Appendix 2 Photographs

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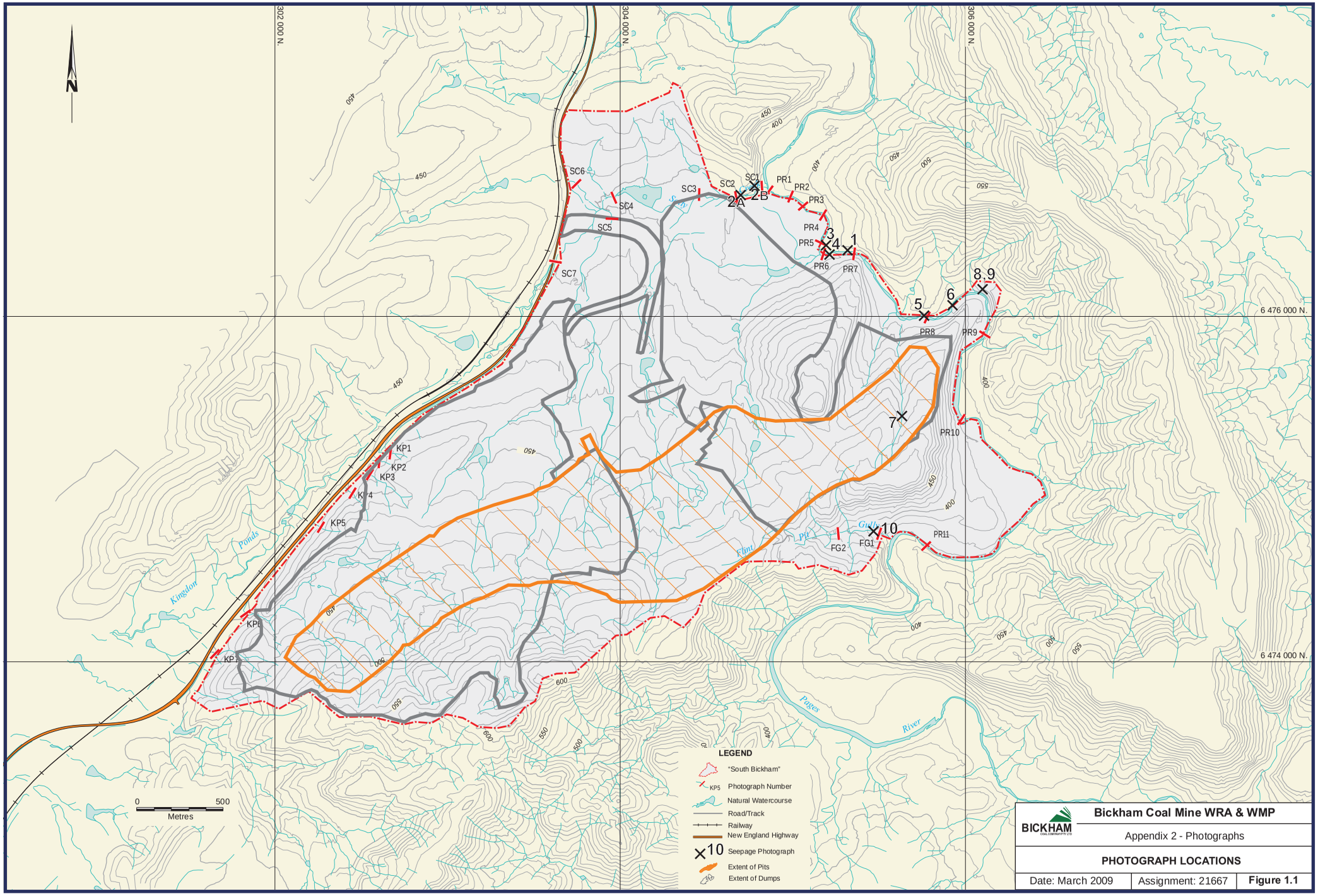
1. INTRODUCTION

This appendix addresses the requirement in DoP's scope to: "*provide photographs across the development site, with particular emphasis on any area for which a licence, permit or approval will apply. If water courses are impacted upon in the vicinity of the development, include photographs also looking upstream and downstream at points of geomorphic change or at distances of no greater than 500 m. A layout plan to indicate the location of the photographic reference points is to be included*".

The water courses of which photographs are included in this appendix are:

- Pages River
- Salty Creek
- Flint Pit Gully
- Tributaries of Kingdon Ponds
- Groundwater Seeps.

The photograph locations are shown on Figure 1.1.


302 000 N
304 000 N
306 000 N
6 476 000 N.
6 474 000 N.
SC1
SC2
SC3
SC4
SC5
SC6
SC7
PR1
PR2
PR3
PR4
PR5
PR6
PR7
PR8
PR9
PR10
PR11
1
2A
2B
3
4
5
6
7
8,9
10
KP1
KP2
KP3
KP4
KP5
FG1
FG2
Ponds
Kingdon
Pit
Flint
Pages
River
0
500
Metres
LEGEND
"South Bickham"
KP5 Photograph Number
Natural Watercourse
Road/Track
Railway
New England Highway
×10 Seepage Photograph
Extent of Pits
Extent of Dumps
BICKHAM COAL COMPANY PTY LTD
Bickham Coal Mine WRA & WMP
Appendix 2 - Photographs
PHOTOGRAPH LOCATIONS
Date: March 2009
Assignment: 21667
Figure 1.1

2. PAGES RIVER

2.1 Pages River Site PR1 – Looking upstream

2.2 Pages River Site PR2 – Looking downstream

2.3 Pages River Site PR2 – Looking upstream

2.4 Pages River Site PR3 – Looking upstream – left bank

2.5 Pages River Site PR3 – Looking downstream – right bank

2.6 Pages River Site PR3 – Looking upstream – right bank

2.7 Pages River Site PR4 – Looking downstream - right bank

2.8 Pages River Site PR5 – Looking upstream - right bank

2.9 Pages River Site PR6 – Looking upstream

2.10 Pages River Site PR6 – Looking downstream into gorge

2.11 Pages River Site PR7 – Looking upstream from gorge

2.12 Pages River Site PR8 – Looking upstream

2.13 Pages River Site PR9 – Looking downstream

2.14 Pages River Site PR9 – Looking downstream

2.15 Pages River Site PR10 – below Long Pool – Looking upstream into Long Pool

2.16 Pages River Site PR10 – Long Pool

2.17 Pages River Site PR11 – Looking upstream

2.18 Pages River Site PR11 - Looking upstream – right bank

3. SALTY CREEK

3.1 Salty Creek Site SC1 – Looking up Salty Creek from left bank of Pages River

3.2 Salty Creek Site SC2 – Looking across section

3.3 Salty Creek Site SC2 – Looking upstream

3.4 Salty Creek Site SC2 – Looking downstream

3.5 Salty Creek Site SC3 – Looking downstream

3.6 Salty Creek Site SC4 – Crossing upstream of dam - Looking downstream

3.7 Salty Creek Site SC5 – Eastern Tributary – Looking downstream

3.8 Salty Creek Site SC5 – Eastern Tributary – Looking upstream

3.9 Salty Creek Site SC6 – Western Tributary at Highway - Looking downstream

3.10 Salty Creek Site SC7 - Centre Tributary at Highway – Looking downstream

4. FLINT PIT GULLY

4.1 Flint Pit Gully Site FG1 - At property boundary looking upstream

4.2 Flint Pit Gully Site FG1 – At property boundary looking downstream

4.3 Flint Pit Gully Site FG2 – Looking upstream

4.4 Flint Pit Gully Site FG2 – Looking downstream

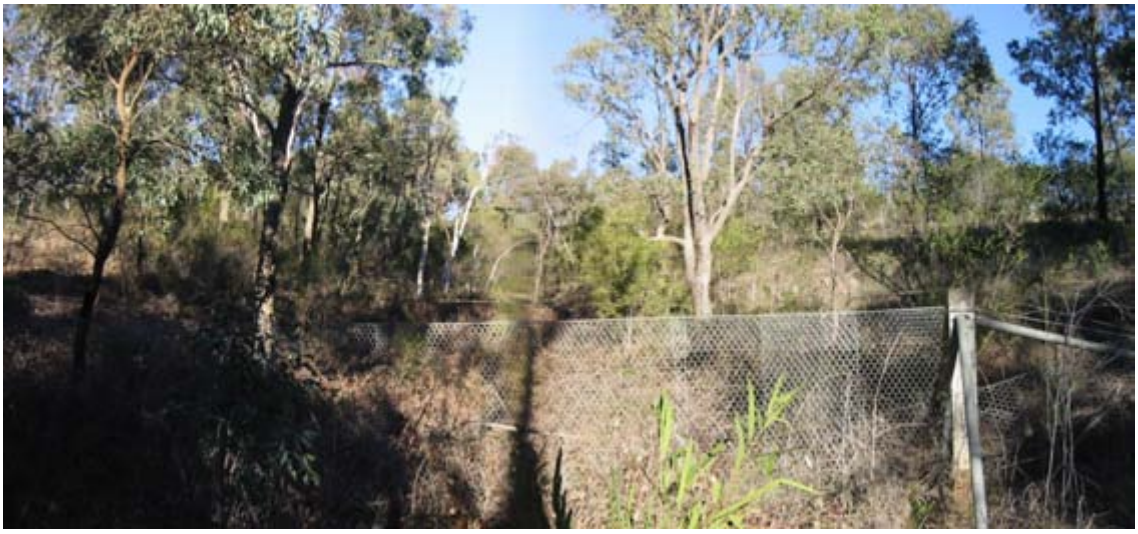
5. KINGDON PONDS TRIBUTARIES

5.1 Kingdon Ponds: Minor Gully Site KP1 – Looking upstream

5.2 Kingdon Ponds: Minor Gully Site KP2 – Looking upstream

5.3 Kingdon Ponds: Minor Gully Site KP2 – Looking upstream

5.4 Kingdon Ponds: Minor Gully Site KP3 – Looking upstream



5.5 Kingdon Ponds: Minor Gully Site KP4 – Looking upstream

5.6 Kingdon Ponds: Minor Gully Site KP5 – Looking upstream

5.7 Kingdon Ponds: Minor Gully Site KP6 from road – Looking upstream

5.8 Kingdon Ponds: Minor Gully Site KP6 from left bank – Looking upstream

5.9 Kingdon Ponds: Minor Gully Site KP7 from road – Looking upstream Note right and left forks

5.10 Kingdon Ponds: Minor Gully Site KP7 - Left fork - Looking upstream

5.11 Kingdon Ponds: Minor Gully Site KP7 - Right fork – Looking upstream

6. GROUNDWATER SEEPS

6.1 Bickham Gorge on Pages River looking north-west from surface water sampling location BCSW1, showing typical gorge structure with Permian hard rocks outcropping on both north and south bank

6.2 a

6.2 b

6.2 Seepages on tributary along northern boundary of Bickham property
a. BCSW7 monitoring site;
b. Pool/soak just above Pages River confluence

These photographs were taken in the northern tributary, which flows into Pages River from the west. It drains from a catchment that includes the alluvial flats upstream of Bickham Gorge, and extends across to the western side of New England Highway. The stream flows intermittently in the middle section (where monitoring sites BCSW7 and BCSW8 are situated), but there is generally no visible water in the downstream section, except periodically in isolated pools. During inspection of the above sites on 16 September 2004, water quality measurements recorded ECs of 3090 µS/cm and 3280 µS/cm and pHs of 8.07 and 8.13 respectively, and there was no visible discharge to Pages River.

6.3

6.4

6.3 Seepage on east bank of Pages River, upstream of Bickham Gorge

6.4 Minor seepage on west bank of Pages River, upstream of Bickham Gorge

Seepages just upstream from the Bickham Gorge are shown in Plates 6.3 and 6.4. The water quality of these seepages was measured on 20 September 2006 as EC 2020 µS/cm and pH 8.45 (Plate 6.3), and EC 1868 µS/cm and pH 7.44 (Plate 6.4).

6.5

6.6

6.5 Seepage from local alluvium above Permian bedrock, on north bank of Pages River, downstream of Bickham Gorge

6.6 Small seepage from Permian sediments on north bank of Pages River, downstream of Bickham Gorge

The seepage zone depicted in Plate 6.5 shows groundwater emerging from the base of streambank alluvium sitting on the top of Permian outcrop above river level on the north side of Pages River, downstream of BCSW1. Water quality parameters for the seepage on 16 September 2004 were measured as EC 1030 µS/cm, pH 8.83. A similar seepage some 500m further downstream is depicted in Plate 6.6.

6.7 a

6.7 b

6.7 Seepage in gully below Haul Road, west of bulk sample site
a. 1 August 2006;
b. 11 December 2006


6.8 Seepages from siltstones above G Seam – north bank of Pages River. The bare patches on the river bed are caused by the high salinity and low pH of the seepage water


6.9 Seepages from siltstones above G Seam – north bank of Pages River. The bare patches on the river bed are caused by the high salinity and low pH of the seepage water

The seepages shown on Plates 6.8 and 6.9 are small volume seeps emerging from shales and siltstones overlying the G Seam where it outcrops on the northern bank of Pages River, north-east of the proposed mine site. The water from these seeps is saline and acidic, with measured EC of 4070 µS/cm and pH of 4.0 when sampled on 1 August 2006. The river within the white patch below the seep had an EC of 1413 µS/cm and pH of 8.3. The clear white patch in front of each seep is caused by seepage water fanning out across the river bed, and the high salinity and low pH inhibiting the growth of weed and algae. The area of influence by the seepages is small, as the river water has reached background EC and pH values within a few metres of the seepage entry point to the river

6.10 Area of lush grass at base of gully below bulk sample overburden dump, 50m above Pages River confluence

Periodically, seepages are also visible in places along the gully below the former flint clay quarry which was rehabilitated during the bulk sample project. At the downstream end of the gully, no seepage has been observed, but there is a lush growth of grass indicating the presence of water close to the surface (Plate 6.10). The highest point of visible seepage within the gully is close to the subcrop line of the base of the Koogah Formation. The seepage does not reach Pages River, as it is lost to evapotranspiration before reaching river level.