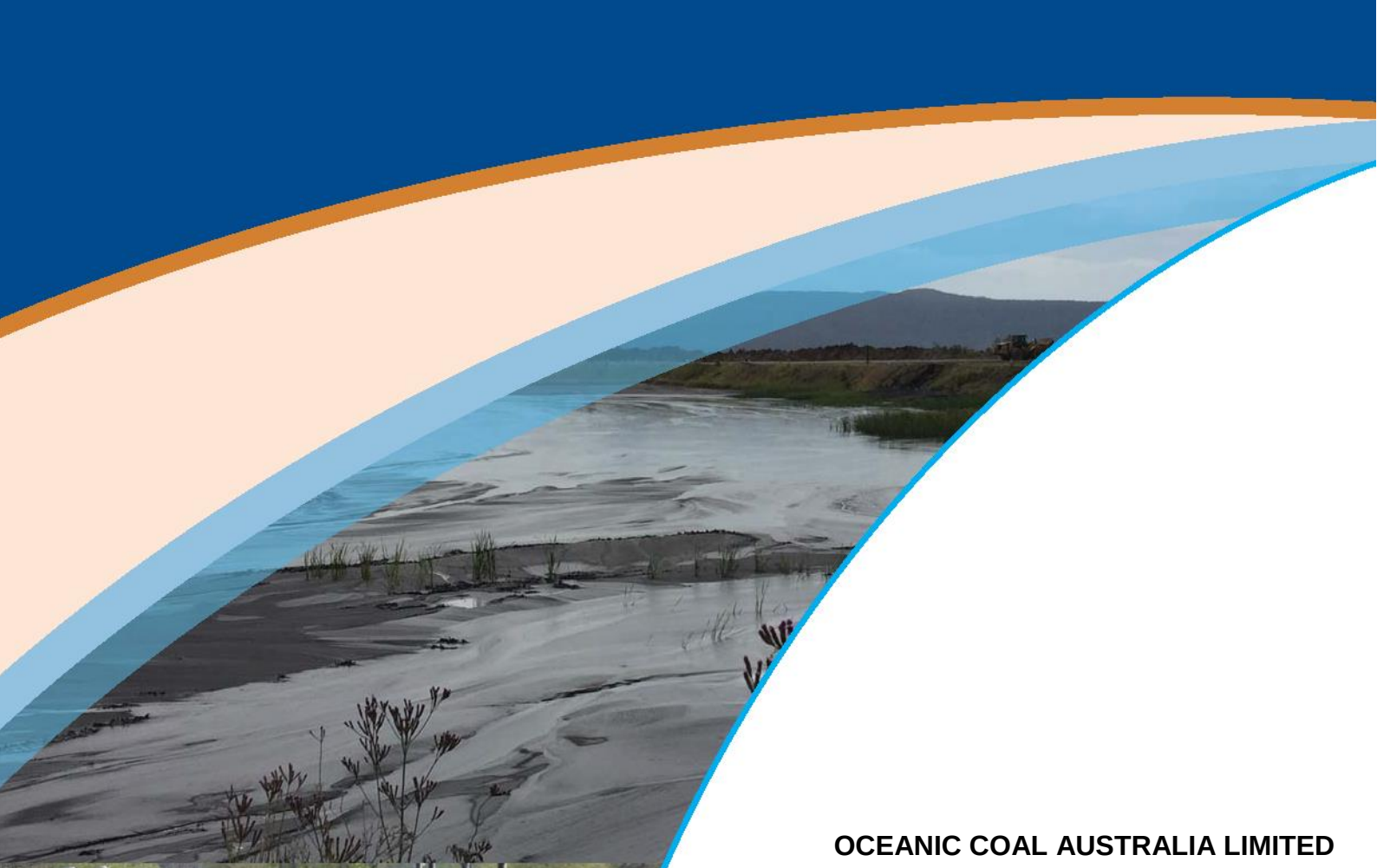






OCEANIC COAL AUSTRALIA LIMITED

Mining Operations Plan
Closure of the OCAL Complex

OCCP-SLR-DOM00-CM-RPT-001

21 November 2016

Glencore
Locked Bag 6015
HUNTER REGIONAL MC NSW 2310

Version: Final

MOP Amendment A

SLR
global environmental solutions

Mining Operations Plan

Closure of the OCAL Complex

1 February 2017 to 31 December ~~2027~~ 2030

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DOCUMENT CONTROL

Reference	Status	Date	Prepared	Checked	Authorised
OCCP-SLR-DOM00-CM-RPT-001 Amendment A	MOP Amendment A	18 May 2018	Nathan Archer	Ben Clibborn	Mark Munro
OCCP-SLR-DOM00-CM-RPT-001	Closure MOP Revision 0	21 November 2016	Andrew Hutton	Ben Clibborn	Mark Munro

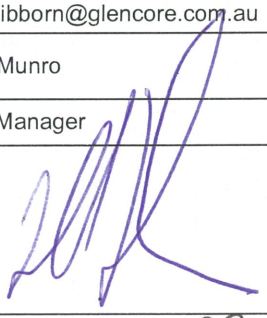
Oceanic Coal Australia Pty Limited	
Mining Operations Plan – Closure of the OCAL Complex	
Name of Mine	Oceanic Coal Australia Pty Limited Complex, which includes: • West Wallsend Colliery • Macquarie Coal Preparation Plant • Westside Mine • Teralba Colliery
MOP Commencement Date	1 February 2017
MOP Completion Date	31 December ~~2027~~ 2030
Mining Authorisations (Lease / Licence No.)	CCL725, CCL718, CCL760, ML1438, ML1451, PPL153, ML1532, ML1567, ML1459, MPL323, CL532, ML 1336, CCL729
Name of Authorisation / Authorisations Holder(s)	Macquarie Coal Joint Venture Participants
Name of Mine Operator (if different)	Oceanic Coal Australia Pty Limited
Name and Contact Details of the Mine Manager (or equivalent)	Mark Munro Operations Manager 02 4941 2108 mark.munro@glencore.com.au
Name and Contact Details of Environmental Representative	Ben Clibborn Environment and Community Manager 02 4941 2163 ben.clibborn@glencore.com.au
Name of Representative(s) of the Authorisation Holder(s)	Mark Munro
Title of Representative(s) of Authorisation Holder(s)	Mine Manager
Signature of Representative(s) of Authorisation Holder(s)	
Date	~~21 November 2016~~ 23rd May 2018
Version	~~Rev A~~ Amendment A

TABLE OF CONTENTS

1 INTRODUCTION 19
1.1 History of Operations 21
1.1.1 West Wallsend Colliery 22
1.1.2 Macquarie Coal Preparation Plant (MCPP) 22
1.1.3 Westside Mine 23
1.1.4 Teralba Colliery 23
1.1.5 Other Historic Disturbance 25
1.2 Mine Closure Planning 26
1.2.1 Project Closure Schedule 27
1.3 Relevant Consents, Authorisations and Licences 28
1.4 Land Ownership and Land Use 32
1.4.1 Land Ownership 32
1.4.2 Land Use 32
1.5 Stakeholder Consultation 33
1.5.1 Stakeholder consultation completed to date 34
1.5.2 Community Complaints and Enquires 35
1.5.3 Division of Resources and Energy 35
1.5.4 Agency Independent Review Committee 36
1.5.5 Aboriginal Stakeholders 36
1.6 Assessment of Socio-Economic Impact of Mine Closure 37
1.6.1 Baseline 37
1.6.2 Staff and Supplier surveys 38
1.6.3 Impacts and opportunities 38
1.6.4 Risk and Impact Mitigation 38
1.6.5 Opportunities 40

2 PROPOSED MINING ACTIVITIES 42
2.1 Project Description 42
2.1.1 WWC 42
2.1.2 MCPP 42
2.1.3 Westside Mine 43
2.1.4 Teralba 43
2.2 Asset Register 43
2.3 Activities over the MOP Term 45
2.3.1 Exploration 46
2.3.2 Construction 46
2.3.3 Land Preparation 46
2.3.4 Mining Operations 47
2.3.5 Coal Processing and Transport 47
2.3.6 Coarse Rejects and Tailings 47
2.3.7 Waste Management 47
2.3.8 Decommissioning and Demolition Activities 49

2.3.9 Temporary Stabilisation 54
2.3.10 Import of growth media 54
2.3.11 Progressive Rehabilitation and Completion 54
2.3.12 Material Production Schedule 58
2.3.13 Subsidence 58

3 ENVIRONMENTAL ISSUES MANAGEMENT 59
3.1 Environmental Risk Assessment 59
3.2 Environmental Risk Management 61
3.2.1 Geology / Geochemistry and Geotechnical 61
3.2.2 Mine Subsidence – Historical Mining Areas 64
3.2.3 Mine Subsidence – Recent Mining Areas 65
3.2.4 Erosion and Sediment Control 70
3.2.5 Flora and Fauna 71
3.2.6 Weed and Pest Management 71
3.2.7 Air Quality 71
3.2.8 Hazardous Materials (HAZMAT) Management 72
3.2.9 Contamination Treatment and Removal 74
3.2.10 Surface Water Management Strategy 81
3.2.11 Groundwater Management Strategy 82
3.2.12 Greenhouse Gas (Methane/Venting) 83
3.2.13 Visual and Lighting 85
3.2.14 Noise 88
3.2.15 Blasting 88
3.2.16 European Heritage 88
3.2.17 Aboriginal Heritage 89
3.2.18 Bushfire 89
3.2.19 Drought 90
3.2.20 Public Safety and site security 90
3.2.21 Waste Management 91
3.3 Operational Issues which affect rehabilitation 91
3.3.1 Tailings Dam and Rejects Emplacement Area Capping 91
3.3.2 Inadequate Growth Media Material for Rehabilitation Works ~~Growth media material for revegetation of the Tailings Dam and REA~~ 92
3.3.3 Subsidence related to Auger mining and shallow workings 92
3.3.4 Leaking methane from mine 92

4 FINAL POST MINING LAND USE 95
4.1 Identified Preliminary Post Mining Land Uses 95
4.1.1 Options Analysis 95
4.2 Final Post Mining Land Uses 98
4.3 Regulatory Requirements 99

5 MINE CLOSURE PLANNING AND EXECUTION 101
5.1 Domain Selection 101

5.2 Domain Rehabilitation Objectives 103
5.3 Rehabilitation Phases 104

6 DOMAIN 1 WESTSIDE OPEN CUT ADMIN, WORKSHOP, HAUL ROAD 106
6.1 Baseline Conditions 107
6.2 Current Closure / Rehabilitation Status 109
6.3 Closure Commitments/Obligations 110
6.4 Proposed Final Land Use and Landform 110
6.5 Approvals 112
6.6 Rehabilitation and Closure Actions - Scope of Works 113
6.6.1 Decommissioning and Salvage of Assets 113
6.6.2 Demolition 113
6.6.3 Waste Management 113
6.6.4 Hazardous Materials 114
6.6.5 Contaminated Sites 114
6.6.6 Civil Earthworks and Landform 114
6.6.7 Mine Sealing 117
6.6.8 Revegetation 117
6.6.9 Surface Water 118
6.6.10 Groundwater 118
6.6.11 Methane Management 118
6.6.12 Biodiversity & Land Management 118
6.6.13 Heritage Items 119
6.7 Post Closure Monitoring & Maintenance 119
6.7.1 Completion Criteria and Indicators 119
6.7.2 Monitoring Requirements 119
6.7.3 Maintenance Requirements 120

7 DOMAIN 2 WESTSIDE OPEN CUT – NORTH REHAB AREA 121
7.1 Baseline Conditions 121
7.2 Current Closure/Rehabilitation Status 122
7.3 Closure Commitments/Obligations 124
7.4 Proposed Final Land Use and Landform 124
7.5 Approvals 126
7.6 Rehabilitation and Closure Actions - Scope of Works 126
7.6.1 Decommissioning and Salvage of Assets 126
7.6.2 Demolition 126
7.6.3 Waste Management 126
7.6.4 Hazardous Materials 127
7.6.5 Contaminated Sites 127
7.6.6 Civil Earthworks and Landform 127
7.6.7 Mine Sealing 127
7.6.8 Revegetation 127
7.6.9 Surface Water 127

7.6.10 Groundwater 128
7.6.11 Methane Management 128
7.6.12 Biodiversity & Land Management 128
7.6.13 Heritage Items 128
7.7 Post Closure Monitoring & Maintenance 128
7.7.1 Completion Criteria and Indicators 128
7.7.2 Monitoring Requirements 128
7.7.3 Maintenance Requirements 129

8 DOMAIN 3 WESTSIDE OPEN CUT - SOUTH WEST PIT 130
8.1 Baseline Conditions 131
8.2 Current Closure/Rehabilitation Status 133
8.3 Closure Commitments/Obligations 133
8.4 Proposed Final Land Use and Landform 134
8.5 Approvals 136
8.6 Rehabilitation and Closure Actions - Scope of Works 136
8.6.1 Decommissioning and Salvage of Assets 136
8.6.2 Demolition 137
8.6.3 Waste Management 137
8.6.4 Hazardous Materials 137
8.6.5 Contaminated Sites 137
8.6.6 Civil Earthworks and Landform 137
8.6.7 Mine Sealing 138
8.6.8 Revegetation 138
8.6.9 Surface Water 139
8.6.10 Groundwater 139
8.6.11 Methane Management 140
8.6.12 Biodiversity & Land Management 140
8.6.13 Heritage Items 140
8.7 Post Closure Monitoring & Maintenance 140
8.7.1 Completion Criteria and Indicators 140
8.7.2 Monitoring Requirements 140
8.7.3 Maintenance Requirements 141

9 DOMAIN 4 WESTSIDE FINAL VOID 142
9.1 Baseline Conditions 143
9.2 Current Closure / Rehabilitation Status 146
9.3 Closure Commitments/Obligations 147
9.4 Proposed Final Land Use and Landform 147
9.5 Approvals 149
9.6 Rehabilitation and Closure Actions - Scope of Works 149
9.6.1 Decommissioning and Salvage of Assets 150
9.6.2 Demolition 150
9.6.3 Waste Management 150

9.6.4 Hazardous Materials 150
9.6.5 Contaminated Sites 150
9.6.6 Civil Earthworks and Landform 151
9.6.7 Mine Sealing 152
9.6.8 Revegetation 154
9.6.9 Surface Water 155
9.6.10 Groundwater 156
9.6.11 Methane Management 156
9.6.12 Biodiversity & Land Management 156
9.6.13 Heritage Items 156
9.7 Post Closure Monitoring & Maintenance 156
9.7.1 Completion Criteria and Indicators 156
9.7.2 Monitoring Requirements 156
9.7.3 Maintenance Requirements 157

10 DOMAIN 5 VOLUNTARY CONSERVATION AREAS 158
10.1 Baseline Conditions 158
10.2 Current Closure / Rehabilitation Status 161
10.3 Closure Commitments/Obligations 161
10.4 Proposed Final Land Use and Landform 162
10.5 Approvals 164
10.6 Rehabilitation and Closure Actions - Scope of Works 164
10.6.1 Decommissioning and Salvage of Assets 164
10.6.2 Demolition 164
10.6.3 Waste Management 164
10.6.4 Hazardous Materials 164
10.6.5 Contaminated Sites 165
10.6.6 Civil Earthworks and Landform 165
10.6.7 Mine Sealing 165
10.6.8 Revegetation 165
10.6.9 Surface Water 165
10.6.10 Groundwater 165
10.6.11 Methane Management 166
10.6.12 Biodiversity & Land Management 166
10.6.13 Heritage Items 166
10.7 Post Closure Monitoring & Maintenance 166
10.7.1 Completion Criteria and Indicators 166
10.7.2 Monitoring Requirements 166
10.7.3 Maintenance Requirements 167

11 DOMAIN 6 PIT TOP FACILITIES 168
11.1 Baseline Conditions 169
11.2 Current Closure/Rehabilitation Status 171
11.3 Closure Commitments/Obligations 171

11.4 Proposed Final Land Use and Landform 172
11.5 Approvals 174
11.6 Rehabilitation and Closure Actions - Scope of Works 175
11.6.1 Decommissioning and Salvage of Assets 175
11.6.2 Demolition 175
11.6.3 Waste Management 176
11.6.4 Hazardous Materials 177
11.6.5 Contaminated Sites 177
11.6.6 Civil Earthworks and Landform 178
11.6.7 Mine Sealing 178
11.6.8 Revegetation 180
11.6.9 Surface Water 180
11.6.10 Groundwater 180
11.6.11 Methane Management 180
11.6.12 Biodiversity & Land Management 181
11.6.13 Heritage Items 181
11.7 Post Closure Monitoring & Maintenance 181
11.7.1 Completion Criteria and Indicators 181
11.7.2 Monitoring Requirements 181
11.7.3 Maintenance Requirements 182

12 DOMAIN 7 TAILINGS DAM 183
12.1 Baseline Conditions 183
12.2 Current Closure/Rehabilitation Status 185
12.3 Closure Commitments/Obligations 185
12.4 Proposed Final Land Use and Landform 186
12.5 Approvals 188
12.6 Rehabilitation and Closure Actions - Scope of Works 188
12.6.1 Decommissioning and Salvage of Assets 188
12.6.2 Demolition 188
12.6.3 Waste Management 188
12.6.4 Hazardous Materials 189
12.6.5 Contaminated Sites 189
12.6.6 Civil Earthworks and Landform 189
12.6.7 Mine Sealing 201
12.6.8 Revegetation 201
12.6.9 Surface Water 203
12.6.10 Groundwater 203
12.6.11 Methane Management 203
12.6.12 Biodiversity & Land Management 203
12.6.13 Heritage Items 204
12.7 Post Closure Monitoring & Maintenance 204
12.7.1 Completion Criteria and Indicators 204
12.7.2 Monitoring Requirements 204

12.7.3 Maintenance Requirements 205

13 DOMAIN 8 REJECTS EMPLACEMENT AREA 206
13.1 Baseline Conditions 207
13.2 Current Closure/Rehabilitation Status 208
13.3 Closure Commitments/Obligations 210
13.4 Proposed Final Land Use and Landform 210
13.5 Approvals 212
13.6 Rehabilitation and Closure Actions - Scope of Works 212
13.6.1 Decommissioning and Salvage of Assets 212
13.6.2 Demolition 212
13.6.3 Waste Management 213
13.6.4 Hazardous Materials 213
13.6.5 Contaminated Sites 213
13.6.6 Civil Earthworks and Landform 213
13.6.7 REA Growth Media Cover 214
13.6.8 Surface Water - overview 214
13.6.9 Tailings Dam Spillway Overflow Channel 215
13.6.10 Northern REA Contour Banks 215
13.6.11 Northern Conveyance Channel 217
13.6.12 REA Dam 217
13.6.13 Mine Sealing 220
13.6.14 Revegetation 220
13.6.15 Groundwater 220
13.6.16 Methane Management 221
13.6.17 Biodiversity & Land Management 221
13.6.18 Heritage Items 221
13.7 Post Closure Monitoring & Maintenance 221
13.7.1 Completion Criteria and Indicators 221
13.7.2 Monitoring Requirements 221
13.7.3 Maintenance Requirements 222

14 DOMAIN 9 SURFACE FACILITIES 223
14.1 Baseline Conditions 224
14.2 Current Closure/Rehabilitation Status 226
14.3 Closure Commitments/Obligations 226
14.4 Proposed Final Land Use and Landform 226
14.5 Approvals 228
14.6 Rehabilitation and Closure Actions - Scope of Works 228
14.6.1 Decommissioning and Salvage of Assets 228
14.6.2 Demolition 228
14.6.3 Waste Management 229
14.6.4 Hazardous Materials 229
14.6.5 Contaminated Sites 230

14.6.6 Civil Earthworks and Landform 231
14.6.7 Mine Sealing 232
14.6.8 Revegetation 232
14.6.9 Surface Water 234
14.6.10 Groundwater 236
14.6.11 Methane Management 236
14.6.12 Biodiversity & Land Management 236
14.6.13 Heritage Items 236
14.7 Post Closure Monitoring & Maintenance 236
14.7.1 Completion Criteria and Indicators 236
14.7.2 Monitoring Requirements 237
14.7.3 Maintenance Requirements 237

15 DOMAIN 10 MATURATION PONDS 239
15.1 Baseline Conditions 239
15.2 Current Closure/Rehabilitation Status 241
15.3 Closure Commitments/Obligations 241
15.4 Proposed Final Land Use and Landform 241
15.5 Approvals 243
15.6 Rehabilitation and Closure Actions - Scope of Works 243
15.6.1 Decommissioning and Salvage of Assets 243
15.6.2 Demolition 243
15.6.3 Waste Management 243
15.6.4 Hazardous Materials 244
15.6.5 Contaminated Sites 244
15.6.6 Civil Earthworks and Landform 245
15.6.7 Mine Sealing 246
15.6.8 Revegetation 246
15.6.9 Surface Water 246
15.6.10 Groundwater 249
15.6.11 Methane Management 249
15.6.12 Biodiversity & Land Management 249
15.6.13 Heritage Items 249
15.7 Post Closure Monitoring & Maintenance 249
15.7.1 Completion Criteria and Indicators 249
15.7.2 Monitoring Requirements 249
15.7.3 Maintenance Requirements 250

16 DOMAIN 11 TERALBA NORTHGATE 251
16.1 Baseline Conditions 251
16.2 Current Closure/Rehabilitation Status 253
16.3 Closure Commitments/Obligations 253
16.4 Proposed Final Land Use and Landform 253
16.5 Approvals 255

16.6 Rehabilitation and Closure Actions - Scope of Works 255
16.6.1 Decommissioning and Salvage of Assets 255
16.6.2 Demolition 255
16.6.3 Waste Management 255
16.6.4 Hazardous Materials 256
16.6.5 Contaminated Sites 256
16.6.6 Civil Earthworks and Landform 257
16.6.7 Mine Sealing 257
16.6.8 Revegetation 259
16.6.9 Surface Water 261
16.6.10 Groundwater 261
16.6.11 Methane Management 262
16.6.12 Biodiversity & Land Management 262
16.6.13 Heritage Items 262
16.7 Post Closure Monitoring & Maintenance 262
16.7.1 Completion Criteria and Indicators 262
16.7.2 Monitoring Requirements 263
16.7.3 Maintenance Requirements 263

17 DOMAIN 12 INFRASTRUCTURE 264
17.1 Baseline Conditions 265
17.2 Current Closure/Rehabilitation Status 267
17.3 Closure Commitments/Obligations 267
17.4 Proposed Final Land Use and Landform 267
17.5 Approvals 269
17.6 Rehabilitation and Closure Actions - Scope of Works 270
17.6.1 Decommissioning and Salvage of Assets 270
17.6.2 Demolition 270
17.6.3 Waste Management 270
17.6.4 Hazardous Materials 270
17.6.5 Contaminated Sites 271
17.6.6 Civil Earthworks and Landform 271
17.6.7 Mine Sealing 271
17.6.8 Revegetation 274
17.6.9 Surface Water 275
17.6.10 Groundwater 275
17.6.11 Methane Management 275
17.6.12 Biodiversity & Land Management 275
17.6.13 Heritage Items 276
17.7 Closure Execution and Post Closure Monitoring & Maintenance 276
17.7.1 Completion Criteria and Indicators 276
17.7.2 Monitoring Requirements 276
17.7.3 Maintenance Requirements 276

18 DOMAIN 13 TERALBA SOUTHGATE 278

18.1 Baseline Conditions 278
18.2 Current Closure/Rehabilitation Status 280
18.3 Closure Commitments/Obligations 280
18.4 Proposed Final Land Use and Landform 280
18.5 Approvals 282
18.6 Rehabilitation and Closure Actions - Scope of Works 282
18.6.1 Decommissioning and Salvage of Assets 282
18.6.2 Demolition 282
18.6.3 Waste Management 283
18.6.4 Hazardous Materials 283
18.6.5 Contaminated Sites 283
18.6.6 Civil Earthworks and Landform 284
18.6.7 Mine Sealing 284
18.6.8 Revegetation 286
18.6.9 Surface Water 287
18.6.10 Groundwater 287
18.6.11 Methane Management 287
18.6.12 Biodiversity & Land Management 287
18.6.13 Heritage Items 288
18.7 Closure Execution and Post Closure Monitoring & Maintenance 288
18.7.1 Completion Criteria and Indicators 288
18.7.2 Monitoring Requirements 288
18.7.3 Maintenance Requirements 288

19 DOMAIN 14 OTHER MINE OWNED LANDS 290
19.1 Baseline Conditions 291
19.2 Current Closure/Rehabilitation Status 293
19.3 Closure Commitments/Obligations 293
19.4 Proposed Final Land Use and Landform 293
19.5 Approvals 295
19.6 Rehabilitation and Closure Actions - Scope of Works 295
19.6.1 Decommissioning and Salvage of Assets 296
19.6.2 Demolition 296
19.6.3 Waste Management 296
19.6.4 Hazardous Materials 296
19.6.5 Contaminated Sites 296
19.6.6 Civil Earthworks and Landform 297
19.6.7 Mine Sealing 297
19.6.8 Revegetation 297
19.6.9 Surface Water 297
19.6.10 Groundwater 297
19.6.11 Methane Management 297
19.6.12 Biodiversity & Land Management 298
19.6.13 Heritage Items 298

19.7 Closure Execution and Post Closure Monitoring & Maintenance 298
19.7.1 Completion Criteria and Indicators 298
19.7.2 Monitoring Requirements 298
19.7.3 Maintenance Requirements 299

20 DOMAIN 15 PROJECT APPROVAL AREA 300
20.1 Baseline Conditions 301
20.2 Approvals 303
20.3 Current Closure/Rehabilitation Status 304
20.4 Closure Commitments/Obligations 304
20.5 Proposed Final Land Use and Landform 305
20.6 Rehabilitation and Closure Actions - Scope of Works 307
20.6.1 Decommissioning and Salvage of Assets 307
20.6.2 Demolition 307
20.6.3 Waste Management 307
20.6.4 Hazardous Materials 307
20.6.5 Contaminated Sites 307
20.6.6 Civil Earthworks and Landform 308
20.6.7 Mine Sealing 308
20.6.8 Revegetation 309
20.6.9 Surface Water 309
20.6.10 Groundwater 309
20.6.11 Methane Management 309
20.6.12 Biodiversity & Land Management 309
20.6.13 Heritage Items 310
20.7 Closure Execution and Post Closure Monitoring & Maintenance 310
20.7.1 Completion Criteria and Indicators 310
20.7.2 Monitoring Requirements 310
20.7.3 Maintenance Requirements 311

21 DOMAIN 16 RURAL RESIDENTIAL PROPERTY 312
21.1 Baseline Conditions 312
21.2 Current Closure/Rehabilitation Status 314
21.3 Closure Commitments/Obligations 314
21.4 Proposed Final Land Use and Landform 314
21.5 Approvals 316
21.6 Rehabilitation and Closure Actions - Scope of Works 316
21.6.1 Decommissioning and Salvage of Assets 316
21.6.2 Demolition 316
21.6.3 Waste Management 317
21.6.4 Hazardous Materials 317
21.6.5 Contaminated Sites 317
21.6.6 Civil Earthworks and Landform 317
21.6.7 Mine Sealing 317

21.6.8 Revegetation 317
21.6.9 Surface Water 317
21.6.10 Groundwater 317
21.6.11 Methane Management 318
21.6.12 Biodiversity & Land Management 318
21.6.13 Heritage Items 318
21.7 Closure Execution and Post Closure Monitoring & Maintenance 318
21.7.1 Completion Criteria and Indicators 318
21.7.2 Monitoring Requirements 318
21.7.3 Maintenance Requirements 318

22 AREAS OUTSIDE OF DOMAINS 319
22.1 Baseline Conditions 319
22.2 Current Closure/Rehabilitation Status 320
22.3 Closure Commitments/Obligations 320
22.4 Proposed Final Land Use and Landform 321
22.5 Approvals 321
22.6 Rehabilitation and Closure Actions - Scope of Works 322
22.6.1 Decommissioning and Salvage of Assets 322
22.6.2 Demolition 322
22.6.3 Waste Management 322
22.6.4 Hazardous Materials 322
22.6.5 Contaminated Sites 323
22.6.6 Civil Earthworks and Landform 323
22.6.7 Mine Sealing 323
22.6.8 Revegetation 324
22.6.9 Surface Water 325
22.6.10 Groundwater 325
22.6.11 Methane Management 325
22.6.12 Biodiversity & Land Management 325
22.6.13 Heritage Items 326
22.7 Closure Execution and Post Closure Monitoring & Maintenance 326
22.7.1 Completion Criteria and Indicators 326
22.7.2 Monitoring Requirements 326
22.7.3 Maintenance Requirements 326

23 STATUS OF CLOSURE AT END OF MOP 327

24 FORWARD WORKS PLAN 328

25 PERFORMANCE INDICATORS AND COMPLETION/RELINQUISHMENT CRITERIA 329

26 REHABILITATION IMPLEMENTATION 330
26.1 Status at MOP Commencement 330
26.2 Proposed Rehabilitation Activities during the MOP Term 332

26.3 Rehabilitation Methodologies for Activities in the MOP Term 336
26.4 Summary of Rehabilitation Areas during this MOP term 336
26.5 Relinquishment Phase Achieved During MOP Period 353

27 REHABILITATION MONITORING, RESEARCH AND REPORTING 354
27.1 Rehabilitation Monitoring 354
27.1.1 Monitoring during Closure Execution 354
27.1.2 Rehabilitation and Revegetation Methodology Records 355
27.1.3 Inspections of Rehabilitation Areas 356
27.1.4 Monitoring of Subsidence Remediation Works 356
27.1.5 Adaptive Management 357
27.2 Research and Rehabilitation and Use of Analogue Sites 357
27.2.1 Use of Analogue Sites 357
27.2.2 Long Term Rehabilitation and Revegetation Monitoring Program 357
27.2.3 Rehabilitation Trials 359

28 INTERVENTION AND ADAPTIVE MANAGEMENT 360
28.1 Threats to Rehabilitation 360
28.2 Trigger Action Response Plan 360

29 REPORTING 365

30 REVIEW AND IMPLEMENTATION OF THE MOP 367
30.1 Review of the MOP 367
30.2 Implementation 367
30.3 Key Statutory Responsibilities during Closure 368
30.4 Human Resources 368
30.4.1 Employees 368
30.5 Quality 369
30.6 Health & Safety 369

31 REFERENCES 372

APPENDICES

Appendix A	OCAL Mine Closure Programme (updated)
Appendix B	Land Ownership Register
Appendix C	MOP Plans (updated)
Appendix D	Asset Register
Appendix E	Risk Assessment
Appendix F	Post Mining Land Use Plans
Appendix G	Regulatory Requirements
Appendix H	Mine Sealing Designs
Appendix I	Closure Criteria
Appendix J	Materials Management Protocol

ABBREVIATIONS LIST

AAC	Aboriginal Advisory Committee
ACHMP	Aboriginal Cultural Heritage Management Plan
ACM	Asbestos Containing Material
AMD	Acid Mine Drainage
APZ	Asset Protection Zone
BHP	Broken Hill Propriety Limited
BMP	Biodiversity Management Plan
CCC	Community Consultative Committee
CCL	Consolidated Coal Lease
CL	Coal Lease
CLM	Contaminated Land Management
CPP	Coal Preparation Plant
DECCW	Former Department of the Environment, Climate Change and Water
DMCP	Detailed Mine Closure Plan
DP&E	Department of Planning and Environment
DP&I	Former Department of Planning and Infrastructure
DPI Water	Department of Primary Industries – Water
DRE	Former Department of Industry – Division of Resources and Energy
DRG	Department of Industry – Division of Resources and Geoscience
DSC	Dams Safety Committee
EMM	Environmental Management Manual
EMP	Environmental Management Plan
EMS	Environmental Management System
EPA	Environmental Protection Agency
EPL	Environment Protection Licence
ESP	Exchangeable Sodium Percent
GCAA	Glencore Coal Assets Australia
HAZMAT	Hazardous Material
I&I NSW	Former NSW Department of Industry and Investment
LHPA	Livestock Health and Pest Authorities

LMCC	Lake Macquarie City Council
MCJV	Macquarie Coal Joint Venture
MCPP	Macquarie Coal Preparation Plant
ML	Mining Lease
MOP	Mining Operations Plan
NGERS	National Greenhouse and Energy Reporting System
NMP	Noise Management Plan
NPWS	National Parks and Wildlife Service
OCAL	Oceanic Coal Australia Pty Limited
OEH	NSW Office of Environment and Heritage
POEO	Protection of the Environment Operations
RCE	Rehabilitation Cost Estimate
REA	Rejects Emplacement Area
RFS	Rural Fire Service
RIT	Relative Ignition Temperature
RL	Radiation Licence
ROM	Run of Mine
SEPP	State Environmental Planning Policy
SLR	SLR Consulting Australia Pty Ltd
SSCA	Sugarloaf State Conservation Area
STP	Sewerage Treatment Plant
SWMP	Surface Water Management Plan
TARP	Trigger Action Response Plan
UGM	UGM Australia Pty Limited
VBM	Vertical Block Movement
VCA	Voluntary Conservation Area
WMH	Waste Management Hub
WMP	Water Management Plan
WWC	West Wallsend Colliery

1 INTRODUCTION

This Mining Operations Plan (MOP) has been prepared by SLR Consulting Australia Pty Ltd (SLR Consulting) in conjunction with Oceanic Coal Australia Pty Limited (OCAL). Oceanic Coal Australia Proprietary Limited (OCAL) manages the OCAL Complex (the Complex), which encompasses the West Wallsend Colliery (WWC), the Macquarie Coal Preparation Plant (MCPP), the former open-cut Westside Mine and the former Teralba Colliery (Northgate and Southgate sites). These sites are located approximately 20 kilometres southwest of Newcastle in the Lake Macquarie region of New South Wales (NSW), and are owned by the Macquarie Coal Joint Venture (MCJV). OCAL is the major joint venture participant on MCJV with 70% ownership. Other participants are Marubeni Coal Pty Ltd (17%), OCAL Macquarie Pty Ltd (10%) and JFE Minerals (Australia) Pty Ltd (3%). OCAL which also owns OCAL Macquarie Pty Ltd is wholly owned by Glencore. The location of the OCAL Complex is shown in **Figure 1.**

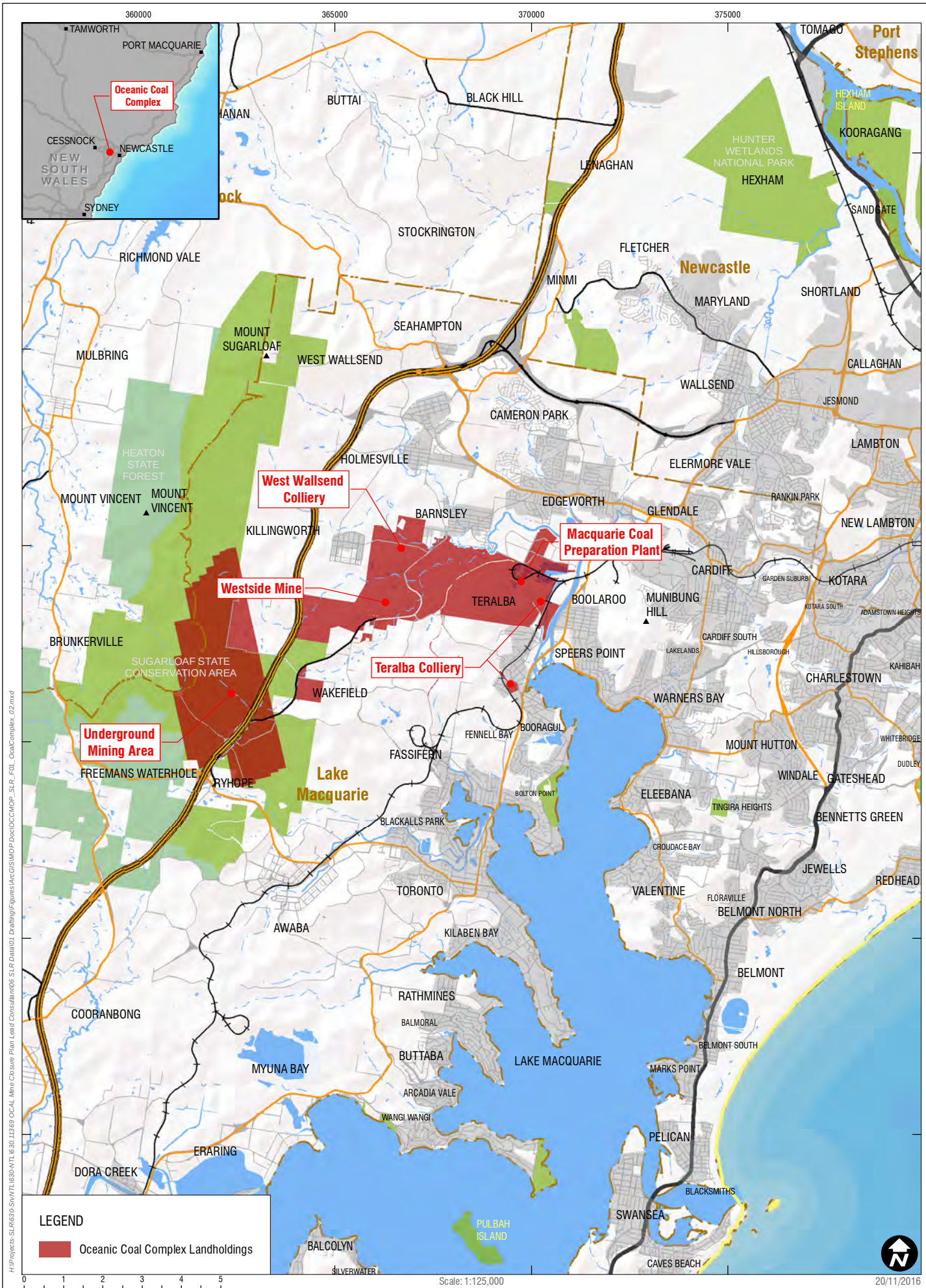
This MOP has been prepared in accordance with the *MOP Guidelines ESG03* (Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) 2013) to satisfy Condition 2 of a Notice under Section 240(1)(d) of the Mining Act 1992 which required OCAL to prepare a Mine Closure Plan to address the rehabilitation of all mining activity at the OCAL Complex. It is intended that this MOP when approved will supersede the current MOP for the OCAL Complex.

Further, this MOP it has also been prepared in accordance with Condition 29 of Schedule 4 of Project Approval (PA09_0203) which requires the preparation of a Rehabilitation Environmental Management Plan for WWC, along with the requirements of various leases across the OCAL Complex.

Extraction of coal from the West Wallsend underground mine was completed in May 2016. Coal washing operations and tailings reject generation ceased in July 2016 with the last coal railed from the product stockpile in October 2016. In addition, since the cessation of mining at the WWC, Shaft 1, Shaft 2, Shaft 3 and the main drift have been sealed in accordance with MDG6001 as proposed in the High Risk Notification submitted to the former Department of Industry – Resources and Energy (now known as the Division of Resources and Geoscience (DRG)) on the 9 June, 2016 and the Mining Operations Plan for the time period submitted on the 23 May 2016 and approved 30 June 2016.

It is intended that this MOP addresses all activities associated with the full closure of the OCAL Complex for a period of eleven years between 1 February 2017 and 31 December ~~2027~~ 2030.

This MOP Amendment A has been prepared to provide additional detail with regard to the sourcing and use of material for rehabilitation and closure activities at the site.



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Location of the OCAL Complex

FIGURE 1

This MOP incorporates all the relevant outcomes from the DMCP in order to provide the Department with a thorough description of the proposed decommissioning, rehabilitation and closure activities for the OCAL Complex through to planned lease relinquishment in ~~2027~~ 2030.

The base assumptions used in the preparation of this Mine Closure MOP are as follows:

- Underground mining at the site was completed in May 2016
- Coal washing operations, and tailings reject generation at the site was completed in July 2016
- Coal Loading operations at the site was completed in October 2016
- All the coal clearance and processing related infrastructure (e.g. bins/conveyors/CHPP) will be removed from the site;
- Any other related infrastructure (Glencore ownership) that can be used for some other beneficial purpose (e.g. offices / workshops / carparks / roads) will be retained;
- Underground mining equipment recovered from the mine will be stored in a designated secure lay down area at the WWC pit top;
- Teralba Southgate site will continue to be leased for industrial use under an existing long term lease with UGM until at least 2020;
- The rail loop at the MCPP is to be retained and maintained until such time as it is determined that it has no economic beneficial use for some other land holder;
- The existing sealed private haul road from Rhonda Rd to the MCPP will be retained to allow heavy vehicle access to the MCPP site post closure of the mine;
- The Tailings Dam and Rejects Emplacement Area (REA) are to be capped, reshaped to be free-draining and then top-dressed with a suitable growth media prior to being returned to pasture;
- All OCAL related mine entries (including all shafts and the drifts) will be sealed to MDG6001;
- The final void at the completed Westside Open cut mine will be retained as a pit lake;
- The current Voluntary Conservation Areas (VCAs) will continue to be managed by GCAA beyond lease relinquishment or until and alternate owner can be determined; and
- Any remaining disturbed areas not identified for a future potential beneficial land use will be returned to bushland.

1.1 History of Operations

Coal was discovered at Newcastle in 1791. Mining has been undertaken on the western side of Lake Macquarie since 1857. Mining at the facilities that now comprise the Complex began with WWC (consent 1969), Teralba Colliery (consent 1973 as the previous West Wallsend No. 2 Colliery), Macquarie Coal Preparation Plant (consent 1981 as the previous Stockton Borehole Colliery) and Westside Mine (consent 1990).

A published book outlining the history of mining in the area is available at the West Wallsend Colliery website www.westwallsendcolliery.com.au.

A brief description of the operations that comprise the OCAL Complex is summarised in **Sections 1.1.1** to **Sections 1.1.4**. A description of other disturbance historically associated with the OCAL Complex is summarised in **Section 1.1.5.**

1.1.1 West Wallsend Colliery

WWC was originally granted development consent DA B66-69 for the pit top facilities and No. 2 ventilation fan in 1969. A board and pillar mining operation commenced in 1969 and continued until 1987 at the commencement of longwall operations. Longwall mining was undertaken to the north and south of the pit top in the Borehole and West Borehole Seams; since 1989 only longwall operations were undertaken in the vicinity of Holmesville, Edgeworth and the Sugarloaf State Conservation Area (SSCA).

Coal was transported via conveyor to surface the hauled by truck via private haul road to the MCPP. The majority of coal mined from WWC was washed and loaded onto trains at the MCPP to be transported to Newcastle Port for export. A small percentage of coal mined from WWC was railed to Eraring Power Station.

The former Department of Planning and Infrastructure (DP&I) approved continued underground mining at WWC in 2012, and in October 2014, a modification to the Project Approval PA09_0203 was granted to include the additional Longwalls 51 and 52 to allow underground mining to continue until December 2021. In May 2016 longwall mining was completed at WWC.

West Wallsend Colliery currently holds mining leases Coal Consolidated Lease (CCL) 725 and CCL718, Mining Lease (ML)1336, ML1438, ML1451, (PLL 153 and Sub-Leases CCL774 and CCL727.

The WWC infrastructure includes pit top facilities, No. 2 ventilation shaft site, No. 3 ventilation shaft site with ballast borehole facility, and Longwall (LW) 11 borehole. Some exploration and groundwater boreholes associated with WWC exist between LW38 in Domain 15 – Project Approval Area, Domain 14 – Other Mine Owned Lands and Domain 16 – Rural Residential Property (associated with LW11 – LW37).

1.1.2 Macquarie Coal Preparation Plant (MCPP)

Development consent DA 88-4-2005 was granted for MCPP on 21 July 1981. MCPP was initially established as part of the previous Stockton Borehole Colliery that was owned and operated by the Broken Hill Proprietary Company Limited (BHP). During 1988, the Coal Preparation Plant was renamed the Macquarie Coal Preparation Plant and from 19 May 1989 until 12 January 1990, the Plant was part of the Pacific Copper Limited Group. Subsequently, the Plant became part of the FAI Mining Group where, on 26 September 1992, it was included in the Macquarie Coal Joint Venture. On 10 June 1993 FAI Mining Limited changed its name to Oceanic Coal Australia Limited (OCAL); however, the legal identity and ownership of the Company did not change. In July 1999, Glencore Coal Australia Limited purchased OCAL. The MCPP is located within the boundary of CCL 718.

Wakefield Colliery (later referred to as Lachlan Colliery) obtained a development consent in 1990 comprising surface facilities and extension of underground mining to the southwest of the West Wallsend lease holding. A ventilation shaft (WWC Shaft#3) was constructed in this area and the WWC operations incorporated the proposed underground workings addressed within the Wakefield Colliery development application.

MCPP received coal from Teralba Colliery up to May 2001, Westside Mine up to 2012, and WWC up to 2016. Key activities undertaken in the MCPP area have included receipt and stockpiling of run of mine (ROM) coal from WWC, Westside and Teralba Colliery and processing ROM coal to produce thermal and coking products; stockpiling and train loading product coal; emplacement of coarse and fine reject material; rehabilitation of emplacement areas; receipt of treated effluent from the Edgeworth Sewerage Treatment Plant (STP) and onsite STPs at MCPP and WWC for use in coal processing; and general maintenance and land management including surface water management, erosion and sediment control and weed management.

Under Sections 100, 102 and 126 of the *Coal Mine Health and Safety Act 2002*, MCPP secured approvals for the construction and use of the [coarse] Reject Emplacement Area (REA) and Tailings Storage Facility (Tailings Dam) and associated dam wall buttress support. The Tailings Dam at the MCPP (previously Stockton Borehole Tailings) is a 'Prescribed Dam' under *Schedule 1 of the Dams Safety Act 1978.*

Other key MCPP infrastructure includes Maturation Ponds, Catch Dams, stockpiles, administration area, and winder house.

When Westside Mine ceased operations, OCAL submitted a Section 100 application under the Coal *Mine Health and Safety Act 2002 and Environmental Planning & Assessment Act 1979* proposing the use of Westside Mine void for coarse reject emplacement from MCPP. This application was approved in January 2012.

1.1.3 Westside Mine

Westside Mine began as an underground mining operation in the 1950s and 1960s in the South Pit Area, with coal extracted from the Great Northern Seam by the RW Millar Company who at the time operated the former Rhondda Colliery West Tunnel. This was worked using bord and pillar operations. Mining leases applicable to the Westside Mine are ML1532, CCL725, CCL718, CL532, ML1336 and PLL153.

Development consent DA 90/0242 was granted to Westside Mine in 1990 for open cut mining in the northern and southern portions of the mine lease area, with mining commencing in 1992. Mining within the North, South (West) and East Pits targeted both the Great Northern and Fassifern Seams.

Mining was by truck and shovel method using contractors with sequential mining of narrow strips followed by backfilling of mined strips and rehabilitation on a continuous basis. Raw coal was screened at the site and transported from the mine by truck via a private haul road connecting to Powercoal's (now Centennial) private haul road to access the Central Coast Power Stations. At the end of operations, part of the southern pit wall was auger mined.

Mining operations ceased in 2012, culminating in the East Pit area and the site has been undergoing progressive rehabilitation since that time. Provisional sign-off was received for rehabilitation of the North Pit with a Mining Operations Plan (MOP) for Mine Closure being approved by the then NSW Department of Trade and Investment – Division of Resource and Energy on the 9 December 2011.

1.1.4 Teralba Colliery

Mining around the Teralba area commenced in 1886 with mining in the Great Northern Seam. The site has operated under several different names including the Northern Colliery, the Pacific Co-operative Coal Company and Pacific Colliery when it was owned by the Great Northern Coal Company. In 1967, BHP purchased the Southgate site and it was subsequently renamed Macquarie Colliery, with a name change in 1985 to Pacific Colliery, and finally Teralba Colliery (rationalisation of Stockton Borehole Colliery and Pacific Colliery) in 1988 (development under the existing development consent was approved in 1973). In 1989 Teralba was a part of the FAI Mining Group, which subsequently became OCAL in 1993 and was then acquired by Glencore the same year. Teralba Colliery currently holds mining leases ML 1567, CCL760, CCL 718 and CCL 727.

Teralba Colliery consists of two sites. The Northgate site of approximately 8 ha has been used for coal mining purposes for at least the last 100 years and is located adjacent to the MCPP (former Stockton Borehole Colliery which commenced mining in the late 1800's). Southgate site is a pit top located 4 km south of the Northgate, the site of the former Pacific Colliery. The Southgate site a 5.7 ha site on the corner of York Street and Pitt Street, Teralba. The site is situated adjacent to residential development, with a retirement village to the east of the site and the Main Northern Railway bordering the south-western side of the site.

During operations, coal was transported to two underground bins which were then conveyed to the surface via a drift conveyor at the Northgate site. The drift at the Northgate site was also used to transport heavy machinery to and from the underground workings. The site was composed of a number of buildings including workshops, storage buildings, disused shaft winder and headframe, yard storage areas, administration buildings, bathhouse, drift winder, methane drainage stack, loco charging room and an electrical sub-station. All ROM coal was conveyed to the MCPP for processing.

In May 2001 the last coal was mined from Longwall 17 and Teralba was put under care and maintenance. Rationalisation activities including appropriate disposal of unwanted equipment were undertaken at Teralba Colliery since operations entered Care and Maintenance in 2001.

In 2002 development consent DC/01/03498/1R was granted by Lake Macquarie City Council (LMCC) for underground coal mining within ML 1567 (applicable to sub-surface strata only). Mining within this lease was never undertaken. OCAL remain the property owner and mining lease holder, however, under an agreement between UGM and OCAL, UGM are the 'Nominated Operator' of the site and are responsible for activities.

Based on a June 2003 archaeological assessment at Teralba Northgate, an archival record was made of these buildings which were subsequently demolished in September – October 2003 (two old winder houses, carpenter's shop, old storage shed, old workshop and old compressor room) and the area reshaped. The Envirogen power generating plant was built on most the site where these buildings were cleared. The area (Lot 1) and the access road to the power generation plant were excised from Teralba Lease subject to a lease agreement with Envirogen. The Methane Drainage Plant was located at Teralba Southgate site extracted methane from underground longwall goaf areas and then re-directed it back into underground workings via indirect roadway/pipe network for migration to the No. 1 Shaft Northgate extraction point for the power plant.

Following a heritage assessment undertaken in 2009 of existing site infrastructure at the Teralba Colliery Northgate site, two pit houses owned by Teralba on the road to the MCPP (Railway Street) were demolished and approximately 0.4 ha of land hydro-mulched on the area. A non-permanent air lock seal for the Northgate drift was also installed.

A Section 92 approval under the *Coal Mines Health and Safety Act 2002* was granted by the then DTIRIS on 31 August 2009 to fill the No.1 and No.2 Shafts at the Southgate site. The shaft fill design was prepared in accordance with the draft DTIRIS Guidelines for the Permanent Filling and Capping of Surface Entries to Coal Seams and in consultation with DTIRIS. Filling of the former No.1 and No.2 shafts at the Teralba Southgate site commenced in late 2009 with material sourced from a fill platform in the vicinity of the former bathhouse at the Teralba Northgate site. Filling of both Shafts was completed during 2010.

In 2010 UGM Australia (UGM) was granted development consent DA/1174/2010 to undertake mining related activities and rationalisation activities including demolition at the Teralba Southgate site. An agreement was established between OCAL and UGM for these works and other mining related activities including use of buildings and workshop, mechanical/electrical repair of mining equipment and overhaul and testing of equipment related to the mining industry. UGM assumed operational control of the surface facilities at Southgate site in 2010. In 2010 structures demolished or removed at Teralba included the shaft winder, stone dust bin and diesel tank at Southgate and bathhouse and office building at Northgate.

A November 2010 MOP amendment was submitted to DTIRIS to undertake additional rationalisation activities including the decommissioning and sealing of Ventilation Shafts 3 and 4; approval was granted.

During 2011, dismantling of the drift portal structure and conveyor motor room at Northgate site was undertaken. In 2012 demolition of the electrical workshop, store and workshop was completed at Northgate.

Development consent CC/1631 was granted to UGM in December 2012 to allow modifications for construction of a pipeline shed under the lease agreement.

As at 20 July 2016, the following was completed at Teralba Colliery in relation to rehabilitation:

- Teralba Northgate
    - Heritage assessment of site buildings;
    - Demolition of buildings (except locomotive shed, winder house and gantry which were used and managed by MCPP) and pit houses; and
    - Removal of gas and electricity services from pit houses and buildings.
- Teralba Southgate
    - Underground salvage of equipment;
    - Removal of underground services;
    - Decommissioning of surface gas drainage infrastructure;
    - Redundant plant and equipment removed;
    - Filling and capping of shafts;
    - Decommissioning of Methane Drainage Plant; and
    - Removal of subsidence pegs.

The methane drainage borehole pipeline at Southgate is still used for water level monitoring and UGM operates the Southgate site.

1.1.5 Other Historic Disturbance

All areas currently and historically disturbed within the existing land owned by the OCAL Complex are addressed in this MOP. Other historic disturbance outside of the existing closure domains that that were associated with the existing OCAL area and infrastructure (e.g. previously BHP, Stockton Borehole Colliery, Pacific Colliery, etc.) include Bolton Point and Brush Creek Borehole. This historic disturbance is summarised below.

Brush Creek Borehole located at Fredrick St., Argenton (off Glendale) was previously used for the de-watering of New Wallsend No. 2 Mine. It was re-activated and licensed as Environment Protection Agency (EPA) Point 11 under the Environment Protection Licence (EPL) in 2004 to discharge mine water that would potentially impact future mining at Teralba to Brush Creek. Mine water was extracted from the borehole up to December 2008. No surface mining lease was held for the Brush Creek Borehole and OCAL previously held an access agreement with landowner Waratah Golf Club.

In November 2010 approval of a Mining Operations Plan amendment and was granted by the then DTIRIS to decommission and seal Brush Creek Borehole and in July – August 2011 it was decommissioned and rehabilitated. The water pump was decommissioned and removed, security fencing removed, electrical lines and other surface infrastructure removed, concrete culvert from Brush Creek Borehole to Brush Creek removed, the borehole sealed, and the area rehabilitated including topsoiling and revegetation with native grass species.

Penrose Street (Edgeworth) Borehole was a small diameter borehole located on private property near Cockle Creek without any additional surface infrastructure. This borehole was used to obtain water levels in the adjacent Gretley/New Wallsend Colliery workings. In 2011 it was decommissioned and rehabilitated by filling and sealing the borehole in accordance with DRG requirements followed by topsoiling and revegetation with native grass species.

Bolton Point was a drill site kept as a Mining Purposes Lease; approval was gained in March 1997 for the proposed Teralba No 3 ventilation shaft at Bolton Point. No shaft was ever constructed in this location and the drillhole was rehabilitated in accordance with DRG requirements followed by topsoiling and revegetation with native grass species.

1.2 Mine Closure Planning

SLR Consulting Pty Ltd (SLR) was commissioned in January 2016 to develop a Detailed Mine Closure Plan (DMCP) for the entire OCAL Complex in accordance with the requirements of the Glencore Coal Assets Australia (GCAA) Mine Closure Planning Protocol and in consultation with the DRE.

The DMCP presents an overview of the selected strategies for closure execution at OCAL Complex with the aim of meeting all legal and other requirements associated with WWC, MCPP, Westside and Teralba; this includes Development Consents, mining titles, contracts and applicable legislation. Where pertinent, the DMCP strategies were developed in consideration of technical (regulatory) guidelines and other relevant standards and guidance.

A key component of the detailed mine closure preparation has been undertaking the following assessments/studies and developing management plans, registers and strategies to inform the detailed closure of the site:

- Knowledge Gap Analysis;
- Environment and Socio-Economic Baseline and Social and Community Engagement Plan;
- Post Mining Land Use;
- Plan of Geotechnical Constraints;
- Plan of Biodiversity Constraints and Opportunities;
- Plan of Archaeological Constraints and Opportunities;
- Legal & Governance Register and Approvals Strategy;
- Geochemistry Report;
- Initial, Mid- and Final Closure Report Risk Assessments;
- Rejects Emplacement Area (REA) Landform and Tailings Capping Plan;
- Buffer Land Management Plan;
- Closure Criteria;
- Rehabilitation Plan;
- Demolition Plan;
- Hazardous Materials Report and Plan;
- On site investigations and testing;
- Contamination Report and Plan;
- Waste Disposal Plan;
- Plan of Surface Water Management;
- Plan of Underground Water Management;
- Methane Management Plan;
- Environment and Rehabilitation Monitoring Plan;
- Post Closure Management Plan;

- Mining Lease Relinquishment Plan
- Quantity Risk Analysis, Value Engineering and Safety in Design workshops and reports; and
- Engineering Bill of Quantities (BoQ) and estimate for works.

This MOP has been prepared in accordance with the *MOP Guidelines ESG03* (Department of Trade and Investment, Regional Infrastructure and Services (DTIRIS) 2013) to satisfy Condition 2 of a Notice under Section 240(1)(d) of the Mining Act 1992 which required OCAL to prepare a Mine Closure Plan to address the rehabilitation of all mining activity at the OCAL Complex). It is intended that this MOP when approved will supersede the current MOP for the OCAL Complex

1.2.1 Project Closure Schedule

The Mine Closure Plan Program includes:

- An update on the Key Project Schedule Milestones;
- A detailed schedule on the activities required until full closure and lease relinquishment; and
- A mine closure project Broad Brush Risk Assessment for the Closure Project.

A Project Schedule for the Closure of the OCAL Complex has been completed by the project team. A copy of the current schedule has been attached as **Appendix A** with the key milestones summarised in **Table 1** below.

> ***NOTE:*** *It is important to note that these dates are dependent on internal approvals which are required for projects requiring this level of expenditure. Furthermore, corporate governance processes will require approval of the disposal or demolition of assets by the OCAL Joint Venture partners prior to the commencement of works. Where there are any changes as a result of this internal approval process, OCAL will update the DRG at regular project meetings.*

Table 1 Key Project Milestones (as at 30 April 2018)

Milestone	Date
Engagement of Closure Consultant	Completed (SLR)
Closure Broad Brush Risk Assessment Complete	Completed
Cessation of Coal Mining	Completed (May 2016)
Retrieval of longwall and underground mining equipment	Completed (August 2016)
Cessation of Coal Washing & Processing	Completed (July 2016)
Cessation of train loading	Completed (October 2016)
Sealing of Mine and Fans off at WWC	Completed (October 2016)
Preparation of the GCAA Detailed Mine Closure Plan	Completed (November 2016)
Pit Top Facilities: Commence demolition	~~September 2017~~ Complete (August 2017)
Pit Top Facilities: Demolition complete	~~February~~ ~~2018~~ January 2019
CHPP: Commence demolition	Complete (February 2018)
CHPP: Demolition complete	October 2018
Teralba North Gate: Commence demolition	~~October~~ Complete ~~(~~January 2018)
Teralba North Gate: Demolition complete	~~March~~ December-2019
Closure of all remaining shafts complete (Teralba Northgate)	July ~~2017~~ 20818

Milestone	Date
Closure of all remaining shafts complete (Teralba Southgate)	~~February~~ June 2018
Commence field data testing to Tailings Dam	~~November 2016~~ Complete (February 2017)
Commence capping Tailings Dam	~~May 2019~~ January 2020
Complete capping of the Tailings Dam	~~March 2021~~ October 2025
Commence capping of the REA	~~July 2021~~ September 2018
Tailings Dam REA capping rehabilitation works complete	~~October 2021~~ September 2025
Subsidence remediation completed	~~September 2017~~ November 2019
Project complete; all areas rehabilitated, release of final bonds	~~2027~~ 2030
Relinquishment of all Mining Titles	~~2027~~ 2030

1.3 Relevant Consents, Authorisations and Licences

Table 2 lists the approvals, leases and licences held for OCAL at the time of MOP preparation.

Table 2 Approvals, Leases and Licences

Issuing / Responsible Authority*	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
Approvals				
Lake Macquarie City Council	B/52-73TR	10 Jul 1973	NA	Mining operation and surface facilities at Teralba
Department of Planning and Environment (DP&E)	Development Consent DA 88-4-2005	21 Jul 1981	Not specified	Original development consent for the (former) Stockton Borehole Colliery (incl. washery operation and surface facilities) at MCPP. Conditions of consent modified on 3.06.1994.
Lake Macquarie City Council	89/0012	4 May 1989	Perpetuity	WWC Overland Coal Conveyor
Lake Macquarie City Council	DA 91/00557	20 Dec 1991	Perpetuity	Westside Mine Haul Road
Lake Macquarie City Council	DA 90/0725	28 Feb 1991	Perpetuity	Lachlan Colliery (Includes No. 3 Ventilation Shaft) at WWC and Approval for extension to surface facilities incl. coal stockpiles (Located within the Lachlan Colliery DA boundary) at MCPP

Issuing / Responsible Authority*	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
DP&E	Development Consent DA 90/0725	28 Feb 1991	Not specified	Ensures the landscape and scenic quality of the locality at MCPP is maintained
Lake Macquarie City Council	90/725/B	28 Feb 1991 Modification determined 15 Apr 2010	Perpetuity	Modification for Construction of New Ballast Borehole at WWC
Lake Macquarie City Council	DA 90/0242	18 Jul 1990	Perpetuity	Westside Mine Open Cut Coal Mine, Access Road, Office Amenities and Maintenance Buildings
Lake Macquarie City Council	BA/98/02188	18 Jun 1999	Perpetuity	WWC Ballast Borehole Facility and Hopper
Lake Macquarie City Council	BA/98/02182	4 Jun 1999	Perpetuity	Addition to WWC Ventilation Fan Installation
Lake Macquarie City Council	DC/01/03498/1R	21 Jan 2002	Not specified	Mining within ML 1567 at Teralba
Lake Macquarie City Council	DC/02/02090/1M	5 Sept 2002	Perpetuity	WWC Regional office records room
DP&E	DA 125-5-2002	23 Jan 2003	1 Feb 2026	Westside Mine Southern Extension Development
Lake Macquarie City Council	DA 2434/2005	29 Dec 2005	Perpetuity	LW11 Borehole Pump Shed at Westside Mine and Borehole Pumping Shed for LW11 Borehole WWC
Lake Macquarie City Council	~~OSSM/141/2002~~ OSSM - SEPTIC/14/2017 WWU Killingworth	~~20 Oct 2010~~ 20 November 2017	~~30 Jun 2019~~ 20 November 2022	Approval to operate a Sewage Treatment System at WWC
Lake Macquarie City Council	OSSM - SEPTIC/15/2017 MCPP Teralba	27 November 2017	27 November 2022	Approval to operate a Sewage Treatment System at MCPP
Lake Macquarie City Council	DA/90/0725C	15 Apr 2010	Perpetuity	Installation of new ballast borehole adjacent to existing ballast borehole at WWC

Issuing / Responsible Authority*	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
DP&E	PA09_0203	25 Jan 2012	31 Dec 2021	WWC Continued Operations Project Approval
DP&E	PA09_0203 (MOD 1)	21 Oct 2014	31 Dec 2021	Modified to include the extraction of additional LW panels LW 51 and LW 52 at WWC
Leases				
DRG	Consolidated Coal Lease (CCL) 718	16 Sept 1991	10 January 2030	Consolidated Coal Lease for WWC, MCPP and Teralba
DRG	CCL 725	16 Sept 1991	10 Oct 2029	Main mining lease for existing and future workings. Applies to WWC and Westside Mine.
DRG	ML1336	2 Nov 1993	2 Nov 2035	Applies to WWC and Westside Mine
DRG	CL532	6 May 1996	1 Nov 2018	Westside Mine
DRG	ML1451	17 Jun 1999	16 Jun 2020	WWC Western Extension
DRG	ML1438	1 Feb 1999	31 Jan 2020	WWC Small Infill Area
DRG	ML 1567	21 Jan 2002	12 Sept 2026	Teralba Colliery
DRG	ML1532	26 Feb 2003	25 Feb 2024	Westside Mine
DRG	PLL153	30 Apr 2007	29 Mar 2024	Westside Mine
DRG	CCL 760	29 Jul 2009	4 Jul 2021	Teralba Colliery
DRG	MPL 323	6 Apr 1991	6 Apr 2020	Applies to WWC
DRG	CCL 729	16 Sept 1991	12 May 2007**	Consolidated Coal Lease
Licences, Permits and Other Consents				
Environmental Protection Authority (EPA)	Environment Protection Licence (EPL) 1360	Current licence version issued 26 May 2015	Anniversary Date: 31 Dec	Consolidated EPL held for WWC, MCPP and Teralba
EPA	Environment Protection Licence (EPL) 4033	Current licence version issued 29 Nov 2013	Anniversary Date: 26 June	EPL for Westside
DRG	Section 126 Tailings Emplacement Approval	2 Jul 2002	Not Specified	Approval to emplace coarse and fine rejects at MCPP.

Issuing / Responsible Authority*	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
	Section 100 Tailings Emplacement Approval	17 Sept 2007	17 Sept 2014	Approval for the current MCPP Tailings Dam.
	Section 102 Tailings Emplacement Approval	3 Aug 2009	Not specified	Approval to emplace coarse rejects on the northern side of the Tailings Dam wall at MCPP.
	Section 100 Tailings Emplacement Approval	Nov 2011	Not Specified	Approval for the transfer and emplacement of coarse reject material within the final void at Westside Mine
	Section 100 Coarse Reject Area within Westside Mine Final Void	25 Oct 2011	1 Nov 2021	Approval to transport and dispose of rejects in the Westside Mine final void
	Section 100 Rejects Emplacement Approval	5 Apr 2013	1 Apr 2018	Approval for augmentation of the Reject Emplacement Area at MCPP.
~~NSW WorkCover~~	~~Dangerous Goods Notification NDG028692~~	~~28 May 2014~~	~~9 Dec 2015~~	~~MCPP stores dangerous goods (in the form of spent pickle liquor) above the specified threshold and submits a Dangerous Goods Notification to WorkCover annually.~~
OEH	CCHR1213_01_Consent_126198	23 Jul 2012	22 Jul 2017	Consent to undertake subsidence management and monitoring activities within Sugarloaf State Conservation Area WWC
DP&E	LW 41 Extraction and Subsidence Management Plan	23 Jul 2012	No defined expiry date	Mining of LW 41 at WWC
DP&E	LW 44 and LW 45 Extraction and Subsidence Management Plan	10 May 2013	No defined expiry date	Mining of LW 44 and LW 45 at WWC

Issuing / Responsible Authority*	Type of Lease, Licence, Approval	Date of Issue	Expiry	Comments
DP&E	LW 42 and LW 43 Extraction and Subsidence Management Plan	8 Apr 2014	No defined expiry date	Mining of LW 42 and LW 43 at WWC
DP&E	LW 51 and LW 52 Extraction Plan	6 Oct 2015	No defined expiry date	Mining of LW 51 and LW 52 at WWC
DP&E	LW 46 Extraction and Subsidence Management Plan	19 Feb 2015	No defined expiry date	Mining of LW 46 at WWC
Note that current government Department names have been listed in this table. These may be different to the Department name at the date of approval.* * Renewal pending*				

1.4 Land Ownership and Land Use

1.4.1 Land Ownership

A large area of land within the OCAL complex is owned by the MCJV and managed by OCAL. The OCAL Complex project area is situated within both the Lake Macquarie and Cessnock local government areas.

There is an area of land owned by Lake Macquarie City Council above the previously mined LW 51 and adjacent to LW 51 and LW 52 which is designated as a biodiversity offset. Additionally, the majority of the balance of land directly above these longwalls is Crown Land, which is managed by the National Parks and Wildlife Service (NPWS) and is known as Sugarloaf State Conservation Area (SSCA) with additional small areas constituting unformed Crown Road reserves.

A list of land ownership (Schedule of Lands) is attached as **Appendix B**, and land ownership is shown on **Plan 1C**.

1.4.2 Land Use

At WWC the surrounding land uses include the M1 motorway and associated services, local roads and rural land holdings. The SSCA has previously been used for timber logging, but is now used for primarily recreational and habitat purposes. Within this area are unsealed roads, tracks and fire trails.

MCPP is adjacent to Cockle Creek, which is the principal northern tributary of Lake Macquarie (2 kilometres to the south). Cockle Creek is estuarine in the vicinity of the site producing wetland areas on the floodplain including State Environmental Planning Policy (SEPP) 14 wetlands adjacent to the MCPP rail embankment (Refer to **Plan 1B**).

The areas to the west and southwest of MCPP are predominantly bushland with varying degrees of past disturbance including historic mining (Rhondda Colliery), open cut mining (Westside Mine) and power transmission easements. Remnant vegetation associated with the forested ridge borders MCPP to the south. The ridge has local highpoints reaching approximately 67 m AHD in proximity to the MCPP.

There is also Edgeworth STP, rural landholdings and the residential areas of Barnsley, Boolaroo and Teralba within 2 kilometres of the MCPP. The nearest private residence to MCPP (not owned by OCAL) is approximately 700 m to the south.

Westside Mine is predominantly surrounded by native vegetation, with some areas of open cut and underground mining and quarrying activities. Westside Mine is directly adjacent to the old Rhondda Colliery which is currently undergoing rehabilitation. The landscape is characterised by natural vegetation which forms part of a relatively large expanse of remnant forest which forms a corridor with the Heaton and Awaba State Forests. Portions of the surrounding area are also used for low intensity agriculture with rural residential properties located in Wakefield approximately 2 kilometres from Westside Mine.

Teralba Northgate is located directly adjacent to MCPP. The site is separated from Cockle Creek to the east by the Main Northern Railway and to the north by the Boolaroo Sanitary Depot, which is situated on the floodplain of the creek. The area to the west and southwest of the Northgate and MCPP site is predominantly bushland, although much of the land has been disturbed by a variety of past land uses, including underground mining and power transmission lines. The Metromix gravel quarry is located approximately 2 kilometres southwest of the site.

Teralba Southgate is adjacent to residential development, with a retirement village to the east of the site and the Main Northern Railway bordering the south-western side of the site. A bushland reserve is to the east. The site is currently leased to UGM until 2 December 2020.

1.5 Stakeholder Consultation

Stakeholder consultation by OCAL is undertaken in accordance with the OCAL Social Involvement Management Plan (WWC SD FWK 0008). The Glencore Project Management System and Mine Closure Protocol require a Stakeholder Engagement Strategy to be developed and approved. OCAL will continue to engage all relevant stakeholders throughout the MOP period in regard to the detailed closure planning process. Stakeholder consultation will be ongoing over the next period up until the full closure of the site.

A Community Consultation Committee (CCC) was established in 2012 by OCAL and currently meets every six months. The last meeting was held in ~~November 2017~~ March 2018. It is intended that the CCC with continue to meet during the MOP term whilst closure activities are ongoing on site, and will discuss environmental performance, rehabilitation, suspension of operations and the future of the site. In addition OCAL will continue to prepare and distribute regular community newsletters.

A Stakeholder Engagement Strategy for Mine Closure has been developed which details the consultation to be undertaken as part of the detailed closure process. This Strategy included a Stakeholder Identification Workshop and development of engagement mechanisms such as a community newsletter and a media strategy.

The following is a summary of the key consultation commitments along with the engagement strategies that will be utilised:

- Government Departments (Dam Safety Committee, LMCC, RMS, DPI Water, MSB, DRG, EPA, DP&E, OEH, etc.) – as needed with face-to-face meetings or written correspondence with the Dam Safety Committee and DP&E and six-monthly meetings with DRG as per MOP;
- Registered Aboriginal Parties (ATOCAC, ALALC (Awabakal Local Aboriginal Land Council), Descendants of Awabakal Traditional Owners, Keepa Keepa Elders, etc.) – existing 6 monthly meeting schedule;
- Local Members/Ministers and Departments (NSW State Government, Minister for Mining, Planning Minister, Federal Member, Council Ward) – letters with newsletters, meetings as needed
- Greater Community (Barnsley, Killingworth, Wakefield, Argenton, Edgeworth, Boolaroo, etc.) – newsletter six monthly
- MCJV Partners (JFE Minerals and Marubeni) – regular meetings;
- Community Members (surrounding landowners, community complainants, private landholders private tenants) – newsletters and face-to-face for surrounding landowners as needed

- Community Consultative Committee (West Wallsend Colliery Community Consultative Committee, Westside Mine Community Consultative Committee) – existing meeting schedule or modified meeting schedule with agreement of the CCC;
- Community Groups (Lake Macquarie Field Archers, Waratah Golf Club, Sugarvalley Neighbourhood Centre, Holmesville Progress Association, Teralba Public School, Lake Macquarie Concert Band, Wakefield School, Diega Creek Landcare Group, etc.) – newsletters, letters, face-to-face meetings as relevant;
- Media (Newcastle Herald, ABC Radio, Social Media, etc.) – pre-prepared statements as needed
- Infrastructure owners e.g. Transgrid, Caltex, Hunter Water, Telstra as needed
- OCAL employed stakeholders e.g. Union (CFMEU), Staff Association and GCAA Corporate (employees and full-time contractors were engaged in surveys and gathering socio-economic data) as required
- Business/Industry Stakeholder groups e.g. Tourism Association, NSW Minerals Council and Lake Macquarie Chamber of Commerce (Dantia will be engaged in face-to-face meetings) as needed; and
- Environmental Groups/Non-Governmental Organisations (NGO's) e.g. Mine watch, Nature Conservation Council and Hunter Environment Lobby as required.

1.5.1 Stakeholder consultation completed to date

Table 3 below includes a summary of the consultation undertaken for the project to date, including a summary of the issues raised, and where it has been addressed in the MOP.

Table 3 Consultation summary for the Mine Closure Project to date.

Consultation Summary	Date	Issue Raised
LMCC	1.3.18	Meeting to discuss ongoing rehabilitation and desire to import material from offsite to rehabilitate and/or develop onsite borrow pits to source material required.
D&PE	9.1.18	Letter advice from McCulloguh Robertson Lawyers confirming MOP amendment being an appropriate approvals pathway to allow bulk material to be imported to the site for capping and rehabilitation purposes provided to Colin Phillips of DP&E
D&PE	8.2.18	Letter sent to DP&E confirming outcome of phone conversation between Ben Clibborn and Colin Phillips confirming MOP amendment to be the correct approval pathway to allow importation of bulk material from offsite
D&PE	18.1.18	Site visit by Michael Frankcombe, Senior Compliance Officer - Northern Region. Nil issues raised
Landcom	16.1.18	Meeting with Landcom to discuss Coyles Shaft status
EPA	6.9.17	Emails regarding EPL variations for closure
LMCC	28.8.17	Emails with LMCC discussing future land use intentions and rezoning.
NSW Minerals Council	23.8.17	Visit by Sarah Cruickshank (CoS to NSW Premier) to Westside and West Wallsend
LMCC	19.12.16	Meeting with nine council officers discussing continued industrial land use as described in this MOP. LMCC response provided 1 February 2017.
DRG (Tim Martin)	On-going	Tailings dam management into closure and rehabilitation process. Emails in August and November 2016.

Consultation Summary	Date	Issue Raised
DRG (Neil McElhinney)	On going	Meeting held with Neil McElhinney 12 Jan 2016, 26 April 2016 and 28 September 2016, to give an update on MOP preparation and mine closure planning. Emails January 2017 discussing final landform of REA.
DP&E	On going	Management plan update to allow rehabilitation activities
CCC	17.2.16 (meeting) 25.5.16 (meeting)	CCC member input into social impact assessment and 2 meetings during 2016 completed with a 3 meeting planned for December 2016
LMCC	13.4.16	Meeting held with Sharon Pope and Ian Moore of LMCC to discuss future land use.
OEH	Ongoing	Bi weekly subsidence management update, 6 monthly public safety meetings. Primary consultation regarding subsidence remediation activities in the sugarloaf conservation area.
OCAL employed stakeholders	2016	See **Section 1.6** below
OCAL major suppliers	2016	See **Section 1.6** below
EPA	30.11.15	Discussion to understand statutory requirements Use of virgin excavated material and excavated material for rehabilitation works.
DPI Water	Ongoing	Water licensing approvals process.

1.5.2 Community Complaints and Enquires

OCAL also operates a 24 hour Community Complaints and Enquiries Line (02) 4941 2100 to ensure that any community concerns can be recorded and responded to, as soon as possible. The number is advertised on the company website and in the community newsletter. Any complaints received are managed in accordance with the WWC Community Complaint and Environmental Incident Management Procedure (WWC SD PRO 0036). This will be maintained during the term of the MOP.

1.5.3 Division of Resources and Energy

Regular consultation with DRG is undertaken by OCAL regarding closure across the OCAL Complex. On 2 October 2015, the DRG issued OCAL with a Notice under Section 240(1)(d) of the Mining Act 1992 requiring the preparation of a Mine Closure Plan. The conditions of this Notice and where they have been addressed in this document are listed in **Table 4.**

Table 4 DRG S240(1)(d) Notice Requirements

Requirement	Where addressed
2. Prepare a Mine Closure Plan to the satisfaction of the Director of Environmental Sustainability. The Mine Closure Plan must: *(a) be prepared to ESG03: Mining Operations Plan (MOP) Guidelines, September 2013*	This MOP document has been prepared to fulfil the requirement for a Mine Closure Plan in accordance with ESG03: MOP Guidelines (DTIRIS 2013).
(b) address the rehabilitation of all mining activity within CCL725 (1973), CCL718 (1973), CCL760 (1973), ML1438 (1992), ML1451 (1992), PPL153 (1906), ML1532 (1992), ML1567 (1992), ML1459 (1992), MPL323 (1973) and CL532 (1973)	This MOP addressed rehabilitation of all mining activity within these leases.

Requirement	Where addressed
(c) include rehabilitation objectives and completion criteria to give the Department the confidence rehabilitation is sustainable and long-term harm to the environment would be mitigated.	**Section 6** through to **Section 24** lists the rehabilitation objectives for each domain, and Section 6 and **Appendix F** detail completion criteria for the rehabilitation of the site.
(d) where there are further studies required to be completed to inform the final mine closure plan, a detailed schedule of works is to be provided within the MOP; and	A list of further studies is provided in the Forward Works Plan **Section 23**.
(e) be developed in consultation with, but not limited to, the Department and the Office of Environment and Heritage, Lake Macquarie City Council	Details of consultation undertaken regarding the preparation of the document are discussed in **Section 1.5**

A number of meetings have been held between OCAL and the DRG as part of the preparation of this MOP. Meetings were held on the following dates:

- July 2015
- August 2015
- 18 September 2015;
- 2 October 2015;
- 16 October 2015;
- 12 January 2016;
- 26 April 2016; and
- 28 September 2016.

The Meeting in April 2016 discussed mining lease relinquishment (including partial relinquishment), provided an update to DRG on closure planning activities, and included a discussion around MOP Amendment A that was submitted and approved by the DRG in May 2016.

OCAL will consult with the DRG on a regular basis going forward to ensure that the DRG are kept update with closure activities at the OCAL Complex.

It is intended that consultation will also be undertaken with the DP&E and the LMCC during the closure process as required.

1.5.4 Agency Independent Review Committee

OCAL ~~operates~~ operated an Independent Review Committee (IRC) in consultation with the DP&E, OEH, Department of Primary Industries – Water (DPI Water), Lake Macquarie City Council and the DRG in accordance with the WWC Project Approval PA09_0203. The IRC was established is 2012, and meets every six months to monitor the progress of mining operations with the Diega Creek and Palmers Creek catchments. The IRC includes the involvement and review by appropriate subsidence experts. The last IRC meeting was held at WWC ~~on 23 March 2015~~ in 2016 and during the meeting it was agreed that as mining had ceased the IRC would cease operating.

1.5.5 Aboriginal Stakeholders

OCAL operates an Aboriginal Advisory Committee (AAC) in accordance with the Aboriginal Cultural Heritage Management Plan (WWC SD PLN 0062) in partnership with:

- Awabakal Descendants Traditional Owners Aboriginal Corporation;
- Awabakal Local Aboriginal Land Council;

- Awabakal Traditional Owners Aboriginal Corporation; and
- Cacatua Culture Consultants

The AAC was established in 2012 and meets regularly. It is intended that AAC meetings will continue to meet during the MOP term and that the closure of the site will be discussed with the Committee at each meeting.

1.6 Assessment of Socio-Economic Impact of Mine Closure

SLR prepared a Socio-Economic Impact Statement as part of the detailed Mine Closure Plan engaging the services of Elliott Whiting. The outcomes from this work is summarised below.

1.6.1 Baseline

Collectively, the population of the Local Area in Australian Bureau of Statistics' (ABS) Statistical Area 2 (SA2 composed of West Wallsend- Barnsley-Killingworth (including Wakefield), Edgeworth-Cameron Park, and Bolton Point-Teralba) closest to the OCAL site included 22,255 people in 2011. Population growth since 2011 has been variable, but was strong in the Edgeworth-Cameron Park area. The Local Area had lower median ages than the State average, with the exception of the Bolton Point-Teralba area.

Communities in the West Wallsend, Barnsley, Killingworth and Wakefield areas are characterised by high numbers of families with children, high proportions of households buying their homes, and high workforce participation. The Bolton Point-Teralba area has an older demographic with higher numbers of couple only families. The Local and Regional areas have higher percentages of Indigenous people, and lower percentages of people born outside Australia than the State averages.

Based on the usual residential population, there were 341 people employed in the mining industry in the Local Area in 2011 which represented 10.2% of the Region's mining workforce of 3,337 people. The West Wallsend-Barnsley-Killingworth and Edgeworth-Cameron Park areas had high labour force participation rates and lower unemployment rates than the State average.

During the past five years, unemployment in the local area has increased in all local SA2s and both the Local Government Areas (LGAs), but the most recent data show unemployment rates decreasing.

The Local Area's housing profile is typical of suburban fringe and semi-rural areas, with high proportions of detached dwellings, relatively affordable housing, and generally high levels of ownership or purchase. Rental vacancy rates are low in the local area, and rental price trends indicate a stable market over the past three years. Sold properties have shown a steady increase in value over the past three years.

Local communities access regional services accessed through Newcastle, Toronto and other centres in Lake Macquarie City. At the local level, there is a good network of local schools, a large aged care residential facility, and a local childcare centre.

Overall, the local area shows signs of a healthy and cohesive community, with good levels of community resilience. There is some evidence of vulnerability to change or social impacts in the Local Area, including higher levels of people with disability in some age groups, higher proportions of Indigenous people, and a higher than State average proportion of State Housing Authority tenancies. The Region as a whole is also showing signs of growth and resilience to the mining downturn.

1.6.2 Staff and Supplier surveys

As part of the stakeholder engagement undertaken OCAL completed a survey of employees and suppliers. The results indicate that stakeholders were generally well prepared for the end of production, and that many employees and business have taken steps to transition from dependence on OCAL.

Survey results also indicate that OCAL employees and businesses are widely distributed across the Lake Macquarie and Newcastle regions, and as such, it is unlikely that any local communities will experience changes to social indicators because of OCAL's closure.

1.6.3 Impacts and opportunities

The following community/socio-economic impacts and opportunities were identified in the assessment:

- Impacts:
    - Change to population growth and demographic characteristics;
    - Increased regional unemployment;
    - Changes to housing access;
    - Reduced quality of life;
    - Changes to community values – local identity;
    - Concern about future land uses;
    - Decreased residential amenity;
    - Changed access to community events and programs;
    - Decreased social infrastructure;
    - Decreased amenity of community facilities;
    - Decreased recreational amenity;
    - Decreased visual amenity;
    - Effects on cultural heritage;
- Opportunities:
    - Increased employment diversity;
    - Recreational uses;
    - Connectivity;
    - Residential amenity; and
    - Business supply opportunities.

1.6.4 Risk and Impact Mitigation

Potential community and socio-economic impacts were assessed and ranked based on significance criteria as part of the Social Impacts and Opportunities Assessment. Actions OCAL intend to undertake for the mitigation of impacts risk ranked as significant (likelihood of possible, likely or almost certain and moderate, major or catastrophic consequence) associated with closure of the OCAL Complex are summarised in **Table 5**:

Table 5 OCAL Community and Socio-Economic Mitigation for Potentially Significant Impacts

Impacts	Action	Stakeholders
Decrease in Glencore's social investment expenditure	Advise all Community Investment partners (by letter) about the closure progress and future arrangements for Glencore's community investment.	Community Investment partners
	Advise the Sugarloaf Valley Neighbourhood Centre that Glencore funding for the breakfast program for 2017 is secure, but other funding sources should be sought for the following years.	Sugarloaf Valley Neighbourhood Centre
Potential for traffic impacts on residents and Wakefield School, Barnsley Public School, Fairyland Childcare Centre and RFBI Masonic Village	Consider traffic impacts in pre-works assessments through the risk management process and contact Wakefield School to advise of relevant closure activities (earthworks, sealing and demolition), identify any concerns and provide contact details for ongoing communication. Ensure transport drivers (e.g. concrete and demolition companies) are aware of the location of the following facilities: • the childcare centre in George St Barnsley; • the RFBI Hawkins Masonic Village on Northville Drive Edgeworth; • Barnsley Public School on Northville Road, The Weir Road and Cliffbrook Street; and • Wakefield School on School Road Wakefield. Advise transport drivers of the need to manage high intensity activities to avoid school locations during drop off and pick up times.	Schools and community facilities in Barnsley, Edgeworth and Wakefield
Effect on visual amenity	Communicate any visual amenity mitigation strategies.	Potentially affected residents and general public
Impacts on recreational access and scenic amenity of Diego Creek and subsidence areas within Sugarloaf National Park	Continue to work with the Office of Environment and Heritage to complete the remediation and rehabilitation of subsidence areas and Diego Creek. Maintain communication with the mountain bike riders group who access Sugarloaf State Conservation Area regarding the progress of remediation and rehabilitation. Provide information as part of regular newsletters on the progress of remediation and rehabilitation.	OEH Mountain bike riders group

Impacts	Action	Stakeholders
Potential effects on Aboriginal cultural heritage management	Meet with representatives of the Awabakal Traditional Owners (Awabakal Local Aboriginal Land Council and Awabakal Traditional Owners' descendants group) and continue closure consultation as per the Stakeholder Engagement Plan including: • thanking them for their co-operation during the mine's operation; • updating on the closure and rehabilitation process and timeframe, and seeking their input on land management strategies as relevant; • identifying any specific interests in the site from ALALC or others; • confirming the process for cultural heritage management during the closure process; and • agreeing on a meeting schedule for the closure process.	Awabakal Local Aboriginal Land Council and Awabakal Traditional Owners' descendants
Memorial Sites	Contact the families of Mr. Alan Lynch and Mr. John Foster to: • confirm that the memorial plaques are in situ and being cared for; • advise that depending on future ownership of the site, the memorials may need to be moved; and • seek consultation with the families in respect to the future of the memorials.	Families of Mr. Alan Lynch and Mr. John Foster
Concern or anxiety about future site uses/management	Community information and engagement actions in accordance with the Stakeholder Engagement Plan.	Adjoining landowners and nearby communities

1.6.5 Opportunities

Community and socio-economic opportunities that may result from closure and have potentially significant social impacts were identified. Based on consideration OCAL has elected to undertake the actions summarised in **Table 6** to realise significant potential opportunities:

Table 6 OCAL Actions to be undertaken to Realise Potentially Significant Opportunities

Opportunity Areas	Action	Stakeholders
Recreational and community uses	Based on land use options, as relevant receive and consider proposals to enable commercial or community use of OCAL land or water bodies for recreational purposes. Consult with the Lake Macquarie City Council regarding any potential interest in Council purchasing leasing or managing any areas of interest (such as recreational uses) within the OCAL Complex.	Lake Macquarie City Council Commercial operators
Employment generation	When the closure plan is complete, and if, or when, external use of OCAL infrastructure is considered; communicate the availability of	Local businesses

Opportunity Areas	Action	Stakeholders
	workshops, sheds and offices to OCAL's supplier network and the local business community (e.g. advertise through the Lake Macquarie Chamber of Commerce).	
Former OCAL suppliers	Recommend reliable OCAL suppliers to Glencore's procurement teams. Consider offering unsolicited letters of appreciation and/or recommendation to OCAL's major suppliers.	OCAL suppliers
Legacy project	Publish and promote the availability of the OCAL history booklet.	Community, schools, museums and LMCC
	Consider whether a portion of land within the Complex, and/or time-limited use of a building, could be offered to the ALALC for social and cultural purposes, as a legacy project.	Awabakal Local Aboriginal Land Council

2 PROPOSED MINING ACTIVITIES

2.1 Project Description

Mining at the OCAL Complex ceased in May 2016, since that time there has been works undertaken to identify and recover equipment from the underground as well as the planning and execution of a mine sealing program at the West Wallsend Colliery.

There is no future mining planned as the site, therefore all activities within the duration of this MOP are related to the decommissioning, rehabilitation and closure of the OCAL Complex. All activities, including indicative timing is included in the Works Programme attached as **Appendix A**, and summarised in the following sections.

2.1.1 WWC

Extraction of Coal from the West Wallsend underground mine was completed in May 2016. Coal washing operations and tailings reject generation also ceased in late May 2016, with train loading of coal stockpiles were completed in October 2016.

It is intended that some of the infrastructure will be retained for future use post mining. The coal clearance infrastructure will be decommissioned, and, shafts, drift, portals and boreholes have already been sealed and capped as per regulatory requirements.

The hard stand areas on the pit top have been progressively cleaned with the usable equipment being catalogued and provided for future use. A program of waste clean-up and recycling of steel is ongoing.

The longwall chocks have been removed from the underground and are located inside the existing water management system. They have been stored using a special oil and will be covered with lanoline and regular maintained so they can be recommissioned and used in the future.

Subsidence impacts continue to be monitored and remediation activities will continue to be undertaken during the MOP term as required following the completion of mining and in accordance with the approved Extraction Plan for the site.

Further detail in relation to the closure activities for each domain relevant to WWC is discussed below in **Sections 6** through to **Section 22**.

2.1.2 MCPP

The MCPP continued to process stockpiled ROM coal after the cessation of mining at the WWC in May 2016. The final processing of coal at the MCPP ceased in October 2016 with the emplacement of coarse and fine rejects continuing until all coal processing was completed. Since that time the surface of the Tailings Dam has been actively managed to remove any water so that drying of the surface occurs.

Closure activities at the MCPP will include the decommissioning and demolition of the Coal Preparation Plant (CPP) and industrial buildings, workshops/store, conveyors, transfer stations and gantries, along with the coal reclaim tunnel. The offices will be retained to firstly support closure activities at the site and where an appropriate post mining land use can be identified they will be retained rather than demolished. Any contamination identified at the site will be remediated, and the site rehabilitated with a total of 16.53 ha of hardstands to be established for some future land use. The rail way line is to be retained until such times that it is determined that there is no future user of the line.

The existing water management infrastructure will continue to be utilised during the MOP term, with capping of the REA scheduled to commence at the end of 2018. The Tailings Dam will be managed and dried out over the MOP term, with capping also proposed to commence in 2018.

Further detail in relation to the closure activities for each domain relevant to MCPP is discussed below in **Sections 6** through to **Section 22**.

2.1.3 Westside Mine

Since the completion of mining in 2012, all remaining disturbed mining areas have been shaped and seeded, including the final void. Since the commencement of operations at Westside Mine, approximately 120 hectares of disturbed land has been rehabilitated. Ongoing monitoring and maintenance of these rehabilitated areas will continue to be undertaken during the MOP term in accordance with the previously approved Mine Closure MOP for the site dated the 9 December 2011.

The Voluntary Conservation Area (VCA) will be subject to ongoing monitoring and maintenance during the MOP term.

Further detail in relation to the closure activities for each domain relevant to Westside is discussed below in **Sections 6** through to **Section 22**.

2.1.4 Teralba

During the MOP term, infrastructure at Teralba Northgate, including the services, buildings, conveyors and gantries not required for future use post mining will be demolished and removed, and any contaminated areas remediated. Generally the rehabilitation at Teralba will be to establish a pasture final land at the site once the remaining infrastructure has been removed.

Teralba Southgate remains in care and maintenance, with the Great Northern Seam Heading, the Fassifern Seam and Australasian Seam Drifts and the Southgate de-watering bore to be filled and capped following cessation of the lease to UGM. The infrastructure at the Teralba Southgate site will be utilised until 2020. At this time future lease opportunities will be considered; after which the services, buildings, conveyors and gantries not required for future use post mining will be demolished and removed. All contaminated areas will be remediated. It is intended that the areas where the infrastructure is not retained for some approved post mining land use will be rehabilitated to grassland.

Further detail in relation to the closure activities for each domain relevant to Teralba is discussed below in **Sections 6** through to **Section 22**.

2.2 Asset Register

The asset register (**Table 7**) provides a summary of the key features of each primary domain (see **Section 5.1**), and principal activities required for decommissioning and rehabilitation.

Table 7 Asset Register

Mining Areas (Domains)	Area (ha)	Major Assets*
WWC – *Includes Domains 6 – Pit Top Facilities and 12 – Infrastructure (part) and 15 Project Area (subsidence)*	1,120.71ha	• Winderhouse/electrical; • Bathhouse and offices; • Workshop; • Dams; • No 1 shaft; (now sealed and surface infrastructure demolished) • No.2 and No. 3 fan shaft; (now sealed and surface infrastructure demolished) • Drift (now sealed and surface infrastructure demolished) • Laydown yard stores; • Above-ground diesel storage tank • Hydraulic oil tanks
MCPP – *Includes Domains 7 Tailings Dam, 8 – REA, 9 – Surface Facilities and 10 – Maturation Ponds*	164.01 ha	• Hunter Water pipeline and pumps for access to Edgeworth Waste Water Treatment Works; • Rail loop; • Dams; • Offices and bathhouse; • Drift winderhouse; • Workshop; • CHPP with thickener tank, conveyors and towers; • Daracon Workshop; • Bulk fuel facility; • Substation; • Product Stockpile • Reclaim Tunnels
Westside – *Includes Domains 1 – Admin Workshop Haul Road and 4 – Final Void, 5 VCAs*	83.50 ha	• Offices – metal shed and ATCO demountable buildings; • Final void;

Mining Areas (Domains)	Area (ha)	Major Assets*
Teralba – *Includes Domains 11 – Northgate and 13 – Southgate*	20.04 ha	• No. 1 Shaft – methane drainage (open); • No. 2, 3 and 4 Shafts (temporarily capped); • Drift (sealed at surface); • 2 boreholes for gals/ventilation and water (sealed to DRG standards);No. 1 Shaft (filled and capped to DRG standards); • No. 2 Shaft (filled and capped to DRG standards); • Borehole for methane return pipeline (in use to measure water levels in mine workings); • 2 boreholes to Australasian drift (unfilled and capped); • Australasian drift (sealed); • Great Northern Tunnel/Drive (sealed); • Bathhouse (refitted by UGM for administration purposes); • Lamp room, offices and Control Room (refitted by UGM for administration purposes); • Compressor house (UGM workshop); • Conference room and offices; • Carpark and hardstands; • Workshop; • Stores; • Chemical storage shed; • Dam; • Methane drainage plant (decommissioned and not owned by OCAL); • Electrical sub-station; and
Other – *Includes Domain 12 (part), 14 – OCAL owned land & 16 – Rural Residential Property*	752.69 ha	• Residential premises. • OCAL owned lands not disturbed by mining • Private Haul Road • Longwall 11 borehole facility (decommissioned);

This asset register is intended to provide a suitable level of context for the Rehabilitation Cost Estimate (RCE). The RCE provides for third party rates to undertake the following:

- Decommissioning and demolition of all surface infrastructure planning to be demolished;
- Rehabilitation of all areas disturbed by mining as depicted in **MOP Plan 2A**, **Appendix C**) with the exception of some infrastructure that will be retained for post mining use; and
- Mobilisation costs, project management and contingencies.

OCAL propose to retain all infrastructure for future post-mining land use with the exception of coal clearance infrastructure which will be decommissioned during the MOP term. This includes the CPP, coal stockpiles, conveyors, transfer stations, gantries, coal bins and coal reclaim tunnel (and associated concrete footings), ventilation shafts, portals, and boreholes associated with WWC pit top and the MCPP surface facilities.

2.3 Activities over the MOP Term

The following section outlines the activities planned at OCAL throughout the MOP term.

2.3.1 Exploration

There is no coal quality drilling or other exploration proposed to be undertaken at the OCAL Complex during the MOP term.

2.3.2 Construction

As WWC ceased production in May 2016, there will be no construction activities required during the MOP term.

2.3.3 Land Preparation

Land preparation refers to the sequential clearing of vegetation and stripping of soil material prior to construction or any ground disturbance. As underground mining activities ceased in May 2016, there is no further clearing of vegetation required as part of the mining process, however some clearing of vegetation may be required to execute some of the planned closure activities.

2.3.3.1 Vegetation Clearing

Vegetation clearing during the MOP term will be minimal. As part of closure of the site there may be some areas requiring clearing, including but not limited to, works associated with the establishment of the site surface water system (i.e. drains, banks, etc.) as well as works planned to repair and make safe surface water dams.

In addition, clearing during the MOP term may be required to be associated with some minor disturbance of existing rehabilitated areas to source suitable growth media material for the REA and Tailings Dam.

Currently the concept design option for the Tailings Dam rehabilitation includes the establishment on a buttress on the northern wall. Further detailed geotechnical engineering works are planned to review this requirement further. Should ultimately the buttress be required as part of the embankment augmentation works, there may be a need to clear a small area of existing trees.

Prior to any clearing, OCAL will undertake a programme of seed collection in the appropriate season to gather and store seed from the local species.

Notwithstanding, prior to the commencement of any clearing activities a Ground Disturbance Permit is to be completed to ensure all required statutory approvals have been obtained and all necessary controls are in place to minimise any potential impacts from the clearing. Disturbance limits will be demarcated in the field using surveyors tape prior to commencement of site works, and machinery operators will be informed of the limits of clearing and all exclusion areas which are to remain undisturbed.

2.3.3.2 Soil Stripping and Stockpiling

Other than small areas to be cleared as part of the closure, no soil stripping or stockpiling is anticipated in the MOP term. Where ever topsoil is identified, it is intended that it will be recovered for use in the revegetation of the site. Where existing rehabilitation is disturbed as part of closure, an assessment will be made into the feasibility of recovering the existing topsoil for reuse.

During this MOP term OCAL will continue to investigate potential sources of topsoil and topsoil substitutes that will be required for rehabilitation works at closure. Any material received from external sources will be placed directly onto rehabilitation works or stockpiled in existing stockpile locations in accordance with the *Materials Management Protocol* (**Appendix J**).

The use of bio-solids in accordance with the approved EPA Guidelines is being assessed and is likely to be used in conjunction with compost to assist in rehabilitation establishment where there is no topsoil available.

2.3.4 Mining Operations

WWC previously mined the West Borehole coal seam using longwall mining techniques, up to a height of 4.4 metres. The target coal resource included a range of coal types from export coking to export thermal and domestic thermal. The target coal resource was part of the Newcastle Coal Measures. Past underground mining resources for WWC are were in the West Borehole Seam. The seam was up to 5 metres thick and is formed by the coalescence of seams that occur in the eastern part of the Colliery Holding, where mining was conducted in the past. LW 51 and LW 52 were the last two panels mined at WWC. The maximum mining height typically ranged from approximately 4.2 metres to 4.5 metres. Mining in LW 52 was completed in May 2016.

No mining operations are proposed at the OCAL Complex during the MOP term.

2.3.5 Coal Processing and Transport

Coal washing operations at the MCPP ceased in July 2016 with washing completed in October 2016.

No further coal processing will occur during the remainder of the MOP period.

2.3.6 Coarse Rejects and Tailings

Tailings and coarse reject generation ceased in July 2016. There will be no reject generation during the remainder of the MOP term.

The coarse reject generated as part of the previous operation have been placed on the eastern wall of the REA for future re-use in the capping of Tailings Dam.

2.3.7 Waste Management

General waste generated by the OCAL Complex is managed in accordance with the Waste Management Plan. Waste management practises are based on the waste management hierarchy whereby waste is minimised in the first instance, reused/recycled in the second instance and disposed of as a last resort. OCAL currently has a total waste management system which includes training, segregation, disposal and reporting. Waste is removed from site by a licenced contractor.

During demolition and mine closure there are a number of waste generated which will require management. Based on the closure strategies developed as part of detailed mine closure planning; generation of the following wastes are anticipated:

- Contaminated soil/fill;
- Wastewater (mine water, contaminated water);
- Sludge (dams, etc.);
- Tyres;
- General domestic waste (food, fabrics, etc.);
- General regulated wastes (medical wastes, batteries, oily absorbents, paint, oils, solvents, etc.);
- Recyclable wastes (paper, cardboard, aluminium cans, etc.);
- Asbestos;
- Construction wastes (brick, wood, piping, etc.);

- Carbonaceous material;
- Concrete; and
- Steel/scrap metal.

The strategies for management of waste materials generated from the Complex closure works are:

- Off-site recycling/recovery – wastes will be decontaminated and disposed off-site to suitable waste recycling and/or recovery facilities within 150 km of the OCAL Complex e.g. oils;
- Off-site landfilling and/or treatment – wastes considered unfeasible for processing for recycling will be classified and collected from individual domains and/or waste management hubs (See below) by licenced waste contractors for disposal off-site to EPA-licenced landfills or destruction in waste treatment facilities with the payment of associated disposal fees e.g. construction waste; and
- Use of temporary waste management hubs (WMHs) – the WMHs will be located in Domain 6 – Pit Top Facilities and Domain 9 – Surface Facilities. The Domain 9 WMH will include equipment for screening and crushing of high priority wastes (i.e. processing for on-site re-use) and for segregation and stockpiling of recyclable wastes (e.g. scrap metal). The temporary WMHs will be located on areas with existing hardstands within these domains. Both WMHs are easily accessible via public roadways.
- On-site encapsulation – wastes that cannot be reused in rehabilitation works and for which off-site disposal is not practicable will be considered for encapsulated on-site within engineered containment cells e.g. contaminated sediments/sludge;

2.3.7.1 Sewage

Whilst in operation, sewage and bathhouse wastewater generated at the WWC was treated on-site through the biological STP. Treated water was then pumped approximately 3.2 kilometres via a dedicated pipeline to the maturation ponds at the MCPP and subsequently used as process water. Wastewater at the MCPP is also treated through a biological STP and pumped to the maturation ponds.

Treated effluent was also piped from the Edgeworth STP to the maturation ponds for use in coal processing under EPL 1360. The WWC and MCPP sewerage systems are to be converted into appropriately sized transpiration systems which will be licenced through Lake Macquarie City Council. The Edgeworth pipe line will be partially removed and decommissioned.

2.3.7.2 Regulated Waste

The bulk storage facility at WWC has a maximum storage capacity of 55,000 litres and is bunded. This will be decommissioned and removed as part of the mine closure.

All oils, grease and detergents have been stored onsite within bunded, areas. The workshop wash down area is located so wash down water drains to newly installed oil/ water separator. The waste oil captured by the oil/water separator is collected by a licenced waste contractor for transportation to a treatment facility.

Throughout closure a licenced waste contractor will be engaged to dispose of wastes in accordance with the waste provisions of the *Protection of the Environment Operations Act 1997 (POEO Act)* and the *Protection of the Environment Operations (Waste) Regulation 2005.*

2.3.8 Decommissioning and Demolition Activities

Decommissioning and demolition has already commenced at the site following the cessation of longwall mining in May 2016, with a number of fans, shafts, bore holes and the drift having been sealed. It is expected that demolition works will be ongoing over the next 3-4 years. This is discussed in greater detail in the Domain specific scope of works included as **Section 6** through to **Section 24** below.

Generally though the decommissioning of infrastructure at the OCAL Complex will include the following:

- Updating the HSEC Management Plan as required;
- Liaising with service providers for scheduling;
- Decommissioning, depressurising and isolating energy sources;
- Diverting services where required;
- Purging service lines air, water, fuel, etc.;
- Identification and removal of hazardous materials;
- Draining and bleeding tanks, lines, machinery, storage vessels, motors, etc.;
- Removing redundant cabling, conduits, pipework, etc. as appropriate;
- Recording disconnection of services and completed decommissioning activities e.g. purged vessels, disconnected electricity;
- Salvaging items, plant and infrastructure (see the section on asset salvage/management);
- Disposing of decommissioning wastes; and
- Updating the site service plan as required.

The demolition of infrastructure to be removed at OCAL Complex will generally be undertaken as follows:

- Development of detailed demolition project management plans to address key aspects including quality, waste management, hazmat, traffic management and health and safety;
- Mobilisation of plant and equipment to the various sites requiring demolition;
- Site establishment including installation of safety signage, temporary fencing, etc.;
- Risk assessment prior to commencement and determine structural engineering requirements where applicable;
- Segregating and recovering scrap and salvage materials as practicable for recycling, etc.;
- Demolition of above ground fixed plant and infrastructure down to ground level, and removal of hardstands and footings to a depth of 1.5m;
- General site grading upon completing removal of footings;
- Removal of bitumen surfaced roadways within the mine area that will not be retained;
- Segregation of demolition wastes and debris to facilitate disposal to licenced offsite landfill; and
- Demobilisation of plant and equipment.

The decommissioning and demolition processes will include supervision, site documentation and engineering considerations or requirements. Personnel and contractors will be appropriately licenced demolition companies for the works to be undertaken in accordance with AS2601-2001.

2.3.8.1 Retained Infrastructure

Where infrastructure is to be retained post mining for some other beneficial land use, a new owner will be identified and they will be responsibility for the maintenance, up-keep of the infrastructure.

2.3.8.2 Salvage and Removal of Surface Equipment

The decision to salvage selected assets for sale for scrap material value, resale for ongoing use, or distribution to other Glencore operations was made based on the outcome of a Risk Assessment and detailed cost benefit analysis. Plant and equipment that was salvaged from the site is being temporarily stored in designated hard stand areas prior to removal off site. Prior to storage, all equipment and machinery has been inspected for any actual or potential leakages, which were appropriately contained and treated. Regular inspections will continue whilst the machinery/equipment is stored on site.

Any equipment not proposed for salvage will be disposed of on site in accordance with an approved Waste Management Strategy, transported to a suitable industrial scrap material recycling facility or transported to the appropriate waste recycling / landfill facility in accordance with all regulatory requirements and Australian Standard *AS2601-2001: The Demolition of Structures*.

As part of detailed mine closure planning and decommissioning of the underground asset registers were prepared for the following key aspects/locations.

The prepared equipment list includes information on the surface locations; asset type, number, description, specific (last underground) location, and salvage, status (recovered or not), nominated storage location on surface. In addition in includes comments on the potential value and use elsewhere in the company, interested parties and actions. A full list is attached as **Appendix D**.

Table 8 below provides a summary of the general asset register for the WWC.

Table 8 General Asset Register for WWC

General Asset Register listing assets for WWC*	
• pumps, • software, • methane drainage plant (Teralba Southgate, etc.), • substations, • drift haulage equipment, • drive heads, • conveyor belts and associated structures, buildings, • fencing, • high tension cables, • jib ends, • skips, • WWC drifts and shafts, • water heaters, • water tank, • transformers, • oil storage sheds, • vent fans, • surface compressors and pipework, • oil/water separators	• Portable Methanometer, • light poles, • furnishings and fittings, • sewage Treatment Plant, • fibreglass acid storage tanks, • fibre optic links, • explosives magazine, • mine dewatering borehole system, • light vehicles, • cameras and video monitoring e.g. CCTV, • trailers, • computers, • mobile equipment (forklift, dozer, etc.), etc. • longwalls, • conveyors, • shuttle cars, • hired assets, • air compressors, • auxiliary fans, • forklifts, • gensets,

General Asset Register listing assets for WWC*	
• portable gas monitors, • underground diesel tanks and • bay, Joy 15SC Shuttle Cars, • continuous miners, • shearers, • concrete dozer refuelling pad	• substations, • trailers, • road registered vehicles, • ventilation fan systems, • winders and QDS.

*Note that a number of these assets have now been removed from WWC (sold or disposed as waste)

A number of the identified underground assets were salvaged and stored on the surface including the Longwall chocks that are stored at surface at the Bottom Yard; the Diesel bay hose reels, air pumps and oil pods for gear, and hydraulic, engine and waste oil from SWDB, UPS batteries for gas monitoring equipment along with some high value assets including the NLT nodes. The underground toilets were recovered during the last week of underground works prior to sealing.

Surface storage of the underground assets commenced with key locations including Top Yard, Bottom Yard, Grave Yard, Surface Motor Store, Electrical Workshop, and Westside. Notwithstanding, some of the equipment has been taken by other Glencore sites, this includes a grader, water tank, 40 man car from drift winder, conveyor frames, magnet on conveyor, and a tyre loading frame.

Where a future use has not been determined and the equipment is no longer required it has been assessed and recovered for scrap.

Not all equipment in the underground was removed with some equipment being unsafe or impractical to recover. This equipment was decommissioned and decontaminated (including drained) where relevant and left underground (e.g. 11 kV isolator/circuit breakers, auxiliary fan, continuous miner, conveyor belting, longwall roof supports).

Key considerations for equipment to be left underground included:

- Transformer oil was drained; and
- Underground bulk fuel storage system were drained after last required usage and prior to sealing the mine.

A few pieces of equipment retained underground could not be accessed for draining oils due to lack of access, previous sealing, etc. e.g. substations 11kV/690/415 volt and 11/415v 500kVA (*note this was considered in groundwater modelling and risk assessment*) and a few pieces of underground equipment could not be located.

Similarly, a list was prepared for the MCPP which included a general equipment register, MCPP Screen register and MCPP gearbox register. All the equipment lists include specifications, age, quantity and the documented service history alongside photographs of the equipment. The MCPP Conveyor Belt Register describes the conveyor belt and its current condition, rating, width, plies, grade, cover thickness, length and last available report.

2.3.8.3 Shaft, Drift and Borehole Sealing

The following sites listed in **Table 9** have been identified as needing to be sealed (listed by associated operations). With the exception of the LW11 dewatering hole off Wakefield Road, all WWC mine entries have been sealed in accordance with EDG2 to allow the mine ventilation system to be turned off. The remaining Teralba Northgate and Teralba Southgate entries are planned to be sealed during the term of this MOP.

Table 9 List of Shafts, drifts and boreholes to be sealed at the OCAL Complex

List of Shafts, drifts and boreholes	

WWC ~~(Sealing complete with exception of LW 11 dewatering borehole)~~	• WWC Shaft#1 Elevator (Domain 6 Pit Top Facilities) (Sealed);
	• WWC Shaft#2 Upcast fan shaft (Domain 12 Infrastructure) (Sealed);
	• WWC Shaft#3 Upcast fan shaft (Domain 12 Infrastructure) (Sealed);
	• Drift (Domain 6 Pit Top Facilities) (Sealed);
	• WWC Service Boreholes
	  ○ Fan 3 Site (Domain 12 Infrastructure)
	  ▪ Ballast Borehole (Sealed);
	  ▪ Blocked Ballast Borehole (Sealed);
	  ▪ Nitrogen Borehole (Sealed);
	  ○ WWC Pit Top (Domain 6 Pit Top Facilities)
	  ▪ 2 x Electrical Boreholes(Sealed);
	  ▪ 2 x Water Boreholes (Sealed);
	  ▪ 1 x Diesel/ Solcenic (Sealed);
	  ▪ 1 x OLD Diesel/Solcenic (Sealed);
	  ○ Off Wakefield Rd (Domain 12 Infrastructure)
	  ▪ LW11 dewatering hole (off Wakefield Rd) – Piezometer to be installed.

Northgate	• Northgate Shaft#1 Elevator (Domain 11 Teralba Northgate) (Sealed); • Northgate Shaft#2 Upcast fan shaft (Domain 11 Teralba Northgate) (Sealed); • Northgate Shaft#3 Upcast fan shaft (Domain 1 Admin, Workshop Haul Road) (Sealed); • Northgate Shaft#4 Upcast fan shaft (Domain 1 Admin, Workshop Haul Road) (Sealed); • Northgate Drift (Domain 11 Teralba Northgate) (Sealed); • Wakefield Drift (Domain 11 Teralba Northgate (Sealed).
Southgate	• Southgate Service Boreholes (Domain 13 Teralba Southgate) (Sealed); • Australasian Seam Drift Old Pacific (Domain 13 Teralba Southgate) (Sealed); • Fassifern Seam shaft Old Pacific (Domain 13 Teralba Southgate) (Sealed); • Great Northern Seam Drive Old Pacific (Domain 13 Teralba Southgate) (Sealed); • Fassifern Seam Drift Old Pacific (Domain 13 Teralba Southgate) (Sealed).
Others	• A Shaft Old Pacific (outside domains) (Sealed); and • Coyle's Shaft Old Pacific (outside domains) (made safe but not sealed as per DRG guideline as the site has heritage status).

The sealing strategy adopted for OCAL Complex includes the following activities:

- Underground sealing works – pumping for access as required, decommissioning of services, sealing service boreholes at base, and installation of bulkheads and/or concrete plugs in shafts/drifts as required; and
- Surface works – site establishment (secure access including fabrication where required), dismantle elevator and fan sections, decommission services at surface including elevator and dolly car, demolish fans and associated buildings/infrastructure, remove lightning paths, fill openings (including aboveground grouting boreholes), complete capping and site demobilisation.

As required, all sealed openings will be surveyed after rehabilitation works are completed and monitoring for key aspects including methane emissions, settlement, etc. will be undertaken.

Where required identified strategies for sealing have and will generally include:

- Services will be decommissioned and cables etc. removed where practicable;
- Doors will be installed to facilitate delivery of grout and fill;
- Fill material sourced from Westside will be nominally graded (300 mm diameter with minimal fines and 20% maximum clay content) and moved along transport routes that include public as well as mine owned roads. Traffic Management Plans (including diagrammatic travel routes, entry and exit points considering signage, power lines, and concrete barriers/windrows etc.) and appropriate notifications will be used to manage this process;
- Concrete/grout fill will be placed above the water table level using methods that ensure segregation of the grout product does not occur and voids are not present in the final grout mass;
- Concrete will be delivered to drifts using a tremie concrete placement method via concrete pump line through lined boreholes;
- Shaft caps will be vibrated during concrete placement;
- Shaft grout fill will be non-segregating;
- Borehole grout fill will be high pumpable grout and borehole concrete will be quick setting grout;
- Existing concrete collars will be retained for development of the final capping seal (if adequate);
- Surface infrastructure will be removed to construct the final capping seal;
- Surface bulkheads will be covered by mounding earth over the area;
- Brass plaques will be created and placed in visible locations fixed to concrete footings to specify name of the opening, colliery name and date of sealing to MDG6001 requirements;
- Final signoff will be obtained from an appropriately qualified engineer and monitoring implemented where required; and
- Requisite information will be presented to the DR~~G~~ for acceptance of the rehabilitated openings and associated landforms once completed.

Central to the sealing programme is sequencing of these works, gas management and ventilation management. Health, safety, environment, community, quality and site security aspects are also key; emergency preparedness will be maintained throughout the programme and the safety and other aspects managed as outlined in accordance with the site safety management plan.

If required, ventilation will be maintained as required to allow access for all underground sealing works and surface works based on risk and regulatory stipulations. Site-specific risk assessments will be conducted for mine entry sites prior to above and below ground works.

Sealing Inspection and Testing Procedures (ITPs) will be kept in a control list and are required for the following:

- Bulkheads – pre pour inspection;
- Final shaft caps – pre pour inspection;
- Borehole Sealing – underground plug;
- Borehole sealing – aboveground grouting;
- Shaft fill;
- Civil compaction to drift;
- Lightning path removal to drift and shafts; and
- Survey of concrete plug.

2.3.8.4 Site Services

All services on the surface (not required post mining for an alternative use) including power, water and telephone will be disconnected and terminated to make them safe. The inspection pits and junction boxes for underground services will be sealed. Generally all underground services will be made safe and left buried in the ground. Overhead power lines will be removed and the materials (i.e. poles and wire) recovered for potential re-sale or recycling as applicable.

2.3.8.5 Buildings and Fixed Plant

All coal clearance infrastructure at the site will be decommissioned and demolished or sold. Where it cannot be sold or recycled, the demolished materials will be separated and will either be disposed of on site in accordance with an approved Waste Management Strategy or transported to licence recycling and waste management facilities.

The crushers, conveyor gantries and coal bin will be dismantled and removed off site. All concrete footings will be broken up and removed. Where this is not possible they will be covered, surveyed and marked on the as-constructed final landform drawings for the site. Concrete and other inert waste generated from this process will either be disposed of on site in accordance with an approved Waste Management Strategy or disposed of to an appropriately licensed landfill or recycled for reuse where viable.

This is discussed in greater detail in the Domain specific scope of works included as **Section 6** through to **Section 21** below.

2.3.8.6 Roadways and Car parks

All roadways and carparks will generally be retained for the post- mining land use.

2.3.8.7 Product Coal Stockpile Reclaim Tunnel

The reclaim tunnel under the product stockpile at the MCPP will be recovered where practicable. Where this cannot be achieved, the voids (tunnels, etc.) will be backfilled and sealed to make them safe. Remnant structures that are buried at depth will be surveyed and marked on the as-constructed final landform drawings and listed on the Section 149 Certificate for the site.

2.3.9 Temporary Stabilisation

Temporary rehabilitation will be undertaken to control wind-blown dust and assist in mitigating visual impact where required. It is considered opportunistic and therefore not specifically shown on the plans. The most likely area where this may be used is on the Tailings Dam and REA.

2.3.10 Import of growth media

During the MOP term, material will be sourced from offsite to be used in rehabilitation activities. Material will either be placed directly onto rehabilitation works or stockpiled in existing stockpile locations. Details are provided in the *Materials Management Protocol* (**Appendix J**).

2.3.11 Progressive Rehabilitation and Completion

Rehabilitation activities over the MOP term are shown on **Plans 3A** to **3H**.

In summary, a total of 19.38 ha of pasture rehabilitation and 133.85 ha of bushland rehabilitation were completed at the OCAL Complex at July 2016.

Table 10 is a summary of the current rehabilitation status as well as the proposed rehabilitation during the term of the MOP within each domain.

Table 10 Bushland Revegetation Species Mix and Sowing Rate

Domain	Total Area (ha)	Undisturbed Vegetation (ha)	Existing Bushland Rehab (ha)	Existing Pasture Rehab (ha)	Required Bushland Rehab (ha)	Required Pasture Rehab (ha)	Comment
1	7.54	3.91	0.6	-	0.29	-	2.74 ha dams, infrastructure, hardstands
2	40.30	0.18	42.15	-	2.07	-	1.46 ha dams, roads
3	70.42	-	56.75*	-	8.84	-	2.89 ha dams, roads, 1.94 ha subsidence
4	42.89	-	2.57	1.31	9.83**	8.28**	20.24 ha void and spillway, roads, 0.66 ha subsidence
5	33.07	31.63	N/A	-	0.29	-	0.17 ha roads, 0.98 ha subsidence
6	22.69	9.55	-	0.93	0.62	0.27	11.31 ha dams, roads, hardstands
7	34.96	-	-	-	5.22	29.69	0.05 ha spillway
8	59.31	5.85	-	-	-	50.61	2.85 ha dams, spillway
9	59.73	17.06	-	-	6.73	-	35.93 ha dams, spillways, roads, hardstands, infrastructure
10	12.22	-	-	-	-	7.52	4.70 ha dams, roads, substation
11	12.99	1.20	-	5.46	1.43	2.76	2.13 ha wetlands, infrastructure, roads, hardstand
12	21.88	4.27	-	-	9.53	0.01	8.08 ha roads, infrastructure, hardstands, dams
13	7.05	2.85	-	-	-	-	4.20 ha dams, hardstands
14	707.1	627.69	-	-	11.81	-	67.14 ha wetlands, spillways, roads, dams, infrastructure 0.44 ha subsidence
15	1,092	1091	N/A	-	TBD	-	0.97 ha infrastructure
16	30.53	-	-	-	-	-	30.53 ha residential

**Some of the 56.75 ha of existing rehabilitation in Domain 3 requires maintenance works*

***9.11 ha bushland and 7.73 ha pasture rehabilitation require complete rework and are included in new required rehabilitation.*

No areas outside of domains requiring rehabilitation have been confirmed; however, OCAL has made provision for this.

The following strategies will be utilised for the remaining rehabilitation at the OCAL Complex:

- Bio-solids or organic compost will be used as growth media where topsoil is not available as there is a significant topsoil deficit across the site. The use of biosolids will be in accordance with the current EPA guidelines;
- In the absence of topsoil, and where biosolids cannot be used due to restrictions, ameliorated subsoil or other suitable growth media (eg. composted material) will be spread at a depth of 100 mm over the final landform;
- Spreading of growth media will be performed with a grader or dozer; this will comprise a single pass application for the spreading of topsoil/subsoil so as to not overwork, over roll or over track the material thus causing excess compaction and structure loss;
- The use of fertiliser/organic amendments will be determined after further soil testing of subsoils and potential substrate material amelioration after recommendations from an appropriately qualified Soil Scientist (or similar). Spreading of fertiliser and/or gypsum using a mechanical spreader will be undertaken prior to ripping for incorporation if required;
- In all domains (except Domain 7 and Domain 8 where tailings and/or reject material may be bought to the surface) ripping along the contour will be undertaken to a depth of 300 mm with a tyne spacing of 0.75 - 1 m with a Cat D6-D7 or equivalent dozer. Ripping will be used immediately prior to seeding to incorporate ameliorants, fertiliser and to assist in the prevention of land slip, vegetation penetration deep into the soil profile, encouraging water infiltration and percolation, and minimising erosion. Any large rocks brought to the surface will be raked aside and reburied;
- Domain 7 and Domain 8 surfaces will be harrowed to a 100 mm depth after application of growth media immediately prior to seeding;
- Direct seeding will be undertaken by hand seeding, a seed spreader, or helicopter considering site safety considerations, area being seeded, timing, site access and associated efficiencies and economy. As the OCAL Complex is in a coastal area, direct seeding may be undertaken year round as required; and
- Hydro-mulching will be used to enhance pasture establishment on batter areas such as the Northern Embankment of the capped and covered Tailings Storage Facility (Domain 7) and Reject Emplacement Area (Domain 8). Seed, fertiliser, mulch, soil binder and water will be thoroughly mixed together in a hydro-mulcher to provide a slurry and then applied under pressure onto the batter by operators trained in the use of the equipment using selected rates for fertiliser and pasture seed. Wood-fibre mulch will be included at 2.5 tonnes/ha and polymer binder at 250 litres/ha.

Bushland:

- After ripping, establish various native tree, understorey and Acacia species (see **Table 11**) by directly seeding at a rate of 7.5 kg/ha with a seasonal cover crop (millet in spring, oats in autumn at 2 kg/ha).

Pasture:

- A suitable di-ammonium phosphate (DAP) fertiliser will be applied at 300 kg/ha; and
- After ripping, establish a mixture of seasonal cover crop (millet in spring/summer, oats in autumn/winter at 10 kg/ha) and pasture species at a rate of 45 kg/ha (see **Table 12**).

Table 11 Bushland Revegetation Species Mix and Sowing Rate

Species	Sowing Rate (kg/ha)
Tree Species	
Spotted Gum (*Corymbia maculata*)	0.4
Forest Red Gum (*Eucalyptus tereticornis*)	0.3

Species	Sowing Rate (kg/ha)
Sydney Peppermint (*Eucalyptus piperita*)	0.3
Red Bloodwood (*Eucalyptus gummifera*)	0.2
Swamp Mahogany (*Eucalyptus robusta*)	0.4
White Mahogany (*Eucalyptus umbra*)	0.2
White Stringybark (*Eucalyptus globoidea*)	0.3
Red Ironbark (*Eucalyptus fibrosa*)	0.3
Hard-leaved Scribbly Gum (*Eucalyptus haemastoma*)	0.2
Red Mahogany (*Eucalyptus resinifera*)	0.3
Cabbage Gum (*Eucalyptus amplifolia*)	0.3
Smooth Barked Apple (*Angophora costata*)	0.4
Rough Barked Apple (*Angophora floribunda*)	0.3
Mid and Understorey Species	
Black She-Oak (*Allocasuarina littoralis*)	0.2
Lemon-scented Tea Tree (*Leptospermum polygalifolium*)	0.2
Giant Honey Myrtle (*Melaleuca armillaris*)	0.3
Large-leaf Hop Bush (*Dodonaea triquetra*)	0.2
Heath Parrot Pea (*Dilwynia retorta*)	0.2
***Acacia* Species**	
Sydney Golden Wattle (*Acacia longifolia*)	0.6
Hickory Wattle (*Acacia falcata*)	0.5
Green Wattle or Black Wattle (*Acacia decurrens*)	0.4
Red-stemmed Wattle (*Acacia myrtifolia*)	0.6
Sunshine Wattle (*Acacia terminalis*)	0.4
Total Tree , Understory and *Acacia* Species	**7.5**
Cover Crop	
Japanese Millet in Spring/Summer	2
Oats in Autumn/Winter	2
Total Cover Crop Species	**2**
Total Seeding Rate	**9.5**

Table 12 Pasture Species Mix and Sowing Rates

Species	Sowing Rate (kg/ha)
Pasture Species	
Couch Grass (*Cynodon dactylon*)	8
Paspalum (*Paspalum dilatatum*)	5
Kikuyu (*Pennisetum clandestinum*)	5
Perennial Ryegrass (*Lolium perenne*)	7
Green Panic (*Panicum maximum*)	5
Lucerne* (*Medicago sativa)*	5
White clover* (*Trifolium repens*)	5

Species	Sowing Rate (kg/ha)
Subterranean clover* (*Trifolium subterraneum*)	5
Total Pasture Species	**45**
Cover Crop	
Japanese Millet in Spring/Summer	10
Oats in Autumn/Winter	10
Total Cover Crop Species	**10**
Total Seeding Rate	**55**

** Legumes inoculated with Rhizobia and lime pelleted prior to sowing*

2.3.12 Material Production Schedule

The OCAL complex is no longer operational therefore a material production schedule is not required.

Notwithstanding, during the closure of OCAL Complex there will be a requirement to move coarse rejects material to cap the Tailings Dam. In addition a further 0.5m of growth media is planned to place over the placed rejects cap to facilitate the quick establishment of a vegetation cover.

In addition, there will also be a requirement to move carbonaceous and other unsuitable material around the site during closure.

These volumes are discussed in greater detail in the Domain 7 and 8 scope of works included as **Sections 12** and **13** below.

2.3.13 Subsidence

WWC has developed an Extraction Plan for LW 51 and LW 52 (WWC SD PLN 0128) in accordance with Condition 5 of Schedule 3 of PA09_0203. The Extraction Plan was approved in May 2015. Further detail on subsidence monitoring and remediation at OCAL is discussed in **Section 3.2.3** below.

3 ENVIRONMENTAL ISSUES MANAGEMENT

3.1 Environmental Risk Assessment

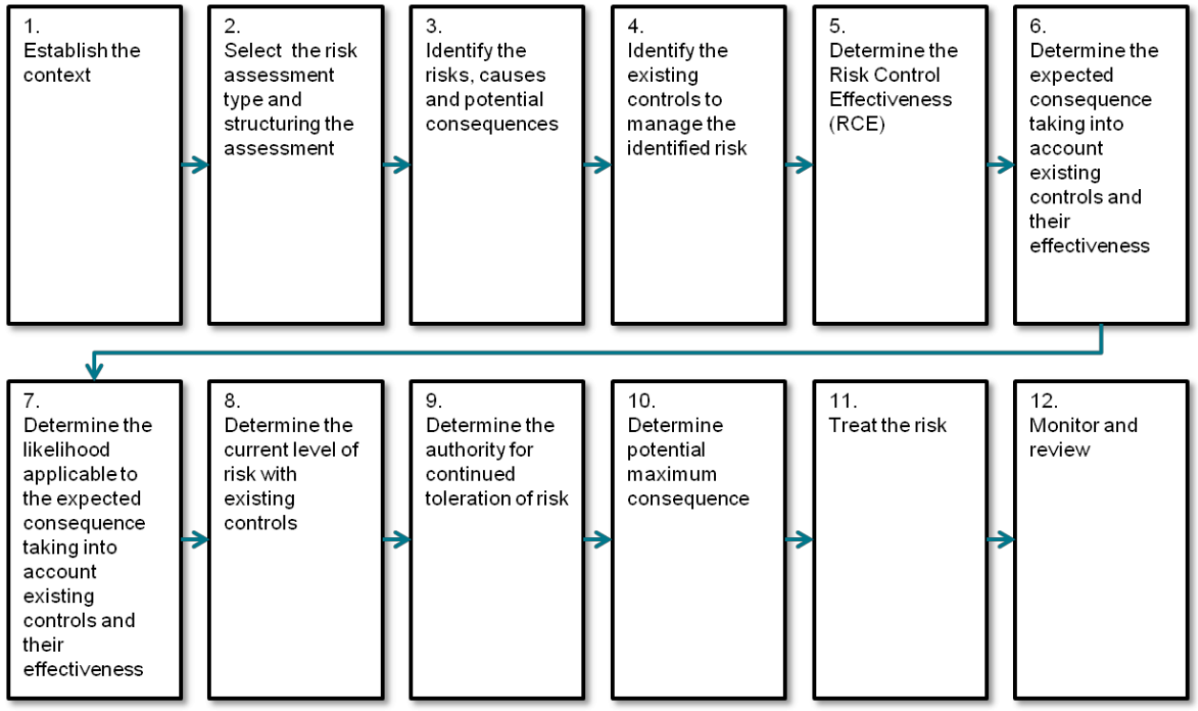
The GCAA Risk Management Standard stipulates that management must systematically assess, monitor and review risks and that an appropriate risk assessment must be performed for relevant business activities and identifies controls critical to the achievement of the overall objectives of the relevant activity. The methodology utilised for risk and hazard identification for closure was in accordance with the GCAA Mine Closure Planning Protocol, GCAA Risk Management Standard and Matrix.

The closure risk assessment considered and recorded:

- Identified risks/hazards and opportunity events, causes and potential consequence/impact;
- Current preventative and/or mitigative controls/management strategies;
- Whether the item identified is a risk or opportunity;
- Effectiveness or adequacy of existing controls;
- Consequence category (i.e., Health and Safety, Environment, Financial, Reputation, Legal etc.);
- Probable consequence with current control measures in place and potential maximum consequence;
- The likelihood of the event occurring with that consequence, considering existing controls and their effectiveness; and
- Any additional controls/actions to be included in a forward works plan.

The risk management process is summarised in **Figure 2:**

Figure 2 The 12 Steps Risk Management Process (GCAA Standard Risk Management)



Three working groups were established to participate in the risk assessment workshops and provide input for the OCAL Complex closure risk registers.

Potential issues considered during the risk assessments included a range of key aspects. A summary of the relevant topics considered is included below:

- Erosion and surface water management;
- Safety and health;
- Legal and compliance requirements e.g. National Greenhouse and Energy Reporting;
- Water management (surface and underground);
- Contaminated land;
- Waste management;
- Gas drainage;
- Geology, geochemistry and geotechnical;
- Rehabilitation – landform design and earthworks;
- Rehabilitation – revegetation and biodiversity re-establishment;
- Monitoring;
- Infrastructure and fixed plant;
- Mobile equipment;
- Human resources;
- External relations;
- Cultural and historical heritage;
- Closure costs;
- Tenure and land ownership;
- Joint Venture and commercial; and
- Interface with surrounding operations and other Glencore Operations

An Initial Closure Risks and Opportunities workshop was conducted on 1 April 2016 with a further mid-point Risk Assessment being undertaken for the closure project on 28 July and the 3 August 2016. The final mine Closure Risk assessment following the completion of all technical studies was completed on the 10th November 2016.

The risk assessment was undertaken in accordance with AS/NZS ISO 31000:2009 *Risk Management – Principles and Guidelines*, the *Risk Management Handbook for the Mining Industry (MDG1010)* as well as the Glencore Coal Assets Australia Risk Standard.

A risk assessment approach was undertaken during the investigations, assessments, studies, etc. and while technical reports and plans were under development for detailed closure planning. Accordingly, additional risks were identified through this process and updates made to previous risks based on completed actions and outcomes.

Actions implemented as a result of this assessment included incorporation of additional aspects in the ongoing investigations or where necessary commissioning of new/additional studies.

The completed risk assessment appropriate to this MOP is provided in **Appendix E**. The risk assessment was reviewed as part of MOP Amendment A and key risks relating to the import of material from offsite are discussed in the *Materials Management Protocol* (**Appendix J**). **Section 3.2** provides details of environmental management measures for the medium and low risks to rehabilitation, and **Section 3.3** discusses the management of the key risks to rehabilitation at the OCAL Complex.

3.2 Environmental Risk Management

The OCAL Environmental Management System (EMS) is the primary system for the management of environment and community aspects and impacts associated with the OCAL Complex. The OCAL EMS includes a range of management plans and procedures which are applicable to all OCAL operations. Each individual site also has its own Environmental Management Plan (EMP) or Environmental Management Manual (EMM) which sits under the umbrella of the OCAL EMS and addresses site specific environment and community aspects and impacts.

Documents such as management plans and procedures are regularly reviewed and updated in accordance with regulatory requirements, changes in operations or as required by review of the Environment and Community Operational Risk Assessment. New management plans and procedures are developed for the operation as required and it is intended that they will be fully reviewed for closure execution.

Copies of all relevant Environmental Management Plans can be found at the following website: http://www.westwallsendcolliery.com.au

The following sections describe the general environmental management of environmental issues for this MOP term. Management and mitigation of issues that present key risks to achieving rehabilitation success are discussed below.

3.2.1 Geology / Geochemistry and Geotechnical

The risk to rehabilitation relating to geology/geochemistry and geotechnical issues at the OCAL Complex was assessed during the Risk Assessment.

The land within the previous mining areas is shown on **Plan 3A**, with the land located to the east of the M1 Motorway and south east of the Sugarloaf Range. The previous longwall panels were located within undeveloped bush land consisting of the lower slopes and foothills of the Sugarloaf Range, with ridges and creek gullies.

There are no landscape features as defined in Schedule 3, Condition 1 of PA09_0203 mapped within the previous mining area, with the exception of an area of steep slopes (approximately 8.3 hectares). The steep slope areas generally range from 18° and 35°. The height of the slopes range from approximately 30 metres to 40 metres above the valleys.

The stratigraphy of this previous mining area, as in many other parts in the Newcastle coalfields, is marked by rapid lateral variations in inter-seam sediment thicknesses/intervals, resulting from the deposition of sandstone and conglomerate channels. The targeted coal resource included a range of coal types from export coking to export thermal and domestic thermal.

The surface terrain above the targeted coal resource was formed by the Moon Island Beach Sub-Group of the Newcastle Coal Measures. Sandstone and conglomerate of the Teralba Conglomerate Formation dominate the ridges within the Tuffaceous claystone (Awaba Tuff), siltstone and coal seams (Fassifern Seam) generally underlie the near surface conglomerate units.

In relation to geochemistry, the key risks related to a lack of understanding around the characteristics of the capping material either currently onsite or to be brought onto site as part of any future capping project (which were considered a medium risk to closure during the Risk Assessment). This is currently managed through the *Procedure for Receipt of Capping Material which has* recently been updated to include details of handling procedures for topsoil and other substitutes brought into the site for rehabilitation.

Further work was undertaken by SLR during the preparation of the Detailed Mine Closure Plan to better understand the geochemistry of the coal rejects and the coal stockpile material. This is discussed in **Section 3.2.1.2** and **3.2.1.3** below.

3.2.1.1 Geotechnical

SLR prepared a Geotechnical Constraints Report as part of the detailed Mine Closure Plan using a process including a desktop study/document review as well as site assessment with a walkover of key areas. In addition to this work, SLR engaged Steve Ditton to prepare a subsidence risk map for all the old workings around the OCAL complex. Further discussion on this is contained within the Subsidence section (see **Section 3.2.2**) below.

In addition, ATC Williams was engaged by SLR to support a review the Tailings Dam and REA landforms. The key outcomes relate to the long term stability of the Tailings Dam and REA landform as well as the other embankments on the existing dams that are being retained. The Tailings Dam and REA are also subject to routine inspections by a certified engineer with a dam inspection/report required under Dam Safety Committee approval. This risk was deemed low during the Risk Assessment and these inspections are programmed to continue annually beyond the cessation of mining.

Sections 12 & 13 outlines in more detail the decommissioning and closure activities relating to the Tailings Dam and REA. This section includes a summary of a range of land form options being considered as well as an assessment undertaken by ATC Williams who were engaged by SLR to review the embankments and prepare the tailings capping concepts.

In addition to the areas discussed above, an area of the Westside Open cut southern high wall was historically auger mined. This area is now subject to subsidence and surface cracking resulting in potholes and areas of instability. On 30 June 2008, a surface subsidence event occurred whereby approximately 200 m of the southern high wall failed, resulting in surface cracking and differential subsidence.

Investigation of the incident found that the failure of the highwall was caused by geotechnical instability in old underground mine workings which was affected by auger mining operation in the lower coal seam. The remediation of this area is discussed further below in **Sections 8, 9 and 10** relating to Domains 3, 4 and 5.

3.2.1.2 Spontaneous Combustion

The potential for spontaneous combustion to impact on rehabilitation at the OCAL Complex is considered to be low across all sites. The possible exception is the WWC underground which has a medium level risk due to a low depth of cover within LW 51 and 52 (as assessed in the LW 51 and LW 52 Extraction Plan (WWC SD PLN 0128) risk assessment). Now that the mine is filling with groundwater, these risks have been eliminated.

There was historically a low risk of spontaneous combustion in the stockpiles or within the coal because the coal has a low volatile to fixed carbon ratio and therefore, a lower risk of spontaneous combustion. Additionally, the coal is typically high in montmorillonite which absorbs water and displaces air, as well as rejects material having a high ash content, which all contributes to a low risk of spontaneously combusting. To date there have been no incidences of spontaneous combustion at ROM and product stockpiles or at the REA.

Substantial civil works in Domain 7 and 8 are planned to enable the decommissioning and rehabilitation of the Tailings Dam. This will include utilising coarse rejects from the eastern emplacement to develop a cover, and create a free draining landform, prior to a suitable depth of suitable material be placed on top to establish a vegetated cover. It is proposed to transport any residual carbonaceous material (i.e. bedding coal and residual material from stockpiles, rejects that have been used for road construction etc.) back to the Tailings Dam / REA as part of the closure program.

SLR collected a number of samples around the site to undertake a geochemical and spontaneous combustion investigation. It was used to develop a more detailed understanding of the geochemical risks associated with using course reject material to cap / cover the Tailings Dam and the northern saddle dam embankment, and to validate the existing understanding of the spontaneous combustion potential of the residual carbonaceous material that will be removed as part of the closure execution works.

Target areas for the geochemical investigation were the coarse rejects from the REA and the haul road between WWC and MCPP. SLR was provided with anecdotal evidence that reject material was used for construction and/or remedial works on the haul road. A portion of the haul road will be removed as part of the current closure works program, and therefore the suitability of this material for use in the Tailings Dam rehabilitation works needed to be determined.

The thermal and coking coal product stockpiles, and the Westside “rubbish coal” stockpile (Lucky’s Pad) were also target areas for the spontaneous combustion investigation. Bedding coal samples from the thermal and coking coal product stockpiles was unable to be collected as the stockpiles were full, so product samples were collected and evaluated as a worst case scenario (i.e. that bedding coal from these areas would contain silt, sand and gravel and further reduce the potential for spontaneous combustion). Samples collected from Lucky’s Pad included some residual stockpile material, and representative sampling of the residual bedding coal following previous scalping works.

The spontaneous combustion investigation program included four composite samples and involved Relative Ignition Temperature (RIT) tests on each sample, and Adiabatic Self Heating Tests (T70) on two of the four composite samples.

The four composite samples taken from the thermal and coking coal stockpiles and Lucky’s Pad returned Relative Ignition Temperatures results between 159˚C and 167˚C. As all the samples tested within the middle of the range between “troublesome’ and “safe”, two samples were subjected to the Adiabatic Self Heating test. The thermal coal stockpile sample showed a self-heating rate of approximately 0.75˚ / hour (i.e. a moderate propensity to spontaneous combustion), and the Lucky’s Pad sample showed a self-heating rate of below 0.25˚ / hour (i.e., low propensity to spontaneous combustion).

3.2.1.3 Acid Mine Drainage

Acid mine drainage (AMD) is not considered to be an issue within the OCAL Complex. It is not considered to be an issue at due to low propensity for coarse and fine rejects materials emplaced at the site to leach acid. McColl (1981) characterised rejects at the MCPP and concluded that due to the insignificant pyrite content and any acidity produced would be likely to be absorbed by the alkaline material of the reject (McColl, 1981).

At Westside Mine the Great Northern seam overburden and associated soils are slightly acidic in the range of 5.1 to 5.5, although these pH levels are not indicative of oxidised sulphide minerals and associated clay minerals that would form acid mine drainage.

The geochemical investigation program included 12 samples (10 individual and 2 composite) and involved the determination or calculation of the following:

- Multi-element analysis;

- Existing pH and Electrical Conductivity
- Existing Salinity
- Total sulphur content and sulphur speciation;
- Maximum potential acidity (MPA);
- Acid neutralising capacity (ANC);
- Net acid producing potential (NAPP); and
- Net acid generation (NAG) capacity.

Most of the rejects samples were slightly enriched with arsenic, mercury, selenium and sulphur when compared to median concentrations reported for background soil, otherwise, the concentrations of other elements of environmental importance in the coal mineral coarse rejects were similar to the median values reported for background soil. One sample taken from the haul road (MP-HR-TP05), was significantly enriched (GAI.3) with selenium (5 mg/kg) and uranium (29 mg/kg), and more generally the elemental analysis results suggest it is anomalous in comparison to all the other samples.

All of the rejects samples were slightly alkaline and all but one was either non-saline or only slightly saline. One sample (MP HR TP05-R) had no capacity for neutralisation of acid, and all other samples tested had small capacities. Although sulphur contents were slightly elevated based on the elemental composition analysis, the NAPP and NAG test results suggest that the rejects represented by 10 of the 12 test samples will be Non Acid Forming. The classifications of the other two samples were uncertain due to conflicting NAPP and NAG results, but based on the results that are currently available it is expected that the rejects as represented by the two uncertain samples will also be Non Acid Forming

3.2.2 Mine Subsidence – Historical Mining Areas

SLR engaged, Ditton Geotechnical Service (DgS) to undertake a preliminary assessment of the possible long-term subsidence risks due to the instability of the historical OCAL workings (dating back to circa 1970s).

The OCAL mine workings included were the underground coal mine workings by West Wallsend No. 2 and Teralba Collieries in the Borehole (BH), West Borehole (WBH) and Young Wallsend (YW) Seams (circa 1970's to 2016); the BH Seam converges with the YW Seam to become the WBH Seam in the western area of West Wallsend No. 2 Colliery.

The old mine workings consist of first workings and second workings with bord and pillar, pillar extraction and longwall panels present in each seam. The cover depth over the YW Seam varies between 150 m and 380 m in the study area. The BH Seam mine workings are approximately 20 m to 30 m below the YW Seam, with cover depths ranging from 180 to 400 m (there are no BH Seam mine workings below a depth of 345 m). The WBH Seam mine workings exist between 80 m and 320 m depth. It is important to note that other Non-OCAL mine workings that also exist in higher level seams may also contribute to the long term subsidence predictions.

The mining heights in the YW Seam panels were nominally 3.1 m, but typically increased to 3.3 m due to the collapse of the coal unit between the Nobby's Tuff and the YW Seam. Mining heights in the BH seam ranged from 2.1 m to 2.2 m in the FW panels, and ranged from 1.6 m to 1.8 m in the Longwall panels due to seam thickness constraints.

The assessment considered the potential for future mine workings instability and estimated the maximum subsidence that could occur above OCAL mine workings. It is intend that this information could be used as a guide for the likely design constraints that will be required or defined by Subsidence Advisory NSW (SANSW) for future re-development proposals sited above these workings. Further detailed estimates may be required for specific structures or infrastructure.

Based on the age and the location of the old mine workings, it is considered that the area contains several zones in which the risk of post-mining subsidence may be sufficiently 'low' for future developments to be designed to tolerate relatively small magnitudes of subsidence.

Maximum subsidence above the OCAL mine workings due to future instability is estimated to range from < 20 mm to < 160 mm, depending on the type of workings and whether they have been flooded.

Future structures and infrastructure will probably need to be designed for potential subsidence up to 150 mm, tilts < 4 mm/m, curvatures < 0.2 km-1 and horizontal strains < 2 mm/m to satisfy SANSW "Safe, Serviceable and Repairable' Design Guidelines in Mine Subsidence Districts.

However, it is notable that the work by DgS was based on preliminary analysis and further detailed investigations mainly based on numerical modelling might be needed to accurately estimate the potential of further post-mining subsidence in each sub-area of the site, particularly in areas that contains multi-seam mining or First Workings adjacent to Second Workings.

In addition, areas where multi-seam mining has accorded with incomplete caving in the lower seam are assessed to have a 'Moderate' Risk of significant subsidence impact occurring in the future (i.e. subsidence > 150 mm).

The flooding of West Wallsend No 2 Colliery may result in additional subsidence due to strata softening or goaf reconsolidation effects. The Teralba Colliery workings are already flooded and have a lower risk of additional subsidence than the dry workings do.

Overall, the study has identified there is 'low' risk over the majority of the study area underlain by YW and BH Seam mine workings associated with OCAL mining complex, however, further merit based assessments of a given site and proposed development may therefore be necessary in Moderate Risk Zones (i.e. Multi-seam mining locations).

3.2.3 Mine Subsidence – Recent Mining Areas

WWC has developed an Extraction Plan for LW 51 and LW 52 (WWC SD PLN 0128) in accordance with Condition 5 of Schedule 3 of PA09_0203. The Extraction Plan was approved in May 2015. Other sub-plans prepared in accordance with this condition for the Extraction Plan include:

- Built Features Management Plan (WWC SD PLN 0129), which details the management measures for proposed secondary working impacts upon public and private infrastructure;
- Water Management Plan (WMP) (WWC SD PLN 0145), which details the management measures for proposed secondary working impacts upon watercourses and aquifers;
- Biodiversity Management Plan (BMP) (WWC SD PLN 0149), which details the management measures for proposed secondary working impacts upon aquatic and terrestrial flora and fauna;
- Land Management Plan (WWC SD PLN 0150), which details the management measures for proposed secondary working impacts upon land in general, with a specific focus on landscape features;
- Aboriginal Cultural Heritage Management Plan (ACHMP) (WWC SD PLN 0062), which details the management measures for proposed secondary working impacts upon Aboriginal heritage items;
- Public Safety Management Plan (WWC SD PLN 0132), which details the management measures to ensure public safety in the mining area; and
- Subsidence Monitoring Program (WWC SD PLN 0151).

These plans address the requirements of the PA09_0203 in order to manage potential environmental impacts of WWC operations. The subsidence risk assessment undertaken as part of the LW 51 and LW 52 Extraction Plan (WWC SD PLN 0128) identified subsidence as a medium risk, including the potential for interconnected cracking and for the subsidence of steep slopes. The Risk Assessment undertaken for this Closure MOP (see Section 3.1) also identified subsidence as a medium risk.

WWC have existing controls implemented to manage these potential impacts and resulting public safety requirements, these include:

- Water Management Plan (WWC SD PLN 0145);
- Height of fracturing and Groundwater Monitoring Program using Piezometers and extensometer;
- Mine planning controls including limited intersection with surface water courses;
- WWC Grouting procedure;
- Mapping / inspections of steep slopes;
- Public Safety Management Plan (WWC SD PLN 0132); and
- Warning signage at entry points.

3.2.3.1 Subsidence Remediation

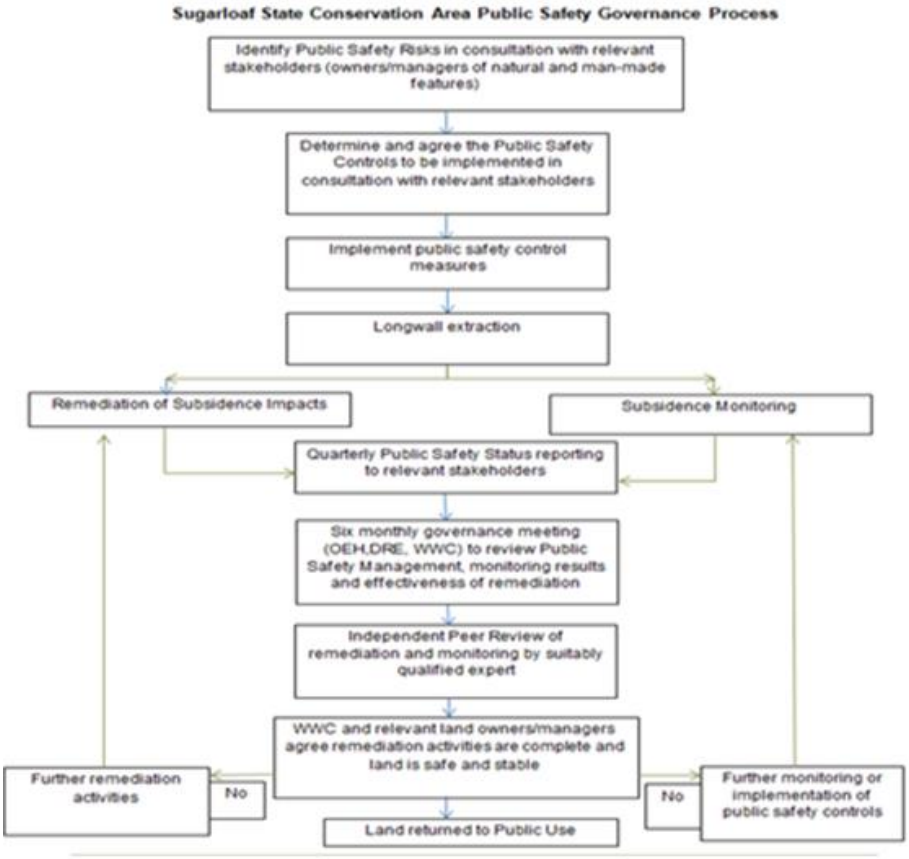
OCAL is committed to remediating subsidence impacts that pose a risk to the public or the environment. OCAL has an extensive Public Safety Governance Process in place which has been developed in consultation with key stakeholders. An overview of this governance process is detailed in **Figure 3.**

The purpose of subsidence remediation is further outlined in the LW 51 and LW 52 Land Management Plan and the LW 51 and LW 52 Public Safety Management Plan. The Land Management Plan aims for the re-establishment of a safe and stable landform following mining and the Public Safety Management Plan aims to ensure that the management of mining impacts within the SSCA meet the relevant requirements of section 30G (2) of the National Parks and Wildlife Act 1974 with respect to the management principles applicable for state conservation areas. WWC is committed to continue remediation activities until there is agreement with OEH that the post mining landform within the SSCA can be safely used by the public.

The progress of subsidence impact remediation areas will be monitored against the following performance indicators:

- OEH safety requirements (public and workplace) are met;
- The site is neat and tidy (i.e. it does not contain any rubbish);
- No weed management measures are required;
- Renewed crack dilation is not evident;
- Drainage, erosion and/or sediment control measures are effective;
- Where appropriate, native vegetation is naturally regenerating or active revegetation is establishing; and
- No further active revegetation measures are required.

Figure 3 Sugarloaf State Conservation Area Public Safety Governance Process



3.2.3.2 Identification of the need for Subsidence Remediation

Geotechnical mapping is conducted prior to longwall mining, on a weekly basis during extraction and in a post extraction end of panel review. The post mining mapping is added to WWC's GIS Database and is forwarded to OEH on a fortnightly basis if there are changes to the database or whenever requested by OEH. This mapping also forms the baseline data for the remediation planning and execution.

Following the mapping of subsidence impacts WWC undertake a review of the mapped results to:

- Determine if remediation is required for the impacts and the most appropriate method;
- Allocate a priority for the remediation of the particular impact; and
- Understand the specific environmental constraints associated with the remediation of the impact should it be required (access, topography, sensitive features, etc.).

An assessment of the need to undertake subsidence remediation works is completed on a crack and crack area basis. The remediation priority assigned to an impact will be based on the risk profile (public safety, environmental, slope stability) associated with the impact.

Following the assessment of each impact location the impact will be given a remediation priority rating of High, Medium or Low in the WWC GIS Database. The overview of the ratings process is outlined below. OEH has directed OCAL to remediate as many cracks as possible within the SSCA, OCAL will endeavour to do so. There may be cracks and crack locations e.g. LW 41 vertical block movement (VBM) site, which have geotechnical and environmental conditions with consequences that have workplace health and safety and environment risks which outweigh the benefits from conducting the remediation or the outcomes of remediation. These cracks will be discussed with OEH during remediation activities with the remediation of the cracks undertaken in accordance with the performance and completion criteria.

3.2.3.3 Subsidence Remediation Methods

A range of subsidence remediation methods are utilised to remediate subsidence impacts. The remediation methods typically utilised by WWC include:

- Remediation of subsidence impacts utilising earthworks machinery and locally sourced, inert or stabilised quarry fill material;
- Remediation of subsidence impacts utilising cementitious grout;
- Remediation of subsidence impacts utilising a polymeric chemical product;
- Remediation of subsidence impacts utilising pneumatic blowing equipment and locally sourced quarry fill material;
- Rock fall stabilisation activities; and
- Combination of the above methods.

These remediation methods have been developed in consultation with regulatory authorities (including the IRC and public safety committee) and will continue to be refined over time. As per Condition 30, Schedule 4 of the PA09_0203, WWC has in consultation with OEH, completed a field trial of the revised surface cracking remediation procedures to be used at WWC, and with a report on the trial submitted to DP&E and OEH in accordance with the PA09_0203.

A Subsidence Remediation Matrix has been developed to assist with determining the most appropriate remediation method for mining induced surface cracking based on the type and location of the identified impact. The remediation technique to be used will be determined via an assessment of the following factors:

- The distance of the impact location from existing access routes;
- The accessibility of the impact location for remediation equipment;
- The disturbance required to remediate the impact effectively;
- The terrain the impact area is located within (gentle, moderate slopes, steep slopes);
- The presence of any landscape features within the impact area (cliff lines, minor cliffs, rock face features); and
- Environmental constraints (presence of threatened flora/fauna, vegetation density, proximity to watercourses, erosion potential, archaeology).

Consistent with WWC EMS, a range of environmental controls will be implemented during the conduct of remediation works including but not limited to:

- Management of any soil and/or vegetation disturbance;
- Surface water, erosion and sediment controls;
- Aboriginal heritage;
- Management of fill products and injection operations;

- Waste management;
- Transport management; and
- Bushfire preparedness and adverse weather.

3.2.3.4 Subsidence Remediation Works – Approval Process

Prior to the commencement of any subsidence remediation activities, approval is to be received from the relevant landowner for the works. OCAL will submit Subsidence Remediation Plan documentation to OEH for adequacy and approval. This is to be co-ordinated and managed by the OCAL Environment and Community Manager or his/her delegate.

If OEH give approval to proceed with the remediation proposal then this approval usually comes with determination conditions. These conditions will be included in the Ground Disturbance Permit (CAA HSEC PER 0004) and complied with by OCAL and its contractor prior to the commencement of any works.

The Ground Disturbance Permit Procedure (CCA HSEC PRO 0002) aims to ensure site clearing of vegetation and topsoil is planned and carried out in a manner to minimise impacts. The work activities should comply with the site approval conditions, management plans and in accordance with this site permit. All works must be undertaken in an environmentally responsible manner so as to ensure conservation of natural resources and the natural environment.

3.2.3.5 Subsidence Remediation Monitoring

The progress of subsidence remediation will be recorded in the WWC GIS Database. Ongoing monitoring and review will continue until agreement is obtained with the landowner / manager that the land is safe / stable and can be returned to public use.

The WWC GIS Database will be used to catalogue and monitor the performance of the measures implemented to remediate surface cracking. Monitoring will be focussed on ground and fill stability, drainage, soil erosion, revegetation effectiveness and weed management. Some surface disturbance areas will be rehabilitated during the life of specific crack remediation programs, whereas others may remain until after the completion of mining operations in the area (e.g. centralised pump sites).

Locations within the Continued Underground Mining Area where rehabilitation or remediation works have been undertaken will be monitored in accordance with a long term monitoring plan which has been developed in consultation with OEH. Following remediation, the condition of the cracks will be periodically monitored as per the long term monitoring process. Specific areas assessed during the monitoring relate to (a) renewed crack dilation, (b) soil erosion, (c) slope instability and (d) status of revegetation.

Further information regarding monitoring of subsidence is located in the Long Term Monitoring Plan Methodology for LW 48 – 52- steep slopes (Douglas Partners, 2014).

The LW42 Ponded Area was undermined between 13 June and 28 June 2014. The subsidence assessment undertaken by DGS identified the potential for the ponded area to be drained as a result of undermining due to surface cracking. Inspections of the site during and post mining have shown that the ponded area had lost water (as predicted). DGS predicted that any surface or subsurface cracking in the vicinity of the ponds would naturally infill following future rainfall events and that the area will find a natural equilibrium post subsidence. The ponded area has since regained water storage following rainfall events suggesting natural infilling of surface/subsidence cracking as predicted. A further assessment of the area is proposed to be undertaken as outlined in Section 3.4 to confirm the water is remaining in the ponded area and subsidence impacts are negligible.

3.2.4 Erosion and Sediment Control

The Surface Water Management Plan (WWC SD PLN 0051) provides an overview of the dirty water management system at the WWC pit top area. In addition, this Plan provides an outline of the measures for the management of dirty water at other surface facilities managed by OCAL, including the No.3 ventilation shaft site. The MCPP currently manages erosion and sediment control in accordance with the MCPP Water Management Plan and the Erosion and Sediment Management Plan.

All runoff from disturbed areas at the WWC pit top area is collected and treated within the water management system. Runoff from the coal stockpiles at WWC is directed into sediment basins/sumps before flowing into the mine water management system for further treatment by flocculation prior to discharge. The sediment sumps and dams are cleaned out regularly to maintain sufficient capacity in the event of a storm. This system is managed through inspections.

During the MOP term, where ground disturbance is necessary at the surface facilities, appropriate soil erosion and sedimentation controls will be implemented and maintained in accordance with the Ground Disturbance Permit Procedure (CAA HSEC PRO 0002). The process is required to be undertaken prior to any ground disturbance works by or on behalf of OCAL operations. The process provides for the assessment of impacts of proposed activities and details the necessary controls for the works. Any erosion and sediment controls implemented for works at surface facilities will be maintained until the area is rehabilitated and deemed to no longer be required through inspections of the works area.

OCAL implements a range of general erosion and sediment controls in accordance with *Managing Urban Stormwater: Soils and Construction Volume 1 (Landcom, 2004) and Volumes 2A, 2C, 2D and 2E* (DECC, 2008) (the Blue Book). These general controls have been designed to control and manage erosion and sediment and will be adopted for the mine closure and rehabilitation of the OCAL Complex. In summary they include the following:

- Installation of erosion and sediment control measures as the first step in the process for land disturbance (even though most of the mine site is rehabilitated and no further disturbance forecast);
- Minimising all disturbed areas and stabilisation by rehabilitation;
- Utilisation of diversion banks upslope of disturbed areas to direct clean water runoff away from the site. The diversion banks will be designed to ensure effective segregation of sediment-laden runoff and allow clean surface water to return to natural watercourses;
- Utilisation of catch drains to capture runoff from disturbed areas and direct runoff into sediment dams;
- Utilisation of sediment dams to capture runoff from infrastructure areas;
- Adding flocculants to dams, where required, to aid the settlement of entrained sediment
- Placement of geotextile liners and rock check dams in drains as required to reduce water velocities and prevent scouring;
- Construction of graded banks over final reshaped areas to minimise erosion and re-direct runoff to catch drains and water storage areas;
- Regular maintenance of controls and inspection of works immediately after storm events to ensure erosion and sediment controls are performing adequately;
- Revegetation of final stable landforms and disturbed areas; and
- Repair or redesign of erosion and sediment controls that are not performing adequately, as identified in field inspections.

Erosion and sediment control was considered during the Risk Assessment. Further detail around surface water management is included in **Section 3.2.~~10~~11** below.

3.2.5 Flora and Fauna

The OCAL complex manages flora and fauna in accordance with the OCAL Biodiversity and Land Management Plan (WWC SD FWK 0007). The primary biodiversity management method on the sites is to conduct quarterly biodiversity and land management inspections and results are recorded on the OCAL biodiversity and land management inspection form. This form addresses the key issues of bushfire management, rehabilitation, mine closure and training and awareness (in regards to biodiversity).

OCAL also implements biodiversity management measures such as stock exclusion, fencing and controlling access, feral animal control, weed control and avoidance of land degradation by minimising erosion and sedimentation. Also, all OCAL land is classified according to land management units and individual biodiversity value, which helps in quantifying and managing flora and fauna.

Westside Mine also has its own Westside Mine Flora and Fauna Management Plan and monitoring is also undertaken biennially in accordance with the objectives in this plan.

Native vegetation communities adjacent to disturbed areas within the OCAL Complex are shown on **Plan 1B**. Vegetation communities consist of remnant dry sclerophyll forest communities to the west of the site and wet sclerophyll forest and sedge woodlands to the east associated with the Cockle Creek floodplain and wetland areas.

No threatened flora species listed under the *Threatened Species Conservation Act 1995* (TSC Act) or the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) have been identified at OCAL since monitoring commenced in 2005.

3.2.6 Weed and Pest Management

Weed and pest management works at the OCAL Complex are undertaken in accordance with the OCAL Biodiversity and Land Management Plan (WWC SD FWK 0007) and the Weed Action Plan (WWC SD PLN 0158). This includes regular inspections for weed infestations and feral animals, and targeted weed control works by experienced personnel. The presence of introduced species within rehabilitated areas will be monitored. If required, OCAL will undertake weed control works in these areas in consultation with OEH.

3.2.7 Air Quality

Both WWC and MCPP have site specific management plans for Air Quality that will continue to apply during mine closure.

The WWC Air Quality and Greenhouse Gas Management plan was prepared in accordance with the requirements of PA09_0203. Key management measures in this plan are in minimising greenhouse gas emission and dust emissions from the site. Similarly, MCPP operates in accordance with the Air Quality Management plan which focuses on dust minimisation management strategies.

Where permanent rehabilitation is not possible due to programming and scheduling, temporary stabilisation (such as hydro-mulching roadside batter and drainage structures) has been undertaken to minimise dust generation and mitigate visual impact.

Air quality monitoring is undertaken at seven dust depositional gauges on a monthly basis as required by EPL 1360. Monitoring results from air quality monitoring are reported in the Annual Review and EPL Annual Return.

Currently the only ongoing activities at Westside Mine are care and maintenance of existing rehabilitated areas and the sourcing of general fill material for shaft filling and civils works around the Complex. This generally requires the use of small earthmoving machinery to repair eroded areas or re-rip areas for supplementary seeding. In the event that more material is sourced from Westside to support the closure of the Complex, additional dust management controls will be assessed as part of a pre-work risk assessment. These may include:

- Temporary use of a water cart to water access roads;
- Controlling speed limits; and
- Limiting activities during windy periods.

Teralba Southgate is predominately sealed and therefore the risk of dust generation from vehicular traffic is considered low.

An air quality monitoring network for all of OCAL sites is currently in operation and will continue during the MOP term with a Risk Assessment and Change Management Process being used to rationalise any monitoring once the demolition and civil works aspects of the projects have been completed.

3.2.8 Hazardous Materials (HAZMAT) Management

A comprehensive HAZMAT assessment has been completed by SLR as part of the detailed Mine Closure Plan.

Storage of hazardous materials at the OCAL Complex is undertaken in accordance with the relevant legislative requirements, along with the Waste Management Plan and Water Management Plans. The Risk Assessment identified hazardous materials as a low risk to rehabilitation.

Given the age of the OCAL Complex it is known that asbestos containing materials (ACM) have been used identified in a number of buildings and structures in materials such as vinyl floor tiles, wall and ceiling linings, winch brake shoes, service conduits and maturation pond baffles. Historically, dangerous goods licences were granted at sites within the Complex and more recently dangerous goods notifications have been issued to meet legislative requirements where necessary.

Strategies selected for HAZMAT, dangerous goods and hazardous substances are removal, and in situ management. Generally, the following approach will be implemented during closure execution:

- In domains where buildings and infrastructure will be retained, there will be ongoing in situ management of ACM posing a low to very low risk under an implemented AMP with all materials being labelled appropriately. The current OCAL Complex Hazardous Materials Register will be revised. Under the current WHS legislation, the Asbestos Register and AMP will be reviewed at least every five years or sooner when identified ACM are known to deteriorate, become damaged or are removed. A review of the structural integrity assessment for buildings and infrastructure to be retained will be undertaken and if any locations are identified where ACM may pose a higher risk, an action plan will be implemented for surveillance (inspection), treatment or removal;
- In domains where buildings and structures were identified and inspected previously, a Hazardous Materials Register and AMP will continue to be implemented until demolition is completed. These structures will then be removed from the register in keeping with legislation and corresponding records maintained;
- In domains where decommissioning/demolition works will be undertaken, a type 3 demolition style survey and subsequent asbestos removal will be undertaken in line with the WHS Regulations 2011, AS2601 (2001): Demolition of Structures, and Work Health and Safety Code of Practice: Demolition Work (2015). This survey has an increased, more intrusive scope in order to ascertain if there are any concealed or otherwise unknown ACM prior to decommissioning and/or demolition works commencing. All known ACM in these domains will be removed by an appropriately licensed contractor and any other HAZMAT identified and managed appropriately to facilitate disposal to landfills licenced to receive this material;

- Historical data has indicated some illegal dumping of ACM on OCAL lands. A Complex wide 'unexpected HAZMAT finds' procedure will be developed to guide the address of any finds outside of building and infrastructure areas. OCAL will implement this procedure to govern development of an action plan for any further HAZMAT discovered within the OCAL Complex domains during the decommissioning process; and
- OCAL will organise the depletion of dangerous goods and hazardous substances based on the closure execution timeline (e.g. fuel stores retained until unnecessary). Dangerous goods and hazardous substances will be removed from all areas subject to demolition; records and evidence will be maintained for compliance including waste tracking and transport documentation. These materials will be removed from site by a licenced third-party contractor and disposed to a licenced landfill. Removal of any retained equipment or containers previously used to store or handle dangerous goods and hazardous materials will be undertaken in consultation with the post mining land user.

The infrastructure and buildings to be retained do not require all identified ACM or HAZMAT to be removed unless they are considered to pose a significant health risk or demolition works are to be commissioned in the near future. By implementing the selected strategies including a Hazardous Materials Register, a Complex-wide Asbestos Management Plan and appropriate labelling of ACM, supported with an overarching procedure for 'unexpected HAZMAT finds'; OCAL will comply with current legislative requirements in a cost effective manner with the least impact on closure activities and post mining land uses.

This is discussed in greater detail in the Domain specific scope of works included as **Section 6** through to **Section 22** below.

3.2.8.1 Fuel Containment

Diesel fuel, used for mobile equipment, is contained within bunded tanks. The hardstand areas are constructed so that the area drains to an oily water separator. The oil from the oily water separator is recovered for recycling by a licensed contractor.

Leading up to the cessation of operations the hydrocarbon stocks have been run down and additional stocks only ordered as required. All remaining hydrocarbons stored in tanks such as diesel, lubricants and centrifroth will be drained and either utilised or disposed of via an authorised contractor. The storage depots will be decommissioned and removed and depending on their condition and either sold or disposed of appropriately.

3.2.8.2 Oil and Grease Containment and Disposal

Oils and greases on-site are contained in bunded, concreted storage areas. Oil/water separators give additional protection against hydrocarbon pollution. Rainfall that accumulates in the existing oil/fuel tank bund is drained through the oil/water separator on site. In addition, an oil absorbent boom is fitted upstream of the licensed discharge point to prevent hydrocarbons leaving the site.

3.2.8.3 Radiation Gauges

The radiation sources at OCAL Complex have already been removed and disposed of in accordance with regulatory requirements.

Previously the MCPP has held a radioactive substances licence in relation to density gauges utilised within the Washery (Radiation Licence RL27914). This licence expired on the 9 December 2015 and it approved selling or possessing radiation apparatuses, radioactive substances, or items containing radioactive substances.

3.2.8.4 Spent Pickle Liquor

Spent pickle liquor (spent hydrochloric acid) is a waste product of steel cleaning and galvanising processes and is obtained from steel manufacturers situated in the Newcastle area. Spent pickle liquor generally comprises hydrochloric acid (less than 4%) and contains up to 10% iron and other metals. Spent pickle liquor has previously been is received at MCPP in accordance with EPL 1360 Condition L5.1 and Dangerous Goods Notification NDG028692.

The spent pickle liquor had two uses at the MCPP being to:

- Improve the efficiency of the fine coal froth flotation separation process and the operation of the tailings thickener; and
- Minimise the concentration of suspended solids contained within the dams on site. Spent pickle liquor acts as a flocculent as it is a source of positively charged ions, which are able to neutralise negatively charged clay particles so that they can settle out of suspension.

Leading up to the cessation of operations, spent-acid stocks were run down. Upon cessation of operations, the entire remaining product was drained and used either for water treatment purposes or disposed of via an authorised contractor.

The tanks containing the spent pickle liquor will be removed and disposed of as part of the decommissioning and demolition works to be undertaken during closure.

3.2.9 Contamination Treatment and Removal

A comprehensive contaminated sites assessment has been completed by SLR as part of the detailed Mine Closure Plan. Based on this work, a number of strategies for management of contamination at the OCAL Complex have been developed.

In addition, and an Unexpected Find Protocol will be established to manage potential contamination issues across the OCAL Complex.

The Scope of Works for the Contaminated Land assessment was undertaken in general accordance with the Sampling, Analysis and Quality Plan (SLR, 2016a). The Scope of Works consisted of the following tasks:

- Collection and review of site history materials inclusive of:
    - Planning Certificate Section 149 (2) & (5);
    - NSW EPA Contaminated Land Record and Notices;
    - NSW EPA POEO Public Register;
    - WorkCover NSW Stored Chemical Information Database (SCID); and
    - Previous reports.
- Pre-work site inspection;
- Soil and sediment sampling at 250 sampling locations and subsequent laboratory analysis for:
    - Heavy metals[1] inclusive of arsenic, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, manganese nickel, selenium, and zinc;
    - Total recoverable hydrocarbons (TRHs);
    - Benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN);

[1] Aluminium, iron and strontium were added to the heavy metal analysis suite for a selected number of sediment samples.

  - Polycyclic aromatic hydrocarbons (PAHs);
  - Phenols;
  - Organochlorine and phosphate pesticides (OCPs and OPPs);
  - Polychlorinated biphenyls (PCBs);
  - Acid sulfate soil analysis (by the Suspension Peroxide Oxidation Combined Acidity & Sulfur (SPOCAS));
  - pH;
  - Asbestos; and
  - Nutrients (total nitrogen, total Kjeldahl nitrogen, nitrate, nitrite, ammonia and total phosphorous).
- Groundwater sampling at seven locations and subsequent laboratory analysis for:
  - Dissolved heavy metals[2] inclusive of arsenic, beryllium, boron, cadmium, chromium, cobalt, copper, lead, mercury, manganese nickel, selenium, and zinc;
  - Total recoverable hydrocarbons (TRHs);
  - Benzene, toluene, ethylbenzene, xylenes and naphthalene (BTEXN);
  - Polycyclic aromatic hydrocarbons (PAHs);
  - Phenols; and
  - Nutrients (total nitrogen, total Kjeldahl nitrogen, nitrate, nitrite, ammonia and total phosphorous).
- Preparation of the Contaminated Land Assessment on the findings/observations and data interpretation made during the investigation.

The Contaminated Land Assessment has had regard to relevant state and national guidelines including, *inter alia*:

- *Friebel, E and Nadebaum, P (2011) HSLs for petroleum hydrocarbons in soil and groundwater, part 1: technical development document, Technical Report No.10, CRC for Contamination Assessment and Remediation of the Environment, Adelaide, Australia;*
- *National Environmental Protection Council (2013) National Environmental Protection (Assessment of Site Contamination) Measure 1999 (Amendment 1, 2013);*
- *NSW EPA (1995) Contaminated Sites - Sampling Design Guidelines, September 1995. NSW Environmental Protection Authority, Sydney, NSW. Available at http://www.epa.nsw.gov.au/resources/clm/95059sampgdlne.pdf. Last viewed on 11 May 2016;*
- *NSW DEC (2006) Contaminated Sites – Guidelines for the NSW Site Auditor Scheme (2nd Edition), April 2006. Department of Environment and Conservation NSW. Available at http://www.epa.nsw.gov.au/resources/clm/auditorglines06121.pdf. Last viewed on 11 May 2016;*
- *NSW DEC (2007) Contaminated Sites – Guidelines for the Assessment and Management of Groundwater Contamination, March 2007. Department of Environment and Conservation NSW. Available at http://www.epa.nsw.gov.au/resources/clm/groundwaterguidelines07144.pdf. Last viewed on 11 May 2016;*
- *NSW OEH (2011) Contaminated Sites – Guidelines for Consultants Reporting on Contaminated Sites, August 2011. NSW Government, Office of Environment & Heritage, Sydney, NSW. Available at http://www.epa.nsw.gov.au/resources/clm/20110650consultantsglines.pdf. Last viewed on 11 May 2016;*

[2] Aluminium, iron and strontium were added to the heavy metal analysis suite for a selected number of groundwater samples.

- *NSW EPA (2015) Guidelines on the Duty to Report Contamination under the Contaminated Land Management Act 1997, September 2015. NSW Environmental Protection Authority, Sydney, NSW. Available at http://www.epa.nsw.gov.au/resources/clm/150164-report-land-contamination-guidelines.pdf. Last viewed on 11 May 2016;*
- *Standards Australia (1999) Australian Standard, AS4482.2, Guide to the Sampling and Investigation of Potentially Contaminated soil, Part 2 Volatile Substances. Standards Australia, Sydney, NSW; and*
- *Standards Australia (2005) Australian Standard, AS4482.1, Guide to the Sampling and Investigation of Potentially Contaminated soil, Part 1: Non-Volatile and Semi-Volatile Compounds. Standards Australia, Sydney, NSW.*

Test pit and borehole logs were prepared for Test Pits TP01 to TP14 and Boreholes BH01 to BH03. Most of the samples collected were ranked 0 for visual indication of contamination, although some fill samples were ranked 1 due to the presence of foreign objects. No olfactory signs of soil contamination were apparent, though some soil and sediment samples exhibited a slight decomposed organics odour with the exception of a fill sample collected from Test Pit NG AS TP14-02 (0.3 to 0.5 m) that indicated a moderate hydrocarbon-like odour.

The PID screening results for the samples collected during the fieldwork did not record readings of greater than 50 ppm.

Laboratory analytical results for the soil samples analysed were compared to the adopted investigation criteria. Exceedances of the adopted investigation criteria for commercial and industrial land use scenario were observed for soil samples collected from Domains 1, 6, 10, 11, 12 and 13 (**Table 13**). The values exceeding the upper range of the criteria are presented in bold.

Table 13 Summary of Exceedances – Adopted Health and Ecological Investigation Criteria

Location	Sample Type	Sampling Depth (m)	Copper (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	TRH C_{10}-C_{16} (F2) (mg/kg)	TRH C_{16}-C_{34} (F3) (mg/kg)	Benzo (a) pyrene (mg/kg)
HIL/HSL D Criterion			**240,000**	**6,000**	**400,000**	**20,000 to 62,000**	**27,000 to 120,000**	**40**
EIL/ESL Criterion (Commercial/Industrial)			***85 to 1200***	***55 to 960***	***110 to 2000***	***170***	***1700 to 2500***	***0.7***
DOMAIN 1: WESTSIDE ADMINISTRATION AND WORKSHOP AREA								
WE FA TP03-01	Soil	0.0 to 0.1				*410*		
DOMAIN 4: WESTSIDE FINAL VOID								
WE VD HA01	Surface Sediment	0.0 to 0.1			*190*			
WE VD HA03	Surface Sediment	0.0 to 0.1			*160*			
DOMAIN 6: WWC PIT TOP FACILITIES								
WW LY TP02-01	Soil	0.0 to 0.1					*1700*	
WW WD HA 01-01	Soil	0.0 to 0.1				*1400*	***11,000***	
WW WD HA 04-01	Soil	0.0 to 0.1			*200*			
WW NE TP02	Near Surface Sediment	Approx. 0.1 m below water surface			*350*			
WW BS TP04	Near Surface Sediment	Approx. 0.1 m below water surface			*310*			
WW BS TP05	Near Surface Sediment	Approx. 0.1 m below water surface			*110*			
DOMAIN 9: MCPP SURFACE FACILITIES								
MP AD BH02-01/0-0.2	Soil	0.0 to 0.2			*280*			
MP RR TP11-01	Soil	0.0 to 0.2			*190*			
MP RL BH02-06	Soil	4.6-4.8						
MP RL HA06	Soil	0.0 to 0.1			*110*			
MP WW BH03-02	Soil	0.5 to 1.0			*520*			
MP WW BH06-02	Soil	0.8 to 1.0	*100*		*150*			
MP WR TP01-02	Soil	1.8 to 2.1				*410*		
MPCD1-A HA01	Near Surface Sediment	0.0 to 0.1			*160*			
MP CD1 TP01	Sediment	Approx. 4 to 5 m below water surface			***51,000***			
MP CD1 TP03	Sediment	Approx. 3 to 4 m below water surface			***10,000***			
MP PO3 TP02	Sediment	Approx. 0 to 1 m below water surface			*1,900*			
MP PO3 TP03	Sediment	Approx. 2 to 3 m below water surface			***8,700***			

Location	Sample Type	Sampling Depth (m)	Copper (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	TRH C_{10}-C_{16} (F2) (mg/kg)	TRH C_{16}-C_{34} (F3) (mg/kg)	Benzo (a) pyrene (mg/kg)
HIL/HSL D Criterion			**240,000**	**6,000**	**400,000**	**20,000 to 62,000**	**27,000 to 120,000**	**40**
EIL/ESL Criterion (Commercial/Industrial)			***85 to 1200***	***55 to 960***	***110 to 2000***	***170***	***1700 to 2500***	***0.7***
MP PO3 TP04	Sediment	Approx. 2 to 3 m below water surface			***6,300***			
MP PO3 TP05	Sediment	Approx. 2 to 3 m below water surface			***13,000***			
MP PO3 TP07	Sediment	Approx. 2 to 3 m below water surface			*460*			
MP PO3 TP12	Sediment	Approx. 3 to 4 m below water surface			***15,000***			
MP PO3 TP13	Sediment	Approx. 3 to 4 m below water surface			*780*			
MP PO3 TP15	Sediment	Approx. 3 to 4 m below water surface			*630*		*1500*	
MP PO3 TP16	Sediment	Approx. 4 to 5 m below water surface			***2,700***			

Location	Sample Type	Sampling Depth (m)	Copper (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	TRH C_{10}-C_{16} (F2) (mg/kg)	TRH C_{16}-C_{34} (F3) (mg/kg)	Benzo (a) pyrene (mg/kg)
HIL/HSL D Criterion			**240,000**	**6,000**	**400,000**	**20,000 to 62,000**	**27,000 to 120,000**	**40**
EIL/ESL Criterion (Commercial/Industrial)			***85 to 1200***	***55 to 960***	***110 to 2000***	***170***	***1700 to 2500***	***0.7***
DOMAIN 10: MCPP MATURATION PONDS								
MP MP01 TP01	Sediment	Approx. 4 to 5 m below water surface	*210*		***4,300***			
MP MP01 TP02	Sediment	Approx. 4 to 5 m below water surface			*990*			
MP MP01 TP04	Sediment	Approx. 3 to 4 m below water surface			*1,200*			
MP MP02 TP01	Sediment	Approx. 2 to 3 m below water surface	*77*		***15,000***			
MP MP02 TP03	Sediment	Approx. 2 to 3 m below water surface	*84*		***12,000***			
MP MP03 TP01	Sediment	Approx. 2 to 3 m below water surface	*73*		***12,000***			
MP MP03 TP02	Sediment	Approx. 2 to 3 m below water surface			***9,400***			
MP MP04 TP01	Sediment	Approx. 2 to 3 m below water surface			***18,000***			
MP MP04 TP02	Sediment	Approx. 2 to 3 m below water surface			*450*			
MP MP04 TP04	Sediment	Approx. 2 to 3 m below water surface			*260*			
MP MP05 TP02	Sediment	Approx. 2 to 3 m below water surface			***11,000***			
DOMAIN 11: TERALBA NORTHGATE								
NG AS TP05-01	Soil	0.0 to 0.1			*150*			
NG DB TP01-01	Soil	0.0 to 0.2			*130*			
NG DB TP04-03	Soil	0.8 to 1.0			*590*			
NG DB TP06-01	Soil	0.0 to 0.2			*130*			
NG DB TP10-01	Soil	0.0 to 0.2			*170*			
NG DB TP12-01	Soil	0.0 to 0.2			*170*			
NG AS TP14-02	Soil	0.3 to 0.5					*2,200*	
NG Septic Tank 2&3-01/0-0.2	Soil	0.0 to 0.2			*140*			
DOMAIN 12: INFRASTRUCTURE								
NG SF3 TP01-02	Soil	0.3 to 0.5			*210*	*240*		
NG SF3 TP02-01	Soil	0.0 to 0.2			*420*			

Location	Sample Type	Sampling Depth (m)	Copper (mg/kg)	Nickel (mg/kg)	Zinc (mg/kg)	TRH C_{10}-C_{16} (F2) (mg/kg)	TRH C_{16}-C_{34} (F3) (mg/kg)	Benzo (a) pyrene (mg/kg)
HIL/HSL D Criterion			**240,000**	**6,000**	**400,000**	**20,000 to 62,000**	**27,000 to 120,000**	**40**
EIL/ESL Criterion (Commercial/Industrial)			***85 to 1200***	***55 to 960***	***110 to 2000***	***170***	***1700 to 2500***	***0.7***
DOMAIN 13: TERALBA SOUTHGATE								
SG DM BH01-06	Soil	5.0 to 5.5						*0.8*
SG HI BH06-05	Soil	3.0 to 4.0				*230*		
SG MP HA01	Soil	0.0 to 0.1			*130*			
SG MP HA03	Soil	0.0 to 0.1			*1200*			

In general, all contaminated soils will be retained on-site where at levels which are not considered to pose environmental or health risks. To retain contaminated soils in a safe and appropriate manner consistent with current NSW and Federal regulatory requirements, an Environmental Management Plan (EMP) will be developed to describe of the retention areas subject to the EMP, assessment of the fate and transport of contaminants in the retention area, description of retention measures, risk assessment and registration of the areas in a Section 149 Planning Certificate (2) and (5) under the EP&A Act.

The NSW EPA will have jurisdiction over any engineered containment facility used to retain contaminated soils on site following closure execution and must generally agree to contamination remaining at depth on a site with key issues satisfactorily addressed e.g. minimised potential for leachate formation and/or volatilisation.

The following identified treatment strategies have been adopted at the Complex:

- Land farming soils contaminated with petroleum based contaminants in a purpose built facility located in Domain 3 (the strategy must be described in a management plan and per Best Practice Note: Land farming (NSW EPA, 2014);
- On-site neutralisation of acidic/acid sulfate soils or potential acid sulfate soils (PASS) using a neutralising agent (slightly alkaline, low solubility products, such as fine agricultural lime (ag-lime) and then using encapsulation;
- Strategic reburial of PASS in accurately surveyed and reported locations; and
- Off-site disposal to NSW EPA approved landfill facilities with site validation of residual ground surface and excavation walls. Where relevant, a comprehensive sampling and analysis program will be developed to enable materials to be classified in accordance with the Waste Classification Guidelines, Part 1: Classifying Waste (NSW EPA, 2014) prior to off-site disposal.

Shallow groundwater wells are planned to be established up-gradient where required to facilitate monitoring groundwater quality for determining whether groundwater is contaminated or within background ranges.

The monitoring for any potential impacts will be undertaken as required in the management/validation of:

- Material undergoing land-farming;
- Follow excavation in residual surfaces and walls;
- To monitor environmental conditions and minimise soil disturbance in PASS soils;
- In areas of PASS reburial; and

- In areas where existing contamination or associated potential is inconclusive.

This aspect is discussed in greater detail in the Domain specific scope of works included as **Section 6** through to **Section 22** below.

3.2.10 Surface Water Management Strategy

A comprehensive surface water assessment has been completed by SLR as part of the detailed Mine Closure Plan.

In describing the management of surface water for the OCAL Complex closure, the following definitions apply.

- Dirty water/sediment-laden water – potentially sediment-laden surface runoff from disturbed areas of the Site (including rehabilitation areas prior to successful revegetation);
- Contact water – surface water runoff that has come into contact with coal fine material and is therefore potentially saline (i.e. reject areas, workshop areas, ROM/Product stockpiles etc.);
- Clean water - surface runoff from undisturbed catchments or successfully rehabilitated areas; and
- Contaminated water – water that has the potential to cause significant environmental harm if released into the environment (i.e. tailings, hydrocarbons, effluent etc).

The final landforms have been designed to generally recreate the natural drainage catchments as closely as possible and will be predominantly free draining, although all sediment dams will remain in place until a stable landform is achieved.

The re-establishment of any ephemeral drainage lines will be undertaken in accordance with the *Rehabilitation Manual for Australian Streams* (LWRRDC and CRCCH), and the *Draft Guidelines for Designing Stable Drainage Lines on Rehabilitated Mine Sites,* formulated by the former NSW Department of Land and Water Conservation (1999), as well as the *Guidelines for Controlled Activities – In-Stream Works* (DWE, 2008) (DWE guidelines).

Where required, additional stabilisation measures such as contour banks, check dams and rock armouring, designed in accordance with the *Blue Book Volume 2E,* will be utilised to achieve landform stability.

The key surface water management strategies planned for implementation/adoption at OCAL Complex during mine closure are:

- Clean water diversions (existing and proposed) will be used wherever possible upstream of the OCAL disturbance areas (but within the site boundary) to redirect clean water runoff around the site into the downstream drainage lines. This would also minimise the runoff to be contained and treated (if required) within the site and the internal water management system during the closure period;
- Dirty water generated from disturbed areas within the OCAL Complex as a result of rainfall/runoff will be captured and conveyed using contour banks or dirty water conveyance channels in a manner which minimises the potential for concentrated and/or unstable overland flow. This water will be managed within the dirty water management system, and treated to reduce the sediment load prior to water reuse or off-site release;
- Runoff that does not meet the relevant quality criteria will be contained on-site, and will be treated to allow it to be discharged off-site as required;
- Mine waste storage facilities (tailings and rejects) will be suitably capped/covered to mitigate the potential for environmental harm as a result of contaminated surface water runoff;

- Erosion and sediment control (ESC) will be undertaken in accordance with the principles outlined in *Managing Urban Stormwater: Soils and Construction (the Blue Book Volumes 1 and 2) (Landcom, 2004 and DECC, 2008).* This framework for the management of erosion and sedimentation will be applied during both the closure execution and post closure phases of the works program. Erosion and sediment controls will be designed and implemented to mitigate the potential for environmental harm to nearby watercourses and the surrounding environment;
- Direct revegetation of all formed surfaces creating the final landform will reduce the amount of potential contaminants in runoff from disturbed areas reducing the dependence on the sediment controls, and helping to improve water quality;
- Where required, water management structures will be suitably maintained to ensure that the required design capacities provide for adequate buffering and treatment of significant rainfall events, for closure and the proposed post mining land uses;
- A number of the existing dams will be retained in the final landform as clean water dams, and are configured to attenuate into the landscape via geomorphological processes as water quality objectives are met, mitigating any requirement for ongoing maintenance and management; and
- The objective of the surface water monitoring program is to provide details of the monitoring undertaken on site to monitor the effects of the OCAL Complex on existing surface water bodies. The purpose of this monitoring is to assist in detecting if any significant off-site impacts occur as a result of mining and to trigger response plans to adverse impacts. Monitoring will continue at the OCAL Complex as per the Environment & Rehabilitation Monitoring Plan until the site has been suitably rehabilitated. The existing surface water monitoring program (including channel stability monitoring) will be augmented to ensure it adequately accommodates the measures required for the closure execution period and the post closure.

Following mine closure execution at the OCAL Complex, some dams will remain for pollution control (i.e. WWC dams and the Teralba Southgate Dam), given that these specific sites are planned to be continued to be occupied for some industrial land use.

3.2.11 Groundwater Management Strategy

A comprehensive groundwater model and assessment has been prepared by SLR as part of the detailed Mine Closure Plan.

Groundwater management requirements relevant to OCAL are outlined in the existing Water Management Plan (WMP). Previously, WWC has been required to manage the impacts of secondary workings in the continued underground mining area on watercourses and aquifers. As outlined in the WMP, there were no significant groundwater resources (including alluvial aquifers) within the continued underground mining area. However, OCAL monitored the groundwater levels surrounding the underground mining area to determine impacts (if any) on regional groundwater aquifers and water levels on privately-owned bores.

Until recently, OCAL had extracted surplus water from the underground workings, via a borehole at LW 11 licensed under 20BL1697963. Since the WWC has stopped production, the extraction of water has ceased, however the LW11 bore will be retained as a permanent groundwater monitoring point.

As part of rationalisation activities, active pumping from the underground workings at Teralba Southgate has ceased, allowing the underground workings to fill with water. No dewatering from the underground workings to EPA Point 3 has occurred since April 2009; meaning only limited surface water run-off is now discharged from EPA Point 3.

The groundwater model prepared by SLR shows that the recovery of groundwater levels in the deeper Newcastle Coal Measures aquifers exceeds land surface elevations only in particularly low lying topographic areas such as where Dora and Cockle Creek's meet Lake Macquarie. However, the modelling also shows that the areas that can be considered to be at risk of surface expression of groundwater due to this recovery are overlain by shallower parts of the Newcastle Coal Measures that do not show the same over-pressurisation potential. This limits the risk of this over-pressurisation leading to groundwater discharge to alluvial aquifers or surface water systems.

The following strategies will be undertaken to manage groundwater during closure execution and post closure as warranted:

- Monitoring for groundwater level recovery over the closure and post-closure period in areas of land that might be subject to surface expression of groundwater. Monitoring in the long-term will show whether actual groundwater level recovery is following model predictions. Monitoring will also allow further refinement of the groundwater model through recalibration to further improve the models predictions over time and further constrain the risk posed by groundwater level recovery;
- Groundwater quality monitoring of contributions to the alluvial aquifer, the shallowest Newcastle Coal Measures aquifer (coal seam), and if present, the intervening Narrabeen Group aquifer, via the shallowest water bearing unit of that formation;
- Monitoring groundwater outside of OCAL Complex to manage the risk associated with Newcastle Coal Measures aquifer groundwater level recovery; and
- Update the Plan of Underground Water Management numerical groundwater model using further groundwater level measurements, land surface elevations based on LiDAR, etc. collected during the closure groundwater monitoring program for re-calibration and further improvement of the reliability of model predictions for closure and post closure.

3.2.12 Greenhouse Gas (Methane/Venting)

Methane has the potential to limit land use (e.g. industrial, recreation) due to potential for leakage/emissions in areas of subsidence where there is connectivity cracking, where underground workings connect to surface e.g. shafts and drifts, and in areas where the worked seams are <200 m below ground surface.

Methane build up in the gassy Teralba Colliery has previously made drilling and potential installation of monitoring wells difficult (e.g. drilling in Teralba Southgate area in August 2016 resulted in methane above trigger levels being encountered, the works being abandoned with appropriate notification, and the hole being sealed to prevent leakage).

Other underground hazards that may trigger methane events are reduced given the geology and cessation of operations i.e. site has low risk of spontaneous combustion, limited equipment and plant retained underground (not in use), underground installed equipment and services consider the effects of lightning causing the ignition of methane, etc.

However, as water levels rise in the underground workings, methane has increased potential to find its way to surface.

As part of detailed mining closure planning, an assessment was undertaken to identify areas of risk for methane emissions from the OCAL Complex to the environment including leakage/transport via groundwater and interconnectivity to surface, and to present strategies for management.

Management options considered for methane emissions included:

- Gas utilisation (power generation) – WWC workings were not considered adequately gassy to deliver a sustainable source of methane for beneficial use in power generation. While Teralba is significantly gassier and may have suitable volumes for use, the process of proving this up would include extensive testing and other works, the appetite and market for this is low in the industry (Glencore does not consider this a core business opportunity or aligned with its business and/or closure strategies), and the significant costs for pumping and maintaining the water levels to continue to access the methane would not likely be sustainable without plans for further mining to intersect coal seams and liberate methane;

- Gas drainage systems – The need for gas drainage systems post closure associated with WWC was considered unlikely due to low gassiness and historic information; however, while this could be useful at Teralba, considering the planned sealing programme, predicted time for groundwater recovery, uncertainty of necessity (based on methane behaviour), and potential greenhouse gas impacts; this was not considered as the primary strategy. It was noted that if required based on success of preliminary contingencies, a flaring system can be set up quickly without significant cost to relieve methane pressures underground as has been completed previously elsewhere, so this is reserved as a targeted contingency approach if required;
- Sealing – As a regulatory requirement, and to significantly reduce costs associated with ventilation of unutilised underground working, OCAL has developed a sealing programme that is underway. While sealing will not prevent all methane emissions to surface, it will restrict the direct avenues and pathways by which methane emissions to surface could occur. Notably, when sealing is completed and water levels rise significantly underground, until the mine workings fill the increased pressure underground will increase the likelihood of emissions to surface via any connectivity or weak points; however, closure execution and relinquishment of the leases and existing approvals cannot be completed without sealing and economic considerations require this to be completed prior to groundwater level recovery;
- Gas monitoring – Given the low gassiness of WWC workings, continued ventilation during implementation of the sealing programme, and the predicted rate of groundwater recovery in the Teralba area, monitoring of excavations for rehabilitation, underground methane-related parameters and surface detection of methane would provide a comprehensive approach to determining the potential volumes that could be emitted, validating risk predictions, and validating and predicting behaviour and locations of any potential or actual surface expressions of methane; and
- Contingencies – Considering the potential for methane emissions to surface, a number of preliminary contingencies could be utilised for mitigation of methane as required; these would be situation- and location- specific and may include restricting access to areas of potential or actual risk, restricting post mining land use to reduce the likelihood of methane interactions, etc.

Based on consideration of these options, the selected methane management strategy for OCAL Complex is a combination of sealing, gas monitoring and contingencies.

3.2.12.1 Preferred Management Strategy

Sealing

A sealing strategy was developed for the OCAL Complex and historical disturbance outside of domains considering key applicable guidelines and legislation including:

- *MDG6001 Guidelines for the permanent filling and capping of surface entries to coal seams*;
- *EDG01 Borehole Sealing Requirements on Land: Coal Exploration* (referred to in MDG6001 for service borehole sealing);
- WHS Mines Regulations Clause 33 – High Risk Notification (Sealing requires 28 days' notice) and Clause 35 – Closure, suspension or abandonment of mine within;
- Safety Bulletin Sealing of a goaf or mined out area in an underground coal mine and management of legacy sealed areas (Mine Safety Report No: SB13-04); and
- XCN SD PRO 0033 – Protection of Underground Mine Fires from Lightning.

Information on the current status of the mine openings requiring sealing was collated and the team undertook investigations to determine technical specifications and requirements for materials, risk assessments, consultations, and development of sealing designs.

The sealing strategy includes decommissioning of services and cables where practicable, installation of access to grout and fill, sourcing fill material, developing bulkheads, placing grout and fill and installing plaques to MDG6001 requirements. As part of the sealing process, when safe and practicable, the ventilation systems will be shut down; currently natural groundwater levels are being allowed to recover.

Service boreholes will be sealed to MDG6001 requirements and any open exploration boreholes identified will be sealed to meet EDG01.

Monitoring

The key considerations included:

- Underground structures including basements, tunnels, carparks, etc. (no non-mining structures were identified in the workings area and immediate surroundings);
- Location of nearby communities, residences, operations, etc.;
- Nearby streams and waterbodies (Teralba proximity to Lake Macquarie);
- Nearby public infrastructure e.g. roadways;
- Groundwater movement and potential expression to surface;
- Boreholes and shafts sealed >20 years ago;
- Areas proposed for safety critical post mining land use e.g. industrial, residential, recreation (Sugarloaf Conservation Area); and
- Subsidence and longwall areas that could have connection paths from underground areas (e.g. goaves) to surface via cracking based on risk assessment.

The parameters to be monitored are:

- Methane monitoring for excavations – methane % Lower Explosive Limit (LEL);
- Underground methane monitoring – mine pressure, gas flow in mine, water level in workings; and
- Methane monitoring and gas detection – methane %LEL.

3.2.13 Visual and Lighting

Risks to rehabilitation from visual and lighting impacts were considered low during the Risk Assessment.

Views of the WWC surface facilities are generally restricted to the pit top facilities and surface infrastructure. The local topography and vegetation heavily restrict the visibility of the mine. Views of the WWC surface facilities are present from surrounding roads. Where possible, trees are retained at WWC surface facilities to maintain visual amenity. A tree screen was planted during 2006 along the heavy vehicle entrance to WWC. This planting has provided further visual screening of WWC.

MCPP has also carried out revegetation in order to provide a visual screen of the site. The plant and reject disposal are visible from the surrounding area from the northwest and northeast. Measures in place to maintain visual amenity include maintenance of buffer lands and progressive rehabilitation and stabilisation. Additionally, the extensive buffer area surrounding the site means that stray light impacts on the nearby community are not considered to be an issue.

SLR have used Civil 3D to develop a rendered TIN surface based on the preferred option for the Tailings Dam and REA landform design contours (see **Section 12** and **Sections 13**).

Base aerial imagery was sourced from SIX Maps and the generation of 3D terrain and vegetation modelled in 3D Studio Max and iToo Software. The final renders generated in 3D Studio Max using Mental Ray render engine.

Figures 4 - 7 below show the modelled outputs for views from TC Frith Avenue as well as the Weir road in Boolaroo.

Figure 4 Existing view from TC Frith Avenue, Boolaroo (note camera height is 9.5m from ground level)

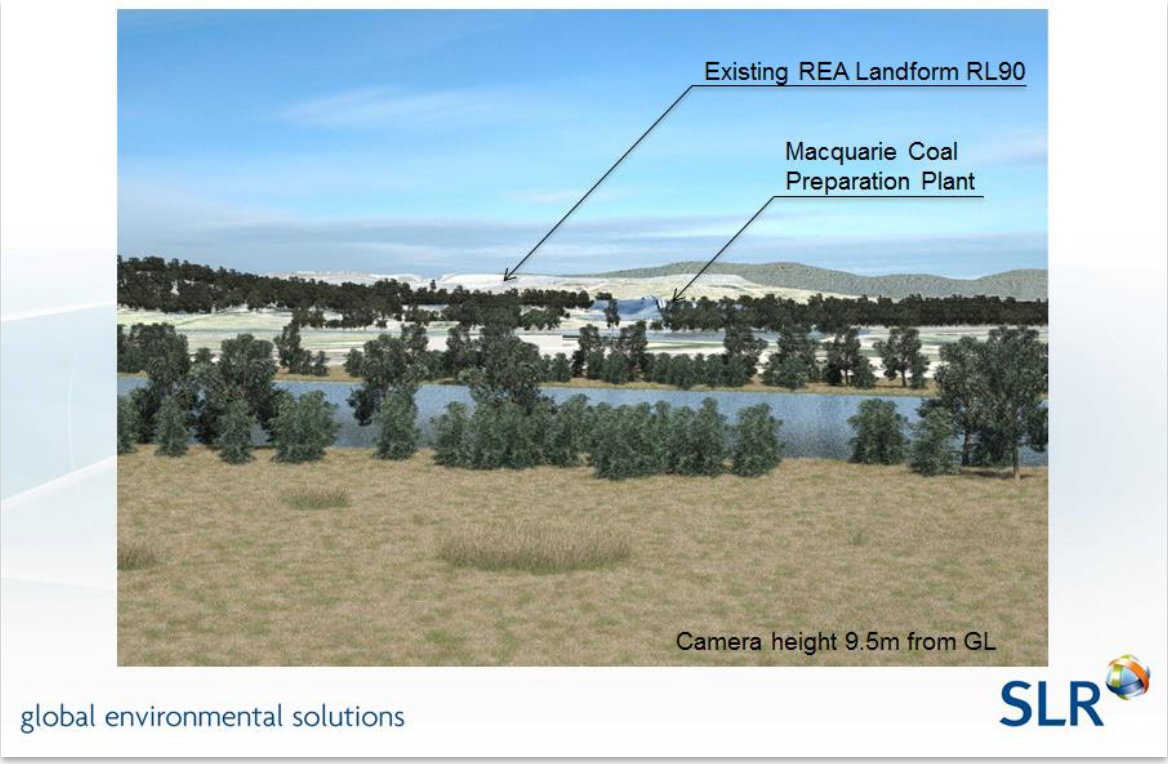


Figure 5 View from TC Frith Avenue, Boolaroo following reshaping and rehabilitation.(note camera height is 9.5m from ground level)

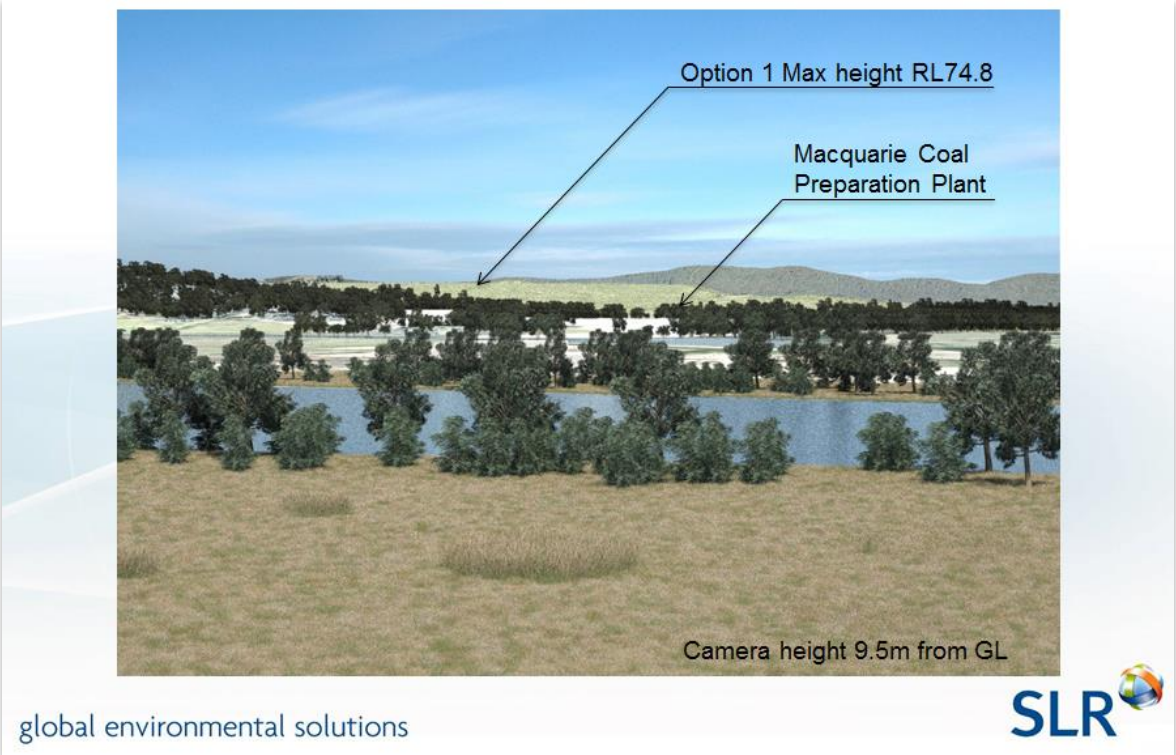


Figure 6 Existing view from Weir Road, Boolaroo (note camera height is 25m from ground level)

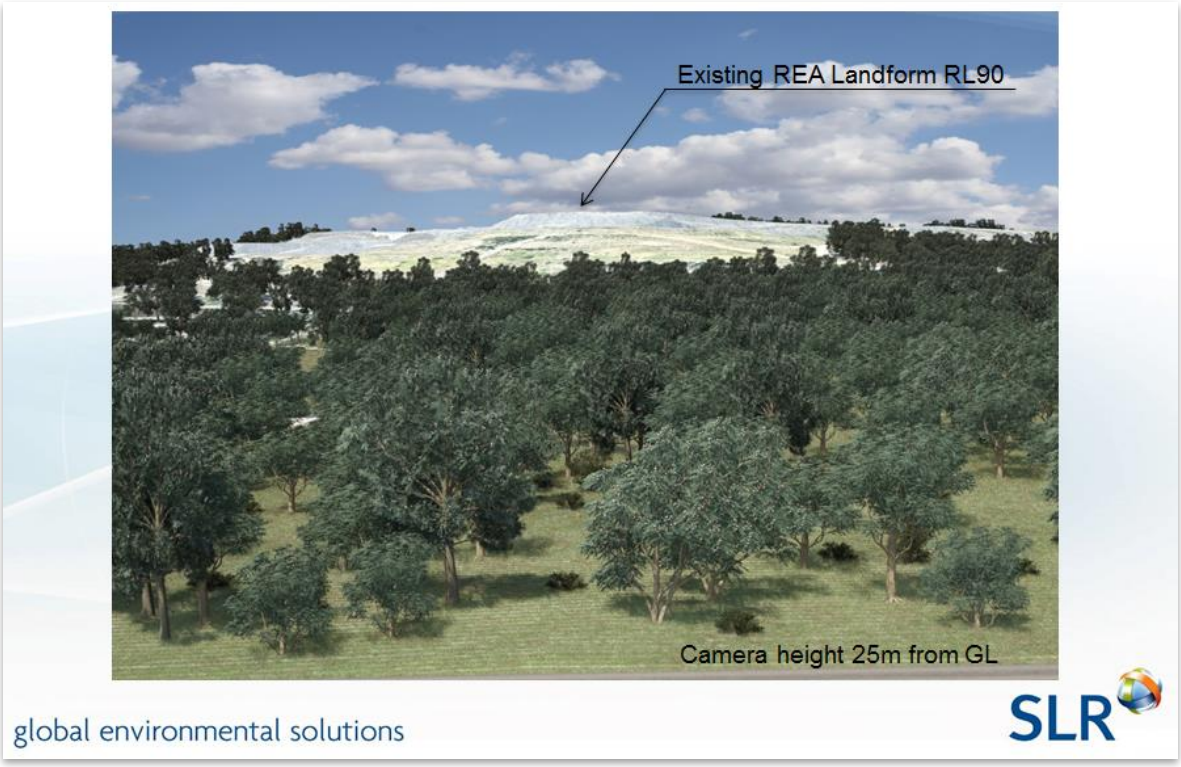
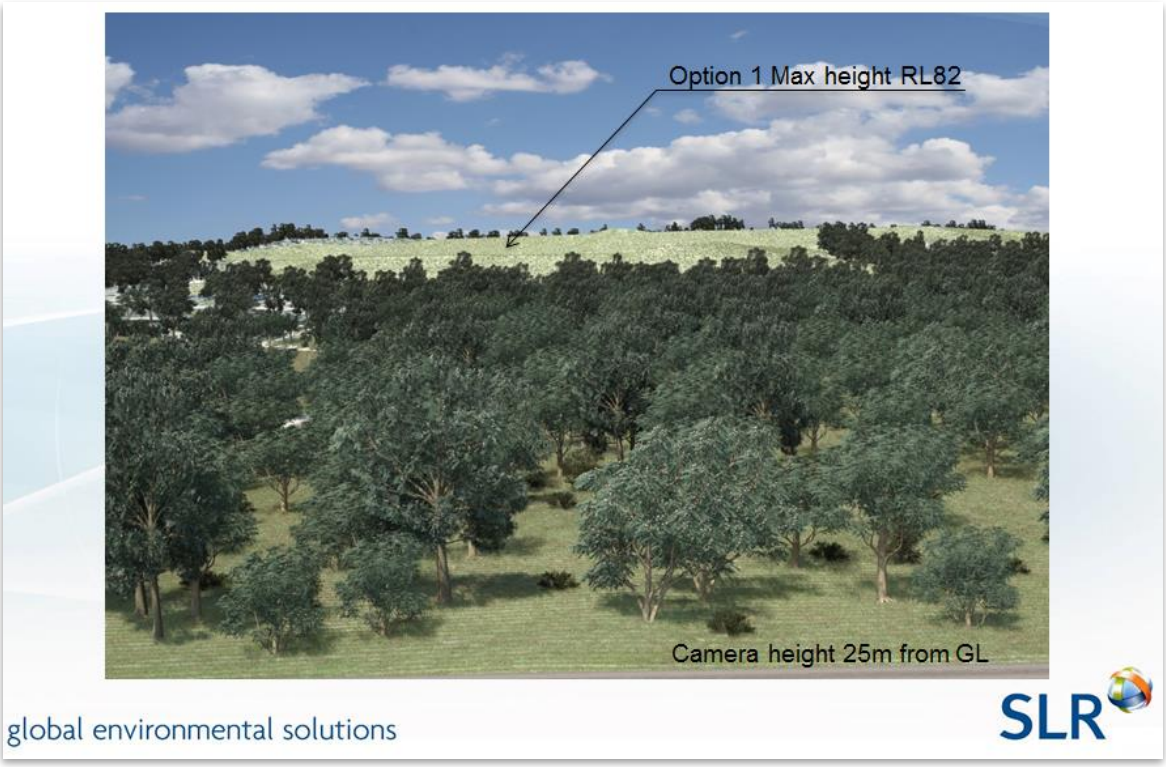


Figure 7 View from Weir Road, Boolaroo following reshaping and rehabilitation (note camera height is 25m from ground level)



Further the removal of the plant buildings and conveyors following closure will remove a visual impact, along with the rehabilitation of the tailings/REA that will mitigate those impacts over time.

As Westside Mine has undergone extensive rehabilitation to date, the site does not have a negative visual impact on the surrounding community. A screen has been established along Wakefield Road by the planting of trees, which helps to minimise visual impacts to the community from care and maintenance activities at Teralba. This screen will be continually maintained by OCAL.

3.2.14 Noise

OCAL recognises the impacts of noise on the local community and implements management measures at all of its sites.

The WWC Noise Management Plan (NMP) (WWC SD PLN 0053) outlines various noise control measures that are implemented at WWC to manage noise impacts and ensure compliance with the noise criteria contained within PA09_0203 and EPL 1360. WWC has employed and will continue to employ various management measures to mitigate noise impacts from its operation.

WWC has developed a noise monitoring program to evaluate the performance of the operation. Under PA09_0203 and in accordance with the NMP, noise is monitored quarterly, with results reported in the WWC Annual Review.

MCPP also operates in accordance with an approved Noise Management Plan and management measures that are implemented on site include:

Further, operating practices during the decommissioning and closure phases which are aimed at minimising noise impact to the community include:

- Community newsletters to give regular update to inform community when audible activities are planned;
- Regular maintenance of all equipment and machinery;
- Consideration of noise in pre works risk assessments; and
- Operating dozers and other equipment on the Tailings Dam and REA in the daytime only.

3.2.15 Blasting

No blasting occurs at MCPP, Westside Mine or Teralba Colliery.

3.2.16 European Heritage

SLR engaged RPS to undertake an assessment of the European heritage items at the site that would need consideration during closure of the site. The following were identified within or immediately adjacent to the OCAL Complex:

- Seaham, West Wallsend, Fairley and Killingworth Railway (in Domain 14 – Other Mine Owned Lands);
- Rhondda Colliery Railway (crossing Domain 1 – Admin Workshop Haul Road); and
- Teralba Conservation Area (adjacent to Domains 13 – Teralba Southgate and 14 – Other Mine Owned Lands).

Other nearby heritage items include the Teralba Water Pump Station (corner of Boolaroo Road) and may require consideration based on proposed land use. Additionally, Coyle's Shaft, Old Pacific Shaft A and other historic affiliated disturbances may require assessment of heritage significance if any changes to land use are proposed in these areas.

The risk of rehabilitation and European heritage interacting during closure was considered low during the Risk Assessment. In addition to the work undertaken by RPS, a Heritage Assessment has been undertaken by Weir Phillips Heritage (2015), and no items of historical heritage significance were identified to be protected from demolition across the OCAL Complex.

Condition 5(k) of Schedule 3 of the PA09_0203 requires the development of a Heritage Management Plan. In order to satisfy the condition for the management of historical heritage items, an historical heritage management section was included within the LW 51 and LW 52 Extraction Plan (WWC SD PLN 0128).

3.2.17 Aboriginal Heritage

An Archaeological Constraints and Opportunities Report for the OCAL Complex were developed by RPS as part of detailed closure planning. No aboriginal heritage constraints outside the existing legal requirements were identified for any proposed land uses.

The Risk Assessment deemed Aboriginal Heritage as a medium risk to rehabilitation at the OCAL Complex.

An Aboriginal Cultural Heritage Management Plan (ACHMP) (WWC SD PLN 0062) has been developed for the OCAL Complex in accordance with Condition 5(k) of Schedule 3 of the PA09_0203 and in consultation with the registered Aboriginal Stakeholders. The ACHMP defines OCAL's approach to continuing to maintain open and ongoing communication between OCAL and all relevant Aboriginal stakeholders. The plan also defines the principles and protocols for the management of Aboriginal sites across the Complex.

As part of the initial mine plan development, impacts to Aboriginal sites were avoided where possible. Aboriginal archaeological artefact salvage for the LW 51 and LW 52 areas were completed in 2015 in accordance with the ACHMP.

Previously, Aboriginal cultural heritage sites have been identified on the MCPP site, and one grinding groove site has been destroyed, with Consent to Destroy issued by the National Parks and Wildlife Service. Two other grinding groove sites have been discovered and are currently remaining in place. There are no planned changes to operations into undisturbed land, and as such, it is unlikely that Aboriginal sites will be further disturbed at MCPP. Regardless, all employees and contractors are made aware of their responsibilities to report and protect any new Aboriginal sites, through training and inductions.

There are no known Aboriginal sites at Westside Mine or Teralba. Where additional clearing is required, the sites Ground Disturbance Permit process will apply and as part of the due diligence an assessment of known and potential Aboriginal sites is undertaken before any works can commence.

If any suspected Aboriginal heritage objects are discovered during the MOP term, works within the area will cease until appropriate investigations are conducted and any necessary permits or management processes are in place, in accordance with the National Parks and Wildlife Act 1974 and other relevant legislation.

3.2.18 Bushfire

OCAL has a Bushfire Management Plan (WWC SD PLN 0035) that covers all of its landholdings, and WWC, MCPP, Westside Mine and Teralba Colliery are managed in accordance with this Plan. It was written to adhere to the requirements of the NSW Rural Fire Service and provides fire prevention, control and response measures at each of the sites. This Plan outlines various management measures to minimise the likelihood of bushfire events and it is intended that this would continue to apply during the term of the MOP. The following is a summary of the management measures adopted:

- The use of Asset Protection Zones (APZ) at sites to create a buffer between bushland and infrastructure;

- Mechanical or manual hazard reduction activities, including slashing and burning, are carried out three times a year;
- Minimisation of fuel sources within the APZs;
- Maintaining a fire trail network and monitoring these trails before and after the fire season;
- Raising awareness amongst OCAL staff and contractors about fire safety and prevention of ignition;
- Prohibiting works with potential to start fires (e.g. Welding) during high/extreme/catastrophic fire days;

3.2.19 Drought

Drought was considered a low risk to rehabilitation during the Risk Assessment given the climate and annual rainfall amounts in the Lake Macquarie region. No additional management actions were warranted for this aspect.

3.2.20 Public Safety and site security

OCAL operates under a developed a safety management system that outlines mine safety issues and how they are managed, therefore public safety was only deemed a medium risk to rehabilitation during the risk assessment. All visitors and contractors are required to sign in and out when they enter and leave the site respectively, all contractors are required to be inducted to work at the site and all underground visitors are to be accompanied by a mine representative.

MCPP and WWC have developed a safety management system that includes the following management measures, which will be continued during the MOP term:

- An electronic 24-hour security system;
- Security patrols undertaken and the site is fenced and signposted;
- All personnel and contractors are required to undertake a Glencore induction and MCPP site familiarisation prior to commencing work on site;
- All personnel, contractors and visitors are required to sign in and out when they visit the site; and
- All visitors to the site are to be accompanied by an official at all times.

Safety measures currently in place at Westside Mine include:

- All visitors are required to report to the mine office on arrival and must sign the visitors' book indicating reasons for visiting and expected time of departure;
- Contractors working on site are inducted in mine safety, environmental and community issues prior to commencing work;
- A security firm will conduct regular site patrols, particularly over weekends, as well as provide back to base monitoring for the alarm system;
- Maintenance of existing security fences on site; and
- Restricting access to rehabilitated areas by trail bike riders and four wheel drive operators.

Teralba has various public safety measures in place to prevent unauthorised access, including enclosing mine entries and shafts with temporary fences prior to, and during, sealing.

During closure activities, the emphasis on public safety will be maintained, and security measures will be implemented where required.

3.2.21 Waste Management

Waste management at OCAL was considered a medium risk to rehabilitation during the Risk Assessment. The waste management practices used at OCAL are detailed in **Section 2.3.7.**

3.3 Operational Issues which affect rehabilitation

This section describes aspects of the operation that have the potential to significantly impact the quality and/or timing of rehabilitation. These aspects were considered high risk in the Risk Assessment discussed in **Section 3.1**.

3.3.1 Tailings Dam and Rejects Emplacement Area Capping

OCAL are committed to filling the Tailings Dam footprint to produce a free draining final landform. It is intended to backfill the dam footprint with coarse rejects and blend the final landform of the tailings area with the REA to produce a free-draining integrated landform rehabilitated for a suitable post mining land use.

The capping of the Tailings Dam for OCAL constitutes a large portion of the closure project. Capping of the Tailings Dam requires a large capital budget and the risks associated in working in the dam will require ongoing identification and management.

The deposition of tailings ceased in mid May 2016. The final six months of deposition of tailings focused on depositing the tailings in the most desirable formation to promote drainage and evaporative drying of the tailings. The typical drying time of a coal Tailings Dam is between 3 to 8 years. During the MOP term, the focus will be on drying out the dam.

ATC Williams has prepared concept design for to Closure that will be used by the project as a basis to form an assumed design until the shear strength profile of the dam is known.

Methods available for capping and reclamation of soft tailings deposits typically include;-

- Displacement method;
- Placed capping layers;
- Placed capping with reinforcement;
- Beached capping layers;
- Controlled placement of tailings; and
- Controlled placement of tailings with pipe-head flocculation.

The estimation of the shear strength profile for a tailings deposit is known to be one of the most important factors when considering the design of a capping system. When the dam is suitably dried out (3 – 8 years post tailings deposition) shear vane and cone penetrometer testing will be completed on the dam to provide the shear strength profile for the dam. The shear strength profile of the dam will allow an option analysis for the best method of capping the dam to be selected and subsequently a detailed design to be completed.

A final landform feasibility design will be completed for the Tailings Dam as part of the detailed closure plan. Completion of the final landform design will enable material quantities to be more accurately estimated. This in turn will allow planning for the sourcing of capping and final landform material to be progressed. The availability of capping material for the Tailings Dam and REA was considered a high risk to rehabilitation during the Risk Assessment.

The MCPP Tailings Dam is currently listed as a ‘Prescribed Dam’ under Schedule 1 of the *Dams Safety Act 1978*, which is regulated by the NSW Dams Safety Committee (DSC).

As part of the decommissioning of the Tailings Dam, the MCPP will be required to undertake the following:

- Submit a 'notice of intention to design or modify a dam' along with detailed information as to the proposed filling and capping techniques to the DSC for review and comment prior to the commencement of work; and
- Following the successful completion of the filling and capping of the dam, submit an application to the DSC to de-list the dam as 'prescribed' under Schedule 1 of the *Dams Safety Act 1978*. It is envisaged that the application will require an 'as-constructed' drawing prepared by a suitably qualified engineer, which demonstrates that it has been adequately decommissioned and that it no longer constitutes a dam.

Following the completion of decommissioning and rehabilitation, covenants may be installed on various parts of the land to notify future landholders of any constraints posed for particular types of land use.

3.3.2 Inadequate Growth Media Material for Rehabilitation Works ~~Growth media material for revegetation of the Tailings Dam and REA~~

At present there are insufficient topsoil stockpile resources for the necessary rehabilitation required across the OCAL Complex. This is a high risk to rehabilitation at the site, as ranked in the Risk Assessment. Where there are insufficient volumes of topsoil for rehabilitation works, OCAL shall ~~consider sourcing~~ source topsoil for use, where required, from external provider sources. Organic ameliorants (e.g. compost) may also be sourced from an external provider. Any material sourced from offsite sources will be done so in accordance with the requirements of the *POEO Act,* waste regulations and the relevant EPA waste classification guidelines.

Further details are provided in the *Materials Management Protocol* (**Appendix J**).

In addition, onsite borrow pit areas adjacent to the Tailings Dam and REA, along with overburden from Westside may be used as onsite sources of growth media. ~~the detailed mine closure plan is considering a number of alternate or complimentary options with two that are being given further consideration being the use of overburden material from Westside as well as identifying suitable borrow pit areas adjacent to the Tailings Dam and REA~~. It is expected under either of these scenarios, that the use of biosolids or compost will be required to further enhance the establishment of a suitable vegetation cover.

3.3.3 Subsidence related to Auger mining and shallow workings

The Westside Mine extracted coal from the Great Northern and Fassifern Seams between the 1980s to 2012 from West Wallsend No. 2 LWs 11 to 15. The Westside Mine also has an area of highwall coal augering in the Fassifern Seam that was completed in 2010/2011. The septum coal between the auger holes has now crushed. It is noted that the surface above the auger holes was previously affected by pothole development from a collapsed shallow underground mine in the Great Northern seam as well.

This is discussed further in **Section 8**.

3.3.4 Leaking methane from mine

The following potential sources for methane emissions have been identified:

- Unsealed, failed or inadequately sealed mine openings
  - Shafts, drifts, etc. passing through worked seams including shafts sealed >20 years ago;
  - Boreholes sealed >20 years ago or unsealed boreholes;

- Subsidence and longwall areas that could have interconnecting paths from underground areas (e.g. goaves) to surface via cracking; and
- Groundwater expression to surface.

The known open, temporarily capped, and/or leaking mine openings to worked coal seams and relevant domain locations are:

- Off Wakefield Rd (Domain 12 Infrastructure)
  - LW11 dewatering hole (off Wakefield Rd) – Piezometer to be installed;
- Northgate Shaft#1 Elevator (Domain 11 Teralba Northgate);
- Northgate Shaft#2 Upcast fan shaft (Domain 11 Teralba Northgate);
- Northgate Shaft#3 Upcast fan shaft (Domain 12 Infrastructure);
- Northgate Shaft#4 Upcast fan shaft (Domain 12 Infrastructure);
- Northgate Drift (Domain 11 Teralba Northgate);
- Wakefield Drift (Domain 11 Teralba Northgate);
- Southgate Service Boreholes (Domain 13 Teralba Southgate);
- Australasian Seam Drift Old Pacific (Domain 13 Teralba Southgate);
- Fassifern Seam shaft Old Pacific (Domain 13 Teralba Southgate);
- Great Northern Seam Drive Old Pacific (Domain 13 Teralba Southgate);
- Fassifern Seam Drift Old Pacific (Domain 13 Teralba Southgate);
- A Shaft Old Pacific (outside domains); and
- Coyle's Shaft Old Pacific (outside domains).

At the time of report writing the MOP, the following are sealed:

- WWC Shaft#1 Elevator (Domain 6 Pit Top Facilities);
- WWC Shaft#2 Upcast fan shaft (Domain 12 Infrastructure);
- WWC Shaft#3 Upcast fan shaft (Domain 12 Infrastructure);
- Drift (Domain 6 Pit Top Facilities);
  - WWC Service Boreholes
- Fan 3 Site (Domain 12 Infrastructure)
  - Ballast Borehole;
  - Blocked Ballast Borehole;
  - Nitrogen Borehole;
- WWC Pit Top (Domain 6 Pit Top Facilities)
  - 2 x Electrical Boreholes;
  - 2 x Water Boreholes;
  - 1 x Diesel/ Solcenic; and
  - 1 x OLD Diesel/Solcenic.

This is discussed further in **Section 3.2.~~11~~12** relating to methane monitoring and management.

The majority of holes drilled post-1996 (i.e. from N2098 onwards) has associated cementing records verified by an OCAL representative; however, cementing prior to this was not verified by an OCAL representative and the info exists in hard copy summary sheets.

4 FINAL POST MINING LAND USE

4.1 Identified Preliminary Post Mining Land Uses

Based on the initial Pre-Feasibility Constraints and Opportunities Analysis undertaken for Mine Closure (2014) and further constraints works completed as part of detailed closure planning (outlined the following preliminary post mining land uses were proposed:

- Bushland;
- Industrial;
- Pit Lake;
- Recreation;
- Residential; and
- Conservation (Voluntary Conservation Area).

These preliminary land uses were expanded and modified due to considerations as part of the final post mining land use determination process.

4.1.1 Options Analysis

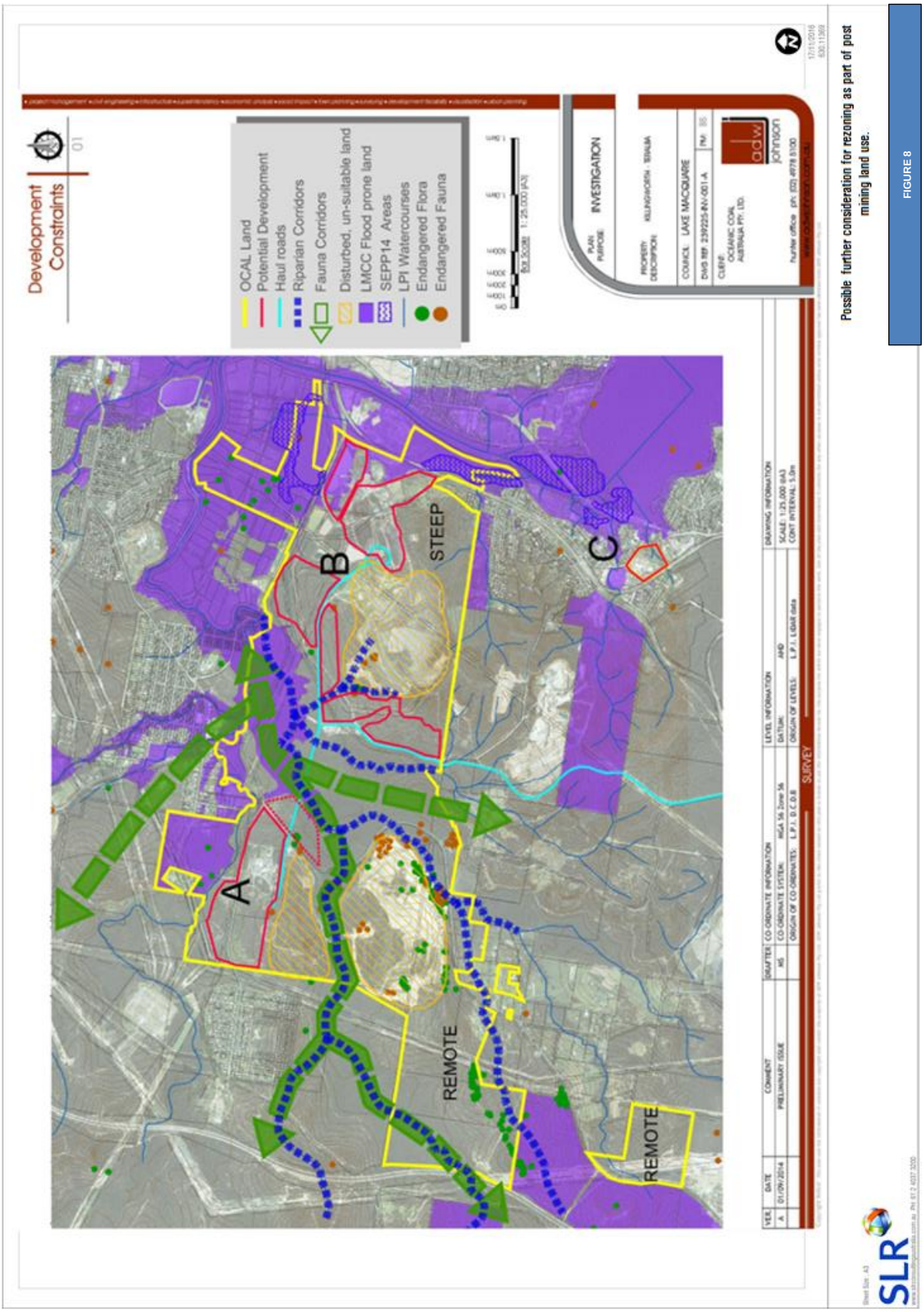
In 2014, OCAL engaged ADW Johnson to undertake a high level strategic review (market analysis and planning) of OCALS landholdings to identify what opportunities there were to increase land value prior to disposal by considering rezoning for residential, industrial or some other mixed use.

Following an initial desktop review, some areas within the OCAL Complex were immediately excluded due to environmental or flooding constraints. Based on the analysis of the remaining areas in the OCAL Complex, three areas were identified for possible further consideration for rezoning as part of post mining land use. These are shown as **Figure 8** below, with the outcomes from the analysis being summarised in **Table 14**:

Table 14 Strategic Assessment of Post Mining Land Use requiring Rezoning

	Area A	Area B	Area C
Domains	6, 14	8, 9, 11, 14	13
Current Zoning	SP 1 Mining, E2 Environmental	SP 1 Mining	SP 1 Mining
Preferred Land use	Residential	Industrial	Residential or Industrial
Likely yield	500 lots (detached Ave. 450m^2)	150 ha (gross site area)	7 ha Industrial 70 lots (detached residential 450m^2) 120 seniors or medium density
Rezoning required	General Residential R(1)	General Industrial IN1	Residential R(3) Light Industrial IN(2) Mixed Use B(4)
Cost to change zoning	$277,000	$205,000	$132,500
Time to change zone	Up to 2 ½ years	Up to 2 ½ years	Up to 2 years
Likely pre rezoning value	$250,000 to $400,000	$500,000 to $800,000	$2.0 to $3.0 million
Likely re zoned value	$5.0 to $7.5 million	$4.5 to $6.0 million	R (3) $3.5 to $4.8 million
Potential disposal time frame	3 years	3 to 5 years	2 to 3 years

	Area A	Area B	Area C
Risks	High lead in costs Lack of council support for rezoning Market failure Site unknowns	Lack of market Time frame for disposal Community opposition Site unknowns	Community opposition Site unknowns Contamination
Benefits	Potential market Increase in value Community perception Relative easy		Likely market Faster disposal (residential) Relatively smooth process


Development Constraints
OCAL Land
Potential Development
Haul roads
Riparian Corridors
Fauna Corridors
Disturbed, un-suitable land
LMCC Flood prone land
SEPP14 Areas
LPI Watercourses
Endangered Flora
Endangered Fauna
INVESTIGATION
A
B
C
STEEP
REMOTE
REMOTE
Possible further consideration for rezoning as part of post mining land use.
FIGURE 8

4.2 Final Post Mining Land Uses

Following considerable internal review and a detailed cost benefit analysis of the various options, OCAL has adopted the following post mining land use options for the Complex:

- Retained Industrial/light industrial infrastructure and roads;
- Bushland;
- Bushland (Voluntary Conservation Area)
- Water management (Dams, Lakes and Wetlands);
- Pit Lake;
- Recreation (State Conservation Area);
- Pasture; and
- Existing Residential.

The post mining land uses per domain are detailed in **Table 15** and included as the OCAL Complex Post Mining Land Use Plan (**Figure 9**).

In addition a full set of the Post Mining Land use Plans for each Domain is attached as **Appendix F** to this MOP.

Table 15 OCAL Post Mining Land Use by Domain

Domain No.	Domain Name	Land Use
1	Admin Workshop and Haul Road	Retained infrastructure for Light industrial (access road, buildings), Bushland, Water management
2	North Rehab Area	Bushland, Water management, Retained access tracks
3	South West Pit	Bushland, Water management, Retained access tracks
4	Final void	Pit Lake Bushland, Pasture Water management, Retained access tracks
5	VCAs	Bushland (managed as Voluntary Conservation Areas), Retained access tracks
6	Pit Top Facilities	Retained infrastructure for Light industrial (access road, buildings), Pasture, Water management
7	Tailings Dam	Pasture Water management
8	REA	Pasture Water management

Domain No.	Domain Name	Land Use
9	Surface Facilities	Retained Infrastructure - light industrial (rail loop, access roads, buildings, hardstands) Bushland, Water management
10	Maturation Ponds	Non OCAL Industrial (substation, access road), Pasture Water management
11	Teralba Northgate	Pasture Bushland
12	Infrastructure	Bushland Water management
13	Teralba Southgate	Retained infrastructure Light industrial (hardstands) Bushland Water management
14	Other Mine Owned Lands	Non OCAL Industrial (roadways, powerline corridors), Retained access roads Residential Bushland Water management Wetland
15	Project Approval Area	Existing Bushland – (State Conservation Area) - Recreation
16	Rural Residential Property	Existing Residential (houses, access roads)

4.3 Regulatory Requirements

Regulatory requirements for post mining land use and the rehabilitation for the OCAL Complex applicable to each operating area of the min are listed in the tables included as **Appendix G**.

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Post Closure Landuse

- Bushland
- Non-OCAL Infrastructure
- Pasture
- Residential
- Retained Hardstand
- Retained Infrastructure
- Water Management
- Wetland

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Oceanic Coal Complex
Post Mining Landuse

FIGURE 9

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5 MINE CLOSURE PLANNING AND EXECUTION

5.1 Domain Selection

Primary and secondary domains have generally defined in accordance with the methodology prescribed in ESG3 (DTIRIS 2013). As such the following applies:

- Primary Domains are defined as the set of discrete areas that have a particular operational or functional purpose. Land management units with similar operational function are likely to have similar geophysical features and constraints /opportunities for rehabilitation; and
- Secondary Domains are land management units with similar post mining land use objectives, such as bushland communities and pastures.

In addition, the GCAA Mine Closure Protocol requires the site to be divided into discrete management Domains which have been adopted for the purposes of the MOP. Whilst not strictly in accordance with ESG3, the nominated Closure Domains have been considering the operational function and where relevant, specific final land use objectives.

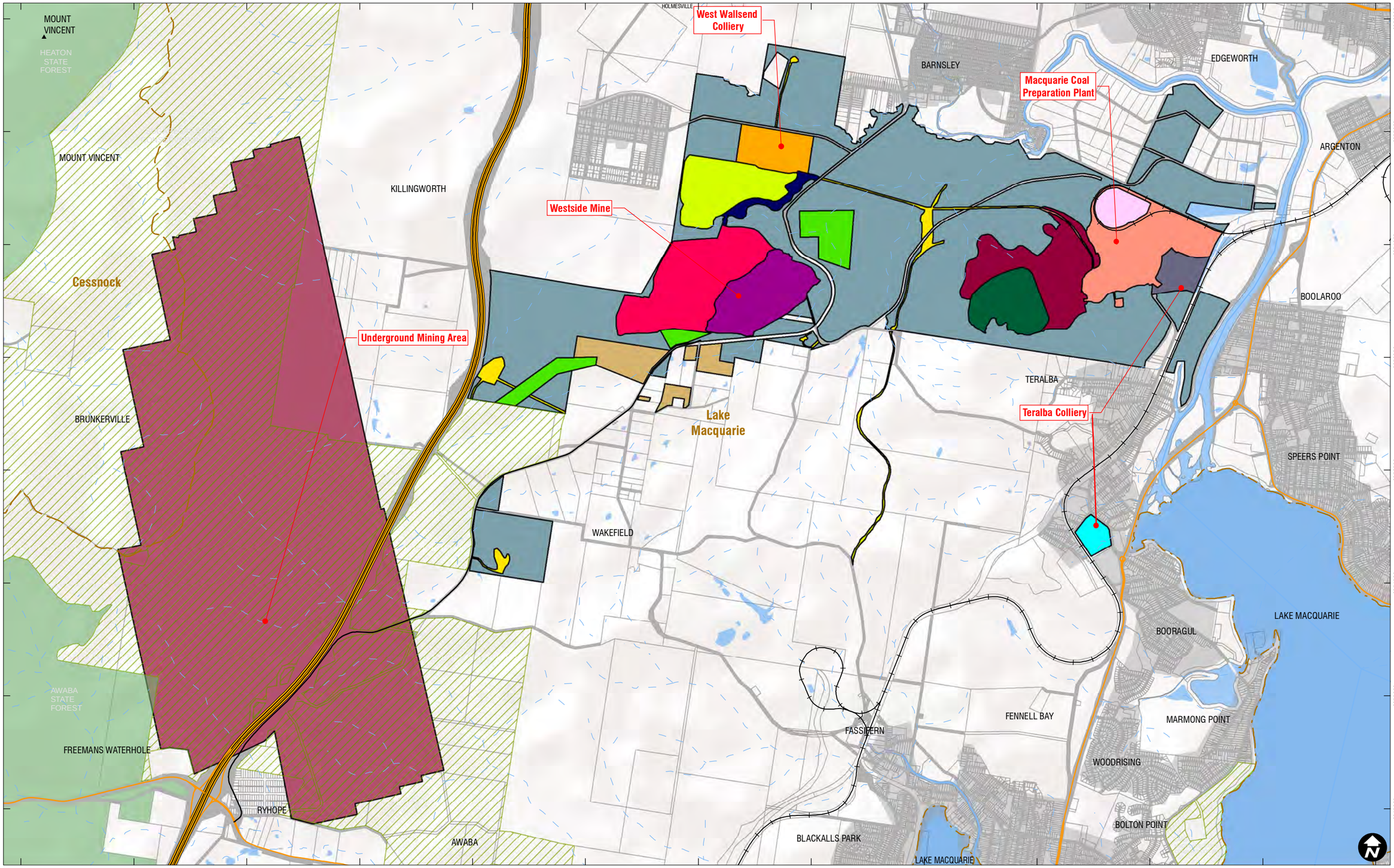
The Domains at the commencement of the MOP period are shown in **Plan 2** as well as **Figure 10**.

OCAL has divided the Complex into a series of domains based on geographical location, and a series of post mining land uses were identified which considers location, surrounding land uses, rehabilitation requirements and a range of other factors.

The OCAL Complex is composed of the following domains (shown in **Figure 10**):

- Domain 1 – Admin Workshop, Haul Road (Westside);
- Domain 2 – North Rehab Area (Westside);
- Domain 3 – South West Pit (Westside);
- Domain 4 – Final Void (Westside);
- Domain 5 – Voluntary Conservation Areas (Westside);
- Domain 6 – Pit Top Facilities (WWC);
- Domain 7 – Tailings Dam (MCPP);
- Domain 8 – Rejects Emplacement Area (MCPP);
- Domain 9 – Surface Facilities (MCPP);
- Domain 10 – Maturation Ponds (MCPP);
- Domain 11 – Teralba Northgate (MCPP);
- Domain 12 – Infrastructure (WWC);
- Domain 13 – Teralba Southgate (Teralba);
- Domain 14 – Other Mine Owned Lands;
- Domain 15 – Project Approval Area (WWC); and
- Domain 16 – Rural Residential Property.

A full set of the Post Mining Land Use Plans (secondary domains) adopted by OCAL have been included as **Appendix F**.



Closure Domains (Primary)

- Domain 1 – Admin Workshop Haul Road
- Domain 2 – North Rehab Area
- Domain 3 – South West Pit
- Domain 4 – Proposed Final Void
- Domain 5 – VCA Areas
- Domain 6 – Pit Top Facilities
- Domain 7 – Tailings Dam
- Domain 8 – Rejects Emplacement Area
- Domain 9 – Surface Facilities
- Domain 10 – Maturation Ponds
- Domain 11 – Teralba North Gate
- Domain 12 - Infrastructure
- Domain 13 – Teralba South Gate
- Domain 14 – Other Mine Owned Lands
- Domain 15 – Project Approval
- Domain 16 – Rural Residential Property
- NSW National Parks Estate
- NSW State Forests

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Oceanic Coal Complex Closure Domains

FIGURE 10

It is expected that each domain will require particular rehabilitation objectives and methodologies to achieve the desired final land use outcomes. Domain objectives and rehabilitation methods are discussed in the following sections.

5.2 Domain Rehabilitation Objectives

The key rehabilitation objectives for each of the Domains are included in the individual domain chapters outlined below in **Sections 6** through to **Section 22**.

In addition to the specific Domain objectives, the overall stated objectives of rehabilitation and closure at the OCAL Complex is:

> ***To maximise the retention of existing infrastructure for reuse, rehabilitate remaining disturbed areas to be consistent with adjoining areas whilst not prohibiting potential future re-development of the site, and establish long-term stable landforms appropriate for the selected final land uses ("beneficial land use").***

Rehabilitation objectives are long-term performance goals of mine rehabilitation. The overarching rehabilitation objectives for the OCAL Complex are:

1 Safe – publicly accessible areas and areas for post mining land use are:

a. Free of public safety risks or measures implemented to restrict access and protect public safety i.e. site risks appropriately addressed including shafts and boreholes, subsidence pegs, noxious and dangerous gases, etc.;

b. Restricted where mitigation of risks is being monitored for effectiveness e.g. Sugarloaf Conservation Area;

c. Appropriately rehabilitated to facilitate protection of built features and key areas of significance unless the owner agrees otherwise or the damage is fully restored, repaired or compensated for under the *Mine Subsidence Compensation Act 1961*;

d. Defined by appropriate landforms designed to consider protection of human and animal health;

e. Free of hazardous materials or relevant materials appropriately managed e.g. asbestos;

f. Within appropriate contamination levels e.g. industrial, etc. or control measures employed;

g. In appropriate condition for ongoing use e.g. infrastructure;

2 Stable – final rehabilitated post mining landforms and areas are:

a. Free draining to the surface water system via hydraulically and geomorphically suitable features and discharging from approved locations as per EPLs;

b. Physically and geotechnically stable within accepted criteria e.g. final void, shafts, subsidence, bunds, dams, REA, Tailings Dam, spillways, drainage and waterways, spillways, contour banks, etc.;

c. Within acceptable erosion and sediment mobilisation rates (similar to natural/analogue);

d. Chemically stable within accepted criteria e.g. spontaneous combustion, leachates, methane, etc.;

3 Non-polluting – post mining areas and associated soils, runoff, emissions, etc. are:

a. Within acceptable surface water and groundwater quality criteria for the Complex (preventing adverse impacts on the environment and pollution incidents);

b. Not contaminated above levels suitable to post mining land use;

c. Within acceptable soil and leachate quality;

d. Capped, covered, backfilled, etc. with material of suitable physical and chemical properties at appropriate depths to prevent pollution long-term e.g. Tailings Dam, REA, shafts;

e. Not causing or likely to cause pollution e.g. retained infrastructure, materials retained underground, encapsulated materials;

4 Sustainable – rehabilitated areas, retained infrastructure, and conservation areas are:

a. Capable of supporting and maintaining the designated post mining land use;

b. Biologically and physically enduring and self-sustaining e.g. biodiversity, habitat, landform, drainage, etc. (infrastructure considers maintenance by post mining land user);

c. Beneficial for use or retention ecologically, socio-economically, culturally, etc.;

5 Compatible – all post mining areas including retained infrastructure are:

a. Consistent with the final post mining land use e.g. bushland, pit lake, industrial;

b. Suitable complements to adjacent land features, infrastructure and uses e.g. vegetation, landforms;

c. Designed to minimise adverse socio-economic effects associated with mine closure and maximise benefits where practicable; and

d. Mindful of visual amenity and aesthetics in the area and comparable where practicable.

Separate to the specific rehabilitation objectives; OCAL has set overall objectives for execution of closure at the Complex. These key objectives are:

- Appropriate provisioning for investigation and planning, rehabilitation execution, monitoring, management and relinquishment;
- Relinquishment of licences, development consents, leases etc. and meeting or exceeding regulatory or other obligations associated with the Complex;
- Reduction of any residual environmental liability for the site; and
- Full recovery of the security bond held by the DRG.

5.3 Rehabilitation Phases

The rehabilitation process can be described as a sequence of conceptual rehabilitation phases to achieve a final land use that is self-sustaining. These phases of rehabilitation are described in **Table 16.**

Table 16 Rehabilitation Phases

Phase	Description
Decommissioning	The process of removing plant and equipment from active services and rendering the area safe.
Landform Establishment	The process of shaping unformed rock of other sub-stratum material into a desired land surface profile. This includes earthworks activities such as cut and fill, rock raking, water storage and drainage construction.
Growth Medium Development	The process of establishing and enhancing the physical structure, chemical properties and biological properties of a soil stratum suitable for plant growth. This includes placing and spreading soil and applying ameliorants.
Ecosystem Establishment	The process of seeding, planting and transplanting plant species. Incorporates management actions such as weed and feral pest control to achieve species establishment and growth to juvenile communities, and habitat augmentation.
Ecosystem Sustainability	The process of applying management techniques to encourage an ecosystem to grow and develop towards a desired and sustainable post mining land use outcome. Incorporates features including species reproduction, nutrient recycling and community structure.

Phase	Description
Land Relinquishment	The completion criteria for rehabilitation are met and the land is determined to be suitable to be relinquished from the mining tenement.
Subsidence Remediation	The process of remediating cracks caused by subsidence above the underground mining area (applicable to Domain 15 only).

6 DOMAIN 1 WESTSIDE OPEN CUT ADMIN, WORKSHOP, HAUL ROAD

The following table summarises the key rehabilitation and closure aspects relevant to Domain 1.

Table 17 Summary of the Key Rehabilitation and Closure Aspects Relevant to Domain 1

Key Aspect	Domain-Specific Information
OCAL Complex Area	Westside Open Cut administration, workshop, haul road areas
Total Area of Disturbance	7.54 ha
Post mining land use	• Light industrial (retained existing industrial workshop sheds, bunded storage areas and oil-water separator, access road) • Bushland • Water management (dams)
Existing components	• Undisturbed remnant bushland; • Existing bushland rehabilitation; • Wakefield Road Underpass and private coal haul road (part); • Partially rehabilitated haul road to former Westside Open Cut; • Existing workshop shed, demountable buildings, bunded storage area stored drums; • Existing hardstand laydown and existing oil-water separator; and • Dams C, G and H.
Key obligations	• Design rehabilitation to reduce the visual impact on surrounding residences; • Rehabilitation works to involve the establishment of native trees and shrubs; • Slopes to be generally less than 14 degrees where possible; • Rehabilitation to be undertaken in accordance with any mining lease approved for the development; • Return the site back to bushland similar to the pre-mining environment; • Ensure regular maintenance of rehabilitation is undertaken; • Removal of all buildings, machinery, plant or equipment upon expiry of the mining lease; • Rehabilitation of the ground surface after removal of any buildings, machinery, plant or equipment; • Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area or any undue interference to fish or their environment; • Minimise soil erosion; • Rehabilitate any lands affected by mining to the satisfaction of the minister; and • Maintain an arboreal screen to minimise visual impacts from the community.
Proposed Works during the MOP Period	• ~~Removal of the existing demountable buildings;~~ • Retention of the existing workshop and oily water separator, sediment dams, pumping system and EPL4033 EPA Point 3 for use by an alternate occupier and land user; • Minor upgrades to Dams C, D and H to repair erosion on the dam

Key Aspect	Domain-Specific Information
	wall and remove establishing shrubs and trees; • A section of the partly rehabilitated internal coal haul road is also retained within the domain to allow vehicle access to the completed Westside Open Cut rehabilitation areas, dams and final void. • Monitoring and maintenance of the previously rehabilitated bushland; • Establishing bushland rehabilitation on the backfilled haul road and culvert under Wakefield Road; • Establishing bushland rehabilitation of the haul road side verges to reduce road width to single vehicle access once haulage is no longer required; • Establishing pasture grass on 30m^2 of Dam G

6.1 Baseline Conditions

Figure 11 shows the existing arrangement of Domain 1 as at July 2016.

Access to Domain 1 is currently either directly from Wakefield Road or internally via the MCPP private coal haulage road.

Domain 1 is a 7.54 ha area that includes the old Westside Open Cut administration office, bathhouse and crib facilities along with the maintenance sheds and associated bunded areas. This hardstand and shed area is enclosed by a six foot chainmail fence and locked security gates. The existing oil-water separator is clean and has been retained on site to enable the site to be reused. The area is no longer in use although some mining equipment and consumables are currently stored there. The concrete-bunded oil lubricant storage area is located immediately west of the workshop building; however, no hydrocarbon products or storage facilities are present.

Non-friable vinyl floor tiles were identified in the shed with the inherent risk was classified as very low at the time of assessment by SLR; these are identified in the Hazardous Materials Register. The domain also includes demountable buildings that were previously used as offices.

The former underground storage tank (50 kL of diesel) was located on the south side of the storage area; this was decommissioned and removed.

The domain also includes a 225 m section of the WWC -MCPP private coal haulage road which passes under the Wakefield public road through an existing culvert.

0.6 ha of rehabilitated areas in Domain 1 was previously seeded following the demolition and removal of the coal conveyors and bins. Currently the revegetation in this area is establishing with small trees of mixed species being observed. A total of 3.91 ha of the domain is undisturbed or remanent bushland, including riparian vegetation alongside Cockle Creek.

Three small erosion and sediment control dams (Dams C, G and H) are retained in Domain 1 adjacent to Cockle Creek, with the runoff water from the hardstand, rehabilitated areas and the haul road being captured prior to discharge to Cockle Creek. Dam G is actively dewatered to Dam H which is actively dewatered to Dam C from which the water can flow via the licenced discharge EPA Point 3 associated with the domain, but located in Domain 14.

A 1.25 ha section of the partly rehabilitated internal coal haul road is also retained within the domain to allow vehicle access to the completed Westside Open Cut rehabilitation areas, dams and final void.

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Domain Boundary
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Domain 1
Admin Workshop Haul Road
FIGURE 11

6.2 Current Closure / Rehabilitation Status

Mining operations ceased at Westside in 2012. The workshop/store building with its adjoining hydrocarbon bunded storage has not been decommissioned as part of the Westside Mine closure process, instead it was maintained to support OCAL's ongoing operations with the shed being used as a storage and laydown area. The demountable administration buildings and bathhouse has also been retained with the area being used to store achieved files, with these building now being removed.

The main diesel tank, fuel dispensing unit and underground pipes were dismantled and removed off site to an authorised waste facility. A Phase 1 contamination assessment was undertaken at Westside Mine in May 2005 (Umwelt 2005), with follow up Phase 2 contamination assessments conducted in 2006 for the bulk fuel area (RCA) and 2010 by Coffey. Hydrocarbon contaminated areas found include the unsealed vehicle parking areas, diesel refuelling bay and beneath the workshop pavement.

As part of the initial Westside Mine closure process, the identified contaminated material from the previous studies was excavated and transported to the current bioremediation area located near the final void (see Domain 4). As the owner of the diesel fuel tank, Hunter Valley Earthmoving (HVE) was responsible for the removal of the tank and decontamination of the site. The oil-water separator was cleaned, decontaminated and retained on the site.

The coal crushing plant facility (part of which was contained within Domain 1) was owned by HVE and was dismantled as part of the closure of Westside Mine. This included the following works:

- Utilities (power and water) to the crusher was disconnected and made safe.
- The crushers, conveyor gantries and coal bin were dismantled and removed off site.
- The concrete footings were broken up or covered;
- Concrete and other inert waste generated from this process were disposed of in the final void;
- Carbonaceous material from the ROM pad, product stockpile and high ash stockpile area were recovered and taken to Lucky's Pad for re-processing;
- A 300 mm cap of inert material sourced from the mine was placed over areas that contained residual carbonaceous material; and
- The coal ash analyser radiation gauge was removed.

A small area (0.6 ha) that previously contained the coal crushing plant is rehabilitated (reshaped and reseeded). The site has a number of established smaller trees, however the understorey is absent.

As referenced in the Westside Mine 2015 Rehabilitation Walkover Inspection Report (Kleinfelder 2015) "*In June 2013 the Division of Resources and Energy (DRE) assessed all areas of Domain 2, except the former ROM stockpile area as meeting the closure criteria for the site*". Note that according to the final domain plan, part of the referenced Domain 2 in the Kleinfelder 2015 report is actually within Domain 1 of the DMCP (south and west of Dam G near the infrastructure) and therefore meets the closure criteria.

The 11 kV powerline and potable water pipeline from West Wallsend Colliery which supplies power and water to Westside Mine has remained in service for the continued use of the infrastructure. The existing envirocycle-type plant treated all sewage generated by the small workforce, with the resultant clear effluent being chlorinated and spray irrigated onto a rehabilitation area. All runoff from the irrigation area collected in Dam G along with rainfall runoff from the surface facilities. The existing sewerage treatment plant and associated spray irrigation area (adjacent to Dam G) was also retained to service the administration facilities. The ongoing servicing of this facility is undertaken as part of West Wallsend Colliery's environmental management system.

The hardstand area both inside the compound and along the haul road is currently used for the storage of plant and equipment, however this is planned to be progressively removed from the site.

The Westside coal haulage road was reduced in area with the roadside ripped and seeded to retain a standard light vehicle access rather than the full haul road.

Domain 1 catchment drains into Dam G. OCAL manages the water management system to maintain all dams at a low level (i.e. Dams G, H and C) in order to capture and treat potential dirty water from storm events. The pumping network has been maintained between Dams G, H and C to allow for the transfer of dirty water to Dam C which continues to be used to treat water as needed (i.e. flocculation) prior to discharge off site via Domain 14's EPA Discharge Point 3.

6.3 Closure Commitments/Obligations

SLR prepared a detailed Legal & Governance Register for mine closure with the key requirements adopted for the mine closure for the OCAL Complex, including those elements for Domain 1.

The following is a summary of the current closure commitments related to Domain 1:

- Design rehabilitation to reduce the visual impact on surrounding residences;
- Rehabilitation works to involve the establishment of native trees and shrubs;
- Slopes to be generally less than 14 degrees where possible;
- Rehabilitation to be undertaken in accordance with any mining lease approved for the development;
- Return the site back to bushland similar to the pre-mining environment;
- Ensure regular maintenance of rehabilitation is undertaken;
- Removal of all buildings, machinery, plant or equipment upon expiry of the mining lease;
- Rehabilitation of the ground surface after removal of any buildings, machinery, plant or equipment;
- Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area or any undue interference to fish or their environment;
- Minimise soil erosion;
- Rehabilitate any lands affected by mining to the satisfaction of the minister; and
- Maintain an arboreal screen to minimise visual impacts from the community.

6.4 Proposed Final Land Use and Landform

Throughout the Life of Mine (LOM) Closure Planning process, OCAL completed a range of mine closure planning tasks for the Westside Mine, including Domain 1. Based on the outcomes of these studies and in consideration of what is permissible under the existing development consent, a proposed final land use strategy was presented in the Westside Mine Closure MOP (Umwelt, 2011). This has been adopted in the detailed Mine Closure Plan for the OCAL Complex.

The final land use outcomes adopted for Domain 1 (shown in **Figure 12**) are summarised below:

- The existing car park, hardstand, workshop and stores shed will be retained for the temporary storage of OCAL assets until they are either sold or removed from the site. Once this is complete, the site will be made available to be leased by a third-party. This includes the retention of the oil-water separator, security fence and gates;
- The 11kV power and potable water will be retained to continue to be provide electricity and water to the site from the existing WWC pit top facilities (see Domain 6);

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Domain Boundary
Recycled Water Pipeline
Surface Infrastructure
Post Closure Landuse
Bushland
Non-OCAL Infrastructure
Pasture
Residential
Retained Hardstand
Retained Infrastructure
Water Management
Wetland
Closure Activity
None
New Bushland Rehabilitation
New Pasture Rehabilitation
Hardstand Establishment
Dam Remediation Required
Spillway Construction
Subsidence Remediation (Auger Mining)
Subsidence Remediation (Longwall Mining)
Decommission
Sheet Size : A3
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Post Mining Landuse
Domain 1
Admin Workshop Haul Road
FIGURE 12

Access to the site will be from the existing access off Wakefield Road;

- ~~The existing demountable buildings will be demolished and removed from the site;~~
- The existing coal haul road will maintained to enable the haulage of growth media material from Westside along the WWC – MCPP private haul road to be placed on the Tailings Dam (Domain 7) and Rejects Emplacement Area (Domain 8) as part of the rehabilitation strategy (should it be required). Once this work is completed, the haul road will be rehabilitated to be a permanent access road for light vehicles only;
- The Wakefield Road Underpass will be backfilled and grouted with the cutting to the west of the underpass being backfilled to approximately natural surface. The 0.29 ha disturbance area will be rehabilitated to bushland with surface water being allowed to pass under Wakefield road through 2 x 600mm culverts;
- Dams C, G and H will be retained, and the existing pipe and pumping network maintained so that the occupier of the site can manage water and allow discharge from the site under the existing EPL; and
- The 0.6 ha area of existing rehabilitation will be monitored to ensure that it meets the Westside rehabilitation success criteria prior to relinquishment.

6.5 Approvals

The following section outlines the various approvals relevant to the OCAL Complex, with the key conditions relevant to Domain 1 summarised:

DA 125-5-2002 (Westside Mine Southern Extension development). The conditions relevant to Domain 1 include:

- Carry out rehabilitation of all mine areas in accordance with the requirements of any Mining Lease granted and shall ensure that the progressive rehabilitation of the area is also to the satisfaction of DWLC (now Office of Water);
- Ensure the prompt and effective rehabilitation of all disturbed areas of the DA area following the completion of mining and associated activities in that area to minimise the generation of wind-blown dust; and
- Undertake measures, as far as practical, to prevent spontaneous combustion from occurring on the site.

DA 91/00557 (Westside Mine Haul Road), DA 90/0242 (Westside Mine open cut operations, and surface facilities). The conditions relevant to Domain 1 include:

- Prepare an Environmental Management and Rehabilitation Plan by qualified civil engineer incorporating matters including “EARTHWORKS AND EROSION CONTROL” and “SITE REHABILITATION AND LANDSCAPING”;
- Landscape site and render ground erosion resistant to LMCC’s satisfaction;
- Site clearing, runoff and erosion control works and rehabilitation shall conform to the specifications and standards contained in: Erosion Control Policy (LMCC), etc.; and
- Prepare and submit to LMCC an annual environmental report detailing the progress of site rehabilitation, the results of the environmental monitoring program, any exceedance of licence requirements and any additional safeguards that need to be installed to meet licence requirements.

In addition, OCAL holds a number of mining tenures and leases. Domain 1 is located within CCL718.

The key licence relevant to Domain 1 is EPL No. 4033. The EPL addresses water pollution, waste, monitoring and testing, reporting via annual returns and maintaining copies of the licence at the relevant areas. Discharge point EPA 3 is associated with this domain, but located in Domain 14.

No water licences are associated with Domain 1.

6.6 Rehabilitation and Closure Actions - Scope of Works

This section specifies the various closure and rehabilitation activities for the domain. It includes a detailed description of the works to be undertaken. It is intended that this will form the basis of the Rehabilitation Cost Estimate (RCE) for each domain.

6.6.1 Decommissioning and Salvage of Assets

OCAL has prepared a detailed asset list which includes an inventory of all assets, including a comment and photographs of all identified equipment. A copy of the detailed asset and salvage register is included as **Appendix D**.

Salvage and recovery activities have been ongoing within the domain since Westside rehabilitation was completed in 2012 and more recently in association with WWC operations cessation in mid-2016. All unwanted equipment not removed will be managed via third party valuation, auction, and re-marketing. Where the equipment has no practicable value, it will be taken for scrap steel or disposed off-site as part of the closure waste disposal strategy.

Currently the workshop is being used to store unused OCAL equipment (i.e. electrical transformers) which will need to be managed prior to the workshop being leased or sold to a third party for some other future use.

6.6.2 Demolition

Liberty Industrial prepared a demolition report (Liberty Industrial, 2015) for the OCAL Complex which included a review of all relevant infrastructure and providing a method statement and costs estimate to undertake the demolition works.

In relation to Domain 1, the current cluster of demountable buildings within the site will be decommissioned and removed from site. Where an alternate user is identified they will be removed by suitable crane and truck. If an alternate user is not identified, the demountable buildings will be demolished on site.

The existing sewage treatment plant and associated spray irrigation area (adjacent to Dam G) has been retained to service the administration facilities (though not currently occupied).

The existing 11 kV and potable water supplies from the West Wallsend Pit Top will be maintained at the site. The existing car park will also be retained for future use. All other services to the site will be maintained, but where they are not required they will be terminated in box-culverts at least 1 m below ground surface, marked with suitable signage and updated in the services plan.

6.6.3 Waste Management

SLR has prepared a Waste Disposal Strategy (SLR, 2016) for the OCAL Complex which has provided a summary of the types and amounts of waste anticipated to be generated as a result of the OCAL Complex closure works; as well as providing advice on constraints and options for disposing of the waste.

The removal of the demountable buildings is not expected to generate much waste, however should the site need to be fully demolished, the buildings within Domain 1 would produce concrete (footings and slab), scrap metal and general wastes. The following is a summary of the quantities and actions:

- Concrete (estimated 492 tonnes): This would be transported to the Waste Management Hub (WMH) located in Domain 9 for screening and crushing for on-site re-use or dispatch to off-site recycling facilities;
- Scrap metal (estimated 51 tonnes): Transport to Domain 6 WMH for segregation for on-site reuse or dispatch to off-site recycling facilities; and
- General waste (estimated 9 tonnes): Transport to Domain 6 WMH for segregation for on-site re-use or dispatch to off-site recycling or landfill facilities.

6.6.4 Hazardous Materials

SLR has prepared a Hazardous Materials Report and Plan (SLR, 2016) for the site which included a review of current HAZMAT, dangerous goods and hazardous substances information for the OCAL Complex and to quantify the presence of hazardous materials located across all domains.

In the 2015 report previous, non-friable vinyl floor tiles were identified in the shed with the inherent risk classified as very low at the time of assessment; these are identified in the Hazardous Materials Register.

The shed with non-friable asbestos tiles will be retained in Domain 1 and on the Asbestos Management Register; however, should demolition be required, an intrusive survey must be conducted prior. No other ACM was identified in Domain 1; however, during demolition of the demountables, consideration will also to be given to sub-surface services that may include ACM such as drainage pipes, electrical or potable water conduits and structure formwork. Once cleared demolition and removal works are able to proceed.

Historical data has indicated that illegal dumping of ACM has been conducted on OCAL lands. A Complex wide 'unexpected HAZMAT finds' procedure will be developed to guide the address of any finds outside of building and infrastructure areas in the Complex. OCAL will implement this procedure to govern development of an action plan for any further HAZMAT discovered within the OCAL domains during the decommissioning process.

6.6.5 Contaminated Sites

SLR has undertaken an extensive review of existing information and an in-field sampling program to quantify the likelihood and extent of any contaminated sites within the OCAL Complex (SLR, 2016).

A sample taken within Domain 1 was found to exceed the Ecological Screening Levels (ESL) criterion for Total Recoverable Hydrocarbons (TRH) C10-C16, however this does not present any constraints to the ongoing use of the site as an industrial site and no further works are required.

Should any material be excavated from the area for use elsewhere, or if the infrastructure is demolished and the site rehabilitated, there would be a need to consider some additional quality assurance management measures which may include testing materials and the use of landfarming and/or the selection of suitable plant species to be used in rehabilitation if appropriate. Sediments in Dam G will require sampling to determine management requirements for sediments.

In addition to above, an Unexpected Finds Protocol will be adopted for works within the domain as a contingency plan. This would be used to address any unexpected contamination or other unexpected finds (e.g. buried tanks and drums) so they can be assessed and managed as part of the closure execution process.

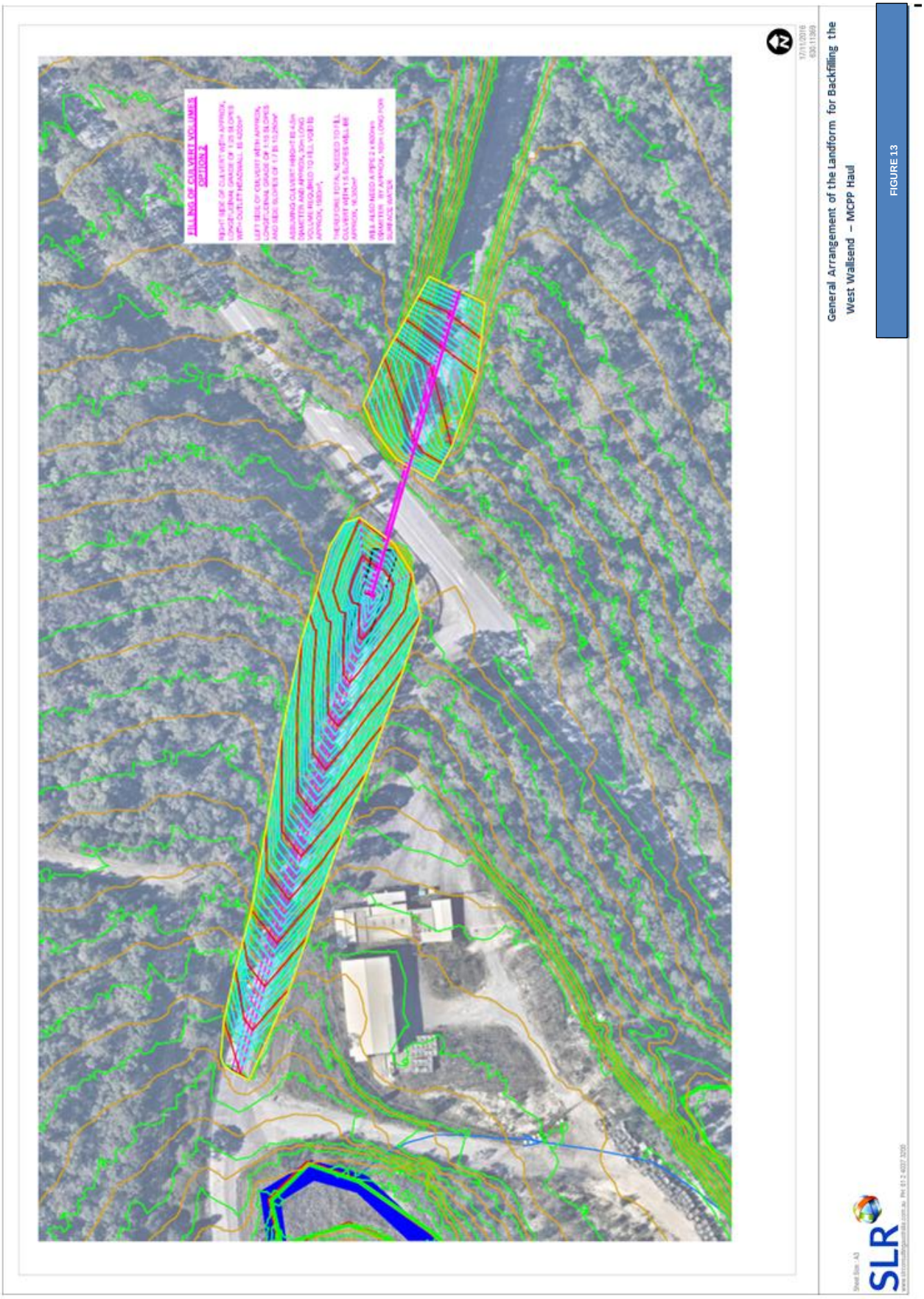
6.6.6 Civil Earthworks and Landform

Within Domain 1 there will be only limited civil earthworks required. The exception is the decommissioning and filling / grouting of the Wakefield Road Underpass. The following is a summary of the general civil earthworks required for rehabilitation and closure within Domain 1:

- Widen haul road by 3.5 m to facilitate hauling Westside growth media and fill material to WWC and MCPP for rehabilitation works, including shaft filling;
- If required, reshaping and preparation of the haul road to allow growth media materials to be transported from the Westside borrow pit area to the Tailings Dam and Rejects Emplacement Area (REA). Once the growth media material has been won, the edges to the haul road will be ripped and seeded to leave a smaller permanent access road for environmental management and bushfire management;
- The table-drain on the northern side along the haul road will require some remedial works to repair the existing erosion and make sure that it is stable in the longer term. This includes some reshaping of the drain and minor repair to the rip-rap coming off the rehabilitated areas. In some of the steeper sections, the use of jute mesh will need to be considered;
- To avoid long-term water issues and reduce the public safety risk of retained excavations, the road cutting leading into the underpass will be backfilled to natural surface. This will include ripping the existing asphalt road surface, prior to backfilling;
- Once access along the haul road is no longer required, the Wakefield Road Underpass will be filled and grouted. This will include placing engineered fill and a pumped lean slurry mix within the culvert. Subsoil draining will be installed via concrete culverts prior to filling to allow passage of water (maintenance of these culverts will be undertaken by the post mining land user);
- Wakefield Road rehabilitation including topsoil spreading, ripping, amelioration and seeding;
- Installation of standard erosion and sediment control measures during decommissioning and rehabilitation;
- Some minor earthworks are required for Dam C for long-term stability. This includes the clearing of vegetation from the embankments and upgrading the spillway to a more permanent structure. The spillway will be reshaped and lined with geo-fabric and rip-rap. A final inspection by a geotechnical engineer is required to ensure the works are appropriate;
- Remove sediments from Dam G and dispose to the Tailings Dam (based on sampling and test results); and
- Vegetation clearing is also required along the embankments of Dams H and C to ensure long-term stability and allow access for future dam embankment inspections.

Figure 13 shows the general arrangement for grouting and backfill of the Wakefield Road Underpass and associated road cuttings. In summary the following activities will be required;

- Ripping of the existing bitumen on the haul road surface, with it to be left in place given that it will be covered with backfill;
- Install subsoil drains prior to filling the culvert to half height with engineered fill;
- Pump a lean mix slurry (5 Mpa) to underside of culvert to within 1 m from the top;
- General fill either side of culvert; including filling the road excavation (14,500 m^3);
- Stormwater pipe 600 mm (reinforced concrete) to be placed under roadway with headwalls to allow some water to continue to pass under the road;
- Scour protection installation on the downstream side to allow water to be transferred off the landform and back into the natural system; and
- Topsoiling, revegetation to bushland.


FILLING OF CULVERT VOLUMES
OPTION 2
General Arrangement of the Landform for Backfilling the West Wallsend – MCPP Haul
FIGURE 13
SLR

6.6.7 Mine Sealing

There are no mine entries or boreholes to be sealed within Domain 1.

6.6.8 Revegetation

The existing 0.6 ha of rehabilitation within Domain 1 is still considered under establishment, with some scattered trees and shrubs being present. Ongoing monitoring of the area will determine whether follow up fertiliser and further seed application is required in order for the area to reach the rehabilitation sustainability phase.

In addition to the existing area, a total of 0.29 ha of bushland rehabilitation is required for the Westside – MCPP internal haul road to be backfilled. Once the culvert is filled and shaped to be consistent with the natural land surface the following key rehabilitation tasks will be employed:

- Where available, topsoil for the rehabilitation will be sourced from a stockpile adjacent to the site and it will be placed at a depth of 200 mm. Where topsoil is not available, bio solids will be used and applied at a rate of 100 t/ha; and
- The area will be ripped on the contour prior to the application of bushland tree seed.

Table 18 shows the Bushland Revegetation Species Mix and sowing rates to be used in Domain 1.

Table 18 Summary bushland species mix and sowing rates

Species	Sowing Rate (kg/ha)
Tree Species	
Spotted Gum (*Corymbia maculata*)	0.4
Forest Red Gum (*Eucalyptus tereticornis*)	0.3
Sydney Peppermint (*Eucalyptus piperita*)	0.3
Red Bloodwood (*Eucalyptus gummifera*)	0.2
Swamp Mahogany (*Eucalyptus robusta*)	0.4
White Mahogany (*Eucalyptus umbra*)	0.2
White Stringybark (*Eucalyptus globoidea*)	0.3
Red Ironbark (*Eucalyptus fibrosa*)	0.3
Hard-leaved Scribbly Gum (*Eucalyptus haemastoma*)	0.2
Red Mahogany (*Eucalyptus resinifera*)	0.3
Cabbage Gum (*Eucalyptus amplifolia*)	0.3
Smooth Barked Apple (*Angophora costata*)	0.4
Rough Barked Apple (*Angophora floribunda*)	0.3
Mid and Understorey Species	
Black She-Oak (*Allocasuarina littoralis*)	0.2
Lemon-scented Tea Tree (*Leptospermum polygalifolium*)	0.2
Giant Honey Myrtle (*Melaleuca armillaris*)	0.3
Large-leaf Hop Bush (*Dodonaea triquetra*)	0.2
Heath Parrot Pea (*Dilwynia retorta*)	0.2
***Acacia* Species**	
Sydney Golden Wattle (*Acacia longifolia*)	0.6
Hickory Wattle (*Acacia falcata*)	0.5
Green Wattle or Black Wattle (*Acacia decurrens*)	0.4

Species	Sowing Rate (kg/ha)
Red-stemmed Wattle (*Acacia myrtifolia*)	0.6
Sunshine Wattle (*Acacia terminalis*)	0.4
Total Tree , Understory and *Acacia* Species	**7.5**
Cover Crop	
Japanese Millet in Spring/Summer	2
Oats in Autumn/Winter	2
Total Cover Crop Species	**2**
Total Seeding Rate	**9.5**

6.6.9 Surface Water

SLR has prepared a Surface Water Assessment and Plan (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

Domain 1 catchment predominantly drains into Dam G. The existing water management system will be maintained, with the levels in all dams to be managed at a low level in order to capture and treat potential dirty water from storm events. The pumping network will be maintained between Dams C, H and G to allow for the transfer of dirty water runoff. Dam C will continue to be utilised as an area to treat water (i.e. flocculation) prior to discharge off-site via Domain 14 and discharge point EPA 3.

Best practice ESC management measures will be undertaken in accordance with the Blue Book during the decommissioning works which includes the upgrade and use of the haul road to take material to Domains 7 and 8.

The erosion and sediment controls will remain in place and be routinely inspected to ensure they are functional until such time as the remediated ground has been revegetated and is considered stable.

6.6.10 Groundwater

There are no requirements to manage or monitor groundwater within Domain 1.

6.6.11 Methane Management

There are no requirements to manage or monitor methane within Domain 1.

6.6.12 Biodiversity & Land Management

SLR has prepared a Biodiversity and Land Management report (SLR, 2016) for the management of existing bushland areas within the OCAL Complex.

Several biodiversity monitoring programmes have been underway at the OCAL Complex for a number of years. Based on review of the existing monitoring programmes, these programmes will continue unchanged in order to maintain consistency of data. It is expected that the information collected in these monitoring programmes will be used as part of the evidence to demonstrate lease relinquishment.

In order to maintain the rehabilitated bushland areas that exist or are planned within this domain, a range of specific management strategies have been proposed. This domain will be subject to routine inspection and land management activities including:

- Weed and feral animal management;
- Erosion and sediment control; and

- Bushfire protection works.

Baseline data on the existing biodiversity values is required in domains where areas of native bushland exist, but no current survey or monitoring has been conducted to date. A baseline survey and monitoring report will be completed in this domain as a 'one-off' exercise as part of the mine closure process, in order to provide baseline information for future bushland management, whilst providing information that might be needed for a due diligence assessment as part of a possible future sale or rezoning of the land.

6.6.13 Heritage Items

There are no Aboriginal and European Heritage items identified in Domain 1. The clearance procedure will continue to be utilised at the OCAL Complex to identify potential heritage locations associated with rehabilitation, undertake inspection/survey where required, and manage any identified heritage items during closure.

6.7 Post Closure Monitoring & Maintenance

The following section outlines the completion criteria and indicators associated with Domain 1 and monitoring and maintenance activities that are to be undertaken within this domain during closure execution and post closure.

6.7.1 Completion Criteria and Indicators

The completion criteria for Domain 1 are outlined in **Section 25** of this MOP. The relevant criteria for all domains as well as Domain specific criteria apply.

6.7.2 Monitoring Requirements

During closure execution, the following monitoring will be required:

- Sediments in Dam G will require sampling to determine management requirements for sediments;
- Post construction geotechnical inspection Dams C and H;
- Clearance inspections and certificates (HAZMAT);
- Management and monitoring of existing rehabilitation areas;
- Rehabilitation monitoring annual walkover;
- Ambient Cockle Creek Monitoring (US/DS - Monthly);
- Water monitoring on discharge and dam water quality as required;
- Bushfire management;
- Environmental inspections; and
- Land management inspection.

Post closure, the following monitoring will be ongoing until the completion criteria have been meet:

- Rehabilitation monitoring annual walkover;
- Ambient Cockle Creek Monitoring (US/DS - Monthly);
- Water monitoring on discharge and dam water quality as required;
- Bushfire management;
- Management and monitoring of bushland areas;
- Environmental inspections; and

- Land management inspection.

6.7.3 Maintenance Requirements

Maintenance required during closure execution and post closure includes:

- Maintenance for bushfire management (firebreaks, etc.);
- Maintenance and calibration of monitoring equipment;
- Maintenance of accesses for sampling; and
- Rehabilitation maintenance (topsoil spreading, bunds, etc.).

7 DOMAIN 2 WESTSIDE OPEN CUT – NORTH REHAB AREA

The following table summarises the key rehabilitation and closure aspects as relevant to Domain 2.

Table 19 Summary of the Key Rehabilitation and Closure Aspects Relevant to Domain 2

Key Aspect	Domain-Specific Information
OCAL Complex Area	Westside Open Cut existing North Pit rehabilitation area
Total Area of Disturbance	40.3 ha
Post mining land use	• Bushland • Water management (dams) • Light industrial (retained access tracks)
Existing components	• Rehabilitated bushland; • Retained access tracks; and • Dams B, J and K (previously sediment dams).
Key obligations	• Design rehabilitation to reduce the visual impact on surrounding residences; • Rehabilitation works to involve the establishment of native trees and shrubs; • Slopes to be generally less than 14 degrees where possible; • Rehabilitation to be undertaken in accordance with any mining lease approved for the development; • Return the site back to bushland similar to the pre-mining environment; • Ensure regular maintenance of rehabilitation is undertaken; • Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area or any undue interference to fish or their environment; • Minimise soil erosion; and • Rehabilitate any lands affected by mining to the satisfaction of the minister
Proposed Activities during the MOP	• Recommencement of rehabilitation monitoring for the previously rehabilitated 40.3 ha Domain 2 area to assess whether the current status of the rehabilitation still meets the completion criteria (as provisional sign-off only has been achieved); • Some drainage lines and pathways into Dam B require minor filling and re-contouring to reduce sediment load into the dam; • Removing a redundant pipeline from Dam B to Dam K; • Completion of any final remediation required as identified by monitoring; and • Consultation with the DRG to formally obtain sign off and relinquishment of the domain.

7.1 Baseline Conditions

Figure 14 shows the existing arrangement of Domain 2 as at July 2016.

Domain 2 is a 40.3 ha area that includes the Westside Open Cut North Pit rehabilitation area. It is situated within the northern portion of the Westside Mine boundary and was operated from August 1992 to March 1998. The area has since been rehabilitated.

The domain has previously received provisional sign-off from DRG with a MOP for Mine Closure being approved by the then NSW Department of Trade and Investment – Division of Resource and Energy on 9 December 2011. 2.6 ha of rehabilitation were completed in 2011 following removal of the Westside coal crushing plant facility.

The domain contains three small sediment dams that have been assessed as stable (Dams B, J and K). Minor remediation works are required on Dam B which actively receives water from the access road within Domain 1 and overflow from Dam K. Water then flows to the licenced discharge EPA Point 2 located downstream of Dam B in Domain 14. Dam J spills into Burkes Creek.

There are some minor access tracks within Domain 2 which are to be retained to facilitate access to the site for environmental inspections and monitoring, as well as bushfire management. The track was previously lightly ripped and revegetated with grass species; drainage mounds were constructed where required to divert surface water runoff and prevent potential scouring.

7.2 Current Closure/Rehabilitation Status

Mining operations at Westside Mine ceased in 2012 and progressive rehabilitation followed. Domain 2 of Westside Mine received provisional sign-off from DRG for rehabilitation via the Westside Mine Closure MOP approved in December 2011.

Rehabilitation of 2.6 ha completed in 2011 following removal of the Westside coal crushing plant facility included seeding with bushland species (note: 0.6 ha associated with the coal crushing plant facility is located in Domain 1). The success of the rehabilitation in this area is still being assessed following initial poor germination. There are some smaller trees and shrubs present; however, ground cover is considered low at present. Ongoing monitoring will determine whether any additional maintenance such as application of fertiliser or re-seeding is required.

Some of the drainage lines and pathways into Dam B require minor filling and re-contouring to reduce sediment load into the dam. A remaining redundant pipeline from Dam B to Dam K is also in place. Required rectification works will be undertaken as part of the final phase of the closure process.

There are no remaining active utilities (e.g. power and water) within Domain 2.

As referenced in the Westside Mine 2015 Rehabilitation Walkover Inspection Report (Kleinfelder 2015) "*In June 2013 the Division of Resources and Energy (DRE) assessed all areas of Domain 2, except the former ROM stockpile area as meeting the closure criteria for the site*". The former ROM stockpile area is outside Domain 2 as per this DMCP Domain Plan and as a result, as at 2013, the entire domain was assessed as meeting the closure criteria for the site.

Ongoing monitoring and maintenance of these rehabilitated areas ceased in 2011 due to rehabilitation receiving provisional sign off. Where it can be demonstrated that the closure objectives and criteria have been met, opportunities will be sought with the relevant government agencies to formally endorse the sign-off of the rehabilitation within this domain.

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WAKEFIELD ROAD

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Domain Boundary

Sheet Size : A3

SLR

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Domain 2
North Rehab Area

FIGURE 14

7.3 Closure Commitments/Obligations

SLR prepared a detailed Legal & Governance Register for mine closure with the key requirements adopted for the mine closure for the OCAL Complex, including those elements for Domain 2.

The following is a summary of the general closure commitments related to Domain 2:

- Design rehabilitation to reduce the visual impact on surrounding residences;
- Rehabilitation works to involve the establishment of native trees and shrubs;
- Slopes to be generally less than 14 degrees where possible;
- Rehabilitation to be undertaken in accordance with any mining lease approved for the development;
- Return the site back to bushland similar to the pre-mining environment;
- Ensure regular maintenance of rehabilitation is undertaken;
- Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area or any undue interference to fish or their environment;
- Minimise soil erosion; and
- Rehabilitate any lands affected by mining to the satisfaction of the minister.

7.4 Proposed Final Land Use and Landform

Throughout the LOM Closure Planning process OCAL completed a range of mine closure planning tasks for Westside Mine, including Domain 2. Based on the outcomes of these studies and in consideration of what is permissible under the existing development consent, a proposed final land use strategy was presented in the Westside Mine Closure MOP (Umwelt, 2011) and subsequently adopted in the Mining Operations Plan.

The final land use outcomes (shown in **Figure 15**) were adopted based on land use options from the work above; this is outlined as:

- A total of 39.55 ha of existing rehabilitated land will be retained as bushland;
- The Dams J and K will be retained as water for native fauna, with no further works being required;
- Dam B will require some minor upgrade works and it will be retained as an active water management structure to allow discharge from the site via the existing EPL through EPA licenced discharge point 2 off site in Domain 14; and
- The 2.6 ha area of existing post-2011 rehabilitation will be monitored and maintained as required to meet the Westside rehabilitation success criteria prior to relinquishment.

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H:\Projects-SLR\630-SrvNTL\630-NTL\630.11369 OCAL Mine Closure Plan Lead Consultant\06 SLR Data\01 Drafting\Figures\ArcGIS\MOP Doc\OCCMOP_SLR_F0X_PCLU_MOPDomains_01.mxd
Domain Boundary
Recycled Water Pipeline
Surface Infrastructure
Post Closure Landuse
Bushland
Non-OCAL Infrastructure
Pasture
Residential
Retained Hardstand
Retained Infrastructure
Water Management
Wetland
Closure Activity
None
New Bushland Rehabilitation
New Pasture Rehabilitation
Hardstand Establishment
Dam Remediation Required
Spillway Construction
Subsidence Remediation (Auger Mining)
Subsidence Remediation (Longwall Mining)
Decommission
Sheet Size : A3
SLR
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Post Mining Landuse
Domain 2
North Rehab Area
FIGURE 15

7.5 Approvals

The following section outlines the various approvals relevant to the OCAL Complex, with the key conditions relevant to Domain 2 summarised:

DA 125-5-2002 (Westside Mine Southern Extension development). The conditions relevant to Domain 2 include:

- Carry out rehabilitation of all mine areas in accordance with the requirements of any Mining Lease granted and shall ensure that the progressive rehabilitation of the area is also to the satisfaction of DWLC (now Office of Water);

- Ensure the prompt and effective rehabilitation of all disturbed areas of the DA area following the completion of mining and associated activities in that area to minimise the generation of wind-blown dust; and

- Undertake measures, as far as practical, to prevent spontaneous combustion from occurring on the site.

In addition, OCAL holds a number of mining tenures and leases that incorporate Domain 2; Domain 2 is located within CCL718.

The key licence relevant to Domain 2 is EPL No. 4033. The EPL addresses water pollution, waste, monitoring and testing, reporting via annual returns and maintaining copies of the licence at the relevant areas. Discharge point EPA 2 is associated with this domain, but located in Domain 14.

No water licences are associated with Domain 2.

7.6 Rehabilitation and Closure Actions - Scope of Works

This section specifies the various closure and rehabilitation activities for the domain. It includes a detailed description of the works to be undertaken. It is intended that this will form the basis of the Rehab Cost Estimate (RCE) for each domain.

7.6.1 Decommissioning and Salvage of Assets

OCAL has prepared a detailed asset list which includes an inventory of all assets, including a comment and photographs of all identified equipment. A copy of the detailed asset and salvage register is included as **Appendix D**.

There are no assets, plant or equipment remaining in Domain 2.

7.6.2 Demolition

Liberty Industrial prepared a demolition report (Liberty Industrial, 2015) for the OCAL Complex which included a review of all relevant infrastructure and providing a method statement and costs estimate to undertake the works.

There is no requirement to undertake any demolition in Domain 2.

7.6.3 Waste Management

SLR has prepared a Waste Disposal Strategy (SLR, 2016) for the OCAL Complex which has provided a summary of the types and amounts of waste anticipated to be generated as a result of the OCAL complex closure works; as well as providing advice on constraints and options for disposing of the waste.

There are no wastes to be managed in Domain 2.

7.6.4 Hazardous Materials

SLR has prepared a Hazardous Materials Report and Plan (SLR, 2016) for the site which included a review of current HAZMAT, dangerous goods and hazardous substances information for the Complex and to quantify the presence of hazardous materials located across all domains.

There are no known hazardous materials to be managed in Domain 2; however, there may be unexpected finds during closure.

Historical data has indicated that illegal dumping of ACM has been conducted on OCAL lands. A Complex wide 'unexpected HAZMAT finds' procedure will be developed for the Complex to guide the address of any finds outside of building and infrastructure areas. OCAL will implement this procedure to govern development of an action plan for any further HAZMAT discovered within the OCAL domains during the decommissioning process.

7.6.5 Contaminated Sites

SLR has undertaken an extensive review of existing information and an in-field sampling program to quantify the likelihood and extent of any contaminated sites within the OCAL Complex.

There are no contaminated sites to be managed in Domain 2.

7.6.6 Civil Earthworks and Landform

Within Domain 2 there will be only limited civil earthworks required. The following is a summary of the general civil earthworks required for rehabilitation and closure within Domain 2:

- Minor earthworks are required for Dam B for long-term stability. This includes clearing vegetation on the crest downstream embankment, and intermediary bund to ensure that the condition of the structure can be viewed and accessed, re-grading the intermediary bund and refill low points, re-grading and lining the spillway with rip-rap, and repairing erosion around associated structures including the licenced discharge point outlet pipe; and
- Installation of standard erosion and sediment control measures during rehabilitation.

7.6.7 Mine Sealing

There are no mine entries or boreholes to be sealed within Domain 2.

7.6.8 Revegetation

The 2.6 ha of rehabilitation associated with the coal crushing facility area within Domain 2 is still considered under establishment, with scattered trees and shrubs being present. Ongoing monitoring of the area will determine whether follow up fertiliser and seed application is required in order for the area to reach rehabilitation sustainability. All other areas are considered successfully rehabilitated.

7.6.9 Surface Water

SLR has prepared a Surface Water Assessment and Plan (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

The current water management system at the Westside North Rehabilitation Area will remain in place. Runoff reporting to Dam J is considered to be consistent with clean water runoff. Water quality testing within dams B and K will be undertaken to ascertain when the runoff is considered to be clean and therefore suitable for off-site discharge.

No new water management structures or management procedures are proposed within Domain 2 and the existing dams will remain as clean water dams that will attenuate into the landscape via geomorphological processes. Ongoing monitoring and maintenance will continue to be undertaken in accordance with Environment and Rehabilitation Monitoring Plan.

7.6.10 Groundwater

There are no requirements to manage or monitor groundwater within Domain 2.

7.6.11 Methane Management

There are no requirements to manage or monitor methane within Domain 2.

7.6.12 Biodiversity & Land Management

SLR has prepared a Biodiversity and Land Management report (SLR, 2016) for the management of existing bushland areas within the OCAL Complex.

Several biodiversity monitoring programmes have been underway at the OCAL Complex for a number of years. Based on review of the existing monitoring programmes, these programmes will continue unchanged in order to maintain consistency of data. It is expected that the information collected in these monitoring programmes will be used as part of the evidence to demonstrate lease relinquishment. Areas for monitoring will be selected and added to the existing programme to facilitate collection of representative biodiversity information for Domain 2.

In order to maintain the rehabilitated bushland areas that exist or are planned within this domain, a range of specific management strategies have been proposed. This domain will be subject to routine inspection and land management activities including:

- Weed and feral animal management;
- Erosion and sediment control; and
- Bushfire protection works.

7.6.13 Heritage Items

There are no specific requirements to manage either European or Aboriginal Heritage items within Domain 2. The clearance procedure will continue to be utilised at OCAL Complex to identify potential heritage locations associated with rehabilitation, undertake inspection/survey where required, and manage any identified heritage items during closure.

7.7 Post Closure Monitoring & Maintenance

The following section outlines the completion criteria and indicators associated with Domain 2 and monitoring and maintenance activities that are to be undertaken within this domain during closure execution and post closure.

7.7.1 Completion Criteria and Indicators

The completion criteria for Domain 1 are outlined in **Section 25** of this MOP. The relevant criteria for all domains as well as Domain specific criteria apply.

7.7.2 Monitoring Requirements

Monitoring during closure execution will be:

- Water monitoring on discharge and dams as required;

- Rehabilitation monitoring annual walkover (and Flora, Fauna, Landscape Function Analysis (LFA));
- Westside Mine biodiversity monitoring;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections; and
- Land management inspections.

Monitoring post closure (execution) will entail:

- Water monitoring on discharge and dams as required;
- Rehabilitation monitoring annual walkover (including Flora, Fauna, Landscape Function Analysis (LFA));
- Westside Mine biodiversity monitoring;
- Bushland monitoring;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections; and
- Land management inspections.

7.7.3 Maintenance Requirements

Maintenance required during and post closure includes:

- Maintenance of accesses to sampling points;
- Maintenance for bushfire management;
- Maintenance for bushland management; and
- Rehabilitation maintenance.

8 DOMAIN 3 WESTSIDE OPEN CUT - SOUTH WEST PIT

The following table summarises the key rehabilitation and closure aspects as relevant to Domain 3.

Table 20 Summary of the Key Rehabilitation and Closure Aspects Relevant to Domain 3

Key Aspect	Domain-Specific Information
OCAL Complex Area	Westside (South and West Pit rehabilitation)
Total Area of Disturbance	70.42 ha
Post mining land use	• Bushland
Existing components	• Existing and rehabilitated bushland; • Area of subsidence due to high wall auger mining; • Previous clay material stockpile/laydown area; • South Pit final void area; • Dams E, F and EV1 (previously sediment dams); • West Pit Void; and • EPA (licenced discharge) Point 6 - WST.
Key obligations	• Design rehabilitation to reduce the visual impact on surrounding residences; • Rehabilitation works to involve the establishment of native trees and shrubs; • Slopes to be generally less than 14 degrees where possible; • Rehabilitation to be undertaken in accordance with any mining lease approved for the development; • Return the site back to bushland similar to the pre-mining environment; • Rehabilitate the mining area to restore the topography and revegetate the land with a mixture of native species and regenerate native forest; • Utilise koala food trees within the rehabilitation plantings where appropriate; • Ensure regular maintenance of rehabilitation is undertaken; • Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area or any undue interference to fish or their environment; • Minimise soil erosion; and • Rehabilitate any lands affected by mining to the satisfaction of the minister.
Proposed Activities during the MOP	• Monitoring and maintenance of the previously rehabilitated bushland; • Establishing bushland rehabilitation; • Monitoring and rehabilitation of the of the 1 historical auger mining area; and • Establishing bushland rehabilitation of haul road side verges to reduce road width to single vehicle access once haulage is no longer required;

8.1 Baseline Conditions

Figure 16 shows the existing arrangement of Domain 3 as at July 2016.

Domain 3 is a 70.42 ha area that includes the Westside Open Cut South Pit. Mining operations were undertaken within this area since 1998, with the site now substantially rehabilitated.

The Domain contains two small sediment dams and a small void that have been assessed as generally being stable, with only some minor remediation works being required.

Dams E and F are twin cell dams that enable water to be treated and then discharged in a controlled manner once suitable water quality is achieved. Both dams are currently treated to reduce the TSS concentration of the discharge water to below 50 mg/L, where required. A licence exemption is in place for when greater than 50 mm of rainfall is recorded over a consecutive 5 day period.

Dam E and Dam F currently receive runoff from South Pit rehabilitation areas. Dam F actively receives water from the access road within Domain 3; licenced discharge EPA Point 6 is located on this dam.

Dam F was assessed as requiring some additional works to repair erosion rills and gullies of surface materials, construct a designed spillway for outflows and riprap this spillway and the inflow channel to prevent scouring. Dam E was also assessed as requiring further work with the embankments undercut and unable to be fully inspected due to tree coverage (site personnel advised that the dam leaks water; however, due to vegetation cover this could not be investigated further during the geotechnical constraints site inspection).

Some minor access tracks and portions of the old haul road within the domain were retained to facilitate access to the site for environmental inspections and monitoring, as well as bushfire management.

The only remaining utility in the area is the powerline off-take from the Wakefield Road power pole, from which is a buried line to Dam E. The underground powerline will remain in place to power the Dam E pump where required. A truck fill-point and associated tanks and double lengths of poly-pipeline to Dam E remain in place at the time of report writing.

Whilst the majority of the domain was rehabilitated, there are two areas that require further rehabilitation. The first includes a 1.55 ha area previously used as a clay material stockpile. During operations the area was also used as a laydown area for the temporary storage of equipment. The laydown area was cleared of all equipment after cessation of coaling. The Land Quality assessment (SLR, 2016) included samples from the area and no land contamination issues were identified.

The second area is the 3.55 ha South Pit final void area assessed as requiring some additional rehabilitation works given that the revegetation is of a poor quality and there is significant gully erosion present.

In addition to the areas above, 1.94 ha of the domain was subject to subsidence and surface cracking resulting in numerous potholes and areas of instability. Historically parts of the South Pit highwall were mined using a highwall auguring method. On 30 June 2008 a surface subsidence event occurred whereby approximately 200 m of the southern high wall failed, resulting in surface cracking and differential subsidence.



Domain Boundary

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Domain 3
South West Pit

FIGURE 16

Investigation of the incident found that the failure of the highwall was caused by geotechnical instability in old underground mine workings which was affected by auger mining operation in the lower coal seam.

8.2 Current Closure/Rehabilitation Status

Mining operations and progressive rehabilitation have been undertaken in this area since 1998. Dam EV1 is the void from the former East Pit, located in the Southern Extension Area, to the east of the South Pit. Mining commenced in the Southern Extension area in April 2003 and moved into the East Pit following the relocation of Wakefield Road and mining at Westside Mine ceased in 2012.

A total of 67.67 ha of area was rehabilitated to bushland and is now at various stages of establishment. The laydown area in the vicinity of the clay stockpile area used for the temporary storage of equipment was cleared of all equipment and the surrounding landform reshaped; however, revegetation has not been completed leaving 1.55 ha of bushland rehabilitation to be completed.

Some work was undertaken on the area south of the South Pit highwall failure area with partial remediation of the subsidence area competed in the form of sealing the cracks with minor surface earthworks and shaping. Despite this, some of the cracks subsequently reopened following rainfall. Whilst is it likely that the subsidence has now stabilised, no final rehabilitation outcome has been achieved for this 5.84 ha area.

Revegetation of the South (West) Pit void was undertaken; however, the revegetation was not all successful and additional maintenance and reseeding works will be required. In total there is an area of 3.55 ha to be redone.

Ongoing monitoring and maintenance of the rehabilitated areas continues to be undertaken in accordance with the approved Westside Closure MOP.

8.3 Closure Commitments/Obligations

SLR prepared a detailed Legal & Governance Register for mine closure with the key requirements adopted for the mine closure for the OCAL Complex, including those elements for Domain 3.

The following is a summary of the general closure commitments related to Domain 3:

- Design rehabilitation to reduce the visual impact on surrounding residences;
- Rehabilitation works to involve the establishment of native trees and shrubs;
- Slopes to be generally less than 14 degrees where possible;
- Rehabilitation to be undertaken in accordance with any mining lease approved for the development;
- Return the site back to bushland similar to the pre-mining environment;
- Rehabilitate the mining area to restore the topography and revegetate the land with a mixture of native species and regenerate native forest;
- Utilise koala food trees within the rehabilitation plantings where appropriate;
- Ensure regular maintenance of rehabilitation is undertaken;
- Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area or any undue interference to fish or their environment;
- Minimise soil erosion; and
- Rehabilitate any lands affected by mining to the satisfaction of the minister.

8.4 Proposed Final Land Use and Landform

Throughout the LOM Closure Planning process, OCAL completed a range of mine closure planning tasks for Westside Mine, including Domain 3. Based on the outcomes of these studies and in consideration of what is permissible under the existing development consent, a proposed final land use strategy was presented in the Westside Mine Closure MOP (Umwelt, 2011) and subsequently adopted in the Mining Operations Plan.

The final land use outcomes (shown in **Figure 17**) were adopted based on land use options from the work above; this is outlined as:

- The existing rehabilitated land will be retained as bushland;
- The haul roads and access tracks will be maintained for light vehicle access to the site to enable land management, monitoring and maintenance to occur. The tracks will also facilitate access for any bushfire mitigation or fire-fighting that may be required;
- Dam E, Dam EV1 and the South Pit Void will be retained as water for native fauna, with some minor upgrade and remediation works being required to address undercutting at Dam E;
- Dam F will be retained with some upgrade works being required after which it will be retained as an active water management structure to allow discharge from the site under the existing EPL through licenced discharge point EPA 6 – WST. Once the rehabilitation is considered successful this dam will be retained as a water storage for native fauna; and
- The entire area of existing and proposed rehabilitation will be monitored to ensure that it meets the nominated rehabilitation success criteria prior to relinquishment.

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Domain Boundary
Recycled Water Pipeline
Surface Infrastructure

Post Closure Landuse

- Bushland
- Non-OCAL Infrastructure
- Pasture
- Residential
- Retained Hardstand
- Retained Infrastructure
- Water Management
- Wetland

Closure Activity

- None
- New Bushland Rehabilitation
- New Pasture Rehabilitation
- Hardstand Establishment
- Dam Remediation Required
- Spillway Construction
- Subsidence Remediation (Auger Mining)
- Subsidence Remediation (Longwall Mining)
- Decommission

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Post Mining Landuse
Domain 3
South West Pit

FIGURE 17

8.5 Approvals

The following section outlines the various approvals relevant to the OCAL Complex, with the key conditions relevant to Domain 3 summarised:

DA 125-5-2002 (Westside Mine Southern Extension development). The conditions relevant to Domain 3 include:

- Carry out rehabilitation of all mine areas in accordance with the requirements of any Mining Lease granted and shall ensure that the progressive rehabilitation of the area is also to the satisfaction of DWLC (now Office of Water);
- Ensure the prompt and effective rehabilitation of all disturbed areas of the DA area following the completion of mining and associated activities in that area to minimise the generation of wind-blown dust; and
- Undertake measures, as far as practical, to prevent spontaneous combustion from occurring on the site.

DA 91/00557 (Westside Mine Haul Road), DA 90/0242 (Westside Mine open cut operations, and surface facilities). The aspects relevant to Domain 3 include:

- Prepare an Environmental Management and Rehabilitation Plan by qualified civil engineer incorporating matters including "EARTHWORKS AND EROSION CONTROL" and "SITE REHABILITATION AND LANDSCAPING";
- Landscape site and render ground erosion resistant to LMCC's satisfaction;
- Site clearing, runoff and erosion control works and rehabilitation shall conform to the specifications and standards contained in: Erosion Control Policy (LMCC), etc.; and
- Prepare and submit to LMCC an annual environmental report detailing the progress of site rehabilitation, the results of the environmental monitoring program, any exceedance of licence requirements and any additional safeguards that need to be installed to meet licence requirements.

In addition, OCAL holds a number of mining tenures and leases that incorporate Domain 3; Domain 3 is located on CCL718, CL532, ML1532 and PLL153.

The key licence relevant to Domain 3 is EPL No. 4033. The EPL addresses water pollution, waste, monitoring and testing, reporting via annual returns and maintaining copies of the licence at the relevant areas. Discharge point EPA 6 - WST is contained within the domain.

No water licences are associated with Domain 3.

8.6 Rehabilitation and Closure Actions - Scope of Works

This section specifies the various closure and rehabilitation activities for the domain. It includes a detailed description of the works to be undertaken. It is intended that this will form the basis of the Rehabilitation Cost Estimate (RCE) for each domain.

8.6.1 Decommissioning and Salvage of Assets

OCAL has prepared a detailed asset list which includes an inventory of all assets, including a comment and photographs of all identified equipment. A copy of the detailed asset and salvage register is included as **Appendix D**.

There are no assets, plant or equipment remaining in Domain 3.

8.6.2 Demolition

Liberty Industrial prepared a demolition report (Liberty Industrial, 2015) for the OCAL Complex which included a review of all relevant infrastructure and providing a method statement and costs estimate to undertake the works.

The only demolition required in Domain 3 is removal of the water fill point and associated pipework.

8.6.3 Waste Management

SLR has prepared a Waste Disposal Strategy (SLR, 2016) for the OCAL Complex which has provided a summary of the types and amounts of waste anticipated to be generated as a result of the OCAL complex closure works; as well as providing advice on constraints and options for disposing of the waste.

Only minor demolition wastes will require management in Domain 3 associated with the water fill point and pipework; in combination, this will likely constitute less than 1 tonne of total wastes.

8.6.4 Hazardous Materials

SLR has prepared a Hazardous Materials Report and Plan (SLR, 2016) for the site which included a review of current HAZMAT, dangerous goods and hazardous substances information for the Complex and to quantify the presence of hazardous materials located across all domains.

There are no known hazardous materials to be managed in Domain 3; however, there may be unexpected finds during closure.

Historical data has indicated that illegal dumping of ACM has been conducted on OCAL lands. A Complex wide 'unexpected HAZMAT finds' procedure will be developed for the Complex to guide the address of any finds outside of building and infrastructure areas. OCAL will implement this procedure to govern development of an action plan for any further HAZMAT discovered within the OCAL domains during the decommissioning process.

8.6.5 Contaminated Sites

SLR has undertaken an extensive review of existing information and an in-field sampling program to quantify the likelihood and extent of any contaminated sites within the OCAL Complex.

There are no contaminated sites to be managed in Domain 3.

8.6.6 Civil Earthworks and Landform

Within Domain 3 there will be a need to undertake civil earthworks during the closure execution phase. The following is a summary of the general civil earthworks required for rehabilitation and closure within Domain 3:

- Some minor earthworks are required for Dam E for long-term stability. This includes;
    - Remove woody vegetation from the crest and downstream slopes to allow access for full dam inspection; and
    - Remediate embankment undercutting at Dam E.
- Some minor earthworks are required for Dam F should it be retained in its current configuration for long-term stability. This includes:
    - Clearing vegetation on the crest downstream embankment; and
    - Repair erosion and apply rip-rap to inflow channel and areas of high erosion on embankment slopes;

- Construct new cross bank to divert runoff into existing drain to Dam F;
- Growth media spreading and application of bio-solids/ameliorants on the old borrow area, reworked rehabilitation for South Pit Void and Tailings Dam borrow pit;
- Installation of standard erosion and sediment control measures during rehabilitation; and
- Remediation of subsidence and surface cracking affected areas south of the South Pit highwall (earthworks required to be determined by investigation following installation of a perimeter fence and signage).

8.6.6.1 Subsidence and Surface Cracking Affected Areas South of South Pit Highwall

Partial remediation of the subsidence area was undertaken in the form of sealing the cracks with minor surface earthworks and shaping. Some of the cracks have subsequently reopened following rainfall. Whilst it is expected that the subsidence will have stabilised the extent of the area impacted is unknown and therefore any remediation works have not yet been determined.

As an initial short-term measure, the area will be mapped using differential GPS and a fence and signs will be erected around the perimeter of the area to excluded unauthorised access to the site.

OCAL has commissioned a qualified geotechnical engineer to undertake and assessment of the area and prepare a remediation plan for the site to allow for final infilling of the cracks and surface revegetation of any areas disturbed as part of the subsidence remediation.

8.6.7 Mine Sealing

There are no mine entries or boreholes to be sealed within Domain 3.

8.6.8 Revegetation

A total of 22 ha of bushland rehabilitation will be required in Domain 3. This includes:

- The area of the existing clay stockpile area;
- A potential borrow area to be disturbed to source growth media material for the Tailings Dam and Rejects Emplacement Area cover;
- The subsidence affected area south of the South Pit highwall; and
- The re-work of rehabilitation required in the South Pit Void.

The remaining 45.65 ha of existing bushland rehabilitation will continue to be monitored to determine whether follow up fertiliser and further seed application is required in order for the area to reach the rehabilitation sustainability phase.

Table 21 shows the Bushland Revegetation Species Mix and Sowing Rates to be used in Domain 3.

Table 21 Summary bushland species mix and sowing rates

Species	Sowing Rate (kg/ha)
Tree Species	
Spotted Gum (*Corymbia maculata*)	0.4
Forest Red Gum (*Eucalyptus tereticornis*)	0.3
Sydney Peppermint (*Eucalyptus piperita*)	0.3
Red Bloodwood (*Eucalyptus gummifera*)	0.2
Swamp Mahogany (*Eucalyptus robusta*)	0.4
White Mahogany (*Eucalyptus umbra*)	0.2

Species	Sowing Rate (kg/ha)
White Stringybark (*Eucalyptus globoidea*)	0.3
Red Ironbark (*Eucalyptus fibrosa*)	0.3
Hard-leaved Scribbly Gum (*Eucalyptus haemastoma*)	0.2
Red Mahogany (*Eucalyptus resinifera*)	0.3
Cabbage Gum (*Eucalyptus amplifolia*)	0.3
Smooth Barked Apple (*Angophora costata*)	0.4
Rough Barked Apple (*Angophora floribunda*)	0.3
Mid and Understorey Species	
Black She-Oak (*Allocasuarina littoralis*)	0.2
Lemon-scented Tea Tree (*Leptospermum polygalifolium*)	0.2
Giant Honey Myrtle (*Melaleuca armillaris*)	0.3
Large-leaf Hop Bush (*Dodonaea triquetra*)	0.2
Heath Parrot Pea (*Dilwynia retorta*)	0.2
***Acacia* Species**	
Sydney Golden Wattle (*Acacia longifolia*)	0.6
Hickory Wattle (*Acacia falcata*)	0.5
Green Wattle or Black Wattle (*Acacia decurrens*)	0.4
Red-stemmed Wattle (*Acacia myrtifolia*)	0.6
Sunshine Wattle (*Acacia terminalis*)	0.4
Total Tree , Understory and *Acacia* Species	**7.5**
Cover Crop	
Japanese Millet in Spring/Summer	2
Oats in Autumn/Winter	2
Total Cover Crop Species	**2**
Total Seeding Rate	**9.5**

8.6.9 Surface Water

SLR has prepared a Surface Water Assessment and Plan (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

With the exception of the areas to be disturbed, the majority of the current water management system at the Westside South West Pit area will remain in place for the duration of the mine closure phase until the rehabilitation has stabilised and runoff is considered clean. All contour banks flowing into the potential borrow area will be removed immediately upslope of the disturbance area and level spreaders constructed at the end of the contour banks.

All existing dams in Domain 3 will remain and attenuate into the landscape via geomorphological processes.

Water quality testing will be undertaken as required to confirm that the runoff reporting to the licenced discharge point is considered to be clean and therefore suitable for off-site discharge.

8.6.10 Groundwater

SLR has prepared a Plan of Underground Water Management (SLR, 2016) including modelling for the rehabilitation and closure of the OCAL Complex.

There are no requirements to manage or monitor groundwater within Domain 3.

8.6.11 Methane Management

There are no requirements to manage or monitor methane within Domain 3.

8.6.12 Biodiversity & Land Management

SLR has prepared a Biodiversity and Land Management report (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

Several biodiversity monitoring programmes have been underway at the OCAL Complex for a number of years. Based on review of the existing monitoring programmes, these programmes will continue unchanged in order to maintain consistency of data. It is expected that the information collected in these monitoring programmes will be used as part of the evidence to demonstrate lease relinquishment. Areas for monitoring will be selected and added to the existing programme to facilitate collection of representative biodiversity information for Domain 3.

In order to maintain the rehabilitated bushland areas that exist or are planned within this domain, a range of specific management strategies are proposed. This domain will be subject to routine inspection and land management activities including:

- Weed and feral animal management;
- Erosion and sediment control; and
- Bushfire protection works.

8.6.13 Heritage Items

There are no specific requirements to manage either European or Aboriginal Heritage items within Domain 3. The clearance procedure will continue to be utilised at OCAL Complex to identify potential heritage locations associated with rehabilitation, undertake inspection/survey where required, and manage any identified heritage items during closure.

8.7 Post Closure Monitoring & Maintenance

The following section outlines the completion criteria and indicators associated with Domain 3 and monitoring and maintenance activities that are to be undertaken within this domain during closure execution and post closure.

8.7.1 Completion Criteria and Indicators

The completion criteria for Domain 1 are outlined in **Section 25** of this MOP. The relevant criteria for all domains as well as Domain specific criteria apply.

8.7.2 Monitoring Requirements

Monitoring required in this domain during closure execution is:

- Water monitoring on discharge (licenced discharge EPA Point 6 – WST);
- Dam inspections as required (e.g. Dam F);
- Rehabilitation monitoring annual walkover;
- Westside Mine biodiversity monitoring;
- Auger mine subsidence remediation monitoring;
- Bushfire (fuel load/asset protection) inspections;

- Environmental inspections; and
- Land management inspections.

As required based on activities during closure, air quality, noise and meteorology will also be monitored.

Monitoring required post closure includes:

- Dam inspections as required (e.g. Dam F);
- Rehabilitation monitoring annual walkover;
- Westside Mine biodiversity monitoring;
- Auger mine subsidence remediation monitoring;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections;
- Land management inspections; and
- Bushland monitoring.

8.7.3 Maintenance Requirements

Maintenance required during and/or post closure includes:

- Maintenance of accesses to sampling points;
- Maintenance for bushfire management;
- Maintenance for bushland management; and
- Rehabilitation maintenance.

9 DOMAIN 4 WESTSIDE FINAL VOID

The following table summarises the key rehabilitation and closure aspects relevant to Domain 4.

Table 22 Summary of the Key Rehabilitation and Closure Aspects Relevant to Domain 4

Key Aspect	Domain-Specific Information
OCAL Complex Area	Westside Final Void
Total Area of Disturbance	42.9 ha
Post mining land use	• Pit lake • Bushland • Pasture • Light industrial (retained access track)
Existing components	• 19 ha of pit lake with high water established at RL12 (invert of spillway) and 0.12 ha of spillway; • 1.31 ha of rehabilitated pasture; • 2.19 ha of subsidence affected area from highwall auger mining; • 1.21 ha of access road including subsidence affected roadway; • 1.28 ha of rehabilitated bushland; • High water level pit disturbance requiring rehabilitation; and • 9.11 ha of existing bushland rehabilitation and 7.73 ha of existing pasture rehabilitation to be reworked.
Key obligations	• Design rehabilitation to reduce the visual impact on surrounding residences; • Rehabilitation works to involve the establishment of native trees and shrubs; • Slopes to be generally less than 14 degrees where possible; • Rehabilitation to be undertaken in accordance with any mining lease approved for the development; • Return the site back to bushland similar to the pre-mining environment; • Ensure regular maintenance of rehabilitation is undertaken; • Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area or any undue interference to fish or their environment; • Minimise soil erosion; and • Rehabilitate any lands affected by mining to the satisfaction of the minister.

Key Aspect	Domain-Specific Information
Proposed Activities during the MOP	~~• The construction of part of the spillway for the final void;~~ ~~• Removing all redundant pipes and discharge infrastructure.~~ ~~• Establishing 9.83 ha of bushland rehabilitation above the maximum high water level of the void as dictated by the invert of the spillway;~~ ~~• Establishing 8.28 ha of pasture rehabilitation between the current void water level and the maximum water level;~~ ~~• Establishing pasture rehabilitation within the disturbed area associated with spillway construction; and~~ • Monitoring and remediation and of 0.66 ha of prior auger mining area including that underlying Westside Mine Access Road.

9.1 Baseline Conditions

Figure 18 shows the existing arrangement of Domain 4 as at July 2016.

Domain 4 is a 42.9 ha area that includes the Westside Open Cut East Pit Final Void. Mining operations were undertaken within this area since 1998. The East Pit is located in the Southern Extension Area, to the east of the South Pit. Mining commenced in the Southern Extension area in April 2003 and moved into the East Pit following the relocation of Wakefield Road. Operations in this area finished in early 2012.

When Westside Mine ceased operations, OCAL submitted an application under the *Environmental Planning & Assessment Act 1979* which proposed the use of the East Pit void for MCPP coarse reject emplacement. This application was approved in January 2012; however, rejects were subsequently not emplaced in the East Pit.

The previous bioremediation facility (approximately 0.3 ha) was located in the northwest corner of Domain 4; established on the northern wall of the East Pit void to store and treat hydrocarbon contaminated material during operations. It comprises two earth bunded areas, both of which contain stockpiled soil materials. Each bunded area had a surface run-off collection point and based on the local topography, much of the surface water collected at these points is expected to discharge in to the void located south of the facility.

From December 2014 to February 2015, a volume of sedimentary materials generated from sediment removal works at WWC was paddock dumped on the north east side of the East Pit final void. The disposal location has been exposed to the atmosphere for at least 18 months and is mostly submerged by the rising level in the East Pit final void.

Domain 4 contains 22.56 ha of rehabilitated areas including the reshaped void batters. Most areas were revegetated to bushland with some small areas of pasture on the northern section of the void. The majority of rehabilitation in the final void area was assessed as requiring additional rehabilitation works given that the revegetation is of poor quality and there is significant gully erosion present on the batters and in addition a large pothole was observed in the southwestern end of the East Pit final void on an existing roadway.

The void water quality is similar to the water that has previously passed through supplementary licenced discharge EPA Point 4 – WST. The water quality has a lower conductivity than the historic contact water discharges since the more saline water is deeper within the void and lower saline water would tend to be at the surface near the discharge point. Heavy metal analysis undertaken on current Westside Mine discharge water has generally not reported elevated concentrations with respect to ANZECC/ARMCANZ (2000) default trigger values and concentrations reported for Cockle Creek (both upstream and downstream of Westside Mine).

The void has slowly filled with water since the cessation of mining in 2012. The final Void Management Plan (FVMP) (GHD 2010) predicts that the void will fill and spill in 2029 with an estimated total storage of 3400 ML. Between years 2030 and 2049, the void is predicted to remain at 60 to 70% capacity and no further discharges are predicted over the simulation period. The fall in storage volume following discharge in 2029 is the result of the greater influence of evaporation (based on BOM rainfall and evaporation data). Note that the predicted storage volumes are based on actual rainfall and evaporation recorded over a 37 year period from 1972 to 2010, as discussed in the FVMP. If these patterns of rainfall and evaporation vary in the future, the discharge pattern will differ also.

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Domain 4
Proposed Final Void
FIGURE 18
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Once the final void has filled to its maximum capacity, it is expected that there will be a period of discharge to the downstream watercourse, although water transfer modelling reported in the FVMP (GHD 2010) indicates that this will not be a continuous long term discharge. Further, the likely higher flows within Cockle Creek during the discharge (given discharge is likely to occur during a high rainfall event) will minimise water quality or flow impacts. Hence, potential impacts to the environment resulting from discharge from the final void water storage are not considered significant or long-term.

9.2 Current Closure / Rehabilitation Status

The previously approved Westside Mine Closure Plan was prepared on the basis that the final void will be water storage facility as detailed in the FVMP (GHD 2010). ~~however, the rehabilitation methodology would facilitate utilising the final void as a coal reject emplacement facility for OCAL's ongoing operations (i.e. WWC) if required.~~

The domain contains 22.56 ha of rehabilitated area including mainly the reshaped void batters. In general this involved the revegetation of the void batters up to the high water level with suitable grass and shrub species that are adaptable to water logged conditions, beyond that bushland species were used. The aim of this approach was to provide that the slopes of the final wall remain stable until such time that area is allowed to fill with water.

Most areas have been revegetated to bushland with some small areas of pasture on the northern section of the void batter. The majority of the rehabilitation in the final void area that has been assessed as requiring additional rehabilitation works given that the revegetation is of a poor quality and there is significant gully erosion present. Additional maintenance and reseeding works will be required. In total there is an area of 9.83 ha of bushland and 8.28 ha of pasture to be redone.

In addition, it was intended that the final void walls would be battered with Awaba tuff at a slope of generally no more than 14 degrees to improve wall stability and safety. The batter would form a barrier between the exposed coal seams and void space, reducing the inflow of coal seam groundwater into the void. SLR was not able to confirm whether the Awaba Tuff had been placed on the slopes and therefore it has been assumed that it has not; however, the Great Northern seam and the Fassifern seams exposed along the southern and south-eastern walls and the southern, eastern and northern walls respectively were covered during the reshaping and rehabilitation of the void.

A large hole in the southwestern embankment of the East Pit void was observed during the site inspection; the bottom could not been seen and it had a tension crack radiation outwards from it. This is likely related to the proximity of the old workings in the Great Northern seam.

The FVMP noted that the spillway for the final void was to be constructed after it was been determined that the void would be allowed to fill with water and not be used for coarse coal rejects. The location of the spillway has been determined during the detailed mine closure planning and it is intended that it will be completed in 2017.

Access tracks within the domain were retained to facilitate access to the site for environmental inspections and monitoring, as well as bushfire management.

The remaining utility infrastructure includes the void dewatering pipeline and diesel pump as well as the Longwall 11 (LW11) pipeline associated with the operation of OCAL's West Wallsend Colliery. The LW11 pipeline currently passes through Domain 4 delivering water from the mine opening in Domain 12 to the licenced discharge EPA Point 4 – WST in Domain 14 (near the East Pit void) for discharge into Cockle Creek. ~~Whilst discharges have now ceased, t T~~he pipes and outlets associated with the discharge point ~~remain in place, however the sections on the surface will be removed.~~ have been removed.

Ongoing monitoring and maintenance of the rehabilitated areas continues to be undertaken in accordance with the approved Westside Closure MOP.

9.3 Closure Commitments/Obligations

SLR prepared a detailed Legal & Governance Register for mine closure with the key requirements adopted for the mine closure for the OCAL Complex, including those elements for Domain 4.

The following is a summary of the general closure commitments related to Domain 4:

- Design rehabilitation to reduce the visual impact on surrounding residences;
- Rehabilitation works to involve the establishment of native trees and shrubs;
- Slopes to be generally less than 14 degrees where possible;
- Rehabilitation to be undertaken in accordance with any mining lease approved for the development;
- Return the site back to bushland similar to the pre-mining environment;
- Ensure regular maintenance of rehabilitation is undertaken;
- Provide and maintain efficient means to prevent contamination, pollution, erosion or siltation of any stream, watercourse or catchment area or any undue interference to fish or their environment;
- Minimise soil erosion; and
- Rehabilitate any lands affected by mining to the satisfaction of the Minister.

9.4 Proposed Final Land Use and Landform

Throughout the LOM Closure Planning process OCAL completed a range of mine closure planning tasks for Westside Mine, including Domain 4. Based on the outcomes of these studies and in consideration of what is permissible under the existing development consent, a proposed final land use strategy was presented in the Westside Mine Closure MOP (Umwelt, 2011) and subsequently adopted in the Detailed Mine Closure Plan for the OCAL Complex.

The final land use outcomes (shown in **Figure 19**) were adopted based on land use options from the work above; this is outlined as:

- A total of 13.11 ha will be rehabilitated as bushland with a further 9.45 ha of pasture. Pasture will be established in the areas below RL12 which is the established high water mark of the void controlled via the inlet of the spillway to be constructed;
- The access tracks will be maintained for light vehicle access to the site to facilitate land management, monitoring and maintenance. The tracks will also allow access for any bushfire mitigation or fire-fighting that may be required;
- The final void and spillway includes an approximate area of 19 ha which will change through the fluctuation of the water level in the void; and
- The entire area of existing and proposed rehabilitation will be monitored and maintained as required to meet the Westside rehabilitation success criteria prior to relinquishment.

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Domain Boundary
Recycled Water Pipeline
Surface Infrastructure

Post Closure Landuse
Bushland
Non-OCAL Infrastructure
Pasture
Residential
Retained Hardstand
Retained Infrastructure
Water Management
Wetland

Closure Activity
None
New Bushland Rehabilitation
New Pasture Rehabilitation
Hardstand Establishment
Dam Remediation Required
Spillway Construction
Subsidence Remediation (Auger Mining)
Subsidence Remediation (Longwall Mining)
Decommission

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Post Mining Landuse
Domain 4
Proposed Final Void

FIGURE 19

9.5 Approvals

The following section outlines the various approvals relevant to the OCAL Complex, with the key conditions relevant to Domain 4 summarised:

DA 125-5-2002 (Westside Mine Southern Extension development). The conditions relevant to Domain 4 include:

- Carry out rehabilitation of all mine areas in accordance with the requirements of any Mining Lease granted and shall ensure that the progressive rehabilitation of the area is also to the satisfaction of DWLC (now Office of Water);
- Ensure the prompt and effective rehabilitation of all disturbed areas of the DA area following the completion of mining and associated activities in that area to minimise the generation of wind-blown dust; and
- Undertake measures, as far as practical, to prevent spontaneous combustion from occurring on the site.

DA 91/00557 (Westside Mine Haul Road), DA 90/0242 (Westside Mine open cut operations, and surface facilities). The conditions relevant to Domain 4 include:

- Prepare an Environmental Management and Rehabilitation Plan by qualified civil engineer incorporating matters including "EARTHWORKS AND EROSION CONTROL" and "SITE REHABILITATION AND LANDSCAPING";
- Landscape site and render ground erosion resistant to LMCC's satisfaction;
- Site clearing, runoff and erosion control works and rehabilitation shall conform to the specifications and standards contained in: Erosion Control Policy (LMCC), etc.; and
- Prepare and submit to LMCC an annual environmental report detailing the progress of site rehabilitation, the results of the environmental monitoring program, any exceedance of licence requirements and any additional safeguards that need to be installed to meet licence requirements.

In addition, OCAL holds a number of mining tenures and leases that incorporate Domain 4; Domain 4 is located on CCL718, CL532, ML1336 and ML1532.

The key licence relevant to Domain 4 is EPL No. 4033. The EPL addresses water pollution, waste, monitoring and testing, reporting via annual returns and maintaining copies of the licence at the relevant areas. Domain 4 is associated with licenced discharge EPA Point 4 – WST located in Domain 14 which received water (from LW11 in nearby Domain 12) via infrastructure located across Domain 4.

The water licence associated with Domain 4 is 20BL168704. There are no specific rehabilitation requirements associated with this licence; however, groundwater monitoring was required in association with interception of alluvial groundwater. Groundwater interception in accordance with this licence ceased with the cessation of mining operations at Westside and is not required in association with closure execution strategies.

9.6 Rehabilitation and Closure Actions - Scope of Works

This section specifies the various closure and rehabilitation activities for the domain. It includes a detailed description of the works to be undertaken. It is intended that this will form the basis of the Rehabilitation Cost Estimate (CCE) for each domain.

9.6.1 Decommissioning and Salvage of Assets

OCAL has prepared a detailed asset list which includes an inventory of all assets, including a comment and photographs of all identified equipment. A copy of the detailed salvage register is attached as **Appendix D**.

The void diesel pump will be removed and managed as part of the Asset Management/Salvage Plan for OCAL Complex. The associated pipeline will be demolished.

9.6.2 Demolition

Liberty Industrial prepared a demolition report (Liberty Industrial, 2015) for the OCAL Complex which included a review of all relevant infrastructure and providing a method statement and costs estimate to undertake the works.

The only demolition required in Domain 4 is removal of the pipes, pump and infrastructure associated with the (supplementary) licenced discharge EPA Point 4 – WST. This infrastructure will require removal before the spillway is constructed.

9.6.3 Waste Management

SLR has prepared a Waste Disposal Strategy (SLR, 2016) for the OCAL Complex which has provided a summary of the types and amounts of waste anticipated to be generated as a result of the OCAL complex closure works; as well as providing advice on constraints and options for disposing of the waste.

Only minor demolition wastes will require management in Domain 4 associated with the pipes and infrastructure for (supplementary) licenced discharge EPA Point 4 – WST; in combination, this will constitute less than 1 tonne of wastes.

9.6.4 Hazardous Materials

SLR has prepared a Hazardous Materials Report and Plan (SLR, 2016) for the site which included a review of current HAZMAT, dangerous goods and hazardous substances information for the Complex and to quantify the presence of hazardous materials located across all domains.

There are no known hazardous materials to be managed in Domain 4; however, there may be unexpected finds during closure.

Historical data has indicated that illegal dumping of ACM has been conducted on OCAL lands. A Complex wide ‘unexpected HAZMAT finds’ procedure will be developed for the Complex to guide the address of any finds outside of building and infrastructure areas. OCAL will implement this procedure to govern development of an action plan for any further HAZMAT discovered within the OCAL domains during the decommissioning process.

9.6.5 Contaminated Sites

SLR has undertaken an extensive review of existing information and an in-field sampling program to quantify the likelihood and extent of any contaminated sites within the OCAL Complex.

Sampling was undertaken from within the existing bioremediation facility on the northern wall of the East Pit final void to determine whether there was any associated hydrocarbon contamination. Whilst no apparent exceedances were recorded for the soil samples, hydrocarbons were detected in the water samples collected from the surface water collection points. This has been assessed as likely to be attributable to soil that was placed in the facility. Ground surface and local topographical features suggest that surface water collected from the sampling points was discharged into areas outside the facility without any particular treatment (e.g. activated charcoal bags for hydrocarbon sorption) and would most likely flow along the surface drain channel towards the final void.

On this basis, the material currently stockpiled in the existing bioremediation area will be levelled out and spread away from the spillway planned to be constructed in that area.

In addition to the soil within the bioremediation area, a volume of sedimentary material from works at WWC was placed on the northeast side of the final void from December 2014 to February 2015. Of the samples collected, two samples were analysed for heavy metals, total recoverable hydrocarbons (TRH)/benzene, toluene, ethylbenzene, xylene and naphthalene (BTEXN), polycyclic aromatic hydrocarbons (PAHs) and nutrients. Two exceedances of the environmental criterion for zinc were recorded for the analysed samples.

Further sampling of the submerged material (for leach testing) and adjacent water body will be undertaken in this area to monitor for environmental impacts on a quarterly basis, for a minimum of 12 months. If water quality impacts are noted which exceed the land use criteria during this period the sediments will require removal for alternative onsite treatment such as bioremediation or strategic reburial in an area where potential impacts to ground and surface waters will be minimised/controlled, e.g. the Tailings Dam. The potential contaminating effects on the East Pit final void water body will be considered if disturbance of the disposed, submerged sediments forms part of future works in this domain.

In addition to above, SLR recommends that an Unexpected Finds Protocol (UFP) will be adopted for works within the Domain as a contingency plan. This would be used to address any unexpected contamination or other unexpected finds (e.g. buried tanks and drums) so that they can be assessed and managed as part of the closure execution process.

9.6.6 Civil Earthworks and Landform

Within Domain 4 there will be a need to undertake civil earthworks during the closure execution phase. The following is a summary of the general civil earthworks required for rehabilitation and closure within Domain 4:

- Remove previous bioremediation stockpiles to new bioremediation facility to be constructed in Domain 9;
- Install cut off trench to intercept and collect impacted shallow groundwater in the old bioremediation area;
- Investigate the cause of, and remediate the large hole in the final void embankment (on an existing access track) which is likely due to historical auger mining or subsidence related to the shallow depth of cover over the Great Northern Seam that is exposed at the southern end of the Final Void and conduct repair works;
- Install standard erosion and sediment control measures during rehabilitation works;
- Install/construct spillway; this includes clearing the area, cut and fill earthworks, and application of geofabric and 50 mm diameter rip rap; and
- Manage erosion of exposed embankment slopes around the void.

9.6.6.1 East Pit Final Void Spillway

The FVMP (GHD 2010) recommended a spillway location on the eastern side of the final void which would report to Diega Creek. During preparation of the DCMP it was determined that a more suitable location for this spillway is located on the northern side of the final void which would report to Cockle Creek via the supplementary licenced discharge EPA Point 4 – WST. This decision was influenced by the capacity of downstream water conveyance structures (i.e. bridges and culverts) and location of existing licenced discharge points.

The East Pit final void spillway was designed to safely convey runoff from a 100 year Average Recurrence Interval (ARI) rainfall event in accordance with the equation listed in Table A21 of *Best Practice Erosion & Sediment Control, Book 2* (IECA, 2008). This calculation included adjusting the spillway base width until at least 0.5 m of freeboard remained between the maximum water level reached during the 100 year ARI storm event and the final void crest level. It is proposed to construct the spillway invert at RL 12.0 m Australian Height Datum (AHD) to achieve this desired freeboard.

Cross-sectional dimensions, design parameters and results of the East Pit final void proposed spillway are provided in **Table 23**. A light vehicle bed-level crossing is proposed across the final void spillway. This bed-level crossing was designed with approach grades of 8(H):1(V) and a sufficient depth to maintain the conveyance capacity of the spillway.

Table 23 Westside East Pit Final Void Spillway Design Parameters and Results

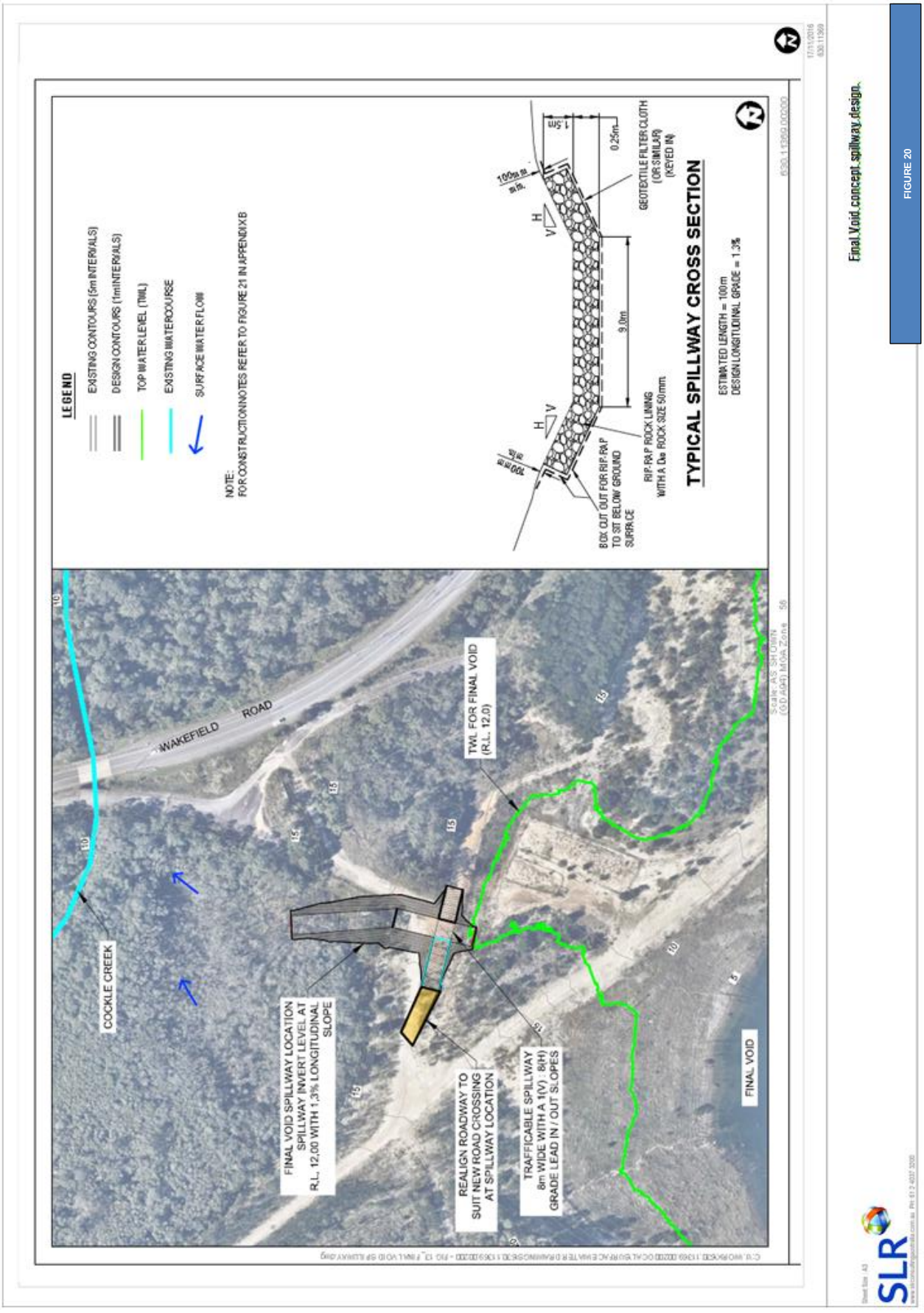
Catchment Area (ha)	100 Year ARI Peak Flow Rate (m^3/s)	Minimum Base Width (m)	Side Slopes (H:V)	Longitudinal Slope (%)	Water Depth (m)	Depth Required Including 0.5m Freeboard (m)	Lining
56.0	18.667	9.0	3:1	1.0	0.99	1.5	Rip Rap (D50 = 50mm)

See the final void conceptual spillway design in **Figure 20**.

In addition to spillway construction, some maintenance works will be undertaken in and immediately adjacent to the final void including the management of erosion on exposed embankment slopes, and revegetation.

9.6.7 Mine Sealing

There are no mine entries or boreholes to be sealed within Domain 4.


LEGEND
EXISTING CONTOURS (5m INTERVALS)
DESIGN CONTOURS (1m INTERVALS)
TOP WATER LEVEL (TWL)
EXISTING WATERCOURSE
SURFACE WATER FLOW
NOTE:
FOR CONSTRUCTION NOTES REFER TO FIGURE 21 IN APPENDIX B
TYPICAL SPILLWAY CROSS SECTION
ESTIMATED LENGTH = 100m
DESIGN LONGITUDINAL GRADE = 1.3%
GEOTEXTILE FILTER CLOTH (OR SIMILAR) (KEYED IN)
RIP-RAP ROCK LINING WITH A Dso ROCK SIZE 50mm
BOX CUT OUT FOR RIP-RAP TO SIT BELOW GROUND SURFACE
0.25m
9.0m
WAKEFIELD ROAD
COCKLE CREEK
TWL FOR FINAL VOID (R.L. 12.0)
FINAL VOID SPILLWAY LOCATION SPILLWAY INVERT LEVEL AT R.L. 12.00 WITH 1.3% LONGITUDINAL SLOPE
REALIGN ROADWAY TO SUIT NEW ROAD CROSSING AT SPILLWAY LOCATION
TRAFFICABLE SPILLWAY 8m WIDE WITH A 1(V) : 8(H) GRADE LEAD IN / OUT SLOPES
FINAL VOID
Final Void concept spillway design.
FIGURE 20
SLR

9.6.8 Revegetation

A total of 22.56 ha of bushland rehabilitation will be required in Domain 4. This includes:

- Reworking surface water drainage, repairing rill/gully erosion and reseeding 9.11 ha of the East Pit final void western batter to bushland;
- Reseeding 7.73 ha of pasture revegetation below RL12 – the design spillway level (high water mark); and
- Remediating subsidence relating to the old south pit high wall and Great Northern Seams, including 0.66 ha of reseeding with bushland once the remediation is completed.

Rehabilitation of the trees above the high water mark for the East Void and pasture area around the pond will require the supply and spread of growth media (bio-solids), ripping, amelioration, seeding and maintenance during establishment. The remaining 1.28 ha of existing bushland and 1.31 ha of existing grassland rehabilitation will continue to be monitored to determine whether follow up fertiliser and further seed application is required in order for the area to reach rehabilitation sustainability.

Table 24 shows the Bushland Revegetation Species Mix and Sowing Rates whilst **Table 25** shows the Pasture species to be used in Domain 4.

Table 24 Summary bushland species mix and sowing rates

Species	Sowing Rate (kg/ha)
Tree Species	
Spotted Gum (*Corymbia maculata*)	0.4
Forest Red Gum (*Eucalyptus tereticornis*)	0.3
Sydney Peppermint (*Eucalyptus piperita*)	0.3
Red Bloodwood (*Eucalyptus gummifera*)	0.2
Swamp Mahogany (*Eucalyptus robusta*)	0.4
White Mahogany (*Eucalyptus umbra*)	0.2
White Stringybark (*Eucalyptus globoidea*)	0.3
Red Ironbark (*Eucalyptus fibrosa*)	0.3
Hard-leaved Scribbly Gum (*Eucalyptus haemastoma*)	0.2
Red Mahogany (*Eucalyptus resinifera*)	0.3
Cabbage Gum (*Eucalyptus amplifolia*)	0.3
Smooth Barked Apple (*Angophora costata*)	0.4
Rough Barked Apple (*Angophora floribunda*)	0.3
Mid and Understorey Species	
Black She-Oak (*Allocasuarina littoralis*)	0.2
Lemon-scented Tea Tree (*Leptospermum polygalifolium*)	0.2
Giant Honey Myrtle (*Melaleuca armillaris*)	0.3
Large-leaf Hop Bush (*Dodonaea triquetra*)	0.2
Heath Parrot Pea (*Dilwynia retorta*)	0.2
***Acacia* Species**	
Sydney Golden Wattle (*Acacia longifolia*)	0.6
Hickory Wattle (*Acacia falcata*)	0.5
Green Wattle or Black Wattle (*Acacia decurrens*)	0.4
Red-stemmed Wattle (*Acacia myrtifolia*)	0.6

Species	Sowing Rate (kg/ha)
Sunshine Wattle (*Acacia terminalis*)	0.4
Total Tree , Understory and *Acacia* Species	**7.5**
Cover Crop	
Japanese Millet in Spring/Summer	2
Oats in Autumn/Winter	2
Total Cover Crop Species	**2**
Total Seeding Rate	**9.5**

Table 25 Pasture Species Mix and Sowing Rates

Species	Sowing Rate (kg/ha)
Pasture Species	
Couch Grass (*Cynodon dactylon*)	8
Paspalum (*Paspalum dilatatum*)	5
Kikuyu (*Pennisetum clandestinum*)	5
Perennial Ryegrass (*Lolium perenne*)	7
Green Panic (*Panicum maximum*)	5
Lucerne* (*Medicago sativa)*	5
White clover* (*Trifolium repens*)	5
Subterranean clover* (*Trifolium subterraneum*)	5
Total Pasture Species	**45**
Cover Crop	
Japanese Millet in Spring/Summer	10
Oats in Autumn/Winter	10
Total Cover Crop Species	**10**
Total Seeding Rate	**55**

** Legumes inoculated with Rhizobia and lime pelleted prior to sowing*

9.6.9 Surface Water

SLR has prepared a Surface Water Assessment and Plan (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

With the exception of the water management structures on the western batter of the void, the majority of the current water management system within Domain 4 will remain in place for the duration of the mine closure phase until the rehabilitation has stabilised and runoff is considered clean. Additionally the spillway will be installed to allow overflow from the East Pit final void at the high water level RL 12.

Water quality near the void surface likely to discharge is not expected to result in environmental impacts due to the tendency for low salinity water near surface and a general absence of elevated heavy metals in Westside Mine discharge. The water quality in Cockle Creek will be monitored in accordance with the Complex's monitoring and maintenance plan and the quality of any water discharging from the final void will be monitored at the licenced discharge EPA Point 4 – WST (EPL 4033).

9.6.10 Groundwater

SLR has prepared a Plan of Underground Water Management (SLR, 2016) including modelling for the rehabilitation and closure of the OCAL Complex.

To mitigate against an outwards hydraulic gradient from the Westside East Pit final void to the groundwater system within Domain 4, groundwater and surface water monitoring in the vicinity of the void will be undertaken to ascertain the nature of the hydraulic gradients as well as help determine the need for more robust modelling in the future. Existing bores will be utilised as available (e.g. N2178 in Domain 14 south of the East Pit final void) and three new boreholes will be installed in Domain 14 south of the East Pit void for monitoring.

9.6.11 Methane Management

There are no requirements to manage or monitor methane within Domain 4.

9.6.12 Biodiversity & Land Management

SLR has prepared a Biodiversity and Land Management report (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

Several biodiversity monitoring programmes have been underway at the OCAL Complex for a number of years. Based on review of the existing monitoring programmes, these programmes will continue unchanged in order to maintain consistency of data. It is expected that the information collected in these monitoring programmes will be used as part of the evidence to demonstrate lease relinquishment. Areas for monitoring will be selected and added to the existing programme to facilitate collection of representative biodiversity information for Domain 4.

In order to maintain the rehabilitated bushland areas that exist or are planned within this domain, a range of specific management strategies are proposed. This domain will be subject to routine inspection and land management activities including:

- Weed and feral animal management;
- Erosion and sediment control; and
- Bushfire protection works.

9.6.13 Heritage Items

There are no specific requirements to manage either European or Aboriginal Heritage items within Domain 4. The clearance procedure will continue to be utilised at OCAL Complex to identify potential heritage locations associated with rehabilitation, undertake inspection/survey where required, and manage any identified heritage items during closure.

9.7 Post Closure Monitoring & Maintenance

The following section outlines the completion criteria and indicators associated with Domain 4 and monitoring and maintenance activities that are to be undertaken within this domain during closure execution and post closure.

9.7.1 Completion Criteria and Indicators

The completion criteria for Domain 1 are outlined in **Section 25** of this MOP. The relevant criteria for all domains as well as Domain specific criteria apply.

9.7.2 Monitoring Requirements

During closure execution, monitoring will include:

- Environmental sampling of the disposed submerged sedimentary material (for leach testing);
- Quarterly water sampling of the void water adjacent to the submerged material to monitor any environmental impacts;
- Rehabilitation monitoring annual walkover;
- Westside final void area biodiversity monitoring;
- Void level and water quality monitoring;
- Auger mine subsidence remediation monitoring;
- Bushfire monitoring;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections; and
- Land management inspections.

Monitoring required during the post closure period includes:

- Rehabilitation monitoring annual walkover;
- Westside final void area biodiversity monitoring;
- Void level and water quality monitoring;
- Westside Mine biodiversity monitoring;
- Auger mine subsidence remediation monitoring;
- Bushland monitoring;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections; and
- Land management inspections.

9.7.3 Maintenance Requirements

Maintenance required during and post closure includes:

- Grading of haul road prior to closure handover;
- Removal and treatment of hydrocarbon impacted groundwater in the old bioremediation area via vacuum truck for off-site liquor disposal;
- Maintenance of water management structures;
- Maintenance for bushfire management;
- Maintenance for bushland management;
- Rehabilitation maintenance;
- Calibration of the groundwater model; and
- Maintenance of accesses to sampling points.

10 DOMAIN 5 VOLUNTARY CONSERVATION AREAS

The following table summarises the key rehabilitation and closure aspects as they relate to Domain 5.

Table 26 Summary of the Key Rehabilitation and Closure Aspects Relevant to Domain 5

Key Aspect	Domain-Specific Information
OCAL Complex Area	Voluntary Conservation Areas (VCA) - various
Total Area of Disturbance	• VCA A – 11.04 ha • VCA B – 3.87 ha • VCA C – 17.99 ha
Post mining land use	• Bushland • Light industrial (access track) VCA B
Existing components	• 30.44 ha of existing conserved bushland; • 0.29 ha of roadway to infrastructure to be rehabilitated in VCA A; • 2.17 ha subsidence impacted area in VCA B from previous geotechnical failure; and • 0.17 ha retained access tracks.
Key obligations	• Conservation of Tetratheca juncea; • Conservation of Sydney Coastal Estuary Swamp Forest; • Conservation of protected flora species; • Conservation of regionally significant flora and fauna species; • Conservation of threatened species; • Conservation of cultural heritage values; and • Facilitation of biological research.
Proposed Activities during the MOP	• Ongoing monitoring and maintenance of the 33.07 ha of VCA area; • Removal of the powerline which traverses 0.29 ha of Domain 5a and hand seeding with species collected from within the VCA; • Weed management and maintenance particularly along the power line easement; and • Monitoring and rehabilitation of the 2.34 ha of historical auger mining area.

10.1 Baseline Conditions

The following **Figure 21**show the existing arrangement of Domain 5 as at July 2016.

364250 364500 364750 365000 365250 365500 365750 366000 366250 366500 366750 367000 367250

6354250 6354000 6353750 6353500 6353250 6353000 6352750 6352500

A

B

C

WAKEFIELD ROAD

WAKEFIELD ROAD

RHONDDA ROAD

SCHOOL ROAD

MILLER ROAD

0 300 600 900 1,200 m

Scale:1:9,000
GDA 1994 MGA Zone 56

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Domain Boundary

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Domain 5
VCA Areas

FIGURE 21

As part of the approval of the Westside Mine Southern Extension, biodiversity offsets were negotiated with the NSW Government to compensate for the loss of vegetation, threatened species habitats and other biodiversity values associated with the mine development. A Conservation Management Plan (Umwelt 2005) was approved by the Office of Environment and Heritage (OEH) in 2006 for the establishment of Voluntary Conservation Agreement (VCA) areas that allowed for the conservation of 18 ha Swamp sclerophyll forest on Coastal Floodplains – an endangered ecological community (EEC) listed under the NSW *Threatened Species Conservation Act 1995* (TSC Act), and five sub-populations of *Tetratheca juncea*, a threatened plant species listed under the TSC Act and the Commonwealth *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), covering an area of approximately 13.6 ha. The conservation areas also aimed to conserve the habitat of other local flora and fauna species, including threatened species known to occur in the area of disturbance (Umwelt 2011).

The VCA lands (Domain 5) are made up of three discrete areas A, B and C. In total it contains approximately 32 hectares of native vegetation. According to the Lake Macquarie City Council (LMCC) vegetation mapping, the main vegetation communities present within the VCA lands are:

- Sugarloaf Uplands Bloodwood – Apple Forest (in the southern areas); and
- Floodplain Redgum – Rough-barked Apple Forest (in the north).

The areas of each vegetation type within the VCA Lands are listed in **Table 27**.

Table 27 Plant Community Types Mapped Within Domain 5

Plant Community Type (LMCC Name)	TSC Act Threatened Ecological Community	Area (ha)
Floodplain Redgum – Rough-barked Apple Forest	Swamp sclerophyll forest on coastal floodplains	18
Sugarloaf Uplands Bloodwood - Apple Forest	-	14
	Total Vegetated Area	**32**

The current status of the VCAs as described in the most recent monitoring report (Kleinfelder 2015) indicates:

- Most of the *Tetratheca juncea* plants recorded across the sites appeared to be in good health and were also in flower. However, there are some trends of declining clump number and size at some of the sites;
- Native plant species diversity was relatively high within all transects in VCA C during the 2015 surveys. The number of native species recorded within each transect has increased since the baseline survey in 2007, with relatively small year-to-year variation in native species richness; and
- The results of the 2015 monitoring surveys indicate the condition of vegetation and fauna habitats within VCAs A, B and C is high and remains relatively unchanged since previous surveys.

Generally, VCAs A and B are free of weeds. However, there are some exotic grasses present along the powerline easements that intersect VCA A. While the majority of VCA C has a low density of weeds, there are infestations of Crofton Weed. Three noxious weed species detected during the surveys were identified as target species for control within VCA Area C: Crofton Weed, Pampas Grass and Lantana.

The powerline easement that passes through VCA A (Domain 5a) is an OCAL utility powering the Shaft 3 fan site and associated infrastructure.

VCA B (Doman 5b) includes a section of the access track which will be retained to facilitate light vehicle access for environmental monitoring and land management. In addition the northern portion of Domain 5b is impacted by subsidence relating to the interactions with the South Pit auger mining and the depth of cover in the Great Northern seam (as discussed in Domain 3 above).

Remediation undertaken in 2008 included topsoil stockpiling for reuse, reshaping the area above Westside South Pit highwall and ripping and backfilling voids as required. For long-term stability, the area against the highwall was backfilled.

A small portion of the rehabilitated highwall area is included within the VCA Domain.

This domain contains sections highly likely to contain acid sulfate soils based on regional mapping.

10.2 Current Closure / Rehabilitation Status

According to the approved Conservation Management Plan, the VCA areas will continue to be managed by OCAL as long as they retain ownership. The VCA is placed on the title of the properties affected and runs with the land. Hence, if the land is sold, the VCA still applies and the new owner is responsible for the requirements and obligations of the VCA terms and conditions.

This commitment requires annual management, inspection and reporting (weed management, fencing, and monitoring) which is currently undertaken by OCAL. Annual monitoring reports have been completed each year by Umwelt, Ecobiological or Kleinfelder since 2007.

The primary objective of the monitoring is to collect useful and relevant data that can be used to identify changes in the conservation values of each of the VCA areas over time and therefore assess the success of the Plan. In addition, the monitoring program specifically targets *Tetratheca juncea*. The monitoring also considers weeds, such as Crofton Weed (*Ageratina adenophora*), a weed species that has been recorded in large infestations during previous surveys.

As part of the VCA, a regular inspection of the VCA lands is currently undertaken jointly by the NSW Office of Environment and Heritage and OCAL. The inspection typically includes observation and discussions with OCAL on:

- Any destruction, removal or dieback of native plants or activity which may have occurred;
- Evidence of exotic flora and exotic fauna;
- Any cultural heritage sites;
- Effects of levels of permitted uses;
- Any evidence of population densities of native fauna and native plant species; and
- Other matters relevant to the management of the conservation areas.

10.3 Closure Commitments/Obligations

SLR prepared a detailed Legal & Governance Register for mine closure with the key requirements adopted for the mine closure for the OCAL Complex, including those elements for Domain 5.

The following is a summary of the general closure commitments related to Domain 5:

- Conservation of *Tetratheca juncea*;
- Conservation of Sydney Coastal Estuary Swamp Forest;
- Conservation of protected flora species;
- Conservation of regionally significant flora and fauna species;
- Conservation of threatened species;
- Conservation of cultural heritage values; and
- Facilitation of biological research.

10.4 Proposed Final Land Use and Landform

Throughout the LOM Closure Planning process OCAL completed a range of mine closure planning tasks for Westside Mine, including Domain 5. Based on the outcomes of these studies and in consideration of what is permissible under the existing development consent, a proposed final land use strategy was presented in the Westside Mine Closure MOP (Umwelt, 2011) and subsequently adopted in this Detailed Mine Closure Plan for the OCAL Complex.

The final land use outcomes (shown in **Figure 22**) were adopted based on land use options from the work above; this is outlined as:

- A total of 32.9 ha of bushland biodiversity offset for the Westside Mine Southern Extension in perpetuity; and
- An access track through Domain 5b (VCA B) of 0.17 ha for light vehicle access to the site to facilitate land management, monitoring and maintenance. The tracks will also allow access for any bushfire mitigation or fire-fighting that may be required (note that bushfire is an integral part of the *Tetratheca juncea* life cycle in breaking seed dormancy and promoting germination, therefore response to bushfire would be appropriate based on risk).

The offset commitment is set out in the project approval and runs in perpetuity. Consequently, options for alternative future uses of this land are limited. Selling the land to a future buyer is considered problematic as the buyer would then be burdened with the VCA management commitments, which run with the title of the properties affected. Notably, Clause 4 of the VCA states:

> *"The Owner must incorporate the terms of this Agreement in any lease or licence issued over the conservation area, and at all times ensure that any servant, agent, lessee, licensee occupying the conservation area or any other person under the control of, or who is in the conservation area with the consent of, the Owner (express or implied) shall be aware of and be bound by the relevant provisions of this Agreement".*

The term of the VCA is in perpetuity "*until amended or terminated by the parties in accordance with the (NSW National Parks and Wildlife) Act (1974)*". Therefore on this basis, the NSW Minster for Environment, being party to the VCA, would have to agree to terminate the VCA, should OCAL wish to look terminate the VCA in the future. Advice received from Office of Environment and Heritage (S Gold *pers. comm.* 9 September 2016) indicates that no VCA in NSW has ever been terminated. Also, this particular VCA is tied to a previous mine consent and associated biodiversity offset, which is designed to be permanent. Hence, the option of relinquishing the VCA (i.e. terminating the VCA), as part of relinquishing the entire OCAL Complex, is not feasible at this stage.

Further, the existing VCA lands cannot generate credits under a BioBanking Agreement: they are already subject to a VCA offset arrangement for the previous Westside Mine Southern Extension approval and any credits generated would be required to be retired from the market to fulfil the offset obligation and therefore no surplus credits would be available to be sold.

The other options considered for the VCA lands are summarised as follows:

- Donate to National Parks estate, as discussed further below;
- VCA on-sale with a suitable parcel of 'unencumbered' land to a post mining land user; and
- Handover to LMCC, presumably with associated negotiations over suitable funding arrangements for ongoing management (as with donation to National Parks estate).

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WAKEFIELD ROAD

WAKEFIELD ROAD

RHONDDA ROAD

SCHOOL ROAD

MILLER ROAD

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Domain Boundary
Recycled Water Pipeline
Surface Infrastructure

Post Closure Landuse
Bushland
Non-OCAL Infrastructure
Pasture
Residential
Retained Hardstand
Retained Infrastructure
Water Management
Wetland

Closure Activity
None
New Bushland Rehabilitation
New Pasture Rehabilitation
Hardstand Establishment
Dam Remediation Required
Spillway Construction
Subsidence Remediation (Auger Mining)
Subsidence Remediation (Longwall Mining)
Decommission

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Post Mining Landuse
Domain 5
VCA Areas

FIGURE 22

10.5 Approvals

The following section outlines the various approvals relevant to the OCAL Complex, with the key conditions relevant to Domain 5 summarised:

DA 125-5-2002 (Westside Mine Southern Extension development). The aspect relevant to Domain 5 is the stipulation of the development consent conditions that OCAL establish a Voluntary Conservation Agreement (VCA) for the protection of threatened species, endangered ecological communities and general flora and fauna habitat.

In addition, OCAL holds a number of mining tenures and leases that incorporate Domain 5; Domain 5 is located on CCL718, ML1532 and PLL153.

No licences are associated with this domain.

10.6 Rehabilitation and Closure Actions - Scope of Works

This section specifies the various closure and rehabilitation activities for the domain. It includes a detailed description of the works to be undertaken. It is intended that this will form the basis of the Rehabilitation Cost Estimate (CCE) for each domain.

10.6.1 Decommissioning and Salvage of Assets

OCAL has prepared a detailed asset list which includes an inventory of all assets, including a comment and photographs of all identified equipment. A copy of the detailed asset and salvage register is included as **Appendix D.**

There are no assets, plant or equipment remaining in Domain 5.

10.6.2 Demolition

Liberty Industrial prepared a demolition report (Liberty Industrial, 2015) for the OCAL Complex which included a review of all relevant infrastructure and providing a method statement and costs estimate to undertake the works.

There is no requirement to undertake any demolition in Domain 5.

10.6.3 Waste Management

SLR has prepared a Waste Disposal Strategy (SLR, 2016) for the OCAL Complex which has provided a summary of the types and amounts of waste anticipated to be generated as a result of the OCAL complex closure works; as well as providing advice on constraints and options for disposing of the waste.

There are no wastes to be managed in Domain 5.

10.6.4 Hazardous Materials

SLR has prepared a Hazardous Materials Report and Plan (SLR, 2016) for the site which included a review of current HAZMAT, dangerous goods and hazardous substances information for the Complex and to quantify the presence of hazardous materials located across all domains.

There are no known hazardous materials to be managed in Domain 5; however, there may be unexpected finds during closure.

Historical data has indicated that illegal dumping of ACM has been conducted on OCAL lands. A Complex wide 'unexpected HAZMAT finds' procedure will be developed for the Complex to guide the address of any finds outside of building and infrastructure areas. OCAL will implement this procedure to govern development of an action plan for any further HAZMAT discovered within the OCAL domains during the decommissioning process.

10.6.5 Contaminated Sites

SLR has undertaken an extensive review of existing information and an in-field sampling program to quantify the likelihood and extent of any contaminated sites within the OCAL Complex.

There are no contaminated sites to be managed in Domain 5.

10.6.6 Civil Earthworks and Landform

Whilst there are no specific civil earthworks required to be undertaken within Domain 5, there may be a requirement to undertake remediation of the subsidence cracks contained within Domain 5b.

Partial remediation of the subsidence area has been undertaken in Domain 3 in the form of sealing the cracks with minor surface earthworks and shaping. Some of the cracks have subsequently reopened, following rainfall. Whilst it is expected that the subsidence will have stabilised there extent of the area impacted is unknown and therefore any remediation works are yet to be determined. Installation of perimeter fence and drainage and provisional repair works will be undertaken.

As an initial short term measure, the area is to be mapped using differential GPS and a fence and signs will be erected around the perimeter of the area to excluded unauthorised access to the site.

OCAL has commissioned a qualified geotechnical engineer to undertake and assessment of the area and prepare remediation plan for the site (which may also include Domain 5b). This will allow for final infilling of the cracks with some surface revegetation required for the areas disturbed as part of the subsidence remediation.

10.6.7 Mine Sealing

There are no mine entries or boreholes to be sealed within Domain 5.

10.6.8 Revegetation

The Rehabilitation and Closure Criteria report (SLR, 2016) has been prepared by SLR.

A total of 0.29 ha of rehabilitation will be required completed in Domain 5 which includes the reseeding on the powerline easement that passes through Domain 5 once the infrastructure has been removed.

10.6.9 Surface Water

SLR has prepared a Surface Water Assessment and Plan (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

No changes to surface water management are proposed for Domain 5; the current water management system will remain in place.

10.6.10 Groundwater

SLR has prepared a Plan of Underground Water Management (SLR, 2016) including modelling for the rehabilitation and closure of the OCAL Complex.

There are no requirements to manage or monitor groundwater within Domain 5.

10.6.11 Methane Management

There are no requirements to manage or monitor methane within Domain 5.

10.6.12 Biodiversity & Land Management

SLR has prepared a Biodiversity and Land Management report (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

Several biodiversity monitoring programmes have been underway at the OCAL Complex for a number of years. Based on review of the existing monitoring programmes, these programmes will continue unchanged in order to maintain consistency of data. It is expected that the information collected in these monitoring programmes will be used as part of the evidence to demonstrate lease relinquishment.

In order to maintain the bushland within the VCA lands to meet conservation objectives as per the Agreement, Domain 5 will be subject to continued monitoring in accordance with the Conservation Management Plan for the VCA (Umwelt 2005). Monitoring will target:

- The health and abundance of threatened species of *Tetratheca juncea* populations during times of flowering – VCAs A and B;
- Monitoring health and cover abundance of flora – VCA C;
- Mapping of weeds listed under the *Noxious Weeds Act 1993* and/or environmental weeds particularly targeting Crofton Weed – VCAs A, B and C; and
- Fauna habitat monitoring considering vegetation structure, presence of hollow bearing trees and waterbodies, etc. – VCAs A, B and C.

Maintenance works will be undertaken as required with Domain 5 subject to routine inspection and land management activities including:

- Weed and feral animal management;
- Erosion and sediment control; and
- Bushfire protection works.

10.6.13 Heritage Items

There are no specific requirements to manage either European or Aboriginal Heritage items within Domain 5. The clearance procedure will continue to be utilised at OCAL Complex to identify potential heritage locations associated with rehabilitation, undertake inspection/survey where required, and manage any identified heritage items during closure.

10.7 Post Closure Monitoring & Maintenance

The following section outlines the completion criteria and indicators associated with Domain 5 and monitoring and maintenance activities that are to be undertaken within this domain during closure execution and post closure.

10.7.1 Completion Criteria and Indicators

The completion criteria for Domain 1 are outlined in **Section 25** of this MOP. The relevant criteria for all domains as well as Domain specific criteria apply.

10.7.2 Monitoring Requirements

Monitoring required during and post closure includes:

- VCA monitoring (*Tetratheca juncea*, endangered ecological community Sydney Coastal Estuary Swamp Forest Complex, fauna habitat assessment, weed mapping);
- Auger mine subsidence remediation monitoring;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections; and
- Land management inspections.

Post closure monitoring for this domain will comprise:

- VCA monitoring (*Tetratheca juncea*, endangered ecological community Sydney Coastal Estuary Swamp Forest Complex, fauna habitat assessment, weed mapping);
- Auger mine subsidence remediation monitoring;
- Bushfire (fuel load/asset protection inspections);
- Environmental inspections; and
- Land management inspections.

10.7.3 Maintenance Requirements

Maintenance required during and post closure includes:

- VCA management works (weeds, bushfire, fencing maintenance);
- Maintenance for bushfire management; and
- Rehabilitation maintenance.

11 DOMAIN 6 PIT TOP FACILITIES

The following table summarises the key rehabilitation and closure aspects as relevant to Domain 6.

Table 28 Summary of the Key Rehabilitation and Closure Aspects Relevant to Domain 6

Key Aspect	Domain-Specific Information
OCAL Complex Area	Pit Top Facilities
Total Area of Disturbance	22.69 ha
Post mining land use	• Light industrial (including retained hardstand) • Bushland • Pasture • Water management
Existing components	• 9.55 ha of existing bushland; • 0.93 ha of existing pasture; • Buildings, access roads, hardstands and associated disturbance; • Dams North East, Top and Bottom (sediment dams); • EPA (licenced discharge) Point 2 – WWC; and • EPA (licenced discharge) Point 8 – WWC.
Key obligations	• Return land affected by the operations to a condition suitable for a range of sustainable future land uses; • Minimise the potential for long-term environmental impact and liability; • Provide for the safety of employees and the public during and following mine closure; • Prevent access to disused underground workings; • Minimise the potential impacts from closure activities; • Ensure that the rehabilitated post-closure landform, including remaining structures will be physically and chemically stable and will not present a hazard to public health and safety; • Through rehabilitation of disturbed areas, provide a sustainable vegetation cover; • If not required by the post mining land use, the bitumen roadways, car parks and hardstand areas around the administration building, stores area and workshop will be ripped up; • Removal of excess sediment form the pit top dams for future use by the subsequent land owner or alternatively filling and shaping of the dams if they are no longer required; • Where dams are to be retained, provide that drainage structures are designed to capture runoff from sufficient catchment area so that the dam can be utilised for its intended use; • The installation of sediment and erosion control measures for areas where drainage by-passes the surface dams and is discharged off site; and • Following the demolition of the buildings and site infrastructure. It is expected that any concrete slabs and footings will be broken up.

Key Aspect	Domain-Specific Information
Proposed Activities during the MOP	~~• Decommissioning and removal of the ROM Conveyor, surge bin, UC1 Conveyor, Bradford breaker, winder house, Onsite Cottages, MCPP Haul Road and associated powerlines;~~ ~~• Sealing of the conveyor portals and man and materials drift; and~~ • Retention of remaining hardstand areas, administration buildings, workshop, store, bathhouse, car parks, potable water, access roads, sediment ponds and associated infrastructure for post mining use by a third party

11.1 Baseline Conditions

Figure 23 shows the existing arrangement of Domain 6 as at July 2016.

Domain 6 is a 22.69 ha area that includes WWC bathhouse, offices, workshops, stores, hardstands and cola clearance conveyors, including a coal bin. In addition it includes Shaft#1 Elevator, Drift, and Pit Top service boreholes. Mining operations were undertaken in this area from based on approval in 1969 with cessation of underground mining in mid-2016. The OCAL Regional offices and associated carparks is also within the Domain.

This domain contains three sediment dams and newly installed clean water diversion drains which were identified as a water management system improvement following water incident investigations in March 2013. Where possible, runoff from undisturbed areas adjacent to WWC surface facilities is diverted around disturbed areas using diversion drains. Water in sediment dams is treated before being used where possible on site for dust suppression and equipment wash down or is discharged off site via licenced discharge EPA Point 2 (located in Domain 14).

Sediment removal and enlargement works were undertaken in these dams in December 2014 and sediments removed from the dams were taken to the north side of the Westside Final Void.

Above-ground storage tanks and associated fuel supply facilities are present near the central section of the heavy vehicle access road. These tanks include:

- Above-ground diesel storage tank;
- Hydraulic oil tank (estimated to be within a range between 10 kL and 20 kL);
- Underground mine fuel tank (approximately 4 kL); and
- Solcenic 2B-W (charge tank-oil, estimated to be smaller than 4 kL).

Sewage and bathhouse water generated at WWC is treated on-site through a package biological sewage treatment plant. Treated sewage effluent is pumped approximately 3.2 km overland to the maturation ponds at the MCPP (Domain 10) and was previously used as process water. Sewage sludge from the treatment plant is pumped out and disposed of by a contractor, as required. The treatment plant is on the east side of Domain 6.

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THE BROADWAY

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Domain Boundary

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Domain 6
Pit Top Facilities

FIGURE 23

11.2 Current Closure/Rehabilitation Status

Domain 6 remains in use for mining related activities, and will continue to be used until the mine sealing programme is completed.

The domain includes buildings, car parks, ~~stacker, winder house, shaft entry,~~ hardstand areas and sewage treatment facility. Sump 1 and Sump 2 drain into the Top Dam from the base of the former stockpile pad via associated drainage channels.

The Top Dam receives inflow from four lined drains~~; however, erosion rills and gullies are present in the exposed walls, particularly the southern wall and no spillway is installed~~. A 350 mm diameter culvert flows from Top Dam to Bottom Dam (Cell 1) via lined drainage channel and the Bottom Dam Cell 1 has a rip rap lined spillway on the southwest corner. Water is pumped from Bottom Dam Cell 1 to Cell 2 and a rip rap lined spillway is present in the north east corner. Moderate erosion has occurred on the exposed downstream embankment face for Bottom Dam Cell 2.

The North East Dam has an installed embankment spillway near the northwest corner and monitoring equipment is located on the west embankment. ~~Some undercutting of the embankment has occurred due to erosion and will require address.~~

11.3 Closure Commitments/Obligations

SLR prepared a detailed Legal & Governance Register for mine closure with the key requirements adopted for the mine closure for the OCAL Complex, including those elements for Domain 6.

The following is a summary of the general closure commitments related to Domain 6:

- Return land affected by the operations to a condition suitable for a range of sustainable future land uses;
- Minimise the potential for long-term environmental impact and liability;
- Provide for the safety of employees and the public during and following mine closure;
- Prevent access to disused underground workings;
- Minimise the potential impacts from closure activities;
- Ensure that the rehabilitated post-closure landform, including remaining structures will be physically and chemically stable and will not present a hazard to public health and safety;
- Through rehabilitation of disturbed areas, provide a sustainable vegetation cover;
- If not required by the post mining land use, the bitumen roadways, car parks and hardstand areas around the administration building, stores area and workshop will be ripped up;
- Removal of excess sediment form the pit top dams for future use by the subsequent land owner or alternatively filling and shaping of the dams if they are no longer required;
- Where dams are to be retained, provide that drainage structures are designed to capture runoff from sufficient catchment area so that the dam can be utilised for its intended use;
- The installation of sediment and erosion control measures for areas where drainage by-passes the surface dams and is discharged off site; and
- Following the demolition of the buildings and site infrastructure. It is expected that any concrete slabs and footings will be broken up.

11.4 Proposed Final Land Use and Landform

Throughout the LOM Closure Planning process OCAL completed a range of mine closure planning tasks for WWC, including Domain 6. Based on the outcomes of these studies and in consideration of what is permissible under the existing development consent, a proposed final land use strategy was presented in the MOP for the Closure of the OCAL Complex (SLR 2016) and subsequently adopted in this Mining Operations Plan.

The final land use outcomes (shown in **Figure 24**) were adopted based on land use options from the work above; this is outlined as:

- Approximately 10ha of the existing infrastructure and/or hardstands will be retained for light industrial use;
- All buildings other than coal clearance infrastructure (e.g conveyors, bins and gantries) will be retained;
- The access road (0.41 ha) will be maintained for access to the site for light industrial use and to facilitate access for any bushfire mitigation or fire-fighting that may be required;
- Retention of the licenced discharge points; and
- Top Dam, Bottom Dam and North East Dam will be retained.

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Domain Boundary
Recycled Water Pipeline
Surface Infrastructure

Post Closure Landuse
Bushland
Non-OCAL Infrastructure
Pasture
Residential
Retained Hardstand
Retained Infrastructure
Water Management
Wetland

Closure Activity
None
New Bushland Rehabilitation
New Pasture Rehabilitation
Hardstand Establishment
Dam Remediation Required
Spillway Construction
Subsidence Remediation (Auger Mining)
Subsidence Remediation (Longwall Mining)
Decommission

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Post Mining Landuse
Domain 6
Pit Top Facilities

FIGURE 24

11.5 Approvals

The following section outlines the various approvals relevant to the OCAL Complex, with the key conditions relevant to Domain 6 summarised:

Development Consent West Wallsend No. 2 Colliery B/66-69 DC:BM (1969). The conditions relevant to Domain 6 include:

- The provision of a dense arboreal screen at least 100 ft. wide between the road to Killingworth and the development on both sides of the road as well as landscaping the development sites to improve aesthetic appearance;
- The location of mining waste dumps at least 150 ft. clear of road boundaries and other boundaries of the company's holding;
- The fencing of the development as well as taking other measures to secure public safety;
- The company executing an agreement with Council with respect to:
    - To the restoration of the land affected by mining and maintenance of the restored land for a period of three (3) years after cessation of mining operations; and
    - For the provision of traffic control devices at the level crossing in Wakefield Road in accordance with requirements of the Inter-Departmental Committee.

West Wallsend Colliery Continued Operations Project Approval PA 09_203 (2012) and modification MOD1 (2014). Conditions relevant to Domain 6 include:

- The Proponent shall ensure that all demolition work is carried out in accordance with Australian Standard AS 2601-2001: The Demolition of Structures, or its latest version;
- During the life of the project, the Proponent shall ensure that there is a suitable meteorological station operating in the vicinity of the site that complies with the requirements in the Approved Methods for Sampling of Air Pollutants in New South Wales guideline;
- The Proponent shall ensure that all surface water discharges from the site comply with the discharge limits (both volume and quality) set for the project in any EPL;
- The Proponent shall rehabilitate the site to the satisfaction of the Executive Director Mineral Resources. This rehabilitation must be generally consistent with the proposed rehabilitation strategy described in the EA, and comply with the objectives in Table 10 (Rehabilitation Objectives);
- The Proponent shall establish and operate a Community Consultative Committee (CCC) for the project in general accordance with the Guidelines for Establishing and Operating Community Consultative Committees for Mining Projects (Department of Planning, 2007, or its latest version), or alternative consultative framework as may be agreed by the Director-General, to the satisfaction of the Director-General; and
- From the end of April 2012, the Proponent shall make copies of the following publicly available on its website:
    - the EA;
    - all current relevant statutory approvals for the project;
    - approved strategies, plans and programs required under the conditions of this approval;
    - a comprehensive summary of the monitoring results of the project, which have been reported in accordance with the various plans and programs approved under the conditions of this approval;
    - a complaints register, which is to be updated on a monthly basis;
    - minutes of CCC meetings;
    - the annual reviews of the project etc.

Development Application 281/2014 (2014). Conditions relevant to Domain 6 include:

- All disturbed areas shall be revegetated or rendered erosion resistant in accordance with Section 2.1.11 of Lake Macquarie City Council Development Control Plan 1 as soon as practical, and no later than the timeframes specified in Managing Urban Stormwater: Soils and Construction "The Blue Book " 41 Edition, Landcom, 2004; and
- To reduce the potential impact on surrounding vegetation and threatened species, herbicides and insecticides shall not be used within the Asset Protection Zone.

Approval to Operate a System of Sewage Management OSSM/141/2002 (2002). Conditions relevant to Domain 6 are:

- The system shall be operated to achieve the following performance standards, as set out in clause 44(1) of the *Local Government (General) Regulation 2005*:
    - The prevention of contamination of water;
    - The prevention of degradation of soil and vegetation;
    - Ensuring that persons do not come into contact with untreated sewage or effluent in their ordinary activities on the premises concerned; and
    - The minimisation of any adverse impacts on the amenity of the premises and surrounding lands.
- The system must not cause sewage or treated effluent to be discharged into a stormwater system, any permanent or intermittent watercourse, or onto any land other than the approved disposal area.

In addition, OCAL holds a number of mining tenures and leases that incorporate Domain 6; Domain 6 is located on CCL718 and CCL725.

The key licence relevant to Domain 6 is EPL No. 3160. The EPL addresses water pollution, waste, monitoring and testing, reporting via annual returns and maintaining copies of the licence at the relevant areas. Licenced discharge points EPA 2 – WWC and EPA 8 – WWC are contained within the domain.

No water licences are associated with Domain 6.

11.6 Rehabilitation and Closure Actions - Scope of Works

This section specifies the various closure and rehabilitation activities for the domain. It includes a detailed description of the works to be undertaken. It is intended that this will form the basis of the rehabilitation Cost Estimate (RCE) for each domain.

11.6.1 Decommissioning and Salvage of Assets

OCAL has prepared a detailed asset list which includes an inventory of all assets, including a comment and photographs of all identified equipment. A copy of the detailed asset and salvage register is included as **Appendix D**.

Assets, plant and equipment in Domain 6 to be decommissioned are the winder house and conveyor related infrastructure. Asset salvage will consider restricted access to the winder house perimeter due to identification of asbestos fines and free-fibre asbestos in the surface soils and winder house.

11.6.2 Demolition

Liberty Industrial prepared a demolition report (Liberty Industrial, 2015) for the OCAL Complex which included a review of all relevant infrastructure and providing a method statement and costs estimate to undertake the works.

The scope of works for demolition in Domain 6 based on the post mining land use is winder house, bathhouse and offices, workshop, laydown yard stores, asphalt surfaces, rail lines and other conveyor related infrastructure.

11.6.3 Waste Management

SLR has prepared a Waste Disposal Strategy (SLR, 2016) for the OCAL Complex which has provided a summary of the types and amounts of waste anticipated to be generated as a result of the OCAL complex closure works; as well as providing advice on constraints and options for disposing of the waste.

High priority waste (concrete) and the second largest anticipated quantity of medium priority waste (scrap metal and carbonaceous materials) are expected to be produced from demolition of Domain 6. Some waste may also be generated from demolition in the adjacent Westside Mine Domain 1 (demountables, admin and workshop etc. if no post mining land user is determined) i.e. high priority waste (concrete) and/or medium priority waste (scrap metal and general waste).

Domain 6 is easily accessible from a public roadway (The Broadway) and contains several existing hardstand areas.

A Waste Management Hub (WMH) (a central area where waste will be sorted and segregated before being transported from site) secondary to Domain 9 will be located at Domain 6. This hub will be used to support the primary Waste hub at Domain 9 and, as such, screening and crushing facilities will not be present in this domain. The Domain 6 hub will have equipment for segregating and stockpiling wastes and will also to be located on existing hardstands in the location of the current coal bin within the domain.

The removal of the winder house and other conveyor related infrastructure, and shafts, drifts etc. is not expected to generate much waste, however should the site be fully demolished at some point, the buildings within Domain 6 would produce concrete (footings and slab), scrap metal and general wastes while there would also be carbonaceous wastes and asbestos. Sampling will determine ongoing sediment management requirements; no disposal of liquids, sludge or sediment is currently planned based on the post mining land use.

The following is a summary of the quantities and actions if Domain 6 was fully rehabilitated:

- Concrete (estimated 521 tonnes): This would be transported to the Waste Management Hub (WMH) located in Domain 9 for screening and crushing for on-site re-use or dispatch to off-site recycling facilities;
- Scrap metal (estimated 540 tonnes): Transport to Domain 6 WMH for segregation for on-site reuse or dispatch to off-site recycling facilities;
- Carbonaceous material (estimated 5,272.5 tonnes): Transport to Tailings Dam for disposal;
- Asbestos (estimated 0.4 tonnes): Package appropriately at source and transport to Domain 6 WMH for dispatch to licenced off-site landfill facilities;
- Contaminated sludge and sediments (estimated 110 tonnes): Dewatering at source for dispatch to off-site landfill facilities;
- Waste tyres (estimated number 1,184 across all domains): Transport to off-site recycling facility;
- General waste (estimated 87 tonnes): Segregate for on-site reuse or dispatch to off-site disposal facility; and
- Bitumen and asphalt (estimated 1,870 tonnes): Transport to off-site recovery or landfill facilities.

11.6.4 Hazardous Materials

SLR has prepared a Hazardous Materials Report and Plan (SLR, 2016) for the site which included a review of current HAZMAT, dangerous goods and hazardous substances information for the Complex and to quantify the presence of hazardous materials located across all domains.

HAZMAT works required for Domain 6 are:

- For the winder house where asbestos fines and free-fibre asbestos were identified in the surrounding surface soils:
    - Immediately restrict access the winder house perimeter by implementing at least a 5 m exclusion zone. Install surface water controls to prevent further migration of contamination. Conduct regular airborne fibre monitoring until such a time where the extent of the asbestos impacted ground surfaces/soils can be determined and effectively removed; and
    - Remove assumed asbestos debris from the main office hot water room. Ensure a clearance certificate is issued and the Hazardous Materials Register updated accordingly
- Include all infrastructure to be decommissioned, demolished, etc. in a demolition style type 3 survey e.g. site cottage, main office, bathhouse, workshop;
- Remove all identified HAZMAT from the winder house, bathhouse and related conveyer infrastructure prior to demolition. Ensure a clearance certificate is issued and the Hazardous Materials Register updated accordingly;
- Ensure all retained buildings are added on the Complex Asbestos Management Plan (the old training cottage is not currently included);
- Maintain the HAZMAT Register including update for removed asbestos; and
- Manage containers of dangerous goods and hazardous substances in strict adherence to the current Material Safety Data Sheet (MSDS) or Safety Data Sheet (SDS) prepared under current Australian Legislation or that of the Global Harmonised System of Classification and Labelling of Chemicals (GHS). Ensure any item exceeding placarding and/or manifest quantities are appropriately labelled and appropriate signage erected at the associated site entrances.

Historical data has indicated that illegal dumping of ACM has been conducted on OCAL lands. A Complex wide ‘unexpected HAZMAT finds’ procedure will be developed for the Complex to guide the address of any finds outside of building and infrastructure areas. OCAL will implement this procedure to govern development of an action plan for any further HAZMAT discovered within the OCAL domains during the decommissioning process.

11.6.5 Contaminated Sites

SLR has undertaken an extensive review of existing information and an in-field sampling program to quantify the likelihood and extent of any contaminated sites within the OCAL Complex.

The sediment dams in Domain 6 will require sampling to advise ongoing sediment management requirements.

The surface soil sample collected near the sewage treatment facility was found to contain thermo-tolerant coliforms of 130 MPN/100 ml (130 MPN/100 ml for *E. coli*). The STP will require decommissioning in a manner consistent with EPL 3160 and sewage impacted soils will require removal and transport to a licenced landfill for disposal, followed by validation.

A management plan will be developed for impacted soils encountered during civil earthworks proposed in the closure works.

11.6.6 Civil Earthworks and Landform

Civil earthworks to be undertaken in Domain 6 include:

- Repair and monitor rills and gullies in Top Dam embankments;
- Repair embankment undercutting at North East Dam;
- Upgrade spillway at North East Dam and install spillway on Top Dam if no post mining land user is determined(shape, regrade and application of rip rap);
- Remove footings from areas of winder house and conveyor infrastructure to be fully rehabilitated;
- Minor earthworks undertaken during closure to re-profile the areas disturbed by decommissioning and demolition works, and facilitate a free draining landform into the existing water management system;
- Installation of erosion and sediment controls for areas that do not report to the dams; and
- Demolition of infrastructure and rehabilitation of surface openings for WWC Shaft#1, Drift and boreholes.

Additional rehabilitation works that may be undertaken based on determination of no identified post mine user for the site are:

- Load, haul and transport hydrocarbon contaminated soil to Westside Mine bioremediation facility in Domain 9;
- Removal and replacement of wash bay structure and associated hydrocarbon impacted soils and provision of oil-water separator;
- Load, haul and dispose carbonaceous material and hydrocarbon contaminated material to the Tailings Dam;
- Reshape non-contaminated material / batters from old stockpile under bin area;
- Remove haul road – rip asphalt and remove off-site, and
    - Scalp carbonaceous to 300 mm and dispose to Tailings Dam;
    - Application of bio-solids / ameliorants in the absence of topsoil; and
    - Ripping, and seeding.

11.6.7 Mine Sealing

OCAL has undertaken the sealing of the WWC following the cessation of mining. Within Domain 6 this included Shaft 1 and the Drift as well as a borehole. The following Notifications have been submitted to the DRG prior to the commencement of works. –

- AD6 Application for cancellation/part cancellation of authority;
- AD8 Application for suspension of conditions of authority; and
- ML14 Application for suspension of Mining Operations (now sought of the Minister under Sch.6 Part 23 159).

Sealing of the mine is considered a High Risk Notification. OCAL has undertaken a review of the sealing methodology following consultation with the inspectorate.

The service boreholes will be grouted and sealed as per *EDG01 – Borehole sealing requirements on land: Coal* and *MDG6001 Guidelines for the permanent filling and capping of surface entries to coal seams*. The water levels within boreholes will be confirmed prior to commencement of sealing.

The WWC Worthington Water “in” water supply to the drift has been maintained after the service borehole is decommissioned.

The WWC – Emergency Water Pump out line pipes are within the borehole casing. The pipe has been removed from the borehole.

11.6.7.1 WWC Shaft#1 Elevator Shaft Sealing

The following section provides a summary of the works undertaken to seal WWC 31 Elevator Shaft.

- Surface site establishment – fall protection point, truck stop, traffic management, etc. for delivery of material (retain existing infrastructure around shaft during pouring of grout plug to base of shaft and remove);
- Pumped out sump and prepare for bulkhead construction (1 m thick concrete bulkheads);
- Built two seals with doors;
- Built the final third seal near final sealing time;
- Filled from shaft bottom to above shaft cavern with 1.0 MPa Grout (Elevator parked at base of shaft);
- Installed doors within elevator cage infrastructure to allow concrete and bulk fill tipping of overburden from Westside;
- Filled the shaft to within 1.5 m of surface with bulk fill;
- Removed lightning paths;
- Completed filling;
- Removed all elevator surface infrastructure required to construct final capping seal; and
- Constructed a final cap seal of 1 m thick non-cohesive fill material layer (sand) below a 10 MPa concrete bonding layer with galvanised steel pipe and flanged lock cap, covered by a reinforced concrete 32 MPa cap over the existing riser and mesh top layers.

11.6.7.2 Drift Sealing

The following section provides a summary of the works undertaken the Drift sealing:

- Removed infrastructure (ARMCO), floor concrete and rails, ballast and conveyor structure at bulkhead site;
- Constructed bulkhead with door (Aquacrete seal which will act as formwork capable of holding staged concrete pours) – 20 PSI bulkhead at 15 m overburden point; run compressed air line through the drift bulkhead (replace section with polypipe);
- Closed door at final seal time;
- Filled to within 1 m of surface with low strength self-levelling concrete, placing grout in maximum 1 m lifts;
- Removed lightning paths;
- Completed filling;
- Sealed with minimum 1 m thick 32 MPa mass concrete cap;
- Pushed in dirt and mound earth over plug; and
- Diverted water flows around the entry.

11.6.7.3 Service Boreholes

The following section provides a summary of the works undertaken the Drift sealing:

- Confirm water level in borehole;

- Placed bulk fill fly-ash grout material with minimum 5% cement (where placed under water, this was placed using a tremie pipe to limit 'freefall' through water; and
- A brass plate was fixed to a suitable concrete footing displaying the sealing details to MDG 6001 requirements including engraving the mine and borehole names and date sealed.

Detailed technical specifications required for rehabilitation works to seal mine entries and boreholes applicable to Domain 6 are outlined in the sections that follow. **Table 29** below includes a summary of the technical specifications for the sealing of the mine entries at WWC.

Table 29 Technical Specifications for Sealing Mine Entries at WWC

Location	Strength	Aggregate	Slump	Notes
In-situ bulkheads	32 MPa	Maximum 20 mm	80 mm	Place in maximum 1 m lifts. Vibrate during placement.
Shotcrete bulkeads	32 MPa	Supplier specification	Low	
Shaft caps	32 MPa	Maximum 20 mm	80 mm	Vibrate during placement.
Plug cap to Shaft#2	10 MPa	10/20 mm	60 mm	
Shaft grout fill	1 MPa	10/20 mm	Minimum 220 mm	Non-segregating

Further technical specifications are detailed on the mine seals design in **Appendix H**.

11.6.8 Revegetation

The Rehabilitation and Closure Criteria report (SLR, 2016) has been prepared by SLR.

A large part of the existing disturbance footprint within this domain will be retained as hard stand.

11.6.9 Surface Water

SLR has prepared a Surface Water Assessment and Plan (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

No surface water management works are proposed for Domain 6 during decommissioning and closure execution; the current water management system will remain in place while suitable post mining land users are determined. The existing dams will continue to be dewatered and desilted in accordance with the Complex's monitoring and maintenance plan. Additional best practice ESC management measures will be undertaken, where required, in accordance with the Blue Book during the decommissioning works to ensure that there are no adverse impacts to the surrounding environment. These controls will remain in place and be routinely inspected to ensure they are functional until such time as any remediated disturbance areas have been stabilised.

11.6.10 Groundwater

SLR has prepared a Plan of Underground Water Management (SLR, 2016) including modelling for the rehabilitation and closure of the OCAL Complex.

There are no requirements to manage or monitor groundwater within Domain 6.

11.6.11 Methane Management

The requirements to manage and monitor methane within Domain 6 are outlined as per the Methane Management Plan prepared by SLR as part of detailed closure planning.

Methane management will comprise sealing, monitoring and contingencies as required. Monitoring for methane in Domain 6 will include excavation monitoring for any remedial works considered to have a significant risk of intercepting methane or resulting in methane emissions to surface. Gas monitors will be utilised in any excavations including digging and drilling where moderate to significant risks are identified prior to the undertaking of works.

Additional monitoring to be undertaken in this domain is:

- Underground monitoring of mine pressure, gas flow (in mine) and water levels in workings; and
- Surface detection monitoring to identify any areas where methane emissions to surface are occurring.

Preliminary contingencies will be implemented to address any initial results or observations outside of acceptable results; this may include investigation of underground monitoring results and restricting access to areas where emissions (or high likelihood for emissions) to surface are identified.

11.6.12 Biodiversity & Land Management

SLR has prepared a Biodiversity and Land Management report (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

Several biodiversity monitoring programmes have been underway at the OCAL Complex for a number of years. Based on review of the existing monitoring programmes, these programmes will continue unchanged in order to maintain consistency of data. It is expected that the information collected in these monitoring programmes will be used as part of the evidence to demonstrate lease relinquishment.

There are no requirements to undertake biodiversity monitoring within Domain 6.

Maintenance works will be undertaken as required with Domain 6 subject to routine inspection and land management activities including:

- Weed and feral animal management;
- Erosion and sediment control; and
- Bushfire protection works.

11.6.13 Heritage Items

There are no specific requirements to manage either European or Aboriginal Heritage items within Domain 6. The clearance procedure will continue to be utilised at OCAL Complex to identify potential heritage locations associated with rehabilitation, undertake inspection/survey where required, and manage any identified heritage items during closure.

11.7 Post Closure Monitoring & Maintenance

The following section outlines the completion criteria and indicators associated with Domain 6 and monitoring and maintenance activities that are to be undertaken within this domain during closure execution and post closure.

11.7.1 Completion Criteria and Indicators

The completion criteria for Domain 1 are outlined in **Section 25** of this MOP. The relevant criteria for all domains as well as Domain specific criteria apply.

11.7.2 Monitoring Requirements

Monitoring required in this domain during closure execution includes:

- Air pump monitoring (related to asbestos fibres);
- Clearance inspections and certificates (HAZMAT);
- Sampling and testing of residual soils for asbestos (and validation report);
- Validation testing of residual soils in hydrocarbon, heavy metals and *E. coli* impacted areas;
- Discharge water monitoring (licenced discharge EPA Point 2 – WWC);
- Burkes Creek monitoring (US/DS);
- Meteorological monitoring;
- Methane monitoring;
- Air quality (deposition dust, TSP, PM_{10}) and dust deposition gauges;
- Noise (attended and unattended) monitoring;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections; and
- Land management inspections.

Monitoring required post closure is:

- Discharge water monitoring (licenced discharge EPA Point 2 – WWC);
- Burkes Creek monitoring (US/DS);
- Sampling, testing, and reporting of dam sediments;
- Meteorological monitoring;
- Methane monitoring;
- Air quality (deposition dust, TSP, PM_{10}) and dust deposition gauges;
- Noise monitoring;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections; and
- Land management inspections.

11.7.3 Maintenance Requirements

Maintenance required during and post closure includes:

- Shaft maintenance (for settlement);
- Sewage treatment plant management and maintenance;
- Maintenance for bushfire management;
- Maintenance for bushland management;
- Rehabilitation maintenance;
- Maintenance of accesses to sampling points;
- Maintenance of dam accesses and sediment capacity (desilting/desludging); and
- Maintenance and calibration of any automated sampling equipment including the meteorological station.

12 DOMAIN 7 TAILINGS DAM

The following table summarises the key rehabilitation and closure aspects as relevant to Domain 7.

Table 30 Summary of the Key Rehabilitation and Closure Aspects Relevant to Domain 7

Key Aspect	Domain-Specific Information
OCAL Complex Area	(MCPP/Stockton Colliery) Tailings Dam
Total Area of Disturbance	29.74 ha
Post mining land use	• Bushland • Pasture • Water management
Existing components	• Disturbance to the south to be rehabilitated to bushland; • 29.69 ha of Tailings Dam surface to be rehabilitated to pasture; and • 0.05 ha of disturbance planned for water management (spillway construction).
Key obligations	• The final landform will be capped with inert material and revegetated. The development of the final landform will involve the strategic use of coarse reject in capping the existing Tailings Dam; • The required thickness of the capping will be finalised in consultation with DPI; • The final landform will be designed to accommodate long term consolidation of the tailings deposit; • In order to minimise the risk of bushfire and spontaneous combustion, revegetation will primarily involve the establishment of pasture species; and • A series of drains will be developed to facilitate the drainage system. A diversion drain will be installed to direct runoff from forested areas to the north of the emplacement area into natural drainage lines.
Proposed Activities during the MOP	• Removing surplus pipelines, pumps and powerlines; • Capping and covering the existing Tailings Dam • Establishing 29.69 ha of pasture; and • Constructing a 0.05 ha spillway head to convey runoff water from the rehabilitated surface through the REA (Domain 8), to Containment Dam 3 at the MCPP (Domain 9) and offsite via. EPL1360 LDP1.

12.1 Baseline Conditions

Figure 25 shows the existing arrangement of Domain 7 as at July 2016.

368250
368500
368750
369000
369250
6353750
6353500
6353250



0
100
200
300
400
m

Scale:1:3,100
GDA 1994 MGA Zone 56

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Domain Boundary

Sheet Size : A3

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Domain 7
Tailings Dam

FIGURE 25

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The MCPP tailings dam/Tailings Storage Facility (Tailings Dam) (originally termed the Stockton Borehole Tailings Dam) was the sole tailings storage since the commissioning of the facility in 1983. Due to the topography of the site large retaining embankments were required, these being the Eastern Embankment (first stage constructed in 1982) and Northern Saddle Dam (first stage constructed in 1995) which are part of Domain 8 – Rejects Emplacement Area. These embankments were raised a number of times to a final crest level of RL 70 m. The MCPP Tailings Dam is a Prescribed Dam under the *NSW Dams Safety Act 1978*, and has been assigned a Consequence Category of 'Significant' by the NSW Dams Safety Committee (DSC). No emergency spillway currently exists at the Tailings Dam which is acceptable by the DSC since the Tailings Dam has always had substantial available freeboard relative to the Significant Consequence Category and the small catchment external to the Tailings Dam (in the order of 20% of the current tailings surface area).

The Tailings Dam is surrounded by natural bushland, with runoff draining into the Tailings Storage Facility (Tailings Dam). The water levels in the Tailings Dam are maintained several metres below the crest of the dam wall. As noted, the dam currently has no spillway; however, water management is achieved via a decant structure located in the western (deeper) side of the dam, which drains to the old Northern Extended underground workings.

The new tailings dam wall buttress support area (approximately 17 ha) is located in Domain 8 Rejects Emplacement Area (REA) in addition to the Tailings Dam Eastern Embankment and Northern Saddle Dam.

12.2 Current Closure/Rehabilitation Status

At the cessation of processing in mid-June 2016, the tailings dam surface included a pond to the south of the facility with water from the fine rejects flowing towards the decant structure (bore riser). Prior to cessation, tailings deposition occurred from the northern side using spigot towers spaced around the eastern and central areas of the tailings beach, to provide tailings coverage over the entire storage area.

At July 2016 the tailings surface was unconsolidated and not trafficable with some salt crusting on surface. A sample of decant water from May 2016 showed a pH of 5.8 and total aluminium 0.23 mg/L, dissolved iron 100 mg/L, total lead 0.002 mg/L, dissolved nickel 0.16 mg/L, dissolved selenium 0.001 mg/L and dissolved zinc 150 mg/L. While there are no discharge limits applicable to the tailings water, pH was recorded below the EPL discharge limits; however, acid mine drainage is not a significant risk for the site.

Previous capping trials have been undertaken by OCAL and towards the end of the active deposition, the spigot's discharging tailings were placed towards the centre of the dam to promote beaching and consolidation.

No active rehabilitation of this domain was undertaken to date, however regular strength testing has been performed and more accurate timing of final capping has been reflected in project schedule (Appendix A).

A research project through the Australian Coal Association Research Program (ACARP) has been approved to investigate the benefit of trees being planting on tailings dam surfaces to speed up drying. This project will most likely be conducted at the Macquarie Coal site.

12.3 Closure Commitments/Obligations

SLR prepared a detailed Legal & Governance Register for mine closure with the key requirements adopted for the mine closure for the OCAL Complex, including those elements for Domain 7.

The following is a summary of the general closure commitments related to Domain 7:

- The final landform will be capped with inert material and revegetated. The development of the final landform will involve the strategic use of coarse reject in capping the existing Tailings Dam;
- ~~The required thickness of the capping will be finalised in consultation with DPI;~~
- The final landform will be designed to accommodate long term consolidation of the tailings deposit;
- In order to minimise the risk of bushfire and spontaneous combustion, revegetation will primarily involve the establishment of pasture species; and
- A series of concrete drains will be developed to facilitate the drainage system. A diversion drain will be installed to direct runoff from forested areas to the north of the emplacement area into natural drainage lines.

12.4 Proposed Final Land Use and Landform

Throughout the LOM Closure Planning process OCAL completed a range of mine closure planning tasks for OCAL, including Domain 7. Based on the outcomes of these studies and in consideration of what is permissible under the existing development consent, a proposed final land use strategy was presented in the MOP for the Closure of the OCAL Complex (SLR 2016) and subsequently adopted in this Mining Operations Plan.

The final land use outcomes (shown in **Figure 26**) were adopted based on land use options from the work above; this is outlined as:

- 26.69 ha of pasture will be established; and
- A portion of the spillway construction for the Tailings Dam is also within this domain.

In addition to this, the Phase One Study & Conceptual Closure Plan notes that the objective of rehabilitation and the final landform includes:

- Inherent stability;
- Blending with local topography; and
- Requirement for minimal ongoing management in the medium term (5 – 10 years) and no management after 10 years.

368250 368500 368750 369000 369250

6353750

6353500

6353250

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0 100 200 300 400 m

Scale:1:3,100
GDA 1994 MGA Zone 56

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Domain Boundary
Recycled Water Pipeline
Surface Infrastructure

Post Closure Landuse
Bushland
Non-OCAL Infrastructure
Pasture
Residential
Retained Hardstand
Retained Infrastructure
Water Management
Wetland

Closure Activity
None
New Bushland Rehabilitation
New Pasture Rehabilitation
Hardstand Establishment
Dam Remediation Required
Spillway Construction
Subsidence Remediation (Auger Mining)
Subsidence Remediation (Longwall Mining)
Decommission

Sheet Size : A3

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Post Mining Landuse
Domain 7
Tailings Dam

FIGURE 26

12.5 Approvals

The following section outlines the various approvals relevant to the OCAL Complex, with the key conditions relevant to Domain 7 summarised:

Stockton Borehole Consent DA 88-4-2005 (1981). The conditions relevant to Domain 7 include:

- Provide adequate diversion drains around the washery waste disposal area, including the Tailings Dam, to prevent clean surface run off from entering the waste disposal area together with a suitable drain under the coarse waste emplacement to collect run off from that area to discharge to Catch Dam 1;

In addition, OCAL holds a number of mining tenures and leases that incorporate Domain 7; Domain 7 is located on CCL718.

The key licence relevant to Domain 7 is EPL No. 3160. The EPL addresses water pollution, waste, monitoring and testing, reporting via annual returns and maintaining copies of the licence at the relevant areas. No licenced discharge points are contained within the domain; however, water from the Tailings Dam drains to the Old Northern underground workings via the decant structure.

No water licences are associated with Domain 7.

12.6 Rehabilitation and Closure Actions - Scope of Works

This section specifies the various closure and rehabilitation activities for the domain. It includes a detailed description of the works to be undertaken. It is intended that this will form the basis of the Rehabilitation Cost Estimate (RCE) for each domain.

12.6.1 Decommissioning and Salvage of Assets

OCAL has prepared a detailed asset list which includes an inventory of all assets, including a comment and photographs of all identified equipment. A copy of the detailed asset and salvage register is included as **Appendix D**.

Assets, plant and equipment in Domain 7 include pumps, pipes, etc. associated with tailings management. Dewatering after sealing the decant structure may also require a pipeline and pump arrangement. Salvage will be completed as per the Asset Register and pipes, etc. will be removed as the surface water management strategy is implemented.

12.6.2 Demolition

Liberty Industrial prepared a demolition report (Liberty Industrial, 2015) for the OCAL Complex which included a review of all relevant infrastructure and providing a method statement and costs estimate to undertake the works.

No infrastructure in this domain will require demolition for closure.

12.6.3 Waste Management

SLR has prepared a Waste Disposal Strategy (SLR, 2016) for the OCAL Complex which has provided a summary of the types and amounts of waste anticipated to be generated as a result of the OCAL complex closure works; as well as providing advice on constraints and options for disposing of the waste.

There are no wastes to be managed in Domain 7.

12.6.4 Hazardous Materials

SLR has prepared a Hazardous Materials Report and Plan (SLR, 2016) for the site which included a review of current HAZMAT, dangerous goods and hazardous substances information for the Complex and to quantify the presence of hazardous materials located across all domains.

Domain 7 contains no buildings or structures and no historical evidence was provided to indicate the presence of any HAZMAT and accordingly, there are no known hazardous materials requiring management during closure; however, there may be unexpected finds.

Historical data has indicated that illegal dumping of ACM has been conducted on OCAL lands. A Complex wide 'unexpected HAZMAT finds' procedure will be developed for the Complex to guide the address of any finds outside of building and infrastructure areas. OCAL will implement this procedure to govern development of an action plan for any further HAZMAT discovered within the OCAL domains during the decommissioning process.

12.6.5 Contaminated Sites

SLR has undertaken an extensive review of existing information and an in-field sampling program to quantify the likelihood and extent of any contaminated sites within the OCAL Complex.

No contaminated sites were identified for assessment as part of the Contamination Study; however, the Tailings Dam scope of works included assessment of tailings characteristics to determine closure strategies and management requirements (see **Section 3.2.1**)

12.6.6 Civil Earthworks and Landform

The civil earthworks required for the Tailings Dam can be summarised as:

- Drill boreholes and install piezometers on the northern saddle dam t better understand the need for a buttress on the northern embankment;
- Construction of initial 1.3 m capping layer by load, haul and dump of rejects to Tailings Dam surface;
- Construction of northern saddle dam buttress by load, haul and dump rejects material from REA area to northern saddle dam buttress (if required);
- Load, haul and dump rejects to Tailings Dam surface for settlement and development of the final landform which is free-draining. This is over and above the initial 1.3m cover. It is expected to be between 3.5 and 8m to ensure that a suitable landform is achieved whilst taking into consideration settlement and consolidation of the tailings;
- Placement of a 0.5m layer of growth media to:
    - Northern saddle batter;
    - Tailings storage facility surface; and
    - Dam wall ;
- Use of bio-solids in the absence of topsoil and the direct seeding of pasture grass species. Hydro-seeding will be used on the steeper slopes to ensure that vegetation is established quickly to provide erosion protection;
- Installation of standard erosion and sediment control measures during decommissioning works;
- Construction of contour bank on surface of the Tailings Dam and bund construction along the eastern edge to divert water to spillway;
- Rehabilitation of the Tailings Dam surface via supply and spread of bio-solids (no topsoil), ripping, amelioration, and seeding with pasture grass species; and

- Spillway conveyance channel construction (section in Domain 7) – clearing, earthworks (cut and fill), installation of 150 mm D50 diameter rip rap and installation of concrete plinth and geofabric.

12.6.6.1 Tailings Cap

The following section outlines the work undertaken by SLR and ATC Williams in reviewing a number of options for the capping and rehabilitation of the Tailings Dam.

The cap is defined as the initial placement of one or more engineered layers of suitable materials to provide a safe, stable cover over the entire tailings surface, capable of supporting earthmoving equipment for the subsequent construction of the final landform. The initial cap has been designed by ATC Williams who have significant experience in similar tailings dams in the Hunter Valley.

The initial engineering design was prepared after completion of the following:

- Prediction of tailings consolidation and settlement;
- Stability analysis of the Northern Saddle Dam Buttress; and
- Stability analysis of the REA and Eastern Embankment.

ATCW's conceptual capping design is based on geotechnical stability assessments of differing initial capping layer thicknesses, layer setback distances, earthmoving equipment loads and construction methodologies. The stability analysis includes an assessment of the bearing capacity of the foundations under the contact pressure of the earthmoving equipment, as well as local and global stability of the system.

The proposed methodology is outlined further in **Section 12.6.6.4.**

12.6.6.2 Final Landform Options Analysis

The final landform is defined as the subsequent placement of materials over the initial cap, which are built up and shaped as required to achieve a stable, non-polluting, free draining landform commensurate with the final land use and surrounding environment. The outer surface of the landform consists of inert material of suitable thickness to support the final land use.

Four design options were assessed during the study. Selection of the preferred landform design was based on predicted long-term stability, amount of materials movement and visual amenity.

Long term average soil loss calculations were conducted for the preferred option to predict the long term surface stability of the preferred landform design.

The landform design selection strategy was aimed at producing slopes whose angles, lengths and shapes that are compatible with the surrounding landscape, suitable for the proposed land use and not prone to an unacceptable rate of erosion. Integrated with this is a drainage network which is capable of conveying runoff without risk of erosion and downstream sedimentation.

There were four options considered for rehabilitation of both the Tailings Dam and the REA landforms. These options are shown in **Figures 27 - 30**. The characteristics of each option that were considered are summarised in **Table 31.**

Table 31 Tailings Dam and REA Landform Design Options

Option	Characteristics
1	• High point in the centre of the Tailings Dam • Multi-directional free draining (2% gradient) • Eastern embankment (4:1 gradient) • Majority of former REA grading at 1% in easterly direction • Spillway located in south-east corner of the Tailings Dam directing runoff to a diversion channel excavated in natural ground • Rejects cap depth ranges from 3.5 to 8 m to allow for differential settlement
2	• High point on western side of the Tailings Dam • Free draining in an easterly direction (2% gradient) • Eastern embankment (4:1 gradient) • Spillway on eastern edge of Tailings Dam extending down the eastern fill batter • Rejects cap depth ranges from 3.5 to 8 m to allow for differential settlement (extra rejects will be placed in the western side to allow for the final landform to grade from west to east).
3	• High point on western side of the Tailings Dam • Tailings Dam surface drainage is facilitated by excavating the Tailings Dam's eastern wall and constructing a conveyance channel (1% gradient) through the REA • No rejects to be used for this option and only a 2 m cover layer to be placed directly on top of existing tailings
4	• High point on western side of the Tailings Dam • Free draining in an easterly direction via an elongated meandering channel (2% gradient on Tailings Dam, 10 – 30% gradient on REA) • Spillway on eastern edge of Tailings Dam extending down the eastern fill batter • Rejects cap depth ranges from 3.5 to 8 m to allow for differential settlement (extra rejects will be placed in the western side to allow for the final landform to grade from west to east).



Base Plan Data Source:

(GDA94) MGA Zone

21.11.2016
630.11369

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TSF FINAL LANDFORM
OPTION 1

FIGURE 27

BUTTRESS -3
(≈ 900,000 m³)

1:5.4 SLOPE

1:5.4 SLOPE

SPILLWAY

2% SLOPE

2% SLOPE

1% SLOPE

1:4 SLOPE

1% SLOPE

1:4 SLOPE

HATCH DENOTES RESHAPED
AREA REQUIRING COVER
(0.5m COVER MATERIAL
ALREADY PLACED IN THIS AREA)

EXCAVATION AREA
(≈3.25 MILLION m³)

COVER LANDFORM AREA
TOP OF LANDFORM AT R.L. 80.0
(≈ 2.55 MILLION m³)

Base Plan Data Source:

(GDA94) MGA56Zone

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TSF FINAL LANDFORM
OPTION 2

FIGURE 28



(GDA94) MGA Zone

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TSF FINAL LANDFORM
OPTION 3

FIGURE 29

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BUTTRESS - 4
(≈ 900,000 m³)

1:4 SLOPE

1:4 SLOPE

SPILLWAY

30% SLOPE

10% SLOPE

HATCH DENOTES RESHAPED
AREA REQUIRING COVER
(0.5m COVER MATERIAL
ALREADY PLACED IN THIS AREA)

EXCAVATION AREA
(≈2.08 MILLION m³)

2% SLOPE

11% SLOPE

2% SLOPE

COVER LANDFORM AREA
TOP OF LANDFORM AT R.L. 83.0
(≈ 2.79 MILLION m³)

(GDA94) MGA Zone

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630.11369

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TSF FINAL LANDFORM
OPTION 4

FIGURE 30

12.6.6.3 Options Analysis

Discussion on Alternate Options

Option 3 – Whilst having the lowest cap and cover volume requirements of all four options, has an elevated risk profile given that the cap and cover is a minimalist approach, therefore likely to suffer future instability given the predicted level of tailings consolidation settlement. Additionally, the spillway, conveyance channel and adjacent batters traversing through the REA require significant stabilisation and represent a greater risk of failure compared to Option 1.

Options 2 and 4 – Both options require a significant increase in cap and cover materials volume compared to Option 1 and require an elevated standard of erosion controls to ensure long-term stability. Option 2 requires the construction of a major spillway on the Eastern Embankment, jeopardising the integrity of this embankment which is integral to the stability of the Tailings Dam.

Option 4 has an elongated meandering central channel which is the major drainage conduit to the existing contact water system. Whilst the channel has a relatively stable slope gradient of 2% on the Tailings Dam, the slope gradient increases to 10 to 30% gradient on the REA. The excessive REA drainage channel gradient would require a significant level of stabilization and present a greater risk of failure compared to Option 1.

Option 1 presented in **Table 31** was the preferred landform design for the Tailings Dam / REA. The landform is expected to be geotechnically stable, non-eroding and cost effective to construct compared to the other three options. The stable, non-polluting, free draining landform is commensurate with the final land use and surrounding environment.

12.6.6.4 Preferred Option

Landform

The landform design selection strategy was aimed at producing slopes whose angles, lengths and shapes that are compatible with the surrounding landscape, suitable for the proposed land use and not prone to an unacceptable rate of erosion. Integrated with this is a drainage network which is capable of conveying runoff without risk of erosion and downstream sedimentation.

Selection of the preferred landform design was based on predicted long-term stability, amount of materials movement and visual amenity. There were four capping / cover design options considered for rehabilitation of both the Tailings Dam (and the REA); of these four, option 1 was selected. The key characteristics of option 1 are:

- High point in the centre of the Tailings Dam;
- Multi-directional free draining (2% gradient);
- Spillway located in south-east corner of the Tailings Dam directing runoff to a diversion channel excavated in natural ground; and
- Rejects cap depth ranges from 3.5 m to 8 m to allow for differential settlement.

Capping Layer

For closure, an economically efficient capping construction methodology of ‘placing capping layers (without reinforcement)’ will be utilised; this was determined based on an assessment of the available capping options from both a cost and risk perspective. A potential timeframe for closure of 5 years and predicted tailings strength were additional key considerations.

This method comprises:

- A safe, stable cover over the entire tailings surface provided by an initial capping construction consisting of one (or more) engineered layers of suitable materials;

- Placement of the first capping layer without the need for reinforcing geotextiles; and
- Construction of the initial capping layer(s) using as a Caterpillar D6 LGP bulldozer (or equivalent) and a 25 tonne to 40 tonne articulated dump truck.

ATC Williams were engaged by SLR to undertake the engineering to develop the initial capping layer methodology. The method adopted has been used successfully on coal tailings storages where significant drying of the tailings had taken place. The key to this system is to be able to jointly satisfy the stability/bearing capacity requirements for the:

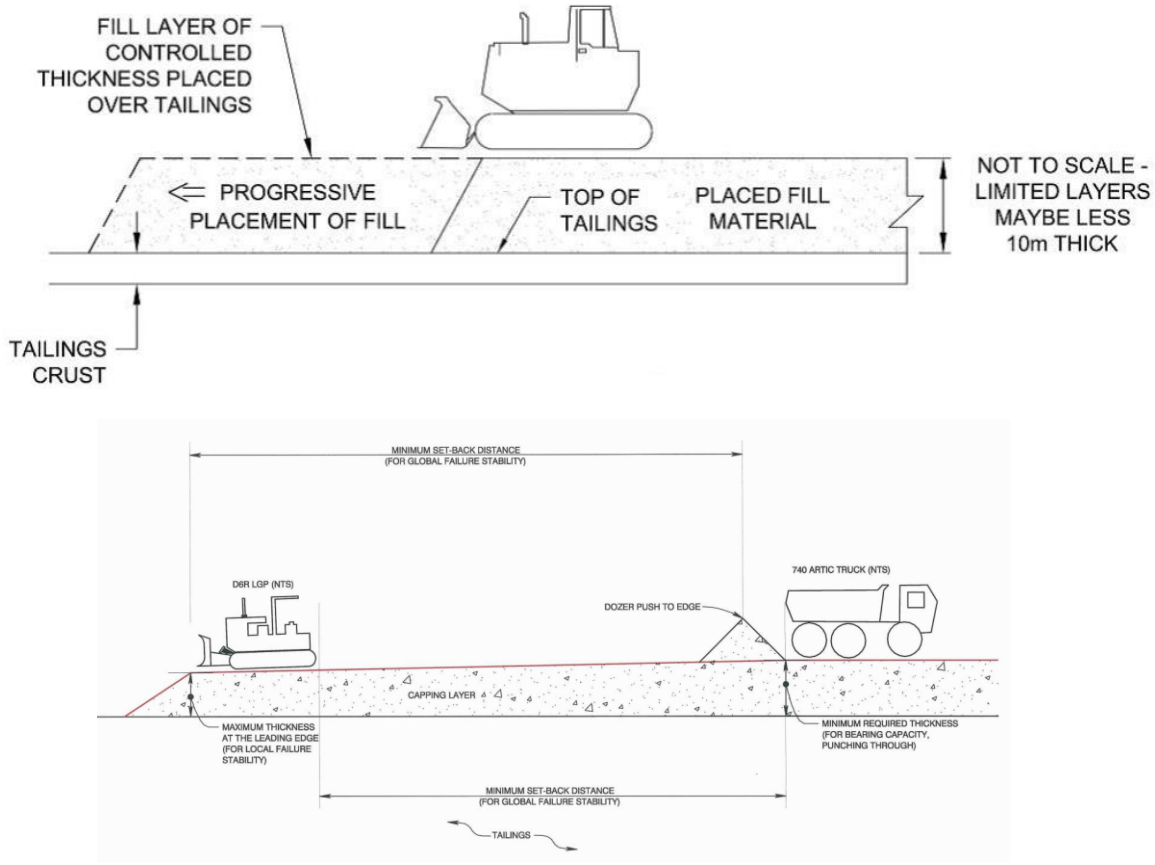
- Layer thickness required to provide local support for the spreading equipment, and
- Effect of global instability of the tailings which will develop under the same layer thickness.

Analyses indicate that the detailed design of the initial capping layer should be based on:

- Coarse rejects used as the construction material;
- Material spreading with a Cat D6 LGP bulldozer (or equivalent) at a minimum thickness of 1.1 m at the leading edge, with spreading conducted such that the layer thickness tapers back to 1.3 m at a distance of 21 m from the leading edge; and
- Material delivery with a 25 tonne to 40 tonne articulated truck (or equivalent), dumping on a minimum 1.3 m thick layer at a distance of 21 m from the leading edge.

Construction of the initial capping layer should proceed as above until the entire tailings surface is covered. Subsequent layer(s) of coarse reject (or other suitable fill material) may then proceed, however this will be subject to detailed design of equipment and layer thicknesses and placement methodologies. The concept is illustrated below in **Figure 31**.

Figure 31 Conceptual Diagram for Placing Initial Capping Layers



Consolidation & Settlement

An assessment of the consolidation of the tailings was undertaken, based on the available tailings properties, supplemented by ATCW's database of Hunter Valley coal tailings laboratory consolidation results. Two areas were considered in the calculation of the consolidation settlement, these being:

- Area 1: Sandy tailings near the northern and eastern sides of the Tailings Dam; and
- Area 2: Fine slimes at the centre of the Tailings Dam and the historical decant pond (south-western corner).

The consolidation analysis was undertaken for a nominal 5 m thick capping layer overlying the tailings. Area 1 is considered to be normally consolidated with no further settlement predicted to occur under self-weight. Consolidation settlement under a surcharge load resulting from placement of a capping layer is predicted to be 2 m to 3 m, occurring predominantly within the first 10 years after construction. A summary of consolidation settlement results is presented in **Table 32**.

Consolidation settlements of 7 m to 8 m are predicted to occur at the centre of the Tailings Dam (Area 2) where the depth of fine tailings "slimes" material is estimated to be over 30 m. This zone is predicted to currently have the lowest consolidation ratio (i.e. under consolidated), and the majority of the predicted consolidation settlement (around two-thirds of the total settlement) will be due to normal consolidation of tailings under its' own weight (i.e. without additional surcharge load). The rate of consolidation is predicted to be very slow, only 75% complete after 40 years.

The conceptual capping design is based on stability assessments of alternative initial capping layer thicknesses, layer setback distances, earthmoving equipment loads and construction methodologies.

Table 32 Summary of Consolidation Settlement Results

Area	Description/ Location	Thickness of Layer (m)	Normally Consolidated/ Consolidation Ratio	Total Consolidation Settlement (m)	Predicted Settlement after Years			
					10	20	30	40
Area 1	Sandy tailings near side of the Tailings Dam	40	Normally consolidated (100%)	2.8	1.5	2.8	-	-
		30		2.5	2.5	-	-	-
		20		2.1	2.1	-	-	-
		10		1.6	1.6	-	-	-
Area 2	Fine slimes at centre of the Tailings Dam	30	64%	7.6	1.9	3.5	4.8	5.6
		20	71%	4.7	2.2	3.5	3.9	4.2
		10	96%	1.6	1.2	1.6	-	-

Shear Strength

The shear strength profiles across the Tailings Dam were not investigated as part of the Tailings & REA Phase One Study & Conceptual Closure Plan conducted. It is intended that this will be undertaken when the surface of the tailings dam is sufficiently dried out to allow safe access. Notwithstanding, a back-calculation was undertaken to determine the minimum required tailings strength parameters for the upper tailings layer (top 5.0 m) to satisfy geotechnical stability based on the proposed construction methodology for the initial capping layer.

The stability results have indicated that the proposed "economically efficient" capping methodology is appropriate for the tailings shear strength profile as shown in **Table 33**:

Table 33 MCPP Tailings Dam Tailings Shear Strength Profile

Layer	Depth (m)	Undrained Shear Strength, Su (kPa)
Surface Crust	0.0-0.5	Su = 10 kPa
Soft tailings	0.5-5.0	Su = 7.5 kPa
Aged tailings	below 5.0	Su = 7.5 kPa + 2.0 kPa/m

Due to the Tailings Dam operational regime generating tailings segregation and variable beach drying potential (deposition essentially from the east, decant water recovery from the south-west), the current strength condition within the Tailings Dam will be variable. Tailings at the eastern end will have a significantly higher strength profile than the tailings in the south-west. It is therefore important to recognise that in reality, the tailings will dry and consolidate at different rates, and that the target strength profile required for capping will not be achieved across the entire tailings beach simultaneously.

It is also important to recognise that a gradual increase in "aged tailings" shear strength with depth below 5.0 m is a key assumption in the target strength profile which requires verification via site geotechnical testing. This has been included in the Forward Work Plan for the closure of the Tailings Dam

12.6.6.5 Soil Loss Prediction

The Revised Universal Soil Loss Equation (RUSLE) is designed to predict the long term, average, annual soil loss from sheet and rill flow under specific management conditions. The predicted losses are empirically derived. Given that the RUSLE takes into consideration all major components likely to affect erosion, it is the most widely used soil loss equation available. The Blue Book recommends use of the RUSLE for predicting future soil losses.

The RUSLE is represented by:

$$A = R\,K\,LS\,P\,C$$

where,

A = *computed soil loss (tonnes / ha / year)*

R = *rainfall erosivity factor*

K = *soil erodibility factor*

LS = *slope length / gradient factor*

P = *erosion control practice factor*

C = *ground cover and management factor*

Table 34 provides the results of long-term average annual soil loss predictions for Option 1 (only) given that it is the preferred option. Individual components of the Tailings Dam / REA precinct have been modelled as each component has varied slope lengths and gradients (LS factor). Erosion control practice (P factor) and ground cover / management (C factor) have been adjusted accordingly.

Table 34 Predicted Long Term Average Annual Soil Loss for Tailings Dam / REA

Component	RUSLE Factor					Soil Loss (t/ha/yr)
	R	K	LS	P	C	
Tailings Dam *	2,500	0.05	0.64	0.8	1.0	**64**
Buttress # (if required)	2,500	0.05	7.27	0.9	0.1	**81**
Eastern Embankment #	2,500	0.05	8.57	0.9	0.1	**96**
REA (east) *	2,500	0.05	0.27	0.8	1.0	**27**
Blue Book Source	App B, Map 9	Section A3	Table A1	Table A2	Table A3	

** Tailings Dam and REA (east) – assumes loose seedbed to 0.3 m depth and broadcast seeding*

 # Buttress and Eastern Embankment – seedbed is rough & uneven and slopes are hydromulched

Table 35 provides the Blue Book Erosion Hazard ratings. The predicted long term average soils losses shown above range from 27 to 96 t/ha/yr, fall well below the "very low" Erosion Hazard rating threshold (i.e. < 150 t/ha/yr).

Table 35 Soil Loss Classes

Soil Loss Class	Calculated Soil Loss (t/ha/yr)	Erosion Hazard
1	0 to 150	Very low
2	151 to 225	Low
3	226 to 350	Low to moderate
4	351 to 500	Moderate
5	501 to 750	High
6	750 to 1,500	Very high

Source: Blue Book – Table 4.2

12.6.6.6 Northern Saddle Dam Buttress

Preliminary stability analyses were undertaken by ATCW on the northern embankment with the key focus being on the stability of the embankment when subjected to a Maximum Design Earthquake (MDE) loading condition. Based on the results of the preliminary analyses, buttressing of the downstream slope by flattening the face may be required to render the Northern Saddle Dam safe in the long term and too satisfy the Dam Safety Committee such that they will support deregistering the dam.

OCAL has committed to undertaking some additional engineering design work following the installation of piezometers in the wall which will determine whether the buttress is required. If it is determined that it is necessary the downstream buttress will be constructed of track-rolled coarse rejects from the REA and will attain a final design gradient of 5.4:1 (h:v).

12.6.6.7 Tailings Dam Spillway Design

The Tailings Dam is a Prescribed Dam under the NSW Dams Safety Act 1978. No emergency spillway currently exists at the Tailings Dam which is acceptable by the DSC since the Tailings Dam has always had substantial available freeboard relative to the Significant Consequence Category and the small catchment external to the Tailings Dam (in the order of 20% of the current tailings surface area).

However, flood water management will be of particular concern during the construction of the initial capping layer over the tailings surface, as the available storage within the Tailings Dam will be progressively filled, thus reducing the flood storage capacity. To manage emergency overflows until this time, a spillway is proposed to be constructed. The catchment area reporting to this spillway will include the Tailings Dam itself and an area immediately to the south of the Tailings Dam.

Given the size and risk associated with overflows from the Tailings Dam, the spillway was designed to safely convey runoff from a 10,000 year Avergae Recurrence Interval (ARI) rainfall event (including a concrete plinth) in accordance with the equation listed in Table A21 of *Best Practice Erosion & Sediment Control, Book 2* (IECA, 2008). This calculation included adjusting the spillway base width until at least 0.5 m of freeboard remained between the maximum water level reached during the 10,000 year ARI storm event and the dam crest level. It is proposed to construct the spillway invert at RL 67.0 m Australian Height Datum (AHD) to achieve this desired freeboard.

The velocity, shear stresses and general potential for scouring to occur downslope of the spillway was also considered in the design. Ultimately this spillway will flow to Catch Dam 1 through an overflow channel.

Cross-sectional dimensions, design parameters and results of the Tailings Dam proposed spillway are provided in **Table 36**. As the Tailings Dam would be full of water during overflow events it was modelled as being 100% impervious and the peak flow rate estimated using XP-RAFTS.

Table 36 Tailings Dam Conceptual Spillway Design Parameters and Results

Catchment Area (ha)	10,000 Year ARI Peak Flow Rate (m^3/s)	Minimum Base Width (m)	Side Slopes (H:V)	Water Depth (m)	Depth Required Including 0.5m Freeboard (m)	Lining
42.094	32.435	17	3:1	0.99	1.5	Rip Rap (D50 = 150 mm)

Figure 32 shows the conceptual design of the spillway design.

12.6.6.8 Geochemical and spontaneous combustion

Section 3.2.1 above outlines the Geochemical testing undertaken by SLR which includes an analysis of the potential spontaneous combustion and acid mine drainage from the coal fines and coarse rejects material.

12.6.7 Mine Sealing

The decant structure in the SW corner of the Tailings Dam will require sealing prior to the commencement of the initial 1.3m rejects capping layer.

12.6.8 Revegetation

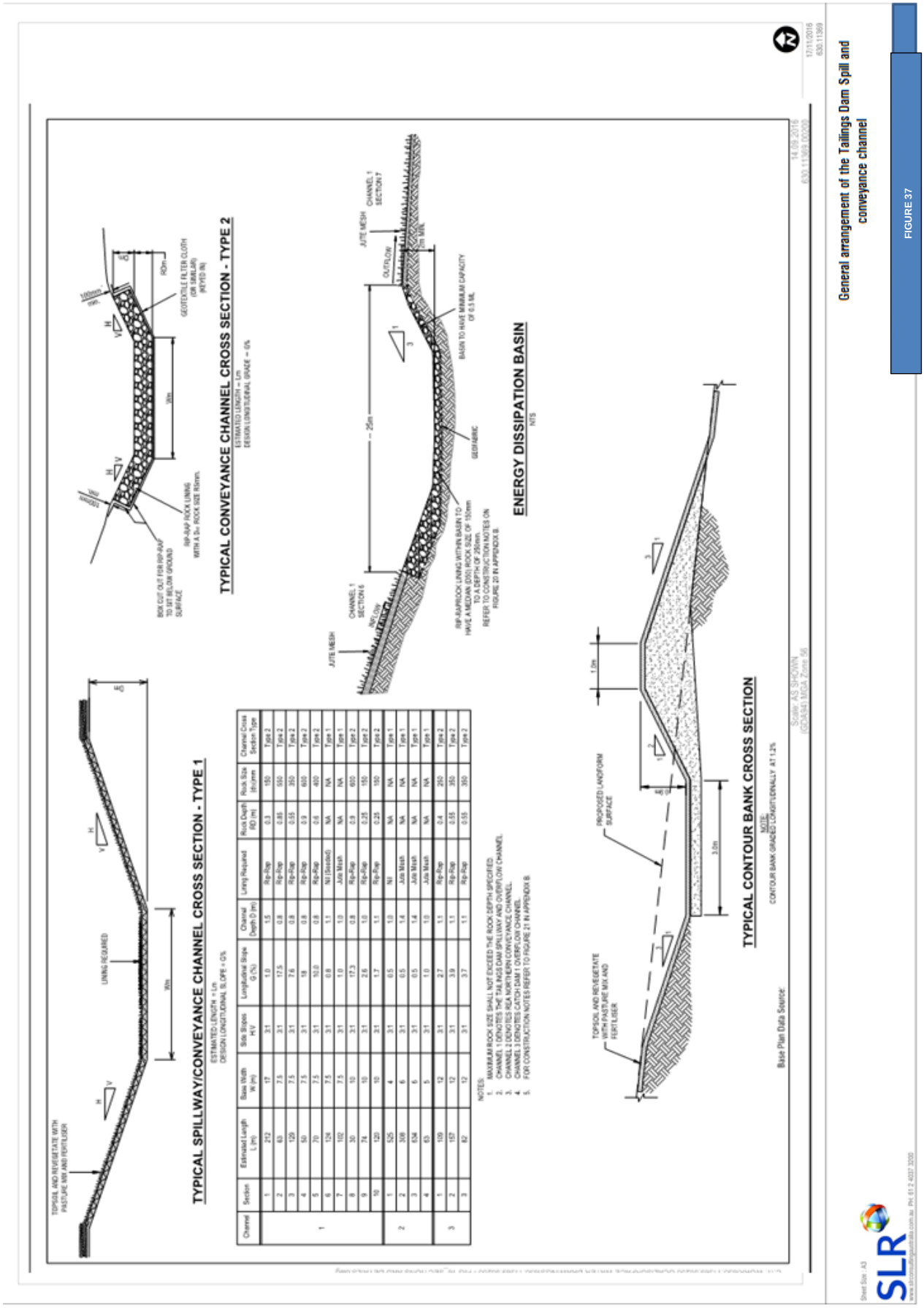
The Rehabilitation and Closure Criteria report (SLR, 2016) has been prepared by SLR.

Domain 7 will be rehabilitated with pasture on the surface area, and bushland to the south on natural disturbed land. Hydro-mulching will be utilised to rehabilitate the 29.69 ha tailings surface and this will include wood-fibre mulch at 2.5 tonnes/ha and polymer binder at 250 litres/ha. The surface will then be harrowed to 100 mm depth. **Table 37** shows the Pasture species to be used in Domain 7.

Table 37 Pasture Species Mix and Sowing Rates

Species	Sowing Rate (kg/ha)
Pasture Species	
Couch Grass (*Cynodon dactylon*)	8
Paspalum (*Paspalum dilatatum*)	5
Kikuyu (*Pennisetum clandestinum*)	5
Perennial Ryegrass (*Lolium perenne*)	7
Green Panic (*Panicum maximum*)	5
Lucerne* (*Medicago sativa)*	5
White clover* (*Trifolium repens*)	5
Subterranean clover* (*Trifolium subterraneum*)	5
Total Pasture Species	**45**
Cover Crop	
Japanese Millet in Spring/Summer	10
Oats in Autumn/Winter	10
Total Cover Crop Species	**10**
Total Seeding Rate	**55**

** Legumes inoculated with Rhizobia and lime pelleted prior to sowing*



General arrangement of the Tailings Dam Spill and conveyance channel

FIGURE 37

12.6.9 Surface Water

SLR has prepared a Surface Water Assessment and Plan (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

Surface water management works for Domain 7 during closure execution will include use of the existing decant structure during consolidation and sealing prior to commencing placement of the rejects as part of the tailings cap. The spillway will be constructed prior to the sealing of the decant structure.

If required, water can be pumped via piping to the existing water management system in Domain 9 (Catch Dam 1) for dewatering and eventual licenced discharge from MCPP under EPL 1360.

Once the Tailings Dam has been capped and the growth media placed at 0.5m, contour banks will be constructed on the final landform to predominately convey runoff to the spillway channel which is predominantly located in Domain 8. These contour banks will have a minimum base width of 3 m, a minimum depth of 0.7 m (including 500 mm freeboard) and a longitudinal grade of 0.5%. A small proportion of the capped area will report to the proposed contour banks on the REA buttress in Domain 8. By the time this occurs it is expected that vegetation will be established on the buttress landform and the runoff from the small capping area will be allowed to flow down into the contour banks.

12.6.10 Groundwater

SLR has prepared a Plan of Underground Water Management (SLR, 2016) including modelling for the rehabilitation and closure of the OCAL Complex.

Groundwater monitoring related to the Domain 7 is planned however the planned monitoring bores are located within Domain 14.

12.6.11 Methane Management

There are no requirements to manage or monitor methane within Domain 7.

12.6.12 Biodiversity & Land Management

SLR has prepared a Biodiversity and Land Management report (SLR, 2016) for the rehabilitation and closure of the OCAL Complex.

Several biodiversity monitoring programmes have been underway at the OCAL Complex for a number of years. Based on review of the existing monitoring programmes, these programmes will continue unchanged in order to maintain consistency of data. It is expected that the information collected in these monitoring programmes will be used as part of the evidence to demonstrate lease relinquishment.

There are no requirements to undertake biodiversity monitoring within Domain 7.

Maintenance works will be undertaken as required with Domain 7 subject to routine inspection and land management activities including:

- Weed and feral animal management;
- Erosion and sediment control; and
- Bushfire protection works.

12.6.13 Heritage Items

There are no specific requirements to manage either European or Aboriginal Heritage items within Domain 7. The clearance procedure will continue to be utilised at OCAL Complex to identify potential heritage locations associated with rehabilitation, undertake inspection/survey where required, and manage any identified heritage items during closure.

12.7 Post Closure Monitoring & Maintenance

The following section outlines the completion criteria and indicators associated with Domain 7 and monitoring and maintenance activities that are to be undertaken within this domain during closure execution and post closure.

12.7.1 Completion Criteria and Indicators

The completion criteria for Domain 1 are outlined in **Section 25** of this MOP. The relevant criteria for all domains as well as Domain specific criteria apply.

12.7.2 Monitoring Requirements

Monitoring requirements during closure execution are:

- Annual surveillance inspections (with Dam Safety Committee);
- Consolidation settlement monitoring survey update (annual);
- Piezometer monitoring;
- Rehabilitation monitoring annual walkover;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections; and
- Land management inspections.

It is envisaged that the consolidation monitoring data would be collected initially on a monthly basis for the first year, then progressively reducing over the following 5 years. These durations would need to be based on the performance of the final landform system, with provision for the monitoring program to be extended or expanded if necessary.

Monitoring requirements post closure will be:

- Annual surveillance inspections (with Dam Safety Committee);
- Consolidation settlement monitoring survey update (annual);
- Piezometer monitoring;
- Rehabilitation monitoring annual walkover;
- Bushfire (fuel load/asset protection) inspections;
- Environmental inspections;
- Land management inspections; and
- Bushland monitoring.

12.7.3 Maintenance Requirements

The following maintenance associated with the tailings dam will be required:

- Documentation – updates will likely be required prior to, during, and after closure execution to reflect site conditions at the time e.g. Operation and Maintenance Manual, Dam Safety Emergency Plan, Tailings Dam Management Plan, Water Management Plan;
- Decanting (water management for evaporative drying) – a strict water regime will be required regime to maintain at all times the decant pond at its minimum practicable extents and facilitate development of significant crust shear strength on the tailings beach. This will include drainage via the decant riser (until this infrastructure is decommissioned) and then pumping will be implemented when required;
- Development of a detailed Tailings & REA Post Closure Management Plan;
- Maintenance of water management structures;
- Maintenance of bushfire management;
- Maintenance of bushland management;
- Cap/cover maintenance (TSF); and
- Rehabilitation maintenance.

13 DOMAIN 8 REJECTS EMPLACEMENT AREA

The following table summarises the key rehabilitation and closure aspects as relevant to Domain 8.

Table 38 Summary of the Key Rehabilitation and Closure Aspects Relevant to Domain 8

Key Aspect	Domain-Specific Information
OCAL Complex Area	Rejects Emplacement Area (REA)
Total Area of Disturbance	54.50 ha
Post mining land use	• Pasture • Water management
Existing components	• Existing bushland; • New Tailings Dam wall buttress and REA emplacement to be rehabilitated to pasture; • REA Dam (sediment dam); and • 1.29 ha of planned water management (spillway).
Key obligations	• Retain a screen of existing vegetation, 50 m wide between the road and the rejects emplacement area; • A free-draining, stable, safe and sustainable landform; • A low bushfire and spontaneous combustion hazard; • Land capability consistent with Land Capability Classification Class (VI), which is suitable for grazing purposes; • A visually aesthetic landscape; • The development of the final landform will involve the strategic use of coarse reject in capping the existing Tailings Dam and developing the existing coarse reject emplacement to final contour; and • Topsoil required for the emplacement area will be sourced from on-site stockpiles, as well as biosolids and soil material recovered from areas that have been temporarily rehabilitated prior to their reshaping to final contour. Where topsoil supplies are inadequate, material will be sourced from offsite in accordance with the *Material Management Protocol* (**Appendix J**). ~~alternative~~ Alternatively organic material, such as biosolids, will be applied where required as a sustainable medium for vegetation growth.
Proposed Activities during the MOP	• Construction of the TSF Spillway and Water Drain; • Excavation of material from the Eastern Embankment for capping of the TSF and establishing a 1:4 (V:H) outer batter slope; • Construction of 0.12 ha of spillway to convey runoff water from the rehabilitated surface of the TSF (Domain 7) to Containment Dam 3 at the MCPP (Domain 9); • The installation of contour drains. • The majority of the infrastructure at the Rejects Emplacement Area (REA) will be removed as part of the closure works program. A number of water management measures are proposed within this domain to safely convey runoff from the altered landform into the existing contact water system which includes a number of treatment dams which ultimately report to Pond 3 before discharging offsite via. EPL1360 LDP1; and

Key Aspect	Domain-Specific Information
	• The Establishment of 48.66 ha of pasture revegetation established over the REA surface.

13.1 Baseline Conditions

Figure 33 shows the existing arrangement of Domain 8 as at July 2016.

Domain 8a comprises the REA, tailings dam embankments and REA Dam while Domain 8b shows the rest of the domain, north and east of the haul road.

Consent to establish the REA was granted by the NSW Department of Urban Affairs and Planning on 21 July 1981 as part of the Stockton Borehole Colliery re-development. This consent was modified in 1991 by the Lachlan Colliery consent that allowed an extension of the raw coal stockpiles into an area previously designated for coarse reject emplacement.

Following the 1981 consent, McColl Partners (1981) prepared a reject management plan that has been the basis for development of the tailings dam and coarse reject emplacement area. The design of the coarse refuse emplacement area in 1981 allowed for its progressive uphill expansion by the uphill emplacement method to RL 85 metres. This landform was subsequently altered to a free-draining landform over the entire reject emplacement area (including the tailings dam), with a final RL of 77 metres (Umwelt 2001). Following McColl Partners' original design, additional design detail was required as the tailings dam was lifted.

The REA is constructed adjacent to and over the TSF Eastern Embankment downstream slope, resulting in an emplacement of similar area to the TSF. The REA was progressively constructed by dumping, spreading and track-rolling in lifts to an ultimate surface RL 70 m, making the Eastern Embankment and the REA effectively a merged structure, with a wide crest and gently graded downstream slopes.

The Eastern Embankment forms the primary tailings retaining structure on the eastern side of the TSF. The Eastern Embankment extends approximately 500 m in length, spanning the broad, east-draining gully upon which the TSF is located. The gully is at approximately RL 25 m beneath the Starter Embankment.

The Eastern Starter Embankment was constructed in several lifts to RL 40 m from 1982 to 1985, using compacted clay and rockfill. A crest raise to RL 42.5 m was completed in 1986. Progressive downstream raising of the embankment between 1986 and 2004 resulted in the current crest at RL 70 m. This raising was conducted as part of the REA works, and consisted of a 5 m wide upstream zone of compacted coarse reject, with the downstream shell being track-rolled coarse reject placed integrally with the easterly-expanding REA.

Based on construction materials it is expected that seepage, emanating from the TSF, will have established a phreatic surface through the Eastern Embankment and into the REA.

The Northern Saddle Dam is the embankment located on the north-western side of the TSF, abutting to the west in natural ground, and to the north-east with the Eastern Embankment. The Northern Saddle Dam was commenced in 1993 to facilitate continued utilisation of the TSF impoundment. A Starter Dam was completed to RL 56 m to 57 m in 1995, using compacted gravelly clay and coarse reject. Progressive downstream raising of the saddle dam between 1996 and 2003 resulted in the crest raised to RL 61.0 m. The final crest raise was completed to RL 70 m in 2004 using compacted gravelly clay and coarse reject.

Since 2009 the Northern Saddle Dam downstream slope was augmented by the creation of an additional coarse rejects emplacement area at the toe and over the slope, forming a stabilising berm. To increase coarse reject storage capacity at the MCPP site, the downstream face of the Northern Saddle Dam was flattened from 2 (H) : 1 (V) to 4 (H) : 1 (V) by the construction of a track-rolled coarse reject buttress. This work was conducted between 2010 and 2013.

In 2007, six standpipe piezometers were installed on the northern edge of the Northern Saddle Dam crest, drilled though the embankment fill into the underlying foundation. The 2014 surveillance report noted that only the westerly two piezometers (P5 and P6) showed significant groundwater response, with P5 showing a level 1 m to 2 m above the foundation. The downstream toe of the Northern Saddle Dam is currently showing signs of seepage; this seepage has been observed over the last 1 to 2 years.

The REA Dam is surrounded by natural bushland with dirty water runoff draining into the dam and clean water runoff being diverted around the outside of the dirty water drainage system. The water levels are maintained at a low level in this dam by a diesel pump that pumps the water back to the TSF or Catch Dam 1. Dirty water runoff from the new tailings dam wall buttress support area (approximately 17 ha) reports to the REA Dam.

13.2 Current Closure/Rehabilitation Status

The REA and northern tailings embankment abut at approximately the same topography (RL 70) as at July 2016 at the end of mining. Total available rejects volumes are estimated to be between 3.7 to 6.0 million cubic metres. A phreatic surface passes from the TSF through the Eastern Embankment and into the REA; an installed monitoring bore in mid-July 2016 yielded a preliminary depth of 10 m to saturated rejects. Seepage was observed daylighting from the Northern Saddle Dam downstream embankment slope approximately one quarter of the way up from the toe.

Erosion rilling present on the REA (up to 1 m depth) was observed, as well as some unassisted vegetation volunteering on the surface of the rejects directly.

Domain 8b includes some undisturbed land, hardstands and an area where runoff from the REA actively pools.

No active rehabilitation of this domain was undertaken to date.