					1.37%	1	0.0%	0	73	Nil	
AN216	Avon North	Wednesday, 22 December 2021	12:13:00	<0.24	<114	0.28	83.0	0.33	92.8	<0.24	<114	0.87	112.6	0.60	108.7					1.35%	1	0.0%	0	74	Nil	

APPENDIX 6

Noise Monitoring Results

January 2021 Survey

Table 6.9: Noise Performance Assessment – Operations – 13 & 14 January 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	33	33	29	35	35	35	Yes	Yes	Yes
Clarke[2]	<25	30	29	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	I/A	I/A	NM	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	<12	16	15	37	37	37	Yes	Yes	Yes
Hall	NM	<25	32	35	35	35	Yes	Yes	Yes
141 Deards Lane	I/A	33	28	35	35	35	N/A[5]	N/A[5]	N/A[5]
Lowrey	<25	I/A	31	35	35	35	Yes	Yes	Yes
Pryce Jones	NM	34	35	43	43	43	Yes	Yes	Yes
Van der Drift	I/A	29	I/A	37	36	35	Yes	Yes	Yes
Greenwood	I/A	I/A	28	35	35	35	Yes	Yes	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.

February 2021 Survey

Table 6.10: Performance Assessment – Operations – 25 & 26 February 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	I/A	30	28	35	35	35	Yes	Yes	Yes
Clarke[2]	33	<25	36	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	<25	I/A	27	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	30	<11	22	37	37	37	Yes	Yes	Yes
Hall	30	26	25	35	35	35	Yes	Yes	Yes
141 Deards Lane	I/A	25	<30	35	35	35	Yes	Yes	Yes
Lowrey	<25	I/A	I/A	35	35	35	Yes	Yes	Yes
Pryce Jones	I/A	29	28	43	43	43	Yes	Yes	Yes
Van der Drift	33	33	27	37	36	35	Yes	Yes	Yes
Greenwood	I/A	25	30	35	35	35	Yes	Yes	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.

March 2021 Survey

Table 6.11: Performance Assessment – Operations – 30 & 31 March 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise LeveldBA[1]			Noise Criteria $L_{Aeq(15minute)}$dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	26	32	39	35	35	35	N/A[5]	N/A[5]	N/A[5]
5 (1) - Bagnall	-[6]	-[6]	31	35	35	35	Yes	Yes	Yes
5 (2) - Bagnall	-[6]	-[6]	31	35	35	35	Yes	Yes	Yes
9 (2) - Williams	-[6]	-[6]	33	35	35	35	Yes	Yes	Yes
10 – Whatmore & Whatmore	-[6]	-[6]	31	35	35	35	Yes	Yes	Yes
Clarke[2]	33	27	36	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	29	33	30	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	20	14	22	37	37	37	Yes	Yes	Yes
Hall	28	I/A	<20	35	35	35	Yes	Yes	Yes
141 Deards Lane	I/A	I/A	26	35	35	35	N/A[5]	N/A[5]	N/A[5]
Lowrey	<25	31	29	35	35	35	Yes	Yes	Yes
Pryce Jones	I/A	28	26	43	43	43	Yes	Yes	Yes
Van der Drift	30	28	30	37	36	35	Yes	Yes	Yes
Greenwood	I/A	I/A	I/A	35	35	35	Yes	Yes	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall. Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.

April 2021 Survey

Table 6.12: Performance Assessment – Operations – 21 & 22 April 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	34	33[7]	30[7]	35	35	35	Yes	Yes	Yes
Clarke[2]	34	44[7]	43[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	30	33[7]	36[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	29	34[7]	33[7]	37	37	37	Yes	Yes	Yes
Hall	I/A[1]	I/A1,[7]	28[7]	35	35	35	Yes	Yes	Yes
141 Deards Lane	I/A[1]	<25[7]	26[7]	35	35	35	N/A[5]	N/A[5]	N/A[5]
Lowrey	I/A[1,7]	NM[4,7]	29[7]	35	35	35	Yes	Yes	Yes
Pryce Jones	I/A[1]	<25[7]	34[7]	43	43	43	Yes	Yes	Yes
Van der Drift	<25[7]	32[7]	26[7]	37	36	35	Yes	Yes	Yes
Greenwood	I/A[1]	I/A1,[7]	34[7]	35	35	35	Yes	Yes	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.

Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.

May 2021 Survey

Table 6.13: Performance Assessment – Operations – 20 & 21 May 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	<25	I/A[1]	34	35	35	35	Yes	Yes	Yes
Clarke[2]	<25	40	43[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	I/A[1]	35[7]	41[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	<12	31[7]	39[7]	37	37	37	Yes	Yes	Yes
Hall	30	<25[7]	29[7]	35	35	35	Yes	Yes	Yes
141 Deards Lane	I/A[1]	<25[7]	26[7]	35	35	35	N/A[5]	N/A[5]	N/A[5]
Lowrey	34	25[7]	32[7]	35	35	35	Yes	Yes	Yes
Pryce Jones	I/A[1]	36[7]	37[7]	43	43	43	Yes	Yes	Yes
Van der Drift	37[7]	NM[4,7]	35[7]	37	36	35	Yes	Yes	Yes
Greenwood	I/A[1]	<25[7]	I/A[1,7]	35	35	35	Yes	Yes	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.

June 2021 Survey

Table 6.14: Performance Assessment – Operations – 24 & 25 June 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	<25	28	24	35	35	35	Yes	Yes	Yes
Clarke[2]	34	38	37	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	32	26	30	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	28	24	24	37	37	37	Yes	Yes	Yes
Hall	<25	33	36/30	35	35	35	Yes	Yes	Yes[8]
141 Deards Lane	I/A	<25	29	35	35	35	N/A[5]	N/A[5]	N/A[5]
Lowrey	34	I/A	31	35	35	35	Yes	Yes	Yes
Pryce Jones	I/A	38	40	43	43	43	Yes	Yes	Yes
Van der Drift	<25	30	29	37	36	35	Yes	Yes	Yes

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Greenwood	33	38	35	35	35	35	Yes	Yes[7]	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.
Note 8: Not considered a beach of noise criteria in accordance with approved NMP.

July 2021 Survey

Table 6.15: Performance Assessment – Operations – 29 & 30 July 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	I/A[1]	34[7]	34[7]	35	35	35	Yes	Yes	Yes
Clarke[2]	46[7]	47[7]	47[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	38	38[7]	40[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall[3]	33	37[7]	38[7]	37	37	37	Yes	Yes	Yes
Hall	31	30	26[7]	35	35	35	Yes	Yes	Yes[8]
141 Deards Lane	I/A[1]	<25[7]	27[7]	35	35	35	N/A[5]	N/A[5]	N/A[5]
Lowrey	<33[7]	34[7]	32[7]	35	35	35	Yes	Yes	Yes
Pryce Jones	I/A[7]	31[7]	35[7]	43	43	43	Yes	Yes	Yes
Van der Drift	32	35[7]	37[7]	37	36	35	Yes	Yes	Yes
Greenwood	I/A[1,7]	I/A[1,7]	32[7]	35	35	35	Yes	Yes	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.
Note 8: Not considered a beach of noise criteria in accordance with approved NMP.

August 2021 Survey

Table 6.16: Performance Assessment – Operations – 19 & 20 August 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	29	28	35[7]	35	35	35	Yes	Yes	Yes

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Clarke[2]	31	39[7]	44[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	31	30[7]	33[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	31	28[7]	32[7]	37	37	37	Yes	Yes	Yes
Hall	I/A[1]	33[7]	27[7]	35	35	35	Yes	Yes	Yes[8]
141 Deards Lane	I/A[1]	33	<25	35	35	35	N/A[5]	N/A[5]	N/A[5]
Lowrey	NM[4]	35	25[7]	35	35	35	Yes	Yes	Yes
Pryce Jones	33	40	39[7]	43	43	43	Yes	Yes	Yes
Van der Drift	I/A	36	29[7]	37	36	35	Yes	Yes	Yes
Greenwood	NM[4]	<25	28[7]	35	35	35	Yes	Yes[7]	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.
Note 8: Not considered a beach of noise criteria in accordance with approved NMP.

<u>September 2021 Survey</u>

Table 6.17: Performance Assessment – Operations – 16 & 17 September 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	34	35[7]	35[7]	35	35	35	Yes	Yes	Yes
Clarke[2]	33[7]	44[7]	45[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	<25[7]	32	30[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall[3]	22[7]	32[7]	34[7]	37	37	37	Yes	Yes	Yes
Hall	25	28[7]	30[7]	35	35	35	Yes	Yes	Yes
141 Deards Lane	I/A[1]	30	28[7]	35	35	35	N/A[5]	N/A[5]	N/A[5]
Lowrey	<30	<30[7]	34[7]	35	35	35	Yes	Yes	Yes
Pryce Jones	I/A[1]	29	35[7]	43	43	43	Yes	Yes	Yes
Van der Drift	32	37[7]	34[7]	37	36	35	Yes	Yes	Yes
Greenwood	I/A[1]	I/A[1]	29[7]	35	35	35	Yes	Yes	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.
Note 8: Not considered a beach of noise criteria in accordance with approved NMP.

October 2021 Survey

Table 6.18: Performance Assessment – Operations – 26 October 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	33	35	24	35	35	35	Yes	Yes	Yes
Clarke[2]	I/A[1]	27	30	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	I/A[1]	I/A[1]	<25	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	-	15	22	37	37	37	Yes	Yes	Yes
Hall	<30[6]	30	29	35	35	35	Yes	Yes	Yes
141 Deards Lane	I/A[1,6]	29	28	35	35	35	Yes	Yes	Yes
Lowrey	I/A[1,6]	<25[6]	28	35	35	35	Yes	Yes	Yes
Pryce Jones	I/A[1]	32[6]	36	43	43	43	Yes	Yes	Yes
Van der Drift	33[6]	34[6]	31	37	36	35	Yes	Yes	Yes
Greenwood	I/A	<25[6]	27	35	35	35	Yes	Yes	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Criteria not applicable due to non-compliant weather conditions.

November 2021 Survey

Table 6.19: Performance Assessment – Operations – 16 November 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	33[7]	38[7]	30	35	35	35	Yes	Yes	Yes
Clarke[2]	37[7]	37	38	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	30[7]	I/A[1]	32	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	29[3]	24[3]	30[3]	37	37	37	Yes	Yes	Yes
Hall	I/A	32[7]	27	35	35	35	Yes	Yes	Yes[8]
141 Deards Lane	I/A	29[7]	24	35	35	35	Yes	Yes	Yes
Lowrey	I/A	33[7]	30[7]	35	35	35	Yes	Yes	Yes
Pryce Jones	<35[7]	30[7]	31[7]	43	43	43	Yes	Yes	Yes
Van der Drift	<30[7]	36[7]	32	37	36	35	Yes	Yes	Yes
Greenwood	30[7]	I/A	I/A	35	35	35	Yes	Yes	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.

Note 7: Criteria not applicable due to non-compliant weather conditions.

December 2021 Survey

Table 6.20: Performance Assessment – Operations – 14 December 2021 Survey

Location	Estimated SMC $L_{Aeq(15minute)}$ Noise Level dBA[1]			Noise Criteria $L_{Aeq(15minute)}$ dBA			Compliance		
	Day	Eve	Night	Day	Eve	Night	Day	Eve	Night
Atkins	34[7]	35	43[7]	35	35	35	Yes	Yes	Yes
Clarke[2]	36[7]	39[7]	39[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Wadland[2,5]	<30[7]	28	34[7]	37	37	37	N/A[5]	N/A[5]	N/A[5]
Bagnall	28[7]	28	32[7]	37	37	37	Yes	Yes	Yes
Hall	I/A[7]	26	28[7]	35	35	35	Yes	Yes	Yes
141 Deards Lane	<25[7]	27[7]	22[7]	35	35	35	Yes	Yes	Yes
Lowrey	31[7]	30	34[7]	35	35	35	Yes	Yes	Yes
Pryce Jones	I/A[7]	<25	24[7]	43	43	43	Yes	Yes	Yes
Van der Drift	37[7]	34	35[7]	37	36	35	Yes	Yes	Yes
Greenwood	I/A[7]	I/A	I/A[7]	35	35	35	Yes	Yes[7]	Yes

Note 1: I/A = Inaudible.
Note 2: Owned by Stratford Coal Pty Ltd. Criteria adopted from Bagnall.
Note 3: Modelled result.
Note 4: Not Measurable
Note 5: Criteria adopted as a guide only.
Note 6: Not modelled. Compliance achieved at representative monitoring location therefore noise levels would comply at this receiver, or criteria not applicable due to non-compliant weather conditions.
Note 7: Criteria not applicable due to non-compliant weather conditions.

Plant ID	Description	2021 Measured SWL dBA	Target dBA	Exceedance	Rectification Status
Static Test					
110	CAT785	116	114	2	Regular inspection at maintenance intervals of exhaust system and Variable speed Fan. Continue to monitor and maintain sound suppression components
116	CAT785	115	114	1	Regular inspection at maintenance intervals of exhaust system and Variable speed Fan Continue to monitor and maintain sound suppression components
503	CAT777	118	115	3	Exhaust System defect repairs completed through site defect management system on 16/02/22
401	Komatsu WA-900	117	110	7	Further investigation into elevated noise levels has recommended louvres/upgrade fans, engine bay absorption and a high-performance muffler. Site continuing to investigate specific suppression and upgrade options for Komatsu WA-900
Dynamic Test					
51	Atlas Copco D65	119	116	3	Full Aletek dual skin exhaust system has been fitted.
215	CAT D10T (2R)	121	117	4	New sound suppressed Track idlers scheduled to be replaced early March 2022
216	CAT D10T (2R)	119	117	2	Continued monitoring of sound suppressed components on undercarriage
217	CAT D10T (2R)	121	117	4	Sound Suppressed track idlers have been ordered and are scheduled to be replaced late March 2022.
110	CAT785	116	115	1	Continue to monitor and maintain sound suppression components
401	Komatsu WA-900	118	112	6	Further investigation into elevated noise levels has recommended louvres/upgrade fans, engine bay absorption and a high-performance muffler. Site continuing to investigate specific suppression and upgrade options for Komatsu WA-900

APPENDIX 7

Complaints & CCC Annual Report

Stratford Complaint Summary

Date/Time of Complaint	Complainant Location	Method of Complaint	Nature of Complaint	Investigation/Outcome
8/01/2021 12:42hrs	Approx. 1.5km east of operations, Bowens Road Stratford	Direct text to MP mobile	Blast vibration	Complaint via text: "You just shock the house we have two more witnesses enough is enough". • SCPL forwarded details of complaint to drill and blast engineer. • Blast results at Clarke monitor: PPV 0.45mm/s MIC Peak 111.6dB(L) • SCPL provided a return text on 8/12/2020 to advise the complaint had been recorded and the blast was compliant. • SCPL advised they would continue to cooperate and provide further information as requested.
10/01/2021 20:36hrs	Approx. 1.5km east of operations, Bowens Road Stratford	Email to Yancoal Head office	Blast vibration	The Complainant emailed the Yancoal head office regarding ongoing concerns: *"I'm writing in regards to a complaint that was made on the 8/1/2021, blasting shaking our home. This is not the first time and nothing is changing or being taken seriously. I would like to be contacted ASAP about all these issues. These are serious issues that are being ignored, no one should have to live with the noise, dust and having their home shaken. This is very disgraceful and needs to be addressed immediately."* • SCPL provided a return email on 11/01/2021. The email reiterated the response and information provided on 8/01/2021 regarding blasting. The email advised the Complainant if they were still unsatisfied with SCPL's response, there is a process in the Development Consent to request an independent review from the DPIE. • SCPL advised they would continue to cooperate and provide further information as requested.

12/01/2021 9:00hrs	Approx. 1.5km east of operations, Bowens Road Stratford	Direct text to MP mobile	Air Quality and Lighting	Complaint via text: "Last night and today dust bad keep it under control". Followed by "Get the light off Bowens rd. I have ask number time to keep it off the road its a hazard". • SCPL forwarded details of complaint to the Mining Supervisor. E&C Supt inspected Wenham Cox Rd/Bowens Rd immediately after complaint. There was no evidence of visible dust or direct lighting from the public road. • SCPL provided a return message to the complainant to state the complaint had been received. • Reply from complainant at 9:30pm stated: "Just more rubbish yous need to have more consideration shaking people home noise dust light on road causing hazard". • SCPL advised they would continue to implement appropriate mitigation measures for noise, dust and lighting. SCPL will cooperate and provide further information as requested. SCPL continue to implement management and mitigation measures for noise.
24/03/2021 21:32hrs	Approx. 1.5km east of operations, Bowens Road Stratford	Direct text to MP mobile	Noise	Complaint via text: "Keep the noise down, people do need to sleep". • SCPL forwarded details of complaint to Mining Supervisor to ensure noise mitigation measures were being implemented. • SCPL provided a return text on 24/03/2021 to advise the complaint had been recorded and offered a follow-up call if required. • SCPL advised they would continue to cooperate and provide further information as requested. • SCPL also recieved a call from DPIE on 25/03/21 stating they had received the same complaint. No further information requested at this stage. SCPL continue to implement management and mitigation measures for noise.

26/03/2021 15:45hrs	Approx. 1.5km east of operations, Bowens Road Stratford	Via DPIE	Noise and Blasting road closures	Complaint received via DPIE. Complaint stated: •Noise from the mine on Wednesday and Thursday nights, around 8:30 – 9:30pm. - Comments provided by the shift supervisor: Normal operations, digger fleet in Avon North, digger fleet in Stratford East, working at higher elevation due to water in pit. Standard noise mitigation measures implemented as per Noise Management Plan. •Thursday 25 March (last night) complainant heard horns at about 10:30pm - Comments provided by for Mining Superintendent: • SMC uses a hornless communication system on all the dig units. Horns are not used on the excavators. Horns are only used by haul trucks when leaving the go lines at the start of shift or after shift break in accordance with safety requirements. Evening shift starts at 2:30pm and the shift break ends at 9:00pm. Horns are generally not used in other areas or at other times. •Blast carried out today at 12:47pm, which complainant wasn't expecting. There were signs on the road, but the road wasn't closed. - SCPL has reviewed drone footage which shows portions of Wenham Cox Road adjacent to the blast immediately prior to and after the blast and there are no public vehicles present. •Could you include Complainant on your blast notification register. - Complainant added to SMS notifications list.
21/04/2021 10:48hrs	Approx. 1.5km east of operations, Bowens Road Stratford	Direct text to MP mobile	Noise	Complaint via text: "The noise last night was ridiculous, keep it down". • SCPL forwarded details of complaint to Mining Supervisor to ensure noise mitigation measures were being implemented. • Observations from Wenham Cox Rd indicated mine noise was audible although not dominant. Attended noise monitoring was undertaken on 21/04/2021, all results compliant. • SCPL advised they would continue to implement appropriate mitigation measures for noise. SCPL will cooperate and provide further information as requested.

26/04/2021 22:02hrs	Approx. 3.2km west of the operation	Community Hotline	Noise	Complaint: "Noise" • ECC returned complainants call at 10:13AM as requested. Complainant stated that 'CHPP noise had increased dramatically over the past week'. The Complainant explained the noise as the plant really revving and operating at a much louder noise than usual. The Complainant added that there was intermittent machine noise and he did not hear any noise that he believed was a dozer. • ECC advised they would continue to implement appropriate mitigation measures for noise. Weather conditions: Strong inversion present at 10:02PM on the 26/4/2021. Consistent very light W wind conditions at the time of complaint. • CHPP Superintendents comments: Plant operating from 06:30am 26/4/2021 until 12:20AM 27/4/2021. ROM loader and small excavator operating at the time of complaint. No unusual operations at CHPP. • Low level LF noise noted on noise recording. Cicadas and other insect noise dominant at Craven noise monitor.
11/05/2021 22:16hrs	Approx. 2.6km west of source	Community Hotline	Noise	Complaint: Noise "Trucks, dozers etc" • ECC returned complainants call at 03:20PM as requested. Complainant did not accept the phone call. A phone message was left on the complainants mobile phone. Weather conditions: Strong inversion (4°C/100m) present at the time of complaint. Consistent very light (1m/s) W wind conditions at the time of complaint. • OCE Superintendents comments: Dozers operating on dumps - Limit noise with hornless systems in trucks/reverse quackers. Operations in Stratford east operating at RL130. ROM loader operating at the time of complaint. No unusual operations at CHPP. • Low level LF noise noted on noise recording. Cicadas and other insect noise dominant at the Deards Lane noise monitor.

11/05/2021 22:36hrs	Approx. 3.2km west of the operation	Community Hotline	Noise	Complaint: "Excessive noise from machinery and trucks" • ECC returned complainants call at 03:25PM. Complainant stated that the noise produced by SCPL was excessive during the evening of 11/5/2021. The Complainant outlined a noise described as 'intermittent loader noise with the cutting in and out of what he believed was a hydraulic fan. The complainant also noted that truck noise was more noticeable that it had been in the previous few months with prominent gear change noise. • ECC advised the complainant of operations at SCPL at the time of complaint and SCPL would continue to implement appropriate mitigation measures for noise. Weather conditions: Weather conditions: Strong inversion (4°C/100m) present at the time of complaint. Consistent very light (1m/s) W wind conditions at the time of complaint. • OCE Superintendents comments: Dozers operating on dumps - Limit noise with hornless systems in trucks/reverse quackers. Operations in Stratford east operating at RL130. ROM loader operating at the time of complaint. No unusual operations at CHPP. • Low level LF noise noted on noise recordings. Cicadas and other insect noise dominant at Craven and Deards Lane noise monitors.
21/05/2021	Approx. 3.2km west of the operation	Community Hotline	Blast	Complaint: "Giant cloud of dust just came over their place from mine" • ECC returned complainants call at 13:08. Complainant did not answer. • 22km/h SSW (197°) wind at time of complaint. Complaints residence approx. 4km West of blast location and approx. 3.2kms from active mining area. • Blasting activities at Stratford East pit undertaken at 12:44. ECC reviewed blast recording, dust observed to travel NNE and remained on the Mining Lease. • No other dust observed by ECC or reported to be leaving Stratford mining operations at the time of complaint.

22/05/2021	Approx. 6.5 km west of source	Email	Lighting	Complaint: I can't find where to register a complaint in order to get a call from you. So, in brief: 1. My complaint is about lighting again. It seems (to me) that there are sets of new very bright white lights pointing towards our properties on the sth end. This addition has grown the combined effect of the other lights - all pointing our way. Also, a glow towards the sth end is now very visible. Will that increase? 2. I read in the Feb minutes that you said "changes were made to the lighting plant configurations to reduce lighting impacts". Whilst no details were noted, from my property I am at a loss to see any such improvements. In fact, as above, I see a deterioration with more lights. Am I missing something? Could you pls advise how these changes have been a benefit to us? 3. I am concerned that the extension towards the Sth will mean a greater lighting impact for us. Can you pls address this concern and what we can expect, eg any more new lights? 4. Did you consider having any new lights pointing east, ie away from where people live? A mining friend recently say the lights and commented "they aren't trying hard enough" in positioning lighting to mitigate the impact on the local community. 5. I am concerned that there are now 6 pages of formal complaints on the register for the past 12 mths. This seems big & growing. • Afternoon shift OCE identified the lighting plant of concern to be a LED lighting plant on the Stratford East NAF dump. The light was repositioned to face north and tilted downwards. • ECC provided a call back to the complainant to provide a summary of changes made in response
28/06/2021	Approx. 1.5km east of operations, Bowens Road Stratford	Direct text to MP mobile	Lighting	Complaint via text: "I've asked a number of times to keep the big lights off Bowens Rd, its a hazard and dangerous, go and check as it dazzles you". • SCPL forwarded details of complaint to Shift Supervisor to ensure light mitigation measures were being implemented. • BRN lighting plant was situated below surface RL. Day shift supervisor moved lighting plant lower into the pit to minimise any potential external glow. • SCPL provided a return text on 29/6/2021 to advise the complaint had been recorded and offered a follow-up call if required. • An inspection was undertaken along Wenham Cox Rd and Bowens Rd during the evening and confirmed no direct lighting plants were visible facing towards the road.

7/07/2021	Approx. 1.5km east of operations, Bowens Road Stratford	Direct text to MP mobile	Noise	Complaint via text: "The noise tomight is completely unacceptable. These complaints need to be taken seriously". • SCPL forwarded details of complaint to Mining Supervisor to review operations and ensure noise mitigation measures were being implemented. • SCPL provided a return text on 07/07/2021 to advise the complaint had been recorded and offered a follow-up call if required. • SCPL advised they would continue to implement appropriate mitigation measures for noise. SCPL will cooperate and provide further information as requested.
12/08/2021 8:34hrs	Approx. 4Km west of the CHPP	Direct text to TK mobile	Lighting	Complaint via text: "A question - why does it seem the lights at electrical substation opposite Upper Avon Rd & Bucketts Way intersection are always on at night? Am I right? It struck me that they could be movement sensitive or similar. They certainly add to the full glare. Also, what proportion of rail loading is done at night when the full light orchestra is performing?". • SCPL inspected electrical switch yard and switched off the lights in question. • SCPL provided a return call ECC Informed the complainant that the lights at the substation were accidentally left on by a electrical contractor and were now switched off. ECC informed the complainant that the lights at the CHPP were required to be on while the CHPP is operating and that the lights are required to safely operate at night.
12/10/2021	22:21hrs	Community Hotline	Noise	Complaint description: "Noise and lights - can't sleep". • Acting ECS called complainant back at 2:42pm 14/10/21. • Complainant wanted to discuss compensation due to noise impacts. • Acting ECS advised that the request would be escalated.

18/10/2021	21:42hrs	Community Hotline	Noise	Complaint description: "Trucks are very loud tonight, there is a heavy drumming". • ECS called complainant back at 8:30am 19/10/21. Complainant had poor reception and advised would call back later. • Complainant returned call at 3pm. • Items discussed included development consent conditions and mitigation and compensation rights, noise assessment in the EIS, noise monitoring requirements and reporting of exceedances, current status of the operations and noise mitigation measures. • ECS suggested any concerns of elevated noise emissions should continue to be reported to SCPL to allow for a timely response to be implemented. • Complainant advised no further information was required at this stage.
21/10/2021	22:00hrs	Community Hotline	Noise	Complaint description: "Noise (shift worker calling) droning of the machine" • ECC called complainant back at 12:30PM 22/10/21. Complainant stated the noise originating from the SCPL CHPP had increased dramatically in the last week. Complainant explained that the most noticible noise was best described as a 'reverberation' from what sounded like a conveyor or similar. The complainant also noted Dozer track slap and truck engine noise. • ECC advised the complainant of operations at SCPL at the time of complaint and SCPL would continue to implement appropriate mitigation measures for noise. • Weather conditions: Weather conditions: Strong inversion (4.1°C/100m) present at the time of complaint. Consistent very light (1.8m/s) SW wind conditions at the time of complaint. • Low level LF noise noted on noise recordings. Minor truck engine noise noted on monitor.
26/10/2021	19:16hrs	Community Hotline	Noise	Complaint: "Why are the noise monitors out when you are not doing major work???" • ECC returned complainants call at 9:31AM. • Complainant stated that he thought it was unsual that the mine had arranged the noise monitoring personel to complete monitoring when there was no operations at the mine. • ECC informed the complainant that there was operations as per the previous nights at the mine, including CHPP washing, train unloading and loading, 3 excavators servicing 3 haul truck fleets, 2 pit dozers and 2 dump dozers.

26/10/2021	22:61hrs	Community Hotline	Noise	Complaint description: "Machine noise - loaders" • ECC called complainant back at 9:41am, Complainant did not answer. • Monthly routine monitoring was completed on the evening of the complaint. Monitoring results adjacent to the complainants residence (compliance limit 35dBA) at 7:24pm had an Leq reading of 29dBA and 10:52pm with an Leq reading of 28dBA. • ECC called complainant at 10:14am. Complainant stated that the ongoing noise of the mine, specifically the loader is impacting the complainants sleep quality. • ECC explained that there was attended noise monitoring being conducted shortly after the complaint and noise levels were below the compliance limit. • ECC advised they would continue to implement appropriate mitigation measures for noise at the CHPP and broader mine site. ECC informed the complainant of the projected mine life at SCPL and what the short term mining activities looked like at SCPL. • Weather conditions: Weather conditions: no temperature inversion present at the time of complaint. Consistent very light (1.5m/s) SW wind conditions at the time of complaint.

Community Consultative Committee Details

CCC / Project Name:	Stratford Coal Mining Complex	**Reporting Period:**	January - December 2021
Independent Chairperson:	**Margaret MacDonald-Hill**	**Proponent Contact:**	**Thomas Kirkwood**

1. Executive Summary

The Stratford Community Consultative Committee (CCC) is a long established committee initiated in 1995 as part of the Stratford Coal Mine Development Consent approval. With the subsequent approval of the Stratford Extension Project, the Committee members oversee the Stratford Mining Complex in accordance with the Department of Planning and Environment's 2019 Community Consultative Committee Guidelines for State Significant Projects. The mine's area of operation is a 1,500 ha site of former grazing land, east of The Bucketts Way and situated between the villages of Craven and Stratford.

The committee comprises:

- five local community representatives;
- two Mid Coast Council representatives (elected and staff);
- two Stratford Coal representatives, with attendance from other personnel as required;
- one independent Chairperson.

The Committee meets quarterly, although as with the previous year, Covid-19 impacted on the meeting schedule. As a result, the February and May meetings were a combination of limited attendance numbers and via tele/video conferencing. The August and November meetings were conducted via tele/video conferencing only. A lot of the technology challenges that were part of the 2020 round of meetings with limited reception and connectivity were overcome and committee attendance numbers remained high.

There has been no change in the committee members' representation for a considerable time, a major contributing factor to the efficacy of the committee. The community members are well known and respected within the local community and a good rapport exists amongst them and with the mine personnel. Relationships are very cordial. The knowledge by staff of the mine's operation and ongoing high standard of pre-meeting information reports and comprehensive presentations ensures a proficient, well informed community consultative committee.

The Committee has a robust relationship with the MidCoast Council, a staff member attends every meeting, as is often the case with the elected representative, Council schedule permitting. Much has been gained from this close relationship, particularly with the reconciliation of long outstanding matters carried over from the former Gloucester Council's reporting of funding received as part of the Stratford Mine's community enhancement contributions. The Stratford Education Fund, community works programs and road maintenance are part of the comprehensive annual report from Council which also includes the developer contributions from Stratford's sister mine Duralie. The Community Development Coordinator has developed a wide ranging reporting format,

very acceptable to both the Stratford and Duralie Committees and attends the November meeting each year to present. Her efforts have received accolades from both the Stratford and Duralie CCCs.

For the reporting period and despite Covid-19 restrictions, the committee had three invited speakers from the MidCoastCouncil. As previously mentioned, the Community Development Coordinator presented the Annual Financial Report.to the November 2021 meeting.

Council's Catchment Officer presented to the May meeting on the Karuah-Borland Landcare Project, which is partially funded by the Duralie catchment contributions as part of the original Karuah River Catchment Management Plan. With Council and the Catchment Officer's proactive approach and the benefit of careful planning and seed funding, this has led to the Branch/Karuah Catchment Grants, Beyond the Shed and a major demonstration project. The community are actively involved in these projects.

Consequently, the Stratford Committee were interested to see what was occurring in the Avon/Manning River Catchment and the Council's Senior Ecologist addressed the November meeting on Council's newly developed Biodiversity Framework, the goals, responsibility and shared vision to 2030. As with the Catchment Officer's presentation, the committee was suitably impressed with Council's stewardship and protection of the environment.

Other topics of discussion for the reporting period also included:

- general environmental management and monitoring, including air quality, noise, surface water and groundwater
- weeds, pest and pasture management, including wild dog control
- community complaints and measures to mitigate ongoing impacts from blasting and lighting
- broader community engagement and community enhancement contributions to Council and allocation thereof
- progress at the mine and the Stratford Extension Project including proposed road closures
- coking/thermal coal production ratios
- Rehabilitation progress
- Biodiversity offset management strategy
- Successful Nest Box Program
- Yancoal land management, including rural leased lands
- Post mining land use and mine closure planning
- Progress on draft water reuse between Stratford Mine and MidCoast Council
- Covid-19 Site response

2. CCC activities over last 12 months

- Committee meetings were held in the months of February, May, August and November via a combination of attendance on site and/or tele/video conference.

Committee site tours were restricted because of Covid-19. The May meeting undertook a site tour of Stratford East, Stratford Main pit and Avon North.

- No joint CCC meetings were held during the period, although the committee is appraised of Yancoal's sister operations at Duralie as the mine approaches end of life stages.

3. Key issues

The Stratford CCC continues its support for the long running Stratford Coal Education Program and the benefits it brings to the youth of the local community. It remains vigilant that the benefits of such funding, along with other community enhancement contributions and Yancoal Community Support Programs should flow through to those communities directly impacted by mining.

With greatly Improved annual reporting by MidCoast Council, the committee is well informed of key activities and funding expenditure, proposed future works and allocations of the community enhancement contributions received from Stratford and Duralie operations.

Community complaints of lighting and noise were raised with further discussion on what could be done to improve mitigation measures.

Issue	Actions Taken	Next Steps
Stratford Coal Education and Yancoal Community Support Programs	Actively support ongoing success of Stratford Coal Education Program and Stratford Coal Community Support through CCC networks and media.	Ongoing.
Stratford Extension Project	Update management plans and include relevant changes to committee presentations for discussion at CCC meetings.	As and when required.
Biodiversity and Conservation Areas information exchange **Catchment Management Programs**	GPS survey of access tracks used by emergency services and contract services completed. Information shared with Committee. MidCoast Council Catchment Officer and Senior Ecologist presentations to CCC meetings.	Available for future fire fighting. Integration of biodiversity connectivity projects with MidCoast Council planning. Ongoing Increased information sharing and knowledge base between Council, Stratford Mine, CCC and the community. Catchment Management Coordinator to present to February 2022 meeting.

Community complaints	Review lighting compliance: installation of timer in heavy vehicle wash down bay. Lower wattage lights used. Lights turned off when not in use. Noise from blasting Noise monitoring	Monitor. Mine protocols established for lighting plant set up. Ongoing communication and education with personnel. Location now included in complaints summary. Early hours of day shift to be included at sites where higher predicted noise affectation is occurring.
Request for production tonnages split	Report on thermal/coking ratios	Included in reporting from February 2021.

1. Focus for next 12 months

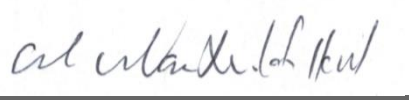
The committee sets its meeting dates at the end of each calendar year for the ensuing year to avoid any known potential conflicts.

The planned activities for 2022 will continue to be guided by the contributions of the CCC members. These activities are likely to include:

- to investigate potential opportunities to increase agricultural land capability whilst meeting rehabilitation requirements
- interest in management of Yancoal owned land, including rural lease areas
- bush fire control
- ongoing interest in Catchment Management Improvement works and biodiversity connectivity projects. MidCoast Council Senior Ecologist to present to February 2022 meeting
- The committee resumes its meeting schedule in February each year and will maintain a similar schedule as the previous year.

To the best of my knowledge, there are no outstanding or emerging issues that have not been addressed or are in the process of being so, to the committee's satisfaction.

Committee Meeting minutes and presentations are available on the website within two weeks of each meeting.

Signature of Chair:	
Date:	February 17 2022.

APPENDIX 8

Export Train Summary

Stratford Mining Complex Export Train Summary

Note: Departure from Stratford rail loop.

Departure Date	Departure Time
Monday, 4 January 2021	7:45:00 PM
Tuesday, 5 January 2021	9:55:00 AM
Tuesday, 5 January 2021	5:50:00 PM
Wednesday, 6 January 2021	10:25:00 AM
Wednesday, 6 January 2021	4:12:00 PM
Wednesday, 6 January 2021	10:15:00 PM
Thursday, 7 January 2021	2:41:00 PM
Friday, 8 January 2021	10:21:00 AM
Friday, 15 January 2021	3:25:00 PM
Thursday, 4 February 2021	2:57:00 PM
Friday, 12 February 2021	11:40:00 AM
Monday, 15 February 2021	7:25:00 PM
Wednesday, 3 March 2021	12:18:00 PM
Monday, 8 March 2021	1:57:00 AM
Tuesday, 9 March 2021	2:40:00 PM
Wednesday, 10 March 2021	10:47:00 AM
Thursday, 11 March 2021	10:14:00 PM
Wednesday, 7 April 2021	4:00:00 PM
Thursday, 8 April 2021	12:20:00 PM
Tuesday, 11 May 2021	3:37:00 PM
Friday, 14 May 2021	11:58:00 AM
Wednesday, 19 May 2021	11:30:00 AM
Thursday, 20 May 2021	11:40:00 AM
Friday, 28 May 2021	12:55:00 PM
Monday, 31 May 2021	1:00:00 PM
Wednesday, 2 June 2021	8:57:00 AM
Wednesday, 2 June 2021	11:14:00 PM
Thursday, 3 June 2021	5:00:00 PM
Tuesday, 8 June 2021	1:33:00 PM
Wednesday, 9 June 2021	10:42:00 AM
Tuesday, 15 June 2021	12:20:00 PM
Tuesday, 29 June 2021	1:27:00 PM
Wednesday, 30 June 2021	11:08:00 AM
Thursday, 1 July 2021	9:09:00 AM
Monday, 5 July 2021	12:32:00 PM
Tuesday, 6 July 2021	1:25:00 AM
Wednesday, 7 July 2021	1:27:00 PM
Monday, 19 July 2021	11:11:00 AM
Monday, 19 July 2021	7:55:00 PM
Tuesday, 20 July 2021	12:50:00 PM

Month	Number of Movements
January	9
February	3
March	5
April	2
May	6
June	8
July	17
August	17
September	21
October	14
November	24
December	22
Annual Total	**148**

Wednesday, 21 July 2021	9:20:00 AM
Thursday, 22 July 2021	9:35:00 AM
Friday, 23 July 2021	1:51:00 PM
Monday, 26 July 2021	10:40:00 AM
Monday, 26 July 2021	6:35:00 PM
Monday, 26 July 2021	12:30:00 AM
Tuesday, 27 July 2021	8:20:00 AM
Wednesday, 28 July 2021	10:40:00 PM
Thursday, 29 July 2021	9:47:00 AM
Friday, 30 July 2021	1:05:00 PM
Monday, 2 August 2021	10:26:00 AM
Monday, 2 August 2021	4:30:00 PM
Tuesday, 3 August 2021	11:08:00 AM
Wednesday, 4 August 2021	9:44:00 AM
Wednesday, 4 August 2021	2:20:00 PM
Thursday, 5 August 2021	9:29:00 AM
Thursday, 5 August 2021	5:14:00 PM
Monday, 9 August 2021	10:00:00 AM
Monday, 16 August 2021	3:00:00 PM
Monday, 23 August 2021	4:05:00 PM
Tuesday, 24 August 2021	10:54:00 PM
Wednesday, 25 August 2021	12:45:00 PM
Thursday, 26 August 2021	11:30:00 AM
Thursday, 26 August 2021	9:01:00 PM
Friday, 27 August 2021	9:20:00 AM
Tuesday, 31 August 2021	10:24:00 AM
Tuesday, 31 August 2021	4:50:00 PM
Wednesday, 1 September 2021	12:28:00 PM
Thursday, 2 September 2021	12:35:00 PM
Thursday, 2 September 2021	10:10:00 PM
Friday, 3 September 2021	8:40:00 AM
Friday, 3 September 2021	2:46:00 PM
Monday, 6 September 2021	11:21:00 PM
Thursday, 9 September 2021	4:13:00 PM
Thursday, 9 September 2021	8:01:00 PM
Thursday, 16 September 2021	9:42:00 AM
Thursday, 16 September 2021	8:02:00 PM
Friday, 17 September 2021	10:58:00 AM
Monday, 20 September 2021	10:45:00 AM
Monday, 20 September 2021	4:58:00 PM
Tuesday, 21 September 2021	1:25:00 PM
Wednesday, 22 September 2021	12:45:00 PM
Wednesday, 22 September 2021	11:48:00 PM
Monday, 27 September 2021	10:25:00 AM
Wednesday, 29 September 2021	2:40:00 PM

Wednesday, 29 September 2021	6:55:00 PM
Thursday, 30 September 2021	3:28:00 PM
Thursday, 30 September 2021	10:20:00 PM
Saturday, 2 October 2021	11:15:00 AM
Thursday, 7 October 2021	4:22:00 PM
Friday, 8 October 2021	7:54:00 AM
Monday, 11 October 2021	4:12:00 PM
Wednesday, 13 October 2021	11:00:00 PM
Monday, 18 October 2021	6:40:00 PM
Tuesday, 19 October 2021	12:48:00 PM
Wednesday, 20 October 2021	8:30:00 AM
Thursday, 21 October 2021	7:43:00 AM
Friday, 22 October 2021	1:25:00 AM
Friday, 22 October 2021	1:12:00 PM
Monday, 25 October 2021	9:46:00 AM
Tuesday, 26 October 2021	12:38:00 PM
Wednesday, 27 October 2021	9:00:00 PM
Monday, 1 November 2021	1:27:00 PM
Tuesday, 2 November 2021	8:00:00 AM
Wednesday, 3 November 2021	9:20:00 AM
Thursday, 4 November 2021	9:45:00 AM
Friday, 5 November 2021	10:48:00 AM
Monday, 8 November 2021	9:07:00 AM
Monday, 8 November 2021	11:00:00 PM
Tuesday, 9 November 2021	7:36:00 AM
Tuesday, 9 November 2021	6:15:00 PM
Wednesday, 10 November 2021	8:02:00 AM
Wednesday, 10 November 2021	11:30:00 PM
Saturday, 13 November 2021	7:50:00 AM
Monday, 15 November 2021	7:15:00 AM
Monday, 15 November 2021	10:05:00 PM
Tuesday, 16 November 2021	4:05:00 PM
Wednesday, 17 November 2021	5:45:00 AM
Wednesday, 17 November 2021	1:25:00 PM
Friday, 19 November 2021	6:37:00 PM
Thursday, 25 November 2021	4:30:00 PM
Saturday, 27 November 2021	2:45:00 PM
Sunday, 28 November 2021	8:00:00 AM
Sunday, 28 November 2021	11:32:00 AM
Monday, 29 November 2021	3:30:00 PM
Tuesday, 30 November 2021	9:00:00 AM
Wednesday, 1 December 2021	10:08:00 AM
Wednesday, 1 December 2021	10:27:00 PM
Thursday, 2 December 2021	1:50:00 PM
Friday, 3 December 2021	7:35:00 AM

Monday, 6 December 2021	11:07:00 PM
Monday, 6 December 2021	4:19:00 PM
Tuesday, 7 December 2021	8:30:00 AM
Tuesday, 7 December 2021	5:36:00 PM
Wednesday, 8 December 2021	12:14:00 PM
Thursday, 9 December 2021	6:00:00 PM
Friday, 10 December 2021	8:35:00 AM
Monday, 13 December 2021	12:50:00 PM
Wednesday, 14 December 2022	1:20:00 PM
Wednesday, 14 December 2022	6:15:00 PM
Thursday, 15 December 2022	9:32:00 AM
Thursday, 15 December 2022	3:05:00 PM
Friday, 17 December 2021	5:00:00 PM
Monday, 20 December 2021	4:55:00 PM
Wednesday, 22 December 2021	12:35:00 PM
Thursday, 23 December 2021	8:46:00 AM
Thursday, 23 December 2021	10:59:00 PM
Wednesday, 29 December 2021	10:28:00 AM

APPENDIX 9

SMC Annual Biodiversity Report 2021

YANCOAL
兖煤澳大利亚有限公司

STRATFORDCOAL
Part of the Yancoal Australia Group

Stratford Mining Complex Annual Biodiversity Report 2021

FOR THE YEAR ENDING 31 DECEMBER 2021

CONTENTS

List of Appendices

1 INTRODUCTION

The Stratford Mining Complex (**SMC**), located in the Northern part of the Gloucester Basin NSW, is approximately 10 kilometres south of Gloucester and is owned and operated by Stratford Coal Pty Ltd (**SCPL**), a fully owned subsidiary of Yancoal Australia Limited (**YAL**).

1.1 Scope

In accordance with the Stratford Extension Project Development Consent SSD-4966, the proponent (SCPL) is required in accordance with *Schedule 2, condition 39* to prepare and implement a Biodiversity Management Plan (BMP). This Plan must include:

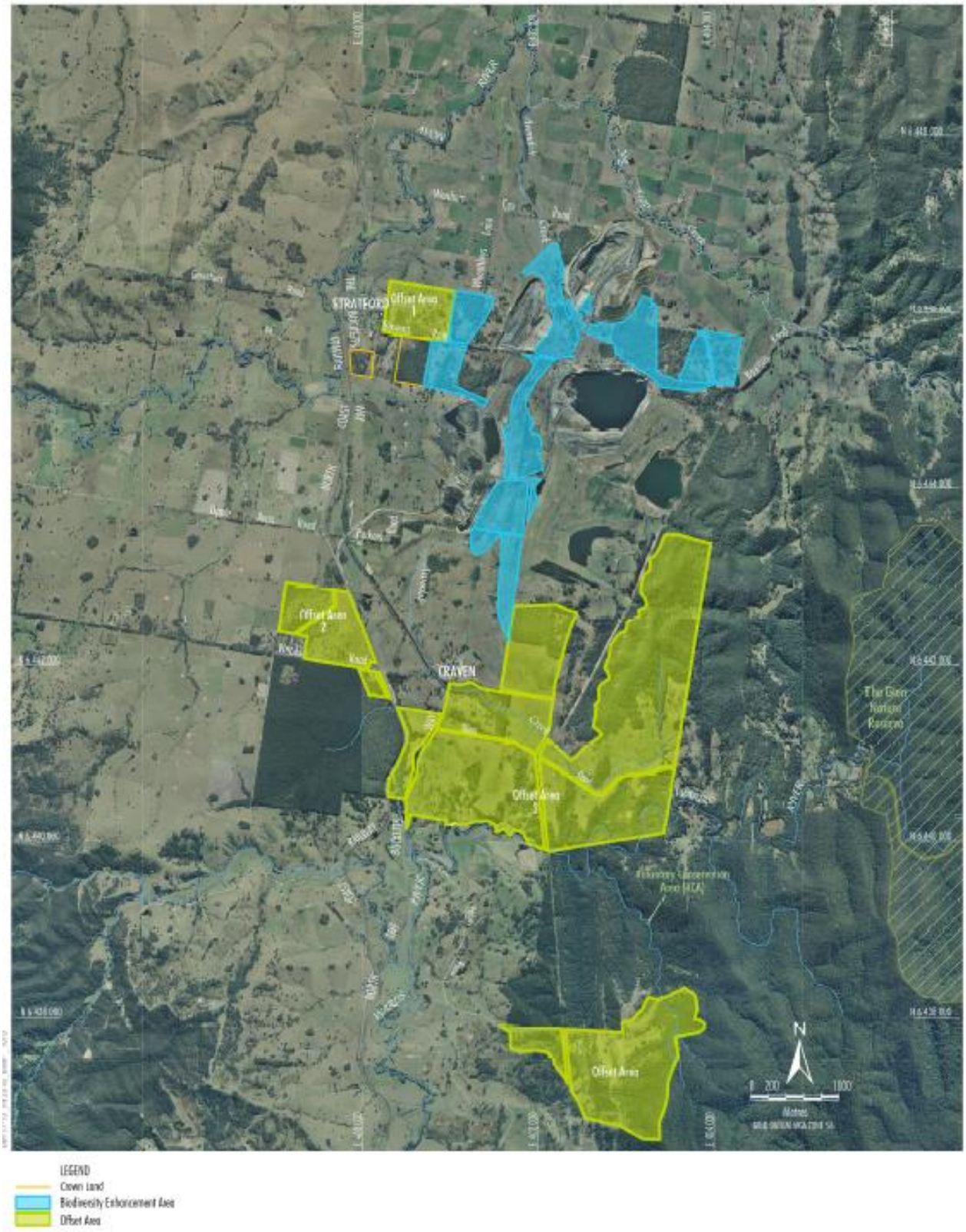
> *"a program to monitor and report on the effectiveness of the measures in the Biodiversity Management Plan, and progress against the detailed performance and completion criteria".*

The BMP was approved by the Department of Planning & Environment on 19 October 2018. This is the third Annual Biodiversity Report prepared for the Stratford Extension Project. This SMC Annual Biodiversity Report provides a review of the effectiveness of measures in the BMP for the annual year ending 31 December 2021 in accordance with Section 8.2.1 of the BMP. The scope of the review includes the Mining Lease areas, the Biodiversity Offset areas and the Biodiversity Enhancement area as indicated on Plan A.

This report (and associated Appendices) is included as an Appendix of the SMC Annual Review which is available on the Stratford Coal website www.stratfordcoal.com.au.

2 STATUS OF BMP PERFORMANCE CRITERIA

Performance criteria as prescribed in the BMP is presented in **Tables 1 to 9**. The performance criteria have been developed to meet the specific objectives for the areas described in Section 1.2 of the BMP. All performance criteria are linked to the management specifications listed in the BMP Section 4 and Section 5, and monitoring/reporting specifications in the BMP Section 7. The status of BMP performance criteria is provided in the subsequent sections of this report.



STRATFORDCOAL

STRATFORD EXTENSION PROJECT

Biodiversity Offset Areas,
Biodiversity Enhancement Area

Plan A – BMP Figure 3

3 VEGETATION CLEARANCE PROTOCOL

3.1 Vegetation Clearance Report

Vegetation clearance is undertaken in accordance with the BMP Section 4.1 Vegetation Clearance Protocol. Prior to any clearance operations being undertaken a Clearing Plan is prepared, and pre-clearance surveys are undertaken.

During the 2021 reporting period, vegetation clearance was undertaken in advance of mining operations in the following areas:

- Avon North Open Cut 3 Extension
- Stratford East Open Cut Stage 3
- Stratford East Open Cut Stage 3 Haul Road Extension
- Roseville to BRN Haul Road

The area of disturbance at the end of 2021 is shown in the SMC Annual Review 2021 Figure 4 (Appendix B).

Information obtained during the preparation of the Clearing Plans and the vegetation clearance activities (i.e. habitat features, hollows cleared and fauna observed) is used to determine the requirements for nest box replacement in the Biodiversity Offset and Enhancement Areas (refer to Section 9). A summary of the vegetation cleared during the reporting period including habitat features and tree hollows is included in Appendix C.

A summary of the habitat features and tree hollows cleared since the commencement of the Stratford Extension Project is included below:

- 2018 – six (6) habitat features including zero (0) tree hollows.
- 2019 – forty-two (42) habitat features including nine (9) glider suitable tree hollows and five (5) other hollows.
- 2020 H1 – thirty-three (33) habitat features including nineteen (19) glider suitable tree hollows and eleven (11) other hollows.
- 2020 H2 – eighteen (18) habitat features including seven (7) glider suitable tree hollows and eleven (11) other hollows.
- 2021 – four (4) habitat features all of which were suitable for gliders.

**Note tree hollows are included in the total habitat features reported above.*

3.2 Salvaged and Reused Material for Habitat Enhancement

Section 4.1.4 of the BMP requires salvaged material from vegetation clearance activities to be used for habitat enhancement within the rehabilitation, Biodiversity Offset areas and Biodiversity Enhancement Areas. Habitat features such as trunks, logs, large rocks, branches, stumps and roots are salvaged and relocated where practicable.

The areas cleared in advance of mining in 2021 as described in Section 3.1 were a mixture of previously cleared pasture and medium density woodland with habitat material available for salvage. In these areas, the cleared vegetation was managed as follows:

- Suitable trees and stumps were salvaged and stockpiled adjacent to the Stratford East Open Cut Area for reuse.

- Suitable trees and stumps were salvaged and stockpiled adjacent to the Turkeys Nest area for reuse.

4 MANAGING ACCESS, FENCING, GATES AND SIGNAGE

Managing access, fencing, gates and signage is undertaken in accordance with the BMP Section 5.1 and 5.2.

Table 1: Fencing, Gate and Signage Performance and Completion Criteria

Management Action	Performance Criteria			Completion Criteria
	Year 1 (January – December 2018)	Year 2 (January – December 2019)	Year 3 (January – December 2020)	
Review of fencing requirements for offset areas.	Review of fencing complete including development of mapping showing fence and gate types, redundant fences and fences to be retained.	-	-	-
Gate and fence installations	50% of gates and fences installed	Installation of gates and fences complete	-	Gate and fence installations complete. Livestock excluded.
Redundant fence removal	50% of redundant fencing removed	Redundant fences removed	-	No redundant fencing
Installation of signage	-	Installation of signage complete	-	Signage installed

Table 2: Access Track Performance and Completion Criteria

Management Action	Performance Criteria			Completion Criteria
	Year 1 (January – December 2018)	Year 2 (January – December 2019)	Year 3 (January – December 2020)	
Operational review and mapping to facilitate site access for offset management activities.	Operational review developed. Mapping complete	-	-	Operational review and mapping completed
Access track enhancement and maintenance	Enhancement of access tracks undertaken as identified in operational review.	Maintenance of access tracks annually	Maintenance of access tracks annually	-

Legend	Not commenced	In progress	Completed

The implementation of the BMP management measures continued in 2021. The BMP requires works to be undertaken to exclude livestock and control access to the Biodiversity Offset areas and Biodiversity Enhancement Areas.

Following the initial 2018 review of the existing fencing, gates and access tracks, contractors were engaged to implement the removal of redundant fencing and install new fencing where required. Contractors were also engaged to maintain access tracks required for the ongoing management of the Biodiversity Areas.

During the reporting period mapping of fencing and access tracks has been completed to assist with ongoing management of the Biodiversity Areas. During the reporting period the removal of redundant fencing has continued and maintenance of existing fencing has been undertaken as required. Access tracks have continued to be maintained.

The installation of signage was completed in 2018. All key points of access to the Biodiversity Areas were identified and had signage erected. During the reporting the need for further signage and locks on gates has been identified to restrict access to the Biodiversity Areas.

5 REVEGETATION MANAGEMENT

5.1 Seed Collection and Propagation

Seed collection and propagation is undertaken in accordance with the BMP Section 4.1.5 and 5.3.

Table 3: Seed Collection and Propagation Performance and Completion Criteria

Management Action	Performance Criteria			Completion Criteria
	Year 1 (January – December 2018)	Year 2 (January – December 2019)	Year 3 (January – December 2020)	
Develop seed collection species list	Species list developed over time.			-
Seed collection	Seed collection commenced	Seed collection to continue	Seed collection to continue	-
Seed propagation	-	Seed propagation commenced	Seed propagation to continue	-

Revegetation in the BMP Revegetation Areas (BMP Management Zone A) will continue via seed and tube-stock. Local endemic (adapted) species are preferentially used where a seed supply is available, however consideration will be given to the use of a high quality seed sourced further from the site as required. An indicative list of flora species proposed to be used in the Revegetation Area (BMP Management Zone A) is provided in the BMP Appendix A.

In preparation for revegetation works each year, SCPL has prepared a scope and schedule for the revegetation works to be implemented (further discussed in Section 5.2). The total volume of seed required was calculated based on the floral listings for the target communities in the BMP appendices.

Kleinfelder, Cumberland Seeds, Hunter Indigenous and Riverdene Nursery have been engaged to assist in the propagation of native plant species with tube-stock grown under controlled nursery conditions and delivered to site as required for revegetation works in the next reporting period.

5.2 Revegetation and Regeneration

Revegetation management is undertaken in accordance with the BMP Section 5.3 Revegetation Programme. The aim of revegetation is to establish a range of habitat niches including native canopy, and understorey. The Revegetation Area (Management Zone A) in the Biodiversity Areas will be revegetated to substantially increase the area of native vegetation in the area and maximise habitat diversity and a range of successional stages.

Table 4: Revegetation and Regeneration Performance and Completion Criteria

Management Action	Performance Criteria			Completion Criteria
	Year 1 (January – December 2018)	Year 2 (January – December 2019)	Year 3 (January – December 2020)	
Site Planning	Site inspection complete and advice received.	-	-	-
Map Revegetation Areas (Management Zone A) and identify target vegetation communities to establish	Mapping complete and target vegetation communities identified	-	-	-
Develop a species list for each target vegetation community	Species list developed	-	-	-
Develop application rates for seeds as well as planting densities for tube stock	Application rates developed	-	-	-
Implement revegetation schedule	Develop revegetation schedule	Implement revegetation schedule	Implement revegetation schedule	-
Revegetation Area (Management Zone A)	Commence revegetation works within the Revegetation Area (Management Zone A) (Figures 12a to 12c)	Continue revegetation works within the Revegetation Area (Management Zone A) (Figures 12a to 12c)	Continue revegetation works within the Revegetation Area (Management Zone A) (Figures 12a to 12c)	Vegetation established and provides suitable habitat for use by native fauna species.
Squirrel Glider Vegetation Pathways (Management Zone A1)	Commence planting *of* flora species which provide habitat for the Squirrel Glider within designated revegetation zones (Figures 12a to 12c)	Continue plantings of flora species which provide habitat for the Squirrel Glider	Continue plantings of flora species which provide habitat for the Squirrel Glider	Squirrel Glider vegetation pathways planted within the indicative area shown on Figures 12a to 12c, and provide connective habitat for the Squirrel Glider.
Allocasuarina spp. Plantings (Management Zone A2)	-	Commence planting of *Allocasuarina* spp. within designated revegetation zones (Figures 12a to 12c)	Complete *Allocasuarina* spp. plantings within Offset Area 3	*Allocasuarina* spp. plantings within the indicative area shown on Figures 12a to 12c, and provide foraging habitat for the Glossy Black-cockatoo
Coastal Floodplain Forest Revegetation (Management Zone A3)	-	-	Re-establishment of flora species characteristic of the Cabbage Gum open forest vegetation community	Improvement in condition of the riparian habitat along Avondale Creek within the indicative area shown on Figures 12a to 12c, as evidenced by monitoring data
Existing Remnant Vegetation (Management Zone B)	Inspection to be undertaken to monitor regeneration.	Inspection to be undertaken to monitor regeneration.	Inspection to be undertaken to monitor regeneration.	-
Power Line Corridor (Management Zone C)*	-N/A	-	-	-

Site Planning & Schedule

During 2019 SCPL prepared a scope and schedule for the revegetation works to be implemented in the Biodiversity Areas. Kleinfelder have been engaged to assist with both the site planning and implementation of the revegetation works. The site planning included:

- Mapping of the priority revegetation areas and vegetation communities to be completed in the 2020.
- Calculation of seed and tube-stock requirements based on the indicative lists of flora species in the BMP appendices.

Plans showing the areas revegetated in the Biodiversity Areas in 2021 are included in Appendix D (*2021 Autumn Stratford Biodiversity Offsets Planting Program Report, Kleinfelder 2021*). These works were implemented during April and May of 2021.

Furthermore, a scope and schedule for the revegetation works to be implemented 2022 has been prepared during the second half of 2021. The proposed revegetation schedule for the Biodiversity Areas in 2021 is included in Appendix E.

Revegetation Implementation

The Autumn 2021 revegetation work was divided into four tubestock planting areas; Wenham Cox Rd Amenity Screen, Rogerson Property, Offsets Area 4 – Johnson/Foreman Properties and Offset Area 3 – Colinda Property.

Ground preparation work was undertaken prior to tubestock planting and involved slashing by tractor to reduce the biomass and then deep ripped to break the soil surface and provide a soil bed for easier tubestock installation. The total number of plants installed were 10,088 consisting of 4297 canopy plants across 11 different species and 5791 midstorey and shrub plants across 29 species. A summary of the revegetation work undertaken during 2021 is included in Appendix D (*2021 Stratford Biodiversity Offsets Planting Program Report, Kleinfelder 2022).*

Plate 1: Ground preparation of Offset Area 3 – Colinda Property 2021.

Plate 2: Ground preparation of Offset Area 4 – Rodgerson 2021.

Plate 3: *Tubestock Delivery in April 2021.*

Plate 4: *Tubestock planting in the biodiversity areas.*

The next round of tube-stock planting is scheduled to commence in April 2022. Details of the 2022 revegetation works will be included in the next annual biodiversity report.

Monitoring

Vegetation Monitoring commenced in 2019 to assess the effectiveness of revegetation in the Revegetation Area (Management Zone A) and to assess the natural regeneration in the Existing Remnant Vegetation Area (Management Zone B). The data gathered in 2019 serves as a baseline to assess the success of the revegetation efforts.

Vegetation monitoring was undertaken again in February 2021. The full report is included in Appendix F (*2021 Stratford Mining Complex Biodiversity Offset Strategy Flora Monitoring Report, Kleinfelder 2021*). Habitat and vegetation monitoring is discussed further in Section 11. Habitat and vegetation condition monitoring will continue to be undertaken annually to quantitatively measure the change in habitat and vegetation condition over time and to inform any ongoing maintenance requirements.

6 WEED CONTROL AND MONITORING

Weed control is undertaken in accordance with the BMP Section 4.4 and Section 5.6. The weed control program aims to manage weeds to minimise their impact on native flora and fauna

Table 5: Weed Management Performance and Completion Criteria

Management Action	Performance Criteria			Completion Criteria
	Year 1 (January – December 2018)	Year 2 (January – December 2019)	Year 3 (January – December 2020)	
Monitoring of weed location and density	Mapping of weed extent and density produced	-	-	-
Bi-annual weed inspections and recording	Inspections and records completed	Inspections and records completed	Inspections and records completed	-
Weed control/treatment program	Strategic weed control as required, recording on areas worked and implementation of recommendations			Priority weed infestations appropriately controlled and minimised as evidenced through monitoring data

The general procedure for controlling weed involves:

- Monitoring to identify locations and densities of priority weed;
- Identification of suitable control measures;
- Implementation of the selected control measure by a suitable qualified person;
- Follow-up inspections to evaluate effective of weed control.

Weed spraying activities are generally undertaken between the months of September and April each year. Physical management measures such as mechanical removal, slashing and/or back-burning can be undertaken at other times of the year as required.

Two contracting companies are engaged at the SMC to undertake weed management activities on an ongoing basis. Weed management during summer 2020/21 was continued following above average rainfall in December 2020. Following a flood event in March 2021 weed spraying re-commenced and continued through autumn. Summer 2021/22 Weed spraying programme commenced again during November 2021 and will continue through to Autumn 2022. The weed control activities in 2021 continued to target areas of known weed infestation. The key species targeted included blackberry, lantana, privet, wild tobacco and Giant Parramatta grass.

Weeds mapping is proposed to be undertaken during the next reporting period to assist in setting future management priorities and developing on-ground actions for weed control.

Weeds monitoring to evaluate the effectiveness of control measures is undertaken in conjunction with the annual vegetation monitoring and is documented in Appendix F (*2021 Stratford Mining Complex Biodiversity Offset Strategy Flora Monitoring Report, Kleinfelder 2021).*

7 FERAL ANIMAL CONTROL AND MONITORING

Feral animal control is undertaken in accordance with the BMP Section 4.5 and Section 5.7. The objective of the feral animal control program is to manage feral animals to minimise their impact on native flora and fauna in the Biodiversity Offset and Biodiversity Enhancement Areas and/or their impact on agricultural production in other surrounding areas.

Table 6: Feral Animal Management Performance and Completion Criteria

Management Action	Performance Criteria			Completion Criteria
	Year 1 (January – December 2018)	Year 2 (January – December 2019)	Year 3 (January – December 2020)	
Abundance of feral animal species established	Initial study undertaken in the Biodiversity Offset Area and Biodiversity Enhancement Area.	-	-	-
Feral animal control and monitoring	-	Inspections and records completed	-	-
Feral animal control program	Feral animal control as required.			Feral animal numbers within offset areas minimised as evidenced through monitoring data

AMBS was commissioned to undertake the initial invasive animal survey in 2017, in accordance with Section 5.7 of the BMP. The objective of the study was to determine the range and abundance of invasive animals that occur or are likely to occur within the Stratford Mining Lease and Biodiversity Areas and provide recommendations for invasive animal control.

MDP Vertebrate Pest Management has been engaged by SCPL since 2016 to implement wild dog and fox control programs across property owned by SCPL including both the Stratford & Duralie Mining Leases and the Stratford & Duralie Biodiversity Offset Areas. During the reporting period one wild dog control programs was undertaken. The control program was conducted between **4 October 2021** to **5 November 2021**. The program was productive and successful with a total of 6 wild dogs and 3 foxes trapped and Shot over the 31-Day control program.

During the control programs no non-target species were trapped. Soft jaw wild dog traps were used to trap targeted pest animals. MDP Trap dog & trail camera monitoring was used to find and locate wild dog & fox signs in the program area for trap placement. The wild dog and fox numbers were moderate in the previous controlled areas of the Stratford/Duralie Mining Lease and Biodiversity Areas which demonstrates the control programs are being successful in having an impact and lowering the numbers and presence of wild dogs and foxes within that area. The program is showing positive results of reducing the impacts of wild dogs and foxes within the area to the native animals and reducing the impact of livestock attacks to the surrounding agricultural properties.

Plate 5 – Wild Dog captured on camera

In accordance with the BMP Section 5.7 follow-up feral animal monitoring surveys would be undertake every two years. A feral animal survey of the Biodiversity Offset Area and Biodiversity Enhancement Area was undertaken during the reporting period by AMBS to monitor the success of control programs and determine priorities for ongoing control measures. The 2021 Stratford Feral Animal Monitoring Report was not available for inclusion in this report at time of publishing. The 2021 Stratford Feral Animal Monitoring Report will be included in the 2022 Annual Biodiversity report.

8 BUSHFIRE PREVENTATION AND RISK MANAGEMENT

Bushfire management is undertaken in accordance with the BMP Section 4.7 and Section 5.9. The objective of bushfire management in the Biodiversity Areas is to prevent impacts from unplanned bushfire and to use fire to promote biodiversity.

Table 7: Bushfire Management Performance and Completion Criteria

Management Action	Performance Criteria			Completion Criteria
	Year 1 (January – December 2018)	Year 2 (January – December 2019)	Year 3 (January – December 2020)	
Mapping of Fire Breaks and Trails	Mapping complete	-	-	-
Monitoring of Fuel Loads	Inspections and records completed	Inspections and records completed	Inspections and records completed	-

Controlled Burning	-	Implement (if required)	Implement (if required)	Controlled burns implemented (where required)

Monitoring of fuel loads to evaluate bushfire risk and guide bushfire hazard reduction activities is undertaken in conjunction with the annual vegetation monitoring and was conducted in March 2021. Further detail is included in Section 11 and Appendix F.

Bushfire risk has continued to be mitigated through the maintenance of access tracks and fire breaks. Additionally, fuel loads have been reduced during 2021 by slashing were required in the Mining Leases and Biodiversity Areas. During 2021 no hazard reduction burning has been undertaken. Following the revegetation works, the aim is to exclude fire from the offset areas for at least 5 years to allow for tubestock and seedlings to establish.

Section 4.7 of the BMP states SCPL will:

- ensure that the development is suitably equipped to respond to any fires on site; and
- assist the Rural Fire Service (RFS), emergency services and National Parks and Wildlife Service as much as possible if there is a fire in the surrounding area.

9 NEST BOX PROGRAMME

Nest box management is undertaken in accordance with the BMP Section 5.10. Nest boxes will be installed to provide habitat opportunities in the short to medium-term for a number of arboreal fauna species including the Squirrel Glider.

Table 8: Nest Box Program Performance and Completion Criteria

Management Action	Performance Criteria			Completion Criteria
	Year 1 (2018)	Year 2 (2019)	Year 3 (2020)	
Nest Boxes – Installation	Nest boxes installed for clearing activities	Installation continued as clearing progresses	Installation continued as clearing progresses	Nest boxes installed as required.
Nest Boxes – Monitoring and Reporting	Quarterly inspections undertaken – undertaken in Year 2	Annual inspection and records completed	Annual inspection and records completed	-
Nest Boxes – Maintenance	-	Maintenance or replacement as required	Maintenance or replacement as required	Nest boxes functioning as designed

Implementation & Installation

The nest box programme described in the BMP Section 5.10, consists of two main components to replace any tree hollows cleared prior to mining activities as described in Section 3 of this report:

- Suitable nest boxes for the Squirrel Glider will be installed at a ratio of least 3:1 for each tree hollow cleared suitable for the Squirrel Glider. Squirrel Glider nest boxes will have a small entrance hole (45-50 millimetres diameter) to exclude larger possums and birds.
- For tree hollows that provide habitat to arboreal fauna species (other than the Squirrel Glider), nest boxes will be installed at a minimum ratio of 1:1 (i.e. one nest box of appropriate size to replace one hollow of similar size and properties). These next boxes will be provided for birds, bats and arboreal mammals.

Nest boxes will be installed within the Biodiversity Offset Area and Biodiversity Enhancement Area in Existing Remnant Vegetation (Management Zone B) as well as the Revegetation Area (Management Zone A).

As described in Section 3.1, a summary of the habitat features and tree hollows cleared since the commencement of the Stratford Extension Project is included below. Full details of the vegetation clearance and nest box replacement Requirements are included in Appendix C.

- 2018 – six (6) habitat features including zero (0) tree hollows.
- 2019 – forty-two (42) habitat features including nine (9) glider suitable tree hollows and five (5) other hollows.
- 2020 H1 – thirty-three (33) habitat features including nineteen (19) glider suitable tree hollows and eleven (11) other hollows.
- 2020 H2 – eighteen (18) habitat features including seven (7) glider suitable tree hollows and eleven (11) other hollows.
- 2021 – four (4) habitat features all of which were identified to be glider suitable tree hollows.

The installation of nest boxes has occurred over four periods with the most recent installation in February and March 2021. During the reporting period 101 new nest boxes were installed in the Biodiversity Areas for additional habitat enhancement (Appendix G, AMBS 2021). The current nest box program involves:

- Five (5) nest boxes targeting Squirrel Glider *(Petaurus norfolcensis),* installed December 2018.
- Twenty-Five (25) nest boxes targeting Squirrel Glider *(Petaurus norfolcensis),* installed May 2019
- Fifty-four (54) nest boxes targeting Squirrel Glider *(Petaurus norfolcensis)* and Sixteen (16) nest boxes targeting a variety of hollow-dependent fauna, installed April 2020.
- Eighty-three (83) nest boxes targeting Squirrel Glider *(Petaurus norfolcensis)* and eighteen (18) nest boxes targeting a variety of hollow-dependent fauna, installed February and March 2021.

Monitoring

In Accordance with section 5.10 of the BMP nest boxes will be monitored by suitably qualified personnel with quarterly inspections during the first year followed by annual inspections in spring. Monitoring reports provide details of the nest box identification number, the tree species on which the box is installed, evidence of use and whether fauna was present. Details on each of the fauna species present within nest boxes is collected (sex, weight, length, breeding status and if it had been a new capture or recapture). Quarterly nest box monitoring was undertaken in February, May, and July 2021 by AMBS. Annual nest box monitoring was completed by AMBS in September 2021. The 2021 Stratford Annual nest box Monitoring Report was not available for inclusion in this report at time of publishing. The 2021 Stratford Annual nest box Monitoring Report will be included in the 2022 Annual Biodiversity report.

Quarterly monitoring is scheduled for January and April 2021. Annual monitoring will be completed following the April survey.

10 SQUIRREL GLIDER MANAGEMENT PLAN

In accordance with Condition 38(a), Schedule 3 of the Development Consent SSD-4966 the management of Squirrel Glider populations is undertaken in accordance with the Squirrel Glider Management Plan (SQMP). The SQMP was approved by the DP&E on 19 October 2018 and includes specific management measures in addition to those in the BMP. The SGMP has

been prepared to facilitate the management of squirrel glider populations at the SMC, Biodiversity Enhancement Areas and Biodiversity Offset Areas.

Squirrel Glider management programs which have been commenced include:

- definition of the Squirrel Glider colonies (SQMP Section 4.1)
- identification of the Squirrel Glider colony home ranges (SQMP 4.2),
- tree hollow census within the home ranges (SQMP Section 7.1)
- nest box program (SQMP Section 7.2), in conjunction with BMP nest box program in Section 9.
- Squirrel Glider vegetation pathways (SQMP Section 8.1), in conjunction with BMP revegetation in Section 5.
- Squirrel Glider population monitoring (SQMP Section 10.1), in conjunction with BMP fauna monitoring in Section 11.2.

10.1 Definition of the Squirrel Glider Colonies

Kleinfelder was engaged to undertake an initial targeted Squirrel Glider survey to confirm the location of Squirrel Glider colonies within the potential habitat in the vicinity of the SMC Biodiversity Areas, including the previously identified Squirrel Glider colonies and any new colonies which have been established within the areas identified as potential habitat. The surveys will ensure that future monitoring requirements of the SQMP are being implemented at locations of known colony locations.

The initial surveys were undertaken during November to December 2018 and the results are provided in the *Initial Squirrel Glider survey as part of Stratford Coal's Squirrel Glider Management Plan (Kleinfelder, 2018)*. Squirrel gliders were identified at five locations out of the 37 locations surveyed. These locations provided the basis for ongoing survey efforts.

Plate 6 – Squirrel Glider photographed during initial camera trap surveys**.**

10.2 Squirrel Glider Home Ranges

Objectives outlined in Section 4 of the SGMP require measures to establish the home range size of known squirrel glider colonies near the SMC. This information will be used to guide the ongoing management of squirrel glider populations within the SMC Biodiversity Offset Areas and Biodiversity Enhancement Areas. This information will also define the study area for

further programs including the census of suitable tree hollows, food resources surveys and habitat enhancement including nest box installations.

Kleinfelder was commissioned by SCPL to conduct a radio tracking program to determine the Squirrel Glider home ranges of the local population based on the colony locations identified in the initial survey.

Two radio tracking programs were conducted between January - April 2019 and July - September 2019 during the 2019 reporting period. The 2019 radio tracking programs consisted of trapping of Squirrel Gliders, followed by processing and collaring. Generally, two gliders from each colony area were targeted for radio tracking. Radio tracking of the selected gliders was then conducted, followed by analyse of the data and estimating home ranges for each radio-tracked squirrel glider. The findings of the initial survey, radio tracking and home range estimations are provided in the Appendix H (*2019 SMC Squirrel Glider Colony & Home Range Report, Kleinfelder 2019)*. The following is an extracted summary from the Squirrel Glider Colony & Home Range Report:

> *"An initial targeted squirrel glider survey was undertaken to establish the locations of any existing Squirrel Glider colonies within the potential habitat in the vicinity of SMC. The initial survey was undertaken from 26 November to 17 December 2018 consisting of a total of 692 trap nights over 37 locations. Squirrel glider presence was confirmed at five locations. Four of these locations were determined as suitable areas to conduct home range surveys using radio-tracking.*
>
> *Radio-tracking was undertaken to examine spatial requirements and use, and den preferences. Radio-tracking was conducted in two periods of 40 nights and are subsequently referred to as seasons. A total of 36 squirrel gliders were captured, 19 gliders were fitted with radio collars and sufficient data points were obtained to allow home range estimates for 13 gliders.*
>
> *Results of the radio-tracking study showed that the seasonal home range for squirrel gliders within the Stratford area in period 1 (Summer) was FK95% 3.9 ± 0.3. ha and MCP100% was 9.7 ± 1.6ha. The FK95% for period 2 (Winter) was 3.6 ± 0.3 and the MCP100% was 12.8 ± 2.1. There was no significant difference between periods (P = 0.366, F7,5 = 1.407). This study also identified areas within the impact area of the Avon North extension where squirrel gliders were denning and foraging.*
>
> *Further studies in accordance with the Squirrel Glider Management Plan into the population dynamics of the squirrel glider within the Biodiversity Offset areas and Biodiversity Enhancement areas would be conducted to determine the impacts predators and habitat fragmentation are having on the local population. This will provide information on the effectiveness of the offset measures and habitat enhancement being implemented for the species."*

Plate 7 - Radio-transmitting collar fitted to squirrel glider

Plate 8 - Squirrel glider (Sharon) with young**.**

10.3 Tree Hollow Census

Condition 38(b), Schedule 3 of Development Consent SSD-4966 requires a census of suitable tree hollows in home ranges and offset areas suitable for Squirrel Gliders. A tree hollow census was undertaken within the home ranges identified by the radio tracking program (Section 10.2) to identify hollow bearing trees suitable for use as den sites by the Squirrel Glider. The results of the tree hollow census are provided in the Appendix I (*2019 SMC Hollow-bearing Tree Census Report, Kleinfelder 2019*).

An extracted summary is provided below:

> *"Radio-tracking and home range estimations was undertaken to comply with the requirement outlined in section 4.2 of the Squirrel Glider Management Plan (SGMP) (Stratford Coal 2018, Kleinfelder 2019). The areas identified to form part of a squirrel gliders home range were then used as study sites for the hollow-bearing tree census as required by Section 7.1 of the SGMP.*
> *The hollow-bearing tree census identified and mapped 480 hollow-bearing trees which contained a combined total of 648 hollows. Attributes of available hollows and known den hollows were compared to investigate the hollow preferences of squirrel gliders. The results indicated that hollow entrance size (area and width of hollow opening) was the most important factors in determining whether a hollow would be selected as a den by a squirrel. Tree species was not a determining factor with seven species being used for dens. Stags and Eucalyptus siderophloia (Grey Ironbark) were the most commonly used den species.*
>
> *Direct comparison of the density of hollow-bearing trees recorded in the biodiversity enhancement and offsets areas to vegetation community benchmark data for the relevant vegetation type shows that the two major vegetation communities at the SMC were found to contain significantly lower densities of hollow-bearing trees.*

Once the squirrel glider food resources have been mapped as outlined in section 6.1 of the SGMP, information provided in this report can be used to identify areas best suited for nest box installation. Nest boxes will be best situated in areas currently lacking tree hollows but have an adequate number of food resources."

Plate 9 - Elsie denning in a termite nest on Grey Ironbark (Eucalyptus siderophloia).

11 BIODIVERSITY OFFSET MONITORING AND REPORTING

The Biodiversity Offset monitoring program is prescribed in the BMP Section 7. The program aims to monitor and report on the effectiveness of the BMP management measures and progress against the detailed performance and completion criteria.

Table 9: Monitoring Program – Biodiversity Offset Strategy

Monitoring Program	Relevant BMP Section	Frequency
Visual Monitoring	Section 7.1.1	Annual
Photo Monitoring	Section 7.1.2	Annually (spring)
Habitat and Vegetation Monitoring Program	Section 7.1.3	Annually (spring)
Fauna Monitoring Program	Section 7.1.4	Every three years
Weed Monitoring	Section 5.6	Biannually
Initial Feral Animal Study of the Biodiversity Offset Area and Biodiversity Enhancement Area	Section 5.7	Within 12 months of approval of the BMP
Feral Animal Monitoring	Section 5.7	Every two years
Nest Box Monitoring	Section 5.10	Quarterly for 12 months and then biannually

11.1 Habitat and Vegetation Condition Monitoring

Habitat and vegetation condition monitoring is undertaken to quantitatively measure the change in habitat and vegetation condition over time. The visual monitoring and photo monitoring programs are undertaken concurrently with the vegetation monitoring to provide additional information on the change of the Biodiversity Areas over time and inform maintenance requirements.

Vegetation Monitoring commenced in 2019 to assess the effectiveness of revegetation in the Revegetation Area (Management Zone A) and to assess the natural regeneration in the Existing Remnant Vegetation Area (Management Zone B). The data gathered in 2019 serves as a baseline to assess the success of the revegetation efforts and progress against the project specific performance and completion criteria. This survey was undertaken prior to the revegetation works commencing in the Biodiversity Offset areas.

Vegetation monitoring was undertaken again in March 2021. The full report is included in Appendix F (*2021 Stratford Mining Complex Biodiversity Offset Strategy Flora Monitoring Report, Kleinfelder 2021*). Habitat and vegetation condition monitoring will continue to be undertaken annually to quantitatively measure the change in habitat and vegetation condition over time and to inform any ongoing maintenance requirements.

An extracted summary of the survey results from the *2020 Stratford Mining Complex Biodiversity Offsets Flora Monitoring Report (Appendix F*) is provided below.

> *"Greening Australia estimated overstorey stem densities for the Duralie Coal Mine Offsets Revegetation program (Section 6.2, DCM BMP, 2018), of 100 stems/ha and 207 stems/ha for woodland and forest respectively. Using these figures, the revegetation effort is on target to produce woodland overstorey densities in most of the revegetation areas. Indeed, in some areas, e.g., Quadrat Q5 and Quadrat Q12, the density is well above these targets, and in due course consideration may have to given to thinning as per the Table 21 of the Stratford Mining Complex – Biodiversity Management Plan, 2018. However, when compared to the reference sites much higher densities are required or possible to be planted. For instance, the Spotted Gum – Grey Ironbark quadrats recorded densities of 450 (Q1) and 400 (Q9) overstorey stems/ha. The Cabbage Gum Woodland reference quadrats recorded densities of 750 (Q6) and 975 (Q15) stems/ha. In comparison in the revegetation areas, only Quadrats Q5 with 450 stems/ha and Quadrat Q12 with 250 stems/ha recorded high densities.*
> *Survival of other planted species from other strata appears to be lower than planted overstorey species. This is partially countered by the natural seedbank present in some of the areas, and species that have been observed to self-recruit from the seed bank include Pimelea linifolia and several species of Acacia. The lower density of shrub and midstorey species will affect the habitat value of these revegetated areas, especially the Squirrel Glider corridor which was specifically planted with a range of species outside the specific community to facilitate food resources. Future monitoring will determine whether in-fill planting would be required and what species should be targeted.*
>
> *Priority weeds were relatively rare, with Quadrat Q6 recording three such species. This area requires weed treatment works which may be conducted as a walkover by suitably qualified professionals, or after a weed mapping exercise is conducted.*
>
> *In summary, good progress has been made with the successful introduction of many target species in areas that have been replanted. The increased rainfall that has continued to be experienced since this survey was undertaken will contribute to good growth for the older rehabilitation and improve survival for the newer planted areas."*

11.2 Fauna Monitoring

Monitoring of fauna usage within the Biodiversity Areas is conducted every three years to document the fauna species response to improvement in vegetation and habitat in the Biodiversity Areas and assess the performance in providing habitat for a range of vertebrate fauna. The surveys include an assessment of habitat complexity, species richness and abundance.

During 2019 AMBS Ecology & Heritage (AMBS) were engaged to undertake a fauna survey within the SMC Biodiversity Offset areas and Biodiversity Enhancement Areas. The full report is included in Appendix K (*SMC Fauna Surveys of the Biodiversity Offset and Biodiversity Enhancement Areas 2019, AMBS 2019)*. An extracted summary of the survey results are included below.

> *"Targeted fauna surveys were undertaken at eight sites. Six sites within the Stratford Offset Areas and two sites within the Biodiversity Enhancement Area. Field surveys occurred during two weeks, from 23 to 27 September 2019 and 28 October to 2 November 2019. At each site survey techniques included pitfall traps, funnel traps, Elliott A traps, harp traps, ultrasonic call recording, spotlighting, diurnal bird surveys and reptile searches. In addition, targeted frog surveys were undertaken at four water sources, one located in the Biodiversity Enhancement Area and three in the Biodiversity Offset Area. Opportunistic observations of signs of fauna were noted throughout the field survey period, including during transit between surveys sites.*
>
> *A total of 167 species of vertebrate were recorded, comprising 11 frogs, 16 reptiles, 97 birds and 43 mammals, most of which were native. Six introduced species were recorded during the surveys, including the Red Fox (Vulpes vulpes), Feral Cat (Felis catus), Black Rat (Rattus rattus), European Rabbit (Oryctolagus cuniculus), European Brown Hare (Lepus europaeus) and Cattle (Bos taurus). This is a reasonable diversity of fauna considering extreme drought conditions throughout the year and the relatively short length of the survey.*
>
> *Twenty-two of the species detected are listed as threatened or migratory on the schedules of the BC Act and/or EPBC Act, including:*
>
> - *White-bellied Sea-eagle (Haliaeetus leucogaster)*
> - *Dusky Woodswallow (Artamus cyanopterus cyanopterus)*
> - *Black-chinned Honeyeater (eastern subspecies) (Melithreptus gularis gularis)*
> - *Black-faced Monarch (Monarcha melanopsis)*
> - *Spectacled Monarch (Symposiachrus trivirgatus)*
> - *Varied Sittella (Daphoenositta chrysoptera)*
> - *Grey-crowned Babbler (eastern subspecies) (Pomatostomus temporalis temporalis)*
> - *Black-necked Stork (Ephippiorhynchus asiaticus)*
> - *Little Lorikeet (Glossopsitta pusilla)*
> - *Yellow-bellied Sheathtail-bat (Saccolaimus flaviventris)*
> - *Little Bent-winged Bat (Miniopterus australis)*
> - *Large Bent-winged Bat (Miniopterus orianae oceanensis)*
> - *Eastern Coastal Free-tailed Bat (Micronomus norfolkensis)*
> - *Large-eared Pied Bat (Chalinolobus dwyeri)*
> - *Southern Myotis (Myotis macropus)*
> - *Greater Broad-nosed Bat (Scoteanax rueppellii)*
> - *Brush-tailed Phascogale (Phascogale tapoatafa)*

- *Red-legged Pademelon (Thylogale stigmatica)*
- *Yellow-bellied Glider (Petaurus australis)*
- *Squirrel Glider (Petaurus norfolcensis)*
- *Koala (Phascolarctos cinereus)*
- *New Holland Mouse (Pseudomys novaehollandiae)*

The fauna surveys suggest the Stratford Offset and Biodiversity Enhancement Areas provide habitat for a range of native vertebrate fauna, including birds, mammals, reptiles and frogs. Two of the threatened species recorded, the Black-chinned Honeyeater and Red-legged Pademelon, have not previously been recorded at the Stratford Mining Complex."

Plate 10 - Brush-tailed Phascogale (Phascogale tapoatafa)

Plate 11 - Koala (Phascolarctos cinereus)

Plate 12 - Red-legged Pademelon (Thylogale stigmatica)

Plate 13 - Northern Brown Bandicoot (Isoodon macrourus)

12 LONG TERM SECURITY AND CONSERVATION BOND

12.1 Long-term Security

In accordance with Condition 36, Schedule 3 of Development Consent SSD-4966, SCPL is required to make suitable arrangements for the long-term security of the Stratford Extension Project Biodiversity Offset Area. SCPL has pursued the mechanisms available under section 88E(3) of the NSW Conveyancing Act, 1919, namely:

- Registration of a Positive Covenant under section 88E(3) of the NSW Conveyancing Act, 1919; and
- Registration of a Restriction on the Use of Land by a Prescribed Authority under section 88E(3) of the NSW Conveyancing Act, 1919.

To finalise securing the offset areas, the following actions were conducted:

- confirmation that the completed instruments are to the satisfaction of the Secretary completed 15 April 2019;
- execution of the instruments by the prescribed authority (the DP&E);
- execution of the instruments by the three separate registered proprietors of the offset lands (i.e. Yancoal's subsidiary companies, CIM Stratford Pty Ltd; Stratford Coal Pty Ltd and Gloucester Coal Limited);
- lodgement of the executed instruments with NSW Land Registry Services (LRS) in accordance with LRS's dealing lodgement requirements;
- LRS assessment/review of the instruments to confirm the instruments are acceptable for registration; and
- registration of the instruments on the titles of the offset lands.

Public Positive Covenants and Restrictions on the Use of Land for the Biodiversity Offsets have been registered on title with NSW Land and Property Information (LPI) in **October 2019**. Copies of the executed Positive Covenants and notice of registration of the instruments was included in the 2019 SMC Annual Biodiversity Report.

12.2 Conservation Bond

In accordance with Condition 40, Schedule 3 of Development Consent SSD-4966, SCPL is required to lodge a Conservation Bond with the DP&E which covers the cost of implementing the Biodiversity Offset Strategy detailed in the BMP.

The conservation bond calculation was prepared by Kleinfelder and a verification of the costs was undertaken by Rider Levett Bucknall. The conservation bond calculation was submitted in January 2019 and subsequently approved by DP&E on 15 January 2019.

The Conservation Bond in the form of a bank guarantee was executed and lodged with DP&E on 8 February 2019.

13 COMMONWEALTH EPBC APPROVAL COMPLIANCE REPORTS

In accordance with Condition 10 of EPBC 2011/6176 for the Stratford Extension Project, by 31 March of each year after the commencement of the action, or as agreed with DoEE, SCPL is required to publish a report addressing compliance with the conditions of EPBC 2011/6176 during the previous calendar year, including implementation of any management documents as specified in the conditions of EPBC 2011/6176.

SCPL commenced the action approved under EPBC 2011/6176 on 4 April 2018. The first annual compliance report was submitted in March 2019. The *Stratford Extension Project (EPBC 2011/6176) Annual Compliance Report 2020*, was submitted on 29 March 2021.

Condition 10 also requires reporting on the implementation of the relevant management documents required in accordance with the conditions of EPBC 2011/6176. This SMC Annual Biodiversity Report provides a review of the implementation of the management measures in the BMP for the annual year ending 31 December 2021. This report is included as an Appendix of the SMC Annual Review.

14 APPENDICES

Appendix A: DPIE Approval of the BMP.

Appendix B: SMC Annual Review 2021 – Figure 4 Mining & Rehabilitation Areas

Appendix C: SMC Vegetation Clearance & Nest Box Replacement Requirements 2021

Appendix D: Kleinfelder - 2021 Autumn Stratford & Duralie Biodiversity Offsets Planting Program Report

Appendix E: Kleinfelder - 2022 Biodiversity Offset Area – Proposed Revegetation Areas

Appendix F: Kleinfelder - 2020 Stratford Mining Complex Biodiversity Offset Strategy Flora Monitoring Report

Appendix G: AMBS Ecology & Heritage - Nest Box Installations within the Stratford Biodiversity Areas – February 2021

Appendix H: Kleinfelder - 2019 SMC Squirrel Glider Colony & Home Range Report

Appendix I: Kleinfelder – SMC Hollow-bearing Tree Census Report 2019

Appendix J: AMBS Ecology & Heritage - SMC Fauna Surveys of the Biodiversity Offset and Biodiversity Enhancement

(Appendices available on request)

APPENDIX 10

SMC Independent Environmental Audit 2020
Responses to Recommendations

Stratford Mining Complex - Independent Environmental Audit 2020
Response to Recommendations

IEA 2020 Recommendations								
Condition Reference No #	**Condition Detail**	**Management Area**	**Risk Level of Non-compliance**	**Auditor Recommendation**	**Stratford Coal Response**	**Target Due Date**	**Completion Status**	**Comments - Status Update - March 2022**
Development Consent SSD-4966 Non-compliance Recommendations								
Sch 3 Cond 14	**The Applicant shall:** **(d) operate a suitable system to enable the public to get up-to-date information on the proposed blasting Schedule on site, to the satisfaction of the Secretary.**	**Blasting**	**Administrative**	Ensure that the blast hotline information is up to date at all times.	SCPL accepts the recommendation. SCPL has operated a blasting hotline during the entire 3 year audit review period and has demonstrated the intention to comply with this condition. The blasting hotline is regularly updated, however at the time this was checked SCPL acknowledges it was not up to date. SCPL will ensure the blast hotline is updated the day prior to any blast at the SMC.	10-May-21	Completed	Ongoing update of blast hotline.
Sch 3 Cond 27	**Unless an EPL authorises otherwise, the Applicant shall comply with Section 120 of the POEO Act**	**Water**	**Medium**	Ensure that all surface water controls are inspected before, during and after forecast (heavy) rainfall events.	SCPL accepts the recommendation. Procedures for the inspection of water management infrastructure will be reviewed.	10-May-21	Completed	All sediment dams, Disturbed Area Dams and water management structures are inspected as required after rainfall events that exceed 25mm. Inspections are completed on the ground and via drone by CBased environmental, the E&C team and the pump crew.
Sch 3 Cond 46	**From the commencement of mining operations in the new mining areas until their cessation, unless otherwise agreed by the Secretary, the Applicant shall pay GSC and GLC annual contributions for the maintenance and resealing of The Bucketts Way in accordance with the terms in Appendix 4.**	**Road Maintenance**	**Administrative**	Continue discussions with Council in relation to payments for Road maintenance on Bucketts Way or seek agreement with Council and DPIE for removal of this Condition.	SCPL have made all endeavours to comply with this condition and to communicate with MidCoast Council. This matter has been raised with MCC on several occasions over the past few years and SCPL are still to receive any invoicing from MidCoast Council regarding this condition. SCPL have provided reminders to MidCoast Council and have also requested a meeting to resolve the matter. SCPL has received a reply from MidCoast Council in December 2020, thanking SCPL for their patience and honesty in relation to the matter, however the accounting has still not been finalised. SCPL has demonstrated the commitment to comply with this condition, yet ultimately the invoicing for these payments is not within the control of SCPL.	30-Jun-21	Completed	MidCoast Council agreed to a meeting with SCPL in February 2021 to discuss matters relating to the Stratford Mining Complex. Invoicing for the Condition 46 and Condition 47 roads contributions have been received in May 2021 and the relevant payments have now been processed.
Sch 3 Cond 47	**From the commencement of mining operations in the new mining areas until their cessation, unless otherwise agreed by the Secretary, the Applicant shall pay GSC and GLC annual contributions for the maintenance and resealing of The Bucketts Way in accordance with the terms in Appendix 4.**	**Road Maintenance**	**Administrative**	Continue discussions with Council in relation to payments for Road maintenance on Wenham Cox Road or seek agreement with Council and DPIE for removal of this Condition.	SCPL have made all endeavours to comply with this condition and to communicate with MidCoast Council. This matter has been raised with MCC on several occasions over the past few years and SCPL are still to receive any invoicing from MidCoast Council regarding this condition. SCPL have provided reminders to MidCoast Council and have also requested a meeting to resolve the matter. SCPL has received a reply from MidCoast Council in December 2020, thanking SCPL for their patience and honesty in relation to the matter, however the accounting has still not been finalised. SCPL has demonstrated the commitment to comply with this condition, yet ultimately the invoicing for these payments is not within the control of SCPL.	30-Jun-21	Completed	MidCoast Council agreed to a meeting with SCPL in February 2021 to discuss matters relating to the Stratford Mining Complex. Invoicing for the Condition 46 and Condition 47 roads contributions have been received in May 2021 and the relevant payments have now been processed.
Sch 3 Cond 52 a	**The Applicant shall:** **(a) implement all reasonable and feasible measures to minimise the waste (including coal reject) generated by the development;**	**Waste**	**Low**	Develop and implement a waste minimisation strategy, covering in particular on-site waste minimisation.	SCPL accepts the recommendation. Whilst SCPL does not have a specific waste minimisation program, SCPL have developed a whole of site waste management contract. This includes regular inspections and recommendations for improvements in waste handling. This also includes regular reporting of waste disposal volumes including the percentage of recycling achieved.	1-Dec-21	Open	SCPL have established a Waste management and Minimisation strategy. SCPL published the Waste management and Minimisation strategy on http://www.stratfordcoal.com.au/ on the 18/11/2021
Sch 3 Cond 52 c	**The Applicant shall:** **(c) monitor and report on the effectiveness of waste minimisation and management measures in the Annual Review.**	**Waste**	**Administrative**	In future Annual Reviews report on the implementation and effectiveness of the waste minimization strategy.	SCPL accepts the recommendation. SCPL will include information in the next Annual Review. Whilst SCPL does not have a specific waste minimisation program, SCPL have developed a whole of site waste management contract. This includes regular inspections and recommendations for improvements in waste handling. This also includes regular reporting of waste disposal volumes including the percentage of recycling achieved.	1-Dec-21	Open	SCPL has included a summary of effectiveness of waste minimisation in the 2021 Annual Review, Section 4.5.4.
Sch 3 Cond 55	**The Rehabilitation Management Plan must:** **(d) describe how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy;**	**Rehabilitation**	**Administrative**	Revise the MOP / Rehabilitation Management Plan to include a section describing how the rehabilitation of the site would be integrated with the implementation of the biodiversity offset strategy.	SCPL accepts the recommendation. The SMC MOP/RMP has been updated in February 2021 and lodged with the Resources Regulator for approval. The SMC Biodiversity Management Plan provides specific detail on the relationship to other management plans including the integration of the site rehabilitation and the biodiversity offset strategy; refer to BMP Section 1.4 RELATIONSHIP OF THE BMP TO OTHER MANAGEMENT PLANS, 1.4.2 Mining Operations Plan/ Rehabilitation Management Plan BMP Section 4.8 REHABILITATION - ESTABLISHING NATIVE VEGETATION AND FAUNA HABITAT. A similar level of detail will be added to the MOP/RMP.	31-Mar-21	Completed	The SMC MOP/RMP has been updated in February 2021 and lodged with the Resources Regulator for approval.
Sch 5 Cond 4 d	**Annual Review** **d) identify any trends in the monitoring data over the life of the development;**	**Annual Review**	**Administrative**	Ensure that future Annual Reviews include (in each subsection of Section 6) a discussion of trends in monitoring data over the life of the development.	SCPL accepts the recommendation. Additional information will be included with the next SMC Annual Review. The Annual Reviews discuss monitoring results and environmental performance and where necessary include reviews against performance criteria in each sub-section. The Annual Reviews also include statements regarding comparison between monitored results and the predicted results in the EIS. SMC has demonstrated a long running good environmental performance and has rarely exceeded any monitoring criteria and as such the statements regarding EIS comparisons are generally brief. Additionally, discrepancies between the EIS predictions have been uncommon and the measures to improve environmental performance have not been required in many circumstances. Overall SCPL	1-Dec-21	2021 Annual Review	In each relevant subsection of Section 6 SCPL has included a discussion of trends in monitoring data over the life of the development. This can be found under the title of Analysis of Data Trends and Comparison with EA Predictions
Sch 5 Cond 4 e	**Annual Review** **(e) identify any discrepancies between the predicted and actual impacts of the development, and analyse the potential cause of any significant discrepancies; and**	**Annual Review**	**Administrative**	Ensure that future Annual Reviews include (in each subsection of Section 6) a discussion of predicted and actual environmental impacts.	SCPL accepts the recommendation. Additional information will be included with the next SMC Annual Review.	1-Dec-21	2021 Annual Review	In each relevant subsection of Section 6 SCPL has included a discussion of trends in monitoring data over the life of the development. This can be found under the title of Analysis of Data Trends and Comparison with EA Predictions
Sch 5 Cond 4 f	**Annual Review** **(f) describe what measures will be implemented over the next year to improve the environmental performance of the development.**	**Annual Review**	**Administrative**	The Annual Reviews do not specifically report on measures to be taken in the next year to improve environmental performance. Note: where no noncompliance's, monitoring exceedances or incidents have occurred during the relevant reporting period the Annual Review could note that no improvement initiatives are planned.	SCPL accepts the recommendation. Additional information will be included with the next SMC Annual Review.	1-Dec-21	2021 Annual Review	2021 Annual Review includes comment on areas of improvement where applicable.

Sch 5 Cond 5a	**Within 3 months of:** **(a) the submission of an annual review under Condition 4 above; the Applicant shall review the strategies, plans, and programs required under this consent, to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted for the approval of the Secretary.**	**Management Plans**	**Administrative**	Establish a register that records the reviews of all management plans (as evidence for future audits). Note: the review of each plan does not necessarily result in the revision of every plan. Where no changes to a plan are warranted, the register can note that the review was undertaken and no changes to the plan were required.	SCPL accepts the recommendation. Whilst full compliance with this condition has not been met, most of the environmental management plans (EMP) have been revised at least 3 times during the audit period. The intention of this condition is to ensure that the EMPs remain current and relevant. The Stratford EMPs have been reviewed/revised regularly and provide the basis for a highly structure and detailed Environmental Management System.	14-Jul-21	Completed	SCPL have established and Environmental Management Plan Revision Register.
Sch 5 Cond 5b	**(b) the submission of an incident report under Condition 7 below; the Applicant shall review the strategies, plans, and programs required under this consent, to the satisfaction of the Secretary. Where this review leads to revisions in any such document, then within 4 weeks of the review the revised document must be submitted for the approval of the Secretary.**	**Management Plans**	**Administrative**	Establish a register that records the reviews of all management plans (as evidence for future audit).	SCPL accepts the recommendation. Whilst full compliance with this condition has not been met, most of the environmental management plans (EMP) have been revised at least 3 times during the audit period. The intention of this condition is to ensure that the EMPs remain current and relevant. The Stratford EMPs have been reviewed/revised regularly and provide the basis for a highly structure and detailed Environmental Management System.	14-Jul-21	Completed	SCPL have established and Environmental Management Plan Revision Register.
Environment Protection Licence EPL 5161 Recommendations								
L1.1	**Except as may be expressly provided in any other condition of this licence, the licensee must comply with section 120 of the Protection of the Environment Operations Act 1997.**	**Water**	**Medium**	Ensure that all surface water controls are inspected and maintained before, during and after forecast (heavy) rainfall events.	SCPL accepts the recommendation. Procedures for the inspection of water management infrastructure will be reviewed.	10-May-21	Open	All sediment dams, Disturbed Area Dams and water management structures are inspected as required after rainfall events that exceed 25mm. Inspections are completed on the ground and via drone by CBased environmental, the E&C team and the pump crew.
O4.3	**The PIRMP must be tested at least annually or following a pollution incident.**	**PIRMP**	**Administrative**	Ensure that the PIRMP is tested within one month of any incident that triggers the implementation of the PIRMP.	SCPL accepts the recommendation. No adverse effects would be anticipated resulting from the non-compliance. The PIRMP was tested on 28 January 2020 and 9 July 2020, however a test was not conducted within 1 month of the pollution incidents on 09/02/20 and 11/03/20. Testing of the PIRMP has been completed during the reporting period. The PIRMP was implemented successfully following the pollution incidents during the reporting period. No changes to the PIRMP were required as a result of the test. SCPL staff have been reminded of the obligations requiring testing of the PIRMP.	30-Apr-21	Completed	The PIRMP was audited and revised in April 2021.
M1.2	**All records required to be kept by this licence must be:** **a) in a legible form, or in a form that can readily be reduced to a legible form;**	**Monitoring Records**	**Administrative**	Ensure that sampling personnel carefully complete the sampling sheets so that all information required by the EPL is legible.	SCPL accepts the recommendation.	30-Mar-21	Completed	Monitoring contractors have been reminded to ensure all field sheets are legible. Checks of monitoring sheets have been completed in May 2021. All monitoring sheets filled out neatly and accurately.
M2.2	**Air Monitoring Requirements**	**Air Quality**	**Low**	No recommendation required as the TEOM was replaced as soon as was possible to do so.	Noted. The continuous air quality monitor was operational for more than 99% of the Audit Period. However, it was not operational for two days in March 2019 due to equipment failure. Consider adding a note in the EPL conditions stating the percentage of time monitoring is required to meet the real-time continuous criteria, i.e. 95% or 99%.	30-Mar-21	Completed	No further action required. Ongoing maintenance of TEOMs.
M2.3	**Water Monitoring Requirements** **Testing Methods**	**Water**	**Low**	Ensure that future sampling reports and records incorporate the EPA sampling point designations.	Overall compliance with this condition was achieved with the exception of one sample missed during the audit period. Less than required pH and Conductivity samples analysed for Groundwater Monitoring Requirements at Point 15 and Point 17. Two samples required during the reporting and only one sample was analysed. The environmental monitoring field sheets and scheduling has been updated. Employees and contractors have been made aware of the environmental monitoring requirements for groundwater sampling.	10-May-21	Completed	Sampling reports and records have been updated to incorporate the EPA sampling point designations.
M6.2	**The licensee must notify the public of the complaints line telephone number and the fact that it is a complaints line so that the impacted community knows how to make a complaint.**	**Complaints Line**	**Administrative**	Update the website and entry signage to ensure that it is clear that the community hotline is also the complaints line.	The Community (complaints) Information hotline is shown on the Stratford website on the Community page, Environment page and Contacts page. The Community (complaints) hotline is also advertised in the local phone directory and periodically in the local newspaper. There is no requirement for this to be signposted at the front entrance. The Stratford website has been updated for clarification. SCPL will continue operation of the complaints line and notify the public via the current avenues.	10-May-21	Completed	No further action required.
M7.2	**All blast shots must be recorded on video from a position allowing the collars of the shot, and where possible, any face, and/or toe, to be seen on the video. The licensee must retain a copy of this video for at least 12 months after the blast was initiated.**	**Blasting**	**Administrative**	Ensure that drone and video camera are checked prior to all blasts.	SCPL accepts the recommendation. SCPL has recorded every blast on video over the 3 year audit period and only missed two blasts due to technical failures. SCPL has demonstrated the intentions of meeting this condition consistently. SCPL will continue to ensure all blasts at the SMC are recorded on video.	10-May-21	Completed	The Blast Prefire checklist has a checkbox for checking that video is operational as it is a requirement of critical control active monitoring.
R2.2	**The licensee must provide written details of the notification to the EPA within 7 days of the date on which the incident occurred.**	**Notification of Environmental Harm**	**Administrative**	Ensure that any future written reports to the EPA are submitted within the timeframes specified in the EPL.	SCPL accepts the recommendation. Incident reports will be provided to the regulators as required in the licence/consent conditions.	30-Jun-21	Completed	No further action required. Ongoing reporting of incidents as required
Mining Lease 1778								
ML4	**(b) Non-conformance notifications under condition 4(a) must be provided in the form specified on the Department's website within seven (7) days of the mining lease holder becoming aware of the breach.**	**Non-compliance Reporting**	**Administrative**	Ensure that notifications to the Department in relation to non-compliances are provided in the specified form (from the Departments Website).	SCPL accepts the recommendation. Incident notifications will be provided to the regulators as required in the licence/consent conditions.	30-Jun-21	Completed	No further action required. Ongoing reporting of incidents as required
ML5	**The lease holder must provide environmental incident notifications and reports to the Secretary no later than seven (7) days after those environmental incident notifications and reports are provided to the relevant authorities under the Protection of the Environment Operations Act 1997.**	**Environmental Incident Report**	**Administrative**	Ensure that all reportable environmental incidents are included in the reporting of incidents.	SCPL accepts the recommendation. Incident reports will be provided to the regulators as required in the licence/consent conditions.	30-Jun-21	Completed	No further action required. Ongoing reporting of incidents as required

APPENDIX 11

SMC Rehabilitation Monitoring Report 2021

Stratford Mining Complex Rehabilitation EFA Monitoring Report 2021

Stratford Mining Complex, 3364 Bucketts Way South Stratford, NSW

20220443

23 December 2021

KLEINFELDER
Bright People. Right Solutions.

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Stratford Mining Complex Rehabilitation EFA Monitoring Report 2021

Stratford Mining Complex, 3364 Bucketts Way South dStratford, NSW

Kleinfelder Project: 20220443

Kleinfelder Document: NCA21R133222

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Prepared	Reviewed	Endorsed
Nigel Fisher		

EXECUTIVE SUMMARY

Stratford Coal Pty Ltd (SCPL) is a wholly owned subsidiary of Yancoal Australia Ltd and operates the Stratford Mine Complex (SMC). The SMC is located between the small towns of Craven and Stratford on the Buckett's Way, approximately 100km north of Newcastle (Figure 1). The SMC consists of the Bowens Road North (BRN) Open Cut, the Roseville West Open Cut, Avon North Open Cut, Stratford East Open Cut, the Stratford Main Pit and associated waste emplacements, coal handling and preparation plant, and other infrastructure.

In accordance with Section 8.1 of the Stratford Mining Complex – Mining Operations Plan & Rehabilitation Management Plan (2021) monitoring and assessment of the rehabilitation areas will be required to demonstrate the effectiveness of the rehabilitation techniques and track the progression towards achieving the performance and completion criteria. This assessment will be conducted using EFA (Ecosystem Functional Analysis) to measure the progression of the rehabilitation towards a self-sustaining ecosystem. This report is submitted to fulfil this requirement and is the sixth monitoring event conducted by Kleinfelder Australia. The LFA and EFA monitoring was conducted by Kleinfelder staff on the 1st, 2nd and 3rd of June 2021.

*Ten transects were selected for data collection from seven ages of rehabilitation, four waste emplacements and two vegetation types that have been conducted at the SMC (**Table 1**). The four waste emplacements are designated Bowens Road North (BRN) Waste Emplacement, Stratford Waste Emplacement (SWE), Roseville Waste Emplacement (RWE), and Avon North Waste Emplacement (ANWE). This survey only included two analogue transects - one native pasture and one native woodland (Spotted Gum – Ironbark Woodland), giving a total of 12 transects monitored.*

Table 1: Details of the monitoring transects where Landscape Function Analysis (LFA) and Vegetation Structure was surveyed at the SMC in 2021

Year of Rehabilitation	Transect	Location at SMC	Vegetation Type	Monitoring Methods	
				LFA	Veg Structure
1996/97	T5	Stratford Waste Emplacement	Pasture	Y	N
2003	T8			Y	N
1996/97	T16		Native Woodland Rehabilitation	Y	Y
2005	T18	Roseville Waste Emplacement (South)		Y	Y
	T21	Roseville Waste Emplacement (North)		Y	Y
2006-08	T25	Bowen's Road North Waste Emplacement		Y	Y
	T30			Y	Y
2011	T27			Y	Y
2014	T31			Y	Y
2020	T36	Avon North Waste Emplacement		Y	Y
Analogue	T33	Adjacent to main SMC access road	Pasture Analogue	Y	N
	T34	East of BRN, off Wenham Cox Rd	Woodland Analogue	Y	Y

Landscape Functional Analysis results for the native flora rehabilitation areas showed that four of the rehabilitation areas recorded Stability Index (SI) scores that were equivalent to the analogue value of 79.4 ± 1.7. These were the SWE 1996/97 rehabilitation area, the BRN 2006-08 and 2011 rehabilitation areas. The BRN 2014 rehabilitation, RWE 2005 rehabilitation and the most recent rehabilitation, the ANWE recorded SI scores below the analogue value. Infiltration Index and Nutrient Cycling Index scores followed a similar pattern with the SWE 1996/97 rehabilitation area, the BRN 2006-08 and 2011 rehabilitation areas recording higher values, but not yet at analogue values, while the BRN 2014 rehabilitation, RWE 2005 rehabilitation and the most recent rehabilitation, the ANWE recorded much lower index scores.

Pasture rehabilitation LFA index scores were equivalent to the analogue areas, indicating that these areas have achieved successful rehabilitation. There were no recommendations for the pasture rehabilitation areas, with normal pasture maintenance and practice to be continued. The analogue plot area was observed to have a high number of germinating overstory species and it was recommended to move this transect further from the paddock trees, or into another area with native flora regeneration.

Vegetation structure results were compared to a single analogue transect/area this year. The major change noted in the analogue transect was a large increase in germination of shrub level plants increasing the stem density from 918 stems/ha in 2020 to 5, 827 stems/ha in 2021. Total stem density was 6, 636 stems/ha with 60 overstory stems/ha and 749 midstory stems/ha.

The data showed that the SWE 1996/97 Stratford Woodland (T16) and the northern section of the BRN 2006-08 rehabilitation areas (T25) have native flora structure that most closely resembles the analogue vegetation. That is, there is a clearly defined overstory, midstory and shrub layer over a grass and forb groundcover – although in the rehabilitation areas the groundcover is almost entirely exotic species. The relative proportions of the different strata are not the same with overstory density considerably less in this section of the BRN (18 stems/ha) but higher in the SWE area (166 stems/ha), with midstory and shrub strata also at a much lower density in both areas. Both of these areas recorded self-recruitment of species from all strata indicating a self-sustaining ecosystem.

The BRN 2006-08 rehabilitation area represented by transect T30 recorded no overstory species and was dominated by dense Acacias. This survey the shrub sized stratum had increased massively with a huge germination of self-recruited Acacias and Ozothamnus diosmifolius, producing a stem density of 36, 000 stems/ha at an average distance of only 0.55m. The total stem density for this area was recorded at 44, 724 stems/ha.

The two remaining BRN areas are the 2011 (T27) and 2014 (T31) rehabilitation areas. The 2011 rehabilitation was very sparse Acacias with only 124 stems/ha recorded over a very dense exotic groundcover. This area continues to record fewer stems each survey, and due to the groundcover, there has been no natural recruitment. The 2014 rehabilitation area consisted of shrubs at a density of 1, 440 stems/ha. The groundcover was patchy with dense areas of exotic grasses and forbs, but also areas of bare soil, soil crusts and areas of cryptograms (lichens and mosses) indicating mixed revegetation success.

The RWE is composed of the southern emplacement (T18) and northern emplacement (T21). The southern emplacement transect consisted of native overstory and midstory/shrub species with a groundcover of exotic and native grasses and forbs. The overstory density of 74 stems/ha is within the target density, while the midstory and shrub strata were combined and recorded 1, 111 stem/ha. The northern emplacement has only a very sparse number of native stems (315 stems/ha) with the vegetation structure measured as "nearest stem" and unable to be divided into different strata.

The most recently rehabilitated area located on the ANWE2020 rehabilitation (T36) has excellent diversity in all strata including the groundcover where native grasses were included in the seed mix. Given the young age of this rehabilitation, vegetation was still relatively small and only two strata were measured – overstory with 2986 stems/ha, and all other stems with 2860 stems/ha.

Some if not all of the woody weeds such as Lantana, Inkweed, Wild Tobacco plus Moth Vine were observed in most of the rehabilitation areas with the SWE 1996/97 and BRN 2006-08 rehabilitation areas the most affected.

Where the revegetation efforts have been successful – SWE 1996/97 and the BRN 2006-08 rehabilitation areas – the vegetation structure has been established albeit with different strata proportions. These areas can be considered well on track to successful rehabilitation.

The remaining areas of rehabilitation at the SMC require remedial actions to achieve revegetation to woodland. Specifically, the RWE northern and southern emplacements and the BRN 2011 and 2014 rehabilitation areas do not have the required density, diversity or structure. Conditions were conducive for self- and natural recruitment) as evidenced by the germination in the BRN 2006-08 rehabilitation areas) the less successful rehabilitation has not benefited from such recruitment either through dense exotic groundcovers such as found at RWE 2005, northern emplacement and BRN 2011 preventing the germination of seed, or a lack of seed production due to dieback of native flora such as at RWE 2005 southern emplacement.

Stratford Coal has recognised that these areas require remediation and will have a planting program targeting these areas starting in early 2022. This will reduce the exotic groundcover. Likewise, a weed control program will be instigated over the same period.

A recommendation from previous years' monitoring for the instigation of environmental or cool season burns will not be applicable once the planting program is undertaken, at least until such time as the plants mature sufficiently to survive such a burn.

Installation of nest boxes for habitat enhancement has also been suggested for the SWE 1996/97 and BRN 2006-08 rehabilitation areas. These areas are now separated from nearby vegetation by mining operations and nest boxes for arboreal mammals would be unsuitable. However, nest boxes for birds are a consideration as these areas do have individual trees of sufficient size to support larger boxes.

Overall, the rehabilitation of the SMC is progressing with the pasture rehabilitation areas supporting commercial grazing. The native flora rehabilitation areas have a combination of excellent and poorer rehabilitation, with remedial actions underway to compensate and improve these areas.

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APPENDICES

1 INTRODUCTION

Stratford Coal Pty Ltd (SCPL) is a wholly owned subsidiary of Yancoal Australia Ltd and operates the Stratford Mine Complex (SMC). The SMC is located between the small towns of Craven and Stratford on the Buckett's Way, approximately 100km north of Newcastle (Figure 1). The SMC consists of the Bowens Road North (BRN) Open Cut, the Roseville West Open Cut, Avon North Open Cut, Stratford East Open Cut, the Stratford Main Pit and associated waste emplacements, coal handling and preparation plant, and other infrastructure.

On 29 May 2015, the NSW Planning Assessment Commission approved the Stratford Extension Project (SEP). The SEP provides for the continuation of mining and processing at the SMC for an additional 11 years.

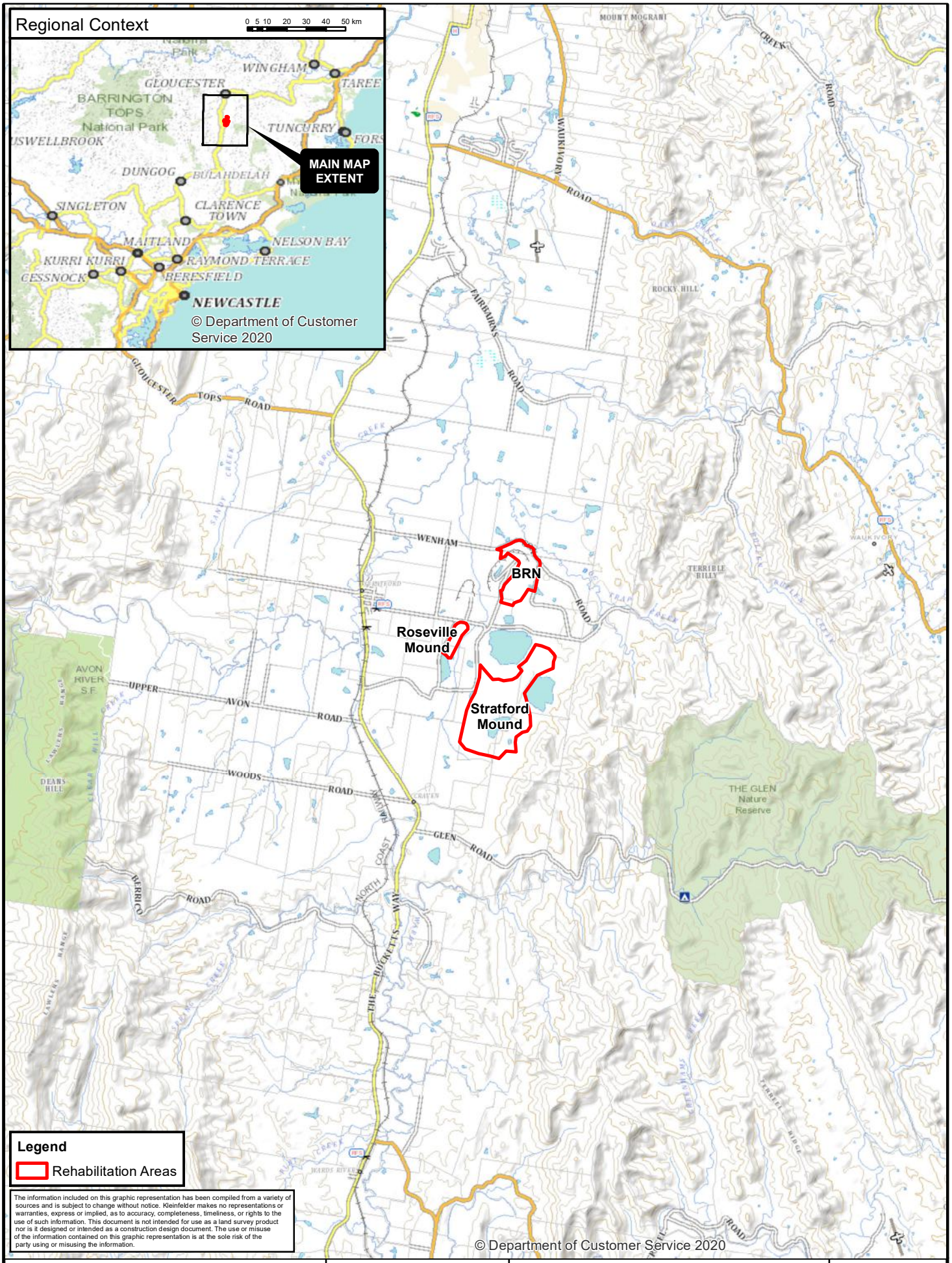
The SMC operates under two key approvals, NSW Development Consent (SSD-4966) and the Commonwealth Approval (EPBC 2011/6176). Both may be viewed at http://www.stratfordcoal.com.au.

In accordance with Section 8.1 of the Stratford Mining Complex – Mining Operations Plan & Rehabilitation Management Plan (2021) monitoring and assessment of the rehabilitation areas will be required to demonstrate the effectiveness of the rehabilitation techniques and track the progression towards achieving the performance and completion criteria. This assessment will be conducted using EFA (Ecosystem Functional Analysis) to measure the progression of the rehabilitation towards a self-sustaining ecosystem. This report is submitted to fulfil this requirement and is the fifth monitoring event conducted by Kleinfelder Australia.

1.1 SCOPE AND RATIONALE

Kleinfelder Australia was commissioned by SCPL to conduct EFA monitoring to ensure compliance with the above stated objectives. The findings of the LFA and vegetation structure surveys and appropriate recommendations are provided in this report.

The LFA and EFA monitoring was conducted by Kleinfelder staff on the 1st, 2nd and 3rd of June 2021.



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PROJECT REFERENCE: 20220443

DATE DRAWN: 2021/08/06 16:30 Version 1

DRAWN BY: GJoyce

DATA SOURCE:
NSW DFSI - 2020

Locality

Stratford Coal Pty Ltd
Stratford Rehabilitation LFA
Stratford Coal Mine

FIGURE:

1

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2 METHODS

2.1 LANDSCAPE FUNCTIONAL ANALYSIS

Landscape Functional Analysis is a monitoring technique that uses eleven soil surface characteristics to determine the functional status of a landscape and is fully described in Tongway and Hindley (2011). These soil surface characteristics correspond to a range of physical, chemical and biological processes that involve physical movement of water, topsoil and organic matter in a landscape. The landscape is divided into a patch and inter-patch system along transects where water and nutrients are accumulated or shed respectively. Full data for each transect is provided in **Appendix 1**.

A photograph was taken looking along transects from the starting peg with the tape measure visible if possible. Where the full transect was not visible due to vegetation, an additional photograph was taken at the half-way point to illustrate the typical conditions. An example of the typical query zone or zones for each transect is also presented (**Appendix 2**).

2.2 VEGETATION STRUCTURE

The second component of the monitoring consisted of assessing the native vegetation structure at each of the native vegetation rehabilitation transects. The “point-centre-quadrat” method as outlined in Tongway and Hindley (2011) was employed to collect density and canopy size of woody vegetation, if present, at each transect. For native flora revegetation areas, at 5 x 5m points along transects, the distance to the nearest stem for stratum designated overstory, midstory and shrubs, was measured and the plant height, canopy density, and dimensions (breadth and width) were recorded. For the analogue site overstory was designated as the dominant tree layer, with midstory being stems above 1.5m in height and below the canopy and shrubs were woody species under 1.5m, regardless of species i.e., young overstory, midstory and true shrub species. Where all three strata were present this method was employed. Where strata were absent, woody stems were classified according to height, for instance where vegetation did not include overstory species, only midstory and shrub layers were recorded. For the latest rehabilitation (Avon North, T36) the vegetation was recorded in two layers - Eucalyptus species regardless of height and all other native woody stems. One rehabilitation area on the Roseville Waste Emplacement (T21) had very low native revegetation and the nearest stem, regardless of size or growth form was recorded.

2.3 DATA ANALYSIS

The collected data is input into a software system purpose designed for LFA where a series of tables are generated providing data on both a hillside and a patch basis. This data can then be used to provide insight into the functional status of the landscape. Vegetation Structure data is also input into purpose-designed software where woody plant density and vegetative volume on a per hectare basis is calculated. The quality of the vegetation data was also assessed and reported on to indicate the reliability of the density and volume data. The purpose-designed software stipulates a minimum of 12 stems per transect to produce statistically valid output. Data quality for each strata is assessed as “Poor” if less than 12 stems are recorded, “Good” if between 13 and 19 stems are recorded and “Excellent” if 20 stems were recorded.

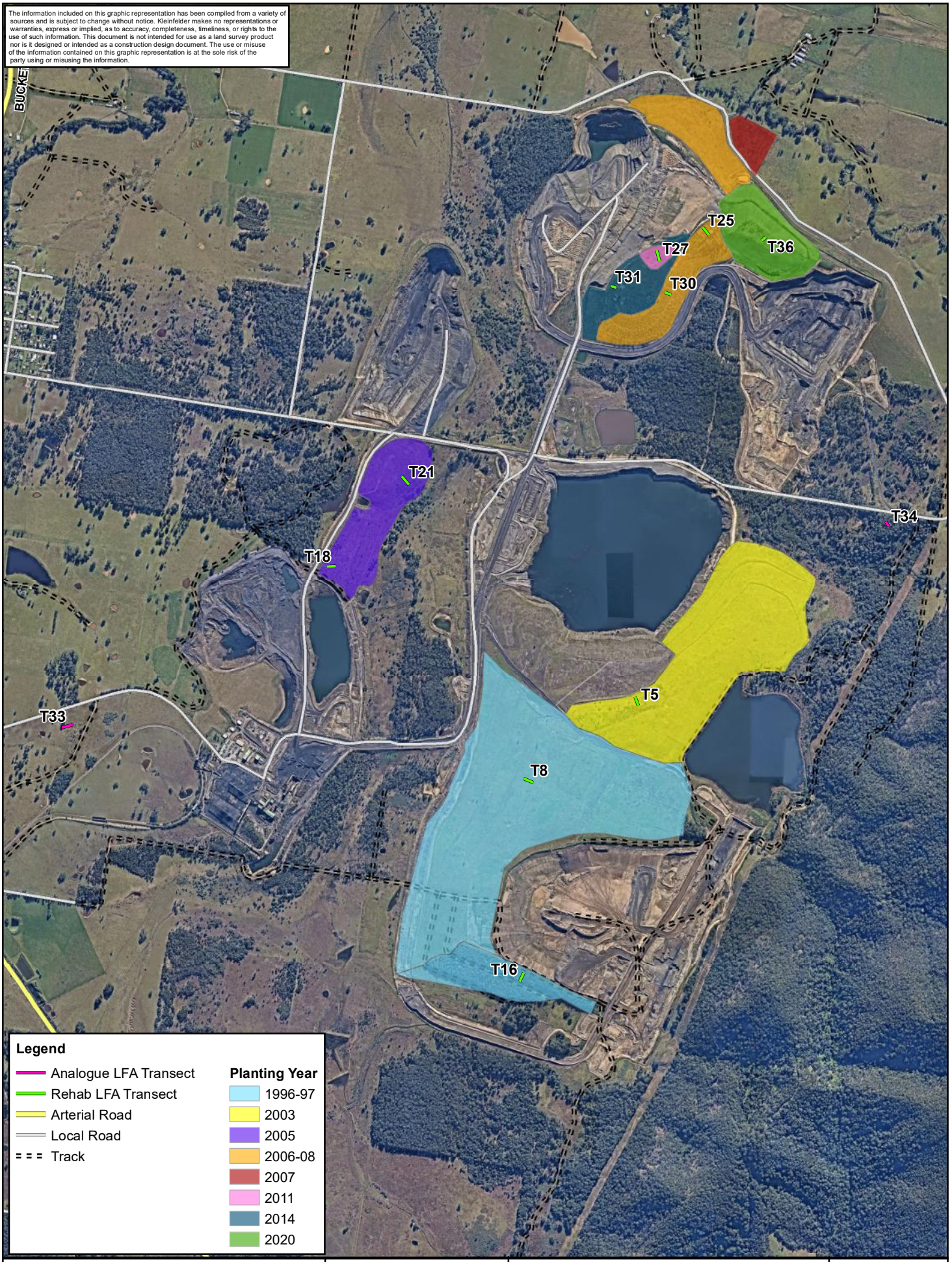
2.4 TRANSECTS SURVEYED

Ten transects were selected for data collection from seven ages of rehabilitation, four waste emplacements and two vegetation types that have been conducted at the SMC (**Table 2 and Figure 2**). The four waste emplacements are designated Bowens Road North (BRN) Waste Emplacement, Stratford Waste Emplacement (SWE), Roseville Waste Emplacement (RWE), and Avon North Waste Emplacement (ANWE). This survey only included two analogue transects - one native pasture and one native woodland (Spotted Gum – Ironbark Woodland), giving a total of 12 transects monitored. This year’s survey did not include the woodland transect T35 to the south of the Stratford Waste Emplacement as it has been subsumed by operational requirements. **Figure 2** shows the location of the surveyed transects throughout the SMC.

Using a subset of the transects established as part of previous monitoring efforts conducted on behalf of SCPL by Greening Australia, LFA data was collected from the three rehabilitated waste emplacements at the SMC. A new transect, T36 was established on the Avon North Waste Emplacement rehabilitated in 2020. A total of 12 transects were surveyed using this methodology. Transects (25m in length for native flora revegetation areas or 50m in length for the pasture rehabilitation areas) were located using co-ordinates sourced from previous reports then located by sight.

Table 2: Details of the monitoring transects where Landscape Function Analysis (LFA) and Vegetation Structure was surveyed at the SMC in 2021

Year of Rehabilitation	Transect	Location at SMC	Vegetation Type	Monitoring Methods	
				LFA	Veg Structure
1996/97	T5	Stratford Waste Emplacement	Pasture	Y	N
2003	T8			Y	N
1996/97	T16		Native Woodland Rehabilitation	Y	Y
2005	T18	Roseville Waste Emplacement (South)		Y	Y
	T21	Roseville Waste Emplacement (North)		Y	Y
2006-08	T25	Bowen's Road North Waste Emplacement		Y	Y
	T30			Y	Y
2011	T27			Y	Y
2014	T31			Y	Y
2020	T36	Avon North Waste Emplacement		Y	Y
Analogue	T33	Adjacent to main SMC access road	Pasture Analogue	Y	N
	T34	East of BRN, off Wenham Cox Rd	Woodland Analogue	Y	Y



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DATE DRAWN: 2021/12/23 09:45Version 2

DRAWN BY: GJoyce

DATA SOURCE:
Nearmap - 2021

2021 Stratford Rehabilitation Monitoring Transects

Stratford Coal Pty Ltd
Stratford Rehabilitation LFA
Stratford Coal Mine

FIGURE:

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3 RESULTS

3.1 LANDSCAPE FUNCTIONAL ANALYSIS

3.1.1 Native Flora Rehabilitation Transects

The 2021 LFA results display a considerable range of values more associated with the individual waste emplacement, rather than of the age of the rehabilitation (**Figure 3**). The analogue transect this year recorded a Stability Index (SI) score of 79.4 ± 1.7. SI scores this survey that were equivalent or above the analogue site were recorded for the Stratford Woodland (SWE) transect T16 (1996/87 rehabilitation) 77.5 ± 0.6, the BRN rehabilitation (2006-08) where transects T25 and T30 recorded SI scores of 76.9 ± 1.2 and 78.1 ± 2.2 respectively, and the BRN 2011 rehabilitation – T27 – 83.8 ± 2.6. Lower SI scores were recorded for the RWE emplacement transects T18 and T21 (65.6 ± 0 and 70.6 ± 2.8 respectively), while the BRN rehabilitation T31 recorded an SI score of 73.1 ± 1.9. The most recently rehabilitated area on the ANWE, Transect T36 recorded an SI score of 64.4 ± 2.0.

The Infiltration Index scores for 2021 recorded a similar pattern to the stability index. The analogue transect recorded an index score of 65.9 ± 5.3. Rehabilitated areas that recorded index scores similar to the analogue were the Stratford Woodland rehabilitation (T16) 57.7 ± 6.5, and the three BRN rehabilitated areas represented by transects T25 (57.4 ± 2.5), T30 (55.8 ± 7.8) and T27 54.2 ± 2.9. Index scores for the RWE transects T18 and T21 were considerably different reflecting the different degree of groundcover vegetation. T21 (RWE North) recorded a score of 47.0 ± 3.1, while T18 (RWE South) recorded an index score of 30.4 ± 0. The BRN area represented by transect T31 recorded a score of 36.7 ± 3.1. The youngest rehabilitated area, the ANWE represented by T36 recorded an index score of 31.1 ± 1.8.

Nutrient Cycling Index scores reflected the above patterns for the first two indices. The analogue transect recorded an index score of 64.0 ± 7.8. The Stratford Woodland transect T16 recorded a score of 57.7 ± 5.7. The three BRN rehabilitation transects T25 (49.0 ± 2.1), T30 (52.7 ± 8.0) and T27 (57.7 ± 4.3) recorded the next highest scores. The RWE rehabilitated area transects T18 and T21 again had very different scores. T21 (RWE North) recorded an index score of 36.4 ± 4.6, while T18 (RWE South) recorded an index score of 20.5 ± 0.0. The BRN area represented by transect T31 recorded a score of 35.1 ± 3.6. The youngest rehabilitated area, the ANWE represented by T36 recorded an index score of 20.0 ± 2.7.

3.1.2 Pasture Rehabilitation Transects

LFA results for the pasture rehabilitation transects for the 2021 survey are shown in **Figure 4**. The analogue transect (T33) recorded index scores of 68.8 ± 4.4 (Stability Index), 40.8 ± 6.5 (Infiltration Index) and 30.7 ± 7.7 (Nutrient Cycling Index). These index scores are equivalent to the previous year's monitoring results, with only minor improvements in the Infiltration and Nutrient Cycling Index scores. The two ages of pasture rehabilitation recorded similar Stability Index scores compared last year's monitoring – 67.0 ± 2.1 for T5 and 68.6 ± 0.0 for T8, but improved index scores for Infiltration Index and Nutrient Cycling Indices. Transect T5 (2003 rehabilitation) recorded Infiltration and Nutrient Cycling Index scores of 39.3 ± 3.8 and 30.9 ± 3.9 respectively. Transect T8 (1996/97 rehabilitation) recorded Infiltration and Nutrient Cycling Index scores of 35.6 ± 0.0 and 28.2 ± 0.0 respectively.

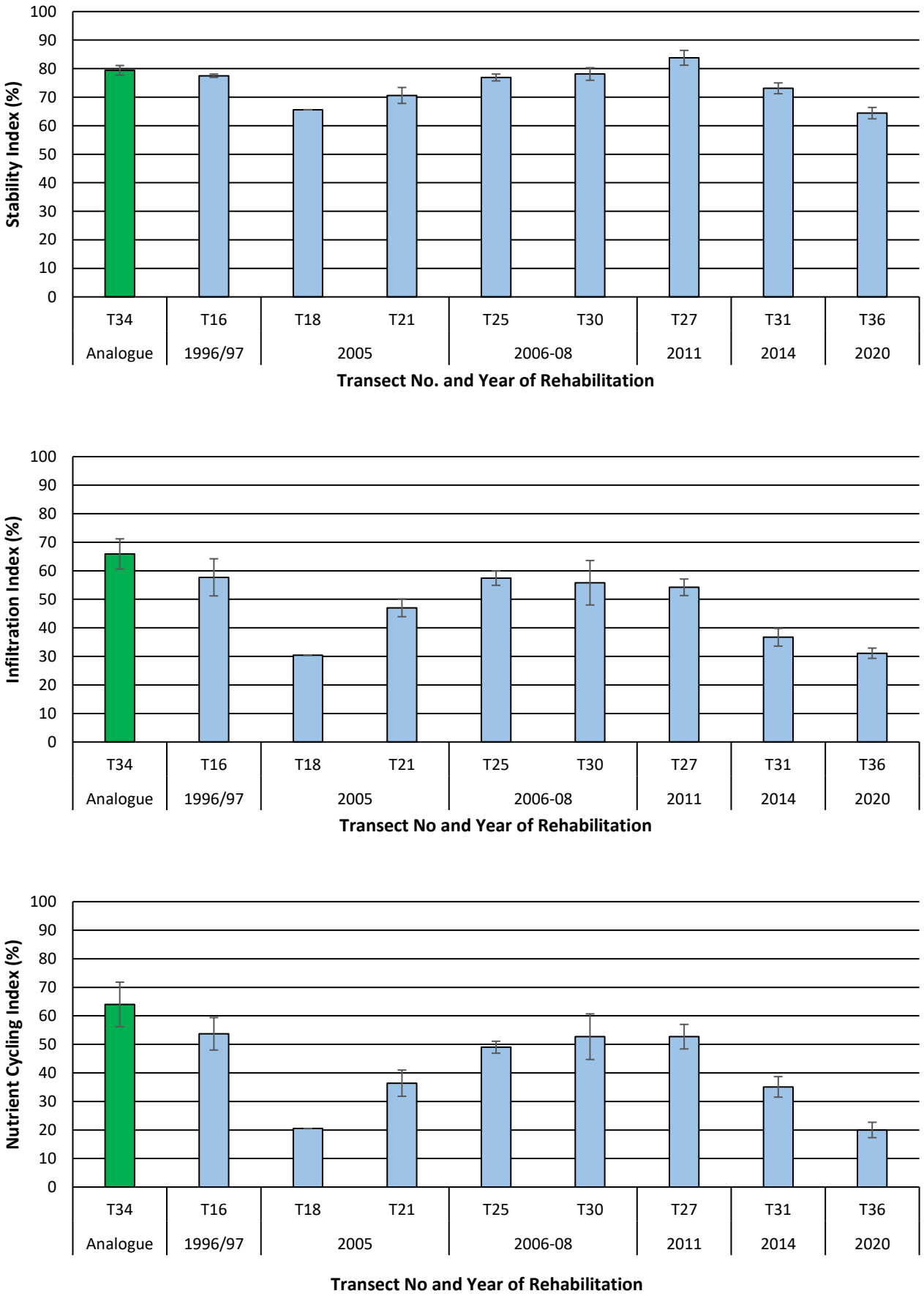

Figure 3: Results of the Landscape Functional Analysis monitoring for the 2021 monitoring of the Stratford Mining Complex native flora rehabilitation transects. Stability Index (top), Infiltration Index (middle) and Nutrient Cycling Index (bottom).

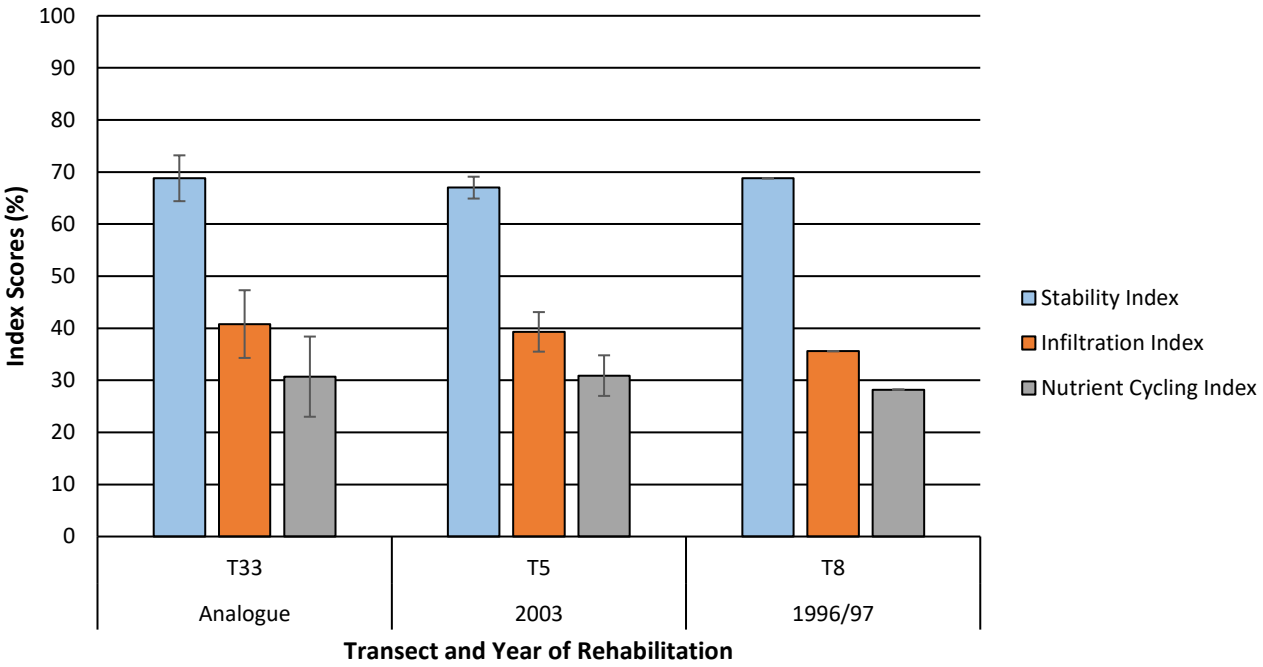

Figure 4: Results of the Landscape Functional Analysis for the 2021 monitoring of the Stratford Mining Complex pasture rehabilitation transects.

3.1.3 Vegetation Structure

The vegetation structure for the 2021 monitoring of the native rehabilitation areas utilised a single analogue area this year and the results are shown in **Figure 5** and **Figure 6**. Transect T34 recorded a total of 6, 636 stems/ha. This was divided between the strata with 60 canopy stems/ha, 749 midstory stems/ha and 5, 827 shrub stems/ha. Total vegetation canopy volume as 33, 366 m^3/ha. This was divided between three strata with values of 29, 572 m^3/ha for overstory, 6, 781 m^3/ha for the midstory and 613 m^3/ha for the shrub stratum. The data quality was excellent for all strata.

The Stratford Woodland Rehabilitation transect surveyed this year, T16 recorded a total of 736 stem/ha. These consisted of 166 overstory stems/ha, with 444 midstory stems/ha and 127 shrub stratum stems/ha. Total Canopy volume recorded 14, 384 m^3/ha for the canopy stratum, 2, 413 m^3/ha for the midstory and 51 m^3/ha for the shrub strata. Data quality was excellent for the overstory and midstory strata, while only rated good for the shrub stratum.

The Roseville Waste Emplacement had two very different vegetation structures. Transect T18 located on the RWE South, recorded a total of 315 stems/ha in two vegetation layers. The *Eucalyptus* stratum recorded a total of 74 stems/ha and a shrub stratum with 1, 111 stems/ha. The total canopy volume was calculated at 203 m3/ha, divided into the *Eucalyptus* stratum with 46 m3/ha and the shrub stratum with 157 m3/ha. Data quality was rated as excellent for both strata. Transect T21 located on the RWE North was very sparsely wooded. Total stem density was 315 stems/ha measured as “Nearest stem” with a canopy volume of 1, 077 m3/ha. Even by combining all strata, data quality was rated as poor.

The BRN 2006-08 rehabilitation areas also displayed two very different vegetation structures. Transect T25 recorded total stem densities of 1, 910 stems/ha in three strata. This was divided into overstory with 18 stems/ha, midstory with 394 stems/ha and shrubs with 1, 497 stems/ha. Total canopy volume was 13, 655 m3/ha. This was divided between the overstory with 3, 035 m3/ha, the midstory with 10, 435 m3/ha and the shrub stratum with 187 m3/ha. Data quality was rated as excellent for all strata. Transect T30 data is shown graphically in **Figure 7**. This transect had very dense 36, 366 stems/ha. This consisted of 2, 699 midstory stems/ha and an extremely high 33, 667 shrub stems/ha. There were no overstorey species within the vicinity of this transect.

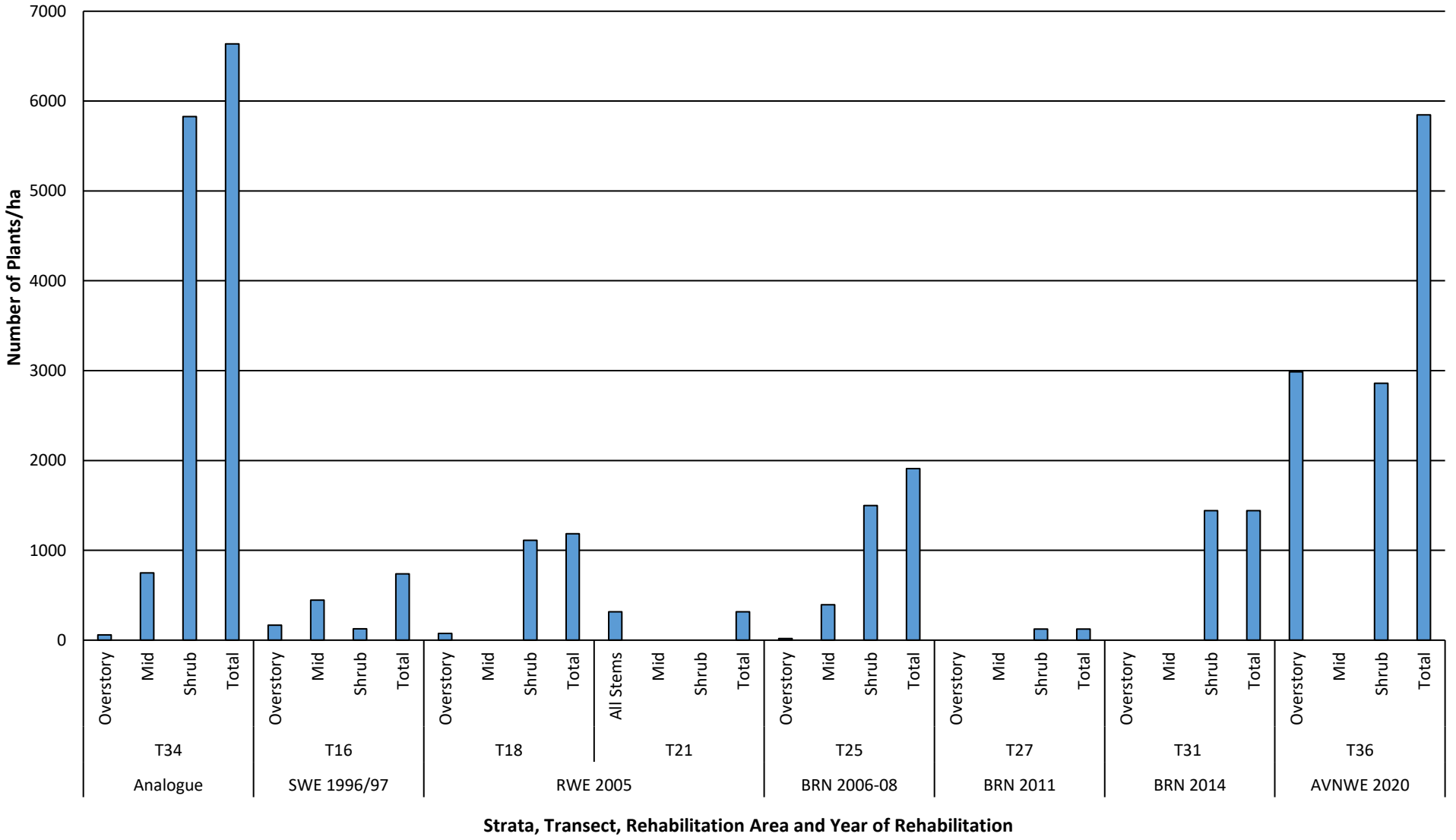

Figure 5: **Vegetation structure results of the 2021 monitoring showing the number of plants per hectare displayed by strata (Canopy, midstory and shrub) by transect and rehabilitation area. Please note the Transect T30 will be displayed separately.**

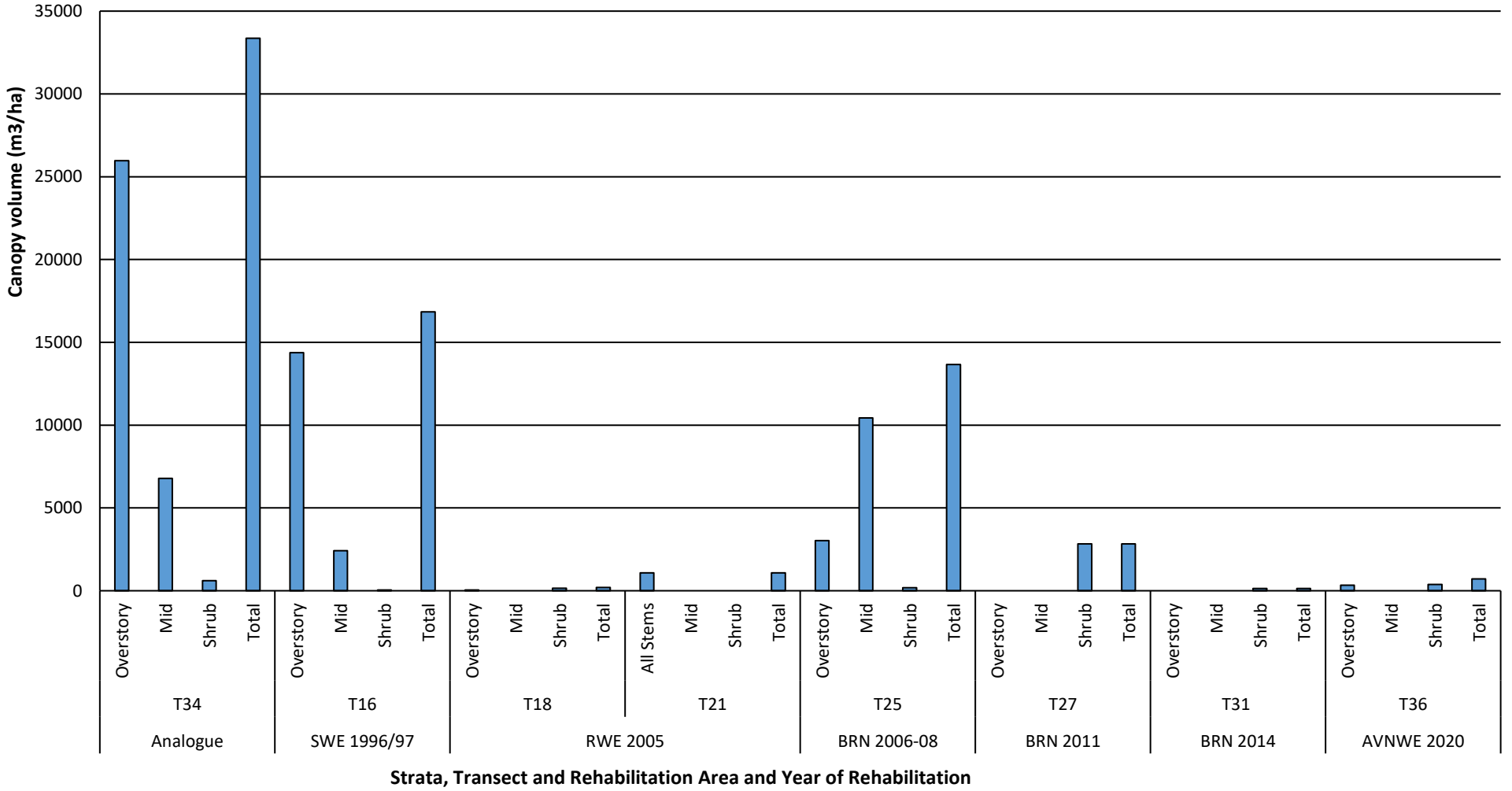

Figure 6: **Vegetation structure results of the 2021 monitoring showing the canopy volume of woody native plants per hectare displayed by strata (Canopy, midstory and shrub) by transect and rehabilitation area. Please note the Transect T30 will be displayed separately.**

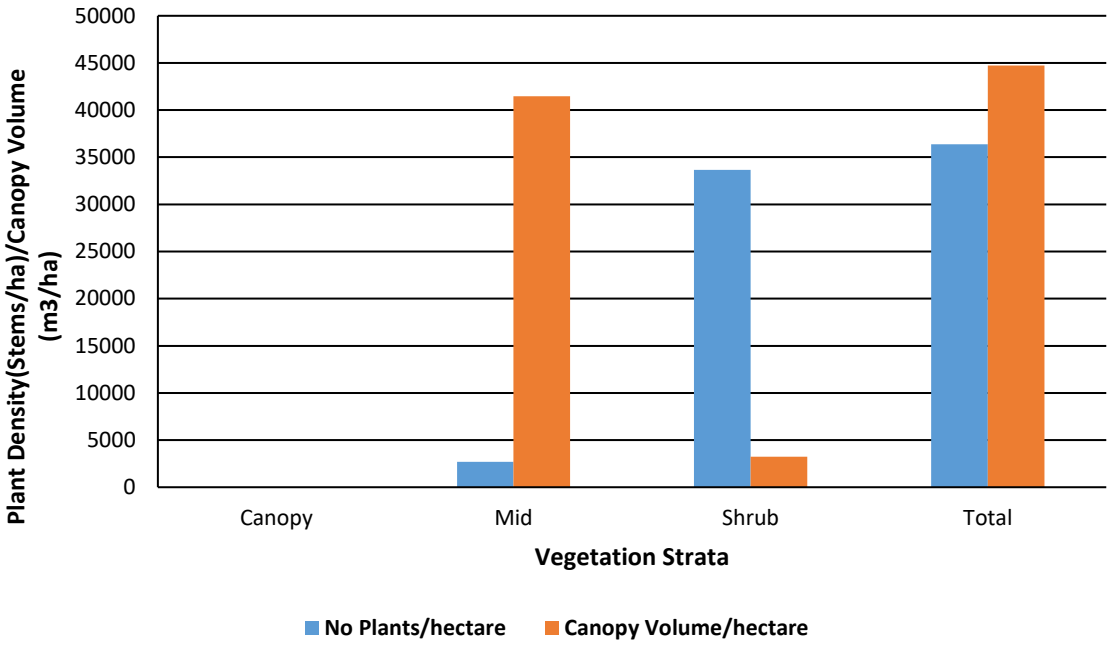

Figure 7: Vegetation structure results of the 2021 monitoring showing the canopy volume of woody native plants per hectare displayed by strata (Canopy, midstory and shrub) for Transect T30 located in the BRN rehabilitation area. Note the high density of plants and high canopy volume.

Total canopy volume was recorded at 44, 724 m^3/ha broken up into midstory with 41, 474 m3/ha and shrubs with 3, 250 m3/ha. Data quality was rated as excellent for both strata.

The BRN 2011 rehabilitation, Transect T27 recorded very sparse midstory/shrub revegetation consisting of 124 stems/ha with a canopy volume of 2, 838 m3/ha. Data quality was rated as good for this transect.

The BRN 2014 rehabilitation, Transect T31 is also lacking in structure with only shrub species recorded with a density of 1440 stems/ha with a canopy volume of 139 m3/ha. Data quality was rated excellent for the stratum measured for this transect.

The AVNWE rehabilitation, Transect T36 is very new, having been seeded in 2020. This area recorded a total density of 5, 846 stems/ha. This consisted of a future overstorey stratum of *Eucalyptus* species (still very young) at 2, 986 stems/ha and all other species (all under shrub height) of 2, 859 stems/ha. Total canopy volume was recorded at 717 m3/ha. The overstorey canopy volume was recorded at 337 m3/ha while the shrub stratum recorded a canopy volume of 381 m3/ha. Data quality was rated as excellent for both strata.

4 DISCUSSION

4.1 NATIVE FLORA REHABILITATION AREAS

The 2021 survey showed that Native Flora rehabilitation areas had achieved or were on trajectory to achieve similar mean index scores to the analogue scores. The Stability Index scores were at, or above analogue values and the Infiltration and Nutrient Cycling Index scores were near analogue values or similar to previous years' monitoring.

4.1.1 Analogue Transect (T34)

The woodland analogue was reduced to a single transect/area this survey (T34) which has had the effect of increasing the analogue LFA values slightly, but the index scores are similar to last year's survey (**Figure 8**). This indicates that any changes to index scores observed in the rehabilitation areas can be attributed to changes in transect as outlined in the methods or to the properties of the rehabilitation area. A noticeable change in the analogue transect area was a large increase in the density of the shrub layer (**Plate 3** and **Figure 10**). The 2020 survey recorded 918 shrubs/ha while this survey recorded 5, 827 shrubs/ha. Examination of the survey data (not shown) shows that this year, in addition to the *Breynia oblongifolia* (Coffee Bush) that dominated the shrub layer in 2020, a number of additional species that were not recorded previously have germinated and increased the density of this layer substantially. These included *Trema tomentosa* (Native Peach) (the majority of the new shrubs) with *Ozothamnus diosmifolius* (White Dogwood) and *Plectranthus parviflorus* (Cockspur Flower) also recorded. This is mentioned to foreshadow that with time, the *T. tomentosa* will grow to become a midstory layer. There were no substantial changes to the overstory or midstory layers this survey.

Lantana is beginning to become established in the area surrounding the transect, and evidence of weed control efforts were observed. Some overspray and damage to native vegetation was also observed.

The only recommendation is for continued periodic weed control.

4.1.2 Stratford Woodland Rehabilitation Area 1996/97 Rehabilitation (SWE - T16)

This area was rehabilitated in 1996/97 and represents the oldest of the native flora revegetation areas. This area, and its neighbouring transect T17, represent rehabilitation that is closest to analogue values. Species observed in this area included *Eucalyptus punctata, E. umbra* and *E. crebra* in the overstory with *Melaleuca nodosa, Acacia irrorata, T. tomentosa and B. oblongifolia* in the midstory and sparse shrub layers. *Hardenbergia violacea* (Purple Coral Pea) and numerous Eucalypt and Acacia seedlings were also observed over a largely exotic groundcover. Weed species included dense *Lantana camara* and *Solanum mauritianum* (Wild Tobacco), with scattered *Araujia sericifera* (Moth Vine), *Solanum nigrum, Sida rhombifolia* and *Verbena bonariensis*.

The Stability index has achieved analogue value and has done since the 2017 and 2019 surveys (the last surveys of this specific transect) (**Figure 8**). The Infiltration and Nutrient Cycling Indices have improved over the 2019 survey and approaching the analogue values.

The vegetation structure of this area most closely resembles the analogue site with defined overstorey, midstory and shrub layers, although the densities of the various strata are not in the same proportions. This rehabilitation area has a higher overstorey density and a much smaller canopy volume for these strata indicating that the individual trees themselves have not yet reached the same sizes as the analogue area. The midstory density is still approximately half that of the analogue area, and the shrub layer is very much reduced in comparison to the analogue site, however both strata recorded a slight increase over the 2019 survey indicating some natural recruitment over that period of time. Diversity is still much lower when compared to the analogue area but the presence of *T. tomentosa and B. oblongifolia* demonstrates that new species are being recruited into the rehabilitation area.

The only recommendation to be made is for control works of woody weeds to be undertaken throughout this area targeting Lantana, Wild Tobacco and Moth Vine. It is noted here that Stratford Coal has engaged suitably qualified contractors to conduct this work beginning in early 2022.

4.1.3 Roseville Waste Emplacement 2005 Rehabilitation (T18 and T21)

The RWE is divided into two smaller waste emplacements with e southern emplacement monitored by T18 and the northern emplacement by T21.

The area monitored by T18 is located on the flat of the southern emplacement and consists of sparse native overstory and midstory/shrub species with groundcover consisting of exotic and native grasses and forbs (**Plate 5**). The current Eucalypt density is within the target range for open woodland, with 74 stems/ha, while the combined midstory and shrub layers are below the equivalent analogue densities. The Eucalypts were observed to be suffering from dieback, with almost all individuals showing signs of stress (**Plate 1**). Many were displaying some re-growth, but the effect of the stress has hindered the revegetation effort with no fruit or seed observed on any of the Eucalypt trees.

Plate 1: Eucalypts displaying dieback on Roseville Waste Emplacement (south), T18

Shrub and midstory species included *A. falcata, A. longifolia, A. ulicifolia* and *Leptospermum polygalifolium*. Groundcover included *Themeda triandra, Eragrostis brownii* and *Imperata cylindrica* with *Glycine clandestine, Lobelia purpurascens, Cyperus* spp. *and Oxalis perennans* observed. No major weed infestations were recorded but Wild Tobacco and some Blackberry was present.

The LFA indices recorded this survey were some of the lowest from this survey. The low infiltration and nutrient cycling indices indicate that this section of the rehabilitation is struggling to progress, and the indices appear to have decreased from the previous 2019 survey. These low index scores combined with the die back and subsequent low rate of litter accumulation, suggest that the spoil emplacement does not retain water well, especially given that other sections of the rehabilitation at the SMC recorded abundant germination and self-recruitment (see below sections). Despite these apparent harsh conditions, a very few Eucalypt seedlings – as opposed to the resprouting trees – were observed.

The 2020 report (Kleinfelder, 2020) made recommendations for supplemental/in-fill planting to occur and the results of this survey support that recommendation. It is noted here that Stratford Coal have engaged suitably qualified contractors to conduct just such a program that will commence in early 2022. Further, weed control efforts will also be undertaken targeting the above-mentioned weeds.

The northern emplacement was monitored by T21 on the east facing slope. This area in contrast to T18, is similar to the 2020 transect T19 with a dense groundcover of exotic grasses *Cenchrus clandestinus* (Kikuyu) and *Setaria sphacelata* (South African Pigeon Grass) and only a few overstory and other natives from the planting undertaken in 2016 (**Plate 6**). The density in this area was calculated to be 315 stems/ha, with all strata included in this count

The LFA indices show that the soil surface stability is quite good, and the infiltration and nutrient cycling indices are higher than the southern emplacement, they are still lower than other, younger rehabilitation areas at the SMC. As with the above transect, the indices have decreased from the previous time this area was surveyed. This suggest that the issues identified above are not limited to the southern emplacement, but inherent to the RWE. These may include shallow topsoil and low rates of litter accumulation that result in low moisture retention. The observation of the native vegetation on this emplacement is that it is sparse, and did not suffer from dieback, and indeed many Eucalypts were observed to have fruit (**Plate 2**).

Plate 2: Example of healthy Eucalypt with fruit at the Roseville Waste Emplacement, T21

Aspect may also be playing a part in the state of the soil surface, and hence revegetation with both eastern faces of the RWE (north and south) having denser groundcover and native vegetation, even if only sparse, at a more mature stage of growth. The dense groundcover does limit self-recruitment with any seed unlikely to be able to germinate and outcompete the grasses.

Recommendations are similar to the southern emplacement with the planting program to encompass tubestock installation on the northern emplacement at the same time.

4.1.4 Bowens Road North Waste Emplacement 2006 – 2008 Rehabilitation (T25 and T30)

The BRNWE rehabilitation will be discussed as two separate domains in line with recommendations from the 2020 monitoring report (Kleinfelder, 2020) due to the very different vegetation structures of the two areas represented by Transects T25 (northern section) and T30 (southern section).

The northern section of the waste emplacement (T25) has good structure with clearly defined overstory, midstory and shrub strata (**Plate 7**). The overstory is composed of various Eucalyptus species including *C maculata, E. punctata* and *E. crebra* but is very sparse with a calculated density of 18 stems/ha. The midstory stratum consists largely of younger Eucalypts plus *A. irrorata, A longifolia* and a single *Grevillea robusta* that is likely to be seeded from birds from a nearby garden or roadside. The shrub stratum consists of seedlings and saplings of *A. irrorata*, with *A. ulicifolia, B. oblongifolia* and *T. tomentosa* as well as very young Eucalypts. A somewhat unusual feature of this area is the clumped nature of the native vegetation with patches of dense overstory and large areas of very sparse shrubs over the exotic groundcover of South African Pigeon Grass and Kikuyu. Vegetation dynamics data (not shown) recorded that the average distance between overstory stems was 24m, but with the clumping effect this ranged from under 1m to well over 60m. Overall, the density of the native woody vegetation has increased in this area, with double the number of total stems – 239 in 2019 compared to 539 this survey – with the largest increases in the midstory stratum where *A. irrorata* saplings have matured into this stratum. The presence of Eucalypts in all three strata indicates at least three recruitment events, a key factor in the development a self-sustaining ecosystem.

Woody weeds were patchy, but dense where present with large Lantana and Wild Tobacco present, along with several Moth Vine plants.

LFA indices have remained consistent over last several surveys indicating uniform soil surface processes. The stability index is at analogue levels, with the remaining indices have remained largely unchanged.

Recommendations here are limited to control of the woody weeds above, with the note that weed control works have been programmed for early 2022.

The southern section of the waste emplacement was monitored by Transect T30 where the vegetation is dense *A. irrorata* of various heights with the occasional *T. tomentosa* and this year a huge germination of *O. diosmifolius* (**Plate 9**). Vegetation structure data shows that stem densities were extremely high with almost 45, 000 stems/ha compared to the 3,834 stems/ha measured in 2019. The shrub stratum recorded over 36, 000 stems/ha at an average distance of 0.55m. Examination of the survey data (not shown) shows that every shrub stem measured was an *O. diosmifolius* highlighting the explosion of germination that this species has produced. The growth form of both the *A. irrorata* and *T. tomentosa* produces dense canopy that serves to shade out the soil surface only allowing sparse groundcover, but a dense cover of litter. Sparse grass has been able to grow where senescing *Acacias* have produced gaps in the canopy. As in previous surveys there are no overstorey within the vicinity of the transect, but some individual trees are located in this section of the BRN, visible from other sites on the SMC.

Recommendations here are limited to control of the woody weeds above, with the note that weed control works have been programmed for early 2022.

4.1.5 Bowens Road North Waste Emplacement 2011 Rehabilitation (T27)

This area of the BRN rehabilitation has been monitored by Transect T25. The vegetation consists of a very dense *S. sphacelata* groundcover with a sparse and diminishing number of *Acacia* species including *A. decora, A. falcata, A. irrorata* and *A. longifolia* with an occasional *O. diosmifolius*. Woody weeds while not dense, are present including the ubiquitous Lantana and Wild Tobacco (**Plate 8**).

LFA indices were consistent with previous surveys. The 2021 Stability Index score was above the analogue site, while the remaining two indices were lower, but as mentioned, equivalent to the previous survey (**Figure 9**). The dense grassy groundcover has successfully stabilised the soil surface, but without further litter input from woody vegetation these remaining indices will continue to lag.

This are recorded only 124 stems/ha, with no overstorey species recorded or observed in the vicinity. This is a slight decrease for the previous survey as the *Acacias* continue to senesce but continues the pattern of decline since monitoring was undertaken from 2012 when 7, 464 stems/ha were recorded (**Figure 10**). Canopy volumes have continued to increase as the longer-lived *Acacias* mature and increase in size. No self-recruitment has been observed in this area (hence the declining stem density) which can be attributed to the groundcover acting to suppress any germination.

Recommendations are for weed control and replanting, noting that the 2022 planting program will encompass this area.

4.1.6 Bowens Road North Waste Emplacement 2014 Rehabilitation (T31)

This area was not surveyed the previous year due to operation restrictions. It is characterised by shallow topsoils, patchy groundcovers and relatively sparse shrub stratum of *Acacia decurrens, A falcata* (the dominant species), *A. ulicifolia, Cassinia aculeata* (Dolly Bush) and *Lomandra longifolia.* The groundcover can be dense where topsoils have not been eroded or have accumulated after transport downslope, and includes *S. sphacelata, Cynodon dactylon* (Couch) and *Themeda triandra* (Kangaroo Grass) (**Plate 10**).

The LFA indices are consistently below the analogue values but are consistent throughout the monitoring history (**Figure 9**). The soil surface of this area shows signs of previous erosion with small rills and terracettes, but the presence of cryptograms (mosses and lichens) and the relatively small areas of bare soil show that these features are not currently active. The lack of litter accumulation and the soil crusting observed in the course of the monitoring indicates that water infiltration into soil profile is not high and is one of the factors hindering revegetation.

There is no vegetation structure to speak of, with only the species listed above recorded in the vicinity. Many of the *Acacias* have senesced, but there is evidence of self-recruitment with seedlings of several of the species observed. No woody weeds were observed in this area.

Recommendations for re-planting will be satisfied with the 2022 planting program to include this area.

4.1.7 Avon North Waste Emplacement 2020 Rehabilitation (T36)

This area was rehabilitated in 2020 by broadcast seeding. This is the first monitoring event undertaken and the results are promising. The native vegetation is diverse with species from what will be all four strata at maturity i.e. overstory, midstory, shrubs and groundcovers (**Plate 11**). The seeding program has resulted in some of the best diversity of any of the rehabilitation areas monitored at the SMC. Many of the Eucalyptus species were still young, but up to four species were confidently identified along with 12 midstory and shrub species and nine native grass species.

Given the young age of this rehabilitation area, the LFA indices are below analogue levels. There has been no time for very much litter accumulation and there were large areas of bare soil.

The vegetation structure is likewise very young but does highlight the future likelihood that this rehabilitation area will consist of three distinct vegetation strata with excellent diversity. The overstory density as measured by this survey is very dense at almost 3, 000 stems/ha. This suggests that either a substantial portion of the Eucalypts germinated for the seed bank, or that rates of applied seed can be further reduced. Target densities for overstory species are in the range of 80 – 150 stems/ha for woodland and up to 260 stems/ha for open forest.

Woody weeds (Wild Tobacco and *Phytolacca octandra,* Inkweed) were observed in the rehabilitation area. Weed control works are recommended and will commence in early 2022.

4.2 Pasture Rehabilitation

4.2.1 Pasture Rehabilitation Analogue (T33)

The pasture analogue transect consists of a mix of exotic and native grasses and forbs and now that cattle have been removed from this area overstory seedlings have been observed germinating (**Plate 12**). *Andropogon virginicus* (Whisky Grass) has become established and is slowly becoming dominant, or at least more visually noticeable.

The Stability Index score has remained consistent for several surveys. The Infiltration and Nutrient Cycling Indices are higher than the previous survey and reflect more variation over the course of surveys. This is probably due to changing management practices, with cattle now excluded and slashing no longer happening allowing for some build-up of litter and less disturbance.

A noticeable feature of the transect area was the increase in natural recruitment overstory species from the paddock trees. This area is beginning to resemble a generating woodland area. It is suggested that another pasture analogue site be chosen if pasture monitoring is to continue.

4.2.2 Stratford Waste Emplacement 1996/97 (T8) and 2003 (T5) Pasture Rehabilitation

Despite the differing ages of rehabilitation, the LFA indices for these transects are nearly identical, and very similar to the analogue site scores. This indicates that the pasture rehabilitation, despite the differences in management between the transect areas are approaching or have achieved a level of equilibrium, with only outside factors such as rainfall having a major influence on the state of the soil surface itself.

4.3 Conclusions and General Recommendations

The 2021 monitoring of the native flora rehabilitation areas show mixed results. Areas where revegetation has been successful appear to have a combination of the factors in their favour. They appear to have good topsoil cover, have been seeded with a good mix of overstory, midstory and shrub species, and often have a favourable southerly or eastern aspect. These include the Stratford Woodland 1996/97 rehabilitation and the Bowens Road North 2006-08 rehabilitation, especially the northern area represented by Transect T25 this year's monitoring and T24 from the 2020 monitoring. These areas most closely resemble the analogue site in terms of the biophysical processes (LFA indices) with good litter production and subsequent nutrient cycling. These areas also show some natural recruitment with seedlings of different species and strata evident, as well as species such as *Trema tomentosa* introduced by fauna. The establishment of overstory species in these areas facilitates the self-recruitment due to the suppression of the exotic groundcovers that are prevalent on the SMC. As stated in Section 4.1.7 T36 above, the early seeding and/or planting of a high diversity of species is the preferred method of revegetation, although the ability to seed into bare topsoil and good timing with rainfall after the seeding ensures the best result possible.

Area with less successful native revegetation such as the Roseville Waste Emplacements and the Bowens Road North 2011 and 2014 rehabilitation areas appear to have less topsoil (or it has eroded as in the area represented by T31), or a less favourable westerly or exposed aspect with higher rates of evaporation. These areas suffer from considerable dieback of native flora that had been initially established, and in the case of the BRN 2011 and the RWE northern mound revegetation areas, dense exotic groundcover has prevented any self-recruitment of the native species that are present. The RWE southern mound did have an area of successful revegetation on the western side of the emplacement, but as with the top section surrounding T18, this has suffered dieback, both natural from senescing *Acacias* and from a presumed inability to retain water – as evidence by the *Eucalyptus* dieback. The low infiltration index score on the T18 transect suggests that water is unable to penetrate the soil, rather than draining away, combined with a high evaporation rate, may be the main reason for the dieback. The planting program methodology will employ ripping to break up the soil surface, which will increase infiltration into the "subsoil" of the waste emplacement. These areas have had a least one attempt at additional planting of overstory tubestock with limited success, although the RWE northern mound does have some survival of these plants – these were the measured overstory individuals in the T21 monitoring. Additionally for the RWE, where the groundcover is mainly native grasses, some minor self-recruitment was observed.

SMC environmental staff have been aware these issues and the combination of the 2022 planting program and weed control works will serve to improve the native flora rehabilitation in these areas.

General recommendations that have been made in previous reports include the consideration of environmental or cool season burns to reduce the grassy biomass and weeds and stimulate the native species. With the implementation of the planting program, burns will be not a suitable management tool until such time as the tubestock matures and is able to survive any fires, and/or wit the cessation of active mining operations.

The installation of nest boxes has been suggested for the BRN 2006-08 rehabilitation and the Stratford Woodland 1996/97 rehabilitation areas in previous reports. However, with the active mining operations still ongoing at Avon North Pit and the Stratford East Extension, these areas have become isolated from other native vegetation, and nest boxes for arboreal mammals is not suitable. However, nest boxes for birds are a consideration as these areas do have individual trees of sufficient size to support larger boxes.

Pasture rehabilitation areas are progressing satisfactorily and are currently supporting grazing. As stated in Section 4.2.1 T33 the analogue transect is beginning to resemble woodland rehabilitation with a many self-recruited overstory seedlings observed. It is recommended that the analogue site be relocated further into the current paddock, away from paddock trees, or if this proves not feasible to another paddock entirely. The pasture

rehabilitation areas do not require any remedial action at this stage, with ongoing pasture management from the current lessees the only requirement.

5 REFERENCES

Monitoring of Landscape Function and Vegetation Structure of Rehabilitation Areas at the Stratford Coal Mine (2015) Report prepared by Greening Australia for Stratford Coal Pty Ltd.

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Tongway, D. and Hindley, N. (2004b) Landscape Function Analysis: Procedures for Monitoring and Assessing Landscapes with special reference to Mine sites and Rangelands. CSIRO Publishing, Canberra.

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APPENDIX A: TRANSECT MONITORING PHOTOGRAPHS

Plate 3: **Native Flora Rehabilitation Analogue Transect T34 showing LFA transect (top) and example of grassy litter groundcover typical of this transect**

Plate 4: Stratford Woodland Rehabilitation Transect T16 (1996/97) showing LFA transect (top) and typical grassy and forb (exotic and native) and litter groundcover (bottom). Note the abundance of woody weeds species Wild Tobacco and Lantana in the top photo

Plate 5: **Roseville Waste Emplacement South Transect T18. LFA transect (top) showing sparse native flora rehabilitation and (bottom) typical grassy groundcover.**

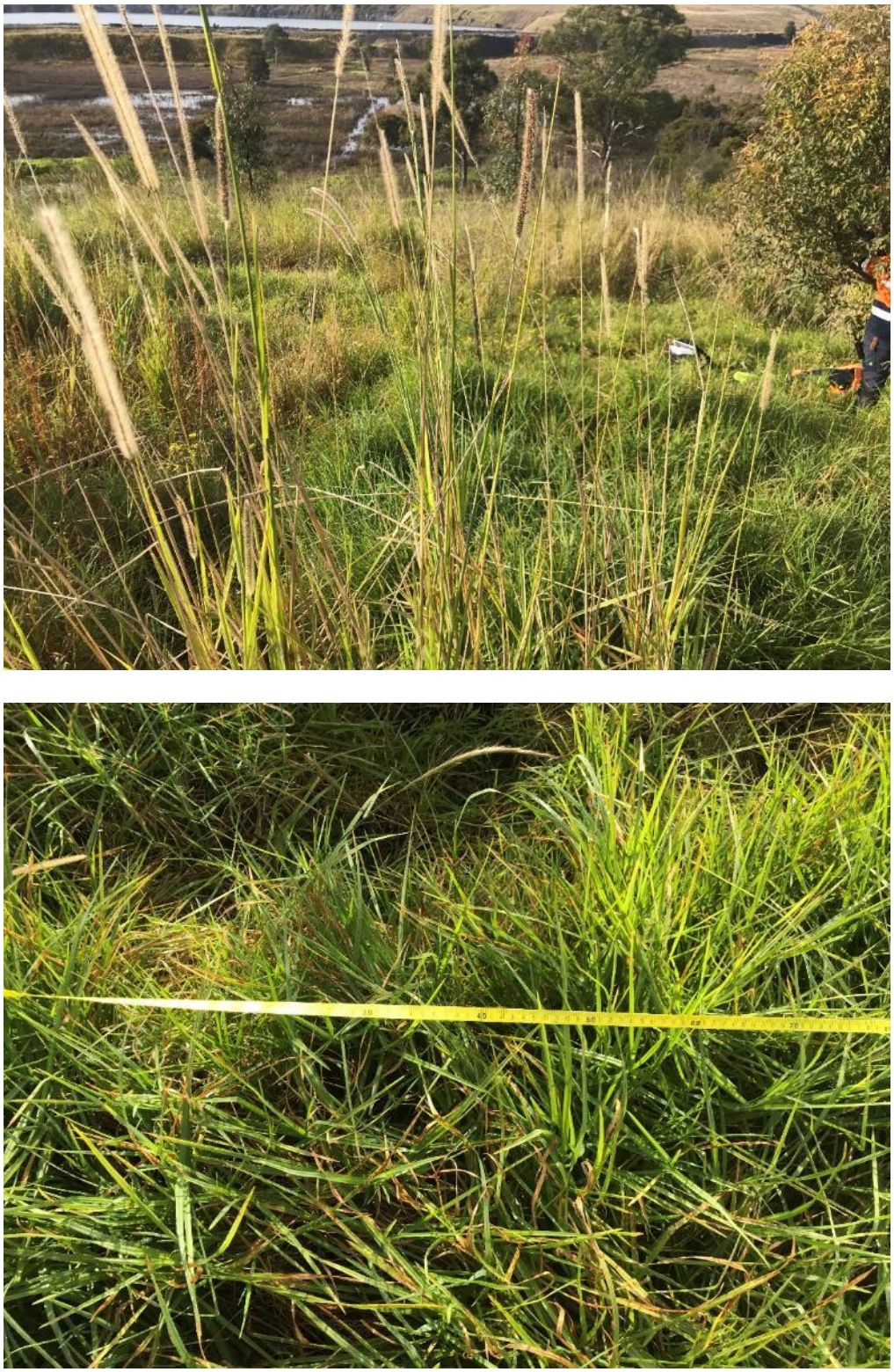

Plate 6: **Roseville Waste Emplacement North Transect T21. LFA transect (top) showing sparse native flora rehabilitation and (bottom) typical dense kikuyu grassy groundcover.**

Plate 7: Bowens Road North Waste Emplacement Rehabilitation Transect T25 showing the LFA transect. The upper transect is under dense canopy before opening up to grassy sward and then under dense shrubs/midstorey. Groundcover photo was not taken.

Plate 8: Bowens Road North Waste Emplacement Rehabilitation Transect T27. Top, LFA Transect showing total absence of overstory species and dense grassy understorey. Bottom, view of typical dense *Setaria* dominated grassy groundcover

Plate 9: Bowens Road North Waste Emplacement Rehabilitation Transect T30. Top, LFA transect showing dense *Acacias.* Bottom, showing typical groundcover under the *Acacia* canopy. Note the number of seedlings including *Acacias* and Lantana, the sparse nature of the grasses and the amount of exposed soil and litter

Plate 10: Bowens Road North Waste Emplacement Rehabilitation Transect T30. Top, LFA transect showing typical *Acacia* dominated woody vegetation with die-back and patchy grassy groundcover. Bottom, view of typical groundcover grass, cryptograms and sparse litter and some bare soil.

Plate 11: Avon North Waste Emplacement Rehabilitation Transect T36. Top, LFA transect showing the young native flora revegetation. Note the young *Eucalyptus* species and multiple *Acacia* and other shrub species. Grasses and forbs – native and exotic – have established, but bar soil is still quite common. Bottom, view of typical groundcover with good establishment of native grasses

Plate 12: Pasture Rehabilitation Analogue Transect T33. Top, LFA transect showing the prevalence of Whisky Grass (upright reddish-brown grass). Bottom, view of typical grass and forb groundcover. Note the Rough-barked Apple seedling.

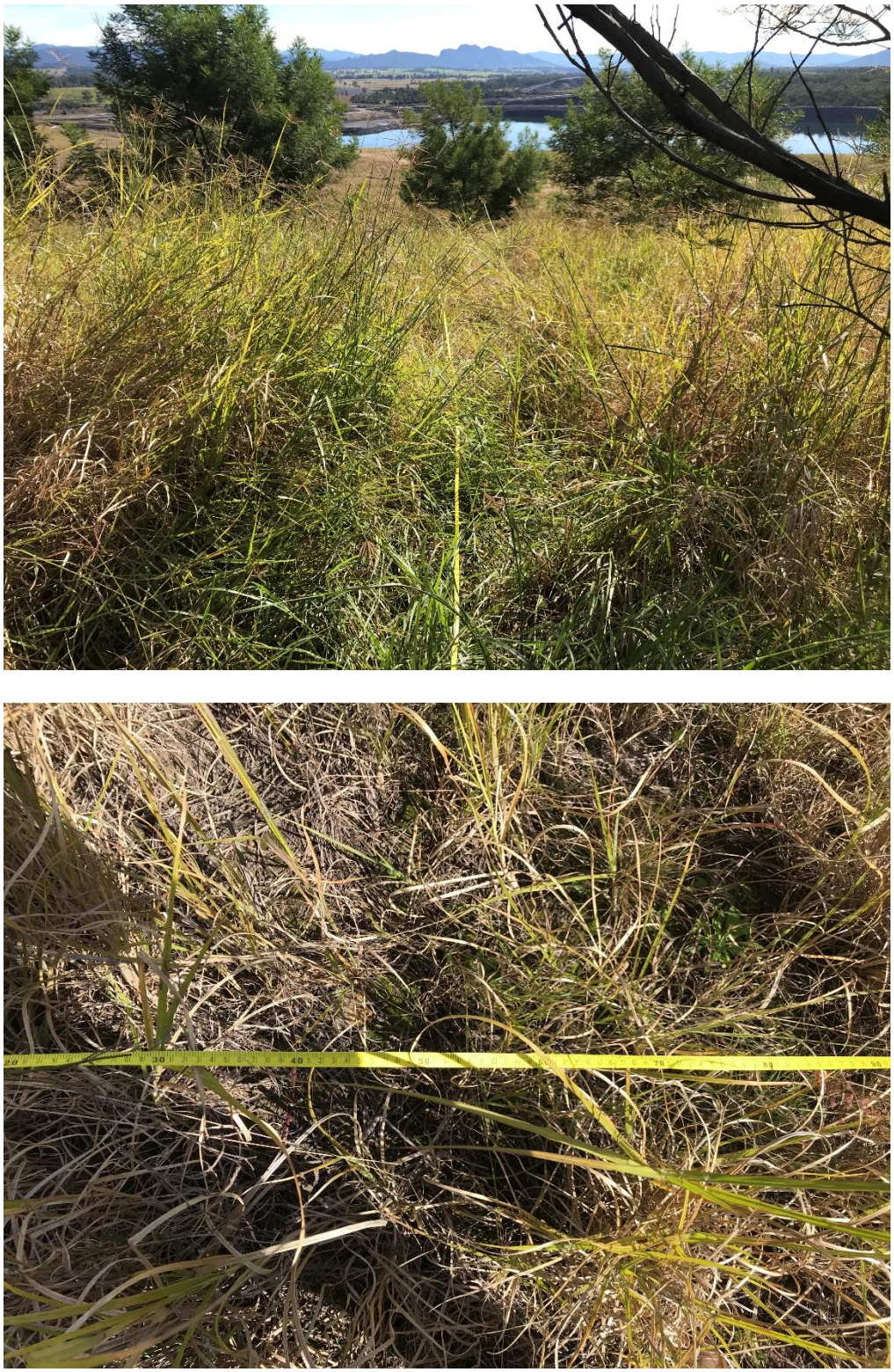

Plate 13: Stratford Waste Emplacement Pasture Rehabilitation Transect T5 (2003 rehabilitation). Top, LFA transect showing dense *Setaria* sward and mature *Acacias*. Bottom, typical dense grassy groundcover.

Plate 14: **Stratford Waste Emplacement Pasture Rehabilitation Transect T8 (1996/97 rehabilitation). Top, LFA transect, Bottom, view of typical grassy groundcover.**

APPENDIX B: HISTORICAL DATA

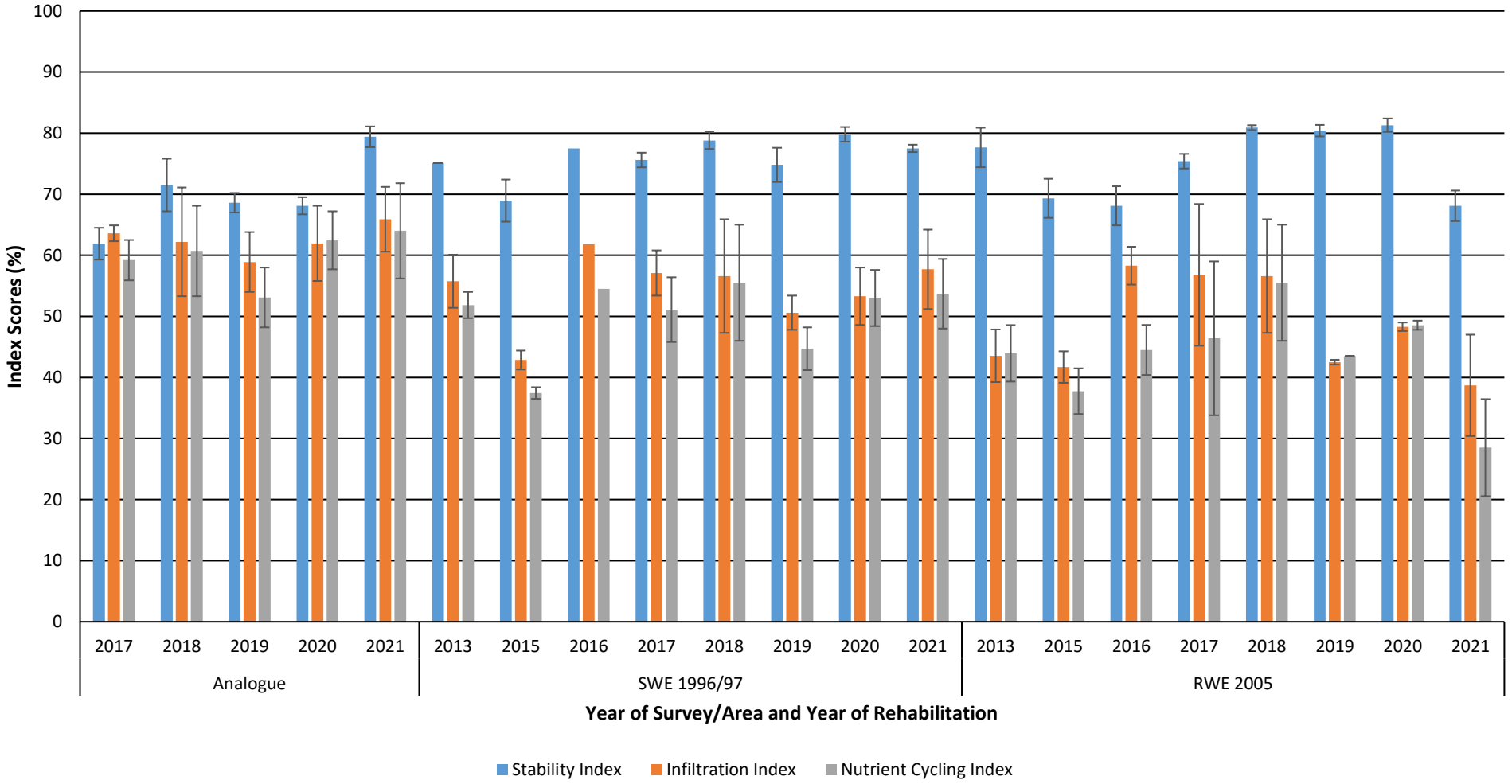

Figure 8: Historical LFA Indices for the Stratford Waste Emplacement and Roseville Waste Emplacement Native Woodland rehabilitation monitoring transects at the SMC

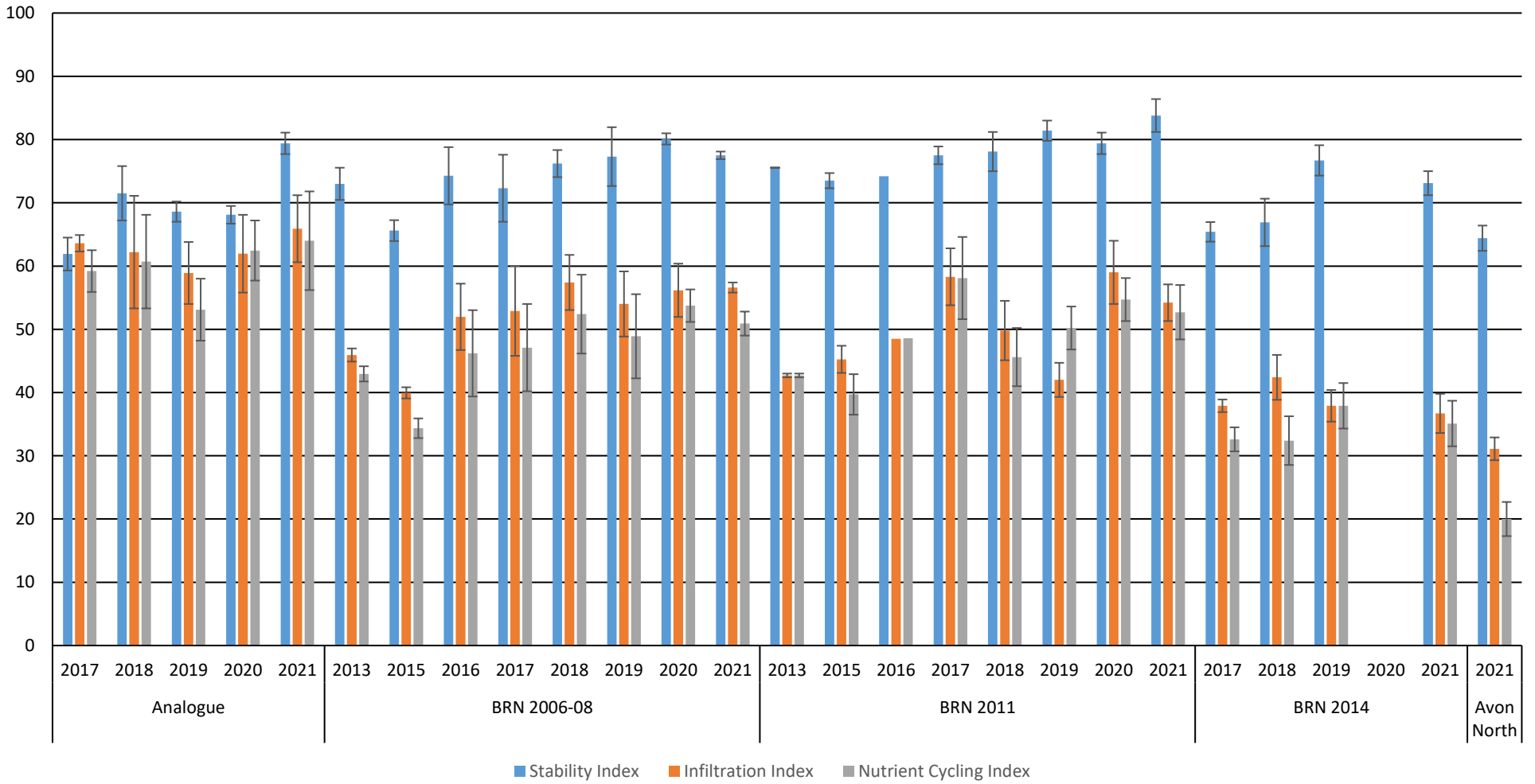

Figure 9: Historical LFA Indices for the Bowens Road North Waste Emplacement and Avon North Waste Emplacement Native Woodland rehabilitation monitoring transects at the SMC

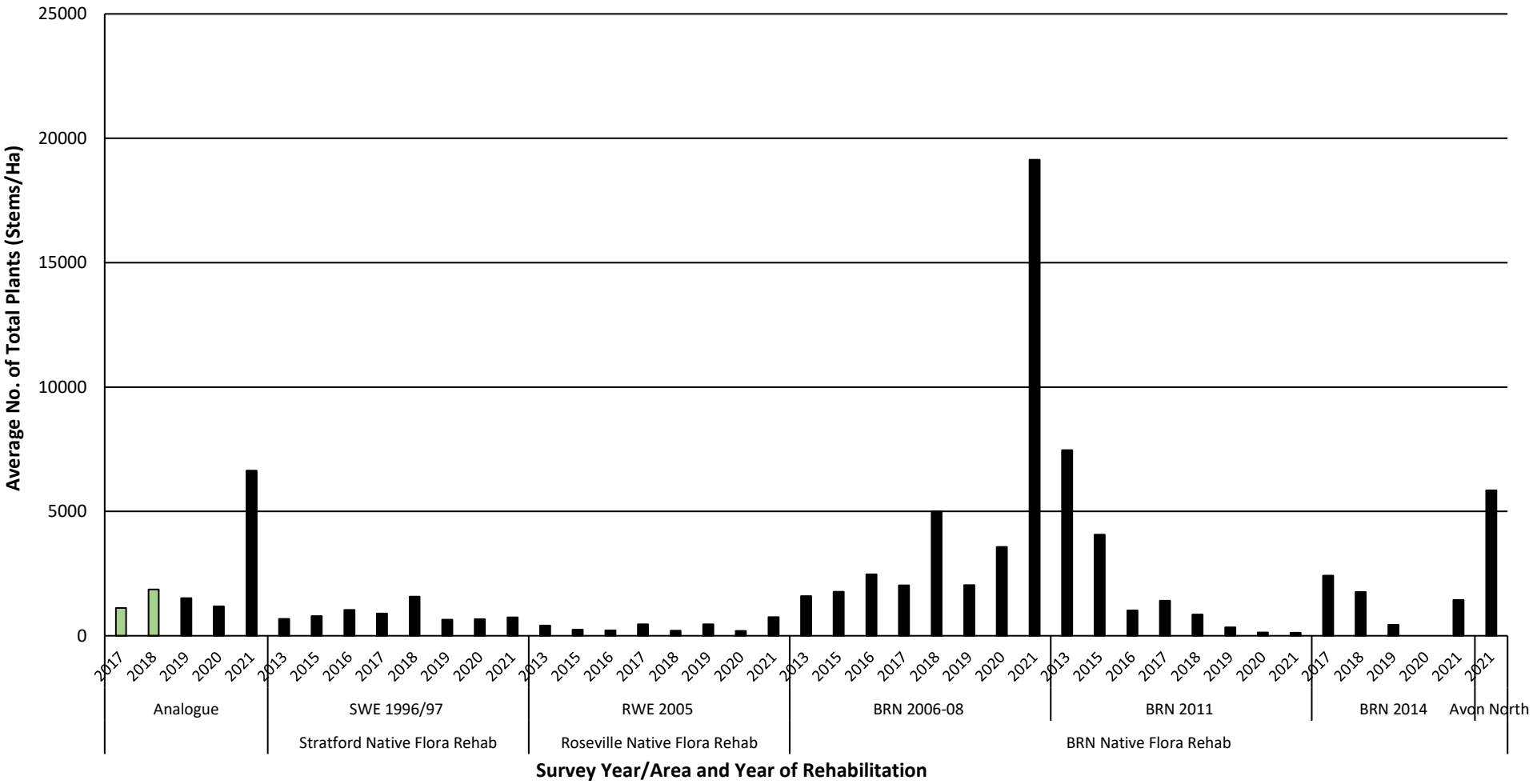

Figure 10: Historical Average stem densities (all strata combined) for the Native Woodland rehabilitation transects at the SMC.

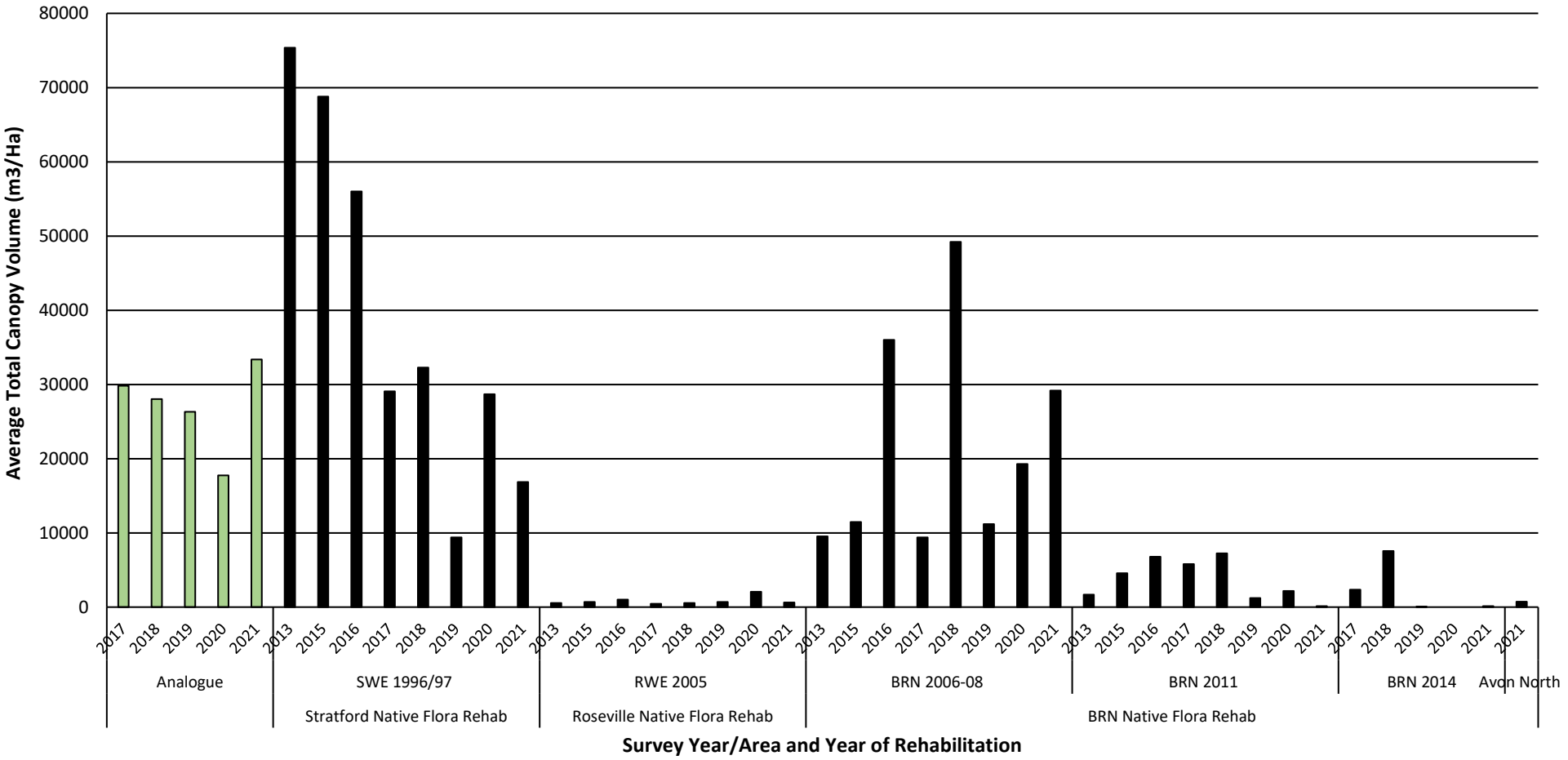

Figure 11: Historical Average canopy volumes (all strata combined) for the Native Woodland rehabilitation transects at the SMC.

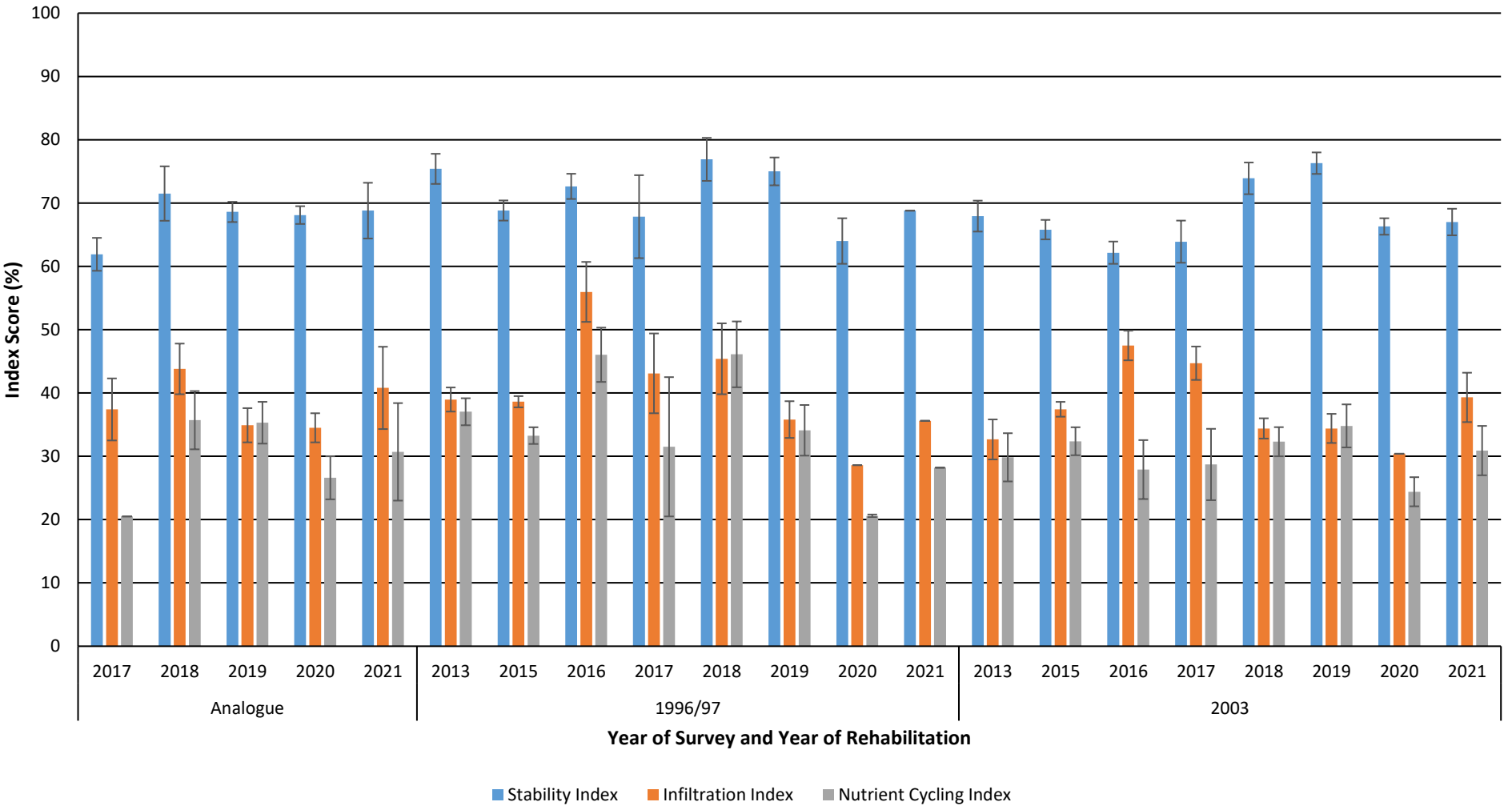

Figure 12: Historical LFA data for the Pasture Rehabilitation areas of the Stratford Waste Emplacement. Note that Analogue transect monitoring was not commenced until 2017