Rio Tinto

Hunter Valley Operations

2016 Annual Environmental Review

March 2017

Rehabilitation Progression at HVO South

Name of Operations	Hunter Valley Operations
Name of Operator	HV Operations Pty Ltd
Development consent /project approval	DA 450-10-2003 / PA 06_0261
Name of holder of development consent/project approval	HV Operations Pty Ltd
Mining Lease Number	Contained within Section 1.4 of this report
Name of Mining Lease Holder	Contained within Section 1.4 of this report
Water Licence Number	Contained within Section 1.4 of this report
Name of Water Licence Holder	Contained within Section 1.4 of this report
MOP/RMP Start Date	HVO North – 18/12/2016 HVO South – 1/11/2015
MOP/RMP End Date	HVO North – 31/12/2018 HVO South – 31/12/2018
Annual Review Start Date	01/01/2016
Annual Review End Date	31/12/2016

I, *Tom Lukeman***, certify that this audit report is a true and accurate record of the compliance status of Hunter Valley Operations for the period 1 January 2016 to 31 December 2016 and that I am authorised to make this statement on behalf of Rio Tinto Coal Australia.**

Note.

a) 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 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.

b) The Crimes Act 1900 contains other offences relating to the 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 2yeasrs imprisonment or $22,000, or both).

Name of Authorised Reporting Officer	Tom Lukeman
Title of Authorised Reporting Officer	General Manager – Hunter Valley Operations
Signature of Authorised Reporting Officer	
Date	27 March 2017

Executive Summary

This Annual Environmental Review (Annual Review) reports on the environmental performance of Hunter Valley Operations (HVO) during the 2016 calendar year and satisfies the requirements of the Hunter Valley Operations (HVO) Development Consents and Mining Leases. The structure of the 2016 Annual Review intends to align with the NSW Government *Post-approval requirements for State significant mining developments – Annual Review Guideline (October 2015).*

HVO produced 17.97 million tonnes of run-of-mine (ROM) coal during 2016, and 13.69 million tonnes of saleable coal, against an approved ROM coal production rate of 26 million tonnes per annum (mtpa).

Noise

HVO manages noise to ensure compliance with permissible noise limits at nearby private residences. During the reporting period there were no non-compliances were recorded against HVO's development consent limits. An additional two Komatsu 830E-DC haul trucks were fitted with sound attenuating equipment to reduce noise output. A total of 340.4 hours of equipment downtime was recorded due to proactive and reactive measures to minimise noise.

Blasting

During the reporting period 289 blast events were initiated at HVO. One blast event on 25th February 2016 recorded an airblast overpressure result of 125.78 dB(L), against a limit of 120 dB(L). No community complaints were received in relation to this blast. HVO was issued a $15,000 penalty notice from the Department of Planning and Environment in relation to this incident. HVO complied with all other blasting-related consent and licence conditions during the reporting period. HVO employs a blast fume management protocol to mitigate generation of post blast fume emissions. One category 3 fume event was recorded in 2016. There were no category 4 or 5 fume events recorded.

Air Quality

Air quality monitoring is undertaken in accordance with the HVO Air Quality Monitoring Programme. An extensive network of monitoring equipment is utilised to assess performance against the relevant conditions of HVO's approvals. During 2016, HVO complied with all short term and annual average air quality criteria. A total of 2568.8 hours of equipment downtime was recorded due to proactive and reactive measures to minimise dust. A total of 350 ha of land was aerial seeded during autumn to minimise wind eroded dust from overburden areas not yet available for rehabilitation.

Heritage

The Cultural Heritage Working Group (CHWG) met and discussed cultural heritage management matters associated with HVO on seven occasions during 2016. Under the provisions of both the HVO South and HVO North Aboriginal Cultural Heritage Management Plans (ACHMP), an ACHMP Compliance Inspection was conducted within both ACHMP areas. The inspection found that all sites have been managed in conformance with the ACHMP requirements. A four day fieldwork program

was conducted at HVO South. During the fieldwork program, four extant Aboriginal cultural heritage sites were salvage mitigated, and a further four new sites were identified and salvaged.

Surface Water

Surface water monitoring activities continued in 2016 in accordance with the HVO Water Management Plan. HVO maintains a network of surface water monitoring sites for mine site dams, discharge points and surrounding natural watercourses. Two water related incidents required notification to government agencies, as detailed in Section 11.3 of this report. As a result of these notifications HVO was issued a $15,000 penalty notice from the EPA in relation to an incident at Parnells Dam, where a pinhole leak was found on some pipework. No material environmental harm resulted from the incidents notified. During 2016 a major upgrade was undertaken on Dam 15N to reduce potential for water leakage to Farrells Creek. The dam wall was remediated to a higher engineering standard and the old pump station was removed from below the dam wall.

Groundwater

Groundwater monitoring activities were undertaken in 2016 in accordance with the HVO Water Management Plan. The monitoring results are used to establish and monitor trends in physical and geochemical parameters of surrounding groundwater potentially influenced by mining. No adverse water quality issues were identified in 2016.

Rehabilitation and Land Management

A total of 72.8ha of mined land was rehabilitated in 2016 and 148.6ha of land was disturbed. Rehabilitation quality improvements included the use of mixed waste compost to improve soil fertility, direct drilling of seed, cover crops and utilising seed harvesting areas to facilitate use of locally sourced seed. During 2016, 162 feral pigs were trapped by control programmes undertaken by HVO and licensees on HVO owned non-mining land.

Biodiversity Management

Weed control, track and fence repairs and vertebrate pest management activities were conducted during 2016 in the Goulburn River Biodiversity Area in accordance with the Regional Offsets Management Plan. Track upgrade work included re-opening the fire track between Seven Oaks and the Goulburn River BA. Two 1080 ground baiting programmes were undertaken on the Goulburn River BA in autumn and spring targeting wild dogs and foxes.

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1 STATEMENT OF COMPLIANCE

Table 1 is a Statement of compliance against the relevant approvals. Table 2 provides a brief summary of the non-compliances and a reference to where these are addressed within this Annual Review.

Table 1: Statement of compliance

Were all conditions of the relevant approval(s) complied with?	
PA 06_02161 (HVO South)	No
DA 450-10-2003 (HVO North)	No

Table 2: Non- compliances

Relevant approval	Condition number	Condition description (summary)	Compliance status[1]	Where addressed in Annual Review
PA 06_02161 (HVO South)	Schedule 3 Condition 7	Airblast Overpressure impact assessment criteria	Non-Compliant (Low)	11.2
DA 450-10-2003 (HVO North)	Schedule 4 Condition 20.	Pollution of waters	Non-Compliant (Medium)	11.3

[1]**Compliance status key for Table 2**

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 unlikely 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 unlikely to occur
Administrative non-compliance	Non-compliant	Only to be applied where the non-compliance does not result in any risk of environmental harm (e.g. submitting a report to government later than required under approval conditions)

2 INTRODUCTION

2.1 Document purpose

This Annual Review is written to satisfy the requirements of the Hunter Valley Operations (HVO) Development Consents and conditions of mining leases for events which occured during the 2016 calendar year. The Annual Review has been written in accordance with the NSW Government *Post-approval requirements for State significant mining developments – Annual Review Guideline (October 2015).*

This report is distributed to:

- NSW Department of Planning and Environment (DP&E);
- NSW Department of Trade and Investment, Division of Resources and Energy (DRE)
- NSW Department of Primary Industries Water (DPI Water)
- Singleton Council and Singleton Library;
- Muswellbrook Shire Council (MSC) and Muswellbrook Library; and
- HVO Community Consultative Committee (CCC).

2.2 Background

HVO is situated in the Upper Hunter Valley between Singleton and Muswellbrook, approximately 24 km northwest of Singleton, and approximately 100 km northwest of Newcastle. The Hunter River geographically divides HVO into HVO North and HVO South; however they are integrated operationally with personnel, equipment and materials utilised as required. This improves operational efficiency, rationalisation of infrastructure and resource utilisation. Hunter Valley Operations is 67.4 per cent owned by Coal & Allied Industries and 32.4 percent owned by Mitsubishi Development.

The layout of the HVO pits and facilities are shown in Figure 1.

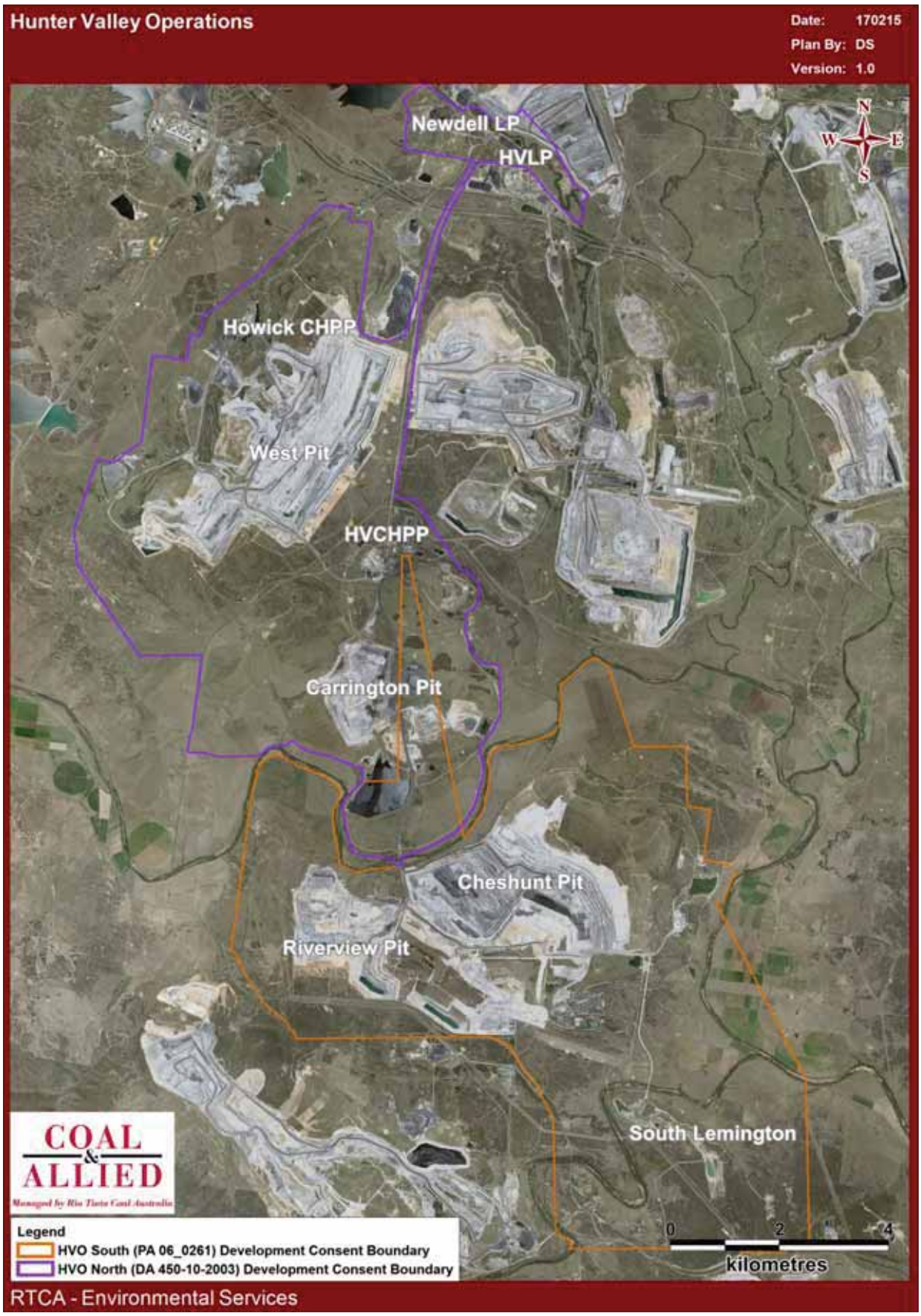

Figure 1: Hunter Valley Operations - Site Layout

2.3 Mine Contacts

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3 APPROVALS

3.1 Approvals, Leases and Licenses

3.1.1 Current Approvals

The status of HVO development consents, licenses and relevant approvals are listed in the following tables:

- Table 3: HVO Major Approvals
- Table 4: HVO Mining Tenements
- Table 5: HVO Licences and Permits
- Table 6: Water Related Approvals
- Table 7: Water Access Licences

Table 3: HVO Major Approvals

Approval Number	Description	Issue Date	Expiry Date
HVO North DA 450-10-2003 MOD 6	HVO West Pit Extension & Minor Modifications (2003); and associated modifications. Covers West Pit (approved production limit of 12mtpa), Carrington Pit (approved production limit of 10mtpa), HVCHPP (approved processing limit of 20mtpa) and WCHPP (approved processing limit of 6mtpa).	12/06/2004	12/06/2025
HVO South PA 06_0261 MOD 4	Hunter Valley Operations – South Coal Project & associated modifications Covers Riverview Pit, Cheshunt, Deep Cheshunt, and Lemington South, with a combined production limit of 16mtpa.	24/03/2009	24/03/2030

Table 4: Summary of Mining Tenements

Title	Mining Tenement	Purpose	Grant Date	Expiry Date	Status
AUTH 72	Authorisation	Prospecting	08/03/1977	24/03/2018	Granted
(Part) CCL 708	Sub-Lease	Prospecting and Mining Coal	17/05/1990	29/12/2023	Granted
CCL 714	Consolidated Coal Lease	Prospecting and Mining Coal	23/05/1990	30/08/2030	Granted
CCL 755	Consolidated Coal Lease	Prospecting and Mining Coal	24/01/1990	05/03/2030	Granted
CL 327	Coal Lease	Prospecting and Mining Coal	06/03/1989	05/03/2031	Granted
CL 359	Coal Lease	Prospecting and Mining Coal	21/05/1990	20/05/2032	Granted
CL 360	Coal Lease	Prospecting and Mining Coal	29/05/1990	28/05/2032	Granted
CL 398	Coal Lease	Prospecting and Mining Coal	04/06/1992	03/06/2034	Granted
CL 584	Coal Lease	Prospecting and Mining Coal	01/01/1982	31/12/2023	Granted
CML 4	Consolidated Mining Lease	Prospecting and Mining Coal	02/03/1993	03/06/2033	Granted
EL 5291	Exploration Licence	Prospecting	28/04/1997	28/04/2018	Granted
EL 5292	Exploration Licence	Prospecting	28/04/1997	27/04/2015	Renewal Pending
EL 5417	Exploration Licence	Prospecting	23/12/1997	08/05/2015	Renewal Pending
EL 5418	Exploration Licence	Prospecting	23/12/1997	08/05/2017	Granted
EL 5606	Exploration Licence	Prospecting	11/08/1999	10/08/2019	Granted
EL 8175	Exploration Licence	Prospecting	23/09/2013	22/09/2018	Granted
ML 1324	Mining Lease	Prospecting and Mining Coal	19/08/1993	18/08/2014	Renewal Pending

Title	Mining Tenement	Purpose	Grant Date	Expiry Date	Status
ML 1337	Mining Lease	Prospecting and Mining Coal	01/02/1994	09/09/2014	Renewal Pending
ML 1359	Mining Lease	Prospecting and Mining Coal	01/11/1994	31/10/2015	Renewal Pending
ML 1406	Mining Lease	Prospecting and Mining Coal	27/02/1997	10/02/2027	Granted
ML 1428	Mining Lease	Prospecting and Mining Coal	15/04/1998	14/04/2019	Granted
ML 1465	Mining Lease	Prospecting and Mining Coal	21/02/2000	20/02/2021	Granted
ML 1474	Mining Lease	Prospecting and Mining Coal	24/11/2000	23/11/2021	Granted
ML 1482	Mining Lease	Prospecting and Mining Coal	19/03/2001	14/04/2019	Granted
ML 1500	Mining Lease	Prospecting and Mining Coal	21/12/2001	20/12/2022	Granted
ML 1560	Mining Lease	Prospecting and Mining Coal	28/01/2005	27/01/2026	Granted
ML 1526	Mining Lease	Prospecting and Mining Coal	03/12/2002	02/12/2023	Granted (Transfer registered on 2 December 2015)
ML 1589	Mining Lease	Prospecting and Mining Coal	02/11/2006	01/11/2027	Granted
ML 1622	Mining Lease	Prospecting and Mining Coal	22/10/2010	10/03/2027	Granted
ML 1634	Mining Lease	Prospecting and Mining Coal	31/07/2009	30/07/2030	Granted
ML 1682	Mining Lease	Prospecting and Mining Coal	16/12/2012	15/12/2033	Granted
ML 1704	Mining Lease	Mining Purposes	05/12/2014	04/12/2035	Granted

Title	Mining Tenement	Purpose	Grant Date	Expiry Date	Status
ML 1705	Mining Lease	Prospecting and Mining Coal	17/12/2014	16/12/2035	Granted
ML 1706	Mining Lease	Mining Purposes	09/12/2014	08/12/2035	Granted
ML 1707	Mining Lease	Prospecting and Mining Coal	09/12/2014	08/12/2035	Granted
ML 1710	Mining Lease	Prospecting and Mining Coal	22/12/2016	10/03/2027	Granted (Part Transfer registered 22 December 2016)
ML 1732	Mining Lease	Mining Purposes	06/04/2016	05/04/2037	Granted
ML 1734	Mining Lease	Mining Purposes	06/04/2016	05/04/2037	Granted
ML 1748	Mining Lease	Mining Purposes	05/12/2016	04/12/2037	
ALA 52	Assessment Lease Application	Prospecting	Mining Lease Application lodged 10th September 2012		Offer of Grant – Pending Determination
ALA 58	Assessment Lease Application	Prospecting	Mining Lease Application lodged 1st December 2016		Application Pending
ALA 59	Assessment Lease Application	Prospecting	Mining Lease Application lodged 1st December 2016		Application Pending
MLA 489	Mining Lease Application	Mining Purposes	Mining Lease Application lodged 10th March 2015		Application Pending
MLA 495	Mining Lease Application	Mining Purposes	Mining Lease Application lodged 12th May 2015		Application Pending
MLA 496	Mining Lease Application	Mining Purposes	Mining Lease Application lodged 12th May 2015		Application Pending
MLA 501	Mining Lease Application	Mining Purposes	Mining Lease Application lodged 10th July 2015		Application Pending
MLA 520	Mining Lease Application	Mining Purposes	Mining Lease Application lodged 23rd December 2015		Application Pending
MLA 534	Mining Lease Application	Mining Purposes	Mining Lease Application lodged 28th October 2016		Application Pending
MLA 535	Mining Lease Application	Mining Purposes	Mining Lease Application lodged 28th October 2016		Application Pending

Table 5: HVO Leases and Permits

Licence No.	Description	Authority	Expiry Date
Environment Protection Licence			
EPL 640	Environment Protection Licence	EPA	N/A
Dangerous Goods / Explosives			
RR12709	Licence to Store	Workcover	06/7/2017
Radiation Licence			
RML5061121	Radiation Management Licence	EPA	05/09/2017
Aboriginal Heritage Permits			
C0001890	Care Agreement	OEH	3/06/2036
C0002193	Aboriginal Heritage impact Permit	OEH	6/12/2026
Road Closure Permits			
538338	Road Occupancy Licences– Golden Highway	RMS	30/06/2017
	Road Closure Approval Lemington Road	Singleton Council	30/06/2017
	Road Closure Approval Comleroi Road	Singleton Council	30/06/2017

Table 6: Water Related Approvals

Licence Number	Type of License	Purpose	Legislation	Description	Renewal Date
20BL030566	Bore	Well	Part 5 Water Act 1912	East Open Cut	Perpetuity
20BL141584	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Carrington Work Licence	Perpetuity
20BL166637	Bore	Monitoring Bore	Part 5 Water Act 1912	No Current Bores	Perpetuity
20BL167860	Bore	Excavation - Mining	Part 5 Water Act 1912	HVO North – Carrington Pit	11/05/2020*

Licence Number	Type of License	Purpose	Legislation	Description	Renewal Date
20BL168820	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: CGW39, CGW45a, CGW46,CGW47, CGW47a, CGW48, CGW49, P50/38.5, ,CGW56, 4036C, 4035P, 4032P, 4034P, 4033P, 4053P, 4052P, 4051C, 4040P, 4038C, 4037P Destroyed:CGW7,CGW50, CGW57, CGW58, CGW59, CGW60, CGW61, CGW62, CGW63	Perpetuity
20BL169241	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: DM1, HF3, HF7 Destroyed DM2	Perpetuity
20BL169641	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: CGW5, CGW51A, CGW52, CGW53, CGW54, CGW55A, CGW53A, CGW52A, CGW54A, CGW6, CFW55, CFW57, CFW57A, CFW59, and CFW55R. Destroyed CGW1, CGW2, CGW3, CGW5, CGW8,CGW9, CGW10, CGW12, CGW13, CGW14, CGW30, CGW33, CGW34, CGW35, CGW36, CGW37, CGW38, CGW40, CGW41, CGW42, CGW43, CGW44, CFW56, CFW56A, CFW58	Perpetuity
20BL169962 (cancelled - replaced by WAL40463)	Bore	Excavation - Mining	Part 5 Water Act 1912	HVO West – West Pit Excavation	22/12/2020
20BL170000	Bore	Excavation - Mining	Part 5 Water Act 1912	HVO North – Pit Excavation	11/05/2016*

Licence Number	Type of License	Purpose	Legislation	Description	Renewal Date
20BL170010 (cancelled - replaced by WAL40466)	Bore	Excavation - Mining	Part 5 Water Act 1912	HVO South – Cheshunt/Riverview Extended Excavation	26/11/2016
20BL170496	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ10 (CHPZ 2A), BZ11 (CHPZ 3A), BZ18 (CHPZ 10A), BZ20 (CHPZ 12A), BZ21 (CHPZ 13D) , BZ21A (CHPZ 13A), BZ20A (CHPZ 12D), BZ11A (CHPZ 3D) Destroyed AP50/47.5, AQ52, AV50/56.5, AS50/62.5, AR55, Bunc 3, BZ25 (Bunc 12) , BZ23 (Bunc 14), BZ24 (Bunc 13),	Perpetuity
20BL170497	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ15 (CHPZ 7A), BZ16 (CHPZ 8D), BZ17 (CHPZ 9A), BZ19 (CHPZ 11A), BZ16A (CHPZ 8A), Bunc 46D Destroyed Bunc 39 (Shallow & Deep), Bunc 44D	Perpetuity
20BL170498	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ12 (CHPZ 4A), BZ13 (CHPZ 5A), BZ14, BZ9 (CHPZ 1A), BC1, BC1a, BZ8-1, BZ8-2, BZ8-3, HG1, HG2, HG2a, HG3, S4, S6, BZ22 (CHPZ14D), BZ22A (CHPZ 14A), BZ5-1, BZ5-2 Destroyed S2, S3, S9, S11	Perpetuity
20BL171423	Bore	Monitoring Bore	Part 5 Water Act 1912	E1.5	Perpetuity
20BL171424	Bore	Monitoring Bore	Part 5 Water Act 1912	Destroyed GW9711	Perpetuity

Licence Number	Type of License	Purpose	Legislation	Description	Renewal Date
20BL171425	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: GW9701, GW9710	Perpetuity
20BL171426	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: GW9702 Destroyed D2(WH236),	Perpetuity
20BL171427	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: C335, C630 (BFS)	Perpetuity
20BL171428	Bore	Monitoring Bore	Part 5 Water Act 1912	D807	Perpetuity
20BL171429	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: B925 (BFS), C122 (BFS), C122 (WDH)	Perpetuity
20BL171430	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: C613 (BFS), C809 (GM/WDH)	Perpetuity
20BL171431	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: B631 (BFS), B631 (WDH)	Perpetuity
20BL171432	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: C130 (AFSH1), C130 (ALL), C130(BFS), C130 (WDH)	Perpetuity
20BL171433	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bore B334 (BFS)	Perpetuity
20BL171434	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: C317 (BFS), C317 (WDH)	Perpetuity
20BL171435	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ3-1, BZ3-2, BZ3-3	Perpetuity
20BL171436	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ4A(1), BZ4A(2), BZ4B	Perpetuity
20BL171437	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: WG1, WG2, WG3	Perpetuity
20BL171439	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: BRN, E012	Perpetuity
20BL171492	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: C1(WJ039), GW9704, North, GWAR981	Perpetuity
20BL171681	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: Bunc 45A, Bunc 45D	Perpetuity

Licence Number	Type of License	Purpose	Legislation	Description	Renewal Date
20BL171725	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: B425 (WDH), BRS, C621 (BFS), C919 (ALL), D317 (BFS), D317(ALL), D317(WDH) Destroyed D420, D425, D621, PB02	Perpetuity
20BL171726	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: SR002, SR003, SR004, SR005, SR006, SR007	Perpetuity
20BL171727	Bore	Monitoring Bore	Part 5 Water Act 1912	SR001	Perpetuity
20BL171728	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: BZ2B, BZ1-1, BZ1-2, BZ1-3, BZ2-1, BZ2-2	Perpetuity
20BL171762	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO South – Bores: C817, D010 (BFS), D214 (BFS), D406 (BFS) (AFS), D510 (BFS), PB01 (ALL), D510 (AFS), D010 (GM), D010 (WDH), D406 (BFS) (AFS), D612 (AFS), D612 (BFS)	Perpetuity
20BL171851	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North/South – Bores: HV2, PZ1CH200, PZ2CH400, PZ3CH800, 4118P, 4119P	Perpetuity
20BL171852	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – PZ4CH1380	Perpetuity
20BL171853	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – DM3	Perpetuity
20BL171854	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: DM5, PZ6CH2450	Perpetuity
20BL171855	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – PZ5CH1800	Perpetuity
20BL171856	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – Bores: HV6, HV3, DM6, HV2 (2), 4113P, 4114P. 4116P, 4117P	Perpetuity

Licence Number	Type of License	Purpose	Legislation	Description	Renewal Date
20BL171857	Bore	Monitoring Bore	Part 5 Water Act 1912	Bores: HV4, HV4 (2) (GA3), GA3,	Perpetuity
20BL171858	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO North – DM4	Perpetuity
20BL171895	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO West – NPZ4	Perpetuity
20BL171896	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO West – NPZ2	Perpetuity
20BL171897	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO West – Bores: NPZ5, NPZ1	Perpetuity
20BL171898	Bore	Monitoring Bore	Part 5 Water Act 1912	HVO West – NPZ3	Perpetuity
20BL173065	Bore	Monitoring Bore	Part 5 Water Act 1912	HQ11	Perpetuity
20BL173062	Bore	Monitoring Bore	Part 5 Water Act 1912	RC14	Perpetuity
20BL173063	Bore	Monitoring Bore	Part 5 Water Act 1912	RC07, RC08	Perpetuity
20BL173064	Bore	Monitoring Bore	Part 5 Water Act 1912	RC06	Perpetuity
20BL173069	Bore	Monitoring Bore	Part 5 Water Act 1912	RC11	Perpetuity
20BL173392 (cancelled - replaced by WAL39798)	Bore	Dewatering Bore	Part 5 Water Act 1912	LUG Bore	N/A
20BL173589 (cancelled - replaced by WAL40462)	Bore	Dewatering Bore	Part 5 Water Act 1912	HVO North – DM7 Dewatering Bore	N/A
20BL173587 (cancelled - replaced by WAL40462)	Bore	Dewatering Bore	Part 5 Water Act 1912	HVO North – DM9 Dewatering Bore	N/A
20BL173588 (cancelled - replaced by WAL40462)	Bore	Dewatering Bore	Part 5 Water Act 1912	HVO North – DM8 Dewatering Bore	N/A
20BL173847 (cancelled - replaced by WAL40462)	Bore	Dewatering Bore	Part 5 Water Act 1912	WB15HVO01	N/A
20CA201247	Works Approval	Pumping Plant	Water Management Act 2000	Associated with WAL965	28/12/2017

Licence Number	Type of License	Purpose	Legislation	Description	Renewal Date
20CA212713	Works Approval	Pumping Plant	Water Management Act 2000	Associated with WAL36190	30/05/2025
20FW213281 Formerly 20CW802613	Flood Work Approval	Levee	Water Management Act 2000	HVO South – Barry Levee	21/09/2017
20FW213277 Formerly 20CW802603	Flood Work Approval	Block Dam	Water Management Act 2000	HVO South – Hobden Gully Levee	21/09/2017
20FW213278 Formerly 20CW802604	Flood Work Approval	Levee	Water Management Act 2000	HVO North – North Pit Levee 3	21/09/2017
20FW802612 Formerly 20CW802612	Flood Work Approval	Levee	Water Management Act 2000	HVO North – Carrington Levee 5	21/09/2017
20WA210991 (see WAL 18307) Formerly 20SL050903	Stream Diversion	Stream Diversion	Water Management Act 2000	HVO West – Parnells Creek Dam	09/01/2023
20WA211427 Formerly 20SL061290	Stream Diversion	Cutting (Diversion Drain)	Section 10 Water Act 1912	Pikes Gully Creek Stream Diversion	07/09/2023
20WA210984 (see WAL 18327) 20SL042746	Diversion Works	Industrial	Water Management Act 2000	HV Loading Point Pump Bayswater Creek	08/09/2022
20WA211428 20SL061594	Stream Diversion	Cutting (Diversion Drain)	Water Management Act 2000	HVO North – Carrington Stream Diversion	31/7/2022
20WA201238 (see WAL 962)	Diversion Works	Pumping Plant	Water Management Act 2000	HVCPP River Pump	16/03/2018
20WA201257 (see WAL 970)	Diversion Works	Pumping Plant	Water Management Act 2000	HVO South – LCPP River Pump	Perpetuity
20WA201338 (see WAL 1006)	Diversion Works	Pumping Plant	Water Management Act 2000	HVO South – LCPP River Pump	Perpetuity
20WA201501 (see WAL 1070)	Diversion Works	Pumping Plant	Water Management Act 2000	HVO South – LCPP River Pump	Perpetuity
20WA201685 (see WAL 13387)	Diversion Works	Pumping Plant	Water Management Act 2000	HVO West – "Lake Liddell" Licence	Perpetuity

*Application for renewal submitted, waiting on DPI Water to convert to WAL under Water Management Act 2000.

Table 7: Water Access Licence

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Approved Extraction (ML)*	Actual Extraction 2016 (ML)
WAL962	HVO North – HVCPP River Pump – Water Access Licence	Hunter River	Hunter Regulated River WSP	Zone 1b (Hunter River From Goulburn River Junction To Glennies Creek Junction)	3,165	37#
WAL965	Hunter Regulated River Water Source	Hunter River	Hunter Regulated River WSP	Zone 1b (Hunter River From Goulburn River Junction To Glennies Creek Junction)	51	0
WAL969	HVO South – Former Riverview pump	Hunter River	Hunter Regulated River WSP	Zone 1b (Hunter River From Goulburn River Junction To Glennies Creek Junction)	39	0
WAL970	HVO South – LCPP River Pump – Water Access Licence	Hunter River	Hunter Regulated River WSP	Zone 2a (Hunter River From Glennies Creek Junction To Wollombi Brook Junction)	500	0
WAL1006	HVO South – LCPP River Pump – Water Access Licence	Hunter River	Hunter Regulated River WSP	Zone 2a (Hunter River From Glennies Creek Junction To Wollombi Brook Junction)	500	0
WAL1070	HVO South - LCPP River Pump – Water Access	Hunter River	Hunter Regulated River WSP	Zone 2a (Hunter River From Glennies Creek Junction To Wollombi	500	0

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Approved Extraction (ML)*	Actual Extraction 2016 (ML)
	Licence			Brook Junction)		
WAL13387	Macquarie Generation Hunter River Pump Station	Hunter River	Hunter Regulated River WSP	Zone 1b (Hunter River From Goulburn River Junction To Glennies Creek Junction)	20	0
WAL18127	Carrington BB1	Hunter River Alluvium	Hunter Unregulated and Alluvial Water Sources WSP	Hunter Regulated River Alluvial Water Source – Upstream Glennies Creek management zone	383	167#
WAL18158	Ollenberry	Hunter River Alluvium	Hunter Unregulated and Alluvial Water Sources WSP	Hunter Regulated River Alluvial Water Source – Upstream Glennies Creek management zone	65	51#
WAL18307	HVO West – Parnells Creek Dam (Diversion Works Bywash)	Unregulated River	Hunter Unregulated and Alluvial Water Sources WSP	Jerrys Water Source; Jerrys Management Zone	500	0
WAL18327	HV Loading Point Pump Bayswater Creek (Diversion Works)	Unregulated River	Hunter Unregulated and Alluvial Water Sources WSP	Jerrys Water Source; Jerrys Management Zone	150	0
WAL23889	Greenleek	Wollombi Brook	Hunter Unregulated and Alluvial Water Sources WSP	Lower Wollombi Brook Water Source	144	0
WAL36190	HVO North, old farm bore	Hunter River	Hunter Unregulated and Alluvial	Hunter Regulated River Alluvial	120	0

Licence Number	Description	Water Source	Water Sharing Plan	Water Source – Management Zone	Approved Extraction (ML)*	Actual Extraction 2016 (ML)
		Alluvium	Water Sources WSP	Water Source – Jerrys Management Zone		
WAL39798	Lemington Underground (LUG) Bore	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	1,800	339
WAL40462	HVO Pit Excavations / Alluvial Lands Bores (x4)	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	2,400	1,124# (175 ML West Pit; 917ML South Pit; 32ML North Pit)
WAL40463					180	
WAL40466					460	
TBA (20BL167860)	HVO North – Carrington Pit	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	220	0
TBA (20BL170000)	HVO North – Pit Excavation	Permian Coal Seams	North Coast Fractured and Porous Rock Groundwater Sources WSP (commenced 1/7/16)	Permian Coal Seams	20	0

* Approved extraction limits are for a financial year.

Passive take / groundwater inflows to pit.

3.1.2 Management Plans, Programmes and Strategies

Under the Project Approvals, HVO is required to develop and submit a range of environmental management plans for approval prior to implementation. Issued in 2009, the HVO South Coal Project Approval (PA06_0261) required submission of a number of monitoring programmes, strategies and some management plans, while the January 2013 modification to the HVO North Consent (DA 450-10-2003) contains a contemporary list of comprehensive management plan requirements. The approval of the modification to the HVO North Consent (Mod 6) in January 2017 and the Independent Environmental Audit triggers a review of all management plans. This will occur by 31 May 2017. Where possible, the HVO South conditions, commitments and obligations have been included in the Management Plans which have been submitted for HVO North, allowing for a single plan to detail management measures which will be employed across the site. Once approved, management plans are made publically available via the Rio Tinto website (www.riotinto.com.au). The status of these management plans is shown in Table 8 and Table 9.

Table 8: Management plans and MOPs required for HVO North

Management Plan	Date Approved
HVO Water Management Plan	10/07/2015
HVO South Aboriginal Cultural Heritage Management Plan	24/04/2010
HVO Bushfire Management Plan	23/06/2015
HVO Noise Management Plan	25/08/2015
HVO Blast Management Plan	4/04/2014
HVO Air Quality and Greenhouse Gas Management Plan	12/02/2014
Hunter Valley Operations / Mount Thorley Warkworth Environmental Management Strategy	3/02/2016
Rehabilitation Management Plan (addressed in MOP)	19/02/2016
Agricultural Lands Reinstatement Management Plan (addressed in MOP)	19/02/2016
Landscape and Rehabilitation Management Strategy (addressed in HVO North MOP)	19/02/2016
Mining Operations Plan (MOP) HVO North 2012-2018	19/02/2016
Mining Operations Plan (MOP) Newdell 2002-2009	29/07/2002
HVO River Red Gum Rehabilitation & Restoration Strategy	24/03/2010
HVO North Heritage Management Plan	12/02/2014
HVGC Amenity Management Plan	22/01/2013
HVO Greenhouse and Energy Efficiency Plan	7/04/2010
Fine Reject Management Strategy	Originally submitted 30/6/2015, revised version submitted 3-2-2016 capturing DRE and DPE comments. Approved by DRE 24/10/2016. Yet to receive correspondence from DPE.

Table 9: Management Plans and MOPs required for HVO South

Management Plan	Date Approved
HVO River Red Gum Rehabilitation & Restoration Strategy	24/03/2010
HVO South Rehabilitation and Landscape Management Plan	24/03/2010
HVGC Amenity Management Plan	22/01/2013
HVO Water Management Plan	10/07/2015
HVO South Aboriginal Cultural Heritage Management Plan	24/04/2010
HVO Bushfire Management Plan	23/06/2015
HVO Noise Management Plan	25/08/2015
HVO Blast Management Plan	4/04/2014
HVO Air Quality and Greenhouse Gas Management Plan	12/02/2014
Hunter Valley Operations / Mount Thorley Warkworth Environmental Management Strategy	3/02/2016
Mining Operations Plan (MOP) HVO South 2015-2018	17/12/2015
Biodiversity Management Plan(Conditon 36) and legally binding mechanism before 31 December 2017(Condition 29A)	Pending

4 OPERATIONS SUMMARY

4.1 Mining

Areas to be mined are geologically modelled, a mine plan is formed and the relevant mining locations are surveyed prior to mining. Figure 2 illustrates the mining process. HVO have no active underground workings.

No changes were made to the mining method during the reporting period. Mining progress deviated slightly from the schedule of the MOPs as a result of normal variations in productivity and utilisation.

The mining equipment fleet employed to carry out mining operations at HVO is detailed in Table 10, along with the fleet transformation from 2016 to 2017 predictions. Changes in the data appear in **bold**.

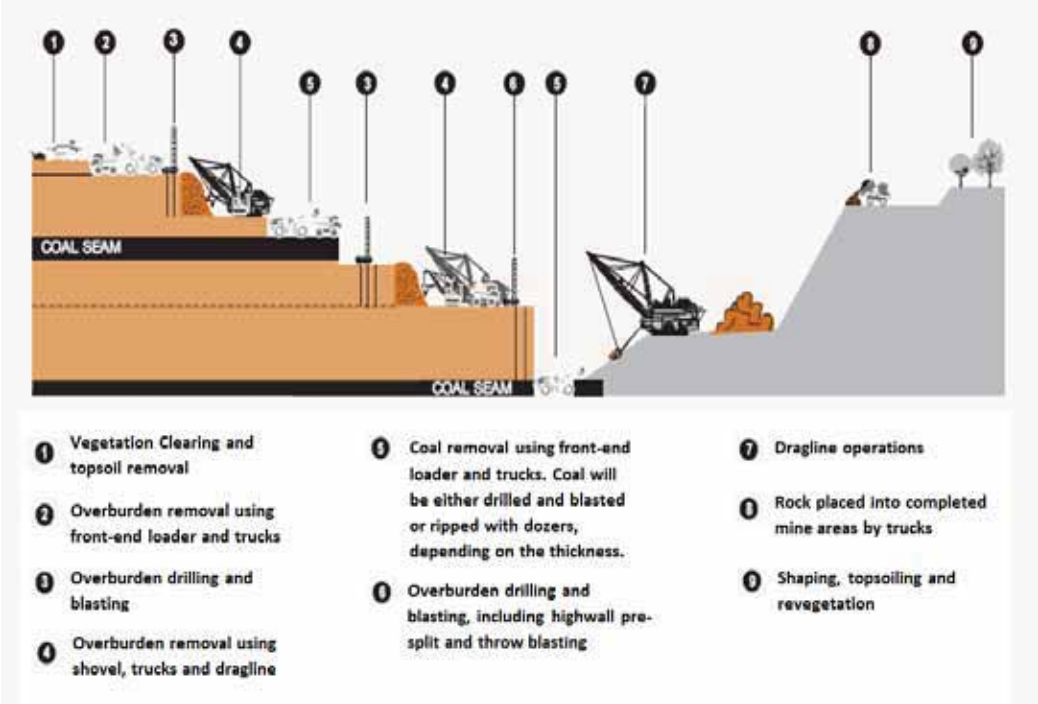

Figure 2: Mining Schematic

Table 10: HVO Equipment Used 2015-2017

Equipment Type	Number Used in 2015	Number Used in 2016	Forecast numbers in 2017
Scrapers	2	2	2
Drills	9	8	8
Draglines	2	2	2
Shovels	4	**3.5**	**3**
Excavators	7	**7.5**	**9**
Trucks	**87**	**95**	**105**
Loaders	7	7	7
Service Trucks	5	5	5
Track Dozers	**30**	**33**	**33**
Rubber Tyre Dozers	5	5	5
Graders	11	11	11
Surface Miner*	**1**	**0**	**0**
Water Trucks	10	10	10
Floats	1	1	1
Cable Reeler	1	1	1
Cable Tractors	5	5	5
Total	187	196	206

*In 2014, HVO commenced a trial of a surface miner. At this time the surface miner will not be utilised in 2017

4.1.1 Mineral Processing

Coal is transported to one of two CHPPs, where it is crushed to size and processed to remove impurities. Processing produces saleable coal, along with coarse and fine reject materials. Coarse rejects are disposed of in pit, and fine rejects are placed in a tailings dam, according to commitments outlined in the MOP. Each CHPP site has storage facilities for processed (saleable) and unprocessed (ROM) coal. The capacity of each site is listed in Table 11. No changes or additions were made to process or facilities during the reporting period.

Table 11: Stockpile Capacities

Location	ROM stockpile(t)	Saleable stockpile (t)
Hunter Valley CHPP	176,000	29,700
West CHPP	15,000	30,000
Newdell CHPP	0	450,000

Processed, or product coal is transported to one of the two loading points via conveyor belt or road, detailed in Table 12. The coal from HVCHPP is transported to the Hunter Valley Load Point (HVLP) by means of overland conveyor whereas coal from West CHPP (Howick) is trucked to Newdell Load Point. After the coal has reached either HVLP or the Newdell Load Point, it is transported to Newcastle by rail.

Table 12: Methods of Coal Transportation

Category of Transport	Quantity (million tonnes)
Coal transported from the site via trains	13.6
Amount of coal received from Hunter Valley Operations South of the Hunter River	10.91
Amount of coal hauled by road to the Hunter Valley Loading Point	Nil
Coal hauled by road to the Newdell Load Point	2.06
Amount of coal hauled by road from the Newdell Loading Point to the Ravensworth Coal Terminal	Nil
Amount of coal hauled by road from the Hunter Valley Loading Point to the Ravensworth Coal Terminal	Nil
Number of coal haulage truck movements generated by the development. (includes -coal hauled to stockpile, coal hauled to bins, coal hauled from stockpile to bins)	51,630

4.1.2 Production statistics

Project approvals allow for the extraction of up to 22 million ROM tonnes from operations north of the Hunter River and 16 million ROM tonnes from operations south of the Hunter River. A summary of production and waste at HVO during 2016 in comparison to previous years is provided in Table 13.

Product coal includes low-ash, semi-soft and steaming coals. During 2016, total product coal increased compared to 2015 production. Table 14 outlines the tonnages produced by each CHPP compared to Project Approval (PA) limits.

Table 13: Summary of Production and Waste at HVO in 2016

	HVO North MOP 2016	HVO South MOP 2016	Reporting Period 2016	Reporting Period 2015	Forecast for 2017
Prime Waste (Mbcm)	49.8	72.1	106.46	104.34	112.95
ROM Coal (Mt) (mined)	9.7	16.0	17.97	17.16	20.00
Coarse Reject (Mt)	2.3	2.6	2.66	2.71	3.00
Fine Reject-Tailings (Mt)	0.9	1.4	1.62	1.44	1.80
Product (Mt)	6.5	12.0	13.69	13.01	15.20

Table 14: Production Statistics and Correlating Project Approval Limits

Product Coal	Project Approval limits (mtpa)	2016 (Mt)	2015 (Mt)	2014 (Mt)	Forecast for 2017 (Mt)
Hunter Valley CHPP	20	15.08	14.84	15.09	16.12
Howick CHPP	6	2.12	1.76	2.25	2.72

4.1.3 Summary of Changes (developments, equipment upgrades)

Consistent with the MOP and EA's, additional machinery was used when compared to 2015; details are outlined in Table 10. In 2016 as planned, HVO retired rope shovel and brought an additional excavator into production.

During 2017, additional truck and excavator capacity will be employed, consistent with the MOP and the EA's.

the Glider Pit, a satellite pit located to the east of Riverview Void, will finish coal extraction in 2017, with dumping and rehabilitation to be completed soon after.

Mining Carrington West Wing location has not yet commenced; at this time mining in this area will not commence in 2017.

5 ACTIONS REQUIRED FROM PREVIOUS ANNUAL REVIEW

The DRE conducted an annual inspection of HVO on the 26 may 2016 to review mining activities as reported in the 2015 Annual Environmental Review. The Department was satisfied with the contents of the report; however two actions were identified. The actions and responses are shown in Table 15. DPE did not complete an inspection.

Table 15: Response to actions from DRE 2015 Annual Review Inspection

Issue/Observation	Action	Response
Tailings Management	A significant volume of standing water was identified during the Annual Review inspection on Dam 6 West Tailings Dam. DRE encourages active management to minimise standing water on the surface of the tailings dams. Report on management practices undertaken during the reporting year in future Annual Reviews.	Tailings management is addressed in Section 8.7
Rehabilitation Completion Criteria	The Department requests that results of monitoring for both native vegetation and pasture is compared to the rehabilitation completion criteria as presented in the Mining Operations Plan, and reported in the rehabilitation section of future Annual Reviews.	Rehabilitation completion criteria are addressed in sections 8.4 and Appendix 5.

6 ENVIRONMENTAL PERFORMANCE

6.1 Meteorological data

The collection of meteorological data is carried out to assist in day to day operational decisions, planning, environmental management and to maintain a historic record. The meteorological (weather) stations record wind speed, wind direction, temperature, humidity, solar radiation and rainfall. HVO operates two real time weather stations; the HVO Corporate Meteorological Station and the Cheshunt Meteorological Station. Data is publically available via the Monthly Environmental Reports published on the Rio Tinto website (www.riotinto.com.au).

6.2 Noise

6.2.1 Management

Mining activities are undertaken at HVO in a manner so as to ensure adverse noise impacts are minimised, and to ensure compliance with permissible noise limits at nearby private residences. A combination of both proactive and reactive control mechanisms are employed to ensure effective management of noise.

6.2.2 Sound Attenuation of Heavy Equipment

Two Komatsu 830E-DC haul trucks were retrofitted with full sound attenuation kits including exhausts during 2016.

In 2017, HVO is scheduled to complete fitment of full sound attenuation kits to all rear dump trucks. This forms part of the programme to have all trucks sound attenuated by end of 2018.

6.2.3 Real Time Noise Management

HVO operates a network of directional real-time noise monitors to ensure noise emissions remain below statutory limits and to minimise community impact. During 2016, the HVO Mine Monitoring and Control Team received and responded to 2454 noise alarms, recording a total of 340.4 hours of equipment stoppage in direct response to real-time noise alerts (Figure 3).

The real-time system generates alarms when elevated noise is measured, triggering the implementation of reactive controls to reduce noise levels. The location of real time and attended noise monitoring locations are shown in Figure 4.

The noise monitoring network was improved following the commissioning of an Environmental Noise Compass (ENC) in July 2016. The ENC utilises a 26 microphone array and conventional beamforming techniques (borrowed from military / submarine applications) to resolve the source direction of measured noise in real-time. The ENC replaced the Jerrys Plains BarnOwl monitor.

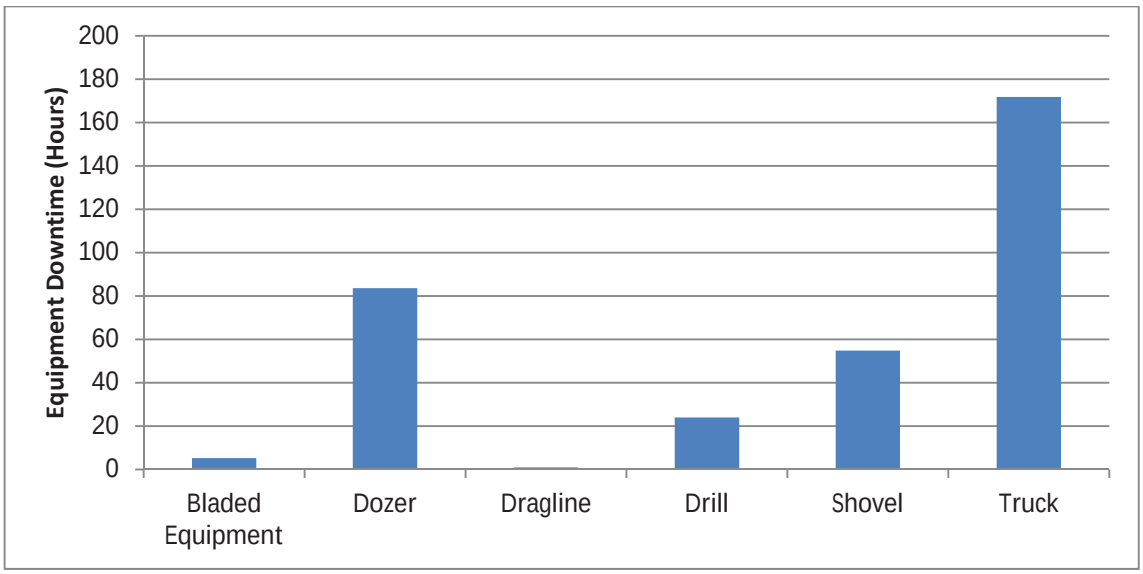

Figure 3: Environmental delays due to noise 2016

Figure 4: HVO Attended and Real-time Noise Monitoring Locations

6.2.4 Operational Noise Performance

To assess compliance with the relevant Project Approval noise criteria, HVO engages Global Acoustics to undertake routine compliance monitoring at nearby private residences, in accordance with the HVO Noise Management Plan. Monitoring is undertaken at a frequency of one night per month so as to ensure that noise impacts are adequately assessed under a range of meteorological conditions throughout the year.

A total of 109 measurements were taken during 2016. Each measurement involves an assessment of HVO mine noise against the various LAeq and LA1, 1min noise criteria in place under the HVO North and South Approvals (a total of 654 assessments). Five measurements exceeded criteria but did not constitute non-compliances as the issues were promptly addressed (within 75 minutes of detection, per approved Noise Management Plan). A summary of noise monitoring results are presented in Table 16. Noise measurements which exceeded criteria are detailed in Section 11.1. Full details for all noise assessments completed can be found in the Hunter Valley Operations Monthly Environmental Monitoring Report, published on the Rio Tinto website.

6.2.5 Noise Non-compliances

See Section 11 of the report for non-compliance details.

6.2.6 Comparison to previous years' results

Table 16: Comparison of 2016 noise monitoring results against previous years.

Year	Number of measurements	Number of measurements which exceeded allowable noise limits by 2dB or greater (under applicable meteorological conditions)*	Number of non-compliances*
2016	109	2	0
2015	107	3	2
2014	75	2	0
2013	85	5	2
2012	75	4	1
2011	95	7	5
2010	114	7	2
2009	71	3	1

* The Industrial Noise Policy allows for the measured result to be less than or equal to 2 dB above the applicable noise limit without constituting a non-compliance. Note: Where the measured result is greater than 2dB above the applicable noise limit, the site has 75 minutes to reduce noise levels below applicable noise limits before constituting a non-compliance.

Table 17 and Table 18 show comparisons between 2016 LAeq attended noise monitoring results and the predictions made in the HVO West Pit Extension and Minor Modifications EIS (2003) and the HVO South Coal Project Environmental Assessment (2008).

Comparisons against the predicted noise levels in the HVO Carrington West Wing EA (2010) have not been made in this years' Annual Review, as this project has not commenced. Mining

activity in the Carrington Pit area was limited to bulk dozer push on the eastern boundary of Cheshunt pit.

Comparisons against the predicted noise levels in the HVO West Pit Extension and Minor Modifications EIS (2003) have been made against the modelled scenario for Year 14 of the development (Table 5.2 of Part J – Hunter Valley Operations West Pit Extension and Minor Modifications Technical Reports Part 3).

Comparisons against the predicted noise levels in the HVO South Coal Project Environmental Assessment have been made against Mitigated Scenario B2 (indicative of mining operations in 2014), (Table 5.4 of Annexure H – Hunter Valley Operations South Coal Project Approval Environmental Assessment Report Volume 2). Where there are multiple predicted noise levels under scenario B2 (under different operating conditions), the comparison has been made against the lowest predicted noise level.

Comparisons have been made by averaging the results (where measureable) of the 2016 attended surveys conducted during each month (presented on a per quarter basis), and comparing directly with the predicted noise level at each monitoring location. The use of averaged results is considered most appropriate so as to provide an annualised comparison against the EA predictions, taking account of meteorological conditions experienced throughout the year. Where attended monitoring has determined HVO to be 'inaudible' or 'not measurable' during any of the surveys, a conservative estimate of 25dB has been used to ensure a valid comparison is made.

Comparison of measured results against the modelled predictions for Year 14 in the HVO West Pit EIS (2003) demonstrates noise levels equal to or lower than predicted at all monitoring locations, with the exception of the Kilburnie South monitoring location.

Table 17: Comparison of 2016 monitoring against HVO North (Year 14, West Pit EIS, 2003) - Night Period

Location	Units	EIS Prediction (INP)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Knodlers Lane	dB(A)	27	Inaudible	Inaudible	Inaudible	Inaudible
Maison Dieu	dB(A)	26	Inaudible	Inaudible	Inaudible	Inaudible
Kilburnie South	dB(A)	34	36.7	Inaudible	<25	29
Jerrys Plains	dB(A)	<35	33.8	26.7	<25	29.7
Jerrys Plains East	dB(A)	38	32.7	25.7	<25	28.3

* Where a '<' reading has been provided, this indicates that the highest recorded value at that location was less than this number. This is generally due to inability to ascertain a more accurate reading due to another dominant noise source, or if the audible noise was not constant during the recording period.

Comparison of HVO South Pit area data measured through routine compliance assessment indicates noise lower than predicted levels for all receptors.

Table 18: Comparison of 2016 monitoring against HVO South (South Coal Project EA, 2006) - Scenario B2 (2014) - Night Period

Location	Units	EIS Prediction (INP)	Quarter 1	Quarter 2	Quarter 3	Quarter 4
Knodlers Lane	dB(A)	37	28.7	31.7	33.2	29.3
Maison Dieu	dB(A)	39	31.8	32.3	37.4	28.0
Shearers Lane	dB(A)	39	31.4	33.3	38.3	28.7
Kilburnie South	dB(A)	35	28.7	27.0	Inaudible	28.3
Jerrys Plains	dB(A)	28	28.0	25.7	26.0	26.0
Jerrys Plains East	dB(A)	33	26.7	25.7	NA	26.3

6.3 Blasting

6.3.1 Blasting Management

The objective of blasting operations is to ensure that optimal fragmentation is obtained whilst minimising dust and fume generation, adhering to safety standards and conforming to approvals criteria for vibration and overpressure.

During 2016, HVO operated a blast monitoring network under Benchmark Monitoring's' Kaboom Blast Monitoring System. HVO achieved 100% blast data capture during 2016. Monitors are located at or in close proximity to nearby privately owned residences and function as regulatory compliance monitors as shown in Figure 5. These monitors are located at:

- Jerrys Plains Village;
- Warkworth;
- Maison Dieu;
- Moses Crossing; and
- Knodlers Lane

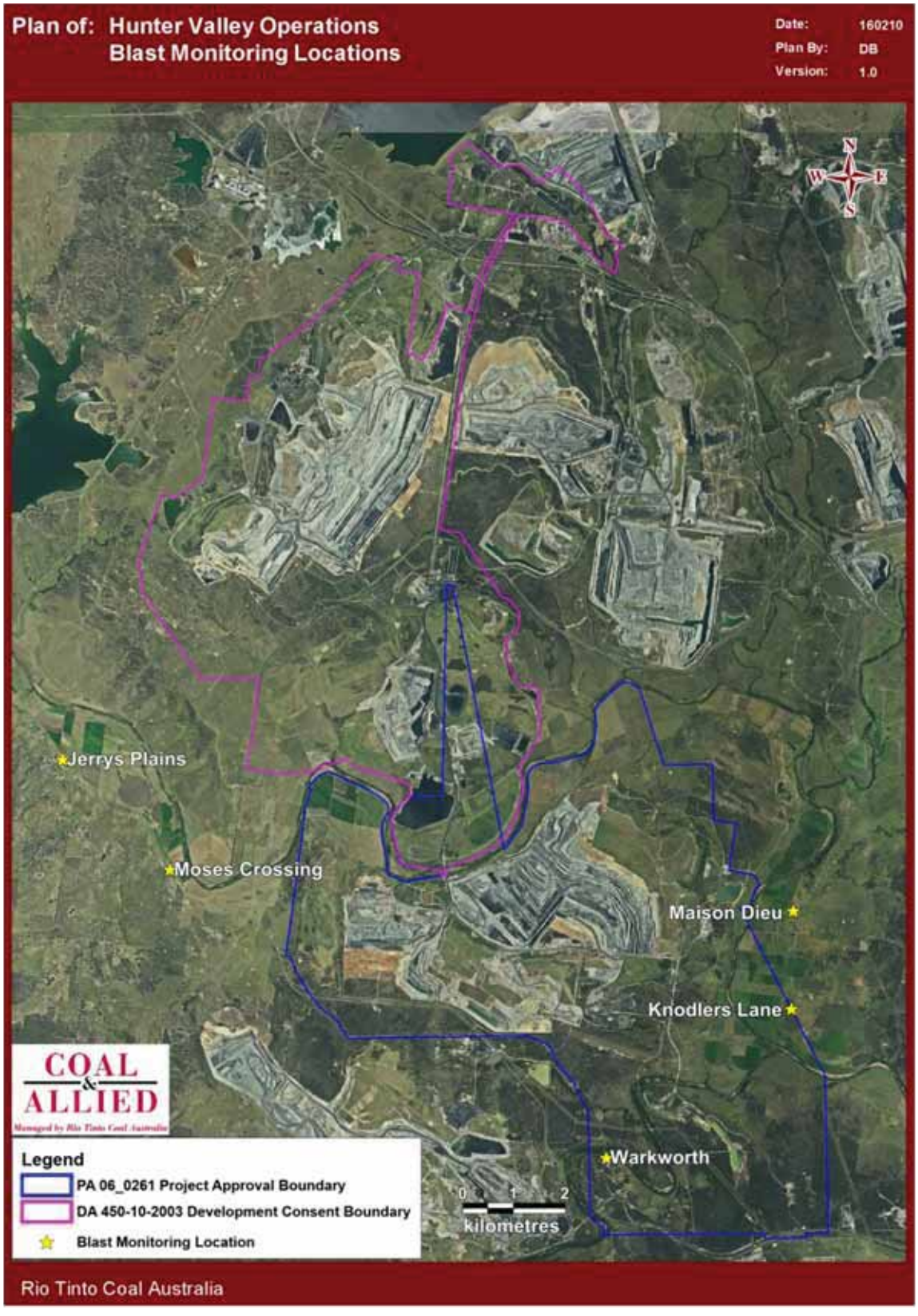

Figure 5: Blast Monitoring Network

6.3.2 Blasting Performance

During the reporting period 289 blast events were initiated at HVO. One blast event on 25th February 2016 recorded an airblast overpressure result of 125.78dB(L), exceeding the Airblast Overpressure criterion of 120.0 dB(L). HVO complied with all other blasting related consent and licence conditions during the reporting period. Airblast Overpressure and Ground Vibration results for all blasts fired during the reporting period are displayed in Figure 6 to Figure 10.

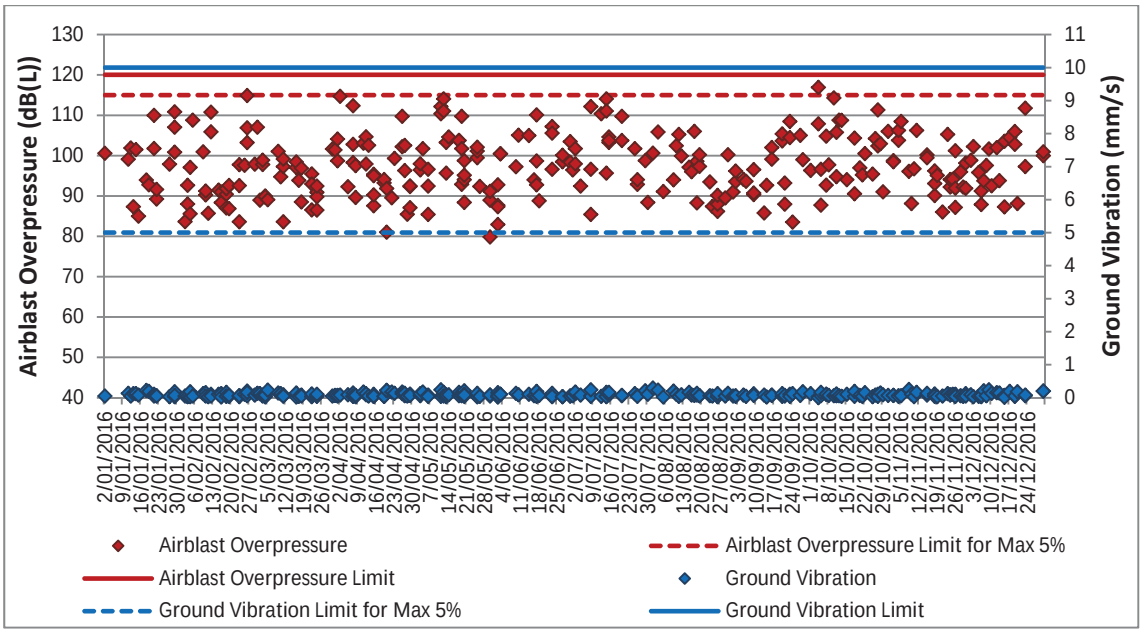

Figure 6: Jerrys Plains Blast Monitoring Results 2016

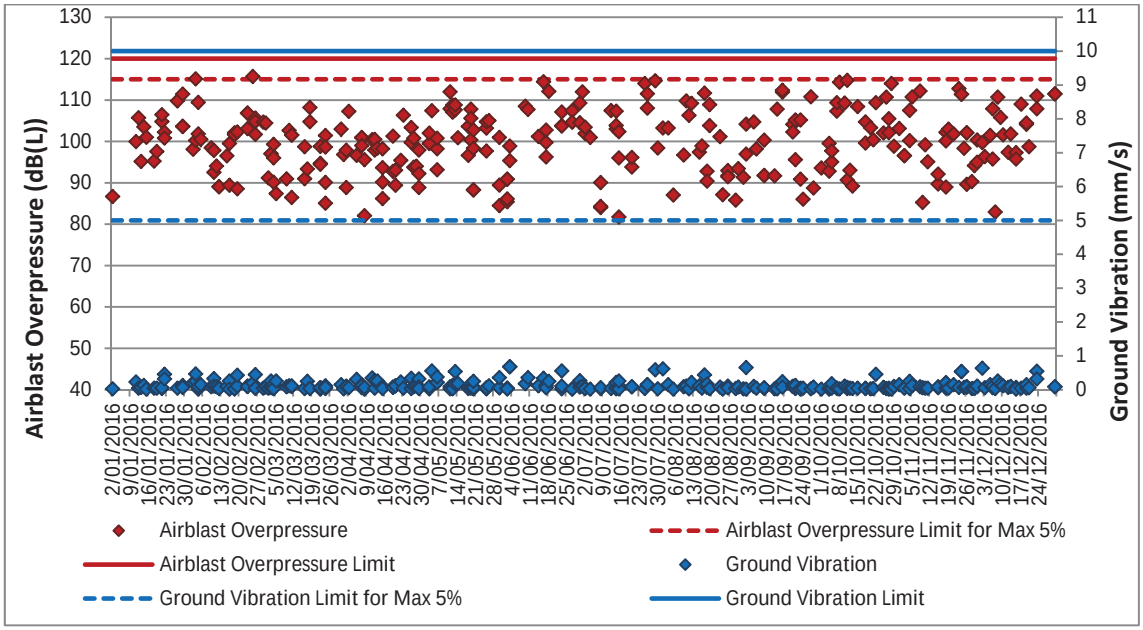

Figure 7: Knodlers Lane Blast Monitoring Results 2016

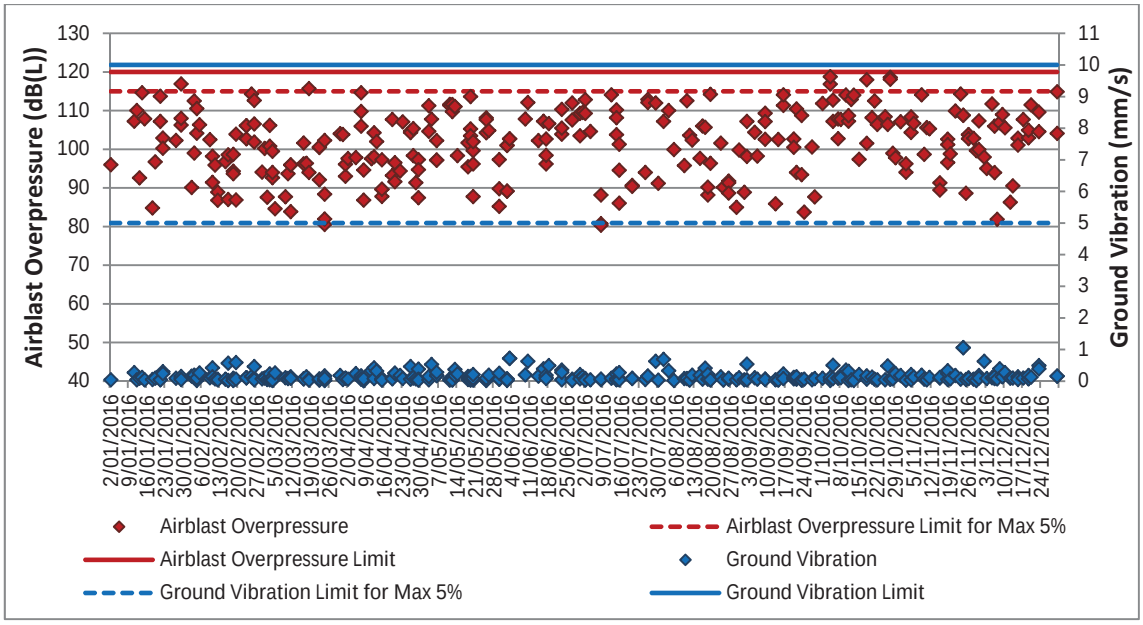

Figure 8: Maison Dieu Blast Monitoring Results 2016

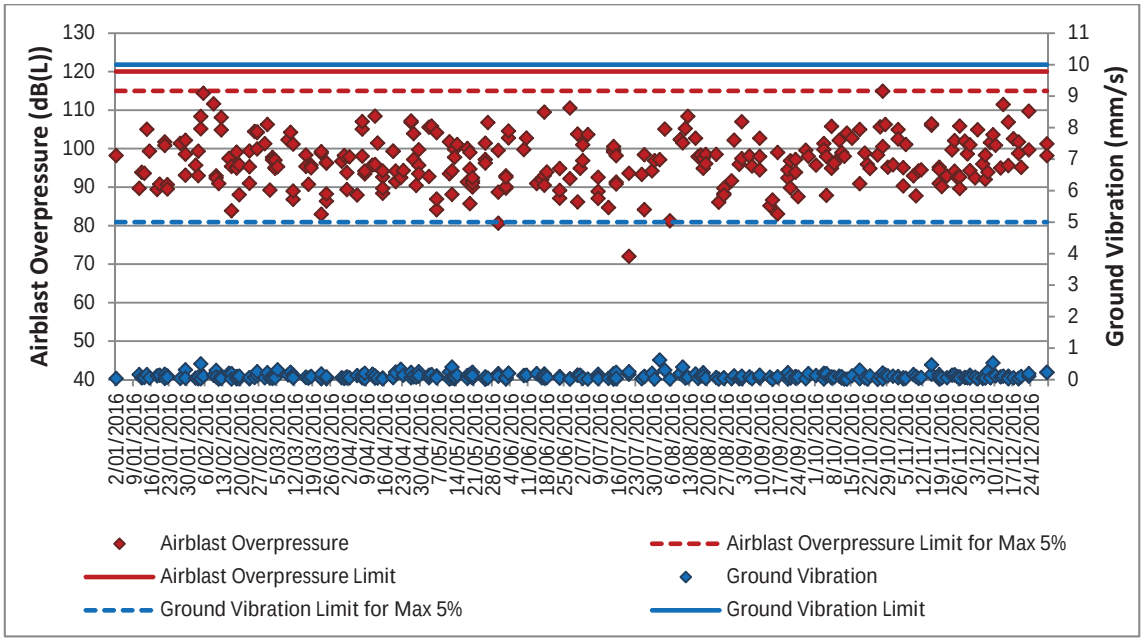

Figure 9: Moses Crossing Blast Monitoring Results 2016

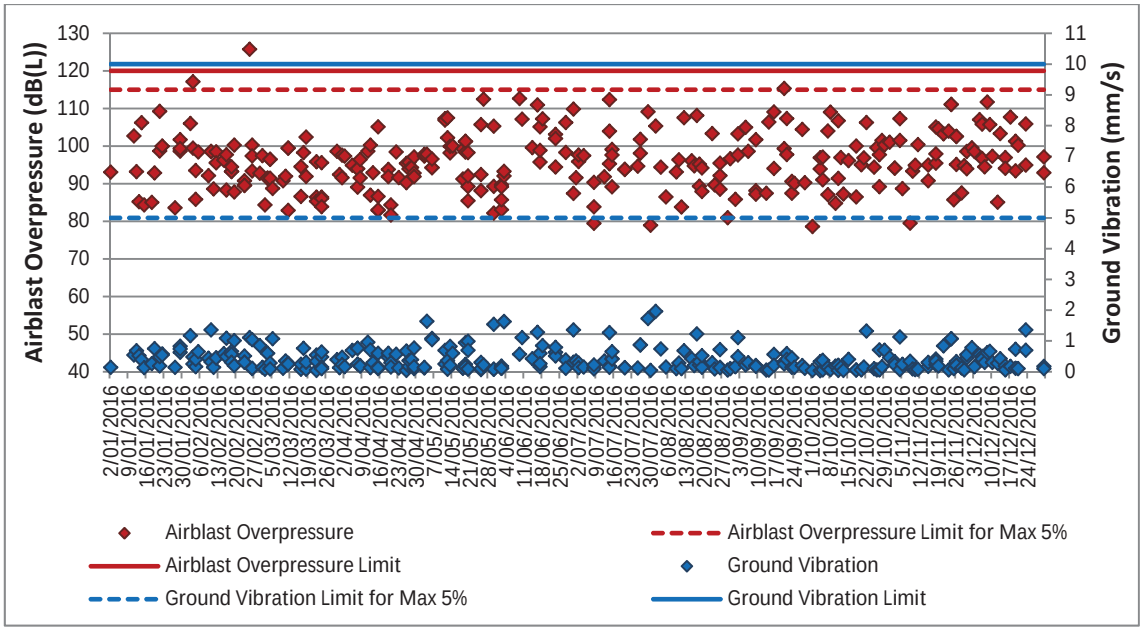

Figure 10: Warkworth Blast Monitoring Results 2016

6.3.3 Blast fume management

HVO operates a Post Blast Fume Generation Mitigation and Management Plan. This document outlines the practices to be utilised to reduce the risk of generation of post blast fume, and reduce potential offsite impact from any fume which may be produced. This includes specialised blasting design, appropriate product selection, on-bench water management, implementation of fume management zones and use existing blasting permissions to identify likely path of any fume which may be produced.

All blasts are observed for fume and any fume produced is ranked according to the Australian Explosive Industry & Safety Group (AEISG) Scale.

Fume rankings for shots fired during 2016 and comparison to previous years is provided in Table 19.

Table 19: Visible blast fume rankings according to the AEISG colour scale

AEISG Ranking	2016	2015	2014
0	275	310	245
1	49	37	40
2	13	17	17
3	1	1	4
4	0	1	0
5	0	0	0
Total*	338	366	306

* Where a number of individual blasts were fired as a blast event, fume was assessed for each individual blast pattern rather than for the event as a whole.

6.3.4 Blasting Non-compliances during the Reporting Period

See Section 11.2

6.4 Air Quality

6.4.1 Air Quality Management

Air quality management initiatives are implemented at HVO to ensure that:

- air quality impacts on surrounding residents are minimised;
- all statutory requirements are adhered to; and
- local community and regulators are kept informed through prompt and effective response to issues and complaints.

Air quality control mechanisms employed at HVO are described in detail in the Hunter Valley Operations Air Quality and Greenhouse Gas Management Plan, publically available via the Rio Tinto website.

6.4.2 Air Quality Performance

6.4.2.1 Real Time Air Quality Management

HVO's real time air quality monitoring stations continuously log information and transmit data to a central database, generating alarms when particulate matter levels exceed internal trigger limits.

A total of 287 real time alarms for air quality and wind conditions were received and acknowledged during 2016. In response, 2,568.8 hours of equipment downtime was recorded due to air quality management. The detailed breakdown of air quality related equipment stoppages (per month, per equipment type) presented in Figure 11 illustrates the prevalence of stoppages during the warmer months, generally associated with elevated winds.

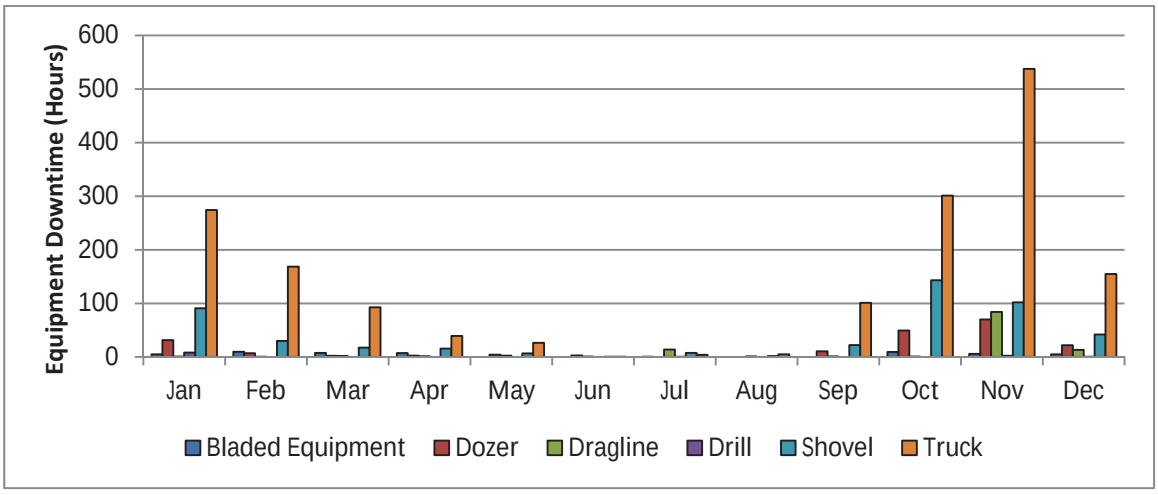

Figure 11: Equipment Downtime Hours for Air Quality Management 2016

6.4.2.2 Temporary Stabilisation

Aerial Seeding was undertaken in May 2016 by a fixed wing aircraft to provide temporary cover to areas exposed to wind generated dust and erosion at HVO. Waste dumps and exposed areas were selected for seeding if they were not planned to be disturbed within six months. The 350ha of area seeded included waste dumps ahead of mining disturbance (Figure 12). All areas were seeded using an exotic pasture and legume mix suitable for autumn sowing. A starter fertiliser was mixed with the seed prior to loading to provide sufficient nutrients for plant growth.

Figure 12: Areas Aerial Seeded in 2016

6.4.2.3 Air Quality Monitoring

Air quality monitoring at HVO is undertaken in accordance with the HVO Air Quality Monitoring Programme (available via the Rio Tinto website). An extensive network of monitoring equipment is utilised to assess performance against the relevant conditions of HVO's approvals. Air quality monitoring locations are shown in Figure 13. During 2016, HVO complied with all short term and annual average air quality criteria; refer to Table 20 and Table 21, along with a summary of HVO's performance against the criteria. HVO currently operates under two separate Planning Approvals (DA450-10-2003 – HVO North, and PA 06-0261 – HVO South). With the exception of the percentile frequency of short term PM10 non-compliance allowable under the HVO South Approval (Table 12 in Schedule 3, Condition 20 of PA 06_0261), the air quality criteria are identical in both approvals. As such it should be noted that the following compliance assessment has been undertaken on a 'whole of HVO site' basis, rather than individually assessing the contribution of each approval area to the measured results.

Air quality monitoring data is made publically available through the HVO Monthly Environmental Monitoring Report, which can be viewed on the Rio Tinto website.

During the reporting period the EPA undertook a programme to contemporise air quality monitoring requirements in the Hunter Valley. As a result HVO was required to commission additional air quality monitoring units (TEOMs) on the mine site boundary at upwind and downwind locations. Three TEOM units have been established at the following locations:

- Howick (EPA ID No. 13)
- HC1 (EPA ID No. 14)
- Golden Highway (EPA ID No. 17)

Two TEOMs from the existing Air Quality Monitoring network were added to the Environmental Protection Licence (EPL) 640;

- Wandewoi (EPA ID No. 15)
- Knodlers Lane (EPA ID No. 16)

Following the commissioning of these additional sites the EPA removed the requirement to monitor High Volume Air Sampler (HVAS) TSP and depositional dust under EPL 640. Hunter Valley Operations has sought approval of the Department of Planning and Environment to cease monitoring HVAS PM10, TSP and depositional dust currently under consent conditions.

Figure 13: Air Quality Monitoring Locations 2016

Table 20: Air quality impact assessment criteria and 2016 compliance assessment (HVO North DA 450-10-2003 and HVO South PA 06_0261)

Pollutant	Criterion	Averaging Period	Compliance
Deposited Dust	4 g/m^2/month	Maximum total deposited dust level	100%
	2 g/m^2/month	Maximum increase in deposited dust level	100%
Total Suspended Particulate matter (TSP)	90 µg/m^3	Long Term (Annual)	100%
Particulate matter <10µm (PM_{10})	30 µg/m^3	Long Term (Annual)	100%
	50 µg/m^3	Short Term (24 hour)	100%

Table 21: Air quality land acquisition criteria and 2016 compliance assessment (HVO North DA 450-10-2003 and HVO South PA 06_0261)

Pollutant	Criterion	Averaging Period	Compliance
Deposited Dust	4 g/m^2/month	Maximum total deposited dust level	100%
	2 g/m^2/month	Maximum increase in deposited dust level	100%
Total Suspended Particulate matter (TSP)	90 µg/m^3	Long Term (Annual)	100%
Particulate matter <10µm (PM_{10})	30 µg/m^3	Long Term (Annual)	100%
	150 µg/m^3 [a]	Short Term (24 hour)	100%
	50 µg/m^3 [b]	Short Term (24 hour)	100%

[a] – Total impact (i.e. incremental increase in concentrations due to the development plus background concentrations due to all other sources);
[b] – Incremental impact (i.e. incremental increase in concentrations due to the development on its own)

6.4.2.4 Deposited Dust

Deposited dust is monitored at nine locations on privately-owned land, in accordance with AS3580.10.1 (2003). The annual average insoluble matter deposition rates in 2016 compared with the depositional dust impact assessment criterion and previous years' data are shown in Figure 14. During 2016 all annual average insoluble matter deposition rates were compliant with the long-term impact assessment and land acquisition criteria. All monitoring locations also demonstrated compliance with the maximum allowable insoluble solids increase criteria of 2g/m^2/month (Figure 15).

During 2016 monthly dust deposition rates equal to or greater than the long-term impact assessment criteria of 4g/m^2/month were recorded at number of sites. Where field observations denote a sample as contaminated (typically with insects, bird droppings or vegetation), the results are excluded from Annual Average compliance assessment.

Meteorological conditions and the results of nearby monitors for the sampling period are also considered when determining HVO's level of contribution to any elevated result. Details of excluded results are presented in the relevant HVO Monthly Environmental Monitoring Report.

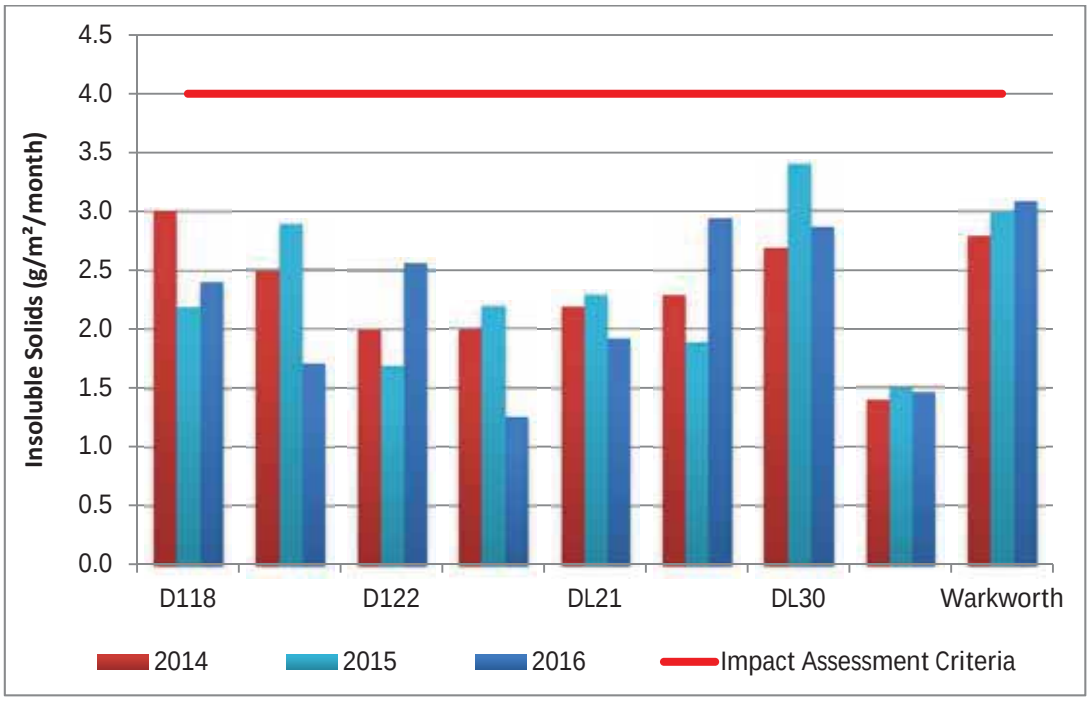

Figure 14: Annual average insoluble matter deposition rates 2014-2016

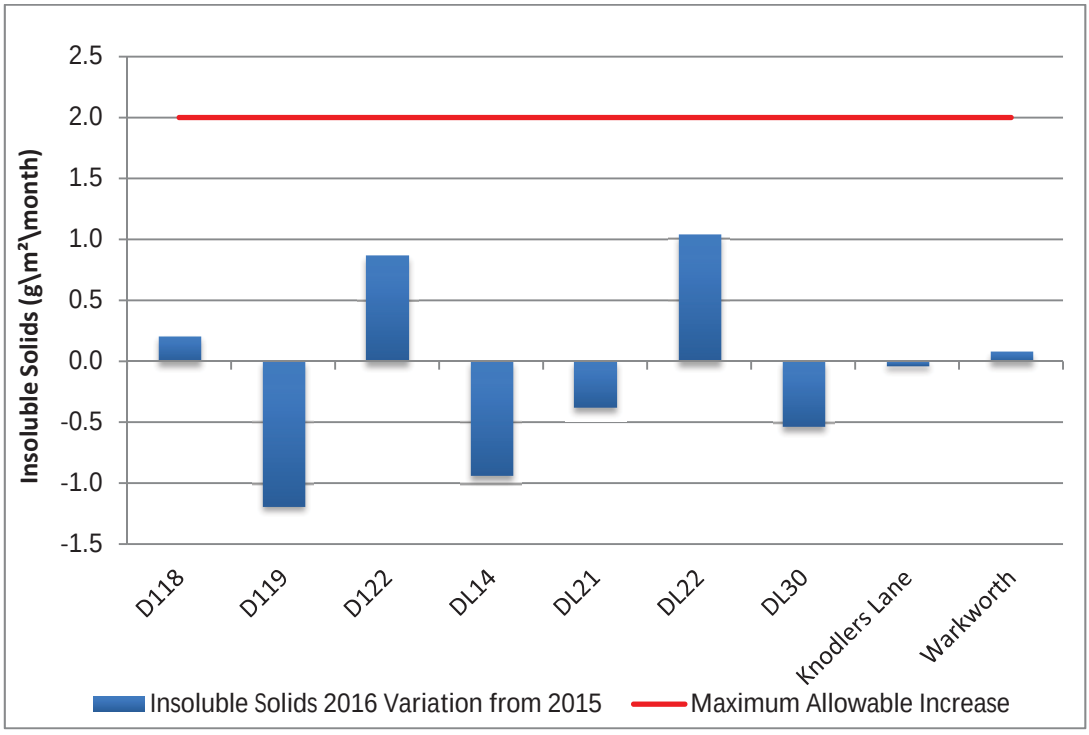

Figure 15: Annual average total insoluble solids variation, 2016 from 2015

6.4.2.5 Total Suspended Particulates (TSP)

Total Suspended Particulates (TSP) are measured at five locations on privately owned land in accordance with AS3580.9.3 (2003). Annual average TSP concentrations recorded in 2016 compared with the long term impact assessment criterion and previous years' data, are shown in Figure 16. During 2016 all annual average results were compliant with the impact assessment and land acquisition criteria.

The annual average TSP concentrations recorded in 2016 are generally consistent with those during previous years with the exception of Knodlers Lane, Maison Dieu and Long Point which recorded increases on the 2015 TSP Annual Average of 16.5 µg/m^3, 1.6 µg/m^3 and 3.8 µg/m^3 respectively.

The increase in annual average at the Knodlers Lane TSP monitor comes after a large reduction in the previous year (2015). it is generally recognised that a PM_{10}: TSP relationship of approximately 40% should be expected in most monitoring contexts. The 2016 results at Knodlers Lane return a relationship of 33%. This low result is likely a result of local sources such as livestock or vehicle movements. Livestock are often sighted in close proximity to the monitoring compound.

The paucity of data from the Long Point TSP monitor makes meaningful comparison difficult (commissioned in 2014). As the monitor is located further away from HVO than other monitors (Maison Dieu, Knodlers Lane and Warkworth) it is unlikely that the measured increases are a direct result of HVO activity.

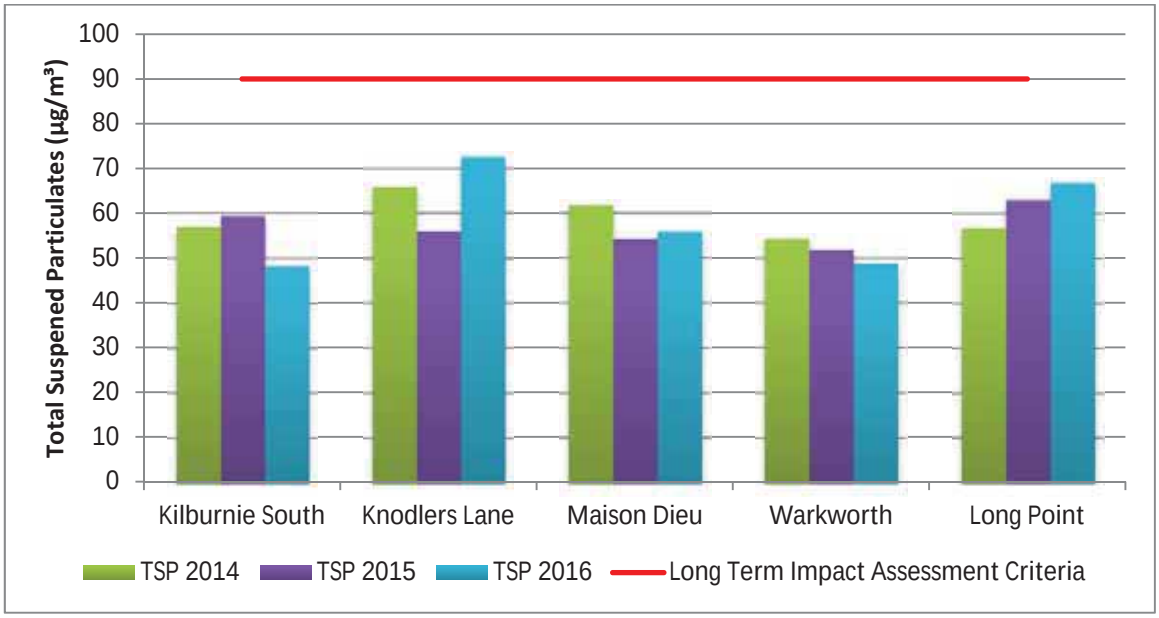

Figure 16: Annual average TSP concentrations 2014 to 2016

6.4.2.6 Particulate Matter <10µm (PM10)

Compliance assessment for Particulate Matter <10µm (PM_{10}) is measured at six locations on privately owned land in accordance with AS3580.9.6 (2003). During 2016 all short term and annual average results were compliant with the impact assessment and land acquisition criteria.

Routine monitoring of PM_{10} at the Hunter Valley Glider Club (HVGC) commenced on 24th November 2014 in accordance with the HVGC Amenity Management Plan, and following consultation with the HVGC.

6.4.2.7 Short term PM10 impact assessment criteria

Monitoring results for 2016 PM_{10} (24 hour) collected through the High Volume Air Sampler monitoring regime compared against the short term impact assessment criteria are shown in Figure 17. All 24hr average results recorded by HVO's surrounding network of TEOM monitors are presented on a quarterly basis in Figure 18 to Figure 21.

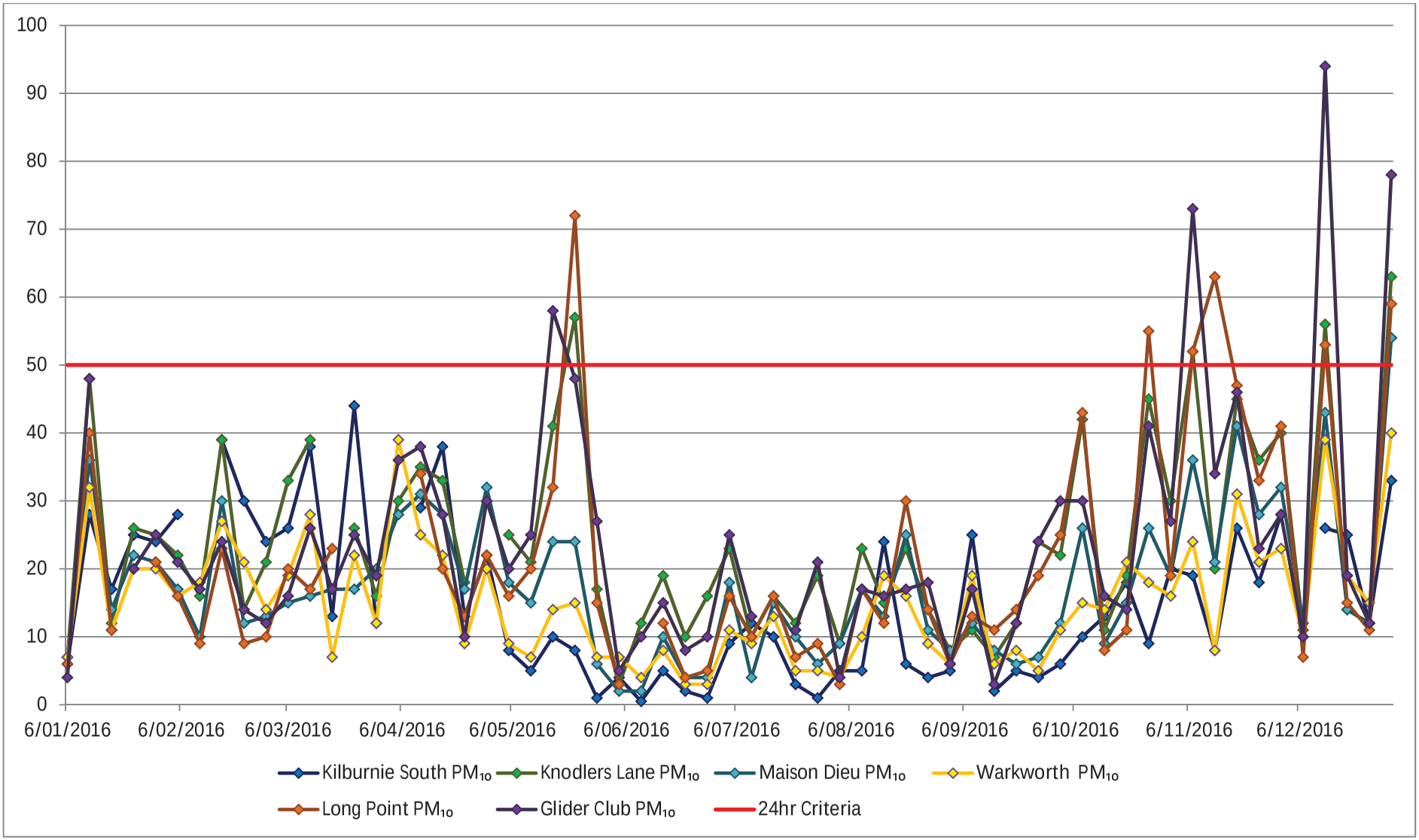

Figure 17: 2016 PM_{10} Results (measured through HVAS network)

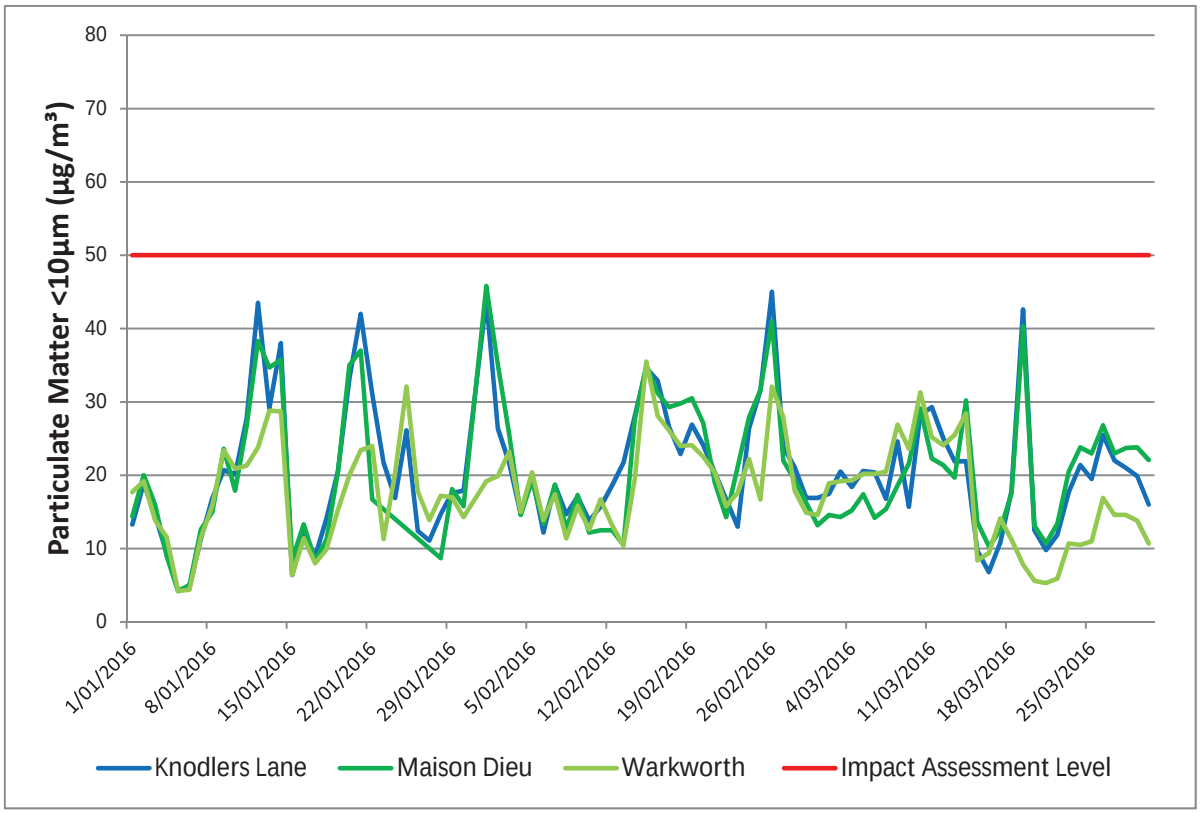

Figure 18: 24hr average PM_{10} (real time monitors) - Quarter One 2016

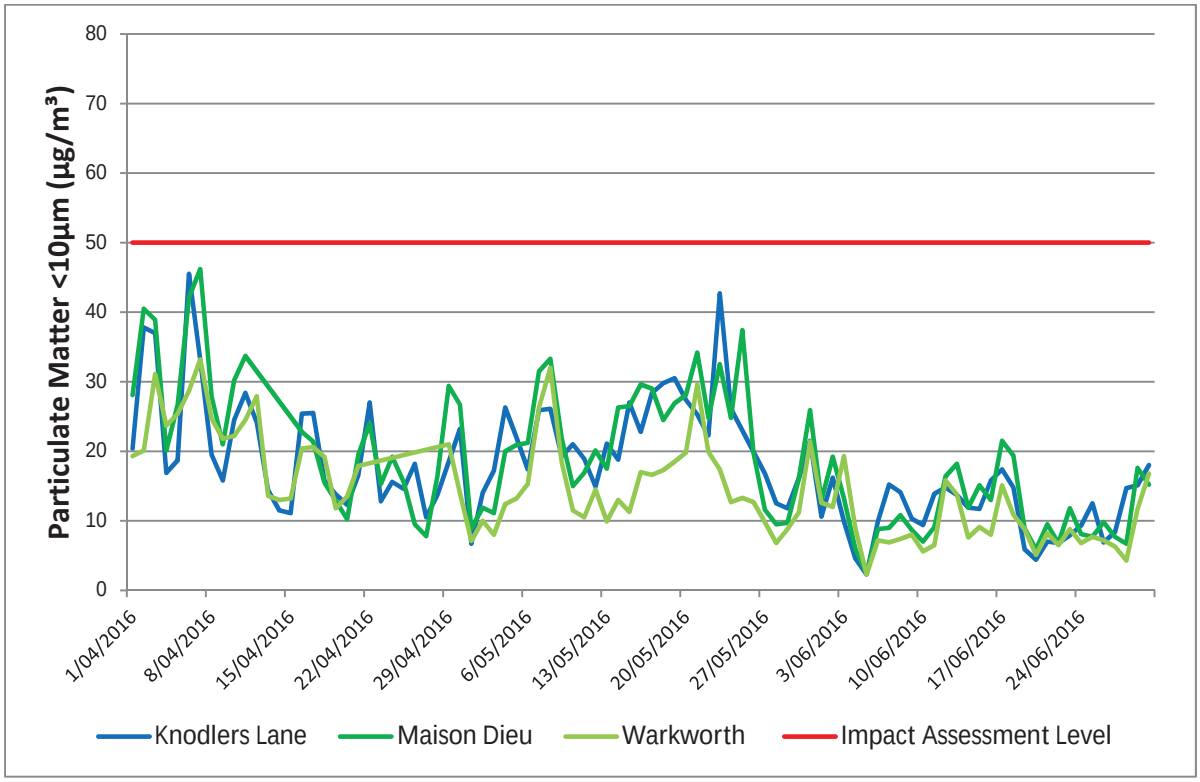

Figure 19: 24hr average PM_{10} (real time monitors) - Quarter Two 2016

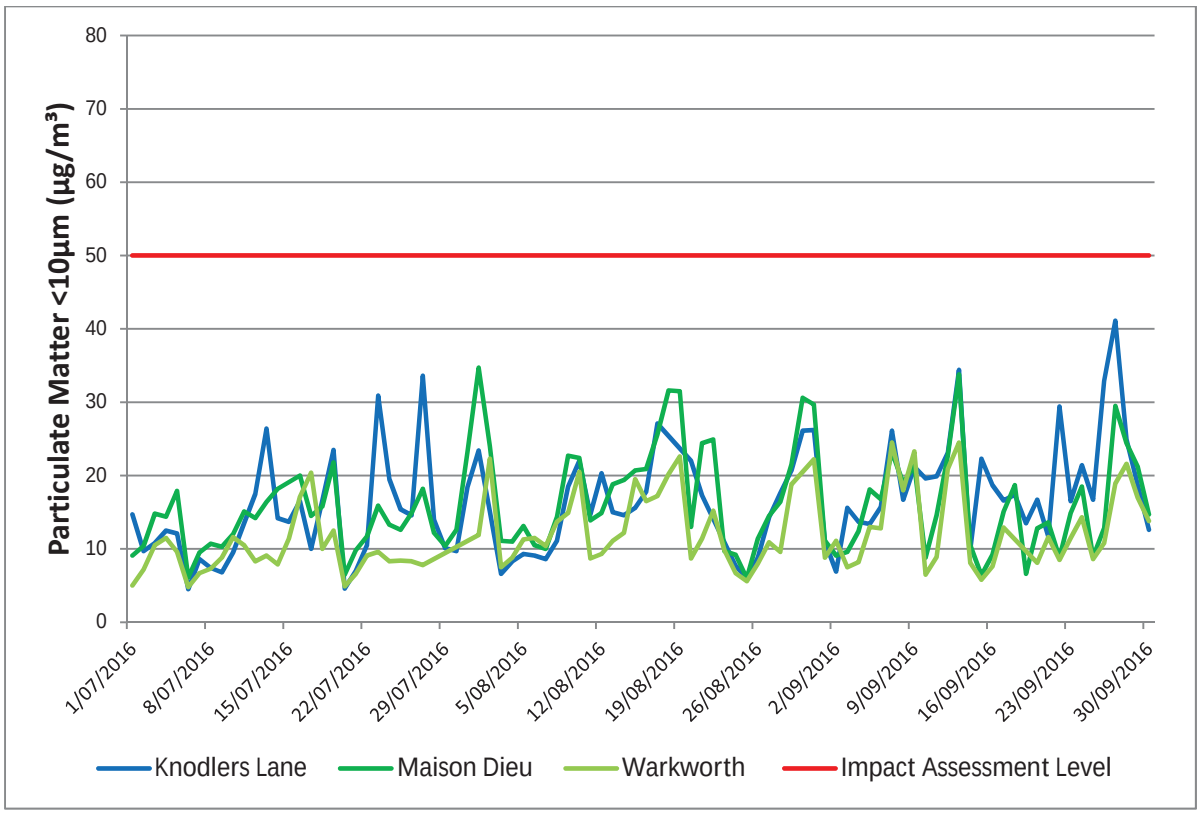

Figure 20: 24hr average PM_{10} (real time monitors) - Quarter Three 2016

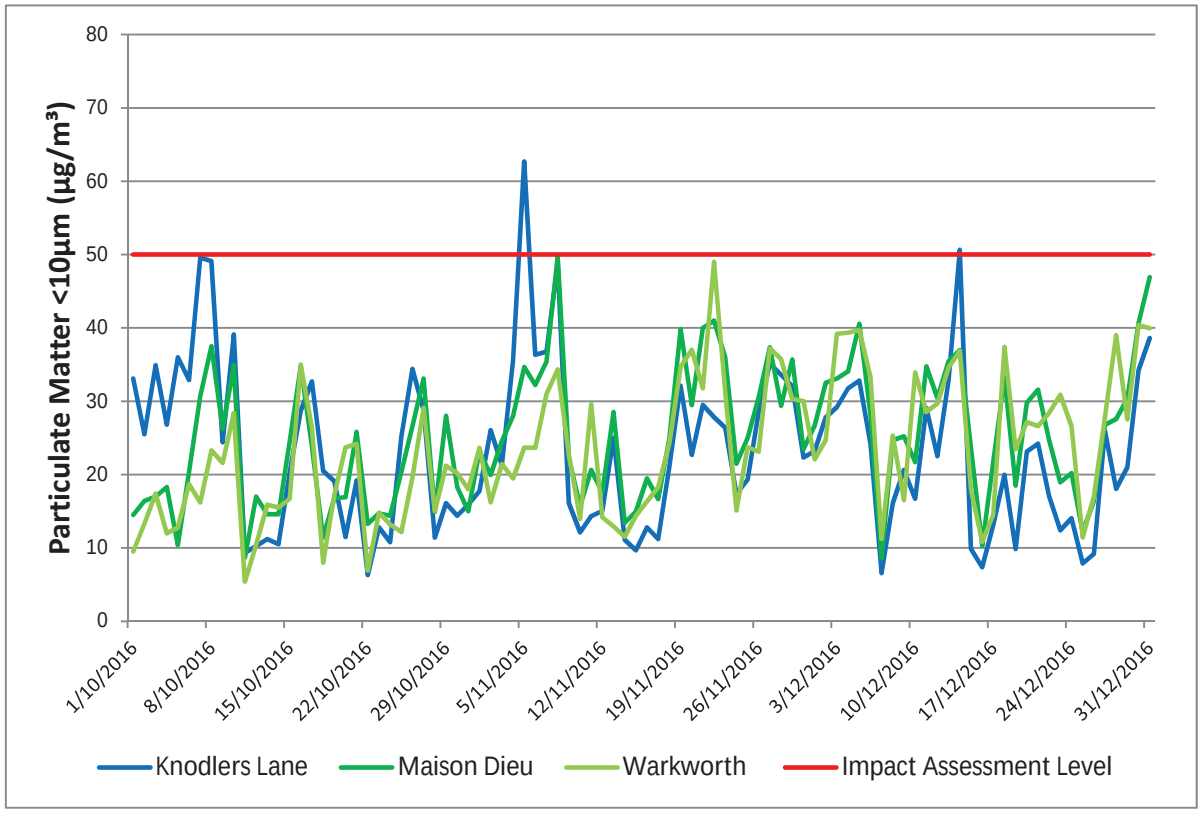

Figure 21: 24hr average PM_{10} (real time monitors) - Quarter Four 2016

Fifteen High Volume Air Sampler measurements and two TEOM PM_{10} measurements exceeded the 24hr impact assessment criteria during the reporting period. Each was investigated to determine the level of contribution from HVO activities to the elevated result (Table 22). For each measurement, it was determined that HVO was not the predominant contributor hence compliant with the impact assessment criteria. DP&E were notified at the time of each exceedance, with follow-up notifications to confirm the outcome of the investigation undertaken. No further requests were received from the Department in relation to these events.

Table 22: 24 hour PM_{10} investigations – 2016

Date	Site	24hr Result (µg/m3)	Estimated contribution from HVO (µg/m^3)	Discussion
17/05/2016	Glider Club PM_{10}	58	-	HVGC Secretary has confirmed that the HVGC was not in use on the 17th May, thus HVO South Air Quality criteria are not applicable on this day.
23/05/2016	Knodlers Lane PM_{10}	57	27	External Investigation determined maximum potential HVO contribution to be 72% of the measured result. As the calculated contribution was less than 75% of the measured result HVO operations are not considered to be a significant contributor to the result as described in the HVO Air Quality and Greenhouse Gas Management Plan.
23/05/2016	Long Point PM_{10}	72	20	External Investigation determined maximum potential HVO contribution to be 28% of the measured result. As the calculated contribution was less than 75% of the measured result HVO operations are not considered to be a significant contributor to the result as described in the HVO Air Quality and Greenhouse Gas Management Plan.
26/10/2016	Long Point PM_{10}	55	39	An internal investigation determined that the maximum potential contribution to be less than the measured result. As the calculated contribution was less than 75% (calculated to be 71%) of the measured result, HVO operations are not considered to be a significant contributor to the results. As described in the HVO Air Quality and Greenhouse Gas Management Plan.
5/11/2016	Knodlers Lane RT PM_{10}	62.7	37.5	An internal investigation determined that the maximum potential contribution to be less than the measured result. As the calculated contribution was less than 75% (calculated to be 60%) of the measured result, HVO operations are not considered to be a significant contributor to the results. As described in the HVO Air Quality and Greenhouse Gas Management Plan.
7/11/2016	Knodlers Lane PM_{10}	52	26	An internal investigation determined that the maximum potential contribution to be less than the measured result. As the calculated contribution was less than 75% (calculated to be 50%) of the measured result, HVO operations are not considered to be a significant contributor to the results. As described in the HVO Air Quality and Greenhouse Gas Management Plan.

7/11/2016	Long Point PM_{10}	52	33	An internal investigation determined that the maximum potential contribution to be less than the measured result. As the calculated contribution was less than 75% (calculated to be 64%) of the measured result, HVO operations are not considered to be a significant contributor to the results. As described in the HVO Air Quality and Greenhouse Gas Management Plan.
7/11/2016	Glider Club PM_{10}	73	-	HVGC Secretary has confirmed that the HVGC was not in use on the 7th November, thus HVO South Air Quality criteria are not applicable on this day.
13/11/2016	Long Point PM_{10}	63	-	Given the wind direction on the day (NW) and the lower result at the glider club (34 µg/m³), which is upstream of Long Point, it is unlikely that HVO contributed to the measured result. It is likely that a local source contributed to this result, no other HVS result was >40 µg/m³ on this day. An estimated contribution has not been calculated.
13/12/2016	Knodlers Lane PM_{10}	56	33	An internal investigation determined that the maximum potential contribution to be less than the measured result. As the calculated contribution was less than 75% (calculated to be 59%) of the measured result, HVO operations are not considered to be a significant contributor to the results. As described in the HVO Air Quality and Greenhouse Gas Management Plan.
13/12/2016	Long Point PM_{10}	53	30	An internal investigation determined that the maximum potential contribution to be less than the measured result. As the calculated contribution was less than 75% (calculated to be 57%) of the measured result, HVO operations are not considered to be a significant contributor to the results. As described in the HVO Air Quality and Greenhouse Gas Management Plan.
13/12/2016	Glider Club PM_{10}	94	-	HVGC Secretary has confirmed that the HVGC was not in use on the 13th December, thus HVO South Air Quality criteria are not applicable on this day.
14/12/2016	Knodlers Lane RT PM_{10}	50.6	2.4	An internal investigation determined that the maximum potential contribution to be less than the measured result. As the calculated contribution was less than 75% (calculated to be 5%) of the measured result, HVO operations are not considered to be a significant contributor to the results. As described in the HVO Air Quality and Greenhouse Gas Management Plan.
31/12/2016	Knodlers Lane PM_{10}	63	-	Due to the wind direction on the day (SSW) it is unlikely that HVO contributed to the measured result. As the wind direction is outside the arc of influence an estimated result has not been calculated.
	Maison Dieu PM_{10}	54	-	
	Long Point PM_{10}	59	-	
	Glider Club PM_{10}	78	-	

6.4.2.8 Long term PM10 impact assessment criteria

Annual average PM_{10} concentrations recorded at the six monitoring locations in 2016, compared with the long term PM_{10} impact assessment criterion and previous years' data, are shown on Figure 22. During 2016 all annual average PM_{10} concentrations recorded on privately owned land were compliant with the assessment criterion, and are consistent with annual average results measured in recent years.

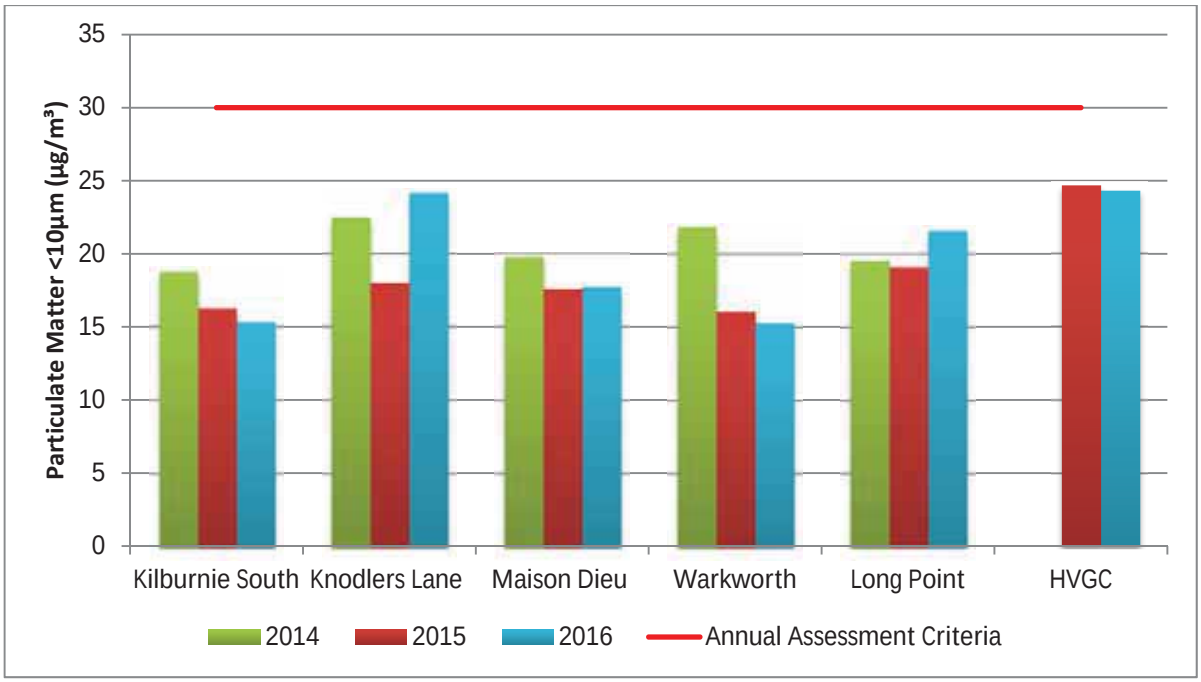

Figure 22: Annual average HVAS PM_{10} results 2014 to 2016

6.4.3 Comparison of 2016 Air Quality data against EA predictions

Table 23 to Table 25 show a comparison between 2016 air quality data and the predictions made in the HVO South Environmental Assessment 2008 (EA). Comparisons have been made against the predictions listed in the EA for the nearest private residence to each monitoring location.

Annual average PM_{10} measurements in 2016 are either below or consistent with predicted levels for all monitoring locations. Comparison of 2016 maximum 24hr PM_{10} values against the predicted maximum values returned results either below or consistent with the predicted worst case results for the Maison Dieu and Knodlers Lane, Long Point, Warkworth and HVGC monitoring locations. It should be noted that the worst case 24hr PM_{10} predictions refer to maximum concentrations generated by HVO South alone, while the measurements provided in Table 23 include PM_{10} concentrations from HVO South and all other sources. Refer to Table 22 for estimates of HVO contribution to measured exceedances of 24hr PM_{10} criteria during 2016.

TSP Annual Averages exceeded modelled predictions in 2016 at all monitoring locations. Section 9.1 of the HVO South Coal Project Air Quality Assessment (Holmes Air Sciences), notes that TSP concentrations are significantly under predicted. This is due to the fact that local dust sources (such as dust from local roads, stock movements and agricultural activity) have not been considered in the model.

Table 23: 2016 PM_{10} annual average results compared against cumulative predictions for 2014 and 2019 (HVO South Environmental Assessment)

Site (EA receptor)	Short Term (24hr) criteria			Long Term (annual average) criteria		
	Predicted maximum 24hr PM_{10} due to HVO South alone ($\mu g/m^3$)		2016 maximum 24hr PM_{10} result ($\mu g/m^3$)	Predicted PM_{10} annual averages ($\mu g/m^3$)		2016 PM_{10} annual average ($\mu g/m^3$)
	2014	2019		2014	2019	
Maison Dieu (47)	81.9	49.4	54	19.7	17.2	17.7
Warkworth (43)	50.8	29	40	32.9	24.8	15.3
Kilburnie South (4)	40.9	16.6	44	16.7	13.7	15.4
Knodlers Lane (32)	138	26.1	63	33.1	23	18.1
Long Point*	50-90	30-50	72	10-30	10-30	21.6
HVGC**	90-200	50-90	94	10-30	10-30	24.3

**No receptor identified in EIS (2008). Estimate has been made based on contours presented in the EIS.*

***No receptor identified in EIS (2008). The HVGC has entered into an Amenity Management Plan with Hunter Valley Operations.*

Table 24: HVO South Project Environmental Assessment cumulative predictions for 2014 and 2019 against 2016 TSP annual averages

Site (EA receptor)	Long Term (annual average) TSP Criteria		
	2014 prediction ($\mu g/m^3$)	2019 prediction ($\mu g/m^3$)	2016 annual average ($\mu g/m^3$)
Maison Dieu (47)	44.0	22.2	55.9
Warkworth (43)	60.1	29.8	48.8
Kilburnie South (4)	40.4	18.7	48.3
Knodlers Lane (32)	61.0	28.0	72.6
Long Point*	0-50	30-50	66.9

**No receptor identified in EIS (2008). Estimate has been made based on contours presented in the EIS.*

Table 25: HVO South Environmental Assessment cumulative predictions for 2014 and 2019 against 2016 Depositional Dust annual averages

Site (representative receptor ID)	Units (Insoluble Solids)	Assessment Criteria	2014 EA Predictions Annual Averages	2019 EA Predictions Annual Averages	2016 Actual Annual Average
D118 (Kilburnie Sth) (4)	g/m^2/month	4	0.8	1.1	2.4
D119 (Jerry's Plains) (13)	g/m^2/month	4	0.7	1.1	1.7
DL14 (Maison Dieu) (47)	g/m^2/month	4	1.0	1.3	1.3
DL21 (32)	g/m^2/month	4	2.0	1.9	1.9
DL22 (16)	g/m^2/month	4	2.2	1.9	2.9
Knodlers Lane (24/34)	g/m^2/month	4	1.5	1.6	1.5
Warkworth (43)	g/m^2/month	4	1.7	1.6	3.1

Table 26 and Table 27 detail comparisons between 2016 air quality monitoring results and the modelled predictions from the 2010 HVO North Carrington West Wing Air Quality Impact Assessment. Predictions have been sourced from modelled scenarios of Year One of the Carrington West Wing development. It should be noted that while Approval has been granted for the commencement of that project, works have not yet commenced.

Table 26: 2016 PM_{10} annual average results compared against cumulative predictions for Year One (CWW) - HVO North Environmental Assessment

Site (EA receptor)	Long Term (annual average) criteria	
	Predicted PM_{10} annual average ($\mu g/m^3$)	2016 PM_{10} annual average ($\mu g/m^3$)
Maison Dieu (6)	19.1	17.7
Warkworth (39)	20.8	15.3
Kilburnie South (4)	19.7	15.4

*no modelled predictions for the Long Point area

Table 27: 2016 TSP Annual Average results compared against cumulative predictions for Year One (CWW) - HVO North Environmental Assessment

Site (EA receptor)	Long Term (annual average) criteria	
	Predicted TSP annual average ($\mu g/m^3$)	2016 TSP annual average ($\mu g/m^3$)
Maison Dieu (6)	44.7	55.9
Warkworth (39)	46.6	48.8
Kilburnie South (4)	45.2	48.3

*no modelled predictions for the Long Point area

Comparison of measured PM_{10} with modelled predictions demonstrates close alignment for all monitoring locations; however TSP measurements have exceeded predictions in a similar fashion to the comparison undertaken for HVO South. Given that the TSP fraction settles out of suspension faster than PM_{10} (and thus much closer to the operation), it is not reasonable to suggest that nearby private residences are being impacted by mine-generated TSP to a greater degree than by PM_{10}, on the basis of measured data exceeding the predictions. Rather, the data suggests the assumptions in the model relating to extraneous dust sources are under predicting total TSP levels which are experienced at receptors.

Regardless of correlation with the modelled predictions, TSP levels measured remain well below the impact assessment criteria of 90µg/m3 and have been relatively stable in recent years (Figure 16).

6.4.4 Air Quality Non-compliances during the Reporting Period

HVO complied with all air quality criteria during 2016.

6.5 Heritage Summary

6.5.1 Management and community consultation

Aboriginal cultural heritage is managed under the provisions of separate Aboriginal Cultural Heritage Management Plans (ACHMP) approved for these development consents. At HVO North, where mining or associated development activities may impact Aboriginal cultural heritage sites, an Aboriginal Heritage Impact Permit (AHIP) must also be sought from the OEH under Part 6 of the National Parks and Wildlife Act 1974 (NPW Act), on the basis of the management requirements established through the ACHMP process. The HVO South ACHMP area was approved as a State Significant Development which excludes the requirement for obtaining AHIPs prior to implementing cultural heritage management measures authorised under the provisions of the ACHMP.

The Coal & Allied Upper Hunter Valley Aboriginal Cultural Heritage Working Group (CHWG) is the primary forum for Aboriginal community consultation on matters pertaining to cultural heritage. The CHWG is comprised of representatives from Rio Tinto Coal Australia and Registered Aboriginal Parties (RAPs) from Upper Hunter Valley Aboriginal native title and community groups, corporations and individuals. The CHWG met and discussed cultural heritage management matters associated with HVO on seven occasions during 2016: January 21st, March 17th, April 28th, June 9th, August 11th, October 20th and December 15th.

Aboriginal cultural heritage at HVO is managed in consultation with the RAPs through the CHWG in accordance with the ACHMPs, development consent conditions, Rio Tinto Cultural Heritage Management Standard and the RTCA Cultural Heritage Management System (CHMS) Work Procedures. The RTCA CHMS combines several elements to protect, manage and mitigate cultural heritage at HVO, including:

- Ongoing consultation and involvement of the local Aboriginal community in all matters pertaining to Aboriginal cultural heritage management;
- Compliance with existing ACHMP's and Development Consent conditions;
- A cultural heritage Geographic Information System (GIS) and Cultural Heritage Zone Plan (CHZP) incorporating cultural heritage spatial and spatial data (site location, description, assessments, date recorded, associated reports, management provisions and various other details to assist with the management of sites);
- A Ground Disturbance Permit (GDP) system for the assessment and approval of ground disturbing activities to ensure these activities do not disturb cultural heritage places;
- Limit of Disturbance Boundary (LODB) procedures to demarcate approved disturbance areas and delineate areas not to be disturbed;
- Ongoing cultural heritage site inspections, monitoring and auditing along with regular compliance inspections of development works;
- Protective management measures such as fencing/barricading sites to avoid disturbance, protective buffer zones, cultural heritage off-set areas; and
- Communicating cultural heritage issues and site awareness to personnel via internal electronic and face to face processes.

In consultation with the CHWG and OEH, Coal & Allied established the Hunter Valley Services Cultural Heritage Storage Facility (CHSF) at Hunter Valley Services. The CHSF is a combined office and storage shed, with an adjacent sea container, fitted out to allow safe and secure storage of cultural materials such as stone artefacts and scarred trees. It is a central repository for all materials collected during community collection and salvage activities on all Coal & Allied mines and lands in the Hunter Valley including HVO.

6.5.2 Aboriginal Archaeological and Cultural Heritage Investigations

Under the provisions of both the HVO South and HVO North ACHMPs, an ACHMP Compliance Inspection was conducted within both ACHMP areas during 2016. The purpose of the ACHMP compliance inspection is to provide the RAPs with:

- the opportunity to visit mine operations and mine areas to inspect operational compliance with ACHMP provisions and GDP procedures;
- to inspect and monitor the condition and management of sites; and
- to review the effectiveness and performance of the ACHMP provisions in the management of cultural heritage at the mine.

This compliance inspection was conducted by RAPs nominated and assisted by RTCA/Coal & Allied personnel. The 2016 HVO South and North compliance inspection was conducted over three days in October, with 82 Aboriginal cultural heritage sites inspected. The inspection found that all sites have been managed in conformance with the ACHMP requirements. The results of the compliance and inspection was reported to the RAPs at subsequent CHWG meetings on the 20th October and 15th December 2016.

In December 2016, a four day fieldwork program was conducted at HVO South in the form of a salvage collection of extant cultural heritage sites, a salvage excavation and investigation of a previously recorded PAD (Potential Archaeological Desposits), and sub-surface archaeological testing of a potential cemetery site. During the fieldwork program, four extant Aboriginal cultural heritage sites were salvage mitigated, and a further four new sites were identified and salvaged. Grader scrapes were completed over the potential cemetery site, as well as within the ACH PAD area, which was also subject to archaeological test excavation.

These works were conducted in accordance both with the HVO North ACHMP and the OEH Code of Practice for Archaeological Investigation of Aboriginal Objects in New South Wales (2010). The results of this program were presented to the CHWG at the December 15th meeting.

6.5.3 Audits and Incidents

During the reporting period there were 57 GDPs assessed for cultural heritage management considerations at HVO. ground disturbance works were conducted on an Aboriginal cultural heritage sites avoidance basis so that no extant sites were impacted by these activities. There were no incidents nor any unauthorised disturbance caused to cultural heritage sites at HVO during 2016.

Coal & Allied has continued a comprehensive desk top review and ground-truthing audit of all Aboriginal cultural heritage sites located on Coal & Allied lands, including HVO leases. The purpose of the process is to confirm or revise and update the Aboriginal sites data held in the OEH Aboriginal Heritage Information Management System (AHIMS) sites database. Coal &

Allied and OEH agree that there are inconsistencies between the AHIMS data and ground truthed data verified by Coal & Allied. These inconsistencies generally relate to errors in historical site location recording conducted over the last 20 years, resulting in incorrect information being recorded in the AHIMS database.

6.5.4 Historic Heritage - Management and community consultation

In 2012 Coal & Allied established the Community Heritage Advisory Group (CHAG) as a community consultation forum for all matters pertaining to management of historic (non-Indigenous) heritage located on Coal & Allied lands. The CHAG is comprised of community representatives with particular knowledge and interests in historic heritage of the region such as historical groups, individuals and local government. Coal & Allied provided the CHAG with an annual Historic Heritage Management newsletter, also made available to the general community, which included information on the Chain of Ponds Inn stabilisation work and historic archaeological investigations associated with HVO.

On the 12th August 2016 a group tour with the CHAG was undertaken. The Stage One Chain of Ponds Stabilisation works, which were completed in 2015, were inspected amongst other historic features on Coal and Allied lands.

The CHAG was consulted during 2016 regarding the salvage excavation work planned for the Barellan Property potential cemetery; preliminary results were presented at the December 14th meeting.

6.6 Greenhouse Gas and Energy Management

During 2016, HVO continued to comply with Australian Government legislation for Greenhouse reporting. Under NGER, Rio Tinto is required to report its annual greenhouse gas emissions, energy use and energy production. Results of Rio Tinto's greenhouse gas and energy information are publicly available online at

http://www.cleanenergyregulator.gov.au/NGER/National%20greenhouse%20and%20energy%20reporting%20data/Corporate%20emissions%20and%20energy%20data/corporate-emissions-and-energy-data-2015-16?Paged=TRUE&p_ID=694&View=%7b66B0C07D-A91E-4A8B-8908-DFAB7991A3F8%7d&PageFirstRow=301

RTCA continues to invest in research and development initiatives to find ways to reduce greenhouse gas emissions throughout the coal chain, with focus on;

- Research to identify new technologies;
- Technology upgrades to improve the way coal is burned; and
- Supporting a policy environment to enable the deployment of low emissions coal technologies.

A summary of greenhouse gas emissions for HVO including fugitive coal seam gas emissions and land management emissions compared to 2015 is displayed in Table 28 below.

Total emissions in 2016 increased on 2015 results, this is attributed to an increase in Process and Diesel Emissions which is a reflection of the increase in the amount of raw coal mined and diesel used.

Table 28: Total Greenhouse Gas Emissions

Hunter Valley Operations Greenhouse Gas Emissions	2015	2016
Electricity (tCO_2-e)	121,170	120,540
Diesel and other fuels (tCO_2-e)	334,000	350,817
Process Emissions (tCO_2-e)	125,399	133,064*
Land Management (tCO_2-e)	7,050	3,581
Total Site (tCO_2-e)	587,619	608,003

* Fugitive (Coal Seam Gas) emissions may be updated after the reporting period on occasion following revision to emission factors.

6.7 Waste and Hazard Management

6.7.1 Management

Current licenses exist for the storage of dangerous goods and explosive materials at HVO given in Table 5.

Inventories of hazardous materials and Safety Data Sheets (SDS) are available through the Occupational Health and Safety department and the ChemAlert system. HVO manages hazardous materials through the ChemAlert system, a register of all chemicals used on site. This register contains all information contained in the SDS and can be accessed at any computer terminal within the operation to provide guidance on storage, use and disposal.

Oil water separators are installed at the HVO North. South and West workshops to ensure the effective treatment of oily water onsite. In addition, absorbent booms and removal of oily water via vacuum trucks are utilised on an as required basis to augment existing waste management practices.

The management of waste generated on the site is undertaken in accordance with Coal & Allied's Total Waste Management System, local ordinances and within existing regulatory guidelines. Waste rubbish not suitable for recycling is disposed of at the Singleton Council's landfill. HVO only uses waste management firms licensed by the NSW EPA.

6.7.1.1 Fuel Containment

The HVO fuel storage systems are located at several sites across HVO including:

- Hunter Valley Store area at the main workshop facility;
- West Pit Workshop service area; and
- Southern Facilities.

HVO also has three in-pit fuel tanker locations, tanks are double skinned providing added protection against spills and leaks. The facilities have been constructed with a synthetic clay liner to reduce potential contamination from fuel spillage

6.7.1.2 Oil and Grease Containment and Disposal

Bulk oil and grease is stored at the Hunter Valley Store. The bulk oils and grease storage facilities are part of the fuel storage facility that complies with Australian Standard 1940.

6.7.2 Performance

6.7.2.1 Non-Hazardous Wastes

All wastes leaving the site are tracked and recorded; Regulated wastes are tracked and reported in accordance with regulatory requirements. Figure 23 and Figure 24 depict the waste statistics at HVO. This information is used by HVO personnel to identify areas of improvements and track performance against targets.

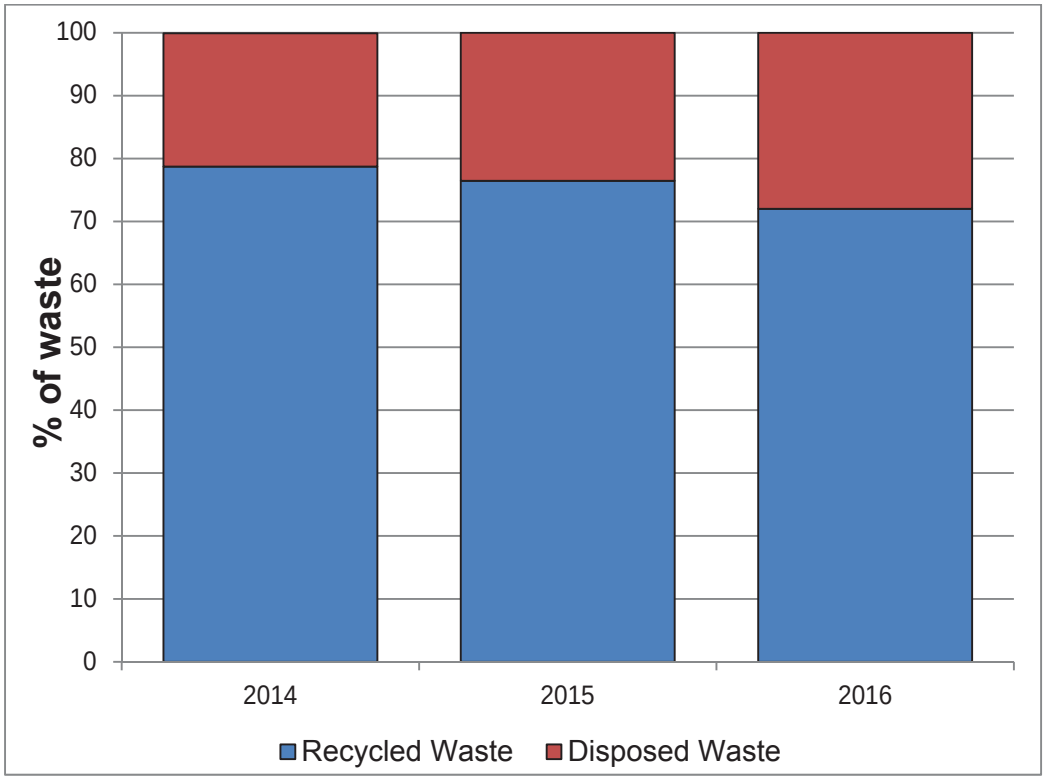

Figure 23: HVO waste streams trend 2014- 2016

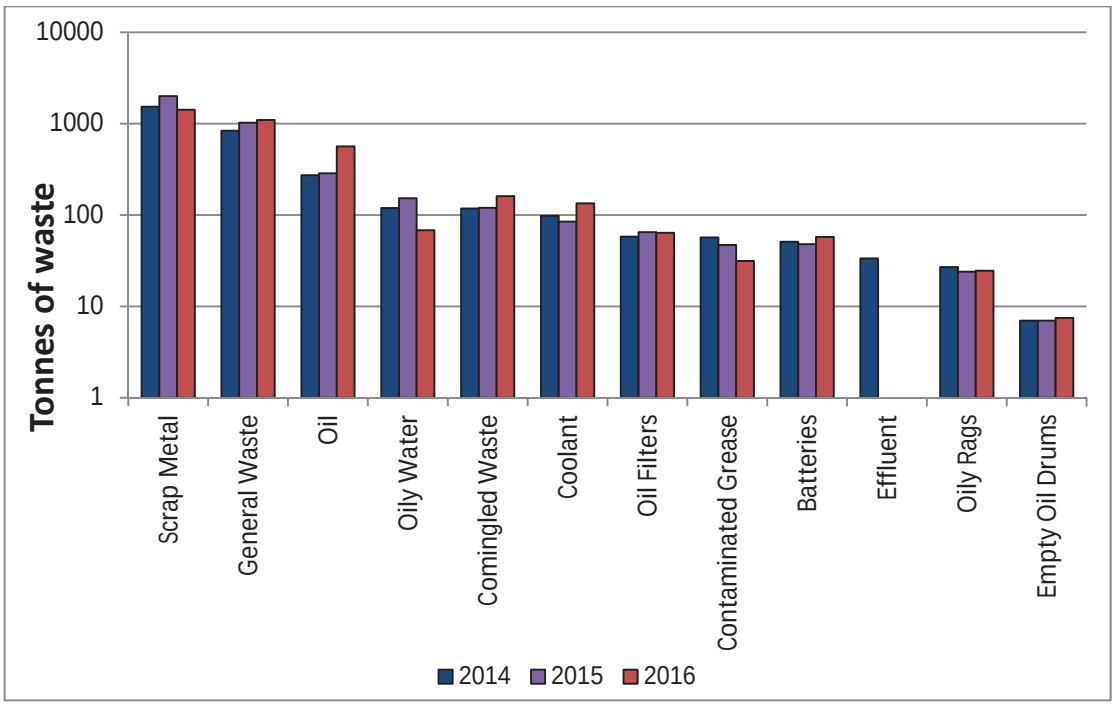

Figure 24: Waste disposed off-site from HVO activities from 2014 to 2016

6.7.2.2 Recycling

HVO has continued to have a focus on training and reinforcing the principles of a good waste management across the site including recycling. In 2016 28 per cent of non-mineral waste material generated at HVO was disposed to licensed offsite landfill facilities. A recycling result of 72 per cent was achieved in 2016, as shown in Figure 23.

The overall recycling percentage has reduced from 2015 (76%) to 2016 (72%). The reduction in recycled waste is attributed to;

- Changes to waste oil recycling, the company which collected, refined and delivered waste oil to HVO for use in blasting ceased to operate.
- Reduction in amount of scrap metal scrapped.

HVO will explore opportunities to continue to improve recycling rates in 2017.

6.7.2.3 Sewage Treatment/Disposal

The sewage treatment and disposal facilities at Coal & Allied's operations consist of packaged sewage treatment plants which treat, disinfect and re-use the treated effluent on-site. The remaining effluent from some septic systems that can't be treated on site is sent to approved facilities for disposal.

HVO currently has 19 on-site sewerage management systems, of which six are located in-pit, a further six are associated with CHPP's and the remaining seven systems are located at infrastructure associated with mining and administration. Two of the 19 systems are large scale systems that service up to four sub-systems.

6.7.2.4 Hydrocarbons

In 2016 HVO used 62kL of waste oil in blasting as a replacement for diesel. Another 914kL was taken offsite to be refined into a base oil for reuse in new oil products. Other hydrocarbons

recycled via a licensed waste hydrocarbon disposal company include approximately 31 tonnes of grease.

6.7.2.5 Contaminated Soil

Management of hydrocarbon contaminated soil employs the use of bioremediation areas that are maintained and operated in accordance with Coal & Allied procedures.

Contaminated soil is taken to one of the bioremediation areas and placed in cells based on the time of contamination. To maximise air circulation, contaminated soil is spread out in beds of no more than approximately 300 mm in height and approximately a grader width at the base. beds are oriented north south to achieve maximum exposure to sunlight. The beds are tined by a grader or equivalent on regular intervals in order to provide aeration for beneficial microbial activity.

Soil in the treatment area is sampled and tested on a regular basis until total hydrocarbon levels are below relevant government guidelines. Soil meeting these criteria is then removed and disposed of in the spoil dump.

6.7.2.6 Waste and Hazard Management Non-compliances during reporting period

There were no externally reportable incidents related to waste or hazard management during the reporting period.

7 WATER MANAGEMENT

7.1 Water Balance

7.1.1 Water Management

HVO manages surface and ground water according to three main objectives:

- Fresh water usage is minimised;
- Impacts on the environment and HVO neighbours are minimised; and
- Interference to mining production is minimal.

This is achieved by:

- Minimising freshwater use from the Hunter River;
- Preferentially using mine water for coal preparation and dust suppression;
- An emphasis on control of water quality and quantity at the source;
- Segregating waters of different quality where practical;
- Recycling on-site water;
- Ongoing maintenance and review of the system; and
- Disposing of water to the environment in accordance with statutes and regulations.

Plans showing the layout of all water management structures and key pipelines are shown in Figure 25 to Figure 27. The HVO Water Management Plan contains further detail on management practices and is available on Rio Tinto Coal Australia's website.

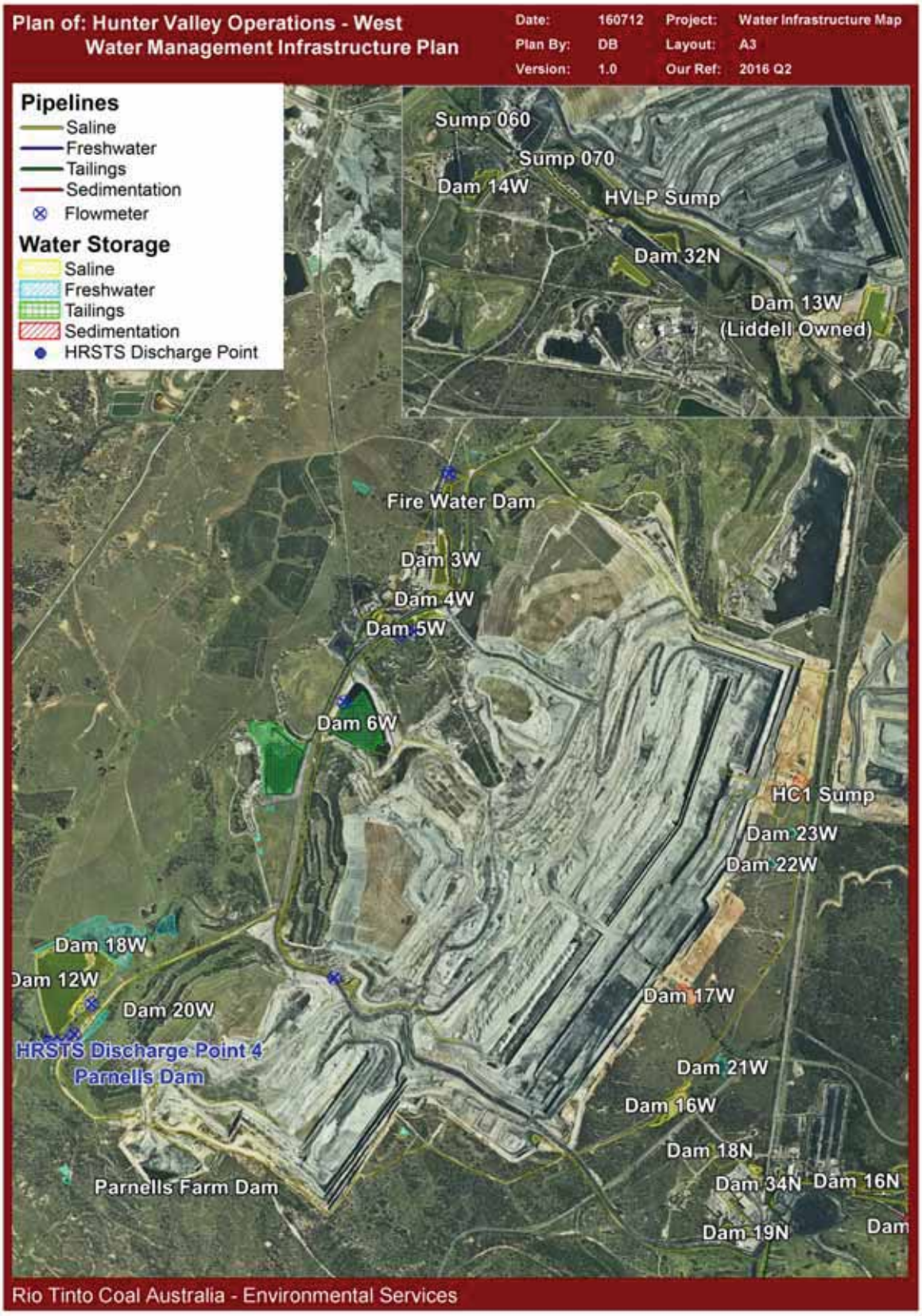

Figure 25: West Pit water management infrastructure

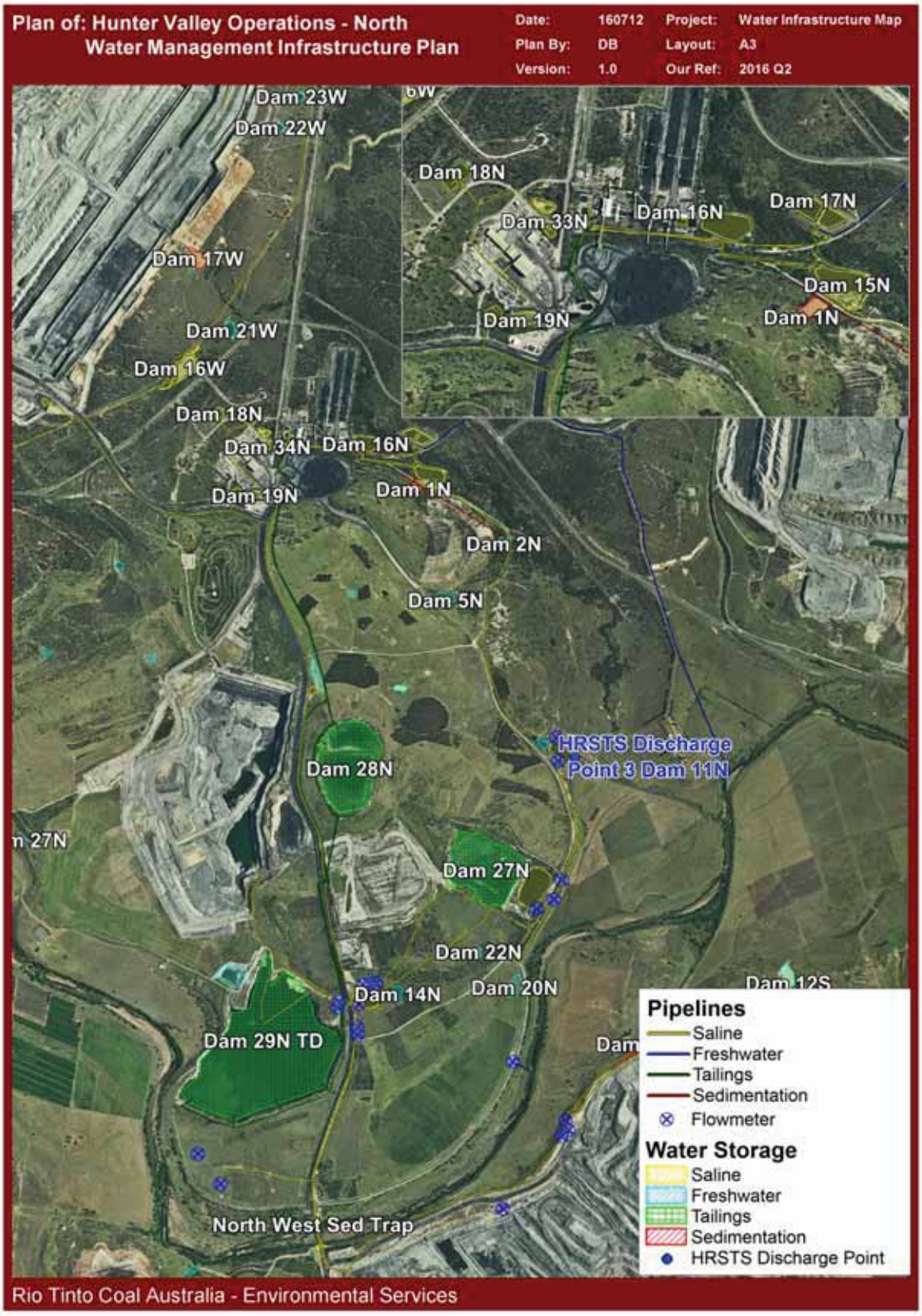

Figure 26: North Pit water management infrastructure

Figure 27: South Pit water management infrastructure

7.1.2 Water Performance

7.1.2.1 Water Balance

The 2016 static water balance for HVO is presented in Table 29 and a simplified schematic of this balance is included as Figure 28. The water balance is for a coal production rate of 17.97 million tonnes per year ROM and 13.69 million tonnes per year of product. Total water inputs were significantly lower in 2016, compared to the previous reporting period, as a result of lower runoff volumes generated by rainfall. Outputs were broadly consistent with the 2015 reporting period – water used for dust suppression was slightly higher due to drier weather conditions. A salt flux schematic is shown in Figure 29.

Table 29: 2016 HVO Water Balance

Water Stream	Volume (ML)
Inputs	
Fresh Water (potable)	25 (<1%)
Groundwater	1,379 (16%)
Rainfall Runoff	5,682 (67%)
Recycled to CHPP from Tails & Storage (not included in total)	2,445
Imported (Liddell)	2 (<1%)
Water from ROM Coal	1,346 (16%)
Total Inputs	**8,434**
Outputs	
Dust Suppression	3,038 (34%)
Evaporation - Mine Water & Tailings Dams	1,809 (21%)
Entrained in Process Waste	1,442 (16%)
Discharged (HRSTS)	0 (0%)
Vehicle Wash-down	255 (3%)
Miscellaneous Industrial Use	350 (4%)
Water in Coarse Reject	572 (7%)
Water in Product Coal	1,318 (15%)
Total Outputs	**8,784**
Change in Pit Storage (decrease)	**350**

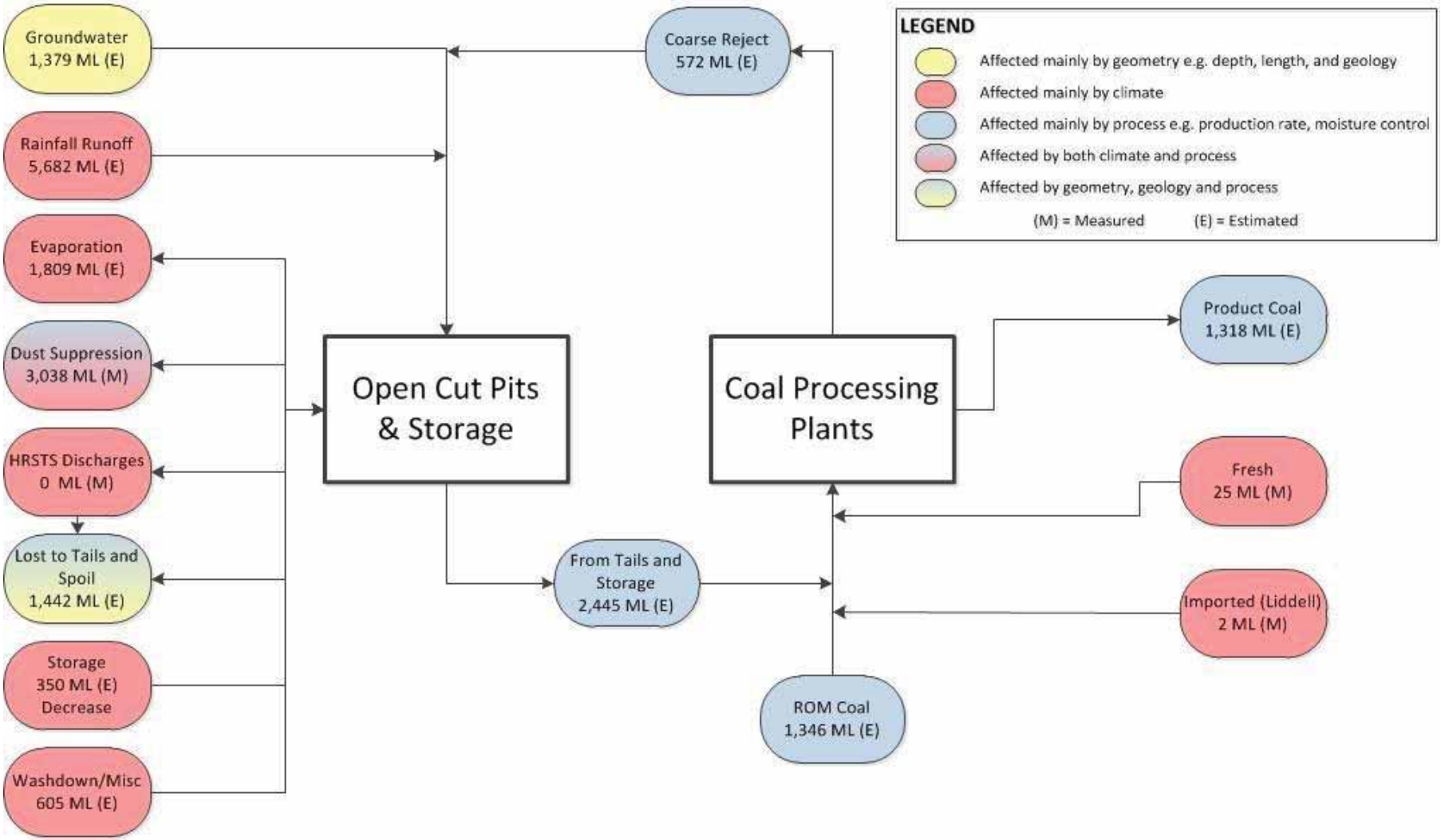

Figure 28: HVO water balance schematic diagram

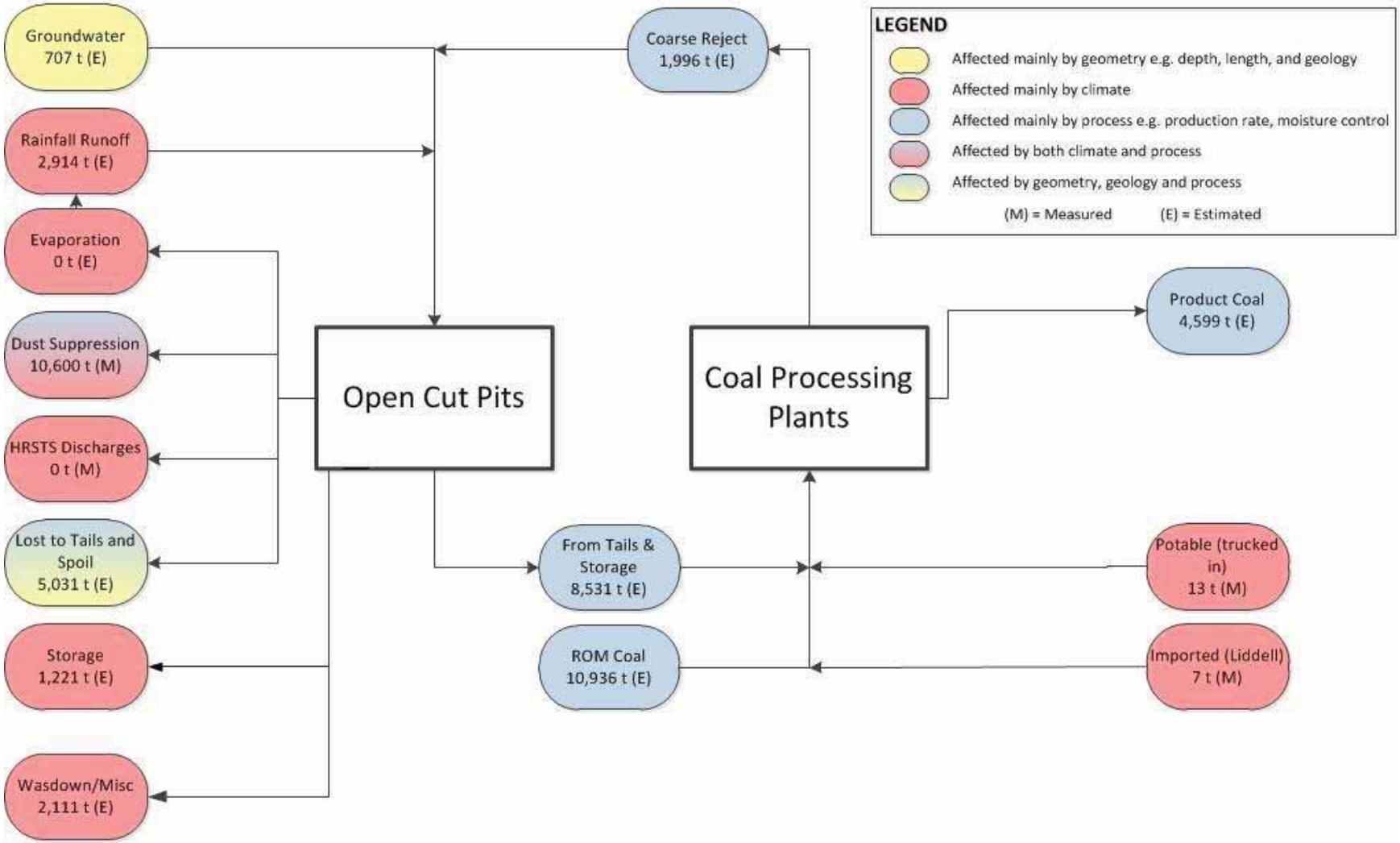

Figure 29: HVO salt balance schematic diagram

7.1.2.2 Water Inputs

A total of 693 mm of rainfall was recorded at HVO in 2016 producing an estimated 5,682 ML of runoff from approximately 6,248 ha of developed, disturbed and mining catchments. Water falling on undisturbed clean water catchments is diverted off site into natural systems where possible.

Groundwater inflows to the pits are calculated via numerical groundwater modelling methods; these are given in Table 6 for the reporting period. Groundwater inflows were estimated to have contributed 1,379 ML to the site during 2016. Groundwater inflows are greater than reported in 2015, due to an upgrade and re-calibration of the groundwater model for HVO South. No fresh water was pumped from the Hunter River during the reporting period.

7.1.2.3 Water Outputs

The main outputs were water use for dust suppression (3,038 ML), evaporation from dams (1,809 ML), water entrained in process waste (1,442 ML) and water in product coal (1,318 ML).

HVO participates in the Hunter River Salinity Trading Scheme (HRSTS) allowing it to discharge from licensed discharge points during declared discharge events, associated with increased flow in the Hunter River. HVO maintains three licensed discharge monitoring locations:

- Dam 11N, located at HVO North, which discharges to Farrell's Creek
- Lake James, located at HVO South, which discharges to the Hunter River; and
- Parnell's Dam, located at HVO West, which discharges to Parnell's Creek.

During 2016 Hunter Valley Operations discharged no water under the Hunter River Salinity Trading Scheme and Environment Protection Licence 640.

7.2 Surface Water

7.2.1 Water Management

Surface water monitoring activities continued in 2016 in accordance with the HVO Water Management Plan and HVO Surface Water Monitoring Programme. HVO maintains a network of surface water monitoring sites located on mine site dams, discharge points and surrounding natural watercourses (Figure 30). Water quality monitoring is undertaken to verify the effectiveness of the water management system onsite, and to identify the emergence of potentially adverse effects on surrounding watercourses. A number of mine water dams are monitored routinely to verify the quality of mine water, used in coal processing, dust suppression, and other day to day activities around the mine.

Surface water monitoring data is reviewed on a quarterly basis. The review involves a comparison of measured pH, Electrical Conductivity (EC) and Total Suspended Solids (TSS) results against internal trigger values which have been derived from the historical data set. The response to measured excursions outside the trigger limits is detailed in the HVO Water Management Plan.

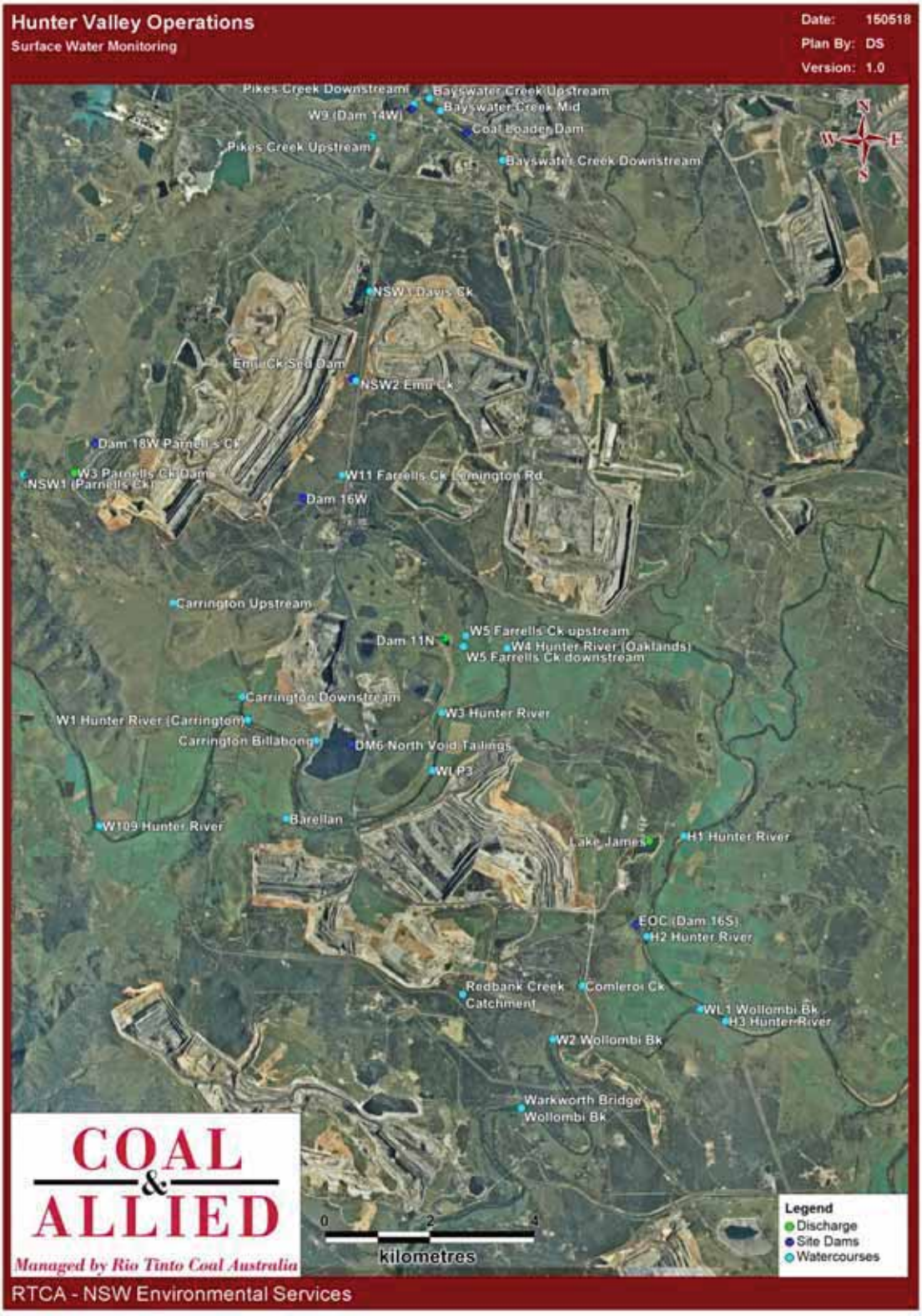

Figure 30: Surface Monitoring Locations

7.2.2 Surface Water Monitoring

Routine surface water monitoring was undertaken from 37 sites at the frequencies described the Surface Water Monitoring Programme. All sampling of surface waters was carried out in accordance with AS/NZS 5667.6 (1998). All analysis of surface water was carried out in accordance with approved methods by a NATA accredited laboratory.

Water quality is evaluated through the parameters of pH, EC and TSS. Pertinent surface water sites were also sampled for comprehensive analysis annually. Long term water quality trends for the Hunter River, Wollombi Brook, other surrounding tributaries and site dams are presented in this section. The sampling frequency for ephemeral water sites was modified in 2016, from quarterly to a rain-event trigger system, in an effort to ensure samples taken were more representative of typical water quality for those streams (up to eight sampling events per annum can now be taken under the revised sampling protocol). Due to dry conditions during the reporting period fewer sampling runs were completed than in 2015 (three instead of four), however there was an improvement in data recovery as fewer sites were recorded as dry during the monitoring events. All required sampling and analysis was undertaken, except as detailed in Table 30. ANZECC criteria are shown in the figures for comparative purposes.

Table 30: HVO Water Monitoring Data Recovery for 2016 (by exception)

Location	Data Recovery (%)	Comments
Carrington Billabong	0%	Site recorded as dry during all 2016 monitoring events.
Barellan	0%	Site recorded as dry during all 2016 monitoring events.
NSW 3 Davis Ck	0%	Site recorded as dry during all 2016 monitoring events.
Pikes Creek Downstream	67%	Site recorded as dry during June monitoring event.
Carrington upstream	33%	Site recorded as dry during June and November monitoring events.
W5 Farrells Ck upstream	0%	Site recorded as dry during all 2016 monitoring events.
W5 Farrells Ck downstream	67%	Site recorded as dry during March monitoring event.

7.2.2.1 Hunter River

The Hunter River was sampled on 28 occasions from seven monitoring locations during 2016. Long term trends for pH, EC and TSS are shown in Figure 31, Figure 32 and Figure 33. Results for water quality were consistent with historical trends; EC was seasonally variable and controlled by flow volumes through the catchment. One TSS trigger exceedance was recorded for H3 – details are given in Table 31.

Table 31: Hunter River Internal Trigger Tracking Results

Location	Date	Trigger limit	Action taken in response
H3	08/12/2016	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event- primary source appears to be localised around confluence with Wollombi Brook. Upstream data does not suggest high sediment load from further upstream. Watching brief.

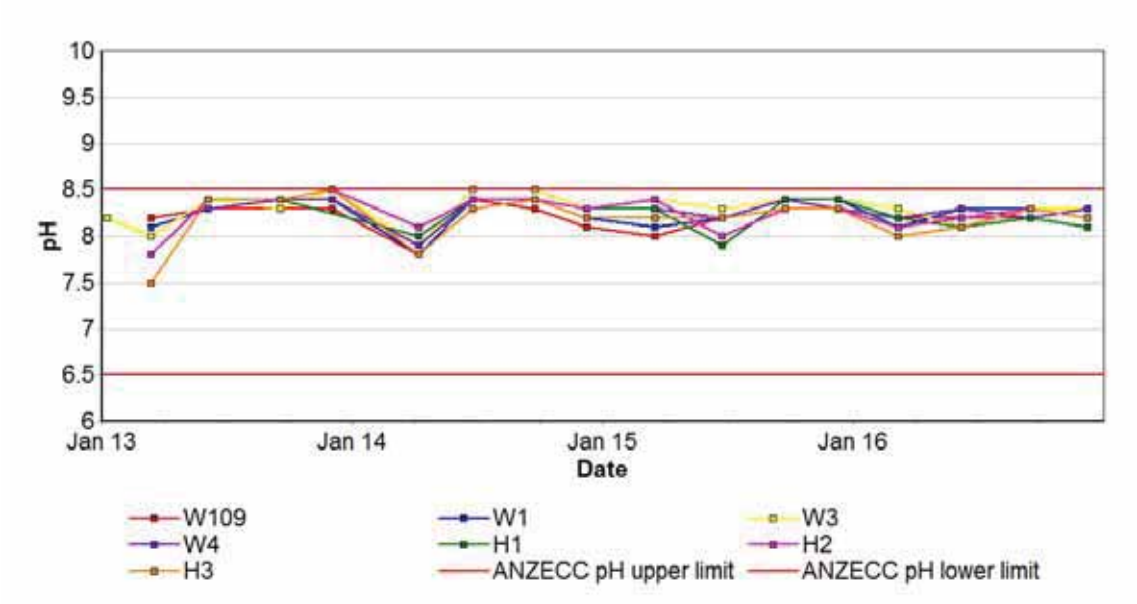

Figure 31: Hunter River pH Trends 2013-2016

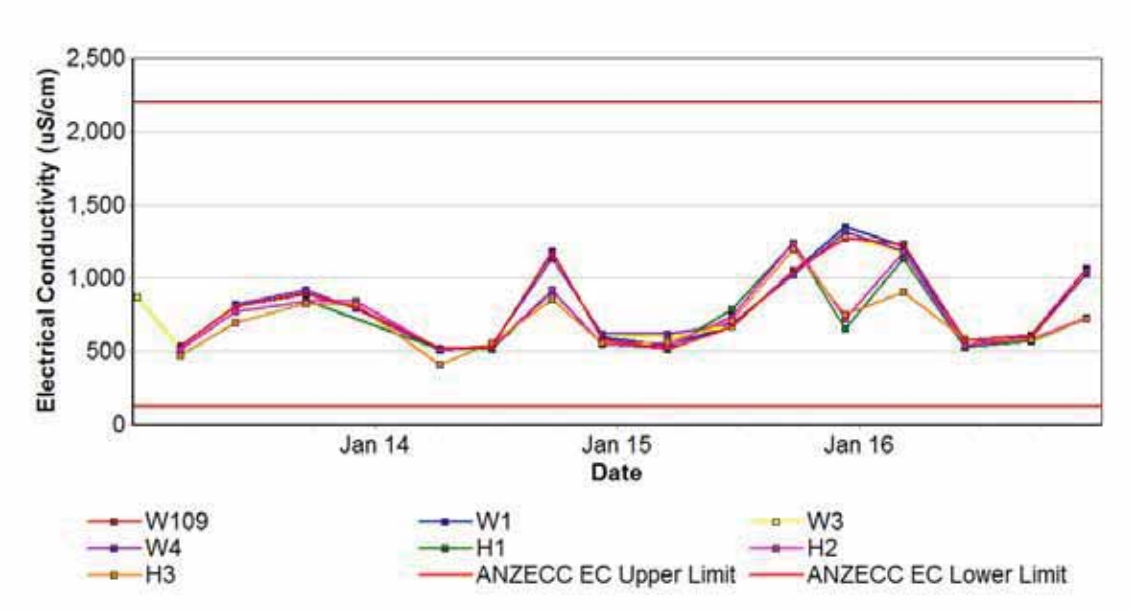

Figure 32: Hunter River EC Trends 2013– 2016

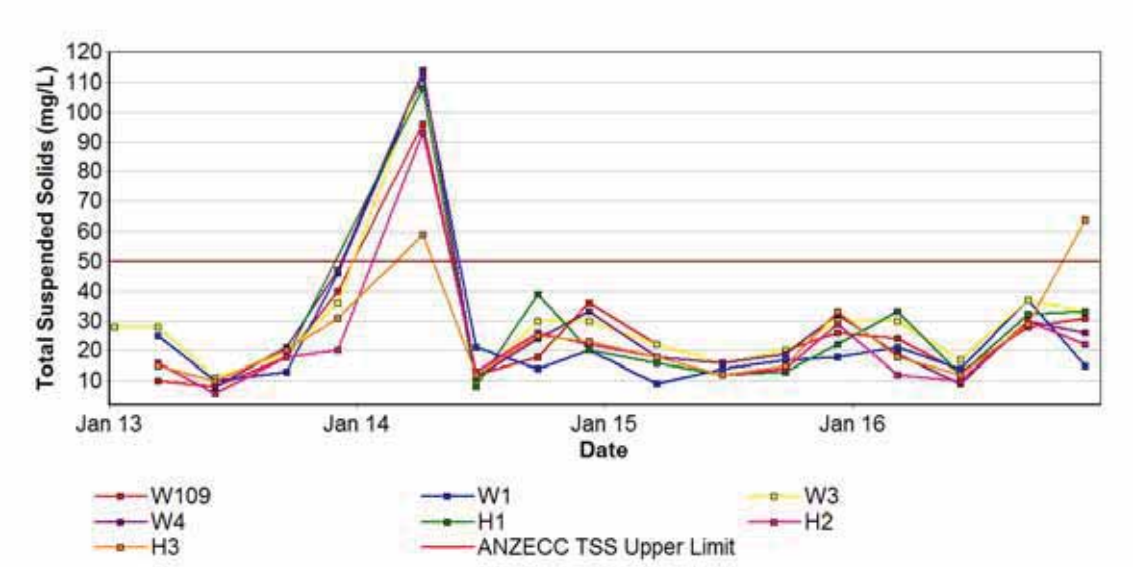

Figure 33: Hunter River TSS Trends 2013 – 2016

7.2.2.2 Wollombi Brook

Wollombi Brook was sampled on 12 occasions from three monitoring locations during 2016. Long term trends for pH, EC and TSS from Wollombi Brook are shown in Figure 34, Figure 35 and Figure 36. Results were consistent with historical trends and acceptable ranges; EC was seasonally variable and controlled by flow volumes through the catchment.

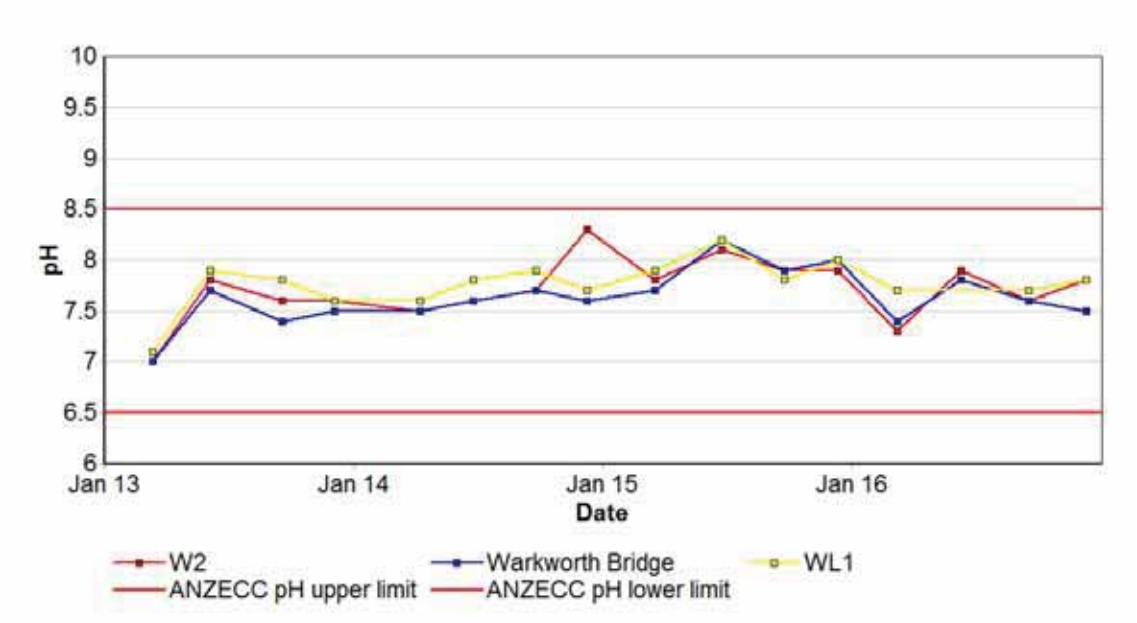

Figure 34: Wollombi Brook pH Trends 2013 – 2016

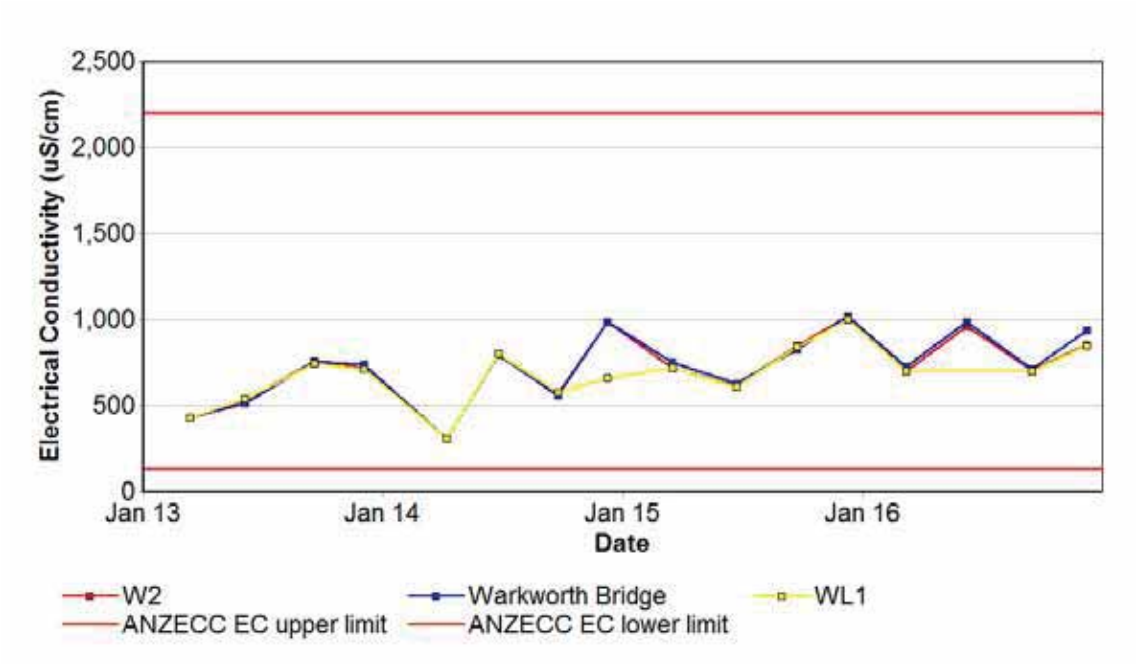

Figure 35: Wollombi Brook EC Trends 2013 – 2016

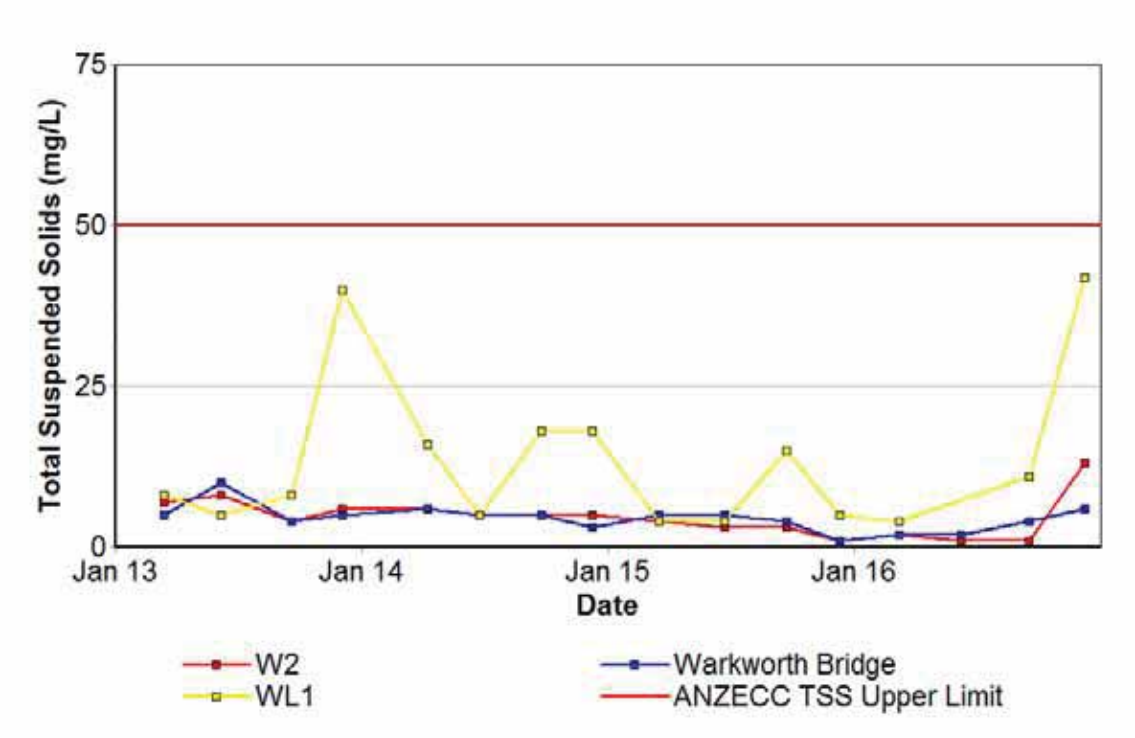

Figure 36: Wollombi Brook TSS Trends 2013 – 2016

7.2.2.3 Other Surrounding Tributaries

35 samples were collected across 17 sites during 2016. Event-based monitoring of natural tributaries surrounding HVO continued during 2016, from monitoring locations on the following water courses:

- Comleroi Creek
- Emu Creek
- Farrells Creek
- Pikes Creek
- Davis Creek
- Bayswater Creek
- Parnells Creek

Long term trends for pH, EC and TSS are shown Figure 37 to Figure 39. Results for water quality remained generally within historical trends and acceptable ranges. An increasing TSS trend was observed at W5 Farrells Creek Downstream during the reporting period; trigger limits are not in place for these sites (W5 Farrells Creek Upstream and Downstream) as they are monitored for the purposes of assessing ambient water quality (EC only) during HRSTS discharge events from Dam 11N (as per conditions on EPL 640). It was noted however that June and November samples were taken from a pool of water, as the creek was not flowing. As a result, the measurements are not representative of water quality in the catchment. The surface water monitoring programme will be reviewed in early 2017. The ephemeral nature of these monitoring locations is the primary reason for the considerable variation in physical water quality.

Trigger tracking results are detailed in Table 32.

Table 32: Other Tributaries Internal Trigger Tracking Results

Location	Date	Trigger limit	Action taken in response
Bayswater Creek Midstream	05/01/2016	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (63mm of rain recorded 03/01/2016 to 05/01/2016) – source of sediment is likely from input from Pikes Creek. No follow up required.
	12/11/2016		Elevated TSS associated with high runoff due to rainfall event – source of sediment is likely from input from Pikes Creek. No follow up required
Bayswater Creek Downstream	05/01/2016	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (63mm of rain recorded 03/01/2016 to 05/01/2016) – source of sediment is likely from input from Pikes Creek. No follow up required.
NSW1 Parnells Creek	05/01/2016	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (63mm of rain recorded 03/01/2016 to 05/01/2016) – review of site indicates upstream erosion and sediment controls in place and compliant. No follow up required.
NSW2 Emu Creek	05/01/2016	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (63mm of rain recorded 03/01/2016 to 05/01/2016) – rainfall event exceeded design capacity for sediment controls (compliant with site Water Management Plan and Blue Book). No follow up required.
Pikes Creek Downstream	05/01/2016	TSS – 50mg/L (ANZECC criteria	Elevated TSS associated with high runoff due to rainfall event (63mm of rain recorded 03/01/2016 to 05/01/2016) – upstream sample indicates high sediment load in non-mine catchment. No follow up required.
	06/06/2016		Sample taken from pool; no water flowing in Pikes Creek. Sample not representative of catchment water quality. No follow up required.
	12/11/2016		Sample taken from pool; no water flowing in Pikes Creek. Sample not representative of catchment water quality. No follow up required.
Pikes Creek Upstream	05/01/2016	TSS – 50mg/L (ANZECC criteria)	Elevated TSS associated with high runoff due to rainfall event (63mm of rain recorded 03/01/2016 to 05/01/2016). No mine-related sources of sediment in catchment.

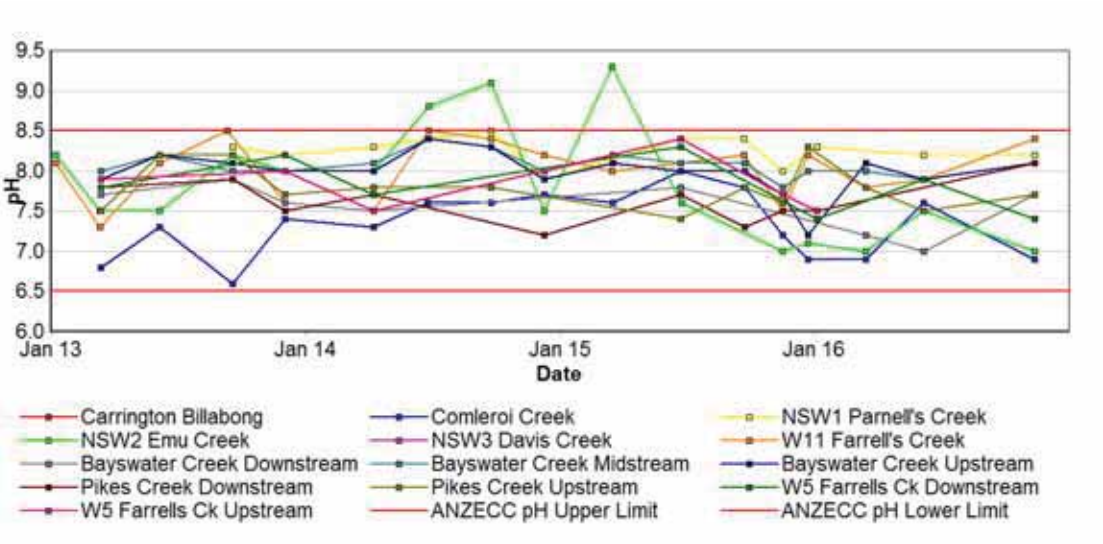

Figure 37: Other Tributaries pH Trends 2013 – 2016

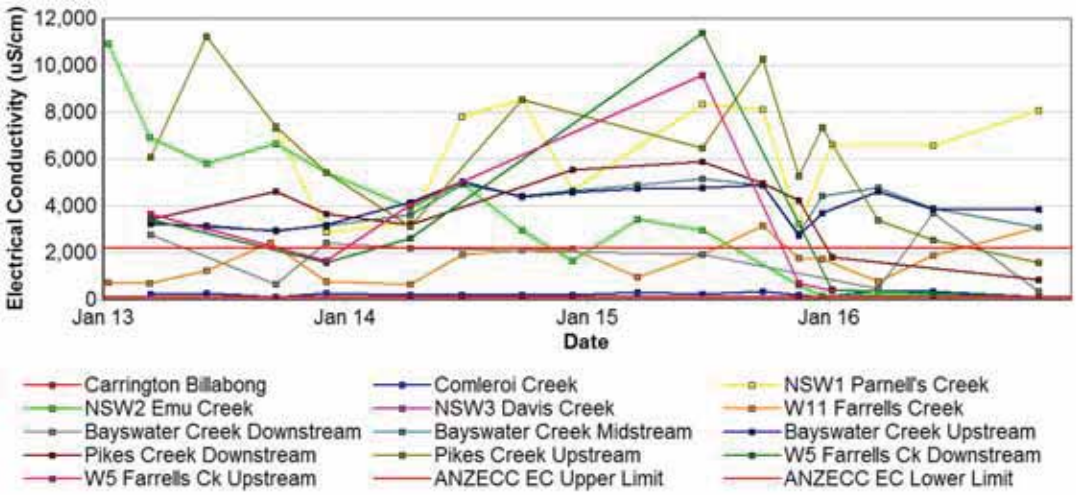

Figure 38: Other Tributaries EC Trends 2013 - 2016

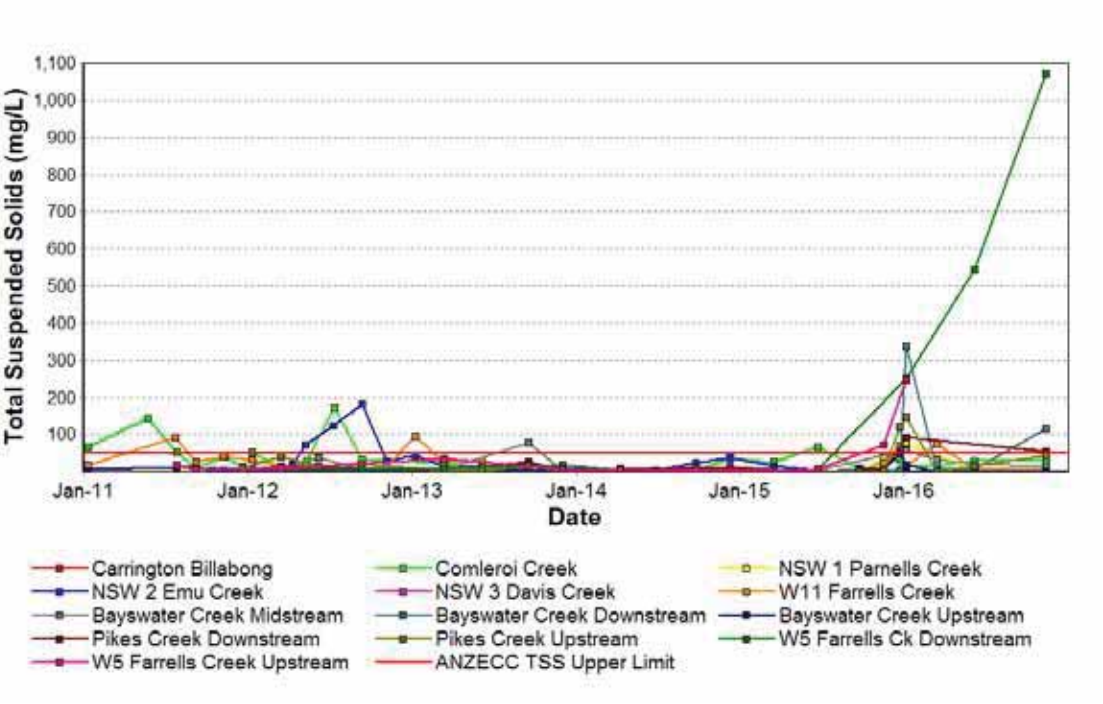

Figure 39: Other Tributaries TSS Trends 2013 – 2016

7.2.2.4 HVO Site Dams

40 samples were collected across 10 dams during 2016; long term trends for pH, EC and TSS are shown in Figure 40 to Figure 42. EC results show a slight increasing trend during the reporting period, as a result of drier weather conditions reducing rainfall runoff inflows to the mine water management system. Emu Creek Sed Dam continues to record elevated TSS concentrations, associated with the advancement of mining around the dam; noting the dam is operated to spill back into the pit and will not flow offsite.

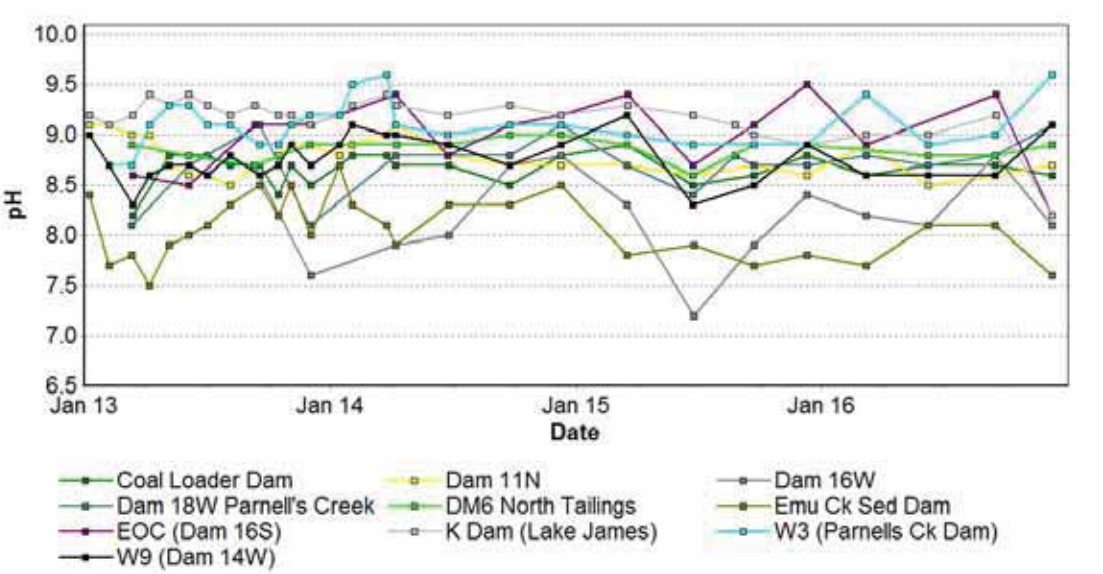

Figure 40: HVO Site Dams pH Trends 2013 – 2016

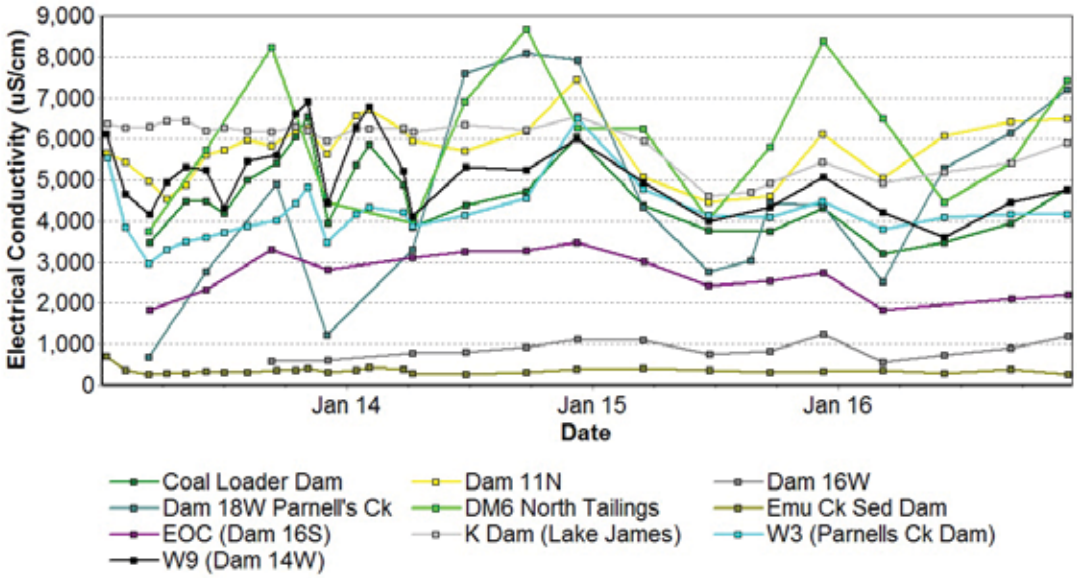

Figure 41: HVO Site Dams EC Trends 2013– 2016

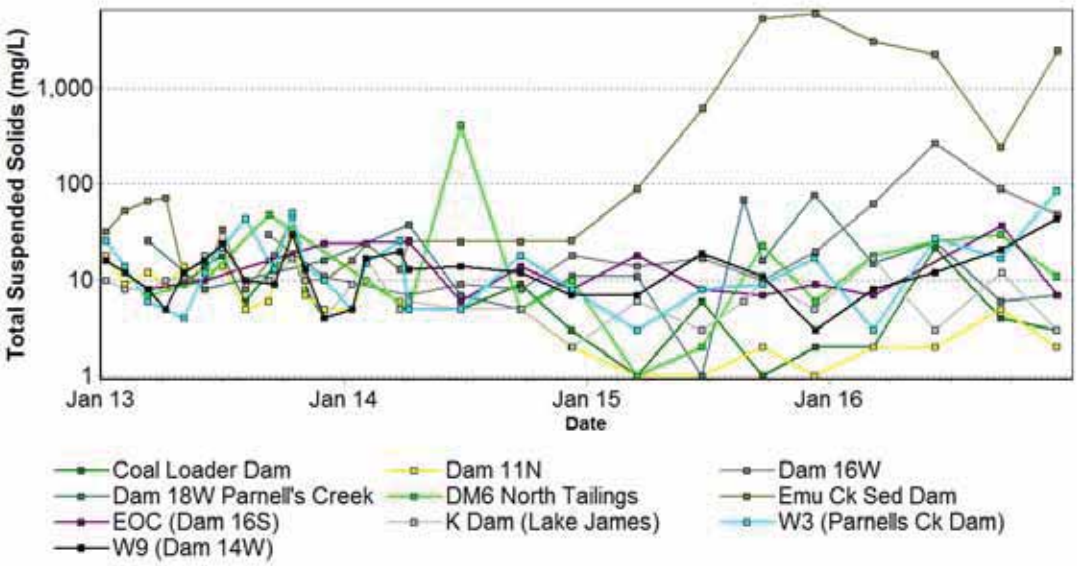

Figure 42: HVO Site Dams TSS Trends 2013 – 2016

7.3 Comparison of 2016 Water Quality Data with EIS Predictions

7.3.1 South Pit EIS Predictions

The South Pit EIS estimated an 'instantaneous' water quality for Electrical Conductivity of 5,700 µS/cm as an upper limit. Instantaneous water quality is a simple estimate obtained by dividing the total salt available by the maximum amount of possible void water. Electrical Conductivity measurements at Lake James averaged 5,368µS/cm, consistent with the predicted 'instantaneous' measure.

The South Pit EIS estimated average runoff water quality from undisturbed catchments to be 400 mg/L for TSS and 615µS/cm for EC. Comleroi Creek, South of Cheshunt Pit had an average TSS of 26mg/L and EC of 168µS/cm during the review period, demonstrating that runoff water from undisturbed catchments in the HVO South area is of better quality than that which was predicted in the EIS.

7.3.2 Carrington Pit EIS Predictions

The long term mine water quality for Carrington is discussed in the Carrington Mine Environmental Impact Statement (ERM 1999). The EIS estimated an "instantaneous" water quality for Electrical Conductivity of 7,050µS/cm.

Dewatering from Carrington is a mixture of surface runoff from overburden emplacements, coal mining areas and seepage from the coal seams and alluvium. Water is directed to Dam 9N and into Dam 11N. The average EC and TSS in Dam 11N during 2016 was 6,015µS/cm and 3mg/L respectively, and is considered broadly representative of mine water quality for Carrington.

The Carrington EIS states that runoff from undisturbed catchments within the Carrington Pit will be directed around the mine via contour banks or surface drains to discharge where possible into natural creeks. The salinity of the runoff water was predicted to be approximately 615 µS/cm. Runoff from rehabilitated lands was initially predicted to have higher TSS, with levels approaching pre-mining conditions after several years. Carrington Billabong (where such water quality would be measured for this comparison) was reported as dry during all scheduled monitoring events in 2016 with no samples collected. A unnamed tributary that flows to the Hunter River immediately West of the active mining area recorded an average EC of 155 µS/cm, well below the EIS prediction.

7.3.3 West Pit EIS Predictions

The West Pit EIS included the data in Table 33 as representative of water quality in the local catchment area. The pH and EC at Emu Creek (NSW2) averaged 7.2 and 132 µS/cm respectively during the review period, slightly below the EIS predictions. The pH and EC at Farrells Creek (combined upstream and downstream monitoring sites) averaged 7.7 and 182 µS/cm respectively during the review period, consistent with the EIS predictions. Davis Creek was reported as dry throughout 2016 thus no comparison can be made against the predicted water quality. Parnell's Dam (W3) measured an average EC of 4,058µS/cm in 2016, within the predicted range.

Table 33: Representative Water Quality for West Pit:

Watercourse	pH (pH Units)	EC (µS/cm)
Davis Creek	7.7 to 8.4	767 to +8,000
Emu Creek	7.5 to 8.8	365 to +1,000
Farrells Creek	7.0 to 9.2	195 to +12,000
Mine Water (Parnell's Dam)	-	2,400 to 6,300

7.4 Performance relating to HRSTS Discharges

HVO participates in the Hunter River Salinity Trading Scheme (HRSTS), allowing it to discharge to the Hunter River via three licensed discharge points, including Dam 11N, Dam 15S (Lake James) and Dam 9W (Parnells Dam). Discharges can only take place subject to the schemes regulations.

As required by the EPL, HVO submitted a discharge report for the 2015/16 financial year. No water was discharged off site during 2016 via the Hunter River Salinity Trading Scheme (HRSTS).

7.5 Complaints

No complaints were received in regards to water during 2016.

7.6 Audits

As part of the NSW whole-of-government approach to minimising the impact of tailings, waste water holding and sedimentation dams ("dams") on the environment, a cross agency environmental compliance audit program commenced in September 2016 at a selection of NSW mine sites. The program focused on dam compliance and was conducted by the NSW Environment Protection Authority (EPA), the Department of Planning and Environment (DPE) and the Resources Regulator within the NSW Department of Industry. Hunter Valley Operations was audited in November 2016. Reports are expected in early 2017.

7.7 Non-compliances

See Section 11 of the report for non-compliance details.

7.8 Groundwater

7.8.1 Groundwater Management

Groundwater monitoring activities were undertaken in 2016 in accordance with the HVO Water Management Plan and Groundwater Monitoring Programme. The monitoring results are used to establish and monitor trends in physical and geochemical parameters of surrounding groundwater potentially influenced by mining.

The groundwater monitoring programme at HVO measures the quality of groundwater against background data, EIS predictions and historical trends. Ground water quality is evaluated through the parameters of pH, EC, and Standing Water Level (SWL) (measured as elevation in metres with respect to the Australian Height Datum, mAHD). On a periodic basis (nominally once per annum) a comprehensive suite of analytes are measured, including major anions, cations and metals. Prior to sampling for comprehensive analysis, bore purging is undertaken to ensure a representative sample is collected.

Groundwater monitoring data is reviewed on a quarterly basis. The review involves a comparison of measured pH and EC results against internal trigger values which have been derived from the historical data set. Trigger limits are calculated as the 95th percentile maximum value (EC and pH) and the 5th percentile minimum value (pH only) from data collected since 2011. Trigger levels have been set on the basis of geographical proximity and target stratigraphy. Bores that record as dry and bores of unknown seam have not been

included in calculation of the trigger limits. The response to measured excursions outside the trigger limits is detailed in the HVO Water Management Plan. Where investigations and subsequent actions have been undertaken following review of monitoring data, these are detailed in this section. Monitoring locations are shown in Figure 43.

7.8.2 Groundwater Performance

Sampling of ground waters was carried out from 100 monitoring bores across Hunter Valley Operations in accordance with AS/NZS 5667.6 (1998). Where laboratory analysis was undertaken, this was performed by a NATA accredited laboratory. Sites with a data capture rate of less than 100 per cent are outlined in Table 34.

Table 34: HVO Groundwater Monitoring Data Recovery for 2016

Location	Data Recovery (%)	Comments
4051C	50%	Bore unable to be sampled in September and December due to obstruction (potential bore collapse) – investigation underway.
4036C	25%	Insufficient water during June, September and December monitoring events.
DM7	75%	No safe access to site during December monitoring event.
4113P	25%	Bore unable to be sampled in June, September and December due to obstruction (potential bore collapse) – investigation underway.
4119P	75%	No safe access to site during September monitoring event.
CGW47a	75%	Insufficient water during June monitoring event.

Figure 43: Groundwater Monitoring Network at HVO - 2016

7.8.3 Groundwater Monitoring Summary

The following section presents groundwater monitoring data in relation to the geographic locations and target stratigraphy for groundwater monitoring bores. Results are given for the following locations:

- Carrington Broonie
- Carrington Alluvium
- Carrington Interburden
- Carrington West Wing Alluvium
- Carrington West Wing LBL
- Carrington West Wing Flood Plain
- Cheshunt / North Pit Alluvium
- Cheshunt Interburden
- Cheshunt Mt Arthur
- Cheshunt Piercefield
- Lemington South Alluvium
- Lemington South Arrowfield
- Lemington South Bowfield
- Lemington South Interburden
- Lemington South Woodlands Hill
- North Pit Spoil
- West Pit Alluvium
- West Pit Sandstone / Siltstone

Each location is discussed below, and a summary of monitoring data presented. Where monitoring results required further investigation following the recording of three consecutive measurements outside the internal statistical limits, these results are summarised in tables for each location.

7.8.3.1 Carrington Broonie

Carrington Groundwater was sampled on 8 occasions during 2016 from two monitoring locations. The EC, pH and SWL trends for 2013 to 2016 for Carrington Broonie Seam groundwater bores are shown in Figure 44, Figure 45 and Figure 46 respectively. Data was consistent with historical ranges.

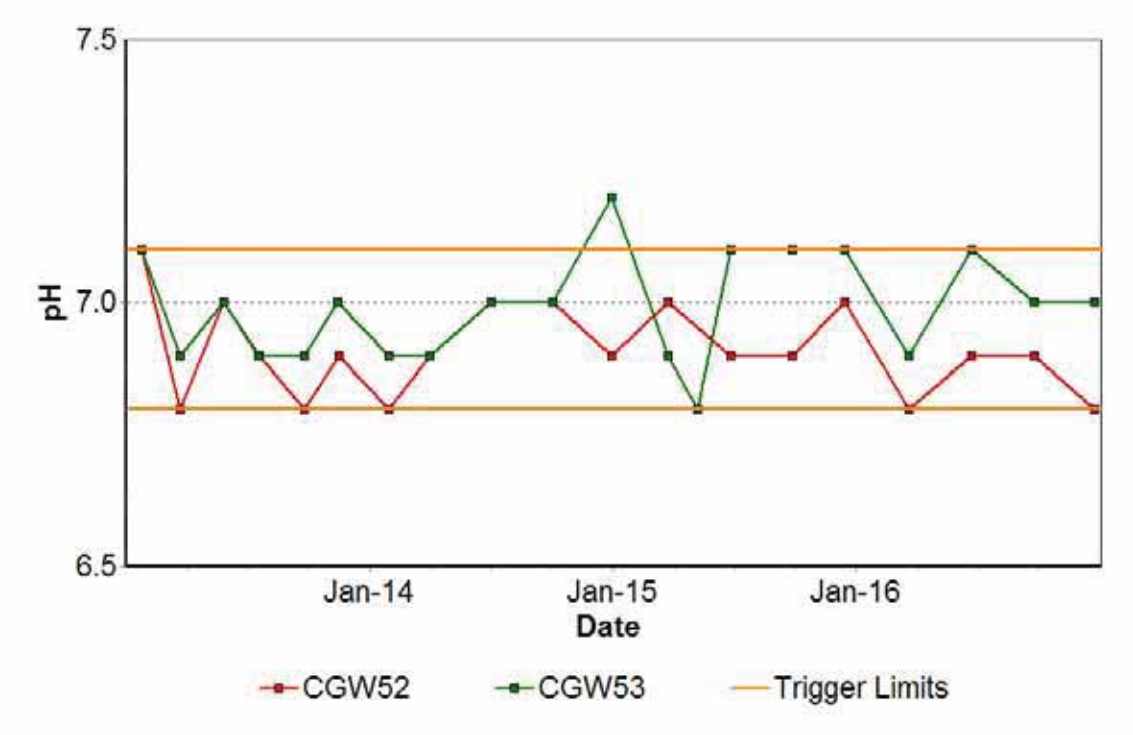

Figure 44: Carrington Broonie Groundwater pH Trends 2013-2016

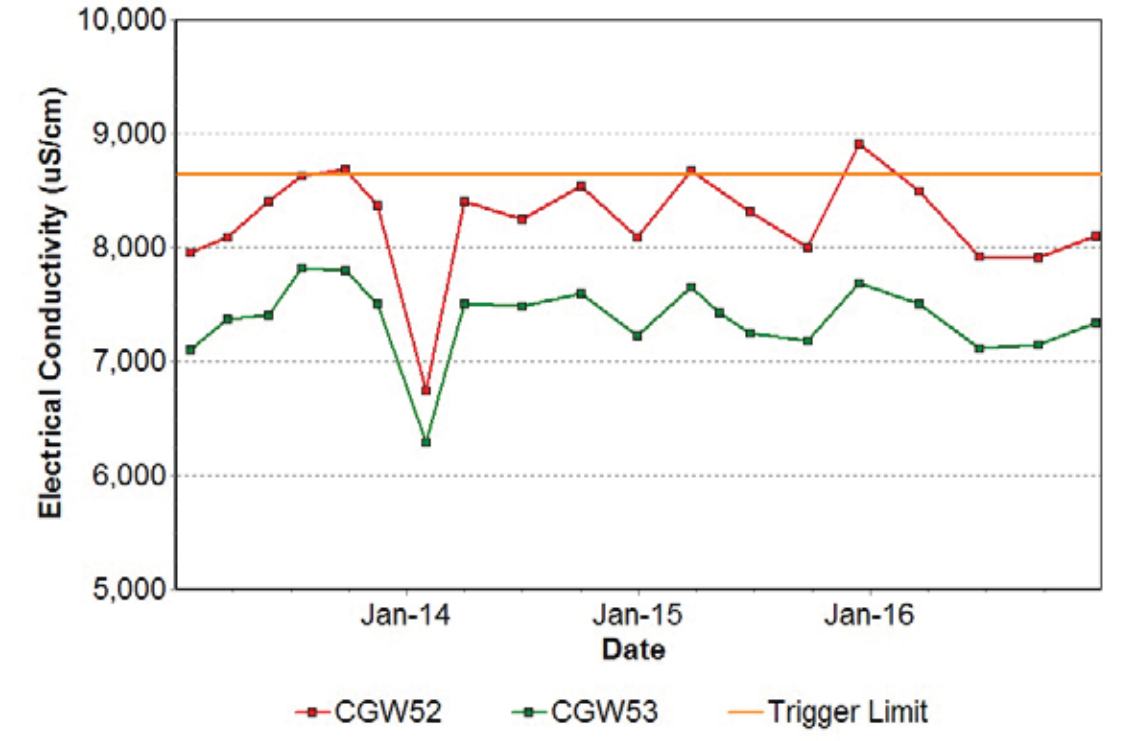

Figure 45: Carrington Broonie Groundwater EC Trends 2013-2016

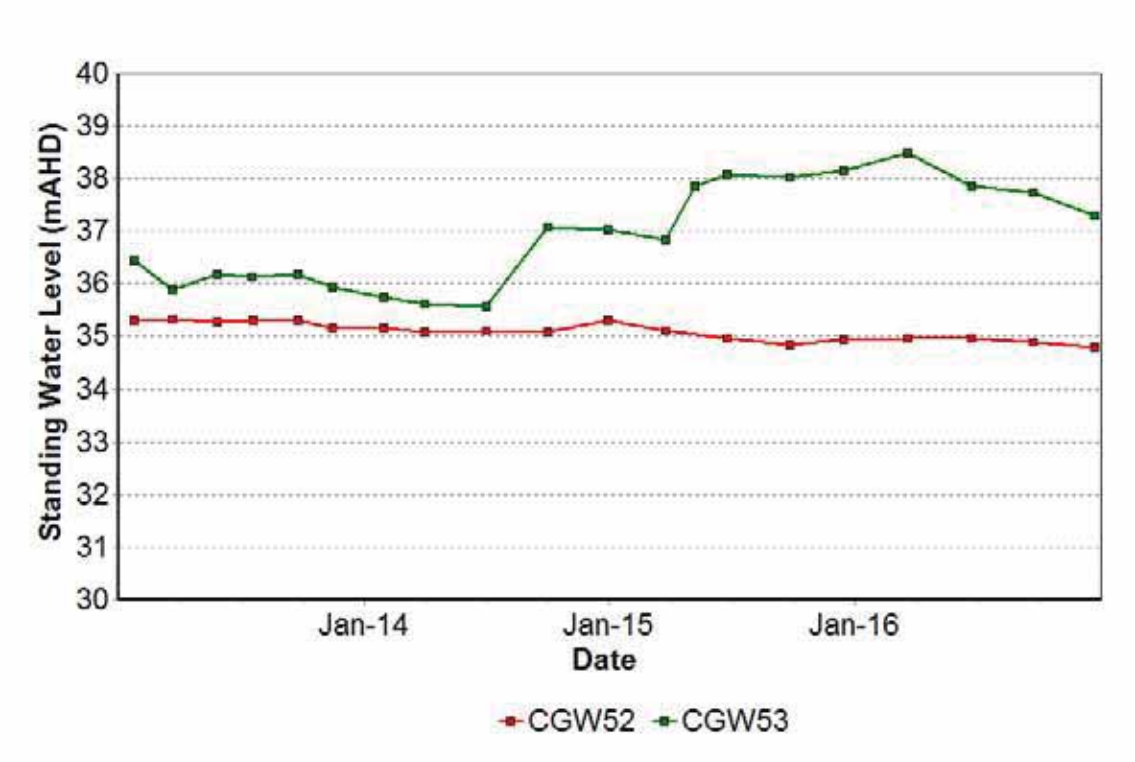

Figure 46: Carrington Broonie Groundwater SWL Trends 2013-2016

7.8.3.2 Carrington Alluvium

Groundwater monitoring in the Carrington Alluvium area was undertaken at five sites during 2016, with 20 samples collected during the reporting period. The EC, pH and SWL trends for 2013 to 2016 for Carrington Alluvium groundwater bores are shown in Figure 47, Figure 48 and Figure 49. Trigger tracking results are listed in Table 35. Water level increases coincide with flow events (increased water levels) in the Hunter River.

Table 35: HVO Carrington Alluvium Groundwater 2016 Monitoring Internal Trigger Tracking

Location	Date	Trigger limit	Action taken in response
CFW55R	16/03/2016 21/06/2016 21/09/2016 22/12/2016	pH - 5th percentile & EC - 95th percentile	Watching brief maintained. Investigation determined that hydrogeochemical speciation has not changed and that water type is consistent with nearby bore CFW57. This, coupled with historical data showing similar elevated EC and depressed pH, suggests the variations are natural and unlikely to be due to anthropogenic impact. Watching brief, no further action required.

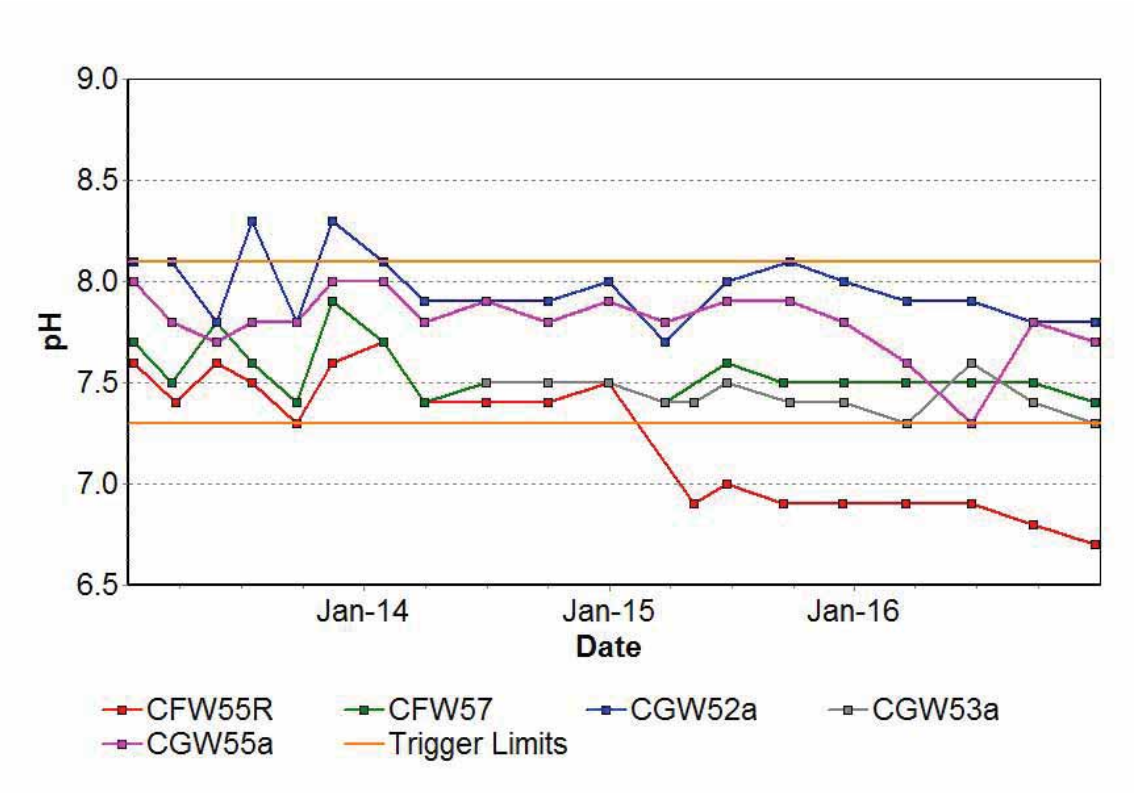

Figure 47: Carrington Alluvium Groundwater pH Trends 2013-2016

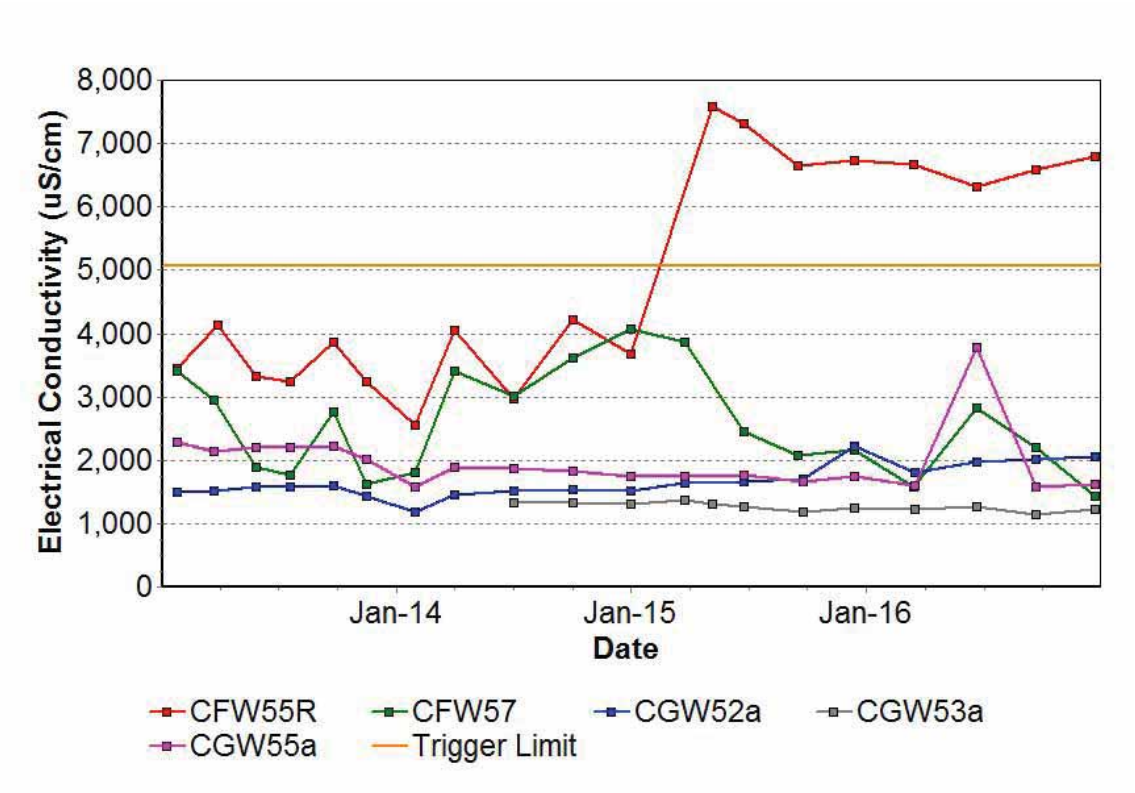

Figure 48: Carrington Alluvium Groundwater EC Trends 2013-2016

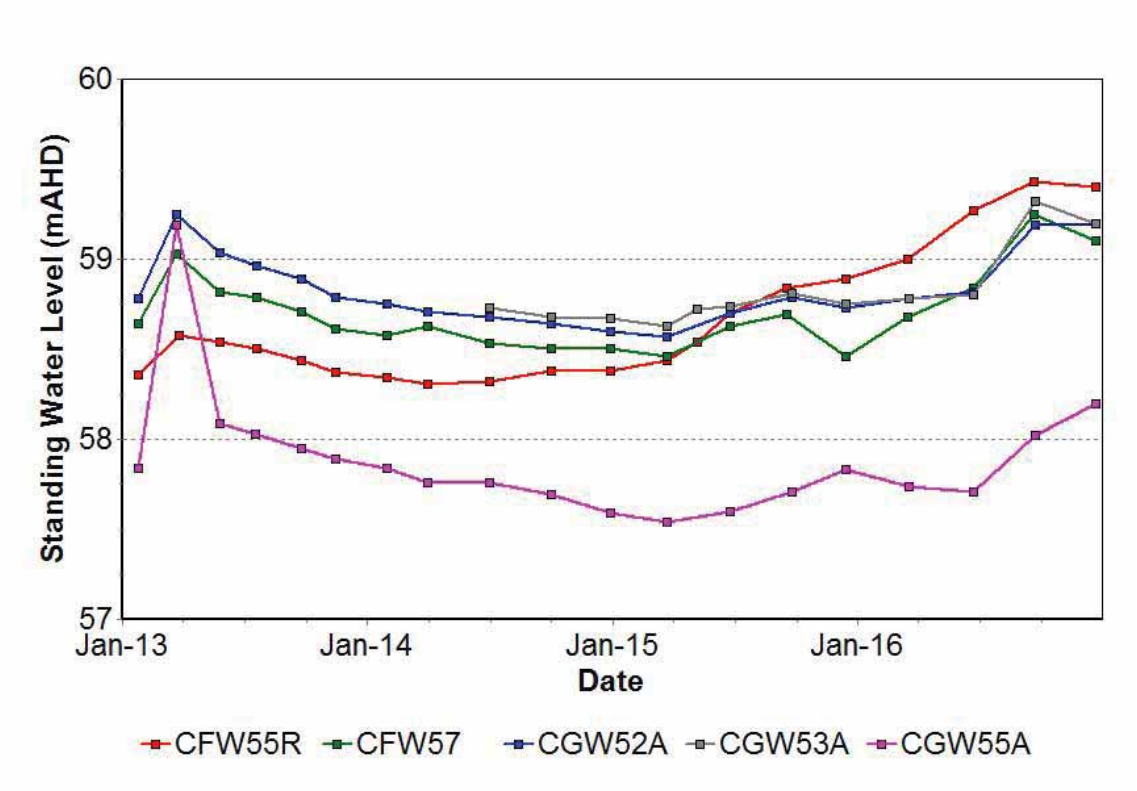

Figure 49: Carrington Alluvium Groundwater SWL trends 2013– 2016

7.8.3.3 Carrington Interburden

Groundwater monitoring in the Carrington Interburden was undertaken three sites during 2016, with seven samples collected for field analysis during the reporting period. The EC, pH and SWL trends for 2013 to 2016 for groundwater bores in the Carrington Interburden are shown in Figure 50, Figure 51 and Figure 52 respectively. Results were steady and consistent with historical trends. An erroneous EC measurement was recorded in Bore CGW51a in September, however the following result in December was consistent with previous data.

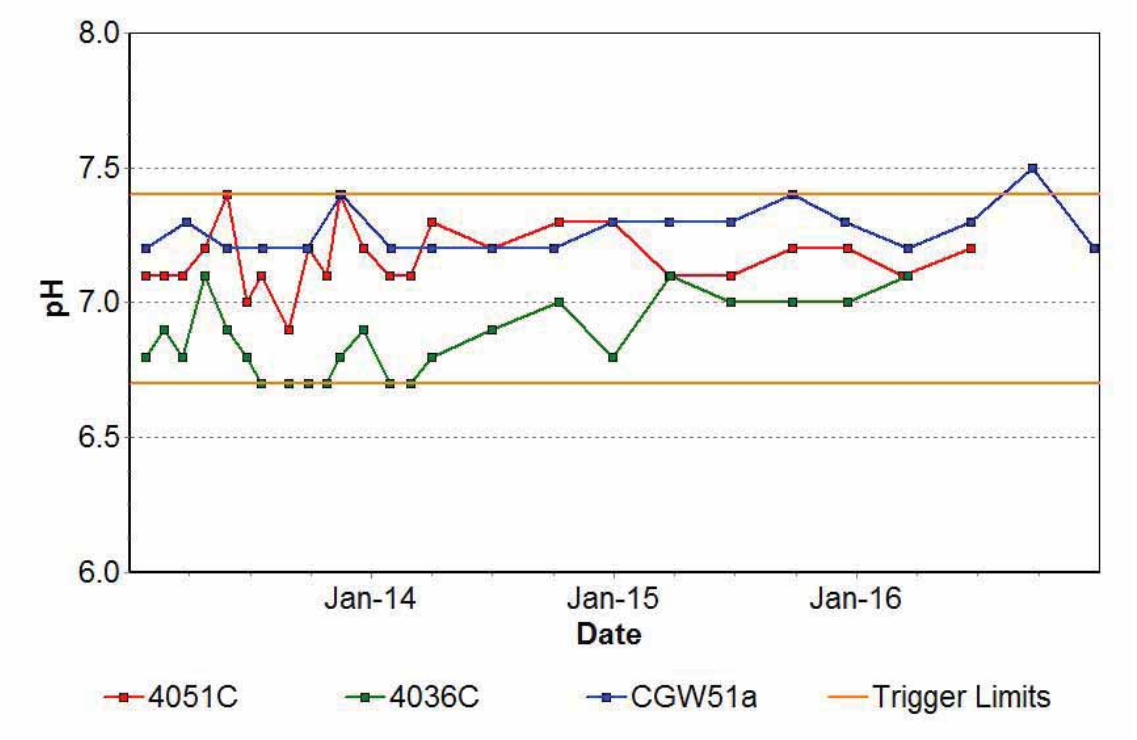

Figure 50: Carrington Interburden Groundwater pH Trends 2013-2016

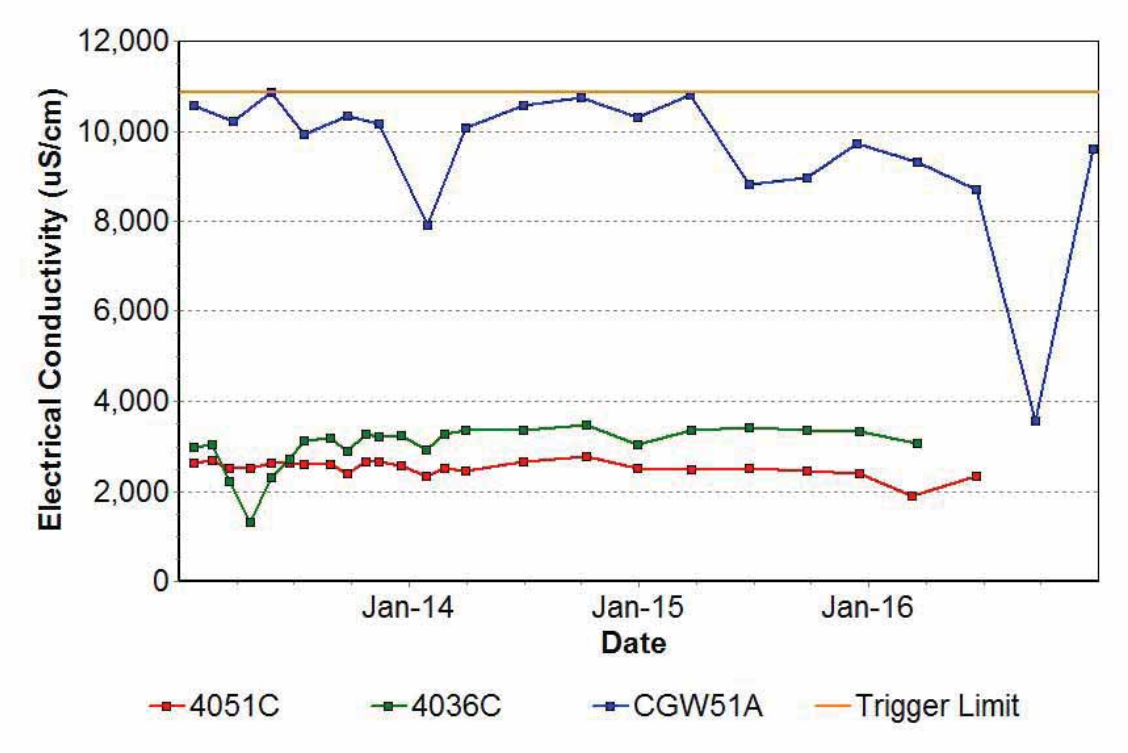

Figure 51: Carrington Interburden Groundwater EC Trends 2013 – 2016

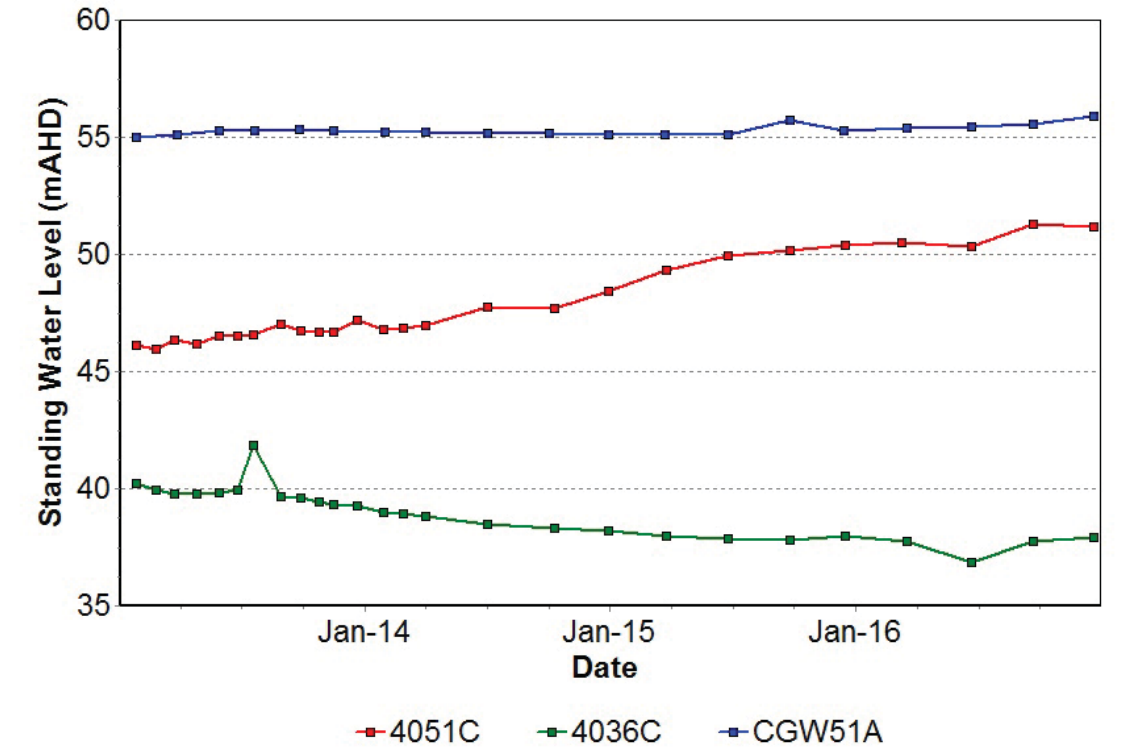

Figure 52: Carrington Interburden Groundwater SWL Trends 2013-2016

7.8.3.4 Carrington West Wing Alluvium

Groundwater monitoring in the Carrington West Wing Alluvium was undertaken at five sites in 2016 with 20 samples collected for field analysis during the reporting period. Results are shown in Figure 53, Figure 54 and Figure 55. Results during 2016 were steady and consistent with historical trends. Water level increases coincide with flow events (increased water levels) in the Hunter River.

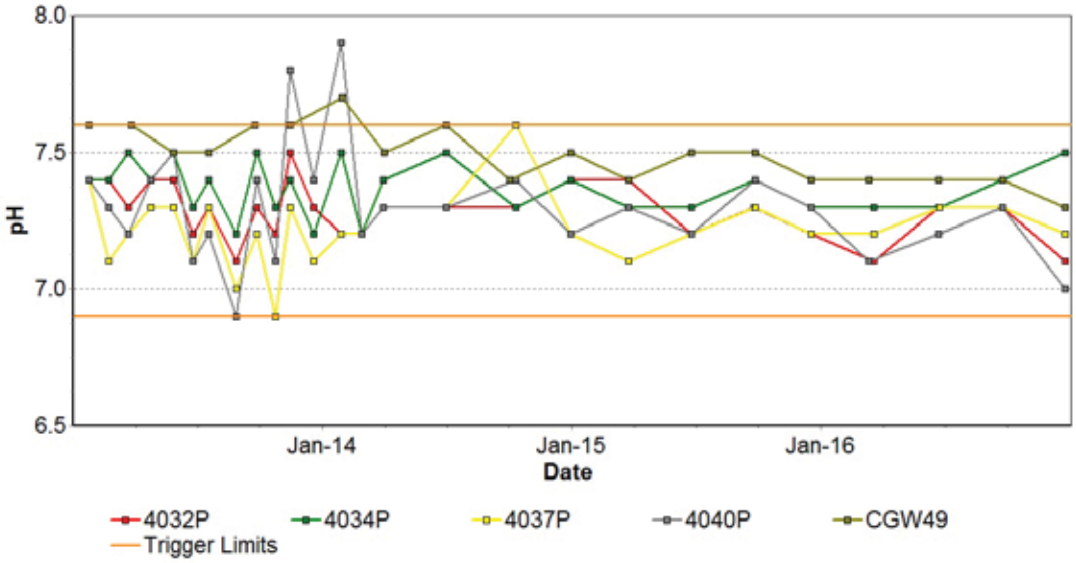

Figure 53: Carrington West Wing Alluvium Groundwater pH Trends 2013-2016

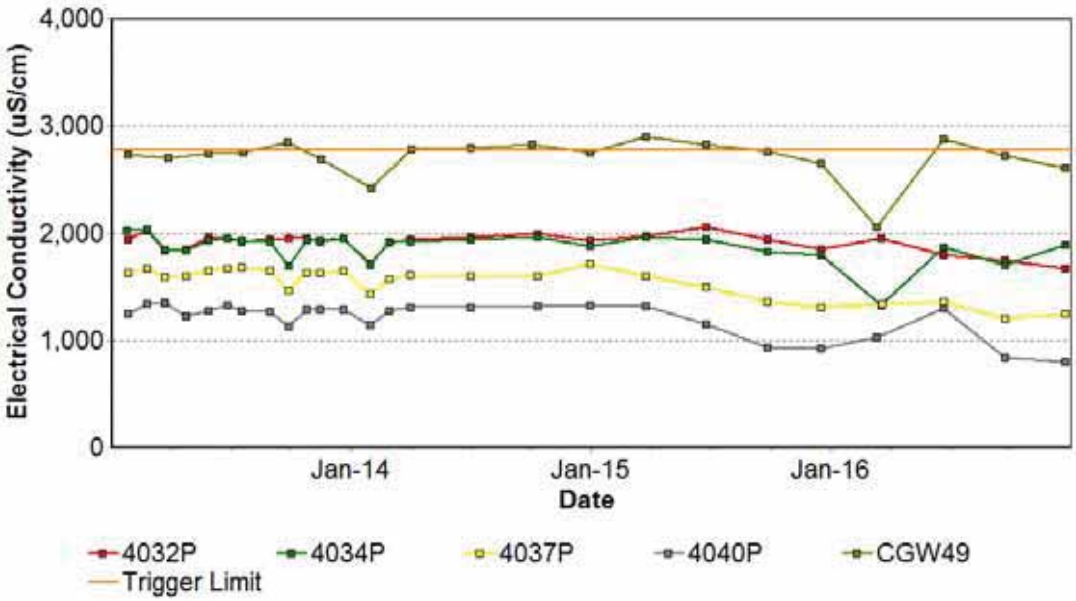

Figure 54: Carrington West Wing Alluvium Groundwater EC Trends 2013 – 2016

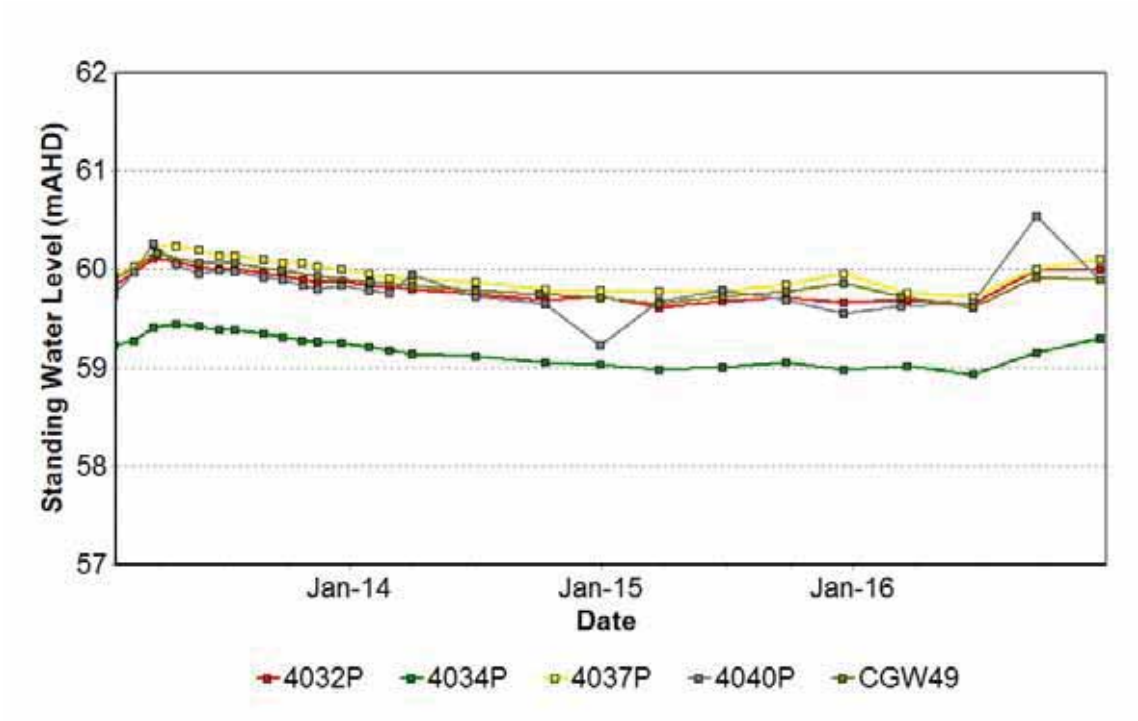

Figure 55: Carrington West Wing Alluvium Groundwater SWL Trends 2013-2016

7.8.3.5 Carrington West Wing Flood Plain

Groundwater monitoring in the Carrington West Wing Flood Plain was undertaken at four sites in 2016 with 15 samples collected for field analysis during the reporting period. Results are shown in. Results are shown in Figures 56, Figure 57 and Figure 58. A slight falling trend in EC was observed during the reporting period, though generally within historical data ranges. A sharp fall in water level was recorded in CGW47A during June (cause indeterminable), however recorded to normal levels during subsequent measurements.

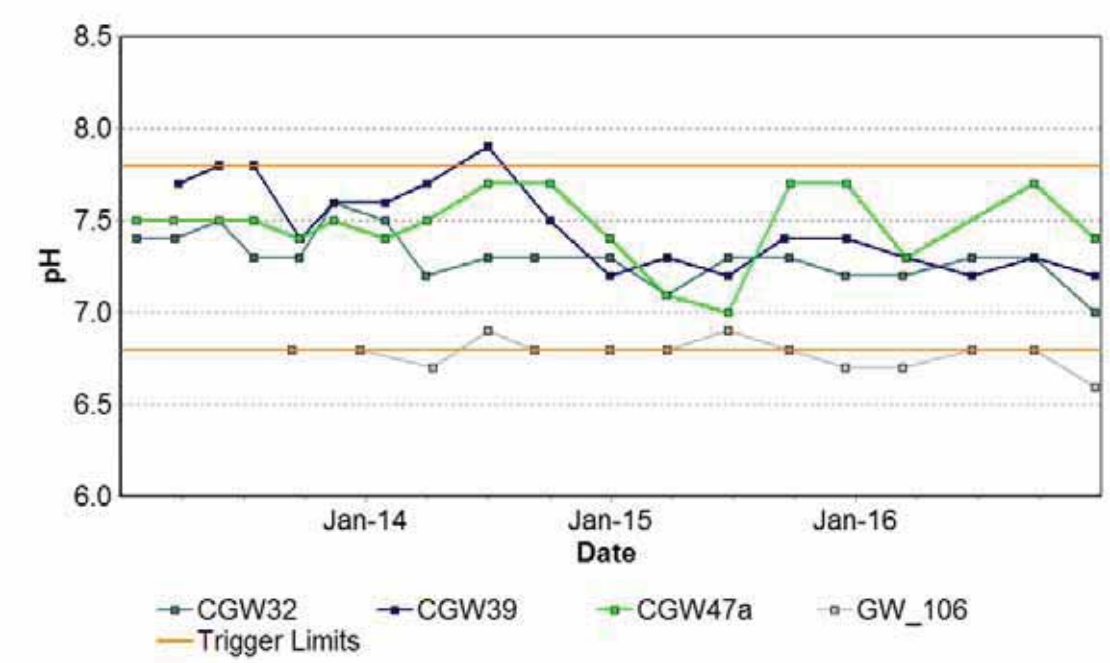

Figure 56: Carrington West Wing Flood Plain Groundwater pH Trends 2013 - 2016

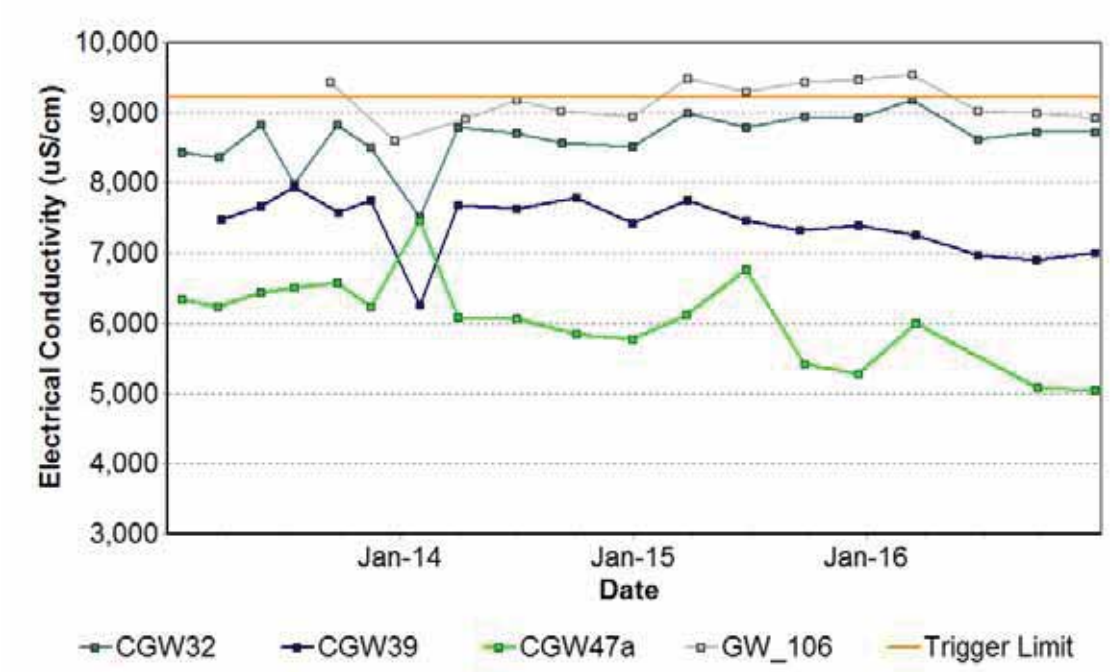

Figure 57: Carrington West Wing Flood Plain Groundwater EC Trends 2013 - 2016

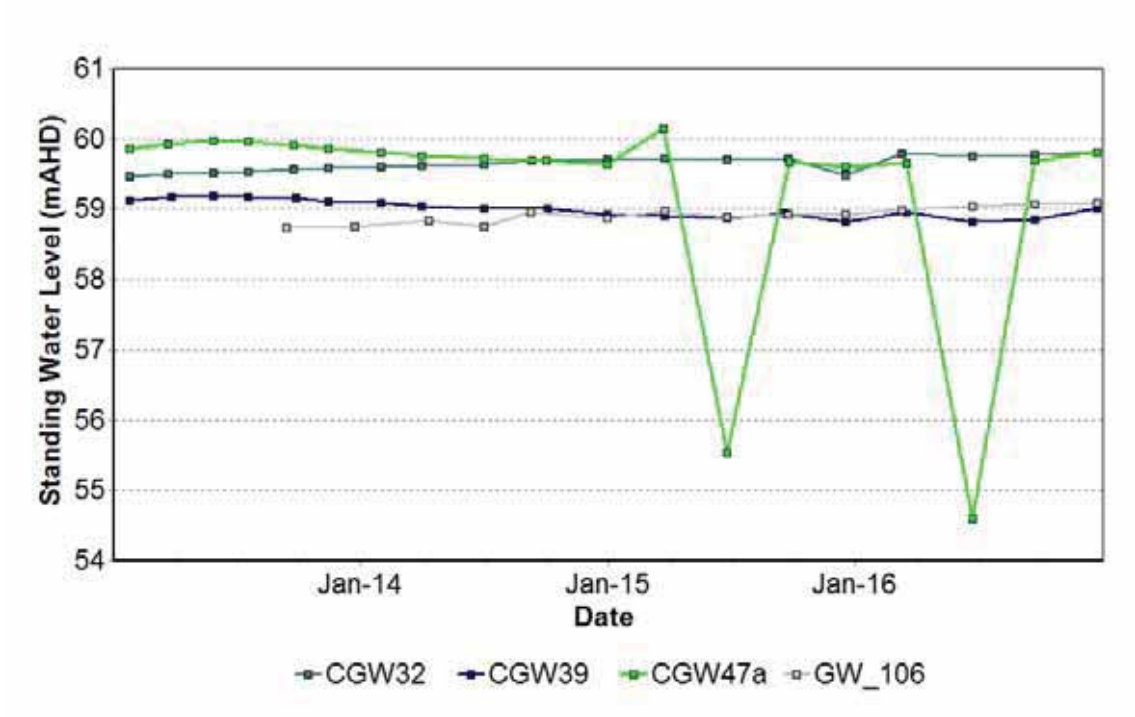

Figure 58: Carrington West Wing Flood Plain Groundwater SWL Trends 2013- 2016

7.8.3.6 Cheshunt / North Pit Alluvium

Groundwater monitoring in the Cheshunt / North Pit area was undertaken at 17 sites during 2016, with 68 samples collected during routine monitoring. Electrical Conductivity, pH and SWL trends for 2013 to 2016 are shown in Figure 59, Figure 60 and Figure 61. A rise in water levels was observed during September, associated with higher water levels in the Hunter River. Water quality results were consistent with historical trends.

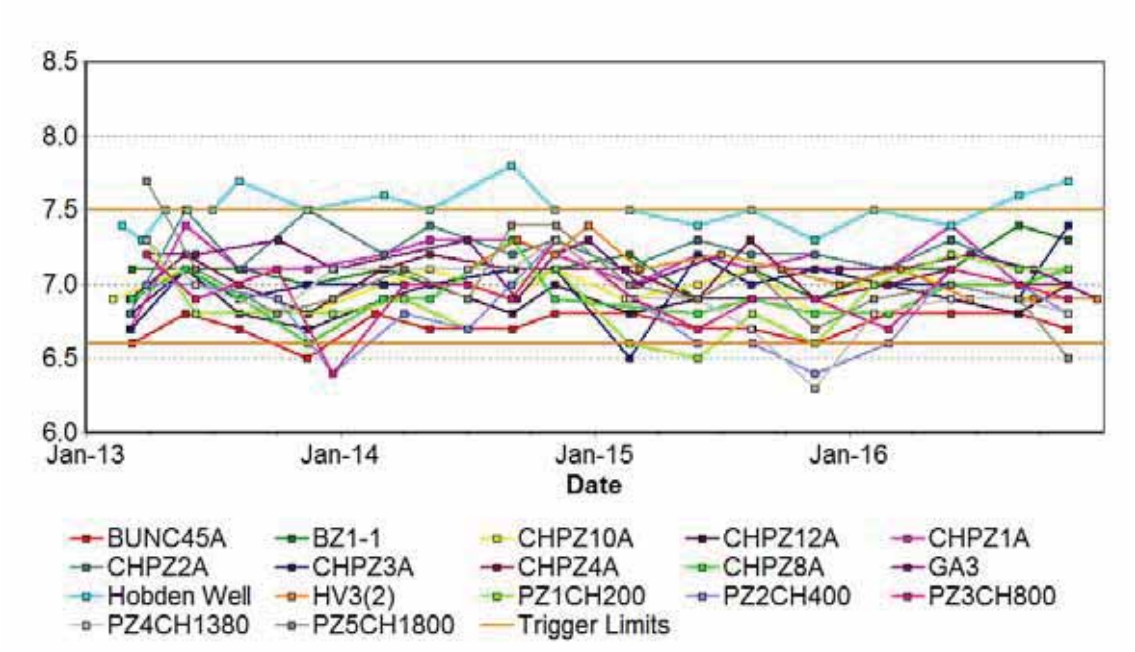

Figure 59: Cheshunt/North Pit Alluvium Groundwater pH trends 2013– 2016

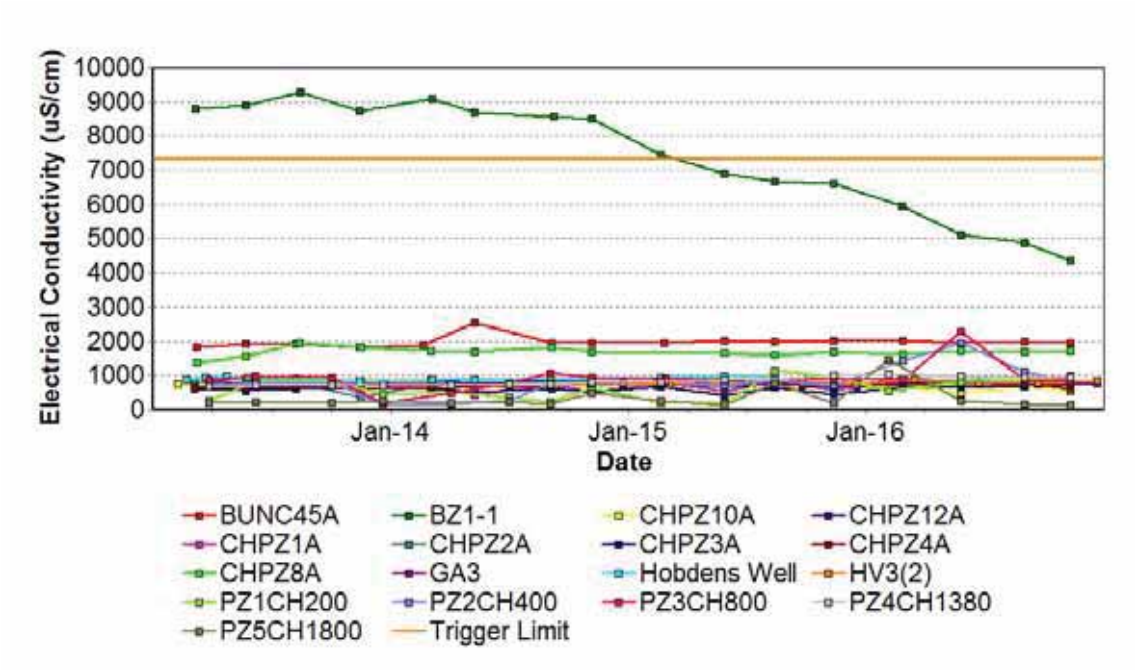

Figure 60: Cheshunt/North Pit Alluvium Groundwater EC Trends 2013 - 2016

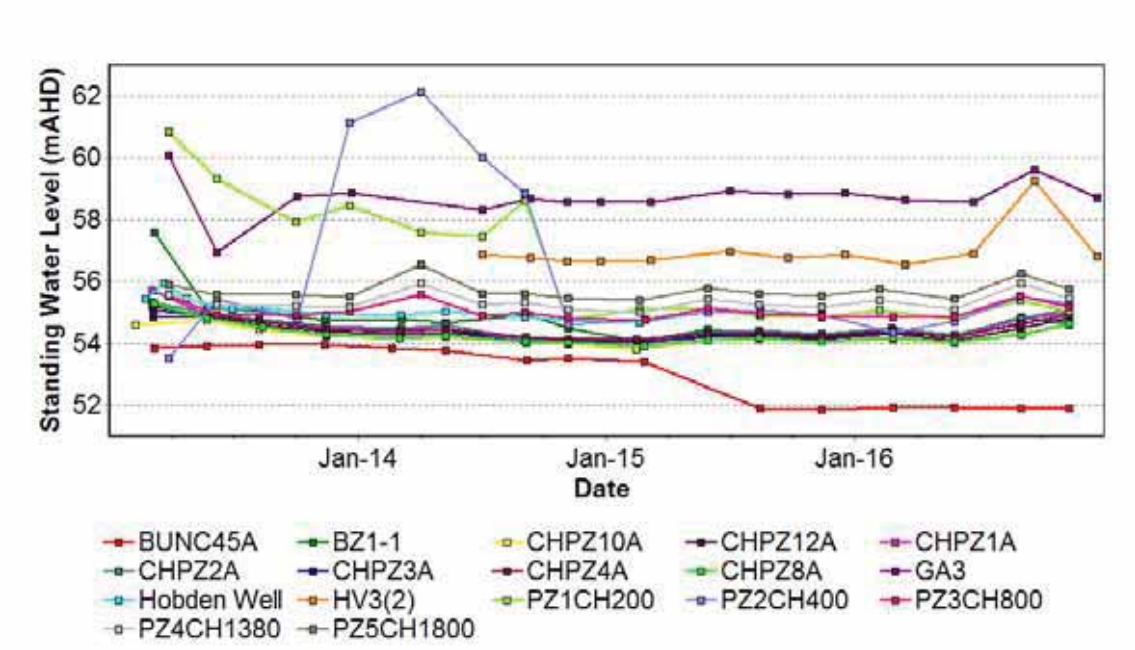

Figure 61: Cheshunt/North Pit Alluvium Groundwater SWL trends 2013- 2016

7.8.3.7 Cheshunt Interburden

Groundwater monitoring in the Cheshunt Interburden area was undertaken at three sites during 2016, with 12 samples collected during the reporting period. The EC, pH and SWL trends for 2013 to 2016 are shown in Figure 62, Figure 63 and Figure 64.

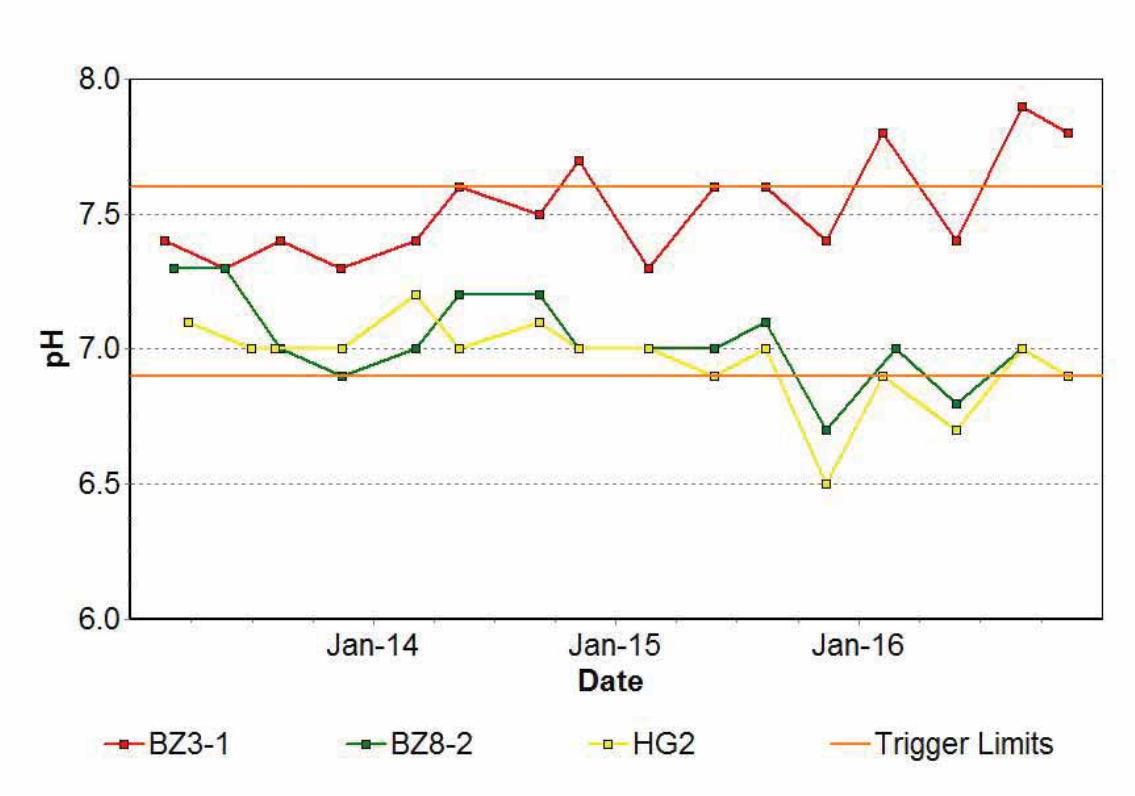

Figure 62: Cheshunt Interburden Groundwater pH Trends 2013 – 2016

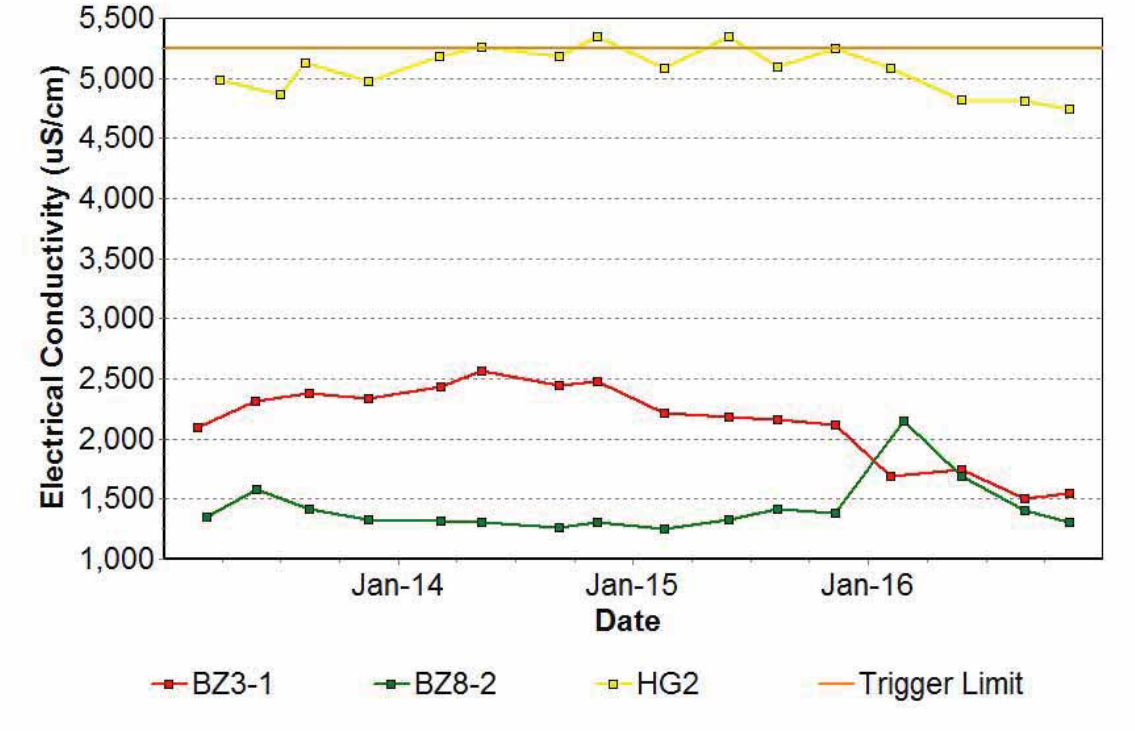

Figure 63: Cheshunt Interburden Groundwater EC Trends 2013 – 2016

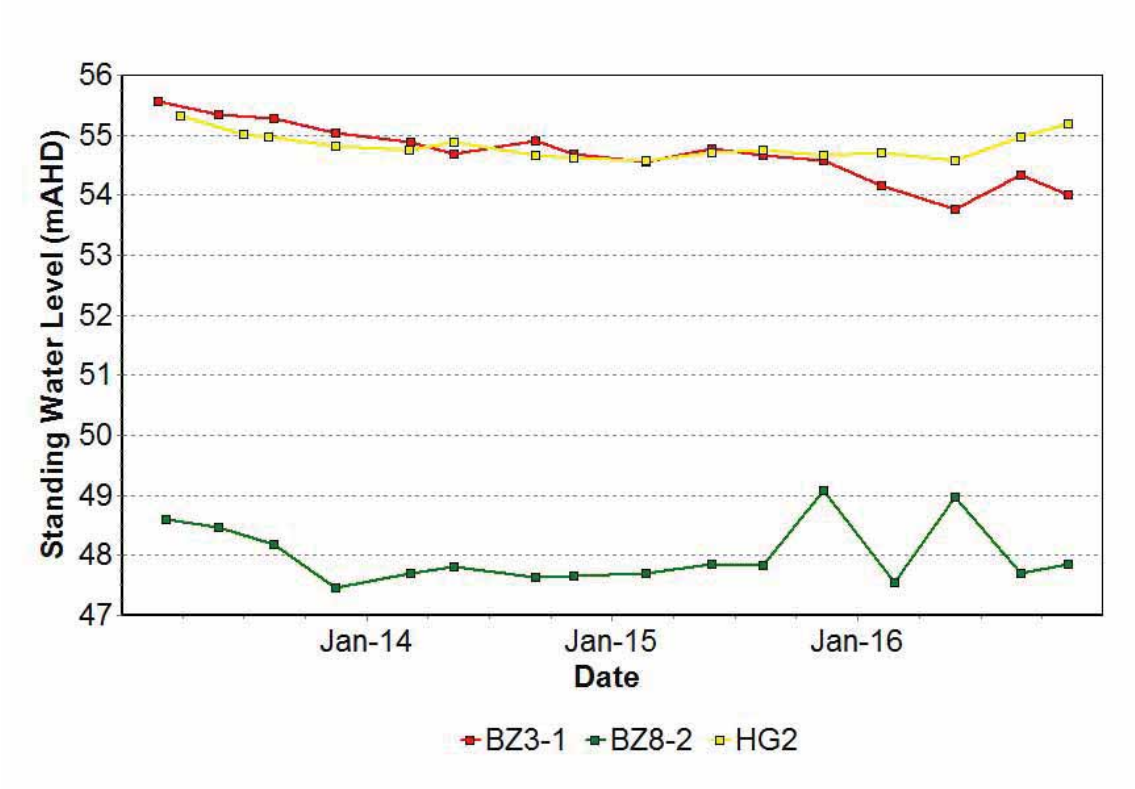

Figure 64: Cheshunt Interburden Groundwater SWL Trends 2013- 2016

7.8.3.8 Cheshunt Mt Arthur

Groundwater monitoring in the Cheshunt Mt Arthur area was undertaken at seven sites during 2016. A total of 28 samples were collected during the reporting period. The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 65, Figure 66 and Figure 67. Trigger tracking results are listed in Table 36. Monitoring results were steady and consistent with historical trends.

Table 36: HVO Cheshunt Mt Arthur Groundwater 2016 Monitoring Internal Trigger Tracking

Location	Date	Trigger limit	Action taken in response
BZ2A(1)	05/02/2016	pH - 5th percentile	Watching Brief*.
	26/05/2016		No adverse trend identified – historical dataset for the MTA bores show pH variable but generally steady. Water level noted to be steady. No further action.

* = 1st/2nd trigger. Watching Brief established pending outcomes of subsequent monitoring events. No specific actions required

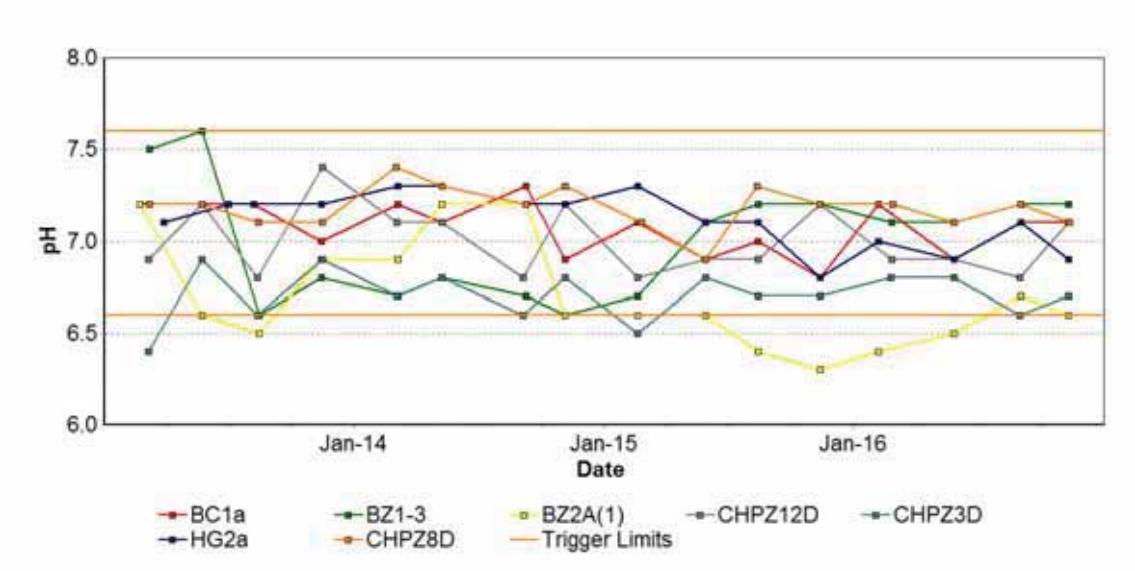

Figure 65:Cheshunt Mt Arthur Groundwater pH Trends 2013 – 2016

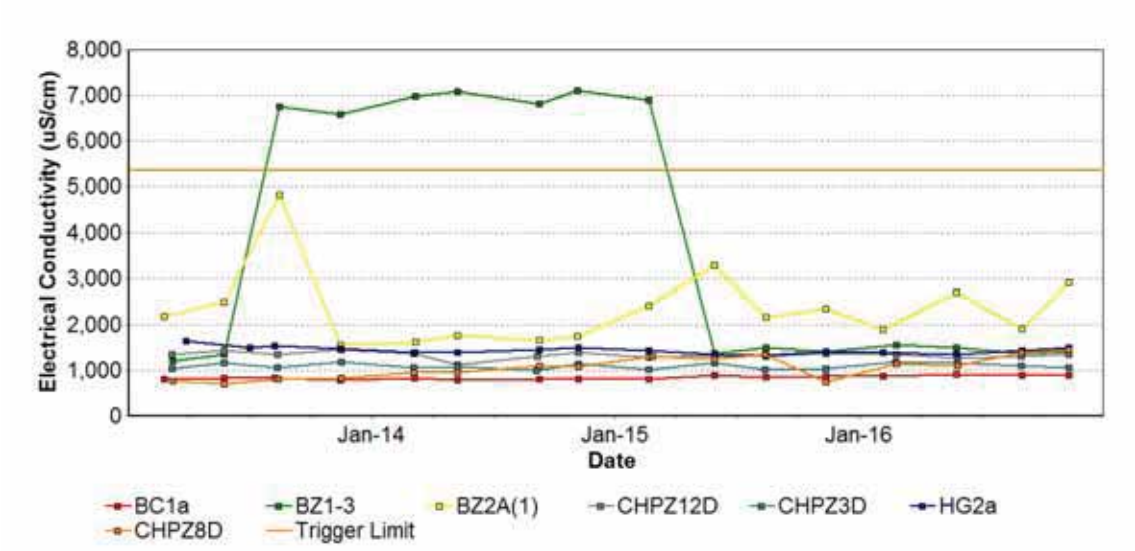

Figure 66: Cheshunt Mt Arthur Groundwater EC Trends 2013 – 2016

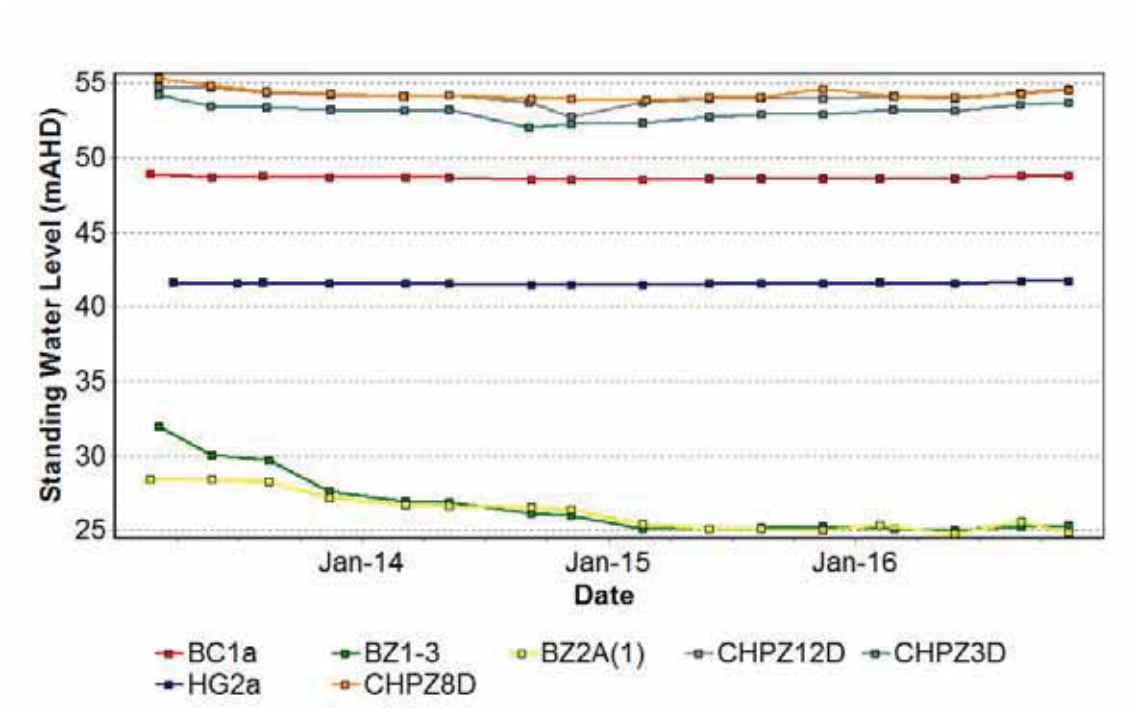

Figure 67: Cheshunt Mt Arthur Groundwater SWL Trends 2013 - 2016

7.8.3.9 Cheshunt Piercefield

Groundwater monitoring in the Cheshunt Piercefield area was undertaken from one site during 2016; a total of 4 samples were collected. The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 68, Figure 69 and Figure 70. Water quality results were steady; the falling water level trend observed has ceased and stabilised during 2016. Assessment of data trends will continue in 2017.

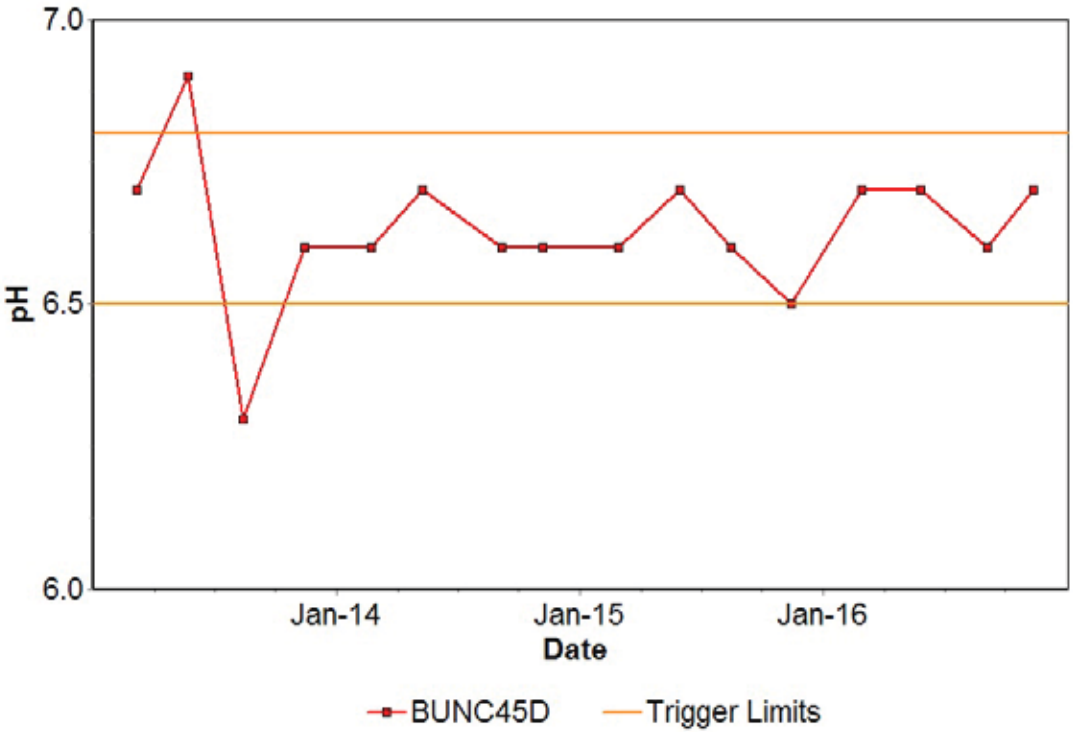

Figure 68: Cheshunt Piercefield Groundwater pH Trends 2013 - 2016

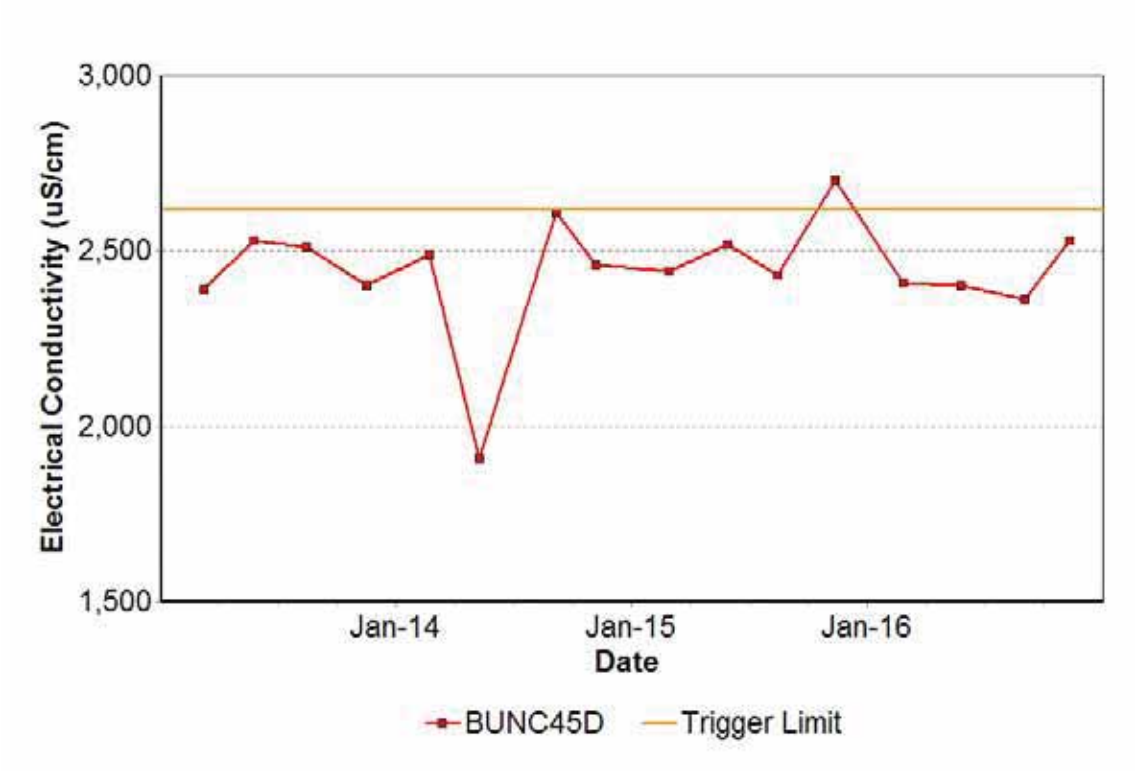

Figure 69: Cheshunt Piercefield Groundwater EC Trends 2013 – 2016

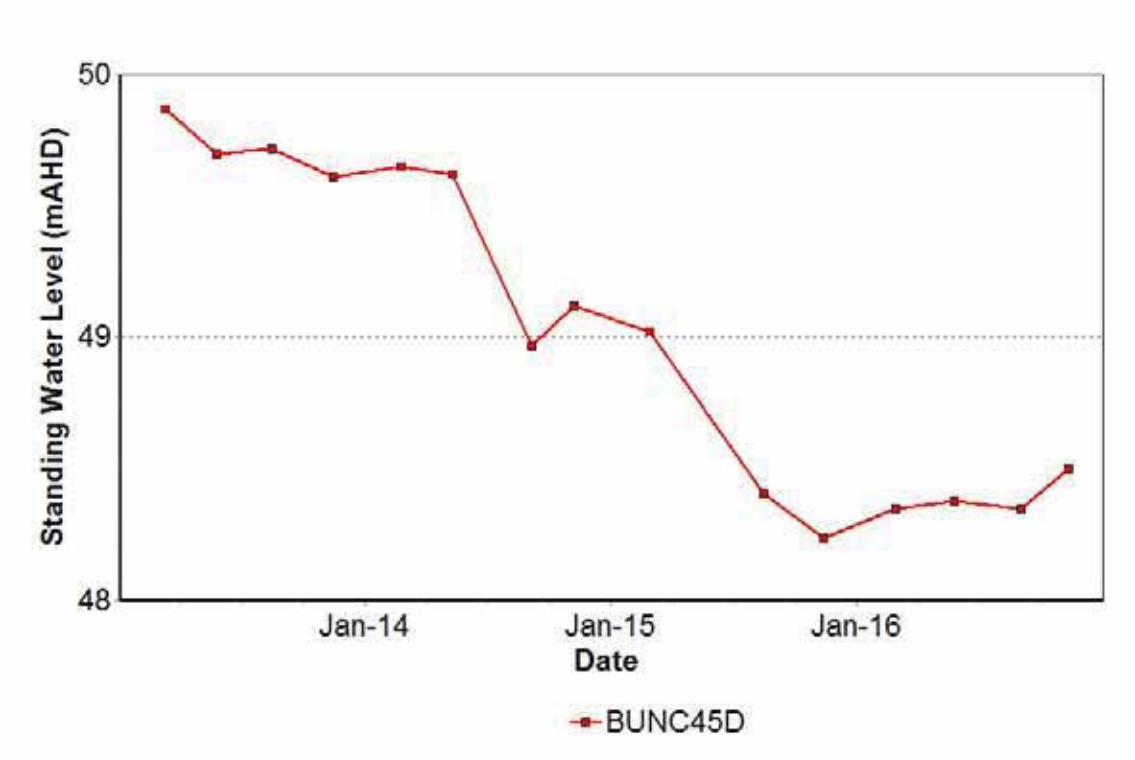

Figure 70: Cheshunt Piercefield Groundwater SWL Trends 2013 – 2016

7.8.3.10 Lemington South Alluvium

Groundwater monitoring in the Lemington South Alluvium area was undertaken at three sites during 2016. A total of 12 samples were collected during the reporting period. The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 71, Figure 72 and Figure 73. Water quality was consistent with historical trends. Water levels show seasonal fluctuations, controlled by streamflow in the Wollombi Brook.

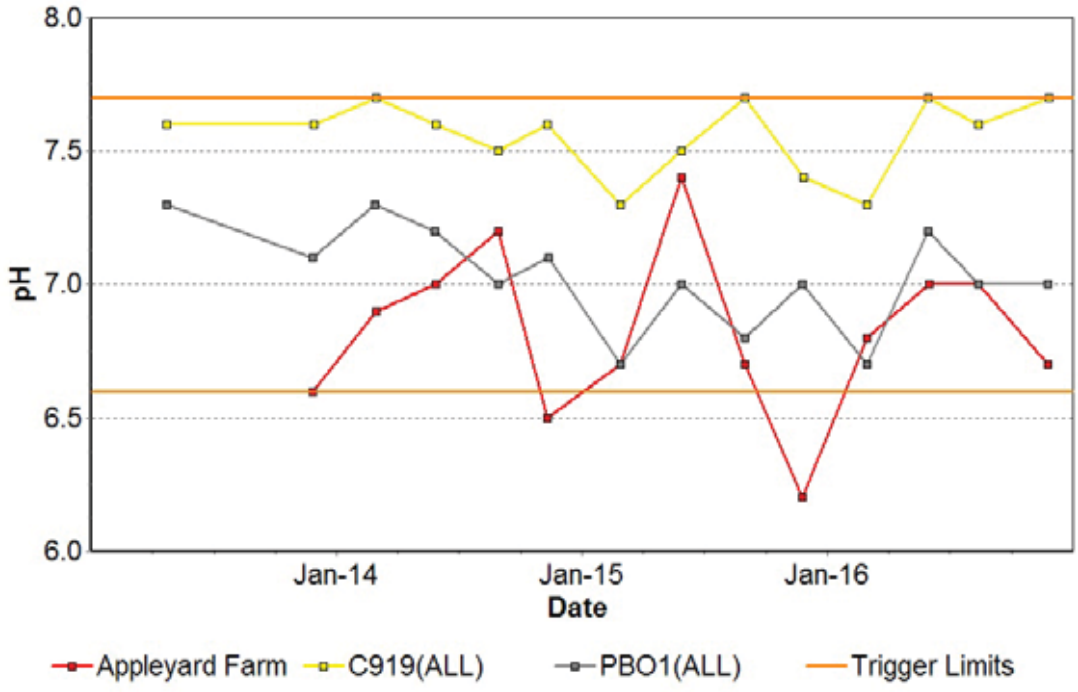

Figure 71: Lemington South Alluvium Groundwater pH Trends 2013 – 2016

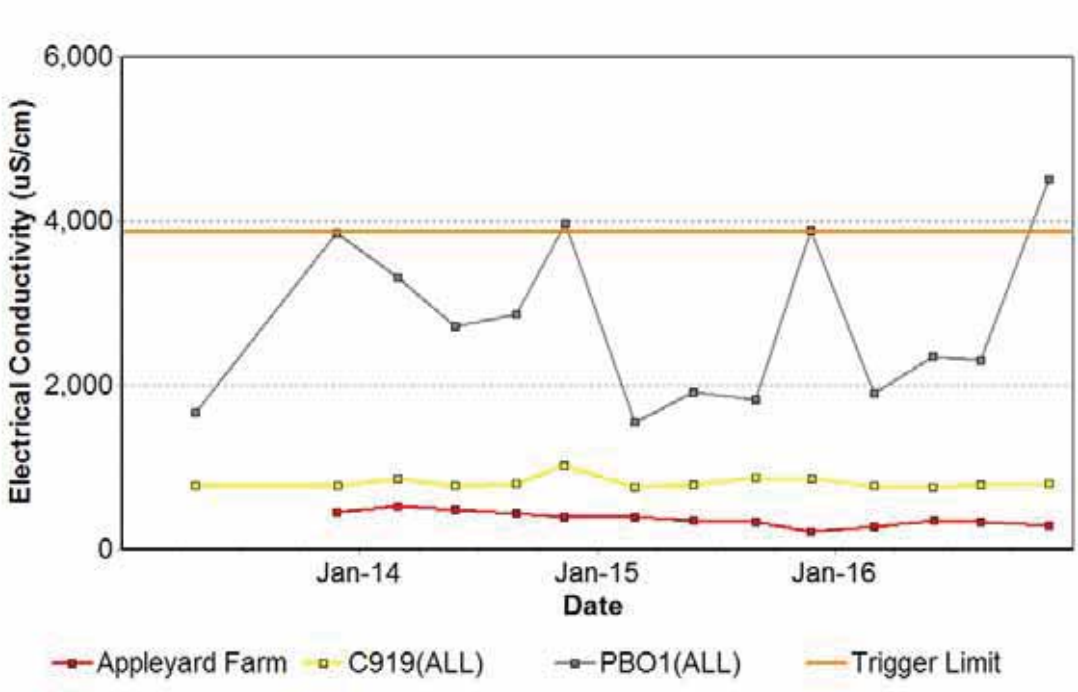

Figure 72: Lemington South Alluvium Groundwater EC Trends 2013 - 2016

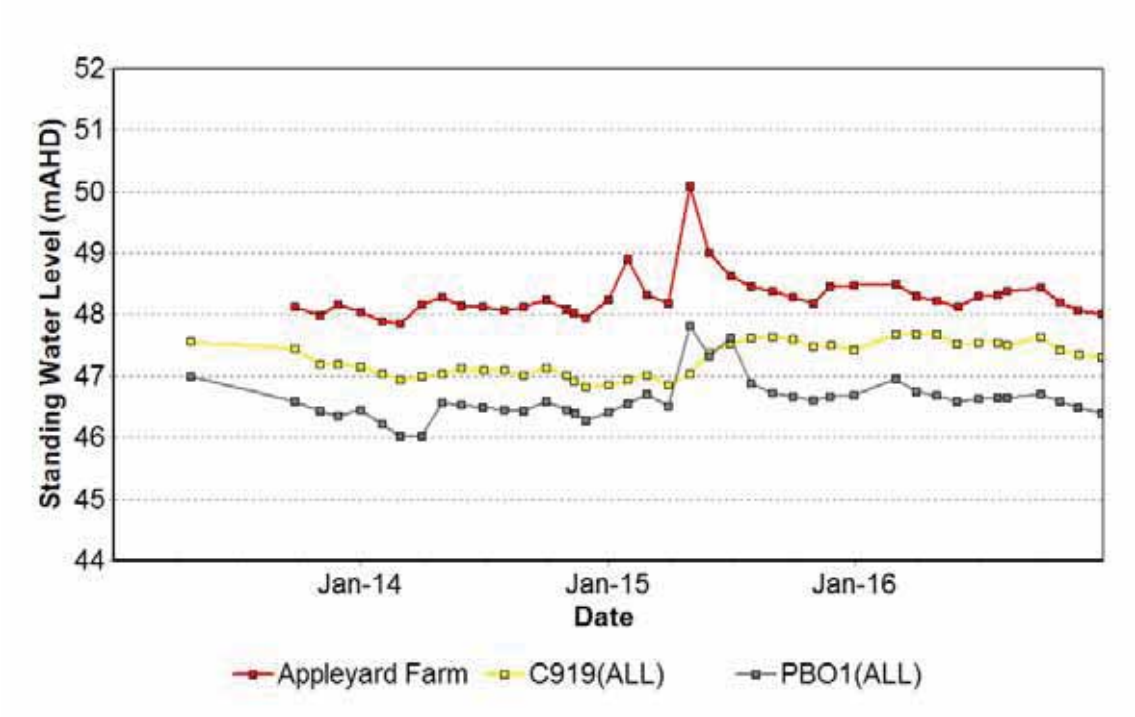

Figure 73: Lemington South Alluvium Groundwater SWL Trends 2013 - 2016

7.8.3.11 Lemington South Arrowfield

Groundwater monitoring in the Lemington South Arrowfield area was undertaken at four sites during 2016. A total of 8 samples were collected during the reporting period. The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 74, Figure 75 and Figure 76. Water quality was variable, but consistent with historical trends.

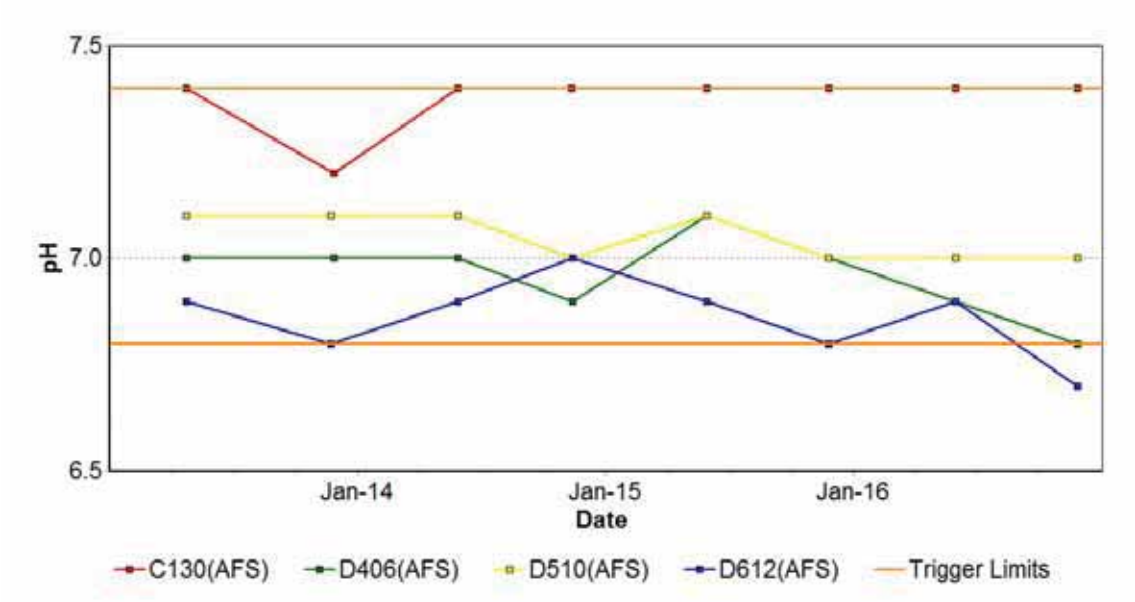

Figure 74: Lemington South Arrowfield Groundwater pH Trends 2013 - 2016

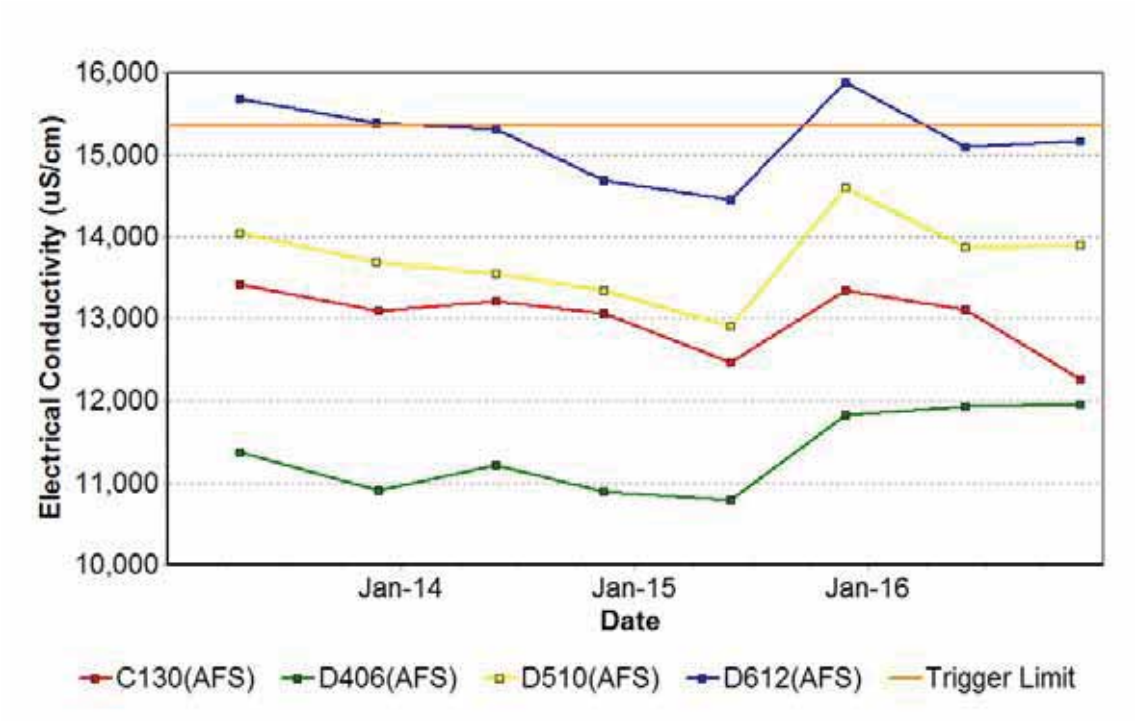

Figure 75: Lemington South Arrowfield Groundwater EC Trends 2013 -2016

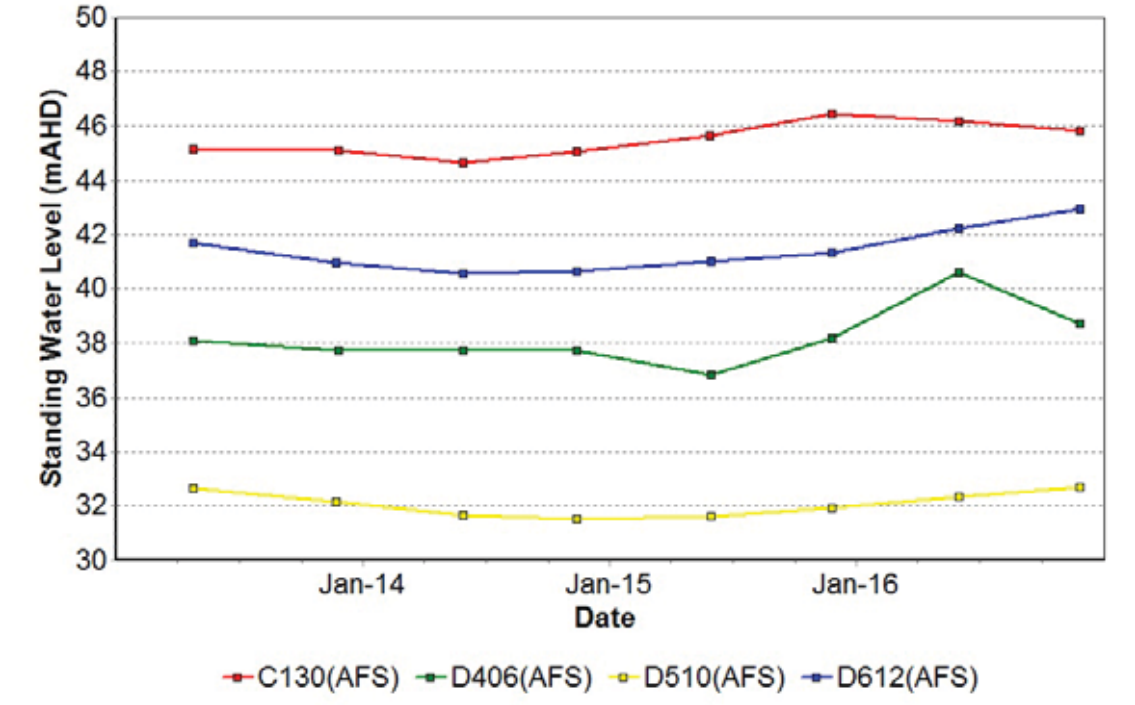

Figure 76: Lemington South Arrowfield Groundwater SWL Trends 2013 - 2016

7.8.3.12 Lemington South Bowfield

Groundwater monitoring in the Lemington South Bowfield area was undertaken at 15 sites during 2016. A total of 30 samples were collected during the reporting period. The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 77, Figure 78 and Figure 79. Trigger

tracking results are listed in Table 37. Results were steady and consistent with historical trends.

Table 37: HVO Lemington South Bowfield Seam Groundwater 2016 Monitoring Internal Trigger Tracking

Location	Date	Trigger limit	Action taken in response
D317 (BFS)	25/11/2015	pH - 95th percentile	Watching Brief*
	30/05/2016		Watching Brief*
	24/11/2016		Cause of elevated pH not identified – EC and water level trend is steady, results not supported by nearby bores in Bowfield seam. Bore not near active mining area. Watching brief will be maintained.
B631 (BFS)	30/05/2016	pH - 5th percentile	Results are stable and consistent with historical trend. No further action required.
	24/11/2016		

* = 1st/2nd trigger. Watching Brief established pending outcomes of subsequent monitoring events. No specific actions required

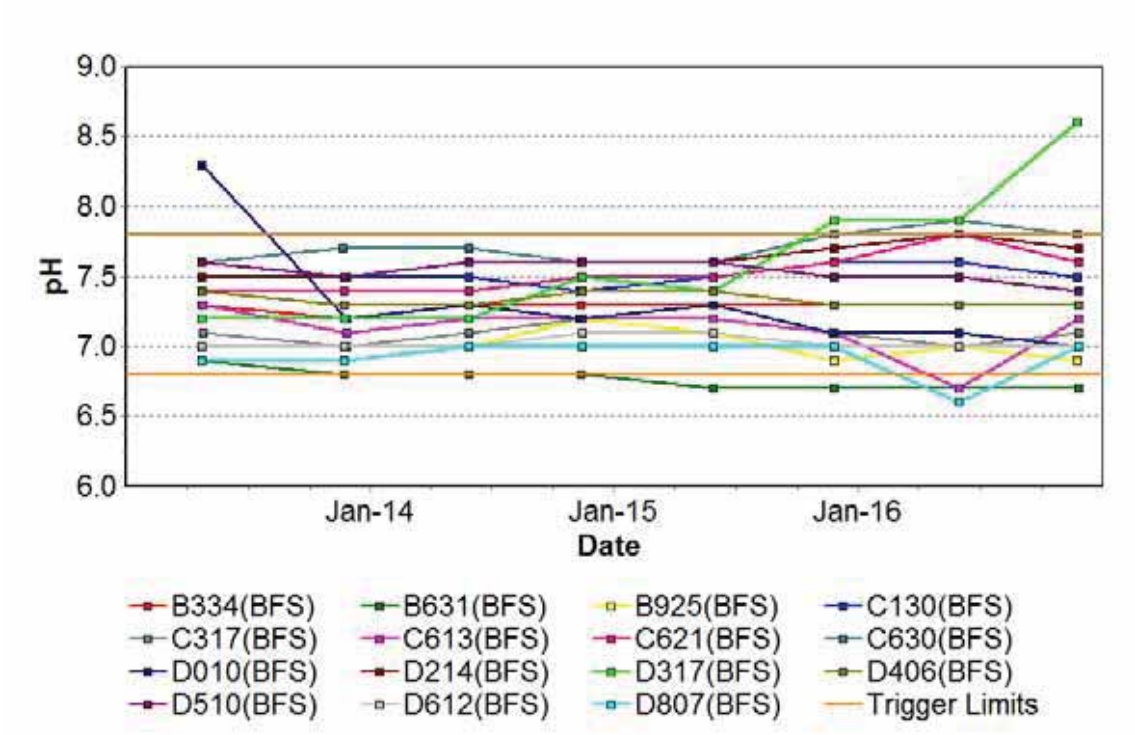

Figure 77: Lemington South Bowfield Groundwater pH Trends 2013 – 2016

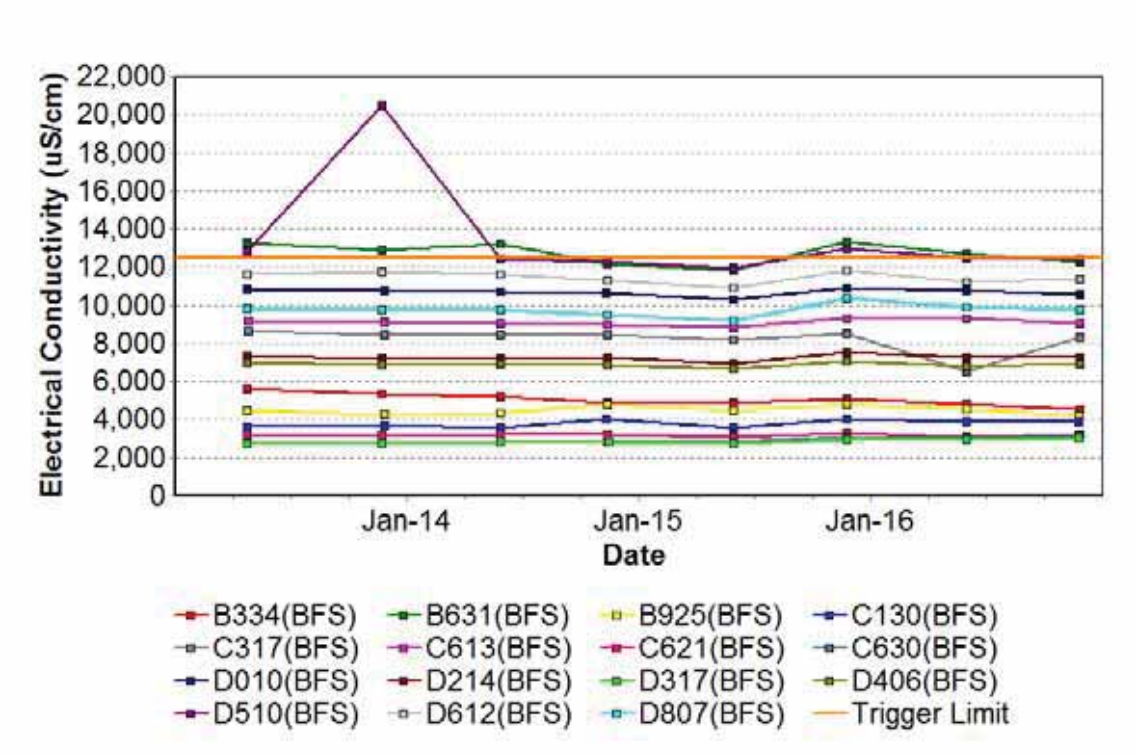

Figure 78: Lemington South Bowfield Groundwater EC Trends 2013 – 2016

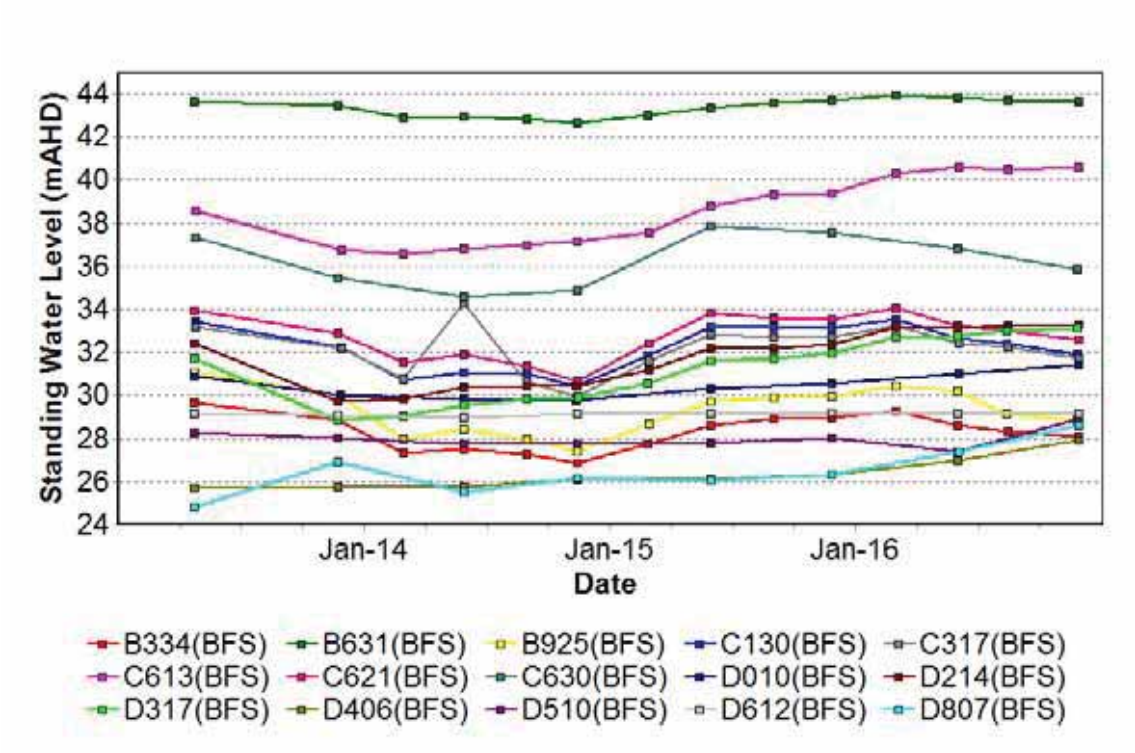

Figure 79: Lemington South Bowfield Groundwater SWL Trends 2013 - 2016

7.8.3.13 Lemington South Interburden

Groundwater monitoring in the Lemington South Interburden area was undertaken at one site during 2016; a total of four samples were collected. The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 80, Figure 81 and Figure 82. EC continues to show a slight declining trend during the reporting period; however it does not correspond with a significant change in water level. Results will continue to be monitored.

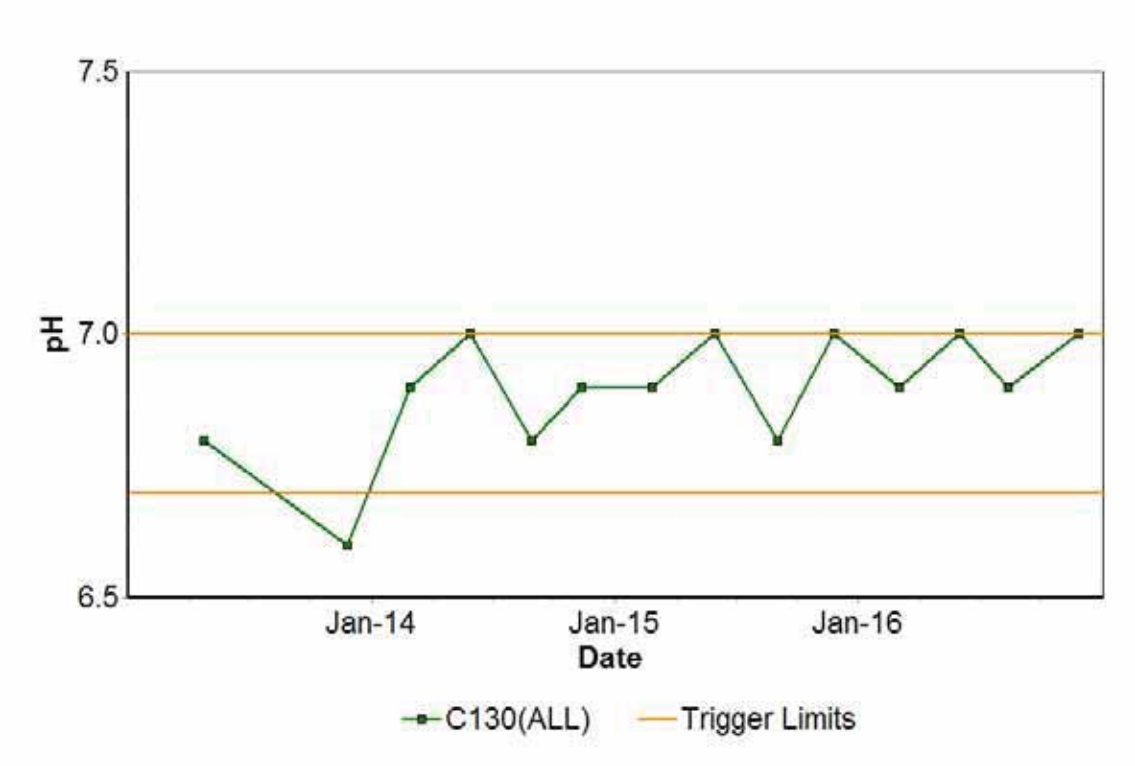

Figure 80: Lemington South Interburden pH Trends 2013 – 2016

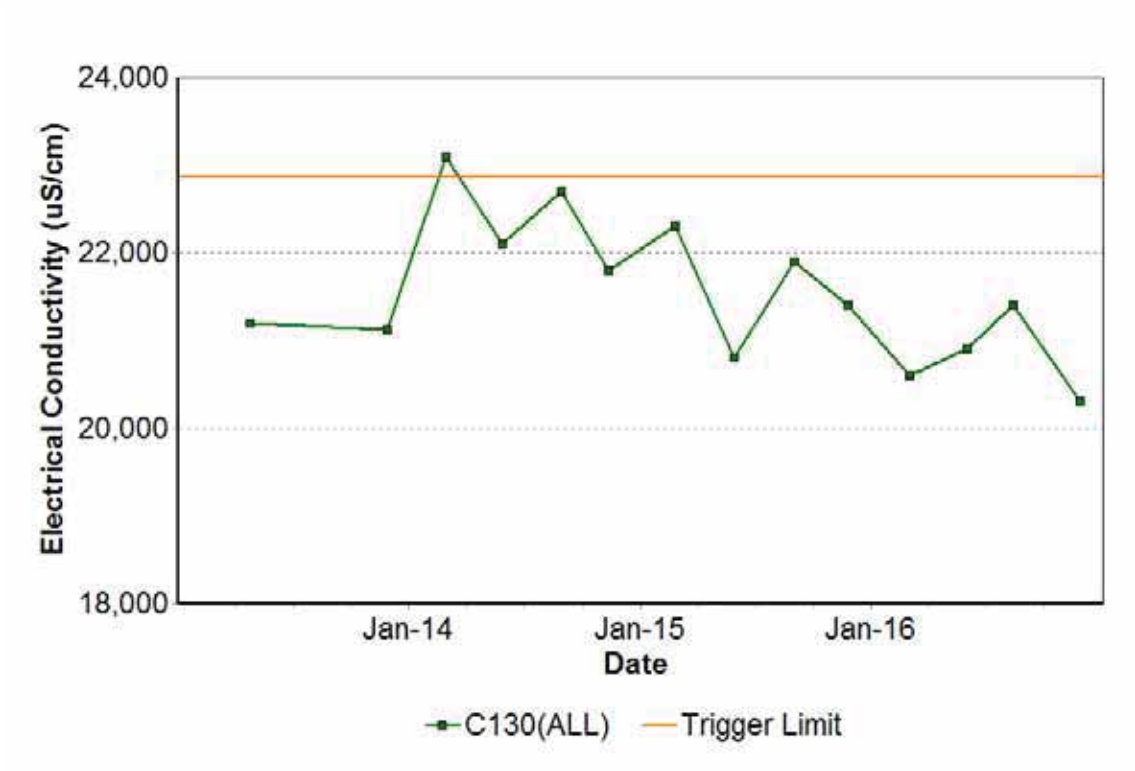

Figure 81: Lemington South Interburden EC Trends 2013 - 2016

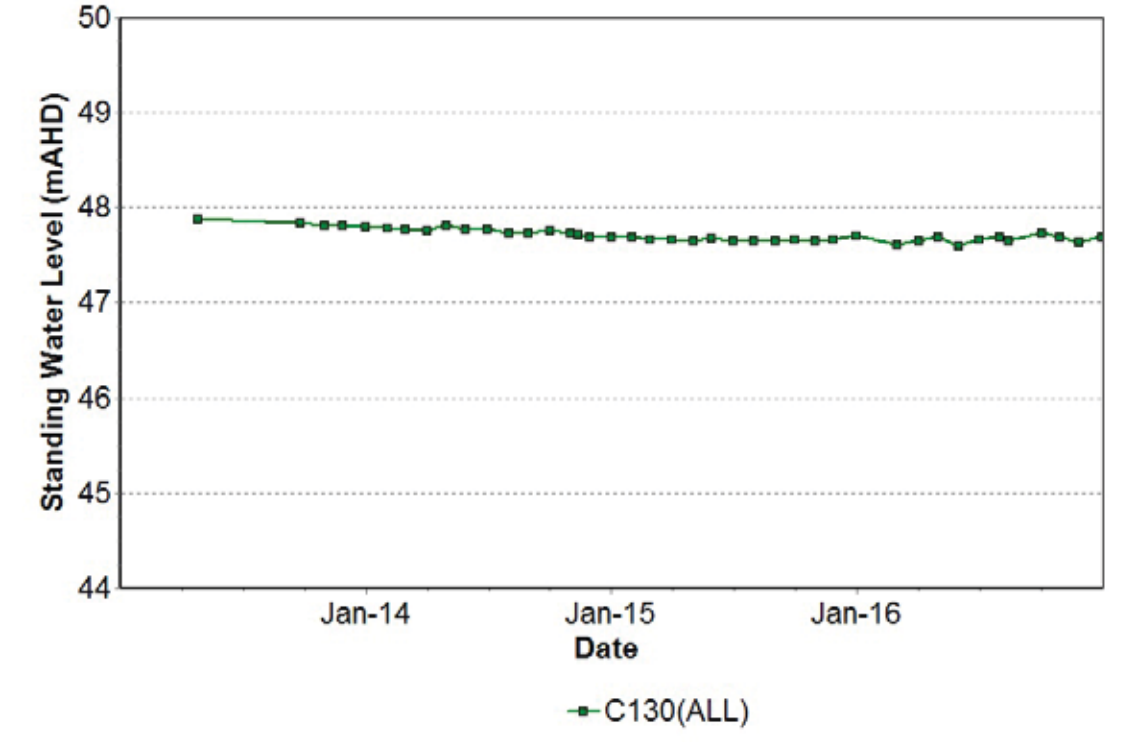

Figure 82: Lemington South Interburden SWL Trend 2013 - 2016

7.8.3.14 Lemington South Woodlands Hill

Groundwater monitoring in the Lemington South Woodlands Hill seam was undertaken at seven sites during 2016. A total of 14 samples were collected during the reporting period.

The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 83, Figure 84 and Figure 85. Trigger tracking results are listed in Table 38. Results were stable and consistent with historical trends.

Table 38: HVO Lemington South Woodlands Hill Seam Groundwater 2016 Monitoring Internal Trigger Tracking

Location	Date	Trigger limit	Action taken in response
C130 (WDH)	25/11/2015	EC - 95th percentile	Watching Brief*
	30/05/2016		Watching Brief*
	24/11/2016		Results are stable and consistent with historical trend. No further action required.

* = 1st/2nd trigger. Watching Brief established pending outcomes of subsequent monitoring events. No specific actions required

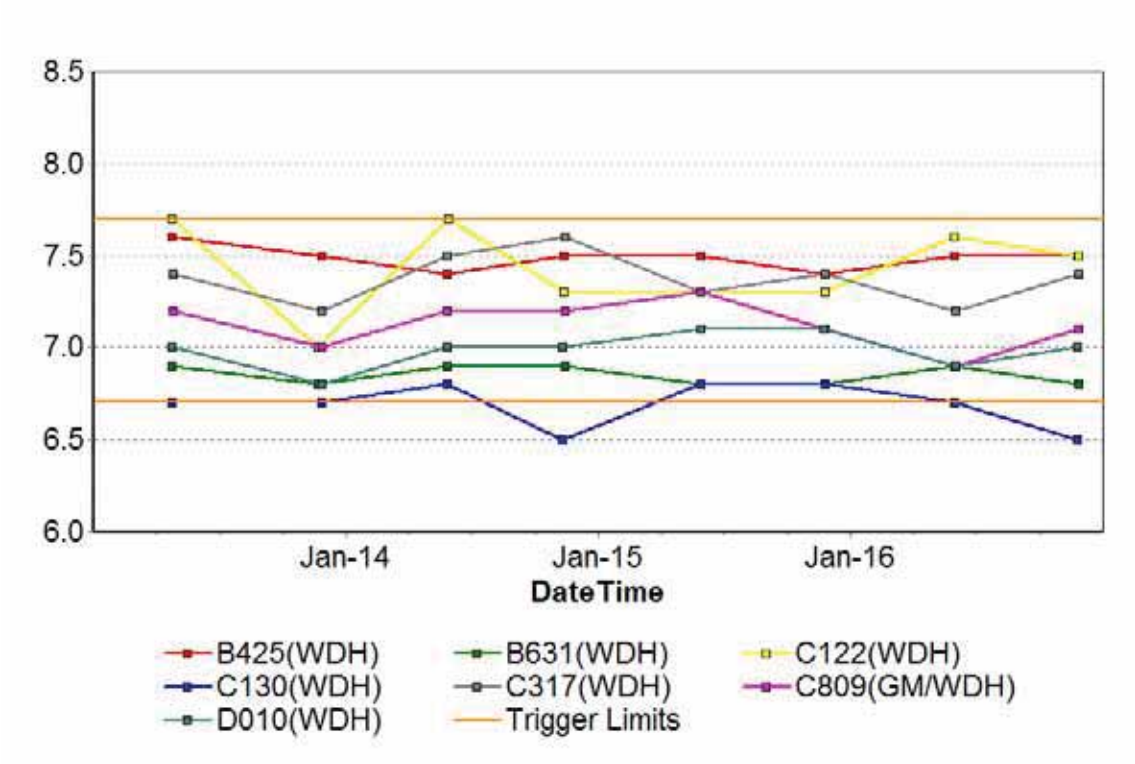

Figure 83: Lemington South Woodlands Hill Groundwater pH Trends 2013 – 2016

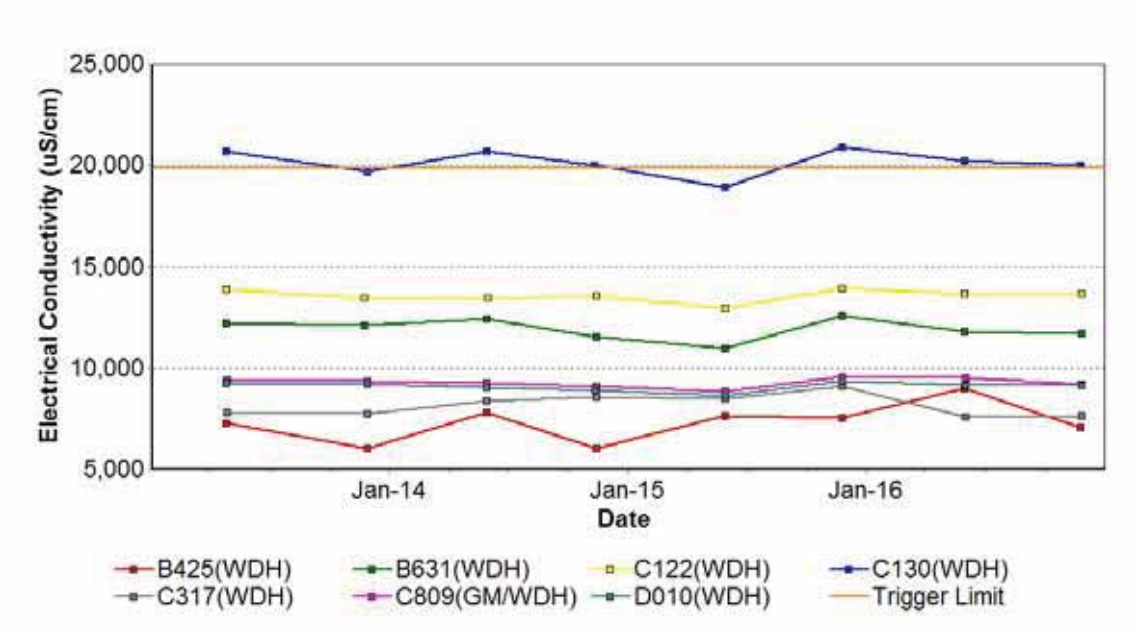

Figure 84: Lemington South Woodlands Hill Groundwater EC Trends 2013 – 2016

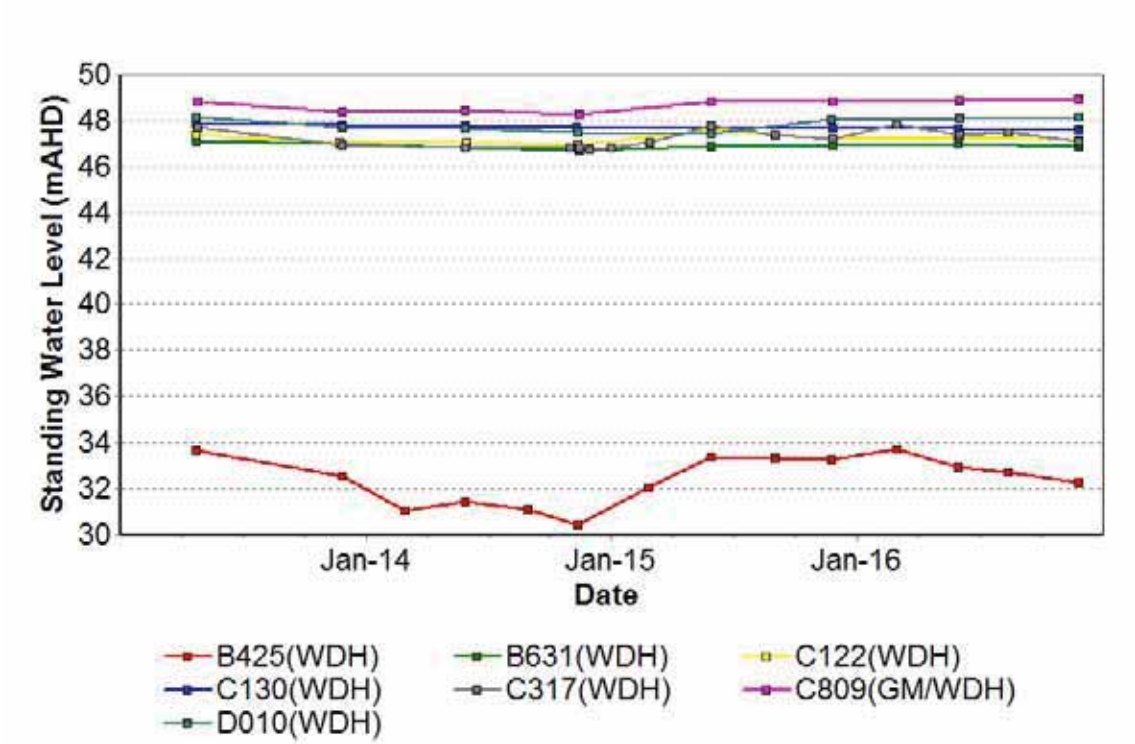

Figure 85: Lemington South Woodlands Hill Groundwater SWL Trends 2013 - 2016

7.8.3.15 North Pit Spoil

Groundwater monitoring in the North Pit Spoil area was undertaken at 15 sites during 2016. A total of 55 samples were collected during the reporting period. The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 86, Figure 87 and Figure 88. Water quality and levels were generally stable and consistent with historical trends.

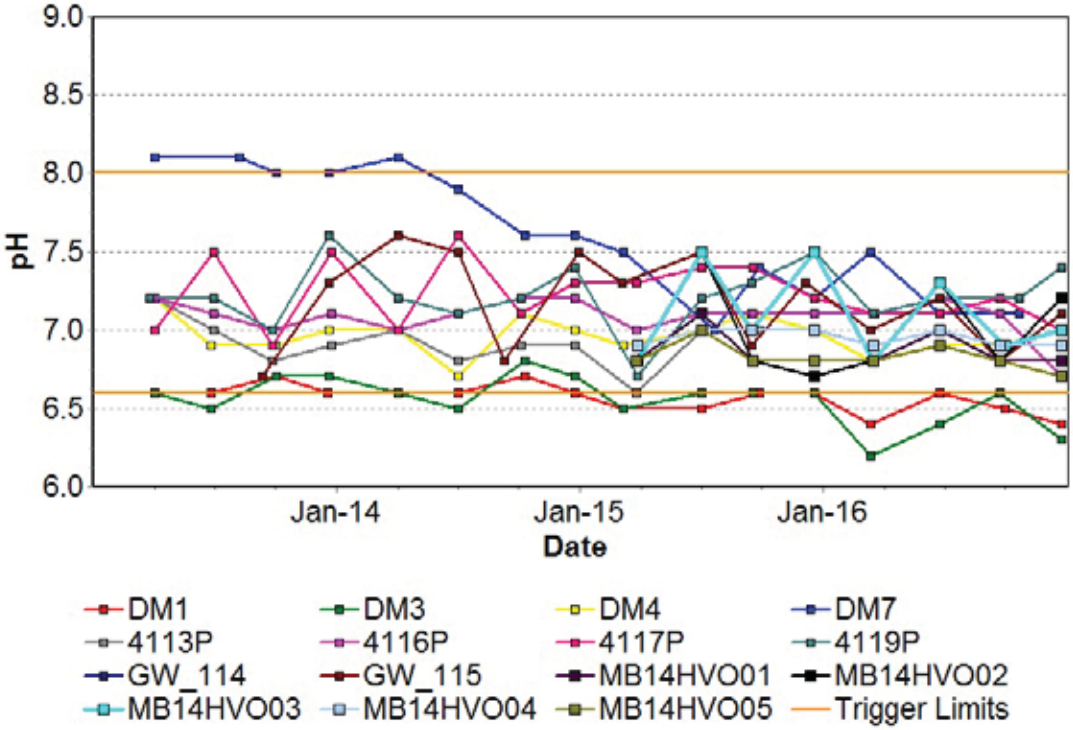

Figure 86: North Pit Spoil Groundwater pH Trends 2013 – 2016

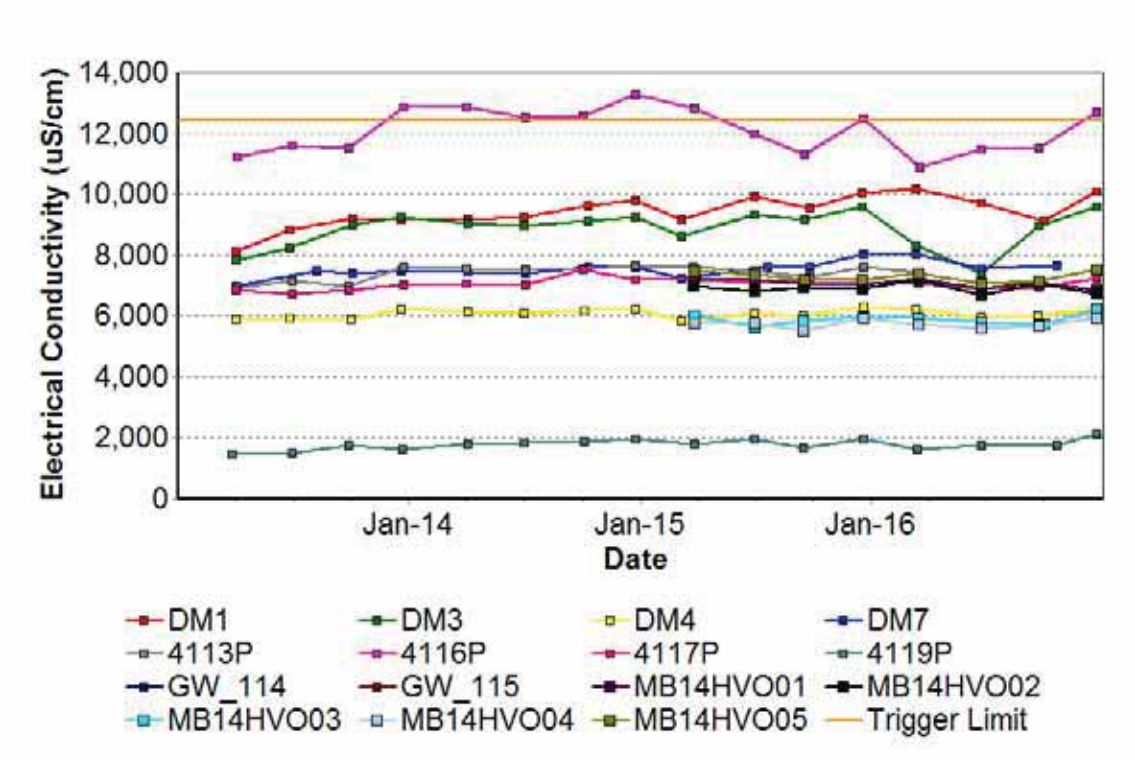

Figure 87: North Pit Spoil Groundwater EC Trends 2013 – 2016

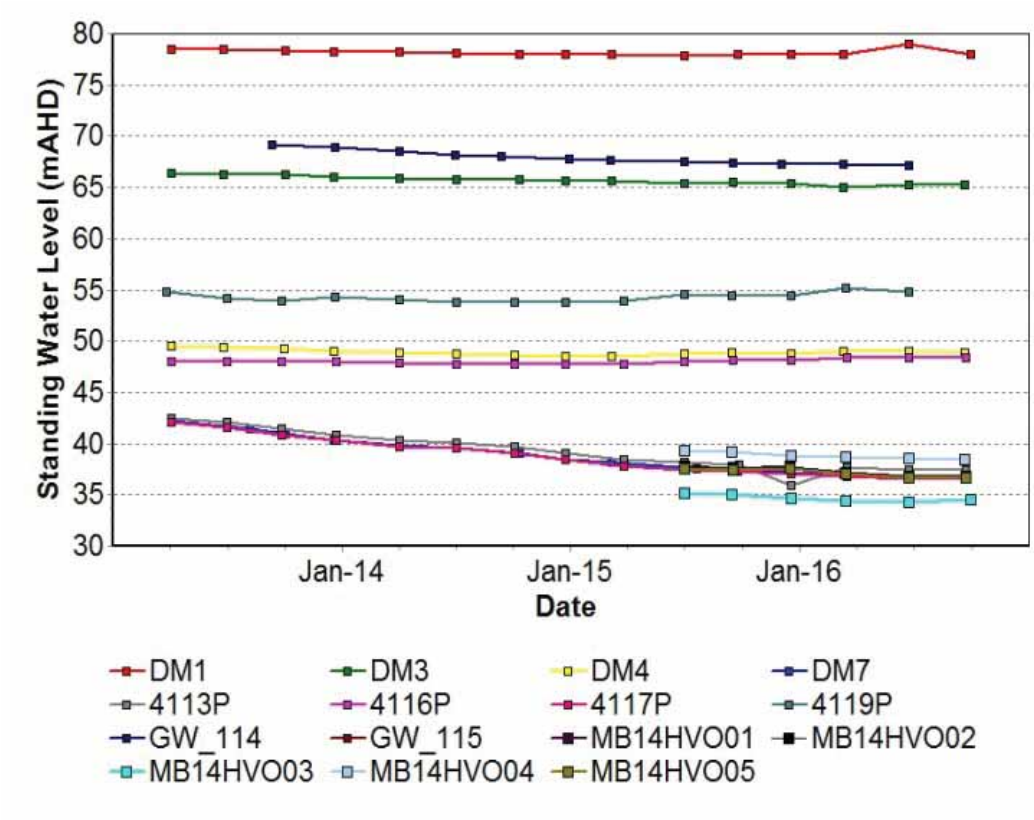

Figure 88: North Pit Spoil Groundwater SWL Trends 2013 – 2016

7.8.3.16 West Pit Alluvium

Groundwater monitoring in the West Pit Alluvium area was undertaken at three sites during 2016. A total of 12 samples were collected during the reporting period. The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 89, Figure 90 and Figure 91. Results were consistent with historical trends.

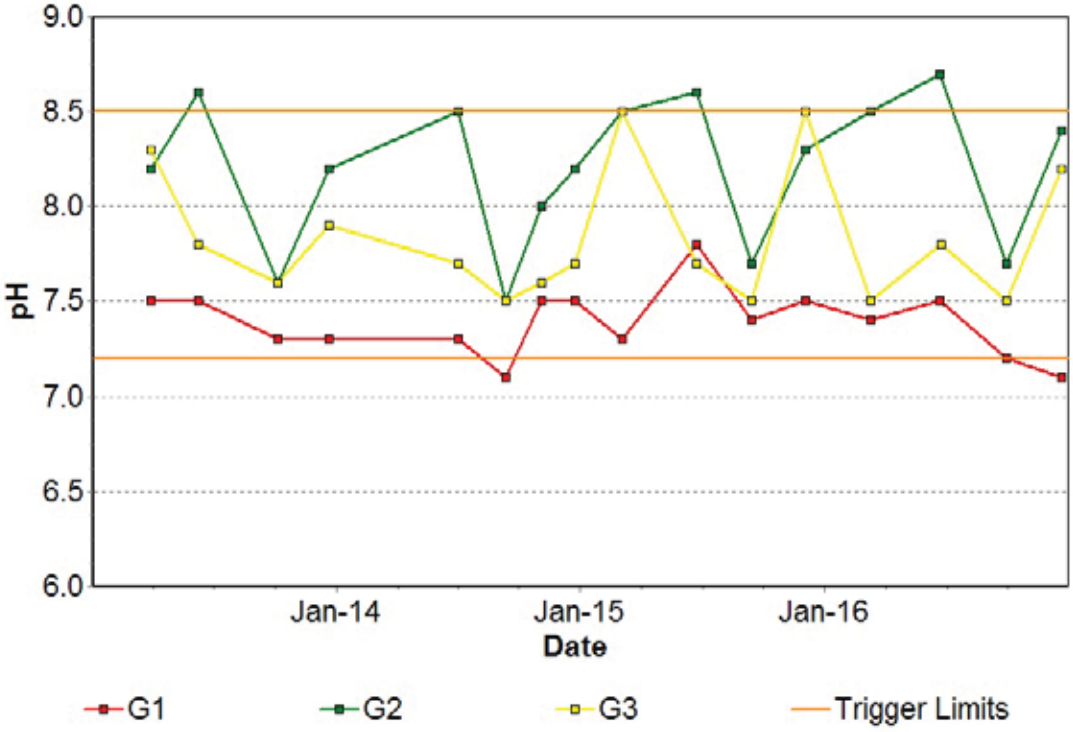

Figure 89: West Pit Alluvium Groundwater pH Trends 2013 – 2016

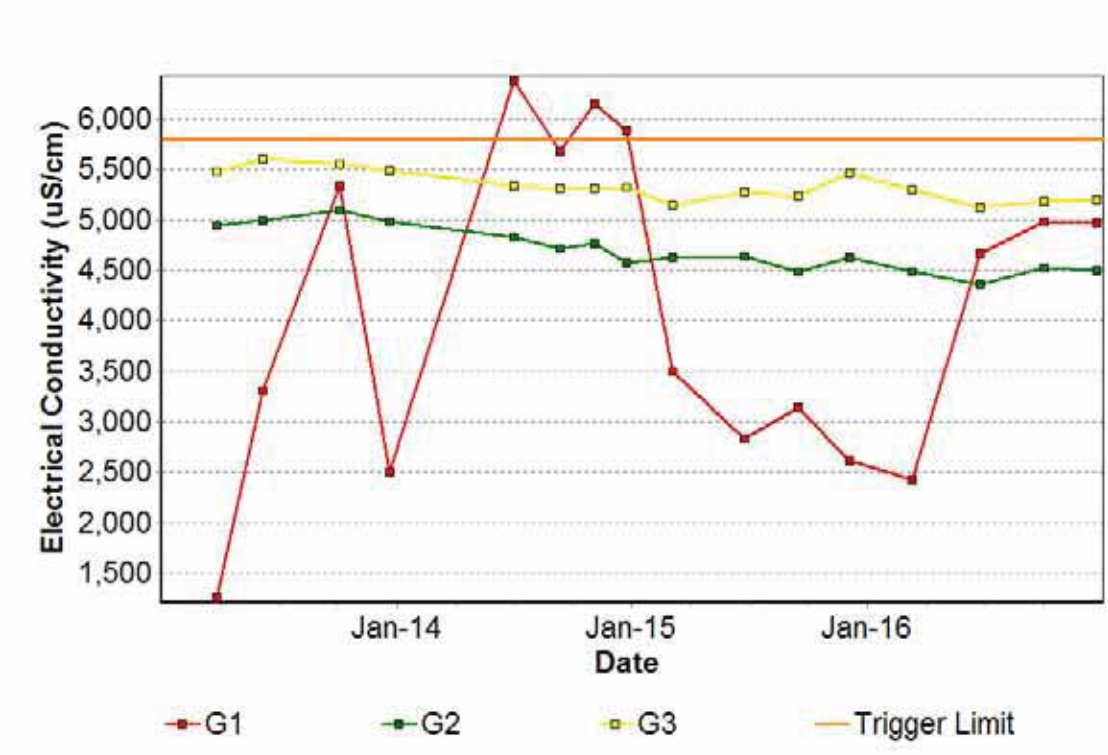

Figure 90: West Pit Alluvium Groundwater EC Trends 2013 – 2016

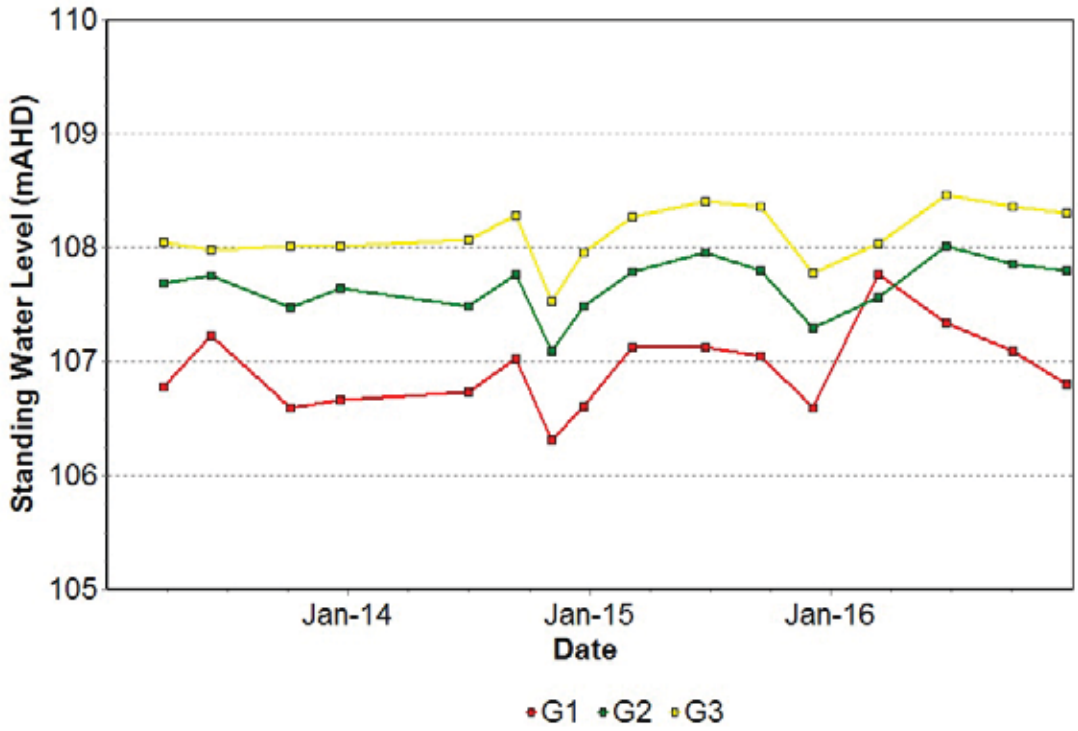

Figure 91: West Pit Alluvium Groundwater SWL Trends 2013 – 2016

7.8.3.17 West Pit Sandstone/ Siltstone

Groundwater monitoring in the West Pit Sandstone/ Siltstone area was undertaken at four sites during 2016. A total of 16 samples were collected during the reporting period. The pH, EC and SWL trends for 2013 to 2016 are shown in Figure 92, Figure 93 and Figure 94. Results were consistent with historical trends.

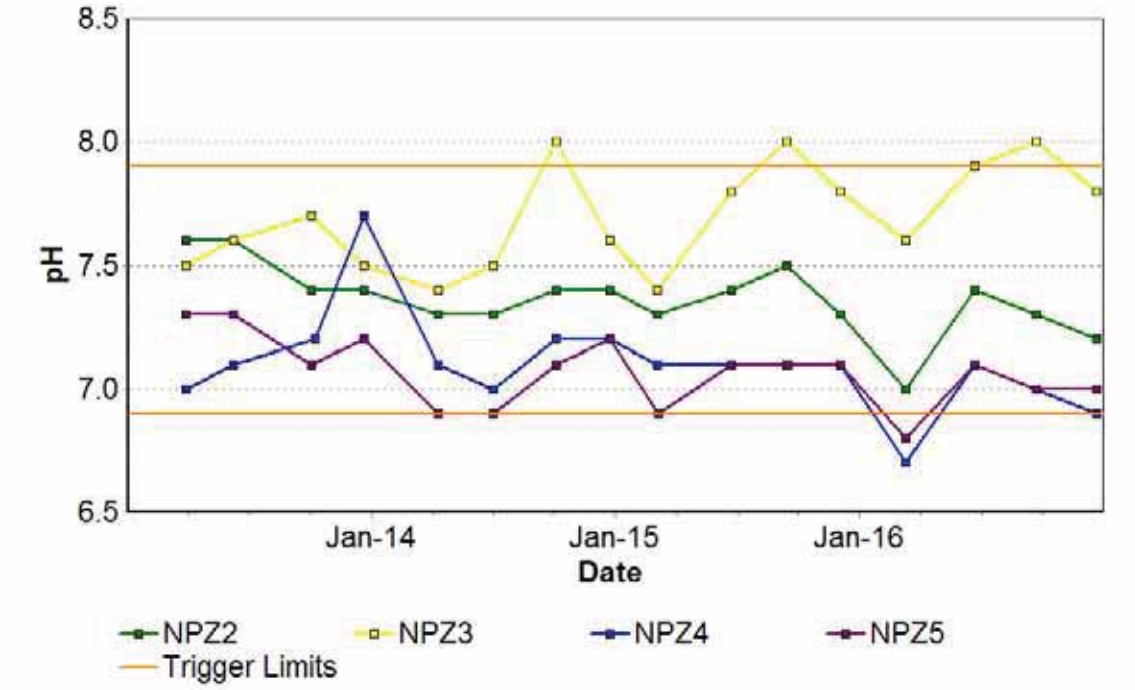

Figure 92: West Pit Sandstone/ Siltstone Groundwater pH Trends 2013 – 2016

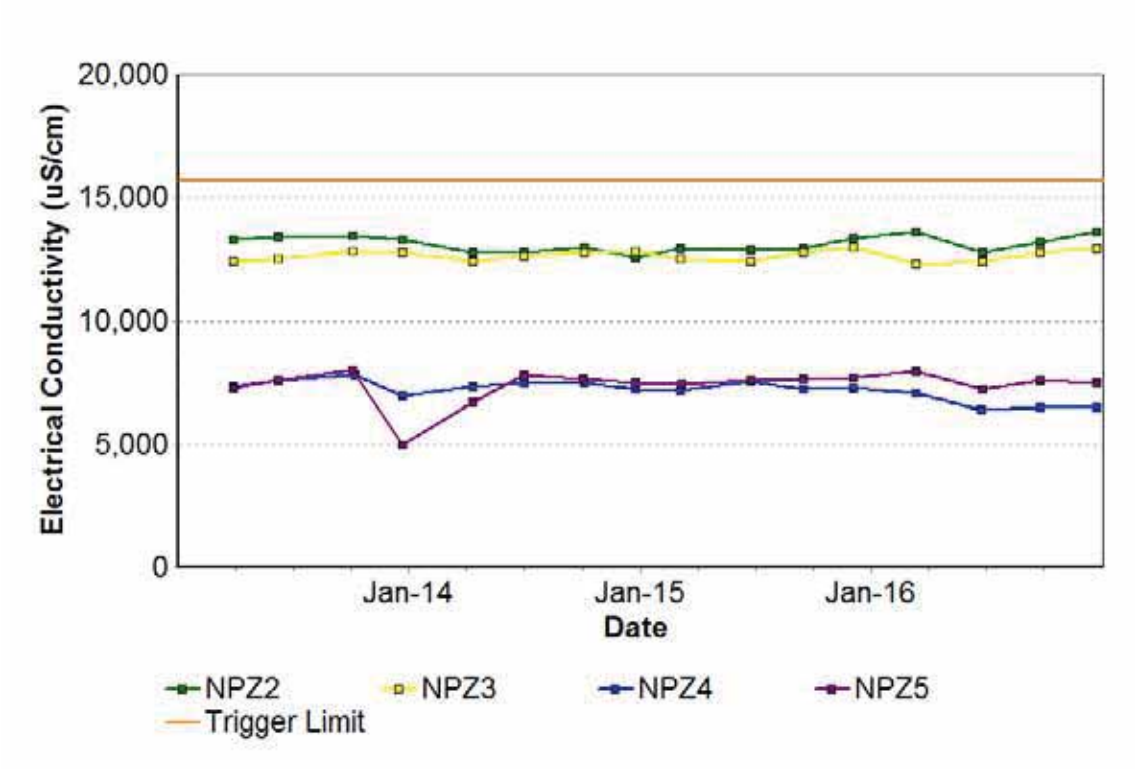

Figure 93: West Pit Sandstone/ Siltstone Groundwater EC Trends 2013 – 2016

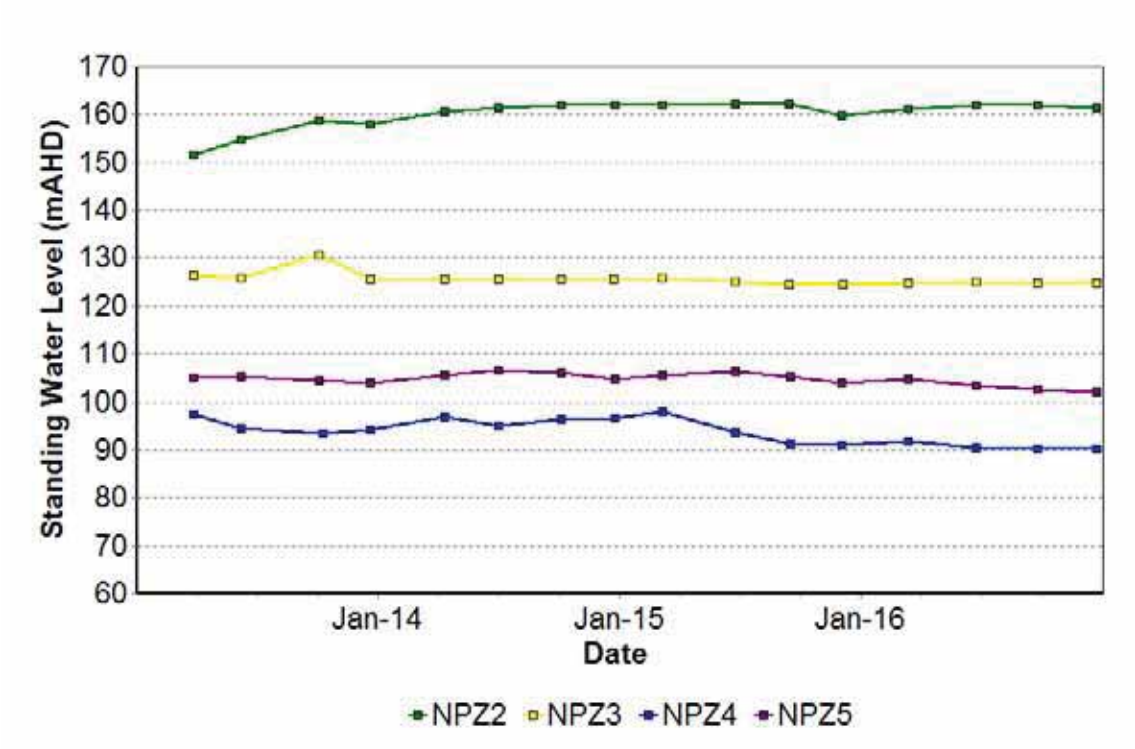

Figure 94: West Pit Sandstone/ Siltstone Groundwater SWL Trends 2013 – 2016

7.8.4 Groundwater Contours

Groundwater contour maps showing the alluvial and coal seam aquifers for HVO North and South are given in Appendix 2. The data is consistent with historical trends.

7.8.5 Ground Water Non-compliances during reporting period

There were no reportable incidents/non-compliances of consent or other approval conditions and no complaints relating to groundwater.

8 REHABILITATION AND LAND MANAGEMENT

8.1 Summary of Rehabilitation

Rehabilitation at HVO is undertaken in accordance with commitments made in the various Mining Operations Plans (MOPs) covering the site: Hunter Valley Operations North MOP (includes Newdell CHPP and Hunter Valley Load Point) and Hunter Valley Operations South MOP.

A summary of the key rehabilitation performance indicators is shown in Table 39.

Table 39: Key Rehabilitation Performance Indicators

Mine Area Type	Previous Reporting Period (Actual) Year 2016-1 (ha)	This Reporting Period (Actual) Year 2016 (ha)	Next Reporting Period (Forecast) Year 2016+1 (ha)
A. Total mine footprint[1]	6,462.0	6,399.0	6,520.5
B. Total Active Disturbance[2]	3,679.1	3,566.2	3,576.1
C. Land being prepared for rehabilitation[3]	49.3	35.8	77.1
D. Land under active rehabilitation[4]	2,733.6	2,797.0	2,867.3
E. Completed rehabilitation[5]	0	0	0

[1] **Total mine footprint** includes all areas within a mining lease that either have at some point in time or continue to pose a rehabilitation liability due to mining and associated activities. As such it is the sum of total active disturbance, decommissioning, landform establishment, growth medium development, ecosystem establishment, ecosystem development and relinquished lands (as defined in DRE MOP/RMP Guidelines). Please note that subsidence remediation areas are excluded.

[2] **Total active disturbance** includes all areas ultimately requiring rehabilitation such as: on-lease exploration areas, stripped areas ahead of mining, infrastructure areas, water management infrastructure, sewage treatment facilities, topsoil stockpiles areas, access tracks and haul road, active mining areas, waste emplacements (active/unshaped/in or out-of-pit), and tailings dams (active/unshaped/uncapped).

[3] **Land being prepared for rehabilitation** – includes the sum of mine disturbed land that is under the following rehabilitation phases – decommissioning, landform establishment and growth medium development (as defined in DRE MOP/RMP Guidelines).

[4] **Land under active rehabilitation** – includes areas under rehabilitation and being managed to achieve relinquishment – includes the following rehabilitation phases as described in the DRE MOP/RMP Guidelines – "ecosystem and land use sustainability" (revegetation assessed as showing signs of trending towards relinquishment OR infrastructure development).

[5] **Completed rehabilitation** – requires formal sign off by DRE that the area has successfully met the rehabilitation land use objectives and completion criteria.

8.2 Management

Performance criteria for each rehabilitation phase have been detailed in the Mining Operations Plan (MOP) for both HVO North and HVO South. These criteria have been developed so that the rehabilitation success can be quantitatively tracked as it progresses through the phases outlined below:

- Stage 1 – Decommissioning
- Stage 2 – Landform Establishment
- Stage 3 – Growing Media Development
- Stage 4 – Ecosystem and Land use Establishment
- Stage 5 – Ecosystem and Land use Sustainability
- Stage 6 – Rehabilitation Complete

The performance criteria are objective target levels or values that can be measured to quantitatively demonstrate the progress and ultimate success of a biophysical process. A monitoring methodology has been developed to measure the performance criteria outlined in the MOPs utilising a combination of tools that provide quantitative data to assess changes occurring over time.

The target levels or values have been based on monitoring results from reference sites and will be detailed in updated Mining Operations Plan to be submitted during April 2017. The results of the rehabilitation monitoring programme for native vegetation areas (presented in Appendix 5) have been compared against the target levels to determine if rehabilitation has been successful or if additional intervention is needed.

Monitoring of grazing sites has commenced for both reference sites and rehabilitation sites across HVO and MTW. AECOM prepared a report detailing the monitoring results and this was included in the 2014 Annual Environmental Review. Eight reference sites have been selected across Coal & Allied owned land adjacent to HVO and MTW. These sites were selected to cover the various soil types found in the area and to cover different Land Capability Classes (five sites on Land Capability Class IV to VI; and three sites on Land Capability Class I-III). Monitoring has also been conducted on four sites each at HVO and MTW on rehabilitated land returned to grazing.

The monitoring program for rehabilitated land returned to native vegetation was commenced by ecologists from Niche Environment and Heritage during 2015. Further monitoring was conducted in early 2017 and a report that details the results of this monitoring program is presented in Appendix 5. Monitoring was conducted across 12 reference sites within the two target vegetation communities Central Hunter Grey Box-Ironbark Woodland EEC, and Ironbark-Spotted Gum-Grey Box Forest EEC. The 2017 monitoring program revisited 16 of the 18 sites monitored in 2016 to check the consistency of the monitoring results from successive years. Additional monitoring methods were incorporated into the 2017 program to measure the density, health and growth of canopy species. Sites were selected to include rehabilitation of varying ages and different rehabilitation methods.

8.3 Grazing Trial

Monitoring of the grazing trial by DPI personnel continued during 2016. This trial was initiated by the Upper Hunter Mining Dialogue in 2014 and is designed to test the suitability of rehabilitated mined land for cattle grazing. The grazing trial consists of two trial sites, one on rehabilitated land at HVO, and a control site on neighbouring un-mined land. The trial sites are 40 hectares each, with 10 Angus steers currently being grazed on each site.

The results from the first group of steers that were turned off the trial in April 2016 showed that the cattle grazing on the rehabilitated pastures were on average 764kg per head compared to the cattle on the unmined paddocks which averaged 611kg per head. The cattle grazing on the rehabilitation paddocks consistently outperformed the cattle on the unmined paddocks during the first trial period.

Based on the condition of the paddocks after the first trial period, it was decided that the rehabilitation paddocks would be able to support higher stocking rates. The number of cattle grazing on the rehabilitated paddocks has therefore been increased from 10 to 15 with the introduction of the second lot of steers to the trial. After 6 months on the grazing trial the rehabilitation cattle, on average, weigh 432kg per head while the cattle on the unmined paddocks average 365kg per head.

8.4 Rehabilitation Performance

A total of 72.9 ha rehabilitation was undertaken during 2016. Details of the rehabilitation areas and the works undertaken are provided in Appendix 4. The location of rehabilitation completed in 2016 is shown in Figure 95 and Figure 96.

Table 40 and Table 41 detail the amount of rehabilitation and disturbance completed during the reporting period compared with commitments in the respective MOP's. Appendix 3 provides the Annual Rehabilitation Report Form, including rehabilitation progress for each domain through the rehabilitation phases.

Table 40: Summary of completed rehabilitation in 2016

MOP	2016 Rehabilitation (ha)		Cumulative Rehabilitation During Current MOP Period (ha)	
	Actual	MOP Commitment	Actual	MOP Commitment
HVO North	20.0	30.0	84.6	116.4*
HVO South	52.9	27.5	117.9	82.3*
HVO Total	72.9	57.5	202.5	198.7

Notes:
Comparison with HVO North MOP 2015 to 2018 approved 19 February 2016) and HVO South MOP 2015 to 2018 (approved 17 December 2015);
*Cumulative MOP figures are for periods 2015-2016

Table 41: Summary of completed disturbance in 2016

MOP	2016 Disturbance (ha)		Cumulative Disturbance During Current MOP Period (ha)	
	Actual	MOP Commitment	Actual	MOP Commitment*
HVO North	61.8	335.4	133.5	506.7
HVO South	86.8	133.5	188.0	236.8
HVO Total	148.6	468.9	321.5	743.5

Notes:
Comparison with HVO North MOP (2015 to 2018) and HVO South MOP (2015 to 2018);
*Cumulative MOP figures are for periods: HVO North 2015-2016 and HVO South 2015-2016

Rehabilitation figures presented relate to areas at or past the phase of Ecosystem and Landuse Establishment. The area of rehabilitation that was sown during the reporting period was 15.4 hectares above the MOP commitment.

The area of land disturbed at HVO during 2016 was 148.6 ha, which was lower than the projected MOP disturbance of 468.9 ha. Disturbance of rehabilitation land accounted for 95.0 ha of the total area disturbed, with the majority of this rehabilitation disturbance occurring to allow Cheshunt pit progression through rehabilitated areas of Riverview pit to access deeper coal seams.

A comparison of rehabilitation progression against predictions in Figure 10 of the HVO West Pit Extension and Minor Modifications Environmental Impact Statement (EIS) Volume 4 (October 2003) indicate that rehabilitation progression is generally consistent with EIS predictions. At the end of 2016, rehabilitation area totalling 1,798ha has been completed for HVO North compared to the EIS projection at 2017 of 2,046ha. West Pit rehabilitation is ahead of projections while Carrington/North Pit is behind. Contributing factors for this lag are: Southeast and Central TSF's haven't been rehabilitated due to geotechnical instability (lack of consolidation of tailings material) preventing capping; Carrington Out of Pit Dump planned to provide capping material for North Void, SE and Central TSF's and hence not rehabilitated; and approval gained from Carrington Pit Extended Statement of Environmental Effects (October 2005) for additional disturbance of previously rehabilitated areas that are included in the EIS 2003 rehab polygons for 2017.

As at the end of 2016, rehabilitation progress for HVO South is ahead of the predictions in the HVO South Coal Project Environmental Assessment Report (January 2008).

Figure 19.3 of the Environmental Assessment Report shows 597.2ha of rehabilitation completed as at the end of 2007 with a prediction of a further 275.5ha to be completed in the period 2008 to 2016. The actual rehabilitation area at the end of 2016 is 999ha which is ahead of the EA report predictions for the end of 2016 of 872ha.

8.5 Rehabilitation Programme Variations

The variations to the rehabilitation programme are summarised in Table 42.

Table 42: Variations to the Rehabilitation Programme

Has rehabilitation work proceeded generally in accordance with the conditions of an accepted Mining Operations Plan	HVO North - Substantially (see below) HVO South – Yes
If not please cite any approval granted for variations, or briefly describe the seasonal conditions or other reasons for any changes and the nature of any changes which have been made.	
Actual rehabilitation completed in HVO North during period 2015 to 2016 = 84.6ha. MOP target for rehabilitation in HVO North during period 2015 to 2016 = 117.9ha. Dump progress in West Pit areas has been slower than the MOP forecast. The reduction in rehabilitation areas in HVO North has been offset by equivalent areas in HVO South addressing high visibility areas in Cheshunt and Riverview Pits.	

Management of Rehabilitated Areas is undertaken when required or when issues are identified through monitoring, auditing or inspections. A licence agreement is in place for grazing 719 ha of HVO North rehabilitation area. Temporary grazing licences aimed at reducing fuel loads are in place for a further 212 ha of rehabilitated land across HVO North.

During 2016, a weed wiper was used in rehabilitation areas to enable taller growing weeds to be selectively targeted with herbicide. The weed wiper was found to be effective at removing quick-growing exotic grass species (i.e. Rhodes Grass, Green Panic etc.) from areas that had been sown with native seed mixes.

Figure 95: HVO North Rehabilitation Areas for 2016

Figure 96: HVO South Rehabilitation Areas for 2016

8.6 Top Soil Management

Topsoil is managed according to Coal & Allied Ground Disturbance Permit and land management procedures. Table 43 outlines the topsoil used and stockpiled during 2016. There were 71.4 ha of rehabilitation top soiled during 2016, using stockpiled and pre-stripped soil resources.

Table 43: Soil Management

Soil Used This Period (m^3)	Soil Prestripped This Period (m^3)	Soil Stockpiled to Date (m^3)	Soil Stockpiled Last Report (m^3)
71,400	148,600	1,875,213	1,798,013

8.7 Tailings Management

Capping of the Southeast TSF commenced during 2016, with rehabilitation scheduled to be completed during 2017. A Fine Rejects Management Strategy for HVO has been developed in accordance with the planning approval for HVO North (Clause 28A of DA 450-10-2003 Mod 4). A revised strategy was submitted on 3rd February 2016 to address feedback provided by DP&E and DRE. The strategy outlines tailings management for the time horizon spanned by current approvals.

Minimising the amount of standing water on tailings storage facilities, by managing the decant water, is important during and post tailings deposition to assist with closure of these facilities. Effective removal of decant water enables better consolidation of the tailings material, which in turn facilitates earlier capping and rehabilitation of the storage facility. Table 44 below outlines the current state of decant water pumping infrastructure across the active and inactive TSF's at HVO.

Table 44: HVO Tailings Storage Facilities

Facility	Status	Decant System
North Void	Active	Decant pumps in place, regular pumping.
Dam 6W	Active	Decant pump in place, regular pumping.
Bob's Dump	Inactive	Solar pump in place, pumping as required.
Southeast TSF	Inactive - capping commenced	Diesel pump in place, pumping as required.
Central TSF	Inactive	No pumps required due to rapid drying after rainfall (small catchment reporting to TSF).

8.8 Carrington Billabong

Cattle grazing has been excluded from the Carrington Billabong since 2007 to reduce the impact on native vegetation. During spring 2015 a native tube stock planting programme was undertaken in the Carrington Billabong including grasses, shrubs and small trees making up a total of 1000 plants. These were broken down into 500 grasses, 250 shrubs and 250 small trees. The tube stock was planted into weed mat islands that were fenced off for protection against rabbit and kangaroo browsing. In addition to these tube stock 300 River Red Gum tube stock were planted into the area during early December. Plants were watered in at the time of planting and have received ongoing watering over the summer period. An additional native understorey planting is scheduled to be undertaken in autumn 2017 to increase the overall diversity of the Carrington Billabong. Figure 97 shows the mature weed mat islands at the Carrington Billabong.

Figure 97: Native tube stock planting at Carrington Billabong

Weed management continued in 2016, weed management activities were implemented in accordance with the Weed Management Plan, which included the use of selective herbicide to eradicate annual weeds, as well as targeting Galenia (Galenia pubescens), Tiger Pear (Opuntia aurantiaca), Prickly Pear (Opuntia stricta), Castor Oil (Ricinus communis), Farmer's Friend (Bidens pilosa) and various Thistles (Onopordum acanthium), (Carthamus lanatus), (Silybum mariamum). Throughout 2017 ongoing weed control will be targeted at facilitating survival of seedlings from planting activities and from natural recruitment of E. camaldulensis.

8.9 Weed Control

8.9.1 Weed Treatment

Weed management and control work was carried out between January and December 2016. Weed management targeted a variety of areas across the site, including mining rehabilitation areas River Red Gum areas and maintenance of environmental monitoring sites. A total of 73 days of weed control work was undertaken on site at HVO during 2016

with 125 ha of land treated. The target species and treatment areas are shown in Figures 98. Figure 98 and Figure 100.

The species focussed on during treatment included:

- African Boxthorn (*Lycium ferocissimum*)
- Galenia (*Galenia pubescens*)
- Golden Dodder (*Cuscuta campestris*)
- Mother of Millions (*Bryophyllum delagoense*)
- Opuntia (Pear) species (Tiger, Prickly and Creeping pear)
- St John's Wort (*Hypericum perforatum*)
- Thistles: Saffron Thistle (*Carthamus lanatus*), Scotch Thistle (*Onopordum acanthium*), and Variegated Thistle (*Silybum marianum*)

8.9.2 Annual Weed Survey

The management and control of weeds at HVO is governed by the Annual Weed Survey (AWS). The AWS lists Weeds of National Significance (WONS), noxious, environmental and other non-declared weed species identified across HVO, and provides a framework to allow for structured weed management and control across operational and non-operational areas of HVO. The following summarises the results of the weed survey undertaken during October 2016:

Eight WONS were identified during the survey, they included:

- African Boxthorn (Lycium ferocissimum)
- Bitou Bush (Chrysanthemoides monilifera subsp. rotundata)
- Blackberry (Rubus fruticosus)
- Fireweed (Senecio madagascariensis)
- Lantana (Lantana camara),
- Pear Species, including:
- Creeping Pear (Opuntia humifusa),
- Prickly Pear (Opuntia stricta),
- Tiger Pear (Optunia aurantiaca).

Three other noxious weeds were identified at HVO during the survey, including:

- Golden Dodder (Cuscuta campestris),
- Mother-of-Millions (Bryophyllum delagoense), and
- Pampas Grass (Cortaderia selloana).

Ten environmental weed species were identified at HVO during the survey, they included:

- African Olive (Olea europea subspecies cuspidae)
- Balloon Vine (Cardiospermum grandiflorum),
- Castor Oil Plant (Ricinus communis)
- Cleavers (Galium aparine)
- Common Thornapple (Datura stramonium)
- Galenia (Galenia pubescens)

- Various Thistles including:
- Scotch Thistle (Onopordum acanthium)
- Saffron Thistle(Carthamus lanatus)
- Variegated Thistle (Silybum marianum) (to a lesser degree).
- Wandering Jew (Tradescantia fluminensis).

Ten weeds that are not officially declared or listed in NSW were also recorded at HVO including:

- Century Plant (Agave americana)
- Fennel (Foeniculum vulgare)
- Golden Wreath Wattle or Saligna (Acacia Saligna)
- Mallow (Small -flowered Mallow) (Malva parviflora),
- Mustard Weed (Sisymbrium sp)
- Narrow Leaved cotton bush (Gomphocarpus fructicosus)
- Purple Top (Verbena bonariensis)
- Spiny Rush (Juncas acutus)
- Tree tobacco (Nicotiana glauca), and
- Variegated Geranium (Geranium species)

Species identified during the 2016 survey will form the basis of ongoing weed management works during 2017.

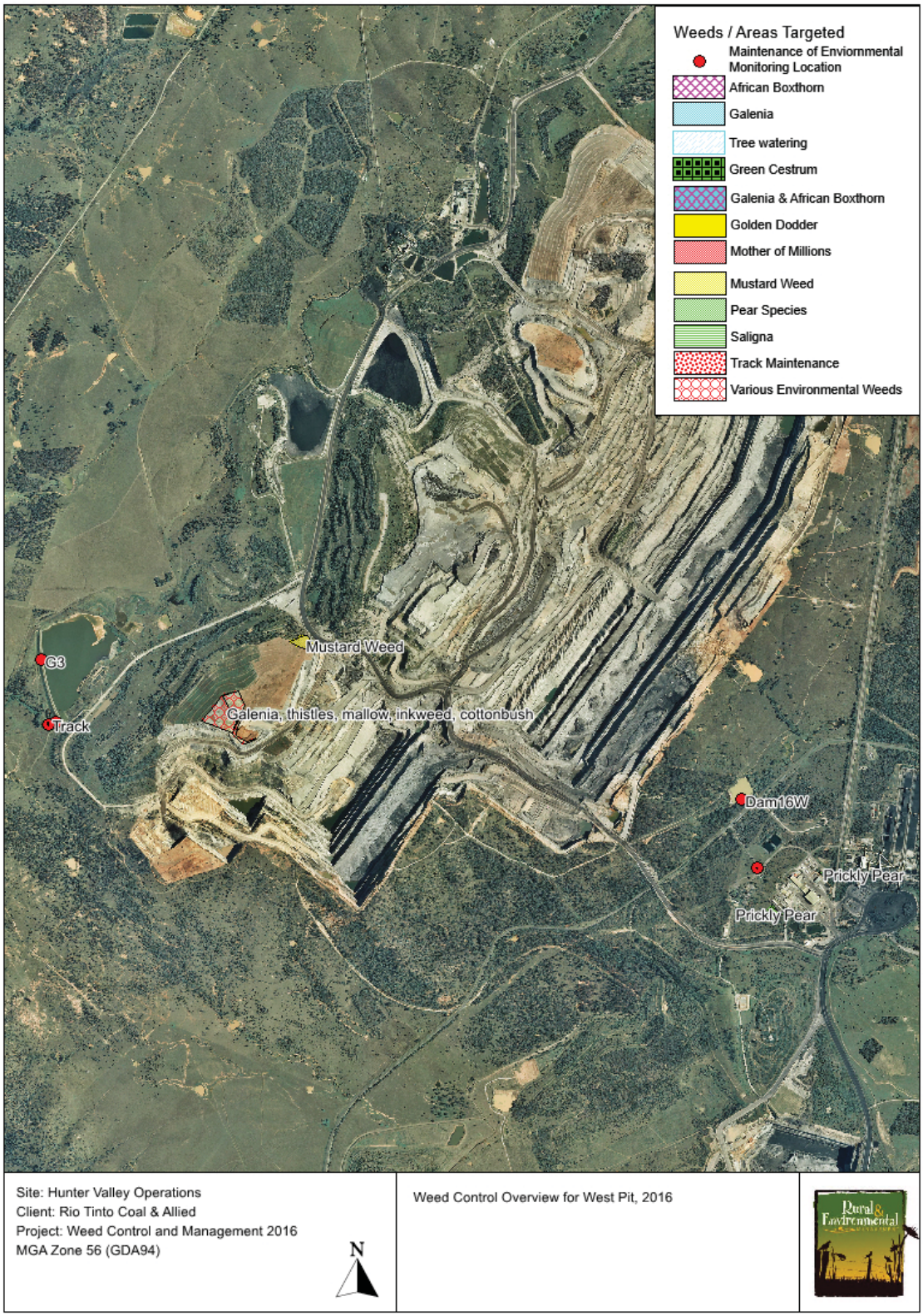

Figure 98: Weed Control Overview for West Pit - 2016

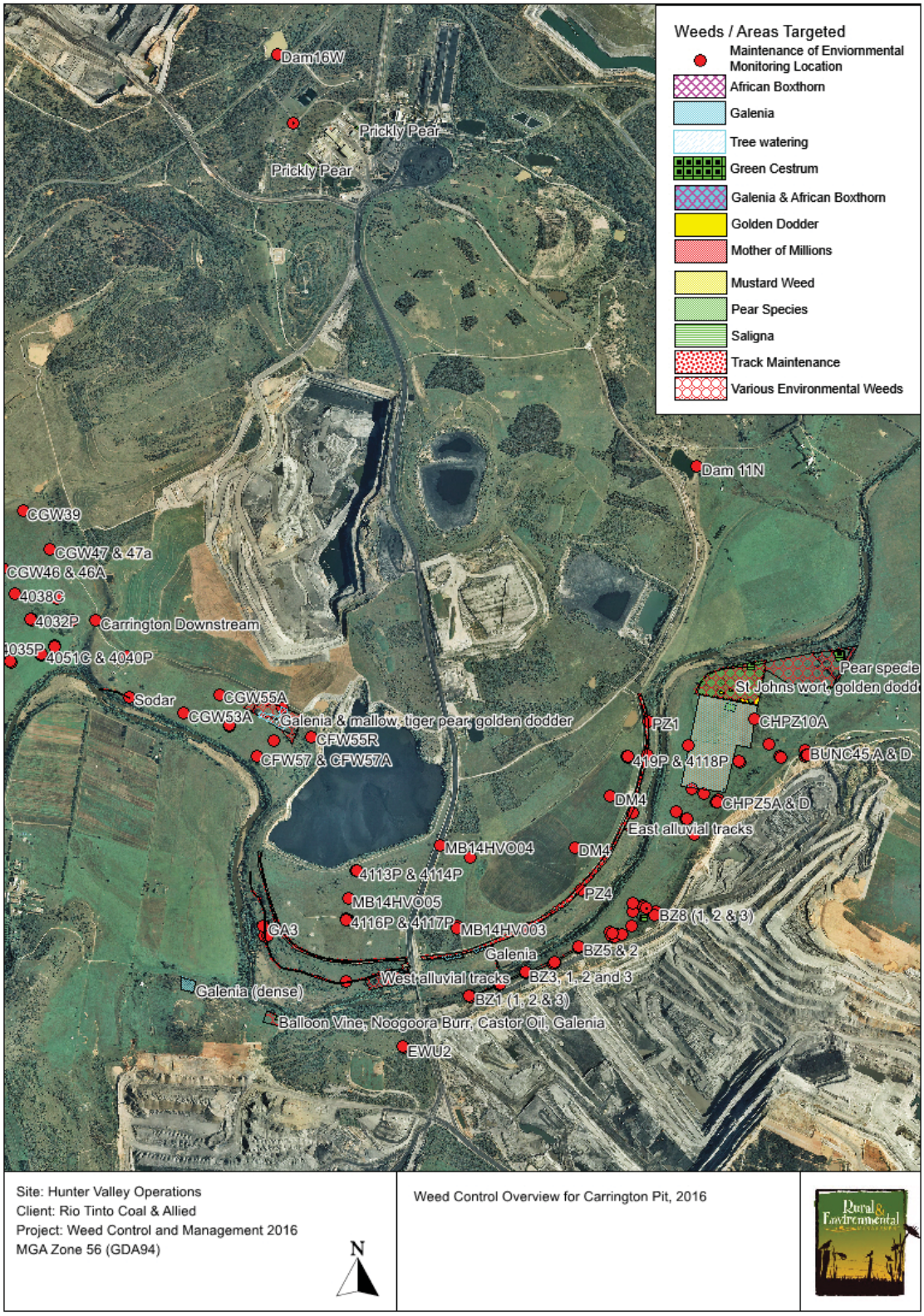

Figure 99: Weed Control Overview for Carrington Pit - 2016

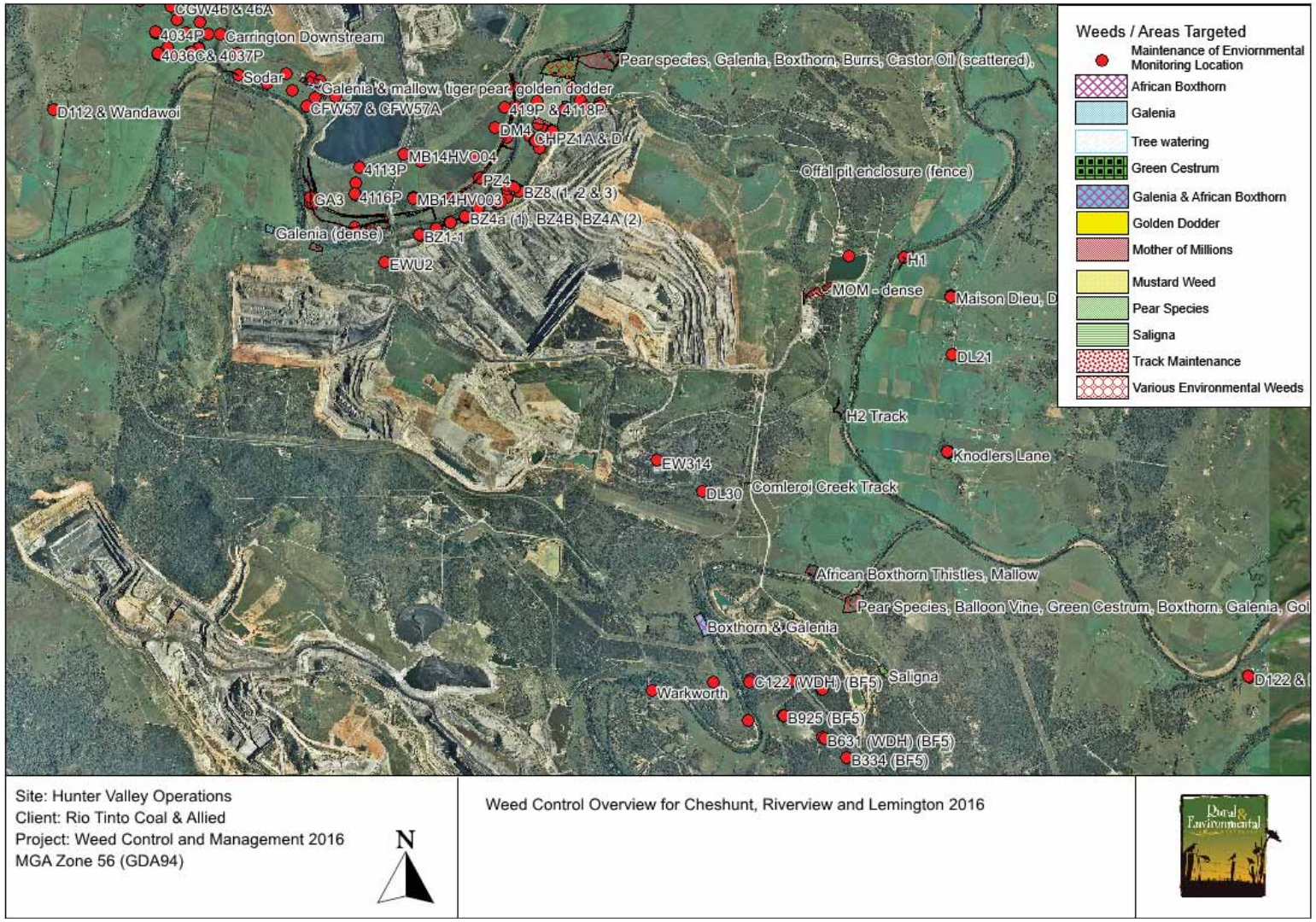

Figure 100: Weed Control Overview for Cheshunt and Riverview Pit - 2016

8.10 Vertebrate Pest Management

As part of HVO's Vertebrate Pest Action Plan a control programme is carried out on a seasonal basis within HVO. Three 1080 ground baiting programmes consisting of 60 bait sites utilising meat baits and ejector baits were undertaken during summer, winter and spring to target wild dogs and foxes. Baits were checked over a two to four week period and replaced each week when taken. Table 45 summarises the results from the programmes carried out at HVO during 2016 with baiting locations and results for the programs illustrated in Figure 101, Figure 102 and Figure 103.

Table 45: Summary of Vertebrate Pest Management 2016

	1080 Baiting			Trapping		Opportunistic Shooting				
Season	Total Lethal Baits Laid	Takes by Wild Dog	Takes by Fox	Feral Cats	Feral Pigs	Feral Pigs	Feral Cats	Hares	Foxes	Deer
Summer	120	49	3	1	106	20	-	47	1	-
Autumn - Winter	180	94	4	-	-	20	4	6	4	1
Spring	180	83	5	-	13	3	-	-	-	-
Total	480	226	12	1	119	43	4	53	5	1

Additional pest management programs included:

- Feral pig trapping was established on rehabilitation areas and on HVO owned non-mining land where pig activity and sightings were evident; 119 pigs were trapped and euthanized and 43 were shot as part of the ground shoot.
- Opportunistic shooting of other vertebrate pests: 53 hares, four feral cats, five foxes and one deer euthanized.
- Feral cat trapping: one cat trapped at HVO and was euthanized
- Rabbit poisoning at the Carrington Billabong: 1800g out of 2000g of 1080 poison carrot was consumed.

HVO will continue to carry out quarterly vertebrate pest control programmes during 2017 to limit feral pest impacts on landholdings and surrounding neighbours.

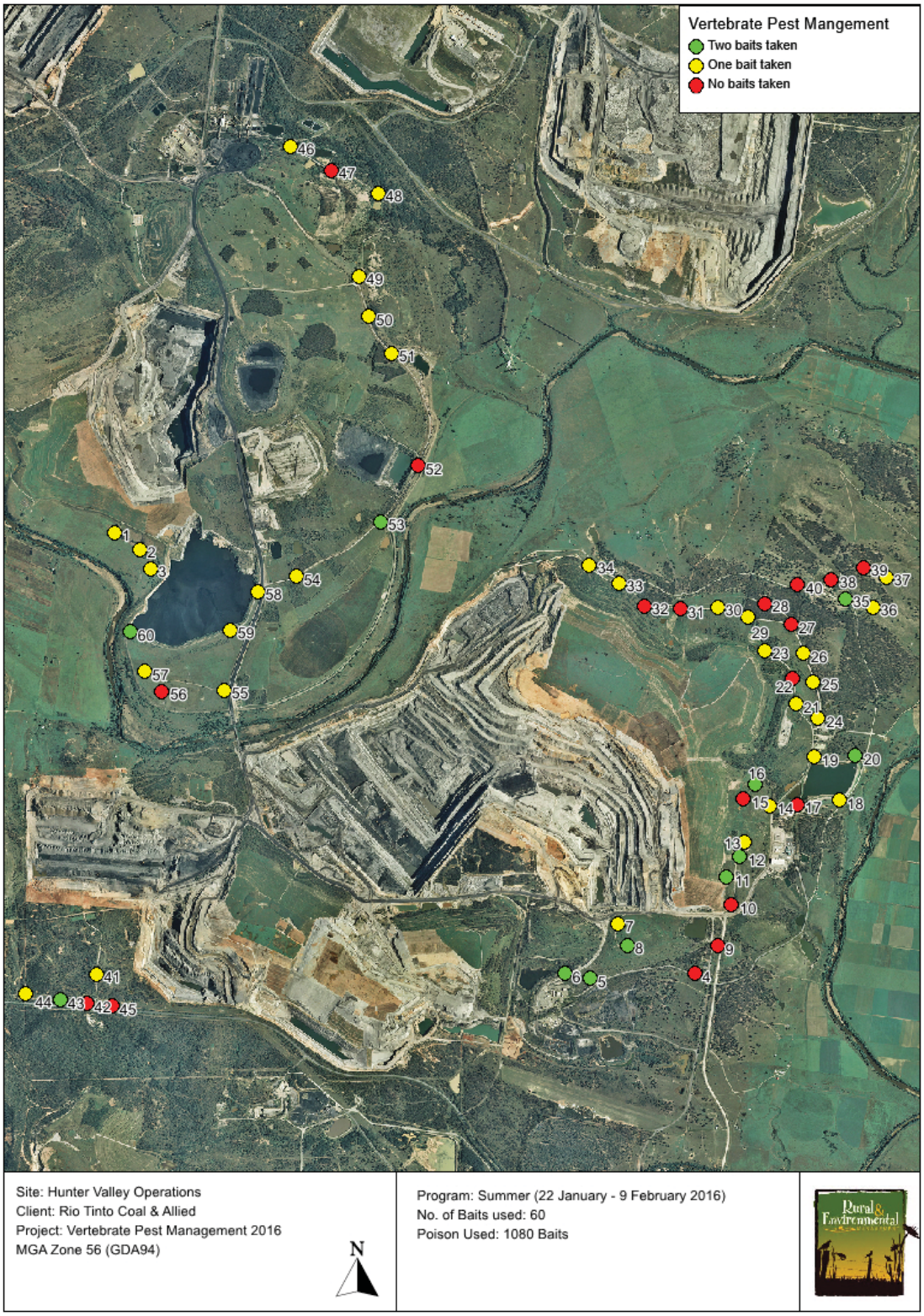

Figure 101: HVO Vertebrate Pest Management Bait Locations – Summer 2016

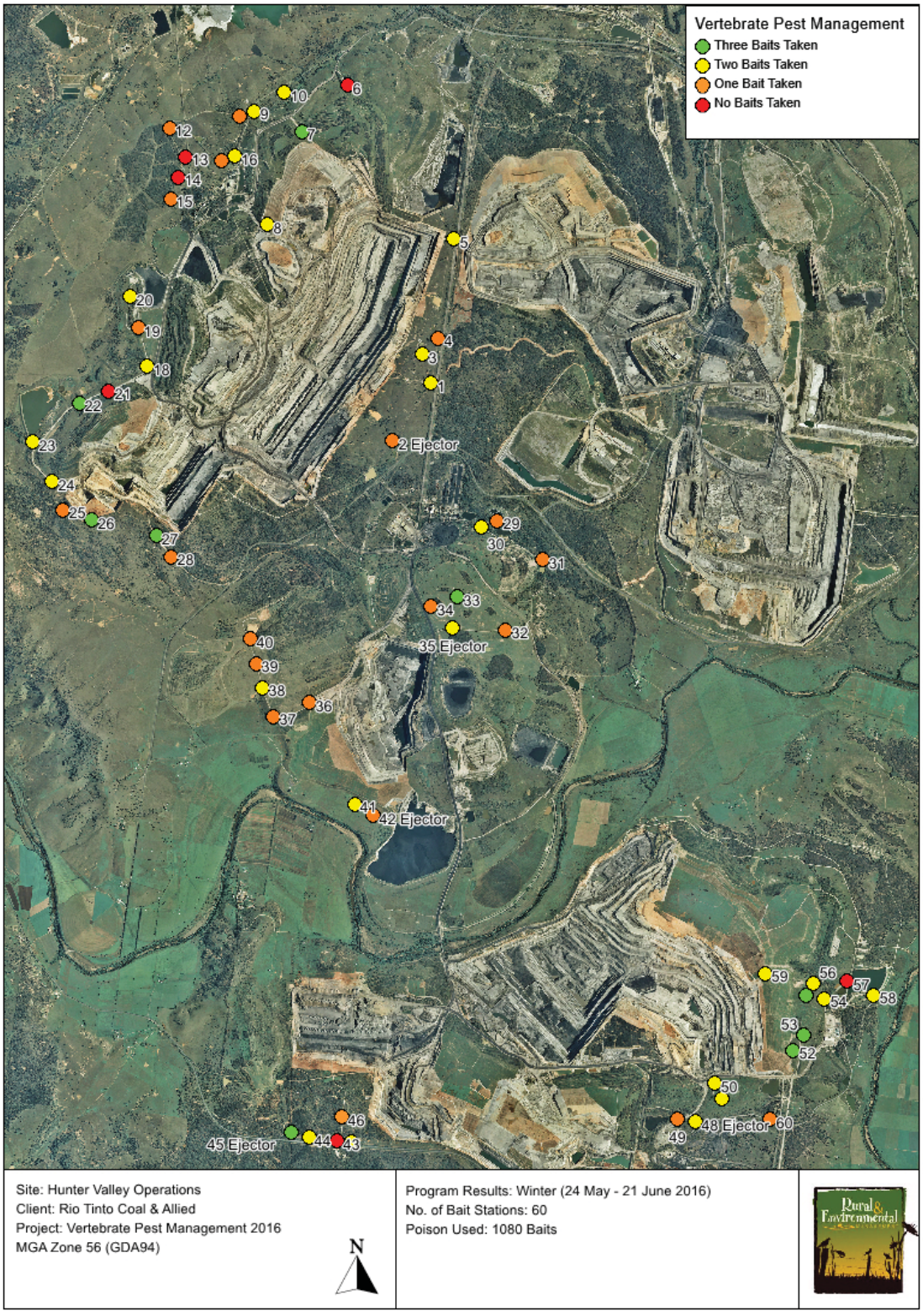

Figure 102: HVO Vertebrate Pest Management Bait Locations – Winter 2016

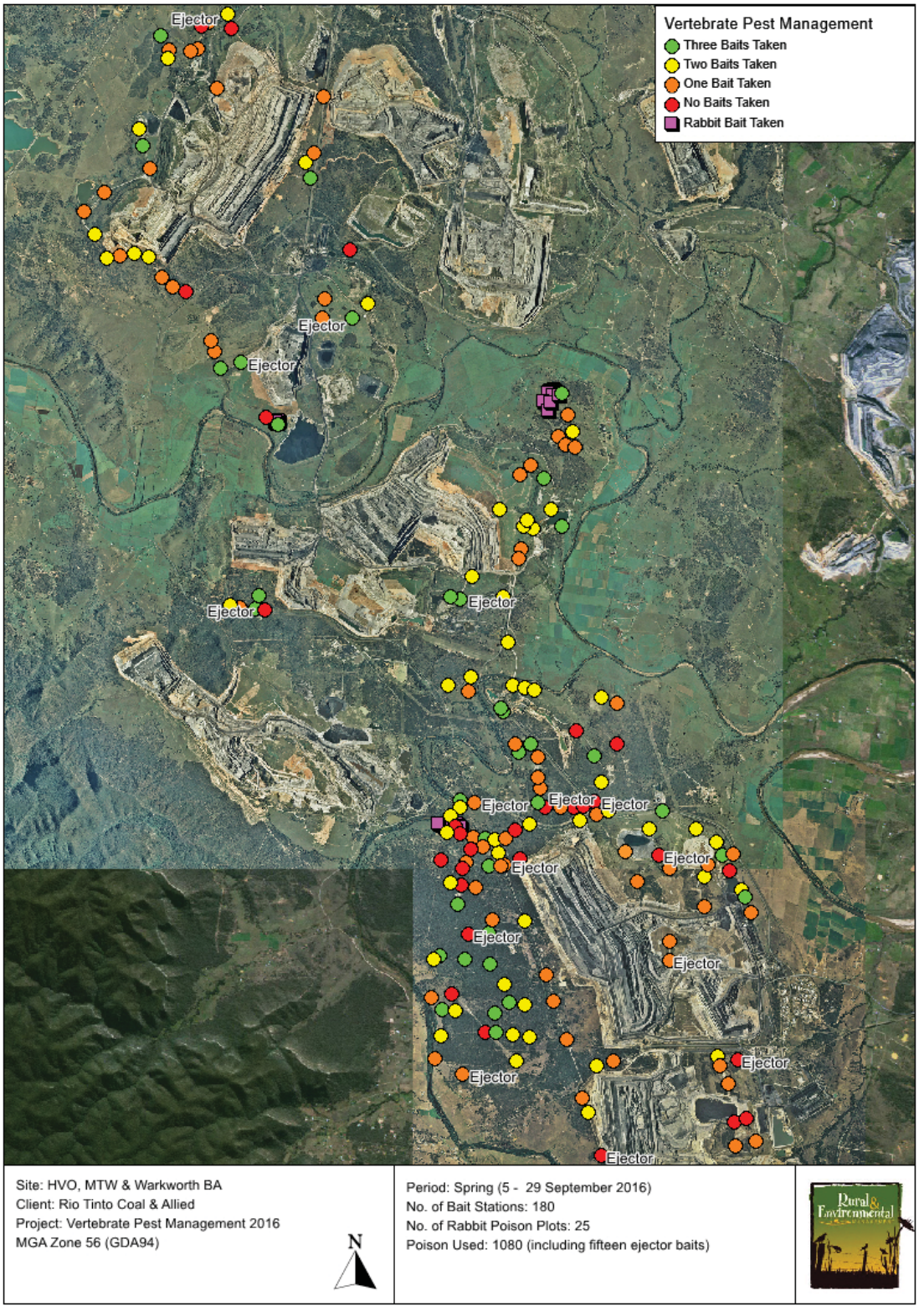

Figure 103: HVO Vertebrate Pest Management Bait Locations – Spring 2016

9 COMMUNITY

9.1 Complaints

A total of 26 complaints were received by HVO during 2016. This represents a decrease of 10 community complaints from the previous year. A full register of environmental complaints is detailed in Appendix 1. Complaints were received in relation to noise, dust and blasting. Figure 104 the breakdown of the environmental complaints for 2016.

Coal & Allied provides a 24 hour Community Complaints Hotline (telephone: 1800 656 892) for community members to comment on concerns relating to its operations. All complaint details are recorded in accordance with Condition M4.2 of Environmental Protection Licence 640.

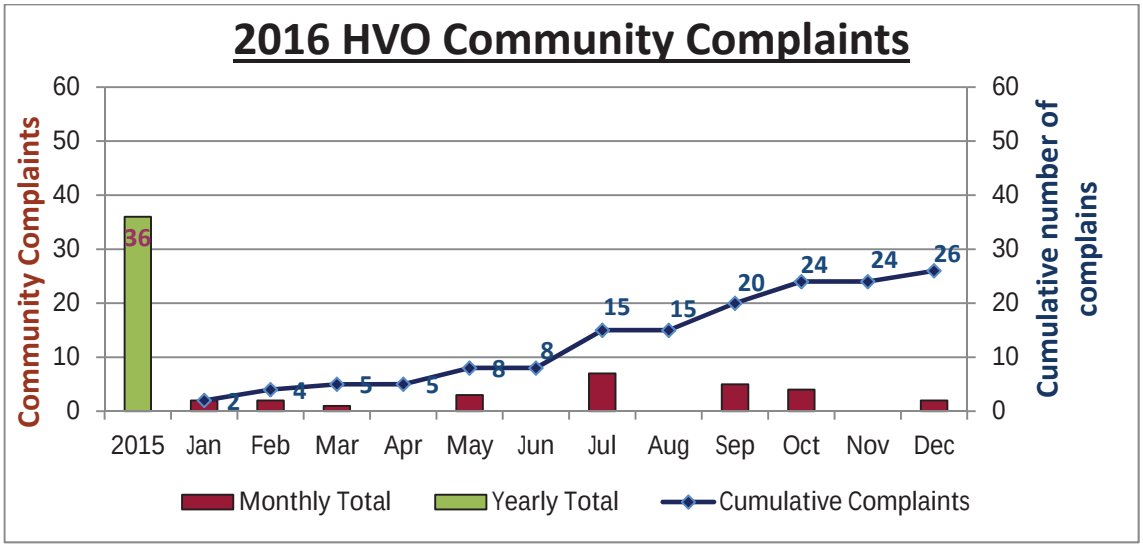

Figure 104: Community Complaints Breakdown

9.1.1 Noise Complaints

Seventeen noise complaints were received during 2016, compared to fourteen complaints received in 2016. Distribution of noise complaints received is as follows:

- Jerrys Plains Road residences – three complaints;
- Maison Dieu residences – 14 complaints

9.1.2 Blasting Complaints

HVO received five complaints relating to blasting in 2016, the majority of which were regarding blast fume/odour. The number of blast related complaints decreased from 2015 (19 complaints received). Of the five complaints, four were received from two households in Long Point; one complaint was received from a household in Jerrys Plains.

9.1.3 Lighting Complaints

HVO received one lighting complaint during 2016, the complaint came from the Maison Dieu area. A lighting plant was adjusted during the shift to rectify the concern and lessen the lighting impact to the neighbouring properties.

9.1.4 Dust Complaints

Three complaints were received during 2016. One complaint was from a household in Long Point, the other two complaints were from households in Maison Dieu.

9.2 Review of Community Engagement

9.2.1 Communication

Coal & Allied has previously distributed a Hunter Valley Community Newsletter, containing regular updates about HVO and its community activities, to businesses and residences in the Singleton and Muswellbrook Local Government Areas (LGAs). In 2016 Coal & Allied transitioned to full-page newspaper advertorials. Newspaper advertorials were published in The Singleton Argus, Muswellbrook Chronicle and The Scone Advocate in the months of June and December. The three publications have a combined readership of approximately 16,000 people. Coal & Allied intends to continue to place these full-page advertorials as another way to communicate about its operations.

Quarterly letters are also sent to HVO's near neighbours to provide an overview of mining operations and other relevant activities, as well as inform residents about how impacts are being managed. In addition, Coal & Allied issues correspondence to specific near neighbours about work programmes occurring nearby. In 2016, this included communication about Assessment Lease Applications as well as aerial seeding activities. Leasing tenants and nearby landowners were also informed of Coal & Allied's feral animal management program, including pig-culling and dog-baiting undertakings.

During the reporting period, Coal & Allied hosted informal community barbeque event in November for near neighbours at Jerry's Plains, Long Point and Maison Dieu. Events such as this are aimed at providing community members with the opportunity to speak with Coal & Allied representatives about current HVO mining plans and programmes. The event was attended by approximately 30 residents from and the surrounding areas, plus Coal & Allied Environmental, Community Relations and Mining staff members. Details of such events are included in regular near neighbour communications, with invitations also displayed at Jerry's Plains Primary School and Jerry's Plains service station.

A range of consultation and engagement activities were also completed, including:

- Consultation with near neighbours to provide project updates at key project milestones and activities, and to response to concerns/queries raised by individual near neighbours
- School engagement- working with teachers and students to assist and enhance learning outcomes and build relationships
- Local Shire Council briefings

- Proactive near neighbour visits for residents living in the HVO area to discuss current operations and future plans for near neighbour engagement, as well as consultation to provide project updates at key project milestones and activities
- Participation in the Upper Hunter Mining Dialogue- a programme coordinated by the NSW Minerals Council to engage the community across the Hunter Valley

Coal & Allied's relationships with local communities were strengthened through involvement in events, such as the Singleton Show and Coal & Allied's Singleton Professions Forum. The Professions Forum was a career expo style event planned and organised by student leaders from Singleton High School, St Catherine's Catholic College and the Australian Christian College. The event aimed to support career options and diversity within the Singleton area.

9.2.2 Community Consultative Committee

The HVO CCC met on a quarterly basis to provide committee members with updates on mining operations, environmental monitoring data, land management and community relations. There was an extraordinary meeting held in October to discuss the HVO South modification. The HVO CCC comprises an independent chair, and community and local Council representatives. In 2016, members included:

- Dr Col Gellatly (Chair – commenced August 2013)
- Cr Hollee Diemar-Jenkins
- Mr Charlie Shearer
- Dr Neville Hodkinson
- Mrs Di Gee
- Mr Brian Atfield
- Mr David Love

In accordance with Coal & Allied Development Consent, copies of the minutes are available on the Rio Tinto website. Following CCC meetings, a letter is mailed to near neighbours to update them about what was discussed and provide any additional information about HVO's operations.

9.3 Community Development

In 2016, Coal & Allied continued its focus on ensuring the long-term sustainability of the communities in which it operates, through the facilitation of community development programmes such as:

- Coal & Allied Community Development Fund (CDF)
- HVO Site Donations Committee
- Community partnerships

9.3.3 Community Development Funding Programmes

In 2016, CDF programmes contributed a total of almost $700,000 to support capacity building and contribute to the long-term sustainability of surrounding communities.

Community Development Fund (CDF)

The year 2016 marked 18 years of operation of the CDF, which has invested over $14.5 million to support over 120 community projects in the Hunter Valley since its establishment in 1999, across the areas of health, education, environment and economic development.

In 2014, Coal & Allied announced that a further $3 million would be made available to the CDF over a three year period (2015 – 2017) for projects in the Singleton, Muswellbrook and Upper Hunter LGAs. Strategic priority areas were refined for the 2015-2017 funding cycle to enable a more targeted approach to addressing identified community need and to leverage other resources Coal and Allied may be able to offer to strengthen community partnerships.

Priority areas for the 2015-2017 funding cycle include:

- Economic Development: encouraging the diversity and competitiveness of the Upper Hunter economy
- Community Health: Supporting projects which target health, safety and social wellbeing of the community
- Education: Promoting the value of education and building skills within our community
- Environment and Land Management: Supporting projects that can make a difference on a greater scale. i.e. beyond C&A mining operations

In 2016, the CDF contributed almost $700,000 to 14 programmes aimed at delivering long term benefits for communities in the CDF catchment, which include the Singleton, Muswellbrook and Upper Hunter LGAs (Table 46, Figure 105). A further $500,000 is available for allocation in 2017.

For more information about Coal & Allied community funding programmes visit http://www.riotinto.com/australia/rtca/community-funds-10413.aspx

Table 46: Coal & Allied Community Development Fund projects approved in 2016

Programme	Partner
Enterprise Facilitation	Sirolli Institute
Supporting Children's Developing Social Competence	Early Links Inclusion Support Service
Science and Engineering Challenge, and SMART Program (2015-2017)	University of Newcastle
Upper Hunter Education Fund Scholarships (2015-2017)	Upper Hunter Education Fund
Business Development Officer	Singleton Business Chamber
Singleton High School Agricultural Course	Singleton High School
University of Newcastle Scholarships	University of Newcastle
Singleton Economic Development and Funding Coordinator	Singleton Council
Singleton Community College Strategic Plan	Singleton Community College

HSC Study Camps	Upper Hunter Education Fund
Ready 4 School Program	Jerrys Plains Public School
Youth Leadership Program	Outward Bound Australia
Tocal Steers Challenge	Tocal College
Early Learning Program	Milbrodale Public School

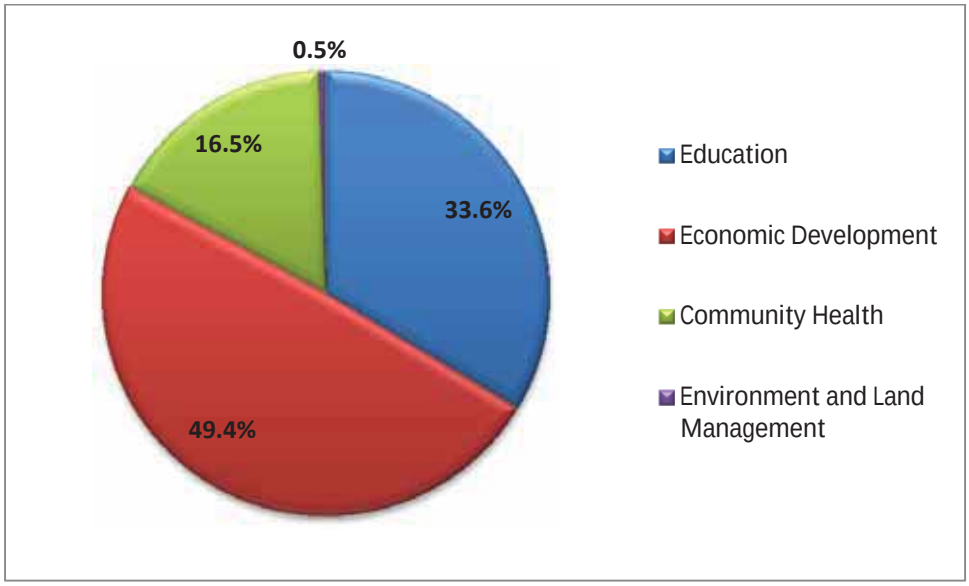

Figure 105: Distribution of Community Development Fund by Category 2016

9.3.4 Site Donations

Coal & Allied considers applications for local donations and sponsorships that have a clear community benefit. In 2016, HVO provided $50,000 to 30 local projects and initiatives, including:

- Singleton Mayoral Scholarships
- Singleton Art Prize
- Invisible Wounds Mental Health workshop – Australian Families of the Military
- 2016 Production of The Wizard of Oz
- Singleton Relay for Life – Cancer Council
- Beyond Blue community fundraiser
- 2016 Prime Stock competition
- Holes 4 Hospital Charity Golf Day
- Singleton Show
- Salvation Army Children's Christmas Party
- Lifeline Newcastle – Upper Hunter Steel Magnolias
- Singleton Roosters AFL – Medical Supplies
- Cancer Council – Transport for Treatment program

9.3.5 Community Partnerships

Coal & Allied has retained an active partnership programme in 2016 with key organisations that provide a service valued by the community and have an approach to their business that is aligned with Coal & Allied principles. Partners include:

- Hunter Research Foundation
- Westpac Rescue Helicopter Service

10 INDEPENDENT AUDIT

This was undertaken in accordance with Schedule 5; Condition 5 of the HVO South Coal Project Approval, and Schedule 6, Condition 6 of the HVO North Development Consent, HVO conducted an Independent Compliance audit of its Planning Approvals and Licences.

On 23 June 2016 an application was made to the Department of Planning and Environment to undertake a single Independent Environmental Compliance Audit against the relevant conditions of both Approvals and Licence conditions. This application was approved by the Department on 22 August 2016.

Environmental Resource Management (ERM) was engaged as suitably qualified, independent experts to undertake the audit. The site inspection component of the audit was undertaken over four days between 24 and 28 October 2016. The audit report and HVO's response to the auditors' recommendations was submitted to the Department for their consideration on 30 December 2016. The audit has been reviewed and accepted by the Department and will be available on the Rio Tinto Coal Australia website (www.riotintocoalaustralia.com.au) shortly. A summary of performance is presented in Table 47 below.

Table 47: Summary of HVO Independent Compliance Audit Findings

Number of Conditions	Non Conformances	Administrative Non - Conformances	Observations
Statutory Instruments			
363	14 High (2)*, Medium (7), Low (5)	9	22
Implementation of Plans			
16	2	1	3

*The "high" non-conformances relate to: reported noise non-compliances (2014-2015) and no evidence of a procedure for River Red Gum Seed collection.

11 INCIDENTS AND NON-COMPLIANCES DURING THE REPORTING PERIOD

11.1 Noise

There were no noise non compliances during 2016. Six measurements and one re-measure exceeded criteria but do not constitute non-compliances as the issues were promptly addressed (within 75 minutes of detection, per approved Noise Management Plan). Non-compliance is determined with reference to the applicable conditions of consent and the NSW Industrial Noise Policy. Noise measurements which exceeded criteria are presented in Table 48 below.

Table 48: Noise measurements which exceeded noise criteria during 2016

Date/Time	Monitoring Location	Criteria	Criteria (dB)	Measured Noise (dB)	Exceeds By?
13/01/2016 23:40	Shearers Lane	HVO South $L_{Aeq\ 15min}$	41	42	1
13/01/2016 23:40		HVO South $L_{A1,\ 1min}$	45	46	1
13/01/2016 23:56		HVO South $L_{A1,\ 1min}$	45	49	4
09/03/2016 23:51	Redmanvale Road	HVO South $L_{A1\ 1min}$	45	46	1
09/03/2016 22:15	Jerrys Plains Village	HVO North $L_{Aeq\ 15min}$	36	37	1
19/09/2016 21:11	Knodlers Lane	HVO South $L_{Aeq\ 15min}$	37	40	3
19/09/2016 21:11	Knodlers Lane	HVO South $L_{A1\ 1min}$	45	47	2

11.2 Blasting

There were no exceedances of the 5 mm/s or 10 mm/s ground vibration criteria at any residence on privately-owned land.

There were a total of 16 blasts that recorded an initial overpressure reading greater than 115dB(L) during the reporting period. Upon investigation, 2 blasts were found to be due to wind reinforcement and as such are not considered to constitute non-compliance with HVO's conditions of approval. The resulting 14 readings over 115dB(L) limit have been assessed for comparison against the 5% of the total number of blasts over a 12 month period these results are shown in Table 49 below.

Table 49: HVO airblast overpressure allowable exceedance summary

Monitoring Location	Allowable Exceedance over 115dB(L) of time over 12 months (%)	Percentage of blasts over 115dB(L)
Moses Crossing	5	0.00
Jerrys Plains	5	0.35
Warkworth	5	1.04
Maison Dieu	5	2.42
Knodlers Lane	5	0.69

During 2016, there was one exceedance of the 120dB (L) overpressure criteria, discussed below in Section 11.2.1. An incident involving the blast hotline is outlined in Section 11.2.2.

11.2.1 25 February 2016

A Glider Pit blast, RE02AFA01A fired at 13:11 on 25 February 2016 recorded an airblast overpressure measurement of 125.78 dB(L) at the Warkworth monitoring location. An investigation was undertaken to determine the validity of the result and subsequent cause.

The investigation determined that the air-blast measurement was caused by one or a combination of the following factors:

- Bridging of stemming material in a single hole which created an environment that prevented confinement of blast gases;
- An increase in blast hole confinement due to the altered tie-up sequence which was implemented due to the drilling pattern; and
- Interactions of rainfall with weathered coal.

No community complaints were received in relation to the blast. The exceedance was reported to the Department of Planning and Environment and the EPA.

Several actions were taken to mitigate reoccurrence, including:

- An escalation protocol for reporting GPS unit faults in drilling rigs is to be enforced;
- Task assign experienced operators to critical areas in the event of GPS unit failure on drilling rigs.
- Metering devices installed on stemming trucks is to be made mandatory for future Glider Pit topo blasts. This will minimise risk of stemming bridges occurring in drill holes;
- Increased inspection frequency of Glider Pit topo drill patterns undertaken by supervisors to ensure quality control; and

HVO was issued a $15,000 penalty notice from the Department of Planning and Environment in relation to this incident.

11.2.2 10 August 2016

On 10 August 2016 HVO received a call from a DP&E officer in relation to HVO's blasting hotline. It was identified that the hotline had not been updated from 3 June 2016 to the 10

August 2016. This task is normally undertaken by a Drill and Blast Engineer on the morning of a blast.

Although the blasting hotline was not current, up-to-date information regarding the proposed blast schedule since 3 June 2016 was available to the community via numerous alternate means, including:

- HVO online blasting schedule;
- Publication of road closures in the Singleton Argus;
- Notification via email and/or phone to landholders/occupiers of any residence within 2 km of the HVO South mining area who registered an interest in being notified. This includes notifications to neighbouring mines and two private residences in Jerrys Plains who have requested such notification; and
- Notification of road closures via signage on affected roads.

HVO has not received any community feedback regarding the lack of updates to the hotline, indicating that the service is not used frequently.

Actions take in relation to this incident include;

- The drill and blast near neighbour notification procedure was revised to specifically include updates to the blast hotline; and
- Pre-blast checklist updated to include update of blast hotline.

11.3 Water

During 2016 there were two non-compliances related to water summarised below.

11.3.1 22 January 2016

On 22 January 2016 at approximately 17:00 a sediment sump at the Hunter valley Load Point (HVLP) was observed to be overtopping via the sump spillway into Bayswater Creek, following a high intensity short duration rainfall event

The water level in the sediment sump is managed via an automated electric pump, however power was lost at approximately 16:00 due to the storm event consequently the pump was not operable. Power returned at 18:12 allowing resumption of pumping to lower the sump level.

The duration of discharge from the sump is unknown; however, on a worst case scenario it would have been no greater than 2 hours. This is known based on commencement of high-intensity rainfall at 16:15 as recorded from the site weather station (five-minute rainfall data) and a subsequent inspection at 18:20, where the sump level was observed below the spillway and not overtopping.

Sampling of the sump water and receiving waters in Bayswater Creek was undertaken on 22 January 2016. The sampled water was analysed for Electrical Conductivity and Total

Suspended Solids. Water quality results show better quality water downstream of the sump, indicating no impact occurred as a result of the overflowing water.

No complaints were received in relation to his event.

The actions taken in respect of the incident included:

- Power to HVO was re-instated at 18:12 and pumping from the sump restarted to reduce the sump level; and
- Water sampling was undertaken to characterise potential impact upon receiving waters. Follow-up sampling was completed on 23 January 2016.

The incident notification was made to the EPA at 17:45 on 22 January 2016. The following agencies were also notified of the event, between 17:45 and 18:20: Singleton Council, Ministry of Health, Workcover, Fire and Rescue NSW and NSW Department of Planning and Environment.

The EPA did not apply any regulatory enforcement action in relation to the incident.

11.3.2 4 November 2016

On 4 November 2016 at approximately 09:30 a pump flange adjacent to the Parnells Dam discharge point was observed to have a small pinhole leak, resulting in an accumulation of water in the discharge point dissipater dam, subsequently overtopping via the discharge point weir into Parnells Creek.

The duration of discharge is unknown; however, on a worst case scenario it would have been no greater than 51 hours. This is known based on the timing of the last inspection at the site, which was undertaken at ~11:40 on 2 November 2016.

Sampling of Dam 9W (Parnells Dam, water source feeding the pipeline), the dissipater dam water and receiving waters in Parnells Creek was undertaken on 4 November 2016. The sampled water was analysed for Electrical Conductivity, pH and Total Suspended Solids. Water quality results show poorer water quality upstream and downstream on Parnells Creek discharge point, indicating that no impact occurred as a result of the overflowing water and there was no material harm.

The actions taken in respect of the incident included:

- The concrete weir at the Parnells Dam discharge point (EPA Identification No. 4, EPL640) was sandbagged to contain the water within the dissipater dam immediately below the pump leak. A small sump was dug and a pump fitted to recover the accumulated water and pump back to Parnells Dam. Flow from the weir ceased at approximately 14:30 on 4 November 2016. This pump-back arrangement will remain in place until the pump is replaced;
- A scoping assessment was undertaken to determine an appropriate methodology to repair the leaking pump. The pump will be replaced on 10 November 2016; and
- Water sampling was undertaken to characterise potential impact upon receiving waters.

The incident notification occurred during an audit inspection at the incident site by a representative from the EPA, DP&E and Resources Regulator at ~09:30 on 4 November 2016. The following agencies were also notified of the event, between 11:38 and 12:05: Singleton Council, Ministry of Health, WorkCover and Fire and Rescue NSW.

HVO was issued a $15,000 penalty notice from the EPA in relation to this incident.

12 ACTIVITIES TO BE COMPLETED IN THE NEXT REPORTING PERIOD

12.1 Noise

Noise management improvements identified for implementation in 2017 include:

- Noise attenuation of up to 30 rear dump trucks
- Implementation of an Environmental Noise Compass (directional noise monitor) in Maison Dieu, and associated revision to the Trigger, Action, Response Plan (TARP);
- Commencement of daily public reporting, including information on noise management for the previous night shift (reporting undertaken on business days only); and
- Revision of the HVO Noise Management Plan.

12.2 Blasting

Blasting management improvements identified for implementation in 2017 include:

- Revision of the HVO Blast Management Plan; and
- Hardware upgrades to ground units to allow for longer storage of blast data

12.3 Air Quality

Air Quality management improvements identified for implementation in 2017 include:

- Commencement of daily public reporting, including information on air quality management for the previous day (reporting undertaken on business days only); and
- Revision of the HVO Air Quality & Greenhouse Gas Management Plan.

12.4 Cultural heritage

12.4.1 Aboriginal Cultural Heritage Activities

Ongoing Aboriginal archaeological and cultural heritage management activities will occur in 2017 at HVO in accordance with the ACHMPs, to inform ongoing land management and development planning. This will include the assessment for cultural heritage values of any unassessed lands required for development associated with the operation of HVO mine. Condition monitoring of those sites both within and peripheral to authorised disturbance

areas will be conducted at regular intervals to ensure operational compliance with the ACHMPs.

12.4.2 Historic Heritage Activities

Coal & Allied will continue to consult with the neighbouring Liddell Coal Operations on any future mining plans that may interact with the Chain of Ponds Inn complex to ensure appropriate protective management measures are implemented where required. Consultation with the CHAG will also continue to discuss and manage any areas or sites of historical interest on HVO owned lands.

12.5 Waste and Hazard Management

Upgrades to Oil Water Separator Systems at the HVO North and HVO South (Lemington Workshops) will be completed in 2017.

12.6 Water

Improvements to mine water management in 2017 will focus on mine water containment. This includes:

- Increasing capacity for stormwater runoff from the Hunter Valley Load Point. This work was due for completion in 2016, however DP&E advised that to proceed a Modification to Development Consent was required, which was granted in December 2016.
- Construction of a secondary containment dam and pump-back arrangement at the Dam 9W (Parnells Dam) HRSTS discharge point.
- Commencement of pipeline secondary containment and leak detection project.

The Water Management Plan will be reviewed in 2017, as a result of Modifications to Consent being granted, and to reflect updated water quality triggers incorporating 2016 data for the surface water and groundwater monitoring programmes.

12.7 Rehabilitation

12.7.1 Performance Criteria and Rehabilitation Monitoring

The rehabilitation monitoring programme will continue in 2017 for both grazing and native vegetation rehabilitation areas. Target levels for MOP performance criteria will be detailed in updated HVO North and HVO South MOP's to be submitted in April 2017.

12.7.2 Rehabilitation Maintenance

During 2017, maintenance activities are planned to result in approximately 140ha of rehabilitation, currently in the initial stage of cover cropping, being seeded with the full native seed mixes. Weed spraying (boom and spot spraying) and weed wiping will be conducted in establishing rehabilitation areas as required to control both noxious and environmental weeds that are likely to impact on successful rehabilitation being achieved.

Rehabilitation monitoring conducted in early 2017 has indicated that the density of canopy species in some rehabilitation areas is much higher than what would be required in mature

vegetation communities. Sites with high numbers of canopy species will be thinned to reduce the risk of overcrowding causing understorey species to drop out.

12.7.3 Habitat Augmentation

Guidelines for fauna habitat augmentation in rehabilitation areas will be developed during 2017. Data on the number of trees containing hollows and length of logs on the ground has been collected for the native vegetation reference sites established during the recent rehabilitation monitoring program. This information will be used to set targets for the habitat-related MOP performance criteria and detailed in the updated MOP to be submitted in April 2017. Habitat augmentation measures, such as the construction of habitat ponds and the placement of salvaged logs in rehabilitation areas, have been undertaken during 2016 and will continue in 2017.

12.7.4 Native Grass Cover Crops

Trials will be undertaken in new rehabilitation areas that have been spread with topsoil to use native grasses as a cover crop rather than using exotic cereal and legume crops. The current use of annual exotic cover crops results in regular spraying out and replacing through re-sowing. Alternatively, the use of a perennial native pasture as a cover crop is planned to reduce this requirement and will begin the establishment of a component of the desired vegetation community. The weed wiper will provide a means of removing quick-growing exotic grasses from the native grass pasture during the early establishment phase.

12.7.5 Grazing Trial

The ACARP grazing trial is due for completion in mid-2017. The current steers will continue to be monitored until the end of the trial. DPI personnel involved with this trial intend to submit an ACARP funding submission in May 2017 for a project to follow on from this grazing trial work.

Rehabilitation Trials

During 2016, a trial of various sowing methods was conducted on a spoil/compost site on Tailings Dam 1 at MTW using native seed mixes. The methods being compared were direct-drilling, hydroseeding and broadcast seeding. The non-flowable components of the seed mix (mainly native grasses) were coated with a clay-based mixture to allow them to flow through the broadcast seeding equipment. The trial will also provide information on whether coating the grass seed assists or hinders germination and early establishment. Monitoring of this trial site will be conducted during 2017 to compare the effectiveness of the various methods.

Further trials planned to be conducted across MTW and HVO during 2017 include:

Sowing Methods Trials

Replication of the sowing methods trials in topsoil. A component of this next trial will be to investigate the need for harrowing post-sowing to provide soil coverage. The disadvantage of harrowing using traditional chain-style harrows on sloping rehabilitation areas is that it tends to smooth the surface of the soil which can lead to increased water run-off and erosion. The planned trial will compare the use of aerators and chain harrows after sowing with a no harrow control. It is thought that the use of an aerator for harrowing would assist in

providing the seed with soil coverage but leave a rough surface that would be more effective at harvesting water run-off and reducing erosion.

Substrate/Compost Trials

Trials will test the effect of different substrates (fresh topsoil, stockpiled topsoil, fresh spoil, leached spoil) and different compost types (mixed source compost, composted green waste) on the germination and establishment of native species. The application of smoke water to soil after sowing will also be part of these trials to test if the germination of native species can be stimulated by its addition.

Stage 2 Rehabilitation Methods Trials

Coal & Allied has experienced inconsistent results in relation to the germination of native species sown into areas that have been initially stabilised with cover crops. Various methods of soil preparation will be investigated to determine effective methods for transitioning areas from the initial clean-up stage, involving cover crops, to the establishment of native vegetation. The use of inoculants containing soil-based bacteria and fungi will also be assessed as a stimulant for the germination and early establishment of native species.

12.8 Community Development

Priority areas for community development in 2016 included education, economic development, community health, environment and land management. Coal and Allied currently support numerous foundations, programmes and scholarships in relation to these priority areas with continuation and commencement of these into 2017.