MEMO

TO	Tom Williams	**FROM**	Thomas Eckhardt
DATE	**16 November 2018**	**CONFIDENTIALITY**	**Confidential**
SUBJECT	**Abbey Consols Constraints and Opportunities Document (Final)**		

Abbey Consols Constraints and Opportunities Document

1. INTRODUCTION

This document is produced as part of the Abbey Consols Metal Mine Surface Water Management System Design and Mine Water Treatment Feasibility Study undertaken by WSP. It summarises the results of the initial desk top reviews of available information together with observations from initial site walk overs with focus on identifying site constraints and opportunities. General information in the main text is intended to be short with more detailed and discipline specific descriptions being provided in the appendices. The information in this document will act as a starting point for the various engineering design activities and for further environmental assessments required as part of subsequent project stages. Details provided in this document are not intended to be final and will be further assessed, updated and validated to meet the environmental, permitting and Health & Safety requirements of the project.

The overall objective of the document is the provision of the Constraints Map which summarises locations on site with particular concerns, i.e. areas which should be avoided or which require more detailed surveys, assessments and potentially mitigation if work is proposed there. The Constraints Map will be updated throughout the project and shared between the NRW and the WSP delivery teams.

Detailed information from site walk overs, preliminary assessments, maps and an Envirocheck report for the site are provided as appendices to this document, i.e. Topographical Survey Map (Appendix 1), Water Feature Survey (Appendix 2), Blow Out Risk Assessment (Appendix 3), Preliminary Ecological Appraisal (Appendix 4), Heritage Report (Appendix 4) and Envirocheck Report (Appendix 5).

All information presented on figures is available as ArcGIS files and is included in the project GIS model.

2. SITE DESCRIPTION

2.1. Site location

Abbey Consols mine is situated in mid-Wales on the edge of the Cambrian Mountains, approximately 23km southeast of Aberystwyth and 1.5km southeast of the small village of Pontrhydfendigaid. The site location and site boundary are shown on Figure 1 in Appendix 1.

The site is cut into the gently sloping land on the northern side of the Afon Teifi valley with a footprint of approximately 5.5 hectares. A steeper slope is observed to the north of the site where the ground rises from ~ 200m AOD to ~ 240-250m AOD (area of the historic mining shafts) and beyond. There is evidence of historical mine infrastructure remaining at several locations onsite and to the north of the site.

The historical mining features can be grouped into three areas (area to the north with mine workings, the adit connecting the workings and the former processing area). To the north of the lower processing area, a series of shafts and vents are located in a linear SW-NE orientation, following a mineralised fault zone. Only one of the shafts is still open while the others have subsequently been partially and loosely infilled or collapsed since mine closure.

An adit connects the mine workings to the north of the site with an obscured adit entrance location in the northern part of the lower processing area. The adit was used both as an ore extraction point and to discharge pumped mine water. The obscured adit entrance location has been estimated from historical maps with the exact location not being confirmed. The adit still acts as the discharge route for water from the mine workings but the mine water emerges in a pipe below a site access road about 40m south of the expected location of the adit entrance. The mine water discharges from the pipe on the south side of the road, with the pipe appearing to run below the road. There is a concern that mine water levels within the mine are elevated above the blocked adit portal that could cause pressure to build up either at the adit entrance and/or at other blockage(s) in the mine workings. This has been assessed in a Mine Water Blow Out Risk Assessment (see Appendix 3), including recommendations on how to investigate the area. The mine was described as an open cast on early OS plans, however recent borrow pit activity by the owner's father extended/opened the small quarry onsite to the west of the adit entrance location, which is unrelated to the mining history.

The adit was connected with the main processing area to the south of the current access road. The former processing area has been covered with mine waste tips forming a significant part of the site. Spoil has been removed previously and may have been used during the construction of the race track that traverses the site. The remaining spoil heaps with below ground structures cover an area of ~1.5 hectares and together with the adit discharge, which flows in a ditch around the waste tips towards the Afon Teifi, act as the main source of groundwater and surface water pollution.

The access road has been extended across the waste tips and is used as a motor race track.

The Afon Teifi defines the southern limit of the site boundary flowing in westerly direction.

Small wooded areas are present close to the river and to the northeast of the site.

2.2. Mining history

The mine, abandoned since the early twentieth century, exploited the ores galena and sphalerite, rich in lead, silver and zinc. Evidence suggests the area was originally mined by monks from the nearby Strata Florida Abbey. The oldest features in the linear series of shafts and vents that follows the mineralised fault zone are believed to be small scale workings to the eastern end close to Bron-y-berllan. A new phase of development in the 1840s drove in new shafts in the western end of the mine footprint. By the 1850s, extensions toward the east were ongoing and the deep adit (now blocked) had been driven horizontally into the hillside to cut the lode. At this point, new infrastructure was rapidly being installed to improve production. At surface, construction of a new watercourse (leat) and wheelhouse provided power for drawing extracted material and pumping out groundwater. By the early 1860s the mine had produced 466 tonnes of lead concentrates and 845 troy ounces of silver among other commodities in a six-year period.

Over the 1870-1890s the mine changed hands frequently and production quietened with a last flurry of activity in the early 1900s; the last output from the mine is reported in 1913.

2.3. Geology

The bedrock geology at regional scales (1:625 000) consists of a south dipping sequence of the Silurian age Llandovery Rocks comprising mudstones, siltstones and sandstones (Figure 2). On smaller scales (1:50 000), the Llandovery sequence in the Abbey Consols locality comprises the Devil's Bridge Formation (an interbedded mudstone and sandstone) and the Rhayader Mudstones Formation (mudstones). Regional folding and uplift occurred during the Caledonian orogeny and gave rise to the synclinal structure observed. The mineralisation is recorded to be contained within a northeast - southwest trending fault to the north of the site, dipping southwards between 55 and 70 degrees. The bedrock is exposed in the small quarry on site.

Superficial deposits of glacial till and alluvium (clay, silt, sand and gravel) are present. Glacial till overlying bedrock is present away from the valley floor as a layer comprising predominantly fine sediments that covers much of the more gently sloping hillside (Figure 3 Appendix 1). As described in the BGS Site Visit Report (2012), glacial till is also exposed at a small cliff next to the river in the south-western part of the site. Alluvium overlays the bedrock along the margins of the Afon Teifi within the floodplains. The sediment is normally soft to firm with compressible silty clay, but can contain layers of silt, sand, peat and basal gravel. To the north of the site, at the steeper slopes, no drift cover is present, with a thin layer of topsoil overlaying weathered bedrock.

Mine waste tips cover most of the central part of the lower processing area. It has not been confirmed whether the waste material was deposited on natural drift deposits or directly on top of weathered bedrock, though the latter is considered unlikely.

It should be noted that previous ground investigations at the site have primarily focused on waste characterisation and definition of metal loadings with little effort spent on defining the vertical and lateral extent of waste or nature of underlying materials. Some intrusive ground investigation was undertaken as part of the Excal (1999) and the BGS (2012) studies.

2.4. Hydrogeology

Regionally, bedrock is expected to be of low hydraulic conductivity, i.e. with very limited ability to transmit groundwater (classed as Secondary B aquifer). The highest hydraulic conductivities are expected within the fault zone to the north of the site and within the weathered bedrock zone. Bedding plane seepages were observed at the quarry face during a site visit in May 2018 and in previous studies (BGS, 2012).

The extent of influence on groundwater dynamics as a result of the historic mine workings is difficult to quantify without groundwater level monitoring data. During mine life, dewatering of the mine would have lowered groundwater in a very localised area around the footprint of the mine due to the tightness of the formation and the low hydraulic conductivities. At the point of mine closure, groundwater levels would have rebounded and raised to the adit level.

Groundwater flow on site is expected to be dominated by the material properties and thicknesses of the drift deposits and the man-made impact at and around the mine waste tips. Preferential flow paths may exist within coarser drift material (in particular within the alluvium) and within the waste material.

The northern half of the waste tips are dominated by coarse material compared to fine waste material (tailings/former slime pits) dominating the southern half of the tips. The fine material may act as a dam or barrier to groundwater flow and together with an increased groundwater recharge rate in coarse material has probably caused a groundwater table rise within the waste tips, indicated by seepages from the fine materials observed during the WSP site visit in May 2018 (Appendix 2: Water Features Survey).

Additional substantial groundwater recharge is likely to originate from steep slope runoff in the northern part of the site, i.e. in the area where drift cover thickness increases approximately along the access road.

A marshy area at the north-western site boundary also indicates a scenario of groundwater accumulation within the waste, perhaps associated with a natural spring line at the break in slope. A contribution of adit discharge to the shallow groundwater/springs in this area cannot be excluded at this point.

Figure 5 (and Figure 6) presents a visualisation of the current conceptual understanding of the groundwater flow conditions on site taking into account potential impacts by the waste tips. This is discussed further within Section 3.

2.5. Hydrology

In addition to the adit discharge ditch there is another small stream running along the western boundary of the site. Both streams receive seepages or groundwater from the waste tips and both streams discharge into the Afon Teifi at the southern boundary of the site.

The Afon Teifi is a major river running through central and south Wales. Flood hydrographs from nearby gauging stations at Pontrhydfendigaid show the catchments to be flashy with short lag times and significant peak flows.

This region of Wales has a strongly maritime climate with high annual average rainfall totals between 1200-1400mm, caused by predominant south-westerly winds pushing moist air in to the higher elevations of the Cambrian Mountains. The average monthly rainfall of 100 to 120mm can generally be expected across all seasons.

Surface water flow generally follows topography with surface runoff estimated to form the predominant flow mechanism on steeper slopes. On shallow gradients, where permeabilities in the glacial till allows, a higher proportion of infiltration will be accepted.

2.6. Utilities search

A number of utilities providers have been contacted regarding services within the vicinity of the Abbey Consols site. The majority were contacted via 'Linesearch Before-U-Dig' (LSBUD) of which only Western Power Distribution have assets in the area. The route of their overhead electricity cables has been added to the summary Constraints Map (Figure 7 in Appendix 1). Potential asset owners which are not registered with LSBUD are listed in Table 2.1 below. These have been contacted separately. Of these, we have not received responses from ten owners, as highlighted on the table. The only one of those we expect to have assets in the area is Welsh Water.

Table 2.1 Contacted potential utilities owners who are not LSBUD registered

Asset Owner	Status of response
BT	Not affected
CenturyLink Communications UK Limited	Not affected
Ceredigion County Council	No response
CityFibre	No response
Colt	Not affected
Dwr Cymru Welsh Water	No response
Energetics Electricity	Not affected
ENGIE	No response
GTC	No response
Interoute	No response
KPN (c/-Instalcom)	Not affected
Mobile Broadband Network Limited	No response
Sota	Not affected
Utility assets Ltd	No response
Verizon Business	Not affected
Virgin Media	Not affected
Vodafone	Not affected
Vtesse Networks	No response
Wales and The West Utilities	No response

2.7. Topographical survey

A detailed topographical survey for the site was undertaken by WSP in May 2018. The survey results are presented on Figure 4 (Appendix 1).

3. PRELIMINARY CONCEPTUAL SITE MODEL

To be able to assess the mobilisation of the heavy metals from the site into the water environment a preliminary Conceptual Site Model (CSM) has been developed. This is based on information provided in previous studies and research carried out for the Water Features Survey (Appendix 2) and Blow Out Risk Assessment (Appendix 3). The CSM will evolve with the ground investigation (i.e. ground model), more detailed reviews of the metal loading distributions and remediation measure discussions required as part of the Benefit Assessment and which are included in the project scope.

The following descriptions should be read together with Figure 5 and Figure 6 (Appendix 1).

METAL SOURCES:

The main sources of heavy metals (zinc, cadmium and lead) on site are:

- Dissolved metals in the groundwater discharges (adit predominantly);
- Reactive mine waste (coarse and in particular fine material); and
- Waste particles that have been transported towards the floodplain via erosion from the tips and natural soils which have been affected by polluted groundwater or surface water over time.

PATHWAYS:

The dominant pathways between the sources and the Afon Teifi are likely to be:

- Direct discharge via surface water flow (e.g. adit discharge or seepages);
- Infiltrating rainfall, mobilising metals from the waste material; and
- Contact between groundwater and the waste material followed by groundwater transport towards surface water features.

RECEPTORS:

Groundwater within the drift aquifer and minor surface water features on site are receptors but the most sensitive receptor is the Afon Teifi which is polluted with heavy metals (mainly zinc) downstream of the site.

The focus of the project is to improve the Water Framework Directive (WFD) water quality status of the Afon Teifi. Proposed remedial measures will therefore target breaking pollutant linkages between the heavy metal sources on site and the Afon Teifi.

4. ENVIRONMENTAL BASELINE (CONSTRAINTS AND OPPORTUNITIES)

4.1. Introduction

This section of the report identifies potential environmental constraints and opportunities within 2km of the site. It also recognises local challenges, gaps in data knowledge and recommends further survey requirements.

4.2. Ecology and biodiversity

STATUTORY SITES OF NATURE CONSERVATION INTEREST

The site is located within a rural setting, surrounded by predominantly agricultural fields and a large area of mature woodland to the south and southeast of the site, with a smaller section of woodland situated to the north of the site. A review of statutory designations within 2km of the site was undertaken, the results are presented in Table 4.1.

Table 4.1 Statutory Designations within 2km of the scheme boundary

Designated Site	Designation	Distance & Direction from the site	Summary of Qualifying Features
Afon Teifi	SAC	10m south of the site.	Designated for presence of Annex II species including salmon, bullhead and three UK lamprey species and annex I habitats including water courses of plain to montane levels with the *Ranuculion fluitantis* and *Callitricho-Batrachion*.
	SSSI	10m south of the site.	
Coed Mynachlog-Fawr	SSSI	400m southeast of the site.	Designated for the presence of Annex II species.
Elenydd	SSSI	1.7km east of the site.	Site of breeding Peregrine Falcons and Red Kites.
Elenydd Maellen	SPA	1.7km east of the site.	Site is designated as it supports Merlin Falcon and Peregrine Falcon populations of European importance.
Rhos Gargoed	SSSI	1.4km northeast of the site.	Designated for the presence of Annex II species.

The desk study was undertaken by using MAGIC website www.magic.gov.uk, and www.lle.gov.wales/home which provides authoritative geographic information about the natural environmental from across the government.

NON-STATUTORY SITE OF NATURE CONSERVATION INTEREST

There are no non-statutory sites within 2km of the site.

SITE CHARACTERISTICS AND HABITATS

The woodland (Coed Penybannau) north of the shaft, is designated as semi ancient natural woodland. The area surrounding the mine is predominately grazed.

PROTECTED AND NOTABLE SPECIES

Ecological surveys have been undertaken between 1992 and 2016. The site has been surveyed for lichens on only three previous occasions (S.P. Chambers 1992; A.M. Fryday & S.P.Chambers 1993, Sam Bosanquet 2016), The surveys have identified the following species of interest;

- Bryophyte species including; Polytrichum piliferum, Hypnum cupressiforme, Dicranum scoparius, Rhytidiadelphus squarrosus;
- Polytrichum piliferum, Pogonatum aloides, Grimmia donniana and Diplohyllum albicans; and
- Notable and nationally rare lichen Rhizocarpon cinereovirens[1].

ECOLOGICAL WALKOVER

An Extended Phase 1 habitat survey was undertaken on the 24th May 2018. During the site visit the following observations were recorded:

- Potential badger sett (to be confirmed following recommendations);
- An otter spraint identified along the banks of the Afon Teifi within approximately 100m of the site;
- Several trees with low potential to support bat roosts within the southern wooded area surrounding the Afon Teifi however this area is not anticipated to be affected by the proposed works. The Proposed Treatment Works currently suggests covering the shafts therefore sealing entrances that may be used by bats to access the mine. Further surveys including hibernation and swarming surveys are therefore required;
- Several habitats with potential to support reptiles; and
- Interesting botanicals with several notable flora species.

A follow up survey has been conducted by NRW on the 6, 21 and 28 August 2018 including both a site desktop study and a series of appraisals from site walkovers. This survey was following up recommendations in relation to bats, badgers and otters along with a small area of marshy grassland identified onsite. The following were identified:

- Marshy grassland corresponding to the Environment Wales Act Section 7 Priority Habitat – Purple Moor grass rush pasture. Mitigation measures should be implemented in order to safeguard this habitat as dictated by the NRW Ecological Report 2018.;
- No suitable water vole habitat was observed during the site survey:
- Significant signs of otter activity were found including regular spraints and the presence of a resting sites. The NRW Ecological Report 2018 states that **"**Should works be required alongside or within 10m of the river corridor then an adequate buffer and working methods will need to be agreed with the ecologist. Pre-commencement checks, a tool-box talk and ongoing monitoring will be required".
- Adit in woodland and air shaft - It is understood there are no proposals to undertake works in the vicinity. Should this change then bat survey and assessment would be required;
- It is recommended that any ground clearance operations should be undertaken outside the bird breeding season (February to August);
- We recommend that ground clearance is undertaken during the late autumn/early winter and completed by March. This is to minimise the impacts to any reptiles present on site.

4.3. Areas of Populations, Community Resources and Infrastructure

The village of Pontrhydfendigaid is located 1.5km to the northwest of the site and contains several community facilities, including; a local convenience shop, pubs and restaurants, Bed and Breakfast accommodation, holiday homes, and a caravan park. Strata Florida Abbey is situated 1.5km southeast of the site. There is one public right of way (PRoW) within proximity of the site which is located to the south of the site boundary and broadly follows the course of the Afon Teifi between Pontrhydfendigaid and Strata Florida Abbey.

The main noise sources in the area include traffic and background noise from cars using Abbey Road, Terrace Road (B4343) and local amenities within Pontrhydfendigaid.

4.4. Water Environment

The Afon Teifi water quality is monitored to aim to achieve good quality status of the waterbody under the Water Framework Directive 2000 (WFD).

[1] Dyfed Wildlife Trust Mid- Wales Metal Mine Survey, 1993

The river is subject to contaminated run off from the site which is having an impact (based on the WFD assessment scale) on the receiving watercourses and is therefore lowering the WFD Classification of the River. The Water Framework Directive Cycle 2 Extended Waterbody Summary Report has defined the overall classification of the site as moderate with an aspiration to have a good status by 2021.

There are no other watercourses within proximity to the site. However, the Afon Teifi also discharges into the Glasffrwd River which is located approximately 440m south-west of the site. The Glasffrwd River (which flows through the Coed Mynachlog-Fawr SSSI) is located approximately 475m downstream of where the Glasffrwd converges with the Afon Teifi. There is a feeder stream from the Glasffrwd passing the Abbey and entering the Teifi upstream of the site.

The site is not within a designated Flood Zone, however the land south of the mine surrounding the Afon Teifi is designated High Risk of flooding from Rivers, and low risk of flooding from surface water.

The site is not located within any Source Protection Zones[2], however, the south west of the site is located just within a Secondary A Aquifer. There is one water quality sampling point south west of the site.

4.5. Historical Land use

There are no historical or recorded landfill sites within 1km of the site and no significant urbanisation within the immediate surroundings during the last 130 years as it's predominately agricultural land.

There are three British Geological Survey (BGS) Recorded Mineral Sites within the site. A large area of the site is designated as a potential contaminated risk due to its historical land use[3].

4.6. Air Quality

There are no AQMAs within 2km of the site and therefore the air quality in this area is considered to be good. There are no heavy industry activities nearby and only one main road (B4343) present.

4.7. Cultural Heritage, Historic and Landscape Designations

The following Cultural Heritage and Historic and Landscape Designations are within 2km of the site:

- Upland Ceredigion Landscape of Outstanding Special Historic Interest which covers the site and extends from Tregaron to Tywi Forest in the south, heading north to Tal-y-bont and Nant-y-moch Reservoir. The site is also within the Ystrad Fflur Historic Landscape Character (HLC)4;
- The Abbey Consols mine is listed by the Royal Commission on the Ancient and Historic Monuments of Wales (RCAHMW) in the National Monument Record for Wales (NMRW) and within the site are 11 recorded non-designated archaeological features which range from Wheelpit remains, fine tips, ruined tanks, site of ore bins, and development rock tips5;
- There are no listed structures at the site. The closest listed structures are at Strata Florida Abbey located approximately 450m southeast of the site, and several at Pontrhydfendigaid which include those listed in Table 4.2;
- There are four Scheduled Monuments within 2km of the site, which include those listed in Table 4.2; and
- There are no World Heritage sites, Conservation Areas or Historic Parks and Gardens within proximity of the site6.

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[2] https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk/?lang=en. Date accessed: 12/06/2018
[3] Envirocheck Maps, May 2018
[4] Metal Mines Remediation Project Part 1: Abbey Consols, DAT Archaeological Services, March 2016
[5] Metal Mines Remediation Project Part 1: Abbey Consols, DAT Archaeological Services, March 2016
[6] lle.gov.wales/ Date accessed: 12/06/2018

Table 4.2. Listed Structures within 2km of the scheme.

Listed Structure	Designation	Distance & Direction from the site
Church of St Mary	Grade II Listed Building	450m southeast of the site
Strata Florida Abbey Ruins	Grade I Listed Building	450m southeast of the site
Great Abbey Farmhouse including Front Garden Wall	Grade II* Listed Building	450m southeast of the site
Outbuilding to south of Great Abbey Farmhouse	Grade II Listed Building	450m southeast of the site
Cowhouse at east End of Farmyard at Great Abbey Farm	Grade II Listed Building	450m southeast of the site
Barn Range at west End of Farmyard at Great Abbey Farm	Grade II Listed Building	450m southeast of the site
Farm Building on North Side of Farmyard at Great Abbey Farm	Grade II Listed Building	450m southeast of the site
Dolgoed	Grade II Listed Building	450m southwest of the site
Dol Teifi	Grade II Listed Building	450m west of the site
Islwyn	Grade II Listed Building	1.2km west of the site
Railings to Rhydfendigaid Calvinistic Methodist Church	Grade II Listed Building	1.2km west of the site
Strata Florida Churchyard Cross	Scheduled Monument	450m southwest of the site
Strata Florida Abbey	Scheduled Monument	500m southwest of the site
Pen y Bannau Camp	Scheduled Monument	500m northwest of the site
Gilfach Y Dwn Fawr Defended Enclosure	Scheduled Monument	1.3km southwest of the site

A site visit was completed by WSP's Heritage Team on the 5th June 2018 (Appendix 4). The site visit identified a number of archaeological assets including the remains of walls and launders (timber channels for carrying water) associated with the historical mining activities. The remains of walls and launders are considered to be of high value and will need careful consideration as part of the design and construction of the project. In general, the archaeology identified as part of the site visit was considered to be in good condition. A record of all archaeological assets identified as part of the site visit can be found in the Heritage Report (Appendix 4) which also analyses the other surveys completed by both Dyfed Archaeological Trust Archaeological Assessment 2016 and Robert Protheroe Jones Site Notes 1992.

4.8. Landscape and Visual Resources

The site is situated within a rural agricultural field and is predominately screened from the road by mature trees and hedgerows which line Abbey Road. There is an access road which runs through the northern part of the site to the Mid Wales Activity Centre, and the views from here are more open and take in the rolling hillsides and mountains which surround the gentle sloping valley. The wider landscape comprises predominately agricultural fields which are separated by mature trees and hedgerows which contain larger pockets of woodland and small track roads which provide access to the local farms.

There are several residential dwellings further west on Abbey Road, however the views from here are restricted due to the vegetation lining the road.

The proximity and the views from the Abbey at Strata Florida towards the site are of particular importance in terms of visual impacts from a proposed remediation scheme.

4.9. Environmental Action Plan for the proposed Ground Investigation

An Environmental Action Plan (EAP) has been developed for the proposed intrusive ground investigation, clearly highlighting actions to manage the environmental constraints. The agreed actions could be relevant for other future site construction activities however will be reviewed when the full scheme goes to construction.

5. SUMMARY MAP FOR SITE CONSTRAINTS

A first version of the site Constraints Map has been produced as part of this preliminary review. Figure 7 in Appendix 1 summarises areas on site which have specific issues as identified in the sections above. That means that if works are considered in highlighted areas specialist advice will be required including potential mitigation measures. There are a number of constraints related to the waste tips themselves. Flood zones, overhead electricity cables and heritage constraints limit the availability of land as potential treatment areas.

The proximity to the Abbey at Strata Florida requires careful assessments of visual impacts of a proposed remediation scheme.

It should be noted that as the project progresses and additional information becomes available these constraints and opportunity areas may change and new constraints and opportunities may be identified.

APPENDICES

Appendix 1 General Figures

FIGURE 1 SITE LOCATION MAP

FIGURE 2 GEOLOGICAL MAP (DRIFT)

FIGURE 3 GEOLOGICAL MAP (BEDROCK GEOLOGY)

FIGURE 4 TOPOGRAPHICAL SURVEY MAP

FIGURE 5 SITE CONCEPTUAL MODEL (GROUNDWATER FLOW CONDITIONS)

FIGURE 6 SITE CONCEPTUAL MODEL (SCHEMATIC CROSS SECTION)

FIGURE 7 SUMMARY CONSTRAINTS MAP

Appendix 2 Water Feature Survey

Appendix 3 – Blow out Potential Risk Assessment

Appendix 4 – Environmental walkovers/desk studies

PRELIMINARY ECOLOGICAL APPRAISAL

ARCHAELOGICAL CONSTRAINTS REPORT

Appendix 5 – Envirocheck Report